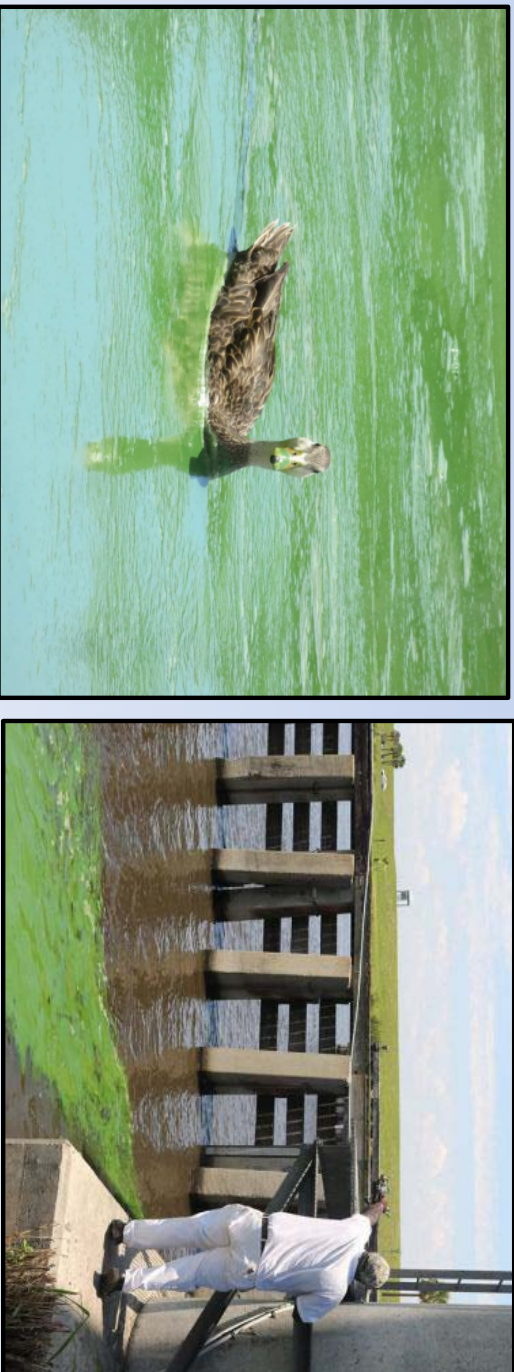


Options for Reducing Harmful Lake Okeechobee Discharges and Everglades Restoration

The Florida Senate Appropriations Subcommittee on the Environment and Natural Resources

January 11, 2017 – Gary Goforth, Ph.D., P.E., Gary Goforth, LLC



Discussion Points

1. The State of Florida suffers significant economic, public health and environmental damages resulting from harmful Lake Okeechobee discharges to the estuaries.
2. The single most important project that can be implemented to reduce damaging discharges to the estuaries and restore flow to the Everglades is completion of the EAA Storage Reservoir, which has been an integral component of Everglades restoration for more than 20 years.
3. Multiple combinations of location, configuration, land area and water depth can achieve the storage and flow objectives of the EAA Storage Reservoir.

Economic and Ecologic Impacts

Economic impacts

- 27,000 jobs and \$840 million per year in water-related businesses around the St. Lucie Estuary
- 50,000 jobs and \$3 billion per year in Lee County; \$40 million lost revenues in 2005 high flows
- Florida Realtors 2015 report: loss of property values associated with large Lake discharge events
 - \$428 million around St. Lucie Estuary
 - \$541 million around Caloosahatchee Estuary; 2016 real estate sales down 22% from 2015

Ecologic impacts

- Estuaries:
 - loss of oysters, seagrass, habitat and associated impacts in food chain (fish, turtles, etc.)
 - deposition of muck, high nutrients and toxic algae
- Everglades, Gulf of Mexico and Florida Bay: loss of flow and associated impacts

1980-2016 average annual discharges to Caloosahatchee and St. Lucie

- 242 billion gallons of harmful Lake discharges
 - could satisfy water supply demand for 4.4 million people
 - about \$850 million/yr to replace this wasted water
- 3.3 million pounds nitrogen
- 222,000 pounds phosphorus
- 31 million pounds suspended sediment

