Forage use of Northeastern woody species to feed ruminants (and hogs)

Part 2, October 20th, 2025:
Scalable development for use of temperate woody forages: Planning efficiency

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What used to happen in our area with woody forages & ruminants?

- Some cattle wintered in woodlots.
- Trees were felled & fed during droughts.
- Leafy twigs, branches or raked leaves were dried in barns when hay crop failed.

How are animals & creative farmers (or zoos) utilizing woody forages now? ?

Marlene Marsh says the cattle at Caney Fork Farm stand on their hind legs to eat black walnut leaves!

(phone contact July 2025)

At Wolfe’s Neck Center, Freeport ME, the calves have sculpted, pollarded or made bonsai of Multiflora Roses and Bittersweet. .

Elizabeth Tarantino photo


At Karl’s job, a lot of willow leaves have not yet made it to the ruminants.

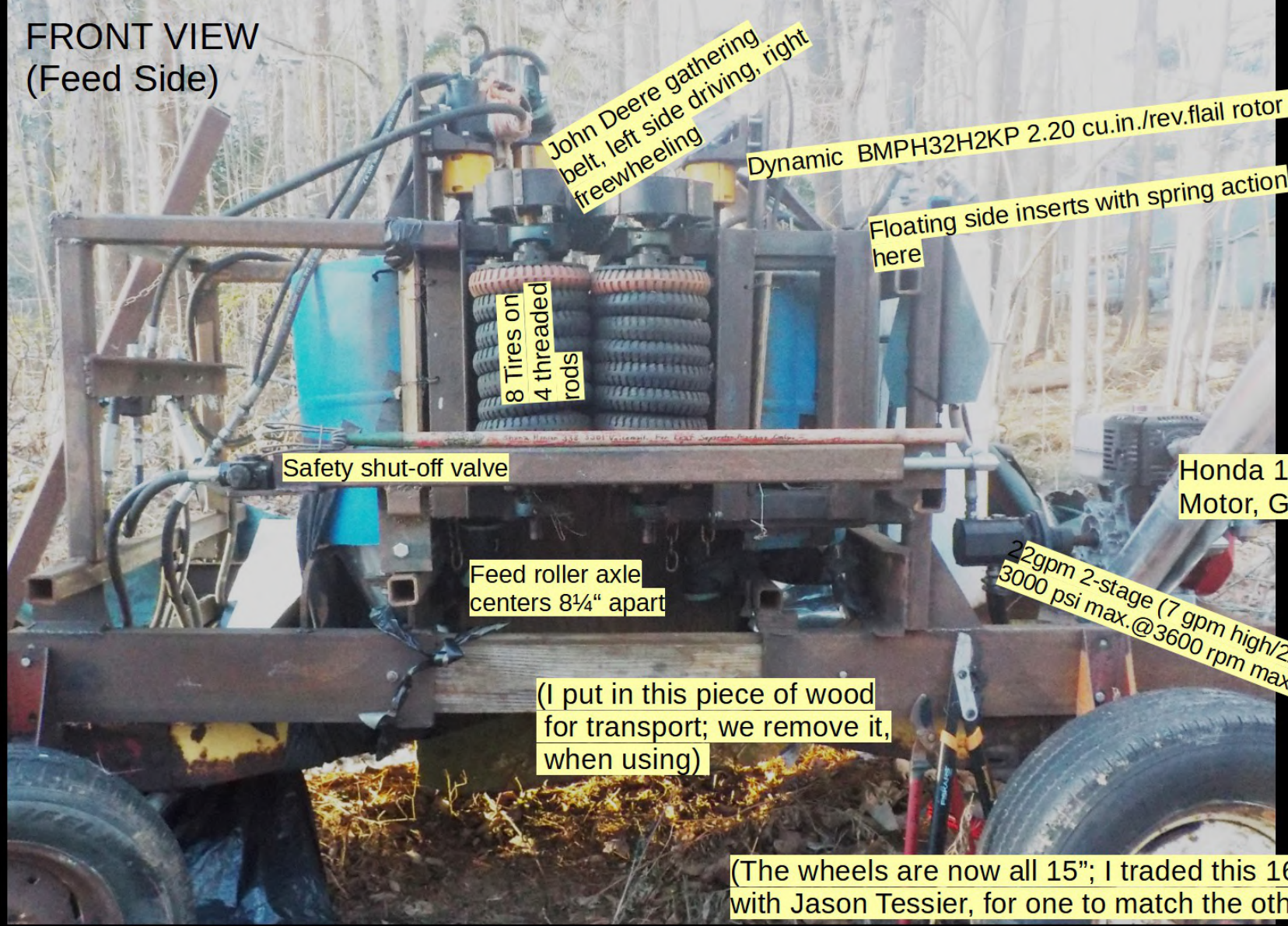
Here’s what cattle would do to it, directly grazing.

