Maitland Valley Conservation Authority

Coastal Resilience Workshop

Public Information Centre #2

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August 15, 2023

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ONE WORLD

SJL ENGINEERING

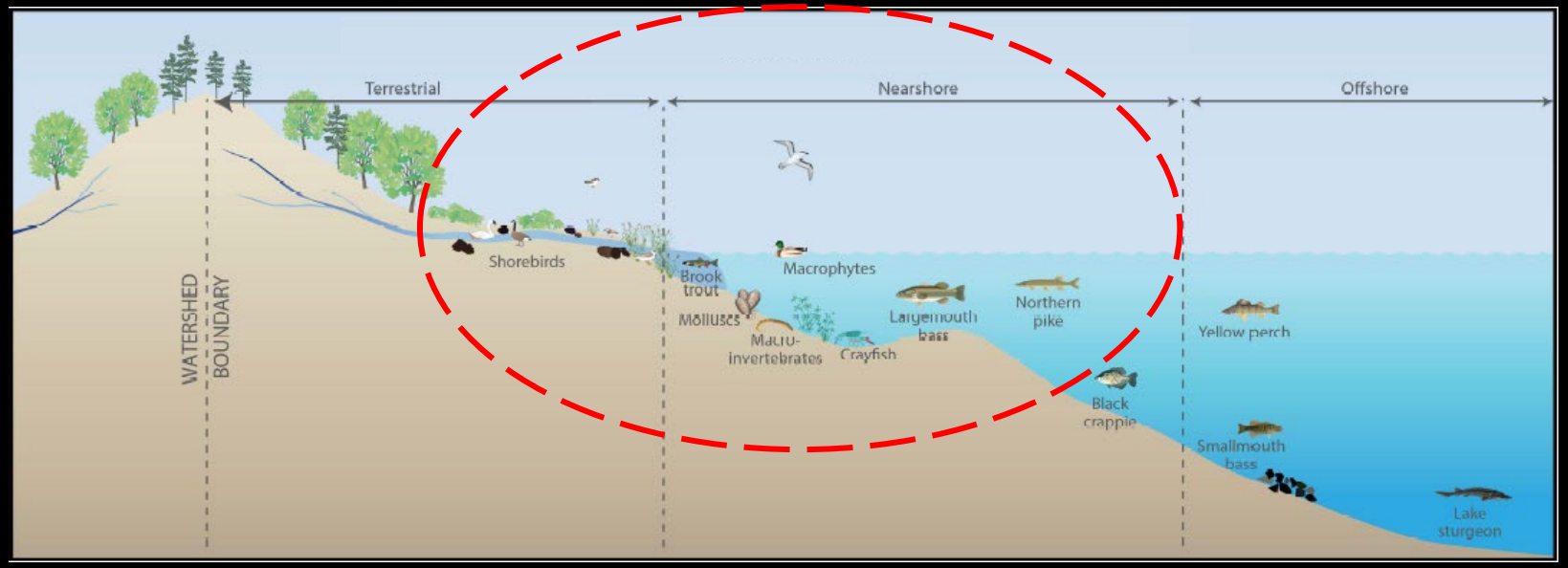
Schedule for Resilience Study

- MEETING 1 - July 16, 2023: Understanding Values (completed)
- MEETING 2 - August 15, 2023: Overview of Resilience Study, Summary of Values, Legislative/Regulatory Guidelines, Co-develop Concepts (today)
- FALL 2023: Meetings with Municipal Staff, Councils, and MVCA Board
- WINTER 2023/24: MVCA and Consultants Refine Actions and Resilience Concepts
- SUMMER 2024: Meetings to Review Actions and Resilience Concepts

Presentation Outline for PIC#2

- Consultant overview of coastal resilience and vulnerability assessment, community values, and government regulatory and legislative framework
- Consultant presentation on options to decrease vulnerability and increase resilience to coastal hazards
  - PARRAP concepts
- Breakout Table Discussions: Review applicability of six PARRAP approaches to MVCA coastline
- Report back to full group on the results of the discussion

I – OVERVIEW OF COASTAL RESILIENCE AND VULNERABILITY ASSESSMENT

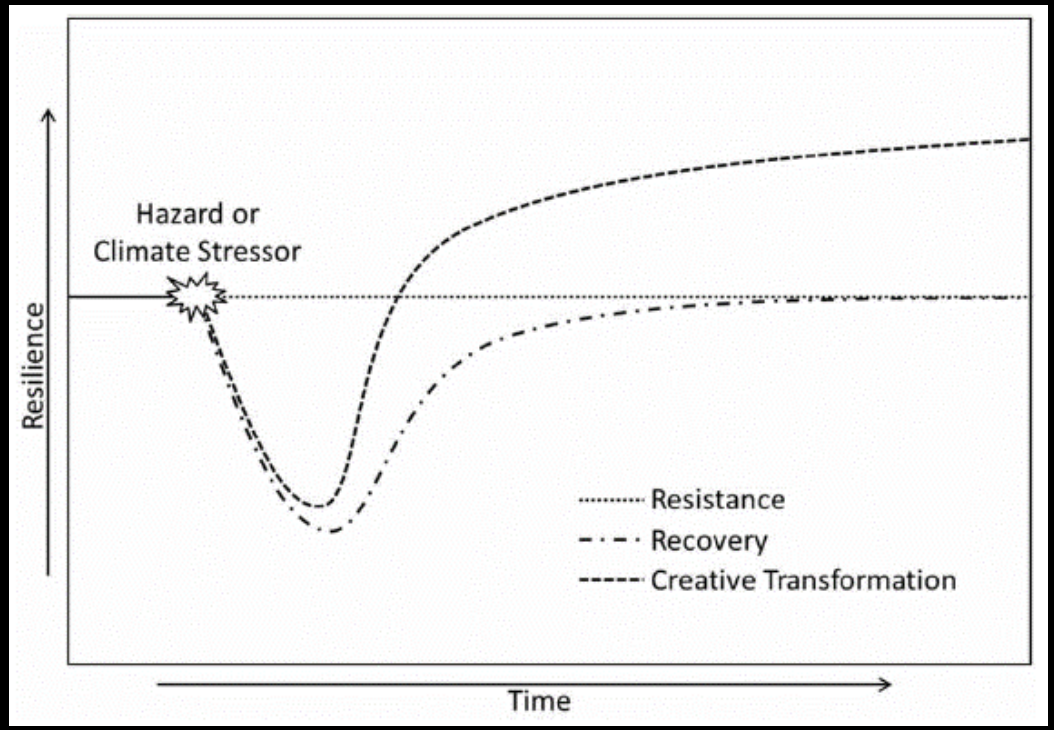


Coastal Resilience Defined

- The capacity of social, economic, environmental, and physical systems in coastal areas to cope with hazardous events, respond and reorganize in ways that maintain their essential function, while also building capacity for learning, innovative and equitable adaptation

- Simple definition: Ability of coastal systems to recover from damaging storm events

