VOLUME 17 ISSUE TWO

Inside Agroforestry

USDA National Agroforestry Center

Healthcare – *"The prevention, treatment, and management of illness and the preservation of mental and physical well-being through the services offered by the medical and allied health professions."* —The American Heritage Dictionary, fourth edition

LIKE human health, environmental health must be preserved, treated, and managed. Certain precautionary techniques help ensure the health of individual agroforestry practices, like using native trees and shrubs, and minimizing threats like emerald ash borer.

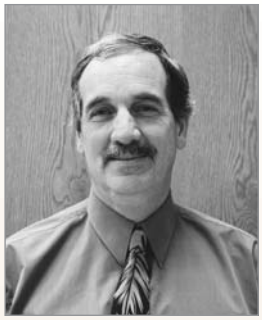
By making investments like these, we receive the greatest benefit from riparian forest buffers, windbreaks, and silvopasture systems now and in the future. Healthy agroforestry systems equate to a more healthful overall landscape, maximum environmental services, and opportunities for diversified income.

This issue of *Inside Agroforestry* explores several aspects of agroforestry health and how they might affect you.

Inside

NAC Director's Corner

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



Time for agroforestry triage

THE health of our nation's working lands is being increasingly challenged by pressures like land development, changing climate, wildfires, and invasive pests. Maintaining healthy forest and agricultural systems is essential for preventing the diminution of productivity and avoiding negative social consequences, like soil erosion, water pollution, and loss of biodiversity. A high proportion of the watersheds in this country are an interwoven mosaic of both rural and urban landuse. Landscape perspectives that take an all-lands approach are needed to provide comprehensive solutions that optimize ecosystem services. Otherwise, it is like trying to make a patchwork quilt without bothering to sew the pieces together—everything comes unraveled.

It is time to perform an agroforestry triage to determine where in the landscape agroforestry technologies can best be used. For example, shelterbelts can provide corridors across agricultural lands to connect forest fragments and increase wildlife benefits, while also protecting soils, crops, and livestock. Riparian forest buffers on farms and ranches can protect surface waters from sediments, nutrients, and contaminants, while enhancing aquatic habitats and sequestering carbon. Farm woodlots can be used to grow specialty products like ginseng or mushrooms under a modified forest canopy, thereby encouraging timber stand improvement practices. Grazing/timber systems allow farmers to generate an annual income from grazing livestock under thinned conifer stands, while producing high quality sawlogs and avoiding problems associated with animal feeding operations. At the agriculture/community interface trees can be planted to provide social benefits and a buffer from agricultural activities and harsh environments. Finally, it is also important to tend to the health of the agroforestry plantings themselves to insure that they produce their intended benefits.

Send us your CanVis visual simulation success story

We want to feature it in *Inside Agroforestry*

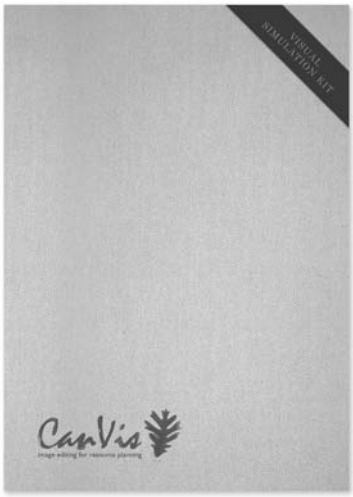
HAVE you used CanVis image editing software to communicate ideas or design alternatives to landowners or engage the public in the design and decision-making process? If so, we want to hear about it.

To submit your story: tell us about the project, how CanVis image editing software helped you communicate your design alternatives, and any simulation creations that you wish to share.

The deadline for submission is July 18, 2008. Send material to: USDA NAC, 1945 N. 38th St., Lincoln, NE 68583–0822. Or send it via email to Nancy Hammond, *nhammond@fs.fed.us*.

CanVis image editing software is an entry-level image-editing program for natural resource professionals. Using the software you can edit a scanned photograph or image from a digital camera to create photo-realistic design simulations. It requires minimal computer skills.

