Stacy Dehne, P.E.
State of Wisconsin DATCP

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

Relevant NRCS Standards referenced in ATCP 50 for shorelands

- 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

Relevant NRCS Standards referenced in ATCP 50 for shorelands 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

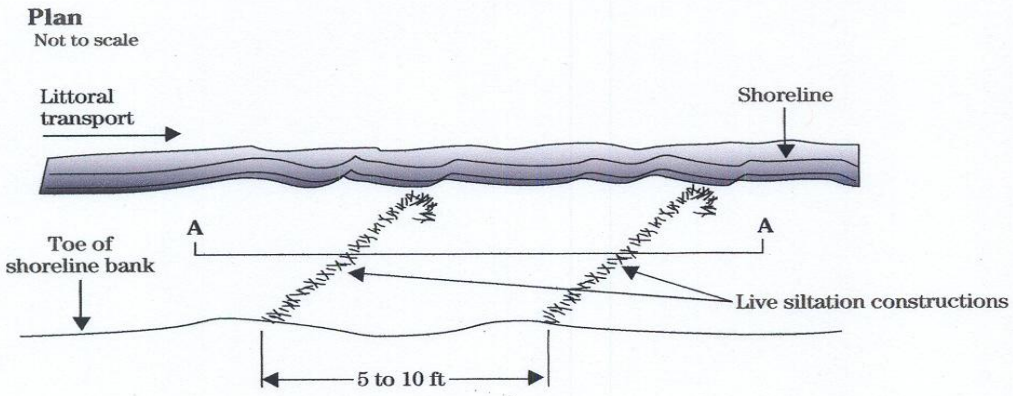
Relevant NRCS Specifications referenced in designs for shorelands

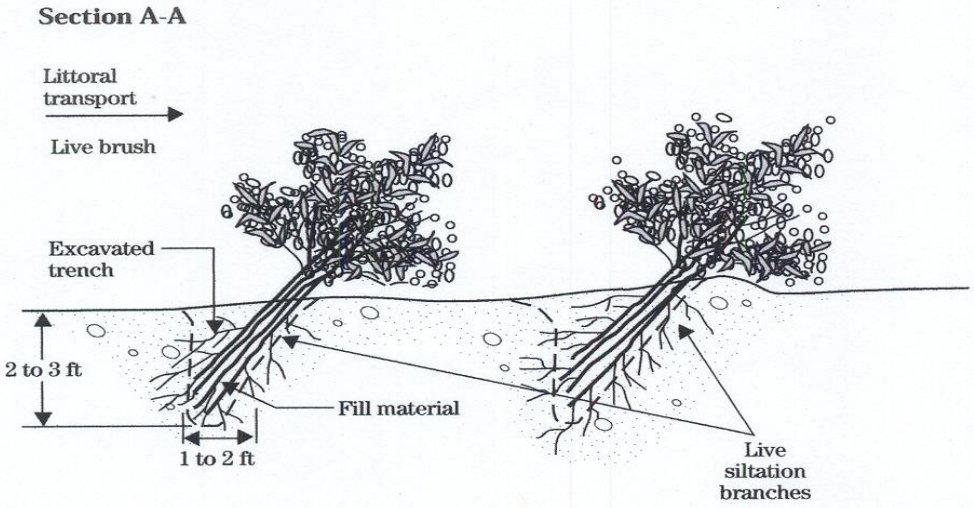
- Wisconsin Construction Specification #1 - Clearing & Snagging
- WCS #2 - Excavation
- WCS #3 - Earthfill
- WCS #5 - Site Pollution Control (includes construction erosion)
- WCS #7 - Mobilization & Demobilization
- WCS #9 - Rock Riparp
- WCS #13 - Geotextiles
- WCS #20 - Soil Bioengineering
- WCS #21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

Engineering Field Handbook

- Same NRCS web page
- Select Engineering from menu on left
- Scroll down to National Engineering Handbook (Engineering Field Handbook)
- Chapters 16(streambank and shoreline) & 17(upland)
- Wisconsin Supplements by Chapter

Figure 16–52 Live siltation construction details





Note: Rooted/leafed condition of the living plant material is not respresentative of the time of installation.

(8) Coconut fiber roll

Coconut fiber rolls are cylindrical structures composed of coconut fibers bound together with twine woven from coconut (figs. 16–56 and 16–57). This material is most commonly manufactured in 12-inch diameters and lengths of 20 feet. The fiber rolls function as breakwaters along the shores of lakes and embayments. In addition to reducing wave energy, this product can help contain substrate and encourage development of wetland communities.

Applications and effectiveness

- Effective in lake areas where the water level fluctuates because it is able to protect the shoreline and encourage new vegetation.
- Flexible, can be molded to the curvature of the shoreline.
- Prefabricated materials can be expensive.
- Manufacturers estimate the product has an effective life of 6 to 10 years.

Figure 16–56 Coconut fiber roll details

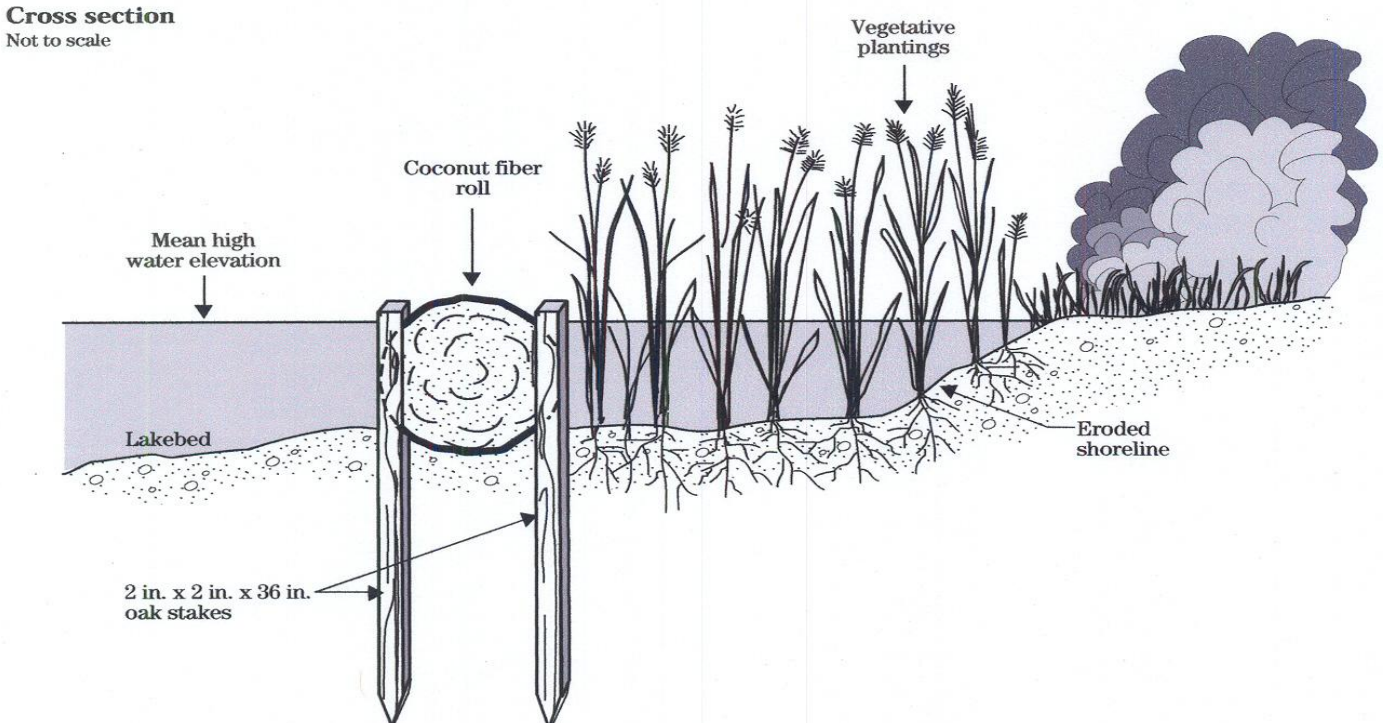
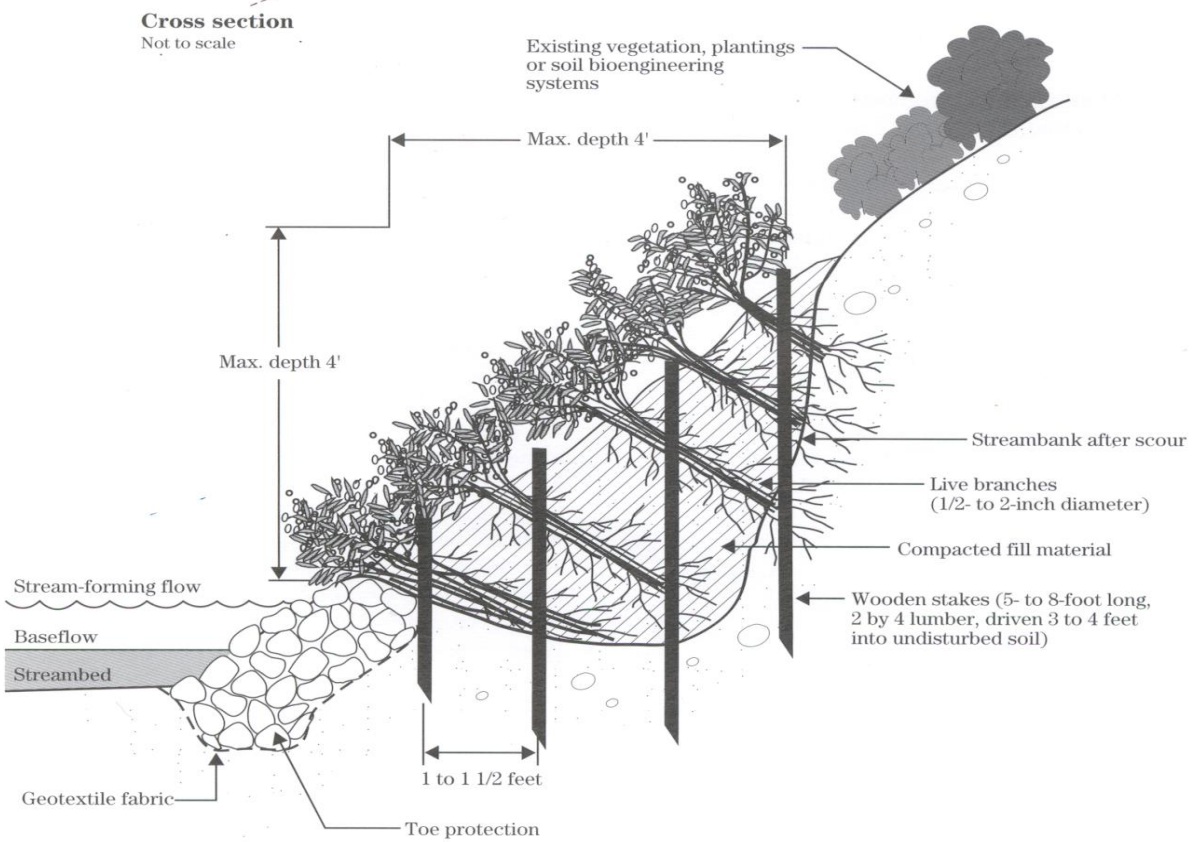
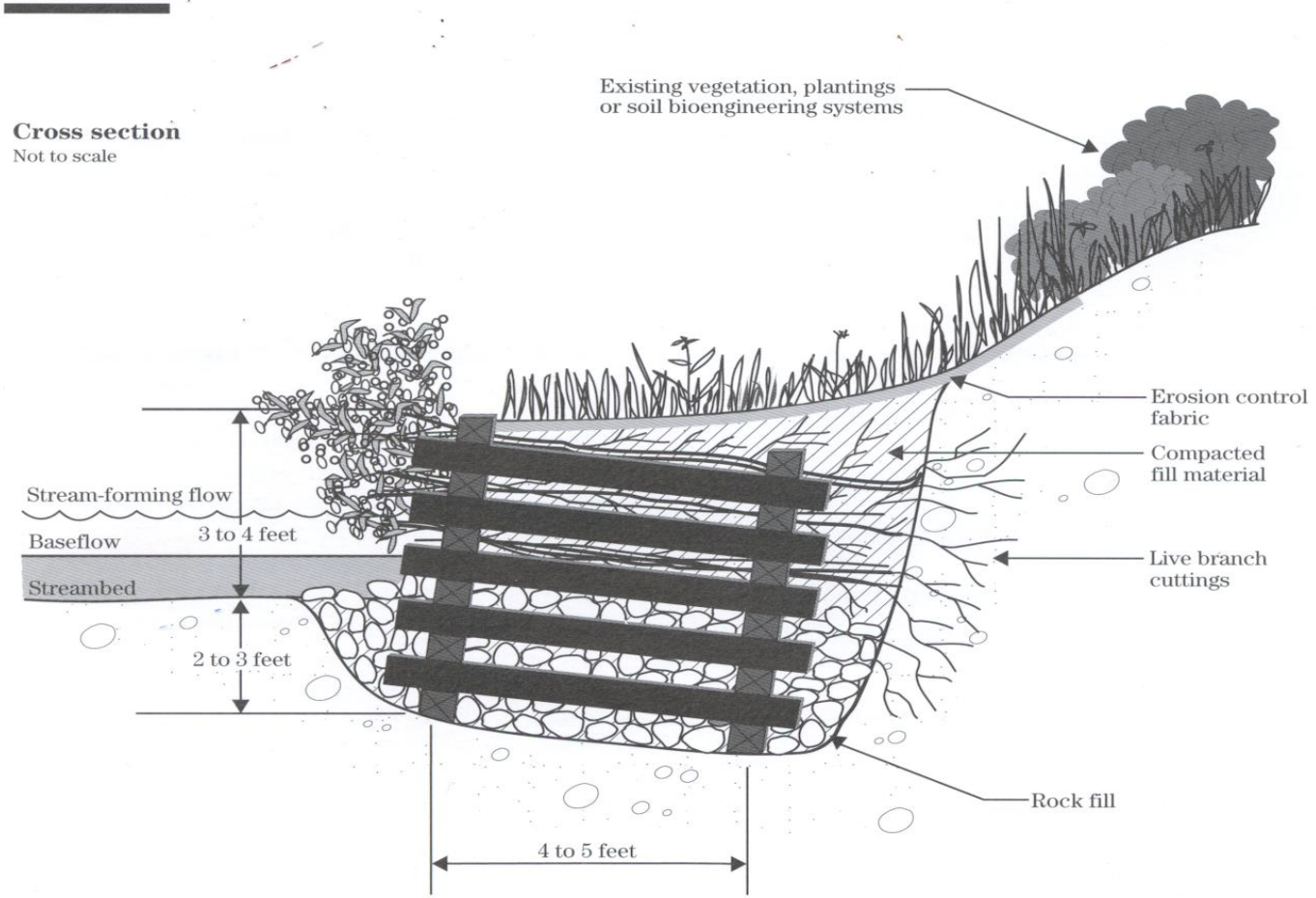


