

Forest Products Laboratory

Strategic Plan

June 2010



Introduction

America's forests are among its most precious and enduring natural resources. For centuries, forest products have been used in countless forms to meet the daily needs of humanity, and over time, the lumber and paper industries have become pillars of the American economy. To address the need for centralized research on forest products, the USDA Forest Service Forest Products Laboratory (FPL) was established in 1910. A century later, FPL is a recognized institution, not only for its innovative research on wood products, but also for its contribution to the establishment of standards for testing, quality, and safety of wood products.

The Forest Products Laboratory has a long and accomplished history. From the earliest work developing preservatives for railroad ties to lengthen their service life and ease the demand for harvesting trees; to wartime efforts when 700 employees worked around the clock to improve aircraft parts, ships, and packaging; to developing a sawing model that saved a probable industry collapse in the 1970's and still keeps one billion board feet of lumber from going to waste every year; FPL has evolved through the years to meet the needs of the era.

Meeting the needs of modern society requires a highly-technical approach, and researchers are treading new ground as they work to develop safe, durable, and energy efficient housing; create high-quality products from materials often seen as waste; and produce biobased energy that will reduce America's dependence on oil and help fight the effects of global warming.

Nanotechnology, the study of matter at the atomic and molecular level, is allowing scientists to study wood at a more fundamental level than ever before, and has the potential to revolutionize the forest products industry.

Sufficient equipment and facilities are essential to conducting breakthrough research of any kind. Opening in June 2010, FPL's new Centennial Research Facility is keeping the Lab at the forefront of forest products research. It allows scientists to perform full-scale testing of wood-framed buildings, formulate new environmentally friendly wood preservatives, develop advanced composite products in a manufacturing-friendly space, and test the durability of wood products with a one-of-a-kind weathering chamber.

Yet even with top-notch facilities, a century-long record of success, and researchers who are among the best in the world, we recognize that a successful future depends on building strategic partnerships. We cannot forge ahead alone. Creating partnerships and conducting collaborative research with industry, academia, and other government agencies allows for leveraging of funding, equipment, and expertise to reach common goals. Such collaborations lead to advancements in both fundamental and applied science that address the many environmental and economic challenges we face now and in the future.

This strategic plan sets the course for research at the Forest Products Laboratory for the next five years and beyond. The document describes the external forces that drive and direct FPL research, explains our current capabilities and areas of expertise, and outlines the capabilities and strategies necessary to meet our goals. Following this plan enables us to meet the needs of the present era as we look to a new century of research.

Mission

The mission of the Forest Products Laboratory is *to identify and conduct innovative wood and fiber utilization research that contributes to conservation and productivity of the forest resource, thereby sustaining forests, the economy, and quality of life.*

The strategic goals set forth in this plan contribute to achieving the mission of the United States Department of Agriculture, *to provide leadership on food, agriculture, natural resources, and related issues based on sound public policy, the best available science, and efficient management.*

FPL's mission also directly supports and integrates with the mission of the USDA Forest Service, *to sustain the health, diversity, and productivity of the Nation's forests and grasslands to meet the needs of present and future generations.*

For more information on strategies of the USDA and the Forest Service, visit:

<http://www.ocfo.usda.gov/usdasp/usdasp.htm> (USDA Strategic Plan)

<http://www.fs.fed.us/publications/strategic/fs-sp-fy07-12.pdf> (Forest Service Strategic Plan)

<http://fsweb.wo.fs.fed.us/rd/pdfs/20080211-final-strategic-plan.pdf> (Forest Service Research & Development Strategic Plan-only available through Forest Service network)

Vision

We envision the Forest Products Laboratory to be a world leader in innovative wood utilization research that significantly improves quality of life and national competitiveness while conserving wood and fiber. In reaching our vision, we will help create a future in which people throughout the world benefit from healthy forests and grasslands that provide round wood, solid sawn wood, composites, fiber, chemicals, energy, and other renewable materials in a sustainable manner.

