Southwest District • Kissimmee River Basin

Draft Report

Nutrient TMDLs for Lake Wales (WBID 1619A) and Documentation in Support of the Development of Site-Specific Numeric Interpretations of the Narrative Nutrient Criterion

Cayla Baughn
Division of Environmental Assessment and Restoration
Florida Department of Environmental Protection

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2600 Blair Stone Road
Mail Station 3000
Tallahassee, FL 32399-2400
https://floridadep.gov

Executive Summary

This report presents the total maximum daily loads (TMDLs) developed to address the nutrient impairment of Lake Wales. Lake Wales is a closed basin lake whose watershed is located in the Kissimmee River Basin in the City of Lake Wales in Polk County, central Florida.

Lake Wales was identified as impaired for nutrients (Assessment Category 5) because the annual geometric means (AGMs) of total nitrogen (TN) and corrected chlorophyll *a* exceeded the applicable numeric nutrient criteria (NNC) for Florida lakes, as established in Subparagraph 62-302.531[2][b]1., Florida Administrative Code (F.A.C.). Lake Wales was added to the 303(d) list by Secretarial Order in June 2017 as the segment with waterbody identification (WBID) number 1619A. TMDLs for TN, TP, and corrected chlorophyll *a* have been developed, and **Table EX-1** lists supporting information for the TMDLs.

The TMDLs were developed in accordance with Section 303(d) of the federal Clean Water Act and guidance developed by the U.S. Environmental Protection Agency. Pursuant to Paragraph 62-302.531(2)(a), F.A.C., the TMDLs will constitute the site-specific numeric interpretations of the narrative nutrient criterion set forth in Paragraph 62-302.530(48)(b), F.A.C., that will replace the otherwise applicable NNC in Subsection 62-302.531(2), F.A.C.

Table EX-1. Summary of TMDL supporting information for Lake Wales

Type of Information	Description
Waterbody name/ WBID number	Lake Wales/WBID 1619A
Hydrologic Unit Code (HUC) 8	03090101
Use classification/ Waterbody designation	Class III Freshwater
Targeted beneficial uses	Fish consumption, recreation, and propagation and maintenance of a healthy, well-balanced population of fish and wildlife.
303(d) listing status	Verified List of Impaired Waters for the Group 4 basins adopted via Secretarial Order dated June 2017
TMDL pollutants	TN
TMDLs and site-specific interpretations of the narrative nutrient criterion	**Lake Wales (WBID 1619A)** **Chlorophyll *a*:** 20 micrograms per liter (µg/L), expressed as an AGM concentration not to be exceeded more than once in any consecutive 3-year period **TN:** 0.98 milligrams per liter (mg/L), expressed as an AGM not to be exceeded **TP:** 0.03 mg/L, expressed as an AGM concentration not to be exceeded more than once in any consecutive 3-year period
Load reductions required to meet the TMDLs	A 40 % TN reduction and a 0% TP reduction to achieve a chlorophyll *a* target of 20 µg/L

Acknowledgments

This analysis was accomplished thanks to significant contributions from staff in the Florida Department of Environmental Protection (DEP) Division of Environmental Assessment and Restoration, specifically the Office of Watershed Services, Watershed Assessment Section, Standards Development Section, Water Quality Restoration Program, and Watershed Evaluation and TMDL Section. Polk County Parks and Natural Resources Division, Southwest Florida Watershed Management District, and City of Lake Wales Utilities staff also provided valuable insight that informed the development of these TMDLs, including information related to the cultural history, hydrologic nature, and ongoing remediation activities at Lake Wales.

For additional information regarding the development of this report, please contact the Division of Environmental Assessment and Restoration office at:

2600 Blair Stone Road
Mail Station 3000
Tallahassee, FL 32399-2400
Phone: (850) 245–8668

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List of Acronyms and Abbreviations

µg/L	Micrograms Per Liter
AGM	Annual Geometric Mean
BMAP	Basin Management Action Plan
BMPs	Best Management Practices
$CaCO_3$	Calcium Carbonate
CWA	Clean Water Act
°F.	Degrees Fahrenheit
DEP	Florida Department of Environmental Protection
EPA	U.S. Environmental Protection Agency
F.A.C.	Florida Administrative Code
FDOT	Florida Department of Transportation
FL	Florida
FLUCCS	Florida Land Use, Cover, and Forms Classification System
F.S.	Florida Statutes
FWRA	Florida Watershed Restoration Act
FWS	U.S. Fish and Wildlife Service
GIS	Geographic Information System
HUC	Hydrologic Unit Code
IWR	Impaired Surface Waters Rule
LA	Load Allocation
MFL	Minimum Flow and Level
mi^2	Square Miles
mg/L	Milligrams Per Liter
MOS	Margin of Safety
MS4	Municipal Separate Storm Sewer System
NA	Not Applicable
NNC	Numeric Nutrient Criteria
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
OSTDS	Onsite Sewage Treatment and Disposal System
PCU	Platinum Cobalt Unit
PLRG	Pollutant Load Reduction Goal
POR	Period of Record
SWFWMD	Southwest Florida Water Management District
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TP	Total Phosphorus
U.S.	United States

WBID	Waterbody Identification
WLA	Wasteload Allocation
WQS	Water Quality Standards

Chapter 1: Introduction

1.1 Purpose of Report

This report presents the total maximum daily loads (TMDLs) developed to address the nutrient impairment of Lake Wales, located in the Kissimmee River Basin. The TMDLs will also constitute the site-specific numeric interpretations of the narrative nutrient criterion set forth in Paragraph 62-302.530(48)(b), Florida Administrative Code (F.A.C.), that will replace the otherwise applicable numeric nutrient criteria (NNC) in Subsection 62-302.531(2), F.A.C., for this particular waterbody, pursuant to Paragraph 62-302.531(2)(a), F.A.C. The waterbody was verified as impaired for nutrients using the methodology in the Identification of Impaired Surface Waters Rule (IWR) (Chapter 62-303, F.A.C.), and was included on the Verified List of Impaired Waters for the Kissimmee River Basin that was adopted by Secretarial Order in June 2017.

The TMDL process quantifies the amount of a pollutant that can be assimilated in a waterbody, identifies the sources of the pollutant, and provides water quality targets needed to achieve compliance with applicable water quality criteria based on the relationship between pollutant sources and water quality in the receiving waterbody. The TMDLs establish the allowable loading to Lake Wales that would restore the waterbody so that it meets its applicable water quality criteria for nutrients.

1.2 Identification of Waterbody

For assessment purposes, the Florida Department of Environmental Protection (DEP) divided the Kissimmee River Basin (Hydrologic Unit Code [HUC] 8 – 03090101) into watershed assessment polygons with a unique **w**ater**b**ody **id**entification (WBID) number for each watershed or surface water segment. Lake Wales is WBID 1619A. **Figure 1.1** shows the location of the WBID in the basin and major geopolitical and hydrologic features in the region, and **Figure 1.2** contains a more detailed map of the WBID.

Lake Wales is a closed basin lake located in a 727-acre (or 1.14-square-mile [mi^2]) watershed located entirely within the City of Lake Wales in Polk County. The watershed does not contain any other major water features. Nearby Crystal Lake was historically known to overflow into Lake Wales, but these occurrences are now exceedingly rare. It is presumed that groundwater fluxes to and from the surficial aquifer are minimal. Lake Wales is characterized by an average depth of 10 feet and a surface area of 263 acres, or 0.4 mi^2.

Figure 1.1. Location of Lake Wales (WBID 1619A) in the Kissimmee River Basin and major hydrologic and geopolitical features in the area

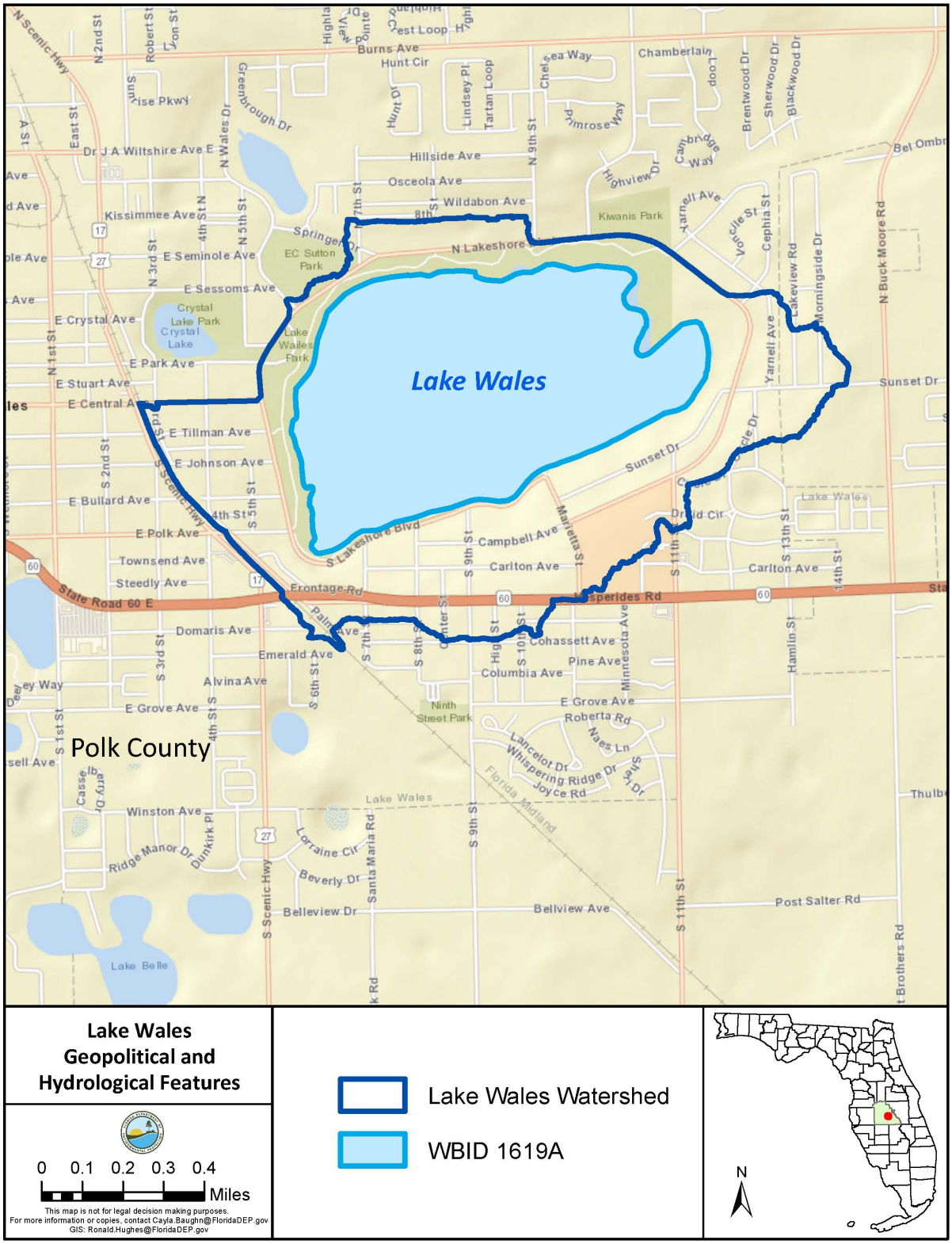

Figure 1.2. Lake Wales (WBID 1619A) Watershed

1.3 Watershed Information

1.3.1 Population and Geopolitical Setting

Lake Wales is known locally as "Lake Wailes." It is rumored that the City of Lake Wales was originally named Lake Wailes as well, but the name was later changed to "Wales" to dispel the unintended reference to sorrow and "wailing" (H. Zarbock, January 14, 2020, personal communication). Lake Wales was given the name "Lake Wailes" in 1879 by government surveyor Sidney Irving Wailes but has since come to be known in federal and state official documents and maps as "Lake Wales" (Spann 2007). To remain consistent with existing state and federal records, the lake is referred to as "Lake Wales" throughout this document; however, this is not the name espoused by local residents.

