

TREE FODDER & CLIMATE RESOURCES

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(Old but good; can't post links to whole books, but some articles are linked under "Tree Fodder-related Documents" below.)

[References for 2019 NOFA MA Winter Conference](#)

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[Tree Forages & Browse for Livestock Year-Round: Continued Learning at 3 Streams Farm, Handout for NOFA NH 2022 Winter Conference](#)

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[Maine Forage Conference Hand-out Nov. 8th, 2024 \(nutritional data summary chart only\)](#)

[Outline & Notes, two 2025 talks for Erica Frenay's Agroforestry Group of NY agricultural educators](#)

Climate Resources

Peter Bane's presentation (video), Soil and Nutrition Conference Nov. 2019 (Bionutrient Food Assoc 2020)

Peter Bane, Permaculture Institute of North America's Executive Director, hand-drew beautiful slides, to illustrate soil/plant/climate dynamics over time. I (Shana) was there in person (you will hear my voice in the discussion).

How Trees Help Moderate Global Climate (Dr Jan Pokorný)

Short video: Over a picnic table, Czechoslovakian scientist Jan Pokorný compares benefits of a tree versus an umbrella (in English).

Heat Planet: Biodiversity, the Solar Interface, and Climate Disruption (Haines 2020)

Christopher Haines, past Green Buildings Certified architect in the Boston area and scholar of climate dynamics, is incredibly familiar with heat effects of man-made surfaces. He wrote this short summary of how climate policy became misdirected, and what is really going on.

Solar Energy Dissipation and Temperature Control by Water and Plants (Pokorný et al. 2010)

These researchers compared 4 sites: white cement surface, agricultural field, forest, and pond, measuring incoming and outgoing light with a radiometer to report infra-red insolation and albedo, and measuring temperature with an infra-red sensing camera plus thermometers. Their results illustrate that high albedo (reflectivity of light) alone does not correlate with low emissivity (emission of heat from infra-red solar rays). Rather the activity of plant life controls air temperature.

Wetlands and Forests Regulate Climate via Evapotranspiration (Heslerova et al. 2019)

This study/review is a chapter in a larger volume.

The role of water and vegetation in the distribution of solar energy and local climate: A review (Huryna & Pokorný 2016)

Finding this article led me (Shana) to contact climate researcher Jan Pokorný, who sent many of the resources listed here, plus presented within our Tree Fodder Seminar 2019.

What can a tree do? (Jan Pokorný 2015)

I (Shana) print this 2 page to hand to people here and there. Jan explains with transporational data how one tree far excells over the air conditioner of a 5 star hotel.

Re-Greening an Earth on Hospice: Climate Care On-Farm, Right Here (Hanson 2021)

Published in *The Natural Farmer* Summer 2021 issue (NOFA's newspaper). The published version lost photos and also lost the credit for Hannah Huryna's diagram of latent heat transfer by plants (I was not given opportunity to view their final draft). I offer my own more complete draft here.

The Photovoltaic Heat Island Effect: Larger Solar Power Plants Increase Local Temperatures

(Allen et al. 2016)

Researchers at Arizona's State University tracked air temperatures throughout the year in a natural desert, a parking lot, and a large solar array with plants remaining beneath, all within a 2 kilometer square area. Temperatures within the solar array were somewhat hotter even than in the parking lot.

Solar Panels on Fields (Hanson 2021)

John Beal, Chair of the Belfast (Maine) City Climate Committee, asked me for my position on solar fields, so I (Shana) wrote this.

Climate Slides (Hanson 2023) I pulled these from my tree fodder presentations, & printed them as a streamer to hang at the Belfast Climate Fair, then around the Chain-Flail Leaf-Separator at Common Ground Fair. The moist, environmentally responsive breath of trees & other plant cover is key to climate regulation.

