New Methods for Floodplain Forest Restoration: Site Preparation and Direct Seeding Trials

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Outline

- Goals of floodplain forest restoration
- Adapting methods to replicate natural success
- Methods and initial results 2016-2019
- Project expansion
  - New sites established in 2019
  - Direct seeding trials 2020
- Looking ahead → challenges and opportunities

Floodplain Forest Restoration

1) What are floodplain forests? Seasonally-inundated forests ...

2) Why restore floodplain forests and riparian forest buffers?

Floodplain forests - and other floodplain habitats - provide important ecological and societal benefits:

- Reduce bank erosion and channel migration
- Protect water quality
- Trap sediment
- Store nutrients
- Attenuate flooding
- Shade and cool temperatures
- Sequester carbon
- Provide important riparian and in-stream fish and wildlife habitat

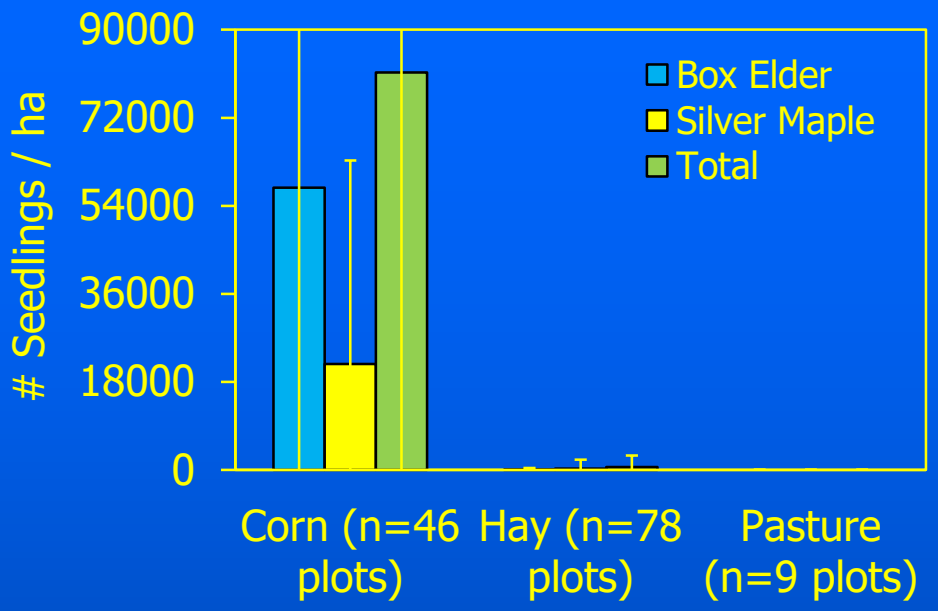
3) Goal? Restore a functioning forest.

"Traditional" tree plantings have had mixed results at some former agricultural sites

BUT we have observed that abundant recruitment of floodplain trees and shrubs often occurs on former cropland but rarely on former pasture and hay fields

Guiding Question:

Can former hay fields and/or pasture be cultivated to stimulate recruitment of floodplain species?