The Lake Wales Watershed covers an area of 727 acres, or 1.14 mi^2. The watershed and the lake itself are both located entirely within the City of Lake Wales in Polk County. As of July 2018, the population of the City of Lake Wales was 16,577, and was 708,009 for Polk County (U.S. Census Bureau 2018a; 2018b).

The Lake Wales Watershed is intersected by only one major east-west roadway: State Highway 60. The watershed is dominated by a medium-density residential area but also includes some urban regions; wetlands; minor agriculture; and some areas used for transportation, communication, and utilities. **Chapter 4** contains detailed summaries of land uses in the watershed.

1.3.2 Topography

Lake Wales is positioned on the western edge of the Iron Mountains region, oriented perpendicular to the Lake Wales Ridge in Florida's Central Lake Physiographic Region. Brooks (1981) characterized the Central Lake District as sandhill karst interspersed with solution basins that contributes a considerable recharge volume to the Floridan aquifer. The Lake Wales Ridge, upon the western edge of which Lake Wales is perched, is a subsection of the Central Lake District and is the topographic apex of central Florida. It comprises paleo sand dune fields, relict beach ridges, and residual sandhills. The Iron Mountains, located in the Lake Wales Ridge, are characterized by sandhills underlain by sand, gravel, and clayey sand that rise to a maximum elevation of 295 feet (Brooks 1981).

Citrus groves have largely replaced the native vegetation of longleaf pine–turkey oak (and the live oak, palmetto, cordgrass, and prickly-pear cactus of the uplands) in this region (Brooks 1981; Southwest Florida Water Management District [SWFWMD] 2015). The City of Lake Wales in particular has become increasingly urban, and regional groundwater pumping has lowered the water table to 7 feet below Lake Wales. Groundwater withdrawals are primarily for agriculture (e.g., citrus), industry (e.g., sand mine), and public water supply within 5 miles of the lake between 2008 and 2012 (SWFWMD 2015).

1.3.3 Hydrogeological Setting

Three additional sinkhole lakes are located in close proximity to Lake Wales: North Lake Wailes, Lake Alta, and Crystal Lake. Lake Wales was historically connected to nearby Crystal Lake to the west but is now a closed basin sinkhole lake that does not receive significant recharge from any surficial or groundwater sources. Lake Wales would only become continuous with nearby Crystal Lake and North Lake Wailes during rare flooding events (Lake Alta may be more aptly described as a small sinkhole that is very unlikely to become connected to Lake Wales). However, several stormwater systems (28 stormwater outfalls) do drain directly into the lake, and an estimated 17 % of the watershed comprises impervious surfaces that are directly adjacent to Lake Wales (SWFWMD 2015). A 30-inch pipe between Lake Wales and North Lake Wailes helps to mitigate extreme flooding events (N. Hernandez, January 13, 2020, personal communication; H. Zarbock, January 14, 2020, personal communication).

The Lake Wales Watershed contains Hydrologic Soil Groups A, A/D, and B. These groups are based on the National Cooperative Soil Survey soil geographic data and associated Florida Soil Survey Geographic Database geographic information system (GIS) spatial coverage. Group A soils are typically well-drained, have deep water tables, and consist of sandy textured soils with relatively low runoff potential. Group B soils are typically loamy with a silt component, moderately coarse texture, and a lower infiltration rate than Group A soils. They are therefore classed as moderately well-drained. Group D soils are variable in texture but generally have a greater clay component and are often found at lower topography with higher water tables that generate a higher hydrologic runoff response. Group A/D soil behaves like a Group A soil when unsaturated and like a Group D soil when saturated.

Table 1.1 lists the soil hydrologic groups and their corresponding acreages in the Lake Wales Watershed. Based on the soil characteristics shown in **Figure 1.3**, soils in the watershed are mostly well drained. The hydrologic characteristics of soil can significantly influence the capability of a watershed to hold rainfall or produce surface runoff.

Table 1.1. Soil type acreage in the Lake Wales Watershed

Hybrid soil type is A/D.

Hydrologic Group	Acres	%
Not Applicable	254.36	34.99
A	399.18	54.90
A/D	47.42	6.52
B	26.09	3.59
Total	727.04	100.00

The climate of the watershed area is subtropical, characterized by an average annual temperature (measured in nearby Lakeland) of 74 °F. Average monthly temperatures range from 61.9 °F. in January to 83.6 °F in August (Florida Climate Center 2010). Annual rainfall in this portion of the Kissimmee River Basin averaged 53.8 inches from 2005 to 2016, based on data derived from the National Weather Service Mountain Lake station (National Oceanic and Atmospheric Administration [NOAA] 2020).

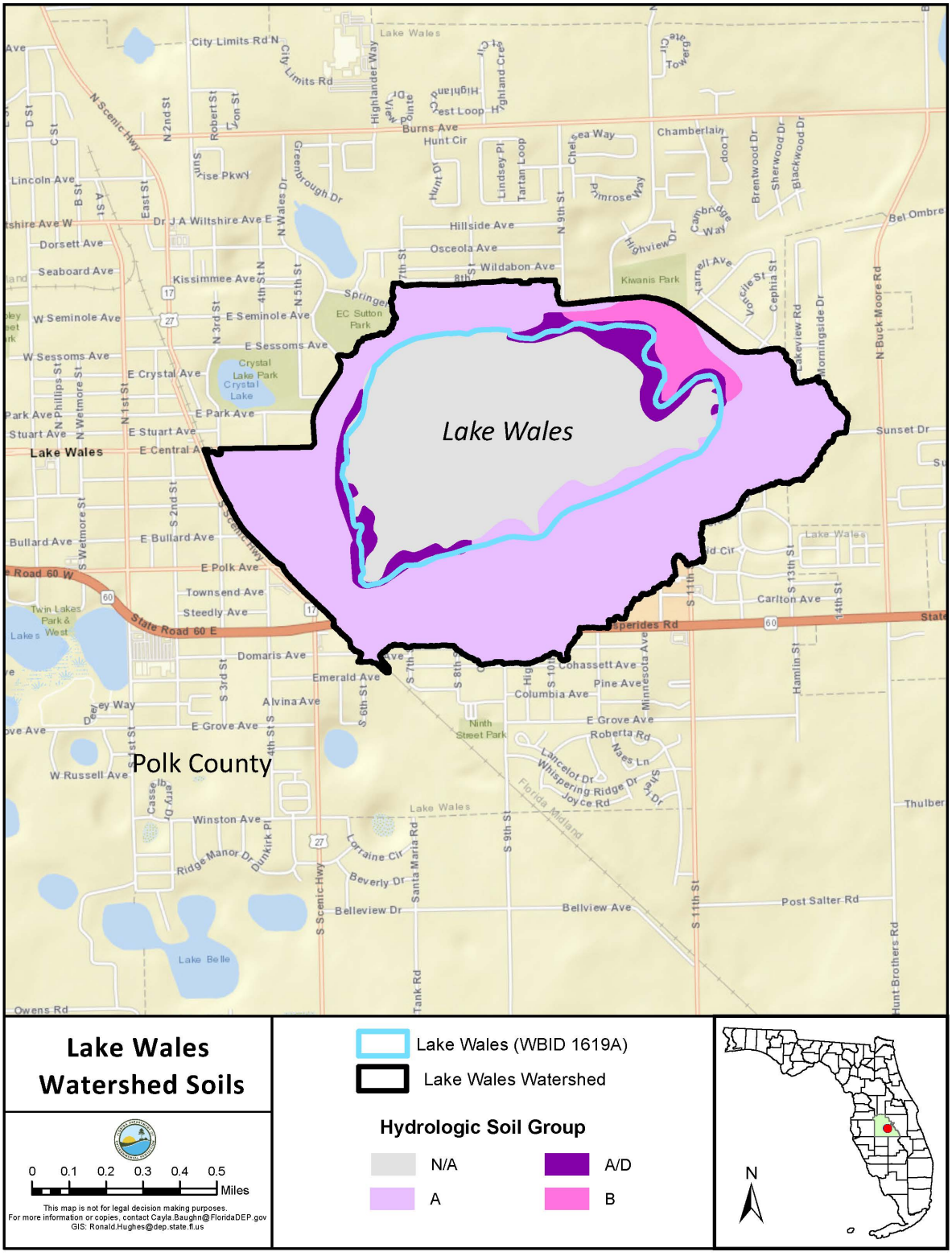

Figure 1.3. Hydrologic soil groups in the Lake Wales Watershed

Chapter 2: Water Quality Assessment and Identification of Pollutants of Concern

2.1 Statutory Requirements and Rulemaking History

Section 303(d) of the federal Clean Water Act (CWA) requires states to submit to the U.S. Environmental Protection Agency (EPA) lists of surface waters that do not meet applicable water quality standards (impaired waters) and establish TMDLs for each pollutant causing the impairment of listed waters on a schedule. DEP has developed such lists, commonly referred to as 303(d) lists, since 1992.

The Florida Watershed Restoration Act (FWRA) (Section 403.067, Florida Statutes [F.S.]) directed DEP to develop, and adopt by rule, a science-based methodology to identify impaired waters. The Environmental Regulation Commission adopted the methodology as Chapter 62-303, F.A.C. (the IWR), in 2001. The rule was amended in 2006, 2007, 2012, 2013, and 2016.

The list of impaired waters in each basin, referred to as the Verified List, is also required by the FWRA (Subsection 403.067[4], F.S.). The state's 303(d) List is amended annually to include basin updates.

2.2 Classification of the Waterbody and Applicable Water Quality Standards

Lake Wales is classified as a Class III (fresh) waterbody, with a designated use of fish consumption; recreation; and propagation and maintenance of a healthy, well-balanced population of fish and wildlife. The Class III water quality criterion applicable to the verified impairment (nutrients) for this waterbody is Florida's nutrient criterion in Paragraph 62-302.530(48)(b), F.A.C. Florida adopted NNC for lakes, spring vents, and streams in 2011. These were approved by the EPA in 2012 and became effective in 2014.

The applicable lake NNC are dependent on alkalinity, measured in milligrams per liter as calcium carbonate (mg/L $CaCO_3$) and true color (color), measured in platinum cobalt units (PCU), based on long-term period of record (POR) geometric means (**Table 2.2**). The long-term average of geometric means for color in Lake Wales was 11 PCU. The long-term average of geometric means for alkalinity in Lake Wales was 37 mg/L $CaCO_3$. The geometric means were calculated based on the results in the IWR Run 58 Database. Using this methodology, Lake Wales is classified as a low-color (≤ 40 PCU), high-alkalinity (> 20 mg/L $CaCO_3$) lake, as displayed in **Table 2.1**.

