

May 6, 2019

via email: frazer@ufl.edu

Dr. Thomas Frazer, Chief Science Officer
School of Natural Resources and Environment
103 Black Hall
PO Box 1116455
Gainesville, FL 32611

Subject: Recommendations for Improving the Basin Management Action Plans for Lake Okeechobee and St. Lucie Estuary

Congratulations on your appointment as the state's Chief Science Officer!

With the Governor's emphasis on improving water quality, one of the more productive areas of focus for you and the Blue-Green Algae Task Force will be recommending enhancements to the state's Basin Management Action Plans (BMAPs). One enhancement that should be considered is to use measured phosphorus loads entering Lake Okeechobee instead of relying on a computer simulation of the best-case scenario; for 2017, the ***measured*** 5-yr average annual phosphorus load was 60 percent higher than the load ***reported*** in the BMAP progress report. Based on the computer simulation, FDEP proclaimed significant progress towards achieving the TMDL, when in reality, ***loading was worse than the period prior to the BMAP development.***

Attached is a summary of suggested recommendations for enhancement of the BMAPs for Lake Okeechobee and the St. Lucie Estuary, based on more than three decades of my experience in water resources, water quality and environmental protection in south Florida. I have served as a state of Florida's expert witness on water quality and water quality treatment, and worked for state and federal agencies on staff and as a consultant. I participated in the development and/or review of major water quality programs for the Everglades, Lake Okeechobee, St. Lucie and Caloosahatchee Estuaries since the late 1980s, including the TMDLs and BMAPs for those waterbodies. Also attached are recent presentations I gave at this year's Everglades Coalition that provide background information on pollution loading to the Lake and estuaries.

Please let me know how I can be of further assistance.

I wish you great success in your new position!

Gary Goforth, P.E., Ph.D.
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Attachments

1. Specific recommendations for improving Lake Okeechobee Watershed BMAP
2. Specific recommendations for improving St. Lucie Estuary Watershed BMAP
3. 2019 Everglades Coalition Plenary presentation
4. 2019 Everglades Coalition BMAP presentation
5. 2007 Northern Everglades and Estuary Protection Program documents for use in BMAP enhancement
 - a. Link to 2013 Draft Technical Support Document for Lake Okeechobee
 - b. Link to 2013 Draft Technical Support Document for St. Lucie Estuary
 - c. Link to 2013 Draft Technical Support Document for Caloosahatchee Estuary

cc w/att: Noah Valenstein, FDEP (noah.valenstein@dep.state.fl.us)

Thomas Frick, FDEP (thomas.frick@floridadep.gov)

Dr. Wendy Graham, UF (wgraham@ufl.edu)

Dr. Mike Parsons, FGCU (mparsons@fgcu.edu)

Dr. James Sullivan, FAU Harbor Branch (jsullivan@fau.edu)

Dr. Valerie Paul, Smithsonian Marine Station (Paul@si.edu)

Dr. Evelyn Gaiser, FIT (evelyn.gaiser@fiu.edu)

Attachment 1 - Key Recommendations for Enhancing the Lake Okeechobee BMAP (page 1 of 2)

No.	Deficiency	Reason This is a Problem	Recommended Remedy
1	The Lake Okeechobee TMDL Rule (Ch. 62.304.700(1)) requires loads to be reported as a 5-yr annual average of measured values. However, the BMAP does not use available measured data when calculating nutrient loads, instead uses a computer simulated best case scenario that ignores many sources of pollution, including Class AA biosolids, excess fertilization, and legacy nutrients	The BMAP underestimates pollution load to Lake Okeechobee. For example, the measured 5-yr average load into Lake Okeechobee for the period ending Dec. 2017 was 60% greater than the load reported in the 2018 BMAP progress report.	Use available flow and concentration data collected, analyzed, made available to the public and reported by the SFWMD when calculating and reporting nutrient loads for attainment of the TMDL. This is required by the TMDL Rule and will be consistent with relevant regulatory programs.
2	The BMAP loading estimate ignores loads from more than 800,000 acres (23%) of the Lake Okeechobee watershed.	The BMAP underestimates pollution load to Lake Okeechobee	Include all of the Lake's watershed when estimating loads to the lake, as required by the TMDL Rule.
3	The BMAP does not identify projects that collectively achieve the TMDL.	The BMAP is not a complete plan to achieve the TMDL.	Identify sufficient projects to achieve the TMDL.
4	There is no deadline to achieve the TMDL. The Florida Legislature removed the January 2015 deadline, established in 2000, and replaced it with an ambiguous 15-20 year timeframe.	With no deadline, there is no sense of urgency, no accountability, and likely, no attainment of the required load reductions.	The legislature should establish a hard deadline to achieve the TMDL with suitable consequences for failure to attain it.
5	The state's nutrient control program for the lake, which is based on the BMAP, does not contain an annual assessment for compliance purposes.	Without an annual assessment for compliance purposes, landowners are not held accountable for implementing timely measures to reduce excessive nutrient levels leaving their property. Without accountability, there is no mechanism to identify what projects and BMPs are working, or to implement additional measures.	Establish an annual assessment for compliance; see e.g., the EAA and C-139 Basin Rules (40E-63 or Goforth et al. 2013, http://www.garygoforth.net/Draft_LOW_TSD_-_Feb_2013.pdf)
6	The BMAP does not establish sub-watershed level performance measures which would focus efforts in the most critical areas. Instead it establishes a single value for the entire watershed. Related, the BMAP does not give an accounting of the status and water quality conditions within the nine sub-watersheds.	Without sub-watershed level performance measures, it is impossible to identify trends, focus on hot spots, and to better understand what BMPs are working well in some basins so these lessons learned could be applied in other basins that may not be working as well.	Establish sub-watershed level performance measures for sub-watersheds, and give an annual accounting of the status and water quality conditions within the nine sub-watersheds (see Goforth et al. 2013)
7	The BMAP has changed reporting periods since its initial development, and these are different from established water year consistent with data reports from SFWMD	This unnecessarily creates conflict and confusion when cross referencing reports and loading estimates.	Use a May 1 to April 30 water year, which is the standard period used by the SFWMD.
8	The BMAP does not calculate or report nitrogen loads to the Lake, in part because the state has failed to set a TMDL for total nitrogen.	The explosive growth of toxic blue green algae (microcystis) in Lake Okeechobee requires high levels of water-borne nitrogen, and due to the public health, economic and environmental consequences of these blooms, particularly when discharged to the estuaries, nitrogen loading to the lake must be controlled.	The state should adopt a Lake Okeechobee TMDL for nitrogen. In the interim, the BMAP could report the nitrogen loads to the lake using available data collected and reported by SFWMD.

Attachment 1 - Key Recommendations for Enhancing the Lake Okeechobee BMAP (concluded)

No.	Deficiency	Reason This is a Problem	Recommended Remedy
9	The BMAP assumes that agricultural BMPs have been implemented (many without field verification) and are working at 100% effectiveness (most without monitoring) as long as landowners sign a notice of intent to voluntarily implement BMPs.	Agriculture is the largest land use within the watershed, and was responsible for more than 75% of the phosphorus load during the starting period. The significant discrepancy between reported and actual phosphorus loading to the Lake is clear evidence that the assumption of 100% effectiveness is flawed.	Multiple actions are needed. 1. Additional staff and agency budget are needed to field verify the implementation of ag BMPs. 2. Additional staff and agency budget are needed to implement reasonable monitoring programs at secondary and perhaps tertiary tiers within each sub-watershed in order to verify the effectiveness of ag BMPs. 3. Report measured loads for each sub-watershed, and if available each tier within the sub-watersheds. This will help identify basins with the higher unit area loads that could be prioritized. 4. if computer simulations continue to be used, they should be re-calibrated each year to estimate the loading from each land use.
10	The BMAP method does not directly account for hydrologic variability, inherent in south Florida rainfall and runoff, and therefore cannot produce a reliable annual assessment. Instead the BMAP uses a computer simulation to represent the overall hydrologic variability of a "long-term period."	Loads are a function of runoff volume which varies from year-to-year with rainfall. Without a method that directly incorporates hydrologic variability, the assessment method cannot ascertain whether source controls are effective, or the loads are variable resulting from variable rainfall patterns.	Establish performance measures that directly account for hydrologic variability; see for example the EAA and C-139 Basin regulatory programs (40E-63, F.A.C.) and the draft assessment method contained in Goforth et al. 2013.
11	The BMAP is not in synch with the Works of the District permitting program establish in 1989 to limit phosphorus levels entering the lake (Rule 40E-61).	There is presently no regulatory program that holds individual landowners accountable for pollution leaving their property. Without accountability, there is no mechanism to identify what projects and BMPs are working or to implement additional measures.	Complete the revisions to 40E-61 as directed by the 2007 NEEPP legislation. Until the BMAP process began, the District was reinforcing the Works of the District regulatory program as directed by the Legislature through the 2007 Northern Everglades and Estuaries Protection Plan (373.4595). A Technical Support Document was drafted (see Goforth et al. 2013) that can be used as a foundation.
12	The BMAP in general requires more rigorous monitoring for projects implemented by municipalities than by agricultural landowners.	A reasonable monitoring program is essential for an effective program and there should be a minimum standard for all projects, or projects within a geographical area.	FDEP should establish a minimum standard for monitoring for all projects, or projects within a geographical area.
13	Inadequate funding opportunities exist for full BMAP implementation.	Water quality improvement projects require adequate funding.	Assist landowners and municipalities with increased state or federal funding opportunities.

Attachment 2 – Key Recommendations for Enhancing the St. Lucie Estuary BMAP (page 1 of 2)

No.	Deficiency	Reason This is a Problem	Recommended Remedy
1	The BMAP does not use available data when calculating nutrient loads, instead uses a computer simulated best case scenario that ignores many sources of pollution, including Class AA biosolids, excess fertilization, and legacy nutrients	The BMAP underestimates pollution load to the estuary. For example, the most recent 5-yr average nitrogen load to the estuary was approximately 70% greater than the load reported in the 2018 BMAP progress report.	Use available data collected, analyzed, made available to the public and reported by the SFWMD when calculating and reporting nutrient loads. This will be consistent with relevant regulatory programs.
2	The BMAP loading estimate ignores loads from Lake Okeechobee regulatory releases.	The BMAP significantly underestimates the pollution load to the estuary. For example, in WY2018, the Lake contributed more than 350,000 pounds of phosphorus - which is more than twice the TMDL for the entire watershed.	Modify the BMAP to account for loads from Lake Okeechobee regulatory releases.
3	There is no deadline to achieve the TMDL.	With no deadline, there is no sense of urgency, no accountability, and likely, no attainment of the required load reductions.	The legislature should establish a hard deadline to achieve the TMDL with suitable consequences for failure to attain it.
4	The state's nutrient control program for the estuary, which is based on the BMAP, does not contain an annual assessment for compliance purposes.	Without an annual assessment for compliance purposes, landowners are not held accountable for implementing timely measures to reduce excessive nutrient levels leaving their property. Without accountability, there is no mechanism to identify what projects and BMPs are working, or to implement additional measures.	Establish an annual assessment for compliance; see e.g., the EAA and C-139 Basin Rules (40E-63 or Goforth et al. 2013, http://www.garygoforth.net/TSD%20for%20SLRW%20-%2012%2018%202013.pdf)
5	The BMAP does not establish sub-watershed level performance measures which would focus efforts in the most critical areas. Instead it establishes a single value for the entire watershed. Related, the BMAP does not give an accounting of the status and water quality conditions within the nine sub-watersheds.	Without sub-watershed level performance measures, it is impossible to identify trends, focus on hot spots, and to better understand what BMPs are working well in some basins so these lessons learned could be applied in other basins that may not be working as well.	Establish sub-watershed level performance measures for sub-watersheds, and give an annual accounting of the status and water quality conditions within the sub-watersheds (see Goforth et al. 2013).
6	The BMAP reporting period is different from established water year consistent with data reports from SFWMD.	This unnecessarily creates conflict and confusion when cross referencing reports and loading estimates.	Use a May 1 to April 30 water year, which is the standard period used by the SFWMD.

