

4.25. Lake Winterset

Background

Physical and chemical characteristics specific to Lake Winterset are presented here in the context of relevant regulatory criteria and requirements (Table 4-50). Lake Winterset (WBID 1521A) is located in the Southern Chain of the WHCL. It is hydrologically connected to lake Eloise via a constructed navigable canal, however the constructed canal to Little Lake Winterset is not navigable (Photo 4-28, Figure 4-102). In 2005, Lake Winterset was declared verified impaired based on elevated TSI values (>40). Later in 2005, a paleolimnological review of Lake Winterset supported the decision to remove the lake from the impaired list based on the evidence that the lake was historically eutrophic and assigned a revised TSI threshold of 60. No TMDL is required for Lake Winterset because it is not identified as an impaired waterbody. The TP, TN, and chlorophyll *a* geometric mean for Lake Winterset for the period of 1997 to 2007 and corresponding EPA NNC water quality targets are listed in Table 4-50. Concentration reductions in chlorophyll *a*, TN, or TP are not required to comply with the NNC.

A summary of water quality statistics for Lake Winterset is presented in Table 4-51. Median chlorophyll *a*, TN and TP concentrations do not exceed the NNC targets provided by EPA for Lake Fannie. Chlorophyll *a* concentrations in Lake Winterset fluctuate but values have remained below 20 µg/L sufficiently to maintain an unimpaired status (Figure 4-103). A statistically significant decline in chlorophyll *a* concentrations from 1983 to 2007 was observed (seasonal Kendall-Tau, $p=0.05$). No water quality improvement projects have been implemented in Lake Winterset to restore water quality. However, several *Hydrilla* infestation eradication projects have been performed in the last ten years. Lake Winterset is an intermediate lake so improvements in water quality of the lake could result in some benefit farther downstream.

The Lake Winterset watershed is 694 acres in size and includes 527 acres (76 percent) of developed lands compared to 167 acres (24 percent) of undeveloped lands. The 2000-2007 median color value (10 PCU) was below 40 PCU indicating the lake is a clear (non-colored) lake and specific conductivity data indicate the lake is alkaline. The lake area, perimeter, water depth, and volume statistics are based on a water level elevation of 129 feet in July 2007. Bathymetry data are available for Lake Winterset for the June 2007 water level elevation (Figure 4-104). A water level of 130 feet was reported in August 2010, reflecting a 1.0 foot increase in water elevation when compared to 2007.

Water Quality Restoration Project Selection and Priorities

The water quality of Lake Winterset is characterized here in the context of relevant regulatory criteria and requirements. No water quality restoration projects are proposed for Lake Winterset at this time (Figure 4-105). However, continued water quality monitoring efforts are recommended for ongoing evaluation.

Lake-Specific Restoration Projects

Table 4-50. Physical, chemical, and regulatory characteristics of Lake Winterset.

Physical			
Location in chain	Southern	High infiltration soils (acres)	542 (78 percent)
Relation to other lakes	Headwater	Developed land (acres)	527 (76 percent)
Watershed area (acres)	694	Undeveloped land (acres)	167 (24 percent)
Lake area (acres)*	549	Median water depth (feet)*	12.7
Perimeter (feet)*	28,242	Maximum water depth (feet)*	30.2
Surface area: lake volume ratio*	0.06	Volume (acre-feet)*	8,876
Watershed to surface area ratio*	1.26		
Water Chemistry			
Locally-derived: acidic or alkaline	Alkaline	Clear or colored	Clear
Geometric mean chlorophyll <i>a</i> (µg/L)	15	NNC chlorophyll <i>a</i> target (µg/L)	20
Geometric mean TN (mg/L)	0.77	NNC TN target (mg/L)	1.81
Geometric mean TP (mg/L)	0.019	NNC TP target (mg/L)	0.087
Regulatory Data			
Impaired	No	TMDL status	NA
Chlorophyll <i>a</i> trend	Decreasing**	TP concentration reduction required	NA

*at a water level elevation of 129 feet

**presented in section 5.0

NA- Not applicable

Photo 4-28. Residential area along Lake Winterset shoreline.



Table 4-51. Lake Winterset water quality summary for 1997 to 2007.

