SOUTH WASHINGTON WATERSHED DISTRICT

Colby Lake

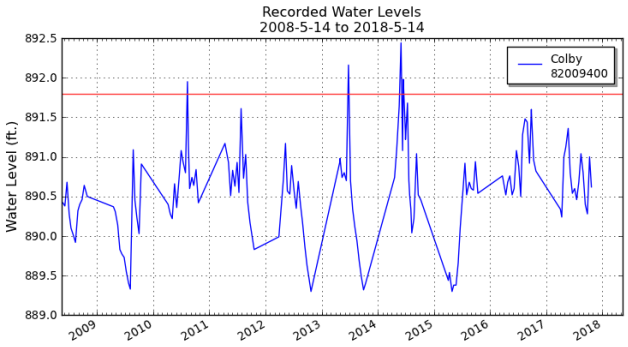
DNR ID #82-0094	Municipality: Woodbury
Surface Area: 68 Acres	Watershed Area: 2,839 Acres
Mean Depth: 7 feet	Maximum Depth: 11 feet
SWWD Maximum Allowable Phosphorus Load: 0.34 lbs/ac/yr	
SWWD Trophic State Index (TSI) Goal: 70-73	

Map 1: Colby Lake

Colby Lake (Map 1) is an approximately 70-acre lake located in the City of Woodbury within southern Washington County. Washington County is located within the Minneapolis-St. Paul metropolitan area of eastern Minnesota. The Colby Lake watershed is situated in the North Central Hardwood Forests ecoregion, though the lake itself is in close proximity to the boundary with the Western Corn Belt Plains ecoregion. Colby Lake is part of a multi-lake system; receiving water from Wilmes Lakes to its north and contributing water downstream to the Bailey wetland. The total cumulative drainage area into Colby Lake is 10.6 square miles, 6.3 of which come through Wilmes Lake. The remaining 4.3 square miles of the drainage area contributes water directly into Colby Lake either through direct runoff or through a series of stormwater infrastructure. Collectively, these lakes make up the majority of SWWD's Northern Watershed (NWS) which is dominated by newer suburban development.

The outlet of Colby Lake is controlled by a 10-foot long weir with a crest elevation at 890.30 MSL (NGVD 29) and an ordinary high water level has been established at 891.8 MSL. Since 1980, lake levels have fluctuated by a maximum of 5 feet, averaging to within a foot and a half of the weir elevation (Figure 1).

Figure 1: Colby Lake Surface Elevation



The fishery within the lake is managed through the DNR's Fishing in the Neighborhood (FiN) program with the goal of providing shorefishing opportunities in the City of Woodbury. The most recent

fisheries report for Colby Lake prepared by the MnDNR in 2015 indicates the vast majority of fish in Colby Lake were black bullhead (*Ameiurus melas*). Additional species present include: black crappie (*Pomoxis nigromaculatus*), bluegill (*Lepomis macrochirus*), pumpkinseed (*Lepomis gibbosus*), hybrid sunfish (*Lepomis sp*.), largemouth bass (*Micropterus salmoides*), northern pike (*Esox lucius*), yellow perch (*Perca flavescens*), and white sucker (*Catostomus commersonii*). Colby Lake has been managed through FiN since 2002 and was stocked in 2002-2003 with black crappie and bluegill, in 2005 with northern pike, bluegill and yellow perch, and in 2008 with northern pike and yellow perch. Further, the DNR stocked channel catfish in 2012 and 2013 in partnership with SWWD and the City of Woodbury. Larger catfish are beginning to show up in the survey. SWWD and the City committed to aerating the lake throughout the winter to maintain oxygen levels while the DNR will continue to stock catfish as a means to controlling bullhead in the lake which stir up the lake bottom causing increased nutrient cycling and more frequent algal blooms. Fish consumption guidelines of once per week have been placed on crappie and northern pike due to mercury.

A vegetation survey of Colby Lake was completed in 2015. 88% of the lake is vegetated with on 16% of the lake having vegetation to the surface. The lake does have Eurasian watermilfoil and curly leaf pondweed, invasive, non-native species.

Colby Lake has been a poor water quality lake since CAMP monitoring began in 1994, exceeding state eutrophication standards and grading at a D or F in every year, including 2017. The last 20 years of lake grades is included in Table 1. There are no clear or significant trends (figs 2-4), as Colby Lake has relatively high year to year fluctuations in water quality, and at times has met SWWD interim TSI goals including the last few years. As a result of generally poor water quality at Colby Lake, nuisance algal conditions generally occur throughout the growing season and restrict recreational opportunities.