For more information, or to order a kit visit NAC's website: *www.unl.edu/nac/simulation/products.htm#canvis*



Invasion by lodgepole pine *(Pinus contorta)* is a common response to warming 20th-21st century conditions in Sierra Nevadan meadows. At Tuolumme Meadows, Yosemite National Park, CA, climate change and other historic land uses have interacted to promote recurrent colonization episodes of pine *(left)*. National Park Service managers counter these effects by periodically removing pine seedlings and small trees *(below)*. *Photos by Constance Millar*

Reframing strategies for climate change

This article is adapted from Climate Change and Forests of the Future: Managing in the Face of Uncertainty, by Dr. Constance Millar, et al. The article focuses on forest lands, but the principles are wholly applicable to agroforestry. Dr. Millar's article appeared in Mountain Views, the Newsletter of CIRMOUNT, *the Consortium for Integrated Climate Research in Western Mountains. March 2008, Vol 3. She works for the* USDA *Forest Service, PSW Research Station.*

CURRENTLY, many natural resource management strategies and practices are based implicitly or explicitly on assumptions of a historically stable environmental background. Even when successional or disturbance dynamics and spatial heterogeneity are acknowledged; the assumption is that the backdrop is static. Incorporating the implications of climate change, either natural variability or human-driven, forces the rethinking of basic management frameworks and methods. When managing for climate change, the point is not just to "think outside the box," but to recognize that the box itself is a moving target. This leads to the question: "OK, we get that the climate is changing. Now, what do we do about it?"

Rather than using the common rule to target historcic pre-disturbance conditions and lake level elevation, water balance and climate models can realign a lake's level to current dynamics and anticipated future climates. *Photo by Constance Millar*

No single solution or individual management approach is appropriate to all, or even most situations. Management tools should be mixed and combined to best match the particular context. The two primary tools are adaptation and mitigation. Adaptation strategies are those approaches taken to adjust, prepare, and accommodate new conditions that are created by changing climates. Mitigation strategies include those actions taken to reduce and reverse the human influence on the climate system, primarily through reduction of greenhouse gas emissions and feedbacks.

see **Climate change** on page 5

Variety is the spice of agroforestry

Richard Straight
FS Lead Agroforester, USDA National Agroforestry Center, Lincoln, NE

PLANT diversity can help absorb the blows of an insect attack, weed invasion, weather extremes, or even market changes. Diversity can be looked at as a disturbance buffer.

Since agroforestry practices require intense management and each component of the system has an influence on the others it is important to make sure that each part of the system is functioning well. One way to maintain the integrity of an agroforestry practice is to create diversity within the system.

Diversity can be created and maintained in several ways. The most obvious are through varying plant selection and management activities.

Plant materials

Diversity in plant selection includes such things as using trees, shrubs, and grasses, not just trees or only trees and grass. Different species and even different seed sources for each of these can also create diversity. Many insects and diseases are host-specific and those that attack a variety of hosts do not usually attack all hosts with the same voracity. Use of a variety of plant species or even a mixture of seed sources (still adapted to your site) may interrupt one of the common vectors that help to spread insects and diseases. Similarly, different species and seed sources often vary in their susceptibility to weather events and stressful weather patterns such as wind storms or drought.

Because market demands and prices change, sometimes unpredictably, economic risk can be reduced by growing a variety of products that respond to different market pressures. Examples of agroforestry crops that respond to different market demands are timber and forage, woody decorative florals, and fruits for jellies and jams.

Management activities

Diversity in management activities includes not only varying cultural, mechanical, and chemical treatments but also their timing. Varying the timing of treatments like prescribed burning, grazing, and tilling as well as choice of pesticides reduces the risk of favoring the same pest or competing vegetation time and time again, or allowing a pest to develop a resistance to management strategies. Undesirable plants—weeds—can develop resistance to a pesticide, especially if only one herbicide is used for control. In the same way haying, or grazing at the same time of year or at the same height year after year, can favor a few forage species and inhibit others. This can lead to a more homogeneous plant population that would be more susceptible to insect, disease, and weather stresses.

