



NFWF

Final Programmatic Report Narrative

Road-Stream Crossing and Riparian Restoration in the Muskegon River Watershed (MI)

#0501.16.052960

Submitted By: Muskegon River Watershed Assembly

Instructions: Save this document on your computer and complete the narrative in the format provided. The final narrative should not exceed ten (10) pages; do not delete the text provided below. Once complete, upload this document into the on-line final programmatic report task as instructed.

1. Summary of Accomplishments

In four to five sentences, provide a brief summary of the project's key accomplishments and outcomes that were observed or measured.

Three road stream crossings were replaced and over 130 riparian acres reforested in the Bigelow Creek watershed, Michigan to begin a whole-system approach to restoring aquatic organism passage and stream function (Figure 1). The road-crossing improvements reconnected over seven miles of high-quality cold-water habitat and reduced sediment loading by an estimated 8.3 tons/year with upstream movement of Salmonids visually observed in 2018. More than 6,000 trees in the Bigelow Creek and Cedar Creek watersheds have been planted on more than 4,000 lineal feet of stream and river corridor to protect the waterways from solar radiation and increased temperatures while decreasing runoff through improved soil infiltration.

2. Project Activities & Outcomes

Activities

- Describe and quantify (using the approved metrics referenced in your grant agreement) the primary activities conducted during this grant.
- Briefly explain discrepancies between the activities conducted during the grant and the activities agreed upon in your grant agreement.

Road Stream Crossings:

The Bigelow Creek watershed has nine road-stream crossings identified as undersized, perched, and misaligned with their road approaches draining directly into the streams (Figure 2). These have led to blockages in fish passage, reduced aquatic connectivity, excessive run-off of nutrients and sediment, and stormwater rapidly entering the river allowing little time for the water to soak into the ground and become cooled. To address the multiple problems associated with the crossings the project partners met prior to the grant award and developed a multi-phased approach to restore complete connectivity in Bigelow Creek watershed. During this time all road-stream crossings were evaluated, locations were prioritized, and replacement was strategically planned to produce near shovel-ready projects. The 1st phase of the strategy was to improve the two highest priority road-stream crossings that were identified in the grant agreement (Figure 2).

An additional road-stream crossing was able to be completed because of partner ability to leverage other funds and brought the project total up to three. The first crossing was located at Spruce Avenue and East Branch Bigelow and was replaced in 2017 with a large box culvert; this site was the most severely impaired crossing in the watershed with a single, small PVC pipe connecting the upstream and downstream sections of the creek and a flex pipe directing run-off directly into the middle of the river channel (Figure 3). The second crossing at 40th Avenue and Bigelow was a small corrugated culvert that was sized much too small to accommodate spring and fall flows. This was replaced in 2018 with a wide-spanning concrete bridge (Figure 4). Both culverts were undersized relative to natural stream-channel width which resulted in high flow velocities in the culverts prohibiting upstream fish and aquatic organism movement. Small-bodied fish (<100 mm) were especially impacted by the crossing and this likely affected their recruitment to older age classes, a limiting factor to a fish community as a whole. The Spruce Avenue crossing had the greatest amount of annual sediment

introduction to the Bigelow Creek watershed, as estimated by the Michigan Road Stream Crossing Inventory as 4.82 tons/yr. The 40th Avenue crossing of Bigelow Creek had an estimated sediment delivery of 3.48 tons/yr. Both crossings were at risk of wash-out that would result in negative impacts to the environment and high maintenance costs. Approaches were improved and paving was added that directed stormwater away from the creeks and into a floodplain area. The additional road-stream crossing which was identified for the 2nd phase, 40th Avenue and East Branch Bigelow, was also completed in 2018. The three improved crossings were all within a 57 acre area and within .75 miles from each other.

The road/stream crossing replacements were all designed with guidance from the USDA Forest Service “Stream Simulation Method: Designing for Aquatic Organism Passage at Road Stream Crossings”. This design technique aimed to mimic natural channel conditions through the crossings by using intra-system references (i.e., natural channel width and slope) as a template. The characteristics of the natural stream channel which was installed at each crossing was informed by the channel dimensions immediately upstream and downstream of the crossing. The replacement concrete box culverts which were placed in the channel both exceeded stream bankfull width (1-2yr RI) and the stream slope was matched throughout the culvert length. A natural stream channel bottom was created using specified sediment gradation based on natural channel references and analogs. The project team, including Trout Unlimited (TU), the Newaygo County Road Commission (NCRC), the United State Forest Service (USFS) and the Muskegon River Watershed Assembly (MRWA) conducted ground surveys to collect all data and information to assist with the design of the improved road/stream crossings.

Riparian Reforestation:

As part of an eight-year investigation to evaluate the Muskegon River Watershed, researchers developed a multi-model risk assessment tool called the Muskegon River Ecological Modeling System (MREMS). The tool identified several problem areas which were negatively influenced by land use changes (urbanization / development), erosion and sedimentation, effects of dams on the river system, as well as climate change. The MREMS provided recommendations to protect the ecological integrity of the Muskegon River Watershed and included the identification of High Priority Riparian Areas in the Muskegon River Watershed and recommendations for the most effective ways to ensure long-term hydrologic stability. One primary recommendation was securing permanent conservation of riparian lands as well as reforestation and installation of vegetative BMPs along riparian corridors in high priority sub-basins. For this particular project, Cedar and Bigelow Creek, two of the priority watersheds of the Muskegon River were targeted for riparian reforestation.