Several factors may be contributing to the high variability in water quality at Colby Lake. First, Colby Lake has a short residence time. Under typical hydrologic conditions, the water in Colby Lake is replaced nearly once per month. Because of this short residence time, the Colby Watershed has a much more acute impact on the Lake than other District lakes. Second, Colby Lake is infested with curly leaf pondweed, and invasive species. Curly leaf pondweed can cause short term variation in water quality when plants die and send a pulse of nutrients into the water column. Finally, the fish community in Colby Lake is dominated by bullheads that may increase internal lake loading by disturbing the lake bottom. Taken together, we believe that high variability in water quality observed at Colby Lake is strongly influenced by annual variations in rainfall volume and intensity, snowfall cover (curly-pondweed abundance), and fish community.

Figure 2: In-lake Total Phosphorus Concentration at Colby Lake

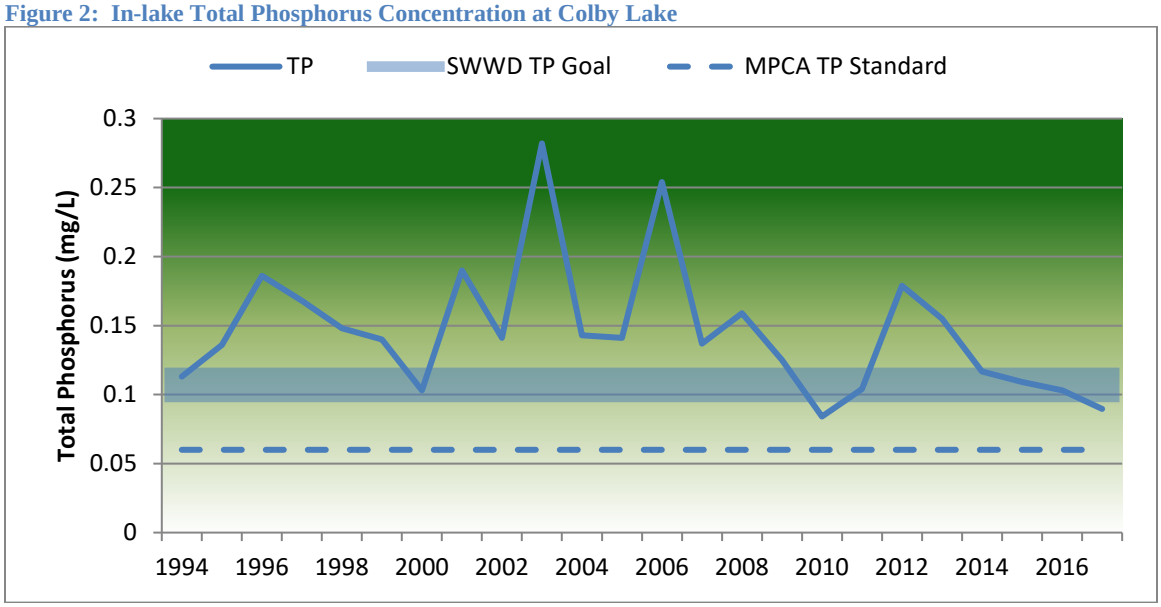


Figure 3: In-lake Chlorophyll a Concentration at Colby Lake

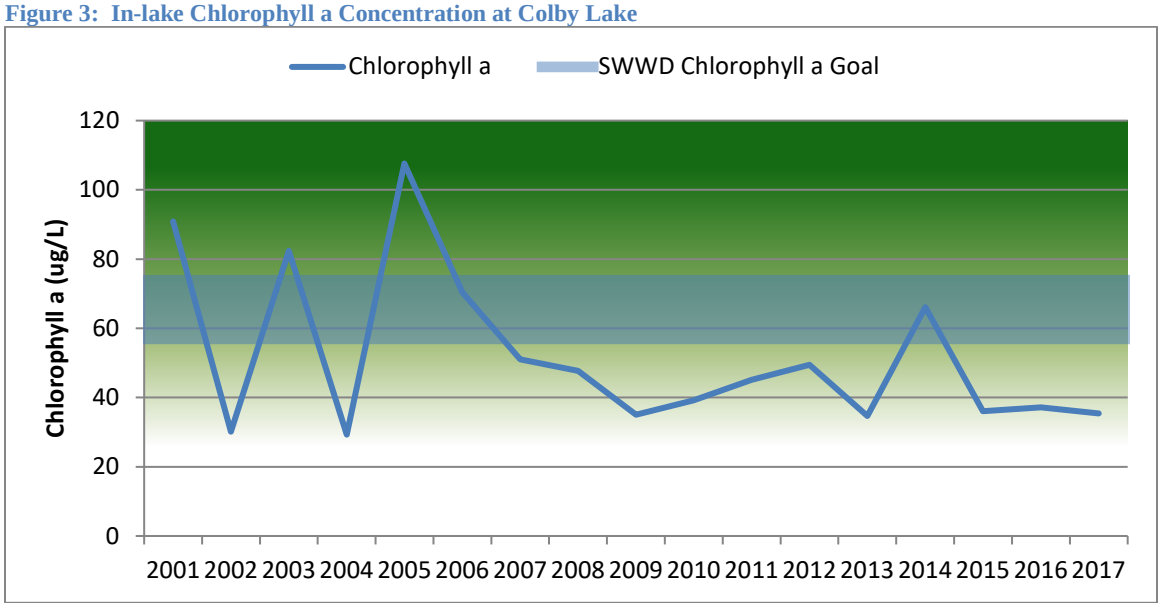


Figure 4: Secchi Transparency for Colby Lake

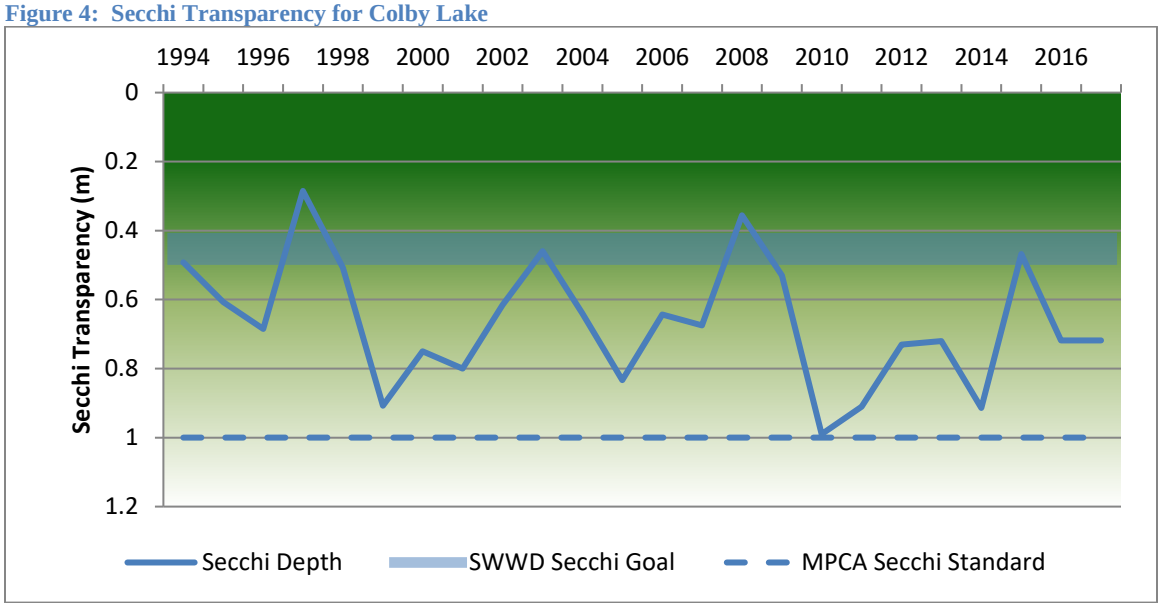


Table 1: Annual Lake Grades for Colby Lake

		Lake Grade																				
Parameter	Tophic Status	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
