

Date 12/13/2001

Facility Name ADELL WHEY (FORMERLY J.B. DOWNING)

Receiving Water UN CR (ADELL CR.) TRIBUTARY TO NORTH BRANCH MILWAUKEE RIVER

Evaluated by MADE, STEVE

Rpt. Revised 12/13/2001 by WIM WAWRZYN SER

This stream classification is not included in the revised code because (select one):

The discharger is no longer at this location.

A new classification has resulted in a full fish and aquatic life designation.

New survey date 1992 Please provide copy of new classification report.

This receiving water should be added to the database and to the code. Specify information, as it should be included in code.

Other (please explain)

WATER RESOURCE APPRAISAL FOR THE ADELL SUBWATERSHED NORTH BRANCH MILWAUKEE RIVER WATERSHED and STREAM CLASSIFICATION FOR AN UNNAMED TRIBUTARY (ADELL CREEK) TO THE NORTH BRANCH OF THE MILWAUKEE RIVER

By Steve Mace, SED 1990

Rev. Will Wawrzyn, SER, December 13, 2001

I. Description of the Subwatershed

The Adell Subwatershed contains the Adell Creek, an unnamed perennial tributary and two intermittent channels that join shortly upstream of the discharge of Adell Whey (formerly the J.B. Downing Co.). The facility discharges approximately 0.5 mi. from the headwaters. Past complaints about the discharge have centered on foul odors and unsightly conditions. The stream has been channelized for much of its length. Similar to the Cascade Swamp Subwatershed, there are extensive wetlands bordering parts of its length. There are no natural lakes or impoundments in this subwatershed.

II. Water Quality Conditions

Adell Creek is currently capable of supporting a forage fish and aquatic life tolerant of pollution (INT-D). This is partially due to severely degraded habitat because of the considerable abuse this stream has experienced in the past. Continued improvement due to upgrading the Adell Whey treatment plant, combined with upland erosion control, should make this tributary to the North of the Milwaukee River capable of supporting a somewhat limited warmwater sport fishery (FAL-B). As such, Adell Creek shall be classified as a Warm Water Sport Fish Community (WWSF). Some subsequent in-stream habitat improvement would accelerate the process. This includes allowing the stream to redevelop natural meanders.

Recent improvements in the treatment process have resulted in better quality wastewater-from the Adell Whey facility. In the past, this tributary was frequently devoid of oxygen due to the high organic and BOD loadings. Because of the considerable damage done to the system in the past, it may be some time before the significance of these improvements manifest themselves as in-stream indicators. Even so, there has been a dramatic improvement in existing conditions.

Extensive portions of Adell Creek have been channelized; this includes the headwaters. Most of these channelized reaches occur in former wetlands or marginal croplands. As a result, water levels in this tributary can vary dramatically. These fluctuating water levels may deny use of upstream and other reaches during low flow periods as well as for spawning in the appropriate seasons. The floodplain is closely contiguous with the stream channel, and implementation of any of the following recommendations should not be construed to encourage development or farming in the floodplain.

In-stream cover in Adell Creek consists primarily of overhanging terrestrial vegetation and depth. Moderate bacterial contamination occurs throughout the summer and during wet weather. in the fall. Sources are indeterminate.

Based on the results of a qualitative fish community assessments completed since the mid-1970s, Adell Creek supports a relatively diverse warm water fish and other aquatic life community. Fish species include:

Creek chub	Bluntnose minnow	Blackside darter	Johnny darter
Sand shiner	Horneyhead chub	Blacknose dace	Stonecat
Bluegill	Northern pike	Pumpkinseed	Common carp
Common white sucker	Rock bass	Fantail darter	Black bullhead
Yellow bullhead	Yellow perch	Green sunfish	Pearl dace
Common shiner	Central mudminnow	Brook stickleback	Largemouth bass
Spotfin shiner	Greater redhorse (state listed Threatened Species)		

III. Water Resource objectives

The recommended water resource management objectives for streams contained in the Adell Creek subwatershed are provided below. They include objectives to be addressed by both NPS and IRM planning processes.

1. Re-classify Adell Creek as a warm water sportfish community.
2. Reduce pollutant discharge to the Adell Creek and downstream reaches of Nichols Creek (North Branch)
3. Evaluate options to further improve the effluent quality of Adell Whey and implement.
4. Improve in-stream habitat and flow stability
 - a. Allow the channel to reestablish meanders
 - b. Prohibit future channelization.
 - c. Close channels that drain wetlands and allow them to reestablish original composition. This should help maintain more stable water levels. (This is an opportunity to retire many of the marginal cropland acres in CRP)

TO: Vanessa Thompson

FROM: Will Wawrzyn

SUBJECT: Investigation and Findings Regarding a Fish Kill along an Unnamed Tributary to the North Branch of the Milwaukee River (Adell Creek) and the North Branch of the Milwaukee River, Sheboygan County

Background

On Wednesday, May 20, 1998, Ted Bosch SER informed me that the Adell Whey facility reported a spill of approximately 50,000 gallons of waste from their treatment facility to an Unnamed Tributary to the North Branch of the Milwaukee River (hereafter referred to as Adell Creek). The discharge was reported to occur between midnight and 6 A.M. on Wednesday, May 20, 1998. This incident follows a similar waste discharge and resulting fish kill in Adell Creek which occurred during October-November of 1997. A copy of the previous incident report is attached.

I met John Nelson (Fish Biologist, Plymouth) and Mark Pearce (Conservation Warden, Plymouth) at CTH W, the first road crossing over Adell Creek to coordinate our assessment of surface water resource impacts from the Adell Whey discharge. My assessment took place at four Adell Creek sites. One site was located upstream of the Adell Whey discharge and three sites downstream of the Adell Whey discharge. Visual observations included surface water quality conditions (e.g. turbidity), the actual or estimated number of stressed or dead fish by species, and stream discharge. Water quality samples were collected at each of the four sites. All samples were preserved according to QA/QC guideline and sent to the University of Wisconsin State Laboratory of Hygiene (SLOH) for pH (su), ammonia-nitrogen and BOD₅ analysis.

