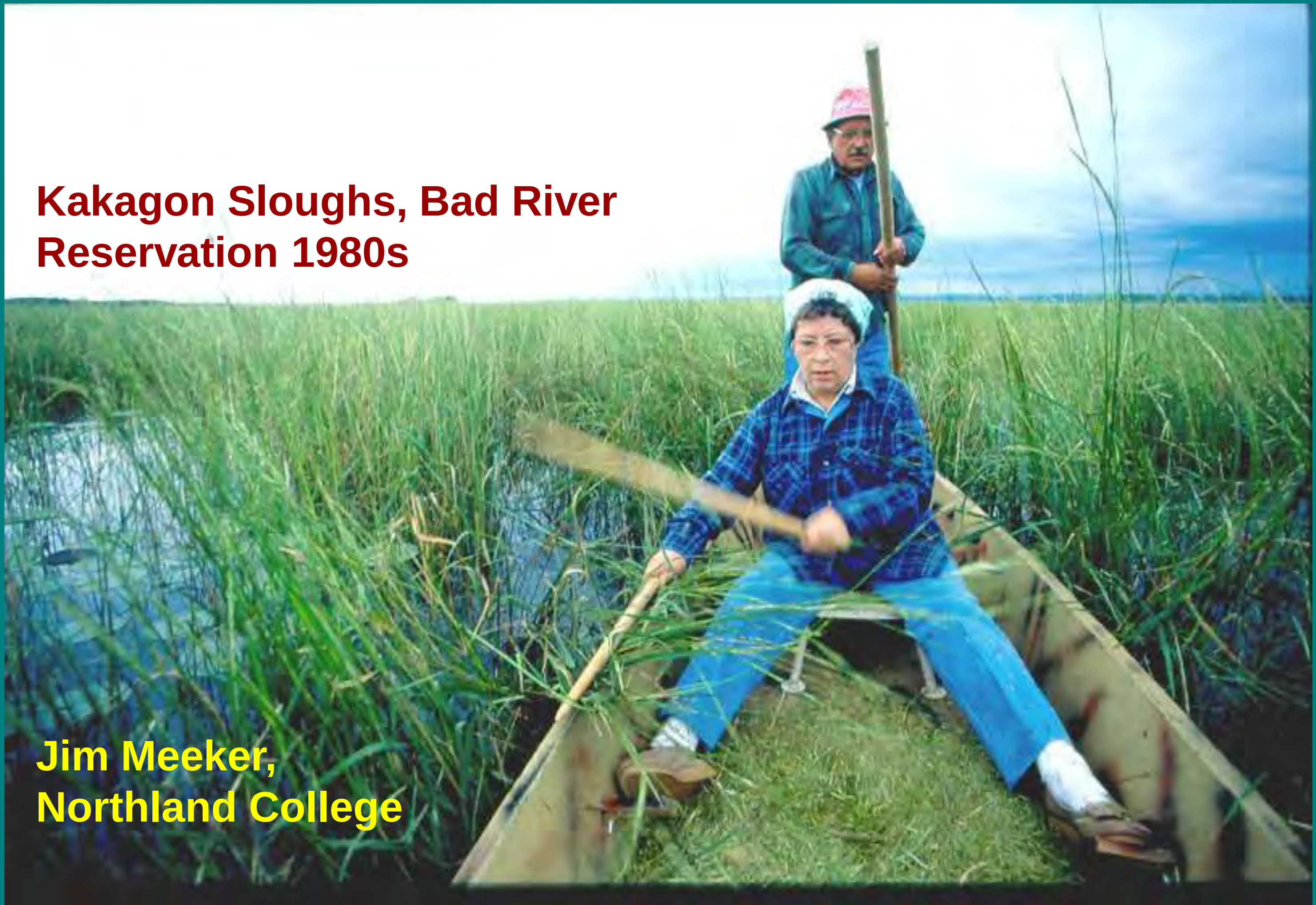
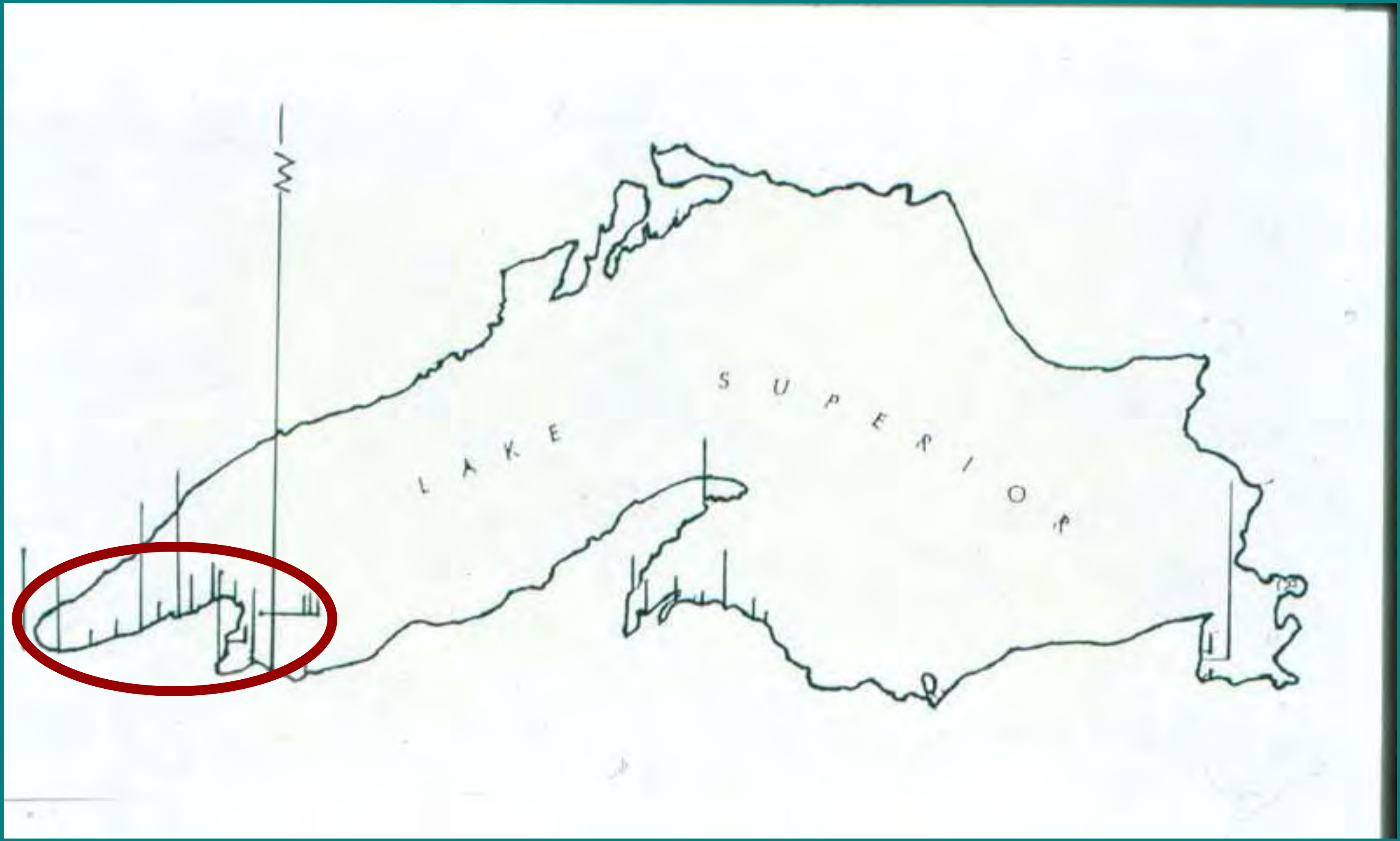
Natural history of coastal wetlands in the greater Chequamegon Bay region



northern Great Lake wetlands are dominated by peatlands with fewer marshes, compared to the lower Great Lakes

