What Does Successful EWN in the Great Lakes Look Like?

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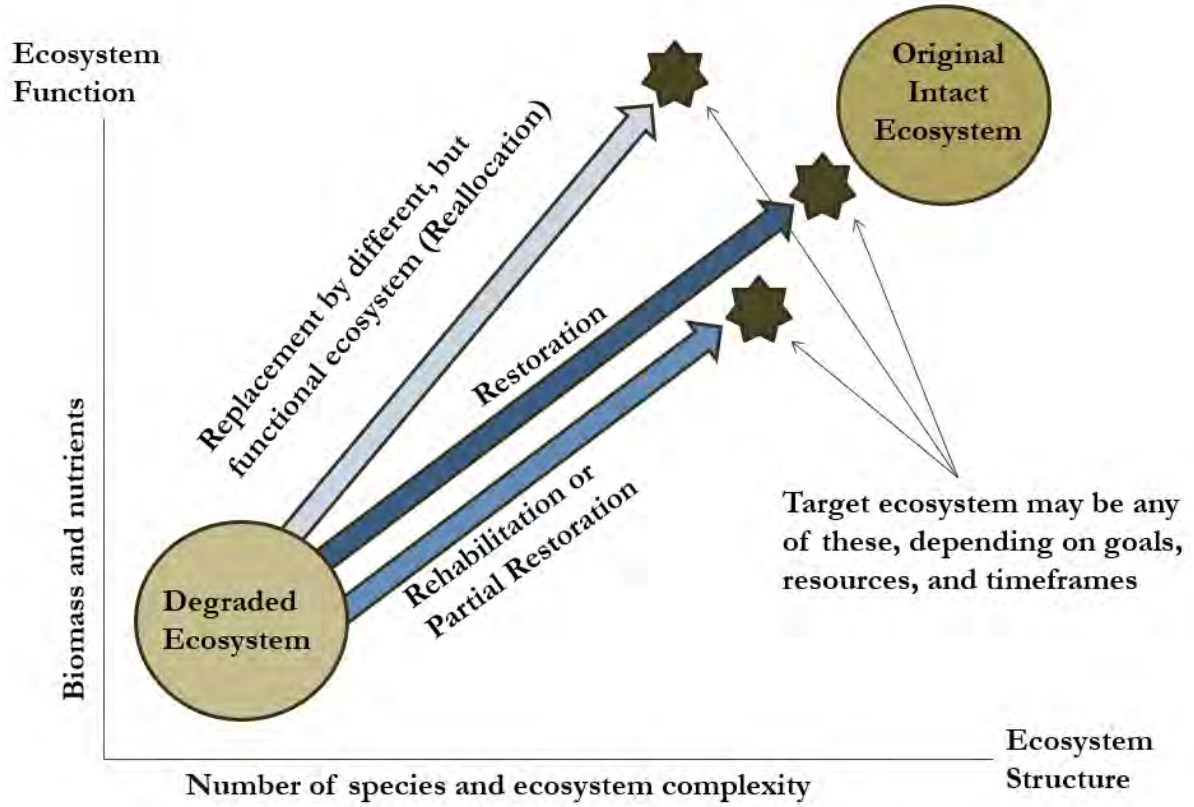
What Does EWN Mean to Me?

- Uses nature-based solutions to solve societal problems while adding ecological benefit
  - Erosion
  - Flooding
  - Water quality
  - Carbon sequestration
- Requires the integration of ecological and engineering principles
- Needs to address physical ,chemical, biological, and anthropogenic factors
- Often hybridizes traditional solutions with ecologically based techniques

How do we define success?

- Solves the problem it was intended to solve
- Restoration of ecological form
- Repair of damaged ecological function/processes
- System is self sustaining over a range of conditions
- Effort reaches a predefined goal



From Forestrynepal.org

What is a *resilient* natural shoreline?

