

Date SEPT 2000

Facility Name AGRILINK FOODS, INC. STP, DARIEN, WI

Receiving Water DARIEN CREEK (WIBC 791800) AND AN UNCR (WIBC 792000)

Evaluated by MAURICYN, WILLIAM

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 Sept 2000 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 QUALITY STANDARDS REVIEW
AND STREAM CLASSIFICATION FOR
DARIEN CREEK, an UNNAMED TRIBUTARY of DARIEN CREEK
and LITTLE TURTLE CREEK - LOWER ROCK RIVER BASIN
WALWORTH and ROCK COUNTIES, WISCONSIN
(Rev. February, 2000)
by Will Wawrzyn, Southeast District**

INTRODUCTION

The Lower Rock River Water Quality Management Plan included a recommendation to conduct a Water Quality Standards Review and Stream Classification for Darien Creek and Little Turtle Creek located in Walworth and Rock Counties, Wisconsin (WDNR, 1991). Following this recommendation, a Water Quality Standards Review and Stream Classification report was completed for Darien Creek in 1992 and again in December, 1997 to account for the 1996 abandonment of the Village of Darien POTW.

This February 2000 report is the most recent and final revision to the Water Quality Standards Review and Stream Classification for Darien Creek and that portion of the Little Turtle Creek downstream of its confluence with Darien Creek. This revision to the previous 1997 report has been amended to include a Water Quality Standards Review and Stream Classification for an Unnamed Tributary of Darien Creek to which the Agrilink Foods, Inc. facility discharges non-contact cooling water. This report and recommendations do not result in any changes to the stream classification or management recommendations previously developed for Darien Creek and Little Turtle Creek since the 1997 report.

BACKGROUND

Darien Creek, the Unnamed Tributary to Darien Creek and Little Turtle Creek are located in the Lower Rock River Basin, Turtle Creek Watershed in southwestern Walworth County and southeastern Rock County.

Darien Creek (WIBC 791800)

Darien Creek is formed by diffuse runoff and groundwater discharge in T1N, R15E, S.12, SE of SE. The perennial stream reach flows northwest for approximately 8 miles before its confluence with Little Turtle Creek in T2N, R14E, S.36, NE of NE and Little Turtle Creek stream mile 0.6. Darien Creek is a first order stream, has an average gradient of 15.1 ft/mi, and drains approximately 18 mi² (WCD, 1961). The reported Q_{7,2} and Q_{7,10} discharge upstream of the former Village of Darien POTW discharge (T2N, R15E, S. 32, NE of SE) is 0.9 ft³/s and 0.4 ft³/s, respectively (Hollstrom, 1992).

Agriculture is the dominant land use in the watershed. Prior to settlement and drainage improvements, much of these lands were wetlands. Houghton-Palms is the primary soil association along the lower half of the watershed. These soils are characterized as being very poorly drained organic soils in depressions; narrow streams bottoms lands, and nearly level wetlands. These characteristics have encouraged stream channelization and tiling to improve agricultural land drainage. The upper-half of the watershed is dominated by the Flagg-Pecatonica soil association. These soils are characterized as being well drained soils that have a subsoil of silty clay loam, formed in a thick layer of loess and the underlying sandy loam to loam glacial till

on uplands. Erosion is a hazard to croplands and water quality because runoff accumulates as channelized flow on the long slopes (USDA, 1971). As of 1985, there were approximately 49 acres of wetlands adjoining Darien Creek.

Prior to January 1996 there were two known point source discharges to Darien Creek. They included the Village of Darien POTW (STORET # 653036; WPDES # WI-0020168-4), and the Agrilink Foods, Inc. STP (formerly Dean Foods and the Larsen Company) STP (STORET # none; WPDES # WI-0050679-3). Prior to its abandonment in January, 1996 the Darien POTW was an activated sludge plant in series with a polishing pond. This facility operated with a design flow of 0.15 mgd. It served an existing and projected year 2010 population of 1,500 and 1,543, respectively. Prior to its abandonment in 1996, treated effluent from the Village of Darien POTW was discharged to a combination underground tile and open stream channel approximately 1.3 miles upstream of its confluence with Darien Creek at T2N, R15E, S.32, SW of NE (Darien Creek mile 2.1) (Sheikholeslami, 1992).

The Agrilink Foods, Inc. STP has a permit to discharge treated cannery waste directly to Darien Creek in the vicinity of the former Darien POTW discharge and to groundwater via a spray irrigation system. This facility has not reported any process waste discharges to Darien Creek since May 17, 1986 (Sheikholeslami, 1992).

Little Turtle Creek (WIBC 791700)

Little Turtle Creek drains approximately 58 mi² and originates in the Village of Sharon as treated wastewater discharge and diffuse urban runoff in T01N, R15E, S.32, SW of SE. Mixed agricultural is the dominant land use. From its origin, it flows west and northwest for approximately 16 miles before its confluence with Turtle Creek at the Turtle Creek Wildlife Area. Darien Creek discharges to Little Turtle Creek at stream mile 0.6.

Unnamed Tributary to Darien Creek (WIBC 792000)

The Unnamed Tributary to Darien Creek has its origin as diffuse runoff and groundwater in T02N, R15E, S.34, NW of NE (WCD, 1970). From its origin, it flows southwest for approximately 2 miles before its confluence with Darien Creek in T02N, R15E, S.32, SW of NE. The majority of this stream has been channelized and a shorter reach has been enclosed in tile. Agrilink Foods, Inc. discharges non-contact cooling water to the Unnamed Tributary to Darien Creek approximately 400 ft. upstream of its confluence with Darien Creek. The non-contact cooling water discharge generally occurs during the months of June through October and at an average rate of 60 gpd. WPDES temperature limits for this discharge are 120°F (49°C). Additional permitted discharges to the unnamed tributary include Sisk Auto Salvage Parts (WI-S059145) and the Walworth Foundries, Inc. facility (WI-S067849). Both permits are stormwater industrial Tier 1 permits and are located in the Village of Darien.

