

Virtues of Yellowbud Hickory









57.6 BILLION METRIC TONS

Is the estimated amount of soil loss in the Midwest due to farming

Thaler (et al) UMass Amherst

90%

Of food consumed in New England comes from outside the region.

-Food Systems New England













Biodiversity

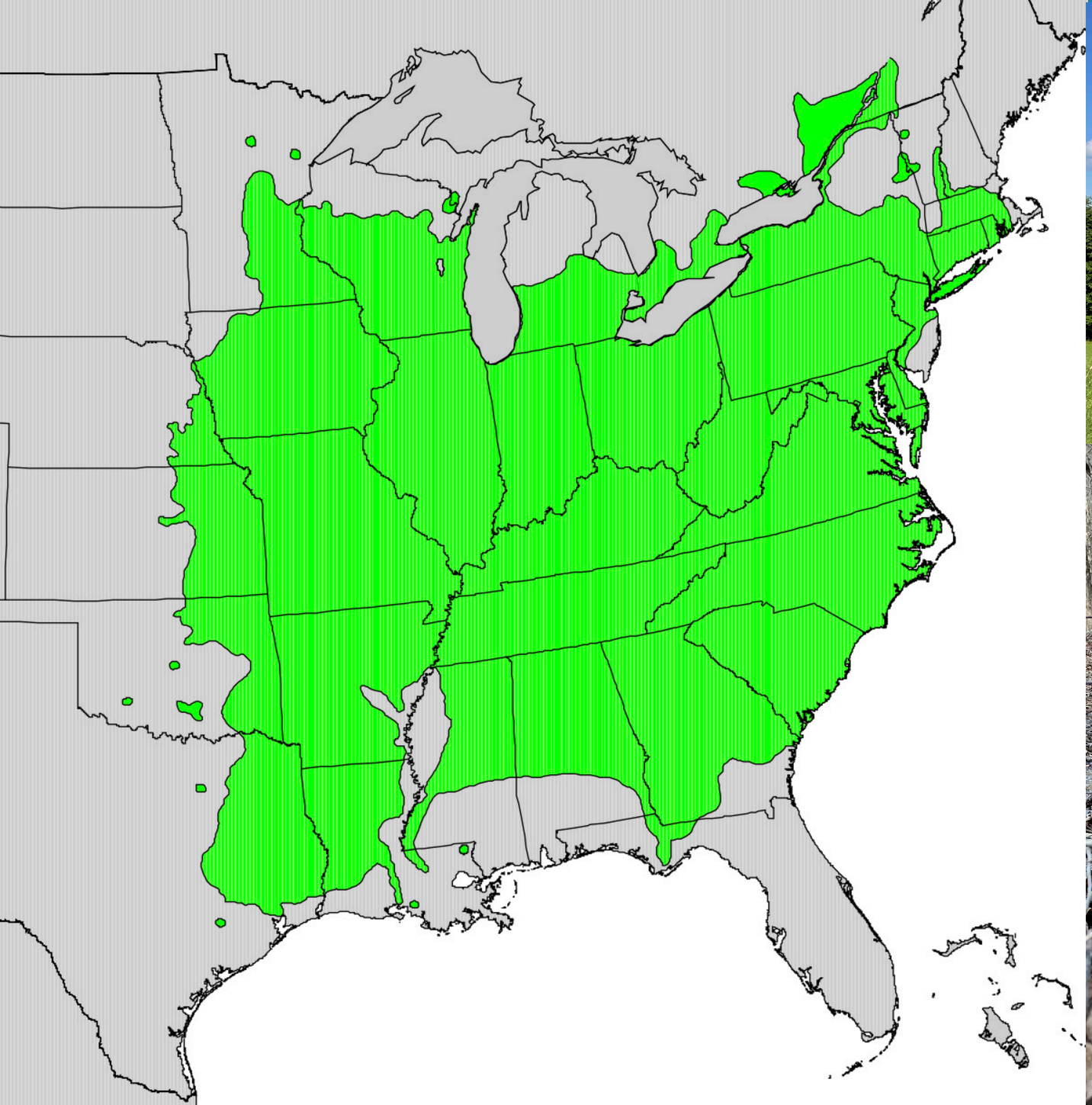


Oak Hickory

- Most common precolonial broad leafed forest type
- Highest biodiversity
- Highest carrying capacity

Adaptable

Widest Geographic range of any tree in the Juglandacea family







Soil Building

TABLE 3. Percentage Calcium Content of Mature Foliage of 27 Forest-Tree Species

Species	Number of trees in sample	Calcium content, expressed as percentage of dry material	
		Range	Average
Tulip poplar (*Liriodendron tulipifera* L.)	14	2.98–3.69	3.24
Red cedar (*Juniperus virginiana* L.)	10	2.63–3.15	2.93
Basswood (*Tilia americana* L.)	26	2.00–3.90	2.81
Black locust (*Robinia pseudo-acacia* L.)	11	1.94–3.62	2.65
Mockernut hickory (*Carya alba* [L.] K. Koch)	10	1.68–3.84	2.62
Bitternut hickory (*Carya cordiformis* [Wang.] K. Koch)	10	1.90–3.36	2.50
White cedar (*Thuja occidentalis* L.)	13	2.06–3.10	2.48
Hop hornbeam (*Ostrya virginiana* [Mill.] K. Koch)	16	1.68–3.10	2.27
Trembling aspen (*Populus tremuloides* Michx.)	18	1.62–2.76	2.21
White ash (*Fraxinus americana* L.)	10	1.50–3.56	2.19
Black cherry (*Prunus serotina* Ehrh.)	4	1.88–2.40	2.14
Shagbark hickory (*Carya ovata* [Mill.] K. Koch)	10	1.34–2.46	1.94
American elm (*Ulmus americana* L.)	10	1.40–2.23	1.81
Sugar maple (*Acer saccharum* Marsh.)	85	1.06–2.91	1.75
Norway spruce (*Picea excelsa* Link)	6	1.52–1.71	1.60
White oak (*Quercus alba* L.)	15	1.22–1.46	1.36
Red oak (*Quercus borealis* Michx. f. var. *maxima* Ashe)	11	0.99–1.76	1.21
Yellow birch (*Betula lutea* Michx. f.)	34	0.96–1.52	1.21
Chestnut oak (*Quercus montana* Willd.)	6	0.80–1.55	1.20
White pine (*Pinus strobus* L.)	15	0.70–1.55	1.20
Balsam fir (*Abies balsamea* [L.] Mill.)	10	0.75–1.35	1.15
Red maple (*Acer rubrum* L.)	40	0.68–1.90	0.91
Red pine (*Pinus resinosa* Ait.)	13	0.50–1.05	0.80
Hemlock (*Tsuga canadensis* [L.] Carr.)	12	0.50–0.90	0.80
Beech (*Fagus grandifolia* Ehrh.)	65	0.50–1.50	0.75
Scotch pine (*Pinus sylvestris* L.)	10	0.50–0.80	0.69
Red spruce (*Picea rubra* [DuRoi] Dietr.)	10	0.44–0.73	0.62