Principles and Values

The Forest Products Laboratory is recognized worldwide as an unbiased source of technical information, and upholding this reputation is at the core of our work. Our researchers are dedicated to scientific excellence, and demonstrate responsibility and accountability through well-documented, reliable research results. We strive to conduct efficient, problem-solving research aimed at the sustainable use of wood resources, and pursue proactive technology transfer and deployment to convert research results to real-life applications that benefit society. The Forest Products Laboratory is a diverse organization committed to safety, honesty, integrity, fairness, teamwork, and public service.

Driving Forces

To effectively develop a plan for Forest Products Laboratory research that meets the needs of society, we must have a thorough understanding of external forces that have an impact on the direction of our work. Most of the following driving forces were identified in the USDA Forest Service Research & Development Strategic Plan, 2008-2012, which provides guidance to the Forest Products Laboratory.

Climate Change

Global warming observed over the past 50 years is due primarily to human-induced emissions of heat-trapping gases. The United Nations Framework Convention on Climate Change recognized the scientific view that an increase in global temperatures should be less than two degrees Celsius. There will need to be a wide range of aggressive mitigation strategies to hold down atmospheric greenhouse gas levels and achieve this goal. One such strategy is the addition of carbon to forest and forest products sinks, which will be important to limiting atmospheric carbon dioxide concentrations.

Forest products research can contribute to the mitigation of greenhouse gas emissions in many ways, including 1) improving durability of wood products to increase storage of carbon in long-lived forest products, 2) increasing performance of wood products so they may substitute steel and concrete which produce more greenhouse gases in their manufacture and use, 3) providing cost-effective processes for producing liquid biofuels which emit less greenhouse gases than gasoline or diesel fuels, 4) decreasing energy use and greenhouse gas emissions from the production of solid wood and paper products, and 5) providing economic uses for small diameter timber and thereby encouraging fire hazard reduction treatments that reduce greenhouse gas emissions from wildfires.

Sustainable Forestry

Sustainable development of forests is a key international and domestic objective. Population growth and development pressures are resulting in deforestation in many developing countries, and maintaining benefits from forests worldwide is critical to ensure they are not replaced by other uses, such as agriculture or urban development. In order to keep forests as forests, it is critical to provide efficient, high-value uses for the wood that is removed. Forest products research is vital to achieving those goals, thereby ensuring retention of forest lands and the many benefits they provide.

Alternative Energy Sources

Given the need to reduce emissions of greenhouse gases, decreases in the availability and security of conventional domestic and international energy supplies, and increases in energy demands in the United States and around the world, there is a need to develop and enhance alternative energy sources and more energy-efficient technologies. Research and development can help create new alternative renewable energy sources with wide-ranging beneficial impacts. These alternatives will not only increase the energy efficiency of forest operations, wood conversion, and manufacturing processes, they can also lead to more energy-efficient housing, cost-effective ligno-cellulosic biofuel conversion processes, and biorefinery options for producing chemicals and energy.

Urbanization

Although urban and suburban residents today are more removed from working forests and rangelands for their livelihoods, their quality of life and well-being continue to depend upon forests and rangelands—sometimes far distant from their homes. Today social, cultural, economic, and political views of urban populations directly and indirectly influence the use and value of all U.S. forests and rangelands. Society needs timely and accurate information and tools to manage, create, and sustain forests and their critical goods and services in increasingly urbanized and urban-influenced areas.

Globalization

Nations, people, businesses, and natural resources are becoming increasingly interconnected globally, with rapid movement of people, capital, technology, and goods across national borders. Globalization expands competition and accelerates structural changes in natural resource product markets and resource uses and values. Decisions and actions in the United States and abroad may have significant environmental, social, and economic ramifications at multiple scales, from local to global. These interactions are leading to changes in forest and rangeland conditions and land uses, and ultimately, to changes in associated ecosystem services such as water quality and production, carbon sequestration, energy options, wildlife habitat, and recreation opportunities. The impacts of these changes are eventually felt in terms of employment opportunities and quality of life for citizens.

