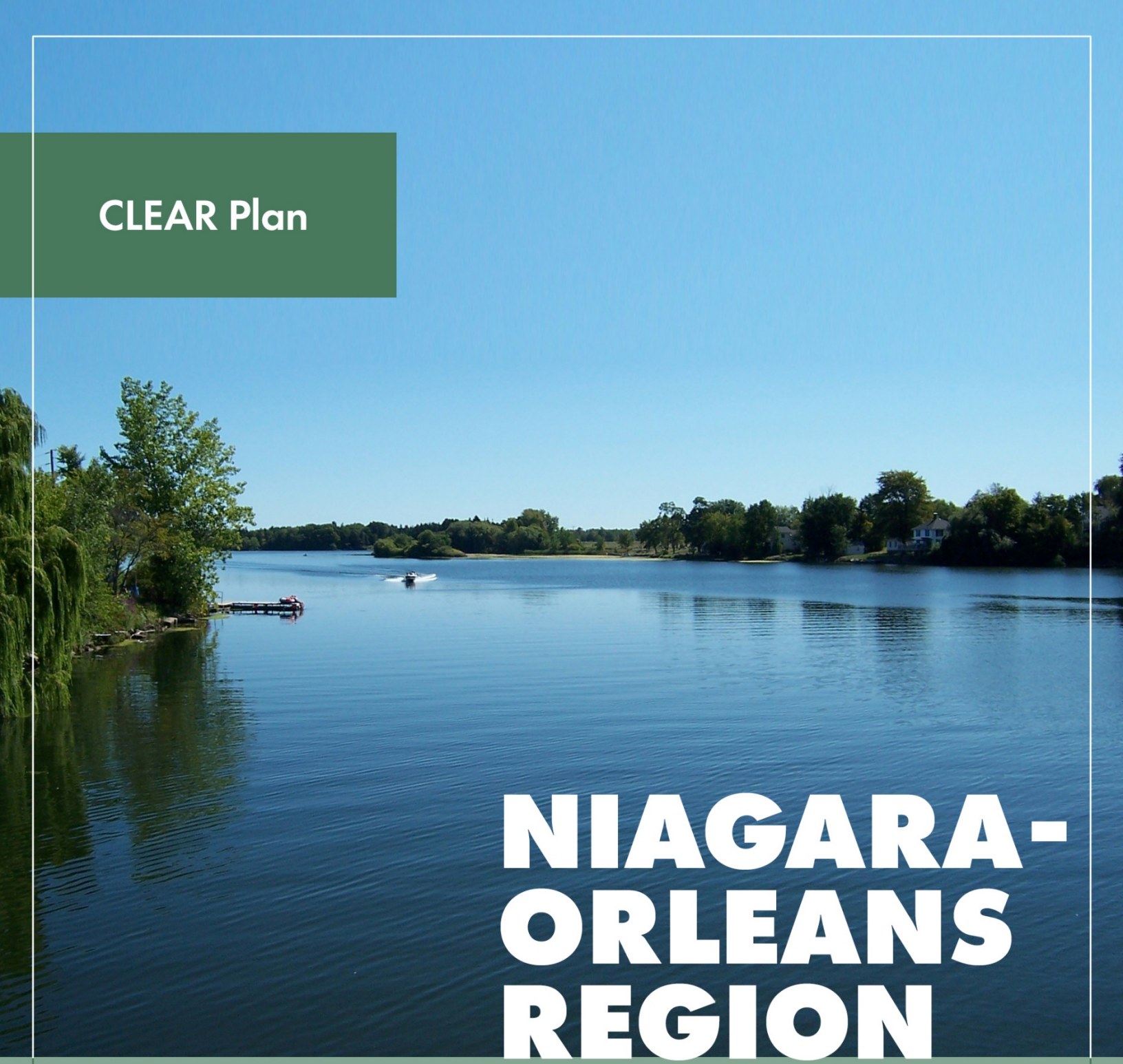
CLEAR Plan



NIAGARA-ORLEANS REGION

Coastal Lakeshore Economy and Resiliency (CLEAR) Initiative

December 2021

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Niagara-Orleans Region

01

Acknowledgements

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1.0 ACKNOWLEDGEMENTS

New York State has led several economic recovery and resilience efforts to assist municipalities and others in addressing the immediate impacts of disaster events as well as helping with longer-term resiliency planning along the Lake Ontario shoreline. The New York State Department of State (NYSDOS) is leading this Coastal Lakeshore Economy and Resiliency (CLEAR) Initiative with the primary purpose of developing strategic plans for shoreline counties such as Niagara and Orleans to reduce future losses and enhance long-term resiliency to changing lake conditions. The CLEAR initiative was paid for using funds from the New York State Environmental Protection fund in partnership with the NYSDOS and Empire State Development (ESD).

The Niagara-Orleans CLEAR initiative was led by a diverse group of partners to support capacity building and foster both horizontal and vertical collaboration. These partners included:

CLEAR partners and the Ramboll-Elan consultant team working collaboratively with the Steering Committee throughout the CLEAR planning process. Guidance from Steering Committee members helped to create an innovative, yet feasible CLEAR Plan grounded in evidence-based scenario planning and inspired by the vision and assets of the local community. The Steering Committee also advised on the most appropriate approach toward community engagement for Niagara and Orleans Counties and took an active role in public outreach. Outreach served the dual purpose of informing and learning from the public. Providing multiple opportunities for public input was particularly important while pandemic-related restrictions were in place that limited opportunities for public gatherings and in-person events.

Niagara and Orleans Counties Steering Committee Members	
James Bensley, *Director*	Orleans County Planning Department
James Bragg, *Planner II*	City of Niagara Falls
Steve Broderick, *Supervisor*	Town of Lewiston
Michael Casale, *Commissioner*	Niagara County Center for Economic Development
Eric Cooper, *Director of Planning*	City of Niagara Falls
Jeffrey Dewart, *Supervisor*	Town of Somerset
Kerrie Gallo, *Deputy Executive Director*	Buffalo Niagara Waterkeeper
Jason Haremza, *Senior Planner*	Genesee/Finger Lakes Regional Planning Council (G/FLRPC)
Amanda Henning, *Agricultural Specialist*	Cornell Cooperative Extension of Niagara Co. Farm & Home Center
Timothy Horanburg, *Supervisor*	Town of Newfane
John "Duffy" Johnson, *Supervisor*	Town of Porter
Jerome Nagy, *Chief Executive Officer*	Neighbor Works Community Partners Niagara Falls
Bruce Newell, *Town Board*	Town of Kendall
Emily Royce, *Planner*	Genesee/Finger Lakes Regional Planning Council (G/FLRPC)
Mark Seider, *District Engineer*	Niagara County Soil and Water Conservation District (SWCD)
Katie Sommerfeldt, *Manager*	Orleans County Soil & Water Conservation District (SWCD)
Richard Sutherland, *Planner*	Genesee/Finger Lakes Regional Planning Council (G/FLRPC)
Other Organizations Invited to Participate	
Olcott Yacht Club	
Orleans County Chamber of Commerce	
Town of Wilson	
Partners	
New York State Department of State (NYSDOS)	
New York State Department of Environmental Conservation (NYSDEC)	
New York State Office of Parks, Recreation and Historic Preservation (NYSOPRHP)	
New York Sea Grant (NYSG)	

CLEAR Plan prepared by:

RAMBOLL Bright ideas. Sustainable change.

ELAN Planning & Design LLC Certified NYS WBE

CLEAR Plan
Niagara-Orleans Region

02

Executive Summary

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2.0 EXECUTIVE SUMMARY

2.1 Overview

Shoreline communities on Lake Ontario, the lower Niagara River, and the upper St. Lawrence River are being impacted by changing lake conditions including historic high- and low-water events, flooding, and erosion. These events have resulted in significant losses for the regional economy including damage to homes, businesses, local infrastructure systems, and natural resources in Niagara and Orleans Counties.

The NYSDOS CLEAR Initiative aims to help shoreline communities reduce future losses through the development of strategic plans to enhance long-term resiliency.

The Niagara-Orleans Region CLEAR Plan (the Plan) identifies potential actions local governments, organizations, and leaders can take to protect their communities and create new, more resilient pathways for growth. Included is a summary of the community-driven process that supported the development of the Plan with a description of the region, community risks and assets, and the community vision. The Plan is intended to serve as a guidebook with ideas and resources that local decision-makers can explore and utilize to build stronger and more resilient communities.

CLEAR Plans were also developed for Monroe County, Wayne County, Cayuga and Oswego Counties, and Jefferson and St. Lawrence Counties and may be used to coordinate resilience actions across regions. A similar methodology was utilized in each region, and a shared set of goals for the initiative are shown on the following page.

Resiliency Planning – CLEAR Process Steps

01 Establish a participatory planning process	• Form local steering committee • Enlist supporting partners • Create public engagement plan and schedule
02 Understand the community context	• Inventory existing conditions • Collect hazard data (risk map) • Inventory community assets
03 Conduct a risk assessment and consider:	• Hazard magnitude and probability • Asset exposure and vulnerability • Social vulnerability and community priorities
04 Define resilience goals	• Identify needs and opportunities • Create a resilience vision statement • Develop resilience scenario statements
05 Detail resilience actions	• Develop resilience strategies • Describe recommended actions • Identify potential demonstration projects
06 Support implementation	• Complete an implementation matrix

CLEAR INITIATIVE GOALS

01 Provide guidance for vibrant communities to thrive in changing and variable lake levels and conditions

02 Connect the coastal communities through resilient innovative strategies and adaptive uses

03 Develop and implement resilience strategies for shoreline property owners and managers

04 Create coastal development pattern goals that provide continued opportunities for existing and new recreation and employment

05 Bring together local governments, organizations, and leaders who are empowered to protect their communities and create new, more resilient paths for community growth

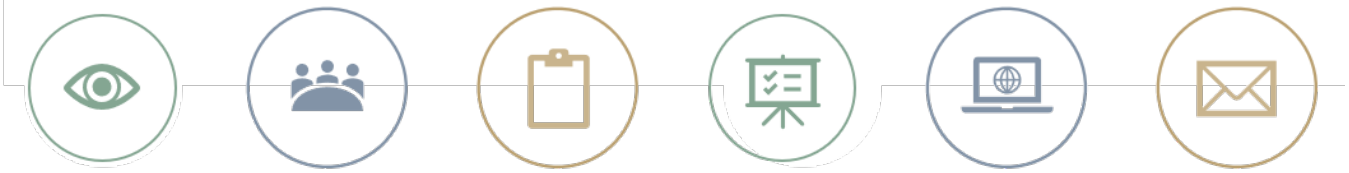
2.2 Community Engagement

The Plan was developed through a participatory process guided by a Steering Committee comprised of municipal elected officials, regional organizations, and community leaders.

The committee was supported by CLEAR partners from relevant state agencies, institutions, and non-profits in the region, and a consultant team who facilitated the process.

Community input was collected throughout the Plan development including on existing conditions, community assets and risks, local needs and opportunities, the CLEAR vision, and potential resilience actions. Public outreach was guided by a public engagement plan developed in partnership with the Steering Committee to reach a broad regional audience. A variety of innovative remote forums were used to engage the community during the pandemic.

Community Engagement Activities



1 "Look and Listen" tour of community assets with the Steering Committee

7 Steering Committee meetings to develop the CLEAR Plan

1 public survey on observed impacts, vulnerabilities, and key community assets

3 interactive public webinars with live discussion and polling

1 stop shop website for information, comments, event links, and recordings

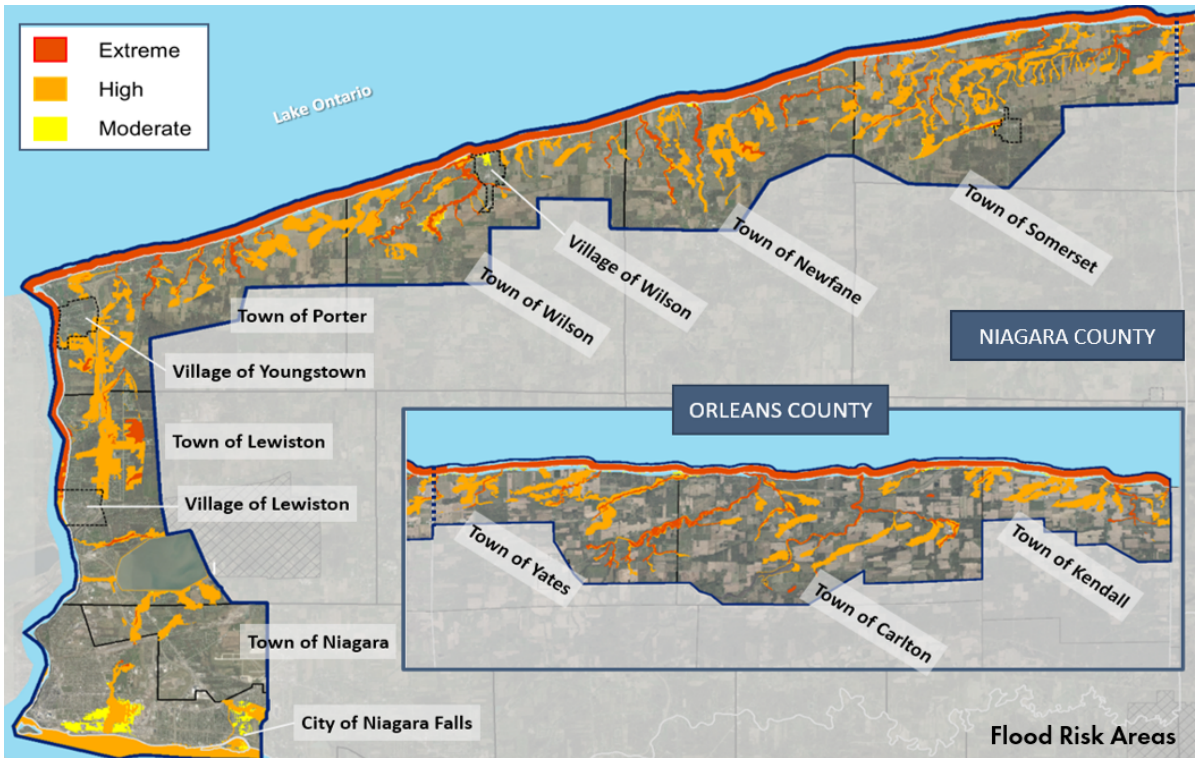
101 subscribers to the CLEAR mailing list

2.3 Summary of Regional Conditions

The Niagara-Orleans CLEAR study area encompasses areas of the Lake Ontario and lower Niagara River shorelines considered to have a moderate, high, or extreme level of flood risk based on their location in relation to coastal and inland flood zones. Moderate flood risk areas are defined as two feet (2 ft) above the Federal Emergency Management Agency (FEMA) base flood elevation; high risk areas are at the FEMA base flood elevation; and extreme risk areas are two feet (2 ft) above the long-term average lake level for Lake Ontario.

There are 13 municipalities located completely or partially within the study area that are included in the Plan: City of Niagara Falls, Town of Niagara, Town and Village of Lewiston, Village of Youngstown, Town of Porter, Town and Village of Wilson, Town of Newfane, Town of Somerset, Town of Yates, Town of Carlton, and Town of Kendall. The study area includes 69 miles of Lake Ontario and Niagara River shoreline, 148 square miles of land area, and 17 square miles of lake area.

The Niagara-Orleans CLEAR region consists largely of rural waterfront areas with a mix of seasonal and year-round homes plus the urban center of Niagara Falls. Land use is dominated by residential and agricultural uses which contribute to the year-round tax base. A diversity of natural, recreational, and waterfront resources including parks and marinas make the area a destination for visitors and residents alike, especially in the summer months. The tourism sector is a significant employer in the region, making it essential to the region's livelihood, reputation, and income base. Many tourist destinations and businesses are located directly on the shoreline, in the extreme flood risk area. As such, economic activity in the Niagara-Orleans region is closely tied to Lake Ontario water levels.[1]



Source: NYSDOS

[1] Niagara Communities 2030 Comprehensive Plan. 2009. Niagara County, New York. And Orleans County Tourism. (n.d.). *Events. Recreation and Leisure.*

Long-term resiliency planning is critically needed to enable the Niagara-Orleans region to thrive under changing lake conditions. Over the years, development patterns along the Lake not only increased density but also installed infrastructure for year-round use (e.g., primary residences) in vulnerable areas. Communities are especially at risk of flooding for prolonged periods of time, stretching public resources and affecting local economies, with sustained winds exacerbating the flood risk and shoreline erosion. Socially vulnerable populations in the City of Niagara Falls, Town of Niagara, and the Town of Yates are especially at risk.

As climate science and regional projections for future long-term trends continue to evolve, the variability is expected to include increased seasonal precipitation and changes in ice cover that could heighten periods of high water and low water moving forward.

Between 1960 (when regulation of lake levels began) and 2014, Niagara County has experienced approximately 40 flood events, and Orleans County has experienced approximately 30 flood events.[2] In recent years, shoreline communities have experienced fluctuating lake levels including high water events in 2017 and 2019 and low water in 2021. Results of these conditions are shown below.

Fluctuating Lake Level Effects	
Flooding and erosion	Creating the need to develop resilient shoreline protection, infrastructure, and flood protection measures
Water quality degradation and ecological changes	Disrupting ecosystem services that communities rely on for tourism/recreation, food, clean water, fish and wildlife habitats, and shoreline protection, among other things
Property damage and business closures	Emphasizing the importance of resiliency to protect the communities' economy and livability
Decrease in tourism activities and revenue	Impacting on the backbone of the region's economy

2.4 Summary of Regional Risks

The Plan identifies 136 at-risk community assets in the Niagara-Orleans region. Using the NYSDOS Risk Assessment workbook (NYSDOS Risk Tool), an overall risk score was calculated for each asset based on the relative exposure of an asset to flooding, high water, and erosion as well as its capacity to recover after a disaster equivalent to a 100-year storm event (hazard). Assets were then sorted into three risk categories – severe, high, and moderate – according to their scores.

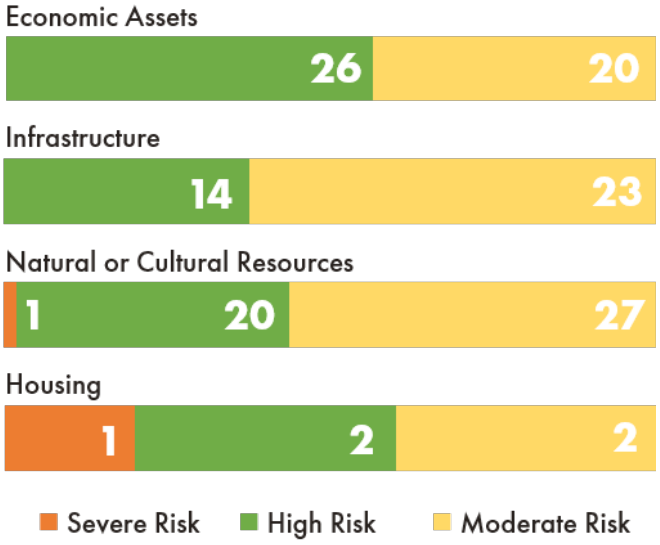
[2] Rosenzweig, C., W. Solecki, A. DeGaetano, M. O'Grady, S. Hassol, P. Grabhorn (Eds.). 2011. Responding to Climate Change in New York State: The ClimAID Integrated Assessment for Effective Climate Change Adaptation. New York State Energy Research and Development Authority (NYSERDA), Albany, New York

The risk assessment also included information on the relative community value of each asset (high, medium, low), whether it served socially vulnerable populations (yes/no), and whether it was considered a critical facility by local or FEMA standards. Consideration of these factors can help communities prioritize the actions they take to reduce risk to various assets.

Key findings from the risk assessment included:

- Assets at **severe risk** are developed shoreline areas in the Towns of Carlton, Kendall, and Yates located in areas with extreme flood risk and a very high rate of lakeshore erosion. The stability of the shoreline is compromised, threatening nearby development.
- There are 62 **high risk** assets distributed throughout the study area, with a higher share in Kendall, Carlton, and Wilson. They are predominately waterfront businesses (23), parks and recreational sites (10), and natural protective features (10). Twenty were ranked as having high community value.
- The 14 infrastructure assets with **high risk** scores include railway infrastructure, municipally owned/operated culverts, bridges (South 86th St.), power plant locations (formerly AES Somerset) and wastewater treatment facilities.

Community Risk Assessment



Risk = Hazard x Exposure x Vulnerability

- 20 assets affect socially vulnerable populations, primarily in Niagara Falls, Carlton, and Yates. Seven of these received **high risk** scores, including access roadways, municipal parks, campgrounds, and public fishing docks.
- 106 assets are considered critical facilities and 63 have high community value.

2.5 Summary of Resilience Goals

The outcomes of the CLEAR risk assessment informed an analysis of the region's top resilience needs and opportunities, listed on the following page, as well as the development of the community's vision for a more resilient future, as shown to the right.

CLEAR Vision Statement

"The Niagara-Orleans region will use a dynamic and multi-pronged approach that includes prevention, mitigation, and adaptation to increase resilience to variable lake levels and climate change. This will be accomplished through partnerships between multiple levels of government, property owners, and community organizations to improve the long-term resilience of communities, infrastructure, and natural ecosystems while enhancing the economy and quality of life for all shoreline users."

TOP 3 NEEDS

- Enhance existing structures and build new to withstand flooding
- Include climate resilience in all regional planning initiatives
- Protect and restore ecosystem services

TOP 5 OPPORTUNITIES

- Prioritize the repair of damaged/degraded infrastructure and proactively relocate key utility and services
- Work with state agencies and environmental organizations to implement resilience-based restoration projects
- Revise local comprehensive plans to include climate-resilience needs and opportunities and revise/create policies
- Work with public and private partners to find ways to reduce carbon emissions that also bolster business
- Improve storm sewers to eliminate flooding to dwellings and water contamination

Mindful of the moderate-, high-, and extreme-risk scenarios, and using both the vision and needs and opportunities statements as a guide, a series of Resilience Scenario statements were created.

These scenarios describe six pathways to enhance long-term resilience in the Niagara-Orleans region. Specific strategies were developed to correspond to each scenario.

Resilience Scenarios and Strategies

Resilience Scenario 1: Protect and restore ecosystem services

Resilience Scenario 2: Enhance existing structures and build new to withstand flooding

Resilience Scenario 3: Include climate resilience in all regional planning initiatives

Resilience Scenario 4: Empower socially vulnerable populations to become resilient

Resilience Scenario 5: Protect critical infrastructure and invest in green infrastructure solutions to coastal hazards

Resilience Scenario 6: Create a sustainable economy built upon resilience practices

2.6 Summary of Resilience Actions

The outcome of the CLEAR planning process is a detailed list of 30 potential resilience actions for the Niagara-Orleans region and is included in the Actions Matrix in Section 11. These suggested actions detail various projects, programs, and planning and policy measures that could be taken to realize the CLEAR Vision.

The list reflects best practices in local resilience building and needs and strategies identified for the Niagara-Orleans region. In line with the vision, the actions include dynamic and multi-pronged approaches to prevent, mitigate, and adapt to shoreline risks. The following is a general synopsis of the types of actions that were developed:

Resilience Actions	
Coordination and Capacity-Building	• Resilience committees and task forces • Regional Resilience Coordinator • Technical assistance for public and private users
Support Programs and Resources	• Regional resilience funding mechanisms • Climate smart communities' program • Incentive programs for resilience measures (public and private)
Nature-Based Adaptation	• Shoreline study • Blue-green infrastructure/natural and nature-based features • Land protection and restoration (e.g., wetlands)
Planning and Policy Techniques	• Update/prepare local laws and zoning to support resiliency • Update/prepare local planning documents with a resilience lens (e.g., comprehensive plans, LWRP, open space plans, cultural resources resilience plan) • Risk assessment of essential systems (e.g., transport, infrastructure)
Public Safety and Equity	• Identify vulnerable populations and needs • Educational outreach to communities • Managed retreat from dangerous areas (if necessary)

Four of these actions were then selected to be profiled in more detail as potential projects and are included in Section 10. These actions were chosen based on their relative feasibility, economic benefit, and innovative approach as well as their ability to serve as a template for actions that could support multiple communities in the region.

The four profiles created include:

- Regional Capacity Building for Resiliency – Regional Resiliency Coordinator
- Regional Resiliency Funding
- Lake Ontario State Parkway – Blue-Green Infrastructure Improvements
- Natural and Nature-based Feature (NNBF) Shoreline Improvements

The potential actions and detailed project profiles detailed in this Plan are intended to provide a curated “menu” of options for local communities and regional agencies/partners seeking to increase their long-term resilience to changing lake conditions. Shoreline communities can adapt each action to meet their needs, integrating the actions into existing plans and processes and/or creating new resilience-focused plans and processes at the local and regional level.

The Plan will provide a useful resource to help shoreline communities in Niagara and Orleans Counties to “improve the long-term resilience of communities, infrastructure, and natural ecosystems while enhancing the economy and quality of life for all shoreline users.”

CLEAR Plan
Niagara-Orleans Region

03

Introduction

3.0 INTRODUCTION

3.1 Coastal Lakeshore Economy and Resiliency (CLEAR) Initiative

In response to changing lake conditions, including the extreme high- and low-water levels experienced over the past decade, NYSDOS is supporting resilience planning efforts in shoreline communities in New York State along Lake Ontario, the lower Niagara River, and upper St. Lawrence River.

The purpose of the CLEAR initiative is to develop strategies to increase long-term resiliency to changing lake conditions including flooding and storm events in shoreline communities.

The initiative has five goals, as outlined below:

CLEAR INITIATIVE GOALS

01 **Provide guidance for vibrant communities to thrive in changing and variable lake levels and conditions**

02 **Connect the coastal communities through resilient innovative strategies and adaptive uses**

03 **Develop and implement resilience strategies for shoreline property owners and managers**

04 **Create coastal development pattern goals that provide continued opportunities for existing and new recreation and employment**

05 **Bring together local governments, organizations, and leaders who are empowered to protect their communities and create new, more resilient paths for community growth**

There are five regions representing the lower Niagara River, Lake Ontario, and St. Lawrence shoreline in the CLEAR Initiative, which include the following:

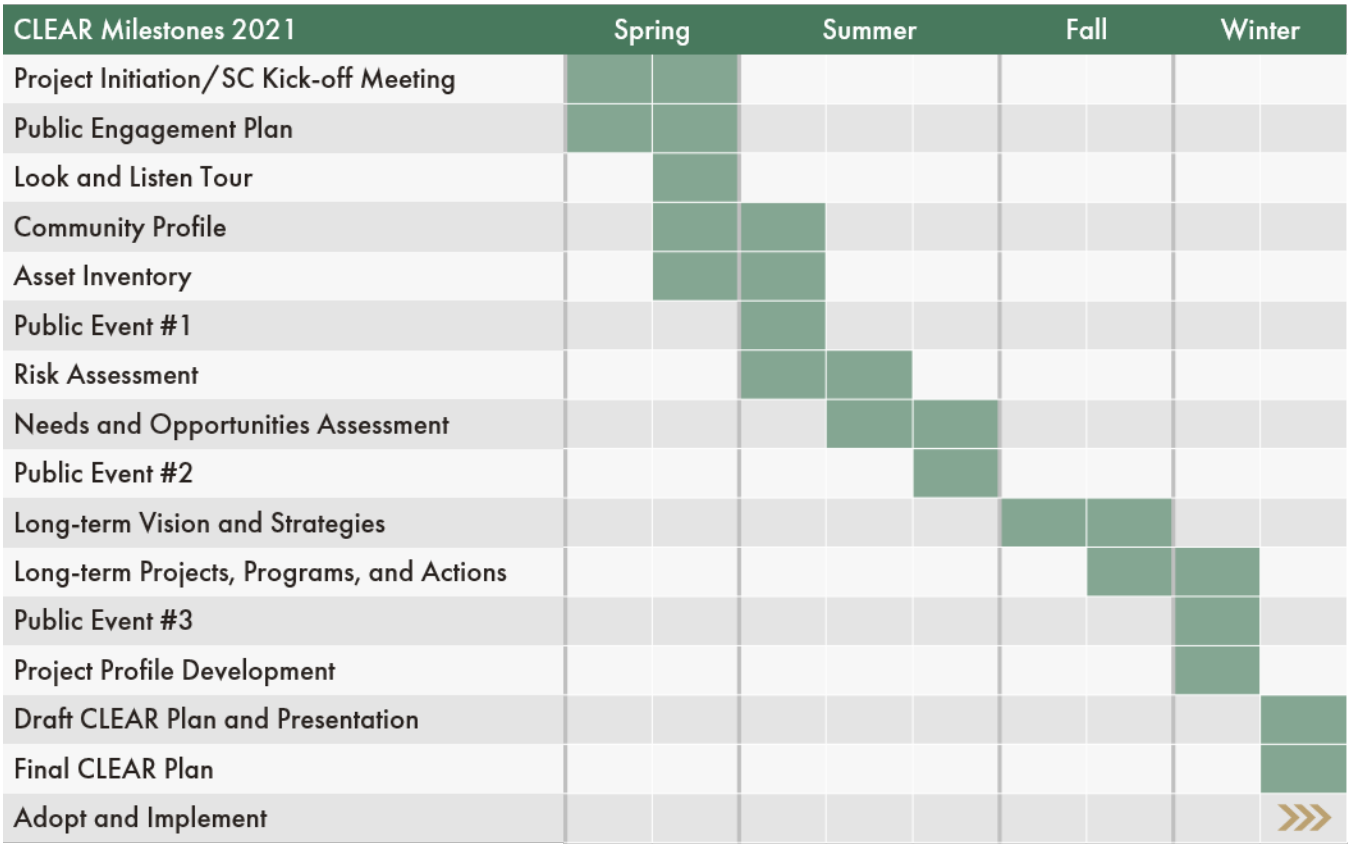
- Niagara and Orleans region
- Monroe region
- Wayne region
- Cayuga and Oswego region
- Jefferson and St. Lawrence region

CLEAR Plans were developed concurrently for each region using a similar methodology so that each region could respond to the specific needs of individual areas while allowing for broader coordination across the shoreline on common issues.

3.2 Niagara-Orleans CLEAR Plan

The Plan provides a regional framework for community leaders to pursue new, more resilient paths for community growth.

The CLEAR planning process kicked off in April 2021 and concluded in December 2021, with milestones illustrated in the following schedule:

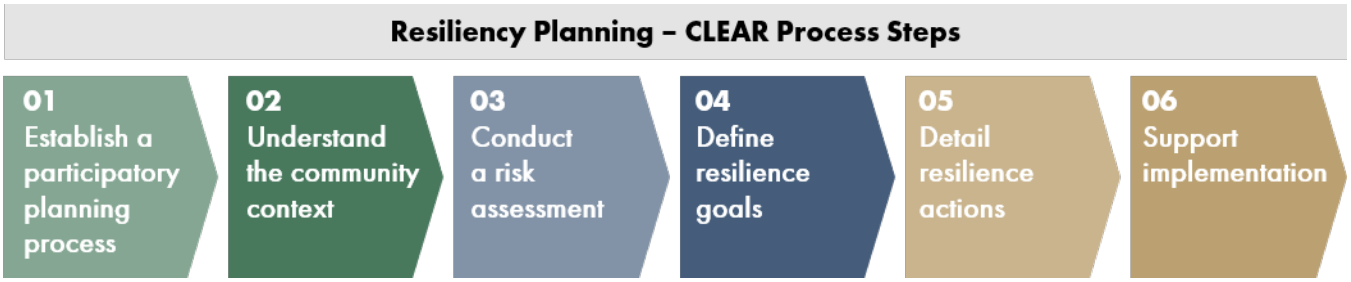


The development of the Plan was guided by a local Steering Committee with the support of New York State agency partners and a consultant team (see Section 1). Community engagement throughout the process helped to ensure that the plan reflects local needs and opportunities and will serve as a useful tool for building local capacity to adapt and thrive in the face of changing lake conditions.

The Plan examines the risks facing local shoreline communities that are disproportionately affected by changing lake levels and flooding, and presents recommendations for local and regional communities to proactively address these risks to mitigate future losses, regardless of the drivers. In developing strategies to increase resiliency and promote future economic growth in lakeshore communities, the Plan considers risks to critical infrastructure, key community assets, and socially vulnerable populations within the study area.

The organization of the Plan follows the steps of the CLEAR planning process. First, there is a description of how the community was engaged throughout the development of the Plan. Second, there is an overview of the community context including socioeconomic conditions, development patterns, community assets, and shoreline hazards. The Plan continues with the outcomes of the risk assessment, including an overview of the assessment methodology. Based on this assessment, the Plan proceeds to outline the resilience goals for the region, which are captured in a list of priority needs and opportunities for the region, the CLEAR vision statement, and six resilience scenario statements. Finally, the Plan includes a list of resilience strategies and potential resilience actions. These are detailed in four profiles and an implementation matrix.

The Plan is intended to serve as a high-level guidebook for resilience planning in the Niagara-Orleans region. The Plan contains ideas and resources that decision-makers can choose to customize and implement with their communities at the local and regional level. The actions suggested herein could be advanced as part of a dedicated resilience plan or they could also be mainstreamed into existing plans and processes. Integrating resilience thinking across different sectors and levels of government will help ensure that shoreline communities remain a vibrant place for residents, visitors, businesses, and all other shoreline users. Linking local actions to the regional Plan could also make communities more prepared as related funding opportunities arise.



3.3 Relationship to the Resiliency and Economic Development Initiative (REDI)

The REDI and CLEAR programs share the goal of increasing resilience within shoreline communities. The REDI program developed recommendations for county-level projects that could be implemented in the short-term to respond to severe flooding that occurred in 2017 and 2019. Recommendations focused on infrastructure, natural and nature-based, and economic-based projects that could be implemented immediately, as well as navigational dredging work that reached across multiple regions.

Through the REDI program, New York State committed up to $300 million to benefit communities in flood-prone areas along Lake Ontario and the St. Lawrence River. The REDI program involved extensive engagement with stakeholder and planning committee workshops to establish a list of critical projects to rebuild and enhance lakeshore and riverside communities.

The CLEAR initiative, which builds upon the REDI program, is a planning effort to support communities with long-term resiliency, planning, and implementation efforts. The CLEAR initiative culminated in the development of the Plan, which serves as a guide for communities to use in understanding possible risks, solutions, and best practices for incorporating long-term resiliency strategies into future efforts with a mind towards enhancing public safety, protecting local assets, and bolstering economic development.

3.4 Relationship to "Plan 2014"

Lake Ontario is distinguished from other coastlines and water bodies experiencing effects of climate change. The Lake's outflow at the St. Lawrence River passes through the Moses-Saunders Dam, an international hydropower project that provides a limited ability to adjust the volume of water flowing out of Lake Ontario. "Plan 2014" is the current regulatory framework for managing water flows and is overseen by the International Joint Commission (IJC). The IJC is a binational organization that cooperatively manages the lake and river systems of the U.S.-Canada borderlands, including the water levels within Lake Ontario and the St. Lawrence River. Controlling outflows at the dam is an attempt to balance the needs of municipal and industrial water users, commercial navigation, hydropower generation, recreational boaters, and - most recently - ecosystem health.

While regulating outflows has created more predictable lake levels overall, cyclical wet and dry periods have continued to lead to relatively extreme highs and lows.

An over-reliance on the ability to maintain levels within a general range of highs and lows has resulted in development patterns along the Lake that not only increased density but also installed infrastructure for year-round use (e.g., primary residences) in areas still vulnerable to high and low lake levels. When unusual high-water events occur on Lake Ontario, communities are especially at risk of flooding for prolonged periods of time, stretching public resources and affecting local economies, with sustained winds exacerbating the flood risk and shoreline erosion. As climate science and regional projections for future long-term trends continue to evolve, the variability is expected to include increased seasonal precipitation and changes in ice cover that would heighten periods of high water and continue to be beyond the ability to fully compensate through adjusting outflows. Building more resilient communities that enhance public safety and protect assets is a goal of the CLEAR initiative.

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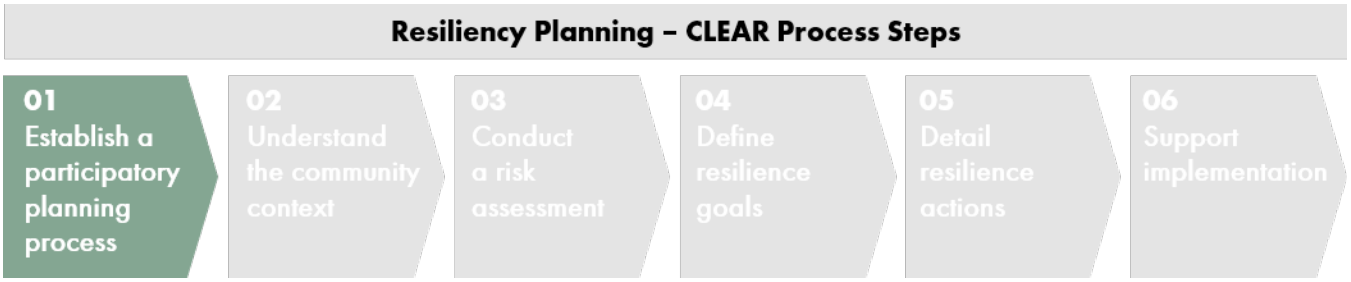
Niagara-Orleans Region

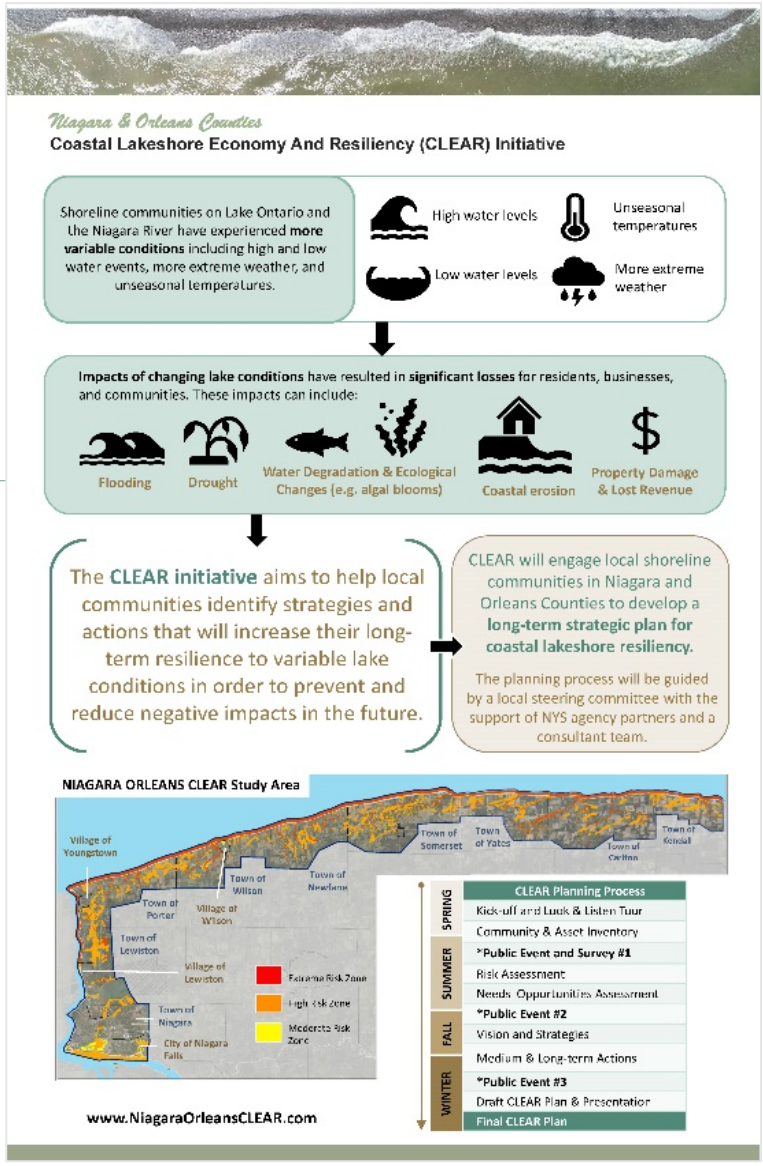
04

Engagement



4.0 ENGAGEMENT

The community was engaged throughout the CLEAR planning process to build local understanding of risks and impacts, local ownership of adaptive strategies and actions, and local leadership to implement sustainable and resilient growth pathways. A Public Engagement Plan was co-developed with the CLEAR Steering Committee at the beginning of the CLEAR initiative and adjusted as needed throughout the process. A summary of community engagement activities is provided below.



CLEAR poster – an example of outreach methods used during engagement

4.1 Engagement Activities

Steering Committee Meetings

Steering Committee members supported the development of the Plan by providing local and subject matter expertise and serving as a liaison to their communities/ organizations. Members were engaged throughout the planning process via a series of interactive meetings:

- **Kick-off Meeting:** An introduction to the CLEAR initiative including scope, schedule, deliverables, and roles and responsibilities. A follow-up questionnaire collected Steering Committee input on at-risk assets, relevant local plans and strategies, and the Public Engagement Plan, including outreach methods and key stakeholders.

- **"Look and Listen" Tour:** An organized virtual tour of affected areas across the region with the CLEAR Steering Committee and partners. Given COVID-19 limitations, the "tour" was held remotely using high-resolution mapping tools. Tour participants "zoomed" around the region via the shared map to provide critical feedback regarding their intimate knowledge of critical community assets and geographic areas at high risk of flooding and/or damage from low-water events.

- **Meeting #2:** A presentation of regional risks and impacts followed by discussion on the revised community assets list, updates to the Public Engagement Plan including accessibility considerations, and Public Event #1. Maps of regional assets and land use were shared in advance from the Community Profile.

- **Meeting #3:** An introduction to the Risk Assessment Tool and methodology followed by a discussion on the qualitative inputs of the risk assessment. These included questions on the relative community value of an asset, whether it is a critical facility, and if the asset serves vulnerable populations.

- **Meeting #4 "Fishing Expedition" Activity:** An interactive activity-based meeting to develop the resilience vision, needs, and opportunities. This visual activity illustrated example needs (goals) and opportunities (approaches) for participants to "fish" for, resulting in the selection of three targeted resilience goals and a list of approaches that will aid in accomplishing them.

- **Meeting #5:** A presentation on impact scenarios and discussion of alternative resilience scenarios and potential strategies to achieve them.

- **Meeting #6:** Discussion of potential resilience actions and detailed project profiles for the Plan.

- **Meeting #7:** Discussion on the draft Plan including the Actions Table.

CLEAR partners also joined Steering Committee meetings and advised on specific topics as needed. In addition to reviewing materials and attending monthly meetings, the Steering Committee members supported public activities and outreach as described below.

Steering Committee Meeting #4 – "fishing expedition"

Public Outreach and Activities

A series of public engagement activities were organized to keep community members informed about the CLEAR initiative and gather critical feedback on elements of the Plan from the vision to potential actions.

In response to the ongoing pandemic, activities were held virtually. Online tools provided an opportunity to engage people at their convenience regardless of where they were located across the large region. For example, seasonal residents could participate even if they were located at their primary residence outside of the study area.

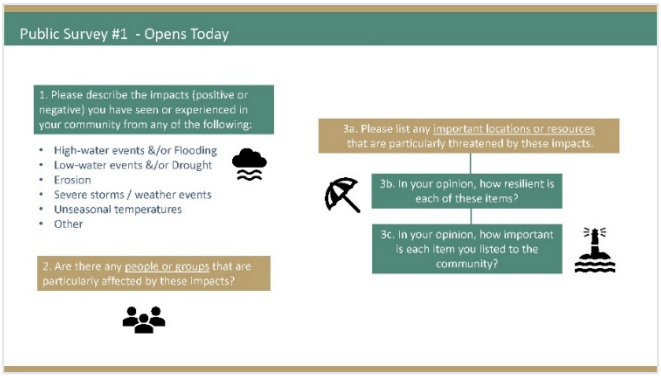
In addition, the public could take advantage of event recordings and extended online surveys or comment periods to participate when their schedules allowed and share information with their networks.

Three public engagement events were held during the plan development process. These were organized as live, interactive webinars with an opportunity to submit comments online following the event. Webinars were recorded and posted on the CLEAR Niagara Orleans website along with information on how to submit comments for individuals who could not join the live event.

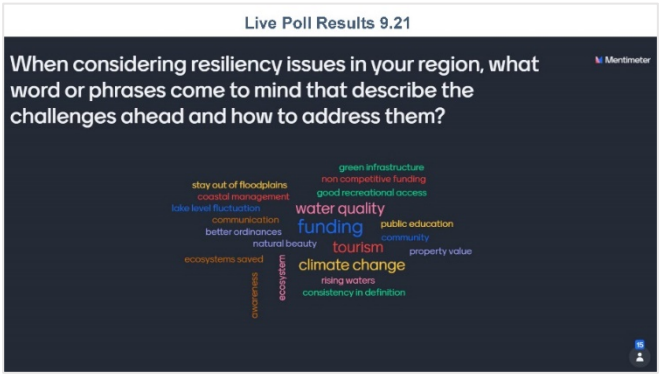
- **Public Event #1** (6.9.2021) introduced the CLEAR initiative and the need to build resiliency to changing lake conditions. The one-hour webinar included a discussion of shoreline hazards, risks, and recurring impacts with participants and an invitation to participate in a public survey.

- The **CLEAR Public Survey** (6.9.2021 - 7.7.2021) invited the public to describe the impacts they have observed from shoreline hazards, identify groups they considered especially vulnerable to these impacts, identify important assets that may be at risk, and provide information related to the community value of an asset. A simplified SMS version of the survey was also available as an offline alternative for community members with limited internet access.

- **Public Event #2** (9.21.2021) presented the outcomes of the public survey, risk assessment, and the initial needs and opportunities exercise for feedback. In addition, the public was invited to participate in a visioning exercise using an online interactive polling method. The result, presented as a word cloud, was used in the development of a draft vision statement that was refined with the Steering Committee. The public was also able to submit comments on the live presentation and visioning exercise following the event via the CLEAR website.



Public Event #1 – live webinar survey launch



Public Event #2 – live webinar discussion

- **Public Event #3** (11.16.2021) presented final CLEAR vision statement and guiding principles, the impact scenarios for the Niagara-Orleans region, and the resilience scenarios that were developed based on the areas at risk and the needs and opportunities identified by the community. Public feedback was also solicited on potential strategies and actions through discussion and live audience polling. Community members who were unable to attend live could submit their comments on the presentation though the website following the event.

Updates on the CLEAR initiative were distributed using a CLEAR mailing list that was initially populated with key stakeholders identified by Steering Committee members and partners, as well as community contacts involved in previous resiliency efforts in the region. As the CLEAR initiative progressed, participants joining in any of the CLEAR events, and individuals who subscribed through the website, were added to the mailing list.

Flyers, event links, and other materials were distributed to the mailing list and the Steering Committee to cross-post to their networks. Emails and press releases were also sent to media outlets in the region, several of whom provided coverage of the planning process.

Finally, the Niagara Orleans CLEAR website (www.niagaraorleansclear.com) served as a comprehensive repository of information for the public.

The website included a description of the CLEAR initiative, key documents, meeting slides and summaries from Steering Committee meetings, video recordings and slides from public webinars, and information on open and upcoming engagement opportunities. There was also a place for people to submit comments at any time during the planning process.

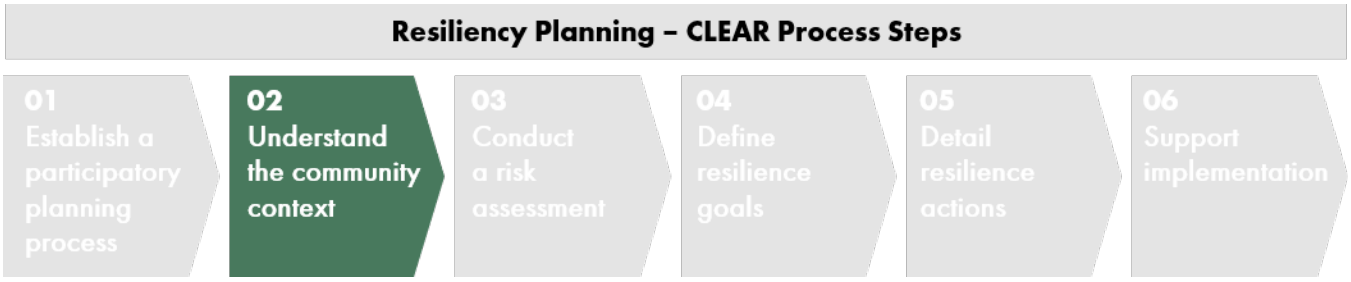
4.2 Participatory Resilience-Building

Community engagement was a key component of the CLEAR planning process, and public support is essential to successfully implement resilience actions. Toward this end, public engagement should continue as part of local resiliency planning and implementation efforts to ensure outcomes reflect the diverse perspectives, needs, and interests within the region, and that participation reflects socioeconomic and geographic diversity including vulnerable and under-served populations.

Just as it was critical to engage the public throughout the regional CLEAR planning process to build understanding of risks and impacts and to establish adaptive strategies and actions, it will be critical to establish a community-driven structure going forward to build local ownership, capacity, and support for resilience actions.

05

Regional Overview



5.0 REGIONAL OVERVIEW

Niagara and Orleans Counties contain critical infrastructure and productive resources in the Southern Lake Ontario shoreline region. The following section summarizes the important physical and socioeconomic characteristics of the Niagara-Orleans CLEAR study area including land use and development patterns, socially vulnerable populations, critical infrastructure and natural resources, and recent flooding and erosion impacts.

Understanding the people, places, resources, and development trends in the study area puts the Plan in context and helps guide decision-makers when developing and prioritizing resilience plans and actions for the region. Municipal Profiles for each of the 13 communities in the study area are included in Appendix A.

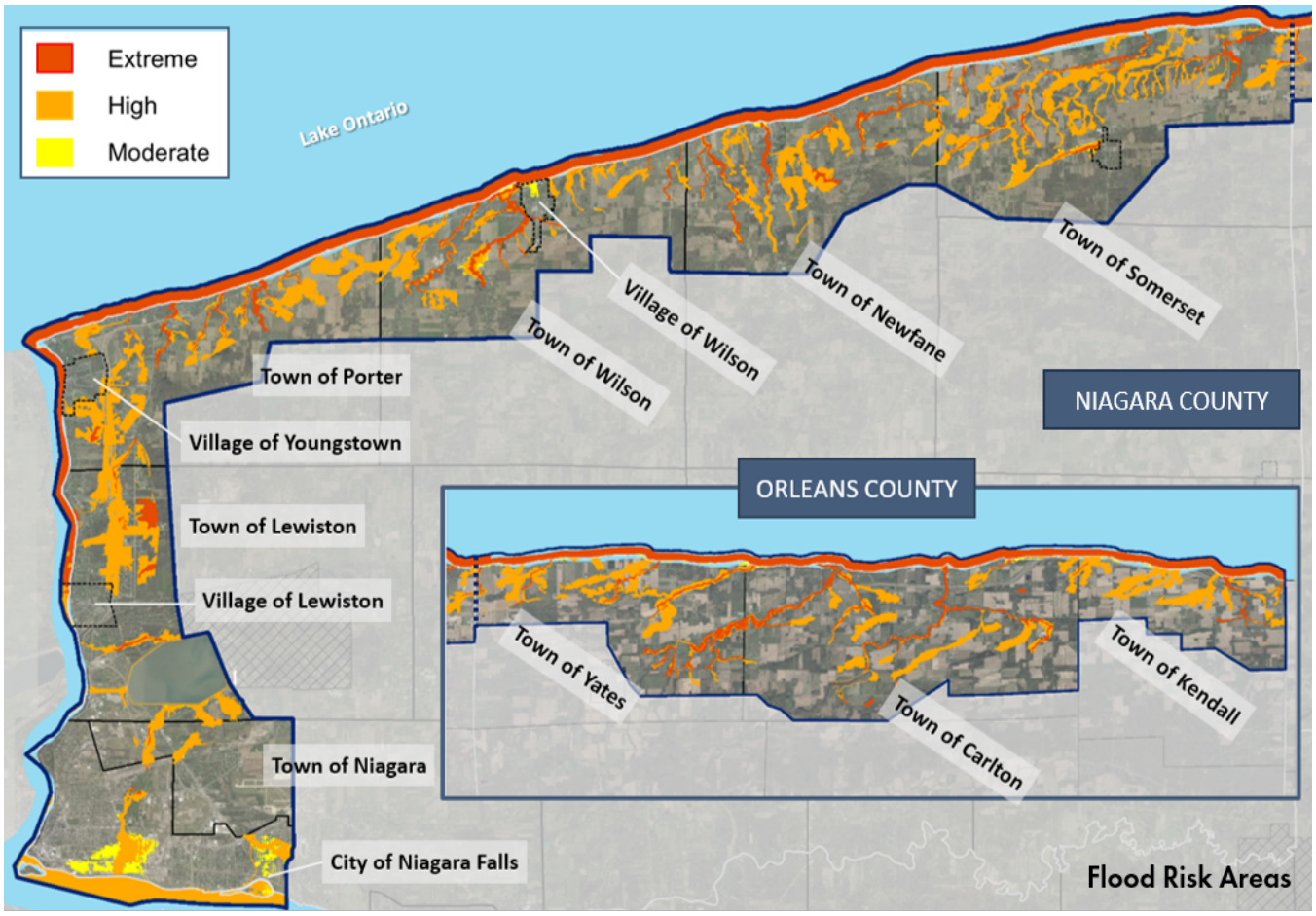
5.1 Geographic Scope of the CLEAR Plan

Niagara-Orleans CLEAR study area encompasses areas of the Lake Ontario and lower Niagara River shorelines considered to have a moderate, high, or extreme level of risk based on their location in relation to flood zones, as illustrated in Figure 5.1. This flood risk map was prepared by NYSDOS based on November 2020 data related to climate, geology, and land use in the Niagara-Orleans CLEAR study area. The map defines areas at risk from coastal and riverine hazards, distinguishing significant differences in the exposure of the landscape. To the extent allowed by the mapping source data, places where flood water can extend up streams and under culverts and bridges are reflected.

When overlaid with subsequent land use and features maps, the data indicate the relative risk to local population and assets from changing water levels on Lake Ontario as well as from inland flooding (e.g., related to precipitation or snowmelt).

In total, the study area includes 69 miles of Lake Ontario and Niagara River shoreline, 148 square miles of land area and 17 square miles of lake area. The landside study area boundary was drawn to encompass the flood risk areas while the waterside boundary stretches 1,500 feet into Lake Ontario in keeping with NYS Executive Law, which enables shoreline towns and villages to regulate uses and structures in Lake Ontario waters up to 1,500 feet from shore[3].

