

STREAM CLASSIFICATION FOR INDIAN CREEK
MILWAUKEE RIVER BASIN
MILWAUKEE COUNTY

June, 1985

by Mike Bozek

Objectives

The objective of this stream classification is to determine the appropriate use designation for Indian Creek based on the Stream Classification Guidelines for Wisconsin (Ball 1980). The final designation is determined by evaluating the physical, chemical, and biological factors which may influence the potential resource value of this water body.

Description of the Water Course

Indian Creek is a continuous tributary of the Milwaukee River in northeastern Milwaukee County (T8N, R22E, Sec. 7, 8, 9, 17, 18). The perennial portion of the stream traverses 1.9 miles through the village of Fox Point and River Hills (U.S.G.S. Quadrangle). The entire perennial segment upstream of Interstate Highway 43 (I-43) is .57 miles in length and flows through the village of Fox Point in a concrete conduit. All intermittent tributaries to Indian Creek in Fox Point are likewise concrete lined. Land use is medium-high density residential with a small commercial section.

The stretch of perennial stream downstream of I-43 is 1.33 miles in length and traverses the light residential/wooded village of River Hills. The large privately owned estates in River Hills provide a wooded corridor that borders the entire stream segment until it is confluence with the Milwaukee River. Former channelization is evident in some areas, but the stream now has regained a natural appearance through most of this reach. Stair step, pool-riffle complexes having large cobble substrates and meanders predominate this stretch. A small wetlands also exists just downstream of I-43 in a formerly channelized segment. Erosion is evident in several areas where the stream is trying to regain its meander.

An intermittent stream joins Indian Creek just before the Milwaukee River confluence (T8N, R22E, Sec. 7, SE, SE). This creek traverses a few small wetlands and the residential area of River Hills downstream of I-43. Upstream of I-43 in Fox Point, this stream reach has been converted to an underground storm sewer.

Indian Creek is currently classified intermediate under NR 104.06 and subject to NR 104.04 of the Wisconsin Administrative Code. Indian Creek shall meet the criteria for fish and aquatic life standards with its exceptions as stated under NR 102.02(3)(a): Dissolved Oxygen not to be less than 2.0 mg/l at any time, nor shall the membrane fecal coliform count exceed 1000 per 100 ml's as a monthly geometric mean based on not less than five samples per month nor exceed 2000 per 100 ml in 10% of any sample during any month.

Habitat

Indian Creek can be divided by habitat into two distinct segments with I-43 as the divider. Upstream of I-43, the entire creek segment and all joining intermittent tributaries have been converted to open concrete storm sewers that carry stormwater runoff from Fox Point. This concrete channelization was part of an MMSD project.

Stormwater runoff via these channels is a major source of water for this stream.

The habitat for this stream reach was rated as poor using the Stream Habitat Rating Guidelines (Table 1). Although the guidelines are not conducive to rating concrete channels accurately, concrete habitat is very poor and unable to sustain most forms of aquatic life.

Indian Creek downstream of I-43 has no concrete segments. However, this section has been channelized, particularly the 400 ft. section immediately downstream of I-43. A small wetlands occurs here with the stream having primarily a clay bottom with 50% coverage by periphyton.

The remaining downstream section of stream is heavily shaded by woods and has some meanders and pool riffle complexes. Many of the meanders have been removed by earlier channelization, but the large substrates throughout the reach have helped create pool-riffle sequences.

The habitat in this reach was rated as fair (Table 1a) and is primarily due to the low flow. The deep pools present however, allow the use potential of this stream to be greatly enhanced. During extremely low flow periods, surface flow disappears between the large substrates connecting pools in several areas. Pools sustain depths of >3 ft. in spots with intergravel flow preventing stagnation. Bark erosion is evident in several areas, with colloidal clay particles remaining suspended in the water column.

Biological Data

No attempt to collect macroinvertebrates or fish samples were made in the concrete segment of Indian Creek upstream of I-43. All instream habitat needed to sustain any fish and aquatic life has been eliminated in this concrete channel reach. Bottom scour in spring is severe thus removing the larger substrates. By summer, the channel contains shallow <3" flat water, and is completely absent of pools and riffles. In dry years, the stream ceases to flow here. Additional habitat needed to sustain fish and aquatic life such as undercut banks, overhanging vegetation, and instream debris are also absent.

