



The Lake Huron Centre for Coastal Conservation

# HARNESSING THE POWER OF NATURE:

## GREEN INFRASTRUCTURE AND ECOSYSTEM SERVICES ON LAKE HURON

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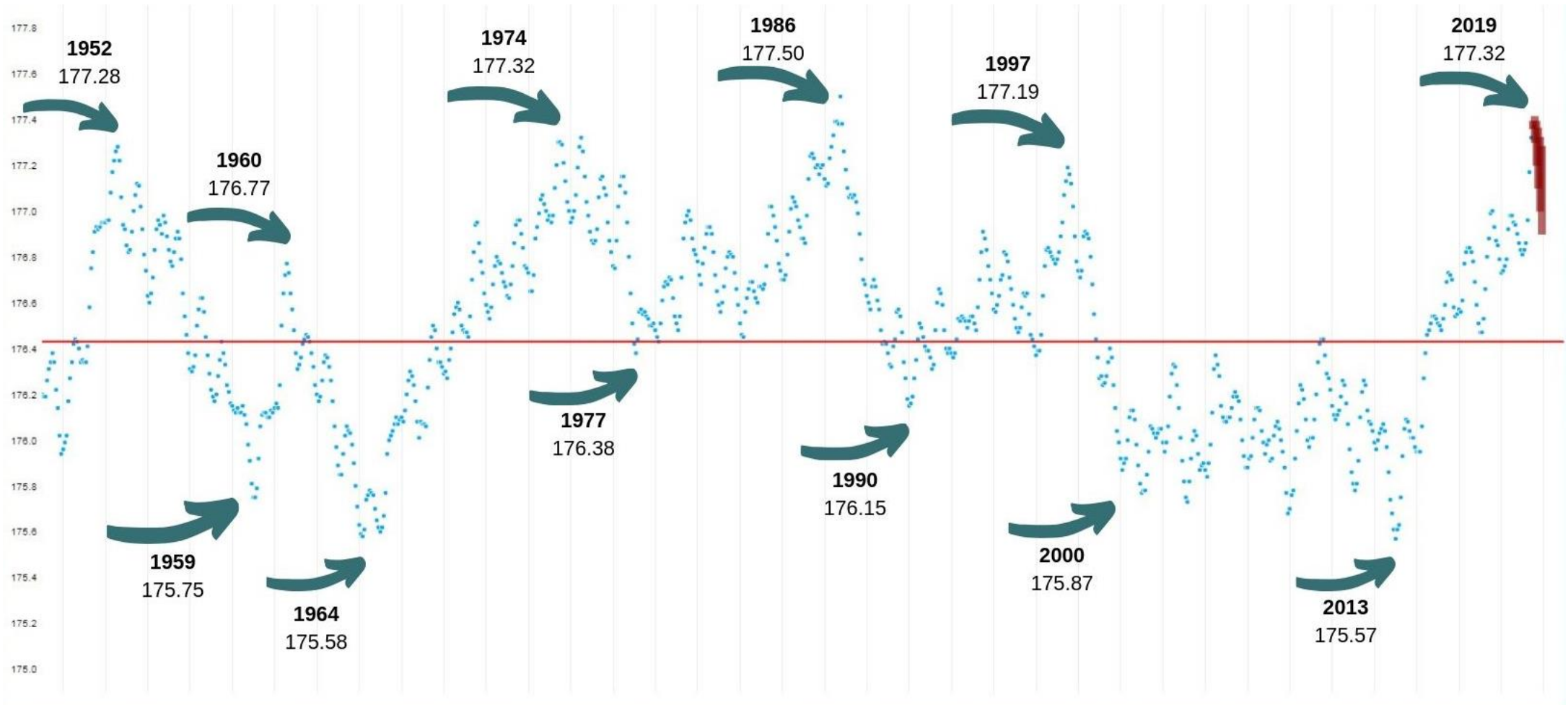
Coastal Stewardship Coordinator  
Lake Huron Centre for Coastal  
Conservation



# MANY DIFFERENT TYPES OF SHORELINES ON LAKE HURON



# HIGHS AND LOWS ON LAKE HURON





# DIFFERENCE IN PERSPECTIVE

1950



1990



2018





# OUR #1 QUESTION OF 2020

“How can I protect my shoreline”?

“Where can I find an engineer”?

“I want to build a wall, can you help me”?

“Are there funds available to help me build a wall”?

