

# Big Spring Run Monitoring

## Biological and Ecosystem Results



# Pennsylvania

Department of Environmental Protection

**Pennsylvania Legacy Sediment Workgroup**

**Jeffrey Hartranft**

**Bureau of Waterways Engineering and Wetlands**

**Division of Wetlands Encroachments and Training**

[jhartranft@pa.gov](mailto:jhartranft@pa.gov)

717-772-5320

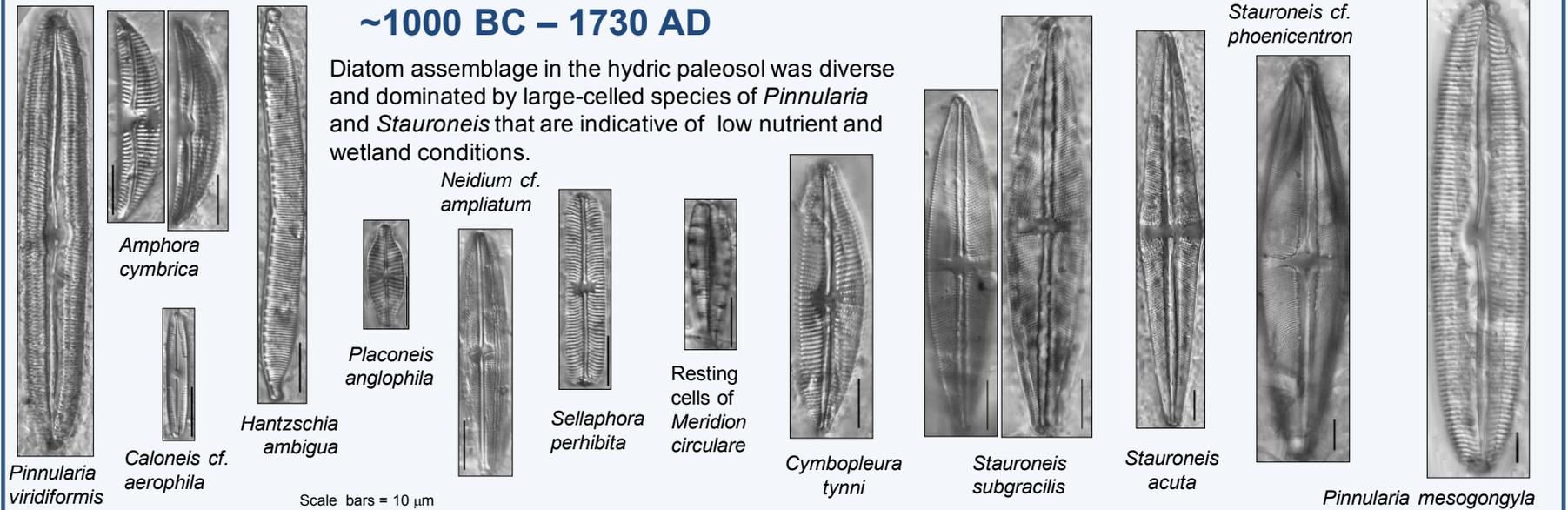
# Presentation Outline

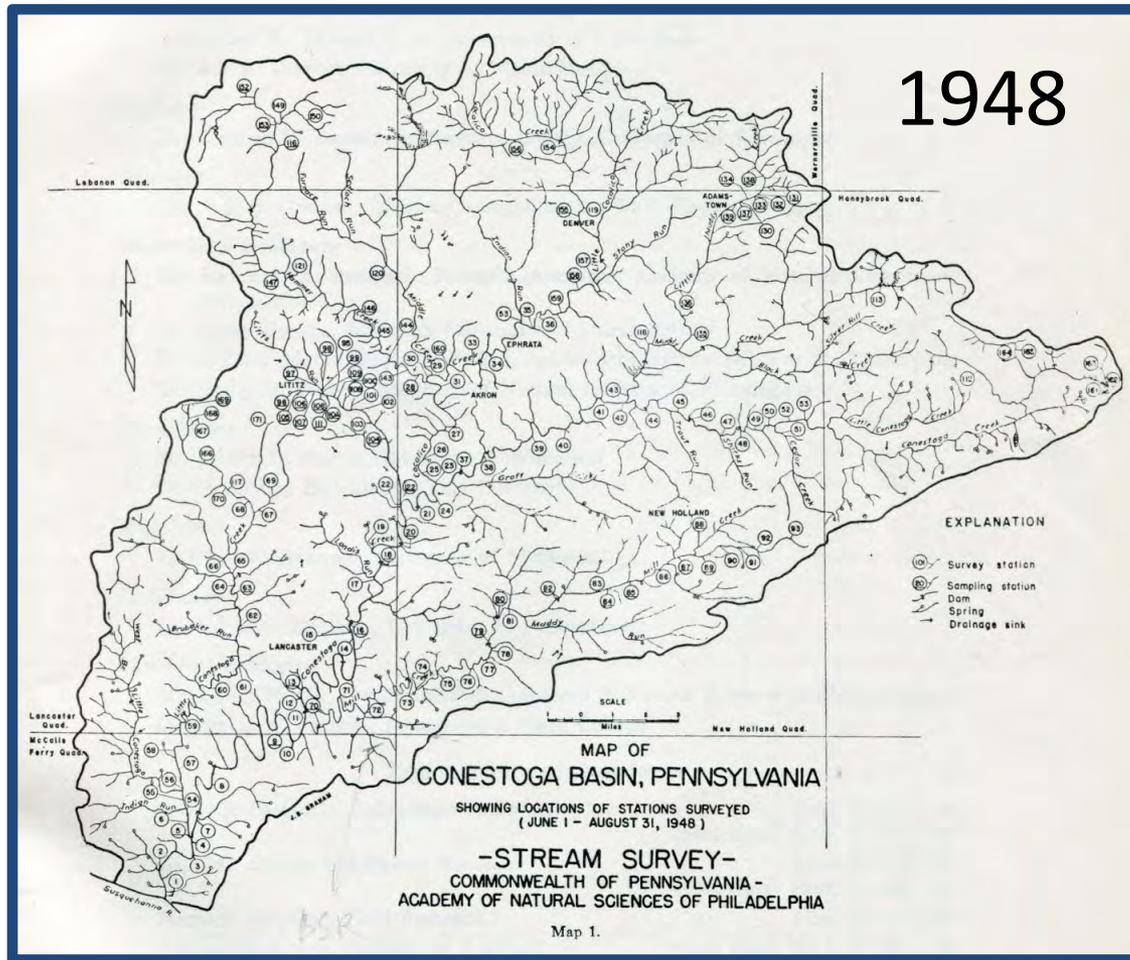
- **Diatom response- primary producer (M. Patapova)**
- **Amphibian response (D. Bowne)**
- **Fish response (PAFBC, PADEP, SRBC)**
- **Vascular plant community response (W. Hilgartner,  
J. Hartranft, S. Chamberlain)**
- **Anecdotal observations – birds and mammals**



## ~1000 BC – 1730 AD

Diatom assemblage in the hydric paleosol was diverse and dominated by large-celled species of *Pinnularia* and *Stauroneis* that are indicative of low nutrient and wetland conditions.





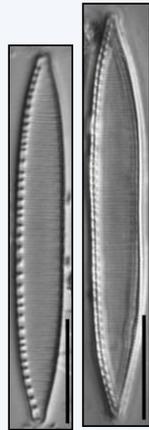
Almost no diatom species that were present before the 1800s remained in the Conestoga River by 1948.

