4.2. Lake Cannon

Background

Physical and chemical characteristics specific to Lake Cannon are presented here in the context of relevant regulatory criteria and requirements (Table 4-3). Lake Cannon (WBID 1521H) is located in the Southern Chain of the WHCL and is hydrologically connected to lakes Idylwild, and Howard via constructed navigable canals and fixed structures to Lake Blue (Photo 4-2, Figure 4-5) and Deer. In 2005, Lake Cannon was declared verified impaired based on elevated TSI values (>60), indicating a nutrient impairment. A TMDL was adopted for the Southern Chain of the WHCL, including Lake Cannon (FDEP 2007), and Lake Cannon was subsequently delisted from impairment by FDEP in 2010. Based on the modeled external TP load to Lake Cannon, a 54 percent reduction in TP load (137 kg TP/year) is required to comply with the TSI criteria of 60 (FDEP 2007). The TP, TN, and chlorophyll *a* geometric mean for Lake Cannon for the period of 1997 to 2007 and corresponding EPA NNC water quality targets are listed in Table 4-3. To comply with the NNC, concentration reductions of 17 percent for TP, 11 percent for TN, and 26 percent for chlorophyll *a* are required.

A summary of water quality statistics for Lake Cannon is presented in Table 4-4. The median chlorophyll *a*, TN and TP concentrations exceed the NNC targets provided by EPA for Lake Cannon. Chlorophyll *a* concentrations in Lake Cannon have fluctuated but have remained consistently elevated above 20 µg/L (Figure 4-6). However, a statistically significant decline in chlorophyll *a* concentrations from 1983 to 2007 was observed (seasonal Kendall-Tau, p=0.0037). Abundant *Hydrilla* populations are commonly found on Lake Cannon resulting in frequent eradication efforts (greater than 60 percent of the lake surface area was treated in 2005). A stormwater alum treatment improvement projects has been implemented in Lake Cannon to restore water quality. Lake Cannon is located in the middle of the southern chain of lakes; therefore, improvements in water quality of the lake could result in benefit farther downstream.

The Lake Cannon watershed is 746 acres in size and includes 712 acres (95 percent) of developed lands compared to 35 acres (5 percent) of undeveloped lands. The 2000-2007 median color value (17 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 June 2007. Bathymetry data are available for Lake Cannon for the June 2007 water level elevation (Figure 4-7). A water level of 130 feet was reported in July 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 Cannon water quality and the surrounding watershed characteristics, four potential water quality restoration projects were identified using the WHCL WQMP decision key (Figure 4-8). 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 4-3. Physical, chemical, and regulatory characteristics of Lake Cannon.

Physical			
Location in chain	Southern	**High infiltration soils (acres)**	501 (67 percent)
Relation to other lakes	Intermediate	**Developed land (acres)**	712 (95 percent)
Watershed area (acres)	746	**Undeveloped land (acres)**	35 (5 percent)
Lake area (acres)*	335	**Median water depth (feet)***	9.9
Perimeter (feet)*	16,440	**Maximum water depth (feet)***	16.6
Surface area to lake volume ratio*	0.10	**Volume (acre-feet)***	3,486
Watershed to surface area ratio*	2.23		
Water Chemistry			
Locally-derived: acidic or alkaline	Alkaline	**Clear or colored**	Clear
Geometric mean chlorophyll *a* (ug/L)	27	**NNC chlorophyll *a* target (ug/L)**	20
Geometric mean TN (mg/L)	1.12	**NNC TN target (mg/L)**	1.00
Geometric mean TP (mg/L)	0.036	**NNC TP target (mg/L)**	0.030
Regulatory Data			
Impaired	Yes	**TMDL status**	Required†
Chlorophyll *a* trend	Decreasing	**TP concentration reduction required**	17 percent

*at a water level elevation of 129 feet
**presented in section 5.0
† TMDL adopted

Photo 4-2. View from western shoreline of Lake Cannon.

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

Parameter	N	Minimum	Median	Maximum
Chlorophyll *a* (µg/L)	287	6	28	73
Color (PCU)	158	5	17	35
Conductivity (µmhos/cm)	98	190	217	285
Dissolved oxygen (mg/L)	98	5.25	8.35	11.46
pH	98	6.2	8.06	9.43
Secchi depth (feet)	321	1.2	2.1	6.4
Total nitrogen (mg/L)	314	0.53	1.08	1.92
Total phosphorus (mg/L)	307	0.003	0.043	1.82

Figure 4-5. Lake Cannon and associated watershed.

