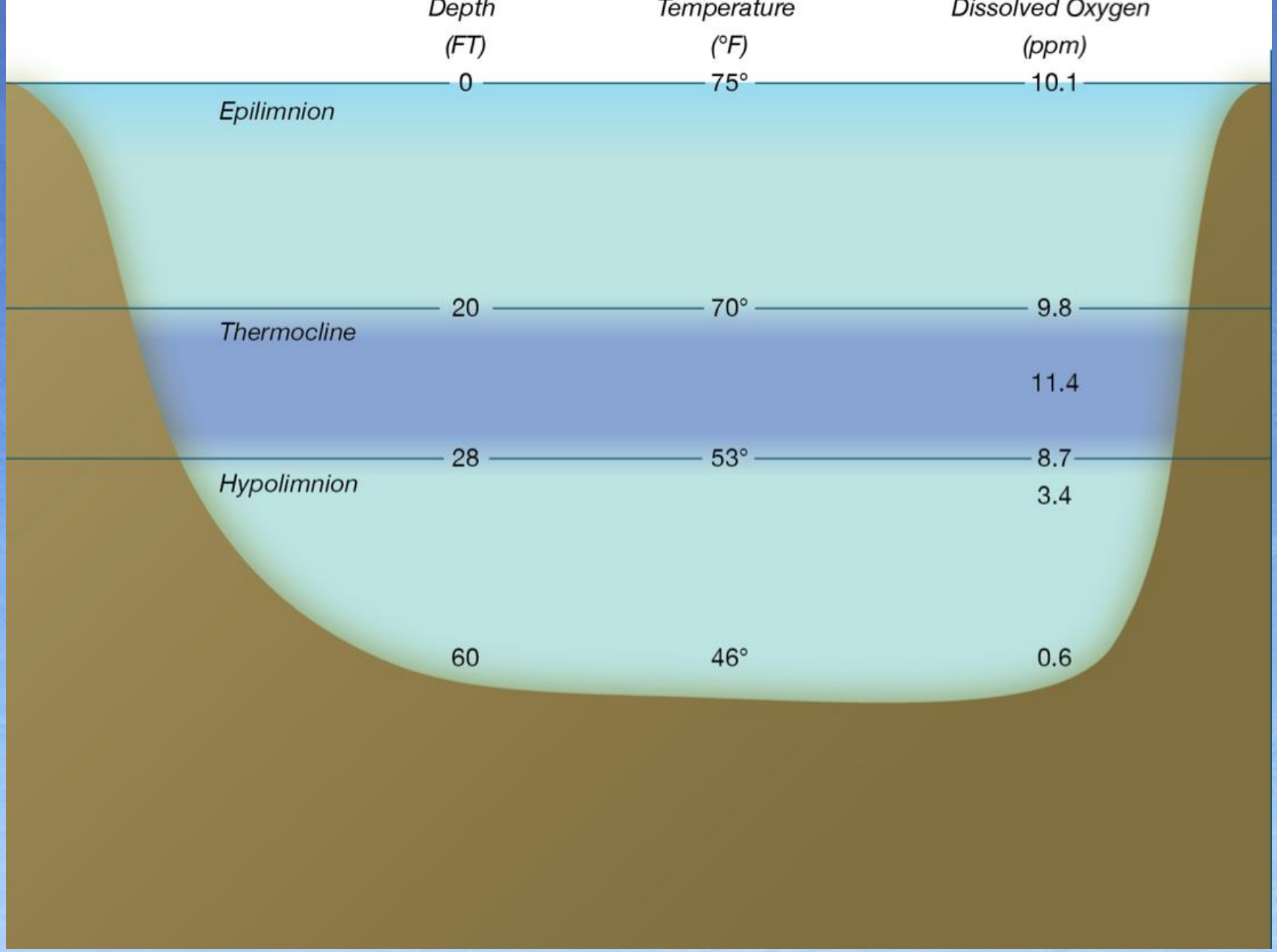
A Lake through the Seasons

An Underwater Tour

Bruce Carlson

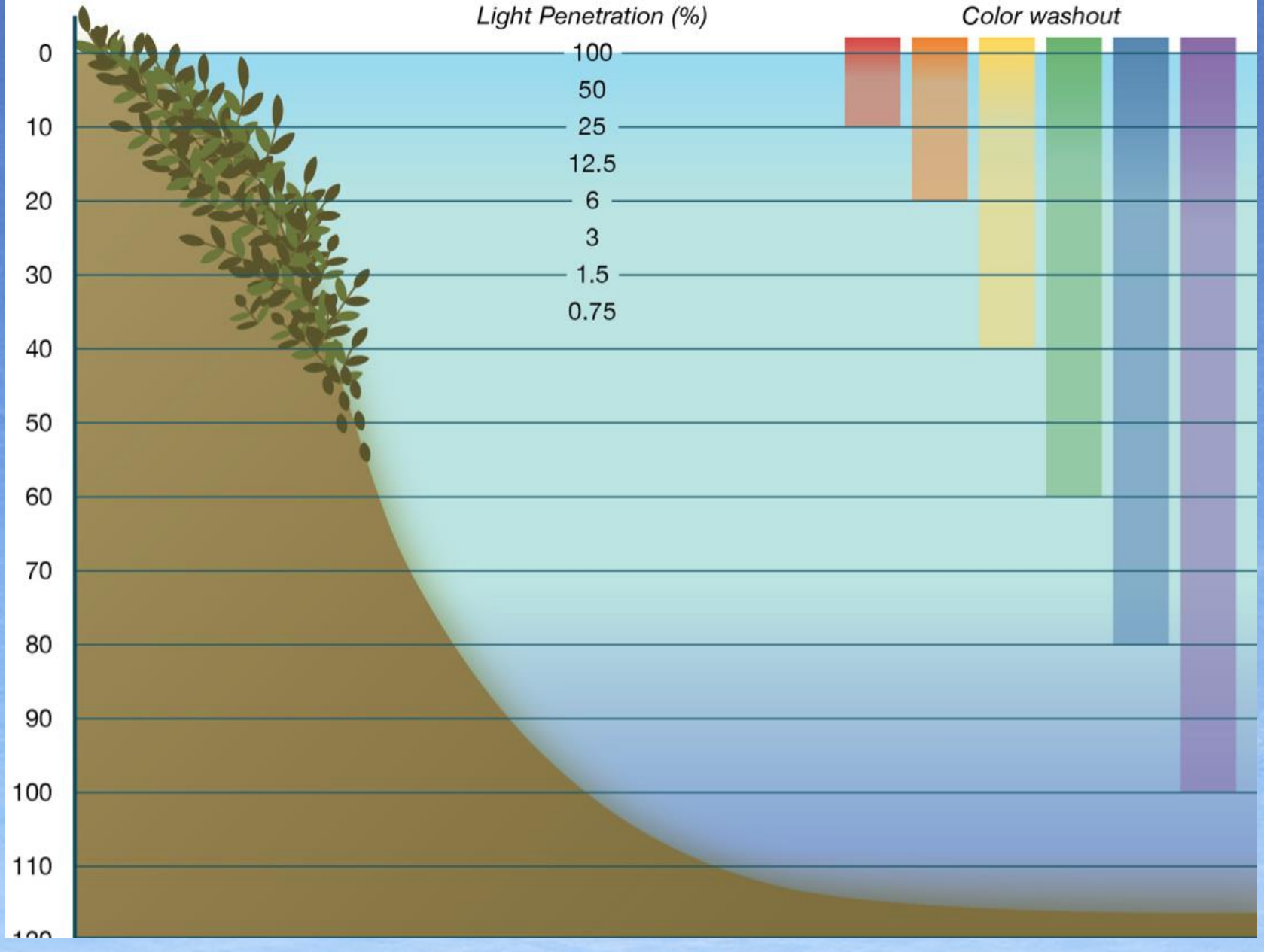
Properties of Lake Water

- Density in relation to temperature
- Sound – 5X faster in water than in air
- Oxygen-holding capacity
- Nutrient content
- Water color
- Effect on light
- Effect on colors

