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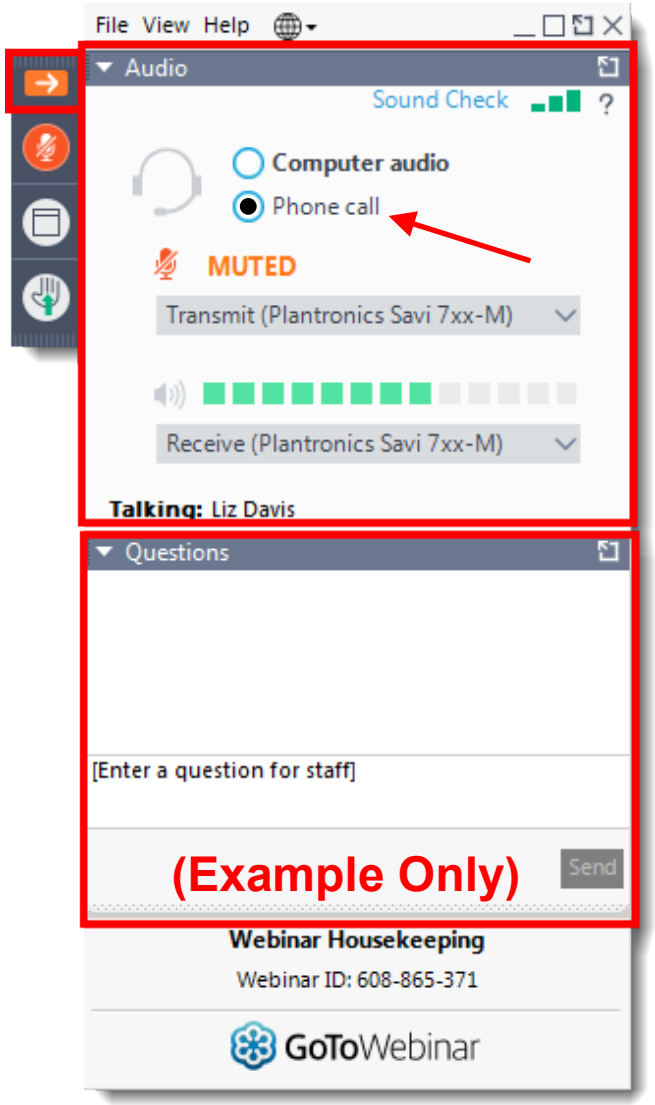
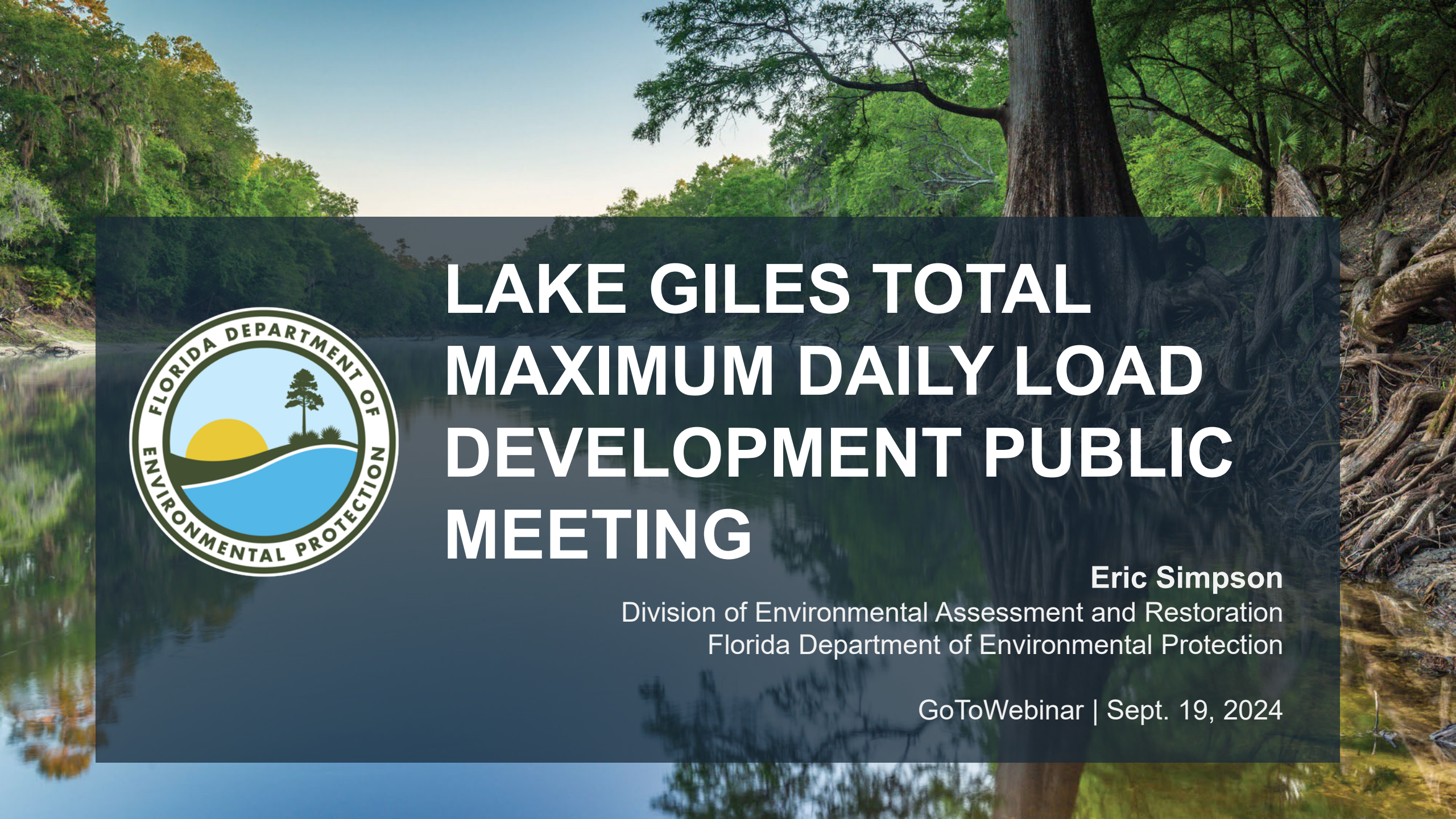




LAKE GILES TOTAL MAXIMUM DAILY LOAD DEVELOPMENT PUBLIC MEETING

Eric Simpson
Division of Environmental Assessment and Restoration
Florida Department of Environmental Protection

GoToWebinar | Sept. 19, 2024

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

Presentation Agenda

- Introduction and overview of Florida's total maximum daily load (TMDL) program.
- Presentation of nutrient TMDLs for Lake Giles:
  - Water Body Identification Number (WBID) overview.
  - Assessment and Verified Impairments.
  - TMDL approach.
- Next steps.
- Public questions and comments.

WATER QUALITY RESTORATION

- Water Quality Standards.
- Monitoring.
- Assessment.
- **TMDL Development.**
- Restoration Plans:
  - Basin Management Action Plan (BMAP).
  - Reasonable Assurance Plan.

FEDERAL TMDL PROGRAM RESPONSIBILITIES

- The Federal Clean Water Act (CWA, 1972) established requirements for states in Section 303(d).
- States must:
  - Assess and provide lists of their impaired waters to the U.S. Environmental Protection Agency (EPA).
  - Develop TMDLs for impaired waters.
  - Identify pollutant reductions and allocations.

FLORIDA WATERSHED RESTORATION ACT

- The Florida Watershed Restoration Act (FWRA, section 403.067, Florida Statutes) established a framework for identifying impaired waters, developing TMDLs, and developing and implementing restoration plans:
  - Authorizes the Florida Department of Environmental Protection (DEP) to be lead agency in watershed assessment, TMDLs and BMAPs.
  - Directs DEP to work with stakeholders on scientifically informed restoration targets and strategies.

SITE SPECIFIC RESTORATION TARGETS

- Typically referred to as TMDLs.
- TMDLs are water quality restoration thresholds produced for waterbodies that are “impaired.”
  - “Impaired” means that the waterbody does not meet water quality standards.
- TMDLs serve as the legal basis for future restoration action as directed by the federal CWA and FWRA, particularly for permitted entities.

TMDLs

- TMDL: The maximum amount of a pollutant that a waterbody can receive and still maintain its designated uses (e.g., drinking water, fishing, swimming and shellfish harvesting).

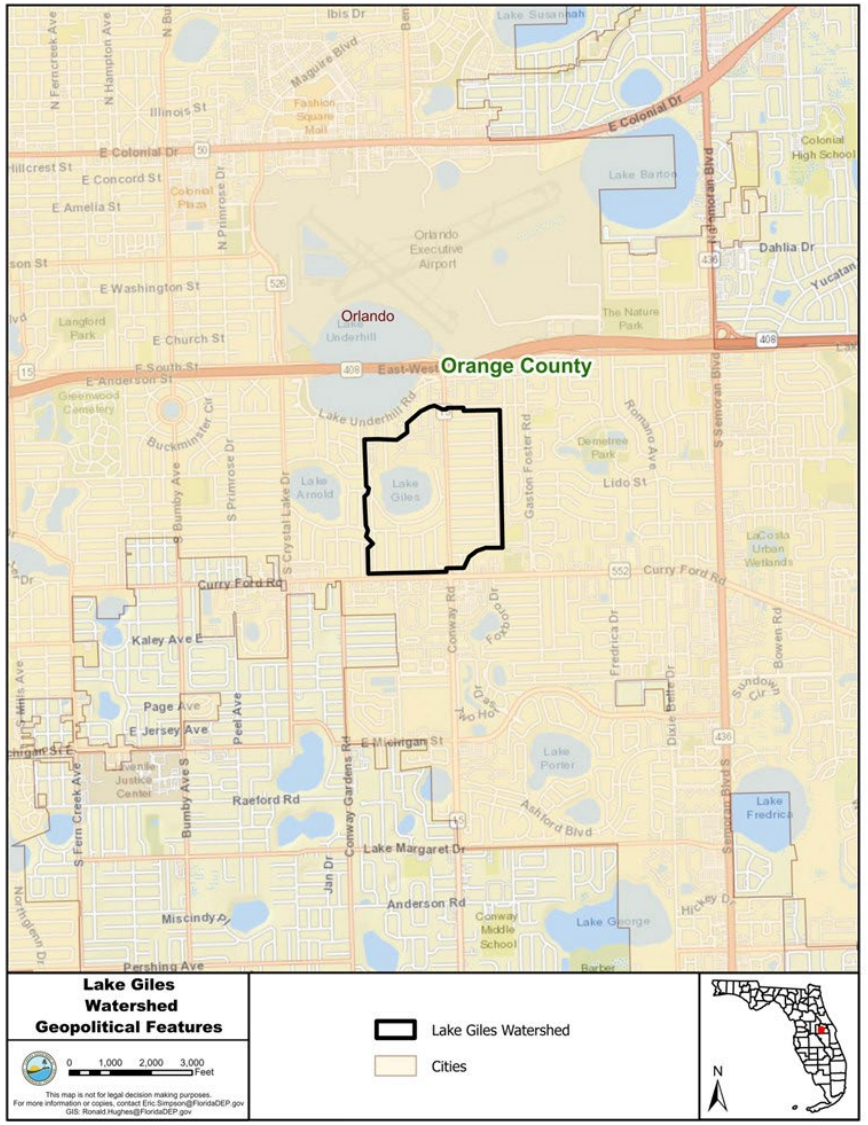
- Under Section 303(d) of the federal CWA and the FWRA, TMDLs must be developed for impaired waters.

