WOOD UTILIZATION RESEARCH (WUR) CENTERS

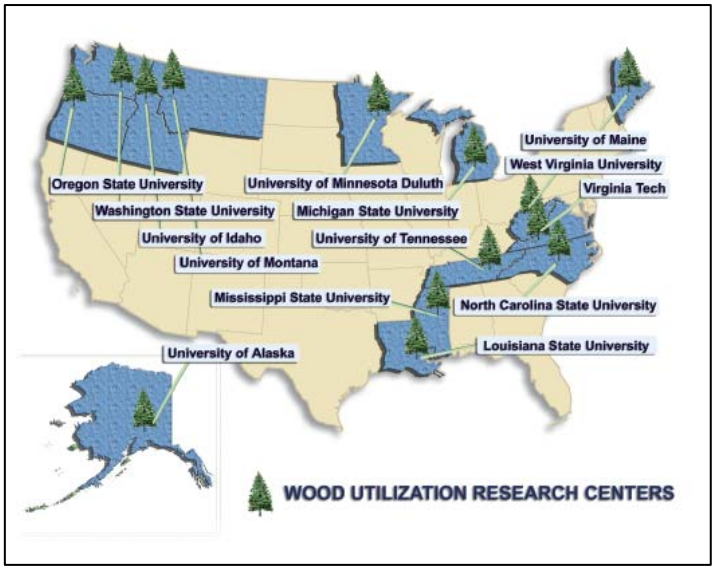
INVESTING IN OUR RENEWABLE FOREST RESOURCES TO CREATE JOBS AND A NEW GREEN ECONOMY

A plan to the President of the United States, to Congress, and the Department of Agriculture

Background

The USDA Special Grant program for Wood Utilization Research (WUR) is authorized and funded by Congress in PL89-106 to stimulate innovation and the generation of new knowledge and technologies that are necessary to balance the sustainable use of U.S. forest resources with the need to maintain a vigorous, globally competitive domestic forest products industry. WUR is the only federal program that supports regionally- and nationally-focused university research to develop knowledge and facilitate innovation to support development of new, environmentally appropriate technologies for wood-based products and biofuels, and enhance the competitiveness of the U.S. wood products industry. The WUR is uniquely charged to address the varying needs and opportunities of different regions of the country, but within a national needs framework.

The WUR Program currently supports research and outreach through 13 university partners at 11 Centers located across the country. Jointly, the WUR Centers address forest biomass utilization and the major challenges confronting the domestic forest products manufacturing industry in all of the forest regions of the U.S. These issues range from biofuels production and the incorporation of nanomaterials into advanced hybrid biocomposites, to making traditional forest products industries competitive in a global economy. Funding of the WUR Program has enabled our nation's wood products industry to advance and adopt new sustainable and energy-efficient technologies in ways that could not be foreseen even 15 years ago. Forest-based industries now produce products ranging from biopharmaceuticals and antioxidants, to hybrid composite materials now protecting our troops in Afghanistan. Further, WUR researchers are leading the way in non-food derived, cellulosic biofuels development which can impact all Americans, well beyond that of the traditional scope of the forest products industry. The WUR national program is allowing industries to re-position themselves to help maintain global



competitiveness and keep a trained workforce employed. The U.S. wood products industry is often considered to be lagging in technology and innovation because it is fragmented and composed of many small firms whose only access to advanced technology and wood science expertise is through government or university laboratories. A major benefit of the USDA Special Grant has been the flexibility of the Centers to rapidly address critical regional or national research needs.

