

**Surface water quality appraisal of the Waupaca County portion of the  
Waupaca/Tomorrow River Priority Watershed Project**

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**WAUPACA - WEYAUWEGA SUBWATERSHED**

The Waupaca - Weyauwega subwatershed consist of the Waupaca River from Waupaca to its mouth at the Wolf River, two perennial, and several intermittent tributaries to the Waupaca River. The Waupaca River is dammed at Weyauwega forming the Weyauwega Millpond. Land use in this subwatershed is predominantly agriculture.

**Water Resource Conditions**

The Waupaca River below Waupaca to its mouth is classified as warm water sport fish communities. Habitat evaluations found good aquatic life habitat in the Waupaca River at Riverside Park located on Hwy 54 and 22 in Waupaca. Substrate at this site is mostly rock and rubble. There is no significant erosion or bank failure. A macroinvertebrate sample Fall 1994 received a biotic index value of 3.3. In Spring 1994, the average of three replicate macroinvertebrate samples was 2.9. These values rate the Waupaca River as excellent water quality with organic pollution unlikely. Samples collected at Harrington Road in 1980 also indicates excellent water quality.

An unnamed tributary (T22N, R12E, Sec 35, SESE) to the Waupaca River received a fair instream habitat rating. This cold water stream has predominantly shifting sand substrate that appears to be natural. This is a clear water stream.

Extensive data was collected on the Waupaca River by Wisconsin Electric Power Company in 1989 and 1990 as part of the Weyauwega hydroelectric facility relicensing process. Monitoring results determined flowage sediments are very clean in regards to heavy metals and pesticides. Water chemistry samples collected both from the flowage and tailwater found little difference between the two locations with acceptable concentrations of regular water quality parameters. Macroinvertebrate samples showed poorer water quality (poor vs fair) upstream than downstream using the Hilsenhoff Biotic Index. More suitable habitat for macroinvertebrates at the downstream site probably accounts for the better rating. Dissolved oxygen, temperature, pH, and specific conductivity monitoring during six 24 hour periods indicate normal daily and annual levels below the dam. Profile monitoring showed slight stratification in the Weyauwega Millpond.

*used  
Ball, 1992  
for Habitat assessments*

Weyauwega Lake Conservation Club and the DNR Lake Planning Grant Program sponsored monitoring on Weyauwega millpond in 1991. Event monitoring found high nutrient inputs from feeder creeks and particularly from storm sewers; however, regular in-lake monitoring indicates nutrient levels lower than typical of other impoundments and even natural lakes in the region.

Macrophyte growth in the impoundment is widespread, very abundant and dominated by a few species. Macrophytes are a nuisance to hydroelectric and recreational activities.

Other than nutrient inputs from nonpoint source promoting plant growth in the Weyauwega Millpond, water resource conditions are generally good in the Waupaca - Weyauwega subwatershed and therefore, nonpoint source management practices should be aimed at protecting these valuable resources.

Water Resource Objectives...

## **CRYSTAL RIVER SUBWATERSHED**

The watershed streams in the Crystal Creek subwatershed consist of Radley Creek, Murry Creek, Naylor Creek, and the Crystal River.

### **Water Resource Conditions**

Pearl Creek turns into Radley Creek at the Waupaca County line. This creek is classified as cold water communities class I above Lake Stratton Road and class II below and as outstanding resource waters. Habitat evaluations at four different stream reaches all rated Radley Creek as good aquatic life habitat. The substrate is mostly sand, however, silt has accumulated in the slow areas near bridges and along the lower banks. The shifting sand substrate appears to be natural. Water temperature and dissolved oxygen levels are normal. Macroinvertebrate samples at Dayton Road in 1993 and 1994 received biotic index values of 3.1 and 2.6 which rates this section of Radley Creek as excellent water quality with no apparent organic pollution. Samples collected in 1980 at Lake Stratton Road also received excellent ratings. Water celery and filamentous algae are abundant in some reaches. Stream bank vegetative cover is generally greater than 90% with diverse trees and shrubs. Radley Creek also runs through the Radley Creek State Fishery Area. Stratton Lake, a groundwater drainage lake, discharges to Radley Creek. Radley Creek drains to Junction Lake on the Crystal River.

Murry Creek is a perennial class I cold water communities and exceptional resource waters classified tributary to Radley Creek. Instream aquatic life habitat is good. The naturally occurring shifting sand is the predominant stream bed substrate with some silt near the banks. Rocks and gravel are uncommon. Bank erosion is nonexistent with a diverse wooded

riparian corridor. Dissolved oxygen and temperature appear normal. Macroinvertebrate samples at West Dayton Road in 1994 received a biotic index value of 3.6 which rates this section of Murry Creek as excellent water quality with no apparent organic pollution.