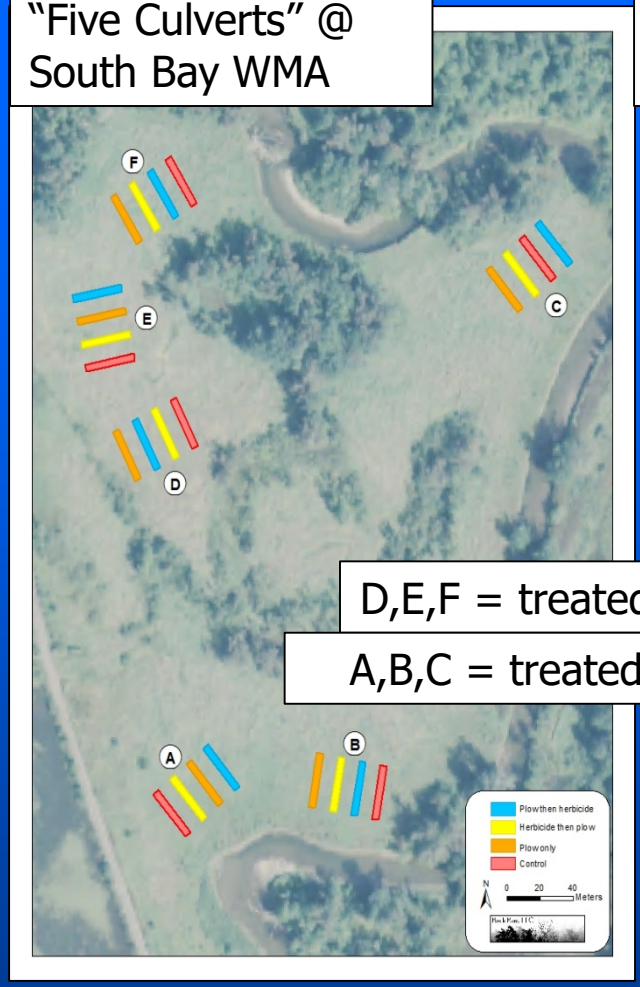



2016


2017


2019

"Five Culverts" @
South Bay WMA



"Riendeau" @
Willoughby Falls WMA

D,E,F = treated 1 year

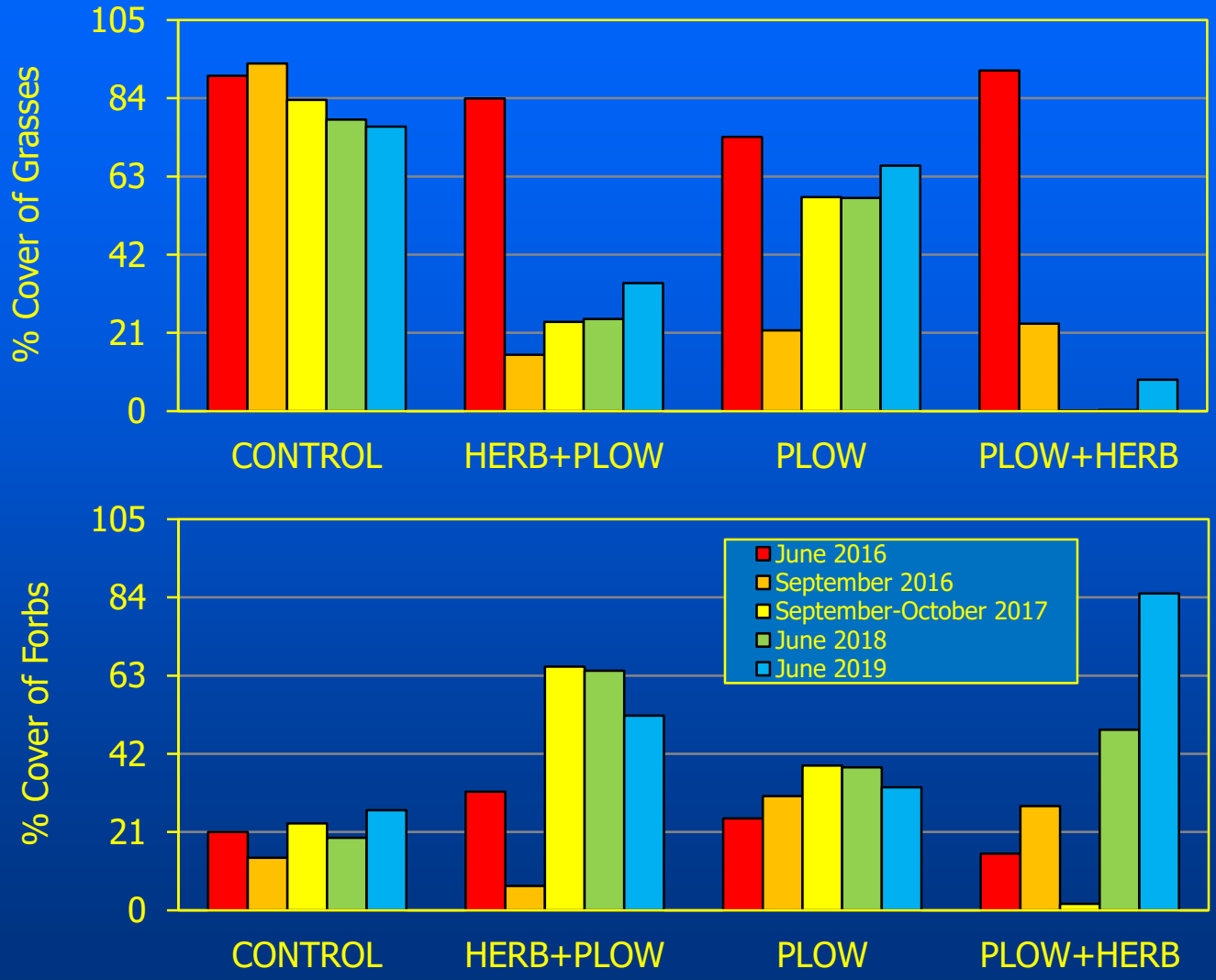
A,B,C = treated 2 years

4 Treatments:

10' x 100' plots

Control
Mow + Plow Only
Mow + Plow + Herbicide
