2020 Oneida County Stream Crossing Prioritization Project
Final Report

Prepared for

The Wisconsin Department of Natural Resources

Prepared by

JoAnne Lund
River Grant Project Specialist
Oneida County Land and Water Conservation
Rhinelander, WI



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Oneida County Land & Water Department Staff
Michele Sadauskas, County Conservationist
JoAnne Lund, River Grant Project Specialist
Jonna Jewell, Administrative Assistant

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Robb Jensen (April 2018-2020)
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John Engel (FSA Rep) (March 2020)

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INTRODUCTION

This report documents the activities completed under the Oneida County Stream Prioritization Project from June 15, 2020-March 11, 2021. Grant support was awarded by the State of Wisconsin Department of Natural Resources. This project augments the Great Lakes Stream Crossing Inventory database created and managed by the Michigan Department of Natural Resources. Survey protocol was developed, reviewed, and tested by the following organizations: Michigan DNR, U.S. Forest Service, Trout Unlimited, Wisconsin DNR, U.S. Fish & Wildlife Service, Huron Pines, Conservation Resource Alliance, Michigan Technological University, and road commissions. Funding for development and testing was provided by the U.S. Forest Service, U.S. Fish & Wildlife Service, and The Nature Conservancy.

This project was overseen by the Oneida County Conservation/UWEX Education Committee, and Jon Simonsen, Environmental Analysis and Review Specialist, Wisconsin Department of Natural Resources. Day-to-day activities were planned and fulfilled by Michele Sadauskas, Oneida County Conservationist and JoAnne Lund, River Grant Specialist, with support from Jonna Jewell, Administrative Assistant.

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OBJECTIVES

The 2020-2029 Oneida County Land and Water Resource Management (LWRM) plan focuses on local natural resource concerns, and provides the basis for local, state, and federal agencies to coordinate implementation of land and water management programs. This project fits within the first 5-year work plan and is listed under Goal 1 (highest priority): Protect and enhance wetlands and surface water quality, Objective E: Reduce erosion caused by road stream crossings (e.g. culverts). Additionally, LWCD wishes to "provide technical and financial (cost sharing) assistance to reduce erosion", and to increase "river/stream cost share projects" (pg. 47-48 of the LWRM plan). The "2020 Oneida County Stream Crossing Prioritization Project" has begun to fulfill these goals. Prioritizing culverts that need repair and/or replacement, and providing the tools

to build more resilient and environmentally friendly stream crossings will enhance surface water quality, and protect and restore fish and wildlife habitat.

At the outset of this project, no known inventories of Oneida County roadway stream crossings had been conducted. It is important to note that Oneida County is the home of many classified trout streams, 34 of which were included in these surveys. Lack of information, improper placement and sizing of structures, and inadequate erosion control measures have resulted in a number of dysfunctional stream crossings throughout the county. All data will be available to town officials as well as the general public, facilitating informed decisions about future investments in proper road crossing infrastructure.

This project will assess and prioritize 105 stream crossings throughout six towns in Western Oneida County: Hazelhurst, Lake Tomahawk, Little Rice, Lynne, Minocqua, and Woodruff. A virtual Townhall Meeting will present results, giving participants information on the condition of individual culverts and how to build more durable stream crossings with minimal impact on the environment.

A GIS culvert layer (Activity 3b) will be developed to aid in identifying priority culverts needing repair or replacement, providing the greatest impact on public safety, environmental protection, and/or soil erosion.

METHODS

Stream crossings to be surveyed were identified using the DNR Surface Water Viewer (https://dnr.wisconsin.gov/topic/SurfaceWater/swdv). A total of 34 classified trout streams were included in these surveys. A decision was made to exclude crossings on state highways due to safety concerns. All data were entered into the Great Lakes Stream Crossing Inventory database, created and managed by the Michigan Department of Natural Resources. Field surveys were completed from July to October, 2020.

