A Multiple-Parameter Approach For Establishing Minimum Levels for Category 3 Lakes of the Southwest Florida Water Management District

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Southwest Florida Water Management District
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Presentation Outline

- Introduction to minimum flows and levels
- Minimum levels for lakes with fringing cypress wetlands (Category 1 and 2 Lakes)
- Minimum levels for lakes without fringing cypress wetlands (Category 3 Lakes)

Introduction to Minimum Flows and Levels

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Florida Statutes

Section 373.042 Minimum Flows and Levels.-

(1) Within each section, or the water management district as a whole, the department or the governing board shall establish the following:

(a) Minimum flow for all surface watercourses in the area. The minimum flow for a given watercourse shall be the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area.

(b) Minimum water level. The minimum water level shall be the level of groundwater in an aquifer and the level of surface water at which further withdrawals would be significantly harmful to the water resources of the area.

Florida Statutes

Section 373.042 Minimum Flows and Levels.- (*continued*)

The minimum flow and minimum water level shall be calculated by the department and the governing board using the best information available. When appropriate, minimum flows and levels may be calculated to reflect seasonal variations. The department and the governing board shall also consider, and at their discretion may provide for, the protection of nonconsumptive uses in the establishment of minimum flows and levels.

Florida Statutes

Section 373.0421 Establishment and Implementation of Minimum Flows and Levels.-

(1) Establishment.-

(a) Considerations.- When establishing minimum flows and levels pursuant to s. 373.042, the department or governing board shall consider changes and structural alterations to watersheds, surface waters, and aquifers and the effects such changes or alterations have had, and the constraints such changes or alterations have placed, on the hydrology of an affected watershed, surface water, or aquifer, provided that nothing in this paragraph shall allow significant harm as provided by s. 373.042(1) caused by withdrawals.

Rules of the Southwest Florida Water Management District

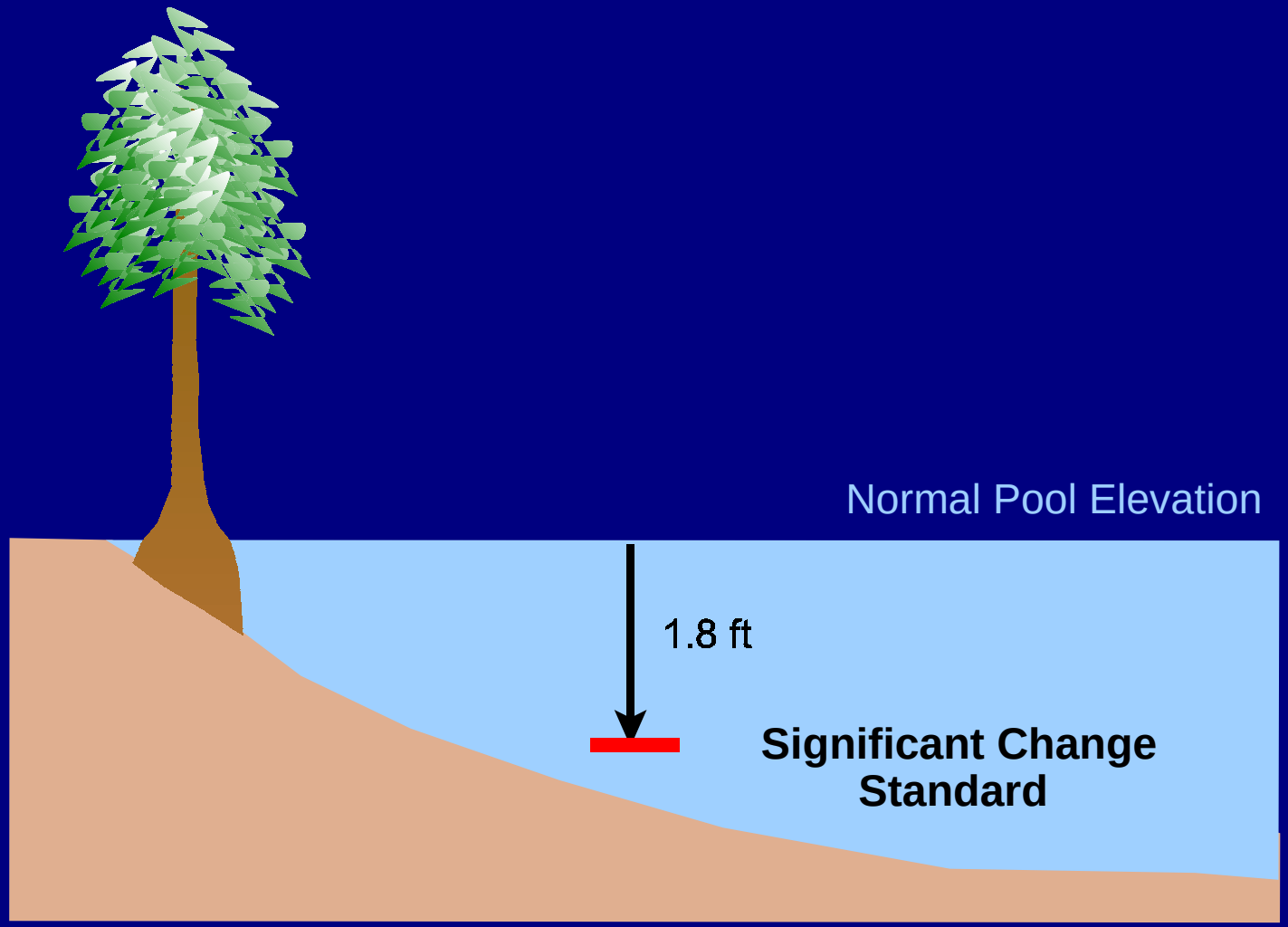
Chapter 40D-8
Water Levels and Rates of Flow

Chapter 40D-8.624
Guidance and Minimum Levels for Lakes

Southwest Florida
Water Management District

Minimum Levels for Lakes with Fringing Cypress Wetlands (Category 1 and 2 Lakes)

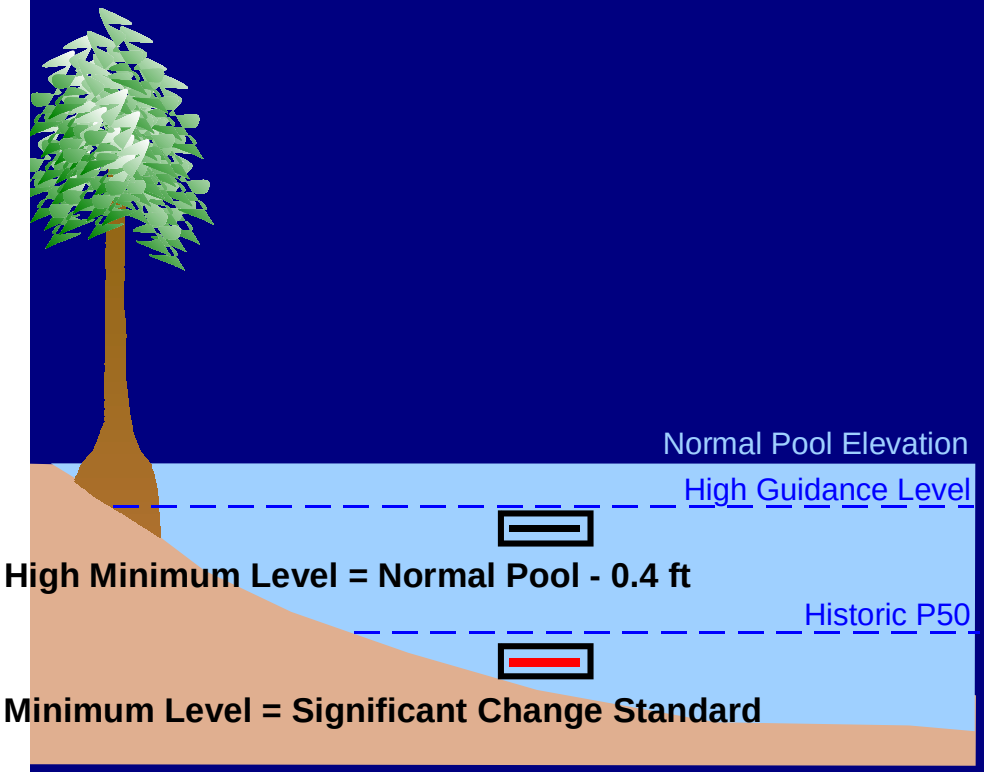
Significant Change Standard Based on Median Water Level (Historic P50) and Cypress Wetland Health



