4.22. Lake Smart

Background

Physical and chemical characteristics specific to Lake Smart are presented here in the context of relevant regulatory criteria and requirements (Table 4-44). Lake Smart (WBID 1488A) is located in the WHCL Northern Chain and is hydrologically connected to lakes Conine and Fannie via constructed canals (Photo 4-25, Figure 4-90). The connection to Lake Conine is navigable, however, the connection with Lake Fannie is controlled using a gated structure and is not navigable. In 2005, Lake Smart was declared verified impaired based on elevated TSI values (>60). A TMDL is required for Lake Smart to calculate load reductions necessary to satisfy the TSI criteria. The TP, TN, and chlorophyll *a* geometric means for Lake Smart for the period of 1997 to 2007 and corresponding EPA NNC water quality targets are listed in Table 4-44. To comply with the NNC, concentration reductions of 10 percent for TP, 13 percent for TN, and 30 percent for chlorophyll *a* are required.

A summary of water quality statistics for Lake Smart is presented in Table 4-45. Median chlorophyll *a*, TN and TP concentrations exceed the NNC targets provided by EPA for Lake Smart. Chlorophyll *a* concentrations in Lake Smart fluctuate and have remained consistently elevated above 20 µg/L, but appear to decrease over time (Figure 4-91). A statistically significant decline in chlorophyll *a* concentrations from 1986 to 2007 was observed (seasonal Kendall-Tau, p=0.0019), indicating an improvement in water quality. Multiple *Hydrilla* eradication projects have been completed in the past several years, with greater than 80 percent of the lake being treated in 2003. No water quality improvement projects have been implemented in Lake Smart to restore water quality. Lake Smart is adjacent to Lake Fannie, an isolated lake with a gated structure; therefore, improvements in water quality of the lake would result in little benefits farther downstream.

The Lake Smart watershed is 352 acres in size and includes 67 acres (19 percent) of developed lands compared to 285 acres (81 percent) of undeveloped lands. The 2000-2007 median color value (46 PCU) was above 40 PCU indicating the lake is a colored lake. Using the adopted EPA NNC for Florida lakes, characterization of alkalinity or acidity is not necessary based on the colored classification of Lake Smart. The lake area, perimeter, water depth, and volume statistics are based on a water level elevation of 125 feet in June 2007. Bathymetry data are available for Lake Smart for the June 2007 water level elevation (Figure 4-91). A water level of 126 feet was reported in August 2010, reflecting a 1.0 foot increase in water elevation when compared to 2007. The subsequent changes in overall surface area, water depth, and volume of the lake should be considered during the development and implementation of water quality restoration projects.

Water Quality Restoration Project Selection and Priorities

Based on Lake Smart water quality and the surrounding watershed characteristics, five potential water quality restoration projects were identified using the WHCL WQMP decision key (Figure 4-92). The decision key presents the factors on which yes/no decisions were based and used to identify and select water quality improvement projects. Projects to address water quality, nutrient and sediment loading, and reduced lake levels are proposed. The projects are listed in order of

priority, based on expected water quality improvements. A detailed discussion of the potential water quality restoration implications for each project can be found in Section 3.0.

- Project 1: Stormwater Infiltration Areas (SIAs)
- Project 2: Sediment Removal/Inactivation
- Project 3: Forested Wetland Rehydration
- Project 4: SAV Planting/Management or FTWs
- Project 5: EAV Planting/Management

Table 4-44. Physical, chemical, and regulatory characteristics of Lake Smart.

Physical			
Location in chain	Northern	**High infiltration soils (acres)**	291 (83 percent)
Relation to other lakes	Adjacent to Terminal	**Developed land (acres)**	67 (19 percent)
Watershed area (acres)	352	**Undeveloped land (acres)**	285 (81 percent)
Lake area (acres)*	282	**Median water depth (feet)***	7.2
Perimeter (feet)*	18,678	**Maximum water depth (feet)***	11.5
Surface area: lake volume ratio*	0.13	**Volume (acre-feet)***	2,227
Watershed to surface area ratio*	1.25		
Water Chemistry			
Locally-derived: acidic or alkaline	NA	**Clear or colored**	Colored
Geometric mean chlorophyll *a* (µg/L)	29	**NNC chlorophyll *a* target (µg/L)**	20
Geometric mean TN (mg/L)	1.42	**NNC TN target (mg/L)**	1.23
Geometric mean TP (mg/L)	0.056	**NNC TP target (mg/L)**	0.050
Regulatory Data			
Impaired	Yes	**TMDL status**	Required
Chlorophyll *a* trend	Decreasing**	**TP concentration reduction required**	10 percent

*at a water level elevation of 125 feet
**presented in section 5.0

Photo 4-25. Lake Smart.

