Appendix V

Twin Door Kewaunee Basin Watershed Narratives and Tables

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WEST TWIN RIVER WATERSHED (TK01)

Existing Management and Monitoring Recommendations

1. Basin staff should conduct assessment monitoring on streams in the West Twin River watershed (TK01) to further define nonpoint source problems. Assessment monitoring should include stream habitat surveys (Simonson et al., 1993) to help identify stream segments that are degraded because of the lack of adequate buffers and vegetative filter strips. This information will help guide CREP, the Targeted Runoff Managament (TRM) Program, and other conservation funding programs to the areas of greatest need.

2. Basin staff should analyze resident fish from selected waters for PCB and mercury contamination.

3. Basin staff should establish a self-help lake monitoring program on Lilly Lake (TK01) (Type B).

4. Groundwater staff should conduct additional sampling to determine whether herbicide and pesticide contamination exists in the Village of Francis Creek (TK01).

Streams Descriptions

West Twin River

The West Twin River begins at the confluence of the Neshota River and Devils River and has a combined watershed area of 176 square miles. Land use is largely agricultural but some industries border the river in the city of Two Rivers.

The Shoto dam, 5.9 miles upstream of the mouth, divides the river into upper and lower reaches. Lake Michigan seiche effects (tidal flows) extend approximately 1.5 miles upstream of the mouth. In the reach below the dam, the river supports a good warmwater fishery of northern pike, smallmouth bass, rock bass, perch and channel catfish. Anadromous (running) salmon and trout from Lake Michigan run seasonally up to the Shoto dam. Natural reproduction of coho and chinook salmon, rainbow trout and walleye in this reach is doubtful. The presence of these fish is attributed to WDNR stocking efforts. Nonpoint source water pollution effects in this reach are generally mitigated by a buffer of cattail marsh along the banks.

Fish flesh screening for toxic chemical contamination revealed that PCB concentrations exceeded FDA health standards in seven species of rough and game fish from the river between 1978 and 1990. A fish consumption advisory is in effect from the river's mouth to the Shoto dam for carp, catfish, yellow perch, northern pike, crappie, smallmouth bass and Lake Michigan salmon and trout. Detailed information on the species, sizes, and the associated risks appears in the *Health Guide for People who eat Sport Fish from Wisconsin Waters*. Anglers should examine the guide regularly to be aware of possible changes in advisory status.

Sediment samples collected in 1984 contained PCB levels at or less than the 0.2 parts per million detectable level (Doelger, 1984). Volatile solids, total phosphorus, ammonia, arsenic, zinc and chromium levels in sediment samples collected by the U.S. Army Corps of Engineers in 1987 were indicative of moderately polluted sediments. Total Kjeldahl nitrogen and chemical oxygen demand levels were characteristic of heavily polluted sediments (IJC, 1991). The Two Rivers harbor was last dredged in 1989 and the dredged material was used to nourish beaches.

The warmwater fishery above the dam is limited by agricultural nonpoint source water pollution and low flows. This reach supports rock bass, channel catfish and northern pike. Two small sections (totalling 1.1 miles) of the West Twin River above the dam are classified as Class II trout waters, but it is doubtful this use

is being supported (Fago, 1985). The greater redhorse (*Moxostoma valenciennesi*) has been found in the West Twin-Neshota River system. This fish is listed as a threatened species in Wisconsin.

Fisheries managers believe that the entire reach above the Shoto dam is being extensively affected by sediment deposition and nutrient enrichment from agricultural runoff and should be classified as a warmwater fishery. This potential is only partially being supported and the fishery could be improved through nonpoint source controls. **The dam at Shoto is limiting the fishery potential by blocking fish migration.** Wetland restoration activities could improve runoff quality.

Historic reductions in the percentage of forested and wetland vegetation have resulted in a watershed that lacks adequate opportunities for infiltration and retention of precipitation and snow melt resulting in flashy runoff which overwhelms existing stream channels and aquatic habitat. This excessive runoff also strips valuable sediments and nutrients from the terrestrial environment and delivers them to our streams and lakes where they result in degraded water quality and poorer habitat which can kill sensitive and intolerant fish and aquatic invertebrates. Flashy runoff also limits the amount of water available to sustain adequate flows during drought. Restoration efforts should focus on increasing the overall percentage of forested and wetland vegetation in this watershed to restore a more natural hydrologic regime and minimize the impacts of flashy runoff and an altered hydrologic regime.

Unnamed Tributary (T20N, R24E, S18)

This creek, classified as marginal, flows into the West Twin River east of the village of Francis Creek. The stream is small and generally well-buffered in its headwaters by wetlands, but has some nonpoint source impacts below Francis Creek from construction erosion and barnyard runoff.

Until 1982, the creek received the discharge from the Francis Creek wastewater treatment plant. When the plant was upgraded and began discharging to groundwater, the effluent entering the creek ceased and water quality greatly improved (Russo, 1983). It is possible that groundwater discharge from the new plant may be affecting this stream (i.e. with elevated chloride levels). Fisheries and water resources managers believe that the use potential may be better than its current classification. A 1986 stream classification survey showed the stream is currently in a stable, healthy condition and could likely support a diverse fish and aquatic life community (Doelger, 1987a).

Kriwanek Creek

Kriwanek Creek is a small tributary to the West Twin River that has a moderate gradient (27.8 feet per mile), gravel and rubble substrate, and good flow in the lower reach due to numerous springs and small tributaries. The lower 0.6 mile of stream is classified as Class II brown trout water. However, the stream is not stocked due to lack of public access. This reach is only partially meeting its potential use due to streambank pasturing. The classification above this reach is as a forage fishery for nearly one mile, and then as limited aquatic life. Fisheries staff noted that the Maribel Sewage Treatment Plant discharges to a tributary of Kriwanek Creek and that chloride concentrations could be limiting ecological health.

Neshota River

The Neshota River is a low gradient, low flow stream with fair water quality. Good bottom substrate is present in much of the river and the upper river likely supports a forage fish community, which includes the greater redhorse (*Moxostoma valenciennesi*), a threatened species. The lower three miles of the river have a warmwater sport fishery that is only partially supporting its use potential due to excessive sediment deposition, nutrient enrichment and turbidity from nonpoint sources of water pollution. Significant nonpoint sources in the watershed include cropland erosion, streambank pasturing and barnyard runoff. Poor manure management practices resulted in a large spill and subsequent fish kill in the middle 1990s. In addition, noxious materials from milkhouse drains are suspected of degrading surface and groundwater quality in the area. If nonpoint sources were controlled, this lower reach of stream could support a higher quality warmwater fishery.

Unnamed Tributary (T22N, R22E, S15)

Pizza Inn - Steve's Cheese Division discharges noncontact cooling water to an unnamed tributary of the Neshota River, locally known as Langes Corners Creek. There are no known effects from this discharge.

Unnamed Tributary (T22N, R22E, S23)

This stream, locally known as Denmark Creek, is a two-mile tributary of the Neshota River. The headwaters are within the village of Denmark and the stream has a 1.1 square mile drainage area (Russo, 1982). The Denmark wastewater treatment plant discharges to the creek. Noncontact cooling water from Lake to Lake Dairy Cooperative contributes to the majority of the flow above the plant. The stream has a limited forage fishery (Doelger, 1990).

King Creek

King Creek is a small, intermittent tributary to the Neshota River. Its watershed is intensely farmed. Streambank pasturing and cropland erosion result in sediment deposition and turbid water. Potts Blue Star Cheese discharges about 5,000 gallons per day of treated wastewater from an aerated lagoon on a fill and draw basis. Due to algae growth in the lagoon and low creek flows, the wastewater discharge could have a significant effect on water quality.

Devil's River

Devil's River is a tributary to the West Twin River and has a moderate gradient (22.7 feet per mile), good substrate and fair water quality. The lower four miles of the river are not classified as trout water, but the Maribel Sportsmens Club has stocked trout in this reach. A stream-shocking survey performed in 1984 on 300 yards of this reach showed that a few trout are still present. The rest of the river is dominated by forage fish including the redside dace (*Clinostomus elongatus*), which is a "watch" species in Wisconsin. Fisheries managers believe that agricultural runoff and stream intermittency are limiting the fishery throughout the entire stream. With management of nonpoint sources of water pollution, the lower four miles may have the potential to be a Class III trout stream.

Table 3. West Twin River Watershed (TK01) - Stream Information Part 1 of 4

Counties: Kewaunee, Manitowoc, Brown
Square Miles: 176

NAME OF STREAM	WBIC	LENGTH (MILES)	EXISTING Biological Use USE/MILES	POTENTIAL Biological Use (MILES)	Supporting Assessment Category	Assessment Data	Codified CLASS
West Twin River	87000	0-5.9	WWSF/5.9	WWSF	Fully/5.9	M	WWSF
		5.9-16.1	WWSF/10.2	WWSF	Partially/10.2		WWSF
		16.1-16.4	COLD II/0.3b	COLD (II)	Not/0.3	M	COLD (II)
		16.4-17.2	WWSF/0.8e	WWSF	Partially/0.8	M	WWSF
		17.2-18	COLD II/0.8b	COLD (II)	Not/0.8	M	COLD (II)
		18-19	WWSF/1e	WWSF	Partially/1.0	M	WWSF
Unnamed Tributaries							
T20N, R24E, S30	87500	5	UNKNOWN				
T21N, R23E, S29	87800	1	UNKNOWN				
T20N, R24E, S18	**Resolve WBIC!!!**	3	LAL/3c	LFF	Partially/3	E	Default
Francis Creek	87600	6	WWFF/6e	WWFF	Fully/6	Unknown	WWFF
Unnamed Tributary							
T20N, R23E S11	87700	2	UNKNOWN				Default
Kriwanek Creek	88000	0-0.6	COLD II/0.6b	COLD (II)	Partially/.6	E	COLD (II)
		0.6-1.5	WWFF/0.9e	WWFF	Fully/.9		WWFF
		1.5-6	LFF/4.5e	LFF	Fully/4.5		LFF
Neshota River	88200	3	WWSF/3e	WWSF	Partially/3	E	WWSF
		3-14	WWFF/11e	WWFF	Partially/11		WWFF
Unnamed Tributaries							
T22N, R22E, S25	88900	1	UNKNOWN				Default
T22N, R22E, S15	89200	1	UNKNOWN				Default
T22N, R22E, S15 (Langes Corners)	89300	4	LFF/4e	LFF		E	LFF
T22N, R22E, S03	89500	4	UNKNOWN				Default
T22N, R22E, S05	89700	1	UNKNOWN				Default
T22N, R22E, S23 (Denmark Creek)	89100	2	LFF/2c	LFF	Fully/2	E	LFF
King Creek	89400	5	UNKNOWN				Default
Twin Hill Creek	89600	4	UNKNOWN				Default
Black Creek (Buck Creek)	88300	10	Unknown				Default
Devil's River	89900	0-4	WWSF/4e	**COLD (III) or WWSF?**	Partially/4	E	WWSF
		4-12	WWFF/8e	WWFF	Partially/8		WWFF
Unnamed Tributary							
T21N, R22E, S09	90000	2	UNKNOWN				Default

Watershed Totals

Table 3. West Twin River Watershed (TK01) - Stream Information — Part 2 of 4

Counties: Kewaunee, Manitowoc, Brown
Square Miles: 176

NAME OF STREAM	WBIC	LENGTH (MILES)	HBI Water Quality "Integrity Indicator"	Joe Ball Habitat Form 3200-68, 1-85 sm= stream miles from mouth
West Twin River	87000	0-5.9	4.45 (very good), fall 1994 (sm=5.8) **(see comments)** 5.95 (fair), spring 1994 (sm=5.8) **(see comments)**	141 (fair) fall 1994 (sm=5.8) 112 (good) Aug 1994 (sm=5.8) 84 (good) June 1994 (sm=5.8) 92(good) spring 1994 (sm=5.8)
		5.9-16.1		
		16.1-16.4		
		16.4-17.2		
		17.2-18		
		18-19		
Unnamed Tributaries				
T20N, R24E, S30	87500	5		
T21N, R23E, S29	87800	1		
T20N, R24E, S18	**Resolve WBIC!!!**	3		
Francis Creek	87600	6	4.13 (very good) Fall 1994 (sm=1.6) 5.02, (good) spring 1994 (sm=1.6)	124 (good) fall 1994 (sm=1.6) 189 (fair) Aug 1994 (sm=1.6) 164 (fair) June 1994 (sm=1.6) 147 (fair) spring 1994 (sm=1.6)
Unnamed Tributary				
T20N, R23E S11	87700	2		
Kriwanek Creek	88000	0-0.6		
		0.6-1.5	3.68 (very good) fall 1994 (sm=0.7) 1.91 (excellent) spring 1994 (sm=0.7)	134 (fair) fall 1994 (sm=0.7) 160 (fair) Aug 1994 (sm=0.7) 121 (good) June 1994 (sm=0.7) 126 (good) spring 1994 (sm=0.7)
		1.5-6		
Neshota River	88200	3	4.08 (very good) fall 1994 (sm=0.8) 5.31 (good) spring 1994 (sm=0.8) 3.31 (excellent) fall 1994 (sm=2.8) 5.06 (good) spring 1994 (sm=2.8)	116 (good) fall 1994 (sm=0.8) 117 (good) Aug 1994 (sm=0.8) 117 (good) June 1994 (sm=0.8) 74 (good) spring 1994 (sm=0.8) 106 (good) fall 1994 (sm=2.8) 127 (good) Aug 1994 (sm=2.8) 141 (fair) June 1994 (sm=2.8) 131 (good) spring 1994 (sm=2.8)
		3-14		
Unnamed Tributaries				
T22N, R22E, S25	88900	1		
T22N, R22E, S15	89200	1		
T22N, R22E, S15 (Langes Corners)	89300	4		
T22N, R22E, S03	89500	4		

Table 3. West Twin River Watershed (TK01) - Stream Information Part 3 of 4

Counties: Kewaunee, Manitowoc, Brown
Square Miles: 176

			Environmental Problems				Data ReliabilityLevel
		LENGTH					1-least
NAME OF STREAM	WBIC	(MILES)	SOURCE	IMPACT	REFERENCES	TREND	4-most
West Twin River	87000	0-5.9	Landfill, NPS, Shoto Dam	PCB Fish Consumption Advisory, Sediments, Nutrients, Ecological disruptions	7,14,15,17,59	Unknown	2
		5.9-16.1					
		16.1-16.4					
		16.4-17.2					
		17.2-18					
		18-19					
Unnamed Tributaries							
T20N, R24E, S30	87500	5				Unknown	1
T21N, R23E, S29	87800	1				Unknown	1
T20N, R24E, S18	**Resolve WBIC!!!**	3	Point Source Municipal, Construction Site Erosion, Barnyards	Sediments, Nutrients	10,37	Unknown	1
Francis Creek	87600	6				Unknown	2
Unnamed Tributary							
T20N, R23E S11	87700	2				Unknown	1
Kriwanek Creek	88000	0-0.6	Streambank Pasturing, Maribel WWTP	Sediments, Nutrients, Chlorides	17	Unknown	2
		0.6-1.5					
		1.5-6					
Neshota River	88200	3	NPS, Streambank Pasturing, Cropland, Barnyards, Manure Management	Sediments, Nutrients, Turbidity	14,52	Unknown	2
		3-14					
Unnamed Tributaries							
T22N, R22E, S25	88900	1				Unknown	1
T22N, R22E, S15	89200	1				Unknown	1
T22N, R22E, S15 (Langes Corners)	89300	4				Unknown	1
T22N, R22E, S03	89500	4				Unknown	1
T22N, R22E, S05	89700	1				Unknown	1
T22N, R22E, S23 (Denmark Creek)	89100	2			11,36	Unknown	1
King Creek	89400	5	NPS, Streambank Pasturing, Cropland	Sediments, Nutrients		Unknown	1

Table 3. West Twin River Watershed (TK01) - Stream Information Part 4 of 4

Counties: Kewaunee, Manitowoc, Brown
Square Miles: 176

		LENGTH	NPS	Additional Comments
NAME OF STREAM	WBIC	(MILES)	Rank	Data Comentary (Spatial & Temporal Limitations)
West Twin River	87000	0-5.9	High	(stream mile = 5.8; HBI's are influenced by Shoto Dam impoundment) (stream mile 5.8 = CTH B)
		5.9-16.1		
		16.1-16.4		
		16.4-17.2		
		17.2-18		
		18-19		
Unnamed Tributaries				
T20N, R24E, S30	87500	5	High	
T21N, R23E, S29	87800	1	High	
T20N, R24E, S18	**Resolve WBIC!!!**	3	High	
Francis Creek	87600	6	High	(stream mile 1.6 = CTH R)
Unnamed Tributary				
T20N, R23E S11	87700	2	High	
Kriwanek Creek	88000	0-0.6	High	
		0.6-1.5		Check Hidden Valley Rd. Invert Bench sheets - **Potential Use as a Reference Site** (stream mile 0.7 = Hidden Valley Rd)
		1.5-6		
Neshota River	88200	3	High	**Large Manure spill in mid 90s resulted in Fish Kill Fish kill originating in Black Cr 8/18/87** (stream mile 0.8 = Nachtwey Rd.) (stream mile 2.8 = CTH BB)
		3-14		
Unnamed Tributaries				
T22N, R22E, S25	88900	1	High	
T22N, R22E, S15	89200	1	High	
T22N, R22E, S15 (Langes Corners)	89300	4	High	
T22N, R22E, S03	89500	4	High	
T22N, R22E, S05	89700	1	High	
T22N, R22E, S23 (Denmark Creek)	89100	2	High	
King Creek	89400	5	High	
Twin Hill Creek	89600	4	High	
Black Creek (Buck Creek)	88300	10	High	(stream mile 1.0 = CTH BB)
Devil's River	89900	0-4	High	
		4-12		(stream mile 5.0 = Kvitek Rd.)
Unnamed Tributary				
T21N, R22E, S09	90000	2	High	(stream mile 0.1 = Kvitek Rd.)