Minimum Levels

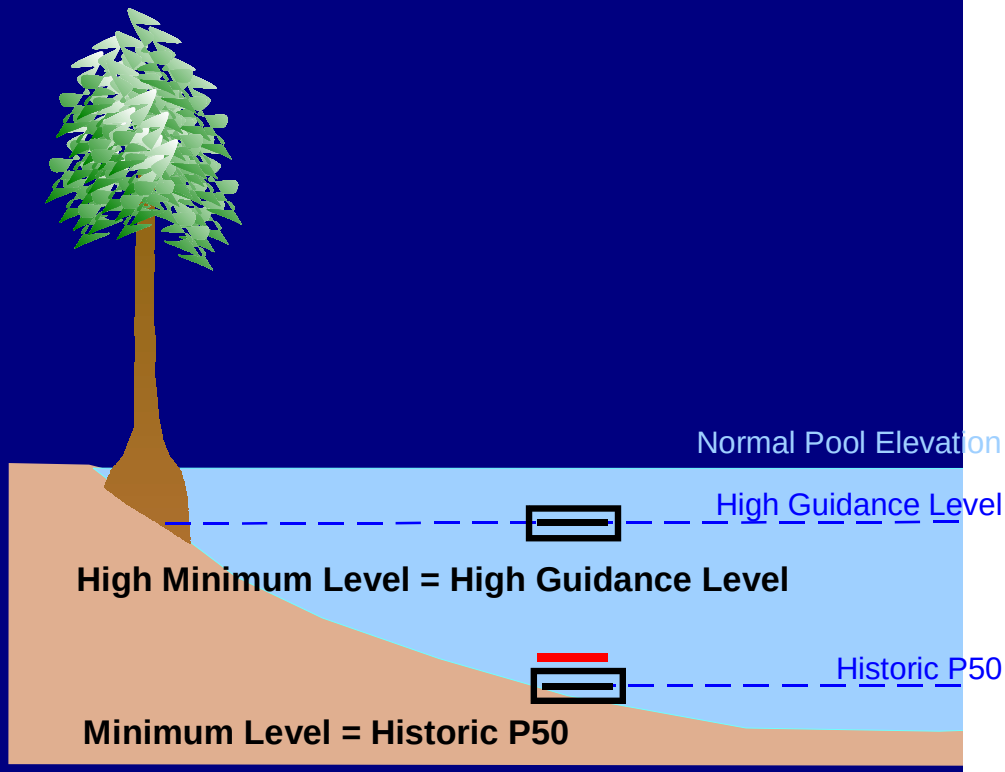
Category 1 Lake

Historic P50 higher than Significant Change Standard



Category 2 Lake

Historic P50 lower than Significant Change Standard

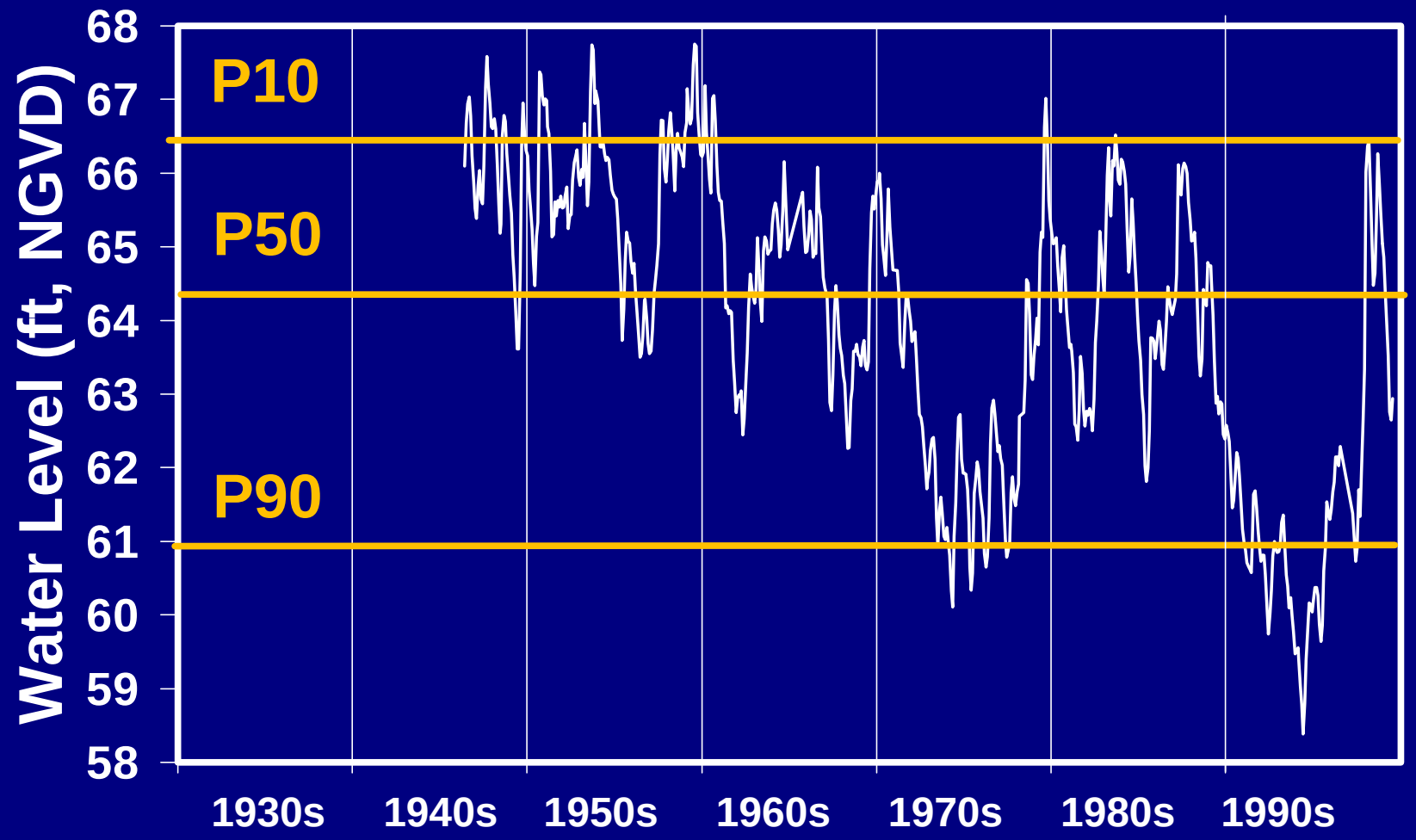


Minimum Levels For Lakes Without Fringing Cypress Wetlands (Category 3 Lakes)

Data Needs - Requirements

- Hydrologic data and statistics (P10, P50, P90)
- Data classification (Current or Historic)
- Reference Lake Water Regime (RLWR) Statistics
- Category 3 Lake Normal Pool elevation
- Control Point elevation
- Bathymetric data

Hydrologic Data and Statistics



Data Classification
Current vs. Historic

Current — A recent Long-term period during which Structural Alterations and hydrologic stresses are stable

Historic — A Long-term period when there are no measurable impacts due to withdrawals and structural alterations are similar to current conditions.

Reference Lake Water Regime Statistics

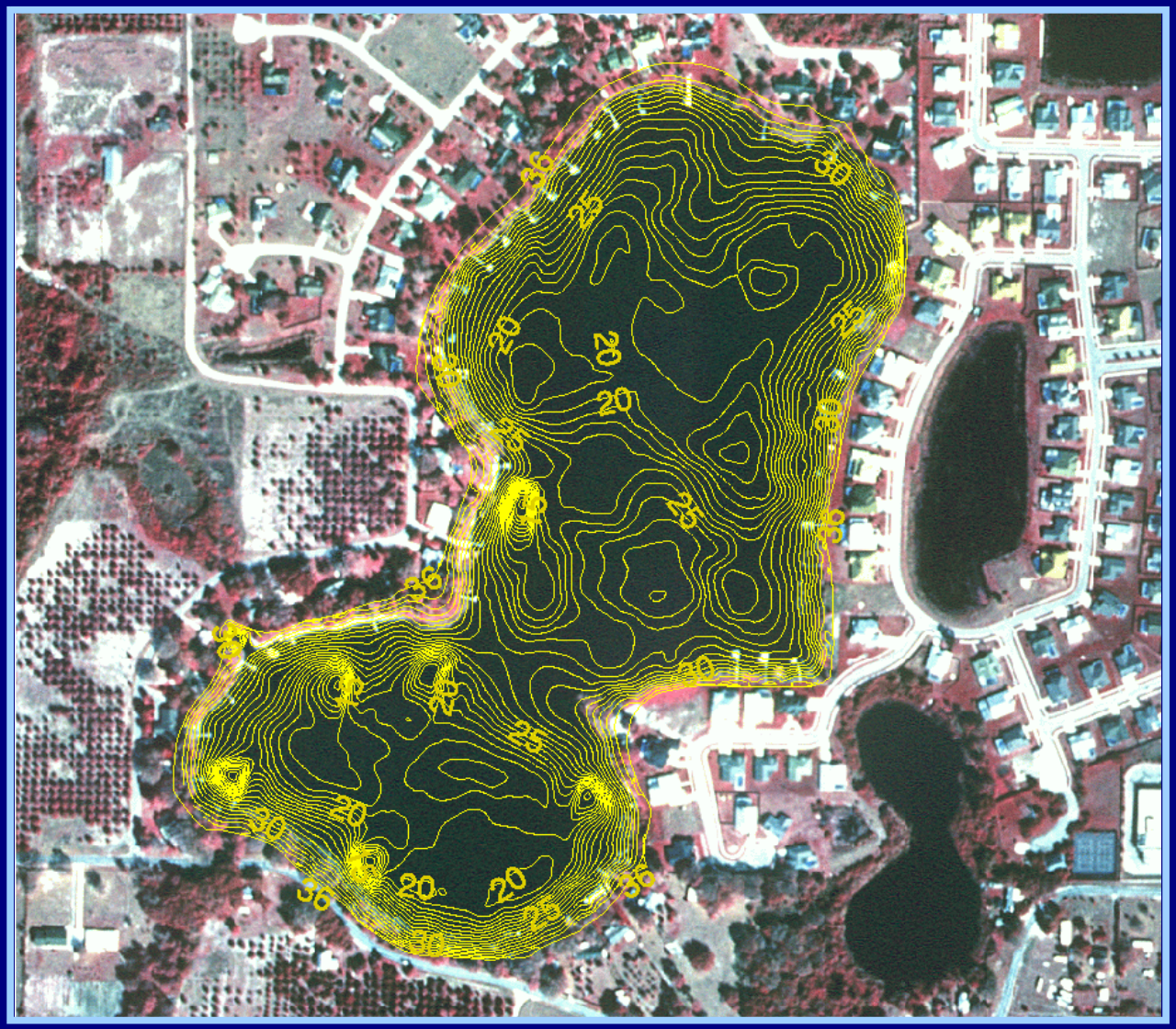
RLWR50	Median difference between reference lake P10 and P50 elevations
RLWR90	Median difference between reference lake P10 and P90 elevations
RLWR5090	Median difference between reference lake P50 and P90 elevations

