United States Department of Agriculture

USDA Building Blocks for Climate Smart Agriculture and Forestry

Case Studies

May 2016

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Soil Health

CASE STUDY

Leon Moses has transformed the farm he operates. More importantly, he has also transformed his thinking. He no longer sees the soil as just a medium for producing crops. Instead, he sees a living soil that's the focus of his operation. "I'm doing something good for the soil, and in turn the soil rewards me with yields that don't even compare to what we used to have," says the superintendent of the 492-acre North Carolina A&T State University farm. Moses began experimenting with no-till and strip till farming 25 years ago as a research technician. "I saw what happened there and decided no-till was the right thing to do. When I became superintendent in 2004, we began using no-till for all our corn and soybeans," he says.

Corn emerging through a terminated cover crop on the North Carolina A&T State University farm near Greensboro. Photo courtesy of USDA NRCS.

In 2006, he added cover crops — not for what they could do for the soil, but because he had a shortage of hay for the farm's livestock. "But I began to learn very quickly that no-till and cover crops combined to make healthy soils that rewarded me with higher yields," Moses says.

Now, he uses no-till and cover crops on 100 percent of his operation. "In 2004, some soybean yields were at 25 bushels an acre. Now we can easily get 65 bushels per acre of soybeans," he says. "It used to take 40 acres of corn to fill our silo and now we only have to cut 10 acres of corn to fill the silo. We were getting 10 tons per acre of silage and now it's 22 tons an acre. The yield we used to get just doesn't begin to compare with what we get now."

"The return on my investment on this farm is easily a 35-percent to 45-percent increase, and we get three or four times more production," Moses says. "It's the best way to go. The proof is always in the pudding."

More information on soil health in North Carolina, including a video with Leon Moses, can be found here: **http://www.nrcs.usda.gov/wps/portal/nrcs/main/nc/soils/health/**.

Nitrogen Stewardship

CASE STUDY

Michigan farmer Myron Ortner of Tuscola County is a leader in nutrient management and soil health. He has partnered with Michigan State University to test strategies to improve nutrient management on a 40-acre plot of land where he grows corn and soybeans. Ortner was chosen, in part, based on his commitment to innovation and meticulous recordkeeping.

"I wanted an accurate picture of what was happening on my farm, and now we've got good scientific data established," Ortner said. "It's been a good learning experience. I've committed one of my fields to this project, and I'm hoping to be a part of it for a while."

As a result of the project, Ortner was able to reduce his N rate by 15 percent without any loss of yield, leading to a first-of-its-kind credit from the American Carbon Registry. "It's not so much the carbon credits and the profit there, but the opportunity to use less fertilizer and save on input costs," Ortner said. "I was up at the 180 to 200 pounds (of fertilizer) level, and I voluntarily went down to about 160 on my farms. I learned from it."

Ortner is participating in the Delta Nitrogen Credit Program, which will pay qualified Corn Belt corn farmers who reduce their documented nitrogen rates. The program began as an NRCS Conservation Innovation Grant.

Nitrogen application in a contoured, no-tilled field. Photo courtesy of USDA NRCS.

Livestock Partnerships

CASE STUDY

Bob Giacomini operates a 720-acre dairy in Marin County, CA with daughters Karen, Diana, Lynn, and Jill. The dairy is the heart of the Point Reyes Farmstead Cheese Company, where the Giacominis make their award-winning cheeses and demonstrate sustainable farming practices. A leader in the dairy industry, Giacomini sat on the National Dairy Board from 1989 to 1995, including as President for his last 2 years of service.

Point Reyes Farmstead Cheese Company. Photo courtesy of the Giacomini Family and Kodiak Greenwood.

Like farmers across the State, his farm has faced record drought, and he has real concerns about having enough forage for his cows. He is not just worried about his 800 animals—he also wonders whether his farm will have enough drinking water since he relies on a well.

Giacomini's farm is at the forefront of conservation. Rotational grazing of their cows keeps soils healthy and helps prevent harmful erosion into Tomales Bay. To preserve their open space and working landscapes, they transferred their development rights to the Marin Agricultural Land Trust.

