Practice Standards and NR 328

Choosing a Technique and Getting a Permit

Choosing a Technique

- Define cause of erosion
  - Upland runoff? Impervious areas? Velocities?
  - Wave energies? Boat or wind generated?
  - Ice action? Prevailing wind direction?
  - Water level fluctuations? Floods or Droughts?
  - Groundwater seeps?
  - Upgradient slope and height of bank?
  - Stability of native soils? Fill soils?
  - Shear stresses on streambanks?

Vegetative Treatment Potential

- When is vegetation going to be enough to stabilize the site?

- Minimal fetch distance (<0.5 - 1 mile)
- Protected cove or bay (not point or island)
- Shoreline is facing such that prevailing winds do not reach it frequently (i.e. faces east and rarely gets a westerly wind)
- When boat traffic and associated waves are not common or constant (i.e. no motorized traffic allowed, no public landing, NOT necessarily due to a SLOW NO WAKE zone as these are not enforced and usually increase the waves thrown)
- When water level fluctuations do not harm vegetation survival rates and/or success

Other Deciding Factors

- Soil type is not conducive to slope stability at given angle without toe protection to prevent slipout
- Development of parcel is limiting such that there is not room to establish a stable slope (i.e. home too close to slope break or existing vertical walls)
- Channel or narrows in lake or controlled wake areas create constant wave action and vegetation can not get established
- Extreme ice action continuously removes or stresses soil/plants
- Vegetation unaltered by landowner is not handling the erosion intensities at the site
- Cultural Resources limitations (ie burial sites)
- Biological/Habitat limitations
- Utility limitations (buried lines, overhead lines, setbacks)
- Access limitations (steep slopes, ice access, barge, etc)

Shoreland Restorations

- Where do I fit in to this?
- DATCP Code 50 (history)
- Land and Water Plans at the County level
  - Erosion
  - Soil conservation
  - Water quality
- Local priorities in each County dictate how they offer cost share funding
  - Practices require a 10 year agreement with the landowners to maintain the practice

Tools - NRCS Standards

- Riparian Forest Buffer 391
  - An area in which vegetation is enhanced or established to reduce or eliminate the movement of sediment, nutrient and other nonpoint source pollutants to an adjacent surface water resource or groundwater recharge area, to protect the banks of streams and lakes from erosion and to protect fish habitat.
- Shoreland Habitat 643A
- Streambank and Shoreline Protection 580

Tools - NRCS Standards Cont'd

- Streambank and Shoreline Protection 580
  - Using vegetation or structures to stabilize and protect the banks of streams, lakes, estuaries or excavated channels against scour and erosion, or to protect fish habitat and water quality from degradation

- Most practices have a 10 year O&M
  - Contract and longevity of design to last 10 years

NRCS Technical Standards

- NRCS = Natural Resources Conservation Service
- Web page = www.wi.nrcs.usda.gov
- Field Office Tech Guide
- Engineering Field Handbook Section IV
- Index of Practices
- Index of Construction Specifications

Relevant NRCS Specifications referenced in designs for shorelands

- Wisconsin Construction Specification #1 - Clearing & Snagging
- WCS #2 - Excavation
- WCS #3 - Earthfill
- WCS #5 - Site Pollution Control (includes construction erosion)
- WCS #7 - Mobilization & Demobilization
- WCS #9 - Rock Riparp
- WCS #13 - Geotextiles
- WCS #20 - Soil Bioengineering
- WCS #21 - Structural Measures for Streambanks and Shorelines
- WCS #22 - Biodegradable or Temporary Breakwaters (Temporary Wave Barriers)

WDNR Tools

- Erosion Calculator on web page
- Surface Water Data Viewer on web page
- "Where You Live"
- Erosion Intensity Scoresheet (EI)
- Bank Erosion Potential Index (BEPI)

http://dnr.wi.gov/waterways/shoreline_habitat/erosioncalculator.html

Erosion Control
- Erosion Control Information
- Biological Methods
- Vegetated Armoring Methods
- Traditional Riprap Methods
- Seawall Methods
- Shoreline Erosion Control Permits
- Shoreline Energy Calculator

Waterway and Wetland Permits
- What's New
- Proposed Rules
- Public Hearings
- Workshops
- Permit Process Today
- Emergency Rules Today
- Current News
- Annual Report

Activities
- Aquatic Plant Control
- Aquatic Plant Barrier
- Beaver Damage
- Boathouse Repair
- Boat Ramp (Landings)
- Boat Shelter
- Bridges

Calculating Energy Along a Shoreline

Follow these steps to obtain an accurate calculation of energy along your shoreline:

1. Print out the map for your lakeshore site (include the scale)
2. Figure out the correct feet-per-inch value using the map scale and your ruler, and enter the number below:

   1 inch = [ ] feet
3. Mark your shoreline site on the lake map.
4. Draw the longest unobstructed straight line originating from your site across the water to any other point on the shore; this is the fetch at your site. Use this example *(PDF, 289KB)* for reference.
5. Using a ruler, measure the length of the fetch line and record this value:

   [ ] inches
6. To convert the ruler measurement of fetch to actual distance, multiply feet per inch (found in step 2) by the measured fetch line (found in step 5):

   Lake Fetch = [ ] feet/inch x [ ] inches = 0 feet
7. Measure the mean depth along your fetch line

   1. Locate and mark at least 5 equally-spaced points along your fetch line.
   2. Estimate and record the depths at these equally spaced points (for example: 45', 105', 75', 55' and 25').
   3. Add these depth values together and then divide by the number of sample points taken, and record the result. For example, (45'+105'+75'+55'+25')/5 = 61 feet. Use this example *(PDF, 273KB)* for reference.

Proposed Rules
Public Hearings
Workshops
Permit Process Today
Emergency Rules Today
Current News
Annual Report

Activities

Aquatic Plant Control
Aquatic Plant Barrier
Beaver Damage
Boathouse Repair
Boat Ramp (Landings)
Boat Shelter
Bridges
Buoys
Culverts
Dams
Dredging
Dry Hydrants
Fish Habitat
Fords
Grading
Irrigation
Lake Levels
Misc. Structures
Nonmetallic Mining
Pea Gravel Blanket
Piers, Docks, Wharves
Pilings
Ponds
Shoreline Erosion Control
Stream Realignment
Swimming Rafts
Utility Waterway Crossing

[ ] inches

6. To convert the ruler measurement of fetch to actual distance, multiply feet per inch (found in step 2) by the measured fetch line (found in step 5):

   Lake Fetch = [ ] feet/inch x [ ] inches = 0 feet

7. Measure the mean depth along your fetch line

   1. Locate and mark at least 5 equally-spaced points along your fetch line.
   2. Estimate and record the depths at these equally spaced points (for example: 45', 105', 75', 55' and 25').
   3. Add these depth values together and then divide by the number of sample points taken, and record the result. For example, (45'+105'+75'+55'+25')/5 = 61 feet. Use this example *(PDF, 273KB)* for reference.

8. Using the two values obtained in steps six and seven, *fetch from your site* and *mean depth on your fetch line*, use the wind wave model below to calculate the storm wave height at your site. The storm wave height is used to determine the *energy category* at your site.

Lake Mean Water Depth	22	feet
Lake Fetch From My Site	3.3	miles
Storm Wind Speed	51.33	ft/sec

Calculate

Storm Wave Height **1.80 feet**

Energy Category **Moderate Energy**

9. Print out this page and submit it with your application.

Note: This page contains one or more Adobe Portable Document Format (PDF) files, which can be viewed and printed with the freely available Adobe® Reader® software.

