# Plant Community Recovery at Dam Removal Sites in Connecticut



#### A Dammed Landscape



### **Ecological Impacts of Dam Removal**

#### Shafroth et al. (2002)



## Previous Dam Removal Research

"Plant community can be expected to reach a variety of "**novel states**" that may differ greatly from the pre-dam species composition." (Shafroth et al. 2002)



18

studies



Invasive species can alter or stall a dam removal site's recovery trajectory.

#### **Research Questions**

# What level of plant community biodiversity currently exists in dewatered dam impoundments in Connecticut?

- a. Does plant community vary with time since dam removal?
- a. Does plant community composition vary with differences in soil, light, and moisture conditions?
- a. Are there significant site-to-site differences in plant community?

7 removal sites in CT 1 as		Study Sites						
		Torringtor shington 3 rd Wate	n Hartford 2 Bristol New Britain					
Site Name	Rem <mark>oval</mark> Year	Impoundment Area (hectares)	Montville					
1. Old Papermill	2019	0.61	10 11 12 14 15 15 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10<					
2. Black Ledge	2018	2.67	New Haven Madison Old Saybrook					
3. Heminway	2018	2.78	ord					
4. Ed Bills	2016	2.22						
5. Pond Lily	2015	1.42						
6. Hyde Pond	2015	2.16						
7. Rutan	2012	0.49						

# Sampling Design

# Random sampling; stratified based on distance from edge of main channels

• 2% area sampled within the impoundment

1 x 1 m Quadrat Plants ≤ 1m height Short herbs and woody seedlings

#### Vegetation:

 Count and percent cover of each species

**Environmental Variables:** 

- Soil moisture and compressive strength
- 15cm soil cores
- Densiometer readings

5m Radius Circle Plants > 1m height and < 10 cm DBH Shrubs, tall herbs, and saplings

#### Vegetation:

- Percent cover of each species
- DBH of woody stems ≥ 2cm

**10m Radius Circle** Plants ≥ 10cm DBH *Mature trees* 

#### Vegetation:

- DBH of woody stems ≥ 10cm
- Canopy class

- We observed 224 species across 81 families:
  - 1. Asteraceae (35 species)
  - 2. Rosaceae (16 species)
  - 3. Cyperaceae (11 species)
  - 4. Polygonaceae (11 species)
  - 5. Poaceae (10 species)
- 36 obligate & 48 facultative wetland species
- 22 invasive species

156 IMPOUNDMENT SPECIES 68 FOREST SPECIES

65

#### Variation in impoundment plant community

#### across chronosequence



Proportion of forbs decreases with site age

Proportion of graminoids decreases with site age

Proportion of trees and shrubs increases with site age

• Generalized Linear Mixed Models (GLMMs) – Site as a random effect

	Са	К	Ρ	Soil Moisture	Compressive Strength	Marginal <b>R<sup>2</sup></b>	Conditional
Overall Species Richness	***				*** +	0.607	0.607
Wetland Species Richness	* -			** +		0.359	0.392
Invasive Species Richness						0.153	0.353
Woody Species Richness	***			** -		0.641	0.729
Woody Seedling Count				* -	* +	0.515	0.678

- We observed significant site-to-site differences in plant community species composition
  - Woody shrubs and trees were more prevalent at older sites, but the species varied.
  - Lythrum salicaria (purple loosestrife) was the most commonly encountered invasive species across all sites.
    - However, high site-to-site variability in prevalence of invasive species.
  - Hyper-dominance of certain species at some sites.



Within-site variation in plant community





## Conclusions

- GLMMs revealed certain environmental and soil variables as significant predictors of plant community characteristics within dewatered impoundments.
  - Soil moisture, Ca concentration, and compressive strength are significant predictors of overall, woody, and wetland species richness.
  - Site-to-site differences play a larger role in invasive species richness.
- However, NDMS and rank abundance curves reveal significant differences between site species composition.
  - More investigation of site-to-site differences is needed to better understand how pre-removal plant community influences post-removal community.
  - Determining appropriate predictor variables for specific invasive species.
  - Micro-topographical shifts may also play an important role in shaping plant community within dewatered impoundments.

# Thank You!



#### Save the Sound®

The Gahagan Family

The Rutan Family

Town of Watertown

Town of Glastonbury

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CT DEEP

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