

Region SCR County Iowa Report Date 1/1990 Classification U/L/LFF
 Water Body: Brewery Creek
 Discharger: Mineral Point WWTP

If stream is classified as Limited Forage Fish (LFF) or Limited Aquatic Life (LAL), check any of the following Use Attainability Analysis factors that are identified in the classification report:

- Naturally occurring pollutant concentrations prevent the attainment of use
- Natural, ephemeral, intermittent or low flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for by the discharge of sufficient volume of effluent discharges without violating State water conservation requirements to enable uses to be met
- Human caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place
- Dams, diversions or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the water body to its original condition or operate such modification in a way that would result in the attainment of the use
- Physical conditions related to the natural features of the water body, such as the lack of a proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to water quality, preclude attainment of aquatic life protection uses
- Controls more stringent than those required by sections 301(b) and 306 of the Act would result in substantial and widespread economic and social impact

Supporting Evidence in the report (include comments on how complete/thorough data is)

- Biological Data (fish/invert)
- Chemical Data (temp, D.O., etc.) (88)
- Physical Data (flow, depth, etc.)
- Habitat Description
- Site Description/Map
- Other: photos (88)

Historical Reports in file:

- 1/13/98 - Dave Marshall
- 7/15/90 - Pat Trochell / Joe Ball memo
- 1/1990 - Dave Marshall 12/1995 - Dave Marshall / Steve Fix
- 2/1988 - Roger Schlessler

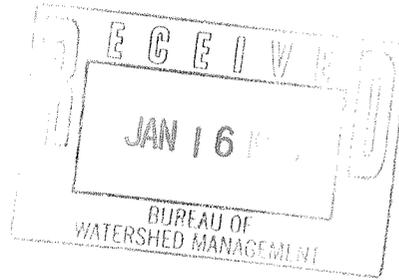
Additional Comments/How to improve report:

- acid leachate / heavy metal problems (96) -- can these problems, which cause LFF class'n, be fixed?
- 88 reports indicates that severe non-point pollution problem to blame. States that stream has sufficient flow & habitat to maintain a balanced FAL community
- check in W / region
- previous disagreement by Joe re. Class'n.

January 13, 1998

To: Joe Ball, Greg Searle WT/2

From: Dave Marshall



Subject: Stream Classification of Brewery Creek, Mineral Point

Enclosed are two copies of the mining waste remediation project and most recent stream classification. While the remediation study indicated substantial water quality improvements in the stream after the roaster piles were moved and capped, acutely toxic zinc levels persist in the stream due to contaminated groundwater and diffuse mining wastes throughout the watershed. High zinc concentrations prevent establishment of benthic macroinvertebrates with the exception of midge species typically found in systems degraded from mining wastes.

While a large number of pollution tolerant forage fish can be found within the stream at any given time, we believe the pollution tolerant minnows and white suckers are migrants between Rock Branch and the upper portions of Brewery Creek, above the former roaster piles and zone of severe pollution. Even before the remediation, when zinc levels were approximately 80% higher, southern redbelly dace and stonerollers were frequently found in the stream.

Whereas high numbers of forage fish would otherwise indicate full fish and aquatic life conditions (probably 99.9% of all streams), Brewery Creek is clearly a unique situation due to the toxic zinc levels coupled with the close association of the stream to other high quality waters in the watershed, i.e. Rock Branch and the upper portion of Brewery Creek.

In an effort to reflect significant water quality improvements with the realization that the stream will never become completely rehabilitated and that conventional organic loading is a minor factor in the overall water quality of this stream, we upgraded the mining waste impact zone to Limited Forage Fish downstream to the confluence with Rock Branch. Below Rock Branch, Brewery Creek is upgraded to Warmwater Fish and Aquatic Life.

cc
Bob Hansis SCR
Steve Fix SCR
Jack Soltez Dodg
Roger Schlessler SCR

DATE: July 15, 1996

FILE REF: 3200

TO: Dave Marshall - SDH
Steve Fix - SDH

FROM: Pat Trochlell - WT/2
→ Joe Ball - WT/2

SUBJECT: Brewery Creek at Mineral Point

On 9 July 1996, Dave Siebert, Pat Trochlell and Joe Ball inspected the wetlands and stream in the area of the roaster pile cleanup project. The wetland analysis is being conducted as a part of an ongoing study to document whether the wetland is experiencing noticeable changes as a result of the stream relocation project. Joe looked at the stream habitat within the relocated segment and in areas both upstream and downstream. We also used a backpack shocker to sample fish, starting from just upstream of Ferndale Road through part of the relocated section of Brewery Creek. Wetlands vegetation observations will be written up in a separate report. This memo addresses our observations of Brewery Creek habitat and fishery.

The habitat of the section of Brewery Creek downstream from the 3-culvert crossing is excellent forage fish habitat. (See attached location map). Habitat above the culverts is fair. The streambed within this area is predominantly hardpan clay with little gravel substrate or rock. "Chunks" of hardpan material provide some cover for aquatic organisms. This area also had several deep pools. Habitat improves again upstream from the wetland area, however, we did not get a chance to shock this stream segment.

The stream yielded a low number of invertebrates throughout, however, there were more invertebrates observed upstream from the wetland area. Low numbers of invertebrates sampled could be partly due to the time of year we were sampling.

Fish shocking yielded eight species of fish. Most of the species are classified as forage fish, although Black Bullhead and Common Sunfish (Pumpkinseed) were also present. Significant numbers of intolerant forage fish were also sampled. All fish appeared to be healthy. Common Shiners and Southern Redbelly Dace were in spawning colors. We observed young of the year forage fish both downstream and upstream of the 3-culvert crossing, which signify that fish reproduction had occurred this year. Although we sampled fewer fish above the 3-culvert crossing, the shocker battery was low.

Fish species and abundance are summarized in the table below.

FISH SAMPLED - 9 JULY 1996

FISH SPECIES	ABUNDANCE
Central Stoneroller	Common
Creek Chub	Abundant
Common Shiner	Abundant
Southern Redbelly Dace	Common
White Sucker	Abundant
Bluntnose Minnow	Present
Black Bullhead	Present
Common Sunfish	Present

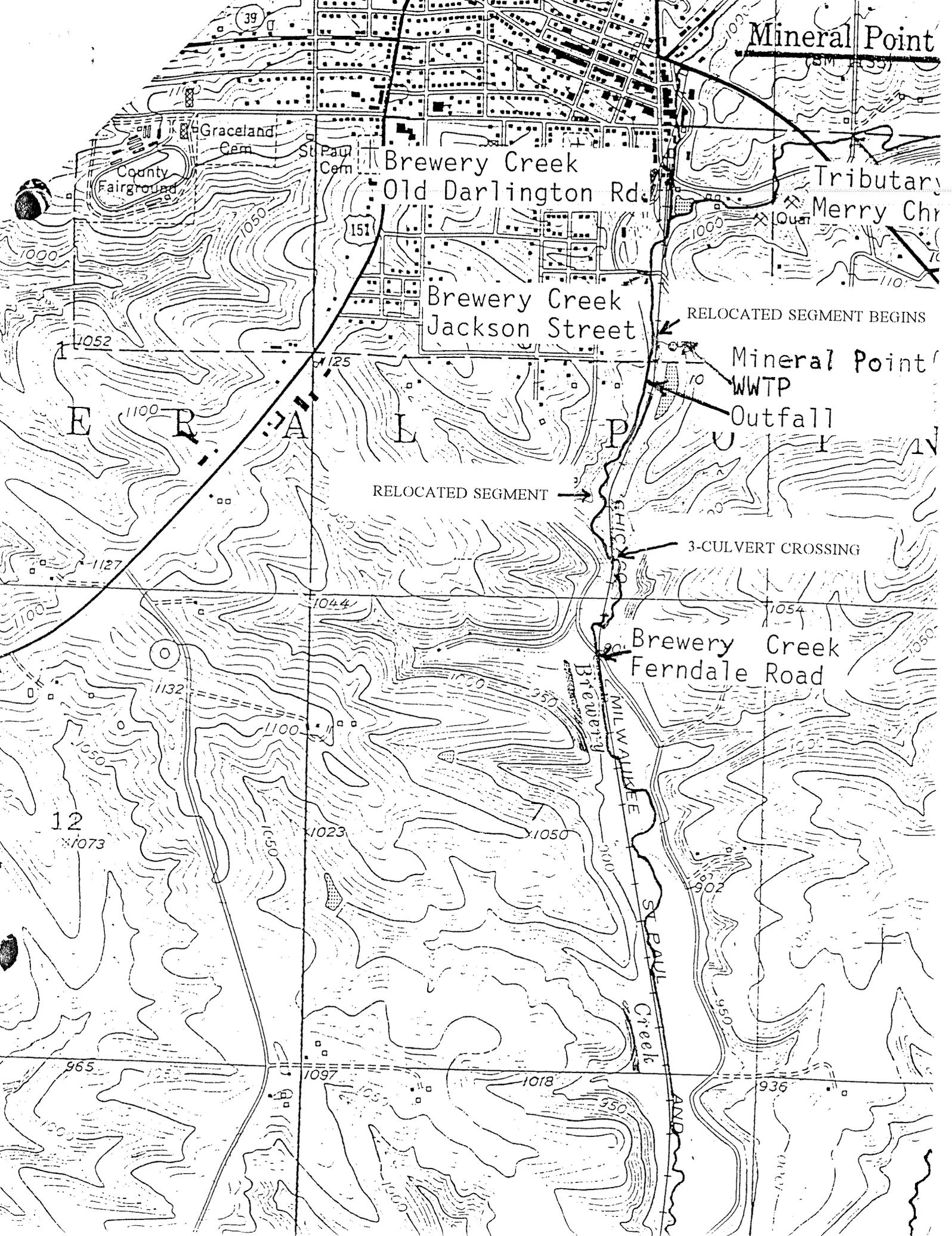
Brewery Creek currently is classified in NR 104 as supporting a limited aquatic life use. Field work conducted in 1994, shortly after the stream relocation and cleanup of mine roaster piles, recommended that the stream be upgraded to a limited forage fish classification. When the stream was assessed in 1994, only a year had passed since the mining wastes had been cleaned up and the stream had been relocated into its current channel. Fish were only beginning to migrate upstream into the new stream segment. In addition, although instream zinc levels were significantly (80%) lower than pre-cleanup concentrations, they were still at levels toxic to aquatic life. The stream was classified as supporting warm water forage fish upstream from the City of Mineral Point's wastewater discharge and as limited forage fish from the discharge point downstream to the Rock Branch.

We fully support the classification decision based upon the data used to reach that decision. However, it appears that significant recovery of the stream habitat and fishery has occurred since the 1994 data were collected. The stream clearly supports a healthy and diverse forage fish community and shows obvious signs that reproduction is occurring.

This would indicate that the stream may now be classified as supporting a warm water forage fish use (proposed WW-A). The need to reclassify this stream is important considering that NR 104 is currently being revised and that future code revisions may not occur for some time.

Please contact Joe (266-7390) or Pat (267-2453) if you have any questions.

c: Dave Siebert - EA/6
Tom Bennwitz - SDH



Mineral Point

Brewery Creek

Old Darlington Rd

Brewery Creek
Jackson Street

RELOCATED SEGMENT BEGINS

Mineral Point

WWTP

Outfall

RELOCATED SEGMENT

3-CULVERT CROSSING

Brewery Creek
Ferndale Road

MILWAUKEE
Brewery

ST PAUL
Creek

AND

County Fairground
Graceland Cem
St Paul Cem

Tributary
Merry Chr

E R A L P U I N

12
1073

1023

1050

1038

965

1097

1018

936

39

151

1052

1125

1127

1044

1054

1132

1050

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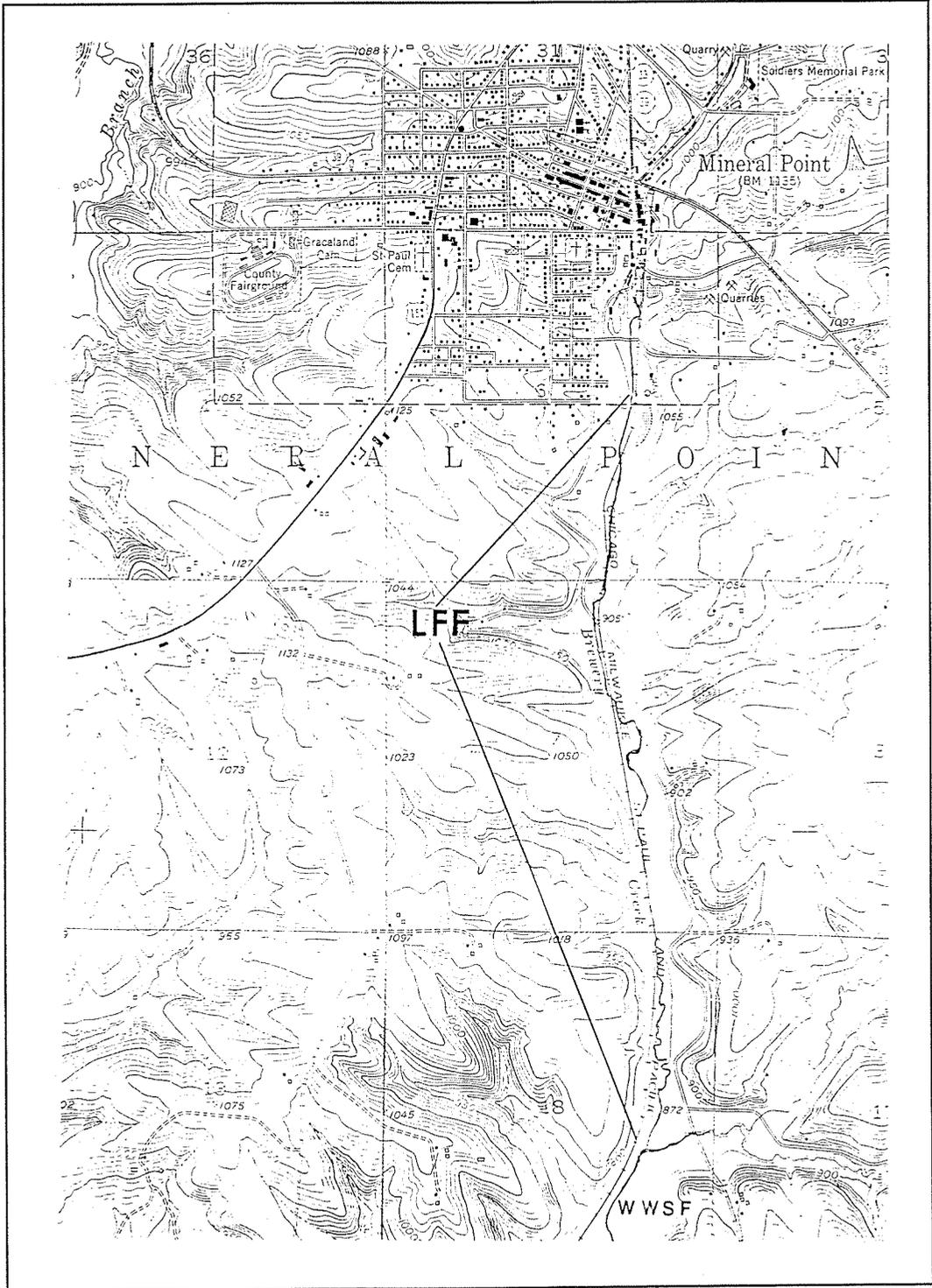
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BREWERY CREEK at MINERAL POINT,
STREAM RECLASSIFICATION REPORT
WDNR SOUTHERN DISTRICT WRM, WMM & FM
Prepared by David W. Marshall



January, 1996

RESOURCE DESCRIPTION

Length: 5 miles, Gradient: 46 ft./mile, USGS estimated $Q_{7,10}$: 0.68 cfs above the WWTP.

