White Iron Lake

St. Louis County

Sentinel Lakes

Prepared in cooperation with the
Minnesota Department of Natural Resources

Minnesota Lake ID: 69-0004
Area: 3,429 acres
Watershed Area: 592,626 acres
Ecoregion: Northern Lakes and Forests (NLF)

Trophic State: Mesotrophic
Maximum Depth: 47 feet
Mean Depth: 16 feet
Mixing Status: Intermittent

Figure 2. Bathymetric map

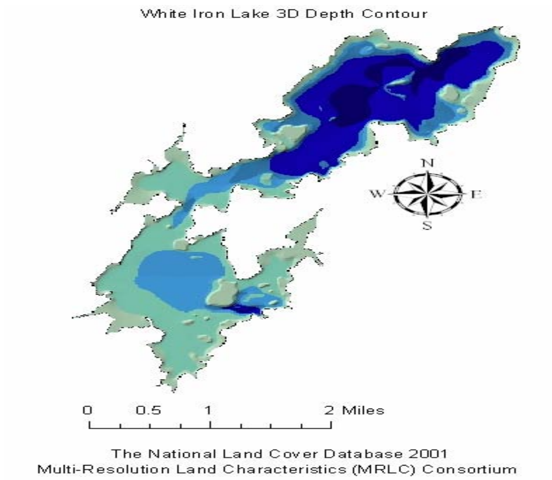

Figure 1. Watershed land use map

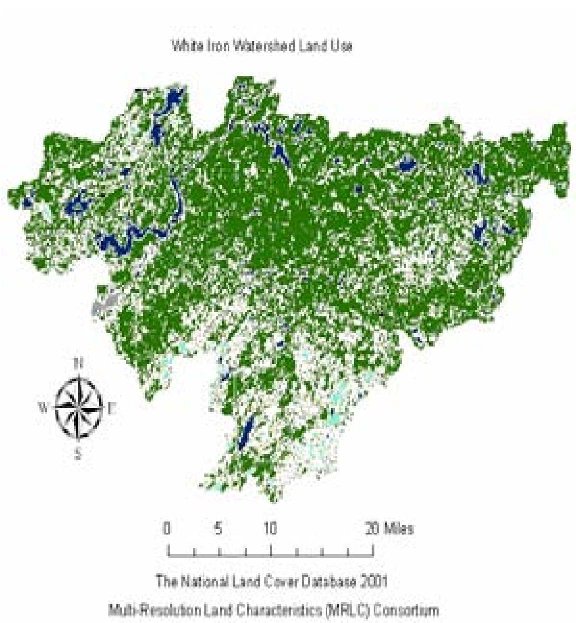

Table 1. White Iron watershed land use as compared to NLF ecoregion reference lakes

Land use	Lake land use percentage	typical land use percentage
Developed	1	0 - 7
Cultivated (Ag)	<1	<1
Pasture & Open	<1	0 – 6
Forest	83	54 – 87
Water & Wetland	15	14 – 31
Feedlots (#)	0	

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Table 2. White Iron Lake 2008 as compared to WICOLA's 2007 and typical range for NLF ecoregion reference lakes
Data from Minnesota Department of Health (MDH) laboratory

Parameter	White Iron Lake 2008	WICOLA 2007 summer mean	MPCA 1996 summer mean	NLF
Number of reference lakes				32
Total Phosphorus (µg/L)	23	20	29	14 – 27
Chlorophyll mean (µg/L)	4.2	4.0	4.1	4 – 10
Secchi Disk (feet) (meters)	4.0 1.2	4.8 1.46	4.6 1.4	8 -15 2.4 – 4.6
Total Kjeldahl Nitrogen (mg/L)	0.62		0.6	0.4 – 0.75
Alkalinity (mg/L)	13.7		15.2	40 – 140
Color (Pt-Co U)	92		100	10 – 35
pH (SU)	6.39			7.2 – 8.3
Chloride (mg/L)	1.3		1.5	0.6 – 1.2
Total Suspended Solids (mg/L)	1.8		1.5	<1 – 2
Total Suspended Inorganic Solids (mg/L)	1.6		0.36	<1 - 2
Conductivity (umhos/cm)	45		51	50 – 250
TN:TP ratio	26:1		21:1	25:1 - 35:1

µg/L = micrograms per liter	Pt-Co-U = Platinum Cobalt Units
mg/L = milligrams per liter	SU = Standard Units
umhos/cm = micromhos per centimeter	