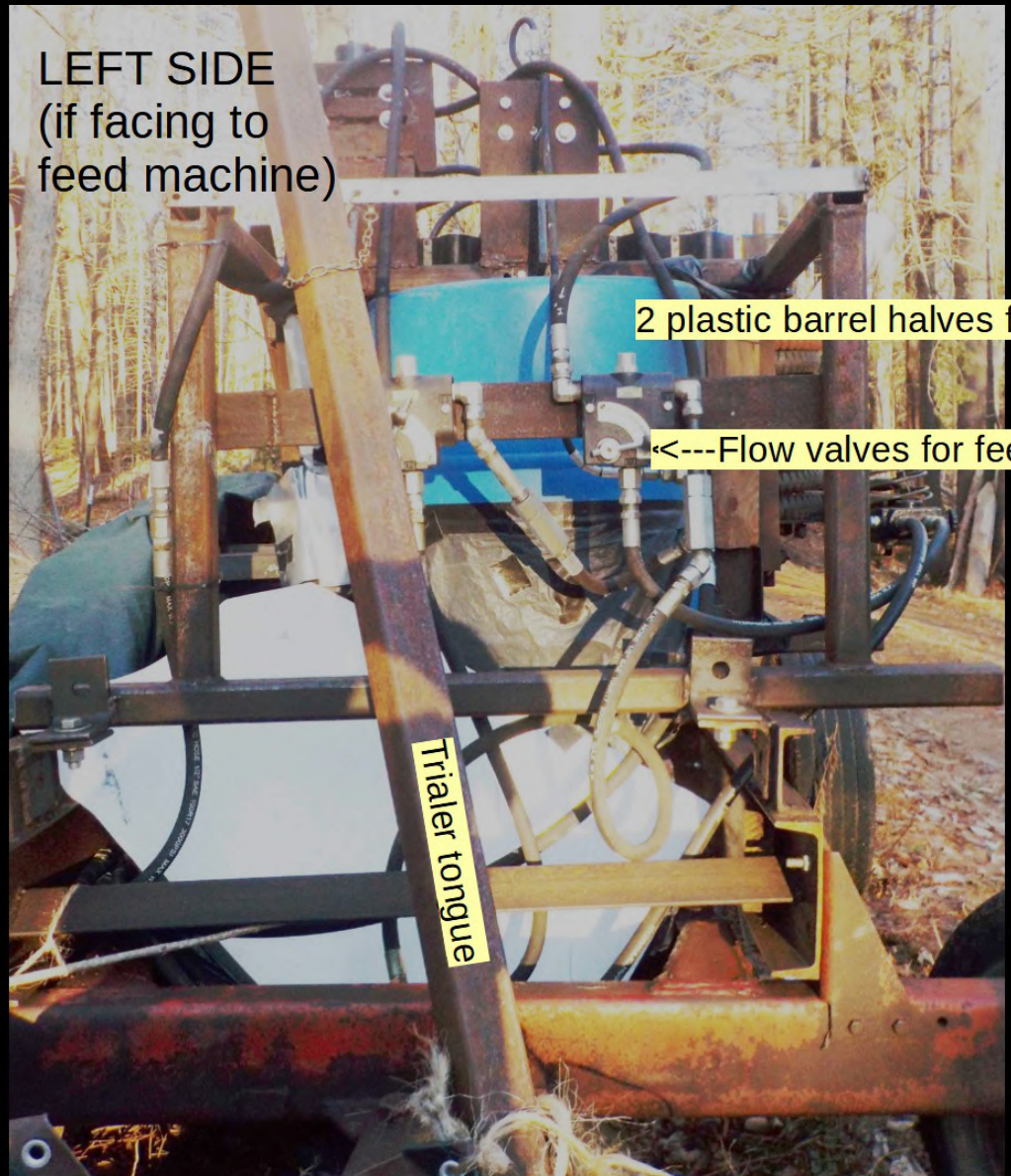
Karl Hallen photo,
2 yr willow growth

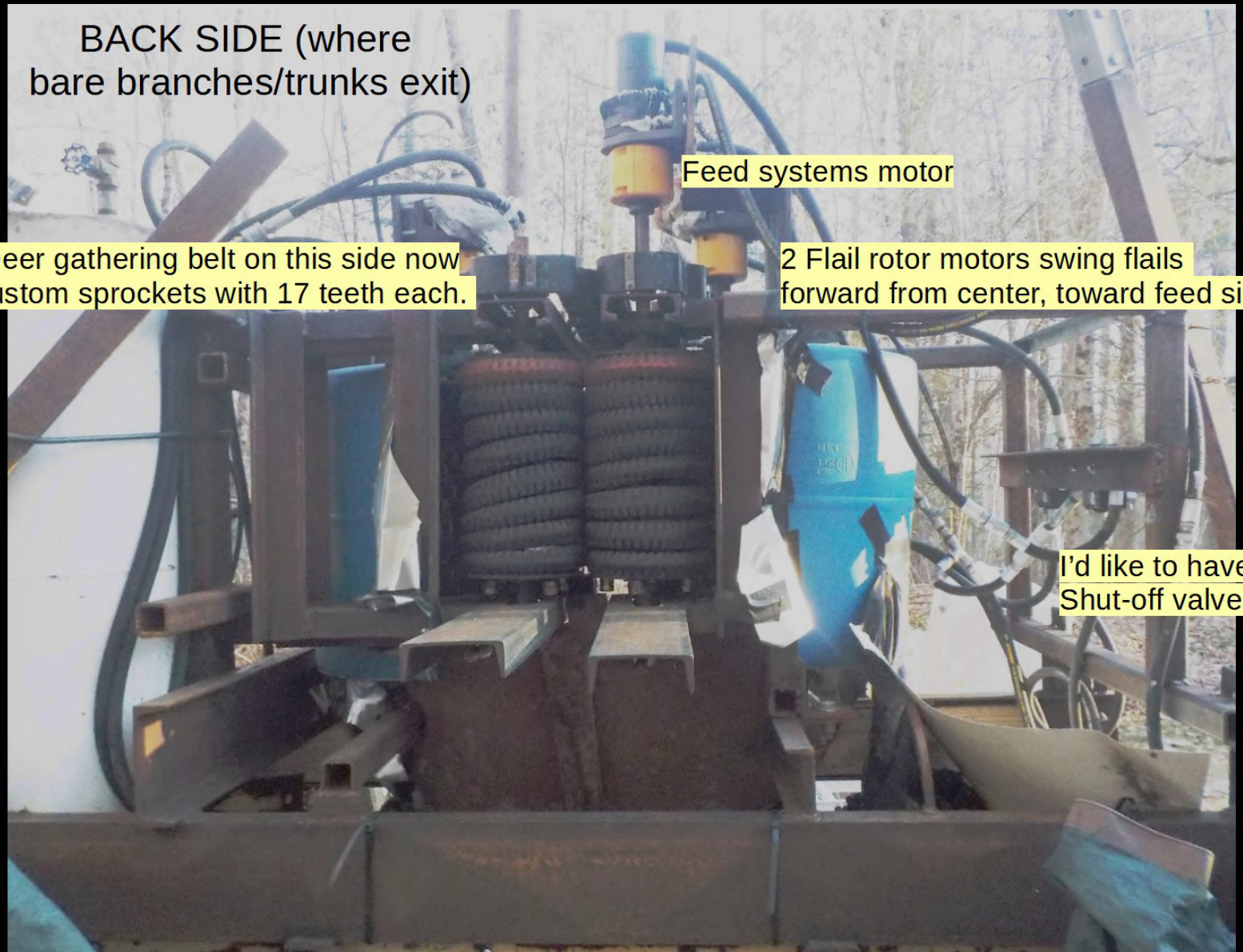
At 3 Streams Farm, I have a Chain-Flail Leaf-Separator,

but still tend to direct feed fresh tree matter year-round,
