

# Erosion Control 101 for Shoreline

*Causes, Factors, and Identification*  
*How to identify it and why it happens*

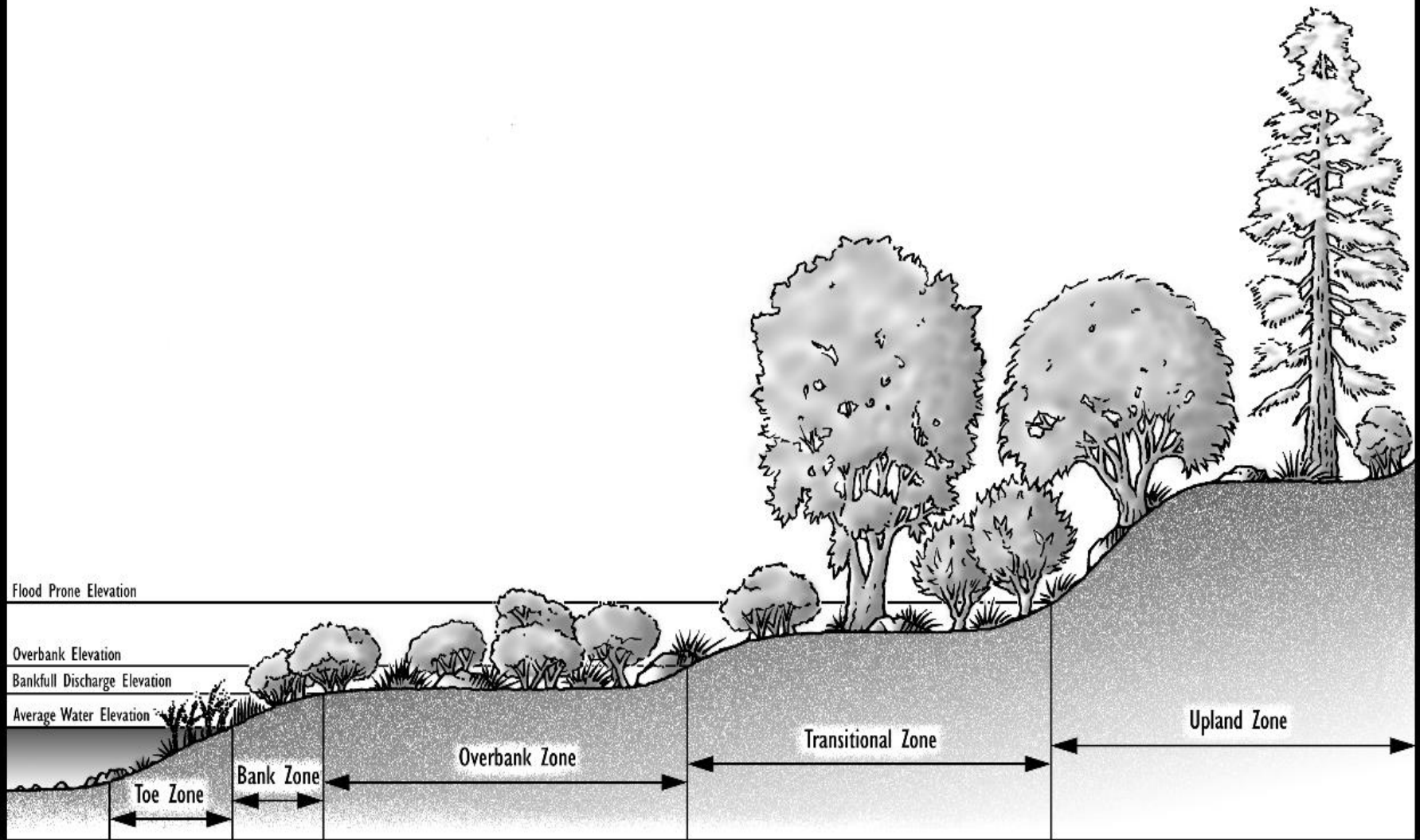
Drew Zelle, Engineering Specialist  
State of Wisconsin DATCP,  
(lake property owner, lake  
association board member)