Following my assessment of the fish kill along Adell Creek, Warden Mark Pearce received a phone call on Friday, May 22, 1998 from an angler regarding a fish kill along the North Branch of the Milwaukee River at CTH A in Sheboygan County, approximately 6.7 miles and 10.7 miles downstream of the Adell Creek - North Branch of the Milwaukee River confluence and Adell Whey facility discharge, respectively. According to the complaint, the angler observed approximately 50 floating dead fish, including bullhead and northern pike, along the North Branch of the Milwaukee River at the CTH A bridge in Sheboygan County. The angler observed the incident the previous evening on Thursday, May 21, 1998 at 19:30. Warden Pearce conducted a follow-up investigation on Friday, May 22, 1998 and confirmed the existence of a fish kill at the site. A copy of Warden Pearce's complaint and investigation report is attached.

Results and Discussion

The May 20-21, 1998 fish kill along Adell Creek and the North Branch of the Milwaukee River was coincidental with the Adell Whey discharge. Observations relative to the number of dead or stressed fish along Adell Creek and the North Branch of the Milwaukee River, and water quality results from Adell Creek, suggests that the fish kill was extensive and substantial.

Dead or stressed fish were observed at all three Adell Creek sites downstream of the Adell Whey discharge. Dead or stressed common white sucker fry were abundant and were far and away the most impacted fish species and age group. Dead adult white sucker, central mudminnow, creek chub,

fathead minnow and pearl dace were also observed in Adell Creek, however their numbers were low following the October 1997 fish kill incident. Live white sucker fry were observed in Adell Creek approximately 0.3 miles upstream of the Adell Whey discharge.

Dead unspiciated forage fish species, northern pike and bullhead were observed by others along the North Branch of the Milwaukee River. Although the full extent and magnitude of the fish kill along the North Branch of the Milwaukee River can not be quantified, it was probably extensive based on the fact that dead fish were observed up to 6.7 miles downstream of the Adell Creek - North Branch of the Milwaukee River confluence and because the river contains a larger resident population of fish considered intolerant of poor water quality. Based on previous fish distribution records (Fago, 1984) fish species present along the seven mile reach downstream of the Adell Creek - North Branch of the Milwaukee confluence included the following:

Creek chub	Bluntnose minnow	Blackside darter	Johnny darter
Sand shiner	Horneyhead chub	Blacknose dace	Stonecat
Bluegill	Northern pike	Pumpkinseed	Common carp
Common white sucker	Rock bass	Fantail darter	Black bullhead
Yellow bullhead	Yellow perch	Green sunfish	Pearl dace
Common shiner	Central mudminnow	Brook stickleback	Largemouth bass
Spotfin shiner	Greater redhorse (state listed Threatened Species)		

The large numbers of dead white sucker fry relative to the low numbers of other adult or juvenile fish species in Adell Creek is not surprising given the previous fish kill in October-November of 1997. Compared to other resident fish species in Adell Creek, white suckers are capable of long migratory spawning runs from adjoining water bodies (Becker, 1983). The observed white sucker fry in Adell Creek are likely the result of offspring produced by white sucker migrating from the North Branch of the Milwaukee River during the spring of 1998. In Wisconsin, white suckers typically spawn from April to early May, shortly after ice out when water temperatures reach 7.2°C (Becker, 1983). Absent any direct intervention, natural restoration of other former resident fish specie populations in Adell Creek via the North Branch of the Milwaukee River populations may not occur or will require a much longer period of time.

Coincidental with the reported Adell Whey discharge, substantially elevated concentrations of BOD₅ and ammonia-nitrogen were noted at all three sample sites located downstream of the Adell Whey discharge. Adell Creek BOD₅ concentrations upstream of the Adell Whey discharge were <8 mg/l, while concentrations downstream of the Adell Whey discharge ranged from < 60 mg/l to >690 mg/l. Total ammonia-nitrogen concentrations were 0.426 mg/l upstream of the Adell Whey discharge and ranged from 1.24 mg/l to 13.5 mg/l downstream of the discharge. Un-ionized ammonia concentrations were 0.008 mg/l upstream of the Adell Whey discharge and ranged from 0.062 mg/l to 0.075 mg/l downstream of the discharge. Un-ionized ammonia-nitrogen concentrations exceeded the state un-ionized ammonia criterion of 0.04 mg/l at all three sites located downstream of the Adell Whey discharge (Table 1). It is very likely that even greater concentrations of BOD₅, total ammonia-nitrogen and un-ionized ammonia-nitrogen were present in Adell Creek as a result of the discharge since all three sites had already experienced significant fish mortality.

Instantaneously measured dissolved oxygen concentrations did not meet the 5 mg/l state water quality standard for dissolved oxygen at any of the monitored sites. Dissolved oxygen concentrations were 2.20 mg/l (25% saturation) upstream of the Adell Whey discharge and ranged from 2.31 mg/l (28.5% saturation) to 4.42 mg/l (51.1% saturation). Depressed dissolved oxygen levels upstream of the Adell Whey wastewater discharge and, absent any known point or nonpoint pollution discharge, was likely

the result of dissolved organic matter from the seasonal discharge by the Adell Swamp. Depressed seasonal dissolved oxygen levels have been reported from streams draining wetlands in the Milwaukee River at the outlets of the Cascade Swamp, Cedarburg Bog and Ulao Swamp. Despite these seasonal events, these streams still maintain diverse and stable fish communities.

The depressed dissolved oxygen levels at the outlet of the Adell Swamp were not sufficiently low to cause mortality in resident fish and aquatic life communities which exist in the headwaters reach of Adell Creek. Evidence is provided by the observed presence of numerous non-stressed white sucker fry upstream of the Adell Whey discharge at CTH A. Similarly, depressed and substandard dissolved oxygen levels in Adell Creek downstream of the Adell Whey facility were not sufficiently low, at the time of measurement, to cause fish mortality in more tolerant fish species such as white sucker and central mudminnow. Substandard dissolved oxygen concentrations downstream of the discharge are likely a result of Adell Whey's discharge high in carbonaceous and nitrogenous oxygen demanding wastes. While wetland drainage may have contributed to low dissolved oxygen levels at the sites downstream of the Adell Whey facility, its contribution may have been insignificant given the observed increase in stream flow from groundwater sources. In the absence of acutely low dissolved oxygen levels and presence of high levels of un-ionized ammonia, the observed fish mortality in Adell Creek and the North Branch of the Milwaukee River is the result of the Adell Whey discharge of high un-ionized ammonia-nitrogen concentrations.

attachments

cc: Adell Creek file WIBC 0033000
Ted Bosch, SER
Sharon Gayan / Jim D'Antuono, SER
John Nelson, Plymouth
Mark Pearce, Plymouth
Matt Coffaro, SER

c:\www\wr\adell.798

References

Becker, George C. 1983. Fishes of Wisconsin. The University of Wisconsin Press. Madison, Wisconsin.