Crystal River begins at the outlet of Long Lake on the Waupaca Chain O' Lakes, flows through Junction Lake, is dammed at Little Hope and again in the city of Waupaca forming Cary Millpond, and eventually discharges to the Waupaca River southeast of Waupaca. The Crystal River is a large clear water river. The lower two miles below Cary Millpond are classified as warm water sport fish communities, but the rest of the river is considered class II cold water. Instream aquatic life habitat is excellent to good. Although sand is common, rocks and rubble are the predominant substrate type. Silt and sedimentation do not appear to be a problem. The stream banks are well protected from erosion. Macroinvertebrate samples at Shadow Lake Road in 1993 and 1994 received biotic index values of 3.7 and 3.0 which rates this section of the Crystal River as very good to excellent water quality with no apparent organic pollution. Samples in 1980 below Little Hope dam received a good rating with some organic pollution present.

Dissolved oxygen and temperature monitoring at Sanders Road on the Crystal River for a 12 day period in early September and also several grab samples did not reveal any state standard violations at any time; yet, the river does exhibit normal diurnal fluctuations.

The 26 acre Cary Millpond has an average depth of two feet. The impoundment contains dense growths of aquatic plants and filamentous algae. The City of Waupaca Inland Lakes Protection and Rehabilitation District and DNR sponsored a lake management planning grant for the Cary Millpond. The monitoring activities are currently underway.

Naylor Creek is a perennial tributary to Crystal River upstream of the Little Hope impoundment. Naylor Creek is classified as class I cold water exceptional resource waters.

Other than nutrient inputs from nonpoint source promoting plant growth in the Cary Millpond, water resource conditions are generally good in the Crystal Creek subwatershed and therefore, nonpoint source management practices should be aimed at protecting these valuable resources.

Water Resource Objectives...

## **CHAIN O' LAKES SUBWATERSHED**

The Chain O' Lakes subwatershed consist of Emmons Creek, Hartman Creek, Allen Creek, and all the lakes in the Waupaca Chain O' Lakes. Land use in this subwatershed is primarily wooded and recreational.

## **Water Resource Conditions**

Emmons Creek is classified as warm water sport fish communities for the first one mile but then changes to class I cold water communities outstanding resource waters for the rest of the creek. The upper reaches are in the Emmons Creek State Fishery Area. Emmons Creek discharges to Long Lake in the Chain O' Lakes. Instream aquatic life habitat is good. The substrate consists of a good mix of gravel, rubble, and sand which provides a diverse community for aquatic life. Stream banks are stable and shaded with a diverse mix of trees and shrubs. Some silt has accumulated in the slow areas of bends and near bridge abutments. A macroinvertebrate sample at West Road in 1994 received a biotic index value of 3.1 which rates this section of Emmons Creek as excellent water quality with no apparent organic pollution. Samples in 1980 at Rural Road received very good and excellent ratings with possible slight to no apparent organic pollution present. Dissolved oxygen and temperature measurements are normal.

Hartman Creek is classified as warm water sport fish community. This perennial stream is dammed to form Hartman Lake in the Hartman Creek State Park. Hartman Creek discharges to Pope Lake in the Waupaca Chain O' Lakes. Habitat evaluations rated Hartman Creek as good. The substrate is mostly rock, rubble, and gravel with some sand present. There is slight, however fairly insignificant, accumulation of silt on the lower banks and inside curves. The riparian corridor is mostly wooded with stable banks. A macroinvertebrate sample at Rural Road in 1994 received a biotic index value of 2.8 which rates this section of Hartman Creek as excellent water quality with no apparent organic pollution.

Allen Creek is a class I cold water communities classified perennial tributary to Hartman Creek. The corridor of this small clear water stream is wooded with stable banks. The bottom substrate is primarily naturally occurring sand with little gravel or rubble present.

Since the existing water resource condition of the Chain O' Lakes subwatershed streams are good, nonpoint source management practices should be aimed at protecting these valuable resources.

Water Resource Objectives...