- Joakim et al. 2015

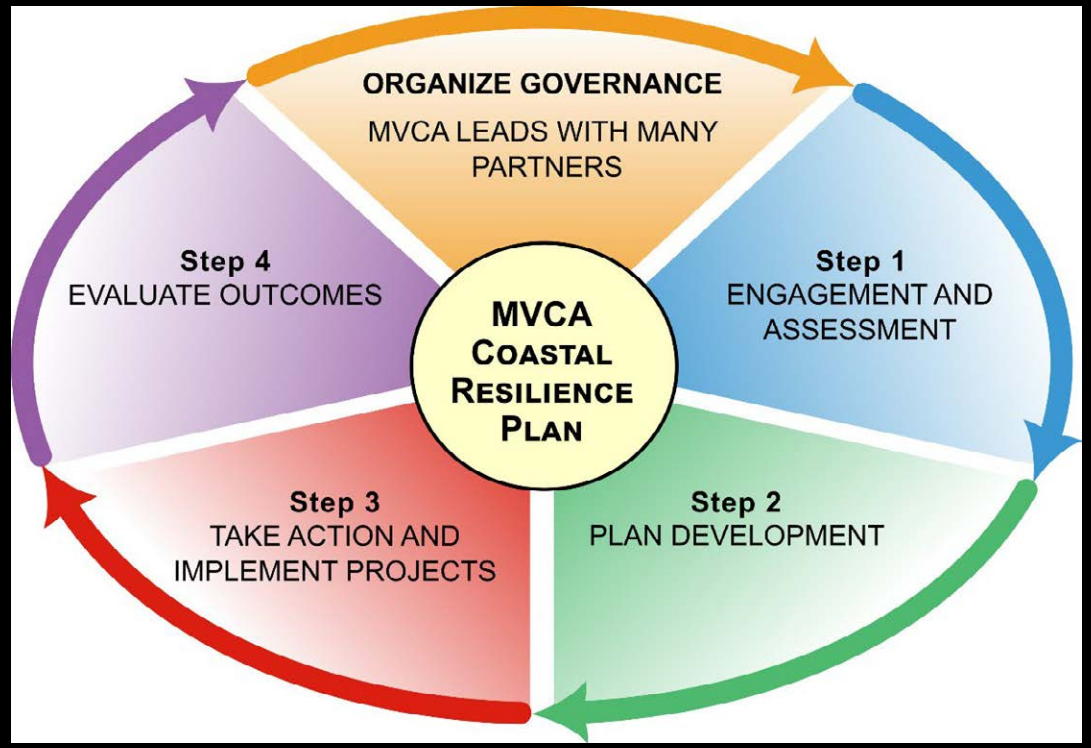


Leverage the New ECCC Coastal Resilience Framework

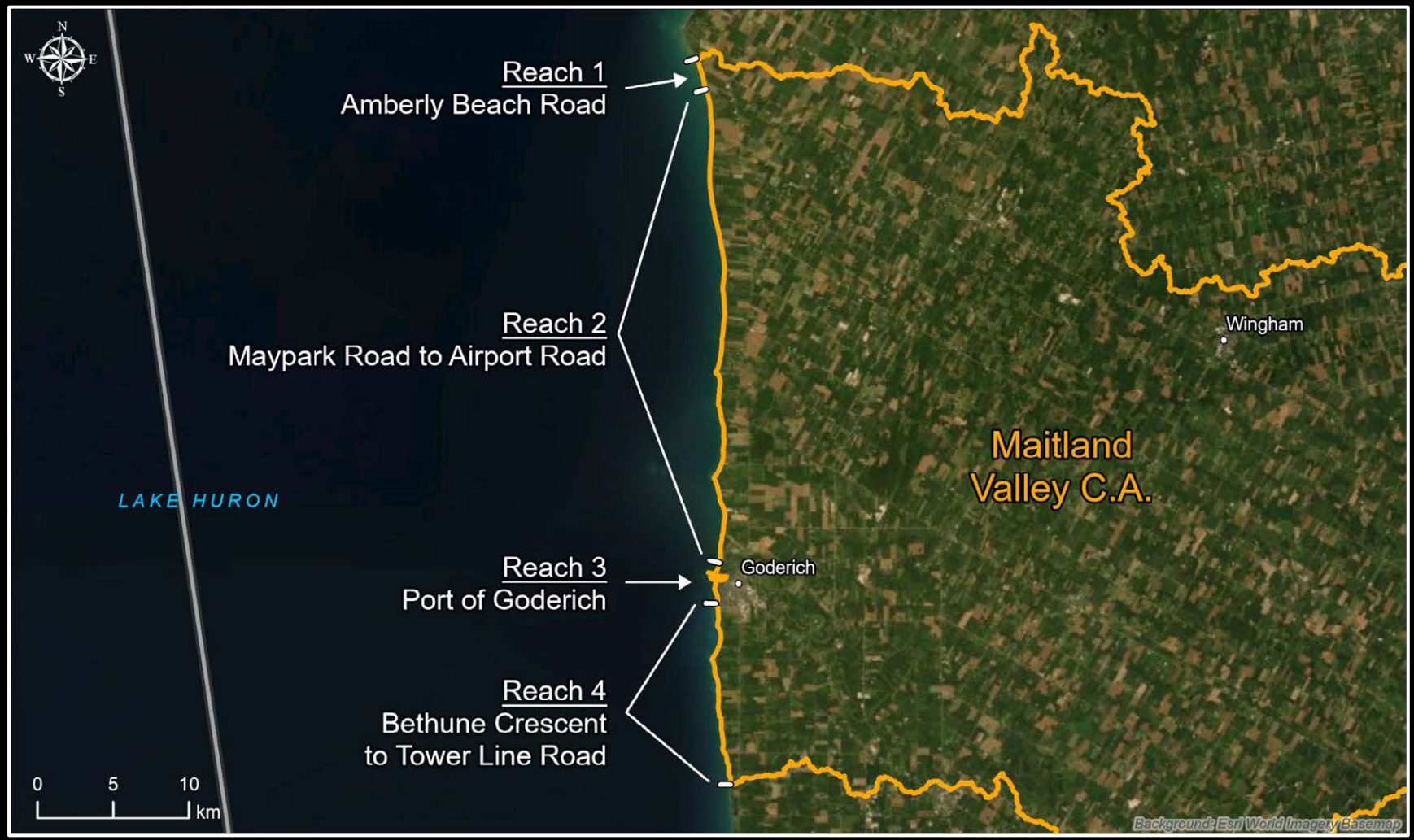
- Recognizes the coast is an integrated social, economic, ecological, and physical system
- Scale is a defining aspect (solutions are community to regional in scale), guided by littoral cell boundaries
- All of society approach (by everyone for everyone)

- https://zuzekinc.com/resiliencframework/

- Increasing resilience is a process, it evolves, requires commitment, and ongoing effort

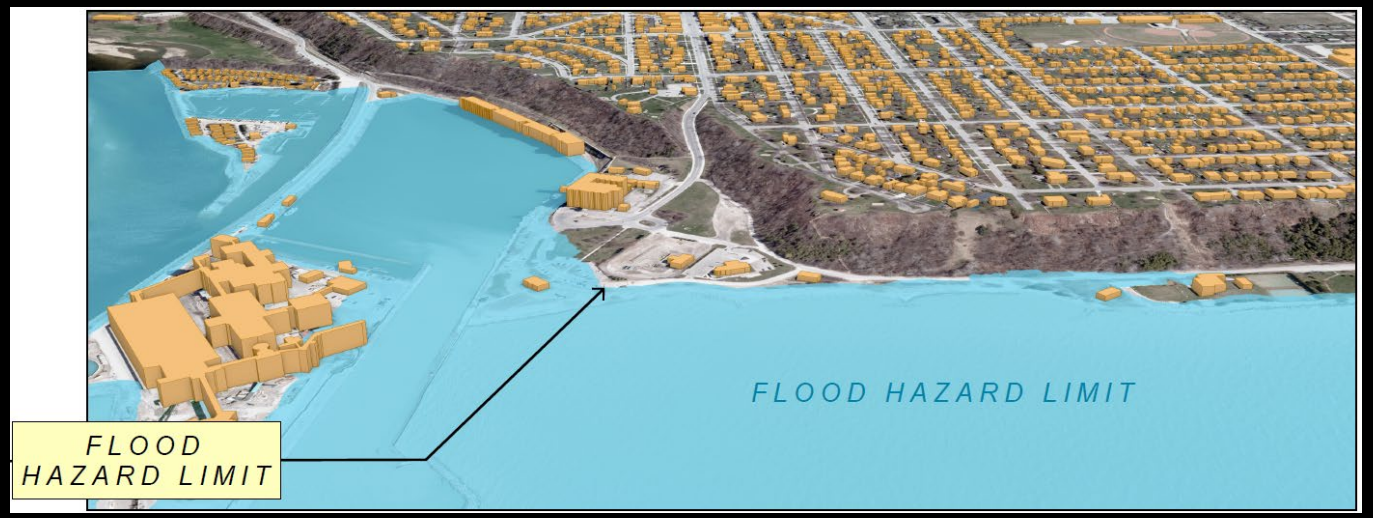


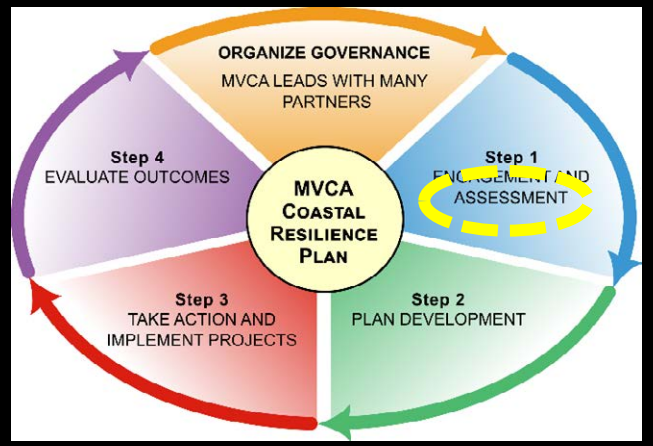
Lake Huron Littoral Cells (left, 1988) and Management Reaches (right)



