USDA
United States Department of Agriculture

100 YEARS
U.S. Forest Service Research and Development

Forest Service

Caring for the land and serving people

USDA
United States Department of Agriculture

THE NEXT 100 YEARS
Forest Service Research & Development 1915–2015

Over its first 100 years, the U.S. Department of Agriculture Forest Service Research and Development evolved together with society's changing relationship with forests and rangelands. From an emphasis on extinguishing fires and production forestry to advances in understanding fire ecology and the extent of forest-related social and ecological benefits, Forest Service Research and Development has been at the forefront of new scientific knowledge.

In the next 100 years, Forest Service Research and Development will keep on evolving. Forest Service scientists will continue to develop innovative methods and tools for sustainable forest and rangeland management. They will provide scientific leadership in understanding climate change effects, as well as developing management tools and processes to mitigate and adapt to a changing climate.

Forest Service scientists will persist in advancing the basic understanding of individual organisms as well as ecosystems and landscapes. They will continue to study soils, water, trees, vegetation, insects, and wildlife, as well as the human dimensions of living and depending on an interdependent planet.

Long term research will continue to reveal critical trends, through studies conducted on experimental forests and

continued on reverse

Caring for the land and serving people

The Next 100 Years...
continued

ranges, within the National Science Foundation's Long-Term Ecological Research Sites, and in collaboration with other Federal, State, university, non-profit and for-profit partners. Forest Inventory and Analysis will continue its documentation of natural conditions, and the Resources Planning Act Assessment will aid planning through assessments and projections of long-term natural resource trends.

What will Forest Service scientists discover in the future? Time will tell. What is known, however, is that through scientific leadership, expertise, and collaboration, Forest Service Research and Development will continue to serve the Nation and the world by investing in a diverse workforce and promoting the highest standards of science and service.

Forest Service Research and Development invites the public to stay informed about the latest scientific advances and to get involved in citizen science investigations.

To learn more, visit
http://www.fs.fed.us/research/
and
http://www.fs.fed.us/outdoors/naturewatch/topics/citizen-science.php.

http://www.fs.fed.us/research

USDA
United States Department of Agriculture

100 YEARS
Forest Service Research & Development
1915–2015

In 2016, Forest Service Research and Development began its second century of service to the U.S. Department of Agriculture Forest Service; the natural resource science community; and to the American public. In anticipation of the next 100 years, these cards provide a snapshot of the first century of Forest Service Research and Development. Each card describes Research and Development milestones accomplished during the tenure of 1 of 14 Research and Development Deputy Chiefs, the organization's top leader, serving between 1915 and 2015.

Forest Service Research and Development has evolved with the Forest Service. Today, over 500 Forest Service scientists and almost 1,500 other research staff work in a variety of biological, physical, and social science fields to support innovative and sustainable management of the Nation's diverse forests and rangelands. Forest Service science covers a lot of territory, with research in all 50 States, U.S. territories, commonwealths, and across the planet.

Forest Service Research and Development focuses on informing policy and land-management decisions. Scientists work collaboratively with a range of partners, including Forest Service managers, other agencies, academia, nonprofit groups, and industry. The information and technology produced through basic and applied science programs are available to the public free of charge for its benefit and use.

For more information about Forest Service Research and Development, visit the online resources on the reverse side of this card.

Forest Service

Caring for the land and serving people

Forest Service Research & Development ONLINE RESOURCES

http://www.fs.fed.us

Click on the "Science and Technology" tab; or for more information, scroll to the bottom of the screen, click on "Research and Development," then click on:

- **National R&D** for the national Research and Development Web site
- **Science Stories** for short summaries of exciting new research
- **People Search** to find and learn about Research and Development staff
- **Treesearch Publications** to search for and download published research papers
- **Forest Inventory and Analysis** to learn about the Nation's Forest Census
- **Stations** to learn more about research in your region

For free science publications and other Forest Service Research and Development science education resources for kids visit: http://www.naturalinquirer.org

USDA
United States Department of Agriculture

1915–2015
100 Years of Forest Service Research & Development

Earle H. Clapp
Deputy Chief,
Research & Development
1915–1935

Pictured: Forest Service R&D at work.