LAKE GILES TMDL DEVELOPMENT

Lake Giles Total Maximum Daily Load Development Public Meeting

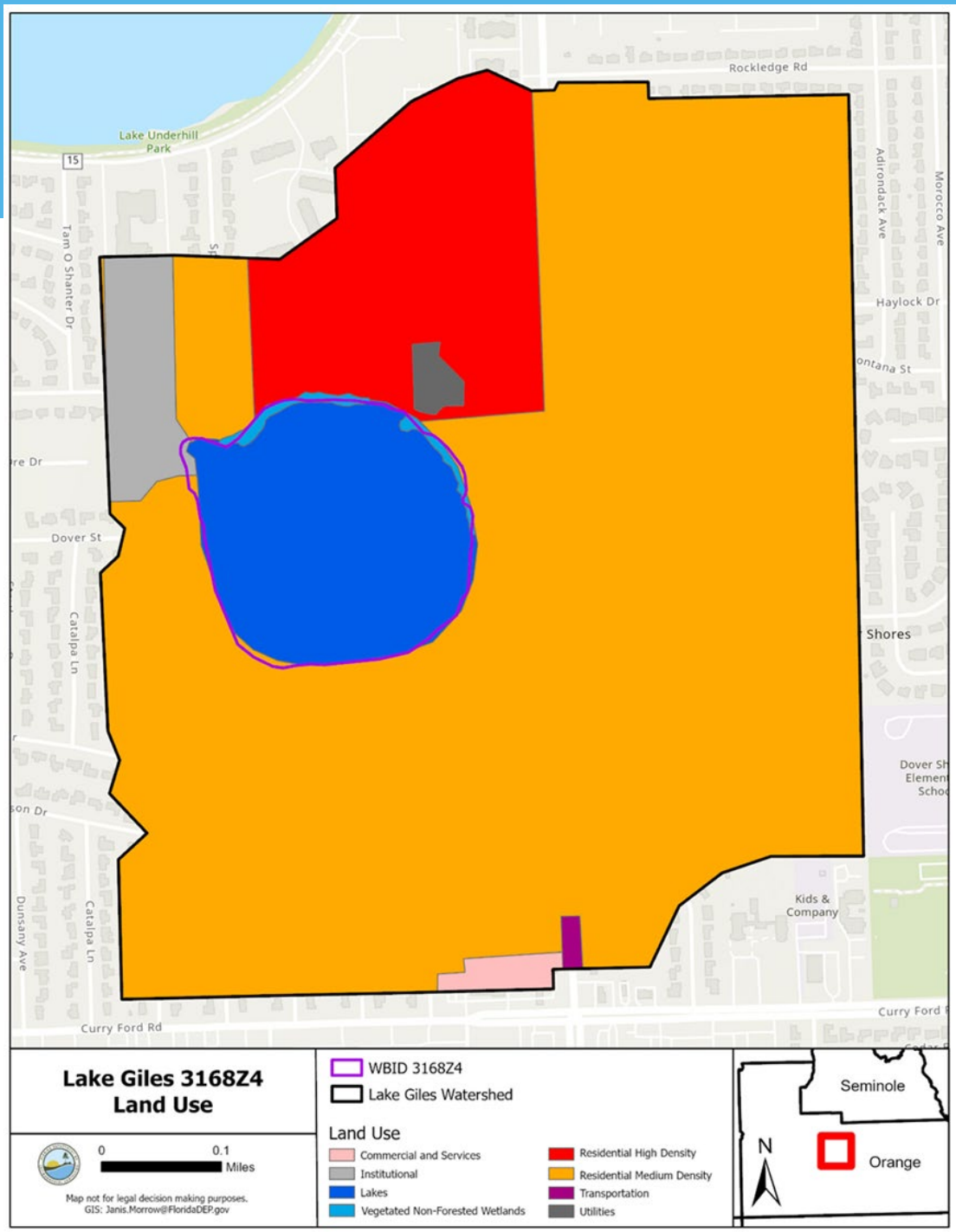
LAKE GILES BACKGROUND

- WBID Number: 3168Z4.
- Basin Group: Middle St. Johns
- Planning Unit: Econlockhatchee.
- County: Orange.
- Waterbody Class: Class 3 Freshwater.
- Waterbody Type: Lake.
- 303(d) Impairment: Nutrients.



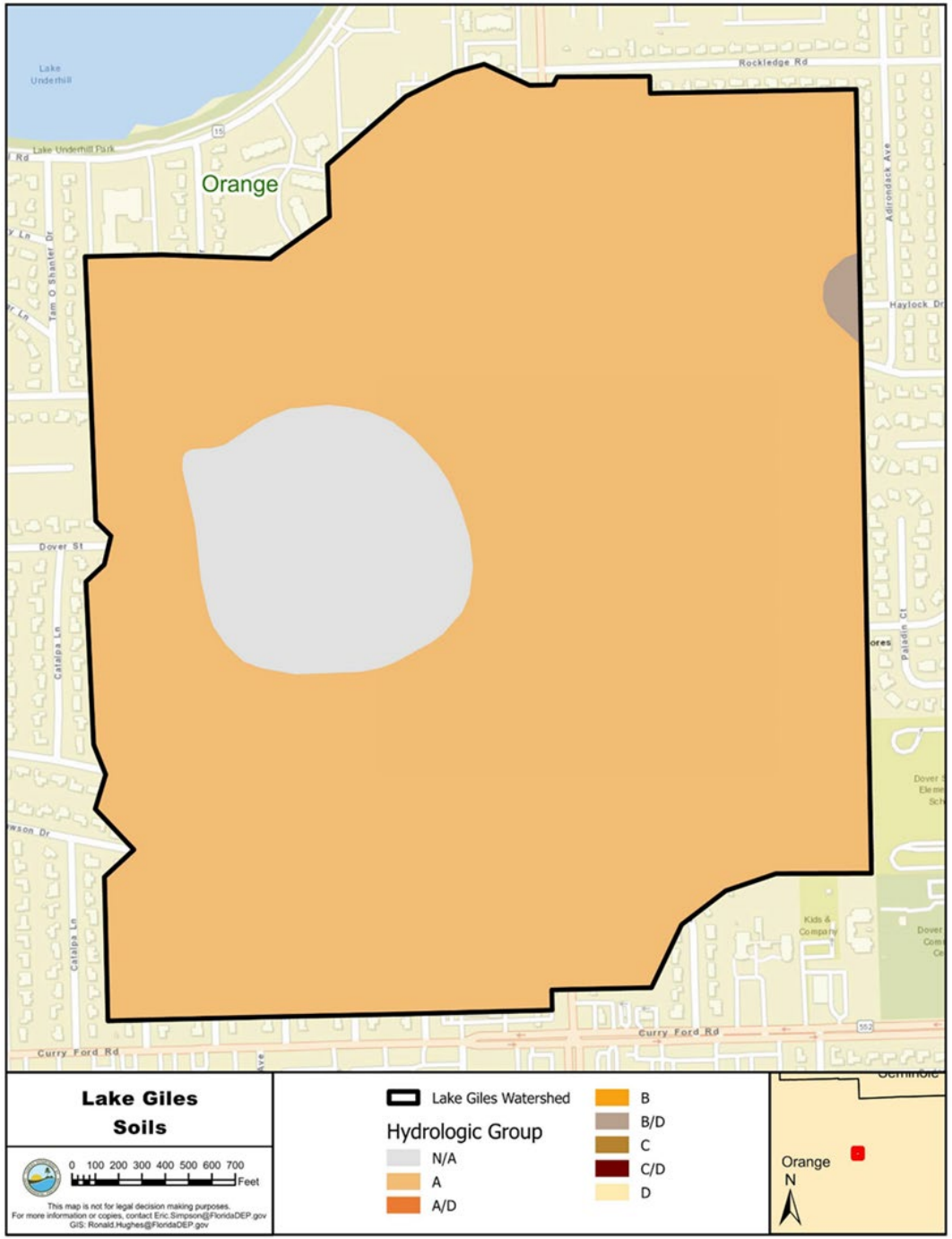
LAKE GILES LAND USE

Land Use Description	Area (Acres)	Percent Area
Residential Medium Density	200	73.8
Residential High Density	33	12.17
Commercial and Services	2	0.73
Institutional	8	2.9
Recreational	0	0
Lakes	26	9.6
Vegetated Non-Forested Wetlands	1	0.37
Transportation	0	0
Utilities	1	0.37
Reservoirs	0	0



