



United States Department of Agriculture

Forest Service Research and Development Tribal Engagement Roadmap Highlights Report



Forest Service

FS-1075

August 2016

U.S. tribes are an integral part of our American story, leaders in our natural resource heritage and the original stewards of the land we hold so dear.

—Tom Tidwell, Chief, USDA Forest Service





United States Department of Agriculture

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Cover Photo: Northern Utah in 2014. Photo by Tania Ellersick

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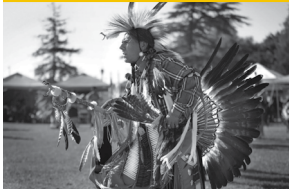
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Contents

Introduction page 1



USDA Forest Service Research and Development
Tribal Engagement Roadmap

Background page 3



Forest Service
American Indians and Alaska Natives and Tribal Sovereignty
Federal Trust Responsibility

Overview of Tribal Engagement Highlights page 5



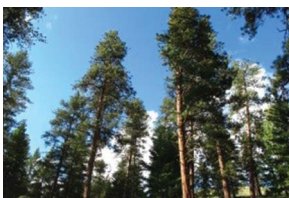
Intent
Methodology
Content

Local and Landscape-Scale Engagement page 8



The Pacific Northwest—Alaska page 8

Coastal Geomorphology and Traditional Food in Southeast Alaska
Wood Energy and Forest Products in Alaska



The Pacific Northwest page 11

Mapping, Cultural Values, and Collaborative Restoration in Washington
Wildfire Risk, Fuels Management, and Technology in Oregon
Blending Traditional and Scientific Ecological Knowledge and Special (Nontimber) Forest Products in the Pacific Northwest



The Pacific Southwest page 14

Traditional Food in California
Agroforestry and Traditional Forest Management for Restoration in California

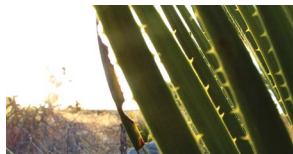


The Rocky Mountains page 17

Fisheries, Genetics, and Citizen Science in Idaho, Montana, Oregon, and Washington
Climate Change and Partnering in Arizona and New Mexico
Vegetation Recovery, Carbon Dynamics, Climate Change, and Post-Fire Management in Arizona

Contents

Local and Landscape-Scale Engagement continued



The South page 21

Land Management Training and Tools for the Southern and Eastern Regions of the United States
Climate Change Adaptation and Seed Banking in North Carolina
Tribal Climate Change Adaptation Partnership in the Southern Region



The North page 24

Forest Inventory and Special/Nontimber Forest Products in the Great Lakes Region
Sustainable Forest Management, Forest Products, and Partnership in Wisconsin
Youth Engagement and Restoration in Maine

Regional-Scale Engagement page 27



Sociocultural Impacts of Nonnative Insect Infestation From the Lake States to the Atlantic
Women's Empowerment and Climate Change in the Northeastern United States

National Engagement page 29



U.S. Tribal Connections Map
Agroforestry Practices in the United States
Wildlife Research Assistantships Across the United States
Student Research Support Across the United States
Indian Forest Management and Research Across the United States
Nontimber Forest Product Assessment for the United States

International Engagement page 34



Invasive Species in the United States and Abroad
Traditional Forest Knowledge and International Engagement
Improving Forest Governance by Strengthening Public Forest Institutions on a Global Level

Moving Forward page 39



Contact Information and References page 41

Introduction

Johnny Velasquez from the Apache Tribe. Photo by Marvin Lychard, 2014, <https://creativecommons.org/licenses/by/2.0/>.



USDA Forest Service Research and Development

The Research and Development (R&D) Deputy Area of the U.S. Department of Agriculture (USDA), Forest Service, is a world leader in innovative science for sustaining global forest resources for future generations. With 81 experimental forests and rangelands and 7 research stations, including the Forest Products Laboratory and the International Institute of Tropical Forestry, the USDA Forest Service R&D employs approximately 500 scientists working at the forefront of natural resource and social science to improve the health and use of our Nation's forests and grasslands. Research has been part of the USDA Forest Service mission since the agency's inception in 1905. R&D scientists develop information and solutions that help sustain forests and rangelands and the services they provide to the American public.

USDA Forest Service R&D has been conducting research for many years with tribes and in Indian country and has collaboratively developed the *USDA Forest Service Research and Development Tribal Engagement Roadmap (Tribal Engagement Roadmap)* to help highlight and prioritize the agency's efforts and raise the visibility of tribal engagement for the agency's scientists,

political leadership, tribes, and the public. The *Tribal Engagement Roadmap* supports and implements the goals and objectives outlined in the agency-wide *Tribal Relations Strategic Plan* (<http://www.fs.fed.us/spf/tribalrelations/documents/plan/TribalStrategicPlan2010-2013.pdf>).

The agency-wide *Tribal Relations Strategic Plan* goals are the following:

- **American Indian and Alaska Native Rights**
Ensure the agency redeems its trust responsibility and protects American Indian and Alaska Native reserved rights as they pertain to USDA Forest Service programs, projects, and policies.
- **Partnerships**
Leverage partnerships to maximize mutual success.
- **Program Development**
Promote integration and utility of the Tribal Relations Program throughout the agency.

Tribal Engagement Roadmap

USDA Forest Service R&D is progressively engaging with tribes and native communities to learn about and share knowledge on critical natural resource issues, such as climate change and fire. Historically, there has been a perceived disconnect between traditional ecological knowledge (TEK) and Western science. There is, however, much to learn from the centuries of on-the-ground knowledge that tribes possess. Similarly, R&D can provide important science and tools to help tribes manage their millions of acres of forests and grasslands. The Tribal Engagement Initiative began in 2010 to improve R&D's "corporate" engagement with tribes and indigenous groups. The goals were to improve two-way communication, partnerships, and joint research with tribes; better coordinate activities across stations on issues of national and global significance; institutionalize trust responsibilities into R&D programs; and incorporate diverse perspectives and traditional knowledge into USDA Forest Service programs and staff. Out of this initiative came the *Tribal Engagement Roadmap* that outlines an agenda for R&D staff regarding services to, engagement with, and learning from Indian tribes and other indigenous groups. The roadmap complements, not replaces, the agency-wide Office of Tribal Relations Strategy that provides program guidance and accountability. Essentially, the roadmap raises the visibility of tribal engagement for USDA Forest Service research scientists and others.

We firmly believe that engaging with tribes on projects that incorporate traditional cultural and spiritual approaches with the best available science will lead to new and effective ways to accomplish sustainable land management across all landscapes. We invite all our partners to join Forest Service Research and Development in this effort.

—Carlos Rodriguez-Franco, Acting Research and Development Deputy Chief, Forest Service

USDA Forest Service Research & Development Tribal Engagement Roadmap Objectives:

1. Build new and enhance existing partnerships with tribes, indigenous and native groups, tribal colleges, tribal communities, and intertribal organizations.
2. Institutionalize trust responsibilities and tribal engagement within USDA Forest Service R&D.
3. Increase and advance tribal and indigenous values, knowledge, and perspectives within USDA Forest Service R&D, including both operational and research activities.
4. Network and coordinate within R&D and across deputy areas to increase agency and R&D program efficacy.
5. Through a collaborative and participatory approach with tribes and tribal organizations, advance research on topics of joint interest, such as: climate change, fire science and management, traditional ecological knowledge, water and watershed protection, fish and wildlife, forest products and utilization, nontimber forest products, restoration, social vulnerability, and sustainability.
6. Develop and deploy research and technologies to support tribal decisionmaking on natural resources issues.

Major themes for future collaborative work between USDA Forest Service R&D and tribes include tribal youth engagement, developing the next generation of scientists; joint efforts on climate change science, including wildfire changes and impacts on culturally important species; and decision support, including tool development and application. For the past few years, USDA Forest Service R&D has been attempting to strengthen its partnerships with tribes, native groups, and intertribal organizations. Prior to this initiative, engagement with tribes and tribal organizations occurred mainly at the scientist level where individual scientists pursued partnerships and projects with these groups. R&D is institutionalizing a tribal research program to ensure that the organization, as a whole, is appropriately engaging with tribes and native communities. This institutionalization will ensure that ties are not broken if and when particular individuals leave. View the *Tribal Engagement Roadmap* at <http://www.fs.fed.us/research/docs/tribal-engagement/consultation/roadmap.pdf>.

Background



Of all the acres held in trust for tribes and individuals, nearly 4,000 miles border Forest Service lands.

▲ USDA Forest Service ranger in the Cabinet Mountains of Montana. USDA Forest Service photo, 1909.

Forest Service

With approximately 818 million acres (331 million hectares) of forest area (USDA Forest Service 2014)—about one-third of land area—the United States is the fourth most forested country in the world. U.S. forests store and filter more than half of the Nation’s water supply and absorb approximately 12 percent of the country’s carbon emissions. The U.S. Department of Agriculture (USDA), Forest Service supports the sustainable stewardship of 18 million acres (7.2 million hectares) of forest lands on Indian reservations, 68 million acres (27 million hectares) of State forest land, more than 137 million acres (52 million hectares) of urban and community forests, and 423 million acres (171 million hectares) of private forest land, as well as manages 193 million acres (78 million hectares) of

National Forest System land. These National Forest System lands include 154 national forests, 20 national grasslands, and 1 national tallgrass prairie and cover 43 States, Puerto Rico, and the U.S. Virgin Islands.

The USDA Forest Service is the Nation’s foremost Federal forestry organization, providing leadership in the management, protection, use, research, and stewardship of natural and cultural resources on the United States’ vast forests and grasslands. The USDA Forest Service was established in 1905 to sustainably manage our national forests and promote conservation across the land. The USDA Forest Service is committed to retaining forests and grasslands for present and future generations.

The mission of the Forest Service is to sustain the health, diversity, and productivity of the Nation’s forests and grasslands to meet the needs of present and future generations.

Background



Huckleberry picking on the Gifford Pinchot National Forest in Washington. USDA Forest Service photo, date unknown.



All or part of every national forest and grassland is carved out of the ancestral lands of American Indian and Alaska Native peoples. Indigenous communities across the country still maintain strong historical and spiritual connections to the land and connections that have not been extinguished despite changes in land ownership.

—Leslie Weldon, National Forest System Deputy Chief, USDA Forest Service

American Indians and Alaska Natives and Tribal Sovereignty

According to 2010 Census data, the combined American Indian and Alaska Native population is 5.2 million. Numerous distinct indigenous groups exist as well, including those of Pacific Islanders in Hawaii, American Samoa, and Guam. Within the United States, 567 federally recognized tribal nations currently exist as sovereign governments. Approximately 229 of these ethnically, culturally, and linguistically diverse nations are located in Alaska; the other federally recognized tribes are located in 33 other States.

American Indian tribal governments have always retained sovereignty and maintained the sole right to self-determination. This sovereignty includes lawmaking and enforcement, defining territory, determining citizenship, regulating trade and property, and forming alliances with other nations through treaties and other agreements.

Federal Trust Responsibility

Since the arrival of European colonists and the formation of the United States, Indian tribal governments have lost up to 98 percent of their aboriginal land base (Smith 2004). In addition to the 18 million acres (7.2 million hectares) of forest lands on Indian reservations, approximately 52 million acres (21 million hectares) of land are held in trust by the United States for various Indian tribes and individuals. Much of the lands managed by the USDA Forest Service and other Federal agencies were ceded to the United States by tribes. Although they no longer reside on these lands, many tribes retain rights

and interests in national forests and grasslands by treaty. Of all the acres held in trust for tribes and individuals, nearly 4,000 miles (\approx 6,400 km) border USDA Forest Service lands.

Federally recognized tribal governments and Alaska Native Corporations have a government-to-government relationship with the United States, as set forth in the Constitution of the United States, treaties, statutes, court decisions, Executive orders, and Presidential memoranda. From 1778 to 1871, the U.S. Government ratified approximately 400 treaties with Indian nations, agreeing to preserve their ability to exercise their sovereign rights as were reserved by the signatory tribes.



Overview of Tribal Engagement Highlights

Uinta-Wasatch-Cache National Forest. Photo by Tania Ellersick, 2014.

The Forest Service Research and Development Tribal Engagement Roadmap is a strong step forward to mobilizing the ingenuity, skill, and effort of USDA Forest Service, Research and Development with the expertise and wisdom of Indian people in order to tackle the large natural resource issues facing our nations. There is so much we know but have been unable to effectively share across cultures. Every day, working together lets us share and learn new lessons, both in improving our understanding of the world we live in and in how to more effectively work together on our common problems. By integrating different ways of understanding, we can learn together to better manage our resources, not only for the benefit of historically underserved tribal communities, but also for the American public broadly.

—Chris Farley, lead editor of the *Forest Service Research and Development Tribal Engagement Roadmap* and management analyst for the USDA Forest Service, Rocky Mountain Research Station, Strategic Management and Accountability program

Overview of Tribal Engagement Highlights

It is important to conduct research with American Indian tribes and communities to incorporate their values, knowledge, and shared interest with natural and cultural resource management approaches of mutual benefit to address the threats and stressors of climate change, ecological disturbances, and related socioeconomic pressures.

—Frank Lake, Karuk descendant, research ecologist and tribal climate change point of contact for the USDA Forest Service, Pacific Southwest Research Station.

Frank Lake and his son Leland, Karuk descendants, after using prescribed fire in northern California to reduce fuels for wildfire risk reduction, to reduce insects and disease, and to improve future harvests of acorns, a culturally valued food source. Photo by Luna Latimer, 2015.



