

WATER RESOURCE APPRAISAL AND STREAM CLASSIFICATION FOR THE UPPER
FOX RIVER PRIORITY WATERSHED

Deer Creek Subwatershed

I. Description of Subwatershed

The Deer Creek subwatershed is located in east central Waukesha County southeast of the city of Waukesha. It originates within the town of New Berlin and flows north through the southwest corner of Brookfield before joining Poplar Creek south of Goerkes Corners. Deer Creek is approximately 8 miles in length, contains four intermittent tributaries and drains approximately 7 square miles (WDNR 1972 and USGS quad. maps).

The stream has a gradient of 5 ft/mile and an estimated $Q_{7,10}$ of .2 cfs at its confluence with Poplar Creek (WDNR 1985). Historically there was a waste water treatment plant located near the headwaters of Deer Creek at Regal Manor (upstream $Q_{7,2}$ and $Q_{7,10}$ measured discharges were equal to <0.1 cfs) (Holmstrom 1979).

II. Water Resource Conditions

A. Perennial Streams

Deer Creek

Stream Classification and Recreational Use Designation

Deer Creek was previously classified as a noncontinuous marginal fish and aquatic life stream (WDNR 1975). A reclassification survey was conducted in 1985 in anticipation of a permit request by the city of New Berlin. This reclassification survey, which was never finalized, recommended that Deer Creek from its headwaters to the C&NW railroad crossing in New Berlin (T6N, R20E, Sec. 3) remain classified as marginal fish and aquatic life while the portion located downstream of the C&NW crossing to its confluence with Poplar Creek be reclassified as an intermediate fish and aquatic life stream (WDNR 1985).

This nonpoint source water resource appraisal will be considered a stream reclassification for Deer Creek based on both the historical and current data collections. The proposed stream classification for Deer Creek will cover its entire length from its headwaters to its confluence with Poplar Creek. Based on the streams available habitat, stream flow and biological potential the creek should be regarded as a warm water sport fish community (WWS).

The fish community consist of very tolerant, tolerant, intolerant (grass pickerel), and sport fish species (Ball 1982). A total of 22 species were collected both historically and during the current appraisal survey and included the sport species northern pike, black crappie, bluegill, yellow and black bullhead, and largemouth bass (Table 1)(WDNR 1975 and WDNR 1985). Deer Creek is currently not meeting its full biological use potential due to the loss of fish, invertebrate, and wildlife habitat, trophic/community imbalance (nutrients), embedded substrates (sediments), temperature extremes, ponding, nuisance vegetation, turbidity, metals, and potential toxicity from pesticides and herbicides. The sources of these impacts are urban runoff, cropland runoff, construction site runoff, golf course runoff, channelization/snagging, bank debrushing, ponding, drain tiles, storm sewers, industrial discharged and drainage of wetlands (Table 4 and Appendix I).

Deer Creeks recreational classification is for partial body contact due to insufficient depth, width and water volume (Table 4). The current and potential recreational and related biological uses include bait fishing, wading, wildlife, fish spawning, and nature study. At this time it is not meeting the recreational use classification due to high levels of bacteria, aesthetics, industrial use conflict, and substrate texture (concrete lining and silt deposition).

Habitat

Instream habitat is considered poor with bottom substrates dominated by clay, concrete, or silt depending on the site. There is very little substrate diversity i.e., lack of boulder, cobble or gravel substrates or woody debris. This creek has also been extensively channelized eliminating important instream habitat which should consist of pools, runs and riffles. The riparian habitat is made up of overhanging vegetation and grasses but due to the urban influence, industrial parks and subdivisions very little high quality riparian habitat remains. Only a small section from the confluence with Poplar Creek upstream approximately 1/4 to 1/2 a mile contains a fairly high quality riparian zone.

Invertebrate Community Analysis

One site, located in segment DC-4 downstream of the C & NW railroad bridge was sampled during the spring of 1990 to assess the streams macroinvertebrate community. The sample had a Hilsenhoff Biotic Index Value (HBI) of 6.2, indicative of fair water quality, suggesting significant organic enrichment (Hilsenhoff 1982). The overwhelmingly dominant genera collected were Orthocladius sp. D and Micropsectra sp. (Midges) and Hyallolella azteca (Amphipod). Other taxa collected included Caenis

sp. (Mayfly), Agabus sp. (Beetle), Asellus intermedius (Isopod), Tubificid oligochaetes and a number of other midges.