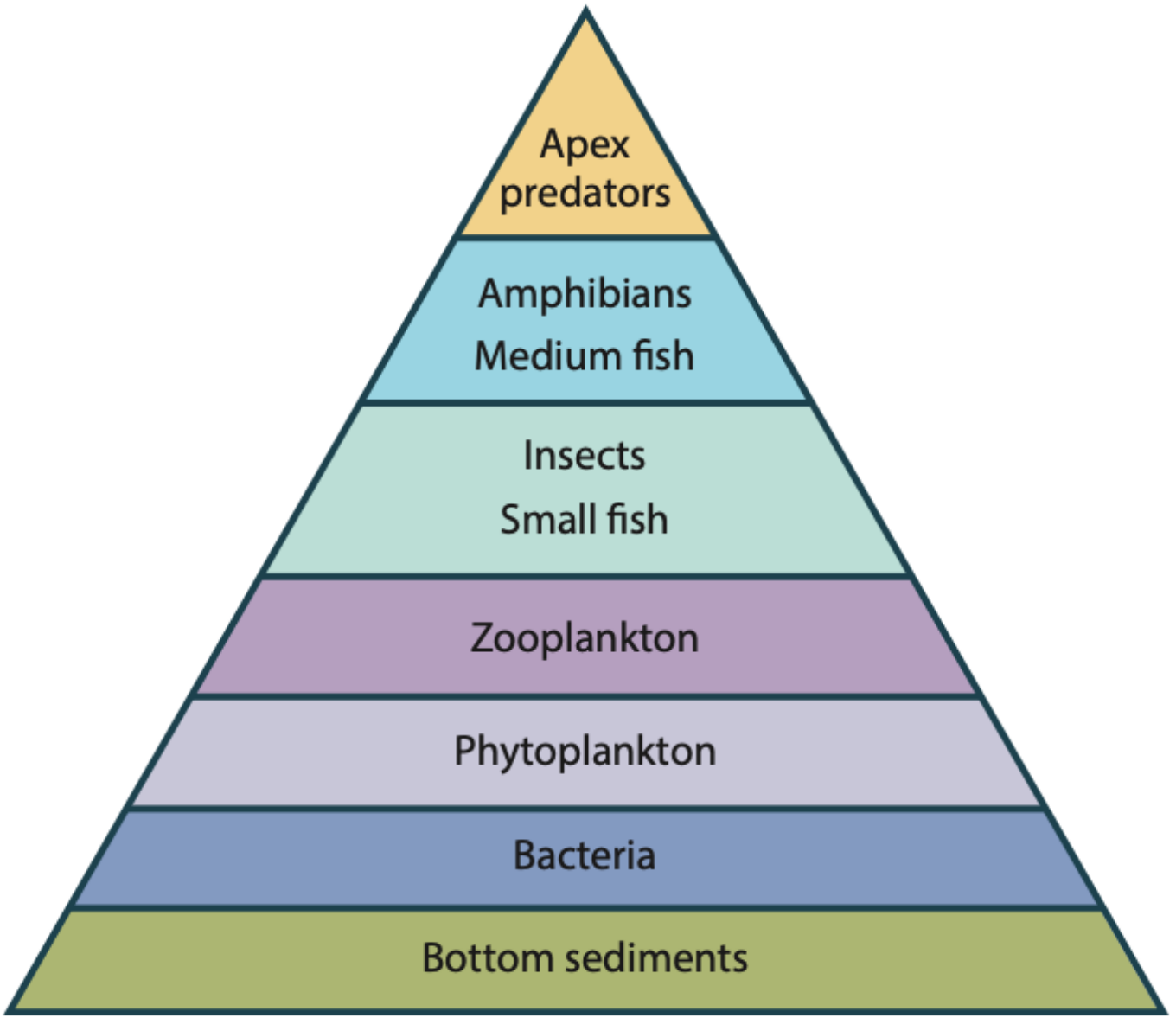


Temperature and Oxygen

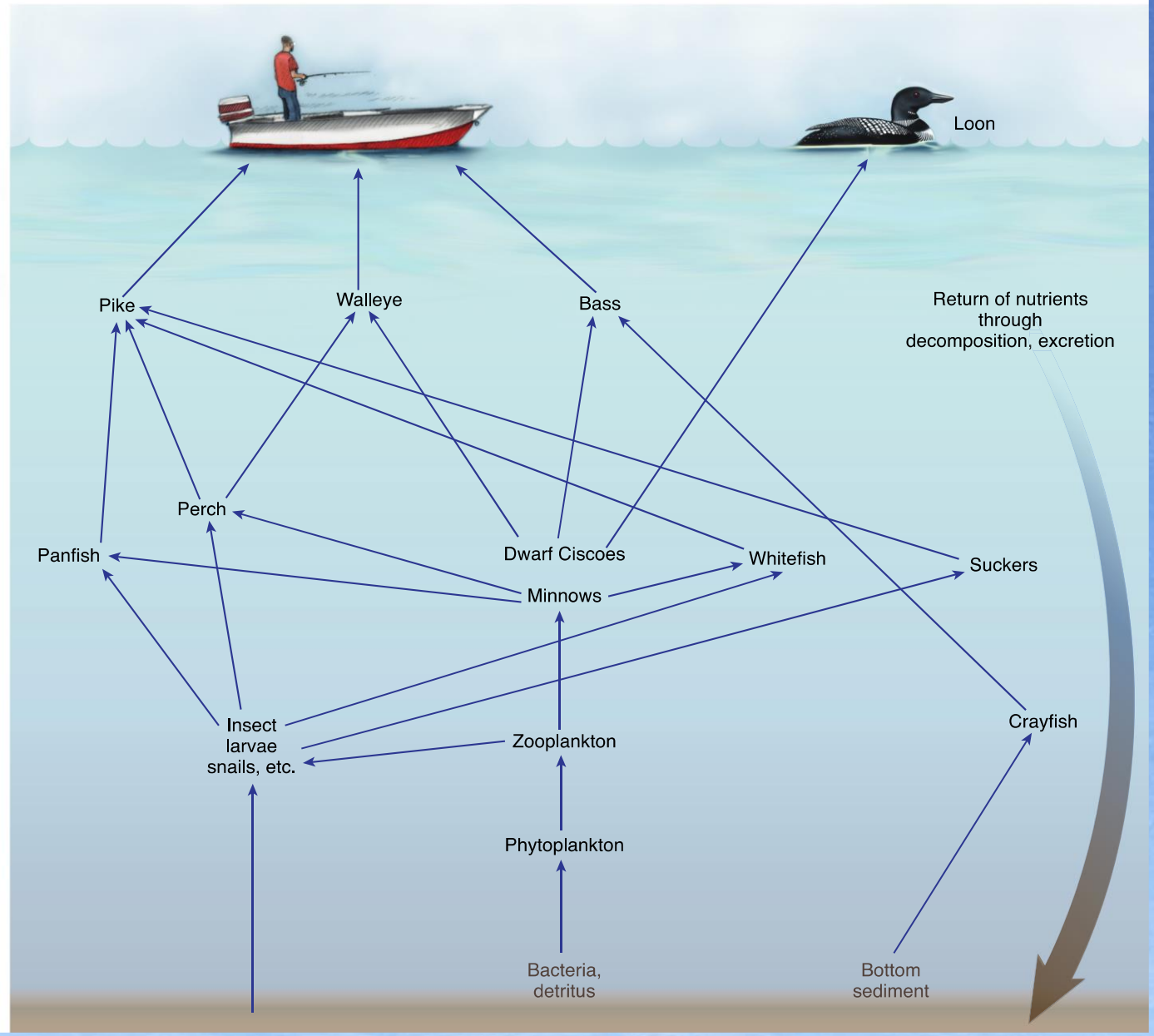
The Thermocline throughout the Year



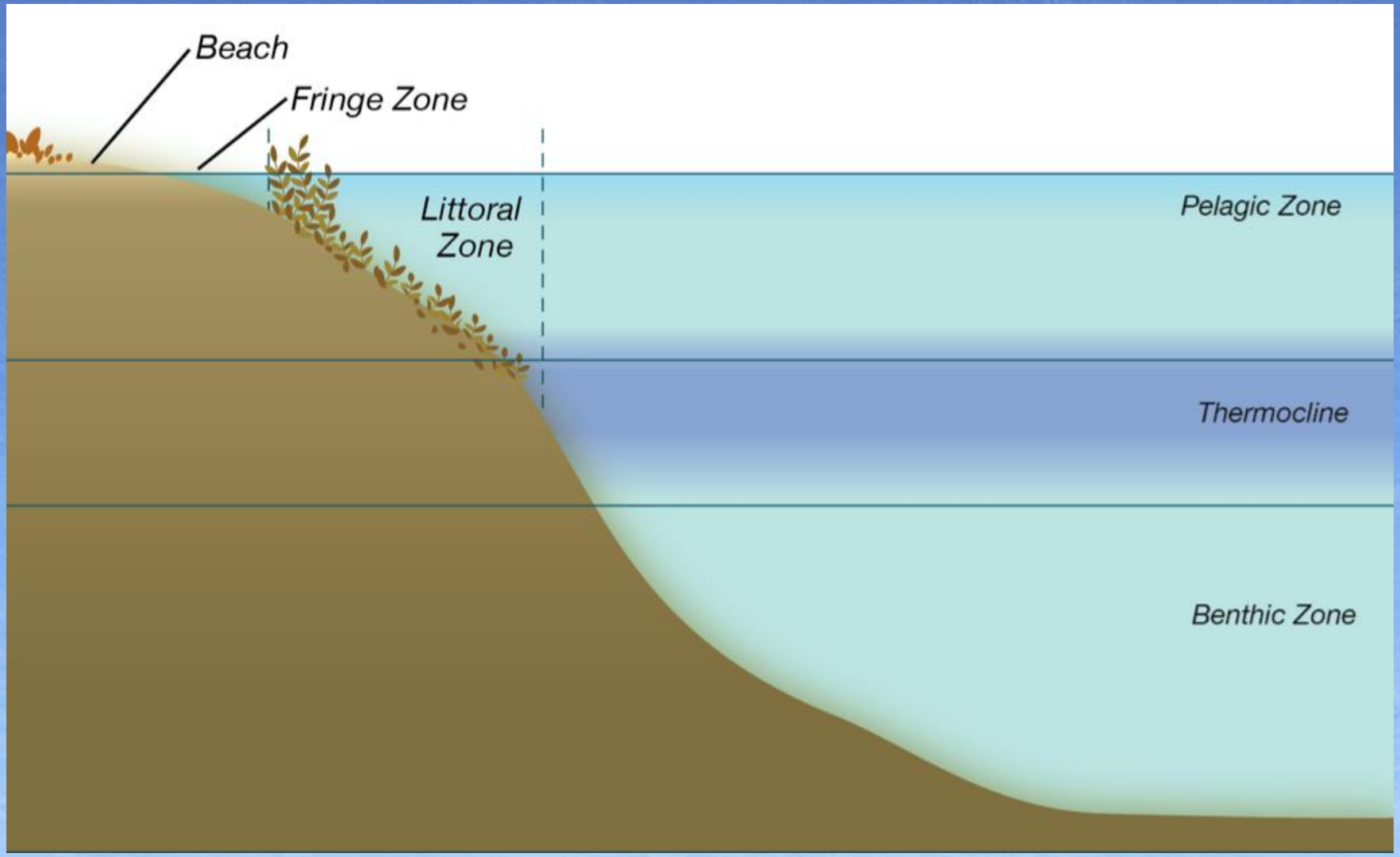
Light in Water



The Food Pyramid


Loon
Pike
Walleye
Bass
Return of nutrients
through
decomposition, excretion
Perch
Panfish
Dwarf Ciscoes
Whitefish
Suckers
Minnows
Insect
larvae
snails, etc.
Zooplankton
Crayfish
Phytoplankton
Bacteria,
detritus
Bottom
sediment

