Western Agroforestry Case Studies

Agroforestry is the intentional combining of agriculture and "working trees" to create productive and sustainable farms, ranches, and woodlands. Traditional applications include alley cropping, silvopasture, forest farming, riparian forest buffers, and windbreaks; other special and landscape-scale applications are emerging. Agroforestry is also a means to connect rural and urban, public and private landscapes to support sustainable food, energy and fiber production.

All of these applications are relevant somewhere in the west. Several case studies are highlighted within this package, which support the discussion to be held at the WFLC 2012 Spring Meeting.

WESTERN FORESTRY LEADERSHIP COALITION

Topic: Opportunity for Agroforestry in a Warming Alaska

Issue: Rising fuel costs and a changing climate make Alaska the ideal place to initiate agroforestry systems for fuel and food. Opportunities to thin and maintain fuel breaks and plant short-rotation woody biomass species such as aspen may provide benefits to moose populations as well as communities harvesting berries in these areas. To use this biomass, wood-fired boiler systems have been installed in many community buildings throughout the state and feasibility studies for many more systems are underway. The fuel sources must be sustainable for the investment in these systems to be feasible in the long term. Can agroforestry systems be designed for use in Alaska that support sustainable production of woody biomass for energy and edible native foods, maximize the value of wildlife habitat, and potentially provide other benefits?

Background: Commercial agriculture is practiced on a limited scale in Alaska compared to other states. Agroforestry practice application, based on USDA program assistance records, is also very limited as evidenced by only 20 completed/planned activities during FY 2010-2014 (4 windbreak/shelterbelts; 4 multi-story cropping; 8 riparian forest buffers; and 4 silvopasture). Subsistence fishing, hunting, and gathering of wild plants are a way of life in Alaska, particularly in rural areas where store-bought food may be unavailable or unaffordable.

Key Points:

- The University of Alaska Fairbanks (UAF) and cooperators are proposing a demonstration project on Ahtna Native Cooperation lands near Glennallen to maximize sustainable biofuel crops while enhancing wildlife habitat and growing edible crops and other forest products using a planned agroforestry system. An application for funding has been submitted to NRCS's Conservation Innovation Grant Program.
- Similar projects could be demonstrated in other parts of the state. For example, agroforestry technologies could be used to incorporate biofuel and food production into "double duty" fuel breaks around Tok, which help protect the community from wildfire.
- UAF is also considering the establishment of agroforestry research and demonstration projects at their Delta and Matanuska Experimental Farms. The results would identify what plants (e.g., berries, fruit trees, medicinal plants) can be grown in various agroforestry systems and potentially replicated on working lands in Alaska.

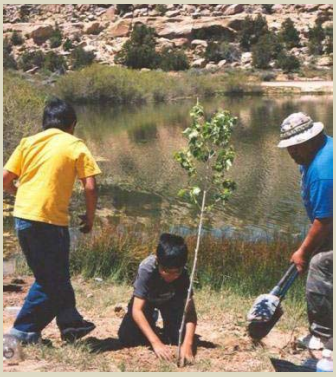
Partners and Collaborators:

- Agroforestry Development Centre, Saskatchewan, Canada
- Ahtna, Alaska Native Regional Corporation
- Alaska Division of Forestry
- University of Alaska Fairbanks – School of Natural Resources and Agricultural Sciences, Palmer Center for Sustainable Living, Cooperative Extension
- USDA National Agroforestry Center
- USDA Natural Resources Conservation Service
- USFS Alaska Region and Pacific Northwest Research Station

Contact: Andy Mason, U.S. Forest Service, USDA National Agroforestry Center, amason@fs.fed.us

WESTERN FORESTRY LEADERSHIP COALITION

Topic: Agroforestry in Indian Country



Issue: American Indian and Alaska Native (AI/AN) people face many issues and opportunities on their farms, ranches and woodlands, and in their communities, that could potentially be addressed by agroforestry practices and systems. Moreover, many Tribes have a keen interest in the restoration of native plants to their lands to produce food and other products for cultural/traditional uses and to meet economic objectives. Agroforestry may also be able to help AI/AN people meet these needs in the face of a changing climate.