Intent

This *USDA Forest Service Research and Development Tribal Engagement Roadmap Highlights Report* is intended to provide recent examples of tribal engagement that reflect the aims of the *USDA Forest Service Research and Development Tribal Engagement Roadmap (Tribal Engagement Roadmap)*, share that information internally and externally across different sectors, interests, and geographic regions; and identify areas where the agency should move forward. The creation of this document helps us, as U.S. Department of Agriculture (USDA), Forest Service employees, to institutionalize our Trust responsibilities;

communicate areas and opportunities for tribal engagement; increase and advance tribal and indigenous values, knowledge, and perspectives within USDA Forest Service, Research and Development (R&D); and network and coordinate within R&D and across deputy areas to increase R&D program and USDA Forest Service effectiveness. This document also serves to communicate and connect some of the existing partnerships and endeavors with tribes, indigenous and native groups, tribal colleges, tribal communities, and intertribal organizations (all objectives of the *Tribal Engagement Roadmap*).

Methodology

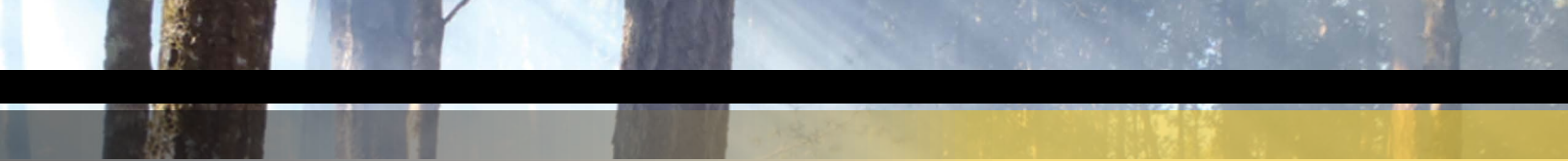
The USDA Forest Service R&D has tribal liaisons at each of the seven research stations:

- (1) Pacific Northwest Research Station,
- (2) Pacific Southwest Research Station,
- (3) Rocky Mountain Research Station,
- (4) Southern Research Station,
- (5) Northern Research Station,
- (6) Forest Products Laboratory, and
- (7) International Institute of Tropical Forestry.

People tell me that working with tribes is the most rewarding aspect of their jobs.

—Fred Clark, Office of Tribal Relations Director, USDA Forest Service

These research scientists/tribal liaisons provided updates on current research efforts, partnerships, agreements, youth engagement, assistantships, internships, and collaborative



initiatives. Of the multitude of recent efforts relayed to the Washington Office, R&D staff chose 27 items to highlight in this report. The items focus on, but are not limited to, the work of the USDA Forest Service Research and Development (R&D) Deputy Area. These highlighted items were chosen to reflect examples from broad geographic regions across the United States (Pacific Northwest, Pacific Southwest, the Rocky Mountain region, the South, and the North) at various scales (local/landscape, regional, national, and international). USDA

Forest Service research scientists and tribal partners, including some of the agency's student research scientists and interns, provided information, text, edits, photographs, and quotes. The items that are highlighted were also chosen to present a broad suite of benefits and values the agency is tasked to provide and protect, as well as to describe some of the many research methodologies and technologies that can support tribal decisionmaking on natural resource issues (*Tribal Engagement Roadmap* objectives 4 and 5).

Content

The topics highlighted in this report reflect many of the traditional issues managed by the USDA Forest Service. Governments in the United States and abroad are contending with past human disturbance, degraded and shifted ecosystems and habitat, invasive insects and plants, fire risk, and increased human populations and related energy demands, development, and loss of forest cover. The USDA Forest Service and tribal governments are interested in forest products and their inventory, sawmill operations, fuel reduction, and restoration, and the highlighted items demonstrate the interest and need for partnering and collaboration across landscapes. The effects of globalization, climate change,¹ and environmental injustice are evident, and the need to respond to these issues urgent. Indigenous populations are particularly vulnerable to climate change impacts and are confronting disproportionate risks to their culture and economies (Parrotta and Agnoletti 2012, Lynn et al 2011). Much, if not most, of tribal engagement resources are utilized to protect remaining species, habitats, and places of cultural value, as well as the people that depend on them. These items illustrate the importance of efficient institutional/forest governance processes and a need for increased capacity and resources.

These examples also illustrate an intrinsic understanding of connectivity across the landscape and across elements of forest ecosystems (e.g., the integration of trees and understory plants and fungi or the link between the headwaters of streams and resulting fish spawn). Tribes have a unique reciprocal relationship with respect for and responsibility to ecological processes, places, and species that demonstrates a holistic view of natural resource management that has evolved over centuries (Lynn et al. 2013). These tribal engagement endeavors help describe

the multiple values and benefits, the “ecosystem services” that forests provide, including the cultural benefits that are integral to tribal identity and existence. Topics such as traditional ecological knowledge, traditional forest management, agroforestry, traditional foods, and socio-cultural impacts are also highlighted. These examples from various geographic regions provide cases where place-based information and local history links to ecological, economic, and sociopolitical global processes. These cases of tribal engagement have informed USDA Forest Service responsibilities within the International Union of Forest Research Organizations and the World Forestry Congress and are integral to the agency's participation in global issues such as Forest Landscape Restoration² and carbon sequestration.

Again, there are similarities in the traditions of tribal communities and the traditions of the USDA Forest Service—all share a respect for individuals who have engaged in these natural landscapes throughout their lives and for communities who have these areas and identities entwined over generations. These traditions, both agency and tribal, are committed to restoring and protecting these areas for present and future generations. Developing relationships with American Indian, Alaska Native, and other indigenous peoples is fundamental to protecting traditional knowledge and culture and finding effective solutions to landscape-scale challenges in the context of climate change and development. The commitment reflected in this tribal engagement document illustrates how cross-cultural learning, transparency, and relationship building can help revitalize tribal communities and rural America, reduce poverty, and facilitate environmental justice.

¹ “Continued emission of greenhouse gases will cause further warming and long-lasting changes in all components of the climate system, increasing the likelihood of severe, pervasive and irreversible impacts for people and ecosystems. Limiting climate change would require substantial and sustained reductions in greenhouse gas emissions which, together with adaptation, can limit climate change risks.” – Intergovernmental Panel on Climate Change 2015

² To find out more about Forest Landscape Restoration and the U.S. pledge to restore 37 million acres (15 million hectares), visit <http://www.forestlandscaperestoration.org/topic/bonn-challenge>.

The Pacific Northwest—Alaska



▲ Copper River Delta, Alaska. Photo by Tania Ellersick, 2013.

Coastal Geomorphology and Traditional Food in Southeast Alaska Yakutat, Hoonah, Angoon, Kake, Klawock, and Kasaan



▲ Adelaide (Di) Johnson, a USDA Forest Service hydrologist, and Sierra Ezrè, a Tlingit High School student from Juneau, AK, conducting a geomorphology beach survey in Yakutat, AK. Photo by Linda Kruger, 2015.

Over the past 60 years, the average temperature across Alaska has increased by approximately 3 °F, more than twice the warming seen in the rest of the United States (Chapin et al. 2014). Rising temperatures in Alaska are already thawing permafrost, decreasing Arctic sea ice, shifting ecosystems, and threatening the traditional livelihoods of Alaska Natives. The location, extent, and productivity of critical areas for vital plants, fish, and wildlife are expected to change, decreasing the availability of traditional foods for Alaska Natives. Many of these affected species are fundamental to the cultural identity of these communities. Because of their vital roles in diet, materials, medicine, and spiritual practices, they are considered cultural keystone species (Garibaldi and Turner 2014).

In the summer of 2015, the USDA Forest Service, Pacific Northwest Research Station initiated a coastal geomorphology and first foods study to explore coastal changes and potential impacts to Alaska Native and rural community foods. The USDA Forest Service is working with Alaska Natives in six southeast Alaska communities (Yakutat, Hoonah, Angoon, Kake, Klawock, and Kasaan). Researchers at the Pacific Northwest Research Station are working with high school students and adult mentors to identify cultural keystone species that are used by local residents, potential changes related to sea level rise, and other climate change-related effects. Using the National Oceanic and Atmospheric Administration (NOAA) ShoreZone database with near-shore



Sheridan Glacier, Cordova, Alaska. Photo by Tania Ellersick, 2013.

ocean depths and available isostatic³ rebound, tectonic movement, and rates of sea level rise, the researchers derived change in shore width and unit length. Researchers compared physical attributes, including slope, substrate, and exposure, with the presence and abundance of species, such as blue mussels, green algae, eel grass, red algae, and bull kelp, as well as intratidal and intertidal ShoreZone database species groups.

High school student interns were selected, and subsistence-related questions were identified through conversations with local residents. Interns met with local residents to identify the communities' use of different species, typical characteristics of

species habitat, and potential threats to habitats and species. Summaries of predicted coastal change and potential threats to species are being developed for each of the six underserved communities. Sierra Ezzrè, a Tlingit High School student from Juneau, Alaska, assisted with the research and gave a presentation on this project at the InterTribal Youth Climate Leaders Congress in the summer of 2015 at the Natural Conservation Training Center in Shepherdstown, West Virginia. More information on the impacts of climate change on traditional foods can be found at http://www.fs.fed.us/pnw/pubs/journals/pnw_2014_lynn001.pdf.

Wood Energy and Forest Products in Alaska

Sealaska Regional Native Corporation, Tlingit-Haida Regional Housing Authority, Gulkana Village, and Gwitchyaa Zhee Corporation

The environmental, economic, and political challenges of using coal and oil have generated unprecedented collaboration between Federal agencies, the private sector, nongovernment organizations, and the public to provide renewable energy. Bioenergy programs and research regarding opportunities, such as woody biomass, have wide-ranging effects from local to international scales, including community economic development and reducing global carbon emissions. Woody biomass utilization must factor in issues such as terrain, accessibility,

These lands are vital not only to our subsistence, but also to our sense of being as Tlingit people.

—Gabriel George, Tlingit, Angoon, Isthmus Town, speaking about subsistence at a USDA Forest Service public hearing in 1990 (Thornton 2012)

³ The equilibrium that exists between parts of the Earth's crust, which behaves as if it consists of blocks floating on the underlying mantle, rising if material (such as an ice cap) is removed and sinking if material is deposited (Oxford).

The Pacific Northwest—Alaska

travel distances, and production costs, but technological improvements and consumer demand could make wood energy a viable competitor with other renewable energy sources such as solar, wind, and geothermal energy in certain areas. The Pacific Northwest Research Station is examining what is necessary to make wood-based energy a viable option for local heating and energy production. Over the past decade, Alaska has seen significant growth in the use of wood for energy, as well as the number of facilities heating with wood. The cost of alternative fuels, such as heating oil, was a primary factor in influencing the switch to wood energy.

In coordination with representatives from the Sealaska Regional Native Corporation and the Tlingit-Haida Regional Housing Authority (both based in Juneau, Alaska), researchers at the Pacific Northwest Research Station recently conducted a wood energy case study regarding wood pellet systems. Case study work also included the examination of three cordwood energy systems, including one in Gulkana Village, a native village located in south-central Alaska. This research will assist tribes and native communities in planning for future wood energy systems, such as choosing the type of wood fuel to use for the greatest benefit. In addition, the USDA Forest Service has been working with the Gwitchyaa Zhee Corporation (Fort Yukon Tribal Government) with biomass harvesting, wood measurement, and moisture content determination. The Pacific Northwest Research Station scientists recently participated in various activities with the Gwitchyaa Zhee Corporation

regarding scaling tree-length material (e.g., cotton wood) and estimating harvest material moisture content. Supervising the preliminary scaling of wood harvested in 2013, 2014, and 2015 resulted in an initial estimate of scale for the corporation's utilities manager. Scientists harvested material and processed and analyzed moisture content samples in coordination with USDA Forest Service, State and Private Forestry staff. The preliminary findings determined that there was not a significant difference in drying rates for material harvested over the 3-year period.

Bioenergy is more commonly used in Europe than in the United States, and much could be learned by examining the policies and technology that have facilitated its use there. Wood-based energy and wood products, especially in niche locations and with new market initiatives, can lead to numerous benefits, including lower energy costs and reduced greenhouse gas emissions. In 2010, the Sealaska Corporation installed Alaska's first large-scale pellet boiler at its corporate headquarters in Juneau, Alaska. The Tok School in southeast Alaska installed a chip-fired boiler that displaces approximately 65,000 gallons of fuel oil annually. More than 20 schools, forest products producers, or government agencies are using wood heating systems in Alaska, and this use of wood energy has enabled rural communities to become more self-sufficient while reducing energy costs. To read more about this issue, visit <http://www.fs.fed.us/pnw/science/scifi174.pdf>.

Local and Landscape-Scale Engagement

The Pacific Northwest



▲ Republic Ranger District, Colville National Forest. Photo by Tania Ellersick, 2010.

Mapping, Cultural Values, and Collaborative Restoration in Washington Confederated Tribes of the Colville Reservation

The USDA Forest Service Collaborative Forest Landscape Restoration Program (CFLRP) has identified 23 high-priority landscapes in 15 States for collaborative, science-based restoration that is focused on fuel reduction to mitigate wildfire risk and support ecological, economic, and social sustainability. In 2012, the Northeast Washington Forest Vision 2020 project (NWFV 2020) was selected for funding under the USDA Forest Service High-Priority Restoration Program and assimilated into CFLRP in 2013. The NWFV 2020 project is focused on restoring fire-regulated forests to increase forest ecosystem resilience and the sustainability of the human-environment systems in and around the Colville National Forest. A new effort is underway between the USDA Forest Service Rocky Mountain Research Station, NWFV 2020, the USDA Forest Service Aldo Leopold Wilderness Research Institute, the School of Geography at the University of Leeds, the College of Natural Resources at the University of Idaho, and the Colville Indian Agency to study native ecosystems and national forest uses of cultural interest to the Confederated Tribes of the Colville Reservation (CTCR).

