Inland lake Shoreline Best Management Practices

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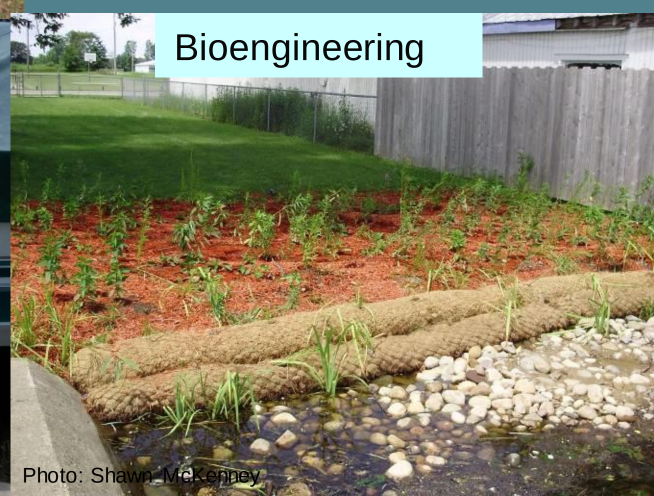
Part 301, Inland Lakes and Streams

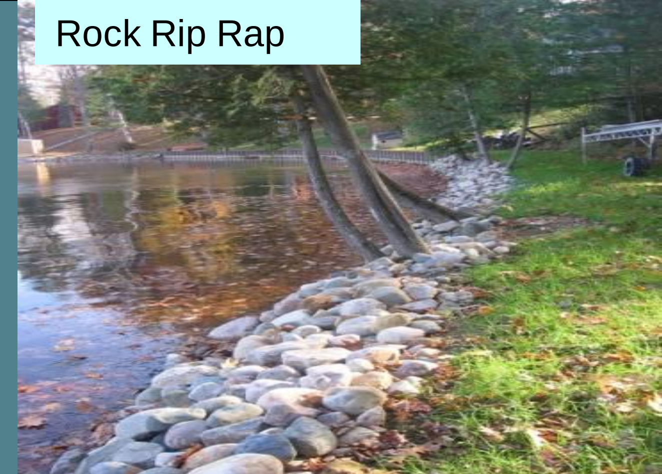
- Protects habitats, uses and health of inland waters
  - Natural, artificial lakes 5 acres or more
- Regulates construction in inland lakes and streams
- Ponds that connect to a stream or within 500ft of another waterbody

ACTIVITIES REQUIRING A PERMIT UNDER PART 301:

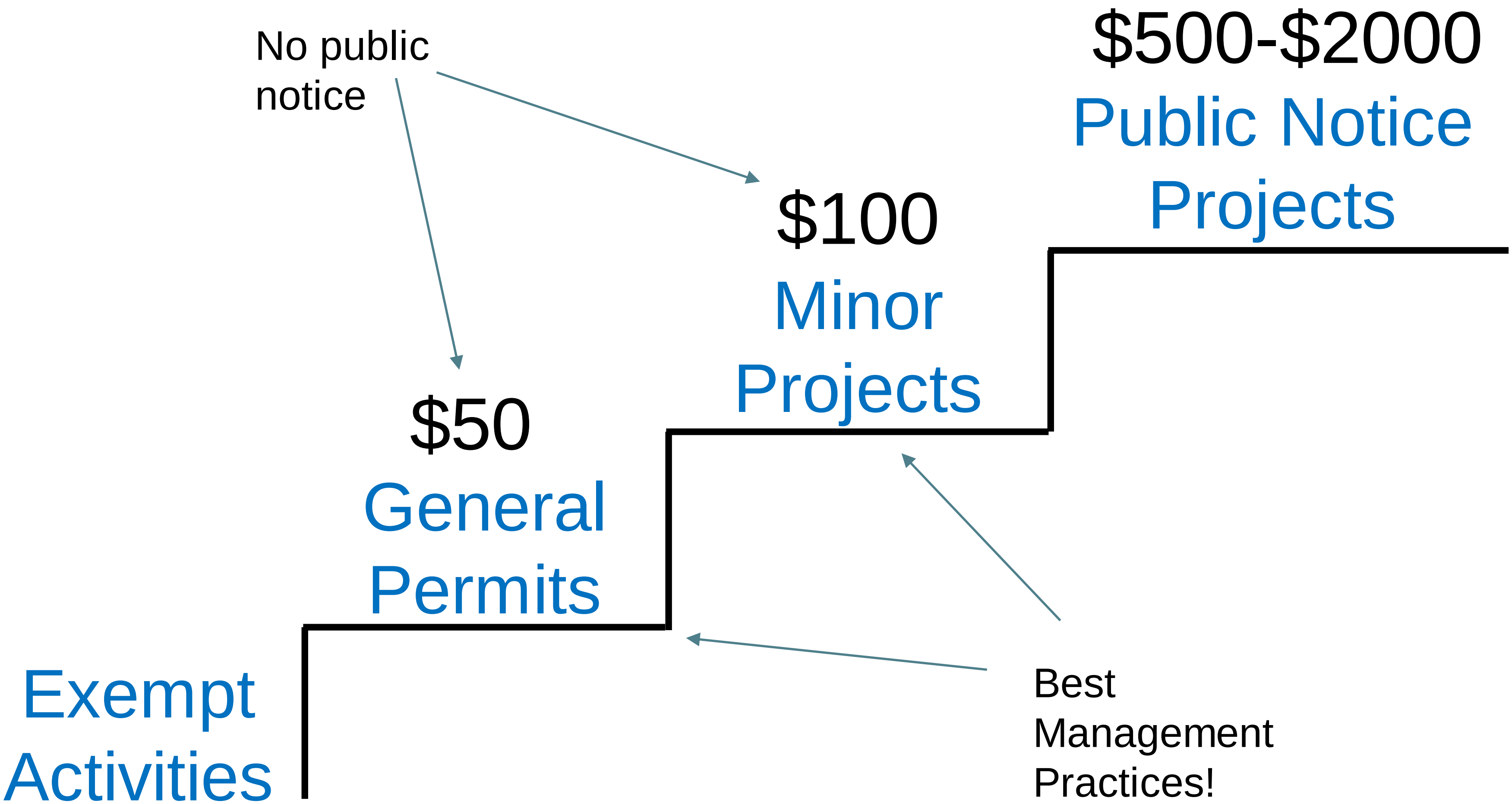
(NOT A COMPLETE LIST)

Swimming area
Navigational Aid
Permanent Boat Hoist
Ponds
Utility Crossing
Dam
Removing a structure
Drawdown
Dry Fire Hydrant





3 Tiered Permitting System



NATURAL SHORELINES PROVIDE IMPORTANT FUNCTIONS AND VALUES!

Stabilize sediments	Valuable habitat
Reduce turbidity	Spawning and nursery areas
Absorbs wave energy	Refuge
Mitigates shoreline erosion	Oxygenate lake

Garrison et al. 2005, Krull 1970, Manis et al. 2015, Newbrey et al. 2005, Savino and Stein 1982, Strayer and Findlay 2010

Flood protection	Habitat
Erosion protection	Fishing
Water Quality	Snorkeling
Nutrient breakdown	Swimming

Erick Elgin, MSUEx

Shoreline simplification results in a loss of refugia and habitat heterogeneity that can cause negative impacts on littoral fish and wildlife communities

Christiansen et al. 1996, Jennings et al 1999, Garrison et al. 2005, Newbrey et al. 2005, Woodford and Meyer 2003, Radomski et al. 2010, Strayer and Findlay 2010

Physically complex shore zones support richer and more diverse communities

Tonn and Magnuson 1982, Strayer and Findlay 2010

Fish density, body size, and species richness is greater in structurally complex habitats with vegetation and woody structure

Barwick et al. 2004, Madjeczak et al. 1998, Jennings et al. 1999, Strayer and Findlay 2010

- 24 amphibian
- 25 reptile
- 87 bird
- 19 mammal

- Algae competition
- Water quality
- Beauty
- Invasion resistance

- Habitat for fish and other animals during all life stages
  - Food
  - Cover
  - Spawning
  - Nursury
- Oxygenate lake

- 65 species of Michigan native fish
- 18 of which are Species of Greatest Conservation Need (Michigan Wildlife Action Plan)

Developed lake shorelines have

- Less woody structure
- Less emergent and floating-leaf vegetation cover, density, and complexity than undeveloped shorelines (Radomski and Goeman 2001, Elias and Meyer 2003, Jennings et al. 2003, Wherly 2012).

- Scouring of the lake bottom and erosion of neighboring properties
- Sediment suspension, nutrient suspension lowers water quality
- Doesn't support aquatic plant growth and natural shoreline vegetation
- No habitat complexity for fish and wildlife
- Create barrier for animal movement
- Remove natural energy dissipating capacity of sloped shoreline and natural vegetation

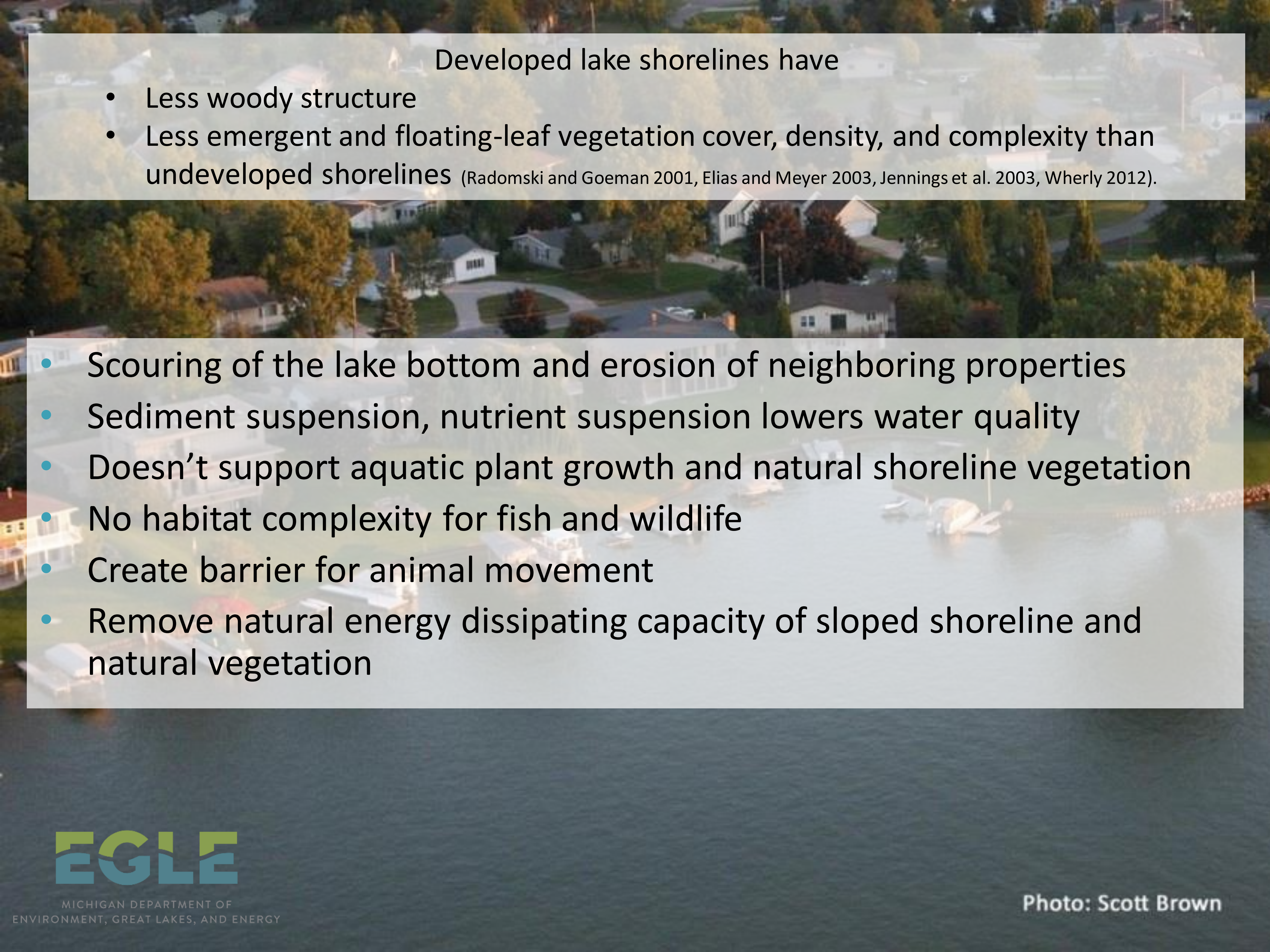


Photo: Scott Brown

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ENVIRONMENT, GREAT LAKES, AND ENERGY

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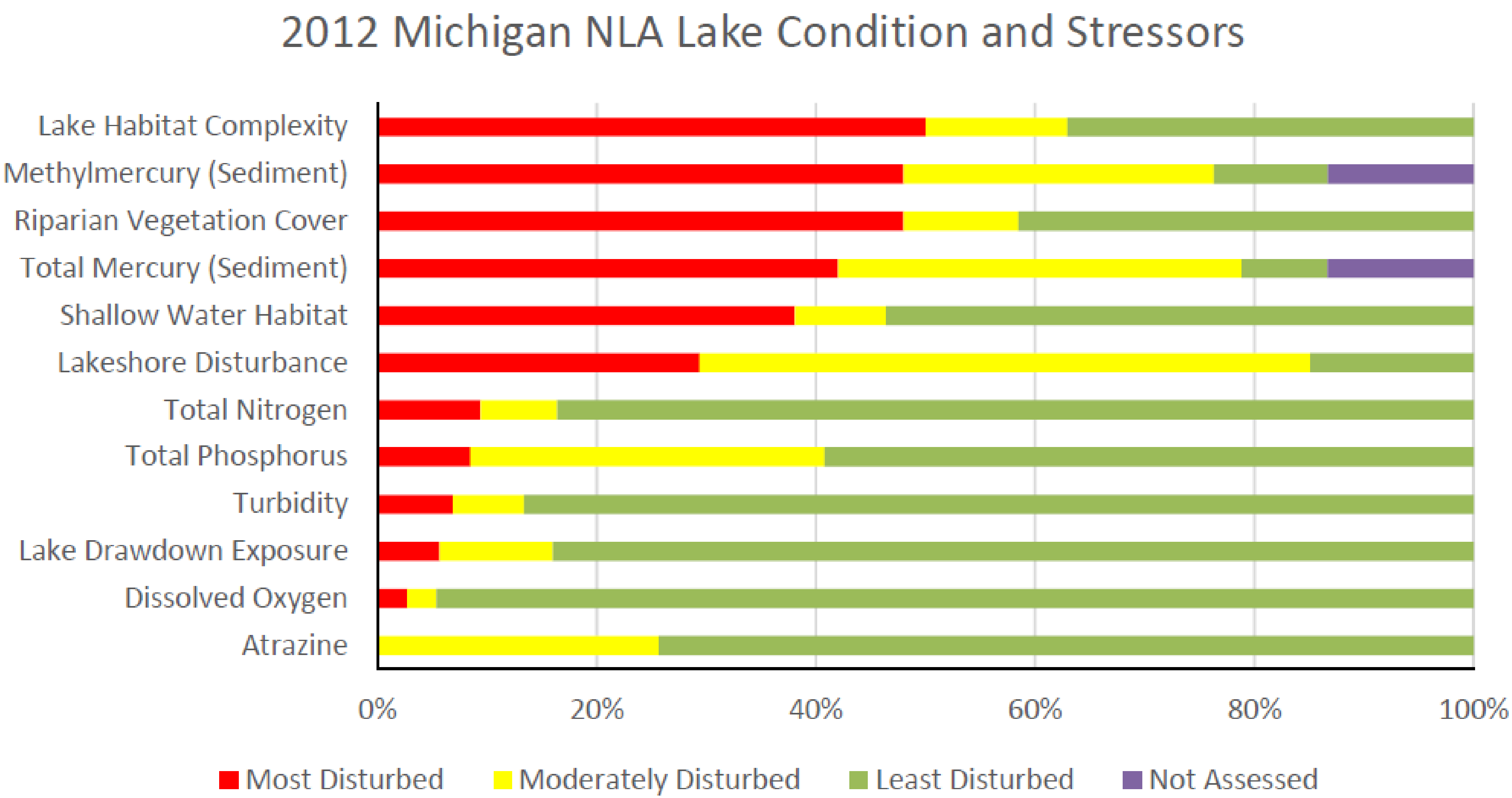
2012 Michigan NLA Lake Condition and Stressors
Lake Habitat Complexity
Methylmercury (Sediment)
Riparian Vegetation Cover
Total Mercury (Sediment)
Shallow Water Habitat
Lakeshore Disturbance
Total Nitrogen
Total Phosphorus
Turbidity
Lake Drawdown Exposure
Dissolved Oxygen
Atrazine
0%
20%
40%
60%
80%
100%
Most Disturbed
Moderately Disturbed
Least Disturbed
Not Assessed

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NATURAL SHORELINE (1938)
TO
DEVELOPED SHORELINE (2014)

Case Study

Silver Lake

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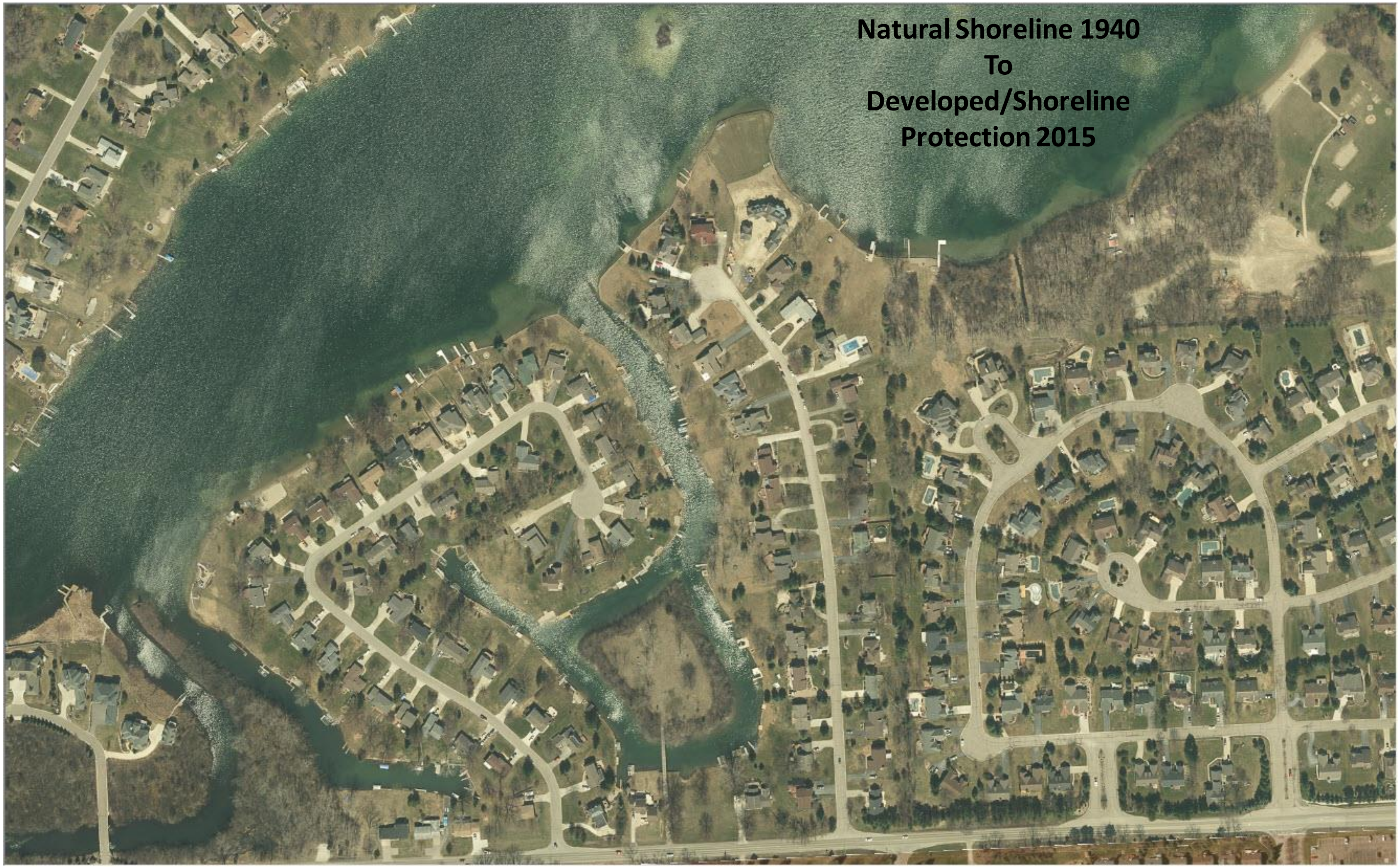
Natural Shoreline 1940
To
Developed/Shoreline
Protection 2015