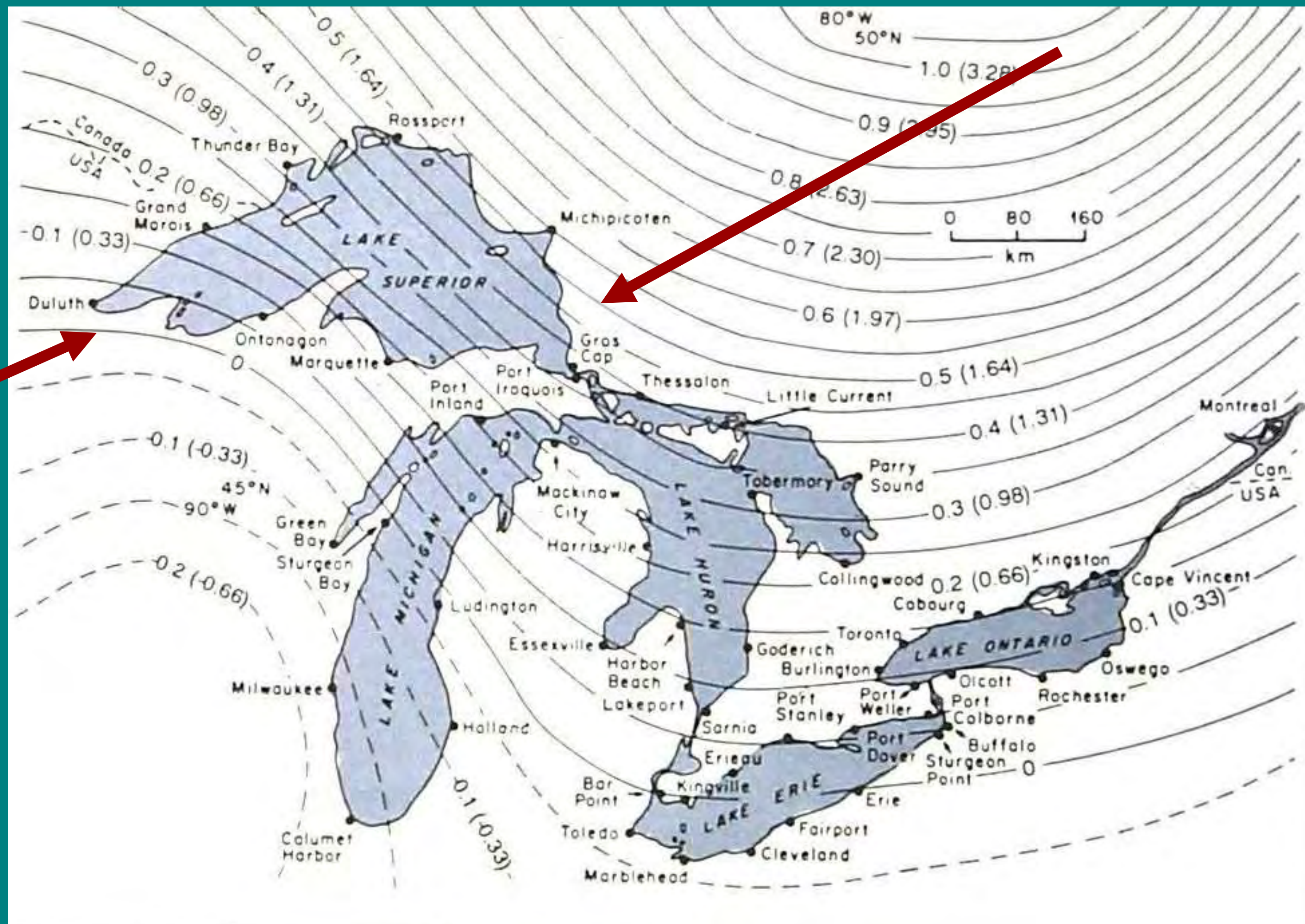

DISTRIBUTION
OF POPULATION
1 dot represents 2500 people

General location of lake-connected coastal wetlands relative to degree of protection and isostatic rebound



Isostatic rebound

The lake's outlet is rebounding faster



Than this end

What was the pre-settlement vegetation in these areas?

“We come to a bay 25 miles around (Chequamegon Bay). In it there is a channel where we take a great store of fish: sturgeons of vast bigness and pike seven feet long. At the end of the bay we land.”

Pierre Esprit Radisson 1658

shore fen

Sphagnum lawn

Sedge meadow

Tamarack swamp

Different from inland peatland types (e.g. Honest John Lake)

Big Change !!

Duluth Harbor

ca 1870

Peatlands

Cedar swamps

Coastal Peatlands in flux - 1

Altered shore fens, Allouez Bay, WI. half way in the "Peatland to Marsh" Transition

Coastal Peatlands in flux -2

Beginning Nutrient enrichment of shore fens (Port Wing, WI)

“The Only Constant is Change”

- **With or without humans, natural systems are dynamic, that is, they change from one state to another.**

- **How does one separate natural change from human-caused or anthropogenic change? Or can we do this?**

