USDA National Agroforestry Center

Inside Agroforestry

Summer 2004

“If your only tool is a hammer, you tend to see every problem as a nail.”

Abraham Maslow

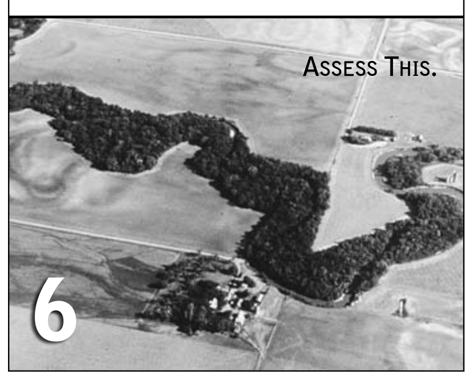
Most would agree that having the right tools on hand can make just about any job easier. Ever try to cut a tree down with a sledgehammer? You’d probably find that an ax would make that chore a whole lot easier.

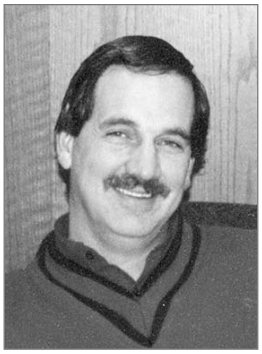
Along with ease, the right tools can also help save time and money. It’s well worth the effort to keep abreast of new technology. For example, today, a chain saw, or even a feller-buncher, is probably the tool of choice when cutting down a tree.

In this issue of *Inside Agroforestry*, you’ll find that numerous tools exist for you to use when designing agroforestry plantings. It’s difficult to imagine what a tree planting might look like in 20 years. But with CanVis, a new visual simulation tool developed by NAC, you can digitally alter photos to illustrate a proposed design alternative. And, if you have to wait 20 years, you probably want to make sure your windbreak will meet your expectations. Using WBECON (WindBreak ECONomics) computer program, you can calculate the economics of a crop field with windbreaks, all while taking into account various factors, like windbreak species and design, soil and climate, crop rotation, yields, and prices.

Here’s a chance to get some new agroforestry tools for your tool bench!

Inside





NAC Director's Corner

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

1st World Congress of Agroforestry

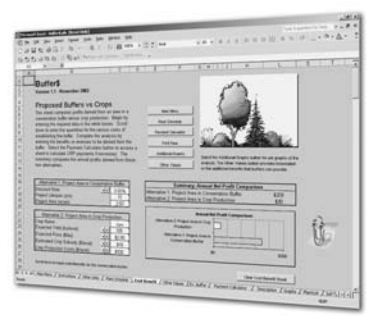
Participants from 82 countries gathered in Orlando, Florida from June 27 to July 2, 2004 for the 1st World Congress of Agroforestry. Over the past 25 years significant progress has been made in building a scientific foundation for the design, installation, and management of agroforestry systems. The resultant gains in crop production and diversification, economic performance, and environmental benefits serve to illustrate the value of agroforestry research and technology development efforts and argue for the need to expand our gains to better meet societal demands.

The Congress produced two books that document the current state-of-knowledge and practice of agroforestry worldwide. These books have already been published and they provide valuable resource tools for those wishing to further explore the potentials of agroforestry. *The 1st World Congress of Agroforestry Book of Abstracts* (426 pages) contains summaries of the talks and poster sessions and represents the collective endeavor of hundreds of researchers, extensionists, landowners, students, and others involved in agroforestry. The second book is titled *New Vista in Agroforestry: A Compendium for the 1st World Congress of Agroforestry, 2004* (480 pages) and it offers a state-of-the-art synthesis of agroforestry as it applies to a broad array of topics in both temperate and tropical ecosystems.

More details on how to acquire these books can be obtained on the conference website at http://conference.ifas.ufl.edu/wca.

"When people can estimate the costs of changing their minds before they install a practice, we are more likely to see conservation on-the-ground ten years after the installation."

Madalene Ransom, NRCS Economist



Critics say, "Two thumbs up... Buffer$ pay!"

Gary Bentrup
Research Landscape Planner
Lincoln, Nebraska

"Buffer$ allows me to quickly calculate an economic return on buffers, saving me valuable time with landowners" says Don Ulrich, a conservation professional with the Natural Resources Conservation Service (NRCS). In the previous issue of *Inside Agroforestry*, we presented Buffer$, a spreadsheet-based application developed by the USDA National Agroforestry Center (NAC) to assist landowners and planners in analyzing the cost-benefits of conservation buffers. Buffer$ 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 potential income generated between a buffer alternative and a cropping alternative.