versus finding time to save summer leaves.
(Red maple bark & twigs are less toxic than red maple leaves >)

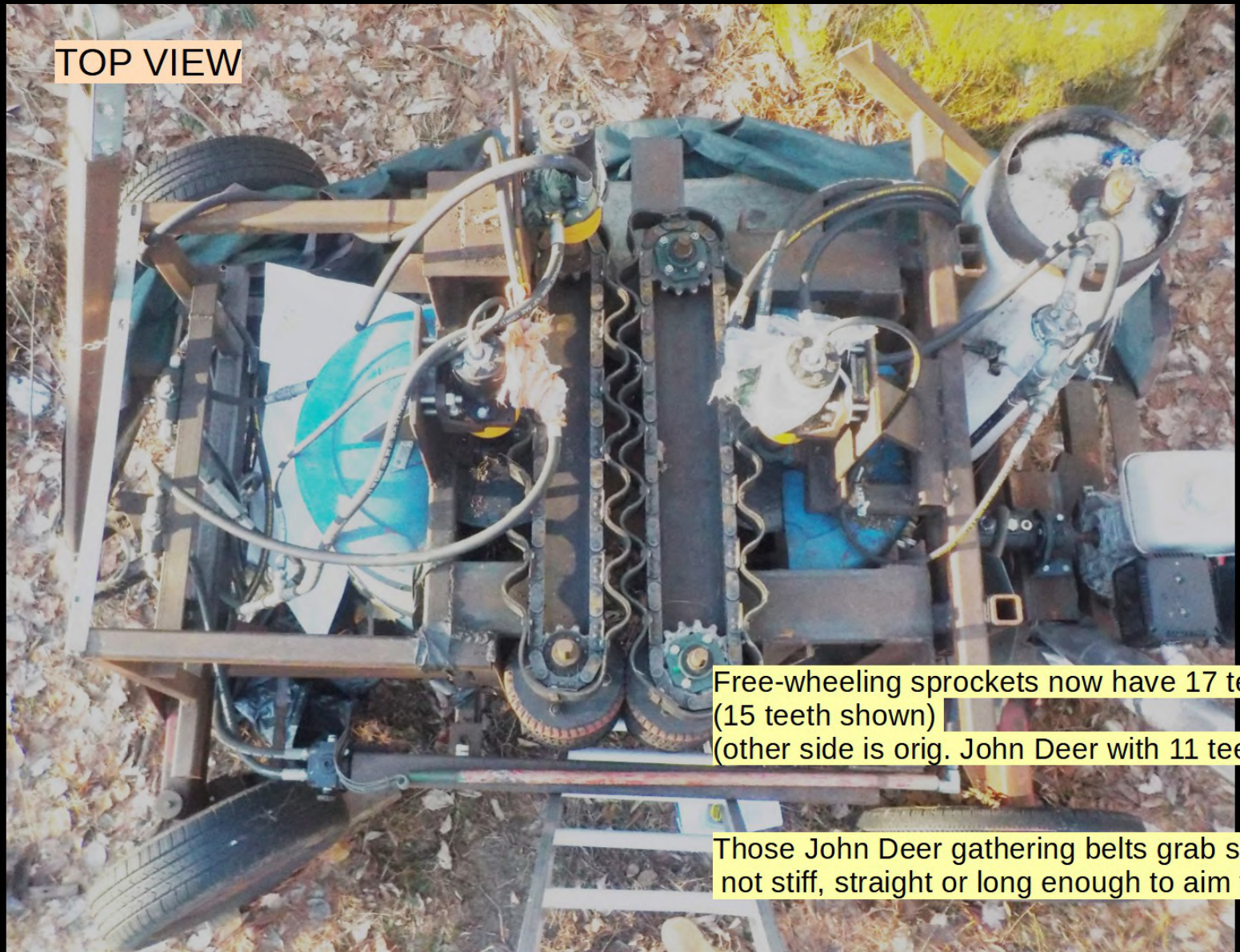
Susan Littlefield (Y Knot Farm) & others helped ensile summer leaves in 2023.


