Livestock Want Browse:

Doable Methods For Use of Wild Woody Perennials

Shana Hanson
3 Streams Farm
NOFA NH Winter Conference February 11, 2023

The following is a post-presentation* version,
with descriptions, points and commentary added as text.

~* This is no longer one hour long. *~

Please skim and find what interests you!

Please call me with further questions,
or to tell me how your projects are going.

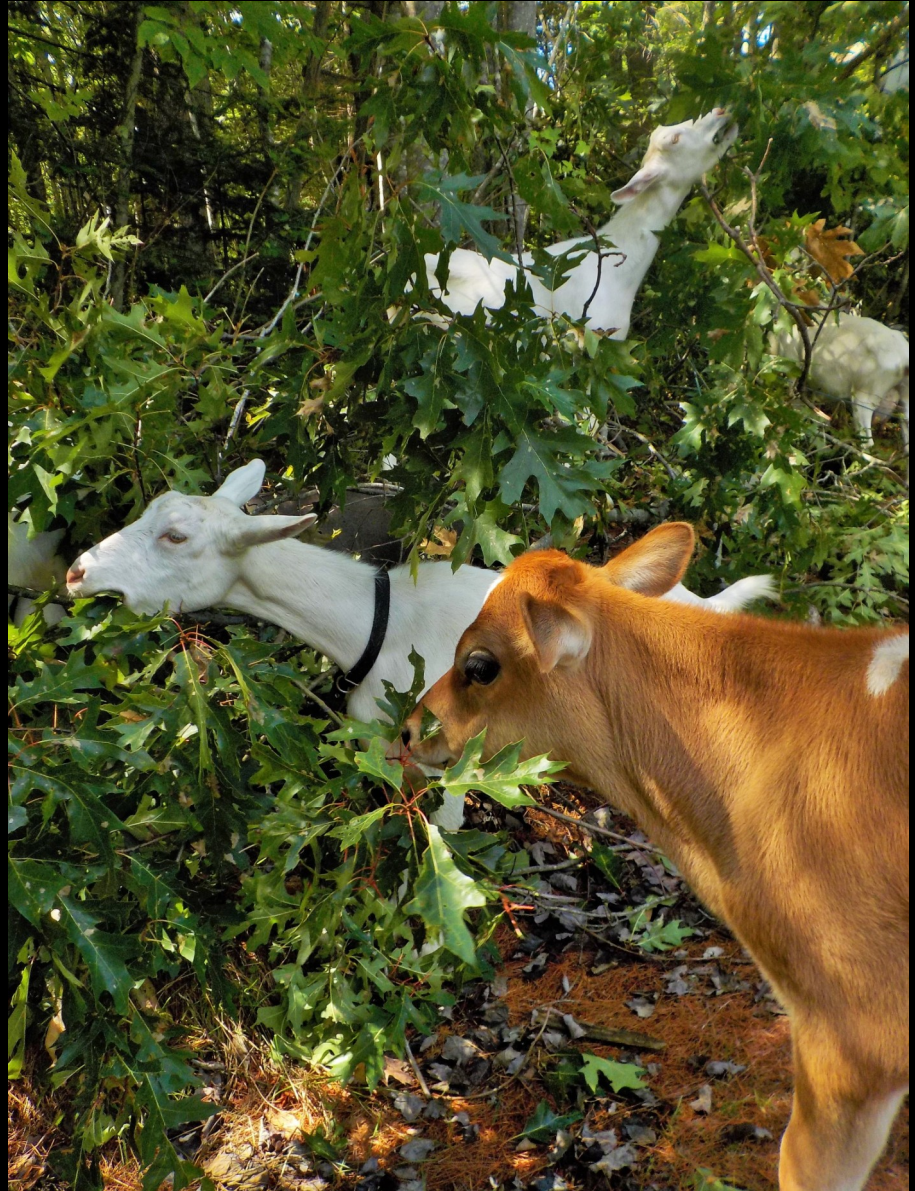
(207) 338-3301
(often voicemail, but I call back if you say your number.)

*My apology to the attendees, that I didn’t ask what you needed to know from me, when the slides crashed.

There is no doubt that livestock want browse... This was Bendito.
Everybody likes white cedar (except Susan's milking sheep - Eliot's sheep do love white cedar).
My white cedars used to re-grow in 3 years from 1/3 greenery, but now they are thin from droughts, as in this picture.

Tulip, Bendito’s mother, enjoyed my pear tree.

Angelo and the Saanen herd this summer walked free with me to eat freshly pruned branches on-site. Here I was pollarding edge trees, leaving branched climbable structures.



We also eat directly from plants,

"extensively," = covering a lot of ground, lightly.

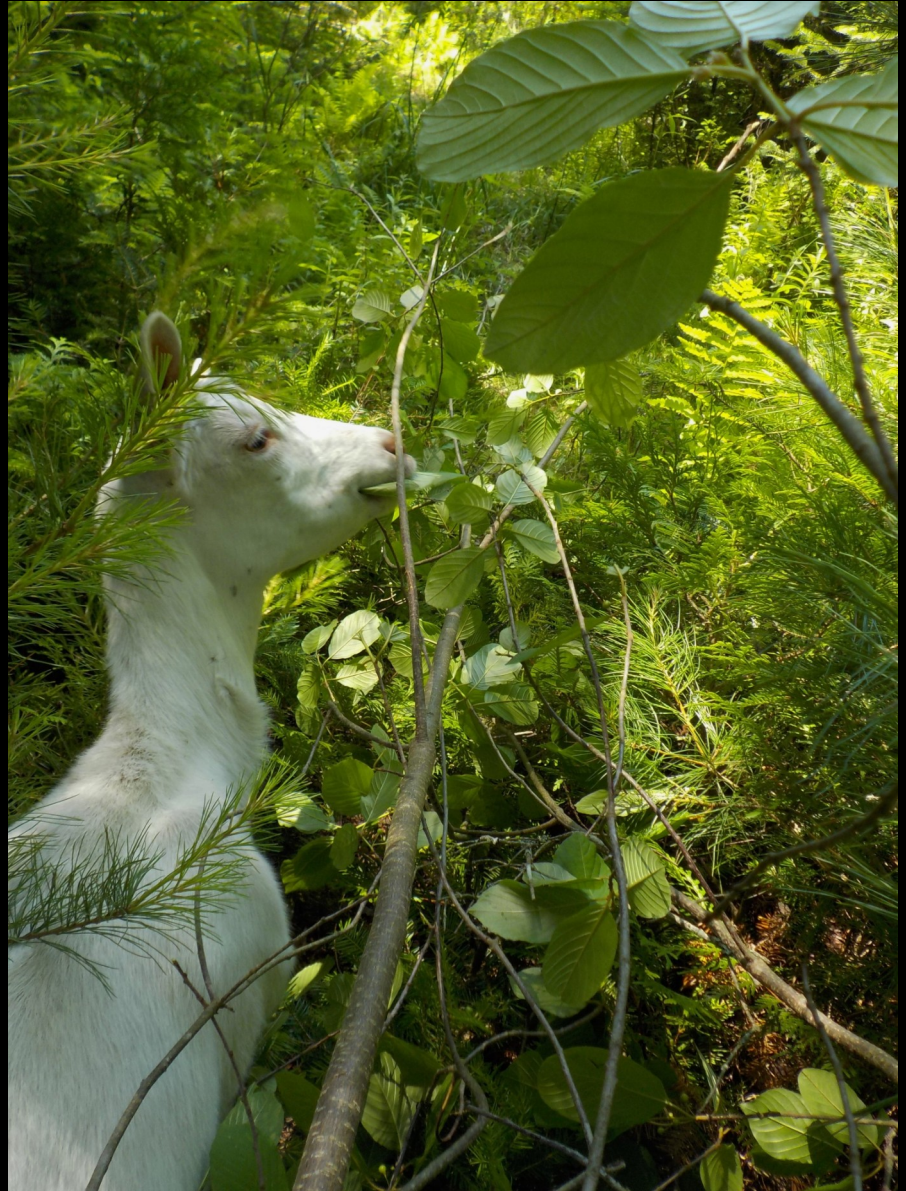
Glossy AKA smooth buckthorn pollard ->

^

Winterberry, our native holly, close friend of buckthorn, eaten mostly in spring and fall

Same buckthorn pollard, closer. They keep highly nutritious green leaves for the longest season of any plant in our woods.

This is our front woods. Incredible biodiversity used to be limited to the road frontage. We have deepened it.



Here you can see our smooth buckthorn closer. This plant has kept us alive through all the droughts.

You may have European buckthorn, which Steve Gabriel tested in SARE FNE19-930, finding it extra high in protein.