Lakes Descriptions

Lilly Lake - Brown County

Lilly Lake, in the town of Eaton, is a 40-acre seepage lake up to 21 feet deep. The entire shoreline is well-buffered by hardwood forest and lowlands and is a county park. Facilities include picnic and play areas, an arboretum, nature trails, a fishing dock, a boat launch (no motors) and parking. Water quality is slightly eutrophic and the shallow lake is subject to periodic winterkills. An aerator has been used to prevent winterkills in the past. The lake has been chemically treated to remove rough fish and has been stocked with panfish and game fish.

Tuma Lake (Ording Lake) - Manitowoc County

Tuma Lake is a 14-acre landlocked lake with a maximum depth of 36 feet. It is a seepage lake with several springs. For a small lake, it has a diverse fishery. Largemouth bass, walleye, and panfish are common. This lake is unique because, despite its bottom being entirely muck and peat, natural reproduction of walleyes is successful. Waterfowl use the lake during spring and fall migrations. Nutrients and organic enrichment have resulted in periodic fish kills in the past.

Hidden Lake – Manitowoc County

Hidden Lake is small seepage lake that is situated near the Devils River North of Hickory Grove. It is approximately 23 acres in size. There is no public access and very little information about its limnology exists.

Shoto Lake – Manitowoc County

Shoto Lake is an impoundment on the West Twin River created by the Shoto Dam approximately 5.8 miles from it's mouth at Lake Michigan. Anadromous fish migrations are not possible beyond this point, and resident fish migrations are also thwarted in this area. The dam causes several disruptions in the natural ecosystem functional values for the West Twin River which should be weighed against the value the dam performs as a lamprey barrier. A cost to benefit ratio should be calculated for its removal the next time costly repairs or replacement are needed. The Shoto Conservation Club operates the Dam.

Table 4. West Twin River Watershed - Lake Management & Trophic State Information Part 1 of 3

				Surface	Maximum	Lake Management Information		
				Area	Depth		History of	
Lake Name	County	WBIC	Twn-Rng-Sec	(acres)	(feet)	Lake Type	Winter Kill	Access
Hidden Lake (Turtle)	Manitowoc	82800	T21 R22E S08	23		Seepage	Yes	None
Lilly Lake	Brown	82900	T23 R22E S32	40	21	Seepage	Yes	Boat Ramp
Shoto Lake (Impoundment)	Manitowoc	87300	T20 R24E S29	55	11	Drainage		Roadside
Tuma Lake (Ording)	Manitowoc	87900	T21 R23E S17	14	36	Seepage		Boat Ramp
Middle Lake	Brown	83000	T23 R22E S32	7	7	Seepage		None
Third lake	Brown	89800	T23 R22E S33	5	15	Seepage		None

Table 4. West Twin River Watershed - Lake Management & Trophic State Information Part 2 of 3

			Mercury	Eurasion	Lake	Planning or
			fish consumption	Water	Management	Protection
Lake Name	County	Self Help	advisory	Milfoil	Organization	Grants
Hidden Lake (Turtle)	Manitowoc		None Listed			
Lilly Lake	Brown	Recommended	None Listed, monitoring conducted in 1994, see comments			
Shoto Lake (Impoundment)	Manitowoc		None Listed		LMO ? ; see comments	
Tuma Lake (Ording)	Manitowoc		None Listed	Present		
Middle Lake	Brown		None Listed			
Third lake	Brown		None Listed			

Table 4. West Twin River Watershed - Lake Management & Trophic State Information Part 3 of 3

		Lake Trophic State Information					
		TSI	TSI	TSI	TSI	Phosphorus	Comments
Lake Name	County	Class	Total Phos	Secchi Depth	Chl A	Sensitivity	
Hidden Lake (Turtle)	Manitowoc					IC	
Lilly Lake	Brown	Mesotrophic	GSM=51	GSM=43	GSM=49	IC	No Mercury Fish consumption advisory listed; four LMB (10" to 14")were tested in 1994 GSM = Growning Season Mean (samples collected in 1994)
Shoto Lake (Impoundment)	Manitowoc					IIC	should the group "Citizens to Protect West Twin River" as listed in "The Lakes List" be entered as an Association? Shoto Lake, because it is a artificial impoundment, will not be a high ecological integrity lake. The dam and its impoundment are negatively impacting the ecological integrity of the west Twin River.
Tuma Lake (Ording)	Manitowoc	Mesotrophic	GSM=51	GSM=41	GSM=47	IC	GSM = Growning Season Mean (samples collected in 1994)
Middle Lake	Brown						
Third lake	Brown						

EAST TWIN RIVER WATERSHED (TK02)

Existing Management and Monitoring Recommendations

1. Basin staff should conduct assessment monitoring on streams in the East Twin River Watershed (TK02) so the watershed can be ranked for nonpoint source priorities. Assessment monitoring should include stream habitat surveys (Simonson et al., 1993) to help identify stream segments that are degraded because of the lack of adequate buffers and vegetative filter strips. This information will help guide CREP, the Targeted Runoff Managament (TRM) Program, and other conservation funding programs to the areas of greatest need.

Streams Descriptions

East Twin River

The East Twin River is 34.5 miles long with a watershed of 133 square miles. It is a low gradient (2.7 feet per mile) stream with a 19-year average flow of 78.6 cubic feet per second (USGS, 1992). The river generally has fair to good water quality and most of it supports a diverse warmwater fishery. Biologists have identified 61 species of fish in the Twin Rivers basin, including the threatened greater redhorse (*Moxostoma valenciennesi*). The redside dace (*Clinostomus elongatus*), a species on Wisconsin's "watch list," is also present. Northern pike, smallmouth bass, and channel catfish are frequently taken. Anadromous salmon and trout seasonally run as far upstream as the Mishicot dam, which serves as an important sea lamprey barrier. In its headwaters, 7.6 miles of the river are Class I and II trout waters. The dam and impoundment at Mishicot may have some impact on water quality and the movement of downstream fishes. The dam is being reconstructed and will be managed by the Village of Mishicot (Koch, 1995). The dam will be designed to prevent lamprey movement and reproduction upstream (Meyers, 1995). Impoundments commonly develop poor water quality due to sediment deposition. Additional land management practices may be needed to control polluted runoff in the East Twin River Watershed to minimize degradation of the pond.

Fish flesh screening for toxic chemical contamination revealed that PCB concentrations exceeded FDA health standards in carp, northern pike, and rainbow trout between 1978 and 1990. A fish consumption advisory is in effect from the river's mouth to the Mishicot dam for carp, catfish, yellow perch, northern pike, crappie, smallmouth bass and Lake Michigan salmon and trout. The WDNR publication, *Health Guide for People who*

eat Sport Fish from Wisconsin Waters, details consumption advisory information. Anglers should examine the guide regularly for possible changes in the advisory.

Much of the East Twin River watershed is in agricultural use. The soils are erodible and little natural buffer areas exist along the river. Nonpoint sources of water pollution include streambank and woodlot pasturing, gully erosion, construction sites and croplands. Fish management personnel believe these nonpoint sources are adding sediment and nutrients to the river, and that restoring wetlands and reducing agricultural runoff would have beneficial effects on the fishery (WDNR, 1982).

Historic reductions in the percentage of forested and wetland vegetation have resulted in a watershed that lacks adequate opportunities for infiltration and retention of precipitation and snow melt resulting in flashy runoff which overwhelms existing stream channels and aquatic habitat. This excessive runoff also strips valuable sediments and nutrients from the terrestrial environment and delivers them to our streams and lakes where they result in degraded water quality and poorer habitat which can kill sensitive and intolerant fish and aquatic invertebrates. Flashy runoff also limits the amount of water available to sustain adequate flows during drought. Restoration efforts should focus on increasing the overall percentage of forested and wetland vegetation in this watershed to restore a more natural hydrologic regime and minimize the impacts of flashy runoff and an altered hydrologic regime.
The Mishicot wastewater treatment plant is the only municipal sewage treatment facility discharging to the East Twin River. The facility was upgraded in 1983, which improved the general water quality below its discharge (Russo, 1985). Recently, the plant has had problems with excessive influent flows, sewer bypassing, and exceeding of ammonia limits. Ammonia toxicity below the outfall is a concern and may need to be addressed through facility planning. WDNR staff have recommended applying a Great Lakes or cold water community classification for water quality standards to the East Twin River below Mishicot (Doelger, 1993).

There are no direct industrial discharges to the river, although Krohn Dairy operates an activated sludge treatment plant that discharges about 14,000 gallons of wastewater per day to an unnamed tributary. The Two Rivers landfill is a suspected source of contaminants to area surface waters.

Jambo Creek

Jambo Creek is the largest tributary to the East Twin River. It is a nine-mile long stream with fair to poor water quality (WDNR, 1982). The first three miles upstream from its mouth are Class II brown trout waters. Fisheries managers feel this reach is not meeting its potential due to pollution from agricultural runoff.

Tisch Mills Creek

Tisch Mills Creek is a low gradient tributary to the East Twin River. It generally has very good water quality and 1.9 miles are Class II brown trout water. The stream is buffered by cedar swamp along much of its headwaters, thus nonpoint sources of water pollution have little impact on the stream. Fisheries managers believe that water quality cannot be significantly increased through nonpoint source management, but habitat improvements may increase fish populations by providing more cover.

Table 6. East Twin River Watershed (TKO2) - Stream Information Part 1 of 4

Counties: Kewaunee, Manitowoc

Square Miles: 190

NAME OF STREAM	WBIC	LENGTH (MILES)	EXISTING Biological Use USE/MILES	POTENTIAL Biological Use (MILES)	Supporting Assessment Category	Assessment Data	Codified CLASS
East Twin River	84000	0-26.9	WWSF/26.9a	WWSF/26.9a	Threatened/26.9	M	WWSF
		26.9-28.2	Cold(I)1.3e	Cold(I)1.3e	Threatened/1.3	M	Cold (I)
		28.2-34.5	Cold(II)6.3e	Cold(II)6.3e	Threatened/6.3	M	Cold (II)
Unnamed Tributaries							
T22N, R24E, S32	86000	2	Unkown				Default
T21N, R24E, S04	86100	1	Unkown				Default
T22N, R24E, S28	86200	1	Unkown				Default
T22N, R24E, S09	86300	2	Unkown				Default
T22N, R24E, S09	86400	4	Unkown				Default
T23N, R24E, S33	86500	2	Unkown				Default
Johnson Creek	84100	**2.4**	WWSF/2.4	WWSF/2.4	Partially/2.4	M	LFF Change to WWSF
Jambo Creek	84300	0-3	Cold (II) 3b	Cold (II) 3b	Partially / 3	E	Cold (II)
		3-8	LFF/5e	LFF/5e	Fully / 5	E	LFF
		8-9	LAL/1e	LAL/1e	Fully / 1	E	LAL
Unnamed Tributaries							
T21N, R23E, S15	84400	4	Unknown				DEF
T21N, R23E, S09	84500	2	Unknown				DEF
T21N, R23E, S15	**Resolve WBIC !!!!**	4	LAL / 4	LAL / 4			LAL
Tisch Mills Creek	85500	0-1.9	Cold II / 1.9b	Cold II / 1.9b	Partially / 1.9	E	Cold (II)
		1.9-8	WWFF / 6.1e	WWFF / 6.1e	Partially / 6.1	E	WWFF
Unnamed Tributaries							
T22N, R24E, S31	85700	1	Unknown				Default
T22N, R23E, S24	85800	1	Unknown				Default
Krok Creek	86700	0-4	Cold I & II	Cold I & II	Partially / 2	M	WWFF change to Cold I & II
Unnamed Tributaries							
T23N, R24E, S20	86800	2	Unknown				Default
T23N, R23E, S22	86900	1	Unknown				Default
Molash Creek	90100	0-3.5	WWFF / 3.5	WWFF / 3.5	Partially / 3.5	M	WWFF
		3.5-6	LFF / 2.5	LFF / 2.5	Fully / 2.5		LFF
Unnamed Tributaries							
T22N, R23E, S28	85100	1	Unknown			Unknown	Default
T21N, R24E, S25	90300	1	Unknown			Unknown	Default
T22N, R24E, S25	90400	6	Unknown			Unknown	Default

Table 6. East Twin River Watershed (TKO2) - Stream Information Part 2 of 4

Counties: Kewaunee, Manitowoc
Square Miles: 190

NAME OF STREAM	WBIC	LENGTH (MILES)	HBI Water Quality "Integrity Indicator"	Joe Ball Habitat Form 3200-68, 1-85 sm = stream mile from mouth
East Twin River				
	84000	0-26.9	4.51 (good), spring 1994 (sm=16.5) 3.77 (very good), fall 1994 (sm=16.5) 5.51 (fair), spring 1994 (sm=18) 4.05 (very good), 1994 (sm=18)	102 (good), summer 1994 (sm=5) 102 (good), summer 1994 (sm=5.5) 86 (good), summer 1994 (sm=11.5) 158 (fair), fall 1994 (sm=16.5) 111 (good), summer 1994 (sm=16.5) 89 (good), spring 1994 (sm=16.5) 154 (fair), fall 1994 (sm=18) 161 (fair)
		26.9-28.2		
		28.2-34.5	4.65 (good), spring 1994 (sm=29) 4.36 (very good), fall 1994 (sm=29)	186 (fair), fall 1994 (sm=29) 132 (fair), spring 1994 (sm=29) 125 (good), summer 1994 (sm=30) 113 (good), summer 1994 (sm=32.5)
Unnamed Tributaries				
T22N, R24E, S32	86000	2		
T21N, R24E, S04	86100	1		
T22N, R24E, S28	86200	1		
T22N, R24E, S09	86300	2		
T22N, R24E, S09	86400	4		
T23N, R24E, S33	86500	2		
Johnson Creek	84100	**2.4**		195 (fair), summer 1994 (sm=0.9)
Jambo Creek	84300	0-3	2.85 (excellent), spring 1994 (sm=1.5) 3.71 (very good), fall 1994 (sm=1.5)	132 (fair), fall 1994 (sm =1.5) 88 (good), summer 1994 (sm =1.5) 70 (Excellent), spring 1994 (sm=1.5)
		3-8		184 (fair), summer 1994 (sm=3.2)
		8-9		
Unnamed Tributaries				
T21N, R23E, S15	84400	4		
T21N, R23E, S09	84500	2		
T21N, R23E, S15	**Resolve WBIC !!!!**	4		
Tisch Mills Creek	85500	0-1.9	3.02 (excellent), spring 1994 (sm=0.6) 2.89 (excellent), fall 1994 (sm=0.6) 3.37 (excellent), spring 1994 (sm=1.7) 3.89 (very good), fall 1994 (sm=1.7)	138 (fair), fall 1994 (sm=0.6) 86 (good), spring 1994 (sm=0.6) 145 (fair), fall 1994 (sm=1.7) 104 (good), summer 1994 (sm=1.7) 91 (good), spring 1994 (sm=1.7)
		1.9-8		156 (fair), summer 1994 (sm=3.6)
Unnamed Tributaries				
T22N, R24E, S31	85700	1		
T22N, R23E, S24	85800	1		
Krok Creek	86700	4	4.57 (good), 1994 (sm=1)	151 (fair), spring 1994) (sm=1) 158 (fair), summer 1994 (sm=2.7)
Unnamed Tributaries				

