A Historical Perspective of Florida Agriculture and Look at Water Management in Florida.

Gene McAvoy
UF/IFAS
Extension Agent Emeritus
Everglades
What has happened

- 1845 – Greater Everglades – 7 million acres
- 2019 – less than 3 million acres
- 1845 – Florida statehood
- 1850 – Swamp and Overflowed Lands Act
- 1850’s Internal Improvement Commission
- 1881 – Hamilton Disston – purchased 4 million acres @ 25 cents an acre
- 1960 – 4 million people
- 2019 – 21 million people
Federal Swamp and Overflowed Lands Act

1850 - granting the state of Florida title to all submerged wetlands (nearly 21 million acres) for the purpose of draining and taming the wilderness to turn it into productive agricultural land and encourage settlement and development.
Internal Improvement Trust Fund

1855 - created an agency of the Florida government to oversee the management, sale and development of public lands granted to the State.

Fund was charged with the construction of canals, railroads and land drainage and reclamation.
Trust Fund

The fund pledged land to railroad companies and guaranteed bonds issued by the railroad companies on the land.

The high costs associated with the American Civil War and Reconstruction caused railroad companies to default on the bonds, the fund became liable and rapidly sank into debt and eventually into Federal Court receivership.

By 1877, the fund was nearly $1 million in debt.
To relieve the debt, the State of Florida under Governor William D. Bloxham offered for sale, four million acres of Internal Improvement Fund land for 25 cents per acre.
In 1881, Philadelphia industrialist Hamilton Disston signed an agreement to purchase the land with the understanding that he would improve the land by draining lands around Lake Okeechobee.

His original plan was to lower the Lake level by connecting Lake Okeechobee to the Caloosahatchee and St Lucie rivers and drain land north of the lake by dredging the Kissimmee River.
Caloosahatchee River
Drainage

Disston’s efforts marked the beginning of what would become the most effective drainage network in the world.

Each year the state spends, hundreds of millions of dollars are spent each year to maintain a system of canals, ditches, berms and levees that stretch from just south of Orlando to Florida Bay.
Yellow fever and malaria
Governor Napoleon Broward hires U.S.D.A. scientist James Wright who determines that “eight canals would indeed drain 1,850,000 acres of swampland” (1904)

The U.S. Congress’ Rivers and Harbors Act includes significant funds to deepen the manmade Hamilton Disston connection of the Caloosahatchee River to Lake Okeechobee (ca.1910)

The resurgence of confidence in sales and a 1920s real estate boom fueled by advances in soil science, and the success of agricultural start-ups located in Moore Haven, Belle Glade, and Clewiston south of Lake Okeechobee

Land in a defined “Everglades Drainage District” more fully cut into sections for development with canals for drainage
More History

- Two very powerful hurricanes causing thousands of deaths and the destruction of property, and thus the state’s “call for a higher dike” (1926 and 1928)
- The state’s reaction to the hurricanes, the 1929 establishment of the “Okeechobee Flood Control District” for the “Everglades Drainage District” as well as the Federal Government’s Army Corp of Engineers taking over “field operations” around Lake Okeechobee
- Hoover directs ACE to construct dike around the lake
Flooding in South Florida

Main Street LaBelle - 1922

W Palm Beach - 1947
Central and Southern Florida Project

Central and Southern Florida (C&SF) Project, authorized by Congress in 1948, is a multi-purpose water resources project.

The authorized purposes of the project included: flood control, regional water supply for agricultural and urban areas, prevention of saltwater intrusion, water supply to Everglades National Park, preservation of fish and wildlife, recreation, and navigation.

Birth of water management in Florida
By the late 1980’s it was apparent while the C&SF project had achieved some goals, there were major problems – sparking a restudy of the plan.
In 1992 Congress authorized a Comprehensive Review Study (Restudy) of the C&SF Project. The purpose of the Restudy is to develop modifications to the Central and Southern Florida Project to restore the Everglades and Florida Bay ecosystems while providing for the other water-related needs of the region.

The Corps of Engineers and the South Florida Water Management District.

