

An Inventory of Calhoun County Road Stream Crossings

{ By: Brooke Mainville and Brett Riser



Introductions

Brett Riser

Brooke Mainville



Calhoun County Road Stream Crossing Inventory 2016

- Awarded a grant through MiCorps

Goals of the Grant

Perform a systematic road stream crossing inventory of targeted subwatersheds within Calhoun County, MI

Gain an understanding of connectivity from a watershed scale

Assess road stream crossings in order to share information with partner organizations

Causes and Effects of Road Stream Crossings

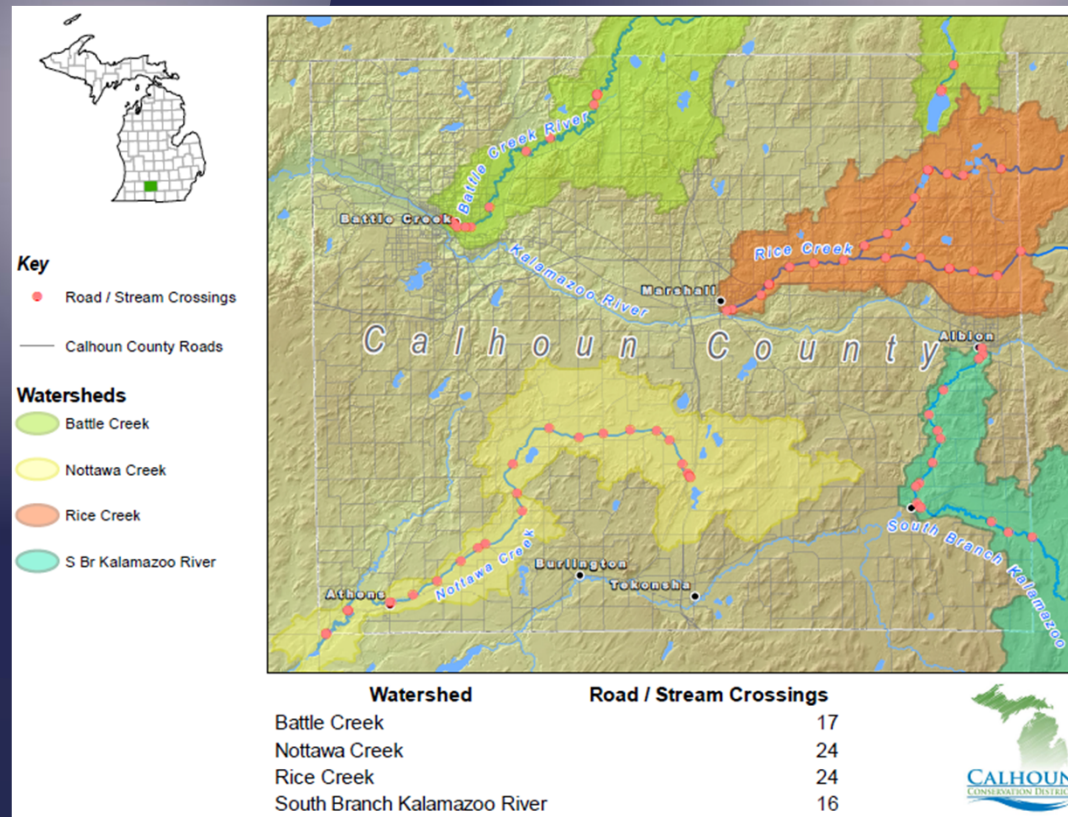
- Agencies responsible for crossings
 - Road commission, drain commission, and MDOT, municipalities
- Misaligned, undersized culverts, or perched culverts
- Road stream crossings act as barriers for ecological processes and stream functions
 - Fish Passage
 - Hydraulics
 - Sediment mobilization

