



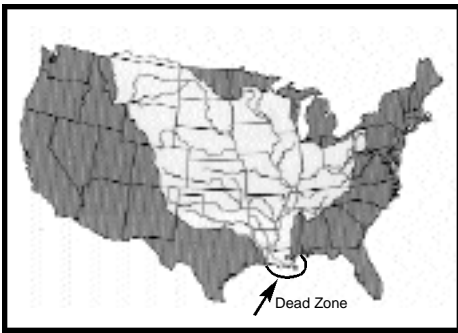
Forest Service
Natural Resources Conservation Service

Inside Agroforestry

Spring, 2000

“Dead Zone” in The Gulf of Mexico is a National Problem; Agroforestry Can Help

by Kimberly Stuhr, Technology Transfer Specialist, NAC, Lincoln, Nebraska

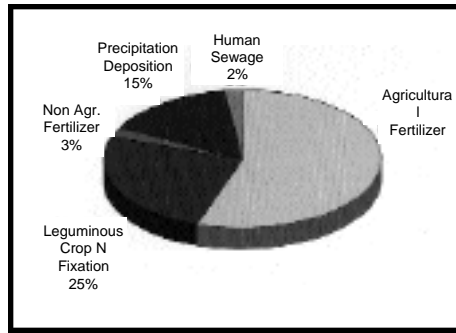


Mississippi River Basin and its major tributary rivers (after Meade, 1995).

It's called *Hypoxia*. Hypoxia occurs when the dissolved oxygen level in water is too low to sustain life. During the last decade, up to 7,000 square miles of the Gulf of Mexico, near the mouth of the Mississippi River, become oxygen-depleted each year. “The Dead Zone,” as it is often referred to by fisherman, unable to sustain animal life during the summer and fall.

As the Mississippi River dumps excess nutrients from its basin, into the Gulf, (See Figure), algae are produced. As this organic matter dies, it settles to the bottom and oxygen is consumed as it decomposes. This creates a hypoxic condition.

Human-caused hypoxia elsewhere in the world has had serious economic impacts on fisheries. Costs impact commercial fishing, consumers of seafood, tourism, recreational fishing, and non-users discouraged by perceived pollution. Commercial and recreational fisheries in the Gulf currently generate \$2.8 billion annually.



Calculated nitrogen sources of the Mississippi River Basin.

Hypoxia is not unique to the gulf of Mexico. It is also found in the North, Baltic, Adriatic, and Black Seas, Long Island Sound, and Japan's Seto Island, and the Chesapeake Bay. Dozens of the worlds hypoxic zones have already lost benthic, or bottom-dwelling, organisms needed to support fish populations and fishing industries.

The Gulf of Mexico's hypoxia problem is the largest human-caused, coastal problem in the Western Hemisphere. The hypoxia begins in late spring, reaches a maximum in

(See Dead Zone on page 6)

Report on the Status of Our Nation's Water

In late 1999 the National Water-Quality Assessment Program (NAWQA) published its first report in the series, *The Quality of Our Nation's Waters*. The report, based on sampling 20 large watersheds, presents insights

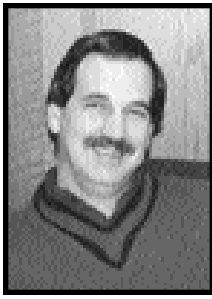
“At least one pesticide was detected in almost every water and fish sample collected from streams.”

on nutrients, herbicides, and insecticides found in surface and groundwater. Differences in land use, chemical use, land management practices and natural processes were examined to help explain results. High levels of nitrogen and phosphorous were detected in agricultural areas and at least one pesticide was detected in almost every water and fish sample collected from streams. For more information on this U.S. Geologic Survey Circular # 1225 visit: www.usgs.gov



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NAC Director's Corner

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

Forested Buffers Needed in Agriculture

On the front cover of this issue we mention the recently published USGS report, *The Quality of Our Nation's Water*. This report examines the condition of our Nation's waterways and groundwater. Unfortunately, the progress in cleaning up contamination from point sources has not been matched by the control of runoff from non-point sources, especially fertilizers and pesticides applied in agricultural and urban areas and nutrients from animal wastes. States found that 40 percent of the surface waters they surveyed were too contaminated for basic human uses, such as fishing and swimming. Concerns for aquatic life were also expressed.