Patrick, R. 1949

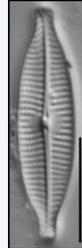
## 2011: pre-restoration



*Nitzschia cf. gessneri*



*Nitzschia  
palea s.l.*



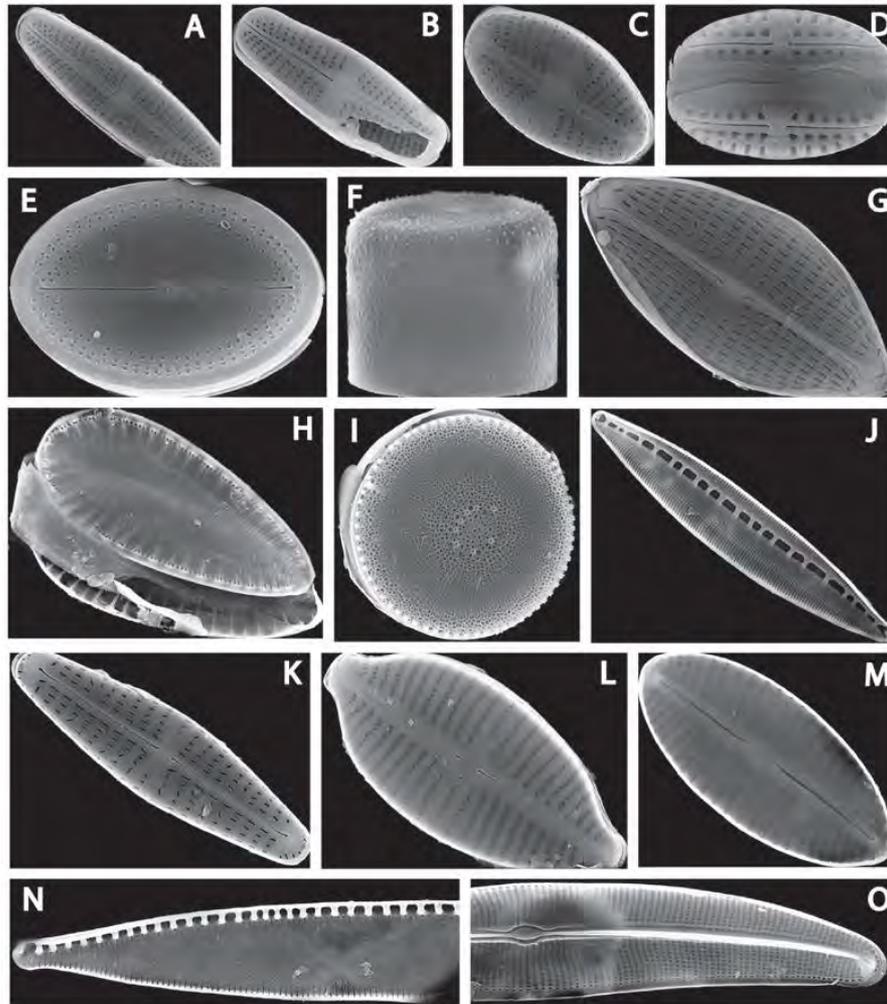
*Navicula  
gregaria*



*Navicula  
reichardtiana*

Diatom assemblages similar to those found in 1948 in relatively “healthy” Lancaster County streams.





## Common diatoms from Big Spring Run

Figure 1.2. Scanning electron microscopy images of the common diatoms from BSR samples. A – *Achnantheidium minutissimum*, B – *A. saprophilum*, C – *Eolimna minima*, D – *Amphora pediculus*, E – *Cocconeis placentula*, F – *Melosira varians*, G – *Navicula antonii*, H – *Surirella lacrimula*, *Thalassiosira weissflogii*, J – *Nitzschia dissipata*, K – *Hippodonta pseudacceptata*, L – *Gomphonema parvulum* var. *saprophilum*, M – *Craticula subminuscula*, N – *Nitzschia palea*, O – *Gyrosigma obtusatum*.

Potapova, et al, 2016

# Diatom Results Summary

Before 1700s Big Spring Run was inhabited by diverse diatom communities that are known to prefer slow-moving clean waters with abundant vegetation and wetlands

The overall diatom species composition in the restored reach did not considerably change by December 2015 compared to pre-restoration, which could be expected considering still relatively high nutrient concentrations in the groundwater and surface water.

Diatom diversity increased after restoration based on mean species richness (rarefied down to 400 individuals) in the restored reach. The increase in species richness may be attributed to enhanced habitat complexity that now provides a greater diversity of substrates and flow conditions.

Diatom nutrient metrics indicated that post-restoration assemblages had fewer diatoms associated with high nutrients and more of those indicative of low nutrients.

It is unrealistic to expect the biota to revert to its pre-1700s condition given the existing water quality, but increased diversity and higher proportion of oligotraphenic species is a benefit and positive ecosystem recovery trajectory.



*Eurycea bislineata* (Northern two-lined) and  
*Pseudotriton ruber* (Northern red) larvae