Although recently released, this tool is already gaining popularity with conservation professionals because it has an easy-to-use interface. Buffer$ uses state average NRCS costs for installation and maintenance budgets and county soil rental rates for calculating program payments. Default values from Nebraska are used to demonstrate the tool. You can easily customize the tool for your area by entering your NRCS state average costs and local county soil rental rates. Buffer$ can be downloaded from the NAC's website www.unl.edu/nac/conservation/ and requires Microsoft Excel to run. A free CD with Buffer$ can also be requested by contacting NAC at (402) 437-5178.

Adding up the benefits

Software calculates the economic potential of windbreaks

Field windbreaks reduce wind speeds for a distance of 20 to 30 times their own height (H) and increase crop yields out to about 15H. Although they compete with crops within their root zone (about 1H) and take land out of production, at maturity, the overall production increases at the field level usually outweigh any localized decreases.

The computer program, WindBreak ECONomics (WBECON), was created to calculate the economics of field windbreaks over their lifespan. WBECON is a useful tool for natural resource professionals and landowners. It calculates the economics of windbreaks taking into account various factors such as species and characteristics, design, soil and climate factors, crop rotation, windbreak costs, crop costs and crop prices. For each year of the windbreak's life, from the time of planting or from a specified age, costs and benefits are calculated. Costs include windbreak establishment, maintenance, and removal, yield losses due to competition, and land taken out of production. The benefits are crop yield increases for each year and reduced input costs. Other economic benefits, such as soil erosion control and crops from windbreak trees, are not considered in the program.

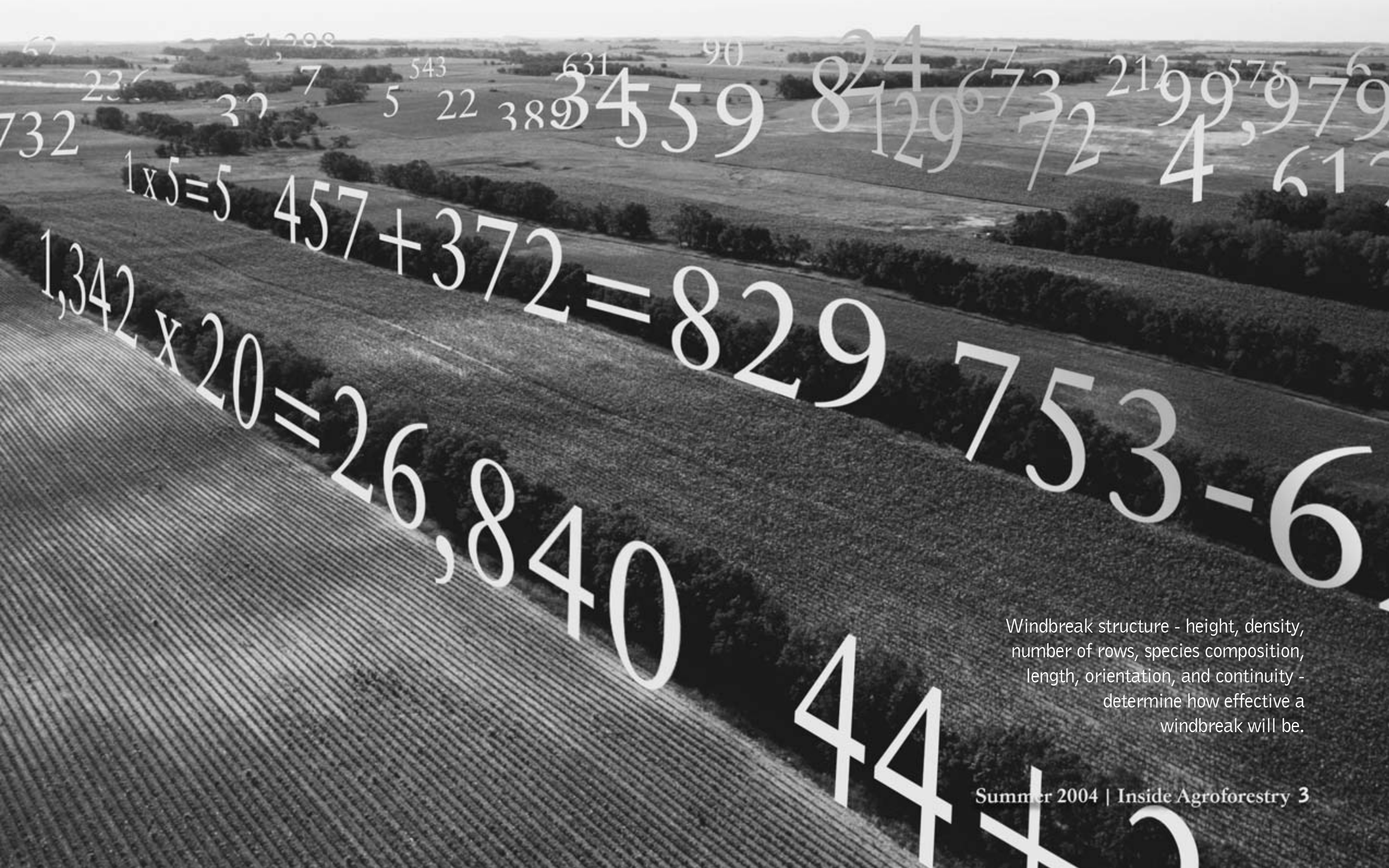
The user enters the following information:

- Soil texture, moisture condition, and prevailing wind
- Crop rotation (for up to five years), production costs, crop prices, expected yield without shelter
- Field dimensions
- Windbreak species, placement, and number

After the user has entered all of the necessary information, the computer does the calculations.

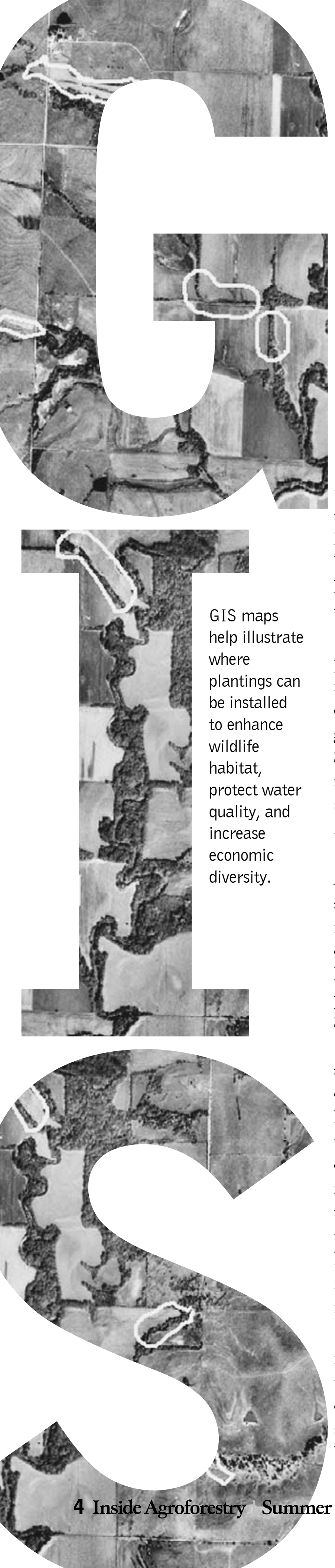
The output summarizes inputs and assumptions used in the calculations. The program calculates the annual benefits of the windbreak at maturity in constant dollars. Most importantly, the windbreak's Net Present Value

see **WINDBREAK ECONOMICS** on page seven



Windbreak structure - height, density, number of rows, species composition, length, orientation, and continuity - determine how effective a windbreak will be.

Mapping opportunities for agroforestry



GIS maps help illustrate where plantings can be installed to enhance wildlife habitat, protect water quality, and increase economic diversity.

Gary Bentrup
Research Landscape Planner
Lincoln, Nebraska

Agroforestry opportunities are being identified using geographic information systems (GIS), a collection of computer hardware and software used to analyze and display geographically referenced data. Using readily-available data layers like soils, slope, and land cover, suitable locations for agroforestry practices can be identified.

In the Pacific Northwest, fast growing hybrid poplar are being increasingly used by the pulpwood industry. To assist landowners who are considering diversifying their operations with poplar, optimal growing sites need to be identified. Dave Hoover, State GIS coordinator for Idaho NRCS, analyzed regional soils data using GIS to find the most suitable sites in the Pacific Northwest for hybrid poplar.

