

Enhanced implementation of Best Management Practices along the Southeast
Shore of Lake Huron: A summary of Ontario Ministry of Agriculture Food and Rural
Affairs Canada Ontario Agreement for Healthy Lake Huron (2021)

A report to the Ontario Ministry of Agriculture, Food and Rural Affairs to support efforts of the Healthy
Lake Huron Initiative and Canada-Ontario Agreement on Great Lakes Water Quality and Ecosystem
Health (COA)

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Introduction

The addition of nutrients, particularly phosphorus, can severely impact aquatic ecosystems by stimulating the growth of algae, a process referred to as eutrophication. Phosphorus is found in soil and water in either a particulate form, where it binds closely to soil particles, or a soluble form, which is a form most readily available to algae. Erosion from rainfall and flooding events has the potential to move soil from agricultural fields to nearby streams or larger bodies of water. This movement of soil carries sediment bound and soluble phosphorus.

Funding to the five conservation authorities along the southeast shore of Lake Huron in 2021 helped to reduce nutrient (particularly phosphorus) loading and improve water quality in the Great Lakes Basin. Improved water quality is a key objective of the:

- 1) Bi-national Great Lakes Water Quality Agreement (updated in 2012),
- 2) Recommendations from the International Joint Commission (IJC's 16th Biennial Report, 2013), and
- 3) Commitments under the Canada-Ontario Lake Erie Action Plan and Made-in-Ontario Environment Plan.

Specifically, in 2021, the Healthy Lake Huron (HLH) Technical Team comprised of technical staff from the conservation authorities (Grey Sauble; Saugeen Valley; Maitland Valley; Ausable Bayfield; and St. Clair Region) coordinated mapping and reporting projects that included:

- 1) A watershed characterization report for the Eighteen Mile Creek, within the jurisdiction of the Maitland Valley Conservation Authority,
- 2) A watershed characterization report with a focus on agricultural practices in the Grey Sauble Conservation Authority area,
- 3) Documenting erosion potential and summarizing drain maintenance activities from 2016 to 2021 across the south east shores area, and
- 4) An implementation strategy to enhance the uptake of best management practices (BMPs) related to reducing erosion and improving important municipal drain infrastructure.

For more information about the Healthy Lake Huron program please see Appendix A.

The purpose of this report is to provide a summary of the findings of the mapping and reporting and to document the implementation efforts that support increased adoption of BMPs. Kroger et al. (2012) outlined a framework (Appendix B) that puts nutrient and sediment originating from the landscape into BMPs that can be categorized in three tiers – Avoid, Control, Trap and Treat (ACTTions). First-tier practices avoid the introduction of nutrients and sediment into the aquatic system and additional tiers control their distribution. The first tier, input management (e.g., nutrient management, perennial cover), **avoids** the introduction of the pollutant. The second

tier **controls** the movement of the pollutant through field management (e.g., conservation tillage). A third management strategy is to **treat or trap** the pollutant in primary aquatic systems (e.g., swales, grassed waterways, and water and sediment control basins). Staff from conservation authorities and other local and more regional agencies encourage the uptake of a suite of BMPs in the rural and agricultural environment to reduce erosion and resultant downstream eutrophication.

