Climate Resilient Pastures:
Establishing long-lived, multipurpose fodder, fruit & nut trees in an Upper Midwest silvopasture system
Year 2 Findings

Emily Buehler O'Leary ~ North Fork Farms, Mazeppa, MN

NORTH CENTRAL
SARE
Sustainable Agriculture
Research & Education

USDA
United States
Department of
Agriculture

National Institute
of Food and
Agriculture

Land Acknowledgement

We farm and make our home on land that is the ancestral home of the Dakota peoples. We grieve for the violence, genocide and desctruction white colonialism brought to this place and these peoples. We celebrate the continued stewardship and leadership of all first nations. We humbly acknowledge the land belongs to itself.

North Fork Farms
Mazeppa, Minnesota

- ➢ Southeastern Minnesota (Zone 4b)
- ➢ 50ac, 45ac in pasture
- ➢ Partial oak savanna
- ➢ Grassfed beef & pastured pork
- ➢ Heritage cattle breeding stock
- ➢ 8-12 cow-calf pairs
- ➢ 4-6 feeder pigs

Added 600 trees in 2024

Drop in-place leaf fodder, tree hay & silage, fruit & nut mast:

- "Red" Mulberry
- Northern Pecan
- Chestnut
- Shagbark Hickory
- Hazelnut
- Apple
- Pear
- Serviceberry
- Persimmon
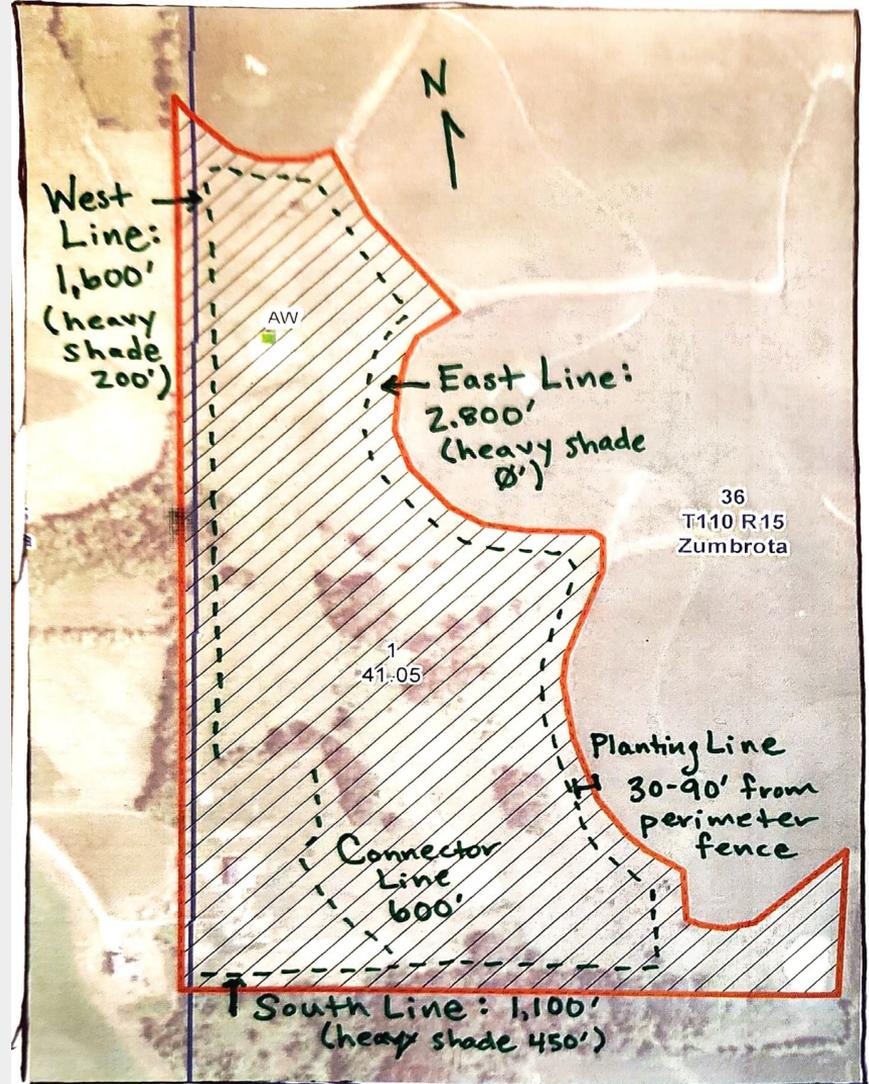
The planting:

➢ Perimeter loop 60-100ft off external fence

➢ Planted 2/3s red mulberry & other species in pollinating groups

➢ Wire cage protection + polywire protection lane to protect from browsing & create additional paddocks

➢ Mulch to be added this spring/summer

Funding for Project

NRCS EQIP:

$29/tree with woven cage protection for HU populations in Minnesota (payment for completed practices after being certified)

– Trees

– Posts

– Cages

– Planting Labor

SARE:

Up to $15,000 to explore sustainable farming solutions and education opportunities (grant with budgeted expenses & required reporting)

– Polywire protection materials & labor

– Mulching equipment & labor

– Watering equipment & labor

– Leaf fodder nutrition sampling

– Outreach

Year 2 Findings

1. Which fruit and nut trees can thrive in a low-input Zone 4b silvopasture environment?
2. Which fruit and nut trees can survive in a low-input Zone 4b silvopasture environment?
3. Do any of the fruit and nut trees that can thrive produce leaf fodder with potential as feed source for livestock?
4. Was the technical design of the planting successful?
5. Were there any other factors that may have impacted the success of the planting?

Year 2 Findings

Year 2 Findings

1. *Which fruit and nut trees can <u>thrive</u> in a low-input Zone 4b silvopasture environment?*

Red Mulberry (89%) and **Apple** (71%) were trees with high survival rates and excellent growth rates over 2 years - both average over 4 feet across the planting, with several trees of each species reaching 7 feet tall

Although **Serviceberry** (87%) and **Shagbark Hickory** (70%) had great survival rates, they had much lower growth rates - both averaging under 2 feet at the end of the year.

Year 2 Findings:

1. *Which fruit and nut trees can <u>thrive </u>in a low-input Zone 4b silvopasture environment?*

SARE: Climate Resilient Pastures at North Fork Farms

Year 2 Status (Sept 2025)

Tree	Total Planted	Survived through Y2	Survival Rate	Average Planting Height in Feet	Average Y2 Height in Feet
Apple	51	36	71%	0.25 - 2.5	4.26
Chestnut	33	21	64%	0.25 - 2.5	2.81
Hazelnut	22	14	64%	0.25 - 2.5	3.32
Hican	5	1	20%	1.5	1.50
Hickory (Shagbark)	23	16	70%	1.0	1.75
Northern Pecan	58	25	43%	1.5	1.58
Persimmon	24	12	50%	1.5	1.38
Pear	10	4	40%	1.5	2.63
Red Mulberry	358	320	89%	1.5	4.23
Serviceberry	23	20	87%	1.0	1.88
Total	**607**	**469**	**77%**		

Year 2 Findings:

1. *Which fruit and nut trees can <u>thrive</u> in a low-input Zone 4b silvopasture environment?*

SARE: Climate Resilient Pastures at North Fork Farms

Year 2 Status (Sept 2025)

Tree	Total Planted	Survived through Y2	Survival Rate	Average Planting Height in Feet	Average Y2 Height in Feet
Apple	51	36	71%	0.25 - 2.5	4.26
Chestnut	33	21	64%	0.25 - 2.5	2.81
Hazelnut	22	14	64%	0.25 - 2.5	3.32
Hican	5	1	20%	1.5	1.50
Hickory (Shagbark)	23	16	70%	1.0	1.75
Northern Pecan	58	25	43%	1.5	1.58
Persimmon	24	12	50%	1.5	1.38
Pear	10	4	40%	1.5	2.63
Red Mulberry	358	320	89%	1.5	4.23
Serviceberry	23	20	87%	1.0	1.88
Total	**607**	**469**	**77%**		

Year 2 Findings

*2. **Which fruit and nut trees can <u>survive </u>in a low-input Zone 4b silvopasture environment?***

Other species such as **Pear** (40%) and **Hazelnut** (64%) that are common in zone 4b had lower survival and growth rates than others, likely due to low sample size, and the fact that many of these trees were grafted cultivars

Year 2 Findings

2. Which fruit and nut trees can <u>survive </u>in a low-input Zone 4b silvopasture environment?

Some species were a stretch for zone 4b:

- **Northern Pecan** had relatively low survival rate (43%) and growth rate (1.6 feet), but a few of the seedling trees are really beautiful and pushing 3 feet.

- All **Persimmon** seedlings died back over winter, but (50%) grew back from the root system. All were still under a foot and a half at the end of year 2, but I'm excited we might have a few that survive.