Table 2.1. Lake Wales POR long-term geometric means for color and alkalinity

Parameter	Long-Term Geometric Mean	Number of Samples
Color (PCU)	11	96
Alkalinity (mg/L $CaCO_3$)	37	43

The chlorophyll *a* NNC for low-color, high-alkalinity lakes is an annual geometric mean (AGM) value of 20 micrograms per liter (µg/L), not to be exceeded more than once in any 3-year period. The associated total nitrogen (TN) and total phosphorus (TP) criteria for a lake can vary annually, depending on the availability of data for chlorophyll *a* and the concentrations of chlorophyll *a* in the lake.

If there are sufficient data to calculate an AGM for chlorophyll *a* and the mean does not exceed the chlorophyll *a* criterion for the lake type in **Table 2.2**, then the TN and TP numeric interpretations for the calendar year are the AGMs for lake TN and TP samples, subject to minimum and maximum limits. If there are insufficient data to calculate the AGM for chlorophyll *a* for a given year, or the AGM for chlorophyll *a* exceeds the values in the table for the lake type, then the applicable nutrient interpretations for TN and TP are the minimum values. These values are listed in **Table 2.2**, as specified in Subparagraph 62-302.531(2)(b)1., F.A.C.

Table 2.2. Chlorophyll *a*, TN, and TP criteria for Florida lakes (Subparagraph 62-302.531[2][b]1., F.A.C.)

*For lakes with color > 40 PCU in the West Central Nutrient Watershed Region, the maximum TP limit is the 0.49 mg/L TP streams threshold for the region.

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

2.3 Determination of the Pollutant of Concern

2.3.1 Data Providers

The majority of the Lake Wales verified period nutrient data were produced through analysis of samples collected by the Polk County Parks and Natural Resources Division at the 21FLPOLKWAILES1 station. Thirty-three samples were collected and analyzed for both TN

and chlorophyll *a* from the station near the center of Lake Wales during the verified period from 2009 to 2016. Two additional samples were collected during the verified period, including one sample collected by DEP's Central District at Station 21FLCEN G4CE0110 and one sample collected by DEP's Southwest District at Station 21FLTPA 27541188134189. **Figure 2.1** shows the sampling locations in the Lake Wales Watershed used to assess Lake Wales during the verified period, as well as an additional sampling location (Station 21FLSWFD25351) from which a sample was collected that was used to inform the TMDL analysis in **Chapter 5**. The individual water quality measurements discussed in this report are available in the IWR Run 58 Database and are available on request.

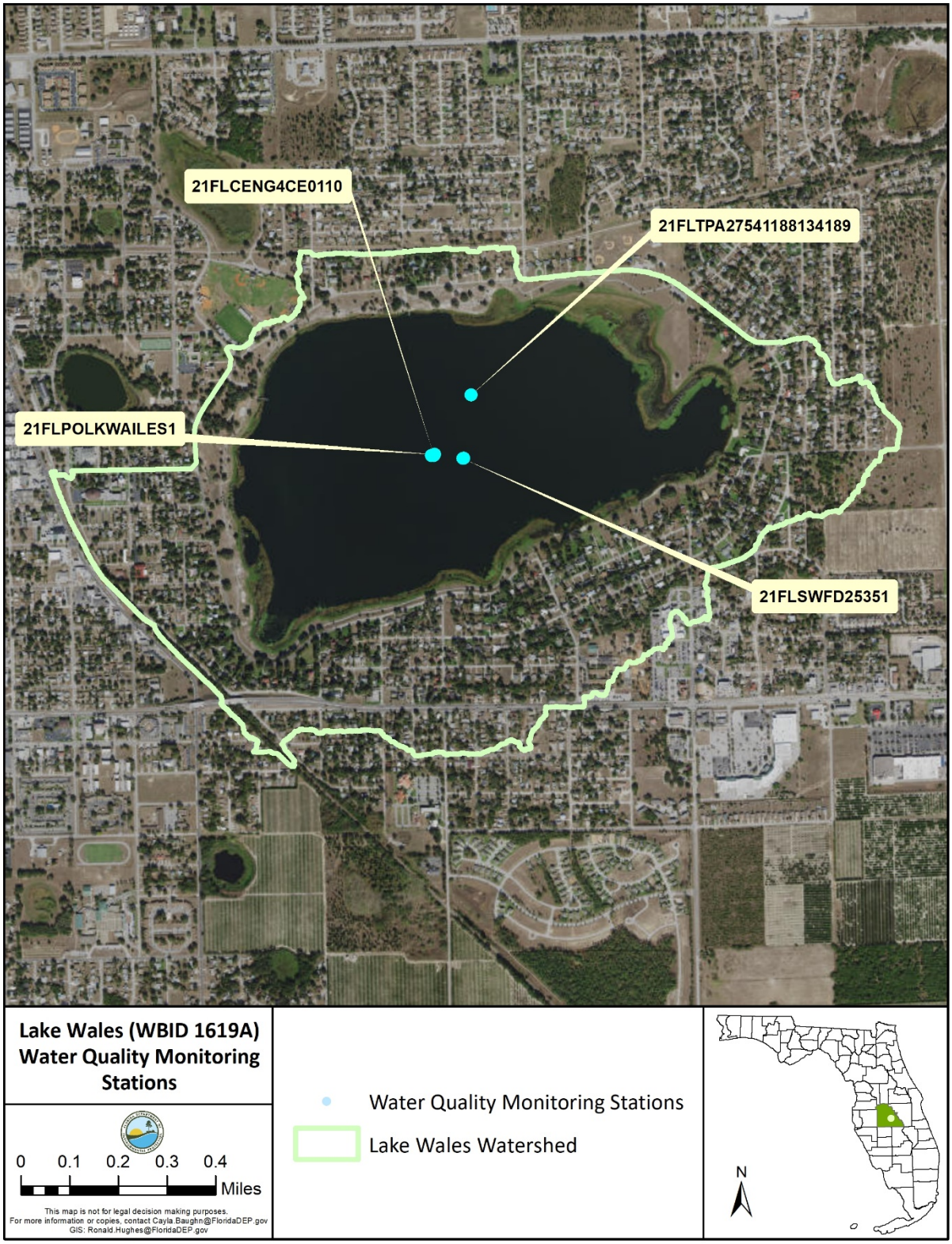

Figure 2.1. Monitoring stations in the Lake Wales Watershed

2.3.2 Information on Verified Impairment

During the Group 4, Cycle 3 assessment, the NNC were used to assess Lake Wales during the verified period (January 1, 2009–June 30, 2016) using IWR Run 53. Lake Wales was assessed as verified impaired (Category 5) for chlorophyll *a* and TN because the AGMs exceeded the NNC more than once in a three-year period. Lake Wales was assessed as not impaired for TP based on the generally applicable criteria. **Table 2.3** lists the Lake Wales AGM values.

Table 2.3. Lake Wales AGM values for the 2009–16 verified period

Note: Values emphasized with yellow shading and boldface type are greater than the NNC of 20 µg/L chlorophyll *a* and the NNC of 1.05 µg/L TN. Rule 62-302.531, F.A.C., states that the applicable numeric interpretations for TN and chlorophyll a shall not be exceeded more than once in any consecutive three-year period.

Year	TN (mg/L)	Corrected Chlorophyll *a* (µg/L)
2009	**1.18**	**35**
2010	**1.50**	**35**
2011	**1.64**	**48**
2012	**1.60**	**44**
2013	**1.46**	**30**
2014	1.03	**21**
2015	**1.35**	**25**
2016	1.02	18

Chapter 3: Site-Specific Numeric Interpretation of the Narrative Nutrient Criterion

3.1 Establishing the Site-Specific Interpretation

The nutrient TMDLs presented in this report, upon adoption into Chapter 62-304.515, F.A.C., will constitute the site-specific numeric interpretations of the narrative nutrient criterion set forth in Paragraph 62-302.530(48)(b), F.A.C., that will replace the otherwise applicable NNC in Subsection 62-302.531(2), F.A.C., for this particular waterbody, pursuant to Paragraph 62-302.531(2)(a), F.A.C. **Table 3.1** lists the elements of the nutrient TMDLs that constitute the site-specific numeric interpretations of the narrative nutrient criterion. **Appendix B** summarizes the relevant details to support the determination that the TMDLs provide for the protection of Lake Wales and for the attainment and maintenance of water quality standards in downstream waters (pursuant to Subsection 62-302.531[4], F.A.C.), and to support using the nutrient TMDLs as the site-specific numeric interpretations of the narrative nutrient criterion.

Table 3.1. Site-specific interpretations of the narrative nutrient criterion

Note: Frequency refers to the interval when a parameter is not to be exceeded. Chlorophyll *a* and TP shall not be exceeded more than once in any consecutive three-year period. TN is never to be exceeded.

Waterbody/ WBID	AGM Chlorophyll *a* (µg/L)	Chlorophyll *a* Frequency	AGM TN (mg/L)	TN Frequency	AGM TP (mg/L)	TP Frequency
Lake Wales (1619A)	20	Once in 3-year period	0.98	No exceedance	0.03	Once in 3-year period

When developing TMDLs to address nutrient impairment, it is essential to address those nutrients that typically contribute to excessive plant growth. In Florida waterbodies, nitrogen and phosphorus are most often the limiting nutrients. The limiting nutrient is defined as the nutrient(s) that limit plant growth (both macrophytes and algae) when it is not available in sufficient quantities. A limiting nutrient is a chemical that is necessary for plant growth, but available in quantities smaller than those needed for algae, represented by chlorophyll *a*, and macrophytes to grow.

In the past, management activities to control lake eutrophication focused on phosphorus reduction, as phosphorus was generally recognized as the limiting nutrient in freshwater systems. Recent studies, however, have supported the reduction of both nitrogen and phosphorus is necessary to control algal growth in aquatic systems (Conley et al. 2009; Paerl 2009; Lewis et al. 2011; Paerl and Otten 2013). Furthermore, the analysis used in the development of the Florida lake NNC supports this idea, as statistically significant relationships were found between chlorophyll *a* values and both nitrogen and phosphorus concentrations (DEP 2012).

3.2 Site-Specific Response Variable Target Selection

The generally applicable chlorophyll *a* criteria (or NNC) for lakes were established by taking into consideration an analysis of lake chlorophyll *a* concentrations statewide, comparisons with a smaller population of select reference lakes, paleolimnological studies, expert opinions, user perceptions, and biological responses. Additionally, color and alkalinity were used as morphoedaphic factors to predict the natural trophic status of lakes (DEP 2012). Based on these resources, DEP concluded that an annual average chlorophyll *a* concentration of 20 µg/L in low-color (≤ 40 PCU), high-alkalinity (≥ 20 mg/L $CaCO_3$) lakes is protective of lake designated uses and maintains the health of a balanced community of aquatic flora and fauna.

The generally applicable chlorophyll *a* criteria are assumed to be protective of individual Florida lakes, absent information that shows either (1) more sensitive aquatic life use (i.e., a more responsive floral community), or (2) a significant historical change in trophic status (i.e., significant increasing trend in color and/or alkalinity). Long-term datasets of color, alkalinity, and nutrient concentrations in Lake Wales suggest that the lake does not differ from the population of lakes used in the development of the NNC and, therefore, DEP has determined that the generally applicable NNC for low-color, high alkalinity-lakes are the most appropriate site-specific chlorophyll *a* criteria for Lake Wales (and will remain the applicable water quality criteria).