*Lithobates clamitans* (Green frog) tadpole

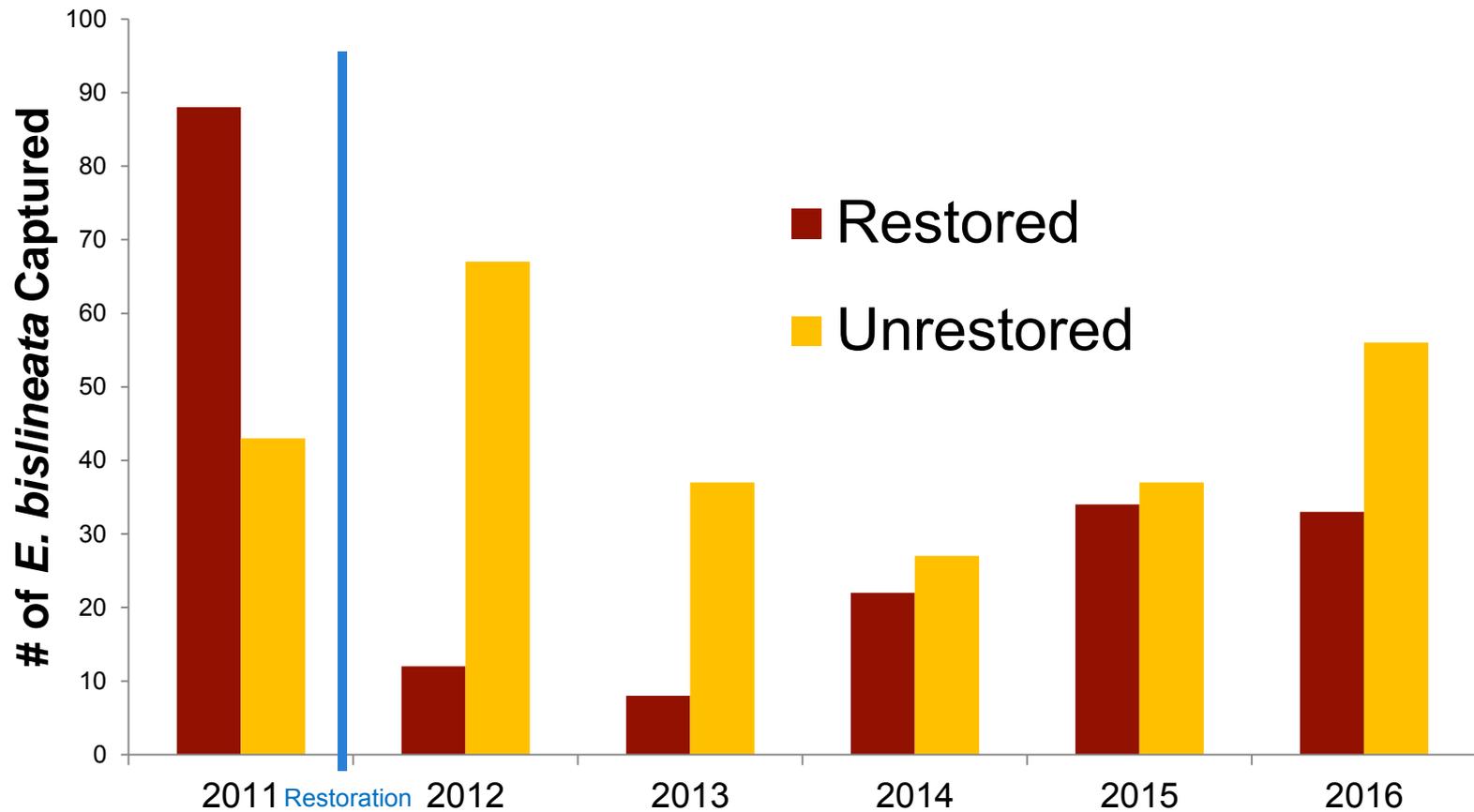


Green frog egg mass



Restored habitat where green frog egg  
mass was found.

## Bowne, D. Elizabethtown College



Capture records of *Eurycea bislineata* (northern two-lined salamanders). The data are the sum of trapping efforts with litter bags, kick nets, and dip nets. Capture effort was equal for each branch.

# Amphibian Results Summary

Prior to restoration, the amphibian community at Big Spring Run consisted of only *E. bislineata* and *P. ruber*.

Our finding that captures increased in the unrestored branch of Big Spring Run after the restoration suggested this branch served as refugia for *E. bislineata*.

In the years following the wetland restoration, *E. bislineata* has consistently increased in the restored stretches while its captures in the unrestored stretches have fluctuated.

While *L. clamitans* is a nationally common frog species, it was found residing and breeding at Big Spring Run after restoration and despite the surrounding agricultural landuses.