Macroinvertebrates were collected in Indian Creek downstream of the North River Rd. bridge in River Hills on May 1, 1984 (Table 2). The standard Hilsenhoff kick method (Hilsenhoff 1982) was used for site this analysis.

The HBI was a riffle comprised mainly of a cobble-gravel mixture. The stream is considered perennial year-round, but during summer, low flow can consist of intergravel flow between pool areas in certain sections. The Hilsenhoff

biotic index was calculated to be 4.42 indicating very poor water quality. 54% of the organisms were the very tolerant *Asellus intermedius* and 32% were a species of tolerant *Cricotopus*. Only 5 species were collected in this sample.

Fish were collected in the Indian Creek at two locations on three dates using D.C. pulse backpack shocker (Table 3). The first site was up and down stream of the North River Rd. bridge on September 9, 1975 and June 12, 1985. The second site was upstream of the Bradley Rd. bridge on May 23, 1984 and June 12, 1985. A total of twelve species have been collected from Indian Creek to date. Seven have been sport species including green sunfish, northern pike, bluegill, rock bass, pumpkinseed, yellow bullhead and black bullhead. All other species collected at this site have been either tolerant or very tolerant forage and rough fish.

No information on size or catchability of the sport species is known from the earlier collections. Sport fish collected in 1985 during extreme low flow were all young-of-the-year.

Green sunfish were the dominant species collected on all sample dates at all sample locations. In 1975, creek chubs and white suckers were also common with carp, yellow bullhead and pumpkinseed present in low numbers. During collections made in 1984 and 1985, only green sunfish were common with other species rare. Seasonal use, which may correspond to flow, is probably the major reason for variability in species present between sample dates.

In 1985 during extreme low flow, young-of-the-year northern pike were collected in pools near North River Rd. Due to the poor shockability of northern pike, only two were collected while at least three others were spotted without being collected. This indicates that Indian Creek is used by northern pike nursery area in summer, and may be used for spawning in the spring. Small wetlands adjacent to the mainstream of Indian Creek and in the intermittent tributary that joins Indian Creek near the Milwaukee River confluence provides typical northern pike spawning habitat.

Indian Creek also serves as a spawning stream and nursery area for green sunfish as indicated by our sampling. It is highly likely that this stream also serves as a spawning area for other game and forage species in the spring, although no sampling has been done to verify this.

Water Quality

The most recent physical and chemical water quality information on Indian Creek was collected on a monthly basis from 1975-1976 (WDNR 1976) (Table 4). Mean annual discharge during this period was 0.83 cfs with only one date in excess of 1 cfs. One post rainfall event had a discharge of 7.6 cfs. Overall, Indian Creek was rated as only a minor source of pollution to the Milwaukee River.

Dissolved oxygen, temperature, pH and unionized ammonia levels did not exceed Wisconsin state Full Fish and Aquatic Life Standards. Five violations did occur, however, for total phosphorus during this period having a mean annual concentration of 0.14 mg/l.

Sediment samples analyzed for heavy metals showed levels in excess of the recommended EPA levels for mercury and zinc. Chromium, copper, lead and nickel while present, did not exceed the recommended federal levels. Also present in the sediments were PCB's and Lindane.

Pollution sources to Indian Creek from the wooded light residential area of River Hills appears to be mainly erosion of stream banks that have not healed since channelization. In these areas, the stream is attempting to regain a natural meander pattern and raw banks have resulted. The resulting fine colloidal clay material appears to remain suspended for a long time in the stream.

Interstate highway 43 runoff is another source of nonpoint source pollution, with trace metals in particular. No point sources are known from River Hills and other urban nonpoint problems are probably minimal.

The village of Fox Point has two sanitary relief stations east of I-43 that discharges directly to Indian Creek. Fecal coliform levels in 1975-76 for Indian Creek show that bacteria were high and did exceed state recommended levels for full body contact recreation. It is likely that these levels are still being violated during high runoff events. No other point sources of pollution are known.