Fago, Don. 1984. Distribution and Relative Abundance of Fishes in Wisconsin. Volume IV Root, Milwaukee, Des Plaines and Fox River Basins. Technical Bulletin No. 147. Wisconsin Department of Natural Resources, Madison, Wisconsin.

Wawrzyn, Will. 1997. Observations Following a Fish Kill Incident on an Unnamed Tributary to the North Branch of the Milwaukee River (Adell Creek), Sheboygan County. April 16, 1997 Memorandum. Milwaukee River Basin, North Branch Milwaukee River Watershed - Adell Creek file WIBC 0033000. Southeast Region.

Attachment 1. Field Observations and SLOH Analytical Results

Adell Creek at CTH A and upstream of Adell Whey outfall 001

Date = 05/20/98, Wednesday

Distance Upstream of Adell Whey Discharge = - 0.3 mile

Water Sample Time = 12:35

Temperature = 22.2 °C

% Cloud Cover = 25%

Dissolved Oxygen = 2.20 mg/l @ 25% saturation

Sample I.D = AC1C (control)

pH = 7.59 su

Ammonia-N = 0.426 mg/l

BOD₅ = <8.0 mg/l

Discharge = <0.01 cfs (estimate)

Water heavily stained with dissolved organic matter but minimal suspended solid material present. No odors present. Primary producers limited to small amounts of filamentous algae. High water mark approximately 1.5 ft. above present water stage.

Numerous active (non-stressed) white sucker fry present in pools and eddy areas.

Adell Creek at CTH W downstream of Adell Whey discharge

Date = 05/20/98, Wednesday

Distance Downstream of Adell Whey Discharge = 0.8 mile

Water Sample Time = 14:00

% Cloud Cover = 25%

Temperature = 28.1 °C

Dissolved Oxygen = 2.79 mg/l @ 35.5% saturation

Sample I.D = AC1T

pH = 7.90 su

Ammonia-N = 1.24 mg/l

BOD₅ = <60 mg/l

Discharge = <0.1 cfs (estimate)

Water moderately turbid. Grayish-white surface scum present in debris and backwater areas.

Warden Mark Pearce reported 6 dead "minnow" species between CTH W and the Adell Whey pond outfall. One stressed year-1 white sucker and adult central mudminnow observed at CTH W.

Numerous (100's) dead white sucker fry observed. Less numerous lethargic and surface "gulping" white sucker fry observed in backwater area.

Adell Creek at CTH AC downstream of Adell Whey discharge

Date = 05/20/98, Wednesday

Distance Downstream of Adell Whey Discharge = 1.1 miles

Water Sample Time = 13:35

Temperature = 25.7 °C

% Cloud Cover = 25%

Dissolved Oxygen = 2.31 mg/l @ 28.5% saturation

Sample I.D = AC2T

pH = 7.46 su

Ammonia-N = 3.65 mg/l

BOD₅ = 218 mg/l

Discharge = 0.2 cfs (estimate)

Water moderately turbid. Grayish-white surface scum present in debris and backwater areas.

Observed fish mortality included numerous white sucker fry; 24 year-1 white sucker; 13 central mudminnow; 2 pearl dace; 1 fathead minnow and 1 unidentified shiner. Two stressed year-1 white sucker and one adult central mudminnow. Approximately 450 ft. of stream surveyed above culvert. All fish collected from debris or along shallow stream bank vegetation. Could not quantify additional dead specimens along the bottom of stream due to turbid water conditions.

Adell Creek at Bates Road downstream of Adell Whey discharge

Date = 05/20/98, Wednesday

Distance Downstream of Adell Whey Discharge = 2.2 miles

Water Sample Time = 13:45

Temperature = 22.2 °C

% Cloud Cover = 25%

Dissolved Oxygen = 4.42 mg/l @ 51.1% saturation

Sample I.D = AC3T

pH = 7.08 su

Ammonia-N = 13.5 mg/l

BOD₅ = >690 mg/l

Discharge = 0.4 cfs (estimate)

Dead white sucker fry are numerous, estimated dead creek chub at 50-75, one 1-year old white sucker and 1-15 inch white sucker, estimate 50-75 central mudminnow, 7 unidentified shiners, and very numerous stressed central mudminnow. Elevated water turbidity prevents an accurate count. All observed dead fish were along shallow stream bank areas and all were lying on bottom of stream.

Table 1

Total Ammonia-N and Un-ionized Ammonia-N Concentrations from Adell Creek Resulting from Discharge by Adell Whey

Sample I.D.	Ammonia (as nitrogen) Total NH3-N (mg/l)	Water Temperature (C)	pKa	pH (su)	Un-ionized Ammonia NH3-N %	Un-ionized Ammonia NH3-N (mg/l)	
AC1C (control)	0.426	22.2	9.33	7.59	1.781	0.008	
AC1T (impacted)	1.24	28.1	9.15	7.90	5.316	0.066	
AC2T (impacted)	3.65	25.7	9.22	7.46	1.695	0.062	*
AC3T (impacted)	13.5	22.2	9.33	7.08	0.557	0.075	*
* Exceeds state un-ionized ammonia nitrogen criterion of 0.04 mg/l							
% NH3-N = $1/1+10^{(pKa-pH)}$							
where: $pKa = 0.09018+2729.92/T$							
T = Receiving Water Temperature (C) + 273.2							
% NH3-N = Percent of the total NH3-N in the un-ionized ammonia form							
c:\data\wr\adelkill.xls							

An Investigation of the Adell Tributary in Conjunction
With the J.B. Downing Company Discharge

Milwaukee River Drainage Basin - Sheboygan County,
Sherman Township, T13N, R21E, Section 2, SWSW

Prepared by:

Joseph E. Kurz
Southeast District Water Quality
Management Section

July 28, 1981

INTRODUCTION

An investigation of the Adell tributary to Nichols Creek was conducted at the request of the DNR Southeast District Wastewater Section. Survey efforts were concentrated around the J.B. Downing Co. wastewater discharge. The objectives of the survey were two-fold: 1) to provide a check on the stream classification of the Adell tributary to establish future effluent limit guidelines; and 2) to determine what effects the J.B. Downing discharge has on the water quality of the Adell tributary.

