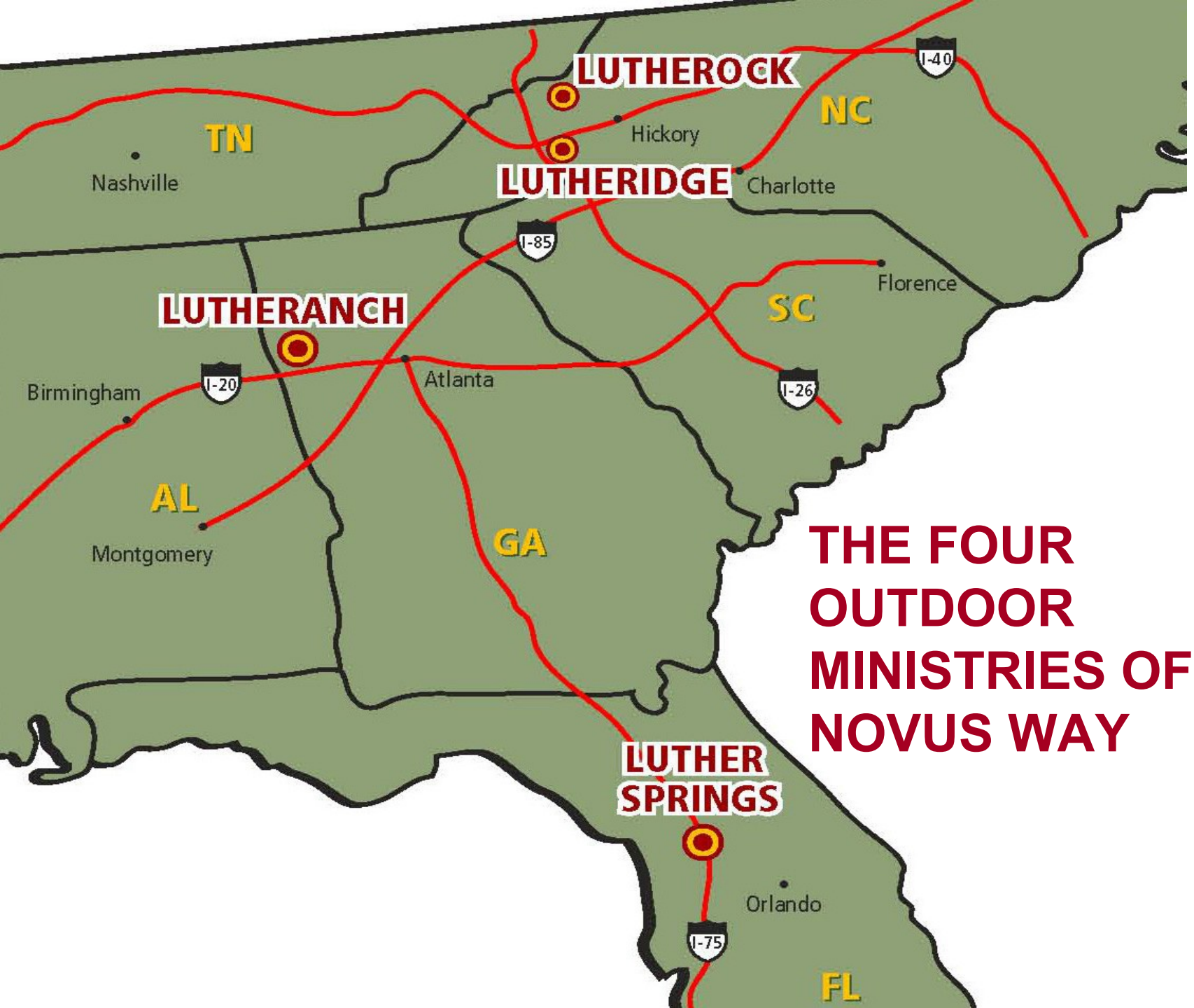
A PRIMER ON THE ECOLOGY OF VAUSE LAKE AT LUTHER SPRINGS FOR THE:

LUTHERAN
OUTDOOR
MINISTRIES
of FLORIDA

And Novus Way Ministries



THE FOUR OUTDOOR MINISTRIES OF NOVUS WAY

DENOMINATION: EVANGELICAL LUTHERAN CHURCH OF AMERICA (ELCA)

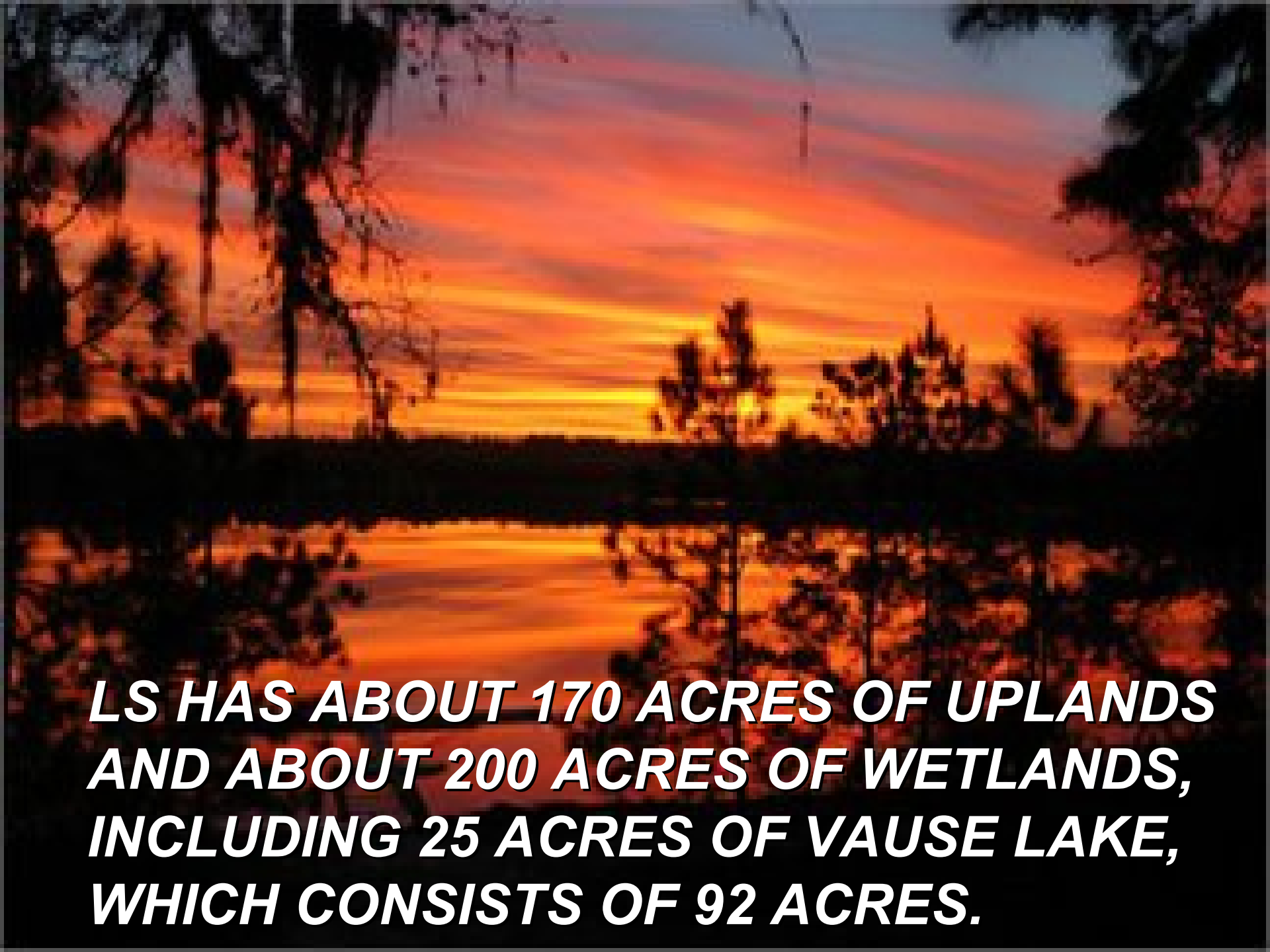
SOCIAL STATEMENT ON CARING FOR CREATION (1993, 2003)

PROVIDES A CHRISTIAN ACTION, BIBLICALLY BASED, DOCUMENT ON CARING FOR CREATION.

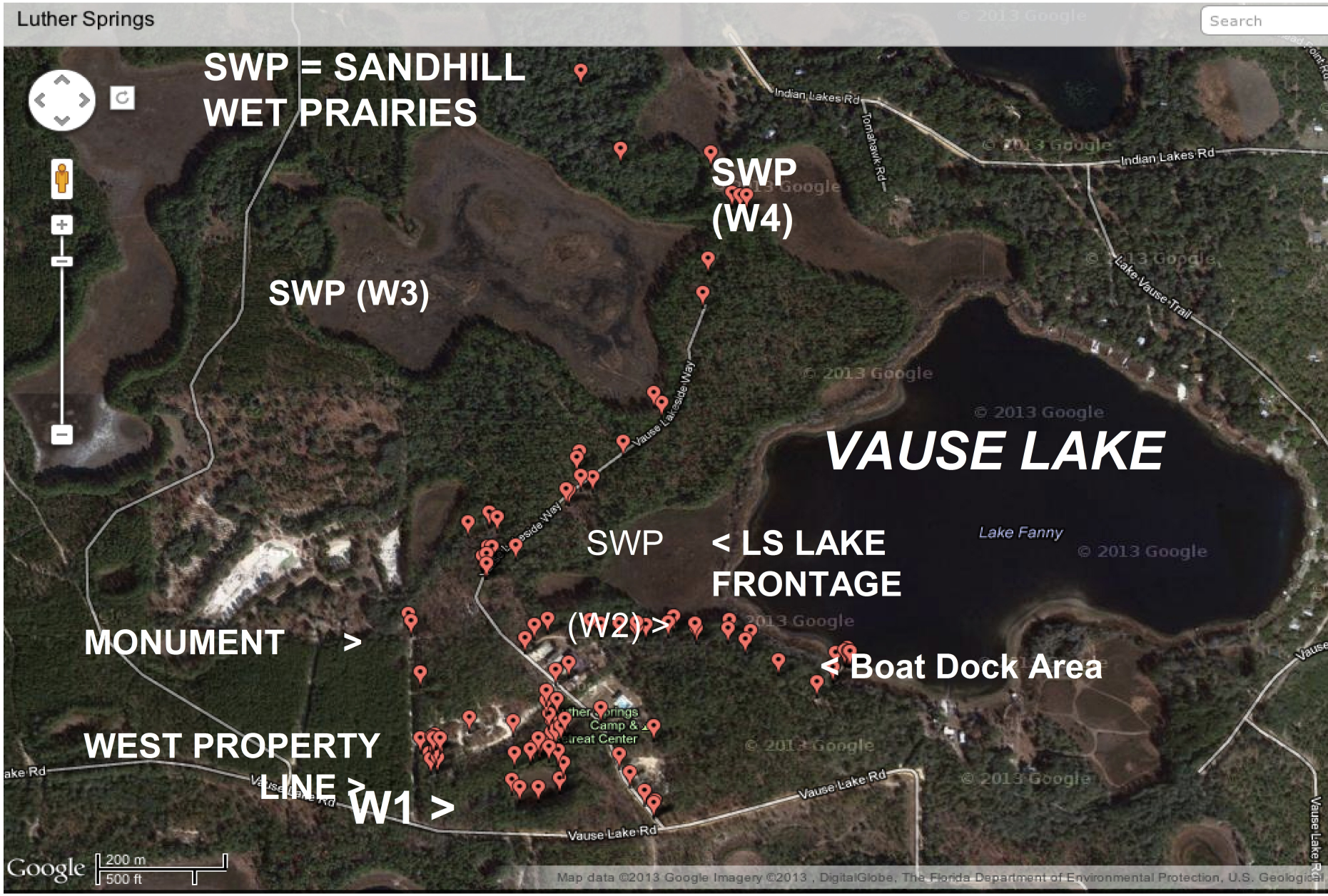
THE BOOK OF GENESIS: " GO AND TILL AND KEEP THE EARTH"