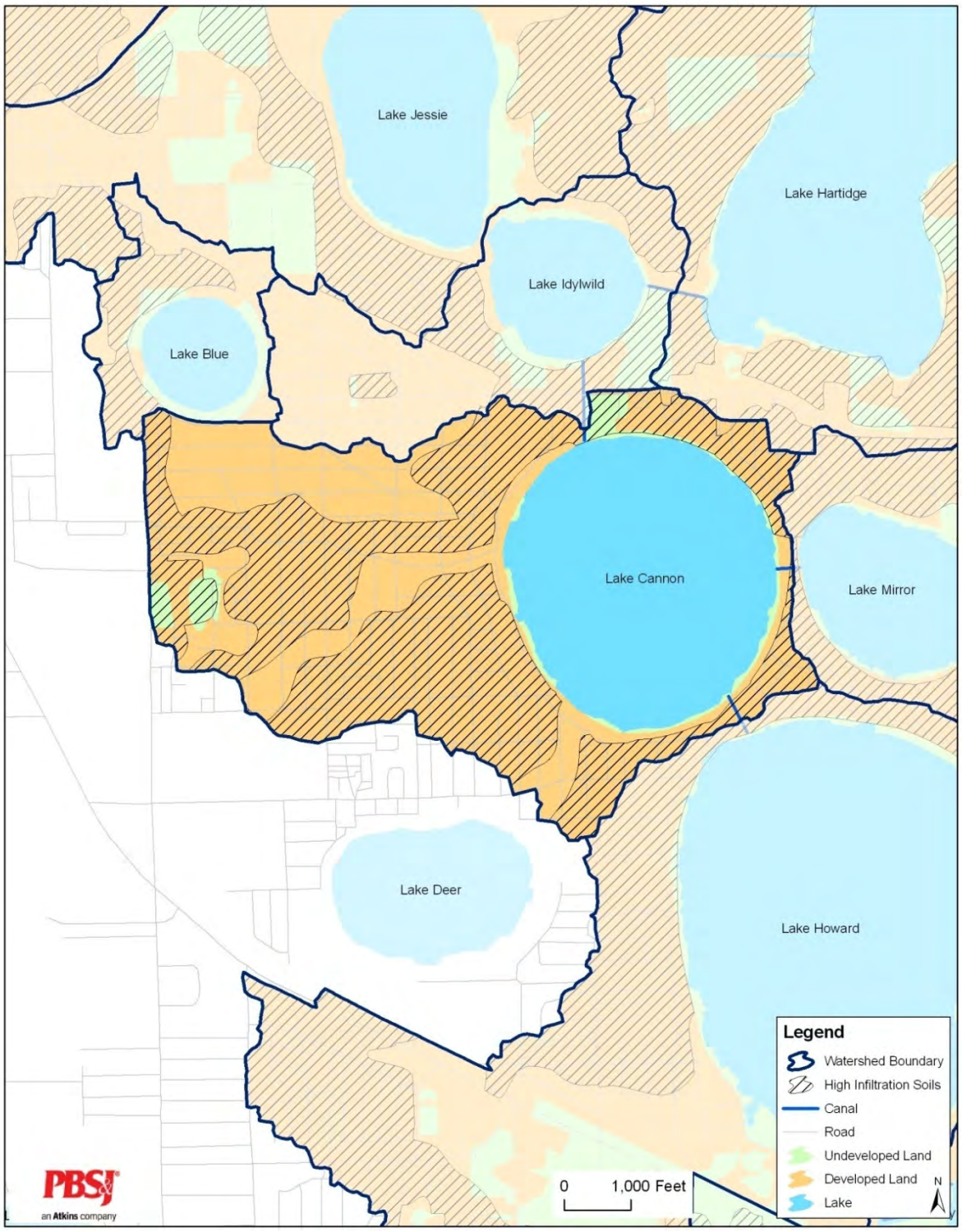


Figure 4-6. Lake Cannon chlorophyll *a* concentrations and *Hydrilla* treatment history using available data from 1983 to 2007.