Description of the Study Area

The Adell tributary originates in the Adell Swamp in Sherman Township (T13N, R21E) of Sheboygan County and is within the Milwaukee River Drainage Basin. It flows for approximately 5.3 miles before discharging to Nichols Creek in the Cascade Swamp area. Stream gradient is approximately 10 feet per mile. The land use in the watershed is primarily wetlands with some agriculture in the middle reach of the stream. The Adell tributary watershed receives two permitted wastewater discharges. The J.B. Downing Co. discharges their whey waste lagoon into the stream approximately 3/4 mile downstream of the headwaters area. The Adell WWTP is located approximately 0.4 miles downstream of the J.B. Downing Co. (Figure 1), but does not discharge to surface water.

The J.B. Downing Co. was previously owned by Foremost Foods and discharged whey wastes to the Adell tributary as early as 1944 when the plant was run by the Western Condensing Co., a division of Foremost Foods. The J.B. Downing Co. purchased the plant on February 13, 1979, and obtained their WPDES discharge permit on October 12, 1979. The plant receives whey from area cheese factories and processes it for addition to animal feed. Originally, only one lagoon was used for waste treatment, but in November, 1969 an additional "hot pond" was put into operation as a primary treatment pond. Both ponds contain surface aerators. The "hot pond" has a retention time of 10 days and the lagoon, 15 days. The present permitted discharge to the Adell tributary is a combination of the lagoon waste discharge and noncontact cooling water. A storm sewer discharges to the southeast corner of the lagoon.

X The present stream classification of the Adell tributary is non-continuous, marginal fish and aquatic life from the Adell Swamp down to the waste lagoon and continuous, intermediate fish and aquatic life from the lagoon outfall down to the confluence with Nichols Creek. Originally, the Adell tributary flowed through the waste lagoon but in November, 1967 the DNR gave authorization to Foremost Foods to reroute the stream around the lagoon. The present classification was based on the assumption that the stream still flowed through the lagoon. This obviously was false and thus the need for a reclassification.

The Adell WWTP went into operation in late 1965 - early 1966. The plant was designed to discharge to a seepage lagoon which overflowed to an intermittent ditch connected to the Adell tributary. Some discharge may have occurred to the ditch in the plant's first year of operation, but since

mid-1967 no overflow of the lagoon has been observed. The Adell WWTP's present WPDES permit does not allow discharge to the ditch or the Adell tributary.

The Department of Natural Resources has received continual complaints on the pollution problems in the Adell tributary from the early 1960's to the present. One complaint of pollution was recorded as early as 1944. The complaints center around foul odors and unsightly condition of the Adell tributary downstream of the whey processing plant.

Past Studies

A basin assessment survey of the Milwaukee River drainage basin, exclusive of areas within Milwaukee County, was conducted in 1966 and 1967. In October, 1966 macroinvertebrate samples were collected at three sites in the Adell tributary: Site 1 - 20 ft. downstream of the Foremost Foods waste lagoon discharge; Site 2 - 0.4 miles downstream of the lagoon discharge and 300 ft. upstream of the Adell WWTP; and Site 3 - 2.3 miles downstream of the lagoon discharge at Bates Road (Figure 1). No sample was collected upstream of the waste lagoon because of the intermittent nature of the stream.

At Site 1, a qualitative sample indicated the presence of Cheumatopsyche, Physa, Helisoma, Simulium and Chironomus. These organisms range from tolerant to very tolerant to organic pollution. At Site 2 a quantitative sample revealed primarily a very tolerant macroinvertebrate community. This poor community was attributed to a poor physical sampling site and high organic content of the water. At Site 3 a quantitative sample contained 65% very tolerant and 34% tolerant organisms. This poor community was also attributed to the high organics content of the stream.

Dissolved oxygen measurements and fecal coliform counts taken throughout the survey are listed in Table 1.

On June 23, 1976 the Kettle Moraine Youth Conservation Camp seined portions of the Adell tributary to determine fish species present in the stream. Results are listed in Table 2. The collection at CTH "NN" (Figure 1), consisted of 100 feet of stream seined while at the remainder of the sites 150 feet was seined.

On February 19, 1980 a DNR Southeast District field crew took dissolved oxygen and temperature measurements and made visual observations of the Adell tributary. Results are indicated in Table 3.

On April 28, 1980, a stream classification was performed on the Adell tributary. Observed instream conditions are listed in Table 4.

Measurements of DO, BOD₅ and fecal coliform bacteria from 1964 to the present are presented in Table 1.

SURVEY METHODS AND MATERIALS

A stream classification was carried out on June 29, 1981 using the proposed classification procedures of Ball (1981) for the State of Wisconsin. This classification scheme addresses the potential of a stream to maintain populations of fish and aquatic life. Potential is based on the intrinsic habitat and water quality conditions of a stream in the absence of point source discharges and with reasonable control of non-point source pollution. Habitat and water quality conditions which are considered in the classification include, but are not limited to, the following: watershed characteristics, stream bank, substrate type, flow, water depth, pool/riffle ratio, dissolved oxygen, temperature and pH.

An initial field investigation was conducted on June 24, 1981 to determine what stream biota could be sampled to most accurately assess the effects of the J.B. Downing Co. discharge. It was determined that only a fish population survey would be conducive to an assessment. The intermittent nature of the stream above the discharge and the stream substrate were considered to be inadequate for an accurate water quality interpretation using macroinvertebrates. Fish were sampled using a backpack shocker for a distance of 75-100 yards of stream length at each of four sites.

Grab water samples were also taken for fecal coliform and fecal streptococcus bacteria to determine if high counts were still present as in previous surveys (Table 1). Fecal coliform/fecal streptococcus ratios (FC/FS) were determined.

RESULTS AND DISCUSSION

Fish populations in the Adell tributary are listed in Table 5. Compared to 1976 fish populations (Table 2), it appears that a reduction in numbers and species of fish has taken place. The central mudminnow (*Umbra limi*) was the most common species collected. The summer habitat of this species is usually heavily vegetated ponds or pools of small creeks where the bottom has a thick layer of organic material (Scott and Crossman, 1973). Stream habitat conditions appeared to be optimum for mudminnow populations (Table 6). At the upstream site mudminnows were only collected in the slow-moving, silt-laden area of the sample site. Mudminnows are tolerant of low DO levels. Black (1945) indicated that the swim bladder of the central mudminnow has a respiratory capability and that mudminnows do gulp air at the surface when oxygen is low.

