

Floodplain Forest Restoration

Fritz Gerhardt, Ph.D.



Welcome to

LiveStream

Connecticut River Conservancy

Outline

- 1) What are floodplain forests?
- 2) Why are floodplain forests special?
- 3) Threats to floodplain forests
- 4) **“Traditional” approach to floodplain forest restoration**
- 5) **“Experimental” approach to floodplain forest restoration**
- 6) **“Ideal” floodplain restoration landscapes**
- 7) Conserved floodplain forests to visit

What are floodplain forests?

"Floodplain forest is a bottomland, deciduous or deciduous-conifer forest community occupying low-lying areas adjacent to [lakes or] streams and rivers of third order or greater, and subject to periodic over-the-bank flooding and cycles of erosion and deposition."

- Michigan ANR

Seasonally-flooded forests along lakes, rivers, and streams



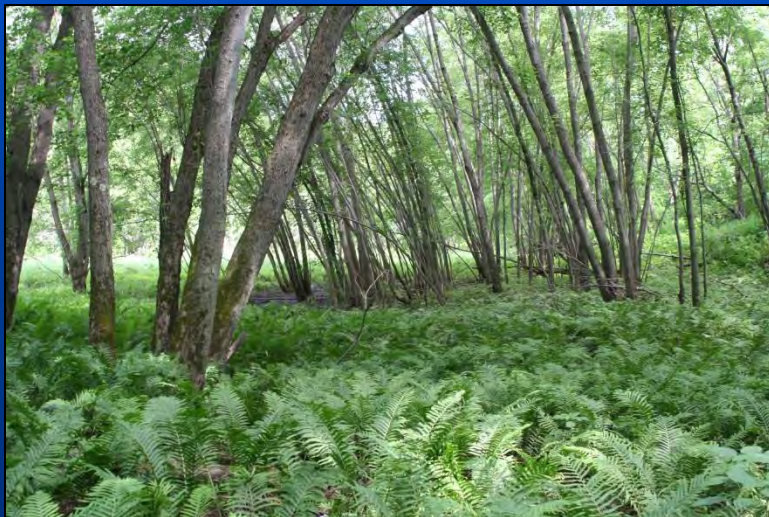
Why are floodplain forests special?

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

- **Store carbon and mitigate the effects of climate change**
- **Moderate temperatures, reduce wind velocities, provide shade, and cool the water**
- **Improve air quality by producing oxygen and trapping dust, pollen, and other air pollutants**
- Attenuate flooding by storing flood waters
- Improve water quality by preventing soil erosion and surface runoff, trapping sediment, and storing nutrients
- **Reduce riverbank erosion and stream channel migration**
- **Important source of woody debris and organic detritus**
- Provide important riparian and in-stream fish and wildlife habitat



Floodplain forest development:
From bare sand to shrubs to trees



Floodplain Forest Natural Communities

Host unique natural communities and native flora and fauna

- Silver maple-sensitive fern floodplain forest
- **Silver maple-ostrich fern floodplain forest**
- Sugar maple floodplain forest
- Boreal floodplain forest
- Lakeside floodplain forest

Based on “Wetland, Woodland, Wildland: A Guide to the Natural Communities of Vermont” (2nd edition)

