4.19. Lake Rochelle

Background

Physical and chemical characteristics specific to Lake Rochelle are presented here in the context of relevant regulatory criteria and requirements (Table 4-38). Lake Rochelle (WBID 1488B) is located in the WHCL Northern Chain and is hydrologically connected to lakes Conine and Haines via constructed navigable canals (Photo 4-22, Figure 4-77). In 2005, Lake Rochelle was declared verified impaired based on elevated TSI values (>60). A TMDL is required for Lake Rochelle to calculate load reductions necessary to satisfy the TSI criteria. The TP, TN, and chlorophyll *a* geometric means for Lake Rochelle for the period of 1997 to 2007 and corresponding EPA NNC water quality targets are listed in Table 4-39. To comply with the NNC, concentration reductions of 37 percent for TP, 7 percent for TN and 22 percent for chlorophyll *a* are required.

A summary of water quality statistics for Lake Rochelle is presented in Table 4-39. Median chlorophyll *a*, TN and TP concentrations exceed the NNC targets provided by EPA for Lake Rochelle. Chlorophyll *a* concentrations in Lake Rochelle have fluctuated but have remained consistently elevated above 20 µg/L (Figure 4-78). A statistically significant trend in chlorophyll *a* concentrations from 1986 to 2007 was not observed (seasonal Kendall-Tau, $p > 0.10$). Multiple *Hydrilla* eradication projects have been completed in the past several years, with greater than 60 percent of the lake being treated in 2002 and 2006. No water quality improvement projects have been implemented in Lake Rochelle to restore water quality. Lake Rochelle is adjacent to a headwater lake; therefore, improvements in water quality of the lake could result in benefits farther downstream.

The Lake Rochelle watershed is 1,162 acres in size and includes 290 acres (25 percent) of developed lands compared to 872 acres (75 percent) of undeveloped lands. The 2000-2007 median color value (25 PCU) was below 40 PCU indicating the lake is a clear (non-colored) lake and specific conductivity data indicate that the lake is alkaline. The lake area, perimeter, water depth, and volume statistics are based on a water level elevation of 128 feet in October 2005. Bathymetry data are available for Lake Rochelle for the October 2005 water level elevation (Figure 4-79). A water level of 126 feet was reported in August 2010, reflecting a 2.0 foot decrease in water elevation when compared to 2005. 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 Rochelle water quality and the surrounding watershed characteristics, five potential water quality restoration projects were identified using the WHCL WQMP decision key (Figure 4-80). 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 4-38. Physical, chemical, and regulatory characteristics of Lake Rochelle.

Physical			
Location in chain	Northern	**High infiltration soils (acres)**	580 (50 percent)
Relation to other lakes	Adjacent to Headwater	**Developed land (acres)**	290 (25 percent)
Watershed area (acres)	1,162	**Undeveloped land (acres)**	872 (75 percent)
Lake area (acres)*	583	**Median water depth (feet)***	11
Perimeter (feet)*	23,179	**Maximum water depth (feet)***	22.5
Surface area: lake volume ratio*	0.09	**Volume (acre-feet)***	6,758
Watershed to surface area ratio*	1.99		
Water Chemistry			
Locally-derived: acidic or alkaline	Alkaline	**Clear or colored**	Clear
Geometric mean chlorophyll *a* (µg/L)	26	**NNC chlorophyll *a* target (µg/L)**	20
Geometric mean TN (mg/L)	1.07	**NNC TN target (mg/L)**	1.00
Geometric mean TP (mg/L)	0.047	**NNC TP target (mg/L)**	0.030
Regulatory Data			
Impaired	Yes	**TMDL status**	Required
Chlorophyll *a* trend	No trend**	**TP concentration reduction required**	37 percent

*at a water level elevation of 128 feet
**presented in section 5.0

Photo 4-22. Lake Rochelle.

Table 4-39. Lake Rochelle water quality summary for 1997 to 2007.

Parameter	N	Minimum	Median	Maximum
Chlorophyll *a* (µg/L)	177	3	30	74
Color (PCU)	51	10	25	135
Conductivity (µmhos/cm)	49	182	229	274
Dissolved oxygen (mg/L)	49	5.72	8.26	12.32
pH	49	7.03	7.96	8.98
Secchi depth (feet)	180	1.4	2.4	8.6
Total nitrogen (mg/L)	182	0.371	1.07	1.71
Total phosphorus (mg/L)	174	0.010	0.050	0.105

Figure 4-77. Lake Rochelle and associated watershed.