Healthy Fat

The range of oleic acid in Yellowbud hickory oil is nearly identical to that of Olive

HICKORY OIL – 61% TO 85.4% OLEIC
OLIVE OIL – 55% TO 83% OLEIC

TABLE 1. *World-wide listing of the taxa of Carya, species' averages and ranges of the fatty-acid composition of the American members*[a]

Taxon	No. samples	% Fatty acids									
		Palmitic		Stearic		Oleic		Linoleic		Linolenic	
Section *Apocarya* C. DC.											
illinoinensis (Wang.) K. Koch	8	6.35	(3.8– 7.5)	2.21	(tr–4.4)	72.86	(64.5–84.6)	17.88	(7.4–25.3)	0.71	(0–1.7)
cordiformis (Wang.) K. Koch	14	8.77	(6.6–15.1)	2.77	(tr–5.0)	72.75	(61.4–85.4)	13.52	(3.9–21.4)	2.09	(tr–4.8)
palmeri Manning	4	14.22	(12.9–15.7)	1.60	(tr–3.1)	60.77	(57.3–64.7)	23.02	(20.7–27.6)	0.32	(0–1.3)
× *lecontei* Little	4	6.85	(5.1– 7.5)	2.90	(2.0–4.2)	60.30	(58.0–62.2)	28.97	(26.9–29.2)	0.95	(tr–1.4)
myristiciformis (Michx. f.) Nutt.	8	9.31	(7.4–11.7)	2.68	(1.0–5.1)	54.17	(47.9–64.0)	33.75	(26.2–41.9)	0.11	(0–0.9)
aquatica (Michx. f.) Nutt.	6	9.08	(7.7–11.0)	2.21	(1.2–2.8)	53.73	(48.1–58.2)	33.88	(29.9–38.5)	1.11	(0.7–1.7)
cathayensis Sarg.[b]											
poilanei (Chev.) Leroy[b]											
tonkinensis Lecomte[b]											
Section *Carya* C. DC.											
2n *ovata* (Mill.) K. Koch	5	10.34	(9.6–11.4)	2.40	(1.0–3.5)	57.72	(47.8–66.8)	29.16	(18.7–39.2)	0.40	(0–1.0)
2n *laciniosa* (Michx. f.) Loud.	6	8.03	(5.5–10.1)	1.73	(0–3.4)	56.06	(41.7–66.1)	33.55	(22.0–45.0)	0.56	(0–0.9)
carolinae-septentrionalis (Ashe) Engl. & Graebn.	4	9.00	(7.4–10.4)	1.10	(0.4–1.8)	54.47	(42.9–63.2)	35.40	(25.6–49.3)	0	
ovalis (Wang.) Sarg.	8	9.10	(5.4–14.2)	2.41	(tr–4.1)	52.41	(38.9–60.6)	35.83	(23.2–42.9)	0.23	(0–1.3)
floridana Sarg.	4	7.57	(7.0– 8.4)	2.25	(1.5–3.5)	50.05	(42.8–54.6)	40.10	(36.1–45.3)	0	
texana Buckl.	29	8.12	(4.8–10.7)	1.87	(0–3.8)	49.36	(31.8–64.9)	39.50	(27.0–55.4)	1.13	(0–9.8)
4n *tomentosa* Nutt.	32	7.82	(5.8–11.3)	1.68	(0–3.2)	48.85	(32.8–68.1)	41.17	(22.6–57.3)	0.47	(0–7.8)
pallida (Ashe) Engl. & Graebn.	5	10.30	(8.2–13.0)	2.10	(1.7–3.0)	46.78	(37.1–63.9)	40.22	(25.2–49.9)	0.66	(0–2.2)
glabra (Mill.) Sweet	18	8.78	(6.6–11.8)	1.56	(0–3.8)	46.13	(32.6–63.1)	43.15	(25.7–58.5)	0.34	(0–2.1)

Three Oil Tests

- Skyrock
  - Monounsaturated- **71.30**
  - Omega 6 to 3 ratio- **5.53**
- Scott
  - Monounsaturated- **63.20**
  - Omega 6 to 3 ratio- **5.5**
- Mixed Batch
  - Monounsaturated- **70.30**
  - Omega 6 to 3 ratio- **3.69**

Smoke Point Myth

- Smoke point does not predict oil performance when heated
- The lower PUFA the better
- The less refined the better



Easily Harvested and Processed

Highest fat content and kernel to shell ratio of any tree in the Juglandacea family