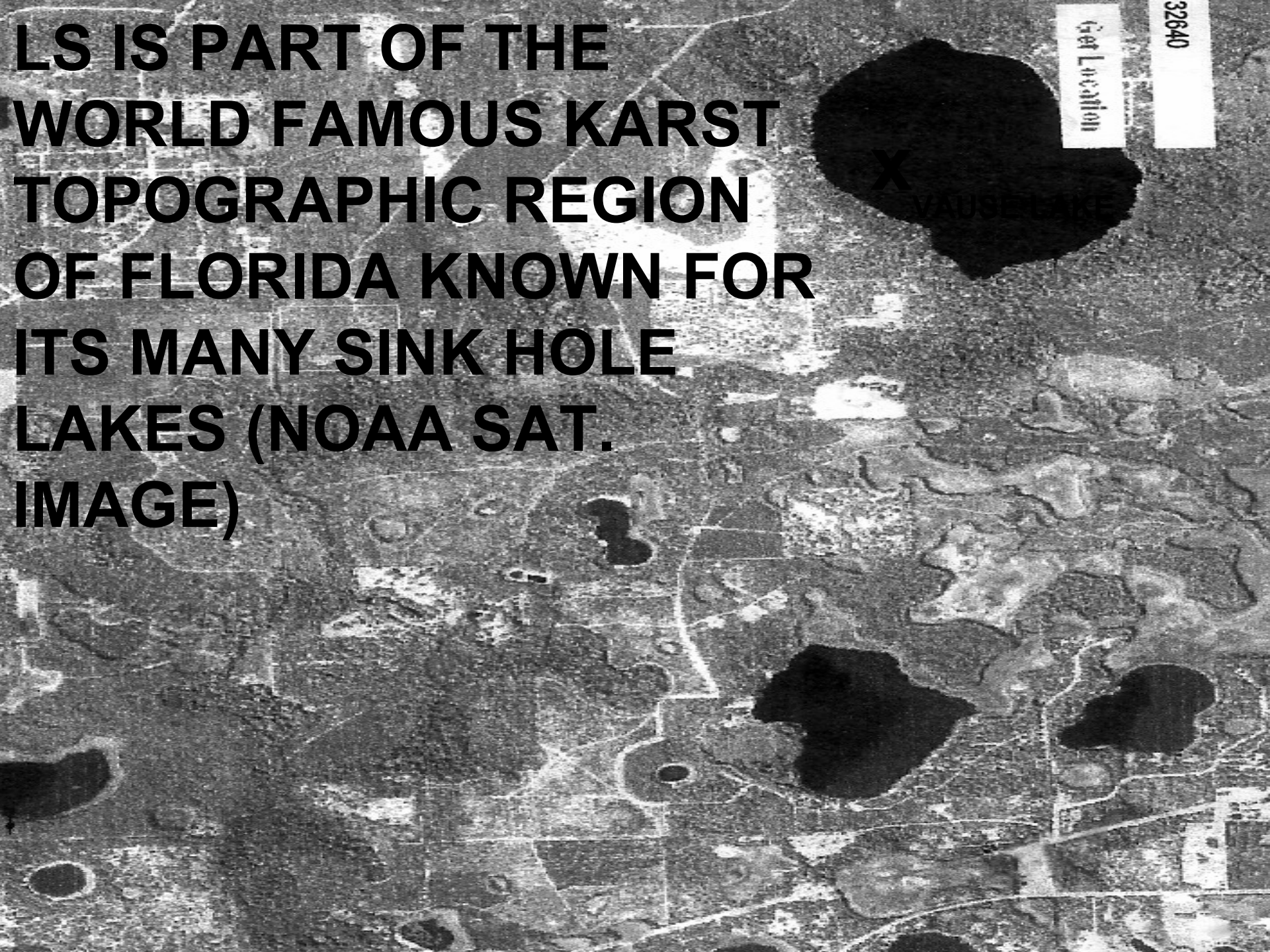
A View of Gibraltar Island Where Dr. Hauser Taught.

LS IS PART OF THE HEADWATER AREA FOR THE ST. JOHN'S RIVER WATERSHED; IT IS THE LONGEST RIVER IN FLORIDA AND IS RANKED AS ONE OF THE TOP 14 HERITAGE RIVERS IN THE U.S.

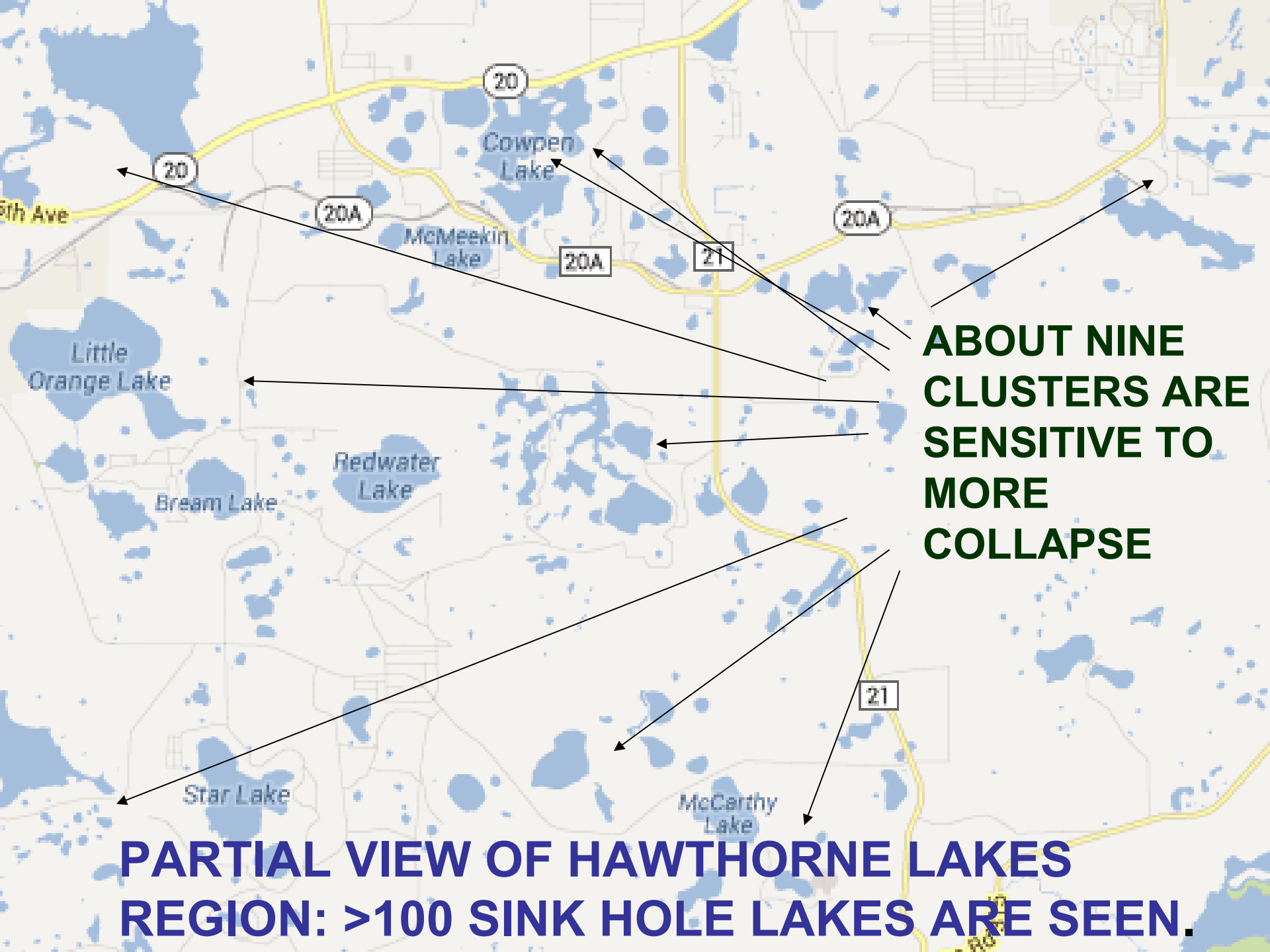

LS HAS ABOUT 170 ACRES OF UPLANDS
AND ABOUT 200 ACRES OF WETLANDS,
INCLUDING 25 ACRES OF VAUSE LAKE,
WHICH CONSISTS OF 92 ACRES.

Aerial View of Luther Springs and all GPS Mapped Points.

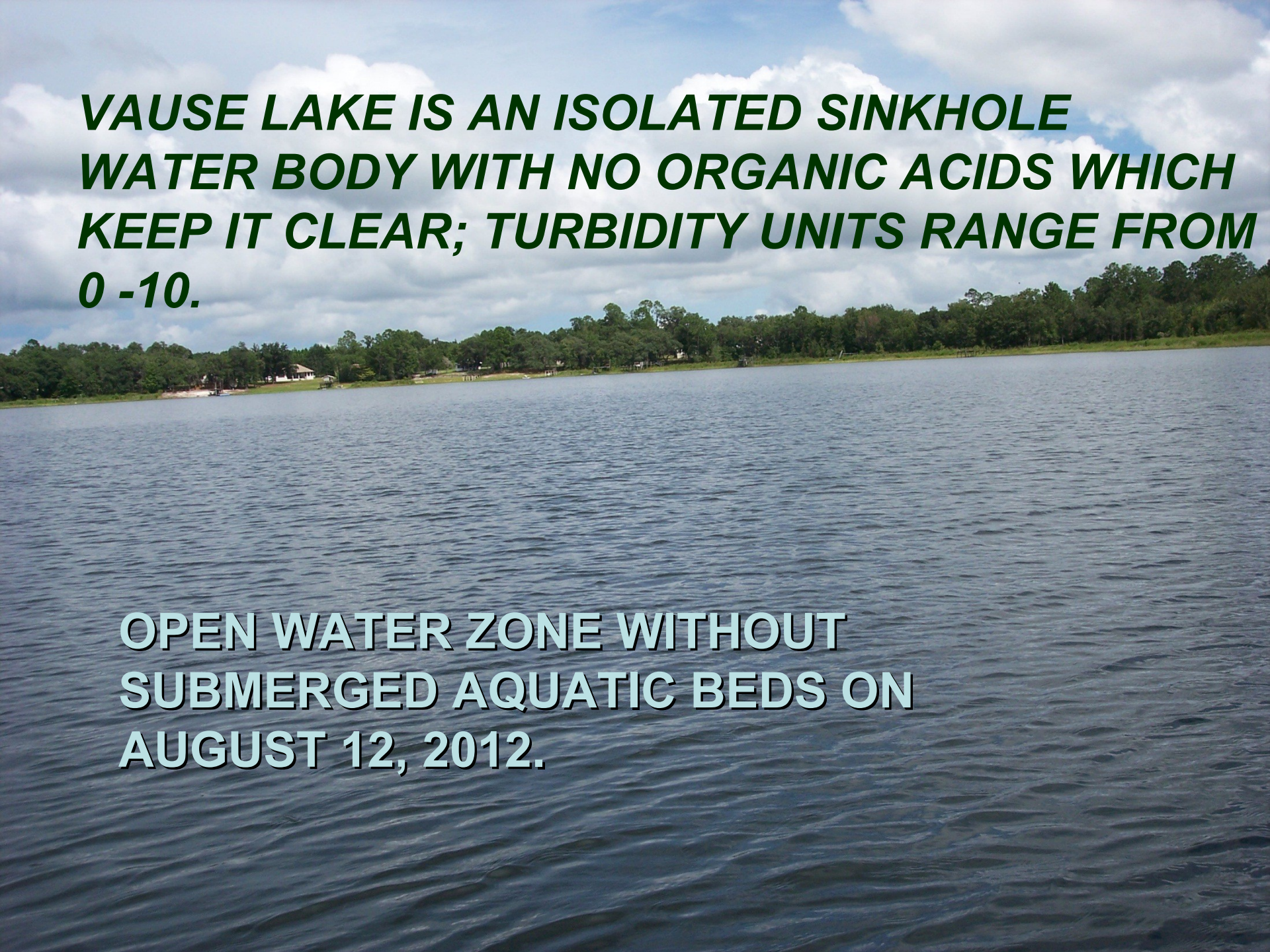




LS IS PART OF THE WORLD FAMOUS KARST TOPOGRAPHIC REGION OF FLORIDA KNOWN FOR ITS MANY SINK HOLE LAKES (NOAA SAT. IMAGE)



PARTIAL VIEW OF HAWTHORNE LAKES REGION: >100 SINK HOLE LAKES ARE SEEN.


VAUSE LAKE IS AN ISOLATED SINKHOLE WATER BODY WITH NO ORGANIC ACIDS WHICH KEEP IT CLEAR; TURBIDITY UNITS RANGE FROM 0 -10.
OPEN WATER ZONE WITHOUT SUBMERGED AQUATIC BEDS ON AUGUST 12, 2012.