Energy Category

- Classifies Shoreline Sites Based on Erosion S

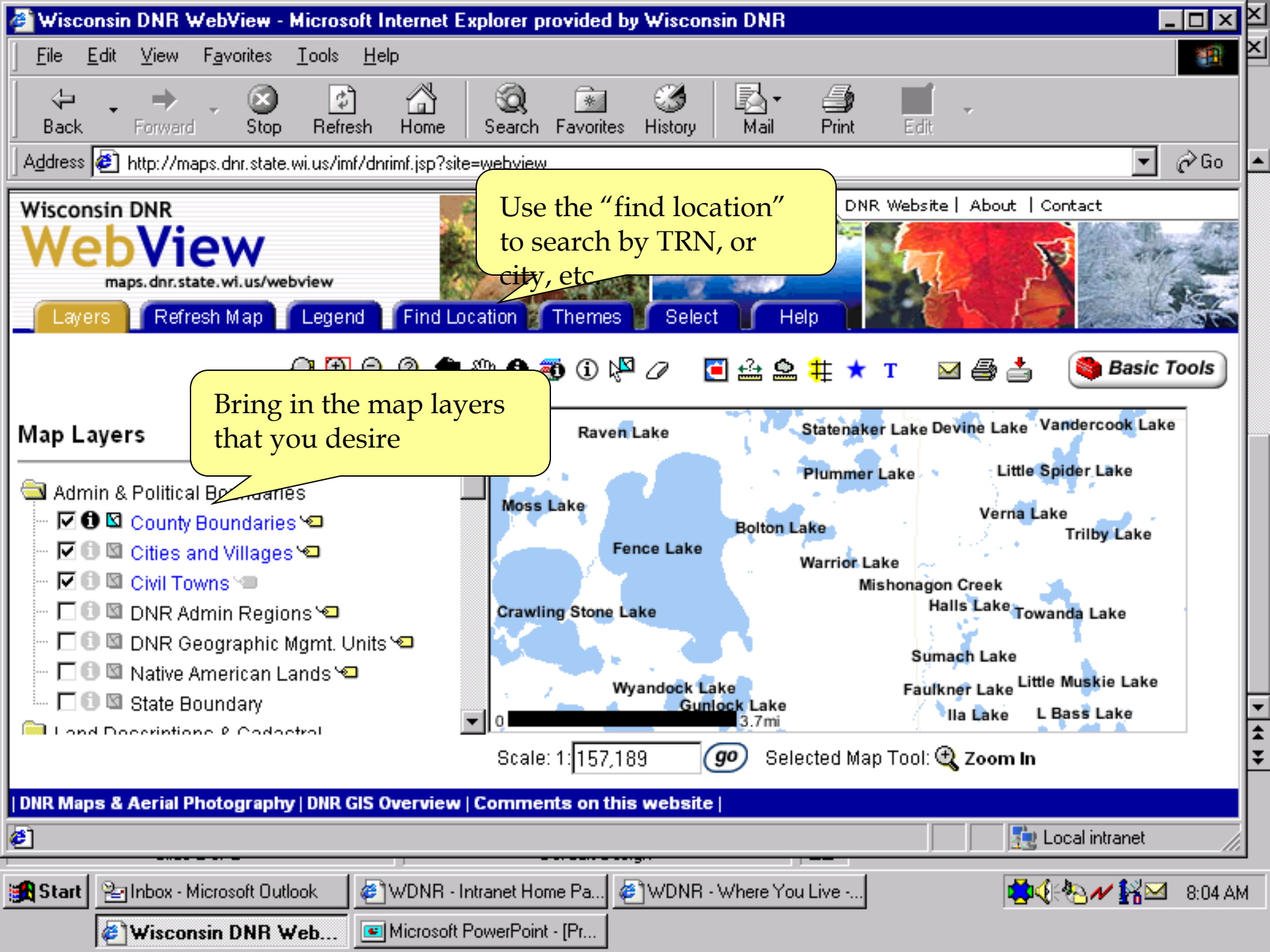
Low Energy	Moderate Energy	High Energy
< 1 foot	1- 2.3 feet	>2.3 feet

NR 328-Using DNR WebView (http://maps.dnr.state.wi.us/webview/) to Calculate Maximum Fetch, Average Fetch, and Shore Orientation

SHAID_TYP – A two-character code for each region. The code represents areal water features. This item is indexed.

BA Backwater
CB Cranberry Bog
DP Duck Pond
DC Ditch or Canal
FH Fish Hatchery or farm
FE Flooded Excavation (e.g. pits, quarries, old mines)
IA Inundation Area
IW Industrial Waste Pond
LP Lake or Pond
RF Reservoir or Flowage
ST Double-line Stream
SD Sewage disposal pond or filtration beds
TP Tailings Pond
UN Unknown hydrography polygon
ZZ Convoluted Stream

Toggle on the Advance Tools button


Wisconsin DNR WebView - Microsoft Internet Explorer provided by Wisconsin DNR
File Edit View Favorites Tools Help
Back Forward Stop Refresh Home Search Favorites History Mail Print Edit
Address http://maps.dnr.state.wi.us/imf/dnrimf.jsp?site=webview
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DNR Website | About | Contact
Use the "find location" to search by TRN, or city, etc.
Layers
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Map Layers
Admin & Political Boundaries
County Boundaries
Cities and Villages
Civil Towns
DNR Admin Regions
DNR Geographic Mgmt. Units
Native American Lands
State Boundary
Land Descriptions & Cadastral
Raven Lake
Statenaker Lake
Devine Lake
Vandercook Lake
Plummer Lake
Little Spider Lake
Moss Lake
Verna Lake
Bolton Lake
Trilby Lake
Fence Lake
Warrior Lake
Mishonagon Creek
Halls Lake
Towanda Lake
Crawling Stone Lake
Sumach Lake
Wyandock Lake
Faulkner Lake
Little Muskie Lake
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DNR Maps & Aerial Photography | DNR GIS Overview | Comments on this website |
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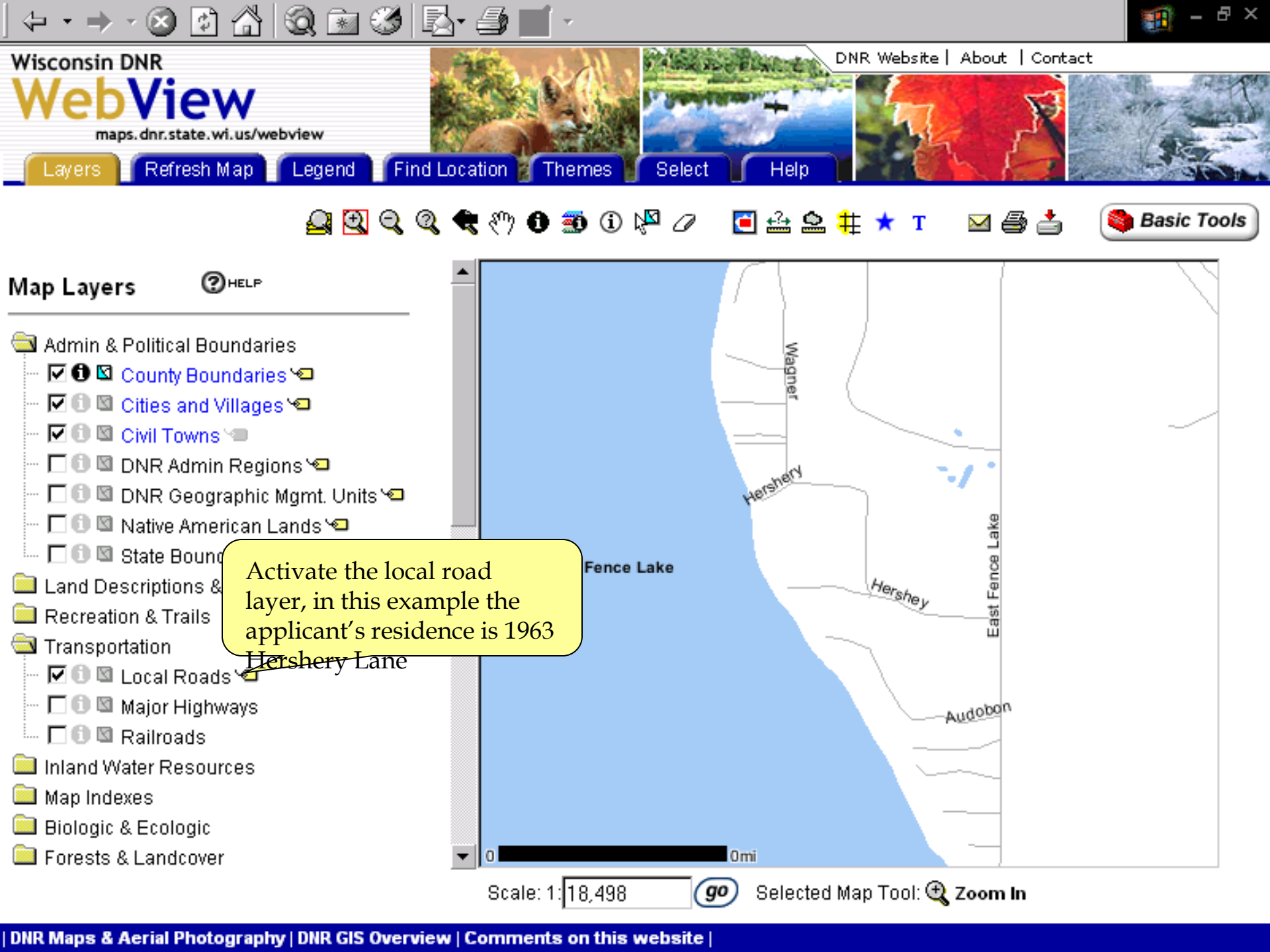
Wisconsin DNR
WebView
maps.dnr.state.wi.us/webview
DNR Website | About | Contact
Layers
Refresh Map
Legend
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Themes
Select
Help
Basic Tools
Map Layers
HELP
Admin & Political Boundaries
County Boundaries
Cities and Villages
Civil Towns
DNR Admin Regions
DNR Geographic Mgmt. Units
Native American Lands
State Boun
Land Descriptions &
Recreation & Trails
Transportation
Local Roads
Major Highways
Railroads
Inland Water Resources
Map Indexes
Biologic & Ecologic
Forests & Landcover
Activate the local road layer, in this example the applicant's residence is 1963 Hershery Lane
Fence Lake
Wagner
Hershery
Hershey
East Fence Lake
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DNR Maps & Aerial Photography | DNR GIS Overview | Comments on this website |