Slow-moving water and heavy vegetation is also habitat for the brook stickleback (*Culaea inconstans*), but low DO levels may have reduced its population. The decline in the number of fathead minnows (*Pimephales promelas*) is puzzling since this species is very tolerant to organic enrichment. It too may have been reduced in number because of low DO levels.

At Bates Road (2.3 miles from the discharge) two additional species were collected--the northern creek chub (Semotilus atromaculatus) and the pearl dace (Semotilus margarita). These two species are tolerant of organic pollution and are generally found in the recovery zone of a stream with high organic loading. Their range in the stream may be limited by low DO levels although a low DO level (2.2 mg/l) was found at Bates Road. This site had very extensive plant growth and it is not understood why the DO level was not higher with such a high capability for oxygen production. It is possible that a high sediment oxygen demand (SOD) utilizes dissolved oxygen faster than it is produced. SOD was not sampled for but sediments were noted to be anaerobic. In general, the fish population at this site was more diverse and higher in number than the upstream sites but diversity and tolerance of the community was still low.

The majority of the stream flow in the middle and lower reaches was contributed by the J.B. Downing Co. discharge. In dry weather conditions the Adell tributary does cease flowing upstream of the discharge as evidenced in the 1966 basin survey. Flow at the upstream site in this survey was estimated at 0.1 cfs. (Precipitation prior to the survey is listed in Table 7.) Flow conditions of the Adell tributary, fish populations and habitat conditions of the stream indicate that the stream is capable of supporting limited populations of tolerant forage fish and/or tolerant macroinvertebrate populations (Class D of the proposed stream classification guidelines).

Bacteria levels were highest in the Adell tributary above the J.B. Downing Co. discharge. There did not appear to be a problem with high bacterial counts from the wastewater discharge at the time of this survey. This was in contrast to counts obtained in the 1966-67 basin survey and other miscellaneous sample collections (Table 1). Prior to the Village of Adell's sewer system, Foremost Foods discharged their septic system wastes to the lagoon. This practice was supposedly abandoned after construction of the Adell WWTP. A sample collected from the storm sewer in the southeast corner of the lagoon on June 11, 1980 indicated a fecal coliform count of 30,000/100 ml. At the time of the present survey no flow was observed from the storm sewer but Sphaerotilus was observed in the stagnant water. Sewage wastes may be entering from this storm sewer and thus may raise bacterial counts in the lagoon during wet weather.

The FC/FS ratio of the samples indicated livestock or poultry wastes. Farm operations are not located along the stream, thus, bacterial counts may be due primarily to other animal wastes entering the stream.

The upstream site and the site at CTH "NN" (3.8 miles downstream of the J.B. Downing discharge) drain extensive marsh areas. Low DO levels were found at both of these sites. A study by Lee, et al, (1969) on the effect of marshes on water quality determined that marsh drainage waters are high in concentrations of organic matter, which contributes to a high oxygen demand and low DO waters. The low DO level at CTH "NN" may be a

result of the combined effects of the J.B. Downing Co. discharge and the marsh condition. The low DO levels at CTH "W", CTH "AC" and at Bates Road (0.9, 1.2 and 2.3 miles from the discharge, respectively), appear to be a result of the J.B. Downing discharge. The Wisconsin standard for DO of ≥ 1.0 mg/l for marginal fish and aquatic life streams was violated in several instances at these sites (Table 1). It is believed that diurnal DO readings would have revealed more extensive instream DO standard violations.

SUMMARY AND CONCLUSIONS

Fish populations were low in number and diversity above and below the J.B. Downing Co. discharge. The central mudminnow was the most common species found. Populations appeared to be in a poorer state than in a 1976 survey. A significant decrease in fish populations was found immediately below the discharge relative to the number of fish found upstream of the discharge. Number and diversity of fish increased further downstream but were still considered poor in quantity.

A combination of the stream's natural limiting factors, primarily low flow and DO, and the poor condition of the J.B. Downing Co. discharge limit the stream's fish population. Anaerobic conditions in the stream are suspected of being caused by high BOD of the water and sediments. It is believed that with the stream's increased flow, as a result of the discharge, that the potential for a larger and more diverse fish population would increase despite the discharge. However, poor water quality conditions (i.e., low DO), as a result of the J.B. Downing Co. discharge, appear to be stifling this potential. The Adell WWTP is not suspected of causing any of the past or present, poor water quality conditions of the stream.

Based on the limited natural stream flow, poor habitat and watershed conditions upstream of the J.B. Downing Co. discharge, the entire stream is potentially capable of supporting tolerant forage fish and/or tolerant macroinvertebrates. Although macroinvertebrates were not sampled, it is expected that only tolerant species would be present given the stream's natural limiting factors. According to the present stream classification scheme the Adell tributary is classified non-continuous, marginal fish and aquatic life.

Bacteria counts from the J.B. Downing Co. discharge were low during this survey. Counts may be higher in wet weather conditions due to a suspected source of sewage contamination via a storm sewer to the waste lagoon. High counts, as observed in past collections, may pose a health problem downstream of the discharge and are definitely in violation of Wisconsin water quality standards. The Village of Adell and the J.B. Downing Co. should cooperate in locating and eliminating this source of sewage contamination and redirect the storm sewer to discharge to the Adell tributary.

X
 * = Use class "B"
 = intermediate
 ?

REFERENCES CITED

- Ball, J.R. 1981. Stream Classification Guidelines (proposed). Wis. Dept. of Natural Res., Madison, Wis.
- Black, V.S. 1945. Gas exchange in the swimbladder of the mudminnow. Proc. Nova Scotian Inst. Sci. 21: 1-22.
- Lee, G.F., E. Bentley and R. Amundson. 1969. Effects of marshes on water quality. Univ. of Wis. Water Chemistry Program, Madison.
- Scott, W.B. and E.J. Crossman. 1973. Freshwater Fishes of Canada. Bull. 184. Fisheries Research Board of Canada. Ottawa.
- Wis. Dept. of Natural Resources. 1968. Report of an Investigation of the Pollution in the Milwaukee River Basin Made During 1966 and 1967. Wis. DNR, Madison, Wis.

Table 1. Miscellaneous Measurements of DO, BOD₅ and Fecal Coliform Bacteria in the Adell Tributary.