The project is applying a Participatory Geographic Information Systems (PGIS) protocol for a collaborative effort between the Colville National Forest staff and tribal members and descendants with knowledge of the Republic Ranger District of the Colville National Forest. This effort would map, document, and monitor the distribution and qualities of culturally important places to the Confederated Tribes of the Colville Reservation and examine how they might be affected by the treatments planned via the restoration project. The project aims to explore the associations between the distribution of those identified

conservation risks and other attributes, such as land cover, land use, fire regime history, and the interactions between plant species. Tribal representatives will be asked how they feel about the ways in which management-ignited fires, mechanical understory thinning, and wildland fire policies interact with the values and meanings they attach to national forest lands and cultural uses (e.g., hunting, fishing, firewood gathering, and the gathering of food plants and resources used for medicines and clothing). Tribal representatives will also be asked to map areas they believe need one or more of these types of treatments and why the treatments are needed. They will also be asked to map and discuss places that should not be treated in any of these ways, and why not. This will allow the information regarding culturally significant resources to be integrated into the larger context of the CFLRP project.

PGIS provides a methodology that can include different stakeholders in collaborative spatial planning processes (Kingston 2007), store and manage geospatial data (Elwood 2006), and enable landscape classifications that are based on values that people have attached to certain locations when coupled with multimedia data such as participant comments and or photographs (Sanchez-Trigueros et al. 2014). All data will remain in the ownership of the tribes and will be used with their permission for CFLRP reporting. For more information on CFLRP, visit: <http://www.fs.fed.us/restoration/CFLRP/index.shtml>. For more information on PGIS, read about Mapping Meanings (Map-Me), a PGIS tool developed in partnership by the Aldo Leopold Wilderness Research Institute and the School of Geography at the University of Leeds at <http://www.map-me.org>.

Wildfire Risk, Fuels Management, and Technology in Oregon Confederated Tribes of Warm Springs

Decades of fire suppression and past land management practices, in combination with a changing climate, have resulted in the largest and/or most destructive fires that many States have seen in decades. Researchers have shown a 78-day increase in the western fire season since 1970, possibly due to a gradual rising of average spring and summer temperatures and the time of snowmelt (Westerling et al. 2006). If these patterns persist, scientists predict the Western States will continue to get hotter and drier by the end of the century. In such conditions, fire seasons will grow longer and fires will likely increase in number and intensity.

The Western Wildland Environmental Threat Assessment Center (WWETAC), a unit of the Pacific Northwest Research Station, generates and integrates knowledge and information to provide credible prediction, early detection, and quantitative assessment of environmental threats in the Western United States. WWETAC has been involved with technology transfer and training of fuel-management tools with the Confederated Tribes of Warm Springs in central Oregon. In February 2014,

WWETAC organized a training for the Warm Springs fire and fuels management group, including 10 personnel from the fuels group, silviculture⁴ group, and Geographic Information System (GIS) staff, who participated in an ArcFuels training.

ArcFuels allows scientists, planners, and stakeholders to incorporate various sources of data to model forest growth and fire behavior for a single forest stand or a large landscape. Information from ArcFuels can aid in vegetation management, fuel treatment planning, wildfire behavior modeling, and wildfire risk assessments. Since then, a fire ecologist at WWETAC has supported the tribes' planning efforts, assisting in the preparing of the tribes' data for use in the Landscape Treatment Designer program to develop an all-lands fuels treatment and silviculture plan. This landscape treatment program helps design fuel treatment scenarios using forest stand conditions, potential fire behavior, and the location of features such as critical habitat or homes that are susceptible to fire. View the WWETAC Web site to learn more: <http://www.fs.fed.us/wwetac/wwetac.html>.

Blending Traditional and Scientific Ecological Knowledge and Special (Nontimber) Forest Products in the Pacific Northwest

Grand Ronde, Karuk, Siletz, and Yakama Tribes in California, Oregon, and Washington

Thousands of nontimber forest products (NTFPs)—or special forest products—are collected for food, medicine, fiber, dye, building materials, arts, etc. The harvesting of NTFPs is quite different than the wood products that are the primary focus of forest management; moreover, this understory vegetation and fungi shifts with changes in tree cover. Integrating these resources into silvicultural plans for producing wood and reducing fuels can create management efficiencies but requires information

about them. Knowing about the ecology, abundance, and spatial distribution of NTFPs, for example, and how harvesting, forest management practices, and social dimensions impact them will aid in sustaining populations of special forest products.


Recent research advanced methods to blend traditional ecological and Western scientific knowledge to learn about good sites for harvesting beargrass (*Xerophyllum tenax*) for tribal

It is important for tribal weavers to communicate with people who have decisionmaking authority over our lands.

—Bud Lane, President, Northwest Native American Basket Weavers Association, 2014

⁴ Silviculture is the art and science of controlling the establishment, growth, composition, health, and quality of forests and woodlands to meet the diverse needs and values of landowners and society on a sustainable basis.



Forest Service employee conducting a beargrass plot survey. Photo by B. Gervais, USDA Forest Service, 2012. 

weaving. This understory plant is native across an extensive range and is used by tribal communities and commercial floral markets in the Pacific Northwest. Many tribal communities locate and harvest beargrass for tribal basketry. The leaves of the plant are flexible and strong, and evidence suggests that some tribal basket weavers prefer thin, long, pliable leaves that are associated with postfire conditions (Hummel and Lake 2015; Hummel et al. 2012). Expert weavers from the Grand Ronde, Karuk, Siletz, and Yakama Tribes in California, Oregon, and Washington participated in the study. Agency researchers examined what forest site conditions were associated with tribal basket weavers, classifying a particular beargrass site as “good, marginal, or poor.” Field measurements, such as the average number of trees per acre, average level of down woody material, and the density and color of beargrass plants were collected and evaluated. The ability to move around and harvest within the sites was also considered and was an important decision factor for the weavers.

As requested by tribal participants, research sites remained confidential. Effective communication between scientists, managers, and resource users is essential, and information regarding the management of culturally important plants derived from both scientific and traditional ecological knowledge can aid in designing silvicultural treatments to sustain desired population qualities and quantities. For more information on this effort, read *Forest Site Classification for Cultural Plant Harvest by Tribal Weavers Can Inform Management*, an Open Access article at http://www.fs.fed.us/pnw/pubs/journals/pnw_2015_hummel001.pdf or download this USDA Forest Service brochure at http://www.fs.fed.us/pnw/pubs/pnw_gtr912.pdf.

Local and Landscape-Scale Engagement

The Pacific Southwest

▲ Giant Sequoias (*Sequoiadendron giganteum*) Southern Sierra Nevada, California. Photo by Tania Ellersick, 2015.

Traditional Food in California Yurok Tribe in Northern California

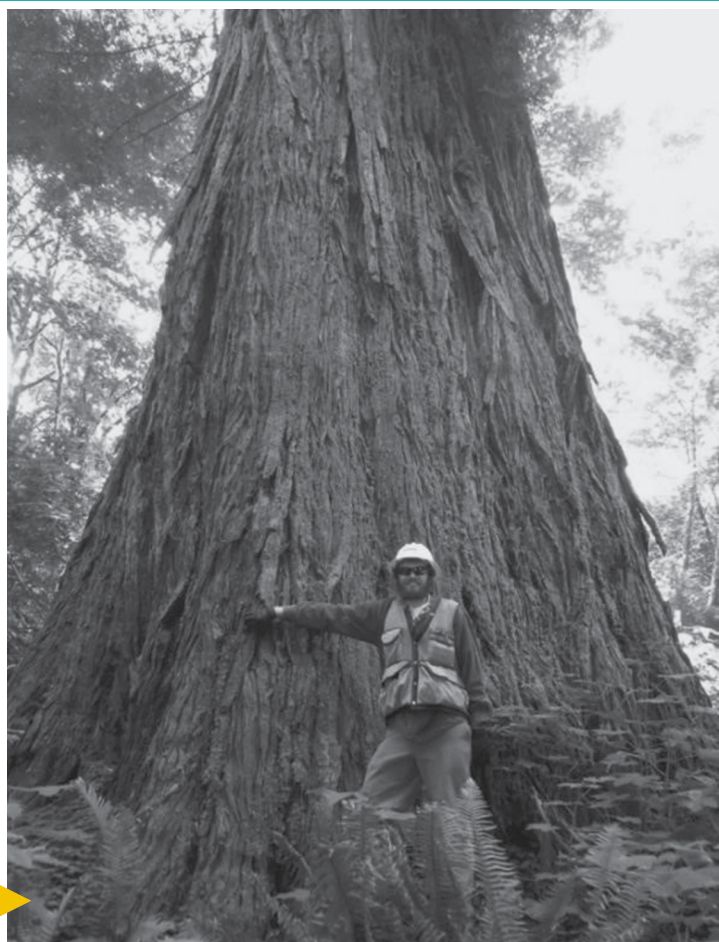
Traditional foods, particularly wild species utilized by indigenous peoples for thousands of years, are mostly harvested on public forests and grasslands. This is becoming increasingly difficult due to development, jurisdictional restrictions, and a changing climate, which is a profound detriment to indigenous communities and a threat to the fabric of culture, tradition, nutrition, trading-based economies, and identity. The need to maintain and enhance community health and well-being through ties to traditional food is essential.

The Yurok people, members of the largest tribe in the State of California, used to live in more than 70 villages throughout their ancestral territory along the Lower Klamath River and the Pacific Coast. Beginning in the

These foods are essential to our people's health, wellness, and religious ceremonies. Our way was never to over harvest and to always ensure sustainability of our food supply for future generations.

—Member of the Yurok Tribe

Kagat McQuillen, Yurok Tribal Member and Humboldt State University master's degree student in the Pacific Southwest Redwood Experimental Forest. Photo by Frank Lake, USDA Forest Service, 2015.





www.istockphotos.com

By putting fire back on the landscape, we intend to restore the currently wildfire-prone desert into a healthy, biodiverse, fruit-, nut-, and wildlife-rich forest.

—Leaf Hillman, Director, Karuk Department of Natural Resources

The Klamath is everything to me. It is my home, church, garden, highway, counselor, friend, brother, and provider.

—Barry Wayne McCovey, Jr., Yurok Tribal Fisheries Department, 2002

1850s, settlers and treaties removed the Yurok people's lands, rivers, and fishing rights. By the end of the Gold Rush Era, at least 75 percent of the Yurok people had died due to massacres and disease. The Yurok people continue to collect traditional foods from the sea, rivers, and forests of northern California. Kagat McQuillen, a Yurok Tribal member in California and a master's degree student at Humboldt State University, is inventorying Yurok traditional food plants in the USDA Forest Service Redwood Experimental Forest, which is administered by the Six Rivers National Forest in Yurok ancestral territory. The forest is on the coast and north of the community of

Klamath, where the Yurok Tribal headquarters is located. The study, in coordination with the USDA Forest Service Pacific Southwest Research Station, is inventorying and mapping food plants. This research partnership with the Yurok Tribe will be used to suggest cultural management practices to be utilized by the USDA Forest Service to enhance the yield of traditional foods. Because the work is conducted within an experimental forest, there is opportunity for implementing research treatments as traditional food management practices to evaluate changes in the ecological qualities of these tribally valued plants.



▲ Frank Lake, USDA Forest Service, and Jesse Goodwin, Karuk food crew member, examine evergreen huckleberries. Photo by Colleen Rossier, 2014.

Agroforestry and Traditional Forest Management for Restoration in California Karuk and Yurok Tribes in Northern California

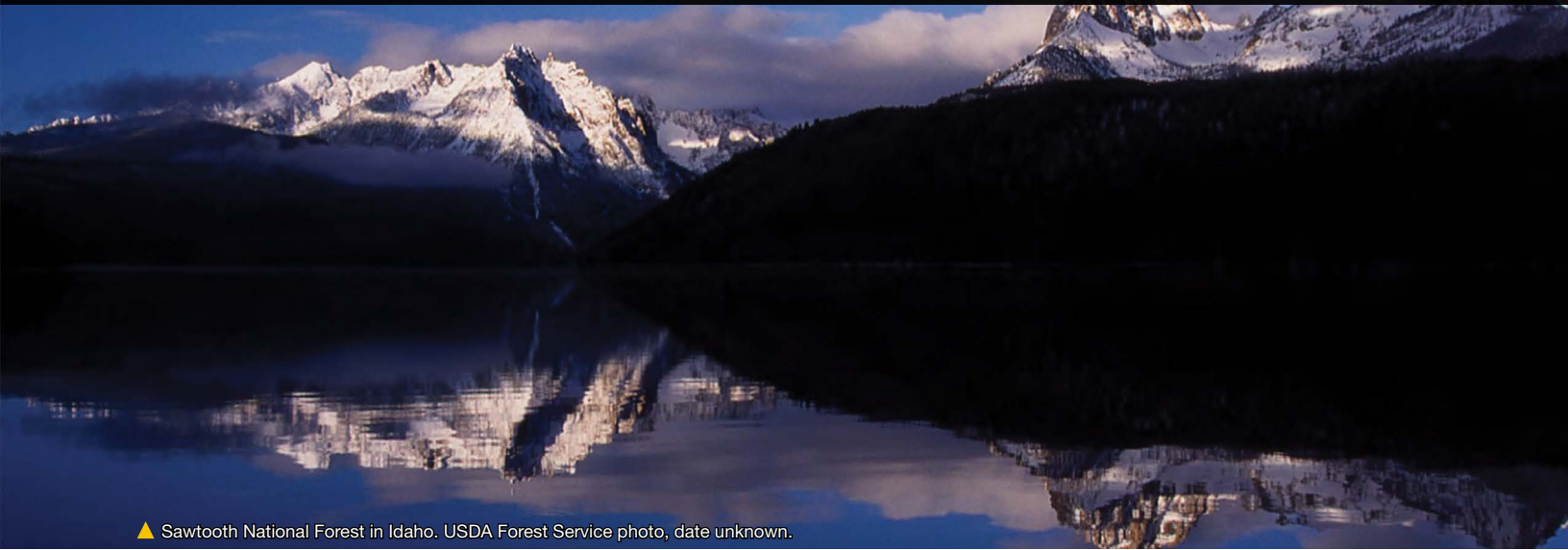
Agroforestry systems, where trees are incorporated with crops (and/or livestock), have various and dynamic forms that have been used and enriched by communities around the world for centuries. These areas have been and are managed to provide food, fuel, building materials, tools, hunting and trapping equipment, baskets, art, and/or ceremonial spaces. In the United States, five agroforestry practices are usually described: forest farming, alley cropping, riparian forest buffers, wind-breaks, and silvopasture.