Annually, in the United States 12 million tons of nitrogen (N) and 2 million tons of phosphorus (P) are added as commercial fertilizers, while an additional 7 million tons of N and 2 million tons of P are applied as manure. Each year, much of this fertilizer finds its ways into surface waters and groundwater. The USGS report estimated that 90 percent of N and 75 percent of P in surface waters originates from non-point sources.

The study evaluated samples taken since 1991 from twenty large watersheds distributed across the U.S. Nutrient concentrations varied seasonally in response to changes in precipitation, streamflow, and fertilizer or manure applications. The highest levels of N in both streams and groundwater were associated with agriculture. High P levels were found near areas of livestock

concentrations. The greatest concentrations were often associated with storm events.

Each year 1 billion pounds of pesticides are applied nationally, with about 75 percent of this application occurring on agricultural lands. Most agricultural pesticides are in the form of herbicides, since insecticides are applied more selectively and at lower rates. The most commonly detected herbicide in streams and groundwater was atrazine and its various breakdown products. At least one pesticide was found in almost every water and fish sample collected from streams, and more than half of the streams contained five or more pesticides. Groundwater was also affected, with nearly one-quarter of the samples registering two or more pesticides.

The report concludes that... "the reduction of nutrients and pesticides concentrations in streams and groundwater clearly require management strategies that focus on reducing chemical use and subsequent transport in the hydrologic system."

Agroforestry practices, like forested upland and forested riparian buffers, have been shown to reduce water pollution when they are located in strategic positions on the landscape. These buffers can slow and reduce the transport of runoff to streams, thereby allowing more time for the environment to degrade pesticides and animal waste products and increase the infiltration of water and contaminants into the soil. 

What's All This Talk About Carbon?

by Kimberly Stuhr, Technology Transfer Specialist, NAC, Lincoln, NE

Carbon, carbon, carbon! Are you wondering what carbon really is and how agroforestry can help "capture" it?


Basically, carbon dioxide in the atmosphere traps heat that is leaving the Earth and radiates it back. This keeps the average Earth temperature livable. Too much carbon dioxide is believed by many scientists to result in an overall warming of the Earth's

surface. Others are not convinced there is a cause and effect relationship.

The one fact that both sides agree on is that atmospheric carbon dioxide levels have risen 30 percent since the beginning of the industrial revolution, primarily from burning fossil fuels.

The good news is that agroforestry can help! Adominant consideration for rebalancing the global carbon cycle is to find ways to promote the

increased growth of trees and shrubs. Much of this opportunity will occur on farms and ranches.

Windbreaks, Riparian Forest Buffers, Silvopasture systems, and Short Rotation Woody Crops practices can help help reduce atmospheric carbon dioxide levels while at the same time, protecting crops, livestock, soils, and water resources and provides additional on-farm income. 

Conservation Buffers Work...Environmentally and Economically

by Max Schnepf, USDA NRCS Public Affairs Liaison, Soil and Water Conservation Society, Ankeny, Iowa

Just three years ago, Secretary of Agriculture Dan Glickman committed the U.S. Department of Agriculture (USDA) to the National Conservation Buffer Initiative as a means of increasing farmers', ranchers', and woodlot owners' awareness of conservation buffers and helping those landowners install 2 million miles of buffers by the year 2002. That's a lot of buffers, the equivalent of about four trips to the moon and back.

Landowners, many of whom want to do the right thing environmentally, have responded. To date, they've used federal and state land retirement, cost-share, easement, and private programs to add 753,000 miles of buffers to the American landscape. And even more buffers are likely now that USDA has announced several new incentives that should make a key federal program—the Conservation Reserve Program (CRP) continuous sign-up—even more economically attractive.

The CRP continuous sign-up was added to the 1996 farm bill to entice landowners to use buffers more widely in addressing water quality and other conservation challenges. The continuous CRP is distinctly different from the general CRP in three ways: 1) landowners can offer land for enrollment at any time, 2) enrollment is non-competitive; and 3) eligible land need not be classified as highly erodible land.