1999 – CERP – 60 separate projects
CERP

Comprehensive Everglades Restoration Plan (CERP), the largest environmental restoration program in history.

Goal is to enhance the Everglades and associated lakes, rivers and bays in south Florida, also enhance the quality of life for people and wildlife.

“Get the water right”
Last few years
Major Constraints Affecting the Ability to Send Flood Releases from Lake Okeechobee to the South

The C&SF Project was designed by the USACE to provide safe water storage in Lake Okeechobee by construction of the Herbert Hoover Dike with high stage safety relief through discharges primarily to the Caloosahatchee and St Lucie Estuaries.
LAKE OKEECHOBEE - The largest constraint is the weather!

- 5000 sq. miles draining into 730 sq. mile Lake

- Current storage in the basin is approximately 147,000 ac-ft (~3-4 inches in Lake O)

- Options for moving water out of the Lake are severely constrained on where you can and cannot send water

Current Initiatives:
- Storage and Treatment North of the Lake
- Kissimmee Restoration
- Dispersed Water Storage program designed to hold more water in the basin ~ > 1 million acre feet
- Southern Reservoir
- ASR’s
STRUCTURE CAPACITY: Trying to move water out of Lake Okeechobee

Structures to the south have a peak capacity of 6,000 cfs while the northern inflow is as high as 40,000 cfs, and are generally not available during wet periods.

The total discharge capacity to the Caloosahatchee (9,000 cfs) and St. Lucie (7,000 cfs) (as designed during Central & Southern Florida Flood Control Project) is less than half of what flows into the lake during wet periods and require local basin flows to be discharged first.

Building new high capacity structures through the Herbert Hoover Dike would be costly, and numerous downstream constraints must still be resolved.

Current Initiatives:
- C-44 Reservoir/STA , C-43 Reservoir, Lake Hicpochee, southern reservoir
- Storage and Treatment North of the Lake
- Coordination of Lake Releases south when capacity is available
CANAL CONVEYANCE: Moving water through the existing canals:

• EAA canals provide both flood control and water supply
• At times, capacity is completely taken up with local basin runoff (rainfall), or the canals must be drawn down in advance of a forecasted storm.
• Other times, permitted water supply needs take up the entire canal capacity, leaving none to deliver additional Lake water to the Everglades
• Making large releases from the Lake to the Water Conservation Areas (WCAs) would require a significant enlargement of the primary EAA canals.
• Similar constraints to moving water through the Caloosahatchee and St Lucie outlets occur at high flow rates.

Current Initiatives:
• Restoration Strategies (Construction EAA A1 FEB, L-8 FEB, expansion of Bolles Canal)
• Lake Releases South when capacity is available
Species Protection

- The Migratory Bird Treaty Act (MBTA) protects nesting birds under federal authority separate and in addition to the Endangered Species Act (ESA).
- Migratory birds nesting in the STAs limit how much water we can process before moving it south.
- The Endangered Species Act has led to very strict limits on hydrologic changes in key areas of the Everglades.
- In the case of the Cape Sabal Seaside Sparrow, too much water in the southern Everglades is the problem.
- This constrains how much water can be stored in the WCAs and sent south to the Park.
STORMWATER TREATMENT AREAS: LIMITED TREATMENT CAPABILITY

The STAs are necessary to meet state and federal water quality regulations—state law and Federal Court rulings. STAs were not designed to treat significant amounts of water from Lake Okeechobee. Sustained large Lake releases to the south result in water depths and nutrient loading that could cause substantial damage to the STAs. The performance of the STAs must be held within very strict limits specified in Federal and state law.

CERP anticipated storage north of the Lake plus ASR, to store water to deal with the excess water from north of the lake.

Current Initiatives:
- Expanding treatment capacity of STA’s
- Implementation delivery and treatment within existing STA’s through out the entire year
- Connection of STA 5/6 for treatment of Lake Water
PUMP CAPACITY:

• The capacity of the pumps needed to move water is a hard constraint on how much water can be moved through the EAA and STAs.

• Every drop of water has to be pumped from the EAA into the STAs and then it has to be pumped again to the Water Conservation Areas (WCAs).