PREVIOUS STREAM CLASSIFICATIONS

Darien Creek, the Unnamed Tributary to Darien Creek and Little Turtle Creek downstream of the Darien Creek were previously classified as variance category streams (Wisconsin Department of Natural Resources, 1997) NR 104.06, table 4, #23). According to the current version of NR 104, Darien Creek is classified as a "continuous, intermediate aquatic life stream" from its origin to its confluence with Little Turtle Creek. The Unnamed Tributary to Darien Creek is classified as an "effluent ditch" (marginal aquatic life), and Little Turtle Creek is classified as a "continuous, intermediate aquatic life stream" from its origin to its confluence with Turtle Creek. These classifications were completed prior to the development and use of the Wisconsin Stream Classification Guidelines (Ball, 1984).

A Recreational Use Classification and Disinfection Determination was completed in 1988 (Wakeman, 1988). Disinfection of the Darien POTW effluent was not considered necessary because it was felt that the stream is not capable of supporting full body contact types of recreational uses (Appendix 1).

SAMPLE BACKGROUND AND METHODS

The stream classifications for Darien Creek, the Unnamed Tributary to Darien and Little Turtle Creek are based on guidelines developed by Ball (1982). Generally, these procedures include the collection of fish and habitat information, Instantaneous flow, conventional water quality parameters and photograph documentation may be obtained.

Darien Creek

Since 1975, 10 qualitative fish distribution samples were collected from Darien Creek at seven different sites. Two sites and three samples were located downstream of the Darien POTW and Agrilink Foods, Inc. STP wastewater discharges, and downstream of the Unnamed Tributary to Darien Creek. The remaining seven samples were collected at five sites located upstream of these discharges (Fago, 1982).

Little Turtle Creek

Since 1968, 13 qualitative fish distribution samples were collected from Little Turtle Creek at 10 different sites. All of the sample sites were located upstream of the confluence with Darien Creek.

Unnamed Tributary to Darien Creek

One qualitative fish distribution samples were collected from the Unnamed Tributary to Darien Creek in 1998 and 1999. Both samples were obtained along a 400 ft. reach beginning approximately 50 ft. upstream of its confluence with Darien Creek and ending at the Agrilink Foods, Inc. cooling water discharge and service road. The 1998 sample was obtained when the Agrilink discharge was inactive and the 1999 sample was obtained when the Agrilink discharge was active.

A summary of fish community sample sites, their locations and other points of reference are provided in Table 1.

Table 1

Fish Community Sample Location and Reference Points	Stream Mile	Collection Date
Turtle Cr. confluence with Little Turtle Creek	0.0	None
Little Turtle Cr. confluence with Darien Cr.	0.6	None
Darien Cr. confluence with Little Turtle Cr.	0.0	None
Darien Cr. at Rock County - Walworth County line	0.3	None
Darien Cr. downstream of North Rd.	0.8	07/06/1992
Darien Cr. at North Rd.	1.1	5/19/1975 and 10/11/94
Darien Cr. at I-43 (formerly STH 15)	1.6	None
Darien Cr. at confluence with former Darien POTW discharge and approximate location of Agrilink Foods pond	2.1	None
Unnamed Tributary to Darien Cr. (via Dean Foods outfall)	2.2	10/07/1998 and 10/04/1999
Darien Cr. at CTH X	2.4	10/07/1998
Darien Cr. at CTH C	3.4	7/25/68 and 7/7/92
Darien Cr. at Townline Rd.	4.4	08/04/1978
Darien Cr. at Peters Rd.	6.4	05/20/1975
Darien Creek T2N, R15E, S. 32, SW, NW	15.9	10/11/94
Little Turtle Creek at CTH X	2.6	08/28/1928 and 07/23/1968
Little Turtle Creek at North Rd.	3.3	05/19/1975 and 10/11/1994(2)
Little Turtle Creek below Lake Shore Dr.	6.4	07/25/1968
Little Turtle Creek above Lake Shore Dr.	6.6	08/04/1978
Little Turtle Creek at CTH J north x-ing	7.3	08/04/1978
Little Turtle Creek at CTH J south x-ing	9.7	05/19/1975
Little Turtle Creek downstream of Rock/Walworth Co. Line	14.0	05/19/1975
Little Turtle Creek upstream of Rock/Walworth Co. Line	14.1	05/19/1975
Little Turtle Creek adjacent to CTH W Walworth Co.	14.3	05/03/1996
Little Turtle Creek between private road and Salt Rd.	14.5	03/30/1999

All fish community samples were obtained using a DC pulsed back pack shocker operating at 2.5 amps and between 150 and 190 volts or DC towed stream shocker operating at 4-6 amps and 150-200 volts. Instantaneous measurements of dissolved oxygen (mg/l), water temperature (C°) and dissolved oxygen as percent saturation (%) were made using an air calibrated Yellow Springs Instrument (YSI) model 56 meter.

RESULTS

Water Quality

Physical and chemical water data for Darien Creek is limited. A dissolved oxygen and temperature profile was obtained in 1974 (WDNR, 1979). Dissolved oxygen levels upstream and downstream of the Darien POTW discharge ranged from 6.8 mg/l to 11.4 mg/l, and temperatures ranged from 24.0 C to 26.0 C. The potential impacts of the point sources, separate or combined, have not been documented.

An investigation of a discharge to Darien Creek in 1983 indicated that organic wastes were impacting the dissolved oxygen concentrations in Darien Creek downstream of the Village of Darien POTW waste discharge (Bornow, 1983). The anaerobic waste (0.0 mg/l) or near anaerobic waste (0.4 mg/l) discharge was

reported on two separate dates. Dissolved oxygen levels in Darien Creek downstream of the waste discharge were 2.5 and 4.5 times lower than ambient dissolved oxygen concentrations and violated state water quality standards on both occasions (2.0 mg/l and 4.0 mg/l). Although not reported during the investigation, the waste point of discharge would have been located in close proximity to the Village of Darien POTW discharge (Appendix 2).