HASATSAN











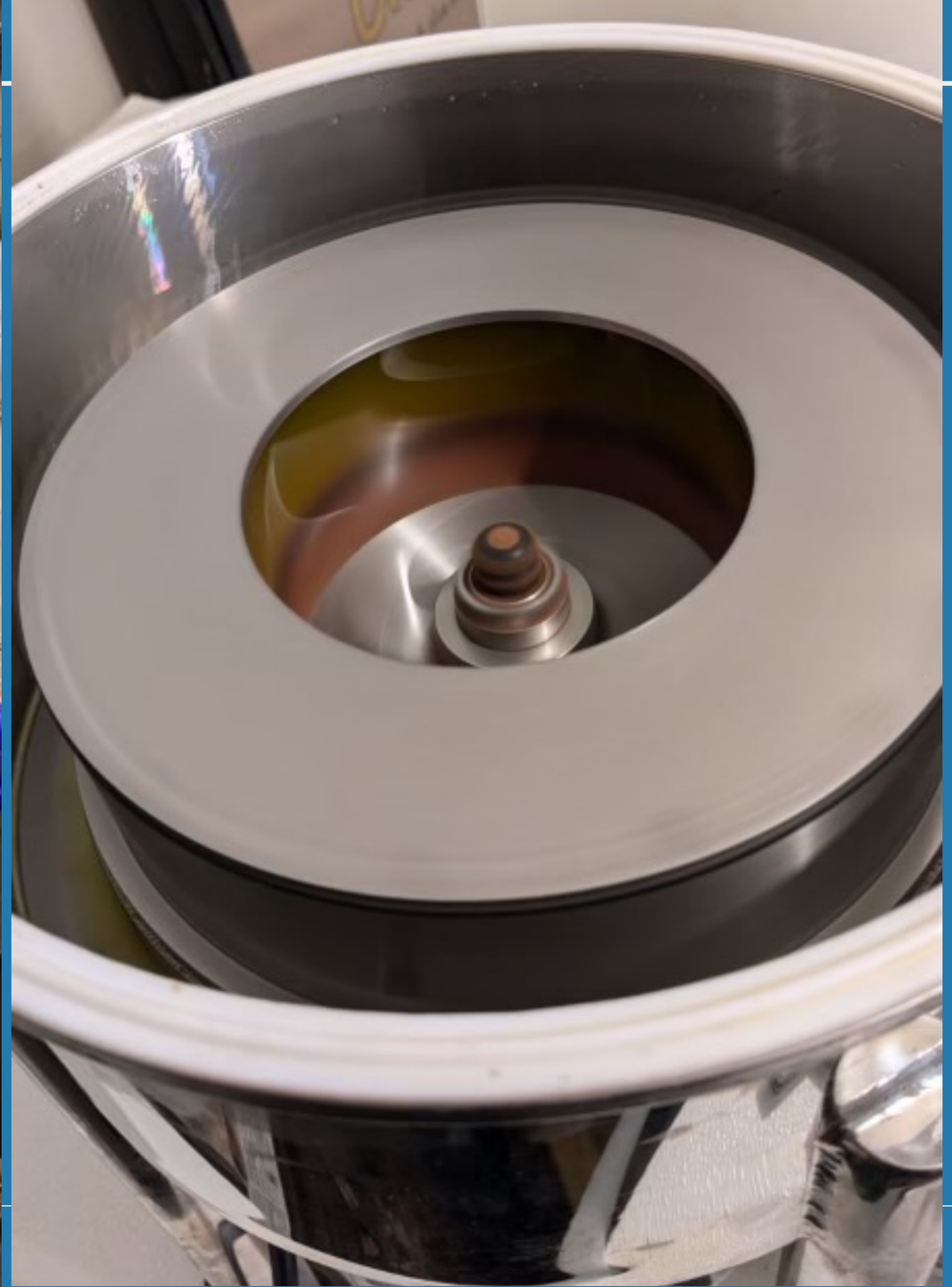






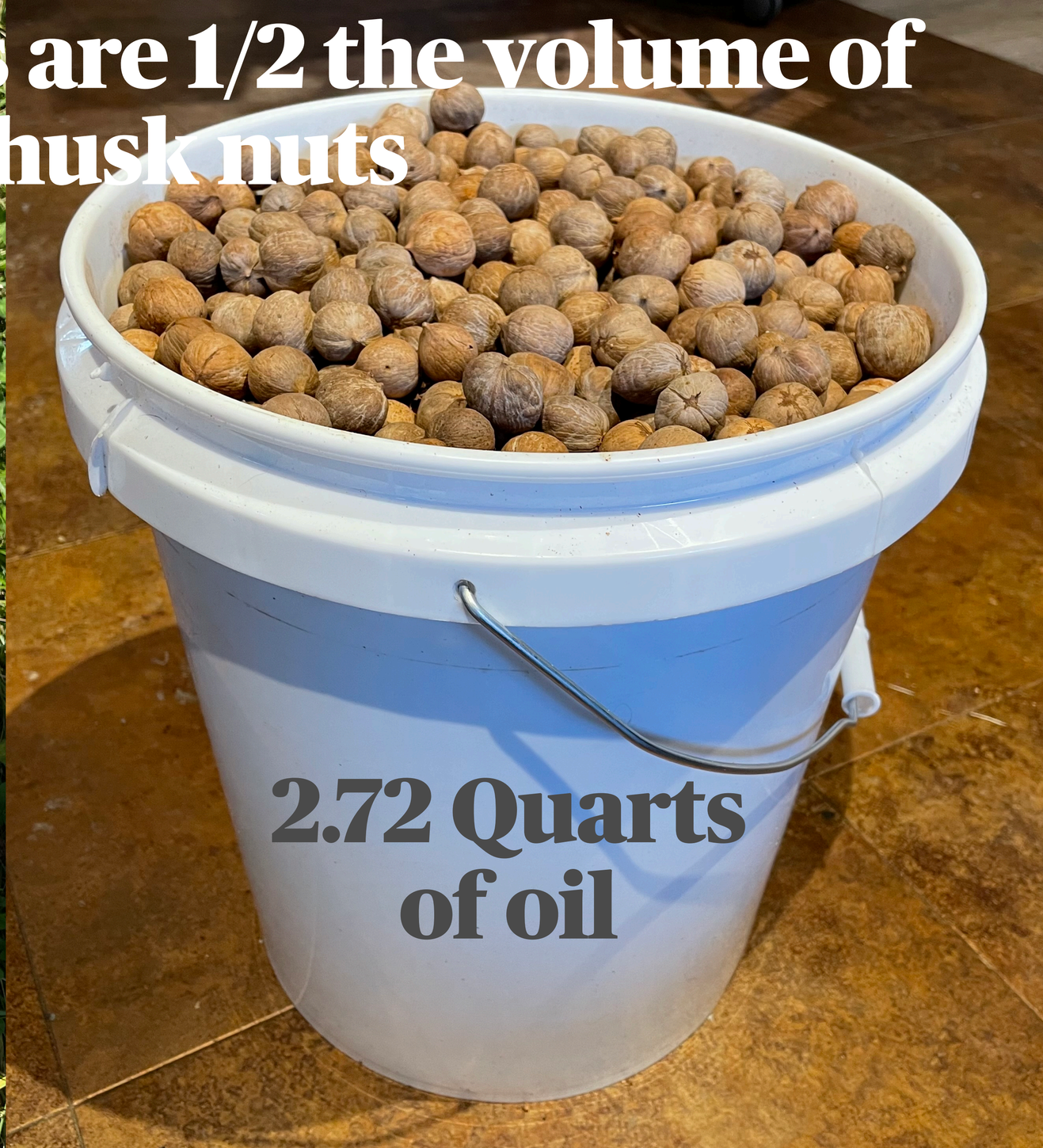

4 days
10 days
Filtered
Fresh hickory oil





Dried & husked nuts are 1/2 the volume of fresh in husk nuts





“If my ancestors could see the ease with which this was processed into liquid gold, I know they’d be absolutely astounded... **Indigenous wisdom combined with modern technology is paving the way to a reciprocal and resilient future that can sustain humans and our surrounding ecology indefinitely.**”

