TRIAL AND ERROR IN UPPER MISSISSIPPI RIVER FLOODPLAIN FOREST REGENERATION

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USACE St. Paul District
La Crosse Environmental Section
22 JUL 2025

US Army Corps of Engineers®

TRIAL AND ERROR IN UPPER MISSISSIPPI RIVER FLOODPLAIN FOREST REGENERATION

- *Upper Miss Management History*
- *Regeneration - Challenges*
- *Some Coping Strategies*
- *Artificial Regeneration* ***<u>ATTEMPTS</u>***

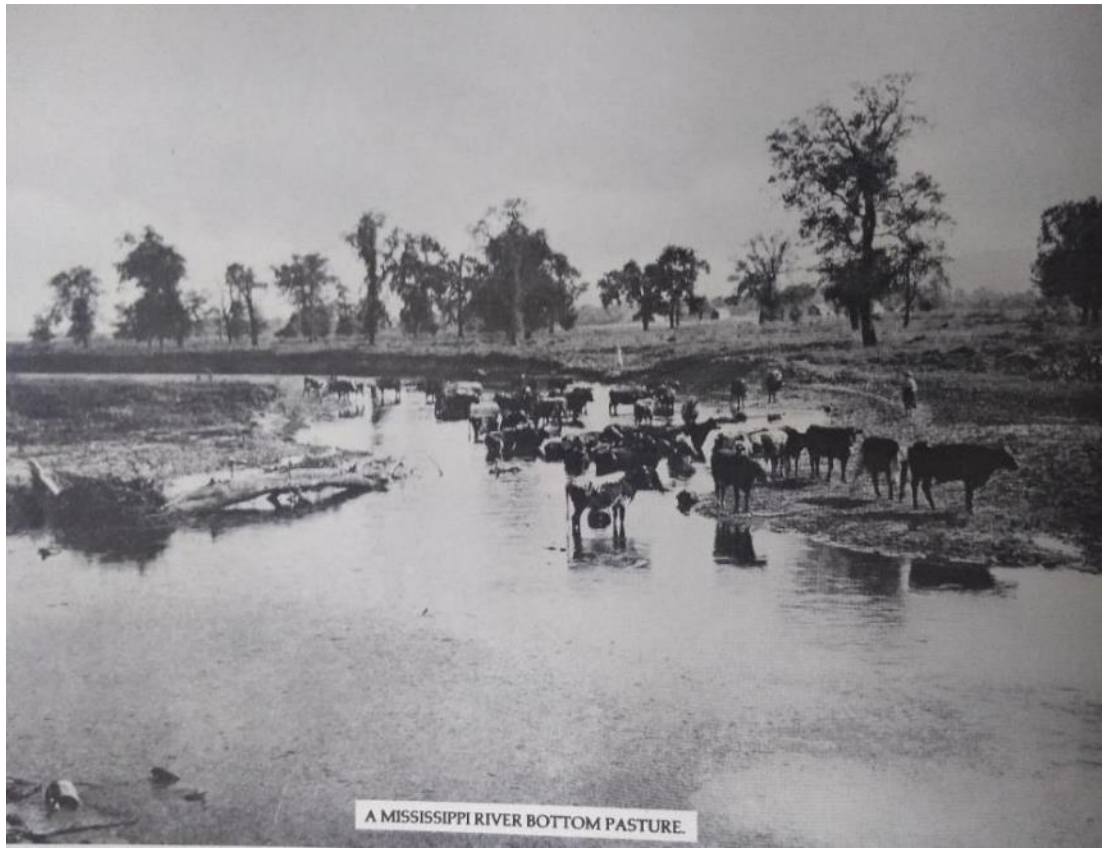
UMR HISTORY AND FORESTS

Wah-ba-sha Village on the Mississippi River 650 Miles above St. Louis, 1845, Seth Eastman

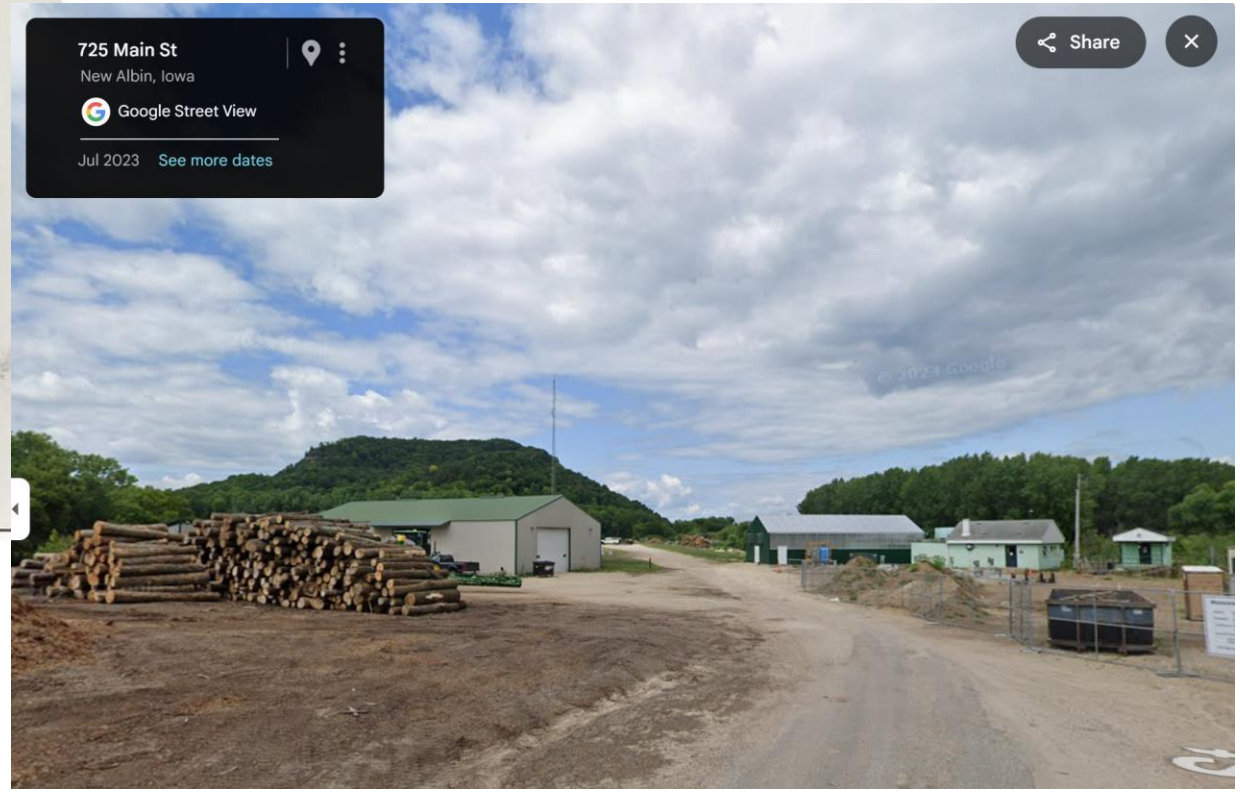
UMR HISTORY AND FORESTS

ca. 1900

These appear to be primarily elm logs, sawmill is within a mile of the Mississippi River



UMR HISTORY AND FORESTS



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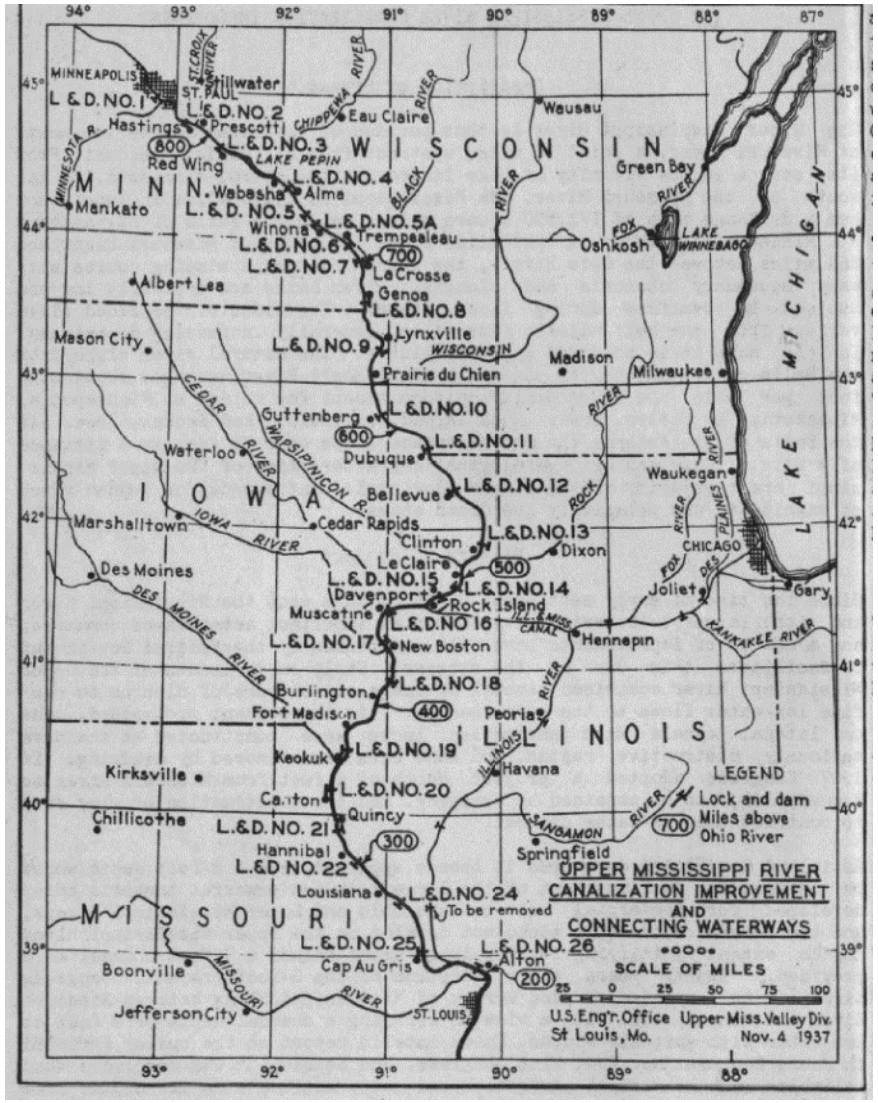
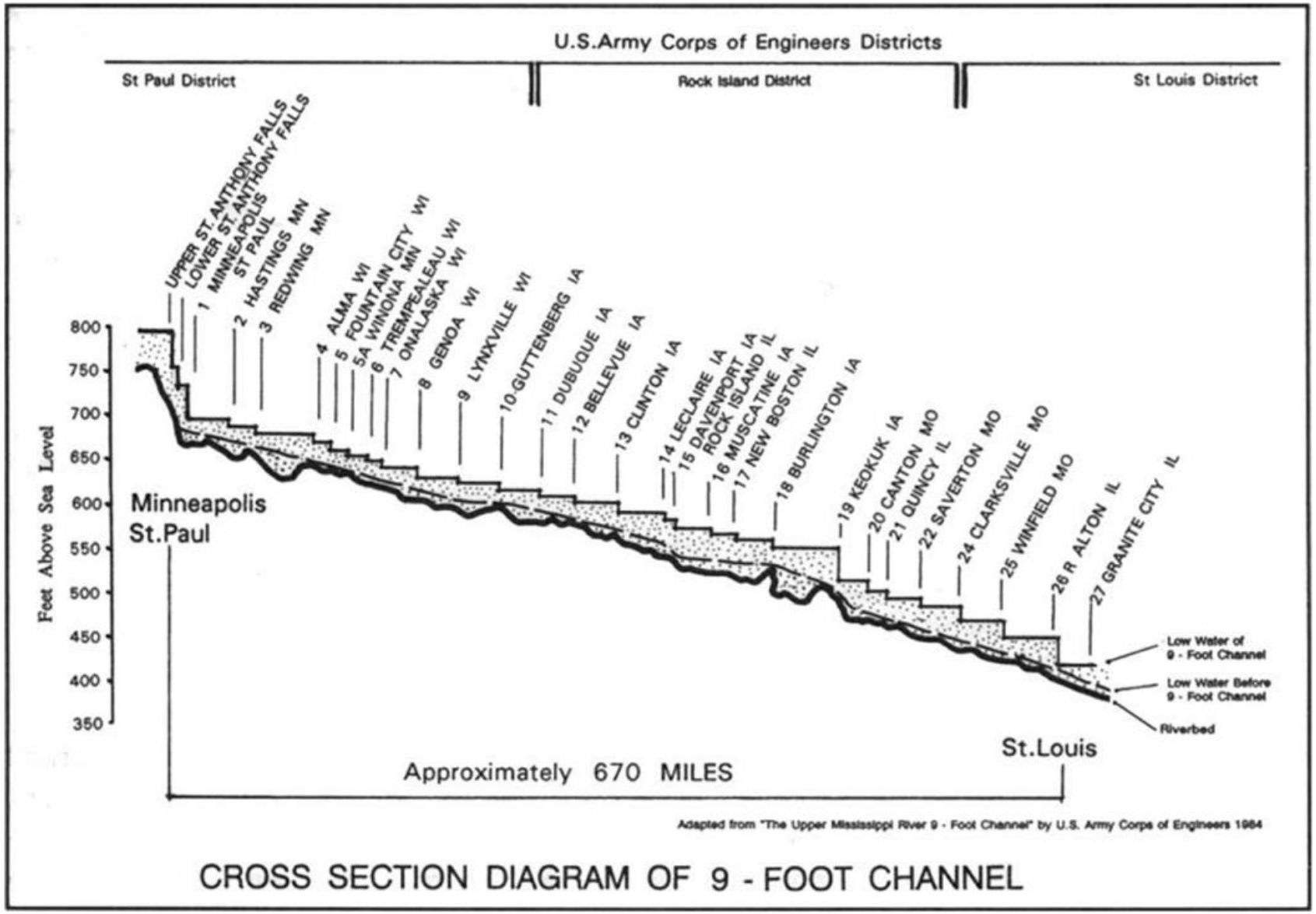
UMR HISTORY AND FORESTS