Mow + Herbicide + Plow

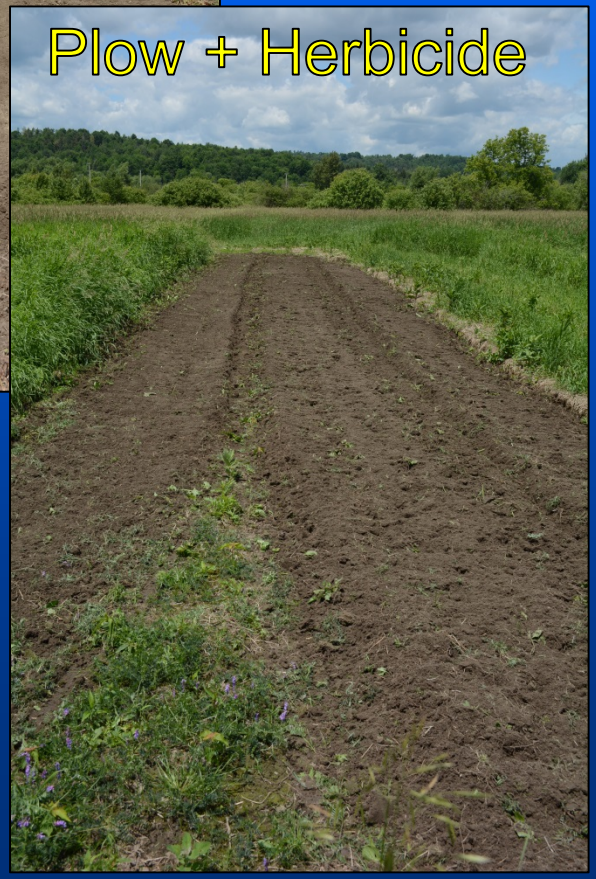
Results – competing vegetation



*** Data include both 1- and 2-year treatments ***

2016

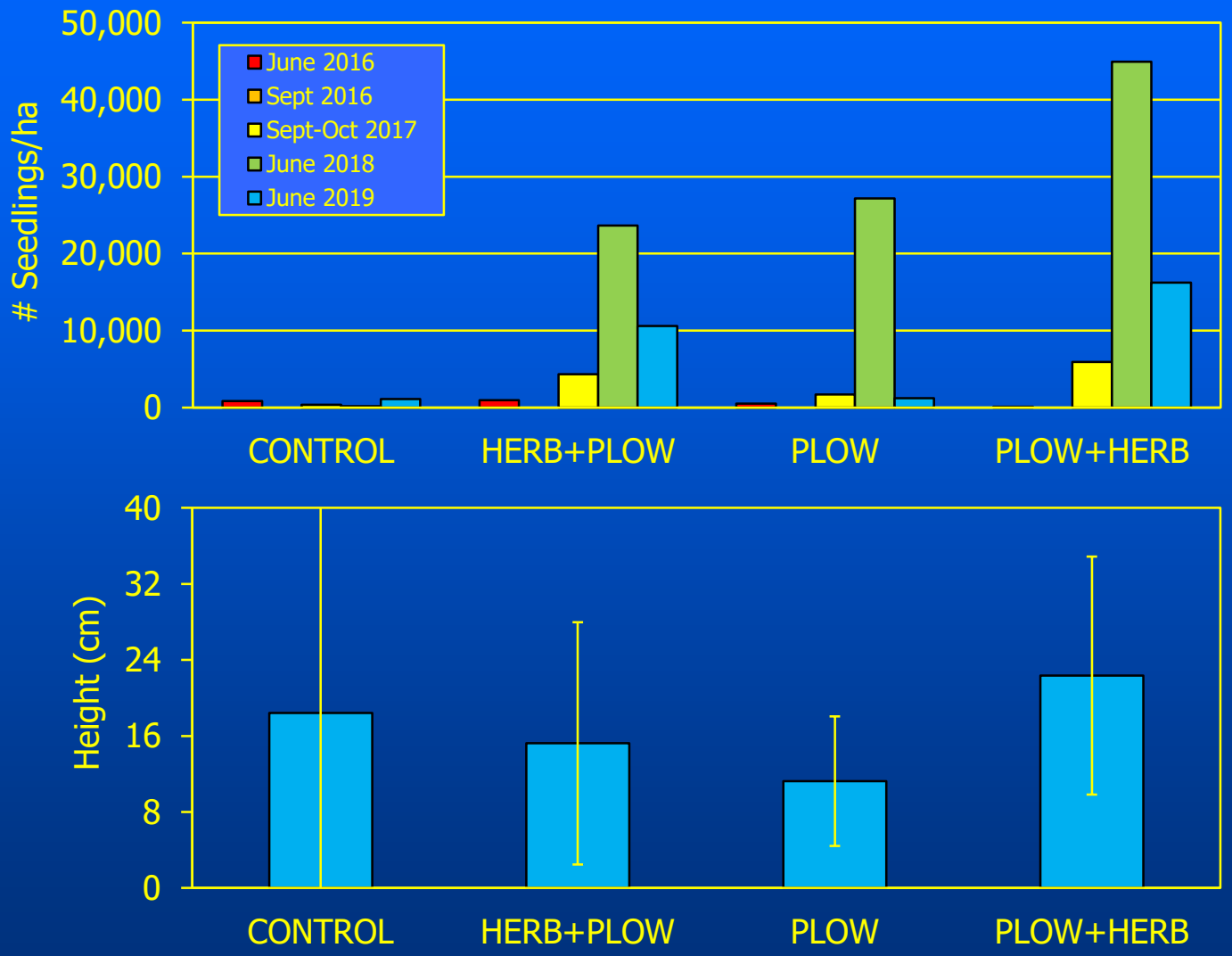
2017



2018

2019

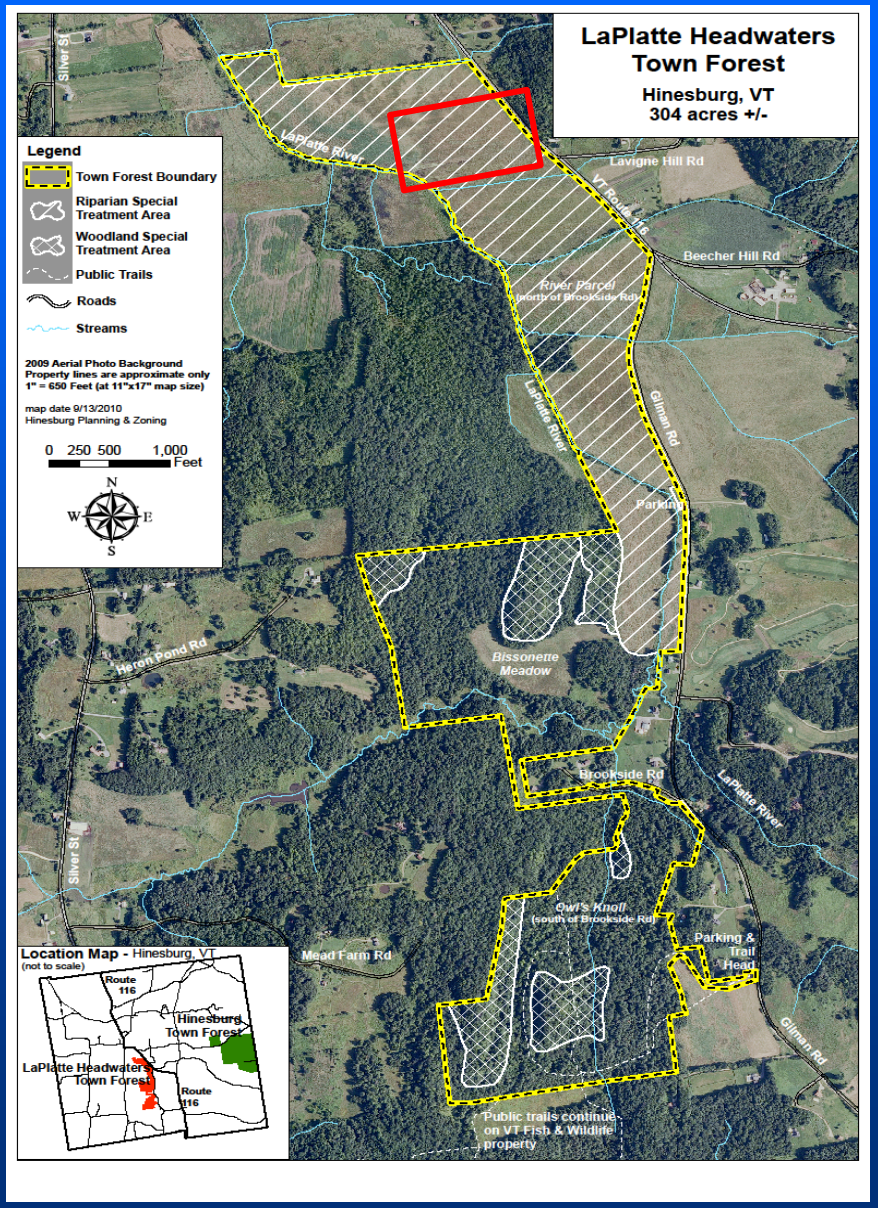
Results – trees and shrubs



Challenges and Lessons Learned