The TP water quality target for Lake Wales was derived using the pre-disturbance inferred water quality from paleolimnological study results measured in Whitmore and Brenner (1995 and 2002, respectively). The studies estimated pre-disturbance average TP levels by applying statistical models based on sedimented diatoms and were calibrated using a large number of Florida lakes (Whitmore 1989; Brenner et al. 1993; Line et al. 1994). The Florida lakes researched in the paleolimnological studies are categorized as low-color, high-alkalinity lakes, located in a lake ecoregion (Trail Ridge/Lake Wales) with similar topography to the lake discussed in the TMDL analysis (Lake Wales). The predicted minimum average TP result from the deepest sediment core depth analyzed (90 centimeters), which equates to pre-disturbance conditions, was 30 µg/L (0.03 mg/L).

The TN concentration identified as the site-specific criterion was in part determined by using a regression approach to achieve the applicable chlorophyll *a* criterion (explained in **Chapter 5**).

3.3 Numeric Expression of the Site-Specific Numeric Interpretation

The TN criterion for Lake Wales was established using the regression approach discussed in detail in **Chapter 5**. This approach relates the lake TN concentration to the AGM chlorophyll *a* levels. The TN criterion is expressed as a maximum AGM concentration not to be exceeded in any year. The frequency of the chlorophyll *a* and TP NNC (20 µg/L and 0.03 mg/L, respectively) is established as not to be exceeded more than once in any consecutive 3-year period, which is

unchanged from the generally applicable criterion and ensures the protection of designated lake uses while accounting for year-to-year variability.

The site-specific numeric interpretation of the narrative nutrient criterion for TN in Lake Wales is 0.98 mg/L (**Table 3.1**), expressed as an AGM lake concentration not to be exceeded in any year.

3.4 Downstream Protection

Lake Wales is a closed basin lake that does not drain into any neighboring waterbodies. Three sinkhole lakes are located in close proximity to Lake Wales but have not been assessed as impaired in regard to any water quality parameter and are not hydrologically continuous with Lake Wales, except during extreme flooding events. It is therefore unnecessary to consider the effects of the Lake Wales nutrient load reductions on downstream waterbodies.

3.5 Endangered Species Consideration

Section 7(a)(2) of the Endangered Species Act requires each federal agency, in consultation with the services (i.e., the U.S. Fish and Wildlife Service [FWS] and NOAA's National Marine Fisheries Service), to ensure that any action authorized, funded, or executed is not likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of designated critical habitat. The EPA must review and approve changes in water quality standards (WQS) such as setting site-specific criteria.

Prior to approving WQS changes for aquatic life criteria, the EPA will prepare an Effect Determination summarizing the direct or indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action. The EPA categorizes potential effect outcomes as either (1) "no effect," (2) "may affect, not likely to adversely affect," or (3) "may affect: likely to adversely affect."

The service(s) must concur on the Effect Determination before the EPA approves a WQS change. A finding and concurrence by the service(s) of "no effect" will allow the EPA to approve an otherwise approvable WQS change. However, findings of either "may affect, not likely to adversely affect" or "may affect, likely to adversely affect" will result in a longer consultation process between the federal agencies and may result in a disapproval or a required modification to the WQS change.

The FWS online Information for Planning and Conservation tool identifies terrestrial species potentially affected by activities in the watershed. DEP is not aware of any aquatic, amphibious, or anadromous endangered species present in the Lake Wales Watershed. Furthermore, it is expected that restoration efforts and subsequent water quality improvements will positively affect aquatic species living in the lake and its watershed.

Chapter 4: Assessment of Sources

4.1 Types of Sources

An important part of the TMDL analysis is the identification of pollutant source categories, source subcategories, or individual sources of the pollutant of concern in the target watershed and the amount of pollutant load contributed by each of these sources. Sources are broadly classified as either point sources or nonpoint sources. Historically, the term "point sources" has meant discharges to surface waters that typically have a continuous flow via a discernable, confined, and discrete conveyance, such as a pipe. Domestic and industrial wastewater treatment facilities (WWTFs) are examples of traditional point sources. In contrast, the term "nonpoint sources" was used to describe intermittent, rainfall-driven, diffuse sources of pollution associated with everyday human activities, including runoff from urban land use types, agriculture, silviculture, and mining; discharges from septic systems; and atmospheric deposition.

However, the 1987 amendments to the CWA redefined certain nonpoint sources of pollution as point sources subject to regulation under the EPA's National Pollutant Discharge Elimination System (NPDES) Program. These nonpoint sources included certain urban stormwater discharges, such as those from local government master drainage systems, construction sites over five acres, and a wide variety of industries (see **Appendix A** for background information on the federal and state stormwater programs).

To be consistent with CWA definitions, the term "point source" is used to describe traditional point sources (such as domestic and industrial wastewater discharges) and stormwater systems requiring an NPDES stormwater permit when allocating pollutant load reductions required by a TMDL (see **Section 6.1** on **Expression and Allocation of the TMDL**). However, the methodologies used to estimate nonpoint source loads do not distinguish between NPDES and non-NPDES stormwater discharges, and as such, this source assessment section does not make any distinction between the two types of stormwater.

4.2 Point Sources

4.2.1 Wastewater Point Sources

No NPDES-permitted wastewater facilities that discharge to Lake Wales were identified through the development of these TMDLs.

4.2.2 Municipal Separate Storm Sewer System (MS4) Permittees

An NPDES MS4 Phase I permit (FLS000015) applies to Polk County and includes 19 individual co-permittees, three of which are located within the Lake Wales Watershed. Of the 19 entities included in permit FLS000015, only the three co-permittees that are located in the Lake Wales Watershed are listed. Also note that while these permittees are located in the watershed, these

permittees do not necessarily have jurisdiction over the entire contributing area for the lake. The Lake Wales Watershed includes three MS4 entities: Polk County, City of Lake Wales, and FDOT District 1. For more information on MS4s in the watershed, send an email to NPDES-stormwater@dep.state.fl.us. **Table 4.1** lists the permittees/co-permittees in the Lake Wales watershed and their MS4 permit numbers.

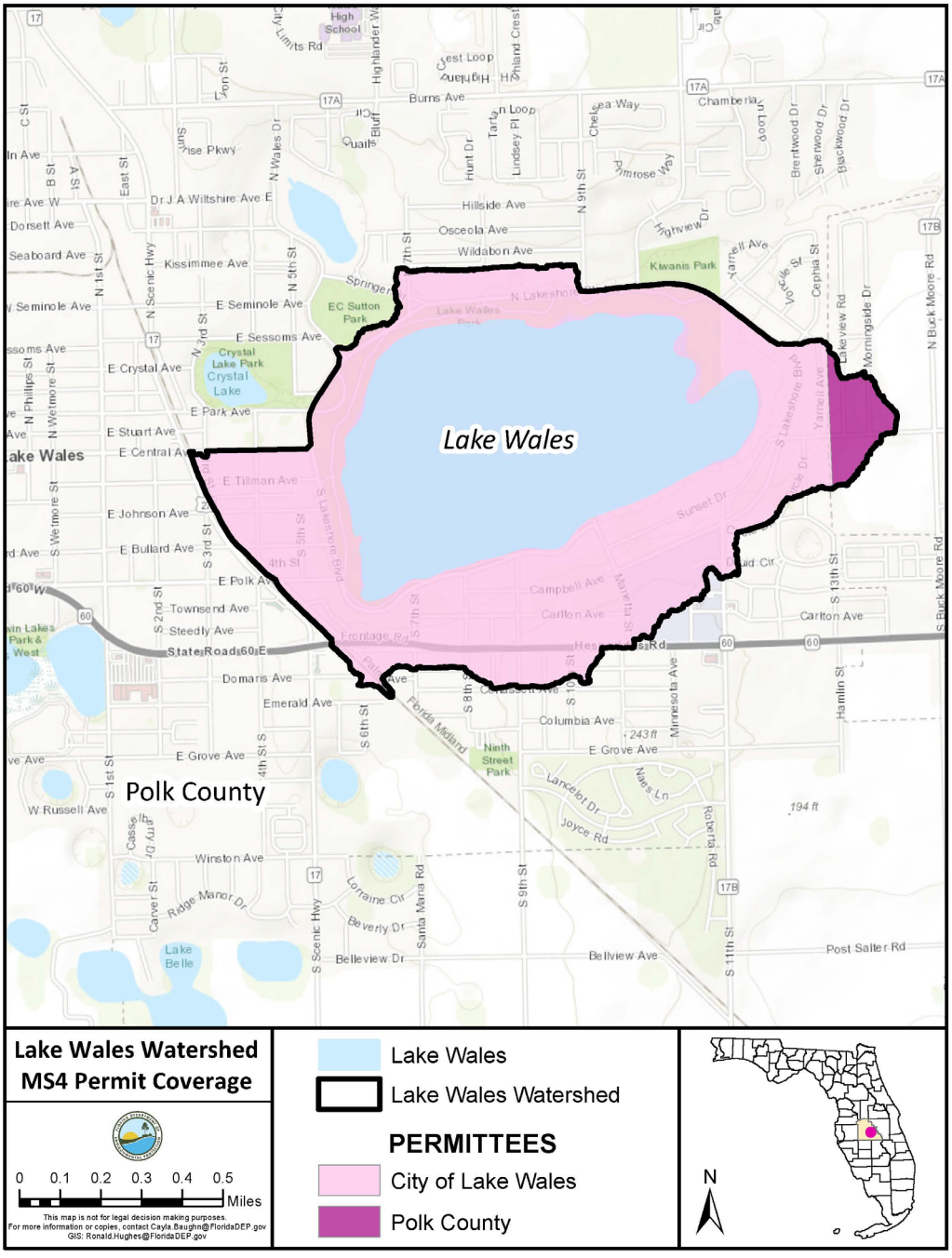

Figure 4.1. Location of MS4 co-permittees in the Lake Wales Watershed

Table 4.1. NPDES MS4 permits with jurisdiction in the Lake Wales Watershed

Watershed	Permit Number	Permittee/Co-Permittees	Phase
Lake Wales	FLS000015	Polk County/ City of Lake Wales/ FDOT District 1	I

4.3 Nonpoint Sources

Pollutant sources that are not NPDES wastewater or stormwater dischargers are generally considered nonpoint sources. Nutrient loadings to Lake Wales are primarily generated from nonpoint sources. Nonpoint sources addressed in this analysis primarily include loadings from surface runoff based on land use type, onsite sewage treatment and disposal systems (OSTDS), groundwater seepage entering the lake, and precipitation directly onto the lake surface (atmospheric deposition).

4.3.1 Land Uses

Land use is one of the most important factors in determining nutrient loadings from the Lake Wales Watershed. Nutrients can be flushed into a receiving water through surface runoff and stormwater conveyance systems during stormwater events. Both human land use areas and natural land areas generate nutrients. However, human land uses typically generate more nutrient loads per unit of land surface area than natural lands can produce. The spatial distribution of land use types in the Lake Wales Watershed was determined based on data from the 2014 SWFWMD Land Use Database's GIS coverage and is displayed in **Figure 4.2**. Land use categories in the Lake Wales Watershed were aggregated using the Florida Land Use Code and Classification System (FLUCCS) (FDOT 1999) expanded Level 2 codes (including Level 2 codes for urban and built-up) and are tabulated in **Table 4.2**.