At the Center for Subtropical Agroforestry (CSTAF) located at the University of Florida, researchers have been developing an online GIS database to help landowners and agroforestry practitioners select plants for southern agroforestry systems. The Southeastern Agroforestry Decision Support System (SEADSS) allows users to select an area of interest and view information on soils, land use, climate, and other data. Based on these data, the tool provides a list of agroforestry plants suitable for the site. Because the GIS tool is linked to a plant database, a user can quickly find out more information on the recommended plants, including management and propagation, products and services, and species photos. The tool is currently being developed for counties in Florida. Future plans include developing SEADSS for Alabama and Georgia. More information can be found at http://cstaf.ifas.ufl.edu/SEADSS.htm.

The most significant benefit of using GIS in agroforestry is the ability to combine different assessment results to simultaneously address rural landowner and community issues. Landowner goals, like minimizing soil erosion and providing crop diversification, may be accomplished by just focusing on site conditions, however to solve community-driven goals like water quality and wildlife habitat requires a larger scale perspective. GIS can provide a way to integrate these different concerns by efficiently combining information from different scales.

The most significant benefit of using GIS in agroforestry is the ability to combine different assessment results to simultaneously address rural landowner and community issues.

At the USDA National Agroforestry Center (NAC), multi-scale GIS-guided assessments are being developed for water quality, wildlife habitat, soil protection, and agroforestry specialty products for the western corn belt ecoregion of the U.S. The individual assessments are then combined to identify where several objectives can be accomplished with agroforestry practices. For instance, one of NAC's assessments has identified perennial vegetation gaps in riparian corridors that could be restored to facilitate wildlife species movement and provide surface runoff filtration. Another assessment has identified suitable locations where decorative woody florals, like curly willow and pussy willow, can be grown. University of Nebraska researchers have shown potential annual net returns ranging from $400 to $3500 per 1000 feet at four- to six-foot plant spacing. By combining these assessments results, areas are identified where riparian buffers can be located to improve habitat connectivity and protect water quality while offering landowners the option to grow a product for profit. More information can be found at: www.unl.edu/nac/conservation/.

Depending on the scale of analysis, GIS-guided assessments can support conservation policy and program development, prioritize projects, develop technology transfer programs, guide additional research, and influence site-scale planning and design. Many states have internet-accessible GIS data clearinghouses providing free spatial information, and skilled GIS technicians can now be found in many state and county-level resource management agencies which may be able to provide assistance. Promoting acceptance, support, and adoption of agroforestry will be easier with GIS mapping the way.

Pixel this:

Visual simulations aid in resource planning


Original photo


Contour buffer strips, riparian forest buffers, and windbreaks are all simulated.

Gary Bentrup
Research Landscape Planner
Lincoln, Nebraska

"What will it look like?" Natural resource professionals often hear those words from landowners who have difficulty picturing a proposed agroforestry tree planting or conservation plan. Planting plans and engineering drawings, while necessary documents, often mean very little to the general public. Landowners lament that if they could only see a picture of the final project.

Now resource professionals have a visual simulation tool to illustrate their design ideas. Visual simulations are images that have been digitally altered to illustrate a proposed design alternative. Digital photos of the landowner's property can be acquired by scanning photographs or taking pictures with a digital camera. Using image-editing software, the proposed design can be "created" by adding images of trees, shrubs, grass, and other materials onto the base image of the landowner's property. In a relatively short time, windbreaks, riparian buffers and other conservation practices can be depicted in rural and urban environments.

In addition to communicating ideas and design alternatives, visual simulations can be used to engage the public in the design and decision-making process. For example, a Wisconsin community was opposing a proposed flood control dike because they had difficulty visualizing how it would impact a local park. Visual simulations were used at public meetings and in the newspaper to better explain the proposal. Once the public saw the proposal, there was overwhelming support for the project.

Visual simulations can be used as a marketing tool for new programs and as a training aid to help new employees visualize new concepts.

To facilitate the use of visual simulations in agroforestry and conservation planning, the USDA National Agroforestry Center (NAC) is creating a manual to show users how to create realistic and accurate simulations. The manual will provide detailed information on acquiring images and how to edit the images using a variety of available software programs. The core of the manual will focus on how to size and locate plant materials and other objects in the images using perspective and scaling principles. Using the manual, resource professionals will be able to gain the skill and confidence that the simulations they create are accurate depictions of the proposed design alternative. See NAC's website, www.unl.edu/nac/conservation/, for the manual availability this fall.