[3] New York Attorney General. (2004). Municipal Home Rule Law



Scenario Example	Probability	Risk
Moderate risk/low probability	Low ↓ High	Moderate (FEMA base flood elevation +2 ft.)
High risk/moderate probability		High (FEMA base flood elevation)
Extreme risk/high probability		Extreme (IGLD average lake level +2 ft., 247.3-ft.)

Figure 5.1, *Source: NYSDOS*

The study area consists largely of peaceful, rural areas advantageously located near urban centers including the City of Niagara Falls (within the study area), Buffalo, and Rochester. There are 13 municipalities (shown to the right) located completely or partially within the study area that are included in the Plan.

Niagara County	
City of Niagara Falls	Town of Somerset
Town of Lewiston	Town of Wilson
Town of Newfane	Village of Lewiston
Town of Niagara	Village of Wilson
Town of Porter	Village of Youngstown
Orleans County	
Town of Carlton	Town of Yates
Town of Kendall	

Major coastal embayments, creeks, and rivers in the study area include:

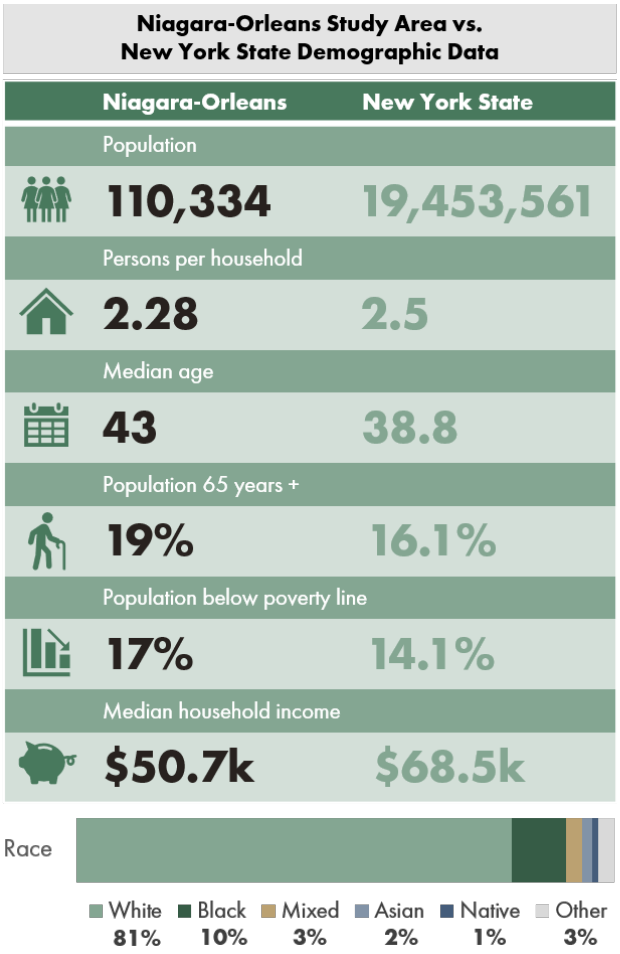
Niagara River	Olcott Harbor
Four Mile Creek	Tuscarora Bay
Six Mike Creek	Key Creek
Twelve Mile Creek	Johnson Creek
Eighteen Mile Creek	Oak Orchard Creek
Wilson Harbor	

5.2 Demographics

The 13 municipalities in the Niagara-Orleans CLEAR region are home to approximately 110,334 people, with many seasonal and second homes located on the waterfront. The median age across these municipalities is 43, reflecting an elevated number of retirees and residents over 65. The median household income across the study area is approximately $50,694, which is well below the state median. Incomes are generally higher in Orleans County and along the Niagara River. The proportion of the population living in poverty is above state and national averages at 17%.

The City of Niagara Falls is somewhat of an outlier for the region with a median household income of $36,346 and 28% of individuals living below the poverty line. The City is also more racially diverse than the region, with Black, Mixed, and Hispanic residents comprising 32% of the population where they often make up less than 15% of the population elsewhere in the study area.

High school graduation attainment (90%) is slightly above state and national averages, throughout the Niagara-Orleans study area, though residents are less likely to hold a bachelor's degree or higher (23% of the population) than state and national rates.[4]



U.S. Census Bureau. 2019. American Community Survey, 2015-2019 5-Year Estimate

In addition to their role as key indicators for development planning, factors including household income, education level, age, and minority status are important indicators of community resilience. Groups in more socially vulnerable categories are generally less equipped to cope with the impacts of hazards such as floods and storms, placing them at a higher risk. The distribution of socially vulnerable populations in the Niagara-Orleans CLEAR region is described on the following page.

[4] Note: All data from U.S. Census Bureau, 2019. American Community survey, 1-year Estimates and 5-Year Estimates. Values are approximate. See Municipal Profiles for town-level date (Appendix A).

5.3 Socially Vulnerable Populations

Socially vulnerable populations are groups that may be more at risk during a natural disaster or emergency. This may relate to a factor that increases their exposure to a risk such as less durable housing, a factor that impedes their ability to escape the impacts of a risk such as limited mobility or English proficiency, or a factor that decreases their capability to bounce back from losses such as a low income. Social vulnerability can be thought of as a pre-existing condition that compounds a person's vulnerability when they are exposed to a given shock or stress including a storm or a flood. It is critically important that regional and municipal leaders work to empower these socially vulnerable populations to become equally as resilient as the general population.

A common tool used to measure social vulnerability is the Centers for Disease Control and Prevention Social Vulnerability Index (CDC SVI) developed by the Geospatial Research, Analysis, and Services Program (GRASP).

The CDC SVI helps public officials and emergency response planners identify, map, and anticipate the needs of socially vulnerable populations within their communities. The index uses 15 social variables grouped into four themes (Socioeconomic Status, Household Composition, Race/Ethnicity/Language, and Housing/Transportation) to rank census tracts using U.S. census data (see Figure 5.2).

On a scale from 0 (lowest vulnerability) to 1 (highest vulnerability), the national average SVI score is 0.5.

The 2018 overall SVI score for Niagara County was 0.3318, indicating **LOW TO MODERATE LEVELS OF VULNERABILITY.**

The 2018 overall SVI score for Orleans County was 0.643 (above the national average at a census tract level), indicating **MODERATE TO HIGH LEVELS OF VULNERABILITY.**

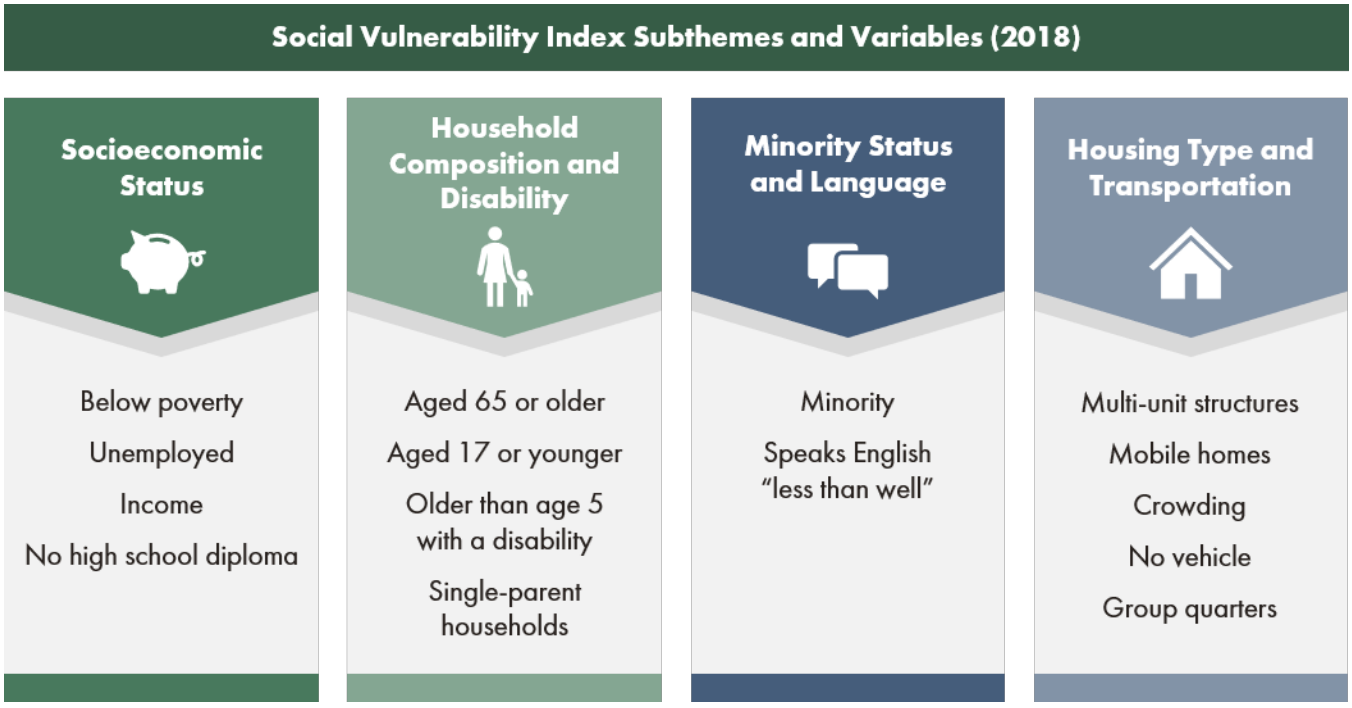


Figure 5.2

As shown in the map below (Figure 5.3), most of the study area has a below average social vulnerability score. In Niagara County, most shoreline areas have a low or moderately low CDC SVI score, except for the most urbanized southeast portion. The majority of the Town of Niagara has a moderately-high CDC SVI score, while most of the City of Niagara Falls receives the highest CDC SVI ranking, with indexes as high as 0.8999 on the scale of 0 to 1. In Orleans County, the shorelines areas of Carlton and Kendall have a moderately-low social vulnerability score while the Town of Yates is moderately high.

The CDC SVI data map is not meant to suggest that there are *no* socially vulnerable individuals in the green and yellow shaded areas of the map, but it can help decision-makers identify populations that are at higher risk and prioritize resources accordingly to meet their resilience goals. For example, if a major storm were to strike the Niagara-Orleans region, areas with higher social vulnerability may require more support than other areas to bounce back to the same level of recovery.

The CDC SVI was utilized during the CLEAR planning process as part of the risk assessment, as described in subsequent sections.

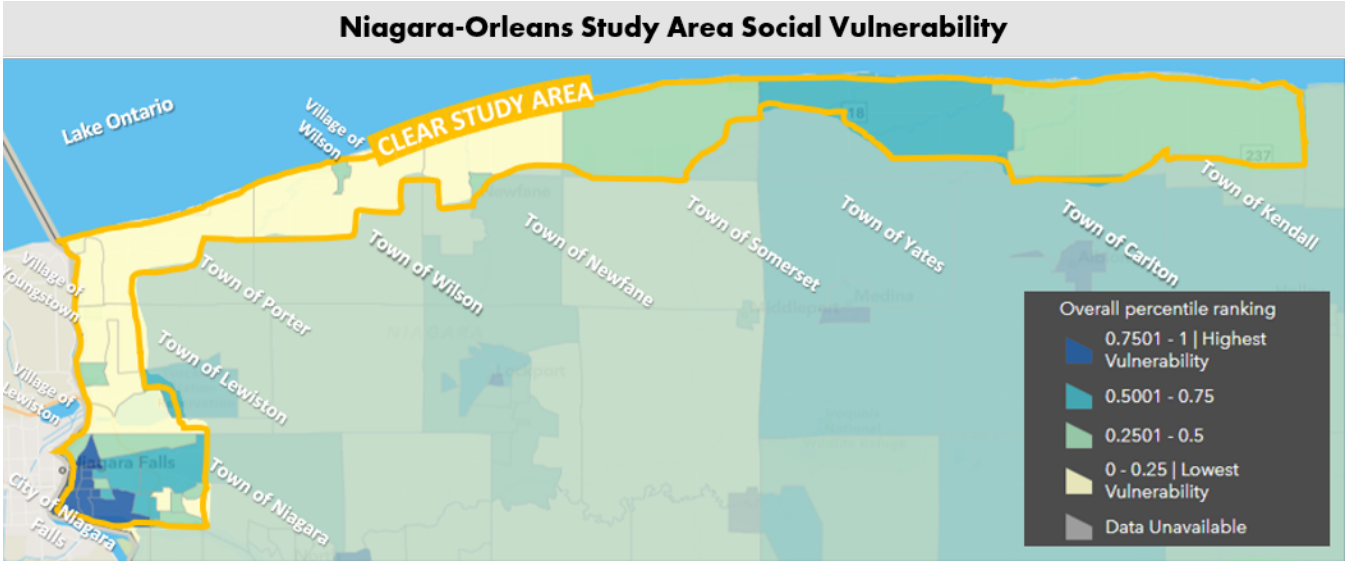


Figure 5.3, *Source: Agency for Toxic Substances and Disease Registry, U.S. Department of Health & Human Services, 2018.*

5.4 Environmental Justice Areas

The New York State Department of Environmental Conservation (NYSDEC) identifies Potential Environmental Justice Areas (PEJAs) to focus on improving the environment in vulnerable communities, specifically minority and low-income communities, and addressing disproportionate adverse environmental impacts that may exist in those communities. PEJAs have been identified based on analysis of reported income and race/ethnicity data from the 2014-2018 five-year American Community Survey (ACS), conducted by the U.S. Census Bureau. There are multiple designated PEJAs in the Niagara-Orleans study area, all located in the City of Niagara Falls. These areas align with the "high vulnerability" socially vulnerable populations identified in the previous section. Figure 5.4 highlights PEJAs by Census Block Group in purple.

Consistent with the NYSDEC Environmental Justice policy "no group of people, including racial, ethnic, or socioeconomic groups, should bear a disproportionate share of the negative environmental consequences resulting from…state and local…programs and policies." Consequently, resilience planning should consider local PEJAs to ensure there is fair treatment and consideration of these more vulnerable areas when implementing resilience actions.

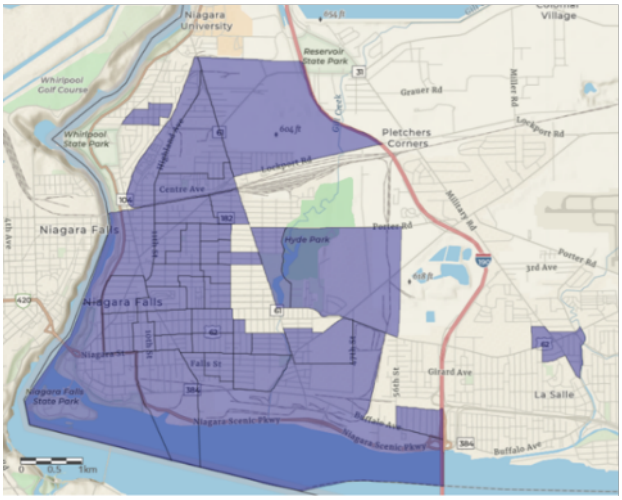


Figure 5.4, *Source: NYSDEC*

5.5 Land Use and Economic Development

In addition to understanding the risks to various population groups, it is also important to contextualize the potential impact of flood risks on the local economy. A summary of land uses in the study area shows what types of uses are most prevalent and therefore more exposed to hazard impacts in the study area. A summary of key sectors and employers illustrates the types of assets that could have the most far-reaching impacts on the regional economy if damaged.

Land Use

Although land use data specific to Orleans County was limited, the overall make-up of Niagara and Orleans Counties appears similar with respect to land uses in the study area, which are predominately devoted to residential development and agriculture. In Niagara County, residential areas, including year-round, single, or multi-family residences; mobile homes; seasonal residences; and vacant residential properties cover 34% of the land area.[5] These structures are important to residents both as family homes and as private investments. They also contribute significantly to the local tax base. Vacant parcels are the third greatest share of land use in the County, which presents an opportunity to ensure future development of these parcels follows resiliency principles and guidelines.

Agricultural land supporting livestock, field crops, orchards, nurseries, fish, game, and wildlife is the second most common land use after residential in the study area, covering approximately one-third of the land area. Niagara County ranks fourth in the state for fruit growing and ranks high for total value of agricultural products sold within the state.[6]

Commercial land use covers a small portion of the study area, accounting for less than five percent of land uses. Commercial parcels contain a range of businesses, including retail, dining establishments, lodging, seasonal rentals, manufacturing, and industrial facilities. Commercial hubs are centered in older, more developed municipalities such as the City of Niagara Falls, Town of Niagara, Village of Lewiston, and Village of Wilson, and near highway corridors including NYS Route 62 in Niagara Falls and NYS Route 78 in Newfane. There is also a scattering of commercial uses along the waterfront in Orleans County including at the mouth of Oak Orchard Creek.

[5] U.S. Census Bureau. (2019). American Community Survey, 1-Year Estimates and 5-Year Estimates.
[6] Niagara Communities 2030 Comprehensive Plan. (2009). Niagara County, New York.

Key Sectors

Though commercial uses do not cover a large area of the waterfront, commercial activities related to tourism and recreation contribute significantly to the regional economy. Niagara Falls, for example, attracts over eight million tourists per year, taking advantage of boating activities and related attractions throughout the region.[7] In 2018, visitors to Niagara County spent over $750 million and the tourism industry employed 23% of the county workforce.[8]

The high abundance of aquatic and natural resources in the Niagara-Orleans study area makes this an attractive destination for recreational activities such as hiking, sportfishing, and boating. Important tourist attractions include Niagara Falls State Park, Fort Niagara State Park, Four Mile Creek State Park, Niagara County Krull Park, Lakeside Beach Park, Golden Hill State Park, Thirty Mile Point Lighthouse, Orleans County Marine Park, and Oak Orchard Lighthouse, in addition to several town parks, beaches, and public waterfront amenities. The region's harbors and lake towns are also important hubs of commercial activity, particularly during the summer, hosting thousands of seasonal residents, marinas, recreation sites, and water-based businesses. Popular spots include Youngstown on the Niagara River, Tuscarora Bay in Wilson, the mouth of Eighteenmile Creek in Olcott, and the mouth of Oak Orchard Creek.[8]

Niagara-Orleans Study Area Employment Rates

Niagara County	Orleans County
Total Employed	
101,000	17,800
Highest Employing Industries	
Healthcare and Social Assistance	
15,600	2,400
Manufacturing	
13,900	2,900
Retail	
13,000	2,000
Highest Paying Industries	
Utilities	
$76,100	$59,563
Mining, Quarrying, and Oil & Gas Extraction	Professional, Scientific, and Technical Services
$65,341	$64,904
Public Administration	
$64,650	

Many tourist destinations and businesses are located directly on the shoreline, in the "extreme" risk area. As such, economic activity in the Niagara-Orleans region is closely tied to Lake Ontario water levels. Building future shoreline protection measures into these areas will be important to the community to mitigate potential impacts due to fluctuations in the water levels that can result in tourist areas becoming damaged, inaccessible, or unusable.

5.6 Critical Infrastructure

When conducting a resilience assessment, it is essential to consider the potential risks to community support systems and services that directly and indirectly impact residents and local businesses. The CLEAR planning process mapped critical infrastructure in the study area including utilities, educational facilities, religious institutions, hospitals, national and civil defense,

[7] Note: All data from U.S. Census Bureau, 2019. American Community survey, 1-year Estimates and 5-Year Estimates. Values are approximate. See Municipal Profiles for town-level date (Appendix A).
[8] Ibid.

and communications infrastructure that were deemed essential to the functioning of local communities. These are primarily concentrated within the southwest portion of Niagara County, away from the Lake Ontario shoreline, as shown in Figure 5.5.

Wastewater treatment facilities within each town are labeled in bright green on the map, which are typically waterfront for effluent discharge. Of note is the Robert Moses Niagara Power Plant; a large hydroelectric power station in Lewiston owned and operated by the New York Power Authority.

The plant produces the largest share of New York's hydropower and has the third largest hydroelectric capacity in the U.S.[9] In addition, COVANTA Company of Niagara operates a large waste-to-energy facility within the City of Niagara Falls.

Given their location, the exposure of many critical infrastructure resources in the Niagara-Orleans region to potential hazards is relatively low. However, given the high consequence of any damage to these resources, it is generally reasonable for decision-makers to assign a higher priority to actions that would bolster resilience for critical infrastructure.

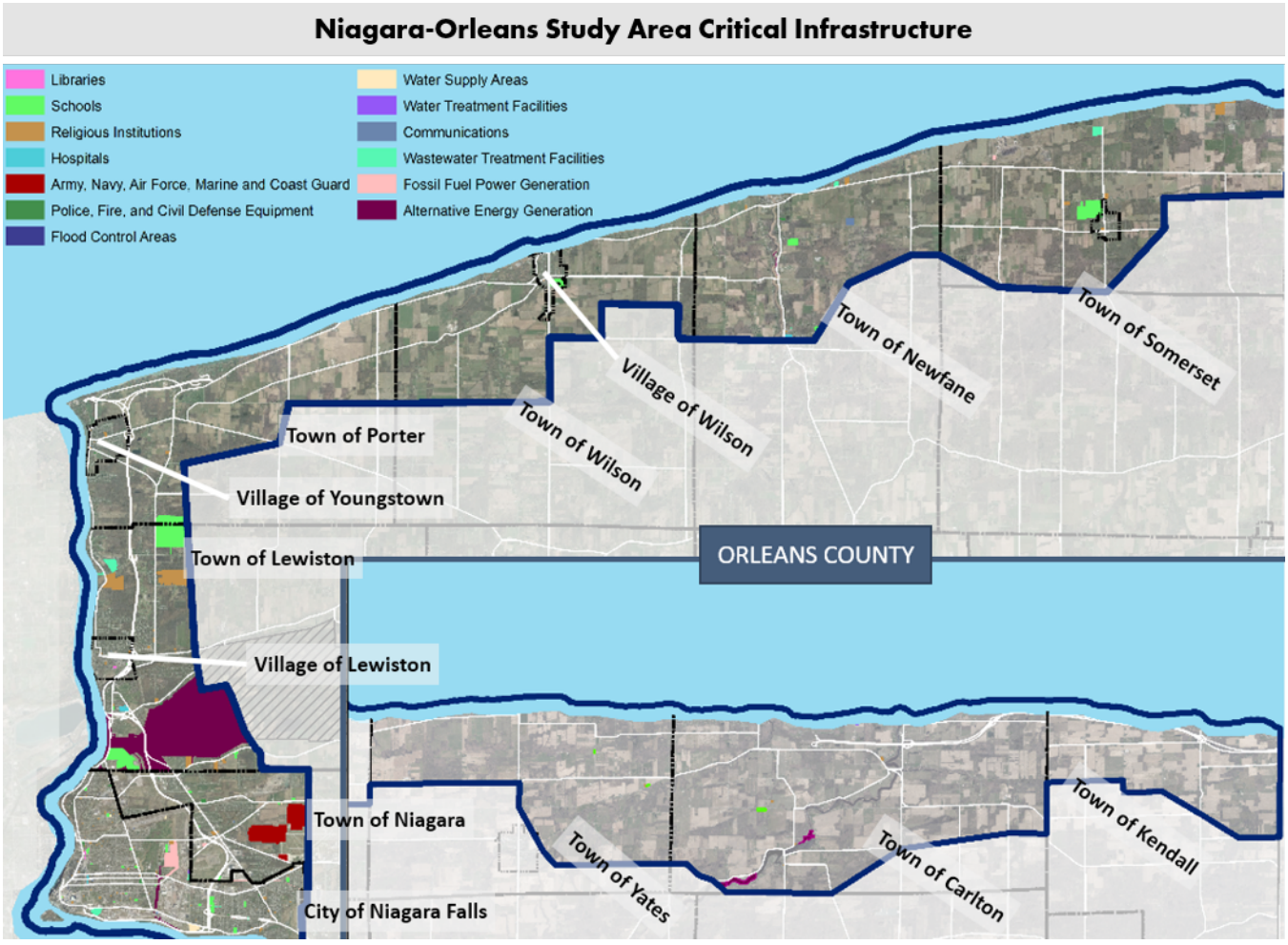


Figure 5.5

[9] U.S. Energy Information Administration. (2021). New York State Profile and Energy Estimates. U.S. Energy Information Administration

5.7 Watershed Characterization and Shoreline Erosion

Shoreline hazards in the Niagara-Orleans region are both a function of and a risk to the natural environment. Natural resources provide essential ecosystem services free of charge including air and water filtration, stormwater retention, temperature regulation, nutrient cycling, food, and recreation, among others. Understanding how the natural environment both mitigates and drives risk can help local communities determine how best to protect valuable natural resources, what types of development pathways to pursue, and which resilience strategies (prevention, mitigation, or adaptation) will be most advantageous in a particular area. The CLEAR planning process included a review of environmental and shoreline characteristics, as summarized below.

The Niagara River and Lake Erie Watershed, which encompasses the southern-most portion of the study area, drains water from over 265,000 square miles in the U.S. and Canada.

Niagara-Orleans Watersheds and CLEAR Study Area

This watershed is connected to four of the five Great Lakes, in addition to receiving drainage from within the local watershed. About half of Niagara County lies within the Huron Plain of the Niagara River/Lake Erie Watershed, between the Niagara Escarpment and the Onondaga Escarpment. The elevations in this area range from 240 feet to about 656 feet above sea level. The slopes in this area decrease in the northwest sector of the watershed where flatter areas experience less erosion than others within the watershed.[10]

Most of the study area in Niagara and Orleans counties is part of the Lake Ontario Tributaries greater watershed. The Lake Ontario Tributaries drain water from 24,720 square miles into Lake Ontario; about 55% of the watershed is located within New York State with the remainder in Canada. The watershed includes several urban areas and has cited nonpoint source pollution concerns with agricultural runoff, stream erosion, and construction sites. Orleans County is within the Lake Plain ecoregion with an average elevation of 330 to 660 feet above sea level.[11]

The Niagara-Orleans CLEAR study area includes 57 miles of shoreline along Lake Ontario. Previous investments have been made to protect and improve the waterfront in the form of armoring and hardened engineered structures. The shoreline in the region is classified into several types ranging from artificial (e.g., seawall/bulkhead, boat launch) to low bank, concrete rubble/riprap, sand or cohesive bluffs, coarse beach, and/or open shoreline wetland. These classifications are based on existing geology and other characteristics of the shoreline as documented as part of the IJC Lake Ontario – St. Lawrence River Regulation Study.[12]

The Orleans County lakeshore is particularly diverse in nature, while the Niagara County lakeshore is characterized predominantly by sandy or cohesive

[10] Buffalo Niagara Riverkeeper. (n.d.) Niagara River Watershed Management Plan (Phase I).
[11] Finger Lakes-Lake Ontario Watershed Protection Alliance. (2000) A Report on Water Resources and Local Watershed Management Programs
[12] IJC, 2002.

bluffs, with a stretch of resistant bedrock in the Town of Newfane. Vertical bluffs in the region range from 15 to 60-feet high and continue to be eroded by wind and wave action.[13]

While the U.S. Army Corps of Engineers estimates approximately 50% of these counties' shorelines are armored, certain reaches of shoreline in the region have no artificial protection and are generally associated with natural features or beaches.[14] Shoreline hardening is an important tool to provide localized protection against wind and wave action. However, applied incorrectly, it can undermine natural shoreline processes in the region and potentially cause more damage in the long term. Helping to identify and implement the most effective shoreline protection measures will be an important part of resilience planning in the region going forward.

Natural based resilience features, such as open shoreline wetlands, are exponentially beneficial to the communities. The NYSDEC protects and manages state-regulated wetlands and corresponding "check zones" (areas around the mapped wetland boundary where wetlands extend). These freshwater wetlands are regulated with a 100-foot buffer zone and are restricted from development. Wetlands are also an important part of the region's ecology and provide several benefits such as natural shoreline protection, wildlife habitat, flood water retention, and water quality filtration.

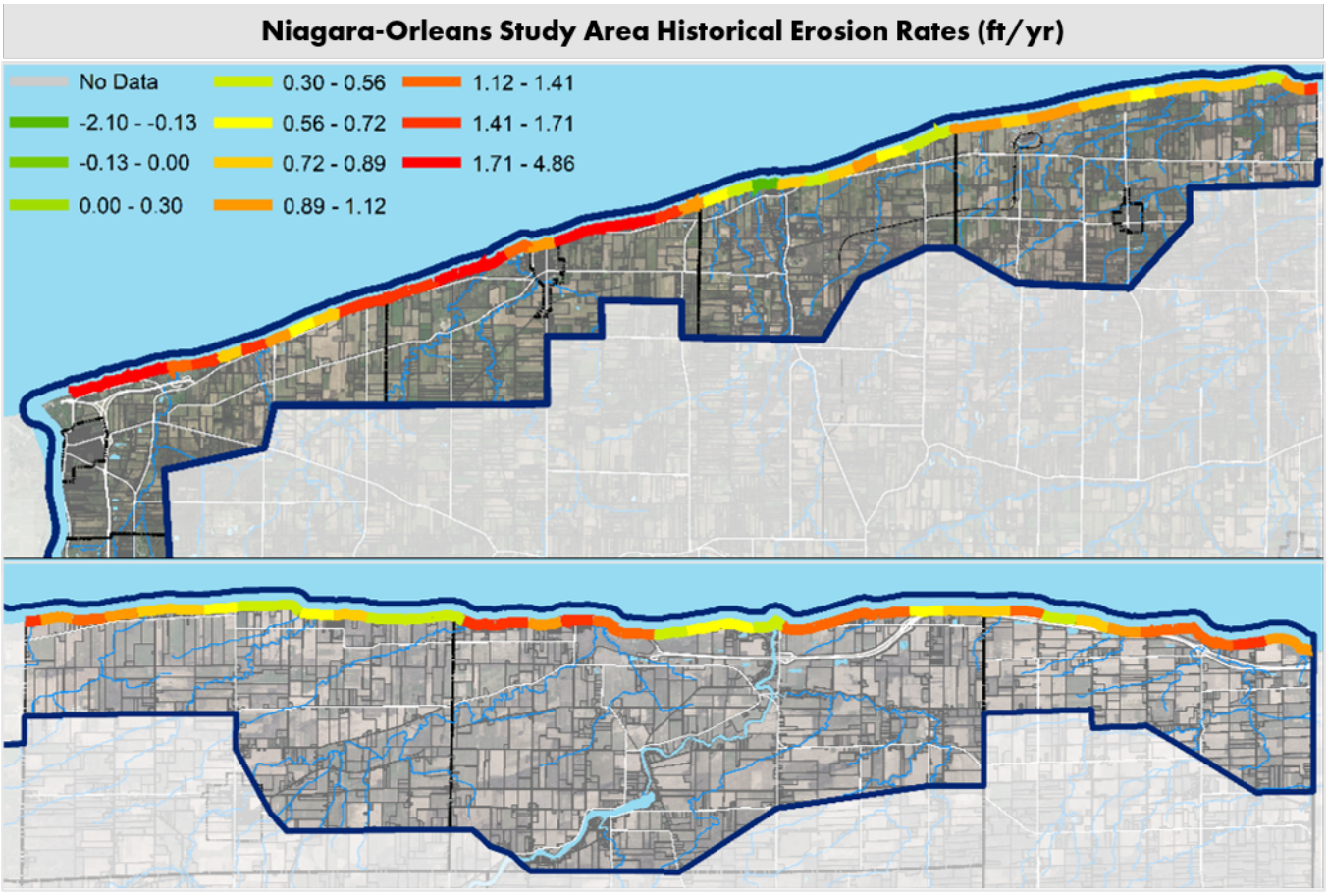


Figure 5.6

[13] Niagara Communities 2030 Comprehensive Plan. 2009. Niagara County, New York
[14] Lake Ontario Natural and Nature Based Feature Opportunities Viewer. U.S. Army Corps of Engineers

Erosion can pose a hazard to shoreline development, habitats, and waterways, but also provides necessary materials for shoreline beaches and barrier bars. These processes are not well documented at a local scale, and managing this balance is an ongoing challenge for shoreline communities and users. The Niagara-Orleans Region has a historical average shoreline erosion rate of 1.19 feet per year. Net longshore transport of sediments moves from west to east, with a tendency for sediment deposition on the westward side of lake piers based on prevailing currents, and with a few concentrated areas of dynamic sediment deposition and erosion near major inlets/embayments, including the Twelve Mile Creek area, Olcott Harbor, Oak Orchard Creek, Marsh Creek, and Golden Hill State Park. The maximum recorded erosion rate in the Niagara study area is 2.95 feet per year, as compared to 1.63 feet per year in Orleans County. Historical erosion rate data for the Lake shoreline was obtained from the Flood Erosion Prediction System (FEPS) database and are shown in Figure 5.6. These estimates are based only on the erodible portion (i.e., unhardened shoreline) of the Lake Ontario shoreline.

5.8 Summary of Historic Flooding Damage

Coastal flooding from high water levels is a regional stressor along Lake Ontario. Between 1960, when regulation of Lake Ontario outflows began, and through 2014, Niagara County has experienced approximately 40 flood events, and Orleans County has experienced approximately 30 flood events.[15] Most recently, in 2017 and 2019, the Lake Ontario and the St. Lawrence River System experienced high water levels that resulted in severe flooding and erosion throughout the region. These conditions had damaging impacts on property, infrastructure, business, and public safety.

The 2017 high-water event included exceptionally wet weather from January through May, as well as higher-than-average inflows from Lake Erie throughout the year. The 2019 high-water event included high inflows of water from Lake Erie, entering Lake Ontario and the St. Lawrence River, resulting in flooding along the shorelines. Both recent events caused significant flooding and erosion throughout the Lake Ontario-St. Lawrence River Region.

Example shoreline erosion conditions

[15] University at Buffalo School of Architecture and Planning. 2018. "Historical Winter Storm Hazards". New York State Climate Hazards Profile. New York State Energy Research and Development Authority (NYSERDA), Albany, New York.

In addition to the impacts related to high-water events, the CLEAR study area is also vulnerable to lower-than-average water levels, such as those which occurred in 2021. Low water levels can leave residents and businesses quite literally high and dry – unable to access waterfront amenities including docks, boathouses, marinas, boat launches, harbors, etc. Low water can also exacerbate conditions that lead to potential reductions in water quality caused by tributary blockages and reduced flushing of non-point source nutrients. These conditions could compromise fish and wildlife habitats and pollute recreational areas including beaches. By impacting the accessibility of waterfront recreational resources from docks to fish populations, low water levels can result in significant economic and ecological losses in the region.

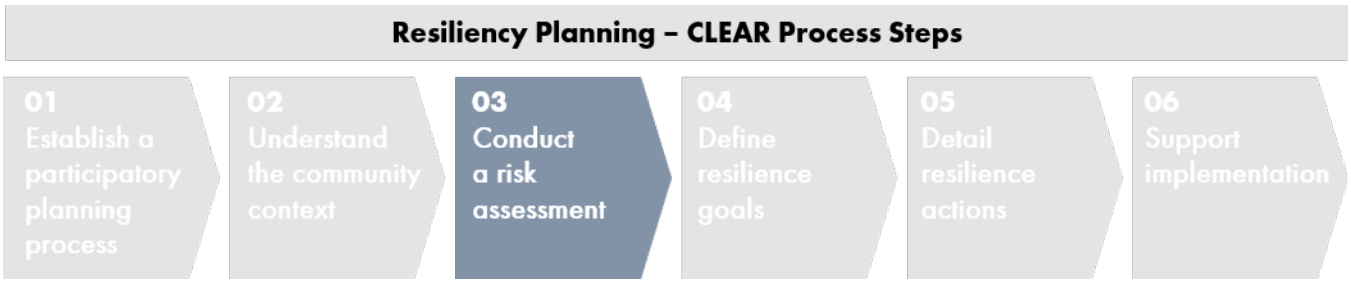
Additional information on individual municipalities is included in Appendix A.

Potential tributary blockages – Johnson Creek

CLEAR Plan
Niagara-Orleans Region

06

Risk Assessment



6.0 RISK ASSESSMENT

Risk assessments are a critical step in the process of resiliency planning. Understanding risk exposure for key community assets such as public health and safety infrastructure, or assets that function as major economic engines for the region, is a fundamental component of defining regional resilience goals in subsequent stages in the CLEAR Process. The NYSDOS Risk Assessment workbook (NYSDOS Risk Tool) can be utilized to better inform the development of long-term resilience strategies by analyzing the physical risk of an asset, as well as taking into consideration the community value of the asset and whether the asset supports a vulnerable population. As the community moves forward in future resiliency planning efforts, this tool can be supplemented with additional assets or modified based on changing landscape conditions.

The tool assists in understanding the extent of risk posed to an individual or grouping of assets. By prioritizing more vulnerable or critical assets during the analysis, the tool can help inform implementation considerations to ensure focus on the more vulnerable or critical assets.

The NYSDOS Risk Tool was utilized in the CLEAR planning process to assess the level of risk, qualitatively and quantitatively, for 136 assets that the community identified. A summary of the key findings and methodology is provided below.

6.1 Risk Assessment Key Findings

The risk assessment analyzed 136 at-risk assets in the CLEAR study area that were identified with the community. The overall risk of each asset – severe, high, or moderate – was calculated based on its relative exposure to flooding, high water, and erosion as well as its capacity to recover after a disaster equivalent to a 100-year storm event (hazard). In total, two assets were found to be at severe risk, 64 are high risk, and 72 face a moderate risk from changing shoreline conditions. Figure 6.1 provides an overview by asset class and risk level.

Primary observations from the risk assessment process include:

- The assets that are most at-risk (severe risk) in the Niagara-Orleans region are developed shoreline areas in the Towns of Carlton, Kendall, and Yates. These assets are in areas with extreme flood risk and have a very high rate of lakeshore erosion, which is adversely affecting nearby development.
- There are 62 high-risk assets distributed throughout the study area, with a higher share

in Kendall, Carlton, and Wilson. They are predominately waterfront businesses (23), parks and recreational sites (10), and natural protective features (10). Twenty are ranked as having high community value. The 14 infrastructure assets with high-risk scores include railway infrastructure, municipally owned/operated culverts, bridges (South 86th St.), power plant locations (formerly AES Somerset) and wastewater treatment facilities.

- Twenty assets affect socially vulnerable populations, primarily in Niagara Falls, Carlton, and Yates. Seven of these received high risk scores, including access roadways, municipal parks, campgrounds, and public fishing docks.
- In total, 106 assets are considered critical facilities by either FEMA or the local communities, and 63 have high community value.

These findings supported general discussions with the Steering Committee and the public on critical concerns relating to extreme precipitation events, flooding, and erosion, including (but not limited to):

- Coastal erosion and flooding
- Water quality degradation
- Ecological changes
- Property damage and business closures
- Decrease in tourism activities and revenue

A detailed list of individual community assets and risk levels is included in Appendix B.

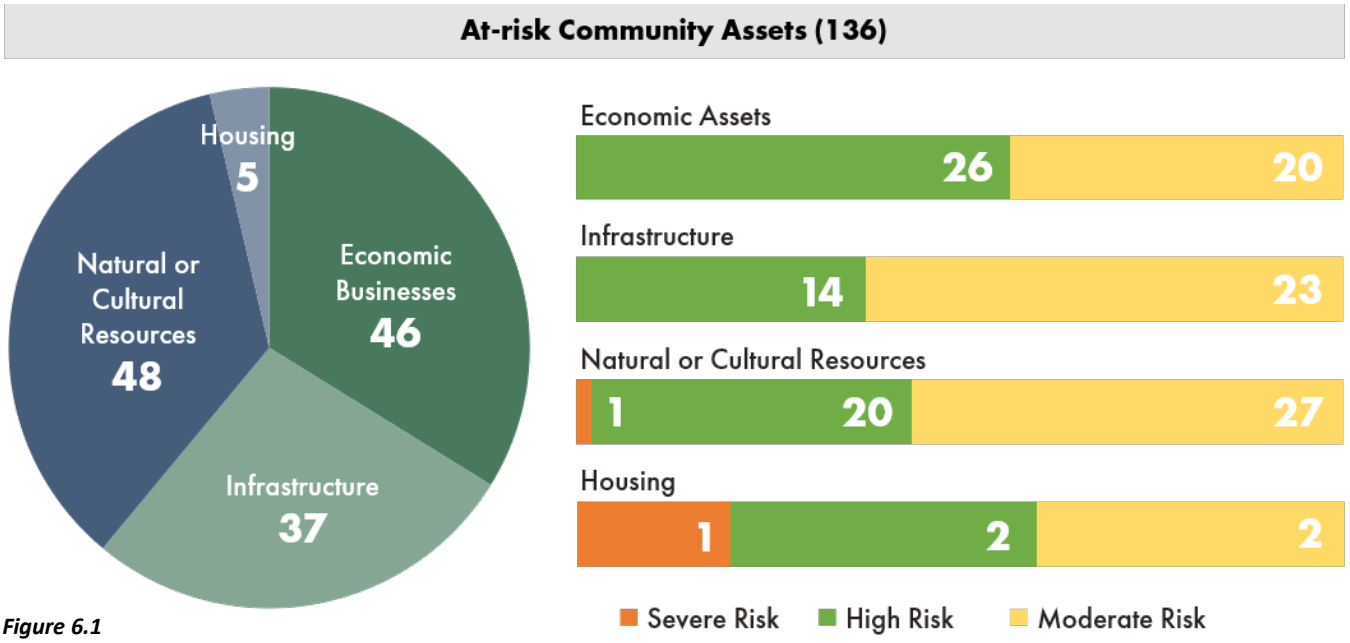


Figure 6.1

6.2 Risk Assessment Methodology

Overview

The NYSDOS Risk Tool was used to assess risk to a list of assets co-developed with community members and helps identify assets with elevated potential for storm damage.

A key principle of the risk assessment process is that **RISK = Hazard x Exposure x Vulnerability,** as illustrated in Figure 6.2. In addition to the risk value, other factors also contribute to determining

which assets should be addressed, how soon they should be addressed, and their priority for the community, including:

- If the asset is a critical facility for public health and safety
- The value of asset to the community
- If the asset supports socially vulnerable populations

The NYSDOS Risk Tool is populated through a series of steps to produce an overall risk score for each asset, as described on the following pages.

Asset Inventory

Assets at risk from impacts due to changing lake conditions were identified with the Steering Committee and the public. Infrastructure projects that were previously identified but not selected to progress under REDI were also included on the list.

Once the assets are identified, they are then categorized by Asset Class, which include Housing, Economic Businesses, Natural or Cultural Resources, and Infrastructure, as well a more distinct Asset Subcategory. An asset location map and ArcGIS geodatabase are then created with distinct points for discrete locations, such as a marina or boat ramp, polygons for assets that covered larger areas, such as a barrier bar or group of homes, and lines for assets such as a sewer/water line or a road. Care should be taken to only represent the portion on the linear asset at risk and not necessarily the entire asset.

For CLEAR, following completion of the asset characterization and mapping, the information was then made available to the Steering Committee to confirm the asset mapping locations.

Risk Score

Once the required information is populated into the NYSDOS Risk Tool, an overall risk score is calculated for each asset by multiplying its hazard score, exposure score, and vulnerability score.

Figure 6.2

Hazard Score

The hazard score is based on the likelihood an event will occur and the magnitude/intensity of the event. Likelihood is derived from the storm recurrence interval, with the magnitude of storm events increasing as the likelihood decreases. For the purposes of the CLEAR risk assessment, a high intensity, 100-year storm event (1% annual chance) was used for all assets. This equates to a hazard score of 3 out of 5.

Exposure Score

The relative exposure of each asset is determined based on the **risk zone** and **landscape attributes** of the asset's location. To determine the **risk zone**, the

asset map is overlaid with risk area map data to determine if the asset is in an “extreme”, “high”, or “moderate” risk area. The following datasets are overlaid, and combined vulnerabilities are used to discriminate geographic areas into three classes:

- **Extreme Risk Area -** Areas at greatest risk of frequent inundation or vulnerable to erosion:
  - Area at or below the ordinary high-water elevation (247.3 ft. IGLD)
  - Coastal areas with greater than 1% chance of flooding that are also susceptible to hazards associated with storm waves
  - Soils in which the likelihood of flooding is likely to occur often under usual weather conditions or is expected infrequently under usual weather conditions (approximately 5 to 50 times in 100 years)
  - Dynamic natural shoreline feature areas susceptible to flooding and erosion

- **High Risk Areas -** Areas outside the extreme risk area that are at a less frequent, but high risk of inundation:
  - Area bounded by the 1% annual flood risk zone (FEMA A zones)
  - Riparian buffer area

- **Moderate Risk Areas -** Areas outside the extreme and high-risk areas but currently at moderate risk of inundation from infrequent events:
  - Area bounded by the 0.2% annual risk (500-year) flood zone, where available
  - Area bounded by the base flood elevation plus two feet of vertical elevation
  - Soils dominated by running water or formed by water-deposited sediments

How exposed an asset is to a hazard can be moderated or exacerbated by the **landscape attributes** of its surroundings. The NYSDOS Risk Tool considers six landscape attributes: Erosion Rate, Beach Width, Presence of Shore Defenses, Presence of Protective Vegetation, Protective Natural Features, and Soils. Erosion rates are determined using National Resource Conservation Service (NRCS) County level GIS soils data, with erosion rates (K-factors) greater than 0.41 considered to be highly erodible. For the CLEAR risk assessment, the remaining attributes were assessed via field visits and discussions with partners and Steering Committee members.

Exposure scores range from 1 to 5. For example, assets in moderate risk areas with protective landscape attributes score lower, while those in higher risk areas with fewer protective landscape attributes are more exposed and scored higher.

Vulnerability Score

A vulnerability score between 1 and 5 is assigned to each asset based on a general assessment of the impact of a 100-year storm on the service or function of the asset. If an asset quickly recovers without external assistance, it has low vulnerability. A score of 1 indicates low vulnerability (insignificant damage anticipated) while a score of 5 indicates high vulnerability (major damage anticipated). The NYSDOS assessment criteria for vulnerability varies according to the asset class (economic, housing, health, and social services, infrastructure systems, natural and cultural resources).

> Vulnerability is defined by NYSDOS as the **capacity of an asset to return to service after a storm, taking into account its material strength relative to the coastal hazard, as well as its regenerative capacity.**

Risk Score

By multiplying the hazard, exposure, and vulnerability scores for each asset, an overall risk score is calculated. This score is a measure of the relative risk of storm damage for this asset: severe, high, moderate, or residual. The risk level (Severe, High, Moderate, Residual) that was computed using the NYSDOS Risk Tool for CLEAR was reviewed with the Steering Committee and by the public as part of Public Event #2 to ensure it accurately represented conditions experienced by the community.

Qualitative Variables

The NYSDOS Risk Tool also includes qualitative information for each asset:

- Does the asset serve Socially Vulnerable Populations? (Yes / No)
- Is the asset a Critical Facility? (Yes, FEMA critical facility / Yes, locally significant / No)
- What is the relative Community Value of the asset? (High / Medium / Low)

Taken together with the risk score, this information can help communities prioritize their resilience actions.

During the CLEAR process, the values for these qualitative variables were prepopulated based on relevant datasets and initial community input provided through the Steering Committee kick-off questionnaire and the public survey. The compiled input was then reviewed by the Steering Committee and CLEAR partners for accuracy and presented to the public for feedback during Public Event #2.

The presence of socially vulnerable populations in each location are prepopulated by overlaying the asset map on the CDC SVI (2016) map. Assets that fall within a census tract with an above-average social vulnerability rating (greater than or equal to 0.50) are considered to serve socially vulnerable populations unless local knowledge of the asset indicates otherwise.

100-Year Event (Hazard Score = 3)

Exposure	Vulnerability 1	2	3	4	5
5	15	30	45	60	75
4.5	13	27	40.5	54	67.5
4	12	24	36	48	60
3.5	10.5	21	31.5	42	52.5
3	9	18	27	36	45
2.5	7.5	15	22.5	30	37.5
2	6	12	18	24	30
1.5	4.5	9	13.5	18	22.5
1	3	6	9	12	15
0.5	1.5	3	4.5	6	7.5

Severe	Risk scores in this category occur only if one of the two factors, exposure or vulnerability, is rated 5, and the other is 4 or higher; asset is in a dangerous situation.
High	Conditions that could lead to significant negative outcomes from a storm. A vulnerability of 4 indicates the likely loss of service of an asset for an extended period of time. For many assets this may be unacceptable.
Moderate	Moderate to serious consequences, but adaptation may be of lower priority due to one factor, exposure or vulnerability, remaining relatively low.
Residual	Exposure and vulnerability are relatively low. Floods would pose minor or infrequent consequences. Note that risk is never completely eliminated.

Critical facility designations are also prepopulated using the Asset Class and Subcategory classifications compared against the list of FEMA Critical Facilities (July 13, 2015 Fact Sheet). For assets not identified as a FEMA Critical Facility, the community is able to assign the designation of "locally significant" to any asset deemed so.

Lastly, a community value is assigned to each asset based on input from the community. Community values for assets identified in the CLEAR process were solicited from the Steering Committee and public using surveys and in-person discussions according to a rating system of high, medium, or low community value, alongside descriptions if a value could not be accurately classified.

A full list of community assets and their corresponding risk levels (severe, high, moderate) can be found in Appendix B.

Community Value Descriptions

HIGH

This community asset is **highly important** to the community.

If it was lost or unable to function for a period of time, there would be **strong direct and indirect impacts** for a significant percentage of people in the community and/or region (i.e., entire sectors, several neighborhoods, etc.).

Compared to other community assets, the significance of this asset to the community's economy, culture, natural environment, or health is **high.**

MEDIUM

This community asset is **important** to the community.

If it was lost or unable to function for a period of time, there would be **moderate to strong direct impacts** for a large group of people in the community (i.e., a group of businesses, several blocks of residential, a large demographic (e.g., seasonal workers, families), etc.).

Compared to other community assets, this has a **medium significance** for the community's economy, culture, natural environment, or health.

LOW

This community asset **holds some value** to the community.

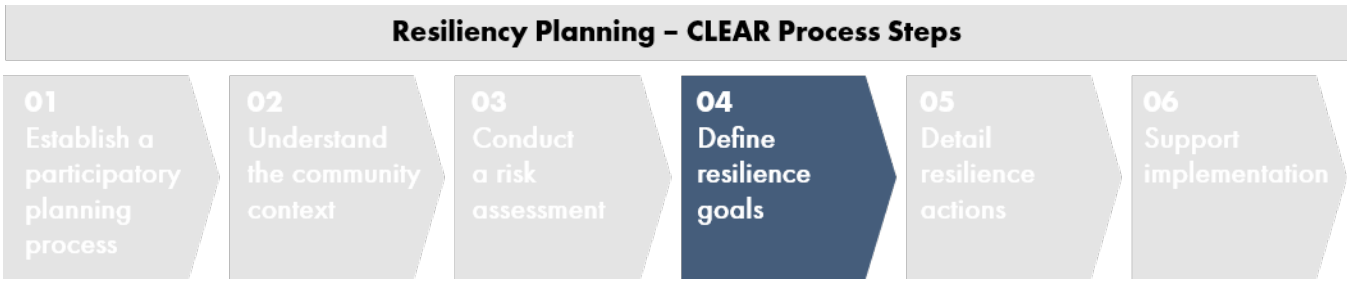
If this asset was lost or unable to function for a period of time, **impacts would be fairly localized** (i.e., several households or businesses).

Compared to other community assets, the significance of this asset for the broader community's economy, culture, natural environment, or health is **relatively minor.**

CLEAR Plan
Niagara-Orleans Region

07

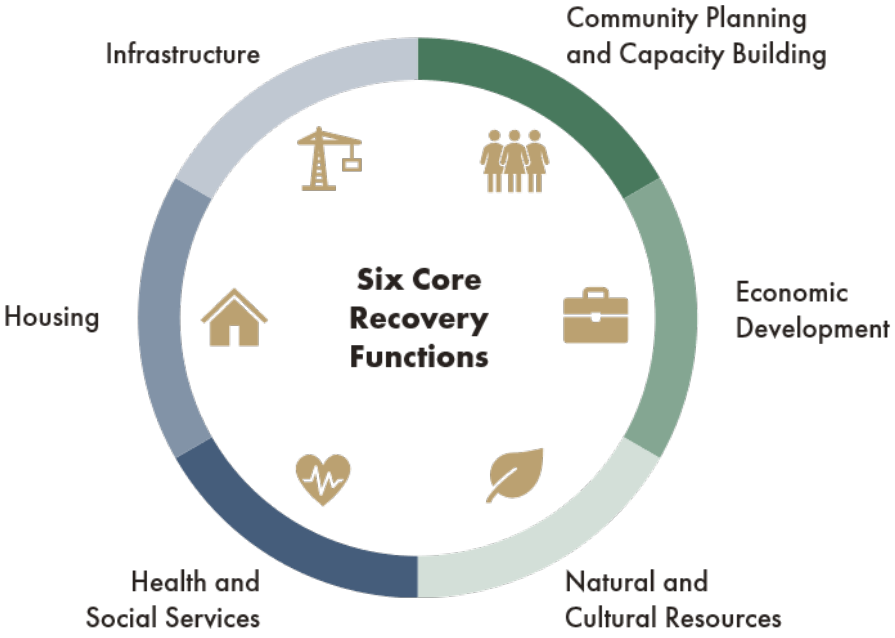
Needs & Opportunities



7.0 NEEDS AND OPPORTUNITIES

A needs and opportunities assessment helps communities define their goals (needs) and understand which approaches (opportunities) will aid in accomplishing their defined goals. This step is necessary in the long-term planning process as it ensures that subsequent implementation actions are indeed tied to and supporting the defined needs of the community. It is essentially a building block to guide a community towards actionable measures and can be used to see where an action may not only serve a distinct need but may also be multi-purpose and able to have a beneficial impact on a larger number of defined needs, thus adding greater value to the community.

An interactive exercise was conducted with the Steering Committee and reviewed with the public to identify various resilience needs and feasible opportunities that reflected community desires. This exercise was completed after the risk assessment so that participants were aware of the relative risk facing community assets in the study area. The exercise considered multiple needs and opportunities related to each of the six core recovery functions. The resilience of these component areas contributes to the overall resilience of a community.



The Needs and Opportunities interactive exercise served to identify the top three (3) resilience needs, and top five (5) resilience opportunities shown in Figure 7.1.

These needs and opportunities combined with the community vision, served as a basis to develop targeted resilience strategies and actions, as described in subsequent sections.

