

Managing Ruminant Livestock Responsibly in Brush and Woodland Settings



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Management will vary

- Your objectives,

And the

- Livestock species you have available
to work with

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What are your objectives?

- Eradicating undesirable invasive woody plants in forests or pastures?
- Sustaining high quality forage browse?
- Renovating abandoned hay fields, orchards and vineyards?
- Maintaining a silvopasture system – sustainable production of tree crops (e.g., orchards, timber, sugar bush), forages and livestock all on the same land

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Each livestock species has unique characteristics

For example, mouth width:



0.8



1



0.9

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Cattle

- Considered grazers as compared to “intermediate” feeders or browsers. Large, strong tongue wraps around clumps of grass
- Digestive capacity to handle large quantities of forage that may be relatively low in quality
- Large hoofed, heavy animals – potential for soil compaction, erosion, damage to tree feeder roots, etc.
- BUT same quality makes them good “steam rollers” in browse
- Most predators not an issue for grown cows and steers
- Fairly easy to fence



In a silvopasture system if you are moving cattle rapidly and they have plenty of fresh feed, may be able to get by with subdivisions of single strand 3mm (9 gauge/12" dia.) braided poly twine



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Sheep –Intermediate feeders – However, prefer grasses and forbs although they will also graze browse. Graze close to ground.



Susceptible to predators, generally not jumpers, 35" height. electronets?

Forbs – herbaceous (non-woody), broadleaf plants

Browse – woody, broadleaf shrubs

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Goats - Also intermediate feeders, prefer browse but also graze grasses and forbs, crave variety-> on the move



- Susceptible to predators
- Require good fencing – 42" height electronet

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Goats are :

- Very social animal – Take learning their eating habits from their herd to an extraordinary level
- Larger liver for processing secondary compounds (tannins, etc.)
- Salivary glands equipped to bind tannins – tannins do not cause them to respond with appetite depression as in other animals

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Goats are more agile than sheep. Can be used for clearing brush in areas that are inaccessible to machinery or too environmentally sensitive. However more susceptible to the internal parasites found in conventional pastures



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Mobile upper lip along with tapered muzzle allows goats to be very selective eaters (tend to eat growing points). Sheep do not have a mobile upper lip.

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Goat and sheep are small ruminants, so

- they have a more rapid rate of passage of food through their rumens than cattle->
- do not utilize mature highly fibrous forages as well
- Therefore, require better quality forage than both large ruminants and horses
- Fermentable fiber content of their forage very important
- Fermentable fiber – fiber that rumen microbes can digest, i.e., “high quality fiber”

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Age? Sex? Breed?

- Goats/Sheep under one year of age have only “baby teeth”
- Less able to girdle hard bark
- Safer for valuable timber and sugar maples
- Mixtures of females and uncastrated males → leads to kids/lambs
- Size affects how high the animal can reach; longer legged breeds more likely to stand on hindlegs?

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How you manage goats/sheep on browse and woods depends on whether you want to eradicate the browse or sustain it

- When will you graze it?
- How much defoliation will you allow?
- How often in a grazing period



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If trying to sustain browse:

- Don't browse it **early in the season** before the root reserves exhausted from putting out spring growth have been replenished,
- Don't browse it **late in the season** after leaves have fallen when goats will tend to girdle trunks and branches,
- Don't defoliate it more than **~66%**,
- Don't return onto it before leaf growth has completely recovered – because of this may only be able to graze it once or twice a season
- Basically, move through it fast at high density, stay on each section a short time, rest each section a long time, i.e., very similar management to silvopasturing.

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Will your animals need supplemental feed?

