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

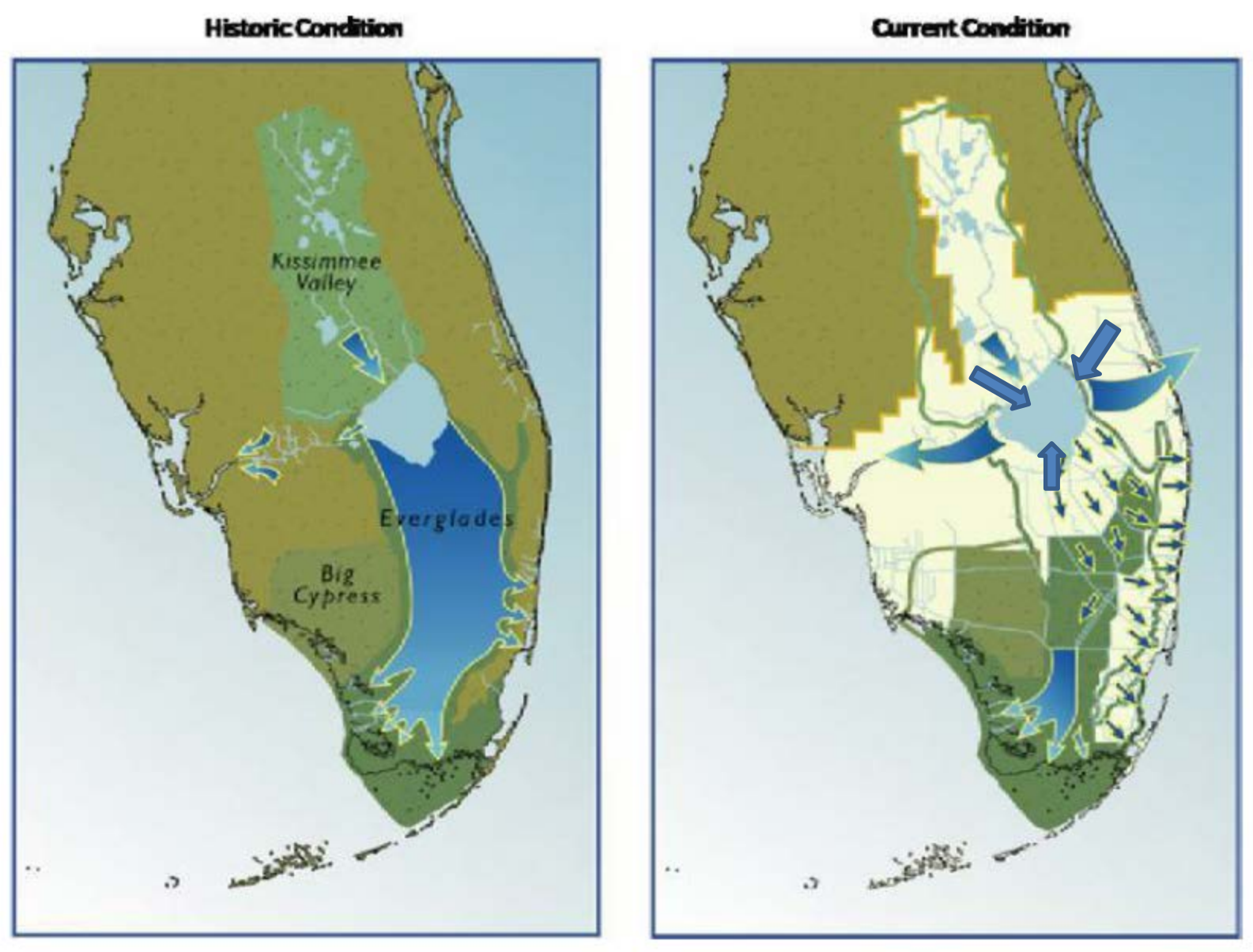
Good Water Quality is Good for the Economy

27,000 jobs and $840 million per year in water-related businesses around the St. Lucie Estuary

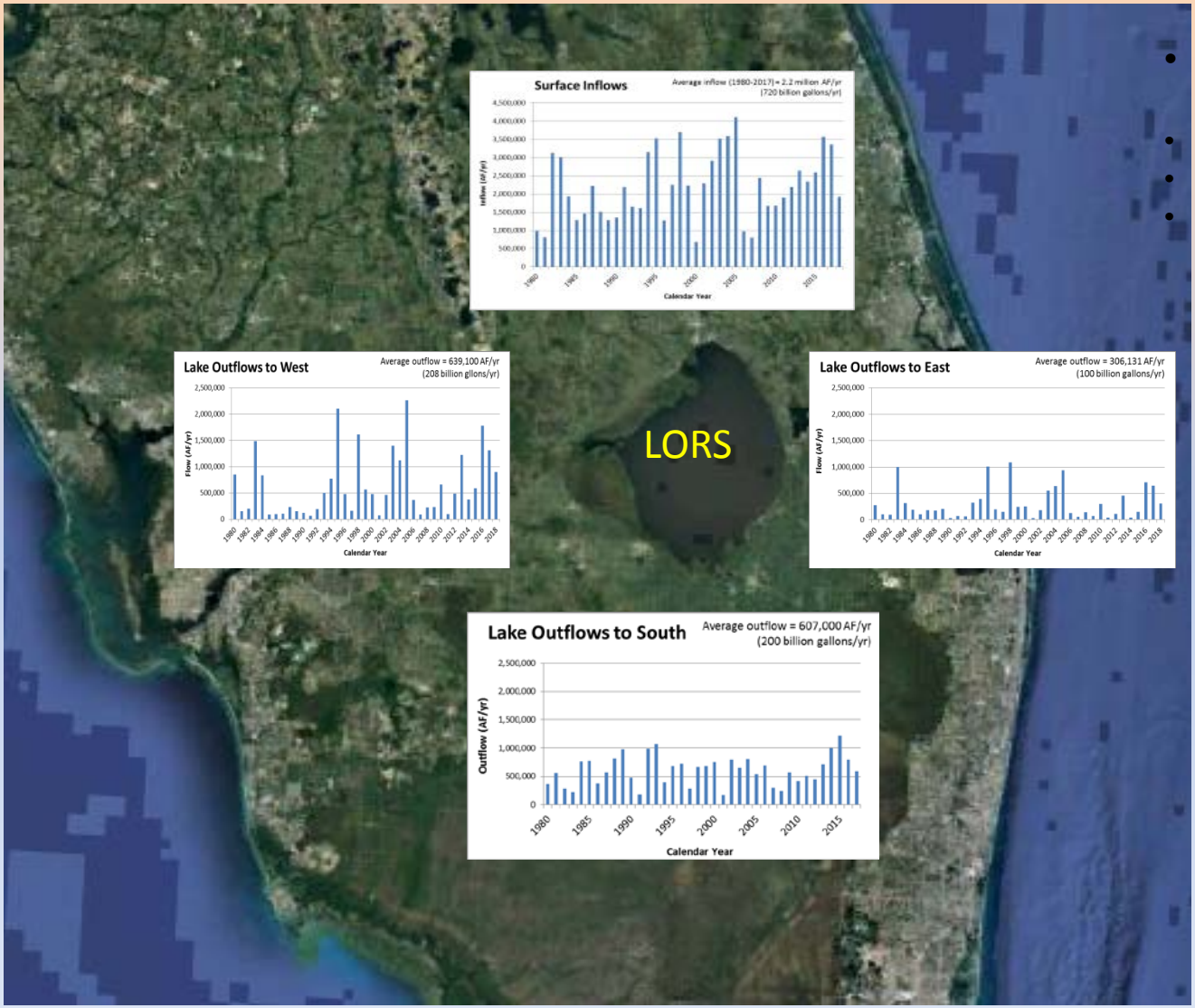
50,000 jobs and $3 billion per year around the Caloosahatchee Estuary

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.



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)