1915 1925 1935 1945 1955 1965 1975 1985 1995 2005 2015

Forest Service
May 2016

Caring for the land and serving people

Clapp • 1915–1935

Research & Development MILESTONES

- As its first Deputy Chief, Clapp oversaw the creation of the Forest Service Branch of Research. Clapp noted, "What the reorganization did was to give the Forest Service research effort recognition it had never had."
- The McSweeney-McNary Act of 1928 accomplished several things. It gave research a more prominent position in the Forest Service. The act addressed non-Federal research needs, and it began to balance silvicultural and products research. One of its most important accomplishments was the authorization of the Forest Survey (now Forest Inventory and Analysis). The act was so encompassing that the Forest Service did not seek additional research legislation until 1978.
- In 1921, the Priest River Forest Experiment Station in Idaho was dedicated to fire research, a research priority that continues into the 21st century.
- Research accomplishments included the development of silvicultural treatments to reduce fire damage, a better understanding of forest and range effects on water flow, utilization studies that improved timber harvest methods, the development of new lumber grading methods that produced more value from each tree, and the classification of the most important range forage species.

http://www.fs.fed.us/research

USDA
United States Department of Agriculture

1915–2015
100 Years of Forest Service Research & Development

Raymond E. Marsh
Deputy Chief,
Research & Development
1935–1937

Pictured: Forest Service R&D at work.

1915 1925 1935 1945 1955 1965 1975 1985 1995 2005 2015

Forest Service
May 2016

Caring for the land and serving people

Marsh • 1935–1937

Research & Development MILESTONES

- In 1935, the branch of Research was organized into Forest Research Divisions.
- The Forest Products Laboratory (FPL) published the Wood Handbook in 1935. The most recent Wood Handbook was published in honor of the FPL's Centennial in 2010.
- The Palustris Experimental Forest was established in 1935 in Louisiana, a result of the efforts of scientist Philip C. Wakeley to develop reforestation techniques for southern pines. Wakeley and other scientists grew seedlings and planted nearly 700,000 of them on the Palustris. These seedlings helped foster a better understanding of how to successfully reforest southern pine forests.
- The Norris-Doxey Cooperative Farm Forestry Act and the Bankhead Jones Farm Tenant Act, both enacted in 1937, boosted Forest Service economics research programs.
- In 1935, the Rocky Mountain Forest and Range Experiment Station (now the Rocky Mountain Research Station) was established in Fort Collins, CO. This station was the last of 12 funded forest and range experiment stations.
- Marsh worked with forestry in Sweden, Finland, and Norway. In 1958, Marsh was honored with the Royal Order of Vasa by the Swedish government for his contributions. Marsh's honor foreshadowed the important role of Forest Service Research and Development in international forestry.

http://www.fs.fed.us/research

USDA
United States Department of Agriculture

1915–2015
100 Years of Forest Service Research & Development

C.L. Forsling
Deputy Chief,
Research & Development
1937–1944

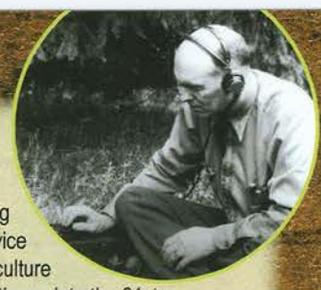
Pictured: Forest Service R&D at work.

1915 1925 1935 1945 1955 1965 1975 1985 1995 2005 2015

Forest Service
May 2016

Caring for the land and serving people

Forsling • 1937–1944



Research & Development MILESTONES

- Forsling was instrumental in developing a relationship between the Forest Service and the United Nations Food and Agriculture Organization, a relationship which continues into the 21st century.
- During World War II, the Forest Products Laboratory (FPL) provided research to support the war effort. Low temperature glues for laminating beams, preservative for wood used in the tropics, improved hardboard production, and enhanced wood alcohol distillation processes (used for rubber substitutes) were some of FPL's contributions.
- The International Institute of Tropical Forestry was established in 1939 in cooperation with the University of Puerto Rico.
- The Appalachian Forest Experiment Station (now the Southern Research Station) became involved with field surveys and reports required by the War Production Board. In 1942, the Appalachian Forest Experiment Station produced a report in cooperation with the War Production Board estimating lumber production in six Southern States. This report was a product of the Forest Survey (now Forest Inventory and Analysis), which was authorized by the McSweeney-McNary Act of 1928.

http://www.fs.fed.us/research

USDA is an equal opportunity provider, employer, and lender

USDA
United States Department of Agriculture

1915–2015
100 Years of Forest Service Research & Development

E. (Edward) I. Kotok
Deputy Chief,
Research & Development
1944–1951

Pictured:
Forest
Service
R&D
at work.