Types of diversity

- Product
- Plant selection and arrangement
- Harvesting
- Management activity
- Risks associated with homogeneity
- Function of diversity

Diversity can be created and maintained in several ways. The most obvious are varying plant selection and management activities.

NAC file photos

Climate change

continued from page 3

Management adaptation strategies can be summarized by the 5 R's:

1. Increase *resistance* to change.

High-risk, high-value, and/or extremely urgent situations, such as critically vulnerable endangered species, extreme fire-risk situations, or volatile invasive species epidemics, are the most appropriate subjects for resistance management. In such cases, using great force to armor resources against change may be the best option. This action can be extremely expensive, consume a lot of time, resources, and staff effort, and may be only short term. Resisting change can be risky; in many situations conditions will eventually become so different that a resource threshold passes and resistance becomes futile.

2. Promote *resilience* to change.

When a species, habitat, watershed, or other natural resource returns to its former condition or function after disturbance, it has "resiled." A widely held, but mostly untested assumption is that "healthy" species, forests, or ecosystems are more resilient to change. Thus, preventative treatments aimed at increasing health are prescribed. As in resistance options, strategies to promote resilience are likely to be successful only for the relatively short-term, in that eventually changed climates will force new environmental conditions such that ecological re-setting rather than resilience will be the "healthiest" path toward adaptation.

3. Enable ecosystems and resources to *respond* to change.

Responding to and managing change is the most proactive of the 5 R's approaches. This strategy assumes that a decision-maker acknowledges the inevitability of change and adopts the humility that we have limited capacity to understand what change will happen at the scales needed by managers. Many types of actions can assist species, ecosystems, or resources to move to new and adapted conditions and processes.

Biomass production from wood fiber removed during forest fuel reduction treatments provides alternative energy, thereby reducing fossil fuel consumption. *Photo by Mark Nechodom, U S Forest Service*

- Assist species and resources to follow changing environments.
- Anticipate and plan for associated risks.
- Experiment creatively and learn from experiments.
- Use redundancy.
- Relax genetic-management guidelines.
- Experiment with refugia.
- Increase diversity.
- Promote connected landscapes.

4. *Realign* conditions to current and future dynamics.

For systems that have been pushed (manipulated, disturbed) beyond their natural variability range, actions that promote alignment with current conditions and processes may be the best approaches for restoration rather than returning to historic conditions. Using historic range of variability and returning habitats to pre-settlement or pre-disturbance conditions are widely used models for ecosystem restoration, but are often inappropriate because so much change has occurred since pre-disturbance times. Re-aligning or tuning to current and anticipated environments and processes is more likely to be successful.

5. *Reduce* greenhouse gases and *reduce* non-renewable energy use.

The forestry sector has an enormous opportunity to reduce human influences on the climate system. Reducing greenhouse gases can be achieved through management actions designed to enhance sequestration so that carbon stored in natural resources is retained longer, emissions are lowered, and non-fossil fuel alternative energy is favored. By contrast, poor management, a lack of management, or inadequate management can inadvertently accelerate negative effects. An example is an increasing number of large catastrophic forest fires.

Today, more than ever, the demands we face exceed our capacity to mitigate them. The conflicts among our management choices have higher stakes. Evaluating options and setting priorities will be increasingly important. At an overall level, we have three options for engaging climate-management, each defensible under different scenarios. We can do nothing (no advance planning), react after disturbance or extreme events (when trajectories are often adaptively reset under natural conditions), or we can act proactively.

Assessing land health

Lyn Townsend
Forester, West National Technology Support Center, Natural Resources Conservation Service, Portland, OR

AGROFORESTRY systems can be built to achieve landowner objectives and address resource issues. To do this sustainably, the health of the individual practices, the system, and the site are paramount. But, what is health?

A healthy agroforestry system is likely "balanced" in terms of providing enough amenities and products while maintaining or improving environmental conditions at the site, and having minimum or no negative impacts on the nearby landscape. Further, it is likely free of debilitating levels of pathogens or pests and gives rise to an acceptable sense of well-being by the landowner, family, and neighbors.