- Schikoy Hause
Sacred Circle Homestead

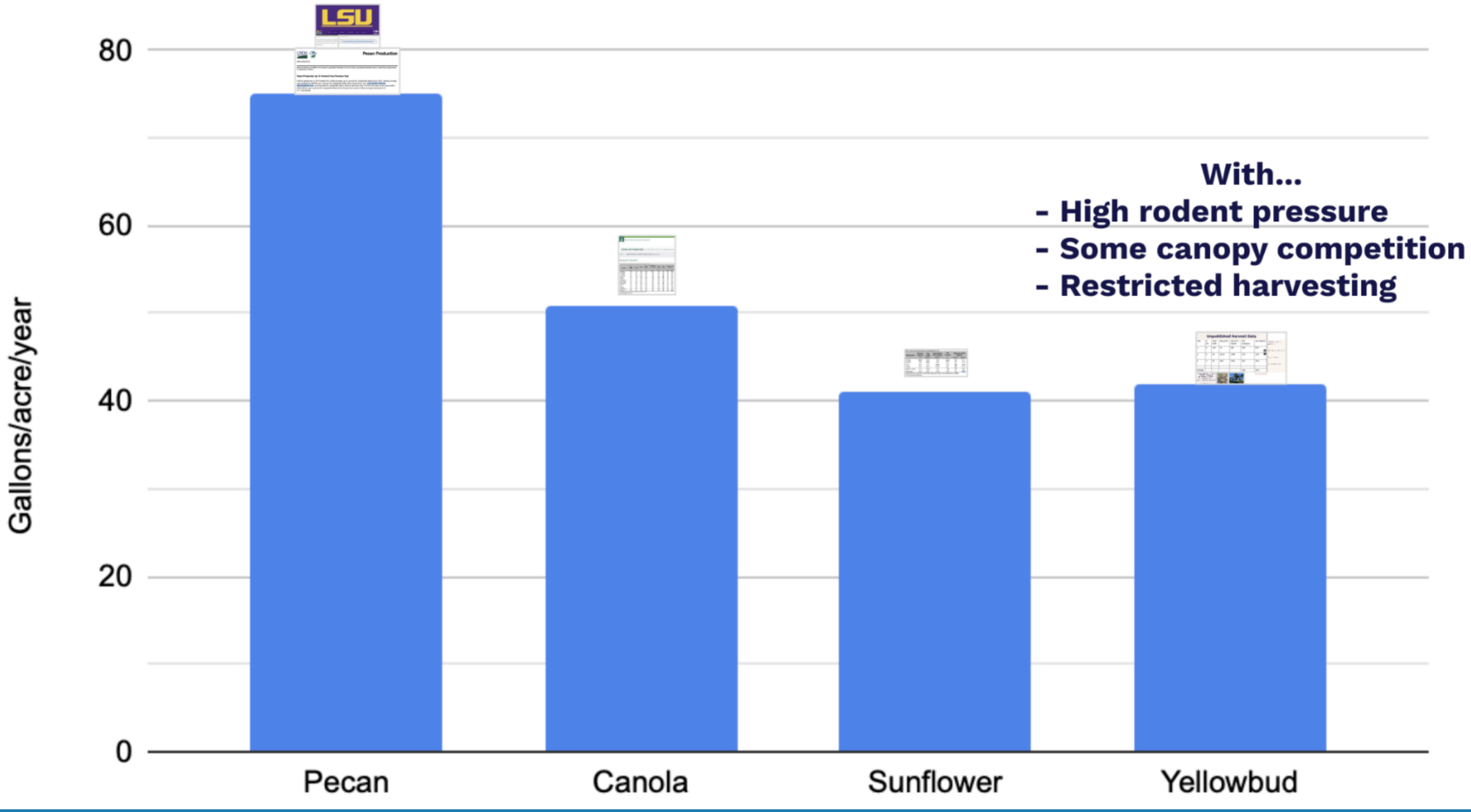
Productive

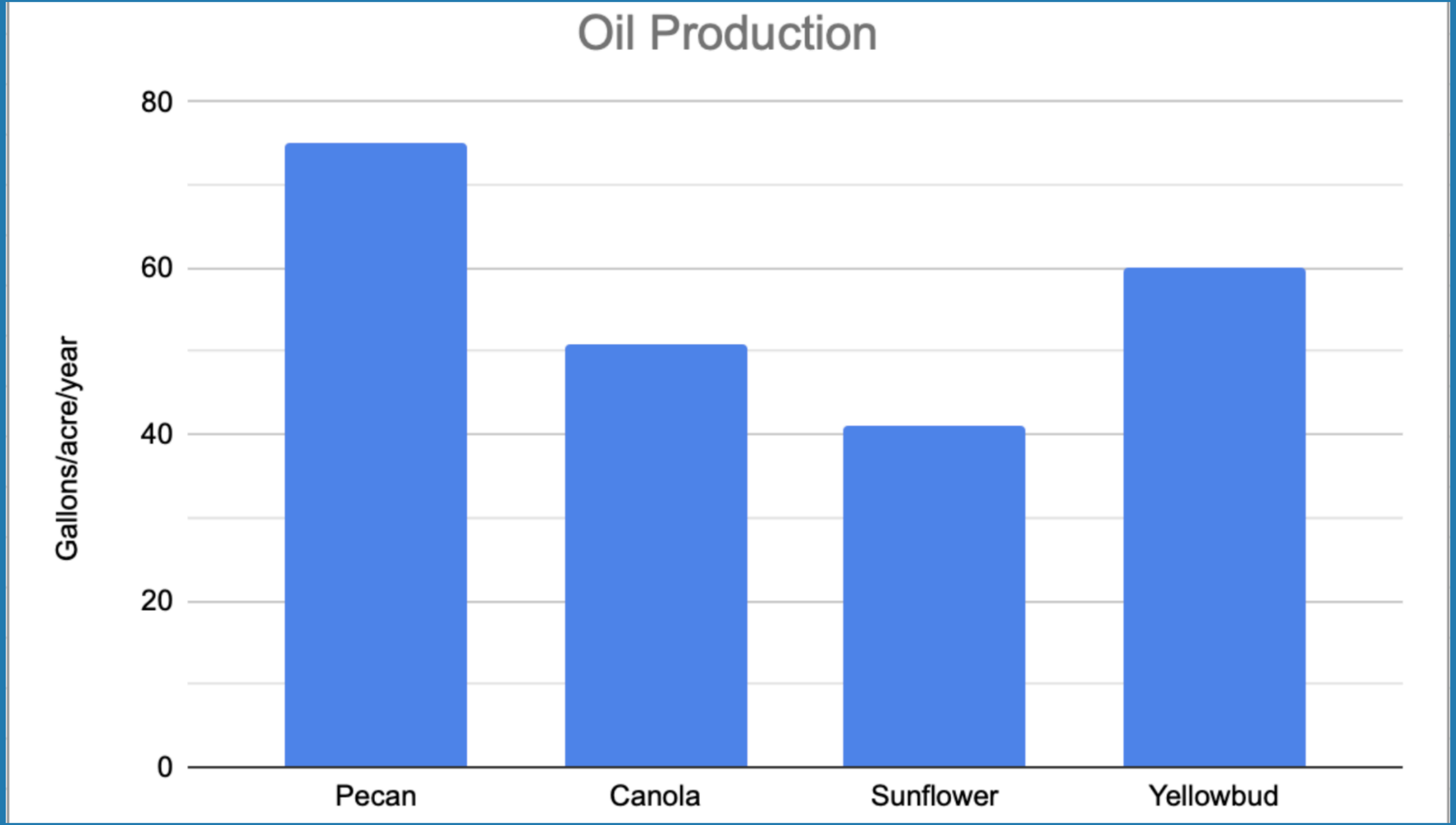
"Bitternut hickory fruit is generally considered unpalatable to wildlife... Seed dissemination is almost entirely by gravity."