## **UPPER TOMORROW SUBWATERSHED**

{The following is just a description of the monitoring I did at Amherst}

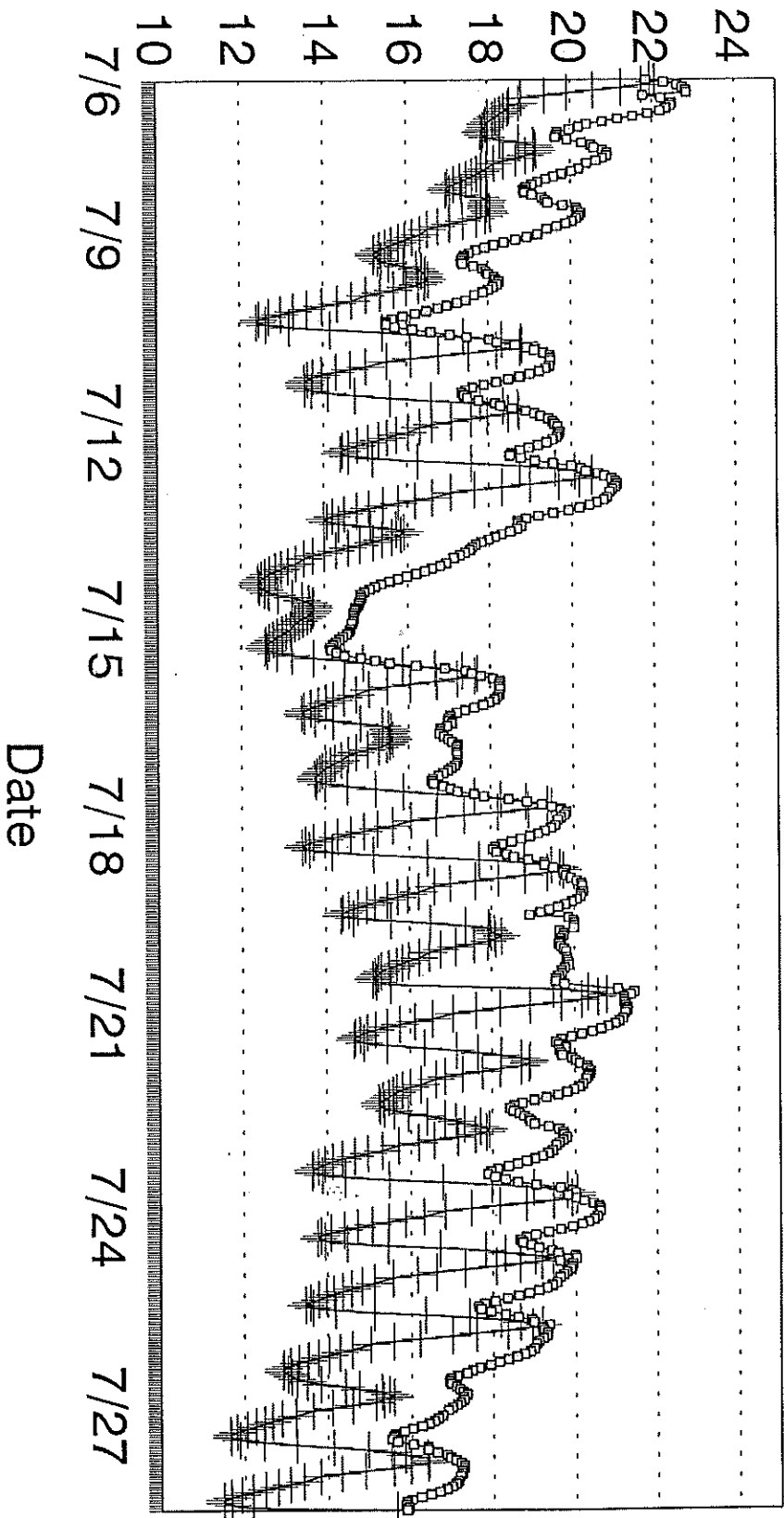
Dissolved oxygen and temperature monitoring was conducted on the Tomorrow River above the Amherst Millpond at Lake Meyers Road and below the Millpond at CTH V from July 6 to 28, 1994 to determine the effects of the impoundment on water quality. Generally, the millpond has a significant dampening effect on normal daily temperature and dissolved oxygen fluctuations as depicted in Figure 1.

# Tomorrow River

Above and Below Amherst Millpond

Water Temperature - 1994

Temperature °C



—□— Below (CTH V) —+— Above (Lake Meyers Rd)

Temperatures were on an average 2.7°C higher below the dam than above, although at both locations water temperature remains cool enough to support trout. At no time did dissolved oxygen fall below the 6 mg/l state standard even during a two to three inch rain event that occurred on July 6, 1994. While the water was clear at the downstream site after the event, it was turbid with high suspended solids at the upstream site. This indicates that the Amherst Millpond acts as a settling basin for sediments from nonpoint source runoff.

## References

Wisconsin Department of Natural Resources, 1991. Wolf River Basin Water Quality Management Plan.

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N.E.W. Hydro, Incorporated, 1993. Application for New License, Weyauwega Hydroelectric Project.