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CanVis
image editing for resource planning

Visual simulations can be created using software programs like JASC PaintShop Pro and Adobe Photoshop Elements. While these programs are quite powerful for creating simulations, they can take some time to learn how to use them. In response, NAC has developed a software program that allows resource professionals to create realistic simulations with minimal computer skills. One of the main benefits of CanVis is its collection of object libraries that contain images of plants materials, agricultural features, people, and urban park elements that can be quickly added to the base image. This saves users' valuable time by not having to create plant and other images from scratch. Some of the other tools available in CanVis include adding shadows and text, cloning textures, and adding hardscape elements like pathways and walls. This program will be available this fall. For more information, check NAC's website www.unl.edu/nac/conservation/.

It's sedimentary: EBA/FRA=efficiency

Moving from generality to specificity in buffer assessments

According to data from the USDA Farm Services Agency (FSA), over 1.5 million acres of riparian forest buffers and filter strips have been installed on American farmlands through the CRP program. Most of these buffers have been installed according to general program guidelines and not necessarily custom designed to the site specific soils, slope, and vegetation cover or even modified with respect to other upland conservation practices on the same fields. Consequently, we as resource professionals need a way to evaluate riparian buffer function in order to know that our conservation program dollars are being used effectively.

With these issues in mind, Mike Dosskey, of the National Agroforestry Center and Matt Helmers, Dean Eisenhauer, Tom Franti, and Kyle Hoagland, all of the University of Nebraska, set about to develop a field-based approach for assessing the sediment trapping efficiency of riparian buffers. It has been long recognized that the concentration of runoff flows reduces the effectiveness of riparian buffers because only a portion of the buffer will interact with the field runoff. This group of researchers devised a visual buffer evaluation system that takes into account the effects of concentrated flows, without requiring lots of expensive monitoring equipment and time.

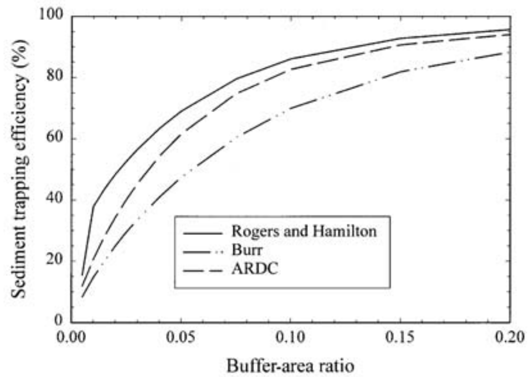

Figure One: Sediment trapping graph.

They found that the relationship of the "effective buffer area" (EBA), that area of the buffer that actually receives runoff, to the "field runoff area" (FRA), that area of the field that contributes runoff through the buffer, is a very good indicator of the buffer's sediment trapping efficiency (*see Figure One*).

The field runoff area is delineated by walking the field margins adjacent to the buffer examining the topography, microrelief, and patterns of erosion and deposition of soil and crop debris.

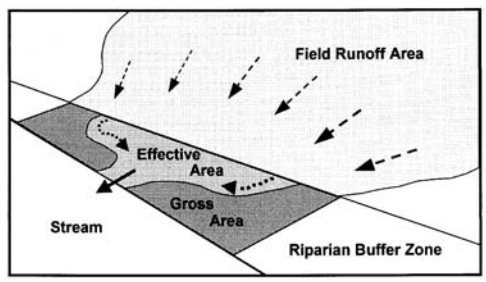

Figure Two: Field runoff schematic.

The effective buffer area estimation is more subjective and requires careful interpretation of the runoff flow path from the field area and into and across the buffer to the stream. One of the most critical areas to examine is the field margin where sediment deposits and tillage berms often direct runoff to flow and concentrate along the edge of the buffer for relatively long distances before finally entering the buffer (*see Figure Two*).

The visual indicators of the runoff flow direction are far easier to find in the spring before buffer vegetation gets to tall and the crop closes canopy over the field. This visual approach to assessing sediment trapping of buffers is relevant for 10-year rain events or larger. Although this appears to ignore more frequent rain events, the researchers believe that the 10-year event is a good indicator of runoff patterns.

More details can be found in the article, Assessment of concentrated flow through riparian buffers, Journal of Soil and Water Conservation. (2002) 57: 336-343.

Riparian forest buffers are an important part of a wise conservation plan for a farm or ranch.

Is your BMP working?

Protocol helps to protect our nation's water resources

Best Management Practices or BMPs have become a part of our conservation language as a result of the 1987 Clean Water Act (CWA). The CWA has identified BMPs as the primary means to address non-point source water pollution. The Environmental Protection Agency (EPA), is required to show evidence of enforcement and has long sought a standard BMP monitoring protocol to provide measurable data that are reliable and comparable among states. As a result, many states, universities, federal agencies, companies, and organizations have developed BMPs to guide their land use management activities.

