



**CLIMATE CHANGE:
2021 and Beyond**

Preparing our communities for the future.

Great Lakes and St. Lawrence Cities Initiative Presents:

Prioritizing Nature-Based Solutions in Resilience Projects

**Jason Stangland / Waterfront Practice Director
SMITHGROUP**

WHY ARE WE TALKING ABOUT THIS?



GREAT LAKES AND ST. LAWRENCE
CITIES INITIATIVE
L'ALLIANCE DES VILLES
DES GRANDS LACS ET DU SAINT-LAURENT



CLIMATE CHANGE:
2021 and Beyond
Preparing our communities for the future.

THE FORECAST

**“Expect Higher
Highs and
Lower Lows”**



**GREAT LAKES AND ST. LAWRENCE
CITIES INITIATIVE**
L'ALLIANCE DES VILLES
DES GRANDS LACS ET DU SAINT-LAURENT



**CLIMATE CHANGE:
2021 and Beyond**

Preparing our communities for the future.

RAPID EVOLUTION



GREAT LAKES AND ST. LAWRENCE
CITIES INITIATIVE
L'ALLIANCE DES VILLES
DES GRANDS LACS ET DU SAINT-LAURENT



**CLIMATE CHANGE:
2021 and Beyond**
Preparing our communities for the future.

EROSION



GREAT LAKES AND ST. LAWRENCE
CITIES INITIATIVE
L'ALLIANCE DES VILLES
DES GRANDS LACS ET DU SAINT-LAURENT



CLIMATE CHANGE:
2021 and Beyond
Preparing our communities for the future.

SLUMPS



Brian Peterson – Star Tribune



GREAT LAKES AND ST. LAWRENCE
CITIES INITIATIVE
L'ALLIANCE DES VILLES
DES GRANDS LACS ET DU SAINT-LAURENT



CLIMATE CHANGE:
2021 and Beyond

Preparing our communities for the future.

FAILING FOUNDATIONS



GREAT LAKES AND ST. LAWRENCE
CITIES INITIATIVE
L'ALLIANCE DES VILLES
DES GRANDS LACS ET DU SAINT-LAURENT



CLIMATE CHANGE:
2021 and Beyond
Preparing our communities for the future.

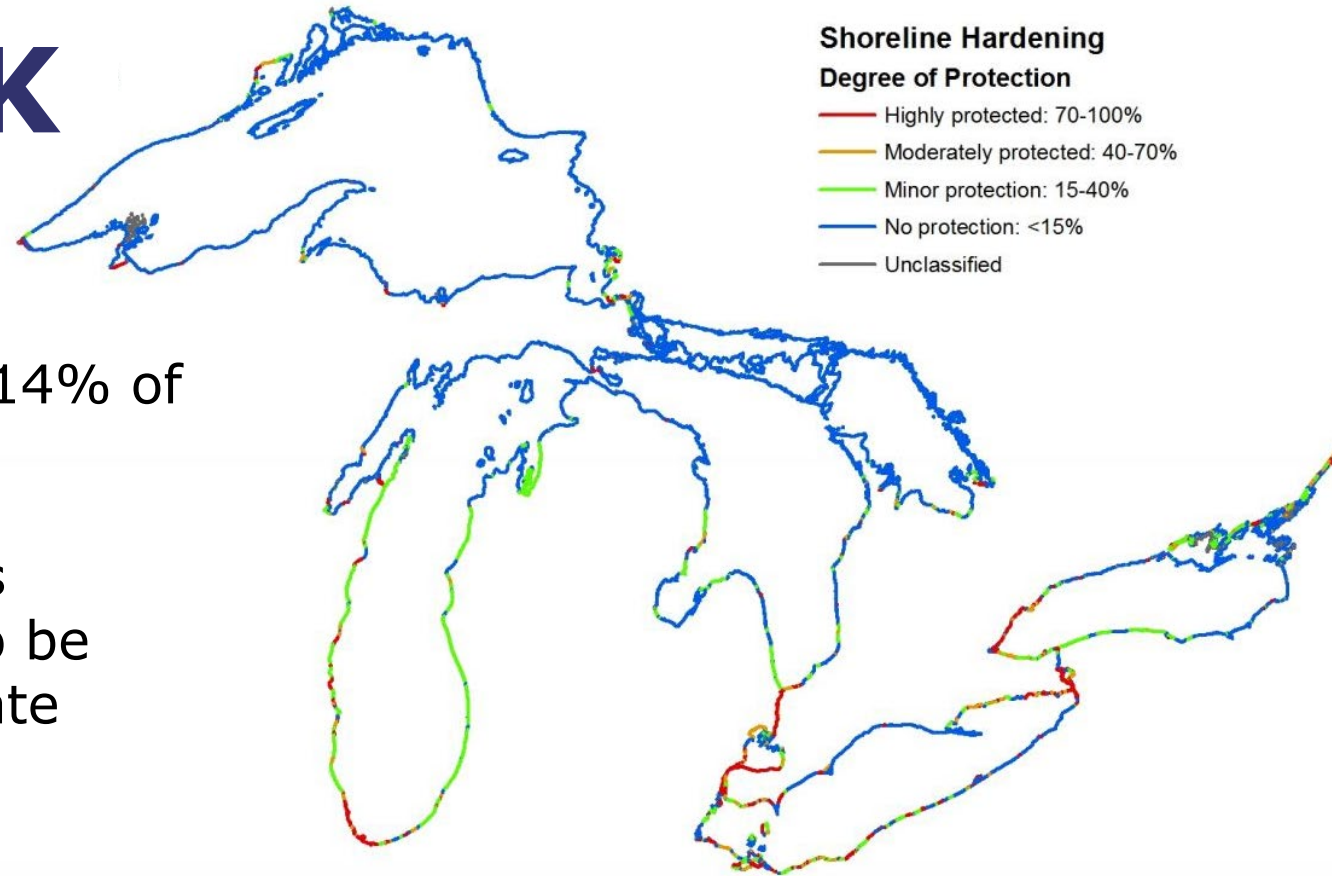
A HARDER LOOK

National Perspective

- 2015 Academic Research Study – 14% of continental US shoreline armored (>14,000 miles)
- NOAA Projection – 1/3rd of nation's contiguous shoreline anticipated to be armored by year 2100 if current rate continues.