Nonpoint sources of pollution from Fox Point include the extensive use of fertilizers and pesticides in the village. The phosphorus violations in 1975-76 sampling may have been attributable to these fertilizers.

Water temperatures did not exceed the state standard, but thermal degradation of water quality occurs in the Fox Point section of the stream. This is a result of low flow, shallow water and lack of any shading along the stream.

Other typical urban runoff nonpoint sources of pollution likely occur as is indicated by the metals found in the stream. No explanation can be given for the excess mercury found.

Recreational Use

The potential recreational uses of Indian Creek are limited by it's small size, generally shallow depth and concrete channelization. Former potential use of the stream by spawning fish during higher stream flows have been eliminated by the concrete channel. This modification has permanently eliminated the use of these stream segments for a recreational fishery. In natural channel reaches, a limited sport and forage fishery exists throughout most of the open water season. Spawning northern pike, panfish species, white sucker and other forage fish species utilize the natural channel reaches for spawning purposes.

The aesthetic values of the concrete lined stream reaches are poor. Debris and periphyton frequently accumulates in the stream due to reduced flows and shallow water depths. These features are, in part, a result of the concrete channelization. In the natural channel reaches, the stream flows through very light density residential areas. The stream banks are wooded and provide important wildlife habitat. Because of the shallow depths, contact with surface waters would be incidental such as by wading or fishing.

Although the Use Class of Indian Creek will remain the same, higher quality benefits of the stream can be realized by pollution abatement procedures. The downstream segments should retain the present channel structure and wooded buffering areas to best protect the best interests of stream and property owner. In the long run, abatement of these pollution sources will help to improve the water quality and the recommended Use Class of the Milwaukee River. (See Appendix I for Pictorial Presentation.)

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Public access is provided by the parkway and numerous roadside right-of-ways.

Although sanitary sewer overflows will eventually be abated, poor bacterial water quality may persist as a result of urban nonpoint sources of pollution.

Based on the available information, it is recommended that Indian Creek's recreational use be classified as partial body contact.

Summary and Recommendations

Indian Creek is a small tributary to the Milwaukee River traversing the villages of Fox Point and River Hills. Fox Point is a medium-heavy residential area with limited commercial areas. River Hills is a light residential area with interspersed woods and having a wooded buffer strip along the stream.

The downstream segment of Indian Creek is designated as a warm water sport fishery (Class B). This designation results from the use of the stream by sport fish as spawning and nursery areas. Although the habitat was only rated as fair, this was in large part due to low flow in the stream. The ability of the deep pools to be used as rearing habitat precludes the limited use that might be anticipated from such a stream with such a low habitat rating. Heavy seasonal use, particularly in the spring for spawning by many other fish species might be expected to occur as well.

The upstream segment of Indian Creek is designated as a Class E stream. Habitat is entirely lacking due to the concrete channelization of that segment and low flow conditions. Lack of deeper pool areas and natural substrates as occurs in the downstream reaches are the major factors limiting use by aquatic life. Prior to concrete channelization, this stream could potentially have supported a biotic community similar to the one presently downstream. Improvement of the Use Class cannot occur as a result of these permanent stream modifications.