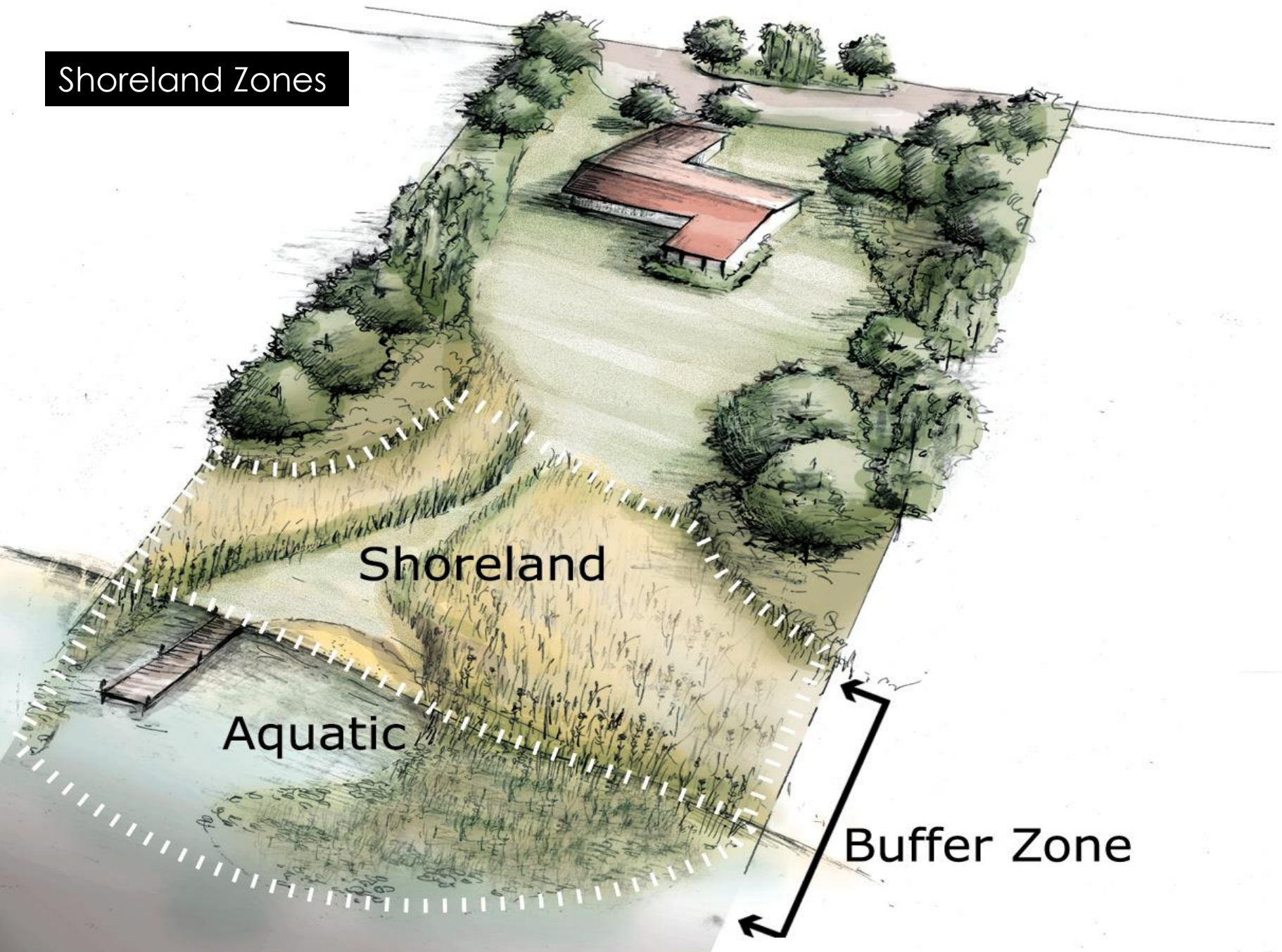
# Terminology

- ▶ Bank Height
- ▶ Biological Method
- ▶ DATCP/DNR/LWCD/NRCS/ARMY CORP OF ENG. (government)
- ▶ Energy Category
- ▶ Erosion-slope failure and toe erosion
- ▶ Erosion Intensity
- ▶ Fetch Calculation
- ▶ Geotextile
- ▶ Impervious/Non-impervious-(surface conditions)
- ▶ OHWM (Ordinary High Water Mark)
- ▶ Riprap
- ▶ Runoff
- ▶ Slope
- ▶ Storm Wave Height
- ▶ Structural Methods

