

Draft Section of 2026 Integrated Report Assessment Methodology: Use of Procedure 51 Macroinvertebrate Community Scores

3.6.2 Assessment Type: Biological

3.6.2.1 Macroinvertebrate Community

In addition to chemical and physical assessment types, Michigan uses rapid bioassessment of macroinvertebrate communities in wadeable streams and rivers (generally Procedure 51; Michigan Department of Environmental Quality [MDEQ], 2014) to determine support for the other indigenous aquatic life and wildlife (OIALW) designated use. Biosurvey sites are selected using both targeted and probabilistic study designs. All biosurvey data are considered to determine OIALW designated use support.

Under the previous version of Procedure 51, macroinvertebrate communities were scored with metrics that rate water bodies from excellent (+5 to +9) to poor (-5 to -9). Macroinvertebrate ratings from -4 to +4 were considered acceptable (Creal et al., 1996). Water bodies with macroinvertebrate communities rating acceptable or excellent were generally determined to support the OIALW designated use. A determination of not supporting or, infrequently, insufficient information was made for water bodies with macroinvertebrate communities rated poor depending on supporting information.

In 2024 the Michigan Department of Environment, Great Lakes, and Energy finished recalibrating the macroinvertebrate community metrics and scoring within Procedure 51 using the reference condition concept as the basis for determining attainment. The process included defining reference criteria (i.e., least impacted available), establishing stream classes that account for natural variability in communities, testing and evaluation of multiple macroinvertebrate metrics, and combining the most responsive metrics into an index for each stream class. Each metric was selected to be included in the index if it showed a consistent response along a known disturbance gradient and was not duplicative of another selected metric. The metrics were combined into an index that gives an indication of biological condition relative to the disturbance gradient.

Indices were developed for seven stream classes across the state based on metrics responsive to each particular stream class (Table 1). Within each stream class, thresholds for an unacceptable difference from reference conditions were chosen based on historic data and modeled departure from reference condition expectations, as described in the updated Procedure 51 macroinvertebrate scoring report (Holden et al., 2024). In all cases, attainment is determined relative to reference condition and/or historic condition following the methodology in Figure 1 using the scoring thresholds on a 100-point scale for each stream class as identified in Table 1. In some cases, a site may demonstrate a substantial drop in score of 20 points or more based on comparison to historic survey results (within the past 15 years). Under these circumstances an impairment decision may be made reflecting the identified specific decline in biological community from known past condition as an indication of impacts to water quality and/or habitat conditions.

Following Procedure 51, biosurvey results should have sufficient supporting information available to determine survey representativeness. Current and past weather and flow conditions, relevant available historic data (typically collected in the past 15 years), assessments of biological communities at the same location or from adjacent stream or river segments in similar condition, and the source and frequency of pollutant exposure are considered to determine if conditions are ongoing or temporary. The presence of additional historic biosurvey data is particularly important for sites scoring between the threshold score and the 25th percentile of reference conditions, following Figure 1. In all cases, the information used to support the assessment decisions will be reflected in the United States Environmental Protection Agency’s Assessment and Total Maximum Daily Load Tracking and Implementation System (ATTAINS).

Macroinvertebrate data for wadeable streams and rivers collected using methods other than Procedure 51 are evaluated on a case-by-case basis. Similarly, biological integrity data regarding water bodies where Procedure 51 is not appropriate (e.g., wetlands, lakes, ephemeral streams) will be evaluated on a case-by-case basis using Best Professional Judgement to assess community characteristics like taxa balance, diversity, and other indicators of system health and function.

Table 1. Macroinvertebrate community Procedure 51 stream classes. Threshold score is a percentile of reference ranging from 5th to 15th (Holden et al., 2024). The 25th percentile of reference is used as part of the assessment process. Typically, a score below the threshold score indicates a stream is not supporting the OIALW designated use, while a score between the threshold and the 25th reference percentile requires additional information to make a use support assessment, following Figure 1.