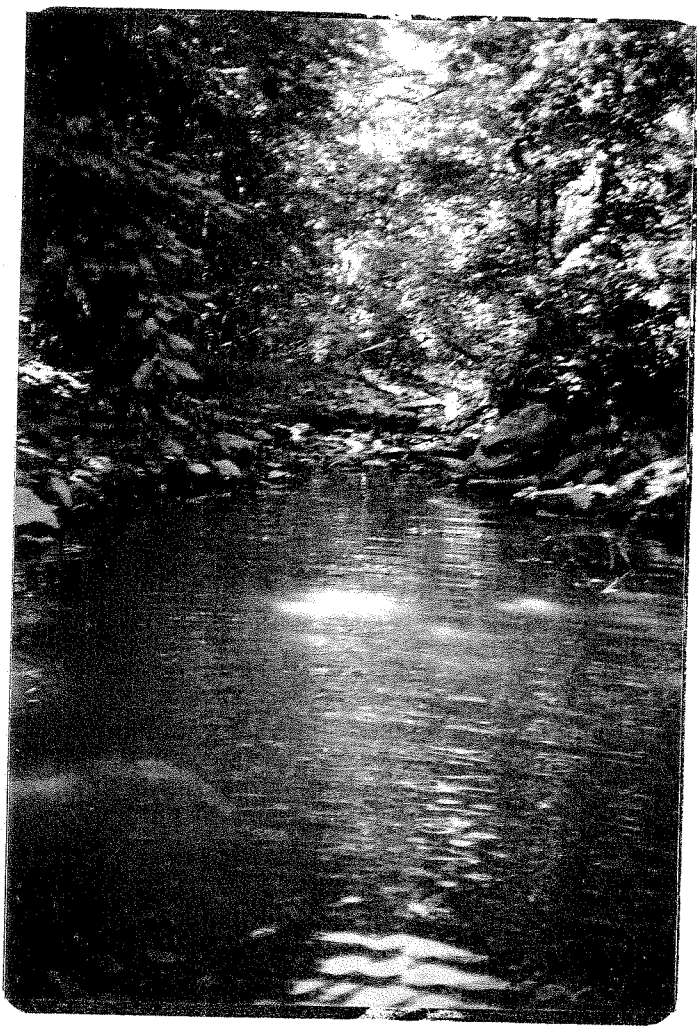
The benthic macroinvertebrate community is dominated by tolerant and very tolerant species. The Hilsenhoff biotic index indicates very poor water quality. This may be attributed in part to the intermittent nature or low flow occurring in parts of the stream. More importantly, the nonpoint pollution sources of thermal degradation, nutrient loading, and suspended solids degrade the water quality and use of the stream by aquatic life. The relief station in Fox Point also can periodically purge the stream water quality and degrade the habitat.

Controllable factors which currently limit water quality of Indian Creek include bacteria and nutrients associated with the sanitary relief overflow in Fox Point, urban runoff and erosion along the stream bank. The stream and homeowners along the lower stream segment could mutually benefit from point and nonpoint source pollution abatement. Eroding property along the stream bank and health hazards caused upstream by sanitary overflows can both be reduced. The wooded stream corridor undoubtedly increase property value and adds to the seclusive nature of the community. Protection of the stream channel in its present natural state is in the best interest of all users.

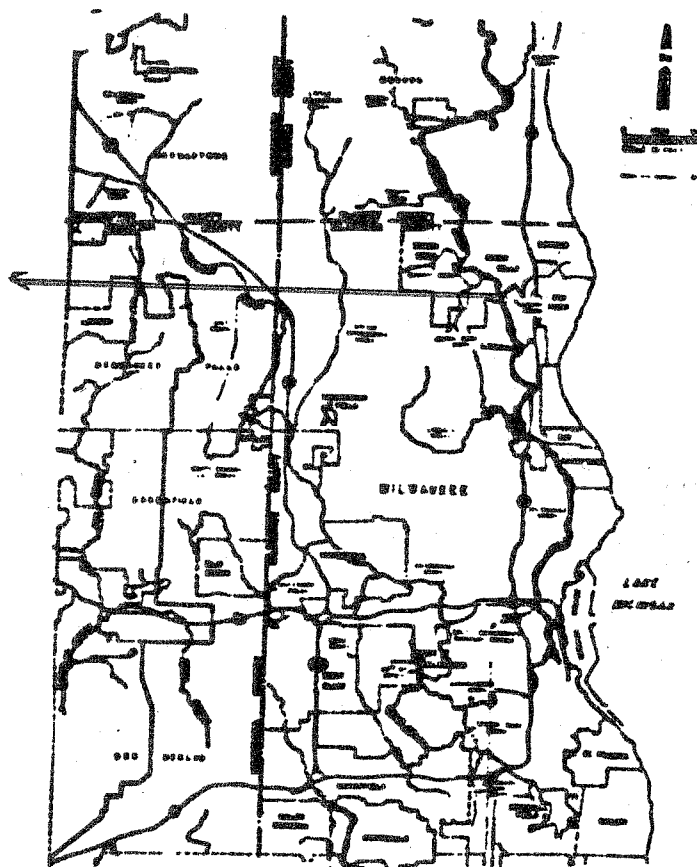
Appendix I

(Pictorial Presentation)