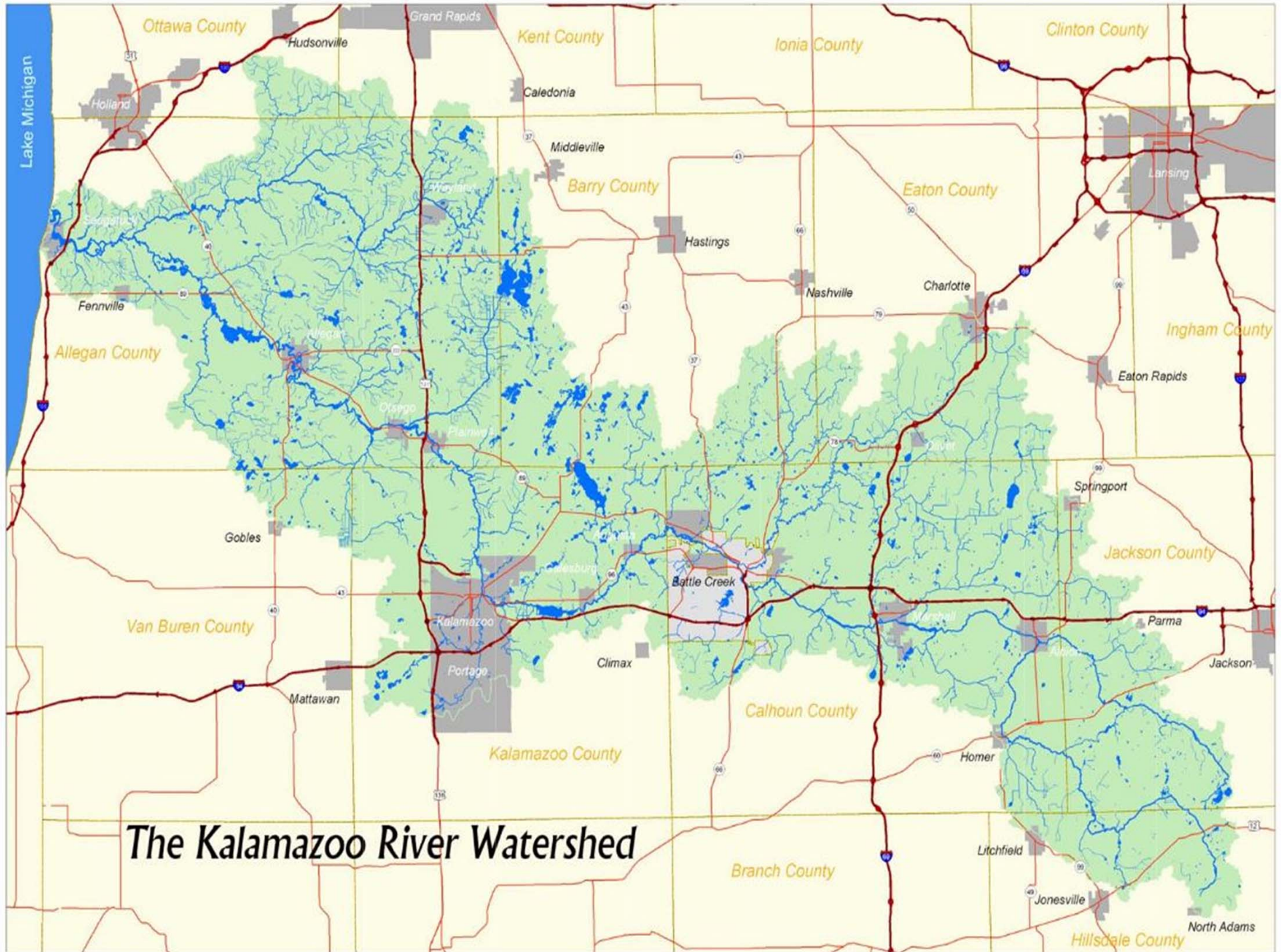
Objective of the Grant

- Reach project goal of 81 road stream crossings throughout four sub watersheds in Calhoun Co
- Expand volunteer base
- Collaborate and share data with other entities
- Prioritize which road stream crossings will need replacement

