

Changes in Habitat with Declining Water Levels

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Declining Water Levels and Short Term Effects

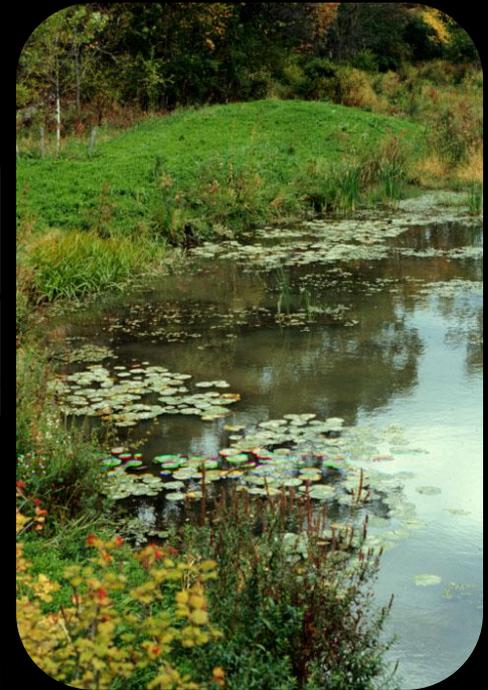
- Beach exposed
- Wood left high and dry
- Some plant growth on exposed shore
- Lake is shallower
- Light can penetrate further into lake
- Light sets depth limit for plant growth so there is an opportunity for plants to grow deeper

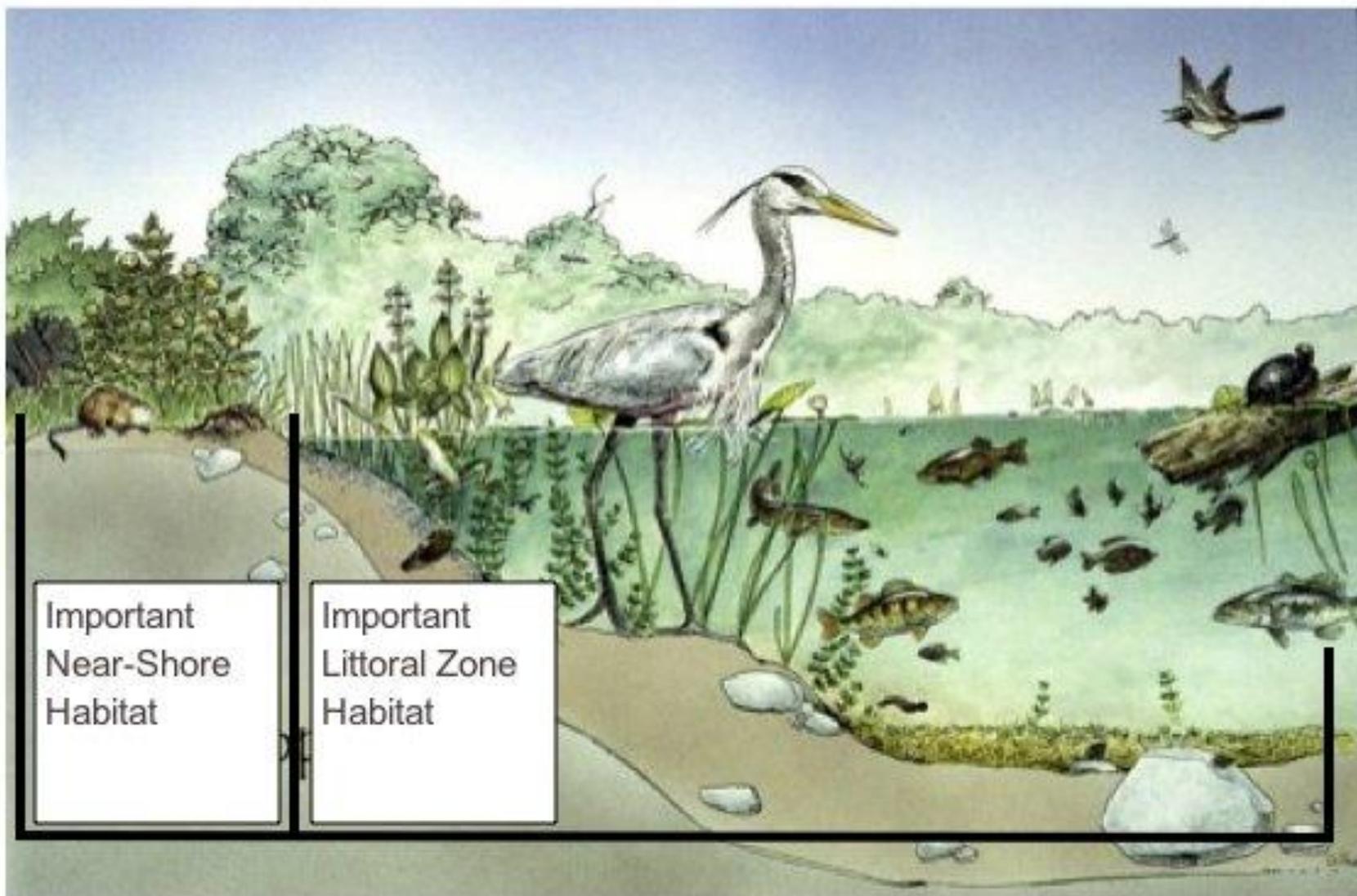
But what does this mean for the lake?

