USDA
National Agroforestry Center

Inside Agroforestry

Winter Spring 2004

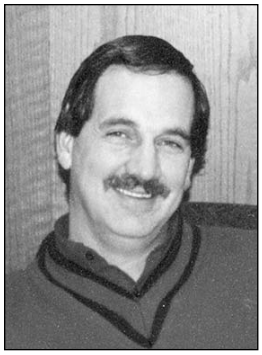
Imagine trying to communicate without linking words and sentences together and applying rules of grammar. Just as the rules of grammar need to be followed to converse effectively, the components of a landscape need to be linked together.

Individual words mean very little by themselves, but when they are organized into sentences, paragraphs, and chapters they work together to tell a story. Just like in a novel, landscapes have individual components, like trees and grasses that are organized into fields, woodlots, and meadows, that form larger units like farms, communities, and forests. This "landscape novel" needs to be interconnected on many levels to create healthy and functioning ecosystems.

Punctuation is woven into writing to add expression and meaning to the words. Similarly, wildlife adds punctuation to the landscape. Without the bees and bats to pollinate plants, birds to watch, fish to catch, or deer to hunt, our landscape would be less interesting.

This issue of *Inside Agroforestry* focuses on wildlife, the punctuation in your landscape. It will, hopefully, spark some new ideas on ways to use agroforestry to incorporate wildlife benefits into our landscapes.

Inside



NAC Director's Corner

A commentary on the status of agroforestry by NAC Director, Dr. Greg Ruark

Wildlife and agroforestry

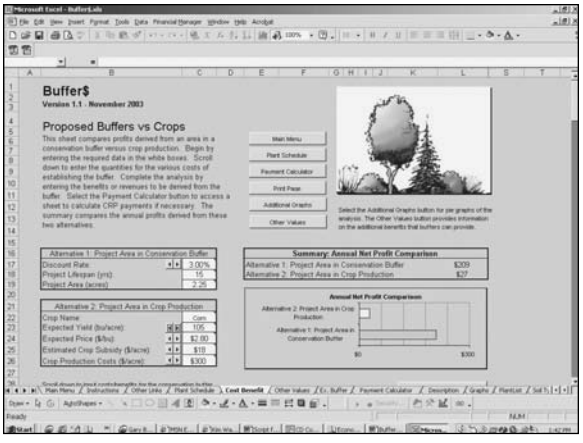
In the U.S. wildlife habitat continues to be displaced by the consolidation and intensification of agriculture and by the expansion of town and cities. As more and more of our landscapes are developed and brought under management in an effort to make life simpler for people, it is ironic that they often become too complex for most wildlife. Apart from excavating a den or weaving a nest, most wildlife do not create their own habitat, rather they make do with what nature provides or, increasingly, with what humans leave.

This issue of *Inside Agroforestry* focuses on examples of how agroforestry can be used to help alleviate the simplification, fragmentation, and reduction of wildlife habitat. For example, there are opportunities in both rural agricultural landscapes and at the interface where expanding communities meet agricultural land. Windbreak systems have been shown to provide critical habitat and protection for bees and other pollinators. Silvopasture systems are being designed to produce timber and livestock forage, while providing quality habitat for wild turkey and other game birds. Research by the Stroud Water Research Center is highlighted to illustrate the importance of riparian forest vegetation as a critical link in the aquatic food chain and in maintaining water quality. Efforts in Guam are using agroforestry to improve the quality of water that flows off the land and into coastal marine ecosystems to protect coral reefs.

Most agroforestry practices can be intentionally designed to optimize wildlife benefits. However, even when an agroforestry practice is primarily designed for economic purposes, substantial wildlife benefits can still occur. Fortunately, most USDA Farm Bill programs can be used to assist landowners in promoting one or several agroforestry practices that can provide wildlife benefits.

Buffer$:

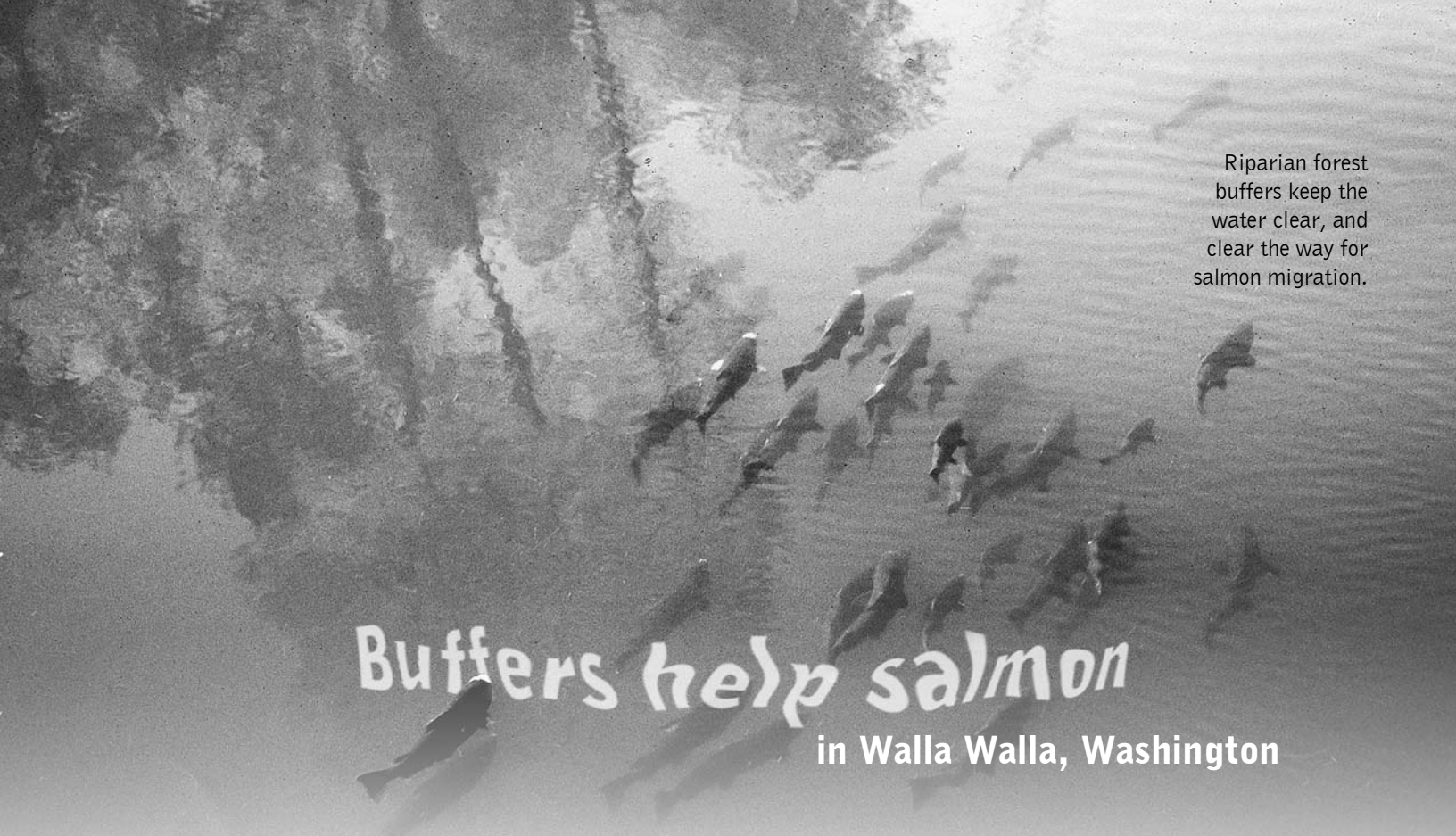
A tool that makes sense



NAC's Buffer$ spreadsheet analyzes the cost and benefits of buffers.

Does it make economic sense for landowners to install buffers with conservation cost-share programs? Can landowners earn income on buffers after these programs expire? Does removing an existing buffer make economic sense? Answering these questions is now easy with a new tool called Buffer$, a simple spreadsheet-based application to assist landowners and planners in analyzing the cost-benefits of conservation buffers.

Developed by the USDA National Agroforestry Center (NAC), Buffer$ can calculate potential income from a buffer using cost-share programs, growing agroforestry specialty products, and incorporating other income opportunities. To aid in decision-making, the tool can compare the potential income generated between a buffer alternative and a cropping alternative. Using this tool, landowners and natural resource planners can also evaluate the economic impact of removing an existing buffer. Buffer$ uses NRCS state average costs for installation and maintenance budgets and county soil rental rates for calculating Continuous Conservation Reserve Program payments. Default values from Nebraska are used to demonstrate the tool. You can easily customize the tool for your area by entering into the program NRCS state average costs and local county soil rental rates. Buffer$ can be downloaded from the NAC's website http://www.unl.edu/nac/conservation/ and requires Microsoft Excel to run. A free CD with Buffer$ can also be requested by contacting Gary Bentrup of NAC at gbentrup@fs.fed.us or (402) 437-5178 ext. 18.



Riparian forest buffers keep the water clear, and clear the way for salmon migration.

