

## Appendix D

### Guidance for Hydrologic and Geomorphic Analyses

#### Planning

A hydrologic analysis performed for a watershed management plan would cover the entire watershed to help stakeholders understand the watershed's hydrologic characteristics and the impact of changes on stream flows, provide a basis for stormwater management, and help determine the critical areas. The scope of the study would vary with the watershed and stakeholder needs. It could include:

- Delineation of watershed boundaries.
- Review of soil, land use, and population information.
- Calculation of stream flows and pollutant loads.
- Comparison of calculated runoff volumes or yields per sub basin.
- Flashiness Analysis (see [http://www.michigan.gov/documents/deq/wrd-hsdsu-flashiness\\_386624\\_7.pdf](http://www.michigan.gov/documents/deq/wrd-hsdsu-flashiness_386624_7.pdf)).
- Analysis of percent imperviousness.
- Analysis of stream order.
- Recommendations to protect or improve treatment of stormwater runoff.
- Recommendations to manage storm flows to protect stream channels from increased erosion.

Plans that recommend streambank stabilization, channel realignment, changes to channel geometry, or changes impacting flow or sediment transport must include a stream geomorphology assessment equivalent to the [USDA-NRCS 580 Standard](#). Also see "[Stream Stability Assessment Guidelines for NPS Grant Applicants](#)" for additional guidance.

#### Implementation

Often streambank erosion is part of a natural stream process that is not caused by human influence and is not causing any stream impairment. When erosion is unnatural and excessive it is often the result of changes in the amount of runoff from the contributing watershed or do to channelization of the stream channel. Grant funding will not be awarded to proposals attempting to treat natural erosion sites or proposals attempting to fix unnatural or excessive erosion without fixing the underlying cause.

In implementation grant proposals where major stream treatments such as stream channel restoration or stream bank stabilization are proposed, a **statement on hydrology/morphology** is required that provides a site-specific analysis of the cause and magnitude of the problem. Additional geomorphic analysis may be needed for the stream rehabilitation design, which can be a funded task in the implementation grant.

The hydrology/morphology statement should describe, in one-to-two pages, the hydrologic and geomorphic condition of the stream, including if and how the hydrologic conditions have changed over time and the corresponding changes to the morphological stream conditions. The statement should summarize reports

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and data and outline the steps taken to determine the hydrologic/geomorphic status. Applicants should be prepared to supply the full reports or data used to make the hydrologic/geomorphic assessment. Applicants should be aware that proposals to stabilize erosion caused by natural river processes are not likely to be funded by nonpoint source grants. The justification to stabilize erosion at these sites may be more appropriate to other grant programs.

The hydrologic/geomorphic assessment should utilize recognized tools such as stream flashiness indexes; channel evolution models; regional reference curves; stream bed particle size assessments; streambank stability analysis; stream power calculations; regime equation calculations; or similar measurements or models. The Michigan Department of Environmental Quality's Nonpoint Source Program has provided a number of guidance documents and tools at [www.michigan.gov/deqnps](http://www.michigan.gov/deqnps), in particular see "[Stream Stability Assessment Guidelines for NPS Grant Applicants](#)". Hydrologic and geomorphic stability assessments are especially important in watersheds that have been significantly disturbed or modified. Hydrologic and geomorphic assessment shall include an inventory of current site condition (i.e., stable, aggrading, or degrading), identification of the type, extent, magnitude, and cause(s) of the stability problem(s) to be addressed, and a prediction of future stream response to the proposed treatment.

Alternative treatment options should be considered that are based on suitability of the site, an analysis of bank and/or bed stability, and be consistent with an appropriate bank and/or bed stabilization techniques. For stream bank stabilization projects, the applicant shall first consider vegetative treatments. Problems that cannot be controlled by vegetative treatments alone should consider a combination of structural treatments and vegetative treatments. No stream stabilization should be implemented until it has been determined that the hydrologic condition of the contributing watershed is stable or actively being stabilized.

Geomorphic assessments for proposed changes in channel alignment, or channel geometry, shall include the stream reaches upstream and downstream of the project area. Channel width-to-depth ratios, stream bed slope, meander pattern, and other bed features of the proposed channel designs, shall be modeled according to a stable reference reach. Reference reaches are nearby, hydrologically and geomorphically stable stream segments. A reference reach could be upstream or downstream of the project area, or in a nearby watershed. Assessment of the current and future discharge and sediment regimes shall be based on conditions in the watershed above the proposed channel alignment, as close as possible to the project reach.