2016 – about 3 times average annual flows and pollution

- Martin/St. Lucie septic tanks estimated to contribute <2% of nutrient loading

2016 – Toxic Algae Blooms in St. Lucie and Caloosahatchee Estuaries from Lake Okeechobee



- Toxic Algae Blooms** - Only occur during years with high Lake discharges to St. Lucie Estuary
- Causes acute human health problems – respiratory and skin – over 100 cases documented in Martin County in 2016
 - Linked to chronic public health problems – Alzheimer's, Parkinson's and ALS
 - Cattle and pet deaths

Unprecedented public and media response

“Store it - Clean it - Move it south!”



Additional storage is needed in all regions

The science is clear, consistent and unambiguous – additional storage is needed south of the Lake

- **Eastern storage** of Lake being accomplished through authorized and on-going CERP Project; C-44 Reservoir designed to capture basin runoff – not Lake discharges
- **Western storage** – C-43 Reservoir and other basin projects
- **Northern storage** – benefits dry season water supply north of lake; limited ability to reduce harmful discharges to estuaries: after filling, majority of discharges flow to Lake

- **Southern storage**

Discharge is to the south; can operate 12 months of the year and significantly reduce harmful discharge to estuaries

- Water Year 2015: 191 billion gallons sent south to Everglades; more than 10 fill/drain cycles
 - 184 billion gallons still went to estuaries
 - Proved that southern storage is effective even though Lake is high and that STA performance doesn't suffer
 - 2016: 80 billion gallons sent south to Everglades; 740 billion gallons to estuaries
- 2009 SFWMD identified a goal of 228 to 358 billion gallons of storage south of Lake (River of Grass)
- 2014 Central Everglades Planning Project (CEPP) – **storage greater than 120 billion gallons is likely needed**
- 2015 Univ. of Florida Water Institute Study

- Achieving substantial reduction in lake-triggered discharges to the estuaries and substantial improvement toward the dry season Everglades demand target will require additional land between the lake and the Everglades
- Recommended between 43-165 billion gallons, on between 11,000 – 129,000 acres

2016 National Academies of Science, Engineering and Medicine – **more storage needed**

- Historical rainfall greater than assumed in CERP -> more storage would likely be needed to accommodate future changes in the quantity and intensity of runoff.
- At the same time, over 325 billion gallons of the originally envisioned storage has been lost due to design changes, new understanding of project feasibility (e.g., ASR wells) and changes to Lake Okeechobee's operating schedule.

EAA Storage Reservoir – The Unfinished 60-yr Old Project

Combined shortfall for EAA Storage Reservoir = 100 billion gallons

1923 – first reported discharges from Lake Okeechobee to the St. Lucie Estuary

1930 – Martin County Commission sends first of many requests to State requesting a stop to the discharges

1955 – *US Army Corps evaluates new outlet and flow-way south of Lake*

1980s - The concept of Regional EAA Reservoir Storage was formalized through the late 1980s and early 1990s

1996 – Governor’s Commission for a Sustainable South Florida: A Conceptual Plan for the C&SF Project Restudy

- Stakeholders unanimously agreed to storage reservoirs in the EAA

1999 - C&SF Restudy - identified EAA Storage Reservoirs as Component G – 120 billion gallons on 60,000 acres

- Land acquired from willing sellers prior to planning and design completion

2000 - The EAA Storage Reservoir was authorized by Congress as part of initial set of CERP projects

- A-1 Reservoir – 62 billion gallons, 12 feet deep on 17,000 acres
- A-2 Reservoir – 55 billion gallons, 12 feet deep on 16,000 acres
- 2006 cost estimate: \$913 million – delay has cost the taxpayers hundreds of millions of dollars

2006 - Construction of A-1 Reservoir began; anticipated construction completion 2009-2011

2008 – Construction of A-1 Reservoir stopped after expenditure of more than \$500 million

2012 – A-1 footprint converted to a shallow water surge basin to provide additional water quality treatment for predominantly EAA runoff, and secondarily, for Lake releases (Restoration Strategies)