1938



UMR HISTORY AND FORESTS

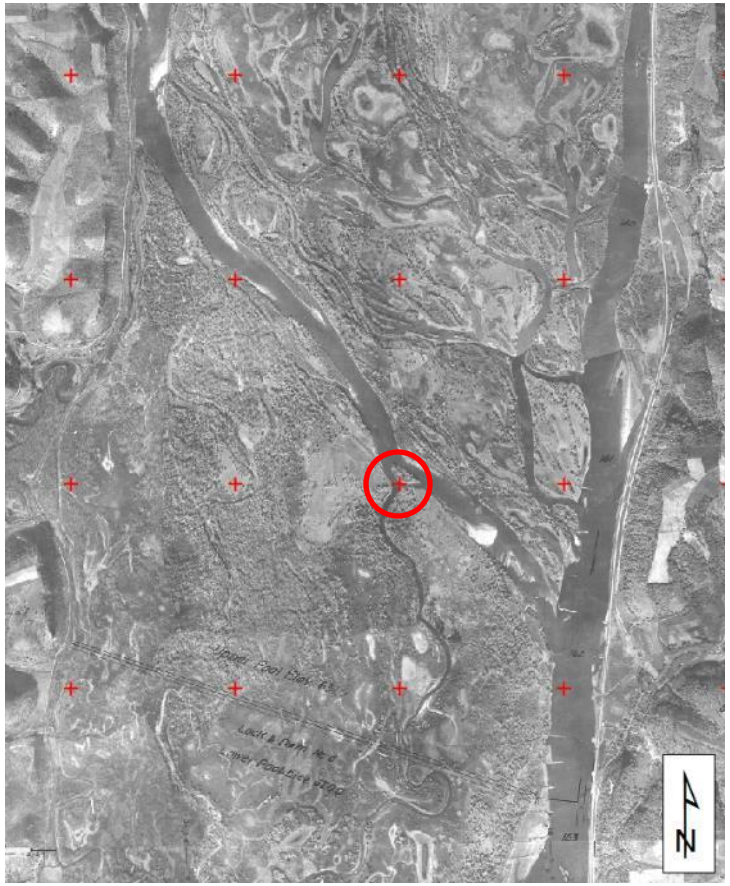


- U.S. Army Corps of Engineers (USACE) manages 29 locks and dams for navigation on the UMR
- Installed in the 1930s
- Created a series of slackwater reservoirs or “pools”
- Federal land acquisition

Source: Upper Mississippi River Project Master Plan for Resource Management

UMR HISTORY AND FORESTS

1929



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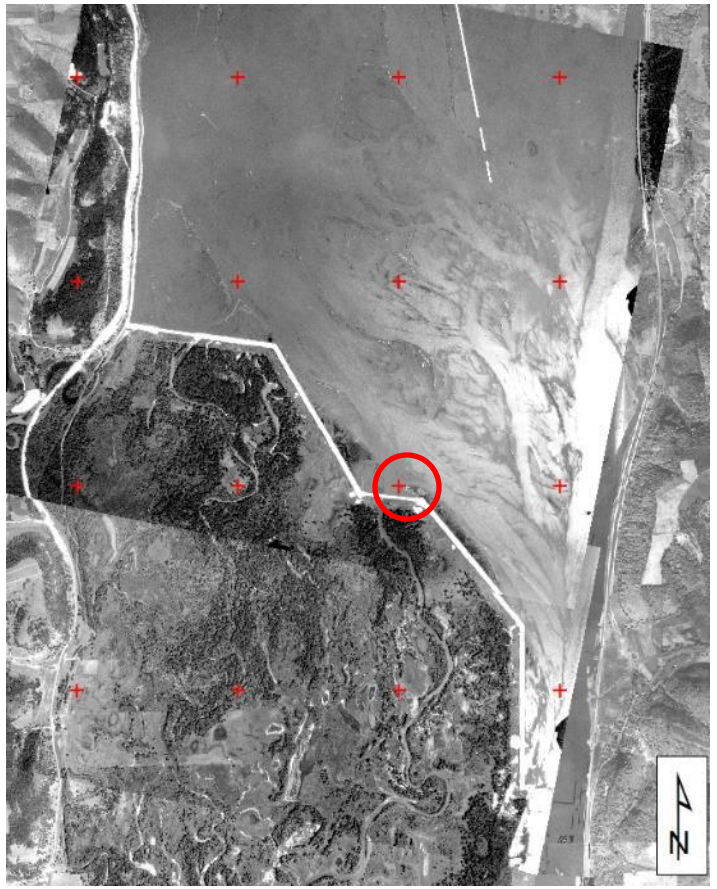
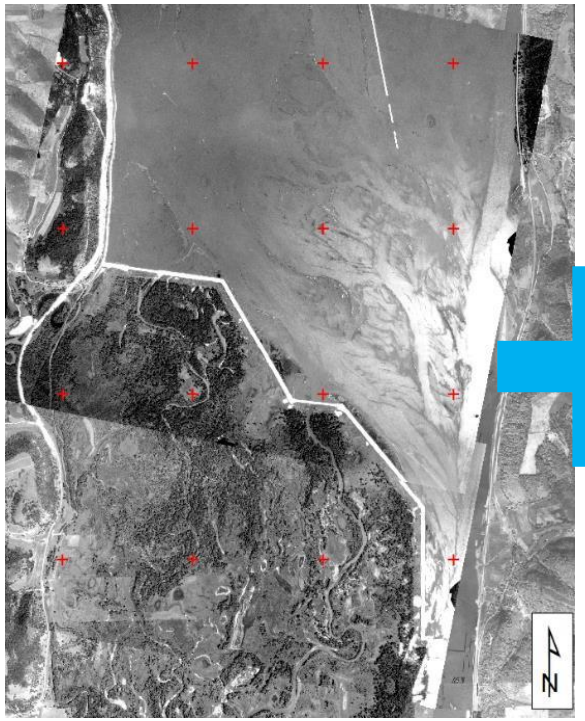


Lock and Dam 8 Spillway

UMR HISTORY AND FORESTS

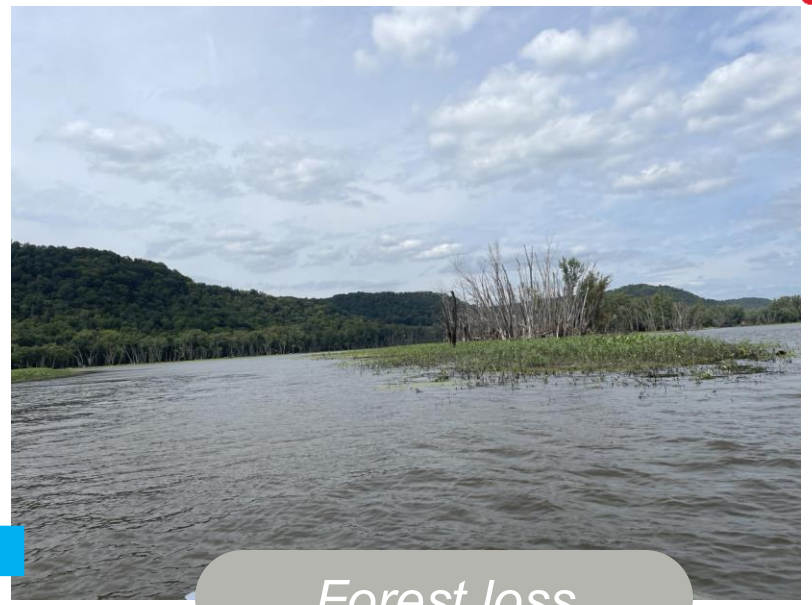


Wetter sites

+

Open canopies

=



Forest loss

INSECTS AND DISEASE

Emerald Ash Borer

Dutch Elm Disease

- Pre-1900 elm and ash about 30% of forest composition
- Currently <10%
- Elm and ash about 35% of current regen
- Delayed impacts as maple begins to reach maturity

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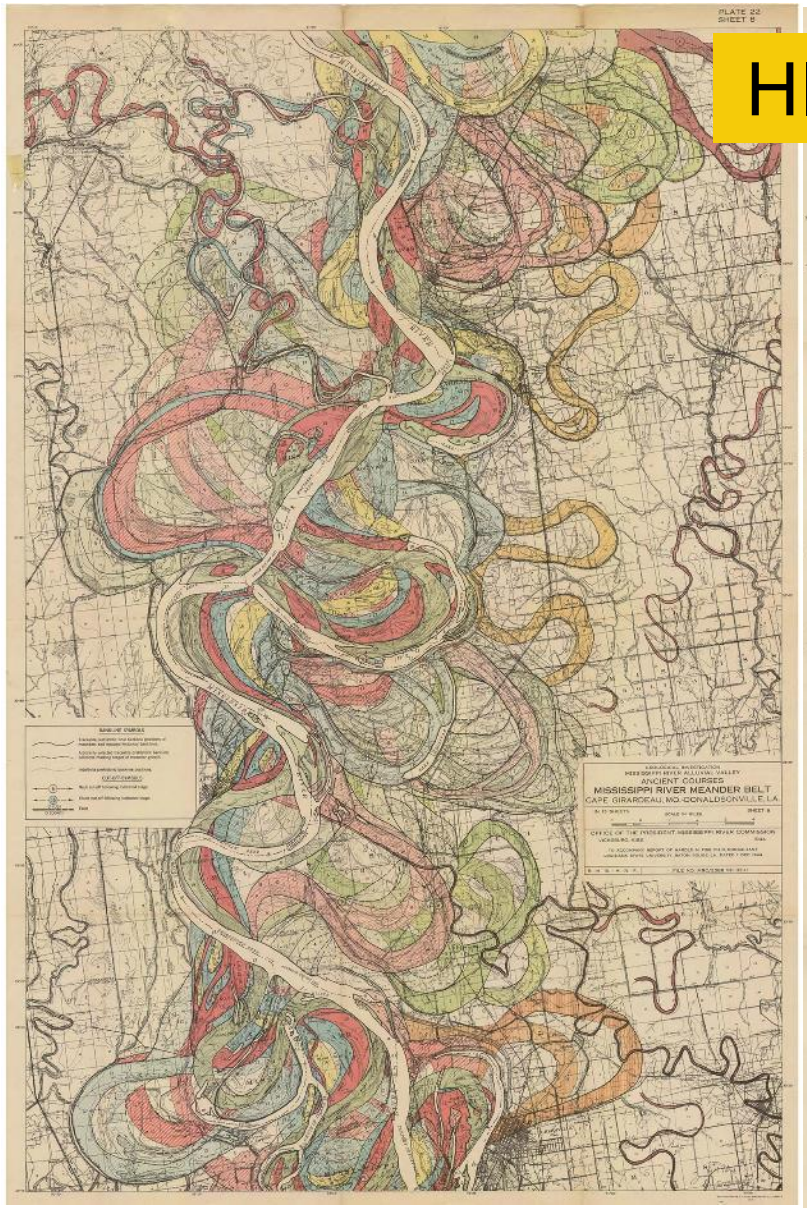
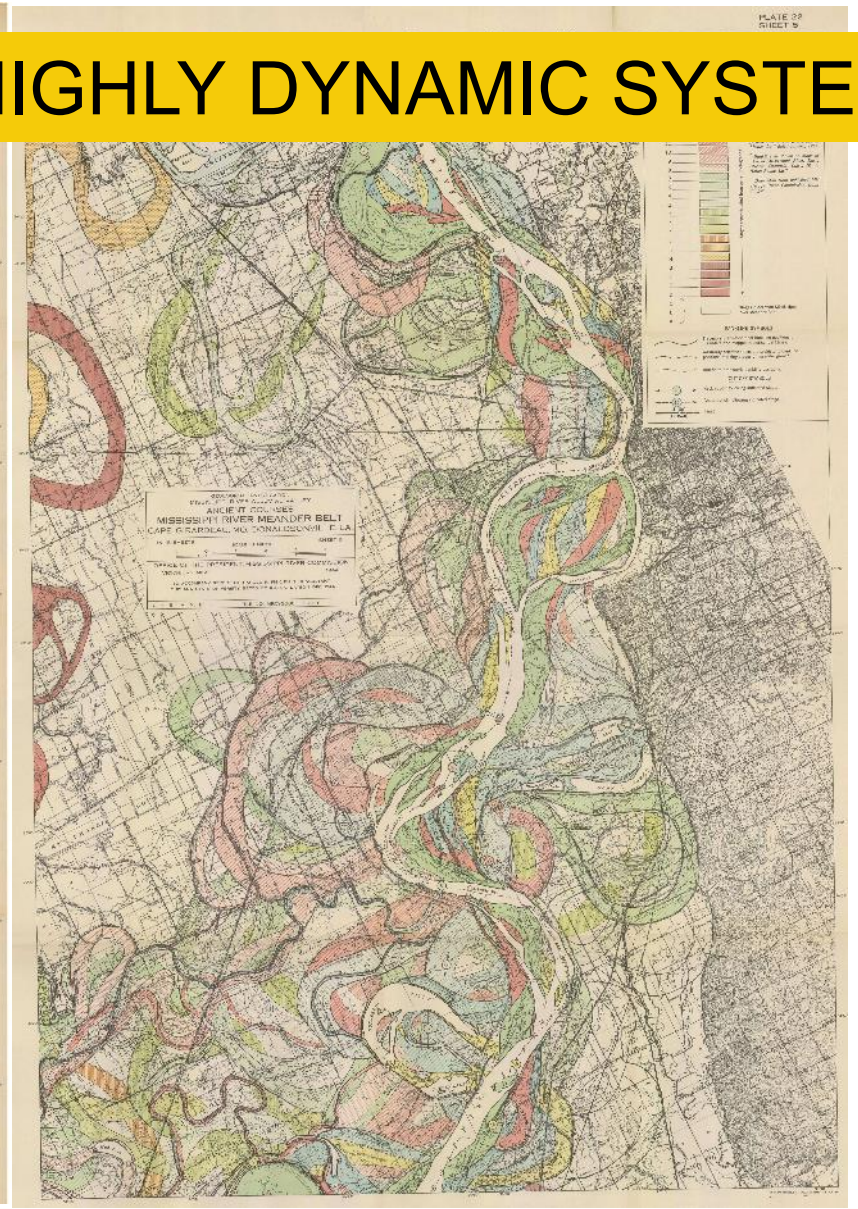
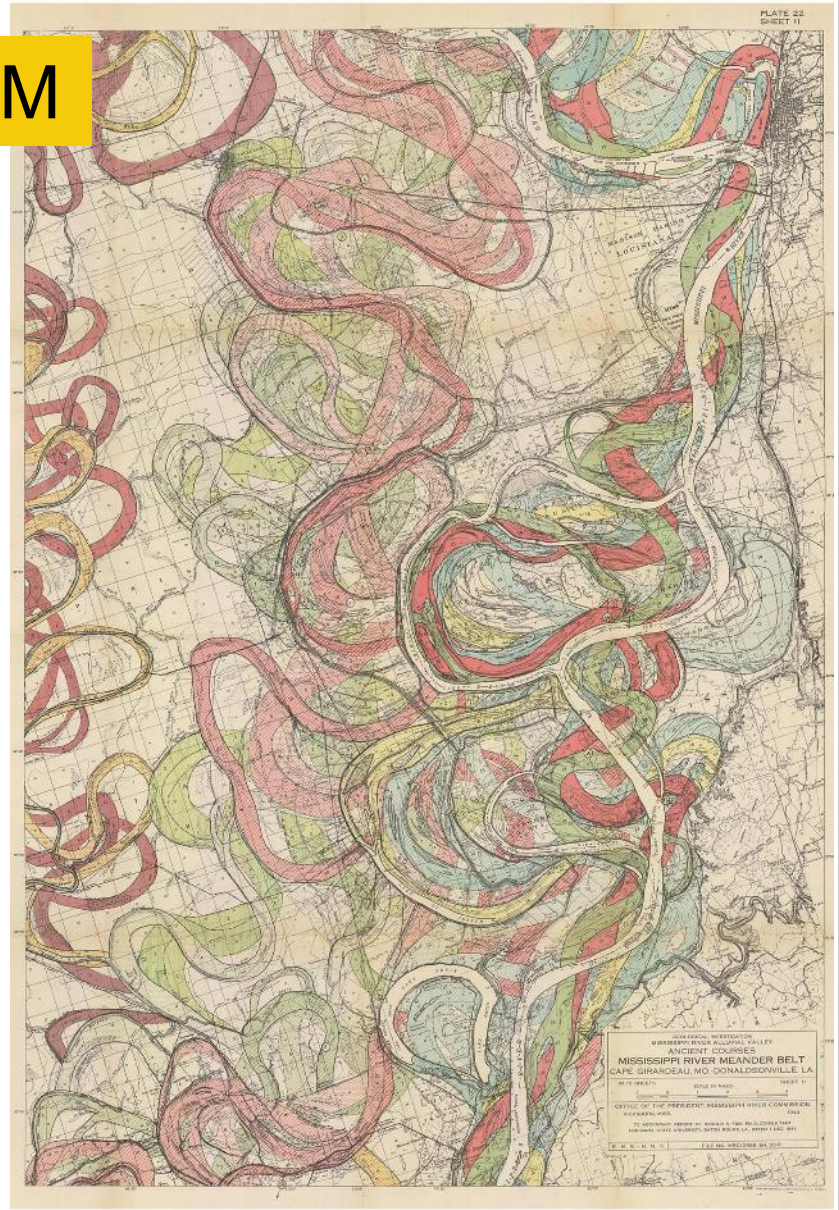
- *Upper Miss Management History*
- ***Regeneration - Challenges***
- *Some Coping Strategies*
- *Artificial Regeneration* ***ATTEMPTS***

