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 21: Colby Lake

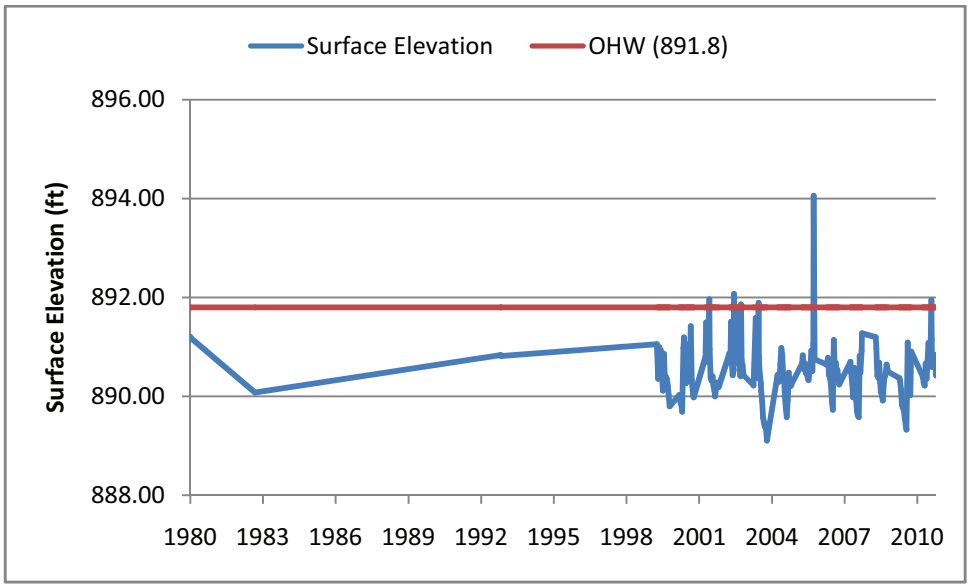
Colby Lake (Map 21) is located in the south-central portion of the Northern subwatershed. It receives flows from Wilmes Lake, so Colby Lake receives approximately 4,240 acres of additional upstream drainage. Almost the entire shoreline is owned by the City of Woodbury. A park is located at the south end of the lake. Although there is no fishing pier, the lake is actively stocked by the DNR.

Results

In Lake

Colby Lake surface elevation has been monitored since 1980 and is shown in Figure 45. Nine water quality samples were collected during the 2010 growing season at Colby Lake. Water quality results are shown in Table 34. Average annual growing season TP, chlorophyll a, and secchi transparency are shown in Figures 46-48. 2010 trophic status and historical lake grades are summarized in Table 33.

Figure 45: Colby Lake Surface Elevation, 1980-2010



Date	Secchi Depth (m)	Water Temperature (°C)	Pheopytin a Corrected Chlorophyll a (ug/L)	Trichromatic Uncorrected Chlorophyll a (ug/L)	TKN (mg/L)	TP (mg/L)
05/02/10	1.5	19.5	11	12	1.3	0.038
05/19/10	1.82	19.7	12	12	1.4	0.034
05/31/10	1.2	19.8	16	17	1.8	0.064
06/16/10	1	21	36	39	1.9	0.069
06/30/10	0.71	26	54	56	1.4	0.098
07/29/10	0.71	29.6	61	61	1.8	0.124
08/15/10	0.91	26.3	49	47	1.3	0.112
08/22/10	0.65	28.2	41	42	1.2	0.089
09/08/10	0.41		61	67	1.8	0.129

Table 34: Colby Lake 2010 Water Quality Results From the Met Council Citizen Assisted Monitoring Program (CAMP)

Figure 46: Colby Lake Historical Mean Growing Season Total Phosphorus Concentration