The stream bed sampled did not consist of the preferred substrate i.e., clean gravel and cobble, but was a riffle that was >90% embedded by fine sediment (silt and clay). As stated earlier, the creeks lack of a diversified natural channel and a protective riparian buffer has substantially limited the invertebrate community.

Fish community analysis

In addition to the recent appraisal survey fish collections two historical collections were also made, one in 1975 (one site) and the other in 1985 (four sites). These collections recovered a total of 22 species including 10 sport species, 4 very tolerant and 6 tolerant species. Nine of the 22 species that were identified in the historical collections were not recovered this fall including the common carp, fathead minnow, common shiner, yellow bullhead, orangespotted sunfish, golden shiner, brook stickleback, northern pike and the grass pickerel. In addition, three species collected during the recent appraisal collections were not collected historically, including largemouth bass, bluegill x green sunfish hybrid and black crappie.

In conjunction with the fish collections, intensive site specific habitat data were also collected to calculate an Index of Biotic Integrity (IBI) (Lyons 1992). The IBI developed by Lyons for warm water streams in the State of Wisconsin uses ten metrics to evaluate the biotic integrity of stream system. These metrics are listed in Appendix II for the sites sampled within the Deer Creek Subwatershed along with the calculated scores. The scores for each metrics are then added together with the total score used to rate the streams Biotic Integrity. Scores will range from 0-100 and are categorized using the following breakdown; 100-65 (Excellent), 64-50 (Good), 49-30 (Fair), 29-20 (Poor), 19-0 (Very Poor), no score (Very Poor).

Table 2 lists the subwatershed stream segment, stream sampled, the IBI score, and the IBI rating. Typical scores for the Upper Fox River Watershed from the 42 sites sampled ranged between 0-50 with the best IBI value recorded from a site on Pebble Creek. The overall watershed average was equal to 27.5. This average did not include the 18 sites out of the 42, where fewer than 50 individual fish were collected and an IBI score could not be computed. Of these 18 sites, some did not recover enough fish due to inadequate sampling length (35 times the width is optimal) while a few of the sites were so severely impacted that few fish were able to survive within them.

Table 1. Comparison of historical (Fago 1984 and WDNR 1985) and current fish species for the Deer Creek Subwatershed.

Species	Historical	Current (1990)	Tolerance
Goldfish	X	X	VT
Sunfish unsp.	X		S
Creek chub	X	X	T
Central mudminnow	X	X	VT
White sucker	X	X	T
Pumpkinseed	X	X	S
Johnny darter		X	T
Green sunfish	X	X	S
Bullhead unsp.	X		S
Largemouth bass		X	S
Bluegill x Green sunfish		X	S
Common carp	X		VT
Fathead minnow	X		VT
Black bullhead	X	X	S
Common shiner	X		T
Yellow bullhead	X		S
Bluegill	X	X	S
Orangespotted sunfish	X		S
Golden shiner	X		T
Brook stickleback	X		T
Minnows unsp.	X		
Black crappie		X	S
Northern pike *	X		S
Grass pickerel *	X		I

I = Intolerant

T = Tolerant

VT = Very Tolerant

S = Sport

* - These fish were collected in 1975.

Listed in Table 2 are the three IBI scores for the Deer Creek Subwatershed. The scores varied greatly improving as you move from the upstream site (DC004) which was located in the industrial park to the downstream sites at DC006 and DC007. The overall average for Deer Creek is below the average score for the entire priority watershed. This subwatershed like many others in the watershed is being adversely impacted by a variety of nonpoint source pollutants. These included urban runoff, sediment loadings (resulting in embedded substrates and loss of pool depth) and an overall loss or lack of a diversified stream habitat the result of stream channelization and concrete lining and bank debrushing. These problems or threats are reflected in the fish community and the IBI scores.