STEP 1 - ASSESSMENT
Vulnerability to Flooding

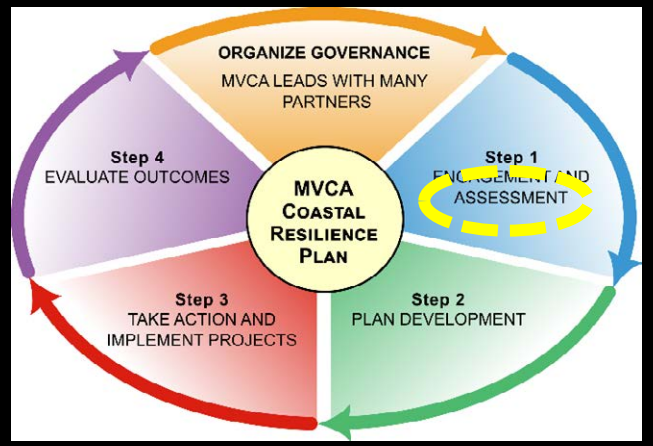
- 374 buildings (primary and secondary) within the Flood Hazard Limit
- Assessed value of buildings and contents is $153 million
- *Based on 2023 assessment data (not market values)*





STEP 1 - ASSESSMENT
Vulnerability to Erosion within the next 100-years

- 1755 buildings (primary and secondary) within 100-year Erosion Hazard Limit (the regulatory limit)
- Assessed value of buildings, contents, and land is $742 million
- *Based on 2023 assessment data (not market values)*



STEP 1 - ASSESSMENT
Beach Stability

- Beaches are naturally variable and dynamic
- Beach width can change dramatically with fluctuating lake levels

- Healthy beaches rely on continuous sediment supply, which comes from shoreline and gully erosion

II – SUMMARY OF COMMUNITY VALUES FROM JULY 16, 2023 MEETING

How do you interact and use the Lake Huron coast?

- Recreation: beach walking, swimming, boating, kayaking, fishing
- Place to gather with family and other social events
- Spiritual retreat, place of solace, mental health regeneration
- Access to the lake and natural areas
- Permanent residences and seasonal properties
- Participate in community events, support the local economy, and tourism activities
- Sunset watching

What do you value most about the Lake Huron coast?

- Natural landscapes, changing seasons, and dynamic processes (storms)
- A place to connect with nature, relax, and rejuvenate
- Healthy coastal ecosystems and clean water
- Access to the lake, beaches, swimming, and all other recreational activities
- Strong sense of community and social fabric
- Family gathering place and multi-generational properties
- Sunsets and happy hour

What changes have you observed with the Lake Huron coast and will these impact your use of the coast?

- New development pressure is resulting in landscape changes (loss of nature, reduction in wildlife, removal of tree canopy, etc.)
- Hardening of the shoreline with walls and rock structures, which limit access to the beach and walking along the shore
- Loss of beach access during periods of high lake levels
- Reductions in nearshore water quality
- Loss of ice cover and more exposure to winter storms (increasing hazard exposure, more winter flood risk)
- Accelerated rates of change (faster lake level fluctuations & higher erosion rates)

- These changes threaten all values and use of the Lake Huron coast, and climate change will continue to magnify them in the future

Value-based Criteria for Concept Development to Increase Coastal Resilience (draft)

- Maintain healthy and accessible beaches
- Protect nearshore water quality for swimming and drinking
- Preserve coastal ecosystems and restore lost habitat
- Reduce exposure to flooding and erosion hazards

- Other criteria?
  - Cost and affordability
  - Durability, longevity, sustainability
  - Maintain and improve emergency access
  - Avoid impacts to neighbouring properties and the coastal ecosystem
  - Please provide feedback …

Legislative and Regulatory Requirements for Solutions (not a complete list)

- Provincial Policy Statement (2020), updated Technical Guide (in press), Conservation Authorities Act, and MVCA Regulations:
  - Authorities should consider the impacts of a changing climate when mapping hazards (done by MVCA)
  - New development should be directed away from hazardous lands
  - Vehicles and people have a safe way of entering and exiting during storms
  - New hazards are not created, and existing hazards are not aggravated
  - No adverse environmental impacts will occur

- Other relevant legislation and considerations:
  - Federal Fisheries Act and Navigable Waters Act
  - Species at Risk Act, Endangered Species Act
  - Crown Bottom Lands (lake bottom owned by province)

RESILIENT COASTLINES AND THE PARRAP FRAMEWORK

PARRAP Framework

- PARRAP is a decision-making framework used to develop concepts and alternatives to reduce exposure to coastal hazards, adapt to climate change, and increase the resilience of coastal ecosystems and communities

Preserve Natural Shorelines

Avoid Development on Hazardous Lands

Retreat From the Hazards

Re-align Land Uses

Accommodate Coastal Hazards

Protect with Nature-based Solutions and Engineered Structures

PRESERVE NATURAL SHORELINES

Preserve Natural Shorelines (PARRAP Framework)

- The objective of the Preserve strategy is to maintain natural shorelines and geodiversity (natural physical processes such as erosion and sediment transport along the shoreline). Natural shorelines often have natural resilience to erosion and flooding and deliver extensive ecological and social benefits.

Preserve Natural Shorelines (PARRAP Framework)

Natural erosion of glacial till bluff shorelines delivers sand and gravel to the nearshore for the creation and maintenance of beaches

Wide beaches protect the bluff toe from wave attack. Trees stabilize the slope. Creeks contribute sediment to the beach and nearshore

Preserve Natural Shorelines (PARRAP Framework)

Sand beaches and protected areas provide public access to the lake and multiple recreational opportunities to visitors, while providing natural shoreline resilience

Preserve Natural Shorelines (PARRAP Framework)