Attachment 2 – Key Recommendations for Enhancing the St. Lucie Estuary BMAP (concluded)

No.	Deficiency	Reason This is a Problem	Recommended Remedy
7	The BMAP assumes that agricultural BMPs have been implemented (many without field verification) and are working at 100% effectiveness (most without monitoring) as long as landowners sign a notice of intent to voluntarily implement BMPs.	Agriculture is the largest land use within the watershed, and was responsible for more than 75% of the phosphorus load during the starting period. The significant discrepancy between reported and actual phosphorus loading to the estuary is clear evidence that the assumption of 100% effectiveness is flawed.	Multiple actions are needed. 1. Additional staff and agency budget are needed to field verify the implementation of ag BMPs. 2. Additional staff and agency budget are needed to implement reasonable monitoring programs at secondary and perhaps tertiary tiers within each sub-watershed in order to verify the effectiveness of ag BMPs. 3. Report measured loads for each sub-watershed, and if available each tier within the sub-watersheds. This will help identify basins with the higher unit area loads that could be prioritized. 4. if computer simulations continue to be used, they should be re-calibrated each year to estimate the loading from each land use.
8	The BMAP method does not directly account for hydrologic variability, inherent in south Florida rainfall and runoff, and therefore cannot produce a reliable annual assessment. Instead the BMAP uses a computer simulation to represent the overall hydrologic variability of a "long-term period."	Loads are a function of runoff volume which varies from year-to-year with rainfall. Without a method that directly incorporates hydrologic variability, the assessment method cannot ascertain whether source controls are effective, or the loads are variable resulting from variable rainfall patterns.	Establish performance measures that directly account for hydrologic variability; see for example the EAA and C-139 Basin regulatory programs (40E-63, F.A.C.) and the draft assessment method contained in Goforth et al. 2013.
9	The BMAP is not in synch with the Works of the District permitting program establish in 1989 to limit phosphorus levels entering the lake (Rule 40E-61).	There is presently no regulatory program that holds individual landowners accountable for pollution leaving their property. Without accountability, there is no mechanism to identify what projects and BMPs are working or to implement additional measures.	Complete the revisions to 40E-61 as directed by the 2007 NEEPP legislation. Until the BMAP process began, the District was reinforcing the Works of the District regulatory program as directed by the Legislature through the 2007 Northern Everglades and Estuaries Protection Plan (373.4595). A Technical Support Document was drafted (see Goforth et al. 2013) that can be used as a foundation.
10	The BMAP in general requires more rigorous monitoring for projects implemented by municipalities than by agricultural landowners.	A reasonable monitoring program is essential for an effective program and there should be a minimum standard for all projects, or projects within a geographical area.	FDEP should establish a minimum standard for monitoring for all projects, or projects within a geographical area.
11	Inadequate funding opportunities exist for full BMAP implementation.	Water quality improvement projects require adequate funding.	Assist landowners and municipalities with Increased state or federal funding opportunities.
12	The FDEP BMAP method ignores the annual variability in the proportion of C-44 Canal Basin runoff that flows to the SLRE (as opposed to Lake Okeechobee).	The BMAP will fail to accurately document the load from the C-44 Canal Basin, by either underestimating or overestimating the load.	Modify the BMAP to account for loads from the entire C-44 Canal sub-watershed, and then separate those loads that are sent to the estuary.

From Cradles of Life to Chambers of Death: The Everglades Connection?

January 11, 2019 – Gary Goforth, Ph.D., P.E.

“The blind pursuit of economic growth had transformed cradles of life into chambers of death.” J. Davis, *The Gulf* (2017)



Disclaimer: Opinions expressed are those of the author and not of Florida Oceanographic Society, EvCo or any other group.

Gary Goforth, LLC

Good Water Quality is Good for the Economy



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 around the Caloosahatchee Estuary



In pursuit of economic growth, what happens in the Everglades no longer stays in the Everglades.
On average, over 1 billion gallons per day of Lake Okeechobee water is diverted to the estuaries.

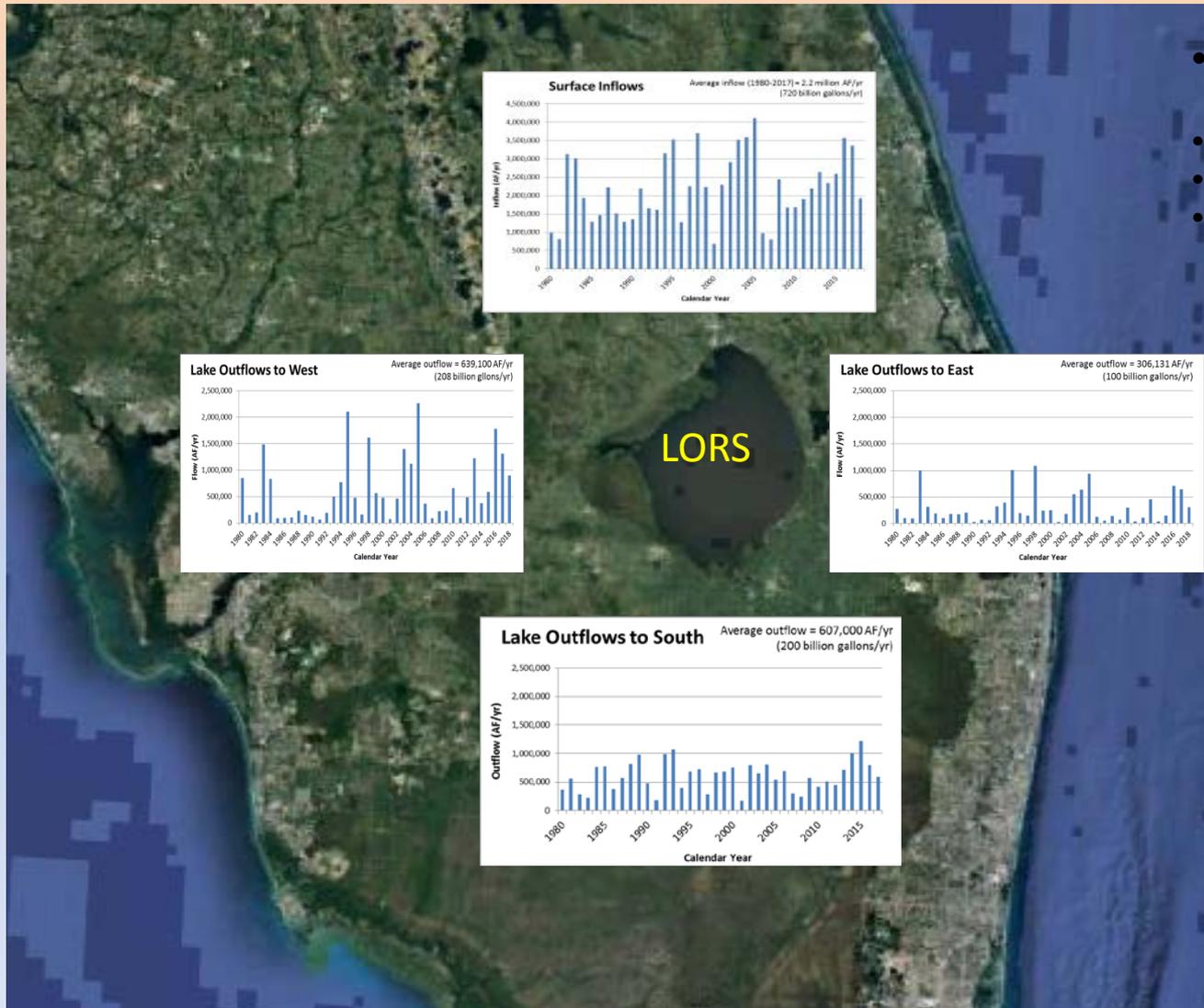
Historic Condition



Current Condition



Lake Inflow and Outflow are Highly Variable



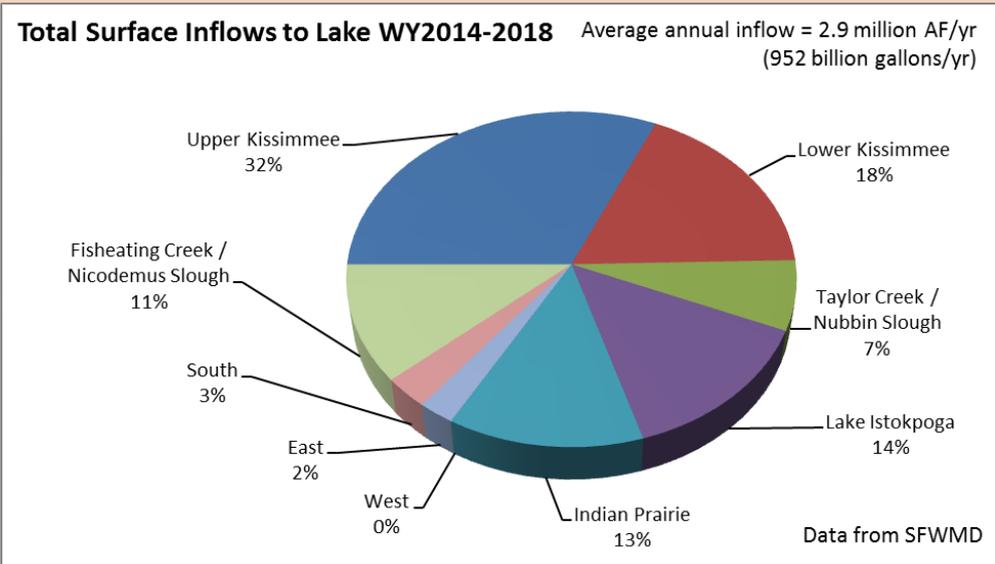
- 9 sub-watersheds covering 3.4 million acres
- 50% agriculture
- 38% natural lands and water
- 12% communities

5-yr average
Surface inflow
~2.6 billion gallons/day
(BG/day)

Outflow influenced by
LORS2008
Average about 2 BG/day

Average inflows increased
about 40%, but
Average outflows
increased more than 60%
during LORS2008