Mapping

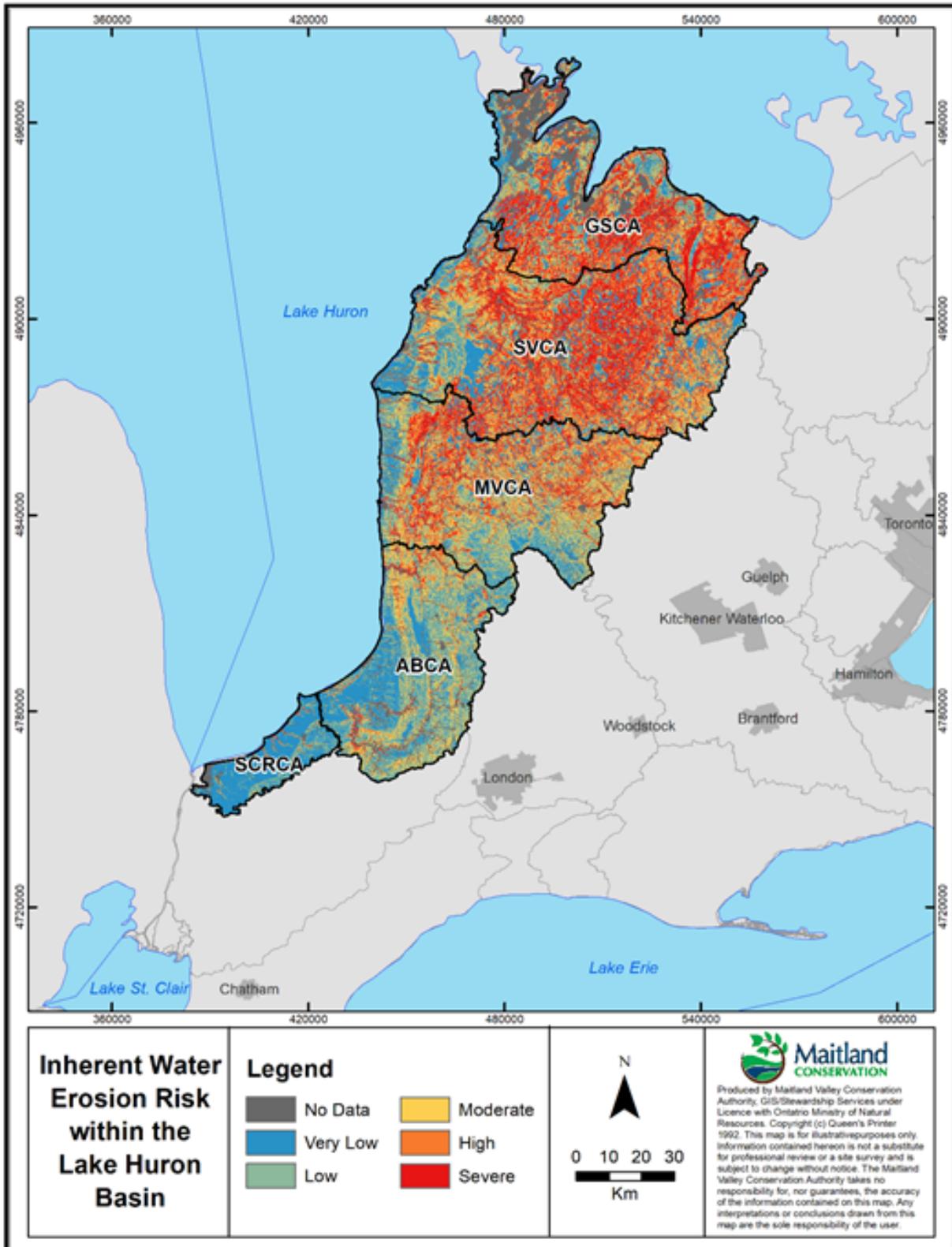
Maps help communicate information. At the outset of the project, the HLH Technical Team prioritized a list of factors that potentially influence water quality including:

- Erosion potential,
- Municipal Drain best management practices,
- Cropping practices, in particular tillage, crop rotations, cover crop adoption,
- Riparian buffer,
- Stakeholders,
- Past best management projects,
- Field size,
- Field conversion from pasture to cropland,
- Rural stormwater infrastructure, and
- Tile drained fields.

Technical staff from the conservation authority rated the factors as a one, two or three category. Category one meant that the staff would map these features even if there was no special funding, category two indicated a priority if funding became available and category three indicated that there was limited interest.

The exercise prioritized the importance of understanding erosion potential on a broader scale. A better understanding of projects permitted under the Municipal Drain Maintenance Review program at the different conservation authorities was also deemed a priority and is subsequently included in this report.