Natural Shoreline 1940
To
Developed/Protected
Shoreline 2015

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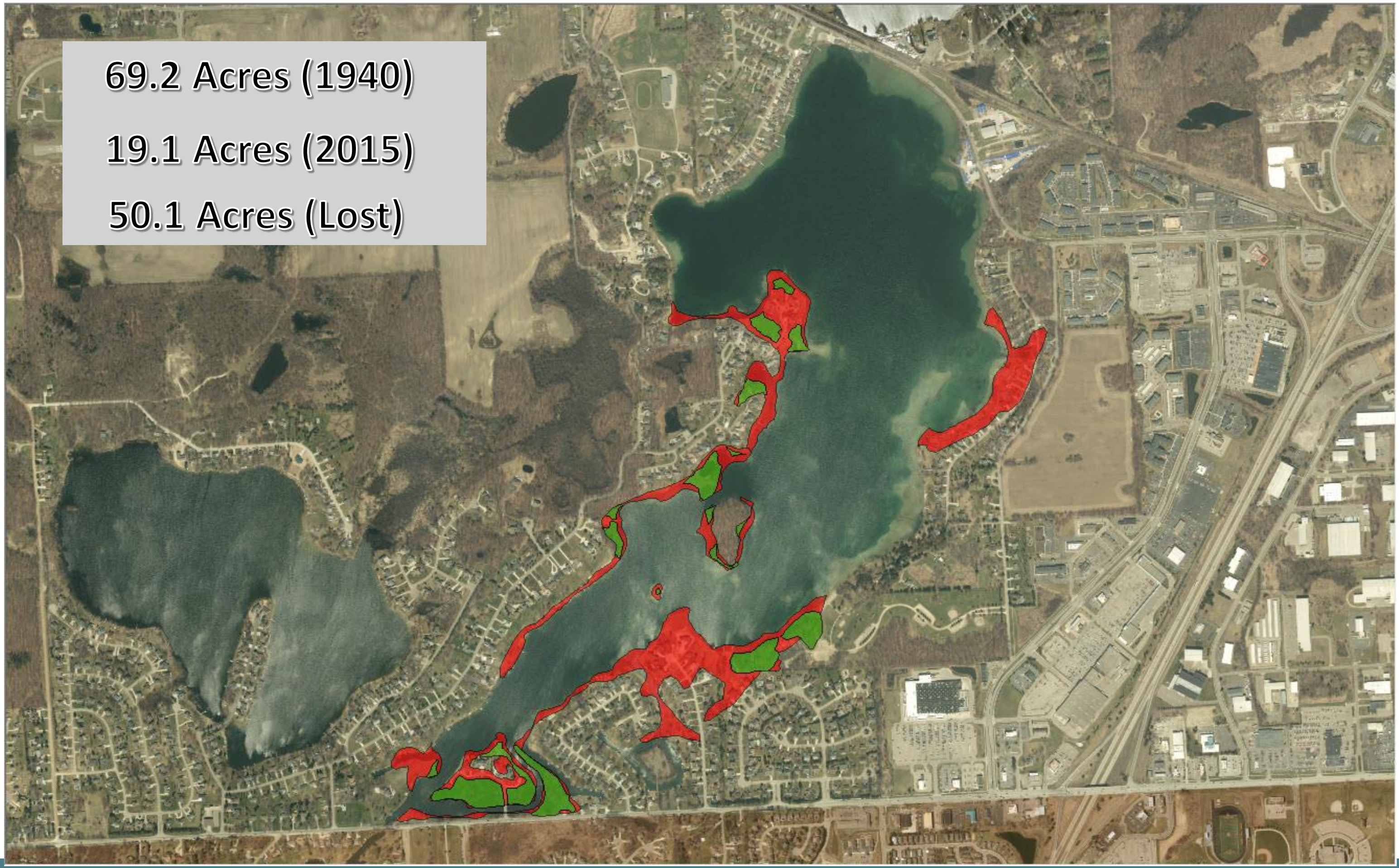
Historic Wetlands



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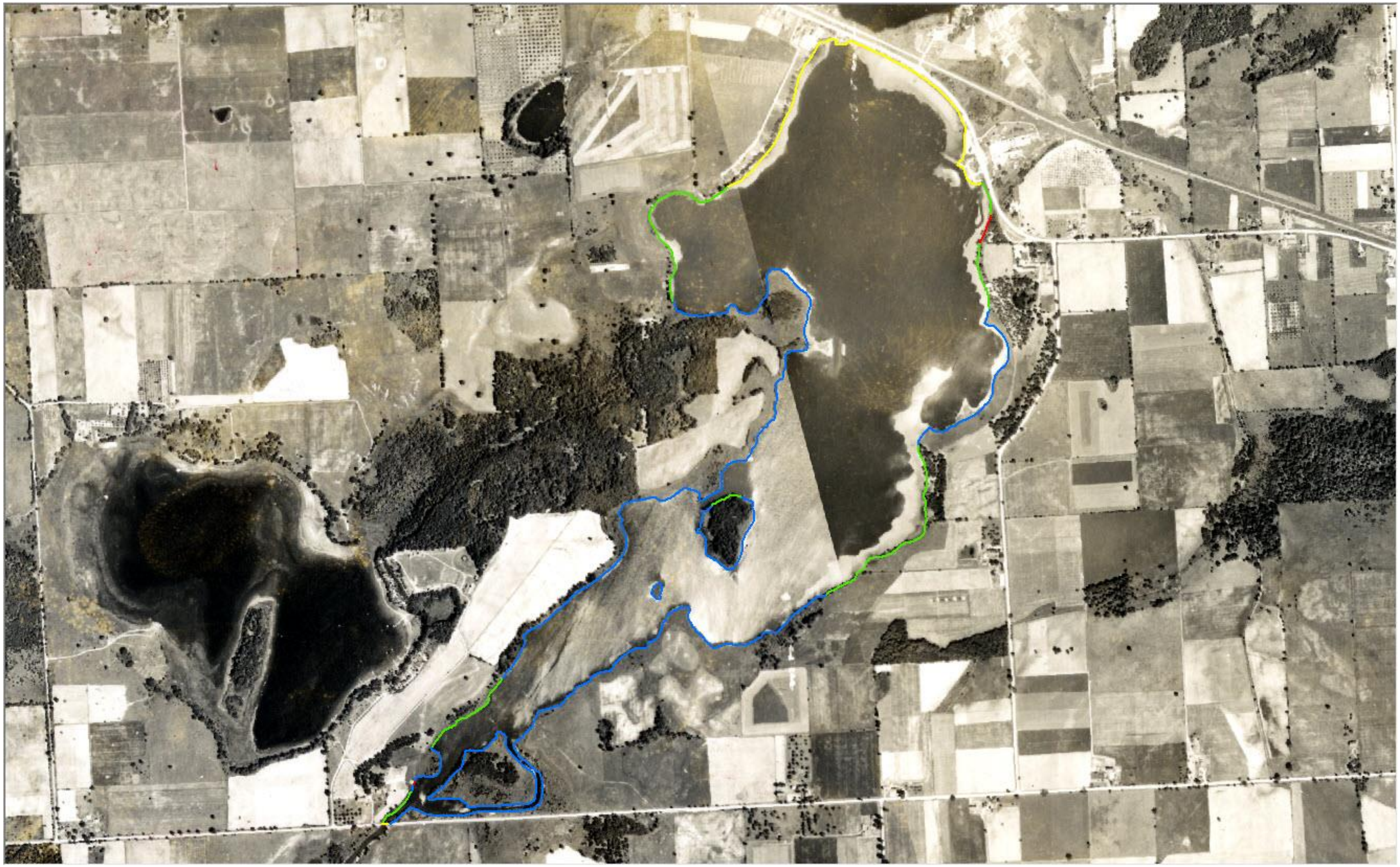
Shoreline Analysis

- **Undeveloped upland shoreline** – undeveloped vegetated upland areas
- **Wetland shoreline** – emergent wetland vegetation
- **Developed shoreline** – grass to the waters edge, structures and roads next to water
- **Hardened shoreline** – seawalls, riprap



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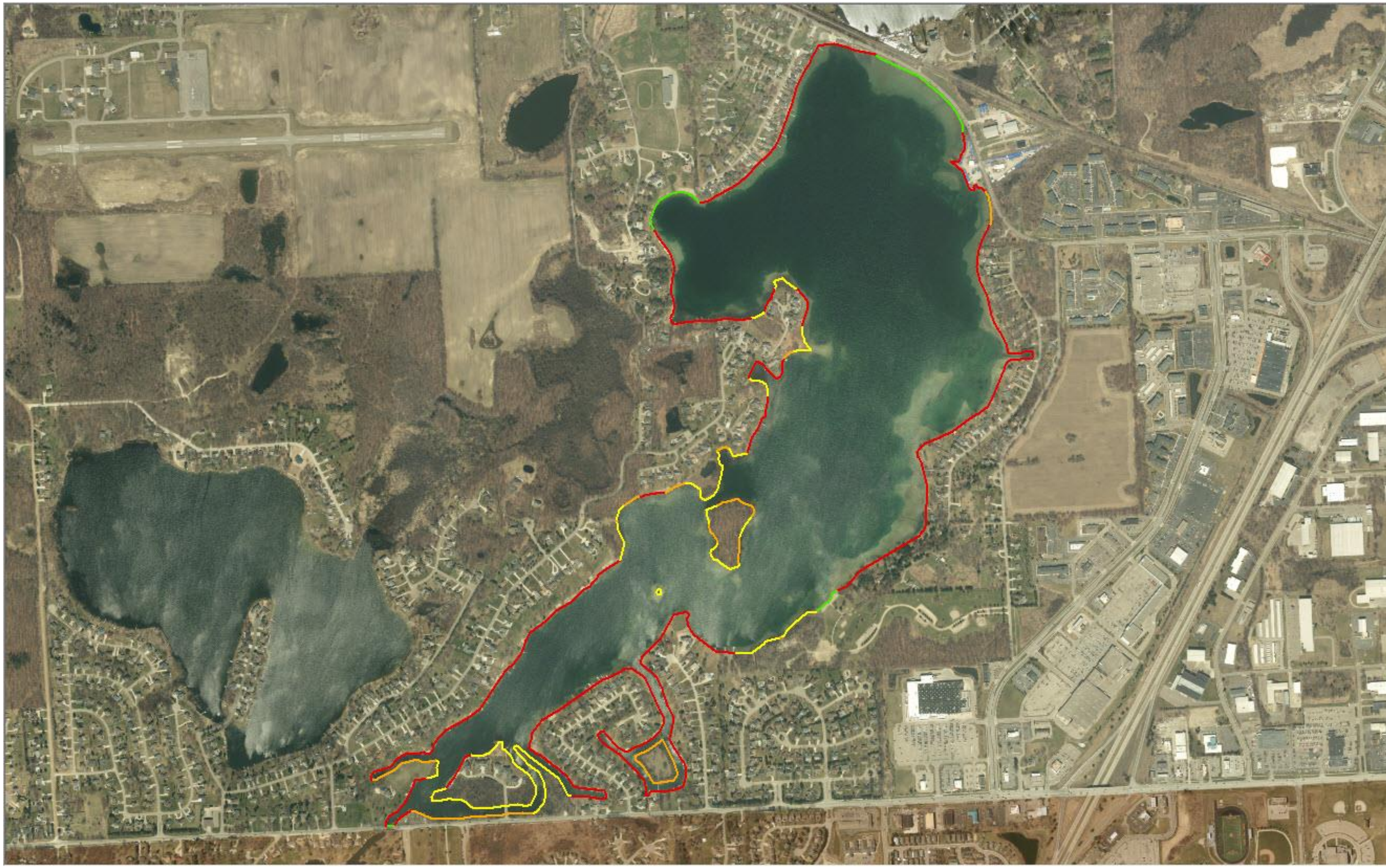

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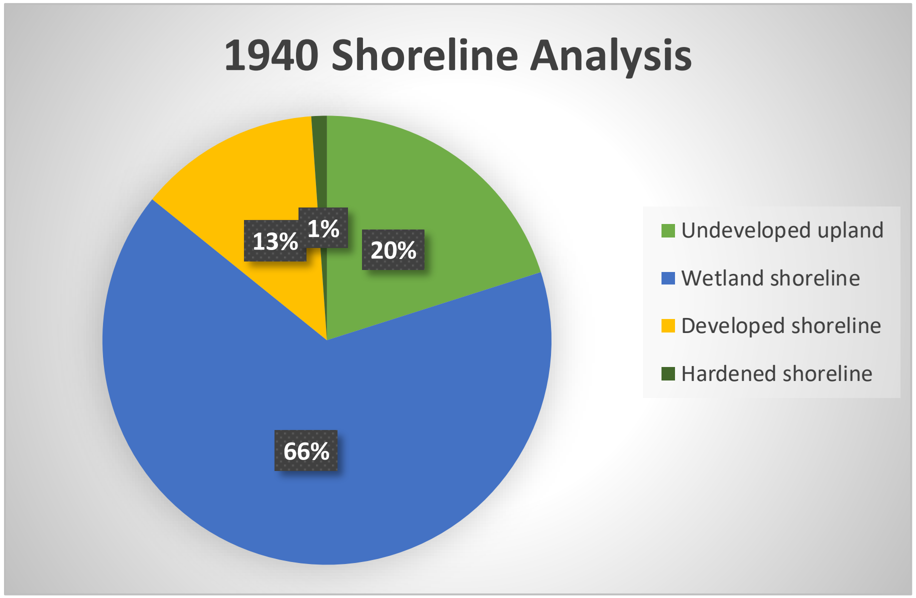
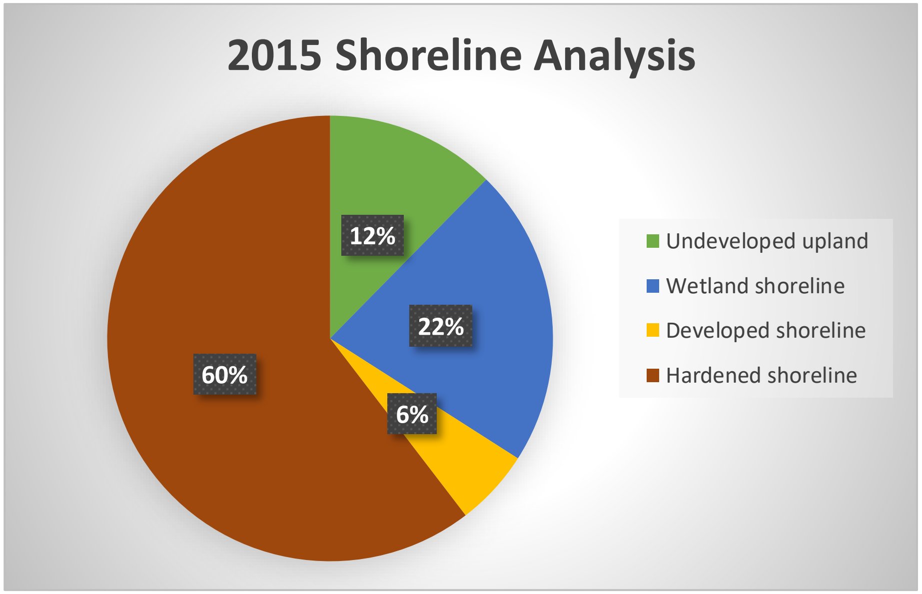


Shoreline Type	Miles
Undeveloped upland	1.26
Wetland shoreline	4.12
Developed shoreline	.82
Hardened shoreline	.07
Total	6.27

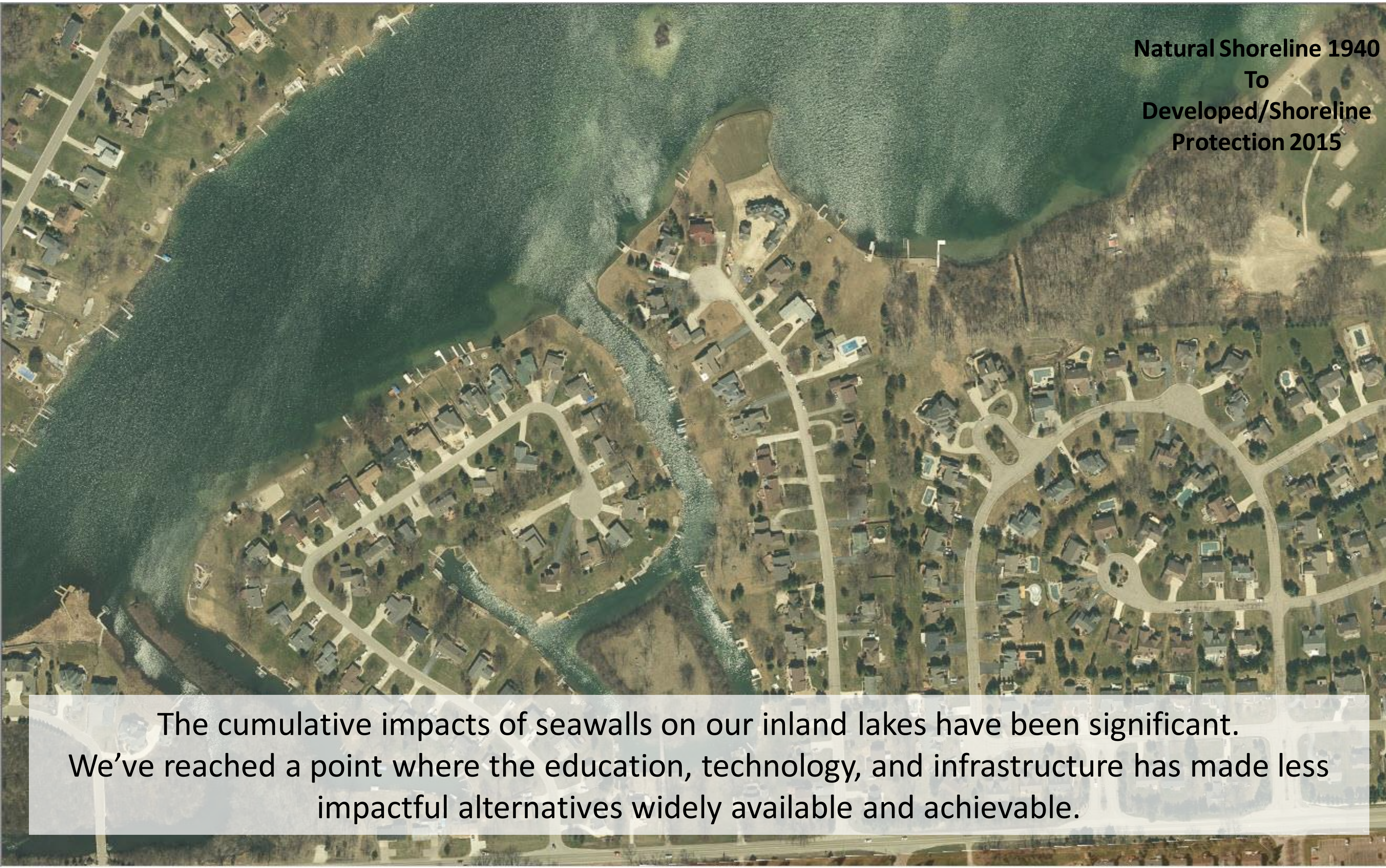


Shoreline Type	Miles
Undeveloped upland	.98
Wetland shoreline	1.72
Developed shoreline	.44
Hardened shoreline	4.79
Total	7.93

Seawalls in Michigan history

- We’ve visually seen our inland lakes change over time
- We’ve collected data and scientifically documented our lakes changing (See NLA slide)
- The changes and impacts from seawalls are widely supported by peer-reviewed science in Michigan, Midwest, and Nationwide (see previous citation slide)

The way we've always done it isn't working anymore

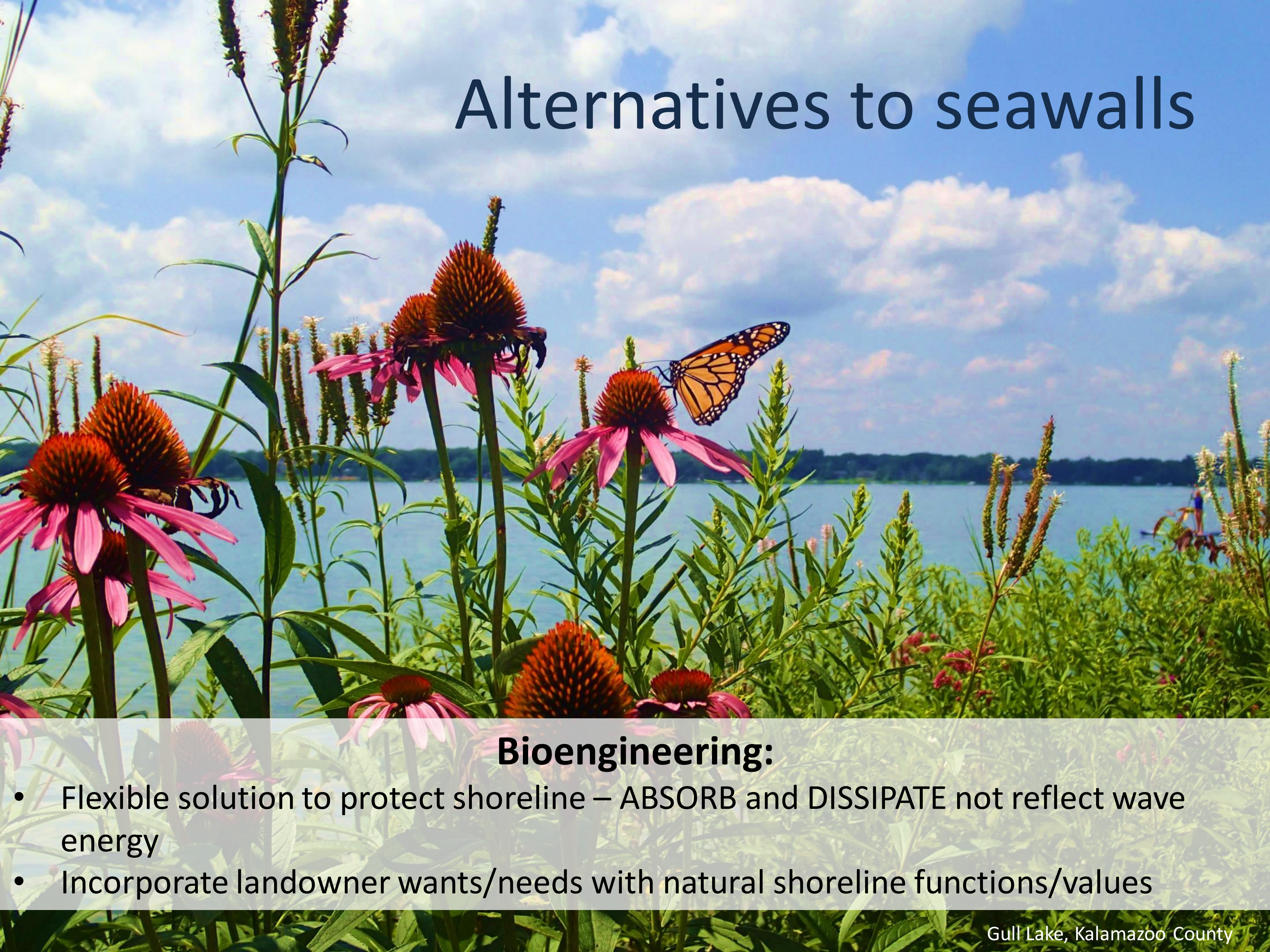


The cumulative impacts of seawalls on our inland lakes have been significant.
We've reached a point where the education, technology, and infrastructure has made less impactful alternatives widely available and achievable.