The Giacominis also use a methane digester to convert cow manure into clean, renewable energy that powers their dairy and cheese facility. The digester, which was installed in 2009, was funded in part by grants from the USDA Natural Resources Conservation Service, the California Energy Commission, administered by Western United Resource Development, Inc., and the Pacific Gas and Electric Company's Self Generation Incentive Program. Most recently, the Giacominis received a grant from USDA's Rural Energy for America Program. Electricity generated by the digester system is used to power dairy operations as well as on-site cheesemaking operations at the family's Point Reyes Farmstead Cheese Company. Hot water is recaptured from the system and used both in the milk parlor and in the cheese plant, saving approximately $1,000 a month on propane costs.

In addition to land stewardship, diversification is a key component of the Giacomini's operation.

In 2010, they opened The Fork, a culinary and educational center situated on their property. Agri-tourism has been an integral component to the marketing and promotion of their products, and the experience creates brand loyalty for both trade and consumer customers who visit them from across the country. Their property is a model for the region and the dairy industry, and they have been recognized for their leadership with the 2013 Leopold Award.

"I've always felt it was the responsibility of a rancher and landowner to take care of the land for the next generation," said Giacomini.

Conservation of Sensitive Lands

CASE STUDY

The Prairie Pothole Region is a huge expanse of grassland, stretching from Iowa, through the Dakotas, and into Canada. Small wetlands called "potholes" or "sloughs" spatter the rolling grasses and provide ideal habitat for waterfowl. Birds such as pintails, mallards, and shovelers rely on the region for breeding habitat—others, including snow geese, depend on the area during migration. The potholes also benefit people by recharging groundwater and storing carbon that builds up over years in the prairie soil. The prairie provides an ideal setting for ranching, allowing cattle to feed on plentiful native grasses.

A Missouri Coteau wetland near Bismark, ND, in the heart of the Prairie Pothole Region. Photo courtesy of Jim Ringelman, Ducks Unlimited.

But all is not well in the Pothole Region. An estimated 194,000 acres of grassland have vanished since 1984, and over half of the potholes in some regions are either gone or degraded. The prairies are increasingly falling under the plow for crop production, as producing certain crops has recently offered farmers higher incomes than traditional ranching. Cultivating grasses for crop production releases carbon into the atmosphere as soil organic carbon oxidizes. It also causes erosion and destroys habitats. Conserving these sensitive lands is a key part of both fighting climate change and ensuring critical habitat is retained for future generations.

Recently, the USDA Natural Resources Conservation Service teamed up with Ducks Unlimited to combat these losses. The USDA awarded Ducks Unlimited with a Conservation Innovation Grant aimed at providing incentives for ranchers to retain rangeland instead of converting their acres to crop production. By registering stored carbon that would otherwise be released via crop farming, ranchers can sell carbon offsets, which act as an alternative source of income. In turn, the partnership protects water quality, reduces erosion, and retains habitat by placing an avoided tillage easement on the ranches to ensure that the working grasslands will be available for grazing and duck nesting habitat for years to come.

South Dakota native Brad Magness made the choice to preserve his ranchland. “I have a concern not just because I’m a rancher, but because I run a livestock auction market. And when I see grass get torn up, that’s just that many fewer cattle that have a chance to come through my sales… (conserving grassland) wasn’t a hard decision, because it wasn’t going to alter any of my operations.”

“There’s interest from landowners to protect these areas that’s consistent with their view of how this land should be used. And really we need the funding to get that job done,” said Scott Stephens, Director of Planning at Ducks Unlimited. Luckily, the USDA is ready to rise to the challenge and work with partners to preserve these critical lands—and at the same time, benefit ranchers, wildlife, and the environment.

Grazing and Pasture Lands

CASE STUDY

The Trigg family, which operates a 52,000-acre ranch in northeastern New Mexico, understands that good grazingland management benefits more than just livestock production, and they have been implementing these systems for almost 15 years. In 2002, they implemented a grazing management program intended to correct decades of overgrazing, shrub increase, and soil erosion. With financial and technical assistance from NRCS New Mexico staff, the Triggs installed new water developments and fencing to improve livestock distribution and allow for better herd management. Implementing techniques they learned in a Holistic Resource Management short-course, they also implemented a thorough and meticulous monitoring and recordkeeping system. Through stocking rate adjustments and changes in herd management, the Triggs documented increases in vegetation cover and in livestock performance.