Brewery Creek is a small spring-fed stream that arises northeast of Mineral Point and flows southwest to the Mineral Point Branch of the Pecatonica River. Above Mineral Point, the stream displays "fair to good" water quality and supports diverse fish and macroinvertebrate communities. Aquatic insects and crustaceans have consistently indicated "good" water quality based on the Hilsenhoff Biotic Index (HBI). The fish community is represented by five Families and most species are considered cool water forage.

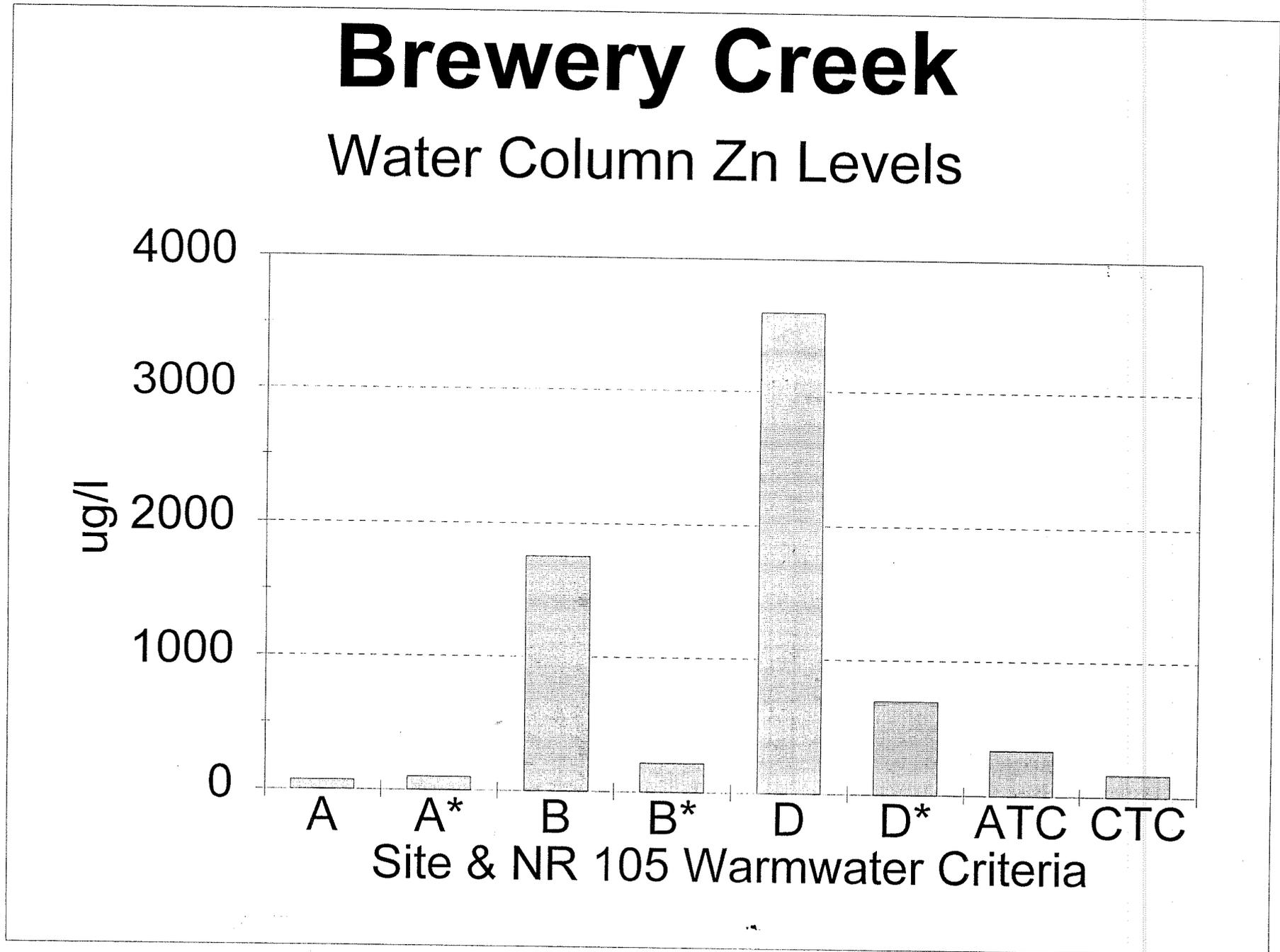
The stream had been described as "biologically dead" below Mineral Point due to acid leachate and heavy metal runoff from mining wastes. For over sixty years, five abandoned roaster piles have been the source of toxic zinc and cadmium and smothering ferric hydroxide precipitate. As leachate emanated from the roaster piles, only the most tolerant drifting invertebrates and migrating fish could be found within the rust colored water.

Construction of a now defunct railroad caused long term habitat disturbance within the contaminated zone. Much of the stream was ditched and straightened to accommodate railroad construction. Regardless of the channelization, stream habitat rated "fair" since the high gradient provided enough riffle and pool habitat for forage fish. Mining waste was clearly the primary limiting factor for fish and aquatic communities and was the primary reason the stream was classified Limited Aquatic Life (LAL) under Wisconsin Administrative Code NR 104.

Following the mining waste cleanup and containment project in 1992-93, Brewery Creek responded as water column metals decreased by approximately 80% and the stream is no longer rust colored. Diversity of fish and macroinvertebrate populations increased significantly, but most species are pollution tolerant. Even though zinc declined by nearly an order of magnitude, water column monitoring in 1994-95 revealed chronically toxic zinc below the former roaster pile above Jackson Street (also above the WWTP) and acutely toxic zinc below all five roaster piles (Figure 1). Toxic zinc concentrations prevent colonization of pollution intolerant species.

During the early planning stages of the mining waste cleanup, managers hoped that the rehabilitation effort would improve the stream enough to support a cold water sport fishery. Based on the post-cleanup monitoring efforts, high residual zinc levels prevent attainment of this goal. To better assess trout stream potential, the Coldwater Index of Biotic Integrity (IBI) was calculated from all of the fish

Figure 1: Brewery Creek Zn concentrations at A (above roaster piles), B (Jackson St), and D (Ferndale Rd) plus NR 105 criteria.



*post cleanup levels. ATC=NR 105 acute. CTC=NR 105 chronic.

collected above the cleanup site downstream to Ferndale Road. Fish collections in May and October, 1994 reflected a "very poor" cold water community (Tables 1 & 2). Very warm water temperatures in 1995 were an additional factor preventing sustained trout survival.

In 1994, nine species of fish (including low numbers of experimentally stocked brook trout) were sampled within the contaminated zone. While the observed fishery was definitely encouraging and reflects major water quality improvements, overall chemical and biological stream indicators suggest an unbalanced stream community. Recognizing that some fish will migrate through the contaminated zone, reproduction is unlikely given the high zinc toxicity. The benthic community, which is dominated by metals tolerant Chironomids, is probably a better pollution indicator than migrating fish (Figures 2 & 3).

USE CLASSIFICATION

Determining the appropriate use classification requires examining both biotic and abiotic variables, along with consideration for future stream improvement. The reach of stream above the former roaster piles displays fair to good water quality and supports a Warm Water Forage Fish Community (WWFF). Below the former roaster piles, the stream still suffers the effects of metals toxicity even though the cleanup effort significantly improved the water quality. While it can be argued that nine fish species within the contaminated zone may reflect "full fish and aquatic life uses", the pollution tolerant invertebrates and acutely toxic zinc concentrations indicate that the stream will not support balanced aquatic communities. Given the nature of the toxicity problem and substantial effort already expended, further metal reductions are unlikely and so the potential for improving the stream. Numerous groundwater seeps and diffuse mining wastes throughout the watershed persist as uncontrollable sources of zinc and other heavy metals.

Above the former roaster piles, Brewery Creek displays fair to good water quality and supports warm water forage fish (WWFF). From the Mineral Point Wastewater Treatment Plant downstream to the confluence with the Rock Branch, Brewery Creek will be upgraded from LAL to Limited Forage Fish Community (LFF). Below Rock Branch, the classification will change from LAL to Warm Water Sport Fish (WWSF) to reflect improved water quality coupled with dilution from the tributary. The overall classification upgrade reflects water quality improvements associated with the mining waste cleanup and containment.

Table 1: BREWERY CREEK COLDWATER IBI CALCULATION
Mining Waste Cleanup and Containment Project
May 16, 1994

Location: Ferndale Road to approximately 100 ft. above last bicycle bridge.

Total shocking length: ~600 ft. combining three sites.

Comments: Brook trout stocked in May, 1994. White sucker with lip tumor.

Species	# Caught	T Carnivore	Tolerant	Stenotherm
Brook trout	14*	14*	0	14*
Brook trout juv	44*	44*	0	44*
Creek chub	63	0	63	0
Common shiner	2	0	0	0
Stoneroller	32	0	0	0
S.Redbely dace	4	0	0	0
White sucker	25	0	25	0
Orangespt sf.	1	0	0	0
Green sunfish	7	0	7	0
Johnny darter	1	0	0	0
B. stickleback	2	0	0	2
Total	195* / 137	0	95	2

* includes stocked fish which are not included in the IBI.

1. Number of Intolerant Species: 0 Score = 0
2. Percent Tolerant individuals: 100 % Score = 0
3. Percent Carnivore Individuals: 0% Score = 0
4. Percent Stenothermal Cool/Coldwater Individuals: 1% Score = 0
5. Percent Salmonids that are Brook trout: 0% Score = 0

IBI Score (without stocked fish) = 0 Integrity Rating: 0 = Very Poor

(Lyons, John and Timothy D. Simonson, 1994 [Draft] An Index of Biotic Integrity for Coldwater Streams in Wisconsin)

Table 2: BREWERY CREEK COLDWATER IBI CALCULATION
Mining Waste Cleanup and Containment Project
October 14, 1994

Location: Ferndale Road to approximately 100 ft. above last bicycle bridge.

Shocking Length: ~700 ft. combining 5 sites.

Comments: Brook trout stocked in May, 1994. Creek chub with tumor.

Species	# Caught	T Carnivore	Tolerant	Stenotherm
Brook trout	13*	0	0	0
Y. bullhead	1	0	1	0
Stoneroller	35	0	0	0
Creek chub	376	0	376	0
Common shiner	59	0	0	0
White sucker	238	0	238	0
Green sunfish	1	0	1	0
Fantail darter	4	0	0	0
Johnny darter	2	0	0	0
Total	730* / 717	0	616	0

* includes stocked fish which are not included in the IBI.

1. Number of Intolerant Species: 0 Score = 0
2. Percent Tolerant individuals: 100% Score = 0
3. Percent Top Carnivore Individuals: 0% Score = 0
4. Percent Stenothermal Cool/Coldwater individuals: 0% Score = 0
5. Percent Salmonids that are Brook trout : 0% Score = 0

IBI Score (without stocked fish) = 0

Integrity Rating: 0 = Very Poor

(Lyons, John and Timothy D. Simonson, 1994 [Draft] An Index of Biotic Integrity for Coldwater Streams in Wisconsin)

