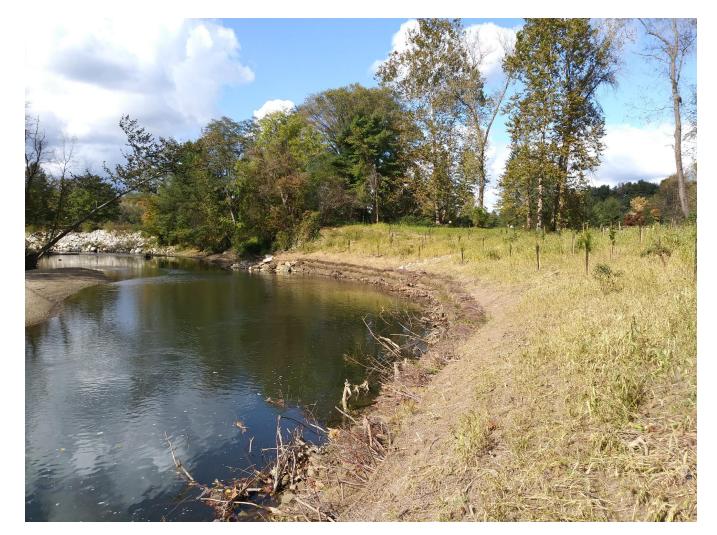


## Engineered Log Complexes: It's the wood that makes it good.



Suzanne Hoehne, Biohabitats Josh Myers, CRWP Ohio Stormwater Conference May 8-10, 2019



# Engineered Log Complexes

- Goals and Objectives
- Design
- Construction
- Project Example Chagrin River Village of Hunting Valley, OH







### Goals and Objectives: Traditional





#### **Stream Bank Stabilization**

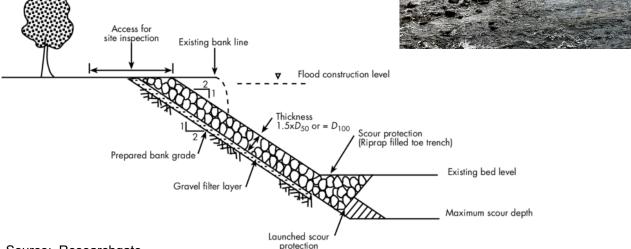
Streams naturally meander or cut back and forth. Eroding stream banks are a major source of sediment in streams. Stream bank erosion is often accelerated due to a lack of deep roots from vegetation, which holds the soil together, and by stormwater inputs. Stream bank stabilization traditionally consists of grading the slope to 2 feet horizontal to 1 foot vertical and then armoring the bank with riprap (various sized rocks). This process typically reduces streambank erosion and sedimentation into streams, but generally reduces habitat for terrestrial and aquatic life, increases water temperatures and accelerates streambank erosion on the downstream opposite bank.



# Traditional Streambank Stabilization Projects

- Bank stability
- Erosion prevention
- Public safety
- Low maintenance





# Natural Systems Streambank Stabilization Projects

- Bank stability
- Erosion prevention
- Public safety
- Low maintenance
- Regenerative
- Revegetation
- Habitat enhancement
- Landscape form & function
- Support natural processes
- Lower cost



# The Importance of Wood in Rivers

- Hydraulic influence
- Channel grade control
- Water, sediment & flotsam retention
- Side channel formation
- Increased floodplain roughness
- Biological structure & ecosystem
   productivity
- Channel and floodplain physical complexity
- Revegetation
- Increased hyporheic exchange
- Aquatic habitat
- Improved water quality





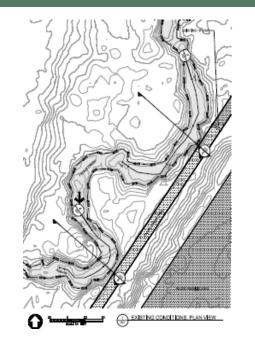




# Large Woody Debris in Restoration

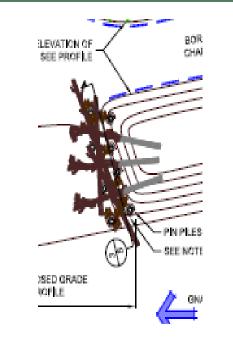
- Log sills
- Log vanes
- Woody debris deflectors
- Standing snags
- Instream wood structures (BDA's)
- Tip ups
- Basking logs
- Brush bundles
- Toe wood
  - Engineered Log
     Complexes

