

2020 Northeast Pasture Consortium Conference Proceedings January 15-16, Lake Morey Resort, 82 Clubhouse Road, Fairlee, VT

Session 3 - The Do's and Don'ts of Silvopasture

This session was moderated by Daimon Meeh, USDA, Natural Resources Conservation Service, Dover, NH. He put this session together as he felt as others have in the Agency that some land-owners had a misconception of what silvopasture is. He arranged to have three speakers address this issue so people will better understand what is involved in practicing real silvopasture management.

The first speaker was Kate MacFarland, Assistant Agroforester, USDA National Agroforestry Center, Burlington, VT. Her presentation was entitled: "Silvopasture: Site and Management Considerations". Kate began her presentation with a definition of silvopasture. Silvopasture is an agroforestry practice that intentionally and sustainably produces trees (or shrubs), forage, and livestock in a single integrated system. The USDA-NRCS Conservation Practice Standard 381 for silvopasture defines it further as "Establishment and/or management of desired trees and forages on the same land unit". There are two paths to silvopasture:

- **Pasture to Silvopasture:** trees are deliberately introduced or enhanced to a forage production system
- **Forest to Silvopasture:** forage crops are deliberately introduced or enhanced in a timber or tree crop production system.



Forest to silvopasture with grass introduced



Pasture to silvopasture with rows of trees introduced and protected from grazing and trampling

Two definitive characteristics of silvopastures are:

1. Management of the livestock type, timing, and impact maintains forage and tree health and rooting zones that stabilize soil in silvopastures.
2. Trees are actively cultivated in silvopasture systems and stem density is controlled to encourage forage and tree vigor.

In order to effectively do the first characteristic, **long rest periods** are needed in the Northeast. Often livestock are only in a silvopasture for a few days (1-7) over the course of a growing season. This has to be done to protect the tree rooting zone, its trunk, and any lower branches until sufficient tree growth is achieved to have enough canopy for vigorous photosynthesis. Silvopasture requires both grassland expertise and forestry expertise to be effectively managed.

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Silvopasture is not:

- Single trees in pastures
- Turning livestock into the woods
- “Feedlots with trees”

Why not? Problems with root compaction, tree girdling, soil degradation, and livestock parasite problems.



Picture on the left was taken in early spring and the cattle are already seeking out shade wherever a lone tree stands. This is particularly the case where endophyte-infected tall fescue is dominant in the grass stand. This is not silvopasture because the trees will never be of merchantable value and may die from root compaction or girdling anyway. Often times animal wastes accumulate here concentrating nutrients under or near trees and lessening deposition in the open grassy areas, over-fertilizing trees and under-fertilizing grass.



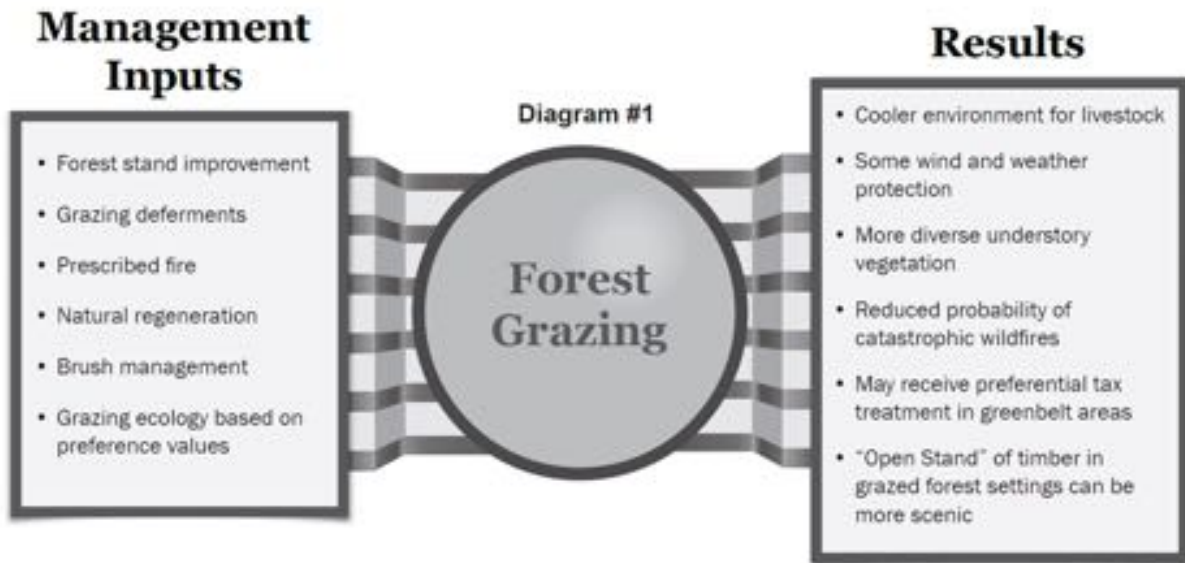
This picture is a forest with virtually no forage base after repeated long term grazing and occupation by cattle. The mature trees are still alive, but there are other examples in the Northeast Region where many mature trees die from too much traffic compaction and root and bark damage.