Numerous quantitative and qualitative tools are available to address site-level health. Two examples to assess stream and associated riparian settings are:

1) Stream Visual Assessment Protocol – Trained conservationists conduct a qualitative evaluation of a stream-riparian area. Up to 15 components are observed; those relating to riparian habitat and cover are the components most likely to be modified using agroforestry practices. The protocol is available at *www.nrcs.usda.gov/technical/ECS/aquatic/svapfnl.pdf*.

2) Stream*A*Syst – This assessment system is a set of materials for landowners who want to learn more about managing streamside areas. The assessment is qualitative, points to sources of professional help, and is available at *http://extension.oregonstate.edu/catalog/html/em/em8761/*.

Currently, no assessment techniques specifically evaluate health of agroforestry systems and the landscape footprint on which they occur. Determining agroforestry landscape health is complex and may require considerable time and an interdisciplinary team to evaluate site conditions. Here are six items to consider:

Soil

Are the site's soils eroding excessively from water or wind sources? Is there only a "two-dimensional" use of the soil's productive capacity?

Indicators: rills, ephemeral gullies, wind-created pedestals, wind-blown sediment in ditches or along fence lines, no trees or shrubs (their tall heights utilizing the vertical "third dimension").

If an agroforestry system exists: Are the practices on the site configured inefficiently and poorly spaced inhibiting the soil's productive capacity? Are they placed ineffectively to control soil erosion in interspersed cropped or grazed areas during times of drought and flood? Do tree and shrub plantings poorly complement soil management activities on cropland, grazing land, and forest land?

Air

Are there many dusty days? Are neighbors noticing odors? Are winds increasing heating needs of farmstead buildings? Are snowdrifts blocking roads and access to buildings? Is wind unabated or funneled through work areas? Are temperatures too high or low for livestock?

Indicators: dust in window wells or on window sills, declarations of non-attainment areas (including your farm or ranch) by local or state air quality authorities, vocal neighbors, high heating bills, snow drifts consistently block roads and buildings in the same place almost every year, livestock stress from high or low temperatures or mortality.

If an agroforestry system exists: Have trees or shrubs lost vigor or died from airborne contaminants or high wind speeds? Are they poorly placed and not intercepting and sequestering air-driven pollutants, odor, soil and dust? Are they too infrequent and sparse to block or reduce winds to facilitate work around the farmstead and in fields and lessen climatic stress on livestock? Is snow not being intercepted and trapped by the trees and shrubs?

Water

Are pollutants visible in or linked to streams on or near the property?

Indicators: excessive sediment, thick green scum, unusual odors, trash. Have shallow or deeper aquifers been identified as contaminated or at risk? Water well reports, declarations by local or state authorities about local aquifers.

If an agroforestry system exists: Have trees or shrubs died or displayed low vigor due to water-borne contaminants such as excessive nutrients or pesticides ? Are they poorly placed and not intercepting and sequestering water-delivered surface and subsurface pollutants?

Animals

Are livestock or wildlife being stressed from inadequate protective cover? Are travel corridors between patches of tree or shrub habitats disconnected? Does wildlife have inadequate seasonal food including woody plant sources? Are common or desired wildlife reproducing poorly?

Indicators: lower than normal numbers of adults or offspring, unexpected mortality or behavior.

If an agroforestry system exists: Are tree and shrub plantings insufficient in amount and configuration to meet habitat needs? Is

An interdisciplinary team in Maryland evaluates a stream and riparian corridor adjacent to cropland to determine health of this landscape setting. They are using the Stream Visual Assessment Protocol. *Photo courtesy of Lyn Townsend*

complementary herbaceous habitat absent? Are the existing woody species not producing adequate cover, habitat, and food for common and desired wildlife? Are plantings disconnected and not facilitating movement of wildlife on and through the site?

Plants

Are crop and grazed plants being stressed by a lack of water or by climatic extremes? Are fruit-bearing plants unable to produce adequately because of persistent winds or lack of pollination? Are crops damaged by wind or crop quality diminished by wind?

Indicators: lower than normal growth or production. Fruits and vegetables display bruises or blemishes.