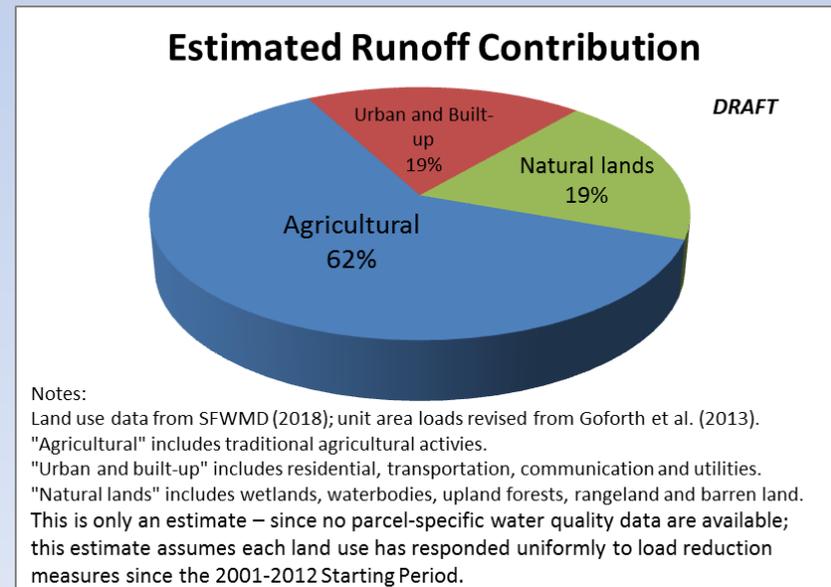
Lake Okeechobee Inflow Sources



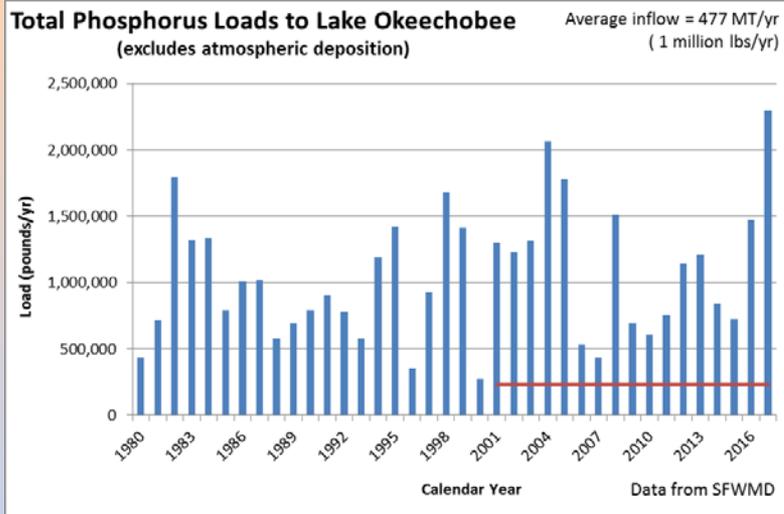
About half of inflows came from Kissimmee Chain of lakes and river valley sub-watersheds

About half came from remaining watershed

Estimated that slightly more than half of surface inflows came from agricultural lands.

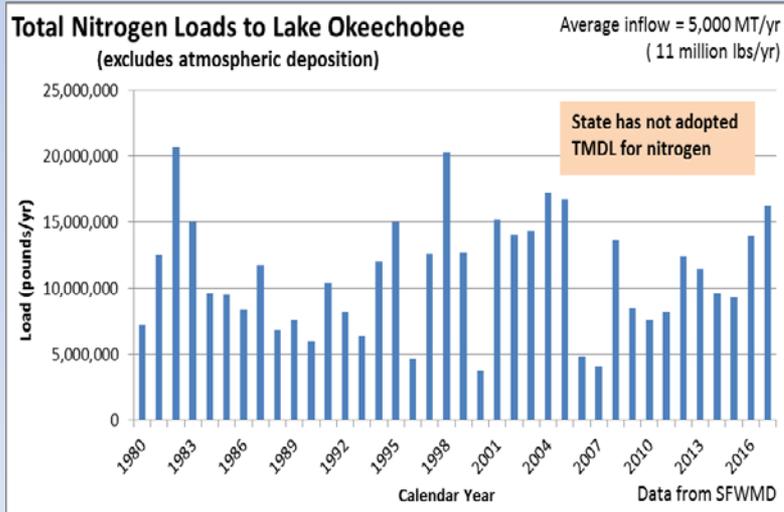


Lake Okeechobee Pollution



During 2017 - historic high phosphorus loads – 2.3 million pounds

1. High inflows from Hurricane Irma
 - However, inflows were lower than from 2004 and 2005 hurricanes

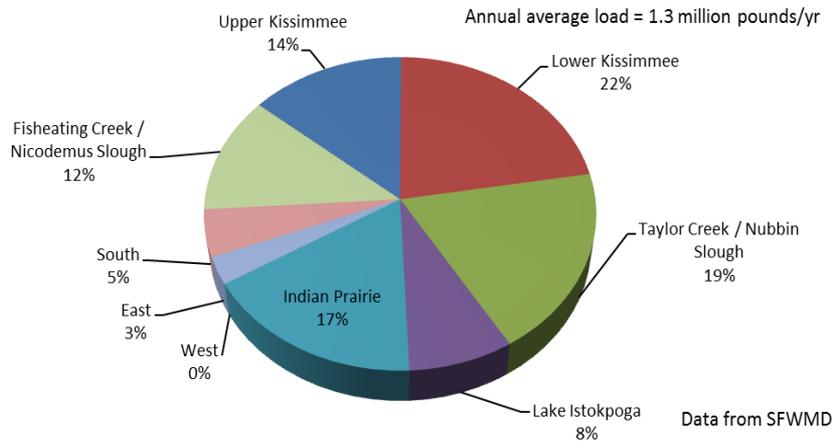


2. **High concentrations from watershed**
 - 252 ppb concentration – 3rd highest in history
 - Much higher concentrations than in 2004 and 2005 hurricanes (212 & 159 ppb, respectively)

The average loading is consistently more than 5 times the TMDL target for the watershed.

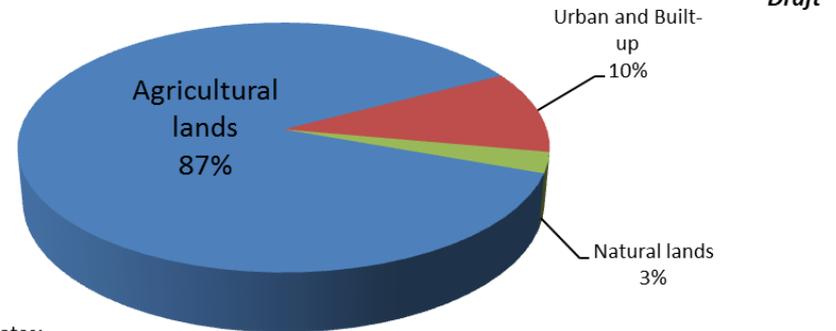
Lake Okeechobee Pollution Sources

Total Phosphorus Loads to Lake - WY2014-2018



Total Phosphorus Loading to Lake Okeechobee - WY2014-2018

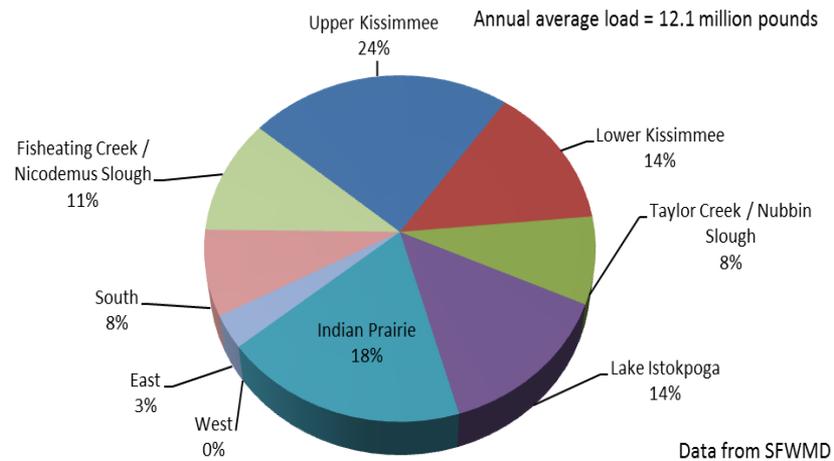
5-yr Ave. Annual load = 1,316,863 lbs/yr



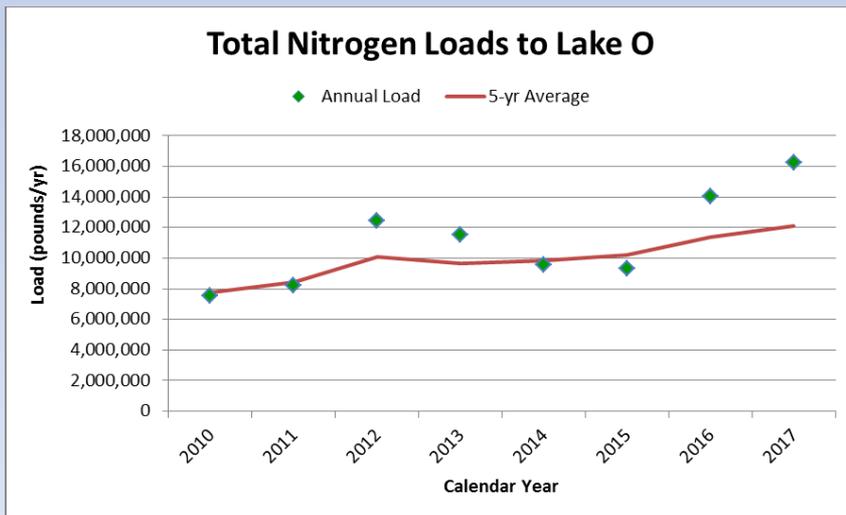
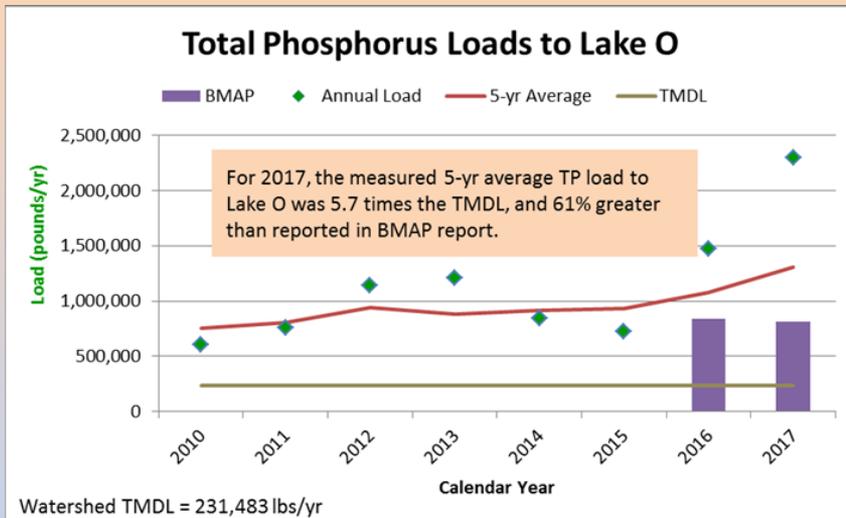
Notes:

Land use data from SFWMD (2018); unit area loads revised from Goforth et al. (2013).
 "Agricultural" includes traditional agricultural activities.
 "Urban and built-up" includes residential, transportation, communication and utilities.
 "Natural lands" includes wetlands, waterbodies, upland forests, rangeland and barren land.
 This is only an estimate – since no parcel-specific water quality data are available; this estimate assumes each land use has responded uniformly to load reduction measures since the 2001-2012 Starting Period.

Total Nitrogen Loads to Lake - WY2014-2018



Lake Okeechobee Pollution Control?



Total Maximum Daily Load (TMDL) for phosphorus set in 2001 at 231,483 lbs/yr from the watershed

- Original compliance date: January 2015
- In 2016, Florida legislature deleted the 2015 deadline and existing regulatory program, and replaced them with an ambiguous process (Basin Mgmt. Action Plan; BMAP) that does not hold landowners accountable for their pollution

The average load was more than 5 times the TMDL for the watershed, and getting worse, despite the BMAP.