Measurements focused on assessment of three factors: passability, condition, and erosion. Passability is defined as the capacity of fish and other aquatic organisms to cross a roadway-stream intersection. Factors negatively affecting passability are water depth (less than 6 inches), water flow velocity (greater than 3 feet per second), the absence of natural substrate in the structure, the length of the structure (greater than 30 feet), and a constriction ratio less than 0.5 (structure width/bankful width) (Januchowski-Hartley et al., 2014). Condition was assessed visually as defined by the Great Lakes Stream Crossing Inventory instructions (Table 1). Where erosion was occurring, measurements to evaluate extent were made. Erosion was calculated using the

U. S. Department of Agriculture, Natural Resources Conservation Service (NRCS) Universal Soil Loss Equation (USLE). Roadways, structures and erosion were photographed and included with each survey.

RESULTS

A total of 105 crossings were surveyed, including 12 bridges, 92 culverts and one dam. Survey locations were in the town of Hazelhurst (n=7), Lake Tomahawk (n=2), Little Rice (n=32), Lynne (n=33), Minocqua (n=26), and Woodruff (n=5). Of the 105 crossings, 97 (87.6%) created at least a partial barrier to fish passage, with 15 (15.2%) posing a complete barrier. A portion of structures (7.6 %) presented no barrier to aquatic organisms. A common crossing design flaw is stream constriction, calculated as the ratio of structure width to average stream bed width. Optimally, the structure should measure at least half the width of the stream bed. We found 63.8% (n=67) of crossings causing significant stream constriction. Structures that are not placed at a proper depth in relation to the stream bed result in a water depth insufficient for fish passage, observed at 72.4% (n=76) of crossings. In general, condition of structures was a minor issue, with 3.8% (n=4) showing major to severe deterioration. Erosion is a common occurrence, especially during heavy rain events; 13 crossings (12.4%) were evaluated with erosion levels of 2 tons per year or greater (J. Simonsen, personal communication, November 11, 2020).

A summary of crossings evaluated as priority sites is shown in Tables 2-5. Priority was assessed based upon three factors: passability issues for fish and other aquatic organisms, impaired structural integrity, and observed erosion estimates. Presented in Table 5 is a brief summary showing number of sites in each town by passability category, structural condition, and those sites with erosion estimates exceeding two tons annually.

1. Passability: Table 2 lists specific sites in each town that create a complete barrier to fish passage. Surveys found one site in Lake Tomahawk, two in Woodruff, seven in Minocqua, one in Lynne, and four in Little Rice assessed as a 100% barrier. Factors contributing to passability issues are shown in red.
2. Structural integrity: Structures were observed with moderate to severe corrosion at 23 sites (Table 3). Among these, three were located in Hazelhurst, one in Woodruff, five in Minocqua, nine in Lynne and five in Little Rice. The most critical condition defects among these sites are printed in red.
3. Erosion: Table 4 lists 13 crossings with erosion estimates greater than two tons per year. These are located in Hazelhurst (3), Woodruff (1), Minocqua (2), Lynne (3), and Little Rice (4).

A virtual Townhall Meeting was held on March 25, 2021 to give participants information on condition of individual culverts, and to aid in prioritizing those crossings having a major impact on stream flow, and aquatic organisms and wildlife. A GIS culvert layer (Activity 3b) was developed to assist in identifying culverts in need of replacement or repair.

CONCLUSION

The impact of culvert crossings on fish and other aquatic species is consequential. Although each roadway stream intersection affects a small segment of a waterway, the effects of all culverts in a watershed are cumulative. For this reason, decisions about crossing improvement are most beneficial when connectivity of the basin as a whole is considered. In evaluating management actions, the optimal goal is to maximize connectivity on a basin scale while minimizing cost. Such a wide view will enhance the benefit of each improvement with cascading ecological influence.

Despite the clear need, there is currently no systematic framework for decision-making about connectivity improvement (Januchowski-Hartley et al., 2013). For optimal efficiency, data from on-the-ground surveys, coupled with improved communication between conservation and infrastructure managers is essential. To date, structures in six of 20 (30%) towns have been surveyed. While this study begins to provide information on Oneida County culverts, more onsite observation is needed for proper planning, design and installation as a means to ensure safe roadways for the public, preserve passage for fish and protect healthy streams.