If an agroforestry system exists: Are trees or shrubs in poor condition and not growing as expected for their age and species? Are the tree and shrub species poorly adapted to the local climate and soils? Are they located upwind of crops and forages?

Human

Are costs and revenues not providing sufficient and expected levels of net income? Does the aesthetic character of the site facilitate a "sense of place" and satisfaction? Are workers stressed from climatic extremes? Indicators: declining net revenues, one or two products are the single-source income, no supplemental income from tree or shrub products, worker irritability.

If an agroforestry system exists: Are tree and shrub species ineffective in ameliorating climatic extremes and not producing supplemental income? Are tree and shrub plantings haphazardly arranged and detracting from the farm or ranch's aesthetic and scenic values?

If there are many "yes" answers, reconsider the health of the enterprise and the existing use, condition, and arrangement of trees and shrubs. Regardless of how questions are answered, consider a "check up" by public or private planners who can do a thorough examination and provide ideas on how to establish or improve the effectiveness of an agroforestry system.

Ultimately, strategically placed and healthy agroforestry systems can be a practical and rewarding solution to improving enterprise diversity, and income needs or mitigating environmental impacts at the site and on nearby landscapes. An agroforestry system is not the only approach but it does provide a strong complement to an existing agricultural and grazing venture.

If you haven't got your health, you haven't got anything

Richard Straight
FS Lead Agroforester, USDA National Agroforestry Center, Lincoln, NE

THE forestry community is afire with discussions and programs related to forest health. Many of the issues hovering around this issue are relevant to agroforestry and in fact may be a good approach to evaluate the functioning and sustainability of agroforestry practices.

Some of the more mature discussions of forest health and how they apply to agroforestry are discussed below.

In a 1998 *American Forests* article, Sampson and DeCoster described forest health as "a condition of forest ecosystems that sustains their complexity while providing for human needs." The Society of American Foresters suggests a more lengthy definition: "the perceived condition of a forest derived from concerns about such factors as its age, structure, composition, function, vigor, presence of unusual levels of insects or disease, and resilience to disturbance" and it properly recognizes that "perception and interpretation of forest health are influenced by individual and cultural viewpoints, land management objectives, spatial and temporal scales, the relative health of the stands that comprise the forest, and the appearance of the forest at a point in time."

From these two definitions two aspects of forest health seem to confound the acceptance of a universally accepted definition: 1) people's expectations from the forest, such as timber, wildlife, clean water, and no trace of human activity, and 2) what scale of the

see **Health** on page 11

GREAT PLAINS STATES CONCERNED ABOUT EMERALD ASH BORER

Steve Rasmussen
Nebraska Forest Service
District Forester / Great Plains
Invasive Coordinator, Norfolk, NE

AN exotic beetle from Asia has four Great Plains states very concerned. Since it was first identified in southeast Michigan in 2002, estimates are that the emerald ash borer (EAB) (*Agrilus planipennis Fairmaire*) has already destroyed over 30 million ash trees. EAB is a threat to all North American ash trees regardless of age or condition. The northern plains region is especially vulnerable since this area has the highest percentage of ash of any place in the United States. Most Great Plains communities have at least 25 percent, some up to 60 percent of their tree resources being green ash (*Fraxinus pennsylvanica*). Additionally, estimates are that over 50 percent of the agroforestry plantings on the rural landscape have a green ash component.

EMERALD ASH BORER IS A THREAT TO ALL NORTH AMERICAN ASH TREES REGARDLESS OF AGE OR CONDITION.

Photo courtesy of Forestry Images

EAB is present in Michigan, Illinois, Indiana, Ohio, Pennsylvania, Maryland, West Virginia and Ontario, Canada. State and federal quarantines are in place and involve significant survey, containment, and eradication operations in affected areas with limited success.