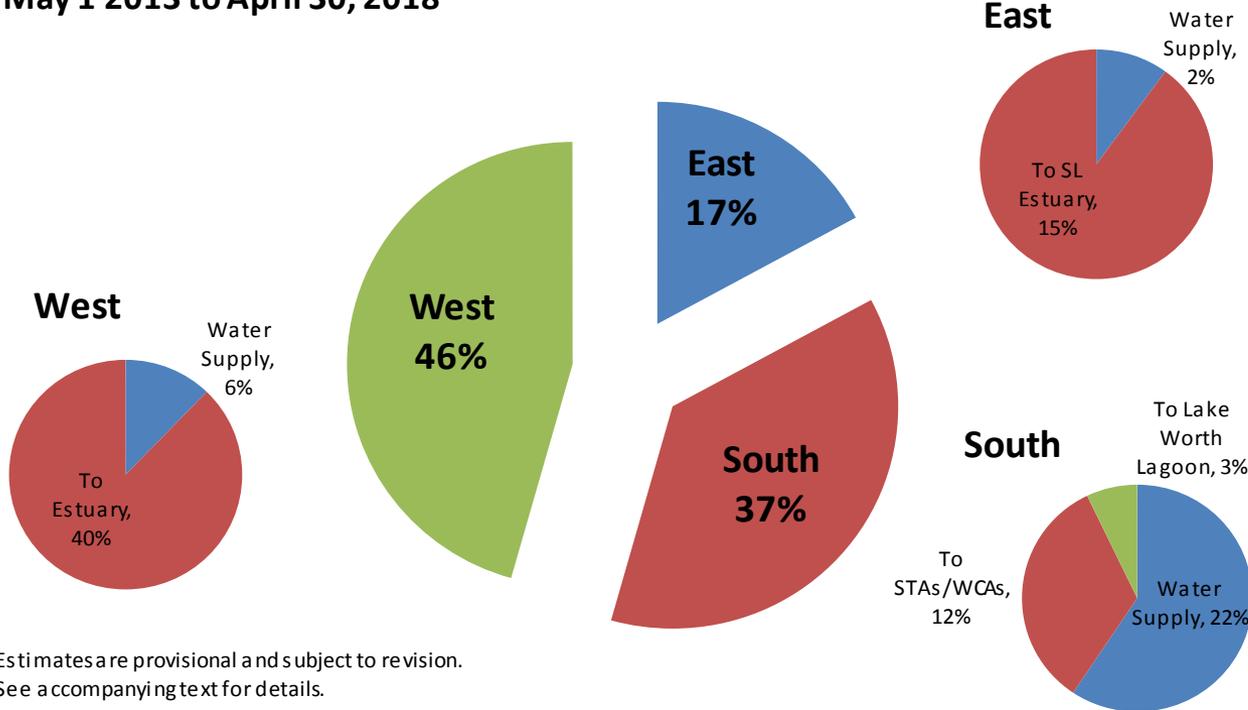
BMAP ignores loading from 800,000 acres of watershed, doesn't use available load data, doesn't identify projects to achieve the TMDL, does not require field verification/monitoring of BMPs, etc. And then reports that load levels are improving!

Total nitrogen is critical as toxic blue green algae (*microcystis*) cannot obtain nitrogen from the air – feeds off of waterborne source. *Yet the state has not set a limit for inflows of nitrogen.*

State's pollution control program for the Lake is broken and needs to be fixed!

The Everglades Connection: Lake Okeechobee Discharges

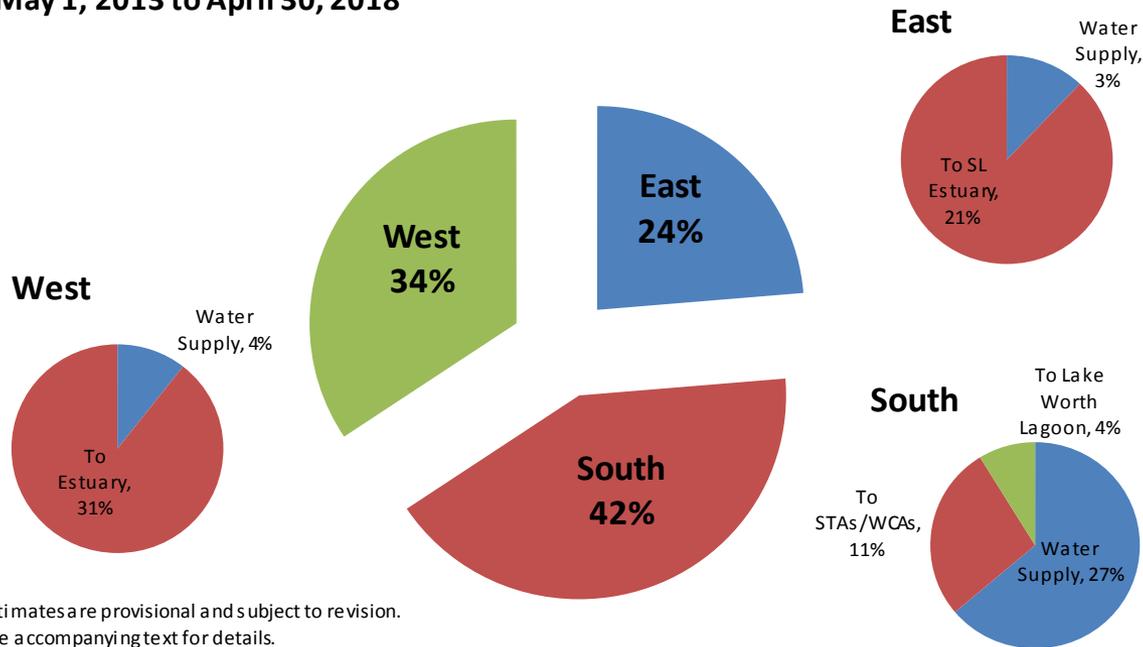
Distribution of Lake Okeechobee Releases May 1 2013 to April 30, 2018



55% of Lake discharges (1.2 BG/day) went to the estuaries, while only 12% went to the Everglades.

The Everglades Connection: Lake Okeechobee Pollution Discharges

Distribution of Lake Okeechobee TP Load
May 1, 2013 to April 30, 2018



52% of TP load leaving the Lake went to the estuaries, while only 2% went to the Everglades.

Lake discharges east and west to the estuaries ***are not treated***, while discharges south to the Everglades ***are treated***.

The average phosphorus concentration of lake water entering the estuaries was 121 ppb – while the average TP leaving the STAs was 23 ppb.

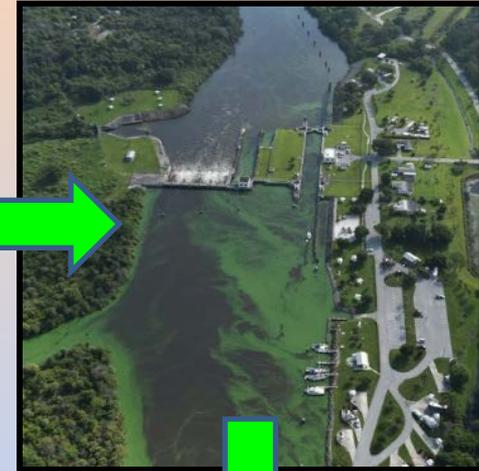
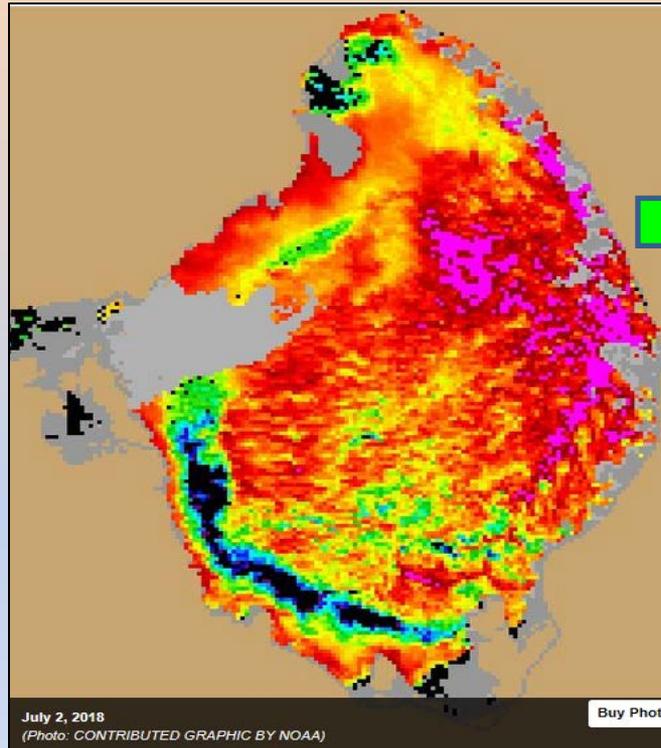
WY2014-2018 Average	Flow, AF/yr	TP Load, lbs/yr	TP Conc, ppb
To St. Lucie Estuary	358,662	171,695	176
To Caloosahatchee Estuary	935,743	253,370	100
Combined Estuaries	1,294,405	425,065	121
From STAs to WCAs	292,000	18,263	23

When Everglades Water Quality Suffers, so Does the Public Health, Environment and Economy of the Estuaries

Aerial photos documented presence of blue green algae on lake on June 1 – the very day discharges of polluted water to estuaries began.

On July 2, 2018, NOAA reported that 90 percent of Lake's open water was covered by toxic blue green algae.

Estuaries are already suffering from pollution from the local watershed.

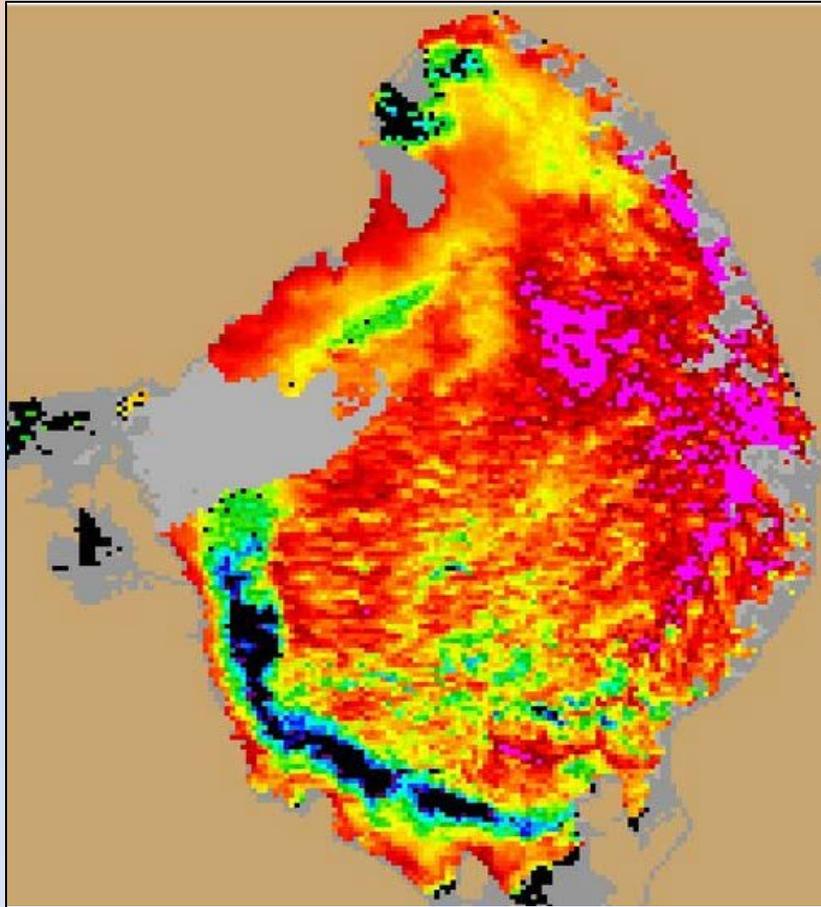


Reasons to be Optimistic

- Grassroots activism – people are engaged
- Now seeing the political courage to make real changes that has been sadly missing in Tallahassee
 - Gov. DeSantis “For Florida, the quality of our water and environmental surroundings are foundational to our prosperity as a state. It doesn’t just drive tourism, it affects property values, anchors many local economies and is central to our quality of life.”
- In addition to long-standing general support, appears to be bipartisan support in the US House of Representatives regarding public health issues
 - Rep. Brian Mast – his many efforts
 - Newly elected Rep. Debbie Mucarsel-Powell
- Corps to begin re-evaluation of LORS in 2019
- Proven precedent in the power of public activism –
 - Kissimmee River Restoration is a good example

WE CAN DO THIS PEOPLE!