REFERENCES/SOURCE MATERIAL

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APPENDIX

Figure 1. Fish Passability Assessment for all Oneida County Sites Surveyed in 2020 (n=105)

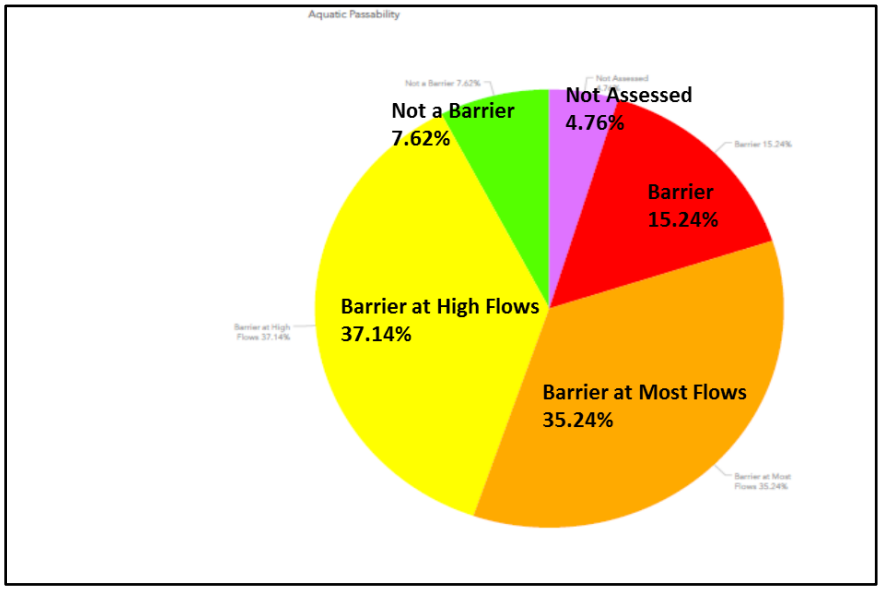

Table 1. Great Lakes Stream Crossing Inventory Structural Condition Assessment Categories

Structural Condition Assessment Categories
New Structure
Not new, but no noticeable corrosion (abrasion, chipping, cracking), no shape changes
Light superficial corrosion, no shape changes
Moderate corrosion, slight shape changes
Moderate to major corrosion (less than 5% of structure), moderate shape changes
Major deterioration from corrosion (5-10 % of structure)
Major deterioration from corrosion (10-50 % of structure)
Severe deterioration from corrosion (more than 50% of structure)

Table 2. Sites Assessed as 100% Barrier to Fish Passability with Contributing Factors

Site ID	Stream Name	Crossing Name	Road	Downstream	Structure	Structure	Bankful	Structure	Water	Lack Substrate	Water	Constriction	Perched	Scour Pool
			Width (ft)	Fill Depth (ft)	Width (ft)	Height (ft)	Width ft	Length>30 ft	Depth<6 in	in structure	Velocity>3 ft/sec	Ratio<0.5		
lake tomahawk 2	Muskie Creek	Lakewood Road	27.6	2.5	10.9	6.9	36	No	No	No	Yes	Yes	No	No
woodruff 1	Minocqua Thoroughfare	County Hwy J	48.5	1.8	4	4	33	No	No	No	Yes	Yes	Yes	No
woodruff 3	Gilmore Creek	County Hwy D	39	11.5	4	4	110	Yes	No	Yes	Yes	Yes	No	No
minocqua 9	Howards Creek	Camp Nine Road	22	2.8	1.4	1.3	9.5	Yes	No	No	Yes	Yes	No	Yes
minocqua 12	Tomahawk River	Blue Lake Road	25	0	41.5	15.5	47.5	No	No	No	Yes	No	No	No
minocqua 13	unnamed creek	Camp Nine Road	20	2.5	2	2	13	No	No	Yes	Yes	Yes	Yes	Yes
minocqua 18	Stone Creek	East Squaw Lake Road	23.5	4.5	5.5	4	32	Yes	No	Yes	Yes	Yes	No	Yes
minocqua 19	unnamed creek	Dam Road	23	1.8	1.1	1.2	6	Yes	Yes	Yes	No	Yes	Yes	Yes
minocqua 25	unnamed creek	Cedar Falls Road	20	4.5	4	4	7	Yes	No	Yes	No	No	Yes	Yes
minocqua14	Tomahawk River	Camp Nine Road	19	4	12	8.5	28	Yes	No	Yes	Yes	Yes	No	Yes
lynne 12	Muskellunge Creek	Muskellunge Road	15.6	0.5	2	2	6.1	Yes	Yes	Yes	No	Yes	Yes	Yes
little rice 16	Little Rice River	Kelly Fire Lane (Bass Lake)	15	2.2	8	3	59.1	Yes	No	Yes	Yes	Yes	No	Yes
little rice 19	unnamed creek	McCord Road	12.8	3	1.5	1.5	3	No	Yes	Yes	No	No	Yes	Yes
little rice 31	Johnson Creek	Old Hwy 8	22	NA	24	5.5	11.4	No	No	No	No	No	No	no data
little rice 32	unnamed creek	Old Hwy 8 (east)	25.8	1.5	2.2	2.2	9.9	Yes	No	No	No	Yes	Yes	Yes
	Classified Trout Stream													