Mapping erosion potential (see Hopkins, 2021 for erosion potential mapping methodologies) at the scale of the Lake Huron basin has provided an important perspective. There is a south to north gradient from potentially less to more erodible landscapes (Figure 1). There is a recognition that more erodible lands in the north, combined with economic pressure to develop these areas for crop production will have potential for considerable soil erosion and resultant decline in water quality conditions in Lake Huron.



The shared perspective that this map provides, underscores the importance of the multi-scale, collaborative approach that the Healthy Lake Huron partnership has enabled since 2012. Variability in topography and management systems and the lack of decision-making framework available for a Great Lake watershed scale, means that ‘the greater us’ does not manage erosion and water quality at the lake level. Landowners and producers, with support from numerous agricultural and conservation organizations, have been managing soil and water at the field scale for decades. Establishing and maintaining robust relationships with landowners and producers will help ‘the greater us’ to continue to understand how field-level decisions determine overall soil health and water quality of inland subwatersheds and Lake Huron as a whole.

At the intermediate scales of the watershed, municipality or government agency, it is important that support staff can ‘zoom in and out’ from the Great Lakes, watershed and farm scale to mitigate erosion. The agricultural industry is dynamic; it is not the role of any agency to change a trajectory, but to support best practices that farmers want to take. Best practices taken in the southern south regions are not necessarily the same best practices that would be recommended in the north.

As discussed in Hopkins (2021), long-established targets (Wall et al. 1997) regarding land use and land management on erodible lands were used to evaluate the degree to which existing land activities conformed to existing best practices. There was some concern that the conversion to cropland in the northern watersheds might compromise the more vulnerable landscapes. Although the land use is shifting in the north, as documented in the Grey Sauble Watershed Characterization Report (Fry and Reid, 2021), the mapping analyses showed that, for the most part, the severely eroded land remains in more perennial systems. A second consideration is that the survey beef producers, showed that there is a diversified age range of producers. There seemed to be many young producers maintaining small beef operations with hay/pasture systems. More detailed spatial analyses over time will be required to determine if land conversion from perennial to annual cropping systems is occurring in more vulnerable landscapes.

Municipal Drain Maintenance

Technical staff, from HLH, collectively reviewed 435 Municipal Drain files. We found that the most prevalent activity under drain maintenance was drain cleanouts. We acknowledged that there are geo-spatial (see Figure 2) and social-economic reasons for the differences in the number of cleanouts and the number of best management practices employed during drain maintenance activities, across this region. We consulted with some local Municipal Drainage Superintendents and determined that, in some areas, 40 % of municipal drain cleanouts occur with some enhanced practices to maintain habitat:

- maintaining natural features like riffles/pools, meanders and vegetation (over and above),
- conducting spot cleanouts,
- installing sediment traps, and
- installing a two-stage ditch or narrow channel.

While establishing an objective for best practices, such as 50% of cleanouts, might incorporate practices that maintain habitat, is possible, further understanding and dialogue with Municipal Drainage Superintendents would enable a more comprehensive Municipal Drain management program. Further research that demonstrates the long-term (> 10 year) effectiveness of the best practices would promote other Municipal Drainage Superintendents to incorporate more BMPs.