Habitat

Darien Creek

Darien Creek habitat quality was rated "fair" at the North Rd. site (Appendix 3). Although USGS topographic maps (1960) indicate the North Rd. reach was historically channelized, habitat survey results indicate that the stream channel is evolving toward a more natural geomorphic condition. In the absence of recent channelization and intense cropping practices along the riparian area, meanders and a well-defined thalweg are returning. Bend formation is at an early stage and is typically less than 60°. Point bars are present along the lower banks and consist of sand and silt material. These bars are generally well vegetated, stable, and are partially responsible for re-establishing a meandering channel and thalweg. The reach is predominately run with water depths ranging from 1 to 1.5 ft. Maximum observed pool depth was 2.5 ft. Fish and aquatic cover at the North Rd. site is provided by macrophytes, overhanging stream bank vegetation, and woody in-stream debris and snags. Macrophytes are common covering up to 50% of the channel. Substrate is dominated by deep silt, sand and detritus. Significant reaches of the stream are bordered by wetlands, which provide valuable fish and wildlife habitat and buffer against runoff.

Darien Creek habitat quality was rated "fair" at the CTH C site. Based on 1960 USGS topographic maps, this site reach has no history of channelization. Fish and aquatic cover is provided by overhanging stream bank vegetation, woody in-stream debris and snags. Though present, macrophytes do not provide a significant amount of cover. Pool substrate is dominated by silt, sand and detritus while riffles and runs are dominated by coarse sand, gravel and lesser amounts of cobble. Well-defined meanders and thalweg are present, and pools and deeper slack water are present in the bends. Additional pools and deep slack water areas are formed by the damming effect of riffles. Point bars consisting of poorly sorted silt, sand and gravel are generally well vegetated and stable. The presence of poorly sorted bar material may suggest that bed material is being transported and deposited under high flow conditions. The source of this material may include eroded upland areas and material stored in the channel and floodplain. The reach is primarily represented runs and pools and lesser numbers of riffles. Water depth in runs range from 1 to 1.5 ft. and the maximum observed pool depth was 4 ft.

An exception to the favorable habitat near CTH C was noted along the upper end of the survey reach where active livestock pasturing is occurring. Pasturing is responsible for eroded stream banks, loss of stream bank and instream cover, sedimentation, excessive channel width and shallow water.

Other factors and sources responsible for limiting habitat quality include historical stream channelization, modification or draining of wetlands, agricultural sources of nonpoint source pollution including upland erosion and runoff, and stream bank pasturing. Approximately 2.6 miles (or 32%) of Darien Creek has been channelized to accommodate agricultural drainage. Major negative impacts associated with stream channelization include reduction in stream length, development of monotonous run-like habitat in lieu of diverse pool-riffle-run complexes, encouragement of sedimentation through increased rates of channel scour and bank erosion, removes fish and aquatic life cover, and increases water temperatures in the summer and cooler water temperatures in the winter (Brooker, 1985; Brookes, 1987; Brookes, 1988; Brookes, 1989;

Brooker, 1991).

All of these factors and sources, which limit habitat quality, are controllable or partially controllable. Installation of agricultural land use best management practices, and other stream and riparian management practices would enhance or restore Darien Creek habitat quality.

Little Turtle Creek

No detailed habitat data is available for Little Turtle Creek downstream of the confluence with Darien Creek and the reach of stream currently assigned a variance classification in NR 104.

Unnamed Tributary of Darien Creek

Habitat in the Unnamed Tributary of Darien Creek is rated "poor" to "fair". Similar to Darien Creek, channelization, sedimentation, and erosion of soil and related pollutants from upland and stream bank sources are the most limiting factors. Embeddedness from fines is excessive ranging from 50% - to 100%. Undeveloped buffer width is minimal ranging from 6 to 18 ft. Much of the coarse substrate lies over compacted clay, another symptom of past channelization. Channelization is also responsible for a monotonous series of shallow riffles and runs. Pools are generally absent except for immediately downstream of the culvert constriction. Most instream cover is provided by overhanging vegetation along the banks.

Fish Community

Darien Creek

Although just a first order stream, Darien Creek supports a very diverse and relatively abundant forage fish community. Twenty-eight fish species have been collected from Darien Creek since 1968 (Table 2). Forage fish include species intolerant to very tolerant of degraded habitat. The slender madtom (Endangered status), ozark minnow (Threatened status), and least darter (Special Concern status) are present. Smallmouth bass, green sunfish, rock bass and black bullhead are resident game or pan fish species. In 1992, six smallmouth bass were collected ranging in size from 2 to 8 inches indicating that some natural reproduction is occurring.

Little Turtle Creek

Little Turtle Creek also supports a very diverse and abundant sport and forage fish community. Forty fish species have been collected at 10 sites since 1928 (Table 3). All of the historical sample sites are located upstream of the confluence with Darien Creek. All but two species, the central mudminnow and largescale stoneroller, have been collected since 1968 and likely still exist in the watershed. Forage fish include species intolerant to very tolerant of degraded habitat. The slender madtom (Endangered status) and ozark minnow (Threatened status) are present. Game and pan fish species include smallmouth bass, bluegill, pumpkinseed, green sunfish, rock bass and yellow bullhead.

Unnamed Tributary of Darien Creek

The tributary to Darien Creek supports a moderately diverse community of intolerant to tolerant warmwater forage fish species (Table 2). Ten and nine different species have been collected from the same surveyed reach during the 1998 and 1999 surveys, respectively. Game fish or pan fish species were not collected, nor were any Wisconsin special status species. Total numbers of fish for all but one fish species were reduced during the 1999 survey date. It can not be ascertained at this time if the Agrilink Foods, Inc. discharge was responsible for this difference.

Recreational Use

Potential or existing recreational uses for Darien Creek and its corridor include wading, fishing, hunting, trapping, hiking, bait fish collection, aesthetics, nature study, and others. No public lands or access are known to exist along the stream or its tributaries.

Full body contact forms of recreation, such as swimming, are not likely to occur on a frequent basis due to shallow water depths and limited public access.

SUMMARY

A Stream Classification report was completed for Darien Creek and Little Turtle Creek in 1992 with subsequent revisions in 1997 and this current 2000 report. Revisions were necessary to account for abandonment of the Village of Darien POTW and to include a classification for an Unnamed Tributary of Darien Creek. Between 1976 and 1991, both Darien Creek and Little Turtle Creek downstream of its confluence with Darien Creek were classified as a "continuous, intermediate aquatic life streams" per NR 104.