## Design



# Assessment

- Setting
- Hydrology & hydraulics
- Geomorphology
- Invasive species
- Available materials



# Design

- Materials
  - Structure stability
    - Buoyancy & ballasting
- Revegetation
- Risk considerations
- Permitting





# Constructability

- Timing
- Temporary E&S
- Sequencing
- Oversight

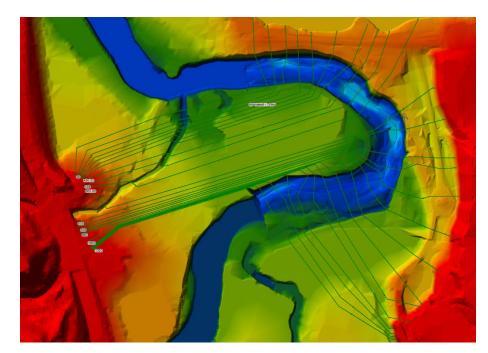
## Design



# Hydrology & Hydraulic Analysis

- Geomorphic Assessment
  - Watershed & reach scale
  - Sediment transport
  - Habitat features riffle/pool sequences
  - Bank stability soils
  - Historic indicators
- Discharge modeling
  - HEC-RAS
  - Scour predictions
  - Climate change impacts

- Topography
  - Lidar
  - GPS/Total station
  - Channel profiles and cross sections
  - Existing and downed trees
  - Site constraints/existing infrastructure

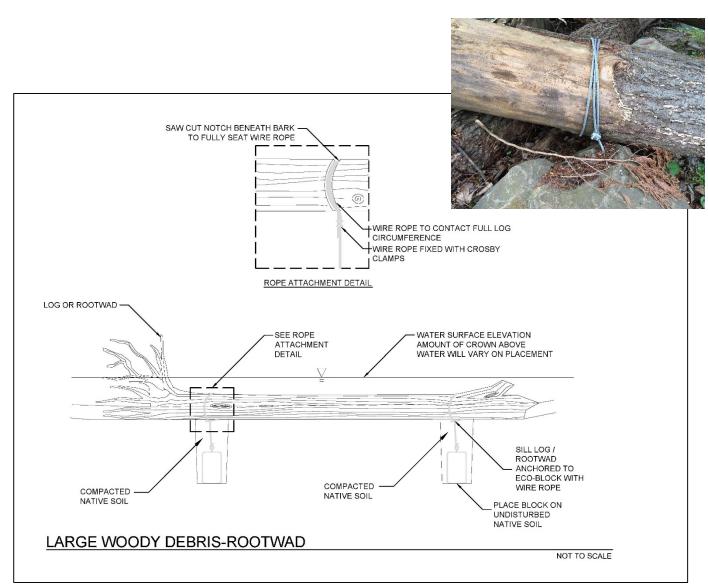


## Design



# Materials Engineering

- Materials selection
  - Size, shape, decay rates
  - Local availability
  - Drag, buoyancy
- Calculations
  - Displacement (submerged volume) of wood
  - Buried surface area of wood and skin friction
  - Surcharge (gravitational load acting on wood)



### Construction



# Timing

- Mussel survey
- Stream closures (salmonid streams)
- Bat tree clearing window
- Summer
- Weather
- Preparation stockpiling

# Temporary Erosion & Sediment Control

- Silt fence
- Straw wattles
- Turbidity curtain



### Construction







# Diversion/Dewatering

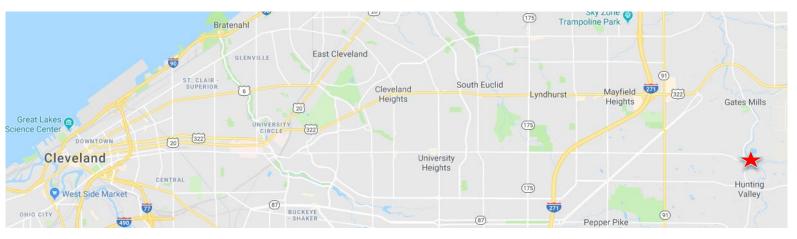
- Gravity flow
- Pumps
- Side channels
- Fish salvage

# Sequencing

- Confine disturbance
- Finish as you go
- Get out of the stream as fast as possible
   Oversight
- Know when to be present
- Communication with operators & designers



## Marcourt Farms River Restoration



Design Build Project

- Ohio EPA Sect. 319 Funding w/private contributions
- Meadville Land Service Prime
- RFP released in Jan. 2018
- \$385k budget (~\$90k for design)
- Mussel survey May 2018
- Construction July-August 2018

### **Project Partners**

- Village of Hunting Valley
- Chagrin River
   Watershed Partners
- Western Reserve Land
   Conservancy
- Private home owners





CRWP provides technical assistance to landowners.