- Has physical and biological characteristics that create stability under a variety of climate-driven conditions
- This includes both low and high water conditions
- Maintains a stable form and function (this does not mean *unchanging*)
- Nature provides a template for understanding how to restore shorelines
- Dynamic stability

Shorelines and Resiliency—Form vs. Processes

- Form based solutions
  - Traditional engineered solutions
  - Typically designed around static or set conditions
  - Focus on static stability-not dynamic stability
- Process based solutions
  - Understands that shorelines are naturally transient and dynamic systems
  - Allow for movement of sediments and vegetation
  - Create conditions that can naturally adapt with less intervention over time
  - “Living” systems

Challenges to EWN

- Complexity
- Acceptance by traditional practitioners/regulators/public
- Physical constraints from existing infrastructure
- Lack of control over outside influences (upstream watershed effects, water level fluctuations, etc)
- Lack of adequate quantified research to inform decisions
- Permitting
- Funding for monitoring and maintenance
- Lack of measurable goals

Site Parameter Category	Site Parameter	Input
Site Location	Where is the site located?	Lake Ontario
Site Conditions	Shoreline/Bank Composition	Clay/Till
	Infrastructure Setback (feet)	None present
	Infrastructure Elevation (feet)	5'-10'
	Design Wave Height (feet)	4
	Water Level at the Time of Installation	Average
	Ice Duration/Frequency	Rare
	Shoreline Length (feet)	50
	Project Area Slope (degrees)	20
	Shoreline width (feet)	5
	Bank height (feet)	5
	Coastal Structure Presence	Shore Parallel
Ecological Features	Existing Wetlands	Present
	Significant Natural Communities	Not present
	Rare Plants/ Animals	Not present
Regulatory Considerations	OHWM	Yes
	Coastal Erosion Hazard Area	Other waterbody
	Bed or Bank Disturbance	Yes
	Federal Funding	No

Commonalities Among Successful Projects

- Balances human use with structural and ecological function
- Focus on ecosystem processes as well as form
- Adequate time for planning and implementation
- Broad stakeholder groups
- Quantified data informs design and success
- Site conditions are appropriate for the intended project
- Maintenance, monitoring, adaptive management

Commonalities Among Less Than Successful Projects

- Physical constraints from existing infrastructure
- Lack of control over outside influences (upstream watershed effects, water level fluctuations, etc)
- Poor design/poor execution
- Lack of adequate quantified research to inform decisions
- Overly weighted toward either structural or ecological principles
- Unpredictability of natural systems
- No monitoring and maintenance

Gaps and Needs

- Need reference conditions to establish project goals (otherwise, how do we know if we succeeded or not?)
  - Physical
  - Biological
  - Ecosystem processes
- Research to inform design
  - Repeat trials in different conditions
  - Quantified metrics to avoid “guesswork”
  - Lack of data can lead to overly conservative designs
- General awareness and education
- We measure success by “form” because it’s easy to measure, but we should also measure function/processes