Table 4-45. Lake Smart water quality summary for 1997 to 2007.

Parameter	N	Minimum	Median	Maximum
Chlorophyll *a* (µg/L)	56	2.1	26	51
Color (PCU)	49	20	46	75
Conductivity (µmhos/cm)	41	202	214	268
Dissolved oxygen (mg/L)	41	6.72	10.48	12.72
pH	41	7.51	8.38	9.38
Secchi depth (feet)	57	0.9	2.1	4.6
Total nitrogen (mg/L)	53	0.81	1.36	2.33
Total phosphorus (mg/L)	56	0.012	0.055	0.131

Figure 4-90. Lake Smart and associated watershed.

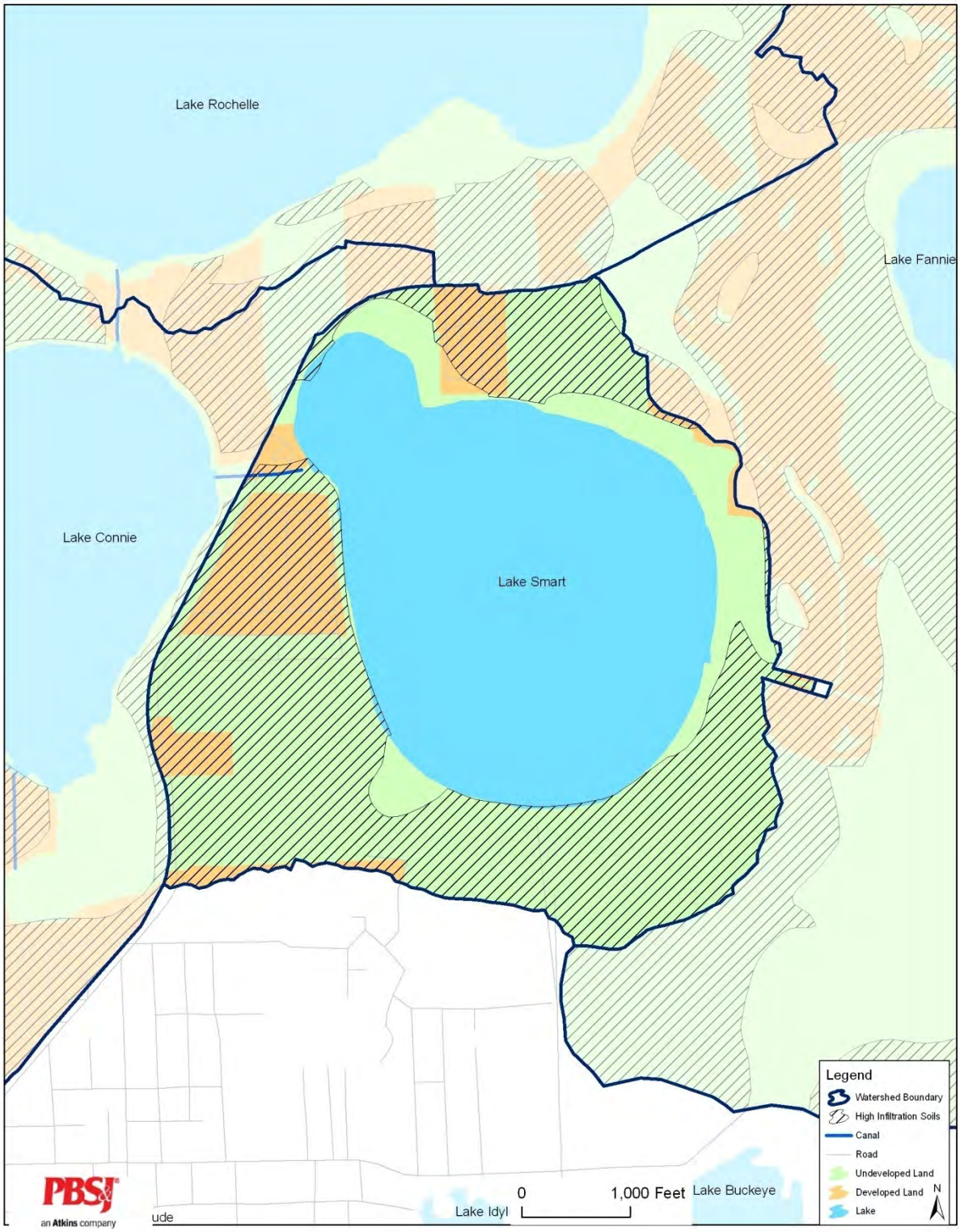
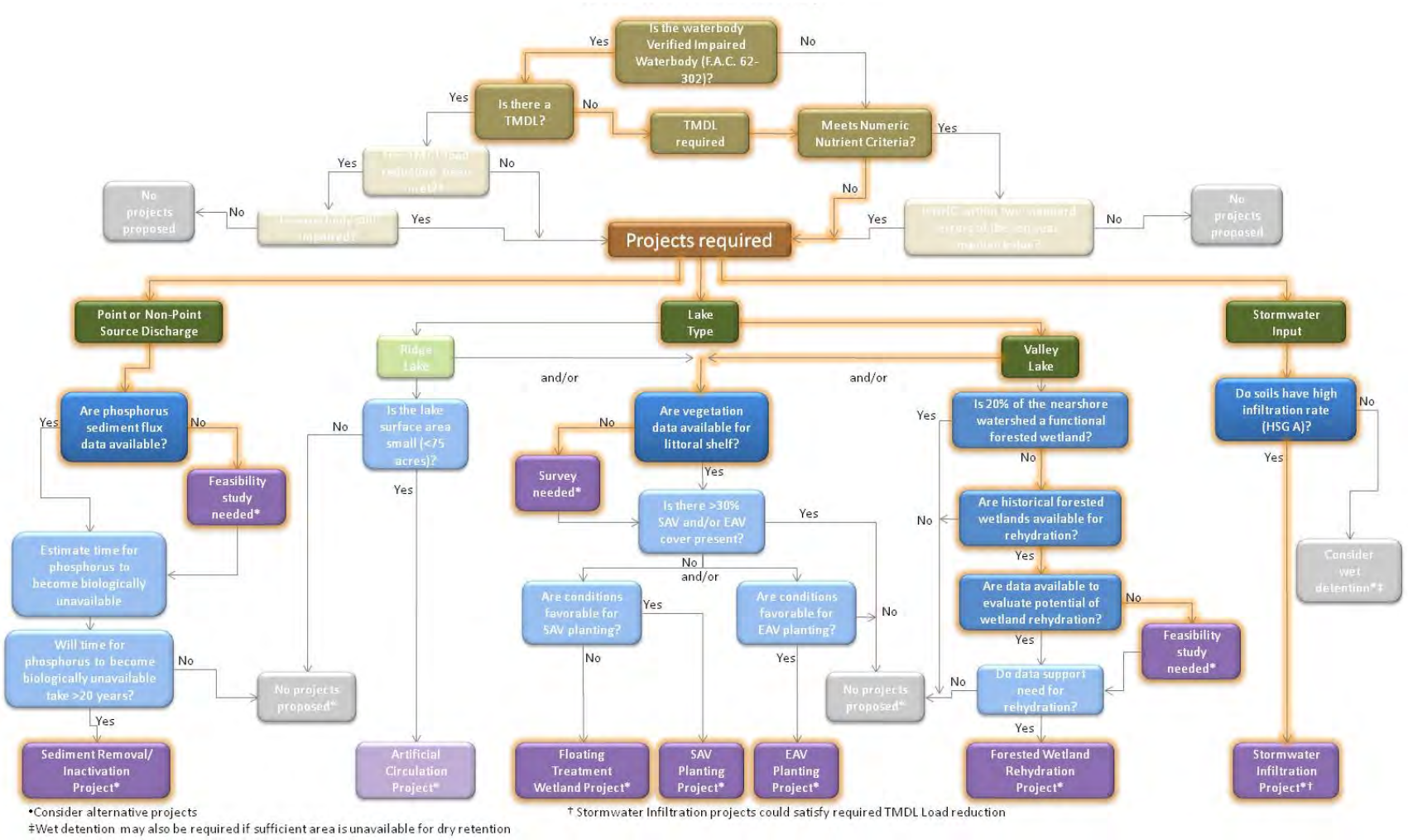