Buffers help salmon

in Walla Walla, Washington

Larry Hooker
NRCS District Conservationist
Walla Walla, Washington

Native salmon and steelhead habitat in Washington has been seriously impacted by the removal or elimination of native riparian vegetation. These losses have resulted in increases in water temperature, rates of sedimentation, and changes in channel morphology. These factors contribute to the habitat degradation of these coldwater fisheries. Since approximately 37 percent of Washington's freshwater salmon streams on private lands pass through agricultural lands, farmers and ranchers can play a significant role in restoring the riparian corridors.

Walla Walla County is leading the way with this restoration challenge. Their buffer efforts started in 1996 following floods that devastated most of their stream corridors, adjacent farmlands and communities. Landowners were looking for solutions, and the Walla Walla County Conservation District (WWCCD) and the Natural Resources Conservation Service (NRCS) responded by meeting with landowners in the affected areas to discuss options for improving stream channel function and restoring the riparian zones. Using funds from several sources including the Emergency Watershed Protection Program, the Bonneville Power Association grant program, and the Wildlife Habitat Incentives Program, the WWCCD with NRCS support assisted landowners with stream bank protection. This included both structural practices (e.g. rock armoring) and bioengineering techniques. The funding also assisted with the installation of in-stream practices, such as j-hooks, barbs, rock toes and weirs, to correct stream bank erosion problems and improve stream conditions for steelhead and bull trout that are both listed under the Endangered Species Act. The re-vegetation of the riparian zones was an integral component of all these projects.

One successful example comes from the Coppei Creek Watershed. The mayor of Waitsburg, Washington, which is in the watershed, invited landowners to a meeting with WWCCD and NRCS to discuss stream and riparian restoration alternatives. This event coincided with the inception of Washington's Conservation Reserve Enhancement Program (CREP) that focuses on establishing riparian forest buffers. The WWCCD leveraged grant funds from several sources to continue in-stream projects with the CREP funds supporting the riparian forest buffer establishment.

In the spring of 2000,the first year of CREP, 3.8 stream bank miles of riparian forest buffer were installed on Coppei Creek. Another two-tenths of a mile was installed on the Walla Walla River. The following year, another 10 stream bank miles of buffer were installed on the Coppei and 0.7 miles on the Walla Walla.

Interest in the CREP incentives continued to grow so the WWCCD hired a part time coordinator in 2002 to help with the increased workload. Mike Pelissier, former WWCCD coordinator, and Larry Hooker, NRCS District Conservationist, had previously trained a group of contractors in the CREP planning process. These contractors, early

see **WALLA WALLA** on page eleven

A painted lady on a butterfly bush.

Photos courtesy Kimberly Stuhr

Pollinators

Wildlife we can't afford to live without

Kimberly Stuhr
NAC Technology Transfer Specialist
Lincoln, Nebraska

Pollination is one of nature's services that we often take for granted. At least one-third of the world's agricultural crops depend on pollination provided by insects and other animals. The assumption that pollination is a "free ecological service" provided by nature is erroneous. Effective pollination requires natural vegetation and suitable habitat for pollinators. Agroforestry plantings can be adapted to many situations and address many landowner concerns; among them diversifying income, protecting water quality, and enhancing wildlife habitat.

Honeybees often come to mind first when someone mentions pollinators. Since 1992, over one million honeybee colonies have been rented yearly for pollination of agricultural crops in the US. But, make no mistake, wild pollinators are just as important as honeybees. Native bees (at least 4,000 species are native to the continental US), butterflies, moths, bats, and flies are at least equally, and in some cases even more adept, than honeybees at pollinating the 100-150 major U.S. crops that require pollinators.

There are nearly 4,000 species of bees native to the continental US.

Buchmann and Nabhan, "The Forgotten Pollinators"

Researchers with the Forgotten Pollinators Campaign, based in Tucson, Arizona, estimate that one in every three bites of food is made possible by a pollinator. Pollinators can play a number of roles in agroforestry systems. In some situations, pollinators are essential to the success of specific crops that are part of an agroforestry system, such as blueberries, blackberries, raspberries, and chestnuts. When this is the case, it is important to understand what type of pollinators are needed and encourage the appropriate habitat.

In other situations agroforestry practices can facilitate active pollination of adjacent crops. For example, bee flight is inhibited at wind speeds greater than 13 to 20 miles per hour. Studies have shown that pollination increases in the area sheltered by a windbreak. This has been attributed to the calmer and warmer conditions in the protected zone. Alley cropping and riparian forest buffer practices could also provide this type of protection.