The forest management community is no different. In fact, the term BMP was defined to refer to precautionary activities designed to protect water resources during timber harvests. It is in the best interest of those involved in timber harvesting activities to effectively use BMPs because then they are exempt from permitting requirements under the CWA.

However, individual state monitoring has been sporadic, qualitative, and only marginally acceptable as a measure of effectiveness. State Forestry agencies have sighted manpower, time, cost, reluctance to change their individual BMP specifications, and monitoring team makeup as barriers to acquiring a common protocol.

The Northeastern Area Association of State Foresters, Water Resources Committee (NAASF), using a grant from the U.S. Forest Service has initiated a project to create a regional BMP monitoring protocol. The protocol focuses on water crossings and riparian areas as having greater potential to adversely impact water resources. Evaluating BMP principles, incorporating a quality control system, and recording impacts on GPS units will overcome state agency barriers and permit evaluation by watershed, political or other boundaries. Quantitative data will permit computer modeling and provide a meaningful foundation for risk and impact analysis and a defensible measure of the impact of forest management activities on water resources.

The protocol focuses on water crossings and riparian areas as having greater potential to adversely impact water resources.

Since Version 1, the monitoring protocol has been through two seasons of field testing in 10 northeastern states and the equipment cost was reduced by a factor of ten when the protocol was adapted for use in PDAs Pocket PCs and Trimble units using Pendragon and Windows software. Several western states are also looking at this protocol for evaluating timber harvesting activities in their regions.

Although this monitoring protocol has been developed to evaluate timber harvest activity BMPs, the protocol may become the foundation for evaluating other land use BMPs.

Adapted from A Protocol for Monitoring Best Management Practices, USDA Forest Service Northeastern Area bulletin.

Windbreak Economics

continued from page three

(NPV) is calculated. NPV is the net benefit over the windbreak's life-span in which the benefit calculated each year in constant dollars is discounted at an annual discount rate to account for real interest rates. For example, at a five percent discount rate, $100 earned at the beginning of the first year has a present value of $100 but $100 earned one year in the future has a present value of only $95. The NPV is important because it permits a realistic comparison of windbreaks which have different life-spans and growth rates.

It is easy to change windbreak design, crop rotation, and other factors and recalculate the economic benefit. This allows the user to try out different scenarios and assess the sensitivity of NPV to changes in inputs.

For more information or to get a copy of WBECON, contact Jim Brandle at jbrandle1@unl.edu or, in Canada, John Kort at kortj@agr.gc.ca.

Agroforestry tools:

The spherical densiometer

In agroforestry, it is often important to manage the tree over story canopy density in order to produce the desired crops in the under story. This is especially true for the practices of silvopasture, forest farming, and, in some instances, alley cropping.

Canopy has often been calculated using ocular estimates which have been shown to be neither accurate nor reliable by two different people. The spherical densiometer is a simple, inexpensive tool that will often meet the needs for collecting canopy estimates. It is essentially a convex, circular mirror etched with a grid that divides the mirror into 24 squares.

To use a densitometer:

- Hold instrument level, with the mirror pointing up, 12 to 18 inches in front of body and at elbow height.
- Assume four equal-spaced dots in each square on the grid and systematically tally the dots covered by canopy material.
- Total dot count equals the percent canopy closure.
- Make four readings per sample point-facing North, South, East and West.

This will provide a reliable estimate for managing canopy density in agroforestry systems.

Upcoming Events

September 18-19, 2004
"Goods from the Woods Marketplace." Grand Rapids, Minnesota. http://specialforestproducts.com/woods/marketplace.php

September 18-19, 2004
Northeast Small Farm & Rural Living Expo. New Paltz, New York. www.smallfarmexpo.com

October 2, 2004
"Wild Fruit and Nut Jam." Nebraska City, Nebraska. Contact: Scott Josiah, sjosiah@unlnotes.unl.edu

October 2-6, 2004
"One Forest Under Two Flags." Society of American Foresters / Canadian Institute of Forestry. Edmonton, Alberta, Canada. www.safnet.org/convention

October 10, 2004
Third Annual Catskill Mountain Ginseng & Medicinal Herb Festival. Catskill, New York. Contact: (515) 965-2883, hoca@mhonline.net.

October 16, 2004
Missouri Chestnut Roast. New Franklin, Missouri. thttp://agebb.missouri.edu/umca/events/chestnut.asp

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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.

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