Prior to January of 1996, the Village of Darien POTW discharged to Darien Creek. In addition, Agrilink Foods, Inc. (formerly Dean Foods or the Larsen Company) has a WPDES permit to discharge cannery process waste to Darien Creek. Agrilink Foods, Inc., or its predecessor, has not discharged to Darien Creek since May of 1986. Both discharges are located in close approximation to each other. Agrilink Foods, Inc. Currently discharges non-contact cooling water to the Unnamed Tributary of Darien Creek on a seasonal basis.

Based on habitat survey information collected in 1992, fish and aquatic life habitat in Darien Creek is rated "fair". Physical habitat conditions are adequate to support a diverse warm water forage and sport fish community. Darien Creek supports 28 different fish species including species considered intolerant to very tolerant of degraded habitat. The slender madtom (Endangered status), ozark minnow (Threatened status), and least darter (Special Concern status) are present. Resident sport fish include smallmouth bass, rock bass, green sunfish and black bullhead. The existence of various age smallmouth bass indicates that some natural reproduction is occurring.

Factors, which limit Darien Creek habitat quality, include stream channel and wetland modifications, erosion and runoff from agricultural lands, and livestock pasturing. All of these factors are controllable or partially controllable, and as such, habitat quality could be significantly improved with installation of agricultural land use best management practices and other stream and riparian management practices.

Little Turtle Creek also supports a very diverse warm water forage and sport fish community. Little Turtle Creek supports 40 different fish species including species considered intolerant to very tolerant of degraded habitat. The slender madtom (Endangered status) and ozark minnow (Threatened status) are resident. Sport fish species include smallmouth bass, bluegill, pumpkinseed, green sunfish, rock bass and yellow bullhead.

The Unnamed Tributary to Darien Creek supports a moderately diverse community of intolerant to tolerant warm water forage fish species. Ten and nine different species were collected from this stream during 1998 and 1999, respectively. Game fish or pan fish species were not collected, nor were any Wisconsin special status species.

RECOMMENDATIONS

1. Darien Creek and Little Turtle Creek contain a diverse community of fish species including warm water sport and forage fish and species identified as endangered threatened and special concern status. Physical habitat is suitable for sustaining these species. Based on existing biological uses and physical habitat conditions, Darien Creek and Little Turtle Creek downstream of its confluence

with Darien Creek shall be classified as a **Warm Water Sport Fish Community**. These recommendations are unchanged from stream classification recommendations contained in reports completed in 1992 and 1997.

2. The Unnamed Tributary of Darien Creek supports a moderately diverse community of tolerant to intolerant warm water forage fish. Physical habitat is suitable for sustaining these species. Based on existing biological uses and physical habitat conditions, the Unnamed Tributary of Darien Creek shall be classified as a **Warm Water Forage Fish Community**.
3. Significant improvements to all of the surveyed streams biological and recreational uses could be attained. The following land and stream management practices could be implemented to enhance or restore aquatic life and wildlife communities, water quality, and recreational use opportunities:
 - a. Prevent future modifications to the stream channel, stream corridor and wetlands throughout the watershed.
 - b. Restore former wetlands whenever feasible, especially along the stream corridor, headwater ditched reaches, and tributaries.
 - c. Protect and restore riparian habitats, which provide important fish, and wildlife habitats. The width of the buffer should be adequate to protect water quality and enhance fish, aquatic life and wildlife populations.
 - d. Restore riparian habitat and control bank erosion and scour by isolating livestock from stream banks and stream channel.
 - e. Encourage installation of soil erosion control practices on lands, which exhibit channelized flow to Darien Creek and its tributaries.
 - f. Develop and implement a comprehensive watershed management plan, which will protect and enhance endangered, threatened, and special concern status biota.

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cc: Industrial Wastewater file for Dean Foods/SER
Municipal Wastewater file for Village of Darien/SER
Watershed Management file for Darien Creek/SER
Joe Ball WT/2
Steve Fix Southern Region

attachments

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Table 2. Fish Distribution Summary for Darien Creek and Unnamed Tributary to Darien Creek - Walworth County, Lower Rock River Basin, 1968 to 1999.

Waterbody			Darien Cr.	Darien Cr.	Darien Cr.	Un. Trib. ***	Un. Trib. ***	Darien Cr.
River Mile @ Darien Creek			0.8	1.1	1.1	2.3	2.3	2.4
Location T,R,S,1/16,1/4			2,15,31,SW,NE	2,15,31,SW,NE	2,15,32,SW,NW	2, 15, 32, NE,SE	2, 15, 32, NE,SE	2, 15, 32, NE,SE
Location Description			below North Rd.	above North Rd.	above North Rd.	above Darien Cr.	above Darien Cr.	below CTH X
Sample Date			07/06/1992	05/19/1975	10/11/1994	10/07/1998	10/04/1999	10/07/1998
Sample Length (ft)			350	316	105	400	400	100
Mean Width (ft)			9.4	12	NA	6.5	6.5	16.2
Common Name	Classification*	Status	Number	Number **	Number	Number	Number	Number
Largescale stoneroller	Intolerant							
Central stoneroller	Intolerant		17					
Stonerollers (unsp)	Intolerant			88		15	9	201
Horneyhead chub	Intolerant		12	11		21	10	13
Southern redbelly dace	Intolerant		6	99		86	1	168
Blacknose dace	Intolerant		5	21		36	14	16
Stonecat	Intolerant			1				
Slender madtom	Intolerant	Endangered		1				
Rainbow darter	Intolerant							
Fantail darter	Intolerant			1				11
Least darter	Intolerant	Special Concern						
Blackchin shiner	Intolerant							
Golden shiner	Tolerant		4					
Common shiner	Tolerant		71	99	5			90
Bluntnose minnow	Tolerant		1	24	5	4	1	68
Johnny darter	Tolerant			53	15	8		10
Creek chub	Tolerant		41	99	15	69	24	38
White sucker	Tolerant		86	99	8	5	5	42
Central mudminnow	Very Tolerant		59	2	20	28	7	51
Common carp	Very Tolerant			13				
Brook stickleback	Very Tolerant			12	2	40	1	4
Fathead minnow	Very Tolerant		19	77				
Ozark minnow	-	Threatened	4	6				
Bigmouth shiner	-		10	26				14
Suckermouth minnow	-			1				
Green sunfish	Sport		7	3	10			2
Black bullhead	Sport		1	2	1			
Smallmouth bass	Sport							
Rock bass	Sport				3			
Largemouth bass (0+)	Sport							1
No. of native taxa	28		15	20	10	10	9	10
Total catch			343	> 738	84	312	72	729