Category 3 Lake Normal Pool

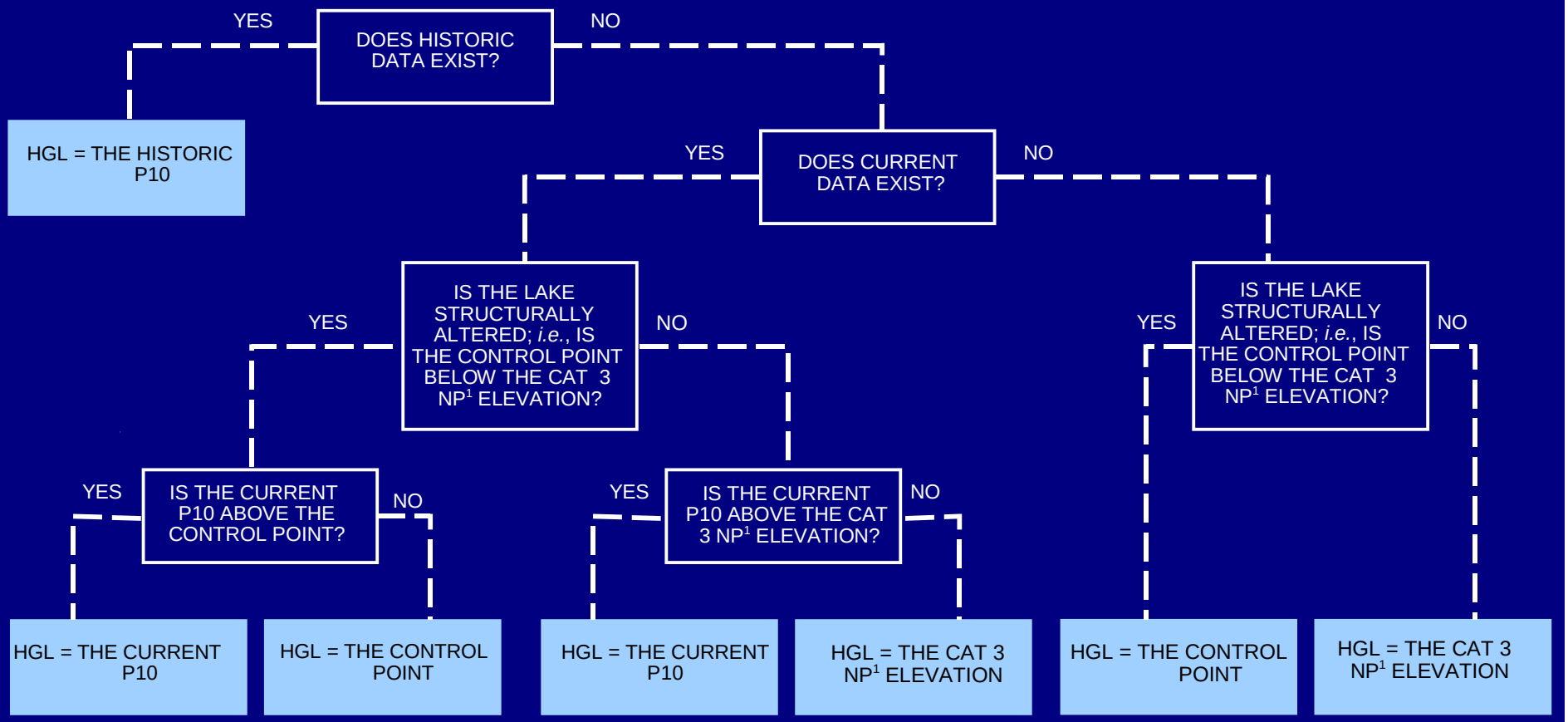
- Normal pool elevation (epiphytic mosses and liverworts, root crown of fetterbush, adventitious roots on St. John's Wort and other species, other indicators of similar hydroperiod
- Inflection point of cypress buttress
- Saw palmetto elevation
- Longleaf pine elevation
- Live Oak elevation
- High scarp
- Stratified beach deposits
- Cultivated groves or stands of plants intolerant of sustained inundation
- Historical information from maps and other documents
- Indicators for lakes connected via canals
- Other indicators of similar hydroperiod