Figure 7.1

08

Vision

Resiliency Planning – CLEAR Process Steps

01 Establish a participatory planning process

02 Understand the community context

03 Conduct a risk assessment

04 Define resilience goals

05 Detail resilience actions

06 Support implementation

8.0 VISION

Creating a vision statement is an important part of long-term resiliency planning because it provides a desired future for the community to work toward. When developing resilience strategies and prioritizing resilience actions, the community can consider how the actions will help to achieve the overall vision. During the CLEAR process, once the community had assessed the risk to local assets and identified their top resilience needs and opportunities, they were asked to finalize a community vision. In other words, once they had defined their current state – "where are we now?" – they were asked to define their desired future – "where do we want to be?" – in terms of community resilience. An iterative dialogue with the Steering Community and public resulted in the following CLEAR Vision statement for the Niagara-Orleans region:

Niagara-Orleans Regional Area Vision Statement

VISION

The Niagara-Orleans region will use a dynamic and multi-pronged approach that includes prevention, mitigation and adaptation to increase resilience to variable lake levels and climate change. This will be accomplished through partnerships between multiple levels of government, property owners and community organizations to improve the long-term resilience of communities, infrastructure and natural ecosystems while enhancing the economy and quality of life for all shoreline users.

Photo by James Hatcher | CC-BY-SA-2.0

When discussing their vision for the future, community members were interested not only in what the future looked like, but also the processes by which it would be achieved.

To that end, a set of **Guiding Principles for Resilience-Building** was created to accompany the vision with input from the Steering Committee and public:

Guiding Principles for Resilience-Building

Integrate resilience principles into all relevant planning and policy processes for the region.

Base local resilience-building practices on an **understanding of the complex interactions** between the local community, economy and environment.

Engage all public engagement participants in the planning and implementation process and ensure they are informed about risks and how to reduce them.

Choose pathways that will **build long-term resilience**, resisting short-term solutions that will ultimately decrease resilience.

Establish partnerships between governments, property owners, non-profit organizations, and other public engagement participants to successfully implement resilience practices.

Pursue a multi-pronged approach that includes **mitigation, adaptation, and managed retreat** where appropriate.

- Adopt more resilient and adaptive uses and development practices.
- Enhance and expand protective features that mitigate risk.
- Reduce exposure of vulnerable people and community assets to hazards.
- Improve disaster response and recovery systems to bounce back quickly from unavoidable losses.

Support resilience efforts with new or existing policies, funding mechanisms, and capacity-building programs.

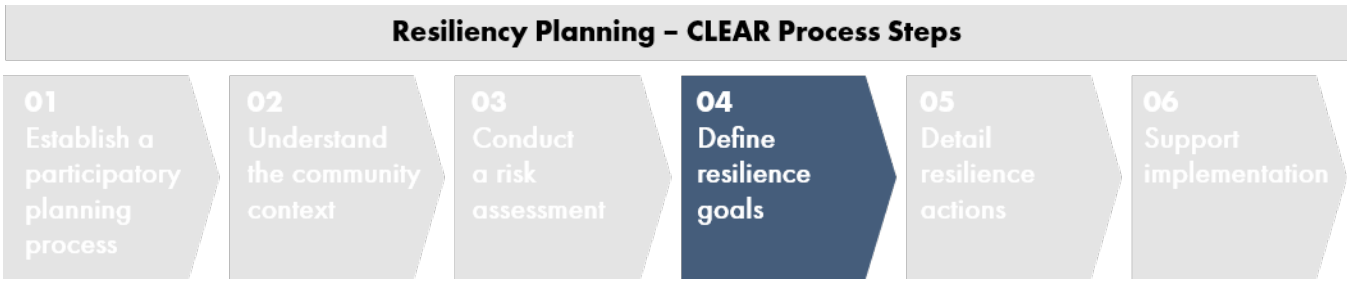
Turn risks into opportunities by prioritizing solutions with co-benefits that increase local investment, environmental quality, equity, and/or quality of life.

Follow an iterative process that is responsive to evolving needs.

CLEAR Plan
Niagara-Orleans Region

09

Scenario Planning

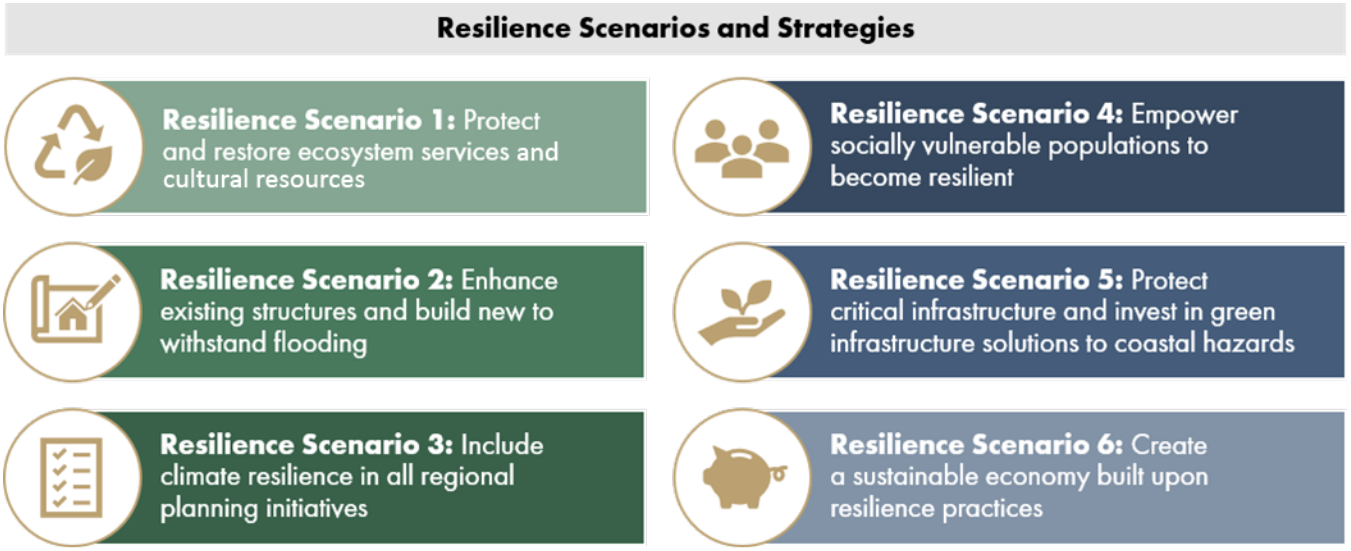


9.0 SCENARIO PLANNING

Once a community has answered the questions "where are we now?" and "where do we want to be?" through a risk assessment, needs and opportunities assessment, and vision statement, the only question that remains to be answered is: "how do we get there?" To address this question, a variety of resilience scenarios can be developed to help conceptualize the types of strategies that would help the community achieve its vision. Scenario planning is a tool for communities to understand and address future uncertainty and to identify strategies that have the greatest potential to advance the resilience vision and goals across a variety of possible conditions.

9.1 Resilience Scenarios Results

The following Resilience Scenarios were selected for the Niagara-Orleans region based on the planning exercise with the Steering Committee and the community. The order reflects the relative priority of the scenarios, though it is expected that all these scenarios would be pursued simultaneously.



9.2 Scenario Planning Methodology

Scenario planning is a tool for communities to understand and address future uncertainty, and to identify strategies that have the greatest potential to advance the resilience vision and goals across a variety of possible conditions. In the context of the CLEAR initiative, scenario planning considered both impact scenarios and resilience scenarios:

- **Impact scenarios** are possible versions of what communities can expect to occur over time in terms of flood extent and lake conditions. These were defined based on the same NYSDOS Coastal Management Program Risk Zones (extreme, high, moderate) that are used in the risk assessment (see pages 25 and 40).

- **Resilience scenarios** are understood as the level of, and options for, achieving resilience under each impact scenario (extreme, high, moderate). These serve as the basis through which the resilience vision can be achieved, despite these impacts.

There are five distinct methods of developing resilience scenarios, shown in Figure 9.1.

For CLEAR, based upon the resilience vision and needs and opportunities, the **topical resilience scenario development** method was selected as strong resilience topics of concern came to light during Steering Committee and public discussions. These concerns were translated into planning scenarios for identified "keystone actions" (needs and opportunities) that were considered critical to resilience success. The scenarios were then refined via feedback from the Steering Committee and the public.

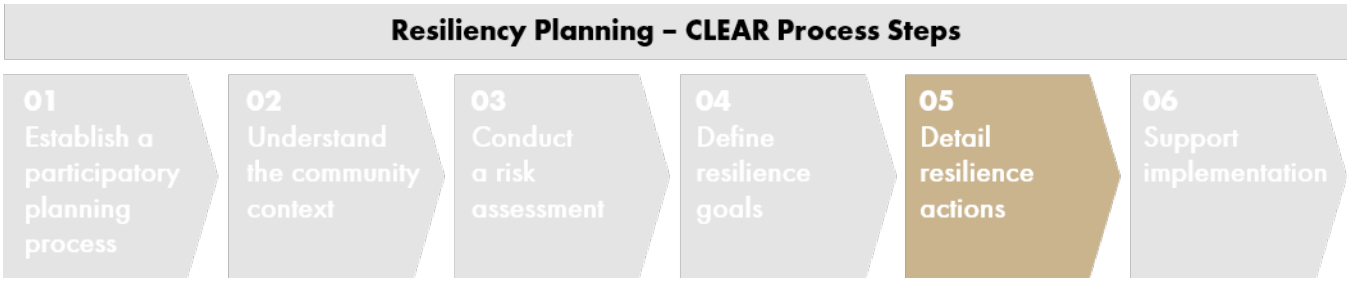
Resilience Scenario Development Methods	
Timeframe-focused	Providing resilience scenarios based upon potential fluctuation in lake levels and the timeframe in which appropriate resilience measures can be achieved
Capacity-focused	Scenarios based upon a regional or local government (or entity) plan for such as master or comprehensive plan development (10, 30, and 50+ year horizons) or capital improvement project planning
Level of resilience	Scenarios often based upon the intensity of resilience such as "status quo," moderate resilience and innovation/transformation
Topical	Scenarios based upon the key resilience goals/objectives selected by the community such as environmental protection and restoration, protection of community assets or economic development concerns
Hybrid	Combination of the above

Figure 9.1

CLEAR Plan
Niagara-Orleans Region

10

Strategies & Actions



10.0 STRATEGIES AND ACTIONS

Once the resilience scenarios are defined, a set of specific strategies and actions can be developed for each. These strategies and actions aim to embed resilience and climate risk considerations into community activities, local government decision-making processes, and private sector actions to enable communities to prepare for and respond to changing lake conditions.

10.1 Strategies

For each scenario identified in the CLEAR process, a series of strategies was identified and refined with the Steering Committee and the public.

The full list of the six scenarios and 21 corresponding strategies is described in the following table:

Scenario	Strategy	
01 Protect and restore ecosystem services and cultural resources	1.1	Enable use of techniques such as green roofs, bioswales, permeable driveways, minimizing footprint, xeriscaping, etc.
	1.2	Incorporate nature-based solutions for shoreline protection
	1.3	Improve stormwater management systems (to reduce flooding and improve water quality)
	1.4	Preserve historic and cultural assets for future generations
02 Enhance existing structures and build new to withstand flooding	2.1	Incentivize retrofits to be more resilient in the future
	2.2	Establish a multi-pronged approach to protect housing
	2.3	Ensure that commercial development occurs in low-risk areas
03 Include climate resilience in all regional planning initiatives	3.1	Develop building guidelines and land development regulations that address lakeshore changes and flooding
	3.2	Coordinate across communities on land use to mitigate future flooding
	3.3	Increase capacity for resilience planning and coordination
	3.4	Develop resilience-based restoration funding program(s)

Scenario	Strategy	
04 Empower socially vulnerable populations to become resilient	4.1	Establish strategies to increase affordable housing opportunities outside of flood risk areas
	4.2	Protect and/or relocate community services including schools and daycare facilities in high-risk areas
	4.3	Ensure disadvantaged communities benefit from resilience efforts, resources, and funding opportunities
	4.4	Implement resilience educational programs, particularly for socially vulnerable populations
05 Protect critical infrastructure and invest in green infrastructure solutions to coastal hazards	5.1	Protect/relocate critical infrastructure in risk areas
	5.2	Protect existing regional transportation systems and physical connections to waterfront areas from flooding
	5.3	Mitigate flooding of water and wastewater facilities (including pump stations and treatment facilities)
06 Create a sustainable economy built upon resilience practices	6.1	Minimize damage and losses to commercial businesses including marinas due to high and low water events
	6.2	Diversify the economy to increase resiliency and support a year-round economy
	6.3	Incorporate emerging green jobs, industries, and technologies

10.2 Actions

Following the formulation of the scenarios and strategies, 30 potential actions were developed with input from the Steering Committee and public to advance the 21 resilience strategies. The following tables illustrate how each action aligns with the corresponding strategies outlined above:

Action	Strategy Alignment																			
	1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3	3.4	4.1	4.2	4.3	4.4	5.1	5.2	5.3	6.1	6.2	6.3
Regional Resilience Committee/ Advisory Board	■				■	■	■	■	■	■		■		■						■	■
Regional capacity building: Regional Resilience Coordinator	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Regional resilience funding	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Local resiliency task forces	■				■	■	■	■	■	■		■		■						■	■
Technical trainings for county and municipal staff										■											
Shoreline study		■		■		■		■	■	■									■		
Living shorelines	■	■	■																		

Action	Strategy Alignment																			
	1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3	3.4	4.1	4.2	4.3	4.4	5.1	5.2	5.3	6.1	6.2	6.3
Blue-green infrastructure:																					
• Vegetated buffers/terraces																					
• Roadway reduction/permeable pavement																					
• Rain gardens/bioretention																					
• Wetland protection and restoration																					
• Natural and nature-based features																					
Review local laws to allow nature-based techniques																					
Educate property owners about nature-based techniques																					
Floodplain and wetland resource conservation overlay district																					
Update stormwater management ordinance																					
Review/prepare LWRP																					
Participate in the climate smart communities program																					
Update/prepare local planning document with a resilience lens																					
Update/prepare open space plans																					
Cultural resources resilience plan																					
Review zoning to support resiliency measures																					
Offer incentives for resilience upgrades that exceed minimum requirements																					
Work with land trusts and communities for vulnerable area land conservation																					
Identify vulnerable populations and needs																					
Educational outreach to increase resiliency awareness																					
Managed retreat (if necessary)																					
Voluntary buy-outs																					
Risk and vulnerability assessment of regional transportation systems																					

The resilience action list is intended to provide a menu of potential actions for communities in the Niagara-Orleans region to choose from, based on the findings of the Plan. Not all actions will be appropriate for all communities, and some communities may already be implementing certain actions in some form.

With this in mind, a general list of actions is provided that Niagara-Orleans communities can consider, adapt, implement, and add to according to their specific needs.

The actions are detailed in full in the Actions Matrix in Section 11.

10.3 Detailed Project Profiles

Detailed Project Profiles can serve as a template for the communities, with guidelines on many of the factors that need to be considered as you advance an idea from conception to future phases, such as funding applications, initial regulatory discussions, community input, etc.

For the Niagara-Orleans CLEAR Region, four actions were selected to profile in more detail based on input from the Steering Committee and the public as well as the selection criteria listed below.

In selecting the profiles, the criteria shown below were considered.

As further detailed on the following pages, the four profiles created include:

- Regional Capacity Building for Resiliency – Regional Resiliency Coordinator
- Regional Resiliency Funding
- Lake Ontario State Parkway – Blue-Green Infrastructure Improvements
- Natural and Nature-based Feature (NNBF) Shoreline Improvements

Resilience Actions Criteria	
☑	**Demonstration Project** Can the project serve as a template for other areas or communities?
☑	**Implementation Feasibility** Can the project receive support from landowners and is it is feasible from a permitting and cost standpoint?
☑	**Multiple Benefit Project** Does the project include elements that benefit multiple communities?
☑	**Innovative** Does the project incorporate innovative technologies/techniques/policies?
☑	**Economic Benefit** Does the project include a demonstrated ability to protect economic assets?

Detailed Project Profile
CLEAR Niagara-Orleans Region

REGIONAL CAPACITY BUILDING FOR RESILIENCY

REGIONAL RESILIENCY COORDINATOR

CLEAR GOALS AND STRATEGIES

Aligns with CLEAR goals 1-5, strategy 3.3, and cross-cutting to all strategies

TIMEFRAME

Short term: 1-3 years

ESTIMATED COST

$150,000 - $250,000 annually (salary, benefits, and administration costs)

POTENTIAL PARTNERS

TBD. Potentially a regional research institute or planning agency, County emergency managers, County planning agencies, regional planning agencies, shoreline municipalities, regional NGOs, regional institutes and networks, state agencies

POTENTIAL FUNDING SOURCES

Cost-share, NYSDOS*, Resiliency Fund, EPA, federal programs

*only for municipalities with approved LWRPs

DESCRIPTION OF THE ACTION

Local capacity for designing and implementing resilience plans and strategies in the Niagara-Orleans region is limited. This is particularly true for Niagara County, which is not part of a regional planning group such as the Genesee/Finger Lakes Regional Planning Council (G/FLRPC) to which Orleans County is a member.

To address this gap, a new position or positions could be created for a Regional Resiliency Coordinator to manage resilience-building efforts with shoreline communities. This position would provide much needed capacity to ensure the successful implementation of a wide variety of resilience actions, including those recommended in the Plan, and to secure additional resources as necessary.

Potential responsibilities include:

- **Securing resilience funding:** The position will help to secure funding for resilience actions from various sources such as grants, loans, special funds, fees, bonds, or credits. The Coordinator will help with grant writing and may support the establishment of dedicated resilience funds as needed.
- **Technical assistance:** The Coordinator will provide technical support and arrange trainings for local communities including municipal staff in partnership with relevant agencies and experts. This could include guidance on resilience best practices including model laws, standards, and implementation techniques.

Regional Capacity Building for Resiliency

- **Support administration of resilience ordinances:** The Coordinator could serve as a resource to support the administration of resilience-related ordinances for local structures and land use. This could include floodplain ordinances, Coastal Erosion Hazard Area regulations, and LWRP Waterfront Revitalization Area policies (that support municipal planning departments).
- **Regional planning:** The Coordinator could lead resilience planning efforts in cooperation with shoreline municipalities. This might include chairing a Resilience Advisory Committee with representatives from local governments to develop coordinated policies and plans for adoption at the local level. The position would also support efforts to integrate resilience-thinking into existing local plans and processes.
- **Regional coordination:** This position could serve as a focal point to coordinate local resilience efforts with different levels of government and diverse regional actors. This might include coordinating working groups of government representatives, experts, and stakeholders to advance regional projects, programs, and policies in a manner that is consistent with the local, state, and federal regulations as well as the needs and visions of the local communities.

CASE STUDY

Niagara-Erie Clean Energy Coordinator: The University at Buffalo Regional Institute hosts a Clean Energy Coordinator for the Niagara and Erie County region. With funding from the NYSERDA Clean Energy Communities program, this coordinator supports local municipalities to implement clean energy actions, save energy costs, improve environmental stewardship, and access funding opportunities.

Leading a regional resilience workshop with community leaders in Long Beach Island, NJ
Source: Ramboll Americas

This role also advises on the Climate Smart Communities program and includes at-large membership of the Erie County Environmental Management Committee (EMC) and the City of Buffalo's Climate Change Task Force.

POTENTIAL BENEFITS

The Resiliency Coordinator would:

- Provide dedicated capacity for regional resilience-building efforts
- Serve as a resource for municipalities in the region seeking to integrate resilience into local plans and policies and to fund and implement these in their communities
- Improve coordination between various public and private entities to help remove barriers to action; delineate responsibilities; reduce waste, duplication, and maladaptation; and promote approaches with broad co-benefits

Detailed Project Profile
CLEAR Niagara-Orleans Region

Regional Capacity Building for Resiliency

The position will advance the CLEAR vision by facilitating effective ***"partnerships between multiple levels of government, property owners, and community organizations to improve the long-term resilience of communities, infrastructure, and natural ecosystems while enhancing the economy and quality of life for all shoreline users."***

CONCEPT

Detailed Project Profile
CLEAR Niagara-Orleans Region

Regional Capacity Building for Resiliency

DEMONSTRATED NEED

The Committee identified that while the strategies and actions would support increased resilience in theory, in practice the communities lack the capacity to implement them. By their nature, individual communities are focused on their day-to-day operations and have no dedicated planning staff to guide long-term efforts related to community growth and resiliency. On a county level, Orleans County is part of the G/FLRPC which could potentially assist in resiliency efforts, though there is currently no position dedicated to this topic area. Niagara County is not part of any regional planning council but has partnered with others for such purposes. For example, Niagara County partnered with Erie County on the One Region Forward plan and previously on a five-county Western New York Regional Sustainability Plan.

The goal of the CLEAR planning process is to think regionally about resiliency and to encourage communities, counties, state agencies, the private sector, and other agencies to work together. Impacts from future climate-related events do not know political boundaries and the entire Lake Ontario shoreline is essentially a shared resource among these various entities. There are economic drivers (i.e., marinas, boat launches, beaches, harbors), residential homes, government facilities, state parks, farms, and other resources that share in the same threat. Thinking and coordinating regionally is a means that can tie all these entities together for increased resiliency.

COMMUNITY SUPPORT

The Niagara-Orleans Steering Committee supported increased local capacity for resilience-building to address this gap. The idea of a Resilience Coordinator received good support from the public during Public Event #3.

CHALLENGES

Challenges for this action include ensuring the Resiliency Coordinator has a sustainable source of funding, is sufficiently supported within its organization, and has the trust and support of local communities and regional entities. These conditions are prerequisites for the position to have the necessary resources and authority to succeed.

Detailed Project Profile
CLEAR Niagara-Orleans Region

REGIONAL RESILIENCY FUNDING

CLEAR GOALS AND STRATEGIES

Advances CLEAR goals 3, 4, 5

Advances strategies 3.3, 3.4, and is cross-cutting to all others

TIMEFRAME

Medium term: 3-5 years

ESTIMATED COST

Varies

POTENTIAL PARTNERS

Regional Resilience Coordinator, county planning agencies, regional planning agencies, shoreline municipalities, regional NGOs, regional institutes and networks, community groups, business and economic development groups, local foundations

DESCRIPTION OF THE ACTION

According to the latest research by the National Institute of Building Sciences, spending on natural hazard mitigation saves $6 on average in future disaster losses for every $1 spent.[1] Yet, despite the evidence demonstrating the value of these investments, governments often struggle to find funds to set aside for preventing future losses.

To address this challenge, local governments have begun to explore new and diverse ways of mobilizing funding for resilience-building. These efforts need not be a zero-sum game – in other words, governments do not need to choose between spending money on resilience or spending money on another need. Resilience is a cross-cutting issue that can be integrated into existing plans and projects.

By modifying conventional development practices, taking advantage of co-benefits, and maximizing future returns, governments can work within existing budgets to achieve their resilience goals over time.

A sample of funding sources and mechanisms is presented on the following page. Some or all of these could be adapted for the Niagara-Orleans region.

[1] *Natural Hazard Mitigation Saves: 2019 Report*. National Institute of Building Sciences. Accessed 12.6.2021 from https://nibs.org/projects/natural-hazard-mitigation-saves-2019-report

Regional Resiliency Funding

Existing Funds and Programs

As a first step, local governments can review existing programs to see if there is an opportunity to integrate resilience actions into planned projects. Could green infrastructure elements be included in a planned road upgrade? Or could the new municipal building near the waterfront include an elevated first floor? In some cases, local governments may find that funding resilience actions is a matter of reallocating available funds, or reimagining planned projects, rather than raising additional capital.

Federal Grants

There are many federal grant programs available for resilience and disaster-mitigation projects. These are particularly helpful for large projects, though may require a local match. Examples include:

- FEMA Building Resilient Infrastructure and Communities Program
- FEMA Hazard Mitigation Grant Program
- FEMA Flood Mitigation Assistance Program
- USHUD Community Development Block Grants
- USDA Community Facilities Direct Loans and Grants
- USDA Conservation Innovation Grants
- U.S. NPS Rivers, Trails, and Conservation Assistance
- U.S. EPA Great Lakes Funding
- U.S. EPA Recreation Economy for Rural Communities
- U.S. EPA Environmental Education Grants
- U.S. EPA Environmental Justice Grants and Technical Assistance
- U.S. EPA OLEM Environmental Work Force and Job training Grants
- New Highway Trust Fund PROTECT grant program for resilient infrastructure

These and other federal grants programs could be used directly for resilience actions, or on related projects such as land conservation, job training, and affordable housing in low-risk areas that increase resilience as part of a broader development project.[2] To help navigate available grants, municipalities can turn to tools like the "Flood Funding Finder," designed by the American Flood Coalition to help small communities (with a population under 50,000) find suitable federal funding programs.

State Grants

New York State offers a wide variety of grant programs that could be applied to mitigate risks from changing lake conditions and support more resilient development pathways. Some programs are included in the annual Consolidated Funding Application (CFA) process (typically due in July) or are targeted funding programs from specific state agencies. Some programs include:

- Water Infrastructure Improvement Act (WIIA) grants
- Water Quality Improvement Project (WQIP) Program
- Intermunicipal Grant (IMG) programs
- Local Waterfront Revitalization Program (LWRP)
- Climate Smart Communities Grants (CSC)
- Trees 4 Tribs (T4T)
- NYSERDA Clean Energy Communities (CEC)
- Green Innovation Grant (GIG)
- Environmental Justice Community Impact Grants
- HCR Affordable Housing Programs
- Rural and Urban Community Investment Fund
- Residential Emergency Services to Offer Repairs to the Elderly
- BRIDGE NY and PAVE NY
- Smart Growth Program

[2] Search Grants.gov for more information

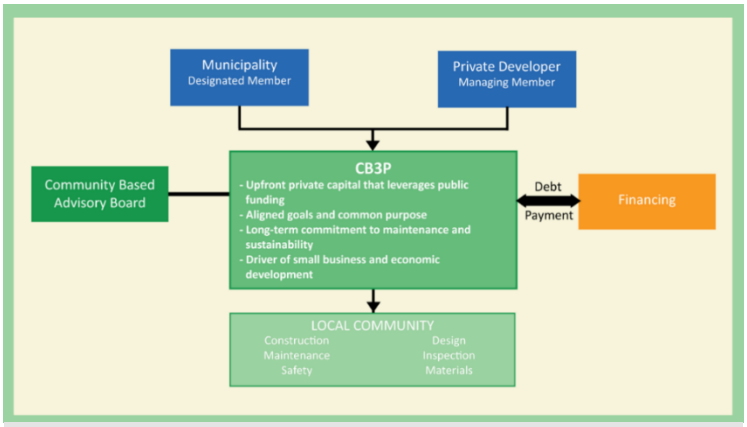
Regional Resiliency Funding

State grants are available for specific resilience projects, or municipalities can integrate resilience principles into broader projects. For example, blue-green infrastructure elements could be integrated into culvert upgrades funded with BRIDGE NY grants.

Private Foundation Funding

Funding from private organizations and foundations is available for local sustainability and resilience projects. Organizations such as the Kresge Foundation fund municipalities directly. In other cases, local governments can partner with private, non-profit, or research organizations on grant applications. In some cases, local governments have helped establish local 501(c)3 non-profit organizations with the express purpose of administering grants and projects in specific areas such as watershed management or parks and recreation. A few examples of funding sources for local resilience projects include:

- The Kresge Foundation – funds municipalities directly
- National Fish and Wildlife Foundation – funds municipalities directly (e.g., National Coastal Resilience Fund)
- Partners for Places program (P4P) – matching grant program for local governments partnered with at least one local foundation
- NOAA Regional Integrated Science and Assessments (RISA) – funds research teams working with local governments on regional climate resiliency projects
- Western New York Community Foundation – funds local non-profits
- Other local foundations



Sample Community-Based Public Private Partnerships model
Source: USEPA

Public Private Partnerships and Community-based Public Private Partnerships

Public Private Partnerships (P3) may be suitable for larger, more complex resiliency projects with high up-front costs, but a decent return on investment over time. Examples include toll roads/channels (e.g., post-disaster repair project), renewable energy installations (e.g., microgrid project to increase energy security), and utilities (e.g., stormwater system upgrades). P3s may involve joint concessions and cost-sharing agreements between one or more public and private entities. One successful case is the Port Miami Tunnel, a P3 design-build-finance-operate-maintain project between the City of Miami, Florida DOT, Miami-Dade County, and the private sector.[3]

An alternative to a P3 is a Community-Based Public Private Partnership (CBP3). This model is structured like a traditional P3, but adds in an obligation to consider community needs, for example, by including a community advisory board to guide investment decisions. CBP3s are in use

[3] L. O'Connell and K. Connors (2019), "Financing Climate Resilience," Harvard Kennedy School. Accessed 12.1.2021 via https://ash.harvard.edu/files/ash/files/financing_climate_resilience_ final_report.pdf

Regional Resiliency Funding

across the U.S. and have been successfully applied to fund green infrastructure and green stormwater projects.[4]

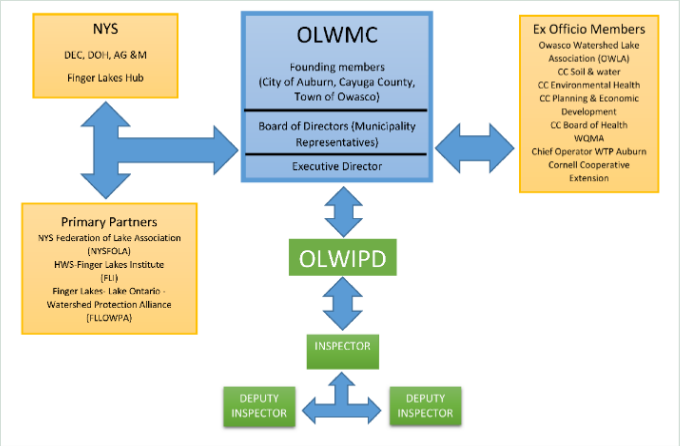
Shared Cost Agreements

Local governments can achieve more impactful results for less by pooling resources and expertise across communities through shared cost agreements. Projects funded in this manner have the advantage of being community-driven with more predictable schedules and revenue. Municipalities can also design cooperative agreements to allow for cash or in-kind contributions from non-government sources. For example, funding for a Regional Resiliency Coordinator could be split between a host research institution and participating local governments, with programmatic funding sourced from grants.

The Owasco Lake Watershed Management Council (OLWMC) provides an illustrative case study. The OLWMC was created to coordinate actions to protect Owasco Lake and its watershed as an important natural and economic resource. The Council was established as a 501(c)3 non-profit development corporation in 2011 with representation from a dozen municipalities. OLWMC staff and projects are funded through regular contributions from these municipalities with additional funding from grants, private donations, and in-kind support from regional partners and local volunteers.[5]

Special Improvement District

Local governments can create improvement districts to address special needs in a sub-section of a municipality. Special services for improvement districts are paid for through a special tax or fee levied on businesses and/or residents of the district. These funds are then spent on projects with a collective benefit for the district, spreading out costs. New York State has almost two dozen types of special service districts including those that focus on watershed protection, drainage, beach erosion control, aquatic plant growth control, dock areas, harbor improvement, parks, water services, sewer, wastewater disposal, water quality treatment, water supply, and business improvement. Municipalities may be able to use new or existing improvement districts to address resilience needs – for example, by establishing a Drainage Improvement District to improve stormwater management or building resiliency into projects in Business Improvement Districts. Alternatively, municipalities in New York could petition to establish a new type of district, such as a "Resiliency



Owasco Lake Watershed Management Council organizational structure with directors (municipalities), staff (E.D. and Inspectors), ex officio members and major partners (yellow).
Source: OLWMC

[4] The US EPA provides information on CBP3s and their application for financing green infrastructure. See https://www.epa.gov/G3/financing-green-infrastructure-community-based-public-private-partnerships-cbp3-right-you Case Studies are also available online, including on the Georgetown Climate Center Adaptation Clearinghouse. See https://www.adaptationclearinghouse.org/resources/chester-pennsylvania-green-stormwater-infrastructure-plan-and-community-based-public-private-partnership.html
[5] See https://www.olwmc.org/

Regional Resiliency Funding

Improvement District" to fund resilience needs such as building retrofits or green infrastructure systems. New special district types can be created through a special act by the State Legislature.

One example of a resiliency district that could potentially be adapted to New York comes from the City of Norfolk, Virginia. In 2019, Norfolk authorized the creation of Special Service Districts to pay for flood mitigation, dredging, water quality improvements, and coastal protection projects. A group of residents can now agree to pay a tax to finance such projects in their neighborhood, provided the projects are feasible and supported by a majority of parcel owners.[6]

Tax Increment Financing District

Tax Increment Financing (TIF) Districts are a public sector financing tool that could be used for resilience projects. NYS TIF Districts allow local governments to divert a portion of future property tax revenue to pay for redevelopment projects including public infrastructure, open space, land acquisition, and site preparation. TIF Districts are a land-value capture tool that allow the public to benefit from public investments that spur private growth. Often, investments in public infrastructure (e.g., broadband) or public spaces (e.g., parks and streetscapes) disproportionately benefit nearby private property owners, who see the value of their properties/businesses/apartments etc. increase in response. TIF Districts allow local governments to recapture some of this (future) profit to pay for the public improvement that drove it, without increasing taxes or limiting growth.

The Town of Elmsford, NY established a TIF District in 1986 for its 9A Corridor to be used for projects including flood mitigation and street improvements that are necessary to the economic vitality of the area. The TIF has been used to fund curb and sidewalk improvements, a flood mitigation study of Saw Mill Creek, and serves as a source of matching funds for grant projects.

Direct User Fees and Taxes

Where a steady revenue source is desired, some local governments have implemented direct user fees or a local sales tax to offset the cost of public resiliency improvements. Direct user fees are intended to target groups that would benefit from the improvements – such as boaters for dredging projects, property owners for utilities upgrades, or park visitors for waterfront park improvements. Consideration should be given to administration costs and equity when designing user fees. For example, flat rates are cheaper and easier to administer, but may place an unfair burden on some users.

Another option is a local sales tax. This may be particularly useful for seasonal and tourist destinations. The City of Austin, MN raises roughly $1.4 million annually through a ½ cent local option sales tax to fund flood mitigation projects and property buy-outs.[7]

Revolving Loan Funds

Revolving Loans Funds are a self-replenishing finance mechanism that can provide low-cost financing for both the public and private sector. They can be administered by any level of government or by non-government organizations for a variety of funding areas. The Clean Water

[6] See https://www.adaptationclearinghouse.org/resources/norfolk-special-service-district-policy-for-flood-protection.html
[7] Headwater Economics "Funding Strategies for Flood Mitigation" handout, *Building Blocks for Regional Resilience workshop* accessed 12.1.2021 via https://toolkit.climate.gov/sites/default/files/HE_Funding-strategies-flood-mitigation-handout.pdf

Regional Resiliency Funding

State Revolving Fund (CWSRF) is a well-known fund that supports local water infrastructure projects. Forthcoming from FEMA is a new hazard mitigation state revolving fund to assist local governments.[8]

Many county and municipal governments also administer small business revolving loan funds that have been seeded from local sources or from state or federal grant monies. New or existing revolving funds can be used to fund a range of resilience actions, from individual home or business improvements to larger infrastructure projects.

Rebates and Incentive Programs

Just as incentive programs have been created for climate change mitigation projects (e.g., renewable energy), incentive programs can be used for climate change adaptation and resilience projects. These programs offer discounts or rebates to individuals, organizations, or governments that invest in resiliency improvements with a broader benefit for the community. Discounts realized by governments could be reinvested in other resilience funds or projects.

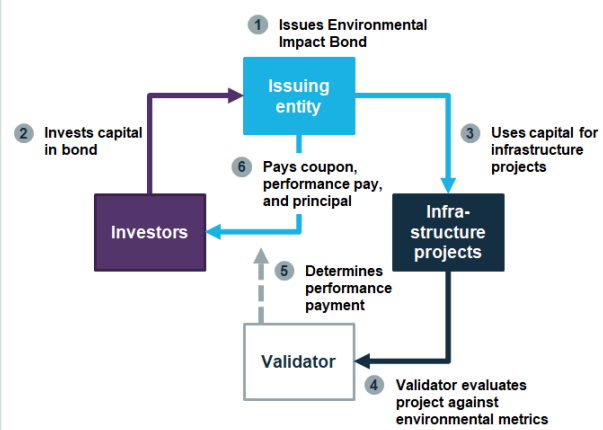
One example is the FEMA Community Rating System (CRS), a voluntary incentive program that provides discounted flood insurance premiums to communities that complete actions to improve their risk rating. Since joining the CRS program, the City of Niagara Falls has received a 10% discount on flood insurance premiums. As the City improves its rating (from its current 8 to a possible 1), this discount will increase.

Another example is New Hampshire's "Coastal Resilience Incentive Zones," which passed into law in 2017. For property owners in these zones, municipalities can waive property tax increases that would otherwise be assessed on substantial improvements that increase resiliency. Eligible improvements are defined by the municipality and might include elevation or relocation of structures, freeboard renovations, or construction of natural protective features. Projects must demonstrate a public benefit and be presented at a public hearing. The waiver expires after a set period.[9]

As an alternative to the New Hampshire example, municipalities could offer a non-monetary incentive, such as the ability to develop their property beyond bulk or area maximums by a certain percentage.

Environment Impact Bonds

Environmental Impact Bonds (EIBs) are used to fund innovative projects with an environmental benefit. EIBs are like regular bonds, but investors receive a higher return based on the project's success. These investors take on a higher risk for the chance of a higher reward – transferring risk away from the municipality and enabling pilots and projects that would be hard to fund through other means. EIBs are also attractive for investors managing



Sample EIB structure
Source: Summer Modelfino, American Flood Coalition

[8] Authorized in 2021 by the Federal STORM Act
[9] New Hampshire Revised Statutes § 79-E:4-a http://www.gencourt.state.nh.us/rsa/html/v/79-e/79-e-mrg.htm

Regional Resiliency Funding

Environmental, Social, and Governance (ESG) portfolios, which contain investments that adhere to certain environmental impact standards.

In 2020, the City of Buffalo launched a $30 million EIB to capitalize its Rain Check 2.0 Grant Program, which provides funding for private property owners to install green infrastructure.[10] The program will help reduce stormwater runoff that causes flooding and contamination from combined sewer overflows.

Local governments may be able to bundle smaller, related investments together in a single bond package to attract investors for smaller projects.

POTENTIAL BENEFITS

By establishing consistent, locally driven funding streams for resilience actions, the Niagara-Orleans region will be able to proactively invest in risk reduction measures that will prevent future damages to the local economy, environment, and community, saving millions of dollars in the long term. More control over resilience funding will also allow local communities to increase their returns by building in social, economic, and environmental co-benefits to resiliency projects in response to local needs and the CLEAR vision.

DEMONSTRATED NEED

Institutional financing for local resilience and climate change adaptation projects has not yet caught up with emerging demand. Given the innovative and long-term nature of many resiliency practices, it is often difficult for local governments to mobilize funding, expertise, and local support for projects that may be considered risky or not worth the delayed returns.

During the CLEAR planning process officials from the Niagara-Orleans region noted it was difficult for local governments to raise matching funds for flood recovery projects, even when the match was a small percentage of the total. There was also the sense that there was a resiliency financing gap for businesses and private property owners.

This sentiment was echoed in the responses to the public survey. Residents and some business owners reported spending thousands of dollars on emergency protection measures, beyond what they could afford. Developing funding mechanisms that spread hazard mitigation costs over several years in an affordable, predictable manner will help reduce financial stress for local governments and stakeholders.

COMMUNITY SUPPORT

“Establishing a Resilience Fund” was selected as a preferred action to include in the Niagara-Orleans CLEAR plan by the public during Public Event #3 and by the Steering Committee.

CHALLENGES

Challenges for this action include ensuring there is sufficient local capacity to access and administer resilience funding, regardless of the source. Establishing new, long-term funding mechanisms that work for communities in the Niagara-Orleans region will also take time, flexibility, and persistence (and could be interrupted by short-term recovery needs in the event of another disaster). Local leaders will depend on the support of public and private partners to secure and scale up resilience funding.

[10] See https://raincheckbuffalo.org/grants/

Detailed Project Profile
CLEAR Niagara-Orleans Region

LAKE ONTARIO STATE PARKWAY

BLUE-GREEN INFRASTRUCTURE IMPROVEMENTS

CLEAR GOALS AND STRATEGIES

Aligns with CLEAR goals 1-5 and strategies 1.2 and 1.3

TIMEFRAME

Short term: 1-2 years

ESTIMATED COST

$2,000,000 - $6,000,000 (Construction labor and materials)

POTENTIAL PARTNERS

Orleans County Department of Planning and Development, Genesee Transportation Council, NYSDOT, NYSOPRHP

POTENTIAL FUNDING SOURCES

Cost-share, NYSDOS, NYSDEC, Resiliency Fund, EPA, FEMA

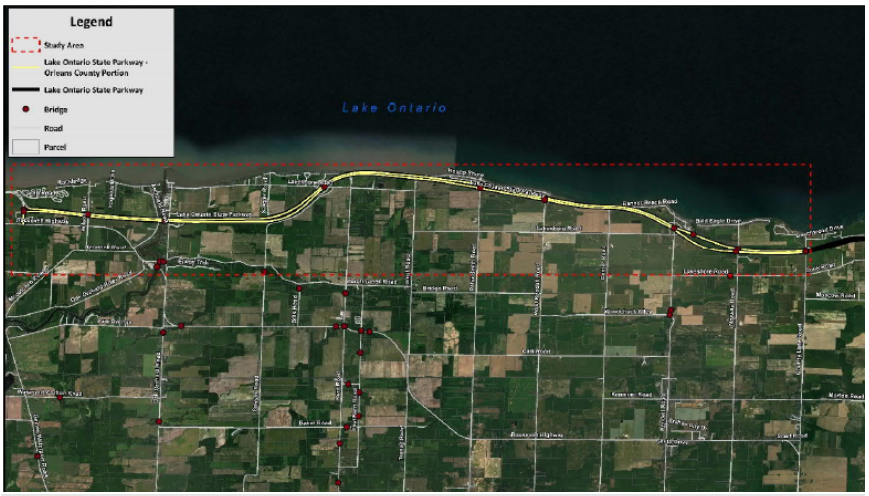
DESCRIPTION OF THE ACTION

The Lake Ontario State Parkway (LOSP) is a 35-mile parkway along the southern shore of Lake Ontario in Western New York (approximately 12.5 miles in Orleans County). It is part of the Seaway Trail, a National Scenic Byway that extends along the shores of Lake Erie and Lake Ontario from northwestern Pennsylvania to the North Country of New York. LOSP serves as a connector between Rochester and several lakeside state parks and communities. It passes through mostly open and rural areas, except near Greece and Rochester. The LOSP was one of several parkways built as part of a 145-mile expansion to New York State's parkway system in 1944.

Given the parkway's proximity to the shoreline, it is vulnerable to erosion in certain locations and may introduce contamination from salt and stormwater runoff into the nearshore area. To mitigate these impacts while increasing water quality, natural habitat, scenic aesthetics, and overall ecosystem health, blue-green infrastructure could be introduced along portions of the LOSP. This infrastructure might include raingardens, bioswales, grassland pollinator garden buffer areas, and permeable pavement. A viable location for many green infrastructure assets would be the median within the LOSP, which could provide space for filtration and retention of stormwater. Permeable pavement would likely be viable along the shoulder of the road.

Lake Ontario State Parkway

Similarly, due to the proximity of the LOSP to the shoreline and risks for ongoing erosion in the area, there is an opportunity to incorporate shoreline resilience measures in key areas to reduce rates of shoreline recession and bluff encroachment on the LOSP. Consideration should be made to a spectrum of shoreline resilience measures ranging from relatively stabilized features (e.g., stone revetments and graded/ vegetated bluffs) in areas of acute risk to the LOSP to those that are more ephemeral but that provide ecosystem benefits (e.g., littoral, beach, or bluff nourishment with sediment). Potentially, dredged sediments from other areas along shoreline can be strategically placed to help slow erosion of shoreline areas near the LOSP. As placed sediment erodes, it will nourish downdrift littoral systems



Portion of the Lake Ontario State Parkway in Orleans County
Source: WSP – Genesee Transportation Council

POTENTIAL BENEFITS

Blue-green infrastructure improvements to the LOSP would greatly increase the resiliency of the roadway. As the LOSP is vulnerable to erosion in certain locations near the shoreline, infrastructure improvements would mitigate the impacts. Additionally, installation of blue-green infrastructure would aid in the mitigation of water quality impacts from roadway salt and stormwater runoff. Dredging and sediment beneficial reuse opportunities could provide the win-win economic and shoreline resiliency.

The action will advance the CLEAR vision by improving stormwater management systems to reduce flooding and improve water quality.

IMAGERY/CONCEPTS

Retention Street

Used to retain water where terrain is favorable

Central Retention

Used to retain water in a larger area connected to other BGI projects

Detailed Project Profile
CLEAR Niagara-Orleans Region

Lake Ontario State Parkway

DEMONSTRATED NEED

Portions along the LOSP have experienced erosion, which becomes exacerbated during heavy rainfall events due to the high velocity and volume of runoff. Infiltrating, detaining, or retaining the runoff would not only decrease the rate at which the erosion is occurring but it would also improve the water quality by filtering the runoff through the sand and soil media.

There are two sections of Parkway within the county that are within 200 feet of the shoreline (1.25 miles east of the Lakeshore Road interchange and 1.25 miles east of the W. Kendell Road Bridge).

Placement of sediment from Johnson Creek along the LOSP bluff
Source: Ramboll

COMMUNITY SUPPORT

Support was expressed by the Niagara-Orleans Steering Committee. It was mentioned how there is already plenty of research on the benefits and effectiveness of each type of solution, and that NYSDEC has standards for the design of blue-green infrastructure. A study has been performed in collaboration with Genesee Transportation Council, NYSDOT, Orleans County, and community stakeholders to assess the feasibility of repurposing portions or the entirety of the LOSP. This study included community surveys which resulted in the support of maintaining the route and providing year-round accessibility, which would require improved drainage. The Regional Dredging Council has expressed strong support for ongoing dredging and sediment management efforts in the region.

CHALLENGES

Challenges for this action include maintenance of traffic, potential impacts of construction, and maintenance of the blue-green infrastructure over time. Agreements for ownership and maintenance will be needed to ensure they continue functioning properly through their useful life. Topographic and geotechnical information would need to be collected to ensure that blue-green infrastructure would be functional in the chosen locations. Environmental and geotechnical considerations are warranted when considering potential sediment reuse opportunities.

Detailed Project Profile
CLEAR Niagara-Orleans Region

NATURAL AND NATURE-BASED FEATURE SHORELINE IMPROVEMENTS

DESCRIPTION OF THE ACTION

Three New York State Parks in Niagara County: Wilson-Tuscarora, Fort Niagara, and Golden Hill are experiencing shoreline erosion and destabilization. Natural and nature-based features (NNBF) can be used to stabilize the shoreline and prevent future erosion. It is likely that the NNBF implementation would be in conjunction with the mechanical soil stabilization or other bioengineered solutions for increasing slope stability. These three parks are potential locations for a pilot project of NNBF utilization for shoreline improvements. Initial assessment will determine the location and NNBF solution to be implemented.

Wilson-Tuscarora: A portion of this park's shoreline was stabilized using native shrubs planted atop revetment during a 2020 NYSOPRHP project. The shoreline will be assessed, and sections designed for stabilization incorporating NNBF, such as the use of vegetated riprap, living shorelines, or other natural features as needed.

Fort Niagara: NYSOPRHP will be working with USACE on the design for shoreline protection at the historic seawall and at the northeast corner of the fort. This will include mechanically stabilized earth to aid in stabilizing the soil, attenuating waves, and increasing the ecological benefits.

Golden Hill: NYSOPRHP is planning to reinforce existing shoreline protection at the Thirty Mile Point Lighthouse in Golden Hill State Park. The shoreline will be assessed for the most effective and practical use of NNBF, including vegetated riprap, aquatic vegetation, or other features.

CLEAR GOALS AND STRATEGIES

Aligns with CLEAR goals 1-5 and strategies 1.2 and 1.4

TIMEFRAME

Short term: 1-2 years

ESTIMATED COST

$5,000,000 - $20,000,000 (construction labor and materials)

POTENTIAL PARTNERS

New York State Office of Parks, Recreation and Historic Preservation (NYSOPRHP), USACE, Niagara County, Towns of Barker, Wilson, and Youngstown

POTENTIAL FUNDING SOURCES

Cost-share, NYSDEC, Resiliency Fund, EPA, FEMA

Detailed Project Profile
CLEAR Niagara-Orleans Region

NNBF Shoreline Improvements

POTENTIAL BENEFITS

NNBF shoreline improvements would greatly increase the resiliency of these state parks. Since the parks border the shoreline, they are vulnerable to erosion and soil instability. NNBFs offer solutions for stabilizing soil through root structures, while also preventing future erosion by attenuating wave velocities. NNBFs also offer the ability for increased habitats and ecological benefits.

The action will advance the CLEAR vision by increasing resiliency and reducing the risk of future flooding for public parks which provide opportunities for tourism and recreation.

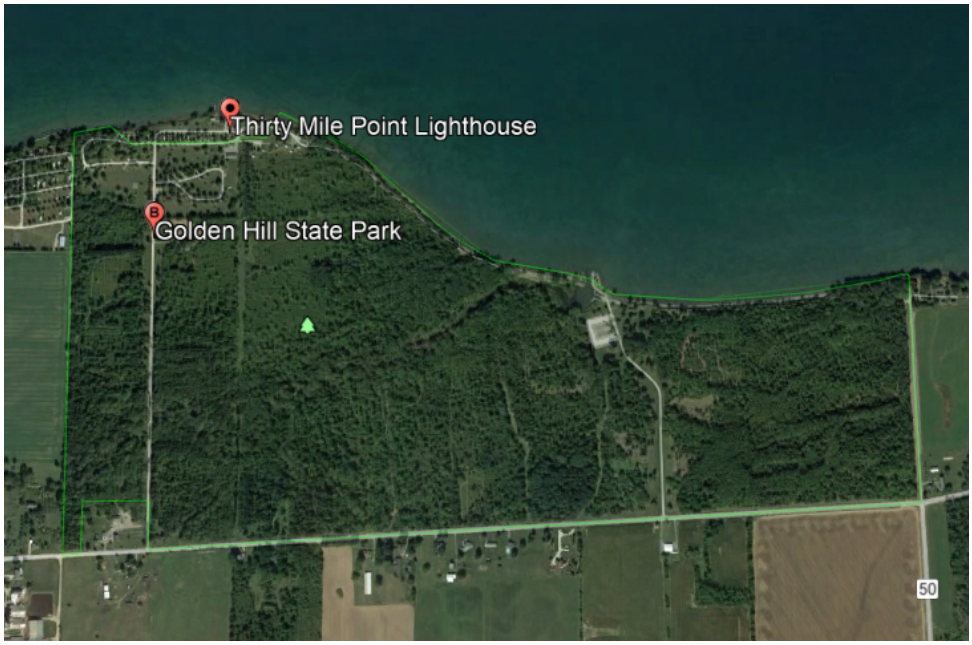
DEMONSTRATED NEED

Portions along the shoreline of the state parks Wilson-Tuscarora, Fort Niagara, and Golden Hill have experienced erosion and shoreline destabilization due to high wave velocities and water levels within Lake Ontario. By implementing NNBF along the shoreline, wave velocities can be attenuated, and soil is able to be stabilized.

Wilson-Tuscarora State Park
Source: Google Earth Pro, imagery dated 9/22/2018

NNBF Shoreline Improvements

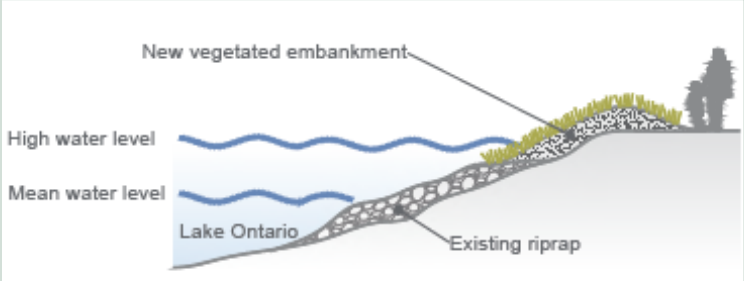
Fort Niagara State Park
Source: Google Earth Pro, imagery dated 9/22/2018



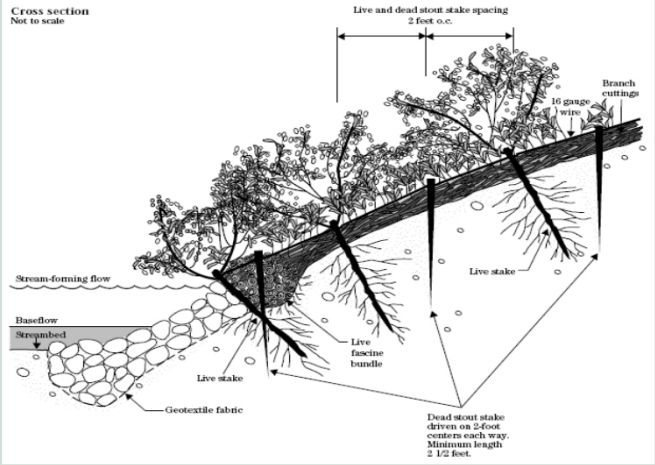
Thirty Mile Point Lighthouse in Golden Hill State Park
Source: Google Earth Pro, imagery dated 9/22/2018

NNBF Shoreline Improvements

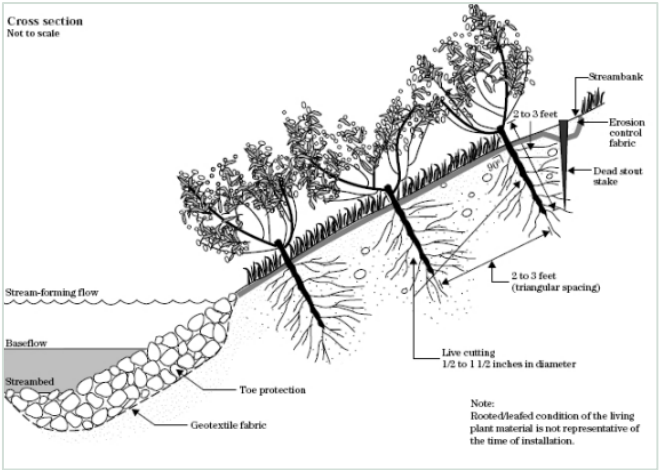
IMAGERY/CONCEPTS



New vegetated embankment
Source: Ramboll, principle sketch, NTS



Source: USDA – NRCS EFH Chapter 16



Source: USDA – NRCS EFH Chapter 16

COMMUNITY SUPPORT

The community has a strong desire for preserving cultural and natural resources as a means for increasing tourism and economic development. The Niagara-Orleans Steering Committee expressed support for a NNBF-approach to address areas of erosion or destabilization. Further, the NYSOPRHP endorsed this approach, and the agency shared their conceptual plans for shoreline improvements at both Fort Niagara and Golden Hill State Parks.