August 2012 – 11 months after construction



# PA Fish & Boat Commission Fish Survey



**August 2012**

“SRBC Water Tour 2017” excerpts



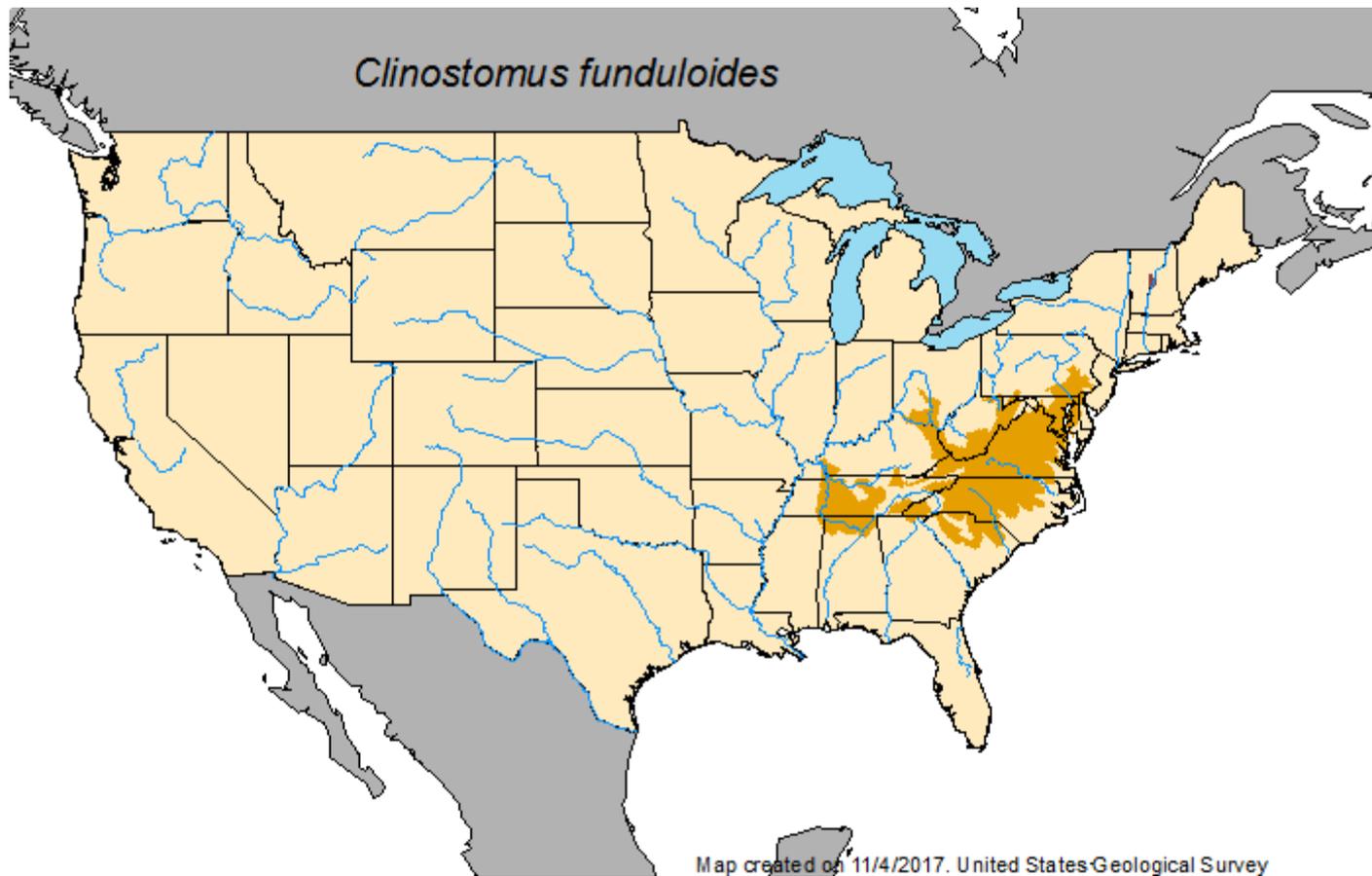
<https://www.youtube.com/watch?v=nnxhs3aTTJs>

Courtesy Susquehanna River Basin Commission, 2017

## September 2015 Fish Survey



rosyside dace (*Clinostomus funduloides*)



■ Native Range

<https://nas.er.usgs.gov/queries/FactSheet.aspx?speciesID=511>

# Fish Results Summary

Prior to restoration, the fish community was typical of warm water fishes in high nutrient streams and dominated by black nose dace and white suckers and these species continue to dominate after restoration.

Habitat characteristics improved with at least of a doubling of stream length and an increased variety of geomorphic features.

Rosyside dace (*Clinostomus funduloides*) was captured within the restored reach in 2015. This species prefers headwater streams typical of cold water fishes and is an indication of improved water quality in the restored reach. It also prefers gravelly riffles for spawning and typically inhabits rocky streams.