Background: The USDA National Agroforestry Center (NAC); Reforestation, Nurseries and Genetics Resources Team (RNGR); USFS Rocky Mountain Research Station (RMRS); and other cooperators have worked with Tribes and Tribal Colleges/Universities for many years. NAC has cooperated with RNGR and RMRS on training and workshops for Tribal nurseries to support the production of native plant materials for reforestation and restoration. For example, in 2011, NAC, RNGR, RMRS, and the College of the Menominee collaborated on a native plant nursery planning workshop in Wisconsin. NAC, Nebraska Forest Service, NRCS, and other cooperators worked with the Santee Sioux Tribe to establish livestock windbreak demonstrations in 1995, and with the Nebraska Indian Community College in 2007 to establish vegetative buffers to reduce soil erosion, provide food and cultural plants for student learning.

Key Points:

- Tribal Conservation Districts (TCDs) are a potential cooperator for agroforestry and other forestry/conservation activities. There are approximately 30 TCDs nationwide; most are in the West.
- Tribal Colleges and Universities (TCUs) are another potential cooperator for natural resource conservation activities. Thirty seven TCUs operate 75 campuses in 15 states; many are in the West. Many TCUs (26 of 38) offer majors in one or more of the following: environmental sciences/natural resources, agriculture/farming, and forestry.
- NAC, NRCS, and Nebraska Forest Service are discussing a new agroforestry research and demonstration project with the Nebraska Indian Community College.
- NAC, the USFS Office of Tribal Relations, and Chequamegon-Nicolet National Forest are cooperating to sponsor a TCU student intern to support an agroforestry project in northern Wisconsin.
- NAC is interested in working with WFLC members, TCDs, TCUs, other Tribal entities, NRCS, and others to expand the application of agroforestry to meet the needs of AI/AN people.

Partners and Collaborators:

- State Forestry Agencies
- Tribal Conservation Districts, Colleges and Universities, other entities
- USDA National Agroforestry Center
- USDA Natural Resources Conservation Service
- USFS Office of Tribal Relations
- USFS Regions and Stations
- USFS Rocky Mountain Research Station and the Reforestation, Nurseries, Genetic Resources Team (RNGR)

Contact: Andy Mason, U.S. Forest Service, USDA National Agroforestry Center, amason@fs.fed.us

WESTERN FORESTRY LEADERSHIP COALITION

Topic: Living Snow Fences

Issue: Blowing and drifting snow jeopardizes public safety and emergency services, interrupts businesses, increases road maintenance costs, and causes livestock and wildlife mortality. These issues and conditions persist for days after a snow and wind event along unprotected roadways. Living snow fences are employed across the northern tier of the U.S., including many western states, to reduce these hazards. With climate change and potentially more extreme weather events, including increasing winds, living snow fences may have an even wider application in the future.

Background: Living snow fences (LSF) are specially designed windbreaks consisting of grass, trees, and shrubs that are located adjacent to roadways where known snow drifting problems exist. State forestry agencies, NRCS, Farm Service Agency, conservation districts, and state highway departments often cooperate to establish LSFs. The USDA National Agroforestry Center (NAC) has worked with cooperators for many years to support LSFs and recently published a new brochure, "*Working Trees* Living Snow Fence", which has been in high demand.

Key Points:

- Living snow fences help save lives by improving driver visibility on highways and save money by reducing snow plowing and helping to keep highways open for travel.
- LSFs can be designed to conserve fuel and energy (fewer trips to clear drifting snow), produce food, and provide habitat for wildlife and pollinators.
- Living snow fences have been widely shown to be more efficient at capturing snow than a 4' tall slatted fence. A mature LSF can capture up to 12 times more snow than a slatted fence.
- The life of a LSF is estimated at 40-50 years, whereas a slatted fence will last only 7-20 years. Over a 50-year span, the life cycle costs of a slatted fence could be 4-7 times greater than a LSF.
- The Minnesota Living Snow Fence Partnership Program is a successful model that could be considered in other states.
- NAC, in cooperation with NRCS and state highway departments, recently supported the establishment of demonstration LSFs and workshops in western Washington and northern Idaho. These efforts helped promote the establishment of additional LSFs in those two states as well as Oregon.
- NAC is interested in working with cooperators to establish new demonstrations sites and multi-agency partnerships that help expand the application of LSFs on private, public, and Tribal lands.