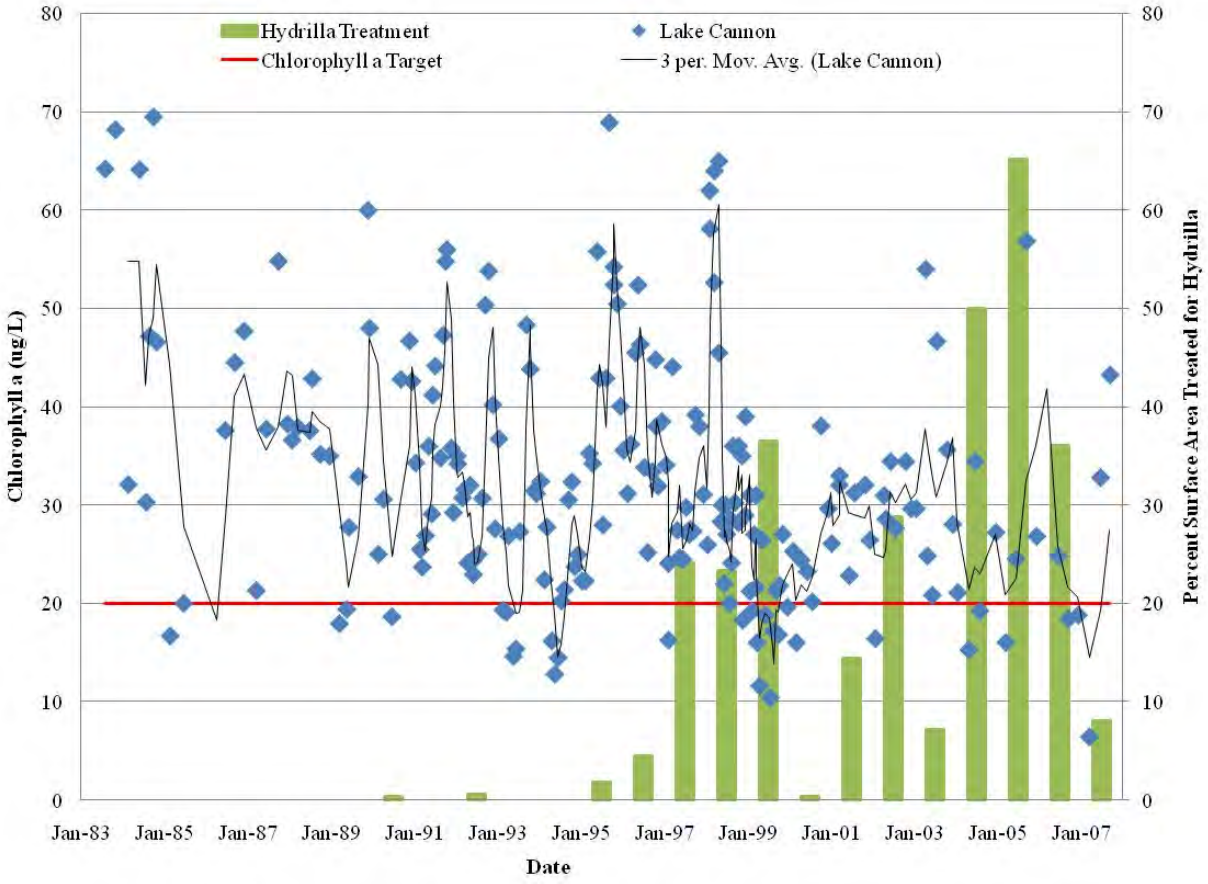


Figure 4-7. Lake Cannon bathymetry (June 2007) at water level elevation = 129 feet (Polk County Water Atlas).