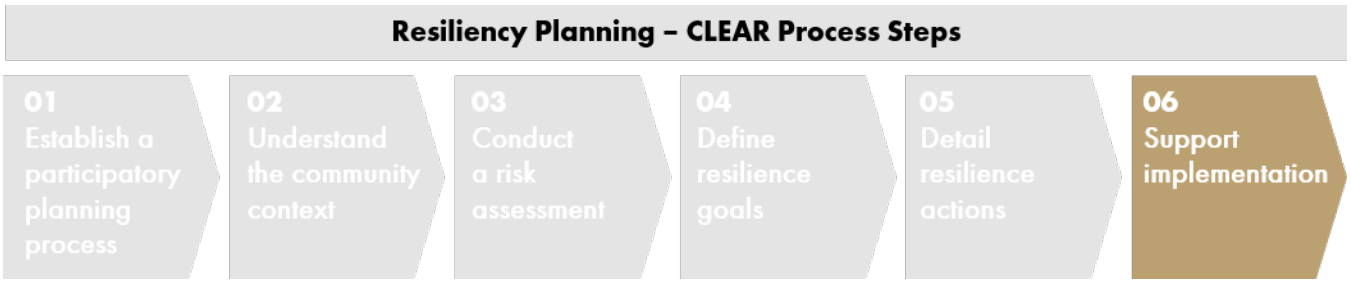
CHALLENGES

Additional geological and hydraulic information would be needed for a detailed design of the NNBFs to accurately design a system that would improve resiliency and ensure slope stability for an extended design-life. As water levels continue to increase in Lake Ontario, it is likely that additional measures will be needed to ensure continued protection to the lake-front state parks.

CLEAR Plan
Niagara-Orleans Region

11

Implementation



11.0 IMPLEMENTATION

The Action Matrix created serves as an implementation tool to guide communities through the various resilience actions identified. The matrix contains a description of each action including its anticipated benefits, how it advances the CLEAR goals and vision, the strategies it aligns with, and a related case study or resource. In addition, the matrix includes information on the suggested timeframe, priority, potential partners, estimated cost, potential funding, and key performance indicators for the action.

Community leaders, non-profits, interest groups, or private citizens/businesses can easily browse the wide variety of potential actions that could be advanced with their support to achieve long-term resilience for shoreline communities in the Niagara-Orleans region. By aligning their programs with the CLEAR plan, they may also be at a competitive advantage for future funding opportunities. This matrix should be a living tool that is routinely revisited and updated to reflect the evolving needs of the community. Over the course of long-term resiliency planning, the defined vision should be proactively considered and advanced to create a stronger and more resilient region that can adapt to the changing and dynamic nature of the shoreline.

Niagara-Orleans Region Priority Action Matrix

Action (How)	Description	Case Study or Reference Resource	Anticipated Benefits	Alignment with CLEAR Goals and Vision	Alignment with CLEAR Strategies	Timeframe	Priority	Ongoing	Potential Partners	Estimated Cost Range (if known)	Potential Funding	KPIs
Regional Resilience Committee/Advisory Board	Regional committee with a representative such as a staff member or elected official from each participating municipality. This committee would serve as a resource to advise municipal officials on resilience-building and enable coordinated regional action. Part of their role could be to formulate potential policies for the region that could be adopted locally by individual municipalities. They could also serve as the 'implementation committee' for the CLEAR plan.	The Erie County Environmental Management Council (EMC) was established in the Erie County Charter in 1971 to advise County government on addressing local environmental concerns and to serve as a liaison between the community and County. The Council is composed of representatives from Erie County municipalities and 12 at-large members. Among other things, the Council provides annual recommendation reports on topics including resilience and climate adaptation. See https://www2.erie.gov/environment/index.php?q=environmental-management-council	Such a committee would improve regional cooperation and coordination so that all communities can learn from each other and adopt similar policies for resiliency that protect the broader region. By pooling resources and expertise, the committee would contribute to increased understanding of and capacity for resilience planning across the region.	Advances Goals 1 and 5 of the CLEAR initiative by bringing together local governments, organizations, and leaders to protect their communities. Advances the vision by building partnerships that increase long-term resilience for all shoreline users and ecosystems.	Advances Strategy 3.3 and supports Strategies 1.1, 2.1, 2.2, 2.3, 3.1, 3.3, 4.1, 4.3, 6.2, and 6.3			X	Municipal elected officials, GFLRPC, County Planning and Economic Development, academia, Soil and Water Conservation, NY Sea Grant, NYSDOS local government services, NYSDEC	N/A	N/A	Committee formed and officially recognized. Process for advising on regional resilience plans and policies initiated.
Regional Capacity Building: Regional Resilience Coordinator	Regional Resilience Coordinator(s) to facilitate funding, capacity building, technical assistance & skills-building, awareness, coordination in the region. (See detailed description in project profile)	The University at Buffalo Regional Institute hosts a Clean Energy Coordinator for the Niagara and Erie County region. With funding from the NYSERDA Clean Energy Communities program, this coordinator supports local municipalities to implement clean energy actions, save energy costs, improve environmental stewardship, and access funding opportunities. This role also advises on the Climate Smart Communities program.	The Regional Resilience Coordinator would provide dedicated capacity for regional resilience-building efforts.	Advances CLEAR Goals 1-5. Advances the CLEAR vision by facilitating effective "partnerships between multiple levels of government, property owners, and community organizations.	Supports all CLEAR Strategies and specifically Strategy 3.3				Academia, regional planning agencies, GFLRPC, County Planning, County emergency managers, municipalities, NY Sea Grant, regional NGOs, regional institutes and networks, State agencies	$150,000-$250,000	NYS agencies, Cost-share, Resiliency Fund, EPA, Federal programs	Coordinator hired and seated in a supporting entity. Improved understanding of resilience actions among key regional actors and officials within 3 years. Increased financial and technical resources available for regional resilience actions within 4 years; Increase in average annual number or projects implemented that have a resilience component within 5 years
Secure Regional Resilience Funding	A variety of mechanisms are available to help local governments address funding gaps for resilience actions. Examples include: Federal and State Grants, Private Foundation Funding, Community-based / Public Private Partnerships, Shared cost agreements, Special improvement districts, Tax increment financing district, Direct user fees and taxes, Revolving loan funds, Environmental impact bonds, and rebate/incentive programs. See a description of each in the detailed project profile for this action.	Municipalities thoughout New York and the U.S. have utilized these mechanisms in different ways. See the corresponding project profile for this action for some examples or browse the Georgetown Adaptation Clearinghouse: https://www.adaptationclearinghouse.org/	By establishing consistent, locally-driven funding streams for resilience actions, the Niagara-Orleans region will be able to proactively invest in risk reduction measures that will prevent future damages to the local economy, environment, and community, saving millions of dollars in the long-term.	Advances CLEAR Goals 3, 4, 5 Advances the CLEAR Vision by using "a dynamic and multi-pronged approach that includes prevention, mitigation, and adaptation" and "partnerships between multiple levels of government, property owners, and community organization ... to improve the long-term resilience of communities, infrastructure, and natural ecosystems while enhancing the economy and quality of life for all shoreline users."	Aligns with Strategies 3.3 and 3.4 and supports all other strategies			X	Regional Resilience Coordinator, County planning agencies, regional planning agencies, GFLRPC, shoreline municipalities, regional NGOs, regional institutes and networks, NY Sea Grant, community groups, business and economic development groups, local foundations	Varies	N/A	At least one consistent funding stream for resilience projects established at the regional and at the local level in the first 3 years. Local governments are able to secure funding for priority resilience project within 2 years of a proposal being advanced.

Niagara-Orleans Region Priority Action Matrix

KEY

Short (1-2 yrs.)
Medium (3-5 yrs.)
Long (6+ yrs.)

Medium
High
Top

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Local Resiliency Task Forces	A Task Force at the municipal level can support and further local resilience planning efforts. This could be through the development of a local resilience plan, or the integration of resilience principles into existing local plans. The Task Force could also advise on the design and implementation of specific actions. The Task Force might include representatives from local planning and emergency management agencies, businesses, community groups, technical experts, community leaders, local residents, relevant interest groups, students, and other stakeholders.	The Town of Sodus Climate Smart Communities Task Force is composed of local stakeholders who assist with the development of strategies and actions to mitigate and increase resilience to the impacts of climate change. This Task Force was formed to support the Town of Sodus' participation in the NYS Climate Smart Communities program.	Local Task forces can assist with the development of local resilience assessments and plans while facilitating community engagement and ownership.	Advances CLEAR Goals 1, 3, 4, and 5 Advances the CLEAR vision by facilitating effective partnerships between government, property owners, and community organizations to improve long-term resilience.	Advances Strategy 3.3 and supports Strategies 1.1, 2.1, 2.2, 2.3, 3.1, 3.3, 4.1, 4.3, 6.2, and 6.3			X	Municipal officials and staff, local community groups, interest groups, business owners, non-profits, planners, emergency managers, technical experts, and residents	N/A	N/A	Task Force is assembled and adopts a mission statement, discrete objectives, operating structure, and regular meeting schedule.
Technical Trainings for County and Municipal Staff	Identify existing training programs through NYSDOS, NYSDEC and others for training to educate County and municipal staff about stormwater, flooding and erosion. Potential to partner with local agencies and groups (e.g. County SWCD, academia) to host workshops and seminars with modules on resilience strategies. Training options could also be identified to satisfy the 4-hour NYS requirement for Planning Board and Zoning Boards of Appeals.	NYSDOS Local Government Training (LGt) programs (on-line and in-person) offer free training courses on land use planning, regulation, and local governance. These courses benefit the members of planning boards and zoning boards of appeals, elected officials, enforcement officials and other municipal employees and can be used for training credits. These have been held successfully in the Niagara-Orleans region and could be referenced for resilience topics.	Increased awareness for staff, Planning Boards, Zoning Boards of Appeals and private property owners. Stormwater trainings could focus on alternative management methods such as Blue Green Infrastructure options and Living Shorelines. Lessons learned can then be integrated into approvals and permitting decisions.	Advances CLEAR Goal 5. Advance CLEAR vision by supporting "partnerships between multiple levels of government" and helping to " improve the long-term resilience of communities, infrastructure, and natural ecosystems while enhancing the economy and quality of life for all shoreline users."	Advances Strategy 3.3 specifically and could support all strategies.			X	Municipal elected officials, County Planning and Economic Development, academia, Soil and Water Conservation, NY Sea Grant, NYSDOS local government services, NYSDEC	Potentially Free (via Technical Assistance Program)	NYSDOS	1-2 Training Programs completed per County in next 2 years.
Shoreline Study	Conduct Shoreline Study including an analysis of sediment flow, historic losses, and damages to inform potential interventions.	The City of Albany's Hudson River Shoreline Stabilization Study (2021) assessed the condition of the City's tidal Hudson River shoreline and developed a strategy for restoring and enhancing the riverfront. It also included recommendations for potential long-range projects to improve public access and park facilities, which informed a recent update of the City's LWRP.	The study can serve as the basis for decision-making for shoreline management practices. Educating on erosion patterns and 'feeder' sites (sites that serve as a source of sediment for other shoreline sites) will increase understanding of which shoreline stabilization techniques to use in which locations, and the potential impacts of different interventions on the broader shoreline.	Advances CLEAR Goals 1, 2, 3, 4, and 5. Advances the CLEAR vision by providing guidance on how to use "prevention, mitigation, and adaptation to increase resilience to variable lake levels and climate change .... to improve the long-term resilience of communities, infrastructure, and natural ecosystems."	Aligns with Strategies 1.2, and supports strategies 1.4, 2.2, 3.1, 3.2, 3.3, and 6.1				NYSDOS, NYSDEC, NYSOPRHP, USACE, academia, TNC, NY Sea Grant	$400,000 - $600,000	Cost-share, NYSDOS, NYSDEC, Resiliency Fund, EPA, FEMA	Shoreline Study completed and distributed to key actors and stakeholders. Study informs multiple public and private shoreline actions within the first 3 years.
Living Shorelines	Living shorelines connect the land and water to stabilize shorelines, reduce erosion, and foster biodiversity of valuable habitats to enhance coastal resilience. See detailed project profile, Natural and Nature Based Feature Shoreline Improvements, for an example of this action.	The City of Marysville, MI replaced 1,885 feet of steel seawall along the St. Clair River (Lake Huron outlet) with a naturalized shoreline in 2012, providing improved public spaces and wildlife habitat. The project was supported by the Great Lake Restoration Initiative. For an overview of living shorelines and links to helpful resources, see https://storymaps.arcgis.com/stories/def578589be547b88870578612897cab	Nature based solutions that integrate gray, green, and blue infrastructure elements offer a feasible, economical and valuable option for regions facing natural hazards and climate change. Living shorelines promote natural ecosystem processes to mitigate the need for traditional gray infrastructure.	Advances CLEAR Goals 1, 2, and 3. Advances the CLEAR Vision by using "a dynamic ... approach that includes prevention, mitigation, and adaptation ... to improve the long-term resilience of communities, infrastructure, and natural ecosystems."	Aligns with strategies 1.1, 1.2, 1.3				NYSDOS, NYSDEC, NYSOPRHP, USACE, academia, TNC, NY Sea Grant, community and environmental groups	$75,000 - $1.5M depending on size and scope	Great Lakes Restoration Initiative, USEPA, USACE, NYSDOS, Foundations, Cost-share	Living / naturalized shoreline project initiated within 5 years in the region to serve as a demonstration project for others.

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Blue-Green Infrastructure	A network of multi-functional green spaces, both new and existing, rural and urban, which support the natural and ecological processes and is integral to the health and quality of life of sustainable communities. "Blue" (water spaces) and "green" (vegetated spaces) infrastructure can be used in place of conventional "gray" infrastructure (e.g. culverts, pipes) in many cases to achieve similar results for stormwater management, shoreline protection etc. with added co-benefits for the environment and community. Some Blue-Green Infrastructure is designed to become a self-sustaining part of the local eco-system, reducing costs and maintaince needs in the long-term. See detailed project profile, Lake Ontario State Parkway Blue-Green Infrastructure Improvements, for an example of this action.	Ramboll Strengthening Blue-Green Infrastructure report https://ramboll.com/-/media/38fc23d12a5d47dcb7b3821716d69270.pdf NYS Stormwater Management Design Manual https://www.dec.ny.gov/chemical/29072.html NY Sea Grant Green Infrastructure Retrofit manual and trainings Great Lakes Commission Green Infrastructure Champions Program https://www.glc.org/work/champions	Blue-Green Infrastructure offers a feasible, economical and valuable option for regions facing natural hazards and climate change. It complements and in some cases mitigates the need for gray infrastructure. Blue-Green Infrastructure (BGI) represents a paradigm shift that recognizes the importance of and value in including the role of hydrology within water management. The “Blue” recognizes the importance of the physicality of water itself, while the “Green” connects hydrological functions with vegetation systems in landscape design. The resulting BGI has overall socioeconomic benefits that are greater than the sum of the individual components.	Advances CLEAR Goals 1, 2, and 3. Advances the CLEAR Vision by using "a dynamic ... approach that includes prevention, mitigation, and adaptation ... to improve the long-term resilience of communities, infrastructure, and natural ecosystems."	Aligns with strategies 1.1, 1.2, 1.3			X	NYSDOS, NYSDEC, NYSDOT, NYSOPRHP, NY Sea Grant, USACE, academia, TNC, SWCD, GFLRPC, community and environmental groups, USEPA, USDOT	Cost varies based on components and features	Highway Trust Fund, NYSDOS, NYSDEC, Great Lakes Restoration Initiative, USEPA, USFWS, FEMA, USHUD,	Local practitioners trained in Blue-Green Infrastructure practices. Blue-Green Infrastructure techniques integrated into mainstream, local infrastructure plans and projects. 1 BGI action implemented in each municipality in next 5 years.
Vegetated Buffers/Terraces	It is best to maintain naturally vegetated buffers along perennial streams, rivers, shorelines and wetlands. In areas where they have been degraded or channelized, designed vegetated buffers should include thickly vegetated strips of land that protect waterways and wetlands from polluted runoff and erosion, and flood absorption. As the width of a vegetated buffer increases, environmental benefits also grow. Buffers less than 50 feet wide offer minimal protection, while those 200 to 300 feet wide improve water quality and protect aquatic habitats. Additionally, riverine and inter-tidal terraces can be implemented within previously channelized rivers to naturalize riverbanks and re-introduce areas for nature to flourish. They can vary significantly in size, from small wood fenders attached to existing river walls, to large stepped terraces replacing hard walls. They are of great benefit to a variety of species, providing space for aquatic planting to develop which in turn provides cover for fish to spawn, niches for aquatic invertebrates and habitat for breeding birds and terrestrial invertebrates.	NYS DEC Riparan Buffer Resources https://www.dec.ny.gov/chemical/106345.html	Vegatated Buffers in particular offer shoreline stabilization, property protection, and opportunity for increased biodiversity in place of hardened gray infrastrucutre.	Advances CLEAR Goals 1, 2, and 3. Advances the CLEAR Vision by using "a dynamic ... approach that includes prevention, mitigation, and adaptation ... to improve the long-term resilience of communities, infrastructure, and natural ecosystems."	Aligns with strategies 1.1, 1.2, 1.3			X	NYSDEC, NYSOPRHP, NY Sea Grant, academia, TNC, SWCD, community and environmental groups, USEPA, USDOT	$600/acre - $3400/acre	NYSDEC, WQIP, Trees4Tribs, USEPA, NFWF, USFWS, FEMA	New buffer projects implemented for 3 streams or other wetland areas in the region in next 4 years.

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Roadway Reduction/ Permeable Pavement	The use of alternative road layouts that reduce the total length of roadways can significantly reduce overall imperviousness of a development site. Permeable paving provides the structural support of conventional pavement, while reducing stormwater runoff by draining directly into the underlying base and soils. It can be used to treat low traffic roads, single-family residential driveways, overflow parking areas, sidewalks, plazas, tennis or basketball courts, and courtyard areas.	Lake George, NY recently installed a porous pavement along its Beach Road to improve stormwater management, water quality, and traffic operations. The innovative project has won several awards and serves as a model for other projects. Cornell Local Roads Program: https://cals.cornell.edu/nysltap-local-roads	Reducing paved surfaces and increasing permeable areas reduces stormwater runoff. This is beneficial for water quality and stormwater service infrastructure, especially in areas with combined sewers. It has also been shown to reduce heat indexes during peak heat in summer months.	Advances CLEAR Goals 1, 2, and 3. Advances the CLEAR Vision by using "a dynamic ... approach that includes prevention, mitigation, and adaptation ... to improve the long-term resilience of communities, infrastructure, and natural ecosystems."	Aligns with strategies 1.1, 1.2, 1.3			X	NYSDOS, NYSDEC, NYSDOT, NYSOPRHP, academia, TNC, SWCD, community and environmental groups, USEPA, USDOT	$12.00/sf - $20.00/sf	Highway Trust Fund, NYSDOS, NYSDEC, NYSEFC, USEPA, USDOT	Local practitioners trained in permeable pavement techniques. 1 demonstration project implemented and 1 larger-scale project initiated in the next 4 years.
Rain Gardens/ Bioretention	These green infrastructure features reduce flooding incidences, promote runoff infilitration, provide water quality treatment, and improve the livability of urban areas. They contribute to flood management and provide wetland habitat. Rain gardens can have a variety of plantings, with species which are both flood and drought tolerant included. They do not have to be large to serve a useful function. Swales contribute to flood management of larger areas. To be of benefit to biodiversity, they should be planted or have vegetation allowed to develop naturally, and not be managed too intensively. Cutting of vegetation after flowering will encourage wildflowers to develop.	The Genesee/Finger Lakes Regional Planning Council provides a list of resources and examples of green infrastructure practices including rain gardens. https://www.gflrpc.org/green_infrastructure_practices/index.php	Blue-Green Infrastructure offers a feasible, economical and valuable option for regions facing natural hazards and climate change with a range of social, economic, and ecological co-benefits.	Advances CLEAR Goals 1, 2, and 3. Advances the CLEAR Vision by using "a dynamic ... approach that includes prevention, mitigation, and adaptation ... to improve the long-term resilience of communities, infrastructure, and natural ecosystems."	Aligns with strategies 1.1, 1.2, 1.3			X	NYSDOS, NYSDEC, NYSDOT, NYSOPRHP, GFLRPC, academia, NY Sea Grant, TNC, SWCD, community and environmental groups, USEPA	$29.00/sf - $45.00/sf	NYSDEC, NYSEFC, NYSDOS, USEPA, USFWS, FEMA, Foundations,	Local practitioners trained in biorention techniques. 3 raingarden/bioretention projects implemented in the next 4 years.
Wetland Protection and Restoration	Wetland protection is defined as removing a threat or preventing the decline of wetland conditions (US EPA, 2007a). Restoration is the manipulation of a former or degraded wetland's physical, chemical, or biological characteristics to return its natural functions. Restoration practices include: Re-establishment, the rebuilding a former wetland; and Rehabilitation, repairing the functions of a degraded wetland. The work begins with the identification of rare, vulnerable, or important wetlands using local data and mapping tools (GIS, color-infrared photography, mapping, modeling, field inspection of soil, vegetation, and hydrologic conditions) to identify and prioritize restorable wetlands.	In 2008, Buffalo Niagara Waterkeeper began a project to restore West Seneca's oxbow wetland on Buffalo Creek and adjacent habitat with support from the National Fish and Wildlife Foundation (NFWF). The project involved the transfer of 14 acres from private ownership to the Town of West Seneca with a conservation easement, thousands of hours of in-kind support from SUNY Buffalo graduate students, informational meetings with local official and residents, and the preparation of a "Watershed Owners Manual" technical assistance guide for Town officials. https://bnwaterkeeper.org/projects/habitat/ws-oxbow/	Wetlands provide an effective strategy for mitigating and adapting to the impacts of climate change via carbon sequestration, valuable flood storage, buffer storm surge, and assist in erosion control. Any loss of coastal wetlands can also increase the risk that rising sea levels and storm surge pose to coastal infrastructure. Healthy wetlands can provide many of the same benefits of traditional man-made infrastructure at a much lower overall investment and maintenance cost. Unlike traditional human-made structures, a well-designed and maintained natural infrastructure project will not depreciate like an artificial system, and in fact, may actually increase in value over time.	Advances CLEAR Goals 1, 2, and 3. Advances the CLEAR Vision by using "a dynamic ... approach that includes prevention, mitigation, and adaptation ... to improve the long-term resilience of communities, infrastructure, and natural ecosystems."	Aligns with strategies 1.1, 1.2, 1.3			X	NYSDOS, NYSDEC, NYSOPRHP, GFLRPC, academia, NY Sea Grant, TNC, SWCD, community and environmental groups, USEPA, USFWS, foundations	$10.00/sf - $15.00/sf	NYSDEC, NYSEFC, NYSDOS, USEPA, USFWS, NFWF, Cost-sharing and in-kind support	Ecosystem services of priority wetlands identified. Restoration of a degraded feature initiated witin 3 years.

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Review Local Laws to Allow Nature-based Techniques	Review local zoning and laws to permit and/or incentivize more nature-based techniques. For example, the use of alternative road layouts that reduce the total length of roadways can significantly reduce overall imperviousness of a development site. Permeable paving provides the structural support of conventional pavement, while reducing stormwater runoff.	City of Utica, NY Form-Based Code requires Low Impact Design (LID) techniques for parking lots such as permeable pavers, bioswales and rain gardens. If LID cannot be done given engineering limitations then a conventional parking area can be designed.	Improved legislation surrounding nature-based techniques will have far reaching impacts for water quality, stormwater management, heat indexes, air quality and livability for residents.	Advances CLEAR Goals 3 and 5 Advances the CLEAR vision by using dynamic approaches to prevent and mitigate shoreline risks while improving the "long-term resilience of communities, infrastructure, and natural ecosystems."	Advances Strategy 1.1				Municipal elected officials and staff, County and regional planning, NYSDOS, NYSERDA, SWCD, academia	$10,000 - $50,000	NYSERDA, NYSDOS	2-3 Zoning Ordinances reviewed and updated per County in the next 2-3 years.
Inform Property Owners About Nature-based Techniques	Identify and assemble existing resources that can be provided to property owners about nature-based solutions to flooding, erosion, and stormwater treatment. Links can be provided on website of municipalities, counties, and other agencies.	NYS REDI Building Resilience in Recovery: Homeowner Program Guidance for Shoreline Management on the Great Lakes and St. Lawrence River. NYSDEC compiled this handbook with general guidelines for coastal design and development projects as part of REDI to share technical and regulatory requirements, best practices, and available resources for rebuilding and maintaining erosion protection. http://on.ny.gov/rediguidance	Increased awareness for property owners and options available to reduce stormwater, flooding and erosion impacts.	Advances CLEAR Goals 1, 2, and 3. Advances the CLEAR vision by sharing resources between "government, property owners, and community organizations" to "improve the long-term resilience of communities, infrastructure, and natural ecosystems while enhancing the economy and quality of life for all shoreline users."	Aligns with Strategies 1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 4.4, 6.3				Municipal staff, NYSDOS, NYSDEC, Sea Grant, SWCD, County Planning, regional planning, local associations	$10,000 - $25,000	NYSDOS, NYSDEC,	4-5 links on municipal and/or County websites in 1-2 years.
Floodplain and Wetland Resource Conservation Overlay District	A zoning overlay district to apply performance standards to new development in stream corridors, including floodplains, buffer areas, and regulated wetlands. The buffer zone would be either adjacent to the floodplain or, where no Special Flood Hazard Area has been mapped, measured from the center line of an adjacent perennial stream. Depending on local ecosystems, hazards, and risk projections, it could be appropriate for overlays to extend beyond flood plains to fully incorporate at-risk areas.	The zoning code for the Town of Hamlin, NY includes a Conservation Overlay along major streams and Lake Ontario that is 100 feet from each bank (streams) or mean high water line (lake) to the landward boundary of the 100-year flood plain, whichever is greater. There is also a 200-foot buffer around all other wetlands, waterbodies, and streams. The Conservation Overlay District provides special controls and protections so development in these areas is limited and subject to special standards and permits. Town of Hamlin Zoning Code Article V, Section 520-24. https://ecode360.com/14919867#14920073	As described in the NYS Model Local Laws for increasing resilience about one-third of flood insurance claims are for properties outside of mapped “special flood hazard areas;” Flood Insurance Rate Maps (FIRMs) in New York State do not demonstrate the extent of flooding from ice jams or wave run up and wave action along the coasts of the Great Lakes (as of 2018); and they also may not account for the increasing frequency, intensity, and duration of precipitation events and storms in the Northeast.	Advances CLEAR Goals 1 and 4 Advances the CLEAR vision by taking steps to prevent and mitigate impacts from "variable lake levels and climate change" in order to "improve the long-term resilience of communities, infrastructure, and natural ecosystems."	Aligns with Strategies 1.1, 4.2., 5.1, 6.2				Municipal planning staff, municipal zoning boards, NYSDEC, USACE, environmental groups, academia, County and regional planning agencies, community groups	$10,000 - $25,000	NYSDOS, NYSDEC	Conservation Overlay District adopted. Process for regular review of district boundaries established.
Update Stormwater Management Ordinance	NYSDEC maintains a Stormwater Management Design Manual. Communities can utilize this resource and integrate by reference in local zoning and/or create a separate stormwater management ordinance that integrates with the DEC manual.	The NYSDEC Stormwater Management Manual provides designers with a general overview on how to size, design, select, and locate stormwater management practices at a development site to comply with State stormwater performance standards. (https://www.dec.ny.gov/chemical/29072.html)	Increased awareness on stormwater management, reduced stormwater runoff, and increased water quality.	Advances CLEAR Goal 2 Advances the CLEAR vision by using "a dynamic and multi-pronged approach that includes prevention, mitigation, and adaptation to increase resilience to variable lake levels and climate change ... to improve the long-term resilience of communities, infrastructure, and natural ecosystems while enhancing ... quality of life for all shoreline users."	Aligns with Strategies 1.1, 1.2, 1.3, 3.1, 5.2, 5.3, 6.1				Municipal elected officials and municipal staff, NYSDOS, NYSDEC, NYWEA, NY Sea Grant, SWCD, County planning, regional planning	$10,000 - $25,000	NYSDOS, NYSDEC	2-3 Zoning Ordinances reviewed and updated per County in the next 2-3 years.

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Prepare / Update LWRP	A Local Waterfront Revitalization Program (LWRP) allows municipalities the opportunity to evaluate local waterfront resources, develop goals and a comprehensive strategy for the best use of those resources, identify future waterfront revitalization projects, and adopt a local program that will guide appropriate development. The NYSDOS LWRP grant program provides funding on a competitive basis to assist municipalities with LWRP preparation. Once an municipality has an approved LWRP, they become eligible to apply for LWRP grant funding to design and construct recommended projects which implement their LWRP.	Many communities in Niagara and Orleans Counties have LWRPs. Additional information including Local Waterfront Revitalization Preparation Guidance and case studies can be found at to https://dos.ny.gov/local-waterfront-revitalization-program	Some of the benefits of completing an LWRP and receiving State and federal approvals include: Identification of a clear and consensus-driven direction for appropriate future development of the waterfront. Establishment long-term State-local partnerships for planning, technical assistance, and advice. Review of government agency actions that affect the local waterfront area. Increased opportunities to apply for financial assistance from State funding sources to implement its LWRP.	Advances CLEAR Goals 1, 2, 3, 4, 5 Advances the CLEAR Vision by building "partnerships between multiple levels of government, property owners, and community organizations to improve the long-term resilience of communities ... and natural ecosystems while enhancing the economy and quality of life for all shoreline users."	Aligns with Strategies 1.2, 1.3, 1.4, 2.3, 3.2, 3.3, 3.4, 4.3, 4.4, 6.2, 6.3			X	Municipal staff, NYSDOS, NYSDEC, NY Sea Grant, SWCD, County planning, regional planning, GFLRPC	$75,000 - $125,000	NYSDOS	By 2024, all shoreline communities in Niagara and Orleans Counties will have an LWRP that was either adopted for the first time or updated within the last five years.
Participate in the Climate Smart Communities Program	Climate Smart Communities (CSC) is a New York State program that helps local governments take action to reduce greenhouse gas emissions and adapt to a changing climate. The program offers free technical assistance, grants, and rebates for electric vehicles. https://climatesmart.ny.gov	A map of participating communities and their level of engagement/advancement within the program can be found here: https://climatesmart.ny.gov/actions-certification/participating-communities/	The benefits of participating include leadership recognition, free technical assistance, and access to grants. Local governments participate by signing a voluntary pledge and using the CSC framework to guide progress toward creating attractive, healthy, and equitable places to live, work, and play. CSC actions can also be used to earn points and discounts in the FEMA Community Rating System (CRS).	Advances CLEAR goals 1, 2, and 5 Advances the CLEAR Vision by using "a dynamic and multi-pronged approach that includes prevention, mitigation, and adaptation to increase resilience to variable lake levels and climate change."	Potentially aligns with ALL strategies, depending on the actions a community chooses to pursue under the program.				Municipalities, planning staff, counties, NYSDOS, NYSDEC, NYSERDA, NYSDOT, NYPA, County planning, regional planning, GFLRPC	$0 - $100,000 Participation is free. 50/50 matching grants are available for related CSC planning and actions, from small monitoring projects to large infrastructure projects.	NYSDEC Office of Climate Change, FEMA, NOAA, EPA, HUD, USDA, Foundations (Kresge etc.)	3 new registered communities in next 2 years. Current CSC communities advance to next level of certification (bronze/silver/gold) in next 3 years.
Update/Prepare Local Planning Document with a Resilience Lens	Evaluate or prepare local plans such as Comprehensive Plans, land use plans, economic development plans etc. in a manner that supports long-term sustainable and resilient development. Consider how/where development should occur relative to risk areas and how local plans can link to County and/or regional resiliency plans and hazard mitigation plans.	The Village of Athens, NY 2020 Comprehensive Plan update incorporated long-term resiliency and sustainability considerations. The plan includes several plan, policy, and action recommendations to reduce shoreline risks and promote smart development that protects local assets and natural resources. An accompanying "Vision for a Climate Resilient Athens" was also created as part of the process. https://athensvillageny.com/planning-documents/	Considering resiliency within the larger planning context will help communities plan for hazard events (flooding, low water, erosion, extreme weather etc) in a partipatory, multi-stakeholder process; identify development and partnership opportunities; and solicit funding.	Advances CLEAR goals 1, 2, 3, 4, 5 Advances the CLEAR Vision by incorporating resilience principles and actions into plans that will "improve the long-term resilience of communities, infrastructure, and natural ecosystems while enhancing the economy and quality of life for all shoreline users."	Potential to align with ALL Strategies			X	Municipal elected officials, municipal staff and planners, NYSDOS, NY Sea Grant, County Emergency Services, County planning, regional planning, GFLRPC, academia, TNC, regional and local community groups and interest groups	$10,000 - $25,000 *partnering with researchers can reduce costs	NYSDOS, EPA, USDA, CDBG, NYS Water Quality Planning Grants, CSC grants	4-5 communities integrate resiliency thinking into a local planning document.
Update/Prepare Open Space Plans	Open space plans typically focus on open spaces for land protection for flora, fauna, and open space preservation. An open space plan can be prepared/updated with a focus on resiliency to determine areas within the community that can be preserved for resiliency purposes such as flood protection.	Open Space Plan for the City of Portsmouth, NH (https://www.cityofportsmouth.com/planportsmouth/open-space-plan). This plan examines a wide variety of open spaces within the City and also considers integration of climate resiliency objectives as they relate to open space.	Potential identification of lands that can help protect from future flood events as well as lands that could potentially be used for new/increased access to the lake and streams for recreational purposes.	Advances CLEAR Goals 1, 2, 3, 4, 5 Advances the CLEAR Vision through preventative measures to "improve the long-term resilience of communities, infrastructure, and natural ecosystems."	Aligns with Strategies 1.2, 1.4, 3.1, and 3.2				Municipalities, NYSDOS, NYSDEC, NY Sea Grant, SWCD, County planning, regional planning, academia	$25,000 - $75,000	NYSDOS, NY Ag and Markets, USEPA	1-2 Open Space Plans completed in the next 3-5 years.

Niagara-Orleans Region Priority Action Matrix

Action (How)	Description	Case Study or Reference Resource	Anticipated Benefits	Alignment with CLEAR Goals and Vision	Alignment with CLEAR Strategies	Timeframe	Priority	Ongoing	Potential Partners	Estimated Cost Range (if known)	Potential Funding	KPIs
Cultural Resources Resilience Plan	There are cultural and historic sites within Niagara and Orleans Counties that could be impacted by future hazard events. In an effort to protect these important assets, a Cultural Resources Resiliency Plan can be developed that inventories these assets to determine future risks and methods to protect them.	Historic Preservation and Resiliency Planning in CT (https://portal.ct.gov/-/media/DECD/Hurricane_Sandy_Relief/Website-Stuff/ResiliencyPlanningStatewideGuide_Reduced.pdf) is a thorough resource for adapting local plans to protect cultural and historical assets.	Cultural and historical assets protected for future generations.	Advances CLEAR Goals 1, 2, 3 and 5 Advances the CLEAR vision by seeking options for the "prevention, mitigation and adaptation" of community assets to "variable lake levels and climate change."	Aligns with Strategy 1.4				Municipal and/or regional planning staff, NYSHPO, NYSDOS, National Historic Preservation, NYSOPRHP, historic societies, cultural non-profit organizations, foundations, academia	$50,000 - $100,000	NYSHPO, NYSDOS, National Historic Preservation	1-2 Cultural Resource Plans developed in the next 5 years.
Natural and Nature-Based Features (NNBF)	NNBS includes a broad-base of shoreline restoration and enhancement measures such as stabilizing soil through root structures, wetland restoration, living shorelines (or hybrid with rip-rap); as well as BGI techniques. See project profile for more detail.	The Ringsted River restoration project in Denmark included the use of natural meadows close to the river to store and clean water before discharging into the river. A multifunctional nature-based system was designed and implemented with multiple recreational values, higher biodiversity and a meadow containing more water with a potential carbon-offsetting effect.	Flood risk reduction, improved biodiversity and environmental protection.	Advances CLEAR Goals 1, 2, and 3. Advances the CLEAR Vision by using "a dynamic ... approach that includes prevention, mitigation, and adaptation ... to improve the long-term resilience of communities, infrastructure, and natural ecosystems."	Aligns with strategies 1.1, 1.2, 1.3				NYSDOS, NYSDEC, NYSDOT, NYSOPRHP, GFLRPC, academia, NY Sea Grant, TNC, SWCD, community and environmental groups, USEPA	Varies	NYSDEC, NYSEFC, NYSDOS, USEPA, USFWS, FEMA, Foundations,	Local practitioners trained in NNBS techniques. 3 NNBS projects implemented in the next 4 years.
Review Zoning to Support Resiliency Measures	Examine local zoning ordinances to determine what type of resiliency measures can be incorporated. Such as, use restrictions in high risk areas, allowing retrofits to buildings even if the building is non-conforming if retrofit helps protect the structure from future hazards, adjusting area and bulk requirements to limit development in risk areas, and creating overlay districts where certain rules apply designed to protect from flooding and erosion.	The NYSDOS's "Model Local Laws to Increase Resilience" (https://dos.ny.gov/system/files/documents/2020/09/model_local_laws_to_increase_resilience.pdf) has a wide variety of tools that can potentially be incorporated into local zoning ordinances.	New development and redevelopment occurs in low risk areas or is adapted in-place to withstand future impacts from hazards.	Advances CLEAR Goals 1, 2 and 5 Advances the vision as a "dynamic and multi-pronged approach that includes prevention, mitigation, and adaptation to increase resilience to variable lake levels and climate change."	Aligns with Strategies 1.1, 2.1, 2.2, 2.3, 3.1, 4.2, 5.1, 6.1				Municipal elected officials, municipal staff, municipal zoning boards, NYSDOS, Sea Grant, academia, County planning, regional planning	$10,000 - $75,000	NYSDOS, NYSERDA	3-4 Zoning Ordinances updated with resiliency measures in next 4 years. Vulnerability of structures in risk areas significantly reduced in next 10 years.
Offer Incentives for Resilience Upgrades that Exceed Minimum Requirements	Offer incentives to property owners who invest in resiliency measures beyond the minimum requirements, especially those with broader benefits for the community or environment such as voluntary conservation/restoration of riparian buffers, installation of green infrastructure, open space and/or wetland restoration, voluntarily raising buildings above the NFIP minimum, wet/dry floodproofing, etc. Incentive examples: zoning bonuses, tax abatements, fee waivers, expedited approval process (where possible) etc.	NYC's "Zoning for Coastal Flood Resiliency," contains specific examples for NYS that could be adapted for upstate areas (https://www1.nyc.gov/assets/planning/download/pdf/plans-studies/flood-resiliency-update/zoning-for-flood-resiliency.pdf)	Local property owners are incentivized and enabled to voluntary adopt resiliency measures that will decrease their risk and costs in the long term. Areas within the communities are protected from future flood/hazard events.	Advances CLEAR Goals 1, 2, 3 and 5 Advances the CLEAR vision by using "a dynamic and multi-pronged approach that includes prevention, mitigation, and adaptation to increase resilience to variable lake levels and climate change" and improving "the long-term resilience of communities, infrastructure, and natural ecosystems while enhancing the economy."	Aligns with CLEAR Strategies 1.1, 2.1, 2.2, 2.3, 3.1, 4.3, 6.1				Municipal elected officials, municipal staff, municipal zoning boards, NYDOS, NYSERDA, NYSHPO, County planning, regional planning, academia	$25,000 - $50,000	NYSERDA	4-5 incentive programs put in place in next 5 years. Uptake of incentives programs increases over first 5 years they are in place.

Niagara-Orleans Region Priority Action Matrix

Action (How)	Description	Case Study or Reference Resource	Anticipated Benefits	Alignment with CLEAR Goals and Vision	Alignment with CLEAR Strategies	Timeframe	Priority	Ongoing	Potential Partners	Estimated Cost Range (if known)	Potential Funding	KPIs
Work with Land Trusts and Communities for Land Conservation of Vulnerable Areas	Similar to working with Land Trusts to protect farmland and open space, lands that can help protect adjacent areas from future flood/hazard events can be identified and protected via conservation easements with voluntary land owners.	The Open Space Institute's report "Strategic Land Protection Curbs Damages Caused by Climate-Related Flooding" aimed at land trusts and policy makers illustrates the use of this technique as a preventative measure for future flood events. https://www.openspaceinstitute.org/news/report-strategic-land-protection-curbs-damages-caused-by-climate-related-flooding	Land preservation for flood/hazard protection as a proactive measure to reduce damage. Opportunity to improve ecosystem services that reduce risk and increase quality of life.	Advances CLEAR Goals 2 and 5 Advances the CLEAR vision by "increasing resilience to variable lake levels and climate change ... through partnerships between ... government, property owners, and community organizations to improve the long-term resilience of communities ... and natural ecosystems while enhancing the ... quality of life for all shoreline users."	Aligns with Strategies 1.2, 1.4, 2.2, 3.1, 3.2				Local land trusts, Open Space Institute, Land Trust Alliance	N/A	N/A	1 conservation easement in place for hazard protection in next 5 years. Land Trusts are established in a way that provides multiple co-benefits beyond resilience.
Identify Vulnerable Populations and Needs	Conduct a vulnerability assessment to identify vulnerable populations in risk areas. Follow a participatory process to identify the needs of these populations and prioritize solutions for improving their ability to avoid, adapt to, and bounce back from various risks.	Resources for Vulnerable Population Mapping: CDC Social Vulnerability Index https://www.atsdr.cdc.gov/placeandhealth/svi/index.html Case Study: The Town of Caroline, NY completed a participatory Vulnerability Assessment that engaged diverse stakeholders to identify local risks and physical as well as social vulnerabilities. Conducted from 2019-2020, the process included in-person and remote methods. http://www.townofcaroline.org/uploads/6/2/7/8/62781479/caroline_cva.pdf	By employing a participatory process to assess local vulnerabilities with populations that are most at-risk, all parties come away with an increased understanding and ownership of how to reduce these risks, including municipal officials, public agencies, and community members. As a result, socially vulnerable populations are better protected from future hazard events.	Advances CLEAR Goals 1 and 5 Advances CLEAR vision by promoting "partnerships between multiple levels of government, property owners, and community organizations to improve the long-term resilience of communities, infrastructure, and natural ecosystems while enhancing the economy and quality of life for all shoreline users."	Aligns with CLEAR Strategies 3.3, 4.3, 4.4				Municipal elected officials, municipal staff, NYS HCR, NYSDOS, NYSERDA, USHUD, USDA, NY Sea Grant, academia, foundations, regional planning agencies, NYSDEC (CSC program), NOAA	$20,000 - $40,000	NYSHCR, NYSDOS, USDA, USHUD, NYSDEC CSC Program	2 participatory vulnerability workshops completed in next 2 years.
Educational Outreach to Increase Resiliency Awareness	The purpose of this action is to conduct special outreach to socially vulnerable populations via non-traditional techniques such as flyers, newspapers, newsletters, and door-to-door information.	Planning for an Emergency: Strategies for Identifying and Engaging At-Risk Groups - This guidance document provides tips and resources for reaching socially vulnerable populations https://www.cdc.gov/nceh/hsb/disaster/atriskguidance.pdf	Socially vulnerable populations are more aware, prepared, and able to respond/adapt to hazard events.	Advances CLEAR Goals 1 and 5 Advances CLEAR vision by improving '"the long-term resilience of communities ... while enhancing the ... quality of life for all shoreline users."	Aligns with Strategies 3.3, 4.3, and 4.4			X	Planning agencies or special outreach organizations, NYS HCR, NYSDOS, NYSERDA, NY Sea Grant, USHUD, USDA, academia, foundations, regional planning agencies	$25,000-$50,000	NYSHCR, NYSDOS, USDA, USHUD	Socially vulnerable populations identified and contacted with relevant information. 1 outreach campaign to a socially vulnerable population in next 2 years. Awareness of risks and resilience techniques increased among at least 20% of at-risk population post-campaign.

Niagara-Orleans Region Priority Action Matrix

Action (How)	Description	Case Study or Reference Resource	Anticipated Benefits	Alignment with CLEAR Goals and Vision	Alignment with CLEAR Strategies	Timeframe	Priority	Ongoing	Potential Partners	Estimated Cost Range (if known)	Potential Funding	KPIs
Managed Retreat (if necessary)	Provide support programs for private property owners to relocate if/when necessary from high risk areas that have become uninhabitable or that are unsuitable for alternative adaptation strategies. Such programs may provide additional support for socially vulnerable populations who are disproportionately impacted. This is typically treated as a last resort, but can offer many opportunities for protection of assets.	Sidney, NY Green Plain (https://www.resilient-sidney.com/greenplain). In response to repeated flooding the Village of Sidney, NY created the Sidney GreenPlain which is a climate adaptation initiative that uses nature and natural flood reduction measures in a managed retreat project to relocate 100 families, buy out over 100 properties on 140+/- acres and remove infrastructure.	Potentially relocating people out of high risk areas that are repeatedly impacted by major hazards (e.g. floods) and where adaptation measures are no longer adequate to protect that population/neighborhood.	Advances CLEAR Goals 1 and 5 Advances the CLEAR vision as part of "a dynamic and multi-pronged approach that includes prevention, mitigation, and adaptation to increase resilience to variable lake levels and climate change"	Aligns with Strategies 1.4, 2.2, 2.3, 4.2, 5.1				Municipal elected officials, municipal staff, County emergency managers, NYSDOS, FEMA, NYSHCR	TBD	NYSDOS (only for feasibilty studies, cannot fund relocation of private property owners), FEMA, NRCS	If desired/needed, one study of an impacted area completed in next 5 years.
Voluntary Buy-outs	The U.S. has a long history of voluntary buy-outs of flood-prone properties. These are typically utilized as a last resort for properties subject to repeat, costly damages. Buy-outs have been funded by local, state, and federal agencies such as the Small Business Administration and the Department of Housing and Urban Development (HUD). Between 1989 and 2017, the US Federal Emergency Management Agency (FEMA) funded over 43,000 voluntary buy-outs across 1148 counties in 49 states and 3 territories. This count includes shoreline communities on Lake Ontario in New York State. Local governments (county or city) administered the buy-outs in 94% of cases. Ensuring populations relocate to an area of LOWER risk that does not increase their overall risk is key. Reference: K.J. Mach, C.M. Kraan, M. Hino, A.R. Siders, E.M. Johnston, C.B. Field Managed retreat through voluntary buyouts of flood-prone properties Sci. Adv., 5 (2019), p. eaax8995, 10.1126/sciadv.aax8995	Case Study: The relocation of the Soldiers Grove, WI business district helped reduce risk while reimagining the district in a way that stimulated growth Anne Siders (2013), Managed Coastal Retreat: A Legal Handbook on Shifting Development Away from Vulnerable Areas, Columbia University Center for Climate Change Law https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2349461 Other resources: Overview of Managed Retreat in the US https://www.sciencedirect.com/science/article/pii/S2590332219300806#abs0015	Safely relocating people out of the floodplain and protected lands	Advances CLEAR Goals 1, 2, 3 and 5 Advances the CLEAR vision as part of "a dynamic and multi-pronged approach that includes prevention, mitigation, and adaptation to increase resilience to variable lake levels and climate change"	Aligns with Strategies 1.4, 2.2, 2.3, 4.2, 5.1				Municipal elected officials, municipal staff, County emergency managers, NYSDOS, FEMA, NYSHCR	TBD	FEMA, CDBG	If desired/needed, buy-out of selected properties completed in next 5 years. High risk areas converted from a liability/expense to productive property that brings value to the community. Number and/or vulnerability of structures/residents in community reduced. Insurance premiums and disaster losses significantly reduced.
Risk and Vulnerability Assessment of Regional Transportation Systems	Risk and Vulnerability assessments should include an analysis of critical infrastructure including transportation infrastructure. This analysis can be conducted as a standalone document, or as part of a broader analysis. Resources are available to determine risks and weigh appropriate solutions including gray (conventional) and blue-green infrastructure (nature-based) options.	Vulnerability Assessment Scoring Tool (VAST) - The U.S. Department of Transportation developed the Vulnerability Assessment Scoring Tool (VAST) to help State departments of transportation, metropolitan planning organizations, and other organizations implement an indicator-based vulnerability assessment of their transportation assets. https://toolkit.climate.gov/tool/vulnerability-assessment-scoring-tool-vast	Increased capacity to prevent and recover from damage to critical transportation infrastructure that supports the regional economy and protects health and well-being of the community.	Advances CLEAR Goals 1, 2, 4 and 5 Advances the CLEAR vision through "prevention, mitigation, and adaptation ... to improve the long-term resilience of communities, infrastructure, and natural ecosystems while enhancing the economy and quality of life for all shoreline users."	Aligns with Strategies 1.2, 1.3, 5.1, 5.2				County highway departments, municipal highway departments, NYSDOT, EPA, NYSDEC, non-profit organizations, academia	$25,000-$50,000	NYSDOS, Cost-sharing, NYSDEC CSC	Risk assessment and recommendations completed/updated for County transportation systems every 5 years.

12

Appendices

12.0 APPENDICES

Appendix A

Niagara County Municipal Profiles

- Town of Niagara
- City of Niagara Falls
- Village of Lewiston
- Town of Lewiston
- Village of Youngstown
- Town of Porter
- Town of Wilson
- Village of Wilson
- Town of Newfane
- Town Somerset

Orleans County Municipal Profiles

- Town of Yates
- Town of Carlton
- Town of Kendall

Appendix B

Community Assets and Risk Level Assessment

CLEAR Plan
Niagara-Orleans Region

APPENDIX A

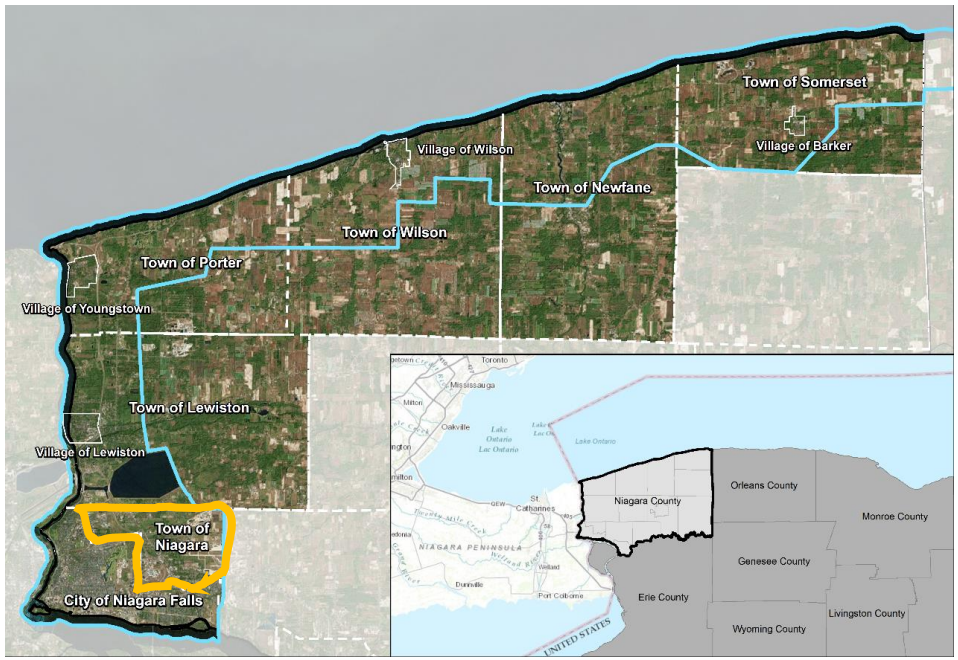
Municipal Profiles

TOWN OF NIAGARA, NY

Municipal Profile

COMMUNITY OVERVIEW – TOWN OF NIAGARA

The Town of Niagara is located between the Lewiston and the City of Niagara Falls within the CLEAR boundary in Niagara County. The Town of Niagara is approximately 9.5 square miles and includes waterfront from Gill Creek and Cayuga Creek. The town is bounded by the Town of Lewiston to the North, the City of Niagara Falls to the south, and the Town of Wheatfield to the east. The closest cities are Buffalo, approximately 10 miles south, and the City of Niagara Falls, directly southeast of the Town of Niagara.



