

Silvopastures: Silvo-WHAT NOW?
By: Matthew Brinckman, Virginia Tech

The first part of the word, silv, is a Latin root meaning forest. The second part of the word, pasture - well we all know what that is. More specifically, silvopasture is an agroforestry practice that intentionally integrates trees, forage crops, and livestock within one management system to enhance diversity and overall productivity. This means that plants and animals are managed intensively on the same piece of land to sustainably produce wood products, high quality forage, and healthy livestock. The benefits of silvopastures to landowners include multiple marketable products, resource conservation, and ecosystem services.

Silvopastures are one of the most frequently asked about agroforestry practices in the South. While some Virginians practice what is known as integrated forest grazing by allowing livestock access to browse in wooded areas, it is important to note that silvopastures are different. They require greater initial investment and constitute an active and simultaneous combination of tree, livestock, and forage tending via silviculture, animal husbandry, and forage crop and soils management.

Thoughts about Establishing and Managing Silvopastures

Silvopastures are complex. It is necessary to carefully consider the types of livestock, forage, and trees that are best suited to a landscape's characteristics and a landowner's objectives. Soil productivity and structure, climate, slope, landscape position, and the way the trees, forage, and animals will interact are important considerations. For instance, you may want to manage for a grass that will produce well in your climate while also tolerating the amount of shade anticipated from your trees. Timing is equally important. Most trees likely need a few years to establish before livestock are introduced. How a silvopasture is arranged is another important aspect. It is common to plant trees in rows to allow for equipment to move through easily and to minimize shade to the forage. Often, trees are placed in strips made up of two or three rows of trees, with a wide stretch of forage in between. Finally, markets must be kept in mind. Choosing both animals and trees that have stable, local markets will help increase your bottom line over the long run.



Examples of silvopasture systems. From left: cattle graze under planted pines; sheep resting under hardwoods in an agroforestry trial at Virginia Tech's Kentland Farm; and a watering trough for livestock amidst planted pines. Photos courtesy of the National Agroforestry Center (left and right) and John Fike (center), Virginia Tech.

Researchers at Virginia Tech are currently studying the long-term opportunities associated with silvopastures at the University's Kentland Farm near Price's Fork. Trials involving sheep, native forage species, and honeylocust millwood-hybrids and black walnut trees are being evaluated. The locusts and walnuts in the study were planted in the mid-1990's using several different spacing arrangements. The millwood-honeylocust produce pods that make an ideal late-season forage for the sheep and do not grow many thorns, while the black walnut trees produce valuable wood and nuts that can be harvested by the farmer for personal use or sale. Black walnut and honeylocusts also leaf out late in the spring and are some of the first trees to drop leaves in the fall, thereby increasing the amount of sun available to forage crops and thus the volume beneath the canopy.

Opportunities to Learn More about Silvopasture in Virginia

Opportunities to learn about agroforestry practices like silvopastures are increasing. Silvopasture workshops were recently offered in New York and North Carolina, while plans to do the same in Virginia are underway.

Federal incentive programs such as the Farm Bill's Environmental Quality and Incentives Program (EQIP) and the Forest Land Enhancement Program (FLEP) are also helping landowners establish and manage silvopastures. At a state level, Pennsylvania's Natural Resource Conservation Service (NRCS) now includes program incentives specific to benefits of silvopastures both in terms of the benefits to a particular landowner and benefits that spread beyond an individual's land such as carbon sequestration, water quality, wildlife habitat, and overall ecosystem health. If you are interested in silvopastures, check with your local Extension agent or forester to see if any programs are available in your area.

While establishing a silvopasture can be complicated at first, there are many resources available to educate yourself. Resources include:

- Establishment of Silvopasture in Existing Pastures by Jarek Nowak, Alan Long and Ann Blount: <http://edis.ifas.ufl.edu/fr145>
- Agroforestry Notes: From Pine Forest to A Silvopasture System by the USDA Forest Service: http://www.sref.info/resources/publications/print_pubs/pub_604/?searchterm=None
- *North American Agroforestry: An Integrated Science and Practice* by H.E. Garrett, W.J. Rietveld, and R.F. Fisher.