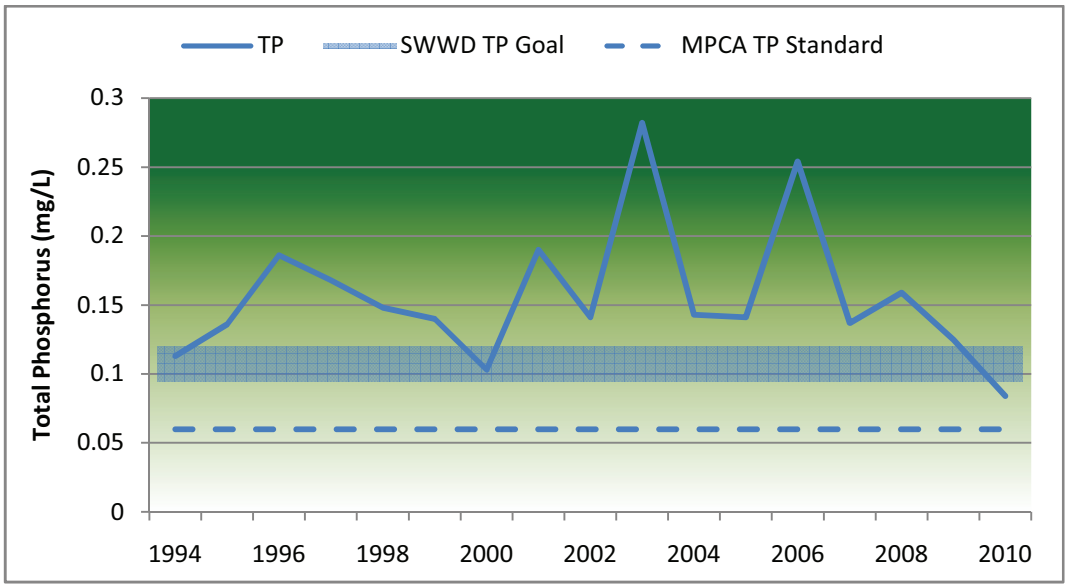


Figure 47: Colby Lake Historical Mean Growing Season Chlorophyll