Declining water levels and habitat changes

- Lake shape, (depth contours), hydrology and trophic status affect response of:

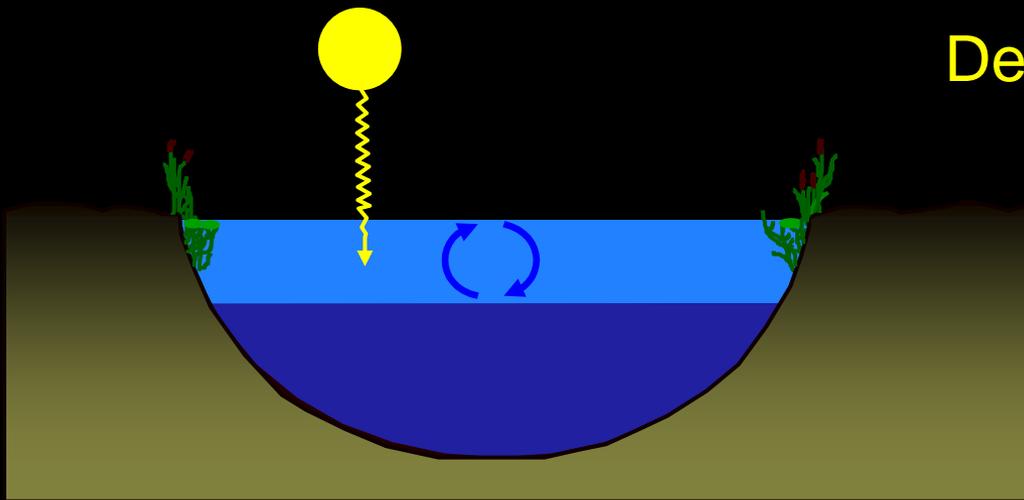
- Wetlands and aquatic plants
- Substrate
- Invertebrates
- Fish and wildlife





