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Establishing Silvopasture in Existing Woodland

Silvopasture is an agroforestry practice that integrates trees, forage, and livestock on the same site and manages the system to protect the environment. If you have woodland on your farm and are interested in converting it to silvopasture, there are several important decisions you need to make. This way of establishing silvopasture is sometimes also called "silvopasture by subtraction" (as opposed to planting trees, or "silvopasture by addition"). With silvopasture by subtraction you don't have to wait several years for trees to grow enough to provide shade, and you typically don't have to protect young trees. But there are some special management considerations.

Understand the potential and value of your existing woodland

Even though the woodlands on your farm do not generate annual income, they may have significant value. A forester can assess the **timber potential** of your site, and you can request a free initial site visit from your county Department of Natural Resources forester. In some cases, livestock pressure may affect the wood quality of even mature trees, so it is a good idea to understand the potential value and vulnerability of the trees on your site before deciding to introduce livestock.

In many cases, farm woodlands do not have much timber potential in the near term, but they still have **recreational or ecological value** that could be impacted by livestock. If there are plants or wildlife in your woodlands that you care about, consider how silvopasture management would affect them. Some animals like deer and turkeys thrive in a silvopasture environment, but other woodland species like wood frogs or lady's slippers probably do not. It is also a good idea to avoid livestock impact in **critical and sensitive areas** such as wetlands or on very steep slopes.

Photo Credit: Diane Mayerfeld, UW-Madison Extension

In general, types of woodland likely to be suitable for conversion to silvopasture include:

- Pine or other softwood plantations
- Woodlands that have been degraded by poorly managed logging or grazing in the past
- Oak savannas that have become overgrown
- Woodlands that have been heavily damaged by storms, insects, and/or disease.

Determine how silvopasture will fit into your overall grazing plan

If you have determined that your woodland is suitable for conversion to silvopasture, the next step is to list your goals for the silvopasture, and how it will integrate with the rest of your farm. Different goals require different design and management, so you may also want to rank your goals so you know which to prioritize. For most livestock farmers, providing shade in summer is a primary goal; other goals might include having tree fodder for emergency forage, tapping trees for syrup, savanna habitat restoration, harvesting firewood or timber, or other uses that could affect management.

Author: Diane Mayerfeld **Review and Design**: Jason Cavadini, Natasha Paris, Ariana Abbrescia, and Matt Wilson
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Extension
UNIVERSITY OF WISCONSIN-MADISON

Determine what trees to remove and how you will remove them

In most cases your woodland will have too much shade for silvopasture, and you will have to remove some trees and/or shrubs to establish a good forage layer. You want to **aim for 25% to 40% canopy cover** when you are done thinning. There are two sources of uncertainty to keep in mind when planning how heavily to thin the stand. The first is that after thinning, trees will be **more susceptible to wind damage** because they will no longer be protected from the wind by their neighboring trees, but they won't have the strong trunks and root systems that open-grown trees develop. The second consideration is that when trees have more room around them, they usually respond by **growing the size of their canopy**. Depending on how great the risk is of wind damage on your site, and on your tree species, you may decide to thin closer to the 40% or the 25% target.

Your goals and the nature of the existing site will determine which trees and shrubs you decide to keep or remove. For example, if your site has healthy black walnut or oak trees with good form, you may want to take a **"crop tree" approach** to thinning, where you work with a forester to identify the trees with the best timber potential (your "crop trees") and remove trees that are competing with those crop trees that you want to keep. Black walnut and oak tend to have deep root systems and their wood is thought to be less sensitive to livestock impact than species such as sugar maple. Ideally, with a crop tree thinning approach your best trees will be evenly scattered across the site in a thinning plan like that in Figure 1.

If your woodland is a plantation with trees in rows, or if your trees do not have high timber value, it may make sense to take a **"patch tree" thinning** approach, creating alleys of open pasture between rows of trees. The advantage of this approach is that it is easier to manage the forage layer once the stumps are gone if there are clear alleys between the rows of trees. This version of patch tree thinning might look like that in Figure 2.