Wisconsin DNR
WebView
maps.dnr.state.wi.us/webview

DNR Website | About | Contact

Layers | Refresh Map | Legend | Find Location | Themes | Select | Help

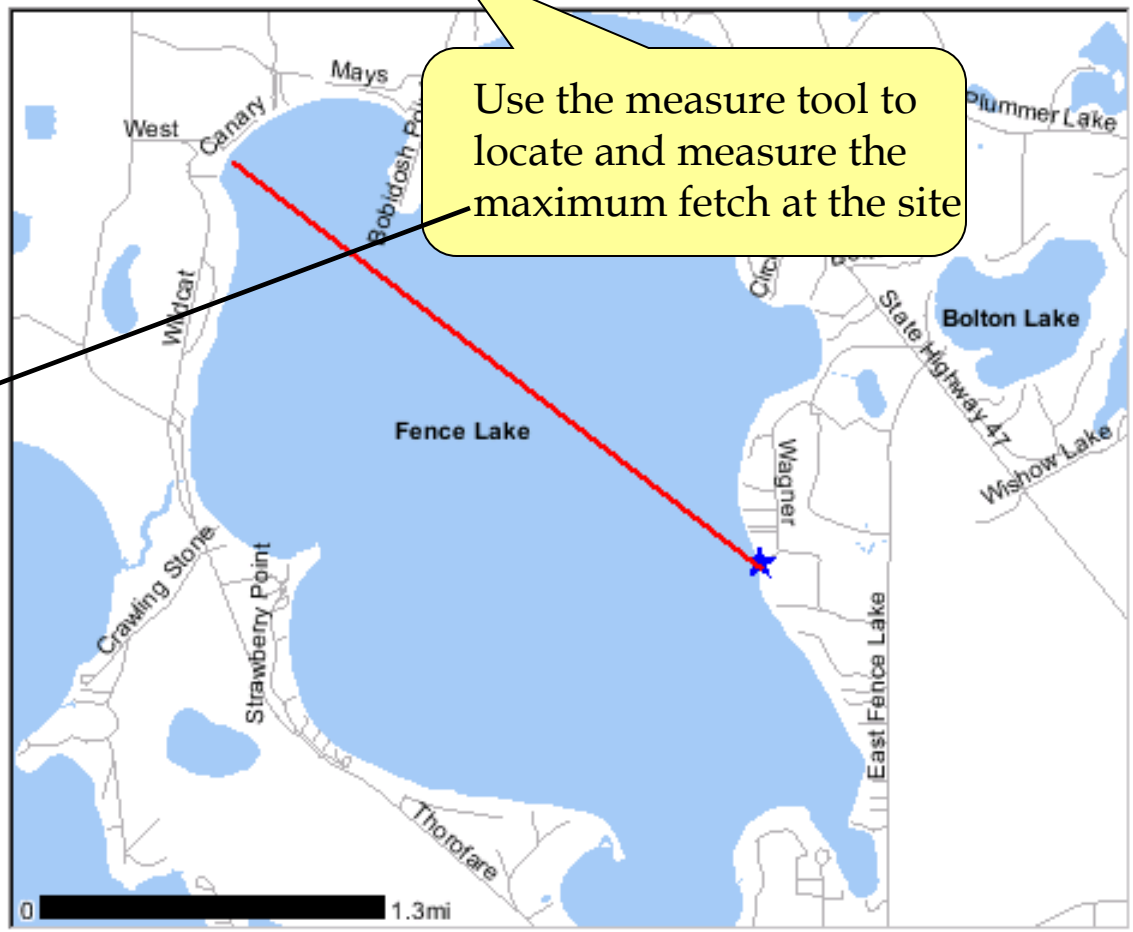
Basic Tools

Measure Tool

This document shows the positions of the points that you have clicked on the map using the measure tool, and reports the great circle distance between them.

Position	89° 49' 19" W 45° 56' 42" N
Position	89° 51' 44" W 45° 58' 0" N
Distance	12,927.8 ft
True Course	307.7°

Clear Points

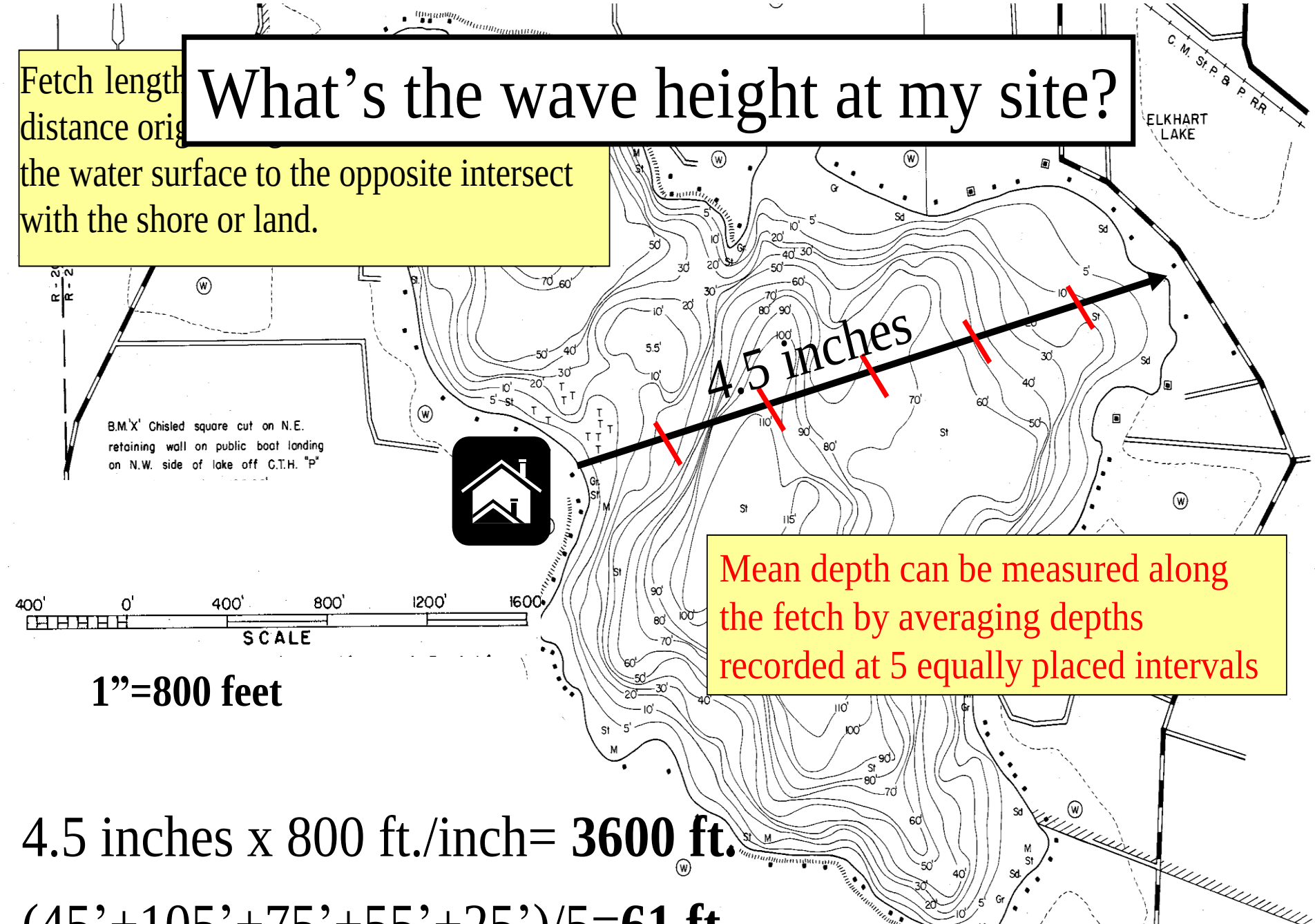


Scale: 1: 53,406 go Selected Map Tool: Measure

| DNR Maps & Aerial Photography | DNR GIS Overview | Comments on this website |

What's the wave height at my site?

Fetch length
distance orig
the water surface to the opposite intersect with the shore or land.



Mean depth can be measured along the fetch by averaging depths recorded at 5 equally placed intervals