-U.S. Department of Agriculture
Forest Service



Oil Production




Oil Production
80
60
40
20
0
Gallons/acre/year
Pecan
Canola
Sunflower
Yellowbud

Pecan Bearing Acreage, Yield, Production, Price, and Value – States and United States: 2017-2019

State	Yield per acre [1]		
	2017	2018	2019
	(pounds)	(pounds)	(pounds)
Alabama [2]	220	200	(NA)
Arizona	1,750	1,640	1,920
California [2]	1,389	1,057	(NA)
Georgia	892	583	535
Louisiana [2]	650	450	(NA)
New Mexico	2,115	1,980	2,100
Oklahoma	163	100	220
Texas	426	300	380
United States	753	593	668

Why are the yields so different?

“My experience picking wild pecans and bitternuts suggests that, in general, bitternut is a more productive tree. Both the average yields and maximum yields of similar-sized trees seems to be greater for bitternut where the two grow near each other.”

- Sam Thayer

Generous Mother Trees

Akiva's Consistent





Skyrock




April 26th


August 2nd

Cordiformis Hybrids

The best of which are more vigorous, more consistent, more productive, and can be low or non astringent



CMO

53% Kernel

4.1 Grams

NW wisconsin

Gotten down to at least -48

Abby

Pecan x Yellowbud




Abby
60% Kernel
2.5 Grams

Abby

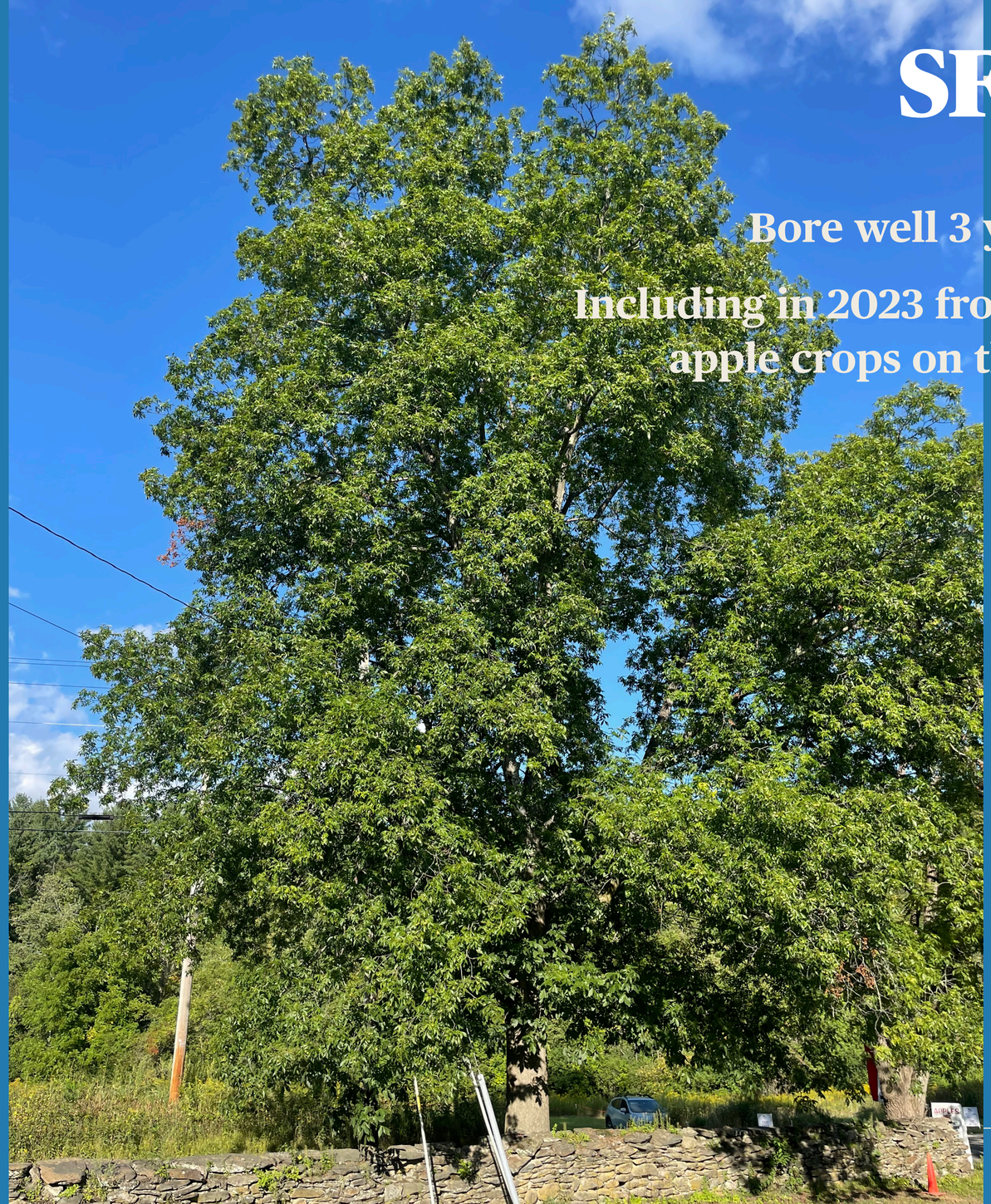
- No damage in late frost year
- Mostly dehiscent
- Bears and fills well
- Pollen fertile