- Provided site visit to landowners at project site in 2013
  - Erosion present but not severe
  - Recommended live stakes, grading to 3:1 slope, revegetating slope, adding stone toe, and constructing bendway weirs



### How The Project Came To Be

- Revisited site July 30, 2015
  - Bank downstream rapidly eroding, threatening road and bridge and impacting water quality
  - Landowners required immediate action on downstream section – riprapped slope
  - Erosion at project site increased from 2013 to 2015



Downstream 7/30/2015



### How The Project Came To Be



Village of Hunting Valley passed emergency ordinance on August 11, 2015 authorizing the Mayor and Village staff to submit an Ohio EPA Section 319(h) application on behalf of landowners

#### Sava Porze August 27, 2015, The Times A5 Group seeks \$243,000 from state to stabilize Chagrin River bank

#### **By RYAN DENTSCHEFF**

HUNTING VALLEY - Council has agreed to serve as a grant sponsor on behalf of a omeowners association seeking about \$243,000 in funding from the Ohio Envionmental Protection Agency that will help pay for a bank stabilization and restoration roject along the Chagrin River.

Significant erosion is occurring at a bend n the river near Courtney Trail in the vilage. Kristen Buccier, project manager with the Chagrin River Watershed Partners, Inc., has been working with the village and the association to draft the application and deelop the conceptual plan. She said the river akes a severe turn that has caused a 15-foot vertical drop and is "actively eroding.

"You're getting the sediment and the nutrients associated with that going into the river. which is minimizing the water quality of the river and downstream areas." she said.

The bank is about 100 feet from Courtney Trail, she said.

The erosion is putting the road infrastruc- rise. Besides the weirs and the regrading, a the river, hurting aquatic and terrestrial spe-

Under the Clean Water Act, the EPA can award grants for water quality improvement projects that meet a certain criteria. Because the land is on private property,

Visconsi Jr., the village will apply for the ners completed a similar project on the Chagrant, which covers 60 percent of the cost. The village would receive the remaining 40 percent from the Marcourt Farm Homeowners Association, which includes five property owners.

cies, she said.

The solution calls for installing bendway weirs - which are rock structures a few feet a more stable slope.

Six weirs would be installed separately along about 500 feet of stream bank. Instead against the bank "Ms Buccier said

The current vertical bank, she said, would

ture at risk and degrading water quality in one-acre vegetation buffer would be estab- to stabilize that bank." lished, which would include native plants and trees to further stabilize the area. The project's total cost, Ms. Buccier said,

would be \$405,500, with the grant covering \$243,300 and the homeowners association picking up the remaining \$162,200. owned by Courtney Trail resident Dominic Earlier this summer, the watershed part-

> grin River in Willoughby If the state does not fund the project, the homeowners association will have to reas-

sess the situation and decide whether they would be able to do the project without the grant, Ms. Buccier said,

"That's something we really haven't diswide that are anchored into the bank and ex- cussed yet, but I know it's on their radar that tend into the river — and grading the bank to if this grant doesn't go through, they have to do something," she said.

The association is also in the midst of a project to alleviate an erosion problem closer of the current crashing into the bank at the to Burton Trail. Village Building Inspector river's bend, the main channel gets redirect- Don Cunningham, who has been an active ed by the structures to the middle of the river part in both projects, said the sharp curve minimizing the force of the water going up near the Burton Trail bridge is even more of a concern than the problems near Courtney.

"It is so severe," he said, "the association be restructured to a 3-1 slope, which extends has elected not to try to go for any grant three feet from the river for every one foot in money on that portion of it because they

have to act this year on their own to be able The erosion is not only threatening the

roadway, but there is also a nearby water line that could be damaged. Grant applications were due Aug. 14, but

the Ohio EPA won't decide which projects to fund until next spring. According to the Ohio EPA website, approximately \$2.2 million in funding will be available in 2016. Ms. Buccier said she believes the Courtney Trail weirs project has a good chance of receiving funding.