This is definitely a pig feedlot with trees. No understory to eat so all the feed eaten comes from hauled-in feed. This area most likely is adjacent to an open bare ground feedlot where the feed can be easily put out for the pigs. This is done for pig comfort alone; therefore, it is not silvopasture. There is no forage base. The trees are being severely stressed and eventually, one by one, they will die.

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Silvopasture is not forest grazing, which often has the goal of supporting the native ecosystem. Forest grazing was what Phil Race was doing on his farm's woodlot.



Steps needed for turning pasture to silvopasture

1. Gather a team of people with the right expertise.
2. Assess the site.
3. Select trees appropriate to site conditions.
4. Make sure these trees also meet manager goals: produce a light shade, produce desired products (nuts, timber, syrup), high value, deeply rooted (lots of near or at surface roots not good, easily hurt by compaction and hoof damage).
5. Determine planting configuration: shade management, mowing, fencing, product growth and harvest.
6. Weed control: mechanical, herbicide, mulch, and
7. Protect trees from grazing animals until well-established and then graze rotationally on a one day – 3-day occupancy, and then use a long return interval.

Steps needed for turning forest to silvopasture

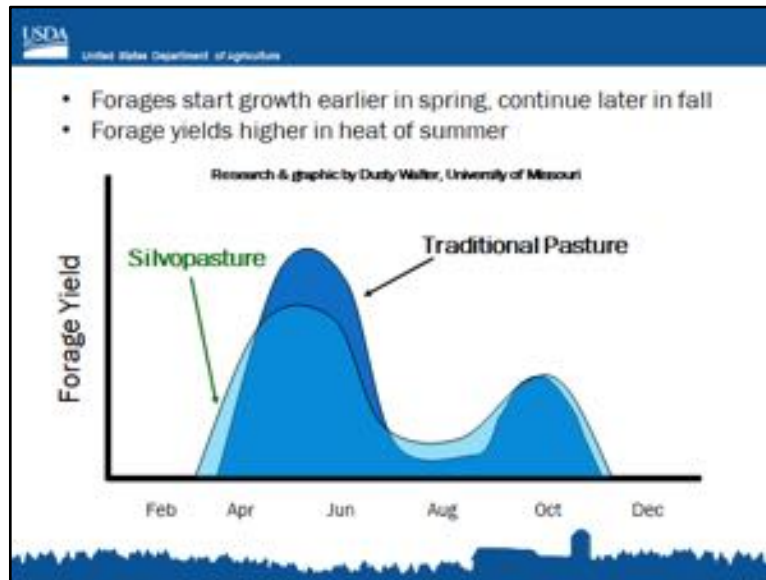
1. Gather a team of people with the right expertise.
2. Assess the site.
3. Select the highest quality trees to remain as crop trees (thin for quality).
4. Modify stand density to allow adequate sunlight to reach the ground (thin for light).
5. Meet the germination requirements for target forage species.
6. Manage the system to avoid negatively pressuring desirable plants and forage (seasonal short duration rotational grazing).

The benefits of silvopasture are the following:

- Incentive to manage woodlands, especially on farms
- Vegetation management: reducing invasive plant species threats

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- Aesthetically pleasing, important to landowners
- Management for forage can benefit trees
- Can support high quality forage and diversify animal diets
- Improve forage availability during the summer slump
- Improved nutrient distribution of animal wastes as area is shade neutral.



