USDA National Agroforestry Center

Inside Agroforestry

VOLUME 25 ISSUE 3

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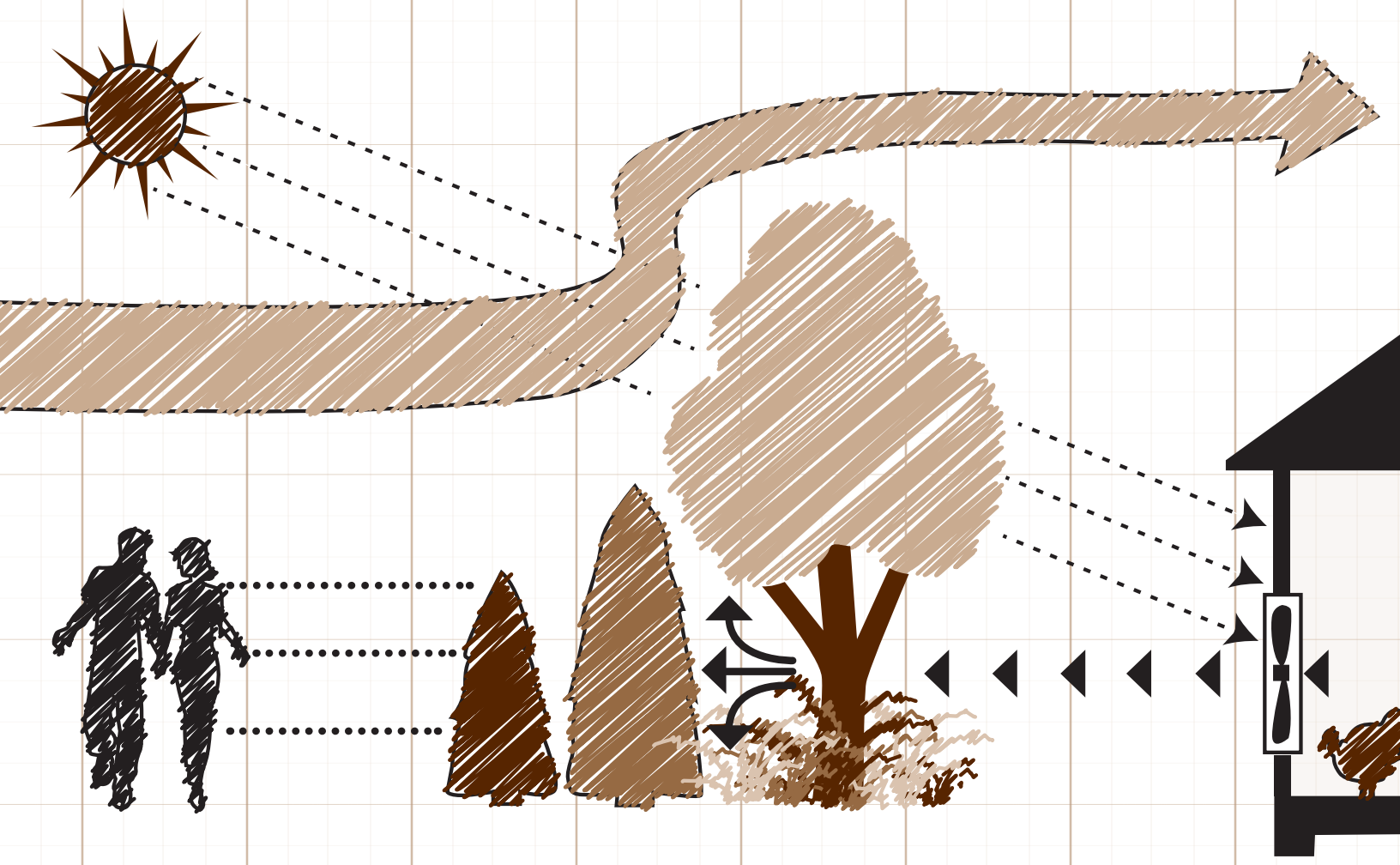
Windbreak Innovation



NAC Director's Corner

A commentary on the status of agroforestry by Susan Stein, NAC Director

Interest in windbreak assessment, renovation and establishment is on the rise – and for good reason. When designed properly, windbreaks can buffer crops from extreme weather and maintain or increase crop yields. They can also keep soil on the ground, enhance pollinator habitat, produce special forest products and provide other sustainable agriculture benefits. But wait, there's more – when planted as living snow fences, windbreaks improve highway safety, and, when planted around farmsteads, they reduce energy costs.

In order to maximize the ability of farmers, ranchers and communities to access windbreak information and assistance, a team of forestry and agriculture professionals from across the Great Plains held a Great Plains Windbreak Action Plan workshop. Representatives of local, state, federal, and non-profit organizations met in Manhattan, Kansas to lay the foundation for the advancement of windbreak research, outreach, and assistance to support and enhance landowner interest in windbreak renovation, maintenance and establishment. Workshop participants focused on four areas: training for natural resource professionals; outreach and education for landowners/producers; programs and policies to support windbreaks; and critical research.

The high level of energy among participants at the Manhattan workshop, and the stories presented in this newsletter, are examples of a renewed recognition that, in the right place and at the right time, windbreaks can continue to fill an important niche in America's sustainable agriculture tool kit.