Throughout the world, agricultural production and agroecosystem diversity are threatened by declining populations of pollinators. The major factors contributing to this are considered to be habitat degradation and

continued on the next page

fragmentation, agricultural and industrial chemicals, parasites and diseases, and the introduction of alien species. One way to combat the decline in pollinators is to provide undisturbed habitat for nesting, roosting, and foraging. Furthermore, some pollinators require plants that flower sequentially, so that they have food sources throughout the season. Agroforestry practices can assist with these efforts.

For example, willow is an excellent source of nectar and pollen in early spring. By incorporating willows into a windbreak or riparian forest buffer design could enhance the pollinators forage opportunities until the target crop begins to bloom.

At least one-third of the world's agricultural crops depends upon pollination provided by insects and other animals.

Food and Agriculture Organization, United Nations

In the article, "Encourage Native Bees; Increase Your Yields," Lynn Byczynski gives another example of how important it is to understand the needs of pollinators: Hornfaced bees are excellent pollinators of apples, but they are active before apple trees are in bloom. In Maryland, the bees forage on winter honeysuckle, which finishes blooming just as apples come into bloom. After the apples bloom, Tatarian honeysuckle begins to bloom, and the bees then use this plant for forage.

Agroforestry practices may not only provide alternative forage but may also improve the nesting habitat for many pollinators. By applying agroforestry practices, plant diversity increases which will, in turn, increase the diversity of pollinators.

In an effort to protect our often forgotten wildlife, foresters, entomologists, and conservationists assisting farmers and ranchers need to include pollinators in their wildlife habitat recommendations. And farmers, orchard growers, and other land managers need to consider pollinators as they make land management decisions.

Next time you're talking about agroforestry and including wildlife and wildlife habitat, remember the pollinators. We simply cannot afford to forget them.

The management of wildlife-human conflicts has become an essential part of contemporary wildlife management and during the past decade there has been significant research and development in this field. Robert Schmidt, Wildlife Biologist at Utah State University, says successful wildlife damage management might best be accomplished by managing the involved wildlife, environment, or people, or by a combination of all these interrelated factors.

A comprehensive reference, Prevention and Control of Wildlife Damage, is available. This handbook, developed by the USDA Animal and Plant Health Inspection Service---Animal Damage Control and The University of Nebraska Cooperative Extension Institute for Agriculture and Natural Resources, and The Great Plains Agriculture Council, is one of the leading references in the field of wildlife damage management. It is a condensation of current, research-based information on all North American wildlife species that cause problems and the recommended damage control techniques.

The handbook is available as a two volume set in three-ring binder format and also on CD-ROM. Either format costs $40.00 plus shipping. Send your order to wildlife Damage Handbook, 202 Natural Resources Hall, University of Nebraska, PO Box 830819, Lincoln, Nebraska 68583-0819. You can also order the handbook from http://wildlifedamage.unl.edu.

Unique Agroforestry Tour

In conjunction with the First World Congress on Agroforestry, the University of Missouri Center for Agroforestry, Iowa State University Department of Natural Resource Ecology and Management, and NAC are sponsoring a motorcoach tour of agroforestry. Tour begins in Columbia, MO. June 23 and returns to Columbia on the 24th. Although participation in the Congress on Agroforestry is not required, this pre-Congress tour creates a unique opportunity for you to interact with people interested in agroforestry from around the world.

Registration is $350 single occupancy or $300 double occupancy and includes motel accommodations, refreshments, meals and a set of Center for Agroforestry videotapes. Tour registration deadline is June 1. Space is limited to 50 people.

The tour coordinator is Julie Rhoads, Center for Agroforestry, 203 ABNR Bldg., University of Missouri, Columbia, MO 65211; phone (573) 882-3234; Fax (573) 882-1977; RhoadsJ@missouri.edu

The mission of the Stroud Center is to advance knowledge of stream and river ecosystems through interdisciplinary research; to develop and communicate new ecological ideas; to provide solutions for water resource problems worldwide; and to promote public understanding of freshwater ecology through education programs, conservation leadership, and professional service.

Stroud Center:

Riparian forest buffers are an essential component of a natural stream habitat.

"The reason we were interested in doing this experiment," wrote Jessica Small, a ninth grade science student, in her final report, "is because before man settled on this continent, streams flowed mostly through the forest and leaves were an important food source for the animals living there. Large quantities of these leaves fell in the streams. Over the years man has removed most of the trees from along the streams. If man keeps on removing the trees, the animals that specialize in eating the stream-borne leaves will die because there will not be a sufficient food source. Man is now also introducing foreign trees into our environment. We do not know if the stream animals are eating the foreign tree leaves or whether they can digest them."