Control Point Elevation

Bathymetric Data

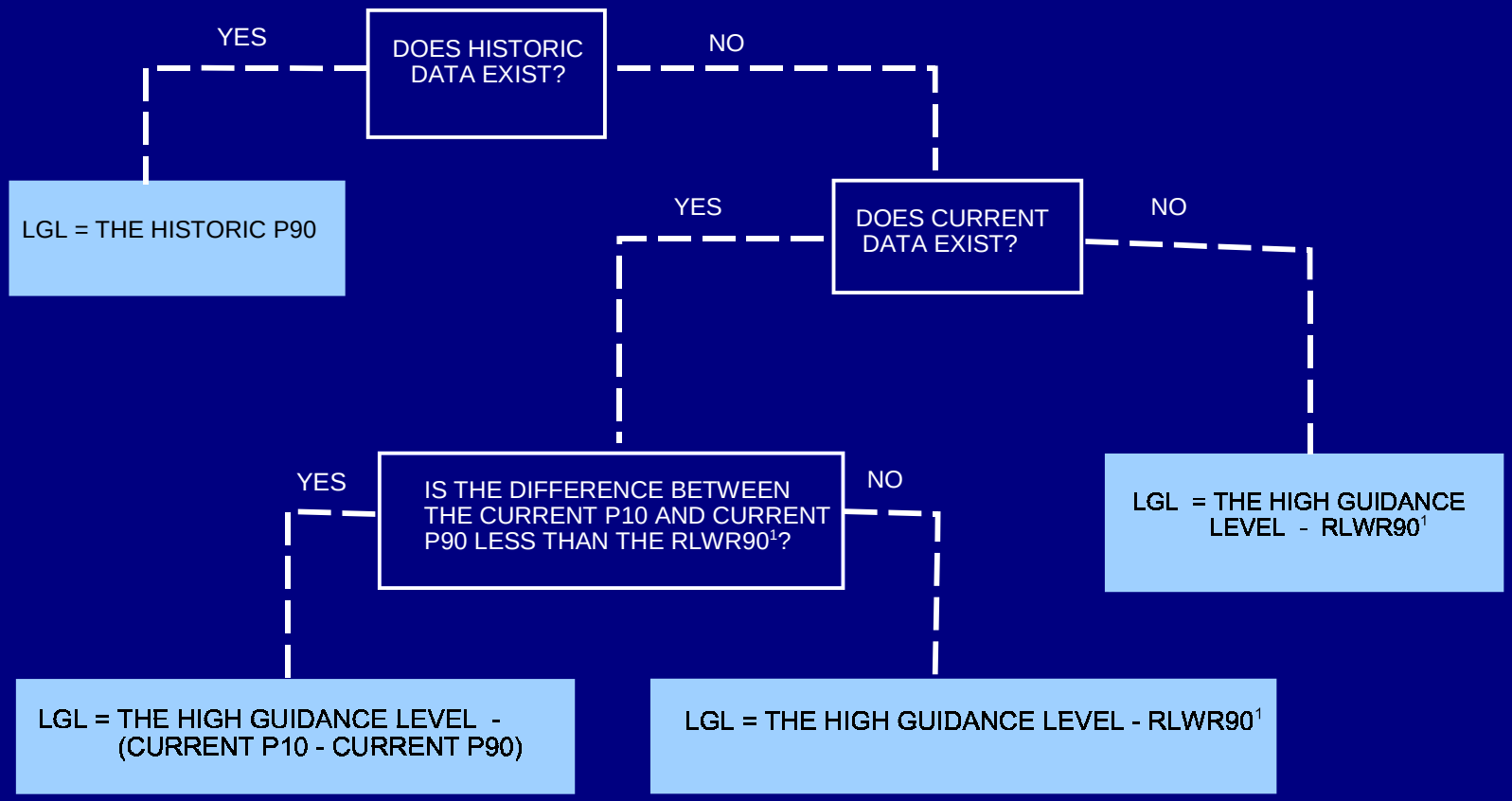


High Guidance Level
Category 3 Lakes



[1] Category 3 Lake Normal Pool

Low Guidance Level Category 3 Lakes



[1] Reference Lake Water Regime 90

Ten Year Flood Guidance Level

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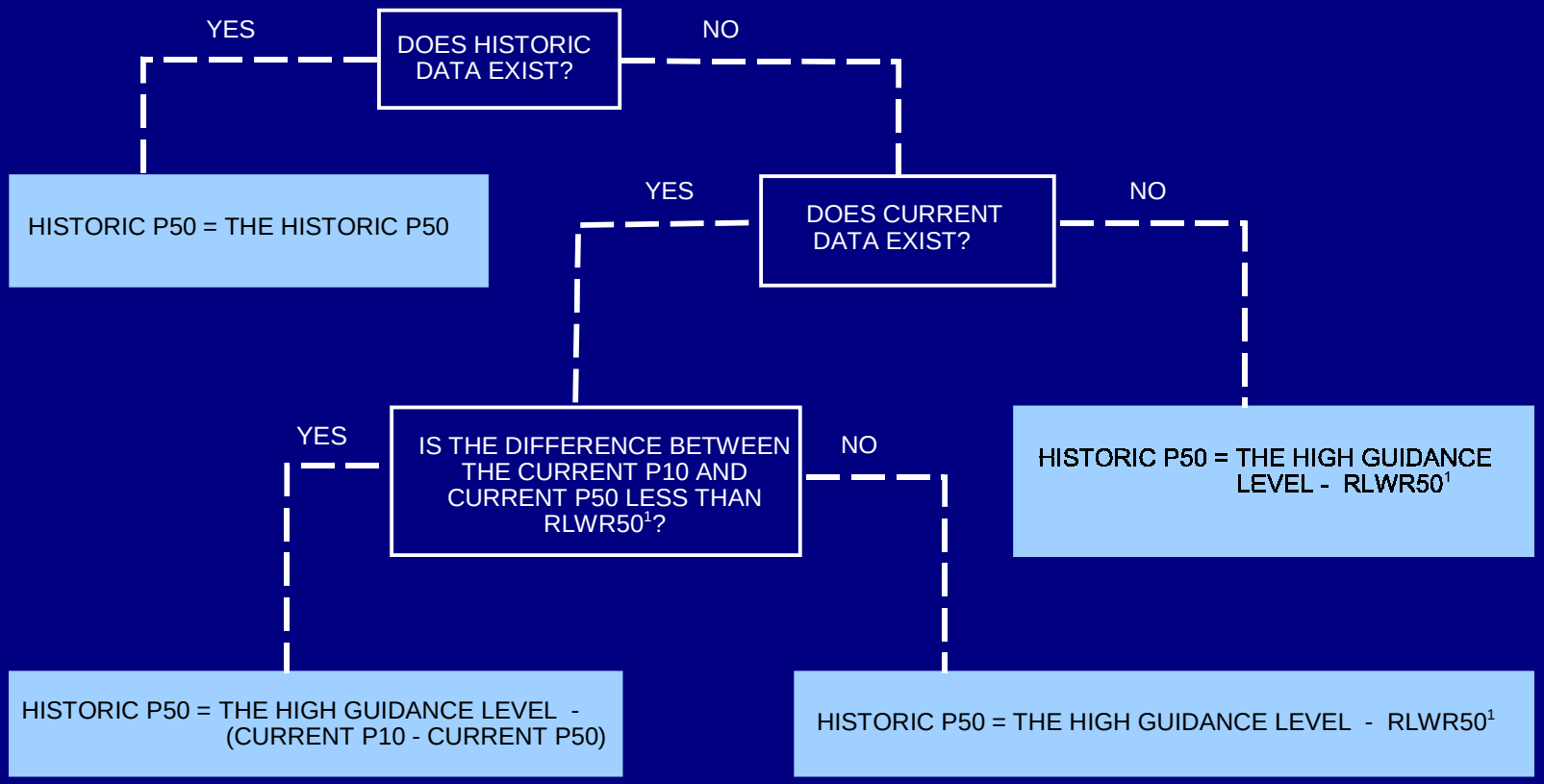
Historic P50
Category 3 Lakes



[1] Reference Lake Water Regime 50

Detecting and Quantifying Ecological Impacts Resulting from Lake Level Reductions

Factors which may be of relatively high value for development of minimum levels:

- reduction of volume
- reduction of area
- reduction of substrate availability
- alteration of connectivity with other water bodies
- alteration of vegetative cover in littoral zone
- alteration of plant species composition in littoral zone
- changes in associated wetlands

Biological Research Associates. 1997. Detecting and quantifying ecological impacts resulting from lake level reductions. Tampa, Florida.

Detecting and Quantifying Ecological Impacts Resulting from Lake Level Reductions

(continued)

Regarding selection of in-lake indicators for minimum levels development:

"The three most logical choices that occurred to the Panel and were reiterated by the recent Biological Research Associates (1999) submission involve lake volume, area, and littoral plant assemblages."

Bedient, P., Brinson, M., Dierberg, F., Gorelick, S., Jenkins, K., Ross, D., Wagner, and Stephenson, D. 1999. Report of the Scientific Peer Review Panel on the data, theories, and methodologies supporting the Minimum Flows and Levels Rule for the northern Tampa Bay area, Florida. Prepared for Southwest Florida Water Management District, Environmental Confederation of Southwest Florida. Brooksville, Florida.

Florida Administrative Code
Chapter 62-40 Water Policy
Part I General Water Policy
62-40.473 Minimum Flows and Levels.

(1) In establishing minimum flows and levels pursuant to Section 373.042, consideration shall be given to the protection of water resources, natural seasonal fluctuations in water flows and levels, and environmental values associated with coastal, estuarine, aquatic and wetlands ecology, including: ...

Florida Administrative Code
Chapter 62- 40 Water Policy
Part I General Water Policy
62-40.473 Minimum Flows and Levels.
(continued)

(a) Recreation in and on the water;
(b) Fish and wildlife habitats and the passage of fish;
(c) Estuarine resources;
(d) Transfer of detrital material;
(e) Maintenance of freshwater storage and supply;
(f) Aesthetic and scenic attributes;
(g) Filtration and absorption of nutrients and other pollutants;
(h) Sediment loads;
(i) Water quality; and
(j) Navigation.

Parameters Proposed for Use in the Establishment of Minimum Levels for Category 3 Lakes

- Lake Mixing and Stratification
- Dock-Use
- Basin Connectivity
- Species Richness
- Herbaceous Wetlands
- Submersed Aquatic Vegetation
- Aesthetics
- Recreation/Skiing