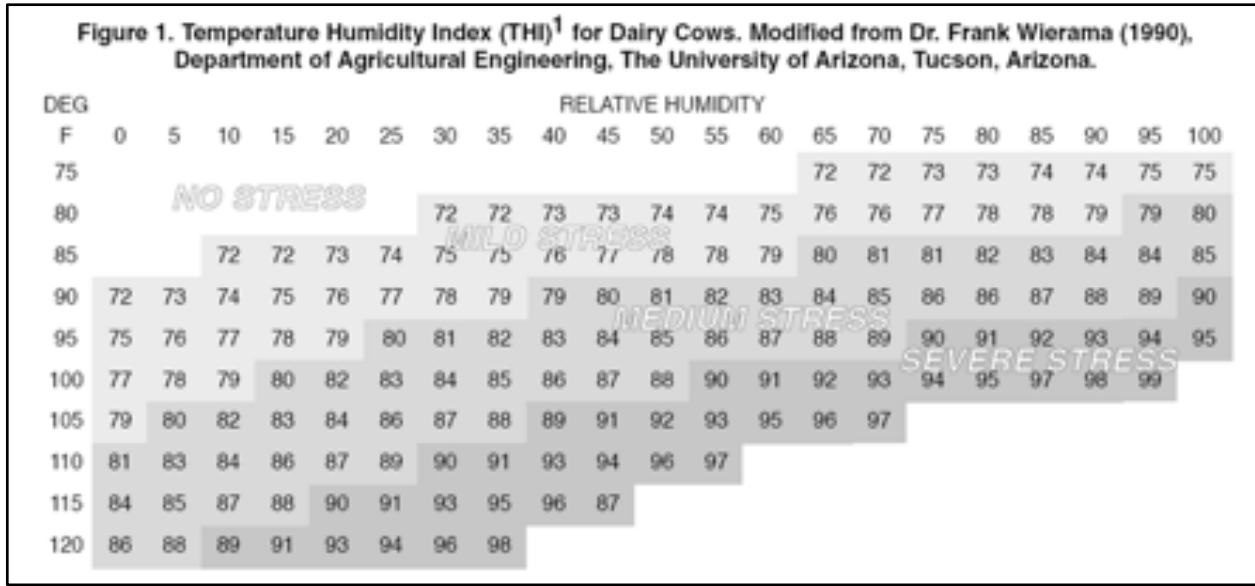
The livestock benefits of silvopasture related to reduced heat and cold stress are:

- Improved animal condition,
- Improved milk production,
- Improved breeding efficiency,
- Improved feed intake, and
- Improved weight gain.

Reduced heat stress: Shade is probably beneficial any time Temperature-Humidity Index (THI) is above 72, especially if livestock are grazing endophyte-infected tall fescue. Below is the temperature-humidity index chart that can tell the livestock producer when to stock livestock on their silvopasture acres.

(Editor's Note: In the eastern United States, it does not take a lot of humidity at high temperatures to cause livestock heat stress. At 80° F., 40% relative humidity yields at THI of 73. During the warmer months, average relative humidity levels are usually 55% or higher, such as at noon local time in July. If they seek shade, they eat less and drop in weight gain and milk yield.)

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The economic benefits of silvopasture are:

- Multiple use, multiple revenue,
- Short term and long-term income sources,
- Risk management: livestock and wood economic boom/bust cycles do not coincide (unlike crops and livestock), and
- Ease of harvesting timber when the time comes (can be felled and removed with less damage to surrounding trees and interference by them in the harvest operation).

The challenges of silvopasture are many:

- Without proper management, high risk of short- and long-term environmental failure,
- Not easy,
- Not right for many sites,
- Requires highly skilled managers and consultants,
- Silvopasture systems change over time requiring management changes,
- Forest regeneration (some solutions: long term livestock exclusion, linear fencing of tree rows or individual fencing of trees), and
- May have considerations for tax and land use programs.



In the picture to the left, individual trees that were planted in a pasture being converted to silvopasture were fenced to keep cattle away from them. This is not an easy task and must be looked after to make sure the fence has not been damaged and rendered useless or more harmful. Linear fencing of trees would not be feasible in a plantation setting as the pasture corridors would be very long and narrow, and a lot of fencing. Windbreak plantings spaced much further apart might be a better situation.

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Silvopasture site requirements should conform to these principles:

- **Site quality:** site capable of growing agricultural crops and/or quality timber.
- **Access:** Relatively easy to reach the location with materials, equipment, and livestock.
- **Erosion concerns:** Site can tolerate managed grazing during heavy rainfalls with negligible long-term impacts.
- **Hazards:** No significant risks such as deep gullies, flood-prone streams, etc.
- **Terrain/"fence-ability":** Site can be enclosed with a secure fence with minimal clearing and excavation.
- **Water:** Potable water is readily available on location for livestock.
- **Size/shape/location:** Area is adjacent to existing grazing operation, large enough to justify the investment in developing it, and a shape that allows for efficient fencing.