Windbreaks in the Webinar Library

Many organizations use webinars to provide training, share information, and promote agroforestry. Because agroforestry is interdisciplinary, these are archived in many different places. The NAC website contains a webinar library with links to archived webinars hosted by its partners. The library has been updated to contain over 75 recorded webinars covering many agroforestry practices and has filtering and sorting capabilities to help users access the content in which they are most interested. Please contact Kate MacFarland at kdmacfarland@fs.fed.us for more information.

Selected windbreak webinars:

- Multipurpose Buffers for Poultry Farms and Production, by Paul Patterson (2017), hosted by the Northeast/Mid-Atlantic Agroforestry Working Group
- Snow Control Tools, by Dan Gullickson and David Smith (2015), hosted by the University of Minnesota
- Shelterbelts, Beef Producers & Behaviors: Investigating an Alternative Approach Using Social Marketing, by Ryan Canart, Ian Shanghvi, William Ashton, and Blair English (2012), hosted by NAC
- Pollinator-friendly Multi-functional Windbreak Design, by Mark Wonneck (2012), hosted by NAC
- Windbreak Economics by Larry D. Godsey (2012), hosted by NAC
- United States National Windbreak Perspective, by Bruce Wight (2012), hosted by NAC

New Frontiers in Tree Inventory and Monitoring for the Central United States

Todd Kellerman, National Agroforestry Center
Dacia Meneguzzo, Northern Research Station, U.S. Forest Service
Greg Liknes, Northern Research Station, U.S. Forest Service

In response to the devastating dust storms of the mid-1930s, more than 30,000 shelterbelts were planted, covering over 18,000 miles across the Central U.S. through the Prairie States Forestry Project/Shelterbelt Program (1935-1942). To date, this remains one of the largest environmental projects in U.S. history. The last official survey of the original shelterbelts planted during this program was conducted in 1954, but the present state of windbreaks in the Great Plains region is largely unknown.

Federal ground surveys of sample locations across the Central U.S. over the past 60 years have provided some information about the windbreak resource. However, those surveys provide little detail about the spatial arrangement of trees on the landscape. In addition, datasets providing detailed spatial tree cover information on the Great Plains are severely lacking. Satellite-based land cover products are often collected at a spatial resolution too coarse (e.g. 30 meters or roughly the size of the infield on a baseball diamond) to accurately depict small areas of tree cover, such as single tree canopies or linear features such as windbreaks. Surveys based on sample locations are generally summarized to a larger scale, such as a county, and may only provide useful information pertaining to larger tracts of wooded land. The Forest Inventory and Analysis (FIA) program of the U.S. Forest Service, which inventories all forest lands across all ownerships, defines forest land as having at least 10% live-tree canopy cover, and is at least 1.0-acre in size and 120 feet wide. As a result, FIA inventories only include 'forested' areas, which may exclude as much as 70% of the tree resource in the Great Plains region according to photo-interpreted estimates.

This project will describe the extent, location and function for nearly 12 million acres of tree cover, **5 million acres** of which would be **considered trees outside forests.**

In an effort to fill the above-mentioned data gap, FIA and the National Agroforestry Center (NAC) have formed a targeted task team to develop methods for efficient mapping of trees outside forests (TOF) and for identifying and quantifying their ecosystem functions in agricultural landscapes. This mission is currently being carried out in two phases, across four states: North Dakota, South Dakota, Nebraska and Kansas. In Phase 1, a baseline of TOF is created by mapping tree cover from high-resolution aerial photography resulting in geospatial data that provide information about the area and location of tree cover. Using that baseline information, tree cover can then be monitored over time by repeated mapping. In Phase II, an ecosystem function is assigned to each contiguous patch of tree cover with an emphasis on identifying windbreaks and riparian corridors.

When data from the two phases are combined, the resulting information will meet the needs of the natural resource agencies in the Great Plains and support the USDA Agroforestry Strategic Framework. Furthermore, this image-based inventory of tree resources will be consistent across the region, facilitating comparisons between states and counties. Because new imagery is collected every few years under the National Agriculture Imagery Program (NAIP), changes to the resource can be monitored over time.

In a similar fashion to what the Kansas Forest Service did in 2008 (see article on page 4), the geospatial datasets resulting from this project can be used to identify priority areas for conservation tree plantings and increase the implementation of windbreak renovation practices. When this effort is fully implemented, about 1 trillion pixels over more than 300,000 square miles in North Dakota, South Dakota, Nebraska, and Kansas will have been mapped. Data will describe the extent, location and function for nearly 12 million acres of tree cover, 5 million acres of which would be considered trees outside forests.

GIS and Remote Sensing for Kansas Windbreaks for Public Outreach

Bob Atchison, Kansas Forest Service, Kansas State University
Darci Paull, Kansas Forest Service, Kansas State University

Identifying priority landscapes for addressing natural resource concerns requires timely, accurate data. Such data can also help organizations make efficient use of limited resources to more effectively engage landowners. Unfortunately when it comes to windbreaks and other agroforestry practices, the data has often been missing. The U.S. Forest Service Northern Research Station (NRS) Forest Inventory and Analysis (FIA) program has done a great job tracking the size and condition of Kansas forestlands. However, agroforestry practices such as windbreaks and riparian forest buffers do not generally meet baseline definitions of "forestland" and are not inventoried. For this reason, the condition and size of windbreaks has not been adequately measured. Consequently, the common perception of a decline in windbreaks throughout the Great Plains is based on anecdotal evidence or limited and local inventories.