From the outset, the buffer initiative has had the support of most agricultural and conservation organizations. Agricultural groups see buffers as a way for landowners to meet their environmental stewardship responsibilities voluntarily and perhaps avoid more onerous regulatory programs. Conservation interests view buffers as a means of achieving multiple envi-

“USDA conservationists and their many partners also assume some responsibility for advising farmers, ranchers, and woodlot owners about the opportunity they have to use buffers for environmental improvement.”

ronmental goals, including soil erosion control, air and water quality improvement, fish and wildlife habitat enhancement, flood control, carbon sequestration, and conservation of biodiversity.


Buffers come in all kinds, shapes, and sizes. Their applications vary, depending on a landowner's goals. New York City, for example, is paying farmers in the Catskill Mountains to install filter strips and other buffers to protect the city's drinking water supply. Landowners in the Pacific Northwest and New England are being encouraged to install riparian forest buffers as a means of protecting the habitat of endangered salmon species. In Missouri, researchers and farmers continue to experiment with tree-based buffers, including alley cropping and windbreaks, not only to protect the environment, but also to diversify farming operations and create new profit potential through the production of forest commodities. Elsewhere, landowners are applying buffers to reduce soil erosion and sedimentation, minimize nutrient and pesticide pollution, and even manage odor pollution from confined livestock production facilities.

Buffers work economically because of the incentives provided by government agencies, like USDA,

and, in some cases, private-sector partners. A growing body of scientific knowledge also demonstrates that buffers work environmentally. Recent research at Iowa State University, for example, shows that grass filter strips can remove up to 90 percent of sediment in sheet flow in the first 20 feet of the filter strip.

Work at the same central Iowa research site also shows that buffers with trees are capable of significantly reducing the nitrate in subsurface flow. Removal rates, however, appear to be influenced significantly by an area's subsurface geology.

ANational Academy of Sciences study completed in 1993 suggested that conservation buffers were among the important practices that could be used by landowners to reduce non-point-source water pollution. Given the many other conservation benefits of buffers and the potential for incorporating profitable forest crops into buffers, such as timber, fruit and nut trees, and ornamental shrubs, conservationists should take note of Secretary Glickman's recent admonishment in *Conservation Voices* magazine:

After acknowledging that landowners must assume ultimate responsibility for taking advantage of the opportunity to install buffers offered by the continuous CRP sign-up and other programs, the Secretary suggested that USDA conservationists and their many partners also assume some responsibility for advising farmers, ranchers, and woodlot owners about the opportunity they have to use buffers for environmental improvement. If that advisory role is indeed accepted, the environmental quality enjoyed by all Americans will certainly be the better for it. 

National RC&D Survey of Agroforestry

by Greg Ruark, Director, NAC, Lincoln, Nebraska

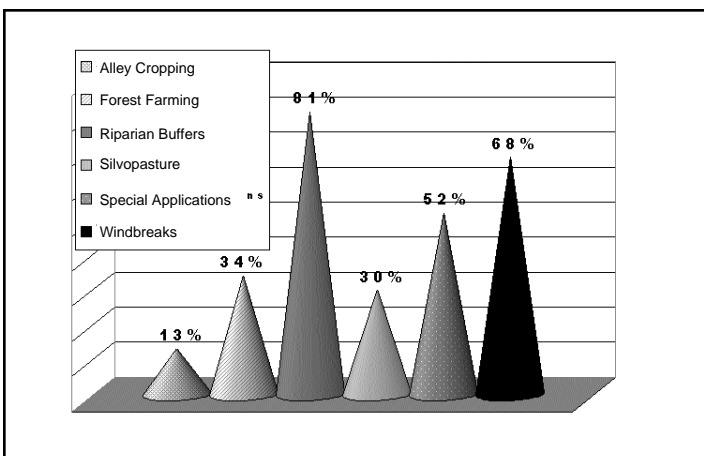
Over 150 RC&Ds Involved in Agroforestry Projects!