Brewery Creek

1994 Macroinvertebrate Data

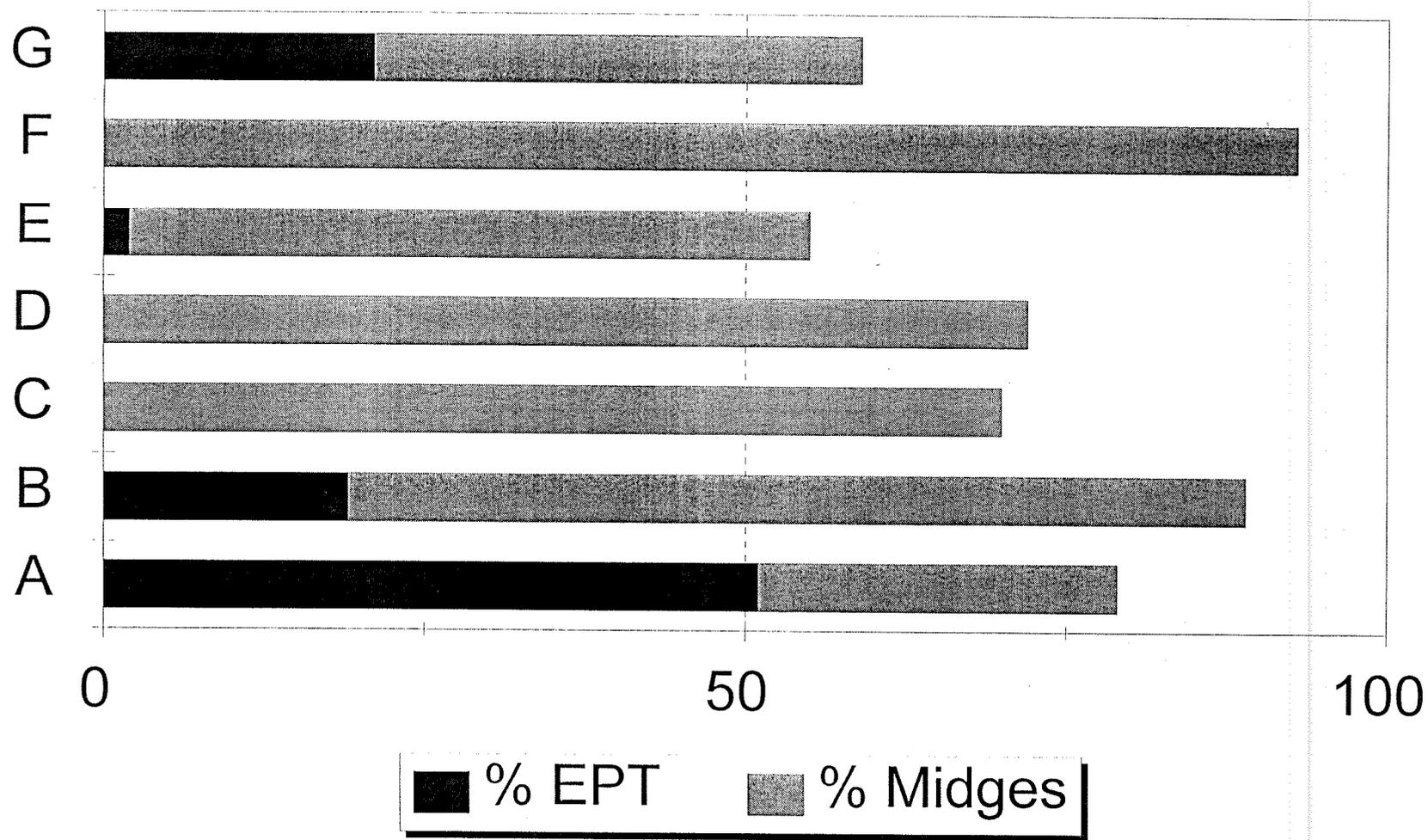
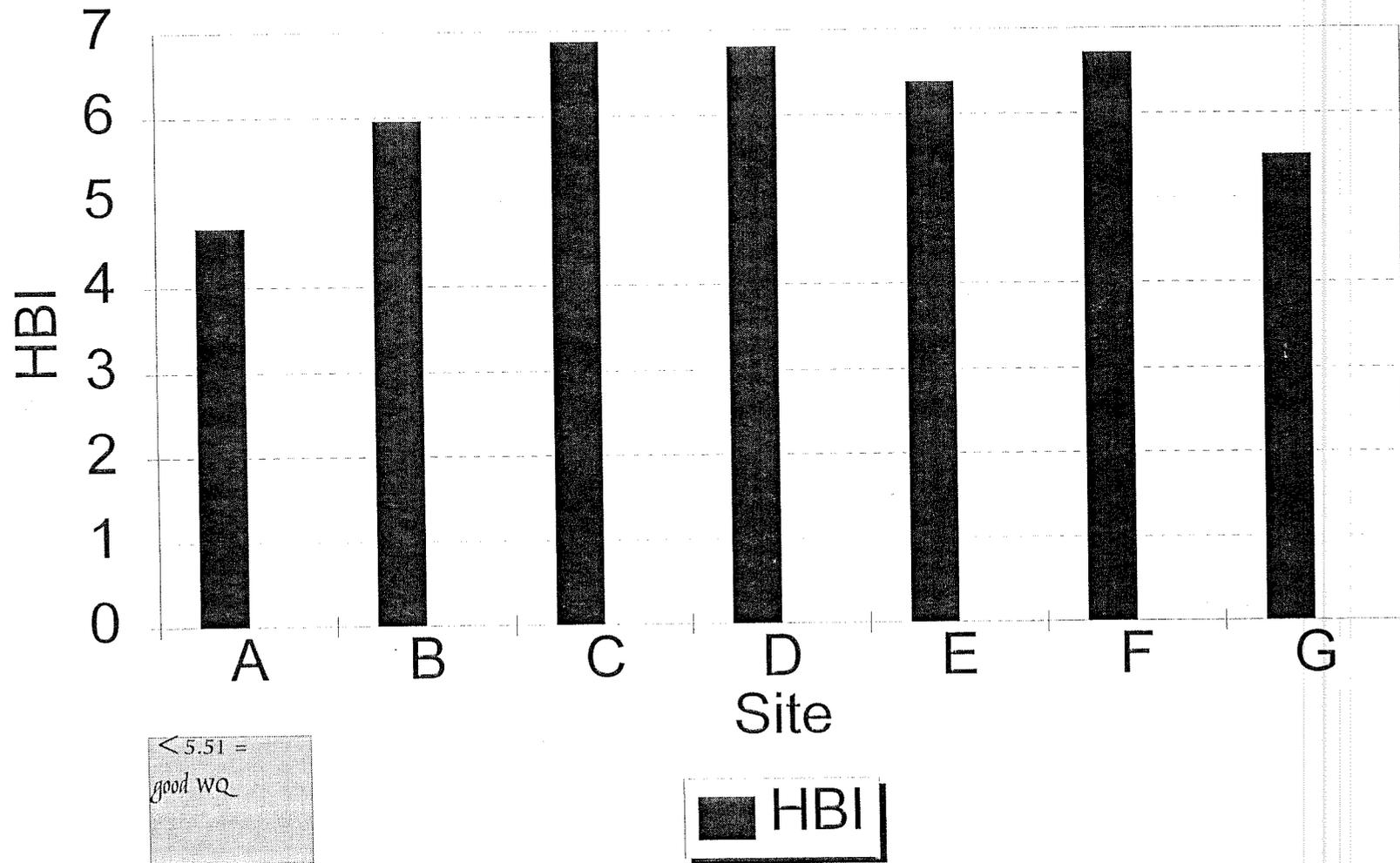


Figure 3: 1994 Macroinvertebrate Data

Brewery Creek

1994 Macroinvertebrate Data



Approximate distance (Miles) from WWTP: A (-.4), B (-.2), C (.4), D (.7), E (1.0), F (1.6), G (2.3)

Table 3: Summaries of Brewery Creek Baseflow data above the WWTP and June, 1995 stream temperature data.

Date	Flow (cfs)	Source
June 2, 1972	1.93	USGS
August 10, 1972	1.53	USGS
July 31, 1973	4.83	USGS
October 9, 1975	2.75	USGS
July 27, 1976	1.35	USGS
September 14, 1976	1.06	USGS
June 23, 1977	0.83	USGS
September 5, 1989	1.7	Dames & Moore
October 30, 1989	3.2	Dames & Moore
November 8, 1994	4.02	WDNR
November 11, 1994	4.23	WDNR
November 15, 1994	3.79	WDNR

Location	Temperature (°C)	D. O. (mg/l)
Site A	25	6.3
WWTP	31.7	9.2
Site D	28.6	7.4
Gordon Creek	19.7	9.0

Stream Brewery Reach Location WWTP to Rock Branch Reach Score/Rating 190 / FAIR
 County Iowa Date Jan, 1996 Evaluator Marshall Classification FFF

Rating Item	Category			
	Excellent	Good	Fair	Poor
Watershed Erosion	No evidence of significant erosion. Stable forest or grass land. Little potential for future erosion. 8	Some erosion evident. No significant "raw" areas. Good land mgmt. practices in area. Low potential for significant erosion. 10	Moderate erosion evident. Erosion from heavy storm events obvious. Some "raw" areas. Potential for significant erosion. 14	Heavy erosion evident. Probable erosion from any run off. 16
Watershed Nonpoint Source	No evidence of significant source. Little potential for future problem. 8	Some potential sources (roads, urban area, farm fields). 10	Moderate sources (small wetlands, tile fields, urban area, intense agriculture). 14	Obvious sources (major wetland drainage, high use urban or industrial area, feed lots, impoundment). 16
Bank Erosion, Failure	No evidence of significant erosion or bank failure. Little potential for future problem. 4	Infrequent, small areas, mostly healed over. Some potential in extreme floods. 8	Moderate frequency and size. Some "raw" spots. Erosion potential during high flow. 16	Many eroded areas. "Raw" areas frequent along straight sections and bends. 20
Bank Vegetative Protection	90% plant density. Diverse trees, shrubs, grass. Plants healthy with apparently good root system. 6	70-90% density. Fewer plant species. A few barren or thin areas. Vegetation appears generally healthy. 9	50-70% density. Dominated by grass, sparse trees and shrubs. Plant types and conditions suggest poorer soil binding. 15	<50% density. Many raw areas. Thin grass, few if any trees and shrubs. 18
Lower Bank Channel Capacity	Ample for present peak flow plus some increase. Peak flow contained. W/D ratio <7. 8	Adequate. Overbank flows rare. W/D ratio 8-15. 10	Barely contains present peaks. Occasional overbank flow. W/D ratio 15-25. 14	Inadequate, overbank flow common. W/D ratio >25. 16
Lower Bank Deposition	Little or no enlargement of channel or point bars. 6	Some new increase in bar formation, mostly from coarse gravel. 9	Moderate deposition of new gravel and coarse sand on old and some new bars. 15	Heavy deposits of fine material, increased bar development. 18
Bottom Scouring and Deposition	Less than 5% of the bottom affected by scouring and deposition. 4	5-30% affected. Scour at constrictions and where grades steepen. Some deposition in pools. 8	30-50% affected. Deposits and scour at obstructions, constrictions and bends. Some filling of pools. 16	More than 50% of the bottom changing nearly year long. Pools almost absent due to deposition. 20
Bottom Substrate/ Available Cover	Greater than 50% rubble, gravel or other stable habitat. (2)	30-50% rubble, gravel or other stable habitat. Adequate habitat. 7	10-30% rubble, gravel or other stable habitat. Habitat availability less than desirable. 17	Less than 10% rubble gravel or other stable habitat. Lack of habitat is obvious. 22
Avg. Depth Riffles and Runs	Cold >1' 0 Warm >1.5' 0	6" to 1' 6 10" to 1.5' 6	3" to 6" 18 6" to 10" 18	<3" 24 <6" 24
Avg. Depth of Pools	Cold >4' 0 Warm >5' 0	3' to 4' 6 4' to 5' 6	2' to 3' 18 3' to 4' 18	<2' 24 <3' 24
Flow, at Rep. Low Flow	Cold >2 cfs 0 Warm >5 cfs 0	1-2 cfs 6 2-5 cfs 6	.5-1 cfs 18 1-2 cfs 18	<.5 cfs 24 <1 cfs 24
Pool/Riffle, Run/Bend Ratio (distance between riffles ÷ stream width)	5-7. Variety of habitat. Deep riffles and pools. 4	7-15. Adequate depth in pools and riffles. Bends provide habitat. 8	15-25. Occasional riffle or bend. Bottom contours provide some habitat. 16	>25. Essentially a straight stream. Generally all flat water or shallow riffle. Poor habitat. 20
Aesthetics	Wilderness characteristics, outstanding natural beauty. Usually wooded or un-pastured corridor. 8	High natural beauty. Trees, historic site. Some development may be visible. 10	Common setting, not offensive. Developed but uncluttered area. 14	Stream does not enhance aesthetics. Condition of stream is offensive. 16

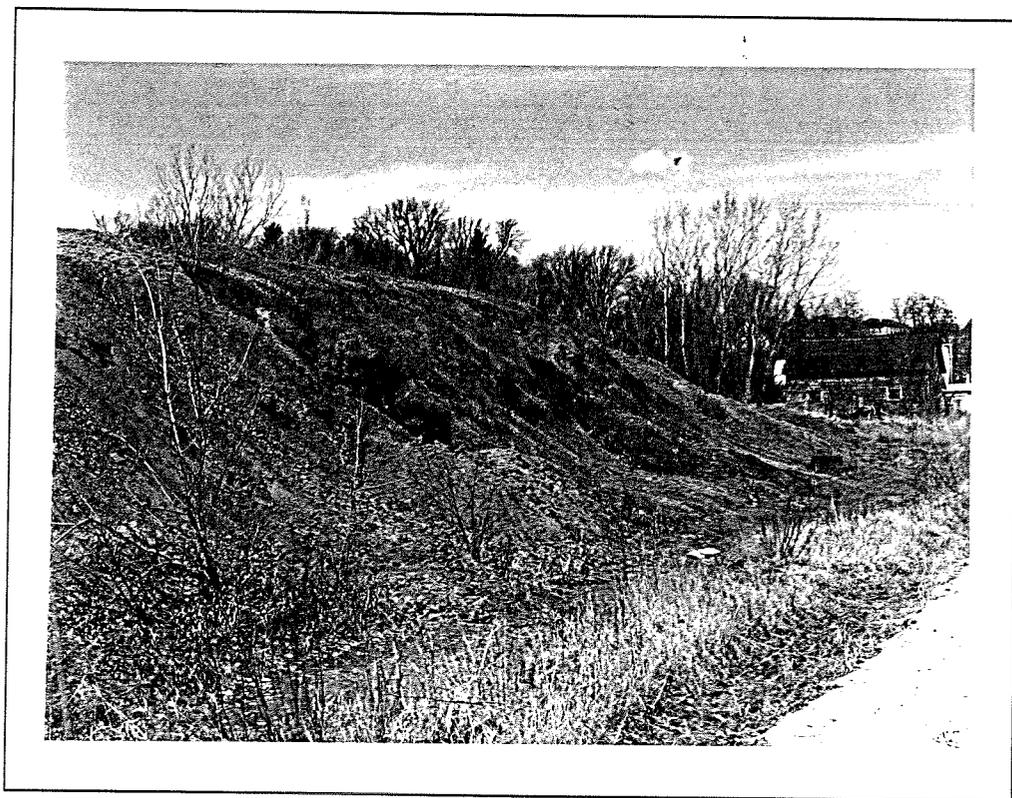
Column Totals: 2 188

Column Scores E 2 +G +F 188 +P = 190 = Score

<70 = Excellent, 71-129 = Good, 130-200 = Fair, >200 = Poor

0

Brewery Creek Water Quality Before and After a Mining Waste Cleanup Project at Mineral Point, Wisconsin



eroding roaster pile prior to remediation

Wisconsin Department of Natural Resources
Southern District Water Resources Management
Prepared by Dave Marshall and Steve Fix

December, 1995

SUMMARY

For over sixty years, abandoned mining wastes have severely polluted Brewery Creek in Mineral Point, Wisconsin. For decades, precipitation reacted with ferric sulfide in five roaster piles to form sulfuric acid, which leached heavy metals into the stream. The stream was considered "biologically dead" due to toxic metals and smothering effect of ferric hydroxide precipitate. The stream was choked by the rust colored flocculant, which covered the substrate and filled the water column. Only low numbers of the most tolerant migrating fish and drifting invertebrates could be found within the contaminated zone.

In 1992-93, four roaster piles were moved to a central containment area which was capped and vegetated. The stream was then re-routed away from the disposal site. Overall, Brewery Creek responded well to the treatment. In 1994-95, water column metals concentrations decreased by approximately 80% and the stream is no longer rust colored. Diversity and abundance of fish and invertebrate populations increased significantly, however most of the recolonizing fauna are pollution tolerant. While some of the water column metals have decreased an order of magnitude, toxic zinc concentrations persist and prevent colonization of more sensitive species. Groundwater seepage is the primary source of metals and toxic zinc levels in the stream. Time will tell whether or not the groundwater source of metals will decrease and if the stream continues to respond to the treatment.

Compared to an extensive statewide water quality monitoring data base, Brewery Creek also contains relatively high lead and zinc concentrations above the former roaster piles and project area. Although the upstream metals concentrations are not toxic, the high levels reflect diffuse mineral deposits and mining wastes throughout the watershed. High background metals, coupled with contaminated groundwater seepage within the project area, suggest that the stream will not be restored to pre-settlement conditions.