Silvopasture also requires a manager that:

- Is already comfortable practicing rotational grazing,
- Has the time/labor available to move animals often,
- Is comfortable working with a system that changes over time,
- Is willing to work without a recipe (adaptive management),
- Has a team: foresters need grazing knowledge and vice versa, and
- Likes working with and learning from others.



Acres of Forest Grazing in New England

State	Land in pasture	Woodland pasture	No. of farms using woodland pasture*	% of total pasture acreage that is woodland pasture
..... (Ac),				
Connecticut	72,018	21,081	1,056 (24)	29
Massachusetts	85,760	17,837	1,093 (59)	21
Maine	118,980	27,105	1,103 (58)	23
New Hampshire	46,446	12,447	706 (54)	27
New York	985,494	146,995	5,286 (186)	15
Rhode Island	10,098	2,281	198 (7)	23
Vermont	195,000	37,100	1,184 (68)	19
Region	1,513,796	264,846	10,626 (456)	17

Of total pastureland in the region, 1 in 6 acres (17%) is woodland pasture. In the New England states, the proportion of woodland pasture to total pasture area is more than 1 in 5 (22%). These data are from the Census of Agriculture, but the management of these pastures was not addressed (Viduck and Clark 2014).

* Number of farms self-identifying as practicing alley cropping or silvopasture management.

Drefice, J., and J. Carroll. 2016. Silvopasture, it's not a load of manure: differentiating between silvopasture and wooded livestock paddocks in the northeastern United States. *Journal of Forestry*. 2017.

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Examples of silvopasture include these choices:

- Introduce trees to a pasture,
- Introduce or enhance forage in a timber or tree crop system,
- Most people using silvopasture have some silvopasture pastures and some without trees: It is not all or nothing, and
- They stock with different kinds of livestock: cattle, goats, sheep, poultry, and other grazers.

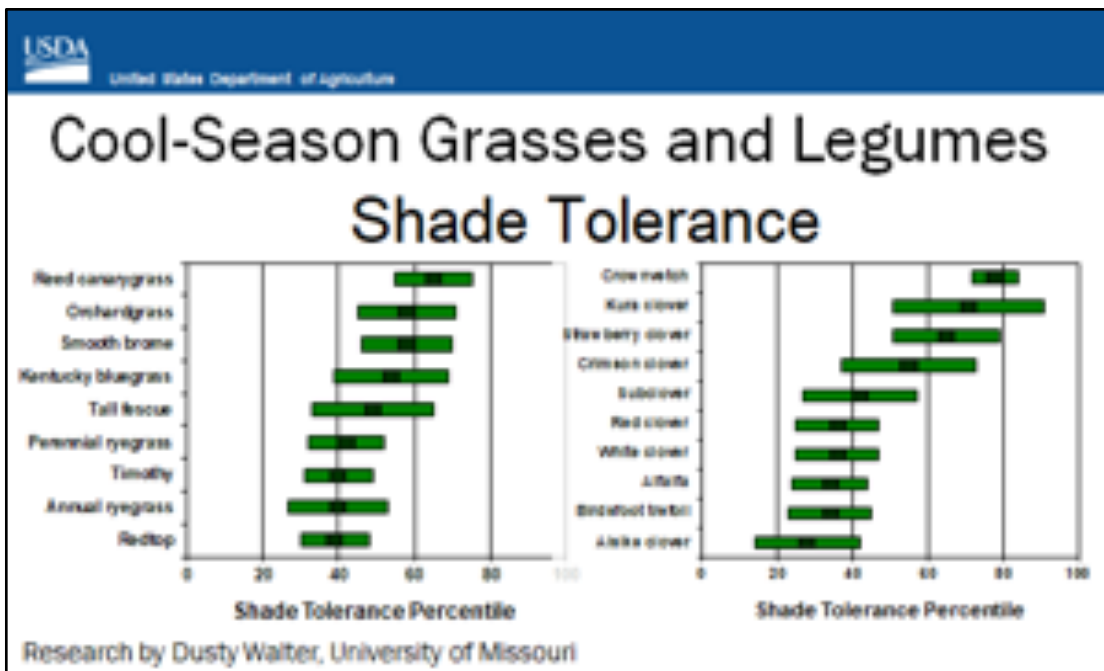
Kate listed some of her conclusions concerning the adoption of silvopasture:

- Opportunity for some but not all: sites and people,
- As in everything, site characteristics, design, and management matters,
- Start small, and
- We are still learning about how to best fit silvopasture to northeastern ag systems and forests – please learn with us. Recommends **Cornell Forest Connect website** for info.