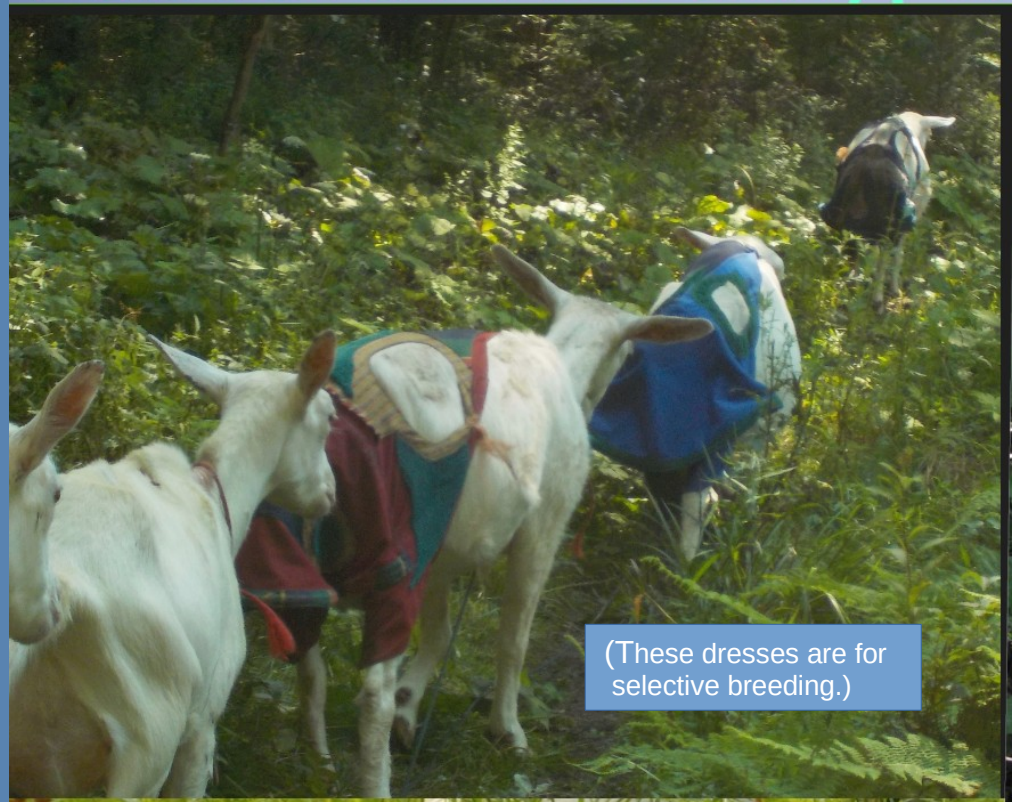
Browsing Dynamics

Animals choose mouthfuls based upon:

- Nutritional array
- Anti-feedant balance
- Airborn communication
- Bite size
- Bite frequency
- Herder permission

There is no way to match fine selection abilities of browsing animals by cutting and carrying, but you can at least cut and carry what they show you they want.

Pastoral Herding Recommended

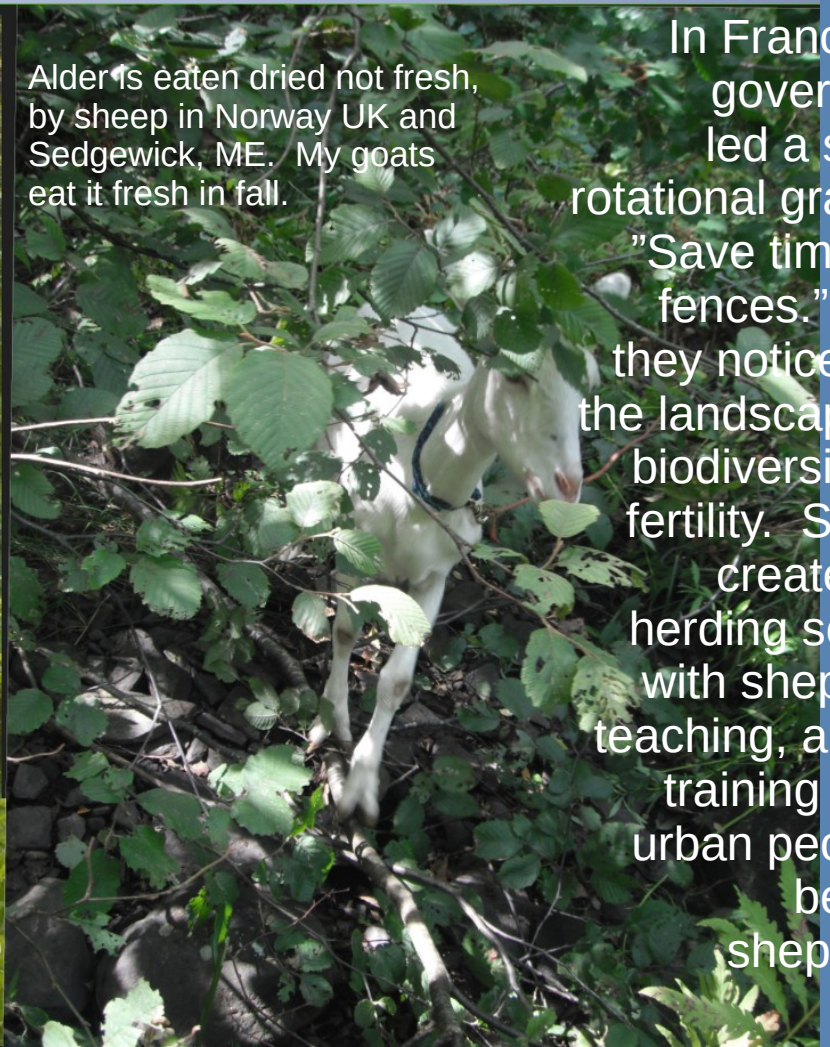


(These dresses are for selective breeding.)

Increases Biodiversity

Increases Animal Dietary Intake

Meuret & Provenza, 2015



Alder is eaten dried not fresh, by sheep in Norway UK and Sedgewick, ME. My goats eat it fresh in fall.

In France, the government led a shift to rotational grazing: ”Save time; use fences.” Then they noticed that the landscape lost biodiversity and fertility. So they created five herding schools with shepherds teaching, and are training young urban people to become shepherds.

Time to

Compose

Design

Mend

Play

Read

Rest

Sing

Study

Write

One must have one eye upon the browsers,
to mediate between them and certain plants
which they love too much, plus
think ahead to the next meal “course,”
and propose as line of travel.

Anyone with a good idea can lead in my herd; even goat kids lead sometimes.

Not everyone has access to extensive browsing lands.*
We are lucky to have neighbors keeping tree growth = logging lands, for multi-generational family tradition of deer hunting.

* In France, there are various legal structures for such pastoral access.

My wire fence clips, visor, knitting, mending,
songs, grant proposals, data analyses,
grant reports, published articles, book contributions,
study of literature related to forestry, climate and livestock,
all happen on browse walks with cattle and goats.

The dishes don’t get done, … so I always eat out of the same bowl :)

I don’t get anywhere at a certain time, and then grieve things I’ve missed.

The chapter in Meuret and Provenza’s book on social costs
made me cry, because it was so familiar (Meuret & Provenza 2015),
as does Rupp’s chapter on illegal silvopasture in Germany (Rupp 2013).*
*See “Notes and References hand-out for NOFA NH Feb 11, 2023”

The milk is incredible.

If we work or live (which word applies?) in this way that includes plentiful observation and rumination, we can address life-tasks accurately.

We notice responses of trees pollarded, shrubs browsed, animals tended, and adjust our impacts toward optimal stimulation of growth and wellbeing.

Socio-cultural thoughts – please feel free to disagree or skip:

Our consumer culture lacks such direct contact with its impacts,
conveniently keeping deterioration or destruction unseen and funded,
while people feel contented that they are “voting with their dollars.”

Our stomachs tell us everything is fine; we with broadly provisioned grocery stores
will be the last to know when the whole live green skin of the earth has died.
By then, it will surely be too late for effective intervention. Right now, about 50% is alive.

Our consumer population outnumbers and over-burdens farmers.
Farmers do have direct contact, and face awareness of ecological fragility.

Our consumer culture creates voluminous leaks in the loop of soil re-creation. Wastes made from our soil never return. Droughts slow soil-building processes, while increasing necessity for same.

Farmers who shield hundreds of families from requiring outdoor manual labor of themselves
do not consistently have time nor resources to effectively and sufficiently address
needs of the land as ecological fragility increases.

The keynote speaker gave a weak pitch; I was hoping she would say consumers must farm,
work on a farm, become herders, or at least cook, clean, mend and babysit for their farmer.