The Food Web



Ecological Zones in a Lake

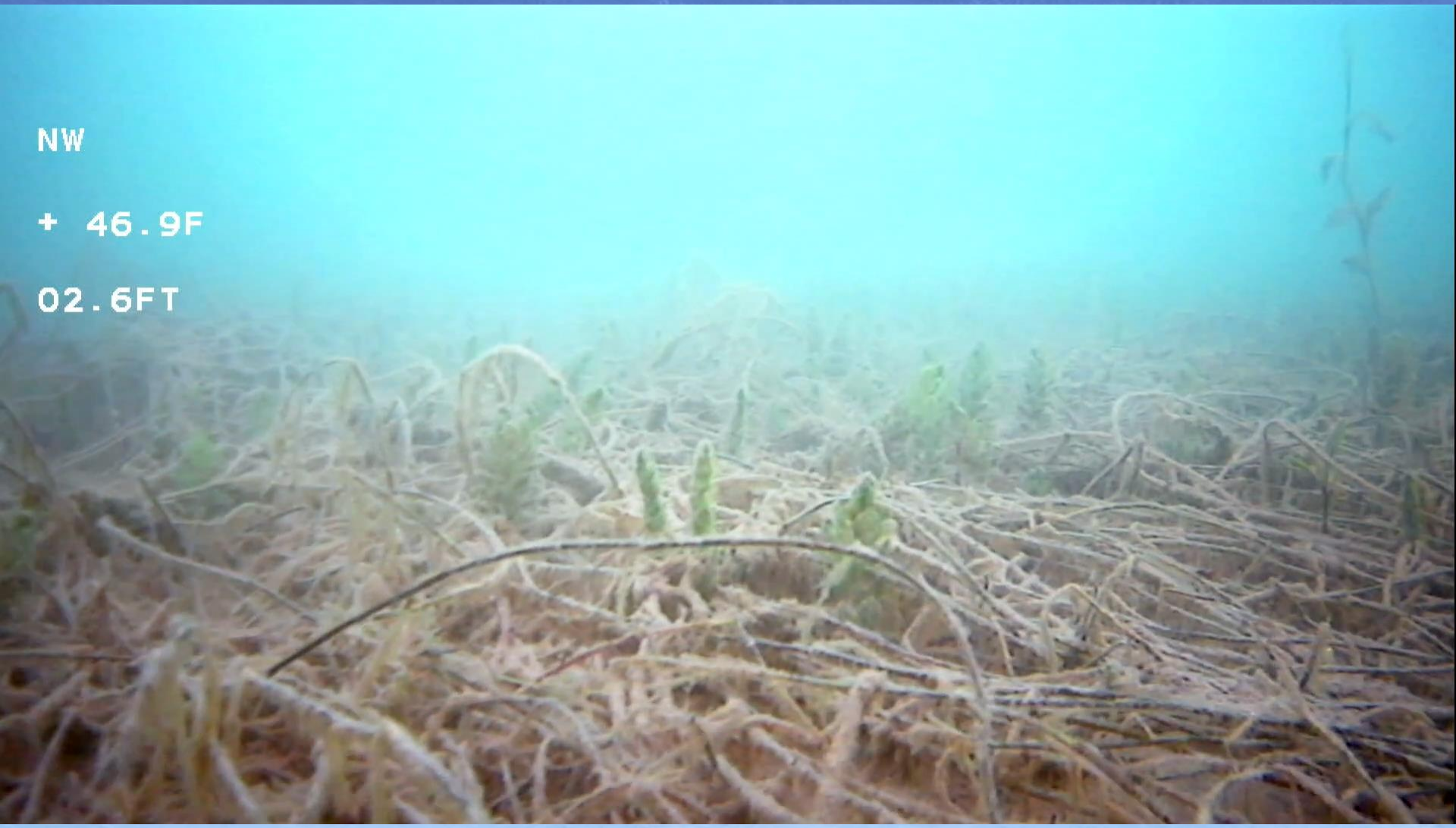
Late Winter

Dead plants

EarlySpring

Awakening from a Long Slumber

Northern pike spawning time



The first green plants emerge through the previous year’s debris

Perch prepare to spawn

Perch eggs

Whitefish are in shallow water

Panfish in bulrushes

Late Spring

The Awakening Continues

Bass and Panfish are the Last to Spawn

Smallmouth bass nest

Male bass protecting its young

Summer

Time for Things to Grow

Life under the Lily Pads

Plants are growing rapidly

Smallmouth bass in shallow water

Logs – Remnants of another era

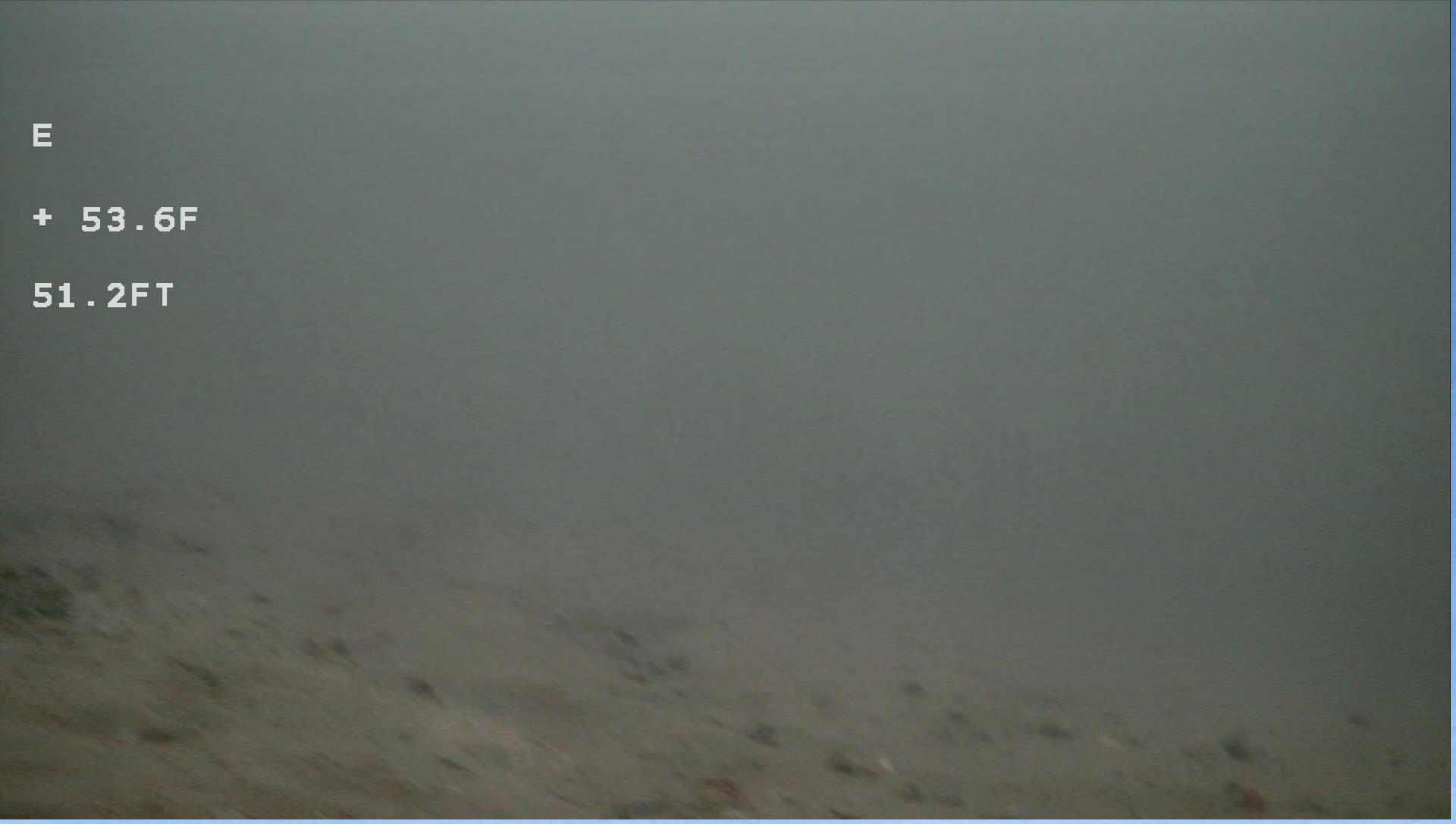
Rock bass – Why so many?