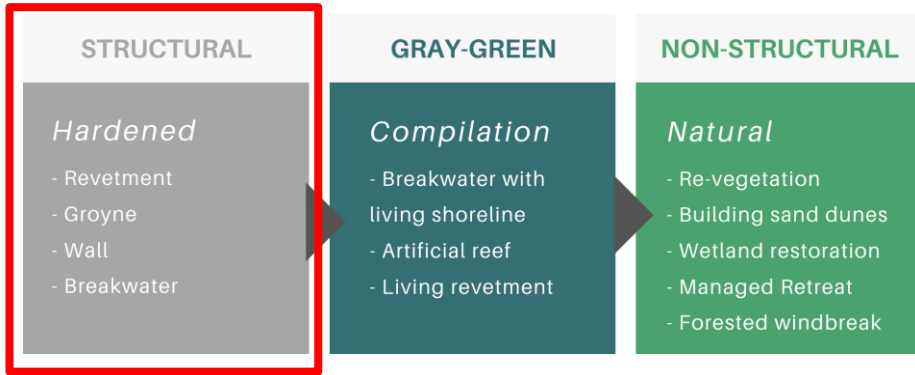




# GREY VS. GREEN INFRASTRUCTURE







*Provide no natural benefits*



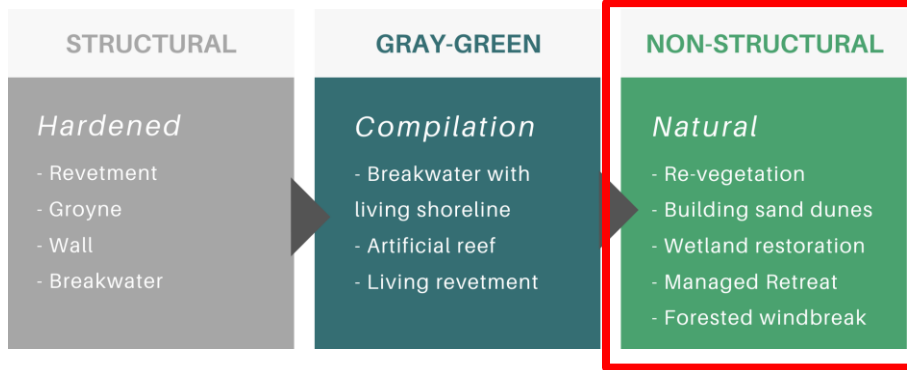




*Provide some natural benefits*





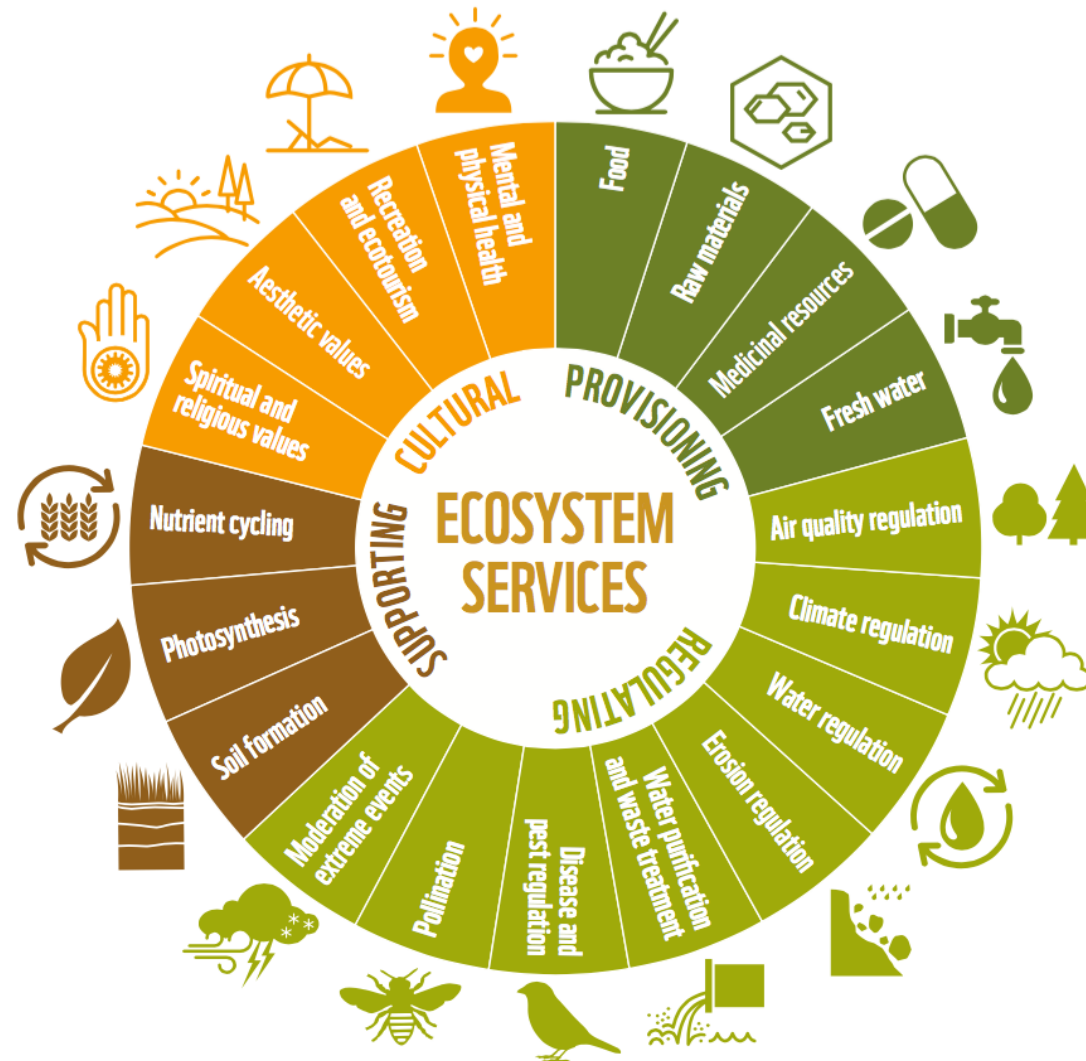


*Provide many benefits (ecosystem services)*





# WHAT ARE ECOSYSTEM SERVICES?



# ECOSYSTEM SERVICES

*...of a Dune*

- Shore protection: **\$3,000** per linear metre.
- Buffer filtering water, prevent sand drifting.
- Habitat, soil formation, erosion control
- Accumulate 23.2g/m<sup>2</sup>/yr carbon.  
*On a 22m long property, this equates to **1.12lbs/meter wide/year** accumulation of Carbon into a mature dune.*





# TYPES OF HARDENED SHORELINES

GROYNES (not groins)





# TYPES OF HARDENED SHORELINES

Metal Walls & Armour Stone





# TYPES OF HARDENED SHORELINES

Small Breakwaters





# TYPES OF HARDENED SHORELINES

'Rip-Rap' Revetments





# TYPES OF HARDENED SHORELINES

## Perpendicular Jetties



# TYPES OF HARDENED SHORELINES

Breakwalls





# HARDENING PREVALENCE



# HARDENING ISN'T IDEAL

*The Science - Biodiversity*

Biodiversity 23% lower on shorelines with seawalls vs. natural shorelines (Gittman et al. 2016).

Total organism abundance **45% lower.**

- Flora 66% lower
- Benthic infauna 20% lower
- Birds 52% lower
- Nekton 24% lower (actively swimming aquatic organisms in a body of water)

*- No difference in biodiversity on riprap revetments and natural shorelines but an alteration in type of flora and fauna present.*





# HARDENING ISN'T IDEAL

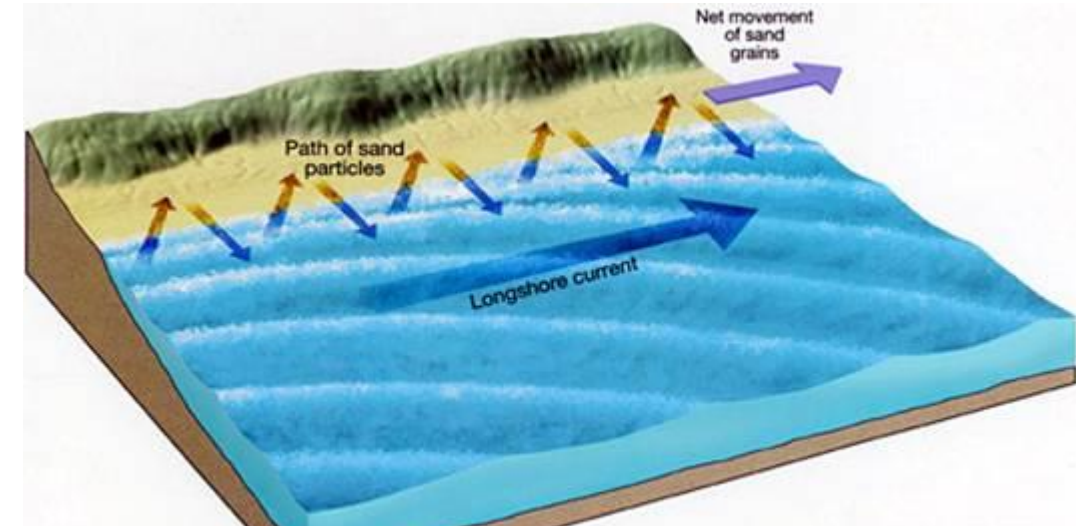
*The Science - Coastal Processes*

Sediment transport feeding beaches down drift.

- These beaches starved of sediment, causing erosion.

Nearshore Nekton require intertidal habitats to spawn and feed (seasonal flooding of wetlands).

Structures impede wave energy, redistributing it, causing more advanced nearshore erosion.