LAKE GILES SOILS

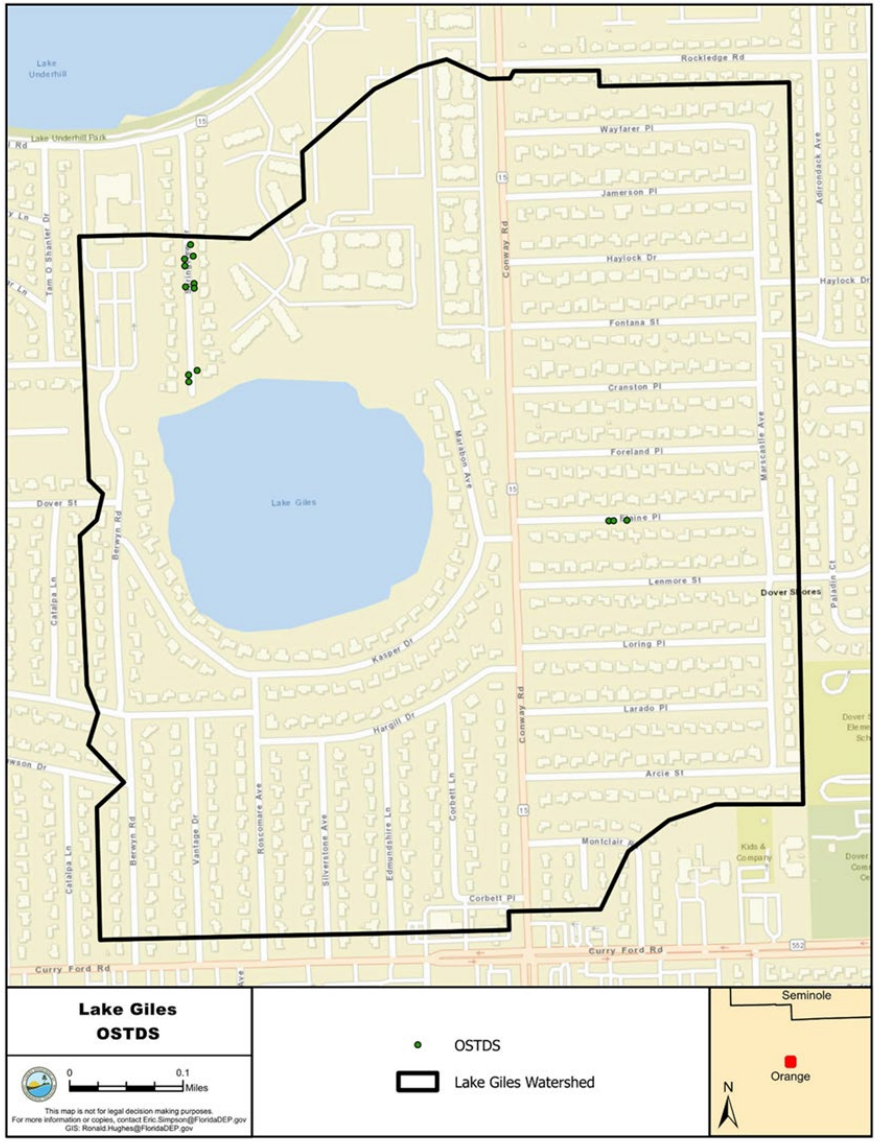
Soil Hydrologic Group	Area (acres)
Group A	244.7
Group B	0
Group C	0
Group D	0
Group A/D	0
Group B/D	0.99
Water	25.9
Total	271.59



ONSITE SEWAGE TREATMENT AND DISPOSAL SYSTEMS (OSTDS)

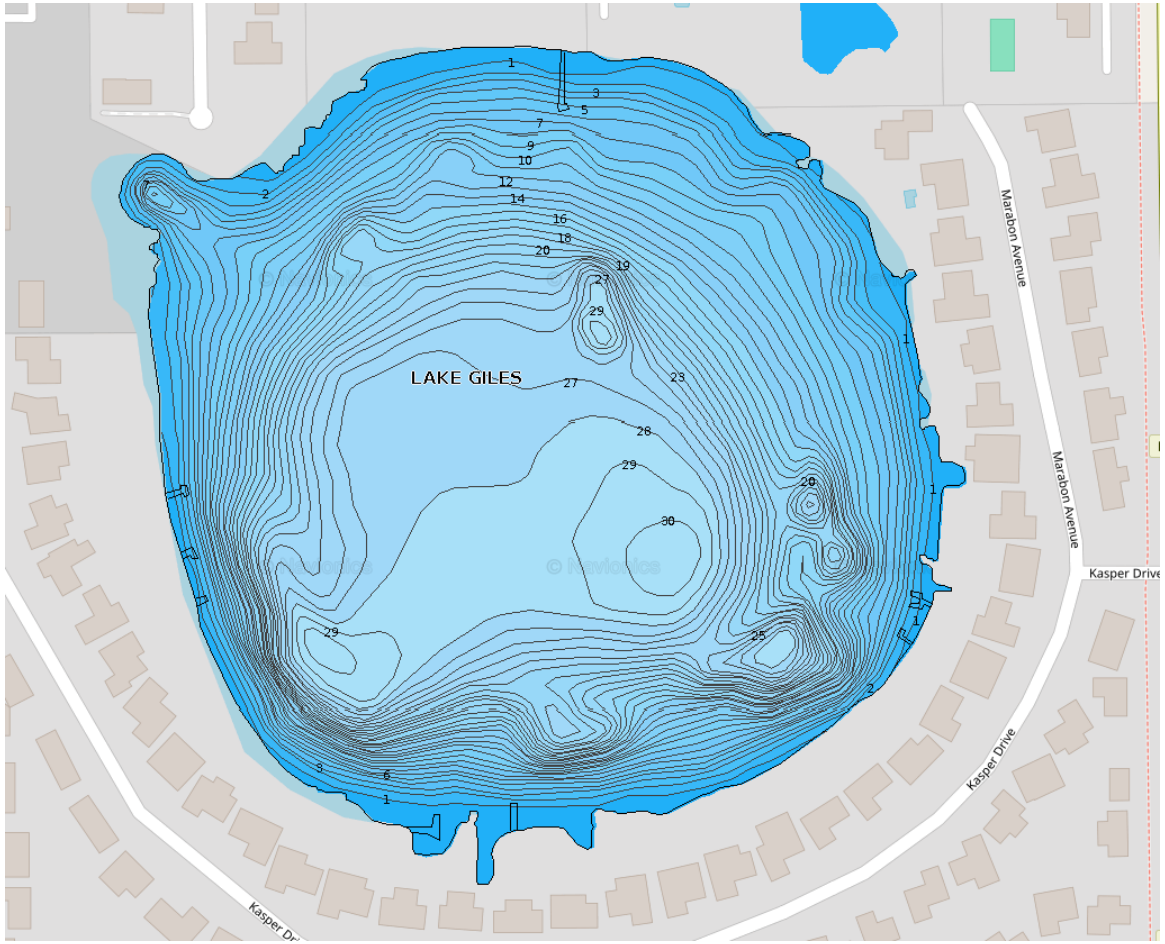
- 13 OSTDS in watershed.
- 11 OSTDS within 200 meters of Lake Giles.

Source: Florida Department of Health



LAKE GILES BATHYMETRY

Lake Surface Area (ac.)	Lake Volume (ac.-ft.)	Mean Depth (ft.)	Maximum Depth (ft.)
26.4	Not Reported	15	33



NUMERIC NUTRIENT CRITERIA (NNC) FOR FLORIDA LAKES (Ch. 62-302.531(2)(b)1, F. A.C.)

Long-Term Geometric Mean Color and Alkalinity	AGM Chlorophyll *a*	Minimum NNC AGM TP	Minimum NNC AGM TN	Maximum NNC AGM TP	Maximum NNC AGM TN
> 40 Platinum Cobalt Units	20 µg./L.	0.05 mg./L.	1.27 mg./L.	0.16 mg./L.	2.23 mg./L.
≤ 40 Platinum Cobalt Units and > 20 mg./L. $CaCO_3$	20 µg./L.	0.03 mg./L.	1.05 mg./L.	0.09 mg./L.	1.91 mg./L.
≤ 40 Platinum Cobalt Units and ≤ 20 mg./L. $CaCO_3$	6 µg./L.	0.01 mg./L.	0.51 mg./L.	0.03 mg./L.	0.93 mg./L.