Leaving the consumers, we go back to our herd. They ask for tree tops.
Tree tops are less chemically defended than small saplings, and vibrantly “happy”= tasty, with leaves in full sun, while roots are in cool, moist places. Harvest of tree canopies feeds us doubly in future, because...

browse layers can grow

once we open the tree canopy.

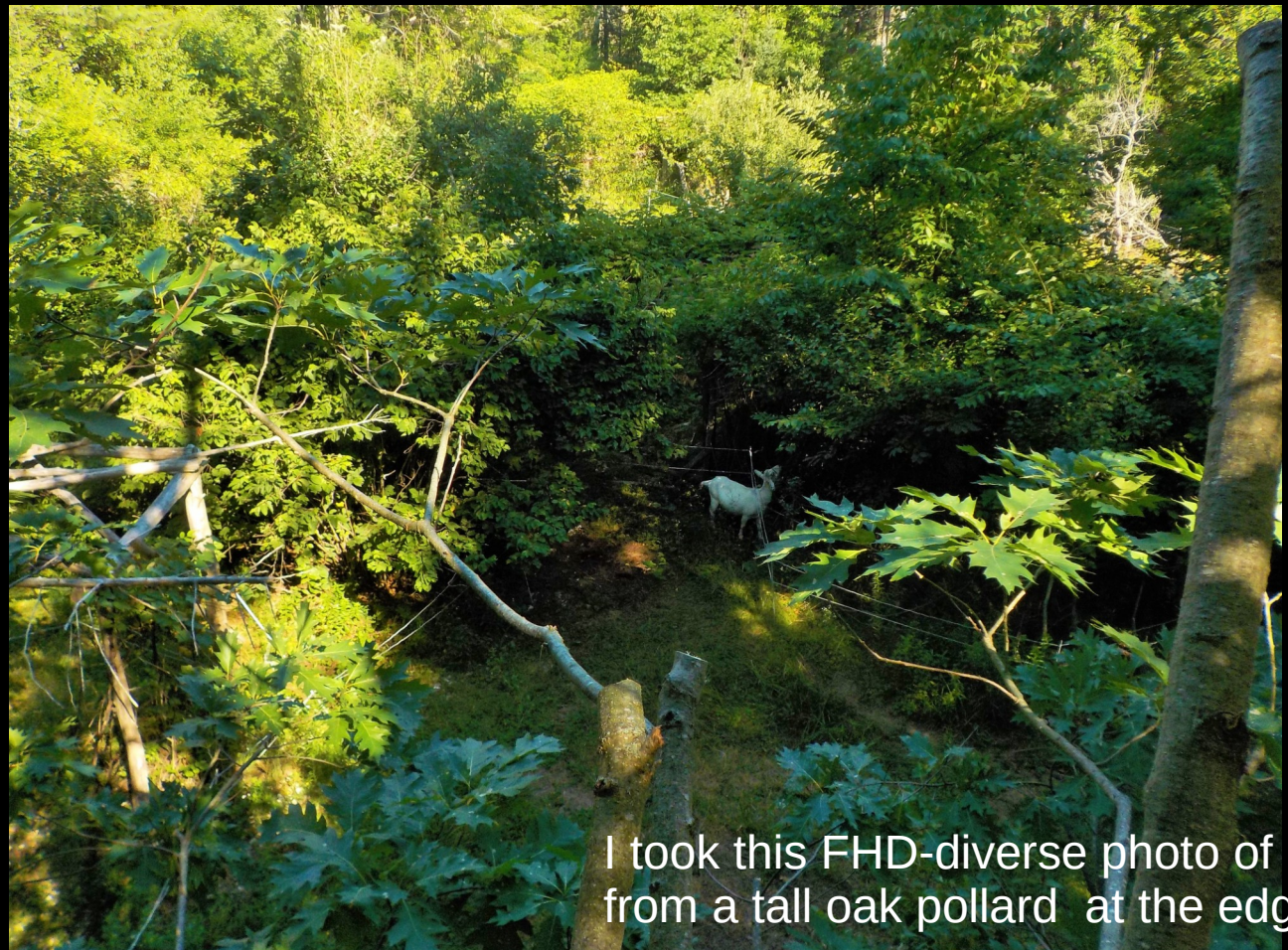
Ephemerals under a closed canopy are mostly tasty and nutritious,
but small in volume.

Canada lillies are
a spring staple,

rattlesnake plantain,
is not eaten,

lady’s slipper
is eaten.

Foliage Height Diversity (FHD)



correlates strongly
with biodiversity and
carbon sequestration.
FHD is the easiest of the
3 to observe or measure.

FHD is my raison d'etre,
to offer my herd abundant
and diverse greenery,
while supporting
comfortable
air temperatures.

I took this FHD-diverse photo of Brave Alfreda
from a tall oak pollard at the edge of our pasture.

Even the IPCC reports that:

^

(with “high confidence”)

Latent heat transfer by trees/plants *has strong local climate effects* (Jia et al. 2019).

= using 70% of infra-red solar energy for phase change of water to vapor. Vapor then travels thru time and space, to condense somewhere cooler, warming only when and where needed.

This export of infra-red energy by trees/plants is responsible for over 90% of earth’s temperature regulation.

This matters for the animals and our physical comfort and wellbeing.

Even more crucial is that new growth halts and tree seedlings die at 115º F (Strong et al. 1997).

Keeping deep intact forest around our canopy harvest patches (I sometimes call them “sun pockets”) is our best assurance of life-supportive air temperatures.

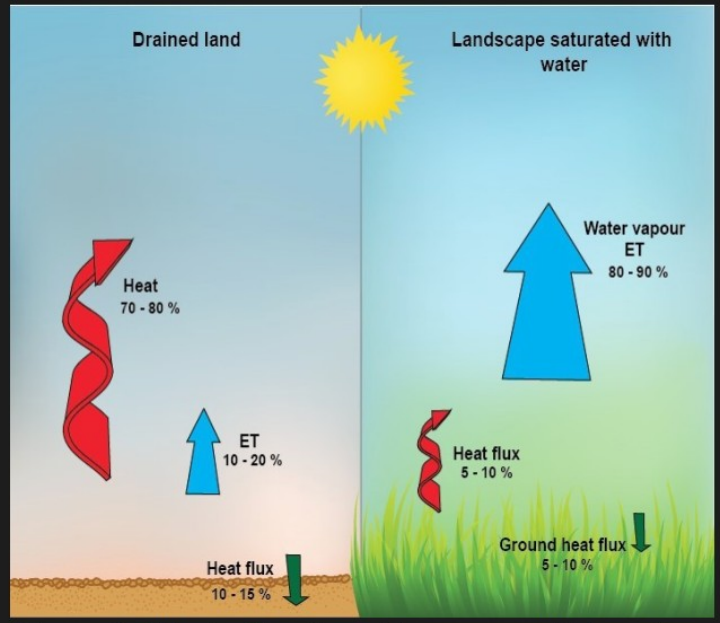


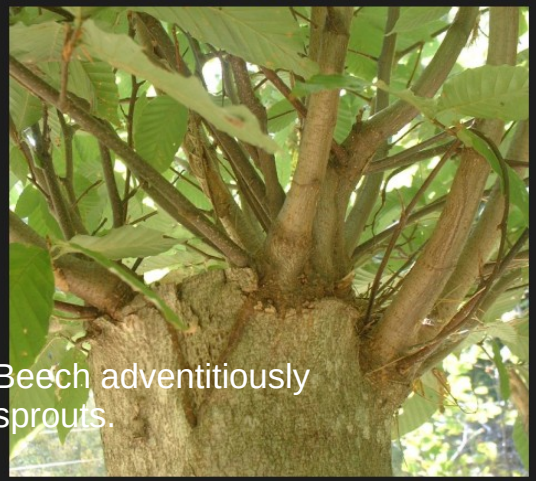
Figure 1: Illustration from Huryna and Pokorný (2016), page 8

Carbon sequestration effects are less strong, but more famous.

It can take 30 years for a side canopy to close, or for browse layers to reach optimal leaf surface area. If the earth stays alive long enough for that, our Foliage Height Diversely pollarded sun pockets may begin to contribute as positively to local climate as does deep forest (plus feed us!).