Town of Niagara: Location Map

Town of Niagara

Population
8,151

Median Age
47

# of Housing Units
3,727

Social Vulnerability Index
0.623

Shoreline Miles
0.0

% Occupied Homes
94%

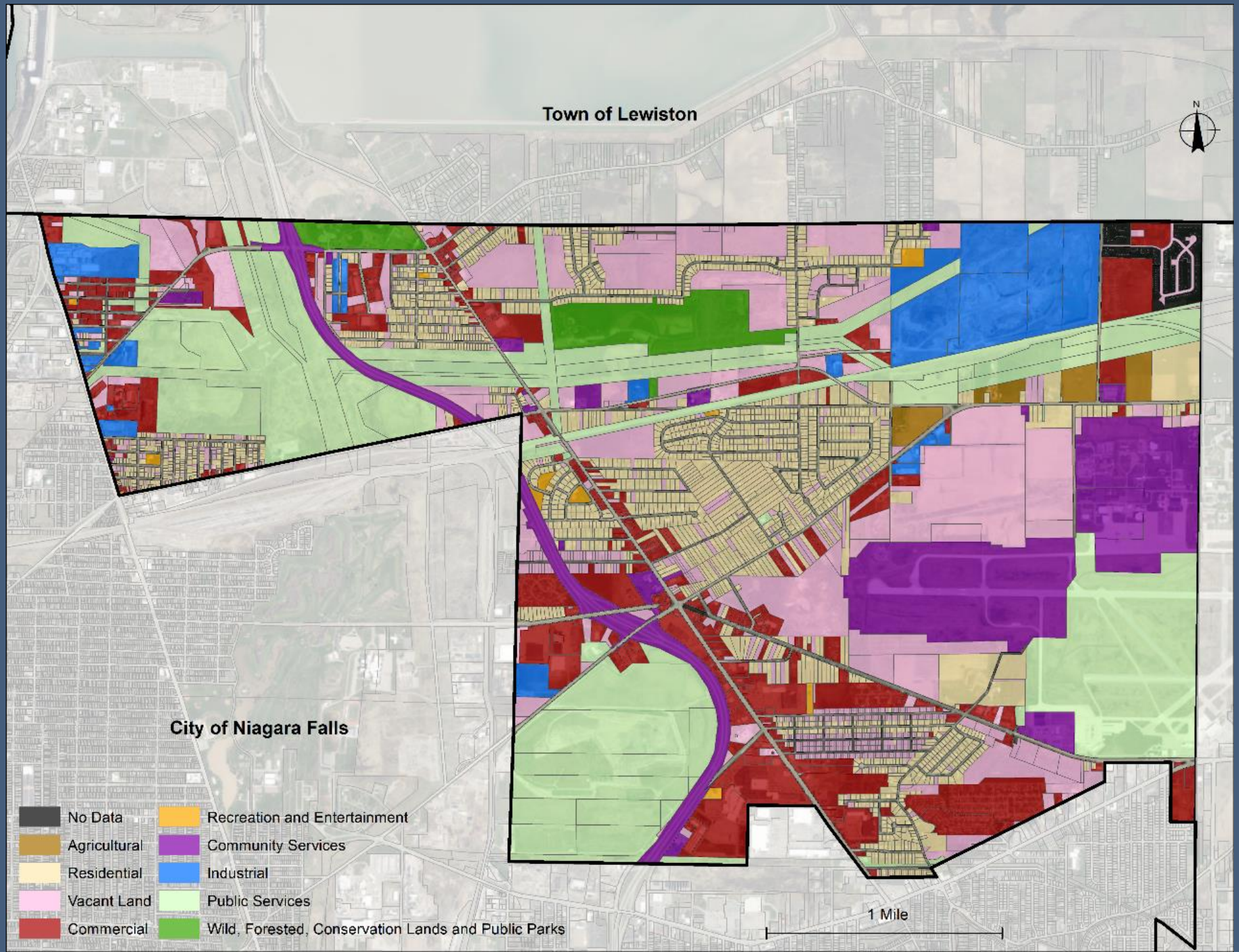
Median Home Value
$103k

Median Household Income
$50,038

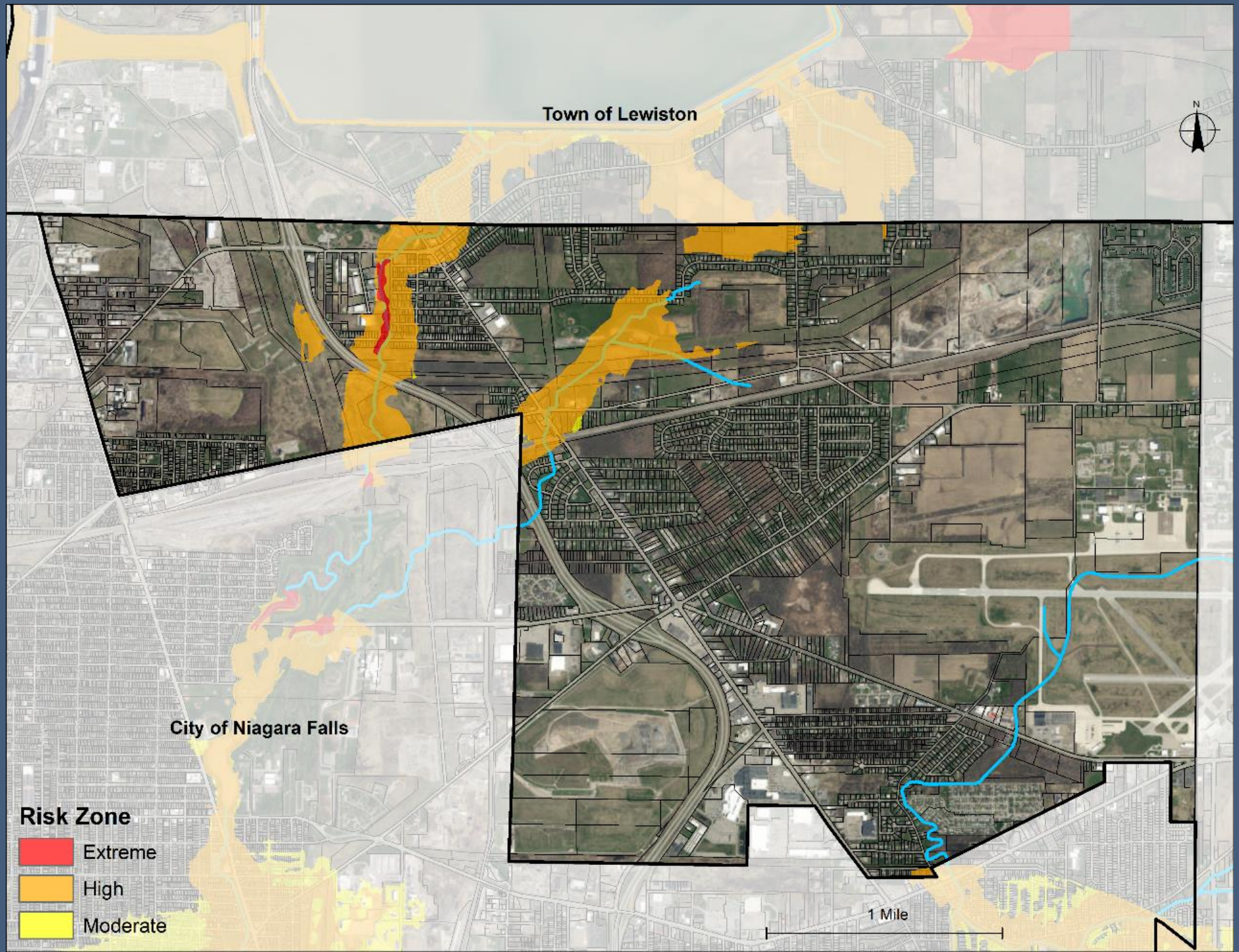
As illustrated by the map on the following page, the land use in the Town of Niagara is predominantly a mixture of community and public services, residential, commercial and vacant land. There are also some conservation areas and public parks including Veterans Memorial Park. The Town of Niagara is landlocked with no shoreline or riverfront areas. Shoreline classification and erosion data is available for Lake Ontario coastal communities. There are no REDI projects for the Town of Niagara.

All data from U.S. Census Bureau. 2019. American Community Survey, 2015-2019 5-Year Estimates, unless otherwise noted. Medians are weighted estimates for the shoreline area based on median age data available at the town-level.

LAND USE MAP – TOWN OF NIAGARA



COMMUNITY RISK – TOWN OF NIAGARA

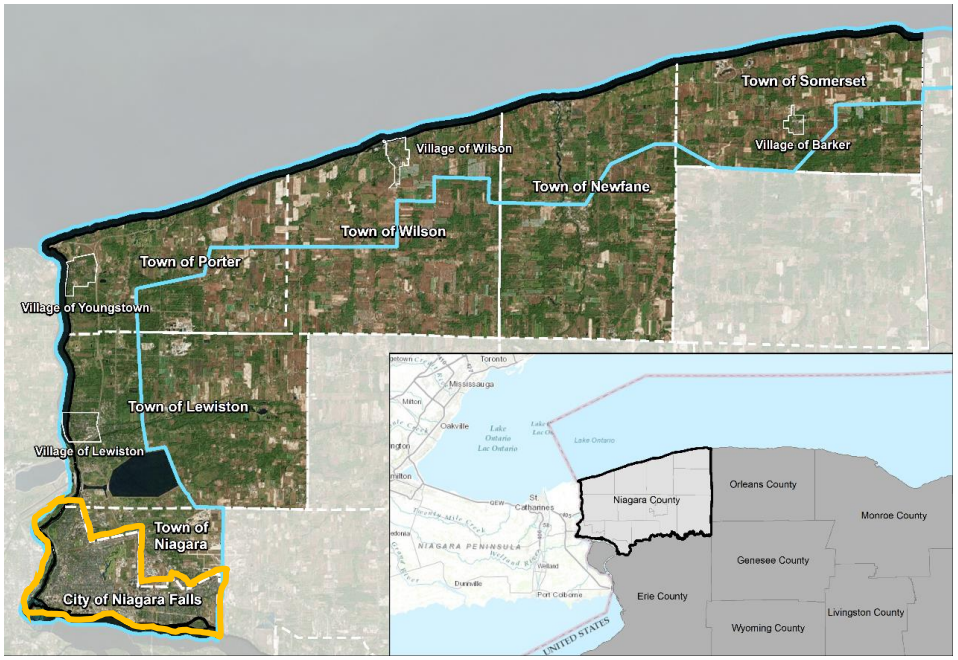


CITY OF NIAGARA FALLS, NY

Municipal Profile

COMMUNITY OVERVIEW – CITY OF NIAGARA FALLS

The City of Niagara Falls is located between the Towns of Niagara, Lewiston and Wheatfield within the CLEAR boundary in Niagara County. The City of Niagara Falls is approximately 14.1 square miles and includes approximately 10.6 miles of Niagara River shoreline with additional waterfront from Gill Creek. The city is bounded by the Towns of Niagara and Lewiston to the north and the Town of Wheatfield to the east. The closest city is Buffalo, approximately 8 miles southeast.



City of Niagara Falls: Location Map

City of Niagara Falls

Population
48,252

Median Age
38

# of Housing Units
26,423

Social Vulnerability Index
0.8426

Shoreline Miles
10.6

% Occupied Homes
82%

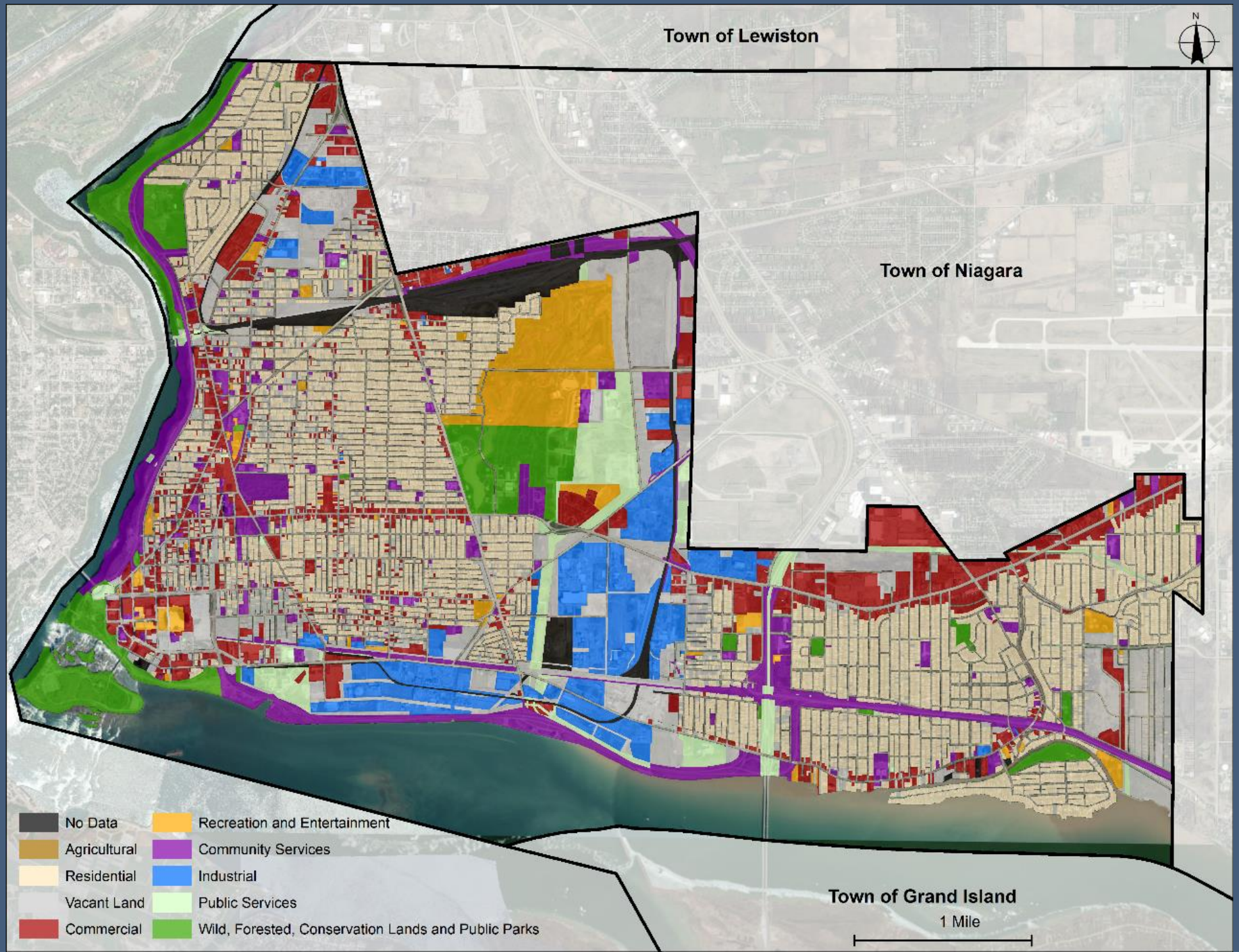
Median Home Value
$77k

Median Household Income
$36,346

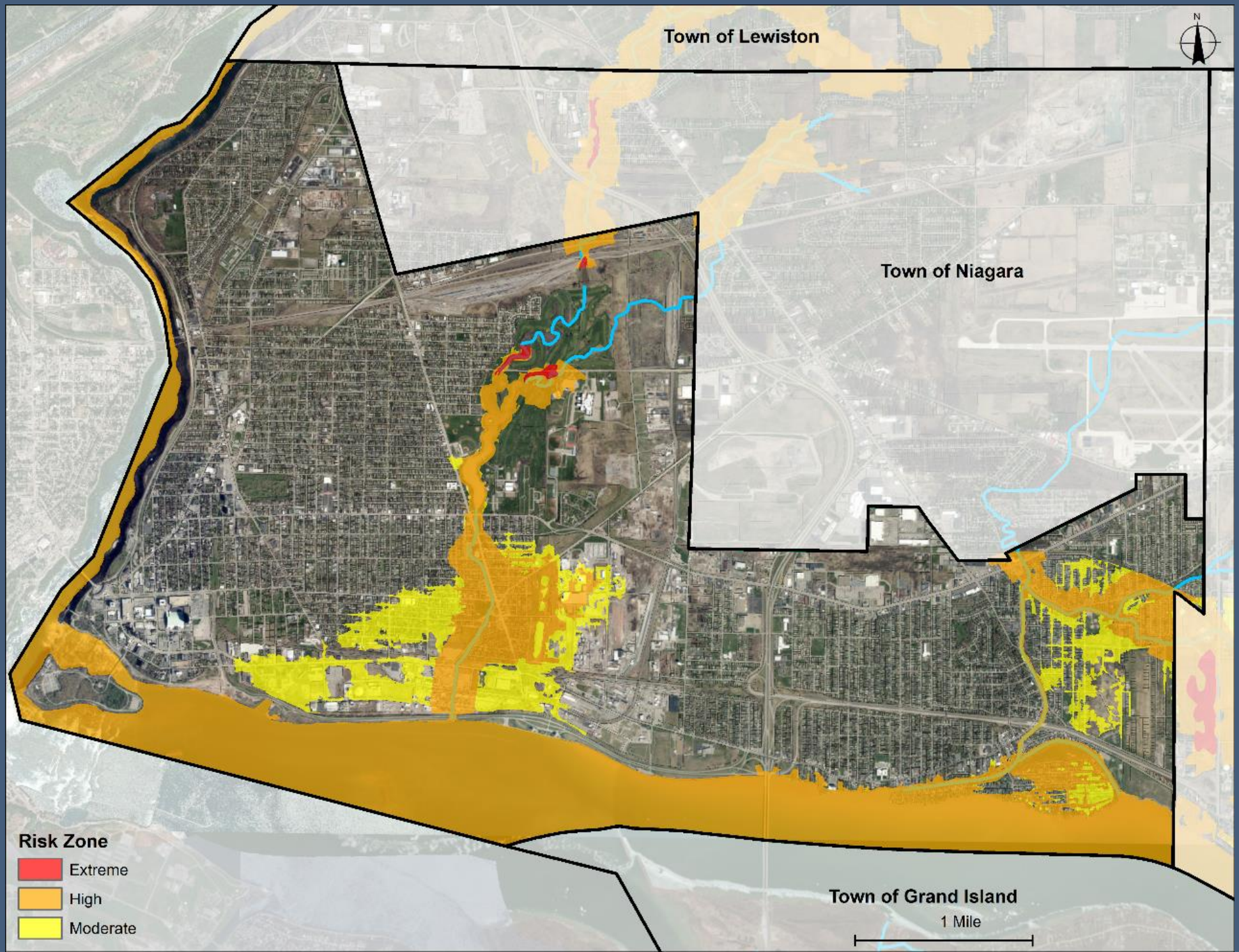
As illustrated by the map on the following page, the land use in the City of Niagara Falls is a mixture of recreation and entertainment, commercial, agricultural, conservation lands, and parks and vacant land. The majority of residences are single family houses located throughout the entire city. There are also some conservation areas and public parks including Deveaux Woods State Park, Niagara Falls State Park and Hyde Park. Shoreline classification and erosion data is available for Lake Ontario coastal communities.

All data from U.S. Census Bureau. 2019. American Community Survey, 2015-2019 5-Year Estimates, unless otherwise noted. Medians are weighted estimates for the shoreline area based on median age data available at the city-level.

LAND USE MAP – CITY OF NIAGARA FALLS



COMMUNITY RISK – CITY OF NIAGARA FALLS

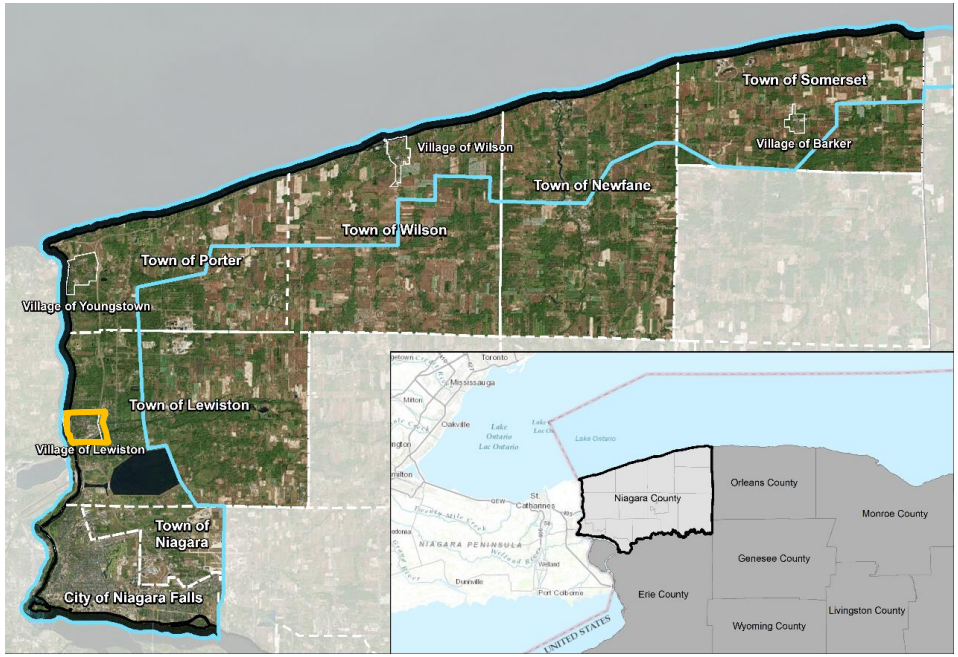


VILLAGE OF LEWISTON, NY

Municipal Profile

COMMUNITY OVERVIEW – VILLAGE OF LEWISTON

The Village of Lewiston is located in the Town of Lewiston within the CLEAR boundary in Niagara County. The Village of Lewiston is approximately 1.2 square miles and includes approximately 1 mile of Niagara River shoreline. The closest cities are Buffalo, approximately 15 miles south, and the City of Niagara Falls, approximately 2.5 miles south.



Village of Lewiston: Location Map

Village of Lewiston

Population
2,587

Median Age
50

# of Housing Units
1,413

Social Vulnerability Index
0.337

Shoreline Miles
1.1

% Occupied Homes
92%

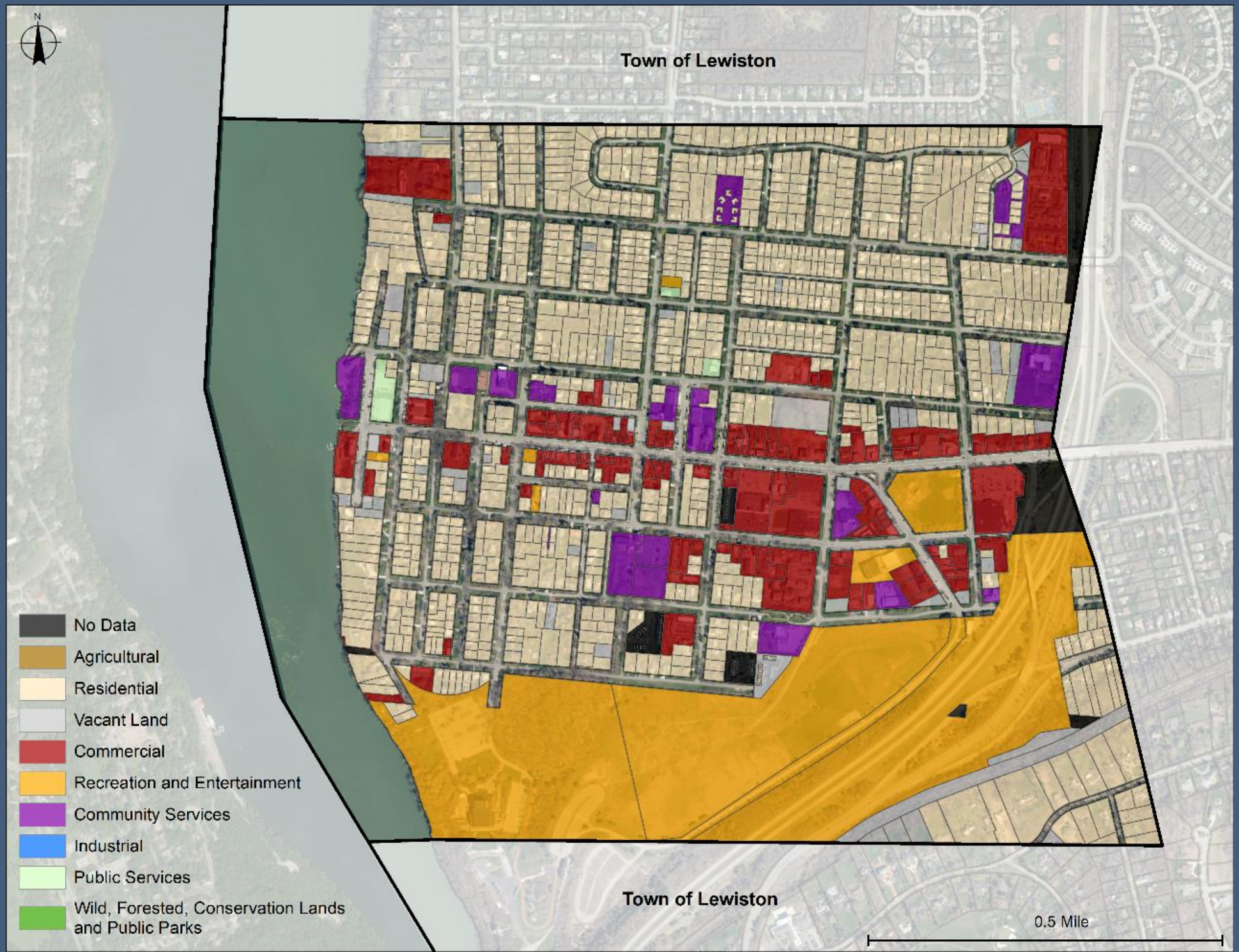
Median Home Value
$170k

Median Household Income
$49,888

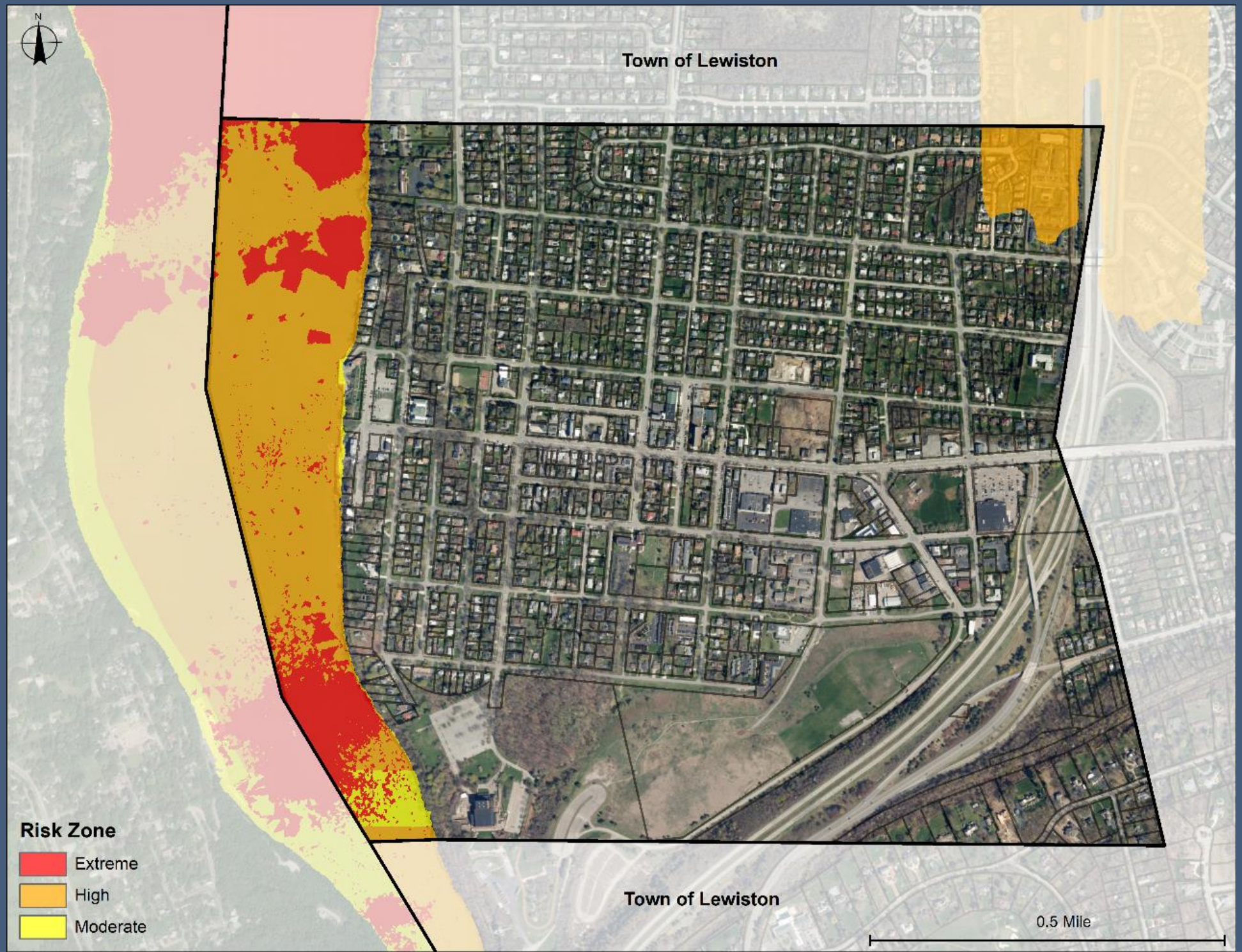
As illustrated by the map on the following page, the land use in the Village of Lewiston is predominantly a mixture of residential, commercial, and community and public services lands. The majority of residences are single houses located throughout the village. There are also some conservation areas and public parks including Kiwanis Park. Shoreline classification and erosion data is available for Lake Ontario coastal communities.

All data from U.S. Census Bureau. 2019. American Community Survey, 2015-2019 5-Year Estimates, unless otherwise noted. Medians are weighted estimates for the shoreline area based on median age data available at the village-level.

LAND USE MAP – VILLAGE OF LEWISTON



COMMUNITY RISK – VILLAGE OF LEWISTON



REDI PROJECTS – VILLAGE OF LEWISTON

In 2017 and 2019, major flooding affected the Lake Ontario and St. Lawrence River system. These flooding events, each of which reached levels of a 1% chance occurrence, caused extensive damage to shoreline systems and communities.

In response to the extended pattern of flooding along the shores of Lake Ontario and St. Lawrence River and underlying economic challenges, the Lake Ontario Resiliency and Economic Development Initiative (REDI) was created to address the immediate and long-term resiliency and economic development needs of these areas.

The following project was selected by the REDI Commission in Fall 2019 to receive program funding:

Village of Lewiston REDI Project	Amount
NO.49 Lewiston Landing	$1,214,688

LEWISTON LANDING (NO. 49)

The Village of Lewiston is rich in history and culture and home to thousands of visitors each year. Lewiston Landing, situated directly on the shoreline of the Niagara River, provides public access, is home to waterfront Whirlpool Jet Boats, and a municipal boat launch and slips. The high water level(s) from flooding along the riverfront have resulted in lost revenue due to decreased tourism.

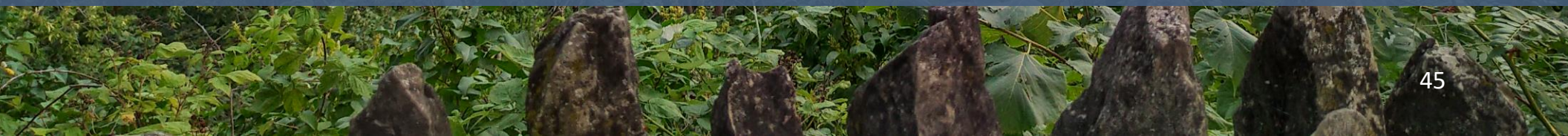
The conceptual project profiles are available at:

https://www.ny.gov/sites/default/files/atoms/files/REDI_Project_Profiles_NO_20191010.pdf

For current project status or additional information related to a REDI project, please contact the local municipality.

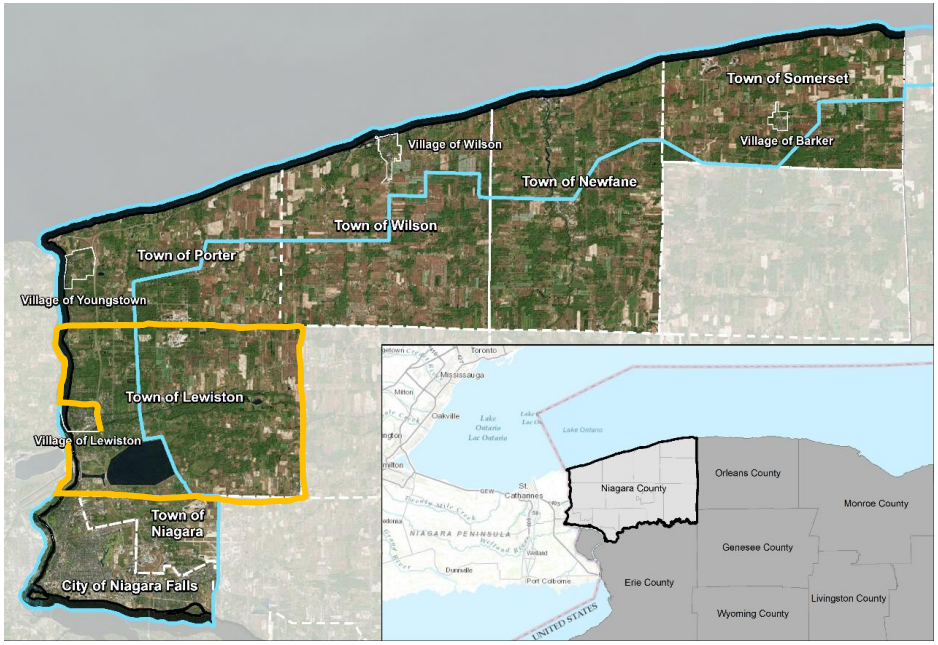
TOWN OF LEWISTON, NY

Municipal Profile



COMMUNITY OVERVIEW – TOWN OF LEWISTON

The Town of Lewiston is located between the Towns of Porter and Niagara within the CLEAR boundary in Niagara County. The Town of Lewiston is approximately 50.5 square miles and includes approximately 6.4 miles of Niagara River shoreline with additional waterfront from Fourmile Creek, Gill Creek and Bond Lake. The town is bounded by the Town of Porter to the north, the Towns of Niagara and Wheatfield and the City of Niagara to the south, and the Town of Cambria to the east. The closest cities are Buffalo, approximately 12 miles south, and the City of Niagara Falls, directly south of the Town of Lewiston.



Town of Lewiston: Location Map

Town of Lewiston

Population
15,830

Median Age
45

# of Housing Units
6,669

Social Vulnerability Index
0.081

Shoreline Miles
6.5

% Occupied Homes
94%

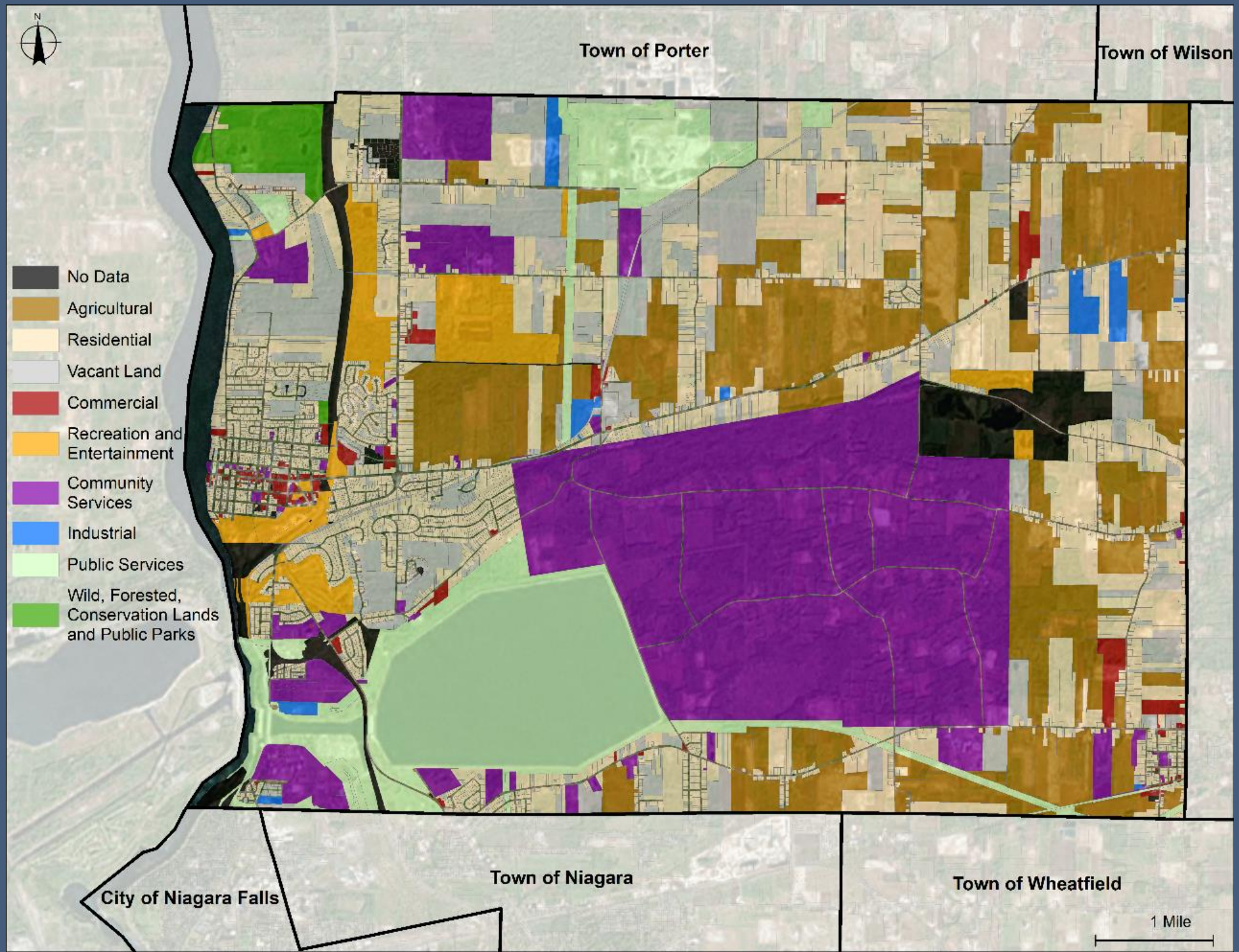
Median Home Value
$180k

Median Household Income
$69,967

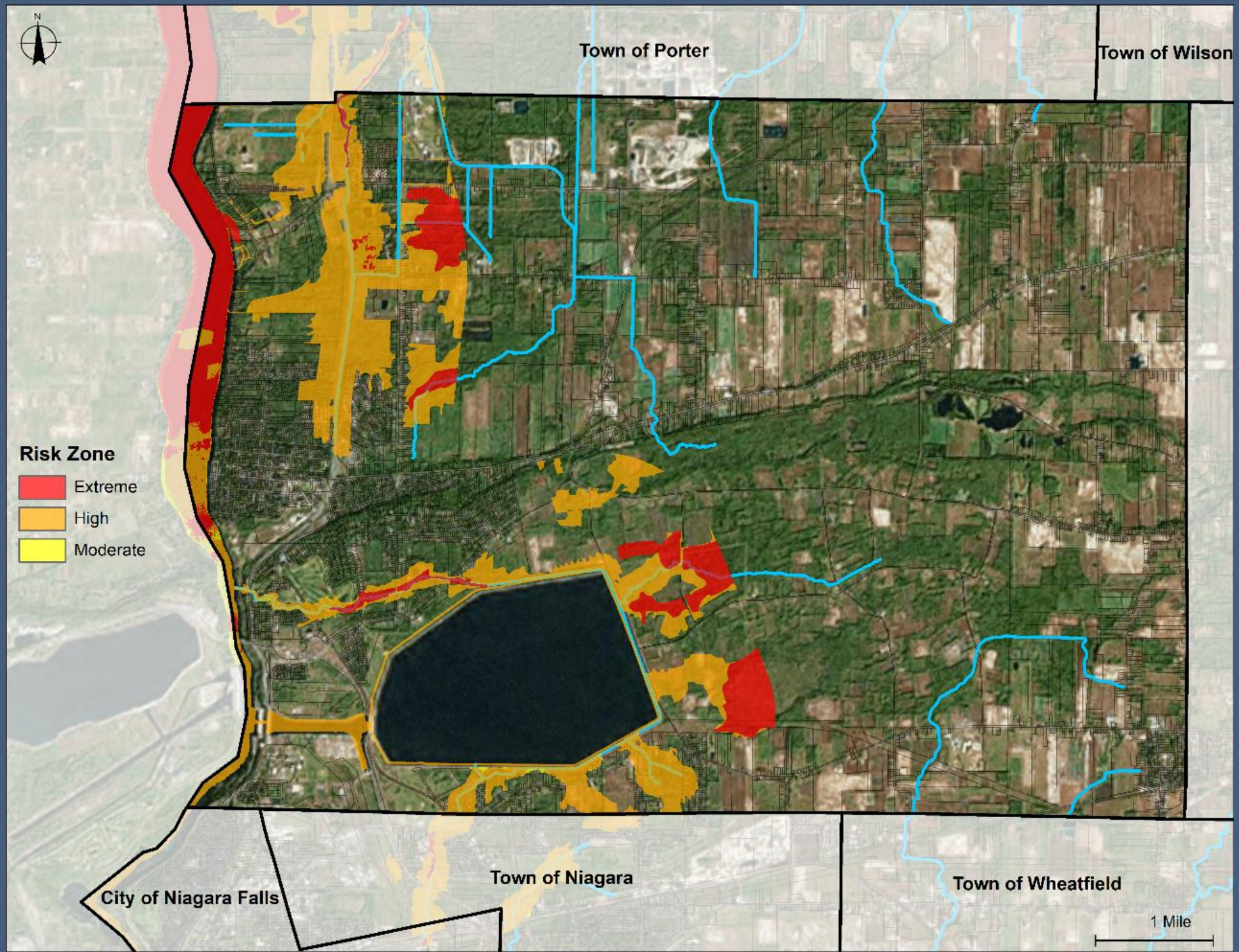
As illustrated by the map on the following page, the land use in the Town of Lewiston is predominantly a mixture of community and public services, residential, agricultural, conservation lands, and parks and vacant land. The majority of residences are single houses located along the Niagara River waterfront. There are also some conservation areas and public parks including Tuscarora Nation Reservation and Joseph Davis State Park. Shoreline classification and erosion data is available for Lake Ontario coastal communities.

All data from U.S. Census Bureau. 2019. American Community Survey, 2015-2019 5-Year Estimates, unless otherwise noted. Medians are weighted estimates for the shoreline area based on median age data available at the town-level.

LAND USE MAP – TOWN OF LEWISTON



COMMUNITY RISK – TOWN OF LEWISTON

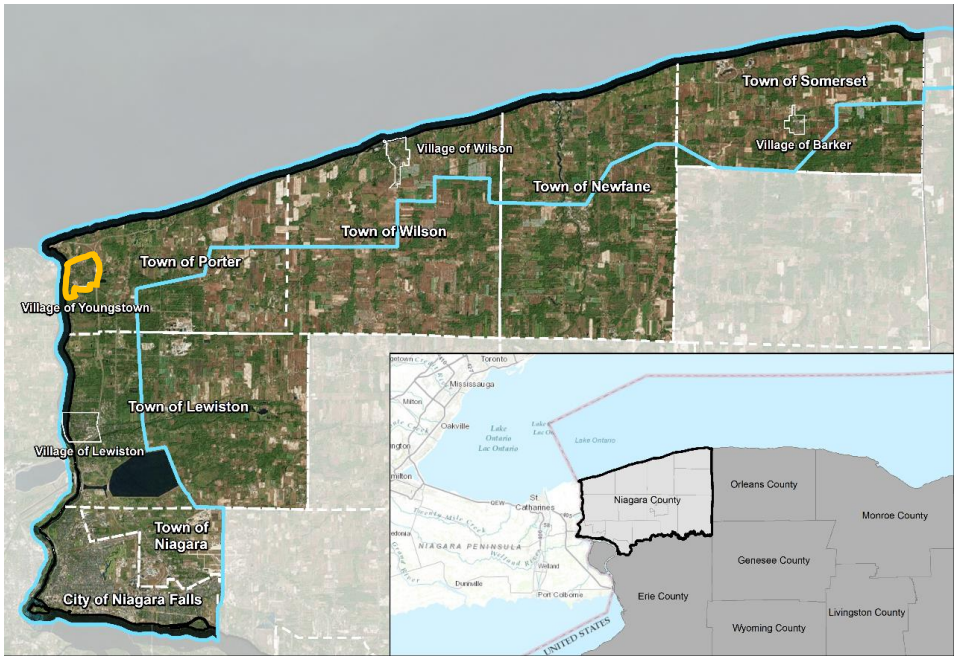


VILLAGE OF YOUNGSTOWN, NY

Municipal Profile

COMMUNITY OVERVIEW – VILLAGE OF YOUNGSTOWN

The Village of Youngstown is located in the Town of Porter within the CLEAR boundary in Niagara County. The Village of Youngstown is approximately 1 square mile and includes approximately 1.2 miles of Niagara River shoreline. The closest cities are Buffalo, approximately 20 miles south, and the City of Niagara Falls, approximately 7 miles south.



Village of Youngstown: Location Map

Village of Youngstown

Population
2,019

Median Age
45

# of Housing Units
919

Social Vulnerability Index
0.115

Shoreline Miles
1.2

% Occupied Homes
87%

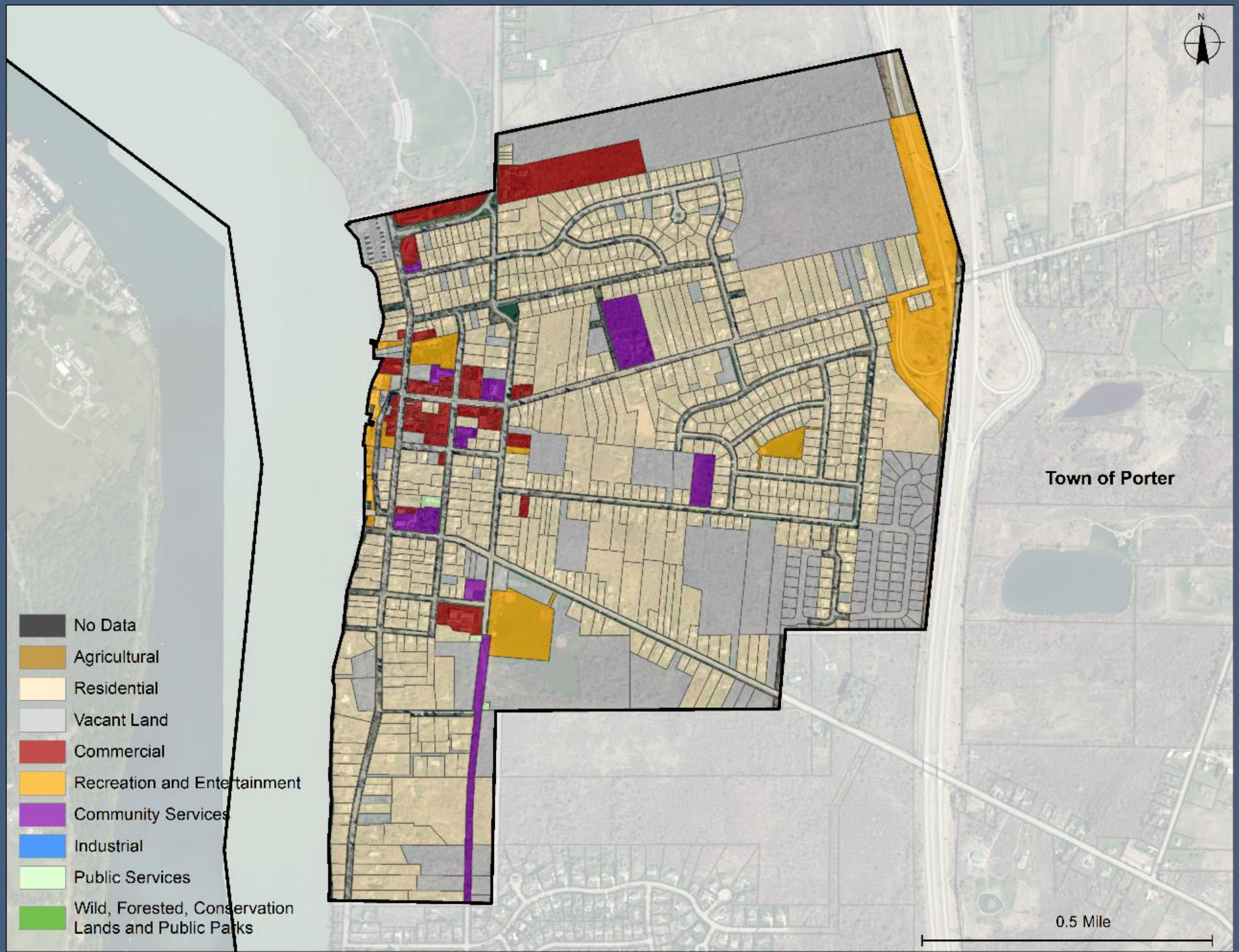
Median Home Value
$163k

Median Household Income
$65,179

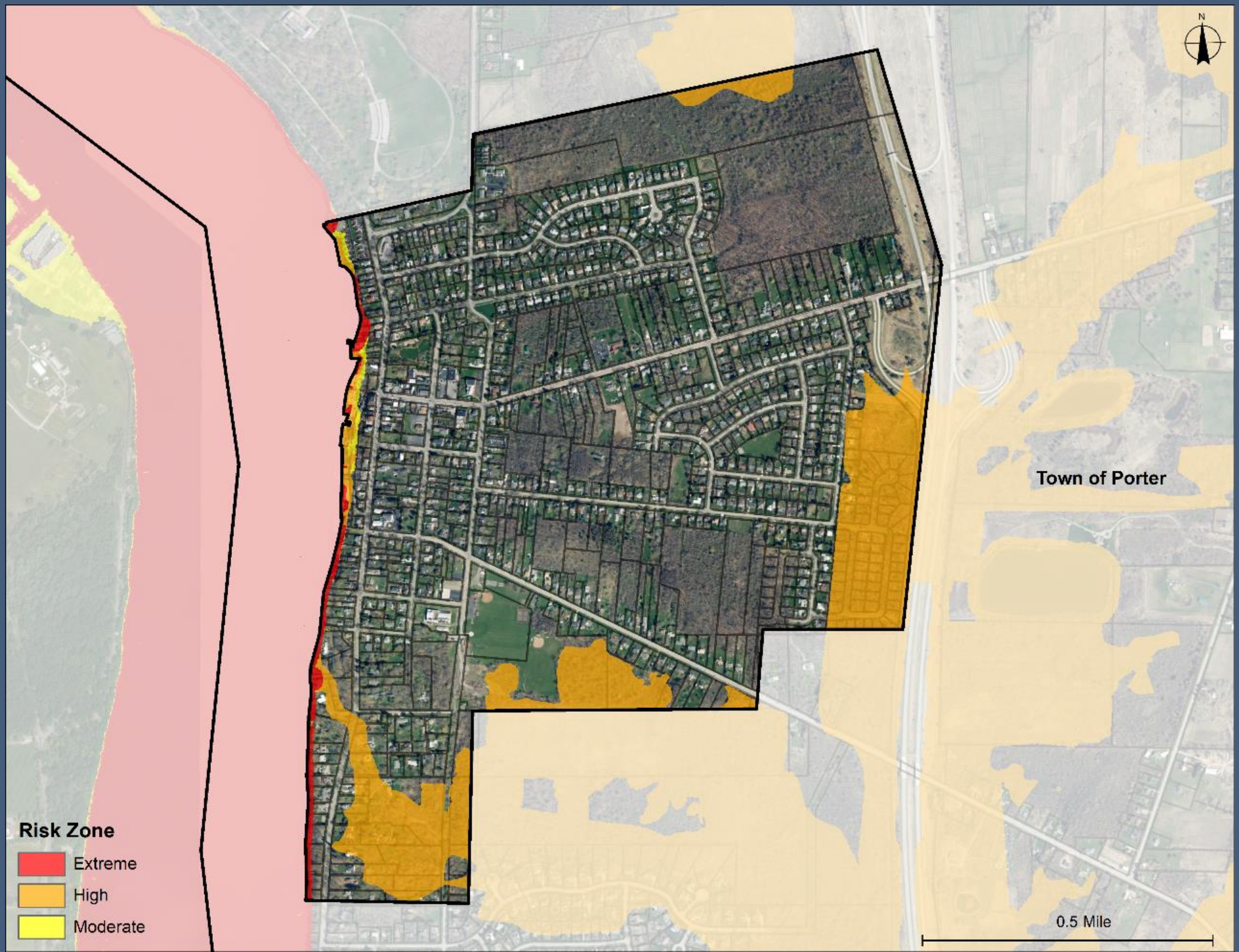
As illustrated by the map on the following page, the land use in the Village of Youngstown is predominantly a mixture of residential, community and public services and commercial land. The majority of residences are single houses located along the shoreline or within clustered neighborhoods. There are also some conservation areas and public parks including Veterans Park and Falkner Park.

All data from U.S. Census Bureau. 2019. American Community Survey, 2015-2019 5-Year Estimates, unless otherwise noted. Medians are weighted estimates for the shoreline area based on median age data available at the village-level.

LAND USE MAP – VILLAGE OF YOUNGSTOWN



COMMUNITY RISK – VILLAGE OF YOUNGSTOWN

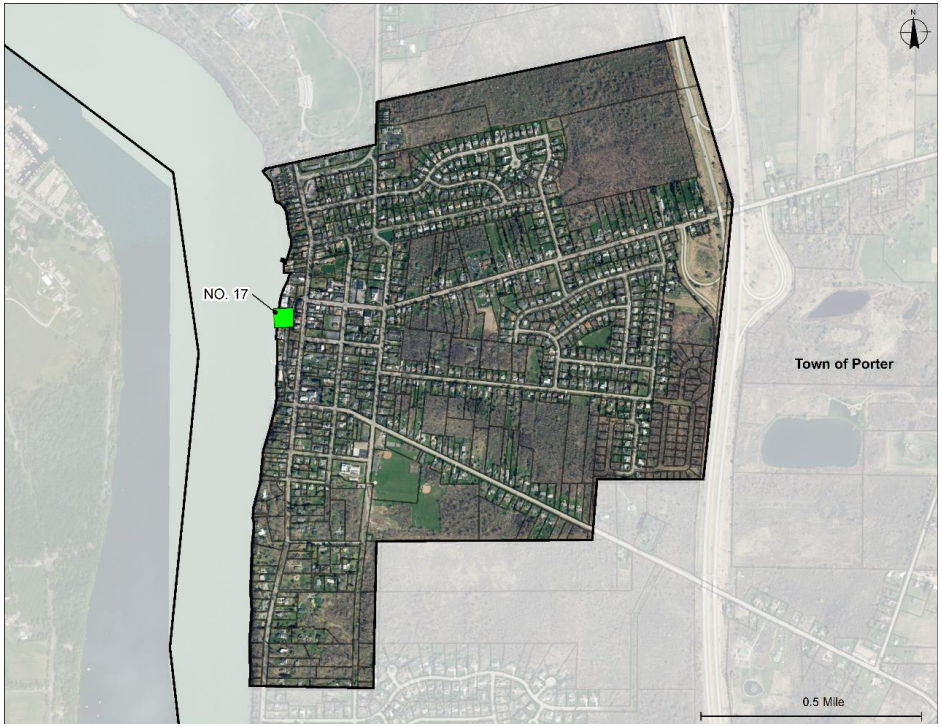


REDI PROJECTS – VILLAGE OF YOUNGSTOWN

In 2017 and 2019, major flooding affected the Lake Ontario and St. Lawrence River system. These flooding events, each of which reached levels of a 1% chance occurrence, caused extensive damage to shoreline systems and communities. In response to the extended pattern of flooding along the shores of Lake Ontario and St. Lawrence River and underlying economic challenges, the Lake Ontario Resiliency and Economic Development Initiative (REDI) was created to address the immediate and long-term resiliency and economic development needs of these areas.