A 2006 United States General Accountability Office (GAO) report highlighted the importance of wood utilization research in U.S. university-based programs, emphasizing that this research addresses a National need. The report stated that research and education must be supported in this field to ensure proper utilization of wood; our most widely used structural material. The GAO report clearly documented the overall decline in U.S. wood utilization research investment. While there are many Federal programs that support the steel and concrete industries, the WUR is the only Federal program that supports universities seeking new breakthroughs, new discoveries, and entire new industries from renewable forest resources. The WUR provides a means to revitalize, reposition, and strengthen the wood products industry. The USDA National Research Initiative (NRI) Competitive Grants program has eliminated their wood utilization research program and, as a result, there is now no national pool of competitive funds specifically targeted for wood utilization research. The GAO report did not document the multi-million dollar investments in wood manufacturing innovation research that are being made in China, India, Vietnam, Canada, and the European Union that are enabling these countries to outcompete the U.S., resulting in further decline for our domestic industry and throughout the supply chain.

WUR funds are being used to leverage state and private funds to grow the capacity of U.S. small and medium wood industries as commercialization efforts expand. The WUR Centers have demonstrated an average match of $2.50 for each federal dollar invested. In FY 2006, $15.5 million of external leverage was provided. The research dollars spent directly benefit domestic producers and consumers of products made in the USA.

WOOD UTILIZATION RESEARCH: 2010-2015 Program Criteria

This plan outlines a request for investment by the Federal Executive Branch in the WUR program, a program that has fostered innovation and will continue to do so for both new and traditional wood products industries in the U.S., enhancing our energy independence, and provide leadership in the sustainable use of forest biomaterials. The funds invested in the WUR program are relevant to national priorities, agency missions and "customer" needs as indicated in the Industry Support tab of this document. There are three primary national goals for the proposed WUR program. Each goal identifies key issues and potential solutions that can be addressed by the requested Federal Executive Branch investment in an expanded WUR program.

GOAL 1: ENHANCE THE GLOBAL COMPETITIVENESS OF THE AMERICAN WOOD PRODUCTS INDUSTRY AND STRENGTHEN RURAL VITALITY

Key Issues

The U.S. is the world's largest producer and consumer of wood products but America's wood products industry is struggling to compete in the global marketplace. Globalization of wood-based industries and product markets is accelerating and the domestic industry faces extreme competition from off-shore regions that produce lower cost fiber than the U.S. This foreign competition is from countries that do not use their forest resources in a sustainable manner. Global competitors take advantage of a lower wage work force, advanced equipment, and new conversion technologies. These competitors are increasingly enjoying the benefits of investments in new technology and research and development. A key objective of the WUR program is to insure that the U.S. can compete using our own natural resources to provide fuel, chemicals, fiber, durable and decorative products, and structural materials from our forests in a sustainable manner, not practiced by foreign competitors.

Over 2.1 million Americans are directly employed in the wood products manufacturing sector, with several million more jobs indirectly supported by the sector (2004 Census Bureau). New products, new technologies, and new business systems must be developed and implemented to position the U.S. as a world leader, to maintain and expand employment opportunities for its citizens, especially in rural areas where many of the employees are located. However, demographers and government forecasters predict a looming shortage of the most highly skilled workers with an unusually high number of impending retirements in industry, academe and government. These highly skilled workers, produced by university programs, are one of the building blocks for future economic leadership. World class manufacturers also report that the development of current production employees is critical, enabling these employees to find ways to innovate daily.

Most wood products manufacturers have little to no capacity to support significant research activities, especially at a more fundamental level. This limits their ability to explore and adopt new, more efficient technologies, and to move toward sustainable production methods. This is true for commodity producers with thin margins as well as small-to-medium sized manufacturers with low capitalization. The USDA has historically supported research on wood-related issues, but has significantly reduced or eliminated those programs over the past ten years. State funding has also declined during this period. In contrast, European and Asian countries have significantly increased their investment in wood research to capitalize on potential exports to the U.S. As a result, the WUR program is now one of the few federal investments in the future of the wood products sector in the U.S. As the U.S. faces a deepening recession, it is critical that we

invest in science, research and technology to allow us to remain competitive, create jobs and prepare the U.S. for a bright, sustainable future.