Alternatives to seawalls

Bioengineering:

- Flexible solution to protect shoreline – ABSORB and DISSIPATE not reflect wave energy
- Incorporate landowner wants/needs with natural shoreline functions/values

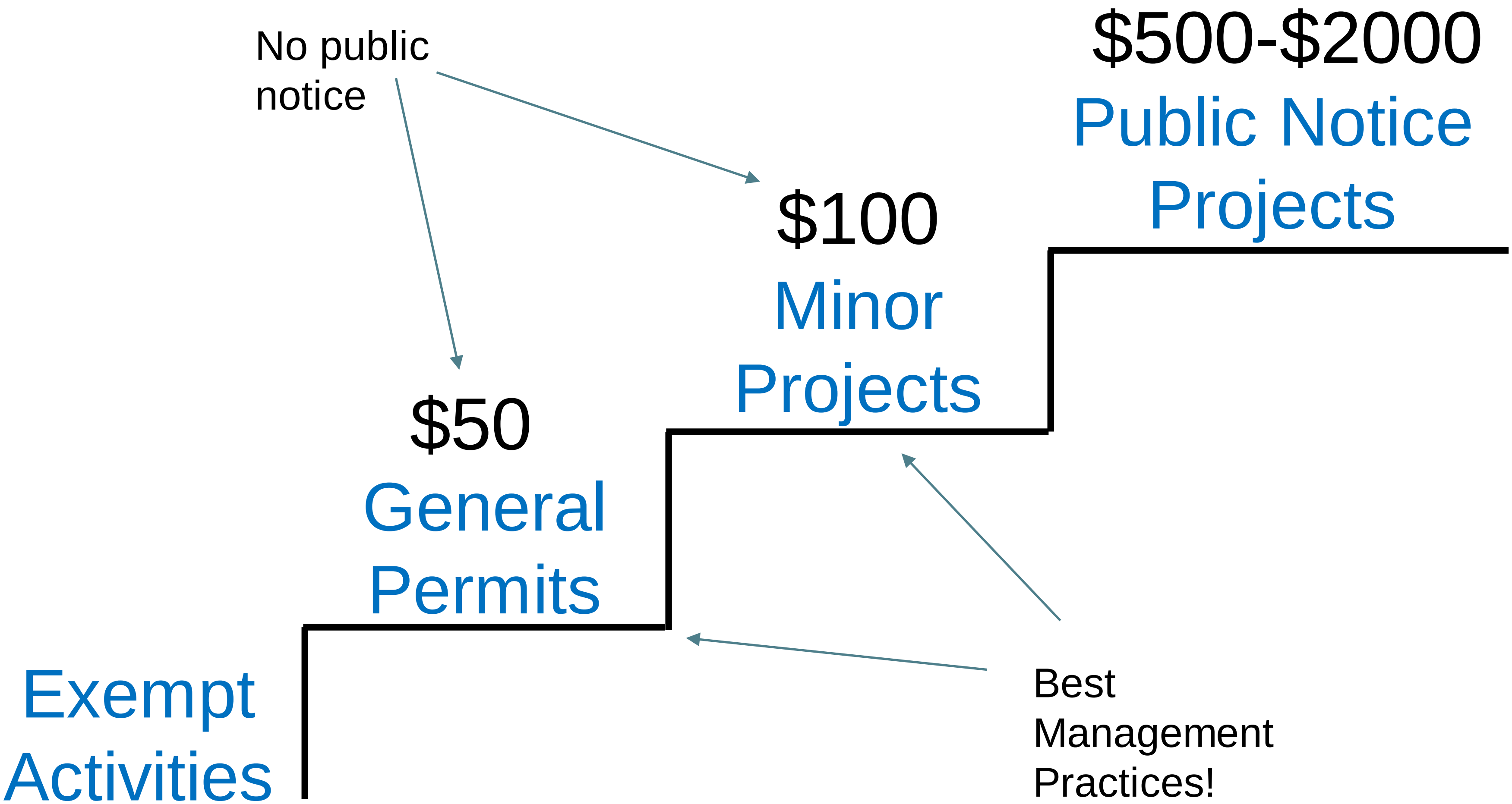


Gull Lake, Kalamazoo County

Natural Shoreline Erosion Control Continuum

Increasing erosion problems and/or energy potential
Increasing complexity of solution

3 Tiered Permitting System



Lower Energy Sites

≤ 1 mile maximum fetch

Not adjacent to a heavily used boating access point or marina

Not located on a unprotected point, headland, or island where erosive forces are high

Site-specific conditions warrant bioengineering – must be necessary to prevent or control erosion

Higher Energy Sites

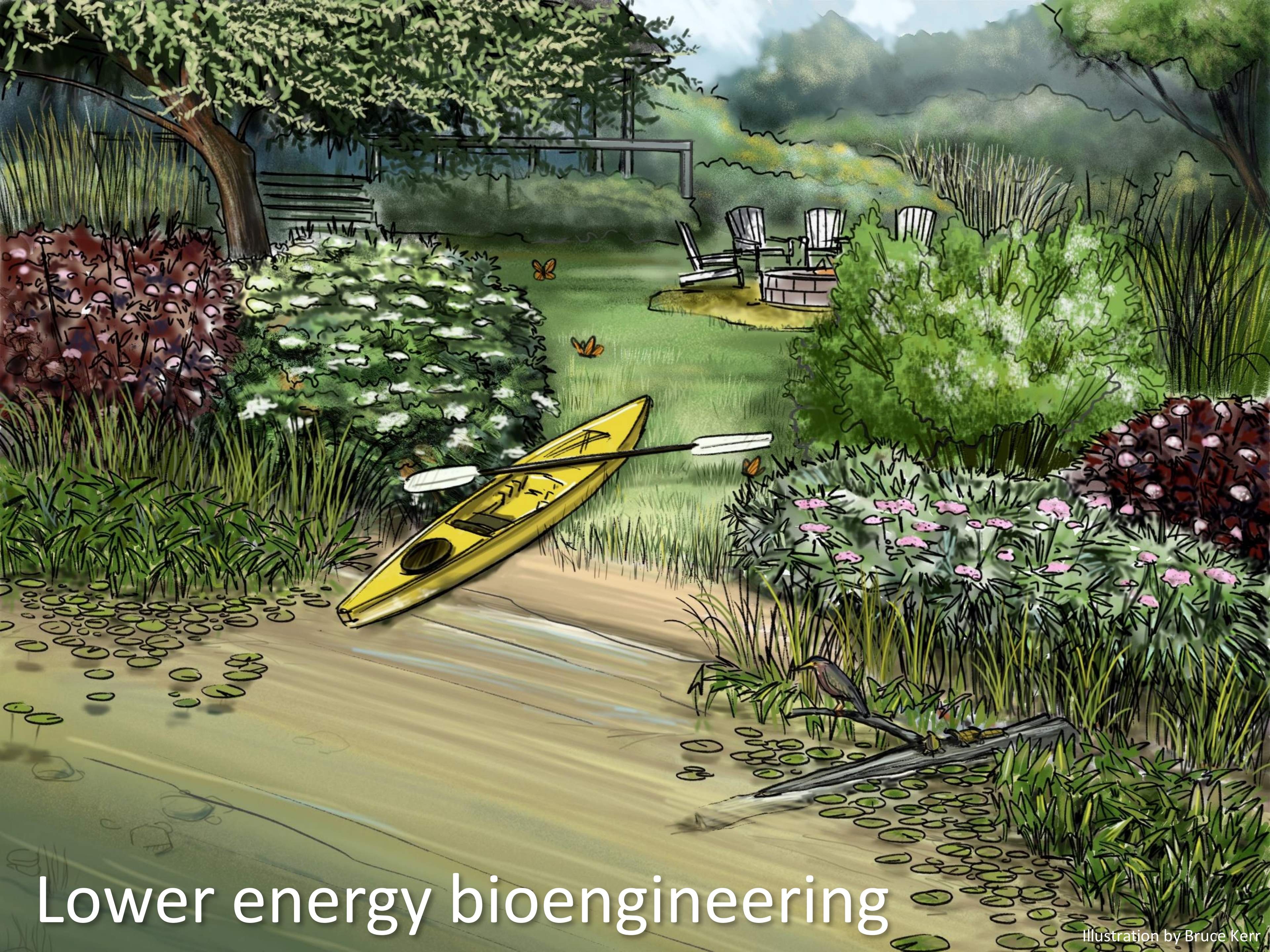
>1 mile maximum fetch

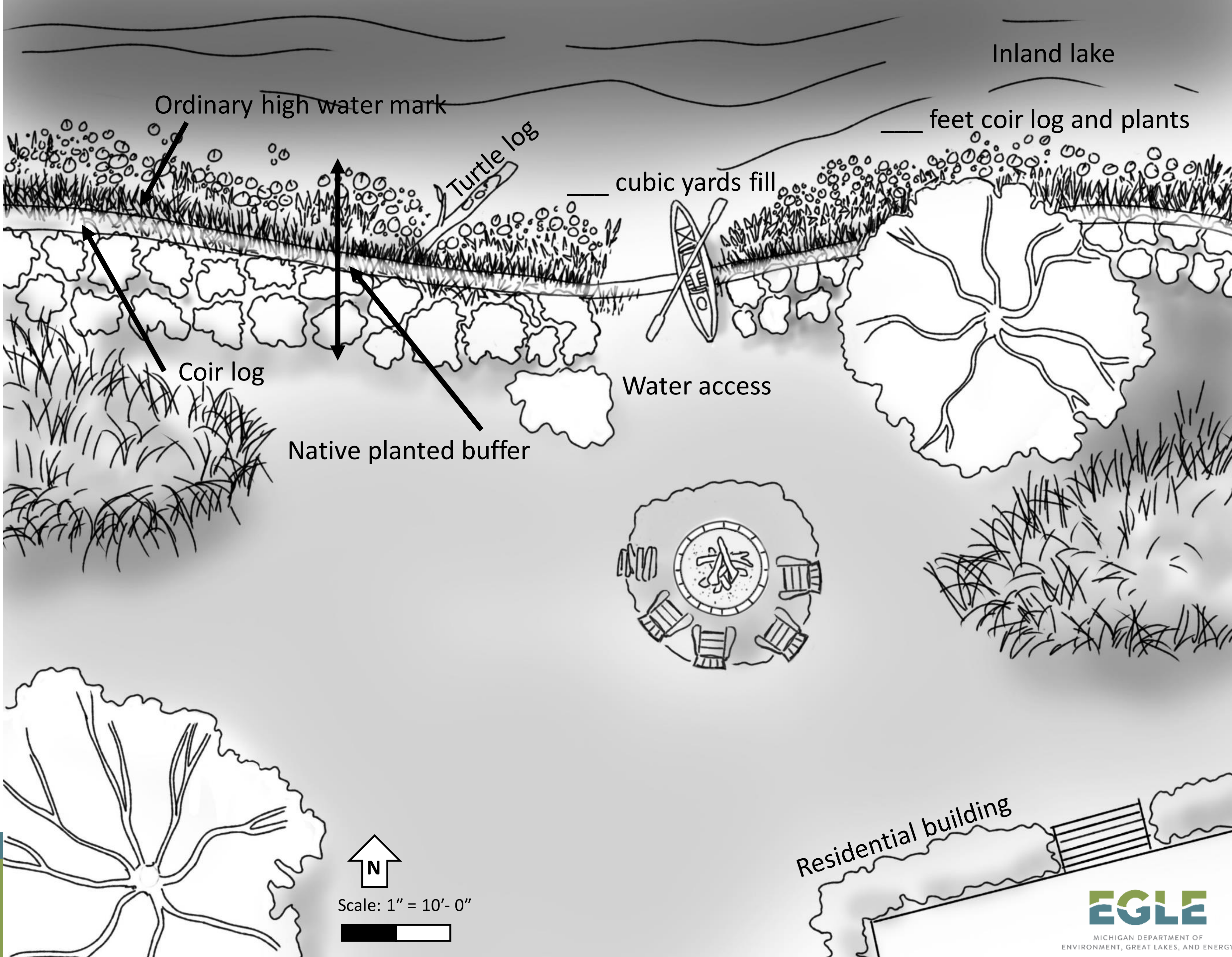
Adjacent to a heavily used boating access point or marina

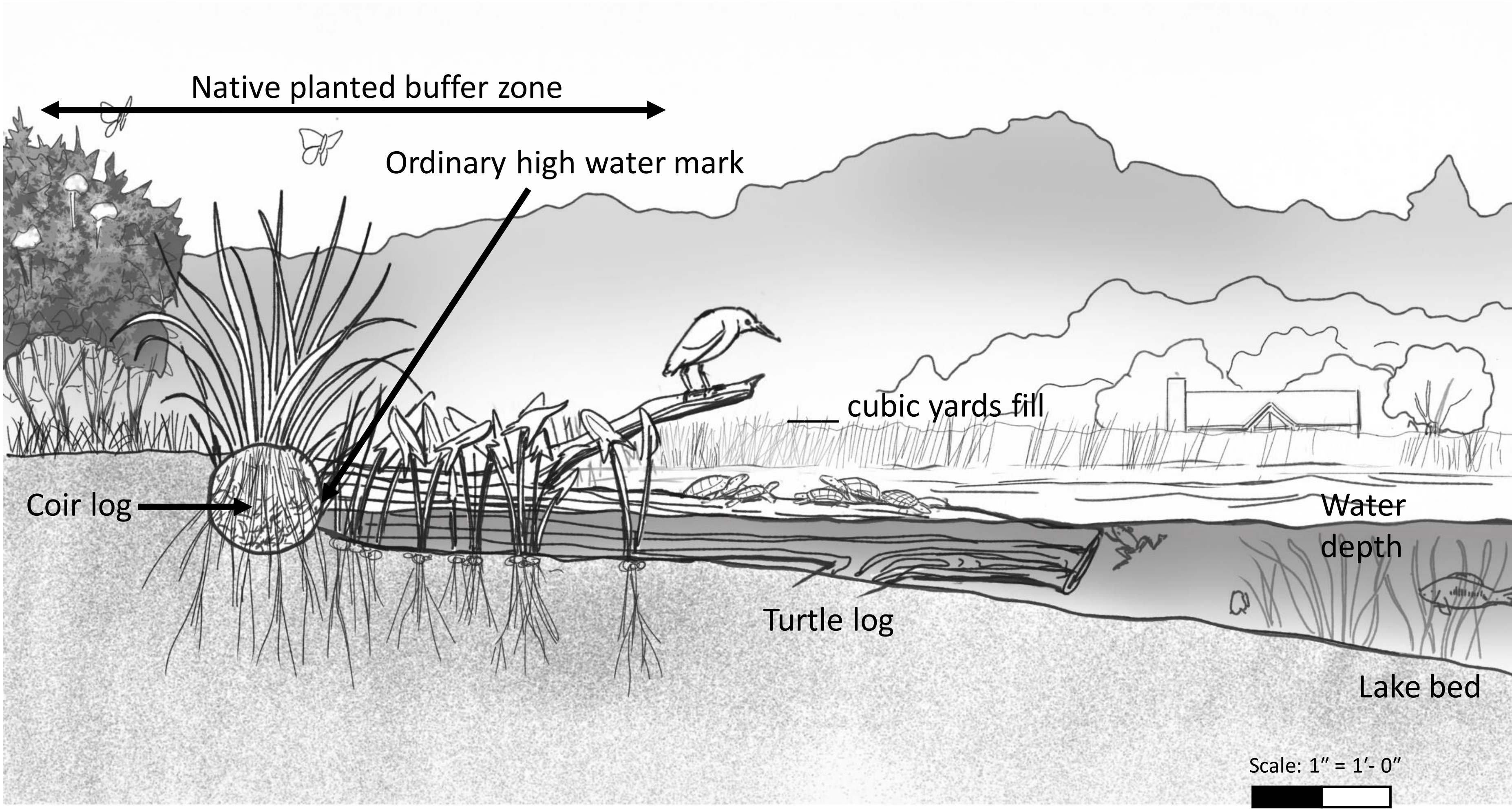
Located on an unprotected point, headland, or island where erosive forces are high

Evidence of ongoing erosion or is where an existing seawall is being replaced with bioengineering

**Applicant must provide documentation of higher energy site conditions


Lower energy bioengineering
Illustration by Bruce Kerr

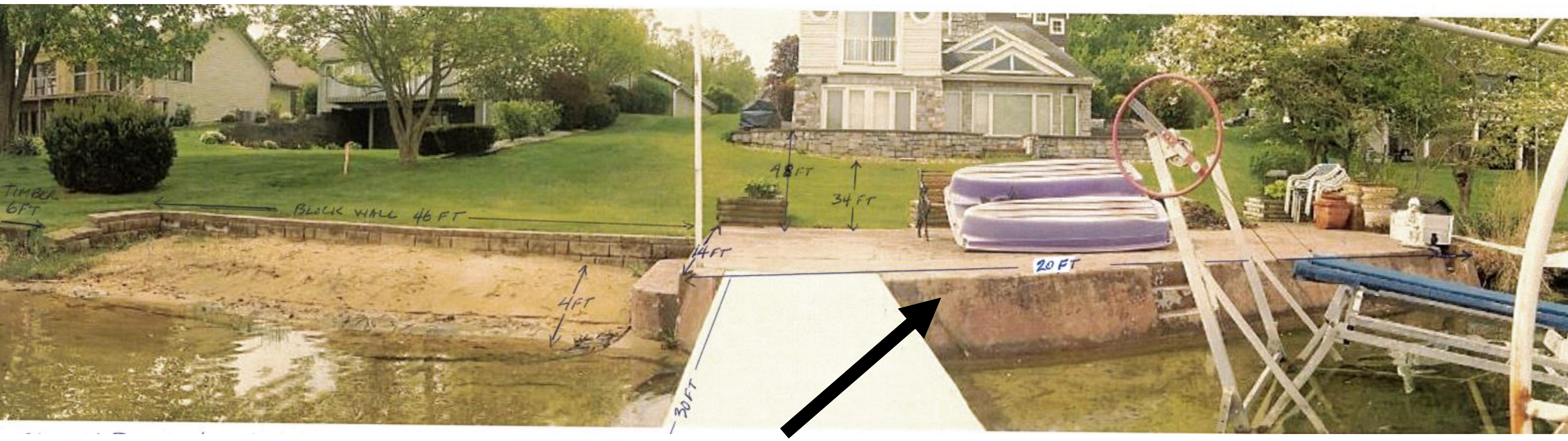

Inland lake
Ordinary high water mark
___ feet coir log and plants
Turtle log
___ cubic yards fill
Coir log
Water access
Native planted buffer
Residential building
N
Scale: 1” = 10’- 0”



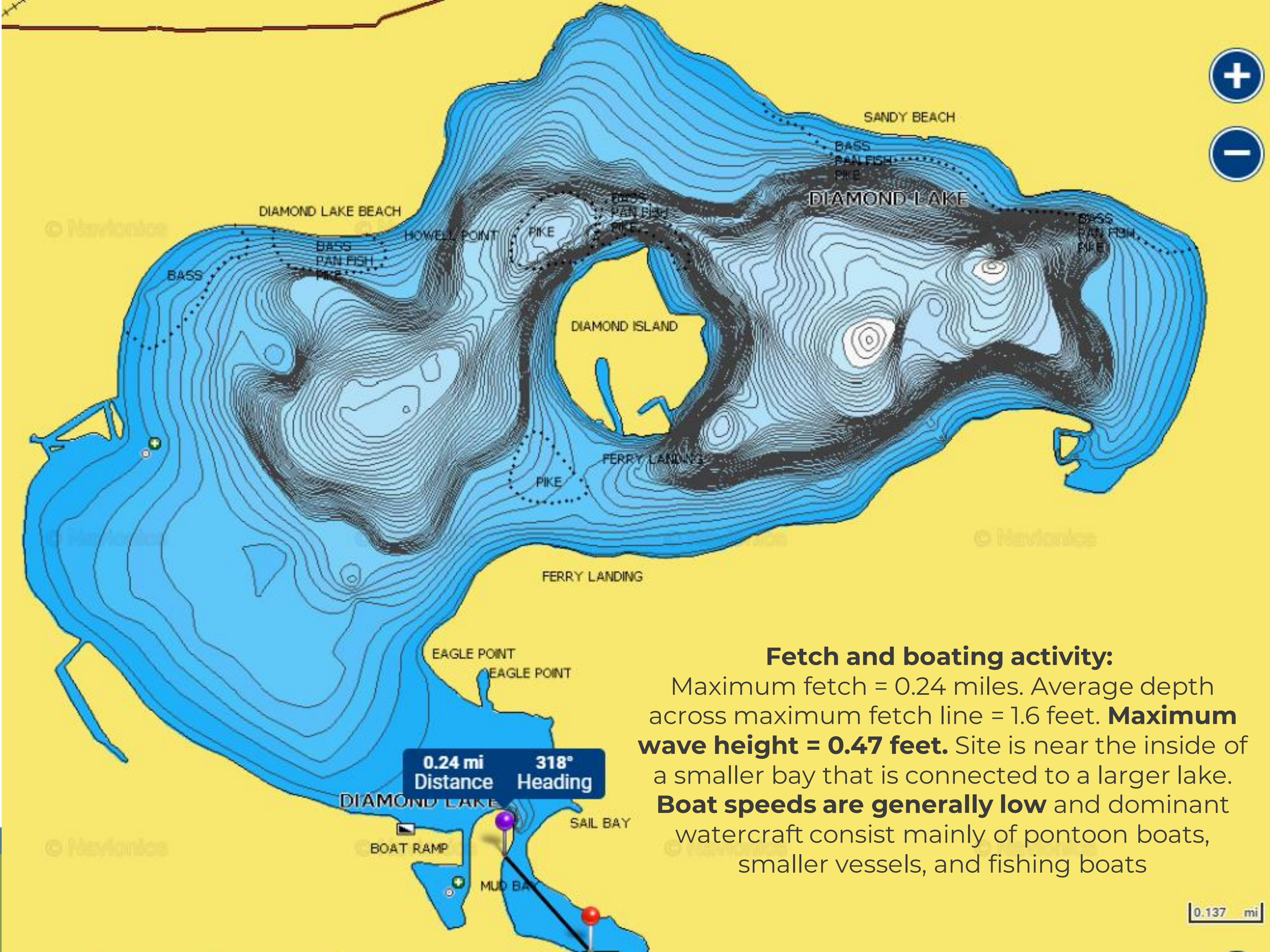
This project can be processed on a quicker timeline and at a lower fee if it meets the criteria of the Minor Project Category. Minor Project categories can be viewed at the following website: https://www.michigan.gov/documents/egle/WRD-Minor-Project-Categories_733320_7.pdf