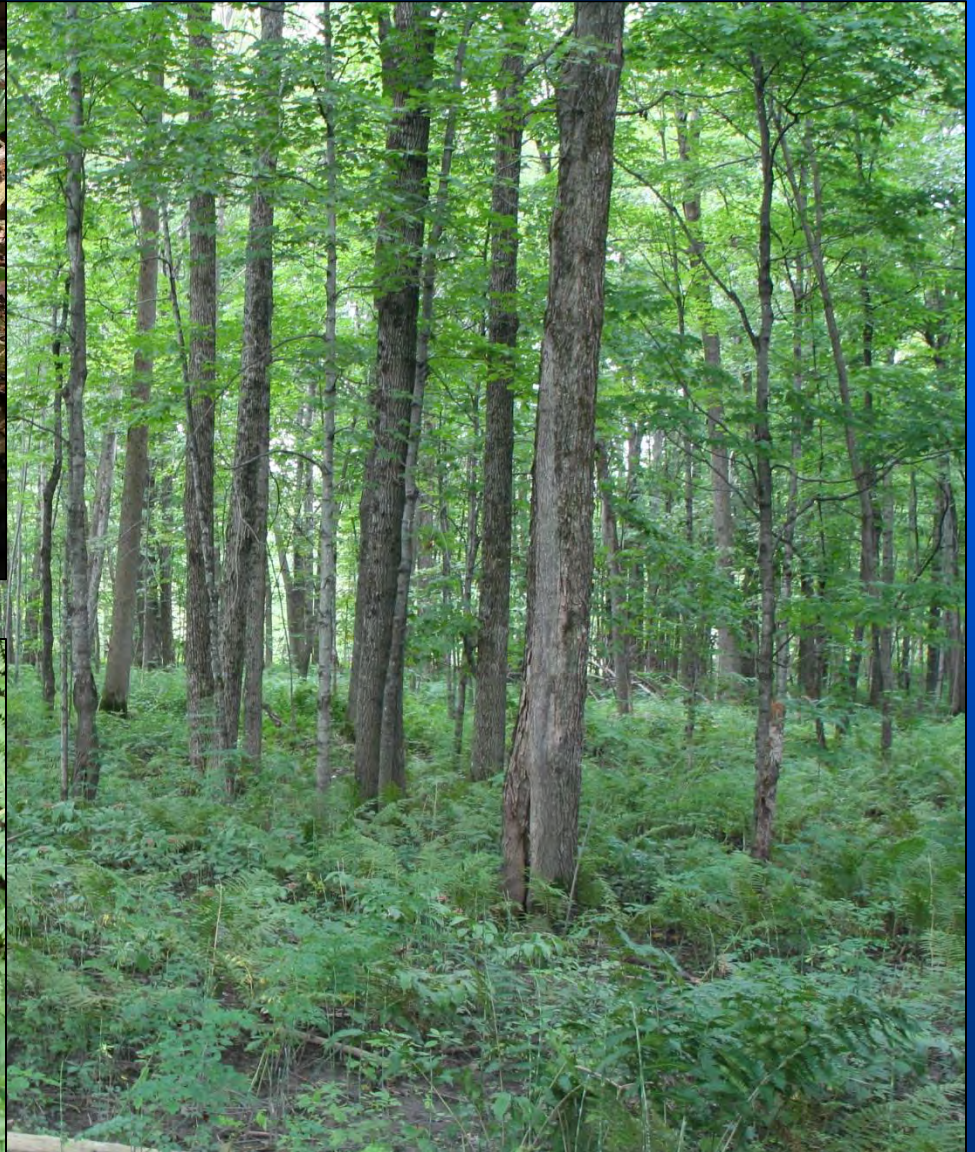
Silver maple-sensitive fern floodplain forest



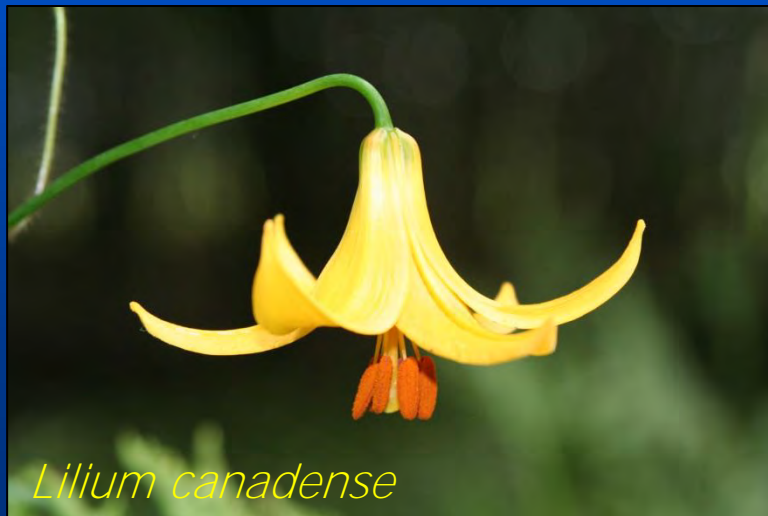
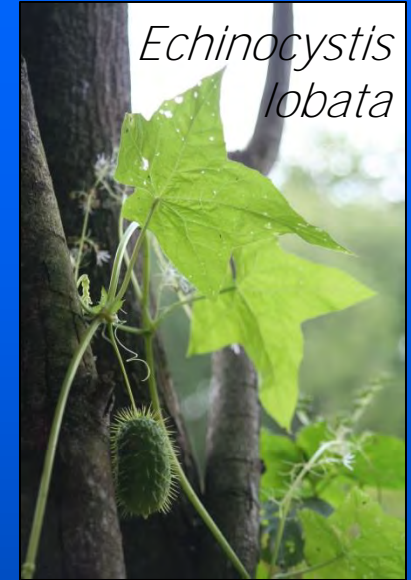
Silver maple-ostrich fern floodplain forest