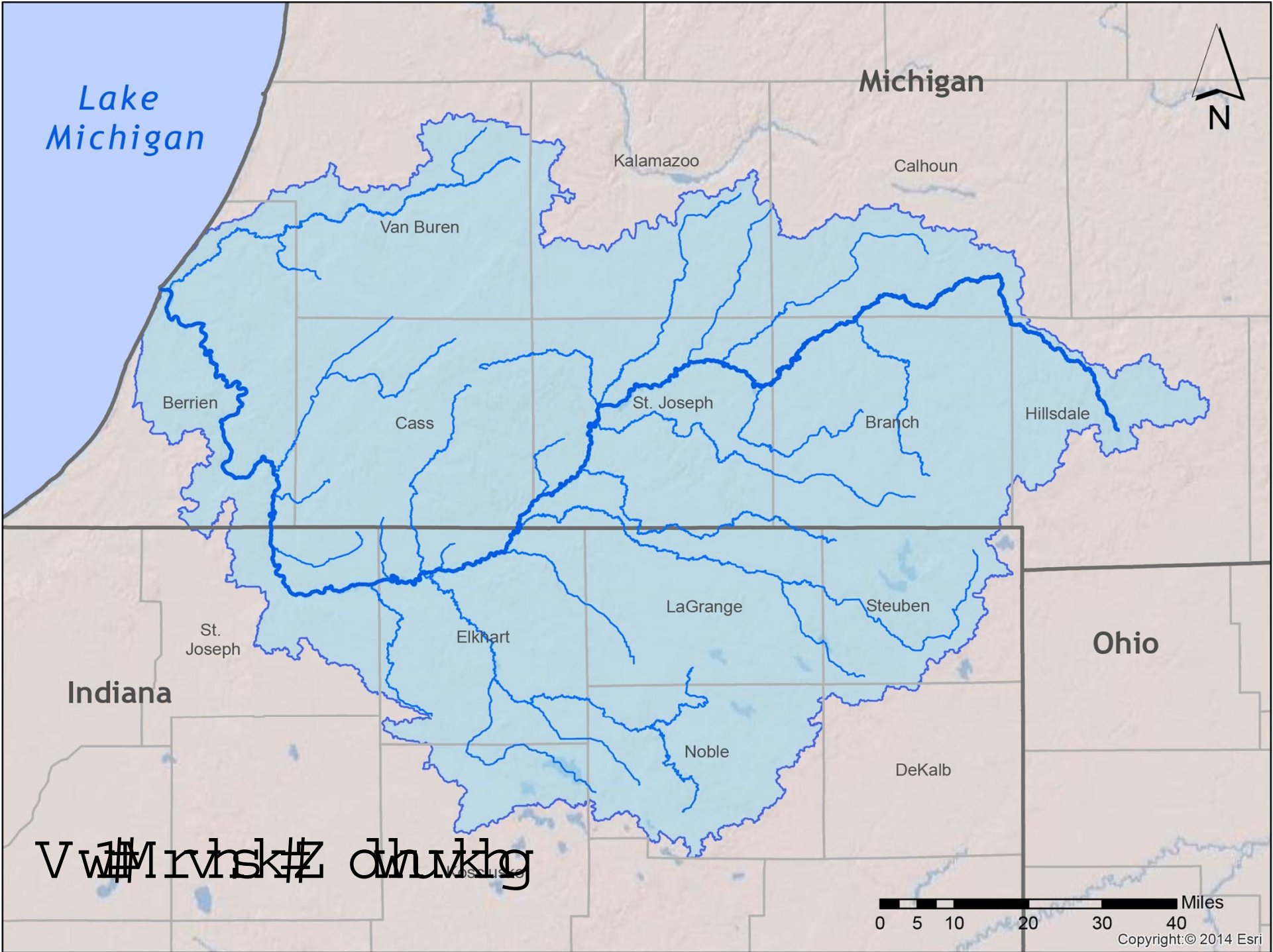
Areas of Interest

- South Branch Kalamazoo River, Rice Creek, Nottawa Creek, and the Battle Creek River
- Crossings were determined through a GIS road query





The Kalamazoo River Watershed



Van Buren River watershed

0 5 10 20 30 40 Miles
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Training

Attended a one day training with MDNR Fish Division Habitat Unit
Biologist: Patrick Ertel