Homeowner Example #1
(lower energy)

Picture taken: 2016



- Scouring of the lake bottom and erosion of neighboring properties
- Sediment suspension, nutrient suspension lowers water quality
- Doesn't support aquatic plant growth and natural shoreline vegetation
- No habitat complexity for fish and wildlife
- Create barrier for animal movement
- Remove natural energy dissipating capacity of sloped shoreline and natural vegetation



Fetch and boating activity:
Maximum fetch = 0.24 miles. Average depth across maximum fetch line = 1.6 feet. **Maximum wave height = 0.47 feet.** Site is near the inside of a smaller bay that is connected to a larger lake. **Boat speeds are generally low** and dominant watercraft consist mainly of pontoon boats, smaller vessels, and fishing boats

Picture taken: 2021

Installation cost: ~$277 per linear foot. Included in that cost was the demolition and removal of the existing concrete seawall

Picture taken: 2021

Design: Lower energy bioengineering
Installation date: 2017
Plant list: Carex bricknelli, various sedges, lilies, and vegetated coir mats. Mixed upland plantings of native and hybrid plants

Homeowner Example #2 (lower energy)

- Erosion issues – turf grass not strong enough
- Little wildlife value
- Increased runoff
- Increased sediment and nutrient suspension
- Promotes geese

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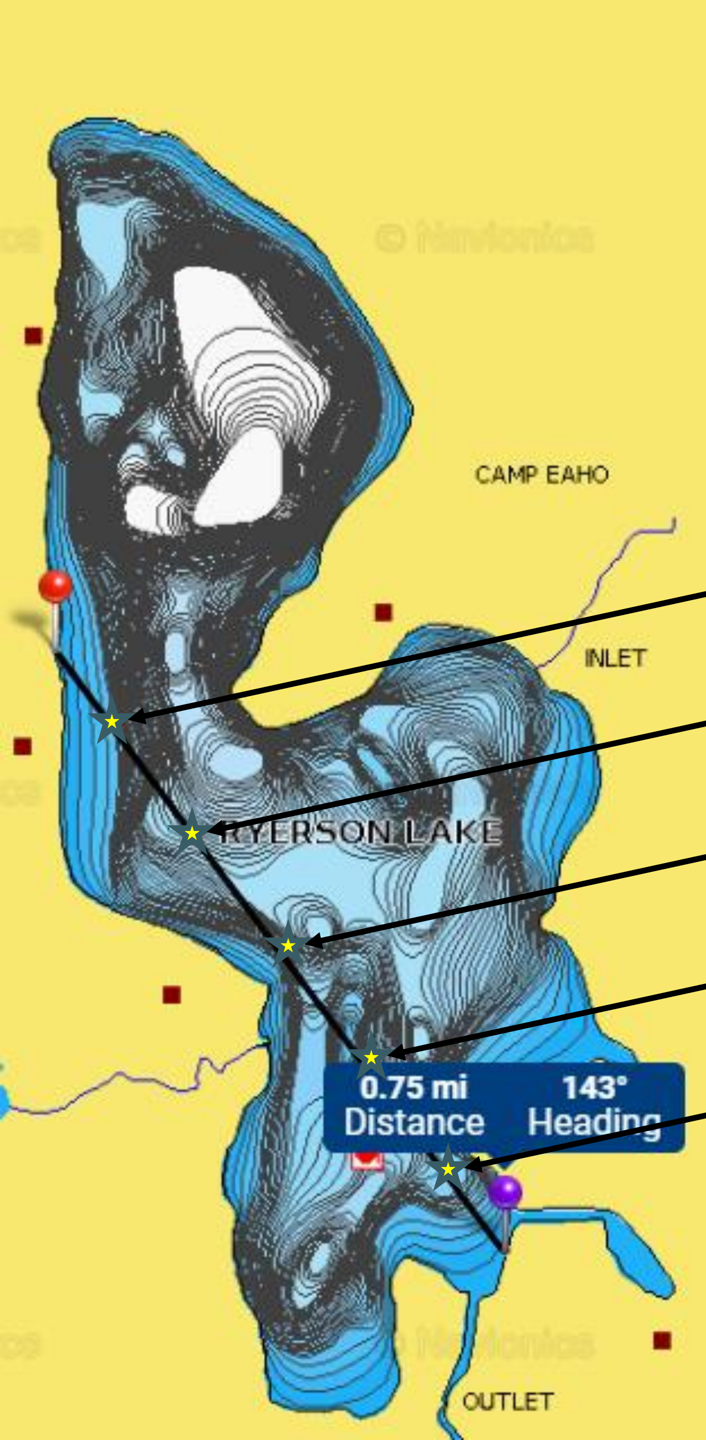
Fetch and boating activity:
Maximum fetch = 0.75 miles. Average depth across maximum fetch line = 17.8 feet. **Maximum wave height = 0.89 feet**. However, boats are very active during the summer months. **Not an extremely high traffic lake, however waterskiing is common** during the summertime.



Young, I.R. and L.A. Verhagen. 1996. The growth of fetch limited waves in finite water depth. Coastal Engineering, Vol. 29, pp.47-78
Young, I.R. 1997. The growth rate of finite depth wind-generated waves. Coastal Engineering, Vol. 32, pp.181-195.

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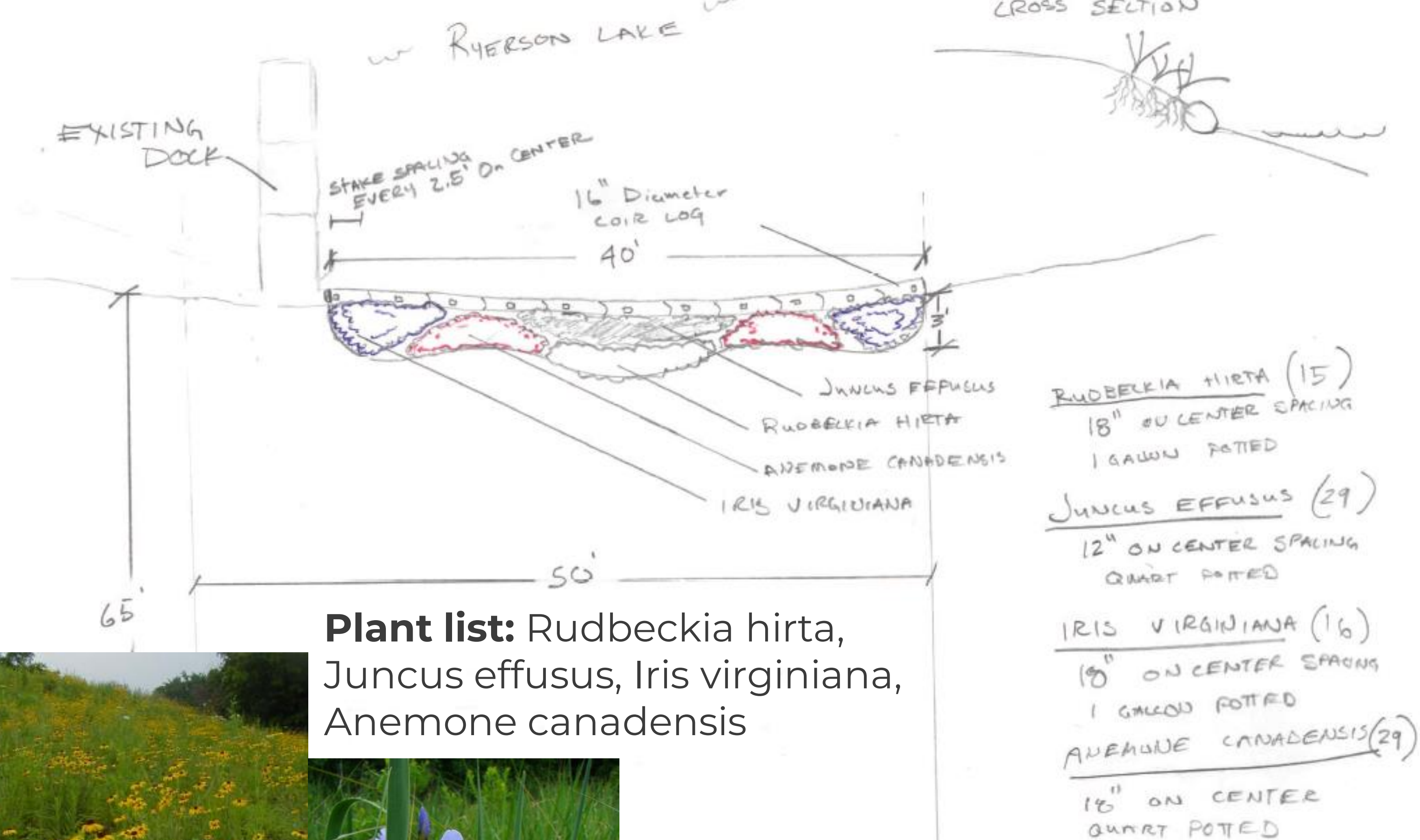
Installation cost: $19 per linear foot. $600 for the coir log, $150 for the plants total for the 40 feet of shoreline.



Plant list: Rudbeckia hirta, Juncus effusus, Iris virginiana, Anemone canadensis

Design: Lower energy bioengineering
Installation date: 2020
Consultant/Contractor: Homeowner installed
Yearly maintenance activity: Small amount of weeding
Yearly maintenance cost: No maintenance cost

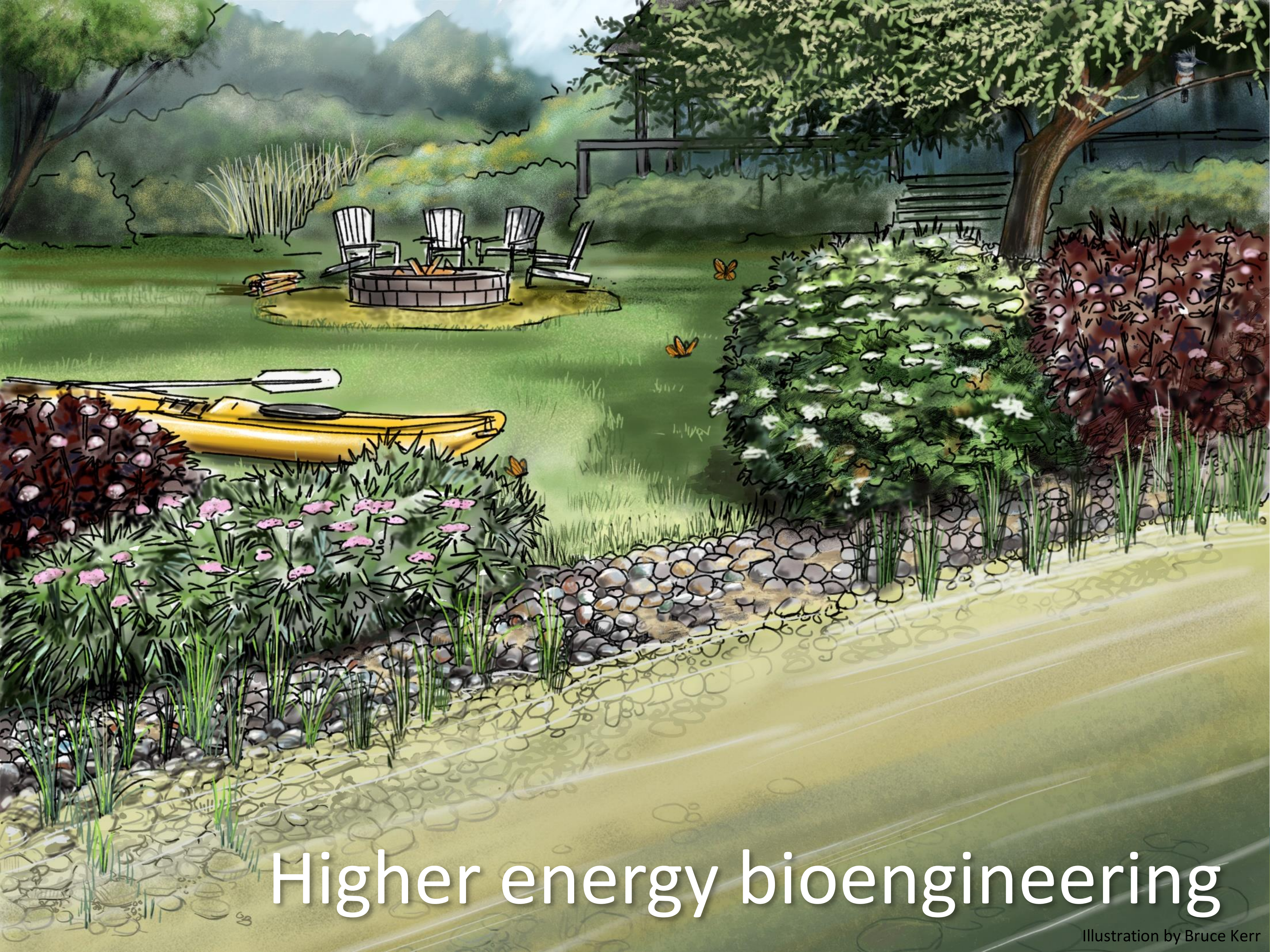
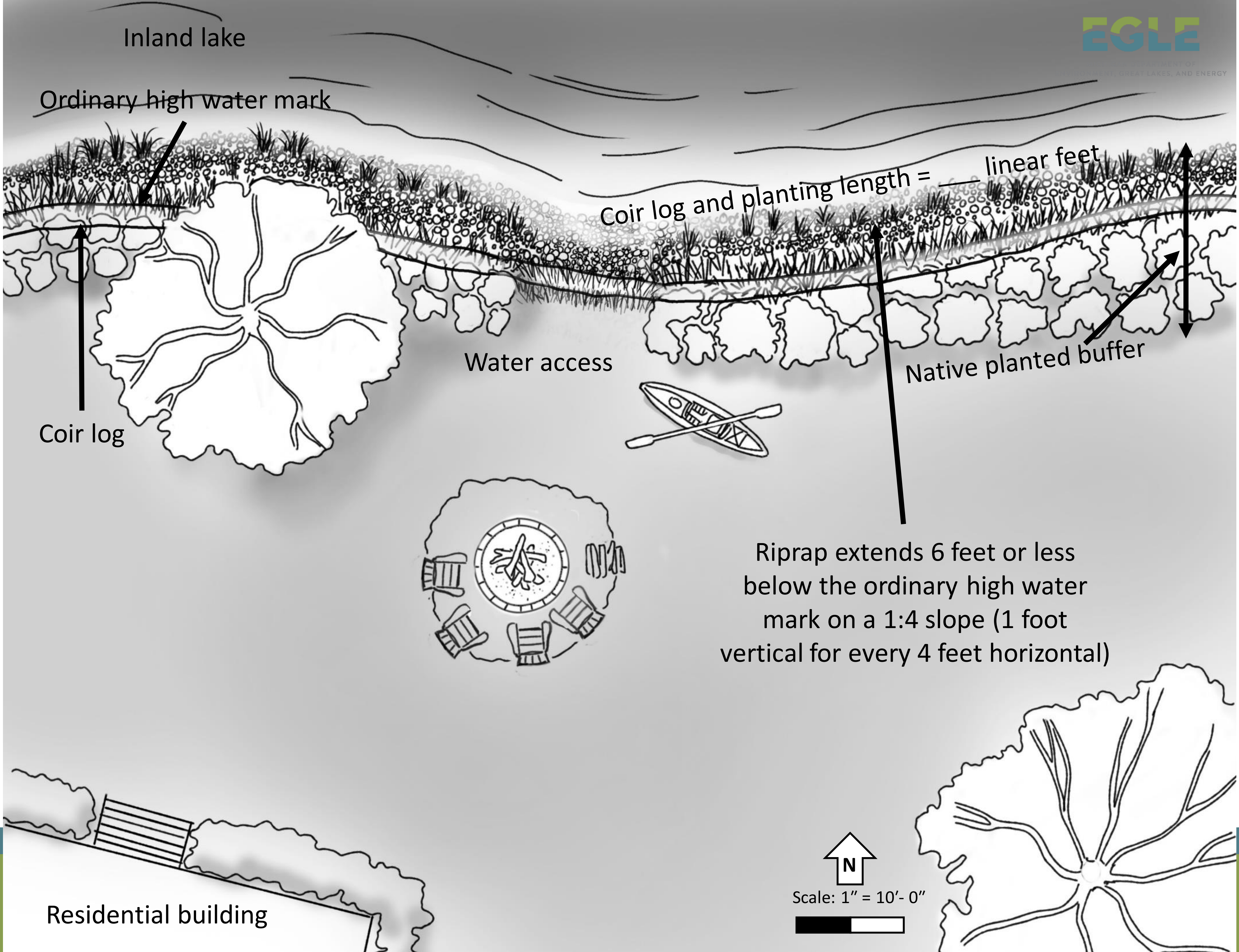
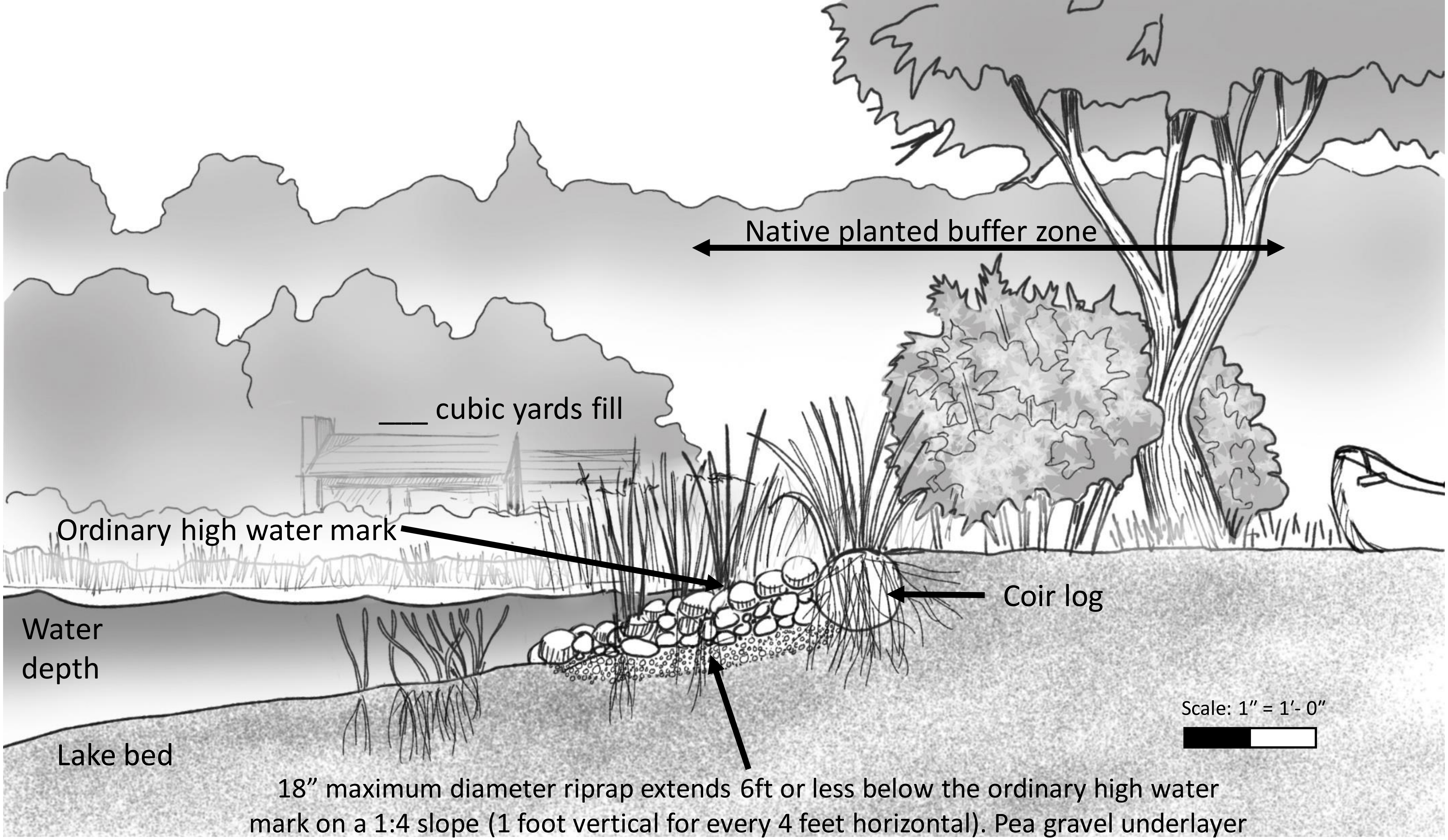


Illustration by Bruce Kerr



Inland lake
Ordinary high water mark
Coir log and planting length = ___ linear feet
Water access
Native planted buffer
Coir log
Riprap extends 6 feet or less below the ordinary high water mark on a 1:4 slope (1 foot vertical for every 4 feet horizontal)
N
Scale: 1" = 10'- 0"
Residential building