Stream Class	Procedure 51 Threshold Score	25th Percentile of Reference Score
North: VeryNarrow	59	69
North: Narrow	48	64
North: MidSizeDry	45	62
North: WideOrMidSizeWet	45	52
South: WestFlat	46	55
South: WestSteep	42	49
South: East	46	64

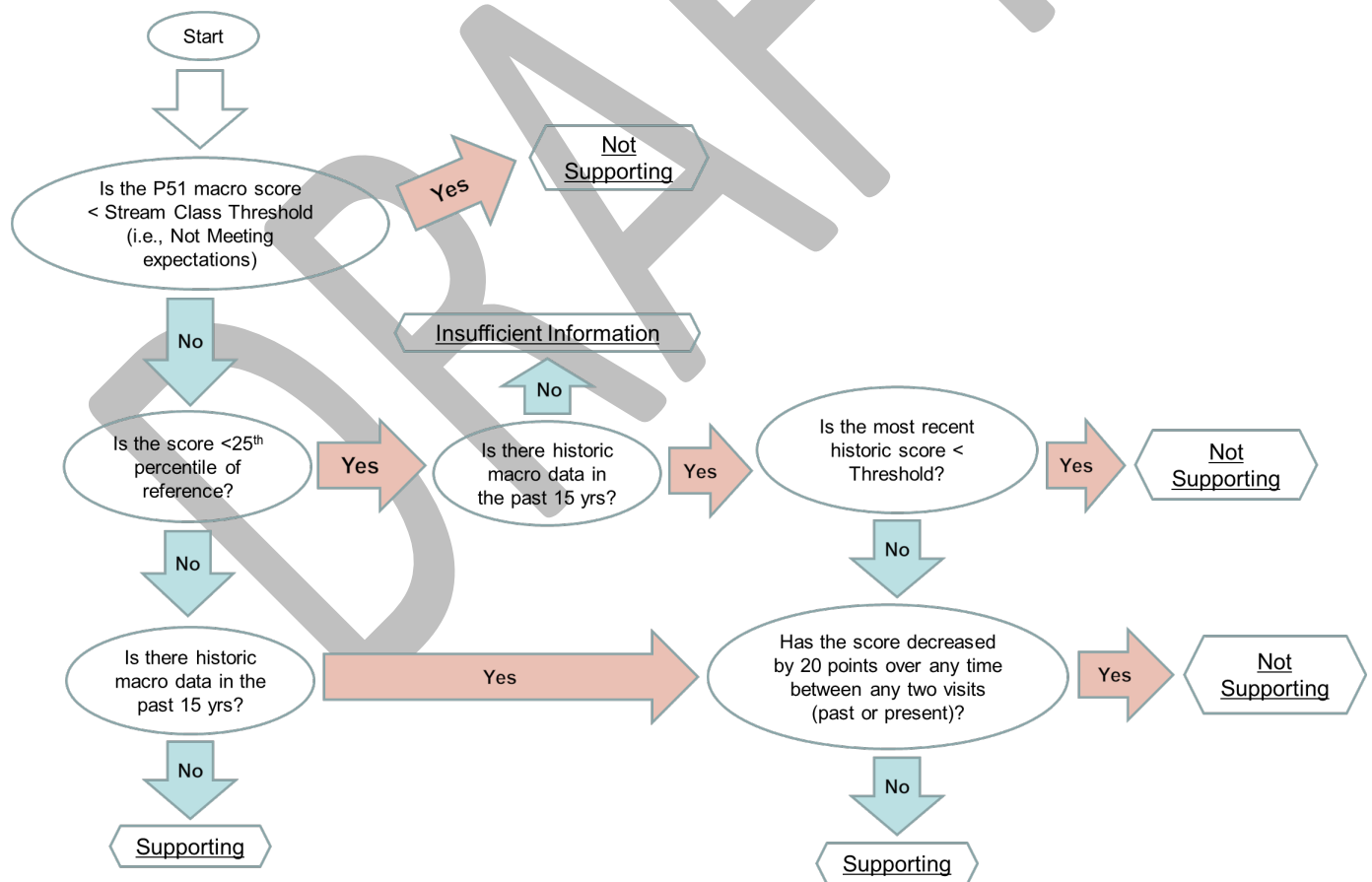
Reference

Creal, W., Hanshew, S., Oemke, M., and M. Walterhouse. 1996. Update of GLEAS Procedure 51 Metric Scoring and Interpretation. MDEQ.

Holden, S., Turek, K., and K. Goodwin. 2024. Update of Water Resources Division Procedure 51 Macroinvertebrate Scoring and Interpretation. EGLE Staff Report #MI/EGLE/WRD-24/003.

MDEQ. 2014. Qualitative Biological and Habitat Survey Protocols for Wadeable Streams and Rivers. Procedure Number WRD-SWAS-051.

Figure 1. Determination of OIALW designated use support using Procedure 51 macroinvertebrate community scores. When historic (pre-2021) macroinvertebrate community scores are used in assessment, the scores are calculated using the new methodology (Holden et al., 2024).



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