Figure 16–10 Branchpacking details



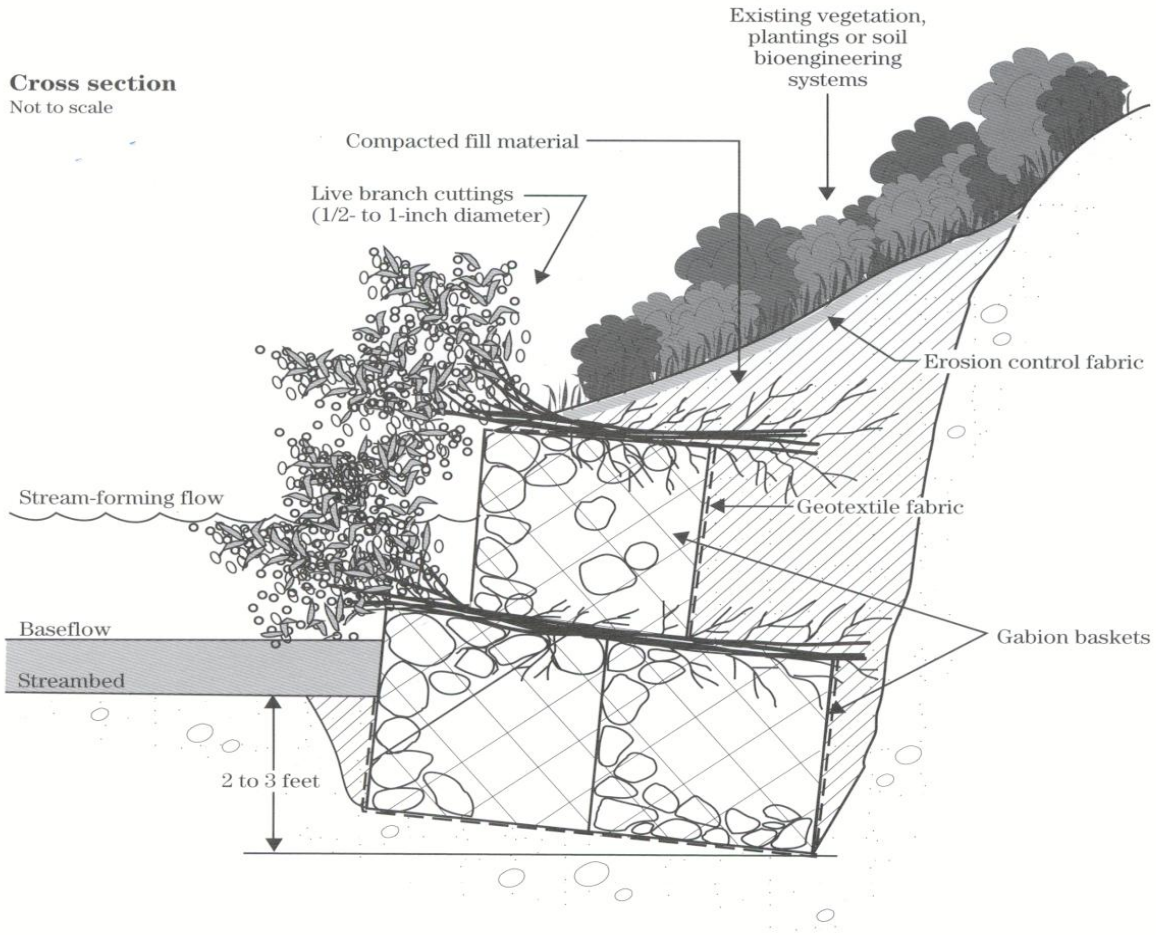
Note:
Root/leafed condition of the living plant material is not representative of the time of installation

Figure 16–14 Live cribwall details



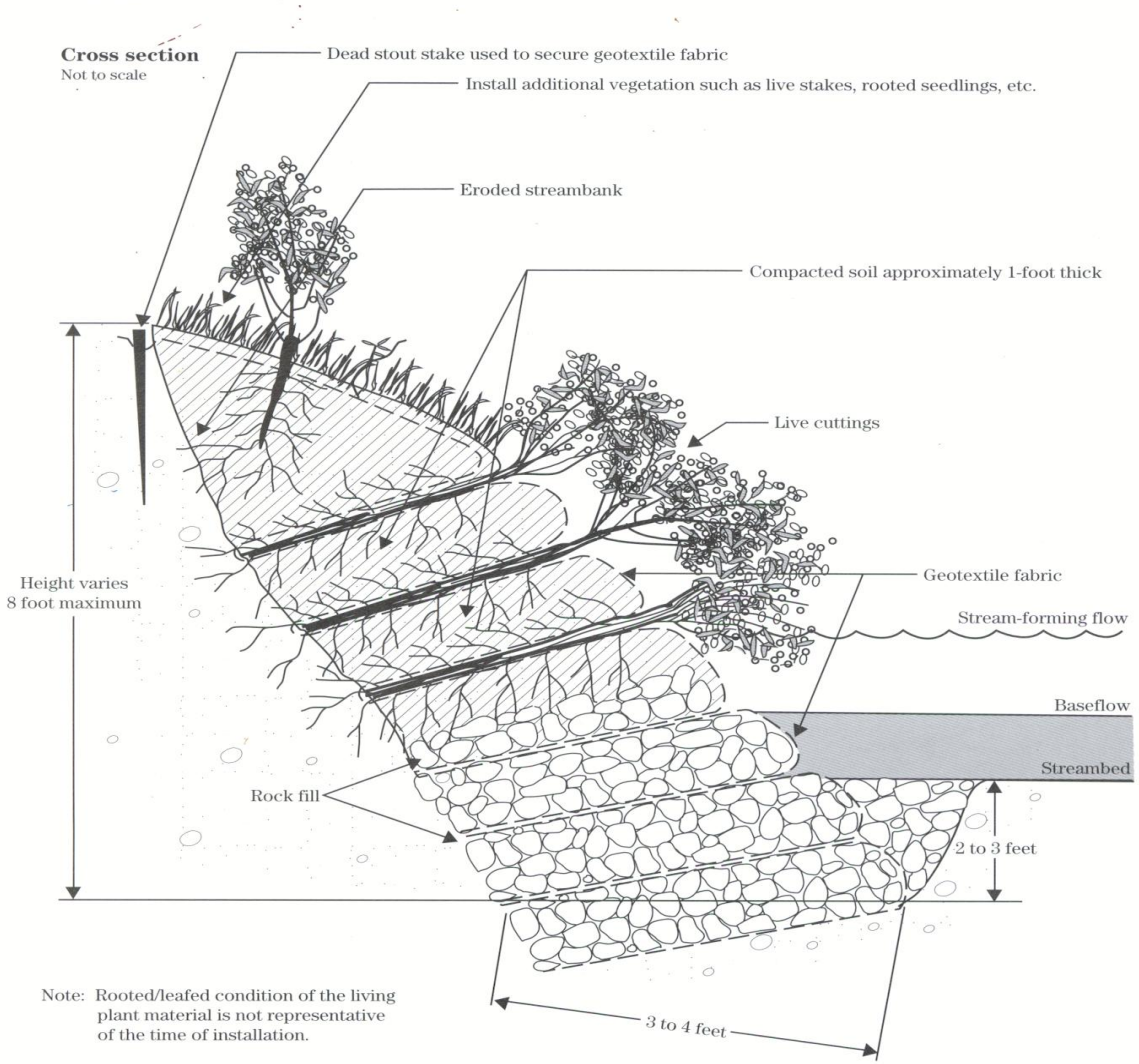
Note:
Rooted/leafed condition of the living plant material is not representative of the time of installation.

Figure 16–42 Vegetated rock gabion details



Note:
Rooted/leafed condition of the living plant material is not representative of the time of installation.

Figure 16–12 Vegetated geogrid details



Note: Rooted/leafed condition of the living plant material is not representative of the time of installation.

Standard 580 HANDOUT #1

Treatment (s) used to stabilize and protect **eroding** banks or stream or constructed channels, and shorelines of lake, reservoirs, or estuaries.

580 Site Assessment

Companion Documents 580-2

HANDOUT #2

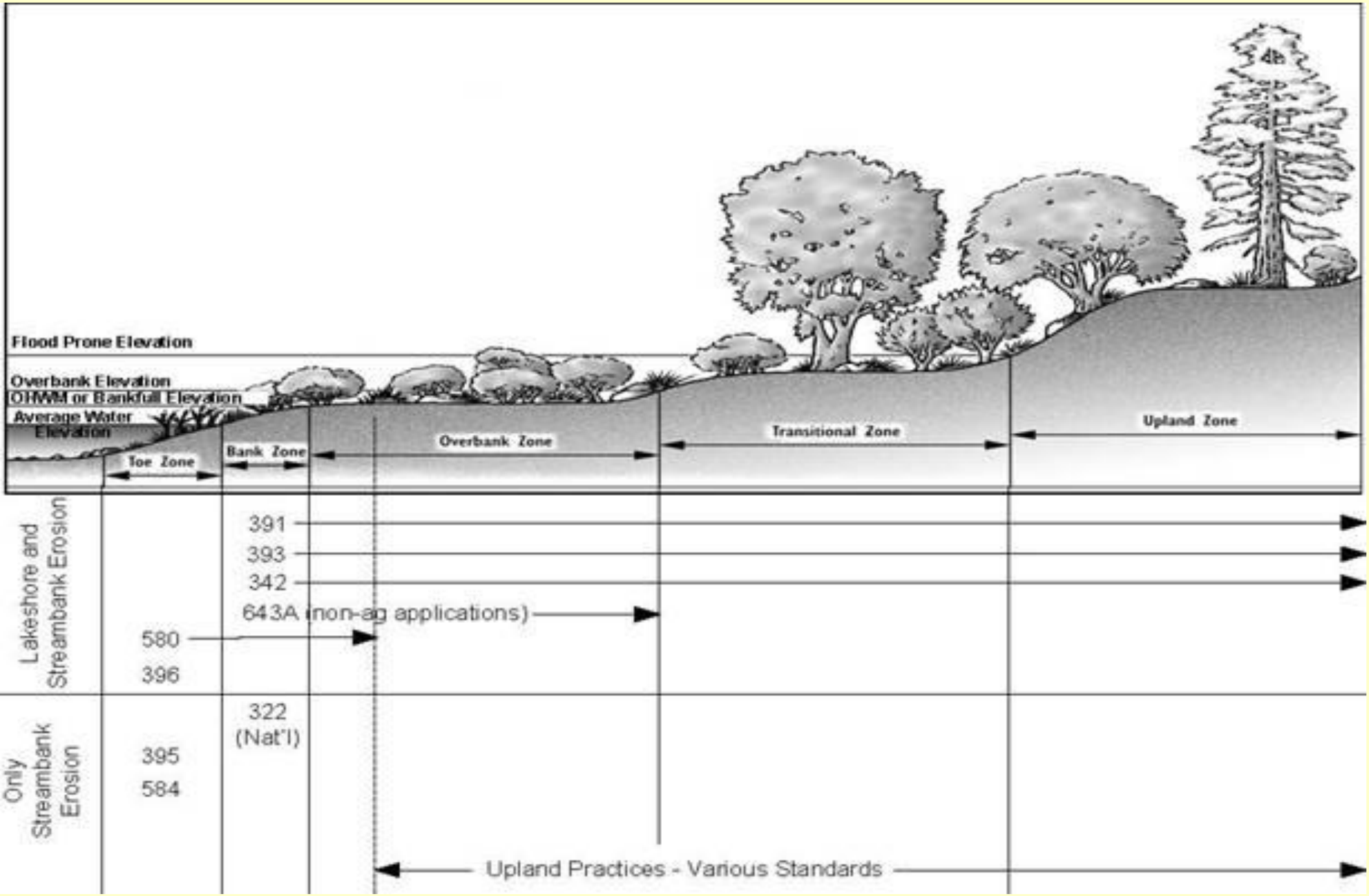
II. Purpose

- Limit loss of land (erosion)
- Maintain or restore channel dimensions
- Reduce Sediment loading
- Improve or protect recreation, habitat, biodiversity, natural scenic beauty.

Condition where Practice applies

- Toe zones
- Bank zones Figure 1
- Structural treatments often in combination with softer treatments as a system
  - Re-vegetation, soil bioengineering, upland erosion control practices

    - Structural treatments = A system of non-living materials with a specific configuration installed as a means of (bank or shore) stabilization including, but not limited to, riprap, tree revetments, log/rootwad/ boulder, dormant post, jacks, coir logs, bulkheads, and stream barbs.


Flood Prone Elevation
Overbank Elevation
OHWM or Bankfull Elevation
Average Water Elevation
Toe Zone
Bank Zone
Overbank Zone
Transitional Zone
Upland Zone
Lakeshore and Streambank Erosion
391
393
342
643A (non-ag applications)
580
396
Only Streambank Erosion
322 (Nat'l)
395
584
Upland Practices - Various Standards

Zones Figure 1 HANDOUT #3

- Toe zones
- Bank zones
- Overland zone
- Transition zone
- Upland zone

Zones and definitions

- Bank Zone - The area above the Toe Zone located between the average water level or the bankfull elevation or OHWM. Vegetation may be herbaceous or woody, and is characterized by flexible stems and rhizomatous root systems.

- Flood Prone Elevation - Twice the bankfull depth.

- Overbank Zone - The area located above the top of the bank, or the bankfull elevation continuing upslope to an elevation equal to two thirds of the flood prone depth. Vegetation is generally small to medium shrub species.

- Toe Zone - The portion of the bank that is between the average water level and the bottom of the lakebed or channel, at the toe of the bank. Vegetation is generally herbaceous emergent aquatic species, tolerant of long periods of inundation.

- Transitional Zone - The area located between the overbank zone, and the flood prone width elevation. Vegetation is usually larger shrub and tree species.

- Upland Zone - The area above the Transitional Zone; this area is seldom if ever saturated.

V. Criteria

- Management Assessment
- Site Assessment (s)

- General Design Criteria (streams and shorelines)
- Specific Criteria

    - Coordinates with NR-328 sub. III (not apposed to one another)

3 major Treatments

- Vegetative
- Structural Treatments
- Soil Bio-engineering

Protective Measures Stream banks and shorelines

Vegetative planting

Soil bioengineering systems

- *Live stakes*
- *Live fascines*
- *Branchpacking*
- *Vegetated geogrids*
- *Live cribwall*
- *Joint planting*
- *Brushmattress*

Structural measures

- *Tree revetment*
- *Log, rootwad and boulder revetments*
- *Dormant post plantings*
- *Piling revetment with wire or geotextile fencing*
- *Piling revetment with slotted board fencing*
- *Jacks or jack fields*
- *Rock riprap*
- *Coconut fiber rolls*
- *Stream jetties*
- *Stream barbs*
- *Rock gabions*
- More than just Riprap

Protective Measures shorelines

Vegetative measures

Structural measures

- **Groins**
- **Bulkheads**
- **Revetments**
- **Coconut fiber roll**

  – More than just Riprap

Soil bioengineering systems

Live stake

Live fascine

Brushmattress

Live siltation ***construction***

Reed clump

Others

- Integrated Treatments
- Temporary wave Berms

- Other systems

3 major Treatments

- Vegetative
- Structural Treatments
- Soil Bio-engineering

PLANNING

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 HANDOUT #4

- 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)


Livestock trampling of Vegetation on a lakeshore


Upland Runoff
Erosion Factor
10/6/00


Ice


Erosion from Wave and Ice Action


Upland Slump in Bank
due to over-saturation

Human Factor

Unstable Soils
on a steep bank


Seepage


Seepage


Water Level Fluctuations
Seawall overtopping and
splash impacts

Existing Seawalls Limit Choices

Water Level Fluctuations

Human Manipulation/Unstable Soils

Ice, Proximity, Slope %, Runoff

Ice push common every spring

Existing Vegetation not holding

BIOLOGICAL ASSESSMENT

UTILITIES


SM&P UTILITY RESOURCES
HAS CHECKED THIS SITE
UNDER REQUEST# 9069788
THERE ARE NO UNDERGROUND CONFLICTS FOR
CTV — TELE
ELEC
DATE/TIME: 11.13.03
LOC# BC 112232