The National Association of Resource Conservation and Development Councils (NARC&DC) worked with NAC to design and administer a national survey of RC&D on agroforestry during the summer of 1999. The survey was designed to determine the extent and geographic location of agroforestry practice throughout the United States. The NARC&DC analyzed the survey and will publish a report by early summer. Maps and graphs are used to illustrate where agroforestry practices are being used, where RC&D Councils are involved in agroforestry projects, and where there are opportunities to apply more agroforestry practices. It also suggests what types of assistance will be needed to enable landowners and support agencies to better advance the adoption of agroforestry technology.

Summary. Of the 315 RC&Ds, 222 completed the agroforestry survey (71 percent return). Of these, 2/3 have had direct involvement in agroforestry projects. The survey showed that the use of, interest in, and demand for agroforestry is extremely high in all regions of the country. The report provides details on the six major agroforestry practices of: 1) alley cropping, 2) forest farming, 3) windbreaks, 4) riparian forest buffers, 5) silvopasture, 6) special applications.

Alley Cropping. Thirteen percent of the RC&Ds from 22 states responded that alley cropping is utilized in their areas, while many others indicated a potential for expanding the use of this practice. Eight RC&Ds have actively promoted the practice. Two, used seminars and conferences, while others were involved with helping to grow

Percentage of RC&D Councils reporting an agroforestry practice being used in their area.



In Need Of Attention...

• Markets

Markets need to be developed or expanded to increase the adoption of some agroforestry practices. Some RC&Ds are already working with partners to identify or create niche markets, but greater involvement by USDA agencies, like the Agricultural Marketing Service and Rural Development is needed.

• Landowner Information and Education

There is a need to demonstrate the economic benefits of many agroforestry applications. RC&D areas can help local partners reach the landowner, but need support to develop educational material.

• General Public Education

There is a need for increased efforts to inform the public about the benefits they receive from agroforestry. RC&Ds can incorporate this information into many of their education programs.

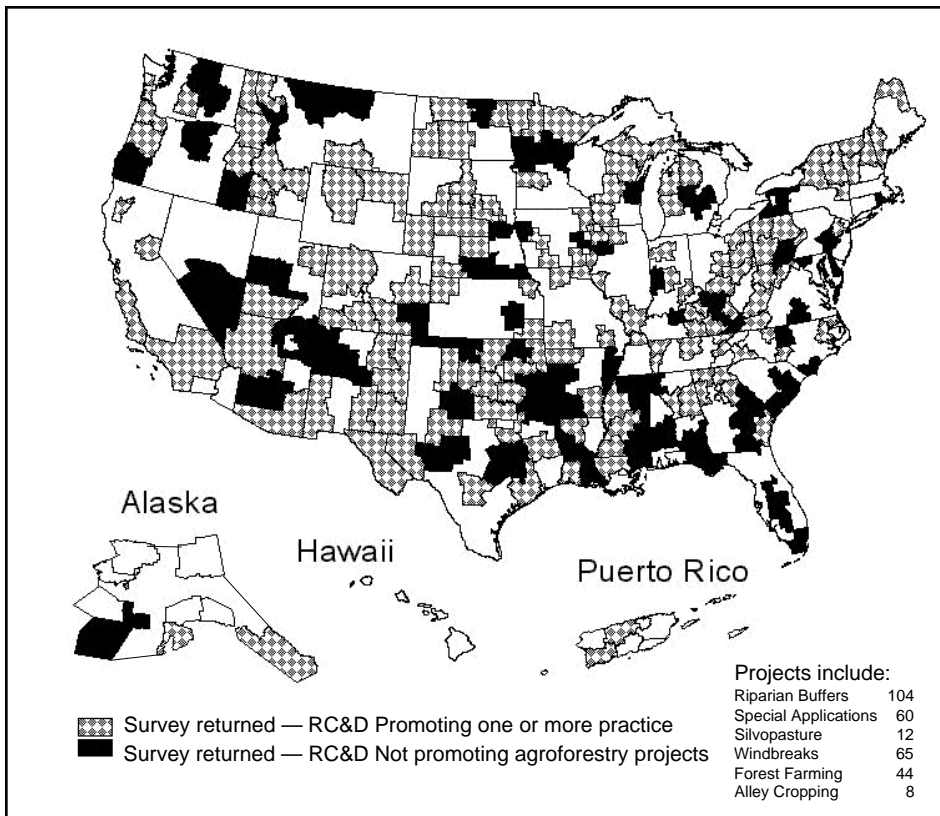
• Assistance to RC&D

RC&Ds need more financial resources to allow them to bring together landowners and communities with relevant local, state, and federal partners.