• These pumps were designed as flood control structures during the Everglades Forever Act in the early 1990s.

• This limits how much water can be moved – changes are costly.

Current Initiatives:

• Expanded pumping capacity in EAA
• Construction of smaller environmental delivery pumps for better operational control during low flows
• Implementation of Restoration Strategies Implementation of Central Everglades Planning Project
WILDLIFE MANAGEMENT AREAS
Between the STAs and WCA's

- Preventing excessive high water periods in areas in consideration of furbearing animals, enable water recession and ascension conducive to wading bird foraging.
- Limits how much water you can put in and how much water you can take out.
- These areas are not currently used to take untreated water during Lake outflow events.

Current Initiatives:

- Through legislative funding in 2015 installed new pumps to allow treated water to be placed in Holeyland
- Developing jointly with FWC optimized regulation schedules for the Holeyland and Rotenberger Wildlife Management Areas
- Investigating discharge structure modifications to improve hydro patterns in Holeyland WMA
WATER LEVEL LIMITATIONS: WATER CONSERVATION AREAS (WCAs)

- Federal water regulation schedules for each Water Conservation Area. When the water level is above schedule in a WCA, no Lake water can be brought in.

- High water periods in the WCA areas must be limited to avoid harm to wildlife species and to reduce degradation of tree island vegetation. - Snail kite and wood stork: depend on the habitat in the WCAs

- Unnatural variations of water levels, higher or lower, have a detrimental effect on cultural resources. Seminole Tribe of Florida and the Miccosukee Tribe of Indians of Florida.

- Impact on coastal urban water supply in Palm Beach, Broward and Miami/Dade Counties

Current Initiatives:
Implementation of the Central Everglades Planning Project provides greater ability to move water out of the WCAs as water is moved into the WCAs from Lake O discharges south.
LOWE EAST COAST (LEC): CANAL CONVEYANCE

• These canals provide the legal flood control and water supply for the local areas.
• They are also routinely used to recharge the local urban aquifer.
• During extremely wet periods in the Everglades, they are also used to release water from the WCAs, but they are small canals with very limited capacity for this use.
• These canals priority are to move flood control waters to the ocean to protect 6 million people in Palm Beach, Broward and Miami-Dade counties.
• Like every other area, local property must receive primary flood control before water can be moved from the WCAs.

Current Initiatives:
CERP Projects (Site 1 Impoundment, Broward County Water Preserve Areas)
LEVEE SAFETY:

- The East Coast Protective Levee is the main barrier between the Water Conservation Areas and the urban coastal population.
- High inflow from the Lake during wet periods was not anticipated in the design of any of the WCA levees.
- The regulation schedule for WCA-3A was lowered several years ago to address safety concerns.
- A lower regulation schedule means less room for additional water from the Lake.
- With rainfall, stages in the WCAs can change very quickly.

Current Initiatives: $20 million has been invested in this levee over the last several years to ensure it meets FEMA and flood control requirements.
FLOW LIMITATIONS:

Three major constraints to moving water south into Everglades National Park have been documented:

- Conveyance restrictions imposed at the S-12 structures
- Conveyance restrictions imposed by the Old Tamiami Trail
- The limited ability to flow water into the east side of the Park.

In addition there is an Endangered Species challenge in the Park, the Cape Sabal Seaside Sparrow. The Sparrow restricts the operations of the S-12A and S-12B structures.

This inability to move water out of the south end causes the water to stack up in the WCAs and stops the flow of water moving south.

Current Initiatives:
Continuation of the Decomp Physical Model Study
Implementation of Comprehensive Everglades Planning Project
Complete Removal of Old Tamiami Trail - (2.6 mile Bridge)
Operation of Mod Waters and C-111 South-Dade projects
A primary mission of the C & SF Project is flood control. Many of the canals, levees and pumps were built, and still must be operated, for that specific purpose.

As more water is sent to Everglades National Park, must ensure flooding is not made worse for the private property east of Everglades National Park.

This is a key constraint

Groundwater seepage from the Park is a chronic, existing problem, and significantly more water would only add to the challenge.