Table 2. Index of Biotic Integrity Data for the Deer Creek Subwatershed

<u>Stream Segment</u>	<u>Stream</u>	<u>IBI Value</u>	<u>IBI Rating</u>
DC004	Deer Creek	0	Very Poor
DC006	Deer Creek	30	Fair
DC007	Deer Creek	40	Fair
Deer Creek Average		23.3	
Upper Fox PW Average		27.5	

The most upstream site (DC004) contained few species and few total numbers, with goldfish the most abundant species collected. Only 49 individuals were collected and thus an IBI score could not be calculated for this site (score = 0). The other two sites were much better and contained a larger number of species even though the majority of fish collected were tolerant. Over all they contained a moderate number of sunfish species and relatively well balanced trophic structure which was dominated by insectivores. Both the total number of intolerant species and those classified as simple lithophilic spawners were very low. This is not surprising with the streams degraded conditions and lack of a natural channel (Appendix II).

It is possible that even with successful control of organic and sediment loadings that the loss of habitat associated with channelization (loss of gravel riffles and stream sinuosity) will always limit the community and the IBI scores may never reach above the maximum score recorded in the Upper Fox River Priority Watershed (50).

Bacteriological data

There is little historical data available with regards to bacteria contamination in Deer Creek. Some information exists, collected during the period when Regal Manor WWTP was still in operation but is of little use in regards to the current status of Deer Creek. A bacterial survey conducted as part of the appraisal survey collected samples at Greenfield Ave. (DC-4) to document the levels of both fecal coliform and fecal streptococcus bacteria in Deer Creek. The following table lists the results of the appraisal monitoring survey.

Deer Creek is primarily an urban watershed with a limited number of livestock operations located within it. There is one horse pasture located near the streams headwaters that may contribute

some bacteria but probably not enough to significantly effect the fecal coliform concentration.

Table 3. Bacteriological Monitoring Results For The Upper Fox River Priority Watershed - Deer Creek Subwatershed.

<u>Sample Date</u>	<u>MFCC/100ml</u>	<u>FS/100ml</u>
8/27/90	650	100
9/10/90	660	190
9/14/90	4000	1300
9/18/90	2600	700
9/19/90	5200	6500
GMEAN	2622	

The bacteria concentrations violated state's standards for surface water full body contact recreational use. The State Standards are that MFCC readings shall not be greater than 200/100mls (mean of at least 5 samples/month) nor exceed 400/100mls in more than 10% of the samples collected within a month (100% of samples greater than this) (NR102) (Borzick 1992).

Industrial Discharges

There are three permitted industrial discharges to Deer Creek via storm sewer or drainage ditch. They are Badger Pattern Works, General Electric Co. Medical Systems both of which discharge non-contact cooling water to segment DC-003. The third discharge is from S and M Rotogravure Services Inc. which also discharges non-contact cooling water (to segment DC-002) but does have specific monitoring requirements written into the permit. These include temperature, BOD, total suspended solids, total copper, and chromium hexavalent (+6). Records indicate that there have been a number of discharge violations for these parameters over the years (WDNR 1990).

B. Intermittent Streams

Unnamed Intermittent Stream A (DC012) (T6N, R20E, S.10, SESE)

This intermittent tributary originates in a wetland south of Monterey Park subdivision and joins Deer Creek at T6N, R20E, Sec. 10, 1/4 SE, 1/4 SE in the Moorland Industrial Park.

Approximately half of this tributary has been channelized and concrete lined near its confluence with Deer Creek.

Based on the limited aquatic habitat available and the very low observed stream flows this tributary is classified as a limited aquatic life stream (LAL) which it is only partially supporting at this time. Factors limiting a higher classification include the loss of fish and invertebrate habitat, loss of wildlife habitat, flow fluctuations, and potentially high concentrations of metals, pesticides or herbicides. The sources of these limiting factors include channelization, bank debrushing, drainage of wetlands, filling of wetlands, and urban runoff (Table 4).

This tributaries recreational classification is for partial body contact due to insufficient depth, width and water volume. At the present time it is fully meeting this use designation (Table 4). Urban pollutants may also be impacting this tributary and ultimately Deer Creek's recreational potential (bacteria).

The instream habitat consists of a concrete lined channel (lower portion of stream) and wetland headwaters.