- Sheep and cattle generally have a hard time maintaining condition on browse alone. Best to have good ground cover (grasses, forbs, legumes) for them as well.
- Good quality browse (berry brambles, multiflora rose, blue stemmed dogwood, honeysuckle and even golden rod) usually deteriorates in feed quality over a growing season slower than conventional pastures. Depending on stage of growth of your goats and sheep and acreage available, well managed browse may be sufficient to meet their needs
- However, when you are trying to eradicate invasives, you leave animals in far longer to get them to girdle trunks, strip bark, eat twigs → usually not sufficient quantity & quality of browse to sustain animals without some supplemental feeding

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Controlling invasive species



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Arnot Forest "Goats-In-The-Woods" Project Too Much of the "Wrong" Thing

American beech,
striped maple –
proliferating in the
understory

- Excluding desired hardwoods
- Limiting access
- Reducing forest diversity



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Arnot's Typical Forested Understory Per Acre

2002 Species	Seedlings 3-54" tall	Saplings 6 - 4" dbh
Sugar Maple	5074	24
American Beech	4169	2489
Red Maple	3396	6
Striped Maple	1614	741
White Ash	1563	.
Red Oak	989	.
Black Birch	804	50
Total	17610	3311

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Conventional Controls Chemical or Mechanical



Comparable to
herbicide treatment

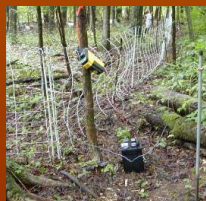


May not be available to smaller woodlots
Accessibility? Cost? Labor? Safety?

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Field Set – Up – portable, flexible and secure

- 42" electronet fence – easy to handle, good visibility, 150 x 75 ft area, 0.1 hectare (~0.25 acre)
- Charger and 12v battery
- Adequate grounding
- 3000 volts - low impedance type
- Weather shelter - Acts as "security blanket" or homing area
- Juveniles – groups of 5 or 20 for 7 days
- Mature goats – groups of 20 for 3 to 4 days



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What Was Tested?

2001
Feeding Regime

- 5 vs. 20 per paddock
- Supplemental (16% CP) vs. Rotation feeding

2002
Diet Quality

- 12% vs. 14% protein
- Low vs. Normal fiber

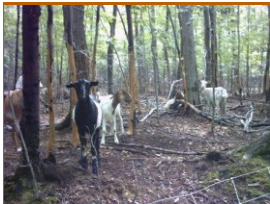
2003
Farm Systems

- Juvenile vs. Mature – but had to be moved faster!
- 16% CPTMR Milled vs. farm mix of corn soy at ~14% CP

Gold font indicates best control of undesirable saplings
Blue font indicates low control of undesirable saplings

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Comparison of Sapling Mortality by "Best" Treatment



Species	2001 16% CP, mixed, juvenile	2002 14% CP, wethered, all male, juvenile	2003 16% TMR, mature
Beech	60%	20%	50 to 90%
Striped Maple	99%	80%	90 to 100%
Black Birch, Ostrya, etc.		58%	>80%

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Conclusions

- Typically, no damage to mature crop trees
- Consistently high mortality of striped maple saplings. Beech mortality more variable
- Goats like bark of: Striped Maple, Red Maple, Hemlock
- Goats "avoid" bark of: Sugar maple, Black Birch, Black Cherry, Red Oak, Aspen
- Needed supplementary feed to perform well (2.5 to 3% body wt. young stock, 2% of body weight for mature goats)



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Sugar bush



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Reclaim orchards and vineyards



Goats ready to move to next paddock in overgrown vineyard

3 years of once annual browsing



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Glynwood Study on land heavily infested with Multiflora Rose (MFR)

Manual removal 0.81 hectare (~2 acres)	1 st Yr. 35 mature goats grazed 10 days, then manually cleared (chain saws & brush cutters), burned piles.	High labor input but immediately opened up land for pasture to develop. Can then rotationally graze with goats and cattle keeps woody plants under control
Rotationally grazing goats with goal of sustaining MFR Many acres rotationally grazed	Large group of goats stay in each paddock until most MFR leaves & growing points are eaten. Move to new paddock before they start eating grass or bark. Return to paddock when leaves regrown.	Provides sustainable good nutritious feed for goats but pasture remains infested with MFR. Plants about 25% smaller than pastures not grazed by goats.
Continuous grazing 0.25 hectare (~0.6 acre)	1 st Yr.: 13 goats grazed continuously May-Sept 2 nd Yr.: 6 goats grazed continuously Apr-Sept., but supplemented w/4 lb. hay/hd/day	MFR biomass declined 38.7% in first 68 days. At the end of the 2 yr. study, average MFR condition was 1.0 (dead). Grass very depleted as well so suggested frost seeding. Forbs stayed about the same as in reference pasture.
Reference Pasture 0.25 hectare (~0.6 acre) paddock	No grazing either year	MFR biomass increased 56.7% in first 68 days. At the end of the 2 yr. study, average MFR condition was 3.1 (moderate)