Current Initiatives:
- Completion of Contract 8 & 9 of C-111 South-Dade
- Operation of Mod Waters and C-111
- South-Dade projects
- Investigation of potential additional protection features to further isolate agricultural/urban area from ENP hydrology
Maintenance of state water quality standards is crucial to the ecology of the WCAs and Everglades National Park.

Legal requirements to reduce phosphorus levels in discharges and achieve water quality standards:
- 1992 (and amendments) Settlement Agreement/Consent Decree
- 1994 (and amendments) Everglades Forever Act

Projects to achieve and maintain water quality standards:
- EAA and C-139 BMP Program and STAs
- Settlement Agreement & State Phosphorus Requirements: 10 ppb
  - WCA-1, WCA-2 & WCA-3
  - Everglades National Park
Constraint Status – past few years

- Higher than average rainfall early in the wet season of the past few years
- High inflows to the lake causing a rapid rise in lake level.
- At the same time excessive rain to the south led to deep water in the Everglades that threatened extended harm to the ecology.
- The constraints prevented sending flow to the south from the lake.
- The conveyance capacity to the coastal estuaries were the only option to prevent potentially
The Kissimmee River Restoration is a $615 million project that is nearing completion. It will add significant temporary storage in the flood plain during wet periods and reduce the nutrient loading into the Lake.

The Indian River Lagoon CERP Project is a mammoth $2 billion suite of projects that includes the C-44 Reservoir and STA as well as up to 80,000 acres of natural storage areas.

The C-43 Reservoir is another CERP project authorized in 2014 that is expected to cost in excess of $600 million and store 170,000 acre-feet of local runoff and Lake Okeechobee releases. This will reduce the high discharge flows to the estuary and provide a reliable source of dry season flow to meet the Minimum flow to the estuary.

Dispersed water storage on Ag lands

ASR wells
Projects in the Queue: South of the Lake

Three major projects that are necessary to consistently move excess Lake water to the south - when completed an annual average of 210,000 acre-feet of Lake water can be sent south.

The Restoration Strategies Project (shown in aqua) is an $880 million project so runoff from the EAA, and a limited amount of Lake water, can meet final water quality standards. The project is scheduled to be fully operational in 2029.

The Modified Water Deliveries Project (shown in red) is essentially complete but will not be fully operational until 2020.

The Central Everglades Project (shown in yellow) has a cost estimate of $1.9 billion and is necessary to move additional water south. The plan has been approved by the USACE, but not authorized by Congress. Full operation is forecast in the 2030-2040 time frame.

EAA Reservoir - $1 billion
May 2017 Rick Scott signed legislation, that provides more than $1 billion to increase water storage south of Lake Okeechobee as part of an effort to reduce harmful lake discharges to the Caloosahatchee and St. Lucie estuaries.

The new Water Resources Law directs the expedited design and construction of a water storage reservoir in the Everglades Agricultural Area (EAA) to provide for a significant increase in southern storage.

The reservoir is a project component of the CERP- Central Everglades Planning Project, and will be designed to hold at least 240,000 acre-feet of water.
SUMMARY

The system has been designed to send Lake Okeechobee water east and west to the Atlantic Ocean and the Gulf without hydrologic constraints.

Numerous hydrologic, ecologic and legal constraints can make it impossible to send lake water south when Lake Okeechobee stages are high and the estuaries are receiving high discharges.

In normal years, some water can be sent south when the various constraints allow it.

Until a number of projects are completed, no significant amounts of additional lake water can be sent south during wet years.

When those projects are built, an additional average of 210,000 acre-feet can be sent south, but only when the constraints allow it.

Additional strategies to move water south in concert with addressing the problems of the Northern Everglades, Lake Okeechobee and the estuaries must be developed in the future.
References

Major Constraints Affecting the Ability to Send Flood Releases from Lake Okeechobee to the South
https://apps.sfwmd.gov/webapps/publicMeetings/viewFile/11957

IT IS HARD WALKIN' ON THIS STUFF.

YEP, SON, WE HAVE MET THE ENEMY AND HE IS US.
Questions