* Classification based on Ball (1982)

** "99" indicates a count of greater than or equal to 99. "+" indicates species as being present, no count specified.

*** Unnamed tributary to Darien Creek. 10/04/99 sample includes active cooling water discharge from Dean Foods and 10/07/98 sample collected when discharge was inactive

Table 2. Fish Distribution Summary for Darien Creek and Un

Waterbody			Darien Cr.	Darien Cr.	Darien Cr.	Darien Cr.	Darien Cr.	Darien Cr.
River Mile @ Darien Creek			3.4	3.4	3.4	4.4	6.4	15.9
Location T,R,S,1/16,1/4			2,15,33,SW,SE	2,15,33,SW,SE	2,15,33,SW,SE	1,15,3,NW,NW	1,15,3,NW,SE	2,15,32,SW,NW
Location Description			CTH C	CTH C	CTH C	Townline Rd.	Peters Rd.	
Sample Date			07/25/1968	07/01/1992	07/07/1992	08/04/1978	05/20/1975	10/11/1994
Sample Length (ft)			NA	N/A	250	NA	264	N/A
Mean Width (ft)			NA	N/A	11	NA	NA	N/A
Common Name	Classification*	Status	Number **	Number **	Number	Number **	Number **	Number **
Largescale stoneroller	Intolerant			1	140			
Central stoneroller	Intolerant					7		
Stonerollers (unsp)	Intolerant					9	99	
Horneyhead chub	Intolerant		+		46	7		
Southern redbelly dace	Intolerant		+		8	31	99	
Blacknose dace	Intolerant		+		2	8	99	
Stonecat	Intolerant				1			
Slender madtom	Intolerant	Endangered						
Rainbow darter	Intolerant		+			1		
Fantail darter	Intolerant				6	5	2	
Least darter	Intolerant	Special Concern				4		
Blackchin shiner	Intolerant		+		2			
Golden shiner	Tolerant							
Common shiner	Tolerant		+		109	99	99	5
Bluntnose minnow	Tolerant		+		40	33	99	5
Johnny darter	Tolerant		+		17	7	99	15
Creek chub	Tolerant		+		46	17	99	15
White sucker	Tolerant		+		51	8	99	8
Central mudminnow	Very Tolerant				4	1		20
Common carp	Very Tolerant							
Brook stickleback	Very Tolerant				3	3	38	2
Fathead minnow	Very Tolerant				5		99	
Ozark minnow	-	Threatened		7	12	5	1	
Bigmouth shiner	-		+		4	29	99	
Suckermouth minnow	-							
Green sunfish	Sport						3	10
Black bullhead	Sport							1
Smallmouth bass	Sport				6			
Rock bass	Sport							3
Largemouth bass (0+)	Sport							
No. of native taxa	28		11		18	16	14	10
Total catch			n.a.		502	> 274	>1034	84
* Classification based on Ball (1982)								
** "99" indicates a count of greater than or equal to 99. "+" indic:								
*** Unnamed tributary to Darien Creek. 10/04/99 sample include.								

CORRESPONDENCE/MEMORANDUM

State of Wisconsin
Department of Natural Resources

DATE: December 31, 1997 **FILE REF:** 3200

TO: Steve Fix Southern Region
Joe Ball WT/2

FROM: Will Wawrzyn WT/SER

SUBJECT: Stream Classification - Darien Creek and Little Turtle Creek Downstream of
Confluence with Darien Creek

Attached for your information is a copy of the revised stream classification (Rev. December 1997) for Darien Creek and Little Turtle Creek downstream of the confluence with Darien Creek for your region or central office files. A stream classification will also be prepared for the remainder of Little Turtle Creek upstream of its confluence with Darien Creek. Absent completion of the formal stream classification for the remainder of Little Turtle Creek upstream of its confluence with Darien Creek, please be advised that the preliminary conclusion is that Little Turtle Creek will be classified as a **Warm Water Sport Fish Community**. If you have any questions, please call me at (414) 263-8699.

attachment

cc: Greg Pilarski SER
Sharon Gayan SER
Judy Gottlieb SER

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**WATER QUALITY STANDARDS REVIEW
AND STREAM CLASSIFICATION FOR
DARIEN CREEK and LITTLE TURTLE CREEK
LOWER ROCK RIVER BASIN
WALWORTH and ROCK COUNTIES, WISCONSIN
AUGUST, 1992 (REV. DECEMBER, 1997)**

by Will Wawrzyn, Southeast District

INTRODUCTION

The Lower Rock River Water Quality Management Plan (WDNR, 1991) contains a recommendation to conduct a Water Quality Standards Review and Stream Classification for Darien Creek and Little Turtle Creek located in Walworth and Rock Counties, Wisconsin.

Following this recommendation, a Stream Classification survey was completed for Darien Creek and Little Turtle Creek downstream of its confluence with Darien Creek. This report contains survey results, a revised Stream Classification and additional water resource management recommendations for Darien Creek and Little Turtle Creek.

The original Stream Classification report for Darien Creek was completed in 1992 and subsequently revised in December, 1997 to account for the abandonment of the Darien POTW, to present additional fish distribution data collected since the 1992 report, and to include an appropriate stream classification for Little Turtle Creek downstream of the confluence with Darien Creek. This revised 1997 report did not result in any recommended changes to the stream classification or management recommendations previously proposed for Darien Creek in the 1992 report.

BACKGROUND

Darien Creek is located in the Lower Rock River Basin, Turtle Creek Watershed in southwestern Walworth County, and to a lesser extent southeastern Rock County. The stream is formed by diffuse runoff and groundwater discharge in T1N, R15E, S.12, SE, SE. The perennial stream reach flows northwest for approximately 8 miles before its confluence with Little Turtle Creek in T2N, R14E, S.36, NE, NE. It is a first order stream, has an average gradient of 15.1 ft/mi, and drains approximately 18 mi² (WCD, 1961). The reported $Q_{7,2}$ and $Q_{7,10}$ discharge upstream of the former Village of Darien POTW discharge (T2N, R15E, S. 32, NE, SE) is 0.9 cfs and 0.4 ft³/s, respectively (Hollstrom, 1992).