- Classroom instruction
- Field Exercise

Calhoun CD has prior road stream crossing inventory experience

Training & Volunteers



Road Stream Crossing Instructions

Great Lakes Road Stream Crossing Inventory Instructions

- Procedure Protocol for performing analysis of road stream crossings.
- Available at MDNR website
 - https://www.michigan.gov/documents/dnr/Great_Lakes_Road_Stream_Crossing_Inventory_Instructions_419327_7.pdf
- Recommend bringing this to the field

Data Sheet

Great Lakes Road Stream Crossing Datasheet

https://www.michigan.gov/documents/dnr/Great_Lakes_Road_Stream_Crossing_Inventory_Datasheet_419328_7.pdf

Stream Crossing Data Sheet Site ID: _____

General Information

Stream Name: _____ Road Name: _____

Name of Observer(s): _____ Date: _____

GPS Waypoint: _____ GPS Lat/Long: _____

County: _____ Township: _____ Range: _____ Sec: _____

Adjacent Landowner Information: _____ Additional Comments: _____

Crossing Information

Crossing Type: Culvert(s) No.: _____ Bridge Ford Dam Other: _____

Structure Shape: Round Square/Rectangle Open Bottom Square/Rectangle Pipe Arch Open Bottom Arch Ellipse

Inlet Type: Projecting Mitered Headwall Apron Wingwall 30-30° or 30-70° Trash Rack Other

Outlet Type: At Stream Grade Cascade over Riprap Freefall into Pool Freefall onto Riprap Outlet Apron Other

Structure Material: Metal Concrete Plastic Wood

Substrate in Structure: None Sand Gravel Rock Mature

General Condition: New Good Fair Poor

Plugged: _____ % Inlet Outlet In Pipe

Crushed: _____ % Inlet Outlet In Pipe

Rusted Through? Yes No Structure Interior: Smooth Corrugated

Multiple Culverts/Spans				
Number the culverts/spans left to right, facing downstream. Include all in site sketch on back page.				
Culvert/ Span #	Width (ft)	Length (ft)	Height (ft)	Material

Structure Length (ft):¹ _____ Structure Width (ft):¹ _____ Structure Height (ft):¹ _____

Structure Water Depth (ft):¹ Inlet _____ outlet _____ Perch Height (ft):¹ _____ or NA

Embedded Depth of Structure (ft):¹ Inlet _____ outlet _____

Structure Water Velocity (ft/sec):¹ Inlet _____ outlet _____

Structure Water Velocity Measured: At Surface OR _____ ft Below Surface Measured With: Meter or Float Test

Stream Information

Stream Flow: None < N Bankfull < Bankfull = Bankfull > Bankfull

Scour Pool (if present) Length: _____ Width: _____ Depth: _____ Upstream Pond (if present) Length: _____ Width: _____

Riffle Information (measured in a riffle outside of zone of influence of crossing)

Water Depth (ft): _____ Bankfull Width (ft): _____ Wetted Width (ft): _____ Water Velocity (ft/sec): _____

Dominant Substrate: Cobble Gravel Sand Organics Clay Bedrock Silt Measured With: Meter or Float Test

Road Information

Type: Federal State County Town Tribal Private Other

Road Surface: Paved Gravel Sand Native Surface Condition: Good Fair Poor

Road Width at Culvert (ft): _____ Location of Low Point: At Stream Other Runoff Path: Roadway Ditch

Embankment: Upstream FFI Depth (ft): _____ Slope: Vertical 1:1.5 1:2 >1:2

Downstream FFI Depth (ft): _____ Slope: Vertical 1:1.5 1:2 >1:2

Left Approach: Length (ft): _____ Slope: 0% 1-5% 6-10% >10% Ditch Vegetation: None Partial Heavy

Right Approach: Length (ft): _____ Slope: 0% 1-5% 6-10% >10% Ditch Vegetation: None Partial Heavy

¹ - Fill out for primary culvert (culvert #1). If multiple culverts are used, number each and use embedded table. Form Date: February 28, 2011

Erosion Information

Use a new row for each distinct gully/erosion location. Note prominent streambank erosion within 50 feet of crossing.