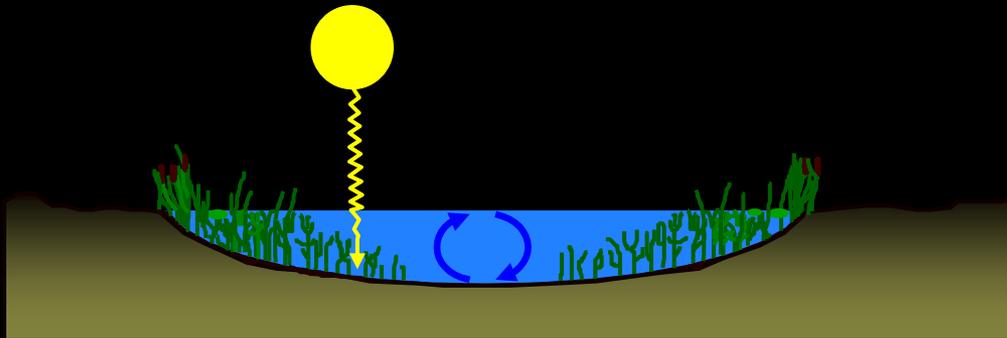
Important
Near-Shore
Habitat

Important
Littoral Zone
Habitat



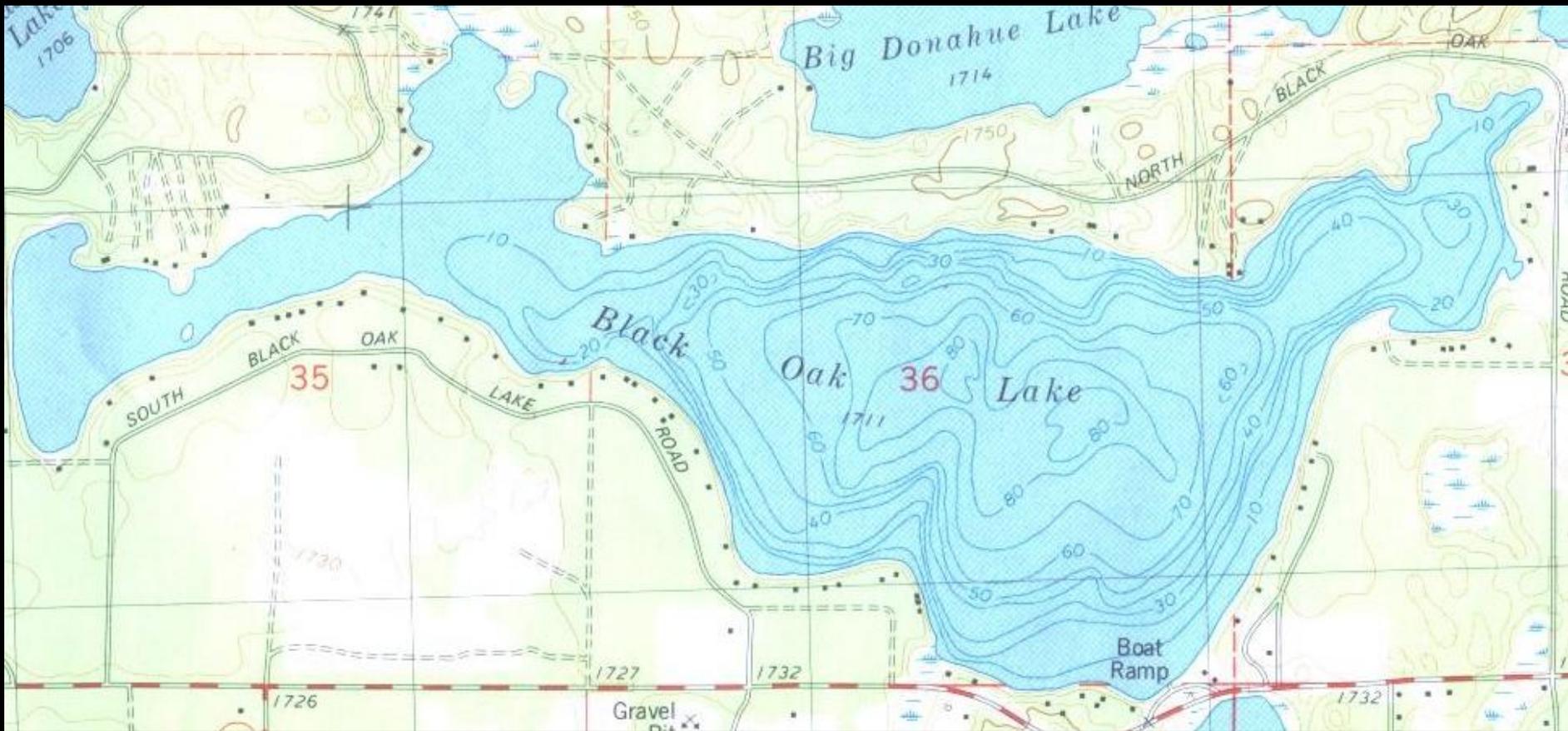
Deep Lake (steep shoreline)

- Littoral Zone may be negligible fraction of the lake area
- May play a minor role as a source of primary production
- However...zone may be extremely narrow and even more important to lake life