UPPER MISSISSIPPI RIVER REGEN CHALLENGES

HIGHLY DYNAMIC SYSTEM







UPPER MISSISSIPPI RIVER REGEN CHALLENGES

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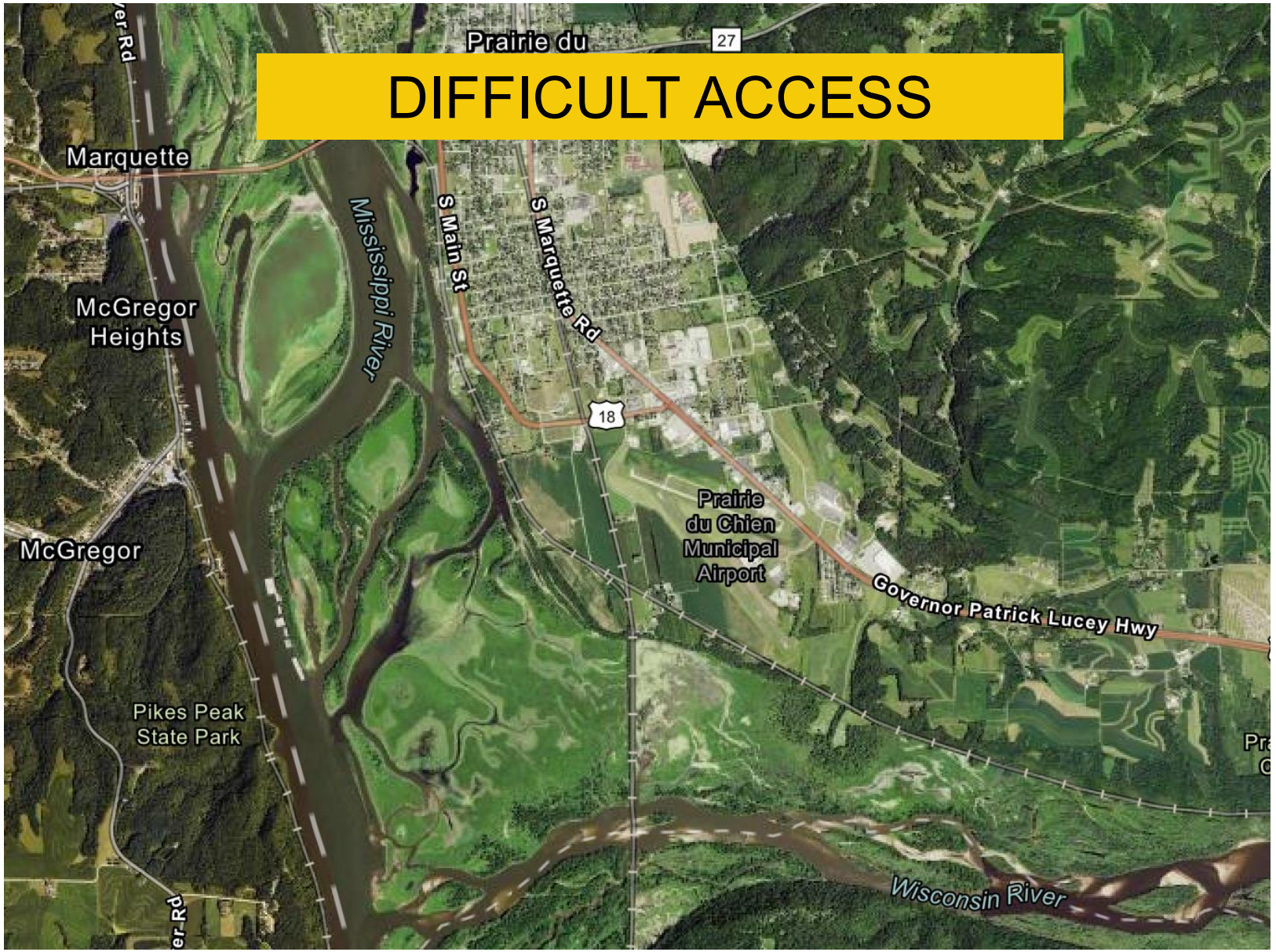

UPPER MISSISSIPPI RIVER REGEN CHALLENGES

LIMITED SILVICS INFO

UPPER MIDWEST FLOODPLAIN FOREST HANDBOOK

???????

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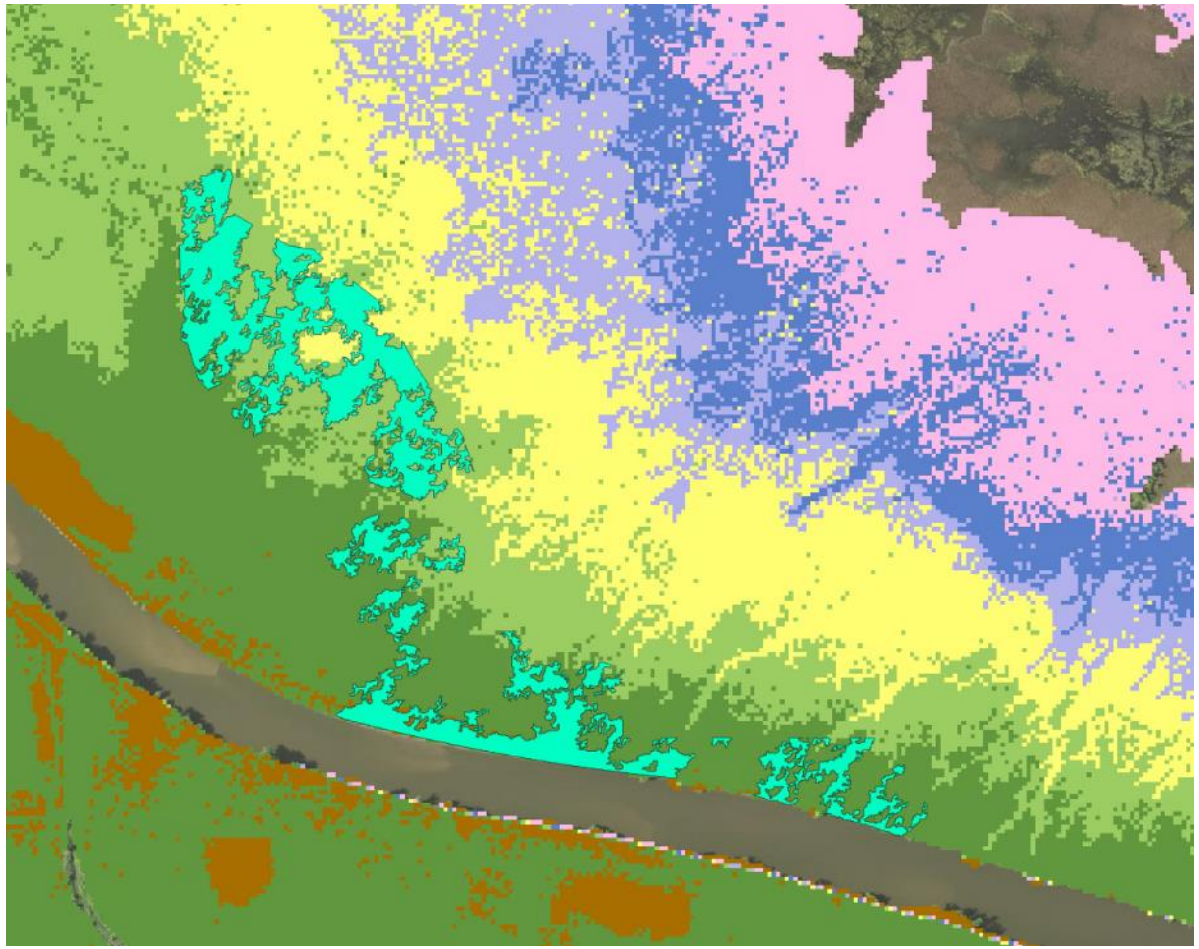
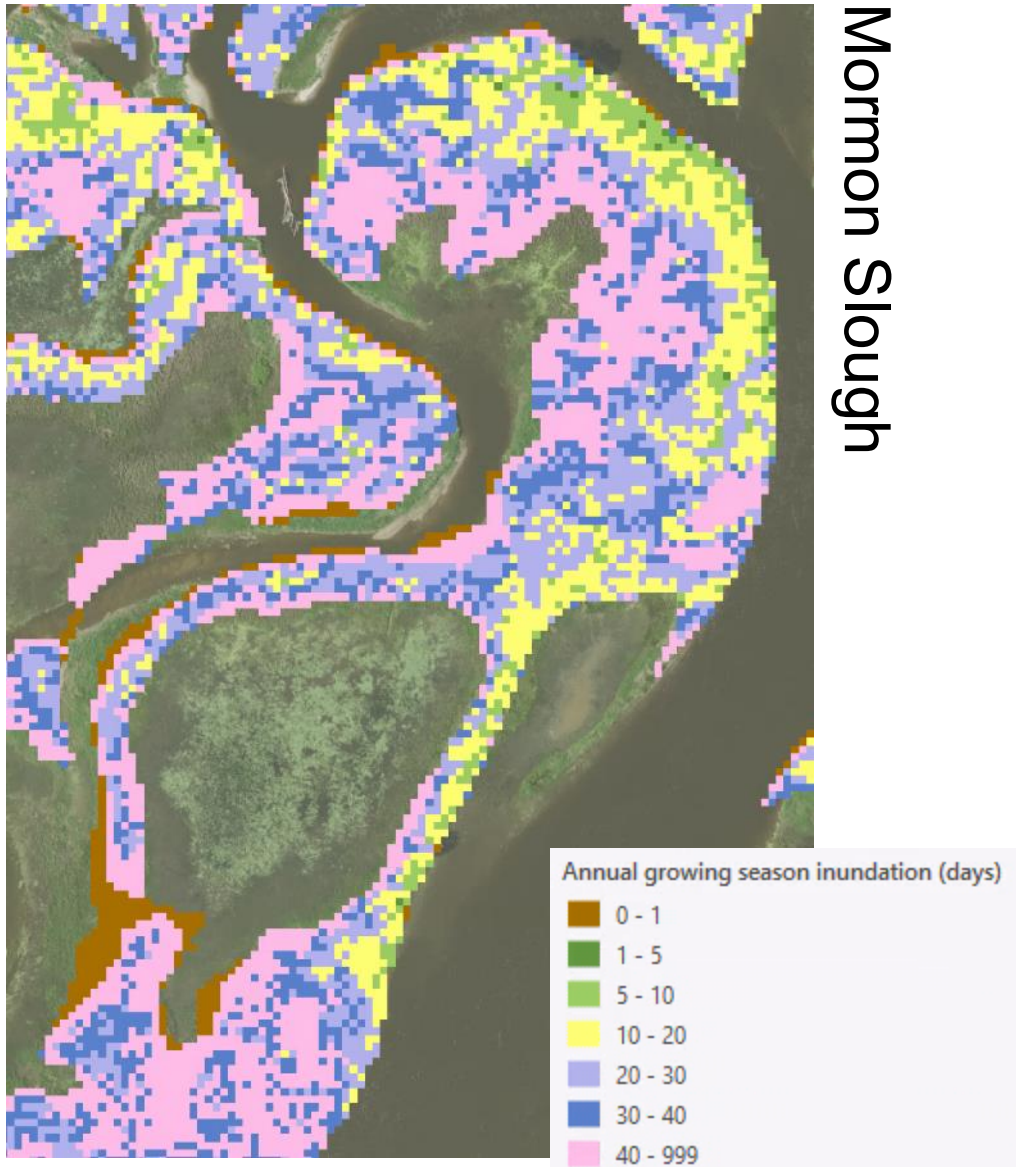
INTERPRETING INUNDATION