# Vascular plant surveying repeated at fixed locations along transects

W. Hilgartner, J. Hartranft, S. Chamberlain

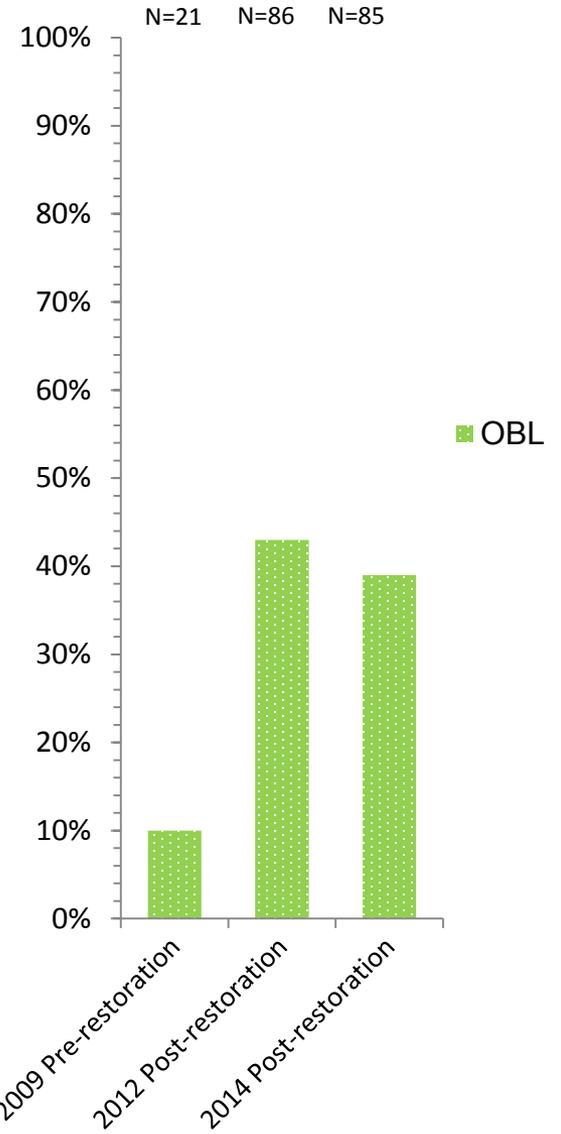
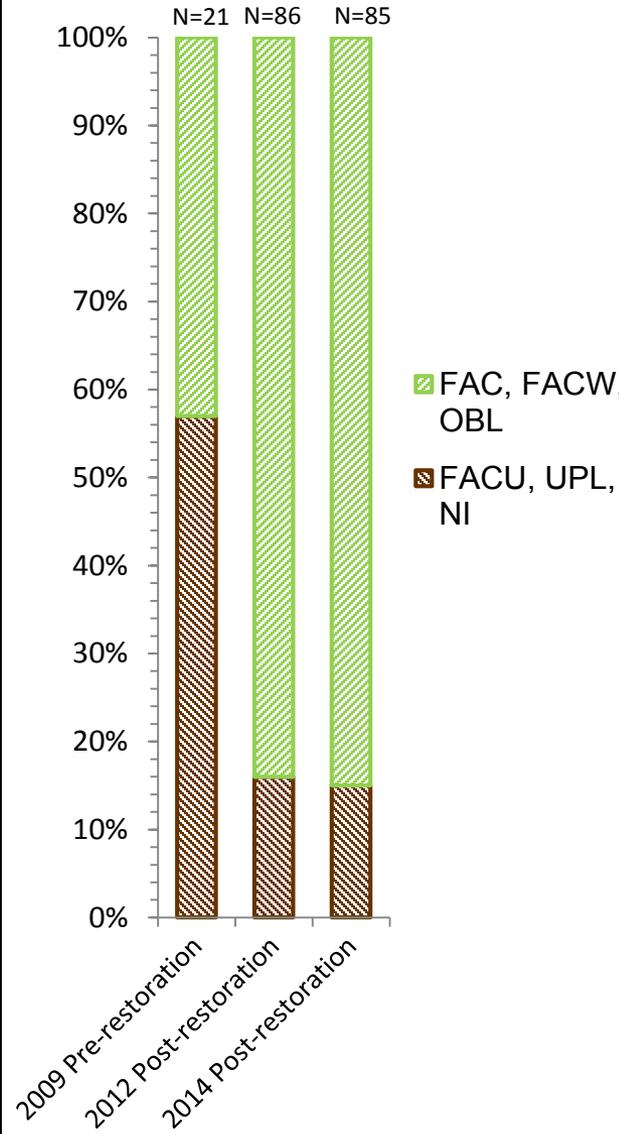
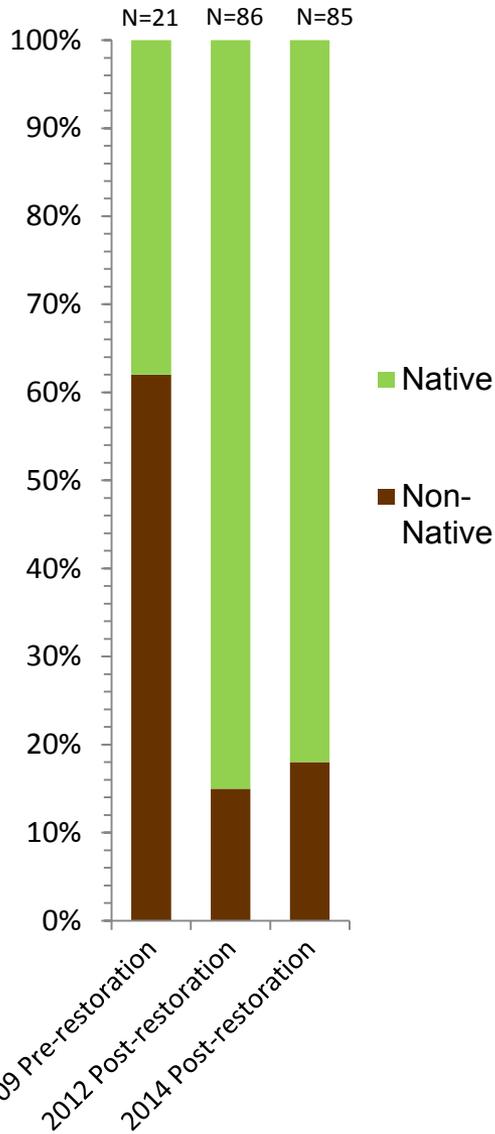