Silvopastures can be rewarding and profitable - consider giving it a try on your land today!

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An Update on Agroforestry
By: John Munsell, Virginia Tech

In June 2011, Kathleen Merrigan, Deputy Secretary for the US Department of Agriculture and architect of the "Know Your Farmer, Know Your Food" program, personally unveiled a strategic framework to advance the science and adoption of temperate agroforestry. The framework was developed by an interagency team over the course of a year and is available at: http://www.usda.gov/documents/AFStratFrame_FINAL-lr_6-3-11.pdf. On the whole, it positions agroforestry as a critical piece in advancing local and regional food, fiber, and energy systems and spurring economic opportunities. The framework calls for integrating agriculture and forestry. In doing this, it is possible to build sustainable and highly productive land management systems that are buffered because of product diversity and also provide wildlife habitat, protect water resources, improve air quality, sequester carbon, and ensure recreational and cultural opportunities.

Agroforestry? It is defined as the deliberate combination and management of trees, crops, and livestock to enhance and diversify production and improve conservation. Agroforestry is not accidental or singular, but intentional and integrative. It is not Christmas tree plantations or cattle wandering through a forest. Rather, it is the integration of multiple crops on the same landscape, all of which are managed together over time in an intensive fashion. So in line with the distinction above, agroforestry would be the purposeful management of both cattle and tree plantations on one plot of land. Complex? Yes, but if the right crops, trees, and livestock are used the system as a whole can be highly productive over time.

Five specific practices are typically associated with temperate agroforestry. Windbreaks are rows of trees that provide shelter to crops and livestock and can positively alter microclimates to improve production. Agroforestry riparian buffers consist of trees, woody shrubs, and grasses next to water bodies and are actively managed to produce crops according to conservation guidelines. Silvopastures integrate grazing and forest stand management, which can be achieved by modifying an existing stand or planting and tending trees in a pasture-based system. Forest farmers cultivate and harvest non-timber forest products in wooded areas, which can require both agricultural and forestry practices to establish and tend the non-timber crop. And alley cropping systems are designed to grow produce between rows of trees. For more details on each practice, please visit the US Department of Agriculture's National Agroforestry Center website at <http://www.unl.edu/nac/index.htm>.

This issue of Virginia's Forest Landowner Update focuses on two applications of agroforestry. In keeping with the newsletter's "You Ain't From Around Here" series, Marrisja Jager covers the use of agroforestry to control Chinese privet and other invasives. Matt Brinckman provides an overview of silvopastures, a much-discussed agroforestry practice in the eastern US. While not in this issue, Katie Trozzo and others describe agroforestry riparian buffers that use fruit and nut trees that are native to Virginia (see the Virginia Forest Landowner Update Volume 25 No. 1, Winter 2011 at: <http://bit.ly/uSth6w>). Additional information can be found in the 2009 spring issue of *Virginia Forests*, a publication of the Virginia Forestry Association, which was titled Agroforestry in the Commonwealth. Also, the University of Missouri's Center for Agroforestry maintains a useful website that is worth a visit (<http://www.centerforagroforestry.org/>).

Lastly, agroforestry workshops and training opportunities, in conjunction with Virginia State University's new forestry Extension Specialist, Greg Frey, are on the horizon in Virginia. Stay tuned to future editions of this newsletter, as well as the Events Calendar on the Virginia Forest Landowner Update website (www.cnre.vt.edu/forestupdate) for upcoming programs.