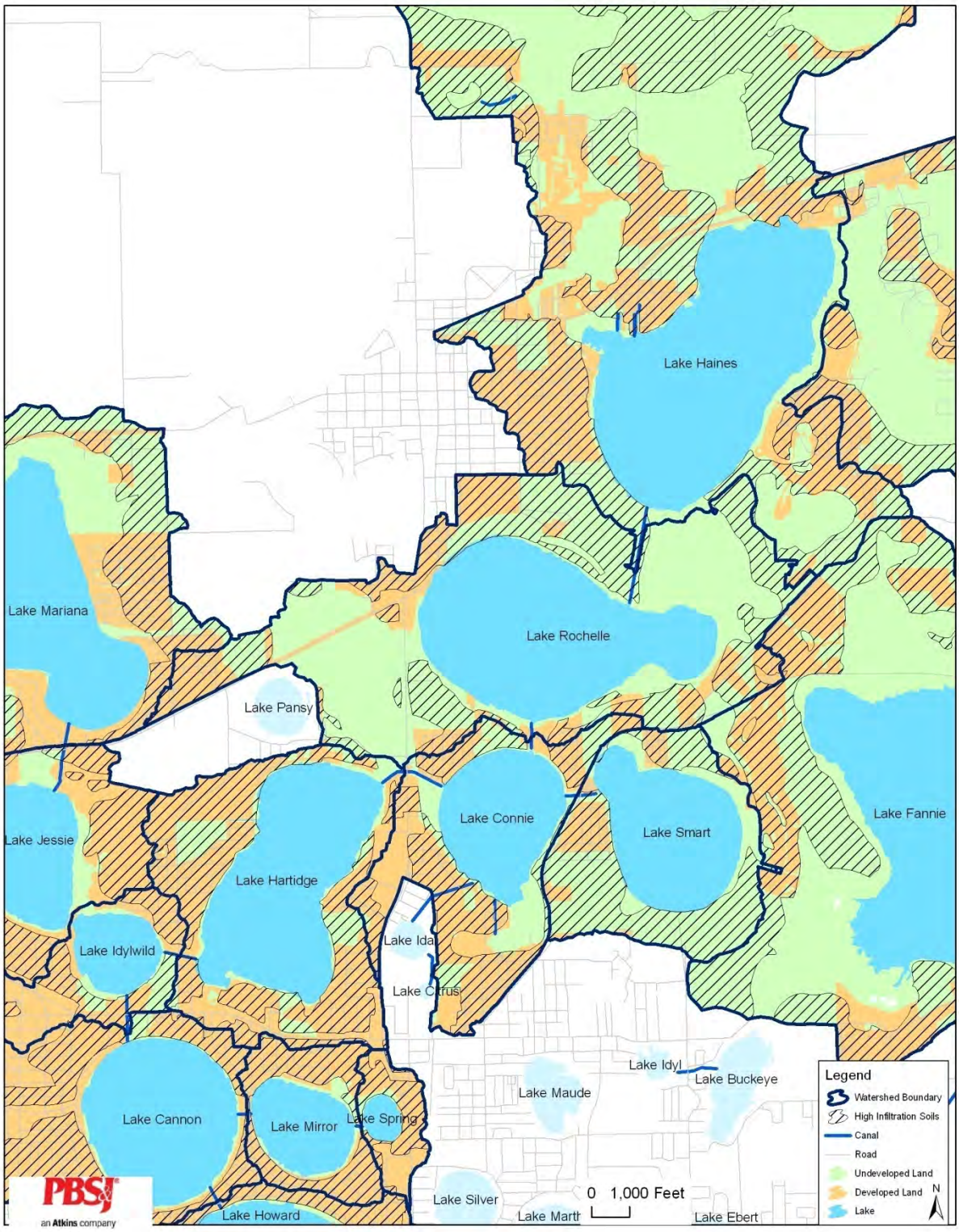


Figure 4-78. Lake Rochelle chlorophyll *a* concentrations and *Hydrilla* treatment history using available data from 1986 to 2007.