FRONT VIEW
(Feed Side)
John Deere gathering belt, left side driving, right freewheeling
Dynamic BMPH32H2KP 2.20 cu.in./rev.flail rotor motors
Floating side inserts with spring action here
8 Tires on 4 threaded rods
Safety shut-off valve
Honda 13 horse Motor, GX390
Feed roller axle centers 8¼“ apart
22gpm 2-stage (7 gpm high/22 gpm low stage) 3000 psi max.@3600 rpm max. hydraulic pump
(I put in this piece of wood for transport; we remove it, when using)
(The wheels are now all 15”; I traded this 16” one. with Jason Tessier, for one to match the others.)


LEFT SIDE
(if facing to
feed machine)
2 plastic barrel halves for flail housing
<---Flow valves for feed speed (left) & flail speed (right)
Trialer tongue


BACK SIDE (where
bare branches/trunks exit)
Feed systems motor
John Deer gathering belt on this side now
has custom sprockets with 17 teeth each.
2 Flail rotor motors swing flails
forward from center, toward feed side.
I'd like to have a 2nd Safety
Shut-off valve, on this side


RIGHT SIDE
(if facing to feed machine)
I rigged this aluminum flashing chimney to redirect exhaust
Hydraulic tank is re-purposed propane tank
CYCLONE
AIR CLEANER
HONDA
GX


TOP VIEW
Free-wheeling sprockets now have 17 teeth
(15 teeth shown)
(other side is orig. John Deer with 11 teeth
Those John Deer gathering belts grab small stock
not stiff, straight or long enough to aim through flails.

Wish list for the next Chain-Flail Leaf-Separator

All in all, these are relatively minor changes.
I am quite satisfied with the effectiveness of Karl's creation!

Cylindrical Flail Rotors
Larger (Pipe?) Frame
High-Tensile Chain Top-Feed System, strongly Spring-Loaded
Improved Exit-Rollers, sharing improved Spring-Loading with the top-feed
Control Bar = Safety Shut-Off Bar, on the ingoing feed side
Rear Shut-Off Button
Accessible Nuts on Tensioning Rods

Leaf-silage in ruminant rations

Ensiled machine-separated TREE LEAVES, with varying amounts of twigs included; Dairy One forage analyses