herbs and medicinals, planting hazelnuts in contour strips, and cropping between rows of black walnuts. Single and multiple-row hardwoods are most frequently used for alley cropping, but single or multiple-row softwoods are also used. Alley cropping is generally found in the eastern half of the country with three exceptions: Oregon, Washington, and Texas. Minnesota and Kentucky reported the use of short rotation hardwoods species, such as hybrid poplar, in alley cropping systems.

Forest Farming. Thirty-four percent of the RC&Ds from 34 states reported forest farming practices in their areas, with the Midwest and Southeast encompassing 70 percent of the activity. Mushrooms and ginseng are the most frequently grown. Twenty-one RC&Ds are directly involved in projects ranging from seminars, conferences, tours, and demonstrations. Three have helped develop cooperatives and associations to help market products. The application of forest farming has a great variety of opportunities, but a

There were 151 RC&D Councils that directly promoted one or more agroforestry projects.



need for market development was identified by 10 percent of the RC&Ds.


Windbreaks. Windbreak usage was reported by 68 percent of the RC&D areas in forty-three states. Of the RC&Ds reporting windbreaks, 82 percent had farmstead/community windbreaks, 68 percent had field windbreaks, and 56 percent reported livestock windbreaks. The issues most often addressed by windbreaks were reducing wind velocity, lowering energy costs, habitat for wildlife, livestock protection, and reducing soil erosion. Some opportunities for expanded adoption were mentioned such as, living snow fences along roadways and screen plantings in the interface between agriculture and communities. Windbreaks have been planted in many areas since the 1930s and many have reached maturity. A number of RC&D areas observed that many windbreak trees are deteriorating and dying. Also, many windbreaks have been removed due to changes in farm machinery and the adoption of center pivot irrigation. The availability of cost share programs was viewed as essential to increase the adoption of some windbreak practices.

Riparian Forest Buffers. This was the most frequently used agroforestry practice and was reported by 81 percent of the RC&Ds. Opportunities for installing additional buffers are recognized by 93 percent of the RC&Ds.

Approximately the same number of forested riparian buffers were planted as were naturally regenerated. These buffers are commonly used to address more than one issue at a time, with the dominant intent being controlling stream bank erosion, followed by controlling non-point source pollution, and enhancing wildlife habitat. In addition, restoration, aquatic habitat, and aesthetics were all addressed more than half of the time. There were 104 RC&Ds directly involved in forested riparian buffer projects. Most worked in partnership with others like Soil and Water Conservation Districts, NRCS, FS and EPA. They are also working with various watershed organizations, The Nature Conservancy, and Future Farmers of America chapters.

Silvopasture. Thirty percent of the RC&Ds reporting, or 67 Councils in 32 states, observed silvopasture systems

being used. About 60 percent of the activity was in the Southeast and occurred most often in southern pine stands. Improved farm economics was the primary motivation for trying silvopasture systems. Other issues that were addressed to a lesser extent by silvopasture included erosion control, water quality, and wildlife habitat. Silvopasture systems are being promoted by RC&D's using tours, meetings, brochures, and grazing trials. One RC&D area holds an annual forestry awareness week for youth, while another helps with grant writing to encourage the practice.