F.A.C. = Florida Administrative Code

AGM = Annual Geometric Mean

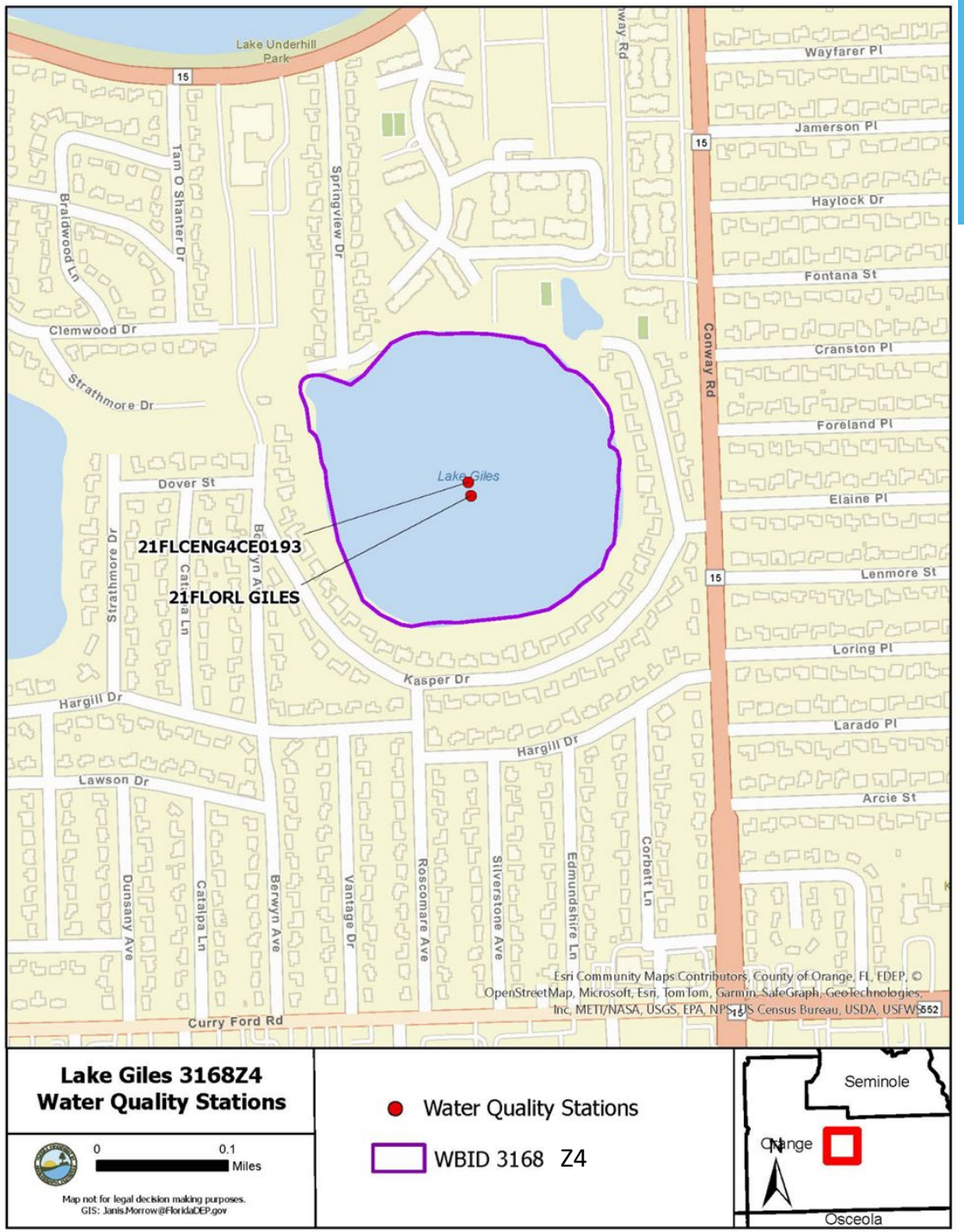
PCU = Platinum Cobalt Units

Lake Giles: Low-color (≤40 PCU), Low-alkalinity (≤ 20 $CaCO_3$)
Color Long-Term Geometric Mean: 11 PCU
Alkalinity Long-Term Geometric Mean: 17 mg./L. $CaCO_3$

Lake color and alkalinity are based on a minimum of ten data points over at least three years with at least one data point in each year.

LAKE GILES SAMPLING SITES

Station Name	Sampling Entity
21FLCENG4CE0193	DEP Central Regional Operations Center
21FLORL GILES	City of Orlando



LAKE GILES IWR ASSESSMENT: NUTRIENT GEOMETRIC MEANS (IWR RUN 65)

NNC:

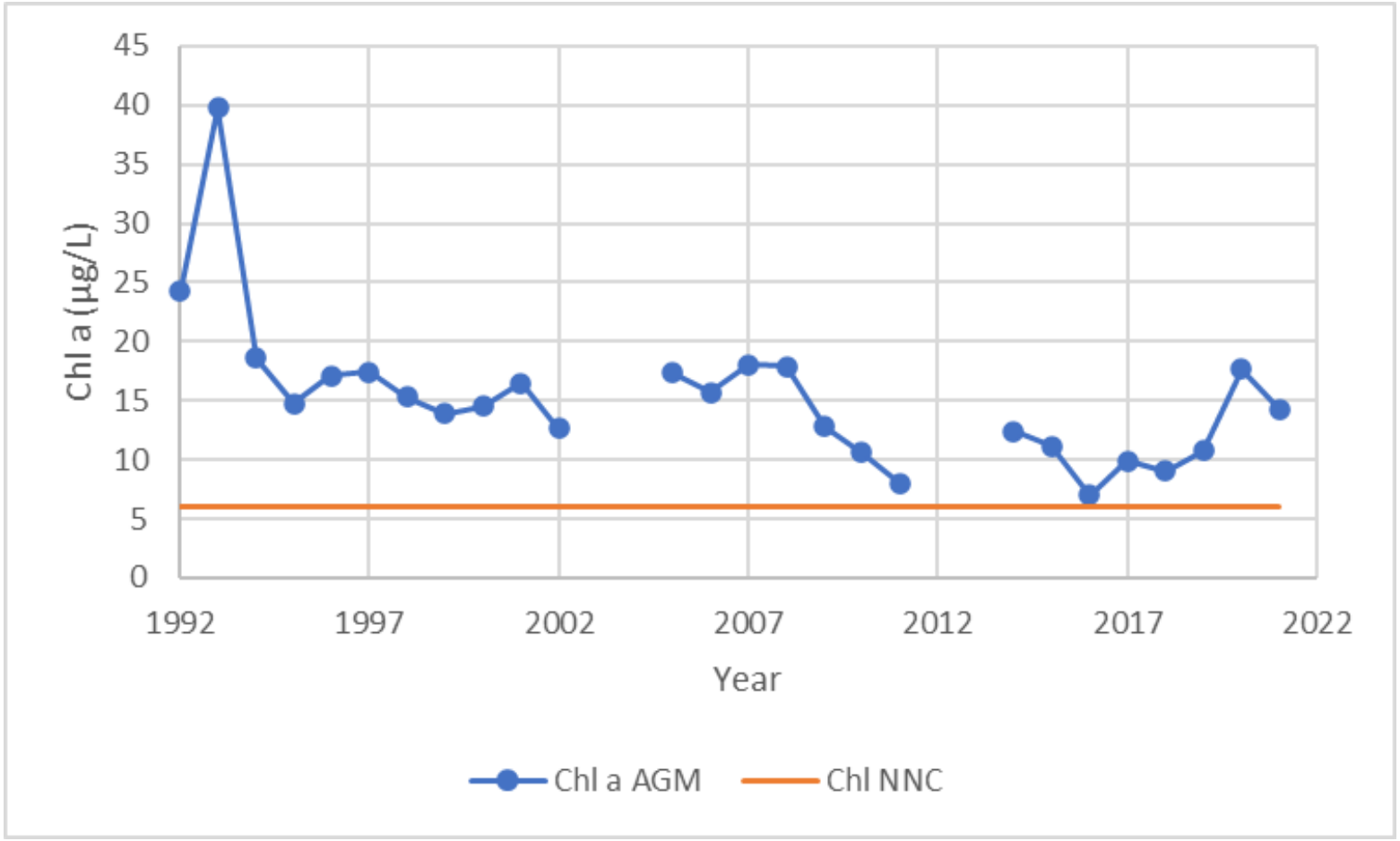
- Chlorophyll *a* – 6 µg./L.
- Total Nitrogen (TN) – 0.51 mg./L.
- Total Phosphorus (TP) – 0.01 mg./L.

Year	Chlorophyll *a* (µg./L.)	TN (mg./L.)	TP (mg./L.)
2013	**15**	**0.7**	**0.03**
2014	**12**	**0.71**	**0.04**
2015	**11**	**0.63**	**0.02**
2016	**7**	**0.59**	**0.03**
2017	**10**	**0.54**	**0.03**
2018	**9**	**0.61**	**0.03**
2019	**11**	**0.57**	**0.02**
2020	**18**	**0.67**	**0.03**
2021	**16**	**0.57**	**0.02**

Values shown in boldface type and blue-shaded are greater than the NNC. Rule 62-302.531, F.A.C., states that the applicable numeric interpretations for TN, TP and chlorophyll *a* shall not be exceeded more than once in any consecutive three-year period.