Unnamed Intermittent Stream B (DC011)
(T7N,R20E,S.34,NESE)

This intermittent tributary originates within the boundaries of the Westmoor Country Club and joins Deer Creek in the Brookfield Hills Golf Course (T7N,R20E,S.34,NESE).

This tributary is classified as a limited aquatic life stream (LAL) which it is only partially meeting due to the loss of fish and invertebrate habitat, ponding, and potential metal, pesticide and herbicide contamination. These threats are the result of channelization, golf course ponds, urban runoff (highway runoff) and golf course tiling and runoff (Table 4).

This tributaries recreational classification is for partial body contact due to insufficient depth, width and water volume. At this time it is fully meeting this use designation (Table 4).

Instream and riparian habitats are not conducive for a productive aquatic ecosystems but this tributary may still play an important role as a reproductive or rearing area for the fish of Deer Creek.

Unnamed Intermittent Stream C (DC010)
(T7N,R20E,S.33,NENW)

No information is available for this stream.

Unnamed Intermittent Stream D (DC008)
(T7N,R20E,S.32,NENE)

No information is available for this stream.

III. Water Resource Management Objectives

The recommended water resource management objectives for the streams contained in the Deer Creek Subwatershed are listed below.

A. Perennial Streams

Deer Creek

1. Maintain and to the highest degree possible enhance the relative abundance/diversity of the warm water sport fishery, the endemic forage fish population and invertebrate community.
 - A. Improve stream habitat by reducing NPS sedimentation by 56%.
 - B. Protecting the existing stream habitat by prohibiting further channelization and drainage of existing wetlands.
 - C. Remove the concrete channel and restore the natural channel to Deer Creek within the Moorland Industrial Park.
 - D. Restore and protect the existing riparian habitat.
 - E. Reduce NPS nutrient loadings by 50%.
2. Protect human health and the recreational uses of Deer Creek.
 - A. Reduce or eliminate the bacterial source on Deer Creek including failing septic systems and barnyard runoff.

B. Intermittent Streams

Unnamed Intermittent Streams A-D

1. Protect and to the highest degree possible enhance the relative abundance/diversity of the existing fish and/or invertebrate community.
 - A. Improve stream habitat by reducing NPS sedimentation by 56%.
 - B. Prohibit future channelization.
 - C. Enforce erosion control ordinance.
 - D. Prohibit future draining and filling of wetlands.

2. Protect human health and recreational use of the unnamed streams and thus that of Deer Creek.

A. Reduce or eliminate failing septic systems.

REFERENCES

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Appendix I
(Information as of 1990)

Barnyard Runoff

Deer Creek (DC001) - A horse ranch located just north of the New Berlin School (T6N,R20E,S.23,NENE).

Concrete Stream Channel

Segments DC012, DC002 and DC003 (T6N,R20E,S.10).

Fish Migration Interference

Impoundments located within Brookfield Hills Golf Club (DC005) and Westmoor Country Club (DC011). There is also an impoundment located within the channel just north of Brookfield Hills Golf Club and I-94 (T7N,R20E,S.34 and 35).

Industrial Discharges

Three industrial noncontact cooling water discharges are located on Deer Creek (segments DC002 and DC003).

Appendix II

Dec- Creek
Subwatershed

METRIC	SEGMENT:	IC-004		IC-006		IC-007			
		Metric	Score	Metric	SCORE	Metric	SCORE	Metric	SCORE
E/NATIVE SP	TAVA #E	3	0	6	0	8	5		
E/TARTER SP	#D	0	0	0	0	1	0		
E/CATABOLMID SP		1	5	1	0	1	5		
E/SUNFISH SP		1	10	4	10	2	10		
E/INTL SP		0	0	0	0	0	0		
1. TREC by #		100	0	94/73	74	0	54	6	
% Sm	62	0	77	5	10	1/10	1	10	
% TL	16	0	67	9	10	54	78	10	
% TL	0	0	1/3	1	0	2	3	0	
% SL	6	0	5	0		1	0		
# INTL (T-INTL) #T		0	-	19	-	29	-		
# INTL/200m		0	-10	76	-	191	-		
% TERT	4/4	-10		0	-	0	-		
TOTAL SCORE		(0)		30		40			
		Very poor		Fair		Fair to good			
Length of reach	200		250		160				
# individuals	49		72		69				
width	7' = 2.1m		10' = 4.1m		7' = 2.1m				
Area	0.74		1.43		0.74				

* no CI, # individuals = 50

Table 4. Watersheds of the Upper Fox River Watershed, Waushara County.