Lake Mixing and Stratification

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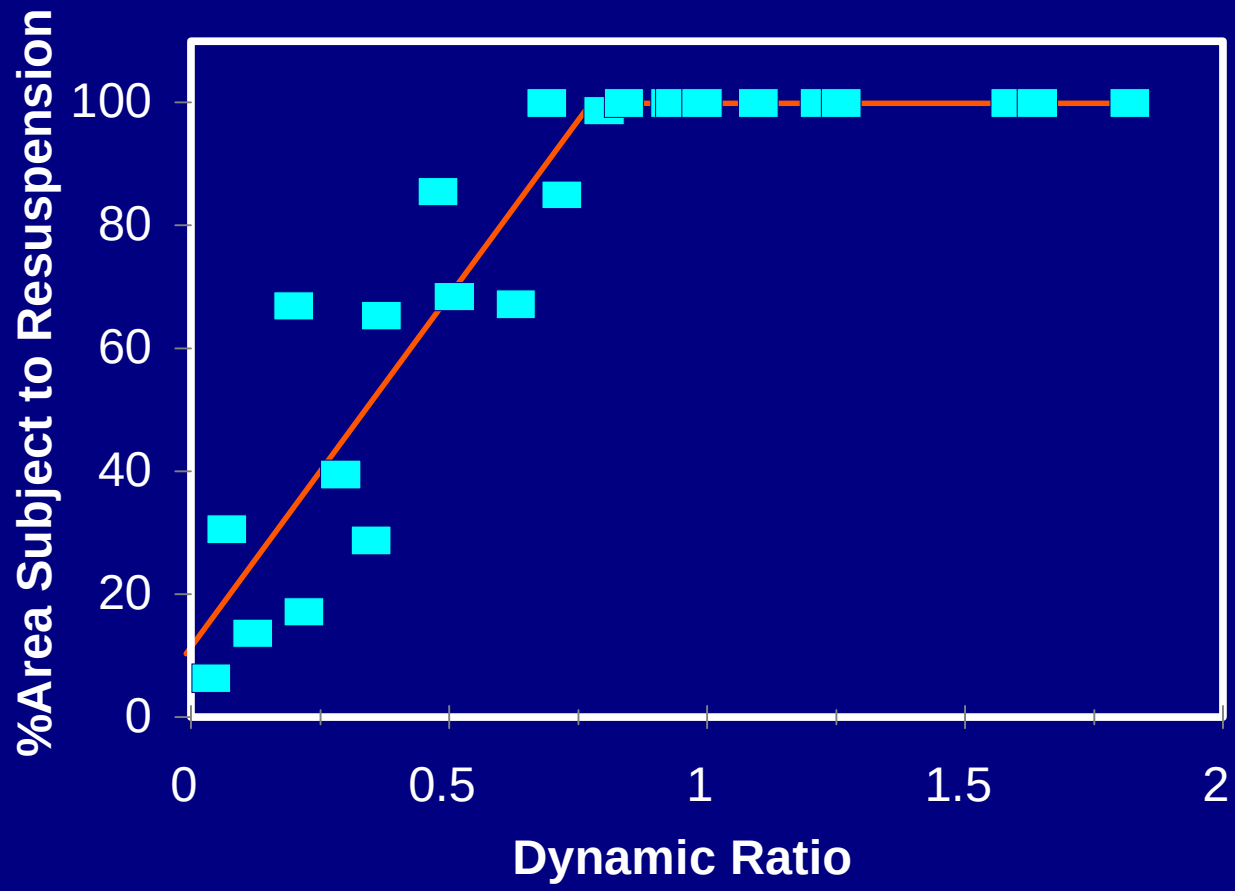
Dynamic Ratio vs. Percent of Lake Area Subject to Sediment Resuspension



Bachmann, R.W., Hoyer, M., and Canfield, D.E., Jr. 2000. The potential for wave disturbance in shallow Florida Lakes. Lake and Reservoir Management 16: 281-291.

Lake Mixing and Stratification Information for Consideration

Change in lake dynamic ratio with change in lake stage considered for development of minimum levels

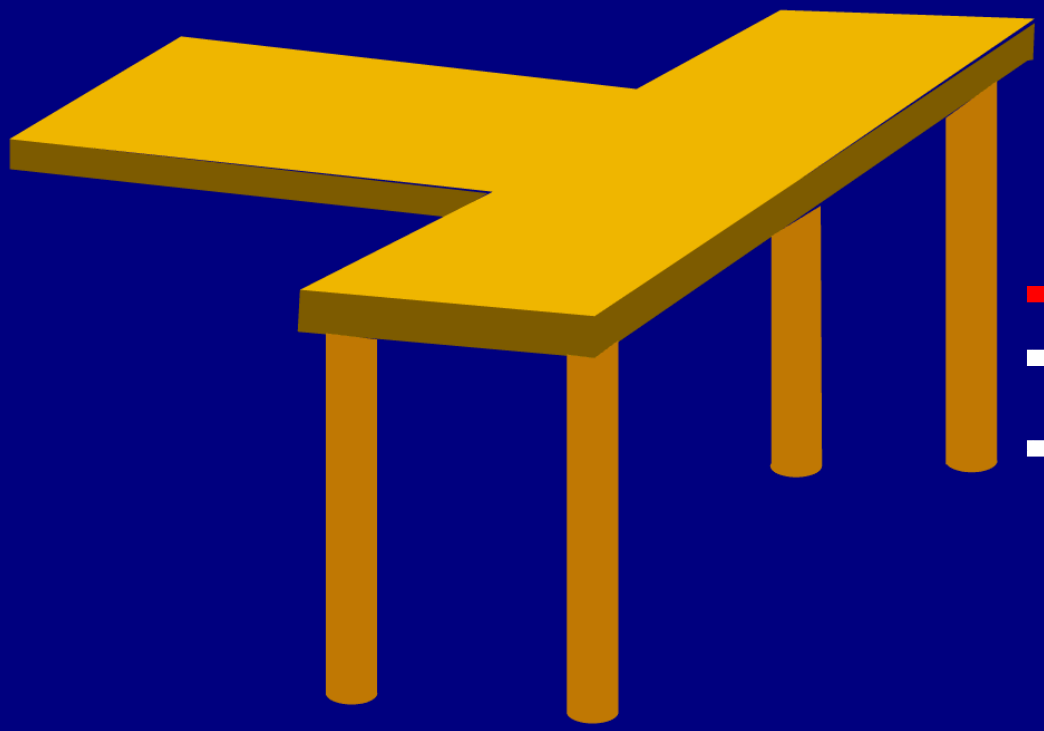
Potential changes in water-column stratification / mixing pattern considered for development of minimum levels

Dock-Use

Dock-Use Standard and Information for Consideration

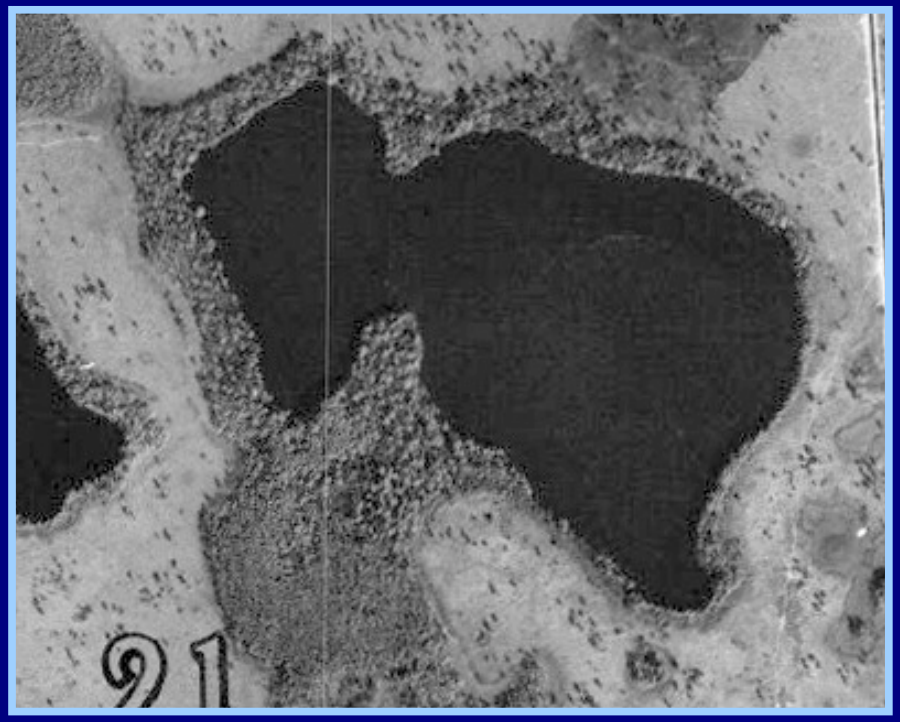
- If boats are used at the lake, elevation exceeded by 10% of the dock-end sediment elevation values (the Dock-End Sediment elevation) is determined
- Dock-Use Standard derived by adding 2 ft and the region-specific RLWR5090 value to the Dock-End Sediment elevation
- If standard < Historic P50 elevation, use of the standard for minimum levels development is appropriate
- Dock-Use Standard and other relevant information considered for development of the Minimum Level

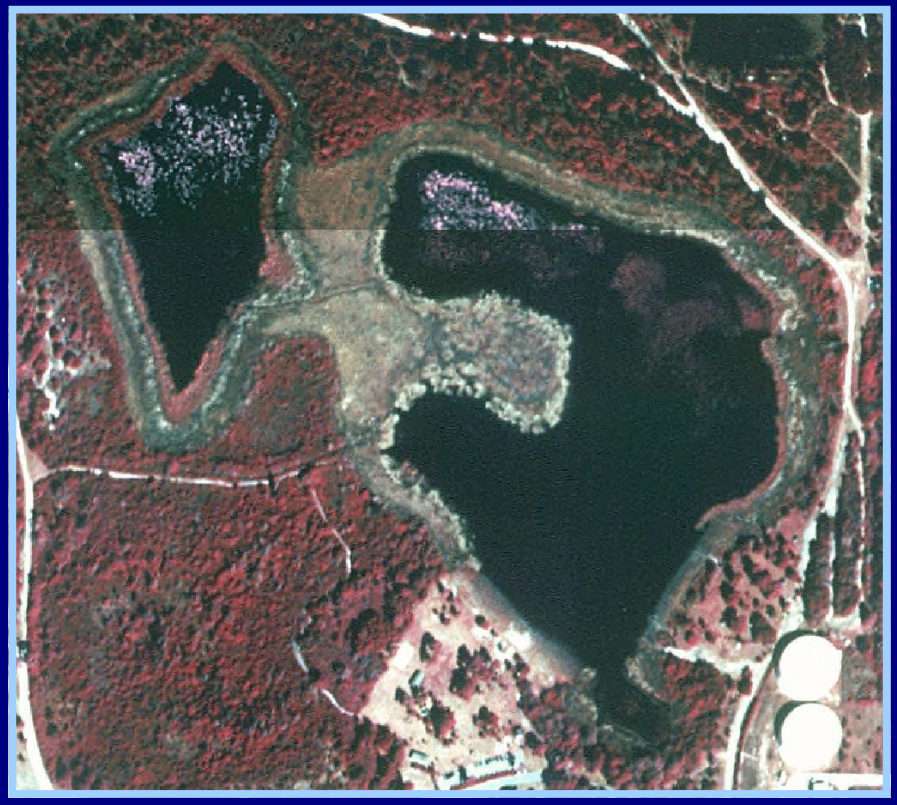
Dock-Use Standard



+ RLWR5090
+ 2 feet
Dock-End Sediment Elevation

Basin Connectivity





Basin Connectivity Standard and Information for Consideration

- If appropriate, critical high-spot elevation between basins or sub-basins identified
- For systems where boats are used, Basin Connectivity Standard derived by adding 2 ft and the region-specific RLWR5090 value to the critical high-spot elevation
- If standard < Historic P50, use of this standard for minimum levels development is appropriate