Parameter	N	Minimum	Median	Maximum
Chlorophyll <i>a</i> (µg/L)	51	4	15	26
Color (PCU)	28	5	10	22
Conductivity (µmhos/cm)	26	240	266	328
Dissolved oxygen (mg/L)	26	7.29	8.96	10.6
pH	26	7.23	7.875	9.02
Secchi depth (feet)	55	1.5	3.6	11.8
Total nitrogen (mg/L)	55	0.39	0.80	1.42
Total phosphorus (mg/L)	51	0.005	0.021	0.06

Figure 4-102. Lake Winterset and associated watershed.

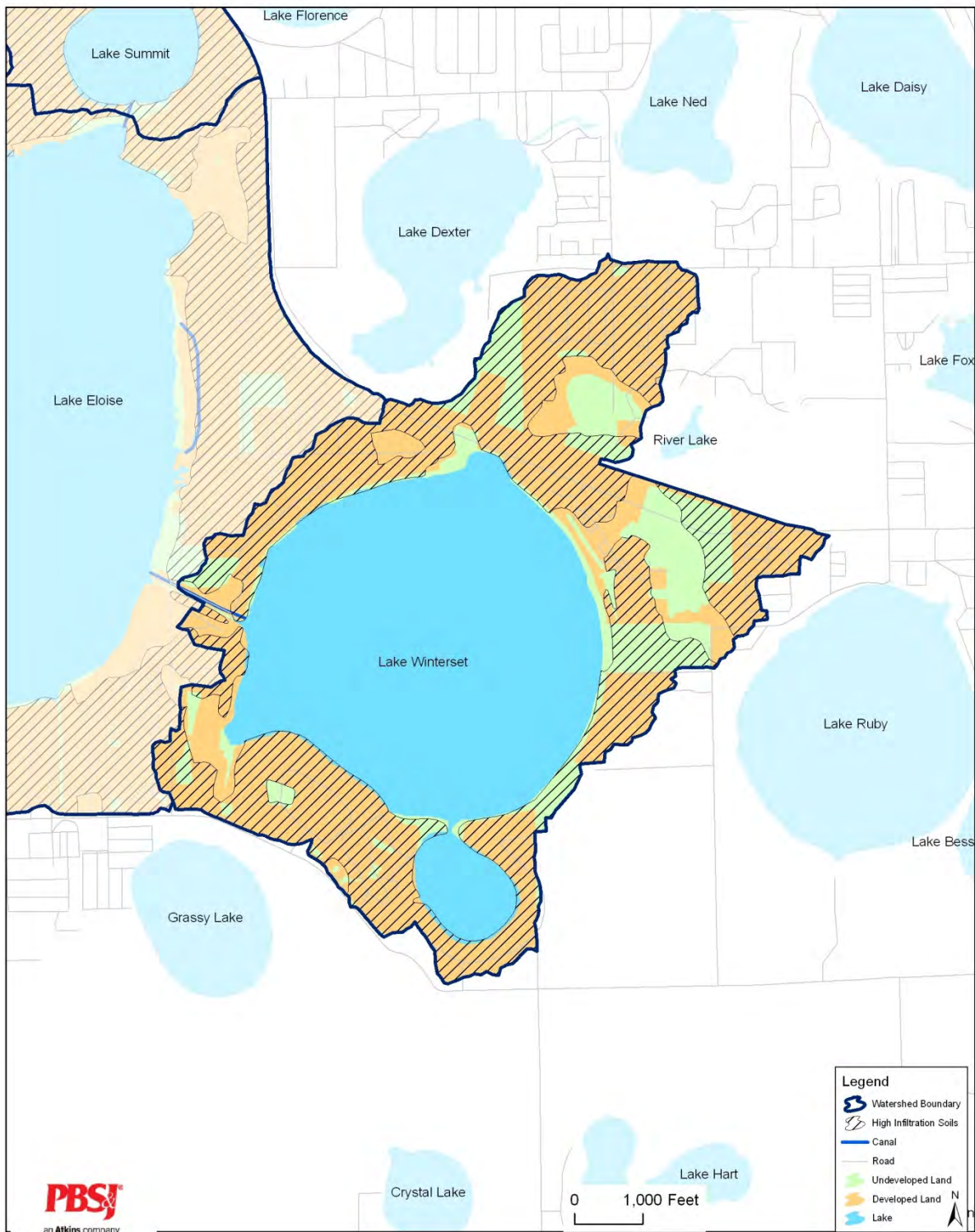


Figure 4-103. Lake Winterset chlorophyll *a* concentrations and *Hydrilla* treatment history using available data from 1983 to 2007.

