4.8. Lake Hartridge

Background

Physical and chemical characteristics specific to Lake Hartridge are presented here in the context of relevant regulatory criteria and requirements (Table 4-15). Lake Hartridge (WBID 1521I), a lake in the WHCL Southern Chain, is hydrologically connected to Lake Idylwild via a constructed navigable canal (Photo 4-8, Figure 4-30. Initially, Lake Hartridge was declared verified impaired based on elevated TSI values (>40). Later in 2005, a paleolimnological review of Lake Hartridge resulted in the removal of 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 Hartridge because it is not identified as an impaired waterbody. However, the NNC are performance based, an exceedance more than once every three years results in non-compliance. The annual geometric chlorophyll *a* mean in 2006 (21µg/L) was above the NNC; however, TN and TP values are below the NNC. Therefore, no concentration reductions are required. The results of this comparison indicate that a slight degradation in water quality in Lake Hartridge could result in an impairment designation. Therefore, water quality restoration projects are recommended for Lake Hartridge as a preventative action. The TP, TN, and chlorophyll *a* geometric mean for Lake Hartridge for the period of 1997 to 2007 and corresponding EPA NNC water quality targets are listed in Table 4-15.

A summary of water quality statistics for Lake Hartridge is presented in Table 4-16. The median recorded chlorophyll a, TN, and TP concentrations are below the NNC targets provided by EPA for Lake Hartridge. However, the TP NNC is within twice the standard error of the ten year median indicating that water quality restoration projects are necessary to maintain unimpaired water quality. Chlorophyll *a* concentrations in Lake Hartridge have fluctuated with values peaking in the mid-1990s. Values have remained below 20 µg/L sufficiently to avoid an impairment designation by FDEP (Figure 4-31). However, a statistically significant increase in chlorophyll *a* concentrations from 1983 to 2007 was observed (seasonal Kendall-Tau, p=0.006). In 2007, the City of Winter Haven and the District implemented a stormwater treatment project on the southern rim of Lake Hartridge (Photo 4-9). The estimate TP load reduction from the stormwater treatment project is 39 kg/year. *Hydrilla* eradication projects have been completed on Lake Hartridge over at least the past 20 years. Most recently, 100 percent of the lake surface area was treated for *Hydrilla*. Lake Hartridge is a headwater lake and, as such, improvements in water quality of the lake could result in benefit farther downstream.

The Lake Hartridge watershed is 508 acres in size and includes 404 acres (79 percent) of developed lands compared to 105 acres (21 percent) of undeveloped lands. The 2000-2007 median color value (15 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 131 feet in October 2006. Bathymetry data are available for Lake Hartridge for the October 2006 water level elevation (Figure 4-32). A water level of 130 feet was reported in August 2010, reflecting a 1.0 foot decrease in water elevation when compared to 2006. 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 Hartridge water quality and the surrounding watershed characteristics, four potential water quality restoration projects were identified using the WHCL WQMP decision key (Figure 4-33). 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: SAV Planting/Management or FTWs
- Project 4: EAV Planting/Management

Table 4-15. Physical, chemical, and regulatory characteristics of Lake Hartridge.

Physical			
Location in chain	Southern	**High infiltration soils (acres)**	391 (77 percent)
Relation to other lakes	Headwater	**Developed land (acres)**	404 (79 percent)
Watershed area (acres)	508	**Undeveloped land (acres)**	105 (21 percent)
Lake area (acres)*	454	**Median water depth (feet)***	2.5
Perimeter (feet)*	23,542	**Maximum water depth (feet)***	21.5
Surface area: lake volume ratio*	0.11	**Volume (acre-feet)***	4,114
Watershed to surface area ratio*	1.12		
Water Chemistry			
Locally-derived: acidic or alkaline	Alkaline	**Clear or colored**	Clear
Geometric mean chlorophyll *a* (µg/L)	15	**NNC chlorophyll *a* target (µg/L)**	20
Geometric mean TN (mg/L)	0.73	**NNC TN target (mg/L)**	1.00
Geometric mean TP (mg/L)	0.030	**NNC TP target (mg/L)**	0.3
Regulatory Data			
Impaired	No	**TMDL status**	NA
Chlorophyll *a* trend	Increasing**	**TP concentration reduction required**	NA

*at a water level elevation of 131 feet
**presented in section 5.0
NA=not applicable

Photo 4-8. Lake Hartridge.

Table 4-16. Lake Hartridge water quality summary for 1997 to 2007.