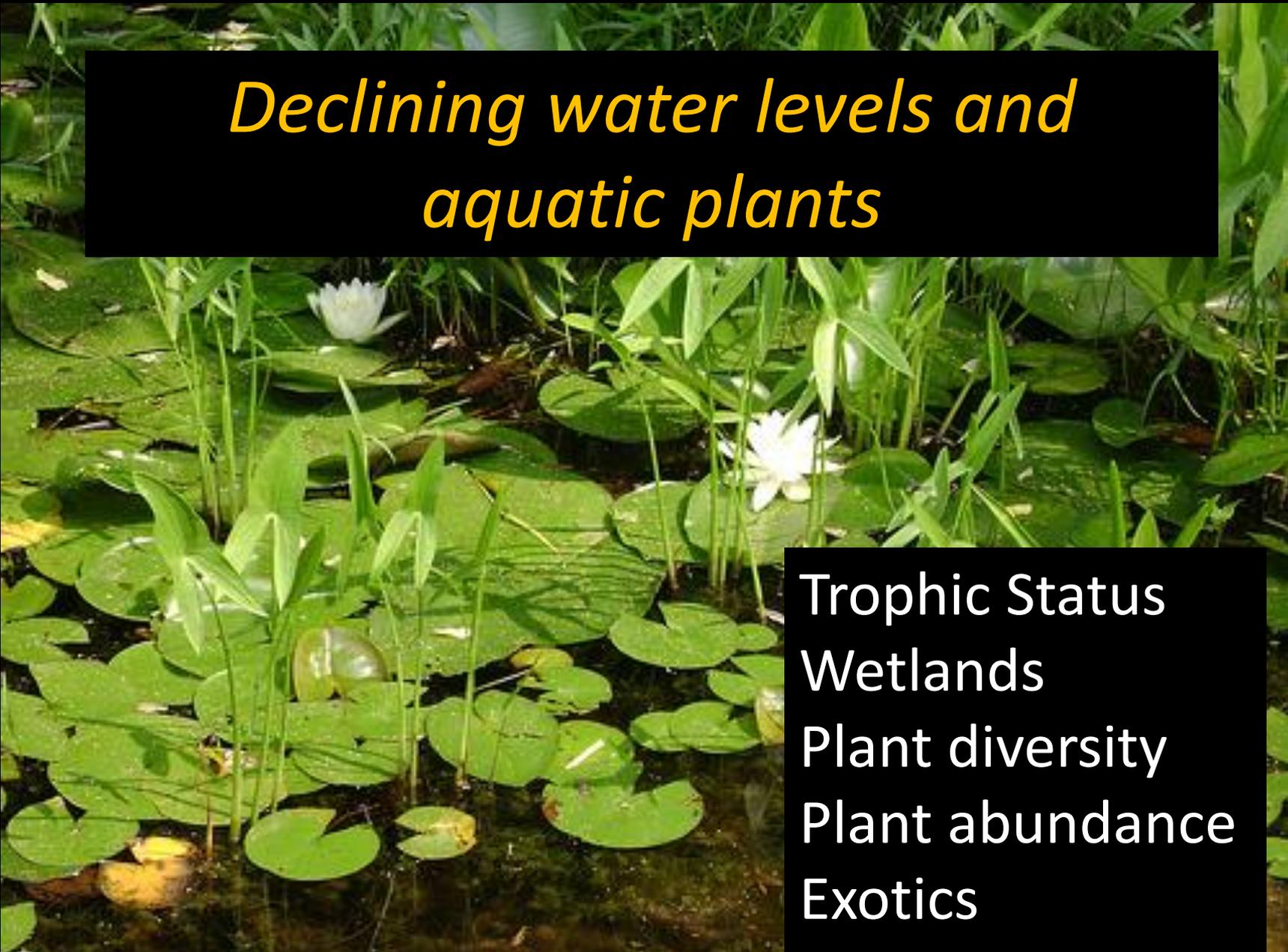
Shallow Lake

- Littoral zone very important in productivity of the lake
- Weed beds provide cover and support grazers and predators
- Shallow seepage lakes especially vulnerable to falling lake levels



Parts of the lake will be vulnerable to declining water levels. Others will be less affected.

Black Oak Lake, Vilas County



*Declining water levels and
aquatic plants*

Trophic Status
Wetlands
Plant diversity
Plant abundance
Exotics

Aquatic Plants: Trophic Status

Low nutrient lakes

- Many seepage lakes have very low nutrients
- Mostly low-growing plants



- Slow-growing, may not be able to retreat with water

High nutrient lakes

- More luxuriant plant growth
- Likely to maintain vigorous population as water levels fall



Aquatic Plants: ***Wetlands***

*Declining water levels
may eliminate wetlands
that function to:*

- reduce erosion
- provide fish and wildlife habitat
- provide staging and breeding habitat for waterfowl
- provide breeding and nursery areas for many fish.



Aquatic Plants: Plant Diversity

Several studies have found that modest water level fluctuations can lead to increased plant diversity.



...BUT

large fluctuations,
especially between
years, may lead to:

- persistence of
common plants
- fewer rare plants
- low species richness
- fewer emergent
plants (temporarily?)
- more exotics on the
shoreline



Aquatic Plants:

Changes in plants near shore



- Near-shore submerged vegetation lost
- New terrestrial plants will colonize newly exposed shores
- Exotics (Purple loosestrife, Reed Canary Grass, Flowering rush) may become established.

Aquatic Plants: ***Flowering on*** ***Exposed Shores***

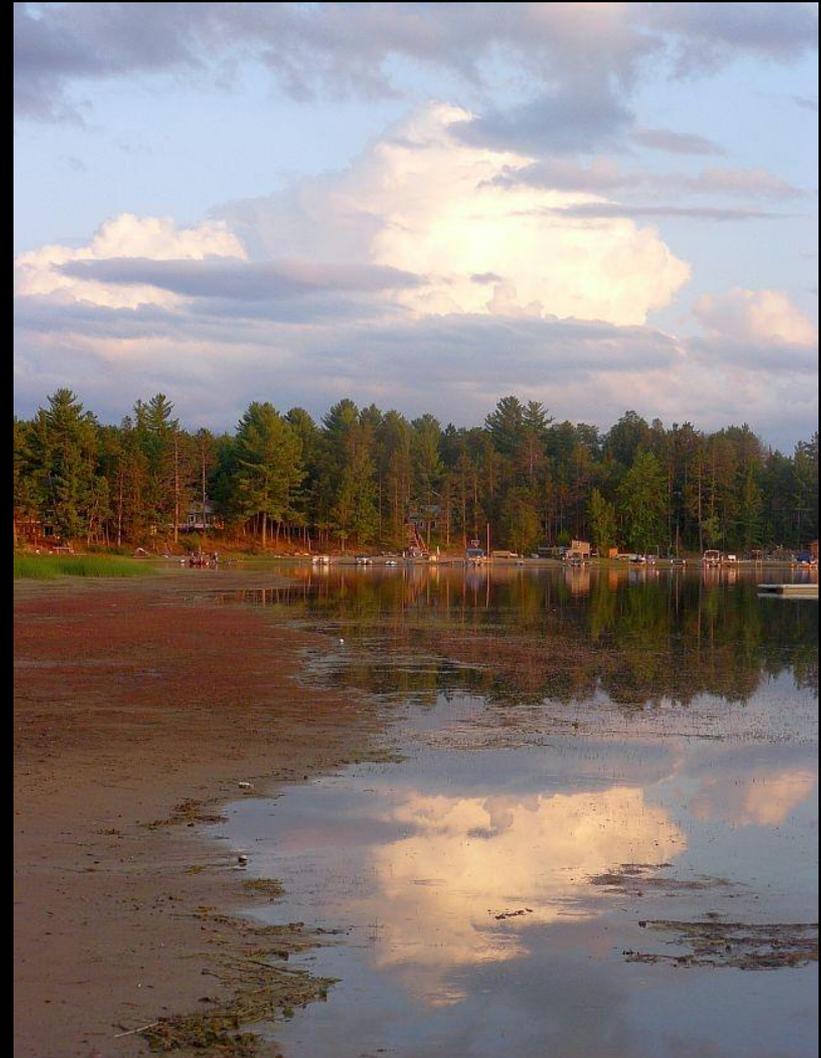
Some plants that are normally submersed will flower when exposed:

- Small purple bladderwort
- Needle spike rush
- Brown fruited rush
- Pipewort



WI Lake Law: Plant Removal on Exposed Shorelines

- NR 109 deals with mechanical removal of aquatic plants from navigable waters.
- This includes all plants located below the Ordinary High Water Mark, including plants on exposed lake beds.
- You can remove plants on exposed lake bed by hand without a permit.



