

LAKE HENDRICKS WATERSHED QUALITY IMPROVEMENT PROJECT

Physical Characteristics, Problems & Impact

The Lake Hendricks Watershed is located on the west edge of Howard County in northeast Iowa. The highly agricultural watershed is 1,228 acres in size, with 73% crops, 13% park area, and the remaining 14% is filled with wildlife and building sites. Corn, soybeans and alfalfa are the dominant field crops. The land is mainly gently-sloping with one small, tributary that begins within the watershed. Overflow from Lake Hendricks runs directly into Watson's Creek. The dominant soils are Clyde (22%), Floyd (16%), and Bassett (12%).

Although Lake Hendricks Watershed is a relatively small watershed, the lake has a significant public impact through the location of the largest county-owned campground facility in northeast Iowa, known as Lake Hendricks Park. Built in 1960, the 54-acre, man-made lake is the central attraction to the 234-acre park. Fishing (artificial bait and electric-powered boats only) and swimming is permitted in the lake. With 80 modern and primitive camping sites (\$15/\$10), the camping revenue totaled over \$41,000 during the Howard County Conservation Board's 2006 FY, averaging 3,160 camper days or approximately 10,000 campers. This figure does not account for the heavy day-to-day usage the park sustains by visiting or non-camping units. In 2002 the Iowa Lake Valuation Project of ISU estimated the total number of household trips to Lake Hendricks to be 17,587. Less than 1 mile north of Riceville, IA, the lake is a major asset to the city both socially and economically.

Lake Hendricks water has been tested systematically by the ISU Limnology Lab since 2000. The results show Lake Hendricks to be low in dissolved oxygen, high in phosphorus levels and having increased algae growth. According to the Iowa Lakes Classification for Restoration report in May 2005, Lake Hendricks ranked 42 overall of 100 lakes in need of restoration and was ranked in the upper third of the percentile ranking in the following categories:

Category	% Rank
Plankton and Planktonic Biota	4
Dredging Potential	23
Nutrients and Eutrophication	24
Attainment and Exceedance of Standards for Designated Use	30
Restoration Potential	31
Potential Public Health Risks	32

During the summer of 2002, high phosphorus levels (168.5ppb) and chlorophyll levels (110.2ppb) were also specified in the ISU study classifying Lake Hendricks as a hypereutrophic lake. With a maximum depth of 19 feet in one small area, the average depth of Lake Hendricks is about 8 feet. High algae growth in this shallow of an area makes fishing, boating and swimming undesirable. Also, the low dissolved oxygen in the water led to a fish kill in the winter of 1995-1996. With recreation as the primary purpose of this lake, it is imperative that the source of these impairments be found, so a viable plan can be formed to remedy the current situation and prevent further loss of animal life.

A summary data table created by the ISU Limnology Lab indicates the deteriorating condition of Lake Hendricks:

Parameter	2005	2004	2003	2002	2001	2000
Lake Depth (m)	4.9	5.1	5.1	5.0	5.1	4.8
Secchi Disk Depth (m)	0.8	1.1	1.8	0.9	1.5	2.0
Dissolved Oxygen (mg/l)	11.8	12.1	13.4	11.7	15.0	10.4
Dissolved Oxygen Saturation (%)	143.7	141.2	157.4	144.0	180.7	124.1
Turbidity (NTU)	17.6	13.3	26.4	23.5	22.3	5.1
Chlorophyll a (g/L)	167.3	41.8	17.5	68.2	41.7	18.2
Total Phosphorus as P (g/L)	96	68	124	132	63	149
Total Nitrogen as N (mg/L)	3.04	9.44	3.07	1.49	4.51	5.29
Inorganic Suspended Solids (mg/L)	1	3	3	2	3	4
Total Suspended Solids (mg/L)	15	9	15	10	16	9
Carlson Trophic State Index (Secchi)*	63	58	52	62	54	50
Carlson Trophic State Index (Chl a)*	81	67	59	72	67	59
Carlson Trophic State Index (TP)*	70	65	74	75	64	76

Dissolved oxygen is one of the best indicators of the health of a water ecosystem. Dissolved oxygen can range from 0-18 milligrams per liter (mg/l), but most natural water systems require 5-6 mg/l to support a diverse population. Therefore, the threshold for listing on the State's 303(d) Impaired Waters 2004 List has been set at 5.0 mg/l or lower. As you can see from the previous chart, Lake Hendricks' dissolved oxygen levels during the summer months are adequate, yet due to various undetermined factors, the dissolved oxygen levels drop to threatening levels during the winter months. The people working on this assessment have identified several potential causes of the dissolved oxygen problem; however, additional study is needed to evaluate all the possibilities in order to identify the *most likely* cause of the decrease.

Poor water quality is the limiting factor for this lake/park area to reach and sustain its potential. The results from a previous Development Grant Study of the entire watershed by the Howard SWCD suggested the watershed is not the primary cause of these impairments. To continue the investigation the next step is to focus this study in-lake to determine the impairment source(s).

EPA's 303d List of Impaired Waters, Total Maximum Daily Load (TMDL) & Future Renovations

Lake Hendricks, a Class A water body, is listed on the 303(d) Impaired Waters 2004 List as the result of the ISU Limnology Laboratory's statewide lake survey. The listed impairments are low dissolved oxygen/organic enrichment leading to oxygen depletion, and increased algae growth. The cause of these impairments is unknown.

A TMDL has not been completed on Lake Hendricks, but the Iowa DNR is looking at a possible development grant and all subsequent activities as the foundation for development of a TMDL. The TMDL staff has contacted the DSC Regional Coordinator about Lake Hendricks. In addition, Lake Hendricks is listed as a Priority Lake in Appendix 9, page 208, of the State Nonpoint Source Management Program – Iowa report by the Iowa DNR in September 2000.

The designated use of Lake Hendricks is public recreation with the lake and park area receiving continual updates and improvements. Lake Hendricks Park, managed by the Howard County Conservation Board, was recently renovated in August 2006 to include 60 designated campsites

in the lower campground, with each site having its own electricity and water hookups, gravel pad, picnic table and fire ring. Along with the upper campground, 2 shelters, 2 shower/bath facilities, and 2 playgrounds, Lake Hendricks Park offers swimming, fishing, hiking, nature study/photography, baseball/softball, a butterfly garden, volleyball, biking, and an enclosed deer pen. A county park ranger lives on the premises year-round. The Wapsi-Great Western Trail also travels through Lake Hendricks, which recently received a \$2 million grant to improve and extend the existing trail.