Indian Creek



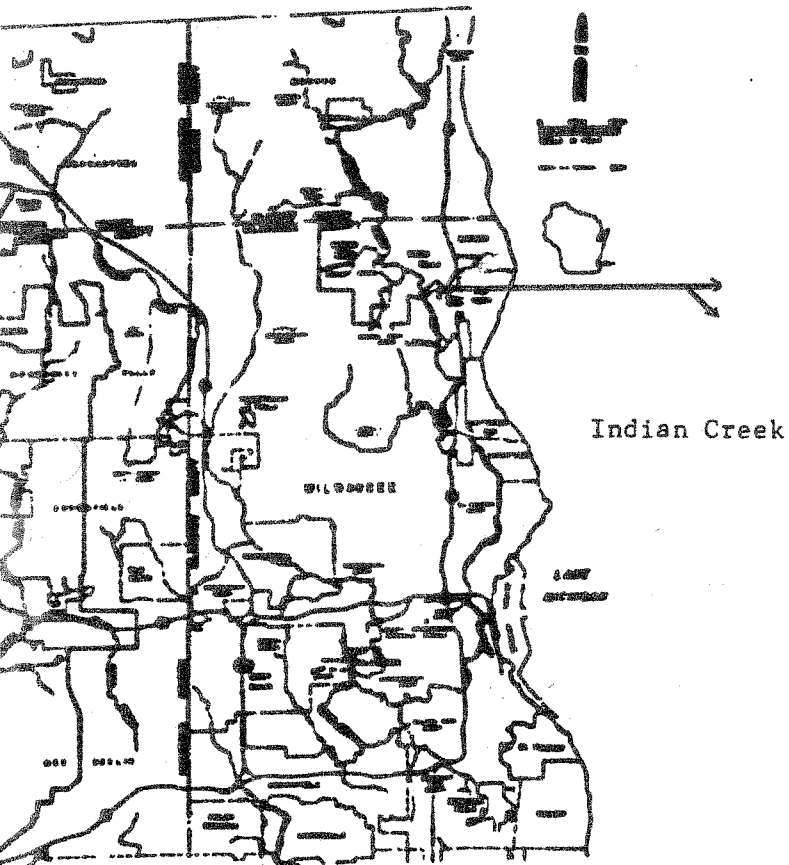
Looking downstream from Brady Road. Location is approximately .1 mile from confluence with Milwaukee River.



Looking upstream toward River Rd.
bridge. Location is approximately
.3 miles from the confluence with
the Milwaukee River.

Milwaukee Co.

Date: 8/14/85

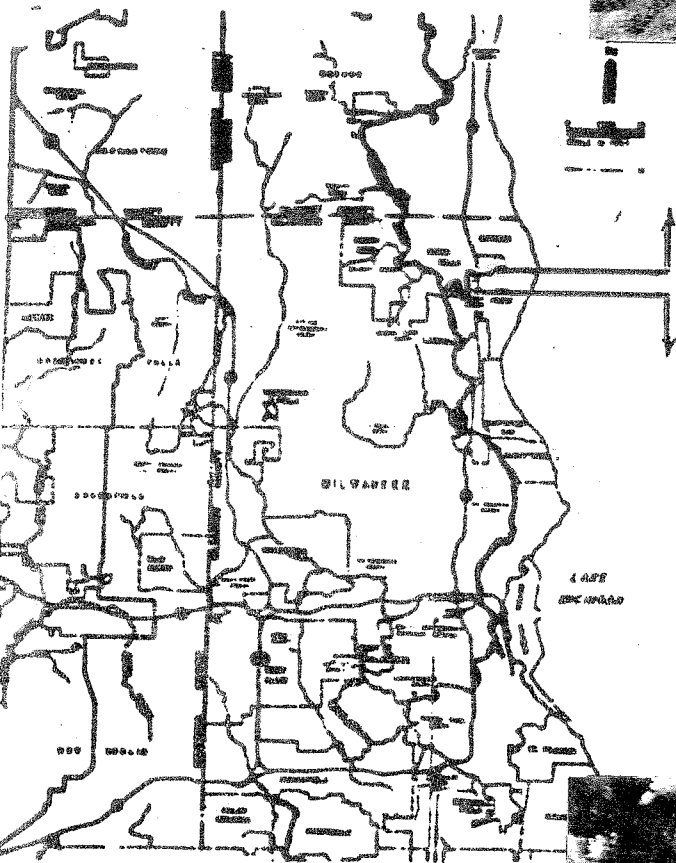


Looking downstream of River
Bridge road.