Special Applications. Fifty-two percent reported special agroforestry applications in their RC&D areas. This included 28 states, of which more than a third are located in the Southeast. Visual screening of unsightly areas is the most common special application and was listed by 58 percent of the RC&Ds in 31 states. The need for interface buffers, such as greenbelts, between agricultural activities and communities was identified by 51 percent in 29 states. Thirty four percent used agroforestry to control noise in 21 states. The disposal of municipal waste was cited by 23 percent of the RC&Ds, while the disposal of animal waste was 22 percent. Trees were used to control dust in 21 percent of the RC&D areas, while application for odor control was 19 percent. Woody biomass production was reported in only nine percent of the RC&Ds and occurred in nine states. To order a free report: www.rcdnet.org or www.unl.edu/nac. 

(Dead Zone from page 1)


midsummer, and then *used* to disappear in the fall. Today, when autumn rolls around, it only shrinks.

The Gulf's hypoxia was first recorded in the early 1970s, but persistent hypoxia began being observed during the 1990s. In 1993, the severe floods which flushed nutrients from midwest soils caused the hypoxic zone to double in size.

Although the source of the problem via the Mississippi river is varied, present-day usage of fertilizer, especially nitrogen, is considered the primary problem. Nitrogen export from the Mississippi River Basin has increased up to seven-fold over the last century. Other nutrients play a role and can drastically affect marine food chains.

The good news is that agroforestry can help. Mike Dosskey, Research Ecologist for NAC says, "riparian forests have been shown to filter out a majority of the nitrogen from runoff that passes through them." He added, "Hypoxia is a non-point source problem, so part of the solution will require a wide-spread installation of buffers."

Hypoxia has been found in the Chesapeake Bay. In 1983 an agreement, led by the Environmental Protection Agency (EPA) was signed by the bay states, to cooperate to solve the bay's water quality problems. According to Al Todd, Chesapeake Bay Program Liaison, "riparian forest buffers have presented a very promising and useful tool in terms of nutrient removal. They provide multiple benefits by also helping to restore fisheries and stream systems, as well as provide wildlife corridors." Todd adds, "I like to describe the Chesapeake Bay as a heart, and the stream systems and riparian areas as the circulatory system connected to the heart. The health of the circulatory system plays a big role in the health of the heart itself."

Adapted from "Gulf of Mexico Hypoxia: Land and Sea Interactions" by the Council for Agricultural Science and Technology Task Force Report. June, 1999. 

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Held in Minneapolis, MN in October, 1998, copies of these proceedings from this conference are for sale while supplies last (US \$25.00, includes shipping). To order call CINRAM at (612) 624-4296 or mail your order and payment (checks payable to the University of Minnesota) to:
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Carbon: Exploring the Benefits to Farmers and Society August 29-31, 2000 • Des Moines, Iowa

Attend this international conference and find out:

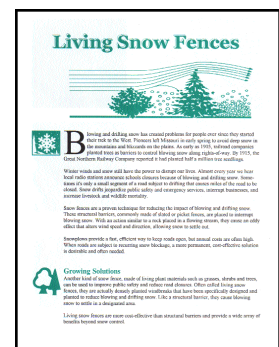
What carbon is worth environmentally, economically, and agronomically
What is known about carbon management, sequestration, and other greenhouse gas mitigation measures
How to manage carbon on agricultural land
How carbon credit trading might work
What's over the hill and on the horizon

Take advantage of roundtables, panel discussions, and poster presentations, offer opinions of what carbon policies and practices might work best, and express concerns with policy makers, scientists, and others.

Conference information: www.cvrcd.org/carbon

New Living Snowfence Brochure Available

Visit NAC's web site at: www.unl.edu/nac to preview a new full-color brochure on living snowfences. This brochure discusses the benefits, planning, plant selection, and design of living snowfences. It applies throughout most of the United States, but is especially applicable to the Northwestern U.S. If you aren't able to view a copy and order from the web site, fax a request to 402-437-5712.



Riparian Forest Buffers and Livestock in Vermont

by Sally Eugair, Soil Conservation Technician, USDA NRCS, Rutland County, Vermont

Editors Note: Sally Eugair, Soil Conservation Technician with the USDA Natural Resources Conservation Service in Rutland County, Vermont has been successful with getting riparian forest buffers established in her area. Following are some of her thoughts.