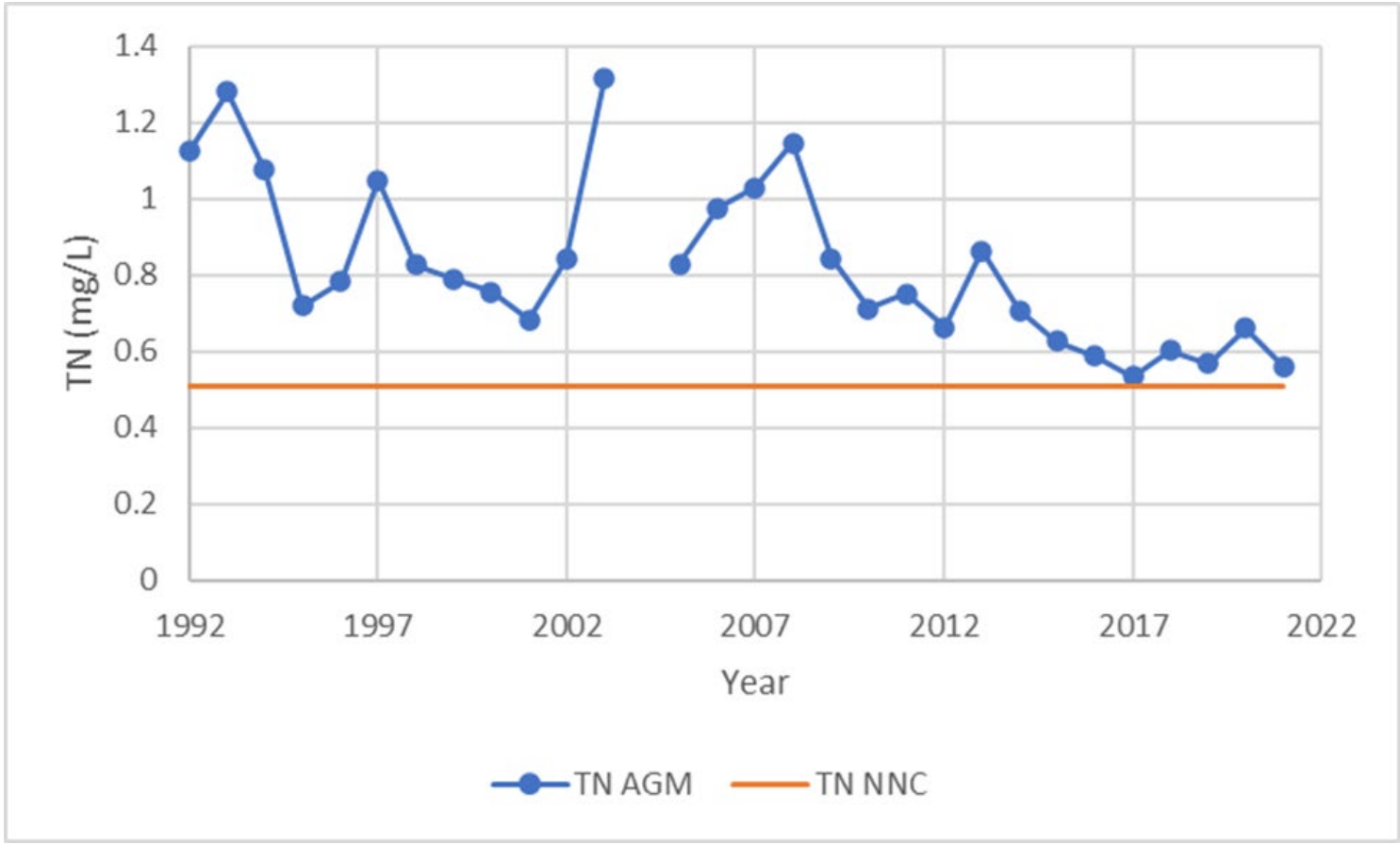
IWR = Impaired Waters Rule

CHLOROPHYLL *a* TIME SERIES



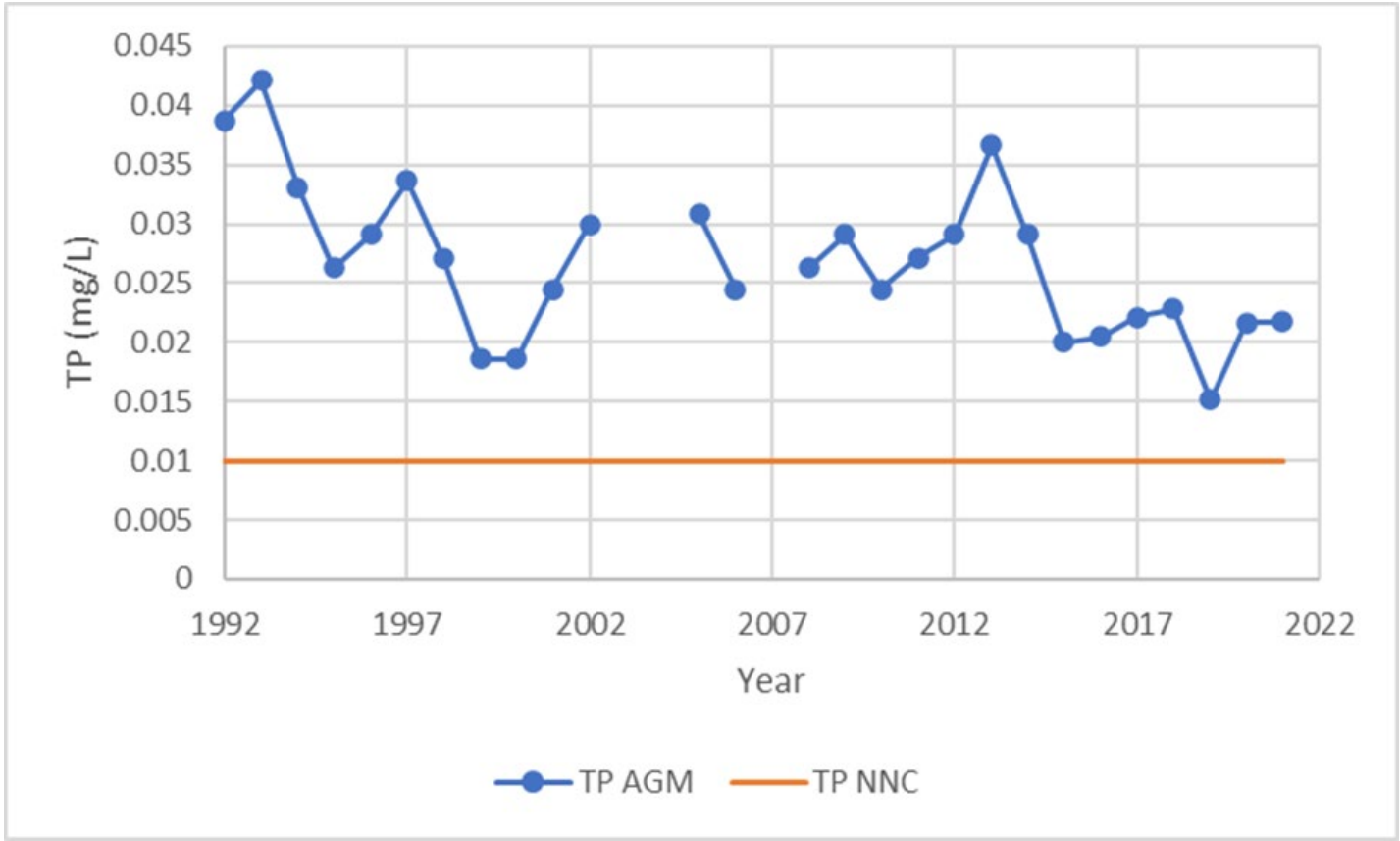
Data from IWR database Run 65.

TN TIME SERIES



Data from IWR database Run 65.

TP TIME SERIES



Data from IWR database Run 65.

LAKE GILES MODELING APPROACHES

- Watershed Model: Pollutant Load Simulation Model (PLSM) Approach.
  - Simulates flow and nutrient loads from the watershed.

- Water Quality Model: Bathtub Model.
  - Simulates in-lake nutrient and chlorophyll a concentrations.

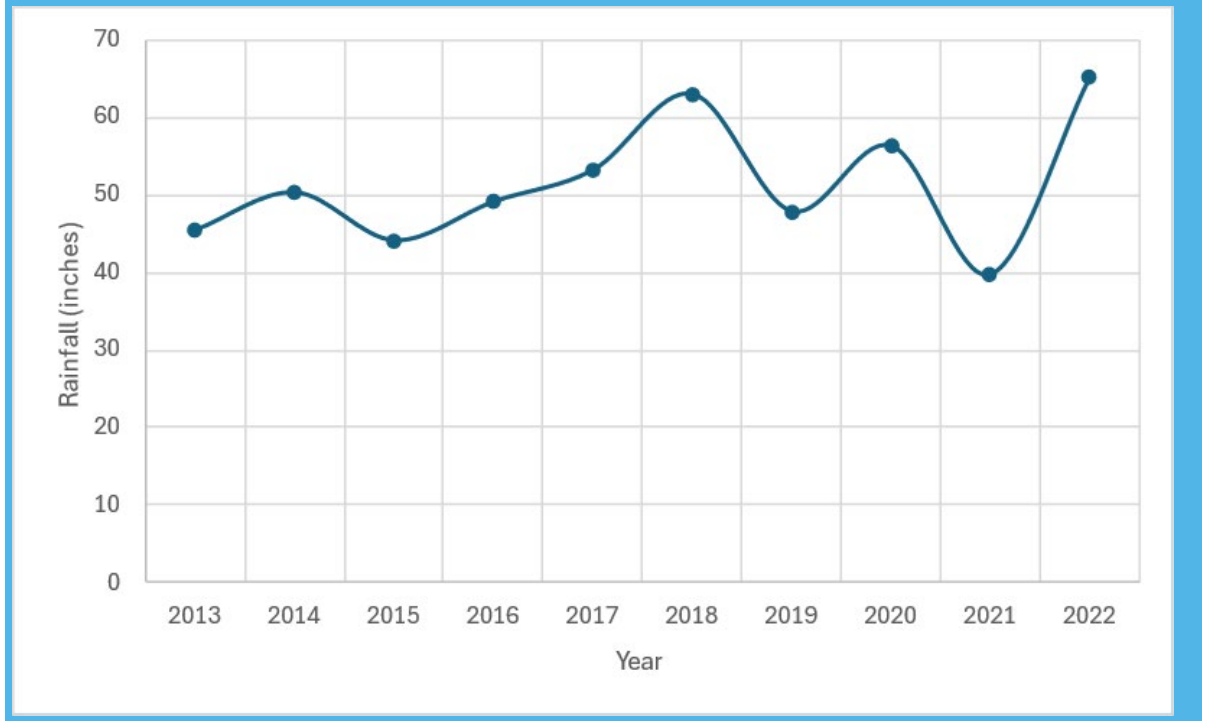
LAKE GILES MODELING: PLSM

- Estimating Runoff Volume and Coefficient
  - Land use, Soil type, Annual precipitation.

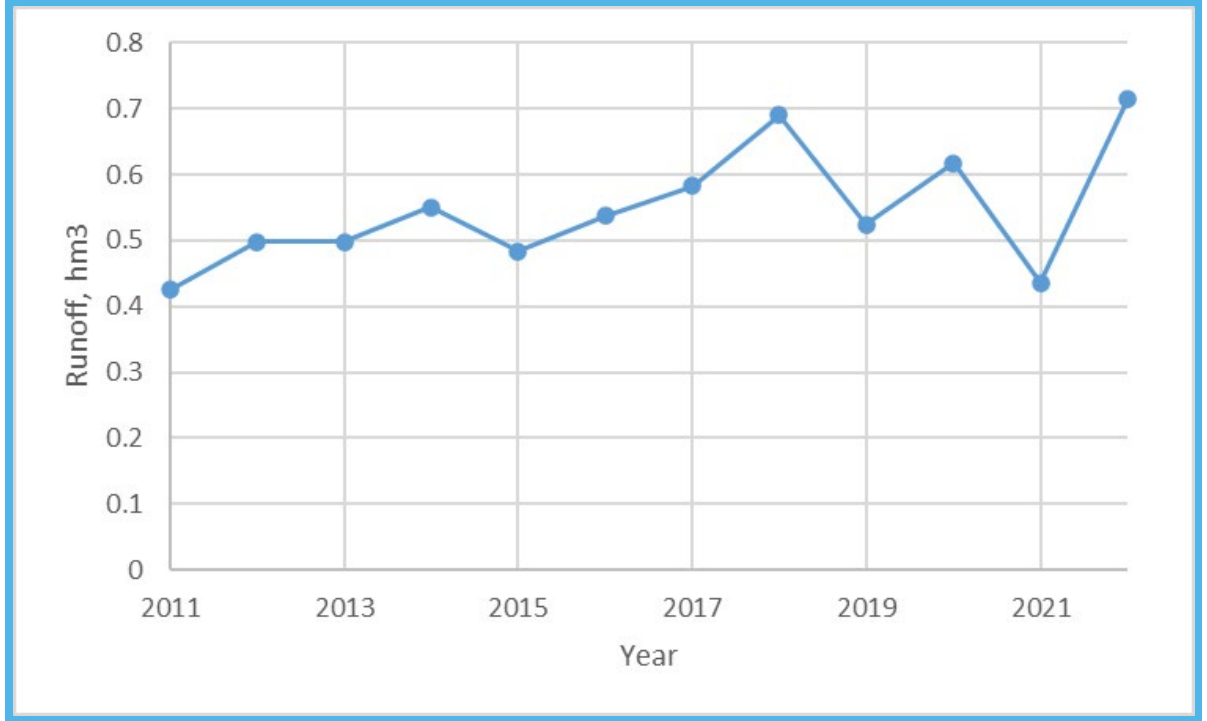
- Estimating the Runoff Nutrient Loads.
  - Runoff Volume.
  - Runoff Coefficient (ROC).
  - Event Mean Concentrations (EMCs).