Great Lakes Perspective

- 98% of Lucas County (western Lake Erie) hardened and armored
- As much as 83% of US Lake Erie Shoreline protected / hardened.
- St. Clair, Detroit and Niagara Rivers have 44 – 70% of shoreline artificially hardened.



Created by the Great Lakes Environmental Assessment and Mapping Project (GLEAM), 2012
Website: <http://www.greatlakesmapping.org>



GREAT LAKES AND ST. LAWRENCE
CITIES INITIATIVE
L'ALLIANCE DES VILLES
DES GRANDS LACS ET DU SAINT-LAURENT



CLIMATE CHANGE:
2021 and Beyond
Preparing our communities for the future.

ARMORING ALTERNATIVES

Reasons to think differently:

- Riparian / shoreline habitat loss
- Aesthetics
- Adaptable – responsive to change
- Multi-purpose investment



GREAT LAKES AND ST. LAWRENCE
CITIES INITIATIVE
L'ALLIANCE DES VILLES
DES GRANDS LACS ET DU SAINT-LAURENT



CLIMATE CHANGE:
2021 and Beyond
Preparing our communities for the future.

**WHAT CAN ~~I~~ DO
ABOUT IT?**

We

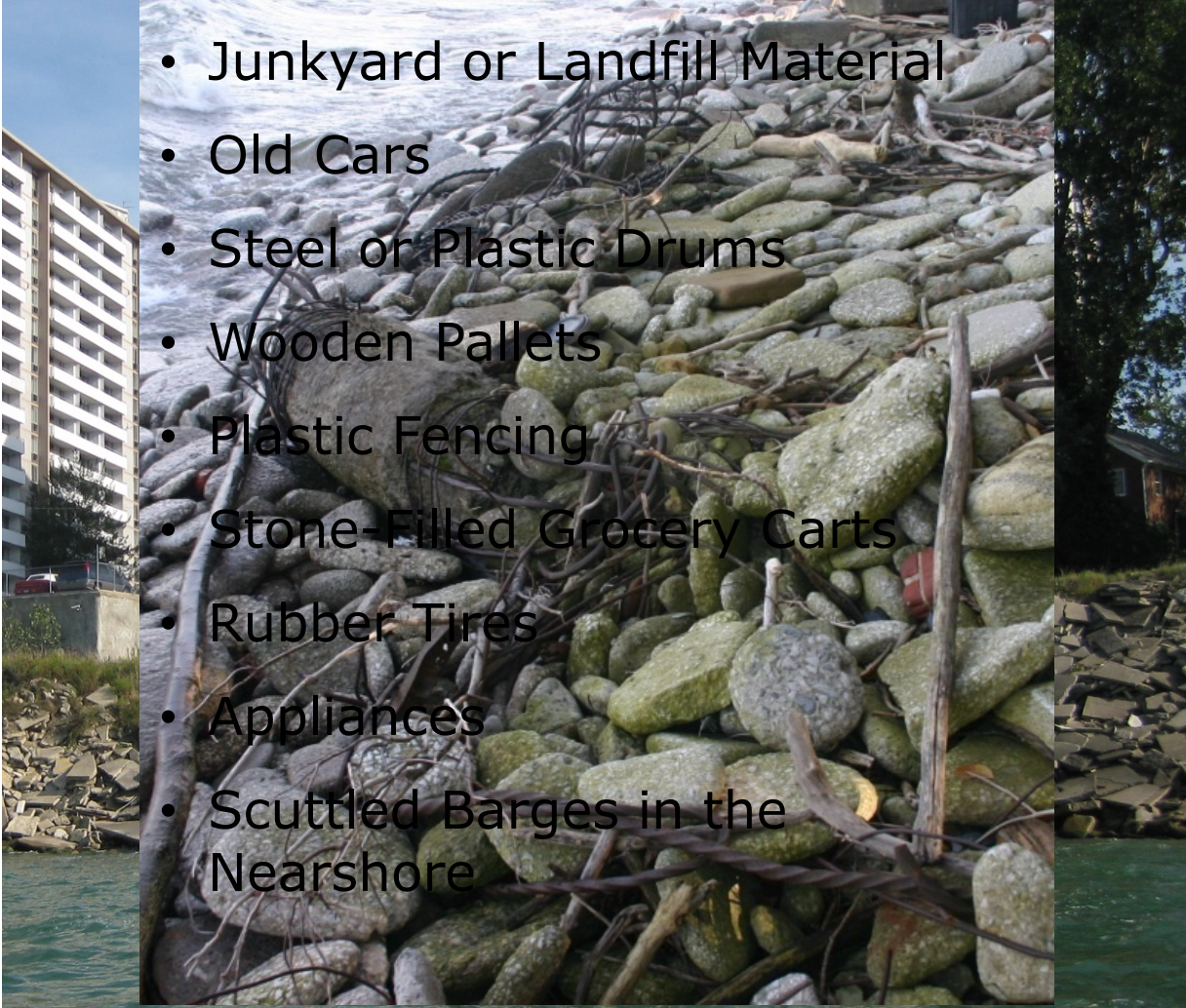


**GREAT LAKES AND ST. LAWRENCE
CITIES INITIATIVE**
L'ALLIANCE DES VILLES
DES GRANDS LACS ET DU SAINT-LAURENT



**CLIMATE CHANGE:
2021 and Beyond**
Preparing our communities for the future.

JUST...DON'T. PLEASE

- 
- Junkyard or Landfill Material
 - Old Cars
 - Steel or Plastic Drums
 - Wooden Pallets
 - Plastic Fencing
 - Stone-Filled Grocery Carts
 - Rubber Tires
 - Appliances
 - Scuttled Barges in the Nearshore