Rapid Changes in Technology

Rapid changes in technology and the ways that information is located and shared via the Internet have contributed to the transformation of businesses and society. Dispersion of people, their homes, and workplaces across once-rural landscapes is changing patterns of land use, and having significant impacts on ecological and human social systems. In addition, continuing advances in information accessibility on the Internet are changing the traditional ways that research findings are disseminated and increasing the ability of citizens to access complex scientific information and engage in public discourse about environmental issues and the future management of natural resources.

Economic Forces

The status of the economy, both in the United States and around the world, plays a key role in determining whether technologies emerging from research and development program are successfully implemented. New products and technologies must be not only technically feasible and beneficial to society, but also economically viable in the global market place.

Political and Social Forces

Congress, Administration priorities, and the needs and expectations of the American public will continue to strongly influence the Forest Products Laboratory. Public expectations for comfort, convenience, safety, and health remain strong, and concerns about the environmental and public health impacts of industrial processes, sustainability of natural resources, consumption, product disposal, and renewable energy are on the rise.

Success in the 21st Century: Reinventing the Forest Products Industry

The forest products industry (FPI) has been greatly impacted by international competition; dependence on production of high volume, low-profit margin commodity products; and the recent economic downturn. The American Forest & Paper Association has noted the following on their website (www.afandpa.org):

Since early 2006, reduced product demand has meant the loss of more than 300,000 jobs or almost one quarter of the FPI workforce. Despite this, the FPI's approximately 1 million workers outnumber those in the automobile industry. As the economy has lagged, the market for consumer goods and advertising products has fallen sharply and reduced the demand for associated packaging and paper products. Also, record-low housing starts have caused a dramatic contraction in wood products. Disruptions in capital markets and the banking sector present serious problems for capital-intensive businesses like forest products companies and their customers. Additionally, tight credit has furthered problems in housing—a significant market for wood products. The inseparable link between the FPI and the forest means that the economy's impact extends beyond product demand and jobs to the environment itself. Together, the decline in the FPI threatens the sustainable forestry practices that the industry's prosperity makes possible, as well as raises the risk of unproductive forestland being sold for development and lost forever.

Science and technology to create new product platforms, gain access to new markets, and develop new functionalities to existing products are needed to help the FPI reinvent itself to be successful in the 21st century and thereby create the jobs and wealth needed in America's rural communities.

Emphasis Areas

Forest Biorefinery

The Forest Products Laboratory is well-placed to pursue research opportunities to improve the economics of producing transportation fuel, bioenergy, and chemicals from woody biomass. Development of profitable biorefineries helps lower the cost of forest management, improves forest health, advances sustainable forest management practices, reduces dependence on fossil fuels, and decreases production of greenhouse gases.

Decades of fire suppression have disrupted the natural fire cycle of U.S. forests, resulting in an estimated 8.4 billion dry tons of material that needs to be removed from the National Forests to improve their resiliency. This material is available for production of wood products, chemicals, and energy, yet profitable uses for the material are needed to reduce the costs of forest management.

Business concepts that focus on converting wood resources into liquid fuels and chemical feedstock are becoming cost competitive. As international concerns over global warming and greenhouse gas generation rise, governmental support for biological fuels is increasing and likely reduces investment risks. Fuels derived from biomass are generally regarded as greenhouse gas neutral because the amount of carbon dioxide released on combustion equals the amount adsorbed from the atmosphere and sequestered by the plant through photosynthesis.

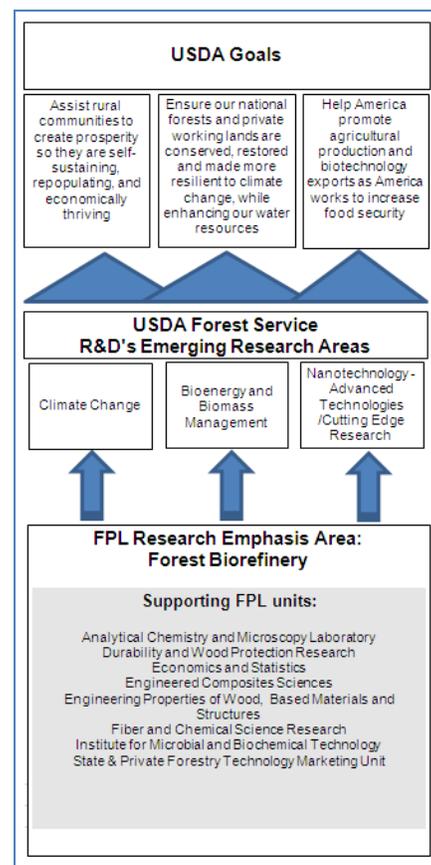
For more information, visit <http://www.fpl.fs.fed.us/real>