Location of Erosion Ditch, approach, or streambank Left or right facing downstream	Erosion Dimensions (ft)			Eroded Material Reaching Stream?		Material Eroded Sand, Silt, Clay, Gravel, Loam, Sandy Loam or Gravelly Loam
	Length	Width	Depth	Yes	No	

If there is erosion occurring, can corrective actions, such as road drainage measures, be installed to address the problem? Y N

Extent of Erosion: Minor Moderate Severe Stabilized

Erosion Notes: _____

Photos - enter photo number in blank corresponding to location

Site ID _____ Upstream Conditions _____ Downstream Conditions _____

Inlet _____ Outlet _____ Road Approach - Left _____ Road Approach - Right _____

Summary Information

Would you consider this a priority site? Fish Passage Erosion Why?

Would you recommend a future visit to this site? Yes No Why?

Were any non-native invasive species observed at the site? Yes No If yes, what species were observed?

Site Sketch

Draw an overhead sketch of crossing. Be sure to mark North on the map and to indicate the direction of flow. Include major features documented on form, such as erosion sites, multiple culverts, scour pool, impounded water, etc.

Form Date: February 28, 2011

Field Work

- Sampled from beginning of July to mid-October at low flow.
- ~20-35 min to complete a single rd stream xing depending on condition.
- 21 days spent performing surveys

Materials	Cost
Stadia Rod	\$ 189.99
Waders	\$ 59.99
200 ft tape	\$ 26.79
Hand level	\$ 65.00
Clinometer	\$ 144.95
Flow probe	\$ 1,038.00
Range finder	\$ 199.00
Total:	\$ 1,723.72

Results

	South Branch Kalamazoo	Nottawa Creek	Battle Creek River	Rice Creek	North Branch Kalamazoo
Bridges	14	18	12	13	12
Culverts	1	1	6	6	1
Dams	0	0	1	0	0

Recommended Future Visits					
	South Branch Kalamazoo	Nottawa Creek	Battle Creek River	Rice Creek	North Branch Kalamazoo
Bridges	1	0	1	2	0
Culverts	1	1	2	6	1

Impediments to Fish Passage

Generally Accepted Parameters

- Velocities - 1.8 ft./s
 - Typical causes - culverts sized below bankfull width
- Slope - 5%
- Culvert Length ~60 ft. or more
- Perched
- Water depth through the culvert

Fish Passage - Battle Creek

- (4/17) 23% of the crossings evaluated on the Battle Creek River are fish passage issues

	Battle Creek
Bridges	1
Culverts	3
Dams	0

Fish Passage - Battle Creek

- Small Cofferdam below Washington St. Bridge
- Bridge spans the river but still a fish passage issue

- Swimming depths
- Velocity
- Burst speed
- Step height



Complex Fish Passage Issues



Buried.....

- Culvert is completely buried
 - Sediment aggradation ranging from ~1-2 ft.
 - Undersized and crushed
 - Buried under the water surface 2.7 ft.
 - Drainage problem - Intercounty Drain
 - Fish passage issue?



Buried...



Fish Passage - Rice Creek

- (1/20) 5% of the crossings evaluated on Rice Creek were a fish passage issue

	Rice Creek
Bridges	0
Culverts	1
Dams	0

Fish Passage - Rice Creek



- 28 Mile Rd. stream crossing
 - undersized, slope, 62 ft in length.
- Disconnects a significant lentic (lake) system
 - Fish community
- Drainage - Controversial