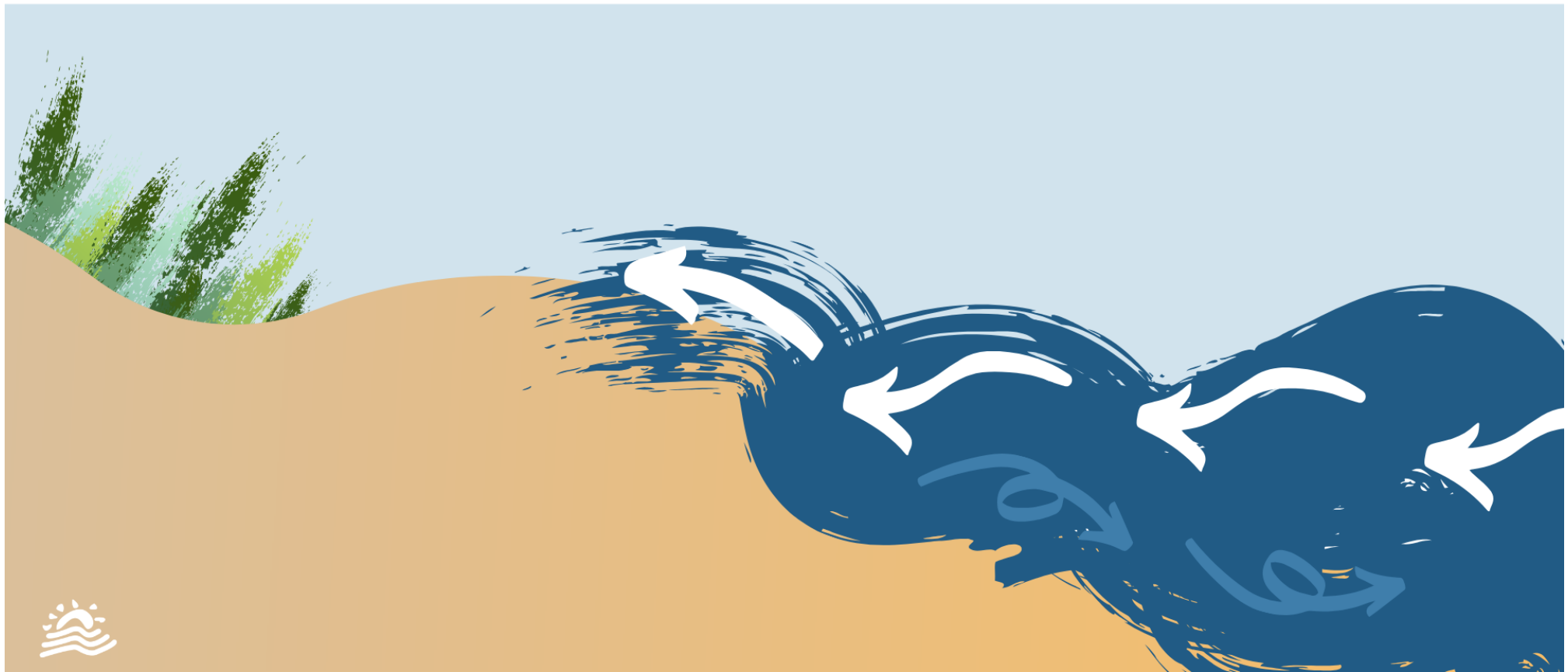


# HARDENING ISN'T IDEAL

*The Science – Erosion*

## **Natural Wave Energy Movement**

Extends up the beach, and dissipates back into the lake



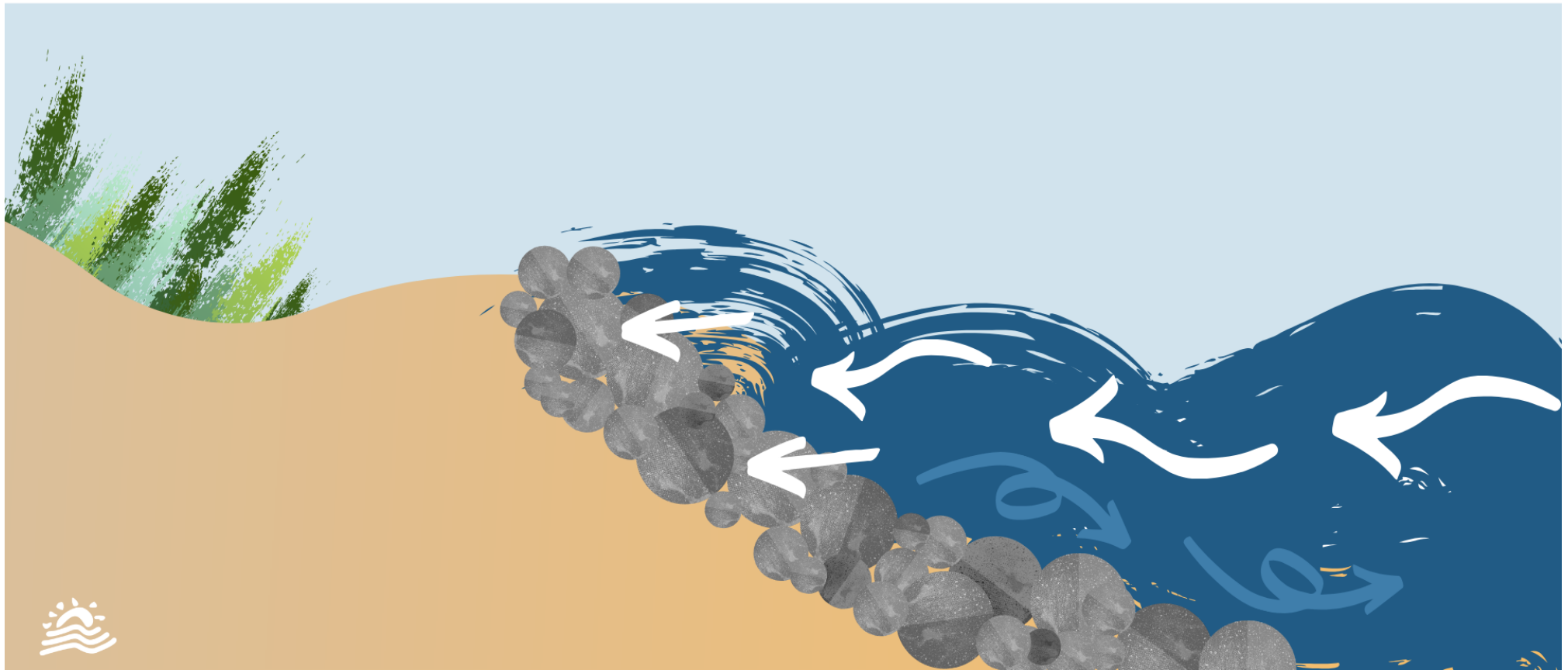


# HARDENING ISN'T IDEAL

*The Science – Erosion*

## **Wave Energy Movement on Stone**

Wave energy hits rocks, some is refracted, some is absorbed

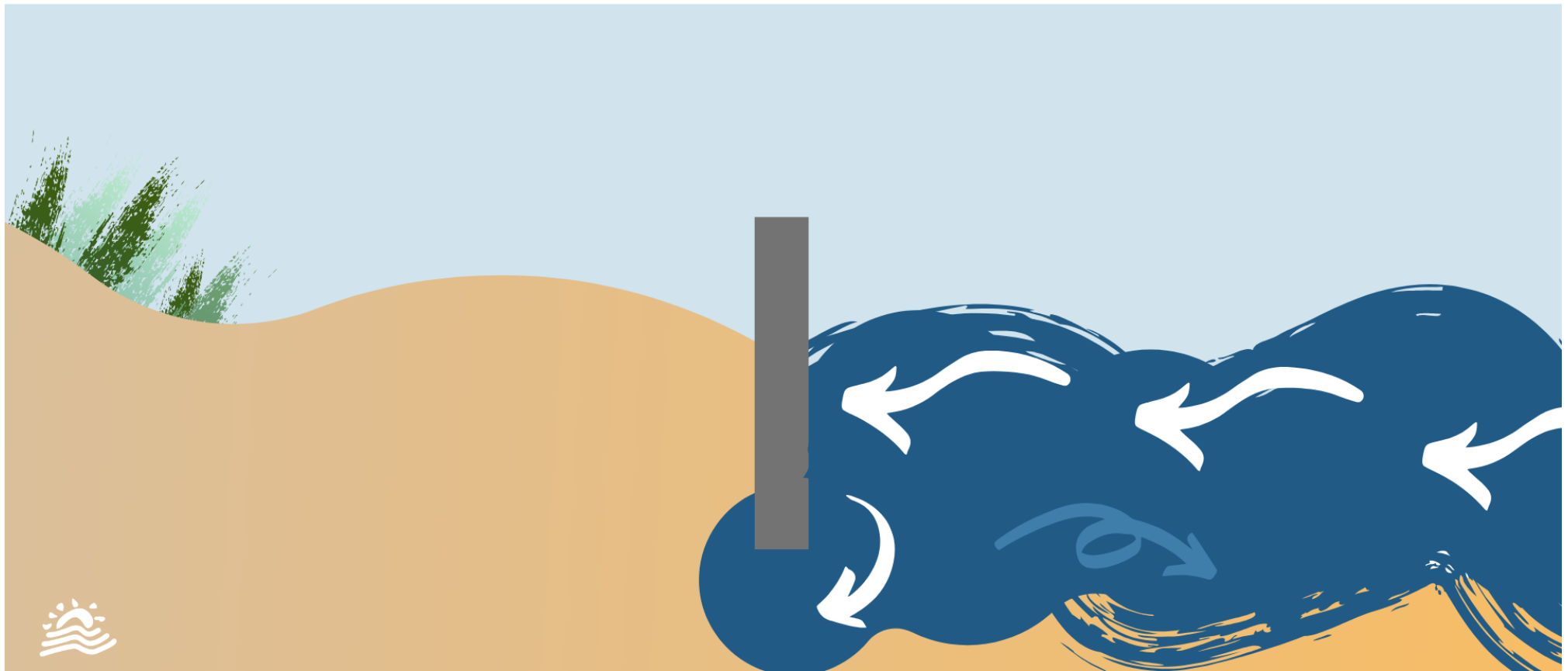


# HARDENING ISN'T IDEAL

*The Science – Erosion*

## **Hindered Wave Energy Movement**

Wave energy hits wall, refracts downward and outward



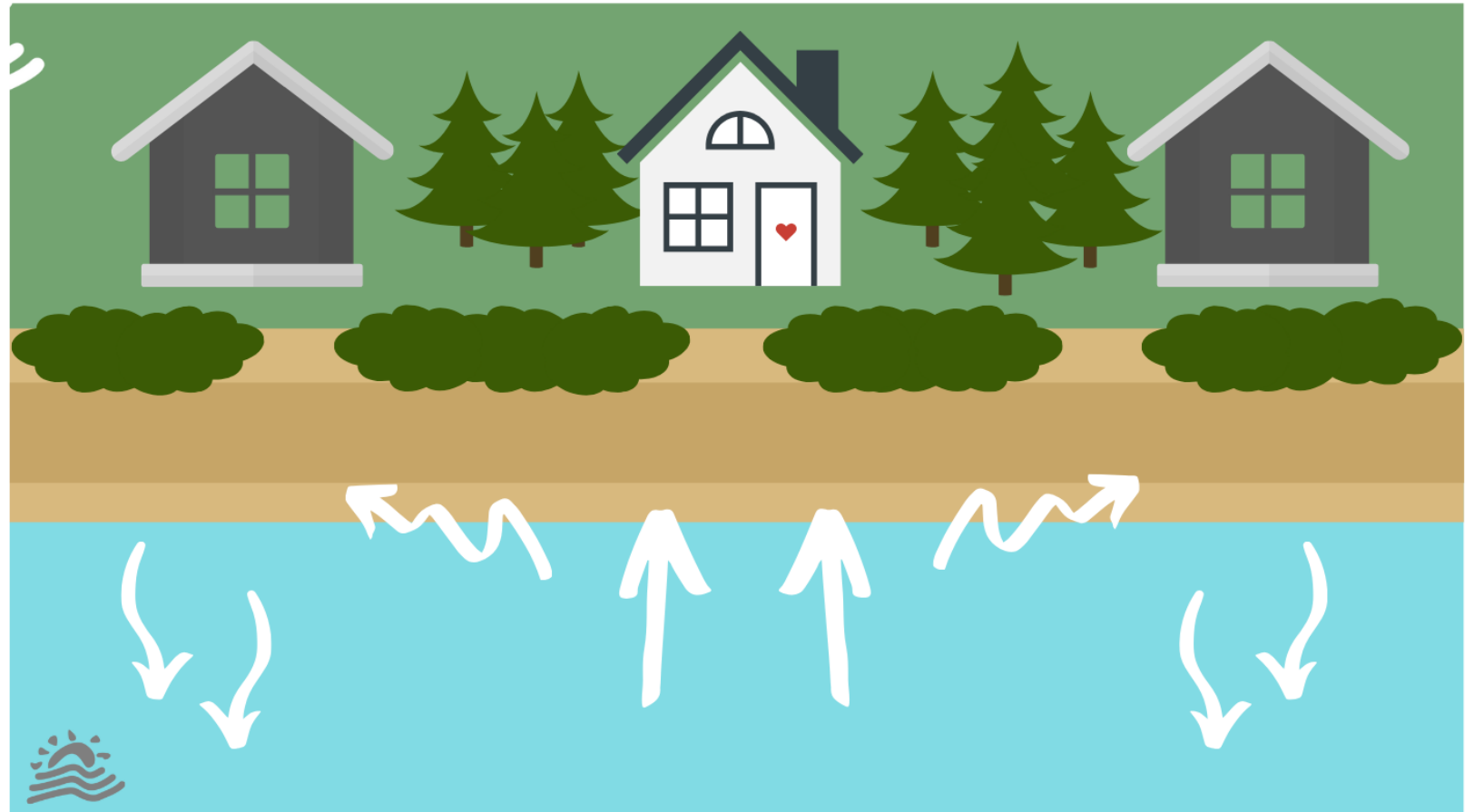


# HARDENING ISN'T IDEAL

*The Science – Erosion*

## Healthy Shoreline

Dune Buffer

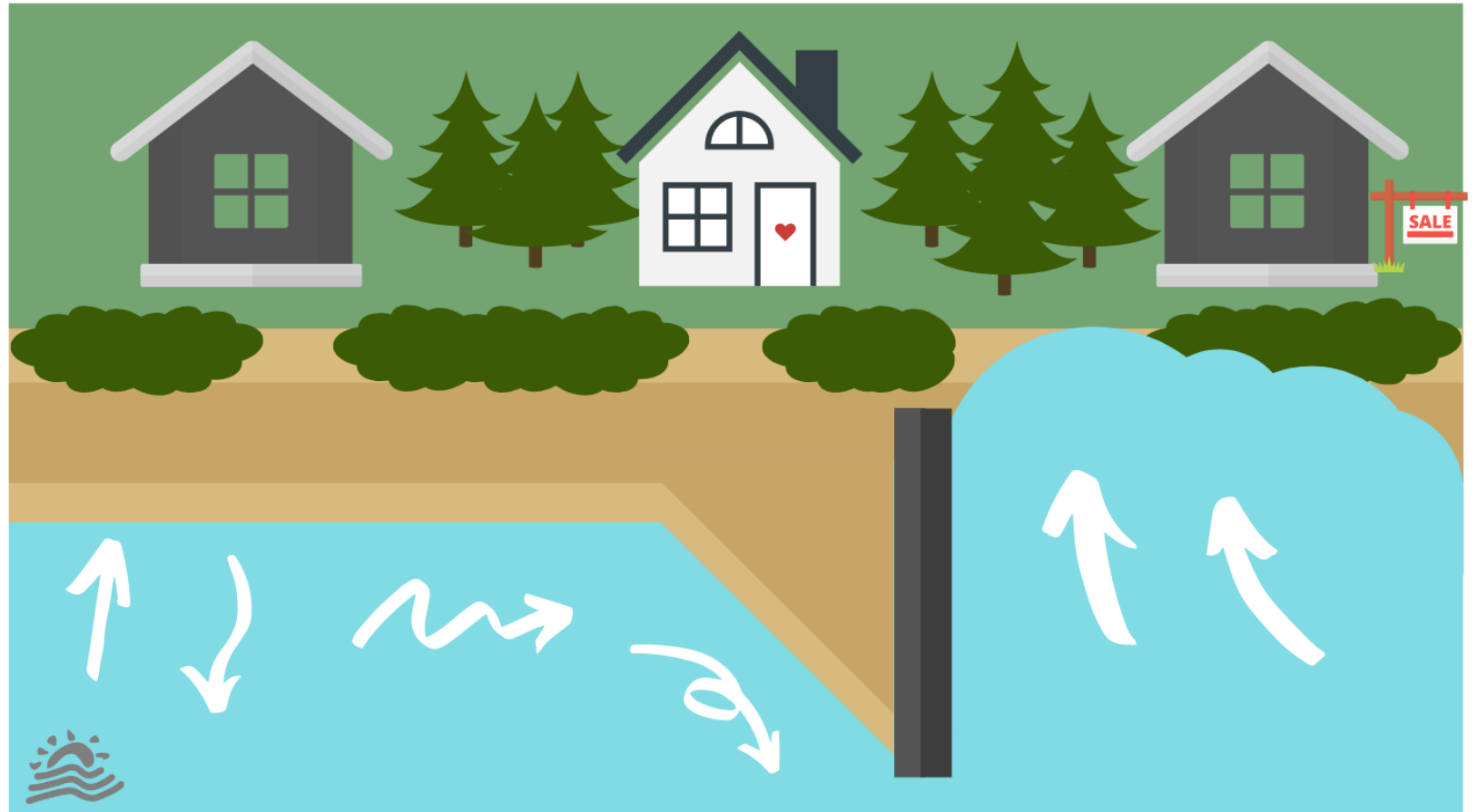


# HARDENING ISN'T IDEAL

*The Science – Erosion*

## Leeside Erosion

Metal or Rip Rap Groyne



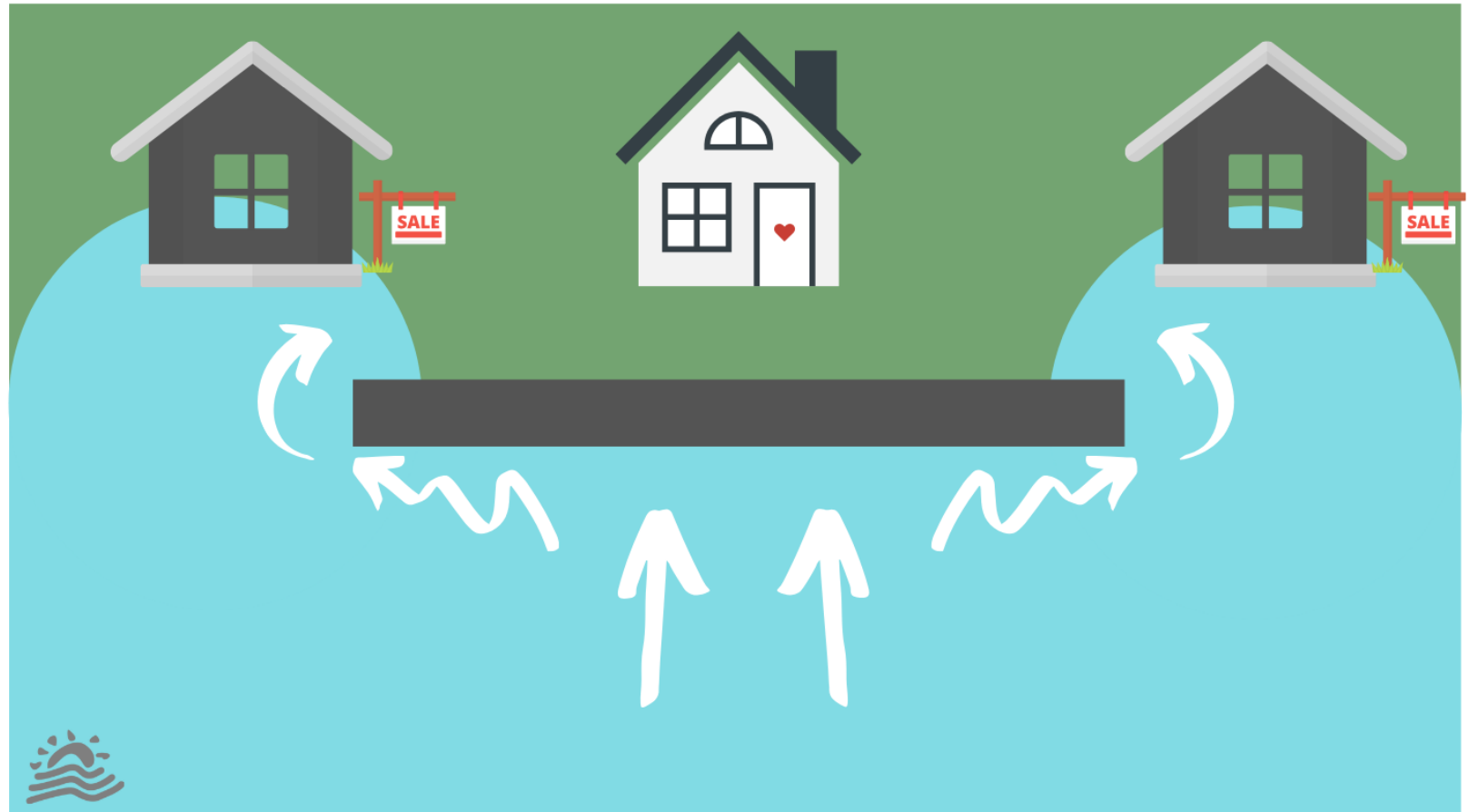


# HARDENING ISN'T IDEAL

*The Science – Erosion*