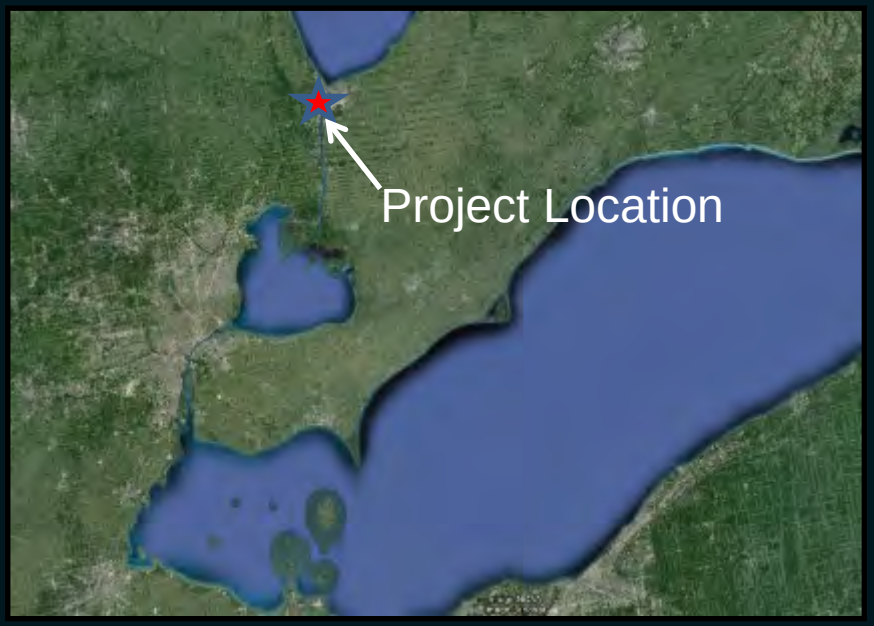
Photo: Denny Albert, OSU

Monitoring Restoration at the Muskegon Lake AOC

- In 2019, we monitored shorelines along Muskegon Lake that have been restored since 2008, including ~25,000 lf and 20 different projects that had used different techniques
- Sites have seen both high and low water periods
- Some commonalities among successful sites
  - Shrubs
  - Gentle slopes
  - Maintenance

Marysville Shoreline Restoration

- St. Clair River
- Dual-purpose shoreline restoration/public use project
- Ice push from multiple directions
- Constructed in 2012
- 2000’ of shoreline restoration including 1900’ of seawall removal
- $1.6 million construction cost ($800/l.f.)




Source: City of Marysville.

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Kasperek Property Bluff Stabilization

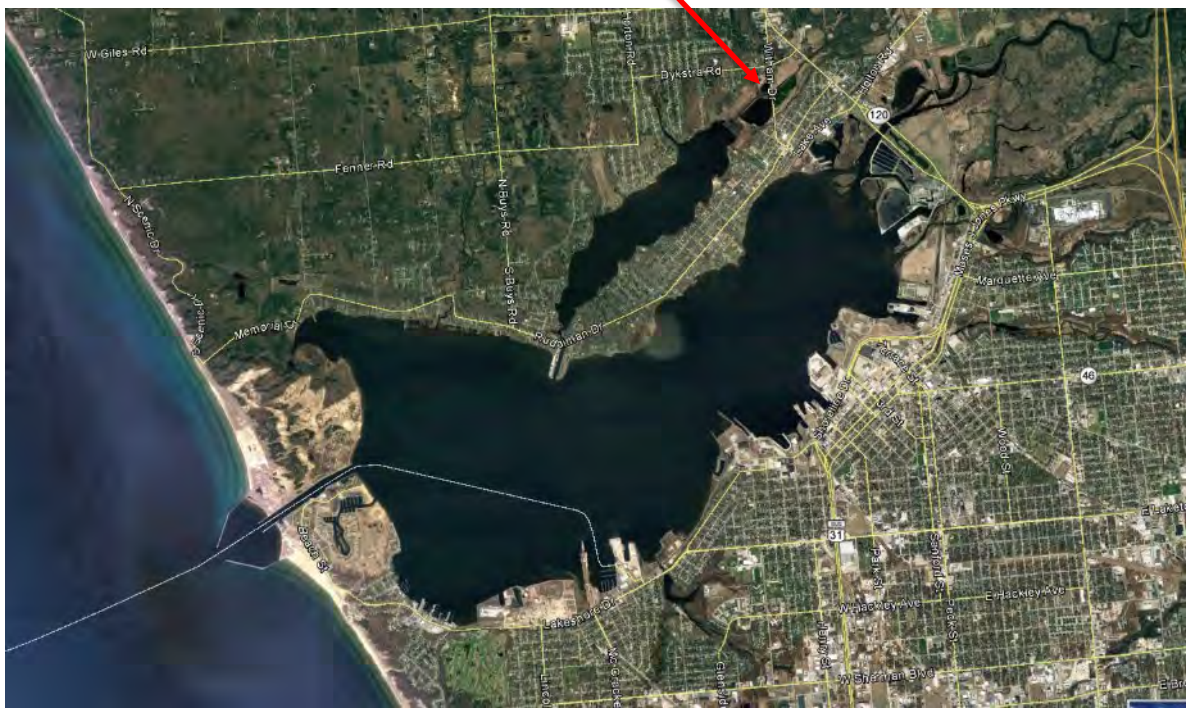
- Private residence
- Bluff destabilized from stair construction and groundwater flows
- Limited access to bluff
- Constructed in 2007
- $95,000 construction cost

Source: deBest, Inc.