...the condition and size of windbreaks has not been adequately measured.

To fill the gap in data on trees outside of forests, State forestry agencies, the U.S. Forest Service, and others have worked together to develop efficient assessment tools. Some of these are described here, focusing on work in Kansas.

In 2008, the Great Plains Initiative (GPI I) was organized to assess trees outside of forests across the Great Plains. This assessment documented 5.1 million acres of trees outside of forests (TOF) across the Northern Great Plains (ND, SD, NE, and KS), including windbreaks, riparian forests and other treed resources. That's almost as much area as the 6.4 million acres of forestland in these states.

Testing Methods in Kansas

Using GIS and an object-based software (initially ENVI-Zoom 4.5) to analyze 4-band NAIP imagery, the Kansas Forest Service was able to identify windbreak locations and estimate their acreage. The software is "trained' to classify objects into a variety of land use covers including windbreaks. Windbreak condition is estimated using a normalized difference vegetation index, NDVI, which measures live-green vegetation. When combined with ground truth sampling (comparing the accuracy of remote sensing with on-the-ground inventory) windbreaks are placed into one of three condition classes (good, fair or poor). The criteria used to assign condition classes is the same criteria used by NRCS Forestry Technical Note KS-11. Windbreaks in fair to poor condition were identified as a "resource concern" and are eligible for windbreak renovation through EQIP (Environmental Quality Incentives Program).

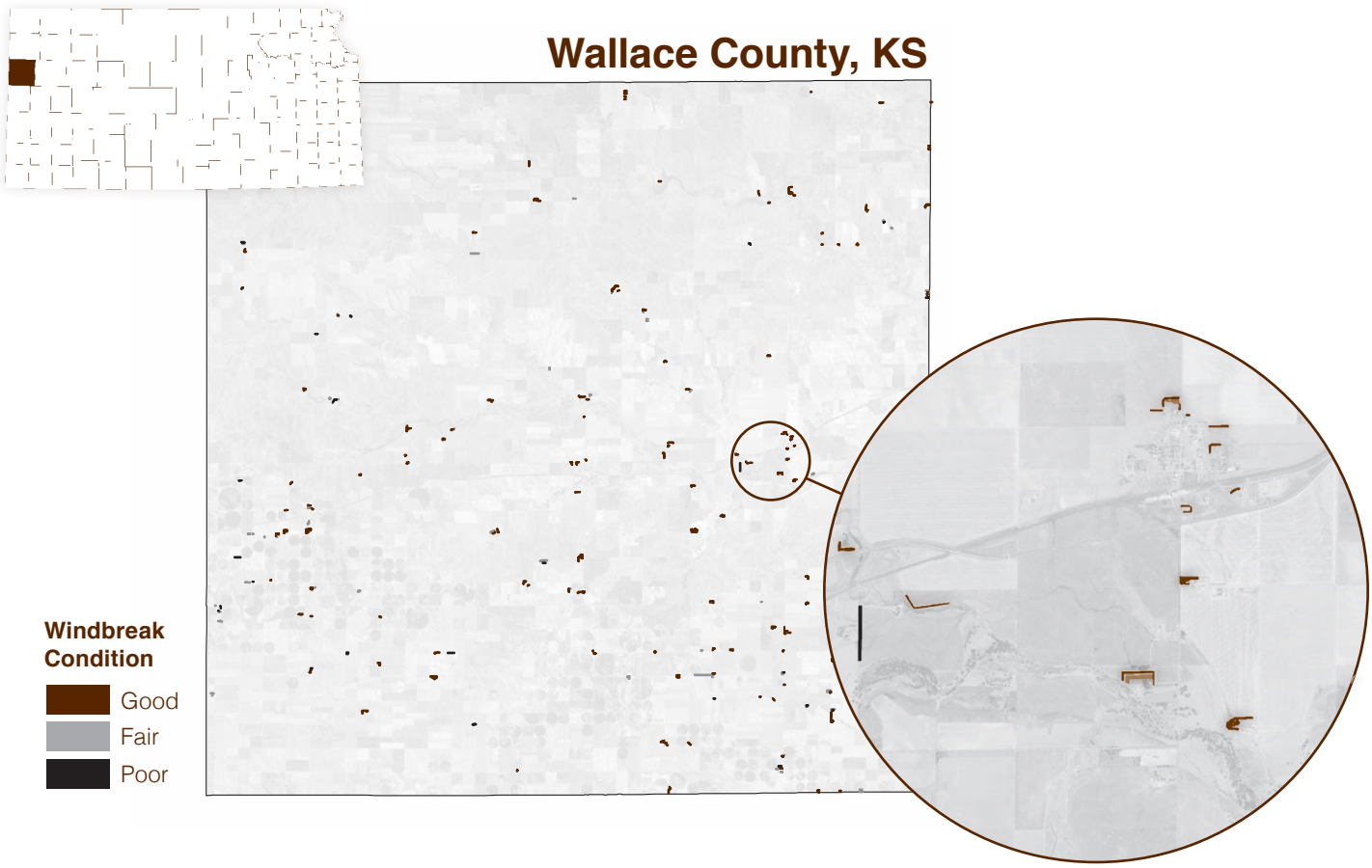
Next the Kansas Forest Service identified the owners of windbreaks in poor or fair condition, using data on land ownership and parcel data acquired from County Appraisers' offices. Working through trusted County Conservation Districts, the Kansas Forest Service then mailed letters to landowners with windbreaks in fair or poor condition, inviting them to consider renovating their windbreaks through EQIP.