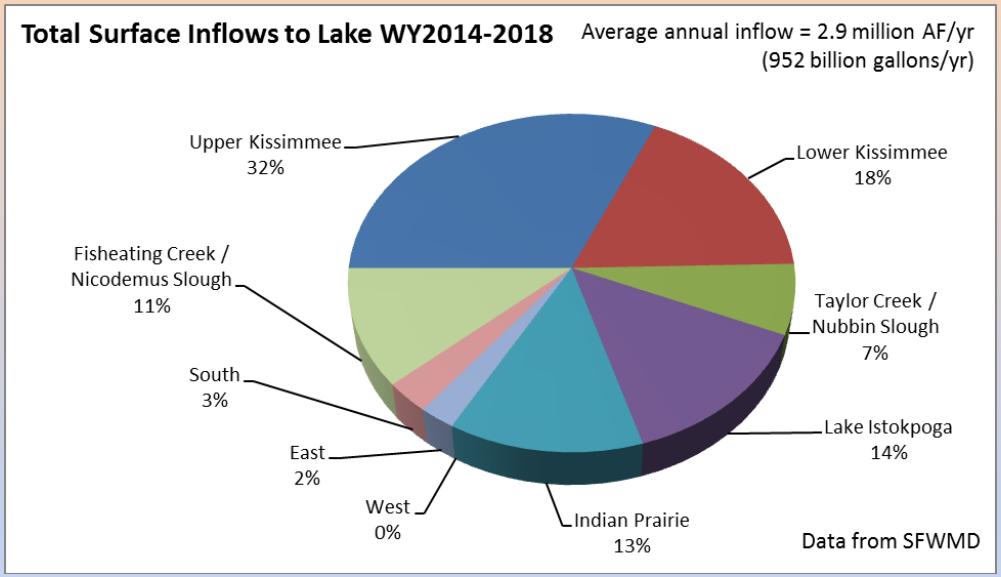
Outflow influenced by LORS2008

Average about 2 BG/day

Average inflows increased about 40%, but

Average outflows increased more than 60% during LORS2008

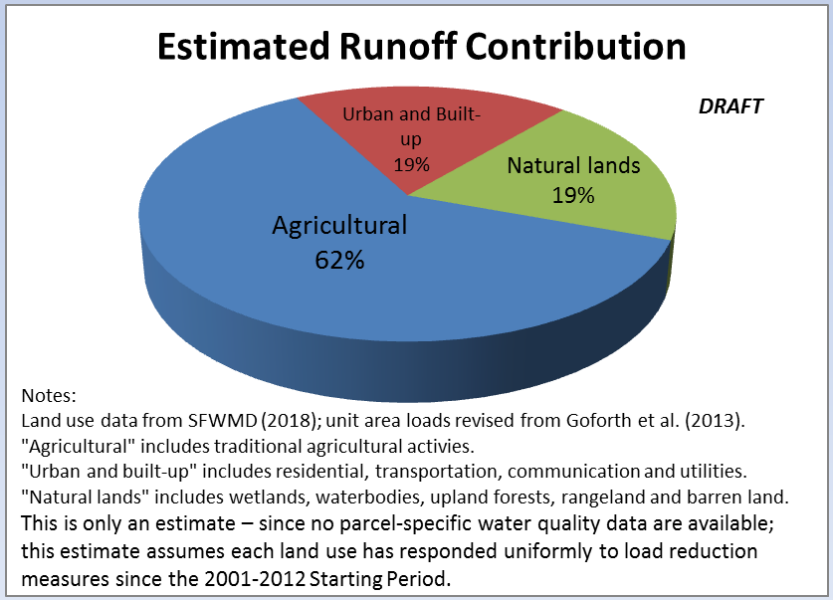
Lake Okeechobee Inflow Sources



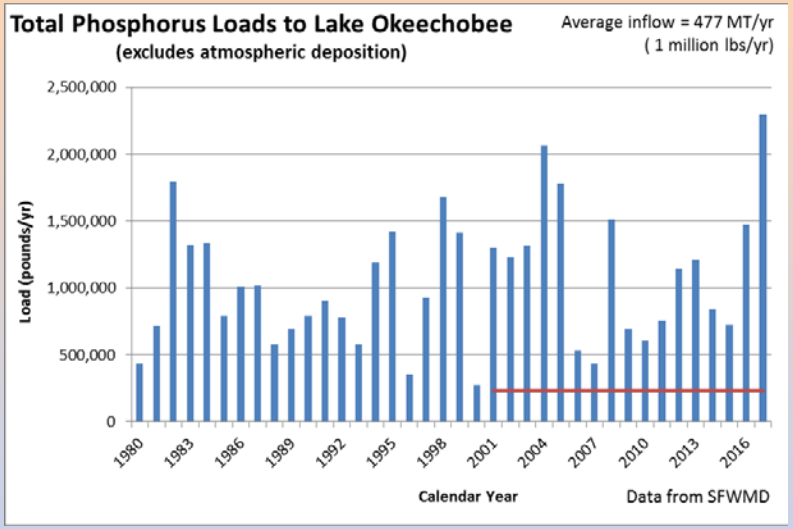
About half of inflows came from Kissimmee Chain of lakes and river valley sub-watersheds

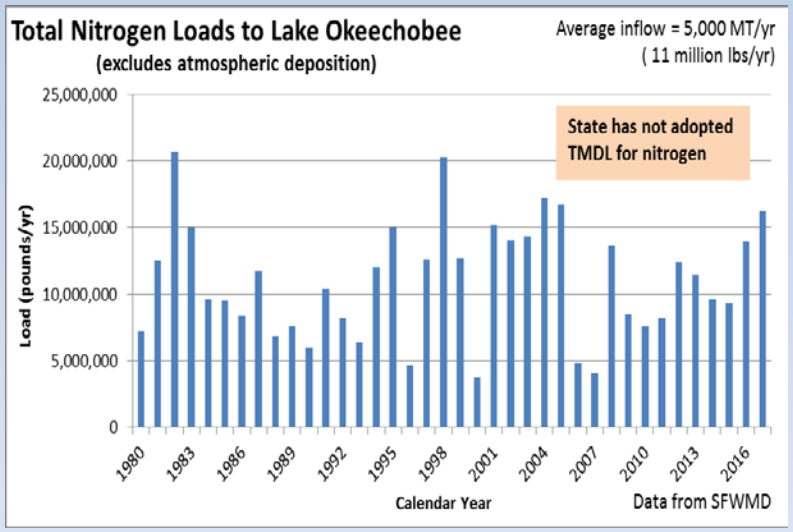
About half came from remaining watershed

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

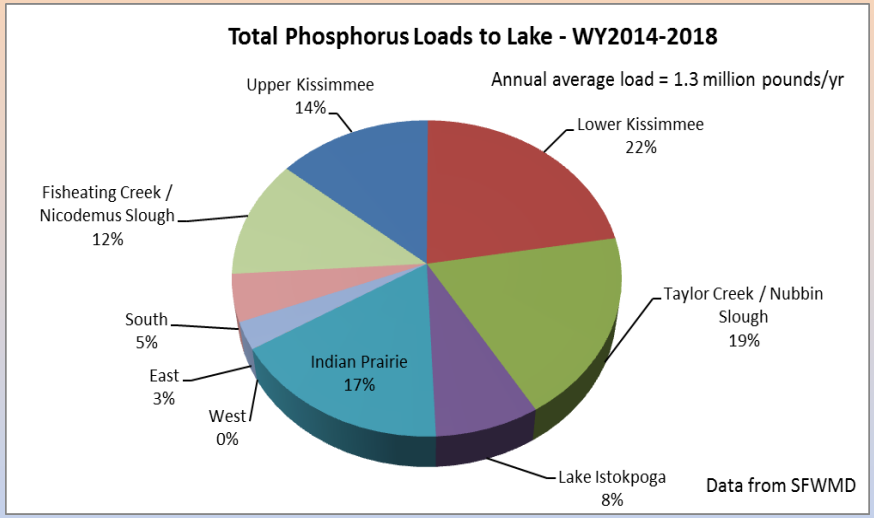
1. High inflows from Hurricane Irma
   - However, inflows were lower than from 2004 and 2005 hurricanes

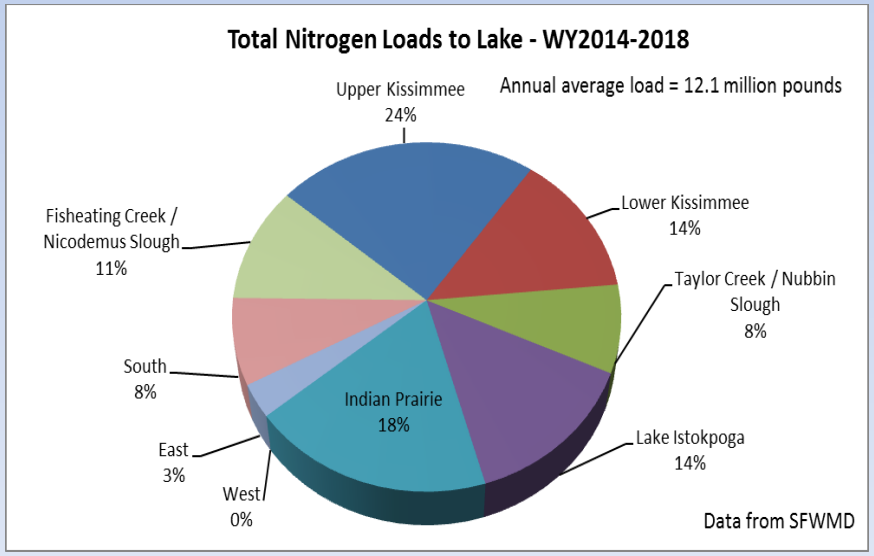
2. High concentrations from watershed

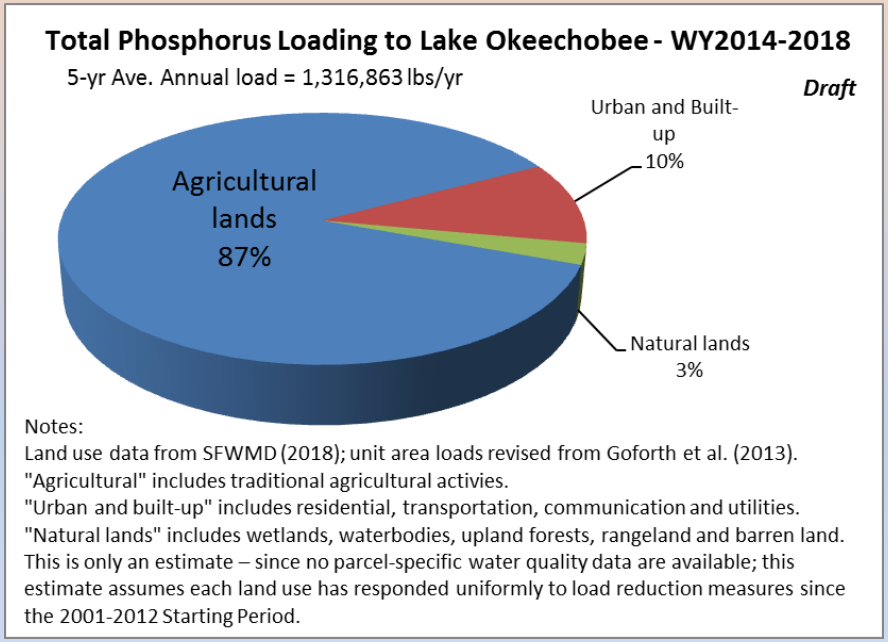
- 252 ppb concentration – 3rd highest in history
- Much higher concentrations than in 2004 and 2005 hurricanes (212 & 159 ppb, respectively)

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

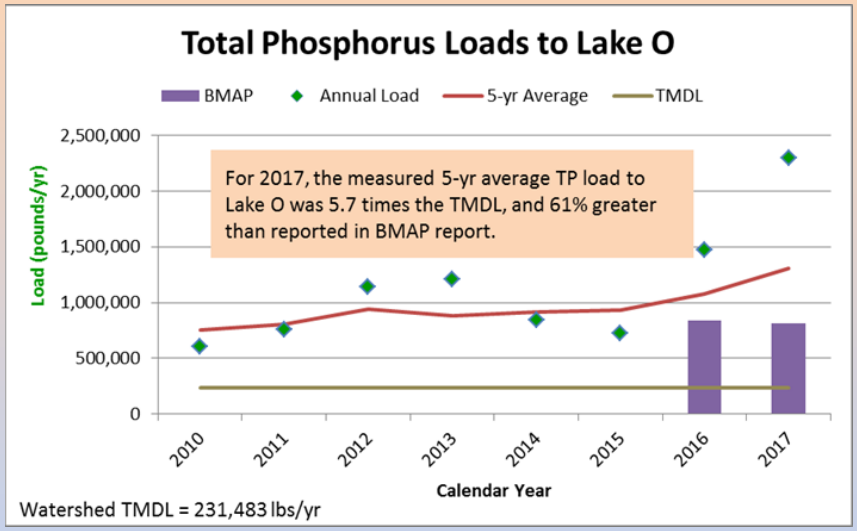
Lake Okeechobee Pollution Sources

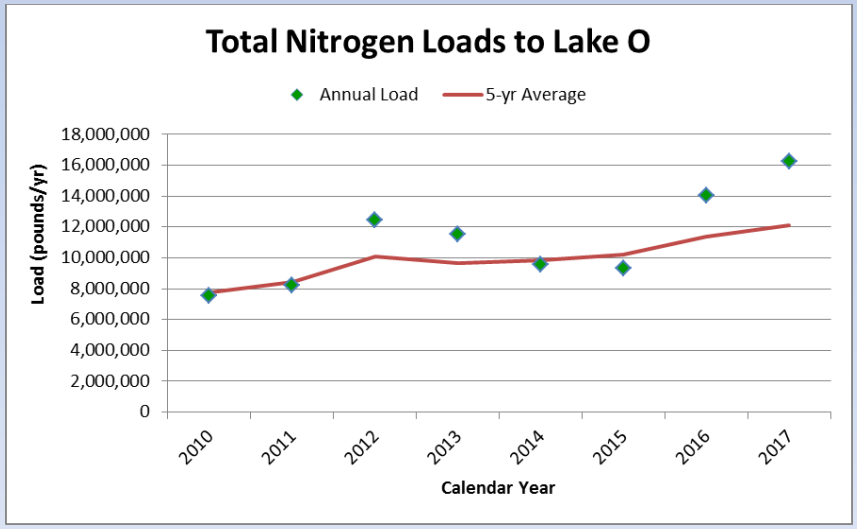






Lake Okeechobee Pollution Control?