Goal

- Economical conversion of wood biomass to liquid fuel, commodity chemicals, and cellulose fiber

Strategies

- Improve the efficiency of conversion processes, such as yeast modification, sulfite pretreatment to overcome recalcitrance of lignocellulose, value prior to pulping, catalyst development, and thermal conversion to achieve economical production of desirable products
- Pursue the creation of a 50,000 square-foot Bioenergy Pilot Plant for the development of processes for the conversion of wood to useful fuel and chemicals
- Optimize the balance of fuel, chemicals, and fiber produced to achieve high economic value
- Develop biobased adhesives to reduce the use of fossil fuels in wood composite production



Nanotechnology

Nanotechnology is the science and engineering of materials in the size range of 1 to 100 nanometers. The application of nanotechnology to wood products can contribute economic value to help maintain industry competitiveness and forest stewardship.

Nanotechnology is a means of manufacturing products from small components and also involves characterization and measurement at the nanometer scale. Nanotechnology is not an end in itself. It is an enabling technology for making new generations of materials and products with unique functionality, improved performance or greater economy.

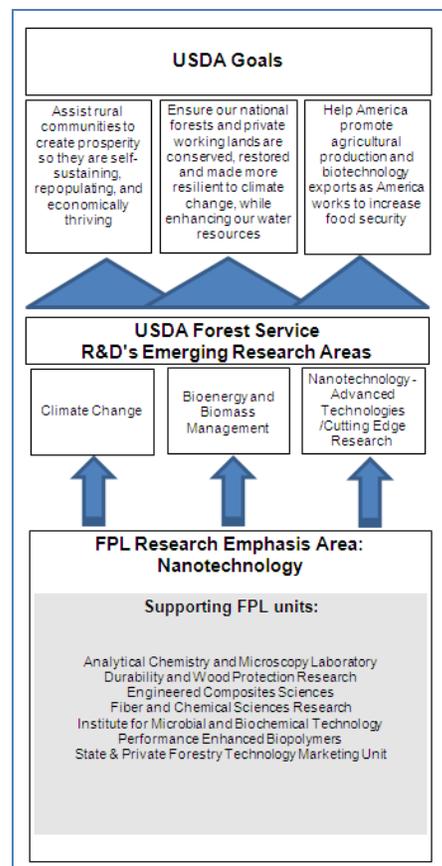
For more information, visit <http://www.fpl.fs.fed.us/rea2>

Goals

- Improve the methods for isolating cellulose nano-crystals, cellulose nano-fibrils, and other nanodimensional architectures from wood
- Develop microscopical and spectroscopic means for characterizing nanodimensional materials: size, shape, mechanical properties, surface chemistry, and molecular organization
- Explore strategies for manufacturing with cellulose nano-crystals and nano-fibrils

Strategies

- Continue partnerships with National Institute for Standards and Technology (NIST) and Purdue University to develop methods for characterizing nano-sized materials, and seek additional collaborative opportunities with other government organizations, academia, and industry
- Collaborate with industrial researchers to develop high-strength polymer composites with cellulose nano-crystals for high-volume applications such as automotive or aircraft
- Apply newly developed methods for time- and pressure-sensitive nanoindentation measurements to the wood/polymer interphase
- Use recently available methods such as electron tomography to explore the organization of the components of the wood cell wall
- Maintain membership on the U.S. National Nanotechnology Initiative (NNI) Nanoscale Science Engineering and Technology Committee (NSET)



Advanced Structures

In the past, structures were primarily designed based on life and safety issues. Today, structural design also includes functionality, environmental impact, and economics. Performance-based engineering encompasses these considerations in structural design and is gaining momentum with architects and engineers.