- Treatment plots were small (3 m x 10 m), so neighboring vegetation is creeping back in as well as germinating from seed bank and rhizomes
- Timing of treatments relative to growing season (late summer)
- No guarantee of success when relying on natural processes:
  - No control over seed production and dispersal. Many floodplain species mast (not consistent seed production each year)
  - Dispersal may be limited if sites are far from existing floodplain forest and flooding occurs infrequently or at wrong times relative to seed rain

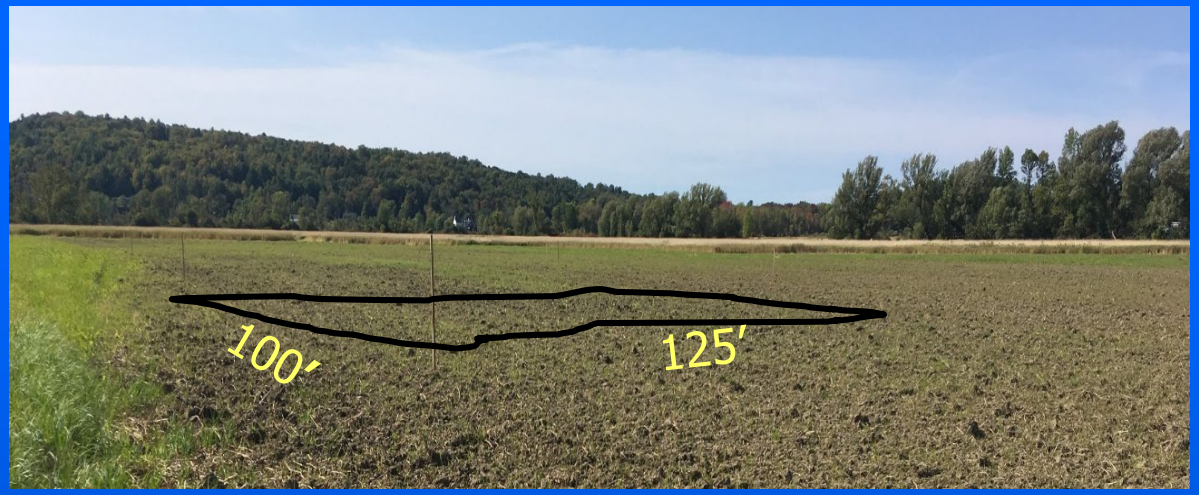
Joining Forces and Expanding Trials in 2019