Year 2 Findings:

2. Which fruit and nut trees can <u>survive </u>in a low-input Zone 4b silvopasture environment?

SARE: Climate Resilient Pastures at North Fork Farms

Year 2 Status (Sept 2025)

Tree	Total Planted	Survived through Y2	Survival Rate	Average Planting Height in Feet	Average Y2 Height in Feet
Apple	51	36	71%	0.25 - 2.5	4.26
Chestnut	33	21	64%	0.25 - 2.5	2.81
Hazelnut	22	14	64%	0.25 - 2.5	3.32
Hican	5	1	20%	1.5	1.50
Hickory (Shagbark)	23	16	70%	1.0	1.75
Northern Pecan	58	25	43%	1.5	1.58
Persimmon	24	12	50%	1.5	1.38
Pear	10	4	40%	1.5	2.63
Red Mulberry	358	320	89%	1.5	4.23
Serviceberry	23	20	87%	1.0	1.88
Total	**607**	**469**	**77%**		

Year 2 Findings

3. Do any of the fruit and nut trees that can thrive produce leaf fodder with potential as feed source for livestock?

- Only able to test species with enough growth and large enough sample size to produce 270g of leaves without killing off the tree

- Collected at the end of August, prime drought time for our area

- Many species that did well had a low crude protein (apple = 10%, hazelnut = 13%, hickory = 13%, chestnut = 13%)

- Red Mulberry was fantastic! Tested the 2 nurseries separately: 18.5% and 19.3% crude protein
  - Are the "red" mulberry really RED mulberry? (White mulberry has been research extensively as a feed supplement in drought conditions at 20+% crude protein)

Year 2 Findings:

3. Do any of the fruit and nut trees that can thrive produce leaf fodder with potential as feed source for livestock?

CUMBERLAND VALLEY ANALYTICAL SERVICES

" Laboratory services for agriculture ... from the field to the feed bunk "

CVAS

Farm:	**NORTH FORK FARMS**	**Copies to:**	
Desc:	**MULBERRY (MISSOURI)**		
Submitter:	**BUEHLER, O'LEARY, EMILY**		
Account:	**NORTH FORK FARMS MN**		

Lab ID:	**37660 074**
Sampled:	
Arrived:	**09/04/2025**
Completed:	**09/15/2025**
Reported:	**09/15/2025**

MULBERRY (MISSOURI)

SAMPLE INFORMATION

Lab ID:	37660 074	Series:	
Crop Year:	2025	Version:	1.0
Cutting#:			
Feed Type:	Misc-unknown		

CHEMISTRY ANALYSIS RESULTS

Moisture	67.3
Dry Matter	32.7

PROTEINS

	% SP	% CP	% DM
Crude Protein			19.3
Adjusted Protein			
Soluble Protein			
Ammonia (CPE)			
ADF Protein (ADICP)			
NDF Protein (NDICP)			
NDR Protein (NDRCP)			
Rumen Degr. Protein			

FIBER

	% NDF	% DM
ADF	105.1	18.9
aNDF		18.0
aNDFom		

MINERALS

Ash (%DM)	13.82
Calcium (%DM)	2.44
Phosphorus (%DM)	0.59
Magnesium (%DM)	0.63
Potassium (%DM)	1.32
Sulfur (%DM)	
Sodium (%DM)	0.01
Chloride (%DM)	
Iron (PPM)	123.00
Manganese (PPM)	57.00
Zinc (PPM)	29.00
Copper (PPM)	12.00
Molybdenum (PPM)	

FERMENTATION

pH	
Total VFA	
Lactic Acid (%DM)	
Lactic as % of Total VFA	
Acetic Acid (%DM)	
Propionic Acid (%DM)	
Butyric Acid (%DM)	

Year 2 Findings:

3. Do any of the fruit and nut trees that can thrive produce leaf fodder with potential as feed source for livestock?

CUMBERLAND VALLEY ANALYTICAL SERVICES

" Laboratory services for agriculture … from the field to the feed bunk "

Farm:	**NORTH FORK FARMS**	**Copies to:**	Lab ID:	**37660 073**
Desc:	**MULBERY (COLD STREAM, MI)**		Sampled:	
Submitter:	**BUEHLER, O'LEARY, EMILY**		Arrived:	**09/04/2025**
Account:	**NORTH FORK FARMS MN**		Completed:	**09/15/2025**
			Reported:	**09/15/2025**

MULBERY (COLD STREAM, MI)

SAMPLE INFORMATION			
Lab ID:	37660 073	Series:	
Crop Year:	2025	Version:	1.0
Cutting#:			
Feed Type:	Misc-unknown		