The Stroud Water Research Center in southeastern Pennsylvania is conducting ongoing research to verify the observations and answer the questions posed by Jessica. In fact Jessica's science class is helping answer these questions through applying the Leaf Pack Experiment, an educational outreach program sponsored by the Stroud Center (see **Education**). The animals that Jessica mentions include a large mixture of species ranging from large fish to small microbes. The fish receive the greatest attention from the public due to recreational fishing, but the "overlooked wildlife" (microbes, macroinvertebrates, etc.) are essential to maintain continuity in the food chain. Research at the Stroud Center is telling us that riparian forest vegetation is a critical link in that food chain.

The river continuum

"It's time to move beyond the notion that you can understand how a river works by studying a tiny piece of it." Robin Vannote, Stroud Center's first director, told the assembled water researchers from across the country in the early 1970's. "A stream is fundamentally different from a lake, and you must consider how the entire system is functionally linked. Because a river changes constantly as it moves downstream, it can only truly be understood as a continuum."

From those early insights, Vannote, other Stroud staff, and a few university colleagues developed the *River Continuum Concept*, which would come to revolutionize stream research. Stroud scientists established the importance of studying the entire watershed. A river's width, depth, velocity, and temperature fluctuate constantly as the water flows downstream. Furthermore, a river's biological and chemical processes correspond to its physical attributes and the nature of biological communities changes in a downstream direction. To understand what is happening at any point along the way, you must understand both the upstream conditions and what is entering from the watershed.

Watershed tea

In studying the hidden life of streams, Stroud scientists discovered that rain water picks up an enormous variety of molecules as it passes through a watershed. When the water enters a stream, it carries with it a special blend of dissolved organic matter, which is then dispersed in the water much like tea from a tea bag. So specific is each watershed's "tea," that migrating salmon use it to find their way home at spawning time. This tea provides

Searching streams for "overlooked wildlife"

food for the bacteria, and recent studies at the Stroud Center indicate that each watershed produces a community of bacterial species which are uniquely fitted to the local food supply.

Millions of microbes

Most of us experience streams through our five senses. Perhaps most of all, we experience a stream with our eyes, watching the play of sunlight on its surface or a fish taking a fly. What we can't see, at least without the help of a good microscope, is the teeming world of tiny organisms, the "overlooked wildlife," that sustain the stream's life and health. Yet as many as a billion bacteria, plus millions of protozoa and hundreds of thousands of diatoms, occupy a square centimeter of a healthy streambed, and the collective efforts of such microorganisms provide or process most of the energy that supports the visible life of the stream.

Fungi and bacteria decompose the decaying matter, and in the process they cycle essential nutrients back into mineral form, where they are consumed again by algae. The decomposers are, in turn, eaten by larger organisms in an ongoing process that returns much of the original energy back to the food chain. The Stroud Center's goal is to describe the interconnectedness of microorganisms with the visible members of the aquatic communities in our streams and rivers.

Riparian forest buffers

We know that the trees, shrubs, and grasses of riparian zones filter out various pollutants that would otherwise enter the stream in groundwater or overland runoff. But, forest buffers are much more than filters for pollution — they are an integral and essential part of the stream ecosystem.

Stroud Center research has shown that trees are critical to maintaining the natural width, depth, and sediments of a stream. Their research on the White Clay Creek and other streams in the eastern United States has found that forested stream channels tend to be wider than those bordered by grass. These wider streams provide greater surface area for biological activity. This also creates more habitat and hence more organisms to process nutrients and other pollutants in the stream.

The composition of the riparian forest vegetation also impacts the "overlooked wildlife." Feeding experiments showed that aquatic insects thrive on leaf material from native trees but fare poorly on the leaves of non-native invasive species. For example, Stroud Center research found that the leaf eating mayfly (*Leptophlebia cupida*) larvae survival was significantly lower when non-native tree and shrub species occupied the riparian area. In fact, when mayfly larvae were fed leaves from the non-native multiflora rose, they all died. Natural temperatures, which are maintained by forest shading, were also found to be key factors in aquatic insects' life histories and successful reproduction.

Macroinvertebrates are often referred to as "canaries of the stream" because they function as living barometers that indicate changes in water quality. The Stroud Center research stresses the importance of the "overlooked wildlife" to stream health and overall water quality. This also reinforces the efforts across the country to restore stream corridors that were previously forested.

see **STROUD CENTER** on page nine

The Stroud Water Research Center is a privately-funded facility located on 900 acres of mixed farm and forestland in a rapidly suburbanizing watershed about 40 miles west of Philadelphia. It provides an excellent living laboratory for helping us to understand how changes to the landscape affect stream ecology.