WUR Solutions for Goal 1

- *Research to provide innovative new science and technology that will lead to new ideas for products, improved manufacturing processes, new business practices, and creative sustainable end uses.* Research areas where WUR has already taken the lead include new human medical and pharmaceutical treatments from the forest, new biobased fuels from non-food sources, and new ways of protecting our troops using new wood-based ballistic panels currently in use in Afghanistan.
- *Effectively transfer new ideas directly to those who can use them in industry and government.* The result is increased competitiveness, improved profitability, job creation, retention, and new options for unleashing the power of renewable forest biomaterials.
- *Rebuild university research capacity to support national needs for new discoveries that foster increased use of domestic renewable forest-based biomaterials.*
- *Recruit and educate graduate and undergraduate students with the skills and abilities to transform the American forest industry to become globally competitive and to set new standards for environmental stewardship.*
- *Develop new training programs using online courses, continuing education and other programs to target specific needs of current and future workers.*
- *Deploy new paradigms for attracting students in K-12 levels to forest operations and wood utilization career opportunities.*

GOAL 2: UTILIZE WOOD TO ADVANCE ENERGY INDEPENDENCE AND ENVIRONMENTAL STEWARDSHIP

Key Issues

One of the new energy opportunities is the potential for woody biomass to contribute to the energy security of the U.S. With the 2008 record high prices for fossil fuels including oil and natural gas, our citizens are faced with major increases in costs of gasoline, heating costs, and food prices. Manufacturers are facing increased costs in raw materials, production of goods, and transportation.

The U.S. has significant areas of sustainably-managed forest land that could be utilized to provide new forms of fuel and energy for our vehicles and power for our homes and industries. The Department of Energy and the USDA reported in "The Billion Ton" report that 1.3 billion tons of non-food biomass (over 30 percent is woody biomass) was available for electric generation, and to convert into liquid fuels and chemicals. Conversion of woody biomass avoids the concerns of developing fuels from bio-based food crops.

Conversion of woody biomass into liquid fuels and electricity will require development of strategies and technology to identify available biomass, develop cost-effective means of capturing biomass from existing forests, shrublands, fast growing energy crops, and logging residues. Finally, cost effective means of converting the biomass into biofuels and electricity need to be developed. The critical key technologies have not yet been developed for this, and this is a critical area where WUR Universities have taken a leadership role. If the U.S. is to be successful in developing this energy security in part from woody biomass, researchers who know the wood products industry will be critical in building new economic opportunities. The WUR Centers are positioned to provide research leadership in identifying ways to convert wood into energy and bioproducts.

WUR Solutions for Goal 2

- *Expand research on cellulosic and lignin bioconversion methods to permit economical biofuels production.*
- *Identify, develop and promote new cost-effective and environmentally responsible ideas for the harvest, transportation, and conversion of woody biomass into bioenergy, chemicals, or other high value bioproducts.*
- *Develop novel harvesting, transportation and manufacturing processes that are energy efficient, environmentally benign and flexible to allow a range of products in response to market forces. Technologies with relatively low capital requirements will be emphasized to stimulate small business growth.*
- *Improve the energy efficiency, carbon storage potential, and cost-savings that accrue from use of wood-based materials in current uses, and seek new applications where wood offers a lower impact alternative and reduced dependence on fossil fuels.*

GOAL 3: ENABLE SUSTAINABILITY THROUGH SOCIALLY AND ENVIRONMENTALLY ACCEPTABLE PRODUCTION AND CONSUMPTION OF WOOD PRODUCTS

Key Issues

Americans consume more wood products annually than any other nation in the world. More wood fiber is used to support our society every year, by weight, than our combined consumption of steel, plastics, and Portland cement. We are the largest producer of wood products. To address these needs, the U.S. has a sustainably managed, abundant and productive forestland base that provides significant amounts of raw materials needed by U.S. manufacturers. However, the U.S. is also an importer of wood fiber and products, which are often lower cost than U.S. sources. If we can identify strategies to reduce the cost of harvesting, transporting, and converting U.S. fiber, we have an opportunity to use domestic wood fiber for conversion into energy, new bioproducts and existing wood products.