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Useful Resources

- Show your love for trees with the Virginia Loves Trees specialty plate! Pre-sale applications available at www.valovestrees.org
- The Virginia Department of Forestry has published the 2011 State of the Forest report. This publication is chock-full of interesting and useful information about Virginia's forests. Download it free from: <http://www.dof.virginia.gov/resources/pub-2011-State-Of-Forest.pdf>
- Just removed some exotic invasives from your property? Looking for native plants to reclaim the site? Check out the U.S. Fish & Wildlife Service's *Native Plants for Wildlife Habitat and Conservation Landscaping: Chesapeake Bay Watershed*. Download it for free at: <http://www.nps.gov/plants/pubs/chesapeake/>
- Virginia forests share a lot of the same management issues with North Carolina's forests. You can read the NC Forest Stewardship newsletter at: <http://ncforests-service.gov/fsandfl/PDF/stewardshipFall2011.pdf>



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EVENTS CALENDAR			For the most complete listing of natural resource education events, visit the on-line events calendar at www.cnre.vt.edu/forestupdate		
Contact	Date	Location	Event	Time	Fee
DCR	Jan., Feb., & Mar.	Virginia State Parks	A variety of events and activities. For a complete list, visit: www.dcr.virginia.gov/parks .	Varies	Varies
MP	Year-round	State-wide	Virginia Master Naturalist Volunteer Basic Training People interested in becoming a Virginia Master Naturalist volunteer should visit http://www.virginiamasternaturalist.org/chapters.html .	Varies	Varies
BT	Jan. 17	Queenstown, MD	Timber Tax Workshop This program will focus on record keeping, how to handle cost share payments, how to report timber sales and capital gains and ways to treat casualty losses on your forest lands.	6:30 - 9	\$10
PO	Feb. 4	Culpeper	Going Wild in Your Backyard! Join the Old Rag Master Naturalists at their open house at Eastern View High School to learn about providing wildlife habitat on small and large properties. Natural resource professionals from more than 20 conservation organizations will be on hand to provide information.	10 - 4	Free
DR	Feb. 9	Galax	Timber Tax Workshop - Landowners This program will focus on record keeping, how to handle cost share payments, how to report timber sales and capital gains and ways to treat casualty losses on your forest lands.	4:30 - 8	\$20*
DR	Feb. 10	Abingdon	Timber Tax Workshop - Forestry Professionals & CPAs This advanced program will focus on record keeping, how to handle cost share payments, how to report timber sales and capital gains and ways to treat casualty losses on your client's forest lands. Continuing education credits will be available.	9 - 4	\$45*
AD	Feb. 18	Manassas	9th Annual Landowners Woods & Wildlife Conference Join Virginia Cooperative Extension for a full day of presentations and workshops geared to help both large and small acreage landowners become better stewards. On-line registration available at: www.cnre.vt.edu/forestupdate .	9:00 - 4:45	\$45/person; \$80/couple*
JG	Feb. 23 Feb. 28 Mar. 13	Powhatan Abingdon Fredericksburg	Real Forestry for Real Estate If you sell rural lands or work with rural landowners, this 8-hour class will teach you how to determine land use history and site quality, tree ID, the value of forests, and more. Approved for 8 PLE/CE/Appraisal CE credits/1 COR CE Credit.	8:30-4:45 8 - 4:30 8 - 4:30	\$25* \$25* \$45*
JG	Mar. 5	On-line	On-line Woodland Options for Landowners Registration opens Jan. 2. Learn the basics of forest management, from setting goals and objectives to developing a management plan in this 12-week class.	NA	\$45/family
DR	Mar. 8	Galax	Estate Planning for Forest Landowners Part I Learn how to effectively plan for the future ownership of your forestland.	2:30 - 7	\$TBD*
LD	Mar. 17	New Kent	Walk in the Woods Take a walk in the woods with forestry professionals at the New Kent Forestry Center.	Free	10:00

*REGISTRATION FEE INCLUDES LUNCH and/or DINNER

EVENT CONTACTS

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You Ain't From Around Here! Exotic Invasive of the Quarter: Chinese Privet (*Ligustrum sinense*) By: Marissa Jager, Virginia Tech

This winter, the Virginia Forest Landowner Update is focusing on agroforestry. Agroforestry is a land management system in which crops or livestock are combined with trees in order to maximize benefits to all the species, with sustainability being the ultimate goal. Chinese privet (*Ligustrum sinense*) is the invasive of the quarter because it is a species that can potentially be controlled using agroforestry practices. These practices could provide a means for long-term suppression of invasive plants and restoration of native communities.