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

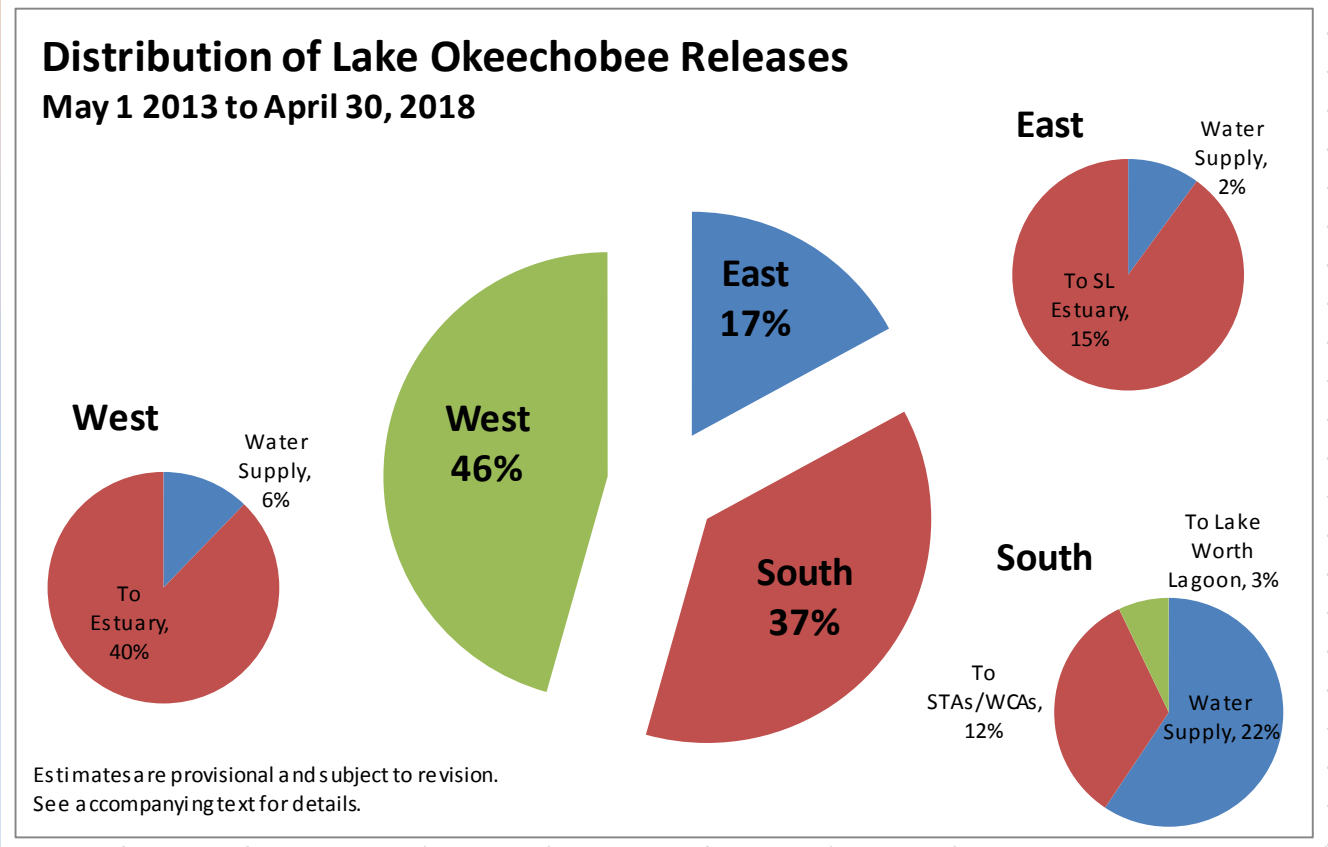
The average load was more than 5 times the TMDL for the watershed, and getting worse, despite the BMAP.

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.*

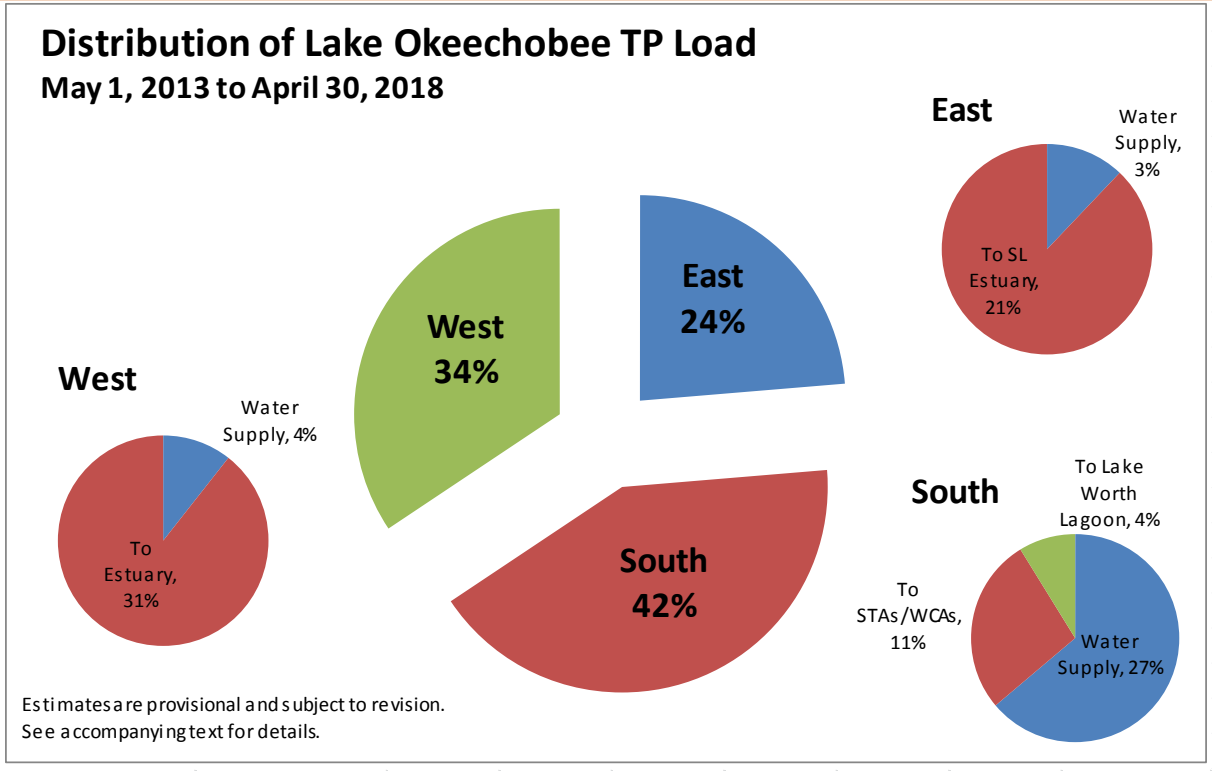
State's pollution control program for the Lake is broken and needs to be fixed!

The Everglades Connection: Lake Okeechobee Discharges



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



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***.

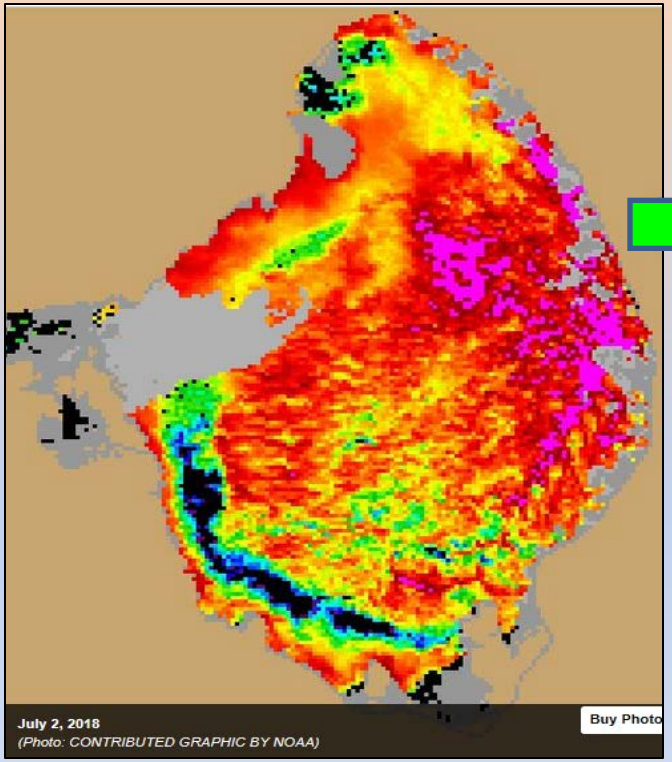
The average phosphorus concentration of lake water entering the estuaries was 121 ppb – while the average TP leaving the STAs was 23 ppb.