a[1] Concentration

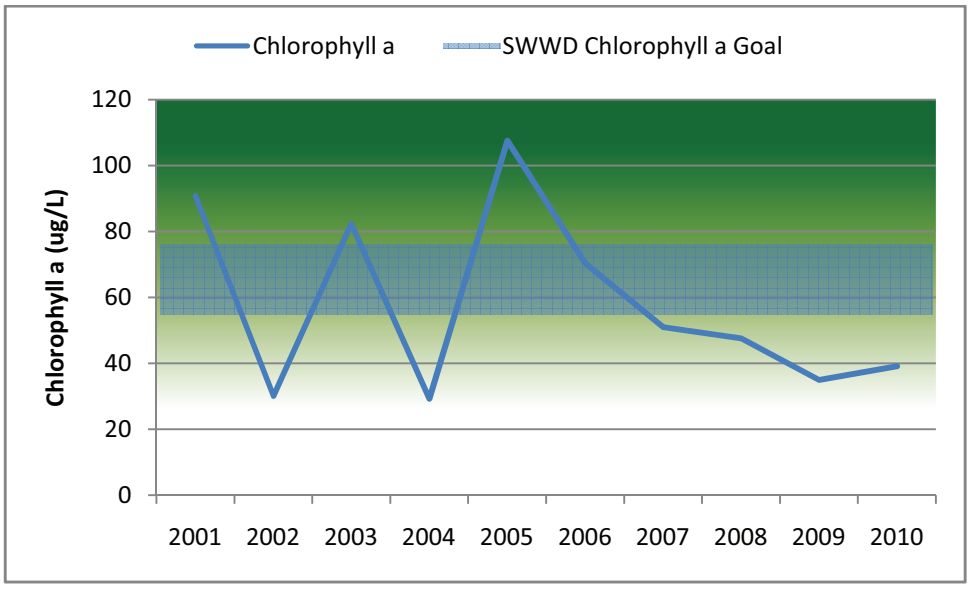
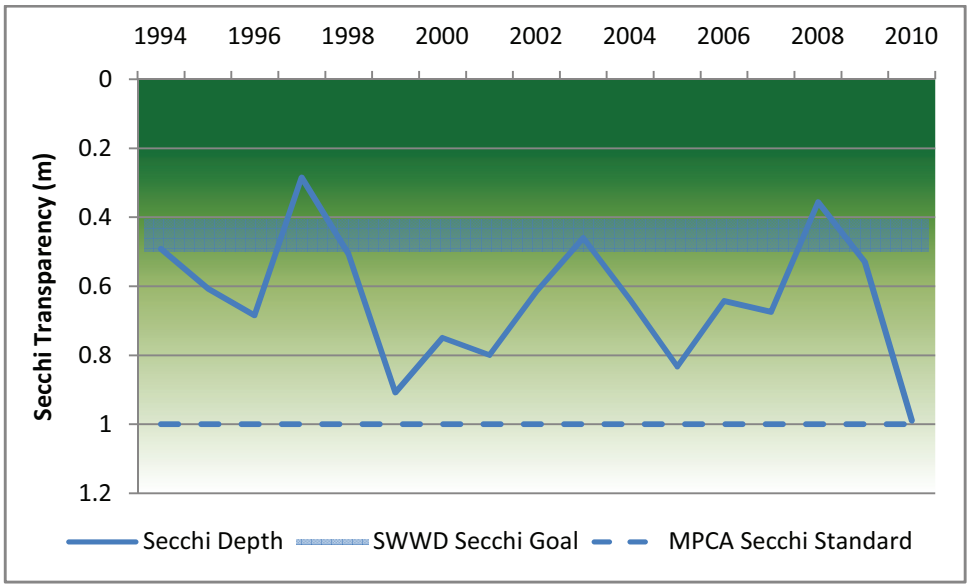