LaPlatte Headwaters Town Forest, Hinesburg

Past tree plantings have been largely unsuccessful

- Dominance of reed canary grass
- Lack of proximate seed source
- Heavy deer browse



What's New?

1. Replicating and expanding methods
2. Larger plots (reduce edge creep)
3. Introducing direct seeding to control for natural variability

14 test plots, 100' x 125'
6 test plots, 100' x 70'

Replicates for each site preparation method

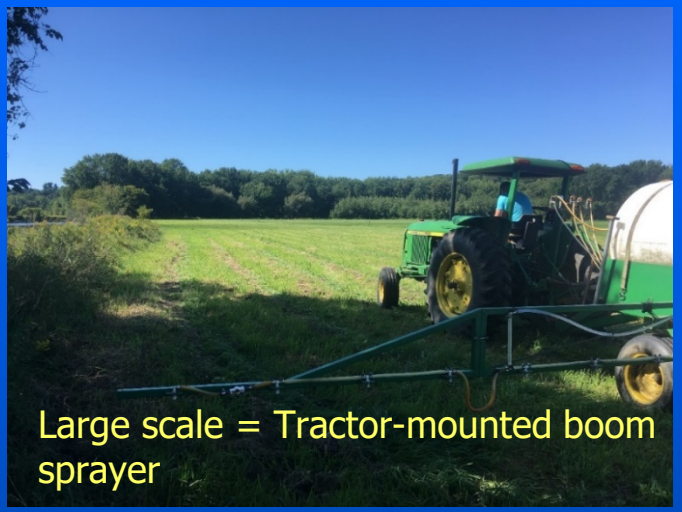
1. Mow + Plow + Till + Herbicide
2. Mow + Plow + Till
3. Herbicide only (fall and spring)

Replicates for each direct seeding method

A. Cottonwood (hydroseeding)
B. Larger Seed (hydroseeding + hand sowing)
C. Natural Regeneration

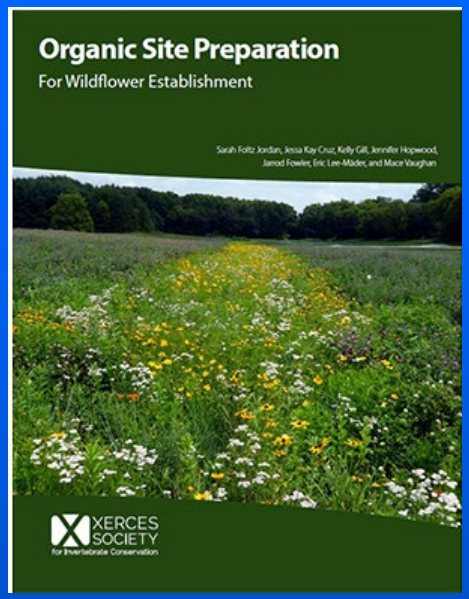
1C	1A	2B	1A	2C	1B	2B
1C	1B	2C	2A	1C	2A	1A
3A	3C	3B	3C	3A	3B	

Additional "herbicide only" experiment where plowing isn't ideal with annual spring flooding



Plans for spring 2020 direct seeding

Organic methods → exploring other means to prepare a "seed bed"



Take-away → we want to develop suite of techniques to meet site-specific needs

What about direct seeding? → drawing on experience from other parts of the country

Hydroseeding

Lower Colorado River Basin

- Consulting with Matt Grabau, USFWS Science Applications, Region 2
- Multi-year research on seed collection, seed storage, germination testing, seeding rates, and hydroseeding protocol

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Residential

Prepare and plan

Plant trees or seedlings

Care and pruning

Direct seeding of native hardwood trees

An innovative approach to hardwood regeneration

Establishing hardwood trees by sowing seed is a relatively new method that has several advantages over traditional planting of seedlings.