1"=800 feet

4.5 inches x 800 ft./inch= **3600 ft.**

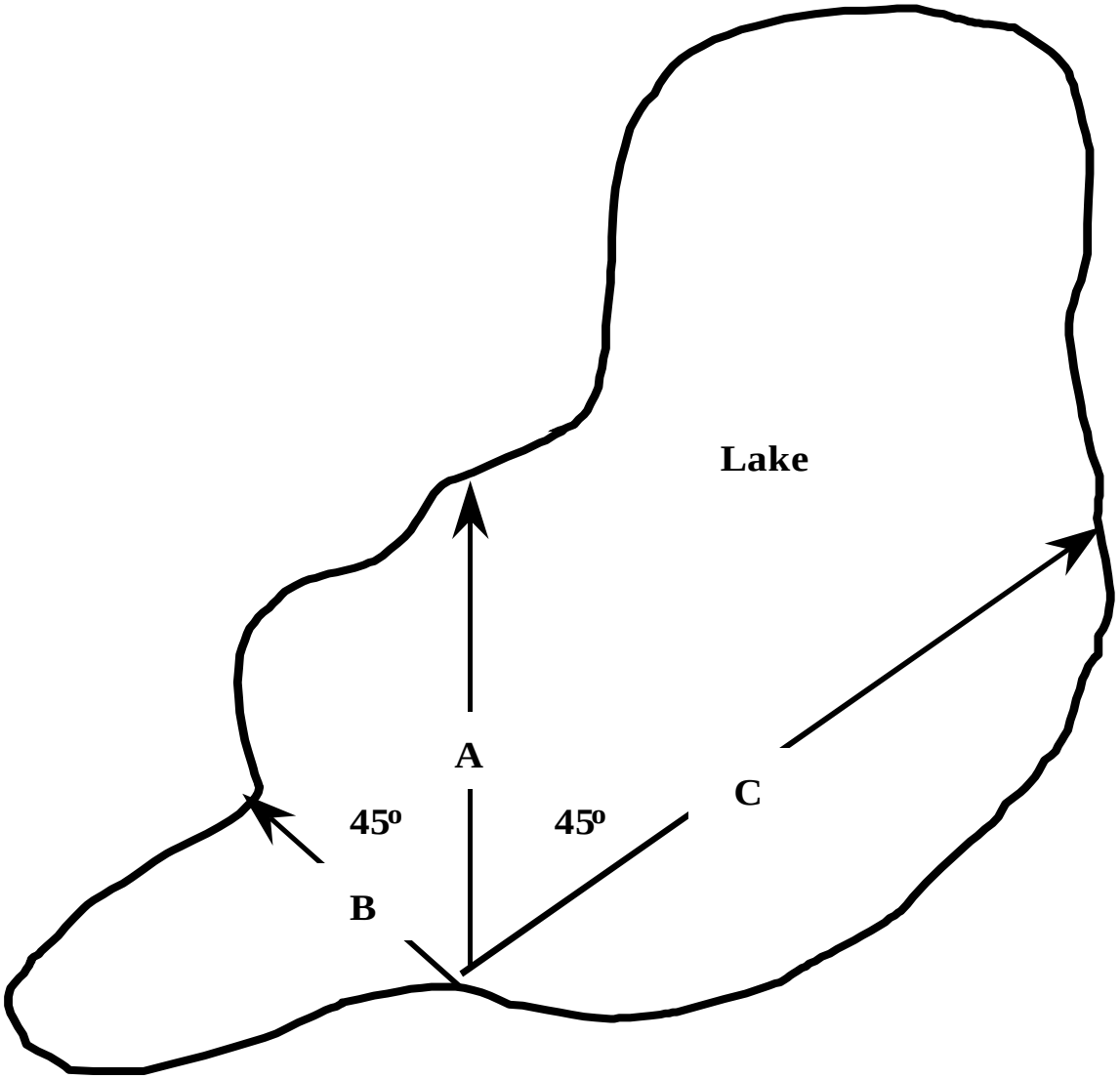
(45'+105'+75'+55'+25')/5=**61 ft**

Erosion Intensity

Alternative Site Assessment Method

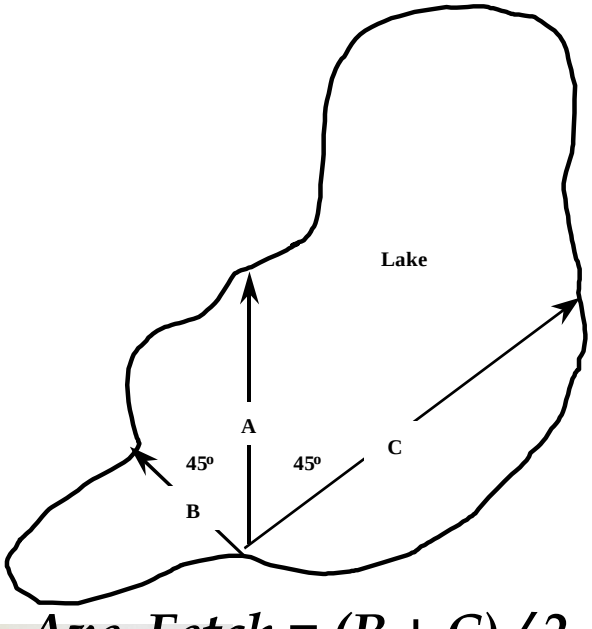
- Fetch
- Shoreline Geometry
- Shoreline Orientation
- Boat Wakes
- Bank Height
- Bank Composition
- Influence of Adjacent Structures
- Depth at 20 Feet
- Depth at 100 Feet
- Aquatic Vegetation
- Bank Stability
- Bank Vegetation

Note: Average fetch; The following diagram describes the calculation of average fetch.



$$ave\ .\ fetch = (B + C)/2$$

Erosion Intensity Metrics, Average Fetch



Ave. Fetch = (B + C) / 2

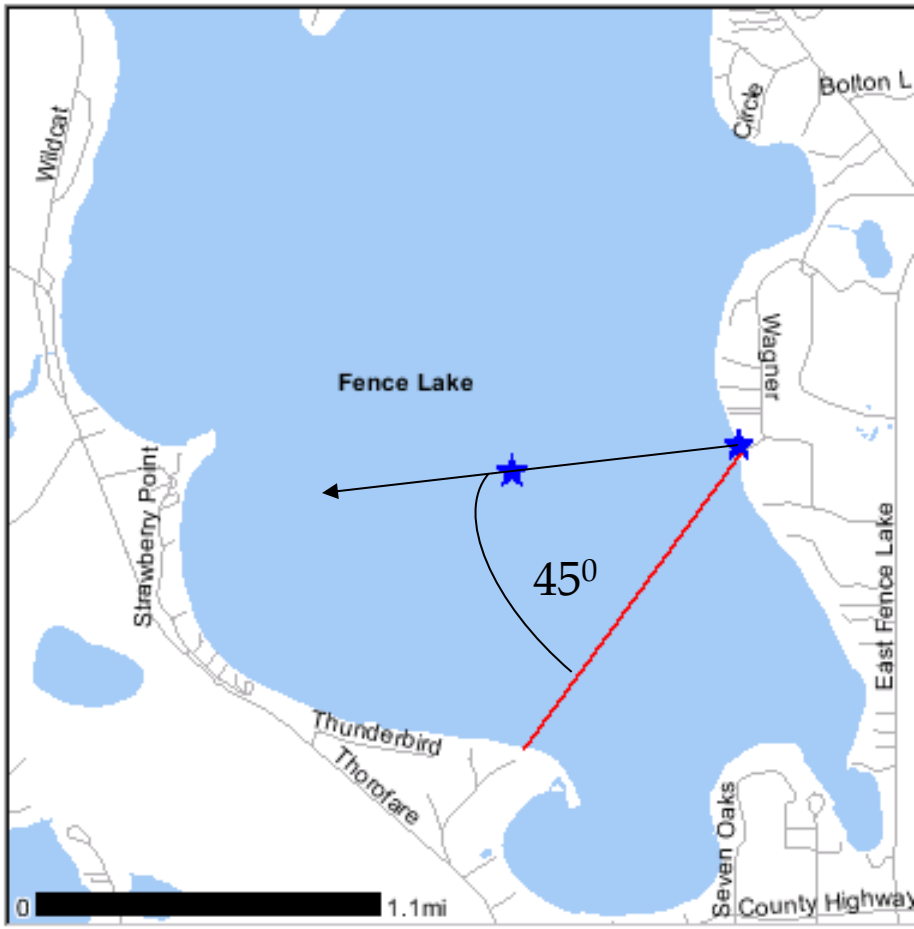
webview

Legend | Find Location | Themes | Select | Help

ositions of the points
nap using the
e great circle distance

Position	89° 49' 20" W 45° 56' 44" N
Position	89° 50' 10" W 45° 55' 56" N
Distance	5,972.7 ft
True Course	216.4°

Clear Points



Scale: 1: 44,728 go Selected Map Tool: Measure

Using the measure tool draw a 45 degree offset to the opposite shore this is the measure of distance B.

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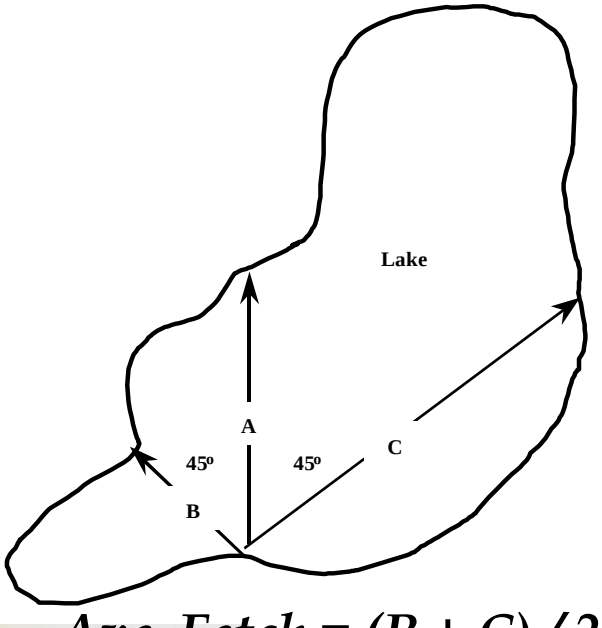
Erosion Intensity Metrics, Average Fetch

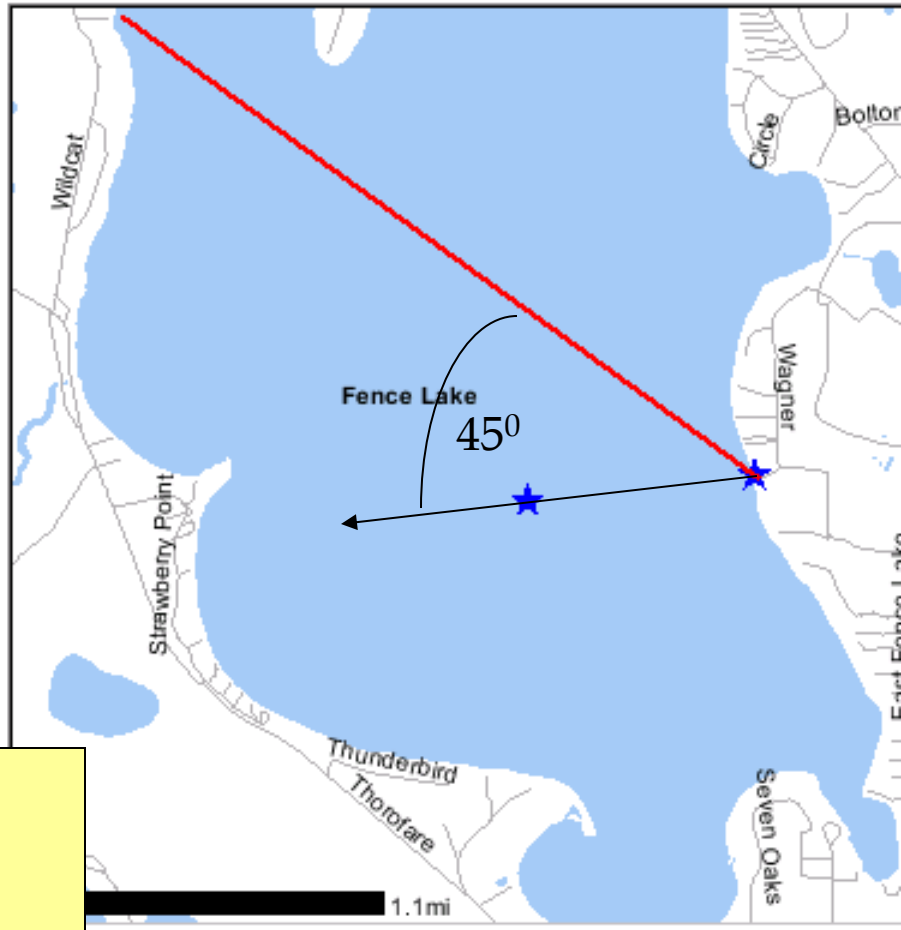


Ave. Fetch = (B + C) / 2

positions of the points
map using the
he great circle distance

Position	89° 49' 19" W 45° 56' 44" N
Position	89° 51' 45" W 45° 57' 58" N
Distance	12,761.8 ft
True Course	306.1°