Basin Connectivity Standard and Information for Consideration

(continued)

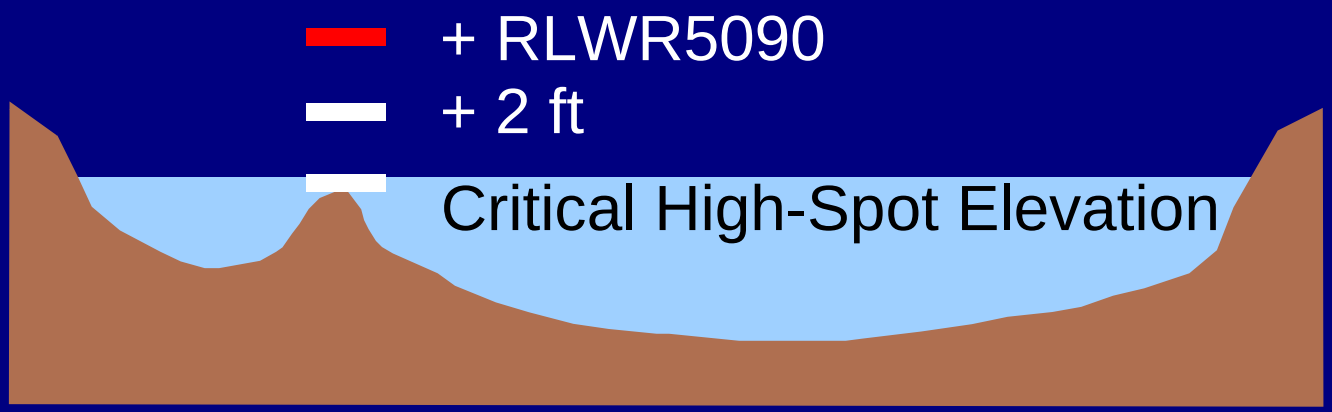
- If standard > Historic P50 elevation, Basin Connectivity Standard derived by adding 1 ft and the region-specific RLWR5090 value to the critical high-spot elevation

- If standard < Historic P50, use of standard for minimum levels development is appropriate

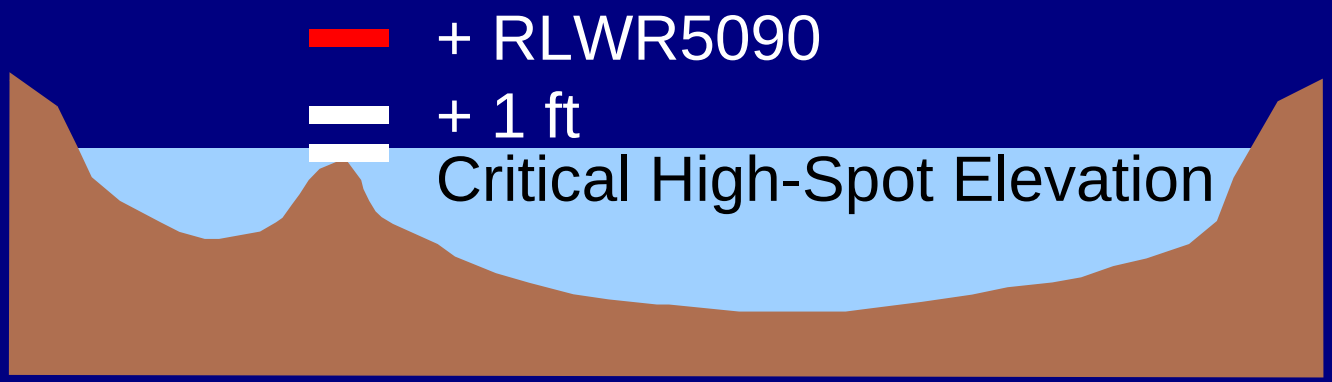
- Basin Connectivity Standard and other relevant information considered for development of the Minimum Level

Basin Connectivity Standard

Power Boats



No Power Boats



Species Richness

~15% decrease in lake area associated with change of 1 in bird species richness
(Hoyer and Canfield, 1994)

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~30% decrease in lake area associated with change of 1 in fish species richness
(Bachmann *et al.*, 1996)

~30% decrease in lake area associated with change of 1 in plant species richness
(University of Florida, unpublished)

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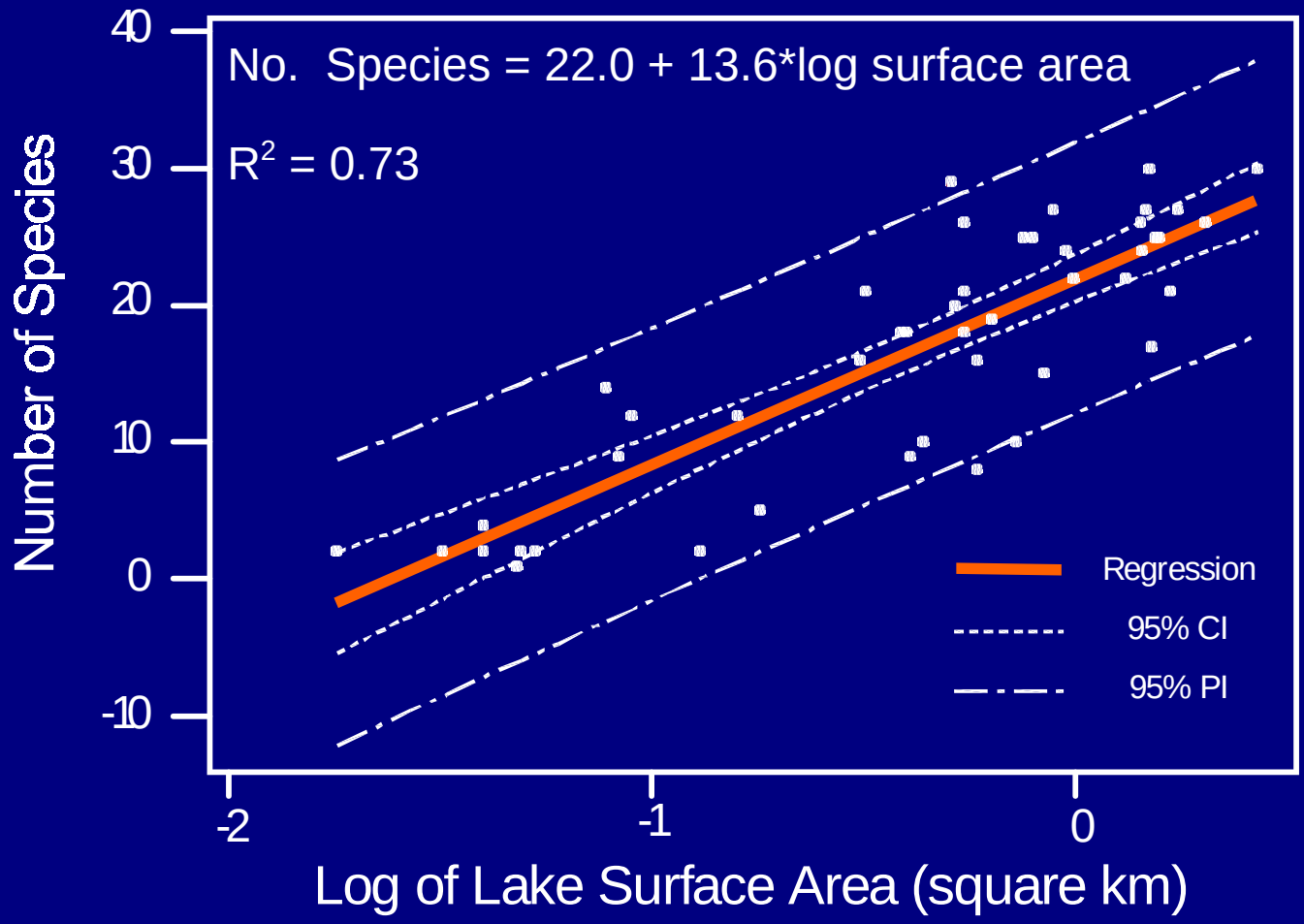
Species Richness - Citations

Bachmann, R.W., Jones, B.L., Fox, D.D., Hoyer, M., Bull, L.A., and Canfield, D.E., Jr. 1996. Relations between trophic state indicators and fish in Florida (U.S.A.) lakes. Canadian Journal of Fisheries and Aquatic Sciences 53: 842-855.