Fortunately, EAB has not been identified in the Plains states yet (Kansas, Nebraska, South Dakota, and North Dakota), though most scientists consider their arrival inevitable. In a proactive attempt to raise awareness and become better prepared, the Great Plains Tree and Forest Invasives Initiative (GPI) was formed. GPI is one of three multi-state projects projects that are being funded by the USDA Forest Service to address one or more of three national themes:

1. Conserve working forest landscapes;
2. Protect forests from harm;
3. Enhance public benefits from trees and forests.

The GPI funding will allow the states to conduct a comprehensive inventory of all species of trees in rural agroforestry plantings and in communities to determine areas of the highest composition of ash which would relate to EAB risk. In addition, the inventory and assessment will help the states' forestry and other natural resource agencies better plan and prepare for an arrival of EAB. GPI will also establish a citizen monitoring program and develop educational material for the public and natural resource professionals on how to reduce the rate of spread of EAB and utilization options for what promises to be a large quantity of ash wood. Perhaps the greatest value of the GPI is the creation of a transferable protocol for inventorying and preparing for future invasive pest infestations. For more information, contact Steve Rasmussen, Great Plains Initiative Coordinator at 402–375–0101 or *srasmussen2@unl.edu*

This vial is from a detection kit that is available through the four state forestry agencies involved in the GPI and can be used to mail in a suspected adult EAB for identification. Information for creating your own detection kit is available from the author.

Actual size

Fire... a hot button for agroforestry!

Lyn Townsend
Forester, West National Technology Support Center, Natural Resources Conservation Service, Portland, OR

HUMANS and fire have had a long history—sometimes good, sometimes not so good. According to the National Interagency Fire Center, over 96,000 fires burned nearly 10 million acres in 2006. This includes wildfires, which comprised most of the acreage, and prescribed fires. From 1999 to 2006, the average wildland fire acres burned was nearly double the average of 1960 to 1998—6.8 million versus 3.5 million acres, respectively! Why? The most likely answers are: 1) an increase in fuel loads on forest and shrub lands resulting from a lack of active fuel management in recent decades, and 2) a change in climate or climate cycles. The risk of the loss of life and property continues to increase as more and more people move into the Wildland Urban Interface (WUI)—pronounced "Wu-eee"—that fringe of wild land near suburbs or suburbs directly embedded into wildlands.

Fires are classed as either "uncontrolled" or "wild," or "controlled" or "prescribed." Of course, the latter can become the former with unexpected high winds or lack of preparation. Fire relates to agroforestry in two ways: by using agroforestry practices to control buffer against wildfire, and by protecting agroforestry practices from being damaged or killed by fire.

Wildfires can be devastating, but defensive agroforestry practices and strategic design criteria can be crucial management tools to reduce wildfire risk.

Key practices and how they address these aspects are:

- **Silvopasture** – In a silvopasture system, trees and shrubs are planted, grown, and maintained on a wide spacing with an understory that is grazed by livestock. Fuel loads are kept low, ladder fuels are nearly absent and, should a crown fire start, the trees are spaced widely enough to inhibit crown-to-crown spread, thereby minimizing the level of damage to the trees or to the adjacent non-grazed forest land. Essentially, a silvopasture acts as a "fuel break" with grazing livestock providing the built-in annual understory fuel management.
- **Riparian forest buffers, windbreaks, alley cropping, multi-story cropping** – These agroforestry practices are effective fire control techniques when fire-resistant plant species, such as many native deciduous or succulent-leaf trees, are used and the planting is strategically located so that it can prevent or at least stall the spread of fire from one area to another. Prevailing wind direction during fire season is an important planning criterion for locating the agroforestry practice. Another tactic is planting fire-resistant trees in the outer rows of multi-row plantings near homes or on the edges of small communities. Here, the trees create a "three dimensional" firebreak and could even catch firebrands that typically jump ahead and downwind during most wildfires. For row-type plantings, the outer edge near a road (which could be a fire-ignition point) can be maintained mechanically as an effective firebreak reducing the likelihood of fires spreading into and through the planting. A design criterion to consider for selecting trees and shrubs, particularly shrubs, are choosing those species with capability to resprout after fire. Even though the damage has been done, at least the shrub can regenerate quickly using the existing root system.