## Side erosion caused by a sea wall

Shoreline Hardening



# HARDENING ISN'T IDEAL

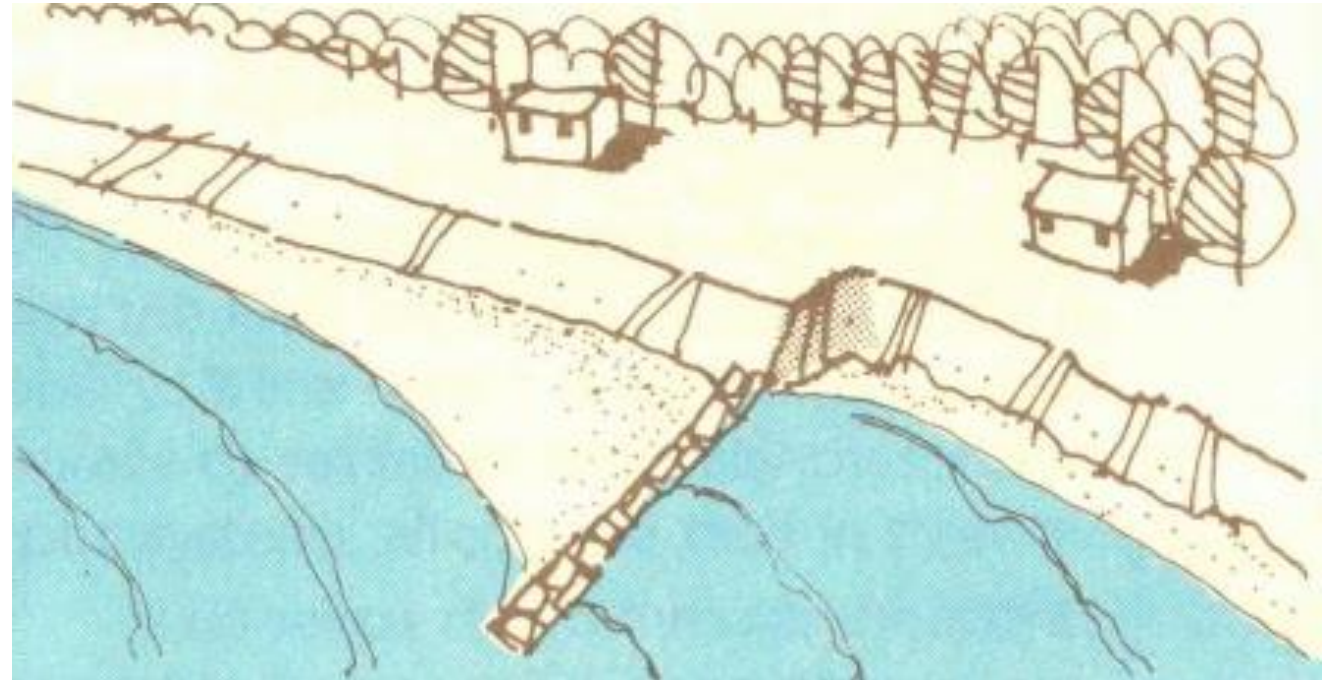
*The Science – Erosion & Liability*

“When groynes succeed in trapping beach material that would otherwise have been moved past a section of shoreline, the next section of shore through which it would also have moved is deprived of that material.

This can cause erosion that would not otherwise have occurred...

When downdrift erosion occurs, the owners of the groynes may be liable for the damage to the downdrift property, a common cause of litigation

(Philpott, MNRF, 1986).





# HARDENING ISN'T IDEAL

*The Science - Maintenance Liability*



Lack of maintenance can cause acute or chronic failure events, posing risks to humans and animals (family pets included).



# HARDENING ISN'T IDEAL

*The Fluff - Visually Offensive*



*#1 reason people enjoy the shoreline is to USE the shore to walk their dog, their grandkids can play by the water, and they can sit on the beach. That is not possible with these structures.*



