

Effects of removal of the dam at Big Rapids

Aquatic Habitat Work Plan

Project purpose: Study effects of removal of a relic dam foundation on transport and fate of sediment, aquatic habitat and water quality of the Muskegon River near Big Rapids, Michigan. This work plan addresses the aquatic habitat portion of the work to be completed by the U.S. Geological survey.

Scheduling Aquatic Habitat Assessments: The proposal calls for three aquatic habitat assessments during the low-flow period (summer months) once each before dam removal, during the year of dam removal, and during the following year. The proposal was approved December 1999, which has hindered our opportunity to conduct the first aquatic habitat study during low flow. Every effort will be made to complete the first aquatic habitat survey before June, however, the work is dependent water level in the river being at lower (more workable) stages.

Planned Work: Each of the three "Aquatic Habitat Assessments" will occur at a minimum of 5 stream reaches per trip: upstream of any darn effects, just above the dam, and at least 3 stream reaches below the dam. "Aquatic Habitat Assessments" will consist of both the habitat assessment portion of the Great Lakes and Environmental Assessment Section (GLEAS) Procedure 51 and the USGS's National Water Quality Assessment transect procedure (modified).

USGS's National Water Quality Assessment transect procedure (modified): The USGS National Water Quality Assessment Transect Procedure is designed to record geomorphic changes in the stream channel. Three permanent transects will be established at each of the five sampling reaches. Transect data is separated into four principal categories: 1) Reach data (Lat/Long location, reach length, percent riffle, percent run, and percent pool); 2) Stream data (Mean canopy angle, mean aspect, mean width, mean depth, and maximum velocity); Bank and edge data (Mean bank height, mean bank angle, amount of overhanging vegetation, amount of undercut banks, amount of woody debris, amount of boulders, amount of macrophytes emergent, and amount of human rubbish); 4) channel configuration and stream-bed type data (10-20 elevation measurements at each transect to record change in elevation and type of material for sueam banks and stream bottoms).

Habitat Assessment Portion of the GLEAS Procedure 51: Habitat quality parameters are separated into three principal categories: 1. Substrate and Instream Cover; 2. Channel Morphology; and 3. Riparian and Bank Structure. These categories, and different scoring levels, are based on levels of importance in influencing biological community composition. The most important biological habitat parameters are those characterizing bottom substrate and instream cover, estimation of embeddedness, and estimation of water velocity. These three parameters have a direct influence on biological composition and abundance. These metrics have a greater score (20) than other parameters (Table 1) because of their greater importance in affecting biological composition. Parameters associated with channel morphology and structure have a slightly smaller score of 15. Riparian and bank parameters, which may directly affect species composition the least, have the lowest score of 10.

A GLEAS Procedure 51 aquatic habitat score is obtained by adding together the individual scores for each of the nine metrics scored in sampling reach. Assuming the upstream control reach is classified as

excellent, the downstream reach scores are then compared to the upstream reach score (control). Each reach is then classified as excellent, good, fair, or poor based on the degree of similarity to the expected optimum habitat conditions as represented by the upstream conko1 or reference sampling reach (Table 2).

Table 1: GLEAS Procedure 51 Habitat Scoring Criteria

METRIC	Excellent	Good	Fair	Poor
Substrate and Instream Cover				
1. Bottom Substrate and Available Cover	16-20	11-15	6-10	0-5
2. Embeddedness/Siltation	16-20	11-15	6-10	0-5
3. Water Velocity	16-20	11-15	6-10	0-5
Channel Morphology				
4. Flow Stability	12-15	8-11	4-7	0-3
5. Deposition/Sedimentation	12-15	8-11	4-7	0-3
6. Pools-Riffles-Runs-Bends	12-15	8-11	4-7	0-3
Riparian and Bank Structure				
7. Bank Stability	9-10	6-8	3-5	0-2
8. Bank Vegetation	9-10	6-8	3-5	0-2
9. Streamside Cover	9-10	6-8	3-5	0-2

Table 2: Reach Classification System

Reach Habitat Survey Category	Percent Similarity to Upstream Reach
Excellent Habitat (Similar to upstream Control)	>90%
Good Habitat (Slightly different than upstream Control)	75-89%
Fair Habitat (Moderately different than upstream Control)	60-74%
Poor Habitat (Greatly different than upstream Control)	<59%