The Rise and Fall of Lake Okeechobee
Changes to Lake Morphology from 1913 to Present Day.

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Introduction

Lake Okeechobee represents an essential component of the Greater Everglades ecosystem, not only for its historic function as a water source to meet the environmental needs of the Everglades, but also for its intrinsic ecological value as a shallow lake community. Lake Okeechobee continues to provide an important hydrologic link between the watershed north of the lake, the remaining natural communities to the south, and the coastal estuaries.

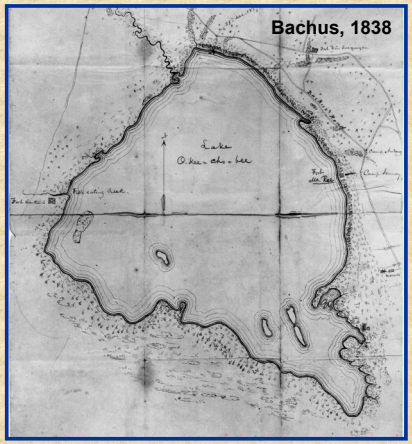
An integral part of our research focused on changes to the physical features of the lake by integrating written historic accounts, lake stages, and historic maps, including bathymetry and topography. Our specific objectives were to look at changes in water levels and lake shoreline, through different time periods associated with major drainage works, the placement of the Herbert Hoover Dike, regulation schedules, and natural events, and associate these to changes in vegetation and water storage.

Methodology

We collected navigational charts prepared by U.S. Coast and Geodetic Survey (1913, 1925, and 1944) and NOAA (1999) from the University of Florida Image Library and SFWMD. Images were geometrically corrected to match existing GIS datasets, and features such as bathymetry points, shorelines, and islands were digitized using ArcGIS software. A 1925 hydrographic survey, conducted between January and April, was the primary source for historic bathymetry, along with a subset of shoreline and island points from the 1913 map. Data were standardized to match different metrics units and datum, and depths converted to elevations (NGVD). Ordinary kriging was used to interpolate data to produce bathymetry surfaces from digitized and surveyed points. We stratified the lake into two areas (below and above 6 ft. depth), and these interpolated areas were merged to produce a final bathymetry surface. These results were used to quantify changes in water levels and storage.

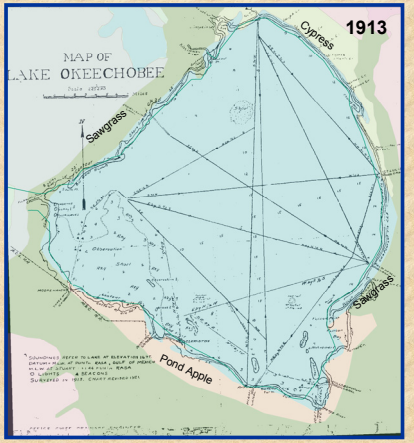
Pre-drainage

Pre-drainage Lake Okeechobee water levels averaged between 22 ½ feet and 19 feet based on written historic accounts and confirmed by shoreline vegetation patterns. During the rainy season, the lake "spilled over" to the south when water levels reached maximum stage.



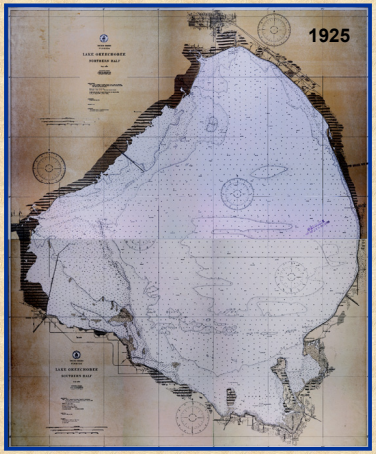
Early drainage period

In the early 1900s, local governments and residents built up the lake's natural embankments with sand, shell, and muck along the southern shore of the lake to protect newly formed towns and farms. Early drainage works began to lower lake water levels in the dry season. By 1911, 60 miles of canals south of the lake had been completed and the increased flows helped maintain lower lake levels.



1913 - 1938

After 1913, lake water levels never again reached historic high stages and overflows to the south may have been eliminated as early as 1918. By 1927 an improved muck dike was completed along the southern face and six large drainage canals were operational. Lake stage targets recommend in 1927 were 17 ft. max - 14 ft. min.

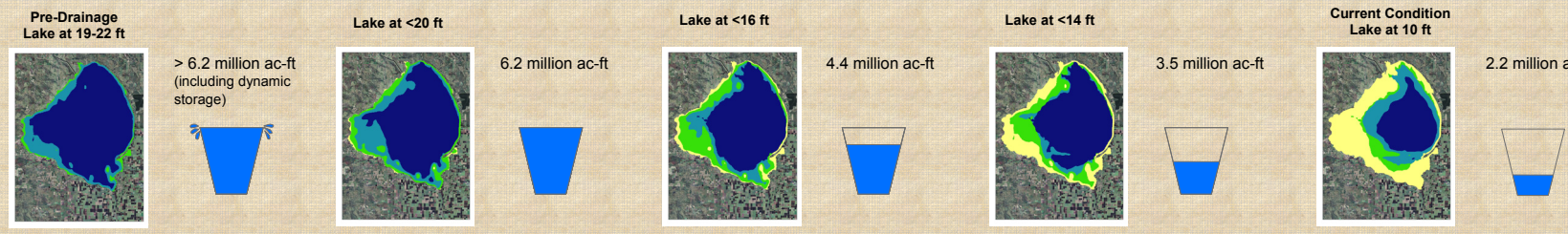


1938 - 1944

Herbert Hoover Dike was constructed by 1938, though the northwest reaches were not completed until the 1960s. Regulation schedules began in the 1930s and since then lake levels have been artificially set below historic levels, creating the hydrological conditions for the current littoral zone. Target levels were initially set between 12.5 and 15.5 ft., increasing to 16 ft. in 1974 and 17.5 ft. in 1978.

How do changes in Lake morphology relate to water levels and water storage?

Note: Lake elevations are in NGVD 29 or m.s.l.



Discussion and Conclusions

- Lake stages have changed from pre-drainage conditions, with an average between 21 feet and 18 feet NGVD, to the present management regime between 13.5 feet and 15.5 feet NGVD.
- With some exception on the southern end, the size of the present day Lake Okeechobee is nearly identical to historic proportions. Even after the construction of the Herbert Hoover Dike, the areal extent of the lake remains over 700 square miles; what has been lost is the hydrologic and ecologic connectivity of the sawgrass and other plant communities that surrounded the lake and the natural outflow to the south.
- Historic maps demonstrated that what historically was lake bottom is now occupied by the "Okeechobee marsh" system that developed with the lowering of lake stages and subsequent shallower water depths.
- The lowering of lake stages, due to drainage and water level management, has resulted in significant loss of water storage, which historically was essential in providing dry season flows to the Everglades.

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