The following project was selected by the REDI Commission in Fall 2019 to receive program funding:

Village of Youngstown REDI Project	Amount
NO.17 Village of Youngstown Waterfront	$2,103,000



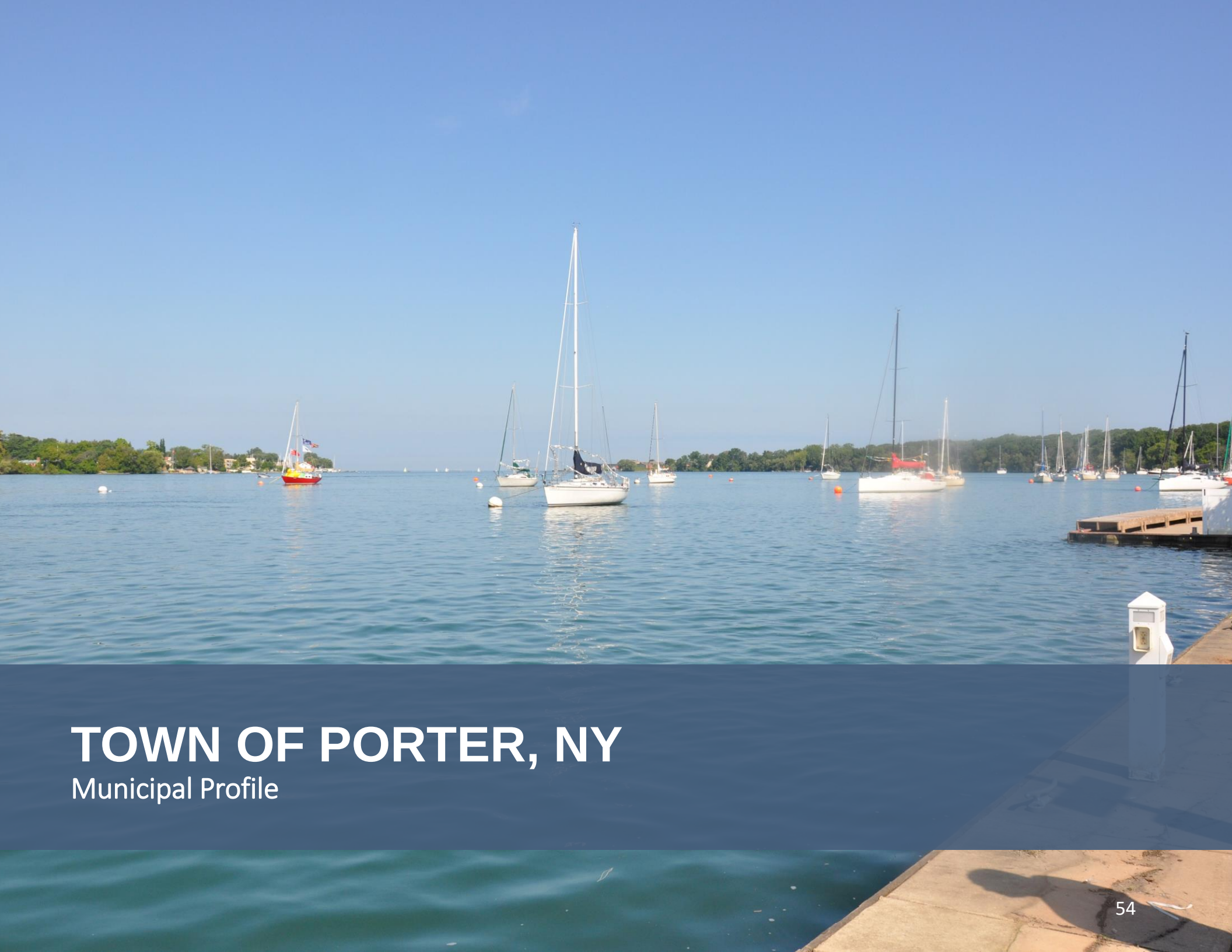
VILLAGE OF YOUNGSTOWN WATERFRONT (NO.17)

The Village of Youngstown waterfront along the Niagara River has been negatively impacted by flooding due to high water level(s). Tourism has suffered with lost revenues to the Village of Youngstown and the Town of Porter with reduced recreational activity along the waterfront, as well as lost revenue to a privately owned jet boat business, and reduced use of the Youngstown Yacht Club facility.

The conceptual project profiles are available at:

https://www.ny.gov/sites/default/files/atoms/files/REDI_Project_Profiles_NO_20191010.pdf

For current project status or additional information related to a REDI project, please contact the local municipality.

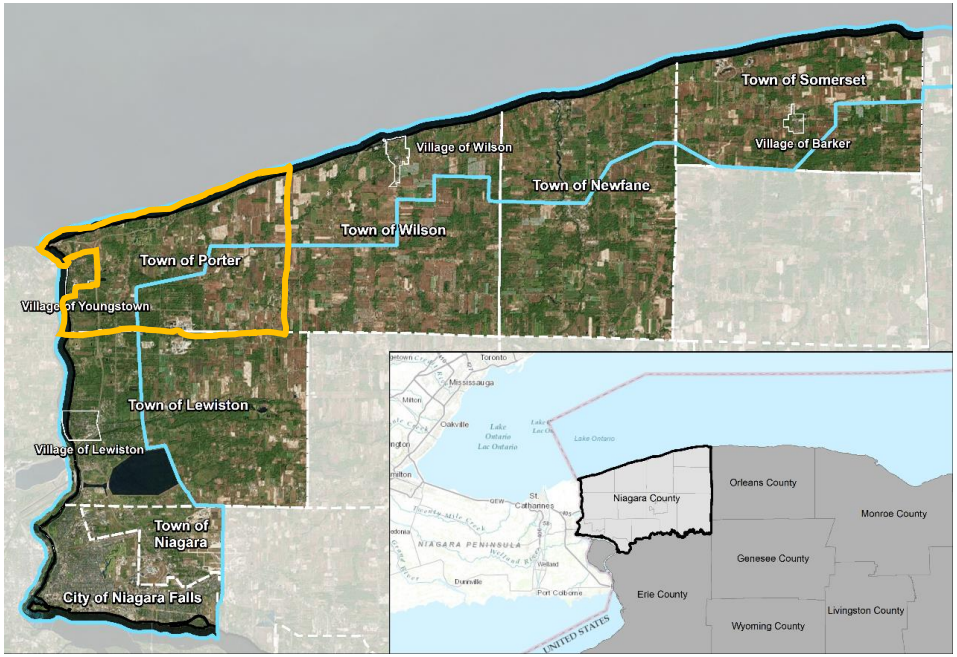


TOWN OF PORTER, NY

Municipal Profile

COMMUNITY OVERVIEW – TOWN OF PORTER

The Town of Porter is located between the Towns of Wilson and Lewiston within the CLEAR boundary in Niagara County. The Town of Porter is approximately 34 square miles and includes approximately 8.8 miles of Lake Ontario shoreline with additional waterfront from Fourmile Creek, Sixmile Creek and the Niagara River. The town is bounded by the Town of Wilson to the east and the Town of Lewiston to the south. The closest cities are Buffalo, approximately 19 miles south, and the City of Niagara Falls, approximately 6 miles south.



Town of Porter: Location Map

Town of Porter

Population
6,572

Median Age
47

# of Housing Units
3,096

Social Vulnerability Index
0.143

Shoreline Miles
12.3

% Occupied Homes
87%

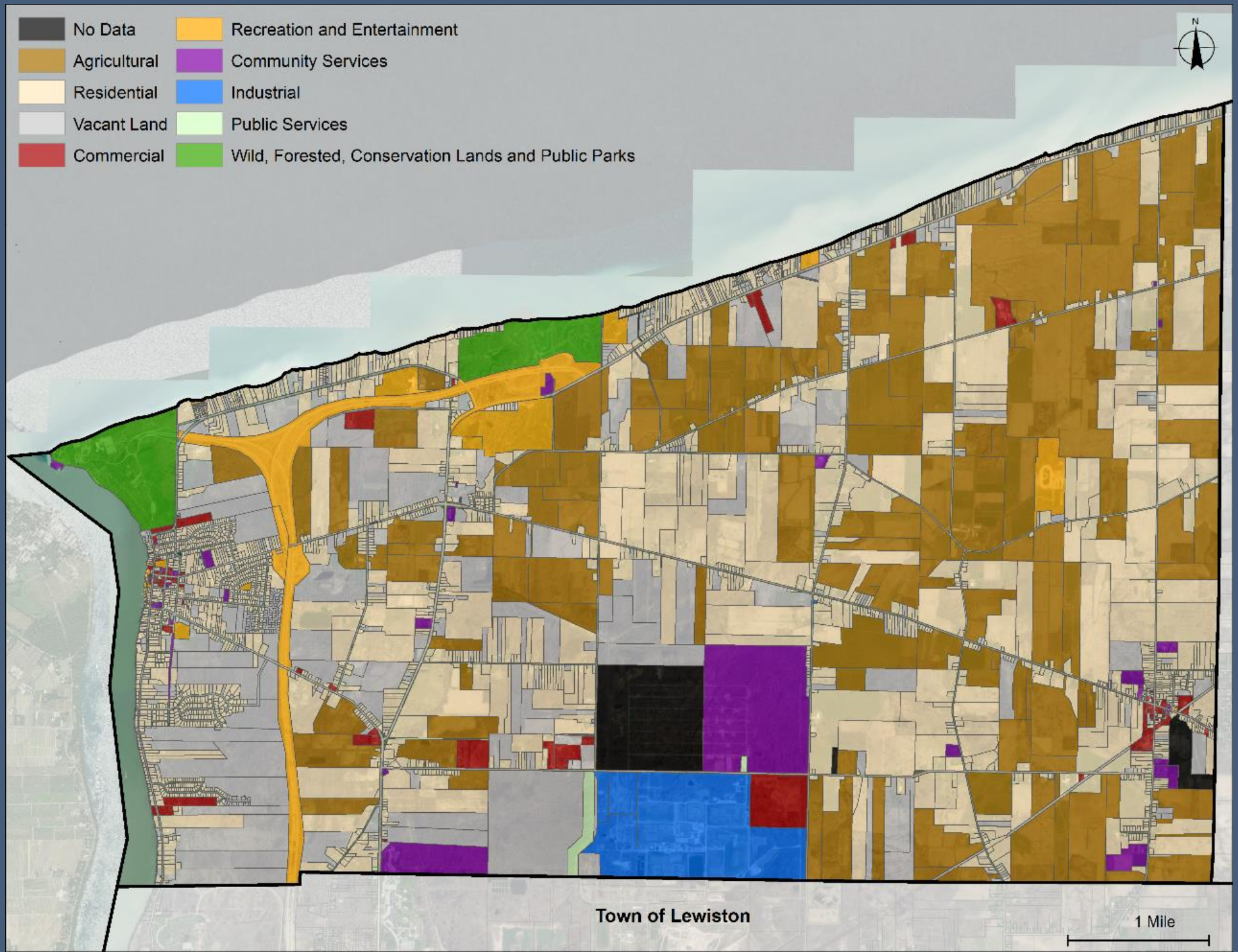
Median Home Value
$168k

Median Household Income
$76,667

As illustrated by the map on the following page, the land use in the Town of Porter is predominantly a mixture of agricultural, conservation lands, and parks, residential, industrial/manufacturing and vacant land. The majority of residences are single houses located along Niagara River and Lake Ontario waterfront. There are also some conservation areas and public parks including Fort Niagara State Park and Fourmile Creek State Park. There are no REDI projects for the Town of Porter.

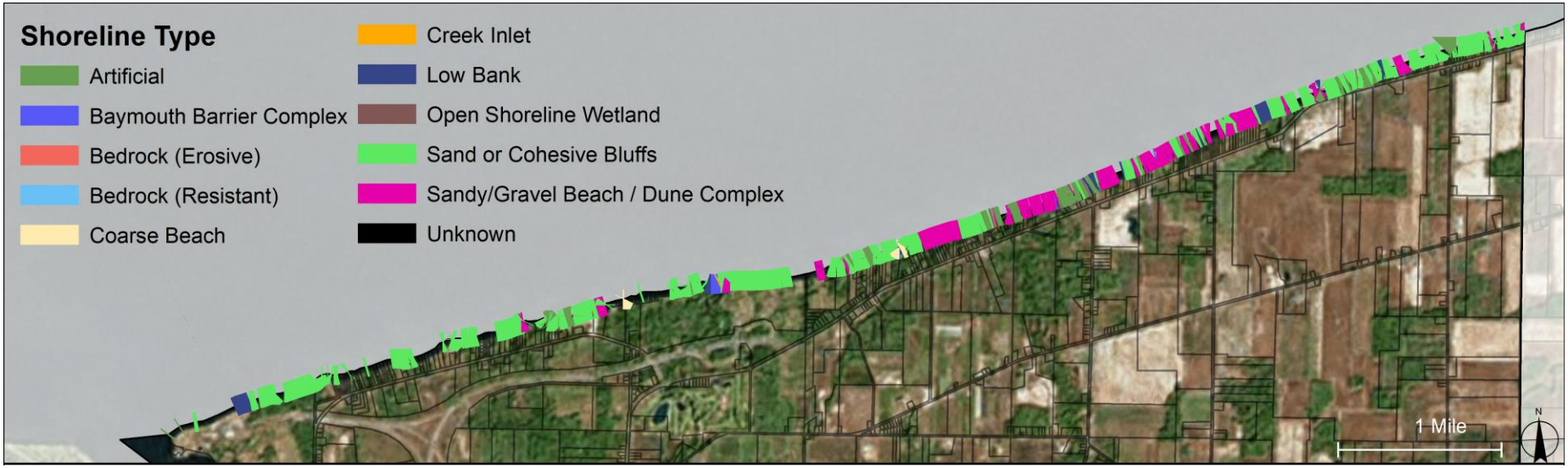
All data from U.S. Census Bureau. 2019. American Community Survey, 2015-2019 5-Year Estimates, unless otherwise noted. Medians are weighted estimates for the shoreline area based on median age data available at the town-level.

LAND USE MAP – TOWN OF PORTER



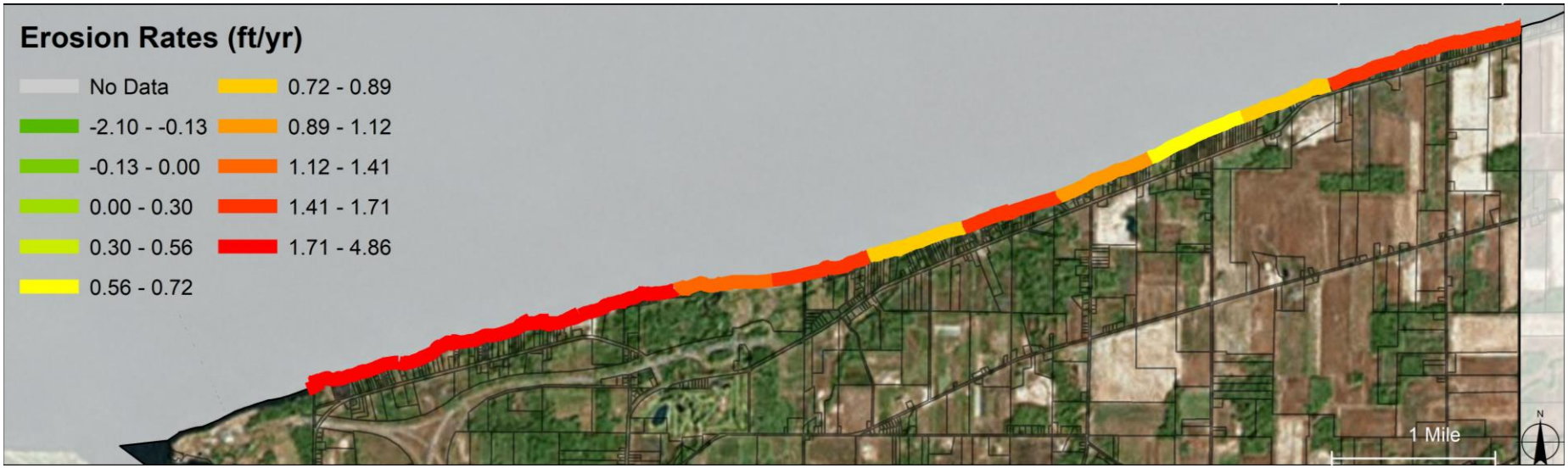
Shoreline Classification

The shoreline is primarily sand or cohesive bluffs with areas of low bank around creek inlets, baymouth barrier complex, coarse beach, sandy/gravel beach/dune complex and artificial hardening with riprap or seawalls.

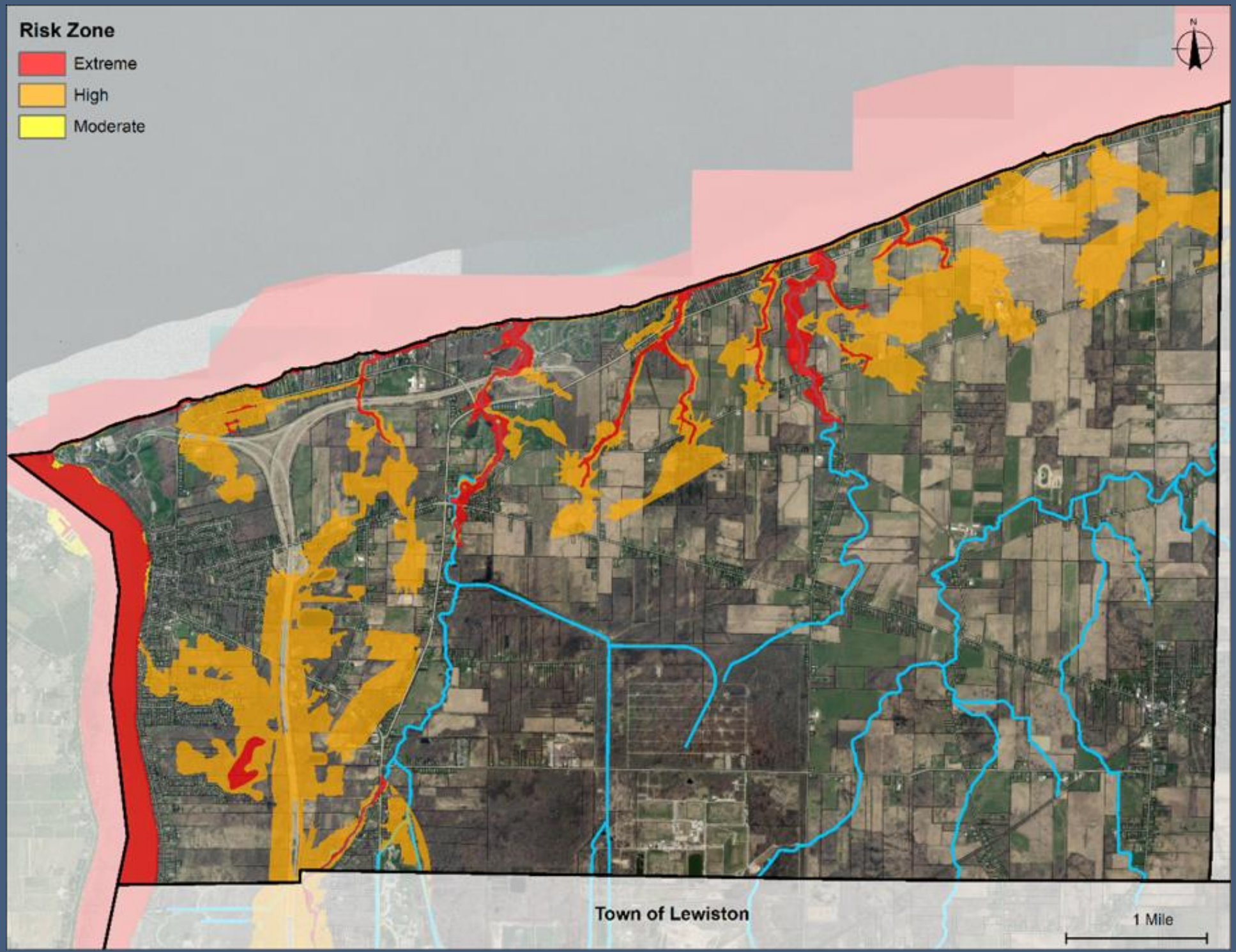


Erosion Rate

The shoreline erosion rate along Lake Ontario ranges from 0.62 to 2.3 ft/yr, with a general mixture of rates closer to the lower and upper ends of this range as demonstrated by the yellow and red reaches respectively. These historical erosion rate estimates were based only on the erodible portion (i.e., unhardened shoreline) of the Lake Ontario shoreline. The extent of data from USACE does not cover the western most portion of the town's shoreline boundary.



COMMUNITY RISK – TOWN OF PORTER

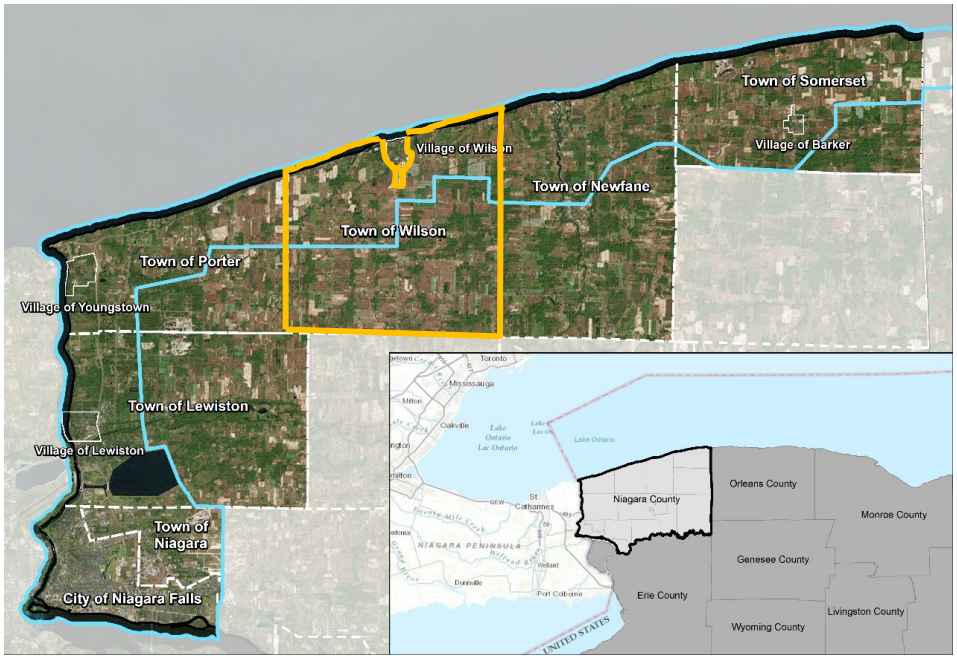


TOWN OF WILSON, NY

Municipal Profile

COMMUNITY OVERVIEW – TOWN OF WILSON

The Town of Wilson is located between the Towns of Porter and Newfane within the CLEAR boundary in Niagara County. The Town of Wilson is approximately 50 square miles and includes approximately 8 miles of Lake Ontario shoreline with additional waterfront from Twelve Mile Creek. The town is bounded by the Town of Newfane to the east, the Town of Porter to the west, and the Town of Cambria to the south. The closest cities are Buffalo, approximately 18 miles south, and the City of Niagara Falls, approximately 9 miles south.



Town of Wilson: Location Map

Town of Wilson

Population
5,820

Median Age
47

# of Housing Units
2,819

Social Vulnerability Index
0.245

Shoreline Miles
7.9

% Occupied Homes
86%

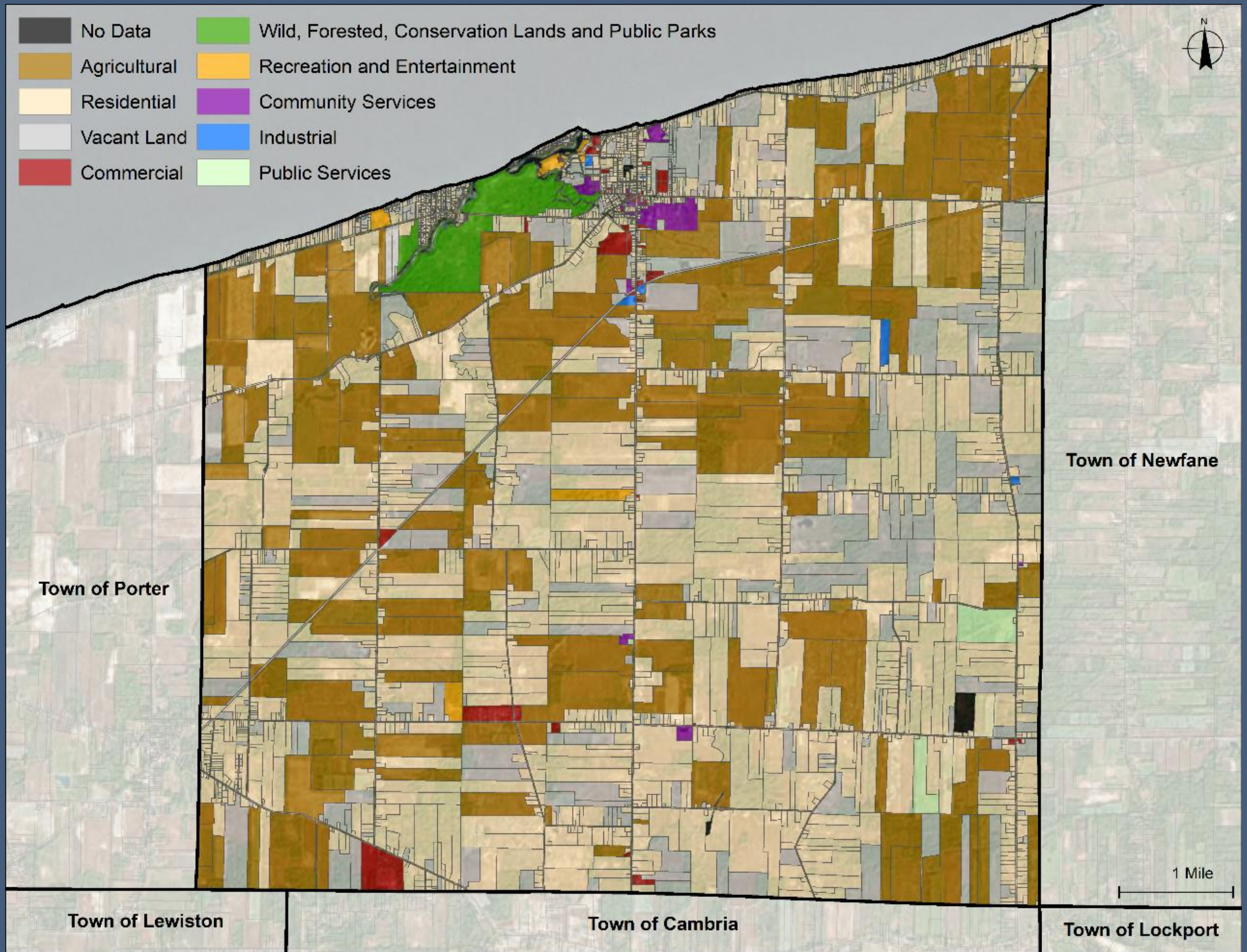
Median Home Value
$147k

Median Household Income
$63,939

As illustrated by the map on the following page, the land use in the Town of Wilson is predominantly a mixture of agricultural, conservation lands and parks, residential, and vacant land. The majority of residences are single houses located along the shoreline or creek waterfront. There are also some conservation areas and public parks including Wilson Tuscarora State Park.

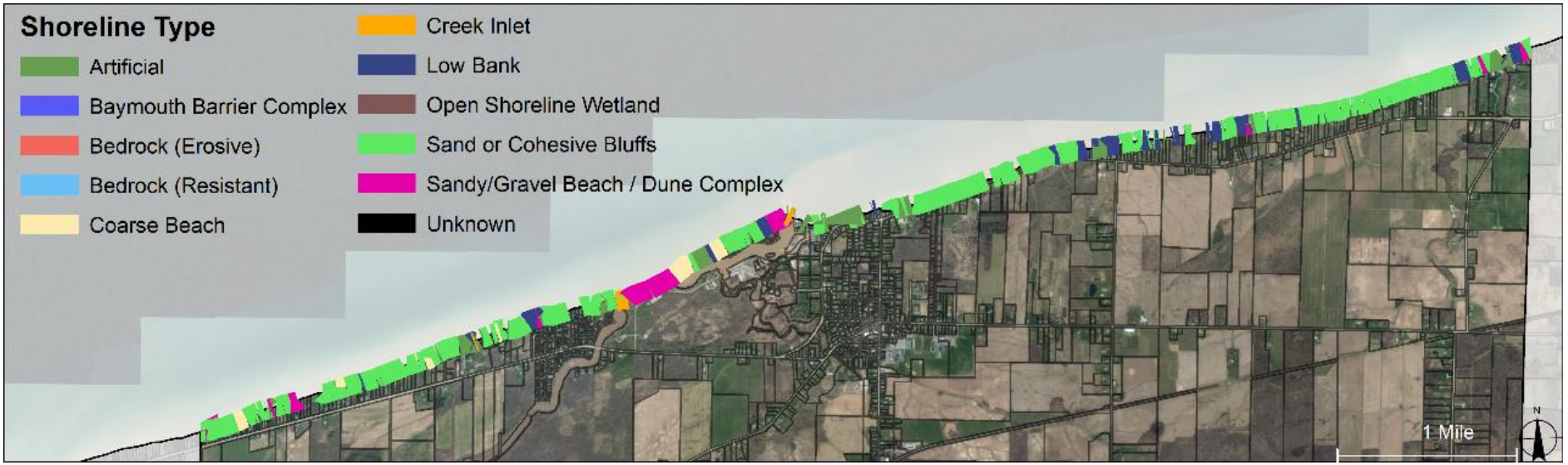
All data from U.S. Census Bureau. 2019. American Community Survey, 2015-2019 5-Year Estimates, unless otherwise noted. Medians are weighted estimates for the shoreline area based on median age data available at the town-level.

LAND USE MAP – TOWN OF WILSON



Shoreline Classification

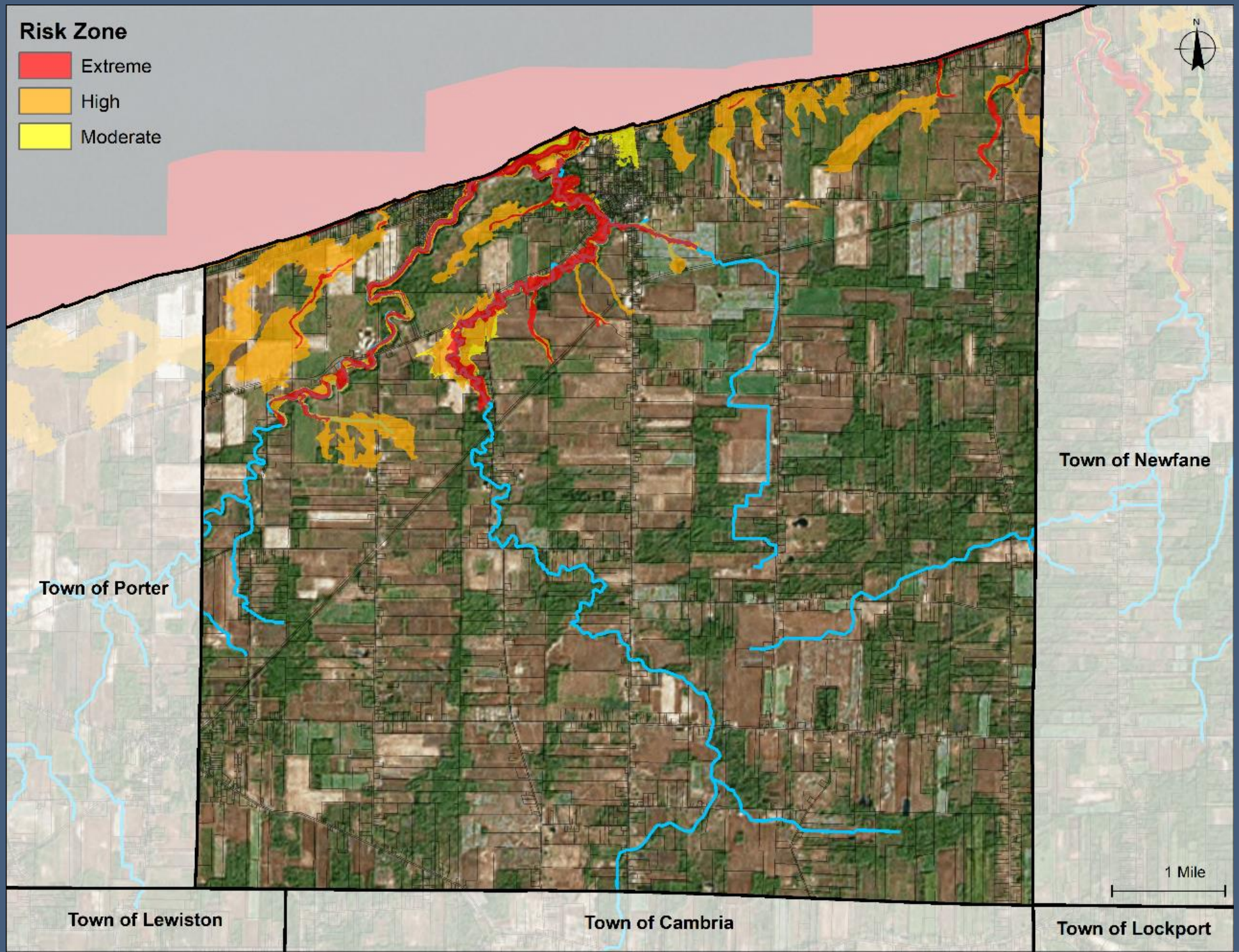
The shoreline is primarily sand or cohesive bluffs with areas of low bank around creek inlets, coarse beach, sandy/gravel beach/dune complex and artificial hardening with riprap or seawalls.



Erosion Rate

The shoreline erosion rate along Lake Ontario ranges from 1.1 to 2.95 ft/yr. These historical erosion rate estimates were based only on the erodible portion (i.e., unhardened shoreline) of the Lake Ontario shoreline. As shown on the map below, the Town's shoreline is a mixture of the higher ranges of erosion rate, shown in orange and red.

COMMUNITY RISK – TOWN OF WILSON

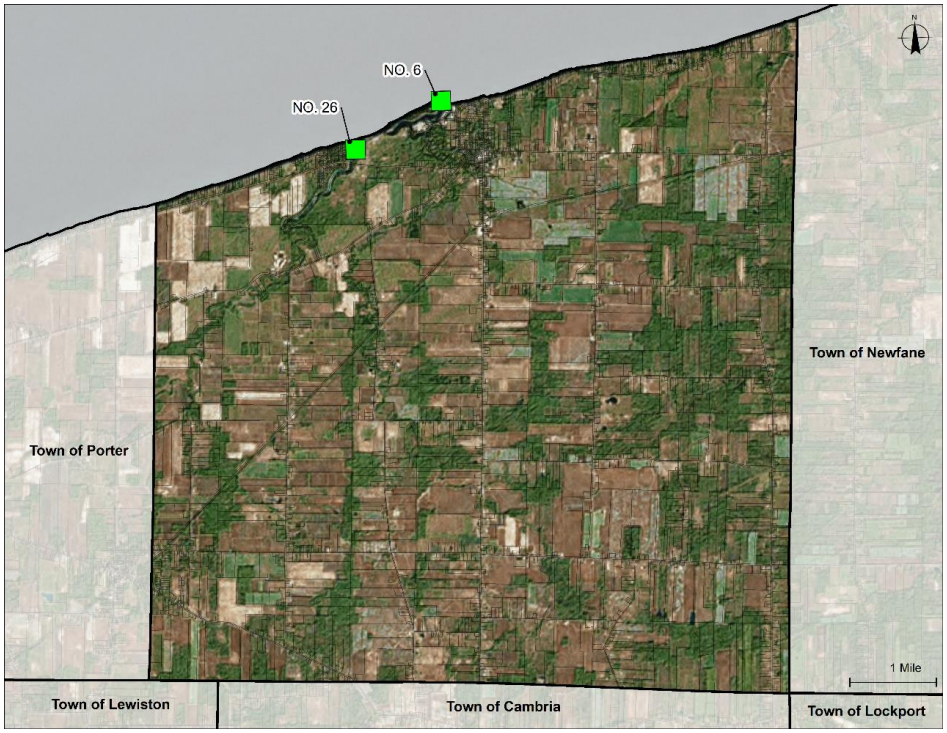


REDI PROJECTS – TOWN OF WILSON

In 2017 and 2019, major flooding affected the Lake Ontario and St. Lawrence River system. These flooding events, each of which reached levels of a 1% chance occurrence, caused extensive damage to shoreline systems and communities. In response to the extended pattern of flooding along the shores of Lake Ontario and St. Lawrence River and underlying economic challenges, the Lake Ontario Resiliency and Economic Development Initiative (REDI) was created to address the immediate and long-term resiliency and economic development needs of these areas.

The following projects were selected by the REDI Commission in Fall 2019 to receive program funding:

Town of Wilson REDI Projects	Amount
NO.26 Roosevelt Beach	$125,000
NO.6 Sunset Island West Barrier Bar	$3,362,000



ROOSEVELT BEACH (NO.26)

Maintaining these types of functional facilities is an important regional consideration to Niagara and Orleans counties, providing economic activity, including support of recreational boating access, restaurants, and fuel sales, sustaining tourism.

SUNSET ISLAND EAST AND WEST BARRIER BAR (NO.6)

This project seeks to address the recurring breaches along a barrier bar that divides Tuscarora Bay and Lake Ontario, while maintaining a balance of natural coastal features and processes, protection of habitat, property, and infrastructure, as well as ensuring recreational access and public health and safety. The west side of Sunset Island (western barrier bar) is a low area with a flooded access road and buried utilities.

The conceptual project profiles are available at:

https://www.ny.gov/sites/default/files/atoms/files/REDI_Project_Profiles_NO_20191010.pdf

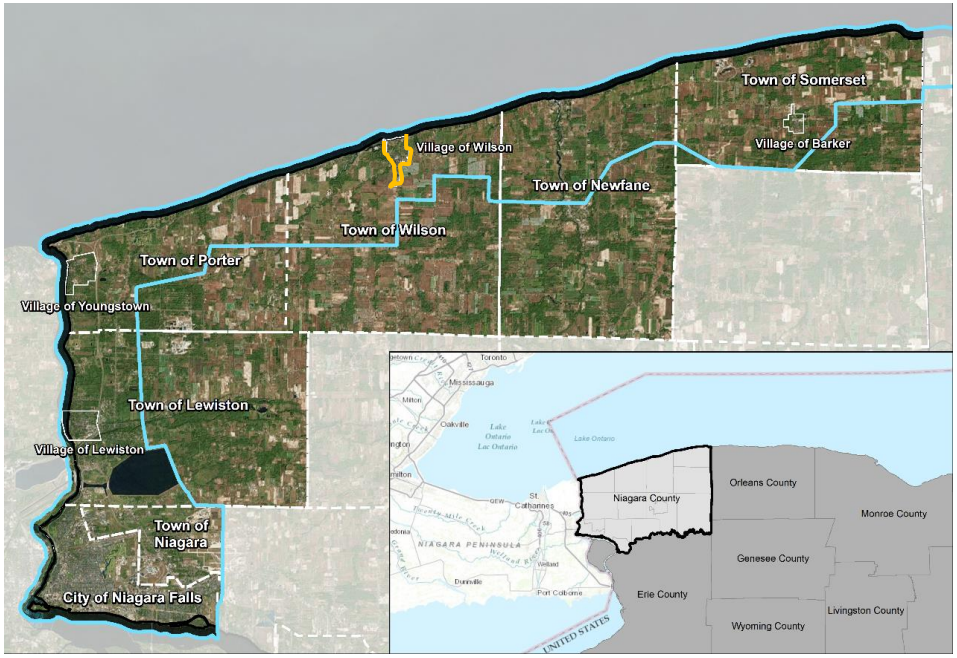
For current project status or additional information related to a REDI project, please contact the local municipality.

VILLAGE OF WILSON, NY

Municipal Profile

COMMUNITY OVERVIEW – VILLAGE OF WILSON

The Village of Wilson is located in the Town of Wilson within the CLEAR boundary in Niagara County. The Village of Wilson is less than 1 square mile and includes approximately 1 mile of Lake Ontario shoreline with additional waterfront from Tuscarora Bay. The village is within the Town of Wilson. The closest cities are Buffalo, approximately 23 miles south, and the City of Niagara Falls, approximately 15 miles southwest.



Village of Wilson: Location Map

Village of Wilson

Population
1,120

Median Age
45

# of Housing Units
590

Social Vulnerability Index
0.272

Shoreline Miles
0.8

% Occupied Homes
84%

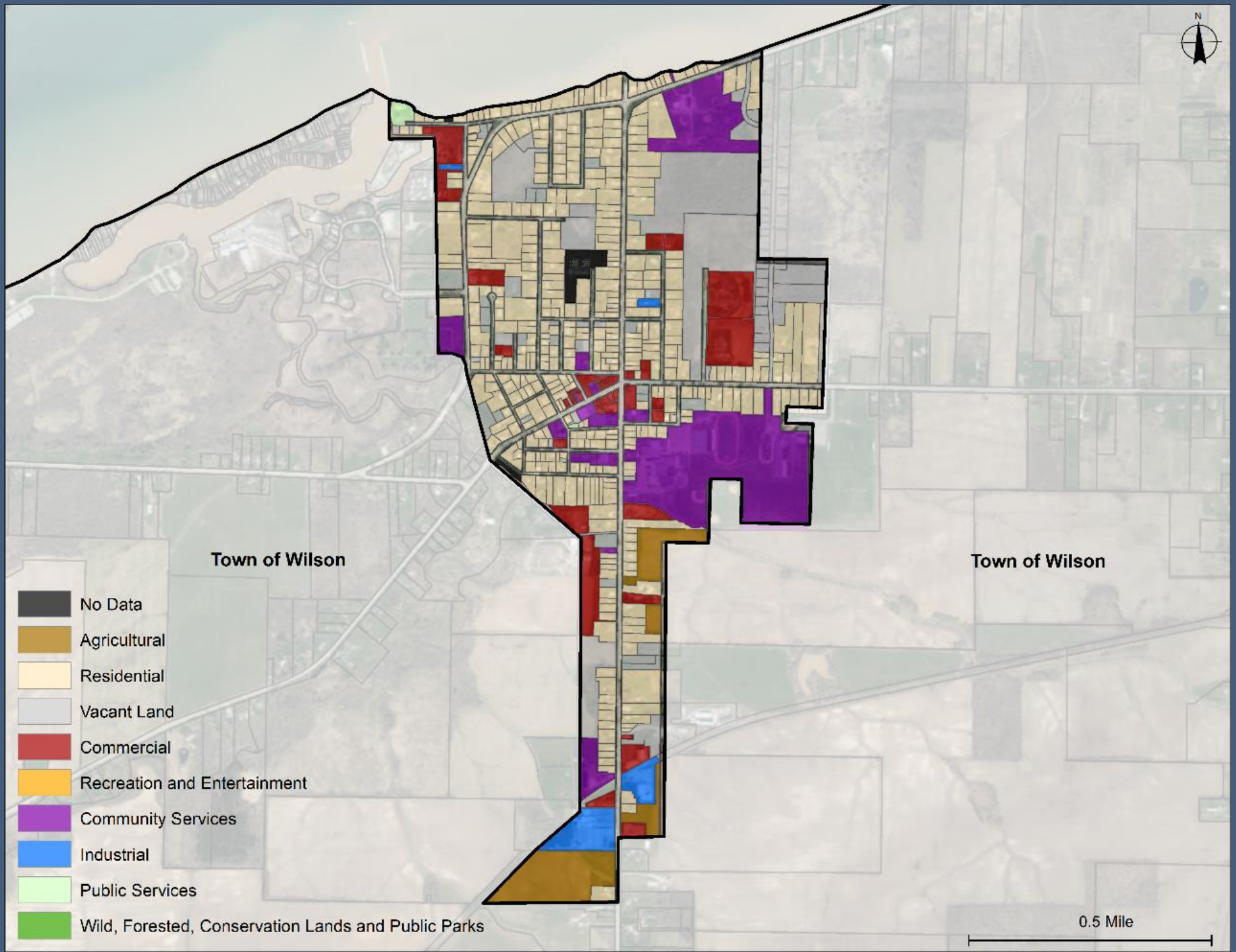
Median Home Value
$108k

Median Household Income
$60,227

As illustrated by the map on the following page, the land use in the Village of Wilson is predominantly a mixture of residential, community and public services, commercial and vacant land. The majority of residences are single houses located along the shoreline or village center. There are also some conservation areas and public parks including Calvin E. Kreuger Park.

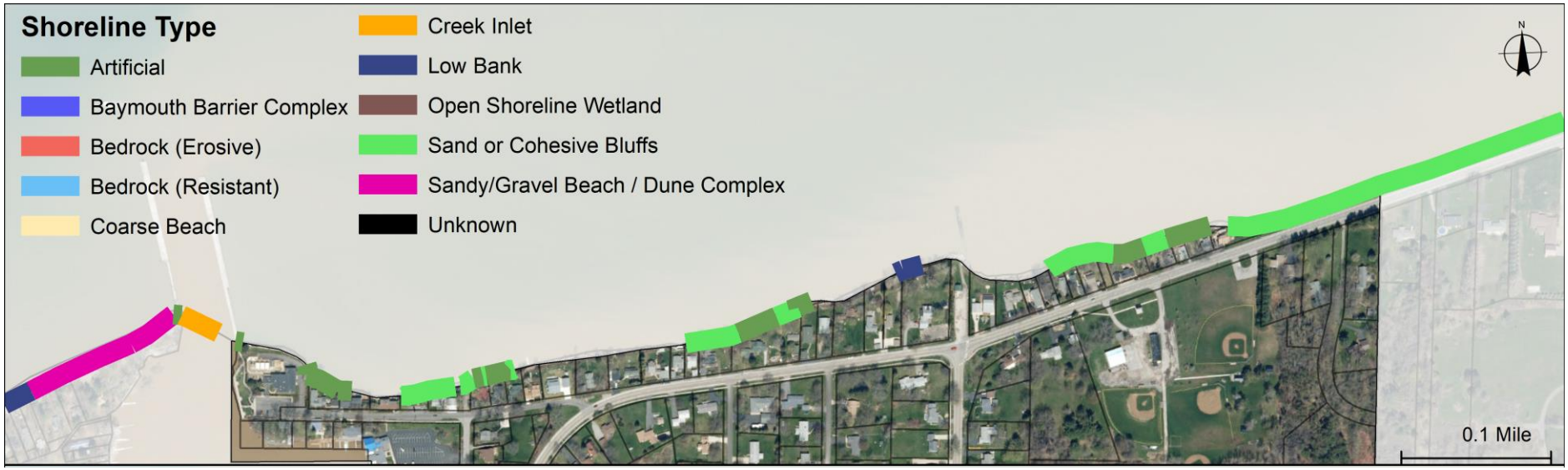
All data from U.S. Census Bureau. 2019. American Community Survey, 2015-2019 5-Year Estimates, unless otherwise noted. Medians are weighted estimates for the shoreline area based on median age data available at the village-level.

LAND USE MAP – VILLAGE OF WILSON



Shoreline Classification

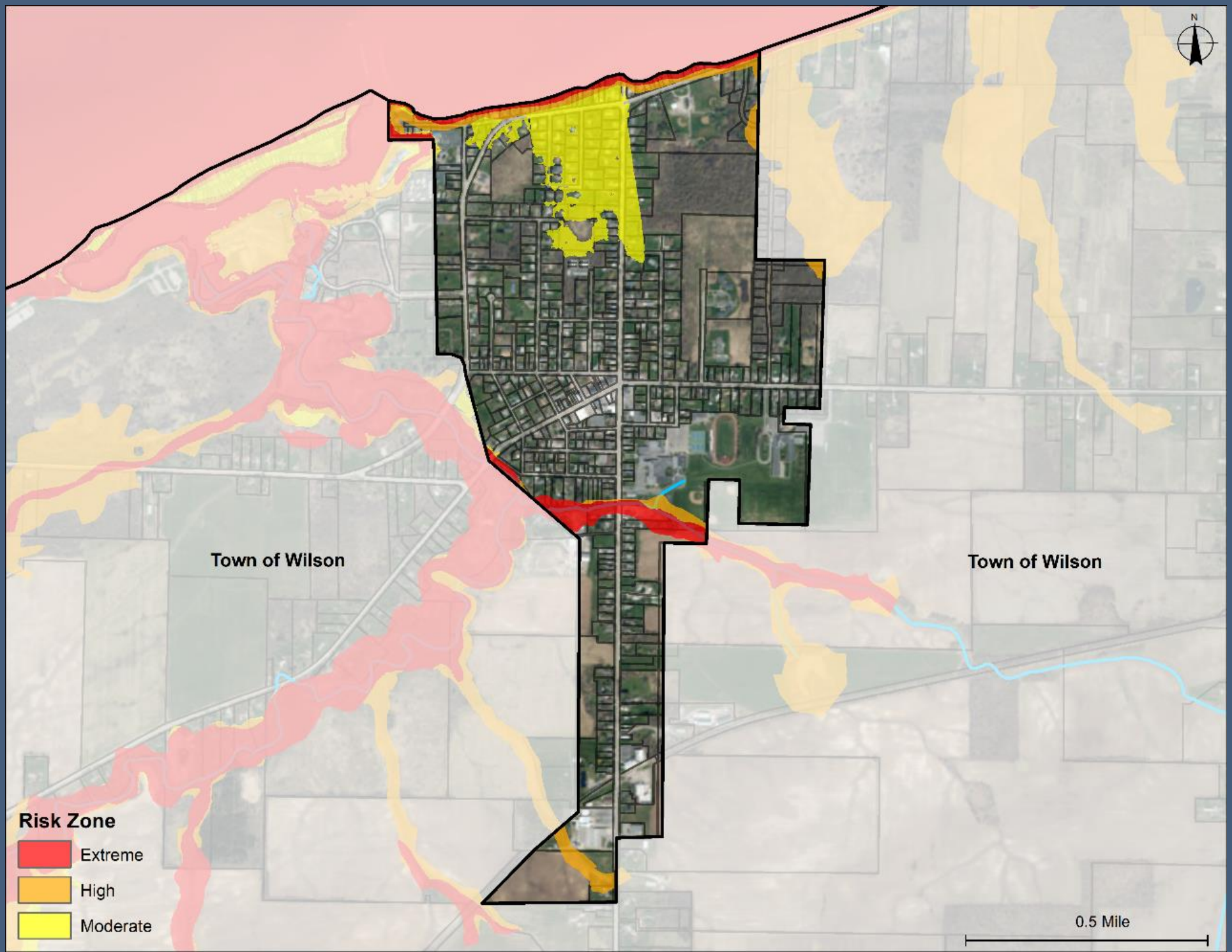
The shoreline is primarily sand or cohesive bluffs and artificial hardening with riprap or seawalls.



Erosion Rate

The shoreline erosion rate along Lake Ontario ranges from 1.06 to 2.8 ft/yr. The shoreline in the Village of Wilson has a fairly uniform erosion rate range shown in orange, with the highest erosion rate showing at the eastern most edge of the Village boundary. These historical erosion rate estimates were based only on the erodible portion (i.e., unhardened shoreline) of the Lake Ontario shoreline.

COMMUNITY RISK – VILLAGE OF WILSON

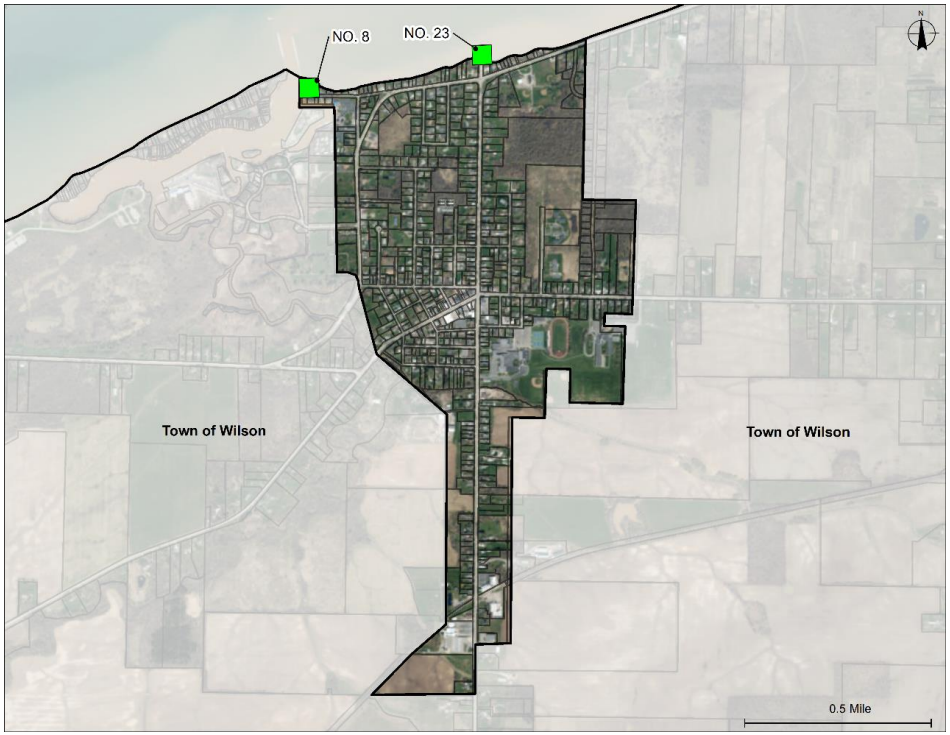


REDI PROJECTS – VILLAGE OF WILSON

In 2017 and 2019, major flooding affected the Lake Ontario and St. Lawrence River system. These flooding events, each of which reached levels of a 1% chance occurrence, caused extensive damage to shoreline systems and communities. In response to the extended pattern of flooding along the shores of Lake Ontario and St. Lawrence River and underlying economic challenges, the Lake Ontario Resiliency and Economic Development Initiative (REDI) was created to address the immediate and long-term resiliency and economic development needs of these areas.

The following projects were selected by the REDI Commission in Fall 2019 to receive program funding:

Village of Wilson REDI Projects	Amount
NO.23 Townline Pier	$1,587,000
NO.8 Village of Wilson WWTP	$4,461,000



TOWNLINE PIER (NO.23)

The Townline Pier in the Village of Wilson has been negatively impacted by high-intensity wave action and erosion. In 2019, the pier was approximately two feet underwater. Enhancements to protect the pier would increase public use and potential development opportunities in the village.

VILLAGE OF WILSON WWTP (NO.8)

This project seeks to address the recurring damage and risk of flooding of critical infrastructure at the Village of Wilson WWTP. This project also seeks to provide a significant economic development opportunity by re-purposing the WWTP property adjacent to Wilson Harbor.