Looking upstream from Port Washington Rd.. Location is approximately 1 mile from the confluence with the Milwaukee River.

Date: 7/22/85



Indian Creek

Looking upstream from Bradley Rd.. Location is approximately 300' above confluence with the Milwaukee River.

Date: 7/22/85



WATER RESOURCE APPRAISAL AND STANDARDS REVIEW FOR THE
MILWAUKEE RIVER SOUTH BRANCH WATERSHED

INDIAN CREEK SUBWATERSHED

I. Description of the Subwatershed

The Indian Creek subwatershed is located in northeast Milwaukee County. Approximately 80% of the subwatershed is "urbanized". The stream drains 3.1 mi² and is dominated by residential land use and lesser amounts of "open space" commercial and transportation types (SEWRPC, 1988).

Indian Creek is the principal perennial stream located in the subwatershed. The stream flows for 2.6 mi before discharging to the Milwaukee River at T8N, R22E, S.18, NW, NE, in the Village of River Hills. Approximately 75% of the stream is considered perennial (SEWRPC, 1988). No low-flow characteristics are available for Indian Creek, however the Q_{7,10} low flow of the creek is estimated to be ≤ 0.5 cfs.

The entire length of the creek upstream of I-43 has been channelized, including its tributary streams. Most of this stream reach is confined in a concrete invert with shorter reaches in a turf lined channel. The riparian zone associated with this reach is landscaped in turf. Although most of the stream is channelized downstream of I-43, it remains in an earthen channel. The stream has begun to recreate a meandering channel along some of these lower reaches.

II. Water Resource Conditions

A. Perennial Streams

Indian Creek

Water resource conditions and biological and recreational use objectives for Indian Creek were proposed in a report titled Stream Classification for Indian Creek-Milwaukee River Basin (Bozek, 1985). This report recommended that Indian Creek be classified as supporting a warmwater sport and forage fishery (FAL-B) for the reach located downstream of I-43. The reach located upstream of I-43 was classified as a marginal fish and aquatic life stream (MAR-E). Because of the entire stream's small size and shallow depth, recreational uses are limited to partial body contact forms of recreation (PBC).

At present, Indian Creek is not meeting its full biological use potential. Observed or potential problems or threats to its use include loss of instream and riparian fish and other aquatic life habitat, low dissolved oxygen, and bacteria. Factors or pollutants responsible for these problems include sediment from bank erosion caused by channelization and excessive hydraulic loading, concrete, and

other forms of channelization, excessive nutrients, filamentous algae growth, urban runoff and sanitary sewer by-passes (Table 1). Although it has been shown that fecal coliform do not routinely exceed partial body contact standards ($<11,000$ per 100 mls) in Indian Creek, these bacteria are discharged to the Milwaukee River and contribute to high levels observed throughout the urbanized watershed.

Instream habitat is divided into two distinct reaches with I-43 as the divider. Upstream of I-43, suitable habitat is entirely lacking due to concrete channelization. Its utility is limited to that of an open stormsewer.

Downstream of I-43, there are no concrete lined channel segments and habitat was rated "fair" according to Ball (1982). This entire reach is channelized with the impacts of channelization being most severe for the first 400 ft downstream of the highway. The entire lower corridor is predominantly wooded with a dense canopy. Despite the extensive shading, filamentous algae is approaching nuisance levels, covering approximately 50% of the substrate. A small emergent wetland is also present and there are remnants of a meandering pool, riffle and run complex. Although not quantified, bank erosion was reported to be "evident in several areas, with colloidal size clay particles remaining suspended in the water column" (Bozek, 1985). Fine textured sediment cover $>50\%$ of the coarse substrate and hydraulic scour is frequent and extensive.