Like any good business managers, the Triggs were also interested in finding new sources of income from their land. Generating and selling carbon offsets from rangeland management provided this opportunity. Through practices that they implemented from 2010 to 2015, the Triggs and several of their neighbors were able to sequester more than 100,000 metric tons of carbon dioxide, or the equivalent of removing more than 20,000 cars from the road for 1 year. The Triggs sold the offsets for more than $100,000, and they were able to reinvest almost 90 percent of that in improving their operation. The Triggs then creatively leveraged their income with the NRCS Environmental Quality Improvement Program (EQIP) to install a variety of conservation practices that furthered their management goals for the ranch.

The Triggs and their New Mexico neighbors were successful in improving their land health, enhancing their income, and contributing to GHG reductions because they had a comprehensive ranch management plan, and they were creative and bold enough to take advantage of new opportunities.

Rotational grazing in New Mexico. Photo courtesy of USDA NRCS.

Private Forest Growth and Retention

CASE STUDY

Wisconsin's working forests provide numerous public benefits including wildlife habitat, jobs, recreation opportunities for hiking, hunting and fishing, carbon storage, and clean abundant drinking water for thousands of residents. Located in northwestern Wisconsin, the Brule-St. Croix Forest Legacy Project permanently protects over 21,000 acres of private forest land through a conservation easement held by the State of Wisconsin and funded in part by the Forest Legacy Program. Under the terms of the easement, this stretch of sustainably managed forestland will help to filter and clean drinking water, provide a steady flow of wood products to local mills and protect a shifting mosaic of forest bird habitat. The St. Croix Forest Company will continue to own the land and manage the forest for timber production while ensuring the forest provides vital public benefits for generations to come.

With miles of streams and acres of lakes, ponds, and wetlands, this project protects valuable water resources. Located along the St. Lawrence Continental Divide, the project contains the headwaters of both the St. Croix National Scenic River and the Bois Brule River. These rivers serve as sources of drinking water to nearby towns. The project represents one of the few remaining tracts of private forestland that can be managed to maintain and expand the globally imperiled Pine Barrens forest community. Pine Barrens support an exceptional number of species, including Sharp-Tailed Grouse and 28 species found on the State list of Species of Greatest Conservation Need. Pine Barren habitat is also critical for migratory species such as the federally endangered Kirtland's Warbler; Wisconsin, Michigan, and Ontario, Canada, have the only documented nesting pairs in the world.

The project secures public access and enhances public recreation opportunities for hunting, fishing, trapping, hiking, and cross-country skiing. Centrally located within a complex of protected lands, this property's road and trail networks provide critical links to recreational opportunities on adjoining Forest Service, State, and county land, enhancing recreational opportunities to over 3.5 million people within a 3-hour drive.

Part of a larger conservation initiative, this project ensures the entire Brule-St. Croix Legacy Forest—totaling over 66,000 acres of globally significant Pine Barrens that spans four counties—is now protected under a working forest conservation easement. Large landscape-level conservation initiatives such as the Brule St. Croix Legacy Forest contribute to climate change adaptation and mitigation by keeping forests as forests so they continue to provide benefits such as carbon storage, habitat connectivity, and drinking water protection in the face of a changing climate.

More information on the Brule-St. Croix Legacy Forest can be found at:
http://www.conservationfund.org/projects/brule-st-croix-legacy-forest.

Stewardship of Federal Forests

CASE STUDY

Congress authorized the Collaborative Forest Landscape Restoration Program (CFLR) in the 2009 Omnibus Public Lands Management Act to accelerate restoration on high priority landscapes through collaborative, science-based approaches. In doing so, CFLR aims to promote forest health and resiliency, reduce the risk of catastrophic wildfires, and support economic stability in rural communities.