Clear Points



Scale: 1: 44,728 go Selected Map Tool: Measure

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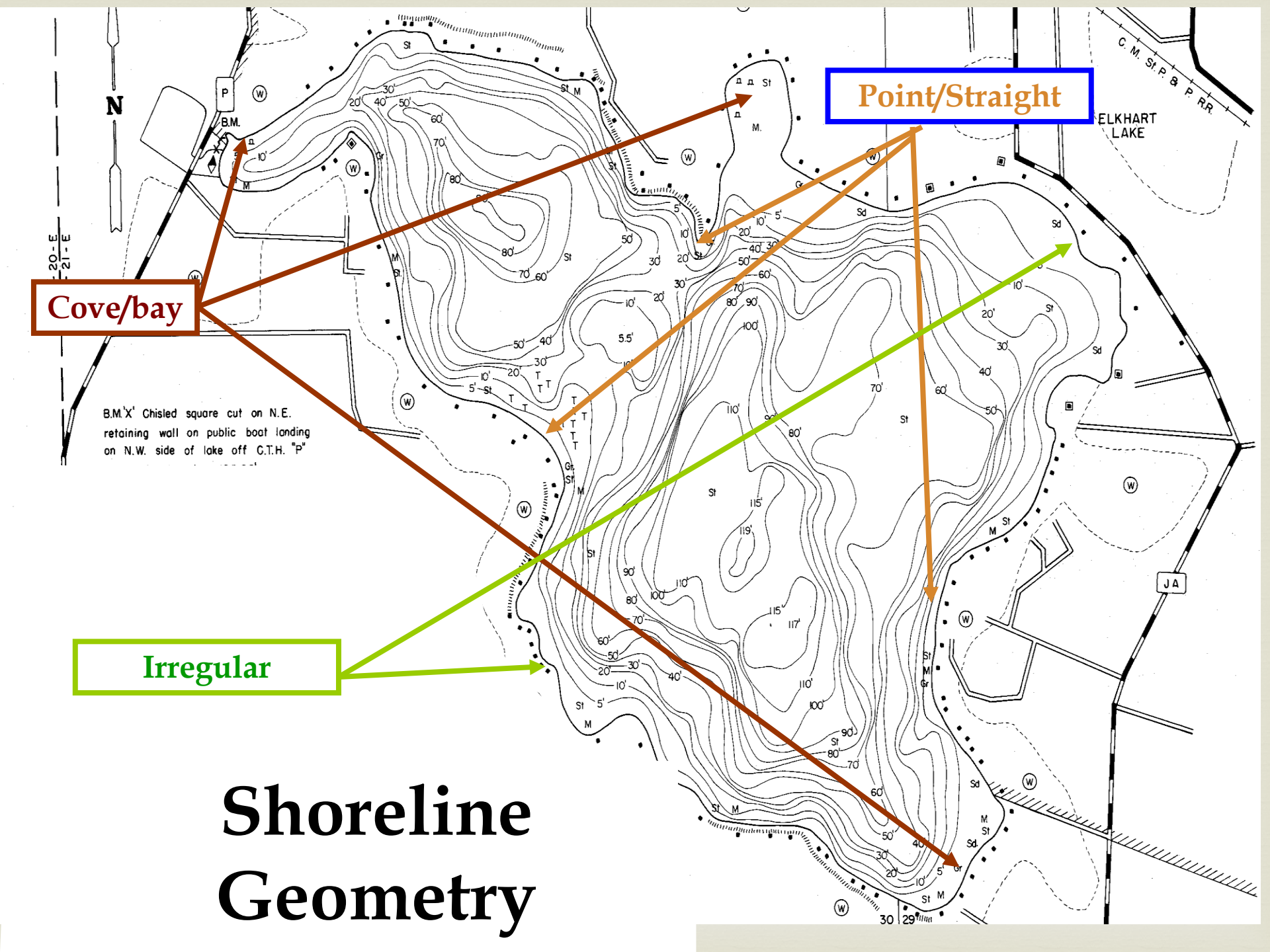
Using the measure tool draw the other 45 degree offset to the opposite shore this is the measure of distance C.

Erosion Intensity

Lake Map

- Fetch (you just measured from the storm wave height exercise)
- Shoreline Geometry (3 choices)
  - cove/bay (1)
  - irregular shoreline (4)
  - headland, point, or straight shoreline (8)



Shoreline Geometry

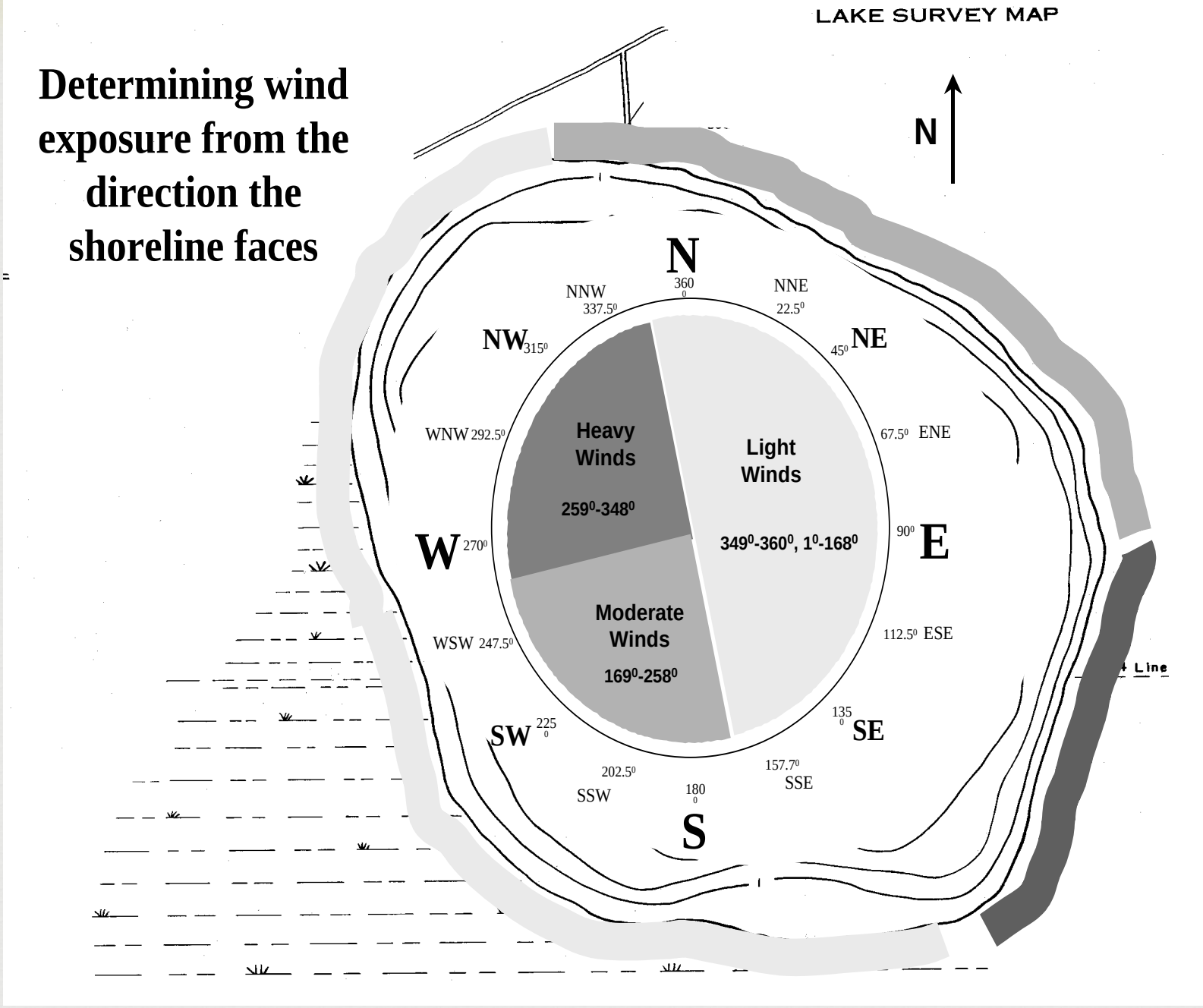
Determining Shore Orientation

The following lakemap shows an example of classifying shore orientation exposed to prevailing winds. Shorelines are exposed to one of the following:

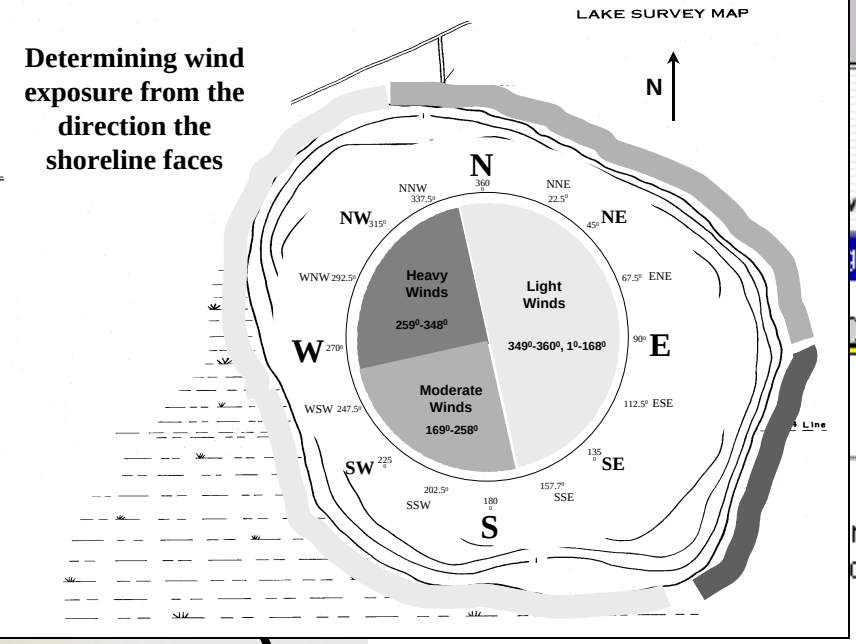
- Light Winds

- Moderate Winds

Determining wind exposure from the direction the shoreline faces



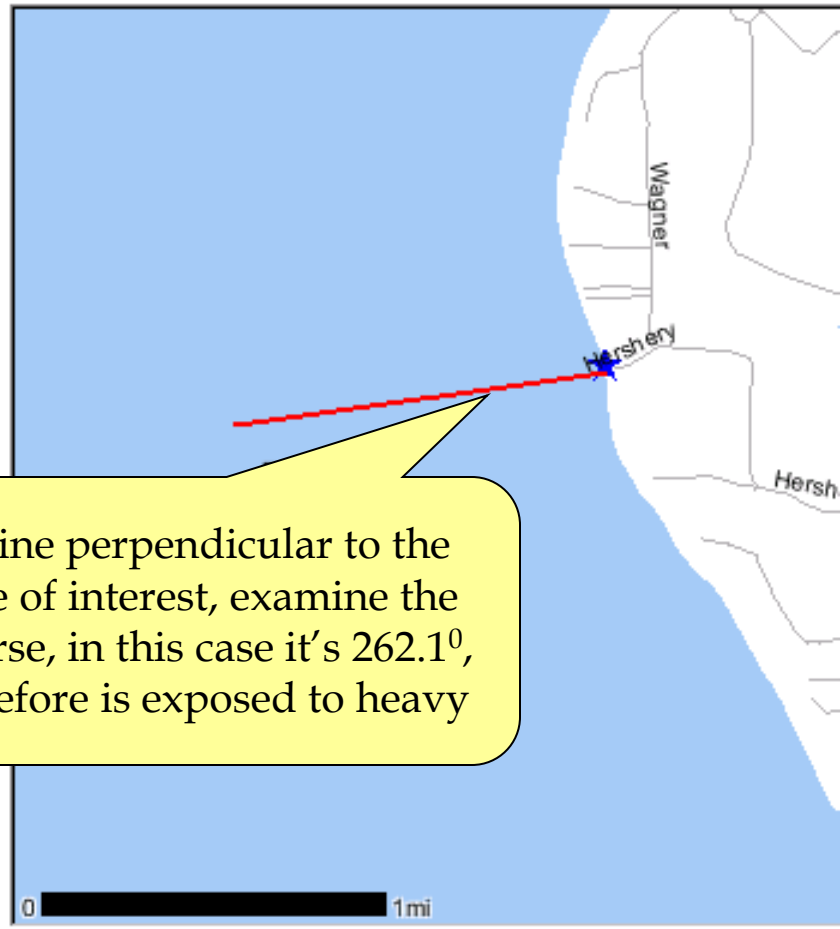
Erosion Intensity Metrics, Shore Orientation



of the points
ng the
circle distance

Position	89° 49' 20" W 45° 56' 44" N
Position	89° 50' 3" W 45° 56' 39" N
Distance	3,058.9 ft
True Course	262.1°

Clear Points



Draw a line perpendicular to the shoreline of interest, examine the true course, in this case it's 262.1^0, and therefore is exposed to heavy winds

Scale: 1: 22,364 go Selected Map Tool: Measure

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Erosion Intensity

Lake Map

- Fetch
- Shoreline Geometry
- Shoreline Orientation
- Boat Wakes (proximity to and use of boat channels)
  - 3 choices are: (1) no channels within 100 yards, broad open water body, or constricted shallow water body; (6) minor thoroughfare within 100 yards of shore carrying limited traffic, or major channel 100 yards to ½ mile offshore; (12) major thoroughfare within 100 yards carrying intensive traffic.

Erosion Intensity

Lake Map

- Boat Wakes (proximity to and use of boat channels)

Note: Boating; A thoroughfare is identified as physical narrowing of the waterbody that by its nature intensifies boating activity near the shore. Thoroughfares which are 250 yards or wider are not scored 12 points, unless the depth contours of the thoroughfare constricts boating activity in close proximity to one shore, and the traffic is intensive.

Note: Boating; Intensive traffic is defined by a location where at least 50% of the public boating access available must pass through the thoroughfare to reach the open water of the lake, provided the waterway has a total of more than 60car-trailer units.

Note: Boating; Limited traffic is defined by a location where at least 30% of the public boating access available must pass through the thoroughfare to reach the open water of the lake, provided the waterway has a total of more than 40 car trailer units.

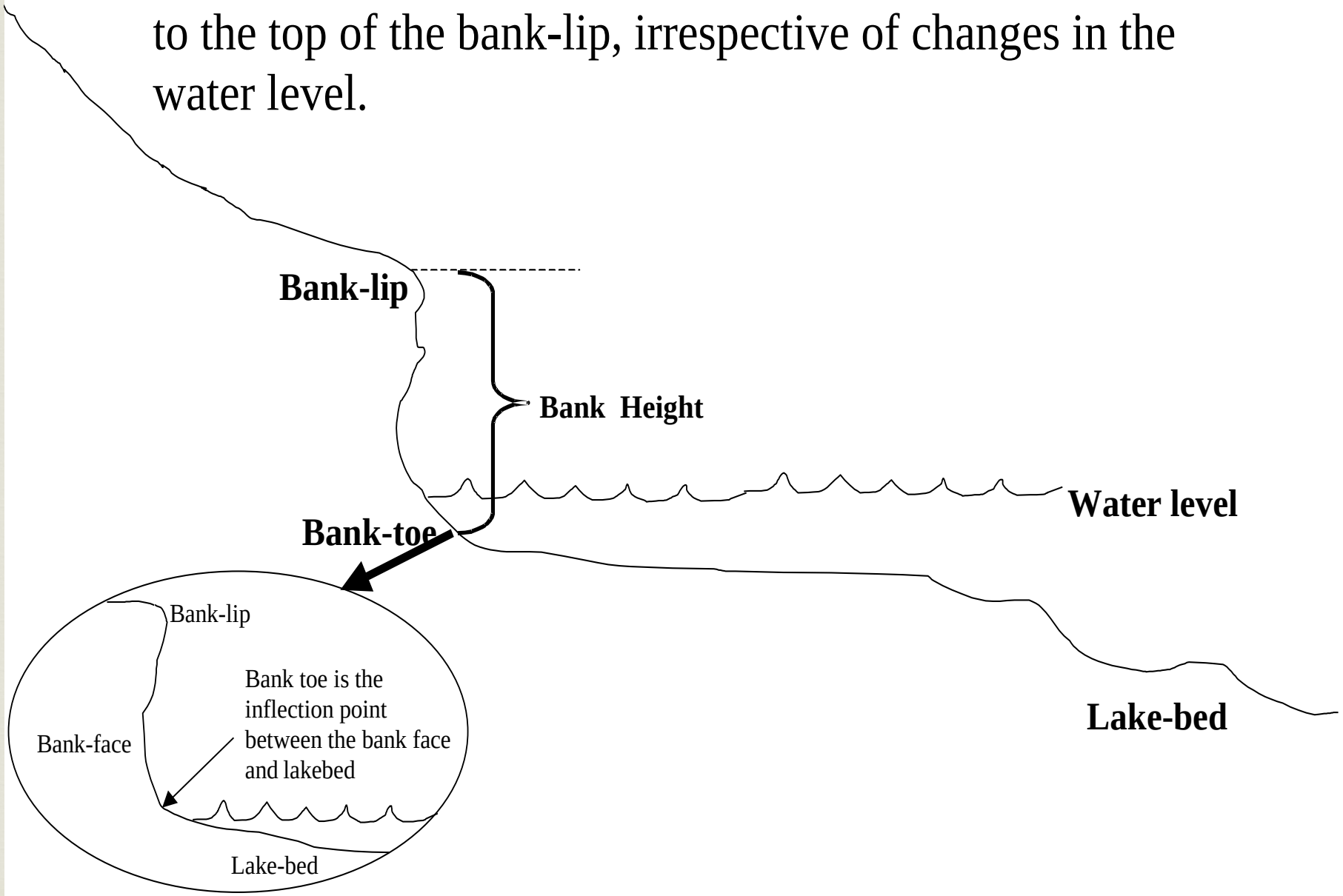
Erosion Intensity

- Fetch
- Shoreline Geometry
- Shoreline Orientation
- Boat Wakes

- **Bank Height (anchor the measure stick at the bank toe, walk back waterward on the pier, and estimate the bank height (ft)).**
  - 5 Choices are: <1, 1-5, 5-10, 10-20, or >20

Erosion Intensity

Bank height is the vertical measure (feet) from the bank-toe to the top of the bank-lip, irrespective of changes in the water level.