Upper Iowa



Mormon Slough



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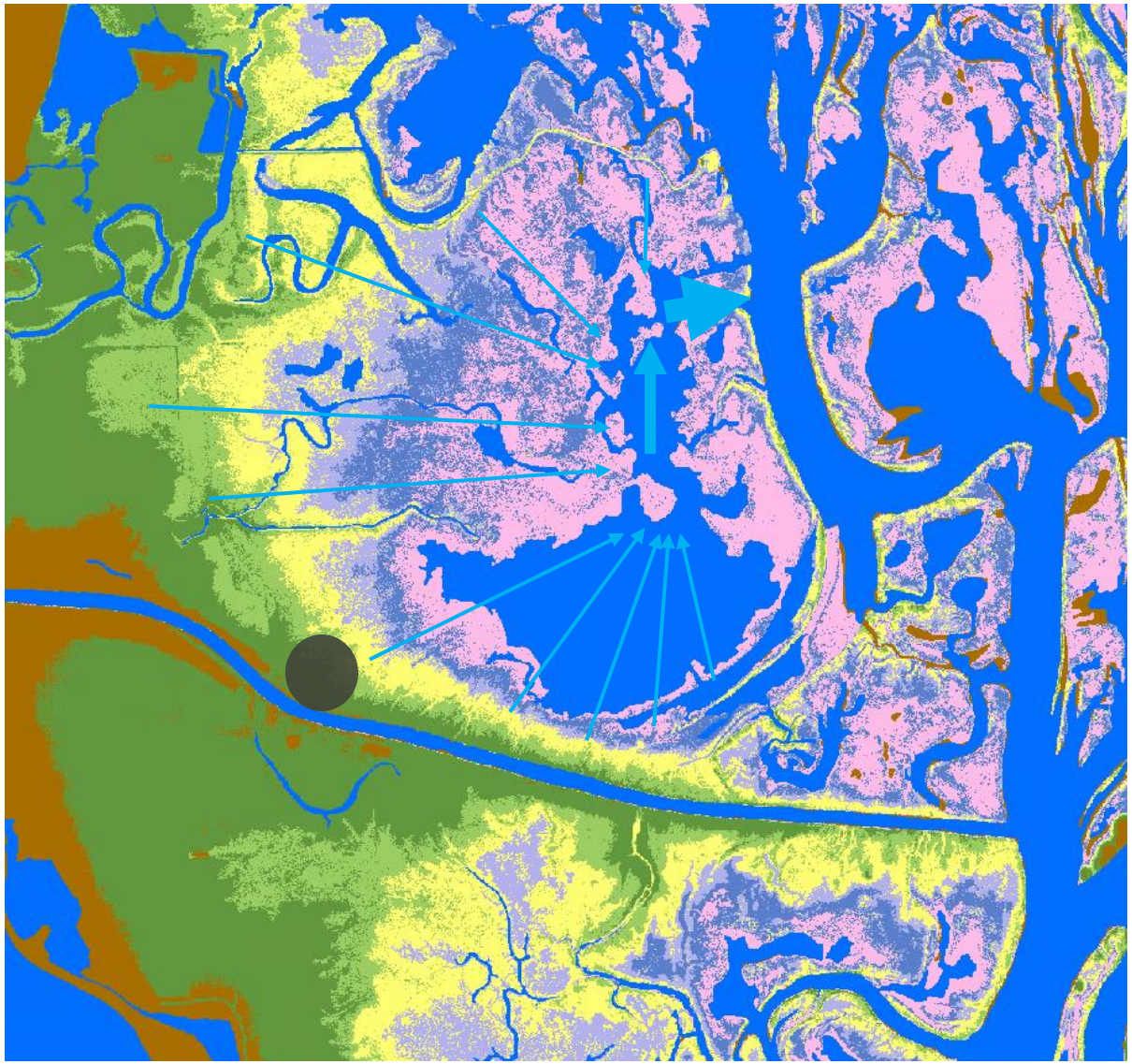

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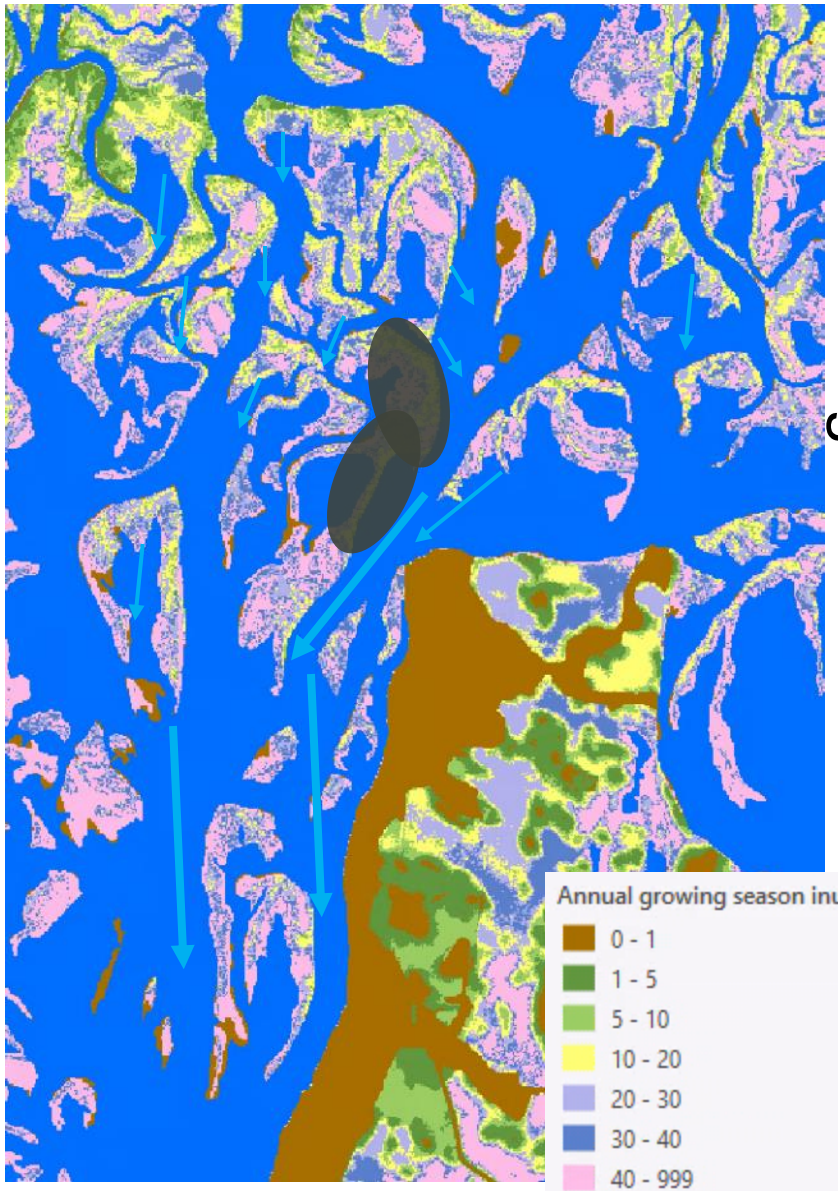

Mormon Slough

SITE SELECTION

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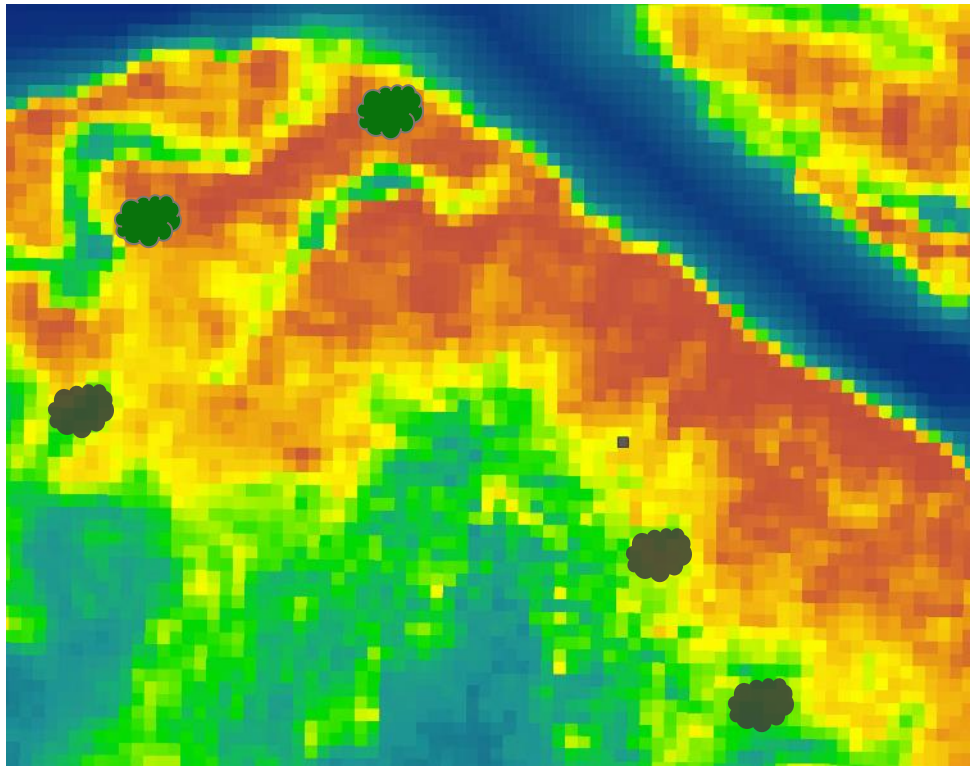

632’

634’

633’


633’
634’

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- *Upper Miss Management History*
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UPPER IOWA RIVER – SITE PREP AND PLANTING

2017

- Chemical site prep
- Backpack spraying 10 acres of reed canarygrass
- 5 acres planted at 8 x 8 spacing
- 1 to 2 foot tall bareroots
- Higher elevation species mix: silver maple (500), river birch (500), red oak (450), swamp white oak (900), black walnut (500), hackberry (700)
- Three years of follow-up spot spraying

UPPER IOWA RIVER – SITE PREP AND PLANTING

2018

UPPER IOWA RIVER – SITE PREP AND PLANTING

2018

Upper Iowa Record Crests

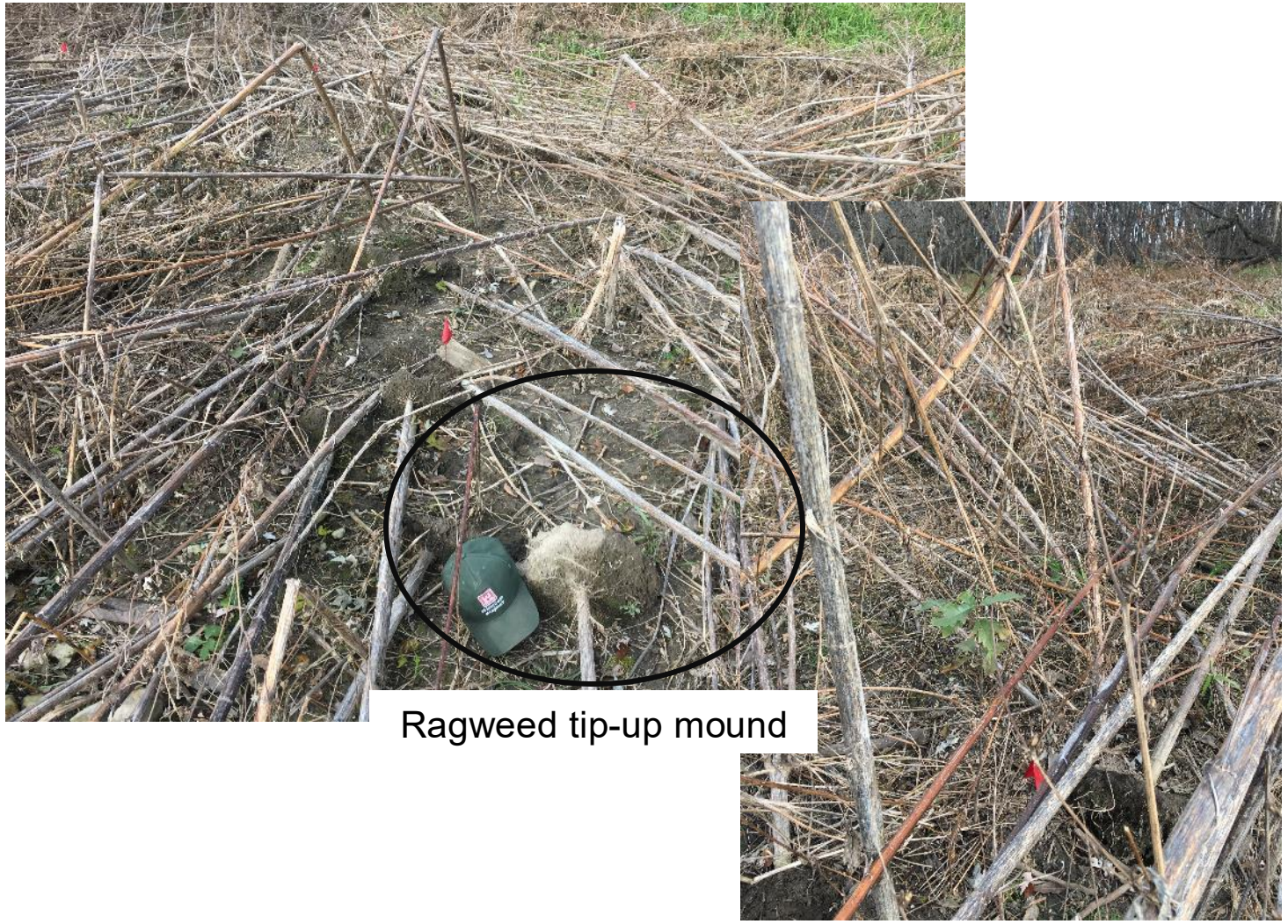
1.	24.30 ft	on 08-25-2016
2.	22.46 ft	on 06-09-2008
3.	22.20 ft	on 02-28-1948
4.	21.80 ft	on 05-30-1941
5.	20.89 ft	on 03-05-1937
6.	20.02 ft	on 06-23-2013
7.	20.00 ft	on 08-17-1993
8.	19.34 ft	on 03-07-1950
9.	19.20 ft	on 07-26-1953
10.	18.95 ft	on 09-06-1946
11.	18.40 ft	on 03-14-2019
12.	18.12 ft	on 03-15-2019
13.	17.98 ft	on 03-17-1945
14.	17.67 ft	on 03-12-1976
15.	17.53 ft	on 06-02-2000
16.	17.50 ft	on 06-13-1947
17.	17.46 ft	on 06-11-2018
18.	17.32 ft	on 08-06-1951
19.	17.20 ft	on 06-30-1942
20.	17.16 ft	on 03-31-1993

25% of records crests in 2010s, 35% from 2000-19

UPPER IOWA RIVER – SITE PREP AND PLANTING

Summer 2018

Fall 2018



Ragweed tip-up mound

UPPER IOWA RIVER – SITE PREP AND PLANTING

2020

- Scattered seedlings still alive
- Japanese hops invading where reed canarygrass was controlled
- First dry year since planting
- Planting largely failed

