

CEDAR CREEK HABITAT ASSESSMENT & IMPROVEMENT PLAN



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By
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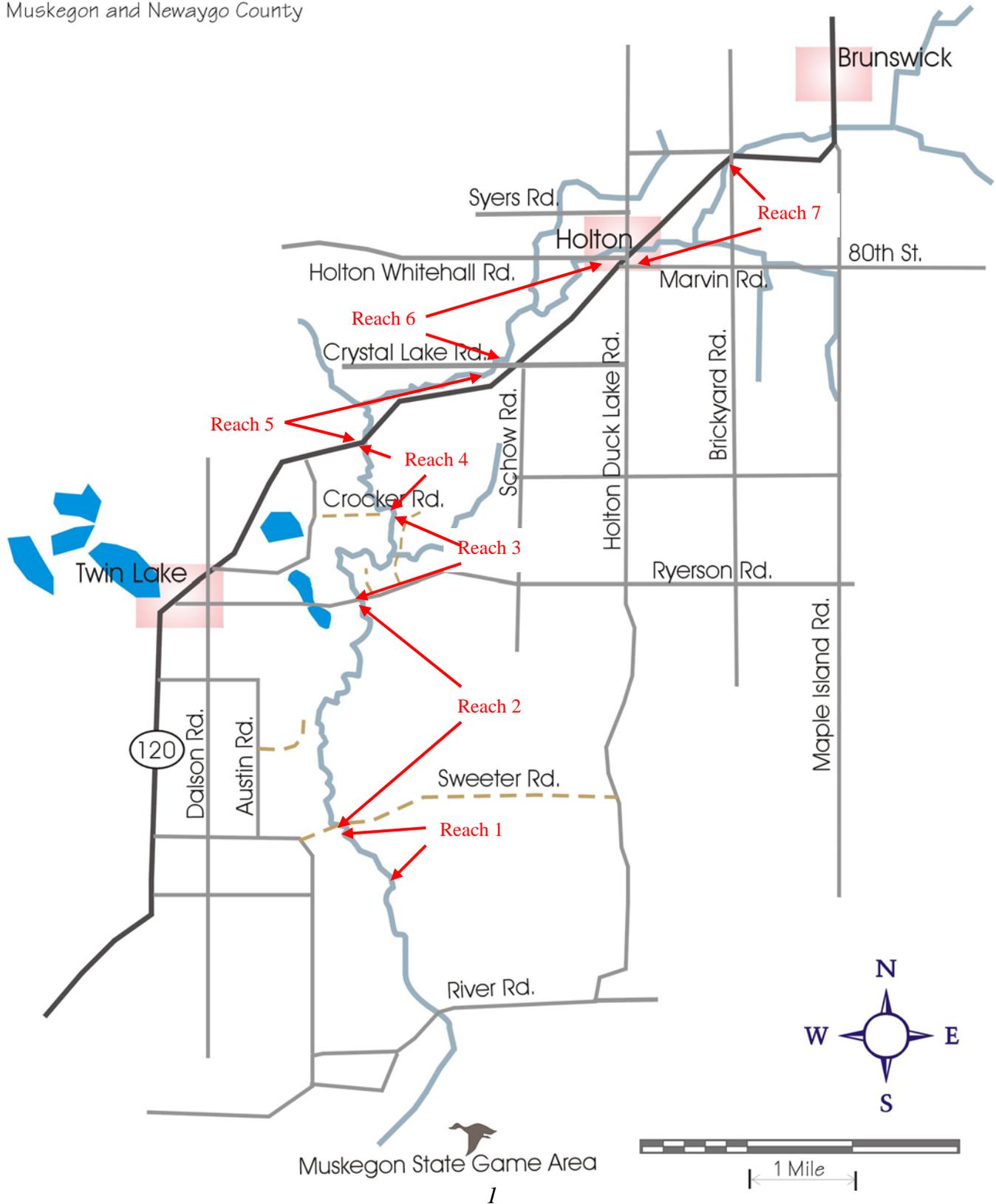
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Reference Key for Codes and Definitions
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Map

Cedar Creek

Muskegon and Newaygo County



Executive Summary

This project has inventoried Cedar Creek's main branch existing stream habitat conditions and identified key reaches that would benefit from habitat improvements to help maintain Cedar as a viable trout stream. Cedar Creek is primarily a brook trout stream and its overall stream habitat is in fair shape. Cedar has a flashy flow due to the extensive drainage in the upper watershed and all structural improvements need to take that into consideration. This Assessment coupled with two in-stream sediment basins, installed in 1985 by the U. S. Forest Service, have established a base line data set as a reference to future land use change effects on Cedar.