Water Quality of Lake Okeechobee and St. Lucie Estuary Watersheds – Are BMAPs Working?



January 11, 2019

Gary Goforth, P.E., Ph.D.



Gary Goforth, LLC

Lake Okeechobee

Watershed is almost 3.5 million acres

- 50% agriculture
- 38% natural lands and water
- 12% communities

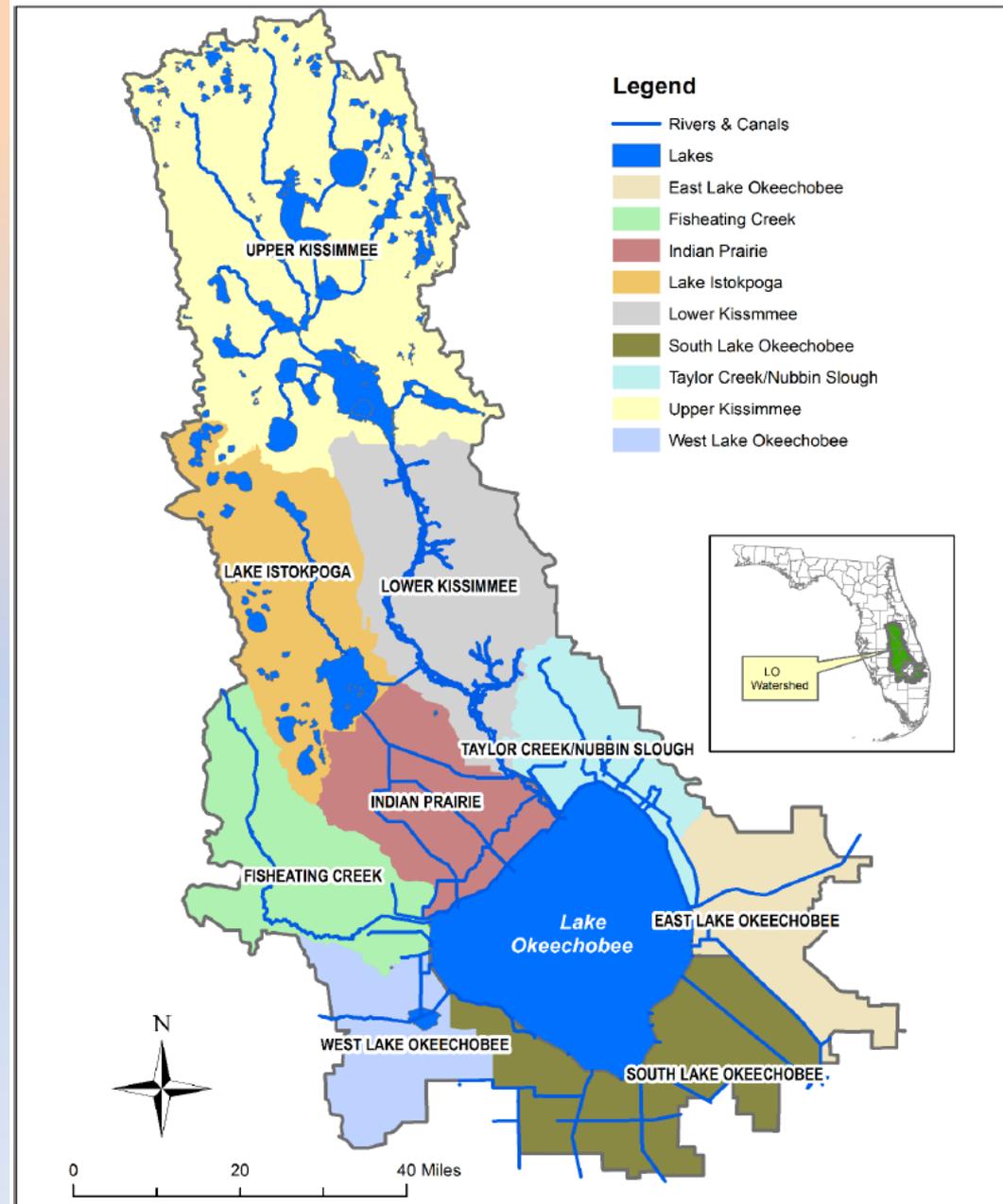
State has studied the causes of pollution for decades and identified solutions

Total Maximum Daily Load (TMDL)

- Set in 2001 at 231,483 pounds/yr of phosphorus from watershed

Original compliance date: January 2015

In 2016, Florida legislature deleted the 2015 deadline, and replaced it with an ambiguous process (BMAP) that does not hold landowners accountable for their pollution

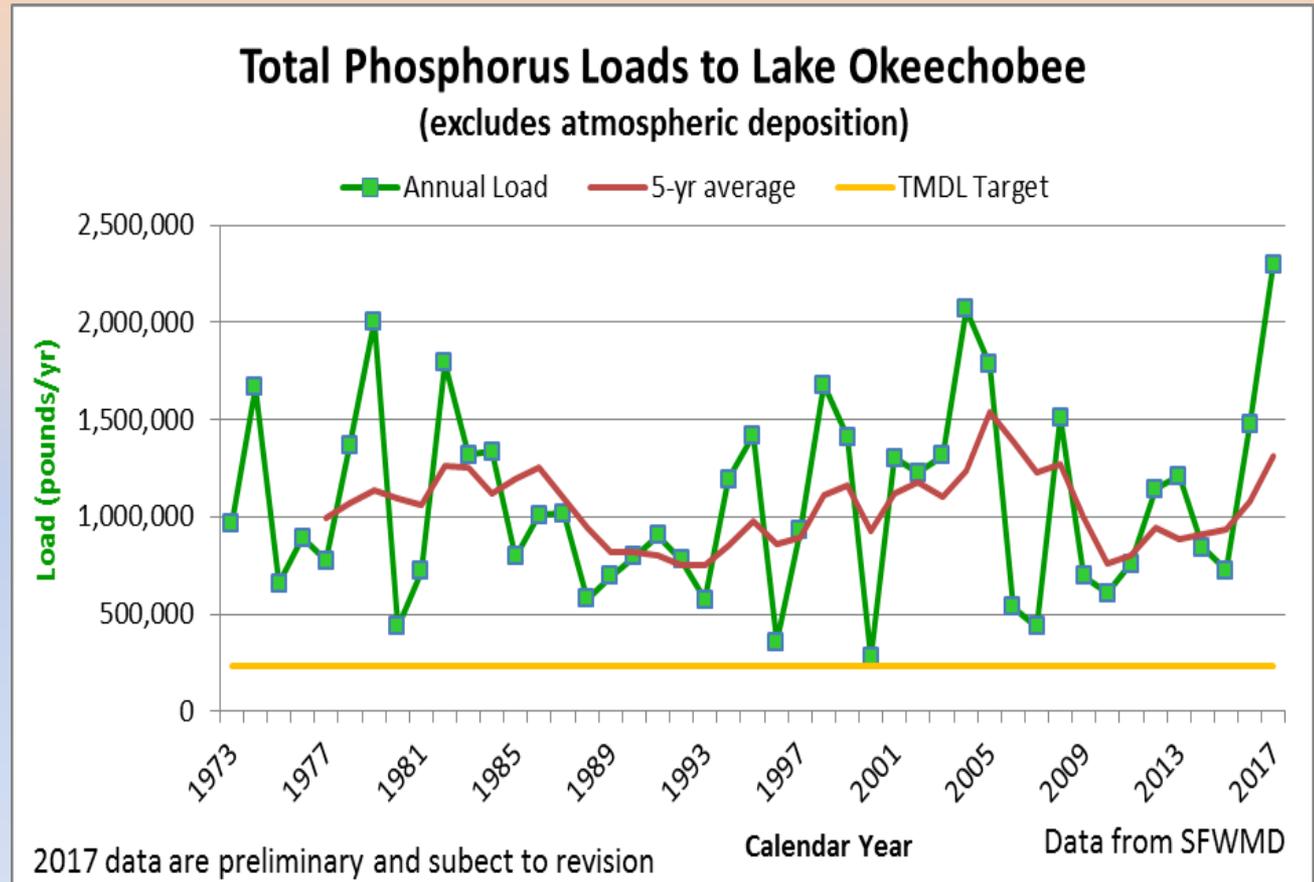


Pollution to the Lake is Increasing

During 2017 - historic high phosphorus loads.

1. High flows from Hurricane Irma
2. **High concentrations from watershed**
 - 252 ppb concentration – 3rd highest in history

The average load was more than 5 times the target for the watershed, and getting worse, despite 2014 Plan.

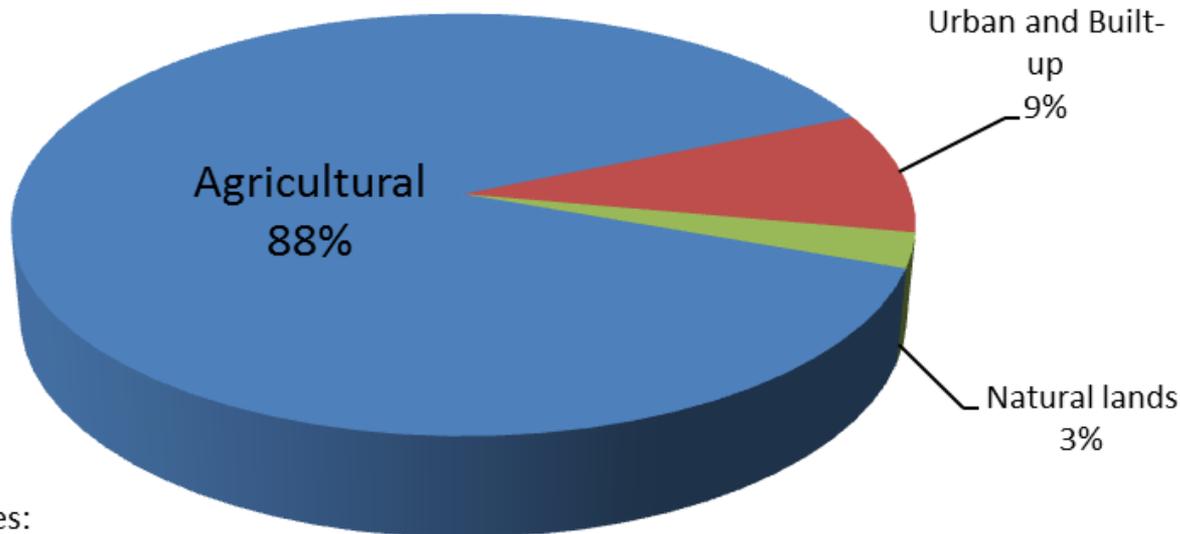


Estimated Pollutant Loading by Land Use – 2017

Total Phosphorus Loading to Lake Okeechobee (2017)

Annual load = 2,298,875 lbs/yr

Draft



Notes:

Land use data from SFWMD (2018); unit area loads revised from Goforth et al. (2013).