Recent national emphasis has been placed on using renewable sources of materials for use in residential and commercial construction, as well as in green products for consumers and businesses. One key aspect of the U.S. Green Building Council Leadership in Energy and Environmental Design (LEED) Green Building Rating System™ is material selection, where key credit points are given for renewable, regional resources such as wood-based products.

There is also growing evidence and concern in some parts of the country that private land ownership patterns are changing rapidly. Reduced local manufacturing capacity can lead to conversion of forest land to other purposes. The presence of a healthy local manufacturing sector is emerging as a critical factor in maintaining U.S. forests and the many benefits they provide.

Cost-effective removal strategies and new uses for small diameter woody materials and logging residues can have a positive impact on the cost of managing and protecting our federal lands from the ravages of fire, insect infestations and disease. Thus, the potential for using woody biomass for biofuels, electric generation, and bioproducts can reduce forest fuel loads, resulting in significant cost savings from fire and hazard suppression and fuel load reduction activities.

The U.S. has an aging infrastructure of government owned buildings constructed from wood materials. This includes buildings in our National Forests and National Parks, military bases, and other agencies. Technological advances stemming from WUR research have led to the ability to identify early stages of structural deterioration, which can be remedied at lower cost, leading to preservation of these structures for future generations. America's transportation infrastructure is also in decline. Research is needed to develop in-place monitoring systems for rural bridges that allow inspectors and engineers to understand their structural health.

Recent weather events of Hurricane Katrina and the Asian Tsunami of 2004 have reinforced the need to protect the lives and homes of people in coastal regions. These events show the importance of improving the way we build wood-frame homes in hurricane and earthquake prone regions. By understanding the forces developed on a wood-frame structure during these extreme weather events, research can contribute to improved design of wood-frame buildings, increased safety, reduced economic losses, and improved performance of American homes in natural disasters.
U.S. military forces stationed around the world require blast-resistant tentage and structures to protect them from harm. Advanced wood-based materials developed at WUR Centers are already providing military forces with improved protection. These same concepts can be adopted to enhance the protection of government buildings for homeland security, reinforced structures for corrections facilities, and improved earthquake, hurricane and tornado resistance in residential and commercial construction.

WUR Solutions for Goal 3

- *Develop and promote the potential for renewable materials to replace petroleum-based or energy-intensive materials creating and retaining U.S. based jobs.*
- *Through science and engagement, improve the durability and service life of wood products.*
- *Improve building design and assembly methods to increase efficiency, reduce cost and construction time, improve safety, and enhance the quality of the built environment.*
- *Develop utilization processes for the efficient use of low-value or small diameter wood, harvest residues, urban trees, and available species.*
- *Identify and overcome market or business barriers to greater use of low-value or recyclable renewable materials.*
- *Facilitate reliable access to biomass through science-based technology transfer of costs, benefits and environmental impacts.*

ALIGNMENT WITH NATIONAL PRIORITIES AND AGENCY MISSIONS

The national goals and purpose of the WUR Program are relevant to the national priorities, agency missions, and "customer" needs as demonstrated through national initiatives, agency strategic plans and industry support. These include:

- **The White House National Economic Council, 2006 National Energy Initiative.**
- **USDA Cooperative State Research, Education and Extension Service Strategic Plan.**
- **H.R. 2419, the Food, Conservation, and Energy Act of 2008; National Institute of Food and Agriculture (NIFA).**
- **Industry support through letters of support from stakeholders and cooperators included with this plan.**

RESOURCE INVESTMENT AND FUNDING ALLOCATION

The proposed five-year program to be funded annually at $11.2 million will address topics under the three strategic goals presented in this document. These goals and the proposed allocation of support focus on key issues of national importance; utilization of our renewable forest resource base and creating natural resource based jobs. The administrative mechanics of the proposed program will contain the following elements:

1. Each WUR Center will develop internally-competitive peer-reviewed research proposals that address research priorities within their region. Each WUR Center will receive $600,000 ($7.2 million total) for these programs. Each Center will prepare a research application similar to that used for USDA Special Research Grants. The peer review of these proposals will use a clearly stated, defensible

method for evaluating each Center's annual research proposal. The regional priorities would be established in consultation with industrial and other stakeholders. The primary rationale for base support is the need for flexibility to respond to quickly emerging needs and opportunities, the need to develop institutional capacity, equipment, and expertise to serve research and stakeholder needs, and to be nimble in attracting the most highly capable students to WUR educational programs. Each Center will design unique programs that address the varying needs and opportunities of their region of the country, but will coordinate their efforts in a national WUR reporting framework.

2. Multi-Center projects: $2 million of funds will be allocated competitively for regional or multi-Center projects that address emerging regional or national issues and that can build strategic or multidisciplinary collaborations that may not otherwise exist. A competitive grant process will be used to encourage researchers and educators across the U.S. to conduct innovative research on wood utilization topics or to propose larger scale engagement and technology transfer programs. A competitive review team will be established with industry, USDA - NIFA, and WUR members to review and select proposals.
3. Innovation in Education and Outreach: $2 million of funds will be distributed nationally on a competitive basis to foster new innovative approaches to student education, technology transfer and outreach both regionally and nationally. A competitive review team will be established with industry, USDA - NIFA, and WUR members to review and select proposals.

PROGRAM ASSESSMENT

To assess the quality and performance of the WUR Program, a regular review process will be initiated. This review process will include annual performance measurements and milestones of research, education, and engagement activities. External reviews of the WUR program will be conducted every 3-5 years by advisory committees to be selected.

Performance measures for issues noted:

1. Develop, improve, and foster adoption of new processes, technologies and products related to wood products, bioenergy, and related areas.

   Metrics: Number of adopted processes, industry testimonials documenting productivity increases and cost savings.

2. Develop and effectively communicate new knowledge to support science-based policy choices relating to forest products harvesting, manufacturing, and utilization.

   Metrics: Number of adopted processes, industry testimonials documenting productivity increases and cost savings.

3. Foster enhanced, cost-effective, safe and environmentally responsible utilization of wood-based products to meet societal needs.

   Metrics: List of technologies adopted and products developed.

4. Development, improvement, and fostering adoption of innovative business management and marketing practices for use by the wood products industry.

   Metrics: Number of publications, number of patent applications and issued patents, number of companies adopting business management and marketing practices.

5. Facilitating advanced and continuing education of the next generation of scientists, technologists, and practitioners to work in wood-based industry, academia, and government service.

   Metrics: Number and type of courses offered, number of new courses emphasizing energy and innovation, number of graduate and undergraduate students, number of students hired by industry, and government.

6. Foster collaborative research between institutions and disciplines that address the critical needs of the forest products sector and leverages federal funds.

   Metrics: Number of collaborative projects between WUR Centers, number of collaborative projects with government agencies, amount of leveraged funds.

7. Develop and effectively communicate new knowledge about wood and wood-based materials at scales ranging from nano to macro level.

   Metrics: Number of publications, courses, workshops, publications, presentations, webinars, and other forms of information, participation in trade shows, participation in scientific conferences.

THE WOOD UTILIZATION RESEARCH (WUR) CENTERS

A USDA RESEARCH, EDUCATION AND ENGAGEMENT PROGRAM

- Inland Northwest Consortium
  - University of Idaho
  - University of Montana
  - Washington State University
- Louisiana State University
- Michigan State University
- Mississippi State University
- North Carolina State University
- Oregon State University
- University of Alaska Fairbanks
- University of Maine
- University of Minnesota Duluth
- University of Tennessee
- Virginia Tech
- West Virginia University

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