LAKE GILES RAINFALL AND RUNOFF, 2011-2020

Rainfall, inches per year



Cubic hectometers per year (hm.^{3}/yr.)

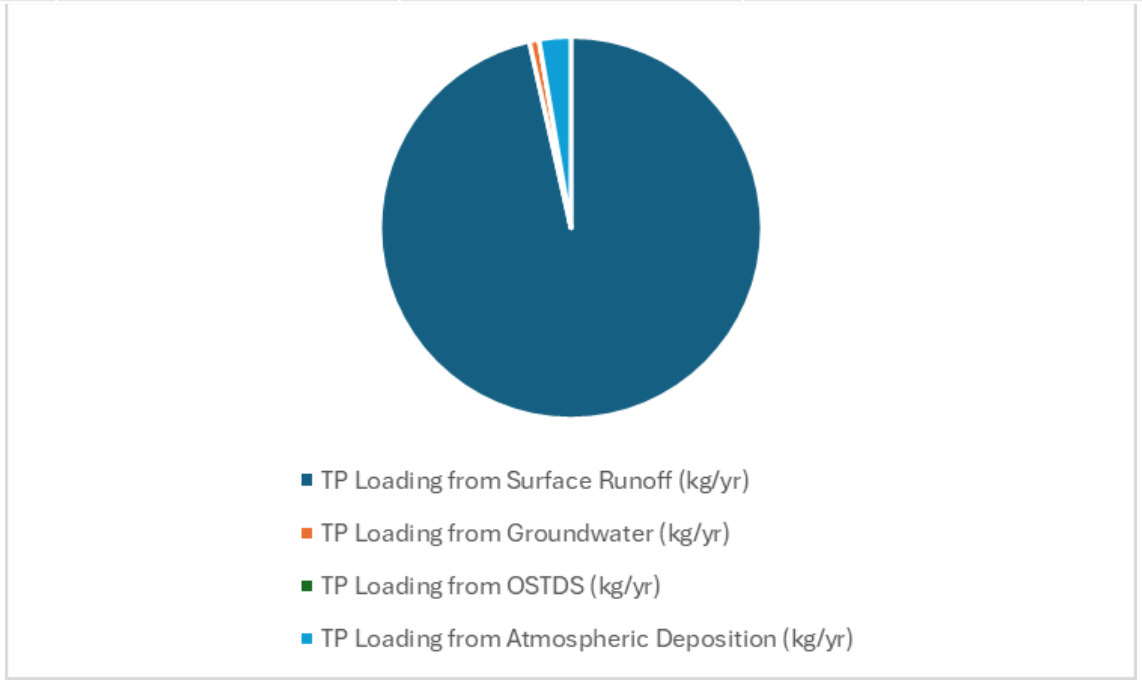


EMCs USED IN PLSM MODEL FOR EACH LAND USE

Land Use	TP EMC (mg./L.)	TN EMC (mg./L.)
Low-density residential	0.178	1.51
Medium-density residential	0.301	1.87
High-density residential	0.497	2.10
Low-density commercial	0.179	1.07
High-density commercial	0.248	2.2
Industrial	0.213	1.19
Mining	0.150	1.18
Pasture	0.621	3.30
Tree crops	0.152	2.07
Cropland	0.489	2.46
Other agriculture	1.050	3.24
Open land/recreational	0.301	1.87
Forest/rangeland	0.055	1.15
Wetlands	0.055	1.15
Water	0.025	0.716

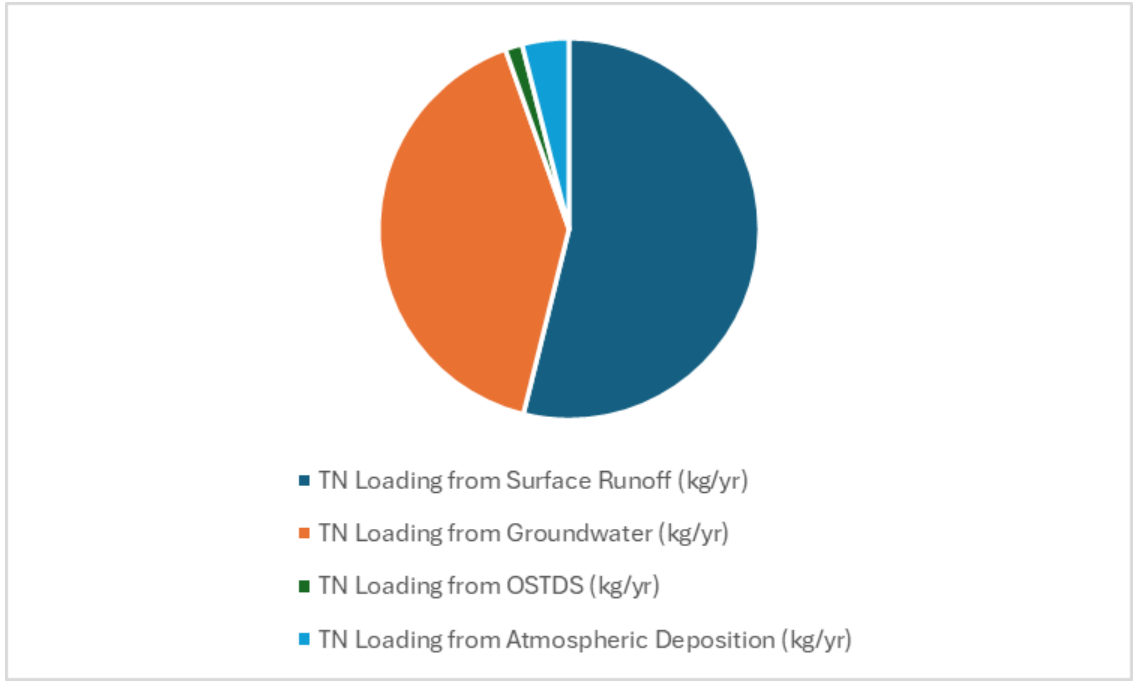
ANNUAL MEAN TP LOADING

Metric	TP Loading from Surface Runoff (kg./yr.)	TP Loading from Groundwater (kg./yr.)	TP Loading from OSTDS (kg./yr.)	TP Loading from Atmospheric Deposition (kg./yr.)
Annual Average	187.52	1.6	0	5.22

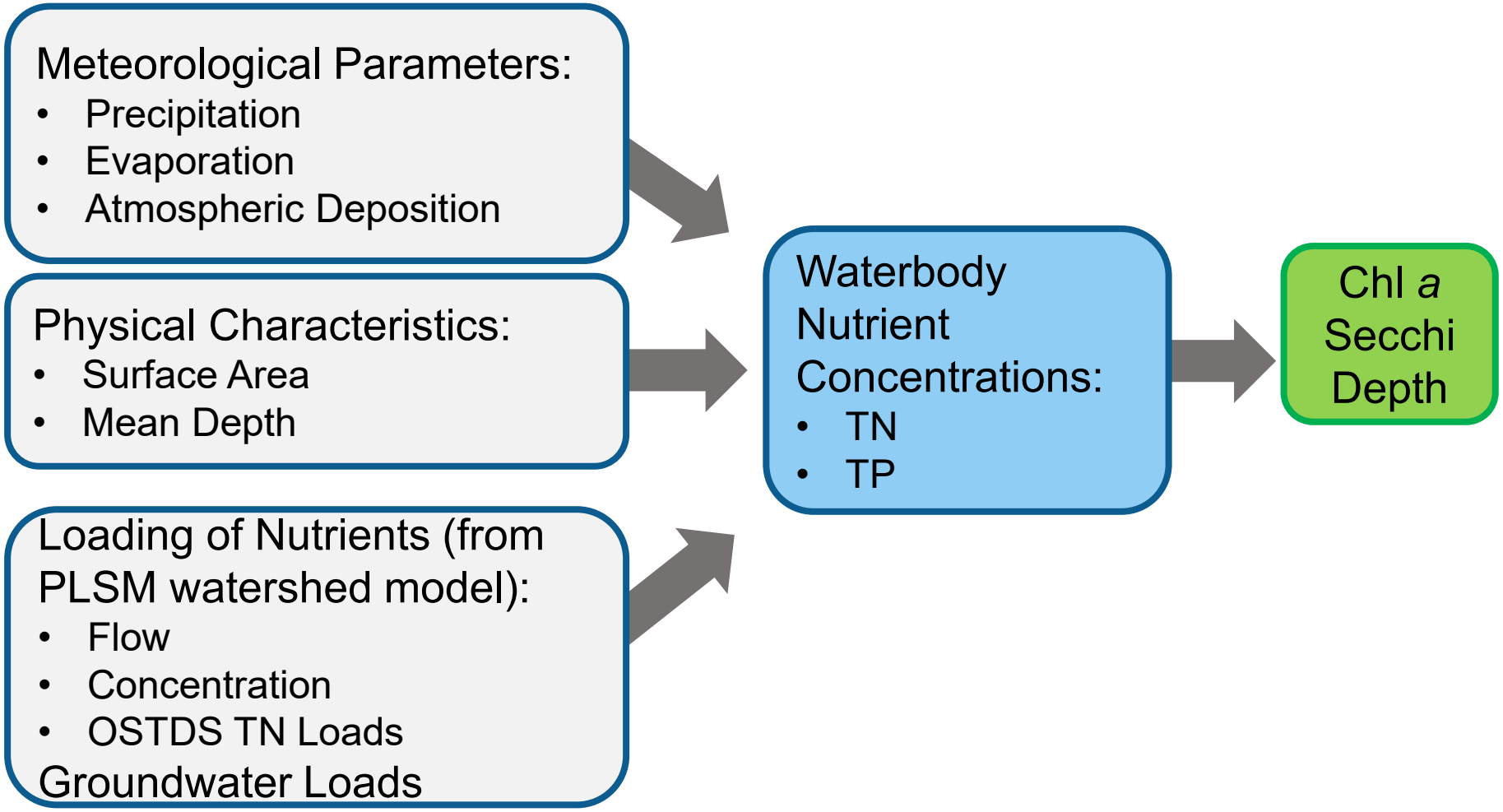


ANNUAL MEAN TN LOADING

Metric	TN Loading from Surface Runoff (kg./yr.)	TN Loading from Groundwater (kg./yr.)	TN Loading from OSTDS (kg./yr.)	TN Loading from Atmospheric Deposition (kg./yr.)
Annual Average	1045.43	790	28.2	77.2