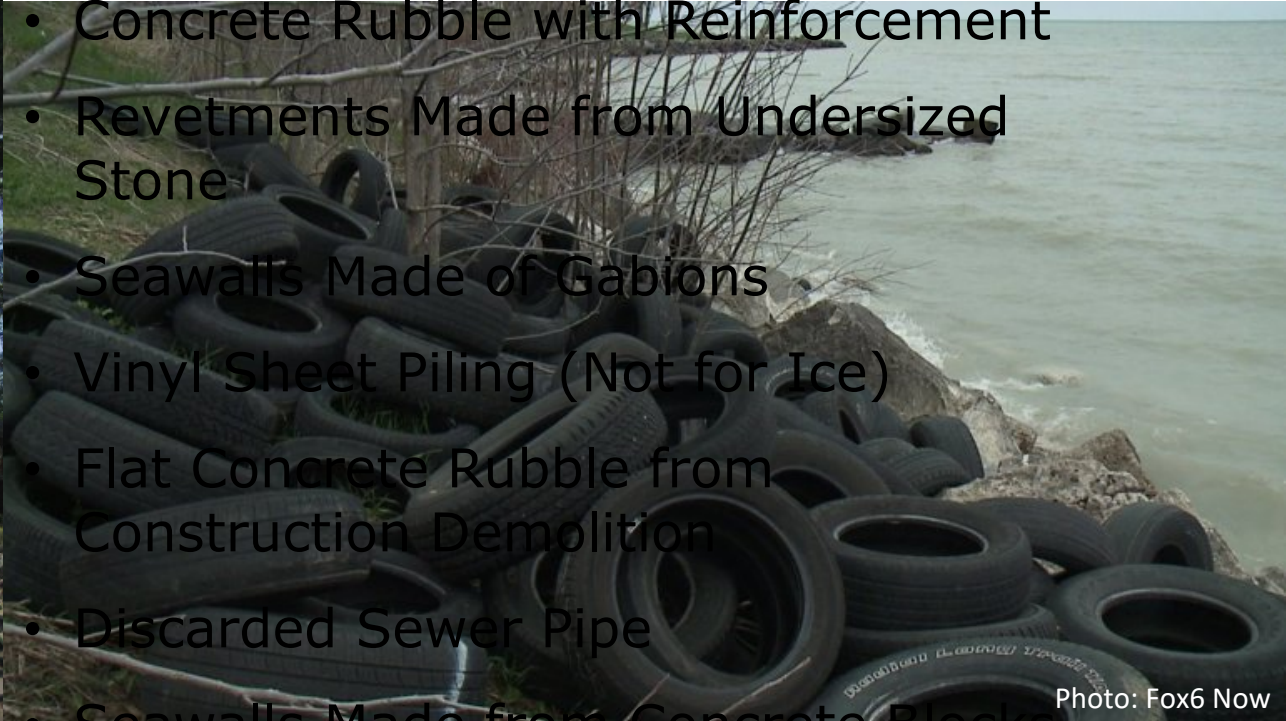
- 
- Concrete Rubble with Reinforcement
 - Revetments Made from Undersized Stone
 - Seawalls Made of Gabions
 - Vinyl Sheet Piling (Not for Ice)
 - Flat Concrete Rubble from Construction Demolition
 - Discarded Sewer Pipe
 - Seawalls Made from Concrete Blocks
 - Sand-Filled Bags

Photo: Fox6 Now

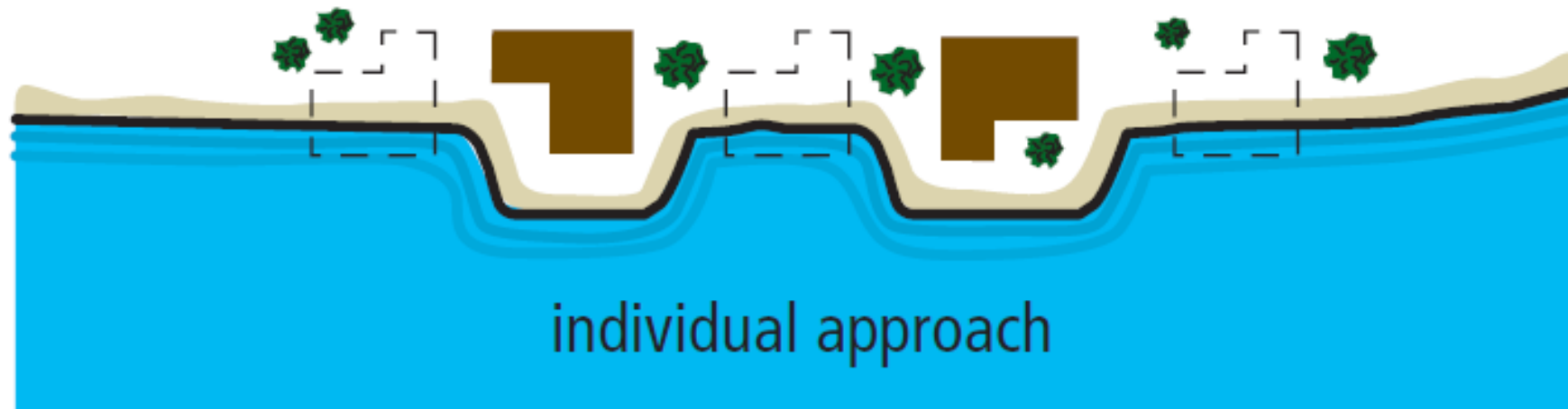
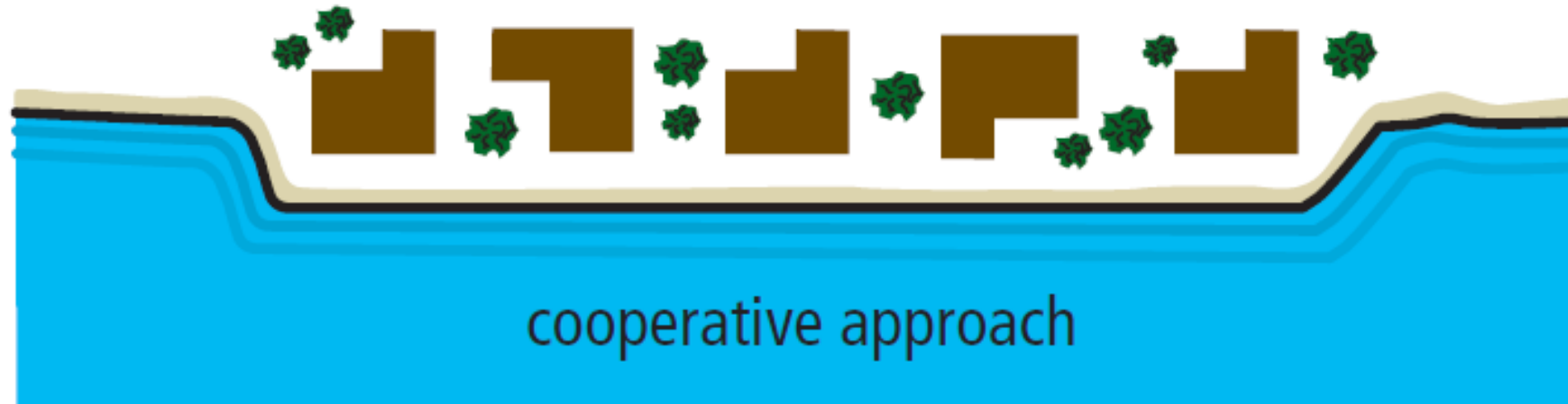