# Shoreland Zones



## Shoreland Zones



# CAUSES OF EROSION

- ▶ Geologic (i.e. soils, landscape, glaciation)
- ▶ Climatic (i.e. weather conditions)
- ▶ Vegetative (i.e. capability of growth, root structure, wind susceptible)
- ▶ Hydraulic (i.e. movement of water, runoff)
- ▶ Human Activity (i.e. alterations, access, use, dams, etc.)

# EROSION FACTORS

## ▶ ACTIVE

- ▶ Rain splash & Runoff
- ▶ Waves (wind and boating)
- ▶ Currents (long shore currents or flows in streams)
- ▶ Ground Water (seeps)-seeps affect toe
- ▶ Frost thaw/ice impact
- ▶ Animal or human access or use
- ▶ Wind
- ▶ Removal/loss of bank vegetation
- ▶ Removal/loss of shallow water aquatic plants

# EROSION FACTORS

## CONT'D

### ▶ PASSIVE

#### ▶ Bank or Shoreline Characteristics

- ▶ Engineering properties-soils and soil types
- ▶ Geology-how was the lake formed
- ▶ Geometry-steep or shallow banks. Sharp edges
- ▶ Vegetative cover-quality and quantity

#### ▶ Adjacent Features/Character

- ▶ land use/development/ desires of the landowner
- ▶ watershed patterns-direction of water flow

# Visual Cues to Problems


- ▶ Large area of bare soils on steep, high bank
- ▶ Recession of shoreline-(look at *entire* shoreline)
- ▶ Leaning or downed trees or exposed roots
- ▶ Patches of muddy water
- ▶ Deposits of sand or sediment on bed of lake
- ▶ Undercut banks
- ▶ Buckled or ice-shoved banks
- ▶ Bank sloughing
- ▶ Seepage