Other organizations such as the Muskegon River Watershed Assembly are working on hydrological impacts on the system, ways to reduce excessive runoff in the watershed that creates the flashy flow condition and assisting local governmental units to minimize land use change impacts on the water resource and the stream integrity.

Reach 1 *has an unusually high percentage (59%) of aquatic vegetation and is transitioning into the slow, warmer water downstream. It needs overhead cover, additional woody debris, increased pool/ riffle areas, more exposed gravel bottom and tree planting.*

Reach 2 *has the only cedar trees and fairly good habitat diversity. It needs overhead cover, additional woody debris, increased pool/riffle areas, more exposed gravel bottom, tree planting, openings cut in areas choked close with tag alder and closing of some of the numerous braids.*

Reach 3 *has fairly good habitat diversity, very good shade, riparian density and good in-stream fish cover. It needs more exposed gravel bottom, increased pool/riffle areas and additional woody debris. Stream habitat improvements have been installed in this reach and need to continue.*

Reach 4 *has fairly good habitat diversity with the largest percentage of sand bottom. It needs increased shade, more exposed gravel bottom, increased pool/riffle areas and additional woody debris. Stream habitat improvements have been installed in this reach and need to continue. The Forest Service maintains an in-stream sand trap at the end of Crocker Road.*

Reach 5 *has the highest riparian density but the lowest in-stream fish cover. It needs additional overhead cover, increased pool/riffle areas, more exposed gravel and additional woody debris. The Forest Service maintains an in-stream sand trap just upstream of M-120.*

Reach 6 *has fair habitat diversity with glide, pool and riffle but very minimal large woody debris complex. It has good shade but very low riparian density. It needs additional exposed gravel bottom, additional woody debris, increased pool/riffle areas and tree planting.*

Reach 7 *is in need of bank erosion control and a reduction in stream velocities from the adjacent drainage area. It has good shade but very low riparian density. It needs additional gravel exposure, more cover, increased pool/riffle areas, additional woody debris and tree planting.*

All habitat improvements should consider the brook trout needs by incorporating structures with more root mass, numerous logs and structural complexity.

*All areas of Cedar need habitat improvement with **Reaches 2 and 5** in the most need. **Reaches 3 and 4** have had improvements installed but need much more work. **Reaches 1 and 6** can use improvements but are lower priority. The high runoff drainage area directly upstream from **Reach 7** has the most adverse impact on the stream and any structural improvements. The high runoff needs to be considered when designing any improvements to the stream; especially, in Reach 7.*

Introduction

Cedar Creek is the first major Muskegon River tributary upstream from the Muskegon River outlet. It is primarily a sand based stream system and a native brook trout stream. It also contains some rainbow trout, steelhead and Chinook salmon. The lower third of Cedar has the least development, the middle third has more private homes and the upper watershed has numerous drained agricultural fields. The runoff from the upper drained area creates a flashy flow condition on Cedar. In-stream banks are becoming more unstable as the flashiness increases due to land use changes.

The major river to this tributary, Muskegon River, is located in north-central Michigan and is 212 miles long, with a 575 ft. drop in elevation between the source and the mouth at Lake Michigan. The Muskegon River watershed encompasses over 2,350 square miles of land. Agricultural and urban development in the watershed is moderate, but the use of floodplains for development and agriculture is significant in some areas. Erosion of sediment into streams occurs in the uplands and water withdrawal for irrigation is significant in some tributaries. Major tributaries in the watershed include West Branch of the Muskegon River, Clam River, Middle Branch River, Hersey River, Little Muskegon River, **Cedar Creek**, Brooks Creek, and Bigelow Creek (O'Neal 1997).

The channel of the Muskegon River and some of its tributaries have been adversely altered. Most of the high gradient stream reaches on the mainstem have been impounded, many tributaries have been dredged and straightened, and the removal of riparian vegetation throughout the watershed has led to less woody debris in streams. All of these factors have led to less diverse stream channels that are much less favorable to aquatic communities than diverse stream channels (O'Neal 1997).