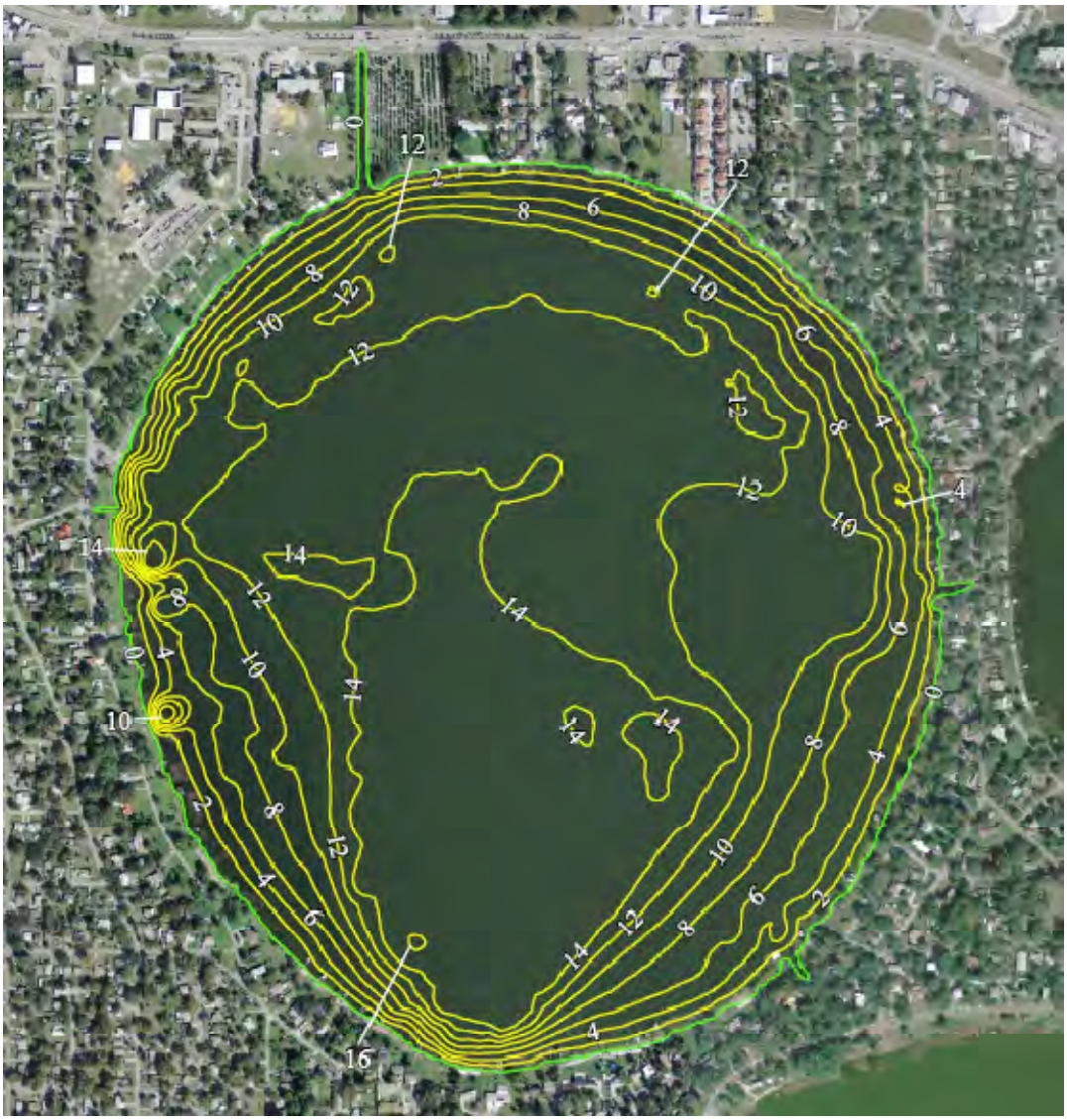
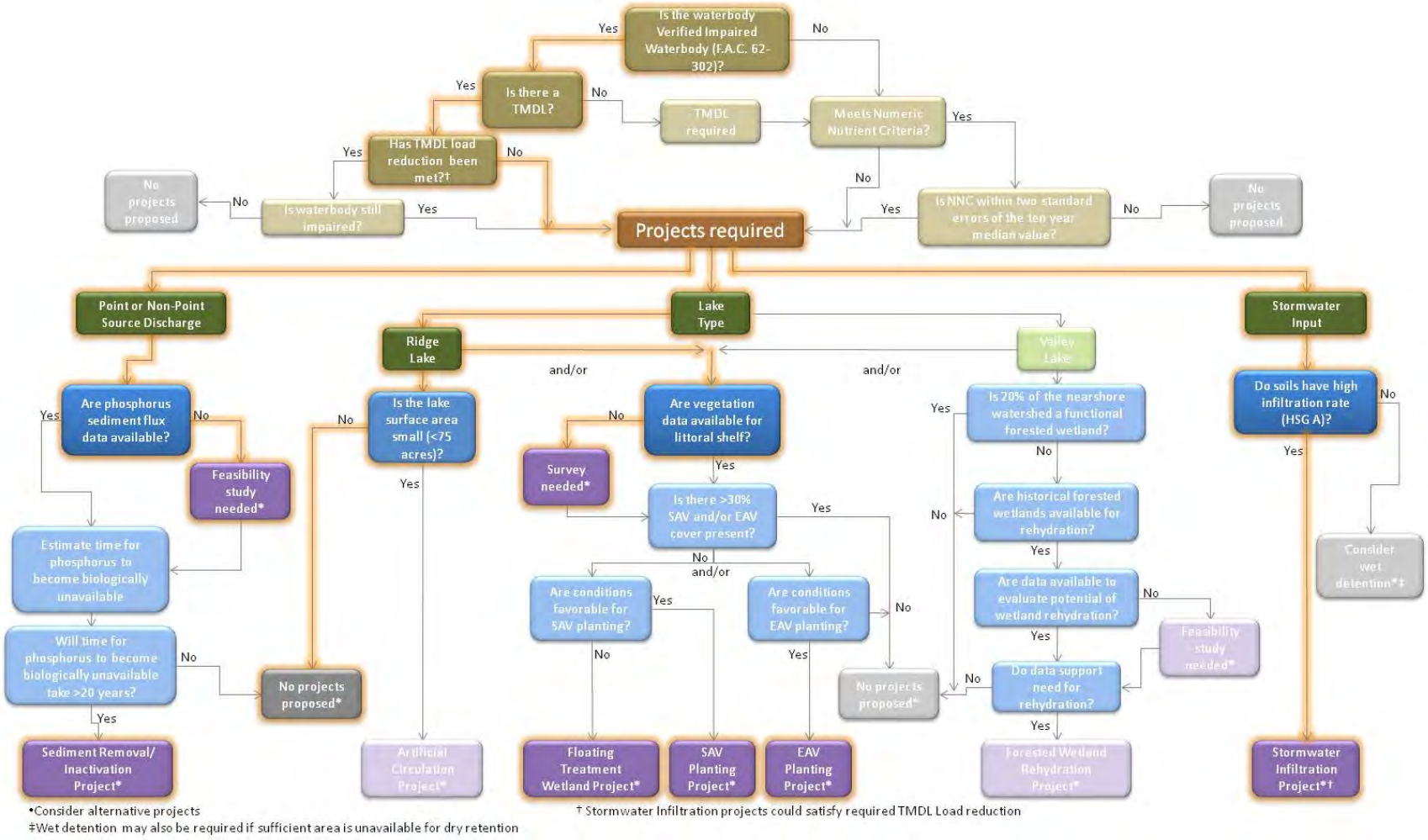