Incorporating traditional ecological knowledge in an agroforestry context has allowed tribal communities to restore forest biodiversity and wildlife habitat in northern California, to some extent. The Karuk and Yurok Tribes, in partnership with the USDA Forest Service, University of California–Berkeley, and University of California–Davis, are using traditional agroforestry methods to revitalize some of their ancestral forests. The traditional land management systems of the Karuk and Yurok Tribes include forest-grown foods, such as acorns, pine nuts,

huckleberries, hazelnuts, raspberries, deer, elk, and mushrooms, as well as salmon and eels that require cool, spring-fed water. While these foods are still present, they are scarce and of relatively poor quality compared to historic levels. Traditional land management systems incorporated a range of burns at different intensities and frequencies, as well as a variety of pruning, gathering, and hunting techniques.

With the recent publication of *Indigenous Traditional Ecological Knowledge in Agroforestry*, the USDA Forest Service National Agroforestry Center aims to: (1) acknowledge indigenous traditional ecological knowledge of agroforestry systems, (2) express a desire to learn from tribal communities that are currently practicing agroforestry, and (3) support others interested in practicing agroforestry. Find this publication at <http://nac.unl.edu/documents/agroforestrynotes/an44g14.pdf>. For more information on agroforestry practices, please visit the Web site of the USDA National Agroforestry Center: <http://nac.unl.edu/>.

The Rocky Mountains



▲ Sawtooth National Forest in Idaho. USDA Forest Service photo, date unknown.

Fisheries, Genetics, and Citizen Science in Idaho, Montana, Oregon, and Washington

Kalispel, Nez Perce, Shoshone-Bannock, and Snoqualmie Tribes

Bull trout, *Salvelinus confluentus*, are members of the salmon family and are native to Washington, Oregon, Idaho, Nevada, Montana, and Western Canada. Once an abundant species, bull trout have declined due to habitat degradation, population isolation, nonnative species invasions (U.S. Fish and Wildlife Service 2014), and range reduction in response to climate change (Eby et al. 2014). They are listed as threatened under the Endangered Species Act. Federal listing mandates that agencies have reliable and precise information about the distribution of bull trout in thousands of streams, but bull trout surveys are expensive because the fish are often rare and difficult to collect (U.S. Fish and Wildlife Service 2008). Consequently, many potentially or historically occupied habitats have been sampled infrequently or not at all. The uncertainty about bull trout distributions comes at a cost: agencies may not be able to efficiently target their limited conservation resources, may forego or delay critical land management decisions for other objectives, and may even avoid monitoring populations because of the added burden of obtaining sampling permits.



▲ Celilo Falls, traditional fishing grounds on the Columbia River, before the Dalles Dam was constructed. Oregon State University Special Collection, date unknown.

The Rocky Mountains

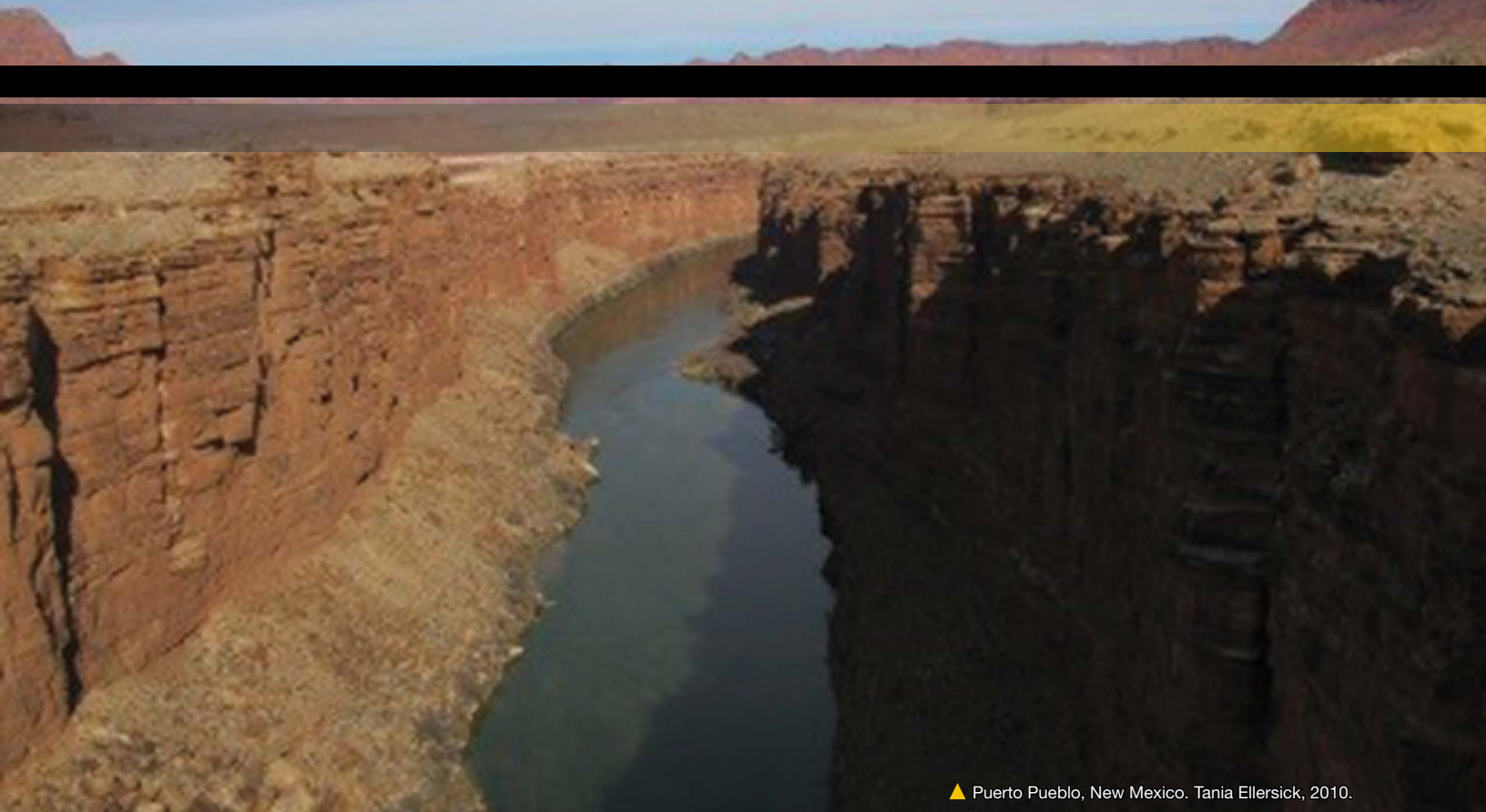


Dan Bingham (former USDA Forest Service employee) and a bull trout. Photo by Michael Young, USDA Forest Service, 2009.

However, researchers at the USDA Forest Service's National Genomics Center for Wildlife and Fish Conservation have pioneered advances in the field of environmental DNA (eDNA), which provide precise, robust information about the presence of bull trout that can be collected quickly and at low cost across the entire range of this species. They have also developed the first reliable eDNA assay for salmonid fish species and a field-proven eDNA sampling protocol that requires only 15 minutes of effort by one individual (Carim et al. 2014; Wilcox et al. 2014 and 2013). These collected samples are easily stored while in the field, can be processed in the lab in under 48 hours, cost as little as \$65 to analyze, and have been found to be remarkably sensitive. In earlier research, 100 percent detection efficiency of target species was achieved despite order-of-magnitude changes in stream discharge (Jane et al. 2015).

USDA Forest Service scientists are engaging with the tribes in Idaho, Montana, Oregon, and Washington to use this genetic sampling to detect bull trout and other species. Researchers

are working with the Snoqualmie Tribe in Washington to detect bull trout presence and develop eDNA tools to detect other species such as redband trout and steelhead. The Shoban Tribe of the Shoshone-Bannock Tribe in Idaho and the USDA Forest Service are working together to detect several culturally important species of interest through designing species-specific assays, including bull trout. The Kalispel Tribe in Washington is collaborating with the USDA Forest Service on nonnative brook trout detection associated with efforts to remove them and restore native cutthroat trout. In Montana, USDA Forest Service researchers are working with the Nez Perce Tribe to develop these eDNA tools for chinook salmon, steelhead, lamprey, and bull trout. This work with tribes is integrated into a larger effort to engage a diverse set of partners, including State and Federal agencies, nongovernmental organizations, academic institutions, and local citizens. To learn more about these efforts, or to get engaged as a citizen science volunteer to collect samples, visit the USDA Forest Service Genomics Center Web site: <http://www.fs.fed.us/research/genomics-center/edna/>.



▲ Puerto Pueblo, New Mexico. Tania Ellersick, 2010.

Climate Change and Partnering in Arizona and New Mexico

Tribes of Arizona and New Mexico

The Institute for Tribal Environmental Professionals (ITEP) based at Northern Arizona University (NAU) since 1992 “strengthens tribal capacity and sovereignty in environmental and natural resource management through culturally relevant education, research, partnerships, and policy-based services.” In 2010, the USDA Forest Service, Rocky Mountain Research Station entered into a joint venture agreement with NAU and ITEP to learn about the needs of tribes in the Southwest in regard to climate change. The aim was to assess the climate change adaptation and mitigation needs and concerns of tribes in Arizona and New Mexico, to research and communicate available opportunities and resources that tribes might utilize

to address those needs and concerns, and to provide relevant management information to USDA Forest Service land managers. The Southwest Tribal Climate Change Network was developed in 2011 to encourage coordination and collaboration between agencies, organizations, and tribes to meet the needs tribes have in accessing climate change resources and information. The network has met by quarterly conference calls, engaging various entities on numerous topics (e.g., desert landscape conservation, restoring sacred waters, and climate change adaptation) and has served as a resource for ITEP to inform tribes and tribal organizations of available funding opportunities, upcoming events, and relevant resources. The ITEP relationship has expanded with partners from the University of Oregon and the Pacific Northwest Research Station, which formed the Pacific Northwest Tribal Climate Change Project (<http://tribalclimate.uoregon.edu>). This facilitates dialogue among northwest tribes, Federal agencies, landscape conservation cooperatives, climate science centers, and tribal organizations such as the Affiliated Tribes of Northwest Indians, Northwest Indian Fisheries Commission, Columbia River Intertribal Fish Commission, and the Intertribal Timber Council. Resources such as newsletters, fact sheets, an adaptation planning toolkit, and ITEP reports can be found on the ITEP Web site: <http://www7.nau.edu/itep/main/tcc/Home/>.



▲ Havasupai member, Arizona. Photo by Terry Eiler, 1972, and courtesy of the U.S. National Archives.

The Rocky Mountains



▲ Prescribed burn in Arizona. USDA Forest Service photo, 2013.

Vegetation Recovery, Carbon Dynamics, Climate Change, and Post-Fire Management in Arizona

White Mountain Apache Tribe

The effects of climate change on forests around the world include shifts in species distribution, increases in drought-related mortality, and changes to disturbance regimes (e.g., increases in insect and disease outbreaks and fire). Understanding the interaction of fire and climate change is of key concern for fire-regulated forests of the Western United States, where increases in fire extent, frequency, and severity have been linked to climate change (Shive et al. 2014, Miller and Safford 2012, Littell et al. 2009, and Westerling et al. 2006) and where severe fires can shift large areas of carbon sinks to carbon sources, intensifying climate change (Shive et al. 2014, Restaino and Peterson 2013, Hurteau and Brooks 2011, and Dore et al. 2008). Strategies to promote forest resilience must incorporate climate change and its effects, including how forests (and the associated carbon) respond to various fuel treatments and fire. The 2002 Rodeo-Chediski Fire in east-central Arizona was one of the largest and most severe wildfires recorded in the United States. The fire burned nearly 470,000 acres (190,000 million hectares), over half of which occurred on the White Mountain Apache Tribal lands. Rocky Mountain Research Station scientists collaborated with researchers from Northern Arizona University, University of California–Berkeley, and the University of Idaho to examine this area in coordination with the White Mountain Apache Tribe. The tribe was engaged in all phases of the research, from getting permission to sample, through the research process, in the presentation of results, to the permission for publishing the results.

The effort *Managing Burned Landscapes: Evaluating future management strategies for resilient forests under a warming climate*

(Shive et al. 2014) modeled the post-fire growth in Ponderosa pine forests using the Forest Vegetation Simulator Climate Extension. This uses information such as pre-fire fuel treatments and fire severity (which is defined by the degree of overstory tree mortality). The results stress the need for site-specific adaptive management approaches that can promote ecosystem resilience and provide forest benefits such as timber, carbon, and habitat in a changing climate. *Simulating post-wildfire forest trajectories under alternative climate and management scenarios* (Azpeleta Tarancón et al. 2014) describes the application of the Climate-Forest Vegetation Simulator (Climate-FVS) to compare alternative climate and management scenarios in severely burned multispecies forest. This study examines the effect of timber cutting alone, as well as combined with prescribed burning on post-wildfire vegetation recovery, fuels accumulations, and successional pathways that are changes in species structure over time. Current forest management does not mandate the modeling of climate change effects in evaluating future scenarios, but this study advocates for the incorporation of climate change in the comparison of alternative management actions. The research project *Interactions of fuel treatments, wildfire severity, and carbon dynamics in dry conifer forests* (Yokum Kent et al. 2015) quantified carbon in overstory trees, standing snags, and forest floor debris in a combination of burn severities and pre-fire treatments 2 years and 8 years after the Rodeo-Chediski Fire. Researchers found that fuel treatments can significantly influence fire severity and the associated carbon fuels and impart that long-term monitoring is vital to understanding post-fire carbon dynamics. Find information and links to the studies in the References Cited section of this report.