There are five major impoundments on the mainstem of the Muskegon River (O'Neal 1997) with the furthest downstream impoundment being Croton Dam. Croton Dam blocks fish passage by both resident and migratory fish species. Only three of the major tributaries in the watershed, **Cedar Creek**, Brooks Creek, and Bigelow Creek, occur below Croton Dam and provide habitat for fish migrating out of Lake Michigan to spawn.

Cedar Creek originates in agricultural drains east of Brunswick in Newaygo County. It supports a good brook trout fishery that is enhanced by natural reproduction. Brook trout are more prevalent in the middle reaches of the creek. The Michigan DNR conducted fishery surveys at two sites in Cedar Creek in 1995. Average estimated brook trout numbers and weight were 1,962/mile, and 56.8lbs./acre. Average estimated steelhead parr numbers and weight were 910/mile, and 10.6lbs./acre. Other species collected included white sucker, sculpins, central mudminnow, yellow perch, burbot, bullhead, and blacknose dace. (O'Neal 1997).

The Michigan Department of Natural Resources (DNR) Fisheries Division identified excessive sediment bedload, removal of riparian vegetation, and lack of instream habitat as three areas of concern in their Muskegon River Watershed Assessment (O'Neal 1997).

“A Fisheries Management Guide to Stream Protection and Restoration” (Gaylord Alexander 1995) emphasizes the importance of vegetation management and sediment control in the stream corridor as vital parts of stream protection and restoration. Improvements to tributaries contribute to the overall health of the main river fisheries, riparian wildlife and general water quality. This leads to the need for tributary improvements in order to affect an overall improvement in the Muskegon River system.

Biologists recommend that stream systems first have an assessment of existing conditions to determine if habitat improvements would be beneficial. If it were determined that habitat improvements would be beneficial a maintenance and improvement plan can be developed from the assessment. Cedar Creek was selected as a focus point for a stream habitat assessment to identify potential improvements that would benefit the overall Muskegon River system.

Project Goal and Objectives

This Project was developed to evaluate the existing conditions of the stream habitat in Cedar Creek and establish recommendations for future stream improvement projects.

Project Goal: *To enhance the fisheries, riparian wildlife and general water quality in the Cedar Creek ecosystem.*

Objectives:

- 1. Assess the current instream and riparian habitat and identify specific areas of concern.*
- 2. Analyze habitat data and identify improvements needed.*
- 3. Install needed improvements*

Methodolgy:

In order to accomplish this task, the project was divided into three phases. This report represents the completion of Phase 2.

Phase 1 *was the detailed field assessment (mapping and photographs) of the existing instream and riparian habitat and any specific areas of concern, such as sediment from stream banks. This was compiled for use in planning needed improvements. This phase covered 83,904 feet of the Cedar Creek main stream.*

Phase 2 *is the analysis of the data to determine a course of action for the improvement of the fishery, riparian habitat and areas of adverse impacts. Partial analysis was done during the collection of the data but the major improvement plan development was done following data collection. Refer to Reach Summaries for improvement recommendations.*

Phase 3 *will be implementation of the needed changes identified in Phase 2. This would involve improvements such as: stream-side vegetation planting, bank stabilization, brush bundles for trapping sediment, instream deflectors, cover logs, cover platforms, increased woody debris, increases in pool/riffle areas, sand movement to expose gravel and other practices and management techniques for improved fish/wildlife habitat and water quality.*

Data Collection (Phase 1) and Analysis (Phase 2)

A method similar to the basin-wide inventory developed by Hankin and Reeves (1988) was used to collect habitat information on Cedar Creek. Individuals walked the entire length of Cedar Creek for the collection of field data. Data collection was from September 2003 – August 2004.

The data collection was done by Kanouse Outdoor Restorations, owned and operated by Shawn Kanouse. Measurements were taken starting just below Sweeter Road and progressed upstream. Each time the habitat type changed a separate set of assessment data were recorded for that habitat type. Length and width measurements were taken with a Walktax Distance Measurer (Hip Chain). Depths were taken with a survey rod. Substrate percentages were visually estimated and shade was a visual estimation of the cover percentage from the riparian vegetation directly over the stream. Riparian density was calculated from the number of trees in a 30 feet by 50 feet area next to the stream at each habitat type. Fish cover in square feet was measured in the beginning until the data collectors obtained a feel for the sizes and later amounts were estimated. The overall rating was estimated from the field observation of all parameters collectively. Pictures were taken with a digital camera and locations were identified with GPS coordinates.