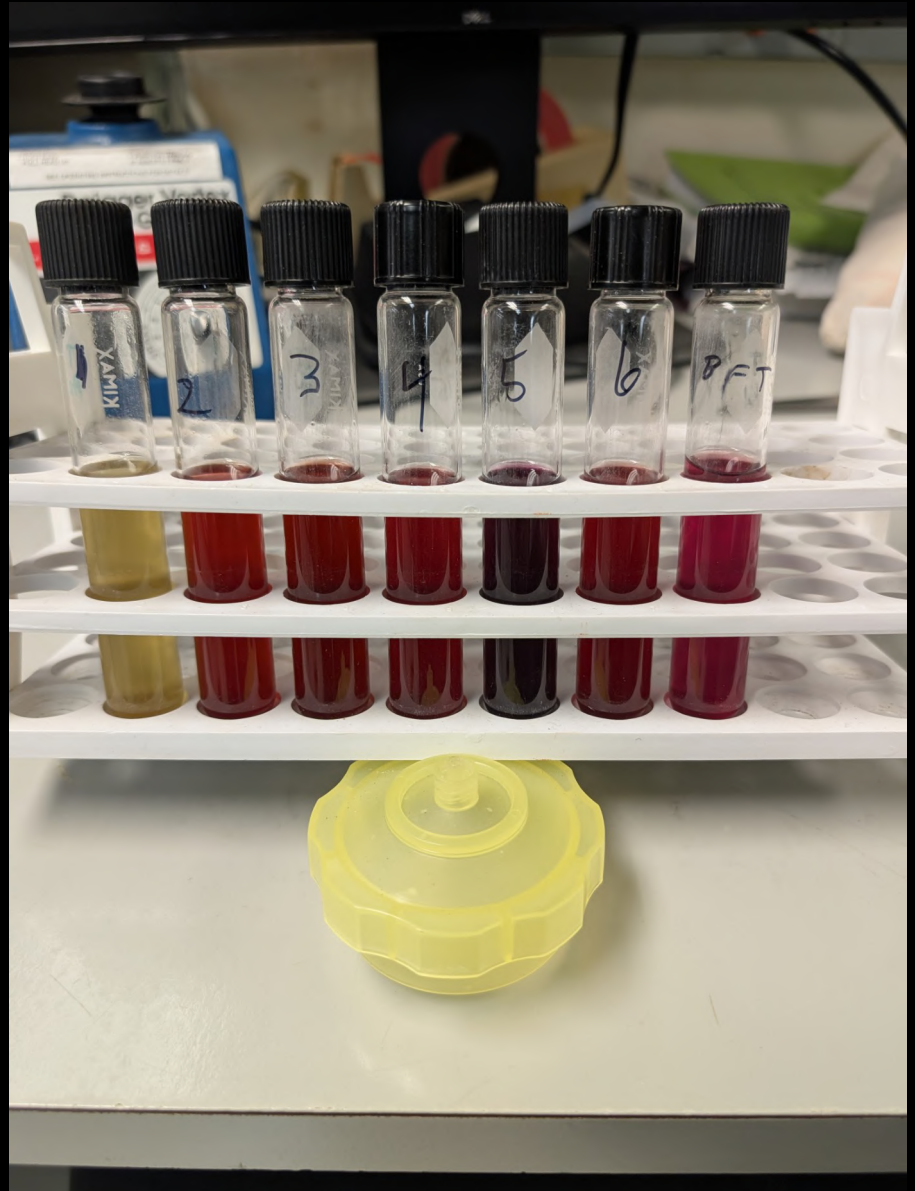
	Dry Matter	Crude Protei	Availa P	ADIC P	Adj CP	Sol P %CP	RDP %CP	SP %DM	RDP %DM	ADF	NDF	Dig F	NFC	WSC	Fat EE
2ND CUT HAY PACKED 12/21/23	81.4	18.6			18.60	33.00	70.00	6.14	13.0	35.9	57.6	21.7	13.9	7.5	
1ST CUT HAY PACKED 12/21/23	83.00	9.40			9.40	28.00	62.00	2.63	5.8	38.50	64.30	25.8	16.3	9.70	
Dairy One Ave 2004-'24 Grass Hay		11.03				33.94	65.02	3.74	7.2				19.4	11.3	2.63
Dairy One Ave 2004-'24 Grass Silage		15.48				53.19	70.70	8.23	10.9				16.8	7.96	3.97
Ave 9 Woody Species	43.20	12.32	8.36	3.95	8.57	15.00	23.85	1.84	2.8	25.92	37.51	11.6	37.1	9.88	5.85
Red Oak Aves	47.08	14.66	11.84	2.80						28.60	45.96	17.4		5.35	6.50
Quaking Aspen Aves	39.93	14.18	10.10	4.07	11.10	11.50	18.00	1.63	2.6	23.50	33.15	9.7		11.17	
Big-Toothed Aspen Aves	39.05	13.52	8.61	4.90	9.70	11.38	18.75	1.59	2.5	25.35	36.30			10.78	
White Ash Aves	41.92	11.08	6.58	4.48	7.58	18.00	19.20	1.99	2.1	26.75	39.20	12.5		8.38	
Green Ash Aves	41.88	12.98	7.98	5.00	8.98	21.75	27.75	2.82	3.6	28.60	41.23	12.6	22.90	7.45	4.90
Black Cherry Aves	41.12	13.47	10.28	3.19	11.83	19.70	20.75	2.65	2.8	22.19	30.02	7.8	42.50	8.77	4.90
Gray Birch Aves	45.91	11.56	6.66	4.89	5.83		(54)			31.87	44.40	12.5	33.78	8.24	6.98
Red Maple Aves	44.86	9.98	7.66	2.30	7.00	13.67	32.50	1.36	3.2	23.50	33.30	9.8	39.63	14.48	7.37
Rock Maple Aves	47.10	9.45	5.55	3.90	6.55	9.00	30.00	0.85	2.8	22.90	34.05	11.2	46.70	14.30	4.45

Non-Fiber Carbohydrates (NFC) are amazing; Water-Soluble carbs are high, within NFC. Crude Protein is respectable. ADICP may or may not accurately describe limits on utilization. Curiously, ensiling increased Fat Ether Extract by 10.89% of fresh level, across 16 species.