"Agricultural" includes traditional agricultural activities.

"Urban and built-up" includes residential, transportation, communication and utilities.

"Natural lands" includes wetlands, waterbodies, upland forests, rangeland and barren land.

This is only an estimate – since no parcel-specific water quality data are available; this estimate assumes each land use has responded uniformly to load reduction measures since the 2001-2012 Starting Period.

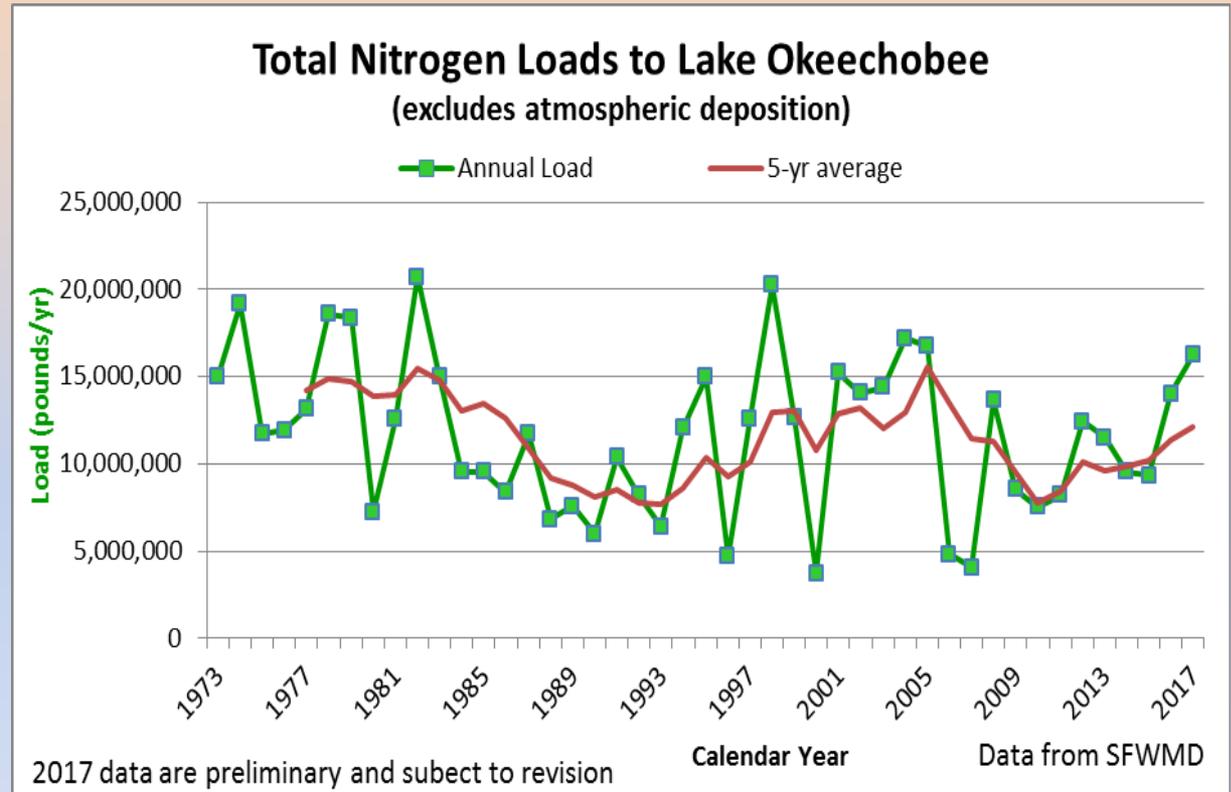
Experimental product for discussion only

Similar Trend for Nitrogen Pollution

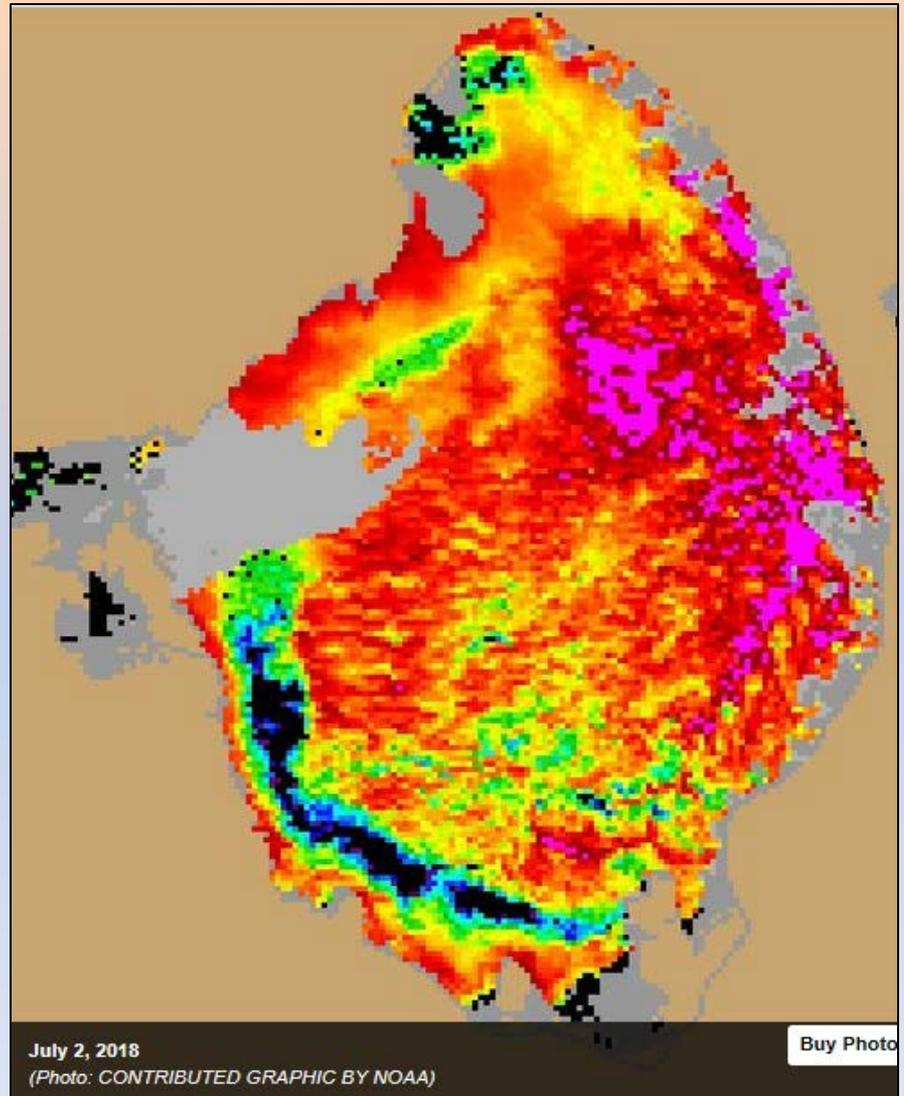
Average nitrogen loads have generally increased after achieving near-historic low in 2010

Total nitrogen is critical as toxic algae cannot obtain nitrogen from the air – feeds off of waterborne source

Yet the state has not set a limit for inflows of nitrogen



On July 2, 2018, NOAA reported that 90 percent of Lake's open water was covered by toxic blue green algae.



So ... in light of

- **historic high pollution loads to Lake**
- **trend of increasing pollution loads**
- **toxic algae bloom on lake**
- **polluted discharges to estuaries**

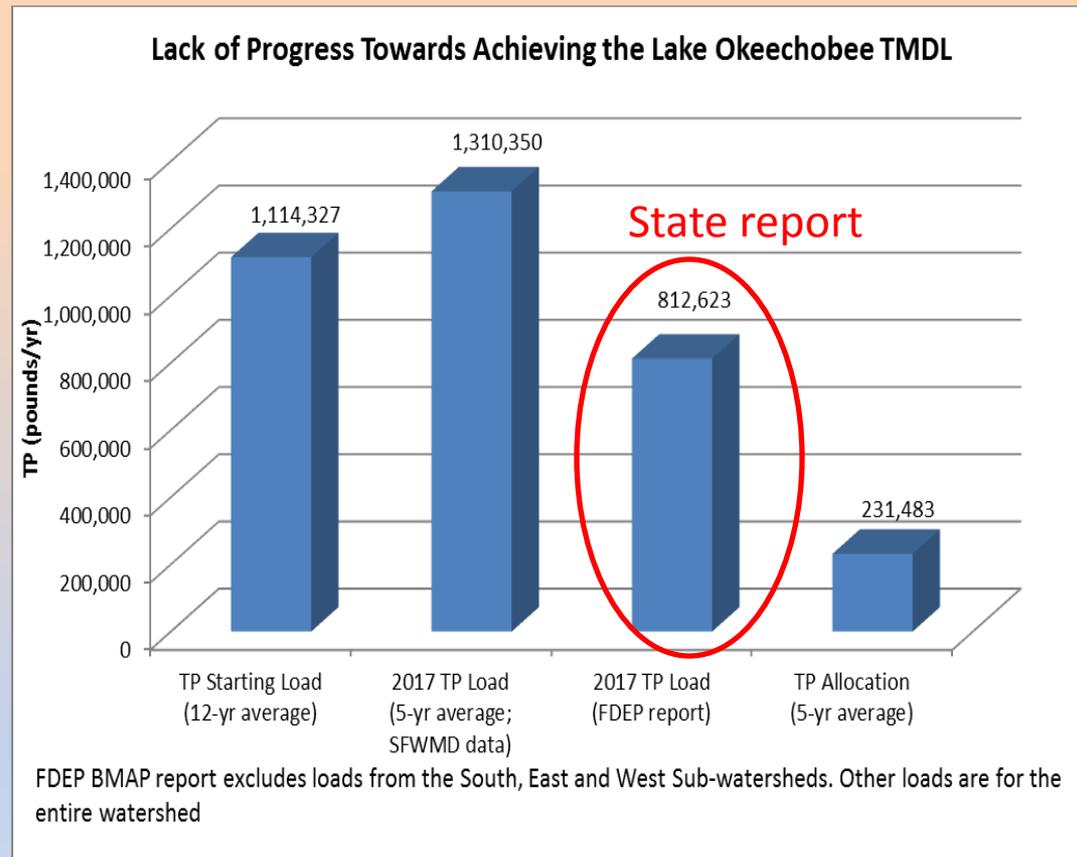
How were these addressed in the BMAP report?