2013 – Central Everglades Project (CEP) –

- A-1 reservoir was removed from CERP – loss of 62 billion gallons of storage
- A-2 reservoir was reduced from 55 billion gallons to 18 billion gallons, a loss of 37 billion gallons

2016 – Sen. Negron proposes acquisition of up to 60,000 acres and construction of EAA Storage Reservoir

- 60,000 acres is less than 15% of the EAA

Benefits of EAA Storage Reservoir

- Create construction jobs and long-term jobs and inject money into the local economy
- Reduce the damaging discharges to coastal estuaries and reduce risk of health problems
- Provide additional water to meet Everglades and agricultural water demands, improving the timing of environmental deliveries of clean water to the WCAs, Florida Bay and the Gulf of Mexico
- Provide additional water to the Florida east coast well fields and combat sea level rise
- Reduce extreme high and low levels in Lake Okeechobee
- Reduce the potential for flooding in the EAA, and reduces the need for emergency flood control back-pumping into Lake Okeechobee
- Improve operational flexibility to move water within the EAA, including flow equalization and optimization of STA performance to further reduce phosphorus inflows to the Everglades
- Provide public access and recreation opportunities

Many configurations and locations can achieve the storage and flow objectives

From SFWMD 2012:
“Value and productivity of land in the EAA decreases with distance from Lake Okeechobee”
“Southern portion of EAA demonstrated better cost effectiveness on a cost per ac-ft of storage when compared to other locations.”

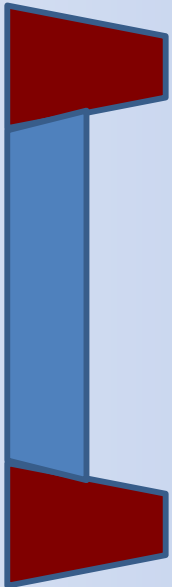
Perhaps the A-2 footprint can be used for a deep water reservoir, as originally planned.



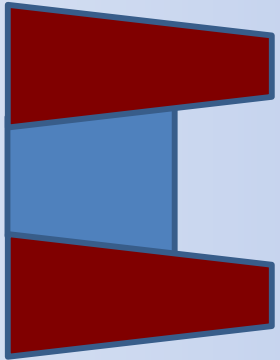
Many combinations of area and depth can achieve the storage and flow objectives

Alternative	Storage Depth (feet)	Land Area (acres)	Storage Volume (billion gallons)
1	6	60,000	120
2	10	36,000	120
3	12	30,000	120
4	14	25,715	120

Note: alternatives evaluated during planning process for initial EAA Storage Reservoir (2006)



Alt. 1. 6-ft deep,
60,000 acres



Alt. 3. 12-ft deep,
30,000 acres

Potential Socioeconomic Benefits of EAA Storage Reservoir Project

Jobs and training for local residents:

- Over \$1 billion construction program
 - \$500,000 expenditures in Tri-cities area
- Estimated over 650 direct jobs:
 - Construction craft workers
 - Heavy equipment operators
- Long-term employment opportunities

SFWMD briefing, April 20, 2007

Potential Next Steps

1. Land acquisition
2. Accelerate planning and design (coordination with Corps)
 - evaluate alternatives, incl. use of A-2 footprint as deep water reservoir
3. Continue stakeholder meetings, including identifying socioeconomic opportunities
4. Construction
5. Revise Lake Okeechobee regulation schedule
6. ***Celebrate completion of CERP EAA Storage Reservoir!***

On a parallel path

- Improve Lake Okeechobee water quality
- Begin health sampling of Glades communities and estuary regions affected by potentially toxic algal blooms

Take Home Messages

1. The State of Florida suffers significant economic, public health and environmental damages resulting from harmful Lake Okeechobee discharges to the estuaries.
2. The single most important project that can be implemented to reduce damaging discharges to the estuaries and restore flow to the Everglades is completion of the EAA Storage Reservoir, which has been an integral component of Everglades restoration plans for more than 20 years.
3. Several combinations of location, configuration, land area and water depth can achieve the storage and flow objectives of the EAA Storage Reservoir.