The conceptual project profiles are available at:

https://www.ny.gov/sites/default/files/atoms/files/REDI_Project_Profiles_NO_20191010.pdf

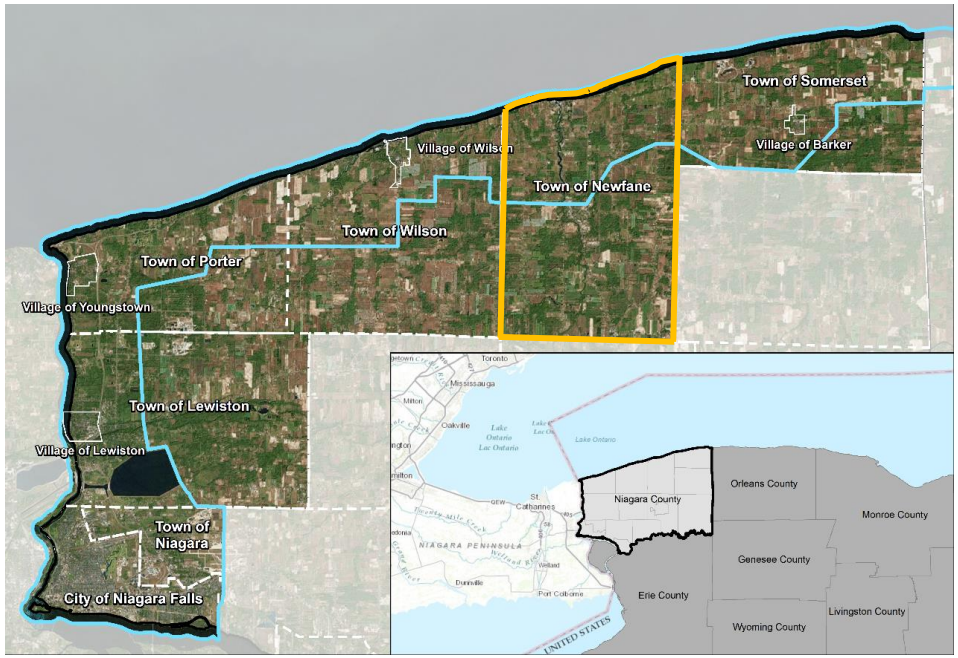
For current project status or additional information related to a REDI project, please contact the local municipality.

TOWN OF NEWFANE, NY

Municipal Profile

COMMUNITY OVERVIEW – TOWN OF NEWFANE

The Town of Newfane is located between the Towns of Somerset and Wilson within the CLEAR boundary in Niagara County. The Town of Somerset is approximately 52 square miles and includes approximately 6.5 miles of Lake Ontario shoreline with additional waterfront from Eight Mile Creek and Hopkins Creek. The town is bounded by the Towns of Somerset and Hartland to the east, the Town of Wilson to the west, and the Town of Lockport to the south. The closest cities are Buffalo, approximately 18 miles southwest, and the City of Niagara Falls, approximately 13 miles southwest.



Town of Newfane: Location Map

Town of Newfane

Population
9,297

Median Age
45

# of Housing Units
4,283

Social Vulnerability Index
0.211

Shoreline Miles
6.5

% Occupied Homes
88%

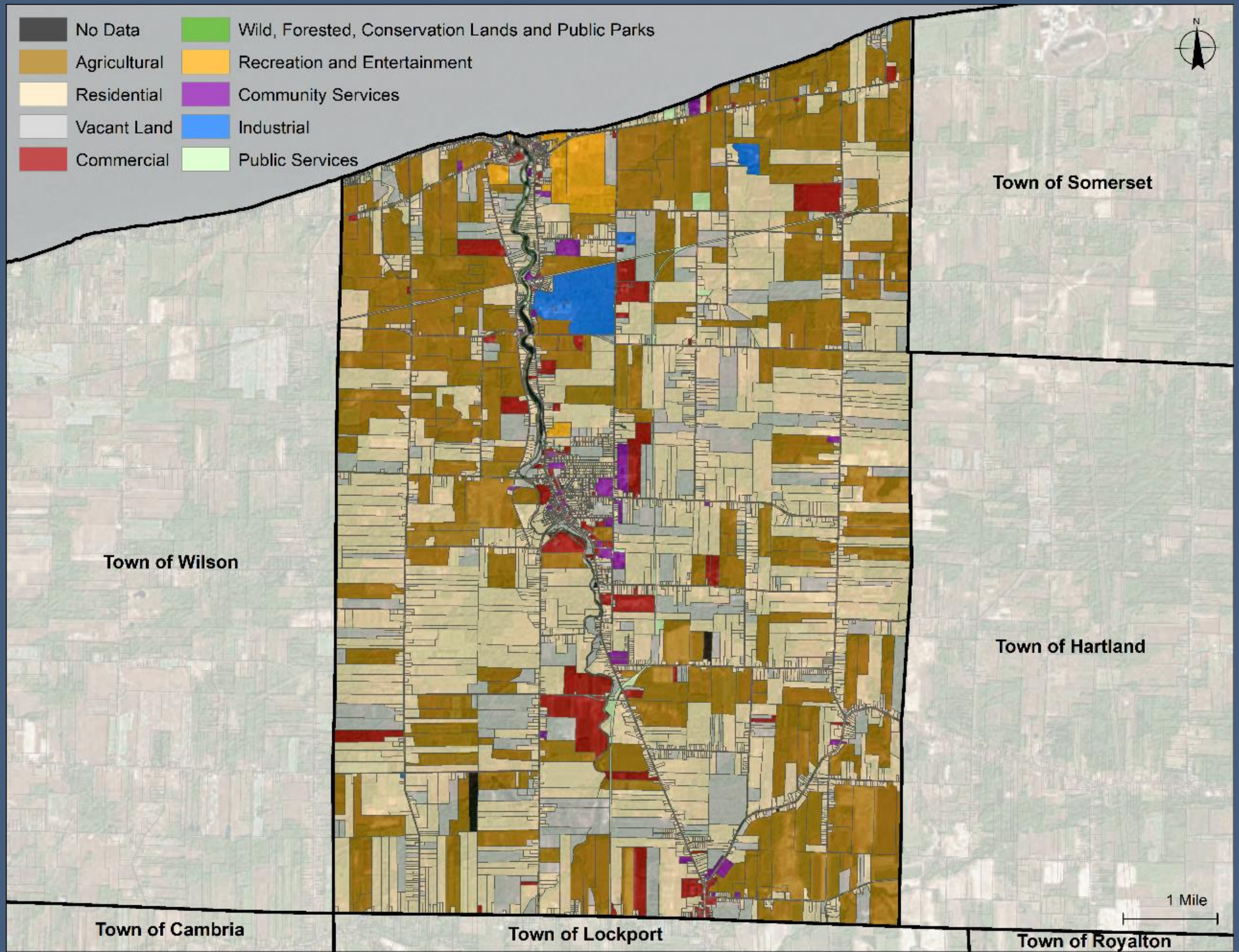
Median Home Value
$116k

Median Household Income
$57,190

As illustrated by the map on the following page, the land use in the Town of Newfane is predominantly a mixture of agricultural, conservation lands and parks, residential, and vacant land. The majority of residences are single family homes set back from the Town's shoreline. There are also some conservation areas and public parks including Splash Park Niagara County Krull Park.

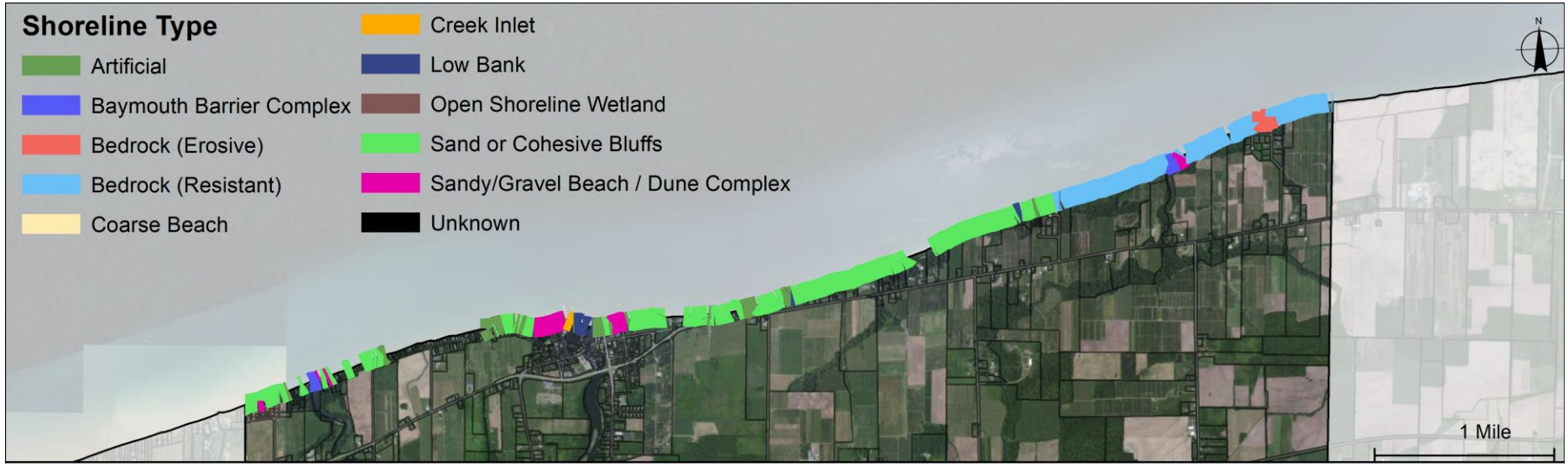
All data from U.S. Census Bureau. 2019. American Community Survey, 2015-2019 5-Year Estimates, unless otherwise noted. Medians are weighted estimates for the shoreline area based on median age data available at the town-level.

LAND USE MAP – TOWN OF NEWFANE



Shoreline Classification

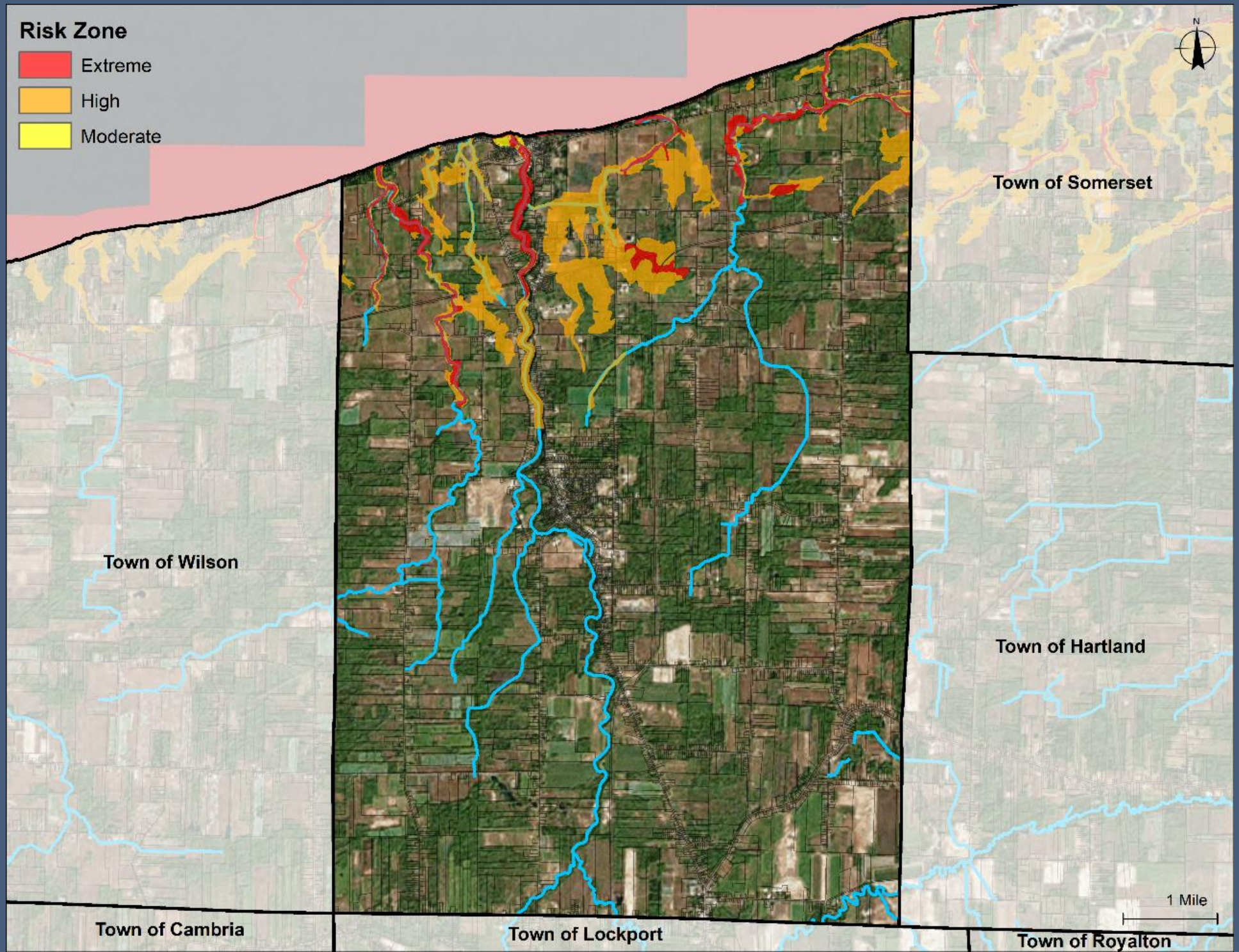
The shoreline is primarily sand or cohesive bluffs with areas of bedrock (resistant and erosive), baymouth barrier complex, sandy/ gravel beach/dune complex and artificial hardening with riprap or seawalls.



Erosion Rate

The shoreline erosion rate along Lake Ontario ranges from 0.46 to 1.13 ft/yr. The majority of shoreline within the Town of Newfane exhibits erosion rates towards the lower to mid range, with shorter stretches at the upper range shown in orange. These historical erosion rate estimates were based only on the erodible portion (i.e., unhardened shoreline) of the Lake Ontario shoreline.

COMMUNITY RISK – TOWN OF NEWFANE

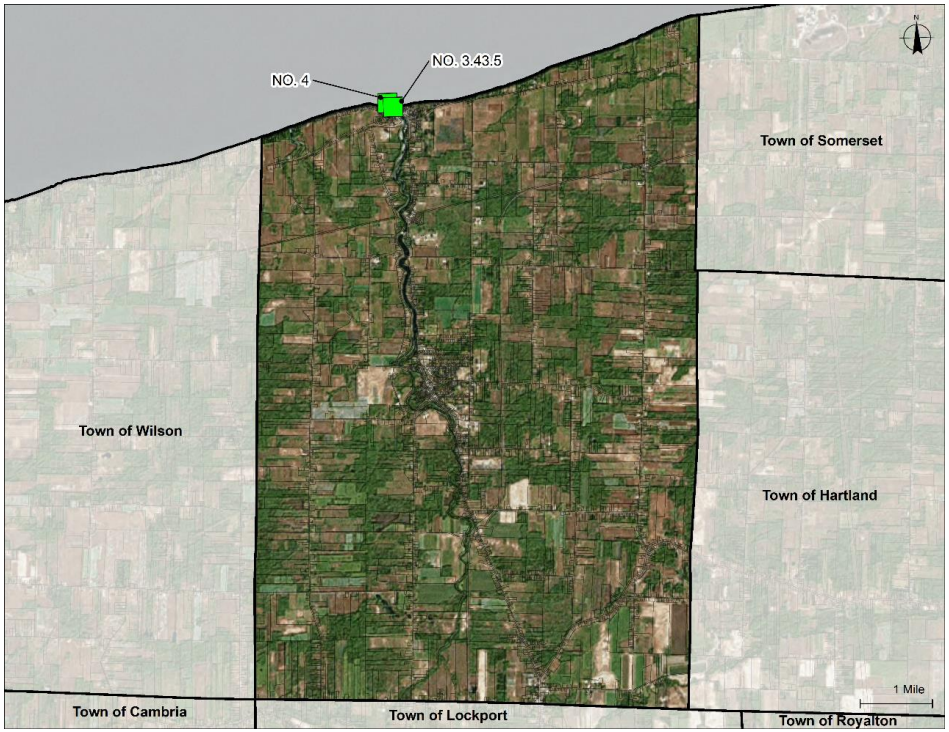


REDI PROJECTS – TOWN OF NEWFANE

In 2017 and 2019, major flooding affected the Lake Ontario and St. Lawrence River system. These flooding events, each of which reached levels of a 1% chance occurrence, caused extensive damage to shoreline systems and communities. In response to the extended pattern of flooding along the shores of Lake Ontario and St. Lawrence River and underlying economic challenges, the Lake Ontario Resiliency and Economic Development Initiative (REDI) was created to address the immediate and long-term resiliency and economic development needs of these areas.

The following projects were selected by the REDI Commission in Fall 2019 to receive program funding:

Town of Newfane REDI Projects	Amount
NO.3.43.5 Olcott Harbor	$15,707,000
NO.4 Olcott Beach Berm	$1,814,000



OLCOTT HARBOR (NO.3.43.5)

Olcott Harbor, a recreational harbor located at the mouth of Eighteenmile Creek, was subject to flooding and wind-driven waves in both 2017 and 2019. This project seeks to mitigate negative effects from flooding of Olcott Harbor through a comprehensive approach to address critical assets.

OLCOTT BEACH BERM (NO.4)

Extreme high water level(s) and waves have eroded the previous berm that protected a town parking lot and a low-lying area with year-round businesses and homes. Buildings were flooded in 2017 and in 2019. This project seeks to address infrastructure and homes at near lake level with no natural protective features. Approximately 900 ft of shoreline is directly exposed to wave action from the lake.

The conceptual project profiles are available at:

https://www.ny.gov/sites/default/files/atoms/files/REDI_Project_Profiles_NO_20191010.pdf.

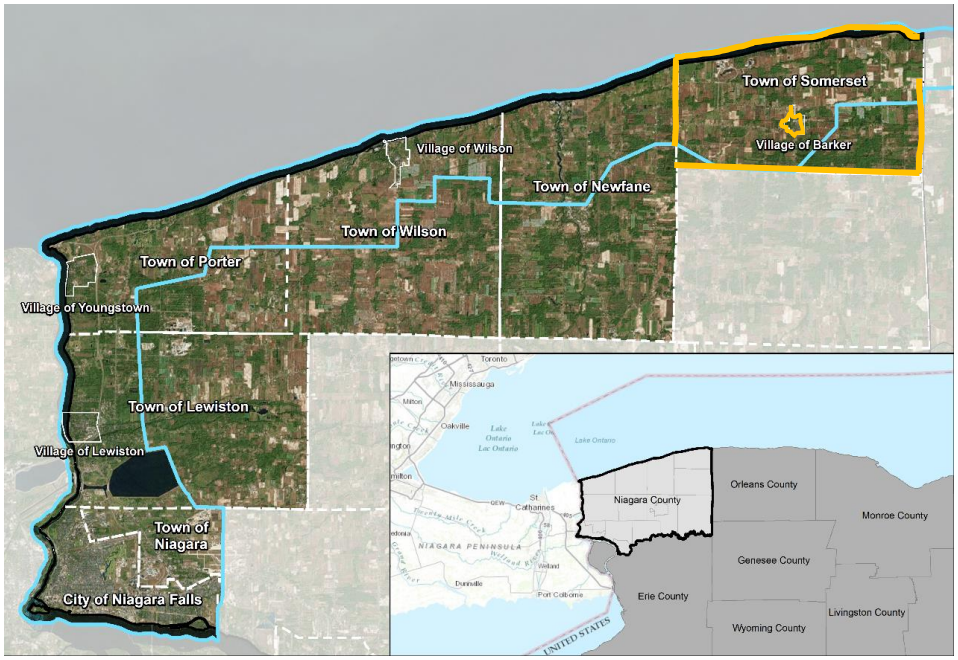
For current project status or additional information related to a REDI project, please contact the local municipality.

TOWN OF SOMERSET, NY

Municipal Profile

COMMUNITY OVERVIEW – TOWN OF SOMERSET

The Town of Somerset is located between the Towns of Newfane and Yates within the CLEAR boundary in Niagara County. The Town of Somerset is approximately 37 square miles and includes approximately 9 miles of Lake Ontario shoreline with additional waterfront from Golden Hill Creek and Fish Creek. The town is bounded by the Town of Yates to the east, the Town of Newfane to the west, and the Town of Hartland to the south. The closest cities are Buffalo, approximately 26 miles southwest, and the City of Niagara Falls, approximately 21 miles southwest.



Town of Somerset: Location Map

Town of Somerset

Population
2,646

Median Age
45

# of Housing Units
1,197

Social Vulnerability Index
0.398

Shoreline Miles
9

% Occupied Homes
85%

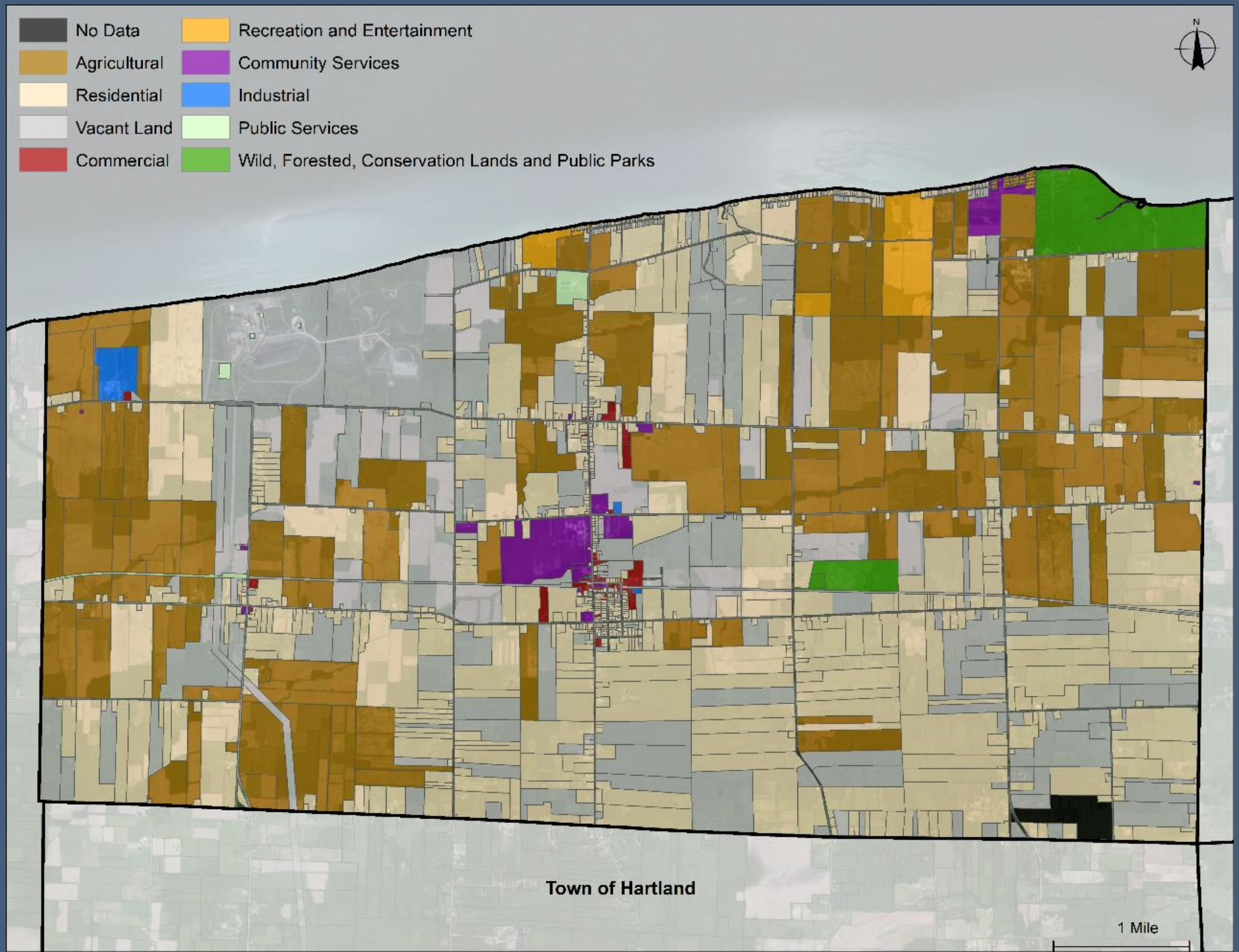
Median Home Value
$63k

Median Household Income
$126,700

As illustrated by the map on the following page, the land use in the Town of Somerset is predominantly a mixture of agricultural, conservation lands and parks, residential, and vacant land. The majority of residences are single houses located along the shoreline or near the Village of Barker. There are also some conservation areas and public parks including Golden Hill State Park.

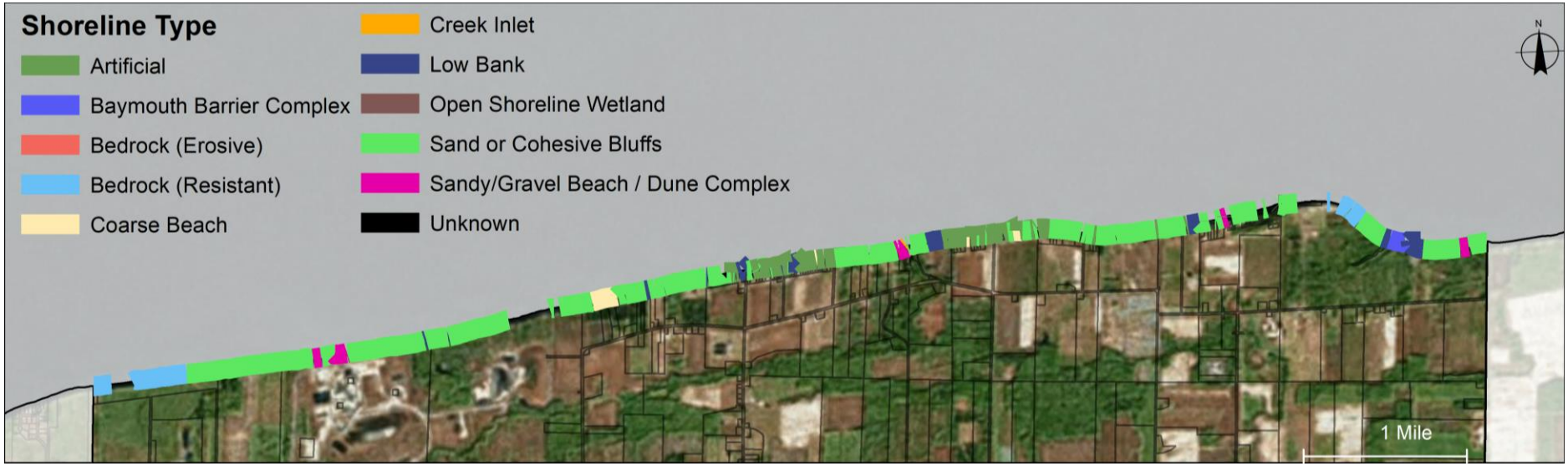
All data from U.S. Census Bureau. 2019. American Community Survey, 2015-2019 5-Year Estimates, unless otherwise noted. Medians are weighted estimates for the shoreline area based on median age data available at the town-level.

LAND USE MAP – TOWN OF SOMERSET



Shoreline Classification

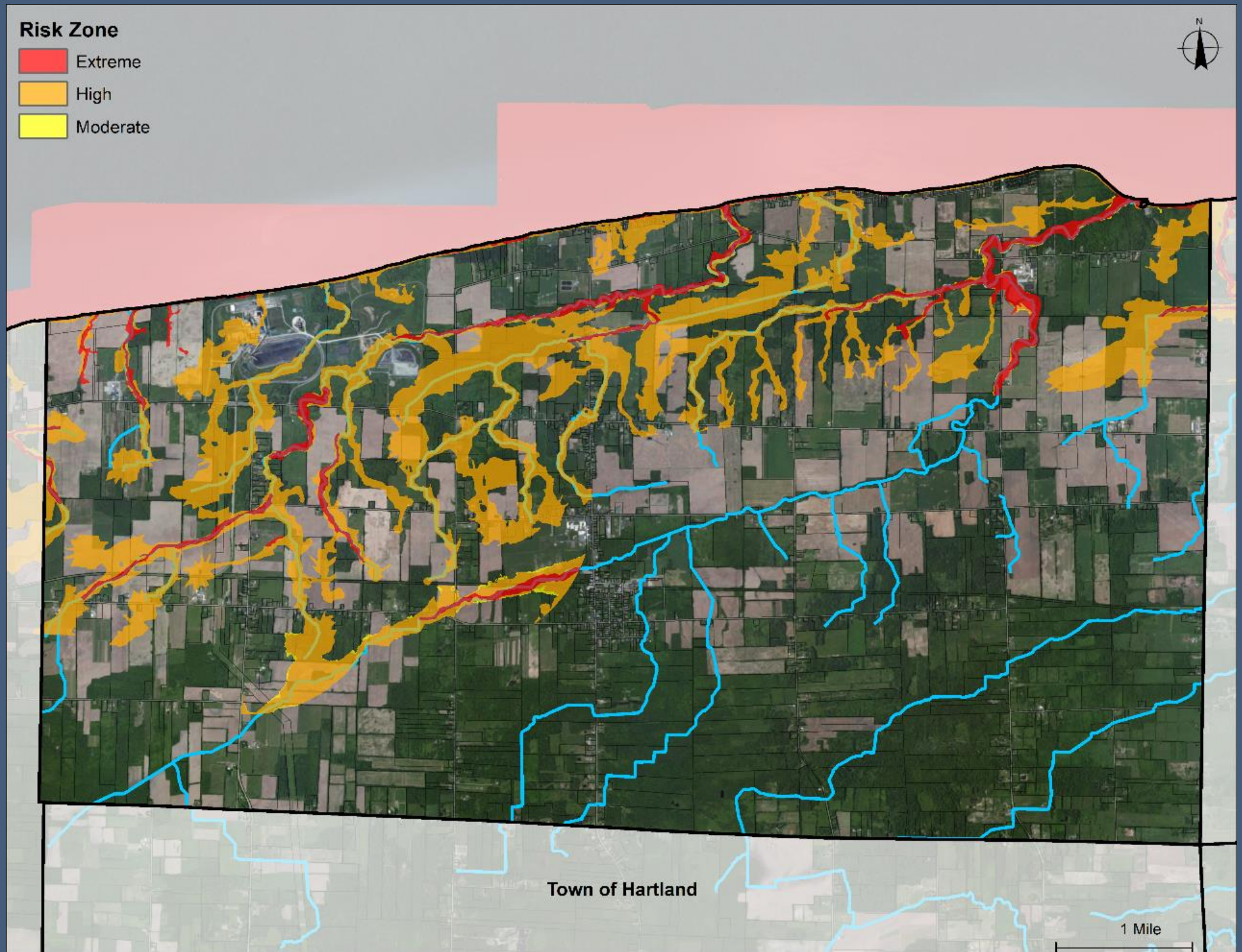
The shoreline is primarily sand or cohesive bluffs with areas of bedrock (resistant), low bank, coarse beach, sandy/gravel beach/dune complex and artificial hardening with riprap or seawalls.



Erosion Rate

The shoreline erosion rate along Lake Ontario ranges from 0.53 to 1.63 ft/yr. The map shows the majority of the shoreline having an approximate 0.72-1.12 ft/yr erosion rate with the eastern most edge of the town boundary having the highest rates of erosion. These historical erosion rate estimates were based only on the erodible portion (i.e., unhardened shoreline) of the Lake Ontario shoreline.

COMMUNITY RISK – TOWN OF SOMERSET



REDI PROJECTS – TOWN OF SOMERSET

In 2017 and 2019, major flooding affected the Lake Ontario and St. Lawrence River system. These flooding events, each of which reached levels of a 1% chance occurrence, caused extensive damage to shoreline systems and communities. In response to the extended pattern of flooding along the shores of Lake Ontario and St. Lawrence River and underlying economic challenges, the Lake Ontario Resiliency and Economic Development Initiative (REDI) was created to address the immediate and long-term resiliency and economic development needs of these areas.

The following projects were selected by the REDI Commission in Fall 2019 to receive program funding:

Town of Somerset REDI Projects	Amount
NO.19 Town of Somerset Multiple Use Site (MUS)	$1,334,000
NO.21 YMCA Camp Kenan	$87,000

TOWN OF SOMERSET MULTIPLE USE SITE (MUS) (NO.19)

The Town of Somerset will use property associated with the former AES Somerset coal-fired power plant to address shoreline erosion for a future multiuse recreational area. The site comprises historic landfills that have been closed with cooperation from state agencies. This asset is intended to provide additional access to the Lake Ontario waterfront, as well as outdoor space for visitors to experience nature and recreate.

YMCA Camp Kenan (NO.21)

YMCA Camp Kenan is situated on Lake Ontario and includes more than 50 acres of scenic land for young campers to explore. The recreational property is used for camping, programs for children and civic groups, and community enhancement activities. Numerous cabins lie directly adjacent to the shoreline where flooding and erosion occur due to high water level(s) and wave action.

The conceptual project profiles are available at:

https://www.ny.gov/sites/default/files/atoms/files/REDI_Project_Profiles_NO_20191010.pdf

For current project status or additional information related to a REDI project, please contact the local municipality.

CURRENT & PREVIOUS PLANNING EFFORTS

The CLEAR plan and profiles aim to build upon existing planning and implementation processes and complement other State initiatives. A review was conducted of the following local and regional Orleans County plans (including but not limited to Local Waterfront Revitalization Plans, Downtown Revitalization Plans, Regional Economic Development Plans and Multi-Hazard Mitigation Plans) in addition to pertinent studies, reports, surveys, and federal, state and local policies to identify the community's needs to enhance coastal resilience and opportunities for coastal economic development.

Local Waterfront Revitalization Program, January 2004
Kendall, Yates, & Carlton

- Outlines program policies, proposed land and water use, proposed public and private projects, techniques for implementation and highlights critical projects for waterfront revitalization across the three municipalities.

Finger Lakes Region Economic Profile, August 2017
Orleans County

- Valuable planning context document with an overview of the region's geographic, demographic, and economic character.

Downtown Revitalization Initiative Guidebook, July 2021
New York State

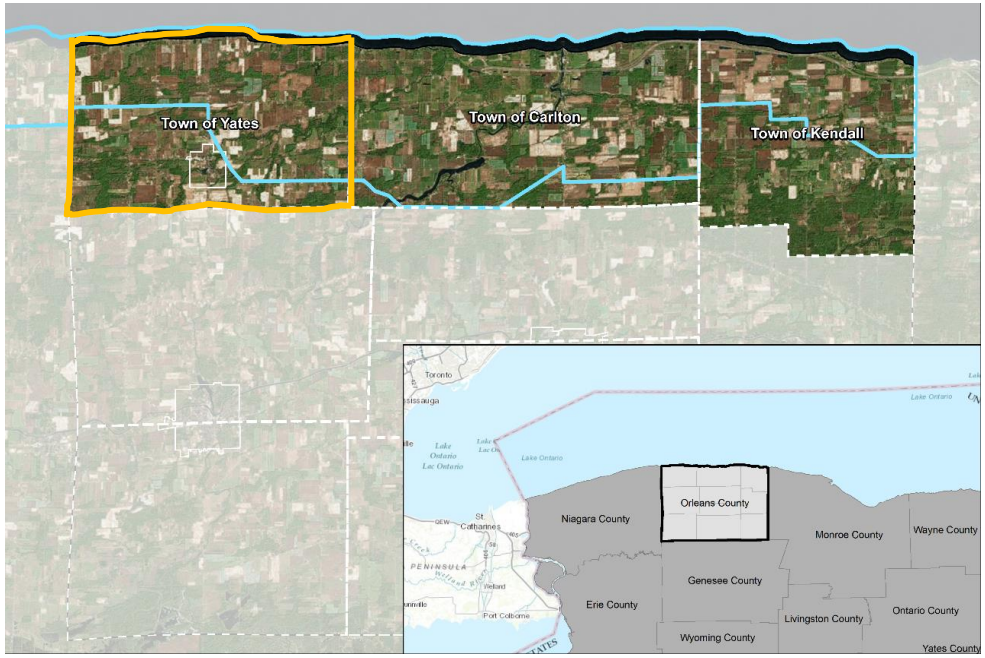
- Guidebook manual for DRI projects describing strategies, project selection, implementation and application process.

TOWN OF YATES, NY

Municipal Profile

COMMUNITY OVERVIEW – TOWN OF YATES

The Town of Yates is located between the Towns of Carlton and Somerset within the CLEAR boundary in Orleans County. The Town of Yates is approximately 37 square miles and includes approximately 8 miles of Lake Ontario shoreline with additional waterfront from Marsh Creek. The town is bounded by the Town of Somerset to the west, the Town of Carlton to the east, and the Town of Ridgeway to the south. The closest cities are Buffalo, approximately 30 miles southwest, and Rochester, approximately 28 miles southeast.



Town of Yates: Location Map

Town of Yates

Population
2,558

Median Age
45

# of Housing Units
1,529

Social Vulnerability Index
0.557

Shoreline Miles
8.1

% Occupied Homes
73%

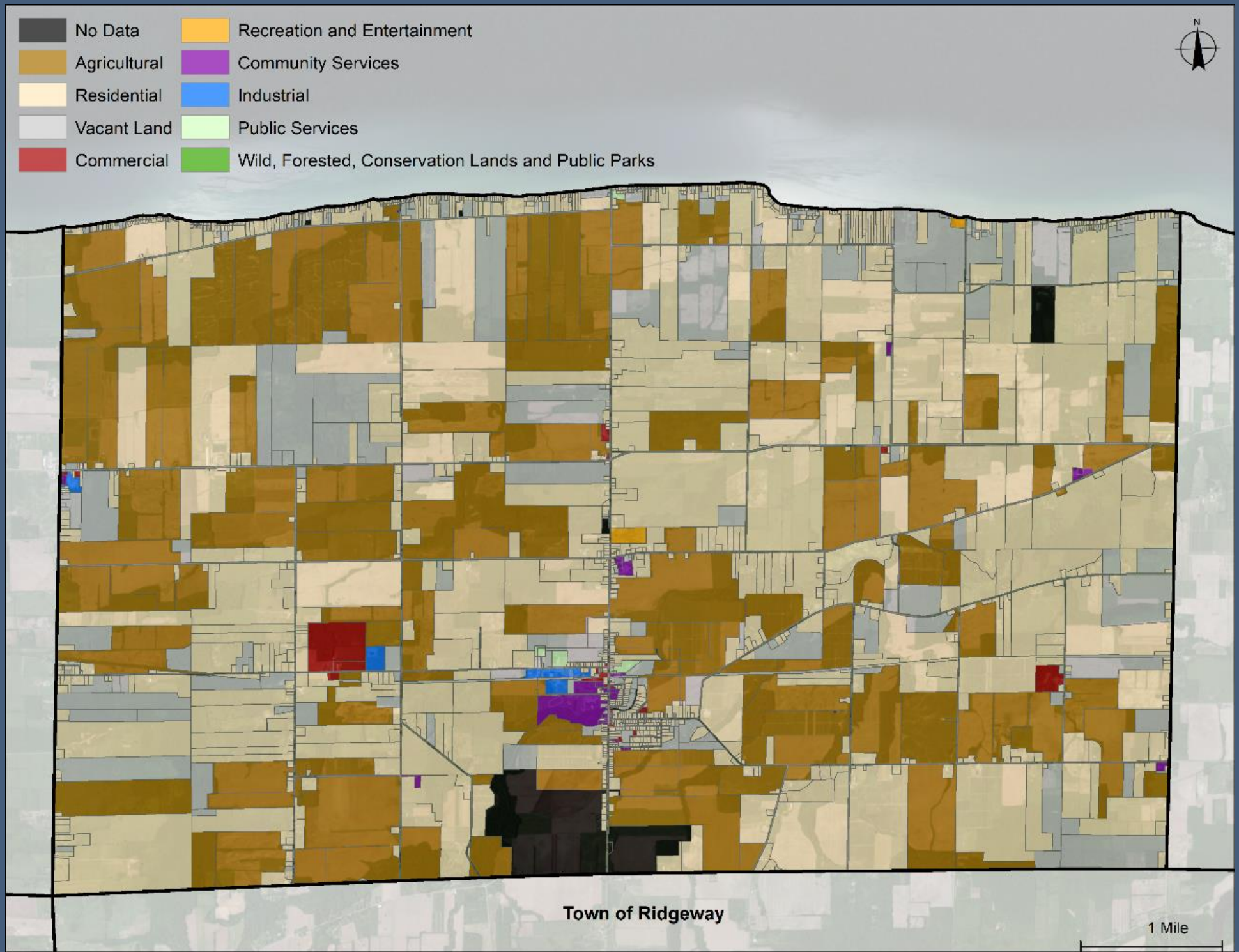
Median Home Value
$102k

Median Household Income
$54,118

As illustrated by the map on the following page, the land use in the Town of Yates is predominantly a mixture agricultural, conservation lands, and parks, residential, and vacant land. The majority of residences are single houses located along the shoreline or Yates Center. There are also some conservation areas and public parks including Yates Town Park.

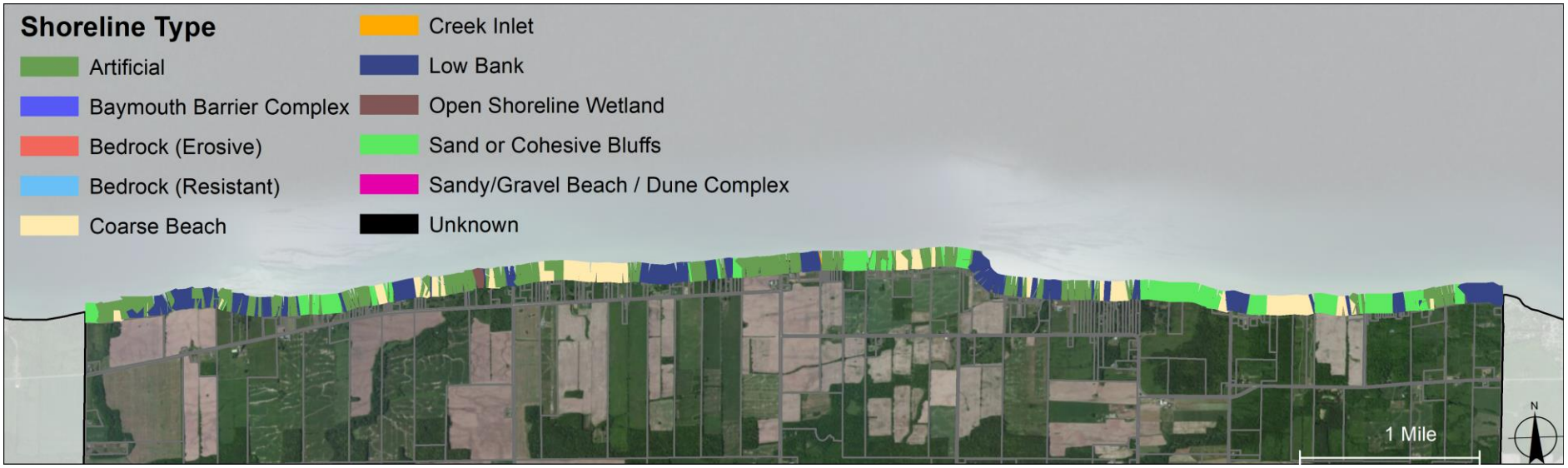
All data from U.S. Census Bureau. 2019. American Community Survey, 2015-2019 5-Year Estimates, unless otherwise noted. Medians are weighted estimates for the shoreline area based on median age data available at the town-level.

LAND USE MAP – TOWN OF YATES



Shoreline Classification

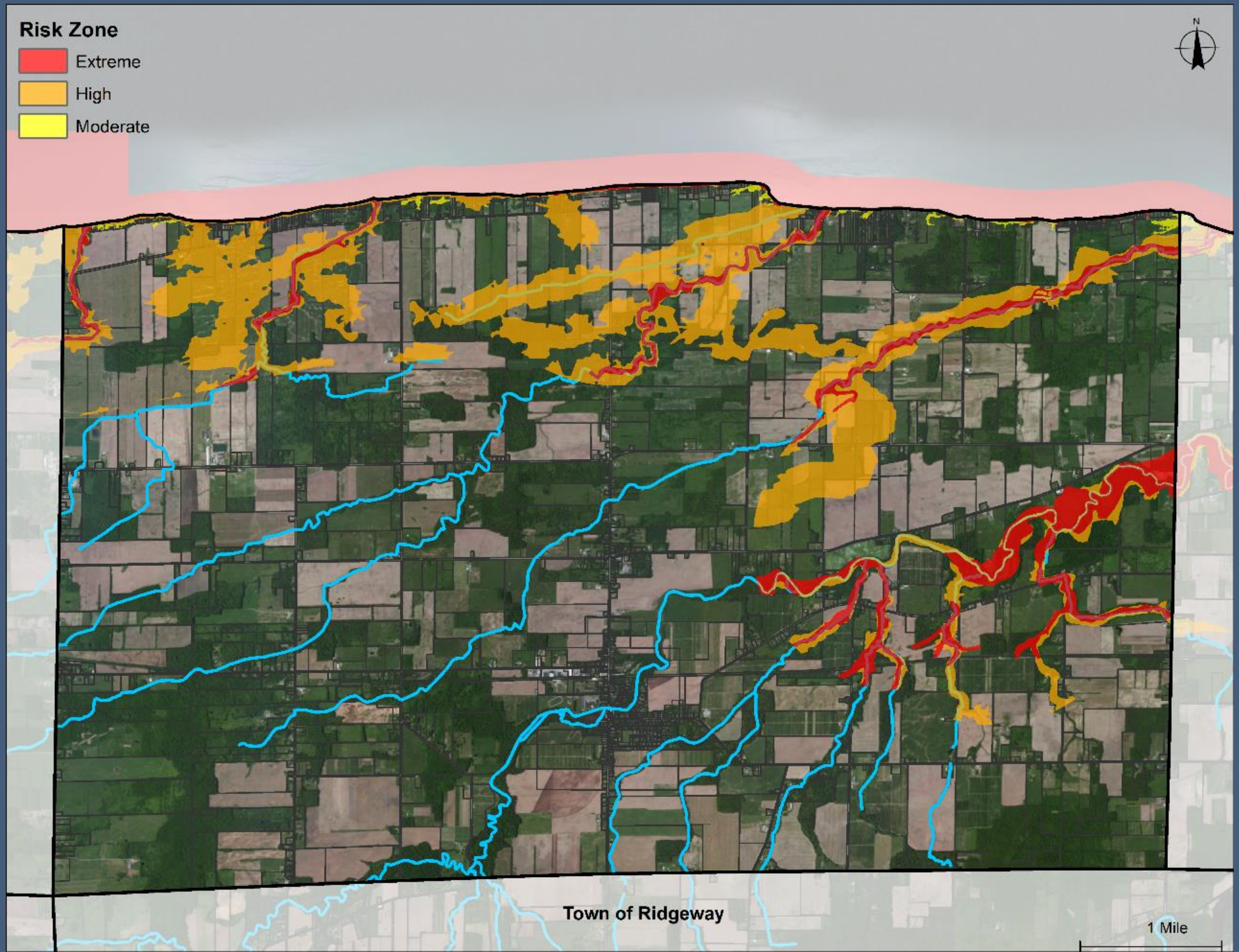
The shoreline is a mixture of low bank, artificial hardening, sand or cohesive bluffs, open shoreline wetland, coarse beach, and creek inlets.



Erosion Rate

The shoreline erosion rate along Lake Ontario ranges from 0.31 to 1.63 ft/yr. The majority of shoreline is on the lower to middle of the range, however there is a higher erosion rate along the shoreline at the western most edge of the Town boundary. These historical erosion rate estimates were based only on the erodible portion (i.e., unhardened shoreline) of the Lake Ontario shoreline.

COMMUNITY RISK – TOWN OF YATES



REDI PROJECTS – TOWN OF YATES

In 2017 and 2019, major flooding affected the Lake Ontario and St. Lawrence River system. These flooding events, each of which reached levels of a 1% chance occurrence, caused extensive damage to shoreline systems and communities.

In response to the extended pattern of flooding along the shores of Lake Ontario and St. Lawrence River and underlying economic challenges, the Lake Ontario Resiliency and Economic Development Initiative (REDI) was created to address the immediate and long-term resiliency and economic development needs of these areas.

The following project was selected by the REDI Commission in Fall 2019 to receive program funding:

Town of Yates REDI Project	Amount
NO.40 Yates Town Park and Expansion	$2,531,000

YATES TOWN PARK AND EXPANSION (NO.40)

The Town of Yates proposes to expand the town park with enhanced recreational and water access opportunities. This project seeks to further enhance the park's environmental resiliency, protect and expand its natural and nature-based features, and increase public access to the area's recreational resources.

The conceptual project profiles are available at:

https://www.ny.gov/sites/default/files/atoms/files/REDI_Project_Profiles_NO_20191010.pdf

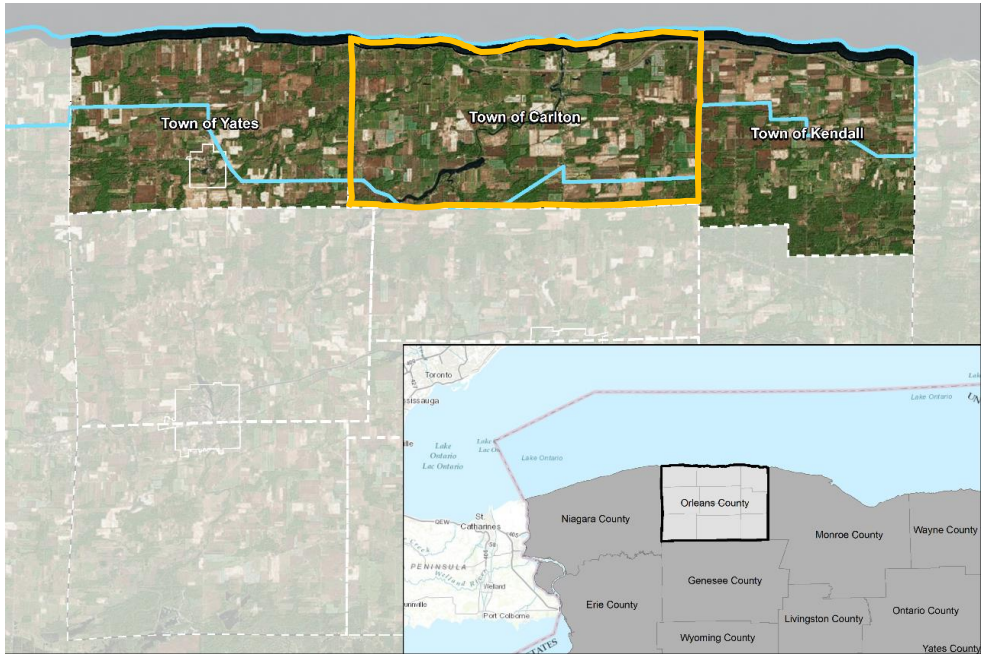
For current project status or additional information related to a REDI project, please contact the local municipality.

TOWN OF CARLTON, NY

Municipal Profile

COMMUNITY OVERVIEW – TOWN OF CARLTON

The Town of Carlton is located between the Towns of Kendall and Yates within the CLEAR boundary in Orleans County. The Town of Carlton is approximately 44 square miles and includes approximately 10 miles of Lake Ontario shoreline with additional waterfront from Johnson Creek, Syren Creek, Oak Orchard Creek, Marsh Creek, and Waterport Pond. The town is bounded by the Town of Yates to the west, the Town of Kendall to the east, and the Town of Gaines to the south. The closest cities are Buffalo, approximately 35 miles southwest, and Rochester, approximately 23 miles southeast.



Town of Carlton: Location Map

Town of Carlton

Population
2,870

Median Age
48

# of Housing Units
1,715

Social Vulnerability Index
0.469

Shoreline Miles
10.1

% Occupied Homes
70%

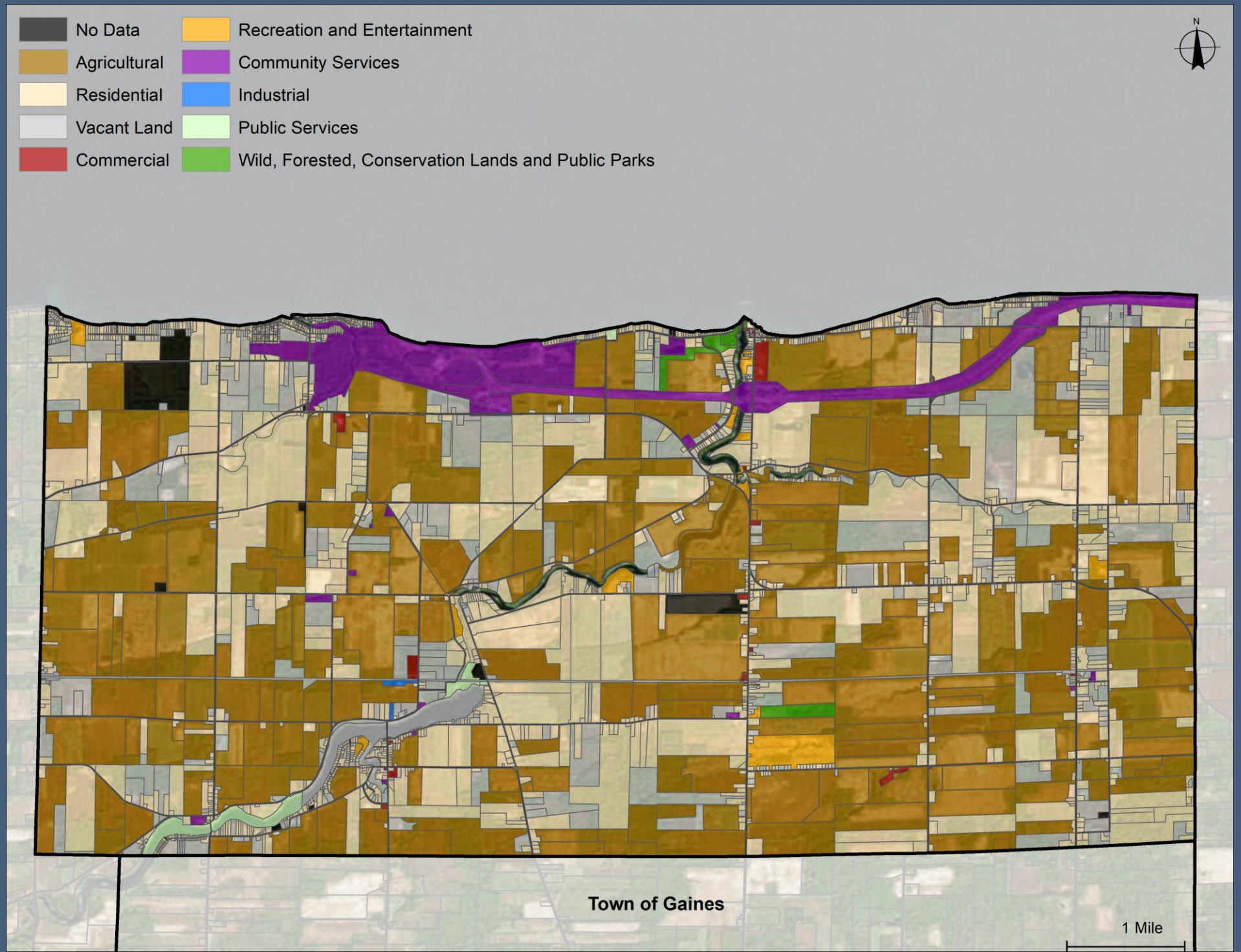
Median Home Value
$119k

Median Household Income
$66,065

As illustrated by the map on the following page, the land use in the Town of Carlton is predominantly a mixture of agricultural, conservation lands, and parks, residential, and vacant land. The majority of residences are single houses located along the shoreline or creek waterfront. There are also some conservation areas and public parks including Oak Orchard State Marine Park and Lakeside Beach State Park.