Fish Passage - Rice Creek



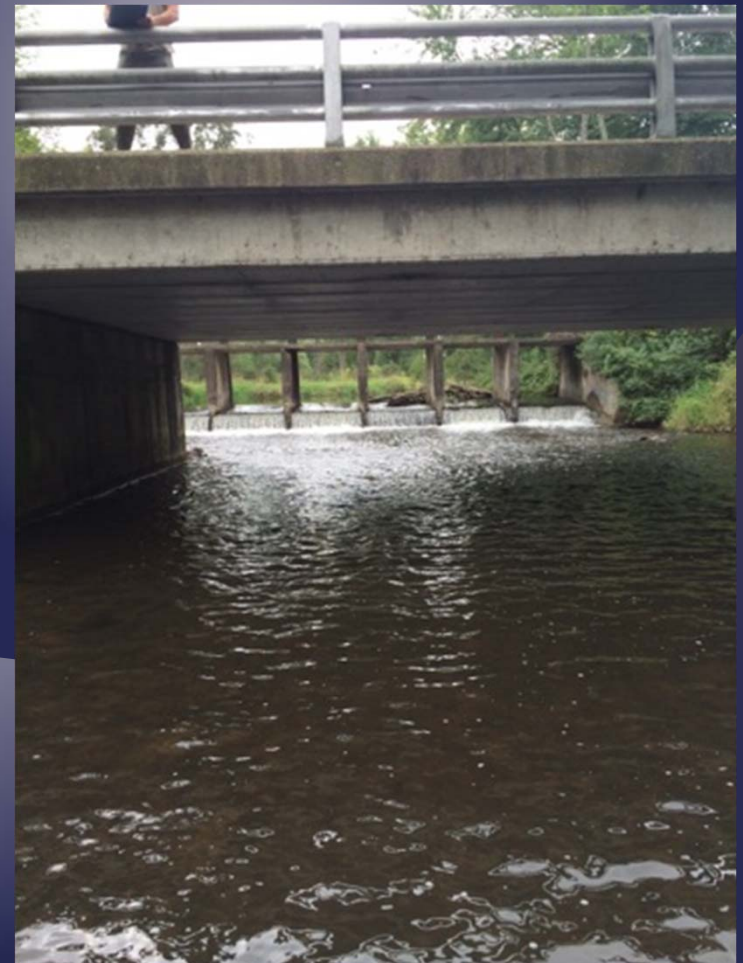
Fish Passage - South Branch of the Kalamazoo

- (1/15) 7% of the crossings evaluated on the S. Branch of the Kalamazoo

	South Branch Kalamazoo
Bridges	1
Culverts	0
Dams	0

Fish Passage - South Branch of the Kalamazoo

- L- Drive
 - Span bridge with associated coffer dam and concrete skirt
- 8.44 Miles upstream from confluence



North Branch Kalamazoo

- (1/13) or 8 % of the crossings sampled were a fish passage issue

	North Branch Kalamazoo
Bridges	0
Culverts	1
Dams	0

Fish Passage - North Branch



- Road stream crossing in the lower reaches of the N. Branch.
- Multiple culvert system
 - Span bridge
- Current Characteristics;
 - Velocities, cascading, blockage, sediment transport

Fish Passage - Nottawa Creek

- 0 fish passage issues in Nottawa Creek crossings sampled
- 1 culvert in the headwaters is significantly undersized and most likely contributes to drainage issues and increased water levels

Undersized Culverts

- Some culverts were significantly undersized (~60% less than bankfull width)
- Significantly undersized culverts tended to be present within drainage basins associated with known perceived drainage issues
- Nottawa Creek Culvert
 - Culvert has a width of 8.32 ft and bankfull width is 35 ft.
 - Hydraulic capacity of 23% of Bankfull Width Capacity (BWC)
 - This particular reach has received “drain maintenance” in recent years
- Rice Creek analysis revealed 7 crossings were significantly undersized
 - 2 crossings within the upper reaches of the S. Branch of Rice Creek only had 47% BWC
 - 5 crossings in the N. Branch of Rice Creek - 2 had less than 65% BWC and 3 had less than 35% BWC

Dams

- Dams were present within all of the systems except Rice Creek
- Battle Creek - One large dam in the lower reaches and another in the middle reach
- The North and South Branch of the Kalamazoo - Both have dam systems in their lower reaches
- Nottawa Creek - impacted in lower reaches

Pigeon Creek - Culvert Remediation

Five Culvert System

- Road Dept. partnership
- Undersized, perched
- Impassible velocities
- Potentially dangerous road stream crossing
- Fish and aquatic organism barrier



Pigeon Creek - Culvert Remediation

Five Culvert System

- Road Dept. partnership
 - Brought money into the community
- Undersized, perched
 - Enlarged opening capacity or ability to pass flood flows (13.5 sq. ft. to 36 sq. ft.)
- Impassible velocities
 - Lowered velocities through the structure
 - Increased water depth
- Potentially dangerous road stream crossing
 - Updated failing infrastructure