UPPER IOWA RIVER – SITE PREP AND PLANTING

UPPER IOWA RIVER – 2022 CONTINERIZED

2022 – Fall Replanting

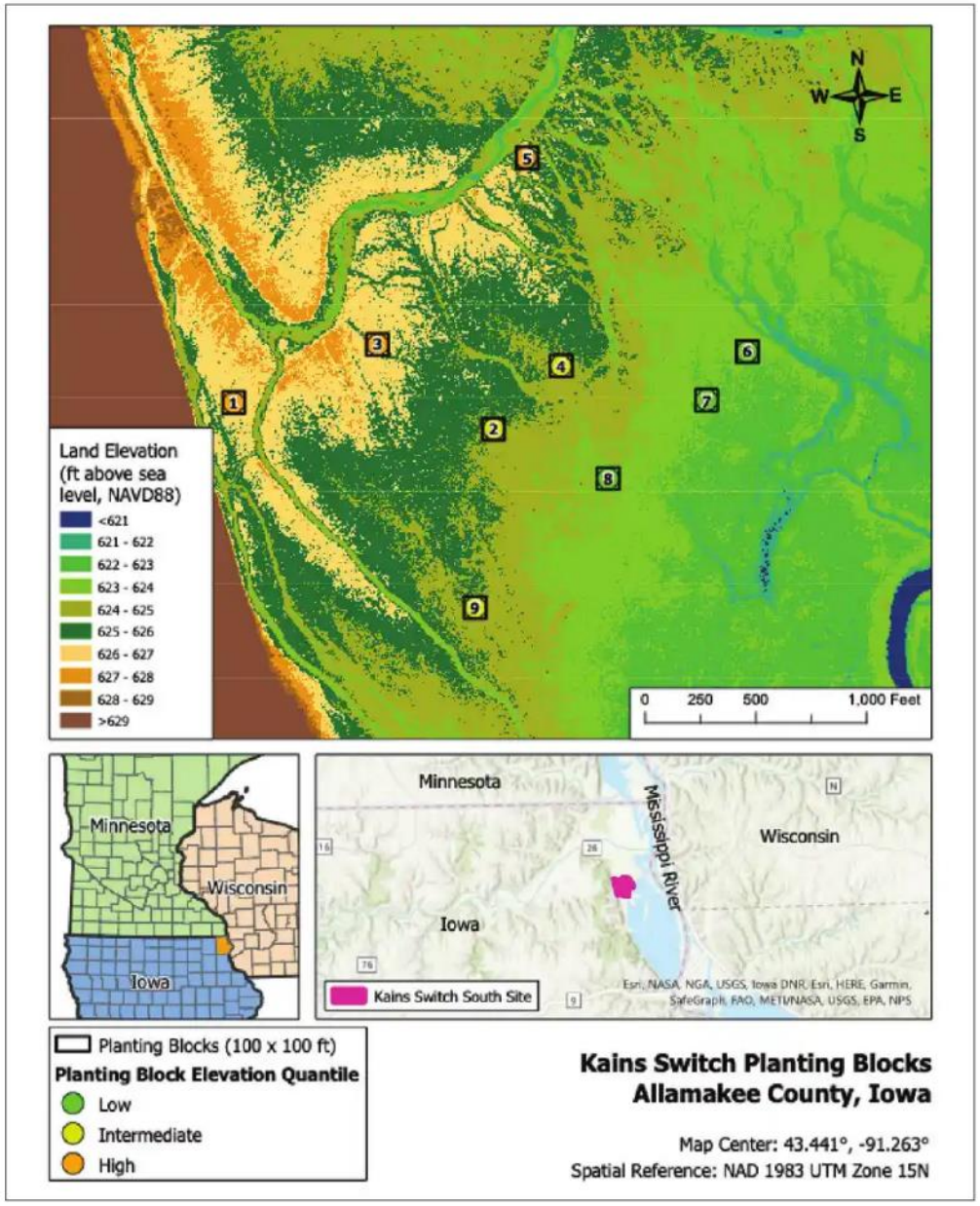
2025 - Spring

Large stock to deal with competing vegetation

Drier summers

Difficult access limits ability to plant

KAINS SWITCH UNDERPLANTING



Species	Avg. Basal Dia (in)	Avg. Ht (in)
Silver maple	0.4	29.3
Sycamore	0.3	21.3
Hackberry	0.3	31.0
Swamp white oak	0.5	39.6

- Planted spring of 2020
- Hydro wells to monitor groundater
- 5 year results in prep