GREAT LAKES AND ST. LAWRENCE
CITIES INITIATIVE
L'ALLIANCE DES VILLES
DES GRANDS LACS ET DU SAINT-LAURENT



CLIMATE CHANGE:
2021 and Beyond
Preparing our communities for the future.

WORK TOGETHER

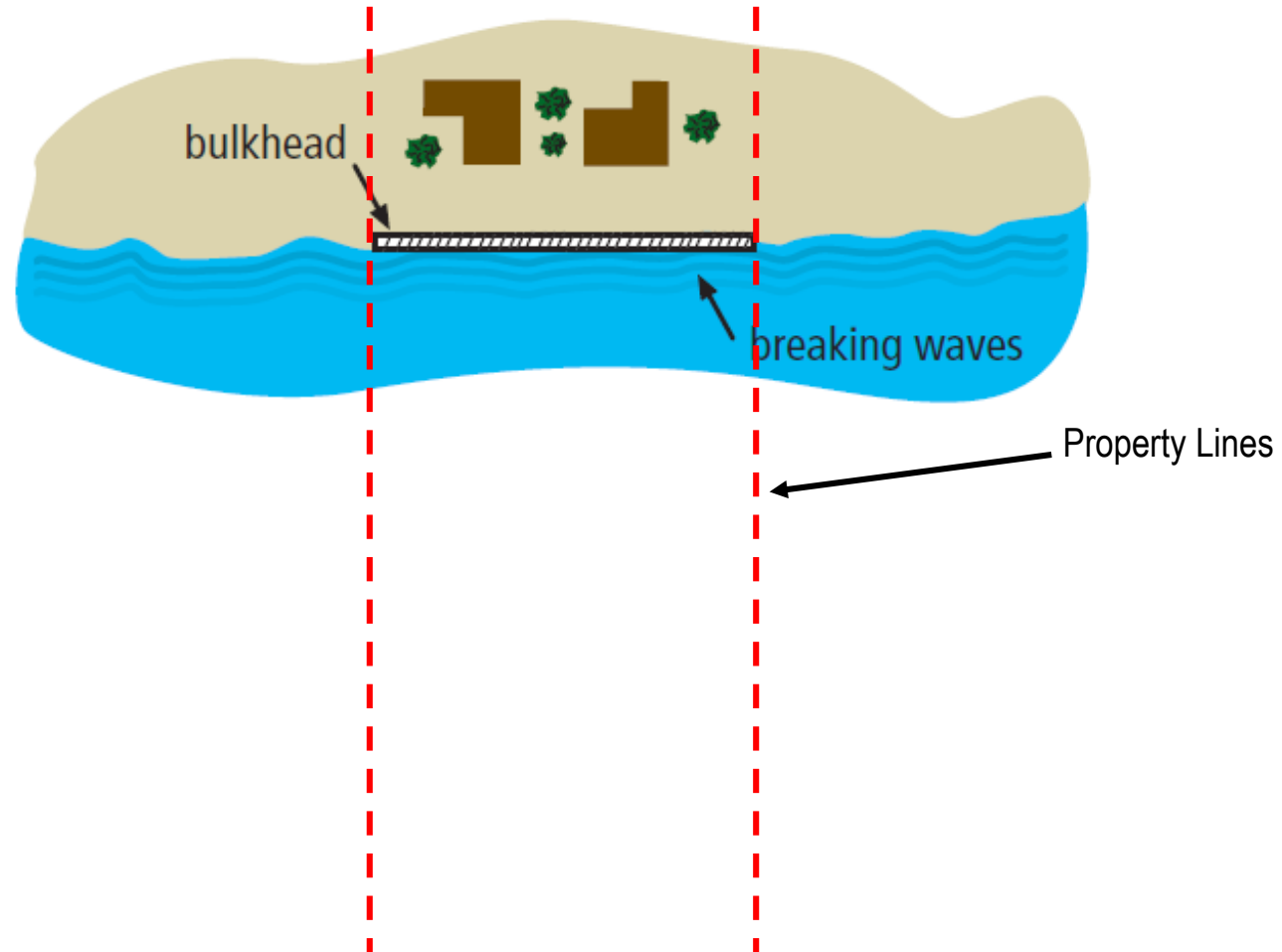


GREAT LAKES AND ST. LAWRENCE
CITIES INITIATIVE
L'ALLIANCE DES VILLES
DES GRANDS LACS ET DU SAINT-LAURENT



CLIMATE CHANGE:
2021 and Beyond
Preparing our communities for the future.