Sugar maple floodplain forest



Host unique native flora and fauna



American elm (*Ulmus americana*)

Classic floodplain species

Previously co-dominant with silver maple

Since 1928, decimated by Dutch elm disease



Efforts underway to restore American elm to floodplains and elsewhere



Threats to Floodplain Forests

- River channelization and straightening, dams, and other changes that alter stream flows and sediment transport
- Development, especially conversion to agriculture, transportation corridors, and other land uses
- Timber harvesting
- Invasive species (Dutch elm disease, emerald ash borer, Japanese knotweed, shrub honeysuckle, common buckthorn, etc, etc)
- Changes in temperature, precipitation, and stream flow patterns caused by climate change
- In the northeastern United States, 57-95% of the floodplain forests have been lost or degraded (Noss et al. 1995)

VT 102

Capon Brook

Canaan, VT

→ Greatly
altered
landscape

Willard Stream



Colebrook, NH

Restore to
functioning
floodplain →

US 3

CT River



"Traditional" Approach

Buy native trees and shrubs from a local conservation nursery

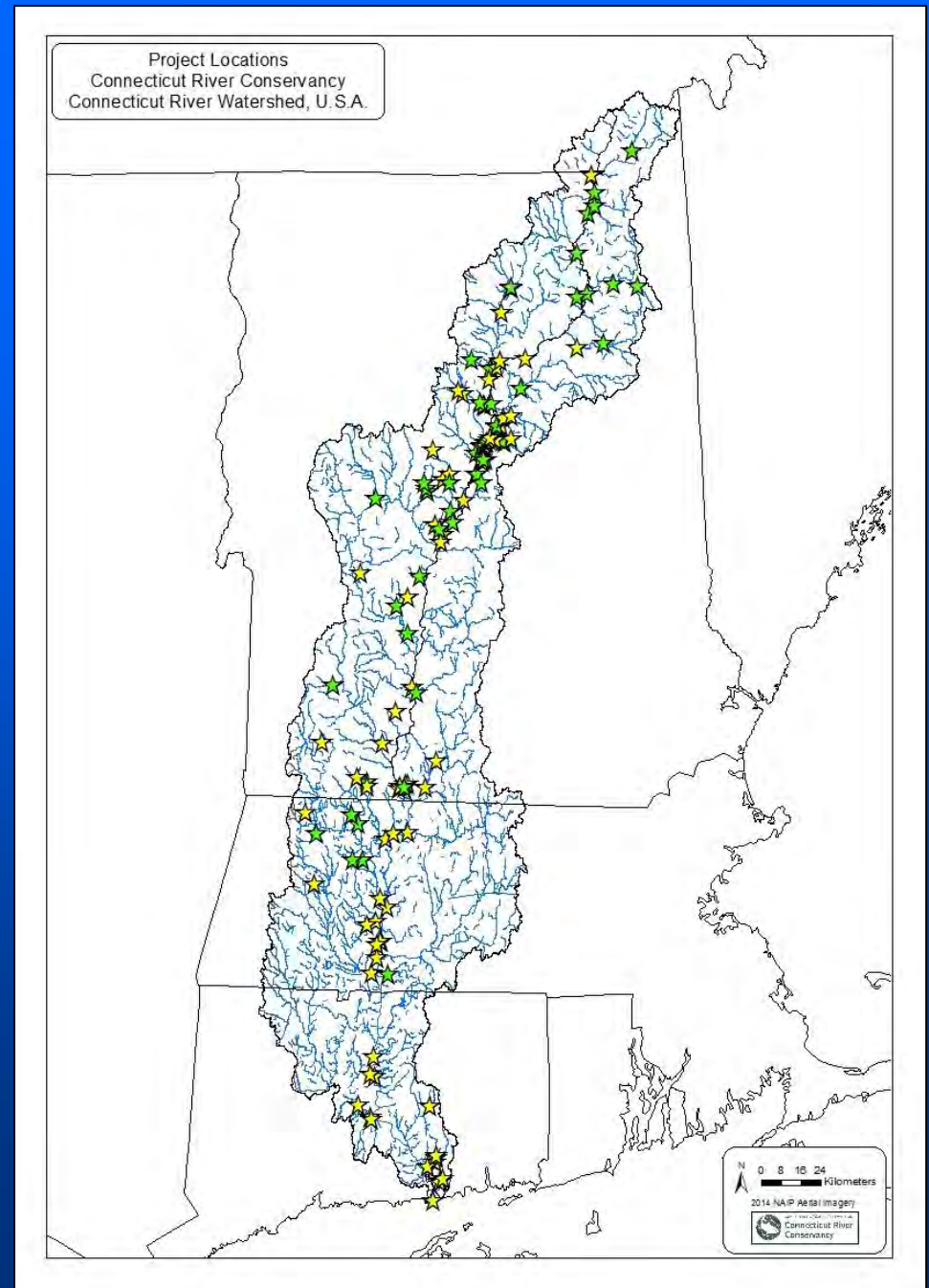
Plant them in the field
(Watch them grow)