DESIGN

OPTIONS AND CONSIDERATIONS

DESIGN REQUIREMENTS

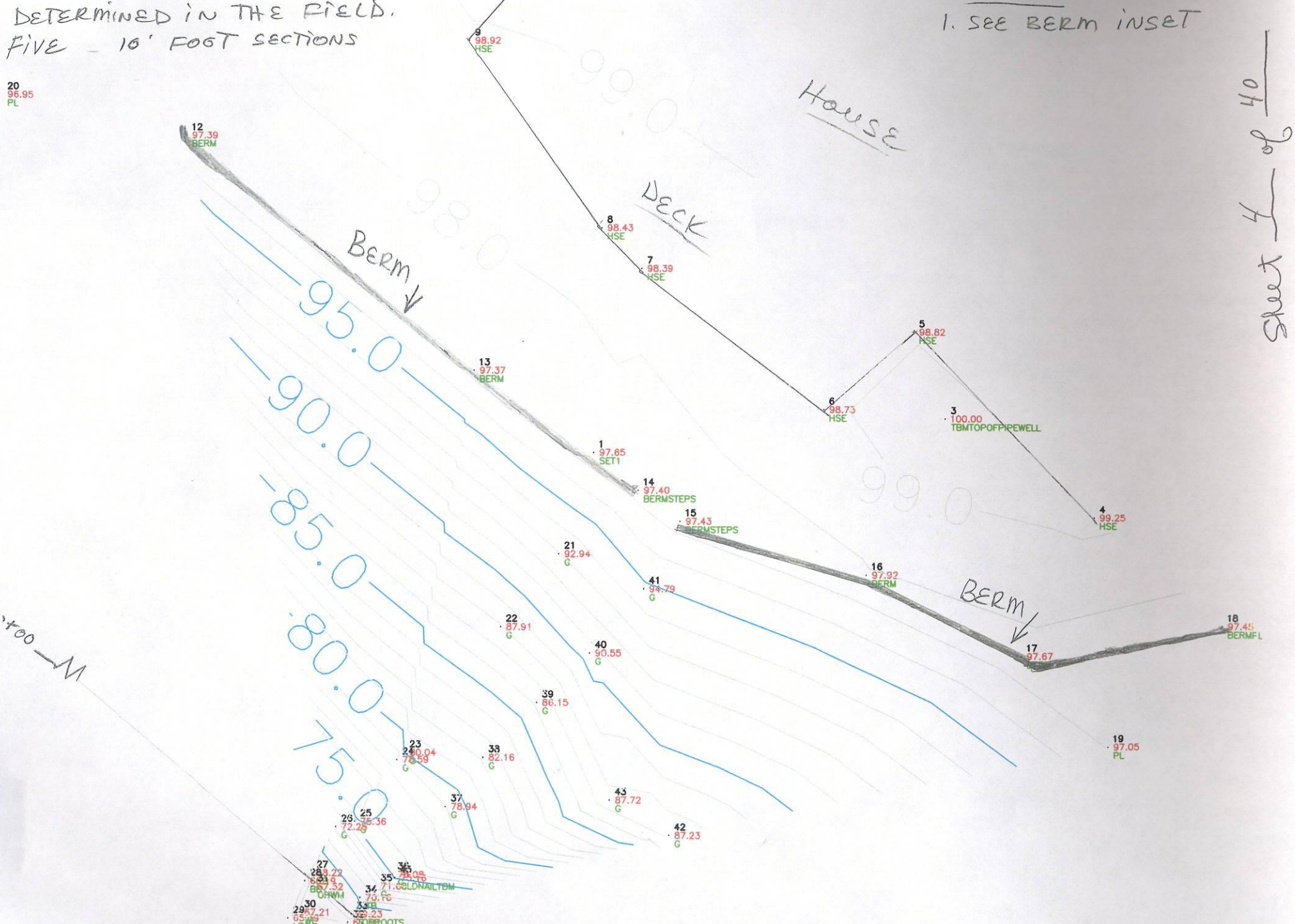
- Topographical survey
- Construction Plan
- Design documentation of calculations and decisions made based on site conditions
- Operation and Maintenance Plan
- Inspection Plan
- Cost Estimate

SURVEYING

DETERMINED IN THE FIELD.
FIVE - 10' FOOT SECTIONS

1. SEE BERM INSET

Sheet 4 of 40



Lakeshore Design

- Spreadsheet Inputs – similar to NR 328 for wind driven waves – also includes method to calculate rock size, revetment shape/configuration, and quantities

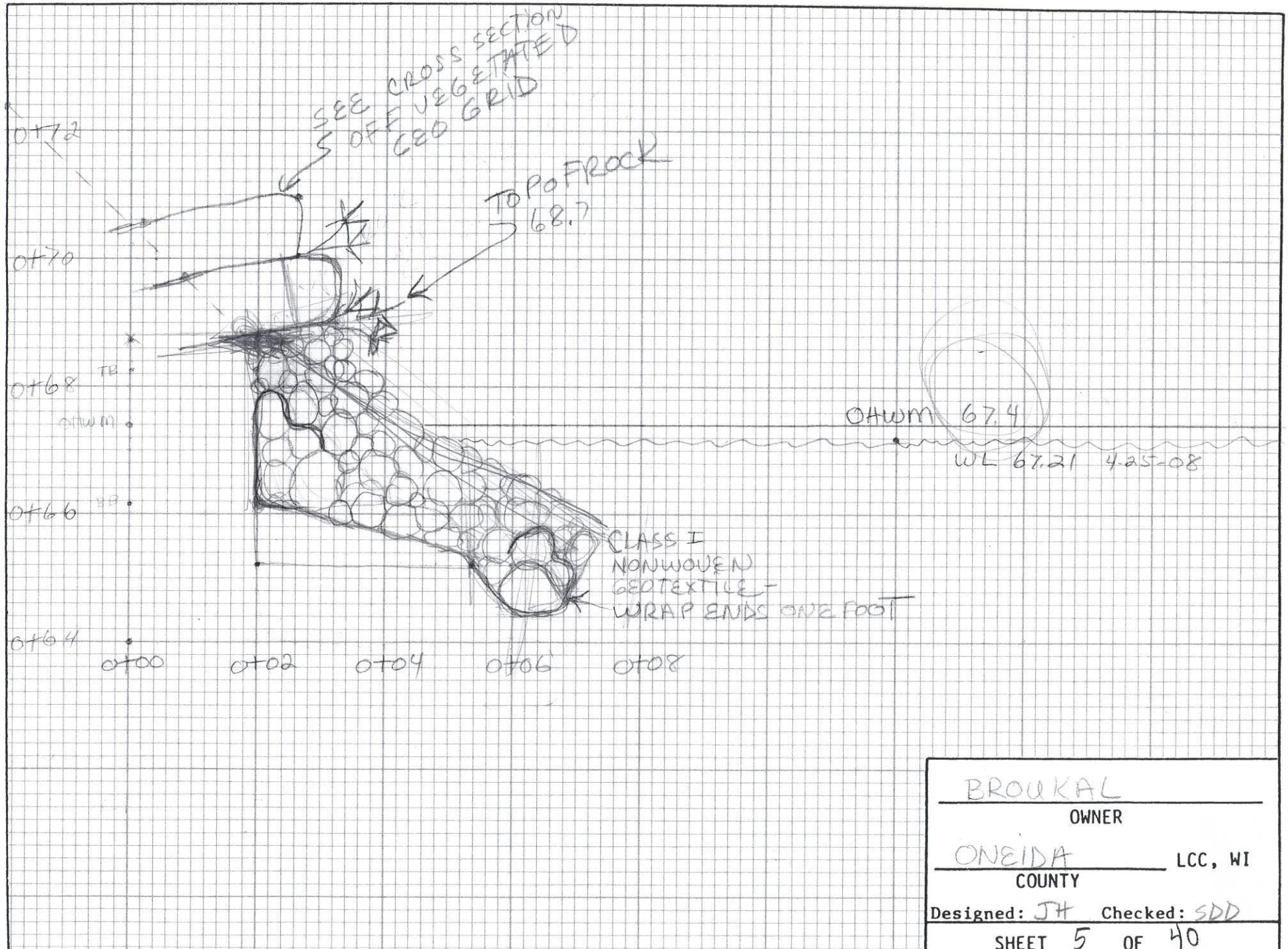
- Photos of Various Protection Methods

Spreadsheet Outputs HANDOUT #5

- Height of protection (same as NR 328)
- Rock size
- Rock type
- Rock cross section (dimensions, slope, etc)
- Quantities
- Cost Estimate

ROUNDED RIP RAP D50=6 INCH

ANGULAR RIP RAP D50= 6 INCH



U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

DRAWING NO. WI-008 8/87

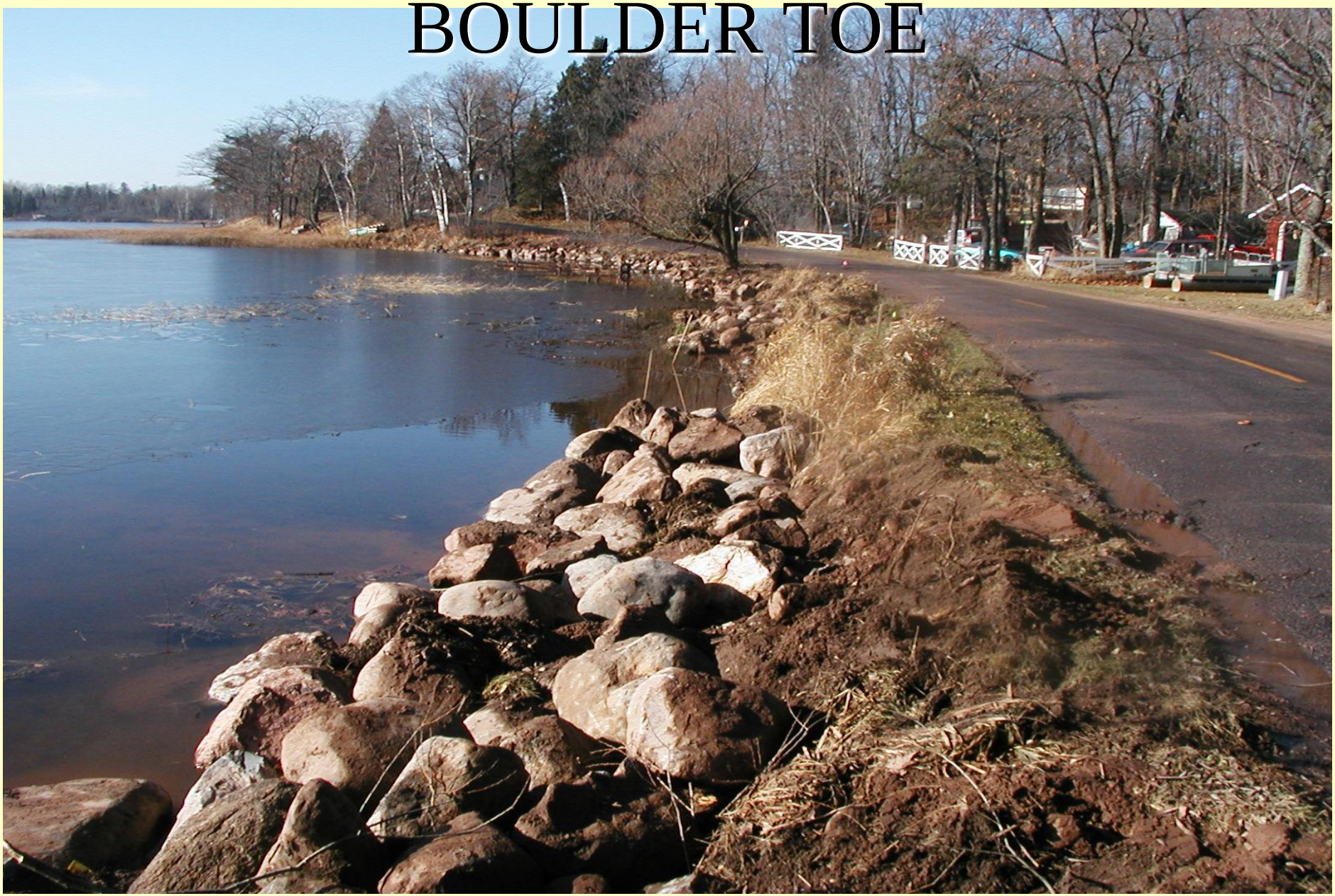
BROWKAL
OWNER

ONEIDA LCC, WI
COUNTY

Designed: JH Checked: SDD

SHEET 5 OF 40

BOULDER TOE



OTHER DESIGN OPTIONS AVAILABLE – FOLLOW MANUFACTURER'S INSTRUCTIONS

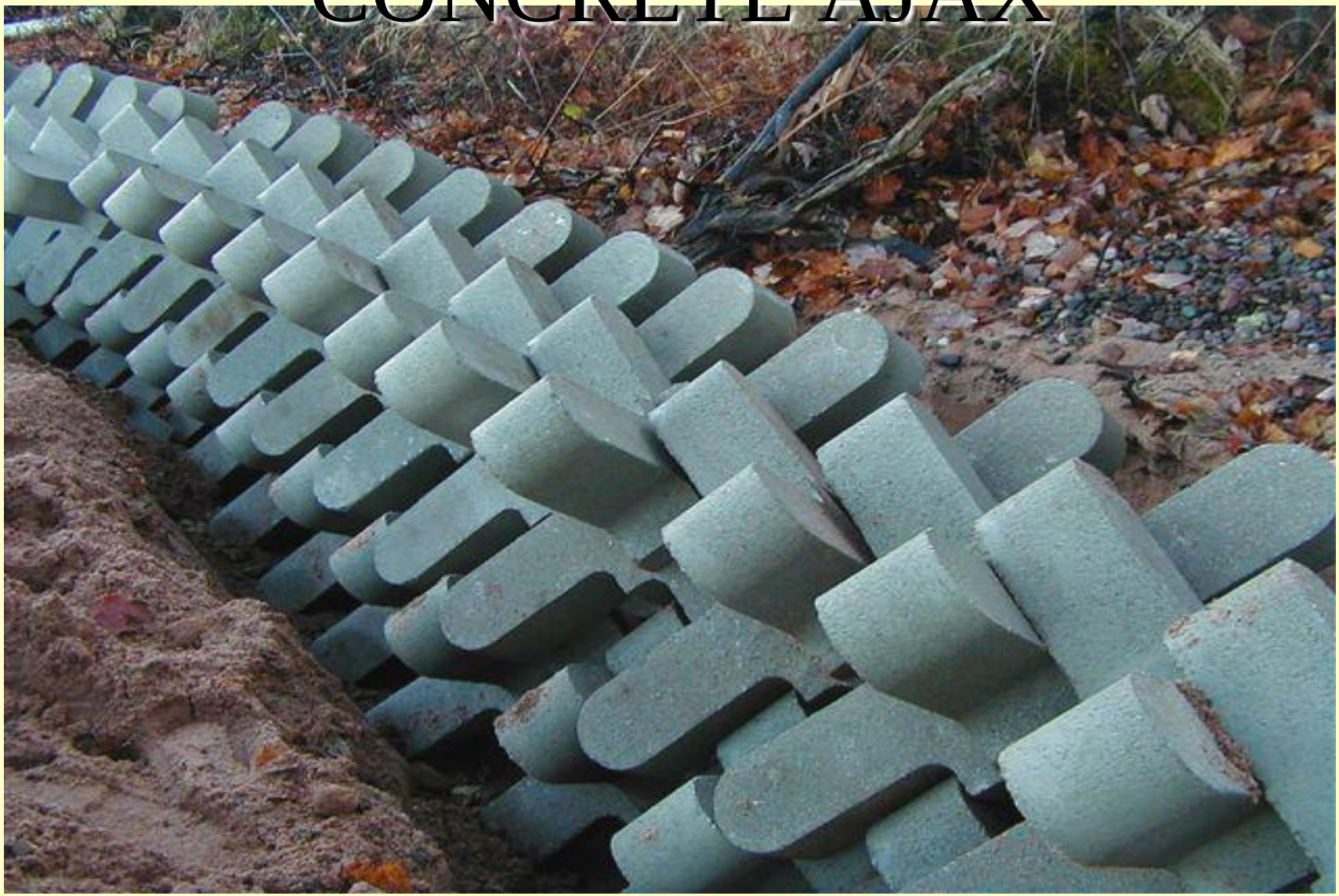

Live Brush Layer
Mats Installed

Vegetating Fiber Roll
With Native Plants

Willow Cuttings
in Front of
Fiber Roll

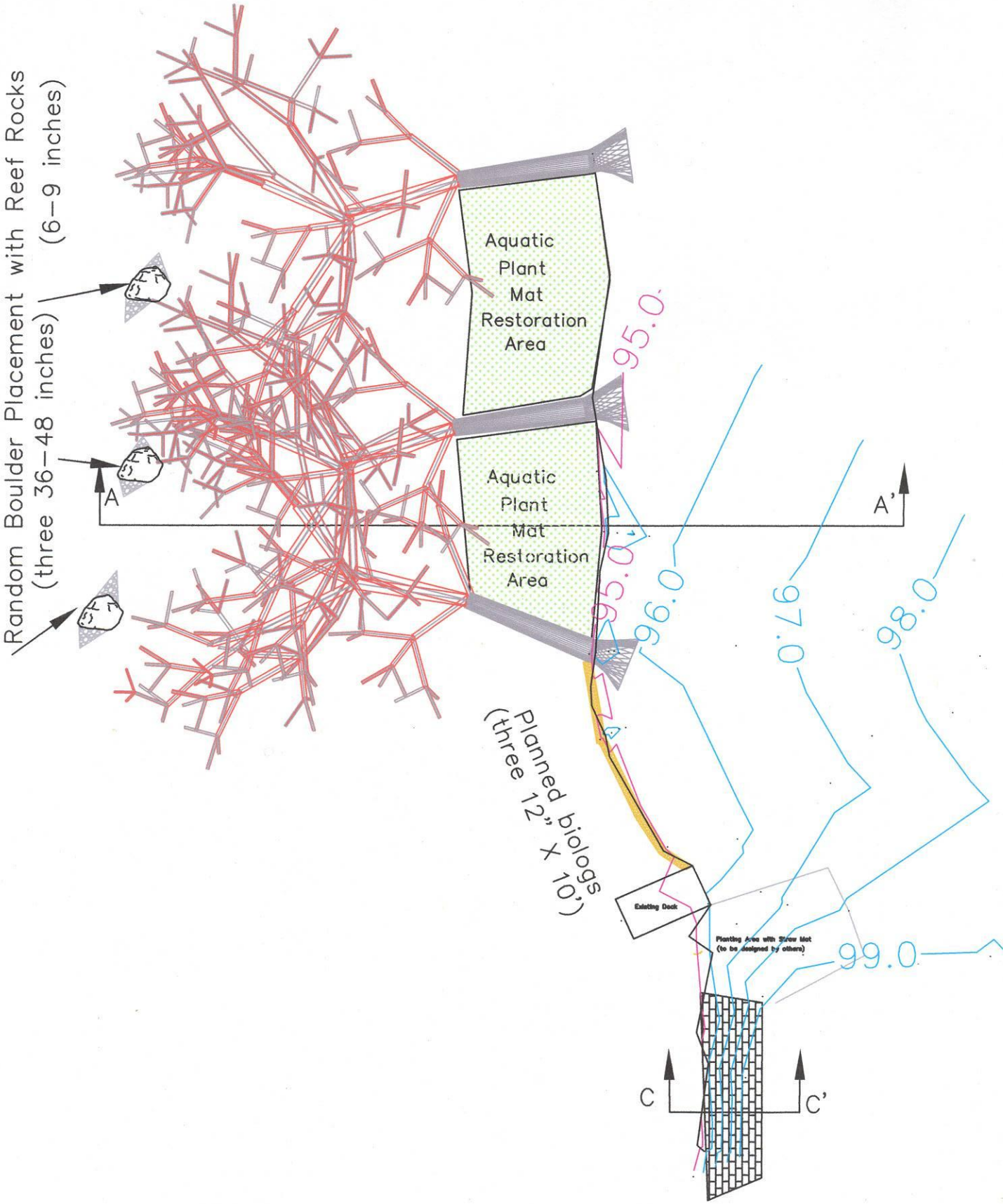
Interlocking Concrete
Block with Plantings