MODELING IN-LAKE CHLOROPHYLL RESPONSE TO NUTRIENT LOADING WITH BATHTUB



MODEL SELECTION AND COEFFICIENTS

- Model Selection:
  - TP: Second Order Decay:
    - Reaction rate scales down with the square of the concentration.
  - TN: Second Order Decay:
    - Reaction rate scales down with the square of the concentration.
  - Chl *a*: P, N, Light and Transparency.
  - Transparency: P, Chl *a* and Turbidity.

MODEL SELECTION AND COEFFICIENTS

- Model Coefficients:
  - TP: 1.3
  - TN: 1
  - Chl *a*: 1.2
  - Secchi Depth: 0.7
- Act as multipliers of concentrations:
  - Can be used for calibration of magnitude when the trend is fit.

MODEL GLOBAL VARIABLES

Year	Precipitation (m./yr.)	Evaporation (m./yr.)	Atmospheric TP ($mg./m^2./yr.$)	Atmospheric TN ($mg./m^2./yr.$)
2013	1.15	1.68	674	32
2014	1.28	1.57	668	35
2015	1.12	1.60	668	35
2016	1.25	1.70	676	51
2017	1.35	1.64	677	40
2018	1.60	1.55	702	47
2019	1.22	1.64	696	33
2020	1.43	1.73	595	44
2021	1.01	1.86	788	69
2022	1.66	1.88	763	77

MODEL SEGMENTS

Morphometry	
Surface Area (km.^{2})	0.109
Mean Depth (m.)	5.4
Length (km.)	0.35
Mixed Layer Depth (m.)	5.4

MODEL SEGMENTS

Observed Water Quality			
Year	**Chl *a* (µg./L.)**	**TN (µg./L.)**	**TP (µg./L.)**
2013	N/A	863	38
2014	12.4	708	35
2015	11.1	628	23
2016	7.0	589	26
2017	9.9	539	27
2018	9.0	607	27
2019	10.7	572	21
2020	17.7	666	28
2021	14.3	565.7	25
2022	7.2	327.5	18

MODEL TRIBUTARIES

Surface Runoff and TN and TP Concentrations

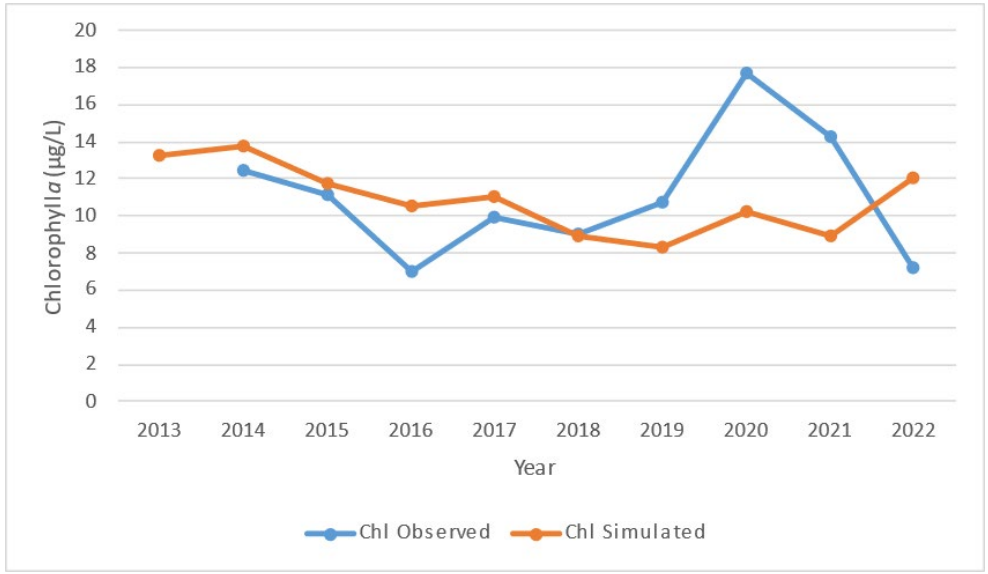
Parameter	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
TP (µg./L.)	330.9	330.9	330.9	330.9	330.9	330.9	330.9	330.9	330.9	330.9
TN (µg./L.)	1853.6	1853.6	1853.6	1853.6	1853.6	1853.6	1853.6	1853.6	1853.6	1853.6
Runoff ($hm.^3$)	0.5	0.6	0.5	0.5	0.6	0.7	0.5	0.6	0.4	0.7

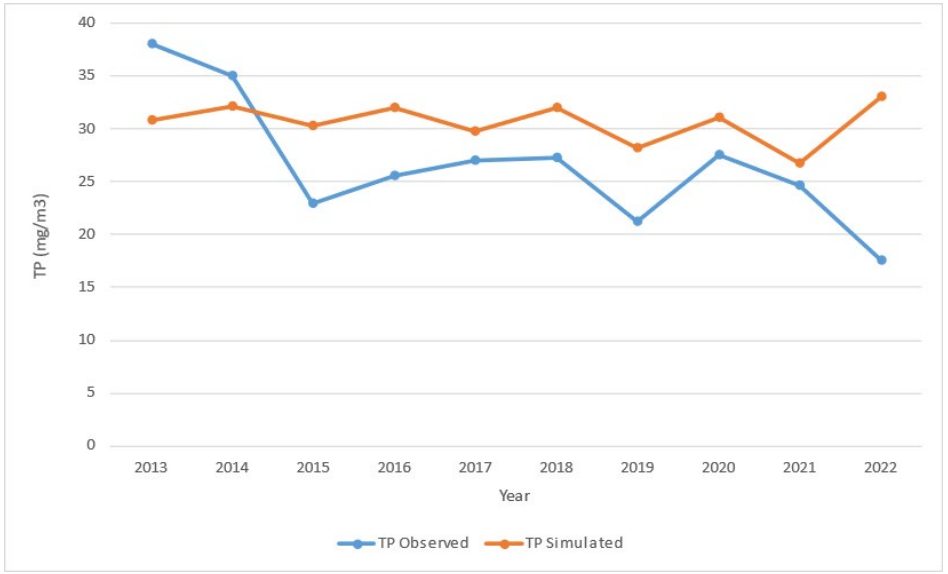
MODEL TRIBUTARIES

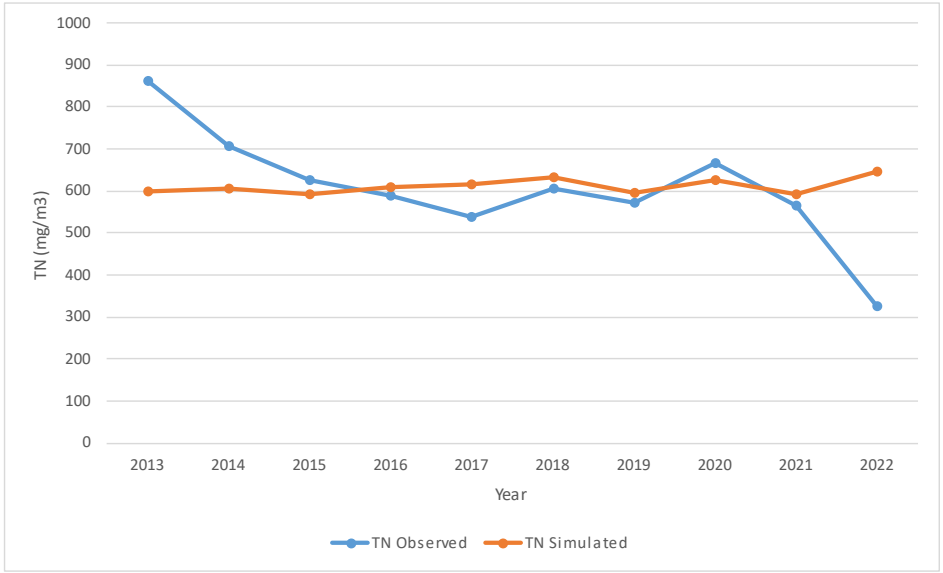
- OSTDS within 200m of water: 11.
  - Flow: 0.0025 hm^3.
  - TN Concentration: 11,270 µg./L.

- Estimated groundwater loading: 1.58 $hm.^3$/yr.
  - TN Concentration: 400 µg./L.
  - TP: 1 µg./L.