Data was entered into excel spreadsheets and analyzed using simple spreadsheet functions for sorting.

An original estimate of length for data collection on the main stream was 121,440 feet. As field data was collected it was noted that the lower portion of Cedar Creek from River Road downstream to the mouth at Muskegon River was wide, slow and more conducive to warm water fisheries. The majority of the stream just below Sweeter Road downstream to River Road had similar physical characteristics. In consultation with the Michigan Department of Natural Resources Regional Fisheries Biologist it was decided not to inventory those areas at this time. Those areas are not conducive to the types of stream habitat improvements that have been emphasized and priority has been on habitat improvements to the smaller stream areas for trout and juvenile fisheries enhancement. Those areas are approximately 42,280 feet in length.

Also the upper portion of Cedar Creek is in agricultural drains which are not conducive to stream habitat improvements since the drains can be dredged in the future and improvements may be removed. That area is upstream from Brickyard Road.

The habitat inventory was completed from just downstream of Sweeter Road upstream to Brickyard Road that is northeast of Holton, Michigan for a total of 83,904 feet.

Cedar Creek main stream was broken into seven reaches for easier data analysis (Refer to map on page 1)

Reach 1 – Just Below Sweeter Road

Reach 2 – Sweeter Road to Ryerson Road

Reach 3 – Ryerson Road to Sand trap at the end of Crocker Road

Reach 4 – Sand trap to M-120

Reach 5 - M-120 to Crystal Lake Road

Reach 6 – Crystal Lake Road to Holton-Duck Lake Road

Reach 7 – Holton-Duck Lake Road to Brickyard Road

Reach Summary and Recommendation

Terminology definitions and detailed data for these summaries are included in the Appendix under (Reference Key for Codes and Definitions, Data Summary Tables & Charts and Raw Data Spreadsheets).

Reach 1 – Just Below Sweeter Road

- ◆ *This reach is 3,609 feet long (4% of the total stream length) and has an area of 125,153 square feet (7 % of the total stream area).*
- ◆ *It has fair habitat with 88% glide and 12% pool but lacks diversity with no riffle or large woody debris complex habitats.*
- ◆ *The riparian vegetation is 56% tag alder, 32% lowland hardwoods, and 12% northern hardwoods. The riparian vegetation provides an average of 46% shade and a density of 566 trees per acre.*
- ◆ *In-stream fish cover consists of unusually high aquatic vegetation (59%), 23% large woody debris and 11% overhanging brush. Overall there is 1.5 square feet of cover per linear foot of stream.*
- ◆ *This reach has the largest percentage of detritus (10%), the largest percentage of silt (20%) and the lowest percentage of sand (69%) with minimal gravel in its substrate.*
- ◆ *This is the shortest reach of the stream inventory and is adjacent to the area that transitions into slow, warmer water downstream*

Recommendation - *It lacks gravel for spawning, riffle and large woody debris complex habitats. It needs shade and cover in the form of riparian vegetation, large woody debris and undercut banks. Reduce the glide area and increase pool/riffle area, expose more gravel and increase cover with woody debris structures. Plant trees to increase shade and riparian vegetation diversity.*

Reach 2 – Sweeter Road to Ryerson Road

- ◆ *This reach is 16,759 feet long (20% of the total stream length) and has an area of 506,893 square feet (26.5% of the total stream area).*
- ◆ *It has fairly good habitat diversity, 87% glide, 9% pool and 2% each of riffle and large woody debris complex.*
- ◆ *The riparian vegetation is 60% tag alder, 20% lowland hardwoods and 13% northern hardwoods. It has the only cedar cover at 6%, provides shade at an average of 47% and a riparian density of only 187 trees per acre.*
- ◆ *This reach has the largest quantity of in-stream fish cover with 34% large woody debris, 33% aquatic vegetation, 18% undercut banks and 15% overhanging brush. Overall there is 2.5 square feet of cover per linear foot of stream.*
- ◆ *This reach has 86% sand with very little gravel or cobble present.*

This is the second longest reach of the stream system, has the only cedar riparian vegetation, the largest quantity of fish cover and the highest rate of fish cover at 2.5 square feet per linear foot of stream; however, 33% is aquatic vegetation..