*Some Photos Showing Causes and Cues Follow...*

Runoff Gully  
Erosion Factor  
Note Sediment  
Plume In Lake

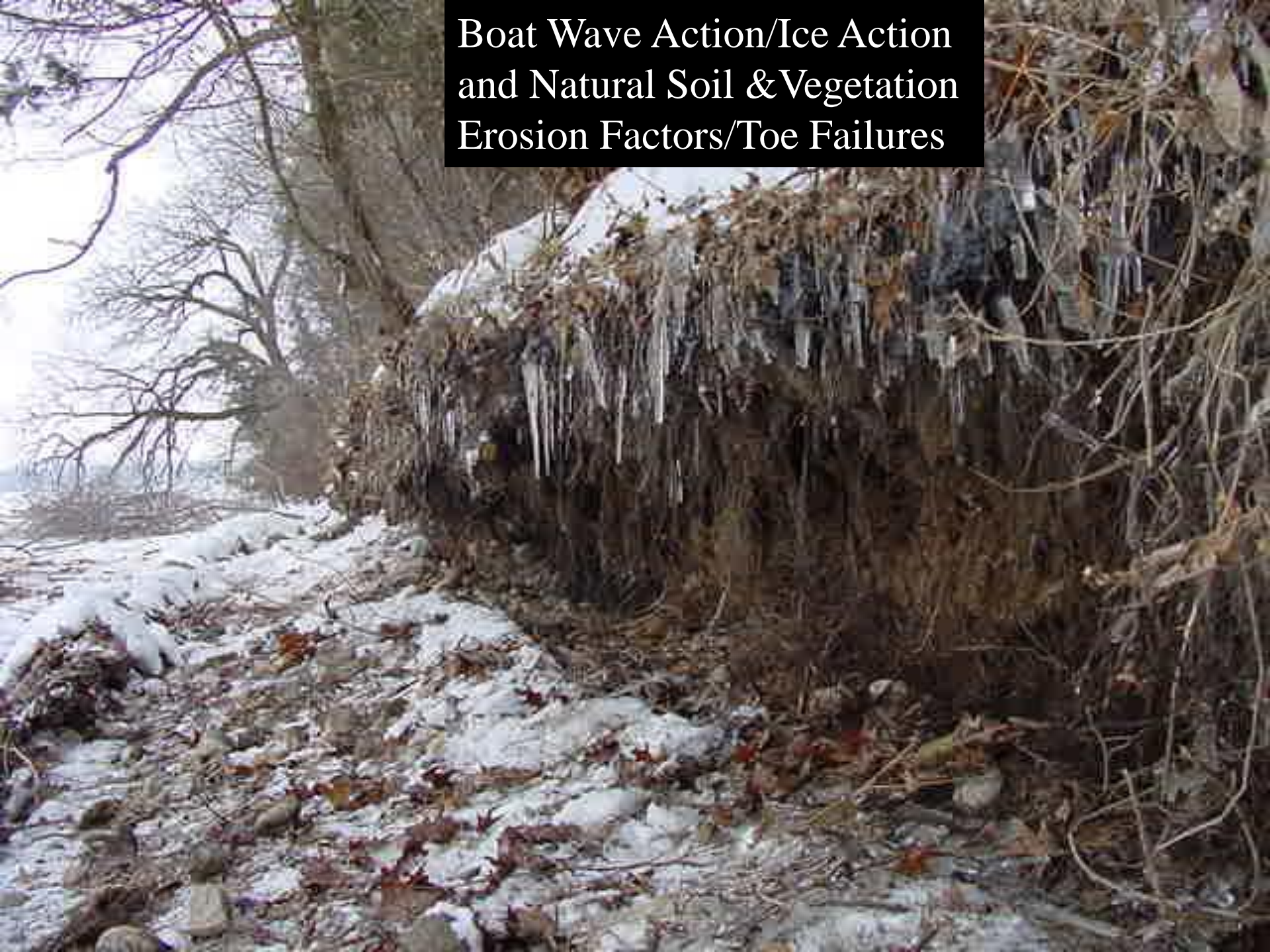


10/6/00

A photograph showing a white building with horizontal siding, partially hidden behind a dense, tangled mass of bare tree branches and fallen leaves. The ground in the foreground is covered with a thick layer of brown leaves and some exposed tree roots, suggesting a steep, eroded bank. The sky is visible through the bare branches in the background.

Gully Erosion  
From Roof and  
Poor Drainage  
Patterns

**Boat Wave Action/Ice Action  
and Natural Soil & Vegetation  
Erosion Factors/Toe Failures**



# Shear Stresses on river bend



steep Bank with  
Fluctuating Water  
Unstable Soils  
Leaves



Toe Erosion Due to  
Fluctuating Water  
Levels



Seepage



Low water levels  
Allowed seeps to  
Erode lakebed



# Water Level Fluctuations Seawall overtopping and splash impacts



## Human Factors And Natural...



Unstable Soils  
on a steep bank





Human Factor -  
Development increasing  
impervious areas

# Bulkhead wall removal







Runoff Erosion  
Foot Traffic

8/21/99

Lack of vegetation  
maintenance





Ice








Ice Push Action —  
Note vertical tree







Recession due to ice shoves – compare to neighbors

Slump in Bank  
due to over-saturation





Isolated area of bare soil  
due to tree fall



Exposed tree roots from  
wave action and soil loss

Runoff from above and toe erosion downstream of a dam (plunge pool scour)



Excessive sediments  
deposited on streambed

08.16.2006 11:32





Foot traffic at campsite  
caused a gully to river

Runoff travelling along road depositing gravel



Soils, Foot traffic, tree removal, wave action, runoff



## Site Evaluation

*Figure the reason why the erosion is happening? Cause and Effect*

- Upland Runoff? (large or small-impervious areas/what flows where?)
- Wave Energies-Boat or Wave-Fetch
- Ice
- Is the Toe of the bank stable? (Soil stability analysis)
- Ground water seepage
- Vegetation-too much or too little
- Human action
- Animal damage or control

# Questions?

