An Introduction to Silvopastoral Systems

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From Forest Grazing to Silvopasture

- Forest grazing has existed since before settlement (e.g. bison grazing savannahs)
- There can be a range of practices, from:
  - just turning cattle loose in the woods; to
  - managing and monitoring forest understories for grazing; to
  - growing trees for wood, fruit and nuts, row crops, then grazing in a tightly managed system.
From Forest Grazing to Silvopasture

- Broadly these practices can be classified under “Agroforestry”, the effort to combine forestry and agriculture on the same land (“silva” is Latin for “forest”)
- Specifically, forest grazing can be formally described as “Silvopastoral Systems”
  - But some tend to use that term more in reference to more carefully regulated and monitored systems
Forest Grazing – The best of both worlds?

➤ How to manage without degrading cattle, trees, or site?

➤ Generally, you will not be managing optimally for any one resource
  ➤ Will grow less timber volume if grazed over entire life of stand (usually an understocked stand - less than 50% canopy coverage)
  ➤ Will grow less forage compared to having open pasture.

➤ Hopefully the combination of value from the two will be greater than either alone.
Today the primary focus will be on cattle, but other livestock also have possibilities

- **Sheep**
  - Can be particularly good at reducing shrub competition with seedlings.

- **Goats**
  - Especially for reducing noxious weed problems prior to planting.
Today, the primary focus will be on cattle, but other livestock are also possible.

- Pigs
  - More common back east – notorious for causing site impacts though
- Chickens and Ducks
  - How much forage do Canadian geese eat?
- All hooved livestock require very specific management techniques (e.g., herding, fencing) to make sure they do not conflict with forest management.
  - Particularly during forest regneration
What’s in it for the cattle grower?

- Access to forage that might not otherwise be available
- Shade for livestock
- Green forage available later in the season?
- Differences in nutrition quality of forage under shade?
- Differences in nutrition quality of forest plants and shrubs?
What’s in it for the forest owner

- Annual income
  - Long wait between income from timber harvests – 20-50 years.
  - Grazing can provide income between harvests.
  - Income early in rotation promptly offsets early rotation costs such as tree planting.
  - Landowner may graze cattle themselves or lease lands for it
  - Also contributes to local economy annually
- Fire risk reduction?
- Competition reduction?
- Eyes and ears of livestock producers making landowner aware of culvert issues, trespass, etc.
- Range improvements (e.g. stock ponds) can sometimes serve multiple uses (water sources for firefighting)
How does it affect other forest values?

- Most forest owners have a variety of values for their property, for example:
  - Water quality
  - Wildlife
  - Aesthetics
  - Invasive species prevention

- Ultimately, plan ahead, to make sure forest grazing does not unduly conflict with these and other values.
Managing Trees in Silvopastoral Systems

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What about the trees?

- Much of this program focuses on managing cattle in the woods, but trees are a valuable asset as well!
- Right now cattle prices are pretty good – will that continue?
  - Timber harvests can buffer the effects of low cattle prices.
  - To some extent you can wait to harvest when log prices are high and/or cattle prices are low.
Shade Tolerance

- Shade Tolerance: A tree's capacity to develop and grow in the shade of, and in competition with, other trees.
- Forest succession tends to move from shade intolerant trees to shade tolerant trees.
Shade Tolerance

**Least Shade Tolerant**
- western larch
- lodgepole pine
- ponderosa pine
- western white pine
- Douglas-fir
- Englemann spruce
- subalpine fir
- grand fir
- western red cedar
- western hemlock

**Most Shade Tolerant**
Forest Succession

- Succession: The replacement of the biota (plants, animals, etc.) of an area over time.
- Because trees are such a dominant forest presence, forest succession is usually described relative to the trees.
- Each step of succession creates the conditions for the next step.
Forest Successional Stages

- Succession goes through recognizable stages
- Successional path is different on different sites
- Wetter sites climax in more shade tolerant species . . .
How much forage: Habitat Types