KAINS SWITCH UNDERPLANTING

2020

Large stock

Competing vegetation

KAINS SWITCH UNDERPLANTING

2021

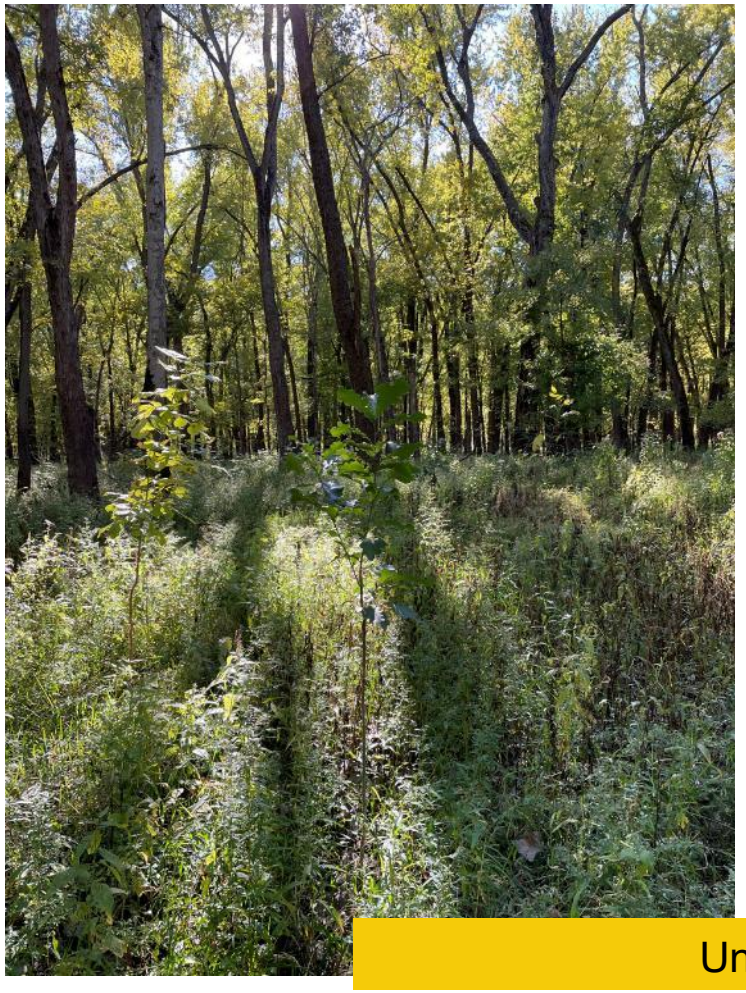
Snail and deer herbivory

KAINS SWITCH UNDERPLANTING

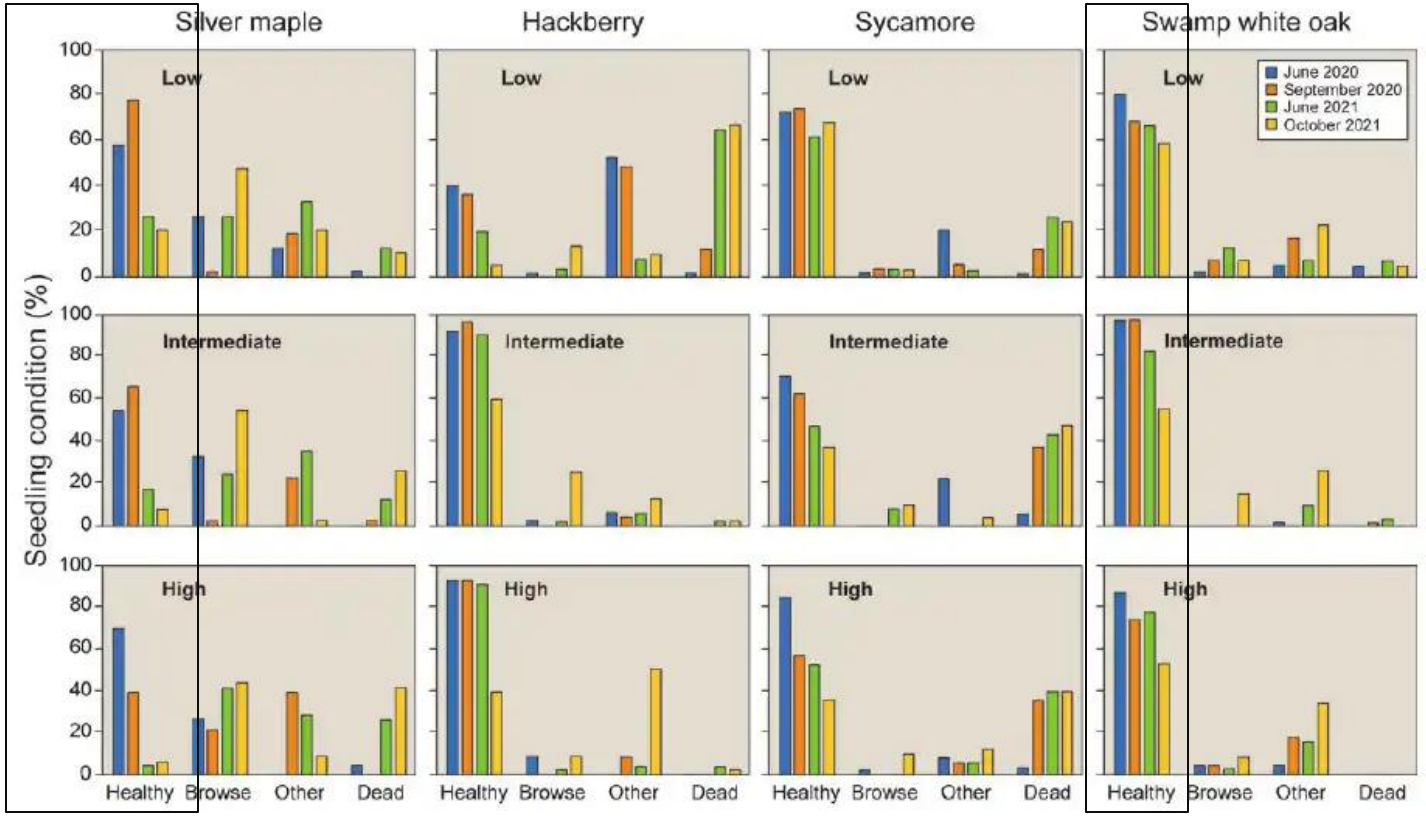
2022

KAINS SWITCH UNDERPLANTING

2023



Two-year summaries



Underplanting effective “pre”-reforestation

Swamp white oak is a superstar

GOOSE ISLAND HERBIVORY TRIAL

2010

2016

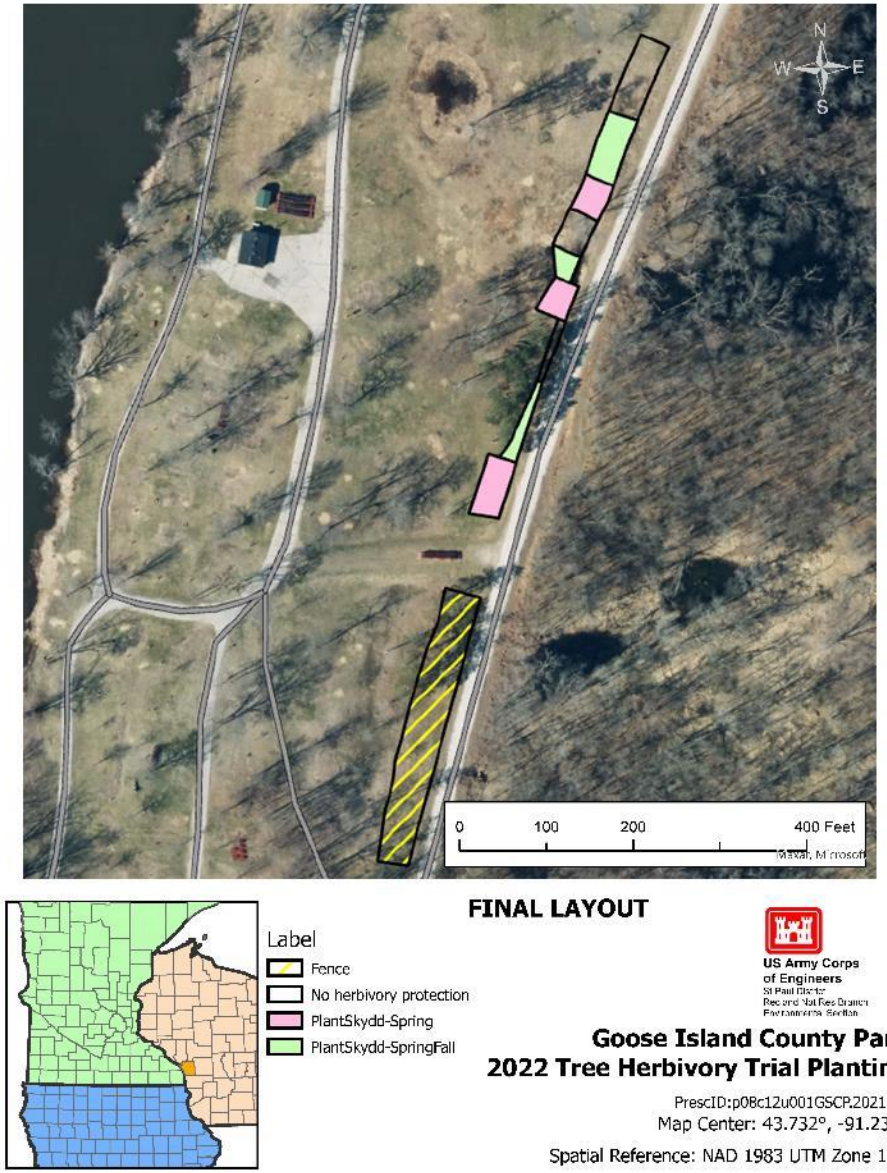
GOOSE ISLAND HERBIVORY TRIAL

2025

2016

GOOSE ISLAND HERBIVORY TRIAL

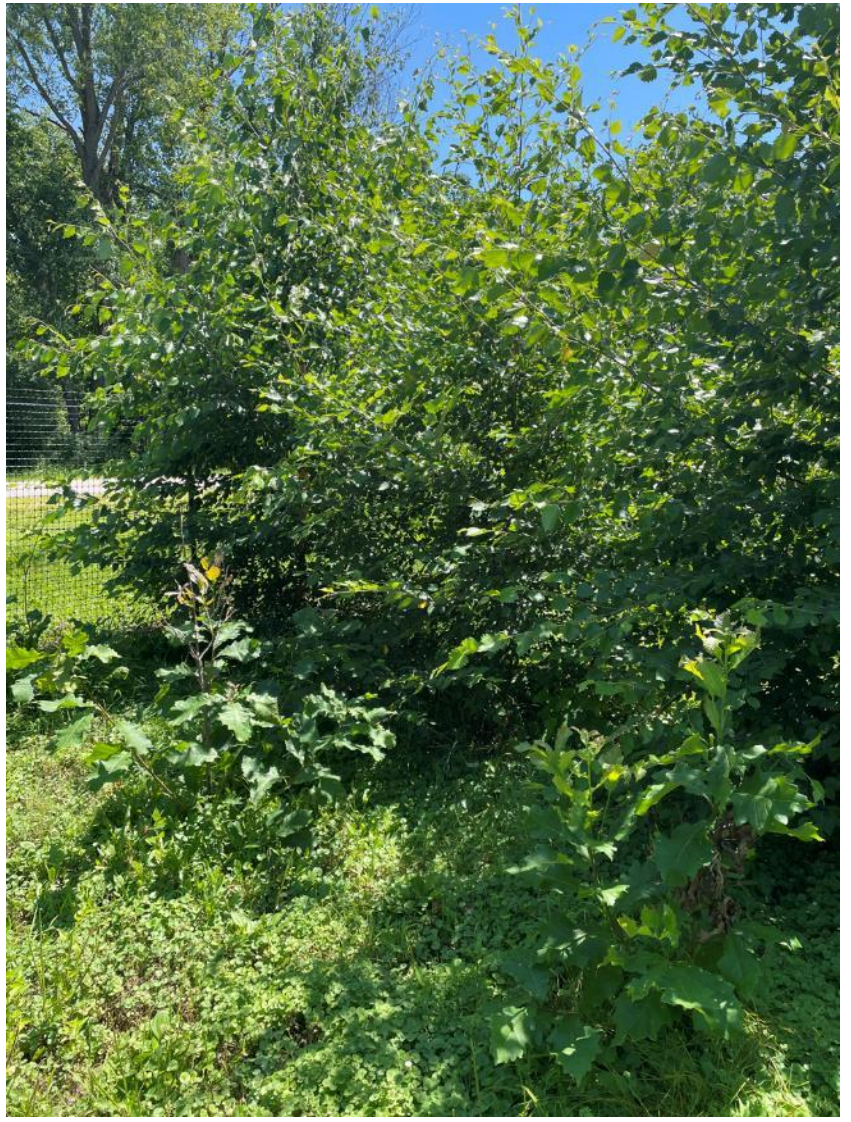
2022



GOOSE ISLAND HERBIVORY TRIAL

2022

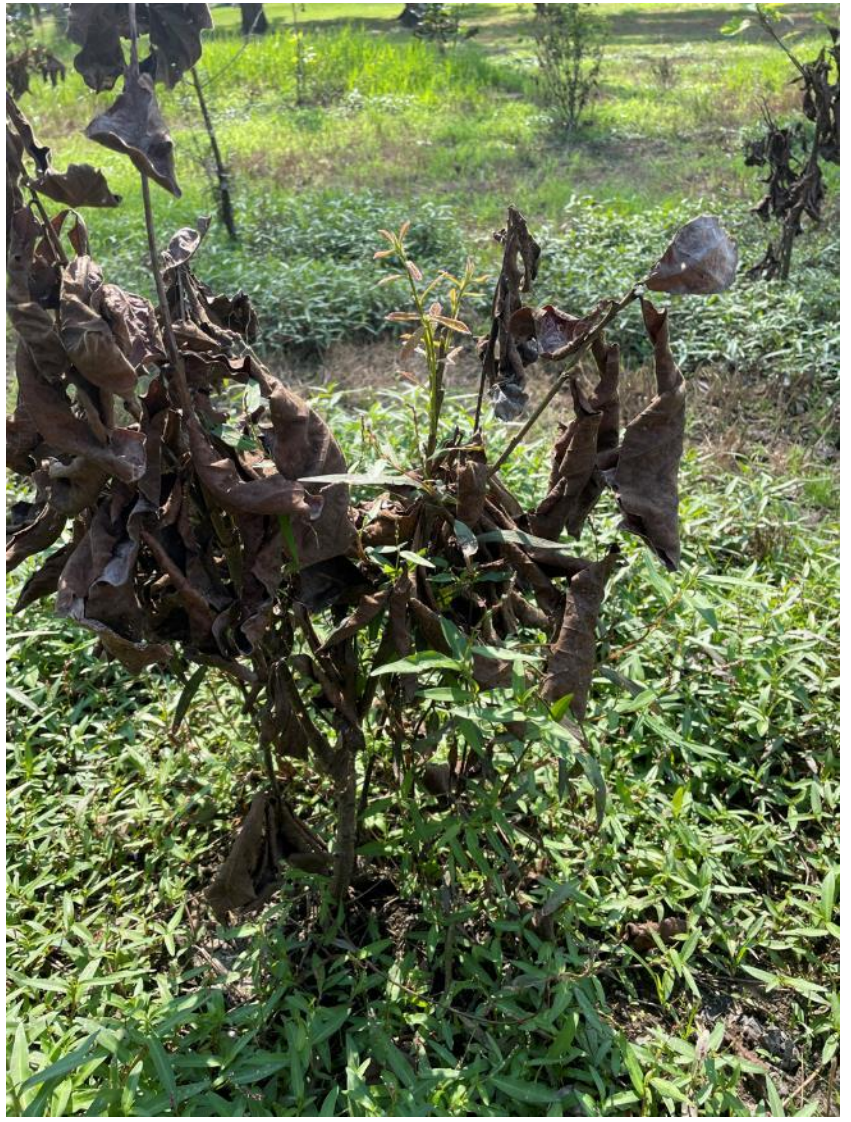
2025



GOOSE ISLAND HERBIVORY TRIAL

2022

2024



GOOSE ISLAND HERBIVORY TRIAL

2022

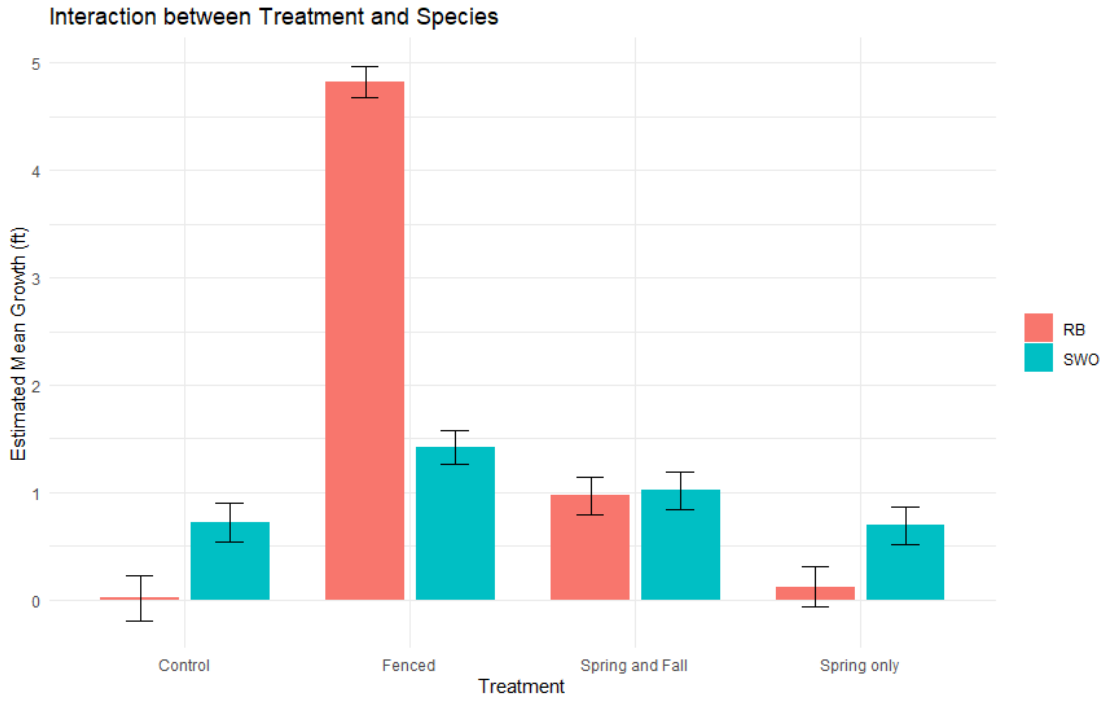
2025

GOOSE ISLAND HERBIVORY TRIAL

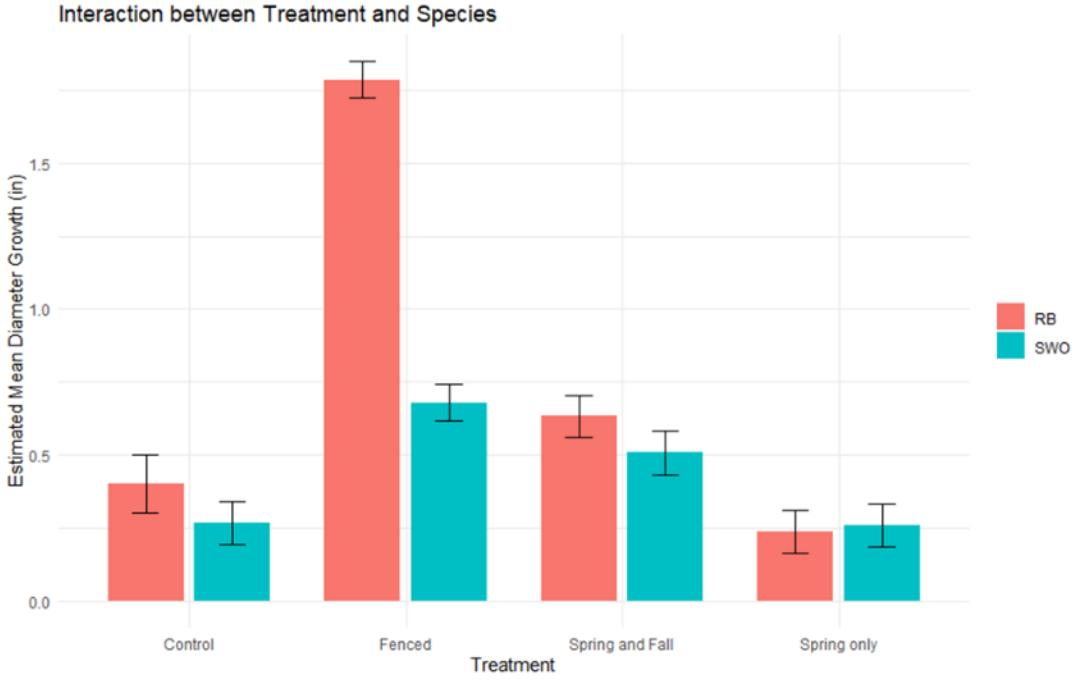
Deer browse does not appear to substantially reduce vigor

Rapid resprout growth

GOOSE ISLAND HERBIVORY TRIAL



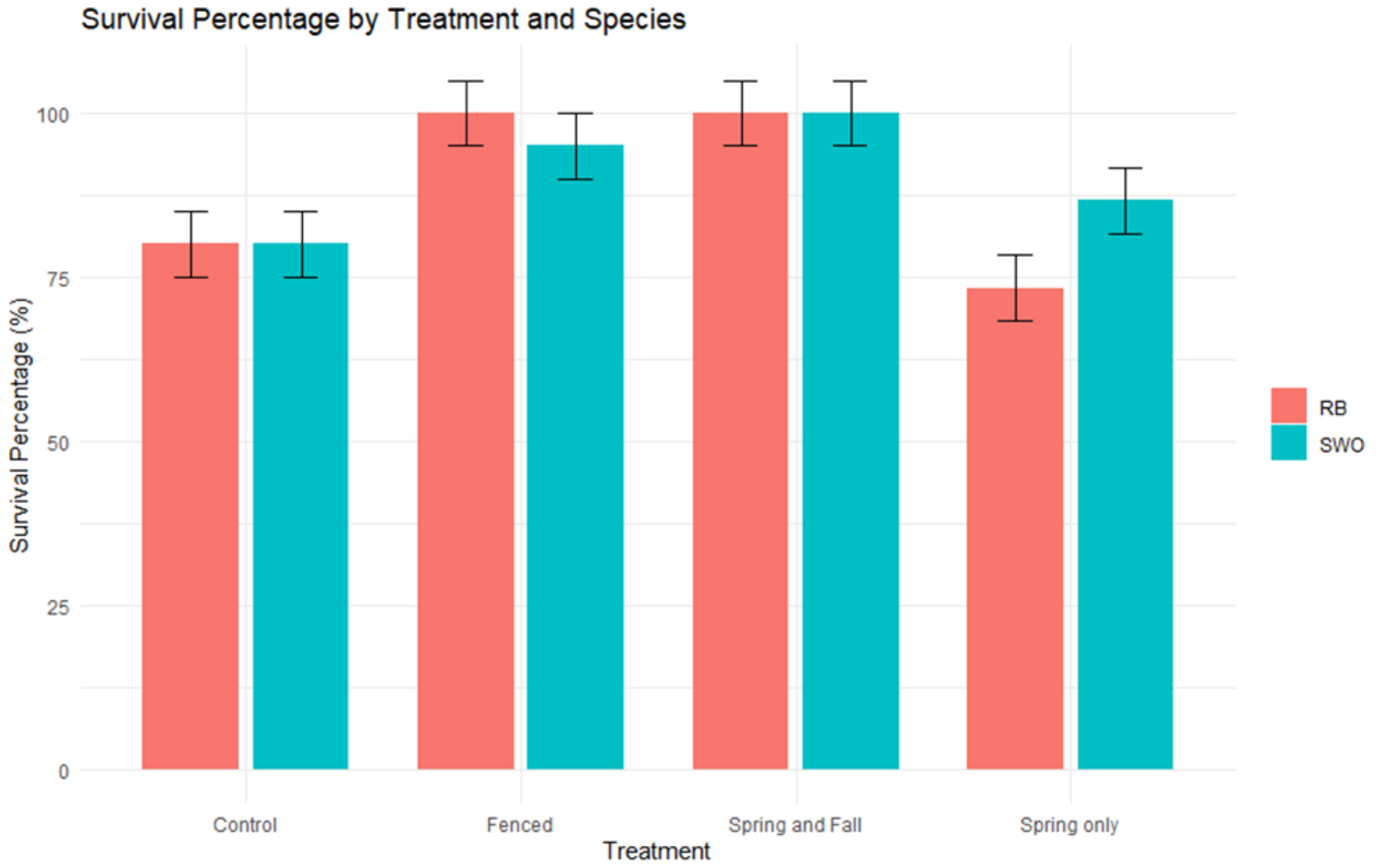
Three year height growth



Three year diameter growth

GOOSE ISLAND HERBIVORY TRIAL

- $2-3 k/ac for one annual spray
- $4-6 k/ac for two annual sprays
- IF survival is 75% AND trees make it above browse height, is that acceptable for the cost savings?



Three year survival

Floodplain adaptations also help against deer for some species?

Most reliable

Least reliable

Widely planted	Scattered plantings
Swamp white oak (*Quercus bicolor*)	Bur oak (*Q. macrocarpa*)
American sycamore (*Platanus occidentalis*)	Honeylocust (*Gleditsia triacanthos*)
River birch (*Betula nigra*)	
Pin oak (*Q. palustris*)	Kentucky coffeetree (*Gymnocladus dioicus*)
Common hackberry (*Celtis occidentalis*)	American elm (*Ulmus americana*)
Silver maple (*Acer saccharinum*)	
Eastern cottonwood (*Populus deltoides*)	
Northern red oak (*Q. rubra*)	Bitternut hickory (*Carya cordiformis*)

Completely Qualitative UMR Species List Based on 10 Years of Experience ONLY

THANK YOU, AND SITE VISIT LOGISTICS

- Steep ~100 ft highway embankment
- Small patch of rip-rap at the bottom
- Crossing the highway
- It’s going to be HOT!