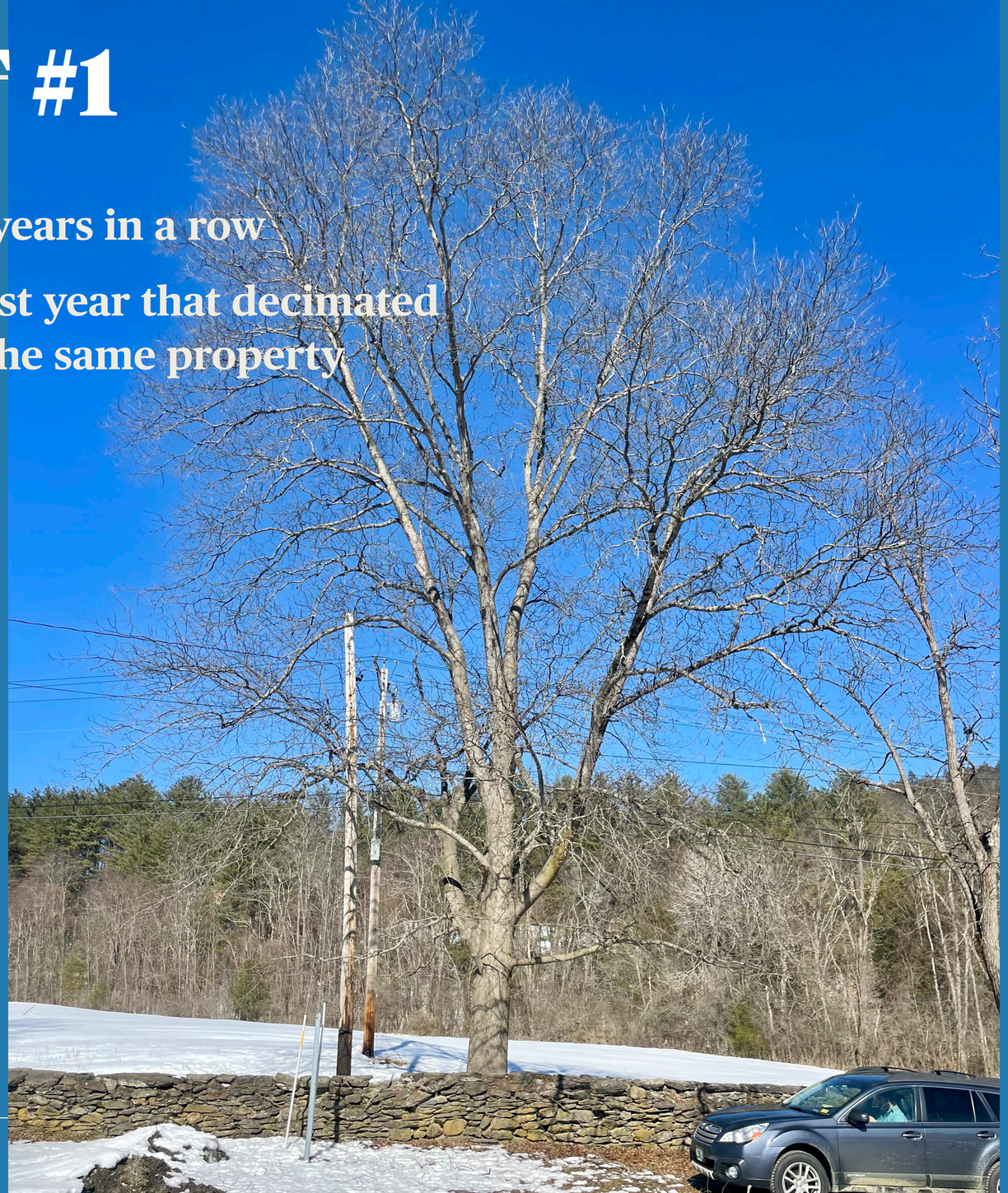


SF #1

Bore well 3 years in a row

Including in 2023 frost year that decimated apple crops on the same property





SF #1




SF #1
53% Kernel
3.8 Grams


SF #1


SF #6


SF #6
56% Kernel
4.9 Grams

Paradise



479lbs (~125gal)
in 2022


Paradise
2023

Paradise

56% Kernel

3.7 Grams




Paradise
STOP
ANTIQUES
Nov 6th 2022


Paradise
Many nuts were not
collected in 2022

Paradise

Vigorous seedlings with variable morphology



Precocity





6 yrs after transplant!



Sam's 2024 Harvest

- 8 years after transplanting a ~2ft tall wild seedling
- 12 ft wide and 25 ft tall
- 3.7 gallons of in husk nuts

Agronomic Extrapolations:

- At 20 x 20 spacing –> 400 gallons nuts/acre
- Over 26 gallons of oil/acre in year 8
- $240/gal –> $6,240/acre
- ~17lbs of presscake/gallon of oil
- At $8/lb of presscake–> $3,536/acre
- WITHOUT irrigation, fertilizer, weed suppression or improved genetics, in Northern Wisconsin – zone 4a
- There are many assumptions baked into the numbers but it's promising
- Marketing will be needed as supply increases over the coming years but harvest/processing development could drive costs down simultaneously

Labor Per Gallon

Minimal equipment/Wild harvest

- 3 hrs to harvest by hand
- 2 hrs to husk and sort
- 2 hrs to crush and press
- 1 hr to bottle, label, clean up
- 1-2 hrs to sell
- 9-10 hrs per gallon

More equipment/Tended contexts

- 30 mins to harvest w/ bag o nut
- 15 mins to husk and sort w/ Hasatsan
- 1 hrs to crush/press w/ 2 presses and hoppers
- ? hrs to bottle, label, clean up with automation
- ? hrs to sell online and to restaurants
- 2-6 hrs per gallon?

How low can this go with help from process engineers?