Figure 3. July 1996 and July 2008 dissolved oxygen (DO) and temperature profile

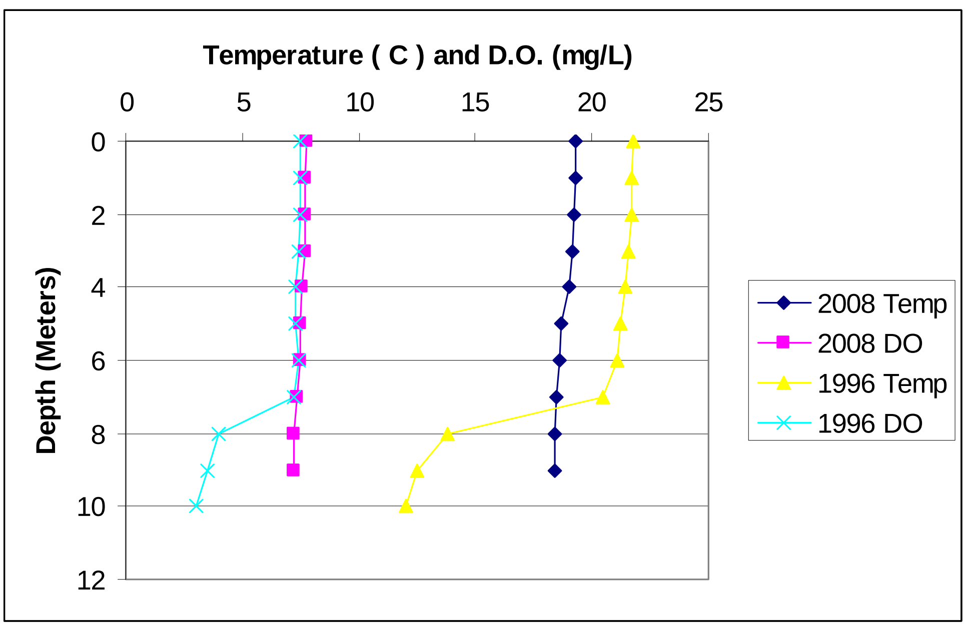
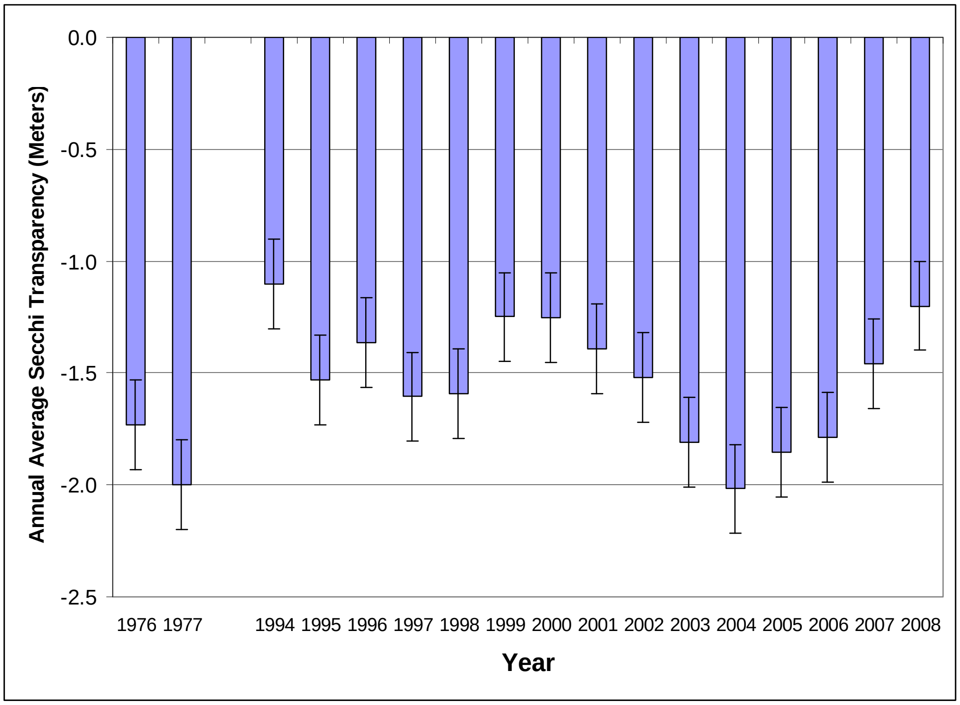