Water/Hydrology is the key

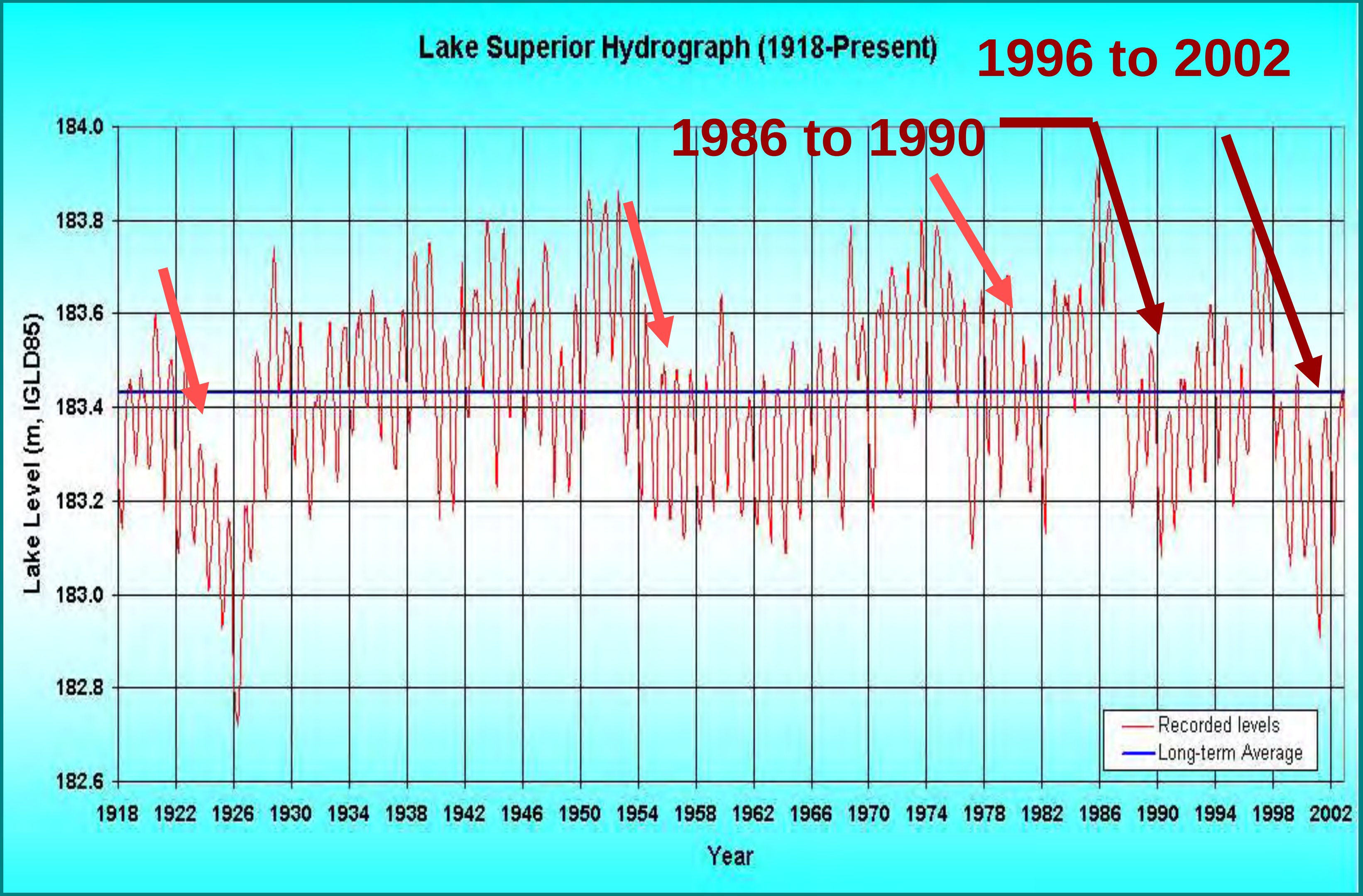
Quantity and timing of water

Changes occur:

- Daily – tides, seiches, wind, waves
- Annually – timing of peaks (early or late summer)

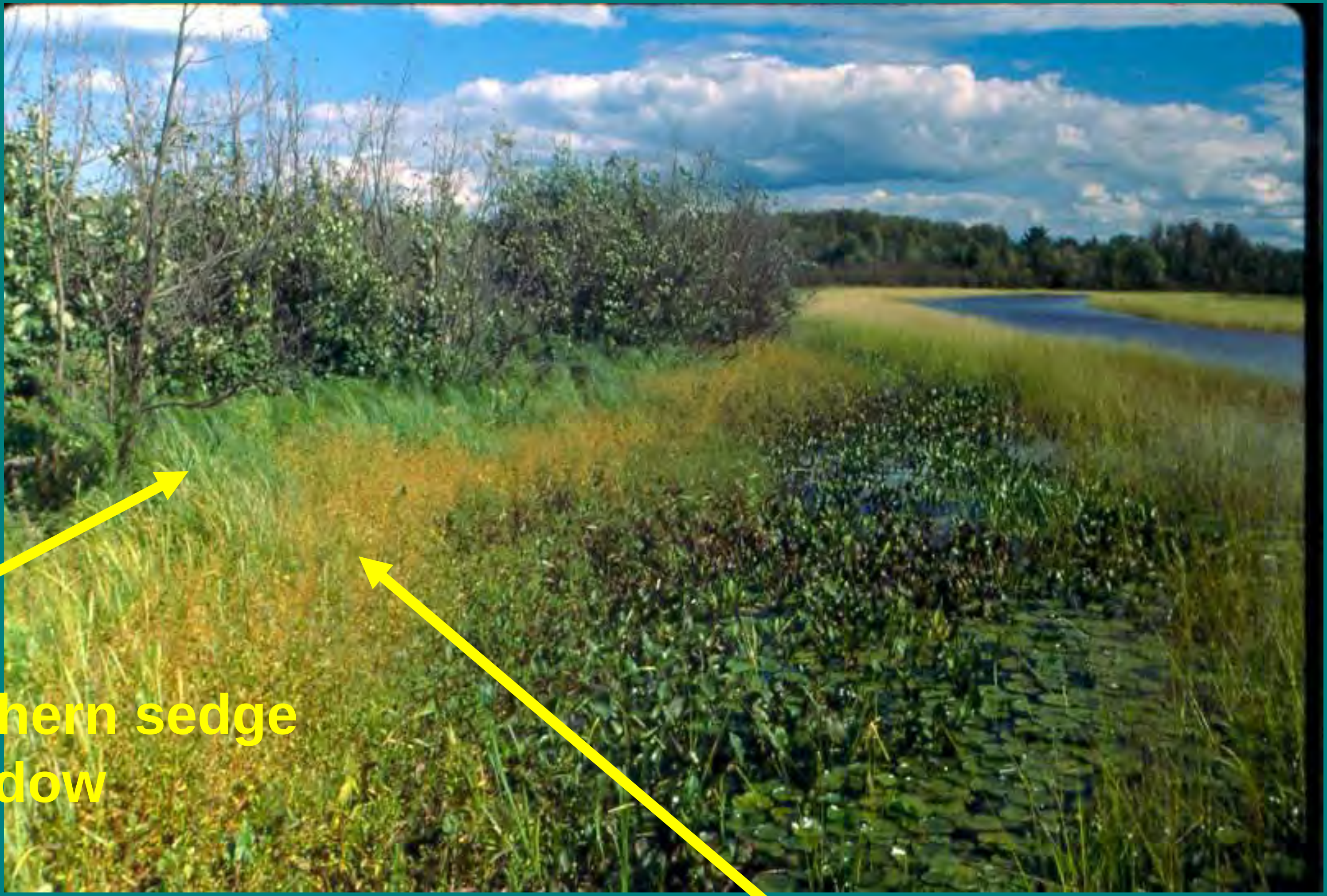
→ **Year to year fluctuations – e.g. 1986 high water**