WORK TOGETHER



GREAT LAKES AND ST. LAWRENCE
CITIES INITIATIVE
L'ALLIANCE DES VILLES
DES GRANDS LACS ET DU SAINT-LAURENT



CLIMATE CHANGE:
2021 and Beyond
Preparing our communities for the future.

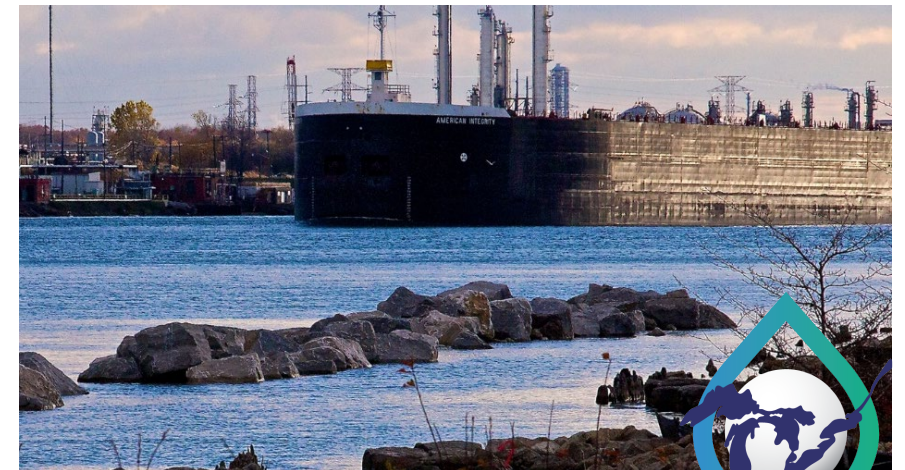
EXPLORE ALTERNATIVE MODELS

Nature Based Shoreline Goals

1. Stabilize shorelines and prevent erosion
2. Restore or enhance habitat to support increased species diversity and production
3. Maintain / support natural processes (i.e. longshore transport)
4. Improve water quality
5. Maintain the land-water interface

Key Factors for Living Shoreline Implementation

- Wave energy (< 1 ft for soft stuff...)
- Nearshore bathymetry (depth, etc.)
- Sunlight
- Shoreline orientation / geometry
- Fetch distance (distance for waves to form)
- Boat wakes / bow thrusters