OVERVIEW OF NITROGEN – PHOSPHOROUS CYCLE :

N + P > PLANT BIOMASS > ANIMAL BIOMASS

BIOMASS FORMS A DEAD ORGANIC POOL

BACTERIA (DECOMPOSERS) DIGEST THE DEAD ORGANIC POOL RELEASING N + P

THE CYCLE CONTINUES INDEFINITELY UNLESS N OR P ARE REMOVED

THE PERCHED WATER TABLE REPRESENTS A SPRING

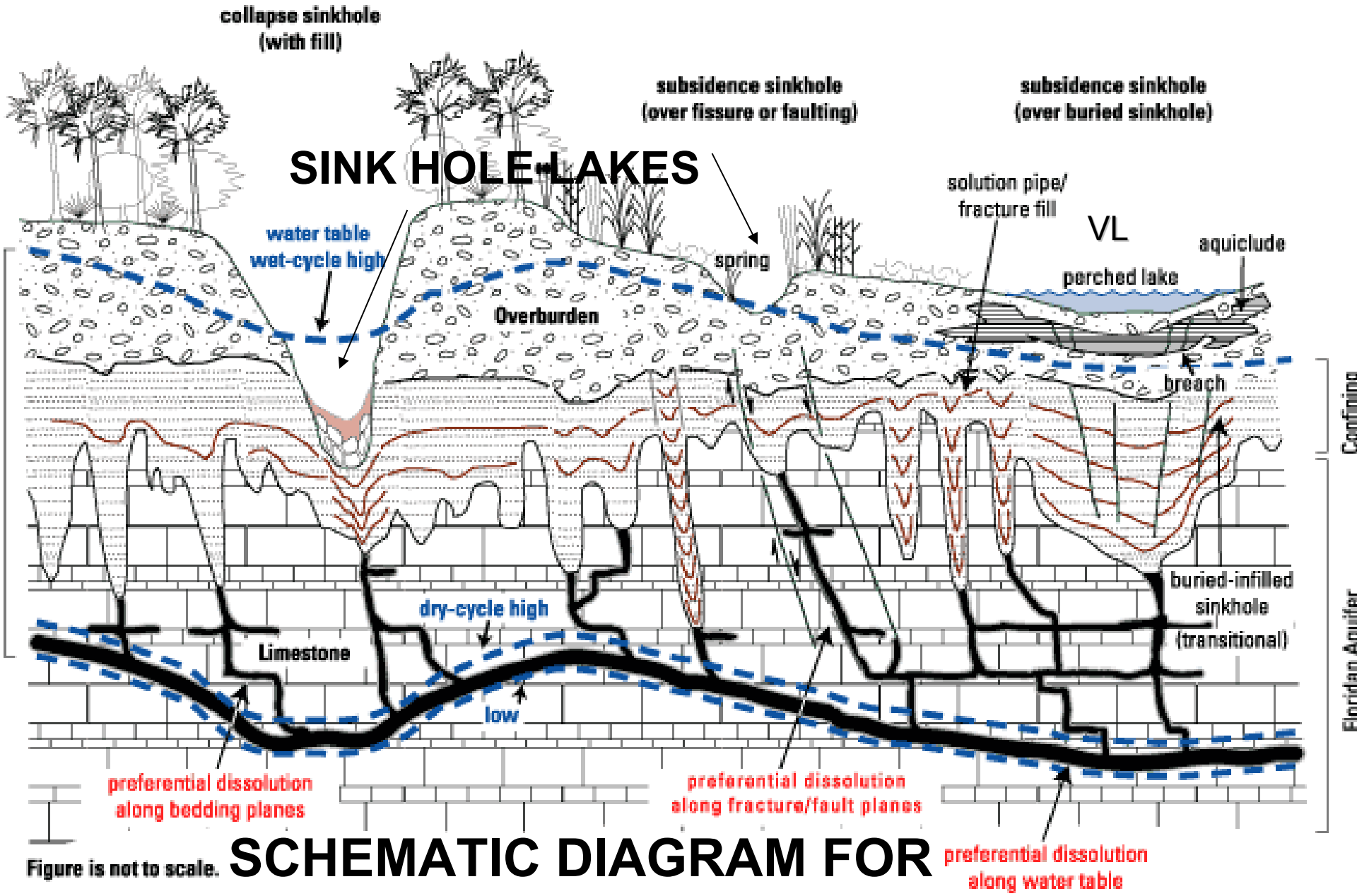
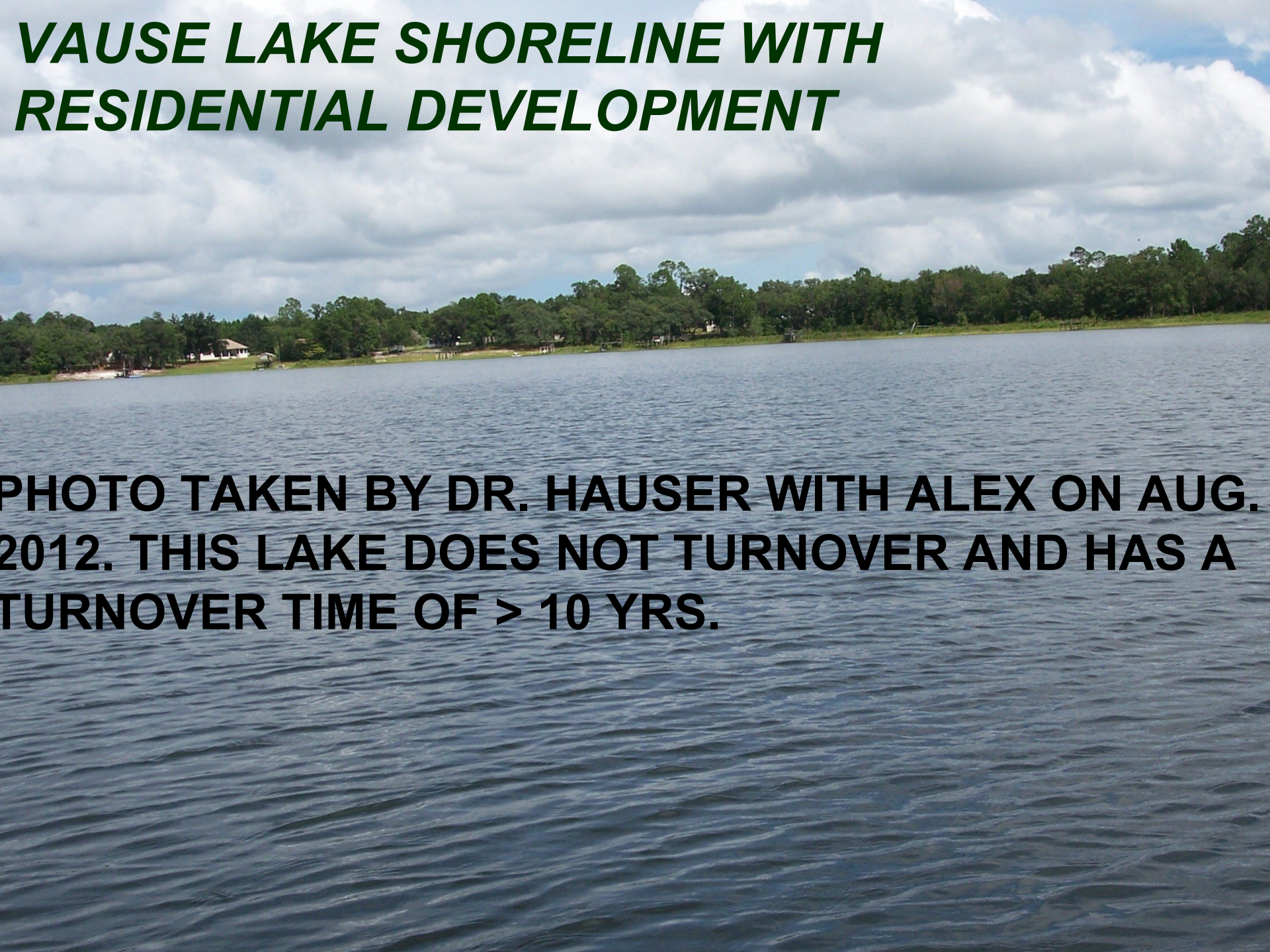


Figure is not to scale.

SCHEMATIC DIAGRAM FOR KARST TOPOGRAPHY


VAUSE LAKE SHORELINE WITH
RESIDENTIAL DEVELOPMENT
PHOTO TAKEN BY DR. HAUSER WITH ALEX ON AUG.
2012. THIS LAKE DOES NOT TURNOVER AND HAS A
TURNOVER TIME OF > 10 YRS.

39 F 55 F

WATER REACHES ITS HIGHEST DENSITY AT 39F; LAKE VAUSE DOES NOT SIGNIFICANTLY TURNOVER. THUS, THERE ARE NO SEASONAL VARIATIONS IN P OR N.

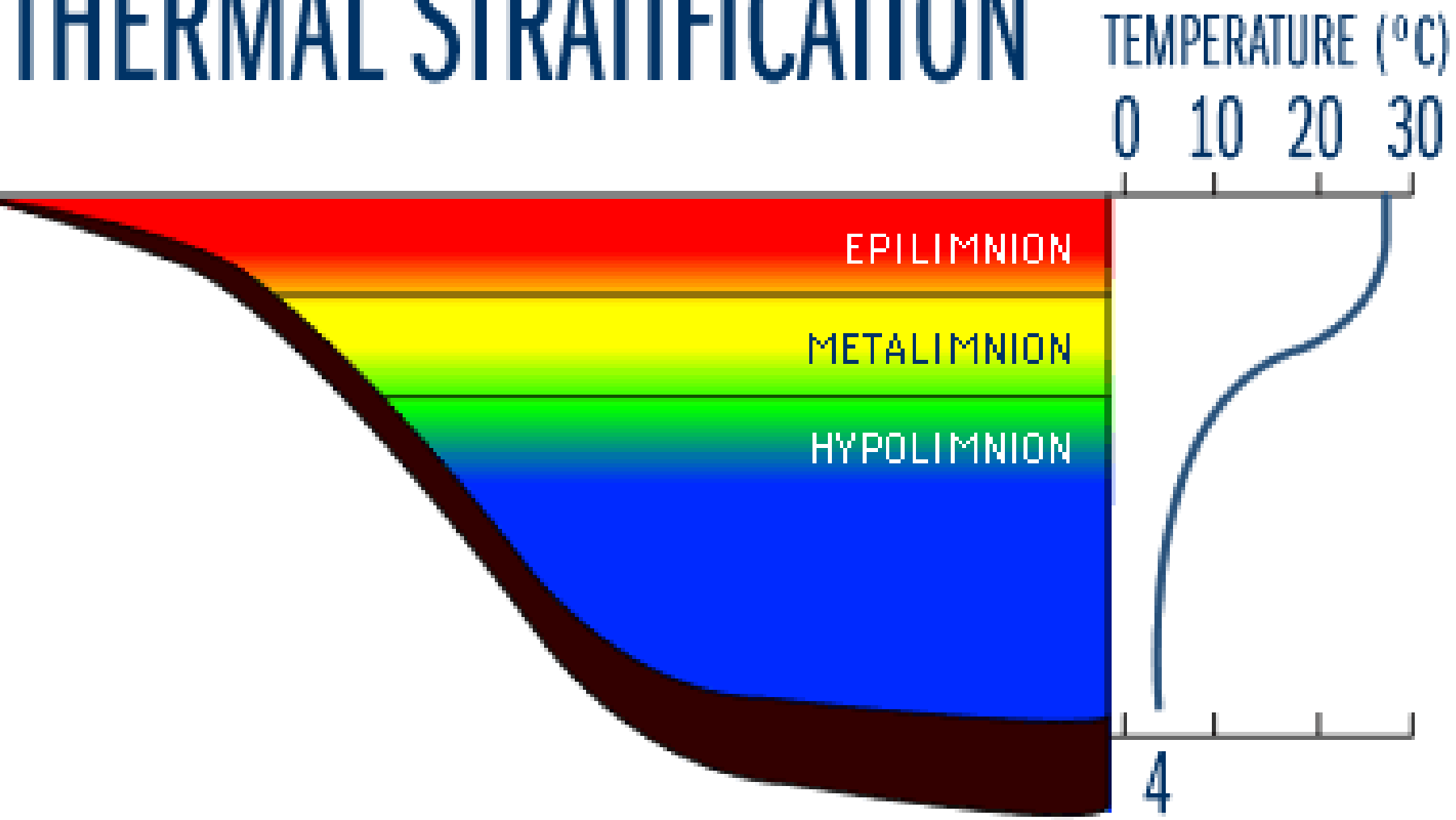
VAUSE LAKE STRATIFICATION (SUMMER – FALL)