Habitat throughout most of this reach is less than ideal for larger sport and forage fish species due to its small size and shallow depths during low flow periods, however, the reach nearest the Milwaukee River provides sufficient backwater depth for spawning habitat and nursery cover for larger sport and forage species indigenous to the Milwaukee River. Historical and more recent fishery data supports this conclusion (Fago, 1984 and Bozek, 1985).

Qualitative fish samples were collected from Indian Creek during three different years. To date, 12 species have been collected from the stream include seven species classified as warmwater sportfish. These include northern pike, bluegill, rock bass, black and yellow bullhead, pumpkinseed, and are dominated by green sunfish. The sportfish collected during June 1985, were dominated by young-of-the-year, indicating that some natural reproduction may be occurring or that the stream is being used as a nursery area. The small wetland parcels located in the small intermittent stream near the mouth of Indian Creek may provide suitable habitat for northern pike spawning (Bozek, 1985).

Semi-qualitative Hilsenhoff Biotic Index (HBI) macroinvertebrate samples were collected in the spring of 1984 (Hilsenhoff, 1982). The resulting HBI value indicated "very

poor" water quality with respect to conventional forms of organic pollution.

The Village of Fox Point operates two sanitary sewer by-passes that occasionally discharge to Indian Creek. The frequency of discharge occurrence and quality of discharge waste from these by-passes or any other point source discharge in the subwatershed has not been reviewed for this appraisal report due to time constraints.

The most recent physico-chemical water quality information on Indian Creek was collected on a monthly basis for one year beginning in 1975 (WDNR, 1976). Mean annual discharge during this period was 0.84 cfs with a maximum runoff event sample of 7.6 cfs. Dissolved oxygen, un-ionized ammonia, temperature, and pH values were within Wisconsin State Water Quality Standards for a full fish and aquatic life stream. The exception was observed during the most intensive runoff sample date when dissolved oxygen fell below the 5.0 mg/l standard. This incident was observed with a corresponding increase in BOD₅. Although not field verified, respiration by dense filamentous algae growth may potentially contribute to substandard dissolved oxygen concentrations during the summer months.

Compared to ambient base flow sample dates, there was a significant increase in suspended solids, lead, fecal coliform bacteria, phosphorus and nitrogen concentrations on runoff sample dates. For example, base flow concentrations of suspended solids increased from 0-14 mg/l to 73 mg/l during the moderate runoff event. Similarly, base flow concentrations of lead increased from ≤ 3 -14 ug/l to 29 ug/l during the moderate runoff event.

B. Intermittent Streams

Unnamed Stream A (T8N, R22E, S.8, SE, NE)

Unnamed Stream B (T8N, R22E, S.7, SE, SE)

Both of these streams are channelized, with major lengths placed in concrete inverts. Stream B is still maintained in a natural channel within the Village of River Hills. No other biological or physical information is available for these streams. Channel scour and bank erosion appear extensive along stream B downstream of I-43 due principally to the increased hydraulic load via the highway drainage. This has not been verified in the field.

III. Water Resource Management Objectives

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

A. Perennial Streams

Indian Creek

1. Maintain and, to the fullest extent, enhance the existing diversity and relative abundance of the forage fish community and sport fish spawning and nursery habitat in Indian Creek and the Milwaukee River.

a. Improve available fish habitat through a 50% reduction in nonpoint sources of sediment and hydraulic loadings associated with existing and proposed urban land uses (NPS).

b. Prohibit future channelization and modification to wetlands (IRM).

2. Protect human health and recreational uses of Indian Creek and the Milwaukee River.

a. Reduce or eliminate sources of fecal bacteria including urban runoff and sewer by-passes (IRM).

3. Protect and, to the fullest extent possible, improve water quality in the Milwaukee River.

a. Reduce nonpoint sources of sediment (NPS).

b. Eliminate sewer by-passes.

4. Improve dissolved oxygen levels and aesthetics in the Milwaukee River and Milwaukee Harbor Estuary by reducing macrophyte and phytoplankton production (as chlorophyll a).

a. Reduce nutrient loadings (as N and P) to the Milwaukee River via Indian Creek subwatershed by 50% (NPS and IRM).