INTRODUCTION

Brewery Creek was the site of a major mining waste containment project in 1992-93. The site is located within the Upper Mississippi Lead-Zinc District, which encompasses southwest Wisconsin and parts of Illinois and Iowa. Southwestern Wisconsin has a rich mining history beginning with modest native American diggings, followed by "badger" immigrants from Germany, Norway and the British Isles. Mines within the hills and valleys of this dolomitic unglaciated area were a major lead source for the United States between 1827 and 1847, while zinc production peaked by 1904.

While the mining communities provided an interesting chapter of European settlement history, the actual mining operations left a legacy of water pollution in many southwest Wisconsin streams. Brewery Creek, in Mineral Point, Wisconsin, was one of the most severely degraded. When the Great Depression delivered a major blow to the zinc mining industry, the Mineral Point Mining Company had to shut down operations and abandoned five roaster piles next to the creek. For the next sixty years, the toxic nature of the roaster piles prevented vegetation growth and created a moonscape appearance to an otherwise fertile valley.

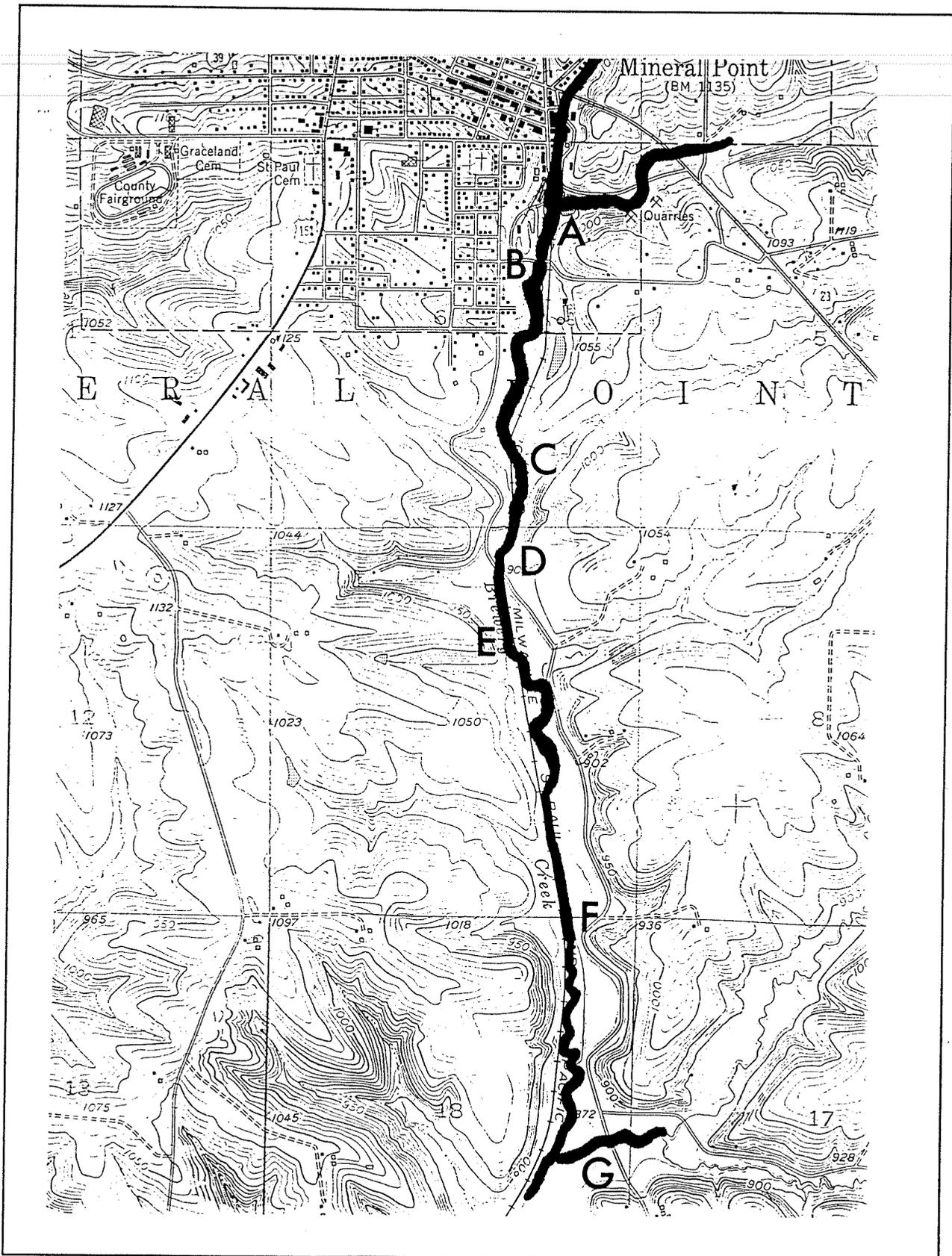
For years, acidic erosion of the roaster tailings leached heavy metals into the stream. During dry conditions, groundwater reacted with iron sulfides to yield sulfuric acid. Following rainfall and snowmelt, both physical erosion and increased acid leaching created extremely toxic conditions. The leachate gave Brewery Creek the characteristic bright orange color common to streams affected by mining wastes. Sulfuric acid runoff and toxic metals prevented growth of all but a few fish and aquatic insects. The toxicity problem was compounded with the smothering effect of ferric hydroxide precipitate on benthic organisms and fish gills. Due to the combination of these factors, the affected stream area was considered "biologically dead" prior to rehabilitation.

In an effort to restore the stream and reduce the toxic effects of the roaster piles, the site was approved for funding under the State Environmental Repair Fund. At a total cost of about \$900,000, around 180,000 cubic yards of roaster and floatation wastes were moved to a central containment area which was capped with clay. The stream was re-routed away from the containment site and the entire project area was graded and seeded with native grasses and forbs. More detailed summaries of the project have been described in articles and technical reports.

STREAM DESCRIPTION

Length: 5 miles, Gradient: 46 ft./mile, USGS estimated Q7, 10: 0.68 cfs. Brewery Creek is a small spring-fed stream that arises northeast of Mineral Point and flows

Figure 1: Brewery Creek Monitoring Stations



southwest to the Mineral Point Branch of the Pecos River. Upstream of the remediation site, the stream exhibits fair water quality and supports at least ten warm water fish species. Below the roaster piles, the stream has been classified Limited Aquatic Life (LAL) because the stream has exhibited very poor water quality for many years. Compared to the mining wastes, stream habitat has not been a serious limiting factor for fish and invertebrate populations. High metals concentrations have been the primary concern even though parts of the stream had been ditched for railroad construction years ago. Brewery Creek is a hard water alkaline stream with mean hardness values around 400 mg/l. High water hardness is a key factor reducing metals toxicity in the stream. The high gradient nature of the stream has prevented significant sludge and sediment from depositing on the predominantly gravel, boulder and bedrock substrate.

METHODS

Water Column Samples: Dissolved oxygen and temperature were measured with a YSI Model 57 or 58 meter. The meters were air calibrated and adjusted to the barometric pressure before each sampling run. Water samples were collected and analyzed at the State Laboratory of Hygiene. The Student's *t*-test was used to determine differences between data sets, consisting of pre and post remediation metals (Cd, Cu, Fe, Pb, Zn) concentrations. Pre-remediation data set was collected in 1975, 1979, 1989 and 1992. Post-remediation monitoring was conducted in 1994-95.

Precipitate analysis: Prior to the rehabilitation project (1992), an effort was made to characterize the precipitate coating stream substrates. Below the roaster piles, submersed parts of overhanging grasses were completely covered by the precipitate. The effort involved an unusual sampling and leaching process. The grasses were clipped and placed into ziplock bags using stainless steel forceps and scissors. In the lab, each bag was initially weighed, 250ml 0.5% HNO₃ added and allowed to leach for 24 hours. The liquid was poured off into clean 250ml metals bottles. As much of the vegetation plus excess liquid were removed from each bag. The weight of the empty bag was subtracted from the initial weight of the bag plus vegetation. Aliquots of the liquid leachates were digested and analyzed for metals.

Macroinvertebrates: Spring benthic macroinvertebrates were collected before and after the rehabilitation project. Samples were collected with a d-frame net and shipped to UW-Stevens Point for sorting and identification. Sample analysis included the Hilsenhoff Biotic Index (HBI), % Ephemeroptera, Plecoptera, Trichoptera (EPT) individuals, % Chironomidae individuals and total species numbers. Macroinvertebrate samples were collected in 1979, 1987, 1989, 1992 and 1994.

Electrofishing: A 12 volt battery powered AbP-3 shocker was used to collect fish which were identified and enumerated in the field before and after the rehabilitation project. Fish were sampled along 100 meter stations in 1989, 1992 and 1994.

WATER CHEMISTRY RESULTS

Several water quality investigations were conducted on Brewery Creek beginning in the mid-1970's. Very high concentrations of zinc, iron and other metals were measured during lowflow conditions in 1975, '79, '89 and '92. In 1979 and 1989, a few runoff events were sampled and even higher concentrations were revealed. Runoff events increased the rates of both physical erosion and leaching, as runoff water reacted with iron sulfides to form sulfuric acid. Zinc concentrations have been the greatest concern since levels measured in the stream were frequently an order of magnitude greater than the NR 105 acute toxicity criteria. Dissolved oxygen and conventional pollutants have been tested frequently as well, but none have indicated serious organic pollution. High gradient and high reaeration potential of the stream are also factors reducing potential impacts of conventional pollution.

Upstream of the roaster piles, the stream exhibits fairly normal characteristics and clear water during lowflow conditions. At no time during the last 20 years did the stream appear orange or become coated with iron precipitate. As expected, metals and conductivity levels were significantly lower above the roaster piles.

Prior to the rehabilitation, the upstream site appeared pristine compared to the polluted section of stream, although clearly not pure. Metals are leached from diffuse mining waste sites and mineral deposits throughout the watershed, raising concentrations higher than most streams in the state. Background conductivity levels in Brewery Creek are high and reflect relatively high metals concentrations. Mean conductivity values in Brewery Creek above the roaster piles and other Iowa County streams are 735 and 567 umhos/cm respectively. Fortunately, Brewery Creek is also a hard water stream. Metals concentrations above the roaster piles would be chronically toxic in otherwise soft water systems. Figure 2 compares zinc and lead at Site A to average concentrations of these parameters statewide.

Site B was located below a single roaster pile, at the Jackson Street bridge. Prior to roaster pile removal, copper, cadmium, iron and zinc concentrations were significantly higher than upstream levels. Zinc was an order of magnitude higher than at the reference site and concentrations exceeded acute toxicity criteria. Comparing metals concentrations at Site B before and after the roaster pile was removed, copper, cadmium, iron and zinc decreased significantly while lead concentrations were fairly constant. Zinc concentrations displayed the greatest change, however water sampling in 1994 and 1995 revealed that levels still exceed NR 105 chronic toxicity criteria.

Site D is located below the last roaster pile and final mining waste containment site. Metals at Site D were significantly higher than both Sites A and B. Over the years, Site D has displayed the worst water quality since all five roaster piles affected the stream at this location. In addition to acutely toxic zinc, cadmium levels also

exceeded chronic toxicity criteria before the project was completed.

Consistent with Site B, four of the five test metals tested at Site D decreased significantly following the stream rehabilitation. Again, lead was the exception and showed no significant change. Cadmium levels are no longer toxic and mean zinc concentrations decreased from 3600 ug/l to 695 ug/l. Currently, zinc concentrations remain acutely toxic since the mean zinc concentration is substantially higher than the acute toxic criteria value of 334 ug/l (based on 400 mg/l hardness). While water column concentrations have decreased by approximately 80%, groundwater seepage is contributing leached metals within the treatment zone.

Event monitoring, performed in 1979 and '89, demonstrated that zinc concentrations increased significantly while hardness and pH levels decreased. Lower hardness coinciding with higher metals contributes to higher overall toxicity. Due to lack of time and funding, no effort was made to characterize water quality during runoff events after mining wastes were contained. Since the roaster piles have now been consolidated and stabilized, significant runoff sources of metals are unlikely. Figures 3-7 report water column metals concentrations before and after the project completion.

PRECIPITATE ON OVERHANGING VEGETATION

In 1992, stream substrates and overhanging vegetation below roaster piles were coated with the characteristic orange precipitate. We harvested grass blades (mostly canary reed grass) submersed in the stream to estimate concentrations of heavy metals coating the plants. Due to the leaching process described in the Methods section, we do not know the relative metals concentrations of precipitate versus plant tissues. Since the highest metals concentrations were found below the roaster piles, the results suggest that the precipitate did contain significant amounts of various heavy metals. Higher than expected levels of lead and other metals were found at the reference site and indicate that plant tissues also contributed to the overall metals concentrations. Due to time constraints and limited monitoring funds, we did not repeat this effort in 1994. Figures 8-10 illustrate metals concentrations between four sampling stations in 1992.

MACROINVERTEBRATE RESULTS

Figures 11-19 display macroinvertebrate data based on % EPT vs. % Chironomidae, HBI, and total species numbers. Figures 11 and 12 represent reference site (A) macroinvertebrate data. The upstream site displayed not only the best water quality of all the sites sampled, but also better water quality in 1994 compared to 1979, 1987, 1989 and 1992. In 1994, we found the lowest HBI value (indicating best water quality), the highest percentage of Ephemeroptera and Tricoptera (EPT) and largest number of species.

Even though macroinvertebrates at Site A suggested that background conditions improved in 1994, downstream sites improved more significantly after the project was completed. Figures 13-15 display post rehabilitation water quality improvements at all sampling stations below the former roaster piles. At site B, all three macroinvertebrate metrics indicated improved water quality. At station D (Ferndale Road), no macroinvertebrates were found in 1992 while 16 species were found in 1994.

Comparing all sampling stations in 1994 (Figures 16-18), the best water quality was found at the two reference sites (A and G) while downstream sites are still affected by heavy metals leaching into the stream. Low mayfly and caddisfly numbers, as well as overall low diversity, reflect persistent zinc toxicity within the affected area. At Site D, Orthocladinae midges are the only insects thriving under the toxic conditions. Armitage (1980), Winner et al, (1980), Chadwick (1985) and Clements et al, (1988) have documented Orthocladinae tolerance of high metals concentrations in other natural and experimental streams.

FISHERIES DATA

Upstream of the roaster piles, Brewery Creek supports at least ten warm water species, based on the Wisconsin Fish Distribution Survey (1976). Most of the fish are pollution tolerant and are commonly found in southwest Wisconsin streams. Site A is located approximately .5 miles below the 1976 survey site. Compared to the 1976 survey, lower species numbers were found at Site A in 1992 and 1994 and may reflect habitat differences between the two upstream sites.

Prior to the rehabilitation, total numbers of individuals and species were extremely low below the roaster piles. Creek chub was one of just a few species found and appears to be fairly tolerant of mining waste pollution. In 1992, only seven creek chubs were collected at Site D and all of the fish were discolored or carried lesions. In addition to the creek chubs, a single southern redbelly dace was also found at Site D and six white suckers were collected at Site B.