Prior to January, 1996 there were two known point sources discharges to Darien Creek. They included the Village of Darien POTW (STORET # 653036; WPDES # WI-0020168-4), and the Dean Food (formerly the Larsen Company) STP (STORET # none; WPDES # WI-0050679-3). Prior to its abandonment in January, 1996 the Darien POTW was an activated sludge plant in series with a polishing pond with a design flow of 0.15 mgd. It served an existing and projected year 2010 population of 1,500 and 1,543, respectively. Treated effluent from the Village of Darien POTW discharged to a combination underground tile and

intermittent stream draining agricultural lands for approximately 1.3 miles prior to discharging to Darien Creek at T2N, R15E, S.32, SW, NE and river mile 2.1 (Sheikholeslami, 1992).

The Dean Food STP (formerly the Larsen Company) has a permit to discharge treated cannery waste directly to Darien Creek in the vicinity of the former Darien POTW discharge and to groundwater via a spray irrigation system. This facility has not reported any process waste discharges to Darien Creek since May 17, 1986 (Sheikholeslami, 1992).

Darien Creek was previously classified as a "continuous, intermediate aquatic life stream". The underground tile or otherwise enclosed portions of the unnamed tributary receiving the Village of Darien POTW effluent was previously classified as an "effluent ditch". The remaining open channel segment of the unnamed tributary was classified as a "non-continuous agricultural stream". Little Turtle Creek downstream of the confluence with Darien Creek was classified "continuous, intermediate aquatic life stream" (WDNR, 1976; WDNR, 1991). These classifications were completed prior to the development and use of the Wisconsin Stream Classification guidelines (Ball, 1984). A Recreational Use Classification and Disinfection Determination was completed in 1988 (Wakeman, 1988). Disinfection of the Darien POTW effluent was not considered necessary because it was felt that the stream is not capable of supporting full body contact types of recreational uses (Appendix 1).

Agriculture is the dominant land use in the watershed. Prior to settlement and drainage improvements, much of these lands were wetlands. Houghton-Palms is the primary soil association along the lower-half of the watershed. These soils are characterized as being very poorly drained organic soils in depressions, narrow stream bottom lands, and nearly level wetlands. These characteristics has encouraged stream channelization and tiling to improve agricultural land drainage. The upper-half of the watershed is dominated by the Flagg-Pecatonica soil association. These soils are characterized as being well drained soils that have a subsoil of silty clay loam, formed in a thick layer of loess and the underlying sandy loam to loam glacial till on uplands. Erosion is a hazard to croplands and water quality because runoff accumulates on the long slopes (USDA, 1971).

METHODS

The stream classifications for Darien Creek and Little Turtle Creek are based on guidelines developed by Ball (1982). A fish community and habitat survey was completed at two Darien Creek sites during July 1992. The Darien Creek - North Rd. site is located 0.8 miles upstream of the Darien Creek - Turtle Creek confluence and approximately 1.3 miles downstream of the current Dean Foods STP discharge and former Darien POTW discharges. The Darien Creek - CTH C site is located 3.4 miles upstream of the Darien Creek - Turtle Creek confluence and approximately 1.3 miles upstream of the current Dean Foods and former Village of Darien wastewater discharges. Fish community samples were obtained using a DC back pack shocker operating at 2.5 amps and between 150 and 190 volts. Historical fish distribution sample results were also used to assess the biological use classification of Darien Creek and Little Turtle Creek (Fago, 1982). No fish or habitat surveys were completed for Little Turtle Creek.

Instantaneous measurements of dissolved oxygen (mg/l), water temperature (C°) and dissolved oxygen as percent saturation (%) were made using an air calibrated Yellow Springs Instrument (YSI) model 56 meter.

RESULTS

Water Quality

Physical and chemical water data for Darien Creek is limited. A dissolved oxygen and temperature profile was obtained in 1974 (WDNR, 1979). Dissolved oxygen levels upstream and downstream of the Darien POTW discharge ranged from 6.8 mg/l to 11.4 mg/l, and temperatures ranged from 24.0 C to 26.0 C. The potential impacts of the point sources, separate or combined, have not been documented.

An investigation of a discharge to Darien Creek in 1983 indicated that organic wastes were impacting the dissolved oxygen concentrations in Darien Creek downstream of the waste discharge (Bornow, 1983). The anaerobic waste (0.0 mg/l) or near anaerobic waste (0.4 mg/l) discharge was reported on two separate dates. Dissolved oxygen levels in Darien Creek downstream of the waste discharge were 2.5 and 4.5 times lower than ambient dissolved oxygen concentrations and violated state water quality standards on both occasions (2.0 mg/l and 4.0 mg/l). Although not reported during the investigation, the waste point of discharge would have been located in close proximity to the Village of Darien POTW discharge (Appendix 2).

Habitat

Darien Creek habitat quality was rated "fair" at the North Rd. site (Appendix 3). Although USGS topographic maps (1960) indicate the North Rd. reach was historically channelized, habitat survey results indicate that the stream channel is adjusting toward a more natural geomorphic condition. In the absence of recent channelization and intense cropping practices along the riparian area, meanders and a well defined thalweg are returning. Bend formation is at an early stage and are typically less than 60°. Point bars consisting of sand and silt material are generally well vegetated and stable and are partially responsible for re-establishing a meandering channel and thalweg. The reach is predominately run with water depths ranging from 1 to 1.5 ft. Maximum observed pool depth was 2.5 ft. Fish and aquatic cover at the North Rd. site is provided by macrophytes, overhanging stream bank vegetation, and woody in-stream debris and snags. Macrophytes are common covering up to 50% of the channel. Substrate is dominated by deep silt, sand and detritus. Significant reaches of the stream are bordered by wetlands which provide valuable fish and wildlife habitat and buffer against runoff.