This project can be processed on a quicker timeline and at a lower fee if it meets the criteria of the Minor Project Category. Minor Project categories can be viewed at the following website: https://www.michigan.gov/documents/egle/WRD-Minor-Project-Categories_733320_7.pdf

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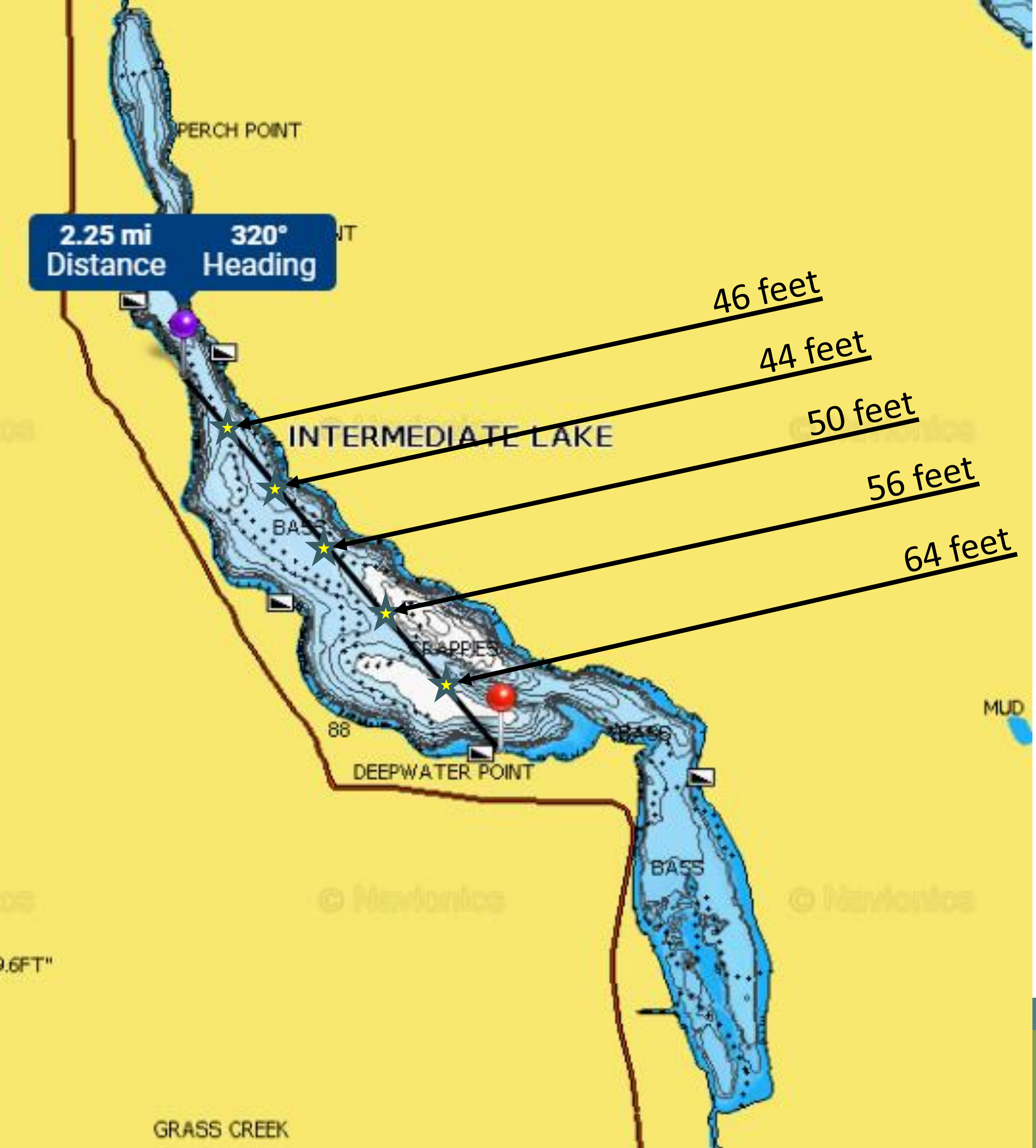
Homeowner Example #3 (higher energy)

Picture taken: 2011

- "Protect shoreline from erosion and to provide habitat and water quality benefits"
- "Replacing seawall with another hardened structure may create more erosion and not provide water quality or habitat benefits"

Picture taken: 2011



Fetch and boating activity: Maximum fetch = 2.25 miles. Average water depth across maximum fetch line = 52 feet. **Maximum wave height = 1.53 feet.** This site is located on a straight shoreline on a relatively long and narrow lake. Boat speeds are generally high and the lake is very busy in the summer. A wide variety of **larger watercraft** use this lake including many **wake boats** during the summer.

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Dekraker:

SHORELINE RESTORATION PROJECT

FIGURE 4 OF 5-Section

WATER BODY: Intermediate

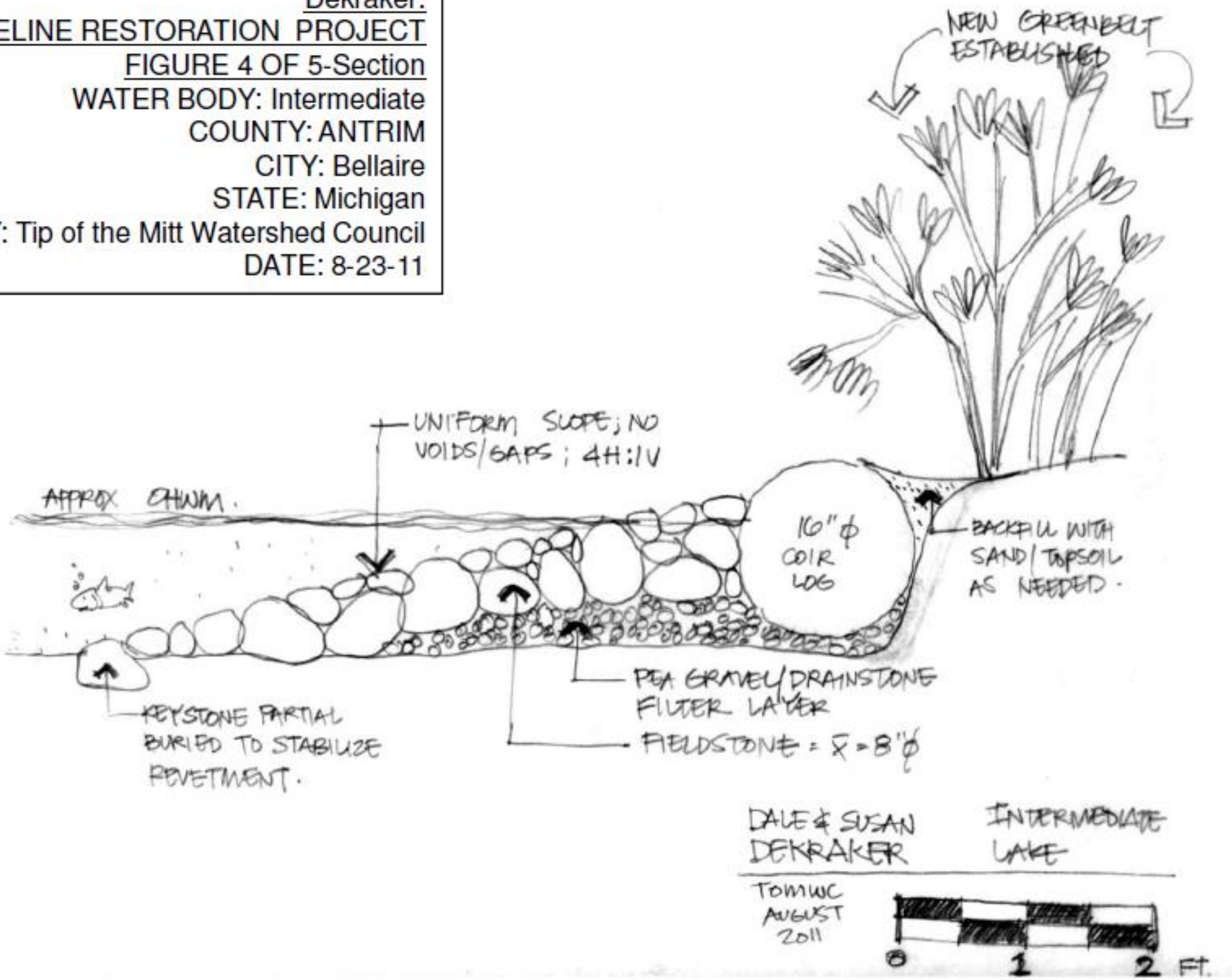
COUNTY: ANTRIM

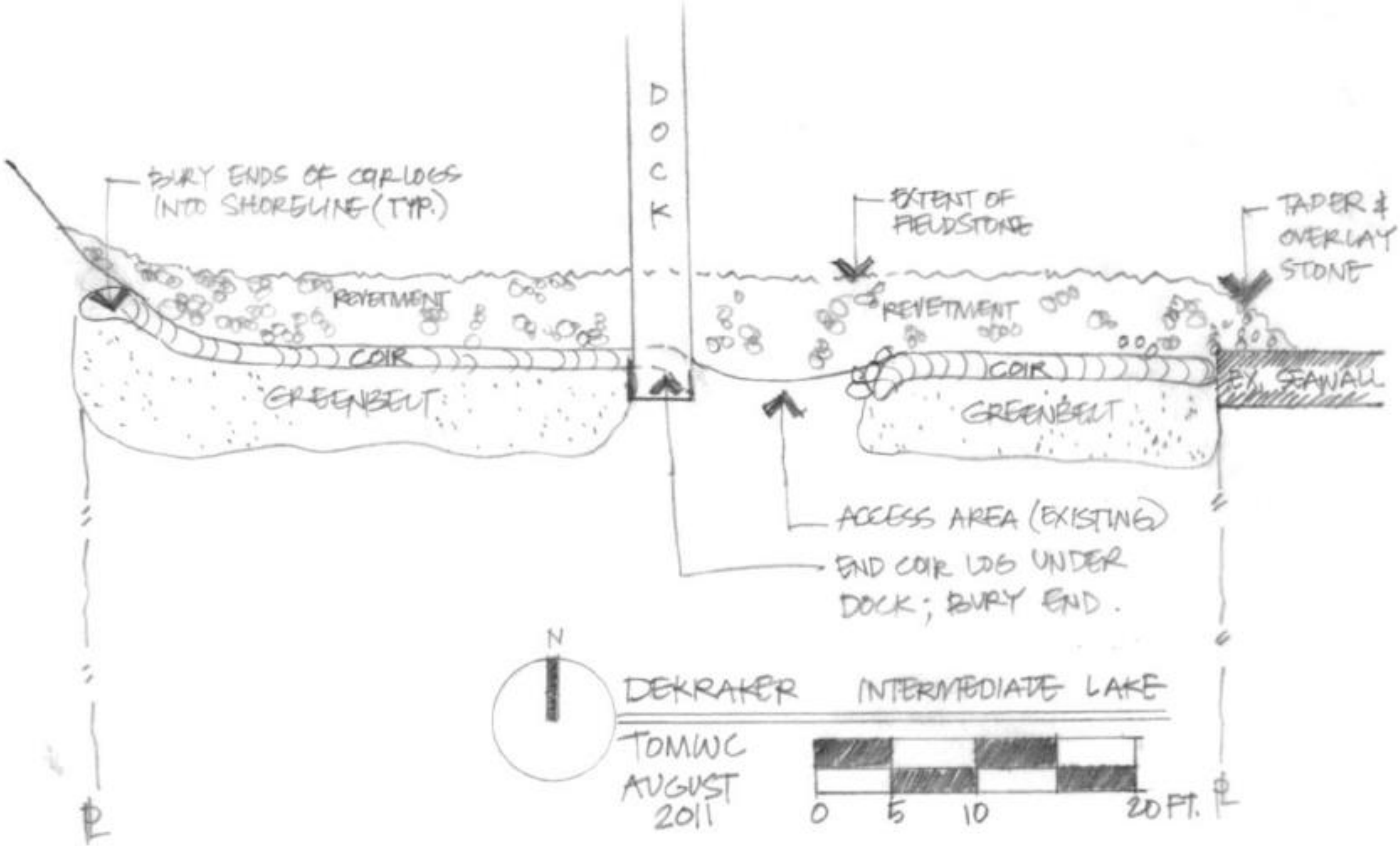
CITY: Bellaire

STATE: Michigan

APPLICATION BY: Tip of the Mitt Watershed Council

DATE: 8-23-11





Dekraker:

SHORELINE RESTORATION PROJECT

FIGURE 5 OF 5- Plan

WATER BODY: Intermediate

COUNTY: ANTRIM

CITY: Bellaire

STATE: Michigan

APPLICATION BY: Tip of the Mitt Watershed Council

DATE: 8-23-11


Picture taken: 2019

Intermediate Lake, Antrim Co.

Maximum fetch = 2.25 miles

Maximum wave height = 1.53

Picture taken: 2021

Julia Kirkwood, EGLE, MNSP

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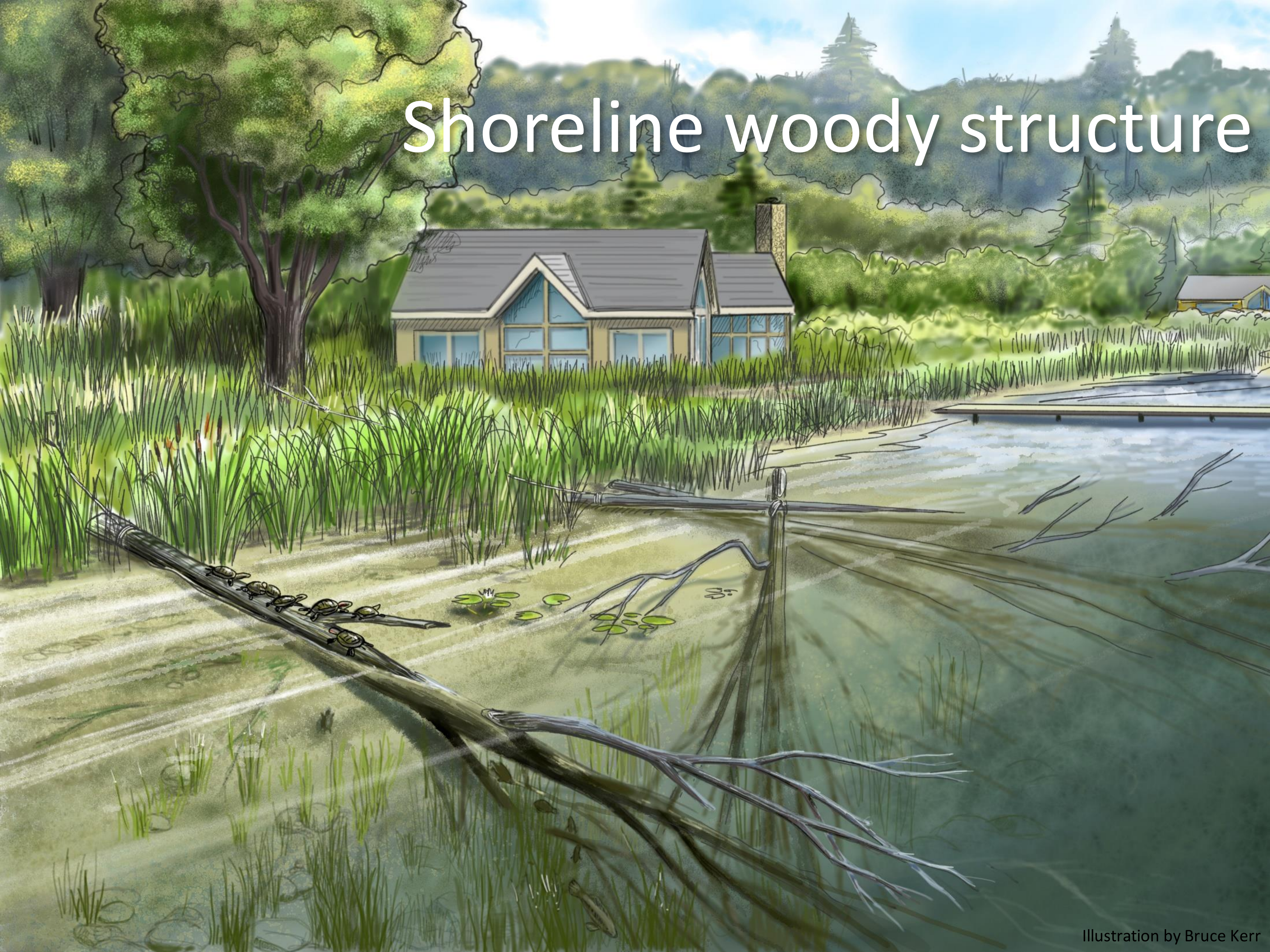
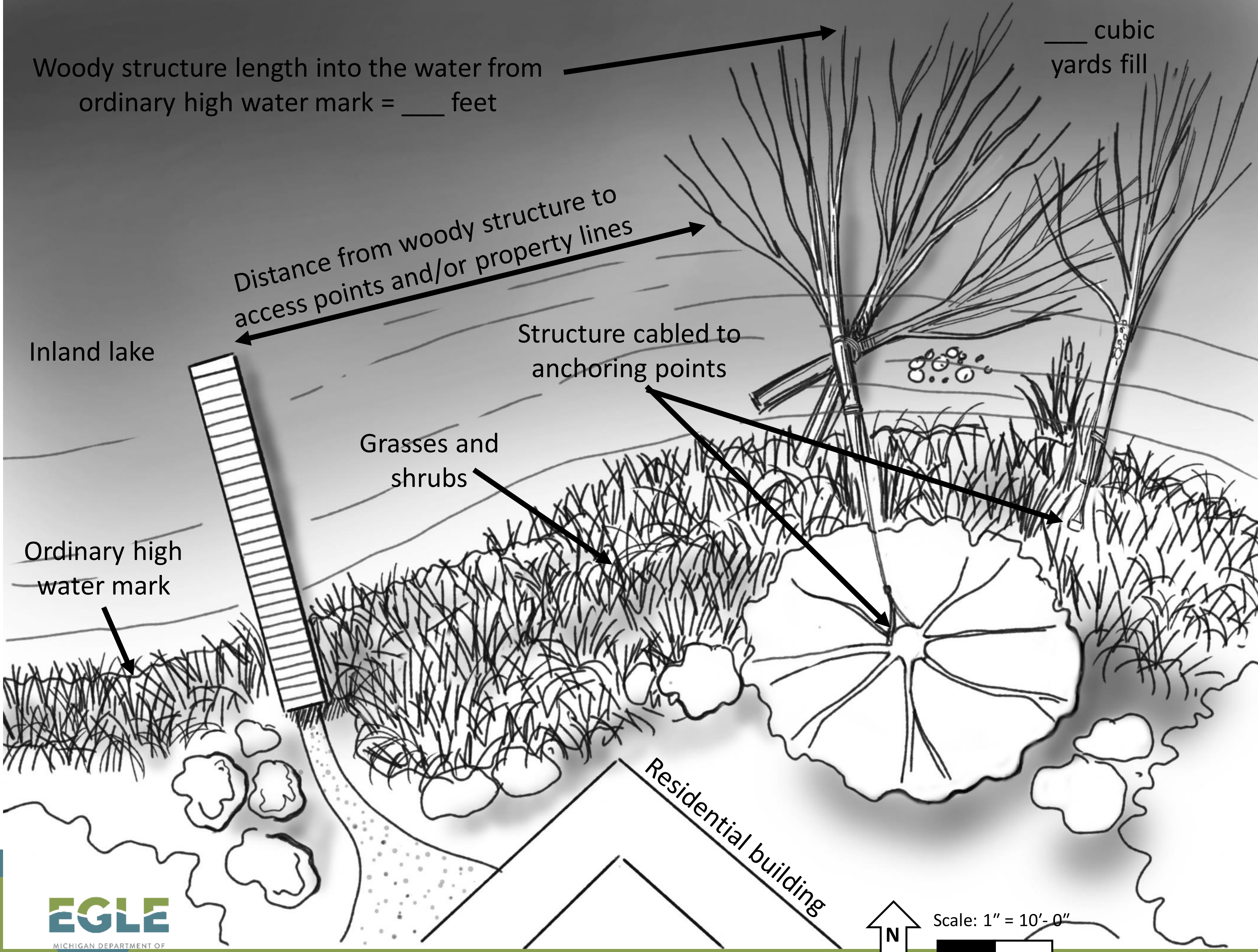
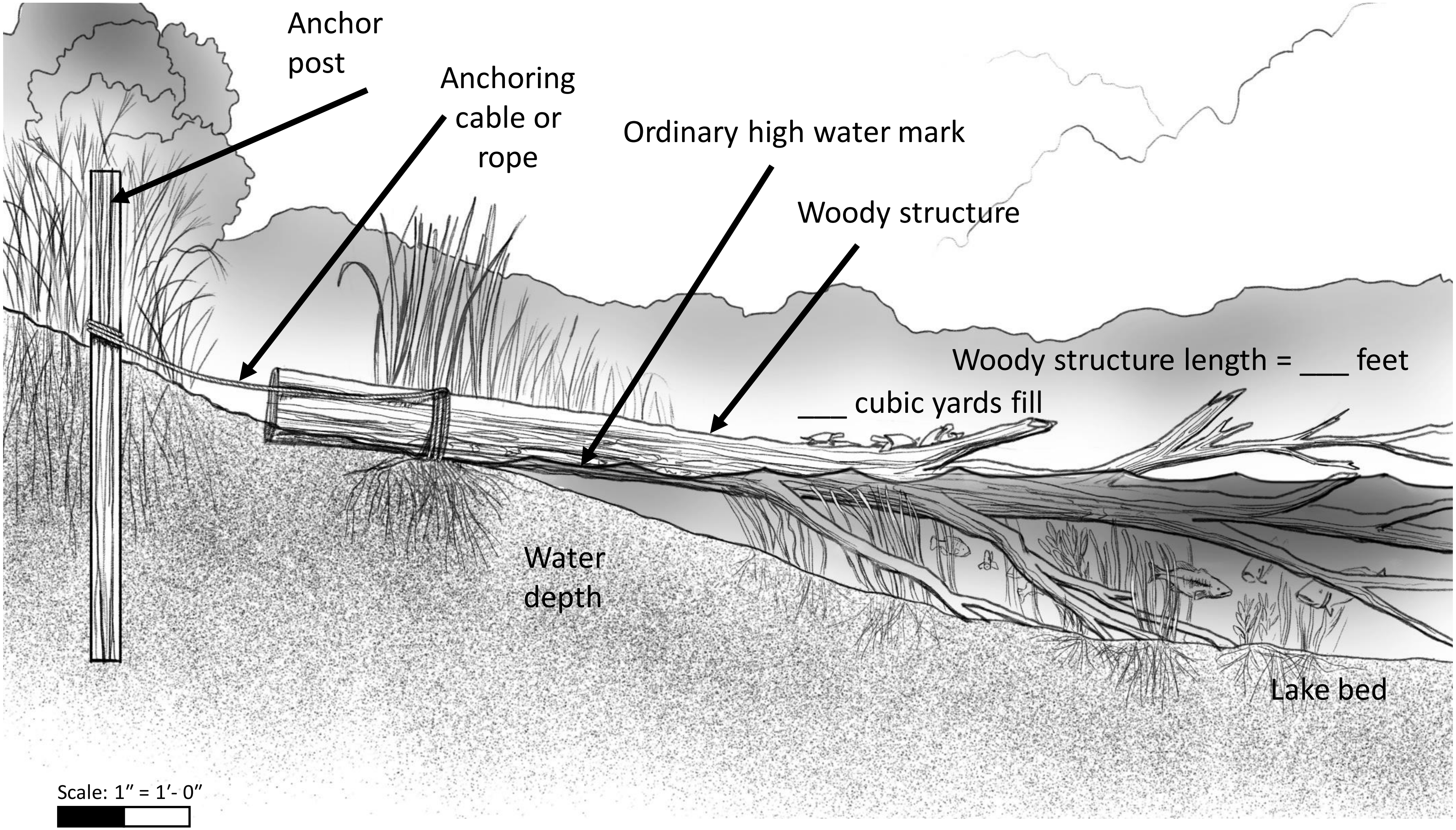