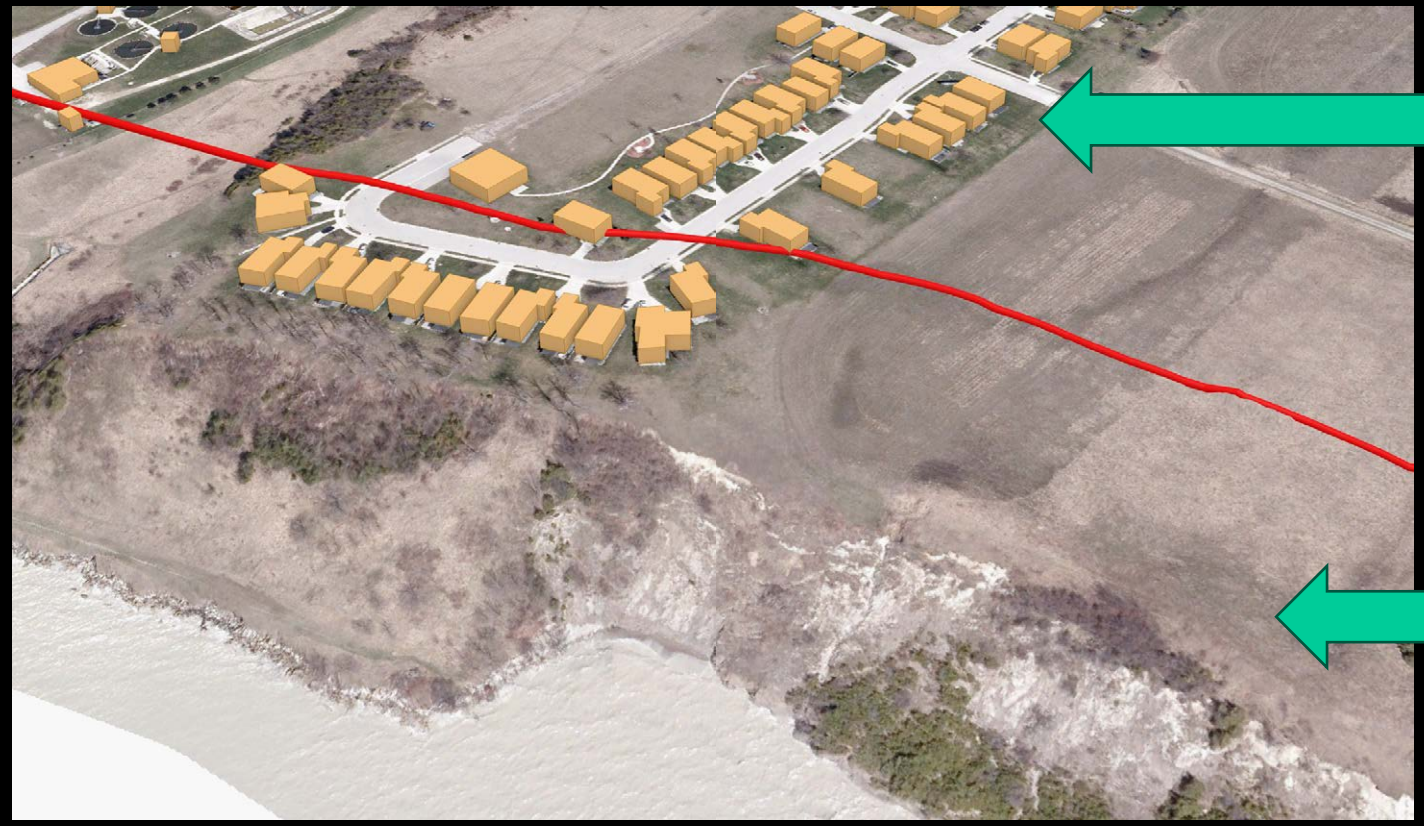
“Preserve” Benefits:	“Preserve” Challenges:
Preserve sediment supply to downdrift beaches	Requires natural shoreline to be present today
Maintain the ecological diversity of the coastal area	Commonly challenged by existing zoning for future lakeshore development
Natural beach/dune systems are resilient to lake level fluctuations and storms	
Natural shorelines offer protection to coastal wetlands	

AVOID DEVELOPMENT ON HAZARDOUS LANDS

Avoid Development on Hazardous Lands (PARRAP Framework)

- The goal of the avoid strategy is to locate future development away from areas of natural or human-made hazards. This reduces the exposure of people and property to natural hazards and associated risks in the future.

Avoid Development on Hazardous Lands (PARRAP Framework)



Development on the landward side of the Erosion Hazard Limit reduces risk to people and property

Avoid development on the lakeward side of the Erosion Hazard Limit where there are risks to human safety and properties

Avoid Development on Hazardous Lands (PARRAP Framework)

Avoid development within the flooding hazard where properties may be exposed to floodwaters or impacts from waves

Avoid development near actively eroding bluffs

Avoid Development on Hazardous Lands (PARRAP Framework)

“Avoid” Benefits:	“Avoid” Challenges:
Avoids the creation of new development at risk to natural hazards	Does not address risks to existing developments
Straightforward to implement when up to date hazard mapping is available	May require changes in land use designation
Little to no investment required by municipalities to implement	May require larger or reconfigured lots to permit sufficient setbacks
Often achieves “Preserve” simultaneously by “Avoiding” development on natural shorelines	Must overcome the desire to live on hazardous lands

RETREAT FROM THE HAZARDS

Retreat From the Hazards (PARRAP Framework)

- The goal of the (managed) Retreat strategy is to relocated public or private assets that are exposed to significant risk associated with coastal hazards. The Retreat strategy is considered when other PARRAP strategies are unable to mitigate the risk or cannot be reasonably implemented due to constructability, cost, permitting constraints, or negative environmental impacts.

Retreat From the Hazards (PARRAP Framework)

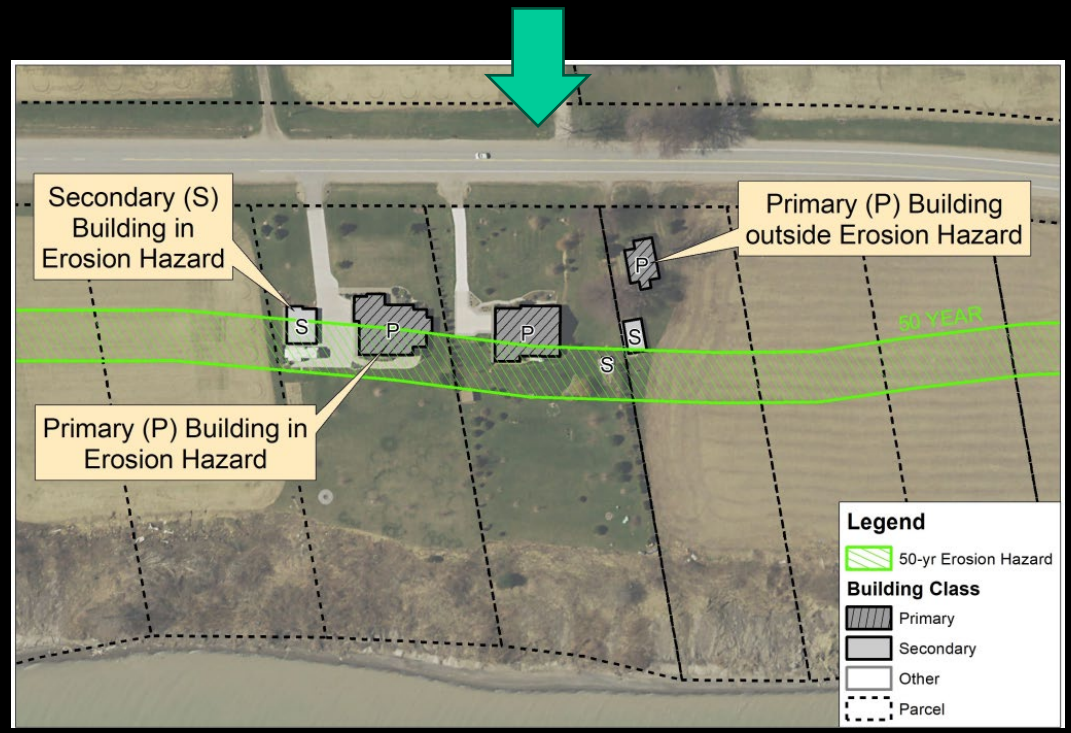
Great Lakes example:

Bluff failure in early 1990s threatens home

Home successfully relocated ~30 m from the bluff edge

Retreat From the Hazards (PARRAP Framework)

Shoreline hazard mapping and risk assessment studies can identify buildings at risk that may be suitable for future relocation



Retreat From the Hazards (PARRAP Framework)

“Retreat” Benefits:	“Retreat” Challenges:
Often the most cost-effective strategy to deal with immanent and unacceptable risk	Moving a building within a lot is not always possible due to lot sizes
Removes people and assets from the hazard	Not all buildings can be readily relocated
No long-term shoreline protection maintenance costs	Creating new property parcels or extending/expanding existing parcels to permit relocation is not straightforward
Permits natural coastal processes to continue or resume	Often carries negative connotations (perceived as a loss)