1925 1935 1945 1955 1965 1975 1985 1995 2005 2015

Forest Service
May 2016

Caring for the land and serving people

Kotok • 1944–1951

Research & Development MILESTONES

- Post World War II was a time of U.S. domestic growth. The National Housing Authority called for nearly 3 million new homes by the end of 1947. The Forest Products Laboratory, therefore, gave priority to kiln-drying research so that properly cured lumber would be available for new construction.
- In 1948, a separate division for fire research was established within the Research Branch.
- The concept of research centers (now forest science laboratories) came out of the South. Research centers were located away from forest and range experiment stations (now research station headquarters) and focused on specific subjects. Hardwood research at Stoneville, MS; research into products produced from pines and other conifers at Lake City, FL; and forest management research at Athens, GA, were examples of subject-specific research centers. Congress approved 19 new research centers for a total of 53.
- Research involving aircraft for planting tree seeds on forest land that had been recently harvested and hybrid seedlings produced at the Institute of Forest Genetics showed great potential to produce heartier and faster growing nursery stock. The Institute of Forest Genetics was placed on the National Register of Historic Places in 1987 and is a part of the Pacific Southwest Research Station.

http://www.fs.fed.us/research

USDA
United States Department of Agriculture

1915–2015
100 Years of Forest Service Research & Development

V.L. (Verne Lester) Harper
Deputy Chief,
Research & Development
1951–1966

Pictured:
Forest
Service
R&D
at work.

1925 1935 1945 1955 1965 1975 1985 1995 2005 2015

Forest Service
May 2016

Caring for the land and serving people

Harper • 1951–1966

Research & Development MILESTONES

- The Research Branch published the Timber Resources Review in 1958. This review included a comprehensive assessment of U.S. timber resources.
- Harper advocated for a strong outdoor recreation research program. In 1958, Senators Hayden and Stennis backed the Outdoor Recreation Resources Review Commission. Strong support for the Forest Service outdoor recreation research budget followed.
- Harper reorganized the research organization from centers to projects, with a senior scientist leading a project and supervising the staff. This reorganization improved research and administration at the field level, and continues into this century.
- By 1960, researchers lacking a Ph.D. degree were enrolled in university training, assisted by the Government Employees Training Act of 1958. This program allowed about 10 percent of Forest Service researchers each year to gain advanced degrees.
- The McIntire-Stennis Act of 1962 made funding available to State agricultural experiment stations and to forestry schools and programs at land grant colleges of agriculture for forestry research. The research covered such areas as reforestation, woodlands and related watershed management, outdoor recreation, wildlife habitats, and wood utilization. This act boosted Forest Service cooperative research, which continues in the 21st century.

http://www.fs.fed.us/research

USDA is an equal opportunity provider, employer, and lender

USDA
United States Department of Agriculture

1915–2015
100 Years of Forest Service Research & Development

George M. Jemison
Deputy Chief,
Research & Development
1966–1969

Pictured: Forest Service R&D at work.

1915 1925 1935 1945 1955 1965 1975 1985 1995 2005 2015

Forest Service
May 2016

Caring for the land and serving people

Jemison • 1966–1969

Research & Development MILESTONES

- The U.S. Department of Agriculture issued a racial hiring quota to the Forest Service. Jemison led Research and Development in recruiting minorities, with an emphasis on bringing minorities into leadership positions.
- Forest Service Research and Development established a Wilderness Management Research Unit in 1967 in Missoula, MT, following the passage of the Wilderness Act of 1964. Initial research focused on wilderness recreation, native vegetation in wilderness, and wilderness fire ecology. In 1993, wilderness research would be strengthened with the establishment of the Aldo Leopold Wilderness Research Institute, located within the Rocky Mountain Research Station.
- To aid in fighting wildland fires, chemicals and compounds were developed, tested, and became an important firefighting tool. Scientists became better able to model and predict fire behavior. Better fire science led to the elimination of the 10 a.m. fire policy, which had decreed that all fires be suppressed by 10 a.m. on the day following the fire's first report.
- By the 1960s, Forest Service research was showing that in many forest ecosystems, frequent low-intensity fires were critical to ecosystem health.
- "Environmental Forestry Research" was a new heading in the 1967 Chiefs Report.

http://www.fs.fed.us/research

USDA
United States Department of Agriculture

1915–2015
100 Years of Forest Service Research & Development

R. Keith Arnold
Deputy Chief,
Research & Development
1969–1973

Pictured: Forest Service R&D at work.