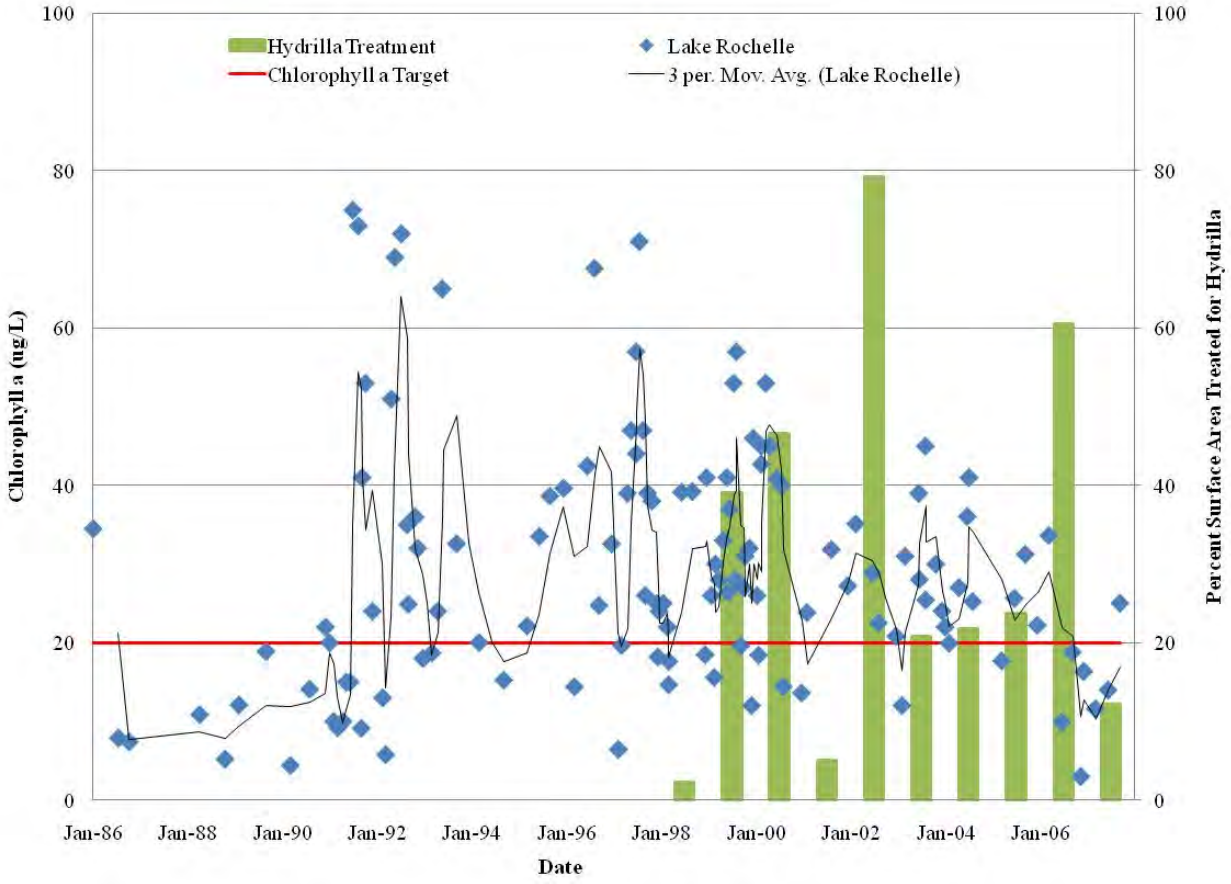
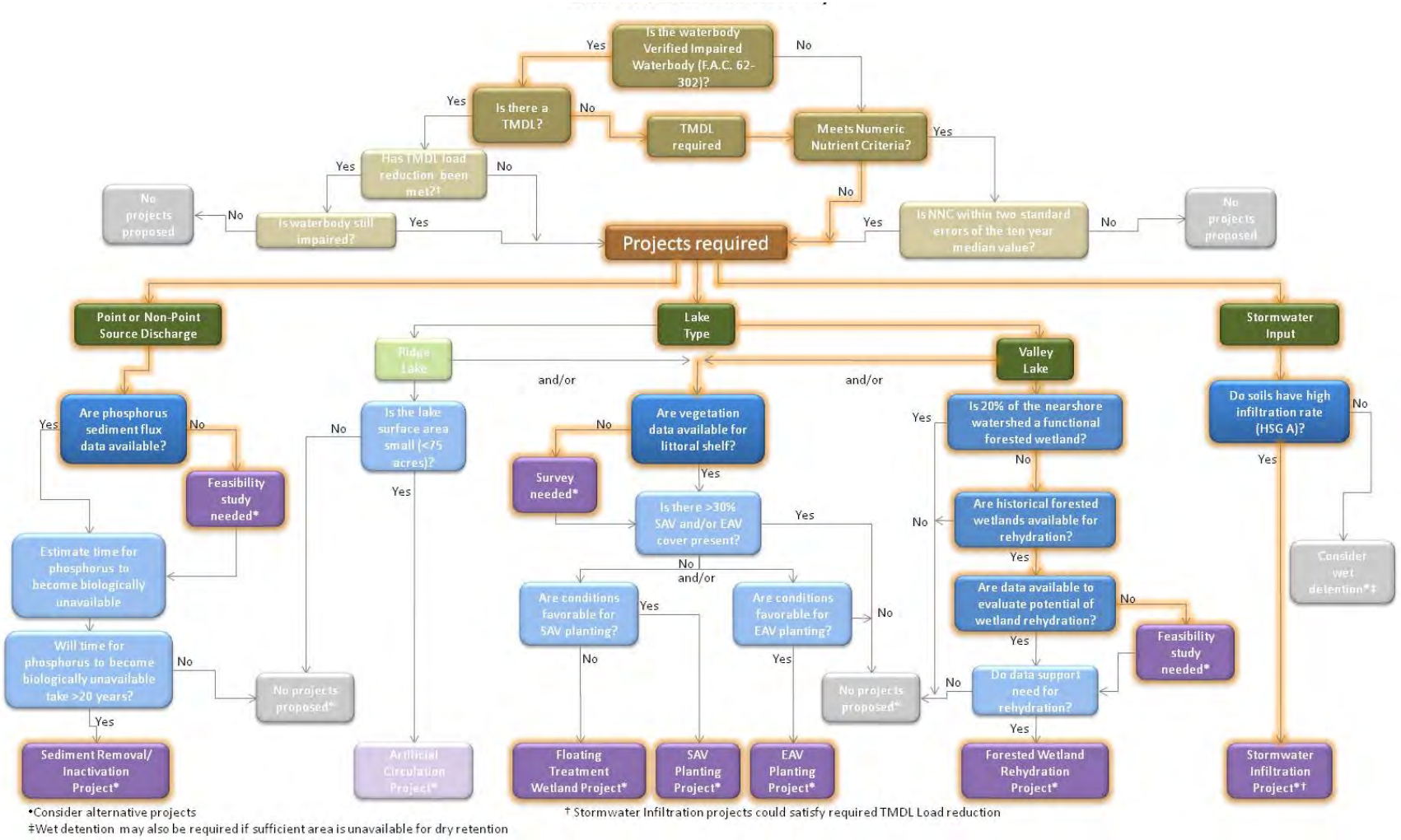