1 meter<sup>2</sup> plots at 5 meter intervals repeated along transects



# Vascular Plant Species Richness



# Notable vascular plant colonizers

*Juncus torreyi*  
Torrey's rush  
**PA State Threatened**  
Facultative



*Carex amphibola*  
narrowleaf sedge  
Facultative



# Notable vascular plant colonizers

*Carex granularis*  
limestone meadow sedge  
Facultative Wetland



*Eleocharis palustris*  
spikerush  
Obligate



# Vascular Plant Results Summary

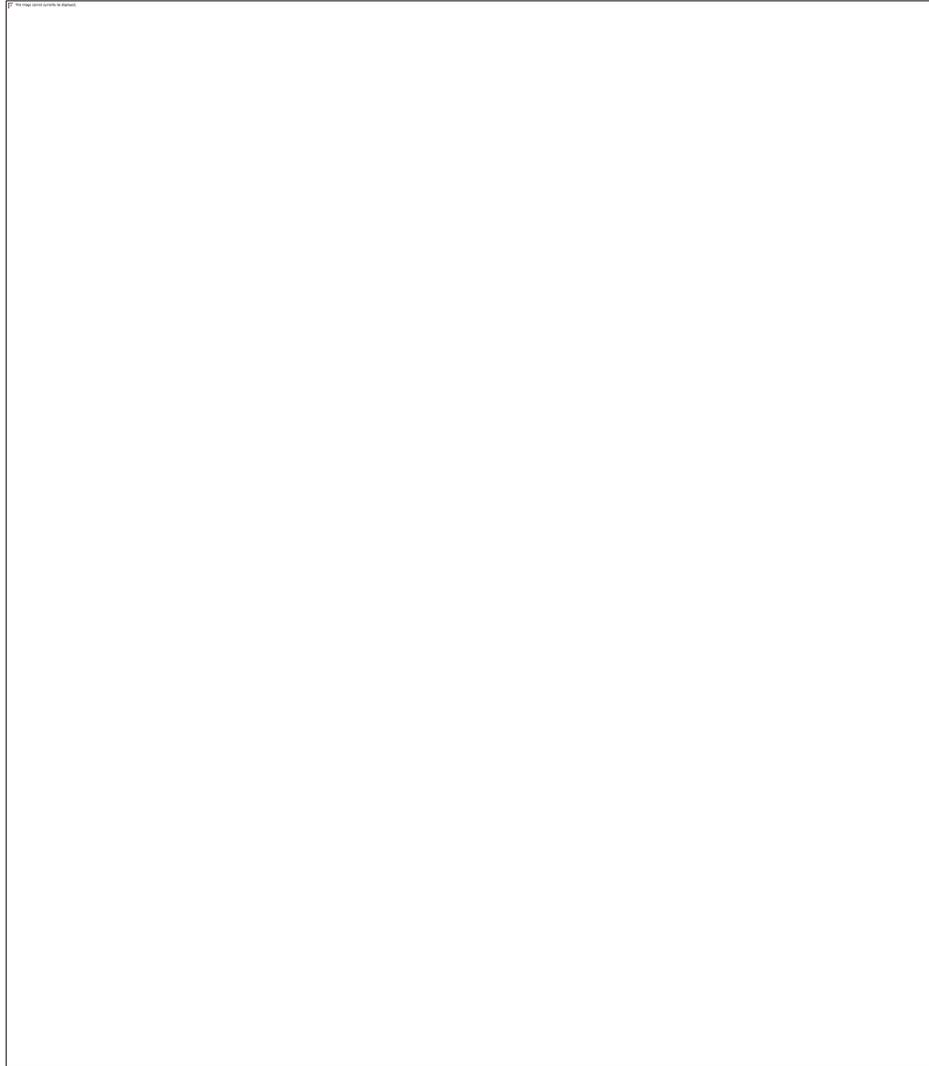
Analysis of vegetation transects before and after restoration reveals a major plant community change in the years following restoration. The plant community shifted from a dry, upland pasture to a hydric, wet meadow that has been sustained for consecutive years.