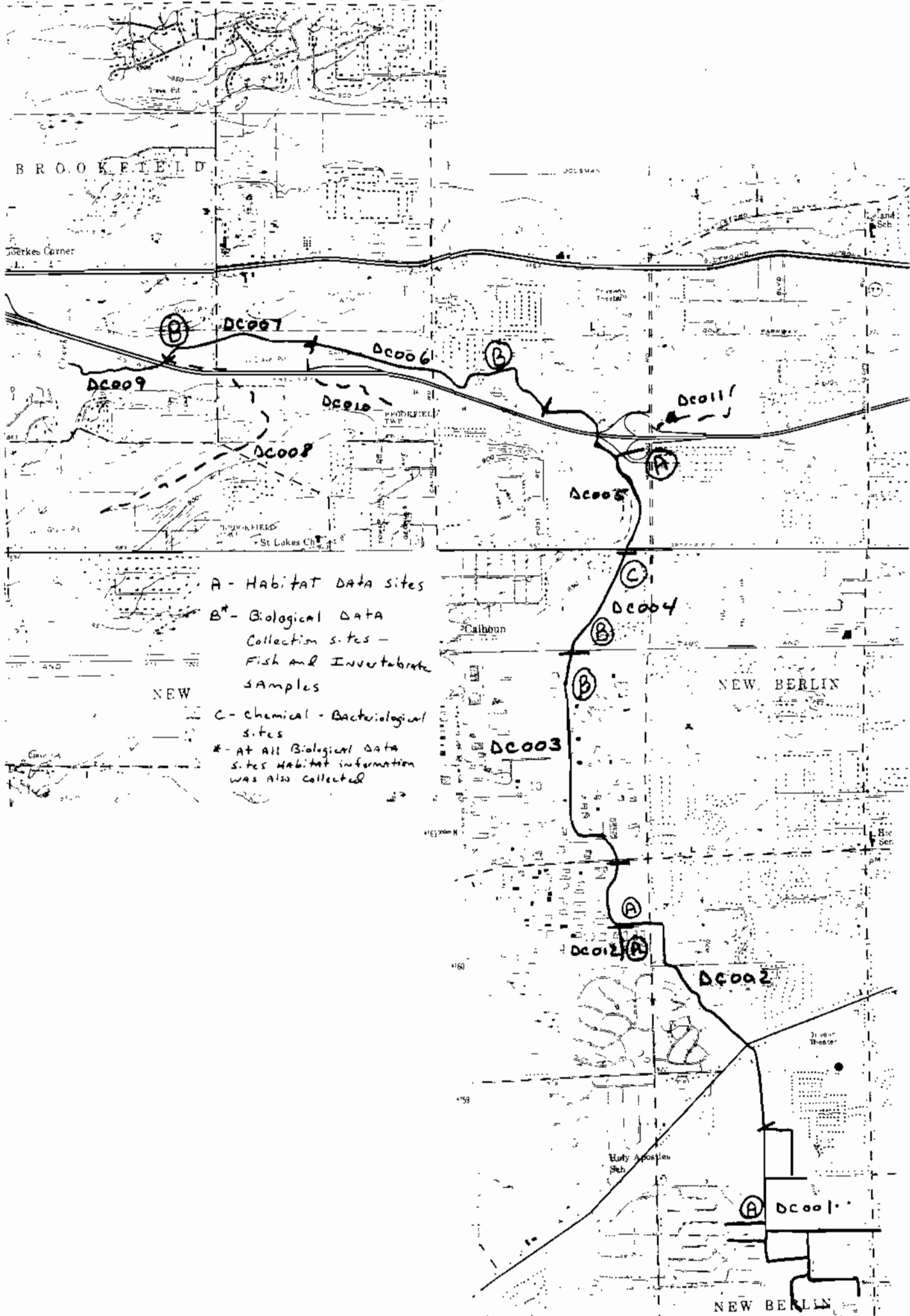
SUBWATERSHED WATERBODY	LENGTH MILES	CURRENT USES USE/MILES	POTENTIAL USES		PROBLEMS OR THREATS TO POTENTIAL USES	POLLUTANTS OR LIMITING FACTORS CAUSING PROBLEMS OR THREATS	OBSERVED OR POTENTIAL SOURCES	PRELIMINARY MANAGEMENT RECOMMENDATIONS
			POTENTIAL USES USE/MILES	FULL PART NOT MILES				
Deer Creek Subwatershed								
Deer Creek	8.0	LAL/8.0	WMS/8.0		8.0 Loss of fish and invertebrate habitat Loss of wildlife habitat	Channelization Bank debrushing Drainage of wetlands Ponding	Urbanization Golf Course	Prohibit future channelization Prohibit drainage of wetlands
					Trophic/community imbalance Nuisance vegetation	Nutrients	Urban runoff Cropland runoff Golf course runoff Drain tiles	Reduce or eliminate runoff Reduce NPS nutrient loadings by 50%
					Stream flow fluctuation or low flow	Low flow and flashy flow	Urban runoff Storm sewers	Provide stormwater control in future developments
					Embedded substrates Turbidity	Sediment	Urban runoff Cropland runoff Streambank erosion Construction site runoff Roadside Ditch erosion	Reduce NPS sediment loadings by 50%
					Temperature extremes	Bank debrushing Channelization/snebbing	Urbanization	Enact/enforce erosion control ordinance
					Toxicity (potential)	Metals Pesticide or herbicides	Urban runoff Industrial discharge Cropland runoff	Prohibit future channelization and bank debrushing Reduce/eliminate runoff Monitor for permit compliance Reduce/eliminate runoff
					8.0 Size and depth Bacteria	Natural Septage (potential)	Natural Urban runoff	None/natural Eliminate septic inputs