Aquatic Plants:

Changes in plants deeper in lake

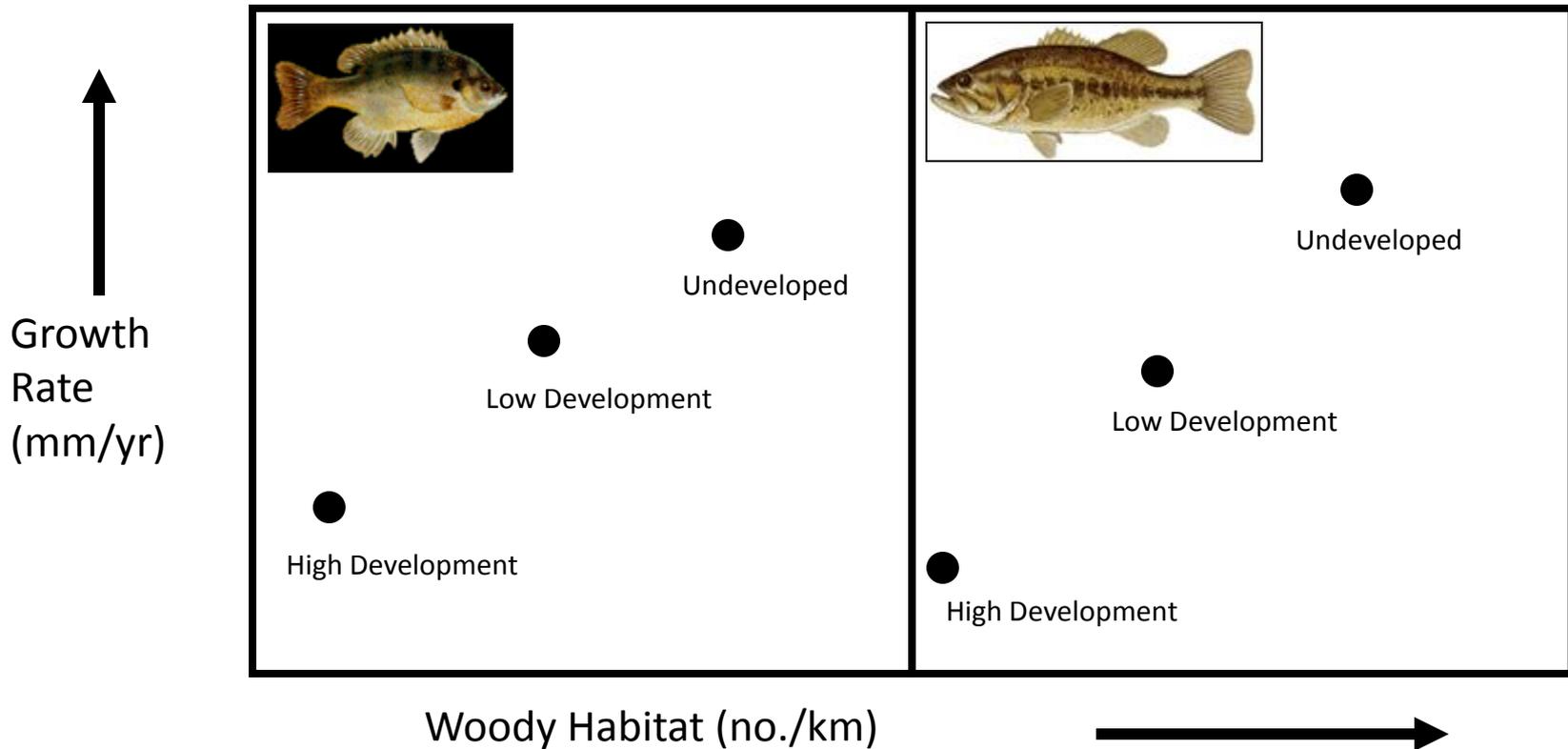
- More real estate available as the sun penetrates deeper into the lake
- Plants will slowly grow to fill in new habitat under water and at shore
- If invasives such as Eurasian water-milfoil are already present , they may be especially aggressive in the new habitat
- Other plants may also invade new habitat



Declining water levels and woody habitat



Fish grow ~3X faster in lakes with lots of woody habitat
The more houses on a lake,
the less woody habitat



Two Experiments

Wood removal from a divided lake

1. Perch disappeared
2. Bass changed diet – more terrestrial



Wood addition

1. Bass are using the wood for nesting
2. More juvenile bass
3. Bass are eating fish & growing faster
4. “Branchier” trees attract more fish