Table 6. East Twin River Watershed (TKO2) - Stream Information Part 3 of 4

Counties: Kewaunee, Manitowoc
Square Miles: 190

			PCB Fish	Environmental Problems		
		LENGTH	Consumption			
NAME OF STREAM	WBIC	(MILES)	Advisory	SOURCE	IMPACT	REFERENCES
East Twin River	84000	0-26.9	Smallmouth bass should not be eaten more than once a week Northern Pike >27" should not be eaten more than once a month Northern pike 18" to 27" should not be eaten more than once a week Channel catfish >18" should not be eaten	Land Fill Leachate, PCB,NPS	Sed, Nut, Fish Consumption Advisory	14,17,39,41
		26.9-28.2		NPS	Sed, Nut	48,59
		28.2-34.5		NPS	Sed, Nut	
Unnamed Tributaries						
T22N, R24E, S32	86000	2				
T21N, R24E, S04	86100	1				
T22N, R24E, S28	86200	1				
T22N, R24E, S09	86300	2				
T22N, R24E, S09	86400	4				
T23N, R24E, S33	86500	2				
Johnson Creek	84100	**2.4**				
Jambo Creek	84300	0-3		NPS	Sed, Nut	48, 17
		3-8				
		8-9				
Unnamed Tributaries						
T21N, R23E, S15	84400	4				
T21N, R23E, S09	84500	2				
T21N, R23E, S15	**Resolve WBIC !!!!**	4				
Tisch Mills Creek	85500	0-1.9		NPS	Habitat	52,17
		1.9-8				
Unnamed Tributaries						
T22N, R24E, S31	85700	1				
T22N, R23E, S24	85800	1				
Krok Creek	86700	4				
Unnamed Tributaries						
T23N, R24E, S20	86800	2				
T23N, R23E, S22	86900	1				
Molash Creek	90100	0-3.5		NPS	Sed, Nut	52
		3.5-6				
Unnamed Tributaries						
T22N, R23E, S28	85100	1				
T21N, R24E, S25	90300	1				
T22N, R24E, S25	90400	6		NPS	Sed, Nut	

Table 6. East Twin River Watershed (TKO2) - Stream Information Part 4 of 4

Counties: Kewaunee, Manitowoc
Square Miles: 190

NAME OF STREAM	WBIC	LENGTH (MILES)	TREND	Data Reliability Level 1-least 4-most	NPS Rank	Data Comentary (Spatial & Temporal Limitations)
East Twin River						
	84000	0-26.9	Unknown	2	High	(stream mile 5.0 = Maplewood Road) (stream mile 5.5 = East Hillcrest Rd) (stream mile 11.5 = Rock Ledge Rd) (stream
		26.9-28.2		2		
		28.2-34.5		2		(stream mile 29 = East Townline Road) (stream mile 30 = CTH F) (stream mile 32.5 = Hwy 163)
Unnamed Tributaries			Unknown			
T22N, R24E, S32	86000	2	Unknown	1	High	
T21N, R24E, S04	86100	1	Unknown	1	High	
T22N, R24E, S28	86200	1	Unknown	1	High	
T22N, R24E, S09	86300	2	Unknown	1	High	
T22N, R24E, S09	86400	4	Unknown	1	High	
T23N, R24E, S33	86500	2	Unknown	1	High	
Johnson Creek	84100	**2.4**	Unknown	1	High	(stream mile 0.9 = CTH V or Randolph Rd)
Jambo Creek	84300	0-3	Unknown	2	High	(stream mile 1.5 = Jambo Creek Road)
		3-8				(stream mile 3.2 = Twin Bridge Rd)
		8-9				
Unnamed Tributaries						
T21N, R23E, S15	84400	4	Unknown	1	High	
T21N, R23E, S09	84500	2	Unknown	1	High	
T21N, R23E, S15	**Resolve WBIC !!!!**	4	Unknown	1	High	
Tisch Mills Creek	85500	0-1.9	Unknown	2	High	(stream Mile 0.6 = CTH BB) - **Designate as a Reference Stream !** (stream mile 1.7 = Hwy 163)
		1.9-8				(stream mile 3.6 = Collegiate Rd)
Unnamed Tributaries						
T22N, R24E, S31	85700	1	Unknown	1	High	
T22N, R23E, S24	85800	1	Unknown	1	High	
Krok Creek	86700	4	Unknown	1	High	(stream mile 1.0 =Hwy 29) (stream mile 2.7 = CTH F)
Unnamed Tributaries						
T23N, R24E, S20	86800	2	Unknown	1	High	
T23N, R23E, S22	86900	1	Unknown	1	High	
Molash Creek	90100	0-3.5	Unknown	1	High	(stream mile 2.0 = CTH O)
		3.5-6				
Unnamed Tributaries						
T22N, R23E, S28	85100	1	Unknown	1	High	
T21N, R24E, S25	90300	1	Unknown	1	High	
T22N, R24E, S25	90400	6	Unknown	1	High	Large Spill in 2001

Lakes Descriptions

Chada Lake – Kewaunee County

Chada lake is a small 7 acre seepage lake with a maximum depth of 5 feet. No public access is available.

Engledinger Lake - Kewaunee County

Engledinger Lake is a 52-acre seepage lake with a maximum depth of 20 feet, an outlet to Jambo Creek and no public access. Water quality information is scarce. Martin, *et al.* (1983) classified it as eutrophic based on a "chlorophyl *a*" trophic state equation. The lake supports a fishery of largemouth bass, panfish, and northern pike.

Harpt Lake (Herman Lake) - Manitowoc County

Harpt Lake is a 31-acre seepage lake up to 54 feet deep with an outlet to Jambo Creek. Public access is provided by a town road and a swimming beach. A lakefront resort also provides a boat landing. The lake is considered eutrophic and is frequently devoid of dissolved oxygen below the thermocline, yet winterkills are not a problem. Submerged rooted aquatic plants (primarily *Potamogeton* sp. and *Ceratophyllum demersum*) were abundant during a 1992 field survey. The lake supports a fishery of largemouth bass, panfish and northern pike. Agricultural runoff is a likely source of nutrient enrichment. Excessive lakeshore development is also a concern.

Heidmann Lake (Bolt Lake) - Kewaunee County

Heidmann Lake is a 24-acre seepage lake as deep as 34 feet. The lake has fair water quality and nutrient enrichment is a problem. The deeper portions of the lake become anoxic in the summer and excessive weed growth afflicts the shallower areas. The lake appears to be turning eutrophic. The fishery consists of northern pike, largemouth bass and panfish. The lake has occasional winterkill problems. Public access and frontage includes a beach, picnic area, and boat launching facilities. Wetlands surround the north shore while the south and southeast shore is developed with cottages.

Mott Lake – Manitowoc County

Mott Lake is a 7 acre lake with a maximum depth of 9 feet. It is a small seepage lake with no public access.

Shea Lake - Kewaunee County

Shea Lake is a 31-acre eutrophic seepage lake with a maximum depth of 24 feet. The lake is extremely productive, with excessive vegetation problems due to nutrient input from nonpoint sources of water pollution. Failing cottage septic systems are likely an additional source of nutrients. The deeper portions of the lake have low dissolved oxygen problems during stratification and the lake winterkills frequently. The fishery consists of largemouth bass, northern pike and panfish. The northern shore is buffered be extensive wetlands. Rooted aquatic plants, primarily *Potamogeton* sp., were abundant during a 1992 field survey. Public access on the southwest shore is provided by a county park with a picnic area, restrooms, boat launch (no motors) and parking.

Seidel Lake - Kewaunee County

Seidel Lake is a 12-acre seepage lake with a maximum depth of 14 feet. It is a "wilderness lake," with no public access. The fishery consists primarily of carp and bullheads. Waterfowl use the lake during spring and fall migrations. No water quality information is available for this lake.

Table 7. East Twin River Watershed - Lake Management & Trophic State Information Part 1 of 3

				Surface	Maximum	**Lake Management Information**		
				Area	Depth		History of	
Lake Name	County	WBIC	Twn-Rng-Sec	(acres)	(feet)	Lake Type	Winter Kill	Access
Engledinger Lake	Kewaunee	85300	T22N R23E S28	52	20	Drainage	Unknown	None
Heidmann Lake (Bolt)	Kewaunee	85200	T22N R23E S28	24	34	Drained	Yes	Boat Ramp
Shea Lake	Kewaunee	85400	T22N R23E S21	32	24	Drained	Yes	Boat Ramp
Chada Lake	Kewaunee	85000	T22N R23E S33	7	5	Seepage	Unknown	None
Seidel Lake	Kewaunee	83100	T23N R24E S24	12	14	Seepage	Yes	None
Harpt Lake	Manitowoc	84600	T21N R23E S17	31	54	Drainage	Unknown	Barrier-free
Mott Lake	Manitowoc	84700	T21N R23E S17	7		Drained	Unknown	None

Table 7. East Twin River Watershed - Lake Management & Trophic State Information Part 2 of 3

		Mercury	Eurasion	Lake	Planning or
		fish consumption	Water	Management	Protection
Lake Name	Self Help	advisory	Milfoil	Organization	Grants
Engledinger Lake		None Listed		Recommended; see comments	
Heidmann Lake (Bolt)	TSI	None Listed	Present	Recommended; see comments	
Shea Lake		None Listed	Present	Recommended; see comments	
Chada Lake		None Listed		Recommended; see comments	
Seidel Lake		None Listed		Recommended; see comments	
Harpt Lake		None Listed	Present	No individual LMO; Manitowoc County Lakes Association	
Mott Lake		None Listed		No individual LMO; Manitowoc County Lakes Association	

Table 7. East Twin River Watershed - Lake Management & Trophic State Information Part 3 of 3

	Lake Trophic State Information					
	TSI	TSI	TSI	TSI	Phosphorus	
Lake Name	Class	Total Phos	Secchi Depth	Chl A	Sensitivity	Comments
Engledinger Lake				52	IC	Individual Lake Management Organization may not be practical; Recommend combined efforts between several lakes.
Heidmann Lake (Bolt)				48	IIC	Individual Lake Management Organization may not be practical; Recommend combined efforts between several lakes.
Shea Lake	Eutrophic	GSM=58	GSM=54	GSM=57	IC	Individual Lake Management Organization may not be practical; Recommend combined efforts between several lakes. GSM = Growning Season Mean (samples collected in 1994)
Chada Lake						Individual Lake Management Organization may not be practical; Recommend combined efforts between several lakes.
Seidel Lake					I	Individual Lake Management Organization may not be practical; Recommend combined efforts between several lakes. GSM = Growning Season Mean (samples collected in 1994)
Harpt Lake	Eutrophic	GSM = 61	GSM = 43	GSM = 50	IA	GSM = Growning Season Mean (samples collected in 1994) There is a Manitowoc County Lakes Association**; are they a member?**
Mott Lake						There is a Manitowoc County Lakes Association**; are they a member?**

KEWAUNEE RIVER WATERSHED (TK03)

Existing Management and Monitoring Recommendations

1. Basin personnel should assess the effects of runoff from the golf course in Luxemburg on School Creek (TK03)

2. Basin staff should reclassify the Kewaunee River (TK03) as a great lakes/cold

Streams Descriptions

Kewaunee River

The Kewaunee River is a large, low gradient stream with a 25-year average flow of 86.3 cubic feet per second (cfs) and low flows ($Q_{7,10}$) of 0.05 cfs (USGS, 1992). The Kewaunee River generally has fair to good water quality throughout. Its major tributaries include Casco, School, Scarboro and Little Scarboro Creeks. The watershed is predominantly agricultural (79 percent). The mainstem of the river and many of its tributaries are receiving sediment and nutrient enrichment from agricultural runoff. Watershed soils are high in fine clays, which are easily suspended in water. Erosion in the watershed delivers these soil particles (and nutrients and herbicides that readily attach to sediments) to the river and to Lake Michigan.

Most of the Kewaunee River supports a warmwater sport fishery and has seasonal runs of salmon and trout from Lake Michigan. It is unique among Class I steelhead streams because, until recently, it did not have a dam to stop upstream fish migration (WDNR, 1988). WDNR now operates a salmon egg-taking facility (C.D. "Buzz" Besadny Andronomous Fisheries Facility) with a lowhead dam on the river. A small channel allows fish to pass through the facility and avoid the dam. Eggs are harvested from spawning females to support Wisconsin's fish propagation efforts. NR 26, Wis. Adm. Code, classifies the river stretch from County Highway F upstream to 500 feet past the return pipe of the facility as a fish refuge. The lower river has extensive wetlands, which serve as nursery grounds for the 28 species of fish supported by the river. Two and one-half miles of the river between the mouth of Casco Creek downstream to County Trunk C are Class II brown trout waters. Sandy soils in this portion of the watershed are important in maintaining base flows to trout waters and in providing gravel substrate for spawning. There are concerns regarding the impacts of carp on Kewaunee River water quality.

The entire reach of river from the mouth of School Creek downstream to the mouth of the Kewaunee River is only partially supporting its potential use due to point and nonpoint sources of water pollution. The existing fishery in this reach could be improved by minimizing cropland erosion, streambank pasturing and pollution from animal waste.

Historic reductions in the percentage of forested and wetland vegetation have resulted in a watershed that lacks adequate opportunities for infiltration and retention of precipitation and snow melt resulting in flashy runoff which overwhelms existing stream channels and aquatic habitat. This excessive runoff also strips valuable sediments and nutrients from the terrestrial environment and delivers them to our streams and lakes where they result in degraded water quality and poorer habitat which can kill sensitive and intolerant fish and aquatic invertebrates. Flashy runoff also limits the amount of water available to sustain adequate flows during drought. Restoration efforts should focus on increasing the overall percentage of forested and wetland vegetation in this watershed to restore a more natural hydrologic regime and minimize the impacts of flashy runoff and an altered hydrologic regime.

Above the mouth of School Creek, the Kewaunee River supports only forage fish and is likely fully supporting its potential use. Water quality in this segment is fair, with low flows and high water temperatures limiting the fishery.

The Kewaunee River delivers a sediment load of about 1900 tons/year to the Kewaunee Harbor and Lake Michigan. In 1988, the Army Corps of Engineers dredged 41,089 cubic meters of sediment from the harbor. The Corps removed an additional 5,220 cubic meters in 1989. Sediment sampling in 1988 revealed levels of oil and grease, total phosphorus, lead and chemical oxygen considered characteristic of moderately polluted sediments. Total Kjeldahl nitrogen and ammonia levels were indicative of heavily polluted sediments (IJC, 1991). Dredged material was delivered to a confined disposal facility.

In 1978 and 1979, fish flesh screening for toxic chemical contamination found that PCB concentrations exceeded FDA health standards in carp at the river's mouth. There is currently no fish consumption advisory for the Kewaunee River. Complete consumption advisories are stated in the *Health Guide for People who eat Sport Fish from Wisconsin Waters*. Anglers should examine the guide regularly for possible changes in advisory status.

The city of Kewaunee and the village of Luxemburg have wastewater treatment plants that discharge to the Kewaunee River. The Kewaunee treatment plant is operating properly and is not known to be degrading water quality. However, there is potential for the plant to discharge toxic contaminants due to several metal working companies operating in the city. Kewaunee Bottling Co. also discharges to the plant. WDNR Wastewater Management personnel recommend toxics assessment of the plant's effluent. The Luxemburg wastewater treatment plant has had problems with BOD_5 and suspended solids levels exceeding WPDES permit limits. The village has worked with Packerland Whey Products to monitor and reduce pretreatment influent loadings. The village also removed sludge from its wastewater treatment lagoons. As a result of these activities, the village's discharge is now in compliance.

WDNR staff have recommended that a Great Lakes or cold water community classification for water quality standards be applied to the Kewaunee River (Kincaid *et al.*, 1992).

Industrial discharges to the river include Kewaunee Equipment and General Housewares, both located in Kewaunee. These industries discharge non-contact cooling water and do not pose water quality threats.

Little Scarboro Creek

Little Scarboro Creek is a cold water, high gradient stream that originates in the Lipsky Swamp and flows 1.5 miles to the Kewaunee River. The East Branch also is a high gradient, coldwater stream that originates in the swamp and enters Little Scarboro Creek near its mouth. Little Scarboro Creek is one of the most productive Class I trout streams in northeastern Wisconsin. It is the only Lake Michigan tributary in Wisconsin with significant natural reproduction of coho salmon and rainbow trout. Brook trout also reproduce in the creek. Public access is excellent, with 432 acres of the Little Scarboro State Public Fishing Area bordering the 1.4 miles of the creek. Aquatic insects collected from Little Scarboro Creek indicate excellent water quality.