At “correct” level (<3% DM), Condensed Tamnins beneficially slow methane production, and rumenal protein break-down (improving protein utilization by up to 25%).

My animals eat A LOT of browse, so may AVOID some high CT (ex: hemlock in a drought year?)

\ They love lower-tannin species such as Ashes, Buckthorns...



Wayne Zeller's 2nd screen of Waldo County, Maine tree/shrub leaves for relative levels of Condensed Tannins

USDA ARS
US Dairy Forage Researh Center,
Madison, WI

All >5 except Sumac.

From left to right:
Staghorn Sumac fresh
Multi-floral Rose ensiled
Bittersweet fresh
Apple ensiled
Striped maple fresh (this is rated a 10)
Hybrid Willow ensiled
Birdsfoot trefoil reference

Wayne Zeller photo, 1/23/25, 11:07AM

Condensed Tannins

rated 1 to 10 (by darkness of liquid);
Higher rating = comparatively more.

0 White Ash

1 Green Ash, Honeysuckle, Pagoda Dogwood

1.5 Creeping Blackberry

3 American Basswood

3.5 Winterberry, Smooth Buckthorn, Norway Maple

5 Red Maple, Rock Maple, Black Cherry, Pin Cherry, American Elm, American Beech, Arrowwood, Leatherwood,

5.5 Red Oak

6 Box Elder, Birdsfoot Trefoil

7 Gray Birch (catkins were same), Quaking Aspen, Big-Toothed Aspen,

8 White Birch

10 Black Locust

from Wayne Zeller's 4/03/24 data chart

Our 2024-“25 findings on Maple species with notable intake limits

Species	Site	Gallic acid (ug/mg)	Hydrolyzed Gallic acid (ug/mg)	Free ellagic acid (ug/mg)	Hydrolyzed Ellagic acid (ug/mg)	Hypoglycin A (HGA) peak area	Hypoglycin B (HGB) peak area	Methylenecyclpropylglycine (MCPrG) peak area	γ-glutamyl-MCPrG peak area
Staghorn Sumac	Belfast Rail Trail, Belfast	20.34	5.45	n.d.	n.d.	11904	n.d.	6413	1621
Staghorn Sumac	Old Belmont Rd., Lincolnville	20.28	52.13	n.d.	n.d.	6043	n.d.	8600	1664
Staghorn Sumac	Y Knot Farm, Belmont	24.01	24.98	n.d.	n.d.	7562	n.d.	7955	1332
Box Elder	Belfast Rail Trail, Belfast	12.61	5.46	n.d.	n.d.	14908	29957	3117	5015
Box Elder	Hunt Rd., Unity	12.89	5.01	n.d.	n.d.	11351	25632	7507	10652
Box Elder	MOFG Kitchen, Unity	12.59	33.76	n.d.	n.d.	17159	161409	7623	52148
Red Maple	Belfast Rail Trail, Belfast	52.48	26.21	n.d.	0.17	2655	n.d.	42351	629
Red Maple	3 Streams Farm, Belfast	35.18	21.4	0.16	n.d.	1429	n.d.	36843	n.d.
Red Maple	Y Knot Farm, Belmont	73.04	6.07	1.20	0.70	1712	561	28661	n.d.
Sugar maple	Belfast Rail Trail, Belfast	15.25	0.32		21.18	5153	n.d.	8692	1020
Sugar maple	3 Streams Farm, Belfast	16.16	4.26	6.05	21.25	74983	934	11062	609
Sugar maple	Y Knot Farm, Belmont	13.91	7.1	0.17	14.65	70984	n.d.	10416	1286
							n.d.		
Norway Maple	Belfast Rail Trail, Belfast	17.83	26.88	n.d.	0.18	755	n.d.	2598	1733
Norway Maple	3 Streams Farm, Belfast	13.48	0.52	n.d.	n.d.	4174	n.d.	8921	1353
Norway Maple	Y Knot Farm, Belmont	13.36	0.56	n.d.	n.d.	5426	n.d.	14890	1899

Thanks to MU Metabolomics Center, & MU Center for Agroforestry

Hydrogen Cyanide in Cherry leaves

Cherry species are sometimes toxic.

Animals at many farms seem to sense & honor safe intake limits.

These data indicated no safety threat nor intake lmit, for our 2022-'23 barrel- & bucket-ensiled cherry leaves.

When I ensiled 7/3/25 young leaves from new sprouts only, in quart containers in a warm room, then froze & sent unopened, some results were irregular & dangerous (dried, also!). More research is needed.