Shoreline woody structure
Illustration by Bruce Kerr


Woody structure length into the water from ordinary high water mark = ___ feet
___ cubic yards fill
Distance from woody structure to access points and/or property lines
Inland lake
Structure cabled to anchoring points
Grasses and shrubs
Ordinary high water mark
Residential building
N
Scale: 1″ = 10′- 0″



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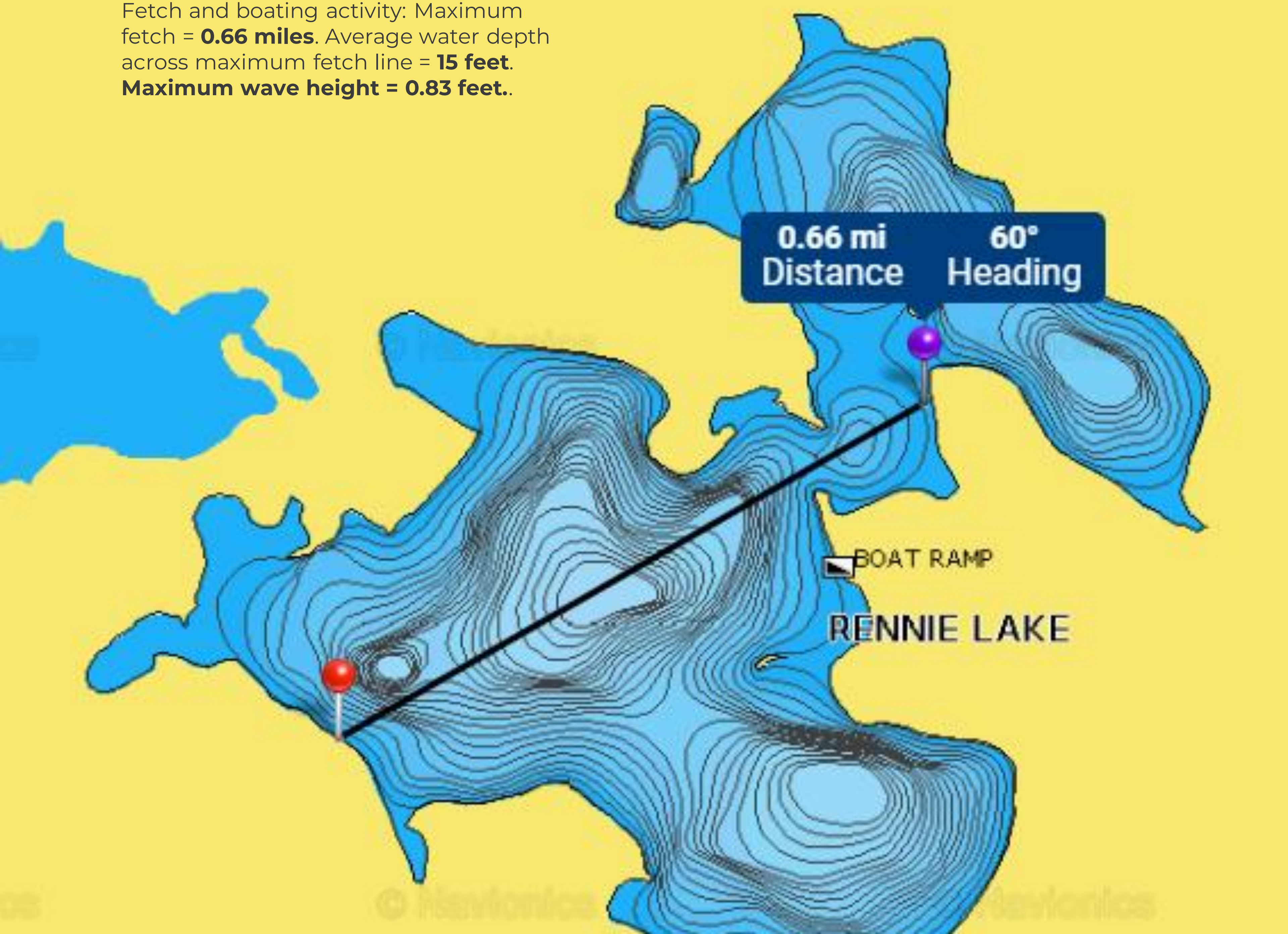
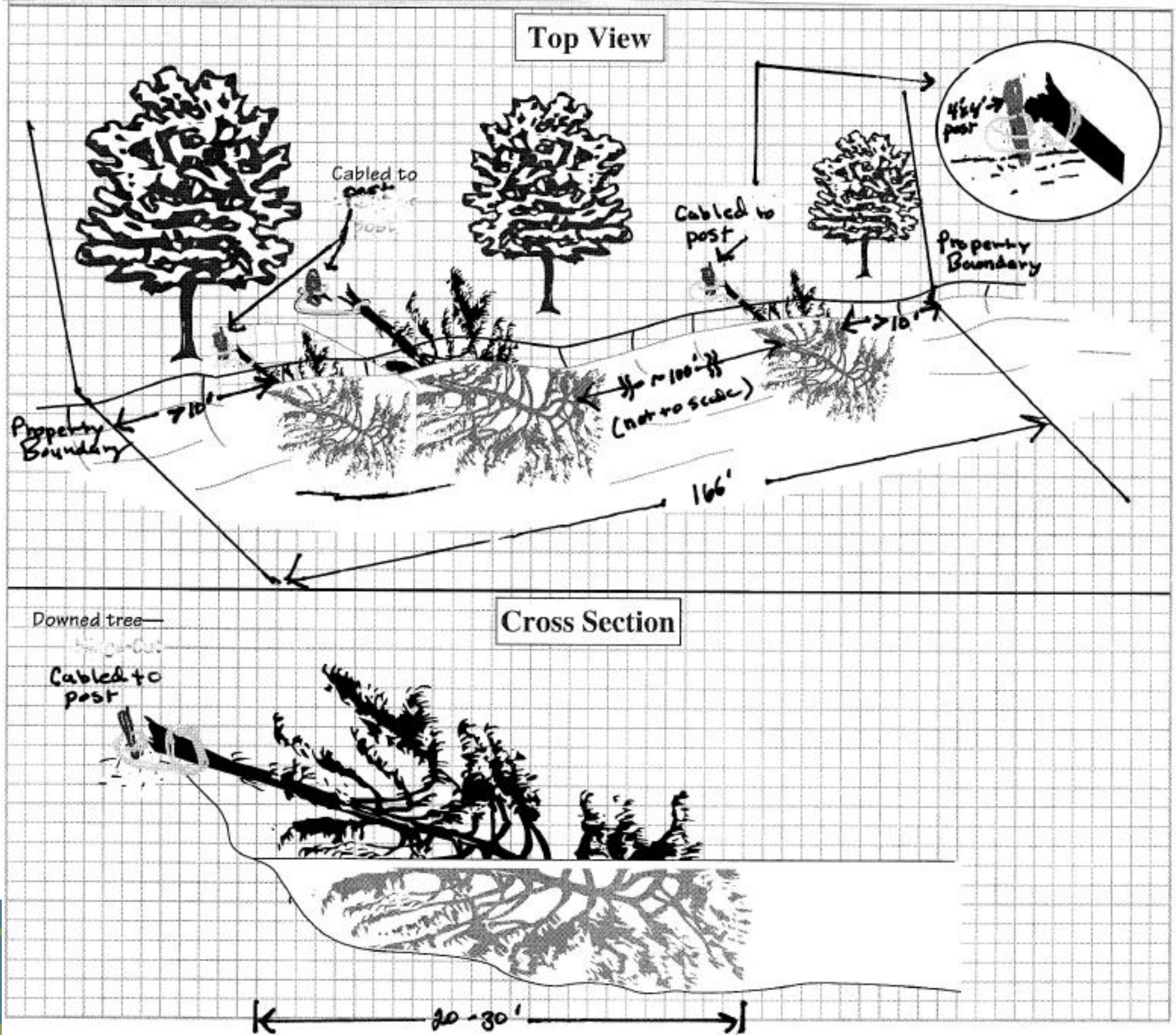
Fetch and boating activity: Maximum fetch = **0.66 miles**. Average water depth across maximum fetch line = **15 feet**. **Maximum wave height = 0.83 feet.**.



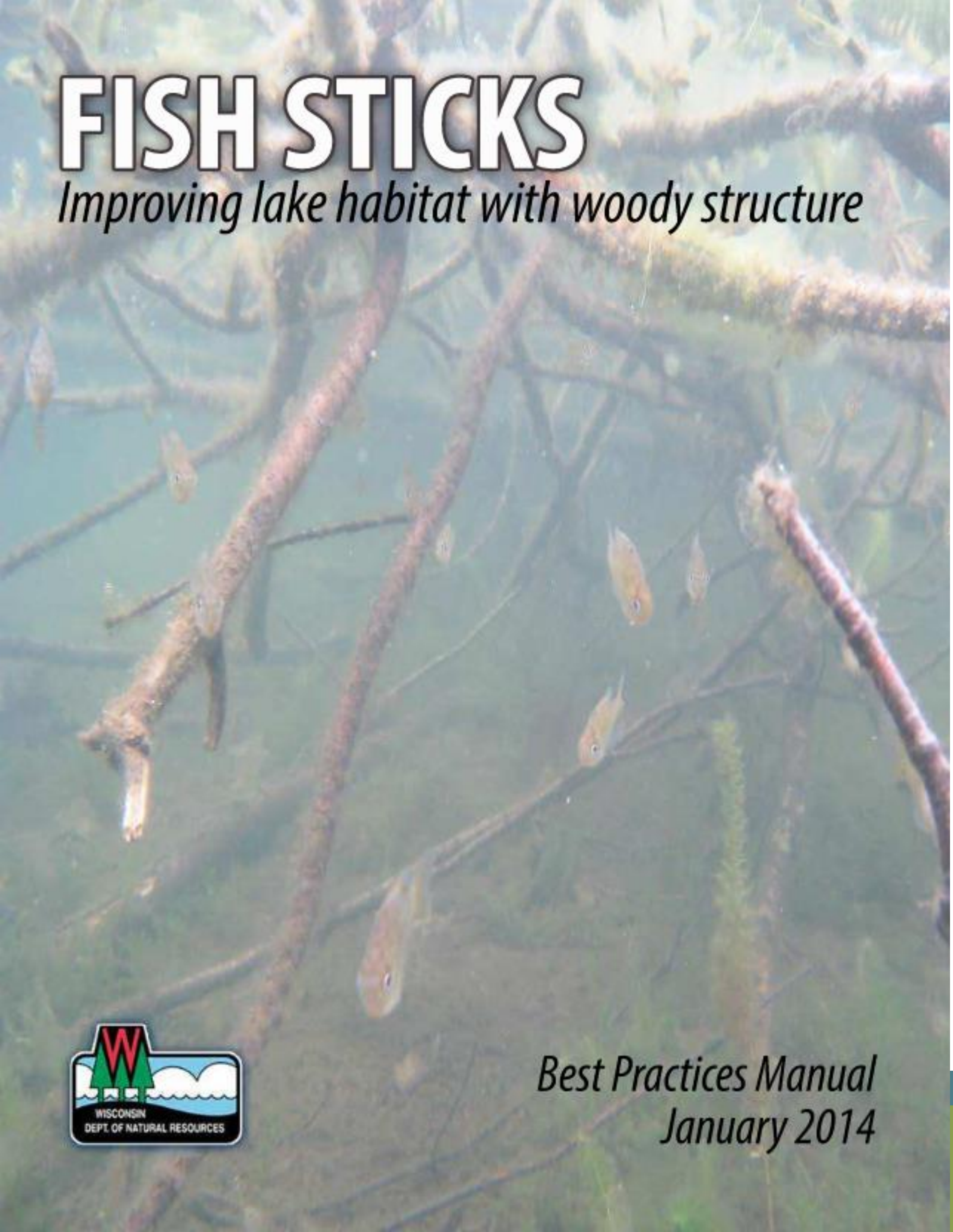

Ralph Bednarz



Top View
Cabled to post
Cabled to post
4"x4" post
Property Boundary
>10'
~100' (not to scale)
>10'
Property Boundary
166'
Cross Section
Downed tree
Cabled to post
20 - 30'

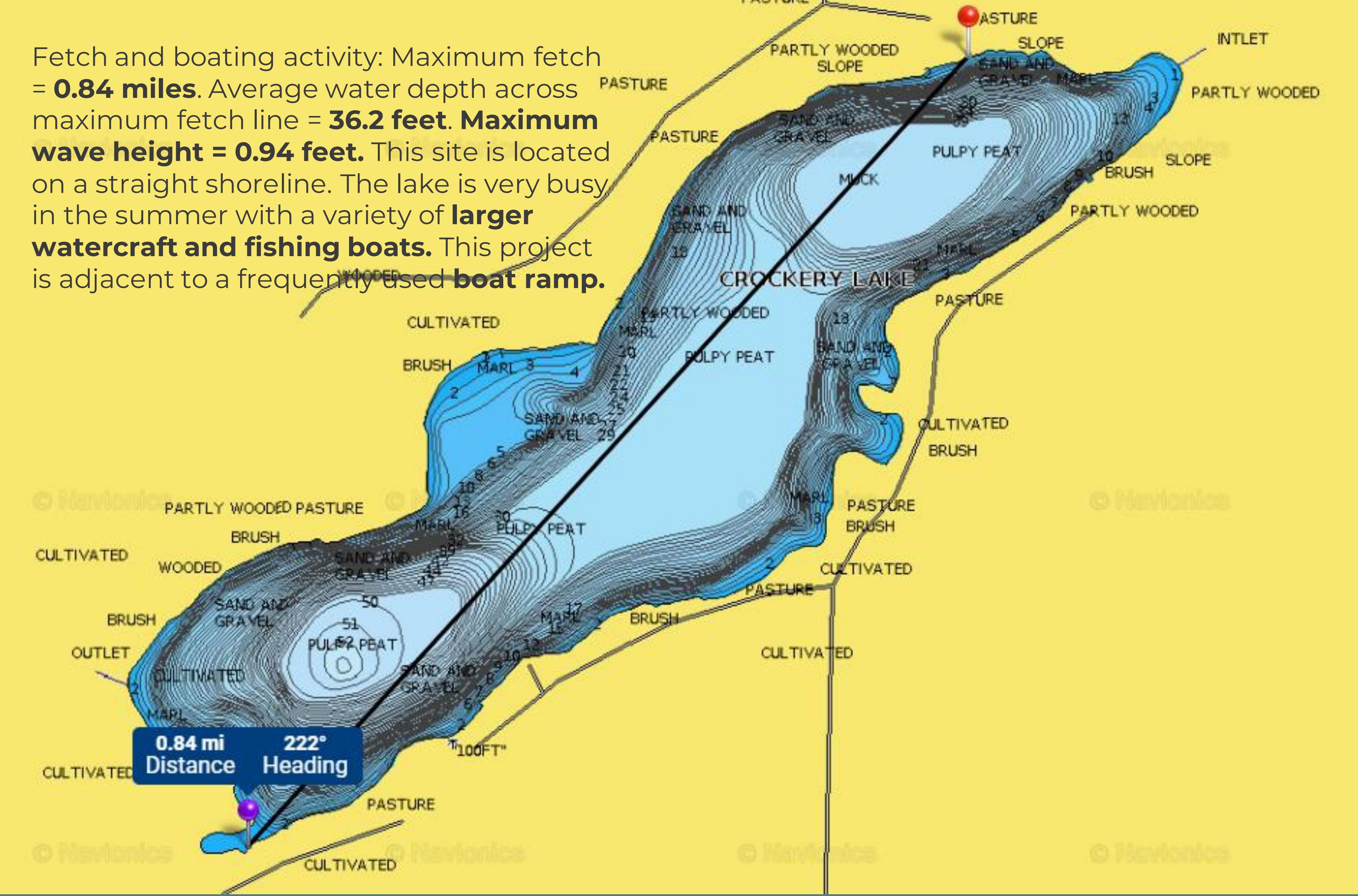
"After" picture

“After” picture

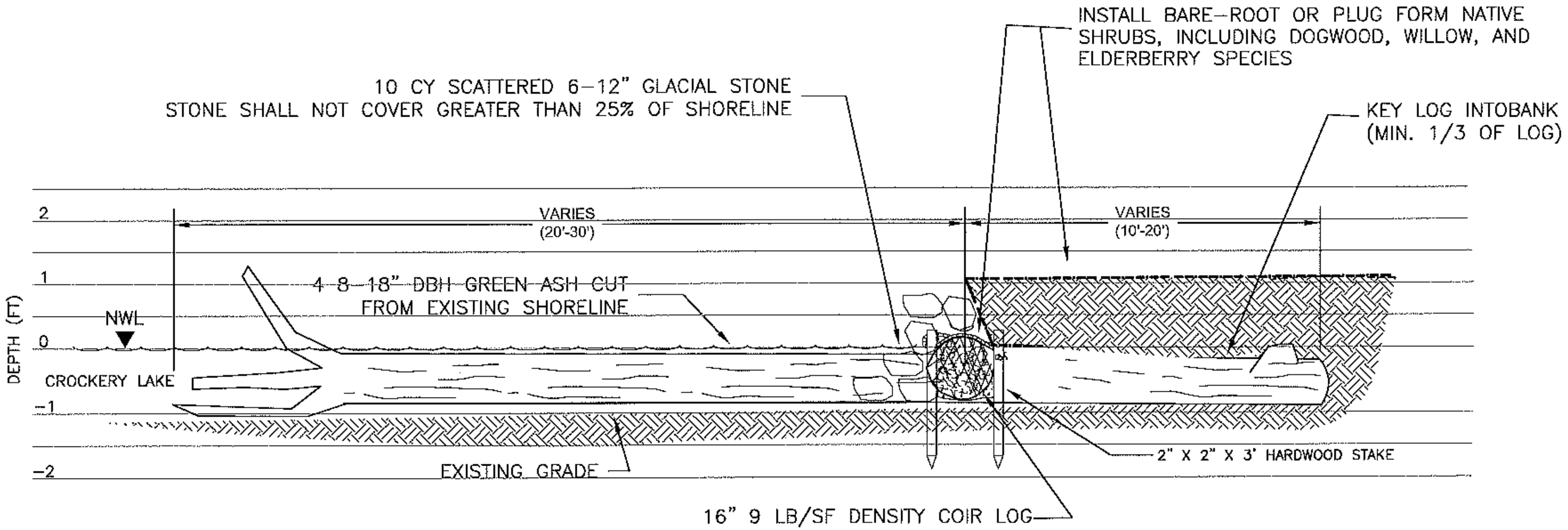


https://p.widencdn.net/jcv7ac/Outreach_FishSticksBestPractices

Fetch and boating activity: Maximum fetch = **0.84 miles**. Average water depth across maximum fetch line = **36.2 feet**. **Maximum wave height = 0.94 feet.** This site is located on a straight shoreline. The lake is very busy in the summer with a variety of **larger watercraft and fishing boats.** This project is adjacent to a frequently used **boat ramp.**