Tree Fodder-related Documents

Wooded Hay Meadows as Viable Production Systems (Rydgren et al. 2012)

Ingvild Austad (one of the authors) sent me this. Their results show that Norwegian a wooded hay meadow with pollarded trees yields more forage than a hay meadow without trees, and unfertilized yields similarly to fertilized tree-less hay meadows there. This study strongly supports fodder use of trees as we develop agroforestry systems. I am putting it here, out of alphabetical order, due to importance :)

1700s-1800s Swedish Farmer Journals on Leaf Harvest (Carlsson 1996)

This informal English translation happened thanks to Yvonne Taylor, Black Locust Farm, reading with me Shana writing notes, & Michael Walder, Mahna Farms, Bancroft Ontario then typing.

2nd European Symposium on Pollarding, Proceedings (Ancelin et al. 2018)

Shana's write-up related to her short presentation about "Tasty Timing of Leaf Fodder Harvest" is here, among information-rich materials from more scholarly presenters from 9 other countries.

A Study of Practical Pollarding Techniques in Northern Europe (Read 2003)

This 200 page report, about historic use of trees in 8 countries, jump-started my own tree fodder work, & connected me with Hakan Slotte (see his doctoral volume in above reference lists plus referenced in my presentations) & Ingvild Austad (see links to some of her work here as well). Thank you, Helen Read, for sending this report on a CD to me, in response to Tina Lee's 2011 email request (I did not yet have an email).

Best Practices Guide for Pollarding (Aragon et al. n.d.) There in Navara, Spain, Helen Read tells me (plus I think this Guide mentions) that they have made large trunk-cuts on Beech trees with successful sprouting; she says such cuts did not work in England. This Guide talks of historic Basque pollarding of oak & chestnut forests in winter for ship parts & charcoal. Sheep were grazed there plus fattened in fall on the nuts of these long-cycle pollards. At Colloque Trognes, I was told that ivy growing on these pollards was cut for winter sheep fodder.

Harvest of Tree Canopies Can Magnify Benefits of Silvopastures (Hanson 2019)

This short practical article was written for the National Agroforestry Center's publication.

Leaf-Silage as a Nutritioius & Climate-Resilient Feed for Ruminants: Less Labor & More Data for Farmers (Hanson 2024) This was published in the Maine Farmer & Gardiner summer issue, during FNE18-897. I much enjoyed working with Holi Cedarholm, who is an excellent editor.

Mineral Content of Leaf and Shrub Leaves (Garmo 1999)

Ingvild Austad connected me to Torstein Garmo, who then sent this. Thank you, both.

Non-Structural Carbohydrate Storage in Northeastern Trees (Aubrecht et. al, 2018)

Thanks to Mark Krawczyk for sending me this article, when I was helping edit portions of his book Coppice Agroforestry.

Nutritional Ecology of Domestic Goats Using Woodland Forages in Maine: What Research on Wild Herbivores Tells Us (Servello 2016)

Fred Servello was unable to present in person for my Tree Fodder Seminar, but agreed to write this article for us. I also have follow-up email conversations with him printed & saved (above is the updated version, after our conversations). At our Seminar, we looked at all this on a browse wander with goats.

Leaves as a resource: New use of old knowledge pp122-123 (English Summary) (Austad et al. 2003)

About shredded tree fodders for sheep, inc. modern harvest, storage &/feed quality. Norwegian title: Lauv som ressurs: Ny bruk av gammel kunnscap.

These researchers used chainsaws & a PTO-driven shredder, to make both ensiled & dried fodders, then thoroughly tested nutrition & sheep health (when fed at 10% of their Dry Matter intake). Ingvild Austad gifted me a bound copy; I do have some English translation notes of the full study, thanks to Yvonne Taylor & also Maija Lindaas. Call me, to visit & read (the study is mostly in Norwegian).

SARE FNE18-897 Tree Leaf Fodder...Transitioning Farm Woodlots to "Air Meadow..." Annual Report (Hanson 2019) Full title: Tree Leaf Fodder for Livestock:

Transitioning Farm Woodlots to "Air Meadow" for Climate Resilience

This preliminary report may have more specifics about our harvest experience, than does the Final Report below; I don't think I wrote one from the other.