Figure 1: Top-Down Schematic of Crop Tree Thinning. Crop trees are marked "C", and the white outlines show the trees to be removed.

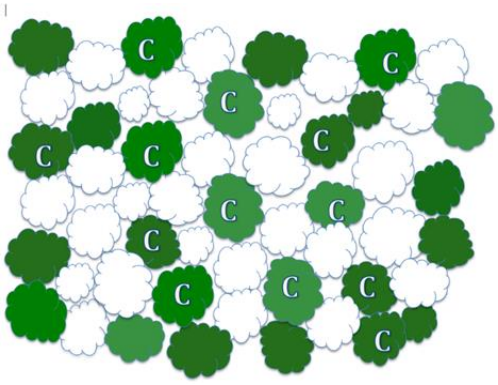
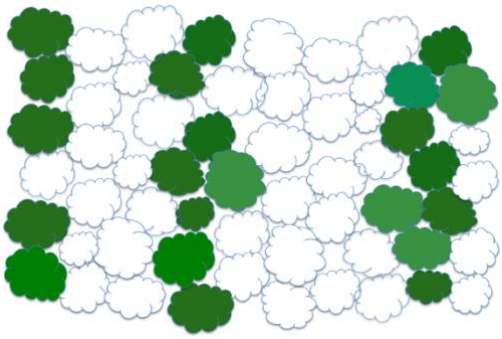


Figure 2: Top-Down Schematic of Patch Tree Thinning



Depending on your goals and site, you might be able to combine elements of both approaches: put in open pasture alleys where there are fewer high-quality trees. Whichever approach to thinning you choose; it is critical to make sure the people removing the trees know which trees to cut and which to leave. If your stand has marketable trees, you can hire a logger to harvest the trees and transport them to a buyer, and you can get paid for the trees you sell. However, in areas that do not have nearby paper mills it may be hard to find buyers unless you have a large stand of desirable trees with good form. Where there is not a local pulp market you may have

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to pay to have the trees cut and may have to get creative about selling or using the wood.

Manage the details of thinning

A forester can help ensure that the thinning goes as smoothly as possible, but here are a few key considerations to keep in mind:

Choose Proper Timing for Thinning Operations: The heavy equipment needed to remove trees can disturb and compact soils, so you want to time thinning operations for when the ground is either frozen or dry. In addition, if there are oaks on the site, thinning during spring and summer can spread oak wilt. It is a good idea to consult a forester about any other insect or disease risks for your area that the thinning plan should consider.

Designate Protected Areas: Identify any areas you want to protect, and make sure the loggers have a plan to minimize impact there.

Managing Slash: Even if there is a local market for the trees, there is no market for the branches, and there will be a lot of them covering the site after thinning. Arrange with your logger ahead of time what you want done with the non-marketable treetops and branches, also called slash. One strategy is to pile this woody debris in long rows or in piles where it will not impede movement. After a few years the slash will decay, but until then it may occupy up to a quarter of the site, depending on how many trees are removed. You can also chip the debris, which will help it decompose faster, but may also make establishing a forage stand more challenging. Although the slash can be a nuisance, it contains valuable organic matter, so burning it is not recommended.

Managing Brush: If there is a lot of brush on the site, consider brush management in addition to thinning. While intensive grazing techniques can help with brush management, most livestock are more likely to browse young resprouts than mature buckthorn, prickly ash or other invasive shrubs. Using livestock to manage brush without damaging a site typically takes years of intensive grazing management. You may want to consider having a forestry mower clear areas of mature or dense brush to improve access for planting the forage layer.

Establish the forage layer

Planting improved forages soon after thinning can help keep unwanted species from taking over the site. Some common woodland understory species such as white snakeroot and bracken are toxic, while other species may be thorny, unpalatable, or simply poor forage. For more information on managing toxic and invasive species see the Renz weed management website.

As with any pasture establishment, planting at the right time (late summer or spring), providing adequate fertility, and ensuring good seed to soil contact are critical factors for success, but there are some additional challenges to planting in thinned woodland. In most cases the stumps and trees will prevent drilling of the seed.