1915 1925 1935 1945 1955 1965 1975 1985 1995 2005 2015

Forest Service
May 2016

Caring for the land and serving people

Arnold • 1969–1973

Research & Development MILESTONES

- The 1970s was known as the "environmental decade." Arnold's goal was "to move forestry research to the cutting edge of environmental policy."
- Forest Service Research and Development was studying most American ecosystems and was the largest single employer of ecologists.
- By the 1970s, recreation carrying capacity research came to the fore. This social science research concept was based on earlier applications of carrying capacity research, such as sustained yield carrying capacity. Carrying capacity is the upper limit of the number of people, other living organisms, or crops that an area can sustain. In the 1970s, other carrying capacity concepts emerged in Forest Service research, such as environmental, wilderness, aesthetic, and ecological carrying capacity.
- University collaboration was supported in the 1970s, and political trends began pulling Forest Service Research toward meeting the needs of Forest Service managers.
- After more than a decade of Forest Service research, the National Fire Danger Rating System became operational in 1972. This system standardized the assessment of and response decisions to wildland fire across Federal and State agencies.

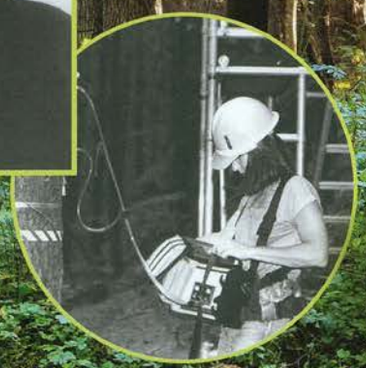
http://www.fs.fed.us/research

USDA is an equal opportunity provider, employer, and lender

USDA
United States Department of Agriculture

1915–2015
100 Years of Forest Service Research & Development

Murlyn B. Dickerman
Deputy Chief, Research & Development
1973–1975



Pictured: Forest Service R&D at work.

1915 1925 1935 1945 1955 1965 1975 1985 1995 2005 2015

Forest Service
May 2016

Caring for the land and serving people

Dickerman • 1973–1975

Research & Development MILESTONES

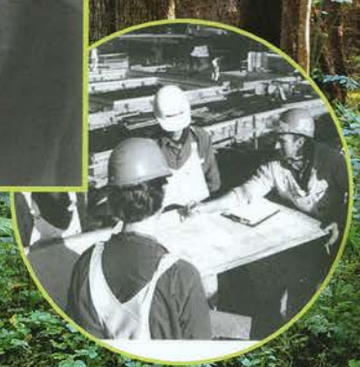
- Forest Service Research and Development worked with Project FIRESCOPE in California following a disastrous wildland fire season. One result was the development of the Incident Command System (ICS) for improving incident response. Today, the ICS is a part of the U.S. National Incident Management System. This system is a model for incident management systems worldwide.
- The Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA) authorized Forest Service long-range planning and research assessment to ensure the future supply of forest resources while maintaining environmental quality.
- RPA required the preparation of a renewable resource assessment and plan every 10 years with an update at 5 years. The RPA Assessment continues to be a major research contribution of Forest Service Research and Development, and provides a scientific basis for natural resource planning into the future.
- Three entomology research programs were particularly supported during Dickerman's tenure. The gypsy moth, Southern pine beetle, and tussock moth were causing natural resource problems, and Dickerman was able to generate significant funding for research to address these problems.

http://www.fs.fed.us/research

USDA
United States Department of Agriculture

1915–2015
100 Years of Forest Service Research & Development

Robert E. Buckman
Deputy Chief, Research & Development
1975–1986



Pictured: Forest Service R&D at work.