The total area of the Lake Wales Watershed is 727 acres, including the lake itself, which covers 263 acres and accounts for 36 % of the total watershed area. The greatest anthropogenic land use type in the watershed is medium-density residential, which comprises 296 acres, or 41 % of the watershed. One hundred and one acres of the watershed are classified as urban and built-up and comprise 14 % of the total watershed area. Wetlands; transportation, communication, and utilities; and agriculture constitute the smallest portions of the watershed at 7 % (48 acres), 2 % (12 acres), and 1 % (8 acres) composition by area, respectively.

Table 4.2. 2014 SWFWMD land use in the Lake Wales Watershed

FLUCCs Code	Land Use Classification	Acres	% of Watershed
1100	Medium-density residential	295.5	41
5200	Water	263.1	36
1000	Urban and built-up	100.5	14
6000	Wetlands	48.2	7
8000	Transportation, communication, and utilities	11.7	1
2000	Agriculture	7.9	1
Total		**726.9**	**100**

4.3.2 OSTDS

OSTDS such as septic systems are commonly used where providing central sewer service is not cost-effective or practical. When properly sited, designed, constructed, maintained, and operated, OSTDS are a safe means of disposing of domestic waste. The effluent from a well-functioning OSTDS is comparable to secondarily treated wastewater from a sewage treatment plant. OSTDS can be a source of nutrients (nitrogen and phosphorus), pathogens, and other pollutants to both groundwater and surface water.

The Florida Department of Health maintains a list of septic systems by county, and the Lake Wales Watershed shapefile (provided by J. Patterson, SWFWMD, January 14, 2020, personal communication) was used to determine the number of known and likely septic systems in the watershed. The Lake Wales Watershed contains 361 septic systems. **Figure 4.3** shows the locations of OSTDS in the watershed.

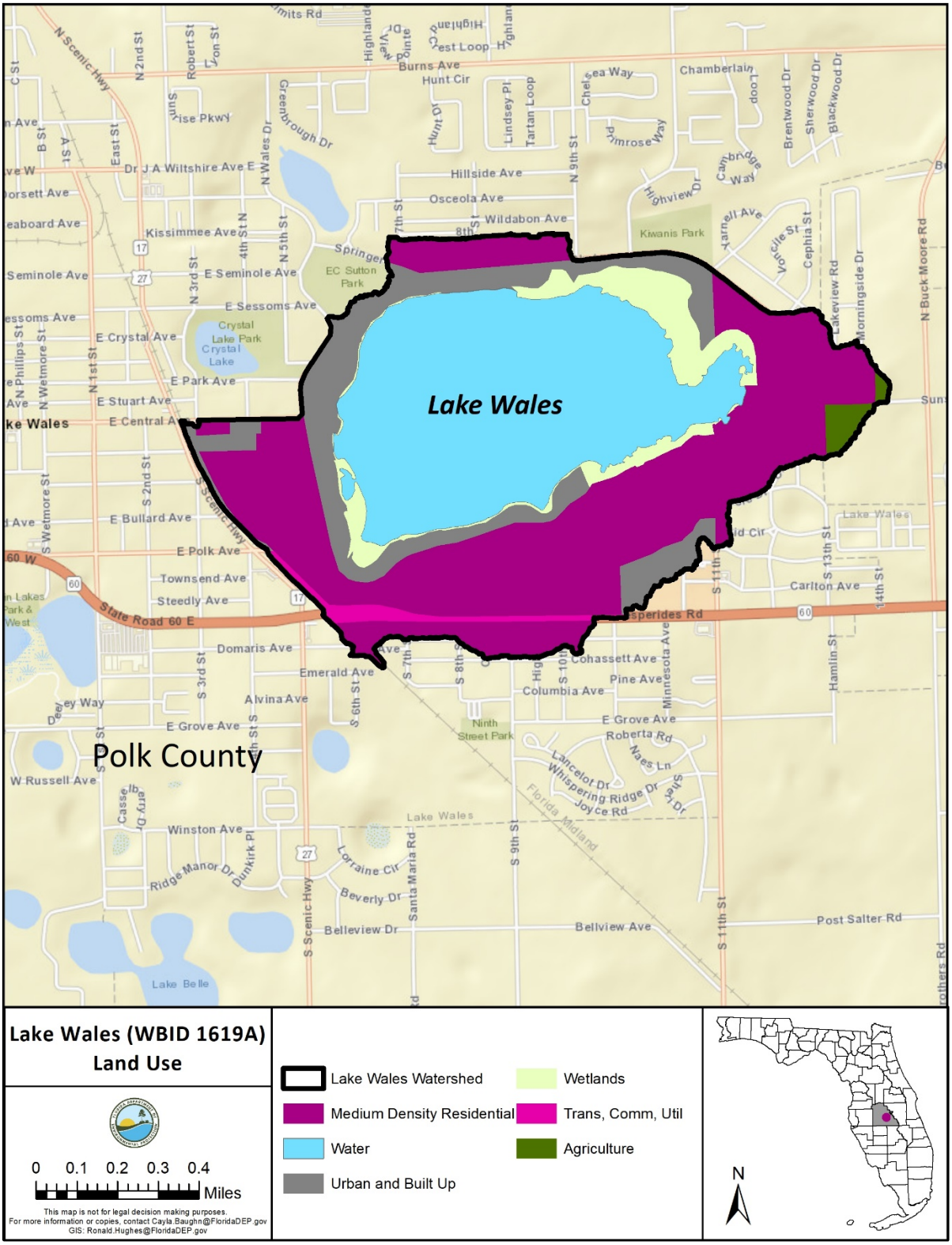

Figure 4.2. Land use in the Lake Wales Watershed in 2014

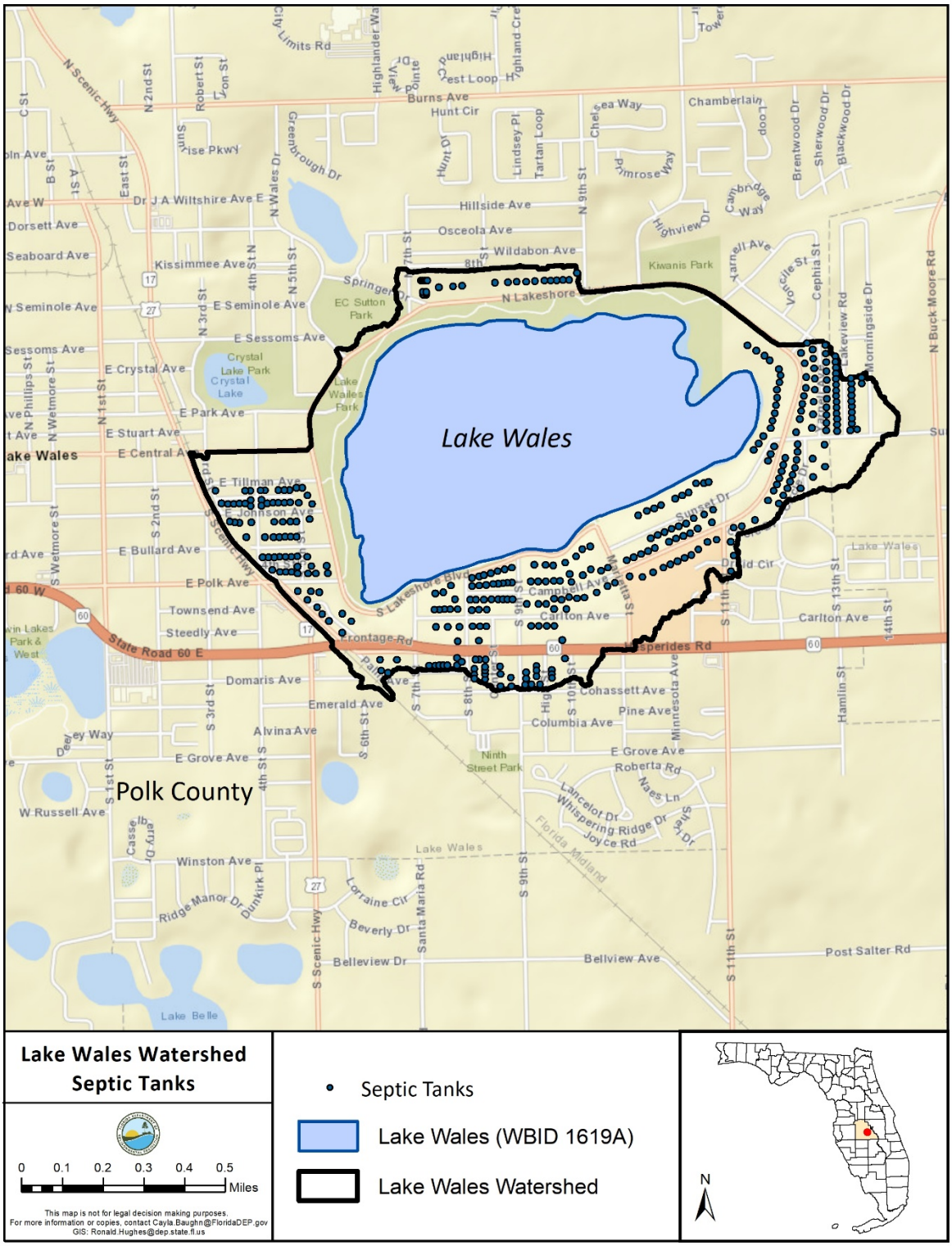

Figure 4.3. OSTDS in the Lake Wales Watershed

Chapter 5: Determination of Assimilative Capacity

5.1 Determination of Loading Capacity

Nutrient enrichment and the resulting problems related to eutrophication tend to be widespread and are frequently manifested far (in both time and space) from their sources. Addressing eutrophication involves relating water quality and biological effects such as photosynthesis, decomposition, and nutrient recycling as acted on by environmental factors (rainfall, point source discharge, etc.) to the timing and magnitude of constituent loads supplied from various categories of pollution sources. Assimilative capacity should be related to some specific hydrometeorological condition during a selected period or to some range of expected variation in these conditions.

The goal of this TMDL analysis is to determine the assimilative capacity of Lake Wales and to identify the maximum allowable TN loadings from the watershed so that Lake Wales will meet the TMDL targets and thus maintain its function and designated use as a Class III water.

5.2 Evaluation of Water Quality Conditions

For the water quality analysis conducted for TMDL development, AGMs were used to be consistent with the expression of the adopted NNC for lakes. For the purpose of this analysis, AGMs were calculated using a minimum of 4 sample results per year, with at least 1 sample collected in the May to September period and at least 1 sample collected from other months. Values with an "I" qualifier code were used as reported. Values with "U" or "T" qualifier codes were changed to the minimum detection limit divided by the square root of 2. Multiple sample results collected on the same day at the same station were averaged. The AGM calculation method for this purpose is somewhat different than the one used to calculate AGMs for performing water quality assessments, following the methodology in Chapter 62-303, F.A.C. Therefore, the AGMs listed in Chapter 2 may not exactly match the AGMs used for TMDL development.

The majority of the Lake Wales nutrient data used in the development of these TMDLs were derived from the analysis of samples collected at the 21FLPOLKWAILES1 station. Sixty-eight samples were collected and analyzed for both TN and corrected chlorophyll *a* from the station near the center of Lake Wales from 2005 to 2016. Three additional samples were collected during this period, including one sample collected by DEP's Central District at Station 21FLCEN G4CE0110, one sample collected by DEP's Tallahassee Laboratory at Station 21FLTPA 27541188134189, and one sample collected by SWFWMD at Station 21FLSWFD25351.