Walleyes + Smallmouth Bass

Northern pike – The water wolf

Below the thermocline

Deep rocks



Deep soft bottom

Deep water moss field

Spikey Deep Moss

Deepwater suckers

Sucker holes

Sucker feeding

Whitefish

Hooked Whitefish

Late Summer/Early Fall

Thermocline Thins and Drops

Fish Move Deeper

Deep-schooling minnows

Hanging around for dinner

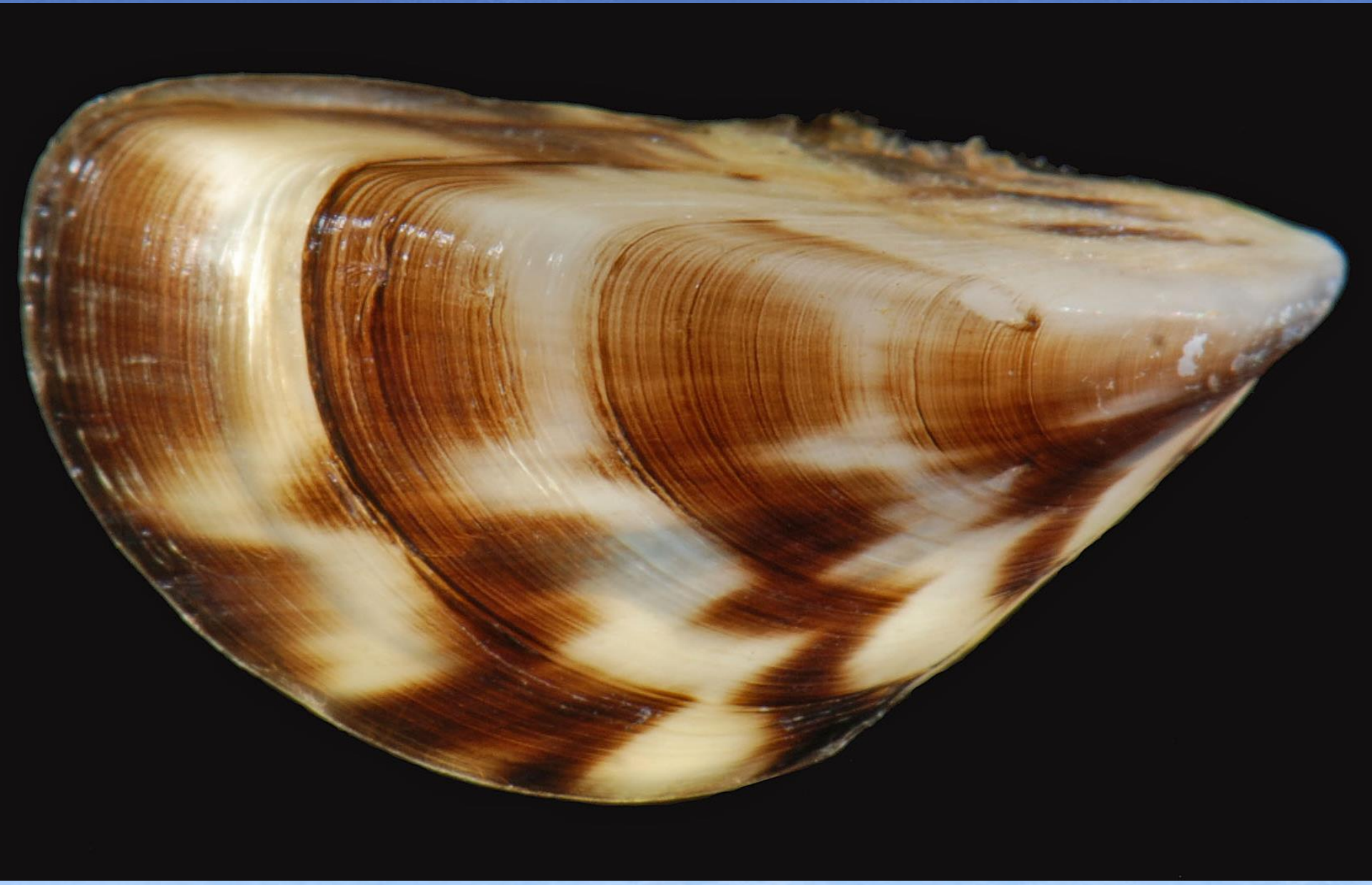
Deep walleye school

Very deep northern pike

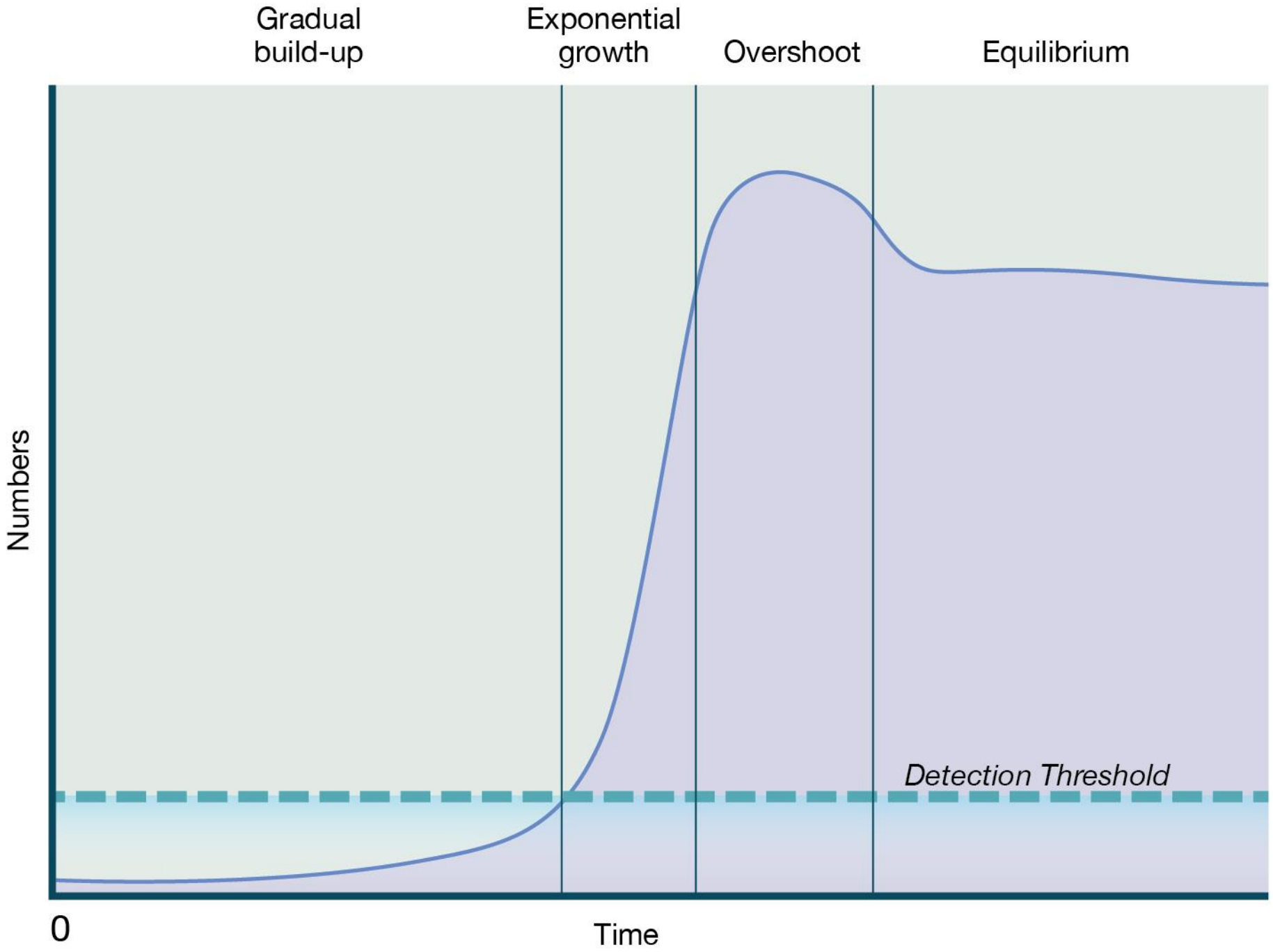
A Lucky Survivor

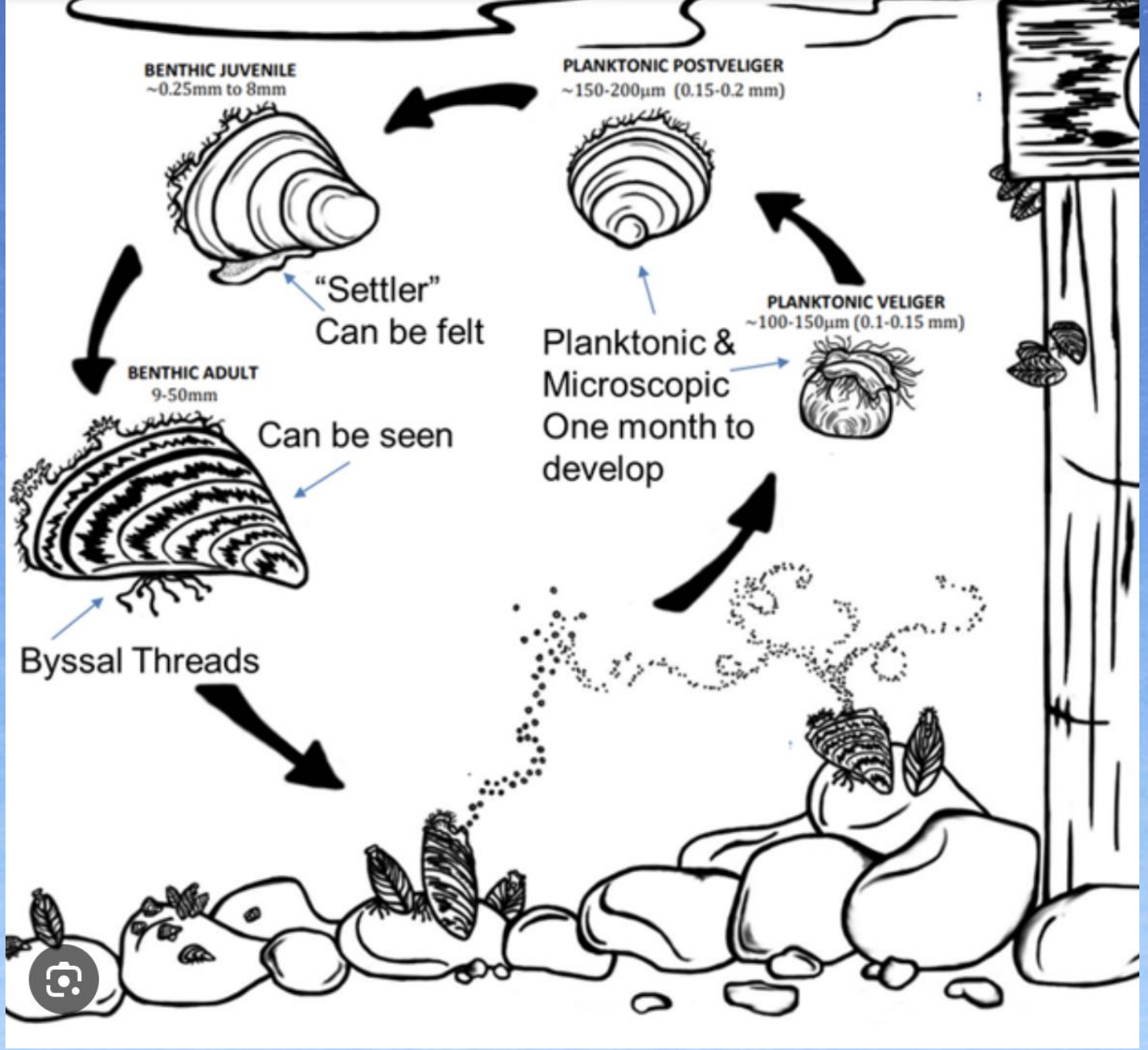
Zebra Mussels

Their Effect on the Ecology of a Lake



Adult zebra mussel


Gradual build-up
Exponential growth
Overshoot
Equilibrium
Numbers
Detection Threshold
0
Time