Figure 4-8. Lake Cannon decision key: highlighted path shows decision process.



Project 1: Stormwater Infiltration Areas (SIAs)

The Lake Cannon watershed has approximately 501 acres (67 percent of the watershed) classified as high infiltration soils. A TMDL has been established for Lake Cannon, and as such, the SIA design should be focused on satisfying the TMDL requirements. SIA projects would need to encompass approximately 9 percent (65 acres) of the watershed in order to accomplish an annual 137 kg reduction in TP loads to Lake Cannon. Acres of SIA estimated to meet the TP NNC was 24 (3 percent of the watershed) for a 17 percent phosphorus reduction in Lake Cannon to meet its NNC. Sixty-seven percent of the watershed is characterized by high infiltration soils; therefore, it may be feasible to satisfy the TMDL or NNC load reductions through SIA implementation.

Project 2: Sediment Removal/Inactivation

Non-point source discharges to Lake Cannon 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

In Lake Cannon, as much as 65 percent of the lake surface has been treated for *Hydrilla* eradication. A survey of existing SAV cover in Lake Cannon 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.

The median secchi depth from 1997-2007 in Lake Cannon was 2.1 feet so SAV should not be planted in water depths greater than 2 feet. The maximum planting effort could result in vegetation cover of approximately 5 percent of the lake bottom (18 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 Cannon 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 Cannon is recommended due to the lack of sufficient data at this time. Based on the results of the EAV 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.