CONCRETE AJAX




Deltalok fabric bag system

Hydroseeding Deltalok system with tackified native seed



Schell Plan View

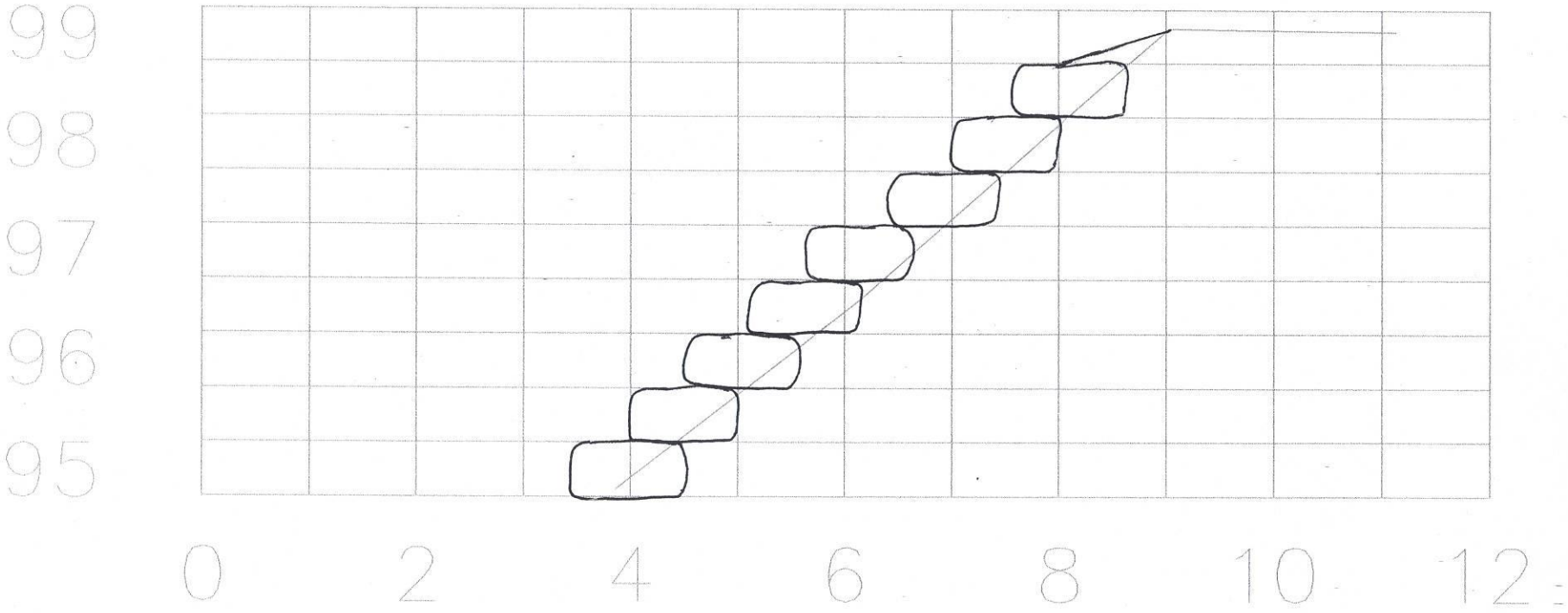
~~Scale 1" = 10 Feet~~

NOT TO SCALE
(Reduced to fit 8'X11)

TURF REINFORCEMENT

ENVIROLOK BAGS

Cross Section C–C'

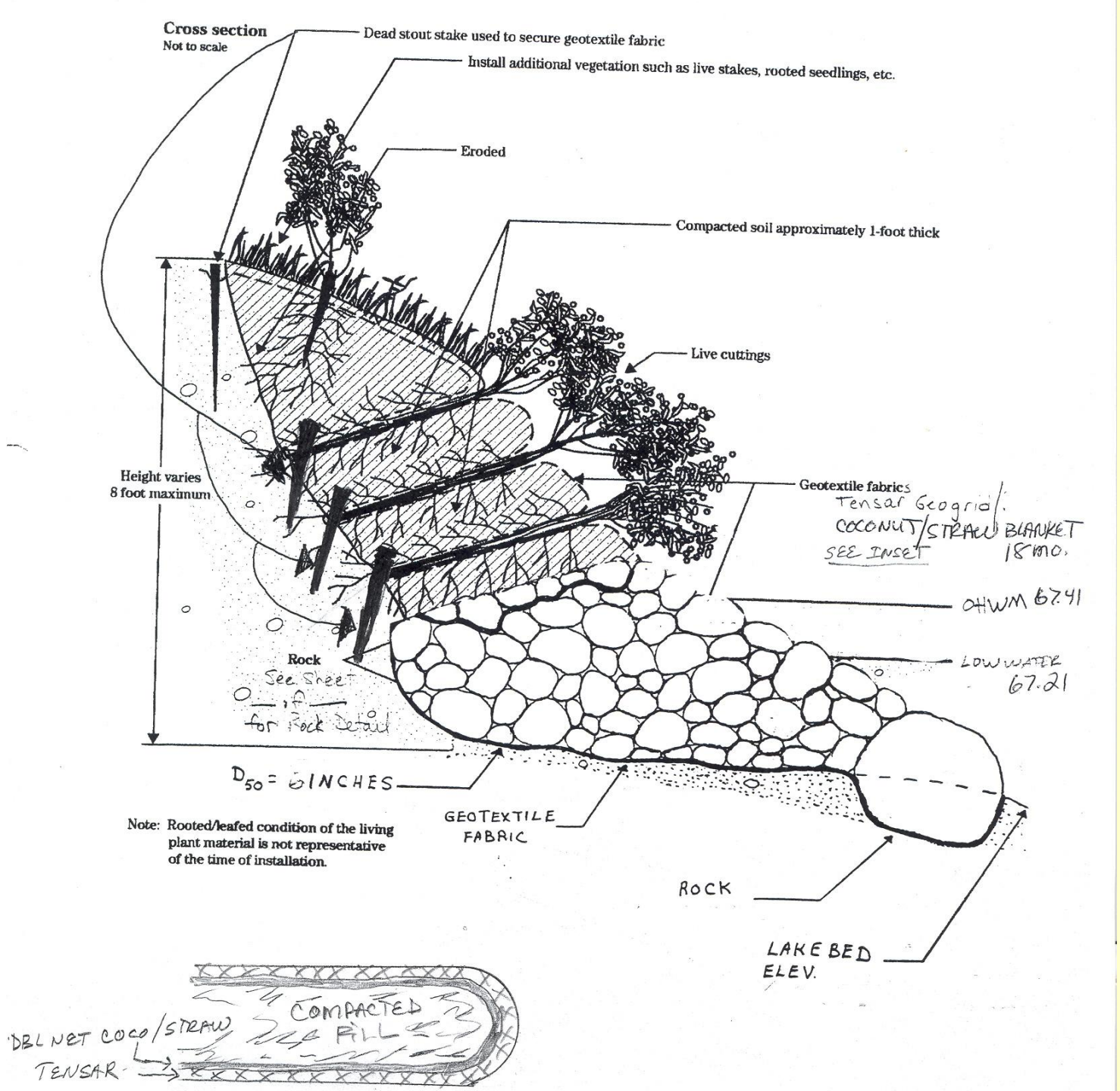


Note:

Enviroloc bags to replace existing rock retaining wall
Bags to be vegetated per a design by others (planting plan)
Bags shall be installed per manufacturer's recommendations
Bags are located above the OHWM and are not planned for toe protection

Vegetated Geogrid Constructed above Rock Toe

GEOGRID ABOVE ROCK TOE


Cross section
Not to scale
Dead stout stake used to secure geotextile fabric
Install additional vegetation such as live stakes, rooted seedlings, etc.
Eroded
Compacted soil approximately 1-foot thick
Live cuttings
Height varies
8 foot maximum
Geotextile fabrics
Tensar Geogrid
COCONUT/STRAW BLANKET
SEE INSET
18 mo.
OHWM 67.41
LOW WATER
67.21
Rock
See Sheet
of
for Rock Detail
D50 = 6 INCHES
GEOTEXTILE
FABRIC
ROCK
LAKE BED
ELEV.
Note: Rooted/leafed condition of the living plant material is not representative of the time of installation.
DBL NET COCO/STRAW
TENSAR
COMPACTED
FILL

CURLEX SEDIMENT LOG WITH BACKGRADE TO BREAK SLOPE

EXACT PLACEMENT WILL BE DETERMINED IN THE FIELD

0+79

0+77

0+75

0+73

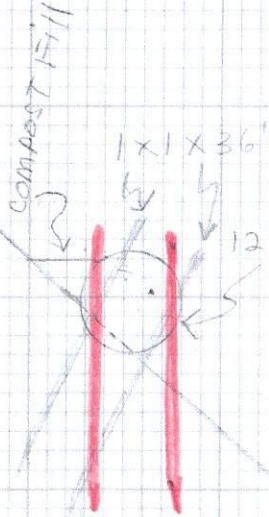
0+71

0+69

0+67

NOTES:

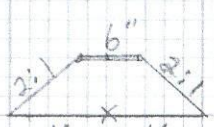
1. STAKE LOG EVERY TWO (2) FEET ON THE DOWNSTREAM SIDE
2. ENDS SHALL HAVE STAKES ON EACH SIDE OF LOG AND ONE PLACED IN THE MIDDLE
3. STAKES MUST BE INTERTWINED WITH THE OUTER MESH ONLY
4. STAKES SHALL BE PLACED IN GROUND A MINIMUM OF 24"
5. LOG TO BE SET INTO GRADE SEVERAL INCHES.



END VIEW

Stakes should be vertical not ⊥ to slope

BERM DETAILS



BROUKAL
OWNER

ONEIDA LCC, WI
COUNTY

Designed: JH Checked: SDD

SHEET 8 OF 40

☆U.S. GOVERNMENT PRINTING OFFICE:

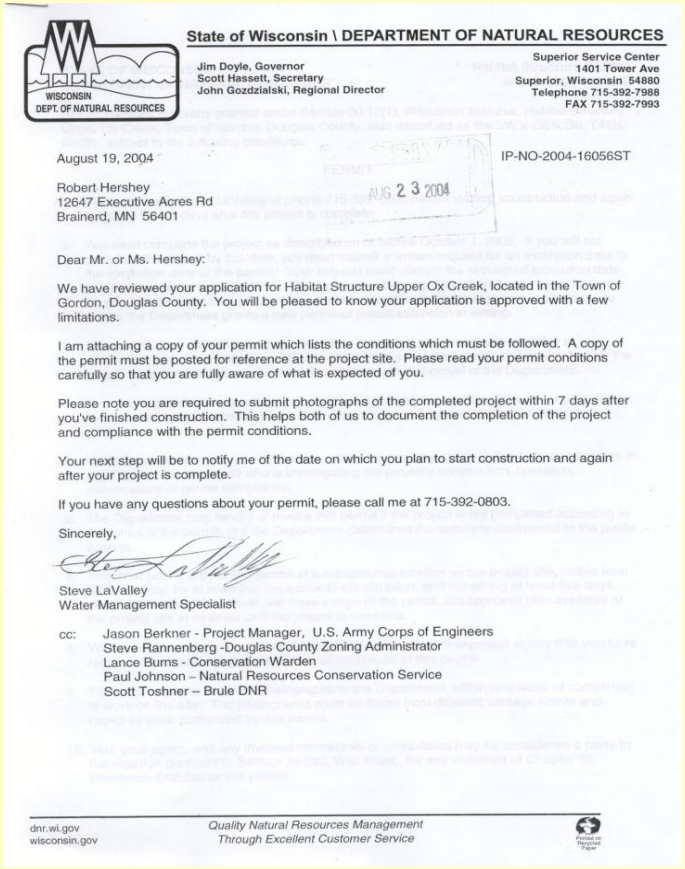
WAVE BARRIERS

- NR 328 allows wave breaks waterward to the 3 foot contour
- Temporary – get vegetation established before removing
- Maintenance required while they are in place
- I’ve not tried any type but a biolog placed waterward and it failed due to ice


Wisconsin Valley Improvement Corporation
Branch Box Breakwater Construction (pre NR 328)

Wetland Plants Installed Behind Breakwater

PERMITS



State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

WISCONSIN DEPT. OF NATURAL RESOURCES

Jim Doyle, Governor
Scott Hassett, Secretary
John Gozdzialski, Regional Director

Superior Service Center
1401 Tower Ave
Superior, Wisconsin 54880
Telephone 715-392-7988
FAX 715-392-7993

August 19, 2004

IP-NO-2004-16056ST

AUG 23 2004

Robert Hershey
12647 Executive Acres Rd
Brainerd, MN 56401

Dear Mr. or Ms. Hershey:

We have reviewed your application for Habitat Structure Upper Ox Creek, located in the Town of Gordon, Douglas County. You will be pleased to know your application is approved with a few limitations.

I am attaching a copy of your permit which lists the conditions which must be followed. A copy of the permit must be posted for reference at the project site. Please read your permit conditions carefully so that you are fully aware of what is expected of you.

Please note you are required to submit photographs of the completed project within 7 days after you've finished construction. This helps both of us to document the completion of the project and compliance with the permit conditions.

Your next step will be to notify me of the date on which you plan to start construction and again after your project is complete.

If you have any questions about your permit, please call me at 715-392-0803.

Sincerely,

Steve LaValley
Water Management Specialist

cc: Jason Berkner - Project Manager, U.S. Army Corps of Engineers
Steve Rannenberg -Douglas County Zoning Administrator
Lance Burns - Conservation Warden
Paul Johnson – Natural Resources Conservation Service
Scott Toshner – Brule DNR

dnr.wi.gov
wisconsin.gov

Quality Natural Resources Management
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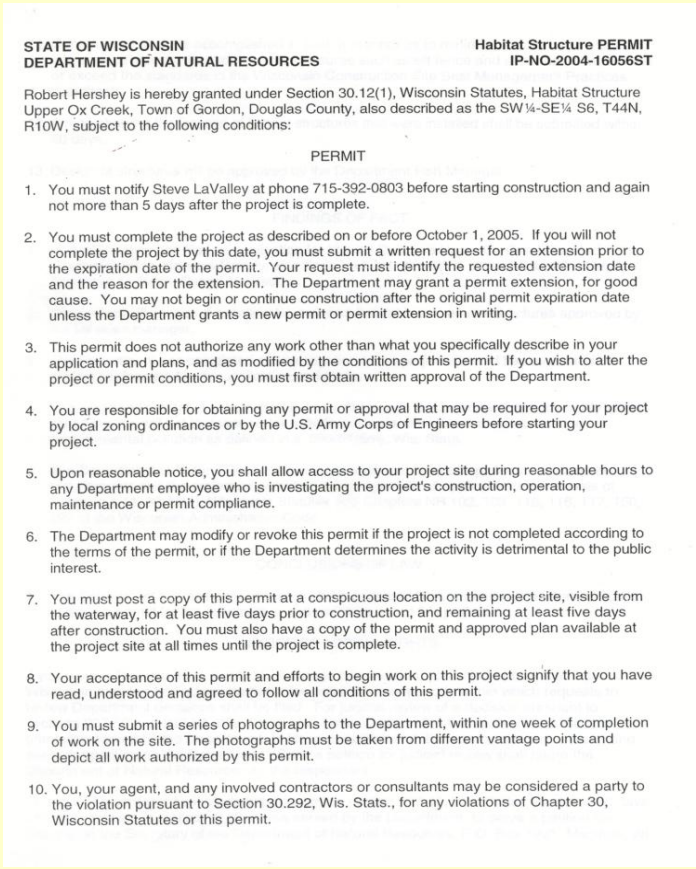


STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES

Habitat Structure PERMIT
IP-NO-2004-16056ST

Robert Hershey is hereby granted under Section 30.12(1), Wisconsin Statutes, Habitat Structure Upper Ox Creek, Town of Gordon, Douglas County, also described as the SW¼-SE¼ S6, T44N, R10W, subject to the following conditions:

PERMIT

1. You must notify Steve LaValley at phone 715-392-0803 before starting construction and again not more than 5 days after the project is complete.

