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DEVELOPMENT OF STABLE OPEN CHANNEL DESIGN CRITERIA

Restoring Our Rivers

CORE QUESTION

By bringing together stakeholders from public, private and non-governmental sectors, can the principles of multi-stage open channel design — a more resilient, natural approach to drainage — be successfully integrated into existing county drain programs and policies?

INTEGRATED ASSESSMENT

OVERVIEW

The conventional trapezoidal drain is the main type of drainage ditch in use throughout Michigan. Trapezoidal drains are highly efficient at providing drainage and moving flood flows, but also have a high risk of failure, require more maintenance and contribute to several other problems related to water quality.

For example, traditional trapezoidal channels can result in:

- Bank erosion and build up of sediment
- Reduction in property values, if not maintained properly
- Degraded habitat
- Warmer water temperatures, increased turbidity (cloudiness) and lower oxygen levels
- More pollutants moving downstream because they do not assimilate pollutants naturally like a stream does

Channel design that mimics self-sustaining, natural systems has been shown to improve long-term drain stability and water quality. The integrated assessment will focus on the Middle Branch and North Branch of the Clinton River in Macomb County. Macomb County has already developed the first open channel design criteria in Michigan which incorporates a multi-staged design approach, more closely resembling a natural system.

Current discussions at the state level to promote multi-stage channels have been controversial. The Michigan Department of Natural Resources and the Department of Environmental Quality could justify a change in drainage practices due to nonpoint source pollution, wetland and habitat losses, and impacts to the Great Lakes fisheries.

However, the Farm Bureau does not support giving up the right-of-way width that may be required with this kind of design, particularly in prime agricultural areas where it could take away growing space — among other issues. As elected officials, county drain commissioners are often caught between the two.

WHAT IS INTEGRATED ASSESSMENT?

Rather than running additional experiments, an integrated assessment research team summarizes what is known and offers an assessment of how the science could be interpreted and used. Researchers work closely with stakeholders to get to results that are current, trusted, accessible and useful.

There is a learning curve for the multi-stage channels; the technical expertise needed to design and execute them is often lacking and public awareness of the issue is limited. By working with a broad group of stakeholders, multi-stage open channel design that minimizes long-term maintenance costs and improves channel stability and water quality can be better understood and more effectively implemented.

PROJECT DESCRIPTION

The research team will develop design guidelines, create practical tools and build partnerships to help people better address county drain design. Researchers will work closely with stakeholders to examine the issue from many perspectives, identify challenges and evaluate feasible solutions. By soliciting stakeholder input, the tools will be understood and as practical as possible. All guidance and tools developed will be accessible online.

The research team will evaluate other options for channel design that may be more appropriate for local soil, geologic and hydrologic conditions. The team will also compile and summarize the relevant data and studies of existing two-stage channels, including a cost-benefit analysis of conventional and more natural ditch designs.

EXPECTED OUTCOMES

At the end of the project, the research team will provide a technical basis for adopting sustainable channel design criteria. The team will create a set of tools based on stakeholder input such as review guidelines and planning checklists specifically for county staff in order to expedite the review process for designs that incorporate best practices.

The outcomes are expected to address three primary goals:

1. Clarify the history, causes and consequences of the issue

The team will compile relevant data, studies and thesis papers on multi-stage channel design to summarize existing guidance, the benefits to stage ditches and the impacts of conventional practices. Linkage will also be provided for management plans for the Clinton River Area of Concern, Lake St. Clair, and Great Lakes connecting channels.

2. Identify and evaluate potential options for addressing the issue

More than one type of channel may be appropriate in certain parts of the county based on geology, soils, vegetation class and hydrology. The answer may be to mimic natural channel processes, but those channel types need to be defined and communicated to stakeholders.

3. Develop information and tools that can guide decision-making

Stakeholder involvement will be important to determine the necessary types of tools – hydraulic curves, model inputs, checklists and spreadsheets that are most practical and user-friendly. Similarly, the county plan reviewers will need to take ownership of their standards and be comfortable reviewing drain improvement plans in a variety of project types and scales.

The general application of the multi-stage channel design criteria, its benefits and how the relationships of hydraulic, sediment and geomorphic characteristics are developed will be applicable throughout Michigan and the Great Lakes basin.

GET INVOLVED

Stakeholder input will be important for successful project implementation. Local engineers can provide input on the development of tools to design and review self-sustaining drainage systems. State support will be important for ensuring that the results are transferrable to other counties.

At a minimum, stakeholder involvement will include the following:

- Meetings every 4-6 weeks with Macomb County engineers to ensure local buy-in and address any possible local barriers.
- Once design criteria have been developed, a local training will be held for the engineers of the Macomb County Public Works Office.
- The Team will hold quarterly stakeholder meetings/conference calls and solicit technical input through a discussion forum on the project website.
- Meetings for the public.

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