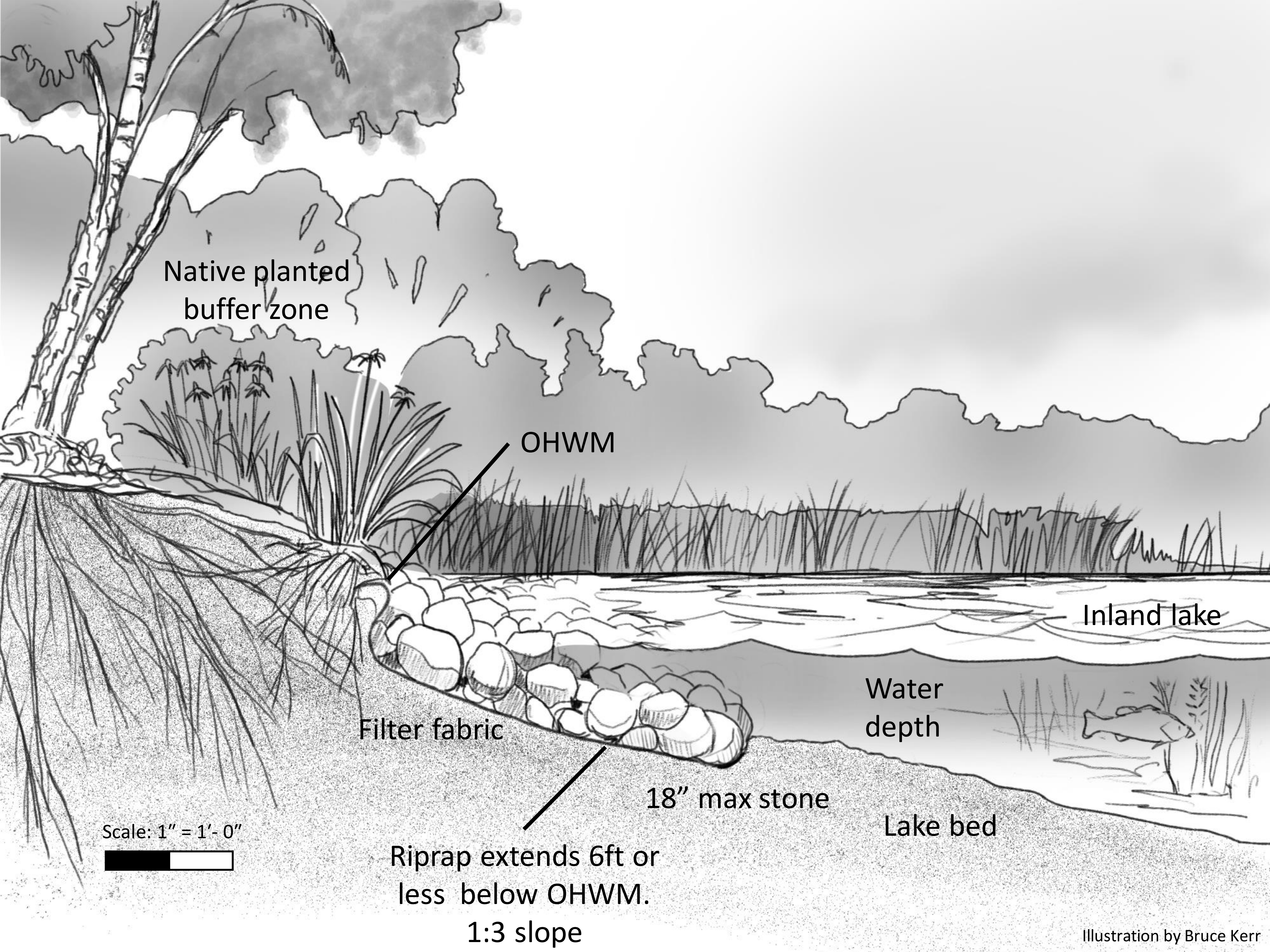


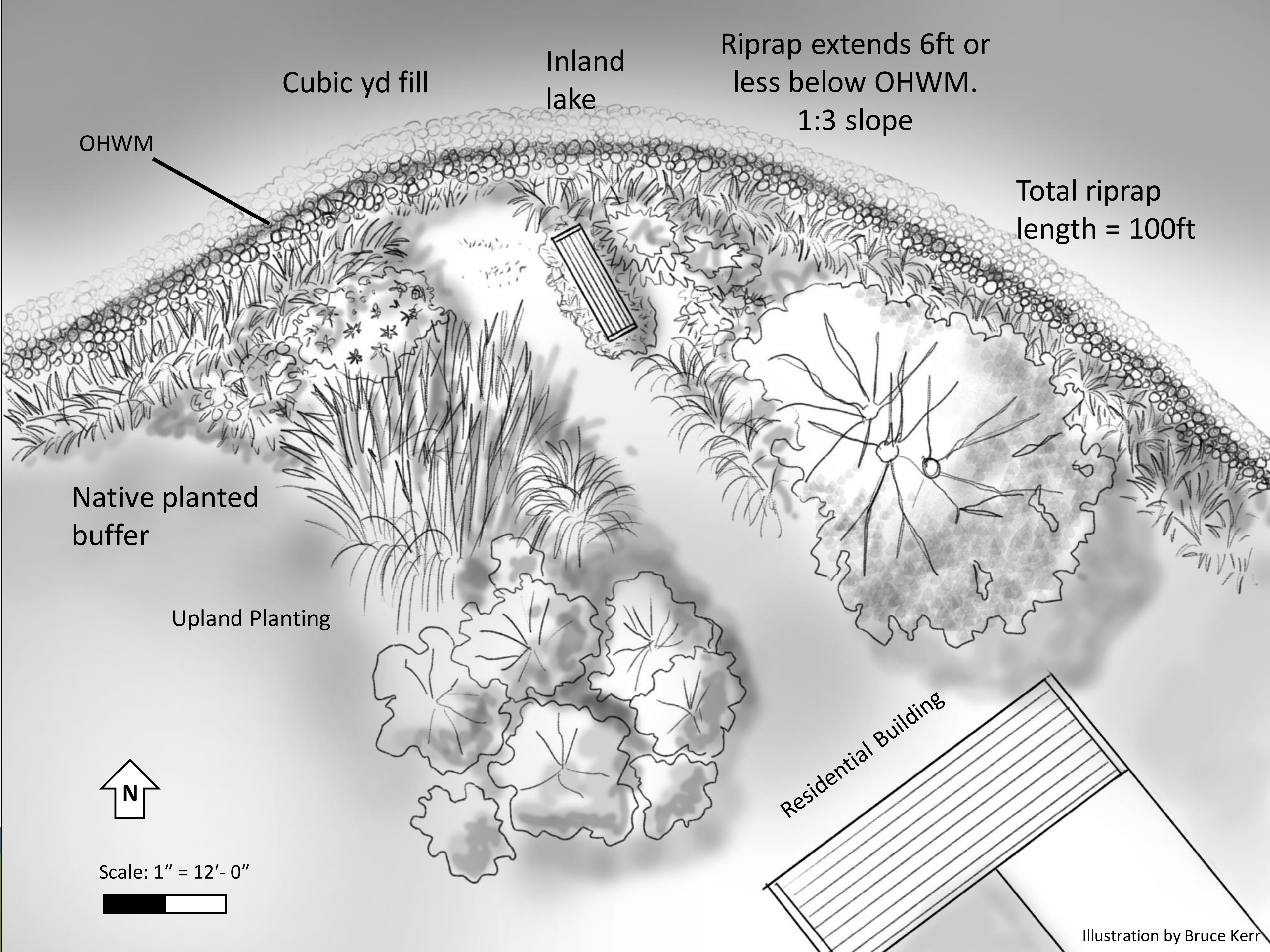
EGLE


INSTALL BARE-ROOT OR PLUG FORM NATIVE SHRUBS, INCLUDING DOGWOOD, WILLOW, AND ELDERBERRY SPECIES
10 CY SCATTERED 6-12" GLACIAL STONE STONE SHALL NOT COVER GREATER THAN 25% OF SHORELINE
KEY LOG INTOBANK (MIN. 1/3 OF LOG)
VARIES (20'-30')
VARIES (10'-20')
4-8-18" DBH GREEN ASH CUT FROM EXISTING SHORELINE
NWL
DEPTH (FT)
2
1
0
-1
-2
CROCKERY LAKE
2" X 2" X 3' HARDWOOD STAKE
EXISTING GRADE
16" 9 LB/SF DENSITY COIR LOG

Crockery Lake, Ottawa County


Riprap
Illustration by Bruce Kerr


Native planted
buffer zone
OHWM
Inland lake
Water
depth
Filter fabric
18” max stone
Lake bed
Scale: 1” = 1’- 0”
Riprap extends 6ft or
less below OHWM.
1:3 slope
Illustration by Bruce Kerr

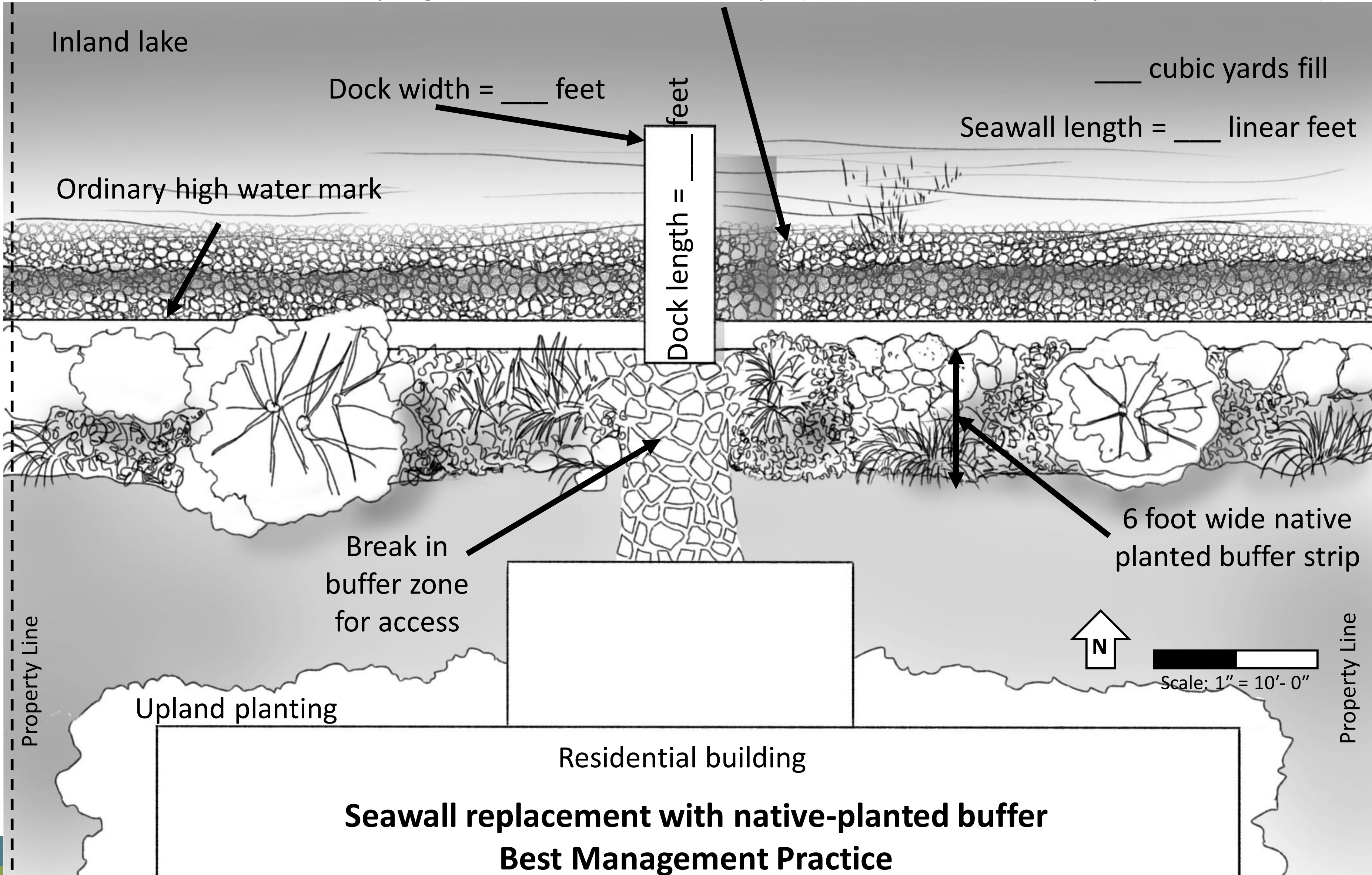

Cubic yd fill
Inland
lake
Riprap extends 6ft or
less below OHWM.
1:3 slope
OHWM
Total riprap
length = 100ft
Native planted
buffer
Upland Planting
Residential Building
N
Scale: 1" = 12'- 0"
Illustration by Bruce Kerr

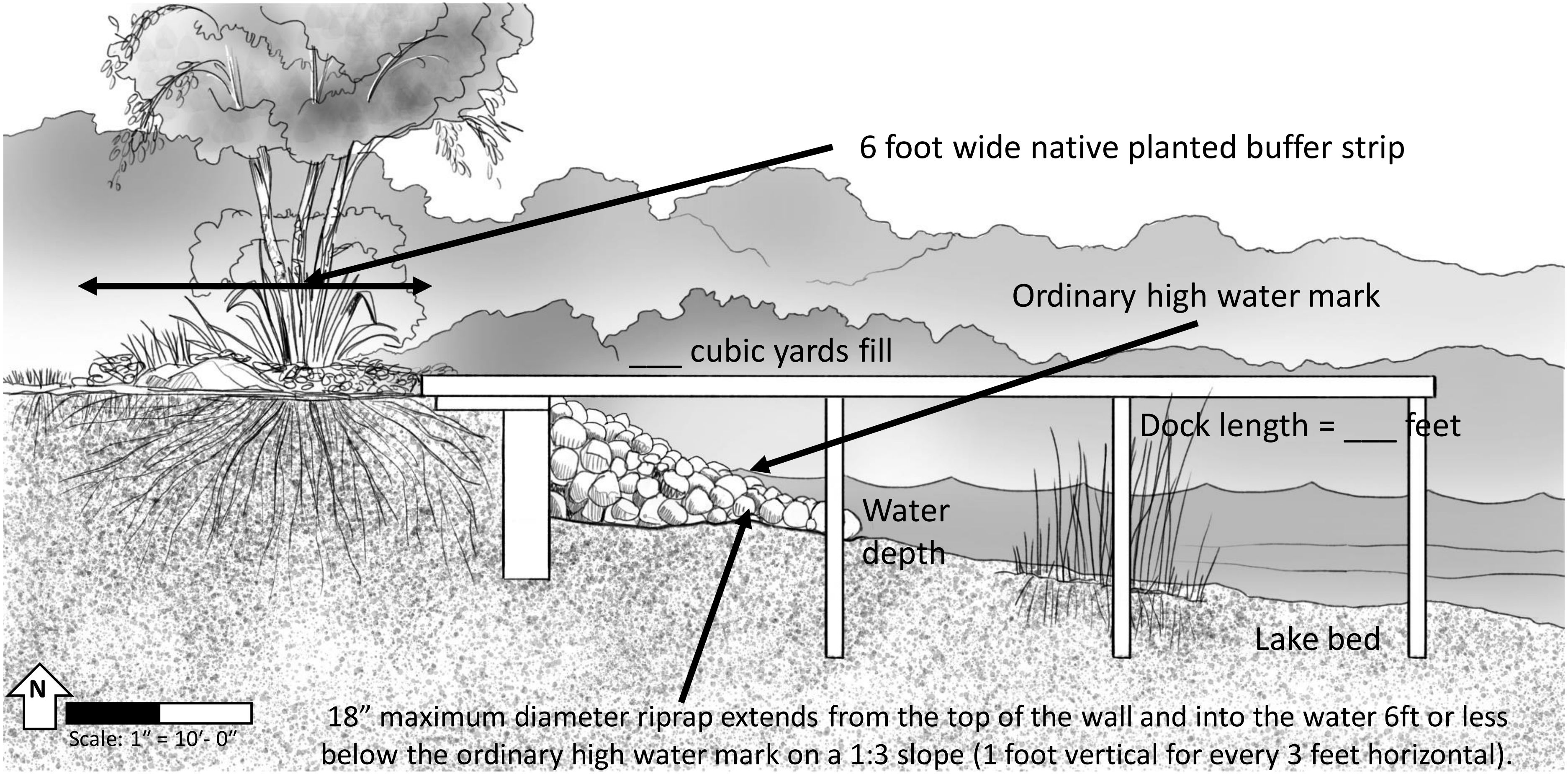
Jen Buchannan, Tip of the Mitt Watershed Council

Seawall replacement with BMPs

Illustration by Bruce Kerr

Riprap extends from the top of the wall and into the water 6 feet or less below the ordinary high water mark on a 1:3 slope (1 foot vertical for every 3 feet horizontal)





This project can be processed on a quicker timeline and at a lower fee if it meets the criteria of the Minor Project Category. Minor Project categories can be viewed at the following website: https://www.michigan.gov/documents/egle/WRD-Minor-Project-Categories_733320_7.pdf

Functions of Seawalls	Functions of BMPs
Scouring of the lake bottom and erosion of neighboring properties	Absorbs wave energy
Sediment suspension, nutrient suspension lowers water quality	Stabilizes sediment
Doesn’t support aquatic plant growth and natural shoreline vegetation	Supports aquatic plants
No habitat complexity for fish and wildlife Create barrier for animal movement	Complex microhabitats Improves land/water connectivity
Remove natural energy dissipating capacity of sloped shoreline and natural vegetation	Allow for energy dissipation

INLAND LAKE FACT SHEET SERIES

Bioengineering (Lower-Energy)

Bioengineering is a best management practice in which native Michigan plants are restored in lower-energy nearshore areas along a lake shoreline. Lower-energy areas along a shoreline are typically characterized by site-specific conditions that may include a relatively short unobstructed distance across the lake from the proposed project, and the project being in a location where erosive forces from wind and boats are low - such as a protected bay. Bioengineering serves many functions that protect lakeshore properties and property values, improve recreational opportunities, and promote lake health. Natural shorelines are a critical component of a healthy lake, and a well-designed bioengineered shoreline can balance lake access, views, aesthetics, and lake health. A bioengineered shoreline does not have to look messy – a finished and well-manicured look can be achieved through careful planning.

ADVANTAGES
of installing shoreline bioengineering

Erosion Control
Bioengineering stabilizes the shoreline by utilizing native plants with strong, deep rooting, and complex root systems that hold soil and sediment and protect the shoreline from erosion.

Improved Water Quality
Bioengineering uses native plants to intercept nutrients and pollutants before they enter the lake, leading to clearer water and decreased algal blooms.

Fish and Wildlife Habitat
Bioengineering provides clean water, cover, feeding habitat for fish; nesting, basking, and feeding habitat for turtles, frogs, birds, butterflies, and other wildlife. Bioengineering also deters property damaging geese!

This bioengineered shoreline stabilizes the soil, slows runoff from upland areas, increases fish and wildlife habitat, improves water quality, and dissipates wave energy from wind and boats. Photo courtesy of Eric Calabro.

Turf-grass to the shoreline leads to poor lakeshore habitat. Poor biological health is three times more likely in lakes with poor lakeshore habitat. Forty percent of Michigan's inland lakes have poor lakeshore habitat. Photo courtesy of Michigan Natural Shoreline Partnership.

DISADVANTAGES
of hardened shorelines and lawn to water's edge

Wave Reflection
Seawalls and hardened shorelines don't allow for the absorption and dispersal of wave energy, they reflect wave energy. The reflection of waves can make erosion worse in other areas through wave flanking and scour - potentially causing erosion problems on neighboring properties.

Weak Roots
Turf-grasses (lawns) are not naturally found at the lake edge, and the shallow roots of turf-grass do not have enough strength to withstand waves and ice. Turf-grass also attracts property damaging geese.

Poor Water Quality
Seawalls degrade lakes by promoting runoff of nutrients and pollutants that lower water quality. Waves reflecting off seawalls suspend sediment in the water column, reducing water quality. Seawalls block the ability of animals, like turtles and frogs, to move in and out of the water, and eliminate habitat required by fish and wildlife.

INLAND LAKE FACT SHEET SERIES

Shoreline Woody Structure

Coarse woody structure is a best management practice in which woody habitat is retained or restored in lake nearshore areas. These partially or fully submerged trees and branches in nearshore areas serve many functions that protect lakeshore properties and property values, improve recreational opportunities, and promote lake health. Woody habitat, as well as diverse, native plant communities, and natural shorelines are all indicators of a healthy lake.

ADVANTAGES
of shoreline woody structure

Erosion Control and Improved Water Clarity
Coarse woody structure can stabilize the shoreline and may prevent sediment suspension.

Attract More Fish
Woody habitat can improve fishing by attracting fish and increasing the number of fish in an area.

Wildlife Habitat
Coarse woody structure provides cover, feeding, nesting, and basking habitat for birds, turtles, and other wildlife.

Nearshore areas on a lake, such as this relatively pristine lake in northern Michigan, trees and branches enter the lake through methods such as wind, ice, waves, or beavers. This shoreline woody structure, as well as native shoreline vegetation, can stabilize the soil, slow runoff from upland areas, increase fish and wildlife habitat, improve water quality, and dissipate wave energy from wind and boats. Photo courtesy of Eric Calabro.

In developed lakes, shoreline woody structure is often removed and shorelines are developed, leading to poor lakeshore habitat. On Michigan lakes in forested landscapes, we would expect one log approximately every 8 feet and on most Michigan lakes we see 3 to 17 percent of that. Poor biological health is three times more likely in lakes with poor lakeshore habitat. Forty percent of Michigan's inland lakes have poor lakeshore habitat. Photo courtesy of Michigan Natural Shoreline Partnership.

DISADVANTAGES
of no shoreline woody structure

Erosion
Lack of shoreline woody structure leaves property unprotected and vulnerable to erosion.

Turbid Water
Lack of shoreline woody structure can allow for the suspension of sediments, increasing the turbidity and lowering water quality of the lake.

Habitat Elimination
Lack of shoreline woody structure eliminates habitat required for fish and wildlife feeding, nesting, and spawning.

INLAND LAKE FACT SHEET SERIES

Native Aquatic Plants

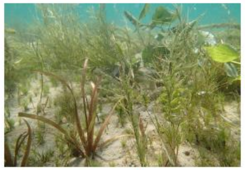
Native aquatic plant preservation and restoration is a best management practice for Michigan's inland lakes. Aquatic plants play an extremely important role in lake processes by stabilizing sediments, reducing turbidity, absorbing wave energy, oxygenating the water, and providing habitat and food resources for a variety of fish and wildlife. Shoreline development projects that remove or shade submerged, emergent, and floating-leaf plants can reduce lake ecosystem services and alter fish recruitment and impair fishing and other recreational opportunities. Native aquatic plants are a vital component of inland lake systems, and preserving and restoring aquatic plants can benefit fishing and other recreational opportunities in addition to protecting shoreline properties and improving water quality.