State of Florida Protection Plan: Doesn't Use the Data

Uses computer model to simulate best case scenario ... as a result,

Significantly underestimated loading

- Claims phosphorus loading to the lake has **decreased**
- The **measured** 5-yr average annual load in 2017 was more than 60% higher than reported



Other flaws in the Basin Management Action Plan (BMAP) process include:

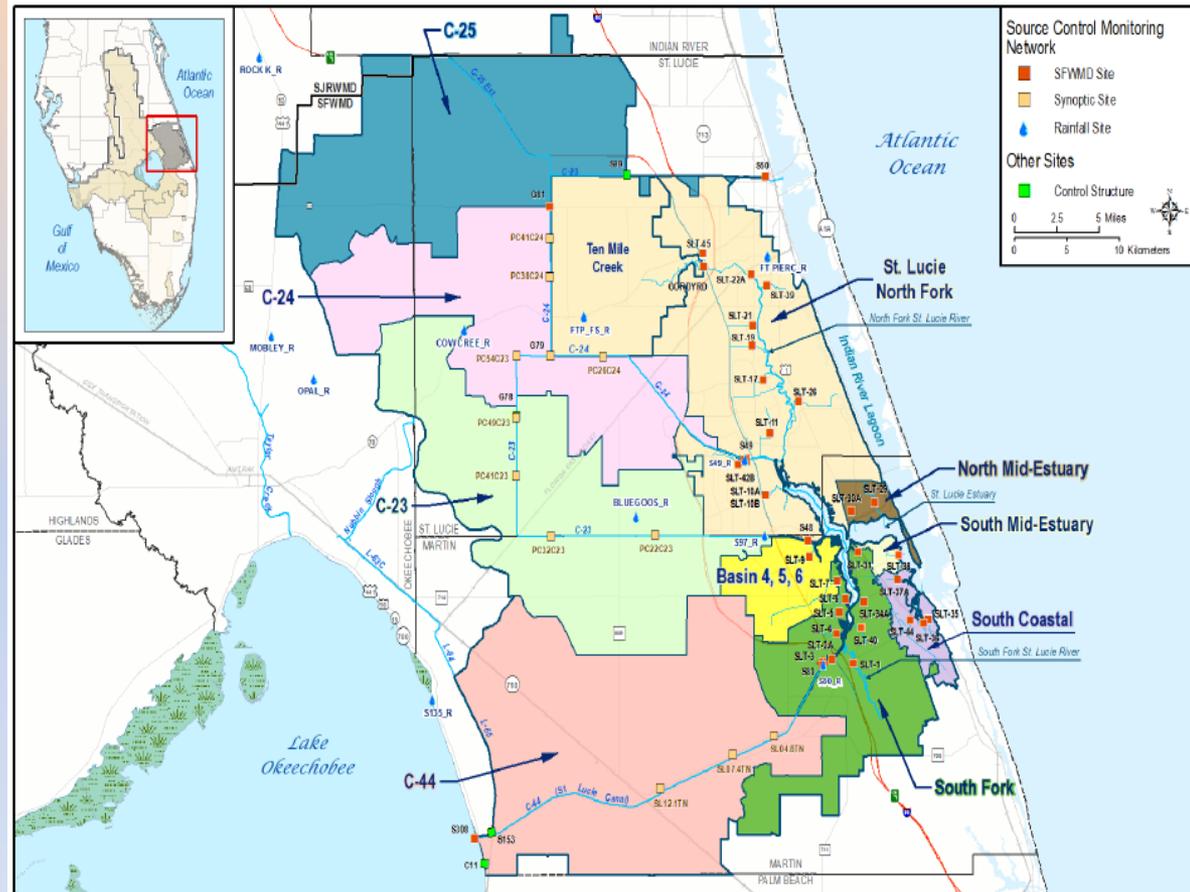
- ignores loading from over 800,000 acres of the watershed;
- fails to require field verification of Best Management Practices before assuming they are implemented;
- fails to use actual BMP performance data and instead relies on optimistic assumed load reductions;
- fails to account for the vast tonnage of nutrients being imported into the watershed from Class AA biosolids;
- fails to identify measures that will collectively achieve the TMDL;
- fails to assess and report loads on a sub-watershed level that would allow remediation of hot spots; instead generates a single load;
- fails to evaluate loading trends – but rather, adopts a “wait and see” approach that can only begin to make necessary corrections every 5-10 years – way too late to be effective.
- No TMDL for nitrogen

Recommendation: fix the flaws in the BMAP process!

Water Quality of St. Lucie Estuary Watershed

Major basins:

- C-23
- C-24
- C-44
- Ten Mile Creek
- Tidal Basins
 - 29 stations – concentrations
- Lake Okeechobee

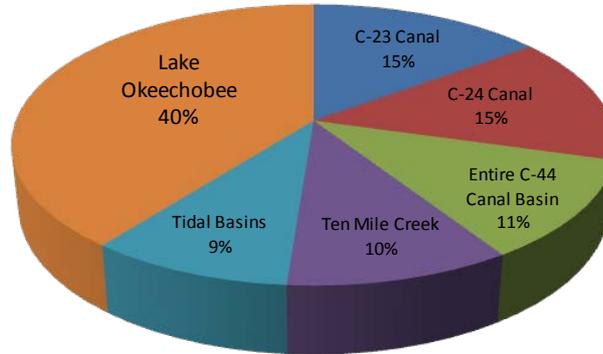


Loading to Estuary – Water Year 2018

117 days of discharges from the Lake **represented the single largest source of flow and pollution loading.**

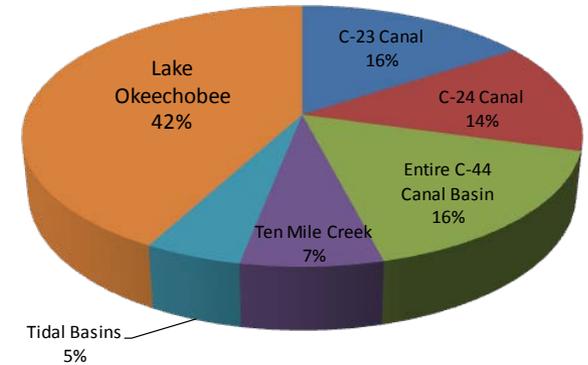
By contrast, runoff from **the highly urbanized Tidal Basin** contributed the smallest amount of pollution loading, ranging from 1-5 percent.

WY2018 Annual Surface Flow From the SLRE Watershed



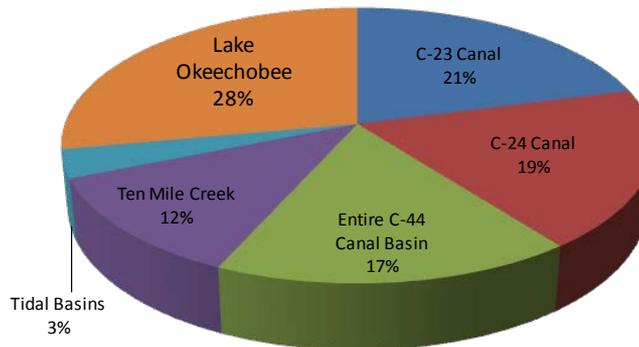
Flow data for Tidal Basins estimated from SFWMD calculations.

WY2018 Annual Nitrogen Loads From the SLRE Watershed



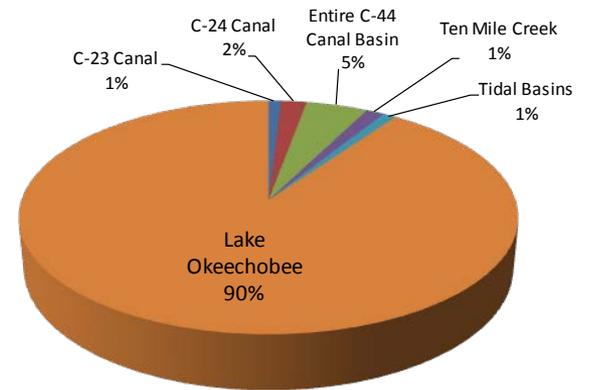
Flow data for Tidal Basins estimated from SFWMD calculations.

WY2018 Annual Phosphorus Loads From the SLRE Watershed



Flow data for Tidal Basins estimated from SFWMD calculations.

WY2018 Annual Total Suspended Solids Loads From the SLRE Watershed



Flow data for Tidal Basins estimated from SFWMD calculations.

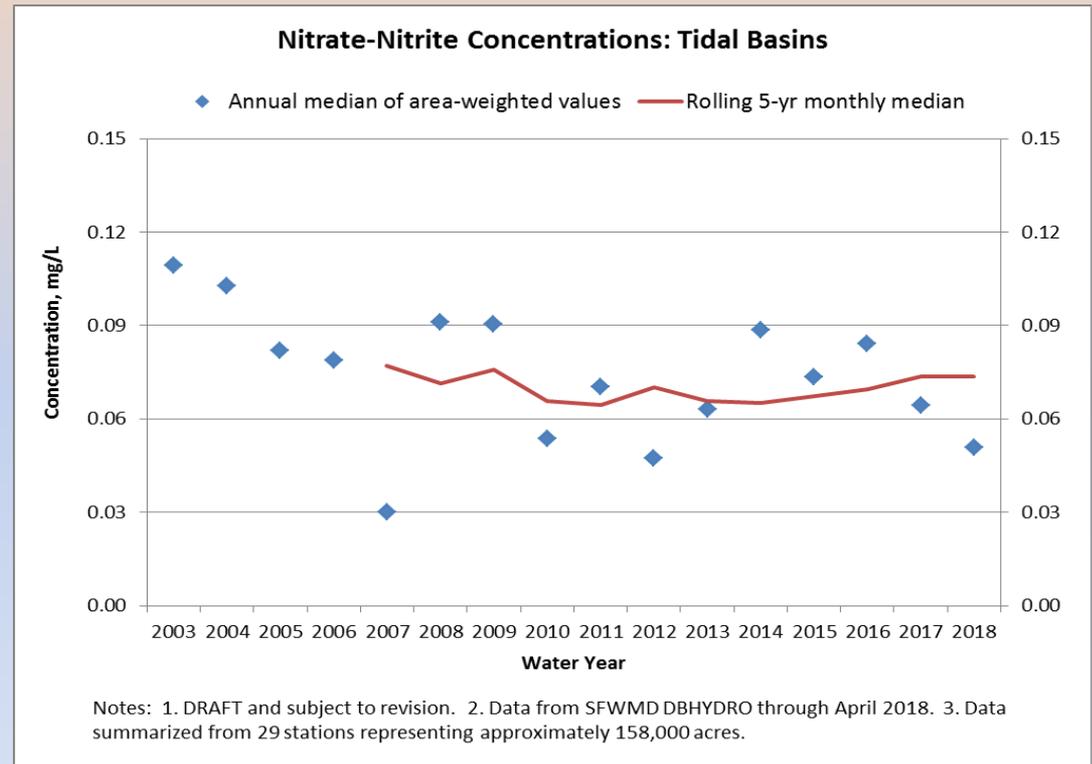
Septic Tanks – Contribution is Getting Smaller

Septic tanks are part of the loading problem

Estimated contribution remains below 10 percent of total nitrogen loading to estuary

Efforts by counties and municipalities are resulting in declining nitrogen levels

- Conversion of more than 8,000 septic tanks and 70 package treatment plants
- Active septic conversion program - \$155 million
- \$85 million spent on other nutrient reduction projects
- Met and exceeded all nitrogen reduction goals of BMAP



St. Lucie Estuary Watershed Report Card

Source Basin	Total Nitrogen		Total Phosphorus	
	WY2018 Status	10-yr Trend	WY2018 Status	10-yr Trend
C-23 Canal	Poor	Improving	Poor	Improving
C-24 Canal	Poor	Improving	Poor	Improving
<i>C-44 Canal</i>	<i>Poor</i>	<i>Worsening</i>	<i>Poor</i>	<i>Worsening</i>
Ten Mile Creek	Fair	Improving	Poor	Improving
Tidal Basins	Fair	Improving	Poor	Improving
Lake Okeechobee	Poor	Improving	Poor	Worsening
Total Inflow	Poor	Worsening	Poor	Worsening

“Fair” indicates the water year exceeded the TMDL by less than 33%.

“Poor” indicates the water year exceeded the TMDL by more than 33%.