SARE FNE18-897 Tree Leaf Fodder...Transitioning Farm Woodlots to "Air Meadow..." Final Report

(Hanson 2020) Full title: Tree Leaf Fodder for Livestock: Transitioning Farm Woodlots to "Air Meadow" for Climate Resilience

We thinned softwoods on one square acre of woodland, then pollarded the remaining multi-aged hardwoods at widely varying heights, mostly cutting branches or trunks at 3" diameter. Goats accompanied us during work-time year-round (eating a lot of fresh Red Maple twigs & bark in winter, plus leaves from dried branch piles tarped on-site). they lined up to be weighed before entering & exiting; we thus recorded weight eaten, to compute yield eaten (adding a defecation rate/hr.). We ran palatability trials of dried or ensiled leafy matter, both intact & chipped, with cattle, sheep, goats & hogs at 6 farms. My goats are fussy; they got fresh Red Maple all winter. Meadowsweet beef cattle ate everything. :)

Lab Testing of Stored Winter Tree Leaf Fodders, VTGPN Mini-Grant Final Report (Hanson 2020)

Full Title: Lab Nutritional Analysis of Ensiled Tree Leaves and Ensiled Chipped Leafy Branches, with Dried (non-ensiled) Comparisons, plus Average Grass Fodder Comparison, and Relation to Animal Responses. Vermont Grass Farmers Network gave me \$1,000 to obtain a bit of nutritional data on stored tree-leaf forage samples from SARE FNE18-897 above. I did a thorough job of reporting. The chipped forages included wood up to 1" diameter. (Out of alphabetical order to be listed under associated FNE18-897.)

SARE FNE22-013 Tree/Shrub Silage Production... Final Report with Table of Contents (Hanson 2025)

Full title: Tree/Shrub Silage Production from Field Edges: Climate-Resilient Forage Supplement for Cattle, Sheep, and Goats

Karl Hallen at SUNY made my dream of a Leaf-Separator machine. We harvested field edges to feed it, & filled barrels for a substancial winter trial with my milk-goats & steer, plus trials at other farms (including with one milking cow). My steer ate way more leaf-matter than the literature would have us expect. Nutritional & toxin tests were included; FNE24-083 below added much more lab work.

SARE FNE24-083 A Closer look to Guide Farm Use of Tree/Shrub Silages Report (Hanson 2025)

A Closer Look to Guide Farm use of Tree/Shrub Silages: Per-Species & Ensilement Analyses for Safe, Nutritious Rationing, plus Replicable Trial Results. This grant added tree & shrub species to reams of existing fresh & ensiled leaf-samples from FNE22-013 above, paid for expensive metabolomic analysis of toxins in maple species & sumac, added what I thought would be thorough cyanide info on cherry species, & made this new website happen! There were some surprises & lots of mistakes; the January 2026 Final Report will update this quite thorough Project Report. I am thoroughly enjoying ongoing work on beneficial Condensed Tannins with Wayne Zeller, which came from all this.

Tree Leaf Fodder for Livestock (Hanson 2017)

Published in the Maine Organic Farmer & Gardiner

Tree Fodder from the Air Meadow (Hanson 2016)

This I wrote at Yvonne Taylor's request, for *Hoofprints*, the Maine Cashmere Society's newsletter. She also passed it to *Goat Keeper* August 2016 issue (Canada). This article led to our 1st Tree Fodder Seminar, in July 2016.

Tree Leaf Fodder Production; Northern Livestock Farmers are Retrieving Ancient Carbon Farming Methods (Hanson 2016). Another link: Acres USA Magazine Pages (both articles)

Published in *Acres USA* May 2017 issue. There was one brutal typo; the editor changed my “<” 3 inch diameter cuts to the words “greater than,” without showing it in “track changes,” so I missed that : (Michael Walder's article *Tree Hay for Meat Goats* (below) is in that same issue.