Scarboro Creek

Scarboro Creek is a clear stream that flows 15 miles from its headwaters in Brown County to its confluence with the Kewaunee River. The stream gradient is about 10 feet per mile until the creek flows into the Kewaunee Valley, where the gradient increases to 30 feet per mile.

The lower four miles are Class II brown trout waters and this reach is stocked annually. This segment also supports brook trout where the gradient is steepest. There is some carryover of these trout, and trout eggs have been observed on the bottom. The three miles above Valley Road supports a fish community in transition, with some warmwater species present but forage species dominant. Above Hill Road, the stream narrows and supports mainly forage fishes. Most of the stream in Brown County is intermittent.

In the lower portions of Scarboro Creek, public access is limited to one road crossing. Access via road crossings increases above Valley Road.

Water quality data indicate the trout waters on Scarboro Creek are degraded, but that the stream has excellent potential for improvement. Macroinvertebrates collected in 1989 represented species typically associated with fair to fairly-poor water quality. Sedimentation is likely affecting trout reproduction. Flow and temperature

conditions are excellent. Dissolved oxygen conditions are probably degraded at times, as indicated by the aquatic insects in the stream. Nutrients and organic matter from nonpoint sources of water pollution are associated with this problem. In addition, turbidity could be affecting the fish. Overall water quality in this portion of the creek is fair to good.

Data indicate water quality has been degraded in the three-mile segment between Valley and Hill Roads. Overall water quality is fair, but dissolved oxygen concentrations are often below the standard established for the protection of warmwater fishes. Problems worsen in a 2.5 mile long stream segment above Hill Road. Water quality here is poor and dissolved oxygen depression more marked. Some of these threats to fish may be related to natural flow and temperature conditions, but some is undoubtedly due to nutrient enrichment and decomposition of organic materials from agricultural sources. Turbidity is also a concern in these upper sections of Scarboro Creek, however, sedimentation does not appear to be much of a problem.

Roger's Creek

Roger's Creek, south of Casco, is a small, clear, springfed tributary to the Kewaunee River. The entire length (0.8 miles) is considered a Class I brook trout stream. No public access is available. Fisheries managers have not recently assessed the fishery, but the creek may not be currently supporting a Class I trout fishery. In dry years, the stream may be intermittent.

Casco Creek

Casco Creek is a small, clear, springfed stream that flows 10 miles to the Kewaunee River. Its habitat and fishery varies considerably over its length.

The 1.4 mile-long segment between the village of Casco and the Kewaunee River has a steep gradient (30 feet per mile), gravel substrate, wooded and well-shaded banks. The 0.4-mile segment near the creek's mouth is a Class I brook trout stream; the remaining mile is a Class II brook trout stream. Public access is limited to one road crossing on this reach.

A dam in Casco forms the Casco Millpond. The pond is 1.3 acres, no deeper than 5 feet and does not support a healthy sport fishery due to natural limitations. There is no public access and the pond is not considered to be a significant fishery resource.

The 7-mile stretch above the millpond has a moderate gradient (10 feet per mile) and often flows through wetlands. Some warmwater fishes have been found in the lower two-thirds of this segment. These species include northern pike, rock bass and black bullhead. However, the fish community is mainly comprised of forage species, particularly near the headwaters. Public access is limited to road crossings.

Water quality conditions are very good in the stream segment below Casco. The fishery will be further protected when the Casco wastewater treatment plant is upgraded to eliminate residual chlorine. Above Casco, water quality is very good, but heavy siltation from nonpoint sources of water pollution has been noted in many areas. Macroinvertebrates collected in 1984 and 1986 indicated fair to excellent water quality (Nachtwey, 1990).

Luxemburg Creek

Luxemburg Creek is a three-mile long, moderate to high gradient (18-62 feet per mile) stream tributary to the Kewaunee River. The creek has poor base flow and is limited to supporting forage fishes throughout most of its length. The stream is heavily channelized along State Highway 54. Water quality has improved substantially throughout the stream since the Luxemburg wastewater treatment plant was upgraded in 1978 and moved its discharge location from Luxemburg Creek to the Kewaunee River.

School Creek

School Creek has only 5.6 miles of perennial flow, yet drains a watershed of 25 square miles. High flows occur sporadically and spring flooding is common. Water quality is generally poor throughout the creek due

to low flows, high water temperatures and severe degradation by agricultural runoff. In addition, noxious materials from milkhouse drains are suspected to be degrading surface and groundwater quality. From its mouth to County Highway P in Brown County, School Creek is capable of supporting a forage fishery, but Fisheries managers believe this potential is not being met. Water resources managers believe that polluted runoff from the golf course at Luxemburg may be degrading the stream. Above County Highway P, the stream becomes intermittent and partially supports its potential for tolerant forage fish and macroinvertebrates.

Table 9. Kewaunee River Watershed (TK03) - Stream Information Part 1 of 4

Counties: Kewaunee, Brown

Square Miles: 139

			EXISTING	POTENTIAL	Supporting	Assessment	
		LENGTH	Biological Use	Biological Use	Assessment	Data	Codified
NAME OF STREAM	WBIC	(MILES)	USE/MILES	(MILES)	Category		CLASS
Kewaunee River	90700	0-14.1e	WWSF / 14.1e	WWSF	Partially	M	WWSF
		14.1-16.6	Cold II / 2.5b	Cold II	Partially		COLD II
		16.6-19.8	WWSF / 3.2e	WWSF	Partially		WWSF
		19.8-26	WWFF / 6.2e	WWFF	Partially		WWFF
Unnamed Tributaries							
T24N, R23E, S14	92000	3	Unknown				Default
T24N, R23E, S03, NWNE	92300	3	Unknown				Default
T24N, R23E, S03, NWNW	92400	3	Unknown				Default
T25N, R23E, S33	92500	6	LFF / 6e	LFF	Unknown		Default
Little Scarboro Creek	90800	1.5	Cold (I) 1.5b	Cold I	Fully	E	Cold I
Unnamed Tributaries							
T24N, R24E, S32	90900	1.5	Unknown				Default
Scarboro Creek	91000	0-4	Cold (II) / 4b	Cold (II)	Partially	M	Cold
		4-6	WWSF / 2e	WWSF	Partially		WWSF
		6-7	WWFF / 1e	WWFF	Partially		WWFF
		7-15	LFF / 8e	LFF	Fully		Default
Unnamed Tributaries							
T23N, R23E, S04	91100	1	Unknown				Default
T23N, R23E, S16	91200	2	Unknown				Default
T23N, R23E, S19	91300	1	Unknown				Default
Roger's Creek	91500	0.8	Cold (I) / 0.8b	Cold (I)	Fully	E	Cold (I)
Casco Creek	91600	0.4	Cold (I) / 0.4b	Cold (I)	Partially	M	Cold (I)
		0.4 - 1.4	Cold (II) / 1b	Cold (II)	Partially		Cold (II)
		1.4 - 2.9	WWSF / 1.5e	WWSF	Partially		WWSF
		2.9 - 7.4	WWFF / 4.5e	WWFF	Fully / 3.5; part / 1		WWFF
		7.4 - 10	LFF / 2.6e	LFF	Partially		LFF
Unnamed Tributaries							
T25N, R24E, S29	91900	2	Unknown				Default
Luxemburg Creek	92100	3	WWFF / 3e	WWFF	Fully	E	WWFF
School Creek	92200	0-5.6	WWFF / 5.6e	WWFF	Not	E	WWFF
		5.6-8.4	LFF / 2.8a	LFF	Fully		LFF

Table 9. Kewaunee River Watershed (TK03) - Stream Information Part 2 of 4

Counties: Kewaunee, Brown
Square Miles: 139

	HBI	Joe Ball Habitat	PCB Fish
	Water Quality	Form 3200-68, 1-85	Consumption
NAME OF STREAM	"Integrity Indicator"	sm= stream mile from mouth	Advisory
Kewaunee River	5.54 (fair), 2000 (sm=12) 4.79 (good), fall 1991 (sm= 12)	96 (good), fall 1991 (sm=12)	Channel catfish >13" should not be eaten more than once every 2 months Channel catfish <13" should not be eaten more than once a month Smallmouth Bass should not be eaten more than once a week North
	(Collected 89 & 90 see thesis)		
Unnamed Tributaries			
T24N, R23E, S14			
T24N, R23E, S03, NWNE			
T24N, R23E, S03, NWNW			
T25N, R23E, S33			
Little Scarboro Creek	3.1 (excellent), 2000 (sm=0.7)		
Unnamed Tributaries			
T24N, R24E, S32			
Scarboro Creek	4.8 (good), 2000 (sm=1.2) 4.28 (very good), fall 1991 (sm=1.2) 4.99 (good), fall 1991 (sm=1.2)	102 (good), fall 1991 (sm=1.2)	
	7.36 (poor), fall 1991 (sm=4)	124 (good), fall 1991 (sm=1.2)	
	7.79 (poor), fall 1991 (sm=8)	163 (fair), fall 1991 (sm=8)	
Unnamed Tributaries			
T23N, R23E, S04			
T23N, R23E, S16			
T23N, R23E, S19			
Roger's Creek			
Casco Creek			
	4.1 (very good), 2000 (sm=0.6)	124 (good), fall 1991 (sm=0.6)	
Unnamed Tributaries			
T25N, R24E, S29			
Luxemburg Creek	5.6 (fair), 2000 (sm=0.5)		
School Creek	6.4 (fair), 2000 (sm=0.3)		

Table 9. Kewaunee River Watershed (TK03) - Stream Information Part 3 of 4

Counties: Kewaunee, Brown

Square Miles: 139

			Environmental Problems		
		LENGTH			
NAME OF STREAM	WBIC	(MILES)	SOURCE	IMPACT	REFERENCES
Kewaunee River	90700	0-14.1e	PCB	Fish Consumption Advisory	15,16,17,23
		14.1-16.6	NPS	Nut, Sed	41,51,59
		16.6-19.8			
		19.8-26			
Unnamed Tributaries					
T24N, R23E, S14	92000	3			
T24N, R23E, S03, NWNE	92300	3			
T24N, R23E, S03, NWNW	92400	3			
T25N, R23E, S33	92500	6			
Little Scarboro Creek	90800	1.5			17,48
Unnamed Tributaries					
T24N, R24E, S32	90900	1.5			
Scarboro Creek	91000	0-4	NPS	Sed, DO, Turb	17, 25
		4-6			
		6-7			
		7-15			
Unnamed Tributaries					
T23N, R23E, S04	91100	1			
T23N, R23E, S16	91200	2			
T23N, R23E, S19	91300	1			
Roger's Creek	91500	0.8			17
Casco Creek	91600	0.4	NPS, Sed		17, 25
		0.4 - 1.4			
		1.4 - 2.9			
		2.9 - 7.4			
		7.4 - 10			
Unnamed Tributaries					
T25N, R24E, S29	91900	2			
Luxemburg Creek	92100	3	Heavy Metals		52
School Creek	92200	0-5.6	NPS, Sed, Nut		
		5.6-8.4			

Table 9. Kewaunee River Watershed (TK03) - Stream Information Part 4 of 4

Counties: Kewaunee, Brown

Square Miles: 139

				Data Reliability		
		LENGTH		Level 1-least	NPS	Additional Comments
NAME OF STREAM	WBIC	(MILES)	TREND	4-most	Rank	Data Comentary
Kewaunee River	90700	0-14.1e	Unknown	2	High	**(Kewaunee Marsh - Arsenic Site = sm 7)** (stream mile 12 = Clyde Hill Rd)
		14.1-16.6				
		16.6-19.8				
		19.8-26				
Unnamed Tributaries						
T24N, R23E, S14	92000	3	Unknown	1	High	
T24N, R23E, S03, NWNE	92300	3	Unknown	1	High	
T24N, R23E, S03, NWNW	92400	3	Unknown	1	High	
T25N, R23E, S33	92500	6	Unknown	1	High	
Little Scarboro Creek	90800	1.5	Unknown	1	High	(stream mile 0.7 = CTH A)
Unnamed Tributaries						
T24N, R24E, S32	90900	1.5	Unknown	1	High	
Scarboro Creek	91000	0-4	Unknown	2	High	(stream mile 1.2 = CTH A)
		4-6				(stream mile 4.0 = Valley Rd)
		6-7				
		7-15				(stream mile 8.0 = Hwy V)
Unnamed Tributaries						
T23N, R23E, S04	91100	1	Unknown	1	High	
T23N, R23E, S16	91200	2	Unknown	1	High	
T23N, R23E, S19	91300	1	Unknown	1	High	
Roger's Creek	91500	0.8	Unknown	1	High	
Casco Creek	91600	0.4	Unknown	2	High	
		0.4 - 1.4				(stream mile 0.6 = Rockledge Rd.)
		1.4 - 2.9				
		2.9 - 7.4				
		7.4 - 10				
Unnamed Tributaries						
T25N, R24E, S29	91900	2	Unknown	1	High	
Luxemburg Creek	92100	3	Unknown	1	High	(stream mile 0.5 = Valley Rd.)
School Creek	92200	0-5.6	Unknown	1	High	(stream mile 0.3 = Valley Rd.)
		5.6-8.4				

Lakes Description

Stump Pond – Kewaunee County

Stump Pond is 6 acres in size with a maximum depth of 3 feet. It is a seepage lake with no developed public access.

Table 10. Kewaunee River Watershed - Lake Management & Trophic State Information - Part 1 of 3

				Surface	Maximum	**Lake Management Information**		
				Area	Depth		History of	
Lake Name	County	WBIC	Twn-Rng-Sec	(acres)	(feet)	Lake Type	Winter Kill	Access
Stump Pond	Kewaunee	90600	T23N R23E S24	6	3	Seepage		None

Table 10. Kewaunee River Watershed - Lake Management & Trophic State Information - Part 2 of 3

		Mercury	Eurasion	Lake	Planning or
		fish tissue	Water	Management	Protection
Lake Name	Self Help	analysis	Milfoil	Organization	Grants
Stump Pond	None	None listed	None Reported		None

Table 10. Kewaunee River Watershed - Lake Management & Trophic State Information - Part 3 of 3

	Lake Trophic State Information					Additional
	TSI	TSI	TSI	TSI	Phosphorus	Comments
Lake Name	Class	Total Phos	Secchi Depth	Chl A	Sensitivity	
Stump Pond						

AHNAPEE RIVER WATERSHED (TK04)

Existing Management and Monitoring Recommendations

1. Basin staff should conduct basin assessment monitoring on streams in the Ahnapee River watershed (TK04) so the watershed can be reevaluated for nonpoint source priorities. Assessment monitoring should include stream habitat surveys (Simonson et al., 1993) to help identify stream segments that are degraded because of the lack of adequate buffers and vegetative filter strips. This information will help guide CREP, the Targeted Runoff Managament (TRM) Program, and other conservation funding programs to the areas of greatest need.

2. Basin should initiate a self-help lake monitoring effort on West Alaska Lake.

3. Basin personnel should assess the impact of golf course runoff on East Alaska Lake (TK04).

4. Basin staff in cooperation with other department programs should identify sensitive areas on East and West Alaska Lakes (TK04).

5. Basin staff should reclassify the Ahnapee River (TK04) as a great lakes/cold water community.

Streams Descriptions

Ahnapee River

The Ahnapee River is a low gradient stream with a 65-acre impoundment at Forestville. It flows through predominantly agricultural land and wetlands in its 117-square-mile watershed. The Ahnapee River generally has good water quality and supports a healthy warmwater fishery. Fish runs occur as far upstream as the dam at Forestville. A fish refuge has been designated from the Forestville dam to 500 feet downstream. It is illegal to take, disturb, catch, capture, kill, or fish for fish in any manner from March 1 to May 15 each year (NR 26, Wis. Adm. Code). Periodic shifts in flow due to Lake Michigan seiche effects are common in this lower reach. Macroinvertebrates collected during a wastewater treatment plant post-operations study in 1983 indicated fair water quality in this reach (Russo, 1983a).

The harbor at the river's mouth has been periodically dredged for navigation. Sediment samples taken by the Army Corps of Engineers in 1986 indicated no sedimentary pollution. However, lead and chemical oxygen demand levels were indicative of moderately polluted sediments (IJC, 1991).

Much of the Ahnapee River's headwater flow comes from a spring pond. This provides suitable habitat for a naturally reproducing, self-sustaining population of brook trout in the first mile of stream. This reach has not yet been classified as a trout stream. One quarter mile of a small tributary called Silver Creek is classified as Class I trout water. (Note: there are two Silver Creeks in the Ahnapee River watershed.)

Fish flesh screening for toxic chemical contamination at the river mouth in 1979 found PCB concentrations exceeding FDA health standards in carp and brown bullheads. It is not known whether these fish became contaminated through exposure in the river or somewhere else in Lake Michigan. There is no current fish consumption advisory for the Ahnapee River. Complete consumption advisories are provided in the *Health Guide for People who eat Sport Fish from Wisconsin Waters*. Anglers should examine the guide regularly to be aware of possible changes in advisory status.