One project under CFLR, the Southwest Crown of the Continent (SWCC), brings together partners from the forestry industry, environmental advocacy groups, State and local agencies, and other groups to restore over 1.4 million acres of high peaks, aspen glades, conifer forests, rivers, and native grasslands. In order to reduce fire risk to nearby communities and increase forest health and resiliency to threats, the project has leveraged multiple funding sources, including CFLR funds, to treat in areas like the Meadow Smith project, located in the wildland-urban interface on the Flathead National Forest. The project has made use of stewardship contracting authorities, in this case with the Rocky Mountain Elk Foundation, which enable the Forest Service to work closely with communities to restore and maintain healthy forests.

When the Condon Mountain Fire erupted from a lighting strike in July 2012—just four air-miles northeast of the community of Condon—the units that had previously been treated in the Meadow Smith project area successfully served as a fuel break. This fuel break allowed firefighters to reduce their exposure and safely manage the fire and helped preserve large diameter ponderosa pine and larch trees. Without the treatments, it's very likely that the mortality for these trees would have been high.

In FY 2015, the Forest Service and its partners planted 125 acres of Whitebark Pine in wildfire burned areas within the SWCC area, a species that reduces runoff, provides food for over 100 wildlife species, including the threatened grizzly bear, and acts as a "nurse" to allow other vegetation to establish in the harsh conditions at high elevations. Since its inception in 2010, the SWCC project has treated over 21,000 acres for hazardous fuels reduction. Forest Service and its partners have also revegetated and reforested over 10,000 acres, achieving more than double their 10-year goal in half the time.

Promotion of Wood Products

CASE STUDY

In September 2015, USDA, in partnership with the Softwood Lumber Board and the Binational Softwood Lumber Council, announced the winners of the U.S. Tall Wood Building Prize Competition. The two winning development teams were granted a combined $3 million in funding to support the development of tall wood demonstration projects in New York and Portland, Oregon.

West coast winner of the U.S. Tall Wood Building Prize Competition: A 12-story building with retail, offices, and workforce housing. Photo courtesy of Lever Architecture.

"The U.S. wood products industry is vitally important as it employs more than 547,000 people in manufacturing and forestry, with another 2.4 million jobs supported by U.S. private-forest owners," said U.S. Secretary of Agriculture Tom Vilsack. "By embracing the benefits of wood as a sustainable building material, these demonstration projects have the ability to help change the face of our communities, mitigate climate change, and support jobs in rural America."

Next-generation lumber and mass timber products are flexible, strong, and fire resistant, and can be used as a safe and sustainable alternative to concrete, masonry, and steel. Using wood helps to reduce GHG emissions by storing carbon and simultaneously offsetting emissions from conventional building materials. Wood can also help struggling rural forest communities. During the Recession, the drop in new construction and decline in home remodeling had a deep impact on wood manufacturing. However, if next-generation wood products can penetrate just 5- to 15-percent of the non-residential North American market, it would mean roughly 0.8 to 2.4 billion board feet of lumber consumed annually. To put that in real-world context, roughly 35 jobs are created for each million board feet of wood processed.

The two winning proposals showcase the safe application, practicality, and sustainability of a minimum 80-foot structure that uses mass timber, composite wood technologies, and innovative building techniques. More information on the Competition can be found at: **http://www.tallwoodbuildingcompetition.org/**.

Urban Forests

CASE STUDY

In addition to the Energy-Saving Trees Program, the Forest Service and its partners are engaged in a wide variety of initiatives to encourage tree planting in urban areas. One of those, the MillionTreesNYC campaign, was launched in 2007 as a public-private partnership to plant and care for 1 million new trees across New York City. At the outset of creating the city's long-term sustainability plan, the City of New York Department of Parks and Recreation leveraged USDA Forest Service research science to make the case to the NYC Mayor's Office that planting trees was a sound investment that would make the city more livable and therefore more attractive to residents and businesses alike. By growing the urban forest, the City hopes to cool surface temperatures, enhance public space, and help advance long-term sustainability. One of the key pivot points for public officials and decision-makers was learning that there had been scientific research on the economic and environmental value of New York City's trees conducted by the USDA Forest Service, including application of the i-Tree Eco and Streets models. NYC Parks also used the Forest Service's Urban Tree Canopy research to help provide a context for these numbers and to determine where there was space across the densely built city to plant all of these new trees.