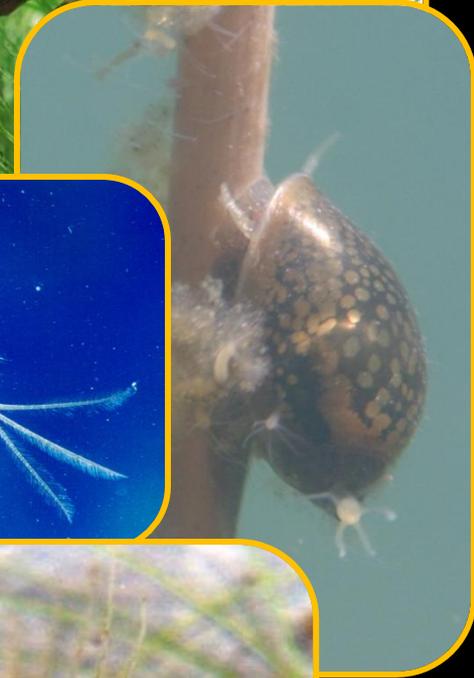
With falling water levels, wood will be left above the water line and may lead to:



- Loss of algae that grow on wood that are food for many invertebrates
- Loss of habitat for invertebrates that live on wood
- Loss of wood-based food web
- Loss of habitat for fish
- Slower growth rates for fish

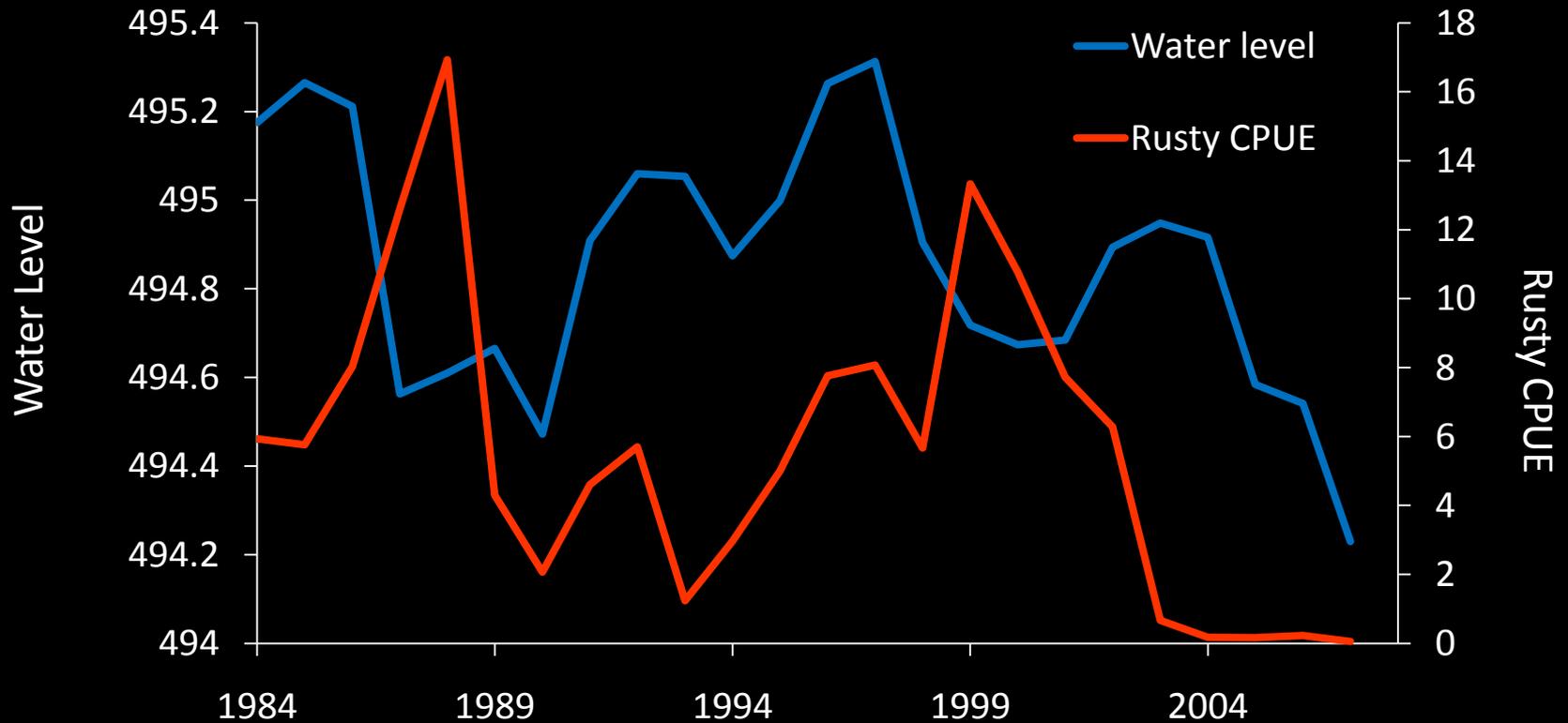
Declining water levels and invertebrates

- Many invertebrates are mobile and can move to deeper habitat
- Inverts relying on wood and emergent plant stems will lose habitat
- Some inverts will have trouble with different, perhaps softer substrates deeper in water
- Potential for huge loss of invertebrates with declining water levels