Partners and Collaborators:

- Communities
- Conservation Districts
- State Forestry Agencies
- State Highway Departments
- Tribes
- USDA National Agroforestry Center
- USDA Natural Resources Conservation Service and Farm Service Agency

Contact: Andy Mason, U.S. Forest Service, USDA National Agroforestry Center, amason@fs.fed.us

Topic: Pacific Islands Agroforestry

Issue: The Pacific Islands are facing significant changes driven by climate change/sea level rise, invasive species, and a loss of indigenous knowledge regarding how to manage diverse island ecosystems that have sustained life for many generations. The health of many island people is in decline due to a shift from foods grown locally with traditional agroforestry systems to imported foods, which also is a food security issue. On some islands there may be opportunities to restore and expand agroforestry systems that conserve ethnobotanical diversity and provide ecosystem services while providing healthy local food and economic benefits. Can these issues be positively addressed with focused agroforestry research, outreach and assistance activities?

Background: Many Pacific Island Forest Action Plans identified food security as an important issue and agroforest as an important forest type. In early 2011, Katie Friday (S&PF, Region 5) conducted an agroforestry needs survey of the Pacific Island Committee (PIC) members to supplement the Forest Action Plans and provide information for discussion at the November 2011 PIC meeting with the USDA National Agroforestry Center (NAC). NAC has historically focused its research and technology transfer activities on the mainland United States.

Key Points:

- The top issues from the agroforestry needs survey included: 1) adaptation of atoll/coastal forests and agroforests to predicted climate change (salinity, drought); 2) windbreaks; 3) new pests, diseases and invasive plants; 4) environmental values of agroforest systems; 5) methods and limitations for highly degraded soils; and 6) adaptation of upland agroforests for predicted climate change (drought, storms, fire).
- Strategies favored most by respondents included: "peer to peer" learning networks, communities of practice, certification of agroforestry professionals, and developing technical resource materials.
- NAC is leading an interagency group to develop a *Working Trees* brochure that will provide an overview of agroforestry in the Pacific Islands.
- Katie Friday and Michael Constantinides (NRCS, Hawaii) conducted a follow-up survey of the Pacific Islanders to gain insight regarding research questions/projects and immediate needs for technical assistance.
- The interagency group has proposed for PIC consideration two potential new positions: A) Post-doc (3 years) to focus on coastal and atoll forests, climate change and agroforestry extension; and B) Tech Transfer/ Extension specialist (longer term) to focus on production agroforestry, including invasive species issues and trials of woody crop species.

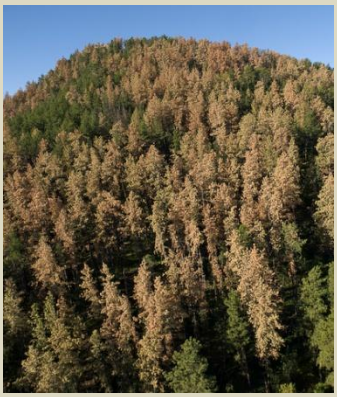
Partners and Collaborators:

- **Pacific Island Forestry Agencies** (Republic of Palau, Federated States of Micronesia (Kosrae, Pohnpei, Chuuk and Yap), Guam, Commonwealth of Northern Mariana Islands, Marshall Islands, American Samoa, Hawaii)
- **USFS Pacific Southwest Region**
- **USFS Pacific Southwest Research Station**
- **USDA Natural Resources Conservation Service**
- **University of Hawaii**
- **USDA National Agroforestry Center** (USFS & NRCS partnership)

Contact: Andy Mason, U.S. Forest Service, USDA National Agroforestry Center, amason@fs.fed.us

WESTERN FORESTRY LEADERSHIP COALITION

Topic: Ponderosa Pine Silvopasture in the West (NE, SD, WY)



Issue: Ponderosa pine forests in the Great Plains States are being treated to reduce hazardous fire fuels and mountain pine beetle-risk, assuming positive but unknown impacts on understory grass and animal grazing capacity, timber production and value, and ecosystem health. Can a ponderosa pine silvopasture system be designed and successfully applied in the Great Plains States, and other parts of the West, that addresses these issues and opportunities?