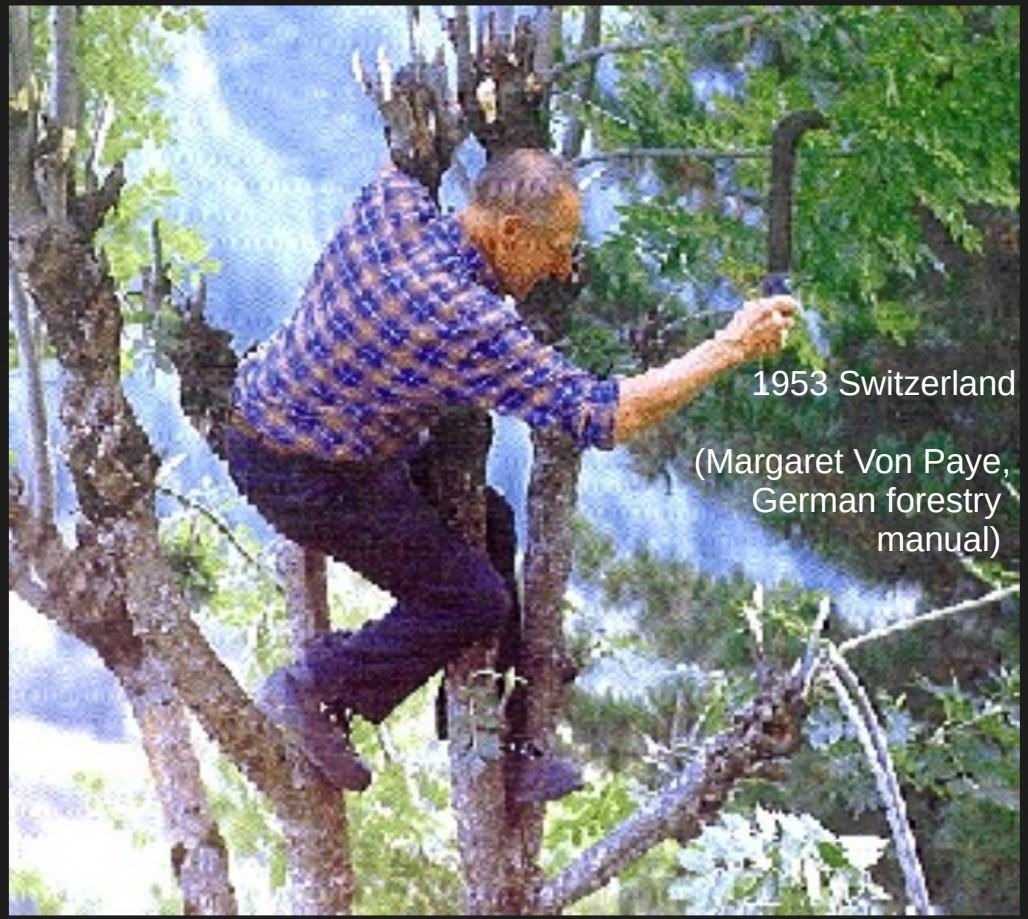
Size, age, species, vigor

Assess trees individually to determine a treatment that they are likely to sustain with continued or enhanced wellbeing.



Maple with many small cuts

- Farmer tools, and vertical comfort zone



1953 Switzerland

(Margaret Von Paye, German forestry manual)

2023 Belmont, ME

Susan Littlefield will be harvesting for our SARE FNE22-013.


3 short trees
like this...


...made a load like this.
Susan Littlefield, Y knot Farm,
does not climb high, and always uses the tractor.


My 3 Streams Farm is lower tech.
This is Nosenia, my retired sow,
hauling hemlock and hay.

Nosenia’s load was from this tree.

I shorten conifer branches to greenery in reach, leaving about 1/3 foliage.

One can bend a hemlock branch in half without it breaking. I can walk out on one branch while holding another.

The porcupine and I collaborate. I didn’t finish the top yet, and today found porky prints and prunings.


Arrived and sharing.
Angelo ate some later.

You may already have wooly adelgids impacting hemlocks. Ours are one county away.

There are three predatory beetles. The one that eats adelgids in both their phases is purchasable by land owners.

Our emerald ash borers are slightly farther away. Neem plugs cause death of every insect that eats leaves throughout the multiple years it takes to exterminate borers (including our native ash borers, whom I personally have met up there).

We also have browntail moth caterpillars defoliating trees and causing poison ivy-like rashes on us. I can climb large oaks, poplars, birches, cherry, and other fruit trees after mid-June without four-day itchy rash ONLY if there have been heavy rains to wash caterpillar spines off the tree. Arborists are plugging these trees with neem or worse insecticides. Oaks are especially known for supporting a diverse multitude of caterpillars which birds collect to feed their offspring.

Our Maine soils lost calcium in the acid rain years, impacting trees.
Also the droughts have impacted key soil fungi.
I try to spread clam shells when there is a time window, and leave wood to rot on soil.

Angelo has potential to haul a lot more brush (but limited by his wish to bring the whole herd).

We often eat on-site, versus carrying brush. Yet brush in their yard gets more thoroughly utilized.

Brush from off-farm pruning jobs, or from loggers, arborists, and line-clearing crews, is worth carrying… OR processing on-site, to carry more easily (see SARE FNE22-013).

Karin Whittmann pollarded this oak with a chainsaw from the ground, for sheep.

Working low.

Sy Schotz's chest-high chainsaw cuts will limit visibility once they sprout. He wanted the initial cut to happen quickly.

(If you send a picture, or get me out to your land,
you may be in the next presentation:
shanahanson@gmail.com)

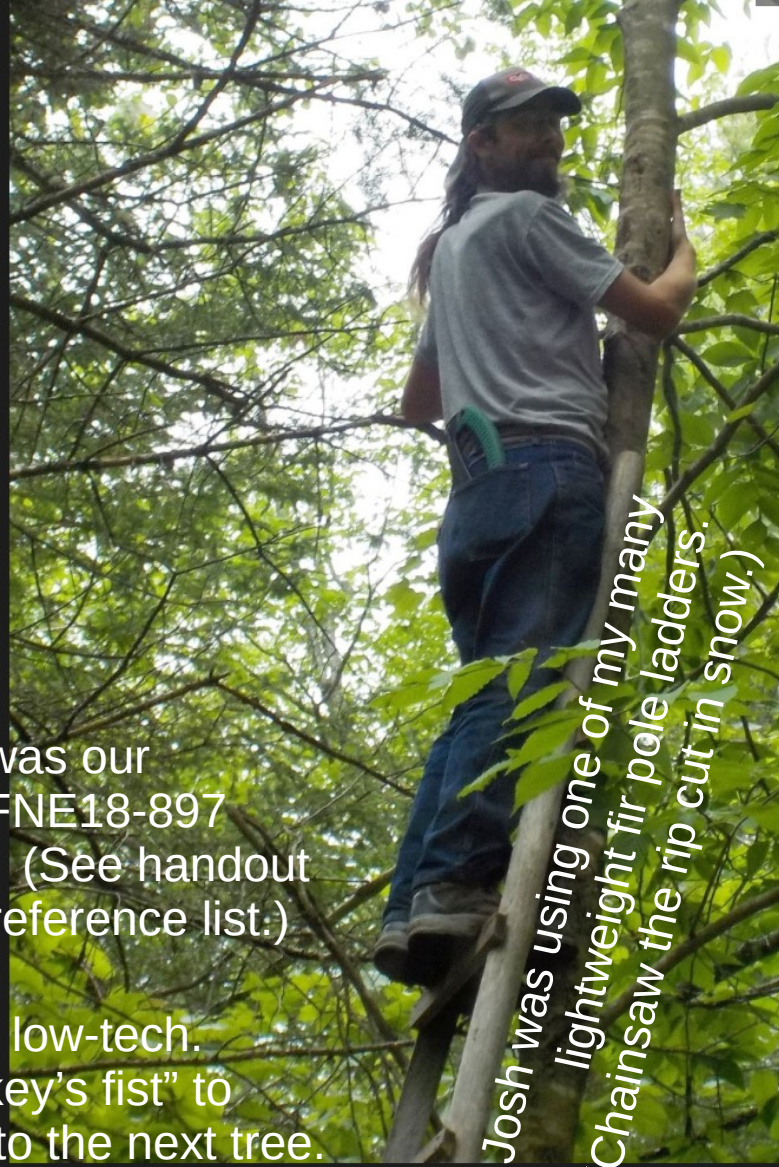
Working high!

Lucas Tree prunes in a 5 yr cycle, ideal for fodder harvest and tree health. We have intentions to collaborate on silage production.

An older arborist near me saved up for a remote-control lift, which moves to where he wants it, when he is in the tree.

This was our SARE FNE18-897 project. (See handout reference list.)

I as usual am low-tech. I tied a “monkey’s fist” to move a rope to the next tree.



Josh was using one of my many lightweight fir pole ladders. (Chainsaw the rip cut in snow.)

Vertigo goes away if you stay still and wait calmly.

Next time it will happen less.

Ropes are SAFE and easy to learn

< (Kelly was at our farm in fall of 2020.)