# EFFECTS OF CLIMATE CHANGE

Armor-stone: rapid disintegration from greater frequency of freezing and thawing cycles.

Coastal wetlands: may become difficult to restore if water levels drop below historic low levels.

Armoring: more challenging with more frequent or more intense storm wave events, or if lake levels exceed historic high levels.



# COST COMPARISON

## *Grey vs. Green Infrastructure*

### Hardened Shore: Armour Stone

Installation cost: \$1,222/m

Maintenance cost: 5%/yr

On a 22m property: \$26,884 + \$1,344/yr

*Lifespan: ~15-25 yrs*

*Cost of removal often 50%-100% the cost of installation*

### Dune Creation:

Installation cost: \$8/m

Maintenance cost: 0%

On a 22m property: \$176 + \$0/yr

*Lifespan: indefinite*



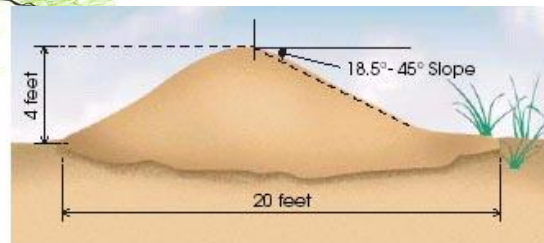
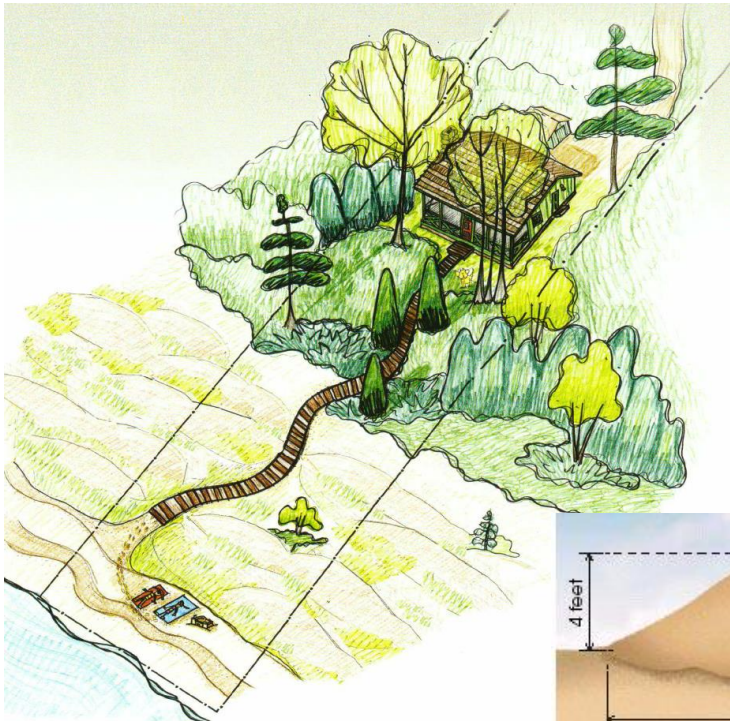


# WHAT ARE MY OPTIONS

## DUNE ENVIRONMENTS

Dunes 6-10m wide on private property

Winding path across dunes





# WHAT ARE MY OPTIONS

## BLUFF/GULLY ENVIRONMENTS

Does this look like enough  
to prevent erosion?

100m vegetated buffer  
recommended





# WHAT ARE MY OPTIONS

## WETLAND ENVIRONMENTS

Understand provincial and local regulations  
for coastal wetland protection





# WHAT ARE MY OPTIONS

## WETLAND ENVIRONMENTS

Compaction from vehicles  
Water pooling  
Lack of plants



Keep it vegetated

Avoid vehicle use on soft soil

Keep structures off coastal wetlands





# WHAT ARE MY OPTIONS

WETLAND ENVIRONMENTS

Avoid dredging





# WHAT ARE MY OPTIONS

BEDROCK ENVIRONMENTS



Pole docks and  
cantilever options  
preserve fish habitat



# WHAT ARE MY OPTIONS

## WOODLAND ENVIRONMENTS

Keep it vegetated w/ native plants (no turf grass)

Use small paths through woodlands and alvars

Protect shallow soil

Strategic pruning.  
A strip for visibility.  
Multiple layers of  
forest cover.