Background: Silvopasture is an agroforestry practice that integrates livestock, forage production, and forestry on the same land unit. Silvopasture systems are deliberately designed and managed to produce a high-value timber product (e.g., sawtimber) in the long term while providing short-term annual economic benefit from a livestock component through the management of forage. Silvopasture systems have been most commonly established on private lands in the Southeastern United States with loblolly pine, native or introduced forage species, and cattle. Past research has been conducted in the Black Hills of South Dakota on livestock grazing, ponderosa pine stocking levels, forage production, and wildlife use. Yet results from these different studies have not been integrated into a silvopasture approach that can be widely applied. Therefore, the usefulness of ponderosa pine silvopasture systems is currently unknown.

Key Points:

- Proposal: Cooperators are considering an interagency project that would establish ponderosa pine silvopasture systems for research and demonstration purposes in existing ponderosa pine forests in Nebraska, South Dakota, and Wyoming.
- Outcomes: Evidenced-based guidelines for the West for wide use by private, public, and Tribal natural resource managers in NE, SD, and WY to manage stocking levels of ponderosa pine and understory vegetation resulting in:
    1) Reduced levels of hazardous fuels and beetle risk and increased production of other goods and services including forage, livestock, timber, and wildlife;
    2) Improved understanding of ecosystem responses to application of an integrated silvopasture system; and
    3) Integration of existing knowledge to support silvopasture guidelines.
- Next steps: 1) Complete a review of existing literature; and 2) Develop a research study plan, budget, and identify potential study/demonstrations sites on private, public, and Tribal lands in the three states.

Partners and Collaborators:

- Black Hills and Nebraska National Forests
- Nebraska Forest Service
- South Dakota Division of Resource Conservation & Forestry
- South Dakota State University
- USDA National Agroforestry Center
- USDA Natural Resources Conservation Service
- USFS Rocky Mountain Research Station
- Wyoming State Forestry Division

Contact: Andy Mason, U.S. Forest Service, USDA National Agroforestry Center, amason@fs.fed.us

WESTERN FORESTRY LEADERSHIP COALITION

Topic: Riparian Buffers in the Intermountain West

Issue: Water quality, water quantity, and wildlife (particularly bird and fish species) are critical issues in the Intermountain West and the management of riparian forests on agricultural lands plays an essential role in the delivery of these ecosystem services and benefits.

Background: Research suggests that continuous, ecologically functioning riparian corridors have beneficial effects on water quality, wildlife and fish habitat, overall ecosystem function, and landscape aesthetic quality. Resource managers need science-based procedures for designing and managing riparian buffers that will optimize the benefits these ecosystems provide on private lands. A study conducted by Utah State University in partnership with the USDA National Agroforestry Center (NAC) and USFS Rocky Mountain Research Station reviewed the riparian buffer literature and, based on this evidence, two protocols were developed specifically for the Intermountain West. The first method identifies optimum buffer widths for water quality while the second protocol determines buffer widths for wildlife habitat tiered to landowner willingness to participate in wildlife conservation.

An award-winning handbook, *Riparian Buffer Design Guidelines for Water Quality and Wildlife Habitat Functions on Agricultural Landscapes*, published in 2008 provides a step-by-step process for using these protocols for determining optimal (variable) buffer widths for water quality and wildlife that maximize riparian benefits and minimize the loss of productive farm and ranch land. The process may be used by individual or teams of resource managers, or through a collaborative plan development process among stakeholders and landowners. At a glance, these steps include: data collection and analysis (including identification of problems and opportunities, objectives, and resources), decision support (formulation and analysis of alternatives), implementation, and evaluation. The handbook also includes a companion CD with a case study, worksheets, and other resources to assist the user.