Consistent with other biological and chemical parameters, fish responded favorably to reduced metals concentrations and ferric hydroxide precipitate in the stream. Following the remediation, total numbers increased significantly and the fish appeared to be healthier. Combining Sites B and D, nine species were collected in 1994 compared to three in 1992. Species numbers also increased at Site A in 1994 and may reflect natural variability and migrating populations now that the most of the toxic barrier has been removed. More fish sampling is requiring to better characterize fish populations in the stream and determine long term responses to the rehabilitation efforts.

CONCLUSIONS

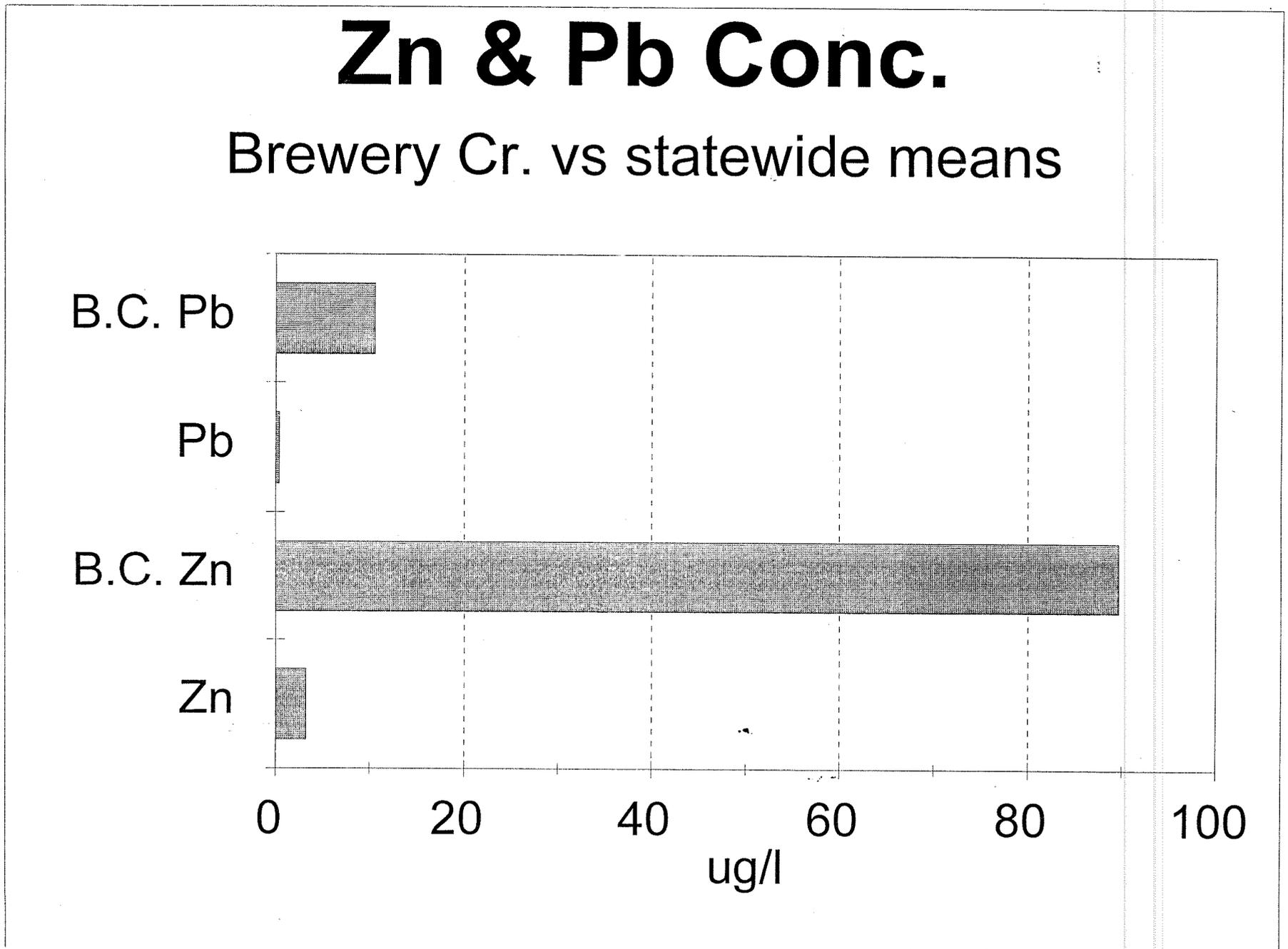
The mining waste containment - stream rehabilitation project was effective at converting a "biologically dead" stream into one that will support tolerant fish and invertebrate populations. For decades, Brewery Creek was little more rust colored soup, barely supporting the most tolerant insects that drifted into the toxic zone. With only a few remaining orange seeps as reminders of the long-term toxicity, the stream now flows clear over rocks that were previously hidden within the cloudy water.

Approximately 80% of water column metals have been removed within the first two years after the project. Yet groundwater seepage is contributing toxic levels of zinc to the stream. Long term monitoring will be necessary to determine if the containment site will remain effective and if the stream continues to respond to the treatment.

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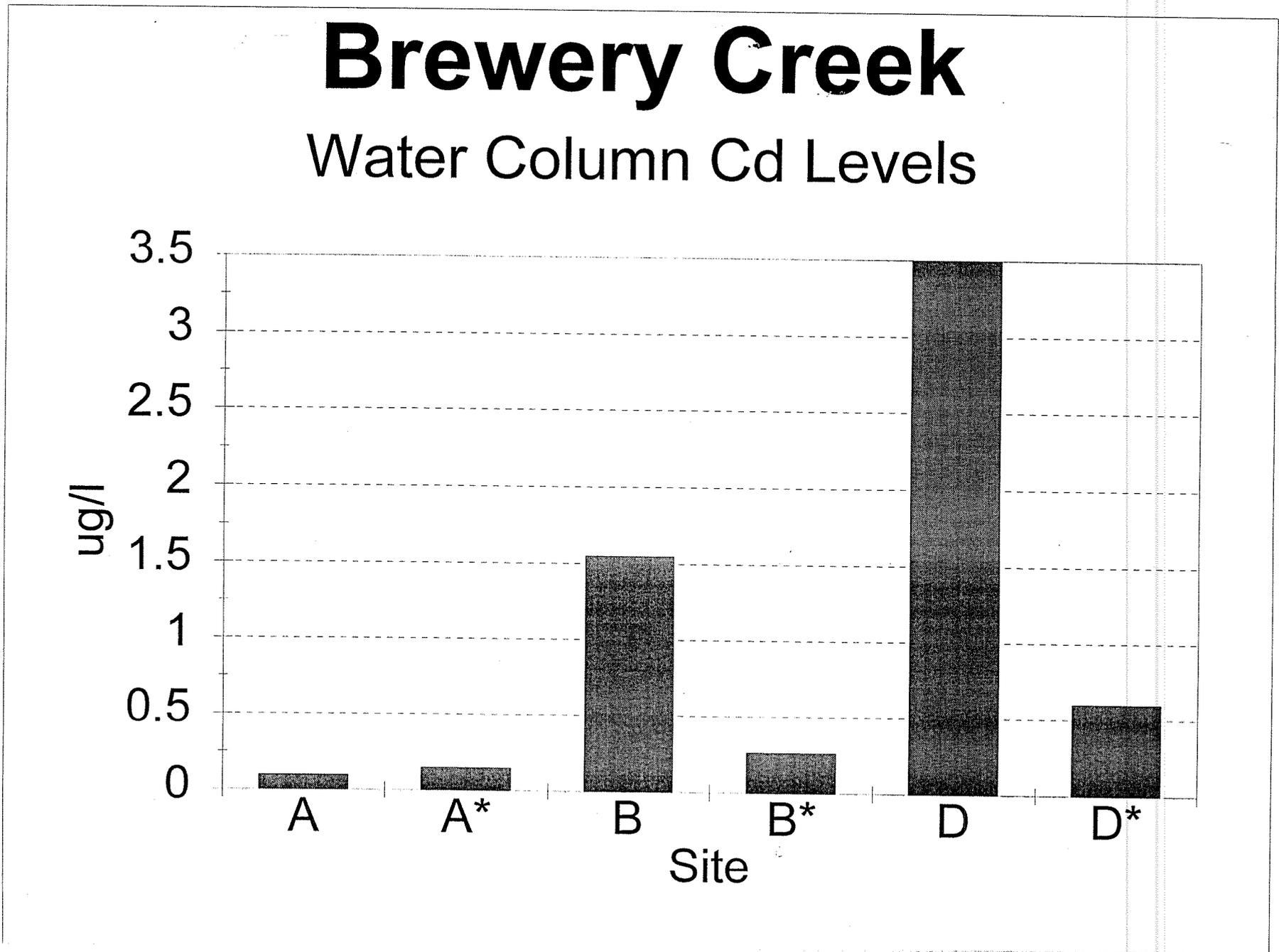
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Figure 2: Brewery Creek Zn & Pb vs statewide mean conc.



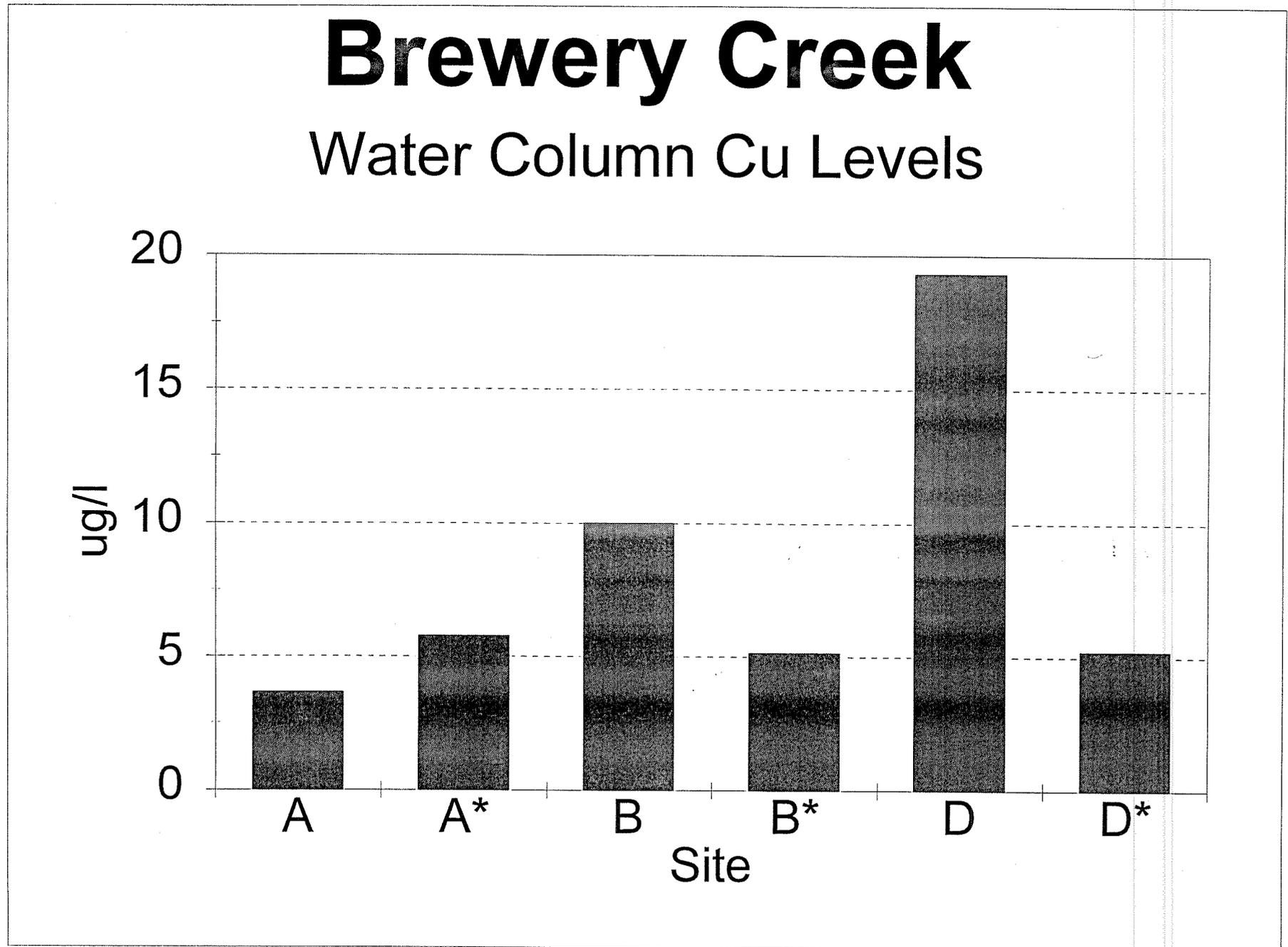
B. C. = Brewery Creek above roaster piles