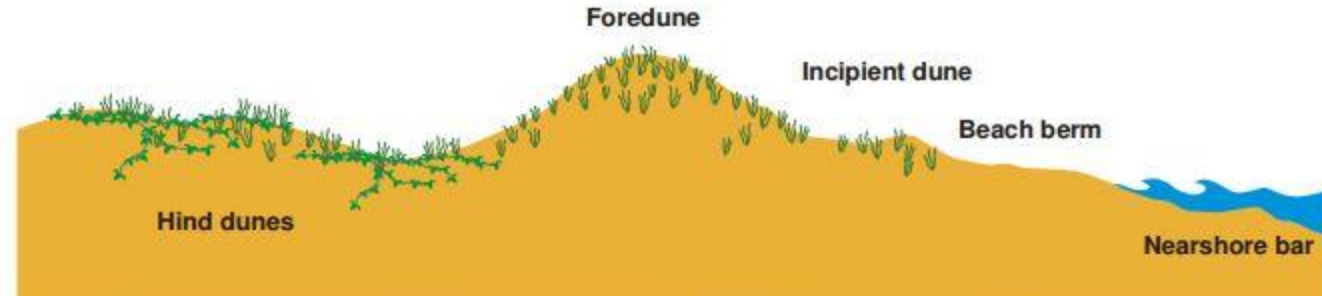


# IT TAKES TIME

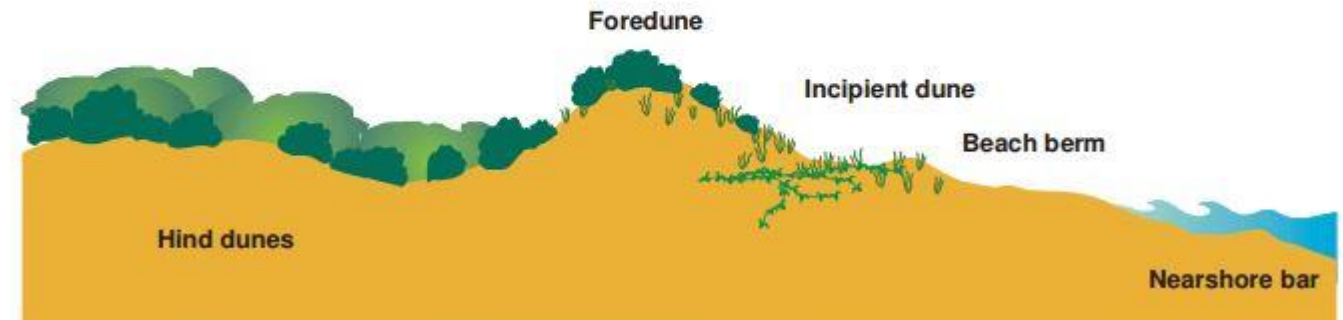
## Re-building Dunes

One wouldn't expect a tree to grow overnight, nor can we expect this of dunes

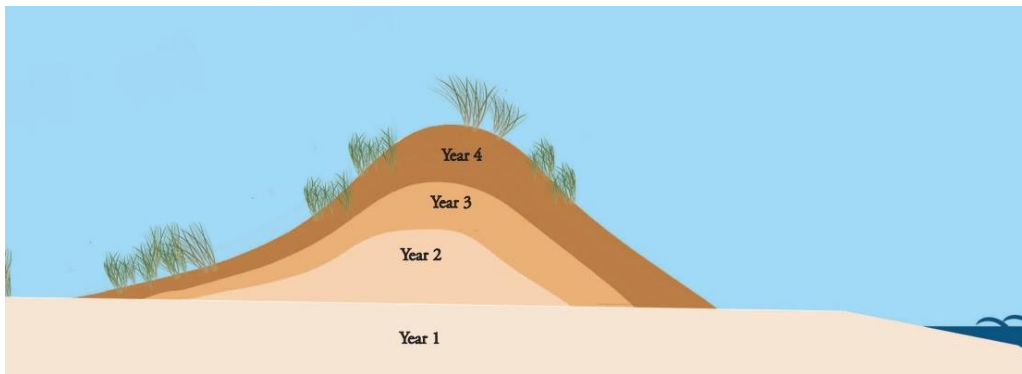
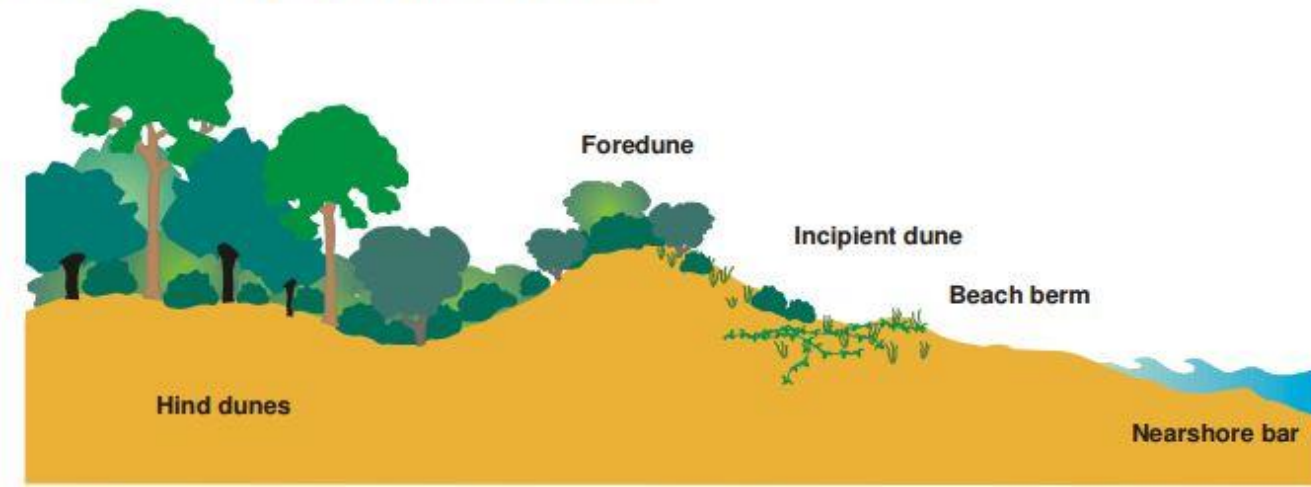
Stage 1 - Grasses and creepers (primary species)



Stage 2 - Shrubs and short-lived trees (secondary species)



Stage 3 - Long-lived trees (tertiary species)