Iowa State Veterinary Diagnostic Labortory Cyanide Analyses on Cherry Leaves

*Ensiled samples were drawn and frozen in winter or early spring.
June-harvested samples had more warm weather for fermentation than did October-harvested.

Harvest Date	Site, Sample Description	HC ppm as fed	Moisture %	HC ppm DM
09/29/22	YKF Black Cherry, Fresh	123.8	60	309.50
09/29/22	YKF Black Cherry, Ensiled	22.3		
06/27/23	MOFGA Black Cherry, Fresh	201.9	62	531.32
06/27/23	MOFGA Black Cherry, Ensiled	<50	66	<147.06
06/29/23	MOFGA Pin Cherry, Fresh	115.3	58	274.52
06/29/23	MOFGA Pin Cherry, Ensiled	<50	67	<151.52
10/11-12/23	YK WW Black Cherry, Fresh	113.4	58	270
10/11-12/23	YK WW Black Cherry, Ensiled	<50	64	<138.89
	(left out 24 hrs on a gray day)			

Level of prussic acid in forage (dry matter basis) and potential effect on animals

ppm HCN	Effect on animals
0-500	Generally safe; should not cause toxicity.
600-1,000	Potentially toxic; should not be the only source of feed.
1,000 and above	Dangerous to cattle and usually will cause death.

An afterword: My subsequent Cyanide findings in Cherry were confusing, irregular & scary (even in a dried sample), when I sampled earlier growth & new growth only. (My animals do seem to know when it’s okay.)

Species-specific toxins do not prohibit forage use.

Be aware of known cautionary tree/shrub/plant species,
& offer those when offering multiple species.

Ideally these species complement vs replace grass-based forages.

Animals select bites knowingly. Be careful when feeding in a stall.

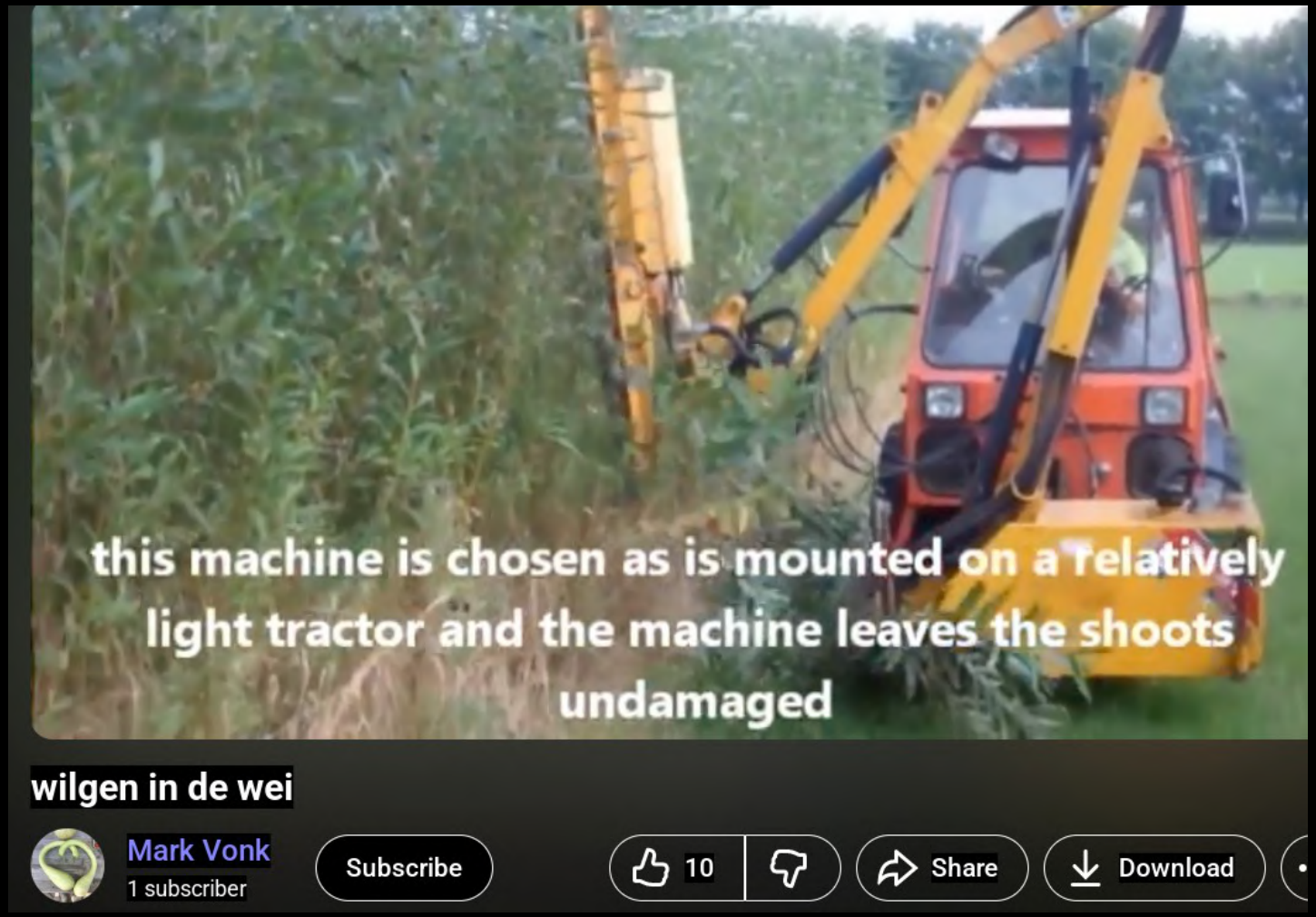
At Mahna Farms in Ontario, Canada, arborist Michael Walder DOES/DID find time to manually cut, bale & dry leafy twigs.