Total Phosphorus	68; hyper-eutrophic	F	F	D	D	F	F	F	D	D	F	D	F	D	D	D	F	F	D	D	D	D
Chlorophyll	66; eutrophic	C	F	F	D	F	C	D	C	F	F	D	D	C	C	C	C	C	D	C	C	C
Secchi Transparency	65; eutrophic	F	F	D	D	D	F	F	F	D	F	F	F	F	D	D	D	D	D	F	D	D
Overall	Eutrophic	D	F	D	D	F	D	F	D	D	F	D	F	D	D	D	D	D	D	D	D	D

Note: Lake grades are based on comparison with other lakes in the Minneapolis-St. Paul metropolitan area. Criteria for assigning lake grades are established by the Metropolitan Council.

SWWD completed its Colby Lake Management Plan in 2011 which included extensive modeling of the Colby Lake watershed and the lake itself. That modeling showed that phosphorus loading to Colby Lake needed to be reduced by approximately 50% in order to routinely meet State water quality standards. Subsequently, SWWD worked with the Washington Conservation District to identify priority projects within the Colby Lake watershed which should provide the most cost-effective solutions for reducing the phosphorus load to the lake. Additional information about the management plans is available at www.swwdmn.org. Improvements completed by SWWD, the City of Woodbury, and Washington County since then are expected to reduce loading to the lake by over 35%. Most of the remaining phosphorus load reductions necessary to restore the lake will come from in-lake management of fish and vegetation communities and by working to restore Wilmes Lake upstream.