B. Intermittent Streams

Unnamed Streams A-B

1. Protect fish and aquatic life habitat and water quality in Indian Creek and the Milwaukee River.

a. Reduce nonpoint sources of sediment and heavy metals by 50% (NPS).

b. Reduce hydraulic loadings as they contribute to bank erosion. This impact needs to be verified in the field (NPS).

Office Writer File: INDIAN.WP
by: Will Wawrzyn

Rev: 07/07/89

Table 3

Fish Distribution Data for Indian Creek, Indian Creek Subwatershed

Date	Location	Species	Number	Class
5/23/85	Upstream of Bradley Rd. 200 ft. reach	White sucker	2	T
		Green sunfish	34	S
		Rock bass	2	S
		Black bullhead	2	S
		Johhny darter	1	T
		Common carp	1	VT
6/12/85	North River Rd.	Green sunfish	14	S
		Northern pike	2	S
		Bluegill	1	S
		Brook stickleback	1	VT
9/9/75	North River Rd.	Common carp	5	VT
		Creek chub	10	T
		White sucker	14	T
		Yellow bullhead	2	S
		Green sunfish	23	S
		Pumpkinseed	1	S

TABLE 1. WATERBODIES OF THE MILWAUKEE RIVER SOUTH WATERSHED. INDIAN CREEK SUBWATERSHED, MILWAUKEE COUNTY

SUBWATERSHED WATERBODY	LENGTH (MILES)	CURRENT USES USE/MILES	POTENTIAL USES USE/MILES	POTENTIAL USES FULL/PART/NOT (MILES)	PROBLEMS OR THREATS TO POTENTIAL USES	POLLUTANTS OR LIMITING FACTORS CAUSING PROBLEMS OR THREATS	OBSERVED OR POTENTIAL SOURCES	MANAGEMENT RECOMMENDATIONS
INDIAN CREEK SUBWATERSHED								
Indian Creek (concrete channel upstream of I-43 including tributaries) T8N R22E S8 NW SE	1.3	MAR-E/1.3	MAR-E/1.3*	/1.3/	Loss of fish and invertebrate habitat Bacteria Aesthetics	Concrete Channelization	Urban land use	Prohibit future concrete channelization or enclosures (WZ) Reduce NPS bacteria sources (NPS) and eliminate sanitary sewer overflows (WW) Prohibit future concrete channelization or enclosures (WZ)
		PBC/1.3	PBC/1.3	1.3/ /		Fecal material Channelization/natural	Nonpoint sources (unsp.) sanitary sewer overflows Urban land use	
Indian Creek (natural channel downstream of I-43 T8N R22E S18 NW NE	1.3	INT-D/1.3	FAL-B/1.3	/ /1.3	Loss of fish and invertebrate habitat Low dissolved oxygen (potential) Bacteria Aesthetics	Channelization Sediment Hydraulic scour Filamentous algae/nutrients	Urban land use Bank erosion/NPS unsp. Urban land use NPS (unsp.)	Prohibit and/or mitigate future channelization (WZ) Reduce bank erosion and other sources of sediment by 50%. Reduce runoff volumes and rates (NPS) Reduce NPS of nutrients by 50% (NPS)
		PBC/1.3	PBC/1.3	/1.3/		Fecal material Channelization/natural Filamentous algae	Nonpoint sources (unsp.) Sanitary sewer overflows Urban land use Nutrients (N & P)	
Intermittent A T8N R22E S7 SE SE	0.7	MAR-E/0.7	MAR-E/0.7	/0.7/	Loss of fish and invertebrate habitat	Channelization and draining of wetlands Low flow	Urban land use	Prohibit and/or mitigate future channelization (WZ)
		PBC/0.7	PBC/0.7	0.7/ /				
Intermittent B T8N R22E S7 SE SE	1.4	INT-D/1.4	INT-D/1.4	/1.4/	Loss of fish and invertebrate habitat	Channelization and draining of wetlands Low flow	Urban land use	Prohibit and/or mitigate future channelization (WZ)
		PBC/1.4	PBC/1.4	1.4/ /				

* Use classification could be upgraded provided concrete channel is removed.