# IT TAKES TIME

Kincardine

2019



2003





# IT TAKES TIME

Grand Bend



2019

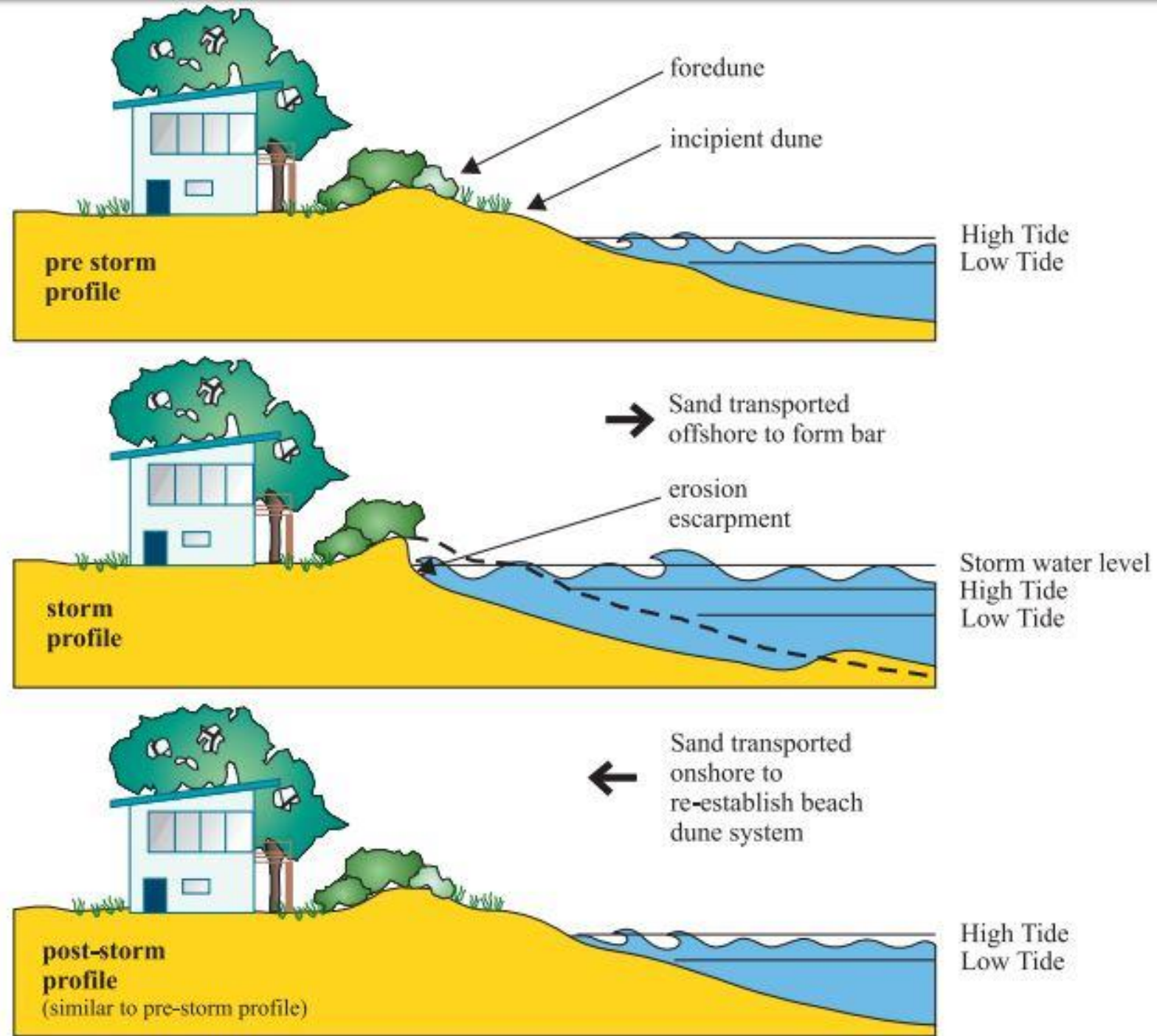


2010



# FIRST LINE OF DEFENSE

*They are meant to change and be destroyed/rebuilt*



# OPTION OF LAST RESORT

*If grey options are the only way...*

Hoops:

- 1) Conservation Authority regulations
- 2) Saugeen Ojibway Nation Environment Office approvals
- 3) Municipal By-laws and regulation (must coincide)
- 4) Ministry of Natural Resources and Forestry nearshore permits
- 5) Fathom Five National Marine Park approvals
- 6) Department of Fisheries and Oceans nearshore permits
- 7) Approved by your neighbours and community.
- 8) Get an engineer, contractor, and sometimes lawyer





# RESOURCES AVAILABLE

From the LHCCC

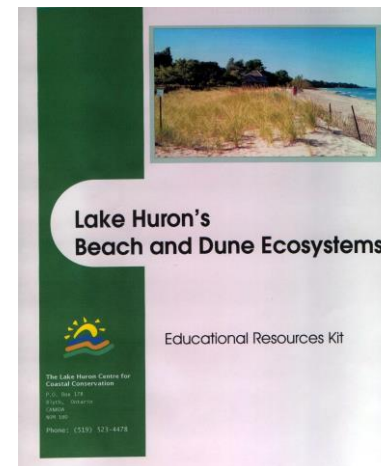
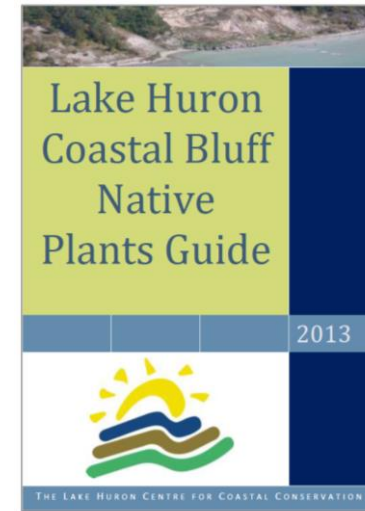
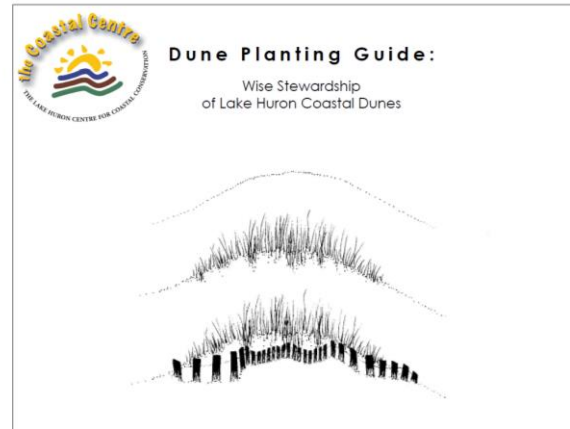


TECHNICAL DOCUMENT



THE LAKE HURON CENTRE FOR COASTAL CONSERVATION

[www.lakehuron.ca](http://www.lakehuron.ca)



[2018 Huron-Kinloss Landowners Best Management Practice Guide](#)



[Kincardine Coastal Stewardship Plan](#)



[Georgian Bay - Shoreline Stewardship Guide](#)



[Lambton - Caring for Our Coast](#)



[Port Franks Beach & Dune Stewardship Guide](#)



[Beach and Dune Guidance Manual for Saugeen Shores](#)

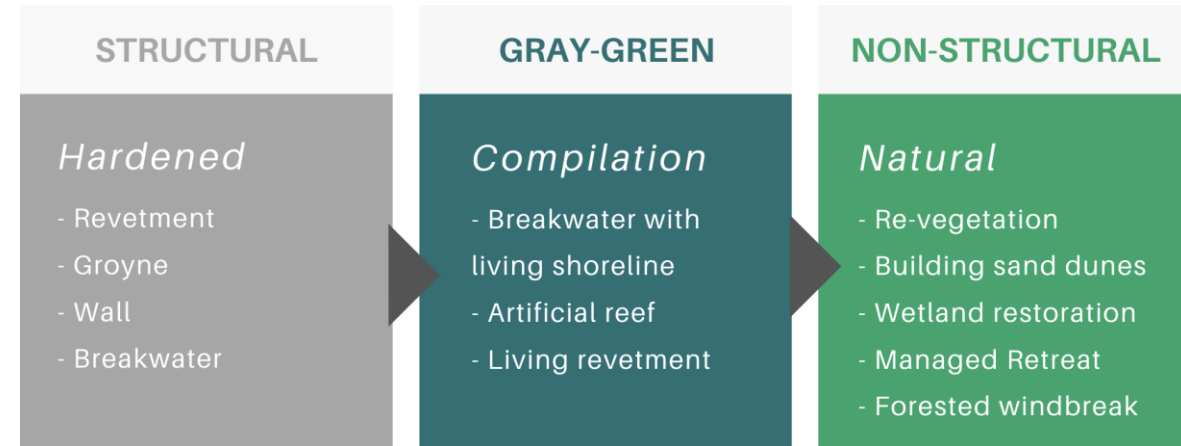


[Saugeen Beach Management Plan](#)



[Management Plan for North Sauble Beach](#)

# SUMMARY



- Consider Natural Methods FIRST - (ecosystem services, cost, hoops, maintenance)
- Be Aware - understand your unique situation by educating yourself about the risks
- Hard Decisions - Be realistic with your situation, don't "pour money into a bottomless bag"
- Be Brave - putting faith in natural infrastructure is abnormal in today's society; think of the long-term benefits/ savings, not the short-term gain
- Remember Why - you are at the lake, for her beauty, recreation, relaxation and culture.  
Think of how your choices fit within the true reasons for being here, do they align?



# WE ARE HAVING A CONFERENCE!

Follow us on:



Our 11th biennial conference provides an opportunity to learn from experts in the Great Lakes region about coastal topics, local actions and solutions to environmental challenges.

Register: [www.lakehuron.ca/conference](http://www.lakehuron.ca/conference)



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# QUESTIONS!

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