Parameter	N	Minimum	Median	Maximum
Chlorophyll *a* (µg/L)	81	4	16	54
Color (PCU)	29	5	15	30
Conductivity (µmhos/cm)	26	149	188	240
Dissolved oxygen (mg/L)	26	6.51	8.27	9.74
pH	26	6.8	7.61	8.74
Secchi depth (feet)	82	1.8	3.3	9.4
Total nitrogen (mg/L)	86	0.07	0.75	1.3
Total phosphorus (mg/L)	83	0.009	0.027	0.073

Figure 4-30. Lake Hartridge and associated watershed.

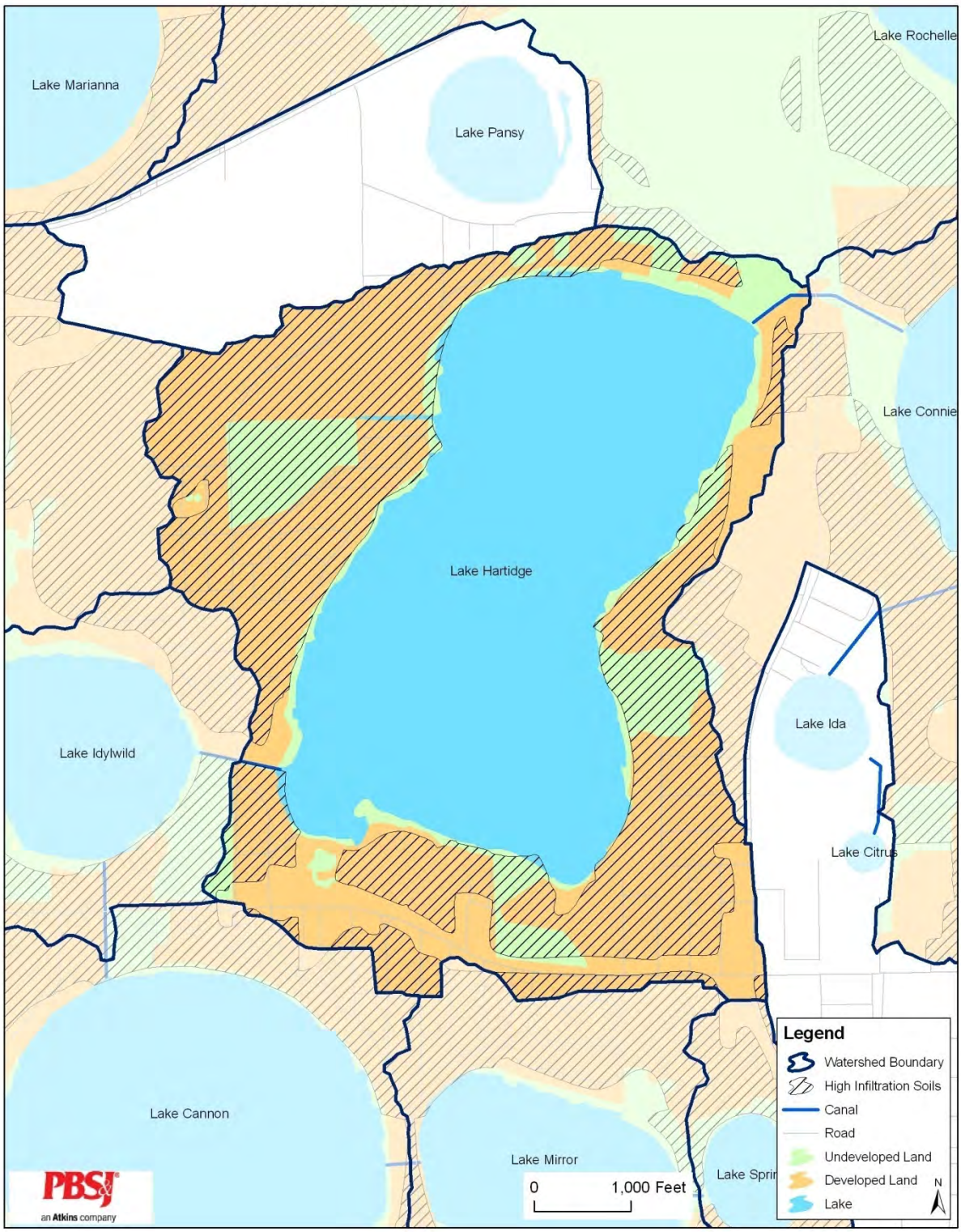


Photo 4-9. Lake Hartridge Stormwater Treatment Project.

Figure 4-31. Lake Hartridge chlorophyll *a* concentrations and *Hydrilla* treatment history using available data from 1983 to 2007.