Andrew.R.Meier@usace.army.mil
651-290-5899

https://www.youtube.com/watch?v=m6NQXuMorLg

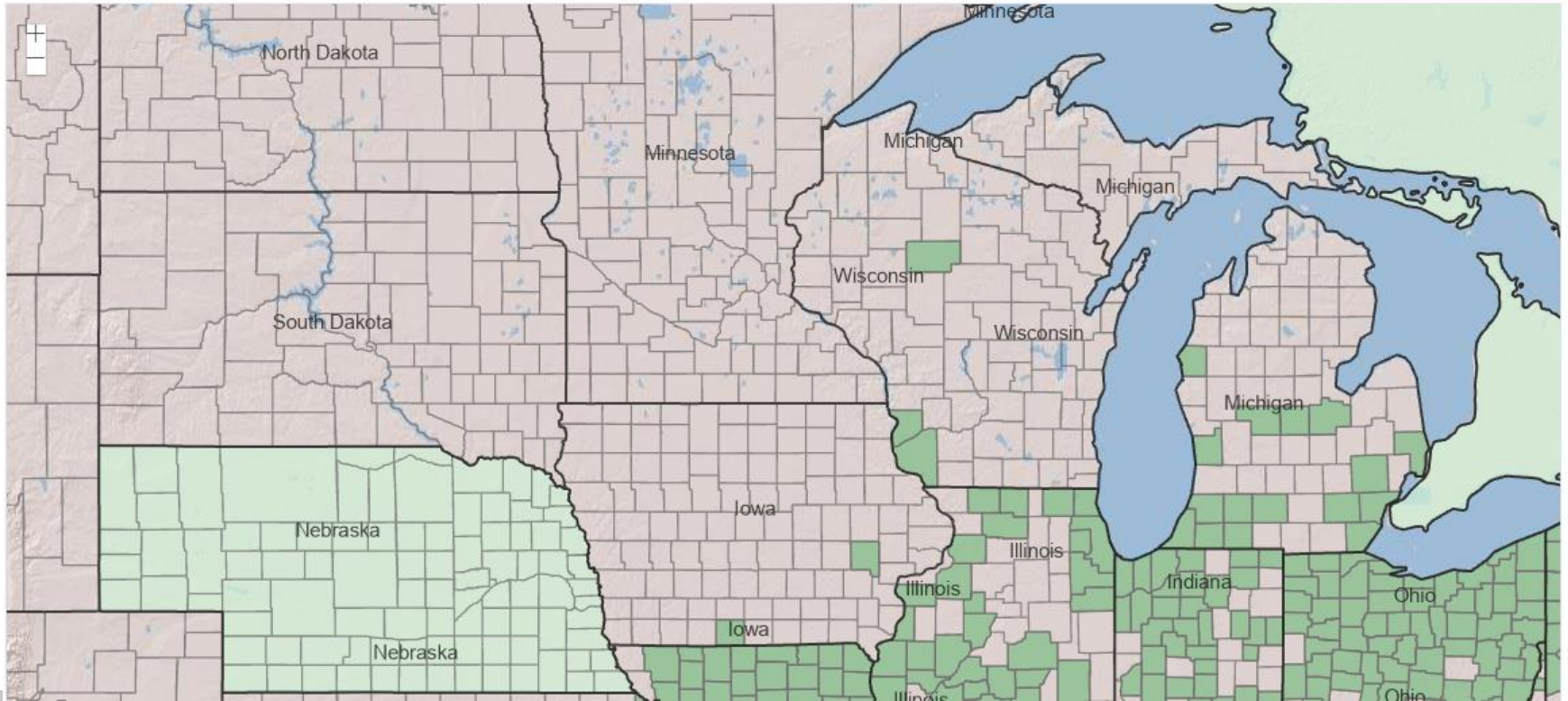
QUESTIONS?

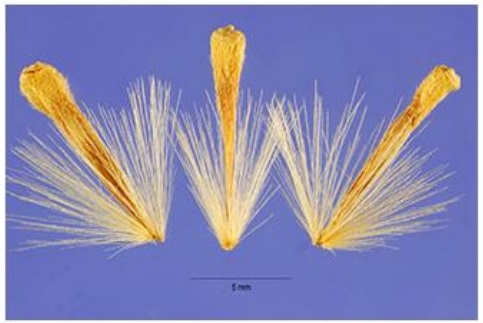
Andrew.R.Meier@usace.army.mil
651-290-5899

pin oak General Information	
Symbol	QUPA2
Group	Dicot
Duration	Perennial
Growth Habits	Tree
Native Status	CAN N | L48 N
Fact Sheet	doc pdf

Download Distribution Data

View Print Options

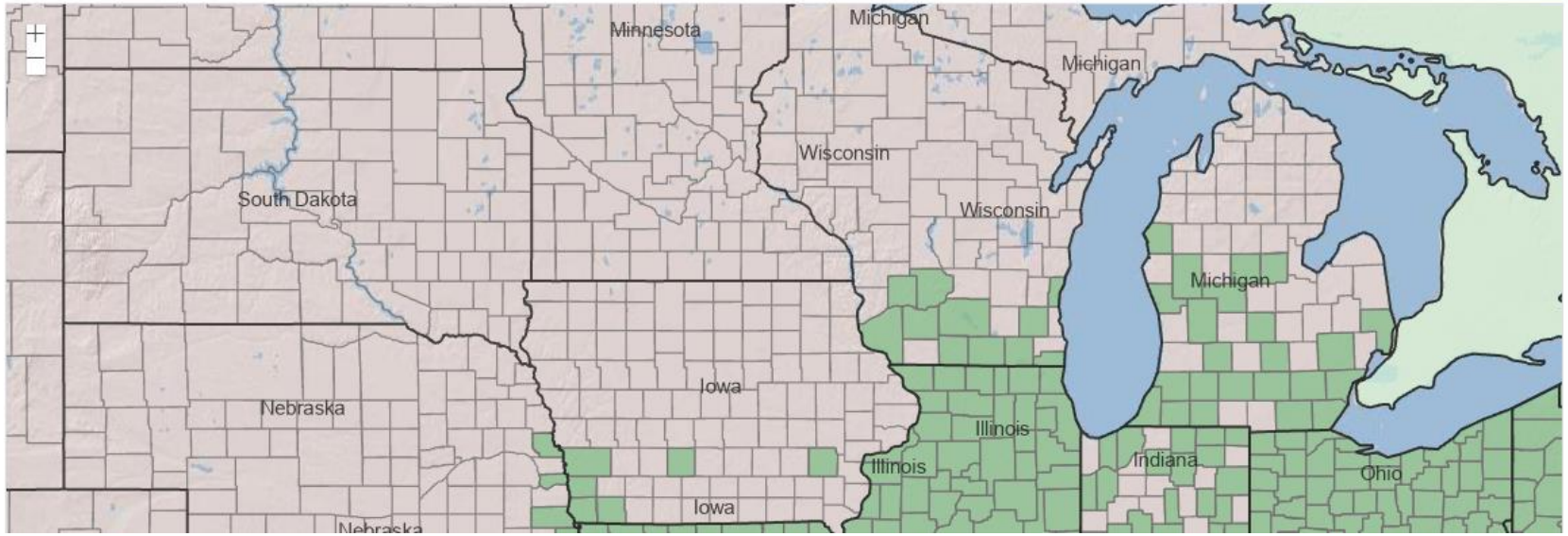




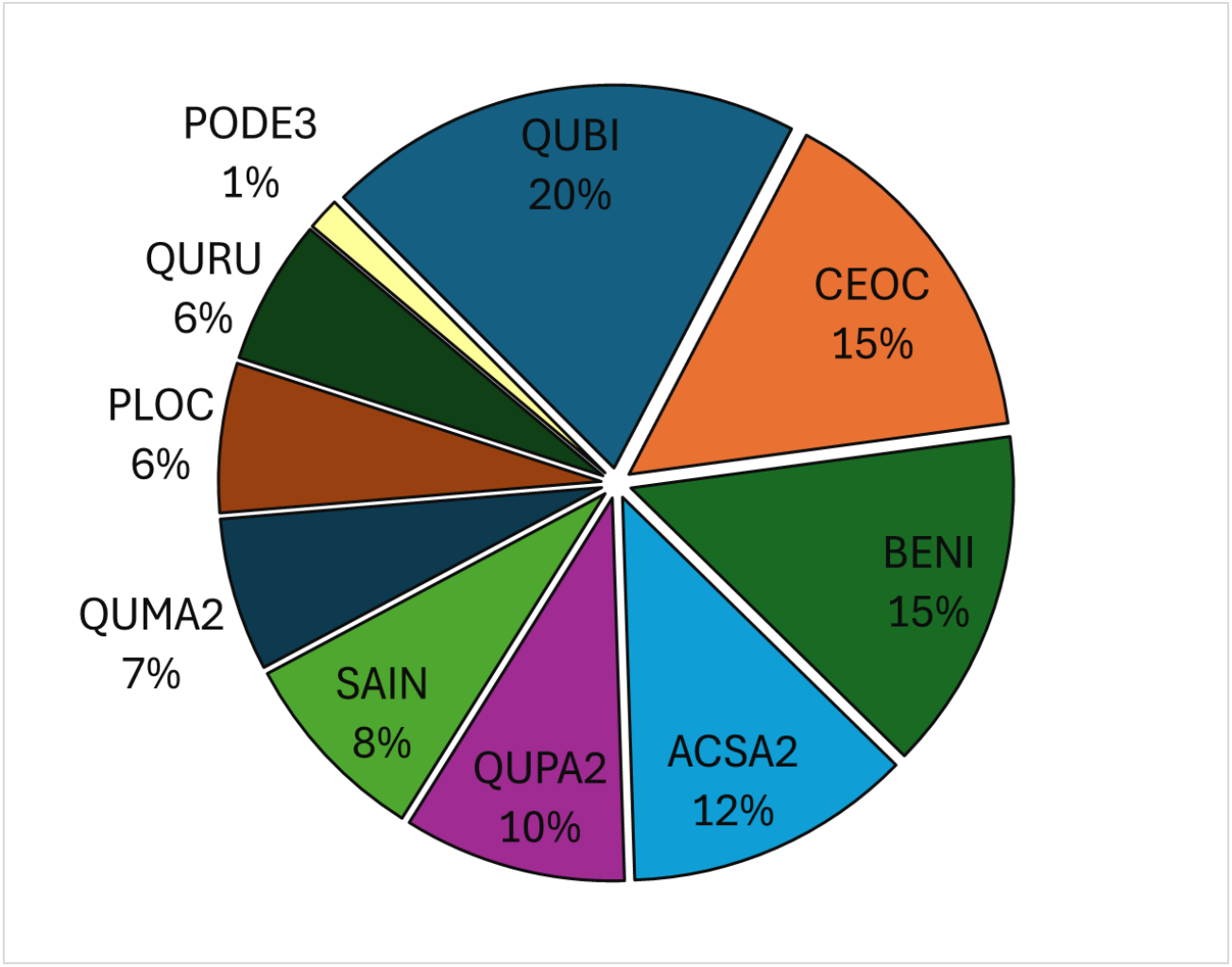
American sycamore General Information	
Symbol	PLOC
Group	Dicot
Duration	Perennial
Growth Habits	Tree
Native Status	CAN N | L48 N
Plant Guide	doc | pdf | pdf

Download Distribution Data

View Print Options

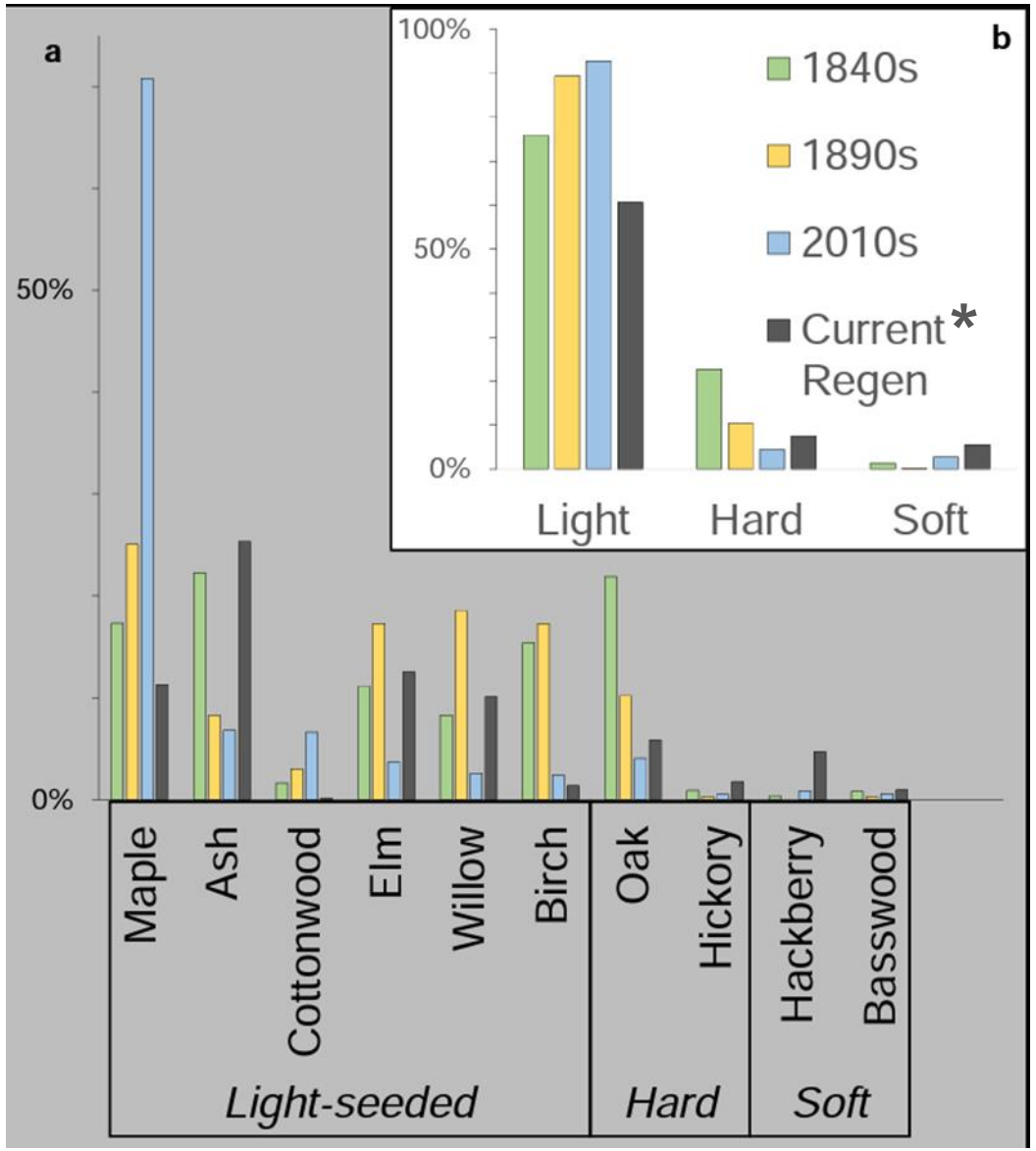


GENERAL PLANTING PATTERNS



% of stems planted, 2020-25

SPECIES COMPOSITIONAL CHANGE



Forest Changes Since European Settlement

- Reduction in hard mast species with concurrent increase in light-seeded species
- Hard mast loss driven by development of higher elevation areas
- Substantial increase in dominance of silver maple and cottonwood, with decrease in all other light-seeded species
- 2010s data not yet reflective of EAB impacts