The wastewater treatment plants for the village of Forestville and the city of Algoma both discharge to the Ahnapee River. The Forestville wastewater treatment plant was upgraded in 1981 and water quality has improved for at least a mile below the outfall (Russo, 1983). However, the plant significantly exceeded suspended solids effluent limits throughout 1991 and 1992. This may be due to its acceptance of concentrated septic effluent and to high levels of infiltration and inflow in the collection system. Water quality in the Ahnapee River has not been seriously affected. While the Algoma plant is currently operating at or above design hydraulic capacity, it is consistently providing adequate treatment. Discharge limits for the facility were calculated based on a warmwater sportfish classification. However, WDNR staff have recommended that the lower stretches of the Ahnapee River be classified as a great lakes/cold water community (Kincaid, *et al.*, 1990). No industries discharge directly to the surface waters of the Ahnapee River.

Upstream from the dam at Forestville, nonpoint sources of water pollution are a moderate problem. Sediment deposition and nutrient enrichment from agricultural land erosion occur in this reach. Downstream from the dam, the stream is well-buffered along its banks and nonpoint source problems are minimal. However, there are several intermittent streams that drain significant areas of agricultural land and may contribute to nonpoint source problems.

Silver Creek

Silver Creek is the largest tributary to the Ahnapee River. It has two tributaries, Havel and Rio Creeks, and a 5.7-acre impoundment near Algoma. The lower 1.5 miles of Silver Creek support a warmwater fishery while the remaining fishery supports predominantly forage species.

Silver Creek has fair to poor water quality due to nonpoint source impacts on its mainstem and on its Rio Creek tributary. Rio Creek has very poor water quality. Both Rio and Silver Creeks run through heavily farmed watersheds. Cropland erosion and streambank pasturing have resulted in excessive sediment and nutrient loadings to these streams (WDNR, 1982).

With pollution control in the Rio and Silver Creek watersheds, the fishery of Silver Creek has the potential to improve. A portion of Havel Creek above the confluence with Rio Creek has the potential to become a Class II trout stream for over a mile. Above that area, the potential is limited to a forage fishery due to nonpoint source impacts and flow variability. Low flows and low gradient also limit the Rio Creek fishery.

Algoma Hardwoods discharges non-contact cooling water, boiler blowdown, and water softener backwash to Silver Creek. There appears to be no water quality impacts from this discharge. A 1987 compliance survey revealed no problems.

Three Mile Creek

Three Mile Creek is a small intermittent stream that drains from Krohns Lake to Lake Michigan and has fair water quality. Approximately 2.9 miles are classified as Class II trout waters. Due to variable flows and impacts from agricultural runoff and streambank erosion, this classification may be inaccurate. WDNR fish managers believe that trout found in the stream result from the stocking of rainbow trout in Krohns Lake, or they have migrated up from Lake Michigan.

Mashek Creek

Mashek Creek is a small intermittent stream with good water quality. Fish runs from Lake Michigan occur in the lower reach as far as 3/4 mile above State Highway 42. Nonpoint source water pollution is likely although undocumented.

Table 12. Ahnapee River Watershed (TK04) - Stream Information - Part 1 of 4

Counties: Kewaunee, Door

Square Miles: 134

NAME OF STREAM	WBIC	LENGTH (MILES)	EXISTING Biological Use USE/MILES	POTENTIAL Biological Use (MILES)	Supporting Assessment Category	Assessment Data	Codified CLASS
Ahnapee River	94800	0-14	WWSF / 14e	WWSF	14	M	WWSF
Unnamed Tributaries							
T25N, R25E, S22	95440	4	Unknown				Default
T25N, R25E, S16	95450	3	Unknown				Default
Silver Creek - (T26N, R24E, S1)	96000	0-0.25	Cold (I) / 0.25e	Cold (I)	0.25	E	Cold (I)
		0.25 - 5	LFF / 4.75e	LFF	4.75	E	LFF
Silver Creek - (T25N, R25E, S27	94900	0-1.5	WWSF / 1.5e	WWSF	1.5	E	WWFF change to WWSF
		1.5-7	WWSF / 5.5e	WWSF	5.5	E	WWFF change to WWSF
(Havel Creek)		7-8.2	WWSF / 1.2e	WWSF	1.2	E	WWFF change to WWSF
		8.2-12.8	WWSF / 4.6e	WWSF	4.6	E	WWFF change to WWSF
Rio Creek	95200	8	WWFF / 8e	WWSF	8	E	WWFF change to WWSF
Bruemmerville Creek	95100	1	Unknown				Default
Mashek Creek	94000	5	WWFF / 5e	WWFF	5	E	WWFF
Three Mile Creek	94600	0-0.25	WWFF / 0.25e	WWFF	0.25	E	WWFF
		0.25-3.15	Cold II / 2.9b	Cold II	2.9		Cold (II)

Table 12. Ahnapee River Watershed (TK04) - Stream Information - Part 2 of 4

Counties: Kewaunee, Door

Square Miles: 134

NAME OF STREAM	WBIC	LENGTH (MILES)	HBI Water Quality "Integrity Indicator"	Joe Ball Habitat Form 3200-68, 1-85 sm=stream mile from mouth	PCB Fish Consumption Advisory
Ahnapee River	94800	0-14	5.39 (good), fall 1994 (sm=7) 5.62 (fair), spring 1994 (sm=7) 5.76 (fair), spring 1994 (sm=12)	176 (fair), fall 1994 (sm=7) 87 (good), spring 1994 (sm=7) 163 (fair), fall 1994 (sm=12) 139 (fair), spring 1994 (sm=12)	Smallmouth Bass should not be eaten more than once a week. Carp should not be eaten more than once a month
Unnamed Tributaries					
T25N, R25E, S22	95440	4			
T25N, R25E, S16	95450	3			
Silver Creek - (T26N, R24E, S1)	96000	0-0.25			
		0.25 - 5			
Silver Creek - (T25N, R25E, S27	94900	0-1.5			
		1.5-7	7.87 (poor), fall 1994 (sm=3.5) 7.86 (poor), spring 1994 (sm=3.5)	146 (fair), fall 1994 (sm=3.5) 122 (good), summer 1994 (sm=3.5) 107 (good) fall 1994 (sm=3.5)	
(Havel Creek)		7-8.2	4.29 (very Good), fall 1994 (sm=8) 5.34 (good), spring 1994 (sm=8)	198 (fair), fall 1994 (sm=8) 173 (fair), summer 1994 (sm=8) 91 (good) fall 1994 (sm=8)	
		8.2-12.8		210 (poor), fall 1994 (sm=12)	
Rio Creek	95200	8	7.86 (poor), spring 1994 (sm=0.6) 7.94 (poor), spring 1994 (sm=3.2)	187 (fair), summer 1994 (sm=0.6) 103 (good), spring 1994 (sm=0.6) 154 (fair), summer 1994 (sm=1.8) 211 (poor), summer 1994 (sm=3.2) 111 (good), spring 1994 (sm=3.2)	
Bruemmerville Creek	95100	1			
Mashek Creek	94000	5	4.59 (good), fall 1994 (sm=0.2) 5.05 (good), spring 1994 (sm=0.2)	140 (fair), fall 1994 (sm=0.2) 158 (fair), summer 1994 (sm=0.2) 94 (good), spring 1994 (sm=0.2) 209 (poor) summer 1994 (sm=3)	
Three Mile Creek	94600	0-0.25			
		0.25-3.15	4.18 (very good), fall 1994 (sm=0.6) 3.66 (very good), spring 1994 (sm=0.6)	205 (poor), fall 1994 (sm=0.6) 157 (fair), summer 1994 (sm=0.6) 110 (good) spring 1994 (0.6)	

Table 12. Ahnapee River Watershed (TK04) - Stream Information - Part 3 of 4

Counties: Kewaunee, Door

Square Miles: 134

			Environmental Problems			
		LENGTH				
NAME OF STREAM	WBIC	(MILES)	SOURCE	IMPACT	REFERENCES	TREND
Ahnapee River	94800	0-14	NPS	PCB, Sed, Nut	15, 37, 38, 59	Unknown
Unnamed Tributaries						
T25N, R25E, S22	95440	4				Unknown
T25N, R25E, S16	95450	3				Unknown
Silver Creek - (T26N, R24E, S1)	96000	0-0.25	NPS	Sed, Nut	17	Unknown
		0.25 - 5				
Silver Creek - (T25N, R25E, S27	94900	0-1.5	NPS	Sed, Nut	48	Unknown
		1.5-7	NPS	Sed, Nut		Unknown
(Havel Creek)		7-8.2	NPS	Sed, Nut		
		8.2-12.8	NPS	Sed, Nut		
Rio Creek	95200	8	NPS	Sed, Nut, DO		Unknown
Bruemmerville Creek	95100	1				Unknown
Mashek Creek	94000	5				Unknown
Three Mile Creek	94600	0-0.25			17	Unknown
		0.25-3.15				

Table 12. Ahnapee River Watershed (TK04) - Stream Information - Part 4 of 4

Counties: Kewaunee, Door

Square Miles: 134

			Data ReliabilityLevel		
		LENGTH	1-least	NPS	Additional Comments
NAME OF STREAM	WBIC	(MILES)	4-most	Rank	Data Comentary (Spatial & Temporal Limitations)
Ahnapee River	94800	0-14	3	High	Forestville Flowage limiting stream ecosystem functional values ie sediments, energy transport, fish migration, thermal regime, dissolved oxygen, & others (stream mile 7= CTH J)
Unnamed Tributaries					
T25N, R25E, S22	95440	4	1	High	
T25N, R25E, S16	95450	3	1	High	
Silver Creek - (T26N, R24E, S1)	96000	0-0.25	1	High	
		0.25 - 5			
Silver Creek - (T25N, R25E, S27	94900	0-1.5	2	High	
		1.5-7			(stream mile 3.5= CTH S)
(Havel Creek)		7-8.2			(stream mile 8 = Black Ash Rd)
		8.2-12.8			(stream Mile 12 = Hawk Rd)
Rio Creek	95200	8	2	High	(stream mile 0.7 = CTH S) (stream mile 1.8 = Lincoln Rd) (stream mile 3.2 = CTH K) Fish Kill in 1994
Bruemmerville Creek	95100	1	1	High	
Mashek Creek	94000	5	2	High	(stream mile 0.2 = Lakeshore Rd) (stream mile 3.0 = Meadow Rd)
Three Mile Creek	94600	0-0.25		High	
		0.25-3.15	2		(stream mile 0.6 = 10th Rd)

Lakes Descriptions

Alaska Lake, East - Kewaunee County

East Alaska Lake is Kewaunee County's largest lake. It is a 53-acre seepage/drainage lake up to 50 feet deep and fed by an intermittent inlet from West Alaska Lake. East Alaska Lake is eutrophic with fair water quality. Aquatic plants are abundant in the littoral zone (Rasman, n.d.), and algae is a periodic problem. One algae sample taken in 1988 was dominated by two species of blue-green algae, the least desirable kind (Rasman, 1988). Nonpoint sources of nutrients include golf course fertilizers, feedlot runoff and failing septic systems. The fishery has largemouth bass, panfish and walleye. Muskellunge are present in the lake from an experimental stocking. An annual fishing tournament occurs on the lake (Anon., 1993). The lake does show potential for winterkill, with hypolimnetic oxygen levels low during summer and winter stratification (Rasman, n.d.). Most of the shoreline is privately owned and developed and an active lake management organization exists. The lake has a boat landing for public access, a small resort and golf course. Water resources managers believe that polluted runoff from the golf course may be affecting water quality. East Alaska Lake ranked "high" in the nonpoint source evaluation for priority lake projects.

Alaska Lake, West - Kewaunee County

West Alaska Lake is a 20-acre seepage/drainage lake with a maximum depth of 41 feet. Little is known about the water quality of this lake but both East and West Alaska Lakes are probably being enriched by polluted runoff. Largemouth bass, panfish and rainbow trout comprise the fishery. Some muskellunge are present, having migrated from East Alaska Lake. A county access site provides boat launching (no motors), parking and swimming. West Alaska Lake has a lake management organization.

Forestville Flowage - Door County

Forestville Flowage is a 65-acre impoundment on the Ahnapee River at Forestville. It has a maximum depth of 5 feet. The village of Forestville owns and operates the dam that forms this impoundment. The upper Ahnapee River and the Forestville Flowage were chemically treated in 1984 to remove carp and bullheads. They were later restocked with bass, panfish and northern pike (Meyers, 1995). Smallmouth bass are present and northern pike, largemouth bass and panfish are common. A fish kill occurred in January 1990. Intermittency and stagnation are probably responsible for depleted dissolved oxygen levels and winterkill in this lake. Waterfowl rest on the lake and nest in adjacent wooded swamps.

The Negative impacts of the Forestville Dam and it’s impoundment on the natural stream ecosystem functional values for the Ahnapee River should be considered the next time significant repairs or replacement are needed on the dam. The impoundment behind the dam has periodic fish kills and intermitent water quality problems that would be alleiviated if the Dam were removed.

Krohns Lake has a surface area of 21 acres and a maximum depth of 38 feet. It is a spring-fed lake with fair to good water quality and good dissolved oxygen concentrations. The lake does receive some nutrient enrichment from watershed runoff although the shoreline is generally well-buffered. The fishery includes largemouth bass, northern pike, panfish, and rainbow and brown trout. Rainbow trout are stocked by WDNR. A county park provides a swimming beach, dock, boat launch (no motors) and parking.

Silver Lake – Kewaunee County

Silver Lake is a small 5 acre drainage lake with no public access.

Krohns Lake - Kewaunee County

Krohns Lake has a surface area of 21 acres and a maximum depth of 38 feet. It is a spring-fed lake with fair to good water quality and good dissolved oxygen concentrations. The lake does receive some nutrient enrichment from watershed runoff although the shoreline is generally well-buffered. The fishery includes largemouth bass, northern pike, panfish, and rainbow and brown trout. Rainbow trout are stocked by WDNR. A county park provides a swimming beach, dock, boat launch (no motors) and parking.

Table 13. Ahnapee River Watershed - Lake Management & Trophic State Information - Part 1 of 3

				Surface	Maximum	**Lake Management Information**		
				Area	Depth		History of	
Lake Name	County	WBIC	Twn-Rng-Sec	(acres)	(feet)	Lake Type	Winter Kill	Access
East Alaska Lake	Kewaunee	94200	T24N R25E S17	53	50	Drainage	Yes	Boat Ramp
West Alaska Lake	Kewaunee	94300	T24N R25E S19	20	41	Drained		Boat Ramp
Forestville Flowage (an Impoundment on the Ahnapee River)	Door	95700	T26N R25E S29	65	5	Drainage	Yes	Walk in Trail
Krohns Lake	Kewaunee	94700	T24N R25E S05	21	38	Spring -fed Seepage		Boat Ramp
Silver lake	Kewaunee	94500	T24N R25E S08	5		Drained		None Listed

Table 13. Ahnapee River Watershed - Lake Management & Trophic State Information - Part 2 of 3

		Mercury	PCB Fish	Eurasion	Lake	Planning or
		fish consumption	Consumption	Water	Management	Protection
Lake Name	Self Help	advisory	Advisory	Milfoil	Organization	Grants
East Alaska Lake		Large Mouth Bass 15"-18" Category 2 LMB <15" Cat 1		Present	LMO; see comments	LPL #560
West Alaska Lake		None Listed		Present	LMO; see comments	
Forestville Flowage (an Impoundment on the Ahnapee River)		None Listed	Carp should not be eaten more than once a month Smallmouth Bass should not be eaten more than once a week Northern Pike and Bullheads have no eating restrictions	Present	LMO	LPL #225
Krohns Lake		None Listed		Present	LMO; see comments	
Silver lake		None Listed		Present		

	Lake Trophic State Information					Additional
	TSI	TSI	TSI	TSI	Phosphorus	Comments
Lake Name	Class	Total Phos	Secchi Depth	Chl A	Sensitivity	
East Alaska Lake	Eutrophic	82.3	44.7	52.3		Fish kill in May2000 Tri-Lakes Association = East Alaska, West Alaska, and Krohns Lake Concerns exist about NPS runoff from Golf Course
West Alaska Lake	Mesotrophic		37.8	48	IC	Tri-Lakes Association = East Alaska, West Alaska, and Krohns Lake
Forestville Flowage (an Impoundment on the Ahnapee River)	Eutrophic				IIC	Dam and impoundment disrupt stream ecosystem functional values; course particulate and fine particulate organic matter transport and trophic system dynamics, migration, thermal regime, diurnal dissolved oxygen regime, flow, and sediment transport.
Krohns Lake	Mesotrophic	GSM=51	GSM=47	GSM=46	IC	Tri-Lakes Association = East Alaska, West Alaska, and Krohns Lake (Hard water lake; Alkalinity = 265 mg/l) GSM = Growning Season Mean (samples collected in 1994)
Silver lake	Unknown					

STONY CREEK WATERSHED (TK05)

Existing Management and Monitoring Recommendations

1. Basin staff should conduct basin assessment monitoring on streams in the Stony Creek watershed (TK05) so the watershed can be reevaluated for possible nonpoint source priority watershed selection.