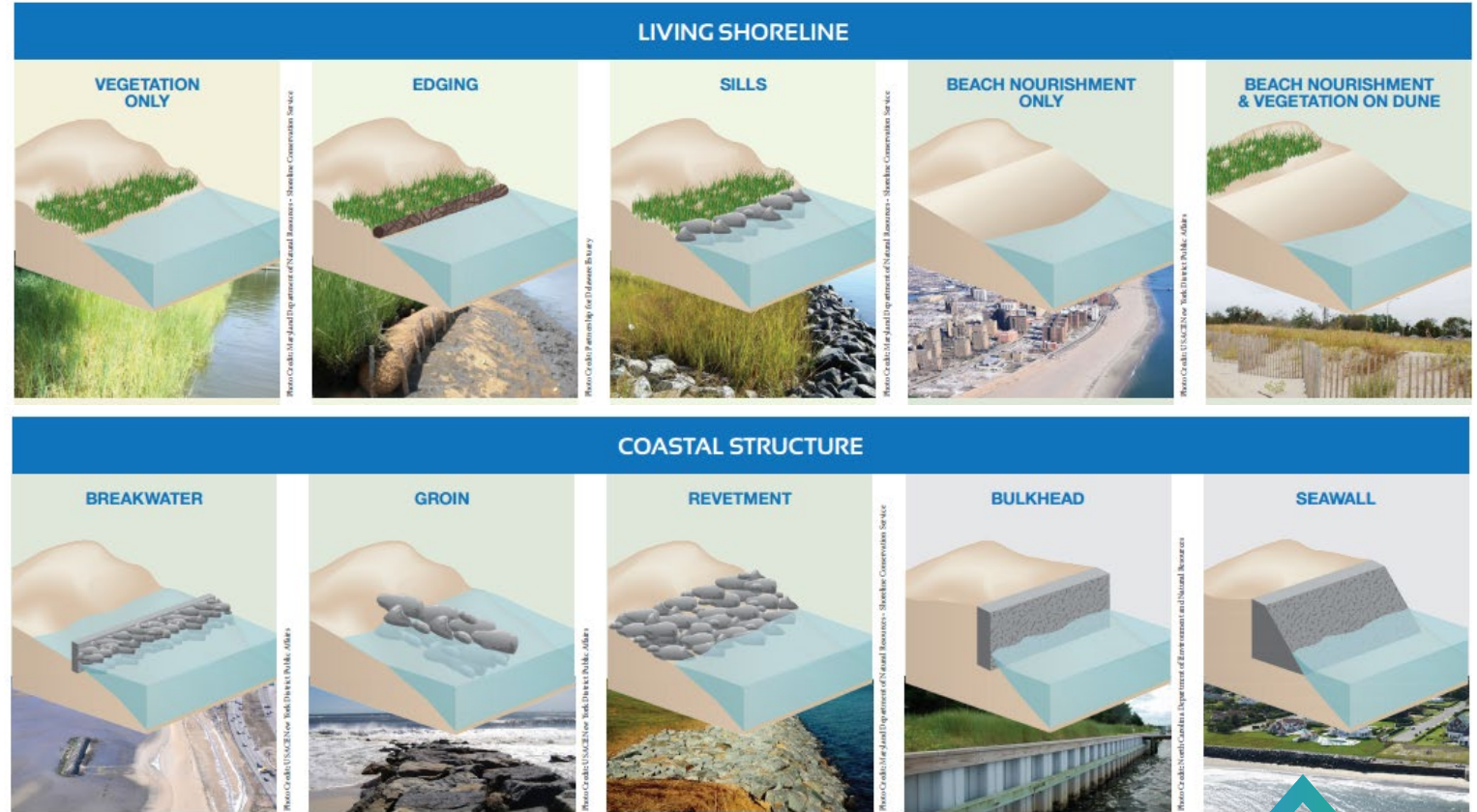
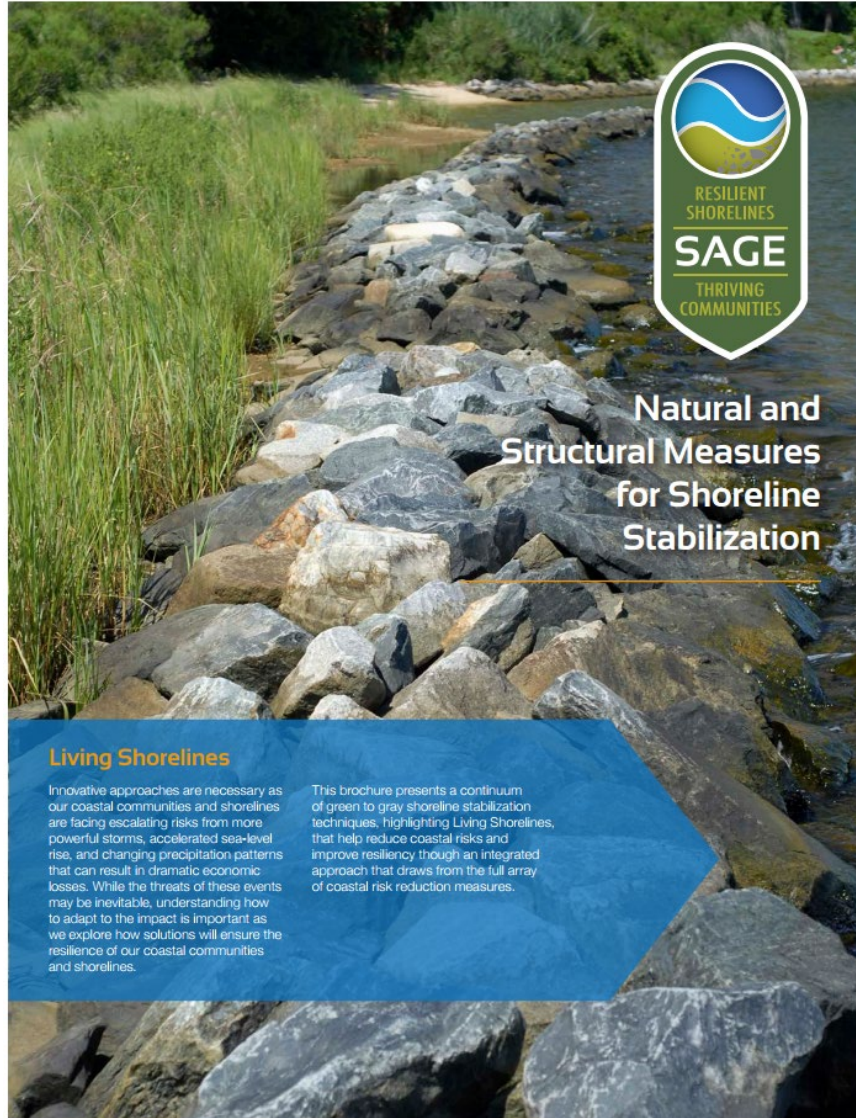


GREAT LAKES AND ST. LAWRENCE
CITIES INITIATIVE
L'ALLIANCE DES VILLES
DES GRANDS LACS ET DU SAINT-LAURENT



CLIMATE CHANGE:
2021 and Beyond
Preparing our communities for the future.

EXPLORE ALTERNATIVE MODELS



The Green | Gray Spectrum



**GREAT LAKES AND ST. LAWRENCE
CITIES INITIATIVE
L'ALLIANCE DES VILLES
DES GRANDS LACS ET DU SAINT-LAURENT**



**CLIMATE CHANGE:
2021 and Beyond**
Preparing our communities for the future.

WHAT'S IT LOOK LIKE?



GREAT LAKES AND ST. LAWRENCE
CITIES INITIATIVE
L'ALLIANCE DES VILLES
DES GRANDS LACS ET DU SAINT-LAURENT



CLIMATE CHANGE:
2021 and Beyond
Preparing our communities for the future.