2. You must complete the project as described on or before October 1, 2005. If you will not complete the project by this date, you must submit a written request for an extension prior to the expiration date of the permit. Your request must identify the requested extension date and the reason for the extension. The Department may grant a permit extension, for good cause. You may not begin or continue construction after the original permit expiration date unless the Department grants a new permit or permit extension in writing.

3. This permit does not authorize any work other than what you specifically describe in your application and plans, and as modified by the conditions of this permit. If you wish to alter the project or permit conditions, you must first obtain written approval of the Department.

4. You are responsible for obtaining any permit or approval that may be required for your project by local zoning ordinances or by the U.S. Army Corps of Engineers before starting your project.

5. Upon reasonable notice, you shall allow access to your project site during reasonable hours to any Department employee who is investigating the project's construction, operation, maintenance or permit compliance.

6. The Department may modify or revoke this permit if the project is not completed according to the terms of the permit, or if the Department determines the activity is detrimental to the public interest.

7. You must post a copy of this permit at a conspicuous location on the project site, visible from the waterway, for at least five days prior to construction, and remaining at least five days after construction. You must also have a copy of the permit and approved plan available at the project site at all times until the project is complete.

8. Your acceptance of this permit and efforts to begin work on this project signify that you have read, understood and agreed to follow all conditions of this permit.

9. You must submit a series of photographs to the Department, within one week of completion of work on the site. The photographs must be taken from different vantage points and depict all work authorized by this permit.

10. You, your agent, and any involved contractors or consultants may be considered a party to the violation pursuant to Section 30.292, Wis. Stats., for any violations of Chapter 30, Wisconsin Statutes or this permit.

DNR WEBSITES

http://dnr.wi.gov/waterways/factsheets/Erosion_Intensity_Worksheet.pdf

http://dnr.wi.gov/waterways/permit_apps/BankErosionPotentialIndexWorksheet.pdf

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

http://dnrmaps.wisconsin.gov/imf/imf.jsp?site=SurfaceWaterViewer


Probably not real habitat
friendly – not recommended!

Notice the developed vs. undeveloped shoreline and what we are trying to avoid with education about preserving natural shorelines

What Causes Erosion?

- Wind-driven waves
- **Boating Waves**
- **Ice action**
- **Long-shore currents**
- **Removal/loss of bank vegetation**
- **Removal/loss of shallow water aquatic plants**
- **Tributary areas and flowing water**

WDNR Tools

- Erosion Calculator web page
- Surface Water Data Viewer web page
- “Where You Live”
- Erosion Intensity Scoresheet (EI) HANDOUT #6

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 Severity

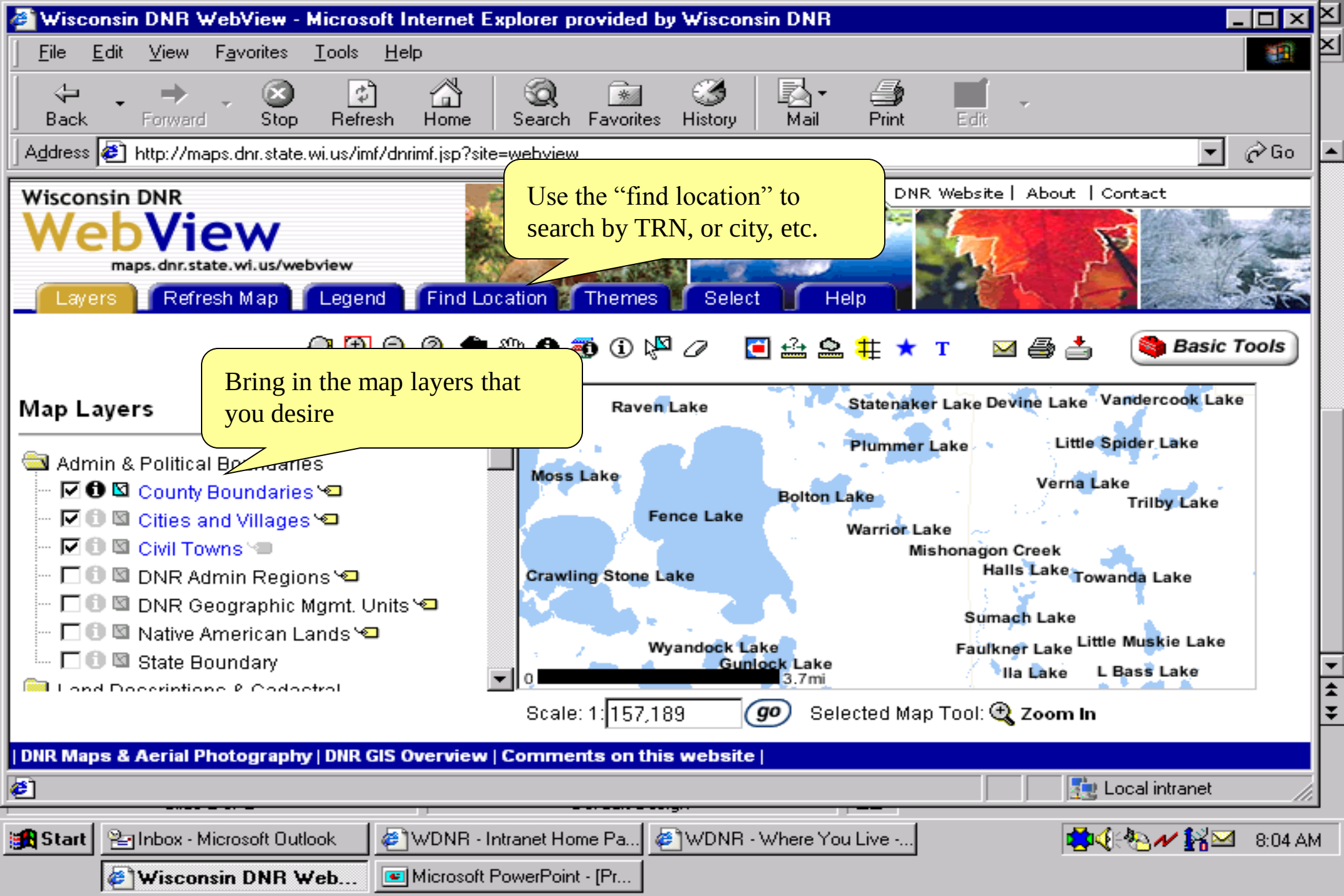
Low Energy	Moderate Energy	High Energy
< 1 foot	1- 2.3 feet	>2.3 feet

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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Use the "find location" to search by TRN, or city, etc.
Layers
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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
Gunlock Lake
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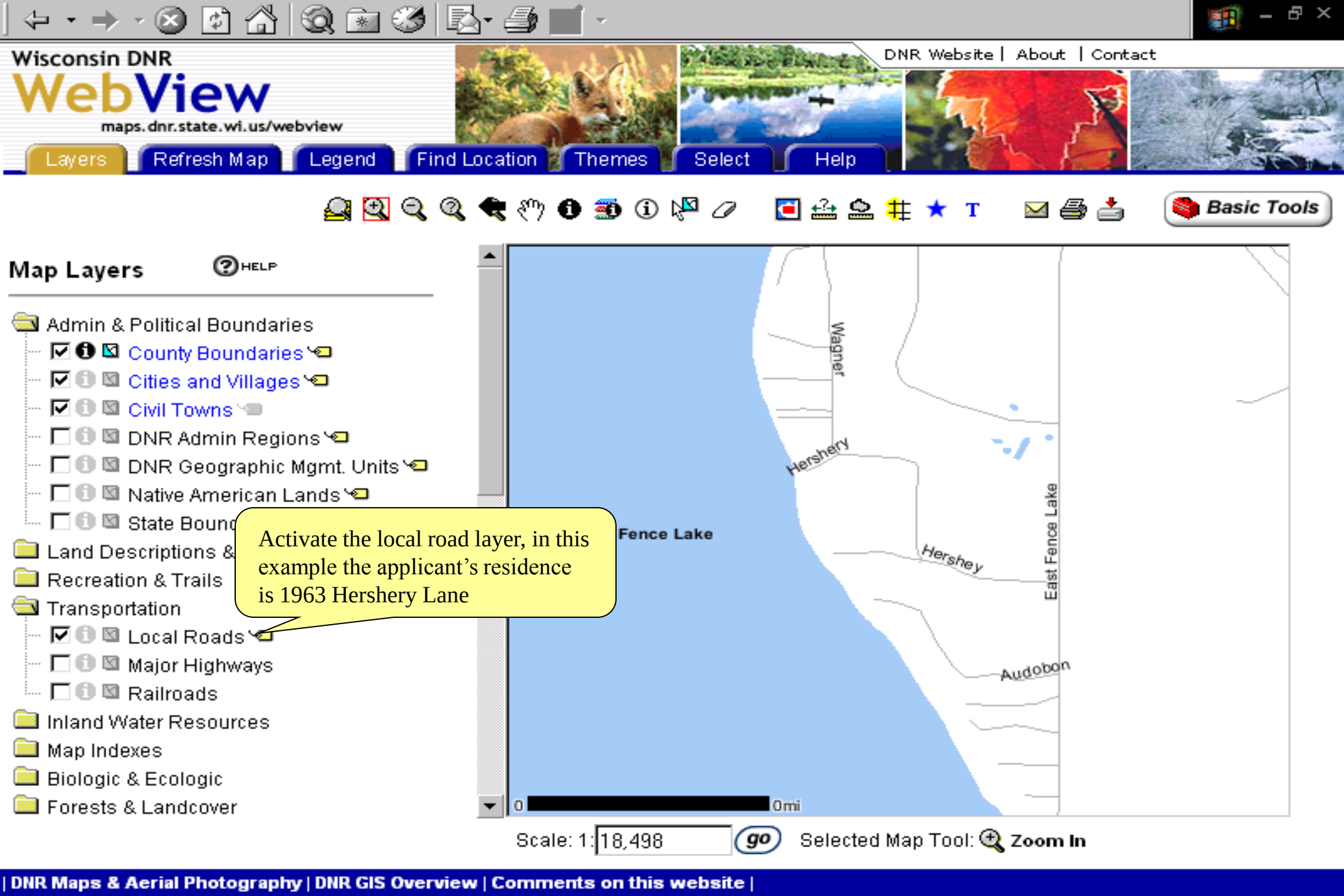
Microsoft PowerPoint - [Pr...


Wisconsin DNR
WebView
maps.dnr.state.wi.us/webview
DNR Website | About | Contact
Layers
Refresh Map
Legend
Find Location
Themes
Select
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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 Bound
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
Audobon
0
0mi
Scale: 1:18,498
go
Selected Map Tool: Zoom In
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Wisconsin DNR
WebView
maps.dnr.state.wi.us/webview

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

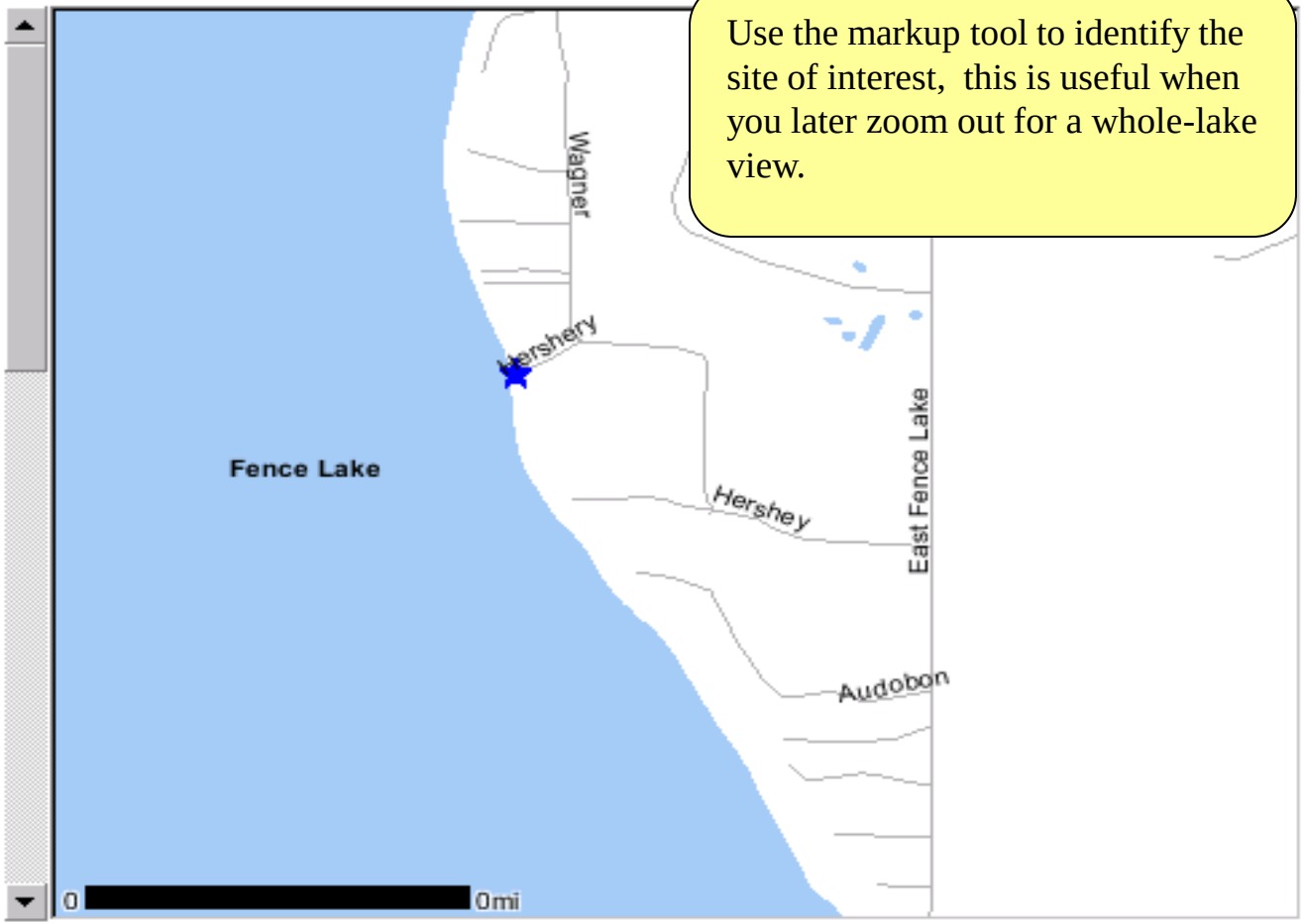
Basic Tools

Map Layers

HELP

- Admin & Political Boundaries
  - [x] County Boundaries
  - [x] Cities and Villages
  - [x] Civil Towns
  - [ ] DNR Admin Regions
  - [ ] DNR Geographic Mgmt. Units
  - [ ] Native American Lands
  - [ ] State Boundary
- Land Descriptions & Cadastral
- Recreation & Trails
- Transportation
  - [x] Local Roads
  - [ ] Major Highways
  - [ ] Railroads
- Inland Water Resources
- Map Indexes
- Biologic & Ecologic
- Forests & Landcover

Use the markup tool to identify the site of interest, this is useful when you later zoom out for a whole-lake view.