The area or strip near the road (far edge of windbreak) will be maintained mechanically as an effective firebreak reducing the likelihood of fires spreading into and through the planting. *Photo courtesy of USDA NRCS*

Wildfires can be devastating, but defensive agroforestry practices and strategic design criteria can be crucial management tools to reduce wildfire risk and, if fire occurs, minimize the damage.

threats to agroforestry health

1. Wildlife can cause significant damage to trees and shrubs, primarily by feeding on leaves, stems and twigs, especially in the early establishment stage.
2. Herbicide drift from nearby agricultural activities can be a one-time or chronic problem that can reduce productivity and functionality of agroforestry practices.
3. Competition from weeds and undesirable grasses can significantly stunt agroforesty growth and reduce vigor.
4. Invasive pests such as emerald ash borer and gypsy moth can be very destructive and even kill valuable trees in agroforestry practices.
5. Seasonal or long-term drought can weaken trees and shrubs making them susceptible to insect and diseases.
6. In minutes, a wildfire can destroy agroforestry practices that took 20 years to develop and another 20 years to regain the same level of benefits.
7. Urban development can increase the frequency and intensity of flooding events, can be a source of invasive weeds, and even cause the removal of agroforestry practices.
8. Uncontrolled livestock can graze, browse or trample young trees and shrubs, keeping them from performing their intended benefits.
9. Economic pressures for short-term investments and high cash flow demands may lead to removal of agroforestry practices in order to increase acres of production.
10. Climatic factors can cause native insects or diseases to become a serious problem which creates stress for trees and shrubs.

Agroforestry and the rural-urban interface

Kimberly Stuhr
Technology Transfer Specialist / *Inside Agroforestry*
Editor, USDA National Agroforestry Center, Lincoln, NE

THE American landscape has changed dramatically over the past one hundred years. People continue to claim land and build homes in the outlying fringe of rural and metropolitan areas. This demographic shift is increasing the size of the "rural-urban interface," where homes and other structures meet rural agricultural land or natural areas.

When development takes place we are challenged with managing the negative impacts while still facilitating the benefits. Strategically located agroforestry plantings can help offset the negative consequences of development.

Green infrastructure

Leaving or developing a network of green corridors, like riparian forest buffers and windbreaks, minimizes disturbance to natural areas. This helps control soil erosion along stream banks and roadsides and maintains hydrological flows. "Ecobelts," trees and other vegetation strategically located in the physical space between agriculture and cities, help mitigate the conflicting lifestyles of urban and country dwellers.

Wildlife habitat

While some animals are generalists when it comes to food and habitat others are highly specialized and may be restricted to feeding on several or a single native plant species or require the freedom to move across the landscape. The trees, shrubs, and other plants in agroforestry plantings can help mitigate the loss of wildlife habitat.

Biodiversity

Residential development displaces native plant and animal species and degrades unique and diverse biological resources. Agroforestry practices can mimic natural ecological processes like plant community succession. Incorporating native species into agroforestry facilitates native plant-animal associations such as pollination, seed dispersal, and food.

Public safety

The increasing number of widely dispersed homes and structures creates problems for access of emergency vehicles. Agroforestry practices like living snowfences can help keep roadways open for emergency vehicles and reduce blowing dust and snow.

Health

continued from page 7

forest is under discussion (plantation, county, state, or ecotype). For the purposes of agroforestry health discussions, we are most likely concerned with the site scale and expectations are generally limited to a discussion of landowner objectives for establishing the agroforestry practice or system.

Sometimes it helps to understand an issue by looking at what it is not. In other words, what does an unhealthy forest look like? E.L. Barnard, Forest Pathologist with the Florida Division of Forestry says: "In fact, more often than not, catastrophic wildfires and southern pine beetle outbreaks are simply fevers and sweats, symptoms of unhealthy forests, not the cause of same. To the extent that unhealthy forests and forest conditions remain, and to the extent that we focus on treating symptoms (e.g., killing beetles, putting out fires) while neglecting the underlying cause(s) of the problems (i.e., unhealthy forest conditions), we can expect more damaging wildfires and more pest outbreaks."

> **"More often than not, catastrophic wildfires and southern pine beetle outbreaks are simply fevers and sweats, symptoms of unhealthy forests, not the cause of same."** E.L. Barnard, forest pathologist

So, if we can determine what conditions prevent insect, disease, or fire related problems, we are well on the way to defining a healthy forest.