In addition to monitoring in-lake water quality of Colby Lake, SWWD periodically monitors loading from various parts of the Colby Lake watershed. Below, are data (Table 2) collected at the Colby West inlet which provides a measure of water quality leaving the Colby 1st residential neighborhood. The Colby 1st neighborhood has been the focus of extensive retrofit

implementation. Included in the table are results from 2009-2011 which serves as a baseline of water quality prior to implementation and 2015-2016. There are no significant trends. SWWD will continue to monitor the West inlet.

Table 2: Loading Summary for Colby West

Year	April-Oct Precipitation (in)	Runoff Yield (cu ft runoff/ in precip)	April-Oct TP (lbs)	TP Yield (lbs/in precip)	April-Oct TSS (lbs)	TSS Yield (lbs/in precip)	April-Oct Chloride (lbs)	Chloride Yield (lbs/in precip)
2009	19.4	113,819	29	1.5	18,285	945	478	25
2010	25.5	117,811	39	1.5	20,431	802	583	23
2011	18.5	168,736	36	2	38,576	2,082	1,766	95
2015	27.8	73,450	26	0.9	13,854	499	255	9
2016	31.5	77,514	32	1.0	11,886	376	307	10
2017	26	130,319	63	2.5	34,375	1,343	704	28

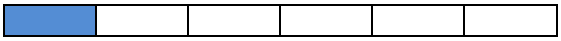
All SWWD monitoring data is available through SWWD's web database at http://wq.swwdmn.org/.

Summary of Restoration Efforts to Date

Upstream Watershed:

Immediate Watershed:

In-Lake:



Woodbury ROW Improvements (upstream): SWWD partnered with the City of Woodbury to retrofit an undersized stormwater pond adjacent to Wilmes Lake to include an Iron Enhanced Sand Filter to remove phosphorus from runoff. The project is expected to reduce upstream loading by approximately *10 kg/summer season*.

Interlachen Drive Reconstruction (upstream): SWWD partnered with the City of Woodbury to install bioretention basins within the Interlachen Drive right of way and retrofit an existing stormwater basin to provide irrigation water for Summit Pointe Park. The project is expected to reduce upstream loading by approximately 10 *kg/summer season*.

Wilmes Ravines (upstream): SWWD assisted the City of Woodbury in restoring/stabilizing two ravines and several ponds discharging into Wilmes Lake. Stormwater runoff through the ravines was causing high rates of sedimentation and nutrient loading in Wilmes Lake, and ultimately increasing the amount of nutrients flowing downstream to Colby Lake. This project is expected to reduce upstream loading by approximately *20 kg/summer season*.

Colby 1st Addition Roadway Rehabilitation (immediate): SWWD assisted the City of Woodbury in incorporating several water quality improvements into their 2012 Road project in the Colby 1st Addition neighborhood. Improvements included narrowing of multiple streets which results in less stormwater runoff, improvement of storm sewer inlets which will capture more sediment, and pond modifications that will result in increased treatment of stormwater before it discharges to the Lake. Together, the improvements should result in more than a *25 kg/summer season* reduction in phosphorus loading to the Lake.

Colby 1st Addition Neighborhood Raingardens (immediate): SWWD, City of Woodbury, and Washington Conservation District, with funding assistance from the State Clean Water Land and Legacy Amendment and cooperation and assistance of private residents in the Colby 1st neighborhood, installed 25 raingardens which will capture and treat runoff from private lawns and neighborhood streets. Though each garden is relatively small, they cumulatively will result in a significant phosphorus loading reduction to Colby Lake. Ultimately, the raingardens are expected to reduce loading by more than *5 kg/summer season.*

Eagle Valley Golf Course Water Re-Use System (immediate): SWWD, City of Woodbury, and Washington County are partnering to construct a stormwater re-use system at Eagle Valley Golf Course as part of the CSAH 19 reconstruction project. The project, partially funded through the MN Clean Water Land & Legacy Amendment is expected to reduce loading to Colby Lake by *25 kg/summer season*.

Ecological Improvements (in-lake): DNR has begun to stock the lake with channel catfish which over time will help control the over-abundant population of bullhead. Reduction in bullhead will ultimately reduce of sediment within the Lake and decrease internal nutrient loading. Along with these new stocking efforts, SWWD and City now aerate the Lake through the winter to prevent winter kill of desirable species.