	CTH "A"	Lagoon Outflow	Final Discharge	Above the Adell WWTP	CTH "W"	CTH "AC"	Bates Road	CTH "NN"
<u>Dissolved Oxygen (mg/l)</u>								
28 Oct. 64		1.2			9.8			
7 July 66	*	7.9		5.5 ³	10.4		5.4	
13 Sept. 66	*	3.3		5.1 ³	4.5		3.3	
17 Oct. 66	*	0.5		7.6 ³	7.3		7.1	
6 Apr. 67	5.0	0			4.4		5.9	
10 May 67	2.1	0			0.9		2.5	0
12 Oct. 67		0.1	6.2		4.2		7.2	9.9
25 Feb. 69		0			0	0.9		
27 Aug. 70	*	7.0			2.2	4.1		
11 Aug. 71					1.0	1.0		
24 Sept. 74		1.1	3.7		2.0	2.6		
3 Oct. 74		1.5			6.4	3.8		
13 Feb. 75			2.0					
6 Aug. 75			9.3					
21 March 75			3.5					
8 Aug. 79		0.2	5.0		5.2			
19 Feb. 80	*				0.05		1.9	0.9
28 Apr. 80					3.7		2.1	3.1
29 June 81	3.9 ¹		5.6 ²			0.8	2.2	1.3
<u>BOD₅ (mg/l)</u>								
28 Oct. 64		51.9			2.1			
6 Apr. 67	2.6	58.3			19.0		9.5	
10 May 67	2.3	91.9			70.1		51.9	26.1
12 Oct. 67		55.0	10.0		3.7		5.5	3.7
25 Feb. 69		305.0	110.0		69.0	52.0		
27 Aug. 70	*	6.0			3.0			
11 Aug. 71		14.0	5.0		2.5	2.5		
24 Sept. 74		148.0	54.0		21.0	17.0		
3 Oct. 74		81.0	23.0		36.0	20.0		
13 Feb. 75			90.0					
6 Aug. 75			30.0					
<u>MFCC (No/100 ml)</u>								
7 July 66	*	80,000		180,000 ³	70,000		100,000	
13 Sept. 66	*	50,000		70,000 ³	20,000		7,000	
17 Oct. 66	*	11,000		9,000 ³	11,000		16,000	
6 Apr. 67	1,400	30,000			23,000		19,000	
10 May 67	1,500	23,000			14,000		4,900	3,000
12 Oct. 67		40,000			11,000		10,000	5,000
25 Feb. 69		25,000			7,800	4,600		
27 Aug. 70	*	<100			<100			
11 Aug. 71			2,900		30	30		
24 Sept. 74					900	40		
3 Oct. 74					400	90		
11 June 80		130 ⁴						
29 June 81	310 ¹		50			10	140	

* No flow observed.

¹ Adell tributary, immediately above confluence with J.B. Downing Co. discharge.

² Adell tributary, 150 ft. below confluence with J.B. Downing Co. discharge.

⁴ Sewage influent to SE corner of lagoon, MFCC - 30,000.

Table 2. Fish Species Collected in the Adell Tributary, June 23, 1976.

Species	CTH "W"		CTH "AC"		Bates Road		CTH "NN"	
	No.	%	No.	%	No.	%	No.	%
Central mudminnow	2	2.5	28	37.8	4	6.0	52	98.1
Blackchin shiner	1	1.2						
Fathead minnow	42	52.5	23	31.1	9	13.4		
Creek chub	5	6.2	5	6.8	26	38.8		
Pearl dace	2	2.5	6	8.1	4	6.0		
White sucker	5	6.2	1	1.4	4	6.0		
Black bullhead	21	26.2			1	1.5		
Brook stickleback	<u>2</u>	<u>2.5</u>	<u>11</u>	<u>14.9</u>	<u>19</u>	<u>28.4</u>	<u>1</u>	<u>1.9</u>
TOTAL	80	100	74	100	67	100	53	100

Table 3. Condition of the Adell Tributary, February 19, 1980.

Stream Site	DO (mg/l)	Temp. (°C)	Comments
CTH "A"	--	--	No flow; frozen solid.
CTH "W"	0.05	14	Extensive floating sludge; substrate 100% sludge; foul odor present; water very turbid, greenish-gray in color; no ice present.
Bates Road	1.9	5.0	Foul odor present; water turbid, greenish-gray in color; some sludge deposition on substrate; no ice present.
CTH "NN" Adell tributary	0.9	0.5	Foul odor present; water slightly turbid; ice thickness ~ 1 ft.
CTH "NN" Nichols Creek (above confluence of Adell trib.)	6.2	0.5	Water clear; ice thickness ~ 1.5 ft.
Cascade Road Nichols Creek (~ 1.5 miles below confluence with Adell trib.)	1.4	0.5	Water clear; ice thickness ~ 8 inches.

Table 4. DO and Temperature of the Adell Tributary, April 28, 1980.

Stream Site	DO (mg/l)	Temp. (°C)	Comments
CTH "I"	--	--	Water clear, brown-colored; flow ~ 1 cfs.
CTH "W"	3.7	8.4	Water very turbid; brown-colored.
Bates Road	2.1	8.0	Water clear, brown-colored; flow ~ 3 cfs; heavy filamentous algae along banks.
CTH "NN"	3.1	8.0	Water clear, brown-colored.

Table 5. Fish Collected in the Adell Tributary, June 29, 1981.

Species	Above J.B. Downing Co. Discharge	150 ft. Below J.B. Downing Co. Discharge	CTH "AC"	Bates Road
Central mudminnow	30	1	16	21
Brook stickleback	1			
Fathead minnow	2	3		1
Black bullhead		3		
Northern creek chub				29
Pearl dace				8

Table 6. Stream Conditions in the Adell Tributary, June 29, 1981.