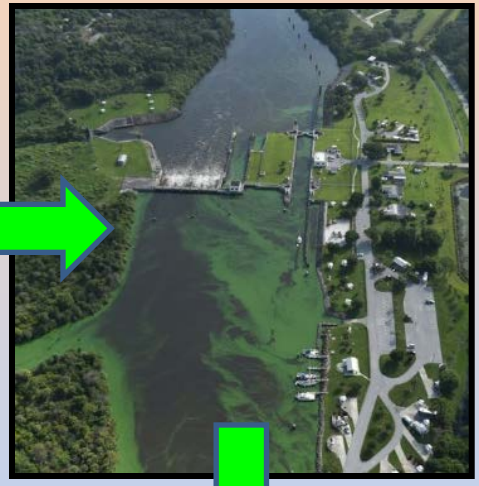
WY2014-2018 Average	Flow, AF/yr	TP Load, lbs/yr	TP Conc, ppb
To St. Lucie Estuary	358,662	171,695	176
To Caloosahatchee Estuary	935,743	253,370	100
Combined Estuaries	1,294,405	425,065	121
From STAs to WCAs	292,000	18,263	23

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

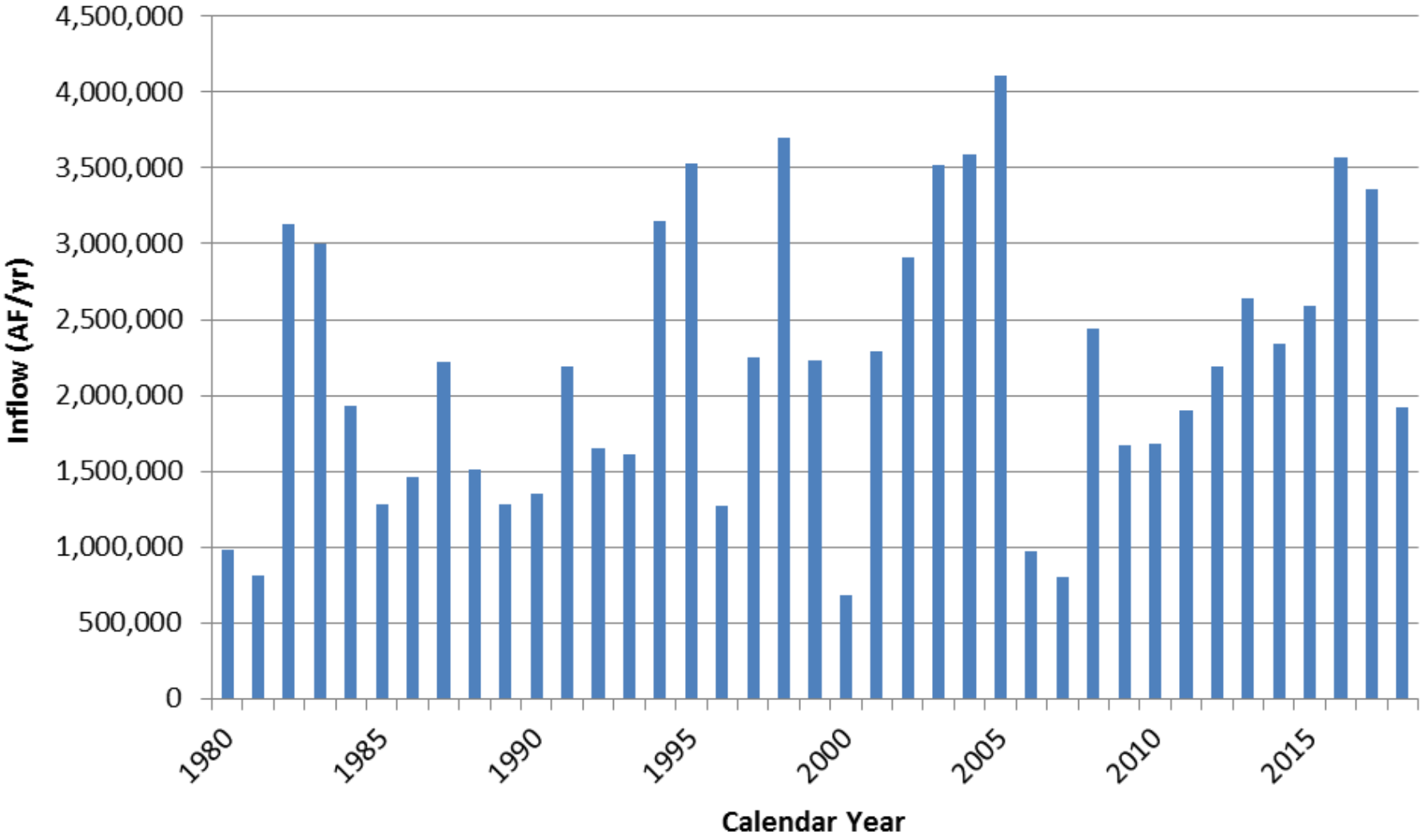
- Grassroots activism – people are engaged
- Now seeing the political courage to make real changes that has been sadly missing in Tallahassee
  - Gov. DeSantis "For Florida, the quality of our water and environmental surroundings are foundational to our prosperity as a state. It doesn't just drive tourism, 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!

Enlarged Versions of Charts

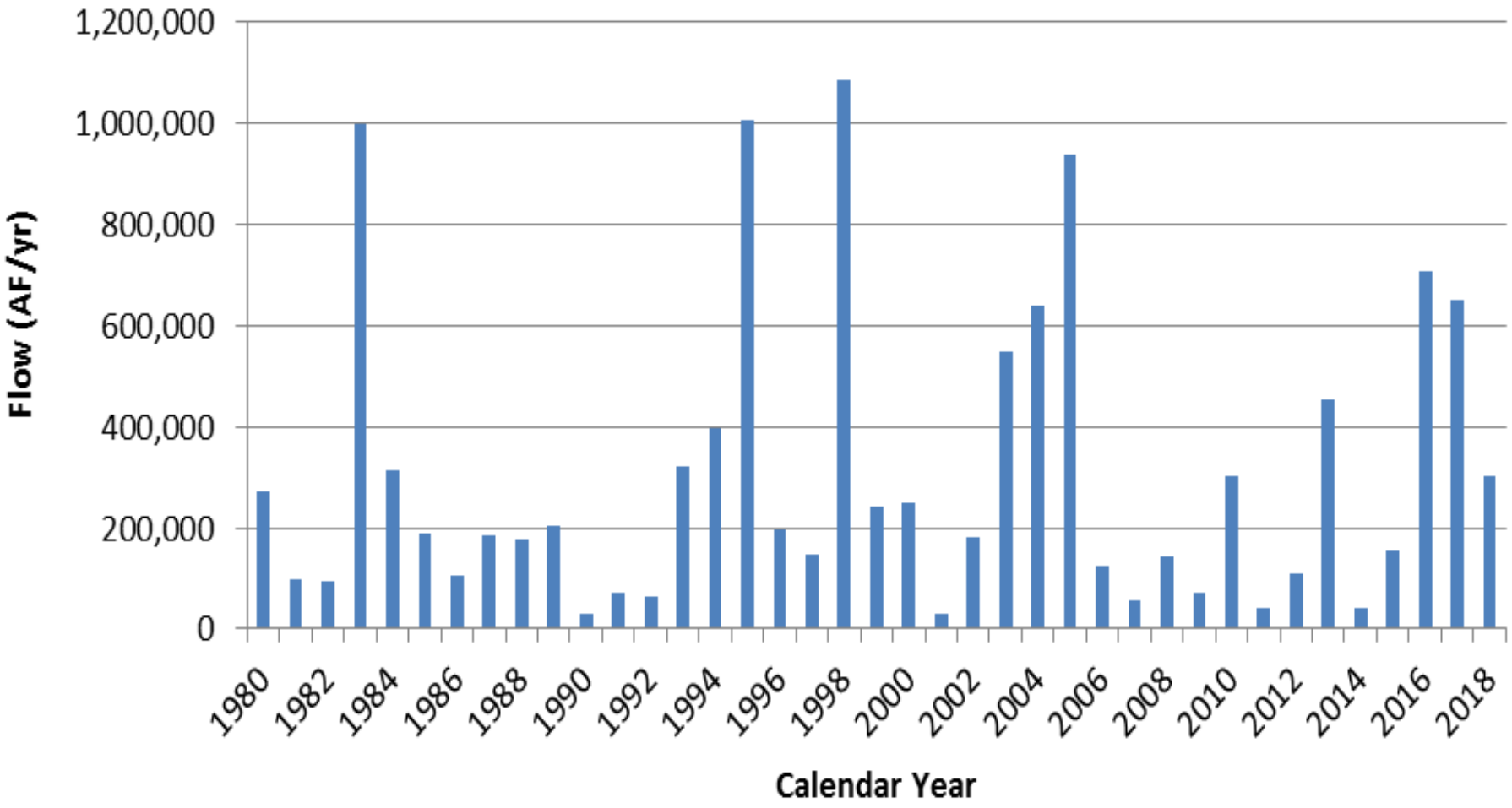
Surface Inflows to Lake O

Average inflow (1980-2018) = 2.2 million AF/yr
(720 billion gallons/yr)



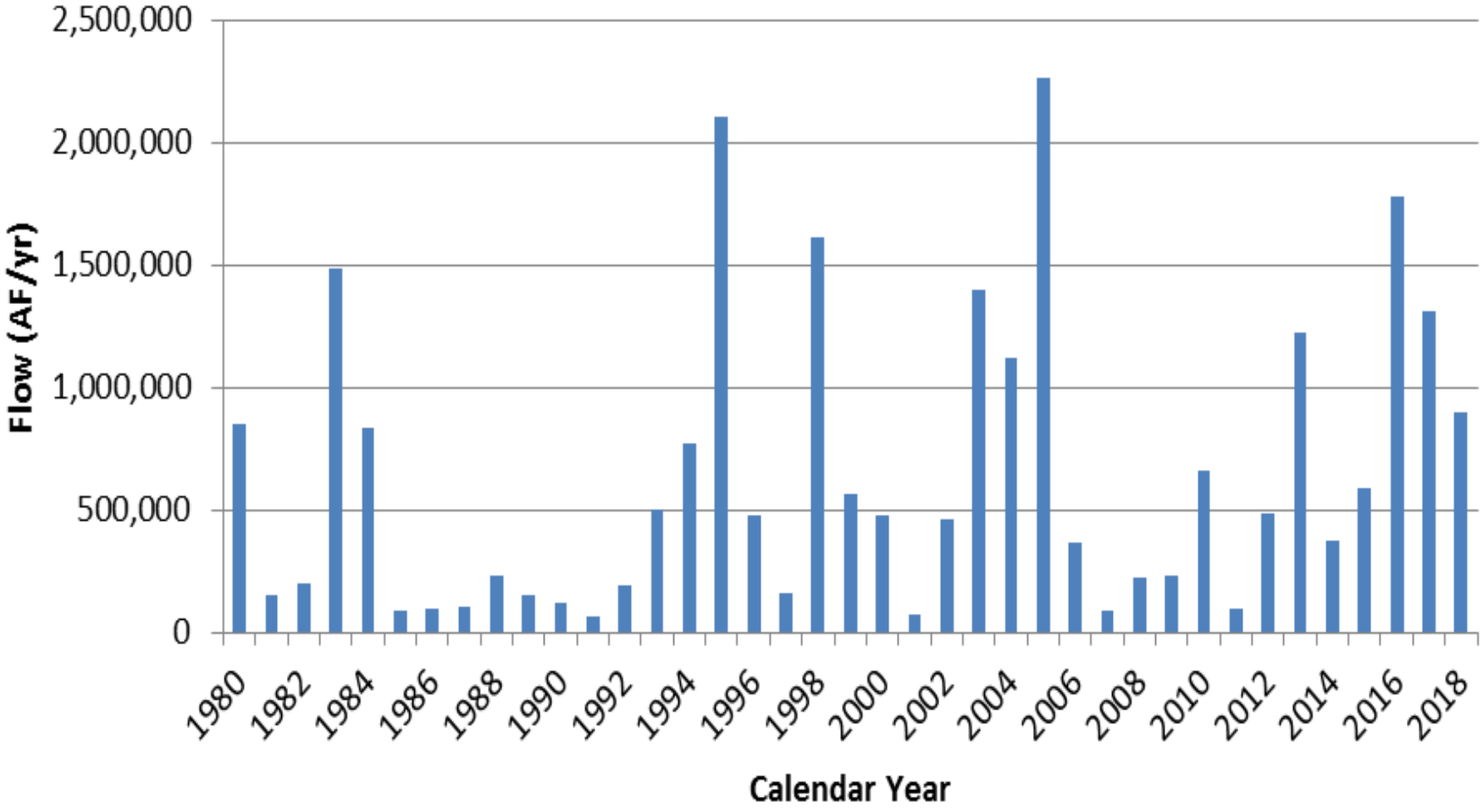
Lake Outflows to East

Average outflow = 306,131 AF/yr
(100 billion gallons/yr)