GREEN | GRAY EXAMPLES



GREEN | GRAY EXAMPLES

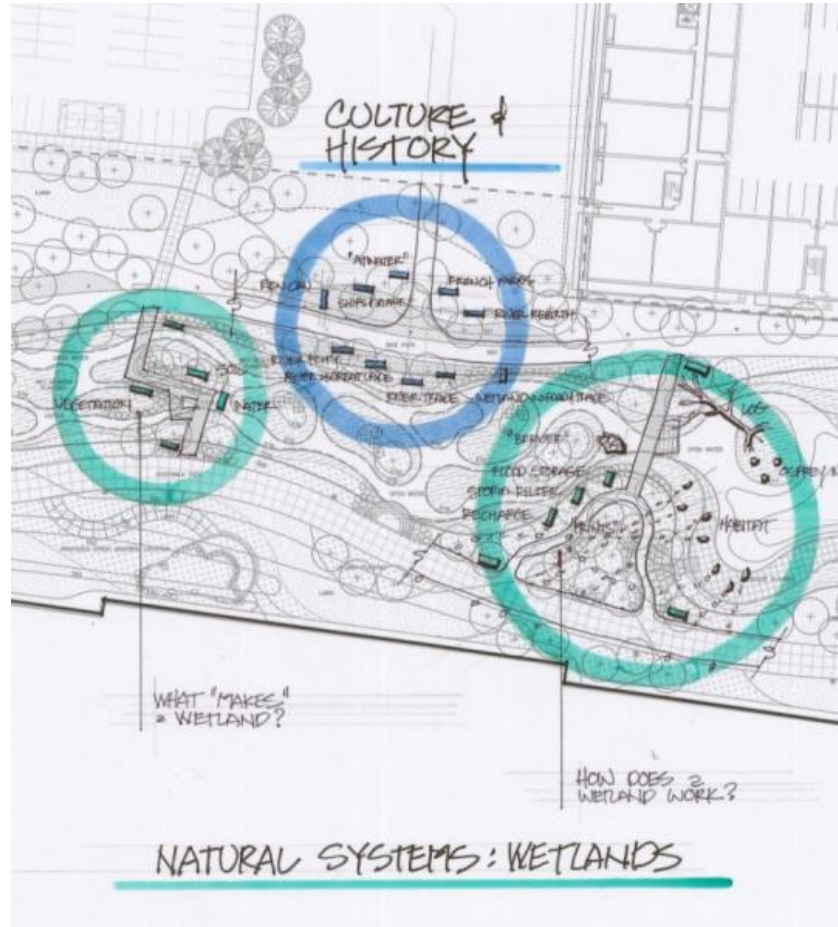


GREAT LAKES AND ST. LAWRENCE
CITIES INITIATIVE
L'ALLIANCE DES VILLES
DES GRANDS LACS ET DU SAINT-LAURENT



CLIMATE CHANGE:
2021 and Beyond
Preparing our communities for the future.

GREEN | GRAY EXAMPLES



GREAT LAKES AND ST. LAWRENCE
CITIES INITIATIVE
L'ALLIANCE DES VILLES
DES GRANDS LACS ET DU SAINT-LAURENT



CLIMATE CHANGE:
2021 and Beyond
Preparing our communities for the future.