	Above J.B. Downing Co. Discharge	J.B. Downing Co. Discharge	150 ft. Below J.B. Downing Co. Discharge	CTH "AC"	Bates Road	CTH "NN"
DO (mg/l)	3.9	--	5.6	0.8	2.2	1.3
Temp. (°C)	22.1	--	30.3	27.0	24.2	24.3
pH	7.6	--	7.9	7.8	7.8	7.7
MFFCC	310	50	120	10	140	--
Fecal Strep.	370	190	340	80	560	--
FC/FS	0.84	0.26	0.35	*	0.25	--
Water Condition	Clear; brown-colored	Clear; floating solids, primarily cooling water	Clear; floating solids	Clear	Clear	Clear; brown-colored
Substrate	Sand & gravel primarily; 100% silt in lower section	--	Sand and gravel 50%, silt - 50%; anaerobic; sludge banks	100% silt; anaerobic; strong odor; sludge banks	100% silt; anaerobic; strong odor	100% silt
Stream Vegetation	Heavy filamentous algae in silt-laden area	--	Scattered <u>Potamogeton</u>	None observed	Heavy <u>Potamogeton</u> and <u>Lemna</u> cover	Moderate <u>Lemna</u> growth. Heavy reed canary grass growth

*FC/FS ratio not applied to samples with fecal strep counts less than 100/100 ml.

Table 7. Precipitation Records Prior to the June 29, 1981 Survey Recorded at Plymouth, Wisconsin by Mr. Ray Kapellen, NOAA Weather Observer.

Date	Rainfall (Inches)	Date	Rainfall (Inches)
June 15	1.36	June 22	0.52
" 16	0.06	" 23	0
" 17	0	" 24	0.02
" 18	0	" 25	0.03
" 19	0	" 26	Trace
" 20	0.59	" 27	0
" 21	0	" 28	0.02

Date: February 21, 1980

File Ref: 3210-3

To: File

From: Joe Kurz JEK

Subject: ~~James Downing Co~~
~~Foremost Foods - Adell~~

At the request of Colin Beveridge a stream classification will be conducted on the receiving stream for the Foremost Foods discharge. The stream is an unnamed tributary to the North Branch of the Milwaukee River in Sheboygan County.

A preliminary field investigation was conducted on February 19, 1980 to determine ice and dissolved oxygen conditions. No flow was observed above the discharge from the Adell Swamp. The swamp was ice-covered. The stream flow below the discharge was primarily effluent. Floating sludge mats and sludge-covered substrate were observed. The stream was very turbid and green-gray in color. A foul smelling odor arose from the stream. The stream was open down to CTH "NN" where ice thickness was approximately one foot. Dissolved oxygen levels below the discharge ranged from 0.05 ppm at CTH "W" to 1.9 ppm at Bates Road. D.O. was below 1 ppm before the confluence with the Milwaukee River. D.O. levels in the Milwaukee River were 6.2 ppm at CTH "NN", upstream of the tributary confluence, and 1.4 ppm at Cascade Road, approximately 1.5 miles downstream of the confluence. Ice cover was present on the Milwaukee River. The low D.O. levels at Cascade Road could be a combined result of the Cascade STP, the Cascade Swamp and the Foremost Foods discharge. It would be difficult to separate the causes but it is felt that the Foremost Foods discharge is affecting the Milwaukee River with the low D.O. levels produced in the tributary.

Due to the present ice conditions a stream classification must be withheld until ice-out and low flow conditions. It will be conducted in the 1980 fiscal year.

JEK:jar

cc: Mark Tusler - WR/2

STREAM: Tributary to N. Br. Milwaukee R.

DISCHARGER: James Downing Co.

COUNTY Sheboygan

CLASSIFICATION RECOMMENDATION

It is recommended that the classification for this tributary be:

- 1) Non-continuous, marginal fish & aquatic life from the Adell Swamp to the J. Downing Co. pond
- 2) Continuous, intermediate fish & aquatic life from the pond downstream to the confluence with the N. Br. of the Milwaukee R.

ADDITIONAL COMMENTS

The fish samples were collected at a time when the stream was affected by the discharge from Foremost Foods (J. Downing Co.). It is expected that with better treatment of the discharge the stream would be able to support a more diverse, less

ATTACHMENTS

Memo from L. Claggett (6 March 80)
USGS Map

REFERENCES USED

Surface Water Resources of Sheboygan Co.

cc: Becky Wallace - WR/2 ←

Frank Schultz - SED Wastewater Section

WISCONSIN DEPARTMENT OF NATURAL RESOURCES
 STREAM CLASSIFICATION WORKSHEET

Receiving Watercourse : Tributary to N.Br. Milwaukee R.
 District : Southeast
 Location : SE 1/4, SW 1/4, Sec 2, T13N, R.21E.
 Major Basin : Upper Milwaukee R.
 Discharger : James Downing Co. (Adell)
 Flow (Design & Actual) : Unknown
 Type of Treatment : Aerated lagoons connected to
 the stream

Recommended No.	Reach	Classification Location
	1	CTH "I", above J. Downing Co.
	2	CTH "W"
	3	Bates Rd.
	4	CTH "NN"

Date of Field Observations : 28 April 80

Personnel : Joe Kurz Class : ES-4

Other Persons Contacted : Colin Beveridge - SED Compliance section

Noted by WQES :

Date :

STREAM CLASS REACHES

PHYSICAL FEATURE		1	2	3	4	5
Watershed Character (maps or observations)	Size (sqmi)					
	Vegetation Type					
	Predominant Land Use	Wetlands	Wetlands	Agriculture	Wetlands	
	Wetland Type	Marsh	Marsh	Marsh along banks	Marsh	
Hydrologic Features (indicate if estimate or actual measurements)	Width (ave)	6'	15'	4'	4'	
	Depth (ave/max)	1.5' ave	not determined	1.5' ave	too variable	
	Velocity (est)(fps)	0.15fps	< 0.15fps	0.58fps	< 0.15fps	
	Flow (cfs) (est)	0.9 cfs	-	3 cfs	-	
	Pools or Refuges for Fish No. observed, death					
% Bottom Type	Silt	20	-	100%	100%	
	Sand	40	-			
	Gravel	40	-			
	Rubble		-			
	Other		-			
Control Structures or Obstructions		Culvert under RR tracks may obstruct flow in low-flow periods	Dam on plant property	None	None	
Irretriev. Channel Alterations		None	None	None	None	
Discharge Q _{7.10}						

BIOLOGICAL CHARACTERISTICS

STATIONS ON RECEIVING WATER

	1	2	3	4	5
Bank Vegetation	Marsh grasses	Marsh grasses	Marsh grasses	Marsh vegetation	
Aquatic Macrophytes	None	None	None	None	
Invertebrates	None observed	Not observed	Not observed	Not observed	
Phytoplankton (algae)	Filamentous algae ~ 20% cover	Floating mats of algae, 10% cover	Heavy filamentous algae along banks ~ 20% cover	Filamentous algae 10% cover	
Fish Observed	None observed	None observed	None observed	None observed	