MODEL CALIBRATIONS







MODEL CALIBRATIONS

Year	Observed Chl *a* (µg./L.)	Predicted Chl *a* (µg./L.)	Percent Difference
2013	N/A	13.3	N/A
2014	12.4	13.8	-11
2015	11.1	11.7	-5
2016	7	10.5	-50
2017	9.9	11	-11
2018	9	8.9	1
2019	10.7	8.3	22
2020	17.7	10.2	42
2021	14.3	8.9	38
2022	7.2	12	-67

MODEL CALIBRATIONS

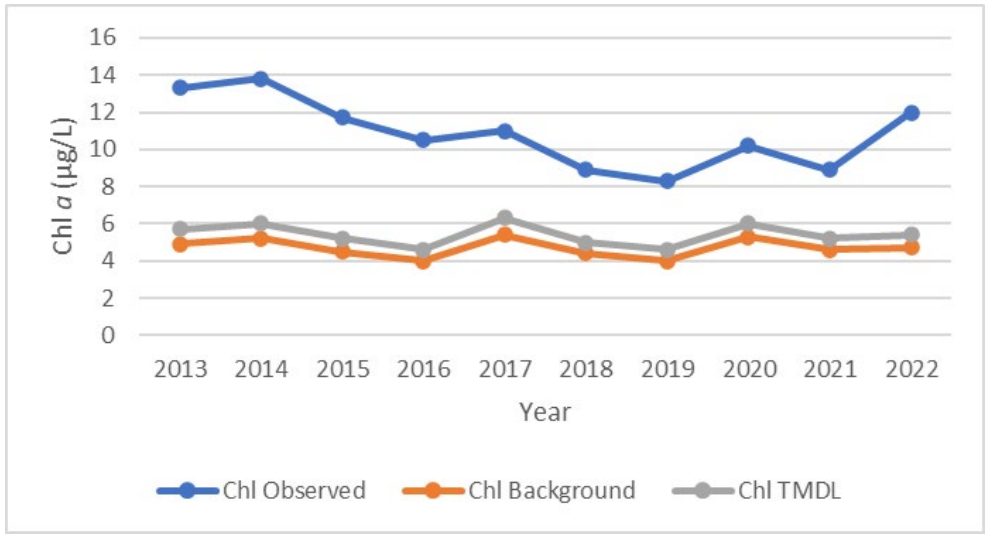
Year	Predicted TP (mg./L.)	Observed TP (mg./L.)	Percent Difference	Predicted TN (mg./L.)	Observed TN (mg./L.)	Percent Difference
2013	0.031	0.038	19	0.6	0.863	30
2014	0.032	0.035	8	0.6074	0.708	14
2015	0.030	0.023	32	0.5942	0.628	5
2016	0.032	0.026	25	0.6081	0.589	3
2017	0.030	0.027	10	0.6151	0.539	14
2018	0.032	0.027	18	0.6327	0.607	4
2019	0.028	0.021	33	0.5965	0.572	4
2020	0.031	0.028	13	0.6264	0.666	6
2021	0.027	0.025	9	0.5941	0.5657	5
2022	0.033	0.018	89	0.6471	0.3275	98

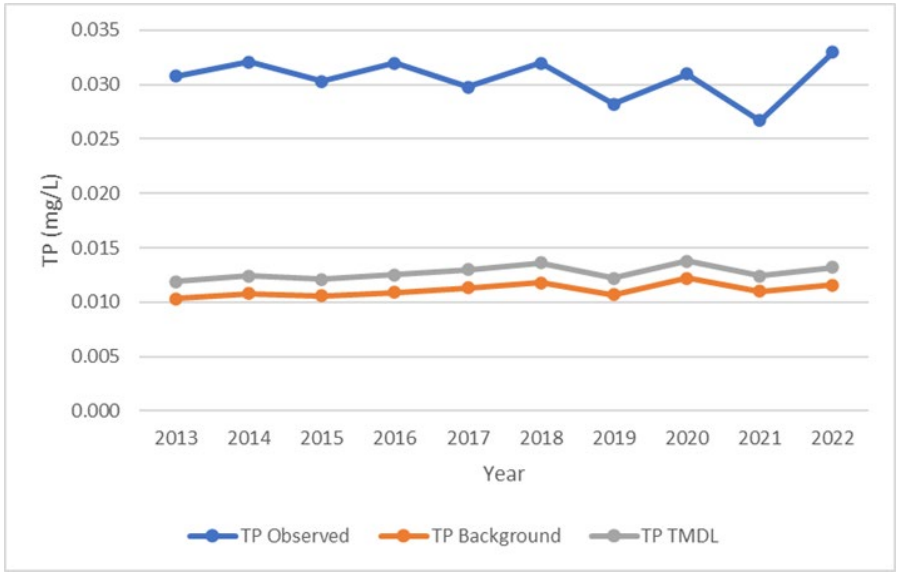
BACKGROUND SCENARIO MODEL

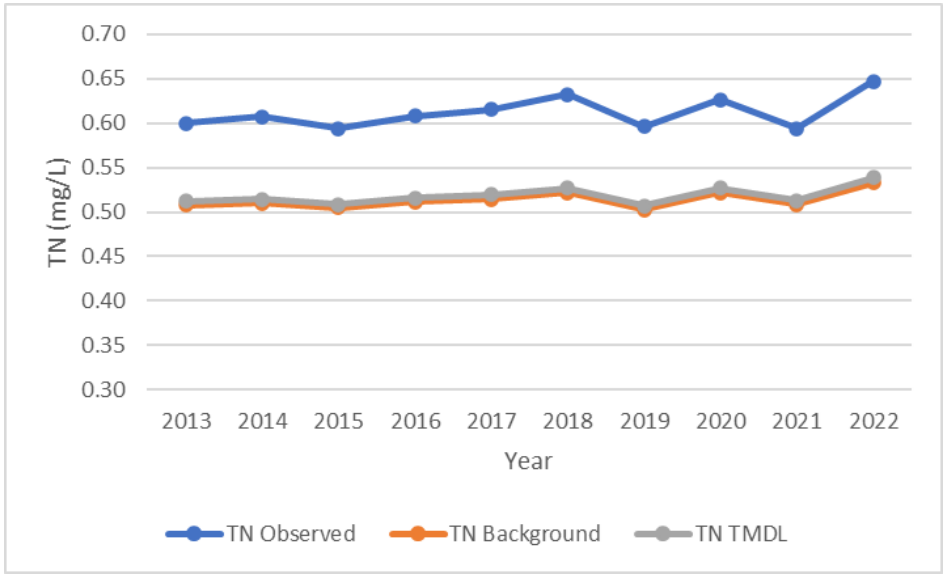
- In the PLSM spreadsheets:
  - Anthropogenic land uses were converted to upland forest.
  - Loads were recalculated with new EMCs/ROCs.

- In Bathtub model:
  - Background nutrient concentrations replaced existing.
  - The OSTDS load was removed.

EXISTING, BACKGROUND AND TMDL MODEL RESULTS







TARGET SETTING AND TMDL SIMULATION

- Target Setting:
  - Chl *a*: 6 µg./L., not being changed from applicable NNC
  - TN and TP: The concentrations that meet the Chl *a* target in the TMDL simulation.
- TMDL Simulation:
  - TP was reduced 76% from the existing surface water runoff.
  - TN was reduced 21% from the existing surface water runoff and OSTDS load.
- Targets Based on 90% Reduction in Anthropogenic Nutrients:
  - TP: 0.014 mg./L.
  - TN: 0.53 mg./L.
  - Chl *a*: 6 µg./L.
    - Not to be exceeded more than once in three years.

TARGET SETTING AND TMDL SIMULATION

Year	Modeled Existing Condition TN Loads (kg./yr.)	7-Year Rolling Average TN Loads (kg./yr.)	Modeled TMDL Condition TN Loads (kg./yr.)	7-Year Rolling Average TN Loads (kg./yr.)	Modeled Existing Condition TP Loads (kg./yr.)	7-Year Rolling Average TP Loads (kg./yr.)	Modeled TMDL Condition TP Loads (kg./yr.)	7-Year Rolling Average TP Loads (kg./yr.)
2013	1818		1457		171		40	
2014	1911		1516		187		43	
2015	1782		1434		166		40	
2016	1893		1505		185		43	
2017	1970		1555		199		47	
2018	2173		1685		234		53	
2019	1847	1,913	1473	1,518	178	188	42	44
2020	2054	1,947	1612	1,540	214	195	52	46
2021	1717	1,919	1396	1,523	156	190	40	45
2022	2243	1,985	1735	1,566	245	202	57	48
Maximum 7-Year Average		**1,985**		**1,566**		**202**		**48**
% Reduction			**21.1**				**76.3**	

TMDL PERCENT REDUCTIONS

[maximum existing load – maximum target load] X 100

• maximum existing load

$$\text{TN Reduction} = \frac{(1{,}985 - 1{,}566)}{1{,}985} * 100 = 21\%$$

$$\text{TP Reduction} = \frac{(202 - 48)}{202} * 100 = 76\%$$

EXPRESSION OF THE TMDLS

Waterbody (WBID)	Parameter	TMDL (kg./yr.)	WLA* Wastewater (% reduction)	WLA NPDES** Storm water (% reduction)	LA*** (% reduction)	MOS****
3168Z4	TN	1,566	NA	21	21	Implicit
3168Z4	TP	48	NA	76	76	Implicit

- *WLA is Wasteload allocation for point source discharges.
- **NPDES is the National Pollutant Discharge Elimination System.
- ***LA is the Load Allocation for non-point discharges.
- ****MOS is the margin of safety, implicit due to the use of maximum seven-year average loadings.

STAKEHOLDER INVOLVEMENT

Draft Report:

- https://floridadep.gov/dear/water-quality-evaluation-tmdl/content/draft-tmdls
- Report posted on Aug. 8, 2024.

Requesting Comments on the Report:

- Requesting comments by Oct. 3, 2024.
- Requesting information on local water quality issues and projects that might influence the TMDLs.
  - Assuring that pertinent local information is used in the TMDL development.
  - Establishing contact with key stakeholders who will help us during the restoration process.

Submit Comments to Eric Simpson, Environmental Administrator

- Eric.Simpson@FloridaDEP.gov
- 850-245-8466

TMDL ADOPTION STEPS

- Review comments provided by stakeholders.
- Revise report and rule package that will be submitted to DEP Secretary for consideration.
- Adopt TMDL into state rule in fall 2024, assuming no major revisions.
- Submit to EPA for approval as a site-specific water quality standard and TMDL.

THANK YOU

Eric Simpson
DEAR/Water Quality Evaluation and TMDL Program
Florida Department of Environmental Protection

Contact Information:
850-245-8466
Eric.Simpson@FloridaDEP.gov