Bear Lake Hydrologic Reconnection

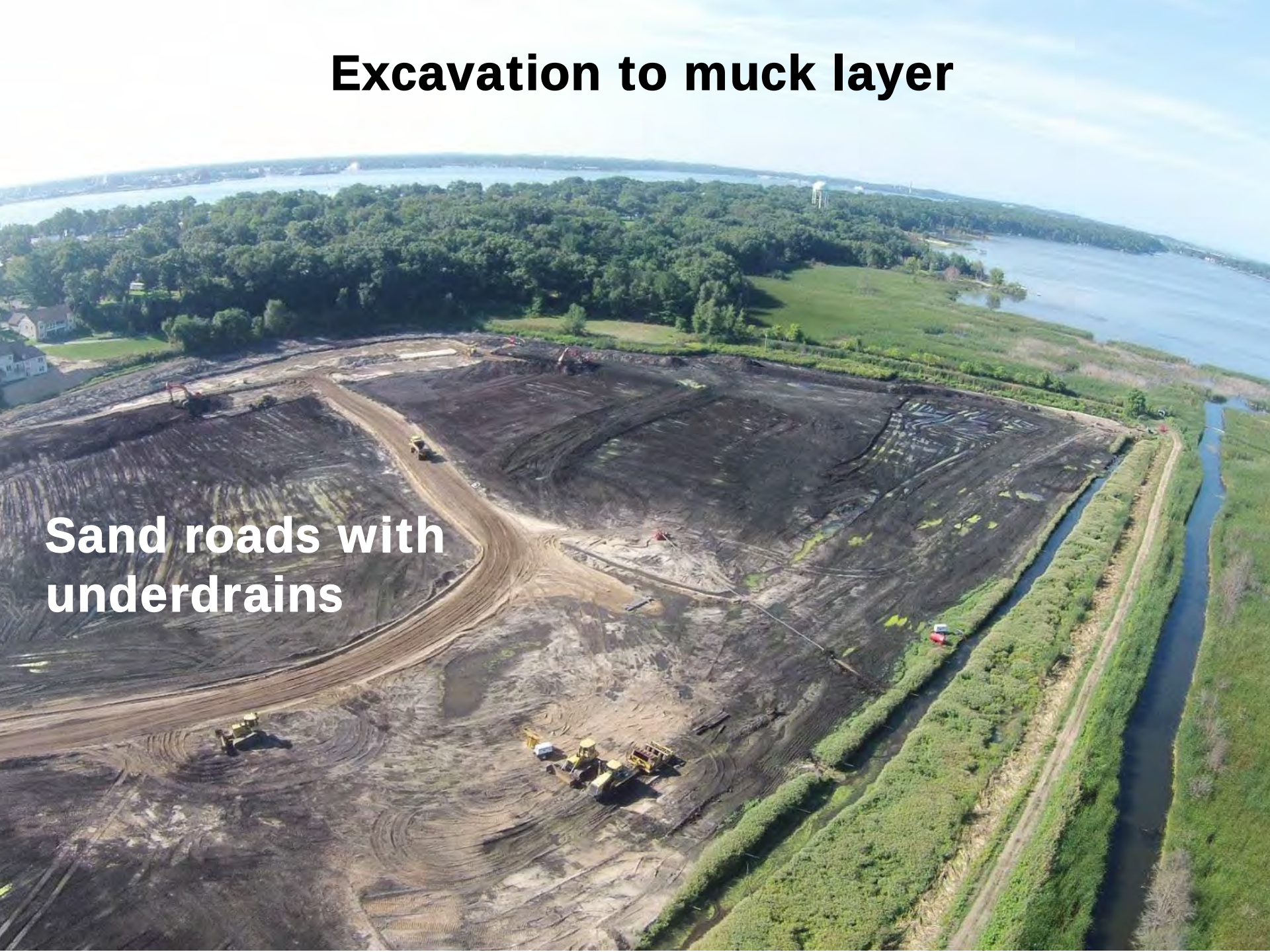
- Wetland restoration through reconnection of 36 acres of former celery farm to Bear Creek, Bear Lake, and Lake Michigan
- Property owned by Muskegon County
- Wetland restoration/water quality goals