Figure 5.1 displays the 2005–16 Lake Wales chlorophyll *a* AGM values, which vary from 12 to 48 µg/L. **Figure 5.2** displays the 2005–16 Lake Wales TN AGM values, which range from 0.7 to 1.6 mg/L.

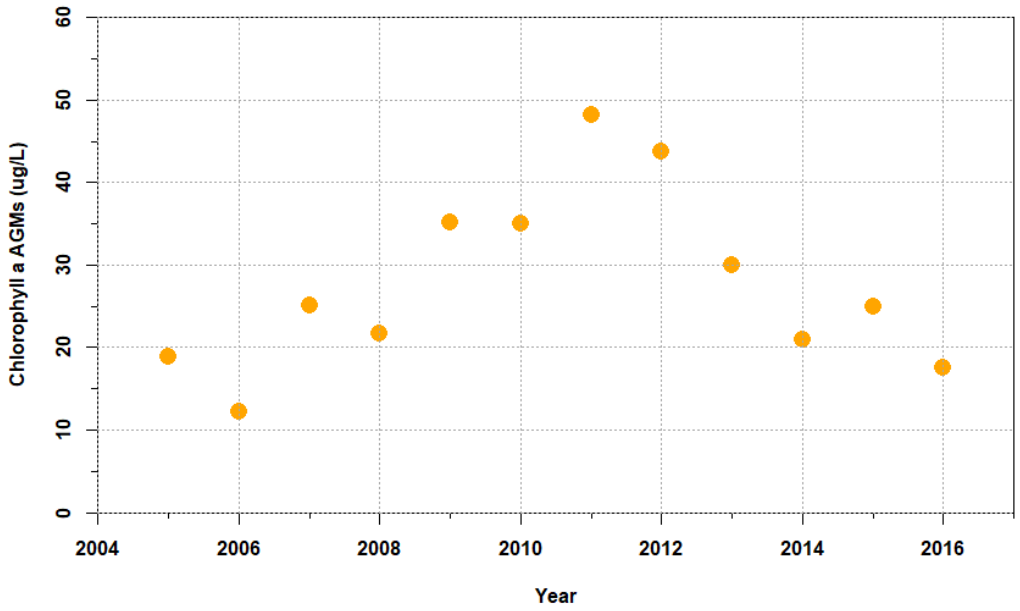

Figure 5.1. Lake Wales chlorophyll *a* AGM values, 2005–16

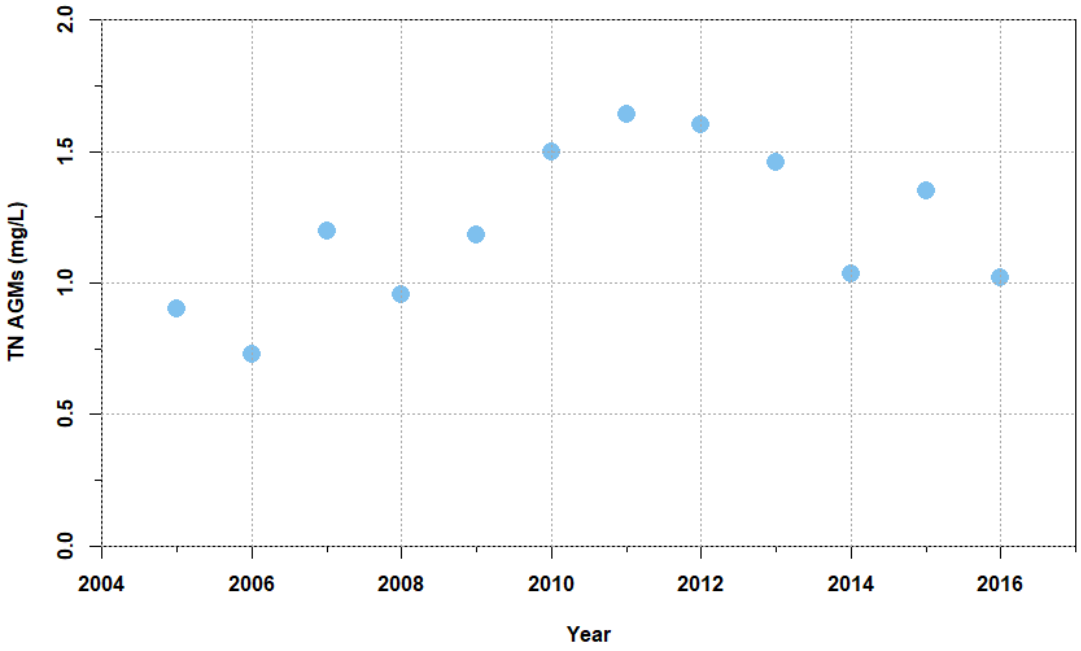

Figure 5.2. Lake Wales TN AGM values, 2005–16

5.3 Critical Conditions and Seasonal Variation

The estimated assimilative capacity is based on annual conditions, rather than critical/seasonal conditions, because (1) the methodology used to determine assimilative capacity does not lend itself very well to short-term assessments, (2) DEP is generally more concerned with the net change in overall primary productivity in the segment, which is better addressed on an annual basis, and (3) the methodology used to determine impairment is based on annual conditions (AGMs).

5.4 Water Quality Analysis to Determine Assimilative Capacity

The Lake Wales TMDLs were developed by the use of a simple linear regression analysis to evaluate the relationship between TN and corrected chlorophyll *a* ($y = 33.18x - 12.49$, *Adj.* R^2 = 0.795, p = 0.000) and to establish the target TN concentration. A simple linear regression analysis was also conducted to examine the relationship between TP and corrected chlorophyll *a*, but no significant relationship was found between TP and corrected chlorophyll *a* AGMs from 2005 to 2016 ($y = 1480.53x - 12.53$, *Adj.* R^2=0.241, p = 0.08539). Lake Wales was not determined to be impaired for TP through the assessment process.

The target TN concentration is the TN concentration necessary to facilitate the reduction of the Lake Wales chlorophyll *a* concentration to the target concentration of 20 µg/L (note that the NNC chlorophyll *a* threshold of 20 µg/L expressed as an AGM was selected as the target response variable through the TMDL development process, as described in **Chapter 3**). The TN target concentration was calculated by manipulating the regression equation displayed in **Figure 5.8** and **Appendix D** that demonstrates the relationship between chlorophyll *a* and TN. The percent reduction in the existing TN concentration necessary to meet the target TN concentration was calculated by a simple arithmetic percent reduction approach.

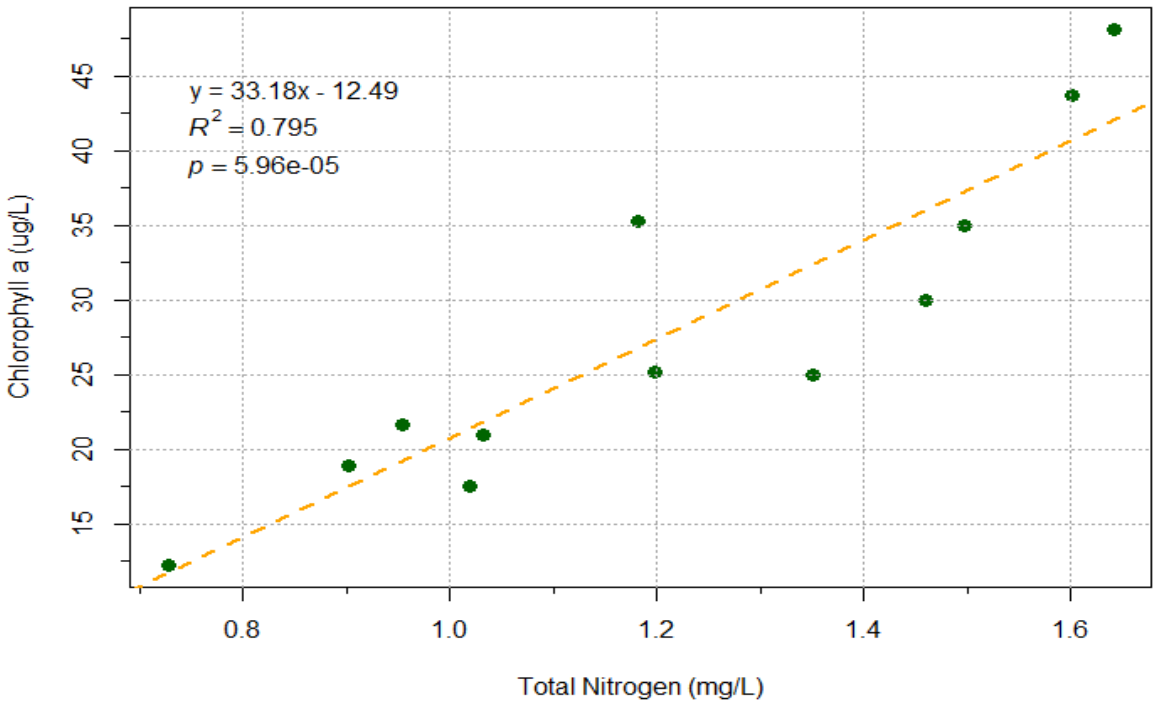

Figure 5.3. Relationship between Lake Wales chlorophyll *a* and TN AGMs, 2005–16

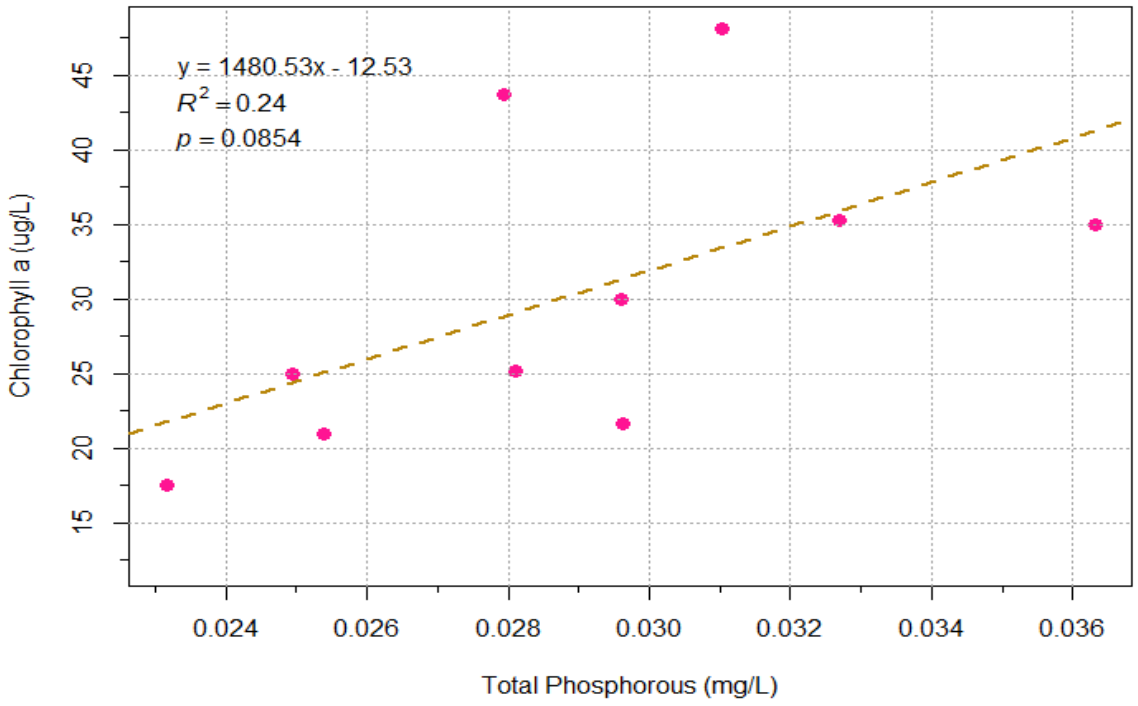

Figure 5.4. Relationship between Lake Wales chlorophyll *a* and TP AGMs, 2005–16

5.5 Calculation of the TMDLs

In some cases, it is necessary to reduce both the TN and TP surface water concentrations in a given waterbody to reduce the chlorophyll *a* concentration to the target chlorophyll *a* concentration, regardless of whether or not there is an identified TP impairment in the waterbody. However, it is expected in the case of Lake Wales that lowering the surface water TN concentration alone to the established TN target concentration will result in a reduction in the measured chlorophyll *a* concentration to meet the target chlorophyll *a* concentration. The Lake Wales chlorophyll *a* target concentration (the applicable statewide NNC) is protective of the lake's designated use and function as a Class III waterbody. The percent reduction necessary to meet the established TN target concentration will address anthropogenic contributions to the water quality impairment.