2. Basin staff the district nonpoint source selection advisory committee should consider the Stony Creek watershed (TK05) as a high priority for selection as a priority watershed project because of its high groundwater ranking.

3. Basin personnel should reclassify the lower five miles of Stony Creek (TK05) as a cold water community (Type B).

Streams Description

Stony Creek

Stony Creek, 13.6 miles long, has been ditched in some sections. It begins northeast of Maplewood and flows south-southeast into Lake Michigan. The lower five miles are not classified as trout stream, but WDNR fisheries managers have found native brook trout in this reach. With habitat improvements, this reach could support a Class II trout fishery.

Table 15. Stony Creek Watershed (TK05) - Stream Information - Part 1 of 3

Counties: Door, Kewaunee

Square Miles:98

			EXISTING	POTENTIAL	Supporting	Assessment	
		LENGTH	Biological Use	Biological Use	Assessment Category	Data	Codified
NAME OF STREAM	WBIC	(MILES)	USE/MILES	(MILES)			CLASS
Silver Creek	95900	0-5	WWFF /5e	WWFF	Partially	E	WWFF
Stony Creek	96100	0-5	WWSF / 5e	Cold (II)	Partially	E	Cold II
		5-16	WWFF / 11e	WWFF	Fully		WWFF
Bear Creek	96400	0-4	WWFF / 4e	WWFF	Partially	E	WWFF
Schuyler Creek	96500	0-4	WWFF / 4e	WWFF	Fully	E	WWFF
Woodard Creek	96600	0-4	WWFF / 4e	WWFF	Fully	E	WWFF

Table 15. Stony Creek Watershed (TK05) - Stream Information - Part 2 of 3

Counties: Door, Kewaunee

Square Miles:98

			Environmental Problems			Data Reliability Level
		LENGTH				1-least
NAME OF STREAM	WBIC	(MILES)	SOURCE	IMPACT	TREND	4-most
Silver Creek	95900	0-5	NPS		Unknown	2
Stony Creek	96100	0-5	Hydrologic Modifications	Habitat	Unknown	2
		5-16			Unknown	
Bear Creek	96400	0-4			Unknown	2
Schuyler Creek	96500	0-4			Unknown	1
Woodard Creek	96600	0-4			Unknown	2

Table 15. Stony Creek Watershed (TK05) - Stream Information - Part 3 of 3

Counties: Door, Kewaunee

Square Miles:98

		LENGTH	NPS	Additional Comments
NAME OF STREAM	WBIC	(MILES)	Rank	
Silver Creek	95900	0-5	High	(stream mile 0.1 = Washington Rd) (stream mile 0.6 = CTH S)
Stony Creek	96100	0-5	High	(stream mile 0.1 = CTH U) (stream mile 1.8 = Rosewood Rd) (stream mile 9.0 = Maplewood Rd) (stream m
		5-16	High	
Bear Creek	96400	0-4	High	(stream mile 0.1 = CTH U) (stream mile 1.6 = Shiloh Rd)
Schuyler Creek	96500	0-4	High	(stream mile 0.1 = CTH U)
Woodard Creek	96600	0-4	High	(stream mile 2.0 = MT Lookout Rd)

UPPER DOOR COUNTY WATERSHED (TK06)

Existing Management and Monitoring Recommendations

1. Basin personnel should collect largemouth bass and northern pike from Mackaysee Lake and analyze them for mercury and PCB contamination.

2. Basin staff should evaluate the need for continuous monitoring sites in nearshore waters of Green Bay and Lake Michigan (TK06) and take necessary steps to gather needed water quality and biological data.

3. Basin staff should conduct an inventory of rare aquatic species in the Mink River Estuary (TK06) and nearby natural areas.

4. Basin staff in cooperation with other WDNR programs should identify sensitive areas on Clark and Kangaroo Lakes (TK06).

Streams Descriptions

Maple Creek (Donlars Creek)

Maple Creek is a low-gradient stream that empties into Gurlack Lake (Mud Lake). The stream is 3.6 miles long with a drainage area of 10 square miles. Wetland and agricultural drainage affect this area. The *Upper Door Nonpoint Source Control Plan* has identified the importance of controlling sediment delivery to this creek to protect the seasonal migration of Lake Michigan fish.

Maple Creek is currently classified as marginal, which means the stream is capable of supporting only very tolerant fish or macroinvertebrates. Macroinvertebrates collected in 1985 and 1990 indicated fair water quality. Stream flow during low flow periods is less than 1 cubic feet per second (cfs). The Sevastopol wastewater treatment plant discharges to this stream.

During investigation of a February 1981 fish kill, fisheries managers found that the creek supported bullheads, northern pike, bluegills, pumpkinseeds, suckers, brook trout, carp and darters. The fish kill was the result of improperly managed animal waste at a large dairy operation. The problem has since been corrected.

Whitefish Bay Creek and Unnamed Tributary (T28N, R27E, S09)

Whitefish Bay Creek, which supports trout runs from Lake Michigan, is the outlet from Clark Lake. Listed in *Wisconsin Trout Streams* as two miles of Class II trout water, it is actually only one mile long. Apparently, part of the two miles described includes the creek's unnamed tributary (T28N, R27E, S09). Fisheries managers believe the unnamed creek has more potential as a Class II trout stream than Whitefish Bay Creek, which has habitat problems that limit its fishery potential.

Logan Creek

Logan Creek originates at Lost Lake and flows into Clark Lake. The stream is 4.8 miles long with a drainage area of 12 square miles. The stream is bordered primarily by wetlands.

The creek is classified as a Class I trout stream and is an Outstanding Resource Water (ORW). Protecting this creek will help preserve the natural brook trout populations and the water quality of Clark Lake. Macroinvertebrates collected in 1985, 1987 and 1990 indicate very good water quality. The owner of a local
supper club was fined under s. 29.29, Wis. Stats., in 1992 for pumping holding tank wastes into the creek. The problem was corrected.

Hibbards Creek

Hibbards Creek originates in Thorp Pond, two miles west of Kangaroo Lake, and outlets to Lake Michigan just north of Jacksonport. It is 5.4 miles long and the gradient is 7.6 feet per mile. The stream is predominantly bordered by wetlands. The drainage area is 17 square miles. The stream supports a native brook trout population and provides habitat for stocked rainbow trout, with 2.8 miles classified as Class II trout waters.

The fishery consists primarily of warm water species such as northern pike, yellow perch, smallmouth bass, and fewer numbers of sunfish and black bullheads. It supports rainbow and brook trout runs as well. Macroinvertebrates collected in 1987 indicate fair to good water quality. Those collected in the fall of 1990 indicated fair water quality.

Heins Creek

Heins Creek, the outlet of Kangaroo Lake, flows through sand dunes before reaching Lake Michigan. It is designated as a Class II trout stream, but has naturally occurring problems related to water level fluctuations, which limit its potential use. Occasionally, fish are trapped in the creek when flows decline and rubble builds up at the mouth from Lake Michigan wave action. This promotes water temperature increases and low dissolved oxygen concentrations. Fisheries management personnel believe there is not enough flow to support a Class II trout fishery, but conditions may be sufficient for it to be considered as a Class III trout stream. In the spring and summer, salmon and trout use the stream for spawning. Macroinvertebrates collected in 1985 indicate fair water quality.

Mink River

The Mink River Estuary is a low gradient stream emptying into Rowley's Bay on Lake Michigan. The last pristine estuary left on the Upper Great Lakes, it is one of the few high-quality estuaries remaining in the United States. The Nature Conservancy owns most of the wetlands adjacent to the river (approximately 882 acres). The upstream area of this estuary is often referred to as Rogers Lake. The Mink River is an Outstanding Resource Water under Wisconsin Administrative Codes NR 102 and NR 207. Additional information about the area is available in the "Wetlands Report."

In 1989, the Hines emerald dragonfly, an extremely rare insect known to exist in only two other locations in the world, was discovered in the wetlands of the Mink River Estuary. This species is proposed for and will likely receive federal status as an endangered species. Another rare species sighted was the yellow rail, an elusive and shy bird found in fresh and saltwater marshes. These birds are known to exist in fewer than five sites in the state.

Hidden Springs Creek

Hidden Springs Creek is a one-mile, spring-fed creek that originates at the base of a ground moraine and flows to Green Bay in Ephraim. The stream is a Class I trout stream and an Exceptional Resource Water (ERW).

Table 16. Upper Door County Watershed (TK06) - Stream Information - Part 1 of 4

County: Door

Square Miles: 260

NAME OF STREAM	Water Body ID Code	STREAM SEGMENT USE/MILES	**EXISTING** BIOLOGICAL USE USE/MILES	**POTENTIAL** BIOLOGICAL USE (MILES)	SUPPORTING Assessment Category	Assessment Data	Codified CLASS
Lilly Bay Creek	97100	0-1.6	COLD II/1.6	COLD	Part	E	COLD (II)
		1.6-3	COLD /1.4	COLD	Fully	E	COLD
Shivering Sands	97200	1	WWFF/1	WWFF	Fully	E	WWFF
Maple Creek ("Dolans / Giesel")	97400	4	**LAL/4**	WWSF	Part	E	**WWSF**
Whitefish Bay Creek	97500	0-0.8	COLD (III)/0.8	Cold (III)	Part	E	**Cold (III)**
		0.8-1.3	COLD (II)/0.2	Cold (II)		E	**Cold (II)**
Unnamed Tributary							
T28N, R27E, S09	97600	2	UNKNOWN				DEF
Logan Creek	97800	0-0.4	COLD (I)/0.4	COLD (I)	Part (0.4)	E	COLD (I)
		O.4-0.7	COLD(II)/0.3	COLD (II)	Part (0.3)		COLD (II)
		O.7-6	WWFF/5.3	WWFF	Part (5.3)		WWFF
Hibbards Creek	98200	0-2.9	COLD(II)/2.9	COLD (II)	Part (2.9)	E	COLD (II)
		2.9-5.8	WWFF/2.9	WWFF	Part (2.9)		WWFF
		5.8-10.0					
Heins Creek	98400	0-0.7	COLD(II)/0.7	COLD (III)	Part (0.7)	E	COLD (II)
Mink River (Estuary)	99500	2 M (70 acr)	WWSF/2	WWSF	Unkown (2)	E	WWSF, ORW
Unnamed Creek (Reibold's) T30N, R28E, S10	99000	2	WWSF/2	WWSF	2	E	WWSF
Three Springs Creek	99300	3	WWFF/3	WWFF	3	E	WWFF
Hidden Springs Creek	99600	0.5	COLD (I)/0.5	COLD (I)	0.5	E	COLD (I), ERW
Ephraim Creek	99700	1	COLD (II)/1	COLD (II)	1	E	COLD
Fish Creek	99800	1	WWSF/1	WWSF	1	E	WWSF
Unnamed (Big Creek) T27N, R26E, S9	100100	1	WWFF	WWFF		E	WWFF

Table 16. Upper Door County Watershed (TK06) - Stream Information - Part 2 of 4

County: Door

Square Miles: 260

NAME OF STREAM	Water Body ID Code	STREAM SEGMENT USE/MILES	HBI Water Quality "Integrity Indicator"	Joe Ball Habitat Form 3200-68, 1-85 sm= stream miles from mouth
Lilly Bay Creek	97100	0-1.6	X=3.88, spring 1985 (sm=0.3)	159 (fair), summer 1985 (sm=0.3) 182 (fair), summer 1985 (sm=0.3)
		1.6-3		
Shivering Sands	97200	1	X=4.4 (very good),spring1986 (sm=0.2) X=4.69 (good),spring1986 (sm=??)	
Maple Creek ("Dolans / Giesel")	97400	4	Inverts collected 5-1-90 (sm=2.2); lab enumeration sheet; **no BI report!** 6.22 (fair), spring 1985 (sm=1.0)	135 (fair), spring 1990 (sm=2.2)
Whitefish Bay Creek	97500	0-0.8	7.5 (fairly poor), spring 1985 (sm=0.2)	
		0.8-1.3		148 (fair), summer 1985 (sm=1.1)
Unnamed Tributary				
T28N, R27E, S09	97600	2		
Logan Creek	97800	0-0.4		
		O.4-0.7	4.59 (good), fall 1990 (sm=0.6) 3.82(very good), spring 1990 (sm=0.6)	129 (good), fall 1990 (sm=0.6) 161 (fair), summer 1985 (sm=0.6)
		O.7-6		
Hibbards Creek	98200	0-2.9		
		2.9-5.8	4.15 (very good), fall 1990 (sm=4.7) 6.07 (fair) fall 1987 (sm= 4.7) 5.19 (good), fall 1990 (sm=5.2) 6.83 (fairly poor), fall 1987 (sm= 5.2)	133 (fair) fall 1990 (sm=4.7) 133 (fair) fall 1990 (sm=5.2)
		5.8-10.0		
Heins Creek	98400	0-0.7	6.25 (fair), spring 1985 (sm= 0.5)	147 (fair), fall 1985 (sm=0.5)
Mink River (Estuary)	99500	2 M (70 acr)		
Unnamed Creek (Reibold's) T30N, R28E, S10	99000	2	X=6.54 (fairly poor), spring 1986 (sm=0.2?)	
Three Springs Creek	99300	3	X=6.23 (fair), spring 1986 (sm=2.2)	
Hidden Springs Creek	99600	0.5		
Ephraim Creek	99700	1	X=5.06 (good), spring 1986 (sm=??)	166 (fair), fall 1985 (sm= ??)
Fish Creek	99800	1	5.3 (good), spring 1999 (sm=0.2) 7.7 (poor), spring 1999 (sm=0.6) 3.8 (very good), spring 1999 (sm=0.8)	146 (fair), spring 1999(sm=0.2) 180 (fair), spring 1999 (sm=0.8)
Unnamed (Big Creek) T27N, R26E, S9	100100	1	6.55 (fairly poor), fall 1992 (sm=0.1)	173 (fair), fall 1992 (sm=0.1)

Table 16. Upper Door County Watershed (TK06) - Stream Information - Part 3 of 4

County: Door

Square Miles: 260

NAME OF STREAM	Water Body ID Code	STREAM SEGMENT USE/MILES	Environmental Problems		Trend	REFERENCES
			Source	Impact		
Lilly Bay Creek	97100	0-1.6	NPS	Sediments, Nutrients	Unknown	17
		1.6-3				
Shivering Sands	97200	1			Unknown	
Maple Creek ("Dolans / Giesel")	97400	4	Point Source Municipal, NPS	Sediments, Nutrients	Unknown	43
Whitefish Bay Creek	97500	0-0.8			Unknown	17,43
		0.8-1.3				
Unnamed Tributary						
T28N, R27E, S09	97600	2			Unknown	
Logan Creek	97800	0-0.4	NPS	Habitat	Unknown	17,43
		O.4-0.7				
		O.7-6				
Hibbards Creek	98200	0-2.9	NPS		Unknown	17,43
		2.9-5.8				
		5.8-10.0				
Heins Creek	98400	0-0.7	NPS	Temperature, Flow	Unknown	17,43
Mink River (Estuary)	99500	2 M (70 acr)			Unknown	
Unnamed Creek (Reibold's) T30N, R28E, S10	99000	2			Unknown	
Three Springs Creek	99300	3			Unknown	
Hidden Springs Creek	99600	0.5			Unknown	17,43
Ephraim Creek	99700	1			Unknown	
Fish Creek	99800	1			Unknown	
Unnamed (Big Creek) T27N, R26E, S9	100100	1	NPS	Sediments, Nutrients, Toxics	Unknown	

Table 16. Upper Door County Watershed (TK06) - Stream Information - Part 4 of 4

County: Door
Square Miles: 260

NAME OF STREAM	Water Body ID Code	STREAM SEGMENT USE/MILES	Data Reliability Level 1=low, 4=high	NPS Rank	Additional Comments
Lilly Bay Creek	97100	0-1.6	1	High	X= mean of 3 replicates (stream mile 0.3 = CTH T)
		1.6-3			
Shivering Sands	97200	1	1	High	X= mean of 3 replicates (stream mile 0.2 = CTH T) X= mean of 3 replicates (**stream mile ??** = Lake Michigan Dr.)
Maple Creek ("Dolans / Giesel")	97400	4	2	High	(stream mile 1.0 = Haberli Road) (stream mile 2.2 = Dunn Rd)
Whitefish Bay Creek	97500	0-0.8	1	High	(stream mile 0.2 = Cave Point Rd.)
		0.8-1.3			(stream mile 1.1 = Clark Lake Rd)
Unnamed Tributary					
T28N, R27E, S09	97600	2	1	High	
Logan Creek	97800	0-0.4	1	High	
		O.4-0.7			(stream mile 0.6 = Hwy 57)
		O.7-6			1995 Basin Plan Lists as ERW/ORW ?
Hibbards Creek	98200	0-2.9	1	High	
		2.9-5.8			(stream mile 4.7 = Honold Rd) (stream mile 5.2 = Fairview Rd)
		5.8-10.0			
Heins Creek	98400	0-0.7	1	High	(stream mile 0.5 = Hwy 57)
Mink River (Estuary)	99500	2 M (70 acr)	1	High	Aquatic & terrestrial **Taxonomic Surveys Recommended** to establish baseline
Unnamed Creek (Reibold's) T30N, R28E, S10	99000	2	1	High	HBI mean (X=) is the average of 3 replicates (stream mile 0.2 = above CTH Q - exact sampling location uncertain)
Three Springs Creek	99300	3	1	High	HBI mean (X=) is the average of 3 replicates (stream mile 2.2 = CTH ZZ)
Hidden Springs Creek	99600	0.5	1	High	
Ephraim Creek	99700	1	1	High	HBI mean (X=) is the average of 3 replicates (stream mile ?? = Hwy 42)
Fish Creek	99800	1	2	High	Sampling site locations uncertain-Sampling sites not clearly identified on field sheets (stream mile 0.2 = Hwy 42)
Unnamed (Big Creek) T27N, R26E, S9	100100	1	1	High	(stream mile 0.1 = Utah Street)

Lakes Descriptions

Arbter Lake - Door County

Arbter Lake is a 16-acre drainage lake no deeper than 2 feet. The lake is located in wooded swampland bordering Lake Michigan. This is a bog lake, separated from Lake Michigan by sand dunes. An intermittent outlet connects Arbter Lake with Schwartz Lake. It suffers from fluctuating water levels and winterkill. Waterfowl frequent the area, making it a popular hunting spot.