Figure 3: Brewery Creek Cd concentrations



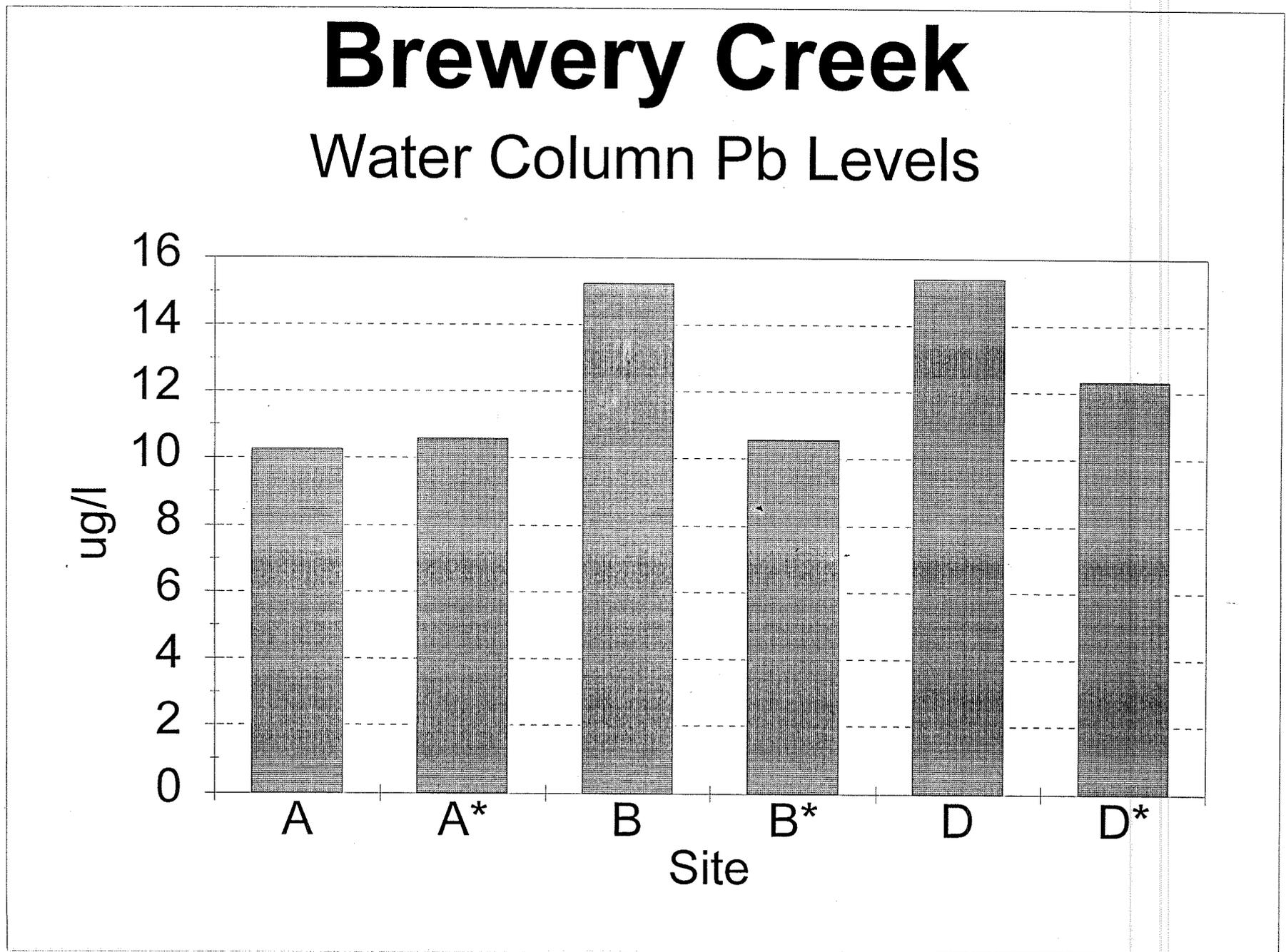
*= post rehabilitation concentrations

Figure 4: Brewery Creek Cu concentrations



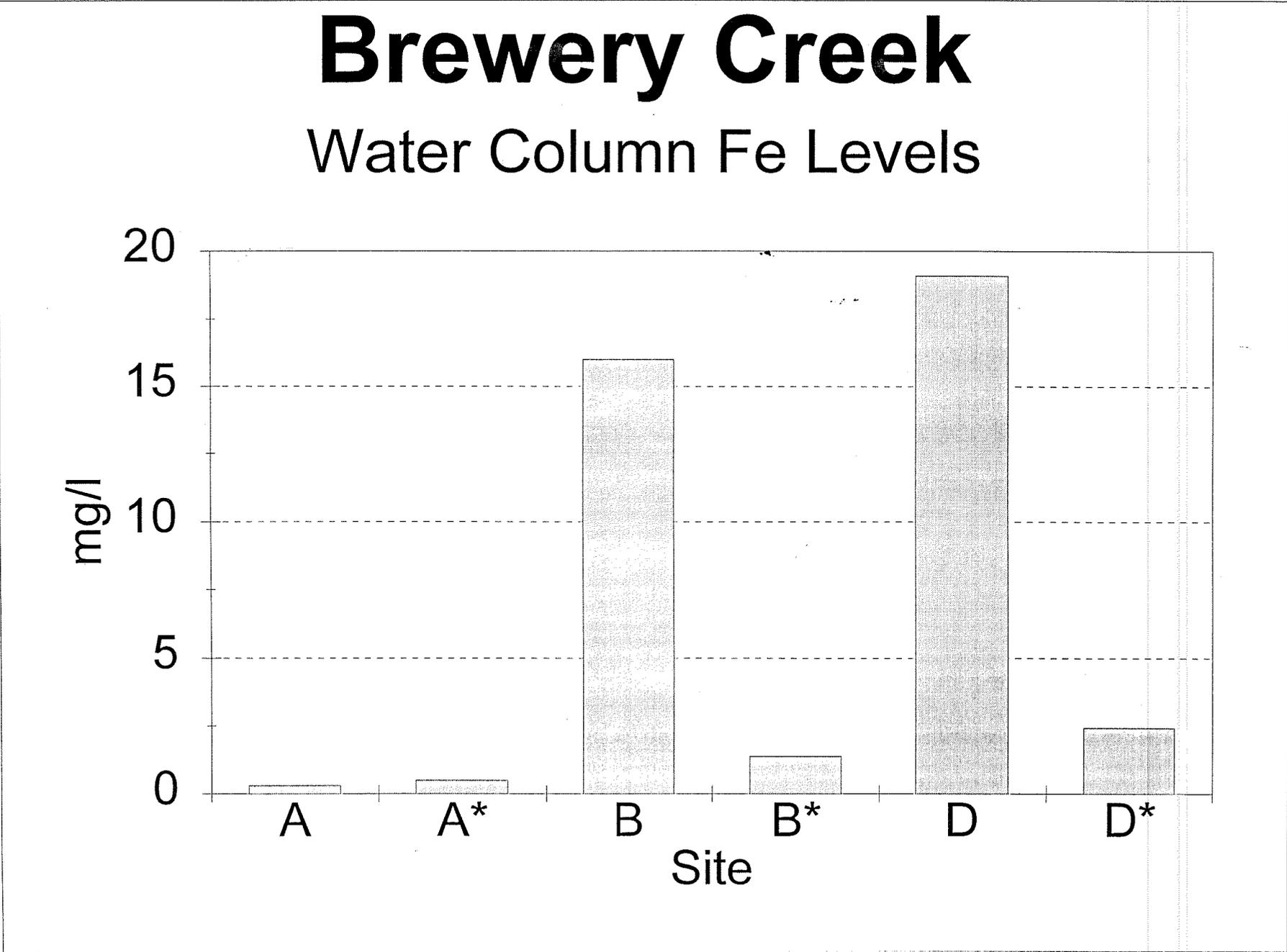
*= post rehabilitation concentrations

Figure 5: Brewery Creek Pb concentrations



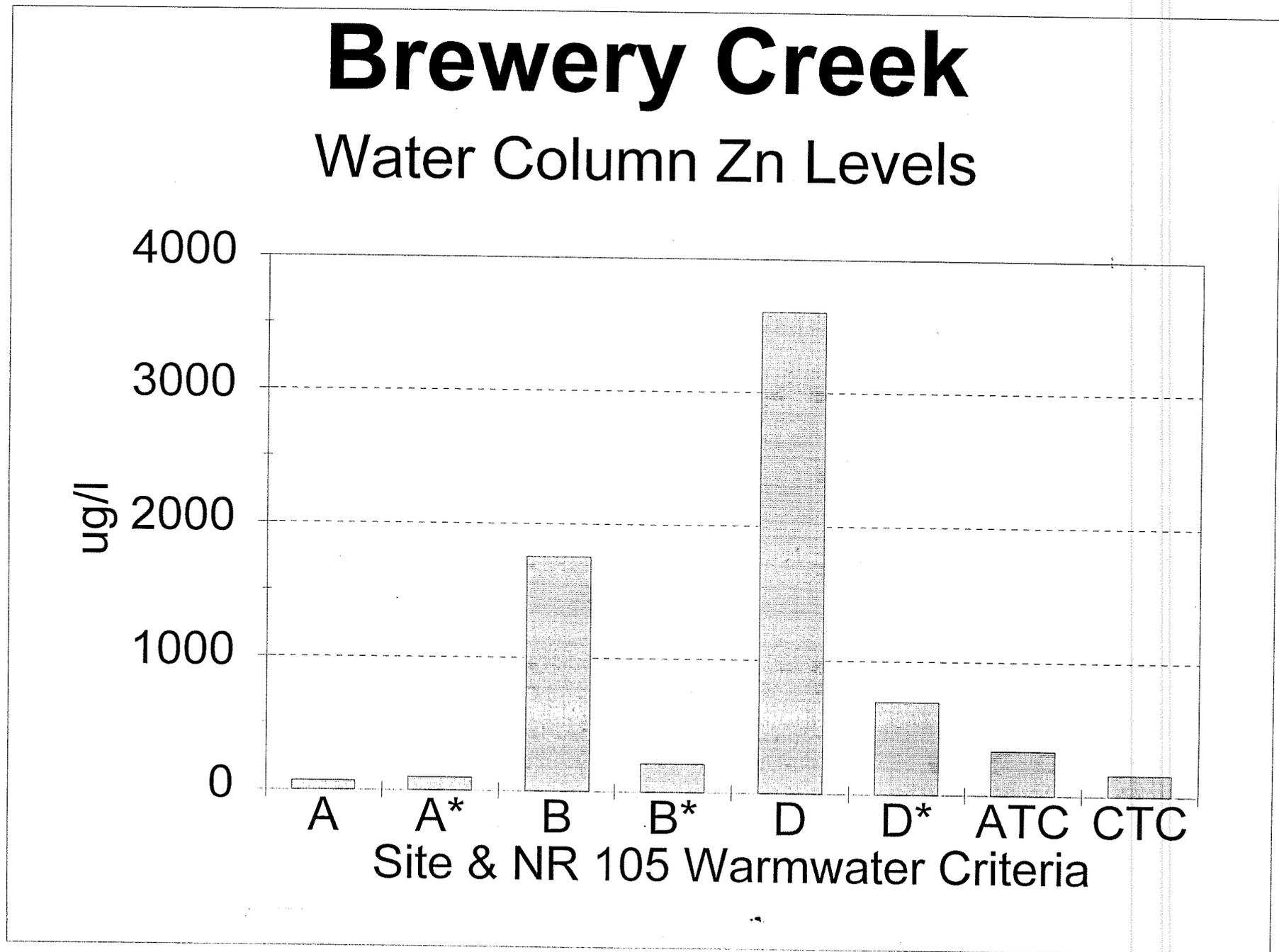
* = post rehabilitation concentrations

Figure 6: Brewery Creek Fe concentrations



*= post rehabilitation concentrations

Figure 7: Brewery Creek Zn Conc. vs Criteria



*= post-rehabilitation, ATC=acute, CTC=chronic