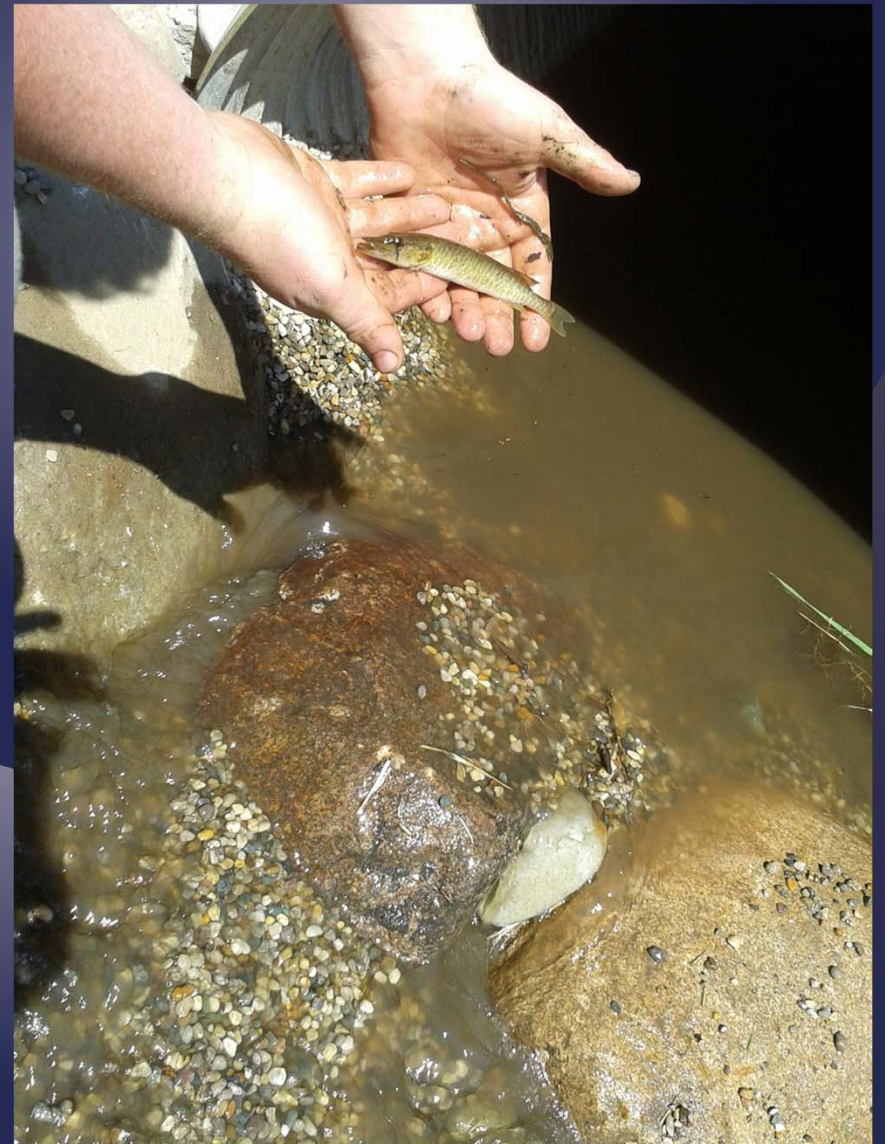


Culvert Remediation

Considerations:

Fish Passage

- Target Fish Species
 - Velocities (1.8 ft/s)
 - Burst considerations
 - Length
- Erosion
 - Continuous, seasonal
 - Pathways - road or ditch
 - Source of Erosion



Recommendations/Suggestions

- Partnerships
 - Road Dpt., Drain Commission, Municipalities
 - Approach - Consider their management goals and objectives
 - Grant writing, data collection, extra funding
- Utilize data already collected
 - MDNR Fisheries Assessments, Academia
- Prioritization
- Impediment to stream processes
- Flow obstruction or drainage issue
- Natural crossing vs. agricultural drain
- Flow probe vs. Orange/Apple Method