Figure 48: Colby Lake Historical Mean Growing Season Secchi Transparency



Parameter	Trophic Status	Lake Grades																
		94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10
Total Phosphorus	Eutrophic	D	D	F	F	D	D	D	F	D	F	D	D	F	D	F	D	D
Chlorophyll a	Eutrophic								F	C	F	C	F	D	D	C	C	C
Secchi Transparency	Eutrophic	F	F	F	F	F	D	D	D	F	F	F	D	F	F	F	F	D
Overall	Eutrophic	D	D	F	F	D	D	D	F	D	F	D	D	F	D	F	D	D

Table 35: Colby Lake 2010 Trohic Status and Historical Lake Grades

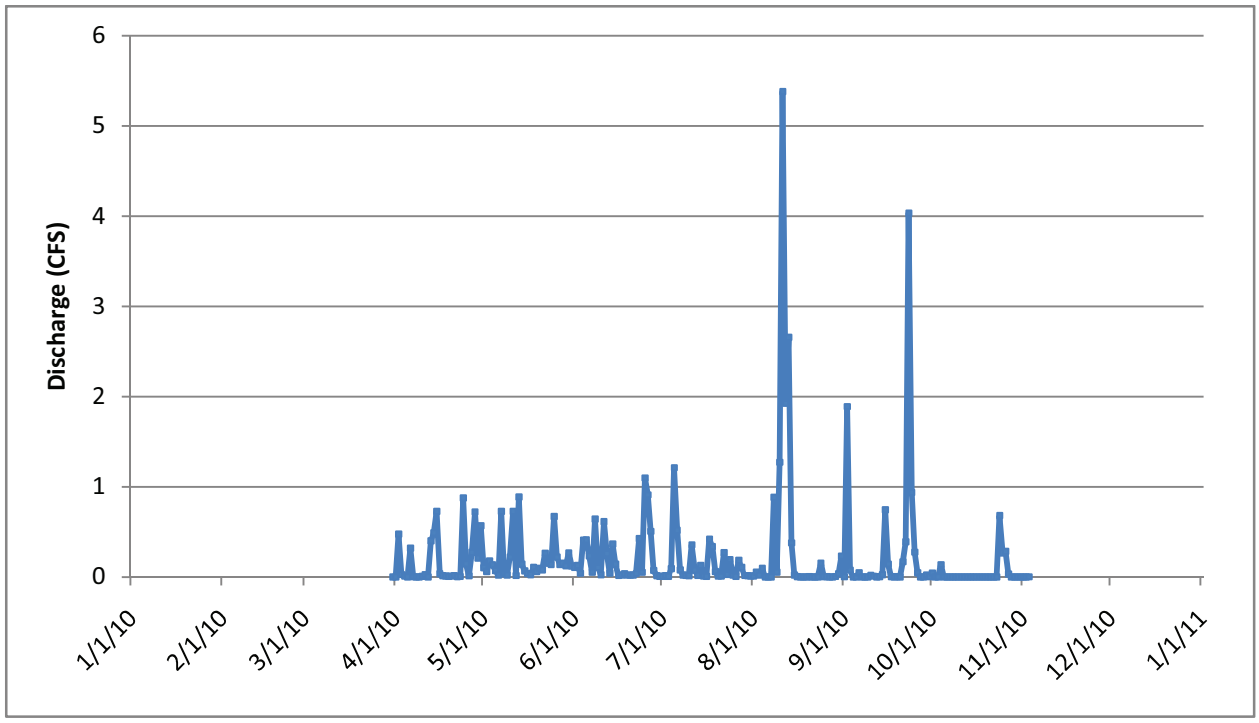
Colby West Inlet

Flow measurements were collected at the Colby West Inlet every 15 minutes from March 31 at 13:45 to November 3 at 10:15. Discharge was calculated using an area velocity relationship, which is the cross sectional area of the water channel as determined by the water level within the pipe multiplied by the measured velocity. Average daily discharge is shown in Figure .

Up to seven types of samples are collected at Regional Assessment Locations; snowmelt grab, snowmelt composite, baseflow grab, baseflow composite, stormflow grab, stormflow composite, and bacteria grab. In 2010, 1 snowmelt grab and 19 stormflow composite samples were collected at the Colby West Inlet. All samples were analyzed at the Metropolitan Council Environmental Services Lab for nutrients and metals. Water quality results are reported in Table 37.

The growing season loading summary is provided in Table 36. Reported values reflect the May 1-September 30 growing season. Additional year to year analyses are performed in odd monitoring years.

Figure 49: Colby West Inlet Average Daily Discharge



Year	Rainfall (inches)	Growing Season Runoff Volume (acre-feet)	Projected Annual Runoff Volume (acre-feet)	Total Phosphorus (lbs)	Total Phosphorus (lbs/ac/yr)	Total Suspended Solids (lbs)	Total Suspended Solids (lbs/ac/yr)
2010		77.56	91.16	34.6	0.09	24595	64

Table 36: Colby West Inlet Growing Season Loading Summary

Discussion

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 2010. However, Colby Lake has at times met SWWD goals. That was the case in 2010, when all three eutropication measures met SWWD interim goals for Colby Lake.

Monitoring at the Colby Lake west tributary indicates high concentrations of metals, possibly due to the flashy nature of the subwatershed and overall lack of detention. However, phosphorus loading at the Colby west tributary was well below SWWD's current loading standard of 0.34 lbs/ac/yr.

In depth monitoring of Colby Lake will continue moving forward, including additional sites. Data will be used to refine ongoing SWWD planning efforts and document improvements following implementation of various SWWD water quality improvement programs including the Subwatershed Retrofit Analysis scheduled for the summer of 2011.