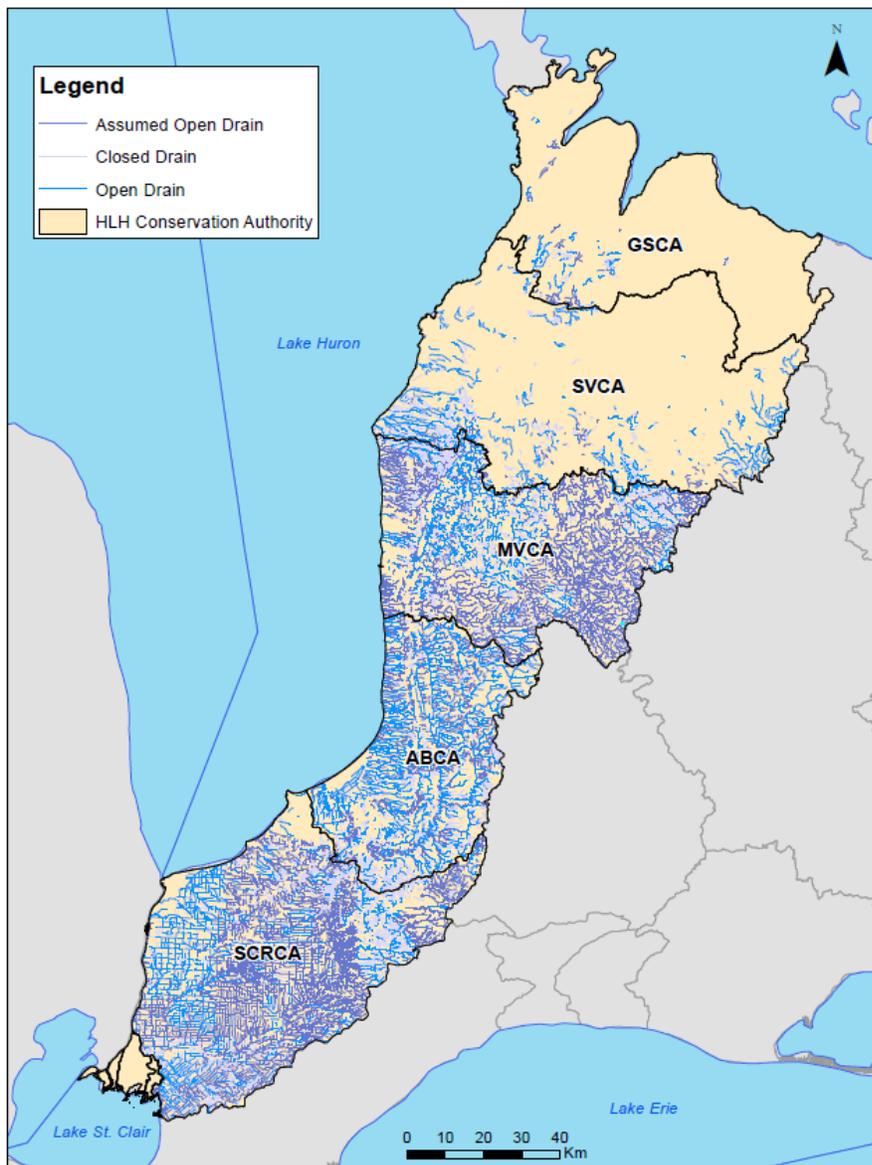


Figure 1: Municipal Drains in the Healthy Lake Huron Watershed

Strategies for Enhanced Implementation of Best Management Practices

Watershed mapping and characterization efforts along with discussions with local producers helped the HLH Technical Team to develop the following recommendations:

1) **Perennial or permanent cover agro-ecosystems are the preferred option in the highly erodible landscapes.**

The Healthy Lake Huron Technical Team recognized that it was beyond the role of an agency or an individual producer to ensure the maintenance of these perennial systems. Through discussions conducted by Grey Sauble with their agricultural producers, there is ongoing discussion that a 'pay for perennial systems' would encourage more hay/pasture systems in the landscape.

2) **Make smaller watershed or farm-scale maps of erosion potential.**

Erosion Risk Potential Mapping has been done for some of the priority watershed areas. It will be completed for other areas as conservation authorities continue to work with their local communities. Furthermore, the St. Clair Region plans to develop this mapping for the Sydenham watershed, in the Lake Erie Drainage Basin. The stewardship staff at the St. Clair Region will also use the maps that show erosion potential during future stewardship site visits.

We understand that a mapping tool for erosion potential may be available for producers and others <http://www.omafra.gov.on.ca/english/landuse/gis/portal.htm> and is currently not being fully utilized. Are there opportunities to make these tools more helpful? For instance, is there an opportunity to develop linkages between drainage and erosion potential? Perhaps the significance of erosion potential is not realized until it is viewed at larger scales, such as Figure 1, and with that perspective, there might be more recognition about the importance of individual practices to address erosion.