ADVANTAGES
of native aquatic plants

Stabilizes Sediment
Aquatic plants hold sediment in place which reduces turbidity and protects water quality. Turbid conditions result in a loss of biodiversity and reduced water quality.

Absorbs Wave Energy
Aquatic plants dampen wave energy and protect shoreline properties from erosion.

Fish and Wildlife Habitat
Aquatic plants provide valuable habitat and food resources for birds, amphibians, reptiles, invertebrates, and fish. Additionally, plants provide spawning and nursery areas for many species and refuge from predators.



Native aquatic plants of Michigan's inland lakes are essential component of lake health. Water quality, biodiversity, and recreation depend on healthy native aquatic plant populations. Photo courtesy of Eric Calabro.

Elimination of aquatic and nearshore plants have resulted in erosion, reduced recreational opportunities, and loss of productive habitat. Photo courtesy of Michigan Natural Shoreline Partnership.

DISADVANTAGES
of removal of native aquatic plants

Reduced Habitat Quality
Increased shoreline development and excessive removal of aquatic plants reduces habitat complexity and has had negative implications for fish and other aquatic species. Physically complex shore zones support a richer biota than simple ones, with higher species diversity.

Increased Erosion
The absence of wave dampening aquatic plants, in combination with shallow-rooted turfgrass, results in shoreline erosion.

Decreased Water Quality
Lack of sediment stabilizing aquatic plants results in increased turbidity and a decrease in water quality.

INLAND LAKE FACT SHEET SERIES

Biotechnical Erosion Control (Higher-Energy)

Biotechnical Erosion Control is a best management practice in which both structural and vegetative measures are used to protect high-energy shorelines from erosion. This type of higher-energy bioengineering design is used in areas where erosive energy from waves and ice are relatively high, and vegetation alone would be inadequate in protecting the shoreline. Deep rooting, native plants in combination with coir logs and field stone protect against erosion and pollution, and provide habitat for fish and wildlife.

ADVANTAGES
of installing shoreline bioengineering

Erosion Control
Coir logs and shallow-sloped (4 horizontal:1 vertical) fieldstone provide a gentle runup for waves and ice. This provides immediate erosion protection. As vegetation becomes established, the roots grow through the coir, rock and soil, creating a strong form of shoreline protection that also provides habitat and water quality protection.

Improved Water Quality
Biotechnical erosion control uses native plants to intercept nutrients and pollutants before they enter the lake, leading to clearer water and decreased algal blooms.

Fish and Wildlife Habitat
The shallow-sloped fieldstone provides easy access to and from the water for frogs and turtles. Biotechnical erosion control also provides feeding habitat for fish, birds, butterflies, and other wildlife. This practice also deters property damaging geese!

This bioengineering design protects the shoreline on this high energy lake by dissipating wave energy from wind and boats while still providing lake access and not impeding lake views. Photo courtesy of Jennifer Buchanan, Tip of the Mitt Watershed Council.

The pictures above compare the shoreline of a Michigan inland lake in 1938 (top) to the same shoreline in 2014 (bottom). Over-engineered shoreline stabilization (seawalls) are not only costly, they lead to poor lakeshore habitat.

DISADVANTAGES
of hardened shorelines and lawn to water's edge

Wave Reflection
Seawalls and hardened shorelines don't allow for the absorption and dispersal of wave energy, they reflect wave energy. The reflection of waves can make erosion worse in other areas through wave flanking and scour.

Weak Roots
Turf-grass (lawns) are not naturally found at the lake edge, and the shallow roots of turf-grass do not have enough strength to withstand waves and ice in high energy areas. Turf-grass also attracts property damaging geese.

Poor Water Quality
Seawalls degrade your lake by promoting runoff of nutrients and pollutants that lower water quality. Waves reflecting off seawalls suspend sediment in the water column, reducing water quality. Seawalls fragment the land and water interface and eliminate habitat required by fish and wildlife.

INLAND LAKE FACT SHEET SERIES

Encapsulated Soil Lifts

Encapsulated soil lifts are a best management practice that are used as a bioengineered shoreline erosion control strategy. Encapsulated soil lifts create a lake-friendly shoreline that can be used on lakefronts that experience moderate to high wind, wave, and ice action. Encapsulated soil lifts can also be used to replace seawalls. These bioengineered structures are built on a rock base and are used to rebuild eroded shorelines. Layers of soil are "encapsulated" inside biodegradable fabric to form the lift. Each lift is placed on top of the preceding lift, but stepped back, to create the desired slope. Encapsulated soil lifts are planted or seeded with deep-rooted, Michigan-native plants that stabilize the soil layers. Once plants are established, the encapsulated soil lifts will protect lakeshore properties and property values, improve recreational opportunities, and promote lake health. Diverse, natural plant communities and natural shorelines are the foundation of a healthy lake.

ADVANTAGES
of installing encapsulated soil lifts

Erosion Control
Encapsulated soil lifts built on a rock base effectively stabilize the shoreline – even in areas of relatively high wave and ice action.

Improved Water Quality
Encapsulated soil lifts' natural vegetation filters pesticides and pollutants before they enter the lake.

Fish and Wildlife Habitat
Encapsulated soil lifts' natural vegetation provides habitat for wildlife, while acting as a deterrent for geese.

This encapsulated soil lift and the established native shoreline vegetation stabilize the shoreline – even with moderate to high wave and ice action. Encapsulated soil lifts also slow runoff from upland areas, improve fish and wildlife habitat, improve water quality, and deter geese from damaging property. Photo courtesy of Michigan Natural Shoreline Partnership.

Seawalls cause poor lakeshore habitat. Poor biological health is three times more likely in lakes with poor lakeshore habitat. 40% of Michigan's inland lakes have poor lakeshore habitat. Photo courtesy of Michigan Natural Shoreline Partnership.

DISADVANTAGES
of hardened shorelines and lawn to water's edge

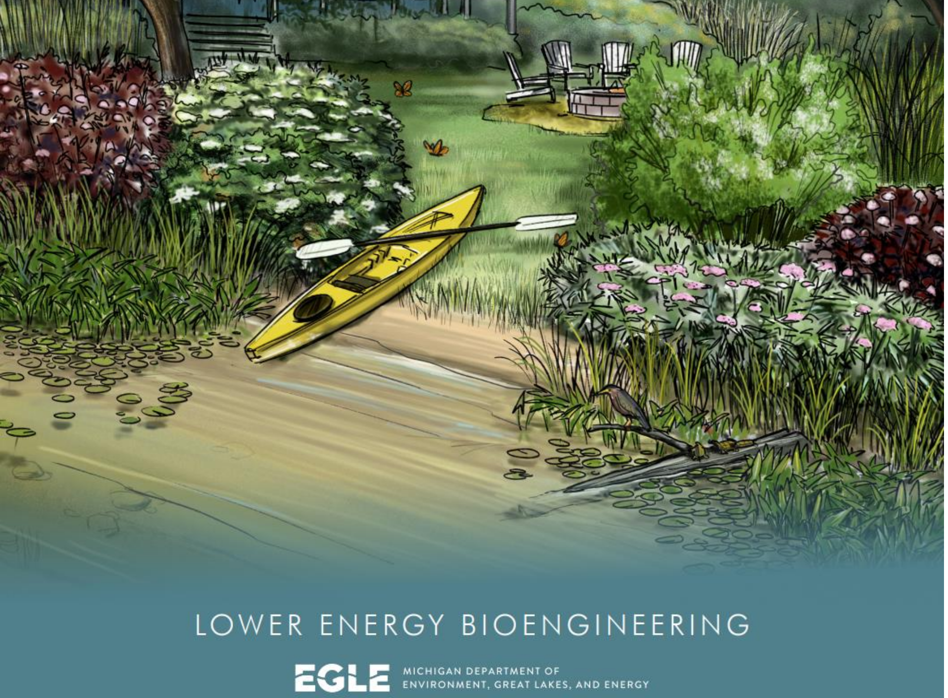
Habitat Elimination
Seawalls eliminate habitat required for fish and wildlife feeding, nesting, and spawning. Seawalls also act as a wildlife barrier, impeding natural movement.

Degraded Water Quality
Seawalls cause the suspension of sediments, increasing lake turbidity and algae. Seawalls also promote runoff - lowering the water quality of the lake.

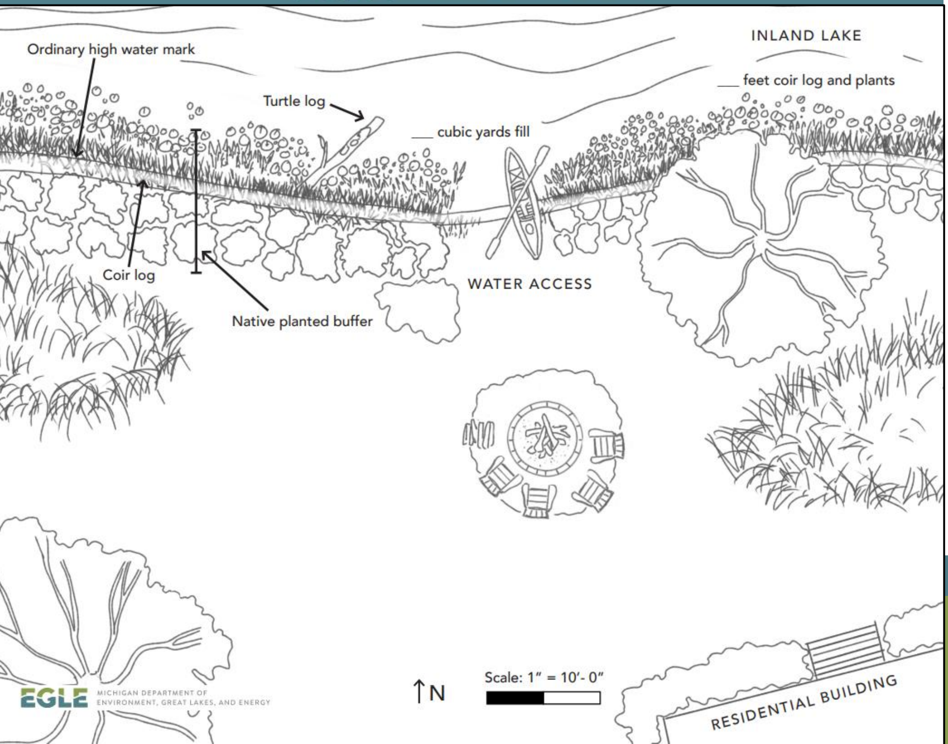
Cumulative Impacts
The effects of multiple shoreline developments around a lake accumulate over time, impairing peoples' use of the water.

EGLE's Shoreline Protection website

EGLE



- [Seawall replacement with native-planted buffer strip best management practice]
- [Lower energy bioengineering]
- [Higher energy bioengineering]
- [Riprap]
- [Docks and boardwalks through a wetland]
- [Shoreline Woody Structure]



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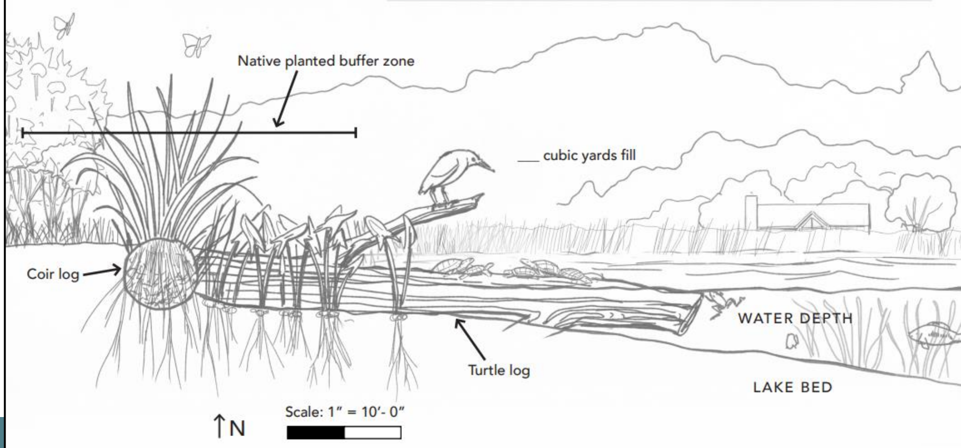

EGLE MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

800-662-9278 | Michigan.gov/EGLE

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03/2022

Michigan Natural Shoreline Partnership

- Learn about shorelines and shoreline design
- Learn about plants for inland lakes
- Find a shoreline contractor
- Get training on natural shoreline construction
- Library of information on health lakeshore management
- Shoreland Stewards Program

Where Do I Go For Part 301/303 Permit?

EGLE MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

About Contact MI.gov Home

MiWaters

NPDES, Groundwater, Resource Permitting, Aquatic Nuisance Control, Wastewater Construction

Sign In

Permitting & Compliance

What can I do here?

For registered users, MiWaters is the portal to several types of actions:

- Apply for permits
- Manage your permits (pay fees, apply for renewals)
- Submit reports (required by your permit or certification)
- Submit service requests
- View issued permits
- See your notifications
- Review evaluations / site inspections

To get started, you'll need an account.

CREATE A MIWATERS ACCOUNT

Sign in with an existing account

Public Information and Services

These services are provided to be freely used by the public; no account is necessary to make use of them.

Public Notice Search

Find public notices, hearings, and other events. Access documents made available to the public.

CSO/SSO Discharge Search

Search for Combined Sewer Overflow (CSO), Retention Treatment Basin (RTB), and Sanitary Sewer Overflow (SSO) discharge events

Site Map Explorer

Use our mapping tools and advanced search capabilities to navigate all available Water Resources Division public site information.

Report Spills, Pollution, Unauthorized Activities

Report observed spills, pollution, or any other unauthorized activities in wetlands, lakes or streams. File a report with complete anonymity if you choose.

https://miwaters.deq.state.mi.us/miwaters/external/home

EGLE/USACE Joint Permit Application

The EGLE/USACE Joint Permit Application (JPA) covers permit requirements derived from state and federal rules and regulations for construction activities where the land meets the water. This JPA prevents duplication of state and federal permitting and provides simultaneous review for activities on or for: Wetlands, Floodplains, Dams, Inland Lakes and Streams, Great Lakes Bottomlands, Critical Dunes, Environmental Areas, and High Risk Erosion Areas. See Applicable Regulations page for more details on the related laws and rules.

The applicant must submit the JPA through MiWaters, our online permitting site. Instructions on how to fill out the JPA form online can be found here. Online payment of permit application fees is also submitted through MiWaters. The status of applications as well as current Public Notice and Hearing Notices can be searched and viewed in MiWaters.

Save time and Money - Request a Pre-Application Meeting with Permitting Staff.

This page can be accessed as www.michigan.gov/jointpermit

Application Information

- JPA Instructions
- Intro to the Digital JPA Webinar
- JPA Fees
- Minor Project Categories
- General Permit Categories
- Expedited Review Information for Minor Floodplain Projects
- Feasible and Prudent Alternatives Analysis
- Applicable Regulations

Application Process

- JPA Public Noticing
- JPA Frequently Asked Questions
- Does my Project Need a Permit?
- JPA Processing Flow Chart
- Permitting Staff and District Office Map
- Withdrawal Guidance
- MiWaters - an online permitting and compliance database
- MiWaters - Starting a JPA for a New Site
- MiWaters - Starting a JPA for an Existing Site
- MiWaters - Paying in MiWaters
- MiWaters - Permit Modification Request
- MiWaters - Revising a Submission
- MiWaters - Who to Contact
- Pre-application Meeting - Wetland[s] and Inland Lakes and Streams
- Application for Special Exception i[n] Critical Dune Areas, 1/2017

Specific Project Assistance

- Resource Program Education and Outreach Series
- Public Transportation Agency Projects
- Dredging Projects and Sediment Testing
- Agricultural Assistance Program
- Utility Corridor Projects in Wetlands Education & Outreach Series
- County Drain Projects
- Seismic Surveys in Wetlands
- Hydraulic Report Guidelines
- Sample Damage Assessment Certification Form

Program Links

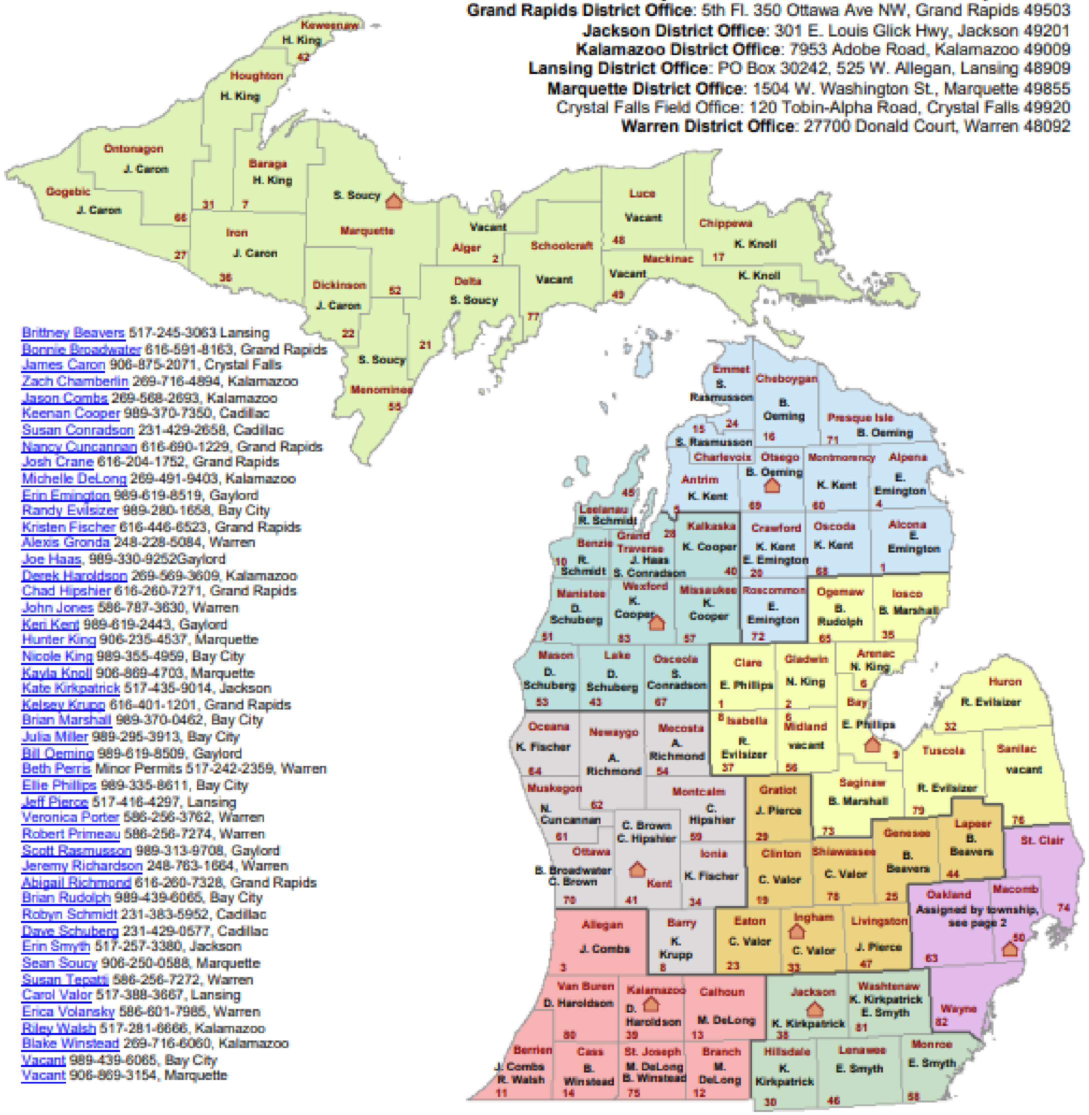
- Critical Dune Areas
- Dams
- Environmental Areas
- Floodplains/National Flood Insurance
- Great Lakes
- High Risk Erosion Areas (HREA)
- Inland Lakes and Streams
- Marinas
- Sand Dune Protection
- Soil Erosion and Sedimentation Control
- Transportation Review
- Water Management
- Wetland Protection

www.michigan.gov/jointpermit

Land/Water Interface Permitting Staff

www.mi.gov/jointpermit

Bay City District Office: 401 Ketchum Street, Suite B, Bay City 48708
Cadillac District Office: 120 W. Chapin St, Cadillac 49601
Gaylord District Office: 2100 West M-32, Gaylord 49735
Grand Rapids District Office: 5th Fl. 350 Ottawa Ave NW, Grand Rapids 49503
Jackson District Office: 301 E. Louis Glick Hwy, Jackson 49201
Kalamazoo District Office: 7953 Adobe Road, Kalamazoo 49009
Lansing District Office: PO Box 30242, 525 W. Allegan, Lansing 48909
Marquette District Office: 1504 W. Washington St., Marquette 49855
Crystal Falls Field Office: 120 Tobin-Alpha Road, Crystal Falls 49920
Warren District Office: 27700 Donald Court, Warren 48092



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Keenan Cooper 989-370-7350, Cadillac
Susan Conradson 231-429-2658, Cadillac
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Joe Haas, 989-330-9252Gaylord
Derek Haroldson 269-569-3609, Kalamazoo
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Julia Miller 989-295-3913, Bay City
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Beth Perris Minor Permits 517-242-2359, Warren
Ellie Phillips 989-335-8611, Bay City
Jeff Pierce 517-416-4297, Lansing
Veronica Porter 586-256-3762, Warren
Robert Primeau 586-256-7274, Warren
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Riley Walsh 517-281-6666, Kalamazoo
Blake Winstead 269-716-6060, Kalamazoo
Vacant 989-439-6065, Bay City
Vacant 906-869-3154, Marquette

EGLE MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY **Water Resources Division**

www.michigan.gov/wrd ↔ 517-284-5567

1/10/2022

- [Joint Permit Application website]()
- [MiWaters]()
- [Inland Lakes and Streams Program]()
- [Land/Water Interface Permitting Staff]()

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