"It definitely fits in the categories," she said. "The thing that I find special with this grant application is that it's showcasing a publicprivate partnership between the village and the association. So I think that makes this project unique and may set it apart from others."



### How The Project Came To Be

- March 4, 2016: Village notified of grant award
- July 1, 2016: Grant start date
- January 4, 2018: RFP released
- What happened from July 2016 to January 2018?
  - Landowner contracts
  - Protection/Maintenance
  - Legal review of documents
- February 14, 2018: Project awarded to Meadville Land Service and Biohabitats







	<b>Original Budget</b>	Actual Budget
Design-Build	\$385,500	\$383,654.01
Legal/Engineering	\$10,000	\$25,389.10
Grant/Project Mgt.	\$10,000	\$14,000*
<b>Total Project Cost</b>	\$405,500	\$424,043.11
Total Project Cost Grant Funds	<b>\$405,500</b> \$243,300	<b>\$424,043.11</b> \$243,300
		•



### Education and Outreach









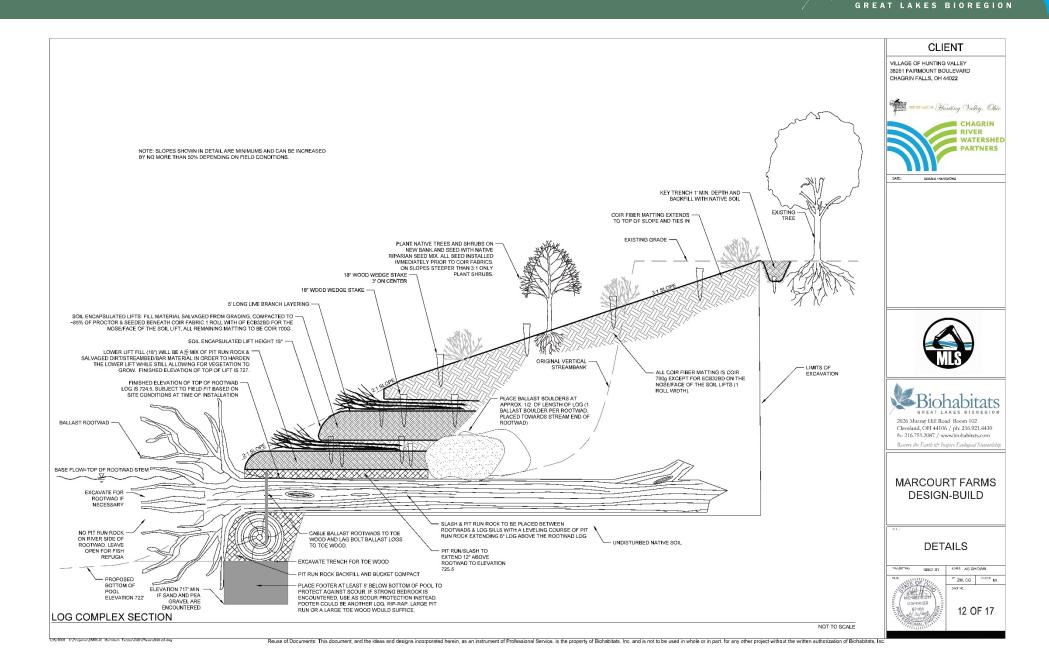
### **RFP** Concept

- Install ~6 bendway weirs
- 500 linear ft. of rock-toe protection
- Regrade banks to stable 3:1 slope
- Plant banks with native woody vegetation
- Vegetate 1 acre of adjacent riparian area with native plants
- "Suggestions that minimize the use of rock while achieving project restoration goals are particularly encouraged."