Performance-based engineering implies design, evaluation, and construction of engineered facilities that meet uncertain future demands. The concepts require a shift away from empirical and experience-based conventions towards a design and assessment process more firmly rooted in accurate prediction of structural performance under a realistic description environmental loading factors that the structure experiences. This approach also emphasizes monitoring the health of the structural system, evaluating performance characteristics and identifying the need for renovation or new construction. It forms the foundation of strategies for revitalizing our decaying infrastructure.

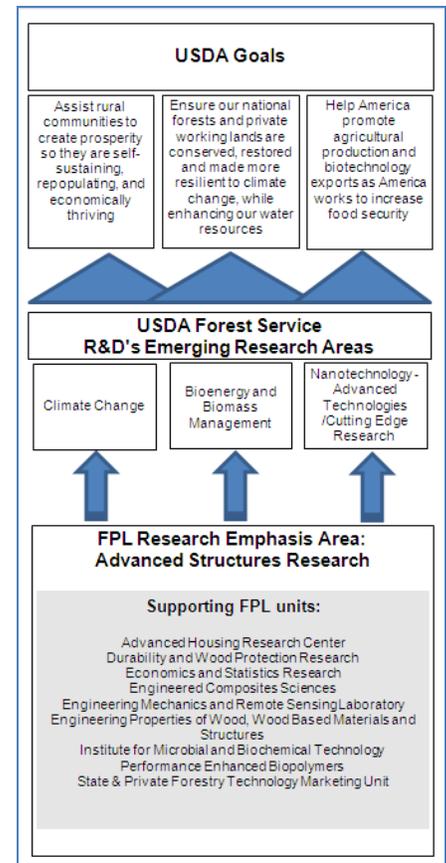
For more information, visit <http://www.fpl.fs.fed.us/rea3>

Goals

- Develop design and assessment processes that accurately predict structural performance under realistic loading environments
- Conduct research aimed at understanding the interaction between various exposure scenarios encountered by wood structures
- Develop methods for quantifying performance levels of wood structures
- Evaluate the cost of improved structural performance scenarios

Strategies

- Develop multi-dimensional models that encompass wood structural systems and subsystems, extreme loading conditions, and simultaneous structural and environmental loading conditions
- Collect baseline information on performance of wood structures in response to environmental conditions such as fire and moisture
- Evaluate the contributions and performance of fasteners and adhesives as critical structural design elements
- Develop methods for inspection, renovation, and upgrading of structures
- Develop and evaluate environmentally friendly preservative treatments



Advanced Composites

For decades, wood composite technologies have been used to create value-added commodity building and home furnishing products (for example, plywood, particleboard, fiberboard, hardboard). More recently, biobased composite products based on natural fibers, and hybrid products, such as wood–plastic composites, have come on the market. New composite technologies, such as nano-enabled composites, are being developed as low-volume, high-value composites. Each of these technologies adds considerable value to diverse wood- and bio-fiber feedstocks, including small-diameter timber, plantation-grown timber, agricultural and industrial residues, exotic–invasive species, and demolition and recycled materials. Biobased composites are also an outlet for timber removals and thinning, which helps forest managers restore damaged ecosystems and promotes sustainable forest management practices.

Recent advances in wood and biocomposites research have led to a new understanding between materials, process, and composite performance. Advances in engineered biocomposites impact a wide range of composite products, including economical commodity products and high-performance niche products. The next generations of biocomposites will combine wood and natural biofibers with non-wood materials for synergistic hybrid materials; be renewable, recyclable, and sustainable; be engineered for specific performance requirements; be more durable, dimensionally stable, moisture proof, and fire resistant; possess sensory capabilities that warn users when problems are imminent; and benefit from emerging new technologies such as nanotechnology.