RE-ALIGN LAND USES

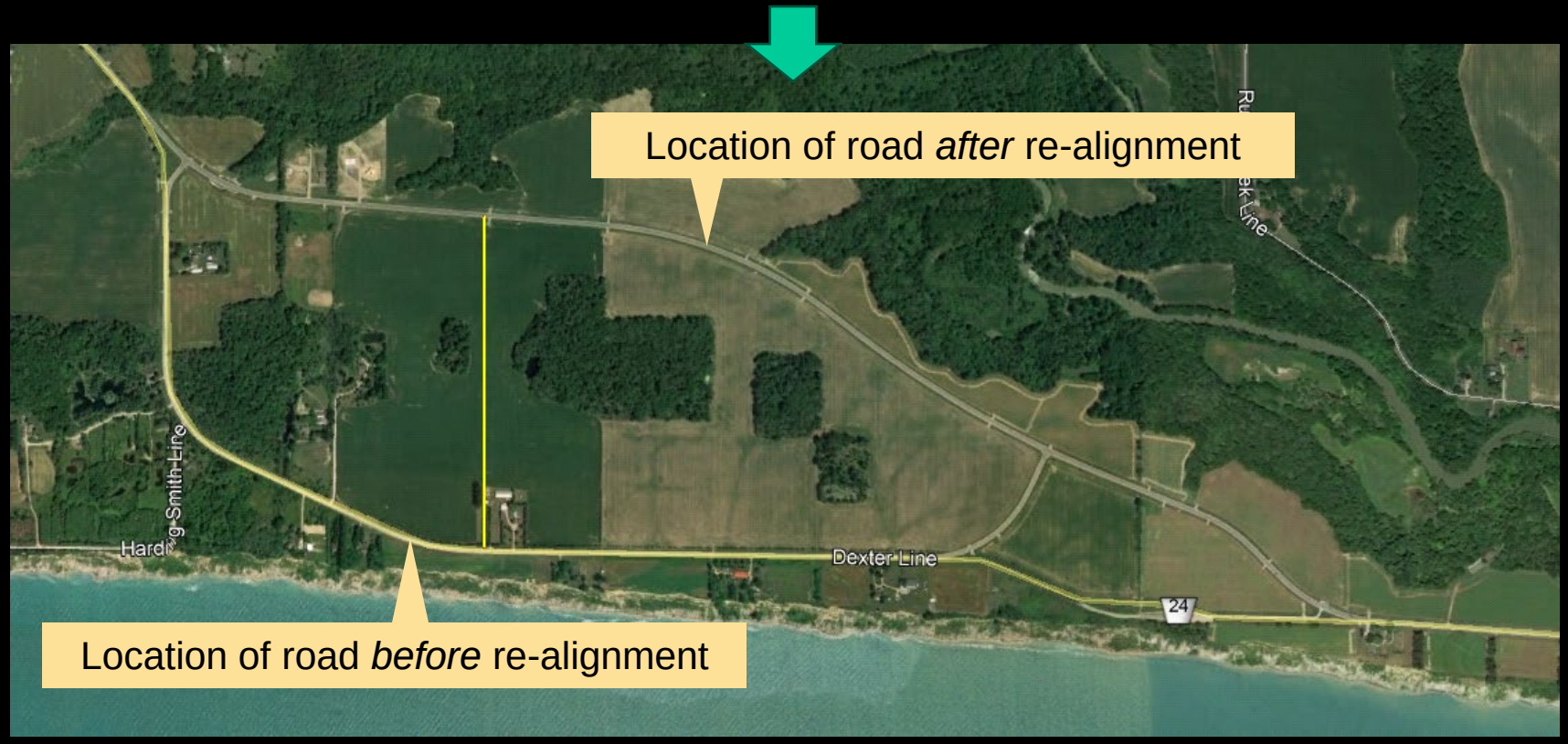
Re-align Land Uses (PARRAP Framework)

- The goal of the Re-align strategy is to change land use where public or private assets are exposed to significant risk. It is considered when other PARRAP categories are not sufficient to mitigate the risk or cannot be reasonably implemented due to constructability, cost, permitting constraints, or negative environmental impacts.

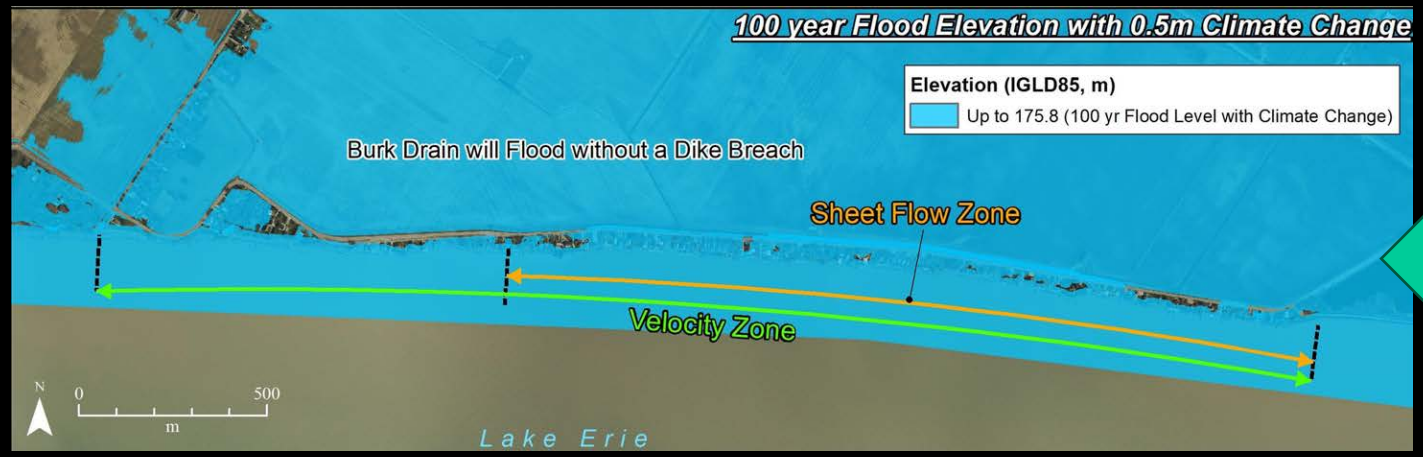
Re-align Land Uses (PARRAP Framework)

Great Lakes example:

Road was moved 800 m inland and re-aligned to maintain the integrity of the transportation corridor



Re-align Land Uses (PARRAP Framework)



Aerial view of flood extent over road and diked farmland

Re-align concept including long-term property buyout program and transformation of hazardous lands to a new, natural barrier beach and wetland system

Re-align Land Uses (PARRAP Framework)

“Re-align” Benefits:	“Re-align” Challenges:
Removes people, assets and infrastructure from the hazard, and restores safe access	May require changes to municipal zoning
Returns the shoreline to a natural state and restores coastal processes	Can require property buy-outs over time from willing sellers
Reduces long-term maintenance or risk mitigation costs	Often has a high upfront capital cost
Creates opportunities for ecosystem restoration	May require purchasing additional lands for new infrastructure (e.g., new road allowances)

ACCOMMODATE COASTAL HAZARDS

Accommodate Coastal Hazards (PARRAP Framework)

- The accommodate strategy leverages adaptive approaches to reduce coastal risk and permit continued occupation of communities on hazardous lands. Examples include:
  - Floodproofing existing buildings
  - Raising building foundations or road elevations
  - Relocating assets or people to areas of least risk within a building
  - Improving site drainage to mitigate flooding or bluff surcharging
  - Upgrading municipal stormwater management systems
  - Upgrading emergency response plans and emergency vehicles

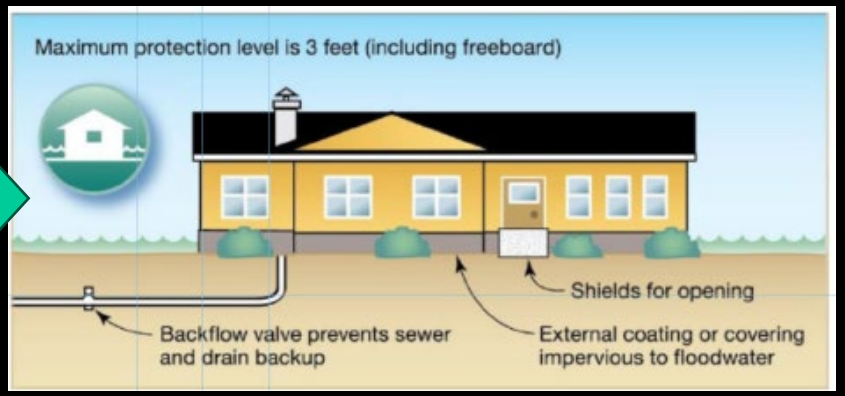
Accommodate Coastal Hazards (PARRAP Framework)

Floodproof existing buildings:

Raise building foundation to reduce flood risk

Install window coverings to prevent flood water entry into basement

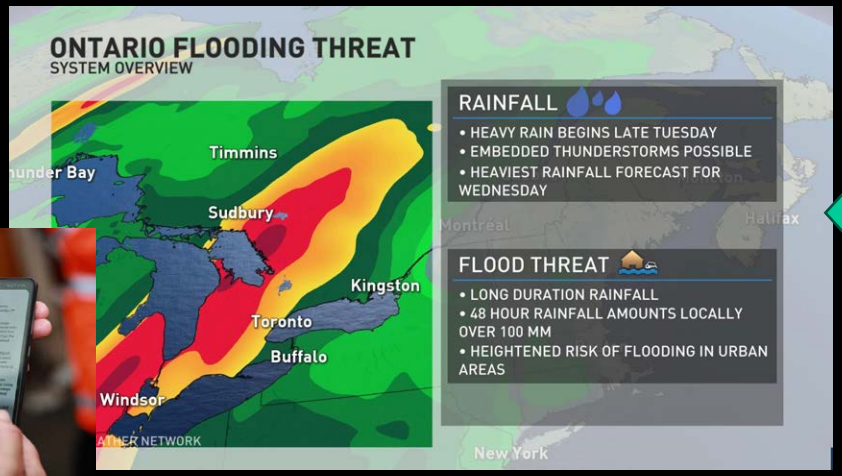
Install backflow valves to prevent sewer/drain backup



Accommodate Coastal Hazards (PARRAP Framework)

Emergency Preparedness:

Upgrade emergency vehicles to improve access to flooded communities



Weather alerts and timely information to help people prepare for threatening conditions

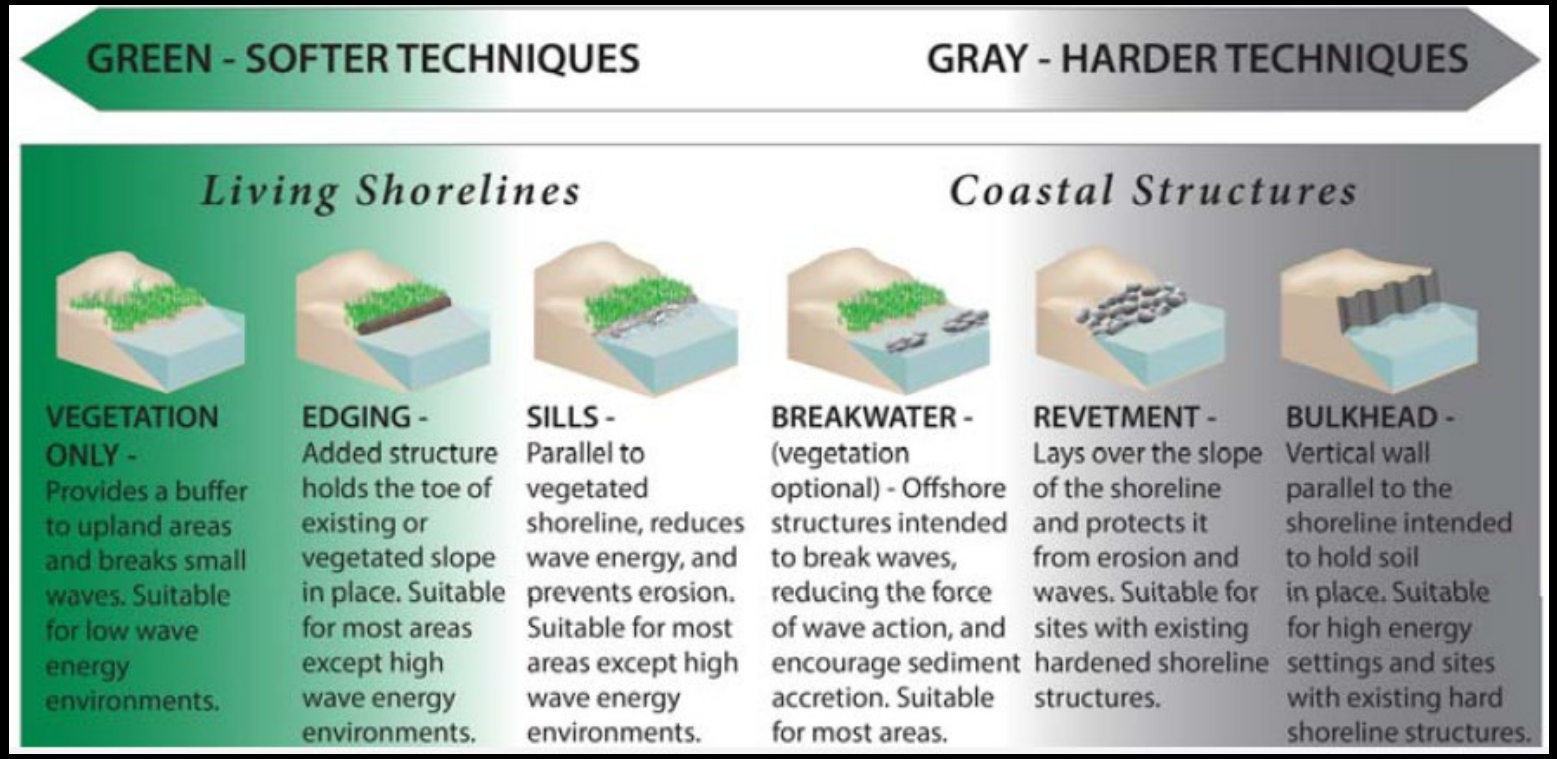
Accommodate Coastal Hazards (PARRAP Framework)

“Accommodate” Benefits:	“Accommodate” Challenges:
Can be relatively inexpensive	May not fully mitigate the risk
Many strategies can be implemented by individual landowners with minimal planning or permitting requirements	Little can be done to “accommodate” when assets are within zone of pending failure for eroding bluffs
Relatively unobtrusive/non-destructive to existing conditions	Often implemented reactively and not proactively (local responses to local events)
Does not necessarily require numerous cooperating parties (e.g., adjacent landowners)	

PROTECT WITH NATURE-BASED SOLUTIONS AND ENGINEERED STRUCTURES

Protect with Nature-Based Solutions and Engineered Structures (PARRAP Framework)

- The protect category is focused on safeguarding people, property, and infrastructure from exposure to shoreline hazards, either through traditional engineering, nature-based solutions, or hybrid (green-gray) solutions.



Protect with Nature-Based Solutions and Engineered Structures (PARRAP Framework)

Nature-based Solutions:

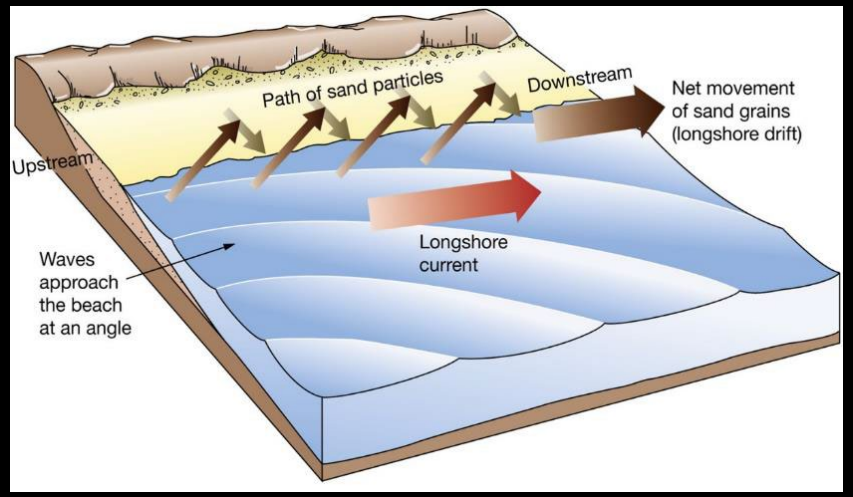
Beachgrass collected from existing colonies and prepared for transplanting

Dune restoration to increase beach resilience

Beach nourishment (sand trucked from elsewhere)

Protect with Nature-Based Solutions and Engineered Structures (PARRAP Framework)