Wild turkeys love silvopastures

Jim Robinson
NAC NRCS Agroforester
Fort Worth, Texas

Turkeys like open areas for feeding and mating, and forested areas for overnight roosting and protection from predators.

Wild turkeys love a mixture of open agricultural land and saw-timber-sized forest. It just so happens that an agroforestry silvopasture system looks very much like this!

Silvopastures are designed to maximize a landowner's options, land, and income. If managed properly, a silvopasture system (the combination of trees with forage and livestock production) can provide multiple benefits to the landowner. In conifer stands the trees are managed for long-term, high-value sawlogs, while the understory is managed for forage production to support livestock grazing. Wild turkeys can thrive in this environment.

Today wild turkeys are present in all of the lower 48 states and Hawaii with Alaska being the only state not in their range. Wild turkeys are non-migratory, year-round residents so they occupy a variety of habitats throughout their ranges. The home range of a wild turkey flock can be between 350 acres to over 60,000 acres. A smaller tract of land, however, that contains a mixture of the necessary habitat components may support wild turkeys better than a larger area that lacks one or more of the needed habitat components. Landowners owning as few as 10 acres can manage for wild turkeys if one or more of the habitat requirements is present on the property and adjacent lands provide other habitat components needed to sustain them.

The most critical aspect of wild turkey management is creating a good interspersion or mixture of different habitat types. Suitable foraging, nesting, brood-rearing, roosting cover, and a water source each located within close proximity to one another is essential to attract wild turkeys and maintain existing populations in an area. With additional effort, a landowner managing a silvopasture system can also manage a wild turkey population. Proper management can help landowners boost local wild turkey populations as well as populations of other species that rely on similar habitat.

Following are critical habitat elements that wild turkeys need and a brief explanation of how silvopasture fits the bill.

Food

Wild turkeys forage throughout the day with most feeding activity occurring right after they leave the roost at daybreak and right before sunset. Their diets are composed mostly of plants and insects, with insects being of critical

see **WILD TURKEYS** on page ten

Foraging for food in a silvopasture opening.

Photo courtesy NEBRASKAland Magazine/Nebraska Game and Parks Commission.

Stroud Center

continued from page seven

Education

Since 1990 when Jessica Small and her classmates examined the overlooked life among the leaves in White Clay Creek, many more have followed. Thousands of students and their teachers have put on rubber boots and waded into a creek to explore the hidden world of insects, snails, crayfish, and worms beneath the water's surface.

Placing bags of leaves in streams and retrieving them over the course of several weeks enables students to learn about the biodiversity of streams, their food chains and issues related to streamside forests.

This article was adapted from the publication "Stroud Water Research Center —- A Portrait: 1967-2000." For more information about Stroud Center projects, visit their website: www.stroudcenter.org

Businesses get publicity, wildlife get habitat

The Wildlife Habitat Council (WHC) is a nonprofit group of corporations, conservation organizations, and individuals dedicated to protecting and enhancing wildlife habitat.

Created in 1988, WHC helps large landowners, particularly corporations, manage their unused lands in an ecologically sensitive manner to benefit wildlife. WHC also works to broaden the understanding of wildlife values. Over 120 companies are WHC members as are two-dozen conservation organizations, plus many individual supporters and contributors. Over two million acres in 48 states, Puerto Rico, and fifteen other countries are managed for wildlife through WHC-assisted projects.

Habitat projects are cooperative efforts between corporate management and employees, community members, local conservation groups, and local, state, and federal agencies.

For example, the Eli Lilly and Company, Tippercanoe Laboratories near Lafayette, Indiana owns and maintains five miles of property adjacent to the Wabash River. Property managers and the wildlife team, along with outside contractors, planned a project to stabilize riverbank areas where erosion and severely unstable banks occurred. The project created a riparian buffer strip that is 1.8 miles long and 300 feet wide. The company's contributions were supplemented by funding through a Five-Star Restoration Grant from the US Environmental Protection Agency, facilitated by the Wildife Habitat Council, and through the USDA Conservation Reserve Program.

Get businesses in your area to create wildlife habitat! For more information, visit the Wildlife Habitat Council online at: www.wildlifehc.org

Managing the forage height and the amount of legumes and shrubs in a silvopasture can enhance wild turkey habitat.