Visit Shana for a free lesson, or stay a safe base for knot names & tips.

call Shana

Three points of support in a triangle make a stable plane.

The points can be a knee, hip, foot, hand
…or D rings on a tree climbing harness.
(Next pic is my cheap home-made one.)

Rock climbing harnesses are cheaper, but lack hip D rings
(and still twice as expensive as a cheap home-made one.)

My climbing harness is placed to step into. Then I send rope at left back and forth between hip D rings and tie, to tighten hip/waist band.

The front D ring holds you from fronts of leg loops, and is for ascent of your rope.

Hip D rings are for more horizontal use with a shorter rope, your lanyard, to lean out from tree and use your leg strength to aid ascent, or for other positioning.

Any of these 3 D rings will hold you safely in event of a fall.

Cutting is easily NOT safe.
Be ABOVE your cut, if possible.

If you are a very accurate directional feller at ground level,

and you have reduced canopies in the arc of falling range to be *very* unlikely to interfere with your falling tree piece,

and you are a good judge of weighted direction,
and good at geometry and the physics of motion, to make your cuts in a way that throws your cut trunk forwards,
or you have tightened a rope to it, to control direction,

and your head is in a good space with no distractions,

then you might make initial high trunk cuts safely yourself.

big-toothed aspen

Felling at ground level makes sense when you
do not plan to open a sunny enough gap for sprouting,
when tree species does not respond to trunk cuts (birch, poplar),
and when remaining trees will benefit from more space.


White birch is eaten in late spring and fall.

Remember:

Latent heat transfer by trees/plants *has strong local climate effects* (Jia et al. 2019).

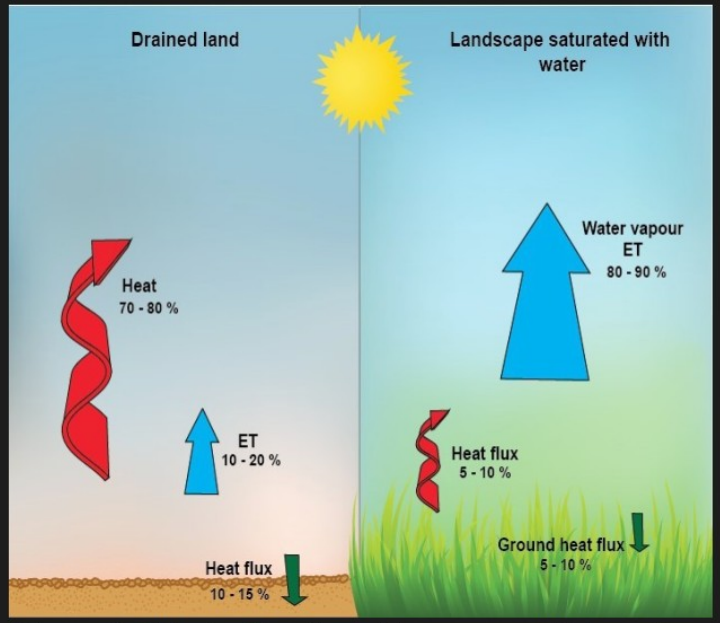


Figure 1: Illustration from Huryna and Pokorný (2016), page 8

The gaps we open initially will at times be 10º F hotter than surrounding woodland, or colder and frostier as well (Strong et al. 1997).

Farm fields *without* retained pollard trees (lacking the “air meadow”) of course have even more extreme temperature fluctuations.

Carbon sequestration effects are less strong, but more famous.

Ash roots across our front stream support many life-forms. Hydrology is complex and alive.

- Soil hydrology, and temperature concerns

10 years after the neighbor clear-cut, dryness remains apparent, slowing vegetative renewal.

This once deep and fertile farm field was stripped of loam, then covered by a large photovoltaic array.

Solar panels are 90% emissive, so can generate air temperatures slightly hotter than those in a parking lot (Riverola et al. 2018, Barron-Gafford et al. 2016).

A rotten fir log is holding moisture for this oasis of gold-thread, where my land was logged by the previous owner.

This tree way of farming changes complex soil hydrology less, and supports a livable climate more, than other ways of farming.

The archaelogical sign of Neolithic tree-based animal husbandry is no soil erosion (once fields were opened for agriculture, the soil erosion began) (Marinova & Thiebalt 2007*, Gardner 2002*)

* These references are in LAST YEAR's NOFA NH hand-out. That presentation has more about Norwegian traditions, seasonal plant species choices, and nutrition.

See https://3streamsfarmbelfastme.blogspot.com for past presentations and hand-outs.

Animals maybe remember that Neolithic tree-based care. Cattle want about 20% browse on average, sheep 30%, goats 50%.

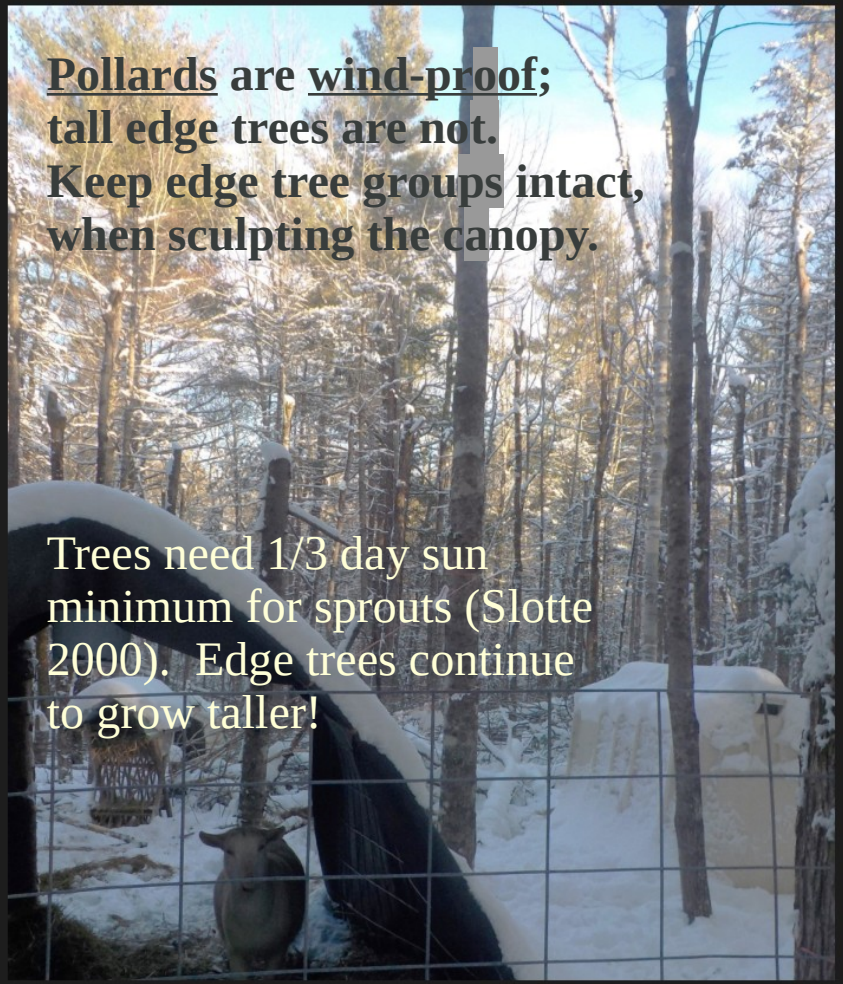
At 3 Streams Farm the animals eat most everything I cut in summer, which limits the quantity stored.*

So I cut fresh tree matter all winter. We strive for the above 50%, and stay in a modest amount of milk, with winter hay input but no grain.

Both past SARE FNE18-897 and current SARE FNE22-013 committed or commit us to store more tree forage for winter.

* We will be measuring: how much leaf silage cattle, sheep and goats eat free choice, milk amounts with and without leaf silage, and how much hay is saved.

- Patch size, sunlight and wind



Pollards are wind-proof;
tall edge trees are not.
Keep edge tree groups intact,
when sculpting the canopy.

Trees need 1/3 day sun minimum for sprouts (Slotte 2000). Edge trees continue to grow taller!

This Winter 2022-'23 I am pollarding red maple (or re-pollarding above 1998 ice storm breakage) and dropping tops to the animals, more dangerously than my usual (trunk cuts!).

I suspect that these pollards of varied height, and same in SARE FNE18-897 Demo Plot, will have enough sun if they're harvested *together* at regular intervals (4 to 8 yrs.).