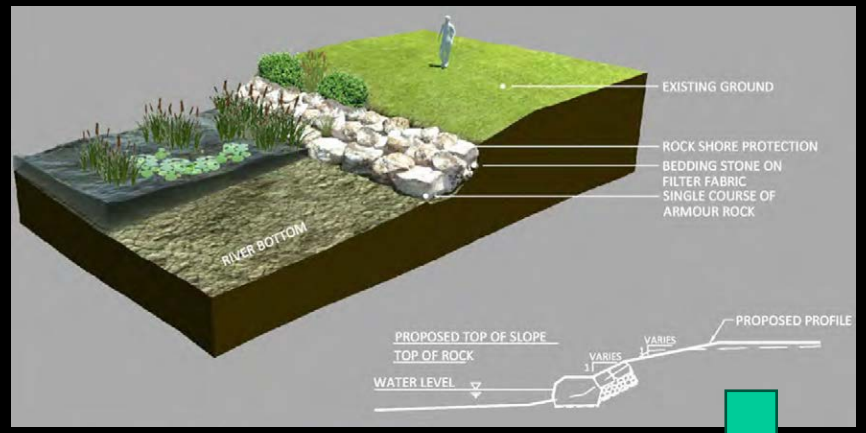
Nature-based Solutions:

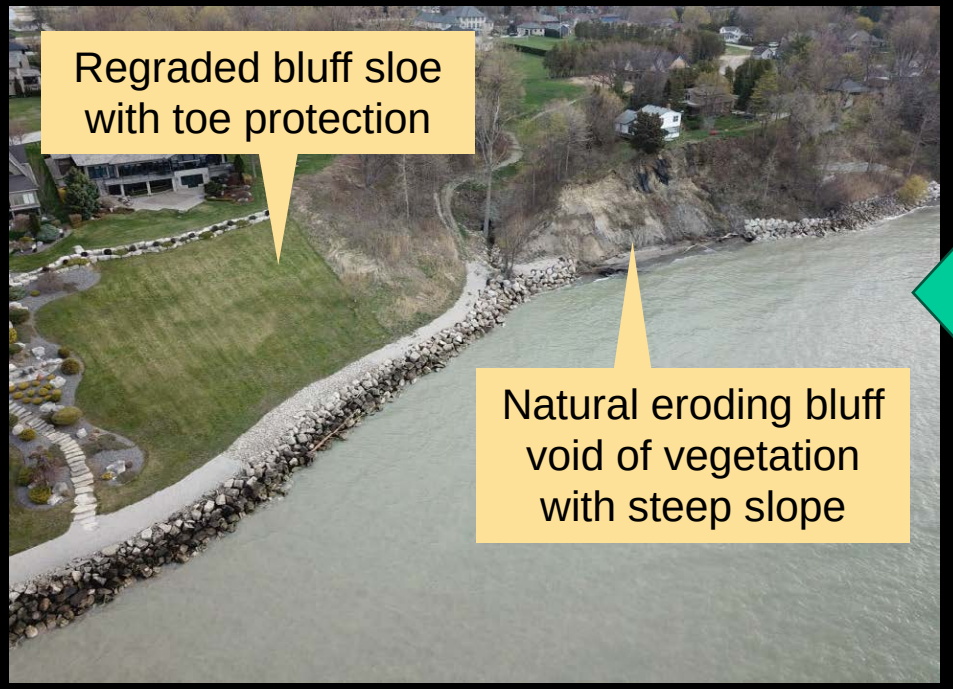


Sediment bypassing at obstructions to longshore transport

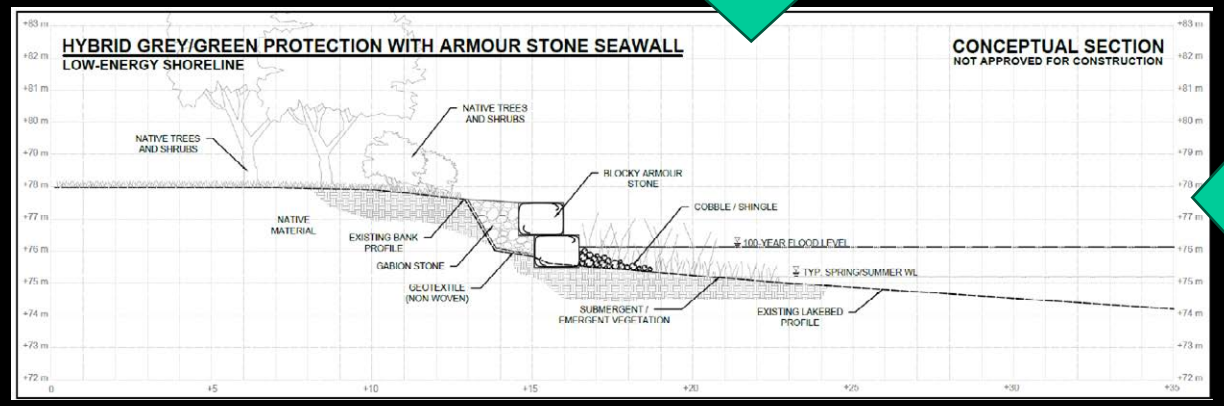
Protect with Nature-Based Solutions and Engineered Structures (PARRAP Framework)

Hybrid (Green-Grey) Solutions:





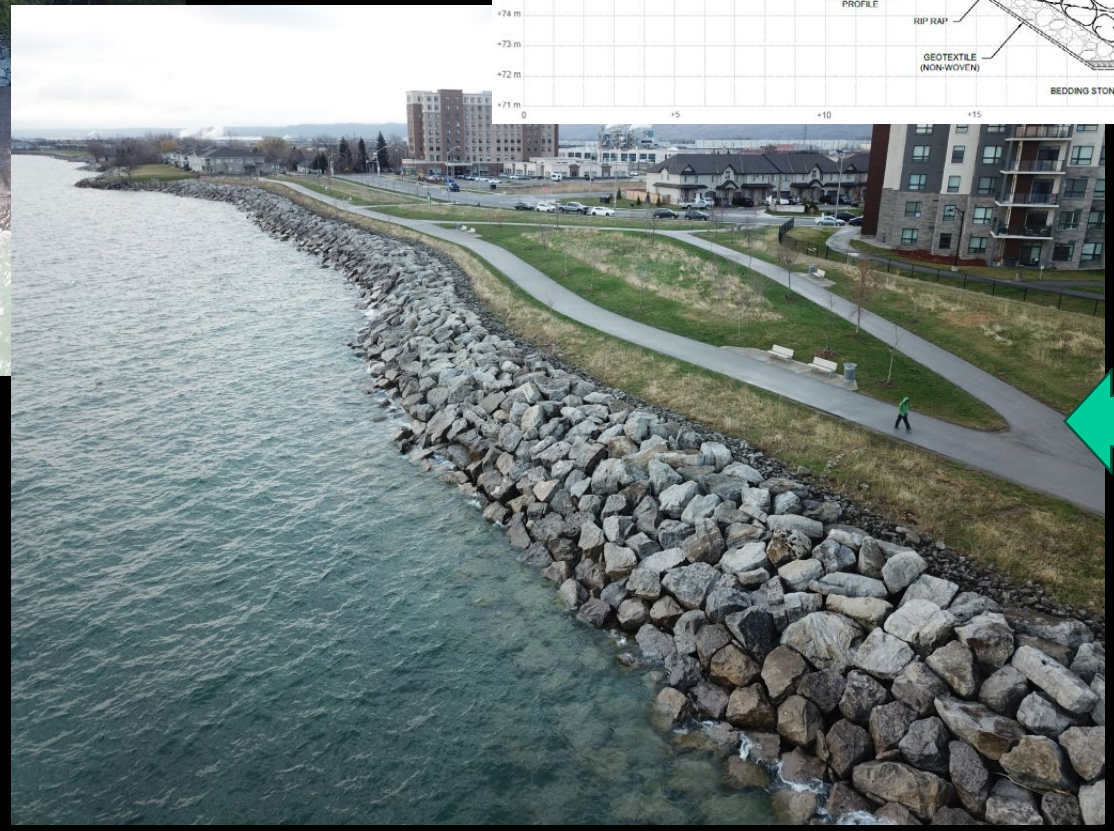
Regrading and revegetating slopes improves stability and erosion risk)