He bought this shredder to shred & feed dried twig refuse that his meat goats leave when fed the dried leafy bales.

They then eat it all.

Alex Caskey, Barred Owl Brook Farm in Essex NY, is feeding large areas of European Buckthorn to Katadin sheep, either by direct browsing shown, or by cutting/carrying. (Photo from his May 2, 2025 presentation for VT Farm to Plate).

Their Barred Owl Brook Farm website offers this link to a farmer in the Netherlands.
https://www.youtube.com/watch?v=VjxqpgAcLWA&list=LL&index=2



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Opportunities for woody forage with minimal processing

1) Direct herd access with rest periods (ideally years)
2) Fall leaf raking/blowing
3) Hedge-trimming
4) Orchard pruning
5) Top-clipping field-grown biomass

Upscaling leaf-silage containment

1) Air-space of twigs becomes an issue in piles versus containers.
2) Lysteria may or may not threaten small ruminants, if dirt enters (can listeria grow in these substrates?).
3) Tree/shrub silages tend to ferment slower & keep longer than grass or corn silages.

What about a reaper-binder?

This is a commercially available willow rod binder similar to the old wheat binders.
Karl helped a Canadian company use this in Cape Vincent, NY last December.
There is a bigger unit that has saw blades instead of a sickle bar. That one has a conveyor that loads onto a wagon, stacked but not tied in bundles.

These are leafy sheaves hand-bound with branches.

Perhaps we can make some very large stacks of reaper-binder harvested sheaves, at SUNY.

Karl Hallen’s thoughts on pre-chipper leaf-separation

Karl, you were supposed to fill this one in. :)

Karl Hallen’s thoughts on post-chipper leaf separation

:) Karl, you were supposed to fill this one in, also.

CALL him: (315)-416-1861


At Karl’s job, a lot of willow leaves have not yet made it to the ruminants.

Here’s what cattle would do to it, directly grazing.

Karl Hallen photo,
2 yr willow growth

Small-scale equipment

components


DELEKS


YARD
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This grapple bucket with a saw (chainsaw style) could mount on an excavator or on the knuckle boom log loader. https://gmt-equipment.com/grapple-saws/

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WEIGHT	85	

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with a rotator coupler

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Weight w/ rotator options	675 lbs
Cutting Diameter	8 in
Working Pressure	2,900-4,500 psi
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Grapple Opening	24 in
Excavators	2-5 ton

https://ragnartech-inc.com/our-attachments/excavators-telehandlers-skid-steers-attachments/ragnartech-tilt-rotator-s would give all position cutting and grabbing, but not the feeding into a chipper or leaf separator, which really needs a knuckleboom on rotating platform.

Mini-Jarraff Urban Tree Trimmer

youtube.com/watch?v=cyknVd1IrKI

Loftness Kwik-Trim, “$179,213 plus we estimate $5,000 freight to Maine”
Billy Good, email response 9/5/25 to my phone call. So ballpark $184,000.

Progressive Rail Kershaw Skytrim Mini 55 TH, $207,000 plus <$4,500 to ship, on 1 ton pick-up with flatbed gooseneck trailer (Hal Acree 9/5/25 phone contact) = ballpark $211,000.

Add this to the system and you are in business
This is a China made one but the better ones come from Finland.
With or without trailer, can be 3 pt hitch for tractor or on a trailer for big or small tractor or ATV.
Most Chinese are 5k $ plus shipping. Finish ones $20k range


FT9 | FT11 | FT13
SINCE 1962
FARMI FOREST
PIONEER IN SMART FORESTRY


Rabaud

We need more research about positive impacts when animals receive the browse they desire,

on animal health, human health, & shelf-life & flavor benefits in milk & meat,

& promotion of known climate-remediating evapo-transporational & carbon sequestration benefits,

to command a market that will support new equipment &/or labor intensity on farms.

The best fertilizer
is the footprint
of the farmer.

Thanks to Erica Frenay for her organizing
of this educational agroforestry event,
thanks to all of you for your work toward
supporting farmers' foliar developments,
& thanks to the trees & animals,
for their patient efforts to teach us what they know.

Thanks also to Northeast SARE
(Sustainable Agriculture Research & Education)
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