Under 50% shade, cool season grasses and forbs (includes legumes):

1. Increase or maintain yield, and
2. Improve quality:
 - Reduced lignin and improved digestibility,
 - Increased, or no change, in ADF, NDF, CP, and
 - Improved N content (careful with this, can get too high as nitrate).

(Editor’s Note: Similar results were achieved at the Appalachian Farming Systems Center at Beaver, WV when they looked at forage yields and quality on their research silvopastures.)



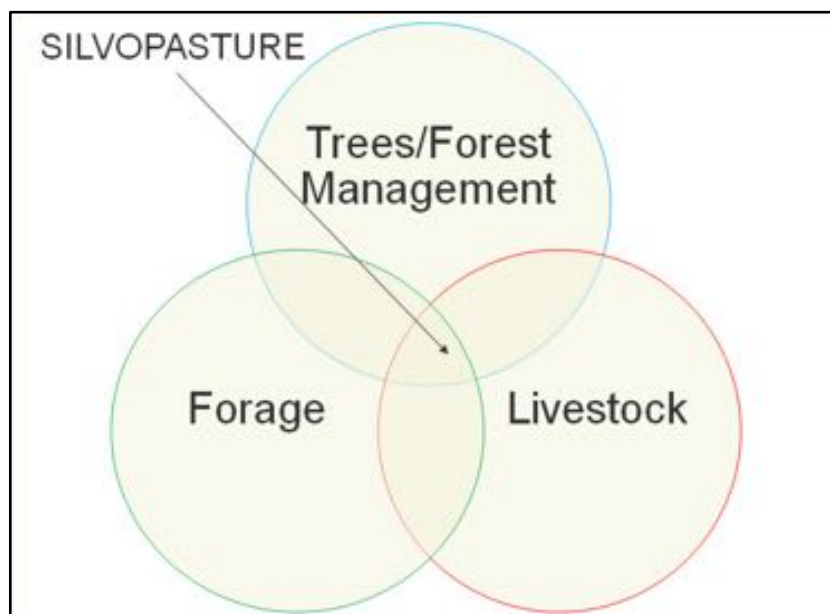
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The last PowerPoint slide shown by Kate was on shade tolerance of grasses and legumes to show which ones can be used in seeding forests that have been thinned to provide enough sunlight to reach the forest floor to grow shade tolerant forages. Orchardgrass ranked second to reed canarygrass, but is the best shade tolerant pasture grass of the two from a management standpoint. Smooth brome grass was a bit of a surprise, but perhaps does alright in diffuse shade. On the legume side, most of the legumes grown in the Northeast are not very shade tolerant except for crownvetch. Perhaps some of the wild vetches are similar in shade tolerance that have naturalized in some New England pastures. Kura clover has not fared well in getting established here. The next 3 clovers below Kura clover are adapted to warmer climates than exist in the Northeast.

She also recommended *Silvopasture Guide* by Joe Orefice.

The second speaker in this session was **Jeff Jourdain**, consultant forester of Jourdain Forest Management, from Becket, MA. The title of his presentation was “Experiences Establishing Silvopasture from a Forest”. This is the most common pathway for developing a silvopasture in the Northeast. Most farms here can be forestland rich and pastureland poor. Some of the forestland may be mostly stocked with low-value trees. Silvopasture can be used to open up the canopy to grow grazable grass while culling out the low-quality trees and keeping the better quality trees.

Jeff started out his presentation from a forester’s perspective: Long history of being trained that livestock and forests do not mix. “Domestic grazing animals not only retard natural reproduction but compact the soil by trampling, injure natural cover, and expose the surface to erosion.” “Grazing injury is a distinct threat to forest management and must be considered with other destructive factors in any protection plans.” (Introduction to Forestry, Sharpe et al 1976.)



This is an old mantra that still holds true if silvopasture management is not followed with the guidance of a forester and a logger that can be trusted to do thinning and removal of slash well so as to do the least harm to the soil and remaining trees. A professional forester is key as they can better recognize the trees that are merchantable or not. They also know how much basal area should remain behind to grow grass well and release the merchantable trees from un-

wanted competition from invasives and low-value trees. As Kate said, Jeff reiterated to be