Hoyer, M.V. and Canfield, D.E., Jr. 1994. Bird abundance and species richness on Florida lakes: influence of trophic status, lake morphology, and aquatic macrophytes. Hydrobiologia 297/280: 107-119.

Bird Species Richness vs. Log Lake Area for 46 Florida Lakes

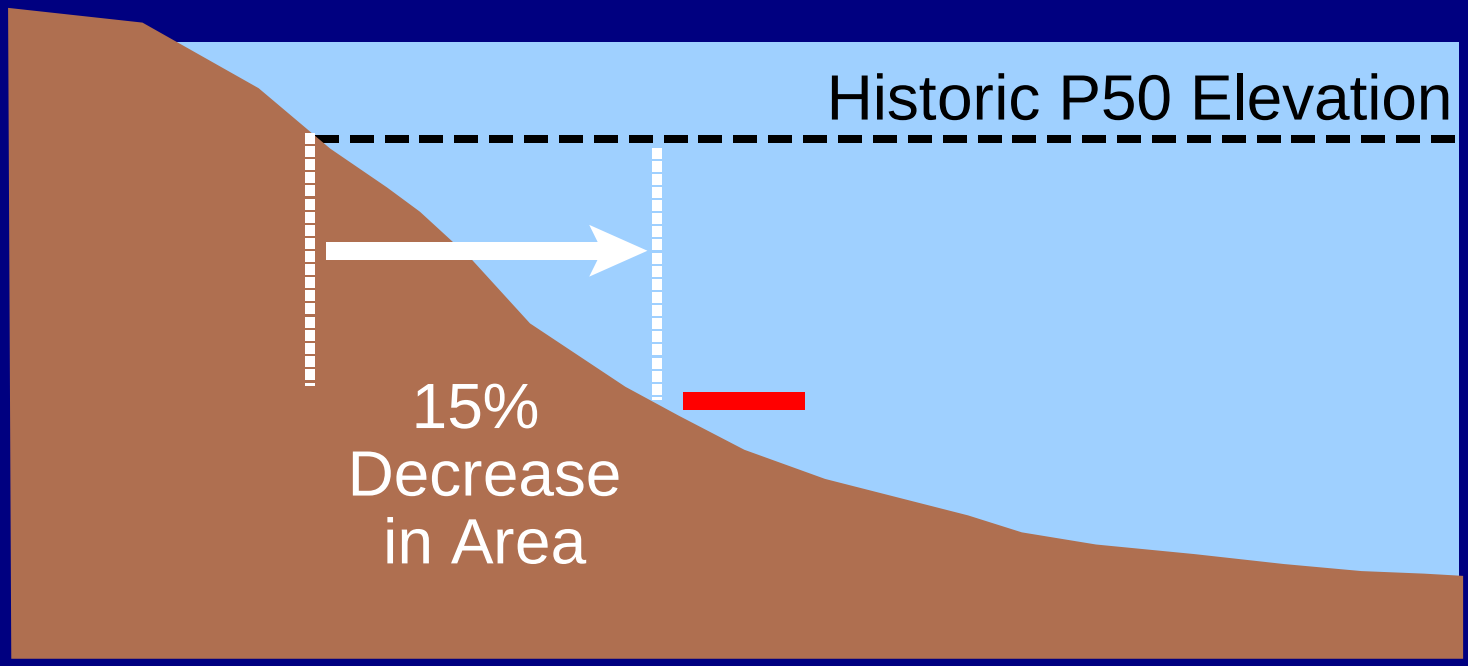


Hoyer and Canfield (1994)

Species Richness Standard and Information for Consideration

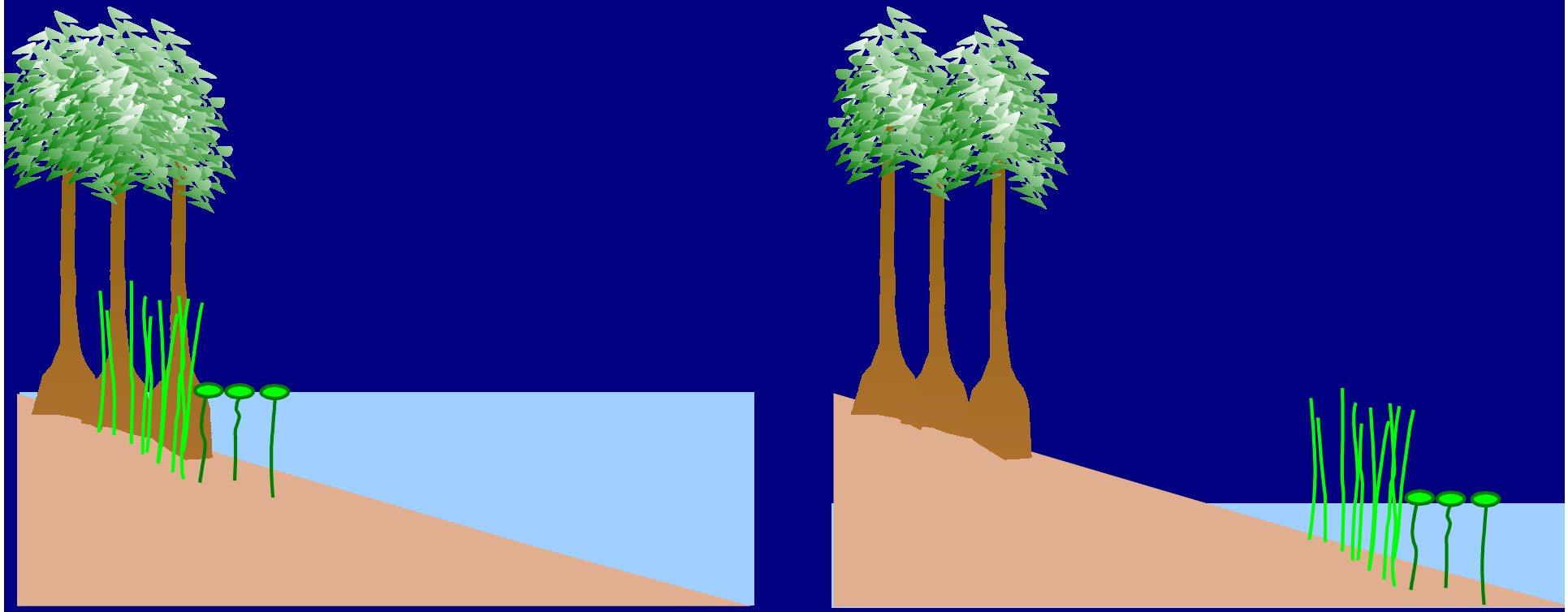
- Use of the bird species richness-lake area relationship is proposed for protection of overall community richness
- Species Richness Standard established at the elevation corresponding to a 15% decrease in lake area from that at the Historic P50 elevation
- Species Richness Standard and other relevant information considered for development of the Minimum Level