Chinese privet is native to Asia and was introduced to the United States in 1852 for use as an ornamental shrub. It has since invaded Virginia, Georgia, Kentucky, North Carolina and Tennessee. This shrub has been widely used as a hedge because of its fast growth, low maintenance, and attractive flowers. Unfortunately, it can easily take over the ground cover in forests and on disturbed sites. The greatest threat is that it displaces native vegetation and hinders seedling regeneration, resulting in alteration of the ecosystem.



Chinese privet fruits. Photo by: Ted Bodner, Southern Weed Science Society.

This persistent plant is tolerant of many sites, but prefers wet, damp conditions. Most often it is found in bottomland forests, riparian areas and abandoned fields. It has been known to grow as tall as 30 feet, but typically is between 5 to 12 feet tall. Chinese privet produces multiple stems which gently arch in all directions. This species is considered to be semi-evergreen because it retains some of its leaves throughout the winter, giving it a competitive advantage over many native plants which are dormant in the winter. And, prolific sprouting and birds, which gobble up its berries, help spread this plant far and wide.

Despite its status as an invasive species, Chinese privet is sold widely in the nursery and gardening industry. Because of its invasiveness in the southeast, planting is not recommended in this region.



Variations in Chinese privet leaf sizes. Photo by: Karan A. Rawlings, University of Georgia.

How to identify Chinese privet:

Leaves: Opposite, simple, ovate and 1 to 2 inches long; the upper surface appears glossy and the underside is pubescent (fuzzy) and whitish.

Stem: Densely covered in hairs that protrude at a right angle from the stem.

Flowers: White to cream colored; tube like shape; occur in terminal clusters; blooms June to July.

Fruit: Blue to purple and less than a quarter inch in diameter; mature late summer-early fall and persist through winter.

How an agroforestry system can control Chinese privet:

Long-term weed control usually requires active suppression. Common suppression tactics include mechanical or physical removal of invasive plants and/or chemical treatment. Agroforestry practices can serve both as a means of restoring natural ecosystems and long-term suppression of future infestations. Implementation of such systems would first require the removal of the invasive, but would decrease or eliminate the need for subsequent treatments.

Black walnut, a common species used in agroforestry, is mentioned in each of the following control methods because it has a competitive advantage over privet. Black walnut roots exude an allelochemical, called juglone, which inhibits the growth of some species, including Chinese privet. An **allelochemical** functions

similarly to an herbicide, but it is produced naturally by a plant. Other allelopathic trees include honey locust, black locust and American sycamore, but they do not exhibit as high concentrations of their allelochemical. Many invasive plants are also allelopathic, but Chinese privet is not.

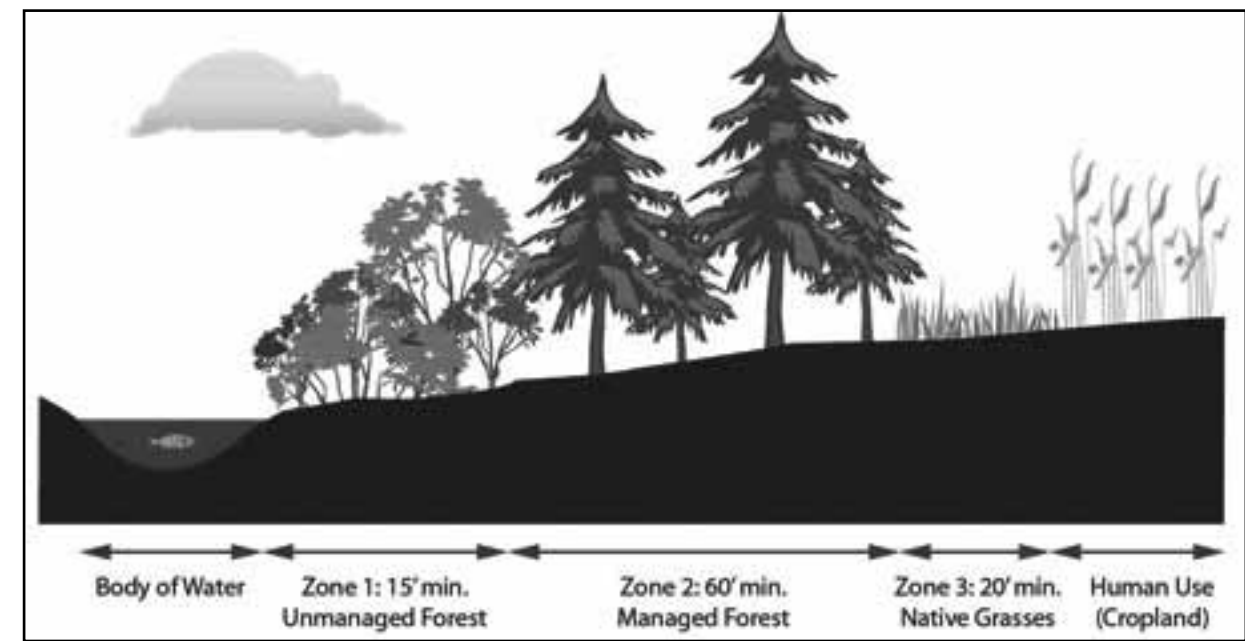
Common places where privet invades, and agroforestry solutions to kick privet out:

Invaded Space 1 - Riparian Areas: Many plants like the fertile soil located in riparian areas (areas adjacent to a body of water), including crops and invasive plants. However, crops and invasive plants often have shallow root systems which do not help improve water quality

Chinese privet cont. from page 3

like forested buffers do. Forest vegetation in riparian areas maintains high water quality by reducing sedimentation, filtering nutrients and toxins and regulating stream temperature.

Agroforestry Solution-Riparian Area Restoration: Reintroducing native species in a riparian buffer is a viable solution to excluding some invasive plants like Chinese privet. Inclusion of trees that exude allelochemicals increases the capability of this proposed solution. The figure below depicts a typical three-zone multi-species buffer strip plan that will protect the stream from nutrient and sediment runoff, provide wildlife benefits and exclude invasive plants. Zones 2 and 3 of the buffer can be managed for products that provide an economic return such as timber, fruit, nuts, woody florals or a combination of products.



USDA 3-Zone Buffer Planning Model. Source: Virginia Outdoors Foundation.

Invaded Space 2 - Abandoned Fields: Chinese privet will readily occupy abandoned crop land and take over. There are several agroforestry practices that could potentially control invasive plants by way of competitive exclusion and allelochemicals. The **competitive exclusion principle** states that two similar species competing for the same resources cannot stably coexist. In agroforestry this principle is usually applied by designing a system of plants that complement each other and exert minimal competition so a stable coexistence can occur. In the case of excluding unwanted plants, efficient utilization of resources by the crop plants leads to competitive exclusion of the invasive plants.

Agroforestry Solution-Alley Cropping: Alley cropping is planting trees in widely spaced rows with a companion crop grown in the alleyways between the rows. Alley cropping in the United States and elsewhere is often considered a good means of restoring soil fertility in a degraded landscape. It is also a way to diversify farm income, improve crop production and provide conservation benefits. Common alley crops include wheat, corn, soybeans or hay. Black walnut is an ideal alley cropping species because its wood is highly valuable and its nuts are also marketable. An alley cropping system very efficiently uses resources, and leaves little room for outside intruders. The presence of juglone in the system would also suppress the re-invasion of Chinese privet.

The use of agroforestry and allelopathy as a means to control invasive species is a budding science in need of further research. Research conducted by the University of Hawaii has had success in restoring a natural ecosystem by way of agroforestry practices. University of Georgia is conducting a study on silvopasture as an invasive control measure for Chinese privet on its campus. Many scientists are researching allelopathy in hopes that it could be harnessed as a natural alternative to herbicides.

Agroforestry offers many benefits, including economic returns and conservation value. It also has the potential to successfully restore native ecosystems and suppress exotic invasive plants like Chinese privet.

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