Existing Lake Wales TN nutrient conditions were evaluated from 2005 to 2016. This period includes the Cycle 3 verified period and more recent years. The AGMs were calculated from the raw results of TN measurements available in IWR Database Run 58. The maximum measured TN concentration from 2005 to 2006 was used in the percent reduction calculation (see **Table 5.1**) as a conservative assumption. This assumption ensures the waterbody will always meet the TN NNC because the TN target concentration and percent reduction will mitigate even the highest observed in-lake TN concentration. The following equation was used to calculate the TN concentration percent reduction for Lake Wales:

$$\frac{[\textbf{Maximum Measured AGM TN Concentration} - \textbf{Target TN Concentration}]}{\textbf{Maximum Measured AGM TN Concentration}} \boldsymbol{x\ 100}$$

To achieve the target concentration of 0.98 mg/L from the maximum TN value of 1.6 mg/L, the Lake Wales TN concentration must be reduced by 40 %. Since no TP impairment was found in Lake Wales, the TP reduction was established at 0 %. The nutrient TMDL values expressed as AGMs address the anthropogenic nutrient inputs contributing to the exceedances of the chlorophyll *a* restoration target of 20 µg/L.

Table 5.1. Reduction required in existing Lake Wales TN concentrations (2005–16) to meet water quality targets

ID = Insufficient data
Note: Values emphasized with yellow shading and boldface type are greater than the NNC of 1.05 µg/L TN. Rule 62-302.531, F.A.C., states that the applicable numeric interpretations for TN shall not be exceeded more than once in any consecutive three-year period.

Year	TN (mg/L)	TP (mg/L)
2005	0.90	ID
2006	0.73	ID
2007	**1.20**	0.03
2008	0.95	0.03
2009	**1.18**	0.03
2010	**1.50**	**0.04**
2011	**1.64**	0.03
2012	**1.60**	0.03
2013	**1.46**	0.03
2014	1.03	0.03
2015	**1.35**	0.02
2016	1.02	0.02
Maximum	**1.6**	**0.04**
TMDL Target	**0.98**	**0.03**
% Reduction to Meet Target	**40**	**0**

Chapter 6: Determination of Loading Allocations

6.1 Expression and Allocation of the TMDLs

The objective of a TMDL is to provide a basis for allocating loads to all the known pollutant sources in a watershed so that appropriate control measures can be implemented, and water quality standards achieved. A TMDL is expressed as the sum of all point source loads (wasteload allocations, or WLAs), nonpoint source loads (load allocations, or LAs), and an appropriate margin of safety (MOS) that accounts for uncertainty in the relationship between effluent limitations and water quality:

$$\mathbf{TMDL = \sum WLAs + \sum LAs + MOS}$$

As discussed earlier, the WLA is broken out into separate subcategories for wastewater discharges and stormwater discharges regulated under the NPDES Program:

$$\mathbf{TMDL \cong \sum WLAs_{wastewater} + \sum WLAs_{NPDES\ Stormwater} + \sum LAs + MOS}$$

It should be noted that the various components of the revised TMDL equation may not sum up to the value of the TMDL because (1) the WLA for NPDES stormwater is typically based on the percent reduction needed for nonpoint sources and is also accounted for within the LA, and (2) TMDL components can be expressed in different terms (for example, the WLA for stormwater is typically expressed as a percent reduction, and the WLA for wastewater is typically expressed as mass per day).

WLAs for stormwater discharges are typically expressed as "percent reduction" because it is very difficult to quantify the loads from MS4s (given the numerous discharge points) and to distinguish MS4s loads from loads of other nonpoint sources (given the nature of stormwater transport). The permitting of stormwater discharges also differs from the permitting of most wastewater point sources. Because stormwater discharges cannot be centrally collected, monitored, and treated, they are not subject to the same types of effluent limitations as wastewater facilities, and instead are required to meet a performance standard of providing treatment to the "maximum extent practical" through the implementation of best management practices (BMPs).

This approach is consistent with federal regulations (40 Code of Federal Regulations § 130.2[I]), which state that TMDLs can be expressed in terms of mass per time (e.g., pounds per day), toxicity, or other appropriate measure. The TMDLs for Lake Wales are expressed in terms of nutrient concentration targets and the percent reductions necessary to meet the targets. The TMDLs represent the lake nutrient concentrations the waterbody can assimilate while maintaining a balanced aquatic flora and fauna (see **Table 6.1**). These TMDLs are based on the maximum AGM value for TN that is not to be exceeded and maximum AGM value for TP that is not to be exceeded in any

consecutive three-year period. The restoration goal for Lake Wales is to achieve the generally applicable chlorophyll *a* criterion of 20 µg/L, which is expressed as an AGM not to be exceeded more than once in any consecutive 3-year period, thus protecting the lake's designated use.

Table 6.1 lists the TMDLs for the Lake Wales Watershed. The TMDLs will constitute the site-specific numeric interpretation of the narrative nutrient criterion set forth in Paragraph 62-302.530(48)(b), F.A.C., that will replace the otherwise applicable NNC in Subsection 62-302.531(2), F.A.C., for these particular waters.

Table 6.1. TMDL components for nutrients in Lake Wales (WBID 1619A)

NA = Not applicable
[1] Represents the AGM value not to be exceeded
[2] The required percent reductions listed in this table represent the reduction from all sources.

Waterbody (WBID)	Parameter	TMDL (mg/L)	WLA Wastewater (% reduction)	WLA NPDES Stormwater (% reduction)[1]	LA (% reduction)[2]	MOS
Lake Wales (1619A)	TN	0.98	NA	40	40	Implicit
Lake Wales (1619A)	TP	0.03	NA	NA	NA	Implicit

6.2 Load Allocation (LA)

To achieve the LA, a 40 % reduction in the current TN load is required. Since no TP impairment was found in Lake Wales, the TP reduction was established at 0 % and the site-specific criteria were maintained at the statewide NNC. The percent reduction represents the necessary reduction from all nonpoint sources, including stormwater runoff, groundwater contributions, and septic systems.

It should be noted that the LA includes loading from stormwater discharges regulated by DEP and the water management districts that are not part of the NPDES stormwater program (see **Appendix A**). The percent reduction in nutrient loads ascribed to specific anthropogenic inputs will be calculated based on more detailed source information when a restoration plan is developed. It is also relevant to note that although the TMDL is based on the percent reduction in nutrient load contributions from all sources to the lake, it is not the intent of DEP to abate natural conditions. The reductions in nonpoint source nutrient loads specifically are expected to result in the added benefit of reduced sediment nutrient flux, which is a common factor in lake eutrophication.

6.3 Wasteload Allocation (WLA)

6.3.1 NPDES Wastewater Discharges

As noted in **Chapter 4**, no active NPDES-permitted facilities in the Lake Wales Watershed discharge either into the waterbody or its watershed. Therefore, a WLA for wastewater discharges is not applicable.

6.3.2 NPDES Stormwater Discharges

The permittees/co-permittees in the Lake Wales Watershed are Polk County and the City of Lake Wales. Areas within their jurisdiction in the watershed are responsible for a 40 % reduction in TN from the current anthropogenic loading.

It should be noted that any MS4 permittee is only responsible for reducing the anthropogenic loads associated with stormwater outfalls that it owns or otherwise has jurisdiction over, and it is not responsible for reducing other nonpoint source loads in its jurisdiction.

6.4 Margin of Safety (MOS)

The MOS can either be implicitly accounted for by choosing conservative assumptions about loading or water quality response, or explicitly accounted for during the allocation of loadings. Consistent with the recommendations of the Allocation Technical Advisory Committee (DEP 2001), an implicit MOS was used in the development of these TMDLs. The MOS is a required component of a TMDL and accounts for the uncertainty about the relationship between pollutant loads and the quality of the receiving waterbody (CWA, Section 303[d][1][c]). Considerable uncertainty is usually inherent in estimating nutrient loading from nonpoint sources, as well as in predicting water quality response. The effectiveness of management activities (e.g., stormwater management plans) in reducing loading is also subject to uncertainty.

An implicit MOS was employed in the development of this TMDL. The maximum measured TN concentration from 2005 to 2006 was used in the percent reduction calculation as a conservative assumption to ensure the waterbody will always meet the TN NNC because the TN target concentration and percent reduction will mitigate even the highest observed in-lake TN concentration.

Chapter 7: Implementation Plan Development and Beyond

7.1 Implementation Mechanisms

Following the adoption of a TMDL, implementation takes place through various measures. Implementation may occur through specific requirements in NPDES wastewater and MS4 permits, and, as appropriate, through local or regional water quality initiatives or basin management action plans (BMAPs).

Facilities with NPDES permits that discharge to the TMDL waterbody must respond to the permit conditions that reflect target concentrations, reductions, or WLAs identified in the TMDL. NPDES permits are required for Phase I and Phase II MS4s as well as domestic and industrial wastewater facilities. MS4 Phase I permits require a permit holder to prioritize and act to address a TMDL unless management actions to achieve that particular TMDL are already defined in a BMAP. MS4 Phase II permit holders must also implement the responsibilities defined in a BMAP or other form of restoration plan (e.g., a reasonable assurance plan).

7.2 BMAPs

Information concerning the development and implementation of BMAPs can be found in Section 403.067, F.S. (the FWRA). DEP or a local entity may initiate and develop a BMAP that addresses some or all of the contributing areas to the TMDL waterbody. BMAPs are adopted by the DEP Secretary and are legally enforceable.

BMAPs describe the fair and equitable allocations of pollution reduction responsibilities to the sources in the watershed, as well as the management strategies that will be implemented to meet those responsibilities, funding strategies, mechanisms to track progress, and water quality monitoring. Local entities usually implement these strategies, such as wastewater facilities, industrial sources, agricultural producers, county and city stormwater systems, military bases, water control districts, state agencies, and individual property owners. BMAPs can also identify mechanisms to address potential pollutant loading from future growth and development.

The Lake Wales Watershed is located in the Lake Okeechobee BMAP area. The BMAP was adopted in December 2014 to implement the TP TMDL in the Lake Okeechobee Watershed and activities are ongoing throughout the larger basin to reduce nutrient loads to Lake Okeechobee. Management strategies in the Lake Wales Watershed will also address nutrient impairments for the lake and will likely benefit the lake at a different level than reported in the Lake Okeechobee BMAP. Additional information about BMAPs is available on DEP's website.