Species Richness Standard

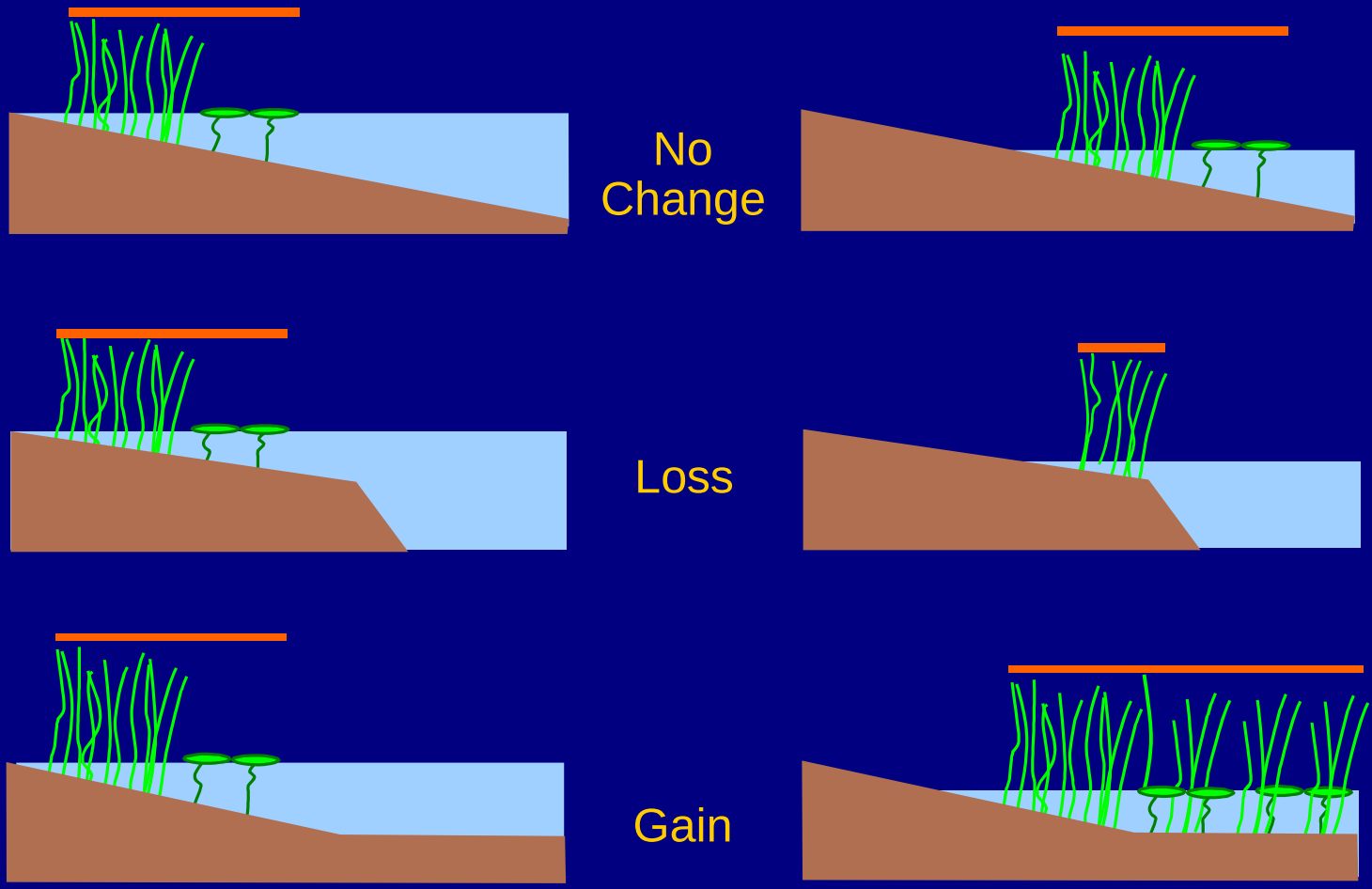


Herbaceous Wetlands
Emergent and Floating-Leaved Aquatic Macrophytes

Herbaceous Wetlands Differ from Forested Wetland in their Spatial-temporal Response to Long-Term Water Level Change



Water Level and Herbaceous Wetland Area



Herbaceous Wetlands Information for Consideration

Lake area of depth **#** 4 ft defined as potential herbaceous wetland habitat

Elevations at which changes in water level would result in major changes in area of potential herbaceous wetlands identified and considered for minimum levels development

Submersed Aquatic Macrophytes

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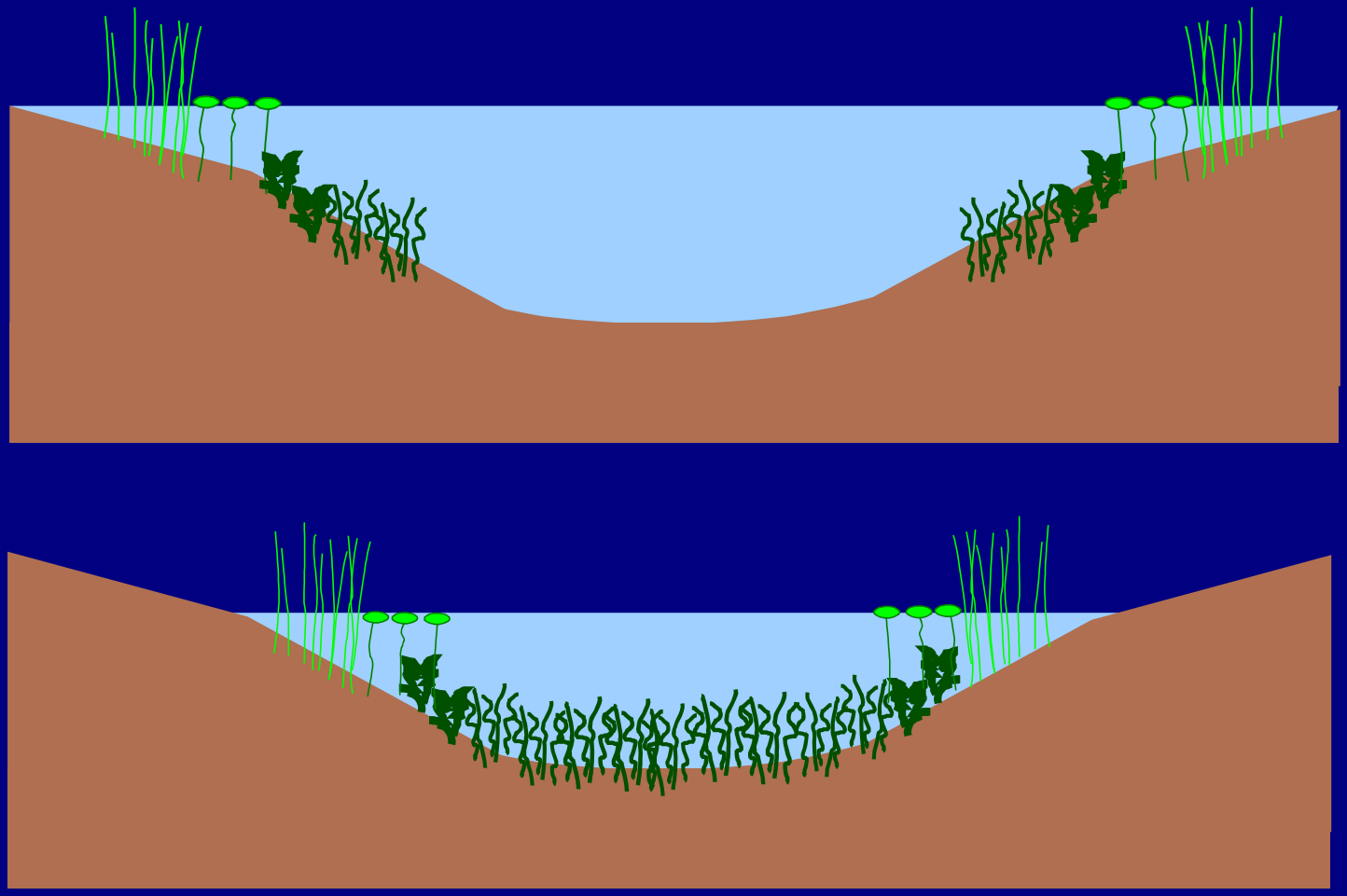
Reduced Water Levels May be Associated with Increased Coverage of Submersed Aquatic Macrophytes



Submersed Aquatic Macrophytes Information for Consideration

Maximum depth of macrophyte colonization may be predicted using Secchi disc depth (Canfield *et al.* 1985)

Elevations at which changes in water level would result in major changes in coverage of submersed aquatic macrophytes identified and considered for minimum levels development

Canfield, D.E., Jr., Langeland, K.W., Linda, S.B., and Haller, W.T. 1985. Relations between water transparency and maximum depth of macrophyte colonization in lakes. Journal of Aquatic Plant Management 23: 25-28.

Aesthetics

Hunters Lake (Hernando County)
Jan 1987

Hunters Lake (Hernando County)
Jan 1994

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Aesthetics Standard and Information for Consideration

Aesthetics Standard established at the Low Guidance Level

Aesthetics Standard and other relevant information considered for development of the Minimum Level

Recreation/Ski Standard

Recreation/Ski Standard and Information for Consideration

- U.S. Coast Guard Office of Boating Safety web site (www.uscgboating.org) recommends ski corridors at least 200 x 2,000 ft in area and at least 5 ft in depth should be maintained for safe water skiing
- Critical minimum elevation at which lake basin would contain a circular ski corridor meeting Coast Guard recommendations is identified using bathymetric data
- If critical minimum elevation is higher than the Low Guidance Level, Recreation/Ski Standard established using critical elevation and RLWR50590
- Recreation/Ski Standard and other relevant information considered for development of the Minimum Level

Establishing Minimum Levels for Category 3 Lakes Using a Multiple-Parameter Approach

Minimum Level established at the elevation corresponding to the ***most conservative*** (*i.e.*, the highest) significant change standard, with consideration given to other relevant information

Other relevant information could include the low floor slab elevation, substantial changes in potential herbaceous wetlands area or coverage of submersed aquatic macrophytes, or frequent submergence of dock platforms

High Minimum Level established using standard elevation and historic data or RLWR50

Minimum Lake Levels - 2001

Hillsborough County

Calm, Church/Echo, Crenshaw, Cypress, Fairy, Halfmoon, Helen/Ellen/Barbara, Hobbs, Raleigh, Rogers, Round, Saddleback, Starvation

Pasco County

Big Fish

Highlands County

Jackson, Letta, Lotela

Polk County

Clinch, Eagle, McLeod, Wales