EXPLORE ALTERNATIVE MODELS



GREAT LAKES AND ST. LAWRENCE
CITIES INITIATIVE
L'ALLIANCE DES VILLES
DES GRANDS LACS ET DU SAINT-LAURENT



**CLIMATE CHANGE:
2021 and Beyond**
Preparing our communities for the future.

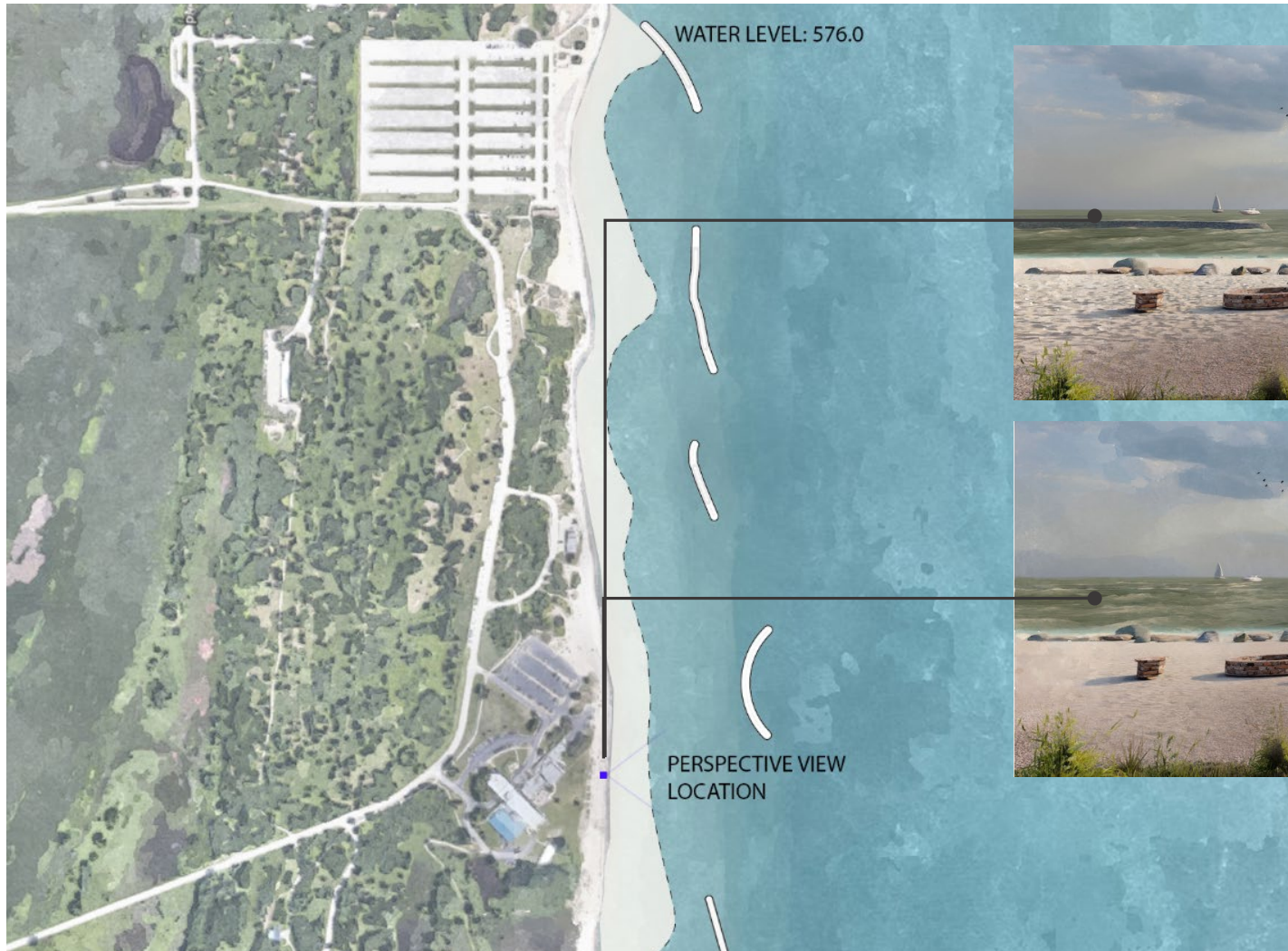
GREEN | GRAY EXAMPLES



GREEN | GRAY EXAMPLES



GREEN | GRAY EXAMPLES



GREAT LAKES AND ST. LAWRENCE
CITIES INITIATIVE
L'ALLIANCE DES VILLES
DES GRANDS LACS ET DU SAINT-LAURENT

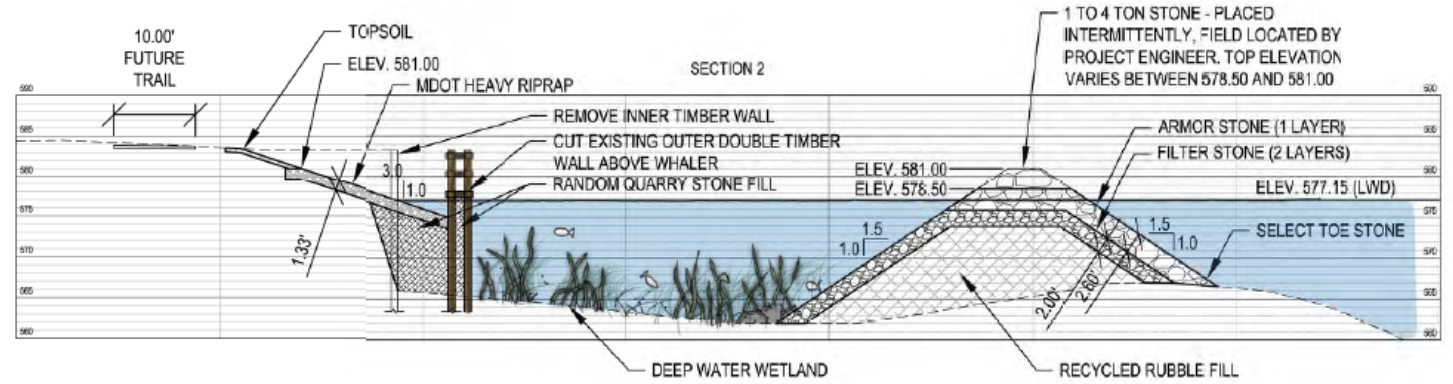


CLIMATE CHANGE:
2021 and Beyond
Preparing our communities for the future.

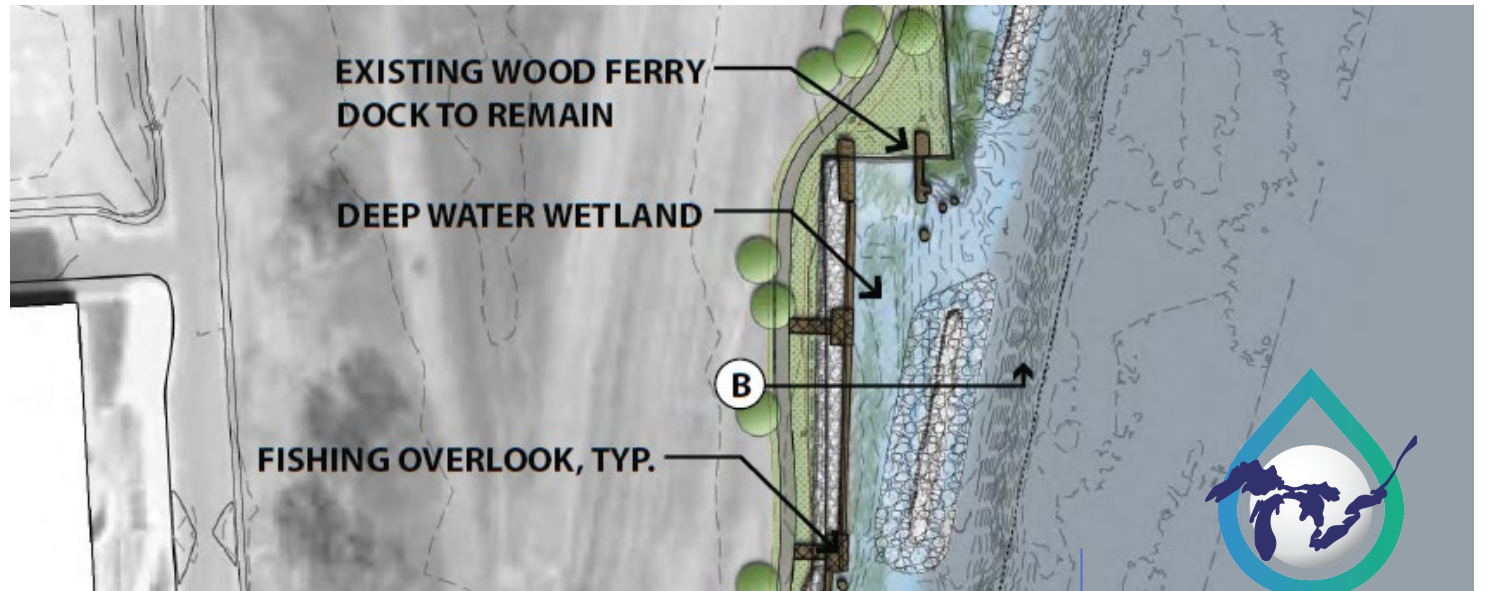
GREEN | GRAY EXAMPLES



GREEN | GRAY EXAMPLES



B - SECTION THROUGH DEEP WATER WETLAND



GREAT LAKES AND ST. LAWRENCE
CITIES INITIATIVE
L'ALLIANCE DES VILLES
DES GRANDS LACS ET DU SAINT-LAURENT



CLIMATE CHANGE:
2021 and Beyond
Preparing our communities for the future.