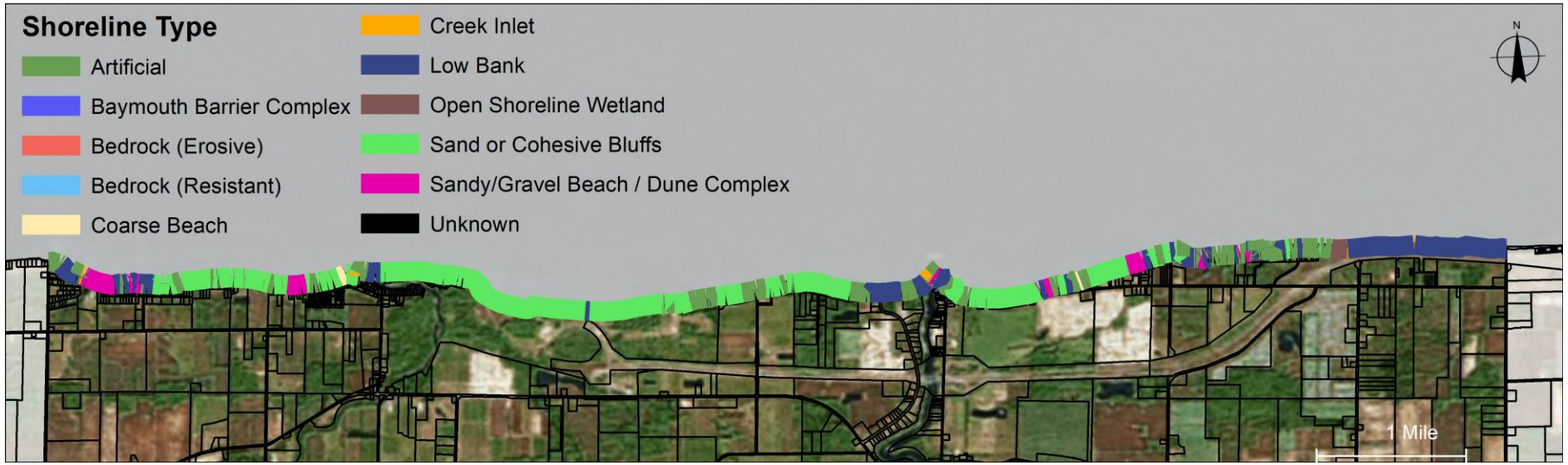
All data from U.S. Census Bureau. 2019. American Community Survey, 2015-2019 5-Year Estimates, unless otherwise noted. Medians are weighted estimates for the shoreline area based on median age data available at the town-level.

LAND USE MAP – TOWN OF CARLTON



Shoreline Classification

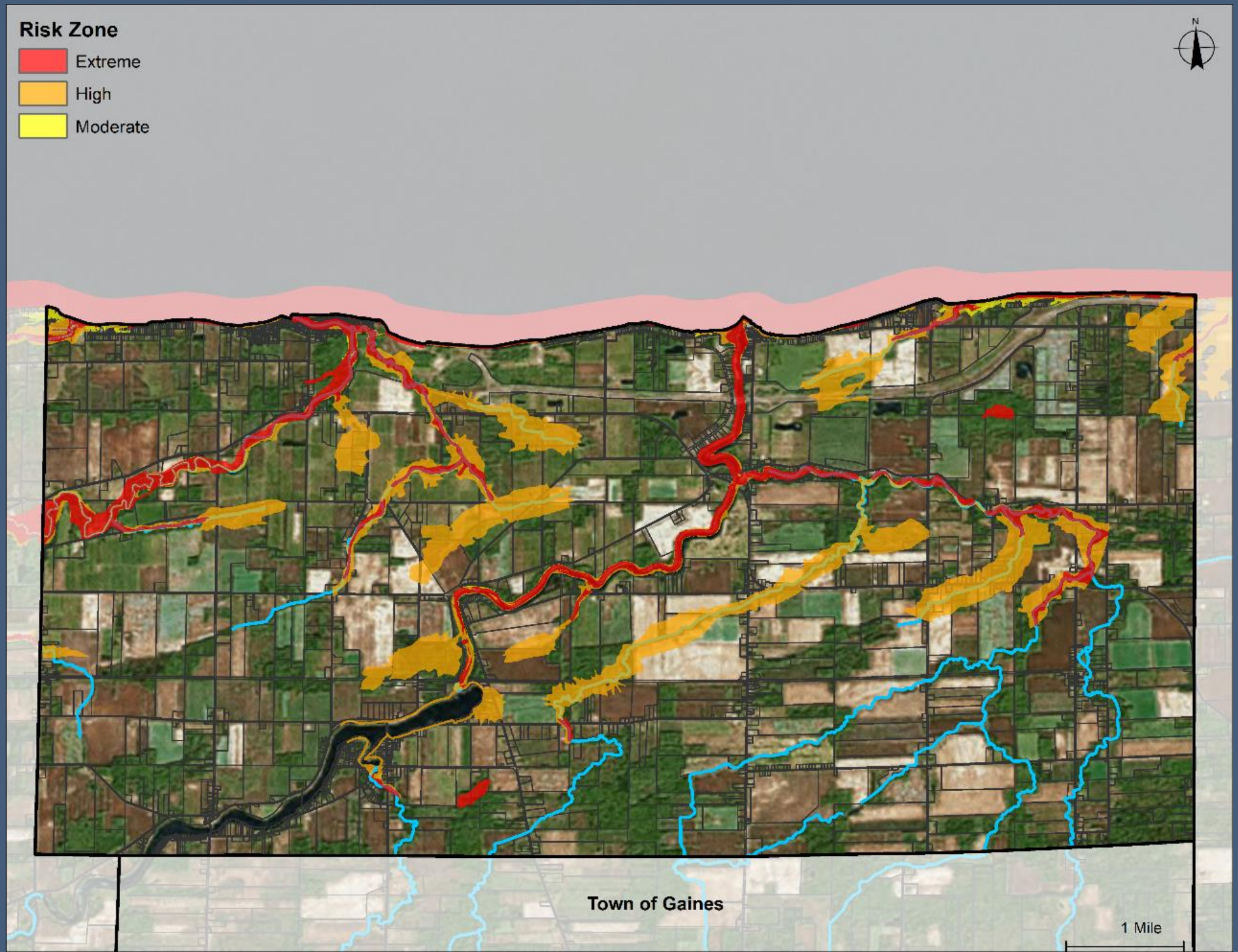
The shoreline is primarily sand or cohesive bluffs with areas of low banks around the creek outlets and areas of artificial hardening with riprap or seawalls.



Erosion Rate

The shoreline erosion rate along Lake Ontario ranges from 0.31 to 1.41 ft/yr. There are two stretches along the shoreline exhibiting the higher rates of erosion (shown in red), while the remainder of the shoreline shows lower rates of erosion. These historical erosion rate estimates were based only on the erodible portion (i.e., unhardened shoreline) of the Lake Ontario shoreline.

COMMUNITY RISK – TOWN OF CARLTON



REDI PROJECTS – TOWN OF CARLTON

In 2017 and 2019, major flooding affected the Lake Ontario and St. Lawrence River system. These flooding events, each of which reached levels of a 1% chance occurrence, caused extensive damage to shoreline systems and communities. In response to the extended pattern of flooding along the shores of Lake Ontario and St. Lawrence River and underlying economic challenges, the Lake Ontario Resiliency and Economic Development Initiative (REDI) was created to address the immediate and long-term resiliency and economic development needs of these areas.

The following projects were selected by the REDI Commission in Fall 2019 to receive program funding:

LAKESHORE ROAD (ROUTE 97) (NO.1)

The bluff adjacent to Lakeshore Road (Route 97) is eroding rapidly and creating a hazardous situation for the roadway infrastructure and the water line adjacent to the road. This project seeks to address the erosion of the bluff, as well as the existing failed shoreline protection.

POINT BREEZE BOAT LAUNCH (NO.27)

Maintaining these types of functional facilities is an important regional consideration to Niagara and Orleans counties, providing economic activity, including support of recreational boating access, restaurants, and fuel sales, sustaining tourism.

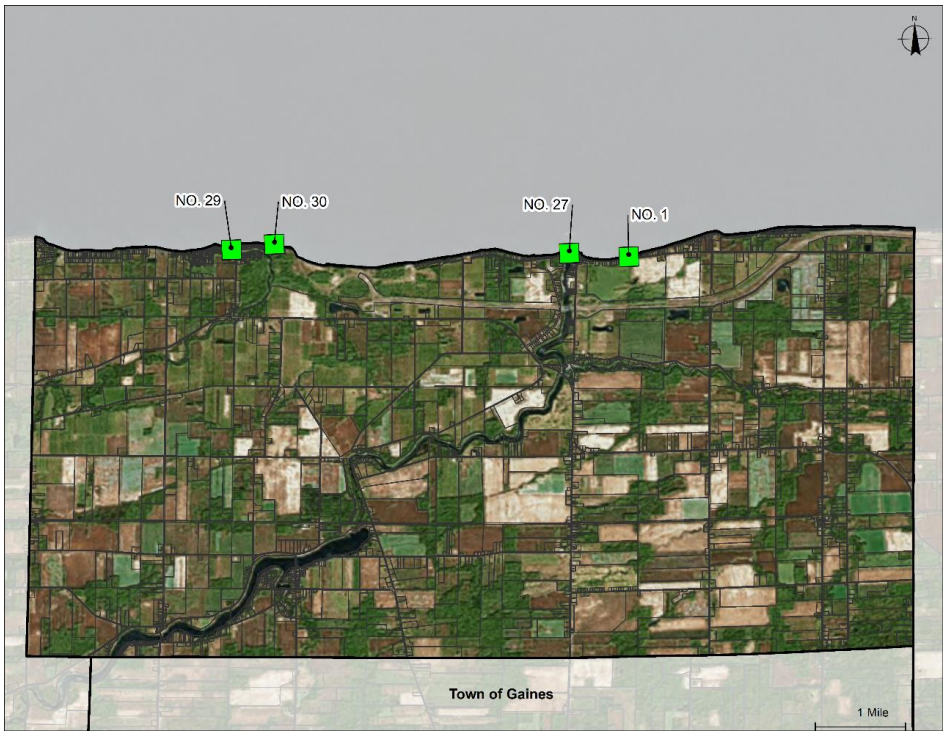
LAKESIDE PARK RD. WEST (NO.29)

The shoreline on which Lakeside Park Rd. sits has been experiencing flooding impacts from both Johnson Creek and Lake Ontario, including the loss of an access road/fire lane, land protecting homes, and public water lines. West of the intersection with Lakeside Rd. there is approximately 300 LF of public water line at risk of being exposed and compromised.

LAKESIDE PARK RD. EAST (NO.30)

The bluff on which the eastern portion of Lakeside Park Rd. sits has been experiencing erosional impacts, creating a 30 to 40-ft drop-off that has become a hazardous condition for the road and public water line in the area. This project aims to stabilize the bluff to protect these assets.

Town of Carlton REDI Projects	Amount
NO.1 Lakeshore Road (Route 97)	$2,062,000
NO.27 Point Breeze Boat Launch	$751,000
NO.29 Lakeside Park Rd. West	$235,000
NO.30 Lakeside Park Rd. East	$385,000



The conceptual project profiles are available at:

https://www.ny.gov/sites/default/files/atoms/files/REDI_Project_Profiles_NO_20191010.pdf

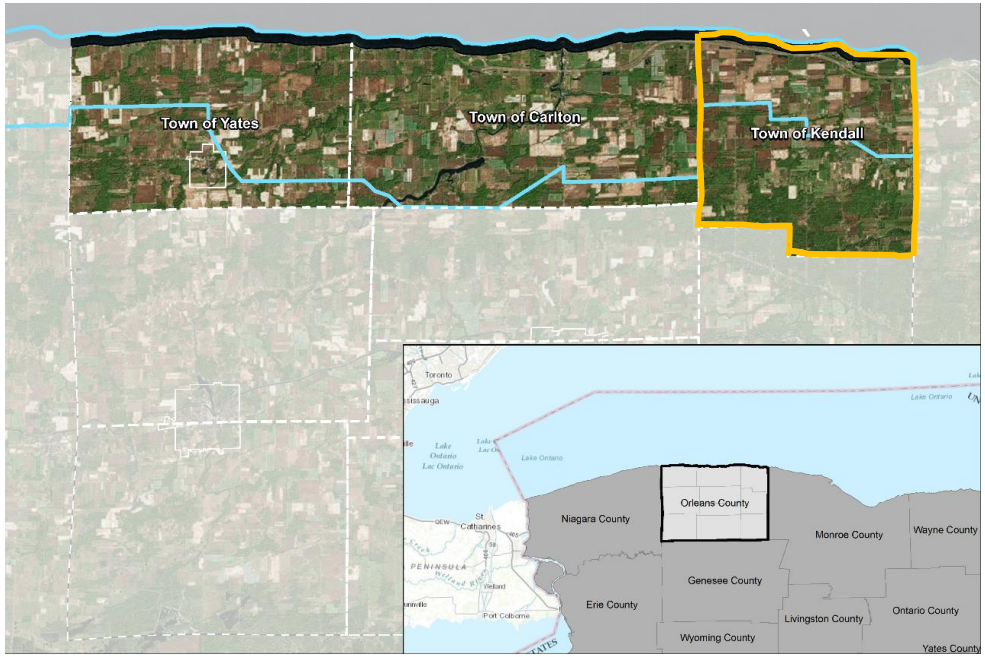
For current project status or additional information related to a REDI project, please contact the local municipality.

TOWN OF KENDALL, NY

Municipal Profile

COMMUNITY OVERVIEW – TOWN OF KENDALL

The Town of Kendall is located between the Towns of Hamlin and Carlton within the CLEAR boundary in Orleans County. The Town of Kendell is approximately 33 square miles and includes approximately 6 miles of Lake Ontario shoreline with additional waterfront from Bald Eagle Creek. The town is bounded by the Town of Hamlin to the east, the Town of Carlton to the west, and the Town of Murray to the south. The closest cities are Buffalo, approximately 42 miles southwest, and the City of Rochester, approximately 18 miles southeast.



Town of Kendall: Location Map

Town of Kendall

Population
2,612

Median Age
47

# of Housing Units
1,254

Social Vulnerability Index
0.469

Shoreline Miles
6.3

% Occupied Homes
88%

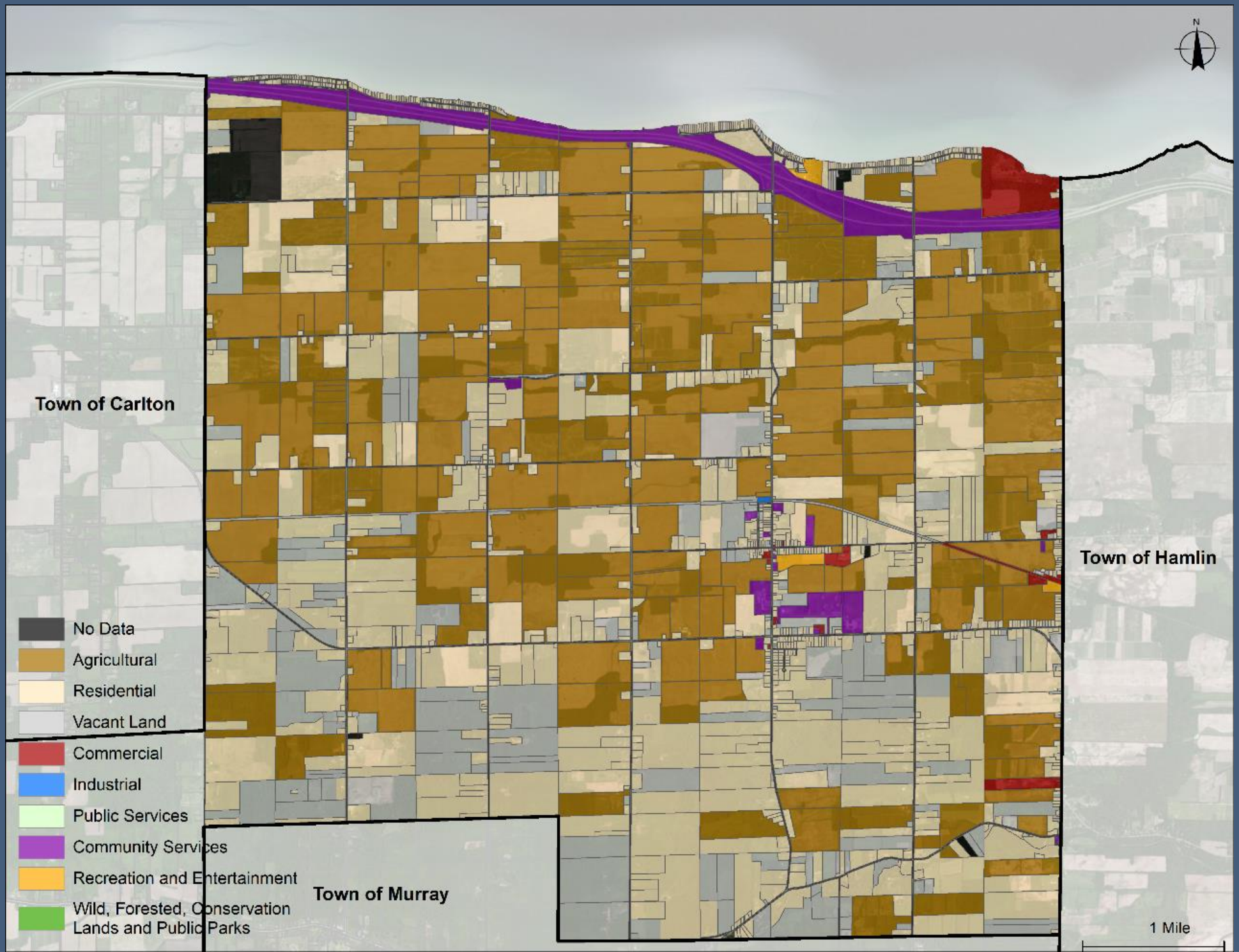
Median Home Value
$123k

Median Household Income
$64,201

As illustrated by the map on the following page, the land use in the Town of Kendall is predominantly a mixture of agricultural, conservation lands and parks, residential, and vacant land. The majority of residences are single houses located along the shoreline or creek waterfront. There are also some conservation areas and public parks including Curtis Memorial Field.

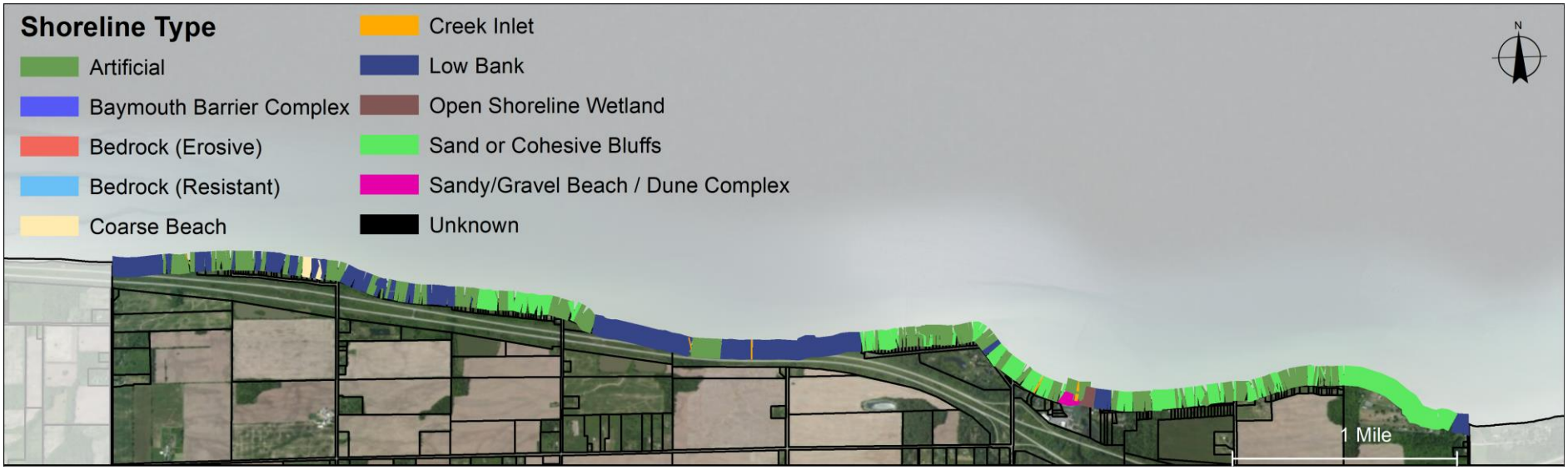
All data from U.S. Census Bureau. 2019. American Community Survey, 2015-2019 5-Year Estimates, unless otherwise noted. Medians are weighted estimates for the shoreline area based on median age data available at the town-level.

LAND USE MAP – TOWN OF KENDALL



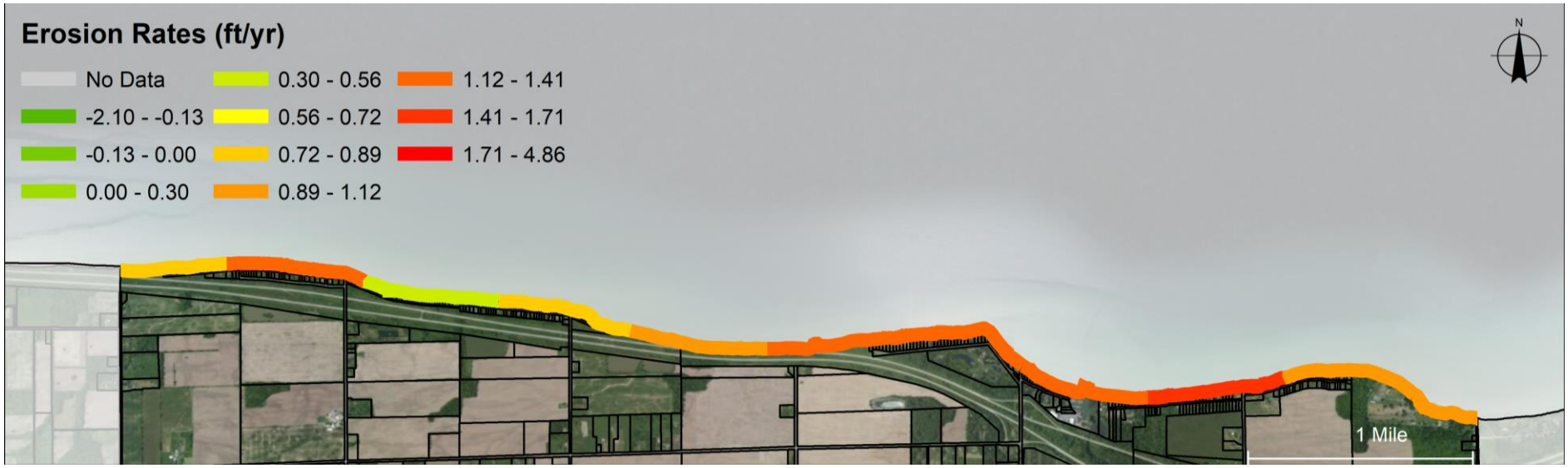
Shoreline Classification

The shoreline is a mixture of low bank, sand or cohesive bluffs, open shoreline wetland, coarse beach, creek inlets, sandy/gravel beach/dune complex and artificial hardening with riprap or seawalls.

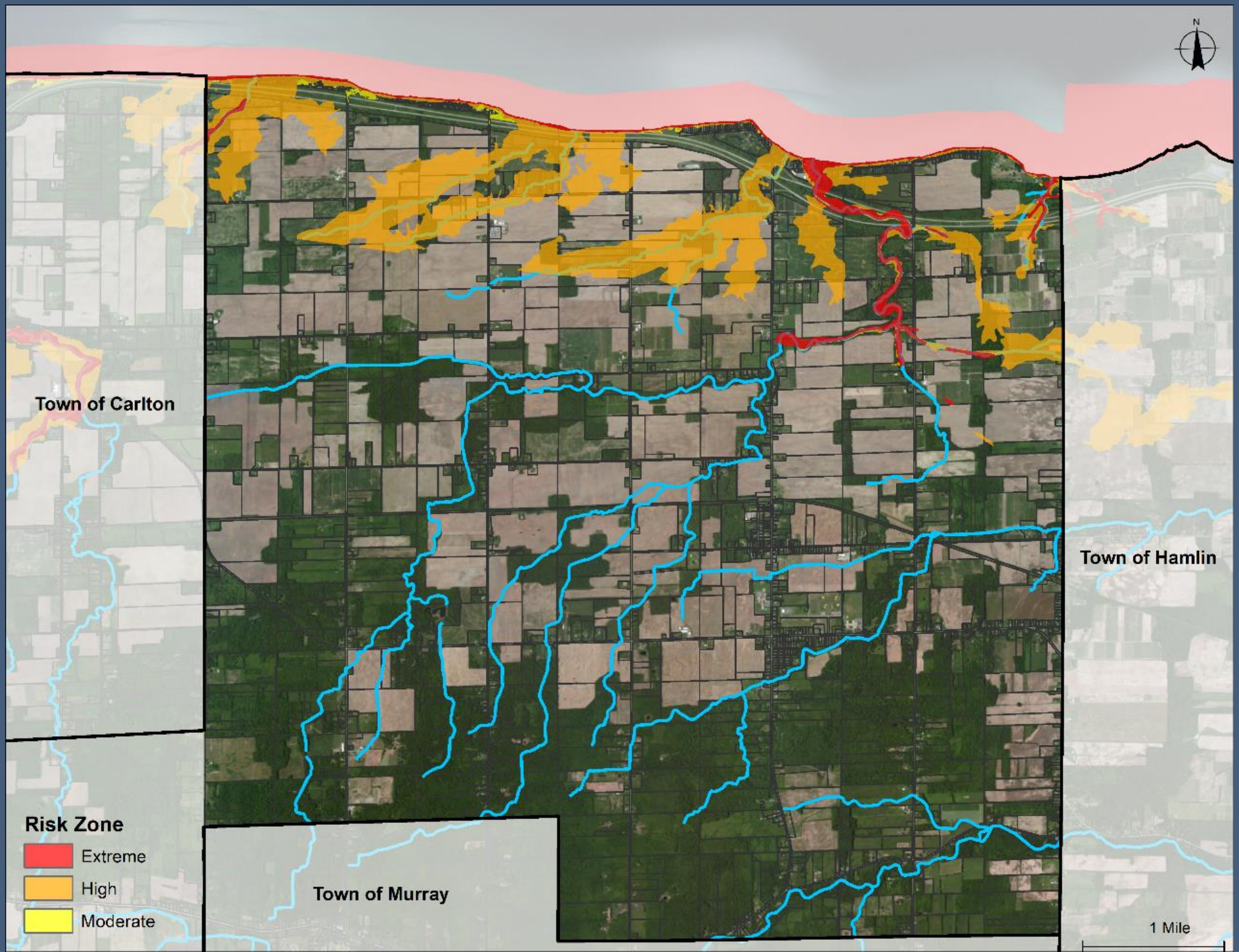


Erosion Rate

The shoreline erosion rate along Lake Ontario ranges from 0.34 to 1.44 ft/yr. The majority of the shoreline within the Town (shown in orange) has an erosion rate of 0.89-1.12 ft/yr, with the higher erosion rates along a shorter stretch near the eastern edge of the town boundary. These historical erosion rate estimates were based only on the erodible portion (i.e., unhardened shoreline) of the Lake Ontario shoreline.



COMMUNITY RISK – TOWN OF KENDALL



REDI PROJECTS – TOWN OF KENDALL

In 2017 and 2019, major flooding affected the Lake Ontario and St. Lawrence River system. These flooding events, each of which reached levels of a 1% chance occurrence, caused extensive damage to shoreline systems and communities. In response to the extended pattern of flooding along the shores of Lake Ontario and St. Lawrence River and underlying economic challenges, the Lake Ontario Resiliency and Economic Development Initiative (REDI) was created to address the immediate and long-term resiliency and economic development needs of these areas.

The following projects were selected by the REDI Commission in Fall 2019 to receive program funding:

THOMPSON DR. (NO.32)

The former Thompson Dr. turnaround provides beach access to the Lake Ontario shoreline. There is an opportunity to turn the former turnaround into beach access, coupled with nature-based shoreline protection.

ROUTE 237 RIGHT-OF-WAY (NO.33)

The shoreline/waterfront area along the Route 237 right-of-way is experiencing significant erosion as a result of high-water level(s), flooding, and wave intensity. A project is currently ongoing to install riprap along the waterfront to protect the eroding shoreline associated with the right-of-way, abutting the riprap of two neighboring private properties.

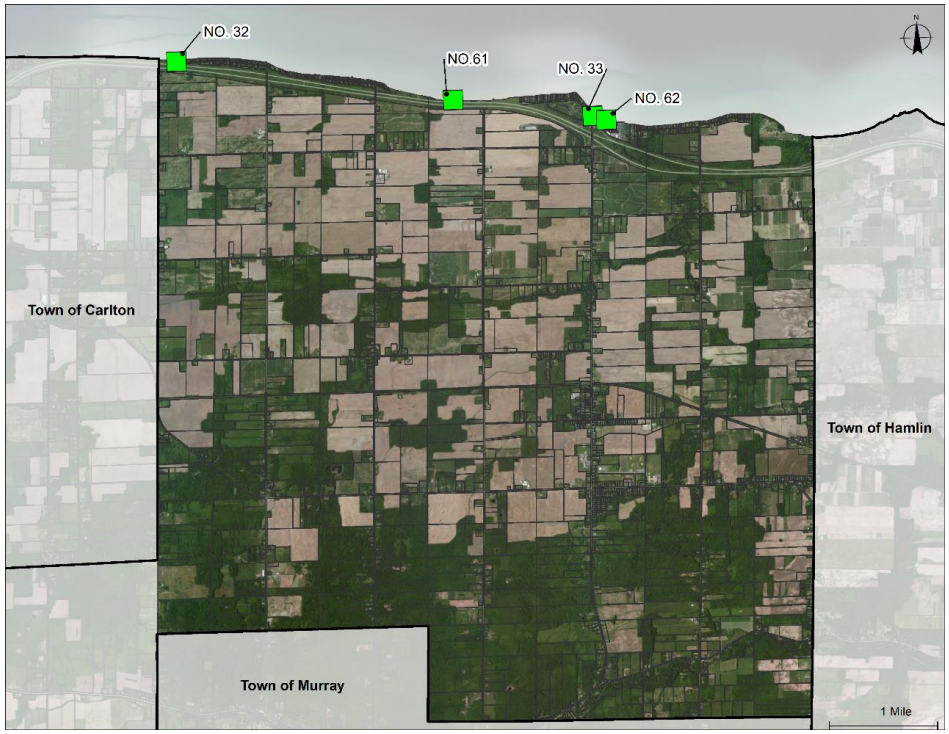
PUBLIC TOWN RD. ENDS/CULVERTS (NO.61)

Culverts adjacent to Endrose Shore, Knapp Shore, and Thompson Dr. are impacted by high water level(s) resulting in culvert ends being clogged with debris. This project will install a more resilient box culvert concept. A culvert located at Lakeland Beach Rd. needs fortification, and riprap will be placed at the outlet of the culvert to provide protection.

WASTEWATER INFRASTRUCTURE (NO.62)

Lakeside residences west of West Kendall Dr., including along Lomond Shore West, Endrose Shore, Knapp Shore, Thompson Dr., and near Lakeland Beach Rd. and Bald Eagle Dr. in the Town of Kendall, plus residences near Beachwood Park Rd. in the Town of Hamlin, are subject to reduced septic functioning during high water level(s). This project will connect these areas to a sanitary sewer and convey wastewater to a treatment facility.

Town of Kendall REDI Projects	Amount
NO.32 Thompson Dr.	$131,000
NO.33 Route 237 Right-of-Way	$40,000
NO.61 Public Town Rd. Ends/Culverts	$1,500,000
NO.62 Wastewater Infrastructure	$9,053,000



The conceptual project profiles are available at:

https://www.ny.gov/sites/default/files/atoms/files/REDI_Project_Profiles_NO_20191010.pdf.

For current project status or additional information related to a REDI project, please contact the local municipality.

CLEAR Plan
Niagara-Orleans Region

APPENDIX B

Community Assets & Risk Level Assessment

Niagara-Orleans Region Community Assets and Risk Level Assessment

Severe risk
High risk
Moderate risk
Residual risk

Municipality			Asset Information							Risk Assessment
County	Town	Village	Asset Name	Risk Area	Asset Class	Asset Sub-category	Socially Vulnerable Populations	Critical Facility	Community Value	
Orleans County	Carlton		**Shoreline - Johnson Creek**	Extreme	Natural & Cultural Resources	Natural Protective Features	No	No	Low	
Orleans County	Carlton, Kendall, Yates		**Residential Waterfront Property**	Extreme	Housing	Single-Family Residence	No	No	Low	
Orleans County	Kendall		**Petersmith Rd. Kayak Launch**	Extreme	Infrastructure Systems	Transportation	No	No	Low	
Orleans County	Carlton		**Roads on Peninsula near Oak Orchard**	Extreme	Infrastructure Systems	Transportation	Yes	No, Locally Significant	Low	
Niagara County	Wilson		**Roosevelt Beach Boat Dock, Pier/Seawall; Jetty on West side of 12 Mi. Creek**	High	Economic	Marina/Water Based Business	No	No	Low	
Orleans County	Carlton		**Point Breeze Boat Launch**	Extreme	Economic	Marina/Water Based Business	No	No, Locally Significant	Medium	
Niagara County	Wilson		**Sunset Island - Main Access Point, Shoreline**	Extreme	Natural & Cultural Resources	Natural Protective Features	No	No, Locally Significant	Medium	
Orleans County	Kendall		**Bald Eagle Creek, Outlets through Bald Eagle Marina**	Extreme	Infrastructure Systems	Navigable waterway facilities	No	No, Locally Significant	Low	
Niagara County	Somerset		**Bicentennial Park**	Extreme	Natural & Cultural Resources	Parks and Recreation	No	No	Low	
Orleans County	Kendall		**Bald Eagle Marina**	Extreme	Economic	Marina/Water Based Business	No	No, Locally Significant	Medium	
Orleans County	Kendall		**End of Norway Rd.**	Extreme	Infrastructure Systems	Transportation	No	No	Medium	
Niagara County	Porter		**Fort Niagara Beach, Lakewood Public Park**	Extreme	Natural & Cultural Resources	Parks and Recreation	No	No, Locally Significant	Medium	
Orleans County	Kendall		**Public Town Rd. Ends/Culverts**	Extreme	Infrastructure Systems	Transportation	No	No, Locally Significant	Medium	

Niagara-Orleans Region Community Assets and Risk Level Assessment

Severe risk
High risk
Moderate risk
Residual risk

Municipality			Asset Information							Risk Assessment
County	Town	Village	Asset Name	Risk Area	Asset Class	Asset Sub-category	Socially Vulnerable Populations	Critical Facility	Community Value	
Orleans County	Carlton		**Shoreline - Brighton Cliffe (East & West)**	Extreme	Natural & Cultural Resources	Natural Protective Features	No	No	Medium	
Niagara County	Wilson		**Wilson Tuscarora State Park Camping**	Extreme	Natural & Cultural Resources	Parks and Recreation	No	No	Medium	
Niagara County	Porter		**Fort Niagara State Park**	Extreme	Natural & Cultural Resources	Parks and Recreation	No	No, Locally Significant	Medium	
Orleans County	Kendall		**Lakeshore Rd. (Route 97)**	Extreme	Natural & Cultural Resources	Natural Protective Features	No	No, Locally Significant	Medium	
Orleans County	Carlton		**Leonard's Landing**	Extreme	Economic	Marina/Water Based Business	No	No	Low	
Orleans County	Carlton		**Orleans County Marine Park**	Extreme	Economic	Marina/Water Based Business	No	No, Locally Significant	Medium	
Niagara County	Wilson		**Residential - Shoreline**	Moderate	Housing	Single-Family Residence	No	No	Low	
Orleans County	Carlton		**Shoreline - Jones Beach (East & West)**	Moderate	Natural & Cultural Resources	Natural Protective Features	No	No	Low	
Niagara County	Somerset		**YMCA Camp Kenan**	Extreme	Economic	Small Business	No	No, Locally Significant	Medium	
Niagara County	Newfane		**Burt Dam**	Extreme	Infrastructure Systems	Water Supply	No	Yes, FEMA	Medium	
Orleans County	Carlton		**Captain's Cove Motel & Marina**	Extreme	Economic	Marina/Water Based Business	No	No	Medium	
Niagara County	Porter		**Fourmile Creek RV park**	Extreme	Economic	Tourism Destinations	No	No, Locally Significant	Medium	
Niagara County	Niagara	Niagara Falls	**Jayne Park**	High	Natural & Cultural Resources	Parks and Recreation	No	No, Locally Significant	Medium	

Niagara-Orleans Region Community Assets and Risk Level Assessment

Severe risk
High risk
Moderate risk
Residual risk

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County	Town	Village	Asset Name	Risk Area	Asset Class	Asset Sub-category	Socially Vulnerable Populations	Critical Facility	Community Value	
Orleans County	Kendall		**Knapp Shores**	High	Infrastructure Systems	Stormwater	No	No, Locally Significant	Medium	
Orleans County	Carlton		**Lakeside Bluff Road**	Extreme	Natural & Cultural Resources	Natural Protective Features	Yes	Yes, FEMA	Medium	
Niagara County	Niagara	Niagara Falls	**Niagara Riverside Resort**	High	Economic	Tourism Destinations	No	No, Locally Significant	Medium	
Orleans County	Carlton		**Shoreline - East of Point Breeze Road**	High	Natural & Cultural Resources	Natural Protective Features	No	No	Medium	
Orleans County	Carlton		**Shoreline - Oak Orchard on the Lake Road**	High	Natural & Cultural Resources	Natural Protective Features	No	No	Medium	
Niagara County	Niagara	Niagara Falls	**South 86th Street Bridge**	High	Infrastructure Systems	Transportation	No	Yes, FEMA	Medium	
Niagara County	Wilson		**Wilson Boat House & Shops**	High	Economic	Marina/Water Based Business	No	No, Locally Significant	Medium	
Orleans County	Yates		**Yates Town Park and Expansion**	Extreme	Natural & Cultural Resources	Parks and Recreation	Yes	No	Medium	
Niagara County	Niagara	Niagara Falls	**53rd Street Fisherman's Park (aka Hooker Docks)**	High	Economic	Marina/Water Based Business	Yes	No, Locally Significant	Low	
Niagara County	Wilson		**East and West Barrier Bar/Sunset Island**	Extreme	Natural & Cultural Resources	Natural Protective Features	No	Yes, FEMA	High	
Niagara County	Porter	Lewiston	**Entire Niagara River (encompassing three listed municipalities)**	Extreme	Natural & Cultural Resources	Natural Protective Features	No	Yes, FEMA	High	
Orleans County	Carlton		**Green Harbor Campground Marina**	Extreme	Economic	Marina/Water Based Business	Yes	No, Locally Significant	High	
Niagara County	Lewiston		**Lower River Road Park**	Extreme	Natural & Cultural Resources	Parks and Recreation	No	No, Locally Significant	Low	

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Niagara County	Somerset		**Somerset Operating Company**	High	Economic	Large Business	No	No	Low	
Niagara County	Wilson		**Townline Pier**	Extreme	Economic	Tourism Destinations	No	No, Locally Significant	High	
Orleans County	Carlton		**Former Crawdaddy's Marina**	Extreme	Economic	Marina/Water Based Business	No	No, Locally Significant	High	
Niagara County	Youngstown		**Fort Niagara State Park - Lakeside Foundation, Seawall, Boat Launch, Docks, Parking Lot**	Extreme	Natural & Cultural Resources	Parks and Recreation	No	No, Locally Significant	High	
Niagara County	Youngstown		**Joseph Davis State Park - Fishing Dock/Boat Launch**	High	Economic	Marina/Water Based Business	No	No, Locally Significant	Medium	
Niagara County	Newfane		**Olcott Beach Lighthouse**	Extreme	Economic	Tourism Destinations	No	No, Locally Significant	Medium	
Niagara County	Newfane		**Olcott Harbor Krull Park Pier (Hotel Pier)**	Extreme	Economic	Tourism Destinations	No	No, Locally Significant	High	
Niagara County	Somerset		**Private Property/Power Plant (MUS) - Former AES facility**	Extreme	Infrastructure Systems	Power Supply	No	No	Medium	
Niagara County	Niagara	Niagara Falls	**Residential - Cayuga Island**	High	Housing	Single-Family Residence	No	No	Medium	
Orleans County	Yates		**Town shorelines, multiple properties on "Fire Lanes"**	Extreme	Natural & Cultural Resources	Natural Protective Features	Yes	No, Locally Significant	High	
Niagara County	Lewiston	Lewiston	**Village of Lewiston Docks**	High	Economic	Marina/Water Based Business	No	No, Locally Significant	Medium	
Niagara County	Somerset		**West Parcel of Former AES Somerset Power Plant**	Extreme	Infrastructure Systems	Power Supply	No	Yes, FEMA	High	
Niagara County	Wilson		**Wilson Tuscarora State Park**	Extreme	Natural & Cultural Resources	Parks and Recreation	No	No	High	

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Niagara County	Wilson		**Clark Island and Tuscarora Yacht Club**	High	Economic	Marina/Water Based Business	No	No, Locally Significant	High	
Orleans County	Carlton		**Ernst's Lake Breeze Marina**	Extreme	Economic	Marina/Water Based Business	No	No, Locally Significant	High	
Niagara County	Newfane		**Fisherman's Park**	Extreme	Natural & Cultural Resources	Parks and Recreation	No	No, Locally Significant	High	
Niagara County	Niagara	Niagara Falls	**LaSalle Yacht Club / Marina / Waterfront Park**	High	Economic	Marina/Water Based Business	No	No, Locally Significant	Low	
Niagara County	Newfane		**Multiple Marinas**	Extreme	Economic	Marina/Water Based Business	No	No, Locally Significant	High	
Niagara County	Olcott		**Newfane Marina**	Extreme	Economic	Marina/Water Based Business	No	No, Locally Significant	High	
Orleans County	Yates		**Park Road, Plots 13200-13214, Access road/fire lane between 13241 and 13214**	Extreme	Infrastructure Systems	Transportation	Yes	No, Locally Significant	High	
Niagara County	Somerset		**Rail Infrastructure**	High	Infrastructure Systems	Transportation	No	No, Locally Significant	Low	
Orleans County	Kendall		**The Cottages at Troutburg**	Extreme	Economic	Lodging	No	No, Locally Significant	High	
Orleans County	Carlton		**Village of Albion Water Treatment Plant**	Extreme	Infrastructure Systems	Water Supply	No	Yes, FEMA	High	
Niagara County	Newfane	Wilson	**Village of Wilson WWTP**	High	Infrastructure Systems	Wastewater	No	Yes, FEMA	High	
Orleans County	Carlton		**Wiley's Riverside Marina**	Extreme	Economic	Marina/Water Based Business	No	No	High	
Niagara County	Wilson		**Calvin E. Krueger Park, Martin Park**	High	Natural & Cultural Resources	Parks and Recreation	No	No	Medium	

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Niagara County	Wilson		**Daisy Barn Campground**	High	Economic	Tourism Destinations	No	No	Medium	
Orleans County	Kendall		**Edrose Shore**	Moderate	Infrastructure Systems	Transportation	No	No, Locally Significant	Medium	
Niagara County	Lewiston		**Joseph Davis State Park**	High	Natural & Cultural Resources	Parks and Recreation	No	No, Locally Significant	Medium	
Niagara County	Niagara	Niagara Falls	**NYPA ice breaker docks / Old Stone Chimney / Former hydraulic canal**	High	Infrastructure Systems	Navigable Waterway Facilities	Yes	Yes, FEMA	Medium	
Orleans County	Carlton		**Oak Orchard State Marina**	Extreme	Economic	Marina/Water Based Business	No	No, Locally Significant	Medium	
Orleans County	Carlton		**Oak Orchard Yacht Club**	Extreme	Economic	Marina/Water Based Business	No	No, Locally Significant	Medium	
Niagara County	Somerset		**Orchards / Vineyards along Shoreline**	Extreme	Economic	Small Business	No	No, Locally Significant	Medium	
Orleans County	Kendall		**Route 237 Right-of-way**	High	Natural & Cultural Resources	Natural Protective Features	No	No, Locally Significant	Medium	
Orleans County	Carlton		**Shoreline - Rock Ledge Rd/Cottage Rd**	Moderate	Natural & Cultural Resources	Natural Protective Features	No	No	Medium	
Niagara County	Lewiston		**Stella Niagara Preserve**	High	Natural & Cultural Resources	Parks and Recreation	No	No, Locally Significant	Medium	
Niagara County	Somerset		**Town of Somerset Multiple Use Site (MUS)**	High	Economic	Small Business	No	No	Medium	
Niagara County	Wilson		**West Lake Road**	Extreme	Infrastructure Systems	Transportation	No	Yes, FEMA	Medium	
Niagara County	Porter		**Willow Beach RV Park**	High	Economic	Tourism Destinations	No	No	Medium	

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Niagara County	Porter		**Four Mile Creek Outlet**	Extreme	Natural & Cultural Resources	Water Bodies	No	Yes, FEMA	Medium	
Niagara County	Lewiston		**Lewiston Landing, Whirlpool Jet Boats**	High	Economic	Marina/Water Based Business	No	No, Locally Significant	High	
Niagara County	Newfane		**Olcott Beach Berm**	Extreme	Natural & Cultural Resources	Natural Protective Features	No	No, Locally Significant	High	
Niagara County	Newfane		**Olcott Yacht Club**	High	Economic	Marina/Water Based Business	No	No, Locally Significant	High	
Orleans County	Carlton		**Public Water Lines (East and West)**	Extreme	Infrastructure Systems	Water Supply	No	Yes, FEMA	High	
Orleans County	Kendall		**Residential Waterfront Properties - Thompson Dr, Lomond Shores, Knapp Shores, Edrose Shores, Bald Thompson Dr.**	High	Natural & Cultural Resources	Natural Protective Features	No	No, Locally Significant		
Niagara County	Niagara		**Town of Niagara Town Park**	High	Natural & Cultural Resources	Parks and Recreation	No	No, Locally Significant	High	
Orleans County	Yates	Lyndonville	**Water Intake**	Extreme	Infrastructure Systems	Water Supply	Yes	Yes, FEMA	High	
Niagara County	Lewiston		**Art Park Fishing Platform and Trail**	Moderate	Economic	Marina/Water Based Business	No	No, Locally Significant	Medium	
Niagara County	Newfane		**Eighteenmile Creek - Shoreline South of Rt. 18**	Extreme	Natural & Cultural Resources	Natural Protective Features	No	No, Locally Significant	Medium	
Niagara County	Niagara	Niagara Falls	**Griffon Park/Griffon boat launch/kayak launch**	High	Natural & Cultural Resources	Parks and Recreation	No	No, Locally Significant	Medium	
Orleans County	Carlton, Kendall		**Lake Ontario State Parkway (East & West)**	Extreme	Natural & Cultural Resources	Natural Protective Features	No	No, Locally Significant	High	

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Niagara County	Newfane		**Lakeview Village Fair and boardwalk area with shops**	Extreme	Economic	Tourism Destinations	No	No, Locally Significant	High	
Niagara County	Niagara	Niagara Falls	**Niagara Discovery Center / Schoelkopf Power Plant ruins**	High	Economic	Tourism Destinations	Yes	No, Locally Significant	High	
Niagara County	Lewiston		**Tennessee Gas Pipeline**	Extreme	Infrastructure Systems	Power Supply	No	Yes, FEMA	High	
Orleans County	Kendall & Hamlin		**Wastewater Treatment Plant**	High	Infrastructure Systems	Wastewater	No	Yes, FEMA	High	
Niagara County	Niagara	Niagara Falls	**1st Street Bridge**	High	Infrastructure Systems	Transportation	Yes	Yes, FEMA	High	
Niagara County	Niagara	Niagara Falls	**Cayuga Creek / Little Niagara River**	High	Natural & Cultural Resources	Water Bodies	No	Yes, FEMA	High	
Niagara County	Niagara	Niagara Falls	**Goat Island Bridges**	High	Infrastructure Systems	Transportation	Yes	Yes, FEMA	High	
Niagara County	Newfane		**Hadley Boat Company**	Moderate	Economic	Marina/Water Based Business	No	No	High	
Niagara County	Newfane		**Keg Creek**	Extreme	Natural & Cultural Resources	Water Bodies	No	Yes, FEMA	Medium	
Niagara County	Niagara	Niagara Falls	**Maid of the Mist**	High	Economic	Marina/Water Based Business	Yes	No, Locally Significant	High	
Niagara County	Niagara	Niagara Falls	**Niagara Gorge and Trails**	Moderate	Natural & Cultural Resources	Parks and Recreation	Yes	No, Locally Significant	High	
Niagara County	Youngstown		**Pump-out Station, Niagara Jet boat, Village Parks (2) and Launch, Youngstown Yacht Club**	High	Economic	Marina/Water Based Business	No	No, Locally Significant	High	
Niagara County	Niagara	Niagara Falls	**Whirlpool Rapids Bridge**	High	Infrastructure Systems	Transportation	Yes	Yes, FEMA	High	

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Niagara County	Niagara	Niagara Falls	**Whirlpool State Park**	Moderate	Natural & Cultural Resources	Parks and Recreation	No	No, Locally Significant	High	
Niagara County	Somerset		**Golden Hill State Park, Lighthouse at 30 Mile Point**	High	Natural & Cultural Resources	Parks and Recreation	No	No, Locally Significant	Medium	
Niagara County	Somerset		**Lakeview Drive Residences**	High	Housing	Single-Family Residence	No	No	Medium	
Niagara County	Newfane		**Lewiston Town Park**	High	Natural & Cultural Resources	Parks and Recreation	No	No, Locally Significant	Medium	
Niagara County	Porter		**Porter on the Lake Town Park**	High	Natural & Cultural Resources	Parks and Recreation	No	No, Locally Significant	Medium	
Orleans County	General	General	**Submerged Structures**	Extreme	Infrastructure Systems	Navigable waterway facilities	No	Yes, FEMA	High	
Niagara County	Porter	Youngstown	**Wastewater Pump Stations No. 5 and 6**	Extreme	Infrastructure Systems	Wastewater	No	Yes, FEMA	High	
Niagara County	Newfane		**Hopkins Creek**	Extreme	Natural & Cultural Resources	Water Bodies	No	Yes, FEMA	Medium	
Niagara County	Wilson		**Marinas in Wilson Harbor**	High	Economic	Marina/Water Based Business	No	No, Locally Significant	High	
Niagara County	Niagara	Niagara Falls	**Niagara Falls State Park**	High	Natural & Cultural Resources	Parks and Recreation	Yes	No, Locally Significant	High	
Niagara County	Newfane		**Niagara Shores Campground**	Extreme	Economic	Tourism Destinations	No	No	High	
Niagara County	Lewiston		**NYPA Fishing Platform**	Moderate	Economic	Marina/Water Based Business	No	No, Locally Significant	High	
Niagara County	Niagara	Niagara Falls	**NYPA water intakes - scenic area/former site of Fort Schlosser (Little Fort Niagara)**	High	Infrastructure Systems	Water Supply	Yes	Yes, FEMA	High	

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Niagara County	Newfane		**Olcott Harbor - East and West Harbors**	Extreme	Economic	Marina/Water Based Business	No	Yes, FEMA	High	
Niagara County	Olcott		**Olcott Harbor/Eighteen Mile Creek**	Extreme	Economic	Marina/Water Based Business	No	No, Locally Significant	High	
Niagara County	Niagara	Niagara Falls	**Rainbow International Bridge**	High	Infrastructure Systems	Transportation	Yes	Yes, FEMA	High	
Niagara County	Lewiston		**Reservoir Park**	High	Natural & Cultural Resources	Parks and Recreation	No	No, Locally Significant	High	
Niagara County	Lewiston	Lewiston	**Residential - Water Street**	Moderate	Housing	Single-Family Residence	No	No	Low	
Niagara County	Niagara	Niagara Falls	**Rivershore Trail**	High	Natural & Cultural Resources	Parks and Recreation	No	No, Locally Significant	High	
Niagara County	Wilson		**Village of Wilson Bike Trails**	Moderate	Natural & Cultural Resources	Parks and Recreation	No	No	Low	
Niagara County	Porter		**(Old) Fort Niagara**	High	Natural & Cultural Resources	Parks and Recreation	No	No, Locally Significant	High	
Niagara County	Lewiston		**Devil's Hole State Park**	High	Natural & Cultural Resources	Parks and Recreation	No	No, Locally Significant	Medium	
Niagara County	Niagara	Niagara Falls	**Gill Creek**	High	Natural & Cultural Resources	Water Bodies	No	Yes, FEMA	High	
Orleans County	Kendall		**Hamlin-Kendall Intermunicipal Wastewater Infrastructure**	High	Infrastructure Systems	Wastewater	No	No, Locally Significant	High	
Niagara County	Newfane		**Stormwater System (Old Pond)**	Moderate	Infrastructure Systems	Wastewater	No	No, Locally Significant	High	
Niagara County	Lewiston	Youngstown	**Water Street**	Moderate	Economic	Marina/Water Based Business	No	Yes, FEMA	Medium	

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Niagara County	Newfane		**Newfane Wastewater Treatment Plant**	Extreme	Infrastructure Systems	Wastewater	No	Yes, FEMA	High	
Orleans County	Carlton		**Waterport Dam**	High	Infrastructure Systems	Power Supply	No	Yes, FEMA	High	
Niagara County	Niagara	Niagara Falls	**Niagara Falls Water Board Wastewater Treatment Plant**	Moderate	Infrastructure Systems	Wastewater	Yes	Yes, FEMA	High	
Niagara County	Niagara	Niagara Falls	**Niagara Falls Water Board Water Treatment Plant**	Moderate	Infrastructure Systems	Wastewater	Yes	Yes, FEMA	High	
Niagara County	Lewiston		**Power Plant**	High	Infrastructure Systems	Power Supply	No	Yes, FEMA	High	
Niagara County	Lewiston		**Power Reservoir**	High	Infrastructure Systems	Power Supply	No	Yes, FEMA	High	