3) **Better integrate agricultural 'influencers' in Healthy Lake Huron**

Although comprised of members with an agricultural background, the Healthy Lake Huron Technical Team recognized that Healthy Lake Huron would benefit from having more agricultural partners and network as a part of the process. For instance, the 2021 process would benefit from having an agricultural steering committee to guide the mapping priorities, to have the learnings from the mapping and the report analyses recommend the next steps. In 2022, the Saugeen Valley and Grey Sauble Conservation Authorities plan to develop Agricultural Working committees as a part of their Board of Director development.

Best management practice ‘targets’ or objectives would potentially have better reception with more agricultural participation in the development of said objectives. During the presentation of some of the OMAFRA COA work to Healthy Lake Huron stakeholders on December 9, 2021 the Technical Team noted that there were few agricultural people in the audience. The conservation authorities find it challenging to leverage long-term producer relationships for short-term projects. However, technical staff recognize the ability to engage producers would benefit a longer-term commitment to the Healthy Lake Huron concept. In particular, the Healthy Lake Huron Technical Team would like more agricultural industry guidance on the following:

- A. A shared understanding on water quality drivers with a recognition of the importance of inherent erosion potential characteristics,
- B. Continued understanding of potential linkages between municipal drain maintenance requirements and erosion potential of surrounding lands, and
- C. Developing a watershed ‘grading’ system that could be more reflective of land management actions

The conservation authorities along the southeast shore of Lake Huron would like to have more capacity to highlight existing best practices, with respect to the Municipal Drain process by

- i) Networking with drainage superintendents/engineers and Land Improvement Contractors,
- ii) Developing more demonstration projects across the Lake Huron basin,
- iii) Preparing case studies, and
- iv) Continuing to present at conferences or prepare articles for farm magazines/papers.

Specific work plan initiatives for the Healthy Lake Huron Team are outlined in Appendix B.

Summary

The mapping and analyses completed in 2021 for smaller watersheds and erosion potential and the Municipal Drain review provided a landscape perspective on important management decisions that are typically made at a field scale. These analyses helped to:

- 1) Illustrate the variability in landscapes and land use across the Lake Huron watershed, and
- 2) Identify areas where further best management practice implementation is recommended.

Findings from the review of the incorporation of drain maintenance best practices and erosion potential suggest that a better understanding of how inherent topography and soil conditions might influence drain maintenance is an area for further study. Lessons learned in the south can help to promote best practices, particularly around Municipal Drainage infrastructure, as agricultural development occurs in the north.

The Healthy Lake Huron Technical Team understands that a focus of Healthy Lake Huron to date has been the ongoing efforts to improve water quality. One of the most significant findings from the priority watershed studies conducted, since at least 2012, is that to improve water quality we needed to reduce the flow. Increased flow in downstream channels erodes channel banks and contributes to increased sediment delivery and reduced water quality. Measures that reduce water flow in upstream landscapes are considered a system of Avoid, Control, Trap and Treat (ACTTions) practices (Appendix B). The Healthy Lake Huron Technical Team would like to acknowledge that the urban, rural, and agricultural best practices that are recommended to improve downstream water quality also provide a suite of nature-based services:

- Improved soil health for agricultural production,
- Downstream flood and erosion management,
- Resilient biodiversity and habitats, and
- Greater ability for watersheds to adapt to the impacts of climate change and development.

References

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Appendix A: Background – Healthy Lake Huron

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Since 2011 the Healthy Lake Huron – Clean Water, Clean Beaches partnership has coordinated actions to protect and improve overall water quality along the southeast shores of Lake Huron.

Water quality concerns along the Lake Huron shoreline have been ongoing for many years. This situation is caused by a combination of nutrient and bacterial pollution from sources such as poorly functioning private septic systems, municipal wastewater, runoff from farm fields and other rural and urban properties, and natural sources such as waterfowl. Canada and Ontario, in partnership with local municipal governments, local public health, conservation authorities, and other local organizations, are working to develop and implement recommendations for actions to deal with these concerns.