Table 4. (Continued) Waterbodies of the Upper Fox River Watershed, Waushara County.

SUBWATERSHED WATERBODY	LENGTH MILES	CURRENT USES USE/MILES	POTENTIAL USES		PROBLEMS OR THREATS TO POTENTIAL USES	POLLUTANTS OR LIMITING FACTORS CAUSING PROBLEMS OR THREATS	OBSERVED OR POTENTIAL SOURCES	PRELIMINARY MANAGEMENT RECOMMENDATIONS
			POTENTIAL USES FULL	PART NOT MILES				
Deer Creek Subwatershed								
Intermittent A (D0012) (T6W,R20E,S.10,SESE)	.25	LAL/.25	LAL/.25	.25	Loss of fish and invertebrate habitat Loss of wildlife habitat	Channelization/snagging Drainage of wetlands Bank debushing Filling of wetlands	Urbanization	Prohibit future channelization Prohibit drainage of wetlands Prohibit bank debushing Prohibit filling of wetlands
		PBC/.25	PBC/.25	.25	Stream flow fluctuation or low flow Potential toxicity	Low flow and flashy flows Metals Pesticides or herbicides	Urban runoff	Reduce flows through proper storm water management Reduce or eliminate runoff
					Size and depth	Natural	Natural	None/natural
Intermittent B (D0011) (T7W,R20E,S.34,NESE)								
	.50	LAL/.5	LAL/.5	.5	Loss of fish and invertebrate habitat	Channelization Ponding	Urban runoff Golf course runoff	Prohibit future channelization
					Potential toxicity	Metals Pesticides or herbicides	Urban runoff Golf course runoff	Reduce or eliminate runoff "
		PBC/.5	PBC/.5	.5	Size and depth	Natural	Natural	None/natural
Intermittent C (D0010) (T7W,R20E,S.33,NEW)								
		N/A		0.5				
No information is available for this tributary and the water resource problems are assumed similar to other tributaries.								
Intermittent D (D0008) (T7W,R20E,S.32,NEW)								
		N/A		1.0				
No information is available for this tributary and the water resource problems are assumed similar to other tributaries.								

BROOKFIELD

Joerkes Corner



A - Habitat Data sites

B* - Biological Data Collection sites - Fish and Invertebrate samples

C - Chemical - Bacteriological sites

* - At All Biological Data sites Habitat information was also collected

NEW

NEW BERLIN

NEW BERLIN