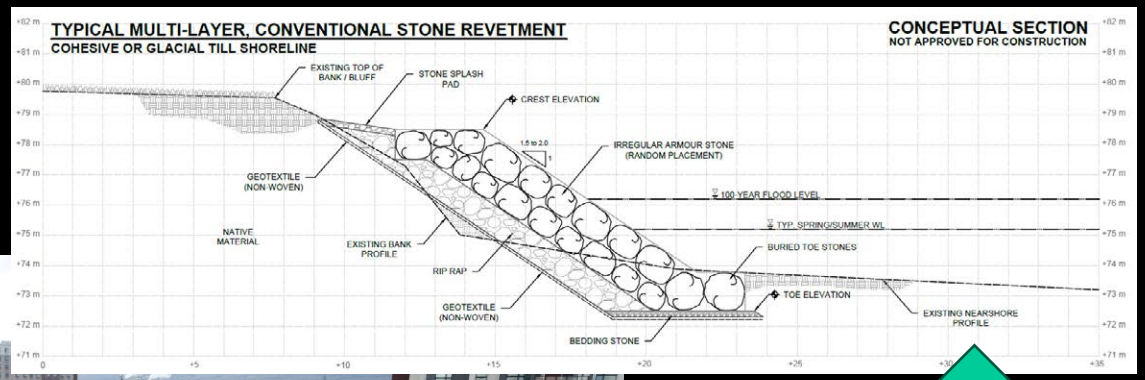


Designing innovative hybrid solutions that protect human safety and create coastal habitat and bio-diversity

Protect with Nature-Based Solutions and Engineered Structures (PARRAP Framework)

Traditional Engineered Structures:

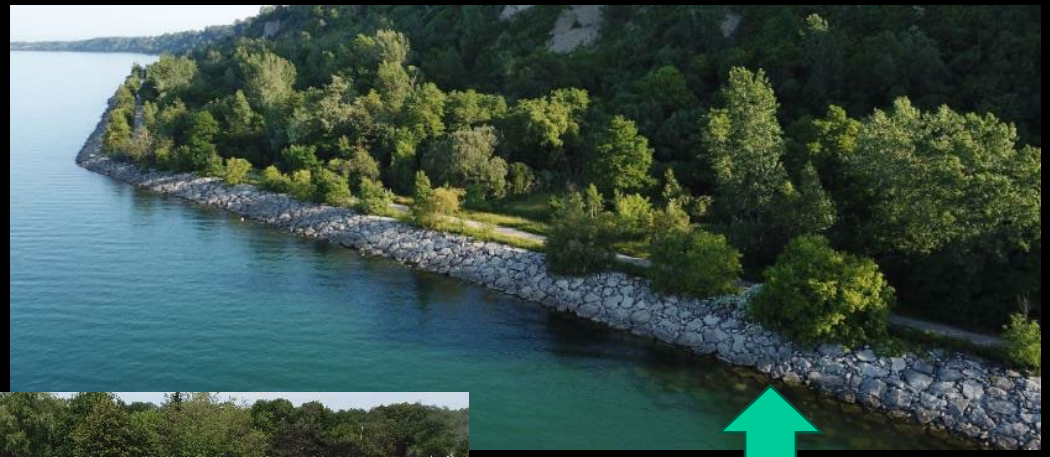




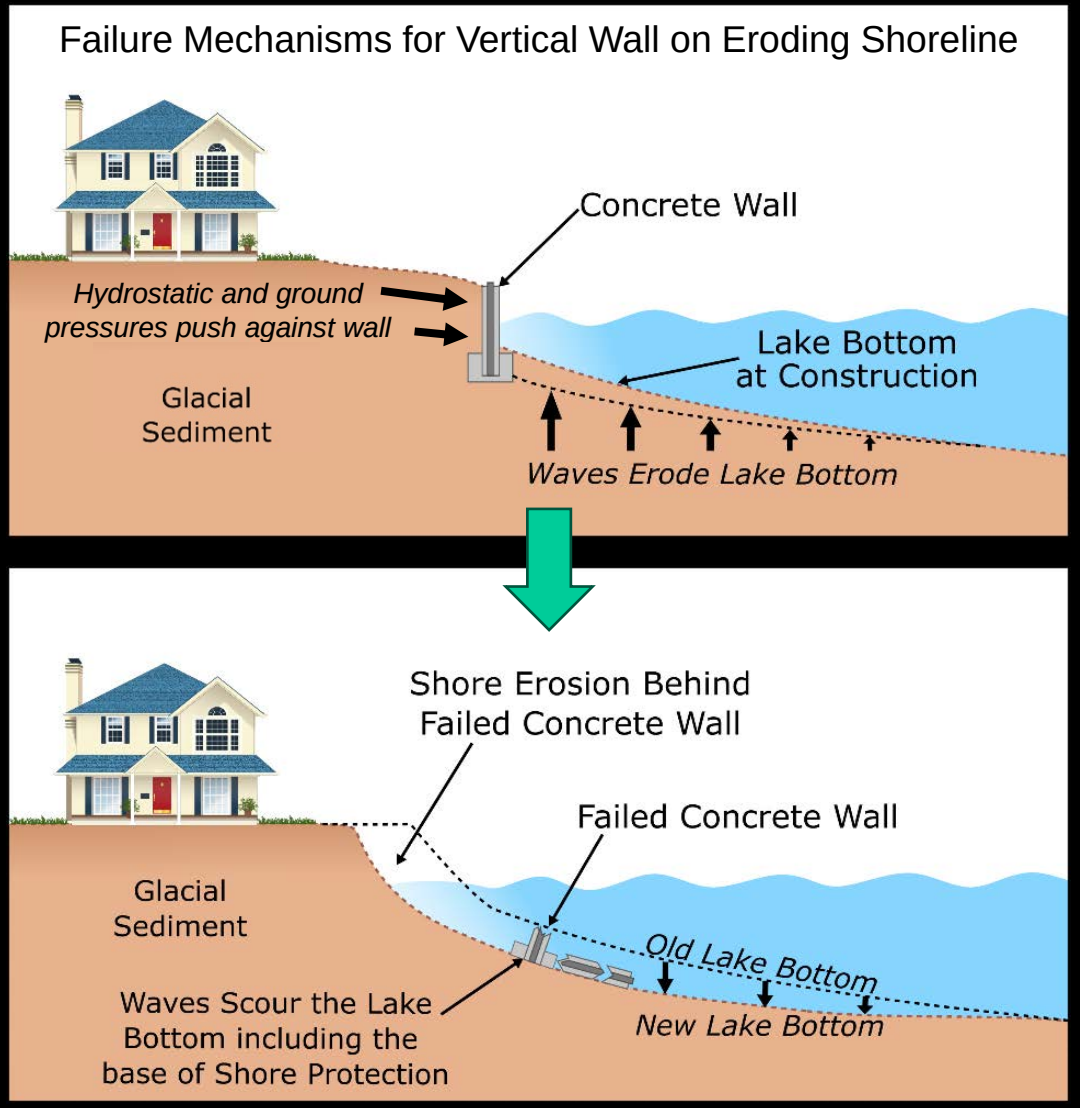
Complete engineering designs for new, traditional shoreline protection structures.

Protect with Nature-Based Solutions and Engineered Structures (PARRAP Framework)

Traditional Engineered Structures:



Properly designed sloping stone structures are recommended over vertical walls for glacial till shorelines



Protect with Nature-Based Solutions and Engineered Structures (PARRAP Framework)

“Protect” Benefits:	“Protect” Challenges:
Can be properly engineered to mitigate risk associated with the hazards for a period of time	Often very costly, especially for high wave exposure shorelines
May have the potential for habitat creation with hybrid solutions	Design life is limited, and regular maintenance (and associated costs) is typically required
Can temporarily avoid investments in relocating major existing infrastructure	Reduces the sediment supply to the nearshore
Can include research and monitoring elements to improve designs and knowledge based on local conditions and impacts	Loss of beach area due to structure footprint and impacts on coastal processes (e.g., increased wave reflection/scour)
	Downdrift impacts and impacts on adjacent shorelines are often unavoidable, and cumulative

Next: Breakout Groups

- We want you to talk to each other
- Discuss each of the 6 strategies in the PARRAP framework and how they may or may not apply to the MVCA shoreline
- Share your experiences
- We are listening, and will help moderate conversation if needed