Project Location



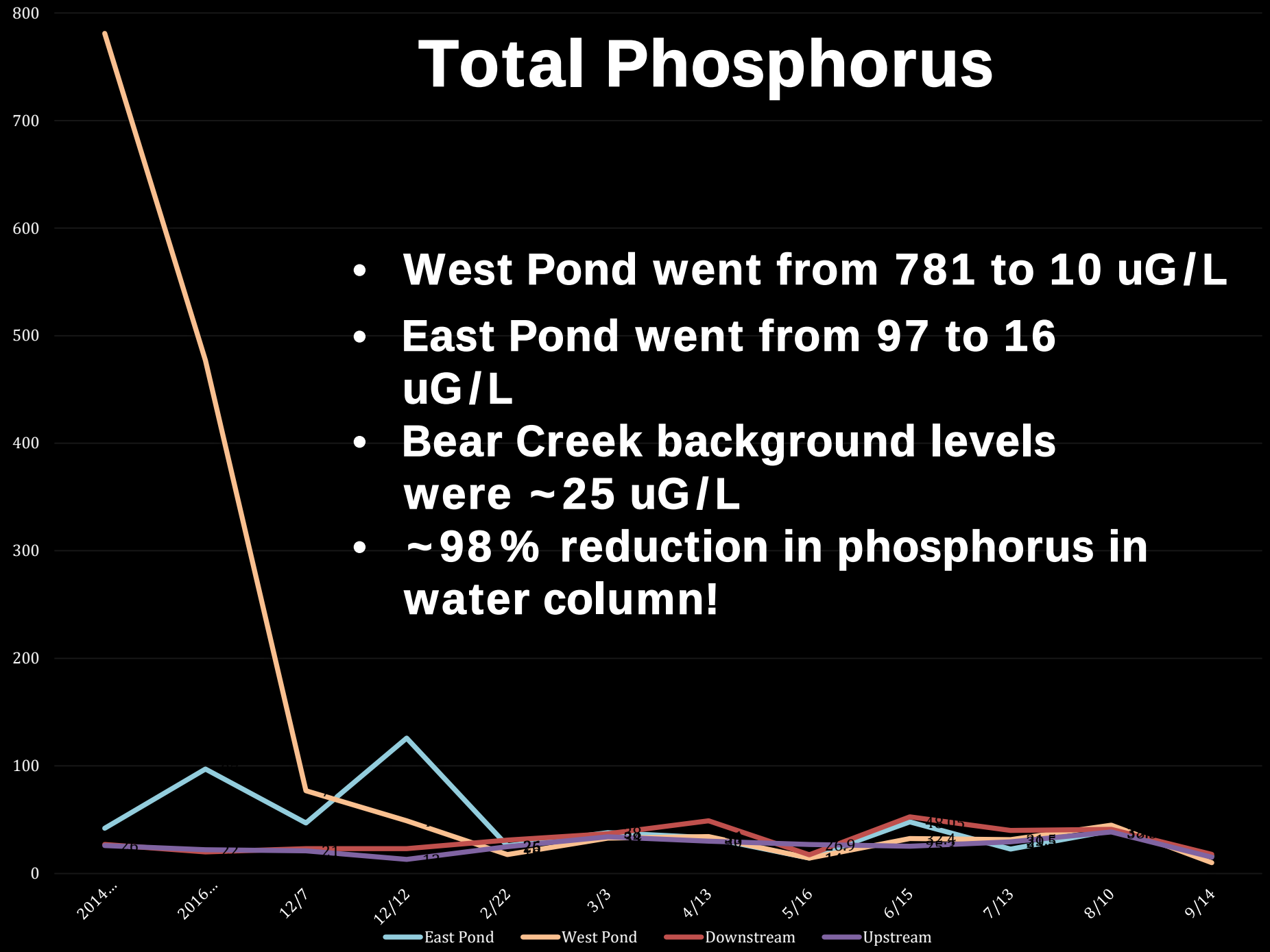

Muskegon Lake
Lake Michigan
Bear Lake
West Pond
Bear Creek
Witham Road
East Pond

Excavation to muck layer




3/28/2017

Total Phosphorus



- West Pond went from 781 to 10 uG/L
- East Pond went from 97 to 16 uG/L
- Bear Creek background levels were ~25 uG/L
- ~98% reduction in phosphorus in water column!

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