Intervale Conservation Nursery (Burlington, VT)



** During the past ten years, CRC and its partners have planted more than 46,000 native trees and shrubs on 80 acres along 11 miles of rivers and streams **



Restoration Guidelines

Plant only species that are native to the area (within 10s to 100s of kilometers) while also considering climate adaptation

Match species to their appropriate habitat(s)

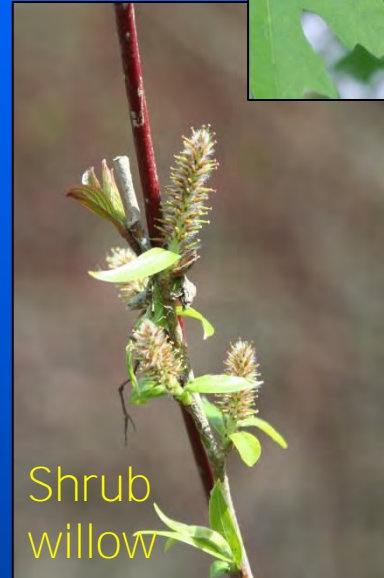
Plant stems that are sufficiently tall (>4' to 5') to outcompete non-native grasses and other vegetation and outgrow herbivores

Understory plants allowed to re-**establish “naturally”**

Control invasive plants if necessary

Monitor and replant if species and/or numbers are not sufficient

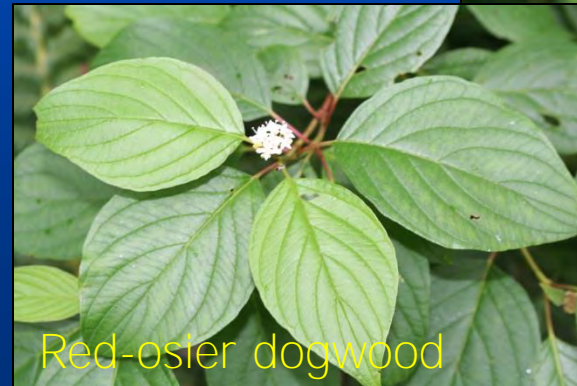
Silver maple



Shrub willow



Basswood



Red-osier dogwood

Piermont, NH
Planted May 2013
Revisited May 2020



These types of projects have largely been successful

But they can be expensive and labor intensive