Tree hay for Meat Goats (Walder 2017)

Published in *Acres USA* May 2017 issue, along with my article above (I talked Michael & the editor into this). Michael Walder, Mahna Farms in Bancroft, Ontario, tells of his very efficient practices. Later he added a shredder that made dried twig refuse into fine grass-like fiber, which the goats ate entirely.

Tree Medicine from Goat Fodder: Using the Fruits, Barks, and Twigs of Our Labor (Byers 2016)

Steve Byers, Licensed Herbalist who once lived at my farm, presented for our Tree Fodder Seminar that year, & wrote this for us.

Trees & Shrubs Offer Useful Winter Forage for Ruminants, *Natural Farmer* layout (Hanson 2025)

Trees & Shrubs Offer Useful Winter Forage for Ruminants, text

I reluctantly wrote again for *The Natural Farmer* Summer 2025 issue (NOFA's newspaper-turned-magazine). I'd written them a climate-farming article with disastrous results (see my version with photos & credits under Climate Resources). I offer two layouts of it; text is in case you need a black screen.

When Art & Science Meet: Integrating Knowledge of French Herders with Science of Foraging Behavior (Meuret & Provenza 2015) This is a great summary of how herder & animals arrange their very effective meal-circuits; the authors' book *The Art & Science of Shepherding* explores many more aspects of this topic in depth.

Woodland Fodder Calendar Sketch (Hanson 2015) Plants & trees on this are specific to 3 Streams Farm's browse wands.

Diverse Videos re: Trees &/or Fodder

Life in Syntropy , Agroforestry in Brazil, sent by Alison Houghton

Poudyal 2017 , Beeju Poudyal's video of Hima and child Bimarsha cutting tree leaf fodder for their cattle and goats in Nepal. Thanks to Carol Kamala Kinsey who connected me to Beeju.

Chronobiology of Trees and the Fourth Phase of Water , Ernst Zürcher, U of Applied Sciences, Bern, Switzerland. I met Ernst Zürcher at Colloque Trognes in Sare, France where we both presented.

Agro-Forest Ecosystem Studies in Brazil , Juan Alvez, UVM, presentation for our Tree Fodder Seminar 2019

Open-burn Biochar Workshop (short) , video-recorded by Sarah Rowe at 3 Streams Farm

Pruning (old) Apple Trees , Ned Lightener, Belfast TV with Shana Hanson

Making Hay From Trees , Tap O' Noth Permaculture

Poor Prole's Almanac, Episode 67 & Poor Prole's Almanac, Episode 68 , Andy Cerone with Shana Hanson about Tree Fodder. I have not listened to this, but lots of folks have called me who did. The transcript was too rough to edit, despite Andy's offer for me to do so. I am not great at being interviewed; my mind is fast & interrupts my speaking (& that of others) with tangential information, so sentences don't get finished. There was a more recent sequel, not posted here, that I dred to hear about :) Thanks, Andy!

Shana's (mostly) Tree Fodder Presentations

My older presentations have more about history, and more humor. Newer presentations focus more on my research results and have ideas about mechanically scaling up. I enjoy making all these rich in photos and color. I usually add a lot of text after the presentation, which makes these stand-alone resources. Perhaps I can print and shuffle them later to make a nice book!

Maine Forage Conference Nov 8th, 2024

Short presentation slide-deck, about SARE results from field-edge harvest, tree & shrub leaf-silage trials & lab tests, text added, updated Jan 2025. I'd presented this in 15 minutes, at that conference.