EPILIMNION: UPPERMOST WATER ZONE @ 5’ IN DEPTH 80+DEGREES F

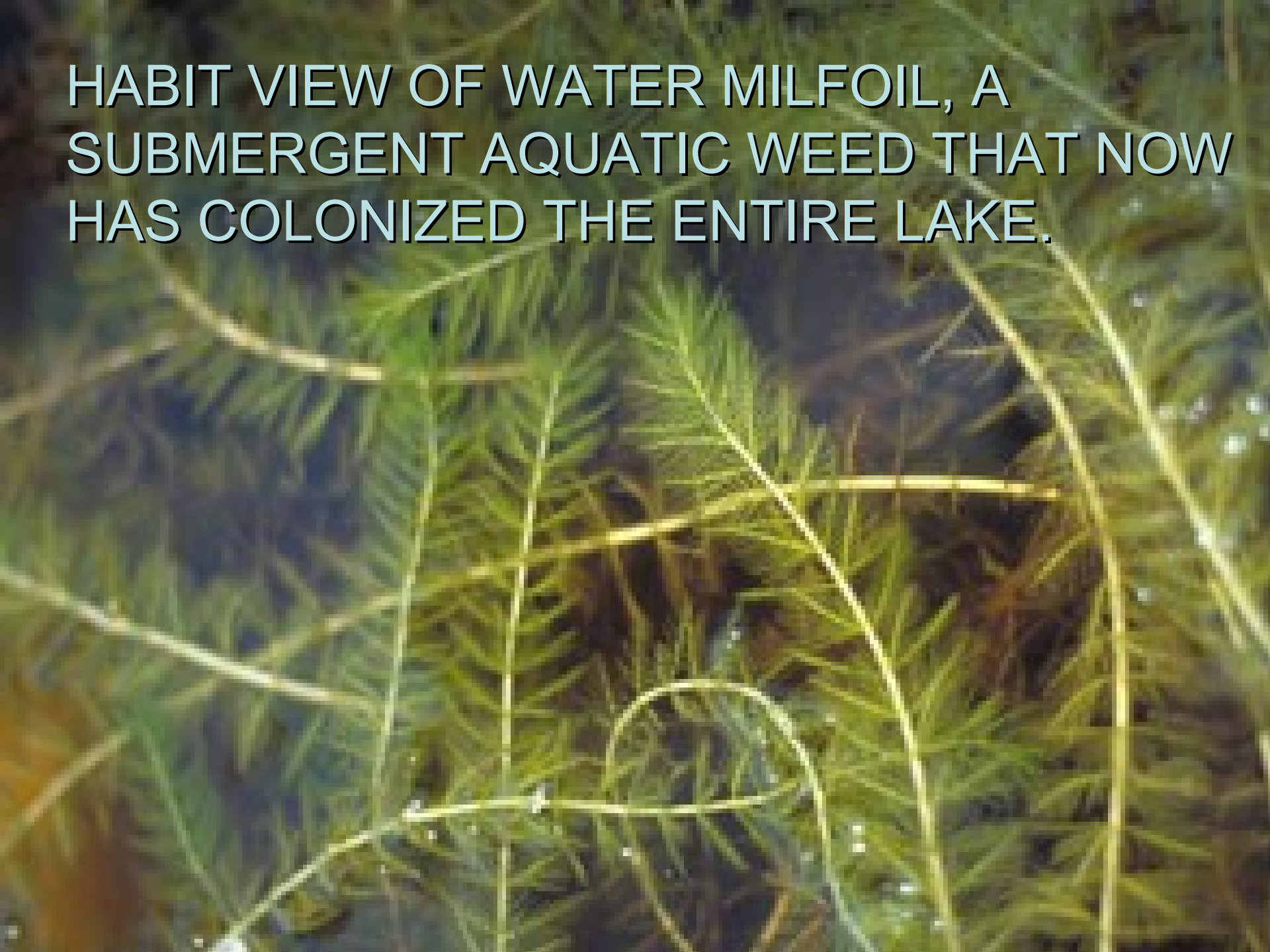
METALIMNION: A MIDDLE WATER ZONE @ 5’ -7’ IN DEPTH 75 DEGREES F

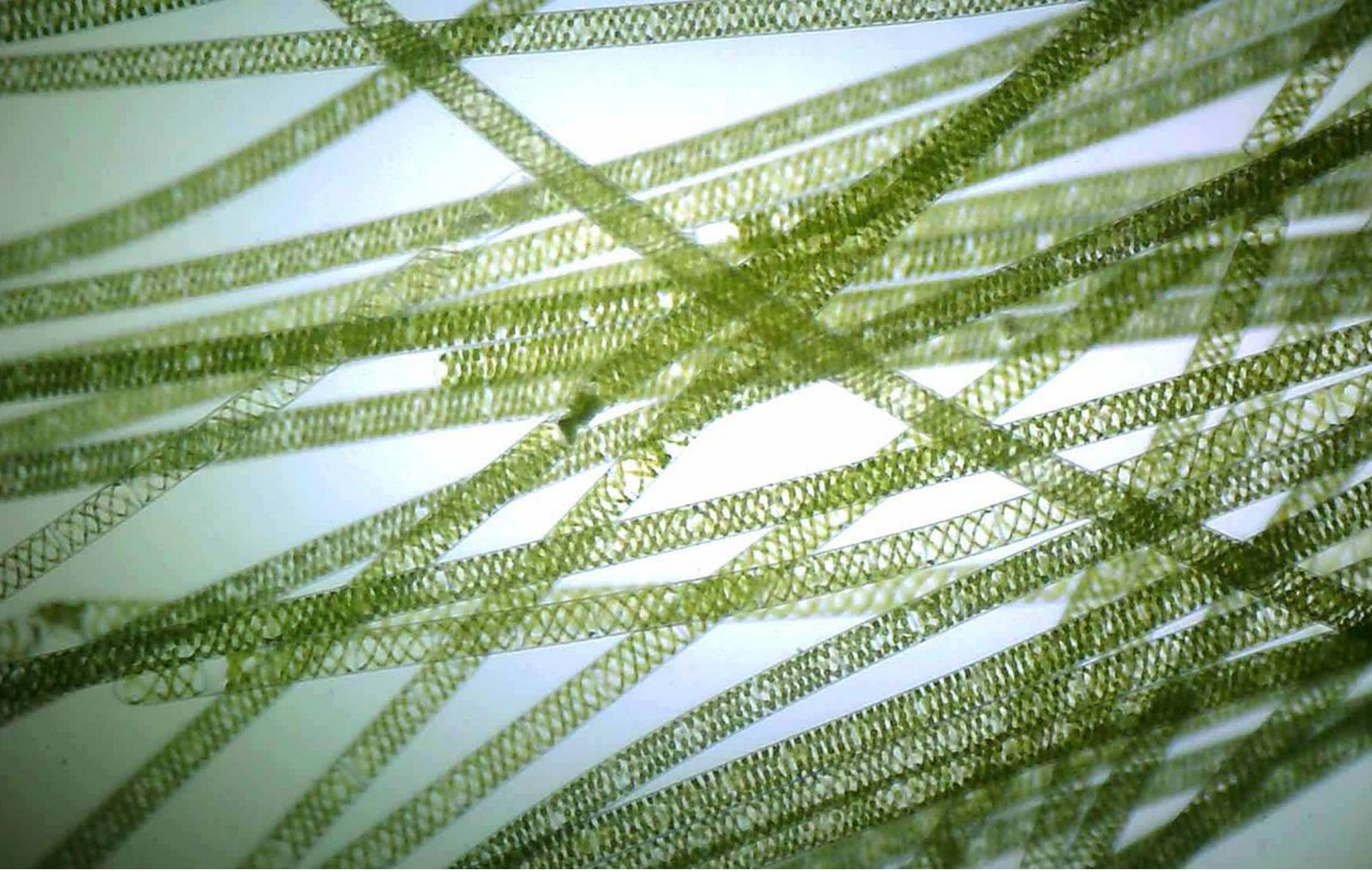
HYPOLIMNION: BOTTOM WATER ZONE @ 7’ – 70’ IN DEPTH 55 DEGREES F

THERMAL STRATIFICATION

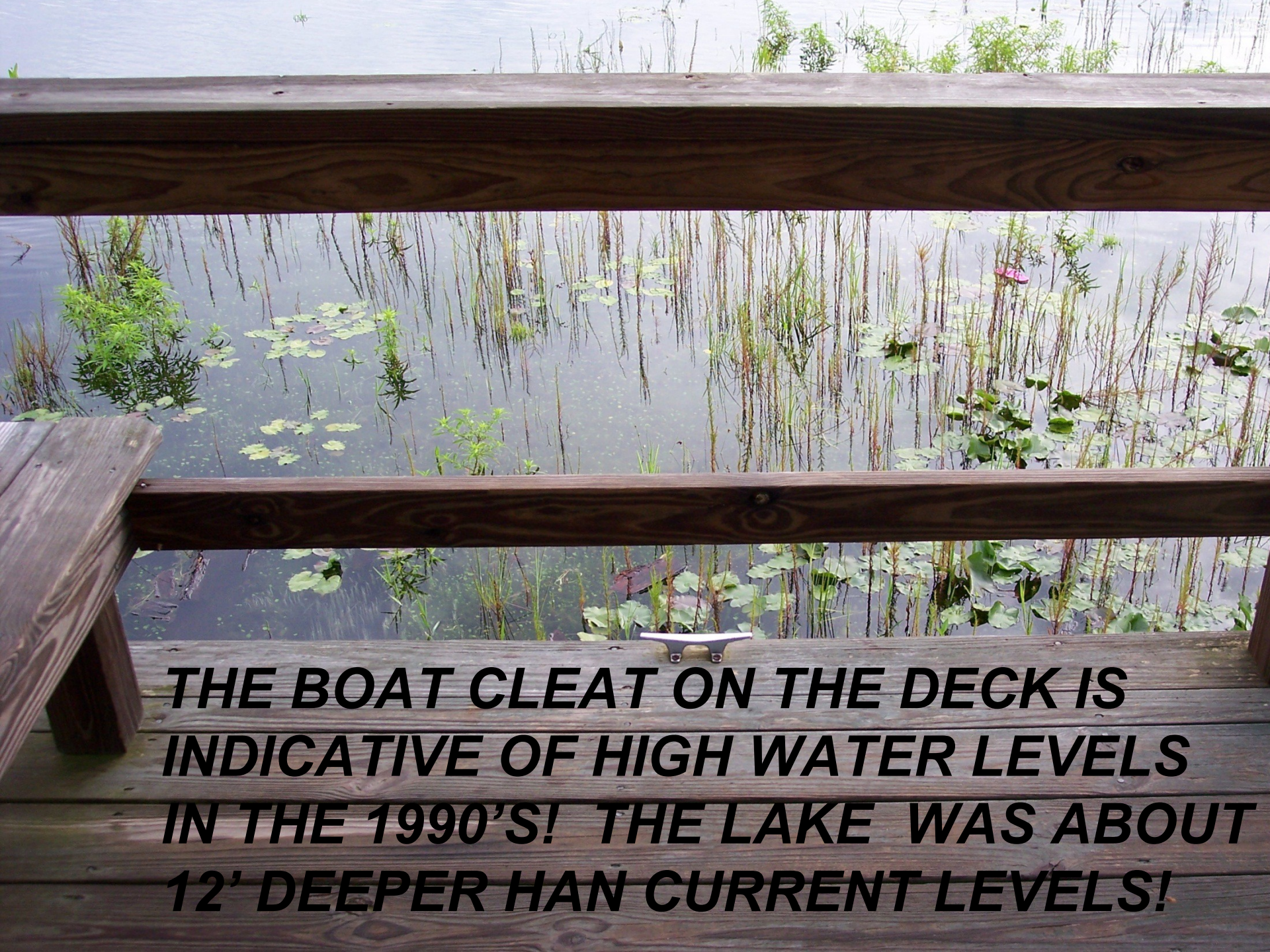


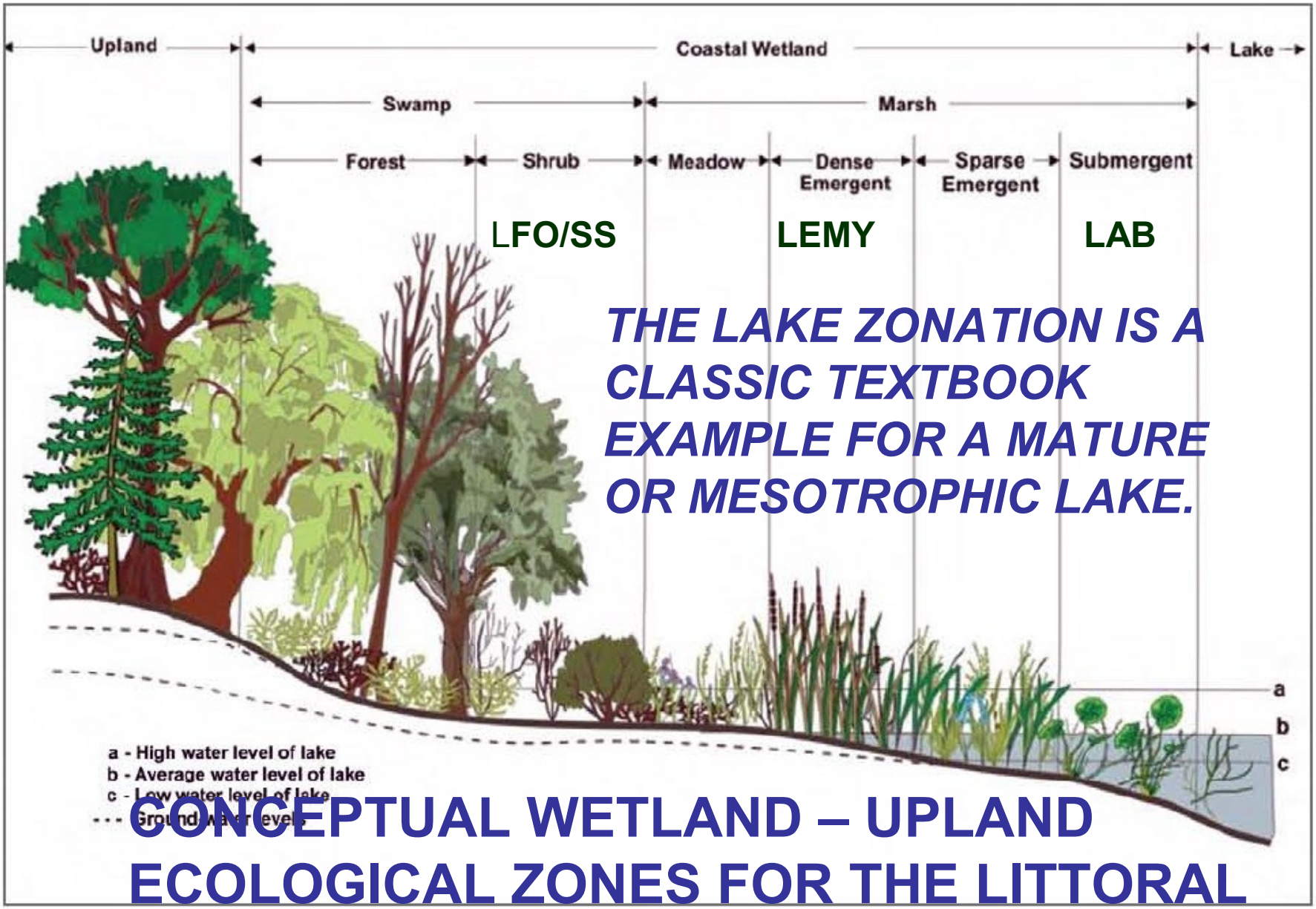

ALEX TAKING LAKE SAMPLES WITH DR. HAUSER
AUG. 22, 2012


HABIT VIEW OF WATER MILFOIL, A SUBMERGENT AQUATIC WEED THAT NOW HAS COLONIZED THE ENTIRE LAKE.



Spirogyra is a slimy filamentous green alga that is now forming dense mats in Vause Lake.


THE BOAT CLEAT ON THE DECK IS INDICATIVE OF HIGH WATER LEVELS IN THE 1990'S! THE LAKE WAS ABOUT 12' DEEPER HAN CURRENT LEVELS!



CONCEPTUAL WETLAND – UPLAND ECOLOGICAL ZONES FOR THE LITTORAL ZONE AT VAUSE LAKE


Aquatic Bed Zone

YELLOW COW LILY (NUPHUR LUTEUM) IS THE DOMINANT FLOATING AQUATIC BED SPECIES.


< LACUSTRINE EMERGENT MARSH >
(LEM)


< SWAMP FOREST>
< SHRUB
SCRUB>


LARGE MOUTH BASS IS THE DOMINANT