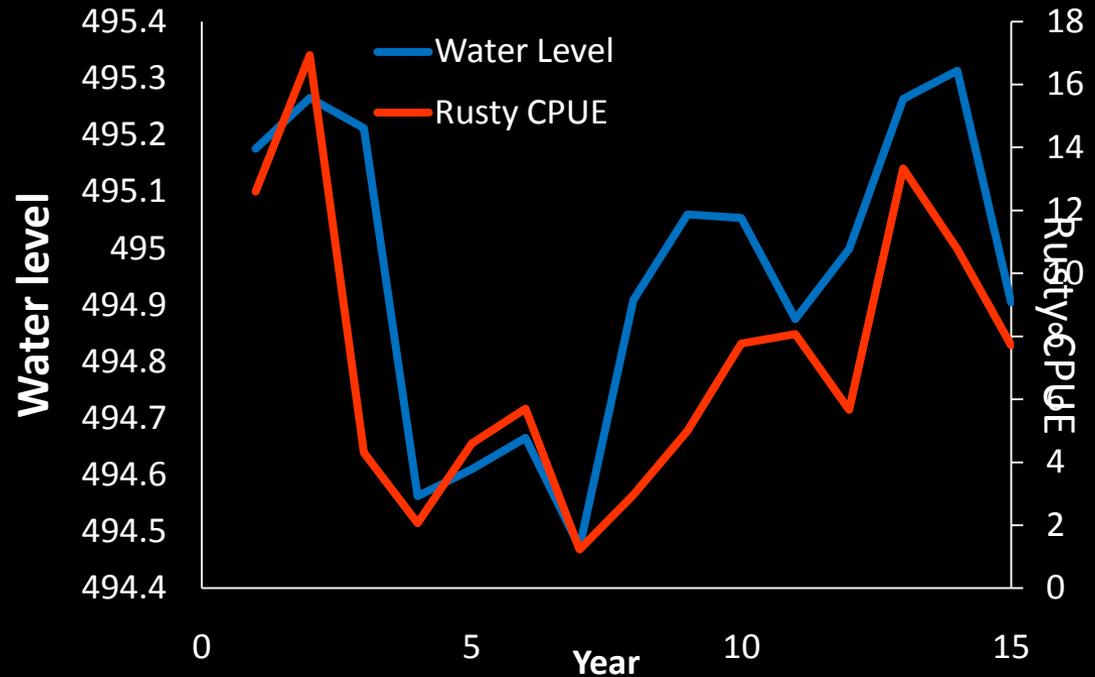




Crayfish Capture and Water Levels



Water Level - 3 year lag



- Very young crayfish prefer cobble (in very shallow water)
- As water level drops, cobble exposed
- Young crayfish cannot escape predation
- Traps catch mostly 3+ year-old crayfish
- After three years of low water, see lower catch because young crayfish did not survive

Declining water levels and fish



Reproduction
will be the
biggest
challenge for
fish in dealing
with
changing
water levels.



Suitable habitat may be in a narrow belt around a lake and may be eliminated if water level falls.



Recruitment of young bass into adult population need a diverse plant community

Some fish, such as bass and bluegills may be able to reproduce deeper into water with little trouble





Fish preferring marsh habitats can be greatly affected by lowered water

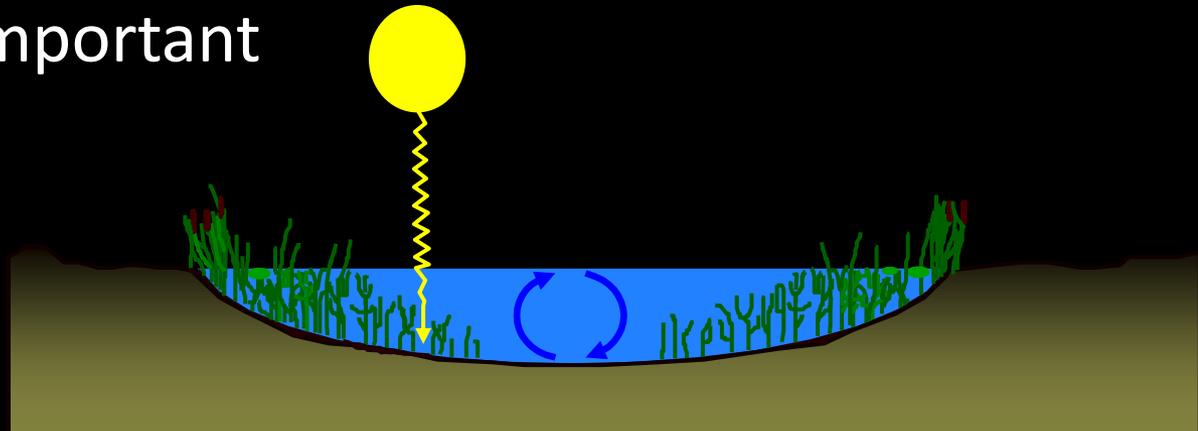
Lower water levels may also lead to higher water temperatures and changes in fish species