400 stems on 1 acre =
\$4,200-\$7,200 per acre

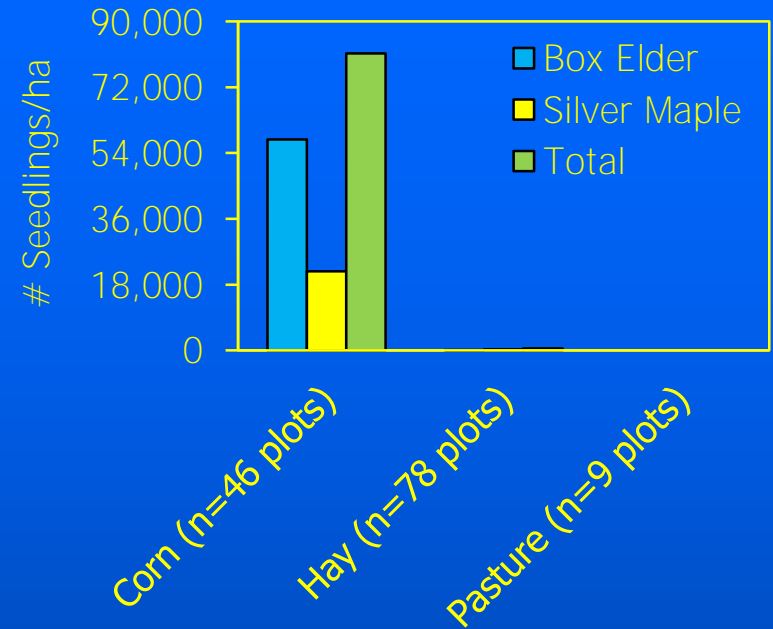
This approach is best for narrow riparian buffers (50-**100' wide**), **shorelines**, **wet or** steep sites, and culturally and/or ecologically sensitive sites

"Experimental" Approach

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



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





Experimental Design

We set up an experiment to test this idea in 2 old hay fields

Each site divided into 6 blocks (total = 12 blocks)

Each block has all 4 treatments:

<u>4 Treatments</u>	<u>Mowed</u>	<u>Plowed</u>	<u>Herbicided</u>
Control	No	No	No
Plow only	1st	2nd	No
Plow + Herbicide	1st	2nd	3rd
Herbicide + Plow	1st	3rd	2nd

Half of blocks treated only one year, half treated two years



Experimental Design

We set up an experiment to test this idea in 2 old hay fields

Each site divided into 6 blocks (total = 12 blocks)

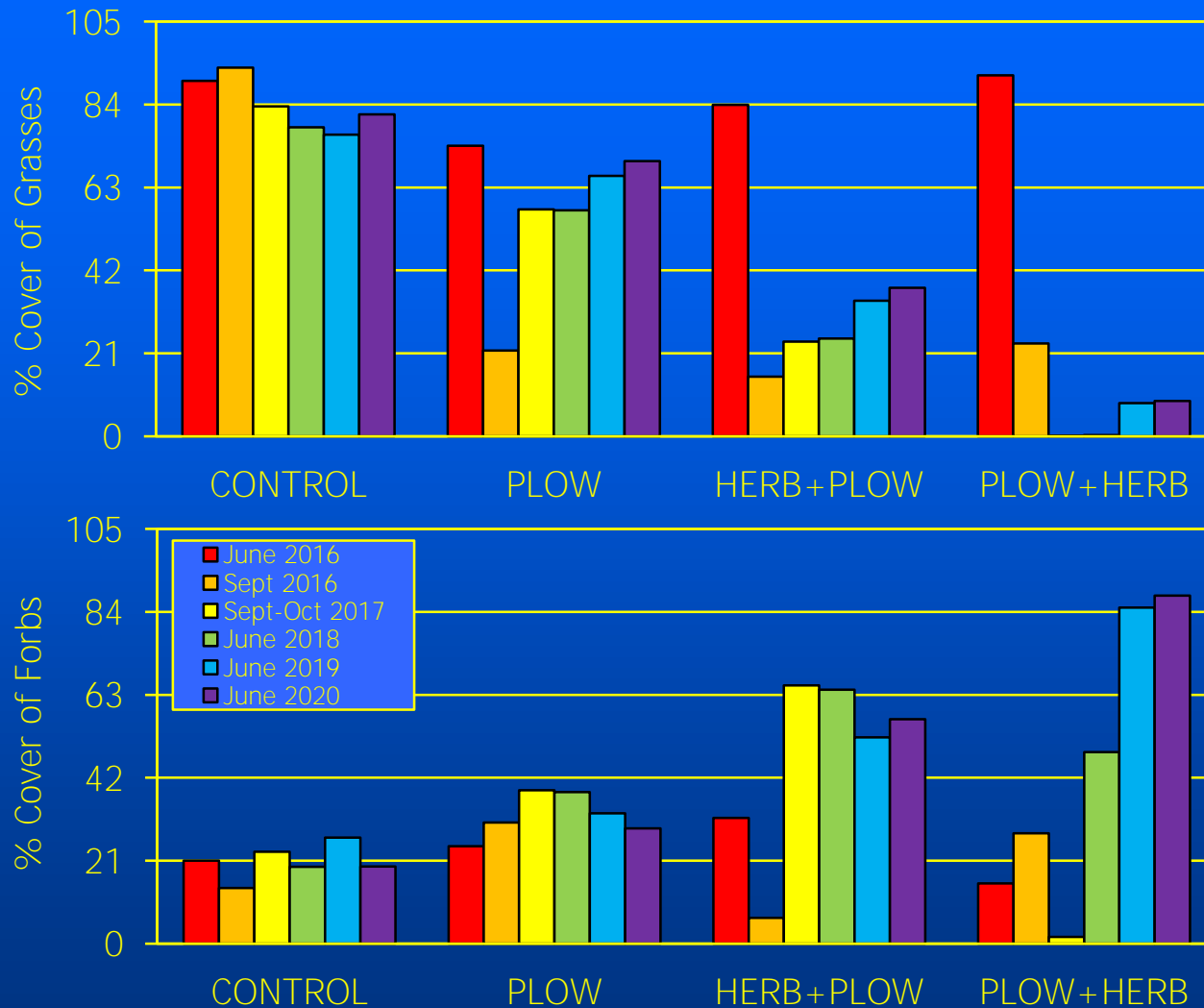
Each block has all 4 treatments:

<u>4 Treatments</u>	<u>Mowed</u>	<u>Plowed</u>	<u>Herbicided</u>
Control	No	No	No
Plow only	1st	2nd	No
Plow + Herbicide	1st	2nd	3rd
Herbicide + Plow	1st	3rd	2nd

Half of blocks treated only one year, half treated two years



Results – Competing Vegetation



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

Control



Herbicide + Plow



2016

Plow only



Plow + Herbicide



Control



Herbicide + Plow



2017

Plow only



Plow + Herbicide



Control



Herbicide + Plow



2018

Plow only



Plow + Herbicide



Control



Herbicide + Plow



2019

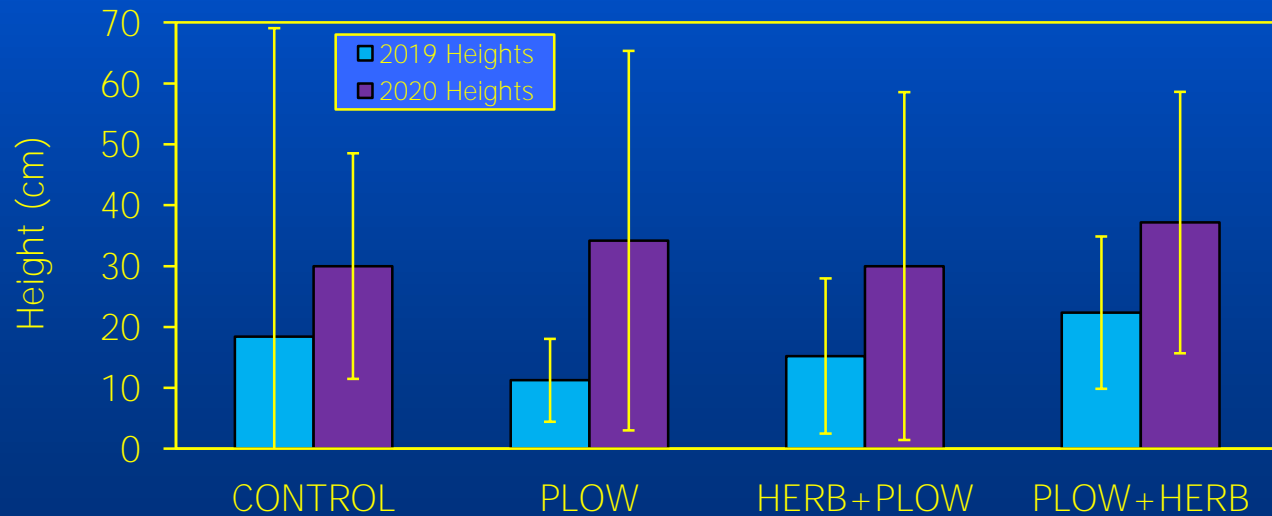
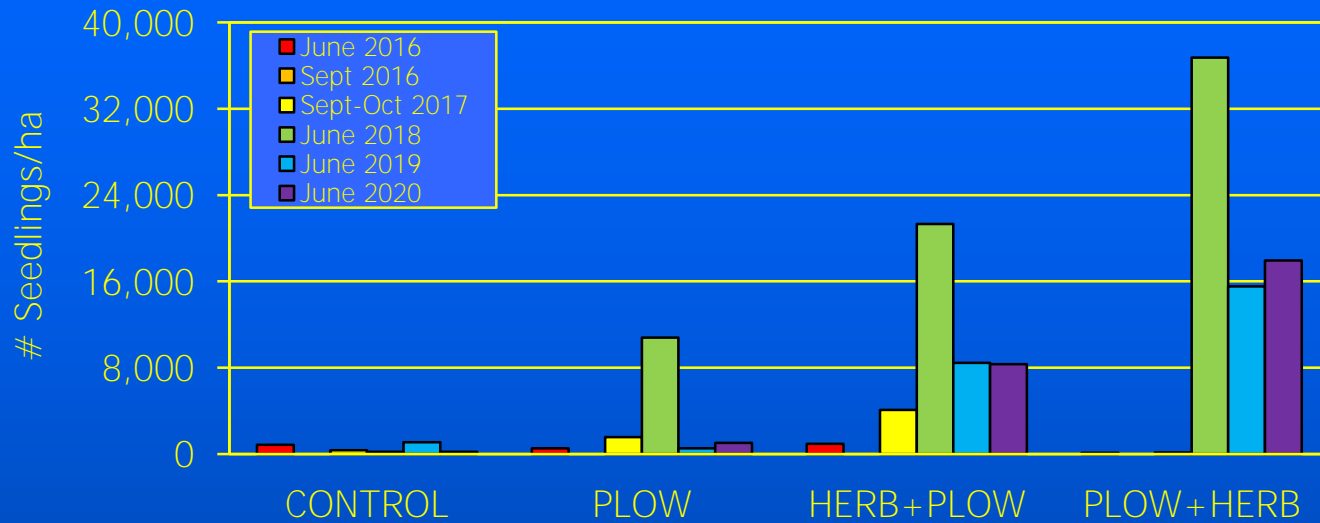
Plow only



Plow + Herbicide



Results – Trees





Plow Then Herbicide treatment most effective

No guarantee of success:

- Timing of treatments relative to growing season (late summer best)
- No control over seed production and dispersal
- **Seed production of many** floodplain species varies greatly among years
- Dispersal may be limited if sites are far from existing floodplain forest and/or flooding occurs infrequently or at wrong times relative to seed production



Best opportunities probably large fields near existing floodplain forest

Hydroseeding in the Lower Colorado River Basin (USFWS)



Direct seeding (Minnesota DNR)



“Ideal” Restoration Landscape

Characteristics of the Best Projects

- Large areas (not just a narrow strip of riparian buffer)
- Lengthy shorelines
- Both shores of river/stream
- Complex mosaic of habitats (floodplains, wetlands, uplands)
- Mix of restoration approaches



Floodplain Forests Near You

Canaan, Vermont and Colebrook, New Hampshire:

- Johnson Farm WMA (VT)
- Connecticut River Drivers WMA (NH)

Lyndonville, Vermont

- Powers Park

Easthampton and Northampton, Massachusetts:

- Arcadia Wildlife Sanctuary (MassAudubon)
- Mill River Unit (Silvio O. Conte NFWR)

South Hadley, Massachusetts

- Bachelor Brook-Stony Brook Conservation Resource Area

Lyme, Connecticut

- Banningwood Preserve (Lyme Land Trust)

Thank you!

www.ctriver.org

Fritz Gerhardt, Conservation Scientist

fgerhardt@ctriver.org



Clean water. Healthy habitat. Thriving communities.

**Connecticut River
Conservancy**