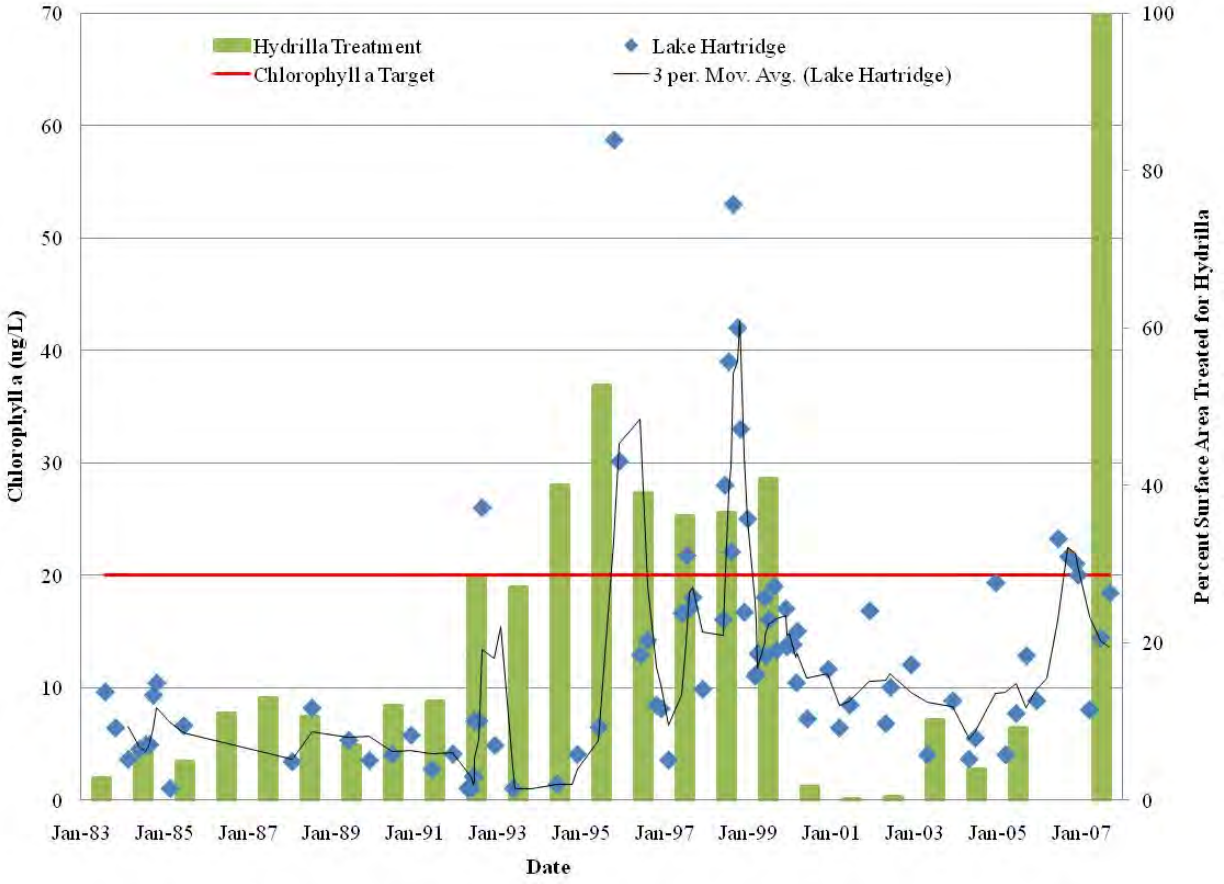
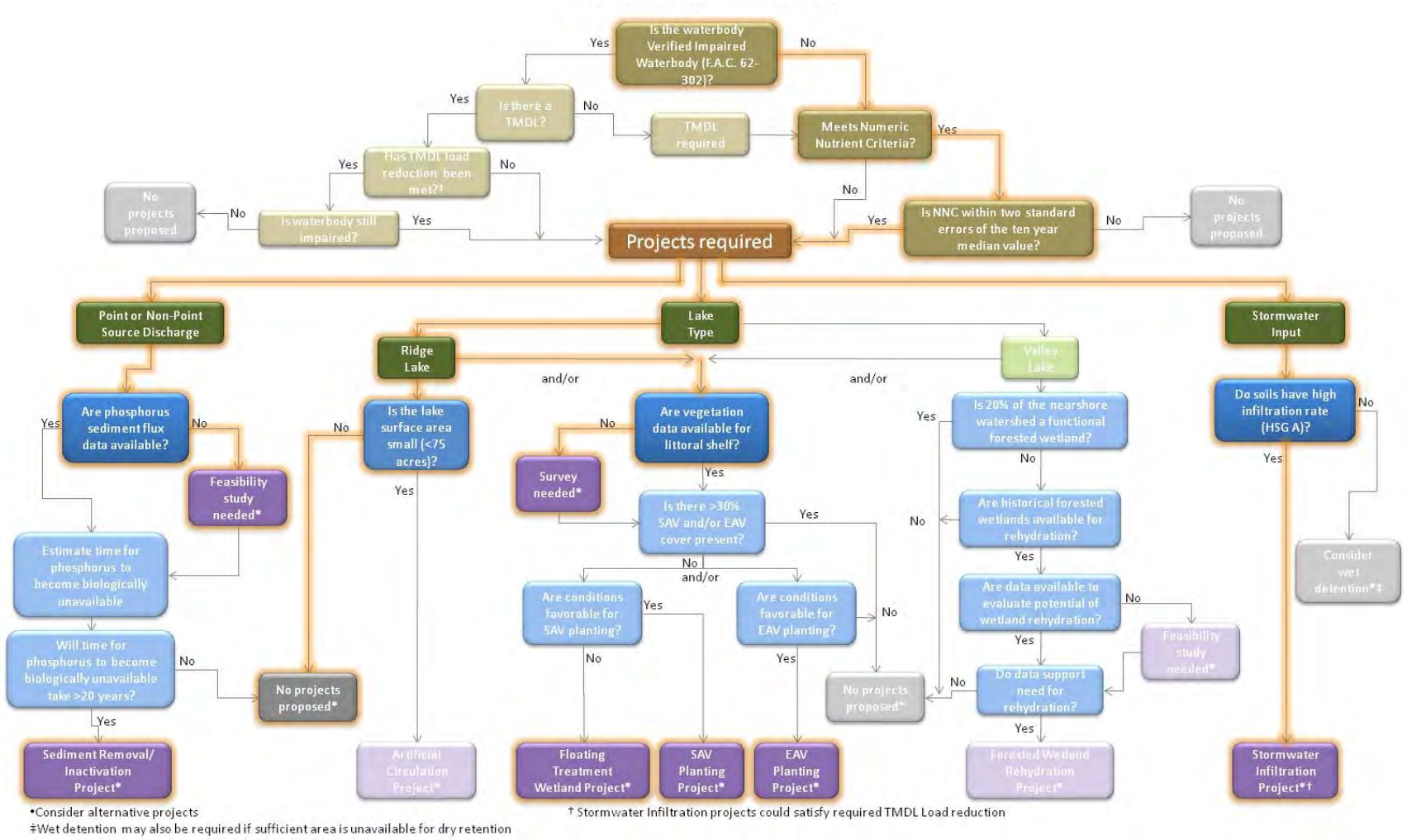