The South

▲ Guadalupe Mountains in Texas. Photo by Tania Ellersick, 2011.

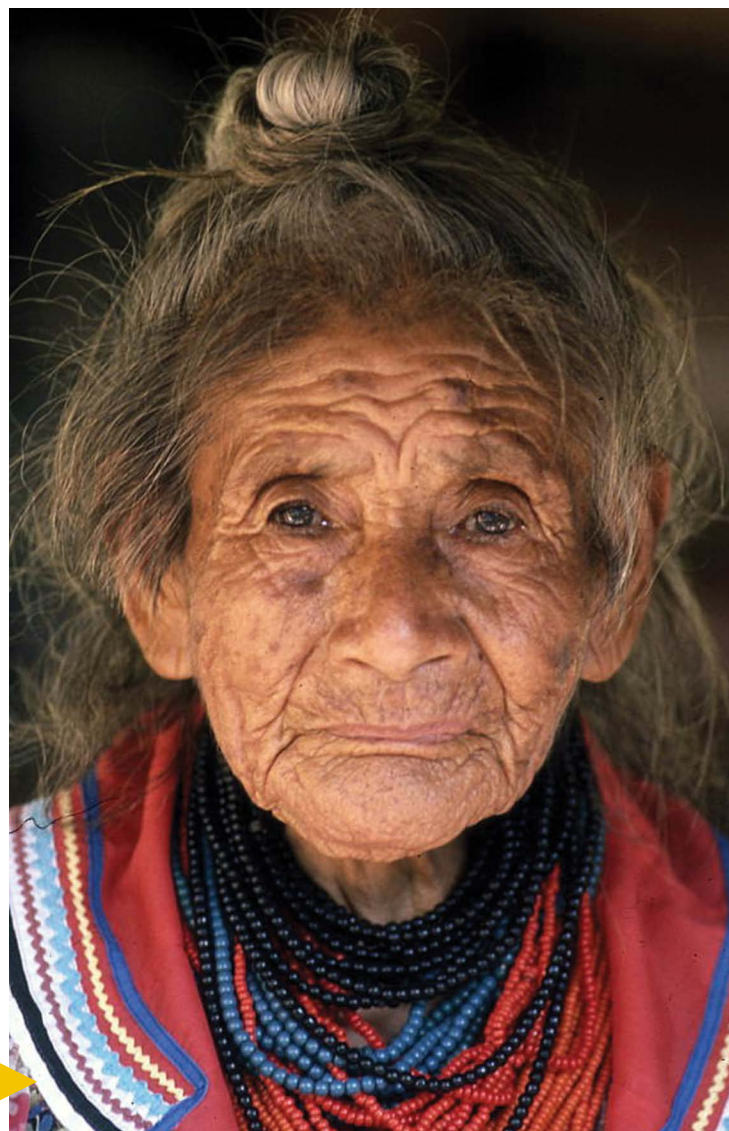
Land Management Training and Tools for the Southern and Eastern Regions of the United States

Twenty-seven tribes through the United South and Eastern Tribes, Inc.

Established in 1969, United South and Eastern Tribes, Inc. (USET), is a nonprofit, intertribal organization that includes 26 tribes across 12 States. USET is “dedicated to promoting Indian leadership, improving the quality of life for American Indians, and protecting Indian rights and resources on Tribal lands.” The USDA Forest Service, Southern Research Station has engaged USET through sharing planning and management tools with tribal representatives and providing online materials that are available for all USET members. Serra Hoagland, who is Laguna Pueblo and co-point of contact for the Southern Research Station’s Tribal Relations Initiatives, attended USET’s semiannual meeting in 2015 to discuss and provide training for various land management tools developed by the Southern Research Station with the USET Natural Resource Committee. The USDA Forest Service has continued working with USET’s Natural Resource Committee leadership on forest management issues that impact member tribes. For more information on the types of USDA Forest Service resources that can support tribal land management, visit <http://www.srs.fs.usda.gov/compass/2013/08/07/eastern-threat-center-tools-support-tribal-land-management/>.

United South and Eastern Tribes, Inc., is “dedicated to promoting Indian leadership, improving the quality of life for American Indians, and protecting Indian rights and resources on Tribal lands.”

Addie Billie of Ochopee, Florida. Seminole women played a critical role in the formation of early tribal governance. Photo courtesy of the State Library and Archives of Florida, 1989.





▲ Pisgah National Forest in North Carolina. Photo by Tania Ellersick, 2015.

Climate Change Adaptation and Seed Banking in North Carolina Eastern Band of Cherokee Indians

The impacts of changing climate and landscape patterns could limit tribal communities' ability to gather and use resources, as these communities are often place-based and natural resource dependent. Communities who use wild-harvested native plants for food, medicine, and cultural practices are identifying ways to protect their natural and cultural resources in response to and in preparation for climate change effects. The Eastern Band of Cherokee Indians is the only federally recognized tribe in North Carolina and lives in the western part of the State, part of its traditional homeland. The Eastern Band of Cherokee Indians has developed a wealth of ethnobotanical knowledge over many generations across the southern Appalachian Mountain region. To protect this cultural heritage, the Eastern Band of Cherokee Indians; the USDA Forest Service, Southern Research Station; the North Carolina Arboretum; and the U.S. Geological Survey have formed a new partnership. Interested in integrating Western and traditional ecological knowledge (and recognizing that tribal knowledge is proprietary), the partners signed a Memorandum of Understanding in 2014 to establish a framework for sharing information, monitoring,

research, and resource management planning. Seeds and other genetic information—collectively called germplasm—from culturally significant native plants will be collected and stored safely at the North Carolina Arboretum Germplasm Repository. Most seedbanks focus on agricultural crops like corn, wheat, and others, but the arboretum focuses on ethnobotanicals native to the southern Appalachians. Edible and medicinal plants like ramps, black cohosh, and sochan (which is also called green-headed coneflower) are some of the species whose seeds may be stored under the terms of the agreement. Climate change could affect the timing and availability of these resources, and reservation boundaries mean that tribal members have limited options for off-reservation gathering or harvesting. By identifying and documenting traditional natural resources in the southern Appalachians, the partnership aims to protect natural resources, as well as the Native American communities that rely on them. To find out more about the work of the Southern Research Station, visit <http://www.srs.fs.usda.gov/compass/>.

Tribal Climate Change Adaptation Partnership in the Southern Region

Multiple Tribes Across 13 States

The USDA Forest Service is creating at least one Tribal Climate Flagship Partnership in each of the USDA Forest Service's nine regions to develop and implement climate adaptation strategies for tribal lands and adjacent national forests and grasslands. Through increased intra- and inter-agency collaboration, these partnerships will develop new and expand existing opportunities to assist tribal communities in preparing for and recovering from the impacts of climate change. One example is the growing relationship between the USDA Forest Service and the Eastern Band of Cherokee Indians in the Southern Region. Previous engagement and collaboration with the tribe includes a Memorandum of Understanding for the reburial of ancestral remains, the purchase of land within a tribal traditional use area that will be used for a learning and research site, and active participation by the Eastern Band of Cherokee Indians in the Nantahala-Pisgah National Forest Land Management Plan revision process.

This successful relationship has flourished into a tribal flagship adaptation partnership through the creation of a new Memorandum of Understanding with other Federal and State

partners to promote cooperation in research and improve the integration of traditional and Western systems of knowledge for addressing climate and landscape change in the southern Appalachians. The emphasis of this science-management Memorandum of Understanding is to provide for the protection of, and tribal access to, information and resources of cultural significance through creation of a framework for cooperation in sharing information, monitoring, research, and resource management planning and identifies management priorities, including restoration of traditional species and prescribed burning, better cultural resource surveys, and consideration of traditional ecological knowledge in forest management. These partnerships will leverage an existing, coordinated effort in tribally focused research—the Tribes and Climate Change Research Project—that incorporates traditional knowledge and western science to meet tribal natural resource needs. For more information about the work of the USDA Forest Service, Office of Sustainability and Climate Change and the tribal adaptation partnership, visit <http://www.fs.fed.us/climatechange/updates/March%202015%20Climate%20Update.pdf>.

The North

Forest Inventory and Special/Nontimber Forest Products in the Great Lakes Region

Anishinaabe (Ojibwe or Chippewa)



Birch bark inventory by Northern Research Station scientist. Photo by Mike Dockry, USDA Forest Service, 2015.

Paper birch (*Betula papyrifera* L.; *wiigwaas* in the Ojibwe language) has provided American Indians in the Upper Midwest with the material for canoes, food storage, tinder, and material for etching traditional stories and images and has been crucial to the economic welfare of tribal artisans. Paper birch is central to the creation story of the Anishinaabe (Ojibwe) and is fundamental to their culture and livelihood.

The Ojibwe and other Native American tribes of the Upper Midwest signed treaties in 1836, 1837, 1842, and 1854 ceding land (“ceded territories”) in northern Michigan, Wisconsin, and Minnesota to the Federal Government, but retained certain rights in the region. To help implement these retained rights on national forests in the ceded territories, member tribes of the Great Lakes Indian Fish and Wildlife Commission, which represents 11 Anishinaabe Tribes, and the USDA Forest Service entered into a Memorandum of Understanding in the early 2000s. Tribal communities in the Great Lakes region have been concerned about a possible diminishing supply of bark from paper birch, which is considered a cultural keystone species. Tribes are permitted to regulate their members’ harvest of nontimber forest products (including paper birch bark) on national forest lands under the Memorandum of Understanding.

The Great Lakes Indian Fish and Wildlife Commission and USDA Forest Service, Northern Research Station have collaborated to evaluate the availability of birch bark for use by tribal artisans. Results include 30 years (1980–2010) of birch bark inventory, an inventory field guide integrating traditional ecological knowledge and Western science to inventory a culturally important resource, a report on inventory results, and a USDA Forest Service, Forest Inventory and Analysis (FIA) report that addresses the particular resource needs of the Anishinaabe.



Leech Lake Band of Ojibwe in wild rice Manoomin fields on Leech Lake. Photo by H. Trevor Booth and courtesy of the Mathers Museum of World Cultures, date unknown.

Eight gatherers from five member tribes shared information about bark characteristics necessary for specific uses and their approaches for finding and identifying trees with the desirable bark features. Information from these experts was collected by interview notes, photographs, and audio recordings. By using the collaborative inventory methods as a supplement to the USDA Forest Service, FIA program, researchers found that the number of paper birch trees has decreased by 49 percent, and total bark supply has decreased by 45.5 percent on forest land in the ceded territories since 1980. The decline in paper birch, both in number and as a proportion of all trees, across the

ceded territories should not materially diminish near-term bark harvest in the region as a whole, but may do so in particular locations. The long-term trend suggests a lack of regeneration and a continued decrease in the total number of trees across the region. A Great Lakes Indian Fish and Wildlife Commission and Northern Research Station technical advisory group continues to work on the next steps in ensuring supply and inventory of paper birch for Native artisans.

Find out more at <http://www.nrs.fs.fed.us/pubs/45701>, <http://www.nrs.fs.fed.us/pubs/48342>, and <http://www.nrs.fs.fed.us/pubs/49374>.

Sustainable Forest Management, Forest Products, and Partnerships in Wisconsin

Menominee Indian Tribe

The USDA Forest Service and the College of Menominee Nation Sustainable Development Institute are collaborating to promote sustainable forestry on public and private forests, sustainable utilization of best practices, and sustainable rural development on native timber lands. In the fall of 2003, the USDA Forest Service and the College of Menominee Nation Sustainable Development Institute signed a Memorandum of Understanding to establish a sustainable forestry research, education, and extension center, called the Center for First Americans Forestlands (CFAF). The USDA Forest Service provides a tribal liaison to the College of Menominee Nation to work collaboratively with the CFAF director to advance the vision, mission, and programming goals of the center. The liaison position is supported by the USDA Forest Service's Northern Research Station, Forest Products Laboratory, Northeastern Area of State and Private Forestry, and Northern Region. The center's goal is to promote sustainable forestry management practices through research, education, policy analysis, and technical assistance through the synthesis of the best practices

of forest ecology, utilization, and Native American expertise and the application of this knowledge to sustainable forestry practices and sustainable development. The mission of the College's Sustainable Development Institute is "to share and implement the Menominee values of sustainability through education, applied research, community engagement, and the sharing of indigenous wisdom."

A facet of this effort is through the center's work with Menominee Tribal Enterprises, a tribally owned and operated forest management and wood products manufacturing operation in Wisconsin. In 2012, the CFAF and the USDA Forest Service, Forest Products Laboratory, initiated a cooperative agreement to assist the Menominee Tribal Enterprises' Millwork Division. The 2-year agreement, with matching funding, provided technical assistance, market research, and marketing plan development for cabinetmaking operations. It involved the Madison Area Technical College (known as one of the best programs for molding), which provided basic and advanced

The North

principles of manufacturing processes related to cabinetmaking, as well as a student internship that focused on communications and marketing materials.

A renewed Memorandum of Understanding between the USDA Forest Service and the College of Menominee Nation is underway to reiterate CFAF's holistic approach to forest land sustainability through program areas of education, research,

outreach, and technical assistance. To learn more about CFAF, visit the College of Menominee Nation Sustainable Development Institute Web site at <http://sustainabledevelopmentinstitute.org/cfaf/>. For more information on the Forest Products Laboratory, visit <http://www.fpl.fs.fed.us/index.php>. For more information on Menominee Tribal Enterprises visit: <http://www.mtewood.com/index.html>.