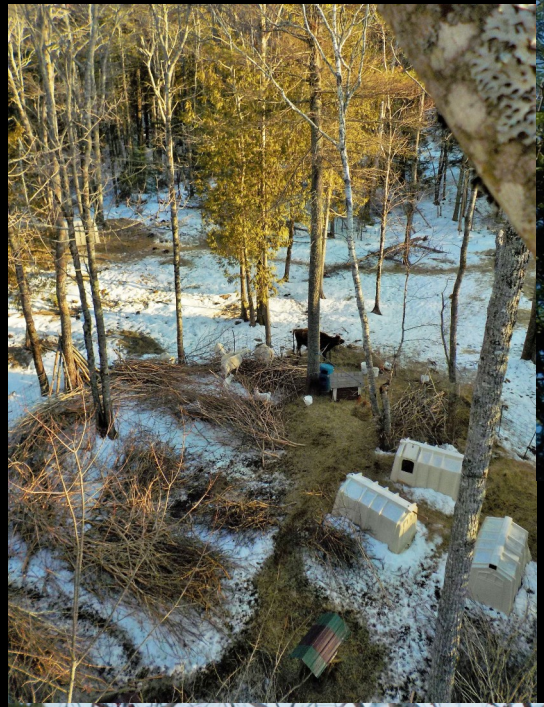
Surrounding white pines shelter the yard on 3 sides. The more southern ones were once wind pollarded.

In **Winter 2021-’22**, I pollarded 25 yr. growth of red maples, from the ground, using a 9 ft. pole chainsaw.

Goats eat twigs with buds first, then eat almost all the smooth bark.

Cattle eat twigs with buds. Flower buds are preferred. Angelo has learned a *tiny bit* of bark stripping.

I do not think that gallic acid is an issue in the twigs and bark. This toxin limits intake of red maple *leaves*.

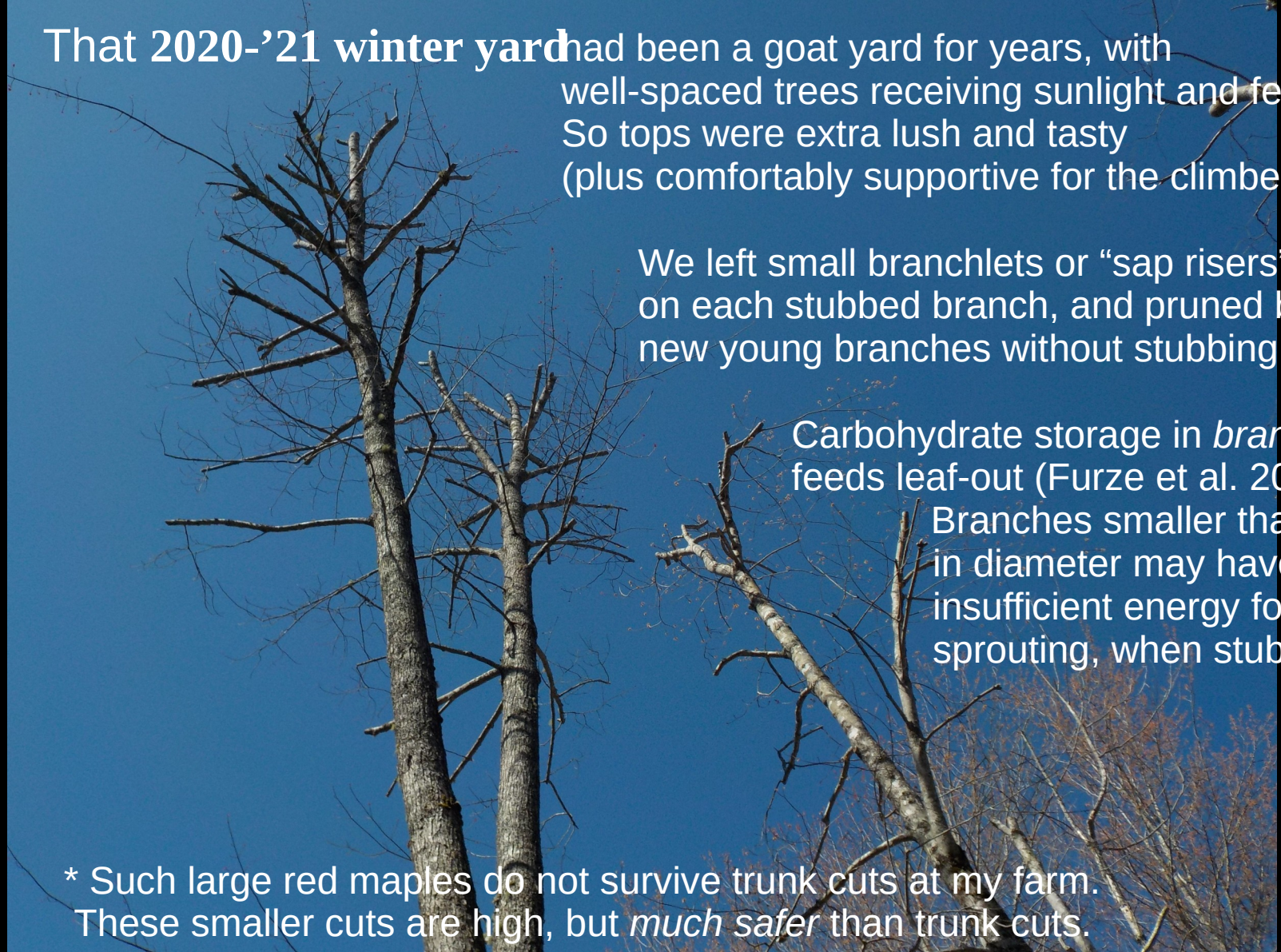


In **Winter 2020-’21**, we pollarded 60 yr. red maples, using ropes or free-climbing from ladders.

Tulip’s yard surrounded the goat yard - she had first dibs on maple buds.

Cutting branchwood from a large tree gives a vast quantity at once, and faster regeneration due to efficiency of the retained form.

To expose new bark, I untangle and turn long pieces daily - vigorous exercise (like climbing).



That **2020-’21 winter yard** had been a goat yard for years, with well-spaced trees receiving sunlight and fertilization. So tops were extra lush and tasty (plus comfortably supportive for the climber).

We left small branchlets or “sap risers” on each stubbed branch, and pruned back new young branches without stubbing.

Carbohydrate storage in *branches* feeds leaf-out (Furze et al. 2019). Branches smaller than 2 or 3” in diameter may have insufficient energy for sprouting, when stubbed.

* Such large red maples do not survive trunk cuts at my farm. These smaller cuts are high, but *much safer* than trunk cuts.

The wind took down this 2nd half of our largest hemlock.
Its friend the spruce (a ways away) went down a few years earlier.
We enjoyed the hemlock greenery for many weeks.


It remains twice as high as this picture, with large low limbs.
It had been storm pollarded before (causing the forked top), and will continue.

Three areas nearby had been thinned (by me) or felled (by my neighbor) a few years before this sequence of wind events.

Our winds now regularly hit 60 mph. A lot of trees will be pollarded, even if we don’t do it.

Pollarding prevents uprooting, and used to double tree longevity in Europe (when harvested consistently).

White pines can reach 100 ft.
A few I delimb and leave standing for piliated woodpeckers (when other trees need sun). Big toothed aspens similarly tower above other trees in my woods.

In the one acre SARE FNE22-897 Demo Plot, we only lowered the canopy by about 15 to 18 ft.. We retained branch forms in reach of trunks. We sculpted higher or lower based upon tree tollerance, and position in relation to shade from tall surrounding trees.

Timing

Dormancies:

Moon *

Cut traditionally when moon is waning. Trees pulse minutely in diameter with moon cycles, and buds also pulse until they open in spring.
Moon/planet cycles also affect trees.
Ernst Zurcher, University of Applied Sciences, Bern, Switzerland, suspects that the water *molecules* are expanding in response to gravitational pull, becoming “waterier.”

Weather

Droughts cause a nap, if not full sleep. An ash may be relieved to lose its top.

Season

Winter used to cause consistent dormancy here.

* Helen Read (2018) found inconclusive moon effects on beech.
I notice moon phase, but still cut whenever I can find time.

Cut when animals want it.

Late white ash, September 24, 2021


Two days later

But all this is labor-intensive.
What if we want more production?


New Shrub Willow Harvester 2017
SUNY EFS Willow Biomass Project
can provide cuttings of 150+ willow species native to the Northeast and Canada (and also 100+ more European etc species, and 4-500 more crosses).
Beds with 2 rows each are straddled by equipment.

Chips steadily blown into a dump truck stayed anaerobic, fresh versus composted, all day.
Large drum chippers or harvesters make uniform pieces which are possible to winnow.