In 2021, with funding from the Ontario Ministry of Agriculture, Food and Rural Affairs, Healthy Lake Huron made progress towards several Canada Ontario Agreement (COA) commitments under the Nutrient Annex, including:

- Enhanced information on land use, soil and management practices relevant to excess phosphorus in the Great Lakes, with specific emphasis on Lake Huron.
- Developed and implemented programs and tools for the agri-food sector to raise awareness and increase adoption of environmental farm planning and best management practices by providing education, technical advice, and funding.
- Provided the opportunity to establish a baseline of agricultural/environmental high-risk areas or create a system of evaluating progress towards adoption of best management practices.

The purpose of the Canada-Ontario Agreement on Great Lakes Water Quality and Ecosystem Health (COA) is to restore, protect and conserve Great Lakes water quality and ecosystem health. The Nutrients Annex under COA proposes an integrated approach to address the issue of excess nutrients and reduce harmful and nuisance algal blooms.

Appendix B: A Suite of Avoid, Control, Trap and Treat Practices

Best Management Practices (BMPs)

Rural ACTions

- Buffers
- Two-stage ditches

- Grassed waterways
- Berms

- Minimum/No-till
- Cover crops

Urban ACTions

- Stormwater ponds

- Rain gardens
- Rain barrels

- Less pavement
- Natural cover



Appendix C: 2022 Work Plan Initiatives

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	Initiative
SCRCA	<ul style="list-style-type: none"> - Share the erosion potential mapping with farmers - Use erosion mapping in phosphorus management plan - Add erosion mapping to GIS system for use in project planning - Promote erosion potential maps for stewardship and permitting, including Municipal Drain site visits, where and when possible - On social media, focus on promoting local champions and BMPs - Continue to work collaboratively with HLH CAs to demonstrate the HLH team can be the delivery agent of LH stewardship programs
ABCA	<ul style="list-style-type: none"> - Involve local agricultural community in Watershed Report Card and understanding differences in watershed report cards and water quality studies - Continue to promote erosion potential maps for stewardship and permitting, including Municipal Drain site visits - Work to better understand barriers to adoption for cover crops - Compare cover crops in Bayfield Watershed with other ABCA watersheds - Better support people to maintain woodlots - In communications, including social media, promote landowner champions - Continue to collaborate on HLH programs with conservation authorities and other rural partners
MVCA	<ul style="list-style-type: none"> - Continue efforts in the Eighteen Mile, and expand HLH efforts to all near shore tributaries - Focus on promoting Cover Crops, Erosion Control and Restoration - Network with local influencers and experts to promote HLH messaging and lessons from erosion mapping - Build on mapping project by mapping other potential drivers of water quality and analyze historical water quality data - Share water quality data with partners - On social media focus on promoting local champions and BMPs - Work to develop more effective environmental programs in the HLH basin
SVCA	<ul style="list-style-type: none"> - Re-build agricultural committee - Focus on building relationships
GSCA	<ul style="list-style-type: none"> - Continue to work with and build relationships with agricultural community through agricultural advisory board - Present previous work of HLH to advisory board - Focus on incorporating drain BMPs and lessons learned in south early in the drain process in GSCA as land changes from livestock to cropping - Share Watershed Report Card with farmers

	Initiative
All	<ul style="list-style-type: none">- Create a 'canned' presentation on HLH to present to partners, advisory committees- Take erosion potential mapping to Conservation Ontario Watershed Report Card committee for inclusion in the WRC- Involve farmers at the beginning of any new projects to brainstorm and ensure findings will be useful and relevant to farmers- Continue to use the Lake Huron-Georgian Bay Community Action Framework to guide work<ul style="list-style-type: none">o Educationo Community Involvemento Take Actiono Evaluate- Continue to post Healthy Lake Huron social media content (i.e., agriculture and food, water, and community initiatives)- Meet quarterly in 2022