7.3 Implementation Considerations for the Waterbody

In 2015, SWFWMD established a minimum flow and level (MFL) for Lake Wales (see SWFWMD 2015), and in April 2019, Wood Environment and Infrastructure Solutions Inc. submitted a report to SWFWMD identifying and evaluating methods by which Lake Wales might meet the MFL (Wood Environment and Infrastructure Inc. 2019). Throughout the development of this TMDL report, discussions were ongoing within SWFWMD and the City of Lake Wales to determine the appropriate recovery method to meet the MFL (B. Ralys, SWFWMD, December 17, 2019, personal communication). The projects initiated to meet the MFL may constitute initial steps toward Lake Wales meeting the TN and corrected chlorophyll *a* NNC established in this TMDL analysis, dependent upon the quality of the water added to the lake through the MFL recovery method (Wood Environment and Infrastructure Inc. 2019).

In the case of Lake Wales, other factors—such as sediment nutrient fluxes and/or nitrogen fixation by cyanobacteria or other mechanisms—also influence lake nutrient budgets and the growth of phytoplankton. Approaches for addressing these other factors should be included in a comprehensive management plan for the waterbody. Additionally, the current water quality and water level monitoring of Lake Wales should continue and be expanded, as necessary, during the implementation phase to ensure that adequate information is available for tracking restoration progress.

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Appendices

Appendix A: Background Information on Federal and State Stormwater Programs

In 1982, Florida became the first state in the country to implement statewide regulations to address the issue of nonpoint source pollution by requiring new development and redevelopment to treat stormwater before it is discharged. The Stormwater Rule, as authorized in Chapter 403, F.S., was established as a technology-based program that relies on the implementation of BMPs designed to achieve a specific level of treatment (i.e., performance standards) as set forth in Chapter 62-40, F.A.C. In 1994, DEP stormwater treatment requirements were integrated with the stormwater flood control requirements of the water management districts, along with wetland protection requirements, into the Environmental Resource Permit regulations, as authorized under Part IV of Chapter 373, F.S.

Chapter 62-40, F.A.C., also requires the state's water management districts to establish stormwater pollutant load reduction goals (PLRGs) and adopt them as part of a Surface Water Improvement and Management Program plan, other watershed plan, or rule. Stormwater PLRGs are a major component of the load allocation part of a TMDL. To date, they have been established for Tampa Bay, Lake Thonotosassa, the Winter Haven Chain of Lakes, the Everglades, Lake Okeechobee, and Lake Apopka.

In 1987, the U.S. Congress established Section 402(p) as part of the federal CWA Reauthorization. This section of the law amended the scope of the federal NPDES permitting program to designate certain stormwater discharges as "point sources" of pollution. The EPA promulgated regulations and began implementing the Phase I NPDES stormwater program in 1990 to address stormwater discharges associated with industrial activity, including 11 categories of industrial activity, construction activities disturbing 5 or more acres of land, and large and medium MS4s located in incorporated places and counties with populations of 100,000 or more.

However, because the master drainage systems of most local governments in Florida are physically interconnected, the EPA implemented Phase I of the MS4 permitting program on a countywide basis, which brought in all cities (incorporated areas), Chapter 298 special districts; community development districts, water control districts, and FDOT throughout the 15 counties meeting the population criteria. DEP received authorization to implement the NPDES stormwater program in 2000. The authority to administer the program is set forth in Section 403.0885, F.S.

The Phase II NPDES stormwater program, promulgated in 1999, addresses additional sources, including small MS4s and small construction activities disturbing between 1 and 5 acres, and urbanized areas serving a minimum resident population of at least 1,000 individuals. While these urban stormwater discharges are technically referred to as "point sources" for the purpose of

regulation, they are still diffuse sources of pollution that cannot be easily collected and treated by a central treatment facility, as are other point sources of pollution such as domestic and industrial wastewater discharges. It should be noted that Phase I MS4 permits issued in Florida include a reopener clause that allows permit revisions to implement TMDLs when the implementation plan is formally adopted.

Appendix B: Information in Support of Site-Specific Interpretations of the Narrative Nutrient Criterion

Table B-1. Spatial extent of the numeric interpretation of the narrative nutrient criterion

Location	Description
Waterbody name	Lake Wales
Waterbody type(s)	Lake
WBID	WBID 1619A (see **Figure 1.1** of this report)
Description	Lake Wales is located in the City of Lake Wales in Polk County, Florida. The watershed covers an area of 727 acres, and the surface area of the lake itself is 263 acres. The lake is 10 feet deep on average and is not characterized by any significant inflows or outflows. The dominant land use type in the Lake Wales Watershed is medium-density residential (42 %), followed by water and industrial/commercial, which comprise 36 % and 14 % of the watershed, respectively. **Chapter 1** of this report describes the Lake Wales system in more detail.
Specific location (latitude/longitude or river miles)	The center of Lake Wales is located at N: 27°54'4.32"/ W: 81°34'19.6." The site-specific criteria apply as a spatial average for the lake, as defined by WBID 1619A.
Map	**Figure 1.1** shows the general location of Lake Wales and its watershed, and **Figure 4.2** shows the land uses in the watershed.
Classification(s)	Class III Freshwater
Basin name (HUC 8)	Kissimmee River Basin (03090101)

Table B-2. Description of the numeric interpretation of the narrative nutrient criterion

Numeric Interpretation of Narrative Nutrient Criterion	Information on Parameters Related to Numeric Interpretation of the Narrative Nutrient Criterion
NNC summary: Generally applicable lake classification (if applicable) and corresponding NNC	Lake Wales is a low-color, high-alkalinity lake, and the generally applicable NNC, expressed as an AGM concentration not to be exceeded more than once in any 3-year period, is chlorophyll *a* of 20 µg/L.
Proposed TN, TP, chlorophyll *a*, and/or nitrate + nitrite concentrations (magnitude, duration, and frequency)	Numeric interpretations of the narrative nutrient criterion: The NNC for chlorophyll *a* in Lake Wales is 20 µg/L, expressed as an AGM concentration not to be exceeded more than once in any consecutive 3-year period. The NNC for TN and TP in Lake Wales are 0.98 mg/L and 0.03 mg/L, respectively, expressed as an AGM concentration not to be exceeded in any year and an AGM not to be exceeded more than once in any consecutive 3-year period, respectively.
Period of record used to develop numeric interpretations of the narrative nutrient criterion for TN and TP	The nutrient concentration (TN) target for Lake Wales was selected through the application of a regression analysis that described the relationship between chlorophyll a and TN concentrations 2005-2016 data that was used to produce AGMs. Based on the relationship between the two variables, the TN target concentration was derived to facilitate Lake Wales meeting the chlorophyll a target concentration. The TP target was based on results from paleolimnological studies of lakes. The paleolimnological results are presented in Whitmore and Brenner (1995, 2002) and Quillen et al. (2013) (see the References section of this report for complete bibliographical details).
How the criteria developed are spatially and temporally representative of the waterbody or critical condition	The regression analysis used AGM values derived from data collected from 2005 to 2016. This period included years characterized by both above- and below-average precipitation. During the simulation period, total annual average rainfall varied from 37.4 to 74.4 inches and averaged 53.8 inches. A comparison with long-term annual average rainfall data indicated that 2005, 2011, and 2015 were wet years, while 2007, 2009, and 2012 were dry years. This period captures the hydrologic variability of the Lake Wales system.

Table B-3. Summary of how designated use(s) are protected by the criterion

Designated Use Requirements	Information Related to Designated Use Requirements
History of assessment of designated use support	During the Cycle 3 assessment, the NNC were used to assess Lake Wales based on data from the verified period (January 1, 2009–June 30, 2016) based on data from IWR Run 53. Lake Wales was assessed and determined to be impaired for chlorophyll *a* and TN and was added to the 303(d) list for these water quality parameters.
Basis for use support	The basis for use support is the NNC chlorophyll *a* concentration of 20 µg/L, which is protective of designated uses for low-color, high-alkalinity lakes. Based on the available information, there is nothing unusual about Lake Wales that would render the use of the chlorophyll *a* threshold of 20 µg/L inappropriate for the lake.
Approach used to develop criteria and how it protects uses	A simple linear regression approach was used to address the nutrient impairment; a regression equation was developed that related the lake AGM TN concentration to the AGM chlorophyll *a* concentration. The TN criterion is expressed as a maximum AGM concentration not to be exceeded in any year. Establishing the frequency as not to be exceeded in any year ensures that the chlorophyll *a* NNC (20 µg/L for low-color, high-alkalinity lakes), which is protective of the lake's designated uses, will be met.
How the TMDL analysis will ensure that nutrient-related parameters are attained to demonstrate that the TMDLs will not negatively impact other water quality criteria	The method employed ensures that the chlorophyll *a* concentration target of 20 µg/L for Lake Wales will be attained at the TMDL in-lake TN concentration, frequency, and duration, while taking into consideration the estimated predisturbance phosphorus conditions in the lakes. There were no impairments for nutrient-related parameters (such as dissolved oxygen or un-ionized ammonia). The proposed reductions in nutrient inputs will result in further improvements in water quality.

Table B-4. Documentation of the means to attain and maintain water quality standards for downstream waters

Protection of Downstream Waters and Monitoring Requirements	Information Related to Protection of Downstream Waters and Monitoring Requirements
Identification of downstream waters: List receiving waters and identify technical justification for concluding downstream waters are protected	Lake Wales is a closed basin lake that is not characterized by any significant natural inflows or outflows.
Summary of existing monitoring and assessment related to the implementation of Subsection 62-302.531(4), F.A.C., and trends tests in Chapter 62-303, F.A.C.	The Polk County Parks and Natural Resources Division conducts routine monitoring of Lake Wales. The data collected through these monitoring activities will be used in subsequent water quality assessment cycles to evaluate the effect that BMPs implemented in the watershed have on lake TN, TP, and corrected chlorophyll *a* concentrations.

Table B-5. Documentation of endangered species consideration

Administrative Requirements	Information for Administrative Requirements
Endangered species consideration	DEP is not aware of the presence of any endangered aquatic species or critical habitat present in Lake Wales that could potentially be adversely affected by these TMDLs. Furthermore, it is expected that improvements in water quality resulting from these restoration efforts will positively impact aquatic species living in the lake and its respective watersheds.

Table B-6. Documentation that administrative requirements are met

Administrative Requirements	Information for Administrative Requirements
Notice and comment notifications	DEP published a Notice of Development of Rulemaking on XXX, 2020, to initiate TMDL development for impaired waters in the Kissimmee River Basin. Technical workshops for the Lake Wales TMDLs were held on XXX, 2020 to present the general TMDL approach to local stakeholders. A rule development public workshop for the TMDLs was held on XXX, 2020.
Hearing requirements and adoption format used; responsiveness summary	Following the publication of the Notice of Proposed Rule, DEP will provide a 21-day challenge period and a public hearing that will be noticed no less than 45 days prior. The hearing was held on XXX, 2020.
Official submittal to EPA for review and General Counsel certification	If DEP does not receive a rule challenge, the certification package for the rule will be prepared by the DEP program attorney. DEP will prepare the TMDLs and submittal package for the TMDLs to be considered site-specific interpretations of the narrative nutrient criterion and will submit these documents to the EPA.