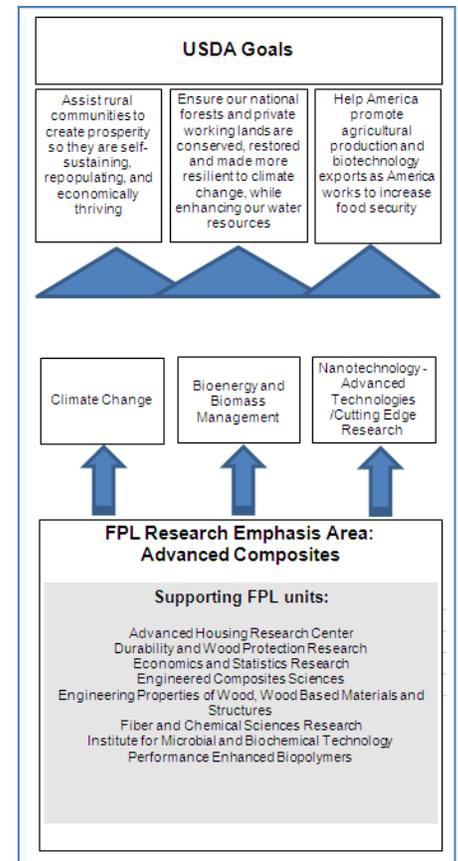
For more information, visit <http://www.fpl.fs.fed.us/rea4>

Goals

- Relate the fundamental properties of raw materials and the interactive relationships among raw materials to composite performance, durability, and service-life
- Develop and enhance processing technologies for both improved composite performance and new engineered composites
- Characterize, evaluate, and improve composite products using both established and emerging technologies

Strategies

- Improve composite performance using new materials and new combinations of materials
- Develop value-added composites from low-value raw materials
- Use nanotechnology to develop composites containing nano-materials and to understand composite properties at the nano-scale
- Improve existing processes and develop new processes with a focus on environmentally friendly processes



- Use modeling to understand the effects of process technology and raw materials variables on composite performance
- Identify performance requirements for the introduction of new composite products and expansion of existing composite products into new markets
- Develop new test methods and improve existing test methods useful for composite evaluation
- Characterize the fundamental properties of composites and manipulate the raw materials, processing method, and composite structure for improved performance
- Establish performance standards to evaluate life-cycle environmental impacts for new composite products
- Determine critical aspects of adhesive-wood interactions to lead to high-performance and cost-effective composites

Woody Biomass Utilization

Forests in the United States contain a substantial amount of small-diameter, overstocked, and underutilized material. The catastrophic wildfires occurring in increasing numbers in the western United States are fueled in large part by overcrowded forests. The forests in Colorado, Wyoming, and other states along the Rocky Mountains are currently suffering a severe epidemic beetle infestation. The southeastern United States has been hit with major ice and wind damage that leaves thousands of acres of dead and broken trees. Overstocked stands, beetle-killed trees, and trees damaged or killed by weather events put our forests at risk for catastrophic fire events. Costs associated with thinning these dense and dead stands of trees range from approximately \$150 to \$2000 per acre, depending on the geographical conditions. Finding uses and markets for this thinned material can help offset the high cost of mechanical thinning and prescribed burning, while improving the vigor and resiliency of our forests.

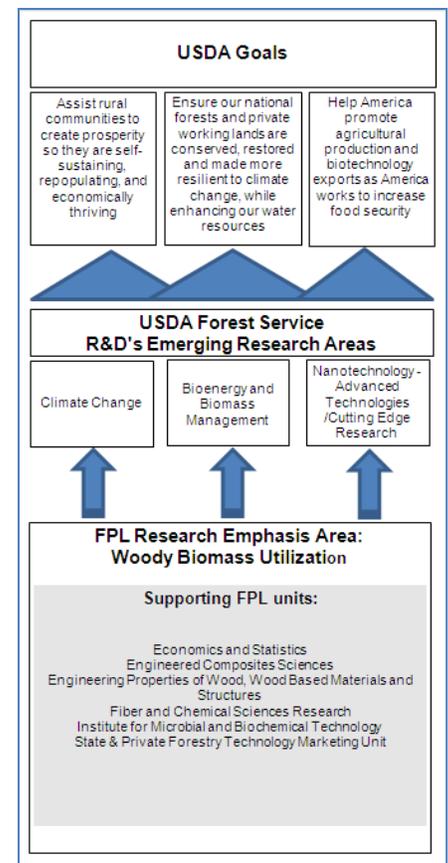
The USDA Forest Service Woody Biomass Utilization Strategy focuses on four goals: building partnerships, developing and applying new science and technology, expanding markets for bioenergy and biobased products, and facilitating a reliable and predictable supply of biomass.