→ **Longer term changes – relative to isostatic rebound /stream capture**



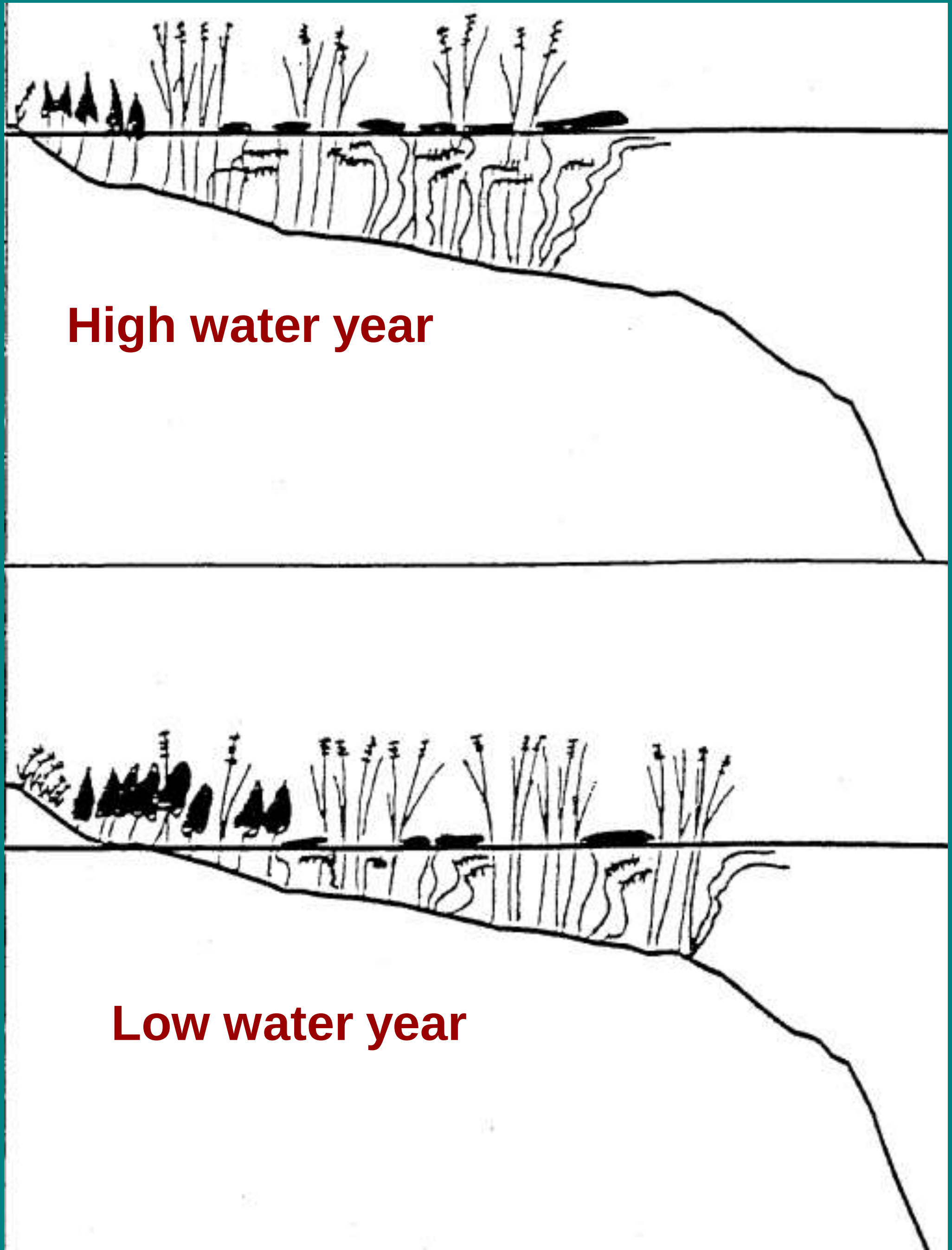
Hydrological pulses in Lake Superior

Classic zonation w/ drawdown



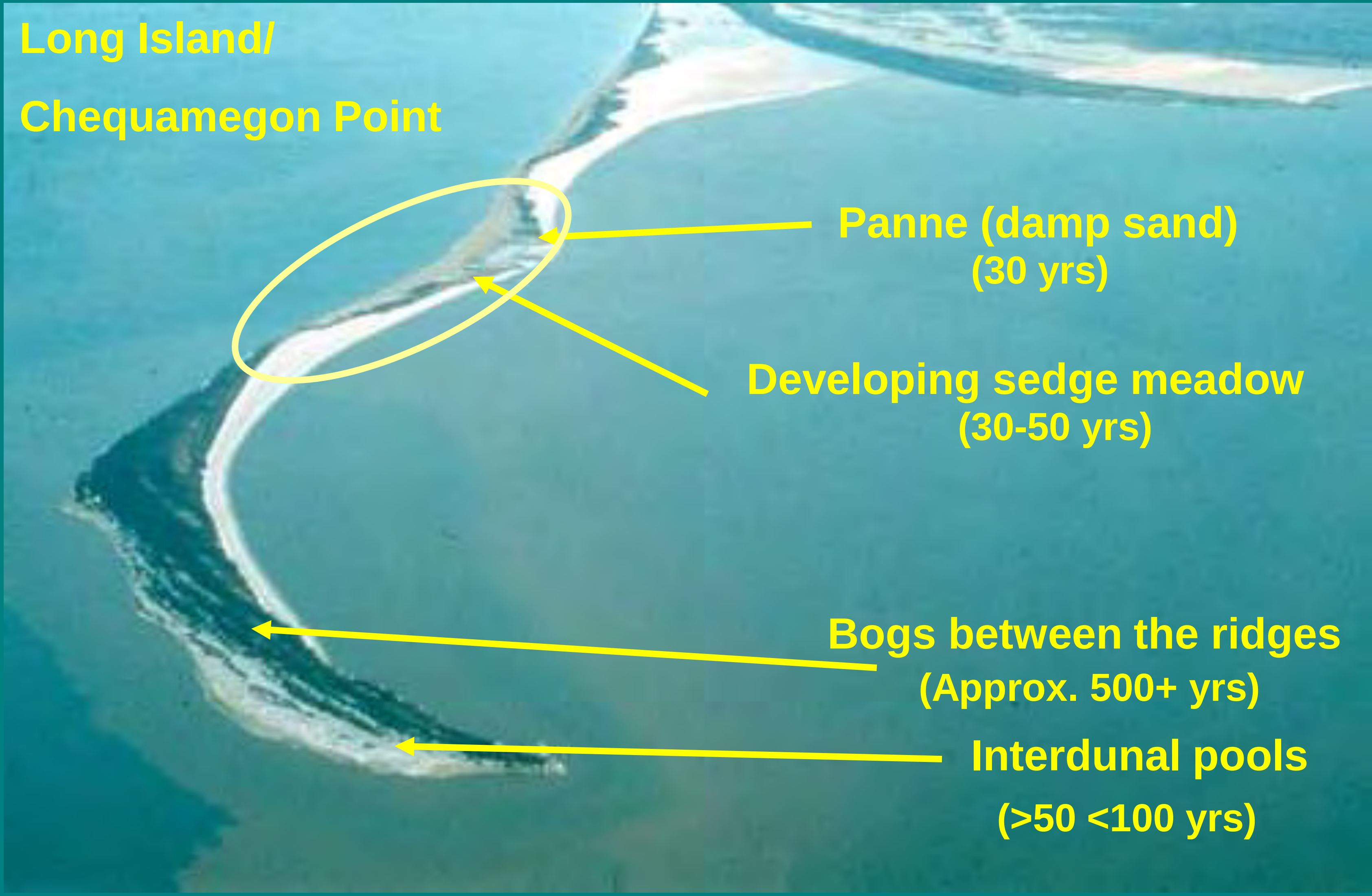
Northern sedge meadow

Mud flat annuals



Wild-rice response to a drawdown

1) migration into channel
2) approximate 40% increase in stem density



Long Island/
Chequamegon Point
Panne (damp sand)
(30 yrs)
Developing sedge meadow
(30-50 yrs)
Bogs between the ridges
(Approx. 500+ yrs)
Interdunal pools
(>50 <100 yrs)