Species	Seed crop freq. (years)	Time to collect seed	Shapeand app.	Collection method*	Cleaning	Storage until seeded in fall	Comments
Silver maple	1	June	Green to brown propellers	Rake	Remove stems and leaves	Plant as soon as possible in early summer	Seed shallow
Sugar maple	3–5	Late September to early November	Green to brown propellers	Rake, T/S, H	Remove stems and leaves	Dry—store in small seed sacks at 40°F	One bushel per person per day is maximum yield for hand picking
Bur oak	2–3	August to September	Acorn almost fully covered by cap, which has a furry fringe	Rake, B-A-N, Pick	Cut open a handful to test for viability; hand sort	Only for a few weeks at 40°F—soak overnight before storage	Race with squirrels and deer for acorns
Red oak PDF	3–5	September to early October	Reddish-brown acorn	Rake, B-A-N, Pick	Float, then remove "floaters" or hand sort	Only for a few weeks at 40°F—soak overnight, sow in fall	Race with squirrels and deer for acorns
Red-osier dogwood	1	July to September	Pea-sized white berries in clusters	H	Remove leaves and twigs	Seed extraction from fruit is not necessary—prevent heating of seed	Sow in fall as soon as possible after collection

- Minnesota DNR has developed guidance around direct seeding
- More similar climate and ecology…
- We've been consulting with DNR foresters Jake Froyum and Randy Schindle

Silver maple broadcast seeding, MN floodplain

Illinois Direct Seeding Handbook:
A Reforestation Guide

Handbook contents available for download

NATURAL RESOURCES CONSERVATION SERVICE

TREE/SHRUB ESTABLISHMENT

CODE 612

Design Guide

See WV conservation practice standard Tree/Shrub Site Preparation, code 490.

General Seeding Recommendations

Inspect seed, as described previously in this standard, when removing from storage before planting.

Seed may be planted whenever soil is unfrozen and moisture is adequate, but seed will be in best condition shortly after collection. Acorns in the white oak group can not be reliably stored for more than 6 months. Other species can be stored up to 3 years.

Planting in July, August or early September, however, may result in lower survival due to high soil temperatures and potential for rapid loss of soil moisture. If sprouting of seed begins seed can still be successfully planted but risk of dehydration is increased.

If there is no source of light seeded species within 500 feet of any portion of the planting site that portion will receive an additional 1,000 seed per acre of either heavy or light seeded species. To overcome predation, double the seeding rate for the first 100 feet beyond a forest edge.

Melbourne, Australia

- Consulting with Dr. Fiona Ede, University of Melbourne School of Ecosystem and Forest Science

And even…

MELBOURNE WATER WAY RESEARCH-PRACTICE PARTNERSHIP

Research for the improved management of Melbourne's waterways

Project 4.6
Evaluating direct seeding as a cost effective technique for riparian revegetation

Revegetation of riparian areas is a significant area of investment for Melbourne Water, with about $7m spent annually on revegetation programs. Planting is currently the most commonly used revegetation technique, but direct seeding has the potential to be more cost-effective, if barriers to seedling establishment can be overcome. Although project costs such as fenc-