Wild turkeys

continued from page eight

importance to poults (young wild turkeys). Wild turkeys are opportunistic feeders and their diets are largely a function of the acceptable food items available. Managing the silvopasture to produce quality forage for livestock and quality trees for timber will provide substantial insect and forage for wild turkey to utilize. This could be further enhanced by including clumps of trees or shrubs that would provide hard mast (e.g. oaks) or soft mast (e.g. hawthorns or dogwoods). Also consider maintaining some legumes in the forage component.

Nesting cover

Generally, shallow nest depressions in the soil surface are either scratched by the female or formed through egg laying activity at the nest site. Forest-nesting turkeys commonly nest in close proximity to openings and edges where poults have access to insects shortly after hatching. Managing a silvopasture to increase nesting cover could include increasing the shrub component to about 20 to 30 percent. Another consideration is to include native warm season grasses in the understory and manage the grass height to a minimum of eight to 10 inches.

Roosting cover

Wild turkeys roost on the ground and in trees. Tom and hen turkeys without broods roost overnight in trees to avoid predators. Timber stands comprised of mature, open-crowned trees with branches spaced at least 18 inches apart that run parallel to the ground provide ideal roosting. The trees in a mature silvopasture can meet this need. The trees should have trunk diameters of 14 inches or greater and be located within one-half mile of a food source. Hens with young roost under large trees within forests containing a dense understory of young trees and shrubs, downed trees, rock outcrops, and brushy vegetation. For hens with young, the silvopasture may either need a greater shrub component or one that is managed to a greater height.

Brood-rearing cover

A lack of suitable brood habitat can severely affect wild turkey population recruitment, as brood habitat plays a key role in the survival of poults during the first eight weeks of life. Forest openings of one-half to three acres in size provide good brood habitat. These habitats best suit wild turkey when they contain a multitude of nutritive, herbaceous forage that supports insects (especially legumes), permits efficient poult foraging throughout the day, and provides cover that enables poults and hens to see and hide from oncoming predators. The forage component of a silvopasture could help meet this need.

Forest cover

Wild turkeys use trees and forest habitat to fulfill various food and cover needs. They prefer hardwood species like oak, hickory, beech, black cherry, white ash, and American elm. Preferred conifer species include pinyon pine, Ponderosa pine, longleaf pine, and junipers. Current silvopasture systems include primarily pine species. The forest cover needs of wild turkey could be enhanced by including clumps of hardwoods like oaks in the silvopasture.

Water

Wild turkeys drink water from spring seeps, streams, ponds, lakes, and livestock watering sources. A source of open water is necessary to support a wild turkey population. All silvopastures will have adequate watering facilities for livestock which could also benefit turkeys.

Before deciding upon management changes in a silvopasture system to enhance wild turkeys, the landowner should consider consulting a natural resource professional trained in wild turkey and silvopasture management. This habitat assessment needs to include not only the silvopasture but also the entire farm and adjoining farms. Once a habitat assessment is completed, a management plan can be developed.

Walla Walla

continued from page three

"technical service providers," with guidance by the District CREP Coordinator helped expedite the implementation of many projects during a short planting period. During that year, 28 CREP contracts were planned on over 800 acres and 39 streambank miles. Project applications were also starting to spread out to other areas including the Touchet River, Dry Creek, Mill Creek,

> **"Farmers in Walla Walla County want to be good stewards..."**
>
> **- Alison Bower, WWCCD**

Cottonwood Creek, Mud Creek, Pine Creek, Cold Creek and others.

By the close of 2003, the popularity of the program continues to grow, as neighbors join together to create contiguous miles of riparian habitat. Through CREP, the buffer must be at least 75 feet in width and average no more than 180-foot per side of the stream. To date, Walla Walla County has 89 CREP contracts that total approximately 109 stream miles, creating about 2175 acres of riparian habitat. Average project size is 1.2 miles of stream length, about 22 acres of area, and a buffer width averaging 159 feet. There is currently a waiting list of 100 landowners who want to enroll in the program.

This CREP targets only the riparian areas of streams with endangered fish species. However, to further protect the habitat of steelhead, bull trout, and other aquatic species, attention must also be given to the upland areas adjacent to the streams. The WWCCD and NRCS have also been promoting the use of upland buffers including contour buffer strips, filter strips, and grassed waterways to trap sediment and other pollutants before they reach the riparian area. The incentives from the Continuous Conservation Reserve Program have been used to implement these practices on 66 contracts covering 1589 acres. "Farmers in Walla Walla County want to be good stewards, and the CREP and other incentives help them to accomplish that goal," said Alison Bower, WWCCD Riparian Restoration Project Coordinator.