Table 3. Sites with Moderate to Severe Condition Issues and Contributing Factors

Site ID	Stream	Crossing	Structure Length (ft)	Structure Width (ft)	Structure Height (ft)	Downstream Fill Depth (ft)	% Plugged	% Crushed	Rusted Through	General Condition
hazelhurst 1	Rocky Run Creek	South Blue Lake Road	49.2	4	4	8.1	None or 0%	1% - 20%	No	Moderate to major deterioration
hazelhurst 4	Kaubashine Creek	Balsam Park Boulevard	29	14	3	21.5	1% - 20%	None or 0%	Yes	Moderate to major deterioration
hazelhurst 5	mccormick creek	County Hwy Y	39.6	3	3	2	None or 0%	None or 0%	Yes	Moderate to major deterioration
woodruff 3	Gilmore Creek	County Hwy D	115	4	4	11.5	None or 0%	None or 0%	No	Moderate to major deterioration
minocqua 5	Yukon Creek	Scottsman Lake Road	13	9	3	0	None or 0%	1% - 20%	Yes	Moderate to major deterioration
minocqua 13	unnamed creek	Camp Nine Road	16	20	3.5	0	None or 0%	None or 0%	No	Moderate to major deterioration
minocqua 16	unnamed creek	W Squaw Lake Road	29	2	2	1.2	None or 0%	None or 0%	No	Moderate to major deterioration
minocqua 20	Little Willow Creek	Price County Road	28	3	3	1.1	None or 0%	None or 0%	Yes	Moderate to major deterioration
minocqua 21	Willow River	Price County Road	21.9	15	6	1.1	21% - 40%	61% - 80%	No	Moderate to major deterioration
lynne 1	Meadow Brook	Townhall Road	29.8	4.5	3.1	1	None or 0%	None or 0%	No	Moderate to major deterioration
lynne 2	Meadow Brook	Ahola Road	28	2	2	2.5	None or 0%	None or 0%	No	Moderate to major deterioration
lynne 4 south	unnamed creek	Ruth Road	48	4.5	3	2.1	1% - 20%	None or 0%	No	Major deterioration 10-50%
lynne 8	unnamed creek	Indian Village Road	41.1	4	4	2	1% - 20%	1% - 20%	Yes	Moderate to major deterioration
lynne C	Little Somo Creek	East Village Road	43	4	4	4.6	None or 0%	1% - 20%	No	Moderate to major deterioration
lynne 16	Little Somo River	Work Road	27.4	3	3	1.7	1% - 20%	1% - 20%	No	Severe >50% deterioration
lynne 18	Little Somo River		37	2.8	2.8	1	None or 0%	None or 0%	No	Moderate to major deterioration
lynne 20	Swamsauger Creek	Flowage Road	16	2.5	3.5	0.5	1% - 20%	1% - 20%	Yes	Moderate to major deterioration
lynne 24	unnamed creek	Thunder Creek Road	33.5	2.5	2.5	0.8	None or 0%	None or 0%	Yes	Moderate to major deterioration
little rice 10	Clukey Creek	Burrows Lake Road	34.1	3	3	0.8	None or 0%	None or 0%	No	Moderate to major deterioration
little rice 11	Brown Creek	Brown Creek Road	35	3.5	3.5	2	None or 0%	None or 0%	No	Moderate to major deterioration
little rice 16	Little Rice River	Kelly Fire Lane (Bass Lake)	35	3	3	2.2	None or 0%	None or 0%	Yes	Moderate to major deterioration
little rice 26	unnamed creek	McCord Road (north)	23.6	3	3	1.1	None or 0%	None or 0%	No	Moderate to major deterioration
little rice 31	Johnson Creek	Old Hwy 8	24	24	5.5	NA	None or 0%	None or 0%	No	Major deterioration 10-50%
	Classified Trout Stream									