FISH SPECIES IN VAUSE LAKE.

LITTORAL ZONE – SIMS DOCK VICINITY AREA: NOVEMBER 5, 2014

HABIT VIEW OF BURR MARIGOLD, A MEMBER OF THE SUNFLOWER FAMILY.


DEAD BOG MOSS MATS IN OPEN WATER ON NOV. 6, 2014


VERNAL POOL
WETLAND 3 (W3) WHICH IS A SANDHILL WET PRAIRIE
AUG., 2012


A PHOTO OF WETLAND 3
WHICH WAS TAKEN ON
JANUARY 14, 2014,
SHOWING SURFACE HIGH
WATER TABLE

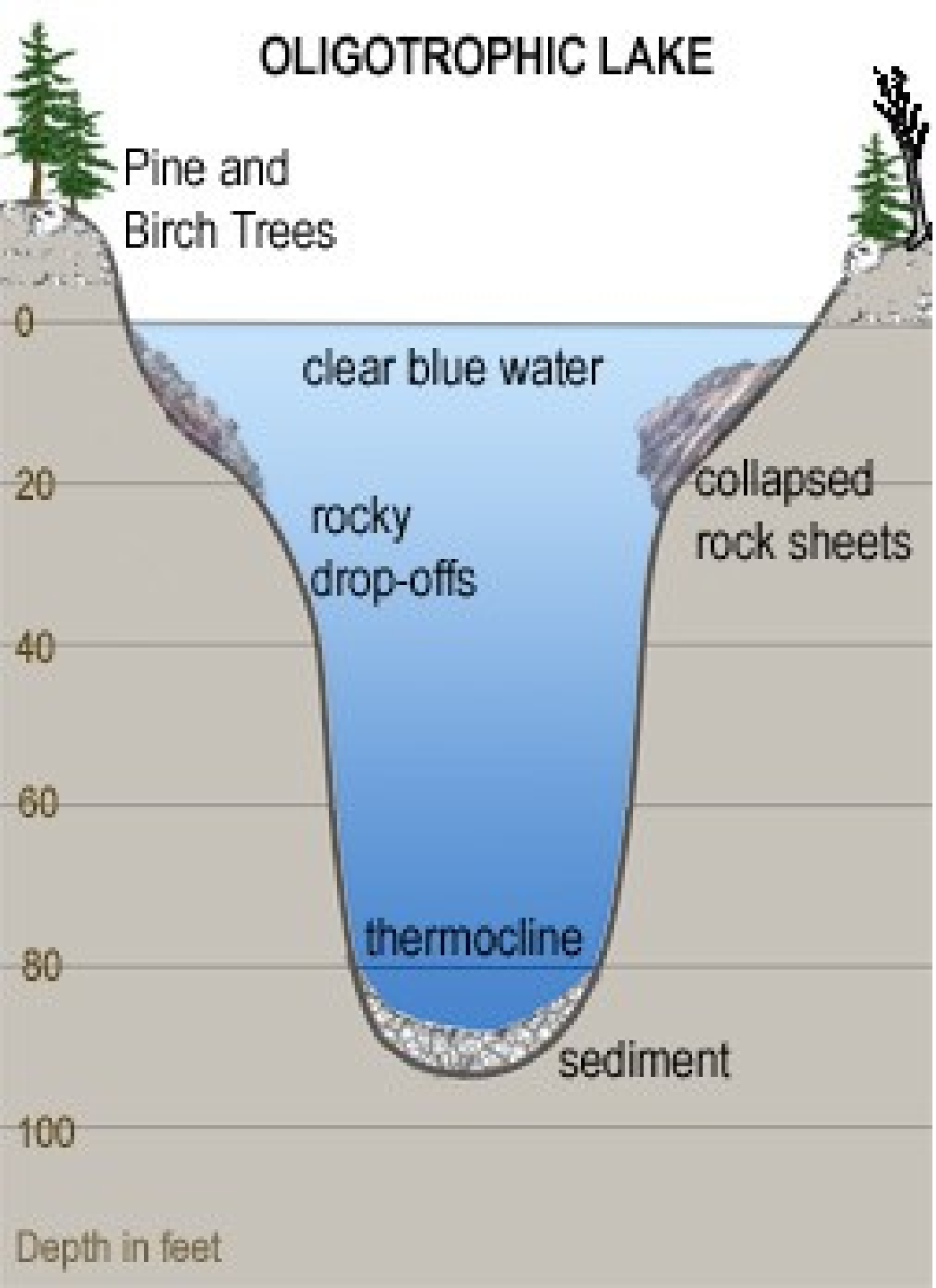

NESTING AREA FOR FLORIDA
SANDHILL CRANES AT VAUSE LAKE. NO
DEVELOPMENT OR USE SHOULD OCCUR
WITHIN 1,000' OF THIS AREA.
X

FLORIDA SANDHILL CRANES FAVOR THE SNADHILL WET PRAIRIE - WET MEADOW - MARSH HABITATS WHICH ADJOINS A SHALLOW AQUATIC BED WHERE IT CAN FEED UPON GRUBS, INSECT LRVAE, SEEDS, FRUITS, SOFT ROOTS, ETC.

IT IS AN OPPORTUNISTIC OMNIVORE.

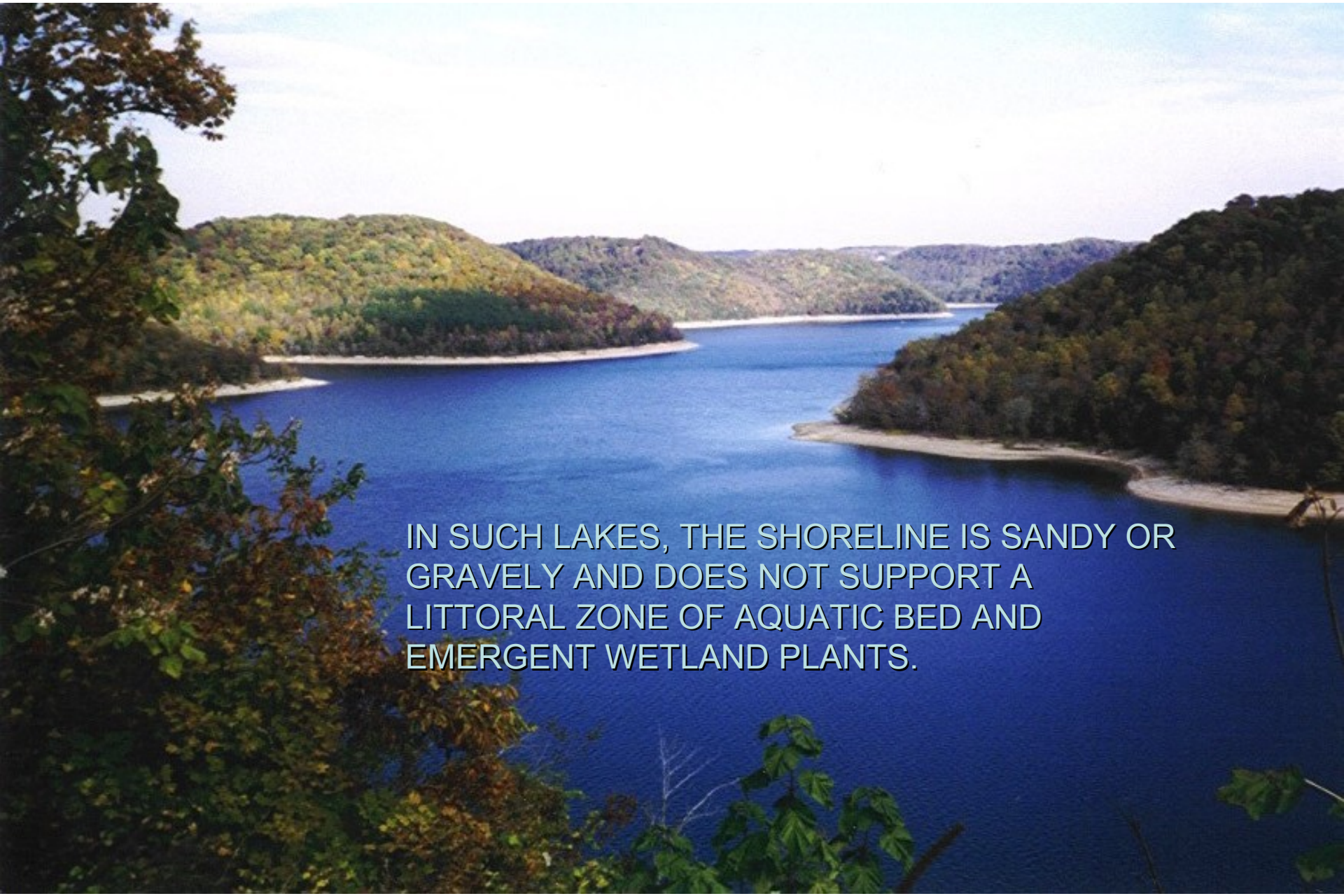
THERE ARE ONLY ABOUT 5,000 INDIVIDUALS AND ONLY 250 BREEDING PAIRS IN FLORIDA OF THIS SUBSPECIES, WHICH IS A NONMIGRATORY RESIDENT OF CENTRAL FLORIDA.

IF CURRENT TRENDS CONTINUE, VAUSE LAKE WILL BECOME A EUTROPHIC (ENRICHED) OR DYSTROPHIC LAKE.