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But what about cattle and sheep? Upper Mountain Research Station Study, North Carolina

- Apple orchard abandoned 15 yrs., grown up in brambles, honeysuckle, multiflora rose (MFR), chickweed, thistles. Wanted to bring back pasture. For 4 years, grazed 45 to 60 days during May to July and again 24 to 35 days during Sept to Oct.
 - Control – no grazing
 - Goats alone – 30 goats/ha
 - Co-species – 17 goats and 2 to 3 steers/ha
 - Favorable pasture species and vegetative cover increased with both grazing treatments, Multiflora rose was eliminated 100% (goats alone) and 92% (goats & steers). But 2 yrs. Later, new shoots sprouting from viable roots.
- Second study - 1.7 steers + 3.4 goats/acre versus 1.7 steers/acre → all paddocks rotationally grazed from Apr to October. Those grazed by steers & goats free of brambles, sumac, poison ivy, honey suckle, pigweed and black locust saplings by end of season and MFR averaged 2' tall. In paddocks grazed by steers alone, MFR plants averaged 6' tall.



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Co-species Grazing

- Minimal dietary overlap, Complimentary grazing relationship
- Cattle consume grass, lesser amounts of forbs and browse: Sheep consume grass, considerably more forbs than both cows and goats: Goats consume browse, some forbs and grass.
- Adding 1 to 2 goat does per acre per head of beef cattle will not decrease beef cattle production
- But will it be worth fencing, shelter, watering, feeding modifications?
- Or possible increases in parasite, predator or health issues?



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Kathy Voth's "Cow eat weeds" training methods

- Train individuals that will have a long-term influence on the herd (young females, cow/daughter pairs)
- First day, give them small quantities of a "treat" they are accustomed to twice a day in feed tubs.
- Next day, offer same feed but in a different form, e.g., whole corn versus cracked corn.
- Next few days, offer feeds that are new to them but nutritious, e.g., soy flakes, alfalfa pellets
- Somewhere in there, introduce them to molasses
- Then give them a feed that is nutritious but a little challenging to eat – such as hay cubes
- By Day 5 or 6 - offer them the target "weed" sprayed with molasses
- Day 7 – offer them the target "weed" plain
- Once they are cleaning it up, put them on target plots that contain the "weed", so they can put eating it into practice while it is still clearly in their memory



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Bale Bombs – can assist in control of undesirable plants



20 cows in a 30 ft. diameter circle around a round bale is @ 1.5 million pounds of density per acre . Can exert quite a lot of pressure on a brush plant. Need to do when ground is dry or frozen. Do not shove bales up against valuable trees – do not repeat in same place, same year → want to avoid build up of heavy mulch around feeder roots → risk of smothering

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Matching Livestock Breed Attributes to Conservation Goals

Kleppel, Gary and Erin LaBarge (University at Albany, Albany, NY)*

Purple Loosestrife

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Maintain orchards and vineyards

- Need to decide whether to
 - alley crop or
 - silvopasture
- Sheep may be best choice especially if young, high-risk trees
- Is fruit present? e.g., in reach or drops
 - Acidosis and/or enterotoxemia risk if not gradually accustomed
 - Listeria risk if damaged or decomposing

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Supplemental Feed

- Trace mineral salt always available! Choose one suitable for your species (i.e. no or very low copper for sheep)
- Feed - Depends on management plan
- Yes if:
 - Stripping bark in woods
 - Growing kids/lambs- maximize gains
 - Choose feed with good level of fermentable fiber and a CP level >12%, ideally 14 to 16%
- Often not necessary if:
 - Defoliating dense, highly palatable forage
 - Rotating paddocks frequently
- Cornell Sheep & Goat Program – can provide example rations