Table 4. Sites with Erosion Estimate of More than Two Tons per Year

Site ID	Stream Name	Crossing Name	Left Approach Erosion Estimate (tons/yr)	Right Approach Erosion Estimate (tons/yr)	Site Erosion Estimate Total
hazelhurst 4	Kaubashine Creek	Balsam Park Boulevard	0.01	0.02	7.75
hazelhurst 1	Rocky Run Creek	South Blue Lake Road	0.11	0.08	3.13
hazelhurst 3	Threemile Creek	Lower Kaubashine Road	1.07	1.75	2.83
woodruff 4	Gilmore Creek	County Hwy E	0.19	0.19	7.44
minocqua 6	unnnamed creek	Bo Di Lac Road	0.08	0.07	11.70
minocqua 20	Little Willow Creek	Price County Road	0.10	0.27	5.07
lynne 18	Little Somo River	Indian Village Road	0.04	0.66	28.30
lynne 10	Hauser Creek	East End Road	0.23	2.68	6.64
lynne 9	Hauser Creek	Indian Village Road	1.87	1.91	3.78
little rice 22	Bear Creek (north)	County Hwy Y	0.07	no data	28.38
little rice 30	unnamed creek	old Hwy 8	0.95	2.26	3.21
little rice 25	unnamed creek	East Village Road	2.40	0.72	3.12
little rice 17	Little Rice River	Kelly Fire Lane (Gobbler Lake)	0.16	0.30	2.14
	Classified Trout Stream				

Table 5. Summary of Passability, Structural Condition, and Erosion Assessments by Town

Town	% Not a Barrier	# Not a Barrier	% Barrier at Most Flows	# Barrier at Most Flows	% Barrier at High Flows	# Barrier at High Flows	Barrier 100%	# Barrier 100%
Lynne (n=33)	12.12	4	21.21	7	54.55	18	3.03	1
Minocqua (n=26)	3.85	1	53.85	6	7.69	2	29.62	7
Little Rice (n=32)	9.38	3	31.25	10	43.75	14	15.63	5
Hazelhurst (n=7)	0	0	57.14	4	42.86	3	0	0
Woodruff (n=5)	0	0	40.00	2	20.00	1	40.00	2
Lake Tomahawk (n=2)	0	0	0	0	50.00	1	50.00	1
Structure Condition Category	**Count**							
Town	**No Deficiencies**	**Good**	**Moderate**	**Major**	**Severe**			
Lynne (n=33)	3	16	11	2	1			
Minocqua (n=26)	4	13	9	0	0			
Little Rice (n=32)	3	18	10	1	0			
Hazelhurst (n=7)	1	3	3	0	0			
Woodruff (n=5)	0	3	2	0	0			
Lake Tomahawk (n=2)	1	1	0	0	0			
Erosion Exceeding 2 tons per year								
Town	**Count**							
Lynne (n=33)	3							
Minocqua (n=26)	2							
Little Rice (n=32)	4							
Hazelhurst (n=7)	3							
Woodruff (n=5)	1							
Lake Tomahawk (n=2)	0							