Erosion Intensity

- Fetch
- Shoreline Geometry
- Shoreline Orientation
- Boat Wakes
- Bank Height
- **Bank Composition (examine the composition and degree of cementation of the bank sediments)**
  - 3 choices are: (0) rock, marl, tight clays and cemented sands that must be dug with a pick; (7) soft clay, clayey sand, moderately cemented easily dug with a knife; (15) uncemented sands or peat easily dug with your hand.

Erosion Intensity

- Fetch
- Shoreline Geometry
- Shoreline Orientation
- Boat Wakes
- Bank Height
- Bank Composition
- **Influence of Adjacent Structures**
  - 5 choices are: (0) no armoring on either side; (1) hard armoring on one side; (2) hard armoring on both sides; (3) hard armoring on one side with noticeable recession; (4) hard armoring on both sides with noticeable recession.

Erosion Intensity

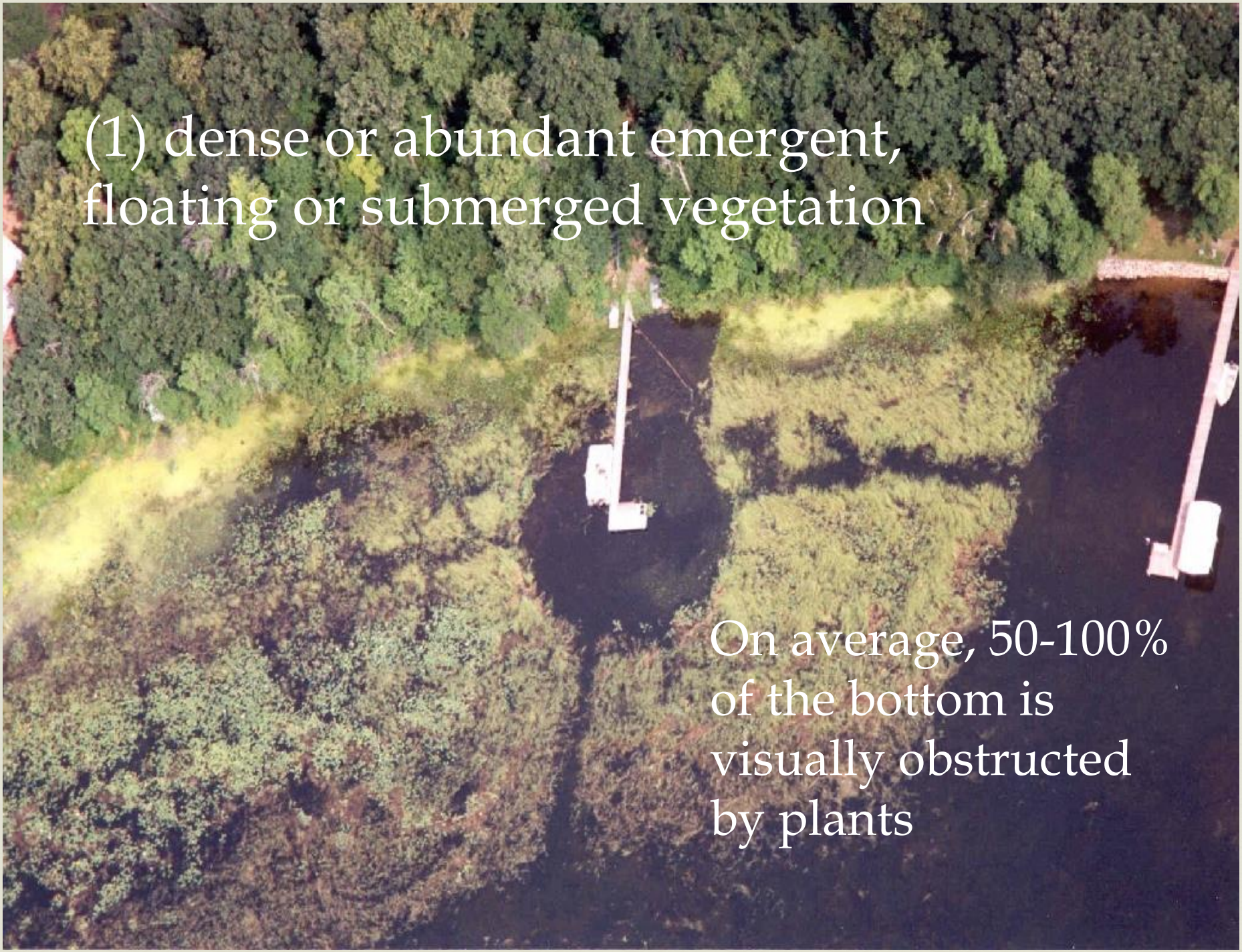
- Fetch
- Shoreline Geometry
- Shoreline Orientation
- Boat Wakes
- Bank Height
- Bank Composition
- Influence of Adjacent Structures
- **Depth at 20 Feet (depth of the water 20 feet from the shore)**
  - 5 choices are: <1; 1-3; 3-6; 6-12; >12.

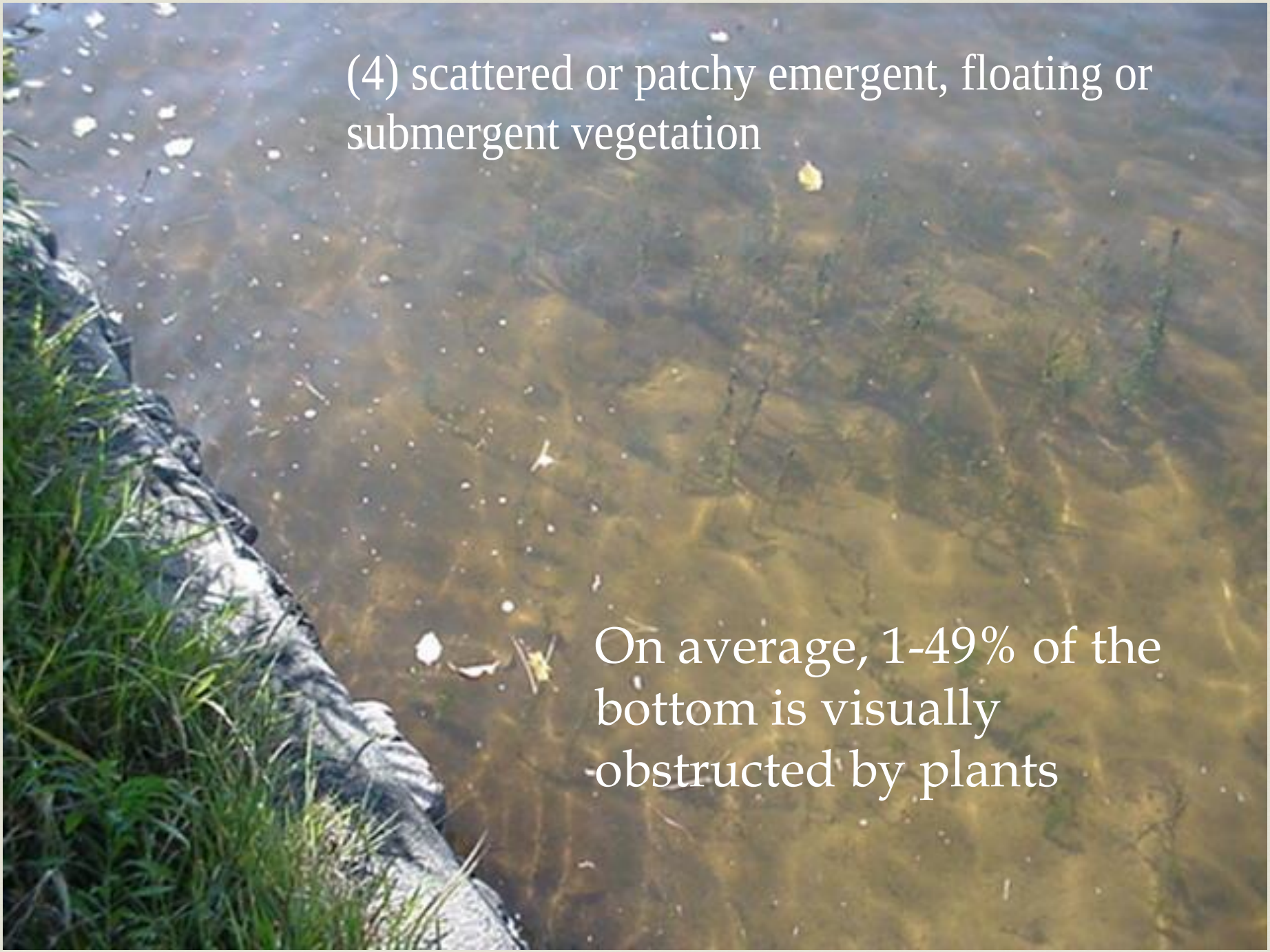
Erosion Intensity

- Fetch
- Shoreline Geometry
- Shoreline Orientation
- Boat Wakes
- Bank Height
- Bank Composition
- Influence of Adjacent Structures
- Depth at 20 Feet
- **Depth at 100 Feet (depth of the water 100 feet from the shore)**
  - 5 choices are: <1; 1-3; 3-6; 6-12; >12.