The most recent outreach efforts focused on Wallace, Logan and Gove counties in northwest Kansas. Nearly 350 letters were sent to landowners with a response rate of over 10%. Due to this outreach, 44 properties were visited and 53 windbreaks were serviced, including creating 33 renovation plans and 5 new windbreak establishment plans. Ninety-two percent of the windbreaks qualified for EQIP and 95% of the EQIP allocation for the Forestland Health category were spent in this 3-county area that same year.

Continued Efforts to Assess Trees Outside of Forests in Kansas and Beyond

While the approach described above has been effective in locating and estimating area of windbreaks, there were some challenges. The process used for estimating condition was effective, but required the use of "ground-truthed" windbreaks as references.

The Kansas Forest Service is now using eCognition, a much more powerful object-based remote sensing software. Thanks to the U.S. Forest Service, NRS, FIA, and the National Agroforestry Center, the Kansas Forest Service just completed and published the rural tree canopy of Kansas using 2015 NAIP imagery



Windbreaks in Wallace County, Kansas were identified and their condition was estimated using GIS and object-based software. This analysis helped identify windbreaks that need renovation. Staff and other resources targeted for windbreak renovation could then be directed to where they were most needed.

at a 1-meter resolution. This automated process was completed in a three-month period and can now be used as the initial analysis of windbreak location. Effectively assigning windbreak condition remains a challenge.

Continuing inventory of the Kansas tree canopy is part of a larger effort throughout the Northern Great Plains known as the Great Plains Initiative 2. The goal is to map the vitally important and often underreported 'trees outside of forests' including windbreaks and riparian forests. Another inventory advancement in the Great Plains is the use of linear intersect tool developed by the U.S. Forest Service Northern Research Station, Forest Inventory and Analysis and the National Agroforestry Center. This tool will help calculate the change in windbreak acreage over time by sampling windbreaks that intersect series of lines laid over the top of the satellite imagery. Two students are currently mapping windbreaks using this tool. The results will be a more accurate representation of windbreak location and acreage and how the resource has changed over time.

Further GIS work is planned to train software to scan imagery and classify groups of trees as either windbreaks or riparian forests. This will improve our ability to inventory and assess the value and benefits of trees outside of forests. By using new GIS techniques and outreach, Kansas Forest Service and other Plains states are using limited resources more effectively to engage farmers on management of windbreaks to conserve soil and enjoy the other benefits windbreaks provide. This is especially important in an age of increased drought and temperature when no-till and residue management may not be as effective.

For more information, see:

Ghimire, K., Dulin, M.W., Atchison, R.L., Goodin, D, Hutchinson, J. (2014). Identification of windbreaks in Kansas using object-based image analysis, GIS techniques and field survey. Agroforestry Systems. 88. 1-11. 10.1007/s10457-014-9731-4.

Pacific Islands Multipurpose Windbreaks

Richard Straight, National Agroforestry Center
Michael Constantinides, NRCS Hawaii

"THEY'RE NOT MAKING ANY MORE LAND!"

The truth of this statement is amplified when living on an island. Farmers and ranchers living on the Pacific islands are acutely aware of both the need to produce and the necessity to conserve soil and water. Here are just three examples of how producers are accomplishing both by growing crops in their windbreaks in Hawaii and the U.S.-Affiliated Pacific Islands.

Photographs by Michael Constantinides

Sapanaria is one of the plants that the Ms. Bello planted to support native pollinators.

Ms. Bello chose many different species for the windbreak in order to provide a variety of benefits. In this image African mahogany, soursop and gliricidia can be seen.

Poohala Farms, LLC | Ms. Mary Bello

Wahiawa, Oahu

Six miles away from the town of Wahiawa, Oahu, Ms. Mary Bello and her family operate a goat dairy on approximately 100 acres of land that was formerly in pineapples. Strong trade winds occur on this central plateau. Ms. Bello contacted the NRCS for assistance in designing and installing a windbreak along the two windward property boundaries, covering a distance of 3,250 feet.

The windbreak is comprised of four rows. Short-statured trees/shrubs are in the windward row, medium height trees in the second row, tall trees in the third row, and medium or tall trees in the leeward row. The windbreak rows are divided into 43 segments ranging from 200 to 1,750 feet long, with each segment containing only one species.