CHEMISTRY ANALYSIS RESULTS	
Moisture	69.1
Dry Matter	30.9

PROTEINS	% SP	% CP	% DM
Crude Protein			18.5
Adjusted Protein			
Soluble Protein			
Ammonia (CPE)			
ADF Protein (ADICP)			
NDF Protein (NDICP)			
NDR Protein (NDRCP)			
Rumen Degr. Protein			

FIBER	% NDF	% DM
ADF	126.0	20.3
aNDF		16.1

MINERALS	
Ash (%DM)	13.53
Calcium (%DM)	2.24
Phosphorus (%DM)	0.72
Magnesium (%DM)	0.52
Potassium (%DM)	1.71
Sulfur (%DM)	
Sodium (%DM)	0.01
Chloride (%DM)	
Iron (PPM)	136.00
Manganese (PPM)	50.00
Zinc (PPM)	36.00
Copper (PPM)	11.00
Molybdenum (PPM)	

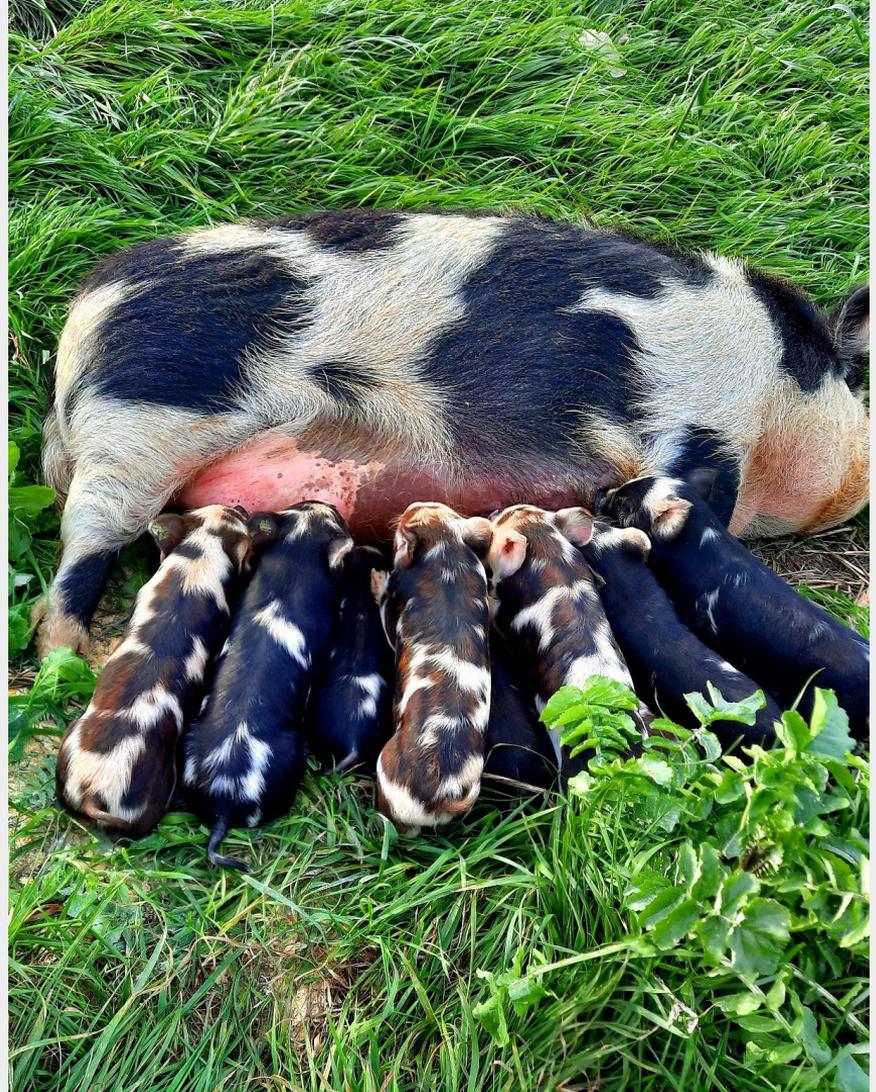| FERMENTATION	
pH	
Total VFA	
Lactic Acid (%DM)	
Lactic as % of Total VFA	
Acetic Acid (%DM)	
Propionic Acid (%DM)	
Butyric Acid (%DM)	

What's Next

Yr 3-5 (2026-2028):
- Finish mulching
- Replace those that didn't survive
- Track survival & growth rates (production for some species)

Yr 6+ (2029+):
- Propagate outstanding seedlings
- Plant a second loop with seedlings/grafts from thriving producers

Contact:

Emily Buehler O'Leary

North Fork Farms

www.northforkfarmsmn.com

embuehler@yahoo.com