Developing sedge meadow

1997

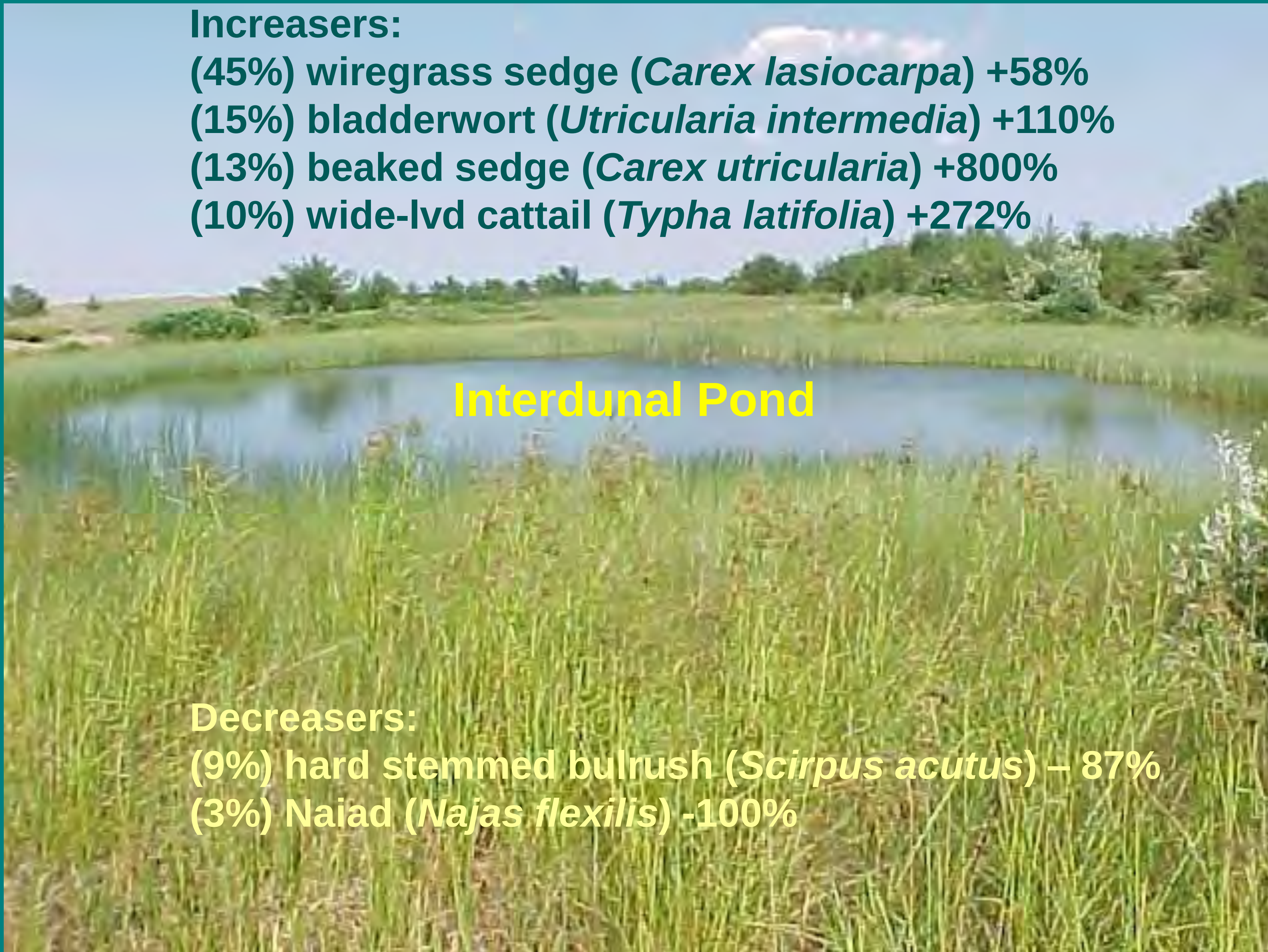
Increasers

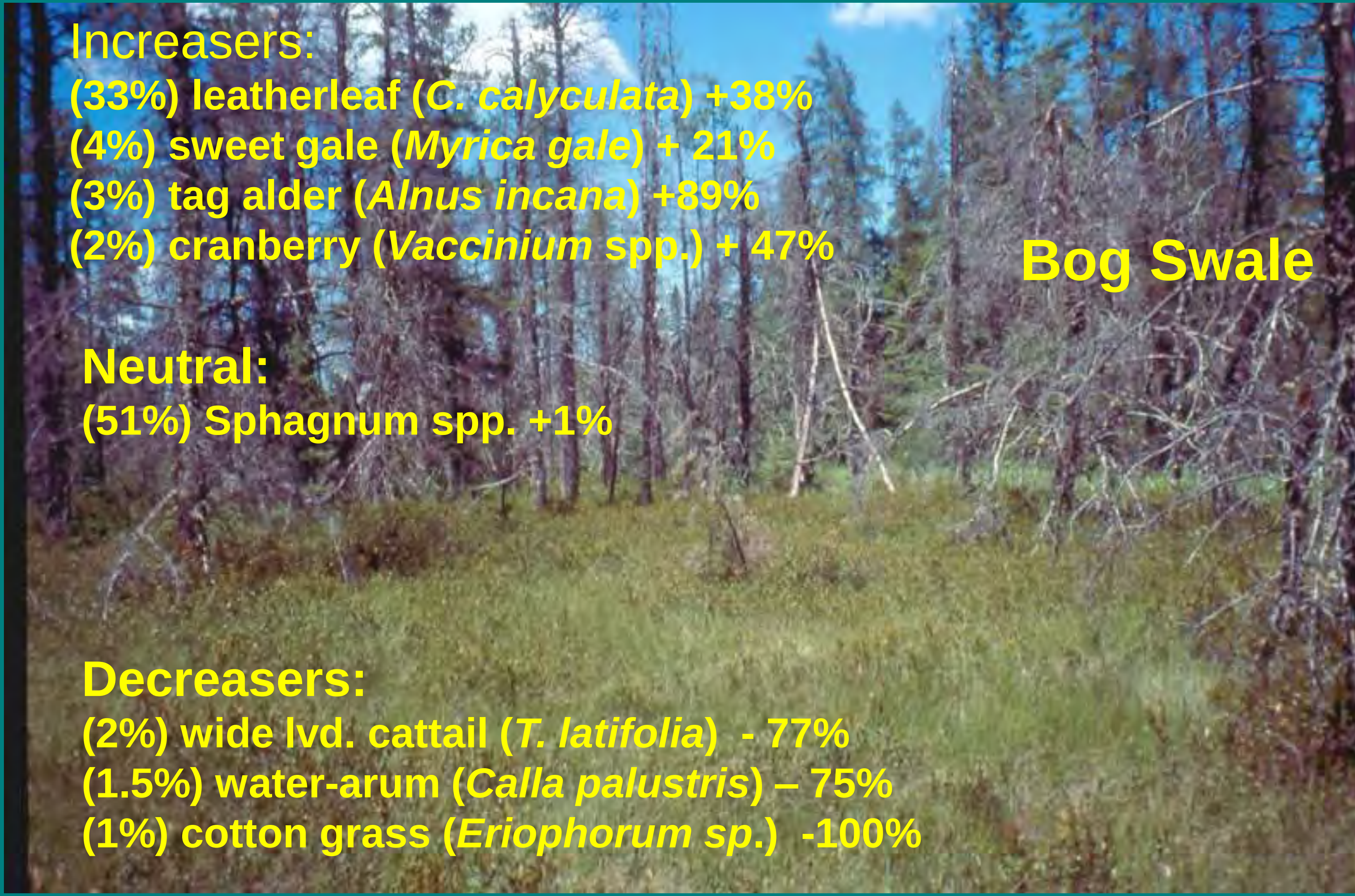
(29%) blue joint grass (*C. canadensis*) +186%
(8%) tussock sedge (*Carex stricta*) +128%
(4%) woolgrass (*Scirpus cyperinus*) +76%
(2%) swamp candles (*Lysimachia terrestris*) + 43%

Decreasers

(23%) wiregrass (*Carex lasiocarpa*) -81%
(14%) bladderwort (*Utricularia intermedia*) -100%
(2%) baltic rush (*Juncus articus*) -57%

2002


Increasers:
(45%) wiregrass sedge (*Carex lasiocarpa*) +58%
(15%) bladderwort (*Utricularia intermedia*) +110%
(13%) beaked sedge (*Carex utricularia*) +800%
(10%) wide-lvd cattail (*Typha latifolia*) +272%
Interdunal Pond
Decreasers:
(9%) hard stemmed bulrush (*Scirpus acutus*) – 87%
(3%) Naiad (*Najas flexilis*) -100%