Over 900 copies have been distributed to resource professionals throughout the Intermountain West. Available for download at:
http://www.treesearch.fs.fed.us/pubs/29201

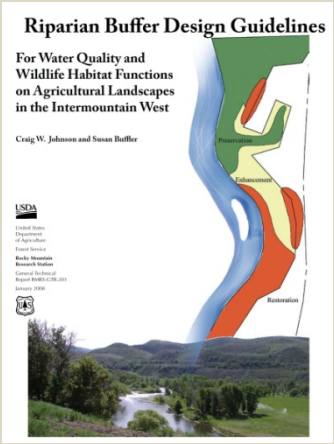
Future Steps:

- Develop webinars and other training opportunities to promote use of the protocols throughout the Intermountain West
- Evaluate and refine the protocols based on stakeholder feedback

Partners and Collaborators:

- Conservation Districts
- USDA Natural Resources Conservation Service
- State Forestry Agencies
- USDA National Agroforestry Center
- USFS Rocky Mountain Research Station
- Utah State University

Contact: Andy Mason, U.S. Forest Service, USDA National Agroforestry Center, amason@fs.fed.us



WESTERN FORESTRY LEADERSHIP COALITION

Topic: Great Plains Windbreak Renovation and Innovation Conference (MT, ND, SD, WY, NE, CO, KS, OK)

Issue: Declining condition of windbreaks in the Great Plains has been identified as a significant issue by State forestry agencies, NRCS, conservation districts, and others. The removal of windbreaks, driven by high crop and agricultural land prices and the demand for biofuels and exports, is also of concern. Windbreaks and other agroforestry practices can be designed and implemented to help Great Plains agriculture achieve the desired production of food, fiber, feed and energy, while at the same time meeting societal expectations of clean air, clean water and wildlife habitat. Windbreaks can also help in achieving these goals under conditions of uncertain climate and weather.

Background: The Prairie States Forestry Project (1935-1942) funded the planting of more than 222 million trees on farmlands from North Dakota to Texas to combat severe soil erosion and to protect crops from drying winds. The last regional windbreak renovation workshop was held over a decade ago. For many years the USDA National Agroforestry Center (NAC) and partners have developed and delivered science-based windbreak tools, technical notes, and training sessions. In 2011, NAC and Canada's Agroforestry Development Centre agreed to work together with partners to sponsor a windbreak conference.

Key Points:

- A conference focused on windbreak renovation and innovation for alternative windbreak is planned July 24-26, 2012 at the International Peace Garden (North Dakota-Manitoba order). The conference is supported by the USDA National Agroforestry Center, Canada's Agroforestry Development Centre, the Plains and Prairie Forestry Association, and other federal, state and local forestry and conservation partners in the Great Plains.
- Pre-registration is required, but there is no registration cost. Conference presentations will be recorded and accessible for future use on the internet. For more information go to http://www.unl.edu/nac/renovation.htm
- The conference will bring together technical expertise and experience to facilitate learning and sharing about windbreak renovation, how to incorporate innovation into the design and management of windbreaks to address current and future needs, with an overall goal to make windbreaks truly multifunctional.
- The conference is being promoted to conservation and forestry partners throughout the Great Plains in the U.S. and Canada. Similar conferences could potentially be held in other states/regions in the future.

Partners and Collaborators:

- Agroforestry Development Centre (Agriculture and Agri-Food Canada)
- Nebraska Association of Natural Resources Districts
- Plains & Prairie Forestry Association
- State Forestry Agencies (Colorado, Kansas, Nebraska, North Dakota, South Dakota)
- USDA National Agroforestry Center
- USDA Natural Resources Conservation Service (Montana, North Dakota)

Contact: Andy Mason, U.S. Forest Service, USDA National Agroforestry Center, amason@fs.fed.us