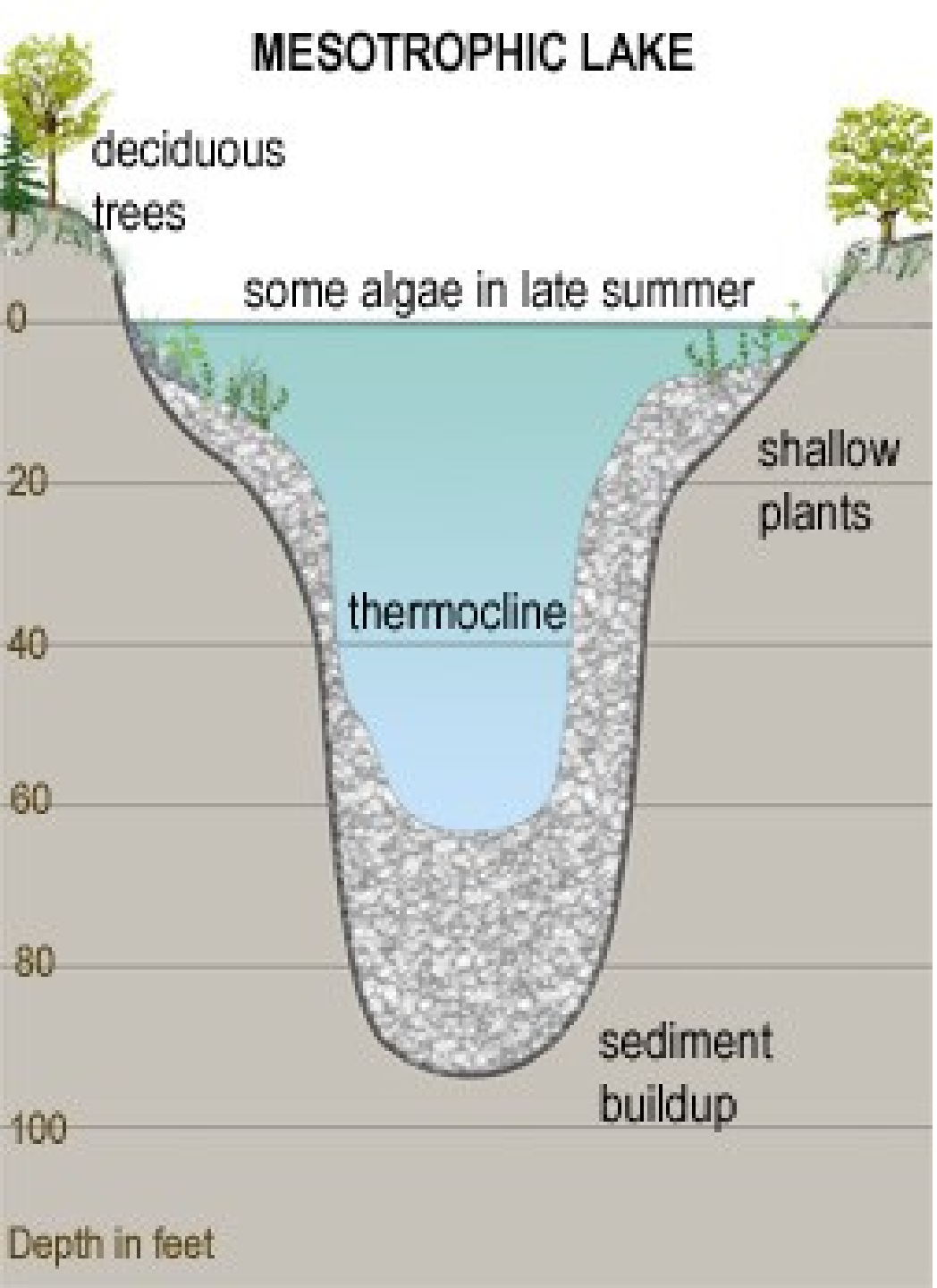


OLIGOTROPHIC LAKES ARE REFERRED TO BY GEOLOGISTS AS BEING IN A STATE OF YOUTH. THERE IS VERY LITTLE OR NO SEDIMENT ON THE BOTTOM. IN FACT, MOST HAVE SANDY, ROCKY, OR GRAVELLY BOTTOMS.

THE PREFIX OLIGO- MEANS FEW; THE ROOT –TROPHIC REFERS TO FOOD (PLANT FOODS ARE N-P-K).

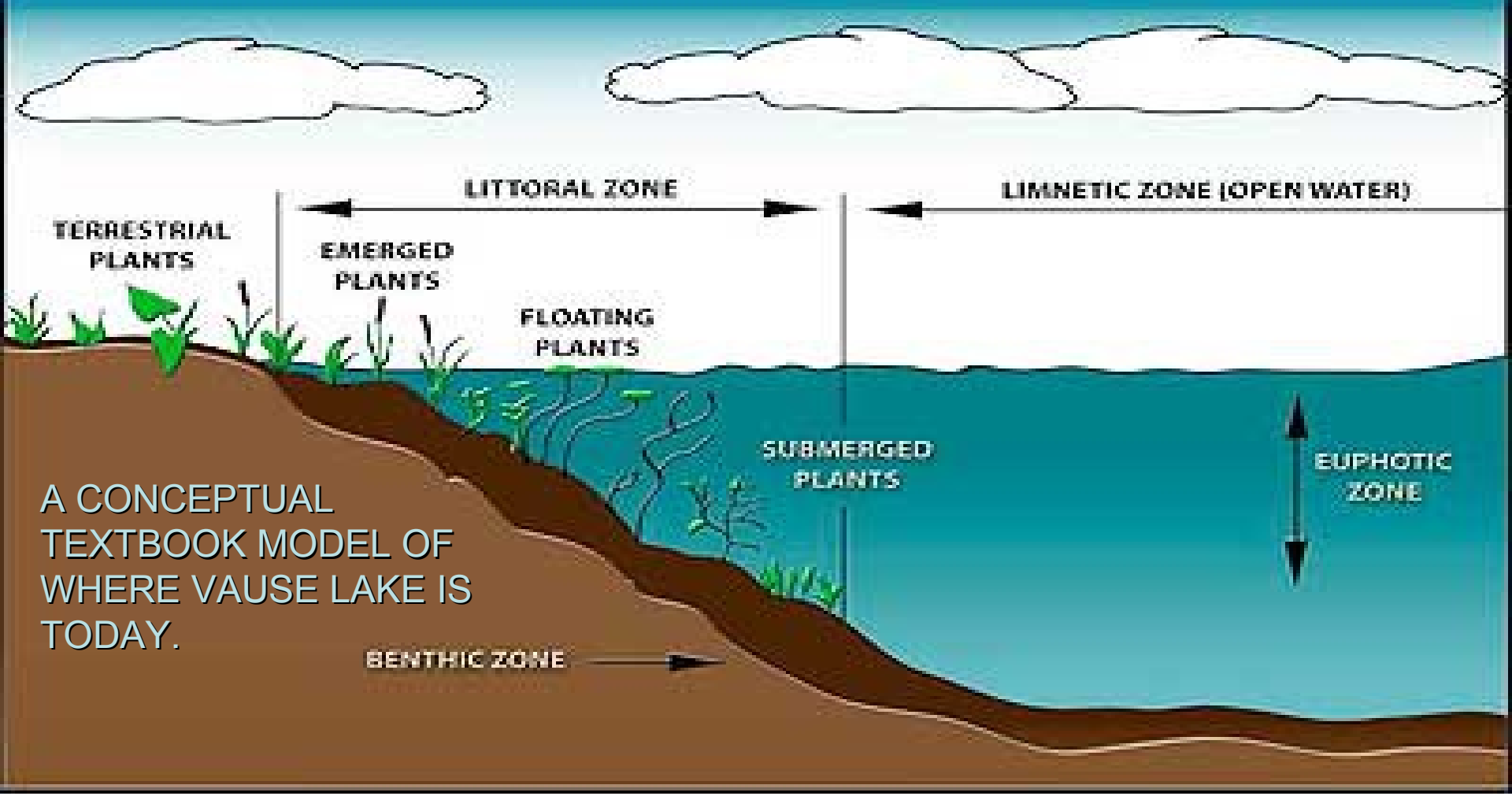


AN OLIGOTROPHIC LAKE



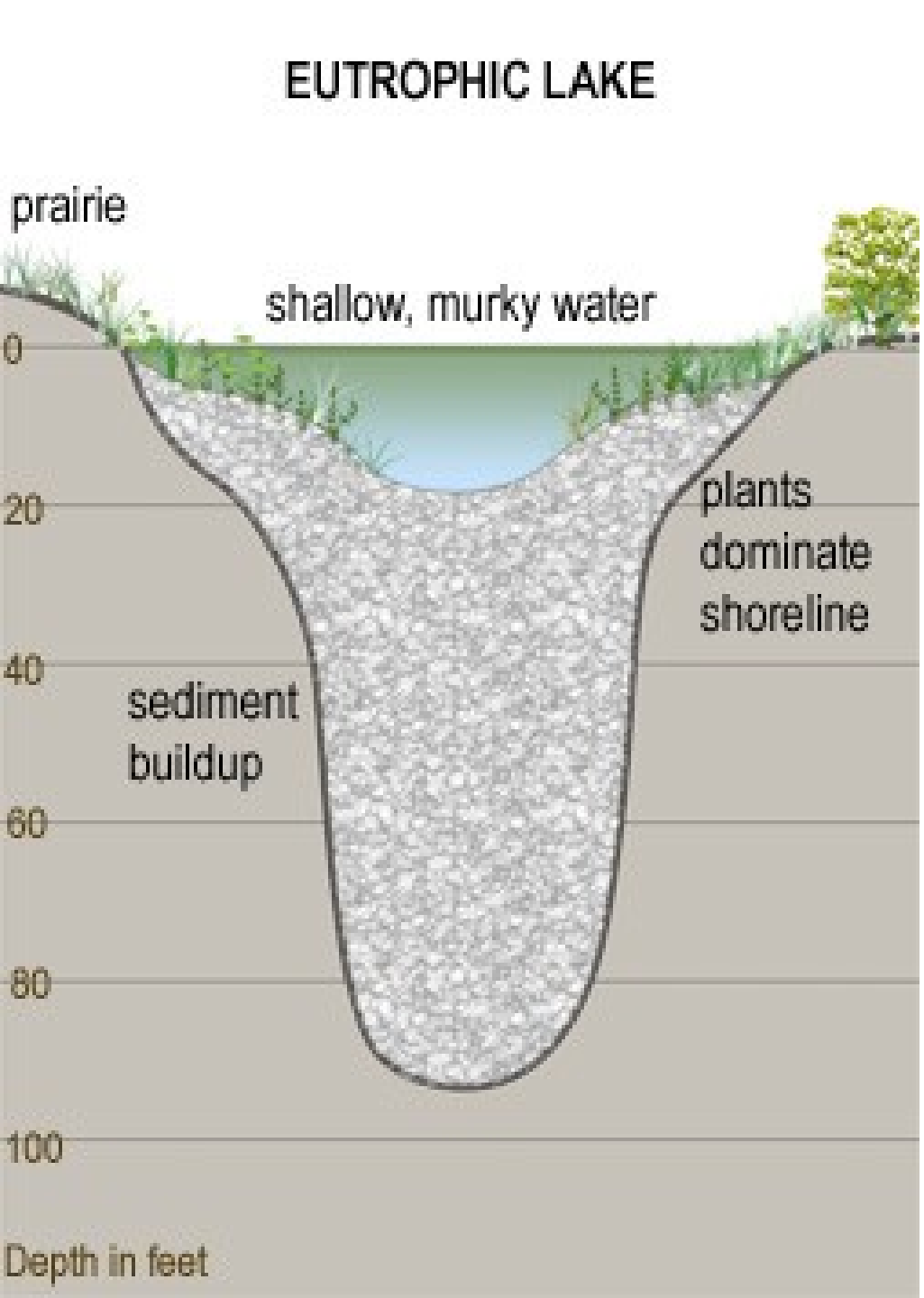
MESOTROPHIC LAKES ARE REGARDED AS BEING MATURE ONES BY GEOLOGISTS. SILTY SEDIMENTS ARE SHALLOW – BUT THEY ARE DEPOSITED ACROSS THE ENTIRE LAKE BOTTOM.

THE PREFIX MESO- MEANS THERE ARE MIDDLE LEVELS OF N-P-K



A CONCEPTUAL TEXTBOOK MODEL OF WHERE VAUSE LAKE IS TODAY.

A MESOTROPHIC LAKE HAS A SHALLOW CONTINUOUS LAYER OF BOTTOM SEDIMENTS; IT HAS MIDDLE LEVELS OF PLANT NUTRIENTS SUCH AS N, P, AND K. IT IS SLIGHTLY ENRICHED. IT SUPPORTS PAN FISH AND SALMONIDS.