Figure 4-79. Lake Rochelle bathymetry (October 2005) at water level elevation = 128 feet (Polk County Water Atlas).

Figure 4-80. Lake Rochelle decision key: highlighted path shows decision process.



Project 1: Stormwater Infiltration Areas (SIAs)

The Lake Rochelle watershed has approximately 580 acres (50 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 Rochelle 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 Rochelle 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 35 percent of the land cover within the 500 foot buffer surrounding Lake Rochelle is classified as wetlands using the 2006 FLUCS data. Forested wetlands encompass 19 percent of the total wetland area, which is within the 10 to 20 percent recommended forested wetland cover required to maintain color levels above 50 PCU. While FLUCS classifies the land cover as forested wetland, the hydrologic connection between the lake and adjacent land might not be present as is observed along the northern rim of the Lake.

Two proposed project area were identified adjacent to Lake Rochelle are expected to rehydrate approximately 310 acres (Figure 4-81). The feasibility study is recommended in order to evaluate the proposed project area for inundation.

Feasibility study cost estimate: $100,000.

Figure 4-81. Proposed forested wetland rehydration project areas for Lake Rochelle.

Project 4: SAV Planting or FTWs

SAV Planting

In Lake Rochelle, *Hydrilla* eradication occurs frequently attributing to the continued degradation in water quality. A survey of existing SAV cover in Lake Rochelle 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 (2.4 feet). The maximum planting effort could result in vegetation cover of approximately 4 percent of the lake bottom (26 acres).

Cost Estimate: $120,000 (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 Rochelle 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 Rochelle 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.