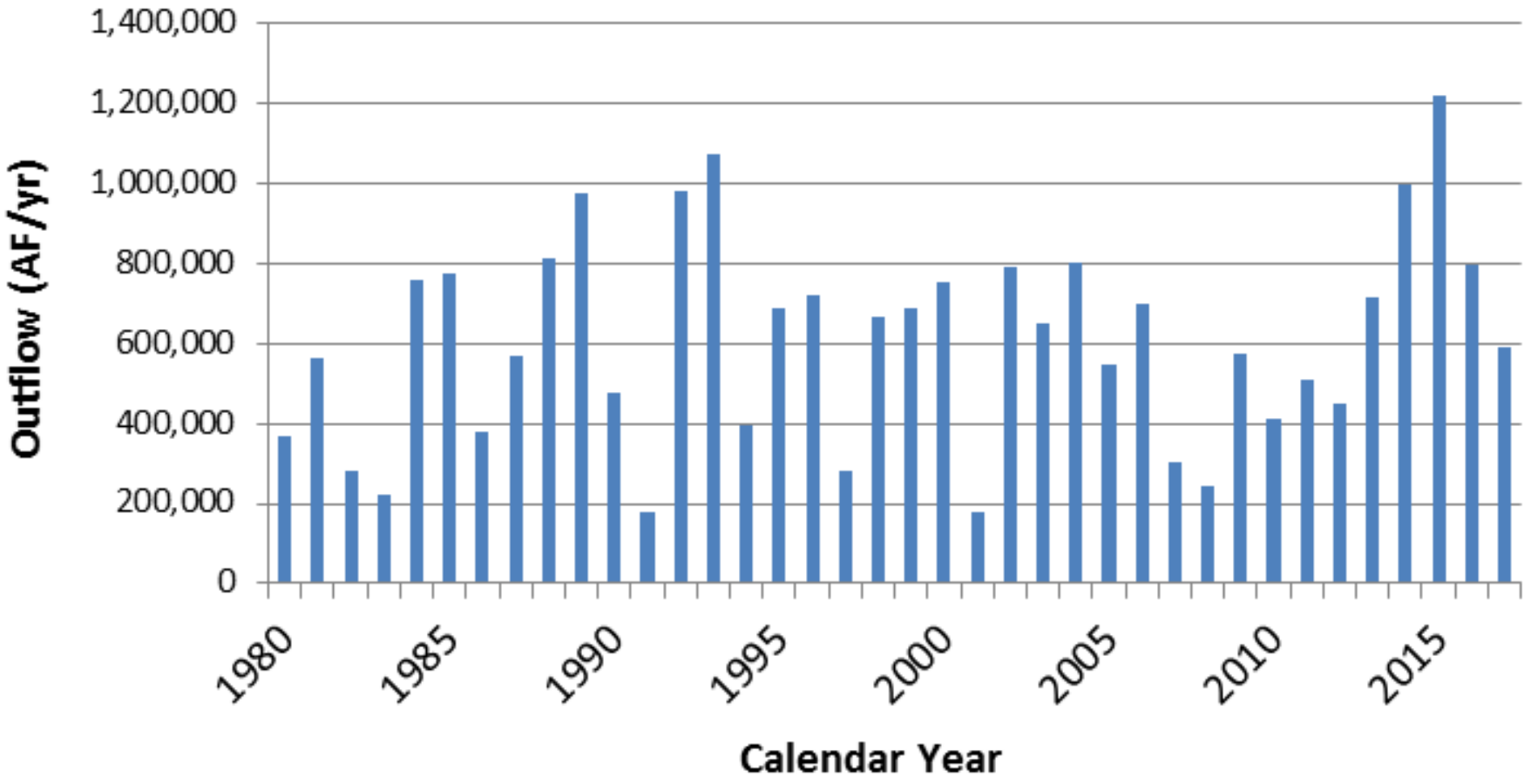
Lake Outflows to West

Average outflow = 639,100 AF/yr
(208 billion gllons/yr)



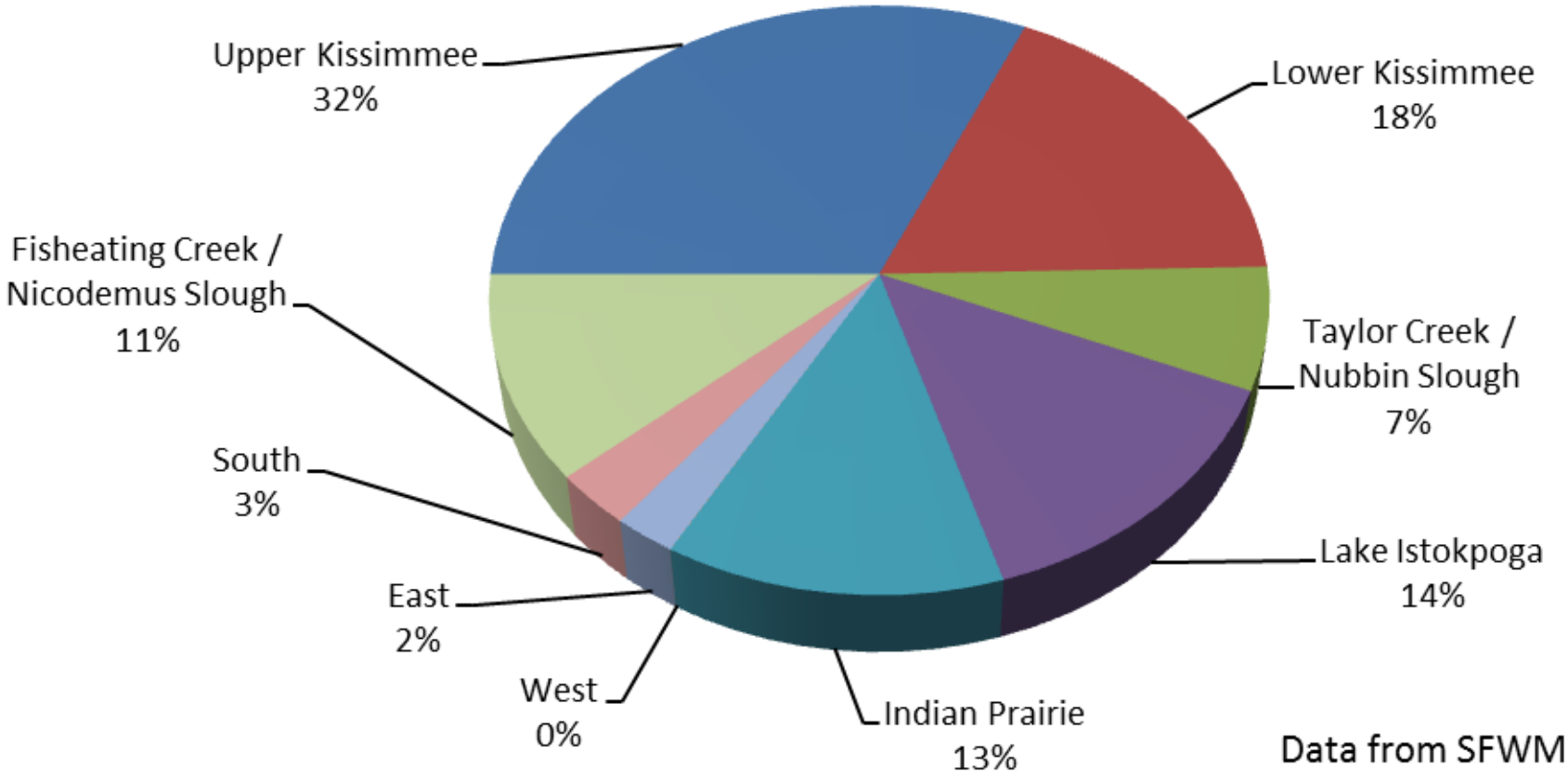
Lake Outflows to South

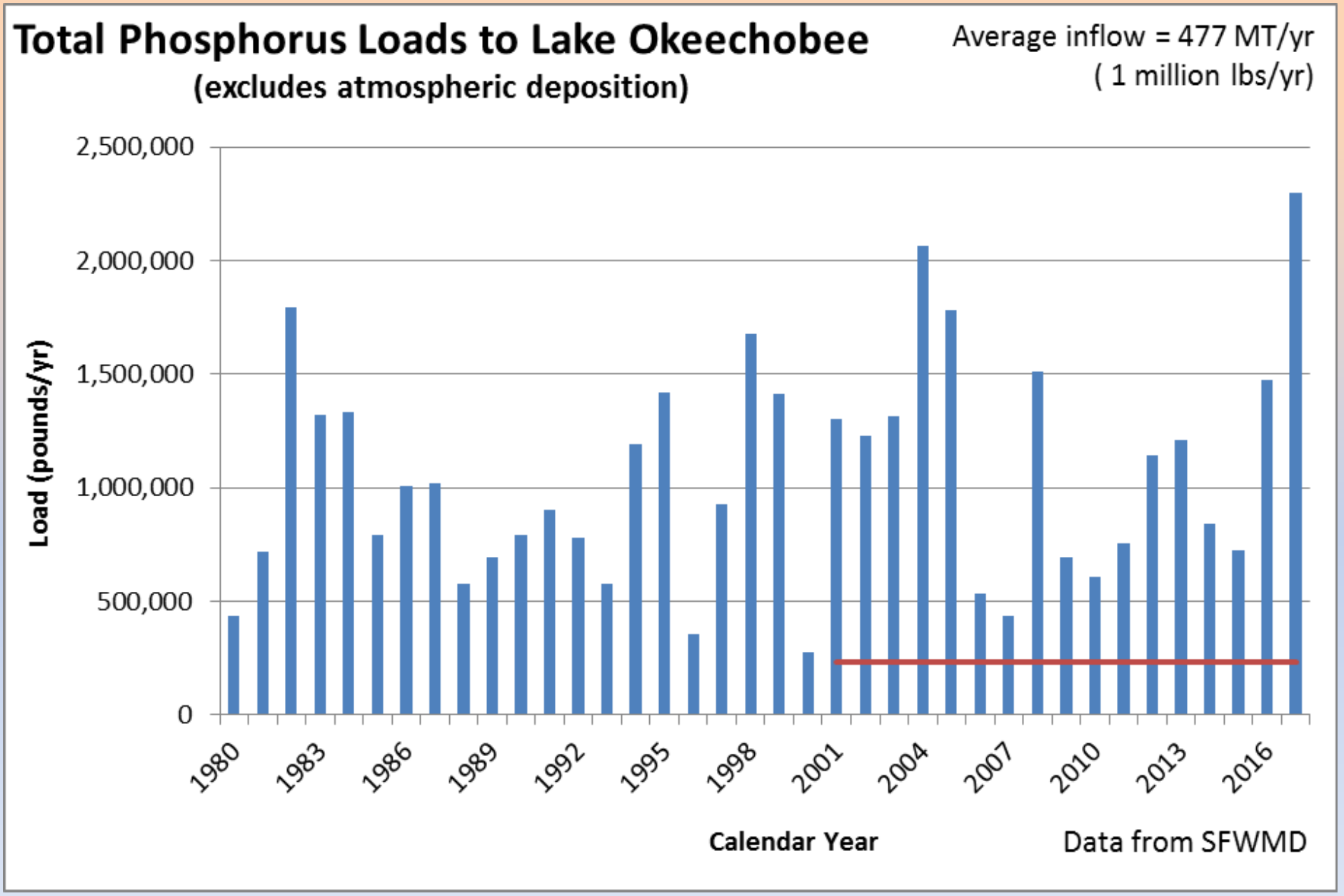
Ave. outflow (1980-2017)= 607,000 AF/yr
(200 billion gallons/yr)