Youth Engagement and Restoration in Maine Penobscot Nation

The USDA Forest Service is cooperating with the Penobscot Nation and the Wabanaki Center at the University of Maine in Wabanaki Youth in Science (WaYS). WaYS is a multi-faceted model education program for Wabanaki Youth that was developed to encourage persistence in science through high school and post-secondary education. One WaYS opportunity is the Penobscot Indian Nation WaYS Forward Program that provides employment, training, and mentoring to Wabanaki youth in Maine. This has involved a 2-year internship for Native American youth in which they are working with Western scientists and Cultural Knowledge Keepers on a combination of Western science and traditional ecological knowledge. Linking the two perspectives strengthens the understanding and relevance for Native youth and ultimately their desire to learn. WaYS Forward students have been conducting monitoring and controlling for nonnative invasive plants in a habitat restoration project at the Penobscot Experimental Forest, the location of 60-plus years of USDA Forest Service

research and demonstration in forest ecology and management. WaYS is funded by the USDA Forest Service, Northern Research Station; the National Fish and Wildlife Foundation; and Wells Fargo, through one of Wells Fargo's "Environmental Solutions" grants. Field work was completed over the summer of 2015, and the Northern Research Station is now working with the students through the school year on entering and analyzing data and developing a treatment plan for invasive species (mechanical, chemical, and no treatment). The students will also be developing their interpretative trail plan and potentially creating a Geographic Information System map. In the spring of 2016, the students will implement the mechanical treatment and the USDA Forest Service will implement the chemical treatment in the designated plots. Data will be collected after the treatments, and the interpretation trail will also be built. For more information on the Northern Research Station, visit <http://www.nrs.fs.fed.us/> and, for more information on the University of Maine's Wabanaki Center, visit <http://www.naps.umaine.edu/>.

WaYS students monitoring and controlling for nonnative plants in a habitat restoration project at the Penobscot Experimental Forest in Maine. Photo by Tish Carr, 2015.



Regional-Scale Engagement

▲ Helena National Forest in Montana. USDA Forest Service photo, date unknown.

Sociocultural Impacts of Nonnative Insect Infestation From the Lake States to the Atlantic

Anishinaabe (Ojibwe), Haudenosaunee (Iroquois), and Wabanaki (Maine) Tribes

Emerald ash borer, an Asian beetle introduced to North America in the 1990s, was discovered targeting ash trees (*Fraxinus* species) in southeast Michigan in 2002. Metallic green, ½-inch long adult beetles feed on ash tree foliage causing little damage, but white or cream-colored larvae (the immature stage) feed on the inner bark and sapwood of ash trees, disrupting the tree's ability to transport water and nutrients and killing the tree within 1 to 4 years. The nonnative invasive species has since killed tens of millions of ash trees in southeastern Michigan alone. Tens of millions more trees have been lost in Arkansas, Colorado, Connecticut, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Massachusetts, Maryland, Minnesota, Missouri, New Hampshire, New Jersey, New York, North Carolina, Ohio, Ontario, Pennsylvania, Tennessee, Quebec, Virginia, West Virginia, and Wisconsin. The issue has caused regulatory agencies and the USDA to enforce quarantines and fines in 21 U.S. States and Ontario and Quebec to prevent potentially infested ash trees, logs, or hardwood firewood from moving out of areas where the insect has been documented.

The insect targets the black ash tree (*Fraxinus nigra*), a cultural keystone species used by tribes from the Lake States to the Atlantic for making baskets, pipes, flutes, lacrosse sticks, and medicines. Adaption planning to date has focused on the ecological implications of the insect, but the issue also has profound social and cultural effects in Anishinaabe communities in Michigan, where the emerald ash borer first established itself. In FY 2016, traditional ecological knowledge experts,



▲ Invasive emerald ash borer. Photo by Macroscopic Solutions. <https://www.flickr.com/photos/107963674@N07/16292189779>.

tribal professionals, and researchers are convening to identify culturally appropriate ways to support communities already experiencing the sociocultural effects of the insect, and help those who are not yet affected prepare for its almost certain arrival. This regional adaption planning is in coordination with the Penobscot Nation faculty, University of Maine, and the St. Regis Mohawk Environmental Division based in New York. One of the outcomes will be development of a model sociocultural adaptation module for tribal emerald ash borer adaptation planning.

More information on the insect and how Emerald ash borer impacts American Indian communities can be found at <http://www.emeraldashborer.info/files/EABImpactsOnAmericanIndianCommunities.pdf>.

Women's Empowerment and Climate Change in the Northeastern United States

Haudenosaunee (Iroquois) and Wabanaki (Maine) Tribes

In September 2015, 80 heads of State recommitted to women's empowerment at the 20-year anniversary of the historic gender equality conference in Beijing. President Barack Obama recommitted the United States to the basic principle affirmed in Beijing:

President Obama noted that "Within the United States, we are taking steps to support working families, encourage women and girls to pursue careers in the STEM [Science, Technology, Engineering, and Math] fields, and provide additional opportunities for women entrepreneurs. But we know that much work remains ... my Administration continues to work to advance the empowerment and education of women and girls here and abroad. It's why we are dedicating additional resources to address violence against women and girls. It's why we are investing in job training and apprenticeships to help women earn better-paying jobs. It is why we launched 'Let Girls Learn', to address the challenges adolescent girls around the world face in enrolling, completing and succeeding in school. And it is why my Administration's Stand with Civil Society initiative is supporting the right of women and all people around the world to work peacefully for the betterment of their societies without fear that their rights and freedoms will be unjustly abridged. Today, we renew our resolve to work tirelessly towards a world where every woman and girl can enjoy the rights and freedoms that are her birthright."

The connection of people within their environment and the responsibilities associated with those relationships are often gendered. This is reflected in indigenous communities in the United States where race and gender are major factors in their colonization history and current conditions of oppression. The colonial history of American Indians, Alaska Natives, and Native Hawaiians, combined with the effects of climate change, manifest into distinctive vulnerabilities for tribal communities (Vinyeta et al. 2015). Historically, native women have played vital roles in bringing their families and communities through times of social and ecological change, and they continue to do so today. In August 2015, the USDA Forest Service, Citizen Potawatomi Nation faculty, and the Center for Native Peoples and the Environment (at the College of Environmental Science and Forestry of the State University of New York) agreed to organize and fund a summit regarding native women and climate change. The event, *Voices of Mother Earth: Native Women's Climate Change Summit*, will bring together women leaders from



Black ash baskets. Photo by Alan R. Pierce, 2015.

northeastern tribes to identify the tools and strengths native women bring for responding to the challenges presented by climate change. This effort will include a culturally appropriate communication product to share results with tribes and others in the region, and the summit is expected to serve as a model for other regional and national gatherings. For more information on gender issues in indigenous communities, see the USDA Forest Service, Pacific Northwest Research Station's General Technical Report completed in collaboration with scientists from the Michigan State University and the University of Oregon: *Climate Change Through an Intersectional Lens: Gendered Vulnerability and Resilience in Indigenous Communities in the United States* available at <http://www.treesearch.fs.fed.us/pubs/49888>.

Women's empowerment and their full participation on the basis of equality in all spheres of society, including participation in the decisionmaking process and access to power, are fundamental for the achievement of equality, development, and peace.

Chippewa women picnic at Grand Portage Reserve on the Superior National Forest, Minnesota. Photo by C.R. Randall, 1936, and courtesy of the Forest Historical Society.



National Engagement

▲ *Abies lasiocarpa*. Photo by Tania Ellersick, 2015.

U.S. Tribal Connections Map

The USDA Forest Service's Office of Tribal Relations and Geospatial Service and Technology Center has developed *Tribal Connections*, a new online interactive tool that shows how lands managed by the agency connect or overlap with current tribal trust lands and lands that tribes exchanged with the Federal Government prior to 1900. Nearly 4,000 miles of shared boundaries between tribal lands and USDA Forest Service-administered/owned land are identified. *Tribal Connections* compiles information from hundreds of Smithsonian Institute maps and displays them in a single visual presentation. USDA Forest Service mapping experts have used information published in 1899 by Smithsonian ethnographer Charles C. Royce who used the best tools and information available at the time but incorporated geographic descriptions that have been difficult to replicate with modern technology. Clicking on the map provides additional current and historical detail for each location. *Tribal Connections* uses the most current data available from Federal Census Bureau, USDA Forest Service, Smithsonian, and other sources. This reference tool will help USDA Forest Service employees and the public better understand historical treaties and the role they play in making current land management decisions. The USDA Forest Service will use the map to help improve decisionmaking on incident and resource management and to honor and strengthen treaty rights and the

Our country has a deep, yet sometimes forgotten, connection to indigenous people and their lands, which all Americans now call home. By showing historical and modern connections to public lands in one place, we can all understand that land management decisions should take into account more than what meets the eye.

—Arthur "Butch" Blazer, former Deputy Under Secretary for Natural Resources and Environment, U.S. Department of Agriculture

Federal trust responsibility. It will improve the efficiency of agency-tribal coordination, collaboration, and consultation and help identify opportunities for new and expanded partnerships between tribes and the agency. The *Tribal Connections* viewer is available online through the USDA Forest Service Geodata Clearinghouse, the online collection of digital data related to forest resources, at <http://usfs.maps.arcgis.com/apps/webappviewer/index.html?id=fe311f69cb1d43558227d73bc34f3a32>.

Agroforestry Practices in the United States

Agroforestry is the intentional integration of trees and shrubs with crops and or animals and has been practiced in the United States and around the world for centuries. Agroforestry has diverse and evolving forms, but there are five agroforestry practices typically described in the United States: forest farming, alley cropping, riparian forest buffers, windbreaks, and silvopasture. Communities in the United States and abroad have developed intricate ways to manage bioculturally diverse ecosystems (Maffi 2007) to provide food, fuel, building materials, agricultural and plant-tending tools, hunting and trapping equipment, baskets, and ceremonial spaces essential to life and maintaining cultural traditions. Many agroforestry practitioners in the United States are learning from these complex systems. While some indigenous communities have been able to continue managing their ancestral homelands, altered political boundaries, laws, regulations, economic incentives, and sociocultural practices mean that most indigenous and tribal communities' ancestral homelands have not been managed in their traditional ways for more than a hundred years, which has made it difficult—if not impossible—to continue traditional management practices.

Traditional ecological knowledge can describe additional practices within and beyond the five widely recognized agroforestry practices in the United States. In northern California (see page 8), tribes light understory fires beneath acorn trees in the early fall to remove weevil- and moth-ridden nuts prior to the full acorn harvest (Anderson 2007), and, later, mushrooms and huckleberries are harvested in the same landscape. Tribes have used fire to enhance huckleberry growth in forest understories. Huckleberry grows more vigorously after being exposed to fire, producing more berries in the third or fourth year and thriving in the enhanced light conditions when the canopy is opened up after the fire. The Tohono O'odom and Pima manage and consume saguaro cactus fruit, tepary beans, chia seeds, acorns, and mesquite tree pods (which are eaten fresh or ground into flour), among many other desert foods that are part of their traditional systems (Curtin 1984). For centuries, native Hawaiians have used traditional agroforestry systems, sometimes including a breadfruit overstory with an understory of traditional cultivars of sweet potatoes, bananas, and taro (Abbot 1992), and sometimes also 'awa (kava), medicinal herbs, and maile (used for lei).

The USDA National Agroforestry Center has published a document describing these systems to help demonstrate how traditional ecological knowledge can inform agroforestry practices both on and off tribal lands. These robust and complex systems can produce multiple products from the same piece of land and emphasize the use of native plants suited to the local



Ron Reed with the Karuk food crew collects gooseberries in northern California. Photo by Colleen Rossier, 2014.

landscape and climate, producing foods and other materials. In 2012, the USDA estimated that less than 1 percent of the land in the United States with the potential for agroforestry had agroforestry in those areas. Traditional ecological knowledge can assist in bringing additional lands into agroforestry management (USDA 2013). Find more information about agroforestry at the USDA National Agroforestry Center, visit <http://nac.unl.edu> and view the document at <http://nac.unl.edu/documents/agroforestrynotes/an44g14.pdf>. To learn more about how agroforestry can play a key role in addressing global hunger and malnutrition, see *Forests, Trees and Landscapes for Food Security and Nutrition: A Global Assessment Report* by the International Union of Forest Research Organizations at <http://www.fs.fed.us/blogs/forests-can-play-key-role-addressing-global-hunger-and-malnutrition>.

Wildlife Research Assistantships Across the United States

The USDA Forest Service, through a partnership with The Wildlife Society, is offering research assistantships for students as part of The Wildlife Society professional development program for Native Americans. The program facilitates native student mentoring opportunities with USDA Forest Service, Research and Development (R&D) scientists and promotes student advancement and training for careers in natural



Pacific Southwest Research Station Native American research assistants Ray Gutteriez and Jessica Lackey examine plants at the cultural use demonstration site on the Sierra National Forest in North Fork, California. Photo by Jonathan Long, USDA Forest Service, 2015.

resource and conservation-related fields. The program targets upper level undergraduate (junior/senior) or graduate (MS or PhD) students interested in wildlife and forest resources. Students gain experience with laboratory or field data collection, data entry, and analysis as it relates to wildlife ecology and management and are able to improve their oral and written communication skills. Support for the 2016 assistantships includes a stipend of \$5,000 to cover living expenses for the 3- to 6-month assistantship time period.

Six assistantships are offered for 2016, providing opportunities for students to learn about:

- White-nose syndrome in bats and integrated disease management.
- Bat populations, restoration, cultural plants, and sharp tail grouse habitat management in Wisconsin.
- Wildfire risk in Mexican spotted owl territories on tribal lands in New Mexico.
- Aquatic wildlife habitat on Dzil Ligai Sian (Mt. Baldy) on White Mountain Apache tribal lands in Arizona.
- Climate change impacts on native Hawaiian stream fauna.
- Genetic technology and wolverine distribution on the Flathead Indian Reservation.