Scale: 1:18,498 go Selected Map Tool: Markup

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

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

Basic Tools

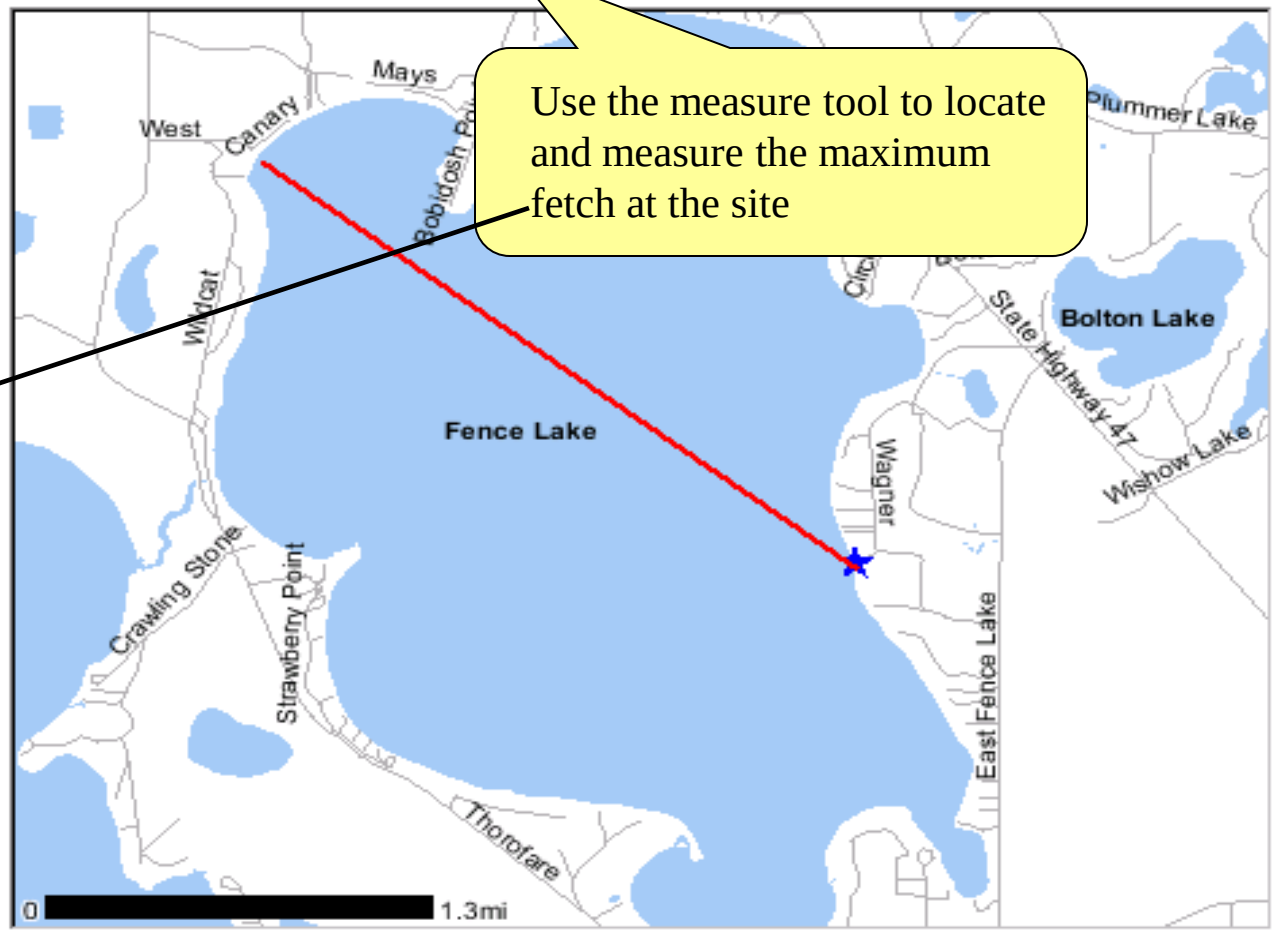
Measure Tool

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

Use the measure tool to locate and measure the maximum fetch at the site



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

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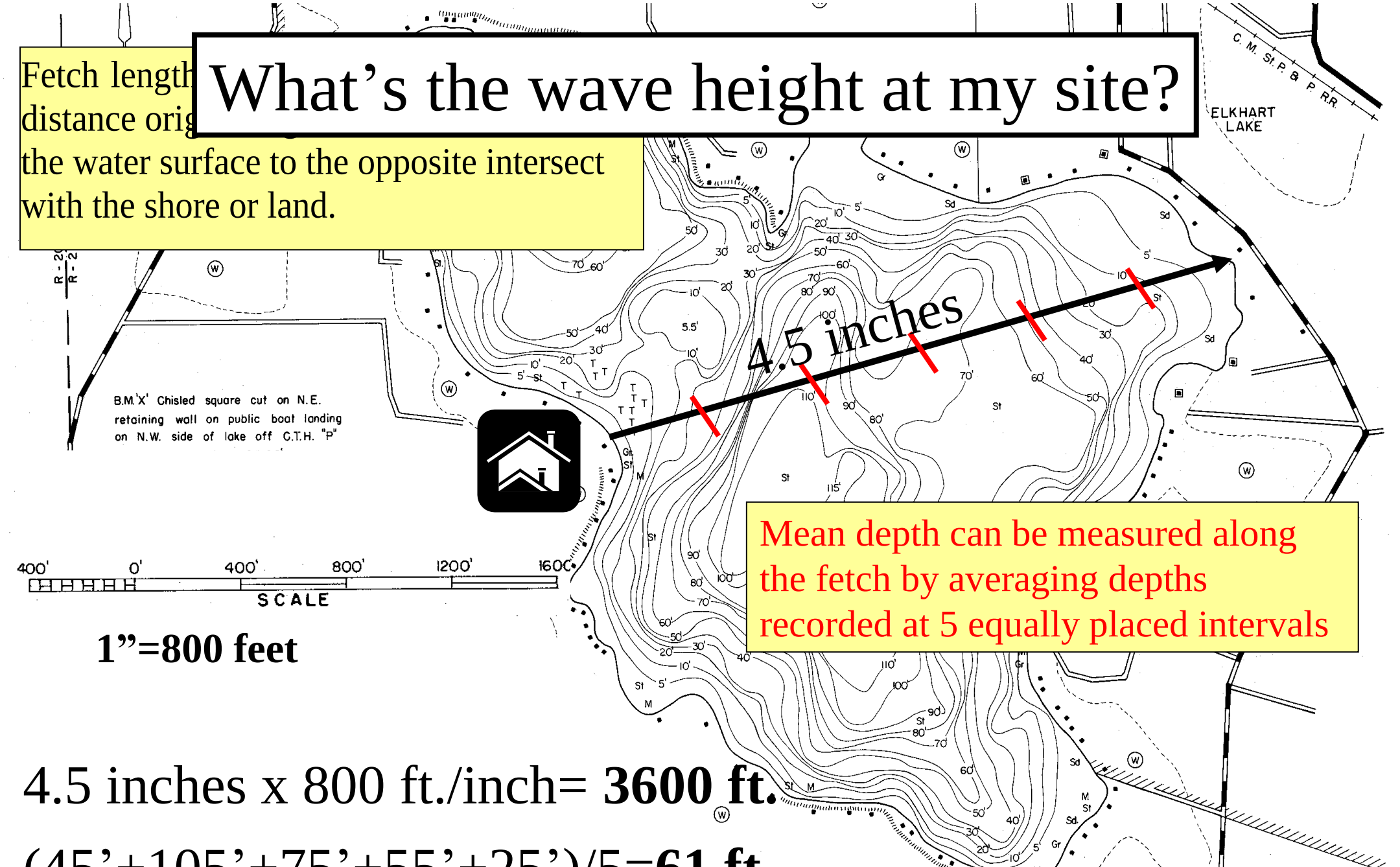
What's the wave height at my site?

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.**

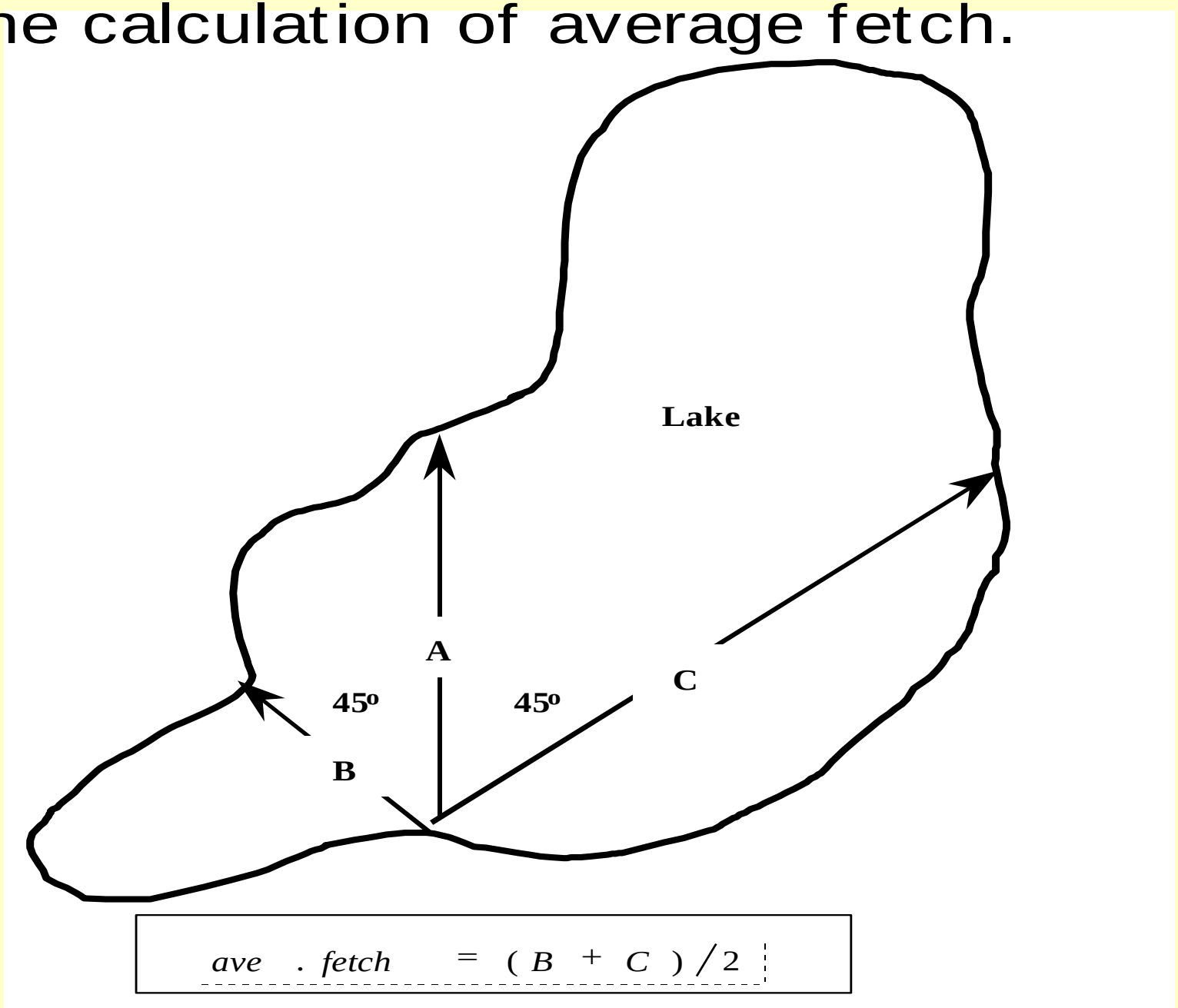
Erosion Intensity

Alternative Site Assessment Method

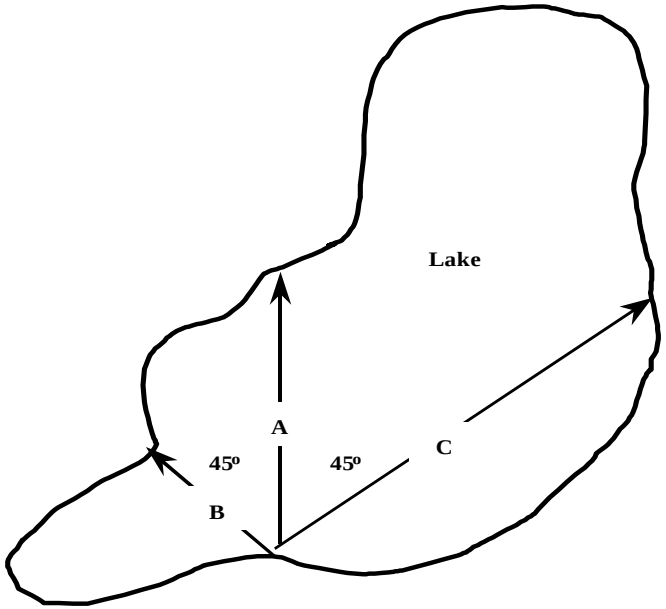
- **Fetch**
- **Shoreline Geometry**
- **Shoreline Orientation**
- **Boat Wakes**
- **Bank Height**
- **Bank Composition**
- **Influence of Adjacent Structures**
- **Depth at 20 Feet**
- **Depth at 100 Feet**
- **Aquatic Vegetation**
- **Bank Stability**
- **Bank Vegetation**

Locating and Measuring Average Fetch

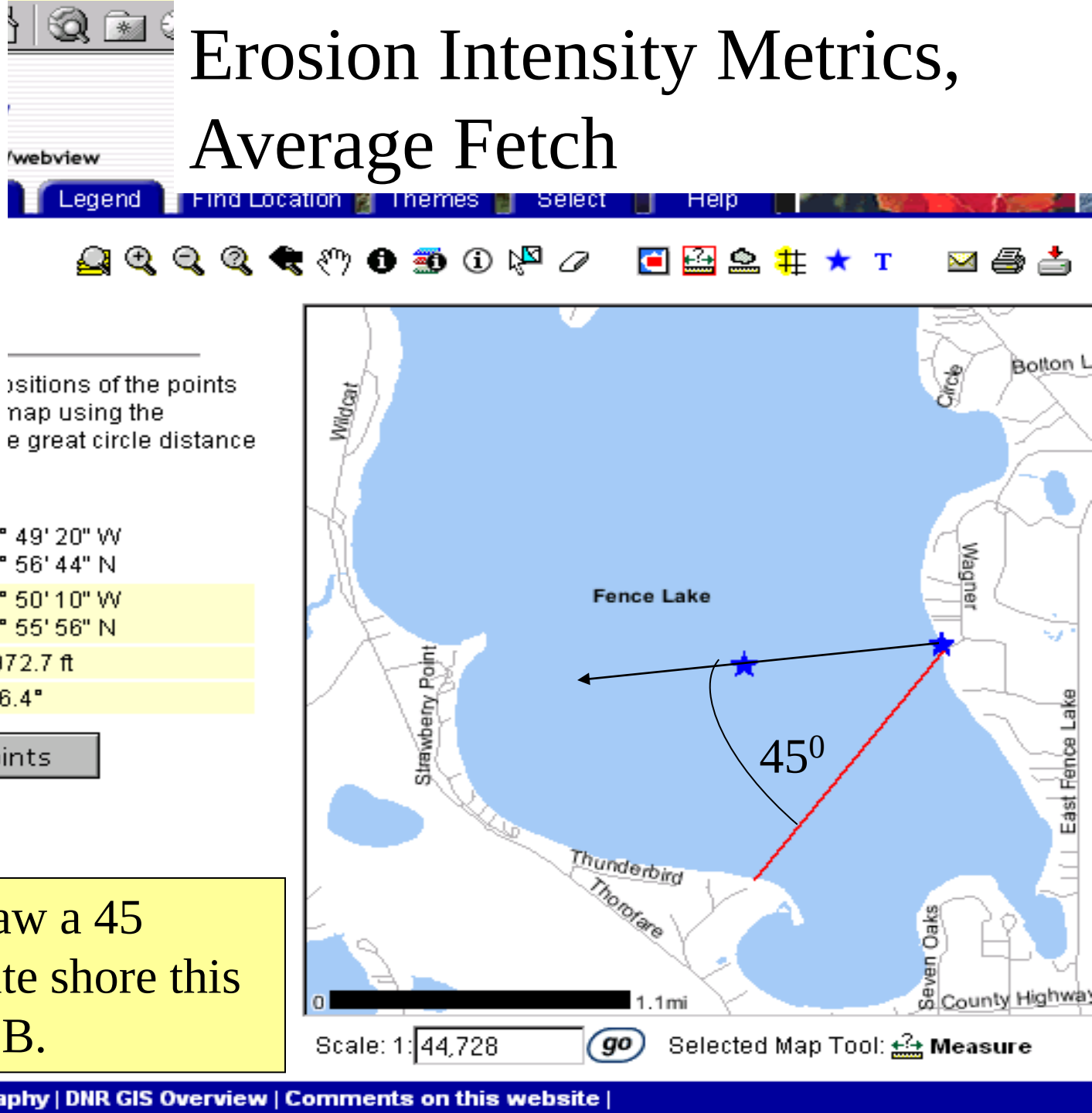
Note: Average fetch; The following diagram describes the calculation of average fetch.