Increasers:
(33%) leatherleaf (C. calyculata) +38%
(4%) sweet gale (Myrica gale) + 21%
(3%) tag alder (Alnus incana) +89%
(2%) cranberry (Vaccinium spp.) + 47%
Bog Swale
Neutral:
(51%) Sphagnum spp. +1%
Decreasers:
(2%) wide lvd. cattail (T. latifolia) - 77%
(1.5%) water-arum (Calla palustris) – 75%
(1%) cotton grass (Eriophorum sp.) -100%

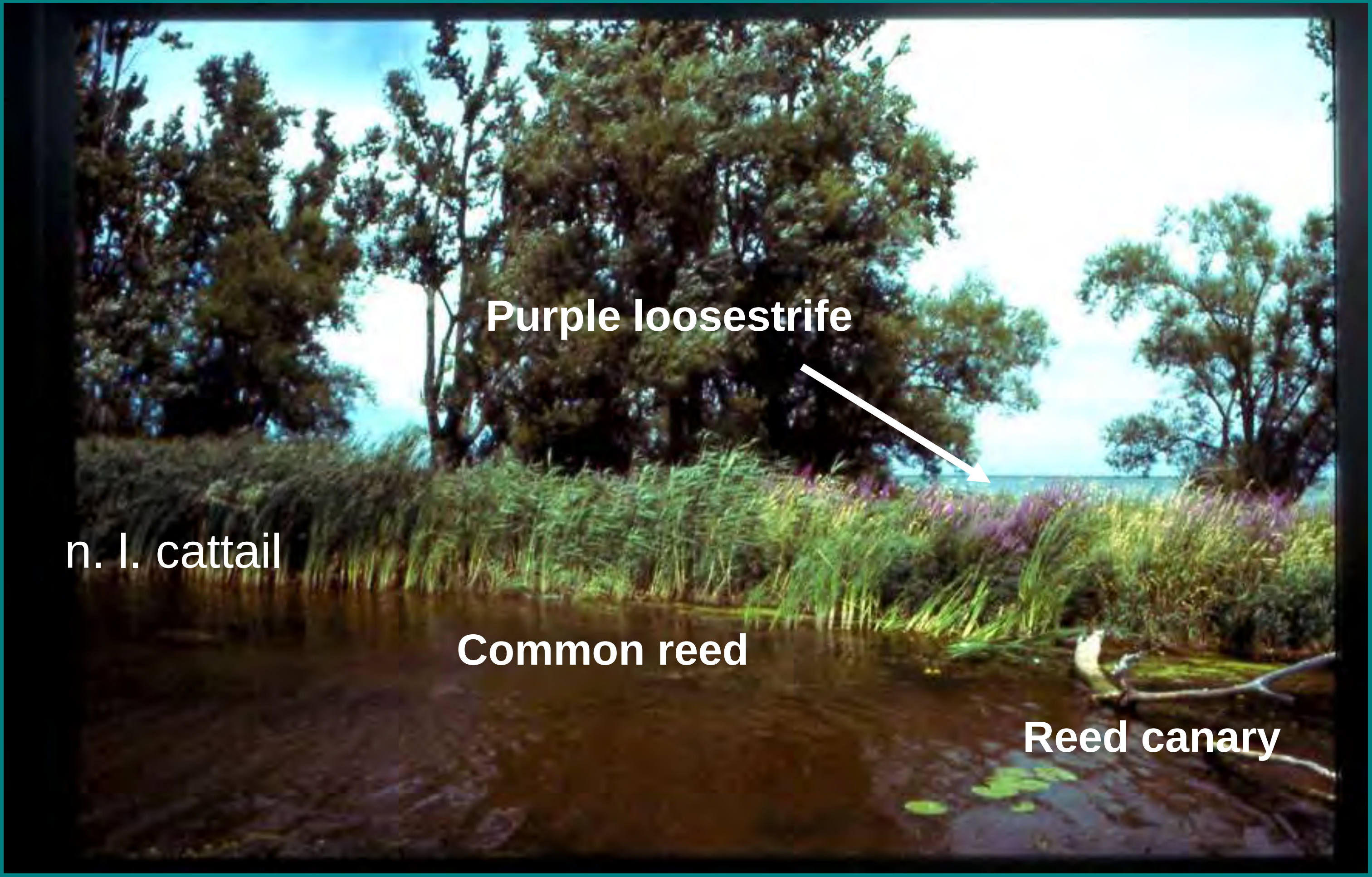
The ultimate question is "which changes are directional and which are cyclic?"

We are now able to predict how these wetland communities *might* change the next time they experience significant high water,

that is, if they are following a cyclic pattern, or a directional change like the "peatland to marsh" process we have seen in many other systems.

Need high water again!!!!!

Rogue's Gallery of Invaders



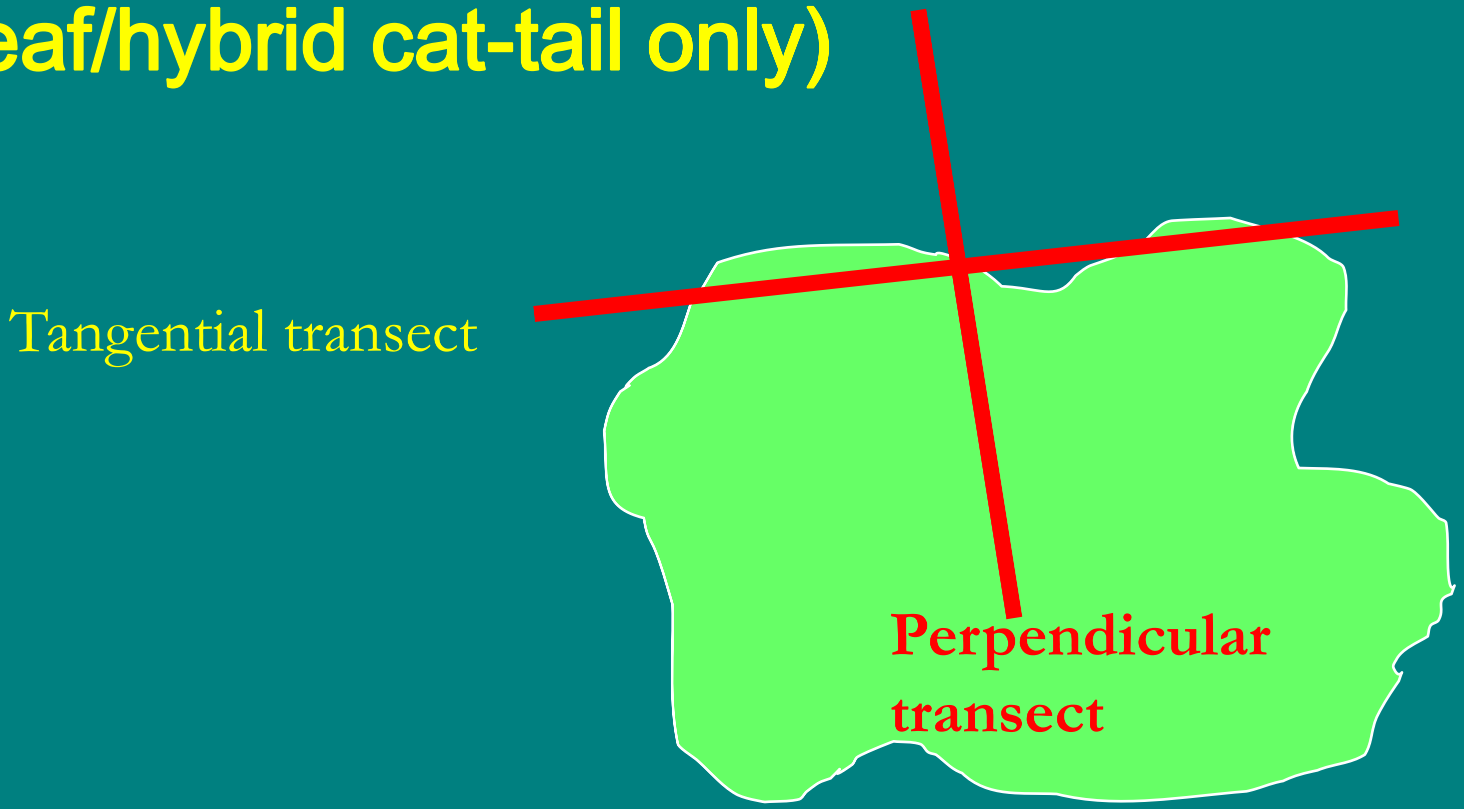
Narrow vs. Wide Leaf *Typha*

Kakagon Sloughs Drowned Delta

Monitoring included:

1) Assessing vegetation in quadrats (1 m^{2}) along two types of transects

2) delineating clone size (for narrow leaf/hybrid cat-tail only)

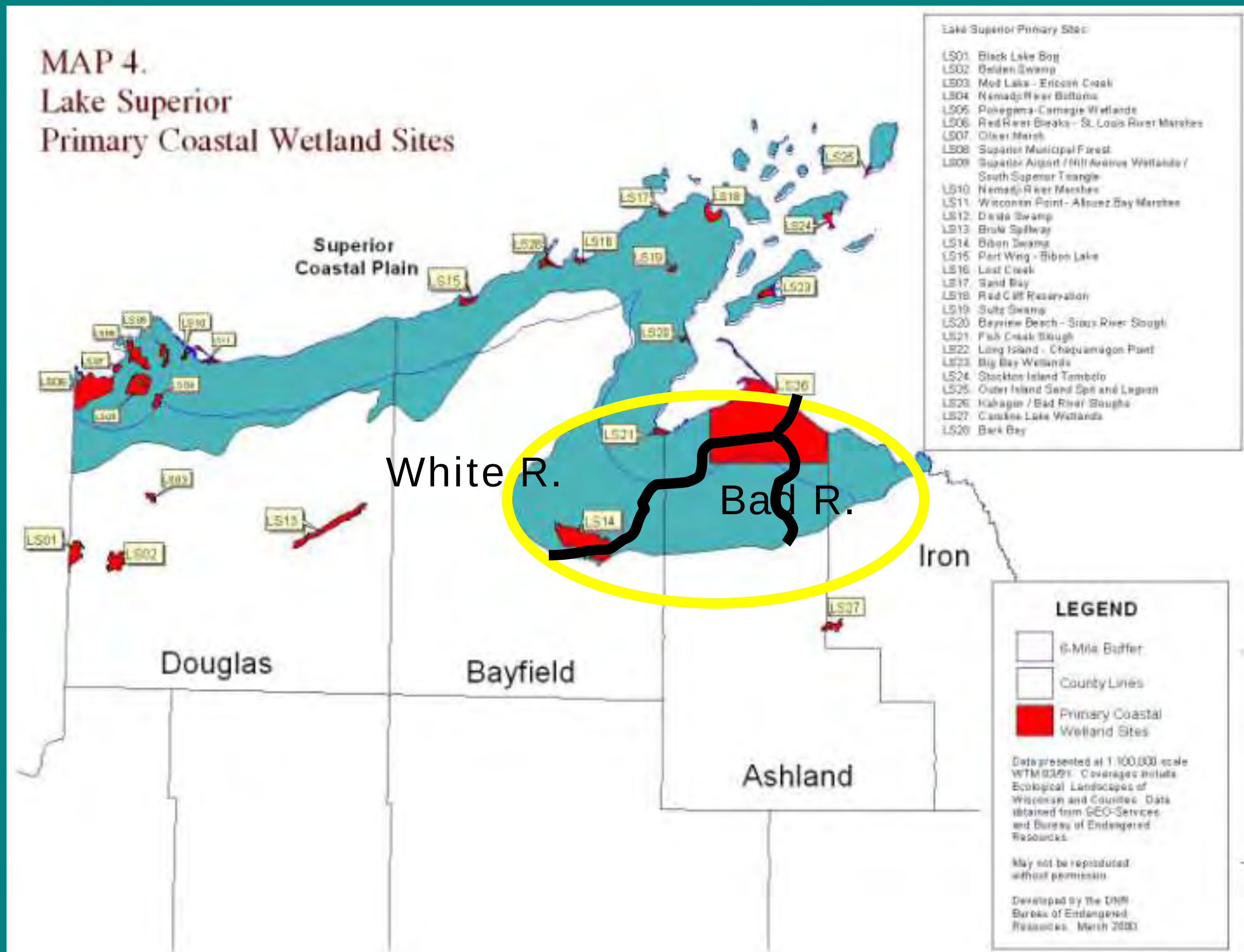


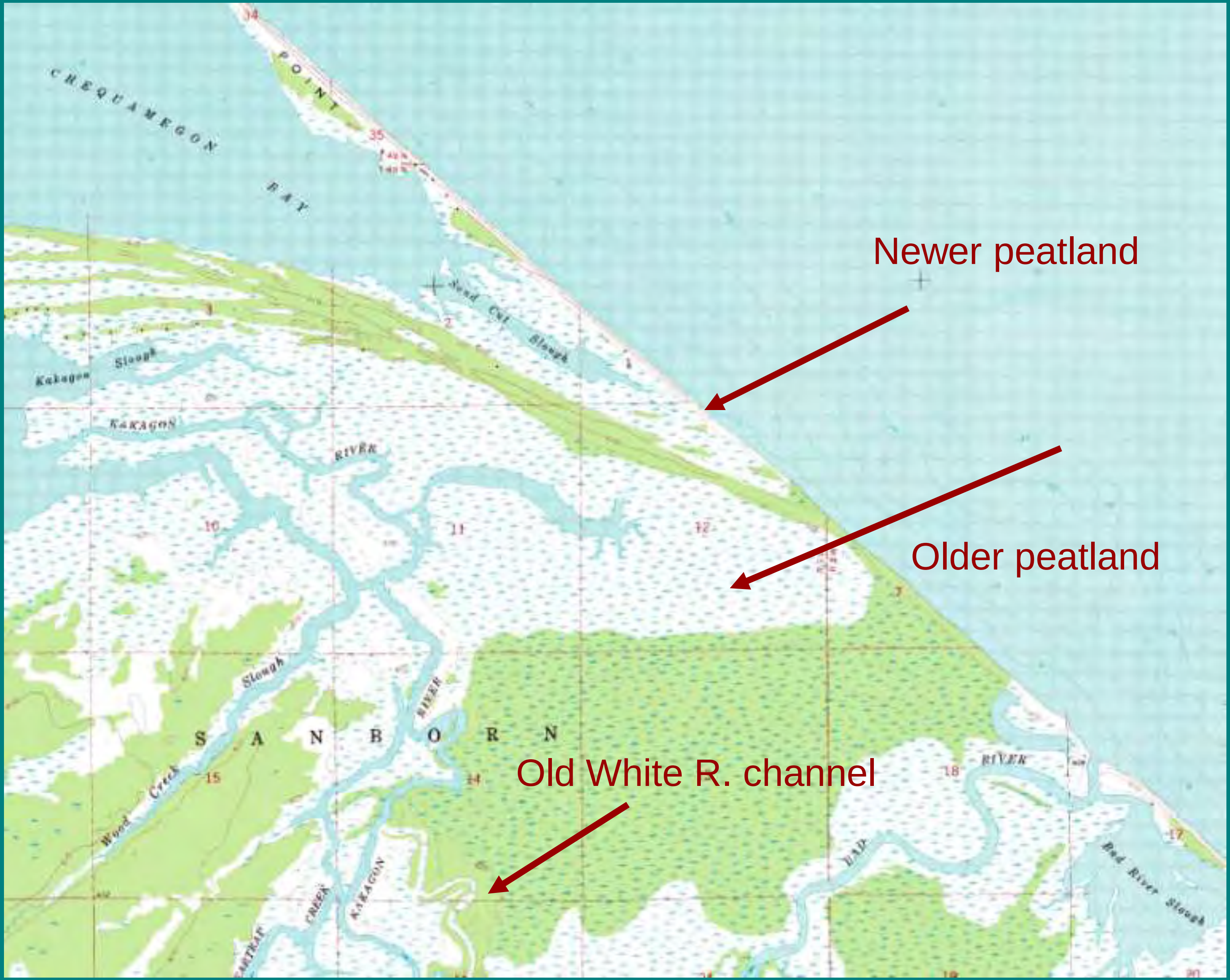
Changes in cattail abundance wide vs. narrow lf (& hybrid)