A species-rich wet meadow plant community with increasing importance of hydrophytes, including scattered flowering composites and sedge dominated patches, provides diverse wetland habitat that is comparable to the sedge dominated paleo plant community.

The dominant plant community is representative of the seed mix and live plant installations, but also includes some invasive native and non-native plants like cattail (*Typha latifolia*) and reed canary grass (*Phalaris arundinaceae*)

Hydrophytes are beginning to colonize the restoration area, including the PA Threatened Torrey's sedge (*Juncus torreyi*).

# November 2012 – 1 year after construction



# November 2012 – 1 year after construction



Depth from surface(inches)	Matrix	Mottles	Texture
0-6	2.5Y 4/2	Faint & Few 7.5YR 4/6	loam
6-11	2.5Y 3/1	Distinct & many 2.5YR 4/8 7.5YR 4/6	loam
11-16	2.5YR 3/1	Distinct & many 2.5YR 3/6	loam
16-18	Basal gravels		
18	Bedrock		

August 2014 – ~ 3 years after construction



August 2014 – ~ 3 years after construction



# August 2012 – 11 months after construction



April 2014 – ~ 2.5 years after construction



April 2014 – ~ 2.5 years after construction



# Big Spring Run, Lancaster County PA



Courtesy Telemonitor, Inc.

September 18, 2012 @ 3:30 PM

Post-Restoration

# Big Spring Run, Lancaster County PA



Courtesy Telemonitor, Inc.

September 18, 2012 @ 4:00 PM

Post-Restoration

# Big Spring Run, Lancaster County PA



Courtesy Telemonitor, Inc.

September 18, 2012 @ 4:30 PM

Post-Restoration

# Big Spring Run, Lancaster County PA



Courtesy Telemonitor, Inc.

September 18, 2012 @ 4:35 PM

Post-Restoration

# Big Spring Run, Lancaster County PA



Courtesy Telemonitor, Inc.

September 18, 2012 @ 4:45 PM

Post-Restoration

# Big Spring Run, Lancaster County PA



Courtesy Telemonitor, Inc.

September 18, 2012 @ 5:00 PM

Post-Restoration

# Big Spring Run, Lancaster County PA



Courtesy Telemonitor, Inc.

September 18, 2012 @ 7:15 PM

Post-Restoration

# Big Spring Run, Lancaster County PA



Courtesy Telemonitor, Inc.

September 18, 2012 @ 8:30 PM

Post-Restoration

# Big Spring Run, Lancaster County PA



Courtesy Telemonitor, Inc.

**September 20, 2012 @ 10:00 AM**

**Post-Restoration**

Jeffrey L. Hartranft

717-772-5320

[jhartranft@pa.gov](mailto:jhartranft@pa.gov)