Ms. Bello sought to address a tremendous variety of resource concerns and create benefits in this highly diverse design:

- **Mitigate dust and odor drift** from a neighboring commercial composting operation. The approach here included a wider design with four windbreak rows, coupled with plant selections that have a high leaf surface area and/or species that produce pleasant scents.
- **Produce fodder** from nitrogen fixing *Gliricidia sepium* trees planted in the first row. While this species can grow to be a medium sized tree, it is also very tolerant of complete crown removal and is easily maintained via coppice management. While serving as a short hedge in the first row, the tree tops are also removed once every few years to provide a cut-and-carry source of nutritious fodder for the dairy goats – they love it!
- **Enhance views** by creating a visual barrier for the commercial operation on the windward side, and installing trees with beautiful flowers or bark along the leeward side, which also faces the farmstead.
- **Produce timber** for the Bellos' custom millwork operation. Inclusion of kou, koaia, kamani, cocobolo, three species of mahogany, pheasantwood, and four species of eucalyptus allows for a diversity of timber production.
- **Enhance native insect pollinator habitat**. This was addressed by including ten native tree and shrub species.
- **Support managed hives** on the farm by using several species known to provide desirable forage for honey bees.

A ten-year old double row of mango helps protect sweet corn and a variety of other vegetable crops on Mr. Nyugen's farm plot.

Mr. Juan Lizama

Kagman, Saipan CNMI

Mr. Lizama manages a farm, on approximately 3.5 acres of land leased from the Division of Agriculture, Commonwealth of the Northern Mariana Islands, near the community of Kagman, in southeast Saipan. He grows a variety of crops including sweet corn, cucumbers, and peas.

The land has a relatively gently slope with substantial precipitation (Kagman receives about 80 inches of annual rainfall). However, as with many tropical islands, the year round heat and sunny conditions combine with steady trade winds to create high evapotranspiration potential and soil water loss. Consequently good water conservation practices are necessary.

For many farmers, the risk of not having a lease renewed often acts as a deterrent for long-term investments such as windbreaks. However, the Division of Agriculture policy ensures that a farmer can keep their lease as long as the lease payments are kept current. As a result, Mr. Lizama decided to plant windbreaks.

On the northeast side of the field is a two-row windbreak with mango in the windward row and citrus trees in the leeward. The mango trees can easily grow to 30 or 40 feet tall which will provide wind protection for the entire field and provide additional fruit to sell at the farmers market. The southeast side of the field has two rows of mango trees planted on a 15'x15' spacing.

SN Farms, LLC | Mr. Andy Nguyen

Kunia, Oahu

Mr. Andy Nguyen of SN Farms, LLC has a diversified agriculture operation on approximately 10 acres of land in Kunia, Oahu. The farm is among thousands of acres in Central Oahu that were historically in pineapple cultivation. The climate is favorable for year-round cropping, but farming is challenged by high winds that buffet the farm throughout the year, limited natural rainfall limited to the point that acute drought conditions are common, and only intermittent access to irrigation.

Mr. Nguyen primarily grows Thai basil and taro for both leaf and corm (similar to a tuber); but also produces some vegetables such as eggplant. Through NRCS technical and financial assistance, Mr. Nguyen installed his primary/windward windbreak, comprised of banana trees, in 2012. Individual stump sprouts were planted along the 1,000 foot windbreak alignment, reaching a mature height of 12-15 feet within 18 months while also rapidly expanding into clumps.

In 2014, Mr. Nguyen opted to add a second row of taller trees to his windbreak to extend the zone of leeward protection farther into his cropped fields. For this second row he chose primarily jackfruit, but also included occasional mango, avocado, lychee and citrus trees.

Here an important theme emerges – in addition to protecting his annual and perennial field crops from mechanical damage and minimizing evaporation losses of scarce irrigation water, Mr. Nguyen pursued an important secondary objective in maximizing the quantity and diversity of production from his small farm by selecting only fruit trees for his windbreak.

Newly planted cucurbits and sweet corn are protected from southeast trade winds by a double row windbreak of mango and citrus trees.

A windbreak consisting of banana and jackfruit protect a crop of taro on the island of Oahu.

Along with the banana windbreak in the background, Mr. Nyugen included a windbreak of citrus part way across the field to ensure wind protection and produce another crop.