Sample Type	Sampled date	End sampling	Suspended solids (mg/L)	Volatile suspended solids (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Total Phosphorus (mg/L)	Total Dissolved Phosphorus (mg/L)	Chloride ion (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Lead (mg/L)	Nickel (mg/L)	Zinc (mg/L)	Hardness (mg/L_CaCO3)	Ammonia Nitrogen (mg/L)	Nitrate N (mg/L)	Nitrite N (mg/L)
Snowmelt Grab	3/11/10 9:32		110	34	1.7	0.324	0.231	33	<.0005	0.0057	0.0112	0.0035	0.0045	0.0422	32	0.53	0.79	0.015
Storm Composite	4/13/10 5:58	4/13/10 8:12	458	138	4.6	0.532	0.032	7								1.2	0.77	0.015
Storm Composite	4/24/10 8:10	4/24/10 10:10	169	55	1.2	0.247	0.067	3	<.0005	<.005	0.009	0.0019	0.0024	0.0283	32	0.09	0.22	0.015
Storm Composite	5/7/10 10:12	5/7/10 15:27	111	42	0.95	0.12	0.041	3	<.0005	<.005	0.0064	0.0012	0.0021	0.0257	20	0.21	0.2	0.015
Storm Composite	5/10/10 19:39	5/11/10 12:37	33	14	0.97	0.095	0.166	2	<.0005	<.005	0.0051	0.0009	0.0014	0.0143	26	0.52	0.46	0.015
Storm Composite	5/13/10 10:14	5/13/10 13:13	20	6	0.98	0.134	0.024	2	0.0006	<.005	0.007	0.0029	0.0034	0.0387	18	0.18	0.2	0.015
Storm Composite	5/25/10 20:16	5/25/10 23:18	145	54	1.4	0.272	0.06	3	<.0005	<.005	0.0089	0.0025	0.0034	0.0591	30	0.17	0.31	0.09
Storm Composite	5/30/10 19:07	5/30/10 20:14	474	141	3.9	0.498	0.137	9	<.0005	<.005	0.0222	0.0037	0.0063	0.0637	88	0.62	0.32	0.12
Storm Composite	6/8/10 6:27	6/8/10 9:29	23	9	0.66	0.052	0.029	1	<.0005	<.005	0.004	0.0003	0.0011	0.012	20	0.36	0.3	0.015
Storm Composite	6/11/10 6:04	6/12/10 13:42	393	59	1.6	0.157	0.034	1	<.0005	<.005	0.0083	0.0035	0.0028	0.0401	12	0.18	0.28	0.17
Storm Composite	7/5/10 15:32	7/5/10 18:15	24	9	1.9	0.309	0.199	7	<.0005	<.005	0.0059	0.0007	0.0023	0.0135	24	0.35	0.37	0.015
Storm Composite	7/11/10 16:09	7/11/10 16:52	51	13	0.8	0.144	0.088	1	<.0005	<.005	0.0051	0.0015	0.002	0.0176	14	0.18	0.24	0.015
Storm Composite	7/17/10 20:50	7/17/10 23:01	35	10	1.4	0.257	0.132	2	<.0005	<.005	0.004	0.0009	0.0017	0.0107	22	0.38	0.33	0.04
Storm Composite	7/27/10 20:26	7/27/10 20:57	56	12	1.3	0.259	0.15	1	<.0005	<.005	0.0034	0.0006	0.0013	0.0091	20			
Storm Composite	8/10/10 20:40	8/11/10 5:27	20	10	1.5	0.235	0.096	3	<.0005	<.005	0.0029	0.0006	0.0015	0.0076	22	0.12	0.26	0.015
Storm Composite	8/13/10 3:26	8/13/10 5:41	53	12	1.1	0.224	0.162	1	<.0005	<.005	0.0042	0.0011	0.0019	0.0127	28	0.2	0.29	0.04
Storm Composite	9/2/10 3:26	9/2/10 4:11	47	10	0.59	0.2	0.126	1	<.0005	<.005	0.0031	0.001	0.0013	0.0106	2.5	0.15	0.26	0.015
Storm Composite	9/15/10 19:18	9/15/10 20:37	113	49	1.2	0.16	0.045	1	<.0005	<.005	0.0045	0.0014	0.0018	0.0204	12	0.23	0.21	0.015
Storm Composite	9/22/10 21:42	9/23/10 1:37	27	10	0.98	0.151	0.079	1	<0.001	<0.010	<0.010	<0.003	<0.020	<0.020	26	0.06	0.12	0.015
Storm Composite	9/23/10 10:17	9/23/10 23:04	31	10	1.1	0.25	0.138	2	<0.001	<0.010	<0.010	<0.003	<0.020	<0.020	28	0.07	0.21	0.015

Key: No Exceedance Determinable; Exceeds CS; Exceeds MS; Exceeds FAV; Exceeds E. Coli Standard for Individual Sample

Table 37: Colby Inlet Water Quality Sample Results and MN Rule 7050.0222 Class 2B Water Quality Standard Exceedances