1915 1925 1935 1945 1955 1965 1975 1985 1995 2005 2015

Forest Service
May 2016

Caring for the land and serving people

Buckman • 1975–1986

Research & Development MILESTONES

- Forest Service scientist Jerry Franklin and seven colleagues published *Ecological Characteristics of Old-growth Douglas-fir Forests* in 1981. This Pacific Northwest Forest and Range Experiment Station (now the Pacific Northwest Research Station) publication summarized research describing the importance of old-growth forests for a variety of wildlife and plant species and led to a growing recognition of the need for a new type of forest management.
- Buckman advocated for international forestry research in developing countries. As vice-president and then president of the International Union of Forest Research Organizations, Buckman elevated Research and Development's role in international forestry.
- Forest Service Research and Development, in collaboration with the U.S. Agency for International Development, created the Forestry Support Program to deliver developmental assistance in forestry and natural resources to more than 50 countries.
- Buckman promoted basic research in Research and Development, supported research into the effects of air pollution and forest decline, and improved efforts to evaluate the effectiveness of forest-related research.

http://www.fs.fed.us/research

USDA is an equal opportunity provider, employer, and lender

USDA
United States Department of Agriculture

1915–2015
100 Years of Forest Service Research & Development

John H. Ohman
Deputy Chief,
Research & Development
1986–1989

Pictured: Forest Service R&D at work.

1915 1925 1935 1945 1955 1965 1975 1985 1995 2005 2015

Forest Service
May 2016

Caring for the land and serving people

Ohman • 1986–1989

Research & Development MILESTONES

- The Forest Ecosystems and Atmospheric Pollution Research Act of 1988 directed an increase in forest inventories that relate to atmospheric pollution and to monitor trends in forest ecosystem health and productivity. This act broadened the activities of Forest Inventory and Analysis.
- In 1989, scientist Jerry Franklin published "Toward a New Forestry" in the journal American Forests. This paper and similar research published by Franklin, Chris Maser, and other scientists supported an ecological approach to forest management.
- In 1989, the Forest Service, the Bureau of Land Management, and the U.S. Fish and Wildlife Service formed the Interagency Scientific Committee (ISC), chaired by Forest Service research scientist, and future Forest Service Chief, Jack Ward Thomas. The ISC's work provided a scientific framework to guide Federal agencies in management efforts to protect the threatened northern spotted owl in the Pacific Northwest.
- Forest Service Chief Dale Robertson used the "new forestry" ideas described by Jerry Franklin, Chris Maser, and other scientists as a way to redirect the Forest Service. Robertson began to integrate parts of this evolving Forest Service science and make it a part of a new Forest Service initiative, which eventually became known as "new perspectives."

http://www.fs.fed.us/research

USDA
United States Department of Agriculture

1915–2015
100 Years of Forest Service Research & Development

Jerry A. Sesco
Deputy Chief,
Research & Development
1989–1997

Pictured: Forest Service R&D at work.

1915 1925 1935 1945 1955 1965 1975 1985 1995 2005 2015

Forest Service
May 2016

Caring for the land and serving people

Sesco • 1989–1997

Research & Development MILESTONES

- Forest Service Research and Development produced "Strategy for the 90s," a strategic plan that focused Research and Development efforts on understanding ecosystems, understanding people and natural resource relationships, and understanding and expanding resource options.
- In 1990, Sesco unveiled a new Global Change Priority Research Program dedicated to understanding the effects of climate change and air pollution on the Nation's forests. This research program was a part of the U.S. Global Change Research Program, used an ecosystem approach, and included long-term monitoring and ecosystem modeling to study effects of the atmosphere on forests and forests on the atmosphere.
- In 1993, Sesco named Barbara Weber the Director of the Pacific Southwest Research Station, the first woman to hold a station directorship. Weber would later become a Research and Development Associate Deputy Chief under Deputy Chief Robert Lewis.
- Under Sesco's leadership, Forest Service Research and Development increased collaboration with the National Forest System to improve ecosystem and landscape management.
- In 1996, the Urban Forestry Effects Model was developed at the Northeastern Forest Experiment Station (now the Northern Research Station). The software was released in 2006 as i-Tree. i-Tree is now used internationally to analyze and assess the benefits of urban forests.

USDA is an equal opportunity provider, employer, and lender

http://www.fs.fed.us/research

USDA
United States Department of Agriculture

1915–2015
100 Years of Forest Service Research & Development

Robert Lewis
Deputy Chief,
Research & Development
1997–2003

Pictured: Forest Service R&D at work.