Darien Creek habitat quality was rated "fair" at the CTH C site. Based on 1960 USGS topographic maps, this site reach has no history of channelization. Fish and aquatic cover is provided by overhanging stream bank vegetation, woody in-stream debris and snags. Though present, macrophytes do not provide a significant amount of cover. Pool substrate is dominated by silt, sand and detritus while riffles and runs are dominated by coarse sand, gravel and lesser amounts of cobble. Well defined meanders and thalweg are present, and pools and deeper slack water are present in the bends. Additional pools and deep slack water areas are formed by the damming effect of riffles. Point bars consisting of well poorly sorted silt, sand and gravel are generally well vegetated or otherwise stable. The presence of poorly sorted bar material may suggest that bed material is being transported and deposited under high flow conditions. The source of this material may include eroded upland areas and material stored in the channel and floodplain. The reach is primarily represented runs and pools and lesser numbers of riffles. Water depth in runs range from 1 to 1.5 ft. and the maximum observed pool depth was 4 ft.

An exception to the favorable habitat in the vicinity of CTH C was noted along the upper end of the survey

reach where active livestock pasturing is occurring. Pasturing is responsible for eroded stream banks, loss of stream bank and instream cover, sedimentation, excessive channel width and shallow water.

Other factors and sources responsible for limiting habitat quality include historical stream channelization, modification or draining of wetlands, agricultural sources of nonpoint source pollution including upland erosion and runoff, and stream bank pasturing. Approximately 2.6 miles (or 32%) of Darien Creek has been channelized to accommodate agricultural drainage. Major negative impacts associated with stream channelization include reduction in stream length, development of monotonous run-like habitat in lieu of diverse pool-riffle-run complexes, encouragement of sedimentation through increased rates of channel scour and bank erosion, removes fish and aquatic life cover, and increases water temperatures in the summer and cooler water temperatures in the winter (Brooker, 1985; Brookes, 1987; Brookes, 1988; Brookes, 1989; Brooker, 1991).

All of these factors and sources which limit habitat quality are controllable or partially controllable. Installation of agricultural land use best management practices, and other stream and riparian management practices would enhance or restore Darien Creek habitat quality.

Fish Community

Although just a first order stream, Darien Creek supports a very diverse and relatively abundant forage fish community. Twenty-eight fish species have been collected at five different sites since 1968 (Table 1). Forage fish include species intolerant to very tolerant of degraded habitat. The slender madtom (Endangered status), ozark minnow (Threatened status), and least darter (Special Concern status) are present. Smallmouth bass, green sunfish, rock bass and black bullhead are resident sport fish species. In 1992, six smallmouth bass were collected ranging in size from 2 to 8 inches indicating that some natural reproduction is occurring.

Little Turtle Creek also supports a very diverse and abundant sport and forage fish community. Thirty-nine fish species have been collected at 10 sites since 1928 (Table 2). All of the historical sample sites are located upstream of the confluence with Darien Creek. All but two species, the central mudminnow and largescale stoneroller, have been collected since 1968 and likely still exist in the watershed. Forage fish include species intolerant to very tolerant of degraded habitat. The slender madtom (Endangered status) and ozark minnow (Threatened status) are present. Sport fish species include smallmouth bass, bluegill, pumpkinseed, green sunfish, rock bass and yellow bullhead.

Recreational Use

Potential or existing recreational uses for Darien Creek and it's corridor include wading, fishing, hunting, trapping, hiking, bait fish collection, aesthetics, nature study, and others. No public lands or access are known to exist along the stream or it's tributaries.

Full body contact forms of recreation, such as swimming, are not likely to occur on a frequent basis due to shallow water depths and limited public access.

SUMMARY

A Stream Classification was completed for Darien Creek in August, 1992 and revised in 1997 to include Darien Creek and Little Turtle Creek downstream of the confluence with Darien Creek. In 1976, both Darien Creek and Little Turtle Creek downstream of its confluence with Darien Creek were classified as a "continuous, intermediate aquatic life stream".

Prior to January of 1996, the Village of Darien POTW discharged to Darien Creek. In addition, Dean Foods (formerly the Larsen Company) has a WPDES permit to discharge cannery process waste to Darien Creek. Dean Foods, or its predecessor, has not discharged to Darien Creek since May of 1986. Both discharges are located in close approximation to each other.

Based on habitat survey information collected in 1992, fish and aquatic life habitat in Darien Creek is rated "fair". Physical habitat conditions are adequate to support a diverse warm water forage and sport fish community. Darien Creek supports 28 different fish species including species considered intolerant to very tolerant of degraded habitat. The slender madtom (Endangered status), ozark minnow (Threatened status), and least darter (Special Concern status) are present. Resident sport fish include smallmouth bass, rock bass, green sunfish and black bullhead. The existence of various age smallmouth bass indicate that some natural reproduction is occurring.

Factors which limit Darien Creek habitat quality include stream channel and wetland modifications, erosion and runoff from agricultural lands, and livestock pasturing. All of these factors are controllable or partially controllable, and as such, habitat quality could be significantly improved with installation of agricultural land use best management practices and other stream and riparian management practices.

Little Turtle Creek also supports a very diverse warm water forage and sport fish community. Little Turtle Creek supports 40 different fish species including species considered intolerant to very tolerant of degraded habitat. The slender madtom (Endangered status) and ozark minnow (Threatened status) are resident. Sport fish species include smallmouth bass, bluegill, pumpkinseed, green sunfish, rock bass and yellow bullhead.

RECOMMENDATIONS

1. Darien Creek and Little Turtle Creek contain a diverse community of fish species including warm water sport and forage fish and species identified as endangered, threatened, and special concern status. Physical habitat is suitable for sustaining these species. Based on existing biological uses and physical habitat conditions, Darien Creek and Little Turtle Creek downstream of its confluence with Darien Creek shall be classified as a **Warm Water Sport Fish Community**.
2. Significant improvements to Darien Creek biological and recreational uses could be attained. The following land and stream management practices should be implemented to enhance or restore aquatic life and wildlife communities, water quality, and recreational use opportunities:
 - a. Prevent future modifications to the stream channel, stream corridor and wetlands throughout the watershed.
 - b. Restore former wetlands whenever feasible, especially along the stream corridor,

headwater ditched reaches, and tributaries.