Recommendation - *This area lacks gravel for spawning and shade and cover in the form of riparian vegetation. Reduce the glide area and increase pool/riffle area, expose more gravel and increase cover with woody debris structures. Plant trees to increase shade and riparian vegetation density and diversity. There are numerous areas choked with tag alder and numerous braids. Openings can be cut through the tag alder and woody structures can block off some of the braids.*

Reach 3 – Ryerson Road to Sand Trap at the end of Crocker Road

- ◆ This reach is 8,795 feet long (11% of the total stream length) and has an area of 270,178 square feet (14% of the total stream area).
- ◆ It has fairly good habitat diversity with 82% glide, 16% pool and 2% riffle but there is no woody debris complex habitat type.
- ◆ The riparian vegetation is 88% lowland hardwoods and 11% northern hardwoods providing very good shade at an average of 73% and riparian density of 630 trees per acre.
- ◆ In-stream fish cover consists of 62% large woody debris, 23% undercut banks and 9% man made structures. Overall there is 2.2 square feet of cover per linear foot of stream.
- ◆ This reach has 81% sand with minimal gravel and cobble.
- ◆ Habitat structures have been installed in the past few years through a joint effort of Muskegon/White River Chapter of Trout Unlimited and the U. S. Forest Service.

Recommendation - It lacks gravel for spawning and large woody debris complex habitat. Reduce the glide area and increase pool/riffle area with woody debris structures. Continue the woody structure installation to move sand, expose more gravel areas and increase cover.

Reach 4 – Sand Trap to M-120

- ◆ This reach is 8,035 feet long (10% of the total stream length) and has an area of 191,463 square feet (10% of the total stream area).
- ◆ It has fairly good habitat diversity with 83% glide, 2% large woody debris complex, 10% pool and 5% riffle.
- ◆ The riparian vegetation is 42% lowland hardwoods, 38% tag alder and 19% northern hardwoods, providing fair shade at an average of 59% with a riparian density of 485 trees per acre.
- ◆ In-stream fish cover is in the form of large woody debris (39%), overhanging brush (39%) and undercut banks (17%). Overall there is 1.5 square feet of cover per linear foot of stream.
- ◆ It has the largest percentage of sand substrate (89%) with little gravel and cobble.
- ◆ Habitat structures have been installed in the past few years through a joint effort of Muskegon/White River Chapter of Trout Unlimited and the U. S. Forest Service. The Forest Service has a sand trap at the end of Crocker Road and it is periodically cleaned to remove instream sand.

Recommendation – It lacks gravel for spawning, shade and cover. Reduce the glide and increase the pool/riffle area with additional woody debris structures. Continue the woody structure installation to uncover gravel for spawning, increase the fish cover and create scour pools with cover. Plant trees to increase shade and riparian vegetation diversity. Continue sand trap maintenance.

Reach 5 – M-120 to Crystal Lake Road

- ◆ This reach is 16,314 feet long (19% of the total stream length) and has an area of 329,053 square feet (17% of the total stream area).
- ◆ It has fair habitat diversity with 93% glide, 6% pool and .3% riffle with no large woody debris complex.
- ◆ The riparian vegetation is 78% northern hardwoods, 19% lowland hardwoods and 3% tag alder providing good shade at an average of 69% with the highest riparian density of 786 trees per acre.

- ◆ Fish cover is large woody debris (68%) and undercut banks (50%). It has similar cover to reach 4 but twice the stream distance giving only 0.8 square feet of cover per linear foot of stream.
- ◆ This reach has 87% sand with minimal gravel and cobble.
- ◆ The Forest Service has a sand trap just upstream from the M-120 crossing and it is periodically cleaned to remove in-stream sand

Recommendation – It lacks gravel for spawning and large woody debris complex habitat. It is in need of additional cover in the form of large woody debris and undercut banks. Reduce glide area and increase in the pool/riffle area, expose gravel and increase cover with woody debris structures. Continue sand trap maintenance.