Research methods

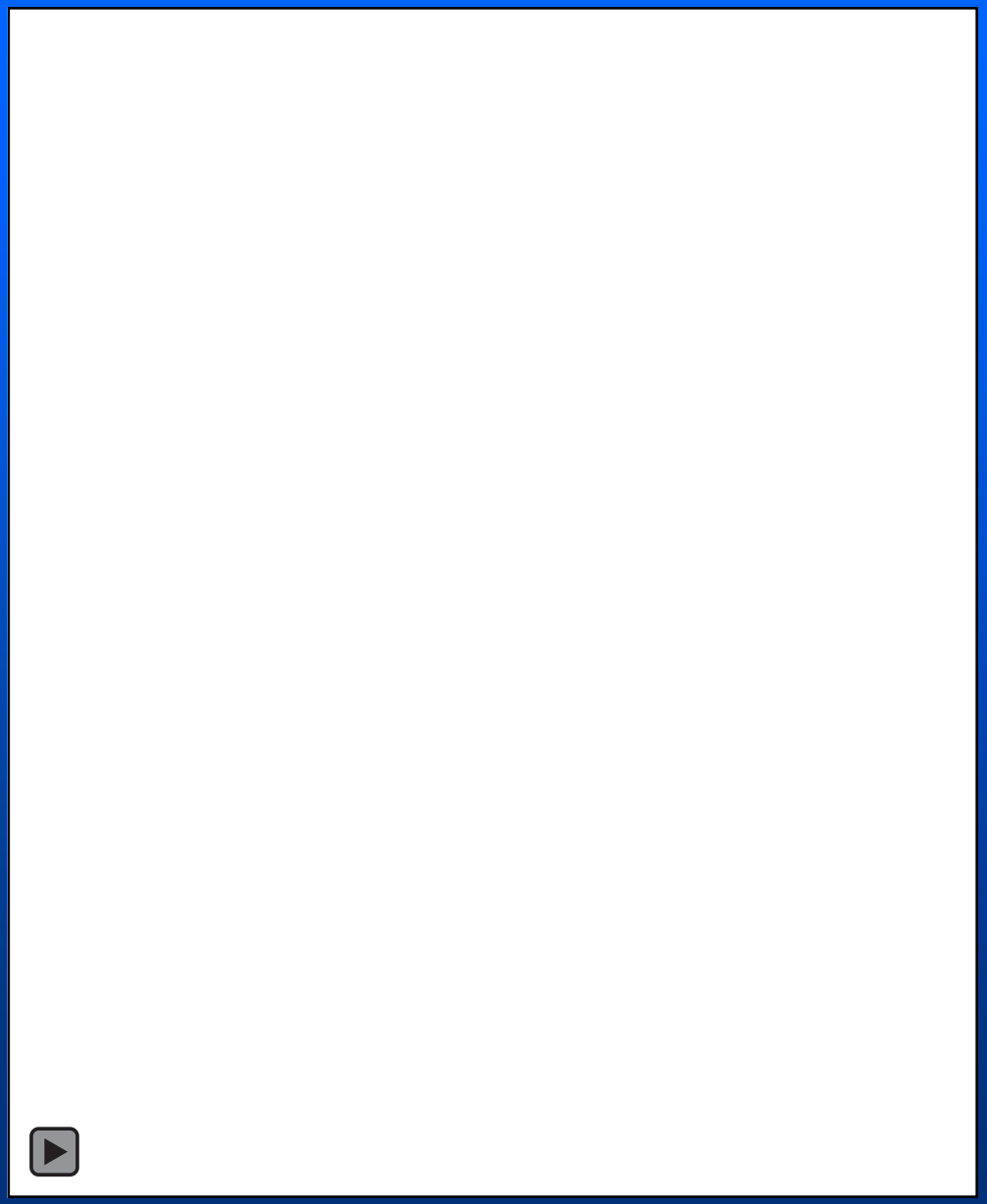
The research approach includes both specifically designed field trials (at Bass River, Cardinia Creek Retarding Basin & Emu Creek) and monitoring of operational Melbourne Water direct seeding projects which are either already underway or due to be established.

Learning from other practitioners

Adapting these methods to fit the Vermont landscape

Spring 2020 and beyond → Challenges and Opportunities

- No control over seed production and dispersal = challenge for natural regeneration AND seed collection efforts
- Unpredictable weather
- Invasive species
- No one-size-fits-all prescription
    - Range of soils, competing vegetation, hydrology, flood regime, site access, budget, project timeline
- Social and political barriers
- Need to expand scope of existing programs / funding




Questions??
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