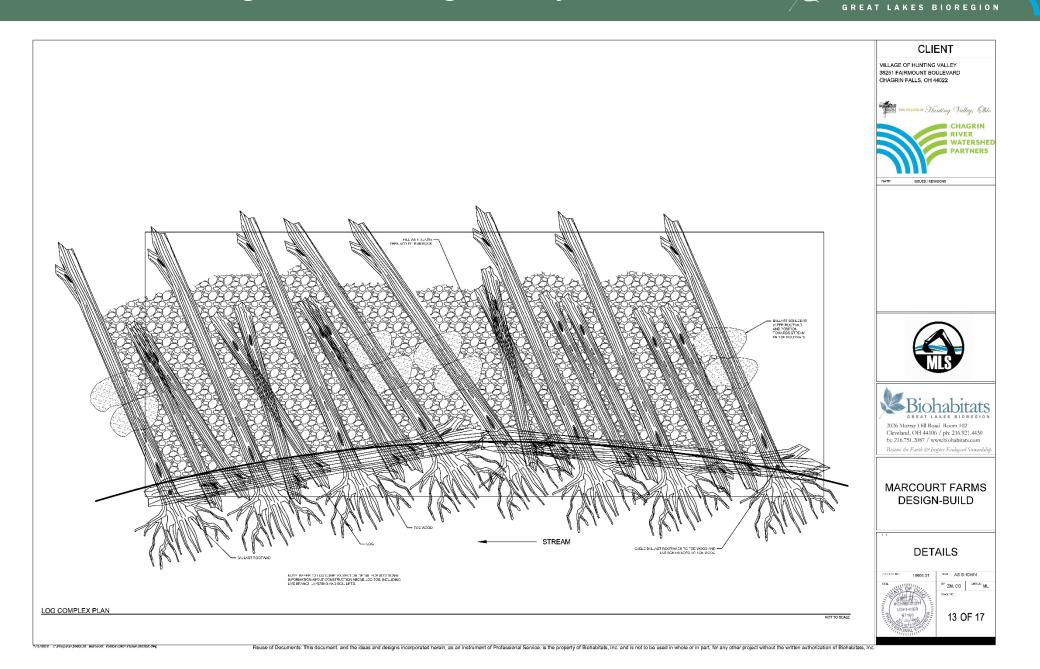


Figure 6. Proposed Project Plan

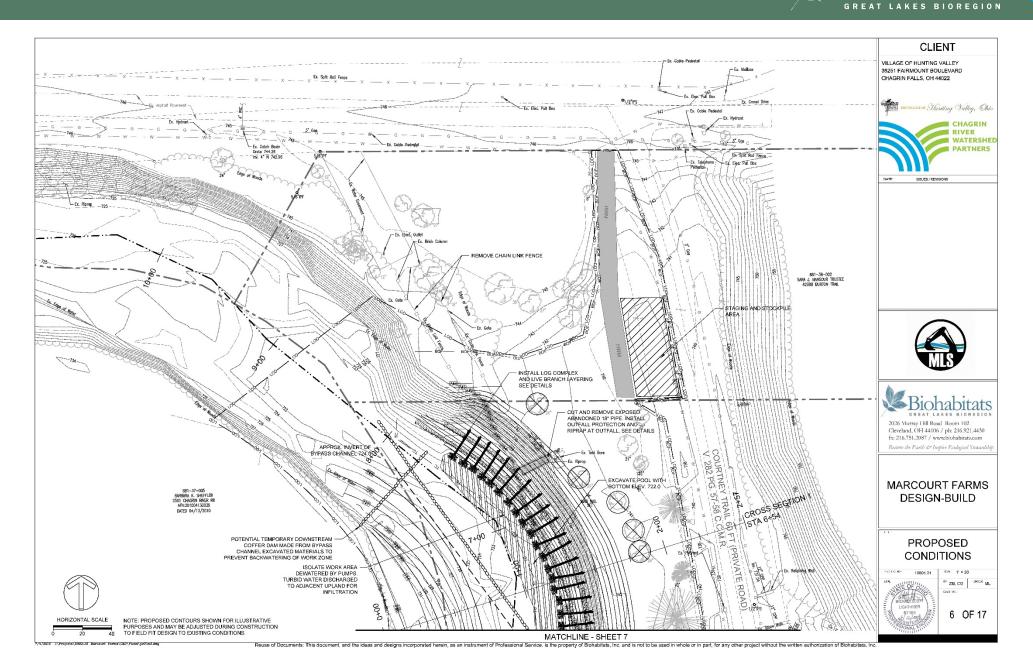
Conceptual Bendway Weir Locations
Proposed Stream Restoration
Proposed Riparian Restoration