Taking these concepts into consideration when planning and designing agroforestry practices should lead us to applications that both meet the landowner's objectives and are resistant to disturbances that would reduce benefits.

Placement of this Iowa windbreak protects the farmstead from troublesome winds and traps snow. The habitat it provides is connected to the riparian area on the left (off of the photo). *Photo courtesy of USDA NRCS*

Field windbreak planning: an example

A SIMPLE field windbreak planning scenario that keeps agroforestry health in mind might look something like this:

A landowner is interested in reducing soil wind erosion, increasing wildlife habitat for hunting, and perhaps creating a small business opportunity for his children so that they can learn the value of money, a day's work, and responsibility.

The crop field is currently under a conservation plan that utilizes crop residue as a key tool in controlling soil wind erosion, however the landowner recognizes that unpredictable weather and dry years may reduce crop residues, allowing soil to blow.

A system of one- or two-row windbreaks will be designed to reduce wind erosion even when crop residue is missing. For the most part, native trees and shrubs that are adapted to the site will be used to encourage healthy plants that are more resilient to stresses out in the open field.

The state forestry agency and extension service have been informing the public that, should it enter the state, emerald ash borer is a potential threat. Consequently, native ash trees will not be used; instead honeylocust, hackberry, and bur oak will be planted, along with Rocky Mountain juniper and Norway spruce. The diverse selection of species will help ensure that no one disease or insect will threaten the entire windbreak system.

To accommodate hunting and the small business objectives, an additional row of fruit bearing native shrubs, like American plum and chokecherry, will be added to two of the broadleaf tree windbreaks. These shrubs will provide cover for migratory songbirds, food for nesting songbirds, and a source of fruit for the children to harvest for making jam or jelly. At least one of the windbreaks with the shrubs will be near the farmstead windbreak to make it easier to access the fruit harvest and to serve as a wildlife travel corridor between the farmstead and the nearby slough.

Upcoming Events

July 26–30, 2008
Soil & Water Conservation Society Annual Conference. Tuscon, AZ. For more information: *www.swcs.org/en/conferences/2008_annual_conference/*

August 18–22, 2008
Short Rotation Crops International Conference: "Biofuels, Bioenergy, and Bioproducts from Sustainable Agriculture and Forest Crops." Bloomington, MN. For more information: *www.cinram.umn.edu/srwc/index.html*

September 9–11, 2008
Great Plains Riparian Forest Management Summit. Sioux Falls, SD. For more information: *www.unl.edu/nac/Riparian_Summit.htm*

For more upcoming events, visit our website calendar: *www.unl.edu/nac/calendar.htm*.

USDA National Agroforestry Center

"Inside Agroforestry" is published three times per year by the USDA National Agroforestry Center. Phone: 402–437–5178; Fax: 402–437–5712.

- **Greg Ruark,** NAC Program Manager (256–372–4540)
- **Michele Schoeneberger,** FS Research Lead (ext. 4021)
- **Richard Straight,** FS Lead Agroforester (ext. 4024)
- **Bruce Wight,** NRCS Lead Agroforester (ext. 4036)
- **Kimberly Stuhr,** Technology Transfer Specialist/ "Inside Agroforestry" Editor (ext. 4013)
- **Ryan Dee,** Technology Transfer Assistant/ "Inside Agroforestry" Designer (ext. 4014)

www.unl.edu/nac

Mission

The USDA National Agroforestry Center (NAC) is a partnership of the Forest Service (Research & Development and State & Private Forestry) and the Natural Resources Conservation Service. It is administered by the Forest Service, Southern Research Station; and its program manager and headquarters are located in Huntsville, AL, on the campus of Alabama A&M University, while NAC's staff are located at the University of Nebraska, Lincoln, NE; University of Idaho, Moscow, ID; and in Blacksburg, VA. 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.

Policy

Inside Agroforestry VOLUME 17 ISSUE TWO

USDA National Agroforestry Center
East Campus–UNL
Lincoln, NE 68583–0822

Official Business
Penalty for Private Use, $300

Address Service Requested