Karl Hallen and the SUNY EFS willows

Karl is “the researchers’ link to reality,” designing and constructing plot layouts, machines, etc..
Later you will see the machine he fabricated for our SARE FNE22-013. He used to dairy farm.

Steve Gabriel’s SARE FNE19-930

Katadin sheep at Wellspring Forest Farm directly browse this willow, plus cherry, poplar, black locust, honeysuckle, and European buckthorn.

Grass withstands much more frequent visits than can the browse plants… hence the advantage of taller and sturdier pollards, within paddocks.

Wellspring Forest Farm photo (Gabriel 2021)

Trees belong in fields.

Trees belong everywhere possible.

Establishing small trees when animals are present is a challenge.

One half of the soda bottle protectors below (viewed from a tall ash pollard) are around tiny wild seedlings of many species which were already present in our pasture, with growth halted for years by frequent biting.

(The other half are white willows from Karl.)

6 or 7 one liter bottles without ends are on two fiberglass rods. Some have electrified wire spiraled around them.


More soda bottles


Electric wire triangles
in the fence line

Eliot Van Peski photo, Meadowsweet Farm

Eliot's Spiky Cages*

* 6 ft. high 14 gauge 2”x 4”
welded wire fence circles,
made dangerously spiny by cutting
every other 4” vertical wire in half
at a steep angle,
and bending outwards -
Held in place with 2 fence rods

(The holes now 4” square may not be
goat-proof, despite spines.
Eliot’s sheep and cattle do stay away.)

What to do with the harvested stuff

Eat it fresh.


My neighbor Jim Rhodes knits lobster trap heads, and made these custom leaf-or-hay bags. Bags get filled when we browse the harvest site.
Brush piles hold fresh brush at nose height. Feet on browse make it dirty = inedible to goats (they avoid intestinal parasites).


Light pole tripod (easily moved), boards around the bottom, tied at top with rope to hang the bundle
Brush bundles tied with baling twine or flexible branches can stay tied for biochar burning (described later).

Hogs don’t fly, but good browse tempted Brackenroot to climb a low brush pile.

Eliot felled ash, then moved sheep and calves onto it.

Susan Littlefield feeds branches in
these long mangers, or in piles outdoors.

(These sheep are shy; there are many more hiding.)

We have had 2 of each “invasive” plant for about 20 years, but none are multiplying.

I go elsewhere to harvest them.

This is one of our 2 multiflora roses.

The next slide shows some we collected at Glendon Mehuren’s Faithful Venture Farm. (His holsteins have more trouble avoiding thorns.)

Glendon and his cattle will soon participate in our SARE FNE22-013.

Multi-flora Rose, bundled then tied to a post;
I use 2 pairs of leather chopper mitts and an arborist saw.
Goats get every leaf out, without untying.

Pollarded* white pine “barns” make good browse racks.

Branch bundles can lean into or be placed across live branches.

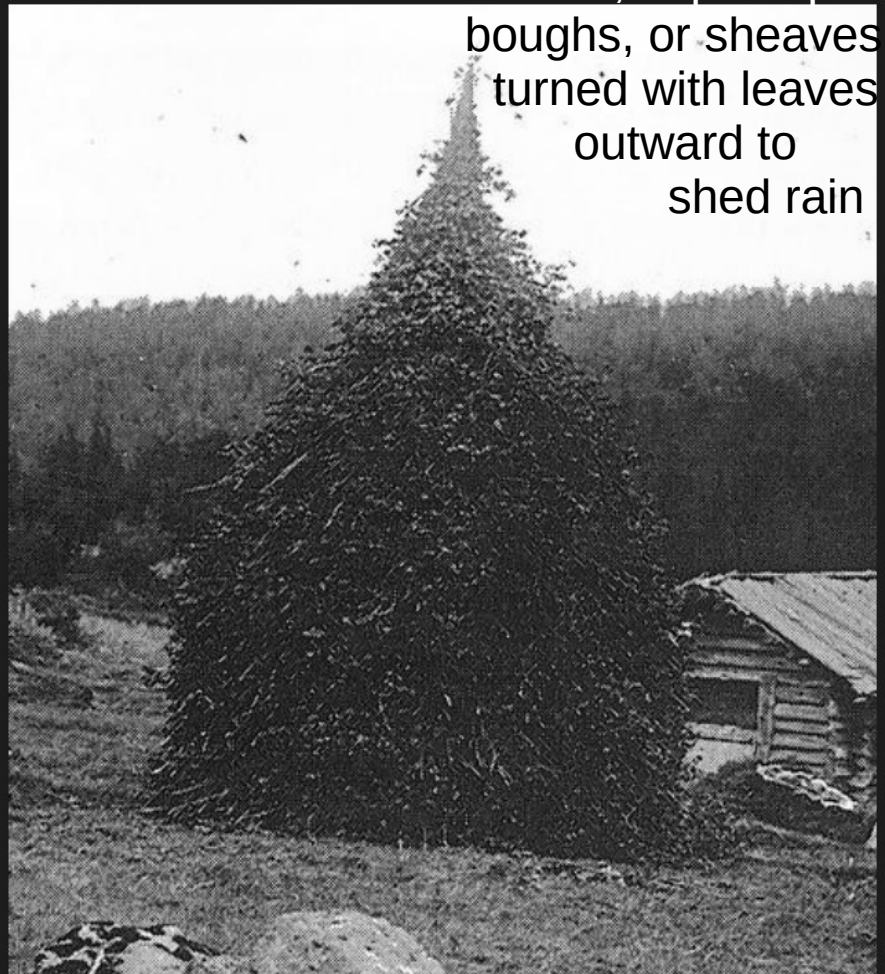
(*We pollard pines in early summer, when all bark is thoroughly devoured.)

Dry it.

Twig-leaf Sheaves

(Slotte 2000)

Twig butts outward and sloping slightly downward, hollow around a center pole, spruce branches or wood underneath, cap of spruce boughs, or sheaves turned with leaves outward to shed rain



Once goats have eaten the leaves, Michael Walder, Mahna Farms, Ontario CA, finely shreds dried stick refuse from his manual-mechnically baled leafy dried bundles.

The meat goats then consume all.

The leafy twigs, and then the shredded twigs, are eaten from a long two-sided slatted manger.

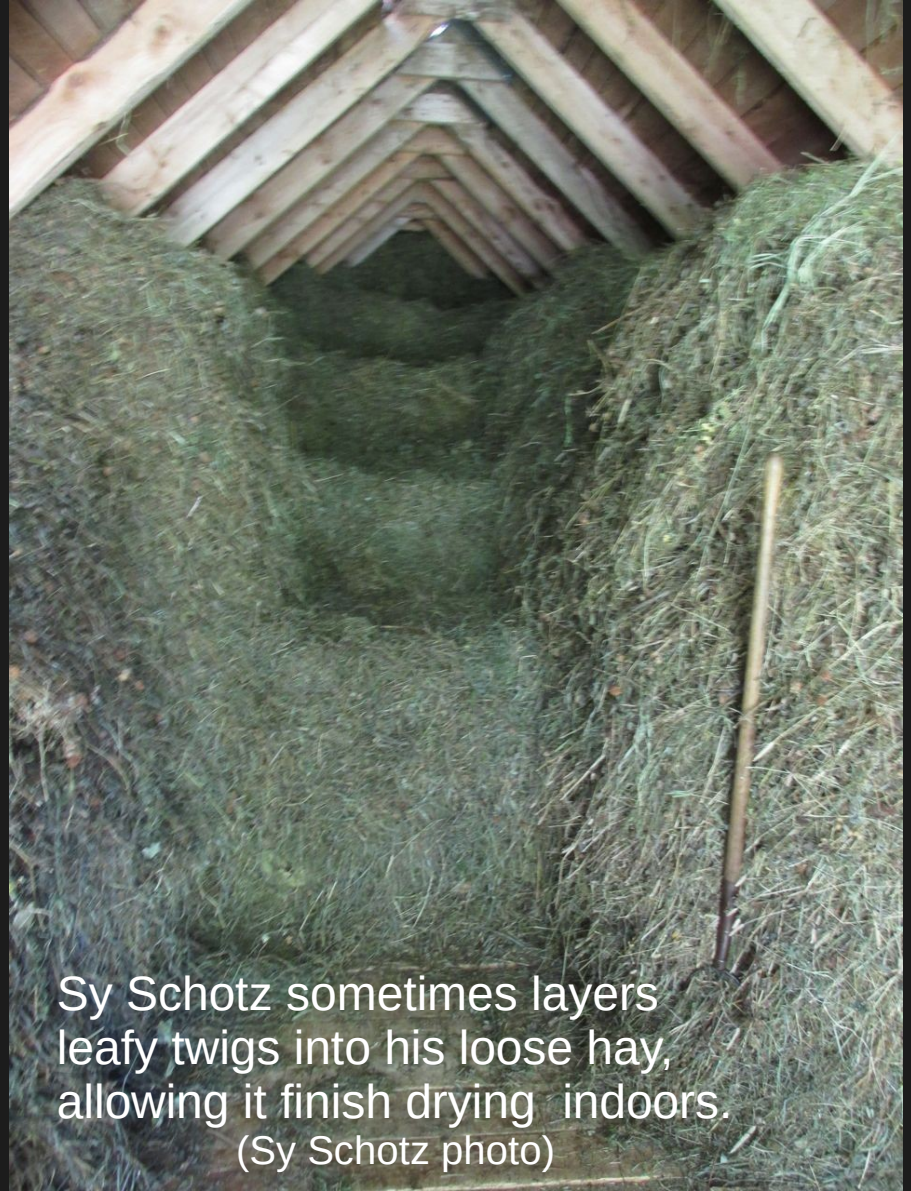
Our 3 Streams Farm July 2016 Tree Fodder Seminar
try at a traditional Swedish drying/fermenting rack,
which would precede stacking for longer storage.