Big Marsh (Gunnerson) - Washington I.

Big Marsh Lake is a 31-acre drainage lake situated in beach sand deposits on the eastern side of Washington Island. The lake does not sustain a fishery but is of high aesthetic value and is subject to limited waterfowl hunting. There is no public access to Big Marsh Lake.

Bradley Lake (Little) - Washington I.

This 24-acre, moderately hardwater seepage lake lies on Washington Island. A cobblestone ridge separates the lake from Lake Michigan. The water is clear and no deeper than 6 feet. Aquatic weeds and fluctuating water levels are major use problems. Although the lake sometimes suffers from winterkill, it has been periodically stocked with yellow perch and smallmouth bass. Much of the shoreline is undeveloped with no public access available; the lake is of high aesthetic value.

Clark Lake - Door County

Clark Lake is an oligotrophic drainage lake fed by Logan Creek and drained by Whitefish Bay Creek. It is the second largest lake in Door County, with an area of 868 acres and a maximum depth of 28 feet. The fishery consists of large and smallmouth bass, perch, northern pike, walleye and panfish. Its high water quality should be protected through nonpoint source controls on Logan Creek and through proper shoreland management. It is being monitored under the Long-Term Trend Monitoring Program. Local property owners have expressed concerns about possible failing and/or nonconforming on-site septic systems around the lake.

Surveys of rooted aquatic plants were conducted in 1986, 1989 and 1992 on Clark Lake (Rasman, 1992). An overall increase in species diversity was found in near-shore areas (areas to 0.5 m depth); however, in the 0.5 to 1.5 m zone there was a decrease in diversity. Surveyors observed noticeable declines in coontail (*Ceratophyllum demersum*) and increases in Eurasian milfoil (*Myriophyllum spicatum*).

Dunes Lake (Gurlack) - Door County

This 80-acre drainage lake is no deeper than a foot, fed by Maple Creek and drained by Shivering Sands Creek. More than 350 acres of wooded swampland border the lake and extend to the Lake Michigan shore. Waterfowl frequent the area--a fall hunting "hot spot."

Europe Lake - Door County

Europe Lake is a shallow, seepage lake with high water quality. The lake has a surface area of 273 acres and a maximum depth of 10 feet. The lake is separated from the close Lake Michigan shoreline by a dolomite ledge and sand dunes. The fishery consists of smallmouth bass, northern pike, perch, walleye

and panfish. Winter fish kills are not a problem even though the lake is shallow. Levels of phosphorus and nitrogen are low and cultural eutrophication does not appear to be a problem.

Kangaroo Lake - Door County

Kangaroo Lake is the largest lake in Door County, with a surface area of 1,123 acres and a maximum depth of 12 feet. It is a clear, high quality lake with low productivity. Its large size and shallowness allow wind action to re-suspend sediments, which occasionally results in high turbidity. The fishery is composed of smallmouth bass, largemouth bass, walleye, northern pike and panfish.

Little Marsh (Wickman) - Washington I.

Little Marsh Lake is a 14-acre seepage lake in the heavily-wooded portion of eastern Washington Island. It is surrounded by bullrush swamp. No fishery exists and there is no public access. However, the lake has high aesthetic value and high waterfowl use.

Lost Lake - Door County

Lost Lake is a 91-acre seepage lake with a maximum depth of 5 feet. It drains to Clark Lake. Water levels in the lake fluctuate considerably and it experiences periodic winterkill. There is not an active fish management program for the lake. The Lost Lake public hunting grounds border approximately two miles of shoreline.

Mackaysee Lake (Muckayee) - Chambers Island

Mackaysee Lake is a 354-acre landlocked lake on Chambers Island west of the Door County peninsula. It is mesotrophic and up to 26 feet deep. The lake supports a variety of aquatic vegetation, large and smallmouth bass, northern pike, and bluegills and other panfish.

Mink River Lake (Rogers) - Door County

The Mink River is an elongate, low gradient stream-lake complex in marshlands adjoining Rowley Bay. The upstream 70 acres are referred to as Mink River Lake or Rogers Lake. The maximum depth here is 13 feet. Northern pike, smallmouth bass and panfish are all common. Public access is available by boat from Lake Michigan and at local boat rental facilities.

The Mink River estuary is the most pristine of the estuarine systems on Lake Michigan (WDNR, 1991a). For information on this State Natural Area see the "Wetlands Report" of this plan.

Mud Lake - Door County

This shallow (no deeper than a foot), 155-acre drainage lake is located in a large swamp between North Bay and Moonlight Bay in the Baileys Harbor township. A spring-fed stream enters from the north and flows to Moonlight Bay. The lake is accessible from Lake Michigan during high water. The bottom is comprised primarily of marl. A limited panfish fishery is present, but the lake suffers from winterkill and fluctuating water levels.

The state currently owns approximately 1,900 acres of primarily wooded wetland in the area and manages it as a state wildlife area. It is one of the few remaining natural waterfowl production areas in Door County (WDNR, 1987). For information on the Mud Lake Wildlife Area see the "Wetlands Report" of this plan.

Schwartz Lake (Schmoke) - Door County

Schwartz Lake is a 30-acre seepage lake with a maximum depth of 4 feet. Arbter Lake drains to Schwartz Lake through an intermittent outlet. Schwartz Lake is drained by an intermittent outlet to nearby Shivering Sands Creek. Wooded swampland surrounds the lake. Winterkills preclude fish management activities on Schwartz Lake, but waterfowl are common and provide ample hunting opportunities.

Voecks Marsh - Door County

Voecks Marsh is a shallow (maximum depth 2 feet) 19-acre swampland depression. A narrow outlet flows from Voecks Marsh to Moonlight Bay. Over 850 acres of timbered swamp border the lake. The area surrounding Voecks Marsh is somewhat unique in that the dominant vegetation is marsh horsetail (*Equisetum palustre*).

Table 17. Upper Door County Watershed - Lake Management & Trophic State Information - Part 1 of 3

Lake Name	County	WBIC	Twn-Rng-Sec	Surface Area (acres)	Maximum Depth (feet)	Lake Type	History of Winter Kill	Access
Arbter Lake	Door	92600	T28N R27E S16	16	2	Drainage	Yes	No Access
Big Marsh (Gunnerson)	Door	92700	T33N R30E S04	31	2	Drainage	Yes	No Access
Bradley Lake (Little)	Door	10000	T27N R26E S06	19	7	Seepage		Trail
Clark Lake	Door	97700	T28N R27E S03	868	25	Drainage		Boat Ramp
Dunes Lake (Gurlack, Mud)	Door	97300	T28N R27E S30	80	1	Drainage	Yes	No Access
Europe Lake	Door	93100	T32N R29E S09	273	10	Seepage		Boat Ramp
Kangaroo Lake	Door	98600	T30N R27E S36	1123	12	Drainage		Boat Ramp
Little Lake	Door	93300	T34N R29E S23	24	6	Seepage	Yes	No Access
Little Marsh (Wickman)	Door	93400	T33N R30E S04	14	2	Spring-fed	Yes	No Access
Lost Lake	Door	97900	T29N R27E S07	91	5	Seepage	Yes	No Access
Mackaysee Lake (Muckayee)	Door	93500	T31N R26E S03	347	27	Spring-fed		Trail
Mink River Lake (Rogers)	Door	99500	T32N R28E S16	70	13	Spring-fed		No Access
Mud Lake	Door	99100	T31N R28E S33	155	5	Drainage	Yes	Trail
Unnamed	Door	96900	T28N R27E S16	<1				
Schwartz Lake (Schmoke)	Door	93700	T28N R27E S21	30	4	Seepage	Yes	No Access
Voecks Marsh	Door	98900	T30N R28E S09	19	2	Drainage	Yes	No Access

Table 17. Upper Door County Watershed - Lake Management & Trophic State Information - Part 2 of 3

		Mercury	PCB Fish	Eurasion	Lake	Planning or
		fish consumption	Consumption	Water	Management	Protection
Lake Name	Self Help	advisory	Advisory	Milfoil	Organization	Grants
Arbter Lake						
Big Marsh (Gunnerson)						
Bradley Lake (Little)						
Clark Lake	Expanded	None Listed; multiple species tested	Carp should not be eaten more than once a week	Present	Association	
Dunes Lake (Gurlack, Mud)						
Europe Lake						
Kangaroo Lake	Secchi	None Listed; multiple species tested		Present	Association	LPL #492 & LPT #52
Little Lake						
Little Marsh (Wickman)						
Lost Lake						
Mackaysee Lake (Muckayee)		Northern Pike 22"-26" category 3 Northern Pike <22" category 1 Smallmouth Bass 18" - 22" category 3 Smallmouth Bass <18" category 1				
Mink River Lake (Rogers)						
Mud Lake						
Unnamed						
Schwartz Lake (Schmoke)						
Voecks Marsh						

Table 17. Upper Door County Watershed - Lake Management & Trophic State Information - Part 3 of 3

	Lake Trophic State Information						Additional
	TSI	TSI	TSI	TSI	Phosphorus	NPS	Comments
Lake Name	Class	Total Phos	Secchi Depth	Chl A	Sensitivity	Rank	
Arbter Lake					IIC	Not Ranked	
Big Marsh (Gunnerson)					IIC	Not Ranked	
Bradley Lake (Little)					IIC	Not Ranked	
Clark Lake	Meso / Eutrophic	46.2	59.5	45	IIA	Not Ranked	Lake management Organization is not listed in " The Lake List"; Publ: FH-407 (99 Rev) 15 fish tested for Mercury; 12 Walleye, 1 LMB, 1 SMB, and 1 Yellow Perch
Dunes Lake (Gurlack, Mud)					IIC	Not Ranked	
Europe Lake	Mesotrophic	GSM=41	GSM=48	GSM=39	IIA	Not Ranked	(GSM= Growing Season Mean) Lake Map Available
Kangaroo Lake	Eutrophic	57.6	54.2	48.5	IIB	Not Ranked	18 fish tested for Mercury; 13 Walleye & 5 Smallmouth Bass Lake map Available
Little Lake	Eutrophic	68.9	77.4		IIC	Not Ranked	Trophic State Report; Feb 2000 (Rasman)
Little Marsh (Wickman)					IIC	Not Ranked	
Lost Lake					IIC	Not Ranked	
Mackaysee Lake	Oligotrophic				IC	Not Ranked	1994 Mercury testing done on 27 fish including 11 Northern Pike, 9 Largemouth Bass, and 7 Smallmouth Bass. Lake Map Available
Mink River Lake (Rogers)					IIC	Not Ranked	
Mud Lake					IIC	Not Ranked	Significant Habitat for Migratory Birds, Recreationally important for Hunting
Unnamed						Not Ranked	
Schwartz Lake (Schmoke)					2C	Not Ranked	
Voecks Marsh					2C	Not Ranked	

RED RIVER AND STURGEON BAY WATERSHED (TK07)

Existing Management and Monitoring Recommendations

1. Fisheries Management should conduct a stream survey on Gilson Creek to determine if the stream should be reclassified (Type B).

Streams Descriptions

Bader Creek

Bader Creek is a relatively short intermittent stream draining primarily agricultural land consisting of small, family dairy operations. The stream's banks are well-buffered from the impact of these operations (Doelger, 1982). The lower 0.1 mile of the creek is considered a forage fishery fully supporting its potential. Water clarity was good and numerous macroinvertebrates were observed (Doelger, 1982). White suckers and rainbow smelt spawn in the creek. A variety of game fish species occasionally use the creek (Welch, 1982).

Gilson Creek

The lower quarter mile of Gilson Creek is a forage fishery only partially supporting its full potential, due to sedimentation and nutrient enrichment from agricultural runoff in the 3.75 miles above the escarpment. Water resources managers believe that stream gradient may be a limiting factor in this area. The water is relatively stagnant below the falls. The use is unknown, but WDNR fish managers believe this reach may be capable of supporting a Class III trout fishery.

Keyes Creek

Keyes Creek is a 7-mile stream which originates from springs, flows through the Gardner Swamp Wildlife Area and discharges into Little Sturgeon Bay. The lower reaches support a warm water sport fishery and forage fish, while the upper reaches are Class I and II trout streams. The stream was stocked with brook trout from 1956-1970, but a fish survey in 1976 found only forage fish (Valvassori, 1990).

Excessive sediment and nutrient loadings from agricultural runoff are severely degrading water quality. Fisheries managers believe a fish kill reported in 1976 may have been caused by excessive barnyard runoff.

Water quality degradation due to nonpoint source water pollution in Keyes Creek is affecting water quality in Little Sturgeon Bay. Thick beds of Eurasian watermilfoil are a nuisance to many.

The use of agricultural best management practices should be encouraged to reduce nonpoint source impacts and to improve the water quality of the existing and potential fishery. Water quality in this area will likely benefit greatly from public participation in the priority watershed project.

Larson Creek

Larson Creek is an intermittent stream that originates in Cunningham Swamp and flows through pastures, feedlots and Larson Swamp before discharging to Sand Bay. This stream is classified as a warm water forage fishery. Larson Creek receives a considerable amount of sediment, indicated by the turbid water when it rains and the high concentration of suspended solids during snowmelt (Gansberg, 1994).

Lost Creek

Lost Creek is an intermittent stream that flows through a golf course before discharging to Sawyer Harbor. This stream is classified as a limited forage fishery. A local golf course may contribute nutrients to this creek through runoff (Gansberg, 1994).

Macco Creek

Macco Creek is a high-gradient intermittent drainage ditch to Green Bay. This stream is classified as a limited forage fishery. Bank erosion is significant along this creek (Gansberg, 1994).

May Swamp Creek

May Swamp Creek is classified as a limited forage fish creek that flows through a cedar swamp before discharging to Sand Bay. Filamentous algae is abundant on the hard substrate. Silt and soft sediment cover most of the creek bed (Gansberg, 1994).

Red River

The Red River is a 9-mile, warm water stream in northwestern Kewaunee County. It is subject to low flow and low dissolved oxygen levels during the summer, primarily due to its intermittent nature in the upper stretches. It is also affected by sediment loading and nutrient enrichment from agricultural nonpoint sources. Agricultural runoff is a major source of problems in this drainage area.

The entire stream is classified as a limited forage fishery, but WDNR personnel believe the lower quarter mile of stream might support a population of forage fishes. The upper reaches of the Red River are intermittent and are affected by nonpoint sources of water pollution.