* 1840s bars indicate percent of plots with species group, 1890s bars indicate percent of “stands” classified by cover type, 2010s bars indicate percent of inventory plots with species group in the overstory, Current regen bars indicate percent of 2010s plots with species group present in the regen layer

MISSING PIECES

MORMON SLOUGH WILLOW STAKES

2023 Containerized and Bareoot

Planting Stock

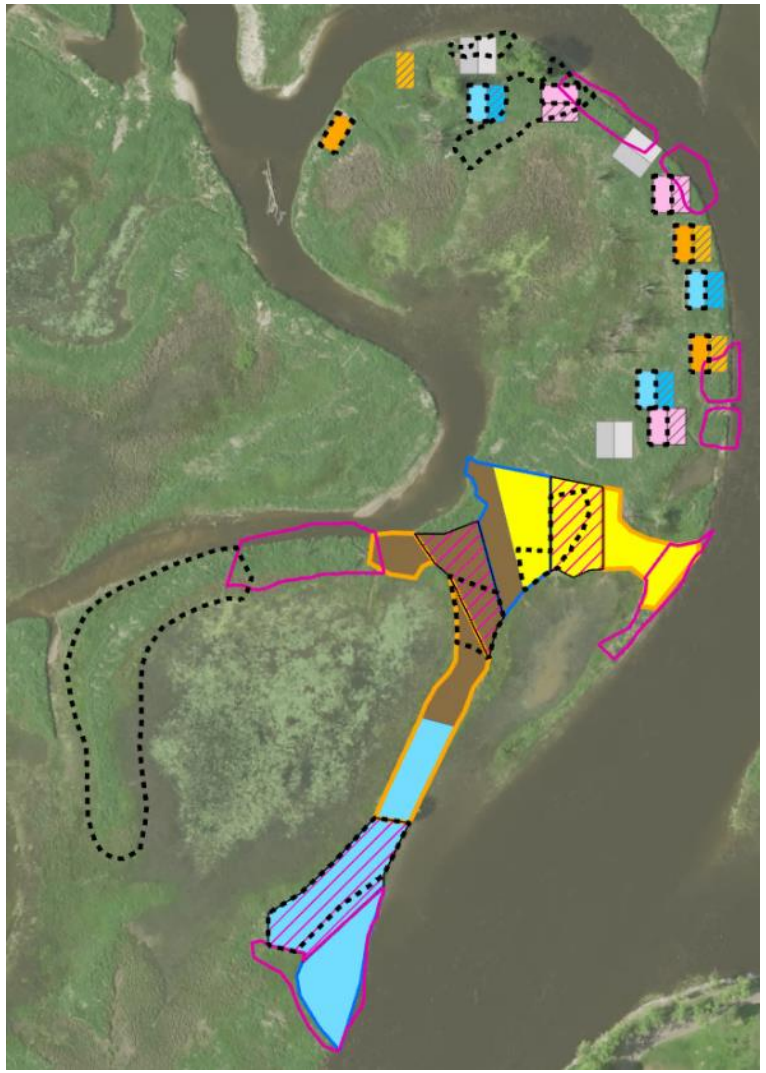
- Fall 2021 Containerized 1
- Spring 2022 Bareroot
- Spring 2022 Containerized 2

Vegetation Control

- Herbicide
- Mow
- No veg control

2020 Cuttings and Containerized

- 16 x 16 maintained
- 16 x 16 not maintained
- 4 x 8 maintained
- 4 x 8 not maintained
- 8 x 8 maintained
- 8 x 8 not maintained
- No planting not maintained
- No planting maintained



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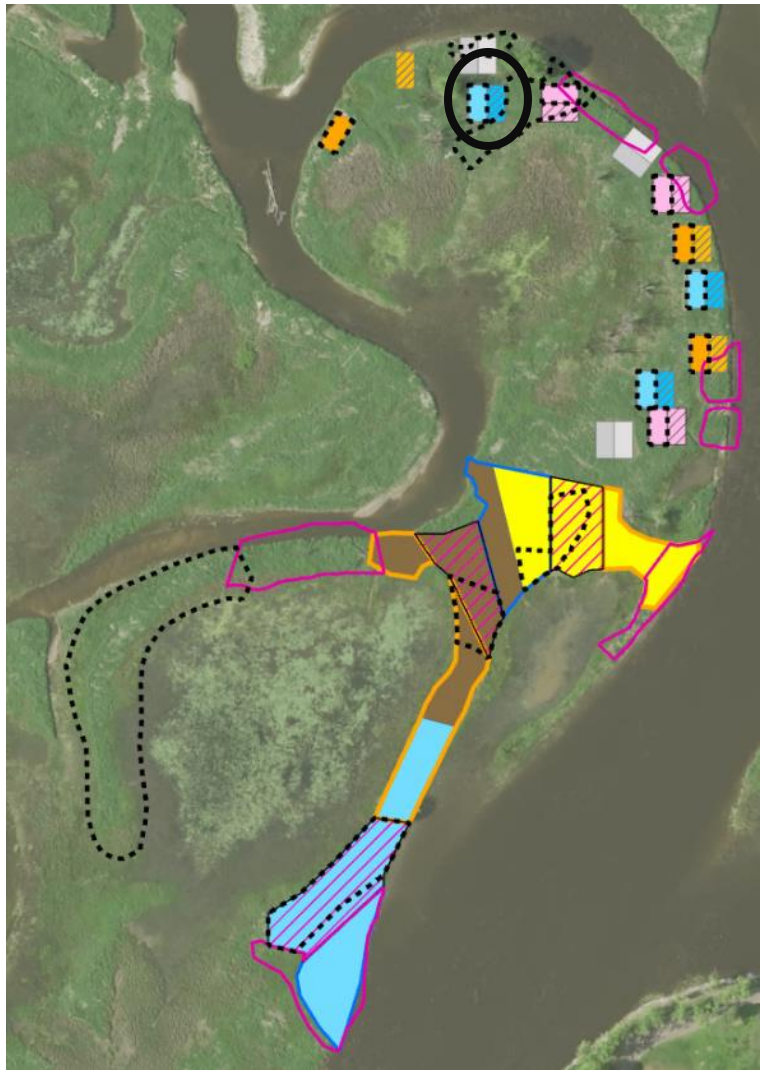

MORMON SLOUGH WILLOW STAKES

Schedule	Activity
Fall 2020	Planting
June 2021	Spot spray
June – Sept 2021	Three mowings
Aug 2021	Spot spray
June 2022	Spot spray
June – Sept 2022	Three mowings
Aug 2022	Spot spraying

Large sandbar willow cuttings
8 x 8 (681 tpa) or 4 x 8 (1,361 tpa)
6-8’ tall, 1-3” dbh

Fall 2020

MORMON SLOUGH WILLOW STAKES

June 2021

Sept 2021

MORMON SLOUGH WILLOW STAKES

July 2022

Sept 2024

Site prep critical

Species selection for site: root suckering, flood tolerant species

MORMON SLOUGH BAREROOTS AND CONTAINER

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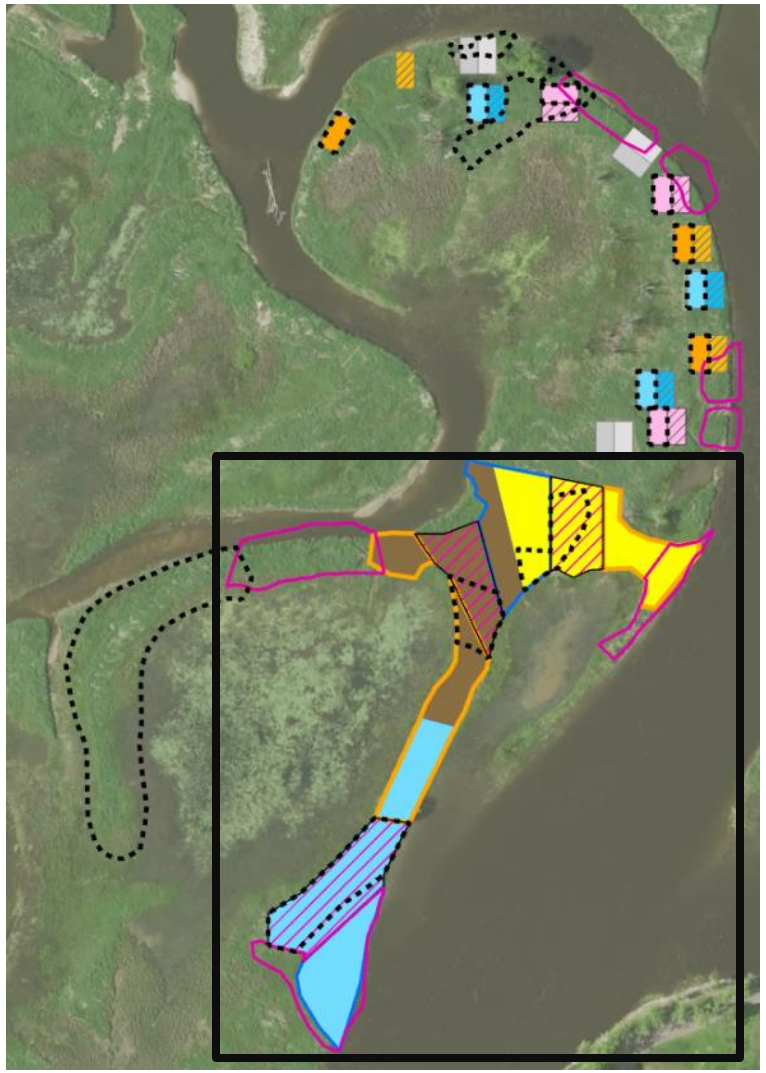


MORMON SLOUGH – SPRING 2022 BAREROOTS

June 2022

July 2022

Swamp white oak
100 3-5 foot, 1-2 stock
100 2-4 foot, 3-0 stock

River birch
100 3-4 foot, 1-2 stock
100 2-4 foot, 2-0 stock

10 x 10 foot spacing (target)

- Flooded immediately after planting
- Total treatment area reduced due to wet conditions
- Spacing reduced to stay on drier ground

MORMON SLOUGH – SPRING 2022 BAREROOTS

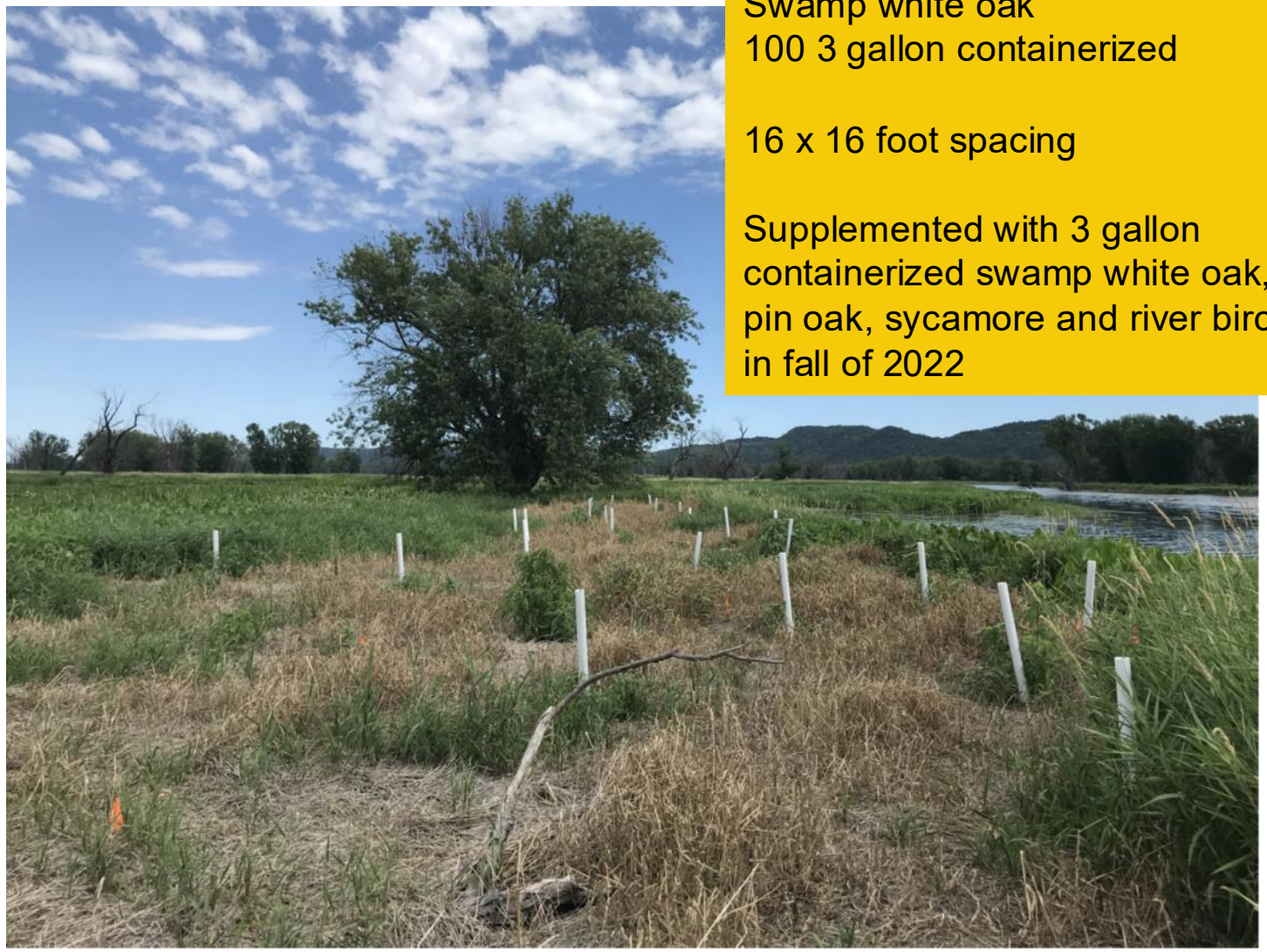
Aug 2024 – Spray

- Flooded immediately after planting
- Total treatment area reduced due to wet conditions
- Spacing reduced to stay on drier ground
- Good growth on surviving trees, though survival was low

MORMON SLOUGH – SPRING 2022 CONTAINER

April 2022

July 2022



Swamp white oak
100 3 gallon containerized

16 x 16 foot spacing

Supplemented with 3 gallon containerized swamp white oak, pin oak, sycamore and river birch in fall of 2022

MORMON SLOUGH – SPRING 2022 CONTAINER

MORMON SLOUGH – SPRING 2022 CONTAINER

June 2023 - Spray

MORMON SLOUGH – SPRING 2022 CONTAINER

July 2023 Weed whack

Aug 2024 – Weed whack

MORMON SLOUGH – SPRING 2022 CONTAINER

MORMON SLOUGH – SPRING 2023 BAREROOTS

July 2023

July 2024

Large stock to deal with competing vegetation

Mechanical vegetation control effective

Needed to adjust to late season flooding

Beavers are more destructive than deer

- Bareroot honeylocust
- Stored VERY poorly for about 3 weeks in Andy's basement
- Planted into reed canarygrass with no site prep
- Weed whacked once per growing season
- Completely underwater in June 2024