Figure 4-32. Lake Hartridge bathymetry (October 2006) at water level elevation = 131 feet (Polk County Water Atlas).

Figure 4-33. Lake Hartridge decision key: highlighted path shows decision process.



•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

Project 1: Stormwater Infiltration Areas (SIAs)

The Lake Hartridge watershed has approximately 391 acres (77 percent of the watershed) classified as high infiltration soils. A TMDL is not required for Lake Hartridge due to the unimpaired status; therefore; SIA acres estimates were calculated using data from the PLRG (USF 2005). The SIA estimate for Lake Hartridge was 10 acres (approximately two percent of the watershed) to meet a 19 percent PLRG. The TP geometric mean for Lake Hartridge is below the NNC; therefore, acres of SIA estimated to meet the TP NNC were not calculated.

Project 2: Sediment Removal/Inactivation

Non-point source discharges to Lake Hartridge 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: SAV Planting or FTWs

SAV Planting

Hydrilla infestations have been a chronic problem in Lake Hartridge. A survey of existing SAV cover in Lake Hartridge 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.

The 1997-2007 median secchi depth for Lake Hartridge was 3.3 feet indicating that SAV plants should not be planted in water depths greater than 4 feet. The maximum planting effort could result in vegetation cover of approximately 18 percent of the lake bottom (83 acres).

Cost Estimate: $400,000 (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 Hartridge 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 4: EAV Planting

A survey of existing EAV surrounding Lake Hartridge is recommended due to the lack of sufficient data at this time. Based on the results of the survey, conclusions and recommendations regarding emergent aquatic or woody vegetation planting can be determined. If limited EAV 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.