Vegetative Environmental Buffers for Mid-Atlantic Poultry Farms

Shawn Belt, NRCS Norman A. Berg National Plant Materials Center

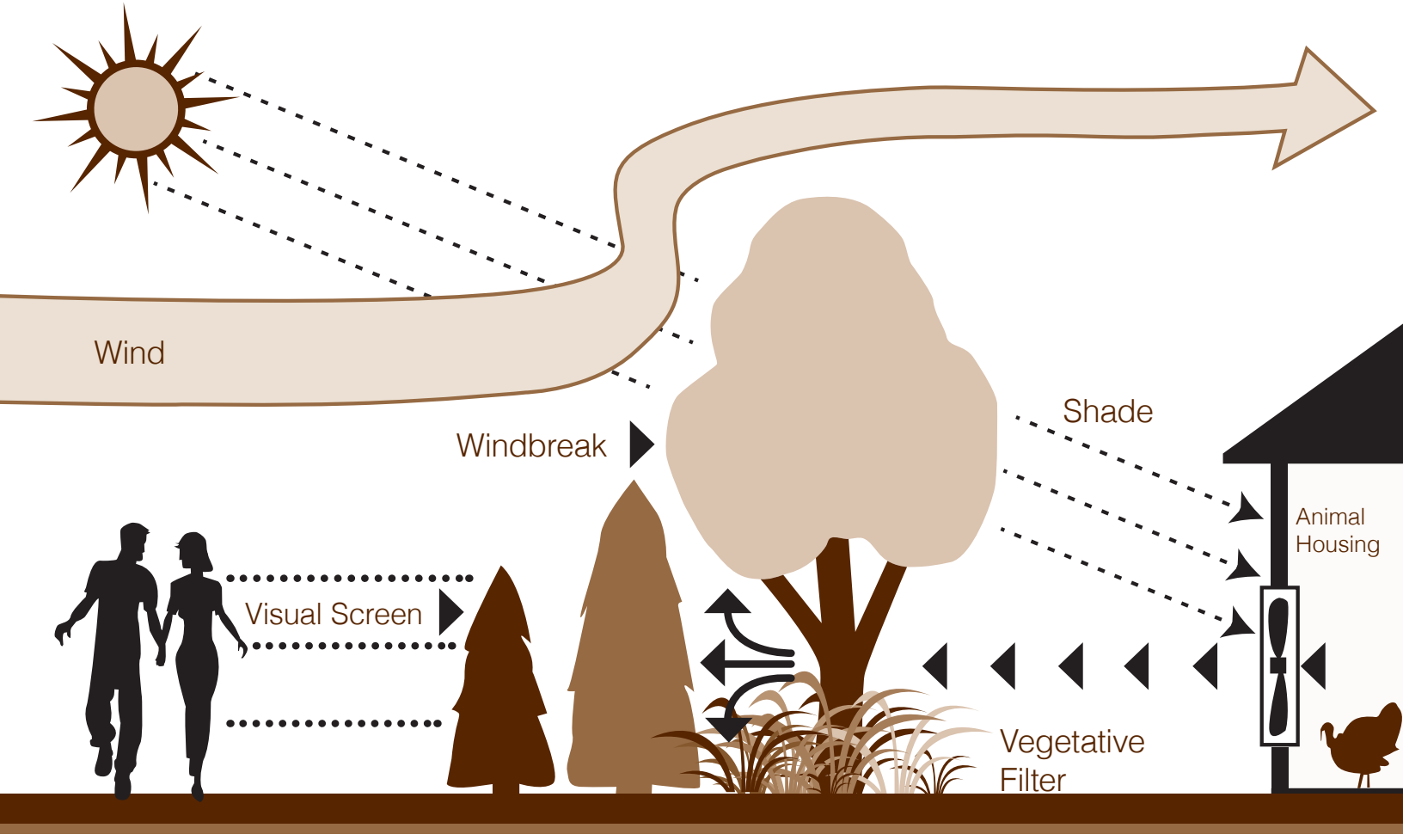
Mid-Atlantic poultry producers are leading the country in implementing conservation practices that decrease environmental impacts and increase the efficiency of producing poultry meat and eggs for a growing population.

More than ten years ago, producers began strategically planting trees, shrubs and grasses as vegetative environmental buffers (VEBs) around their farms. These buffers can improve the environment for poultry farms and their neighbors (**Figure 1**).

The NRCS National Plant Materials Center is expanding the variety of plants available to create successful VEBs. Forty species of new plants were tested from 2009 – 2015, including 9 grasses, 27 deciduous shrubs/trees and 4 evergreens. Fifteen of the 40 different plants tested (38%) had survival percentages above 60% over a two year period (for grasses) or over a three year period (for trees and shrubs)(**Table 1**). Eight of the forty species tested (20%) had survival percentages below 60% and are intolerant of poultry farm emissions. Seventeen plants (43%) require further testing to determine emission tolerance.

Poultry producers are working with NRCS to adopt this agroforestry practice that benefits their operations while at the same time enhancing the environment. From 2014 – 2017 Maryland and Delaware NRCS assisted producers with over $180,000 in cost share funds to install more than 100 VEBs.

Figure 1



Vegetative Environmental Buffers have a number of functions

- Filter and trap dust, odor and viruses from poultry house exhaust fans.
- Reduce the solar heat loads on barns, thus lowering energy expenditures.
- Protect poultry from winter winds.
- Shelter buildings, feed bins, access roads, and doors from drifting snow.
- Slow and buffer water from poultry house roofs, roads and barnyards
- Filter nutrients and sediment.
- Produce renewable bedding, replacing pine shavings traditionally used for bedding, with switchgrass straw, chopped willow, or poplar shavings (the spent litter can be used as a renewable, carbon-neutral fuel to replace fossil fuels like propane).
- Screen poultry management activities from neighbors.
- Beautify the barns and farm at the urban/rural interface.
- Sequester carbon

Research and outreach on VEBs has been carried out by NRCS and a number of partners through the years. Such efforts include:

- The **University of Delaware** and the **USDA Agricultural Research Service** have worked to quantify VEB effectiveness through a NRCS Conservation Innovation Grant (CIG).
- **Penn State** has conducted research on harvesting VEBs for biofuel, litter, and heat.
- **The Delmarva Poultry Industry** association has worked to encourage producer adoption of this practice.
- **USDA's Natural Resources Conservation Service (NRCS)** offers farmers cost share incentives to plant VEBs through the Environmental Quality Incentive Program (EQIP). However, the challenging conditions near poultry house exhaust fans hinder or kill some plants while stimulating growth in others.