	% Frequency		Stem Density	
	1997	2005	1997	2005
Wide leaf	65	48	2.03	0.83
Narrow Lf. (perp.)	67	85	7.57	11.41
Narrow lf. (tang.)	61	95	1.43	10.70

Bad River entering into Lake Superior and spilling into Bad River sloughs after a rain event

Steam Capture ca 750 yrs ago
Catastrophic Change




Newer peatland
Older peatland
Old White R. channel
CHEQUAMEGON
BAY
POINT
Sand Cut Slough
Kakagon Slough
KAKAGON
RIVER
Slough
S A N B O R N
Wood Creek
RIVER
KAKAGON
CREEK
BAD
RIVER
Bad River Slough

Bad River
fluvial dynamics

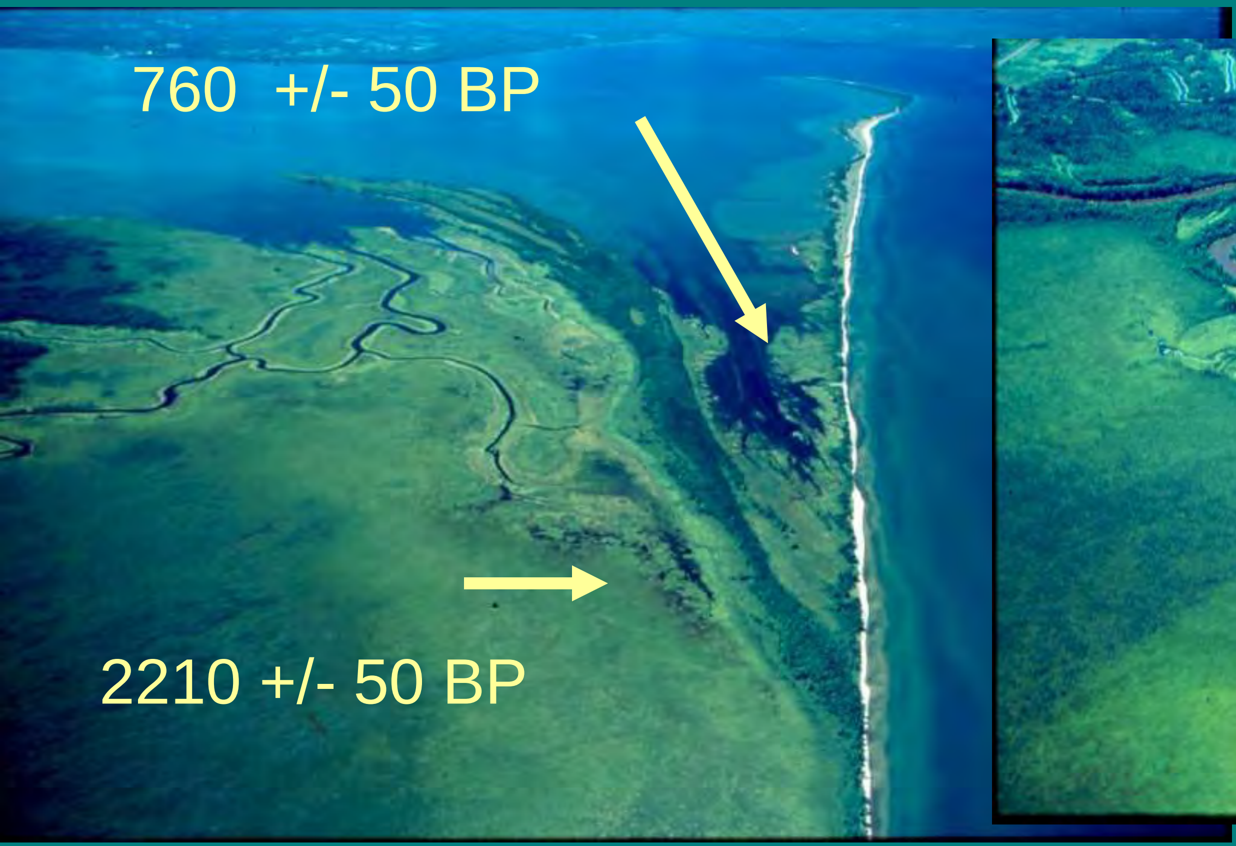
Bad River sediment supply, today it transports the sediment from both the Bad and the White Rivers

Long Island recurved spit

Oak (Brush) Point recurved spit

Added sediment from the capture of the White River added enough extra sediment to build Chequamegon Point

All dates older than Long Island



Former White River Channel

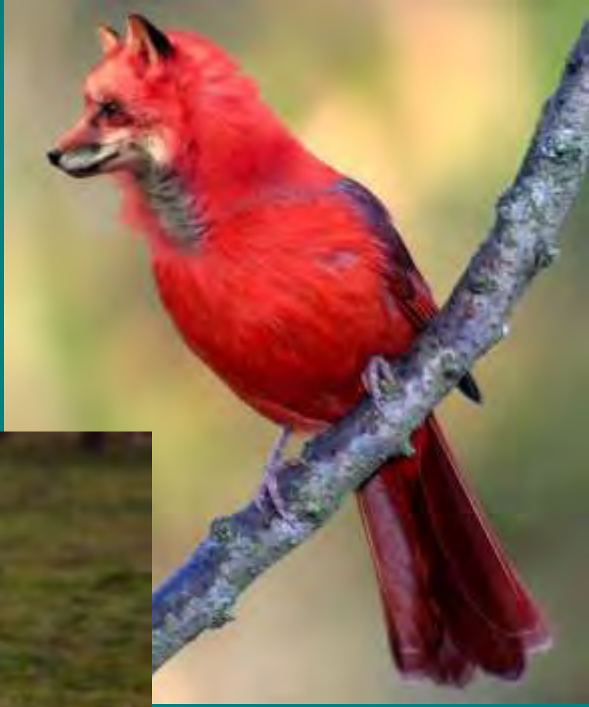
Summary

So…. In the light of all this change ('natural', anthropogenic), Which wetlands do we have the best chance of 'holding on to' pre-settlement conditions the longest?

Stockton Island, Apostle Islands National Park E. Epstein photo

Much more to explore -

Questions??



Honest John Lake