Figure 8: Precipitate on Overhanging Vegetation, 1992

Brewery Creek Precipitate Analysis

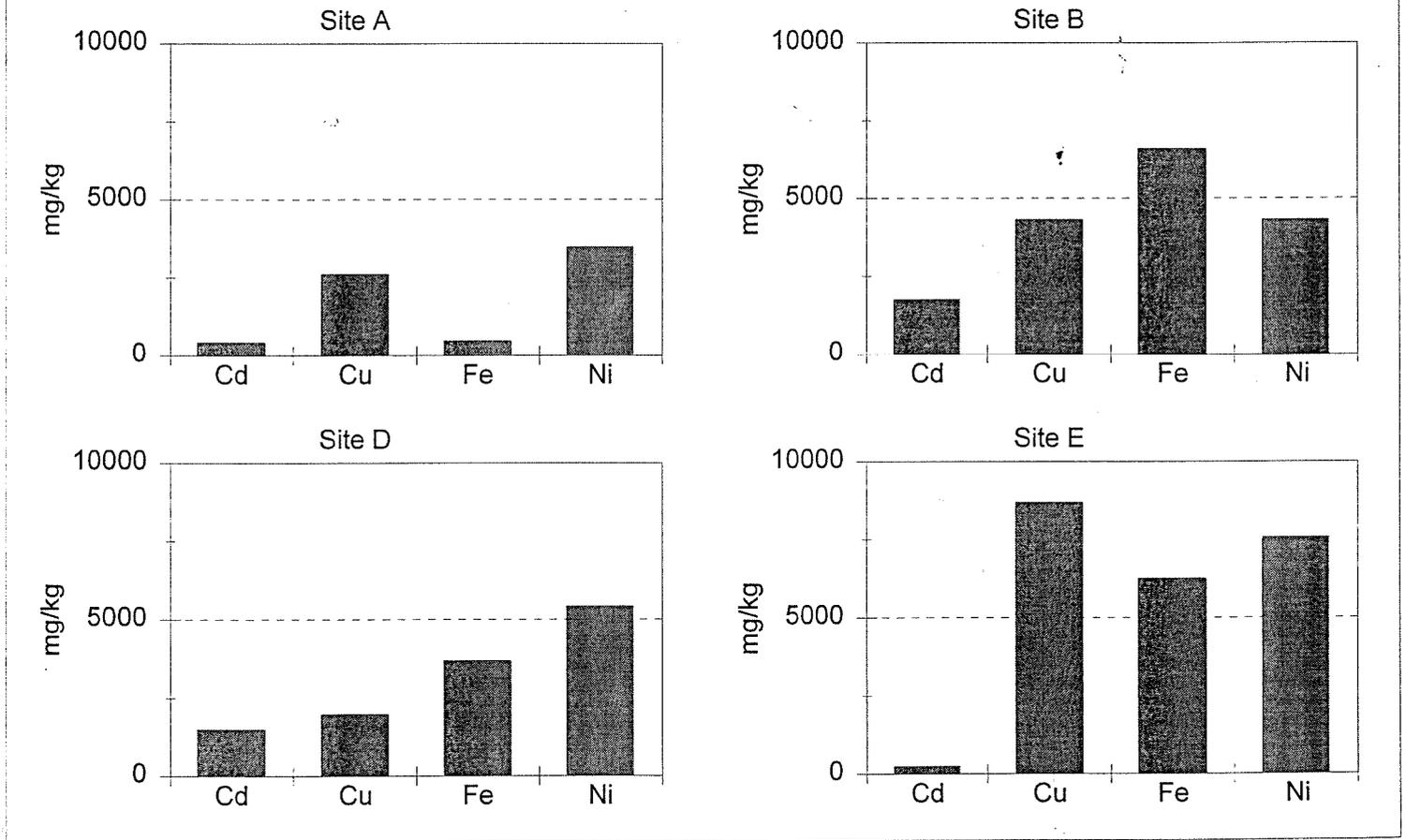


Figure 9: 1992 Pb concentrations in ferric hydroxide precipitate

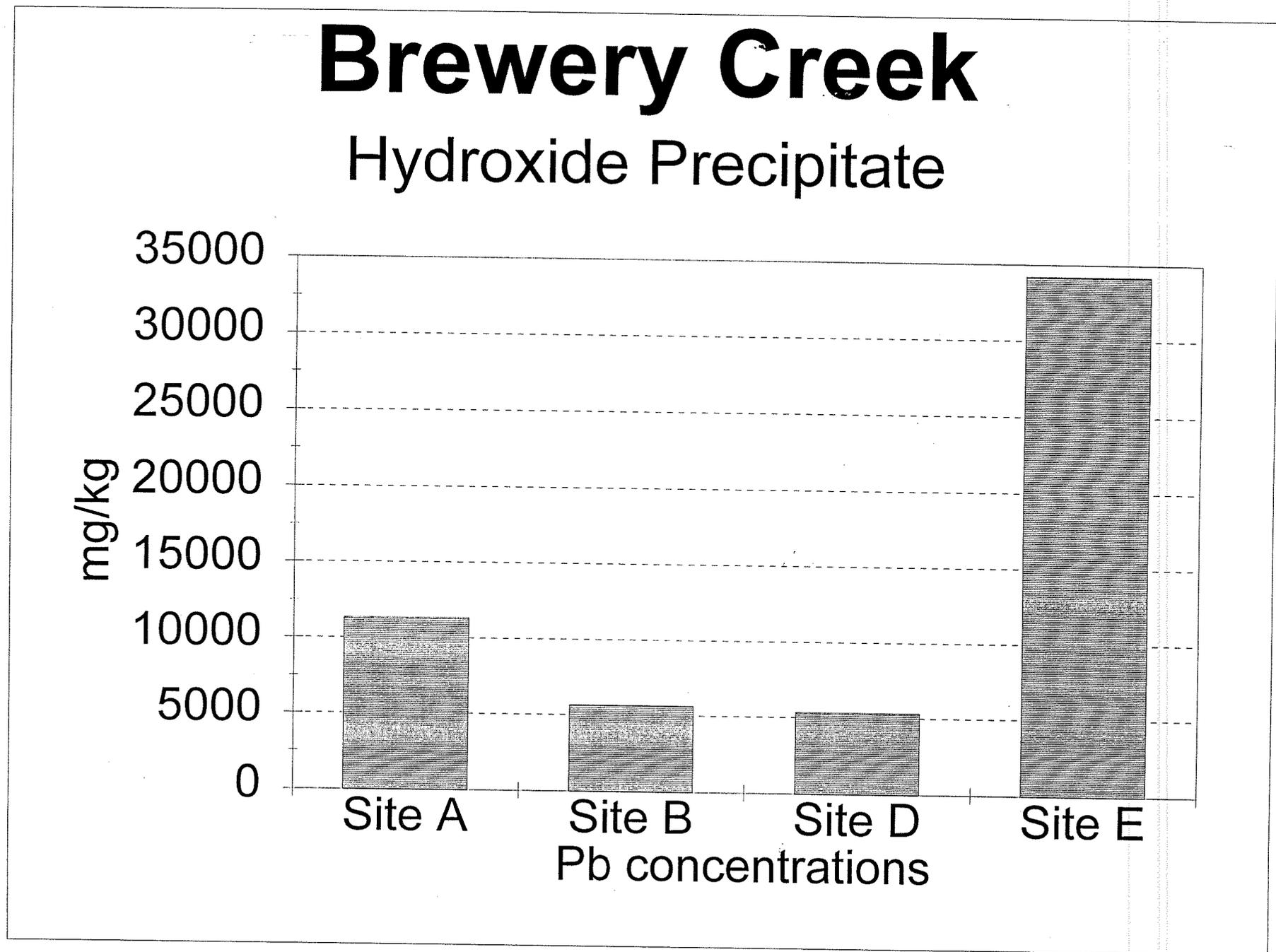


Figure 10: 1992 Zn concentrations in ferric hydroxide precipitate

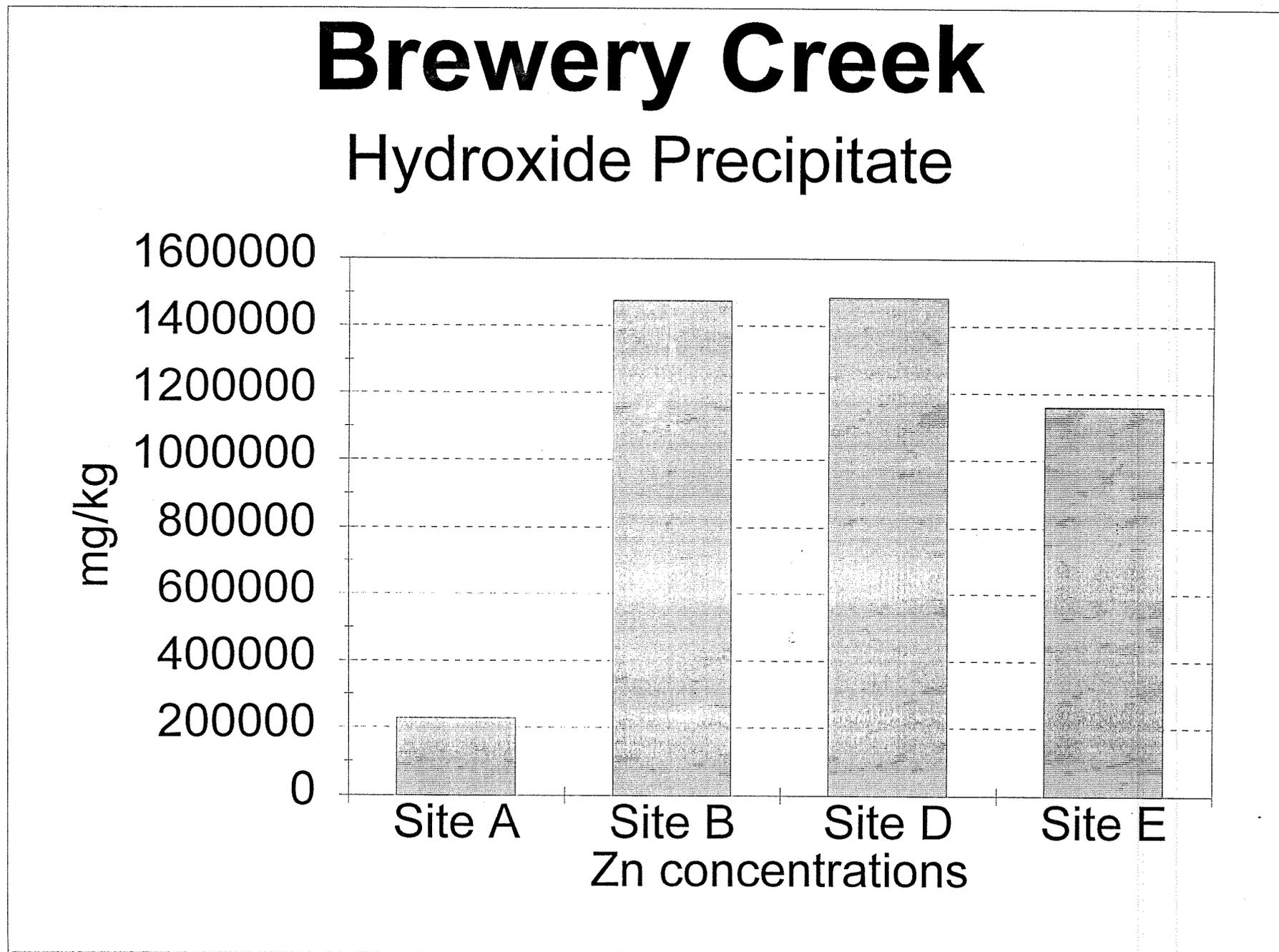


Figure 11: Site A Macroinvertebrate Data

Brewery Creek

Site A Macroinvertebrates

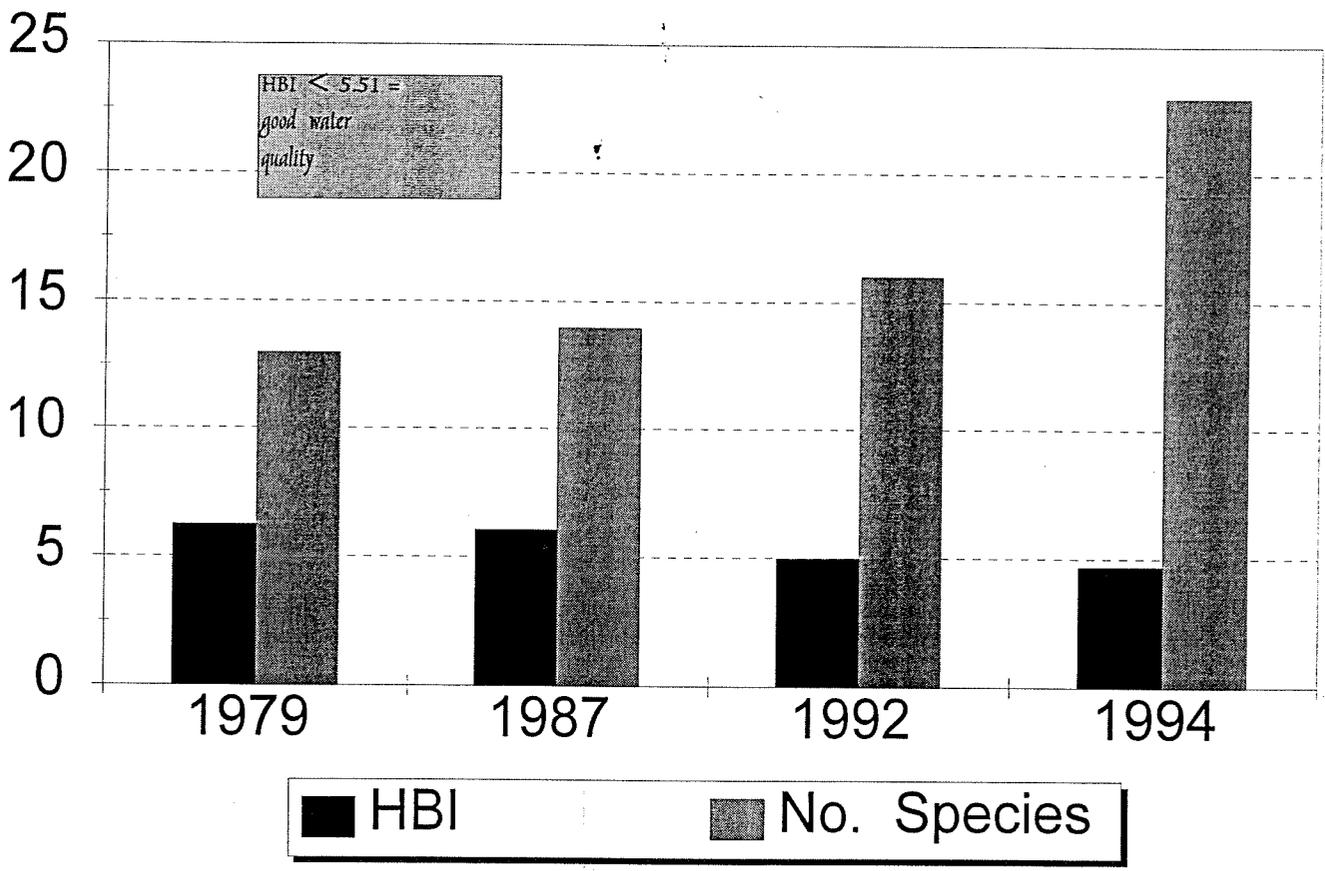


Figure 12: Site A Macroinvertebrate Data