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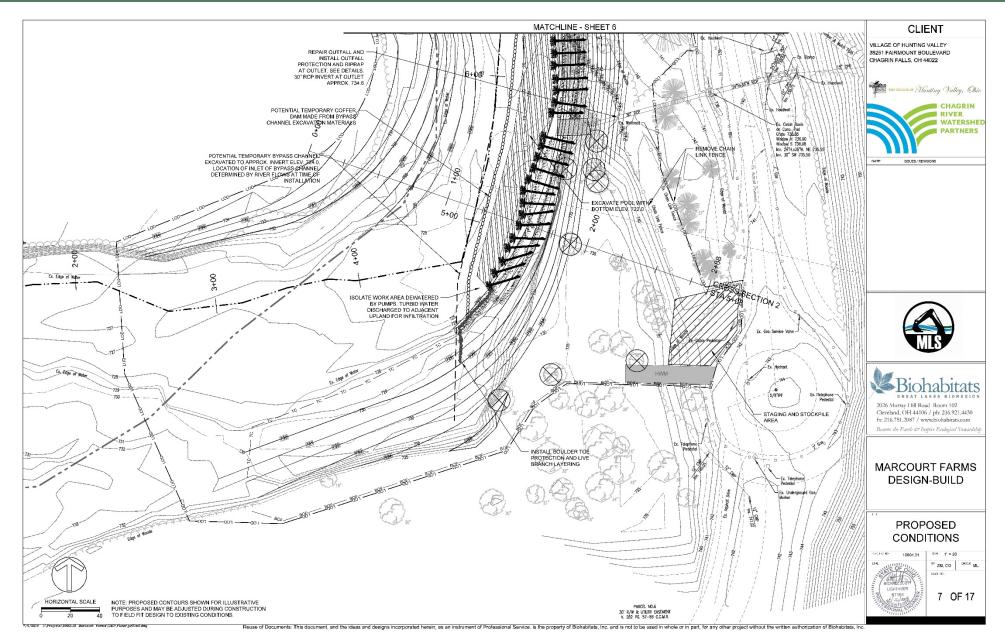


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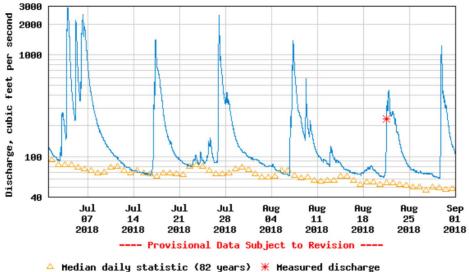


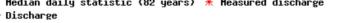






USGS 04209000 Chagrin River at Willoughby OH



































































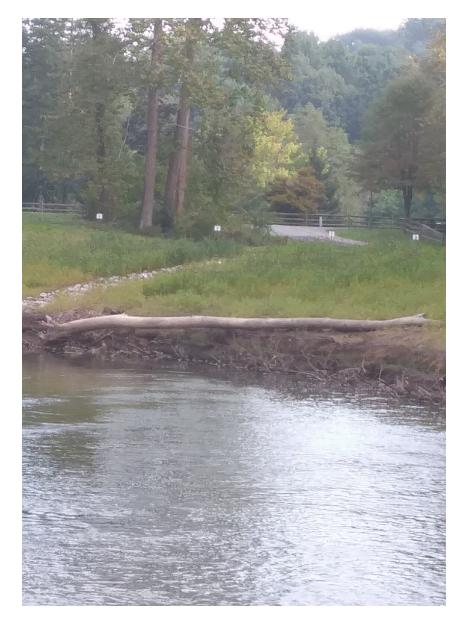




















Lessons Learned

- Talk to your contractor & operator formulate a plan (Benefits of Design Build)
- Get out of the stream as fast as you can
- Install double matting above 2<sup>nd</sup> soil lift for at least one roll width, wedge stake vs. T stake
- Ballast boulders are overkill, reinvest money elsewhere
- Stake shrubs between 2<sup>nd</sup> soil lift and beginning of tree zone
- Additional staking at matting intersections
- Key matting under outfall rock material
- Use mid-slope matting trench
- Maint. of LWD deposition until vegetation becomes established





### **Questions & General Discussion**

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Josh Myers jmyers@crwp.org www.crwp.org (440) 975-3870 x 1007







Western Reserve Land Conservancy

land • people • community



**CHAGRIN** RIVER WATERSHED PARTNERS



THE VILLAGE OF Hunting Valley, Ohio



**CROWLEY'S**