Renard Creek

Renard Creek is classified as a warm water forage fishery that drains to Green Bay. The upper reaches are intermittent and flood easily. Rooted aquatic plants and filamentous algae are extremely dense in some locations. The turbid muddy waters caused by heavy runoff indicate high sediment and nutrient loads (Gansberg, 1994).

Samuelsons Creek

Samuelsons Creek is a flashy intermittent limited forage fish tributary that flows mostly through an urban area before discharging to Sturgeon Bay. This stream received a fair aquatic life habitat rating. The rocky bottom substrate is completely covered with filamentous algae and periphyton (Gansberg, 1994).

Silver Creek

Silver Creek (T26N, R23E, SEC 16, NENE) is a flashy intermittent stream that discharges to Green Bay. Filamentous algae covers the sparse rocky substrate, suggesting high sediment and nutrient loadings (Gansberg, 1994).

Strawberry Creek

Strawberry Creek is a perennial, warm water forage fish stream that supports and annual fall chinook salmon run. WDNR operates an egg-taking facility approximately three quarters of a mile upstream from the creek's mouth. This facility is a primary source of chinook salmon eggs for Wisconsin. Cold-water

fish species are common in the lower reaches of Strawberry Creek because of the cold-water seiche effect from Lake Michigan. A section of the creek has been ditched, which has significantly decreased aquatic life habitat. Habitat evaluations ranked this creek as good aquatic life habitat (Gansberg, 1994).

Sugar Creek

Sugar Creek is a shallow, rubble and gravel stream that drains to Green Bay. The upper reaches of Sugar Creek flow intermittently and are rather marshy, whereas the lower reaches flow continuously and have more stable rubble substrate (Gansberg, 1994). The entire 9-mile stream is classified as a warm water forage fishery. A county park encompasses the mouth of the stream and provides picnicking and launch facilities on the bay.

Table 18. Red River & Little Sturgeon Bay Watershed (TK07) - Stream Information - Part 1 of 4

Brown, Kewaunee, Door

Square Miles: 100

			EXISTING	POTENTIAL	Supporting	Assessment	
		LENGTH	Biological Use	Biological Use	Assessment	Data	Codified
NAME OF STREAM	WBIC	(MILES)	USE/MILES	(MILES)	Category		CLASS
Red River	101000	0-0.25	LFF (0.25)	WWFF	Partially	M	**Default**
		0.25-9	LFF (8.75)	LFF	Partially		LFF
Keyes Creek	100400	0-0.75	WWSF (0.75)	WWSF	Fully	M	WWSF
		0.75-3.75	WWFF (3)	WWFF	Partially	M	WWFF
		3.75-5.95	Cold II (2.2)	Cold (II)	Not	M	Cold (II)
		5.95-7.05	Cold I (1.1)	Cold (I)	Not	M	Cold (I), ERW
Sugar Creek	100500	9	WWFF (9)	WWFF	Fully	M	WWFF
Renard Creek	100600	6	WWFF (6)	WWFF	Fully	M	WWFF
Unnamed Tributaries							
T26N, R23E, S21	100700	1	Unknown				Default
T26N, R23E, S28 NW	**Needs a WBIC**	3	Unknown				Default
Macco Creek	100900	1	LFF (1)	LFF	Partially	M	LFF
Gilson creek	101200	0 - 0.25	WWFF (0.25)	WWFF	Partially	M	WWFF
		0.25 - 4.0	Unknown				Default
Bader Creek (T25N, R23E, S18 NWNW)		2.5	WWFF (2.5)	WWFF	Fully	M	WWFF
Larson Creek	100200	4	WWFF (4.0)	WWFF	Fully	M	WWFF
Unnamed Tributary (May Swamp Creek) T28N, R25E, S32	100300	3	LFF (3.0)	LFF	Partially	M	LFF
Strawberry Creek (T27N, R26E, S16 SE SE)	**Needs a WBIC**	1.6	Cold (1.6)	Cold	Partially	M	Cold
Samuelsons Creek (T27N, R26E, S8 SE SW)	**Needs a WBIC**	1.25	LFF (1.25)	LFF	Partially	M	LFF
Lost Creek (T28N, R25E, S27 NE NE)	**Needs a WBIC**	2.5	LFF (2.5)	LFF	Partially	M	LFF
Silver Creek (T26N, R23E, S09 SW SE)	**Needs a WBIC**	1	Unknown (1.0)				Default
Unnamed Tributaries							
T27N, R26E, S16	**Needs a WBIC**	0.8	Unknown (0.8)				Default
"Krueger Creek" T27N, R24E, S11 NE	**Needs a WBIC**	2.7	Unknown (2.7)				Default
"Malvitz Creek" T27N, R24E, S11 SW	**Needs a WBIC**	2.2	Unknown (2.2)				Default

Table 10. Red River & Little Sturgeon Bay Watershed (TK07) - Stream Information - Part 2 of 4
Brown, Kewaunee, Door
Square Miles: 100

			HBI	Joe Ball Habitat
		LENGTH	Water Quality	Form 3200-68, 1-85
NAME OF STREAM	WBIC	(MILES)	"Integrity Indicator"	sm=stream mile from mouth
Red River	101000	0-0.25		164 (fair), summer 1993 (sm=0.1)
		0.25-9		155 (fair) summer 1993 (sm=1.4)
Keyes Creek	100400	0-0.75		114 (good), summer 1993 (sm=0.5)
		0.75-3.75	7.6 (fairly poor), spring 1993 (sm=1.2) 7.5 (fairly poor), fall 1992 (sm=1.2)	103 (good) summer 1993 (sm=1.3) 148 (fair) spring 1993 (sm=1.3) 161 (fair), fall 1992 (sm=1.3) 144 (fair), summer 1993 (sm=2.2)
		3.75-5.95		
		5.95-7.05		
Sugar Creek	100500	9	6.7 (fairly poor), spring 1993 (sm=0.1) 6.3 (fair), fall 1992 (sm=0.1) 6.1 (fair), spring 1993 (sm=1.5) 5.4 ((good), fall 1992 (sm=1.5)	124 (good), summer 1993 (sm=0.1) 136 (fair), spring 1993 (sm=0.1) 166 (fair) fall 1992 (sm=0.1) 141 (fair) summer 1993 (sm=1.5) 125 (good) spring 1993 (sm=1.5) 165 (fair) fall 1992 (sm=1.5) 176 (fair) summer 1992 (sm=5.2)
Renard Creek	100600	6	7.6 (poor), spring 1993 (sm=0.6) 7.5 (fairly poor), fall 1992 (sm=0.6) 4.4 (very good), spring 1993 (sm=2.7) 6.7 (fair), fall 1992 (sm=2.7)	232 (poor) summer 1993 (sm=0.6) 194 (fair) spring 1993 (sm=0.6) 230 (poor) fall 1992 (sm=0.6) 148 (fair) summer 1993 (sm=2.7) 138 (fair) spring 1993 (sm=2.7) 189 (fair) fall 1992 (sm=2.7) 136 (fair) summer 1993 (sm=3.3)
Unnamed Tributaries				
T26N, R23E, S21	100700	1		
T26N, R23E, S28 NW	**WBIC**	3		187 (fair) summer 1993 (sm=1.5)
Macco Creek	100900	1		191 (fair) summer 1993 (sm=0.3)
Gilson creek	101200	0 - 0.25	4.6 (good), spring 1993 (sm=0.1) 6.9 (fairly poor), fall 1992 (sm=0.1)	181 (fair), summer 1993 (sm=0.1) 158 (fair), spring 1993 (sm=0.1) 180 (fair), fall 1992 (sm= 0.1)
		0.25 - 4.0		
Bader Creek (T25N, R23E, S18 NWNW)		2.5		209 (poor), summer 1993 (sm=0.2) 196 (fair) summer 1993 (sm=0.9)
Larson Creek	100200	4		190 (fair) summer 1993 (sm=1.5)
Unnamed Tributary (May Swamp Creek) T28N, R25E, S32	100300	3		177 (fair) summer 1993 (sm=0.7)
Strawberry Creek (T27N, R26E, S16 SE SE)	**WBIC**	1.6		117 (good) summer 1993 (sm=0.3)
Samuelsons Creek (T27N, R26E, S8 SE SW)	**WBIC**	1.25	7.6 (poor), fall 1993 (sm=0.7)	173 (fair) summer 1993 (sm=0.7) 181 (fair) fall 1992 (sm=0.7)
Lost Creek (T28N, R25E, S27 NE NE)	**WBIC**	2.5		168 (fair) winter 1993 **(sm =?1.0?)**
Silver Creek (T26N, R23E, S09 SW SE)	**WBIC**	1		
Unnamed Tributaries				
T27N, R26E, S16	**WBIC**	0.8	7.4 (fairly poor), 1993 (sm=0.2) 7.4 (fairly poor), fall 1992 (sm=0.2)	166 (fair) summer 1993 (sm = 0.2) 181 (fair) fall 1992 (sm=0.2)
"Krueger Creek" T27N, R24E, S11 NE	**WBIC**	2.7		191 (fair) summer 1993 (sm=1.1)
"Malvitz Creek" T27N, R24E, S11 SW	**WBIC**	2.2		167 (fair) summer 1993 (sm=0.5)

Table 10. Red River & Little Sturgeon Bay (TK07) - Stream Information - Part 3 of 4
Brown, Kewaunee, Door

Square Miles: 100

		Environmental Problems				
	LENGTH					
NAME OF STREAM	(MILES)	SOURCE	IMPACT	Comments	TREND	References
Red River	0-0.25	Stream Banks, NPS	Sed, Nut, Hab	N	Unknown	43, 67
	0.25-9					
Keyes Creek	0-0.75	NPS	Nut, sed, Hab	N	Unknown	43, 67
	0.75-3.75	NPS	Sed, Nut	N		
	3.75-5.95	NPS	Sed, Nut	N		
	5.95-7.05	NPS	Sed, Nut	N		
Sugar Creek	9	Stream bank pasturing, NPS	Hab, Nut, Sed	N	Unknown	30, 67
Renard Creek	6	Stream bank pasturing, NPS	Sed, Nut, Hab	N	Unknown	67
Unnamed Tributaries						
T26N, R23E, S21	1				Unknown	
T26N, R23E, S28 NW	3				Unknown	
Macco Creek	1	Stream Banks, NPS	Hab, Nut, Sed	N	Unknown	67
Gilson creek	0 - 0.25	Stream Banks, NPS	Sed, Nut, Bact, Hab	N	Unknown	67
	0.25 - 4.0					
Bader Creek (T25N, R23E, S18 NWNW)	2.5	Stream Banks, NPS	Sed, Nut, Hab	N	Unknown	6, 67
Larson Creek	4	NPS	Hab, Nut, Sed	N	Unknown	67
Unnamed Tributary (May Swamp Creek) T28N, R25E, S32	3	NPS	Hab, Nut, Sed	N	Unknown	67
Strawberry Creek (T27N, R26E, S16 SE SE)	1.6	NPS	Hab, Nut, Sed	N	Unknown	67
Samuelsons Creek (T27N, R26E, S8 SE SW)	1.25	NPS	Hab, Nut, Sed	N	Unknown	67
Lost Creek (T28N, R25E, S27 NE NE)	2.5	NPS	Hab, Nut, Sed	N	Unknown	67
Silver Creek (T26N, R23E, S09 SW SE)	1				Unknown	
Unnamed Tributaries						
T27N, R26E, S16	0.8				Unknown	
"Krueger Creek" T27N, R24E, S11 NE	2.7				Unknown	
"Malvitz Creek" T27N, R24E, S11 SW	2.2				Unknown	

Table 10. Red River & Little Sturgeon Bay Watershed (TK07) - Stream Information - Part 4 of 4

Brown, Kewaunee, Door

Square Miles: 100

		Data Reliability		
	LENGTH	Level 1-least	NPS	Additional Comments
NAME OF STREAM	(MILES)	4-most	Rank	
Red River	0-0.25	2	High	(sm 0.1 = Red River County Park)
	0.25-9			(sm 1.4 = CTH A)
Keyes Creek	0-0.75	2	High	(stream mile 0.5 = CTH C)
	0.75-3.75			(stream mile 1.3 =Pickeral Rd) (stream mile 2.2 = Fox Lane)
	3.75-5.95			
	5.95-7.05			
Sugar Creek	9	2	High	(stream Mile 0.1 =Sugar Creek Cnty Park) (stream mile 1.5 = Lovers Lane) (stream mile 5.2 = Bayshore Rd)
Renard Creek	6	2	High	(stream mile 0.6 =Shoemaker Rd - West crossing) (stream mile 2.7 = Pleasant Ridge Rd) (stream mile 3.3 = Hwy 57)
Unnamed Tributaries				
T26N, R23E, S21	1	1	High	
T26N, R23E, S28 NW	3	1	High	(stream mile 1.5 = Sand Hill Rd)
Macco Creek	1	1	High	(stream mile 0.3 = Hwy 57)
Gilson creek	0 - 0.25	2	High	(stream mile 0.1 = Shore Acres Subdivision)
	0.25 - 4.0			
Bader Creek (T25N, R23E, S18 NWNW)	2.5	1	High	(stream mile 0.2 = Hwy 57) (stream mile 0.9 = County Line Rd)
Larson Creek	4	1	High	(stream mile 1.5 = Sand Bay Rd)
Unnamed Tributary (May Swamp Creek) T28N, R25E, S32	3	1	High	(stream mile 0.7 = Sand Bay Rd)
Strawberry Creek (T27N, R26E, S16 SE SE)	1.6	1	High	(stream mile 0.3 = Strawberry Rd)
Samuelsons Creek (T27N, R26E, S8 SE SW)	1.25	1	High	(stream mile 0.7 =CTH U)
Lost Creek (T28N, R25E, S27 NE NE)	2.5	1	High	(sm ?1.0? = Hainesville Rd)
Silver Creek (T26N, R23E, S09 SW SE)	1	1	High	
Unnamed Tributaries				
T27N, R26E, S16	0.8	1		(stream mile 0.2 =Tacoma Beach Rd)
"Krueger Creek" T27N, R24E, S11 NE	2.7	1		(stream mile 1.1 = CTH C)
"Malvitz Creek" T27N, R24E, S11 SW	2.2	1		(stream mile 0.5 =CTH C)

Lakes & Partially Bounded Coastal Waters Descriptions

Little Sturgeon Bay

Little Sturgeon Bay provides many recreational fishing opportunities and is an important yellow perch and lake whitefish spawning area (Coberly and Horrall, 1980). Henderson Point at the mouth of the bay is an important fishing area along Green Bay's east shore. The shoreline just around the corner of Henderson Point has good rock structure that drops off quickly into deeper water. Structure and topography make this a prime spot for perch fishing. Smallmouth bass also frequent this area. Large walleye are taken along the adjacent shoreline. Chicago Reef, located between Henderson Point and Rileys Point on the east, is another fishing "hot spot."

Lower water levels and nutrients from nonpoint source water pollution flowing from Keyes Creek are resulting in dense beds of Eurasian water milfoil (*Myriophyllum Spicatum*) in Little Sturgeon Bay (Rasman, 1993). Lower water levels increase photosynthetic response, which in turn creates denser aquatic plant beds. Best management practices should be implemented to control nonpoint source water pollution in Keyes Creek.

Elevated levels of PCBs have been observed in fish taken in the Little Sturgeon Bay area. The cause of these elevated levels appears to be outside of Little Sturgeon Bay (e.g. from the Fox River-Green Bay system), as sediment samples collected in 1985 did not contain PCB levels that would result in the contaminant levels found in the fish (Doelger, 1985).

The DNR should provide an updated aquatic plant survey and management plan to address sensitive area issues and protect critical habitat.

Sawyer Harbor

Sawyer Harbor is an important yellow perch and smallmouth bass spawning area (Coberly and Horrall, 1980). A boat launch at Potawatomi State Park provides immediate access and fishing from the shore in this area is common. Extensive rooted aquatic plant growth provides important habitat that does result in user conflicts with sailing and other recreational use at times (Rasman, 1993a). Rasman (1993a) found wild celery (*Valisineria americana*) to be the most common aquatic plant in Sawyer Harbor. This plant is valuable as food for waterfowl and as habitat for macroinvertebrates and fish. The DNR should provide an updated aquatic plant survey and management plan to address sensitive area issues and protect critical habitat.

Sturgeon Bay

The DNR should provide an updated aquatic plant survey and management plan to address sensitive area issues and protect critical habitat. The aquatic plant management plan should also focus on providing clear guidance on mechanical harvesting and slow-no-wake areas to protect critical aquatic plant habitat and sensitive areas.

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