Declining water levels and winter kill

Most lakes should not suffer winter kill, *unless*

- water becomes extremely low
- vegetation becomes much more abundant
 - More plant growth means more plants die
 - Oxygen used up as plants decompose in fall and winter
 - Not enough oxygen left for fish and other animals
- lake shape important



Declining water levels effects on Habitat and plants and animals: Summary

- Protect your shoreline while the water is low. Leave wood in place.
- Lake shape is very important
- Lake trophic status – nutrient rich or poor
- Wetlands, with so much habitat for fish and wildlife could be severely affected
- Plants exposed as water level drops– some fluctuation good for diversity
- May get more emergents eventually

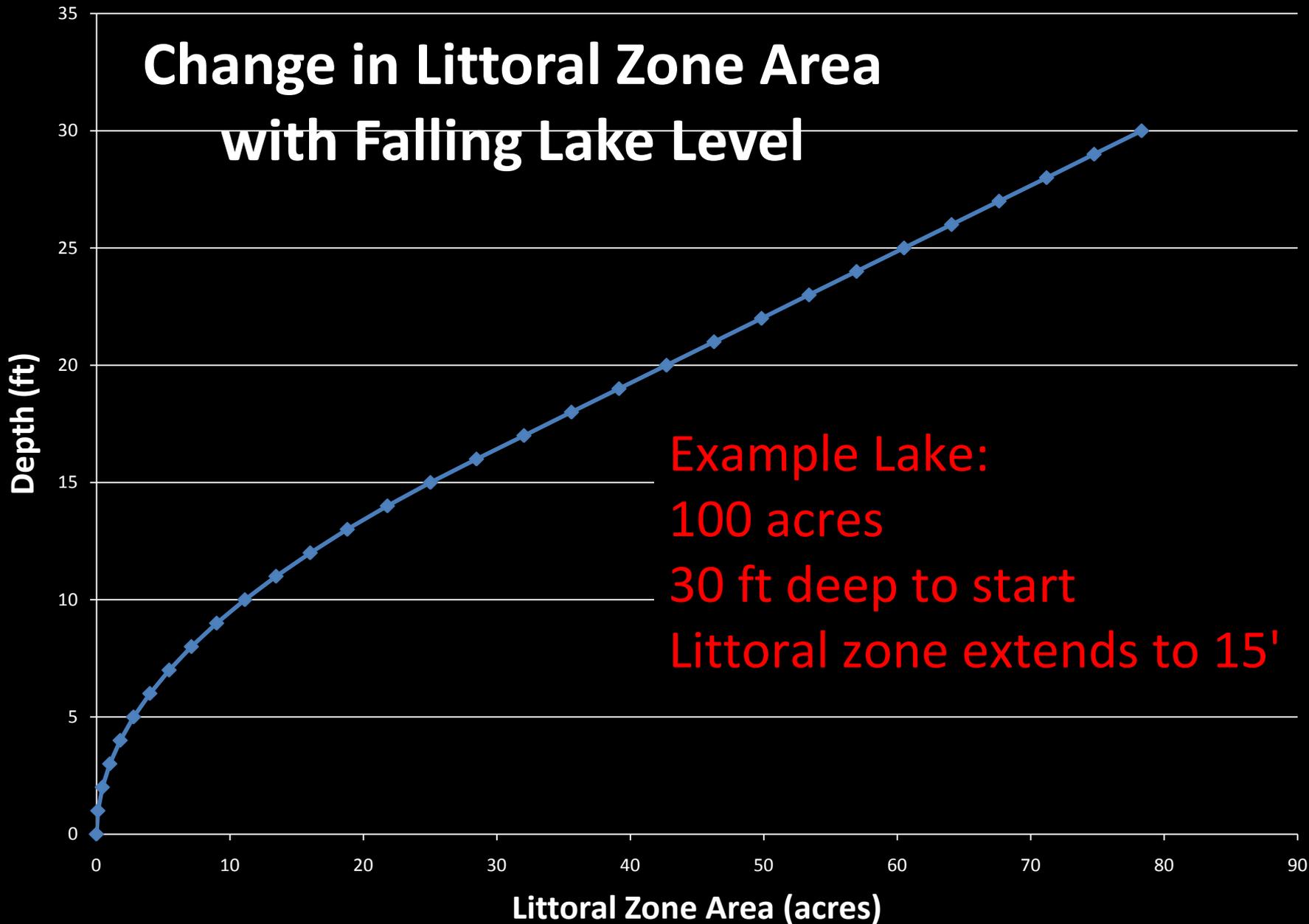
Declining water levels effects on Habitat and plants and animals: Summary continued

- Plants should be able to extend deeper into water, but exotics may beat out natives
- Less woody habitat, linked with fish growth and important littoral processes
- Some invertebrates will be able to move, others may lose preferred habitat
- Some fish may lose habitat critical for reproduction while others may adapt
- Changing water temperatures could mean long term changes in fish species

Questions?



Change in Littoral Zone Area with Falling Lake Level



Central European Lakes

- Decreasing rain and increasing temperatures
- Lake levels going down
- Alder tree roots and reeds along shore have most invertebrate diversity
- Potential for huge loss of invertebrates with declining water levels