Erosion Intensity Metrics, Average Fetch

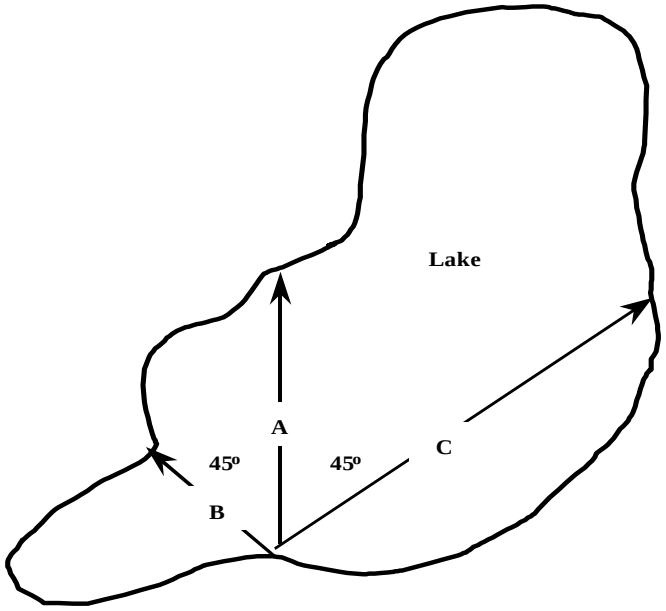


Ave. Fetch = (B + C) / 2



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

Erosion Intensity Metrics, Average Fetch

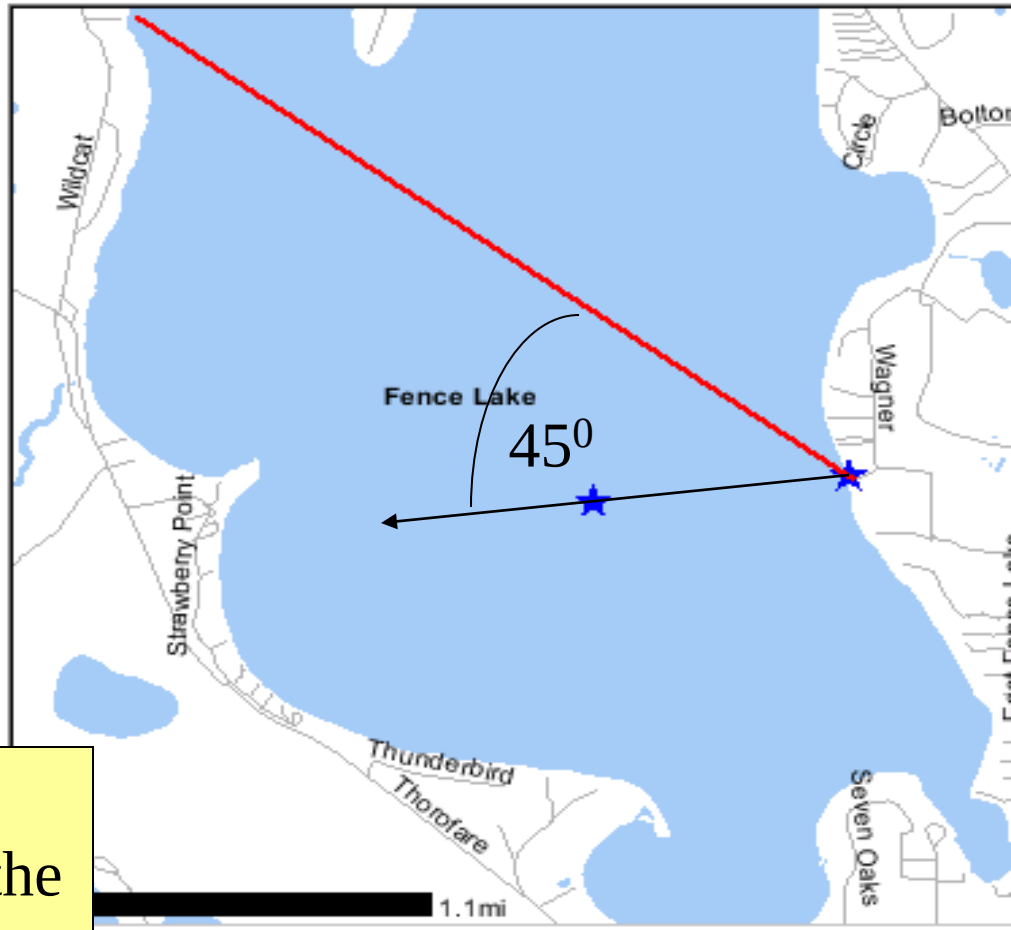


Ave. Fetch = (B + C) / 2

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



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

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

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Erosion Intensity

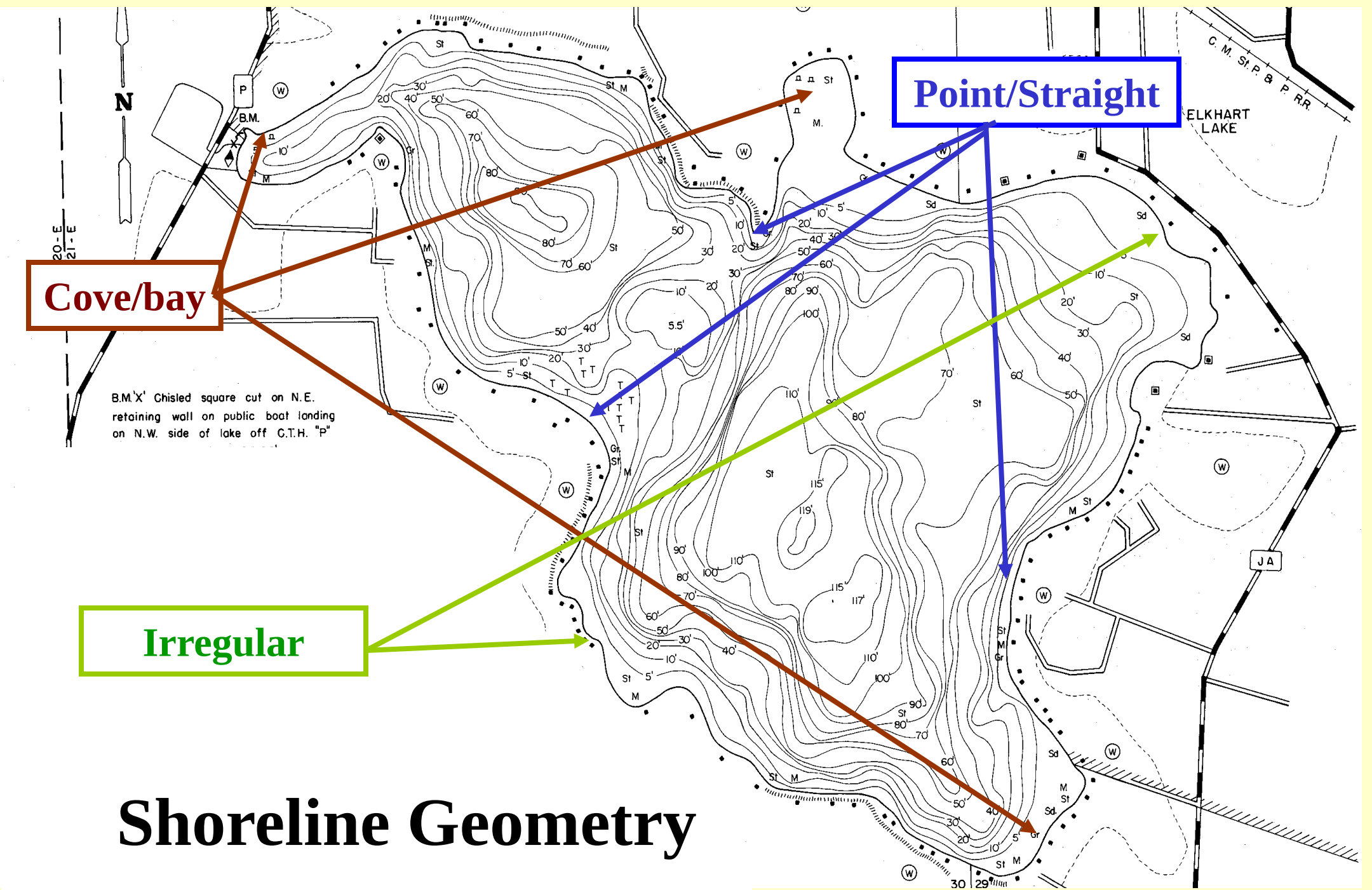
Lake Map

- 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

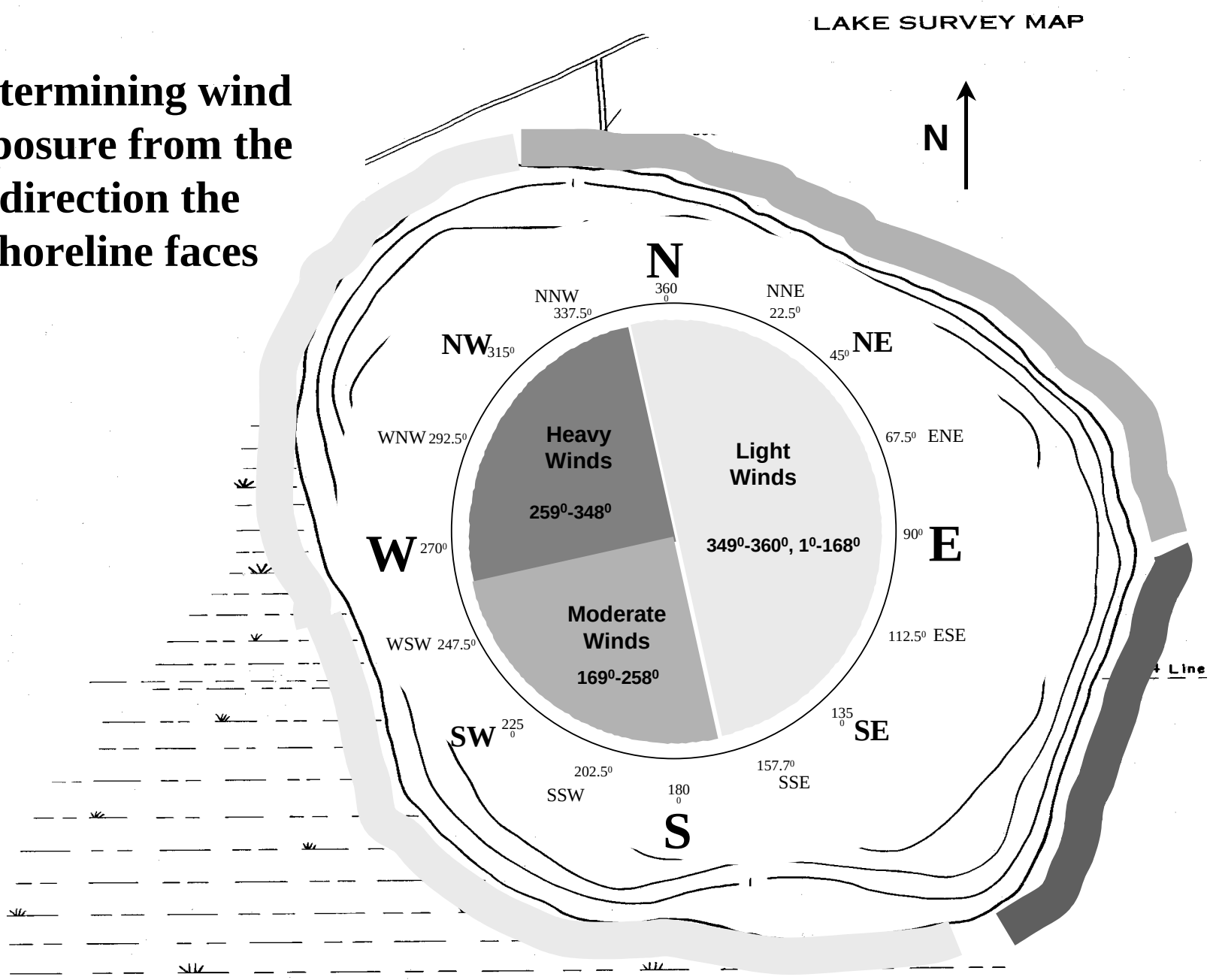
The following lakemap shows an example of classifying shore orientation exposed to prevailing winds. Shorelines are exposed to one of the following:

- Light Winds

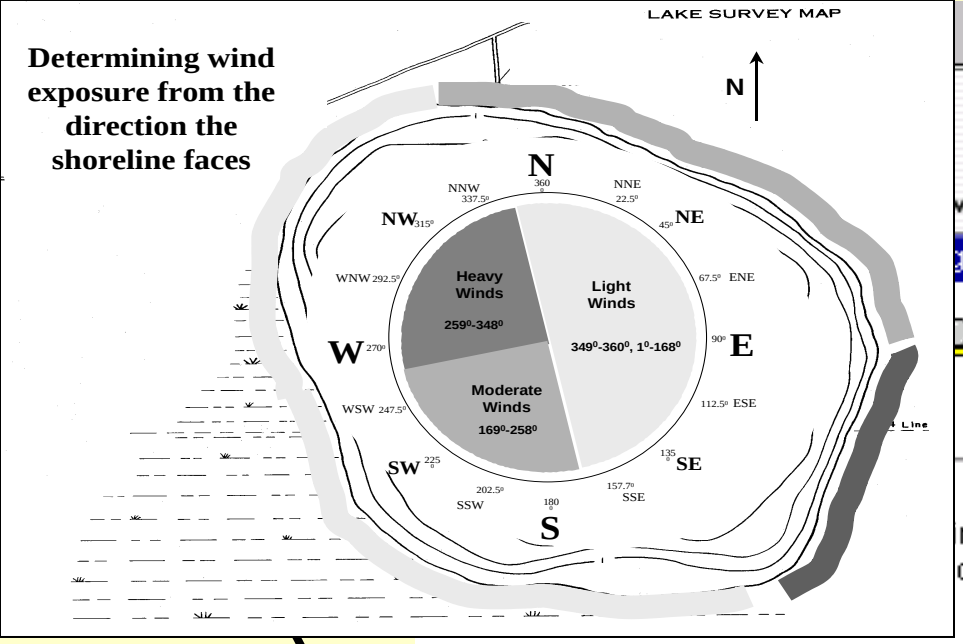
- Moderate Winds

- Heavy Winds

Determining wind exposure from the direction the shoreline faces



Erosion Intensity Metrics, Shore Orientation

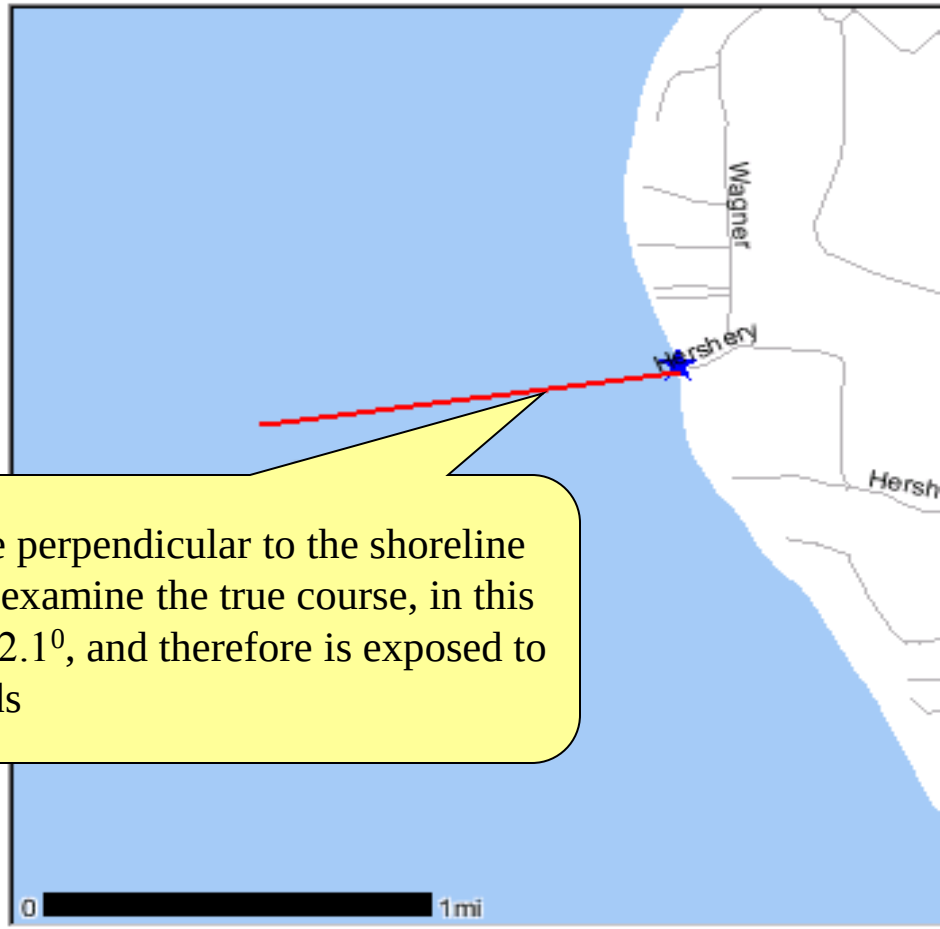


of the points
ng the
circle distance

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.