Total Surface Inflows to Lake WY2014-2018

Average annual inflow = 2.9 million AF/yr
(952 billion gallons/yr)



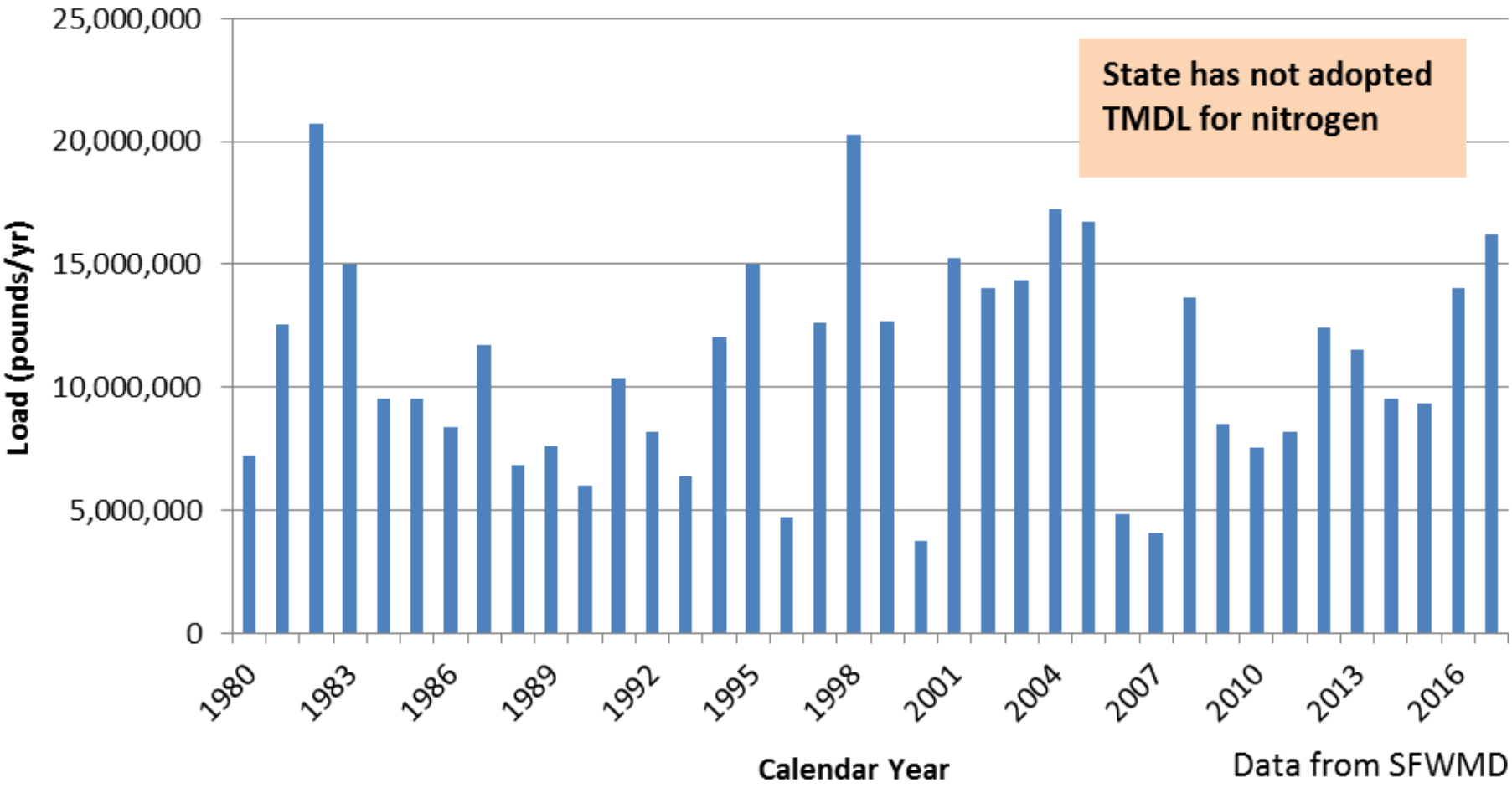


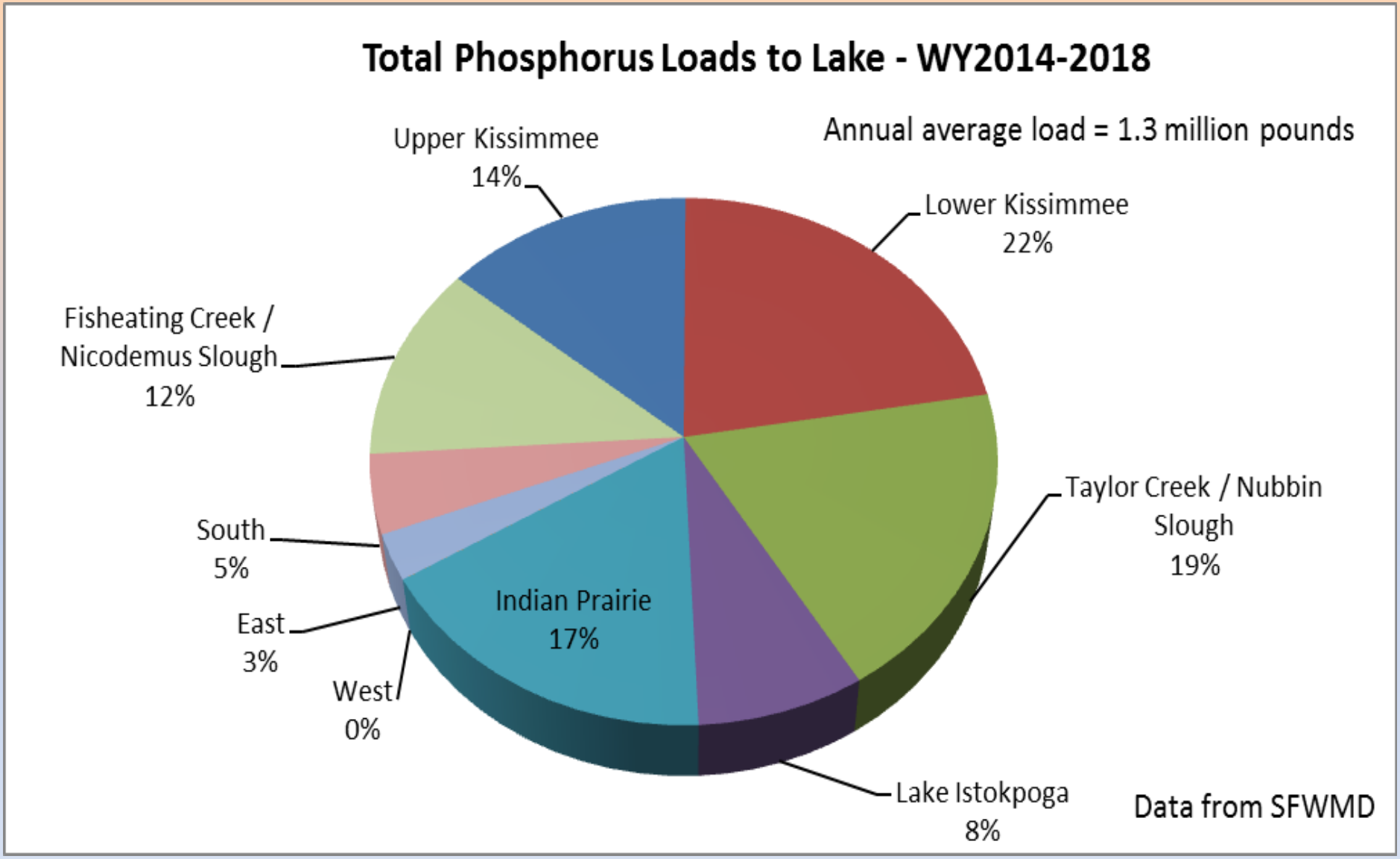
TMDL = 231,483 lbs/yr

Total Nitrogen Loads to Lake Okeechobee

(excludes atmospheric deposition)