Caring for coral

In the 1980's, as visitors flocked to Guam's natural resource areas to hike inner-island forested trails, lie out on the beach, and snorkel the coral reefs, five-star hotels developed on the coastline along with golf courses and high-rise buildings. All the while human-caused fires were burning in the forests of the interior watersheds. The result was soil erosion and runoff, the most common factor in Guam's coral reef degradation.

Coral reefs are formed by tiny communal animals that can only live in a delicately balanced marine environment. They require lots of light and oxygen, low nutrient levels, a steady temperature, and stable salt content or salinity. They not only provide important habitat for a variety of marine creatures, provide coastal protection and climate protection, absorb huge quantities of carbon dioxide, but they yield an average of 15 tons of seafood per square kilometer each year.

> **Increased nutrient runoff creates algal blooms that block needed light from reaching coral reefs.**

The forest and agricultural lands are connected to Guam's coral reefs. Once the forest is burned, soil erodes easily. If burning persists, only sword grass will grow, then nothing at all. All that will remain is red clay. One option being considered is for communities to work together to plant strips of trees, greenbelts, where the trees once protected the watershed.

These greenbelts of trees can be managed as either an alley cropping or forest farming agroforestry practice to grow crops and provide income for the local community. As the tree roots begin to take hold, the soil will eventually become secure, preventing further runoff into the ocean. If strategically planted, the greenbelt trees can also reduce the amount of stormwater runoff entering the community and resort developments.

Through the Fouha Bay Project a group of scientists have taken a multi-science and all-lands approach to the ongoing problem of reef degradation. The Project is a partnership between the Guam Division of Forestry and the Social Science Research Institute (SSRI). They are conducting an impact analysis of the watershed and reef degradation that considers ecological, socio-economic, and governmental interactions.

The results of this study are expected to help address coral reef health, monitor changes, and provide information to guide development and policies responsibly.

Adapted from NASF Washington Update article by Dr. Bob Richmond and Robert McConnell.

Upcoming Events

June 15 - 16, 2004
Plains and Prairie Forestry Association (PPFA) annual meeting: "The Forest of Lewis & Clark." Bismarck, South Dakota. www.ag.ndsu.nodak.edu/aginfo/trees/whatnew/PPFA_2004_Conference.htm

June 25 - 26, 2004
Second Northeastern Forestry / Agroforestry Conference. Oakland, Maine. www.kcswcd.org

June 27 - July 02, 2004
First World Congress of Agroforestry: "Working Together for Sustainable Land-Use Systems." Orlando, Florida. www.conference.ifas.ufl.edu/wca/

June 28 - 30, 2004
American Water Resources Association Summer Specialty Conference: "Riparian Ecosystems and Buffers." Olympic Valley, California. www.awra.org

Editor's Note

FINAL REMINDER!
We're updating our mailing list!

You recently received a form in the mail requesting any changes in contact information. You must complete this form and return it to NAC by April 14 (final deadline) to continue remain on our mailing list. You may also complete this form electronically at www.unl.edu/nac. Thanks for helping us save paper!

Inside Agroforestry is published quarterly by the USDA National Agroforestry Center.
Phone: 402-437-5178; Fax: 402-437-5712.

Greg Ruark, NAC Director ext. 27
Michele Schoeneberger, FS Research Lead ext. 21
Rich Straight, FS Lead Agroforester ext. 24
Bruce Wight, NRCS Lead Agroforester ext. 36
Kimberly Stuhr, TT Specialist/IA Editor ext. 13
Ryan Dee, TT Assistant ext. 14
Mike Majeski, FS Agroforester
St. Paul, MN phone: 651-649-5240
Jim Robinson, NRCS Agroforester
Fort Worth, TX phone: 817-509-3215
Gary Kuhn, NRCS Agroforester
Spokane, WA phone: 509-358-7946

www.unl.edu/nac

Mission

The USDA National Agroforestry Center (NAC) is a partnership of the Forest Service, Research & Development (Rocky Mountain Research Station) and State & Private Forestry and the Natural Resources Conservation Service. NAC's purpose is to accelerate the development and application of agroforestry technologies to attain more economically, environmentally, and socially sustainable land-use systems. To accomplish its mission, NAC interacts with a national network of partners and cooperators to conduct research, develop technologies and tools, establish demonstrations, and provide useful information to natural resource professionals.

Inside Agroforestry | Winter / Spring 2004

USDA National Agroforestry Center
East Campus-UNL
Lincoln, Nebraska 68583-0822

Official Business
Penalty for Private Use, $300
Address Correction Requested

PRSRT STD
POSTAGE & FEES PAID
USDA — FS
PERMIT NO G-40