1915 1925 1935 1945 1955 1965 1975 1985 1995 2005 2015

Forest Service
May 2016

Caring for the land and serving people

Lewis • 1997–2003

Research & Development MILESTONES

- The Forest Service increased the role of scientific reviews in forest management and policy decisions.
- Forest Service Research and Development continued to diversify its research program and increased the use of innovative research technology. A broad range of topics were investigated, signaling the growing diversity and integration of Forest Service research. Climate change, carbon sequestration, genetics, nanotechnology, human dimensions, agroforestry, and non-timber forest products were examples of this research extension; these topics complemented existing research from past decades and provided a more holistic view of natural resource challenges and opportunities.
- A middle school science journal based on Forest Service Research and Development publications was first published in 1998. The publication of *Natural Inquirer* heralded the recognition of how Forest Service research could contribute to the Nation's K-12 Science, Technology, Engineering, and Mathematics education effort.
- Dr. Melvin Tyree was awarded the international Marcus Wallenberg Prize for his pioneering scientific discoveries leading to basic understanding of water transport in trees. Tyree's work provided perspective on the evolution of wood structure and on the distribution of trees in forests around the world.

http://www.fs.fed.us/research

USDA
United States Department of Agriculture

1915–2015
100 Years of Forest Service Research & Development

Ann Bartuska
Deputy Chief,
Research & Development
2004– 2010

Pictured: Forest Service R&D at work.

1915 1925 1935 1945 1955 1965 1975 1985 1995 2005 2015

Forest Service
May 2016

Caring for the land and serving people

Bartuska • 2004–2010

Research & Development MILESTONES

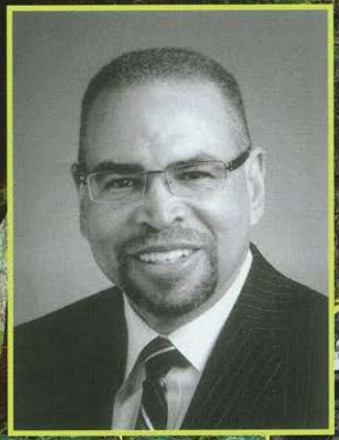
- "Science You Can Use" was adopted as a brand for communicating Research and Development successes and impact, reflecting the growing recognition of the importance of communicating Forest Service Research and Development results with key partners and the public.
- In 2007, Forest Service scientists shared the Nobel Prize with former Vice President Al Gore and other scientists worldwide for their work with the United Nations Intergovernmental Panel on Climate Change.
- A new program in nanotechnology was initiated at the Forest Products Laboratory (FPL). This initiative led to the establishment of a nanotechnology demonstration facility at FPL. As a result, FPL attained a position of leadership in the application of nanotechnology in wood products research.
- A partnership between Forest Service Research and Development and the National Science Foundation was established to promote research in urban ecosystems, with a special emphasis on Urban Long-Term Research Area Exploratory Grants.
- The use of and support for Forest Service Experimental forests and ranges was revitalized. This revitalization led to their improved functioning as a research network and provided resources to enhance a common set of measurements and approaches across key ecosystems.

USDA is an equal opportunity provider, employer, and lender

http://www.fs.fed.us/research

USDA
United States Department of Agriculture

1915–2015
100 Years of Forest Service Research & Development



Jim Reaves
Deputy Chief,
Research & Development
2010–2015

Pictured: Forest Service R&D at work.

1915 1925 1935 1945 1955 1965 1975 1985 1995 2005 2015

Forest Service
May 2016

Caring for the land and serving people

Reaves • 2010–2015

Research & Development MILESTONES

- Forest Service Research and Development analyzed and summarized research to support the restoration of western forests. Some of the scientific themes that emerged included using fire as a tool for restoring forests, addressing the impact of wildland fire smoke, promoting tribal values, and undertaking large demonstration projects.
- Forest Service scientists collaborated with the United Nations and scientists worldwide to produce the Intergovernmental Panel on Climate Change's Fifth Assessment Report in 2013.
- Forest Service researchers applied for patents on their work with super absorbent aerogels made from cellulose nanofibrils, which are particles found in wood. These aerogels offer a sustainable and novel method for oil-spill cleanup and have been jointly developed by the Forest Service and researchers from the University of Wisconsin-Madison.
- In 2014, scientists and staff from the Washington Office and the stations played a leading role in planning the XXIV International Union of Forest Research Organizations World Congress.
- Research and Development, with eight other USDA agencies, established Regional Hubs for Risk Adaptation to and Mitigation of Climate Change. These hubs provide scientific information to farmers, ranchers, forest landowners, and resource managers to support informed climate change decisionmaking.

http://www.fs.fed.us/research