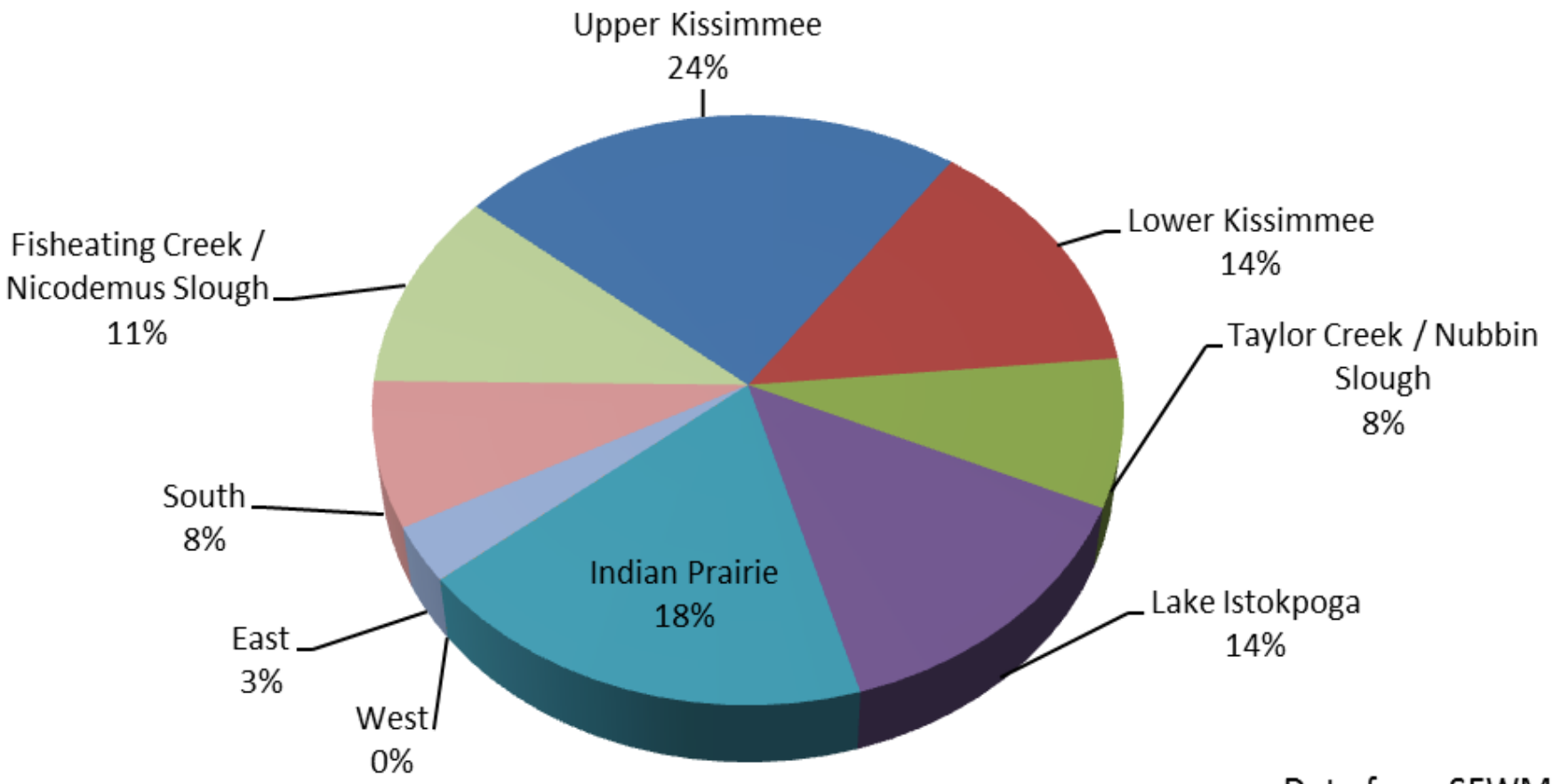
Average inflow = 5,000 MT/yr
(11 million lbs/yr)




Total Phosphorus Loads to Lake - WY2014-2018
Annual average load = 1.3 million pounds
Upper Kissimmee
14%
Lower Kissimmee
22%
Fisheating Creek /
Nicodemus Slough
12%
Taylor Creek / Nubbin
Slough
19%
South
5%
Indian Prairie
17%
East
3%
West
0%
Lake Istokpoga
8%
Data from SFWMD

Total Nitrogen Loads to Lake - WY2014-2018

Annual average load = 12.1 million pounds

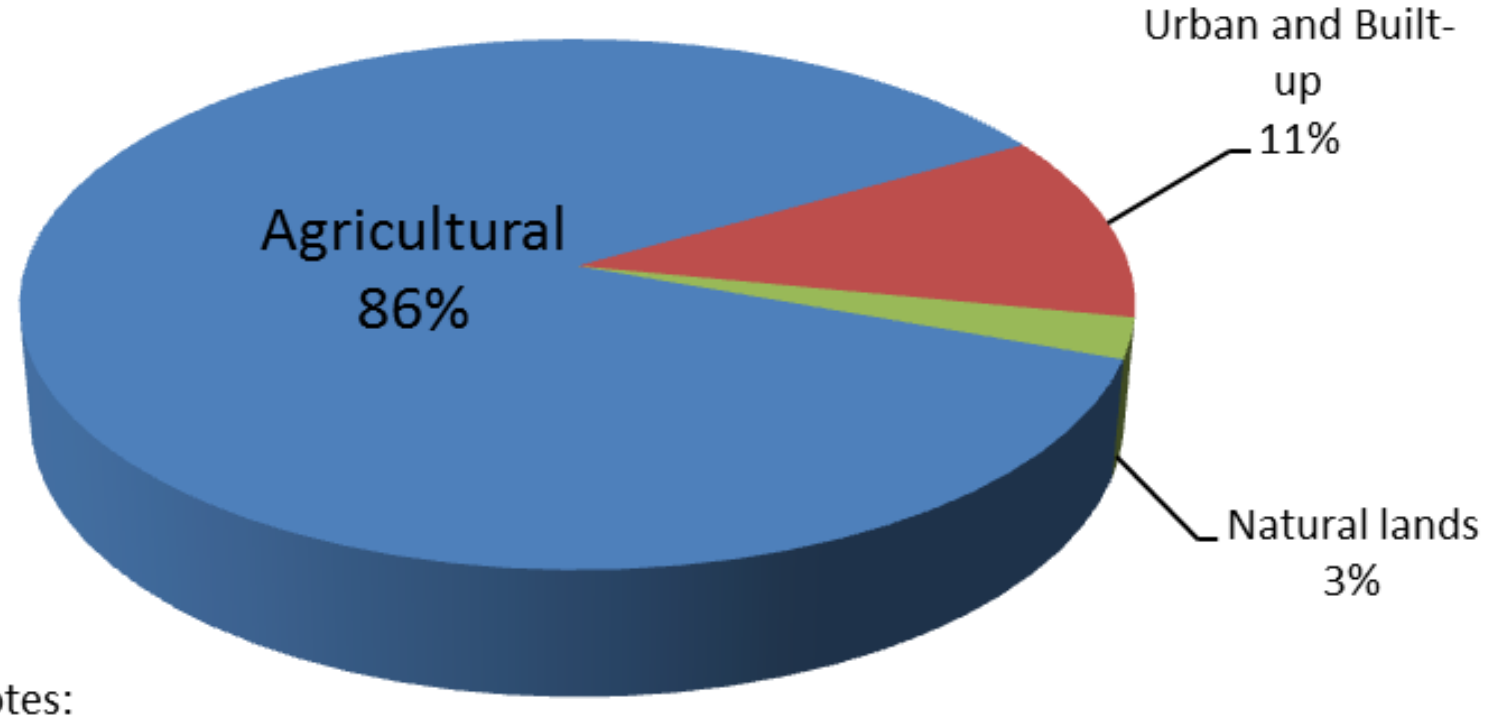


Data from SFWMD

Total Phosphorus Loading to Lake Okeechobee - WY2014-2018

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

Draft



Notes:

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

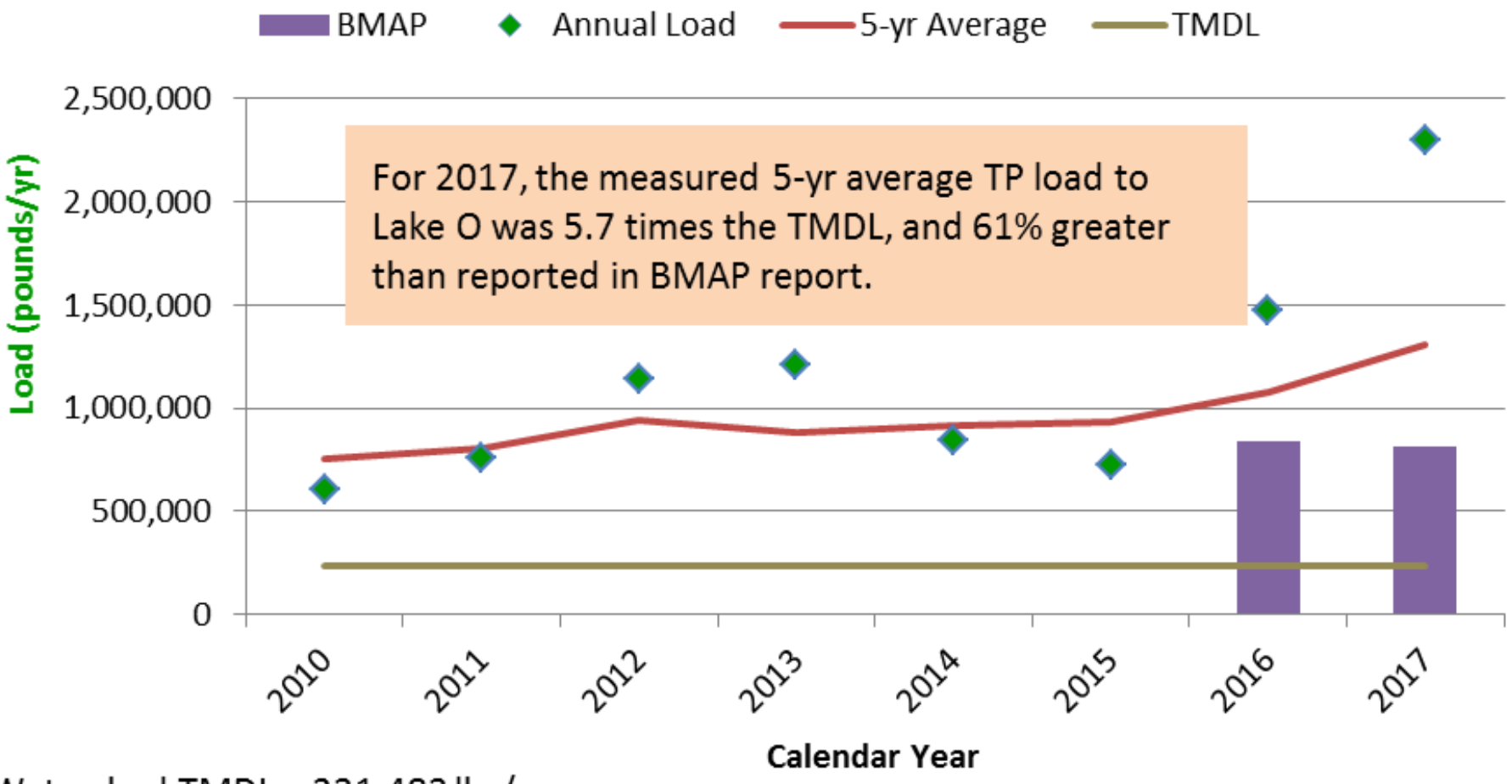
"Agricultural" includes traditional agricultural activies.