Reach 6 – Crystal Lake Road to Holton-Duck Lake Road

- ◆ This reach is the longest reach at 17,435 feet (21% of the total stream length) and has an area of 314,117 square feet (16% of the total stream area).
- ◆ It has fair habitat diversity with 87% glide, 8% pool and 4% riffle with very minimal large woody debris complex habitat type.
- ◆ The riparian vegetation is 58% lowland hardwoods and 33% northern hardwoods providing very good shade at an average of 74% with 264 trees per acre riparian density (numerous large trees).
- ◆ This reach has the second largest quantity of fish cover with the largest percentage of large woody debris at (83%) and undercut banks (15%). Overall there is 2.0 square feet of cover per linear foot of stream.
- ◆ It has 79% sand with 10% silt and the highest reach percentage of gravel at 3%.

Recommendation - This reach can use additional gravel for spawning, large woody debris complex habitat and a decrease in glide area and an increase in pool/riffle area with woody debris structures. Plant trees to increase riparian vegetation density.

Reach 7 – Holton-Duck Lake Road to Brickyard Road

- ◆ This reach is 12,957 feet long (15% of the total stream length) and has an area of 178,013 square feet (9% of the total stream area).
- ◆ It has good habitat with 77% glide and 21% pool but limited diversity with very minimal riffle and no large woody debris complex habitat types.
- ◆ The riparian vegetation is 89% lowland hardwoods and 9% northern hardwoods providing very good shade at an average of 73% with 198 trees per acre riparian density (numerous large trees).
- ◆ In-stream fish cover is present in the form of large woody debris (78%) and undercut banks (11%). Overall there is 1.3 square feet of cover per linear foot of stream.
- ◆ This reach has the second largest percentage of silt at 16% with 10% detritus, 73% sand and little gravel or cobble substrate.
- ◆ It has several major bank erosion areas and has the highest adverse impacts from the drained, high runoff area just upstream.

Recommendation - This reach is the transition zone from the upstream agricultural drains to the downstream less disturbed landscape. It lacks gravel for spawning, cover and riffle and large woody debris complex habitats. Reduce glide area and increase the pool/riffle area, expose gravel and increase cover with woody debris structures. Structures strategically placed can assist in reducing bank erosion. Plant trees to increase riparian vegetation density.

Justification of Recommended Treatments

Muskegon/White River Chapter of Trout Unlimited and the U.S. Forest Service have performed habitat improvements on reaches 3 and 4; however, they have not yet developed a comprehensive plan or evaluation for their lands along Cedar Creek. In the mid 1980's the Forest Service installed a sediment basin at the end of Crocker Road and just upstream from the M-120 crossing. These are excavated basins in the stream channel to catch sand movement in the stream bottom. Periodically they are excavated and a sand movement measurement is obtained for baseline data and measurement of sand movement changes. Forest Service electro-fishing will be done in the future as part of a comprehensive plan to evaluate the Cedar Creek fishery.

Numerous habitat improvements have been done on Bigelow Creek, a Muskegon River tributary upstream from Cedar Creek, and Forest Service evaluations have shown the habitat improvements have resulted in more diverse habitat, increased cover for aquatic wildlife, increased woody debris for aquatic insects, larger fish and greater fish numbers and quality. The improvements recommended in this document are similar to those used in Forest Service habitat improvement areas and will dramatically improve aquatic habitat.

Conclusion

Partner funds were used to complete Phase 1 and 2 of this project. Site improvements will be done in Phase 3 as government and private partner funds are available.

All habitat improvements should consider the brook trout needs by incorporating structures with more root mass, numerous logs and structural complexity. The high runoff needs to be considered when designing any improvements to the stream.

The U.S. Forest Service and the Muskegon/White River Chapter of Trout Unlimited have been installing and maintaining habitat improvement measures and plan to continue their efforts. The Forest Service will be able to utilize this Assessment to assist them in developing a more comprehensive plan for their lands in the next few years.

The improvements proposed here will complement existing habitat work. Based on current application costs, recommended improvements will require an estimated \$503,424.

Cedar Creek will increase its high fluctuation in flow (flashy flow) as land use continues to change in the watershed. Partners such as the Muskegon River Watershed Assembly will continue their hydrological evaluations and working with landowners and local governmental units to minimize the adverse impacts to the stream system from land use changes.