For more information, visit: <http://wildlife.org/research-assistantships-available-for-native-americans/>.

Student Research Support Across the United States

The USDA Forest Service, Southern Research Station has partnered with the Intertribal Timber Council to provide Native American Natural Resource Scholarships. “These students are encouraged to reach out to our researchers, who can assist them with their research project development,” says Serra Hoagland, biological scientist with the Southern Research Station’s Eastern Forest Environmental Threat Assessment Center and co-point of contact for Tribal Relations for the station. “I am sure both the students and our scientists will enjoy working together. This scholarship opportunity is a great way to uphold our Federal trust responsibility with tribal communities by supporting the advancement of these American Indian students in natural resources fields of study,” says Hoagland. Southern Research Station funds provided each student with a \$4,000 research scholarship and an additional \$1,000 to offset the costs of presenting a research poster at the Intertribal Timber Council Annual Timber Symposium at the Coquille Indian

Reservation in North Bend, Oregon, in June 2015. More than 300 tribal forest managers, council members, and resource managers, along with Federal, State, and private groups from the United States and Canada, attended the symposium. The 2015 scholarship recipients were:

- Grace BullTail, Crow Nation: Cornell University—Researching groundwater quality in oil and gas drilling areas around the Fort Berthold Reservation, North Dakota.
- Cody Sifford, Navajo Nation: University of Washington—Developing an impact assessment of local air quality as a result of biomass burns.
- Crystal Tully-Cordova, Navajo Nation: University of Utah—Studying stable isotopes in precipitation, surface, and ground waters: Recording the North American Monsoon in Arizona, New Mexico, and Utah.

National Engagement



- Victoria Walsey, Yakima Nation: University of Kansas—Bridging knowledge systems to improve ecosystem management along the Yukon River: How indigenous peoples can prepare themselves for climate change.
- Kim Yazzie, Navajo Nation: Portland State University—Examining aquifer recharge and watershed response to climate change in the Upper Umatilla River sub-basin using the Precipitation Runoff Modeling System.

For more information, visit the Southern Research Station Web site at <http://www.srs.fs.usda.gov/index.php>, the Intertribal Timber Council Web site at <http://www.itcnet.org>, or email Serra Hoagland at sjhoagland@fs.fed.us.

Kimberly C. Yazzie, a Navajo Nation tribe member and graduate student, Environmental Science and Management at Portland State University. Photo by Kimberly C. Yazzie, 2015.

Indian Forest Management and Research Across the United States

Native American forests and tribal forest management practices have sustained indigenous communities, economies, and resources for millennia. These systems provide a wealth of knowledge and successful applications of long-term environmental stewardship and integrated, sustainable forest management. Tribal forestry has received an increasing amount of attention to provide approaches for solving the most complex issues facing natural resource managers today. Tribal forest management provides numerous examples of balancing complex, multiple objectives in an era of shrinking budgets, novel ecologic interactions, and increasing human demands on our natural resources.

Native American research assistants Ray Gutteriez and Jessica Lackey sample wild strawberries during a tour of forest restoration projects at Blodaett Forest. Photo by Jonathan Long, USDA Forest Service, 2015.



Engagement of tribal leaders, professionals, and experts from each of the six National Climate Assessment regions is included in the cultural chapter of the Nontimber Forest Product assessment. Their involvement helped present management issues, interests, and on-the-ground practicalities that would otherwise not have been available to ensure a robust and balanced approach to the assessment. The assessment will be published in 2016 and available for use by tribal land managers and land managers in rural communities.

—Torat Patel-Weynand, Director, Sustainable Forest Management Research, Research and Development, Forest Service

The Society of American Foresters' Journal of Forestry is the most widely circulated scholarly forestry journal in the world. USDA Forest Service scientists from the Northern and Southern Research Stations are serving as editors for a special issue in 2017: *Indian Forest Management: Innovations for Sustainable Forest Management*. This special issue of the journal seeks to capture the broad range of forest management practices

occurring in Indian country to increase general recognition of the role that tribal forests play in the greater landscape and to engage broad audiences regarding the value of tribal forests and how they can serve as models for sustainability, integrated management, resilience, and restoration. Learn more about the Journal of Forestry at <http://www.safnet.org/publications/jof/index.cfm>.

Nontimber Forest Product Assessment for the United States

Nontimber forest products (NTFPs) include foods such as fruits, nuts, berries, and wild edible mushrooms; medicinal plants and fungi; floral greenery and horticultural stocks; fiber and dye plants, lichen, and fungi; and oils, resins, and other chemical extracts from plants, lichens, and fungi. The United Nations Food and Agriculture Organization has been sponsoring international workshops on NTFPs since the 1980s. In the United States, local and regional conflicts in the 1980s and 1990s over NTFPs (such as beargrass, wild mushrooms, ginseng, and Pacific yew) became apparent to the wider public, and the loss of natural productivity for NTFPs began to concern forest scientists and forest products dealers (Jones et al. 2002). In 2002, a U.S. assessment, *Nontimber Forest Products in the United States*, was developed and published with the assistance of numerous USDA Forest Service R&D scientists (Jones et al. 2002). The message, which remains today, is that NTFPs are vital to U.S. society and to sustainable forest management. USDA Forest Service scientists, such as Marla Emery (research geographer and tribal liaison, Northern Research Station), remain committed to this issue where current conditions and projected future trends demonstrate that forests (Vose et al. 2012) and the societies and economies that depend on them will degrade with changes in climate and anthropogenic disturbances.

The USDA Forest Service R&D will publish a new U.S. NTFPs assessment in 2016. James Chamberlain (Research Forest Products Technologist, Southern Research Station), Marla Emery (mentioned above), and Toral Patel-Weynand (Director of Forest Management Sciences, R&D) are co-editors of *A Comprehensive National Assessment of Nontimber Forest Products and Impacts from Climatic Variability and Change*, which is a collaboration between numerous individuals and entities. While past climate reports have focused on forest trees, this endeavor focuses on the plants and fungi necessary for forest ecosystem health and resilience, native and nonnative culture and identity, and nonmarket and market economies. This technical report for the National Climate Assessment discusses the cultural, social, ecological, economic, and production consequences



Native American tribes medicinally use Pearly Everlasting (*Anaphalis margaritacea*). Photo by Hansen, date unknown.

of climate change on the understory plants and fungi valued as nontimber products. Forests are not fully valued for all the benefits and values they provide; trees and their associated wood products have been the primary focus of forest management. In addition, one of the greatest constraints to creating effective NTFPs policies and programs is the lack of knowledge about the volumes and values of these products. This national assessment will serve as a vital resource for silvicultural management, integrated vegetation management, and collaboration between the USDA Forest Service and tribal communities. This document will reflect on how the ecology, abundance, and distribution of NTFPs are impacted by sociocultural values, harvesting, forest management practices, and climate change and assist stakeholders (including tribal harvesters with indispensable traditional and local knowledge) in the management and policy decisions that affect them. It is estimated that 20 to 25 percent of the U.S. population harvests NTFPs for personal use (Cordell and Tarrant 2002). This publication will not only increase and advance tribal and indigenous values, knowledge, and perspectives but also will assist with the collaborative multifaceted programs and projects the USDA Forest Service aims to improve upon. For more information about this 2016 publication, visit the R&D Web site at <http://www.fs.fed.us/research/>.

International Engagement

▲ Archaeological site in Turkey. Photo by Tania Ellersick, 2015.

It is impossible to work in this place and not stop periodically to just stand in awe. The remarkable flora and amazing history converge into what is, at times, a scene no less than ethereal. But our charter is clearly the study of plants, not history. This is evident as we bypass the entrance of Ephesus with all its bustling tourists to stop at a quiet spot a kilometer past the great city to photograph *Campanula tomentosa*, the largest harebell in the world, an endemic plant restricted to 40 square kilometers of land on the outskirts of the ancient city. A species that has both witnessed and survived the rise and fall of multiple civilizations, at least so far....

—Dean Pearson, USDA Forest Service principal investigator and research ecologist in Turkey for the biogeographic study of the causes and impacts of exotic plant invasions.



▲ Invasive cheatgrass (in brown) across a Montana landscape. Photo by Dean Pearson, 2015.

Invasive Species in the United States and Abroad

Confederated Salish and Kootenai Tribes, and communities in Turkey and Argentina

An invasive species is a nonnative species whose introduction is likely to cause or has the potential to cause economic or environmental harm to an ecosystem or harm human health or commerce (Executive Order 13112). Invasive species are among the most significant environmental and economic threats facing our Nation's forest, grassland, and aquatic ecosystems. They endanger native species and threaten ecosystem services and resources, including clean water, recreational opportunities, sustained production of wood products, wildlife and grazing habitat, and human health and safety. Invasive species cause billions of dollars in damage each year—a 2001 study estimated damage from invasive species worldwide totaled more than \$1.4 trillion per year, 5 percent of the global economy (Aukema et al. 2011, Kovacs et al. 2010, Holmes et al. 2009, and Pimentel et al. 2005 and 2001). These severe impacts on the world's ecosystems are driving an immense effort to understand the sources and results of species introductions (Gurevitch et al. 2011).

The USDA Forest Service, Rocky Mountain Research Station led a biogeographic study of the causes of exotic plant invasions and their impacts in recipient communities. The study involves

extensive surveys and widespread experimental plots across Turkey (native range), west-central Montana, and central Argentina (invaded ranges). In Montana, the USDA Forest Service partnered with the Confederated Salish and Kootenai Tribes, with study sites spanning nearly 5 million acres (20,000 km²) in bluebunch wheatgrass habitat. An average of 13 exotic species inhabited each grassland, and the average total exotic cover per grassland was 25 percent. In addition, 25 percent of the total identified flora was exotic plants. Of the 48 invaders, 11 showed significant impacts on native plants; 5 of these invaders are classified as noxious weeds by the State of Montana (spotted knapweed, St. John's wort, Dalmatian toadflax, Canada thistle, and oxeye daisy). The highest impact invader was cheatgrass, which is currently listed as a regulated plant but not a noxious weed in Montana.

More information on the Montana research can be found at http://www.fs.fed.us/rm/pubs_journals/2015/rmrs_2015_pearson_d001.pdf and the primary biogeography publication will be found at <http://www.fs.fed.us/rmrs-beta/science-spotlights/invasiveness-and-impact-48-exotic-plant-species-native-grasslands>.

Traditional Forest Knowledge and International Engagement

Traditional knowledge and practices contribute to ecosystem conservation and landscape restoration in traditional and contemporary ways and sustain the livelihood of communities. Involving local people by integrating traditional knowledge into conservation practices is an important factor for the success of conservation efforts. Traditional worldviews, particularly causal relationships based on religious or spiritual beliefs, must be considered in the exchange of knowledge and interactions with communities.

USDA Forest Service scientists are working with the International Union of Forest Research Organizations (IUFRO)—the leading global network for forest science cooperation uniting more than 15,000 scientists in almost 700 member organizations in over 110 countries—to assist the global community with engaging indigenous people. Their efforts involve raising the awareness of traditional forest-related knowledge within the scientific community and its relevance for sustainable management and conservation among policymakers at national and international levels. This effort—ongoing since 2005—has resulted in the creation of two new permanent working groups within IUFRO that focus on traditional forest knowledge in boreal and temperate regions and tropical and subtropical regions. Both of these international units have been very active over the past 4 years. IUFRO published the book *Traditional Forest-Related Knowledge, Sustaining Communities, Ecosystems and Biocultural Diversity* (Parrotta and Trostler 2012) in 2012 and featured sessions at the 2014 IUFRO World Congress in Salt Lake City, Utah, including a session on the “Value of Traditional Knowledge for Sustainable Forest Management.” The 5-day IUFRO congress, held every 5 years, is the largest global scientific conference on forests, with nearly 2,500 participants from 100 countries. At the Food and Agricultural Organization World Forestry Congress in Durban, South Africa, in September 2015, these IUFRO units co-organized (with Food and Agricultural Organization and the International Wood Culture Society) a session on “Traditional Values, Practices and Forest Policy: Transforming Local Challenges Into Renewed Partnership.” The session highlighted the importance of traditional knowledge and values for food security, physical and spiritual health, biodiversity conservation, and cultural identity in indigenous and local communities worldwide. Forest Service scientists also contribute expertise to U.S. State Department and U.S. Agency for International Development projects that assist indigenous groups in Africa, Australia, China, Latin America, and Russia.

For more information about the 2014 IUFRO World Congress *Sustaining Forests, Sustaining People—The Role of Research*, visit http://iufro2014.com/wp-content/uploads/2015/04/15-USD-0001-IUFRO-World-Congress-Summary-Report_FINAL_web.pdf.