Mapping

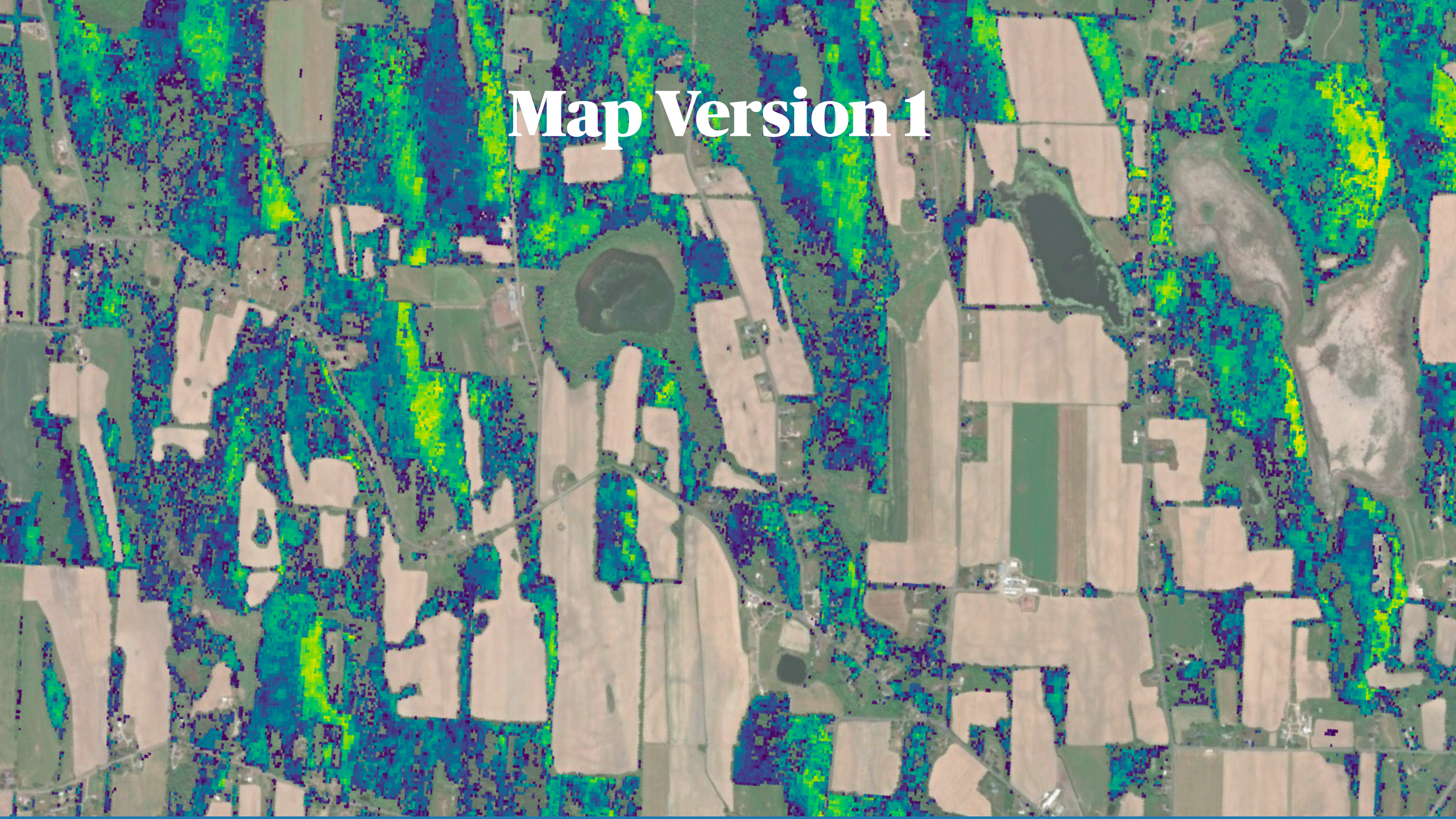
To aid in the harvest and assessment of existing trees

Breaking barriers for rural economies around native nutritious staple foods
Building awareness and processing efficiency while plantings get established

Map Version 1



"The heat Map"


Map Version 1

Map Version 2

The available GIS data in NY will allow for better predictions

- Funding is already allocated to create a more accurate predictive map. Thank you Hudson Valley Farm Hub!
- Version 2 will have a new convolutional neural network and a searchable user interface
- Want to get help? Ground truth predictions to make the tool more functional for everyone!

It will help wild harvesters, growers, breeders to:

- Find new trees to collect from
- Track harvests to find new outliers to add to germ plasm development
- Evaluate trees to assess response to different weather patterns

Desirable Harvest Qualities

- Minimal competition
- Close proximity to harvester
- Car access
- Clear picking surface





Levi's 'Oil Bush' Trials

Fancy Twig Farm

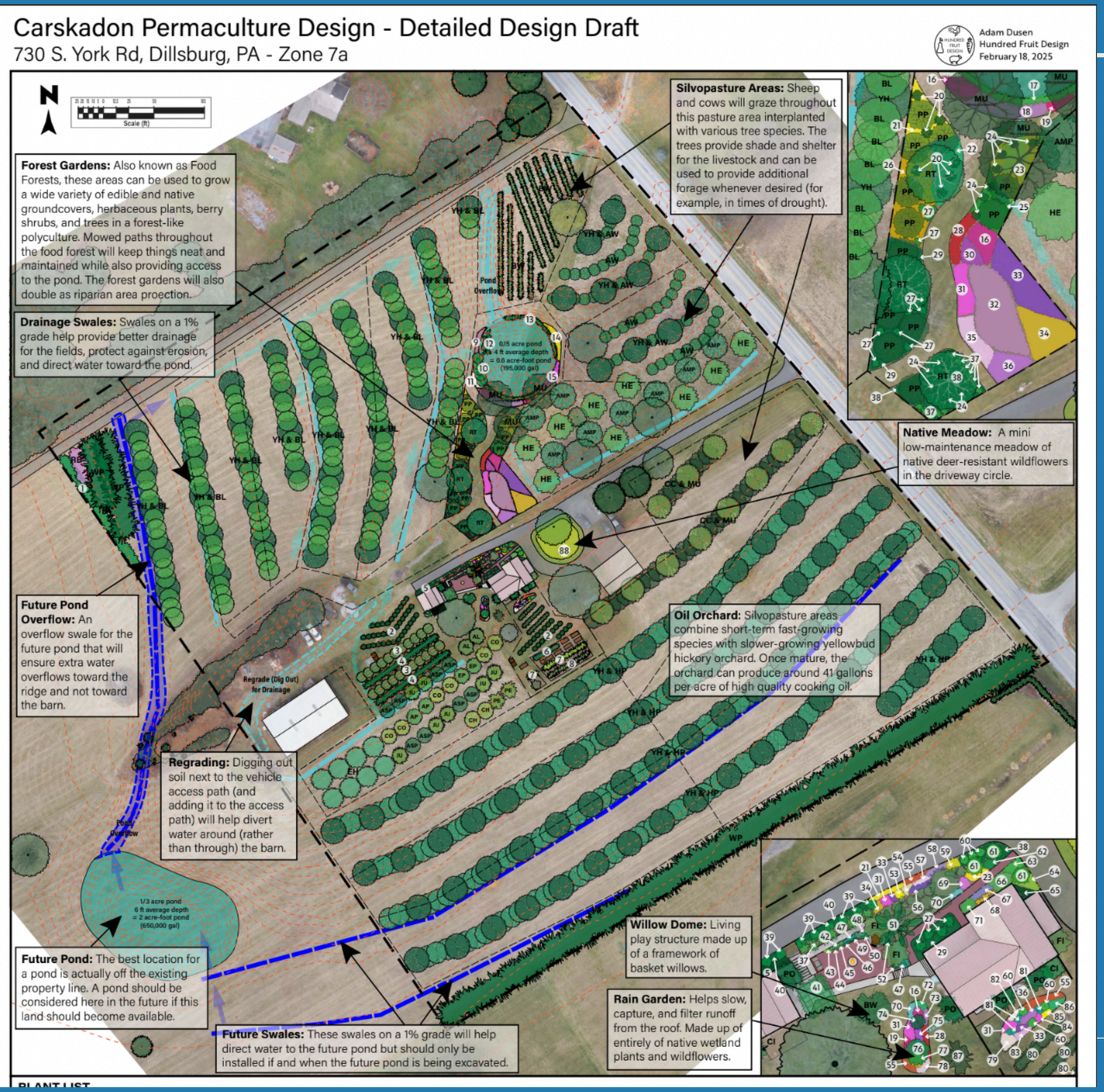
- How can different forest management practices promote mast production? Harvest efficiency?
- Thinning around producing trees
- Making/applying biochar from felled trees
- Returning presscake to the drip line
- Applying urine