Volunteers work during a MillionTreesNYC fall planting day in New York City. Photo courtesy of New York City Department of Parks and Recreation and Malcolm Pinckney.

Representing a transformative investment in the urban forest, more than $400 million in municipal capital funds were committed to the tree planting initiative via the city's sustainability plan. A formal public-private partnership was formed between NYC Parks and the New York Restoration Project. Through this partnership, public funding was matched by several more million dollars from corporate sponsors, private philanthropists, foundations, and individuals that were attracted through social networks, professionalized connections, and savvy outreach and marketing of the campaign. In addition, the leaders of the campaign created an advisory committee of more than 400 individuals from 109 organizations to provide insight and guidance to the implementation of the campaign. A natural resource manager reflected on the role of this network of advisors, "I think the advisory board serves several purposes: breadth and also longevity. So, the advisory board allows us to be able to say in a very real way that it's not just about tree planting; that we want MillionTreesNYC to be about creating…an urban forestry movement for planting and care and awareness."

MillionTreesNYC also launched a Stewardship Corps program to help educate and cultivate citizen stewards. This later evolved into the TreeLC program that offered trainings and mini-grants directly to community-based stewardship groups. Existing Forest Service research on civic stewardship was used to help support this program, as the STEW-MAP database of stewards in New York City provided a list of potential partners to MillionTreesNYC. A decision maker in a public agency noted the transformative impact of the campaign, saying "the investment we were able to make into research, the improvements to our technology, the connections that we've made to academia, other government agencies, and other practitioners in the field have just been extraordinary."

In the fall of 2015, the millionth tree was planted ahead of schedule. In total, trees in New York City remove more than 38,000 metric tons of carbon dioxide from the atmosphere each year, the equivalent of eliminating more than 6,700 cars from the road. More information on MillionTreesNYC can be found at: **http://www.milliontreesnyc.org/**.

Energy Generation and Efficiency

CASE STUDY

American Hmong farmers in the Ozarks who purchased outdated poultry operations face high energy costs and struggle to meet performance goals set by their integrators. Their difficulties as new farmers are exacerbated by cultural differences and language barriers that hinder access to USDA services available to help.

Poultry farmer Kao Her houses 235,000 broiler chickens in 6 poultry houses in Noel, MO. Photo courtesy of USDA NRCS.

A 3-year NIFA Beginning Farmer and Rancher Development grant to improve energy efficiency and farm sustainability provided a springboard for other USDA agencies to formulate a collaborative approach to address the problems of 400 farmers in the region to ensure their long-term viability, and achieve positive environmental outcomes. Within the first 3 months of the grant, NRCS, RD, and FSA State leaders and technical staff participated in five meetings and workshops coordinated by the Hmong National Development, Inc., and their partner, EnSave, Inc., to strengthen support for the Hmong community.

Based on detailed energy audits completed for the first round of Hmong farmers, NRCS EQIP financial resources have been approved to implement facility improvements that will achieve more than 35 percent savings of fuel and electricity use when installed and reduce annual GHG emissions. These facility upgrades will increase production efficiency, resulting in a better financial bottom line.

Over the next few months, Hmong farmers will be helped to diversify their operations using RD grants and FSA loans to expand production of specialty crops and renewable energy and biofuels opportunities of their farms.

USDA agencies are finding creative ways to amplify their assistance for the Hmong by increasing technical assistance through agreements with energy businesses, providing translation services with the help of nonrofit organizations, and expanding recruitment in the Hmong community for agency interns. Expected overall project outcomes include:

- A more vibrant rural community;
- Stimulus for rural businesses providing support green-energy services to agricultural customers;
- Improvement of livestock health and farm biosecurity through improvement of confined feeding operation facilities;
- Increased opportunities to engage farmers as resource stewards;
- Reduction of inherent program barriers by increasing agency interaction and cross-promotion of USDA programs;
- Stronger transparency and coordination of agency funding decisions; and
- A model that can be applied to other USDA initiatives.