Fishery Classification

Forage fish

BIOLOGICAL CHARACTERISTICS
(continued)

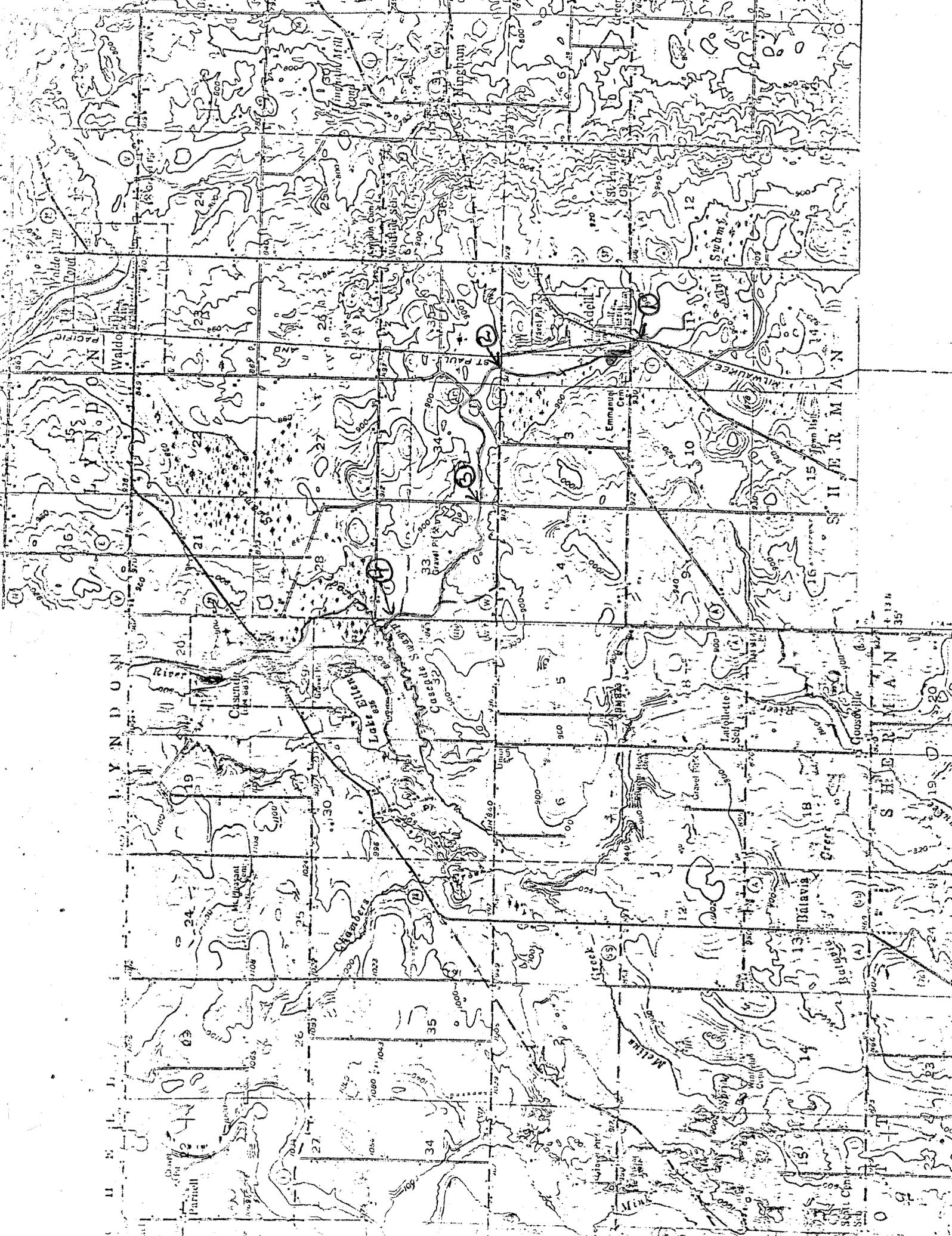
STATIONS ON RECEIVING WATER

		1	2	3	4	5
Reaches of Critical or Particular Wildlife Value eg: ↓	Spawning Areas	None critical	None critical	None critical	None critical	
	Critical Habitats					

CULTURAL FEATURES

STATIONS ON RECEIVING WATER

		1	2	3	4	5
Recreational Uses		Very little use	Very little use	Very little use	Very little use	
		expected	expected	expected	expected	
Type of Drainage Sources Observed		wetlands	wetlands	wetlands	wetlands	
				agricultural surface		
Other Dischargers		None	None	None	None	
			



CORRESPONDENCE/MEMORANDUM

STATE OF WISCONSIN

Date: March 6, 1980

File Ref: []

To: Joe Kurz

MAR 7 10 07 AM '80

From: Larry Claggett

Subject: Fish population of Adell tributary to Nichols Creek

Attached are the collection results from a YCC seining survey of above stream. The results appear to reflect the poor water quality and habitat of the stream. Paul Schultz is knowledgeable of the past water quality abuses the stream has endured.

Table 1. Fish species collected in a tributary to the north branch of the Milwaukee River between Adell and the confluence, 1976.

Species	Number at each location				Total	% of Total
	Mi 10	Mi 11	Mi 12	Mi 13		
Central Mudminnow	52	4	28	2	86	31.4
Blackchin Shiner				1	1	0.4
Fathead Minnow		9	23	42	74	27.0
Creek Chub		26	5	5	36	13.1
Pearl Dace		4	6	2	12	4.4
White Sucker		4	1	5	10	3.6
Black Bullhead		1		21	22	8.0
Brook Stickleback	1	19	11	2	33	12.0
Total	53	67	74	80	274	100

Table 2. Fish collection station description for tributary to Nichols Creek downstream of Adell.

Station	Description
Mi 10	Up and Downstream - Co. Tnk NN T-14-N R-21-E Sec. 33 Seine 100 feet 6-23-76
Mi 11	Downstream Bates Road T-14-N R-21-E Sec. 33 Seine 150 feet 6-23-76
Mi 12	Upstream Co. Tnk. AC T-14-N R-21-E Sec. 34 Seine 150 feet 6-23-76
Mi 13	Downstream Co. Tnk. W T-14-N R-21-E Sec. 35 Seine 150 feet 6-23-76