Table 1. Plants with best survival results

Common Name	Survival Percentage
Coastal panicgrass	100
Switchgrass var. Timber	100
Switchgrass var. Northwind	100
Switchgrass var. Thundercload	91
Prairie Cordgrass var. Southampton	100
Red Maple	100
Chinkapin var. Golden	100
Netleaf Hackberry	100
Common Hackberry	100
Dwarf Hackberry	100
Spreading Euonymus var. Manhattan	100
Honeylocust	100
Eastern Redcedar	75

Additional Information:

Plants Tolerant of Poultry Farm Emissions in the Chesapeake Bay Watershed
https://www.nrcs.usda.gov/Internet/FSE_PLANTMATERIALS/publications/mdpmcsr12671.pdf

Pennsylvania State University Vegetative Buffers
http://extension.psu.edu/animals/poultry/nutrient-management/vegetative-buffers

In Brief...

A periodic summary of agroforestry-related journal articles

John S. Weedon, Stark (OH) Soil & Water Conservation District

Living Snows Fences Provide Quick Impact

Living snow fences (LSF) are windbreaks that capture snow before it blows or drifts onto roads. The economic, environmental, and aesthetic benefits of LSF are well documented, but their effectiveness throughout their life cycle is poorly understood. Researchers in New York State investigated 18 willow and conifer LSF sites to see how they functioned at different ages. Willows increased in height and decreased in porosity over time, while conifer height and porosity remained constant. However, these growth factors appear to make little difference on their effectiveness as LSF. Three years after planting, both willow and conifer LSF had capacities to trap more snow than the estimated quantity of blowing snow transported by wind towards the road. From four to eleven years after planting, the ratio of capacity to transported snow for both types of LSF jumped to at least 3:1 and as much as 110:1, indicating a large capacity to handle massive snowfalls fairly quickly after establishment. Moreover, drift length was consistently less than 10 meters once the capacity to transported snow ratio hits 15:1, which occurred as soon as five years after planting. The shorter drift length should permit shorter setback distances from roads.

Take Home Message: In less than four years after planting, willow and conifer LSF effectively capture drifting snow, and by the fifth year the drift length is less than 10 meters, which expands the number of locations suitable for LSFs.

Heavey JP, Volk TA. 2014. Living snow fences show potential for large storage capacity and reduced drift length shortly after planting. Agroforest Syst. 88:803-814.

Windbreaks Are Climate Smart For Crop Yields

Smart farmers consider predicting seasonal rainfall a fool's errand, especially given the anticipated rainfall intensification under climate change. Instead, they hedge their bets by preparing for high and low amounts of precipitation. According to multiple scientific studies, one way they can do this is by planting windbreaks.

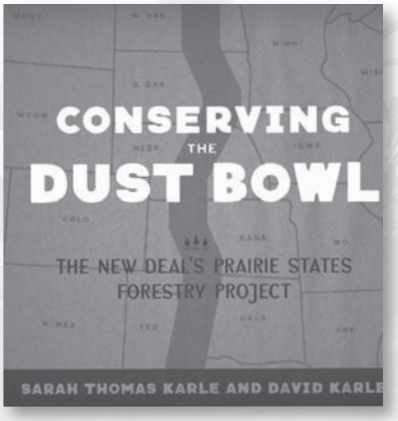
One early study reported increased net crop yields for fields with windbreaks during years with little rain (Kort 1988). Although yields were lower adjacent to the tree rows, due to above and below ground competition for resources between trees and crops, there was much higher production in the sheltered zone (from two to twenty-four times tree height), resulting in a higher overall yield. The increased shelterbelt yields were attributed to creation of favorable microclimates from the reduction of wind speed and turbulent air mixing. Unchecked, both of these factors can cause tearing, shearing and other physical damage to plants. They can also reduce available soil moisture by increasing evaporation.

More recent research in southern Québec indicated that windbreaks minimally impact yields during years of normal or above normal rainfall (Rivest and Vézina 2015). In this study, researchers investigated maize yields on the leeward side of mature (average age of 30) single tree row windbreaks on four sites over three growing seasons. In seven out of nine cases, the net effect of windbreaks on production was negligible with the yield variation in the shelterbelt zone generally decreasing in wetter years.

Take Home Message: Windbreaks increase crop yields in parched seasons while doing no harm in normal and wet years.

Kort J. 1988. Benefits of windbreaks to field and forage crops. Agric Ecosyst Environ. 122(23):165-191.