A quicker, but tarp dependent, modern method

Leaves are less mold- prone than grass. These long branches were tarped fresh in early fall.

This vertical pile has a center pole, and rope around.

Nick Jackson photos, Jackson Regenerational Farm



Sy Schotz sometimes layers leafy twigs into his loose hay, allowing it finish drying indoors.
(Sy Schotz photo)

Eliot Van Peski just puts in leafy twigs or branches to dry.

Ensile it.

Eliot’s sheep eating our yellow birch silage, for SARE FNE18-897


Tulip always ate
the Norway maple first.


Each tree aroma is different,
and delicious.

Machatschek (2002)

I want to know more about fermenting these raked leaves, which were dampened just enough to ferment but not compost.

It seems that no seal was necessary.

These are sweet chestnut leaves for hogs.

Such hillside raking seems a good plan.

Mason Heipel hand-stripped the yellow birch silage shown with Eliot's sheep. for SARE FNE18-897. He came from CA for about a week, to climb and help.

Willow, ash and poplar are much faster to strip than is yellow birch.
Twigs and some air space are okay, so long as the seal is tight.
(Here I was re-packing well-ensiled willow samples.)

Tulip found every leaf.

Thanks to Karl Hallen and SARE FNE22-013,
we have a chain-flail leaf separator prototype.

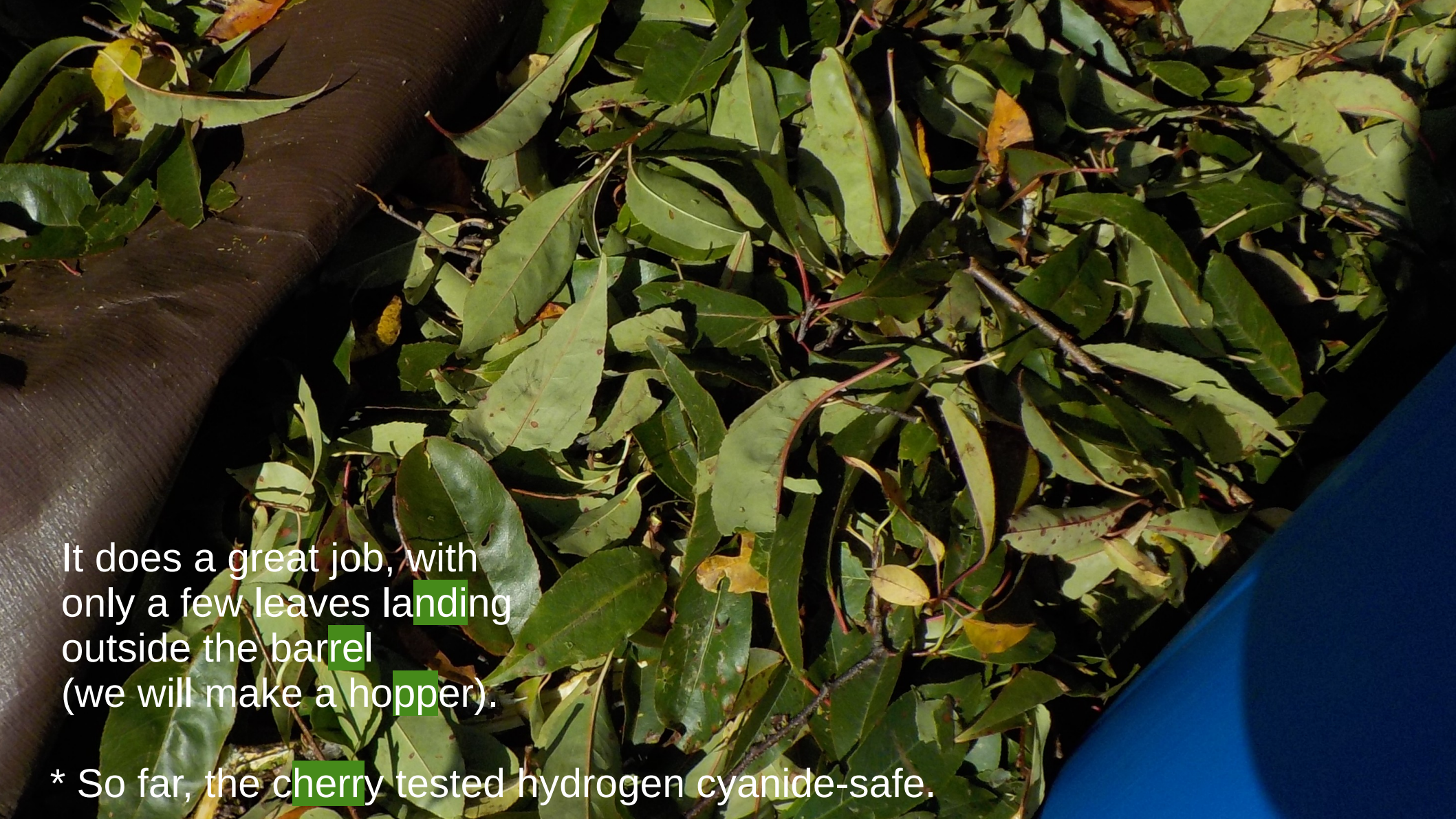
Brush goes through, leaves land in a barrel underneath (not the one that you see).
I imagined a mini chain-flail de-limber, asked around, and found Karl.

* Call and come visit, to help with harvest this June, July or September! (207) 338-3301

See SARE FNE22-013 Annual Report, (Hanson 2023, listed in the Notes and References Handout), for details on machine efficiency and design.

Flails are arranged
to spiral leaves downward.

Two feed systems


It does a great job, with
only a few leaves landing
outside the barrel
(we will make a hopper).
* So far, the cherry tested hydrogen cyanide-safe.

How much woody growth is needed, for how many animals?

Laufers' 1st oak pollard with 8 year-old growth yielded 175 lbs. of tasty leaves.

SARE FNE22-013 so far:

800 lbs. leaves per ton of leafy branches

SARE FNE18-897

approx. yield of initial harvest

1 ton/acre DM *edible* portion.

New growth the summer after initial canopy harvest or pollarding

We actually weighed yield of *eaten* portion, by weighing goats at entry and exit (plus adding an estimated defecation rate).

Goats were very orderly, as they liked the attention, plus wanted to be allowed in to eat, and out to go home.

Cattle and sheep at other farms were excited to rate our stored products.

(I think they will all similarly approve of our current research.)

Woody brush waste

4 year old brush pile

Gabrielle's Wattle Fence

The winter yard is a highly mulched garden opportunity, if we moved brush into such a fence as this.

Gabrielle McSherry photo

Open-burn **Biochar**

A fast-fed fire sucks oxygen away, snuffing out charcoal beneath. Layers of charcoal collect. Only the top surface is burning.

Douse quickly and thoroughly when done feeding the fire, before char turns to ash.

Use to retain nutrients and moisture in soil.

* See 3streamsfarmbelfastme.blogspot.com or Shana Hanson YouTube, for a short video.

Goats or cow are happy to grind up the char, by rolling for skin parasites.

Traditional sheaves of twiggy branches fit in the masonry heater, and keep the house warm :)

Grepp vid pålastning av lövbörda. Nord. Mus.

Brought to you by NOFA NH * & Northeast SARE.*

with special thanks to:

Rhyan Blazek & Jenny Davis, for covering the needs of my animals;
Karl Hallen, SUNY EFS Willow Biomass, for info & the leaf-separator;
&
to the woodlands that feed us.

(* opinions within are of course solely those of Shana Hanson)