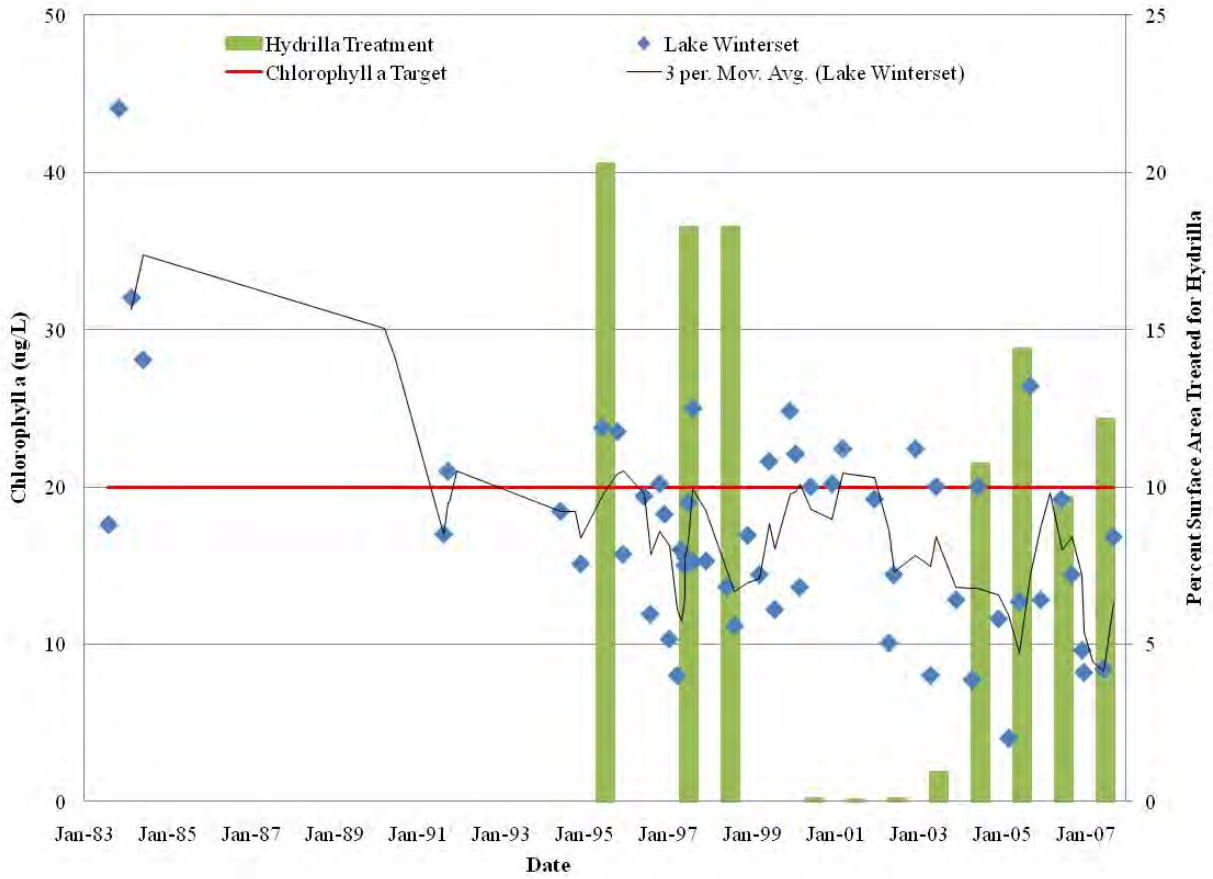
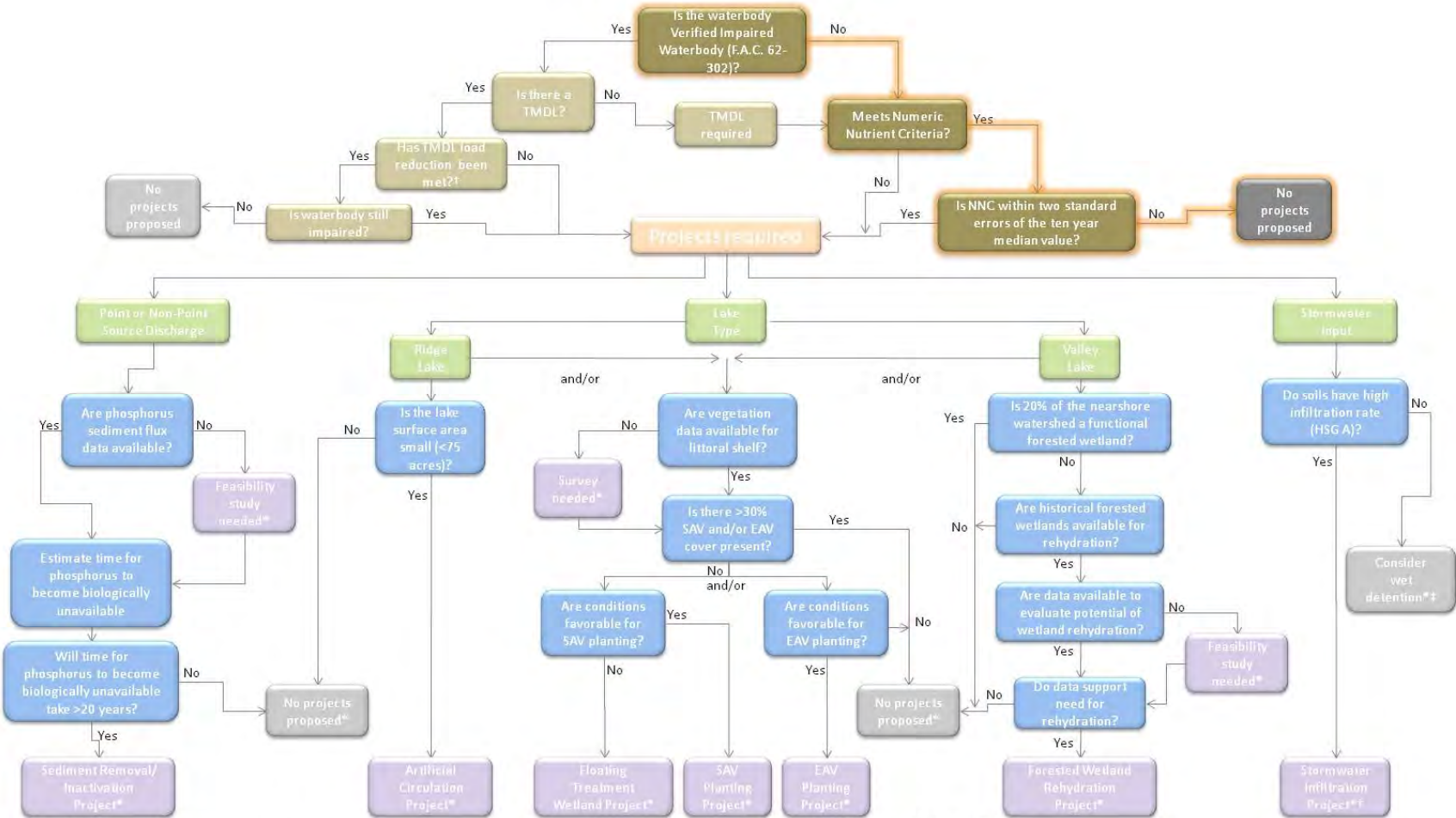


Figure 4-104. Lake Winterset bathymetry (June 2007) at water level elevation = 129 feet (Polk County Water Atlas).



Figure 4-105. Lake Winterset decision key.



*Consider alternative projects
 ‡Wet detention may also be required if sufficient area is unavailable for dry retention

† Stormwater Infiltration projects could satisfy required TMDL Load reduction