(<http://www.fs.fed.us/woodybiomass/strategy/index.shtml>) The Forest Product Laboratory strategic goal for woody biomass encompasses these same goals, although in more definitive measures.

For more information, visit <http://www.fpl.fs.fed.us/rea5>

Goals

- Build partnerships with large and small industries to facilitate the development of markets for new uses of woody biomass



- Develop improved, efficient, and economical processing techniques for turning woody biomass into biobased products and bioenergy
- Develop fundamental scientific information about woody biomass that aids in creating useable bioenergy and biobased products
- Help assess reliable and predictable geographic supply information

Strategies

- Work with Forest Service Forest Inventory Assessment data to quantify woody biomass supplies in various geographic regions
- Synthesize woody biomass utilization research needs from partners, stakeholders, and users, and adapt research programs to meet their needs
- Characterize the fundamental properties of various species of woody biomass, and identify positive and negative aspects that aid in targeting specific uses
- Develop new processes for biofuel conversion from wood, small-scale wood-to-energy technology, biobased products from low-valued sources, separation technologies for high-value products from wood, and applying technologies to product development
- Provide technology transfer through publications, models, pilot projects, tools, field trips, workshops, and consultations

Business Foundation

Funding

The Forest Products Laboratory is federally funded with some additional small revenue streams coming in through established partnerships. Federal funding has remained relatively stable over the past several years, and we expect this trend to continue with possible slight increases annually. However, because FPL's programs of research are focused on solving national problems and embrace emerging science areas, it always remains a possibility that substantive appropriated funding increases could occur. Under any scenario, FPL researchers will continue to seek additional funding through partnerships to leverage research programs and augment their research budgets where possible.

Collaborative Research and Technology Transfer

The Forest Products Laboratory has a history of successful partnerships with industry, academia, trade associations, tribes, non-government organizations, and federal, state, and local government agencies, as well as international research laboratories. Researchers maintain an open and involved dialogue with potential partners and continue to seek collaborations with outside organizations that are mutually beneficial and further the missions of FPL, the Forest Service, and the USDA.

Recent authority was granted to the Forest Service to enter into cooperative agreements with private entities to operate pilot plants and other large-scale preparation facilities for the purpose of bringing technologies necessary for the development and commercialization of new biobased products to the point of practical application. This amendment of the Agricultural Research, Extension, and Education Reform Act of 1998 also states "to carry out a cooperative agreement

with a private entity...the Secretary may rent to the private entity equipment, the title of which is held by the Federal Government.” Furthermore, biobased products produced through such cooperative agreements can be sold by the private partners for the purpose of determining market value.

Under this expanded authority from the Federal government, a new Business Incubator Partnership Program has been developed at FPL to encourage cooperative research. Private start-ups or other entities needing expanded production resources can rent space and equipment at FPL to pilot-test new products or process innovations. By developing product prototypes without excessive overhead costs, and now able to sell these products in limited quantities, business incubator associates can benefit more than ever by partnering with FPL. A host of cooperative research and technology transfer agreements are available, and the Business Incubator environment provides many opportunities for industry partners to move research into the marketplace.

Located at FPL, the USDA Forest Service State and Private Forestry’s Technology Marketing Unit (TMU) provides a broad scope of expertise in wood products utilization and marketing, technology transfer, and technical assistance. The TMU works in collaboration with many different partners to ensure ready adoption of forest-based material technologies to many small, rural forest products businesses. The breadth of their work includes forest products conservation, processing, manufacturing efficiency, marketing, recycling, and bioenergy. The technical assistance they provide includes publications, technical assistance visits, conferences, workshops, meetings, and one-on-one consultations over the phone or in person. The TMU also manages and awards annual grants dedicated to helping improve the utilization of woody biomass removed from forest restoration projects.