Figure 4-91. Lake Smart bathymetry (June 2007) at water level elevation = 125 feet (Polk County Water Atlas).

Figure 4-92. Lake Smart decision key: highlighted path shows decision process.



Project 1: Stormwater Infiltration Areas (SIAs)

The Lake Smart watershed has approximately 291 acres (83 percent of the watershed) classified as high infiltration soils. The Northern Chain was not included in the PLRG study (USF 2005), therefore a TMDL has not been completed for Lake Smart and data to estimate SIA acres for TP load reduction are not available at this time. SIA implementation could have the additional benefit of increasing storage to supplement dry season lake levels and a reduction in stormwater loads that can be later applied to the required TMDL TP load reduction. As such, SIA design should be focused on recharging the surficial aquifer.

Project 2: Sediment Removal/Inactivation

Non-point source discharges to Lake Smart may have resulted in substantial internal nutrient loads due to phosphorus release from sediments. Presently, sufficient data are not available to evaluate the internal phosphorus load and calculate the phosphorus decay rate and the time at which the phosphorus will ultimately become biologically unavailable in the lake sediments. A feasibility study is required to determine whether sediment removal/inactivation is necessary to reduce internal phosphorus loads to the lake.

Cost Estimate: $10,000.

Project 3: Forested Wetland Rehydration

Approximately 13 percent of the land cover within the 500 foot buffer surrounding Lake Smart is classified as wetlands using the 2006 FLUCS data. Forested wetlands encompass seven percent of the total wetland area, which does not satisfy the recommended forested wetland cover required to maintain color levels above 50 PCU.

One proposed project area was identified adjacent to Lake Smart and is expected to rehydrate approximately 15 acres (Figure 4-93). The feasibility study is recommended in order to evaluate the proposed project area for inundation.

Feasibility study cost estimate: $60,000.

Project 4: SAV Planting or FTWs

SAV Planting

In Lake Smart, *Hydrilla* eradication occurs frequently attributing to the continued degradation in water quality. A survey of existing SAV cover in Lake Smart is recommended due to the lack of sufficient data to calculate percent lake cover. Based on the results of the SAV survey, conclusions regarding SAV planting can be determined. If SAV cover is less than 30 percent, lake conditions should be evaluated to assess if additional SAV is viable based on the soil condition, water clarity and water depth. *Hydrilla* harvesting may be required for successful establishment of selected SAV plants.

SAV plants should not be planted in water depths greater than 2 feet based on the median secchi depth values (2.1 feet). The maximum planting effort could result in vegetation cover of approximately 7 percent of the lake bottom (21 acres).

Cost Estimate: $100,000 (estimate based on previous purchase and installation cost of $0.90 per plant provided by EarthBalance®, additional funds included for maintenance)

FTWs

If the feasibility study indicates that more than 30 percent of Lake Smart has SAV cover, FTW may be considered. The installation of floating mats with appropriate aquatic vegetation would be expected to assimilate nutrients from the water column.

Project 5: EAV Planting

A survey of existing shoreline vegetation surrounding Lake Smart is recommended due to the lack of sufficient data at this time. Based on the results of the shoreline survey, conclusions and recommendations regarding emergent aquatic or woody vegetation planting can be determined. If limited shoreline vegetation is present, shoreline conditions should be evaluated to assess if vegetation planting is viable based on the soil conditions, slope, water level and inundation frequency and wave disturbance.

Figure 4-93. Proposed forested wetland rehydration project area for Lake Smart.