Erosion Intensity

- Fetch
- Shoreline Geometry
- Shoreline Orientation
- Boat Wakes
- Bank Height
- Bank Composition
- Influence of Adjacent Structures
- Depth at 20 Feet
- Depth at 100 Feet
- **Aquatic Vegetation (type and abundance of vegetation occurring in the water off the shoreline)**
  - 3 choices are: (1) dense or abundant emergent, floating or submerged vegetation; (4) scattered or patchy emergent, floating or submergent vegetation; or (7) lack of emergent, floating or submergent vegetation.


(1) dense or abundant emergent, floating or submerged vegetation
On average, 50-100% of the bottom is visually obstructed by plants


(4) scattered or patchy emergent, floating or submergent vegetation
On average, 1-49% of the bottom is visually obstructed by plants

Erosion Intensity

- Fetch
- Shoreline Geometry
- Shoreline Orientation
- Boat Wakes
- Bank ~~Height~~
- Bank Composition
- Influence of Adjacent Structures
- Depth at 20 Feet
- Depth at 100 Feet
- Aquatic Vegetation
- **Bank Stability**

Erosion Intensity

- Fetch
- Shoreline Geometry
- Shoreline Orientation
- Boat Wakes
- Bank Height
- Bank Composition
- Influence of Adjacent Structures
- Depth at 20 Feet
- Depth at 100 Feet
- Aquatic Vegetation
- Bank Stability
- **Bank Vegetation (type and abundance of vegetation occurring on the bank face and immediately on top of the bank lip)**
  - 3 choices are: (1) dense vegetation, upland trees and shrubs; (4) clumps of vegetation alternating with areas lacking vegetation; (8) lack of vegetation (cleared), crop or agricultural land.

sion Intensity

Calculator

SHORELINE VARIABLES	DESCRIPTIVE CATEGORIES EROSION INTENSITY VALUE IS LOCATED IN PARENTHESIS ON LEFT SIDE OF EACH CATEGORY BOX							ASSIGNED EI
FETCH-AVERAGE, longest continuous linear distance the site across the water surface to the opposite intersect with the shore or land.	(0) <1/10	(2) 1/10 –1/3	(4) 1/3-1	(7) 1 –3	(10) 3-10	(13) 10-30	(16) >30	
DEPTH AT 20 FEET, Depth of water (feet) 20 feet from shoreline	(1) <1	(2) 1-3	(3) 3-6	(4) 6-12	(5) >12			
DEPTH AT 100 FEET, depth of water (feet) 100 feet from shoreline	(1) <1	(2) 1-3	(3) 3-6	(4) 6-12	(5) >12			
BANK HEIGHT, height of bank (feet) at the shoreline or just behind the sediment beach	(1)<1	(2) 1-5	(3) 5-10	(4) 10-20	(5) >20			
BANK COMPOSITION composition and degree of cementation of the sediments	(0) Rock, marl, tight clay, well cemented sand (dig with a pick or swamp forest)		(7) soft clay, clayey sand, moderately cemented (easily dug with a knife)		(15) uncemented sands or peat (easily dug with you hand)			
INFLUENCE OF ADJACENT STRUCTURES, likelihood that adjacent structures are causing flank erosion at the site	(0) no hard armoring on either adjacent property	(1) hard armoring on one adjacent property	(2) hard armoring on both adjacent properties	(3) hard armoring on one adjacent property with measurable recession	(4) hard armoring on both adjacent properties with measurable recession			
AQUATIC VEGETATION type and abundance of vegetation occurring in the water off the shoreline	(1) dense or abundant emergent, floating or submerged vegetation		(4) scattered or patchy emergent, floating or submergent vegetation		(7) lack of emergent, floating or submergent vegetation			
SHORE VEGETATION type and abundance of the vegetation occurring between the bank and shoreline	(0) rocky substrates unable to support vegetation.	(1) dense continuous vegetation, marsh fringe and shrubs		(4) scattered or patchy vegetation, upland trees and shrubs	(7) lack of vegetation			
BANK VEGETATION, type and abundance of the vegetation occurring on the bank and immediately on top of the bank lip	(1) dense vegetation, upland trees, shrubs and grasses		(4) clumps of vegetation alternating with areas lacking vegetation		(7) lack of vegetation (cleared), crop or agricultural land			
SHORELINE GEOMETRY general shape of the shoreline at the point of interest plus 200 yards on either side.	(1) coves		(4) irregular shoreline		(8) headland, point or straight shoreline			
SHORELINE ORIENTATION general geographic direction the shoreline faces	(0) < 1/3 mile fetch	(1) south to east		(4) south to west		(8) west northwest to north to east-northeast		
BOAT WAKES proximity to and use of boat channels	(1) no channels within 100 yards, broad open water body, or constricted shallow water body		(6) minor thoroughfare with 100 yards carrying limited traffic, or major channel 100 yards to ½ mile offshore		(12) major thoroughfare within 100 yards carrying intensive traffic.			
EROSION INTENSITY SCORE (EI) →								

Energy Category

Method	Low Energy	Moderate Energy	High Energy
Wind-wave	< 1 foot	1- 2.3 feet	>2.3 feet
Erosion Intensity	≤47	48-67	>67

Lakes Overview

Decision	Low Energy	Moderate Energy	High Energy
General	Fiber Logs Temporary Screens Branchbox breakwaters Brush mattresses	Fiber Logs Temporary Screens Branchbox breakwaters Brush mattresses Vegetated Riprap Rock at Toe Fiber Logs	Fiber Logs Temporary Screens Branchbox breakwaters Brush mattresses Vegetated Riprap Rock at Toe Fiber Logs Riprap
Individual	Retaining walls adjacent to Marina	Riprap Retaining walls adjacent to Marina, Navigational channels, Unavoidable situations	Retaining Walls
Prohibited	Retaining Walls Riprap Vegetated Riprap Rock at Toe	Other Retaining Walls	

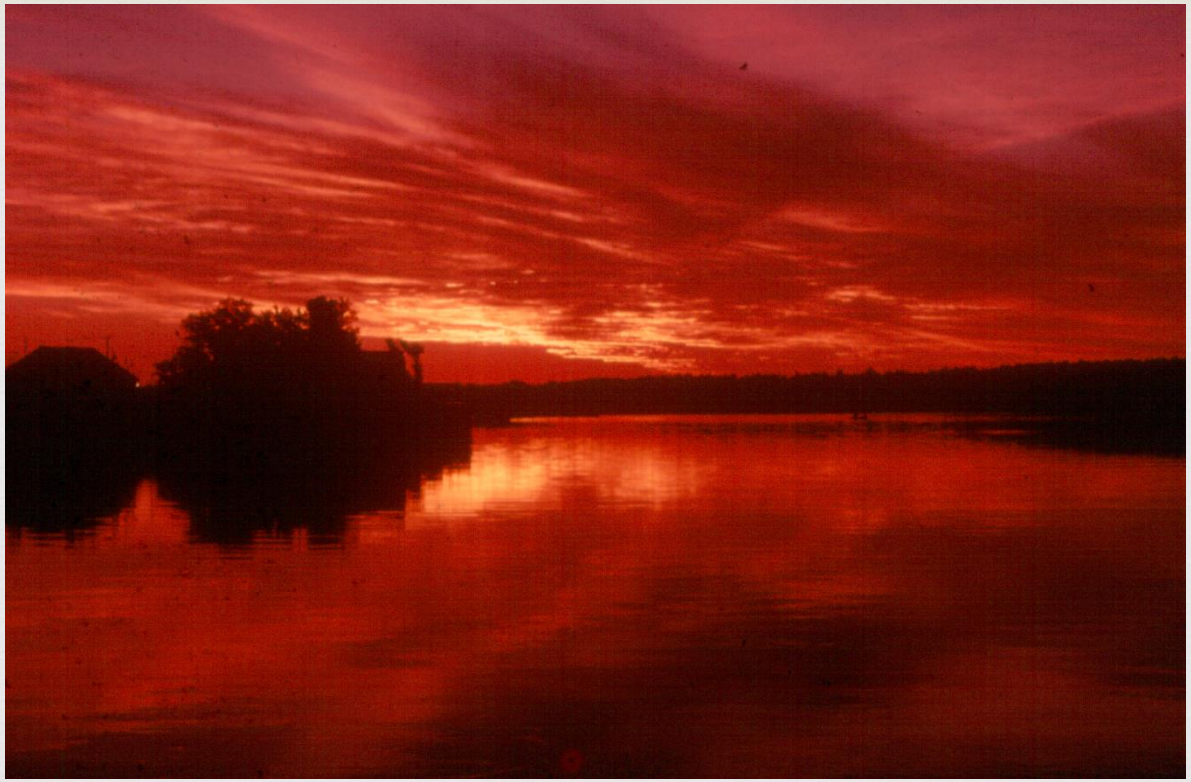
Shoreline Type

- Low Energy
- Moderate Energy
- High Energy

X

Treatment Type

- Biological
- Biotechnical
- Technical



- FOR MORE INFORMATION CONTACT:

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