Figure 4. White Iron Lake long-term summer mean secchi transparency data



Watershed, water quality, and fishery summary

White Iron Lake covers an area of 3,429 acres, and is located 5 miles east of Ely. It has a very large watershed (592,626 acres or 925 mi^2), draining the majority of the Kawishiwi River watershed (173:1 watershed: lake area ratio). The Kawishiwi River enters on the south shore of White Iron Lake, its large watershed gives the lake a short residence time - estimated at 45 days. Lake levels in White Iron (and adjacent lakes) are controlled for hydropower generation. Wetlands in the watershed are responsible for bog stained water, yielding high color and lower Secchi transparency than other lakes in the NLF ecoregion.

There has been a significant amount of historical water quality data collected on White Iron Lake. With cooperation from the MPCA, the White Iron Chain of Lakes Association (WICOLA) has been conducting water quality monitoring on White Iron since 2007, and has participated in the Citizen Lake Monitoring Program since 1994. Overall, there is not a statistically significant trend in Secchi transparency from 1994 to 2008 (Figure 4). Rather, transparency is somewhat cyclic, and summer-mean transparency may be inversely related to water levels (which can vary considerably on an annual basis). Additional research is needed to study this potential relationship. During the 2008 Assessment, the water column was well-mixed (polymictic) throughout the field season, while some stratification was evident in 1996 (Figure 3). July epiliminion DO concentrations were unchanged from 1996 to 2008. The slight decline in hypolimnetic DO in 1996 was consistent with the formation of a thermocline on that sample date. Total phosphorus, chlorophyll-*a* and Secchi transparency were not significantly different among the three years with the greatest amount of data – 1996, 2007, and 2008 (Table 2). The lake continues to exhibit mesotrophic conditions and high color compared to reference lakes with the NLF ecoregion (Table 2).

Table 3. Focal species captured during 2008 surveys and their size and abundance compared with other lakes in its lake class

Species	Stocked	Abundance	Size	Trend	Notes
Walleye*	N	High	Average-large	No Trend	
Northern pike*	N	Average	Average-large	No Trend	
Smallmouth bass	N	Low	Small	No Trend	Discovered in 1967
Black Crappie	N	Low	Average	No Trend	
Bluegill	N	Average	Large	Increasing	36% > 7”
Cisco	N	High	Average	No Trend	
White sucker	N	Average	Average	No Trend	
Yellow perch	N	High	Average-large	No Trend	

*Management emphasis on these species

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Table 4. Aquatic plant summary

Percent cover of aquatic plants ≤ 15ft deep	16.9%
Lake depth beyond which most vegetation disappeared	4.7ft
Number of common species (i.e., ≥ 10% cover)	1
Non-native plant infestation	NA

White Iron maintains high quality, naturally reproducing walleye and northern pike populations. Recently implemented special size and harvest regulations for walleye and northern pike are designed to maintain high numbers and quality size-structure. Similar to other lakes in the border lakes ecoregion, warm-water centrarchids are becoming increasingly abundant. Several quality-sized bluegill were captured in trapnets during summer 2008. Still, the game fish community of White Iron is diverse (Table 3) with substantial populations of cold, cool, and warm water species. This lake will serve as a good indicator lake to look at long-term dynamics across the three species guilds. White Iron Lake is not stocked with walleye, although the Garden Reservoir Lakes (Garden, Farm, South Farm) are stocked biennially with walleye fingerlings. Aquatic plants in White Iron are sparse due to turbid water and rocky substrates (Figure 5). In addition, the non-native rusty crayfish was discovered in White Iron chain in 2003 and confirmed in White Iron in 2007. Rusty crayfish can destroy large beds of aquatic plants by clipping plants with their cheliped pinchers. Future assessments will focus on understanding the extent of rusty crayfish infestation and their potential effects on aquatic plant beds. Aquatic plants were found at 16.9 percent of sites examined in water 15 ft or shallower. Aquatic plants were found at 90 percent of sites 4 ft or shallower. One aquatic plant species was found in more than 10 percent of the sites examined. Non-native aquatic plants were not found in White Iron Lake.

Figure 5. Cover of aquatic plant growth during September 2008 in White Iron Lake
Aerial coverage predicted using kriging interpolation from point-intercept plant survey data