University of Idaho

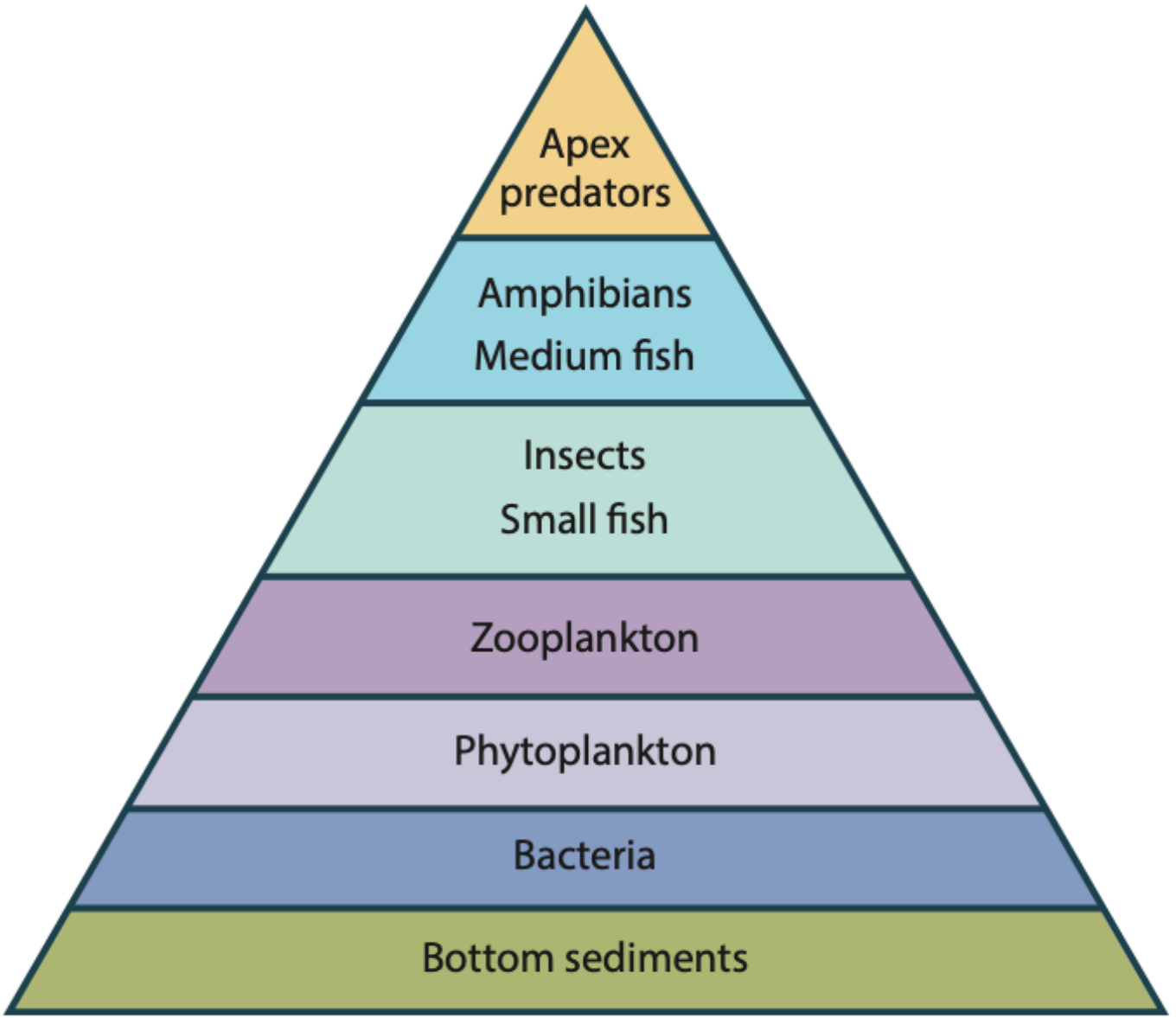

ZEBRA MUSSELS BEFORE THEY STICK

Adult, with Siphons

In a Minnesota Lake

Ecological Effects

- Reduction in phytoplankton numbers
- Increase in water clarity
- Increased depth of aquatic plant growth
- Effect on food pyramid
- Pelagic to benthic shift
- Effects on native mussels, crayfish, etc.
- Effects on fishing



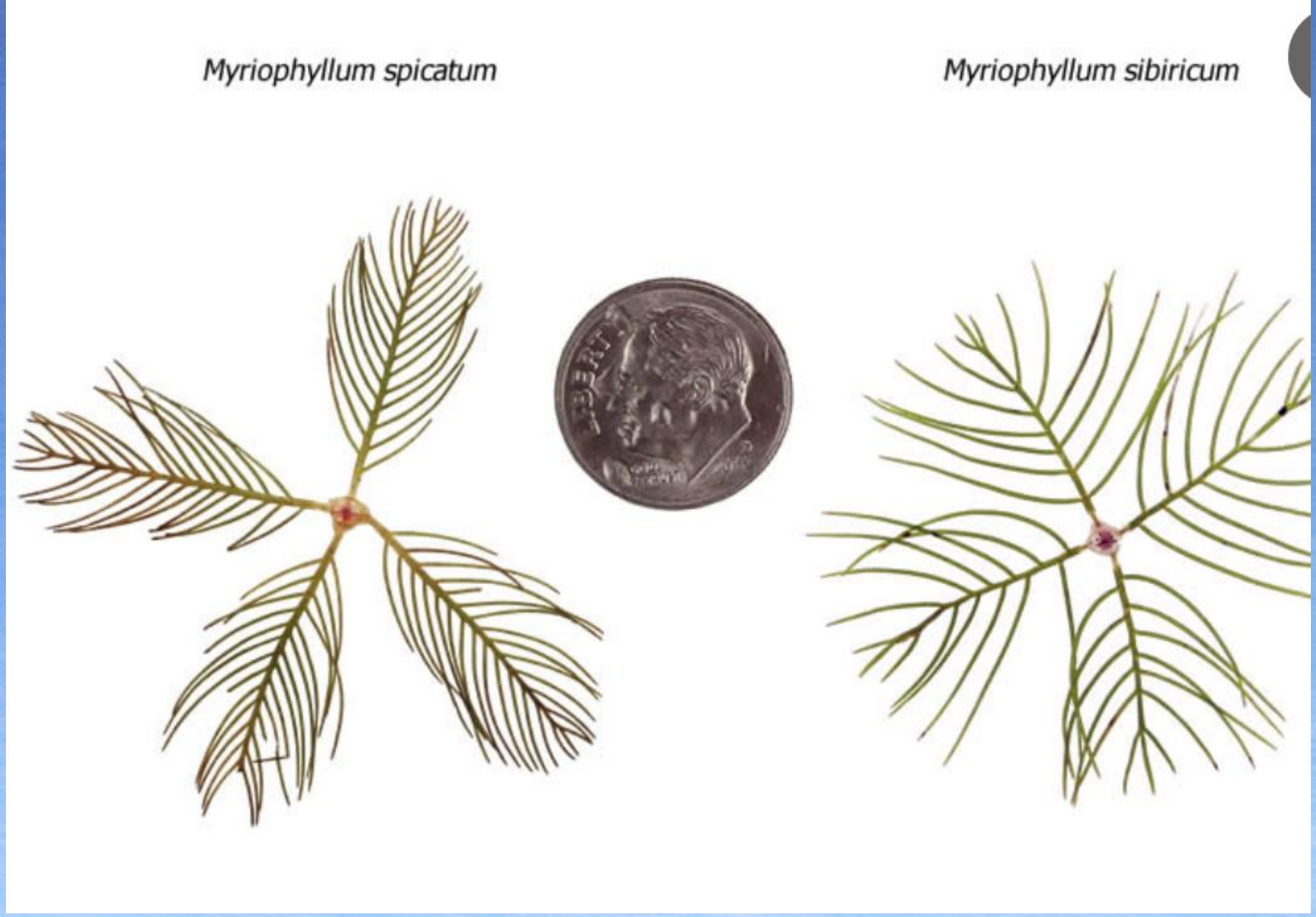
The Food Pyramid

Zebra Mussels on Native Mussel

Zebra Mussels on Crayfish

Eurasian Milfoil

A view from the surface



Eurasian vs. northern milfoil

Ecological Effects

- Due to shape of plants – collective effect
- Little or no light beneath canopy
- Kills plants beneath canopy → monoculture
- Decreased O2; increased phosphorus
- Animal life – stable amount, but change in types
- Benthic to surface shift
- Shelter for small fish