“Improving” indicates the 10-yr average nutrient level was below the base period value, adjusted for hydrologic variability;

“Worsening” indicates the 10-yr average nutrient level was above the base period value, adjusted for hydrologic variability.

The Tidal Basins and Lake Okeechobee assessment were based on observed concentrations; other source basin assessments were based on observed loads compared to hydrologically-adjusted base period loads.

The assessment of trend in each source basin was based on the most recent 10-yr average nutrient level compared to its base period. For the Tidal Basins and Lake Okeechobee, concentrations were assessed; for all other source basins loads were assessed.

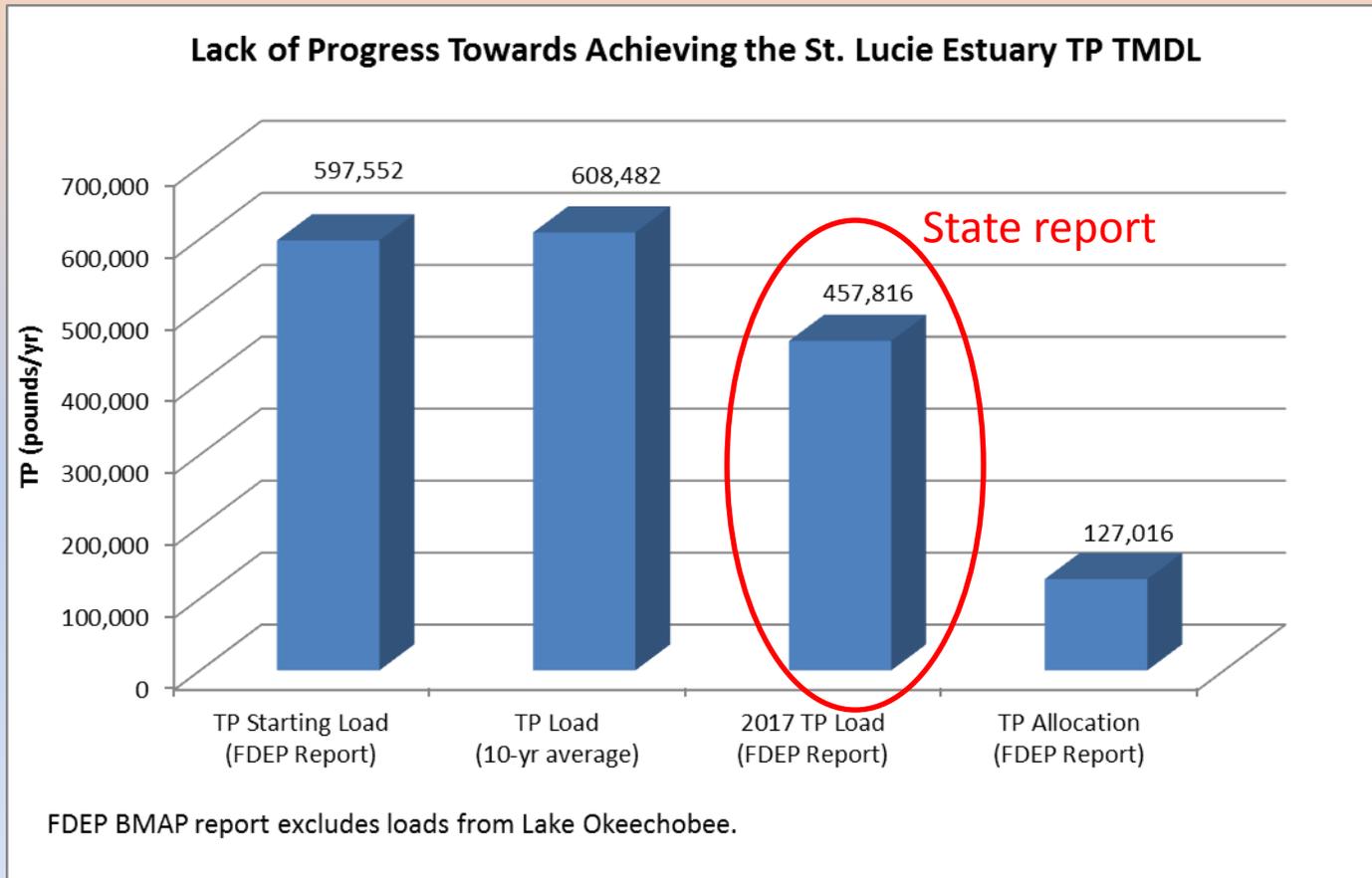
So ... in light of poor water quality entering Estuary from watershed and Lake,

How was this addressed in the BMAP report?

Same deficiencies as identified for the Lake Okeechobee BMAP, plus

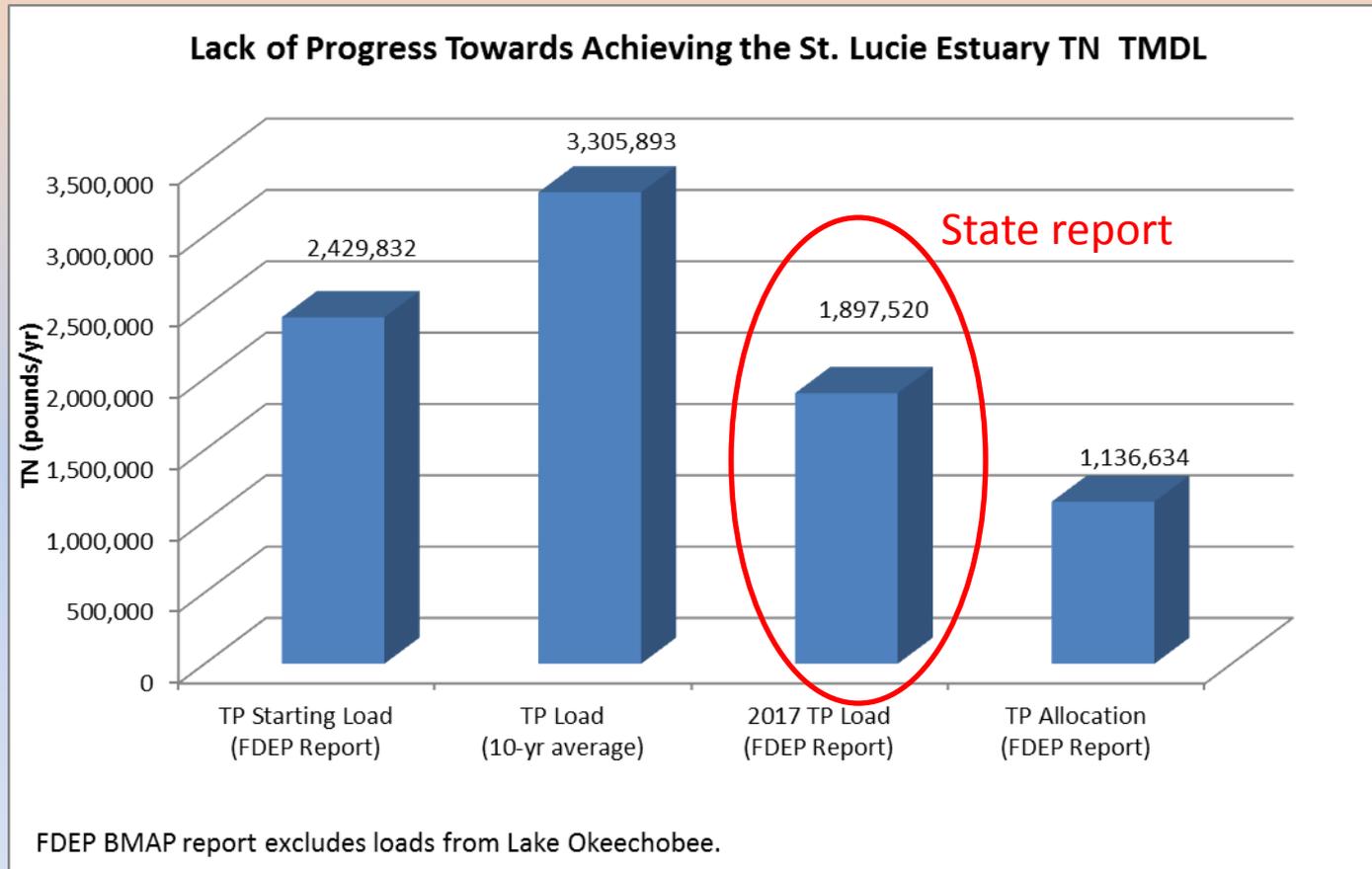
- **BMAP ignores pollution loading from Lake Okeechobee**

BMAP Assessment of Phosphorus Load



Estimated phosphorus load was 33% more than reported by FDEP.

BMAP Assessment of Nitrogen Load



Estimated nitrogen load was 74% more than reported by FDEP.

Others Have Documented BMAP Issues

Impediments to Implementation of the Indian River Lagoon Basin Management Action Plans



2015 report by regional planning councils documented the major impediments to implementing BMAPs:

1. Inadequate funding
2. Legacy nutrient loading from muck is not being addressed
3. Legacy nutrient loading from groundwater is not being addressed
4. No incentives for innovative techniques
5. Incomplete water quality data
6. Inadequate water quality monitoring
7. Unequal treatment of public and private entities, agriculture, and water control districts.
8. Onerous conditions attached to BMAP projects
9. Inadequate technology to meet TMDL goals
10. BMAPs are based on flawed TMDLs.
11. Trends in nutrient loading from the atmosphere are not being considered.
12. Legacy Loading in Lake Okechobee
13. Lack of operations and maintenance monitoring
14. Load allocation process is not consistent between BMAPs
15. Incomplete knowledge of existing infrastructure

My Opinion: Program is Broken

What Can Be Done?

Many effective pollution control projects have been implemented under BMAP.

Many recommendations have been developed and provided to FDEP staff to improve the BMAP program. However, due to a combination of legislative and policy constraints, and shortage of staff, it appears that significant improvements are not forthcoming.

1. **Strengthen water quality regulations**, e.g., rescind relevant provisions of the 2016 Water Act to allow establishing discharge limits for parcels that discharge into state waters (including “Works of the District”), establish appropriate monitoring, set requirements for landowner collaboration, and when necessary, strengthen enforcement;
2. **Strengthen the Basin Management Action Plans**, including accelerating timeframes to achieve the TMDLs; establishing subwatershed-specific load allocations; annual assessments based on measured nutrient loads (or concentrations for tidal basins); increasing staffing to verify and monitor the implementation of Best Management Practices; and incorporating estimates of pollution loading from the application of Class AA and Class B biosolids.
3. **Strengthen biosolids reporting requirements**, monitoring and overall regulation of the application of Class AA and Class B biosolids.

SOUTH FLORIDA WATER MANAGEMENT DISTRICT



*PERFORMANCE MEASURE METHODOLOGIES FOR
COLLECTIVE SOURCE CONTROLS IN THE LAKE
OKEECHOBEE AND CALOOSAHATCHEE WATERSHEDS*

**DRAFT – TECHNICAL SUPPORT DOCUMENT:
LAKE OKEECHOBEE WATERSHED
PERFORMANCE MEASURE METHODOLOGIES**



The GGI Team
Gary Goforth, Inc.

L. Hornung Consulting, Inc.

Soil & Water Engineering Technology, Inc.

In Association With

**South Florida
Water Management
District**



February 2013

SOUTH FLORIDA WATER MANAGEMENT DISTRICT



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HDR Engineering, Inc.**



December 18, 2013

SOUTH FLORIDA WATER MANAGEMENT DISTRICT



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September 30, 2013