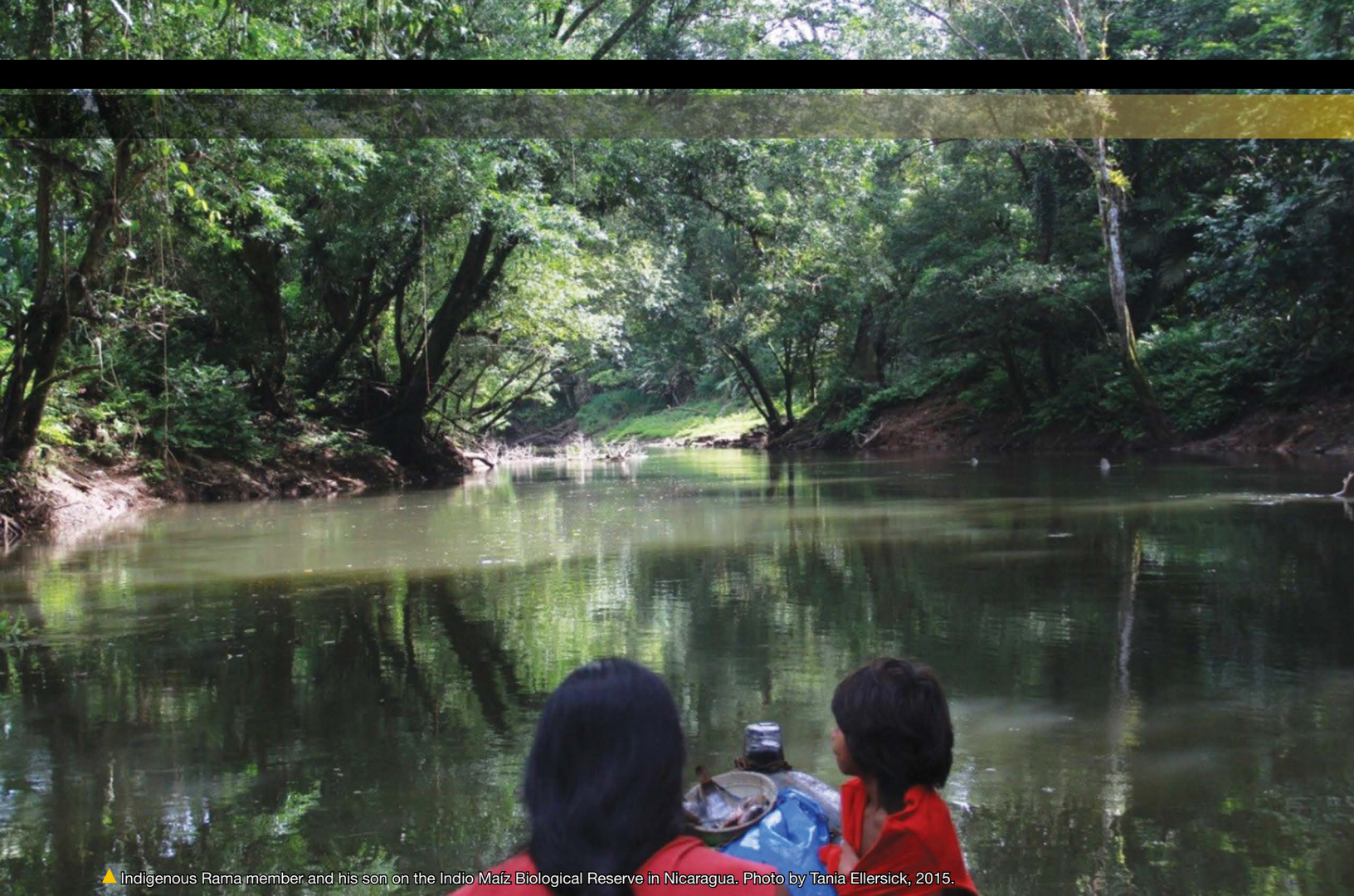
Most, if not all, of the natural resource management challenges we face in our agency are shared by our colleagues in other countries, and a number of the most significant ones are truly global in nature. By working collaboratively with professional and scientific partners worldwide, sharing our knowledge, and learning from others, we stand a far greater chance of moving forward together than if we try to go it alone.

—John Parrotta, Program Leader, International Science Issues, Research and Development, U.S. Forest Service



Sabah, Malaysia. Photo by Tania Ellersick, 2011.

Information about IUFRO and R&D’s national program leader for International Science Issues, John Parrotta—one of the main scientists behind these global efforts—is available at <http://www.fs.fed.us/blogs/conversation-conservation-leader-john-parrotta>.



▲ Indigenous Rama member and his son on the Indio Maíz Biological Reserve in Nicaragua. Photo by Tania Ellersick, 2015.

Improving Forest Governance by Strengthening Public Forest Institutions on a Global Level

The World Forestry Congress is considered the world's most significant forestry event and is organized by the United Nations Food and Agriculture Organization every 6 years in partnership with the host country. The first congress was held in Rome in 1926. The Declaration from the 7th World Forestry Congress, held in Buenos Aires, Argentina, in 1972, still resonates today, maintaining that:

...whatever the political objectives, whatever the form of economic organization, whatever the present pattern of forest land tenure, governments are responsible for planning the continuous flow of the productive, protective and social goods and services from the forest, ensuring that the physical output and environmental benefits of the forests are available for the general welfare of their peoples now and for all time. Since we live in one world, and since the forest resources of the world are unevenly distributed, national policies and plans must take account of the international context.

In September 2015, the USDA Forest Service joined more than 2,600 forestry experts, practitioners, and community members in Durban, South Africa, for the 14th World Forestry Congress. This congress—the first to be held on the African continent—focused on integrated, sustainable forest development through the central theme of “forests and people: investing in a sustainable future.” The key messages from the 2015 World Forestry Congress were the following:

- Investment in forestry is an investment in people.
- Forests sustain life.
- Forests act as buffers against environmental change.
- Integrating forests with other ways of using land is vital for sustainable development.
- Forests can inspire innovative technologies and products.
- Improving information about forests leads to better decisions.
- Sharing knowledge is key to governing forests effectively.

“Improving governance by building capacity” was one of six subthemes of the congress, in which delegates reflected on the capacities needed to more effectively govern the transition to sustainable forestry in a rapidly changing global context. One session in this subtheme focused specifically on improving forest governance by strengthening public forestry organizations. In this session, the USDA Forest Service and other panelists representing the major forested regions of the world reflected on the changing role of public forestry organizations and how to enhance their political, organizational, financial, technical, social, human, ethical, and other key capacities to enable and support responsible and sustainable forest use and management. They emphasized the need for increased

adaptation capacity and more inclusive, cross-sectoral, and transdisciplinary stakeholder engagement by these agencies. Given the importance of indigenous and tribal groups to global forest resources and their conservation, specific significance was placed on the need for and ways in which public forestry organizations should evolve to work more effectively and efficiently with indigenous and tribal communities to foster improved livelihoods, tenure clarity and security, and sustainable forest management. Results of the session contributed to the 14th World Forestry Congress Declaration and will form the basis of a paper to be produced by the session panelists. To learn more about the World Forestry Congress, visit: <http://www.fao.org/about/meetings/world-forestry-congress/en/>.

By working jointly on topics of mutual interest, we can meet tribal needs, share lessons that can be translated to other stakeholders and be in a better position to sustainably manage all our Nation’s natural resources. These stories are just snapshots of our potential but, more importantly, are a testament of our commitment to tribal engagement that demonstrate the power of partnerships coming from lasting relationships and aligned interests.

—Carl Lucero, USDA Forest Service, Research and Development, Director for Landscape Restoration and Ecosystem Services Research

Moving Forward



▲ Augusta, Montana. USDA Forest Service photo, 2014.

This *USDA Forest Service Research and Development Tribal Engagement Roadmap Highlights Report* shows only a fraction of tribal engagement efforts ongoing across the country and internationally. There are notable absences in this report, including (but not limited to) the importance of native grassland ecosystems and urban forests,⁵ issues regarding public health (e.g., the link between disease and the loss of traditional foods⁶), the spiritual aspect of water (particularly headwaters, which in some communities are areas of origin/creation) (Stumpff 2013), the impacts of drought,⁷ wildlife (in relation to food and identity), differences in values (i.e., perceptions of wilderness (Watson et al. 2011)), valuation of nonmarket values and social science methodologies, and the issue of relocation, especially in regard to coastal communities. In addition, only the tribal communities with the resources to engage with other entities are discussed here—some of the poorest, most marginalized communities that could benefit

from increased capacity are not mentioned in this report. It should be noted that Americans Indians and Native Alaskans are the poorest people in the United States with a poverty rate of 29.2 percent, nearly twice the 2013 average for the Nation as a whole (U.S. Census Bureau 2014). Ongoing efforts supported by U.S. Department of Agriculture (USDA), Forest Service programs and policies should not only build on existing efforts, but seek opportunities with the tribal communities that could benefit the most from collaborative engagement. A number of USDA Forest Service initiatives, strategies, and guidelines aim toward the equitable distribution of rights and resources (and their associated benefits/values) that work towards ecological, economic, and social sustainability. These include the USDA Forest Service Tribal Engagement Strategy, the *USDA Forest Service Research and Development Tribal Engagement Roadmap*, the 2012 revision of the USDA Forest Service Planning Rule (Code of Federal Regulations, Title 36, Part 219), the USDA

⁵ The U.S. Department of Agriculture, Forest Service has a role in the stewardship of 100 million acres (more than 40 million hectares) of urban forests where most of the U.S. population lives.

⁶ Salmonids and acorns made up 50 percent of a traditional Karuk diet, however, the majority of Karuk people have experienced the complete absence of both of these traditional foods. In addition, 21 percent of the Karuk population has diabetes, and 40 percent of the population has heart disease (Lynn et al. 2013, Norgaard 2005).

⁷ Our national forests and grasslands provide 20 percent of the Nation's clean water supply, but drought alone was estimated to cost the United States \$50 billion from 2011 to 2013 (National Climate Assessment 2014).

Moving Forward

Forest Service National Roadmap for Responding to Climate Change, and the *USDA Forest Service Strategic Plan: FY 2015–2020*, which outlines the following goals and objectives:

Sustain Our Nation's Forest and Grasslands

- Foster resilient, adaptive ecosystems to mitigate climate change
- Mitigate wildfire risk
- Conserve open space

Deliver Benefits to the Public

- Provide abundant clean water
- Strengthen communities
- Connect people to the outdoors

Apply Knowledge Globally

- Advance knowledge
- Transfer technology and applications
- Exchange natural resource expertise

Excel as a High-Performing Agency

- Recruit a diverse workforce
- Promote an inclusive culture
- Attract and retain top employees

USDA Forest Service, Research and Development (R&D) has the opportunity to move forward in a number of ways. By describing how we, as R&D employees, incorporate indigenous knowledge and values to improve upon our work and including this information in our presentations, briefing papers, and best management practices, we can help increase and advance tribal and indigenous values, knowledge, and perspectives. By networking and coordinating within R&D and across USDA Forest Service deputy areas, we can help describe how indigenous values and knowledge will be addressed (for instance,

within an ecosystem-services perspective in the 2012 USDA Forest Service Planning Rule). By sharing information, tools, and methodologies used by R&D (e.g., nanotechnology, eDNA, stream monitoring, and forest vegetation models), we can support tribal decisionmaking on natural resource issues. There are also opportunities for developing workshops, webinars, presentations, training materials, and events that will help USDA Forest Service staff understand their legal responsibilities for treaty rights, other reserved rights, and trust responsibilities, including obligations for government-to-government consultation. These efforts would not only build USDA Forest Service capacity, but help institutionalize our trust responsibilities. We can build new and enhance existing partnerships in part by identifying ways to sponsor more students and exposing them to research, finding opportunities for scientists to teach at tribal colleges and universities, learning from tribal communities' research, incorporating these findings in future activities, and co-publishing with tribal scientists. By promoting and advancing collaborative work with tribes and tribal organizations, we can improve our collective ability to find effective solutions to some of the most challenging issues our agency has had to contend with.

In order for us to deliver on our agency's strategic plan, Federal trust responsibility, various national-level policies, and the USDA Forest Service mission, we must engage with tribal communities. We cannot sustain these ecosystems, the economy, or society without them. By engaging tribal communities in the broad suite of benefits and values our forests and grasslands provide, we can move toward full and effective participation in natural resource management and fulfill our mission to meet the needs of present and future generations.

Contact Information and References

Contact Information

U.S. Department of Agriculture (USDA), Forest Service
Research and Development Information:

National Web site: <http://www.fs.fed.us/research/>

Station Web sites:

Pacific Northwest Research Station <http://www.fs.fed.us/pnw/>

Pacific Southwest Research Station <http://www.fs.fed.us/psw/>

Rocky Mountain Research Station <http://www.fs.fed.us/rmrs/>

Southern Research Station <http://www.srs.fs.usda.gov/>

Northern Research Station <http://www.nrs.fs.fed.us/>

Forest Products Laboratory <http://www.fpl.fs.fed.us/>

International Institute of Tropical Forestry <http://www.fs.usda.gov/iitf>

Learn more about how to start a partnership with the USDA Forest Service or obtain Federal financial assistance with the Office of Tribal Relations's Guide for Tribal Governments: <http://www.fs.fed.us/spf/tribalrelations/documents/tools/StartPartnershipTribalGuide.pdf>.

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▲ Photo by Ken Rahaim, Smithsonian Institution.

This report aims to support the Presidential Proclamation of 2013, claiming the month of November as Native American Heritage Month. It included the following missive:

"From Alaskan mountain peaks to the Argentinian pampas to the rocky shores of Newfoundland, Native Americans were the first to carve out cities, domesticate crops, and establish great civilizations. When the Framers gathered to write the United States Constitution, they drew inspiration from the Iroquois Confederacy, and in the centuries since, American Indians and Alaska Natives from hundreds of tribes have shaped our national life. During Native American Heritage Month, we honor their vibrant cultures and strengthen the government-to-government relationship between the United States and each tribal nation.

"As we observe this month, we must not ignore the painful history Native Americans have endured — a history of violence, marginalization, broken promises, and unkept justice. There was a time when native languages and religions were banned as part of a forced assimilation policy that attacked the political, social, and cultural identities of Native Americans in the United States. Through generations of struggle, American Indians and Alaska Natives held fast to their traditions, and eventually the United States Government repudiated its destructive policies and began to turn the page on a troubled past."

My Administration remains committed to self-determination, the right of tribal governments to build and strengthen their own communities...

As we observe Native American Heritage Month, we must build on this work. Let us shape a future worthy of a bright new generation, and together, let us ensure this country's promise is fully realized for every Native American.

—President Barack Obama