The goals of the reforestation component of this project included protecting, restoring and enhancing habitat for cold-water aquatic species, increasing wetland habitat values that benefit aquatic species, and improving local recreational and economic values. An additional goal included the collaboration of state and federal agencies along with NGO’s to restore aquatic ecosystems in watersheds across the Huron-Manistee National Forest. To accomplish these goals the Muskegon County Conservation District (MCCD) recruited seven private landowners for the riparian reforestation and secured long-term maintenance contracts to ensure trees were cared for and maintained. Landowners were instructed on the importance of trees in maintaining cool stream temperatures and reducing storm water runoff into rivers and tributaries. Most of the sites were adjacent to tributaries of the Muskegon River while one property was immediately on the mainstem of the Muskegon River where almost ¼ mile of tree planting occurred (Figure 5). The acreage of native tree planting in the agreement was exceeded by almost 100 acres because of willing landowners and additional funding which became available.

The following methods to achieve reforestation included:

1. Landowner solicitation to determine interest in reforestation efforts on private property.
2. Meetings with interested landowners (meetings included site visit of proposed reforestation site, signed cooperator agreement to move forward with reforestation efforts, and maintenance agreement).
3. Development of reforestation site plans / maps of property. Specific locations were selected for each property to install riparian trees.
4. Trees were ordered from local nurseries with tree guards and stakes.
5. Completed reforestation activities on properties

Outcomes

- Describe and quantify progress towards achieving the project outcomes described in your grant agreement. (Quantify using the approved metrics referenced in your grant agreement or by using more relevant metrics not included in the application.)
- Briefly explain discrepancies between what actually happened compared to what was anticipated to happen.
- Provide any further information (such as unexpected outcomes) important for understanding project activities and outcome results.

Road-stream Crossings:

The outcomes of the road/stream crossing improvements were improved fish and aquatic organism passage, reconnection of over 7 miles of high-quality habitat and fish populations, and restoration of natural stream ecosystem processes (e.g., sediment and organic material transport). Additionally, the project improved the road surfaces which were contributing to excessive sediment loading and reduced sedimentation by approximately 8 tons/year. The fish species known to benefit from the improvements include brook and brown trout, potadromous Chinook salmon and steelhead, and mottled sculpin, blacknose dace, central mudminnow, creek chub, johnny darter, northern redbelly dace, and white sucker.

Status and trends fish sampling locations will help evaluate fish population dynamics and improvements to the fishery resulting from the road-stream crossing replacement. The Michigan Department of Natural Resources Fixed Status and Trends Stream (FSTS) site located downstream of 58th Street is documented to support the highest total salmonid biomass reported of any of the 44 FSTS sites statewide. This site, as well as other upstream sites, have baseline information and they will be monitored to evaluate fishery benefits. Post-construction data collection is ongoing to help evaluate project success/effectiveness. Immediate improvements have been realized as the upstream movement of Salmonids have been visually observed through the culverts this fall demonstrating improved aquatic organism passage.

Riparian Reforestation:

The outcomes of the riparian reforestation included the planting of 8,650 trees including red cedar, white cedar, larch trees, white spruce, dogwood, and black spruce. This occurred on over 4,000 lineal ft. of stream and river corridor. The acreage reforested exceeded the 40 acre target to over 130 total acres.

3. Lessons Learned

Describe the key lessons learned from this project, such as the least and most effective conservation practices or notable aspects of the project's methods, monitoring, or results. How could other conservation organizations adapt their projects to build upon some of these key lessons about what worked best and what did not?

One primary lesson learned by the partners was how successful collaboration on one project can build trust and communication that leads to unexpected opportunities to achieve restoration. Support from NFWF not only helped foster collaboration and relationships among project partners but also provided opportunities for each partner to leverage unique assets and skills to accomplish more than originally scheduled. This project enhanced recent and current projects to reduce runoff. Four recent major projects include funding through the Great Lakes Basin Fish Habitat Partnership, EPA GLRI, Great Lakes Fishery Trust, and USDA GLRI. The increased collaboration between partnering agencies has also produced new on-the-ground activities including BMP's for road-stream crossings and tree planting. Following the success of this collaboration the partners immediately applied for and received two other grants to continue implementing the multi-staged approach for replacement of culverts and improvement of road approaches to the creek. This showed the value of having a strategic plan for implementing a watershed approach where near shovel-ready projects were available. Additionally, the partners recently applied for a Department of Environmental Quality Non-Point Source grant to continue reforestation throughout the watershed.

4. Dissemination

Briefly identify any dissemination of lessons learned or other project results to external audiences, such as the public or other conservation organizations.

Completed projects funded with NFWF SOGL contributions have already been used as demonstration projects throughout the region. Site visits to the replaced culverts have resulted in public interest on the strategies for improving watersheds. Additionally, promoting the benefits of tree planting has been a considerable focus over the past 10 years for the project partners. During this grant the MRWA and MCCD conducted site visits and acquired landowner commitment to install

riparian reforestation BMP's. A by-product of meetings was interest from neighbors who have committed to installing BMP's on their properties. MRWA and project partners will continue to promote and describe the project success through periodic newsletters, blogs and social media. Public awareness will be raised and hopefully result in recruitment and action of residents.

5. Project Documents

Include in your final programmatic report, via the Uploads section of this task, the following:

- 2-10 representative photos from the project. Photos need to have a minimum resolution of 300 dpi and must be accompanied with a legend or caption describing the file name and content of the photos;
- report publications, GIS data, brochures, videos, outreach tools, press releases, media coverage;
- any project deliverables per the terms of your grant agreement.

POSTING OF FINAL REPORT: *This report and attached project documents may be shared by the Foundation and any Funding Source for the Project via their respective websites. In the event that the Recipient intends to claim that its final report or project documents contains material that does not have to be posted on such websites because it is protected from disclosure by statutory or regulatory provisions, the Recipient shall clearly mark all such potentially protected materials as "PROTECTED" and provide an explanation and complete citation to the statutory or regulatory source for such protection.*