EUTROPHIC LAKES ARE SAID TO BE IN OLD AGE BY GEOLOGISTS. SILTY SEDIMENTS HAVE NOW FILLED IN > 90% OF THE LAKE BASIN.

THE PREFIX EU- MEANS OPTIMUM OR HIGH LEVELS OF N-P-K ARE NOW AVAIABLE. THESE ARE VERY PRODUCTIVE LAKES AND SUPPORT HIGH BIOMASS LEVELS.


A MARSH WETLAND OFF OF A
FINGER OF A EUTROPHIC LAKE

A MARGIN OF A EUTROPHIC LAKE WITH WELL DEFINED PLANT ZONES.

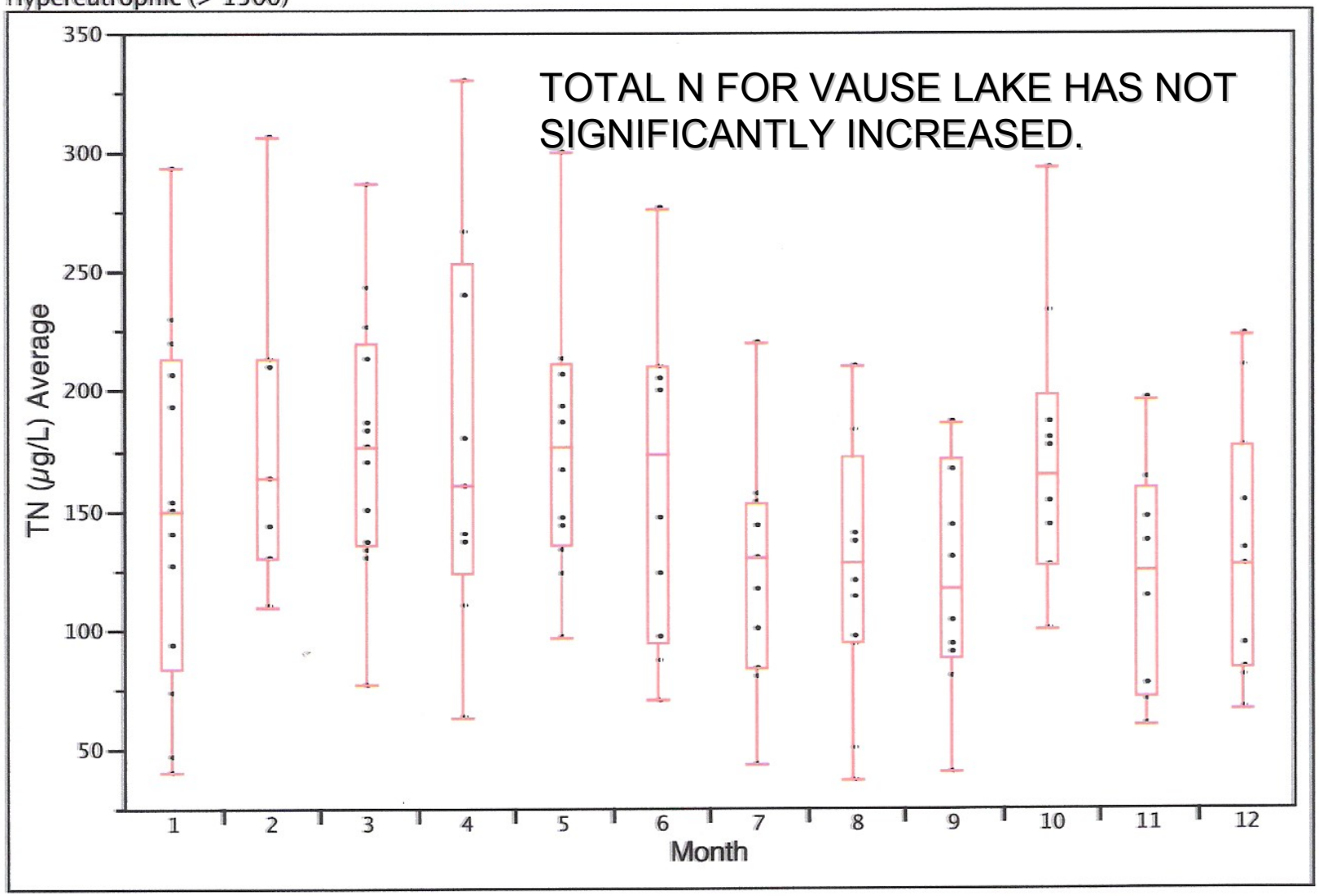
ECOLOGICAL SUCCESSION IS THE NATURAL ECOLOGICAL PROCESS BY WHICH ONE TYPE OF ECOSYSTEM IS REPLACED BY ANOTHER. IT IS NOT REVERSIBLE UNLESS THERE IS MAJOR INTERVENTION. ONE CAN SLOW THE OVERALL PROCESS WITH ENVIRONMENTAL INTERVENTION.

NORMALLY, THE PROCESS OCCURS ON AN EVOLUTIONARY SCALE (LONG TERM); IT CAN BE ACCELERATED (REVOLUTIONARY OR SHORT TERM) BY SIGNIFICANT INCREASES IN N AND P.

LAKE > MARSH > WET MEADOW > SHRUB SWAMP > SWAMP FOREST > UPLAND FOREST

Putnam: Fanny TN (µg/L) Seasonal Trend

TN (µg/L) : Oligotrophic (<400) Mesotrophic (400–600) Eutrophic (600–1500) Hypereutrophic (> 1500)

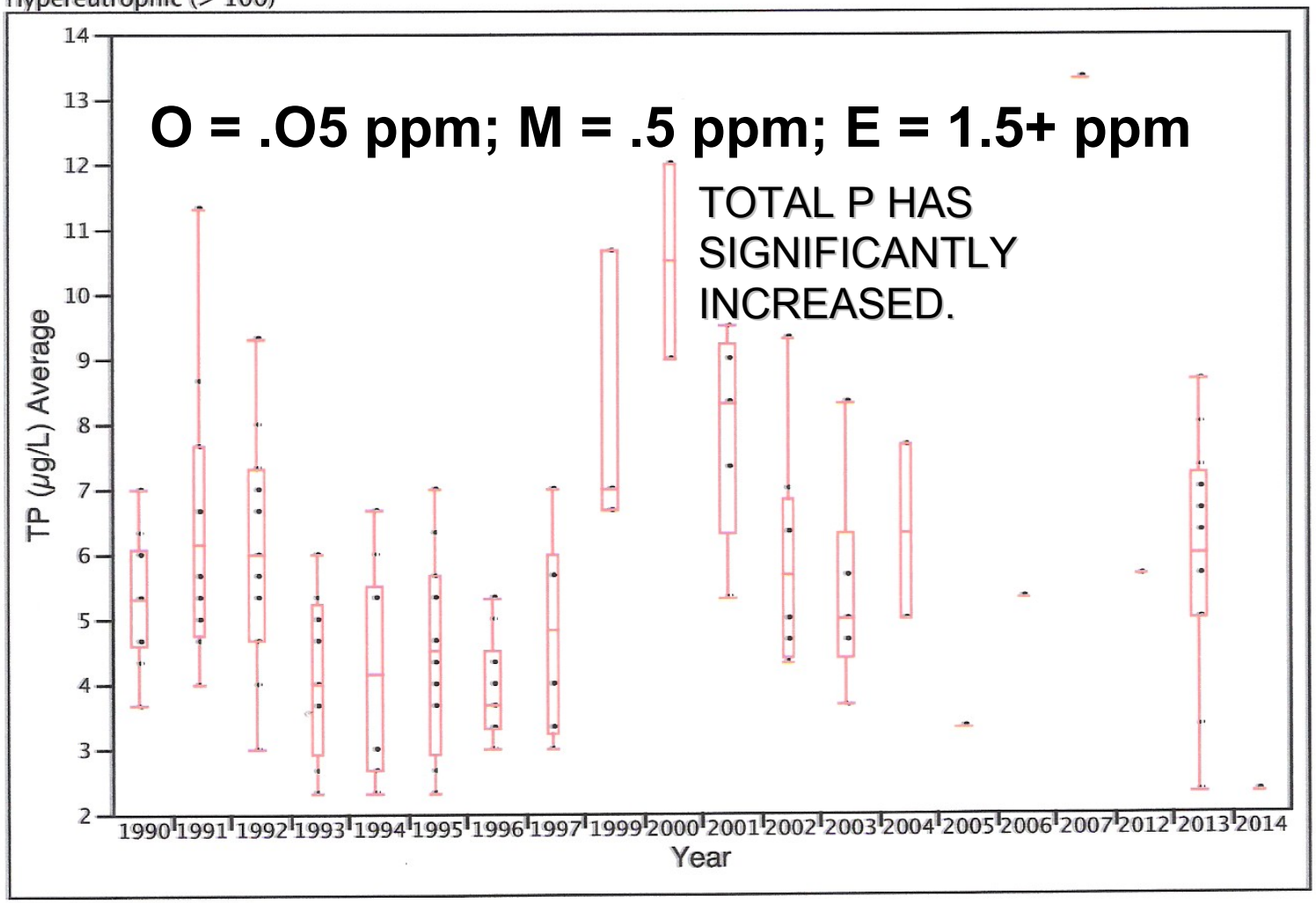


Missing Rows 2

Quantiles

Putnam: Fanny TP (µg/L) Temporal Trend

TP (µg/L) : Oligotrophic (<15) Mesotrophic (15–25) Eutrophic (25–100) Hypereutrophic (> 100)



Missing Rows 2

Quantiles

N:P RATIOS FOR LAKES:

O = 35: 1

M = 18:1

E = 9:1

VAUSE LAKE = 1:18.2 = M

(BASED ON 20 YR. MEDIAN – FLORIDA LAKE WATCH DATA)

VAUSE LAKE - LUTHER SPRINGS LOG DATA LITTORAL ZONE (50' – 300') NOV. 5, 2014

GPS	TEMP.	SD	DEPTH	OBSERVATIONS
213	26.9	2.5 m	2.5 m	Submerged aqutic bed cover 100% at the surface, 50' offshore.
214	23.9	3.5 m	3.5 m	Submerged aquatic bed cover > 90% at the surface, 100' offshore.
215	22.1	2.5 m	3.0 m	Submerged aquatic bed cover > 90% at the surface, 300' offshore.

AVG. TEMP. = 24.30 C = 75.7 F
AVG. SD = 3.0 m = 9.84'
AVG. DEPTH = 3.0 m = 9.84'

VAUSE LAKE - LUTHER SPRINGS LOG DATA OW ZONE: NOV. 5, 2014

GPS	TEMP.	SD	DEPTH	OBSERVATIONS
216	22.4	3.5 m	3.5 m	Submerged aqutic bed cover > 90% at the bottom.
217	22.7	3.5 m	3.5 m	Submerged aqutic bed cover > 90% at the bottom.
218	24.3	3.0 m	3.5 m	Submerged aqutic bed cover > 90% at the bottom.
219	22.9	4.5 m	4.5 m	Submerged aqutic bed cover > 90% at the bottom.
220	22.3	4.75 m	4.75 m	Submerged aqutic bed cover > 90% at the bottom.

AVG. TEMP. = 23.4 C = 74.19 F

AVG. SD = 3.85 m = 12.63’ (SD = secchi disk reading)

DEPTH = 3.85 m = 12.63’

Bog Moss is a native species that now forms huge mats. It is the primary nuisance species at Vause Lake.