*“As a farmer myself,
I understand how difficult
it is to take
70 feet of land along the river
out of production.”*

I don't want to see our nation's water supply ruined. Having lived overseas for several years, I have first-hand knowledge of how serious polluted waters can be. I am strongly opinionated regarding water quality, and working with farmers can be really gratifying when I see the measures they take to help protect our waters.

On-farm conservation practices that help prevent water pollution are growing in Rutland County. Over the last three years, I have installed and contracted 140 acres of riparian buffers. Since January 2000, alone, 43 acres went in to buffers to exclude livestock from the waterways. And more landowners are waiting for assistance.

Many landowners can see the benefits of fencing their livestock away from streams, but the cost can be prohibitive. As a farmer myself, I understand how difficult it is to take 70 feet (35 feet on each side of the river, times the distance of land along the river) out of production. Installing a pipeline for alternate water supplies, building a crossing area for livestock, planting trees and shrubs, and

installing electric fencing and charger, in addition to maintenance can be a serious financial burden. I feel that this awareness allows me to talk with landowners on a common level when it comes to encouraging them to protect streambanks and ultimately the water quality of the entire watershed. I believe that riparian buffers and use exclusion are the least expensive practices available to protect water quality. Landowners are doing their share for the environment. The financial investments they make towards water quality benefit everyone. With obvious installation costs aside, the landowner still has to pay taxes for land that is taken out of production each year to accommodate the buffers. Also, the landowner is responsible for maintenance of the buffer, which can require replacement costs and hours of fence mending .

Lots of one-on-one contacts, partnerships, and incentive programs provide the means by which I am able to help landowners achieve water pollution prevention. "What is impressive in all of this is that all of our goals are being reached - improved water quality and wildlife habitat is being preserved for the next generation." Through the USDA's Environmental Quality Incentives Program (EQIP), Conservation Reserve Program (CRP) and strong partners such as U.S.Fish and Wildlife Service (Partners for Fish and Wildlife Program) ,The Nature Conservancy ,Vermont State License Plate Grant, and assistance from the Green Mountain College Students and the Vermont State Community Work Crew I have been able to fully implement most projects. 

Plains & Prairie Forestry Association (PPFA) Annual Conference Las Vegas, NM August 8-10, 2000

The Conference topics include: *Protecting and Restoring Rio Grande Bosque; Corrizo Demonstration* - restoring Pinyon and Juniper ecosystems; and *Pecans in the Desert* - using small diameter trees.

**For more information contact:
New Mexico Energy, Minerals &
Natural Resources Department
505-425-7472**

Stream Corridor Restoration Technology -An Introduction-

**Sunday, July 9 and
Tuesday, July 11, 2000**

Two one-day workshops will be offered during the *Soil and Water Conservation Society Annual Meeting* in St. Louis, Missouri. Each workshop will introduce the principles, processes, and practices of stream corridor restoration.

**For more information:
www.swcs.org**

Upcoming Events

June 18-21, 2000

RC&D National Conference, Ogden, UT. Contact: www.rcdnet.org.

July 8-11, 2000

Soil and Water Conservation Society Annual Conference. "Gateway to the Future - Conserving Private Land." St Louis, MO. Contact, Pat Mulligan, 515-289-2331, ext. 17 (patm@swcs.org)

August 8-10, 2000

Plains and Prairie Forestry Association Meeting, Las Vegas, NM. Contact: Paul Lyons 505-425-7472.

August 29-31, 2000

Carbon: Exploring the Benefits to Farmers and Society. Contact: www.cvr.cd.org/carbon.

September 8-10, 2000

American Ginseng Production in the

21st Century. Leeds, NY. Contact: Bob Beyfuss, 518-622-9820; www.cce.cornell.edu/greene.

October 10-13, 2000

Third Biennial Conference: Short Rotation Woody Crops Operations Group. Syracuse, NY. Contact: 315-470-6891, ce@esf.edu, www.esf.edu/willow

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Mission

The National Agroforestry Center (NAC) is a partnership of the USDA Forest Service, Research & Development (Rocky Mountain Research Station) and State & Private Forestry and the USDA Natural Resources Conservation Service. The Center'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, the Center 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.

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