Premise: Climax vegetation of the site is the most meaningful index of the environmental factors affecting vegetation:

- Precipitation,
- Soils,
- Parent materials,
- Elevation,
- Aspect, etc.
Habitat Types

- **Series**: Climax tree species
  - (e.g.: Western Red Cedar).
- **Habitat Type**: A subdivision of the series, identified further by an understory plant which is dominant or characteristic for the type
  - (e.g.: Western Red Cedar/Lady Fern = Thuja plicata / Athyrium filix-femina = THPL / ATFI).
- **Phase**: A subdivision of the habitat type, identified further by another understory plant which is dominant or characteristic for the type
  - (e.g.: Western Red Cedar/Lady Fern - maiden hair fern phase).
- **Ecotone**: Transition between habitat types.
Habitat types

Distribution of forest trees in the Rocky Mountains of northwestern Montana. Arrows show the relative elevational range of each species; solid portion of the arrow indicates where a species is the potential climax dominant (late successional) and the dashed portion shows where it is seral (early successional). (After Pfister et al., 1977).
Habitat Types

• The mix of key indicator plants found on the site can help you predict the ultimate climax plant community (and the successional stages in between).

• Can make management decisions based on how habitat type is likely to respond successional to disturbances or lack thereof (ex: Are you likely to get a heavy stand of Ceanothus, or key forages after a clear-cut?).

• Generally, habitat types associated with more shade tolerant species are also associated with more moisture, so will likely grow more forage as well.
Forest management to benefit livestock

- “Transitory range”
- Thinning
- Fertilization
- Slash Treatment (both to improve livestock access and to manage livestock movement)
Will Cattle graze under a canopy?

- Cattle tend to prefer more open areas
- May need to use fencing or other techniques to get them to use understory forage
Livestock Damage

- Trampling most common with cattle
- Seedling browse is more common with sheep and goats, especially on fir.
- Manage cattle:
  - Spread them out
  - Salting
  - Fencing
  - Water developments
  - Herding
Livestock Damage

- Keep livestock out of plantations 1st 3-6 years?
- Once trees are shoulder-height:
  - Livestock more likely to go around trees.
  - Trees better able to recover from livestock injury.
Grass seeding

- Avoid seeding grass prior to full seedling establishment.
  - Grass is a very effective competitor for moisture
  - On dry sites, grass can prevent reforestation outright
    - We often use herbicides when planting trees
  - Wait till trees have fully established before doing any seeding
    - Trees still will not grow as fast as with no grass, but they should survive.

- Seeding roads and permanent skid trails OK – no trees.
Thinning

- Reducing stand density is critical to getting more light to understory for forage
  - 50% crown coverage or less is a typical target
- Don’t thin too aggressively (do not take more than 60% of BA at any one time)
- Leave the tallest best trees, cut the poorer trees
  - See “Logging Selectively” publication
- Leave seral species (pines and larch) over shade tolerant species.
Prescribed burning

- Reduce fire risk?
- Stimulate understory forage
- Seek professional help
Protecting forest streams

- Idaho Forest Practice laws have strong guidelines to protect forest water quality.
  - 75 foot stream protection zones on fish-bearing streams ("Class I streams")
  - 30 foot stream protection zones on anything with clearly defined beds and banks ("Class II Streams")
- Excessive (?) livestock concentrations near stream may erode streambanks.
Protecting forest streams

- Restrict cattle access to streams so they do not degrade streams:
  - Fence off streams except for select locations (e.g., rocked areas) where they will not send sediment to streams
  - Use solar powered watering stations
  - Use herding, salt blocks, etc to keep livestock from parking in riparian zones
- Restore degraded streambanks with willow, alder cuttings, etc.
Conclusion

- Livestock and forest management are ultimately compatible with careful attention to details and ample communication between foresters and livestock managers.