Personnel

The Forest Products Laboratory’s reputation for addressing all aspects of wood use is based on a broadly experienced, highly trained, and well-educated workforce. However, in the next five years, 50 percent of FPL’s workforce will be eligible to retire, potentially creating a large gap in our institutional knowledge and scientific expertise, yet also creating the opportunity to rapidly move in new directions. FPL is developing a workforce succession plan that uses this period of high turnover as an opportunity to recruit and retain a diverse, talented workforce with the knowledge, skills, and abilities to successfully carry out the mission and vision of the Forest Products Laboratory.

Facilities and Equipment

Continually maintaining and upgrading facilities and acquiring state-of-the-art scientific equipment and instrumentation helps keep the Forest Products Laboratory at the forefront of forest products research. FPL leadership plans and prioritizes the efficient acquisition of equipment, and where it is not practical or possible to obtain specialized equipment, external facilities are available to supplement FPL instruments.

Recent and planned upgrades to Forest Products Laboratory facilities include:

Centennial Research Facility (CRF) – This 87,000 square foot combined research facility consolidates research activities, allowing for maximum collaboration between scientists and with

outside partners. The CRF houses state-of-the-art equipment in three major areas of research: Engineering Mechanics and Remote Sensing, Wood Preservation and Durability, and Composites. It allows scientists to perform full-scale testing of wood-framed buildings, formulate new environmentally friendly wood preservatives, develop composite products in a manufacturing-friendly space, and test the durability of wood products with a one-of-a-kind weathering chamber.

Fire Test Laboratory – New evaluation technologies are urgently needed to address wildland fire threats to buildings, for use with performance-based building codes, and for assessing fire performance of environmentally compatible protection of wood-based construction. Research on fire growth and improving survivability of wood structures in the wildland-urban interface and other large fire threats can be fully addressed only through large-scale tests. The construction of a new fire test facility is allowing for such research progress. This facility is key to developing safe, durable building products, as it is equipped to perform standardized tests for flame retardancy and fire resistance. This addition to FPL’s facilities will enable simulation of actual fire scenarios and better validation of computer models, allowing evaluation of protection options or design changes.

Bioenergy Pilot Plant – Construction of a bioenergy pilot plant located at the Forest Products Laboratory has been proposed. This research facility and pilot plant would facilitate the development, scale-up, and evaluation of technologies for commercially viable conversion of biomass to advanced biofuels, and related chemicals and products. The envisioned 50,000-square-foot facility provides research and analytical laboratories, computer laboratories, high-bay pilot plant space, and facility and occupant support spaces. The proposed pilot plant facilitates improved efficiency of innovative technologies and expedites scale-up and commercialization of existing bench-scale processes for conversion of cellulosic materials to fuels and chemicals.

Whether in the design and construction of new buildings or the maintenance of existing facilities, providing a safe, secure, and functional workplace for employees is a top priority at the Forest Products Laboratory.

Customer Service

As a federal laboratory, the Forest Products Laboratory is a public entity, and work performed here is intended to serve the American public. In addition to conducting research that improves the economy, the environment, and people’s safety and quality of life, part of our responsibility to the public lies in being accessible and available to them. With this responsibility in mind, FPL strives to serve the public by responding to inquiries, providing wood identification services, conducting tours of our facilities and giving public presentations, providing information through publications and our website, and being responsive to the needs of our customers to the best of our ability.

One shining example of FPL’s dedication to the public is the production of the world renowned Wood Handbook, first published in 1935. Recently republished in its seventh edition, this guide to all things wood is useful to engineer and homeowner alike. The full text of the Wood Handbook available on FPL’s website at <http://www.fpl.fs.fed.us/woodhandbook>

At the Forest Products Laboratory, we are working toward a future in which humans live sustainably on the land. Through continued improvements in our use of forest products, we can meet our needs for durable, beautiful housing and clean, renewable energy. We can create a vibrant economy through research on new biobased products and more intelligent use of existing natural materials. And we can enjoy thriving forests and grasslands now and for generations to come through careful stewardship of the land.

Contact us for ways to partner in our work.

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