IMPROVING LAKE OKEECHOBEE ECOLOGY

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LOCATION MAP

- South Central Peninsular Florida
- Covers approximately 735 square miles
- Second largest lake in the continental U.S.A
- Surrounding watershed is largely agricultural
  - Cattle farming
  - Sugar Cane.
  - Dairy, winter vegetables, citrus

Urban
Improved Pasture
Unimproved Pasture
Sugar Cane
Citrus Groves
Dairies
Other Agriculture
Rangeland
Upland Forests
Water Bodies
Wetlands
Barren Land
Sub-watershed
A BIT OF HISTORICAL PERSPECTIVE

- First reliable Lake O map 1838
- Hamilton Disston 1881-1894
  - Straightened Kissimmee River
  - Connected Lake to the west coast of Florida
- Everglades Drainage Dist. 1905-1928
  - Connected Lake to the east coast of Florida
  - Built southern agricultural canals
  - First muck dike at south end of Lake
- Hurricanes of 1926 and 1928
SOUTH FLORIDA WATER MANAGEMENT DISTRICT

THE NEED FOR FLOOD CONTROL

1928

1928

1926-1928

DEVASTATING HURRICANES
LOSS OF 2,500 LIVES

HOOVER DIKE
AUTHORIZED 1930

COMPLETED 1937

sfwmd.gov
CONSTRUCTION OF THE HERBERT HOOVER DIKE

- 177 km long
- Encircles entire lake
- No Spillway
- All inflows and outflows gated except Fisheating Creek
- Lake can fill up to six times faster than it can be emptied
LOCATION OF THE LITTORAL ZONE SHIFTED

Lake Okeechobee: Primary Marsh Regions

littoral zone
Inside the lake

Littoral Zone
Outside the Lake
Phosphorus loading consistently exceeds Total Maximum Daily Load.

Large internal mud sediment nutrient pool.
Between 1973 and 2012 the Moore Haven Marsh changed from being spikerush dominated to being dominated by cattail.

Close to 10% of marsh is Torpedo Grass Monoculture.
CURRENT ISSUES SUMMARY

• Extreme water-levels and fluctuations

• Eutrophication increased P loading

• Sediment accumulation (“mud zone”)

• Invasive plant species
HISTORIC FLOWPATH TO THE EVERGLADES CANNOT BE REESTABLISHED
TOOLS IN THE TOOLBOX

- Phosphorus Source Control (Removal of the internal sediment nutrient pool is infeasible)
- Control of Exotic Invasive and Nuisance Vegetation
- Stage regulation
  - The key constraint:
    - Improved water quality in the absence of water-level management will yield limited environmental benefits to the lake
    - Improved water-level management would mitigate some water-quality impacts in the nearshore and littoral zones
**PHOSPHORUS SOURCE CONTROL**

- Northern Everglades Protection Program
- Three coordinating agencies: FDEP, FDACS, SFWMD.
- Improve the quality of water discharged from the watershed and minimize undesirable flows
- A variety of projects and initiatives.
- Emphasis on Best Management Practices

- Five year average TP load 438 MT
- Exceeds TMDL by 296 MT
- Current load reduction capacity is ~ 16 MT annually
- After TMDL is achieved will take decades to bury internal nutrient pool under clean sediments.
VEGETATION MANAGEMENT CONSISTS OF MONITORING AND CONTROL

Maps quantifying the distribution of emergent species in the marsh are created every 4 to 5 years.

In other years sentinel sites consisting of 0.5 km² or 1.0 km² grids are used to monitor changes in the marsh resulting from hydrologic conditions or management actions.
VEGETATION MANAGEMENT

CONTROL IS ACCOMPLISHED BY HERBICIDE APPLICATION AND BURNING WHEN CONDITIONS ALLOW
Resulting open marsh habitats support forage and sport fish that serve as a critical link in the energy pathway between primary producers and higher trophic level consumers (birds, reptiles, humans).
FEDERAL WATER CONTROL PLAN
MANAGED BY ACOE

Lake is managed for water supply, flood control and environmental benefits

LORS Operational Bands:
- Interim Schedule During Dike Repairs
- Top High Lake Mgmt. 17 ft NGVD
- Bottom Base Flow, 12.5 ft NGVD

Decision Tree
Regulation Schedule Helps Determine Water Depth and Duration of Inundation in the Littoral and Nearshore Zones Which in Turn Establishes Plant Community Distribution.
Ecological Impacts of Lake Stage

Incursion of High Nutrient Pelagic Zone Water into the Littoral Zone

- Below 14 ft NGVD Little Incursion of High Nutrient Pelagic Zone Water into the Littoral Zone.
- At 14 ft NGVD and Above Incursion is Roughly Proportional to Lake Stage.
- Recent Conversion of Large Acreages of Wet Prairie into Dense Cattail Habitat may be Related to Such Incursions Caused by the 2004-2005 Hurricanes.

First Flush Upon Re-flooding
Wading Bird Hydrologic Variables

Great Egret
- Days Since Drawdown
- Hydroperiod
- 2-week Recession Rate

Snowy Egret
- Depth
- Days Since Drawdown
- Hydroperiod
- 2-week Recession Rate

White Ibis
- Depth
- 4 week Recession Rate
ADDITIONAL IMPACTS OF WATER LEVELS ON LAKE ECOLOGY

Based on Statistical Relationships Between Stage and Long Term Monitoring Data Sets

- **CYANOBACTERIAL ABUNDANCE** – Lake stage above 14’ NGVD in May increases probability of Cyanobacterial blooms

- **PANFISH** – Abundance favored between 12 and 15 ft NGVD. Negative effects at stages greater than 16 ft NGVD

- **VASCULAR SAV** – Summer conditions between 12 and 15 ft NGVD optimal. Lower and higher lake stages suboptimal.

- **EPIPELON** – Optimal conditions when spring and fall lake stages are below 12 ft NGVD or between 12 and 15 ft. NGVD.

- **EPIPHYTON** - Optimal conditions when spring and fall lake stages are below 14 ft NGVD
Impacts of Climatic Events and Disparity Between Inflow and Outflow Rates on Lake Levels

Lake Stage 1992 - 2013

- RUN 25
- WSE 2000
- LORS 2008
- AP 2010
Long Term Solution Requires Recoverable Storage

- Currently 62,000 acre feet of dispersed storage, most non-recoverable, in Lake O watershed
- Original CERP planning called for 883,000 acre feet of above ground recoverable storage
  - Equivalent to a bit less than 2 feet of Lake Okeechobee elevation
  - Would help smooth out extreme high and low stages.
  - Limitations may be due to disparity between climatic conditions and operational needs.
THANK YOU!