One seeding option is to broadcast seed with an ATV. Some farmers have had success establishing a forage stand in silvopasture by unrolling bales that contain seeds in the thinned woods. As the cattle eat the hay, their hoof action also helps provide seed to soil contact. Drone seeding may work in woodlands that have been cleared to a low stand density with clear alleys, but this approach is still experimental.

When selecting forage, you will want to consider species that tolerate shade and are suited to your site's soil types. Orchardgrass, meadow fescue, and festulolium tolerate shade relatively well. Kentucky bluegrass is another species that does well in shade. It has a sod-forming growth habit in contrast to the bunch growth habit of the other species mentioned above. While Kentucky bluegrass produces less biomass than the other species, it complements them well by filling in the gaps between bunches, preventing both erosion and encroachment of unwanted species.

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Manage grazing

While managing stocking, forage use, and recovery periods is the foundation of any grazing system, silvopasture systems can be particularly vulnerable to overgrazing. Typically, forages grow more slowly in shade, so silvopasture requires longer rest periods than open pasture. Forage stands are also less dense under shade, which needs to be taken into consideration when planning stocking density and duration of a grazing event.

When a farm has limited shade, it can be tempting to overuse silvopasture areas, leading to problems such as soil compaction, erosion, tree damage, and even livestock mortality if there are toxic species and insufficient good forage on the site. Thus it is important to be clear on how you will prevent overgrazing of your silvopasture, and to have alternative options for managing heat stress when the duration of hot weather exceeds the capacity of the farm's silvopasture.

One strategy to reduce overgrazing of your silvopasture is to delay grazing those paddocks until hot weather – or conduct the first grazing early enough so the forage has ample time to regrow before hot weather is likely. It is also best to keep livestock out of silvopasture paddocks when it is wet, as animals tend to congregate under trees in the rain, and the lower density of forage under the trees is especially sensitive to trampling in wet conditions. Finally, if you do not have alternative options for managing heat stress when the duration of hot weather exceeds the capacity of the farm's silvopasture, providing supplemental hay in the silvopasture paddock may help protect the site.

Even a very small branch can ground electric fences or bring down temporary polywire, so it is critical to inspect fencing under trees frequently, particularly after storms.

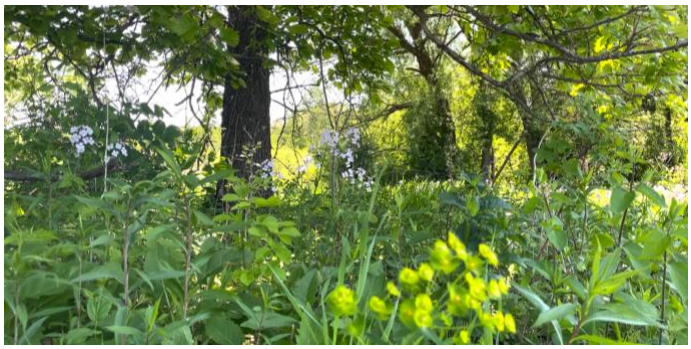

Photo Credit: Ariana Abbrescia, UW-Madison Extension

Conclusion

In the right circumstances converting woodland to silvopasture can increase farm resilience, improve animal welfare, and provide a range of other benefits. However, careful management is needed to prevent the environmental problems that have often been associated with letting livestock into the woods. Because of the history of degradation resulting from poor management of woodland grazing, the Natural Resources Conservation Service in Wisconsin does not offer financial or technical assistance for converting woodland to silvopasture. Nevertheless, increasing numbers of grazing educators, farmers, and even some foresters are cautiously looking at establishing silvopasture in certain types of existing woodlands. Check with your local grazing network, the Savanna Institute, or join the Wisconsin Silvopasture google group to find others who have explored this practice. This factsheet can also help you decide if silvopasture by removal is a good idea for your farm.

For more information

The National Agroforestry Center website has a number of silvopasture resources, including this article on converting woodland to silvopasture.

The University of Missouri Center for Agroforestry website offers a variety of agroforestry resources, including a Handbook for Agroforestry Design.

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