VAUSE LAKE - LUTHER SPRINGS LOG DATA FOR pH: NOV. 5, 2014

W3 Wetland shallow water at periphery……. 4.6

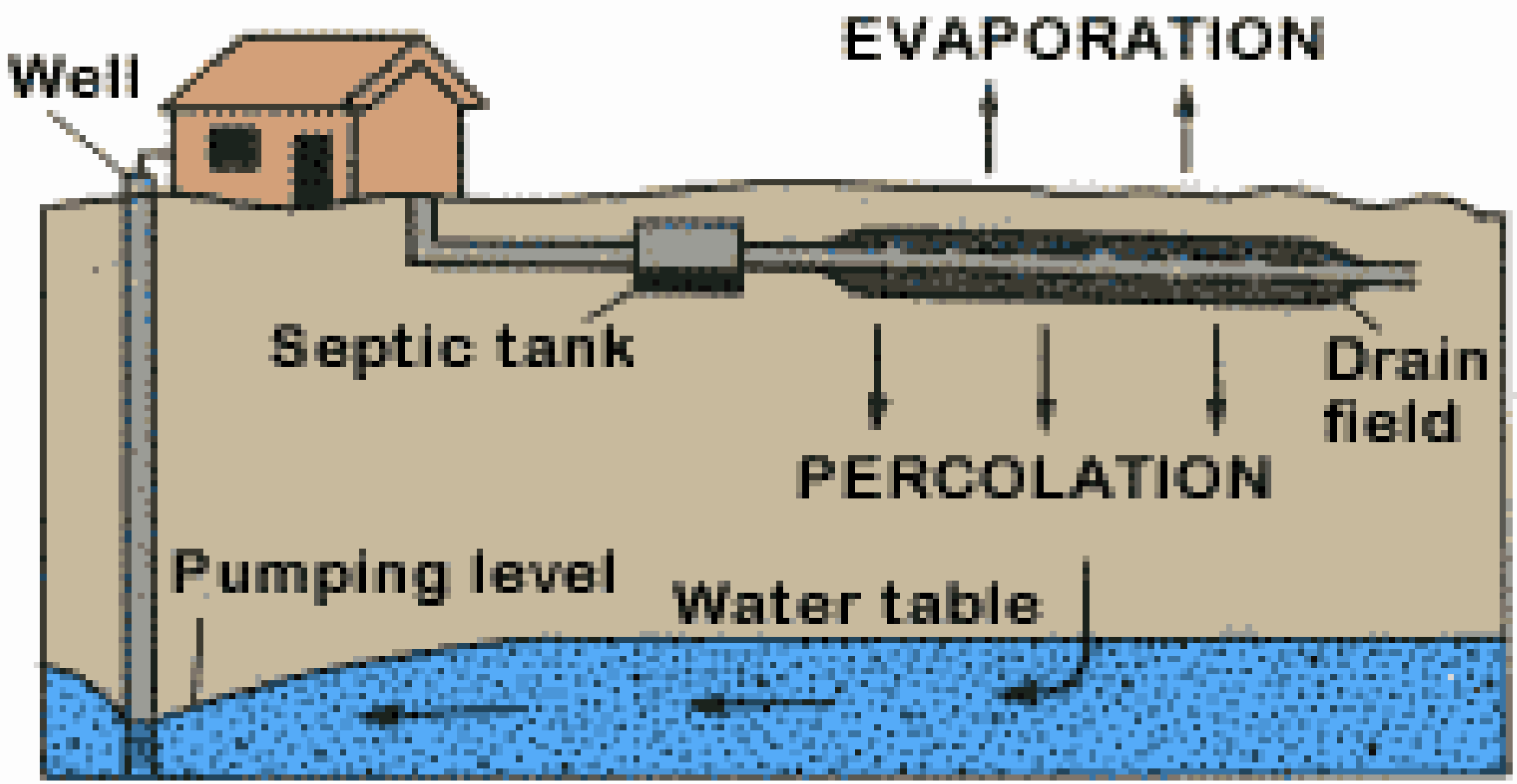
Littoral zone at the boat dock area …….. 4.7

Lake sample 300’ offshore edge of bog moss mats ……. 4.5

Lake open water midpoint from plankton net sampler ….. 4.1

Average pH = 4.5 (very acid)

This pH is in the range of a bog which could explain the dominance of the bog moss beds.



How septic effluent percolates to the water table.

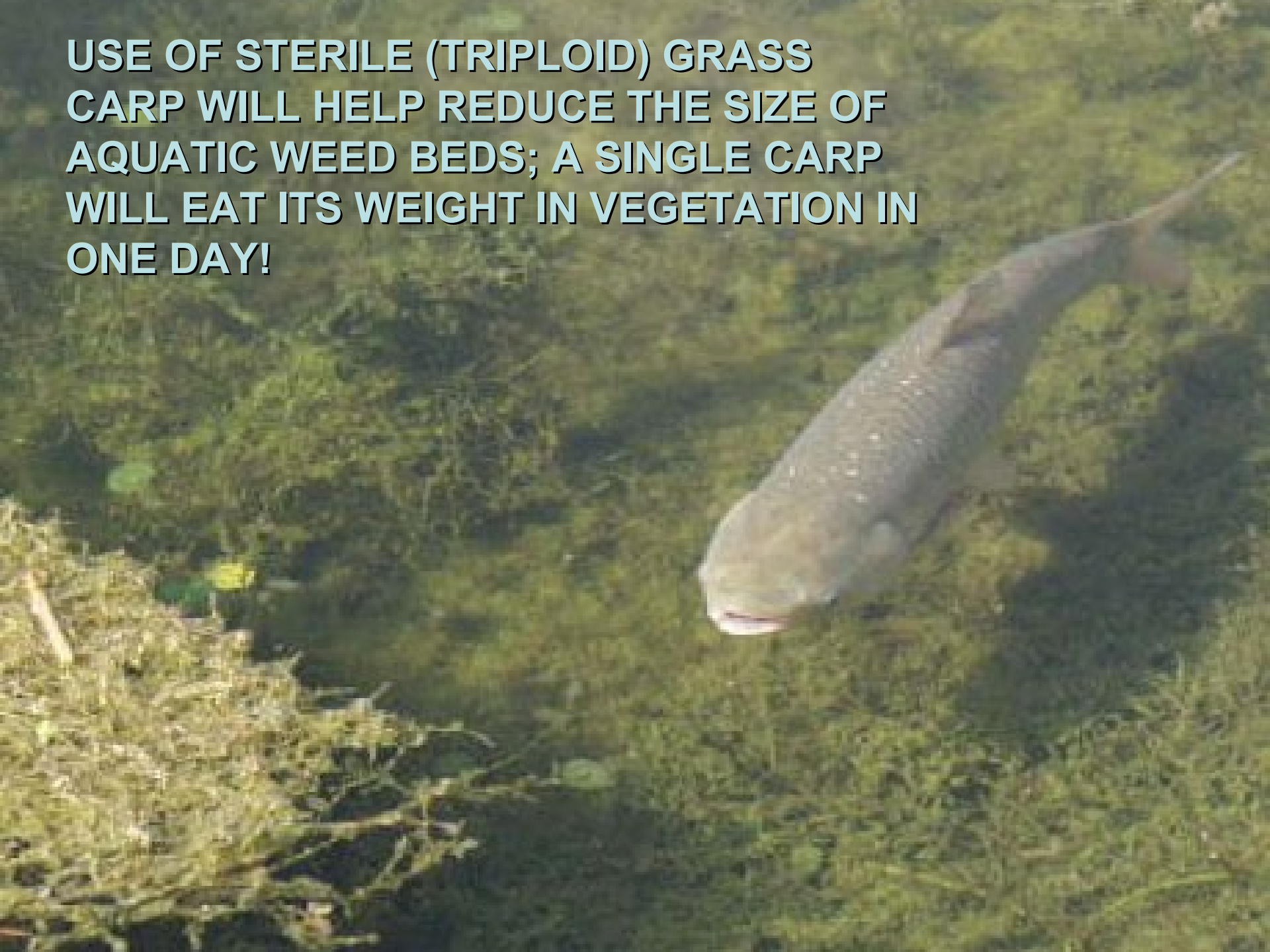
AT VAUSE LAKE, THE SURROUNDING WATER TABLE IS SANDY WITH A PERCOLATION OF > 6”/HR. SEPTIC LEACHATE IS A PRIMARY SOURCE OF P.

GRASS CLIPPINGS AND FERTILIZERS MAY BE SOURCES OF P IN A LAKE.


LEAVES MAY BE SOURCES OF P.

Non-point Sources of P Enrichment

- Atmospheric Deposition (Water Cycle)
- Atmospheric Deposition (Sand and P Mining in LS Vicinity Area)
- Terrestrial Ecosystem Release (Decayed Organics)
- Fecal Deposition from Birds, Mammals, and Reptiles that may Feed or Use the Lake


USE OF STERILE (TRIPLOID) GRASS CARP WILL HELP REDUCE THE SIZE OF AQUATIC WEED BEDS; A SINGLE CARP WILL EAT ITS WEIGHT IN VEGETATION IN ONE DAY!

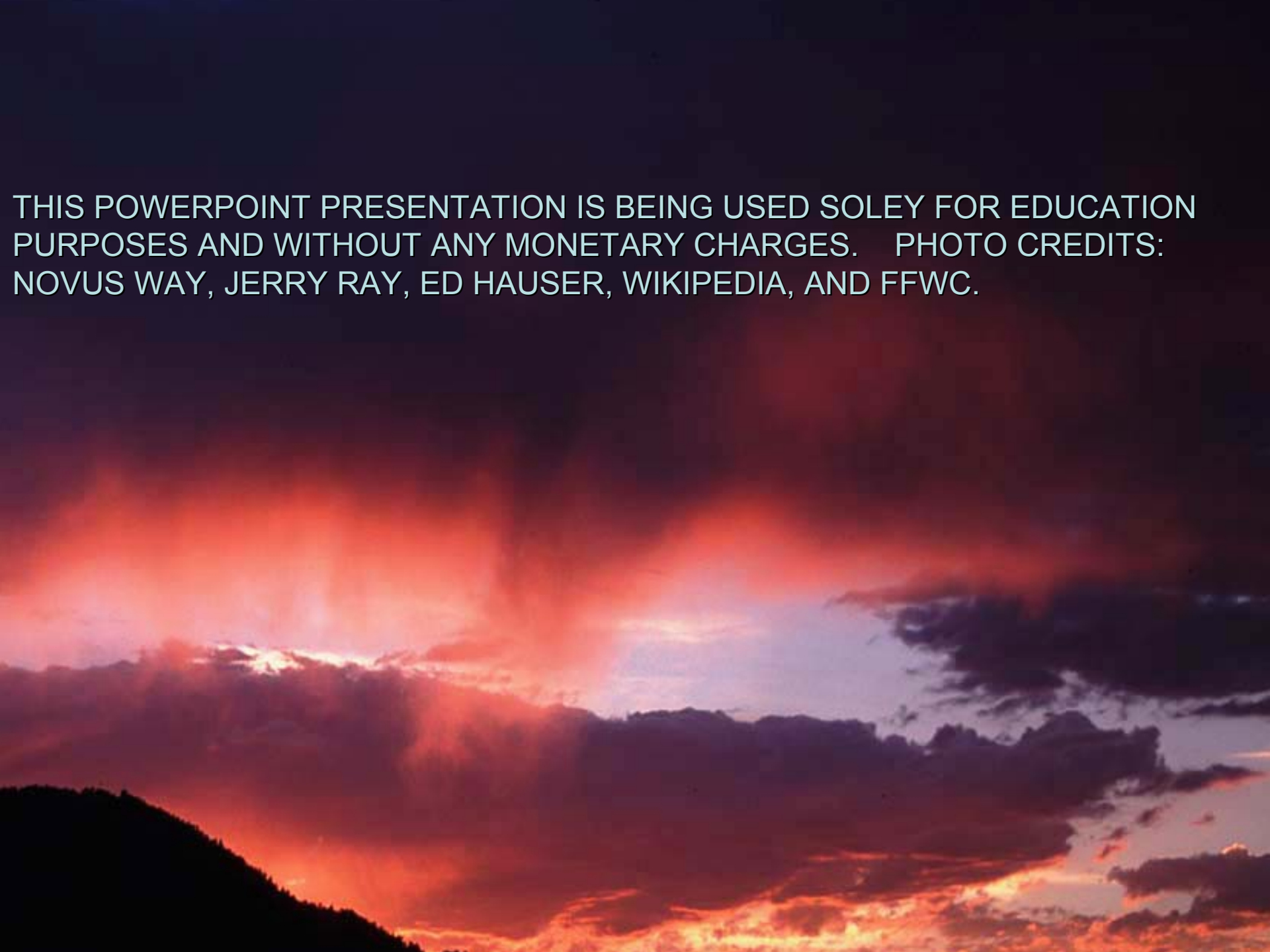
- PESTICIDE (BIODEGRADABLE HERBICIDE CONTROLS) MAY BE NEEDED TO FURTHER REDUCE THE POPULATION OF NUISANCE AQUATIC WEED BEDS. STOCK CARP IN WINTER; USE HERBICIDES IN EARLY SUMMER.

CONCLUSIONS

- VAUSE LAKE IS MESOTROPHIC (MATURE); IT IS VERY SENSITIVE TO ENRICHMENT; THE TURNOVER TIME IS PROBABLY 5-10 YEARS

- TRIPLOLID CARP CAN HELP REDUCE AQUATIC WEED BEDS.
- HERBICIDE USE MAY BE NEEDED.

- SOURCES OF ENRICHMENT FOR N AND P NEED TO BE DETERMINED AND MITIGATED.



THIS POWERPOINT PRESENTATION IS BEING USED SOLEY FOR EDUCATION PURPOSES AND WITHOUT ANY MONETARY CHARGES. PHOTO CREDITS: NOVUS WAY, JERRY RAY, ED HAUSER, WIKIPEDIA, AND FFWC.