- c. Protect and restore riparian habitats which provide important fish and wildlife habitats. The width of the buffer should be adequate to protect water quality and enhance fish, aquatic life and wildlife populations.
- d. Restore riparian habitat and control bank erosion and scour by isolating livestock from stream banks and stream channel.
- e. Encourage installation of soil erosion control practices on lands which exhibit channelized flow to Darien Creek and its tributaries.
- f. Develop and implement a comprehensive watershed management plan which will protect and enhance endangered, threatened, and special concern status biota.

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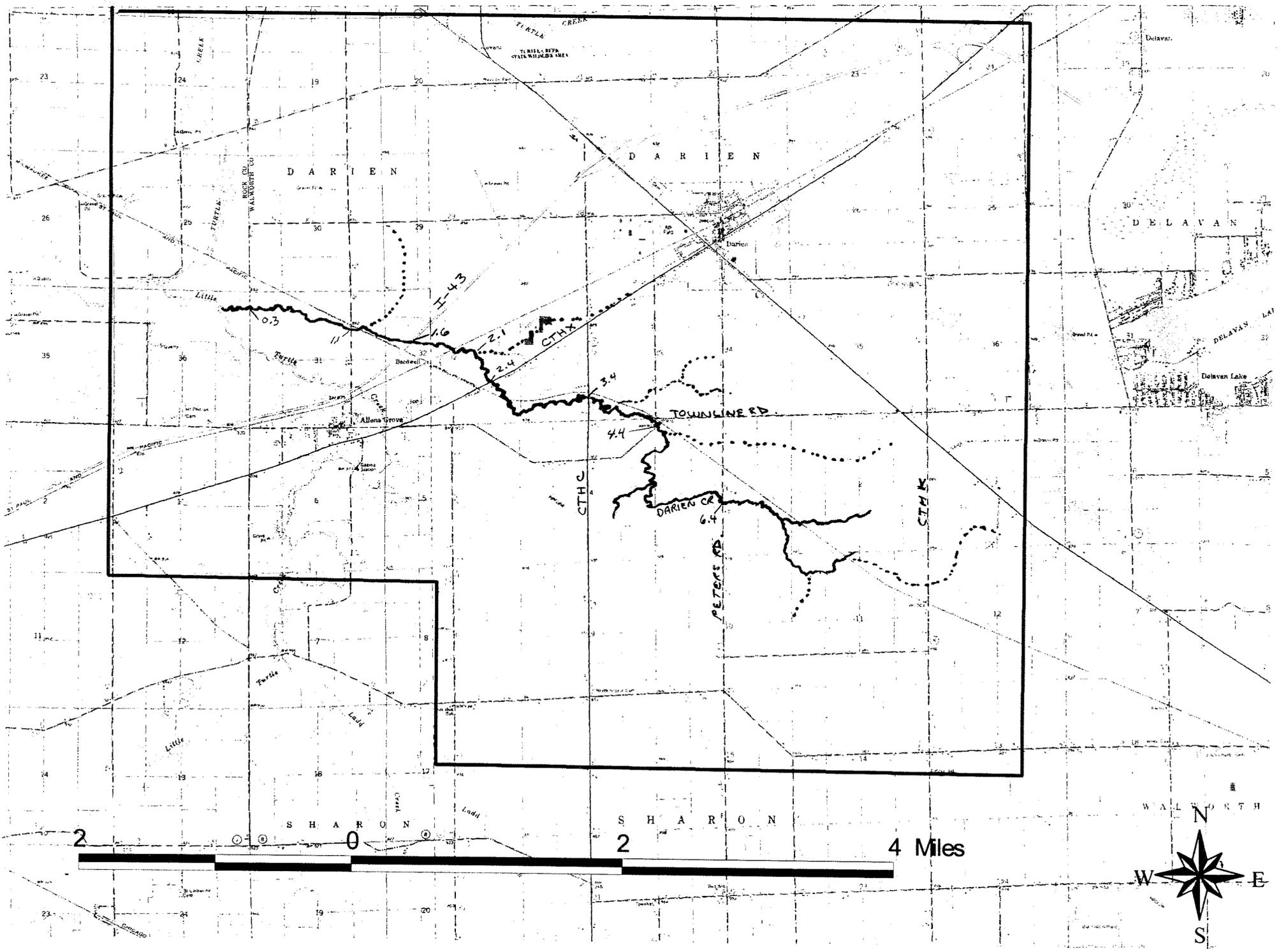
cc: Industrial Wastewater file for Dean Foods/SER
Municipal Wastewater file for Village of Darien/SER
Watershed Management file for Darien Creek/SER
Joe Ball WT/2
Steve Fix Southern Region

attachments

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Location Description for Darien Creek Reference Points

Location Description	River Mile	Fish Collection Site and Collection Date
Turtle Cr. confluence with Little Turtle Creek	0.0	
Little Turtle Cr. confluence with Darien Cr.	0.6	
Darien Cr. confluence with Little Turtle Cr.	0.0	
Darien Cr. at Rock County - Walworth County line	0.3	
Darien Cr. downstream of North Rd.	0.8	7/6/92
Darien Cr. at North Rd.	1.1	5/19/1975 and 10/11/94
Darien Cr. at I-43 (formerly STH 15)	1.6	
Darien Cr. at confluence with former Darien POTW outfall and approximate location of Dean Foods pond	2.1	
Darien Cr. at CTH X	2.4	
Darien Cr. at CTH C	3.4	7/25/68 and 7/7/92
Darien Cr. at Townline Rd.	4.4	8/4/78
Darien Cr. at Peters Rd.	6.4	5/20/75
Darien Cr. at CTH K	8.3	



LITTLE
TURTLE
CREEK

TURTLE
CREEK
TURTLE CREEK
STATE WILDLIFE AREA

D A R I E N

D A R I E N

D E L A V A N

Little
0.3

H-43

CTHC

Turtle

1.6

2.1

2.4

3.4

TOWNLINE RD

4.4

DARIEN CR

PETERS RD

6.4

CTHC

S H A R O N

S H A R O N

W A L N O R T H