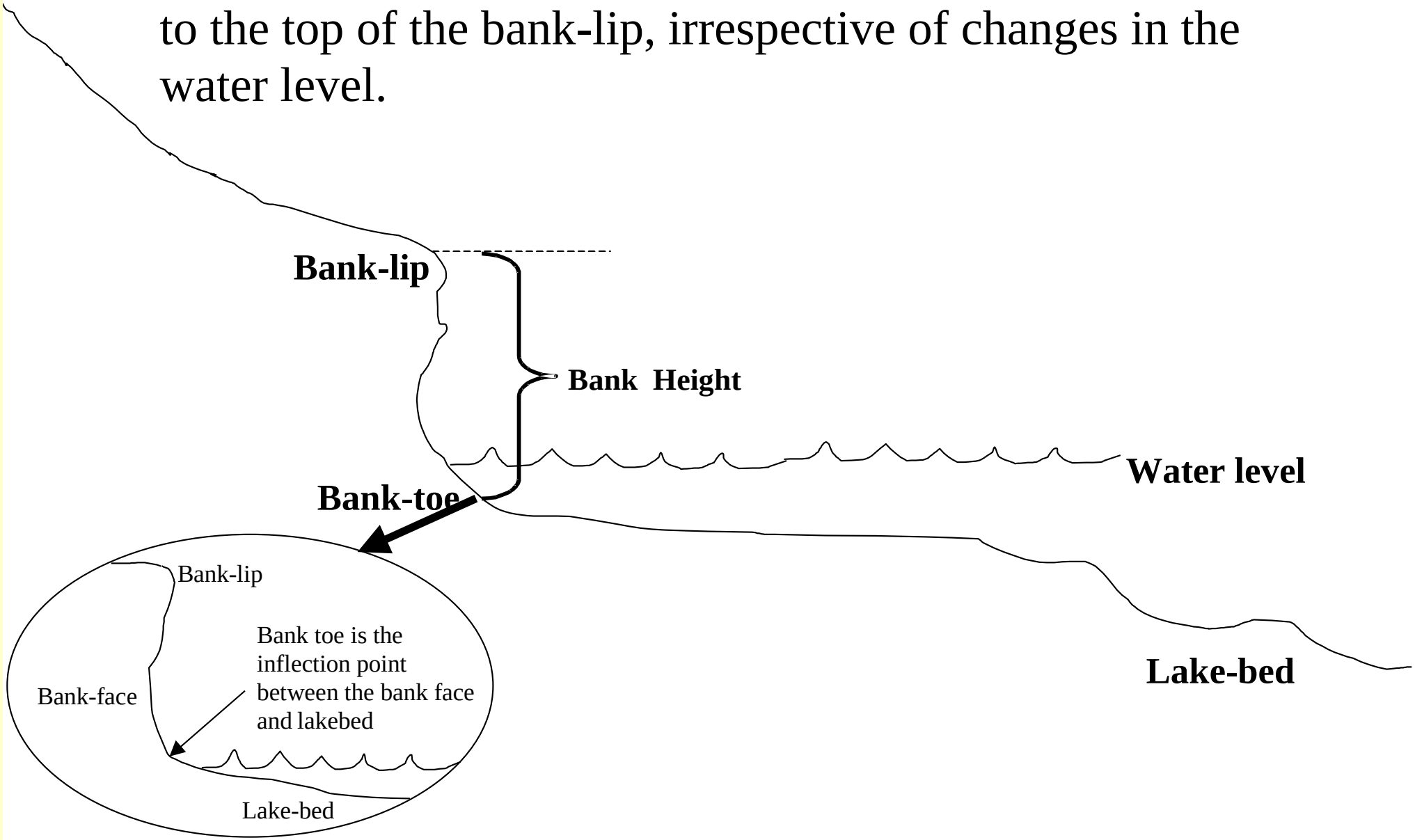
Note: Boating; Limited traffic is defined by a location where at least 30% of the public boating access available must pass through the thoroughfare to reach the open water of the lake, provided the waterway has a total of more than 40 car trailer units.

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

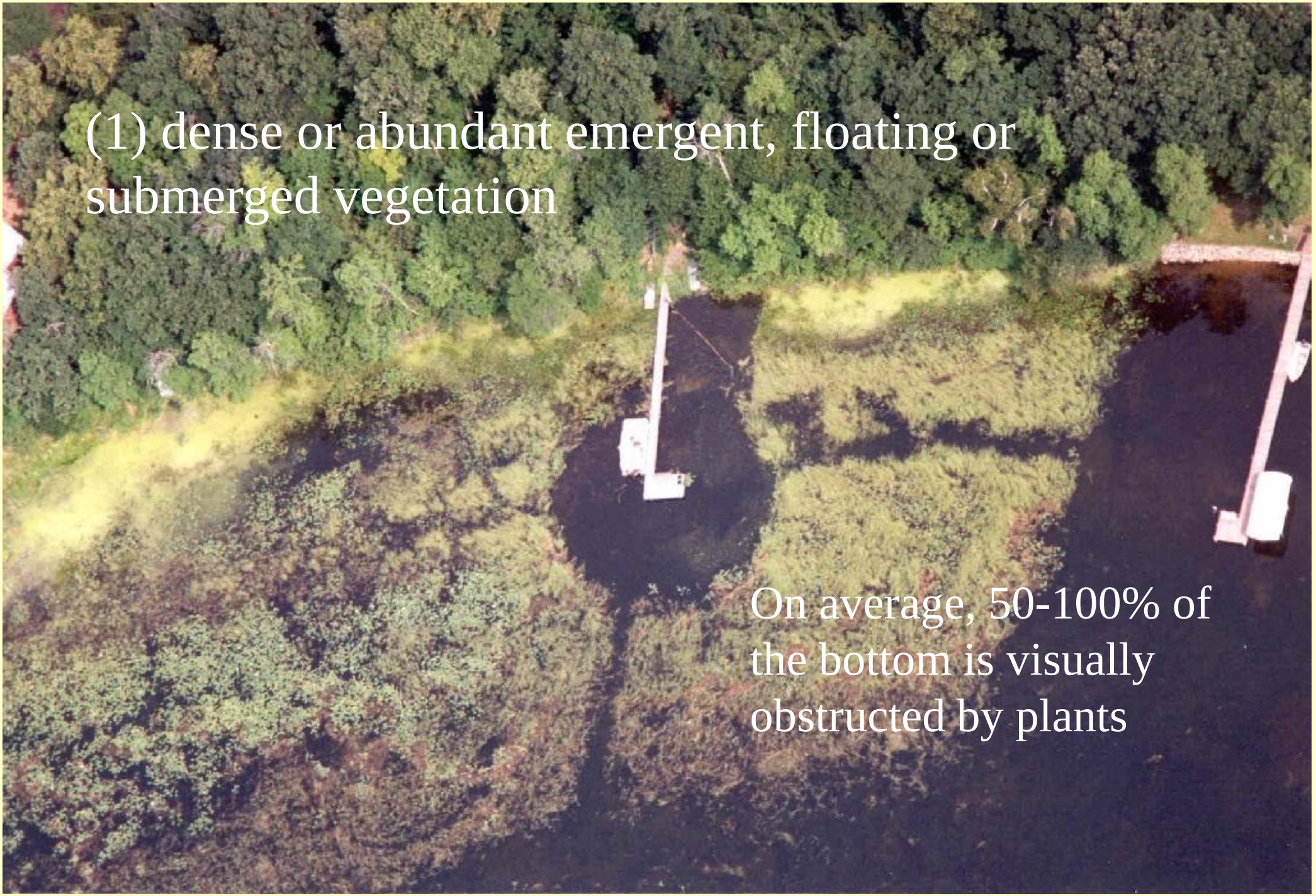
- Fetch
- Shoreline Geometry
- Shoreline Orientation
- Boat Wakes
- Bank Height
- Bank Composition
- Influence of Adjacent Structures
- **Depth at 20 Feet (depth of the water 20 feet from the shore)**
  - 5 choices are: <1; 1-3; 3-6; 6-12; >12.

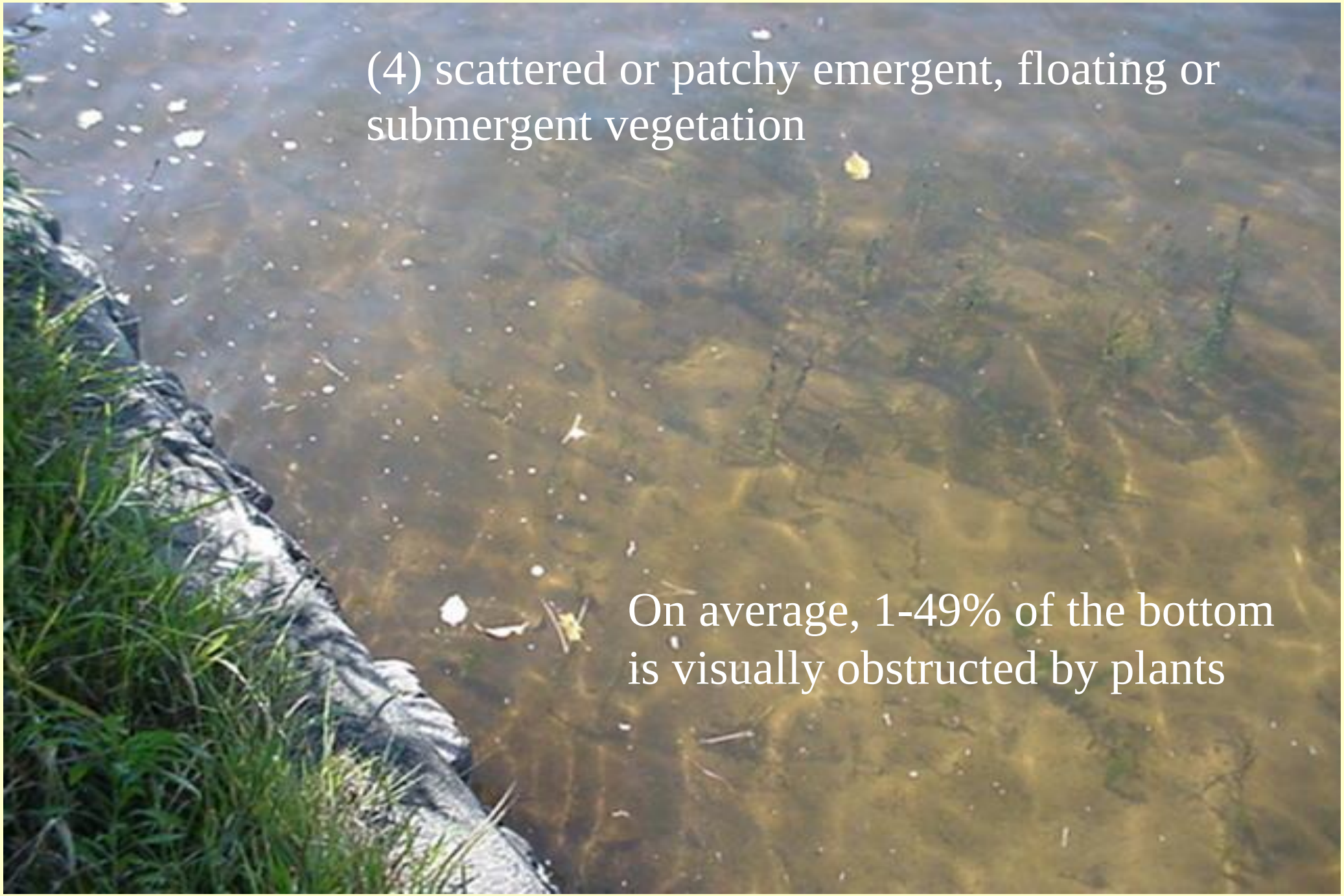
Erosion Intensity

- 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.

Erosion 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	

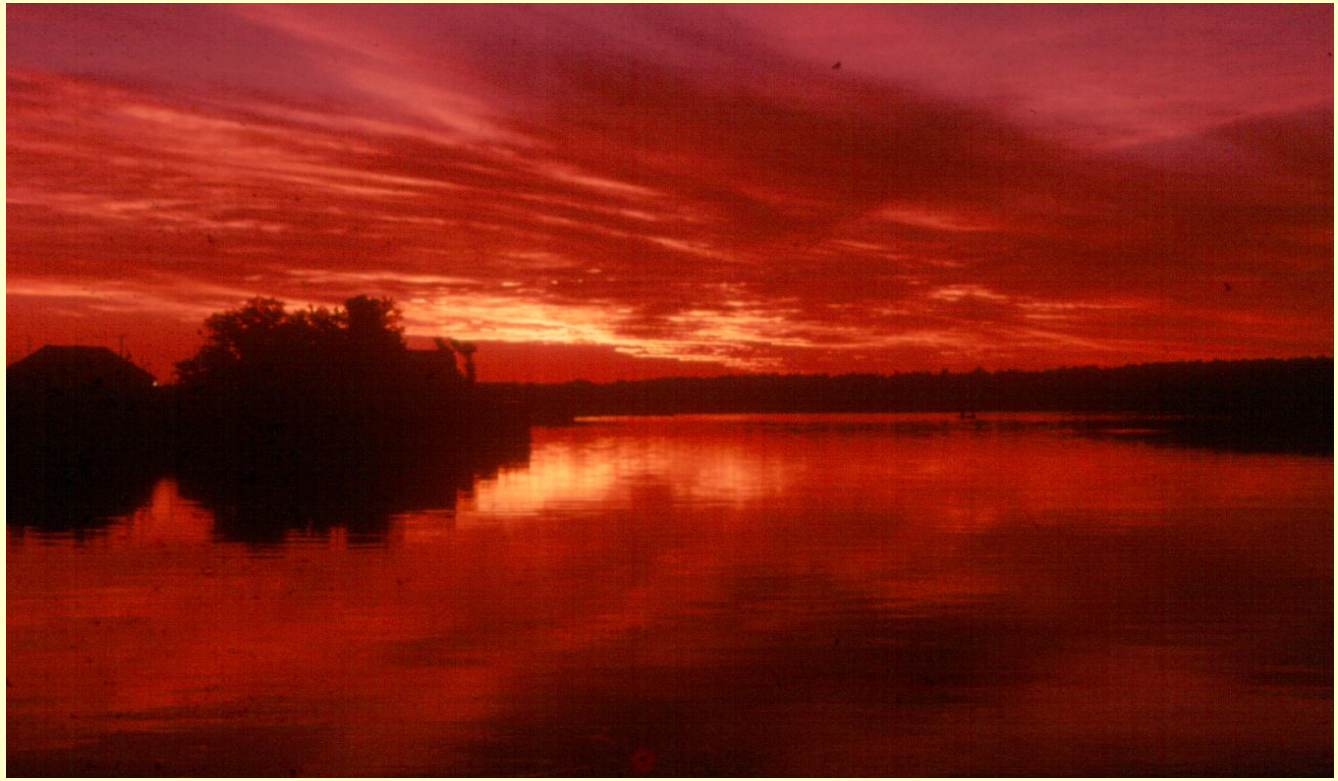
Shoreline Type

- Low Energy
- Moderate Energy
- High Energy

X

Treatment Type

- Biological
- Biotechnical
- Technical



- FOR MORE INFORMATION CONTACT:

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- WISCONSIN DEPT. OF AG, TRADE AND CONSUMER PROTECTION
- 715-744-3066
- stacy.dehne@wisconsin.gov