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Water, riparian buffers and natural water sources

- Use common sense -> avoid erosion of banks and fecal contamination of watersheds → Giardia, cryptosporidium
- Provide clean and convenient water away from riparian buffers and natural water sources (need to plan out a water system that works for you)
- Fence livestock out of riparian buffers, etc. if possible.
- If animals must have access or need to periodically graze to keep a good plant balance, avoid congregating, i.e., graze for very short duration when ground frozen or dry, leave good cover and allow long recovery
- Degradation of buffer can happen very rapidly
- Strategically place minerals and supplemental shade away from riparian buffers and natural water sources
- Always avoid riparian buffers and ponds, streams etc. when very warm – especially with cattle (goats and sheep far less likely to “take a dip”)

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Meningeal worm (deer, brain worm)

Parelaphostrongylus tenuis



- Parasite of White Tail Deer that coexists well with the deer
- Small ruminants are an abnormal host (sheep, goats, llama, alpaca)
- Parasite has indirect life cycle – snails and slugs needed for infection



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Animal must ingest the slug or snail or vegetation with slime trail → moist environments/leaf litter → i.e. especially fall conditions

Larva travel from intestinal tract to spinal cord to brain, causing →

Nerve damage (can include lameness, gait abnormality, itching) → can be as extreme as paralysis or even DEATH

→ Animals maintain appetite

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Cornell Protocol for afflicted goats and sheep

- Safeguard (10% Fenbendazole) orally for 5 days at 25 mg per kg live weight (1 ½ cc per 10 lbs.)
- Ivermectin 1% injectable SQ for 5 days at 0.2 mg/kg live wt. (1/2 cc per 22 lbs.)
- anti-inflammatories important
 - corticosteroids if not in last month of pregnancy: dexamethasone injectable 2 mg/ml IM at 0.2 mg/kg live weight for 1st 3 days then reduced to 0.1 mg/kg for next 2 days (1/2 cc of dexamethasone per 10 lb live wt. for 3 days followed by ¼ cc per 10 lbs. for 2 days).
 - If in late pregnancy give flunixin meglumine (Banamine) 50 mg/ml instead at 1 cc per 100 lb. live weight orally for 5 days

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Toxic plants - learning from feedback

- Foragers associate feedback with
 - The plant they ate the most of
 - The plant they ate last
- There is a nutritional cost to eating toxins – converting toxins usually requires additional energy and protein
- Depending on feed history, ruminants may possess rumen microbes to break down some secondary compounds such as alkaloids
- Nutritionally compromised animals more likely to make bad decisions about plant toxicity

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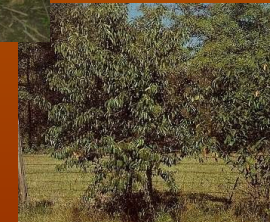
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Specific toxic plants that “feed back” does not work well on



Black Cherry in the **wilt/stress** stage


- All Cherries and Prunus family – leaves, bark, etc.
- Amount consumed, specific plant




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Yew

Rhododendrons,
Azaleas,




Mountain laurels



© William S. Justice

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Check your animals often!

- Are all of them there?
- Accidents can happen
 - Goats especially like to climb
- Is there enough charge on the fence?
 - 3000 volts if possible
- Is the fence still standing?

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Vaccinations

- What specific ones recommended for species?

Goats & sheep

- Tetanus
- Enterotoxemia – overeating disease
- May want to consider Rabies if increased contact with raccoons, skunks, etc.



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Predators

- Guard dogs
- Llama and donkeys
- Secure “night lot”
- Electric fence – taller “electro nets” can sometimes be a reliable deterrent

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Parasite Control - Internal

- Gastrointestinal worms, coccidia, liver flukes
- Do regular "5-point checks"
 - FAMACHA – check inside lower eyelid
 - Bottle jaws
 - Diarrhea
 - Hair/fleece condition
 - Body condition



Aggravated by centralized feeding or watering facilities



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