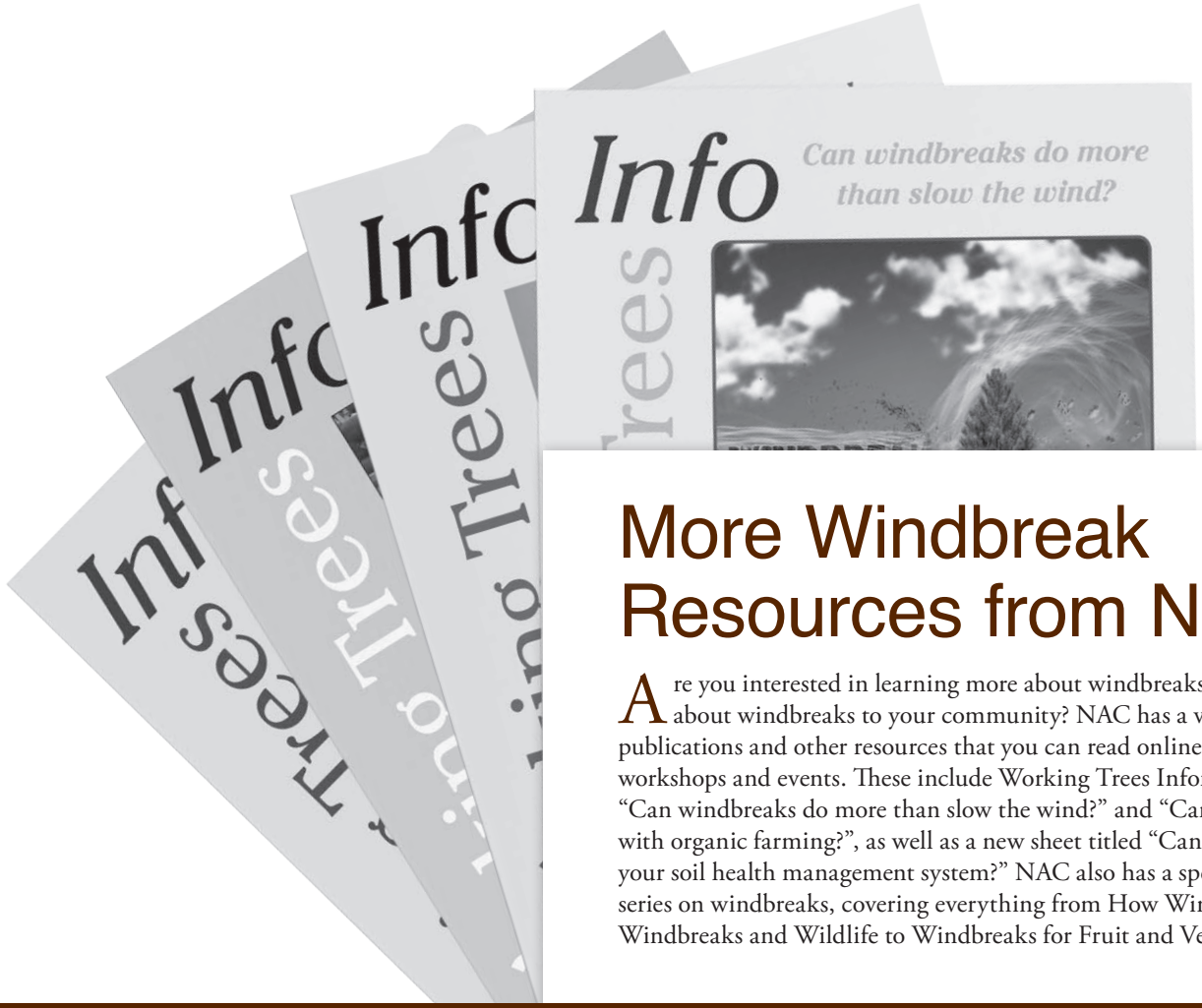
Rivest D, Vézina A. 2015. Maize yield patterns on the leeward side of tree windbreaks are site-specific and depend on rainfall conditions in eastern Canada. Agroforest Syst. 89:237-246.



Conserving the Dust Bowl:

The New Deal's Prairie States Forestry Project

The Prairie States Forestry Project was an innovative approach to conservation initiated by President Franklin D. Roosevelt in 1933 with the goal of creating a "Great Wall of Trees" across the Great Plains. Sarah Thomas Karle and David Karle recently published a book describing this innovative time and the agroforestry efforts carried out throughout the region titled *Conserving the Dust Bowl: The New Deal's Prairie States Forestry Project*, published by the Louisiana State University Press. This book describes the economic, environmental, and social factors that led to the Dust Bowl and Great Depression and how conservation-focused projects, such as the Prairie States Forestry Project were used to create jobs and reduce soil erosion.



More Windbreak Resources from NAC

Are you interested in learning more about windbreaks or providing materials about windbreaks to your community? NAC has a variety of windbreak publications and other resources that you can read online or order for use at workshops and events. These include Working Trees Information Sheets titled "Can windbreaks do more than slow the wind?" and "Can windbreaks help with organic farming?", as well as a new sheet titled "Can windbreaks benefit your soil health management system?" NAC also has a special 12 brochure series on windbreaks, covering everything from How Windbreaks Work to Windbreaks and Wildlife to Windbreaks for Fruit and Vegetable Crops.

To learn more, visit https://nac.unl.edu/practices/windbreaks.htm

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Upcoming Events

November 3, 2017
Using the NTFP Calculator
Webinar
www.nemaagroforestry.org/webinars

November 15th, 2017
Agroforestry Technical Tour - SAF
Albuquerque, NM
http://bit.ly/2gIjHhG

November 28-29, 2017
Green Lands, Blue Waters
Madison, WI
https://greenlandsbluewaters.net

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

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USDA National Agroforestry Center

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. NAC's staff is located at the University of Nebraska, Lincoln, NE. NAC's purpose is to accelerate the development and application of agroforestry technologies to attain more economically, environmentally, and socially sustainable land use systems by working 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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