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

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

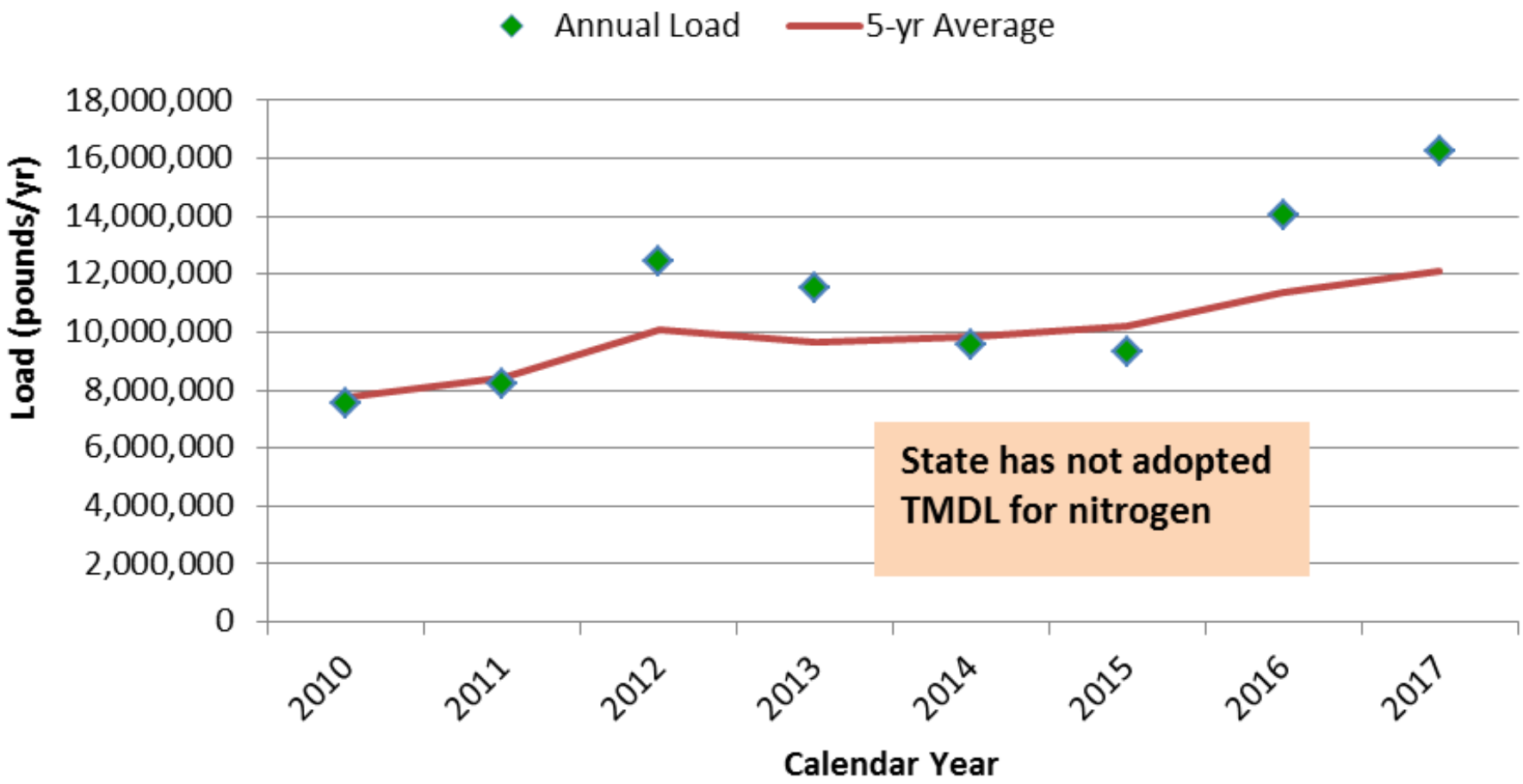
This is only an estimate – since no parcel-specific water quality data are available; this estimate assumes each land use has responded uniformly to load reduction measures since the 2001-2012 Starting Period.

Total Phosphorus Loads to Lake O



Watershed TMDL = 231,483 lbs/yr

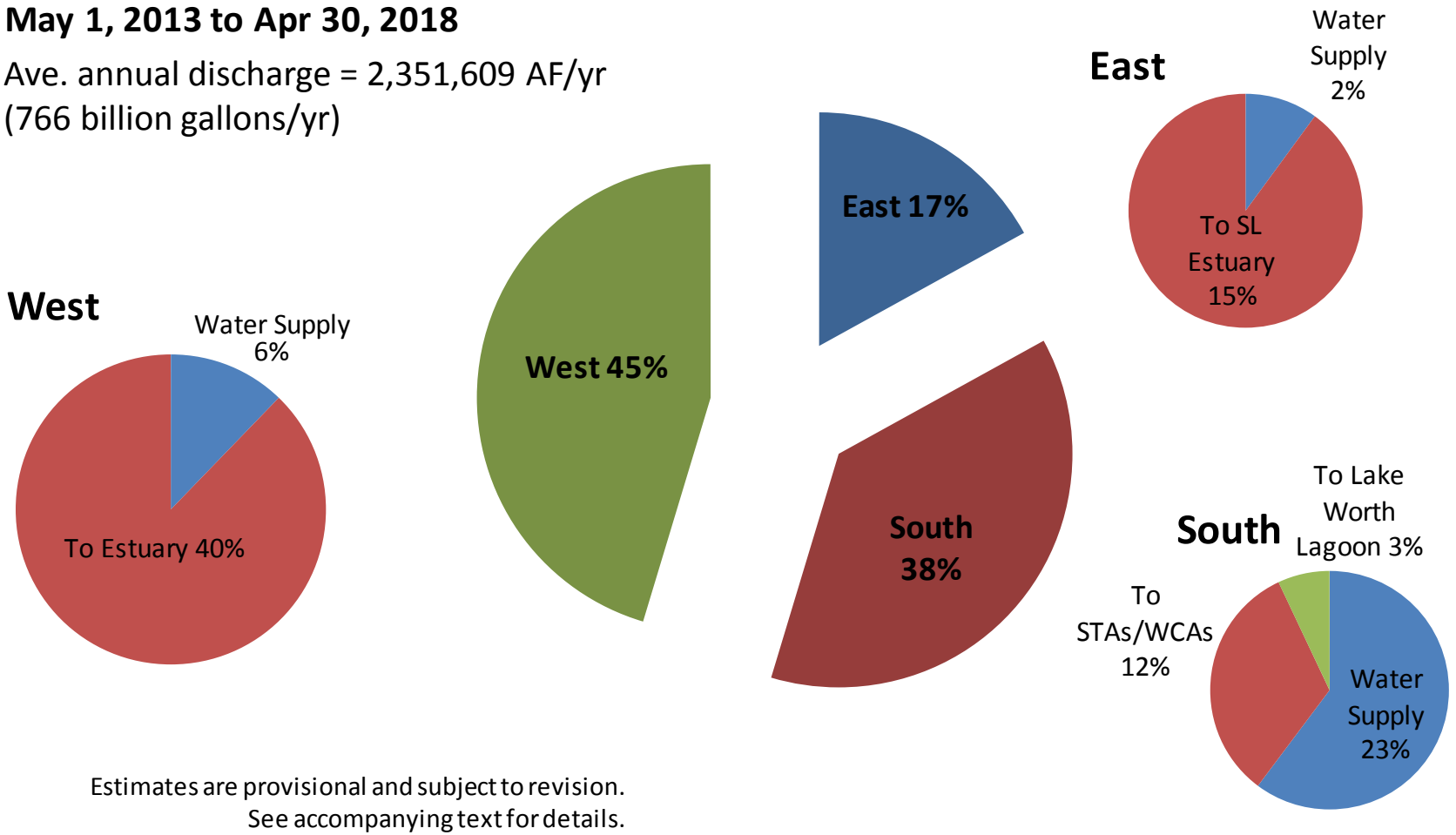
Total Nitrogen Loads to Lake O



Distribution of Lake Okeechobee Releases

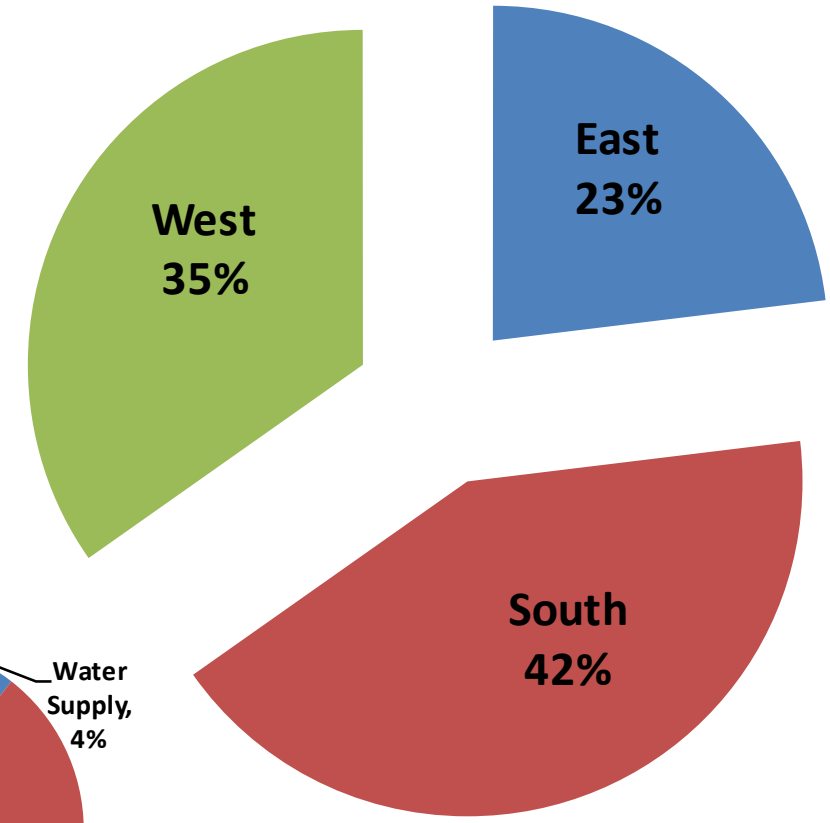
May 1, 2013 to Apr 30, 2018

Ave. annual discharge = 2,351,609 AF/yr
(766 billion gallons/yr)

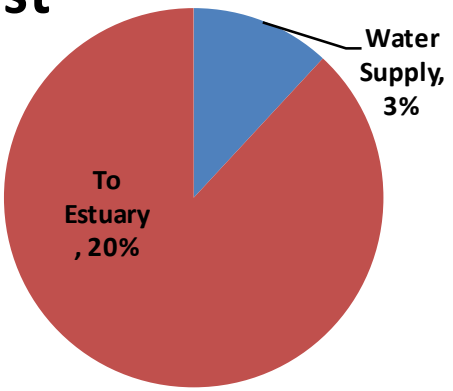


Estimates are provisional and subject to revision.
See accompanying text for details.

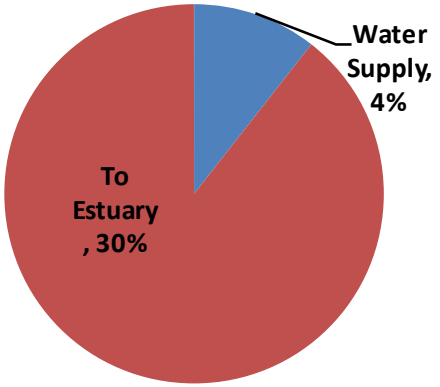
Distribution of TP Load - WY2014-2018
Average Annual TP Load = 846,400 lbs/yr



East



West



South