Tree & Shrub Leaf Silage Production for Agroforestry Systems, NOFA MA, May 2nd 2024:

NOFA MA web presentation May 2nd 2024, updated Feb 1st 2025 , slides with text added

NOFA MA 5/2/24 Webinar Recording

Two virtual talks for a NY State Agroforestry Group of agricultural educators

The sound on my old computer got really quiet for these. I bought a microphone, but we didn't get it to connect. So I talked into my home cell device curly cord phone, which worked. I do wonderful slide prep on browse walks, then fail when stressed by technology. And Karl Hallen our machine wizard found no time to prepare anything at all, with 4 months lead time. The organizer Erica Frenay, however, never missed a beat.

9/6/25 Recording:

Forage Use of Northeastern Woody Species: Opportunities in Existing Silvopastoral Systems

Slides: Part 1 updated: Woody Forage Use within Existing Agroforestry Systems, for NY educators

10/20/25 Recording:

Scalable Development for Use of Woody Forages: Planning Efficiency

Slides: Part 2 updated: Scalable Development for Use of Woody Forages, for NY educators

NOFA NH 2023 Winter Conference:

Livestock Want Browse: Doable Methods For Use of Wild Woody Perennials

NOFA NH 2023 Presentation Slides

NOFA NH 2022 Winter Conference:

Tree Forages & Browse for Livestock Year-Round: Continued Learning at 3 Streams Farm

NOFA NH 2022 Presentation Slides & NOFA NH 2022 Recording

NOFA MA, Jan. 2019 Slides: Tree Fodder for Livestock & Climate Resilience, NOFA MA

NOFA NH, March 2019 Slides: Tree Fodder for Livestock & Climate Resilience Updated, NOFA NH

MOFGA Farmer to Farmer 10/4/19

Slides: [Extending the Grazing Season; Tree Fodder & other Strategies](#)

Recordings: [Part 1](#) & [Part 2](#)

I was disappointed by a Farmer to Farmer Conference presentation I attended about establishing silvopasture with a bulldozer. MOFGA Livestock Specialist at the time, Diane Schivera, promised that if I got a SARE grant, I could present about my own agroforestry there. When I finally did get one, MOFGA resisted. I added non-tree options in order to convince them to include me; then it was misleadingly listed as only "Extending the Grazing Season" in the program, so only a few people found me : (

Common Ground Fair 2018 Powerpoint: ["Tree Leaf Preferences of Cattle, Sheep, Goats and Hogs;"](#)

Shana's pre-Tree Fodder Seminar library talk, 2016, with pictures inserted by Jenny Johnson:

["Our Sustenance From Trees; A New Look At An Ancient Solution;"](#) Believe it or not, I wore a narrow dress, for fun.

2015 Maine Primitive Skills School, ["Tree Pollarding" video with Shana](#)

["Gathering Tree Fodder"](#) by Katia Danilova and Jenny Johnson

* One comment taken out of context, becoming inaccurate, in this. ~Shana

Shana Hanson with Ned Lightner on [Pollarding](#)

More Videos & Talks on Shana Hanson's [YouTube Channel](#)

Look for:

*Eliza Greenman's Tree Fodder Seminar talk (in many pieces- editing help welcome!)

*Dan Tansky on syruping various tree species

*Shana's Common Ground Fair Leaf Fodder talk (in many pieces; editing help welcome!)

*Green Foliage can Change Climate, parts 1 & 2) Sy Schotz and Shana Hanson, 2019

*Ivan Fernandez on Woodland Soils and Atmospheric Depositions, Tree Fodder Seminar 2019

*Moe Martin's Fruit and Nut Mountain, Tree Fodder Seminar 2018

*Many more clips of Tree Fodder Seminar events over the years (help to improve is welcome!)

Songs & Music of Farmer Shana at 3 Streams Farm

[GoatSong, Music of Shana Hanson at 3 Streams Farm](#) (Above link is to a folder of individual song files, posted on my Google Drive.)

I'm happy if you learn and sing my songs (do give credit to Shana at 3 Streams Farm, if you perform).

The pics on the music videos are just my pocket camera having to point somewhere (mostly out my window, or out with my herd). :) Enjoy. Sh