Hickories in Silvopasture

Angus Glen Farm

Subtractive Silvopasture





Julia Carkadon

- Nature Preschool
- 50’ between rows
- 40’ apart in rows
- 3 shade/fodder trees in between each hickory in row

Other Silvopatoral Hickory Plantings

- Savanna Institute
- Breadtree Farms
- Trees for Graziers
- Yellowbud Farm and many more

Hickories in Alley Cropping

HUDSON VALLEY FARM HUB

50’ x 20’ Native Pollinator Alley




PLANT SCHEDULE
OVERSTORY TREES
QTY
SPACING
402
50' x 20' spacing
(trees are shown at age 15-20 years)
RIPARIAN TREES
QTY
SPACING
134
40' x 20' spacing
UNDERSTORY ALLEYS
QTY
SPACING
128
20' x 15' spacing
Access Lane



Design **Inspect**

Section

area	11.66 ac
stems	1,685 stems
density	145 stems/ac

Rows

length	20,040 row ft
qty	15 rows

Crops

Bitternut Hickory
- area 5.83 ac
- length 10,020 row ft
- stems 850

Speckled Alder
- area 1.40 ac
- length 2,400 row ft
- stems 200

amorpha
- area 1.47 ac
- length 2,520 row ft
- stems 210

redbud
- area 1.50 ac
- length 2,580 row ft
- stems 215

senna
- area 1.47 ac
- length 2,520 row ft
- stems 210

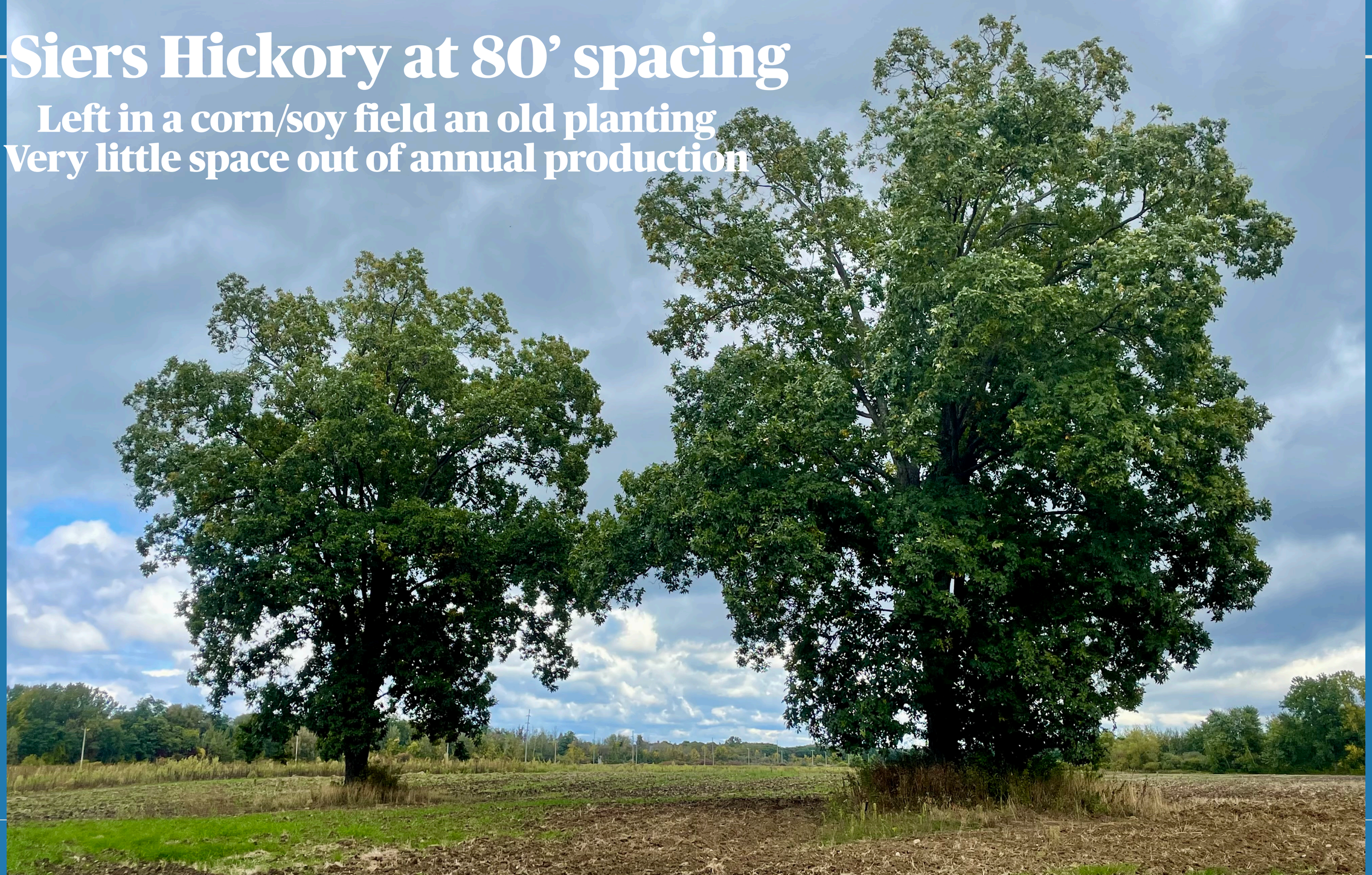
Section Notes + New Note

Dynamic Alley Cropping

- ~10 acres
- 24’ x 24’ spacing of hickory
- ~8 years of grain rotation
- No time out of production
- Improved seedling trial meets production trial
- Grafted seed orchard on edges at 48’ x 40’

Siers Hickory at 80’ spacing

Left in a corn/soy field an old planting
Very little space out of annual production




Siers Hickory at 80’ spacing
Trees are annually productive

Overview

- Biodiversity attracting native tree
- Promotes soil building
- Nutritious and delicious
- Productive
- Efficiently harvested and processed
- Can be incorporated into diverse systems
- Hickory oil has a long lineage of indigenous use