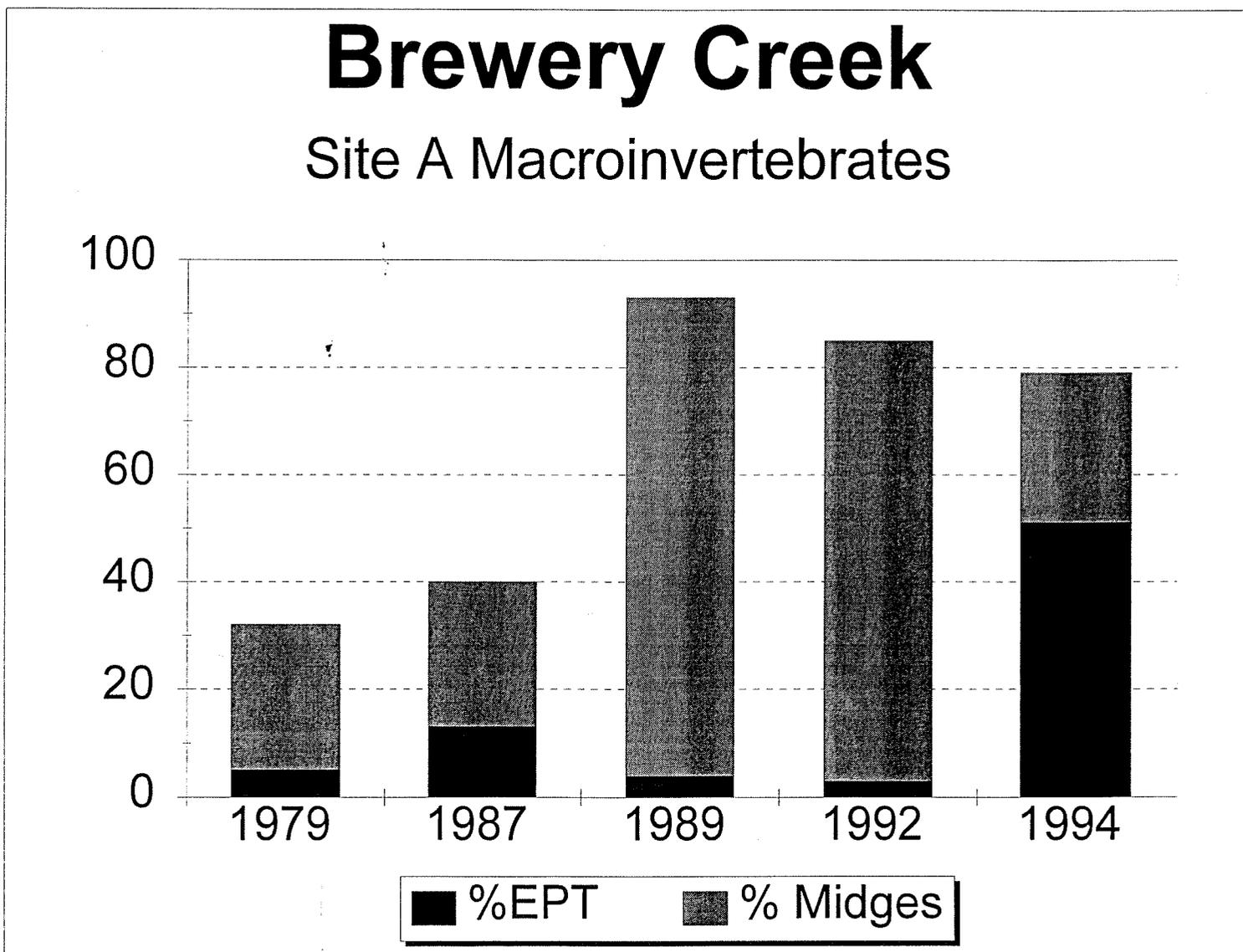


Figure 13: Site B Macroinvertebrate Data

Brewery Creek

Site B Macroinvertebrates

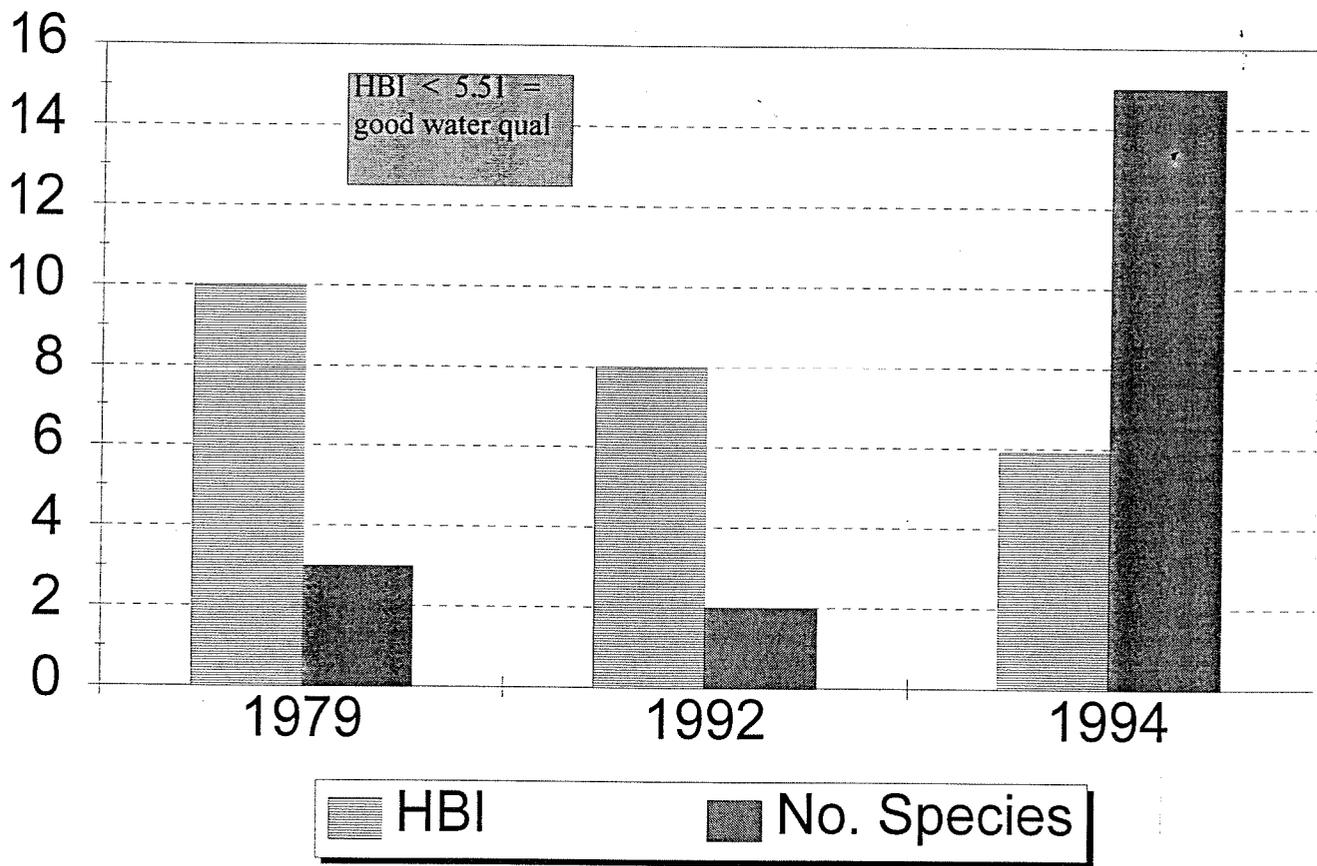


Figure 14: Site B Macroinvertebrate Data

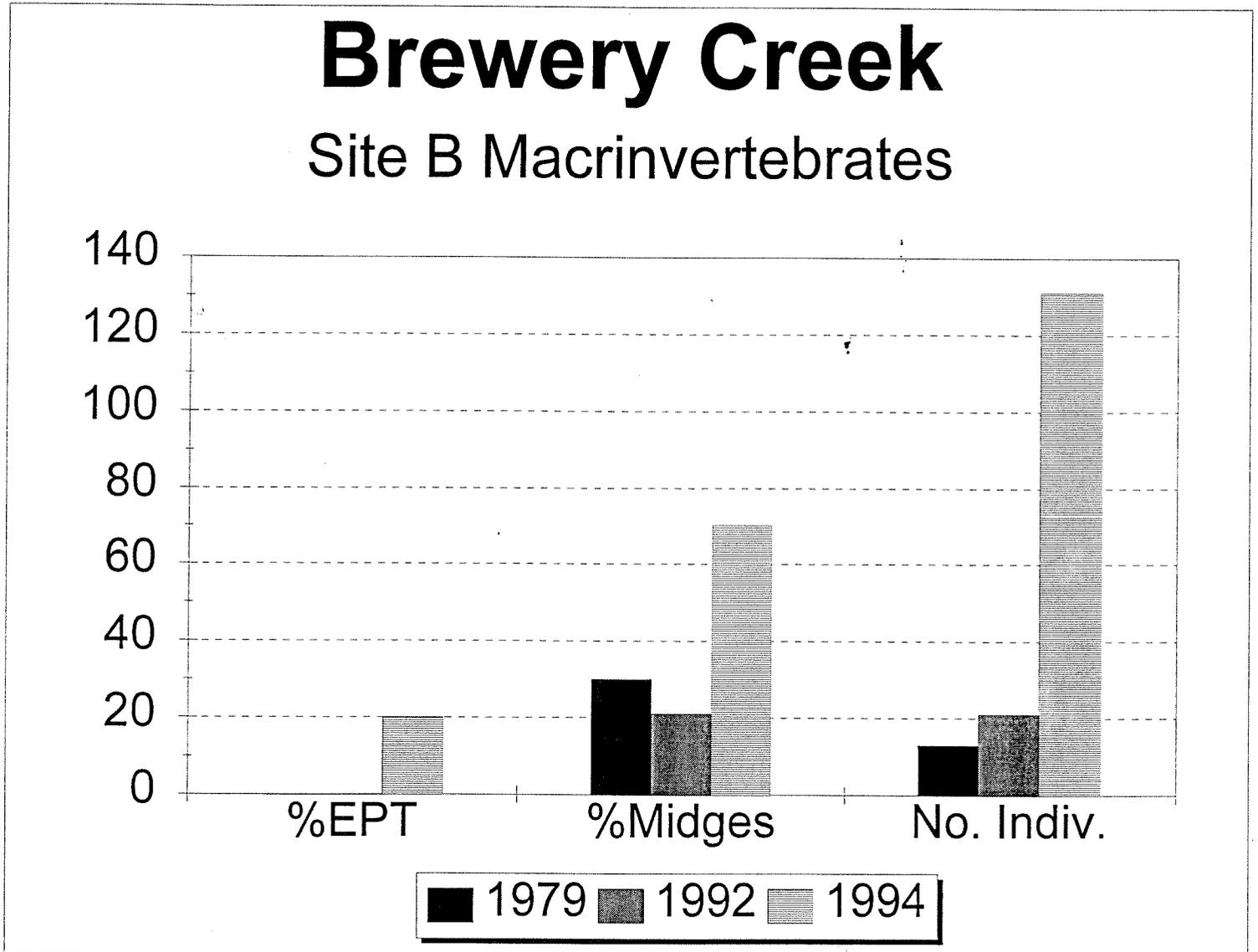


Figure 15: Site D Macroinvertebrate Data

Brewery Creek

Site D Macroinvertebrates

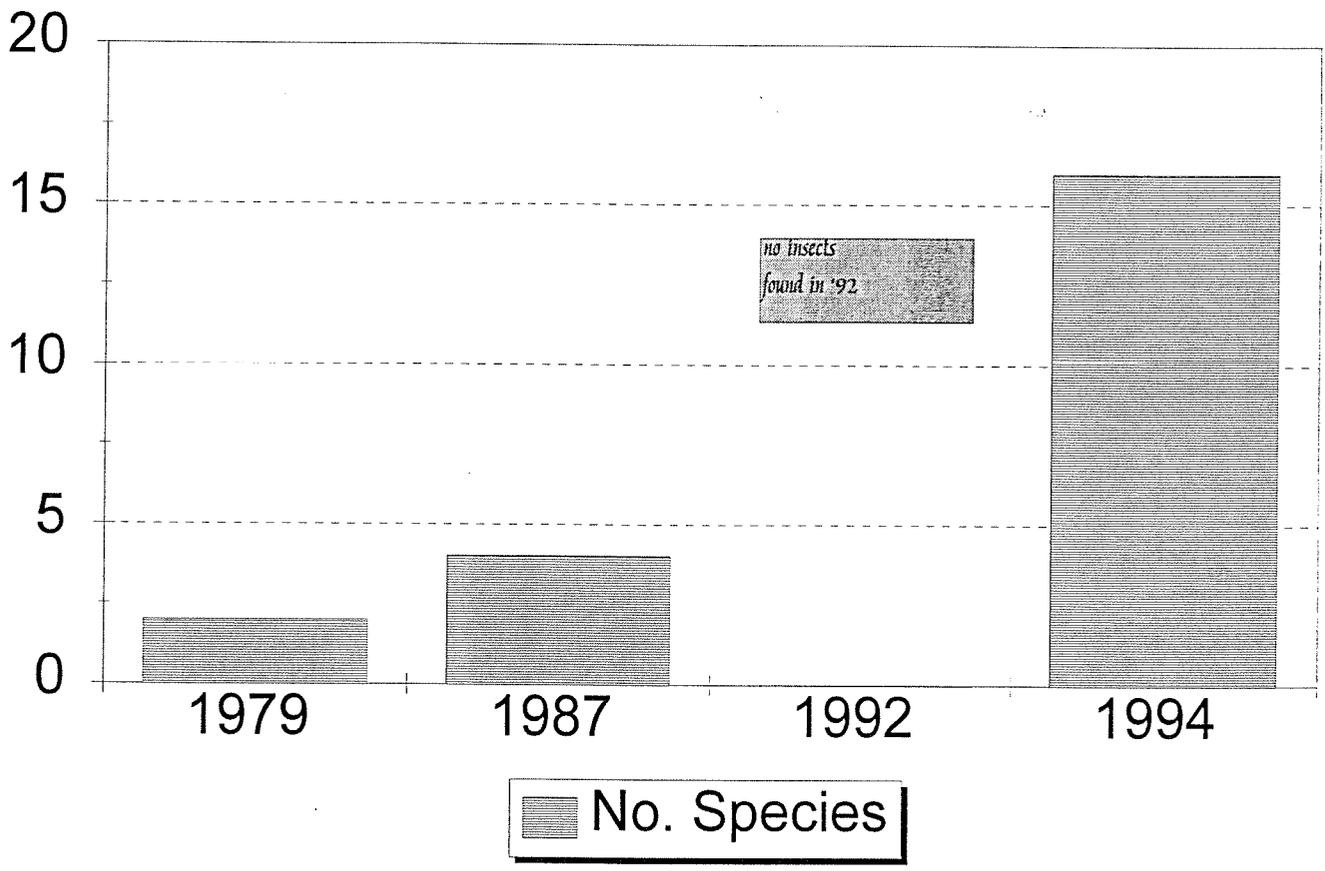


Figure 16: 1994 Macroinvertebrate Data

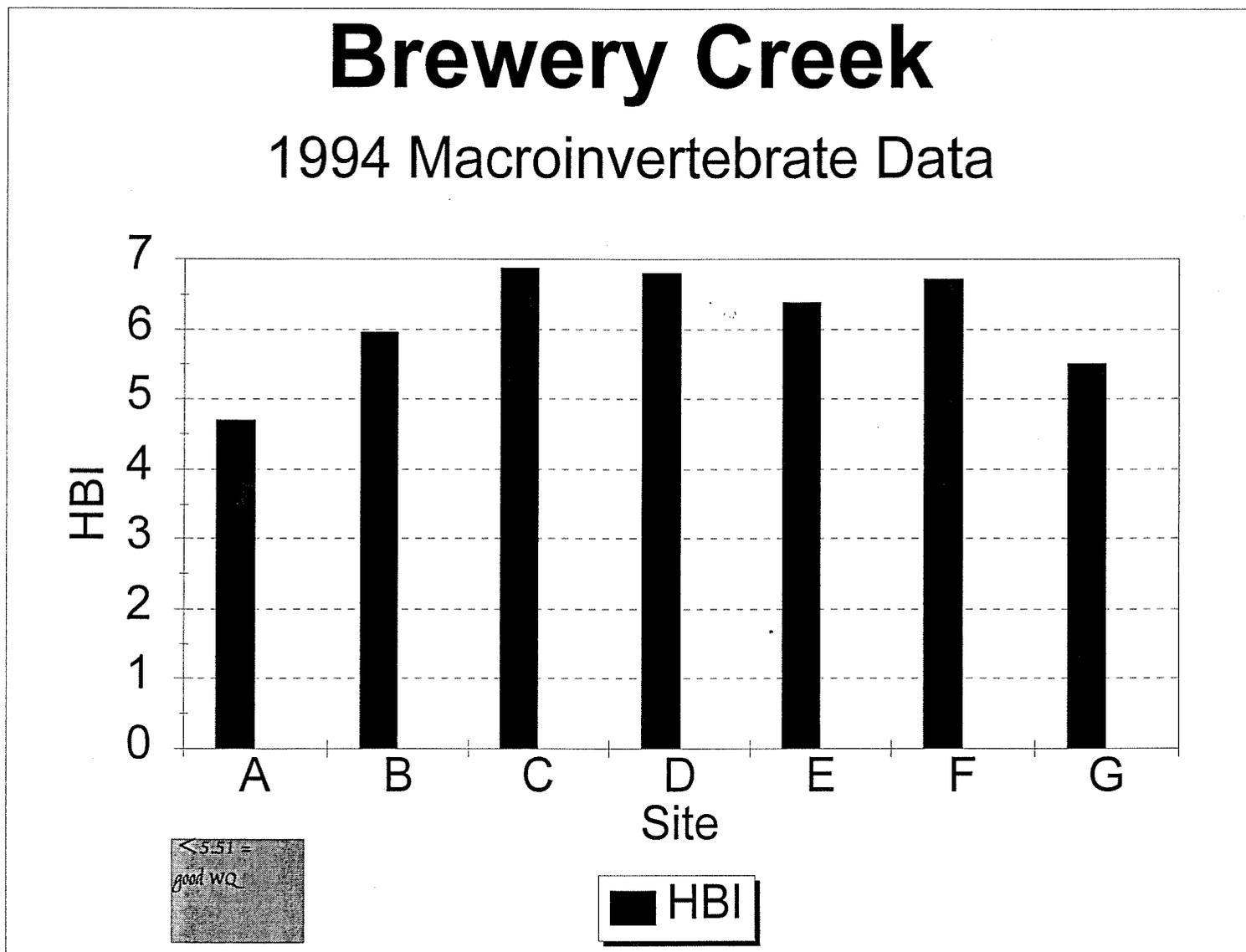


Figure 17: 1994 Macroinvertebrate Data

Brewery Creek

1994 Macroinvertebrate Data

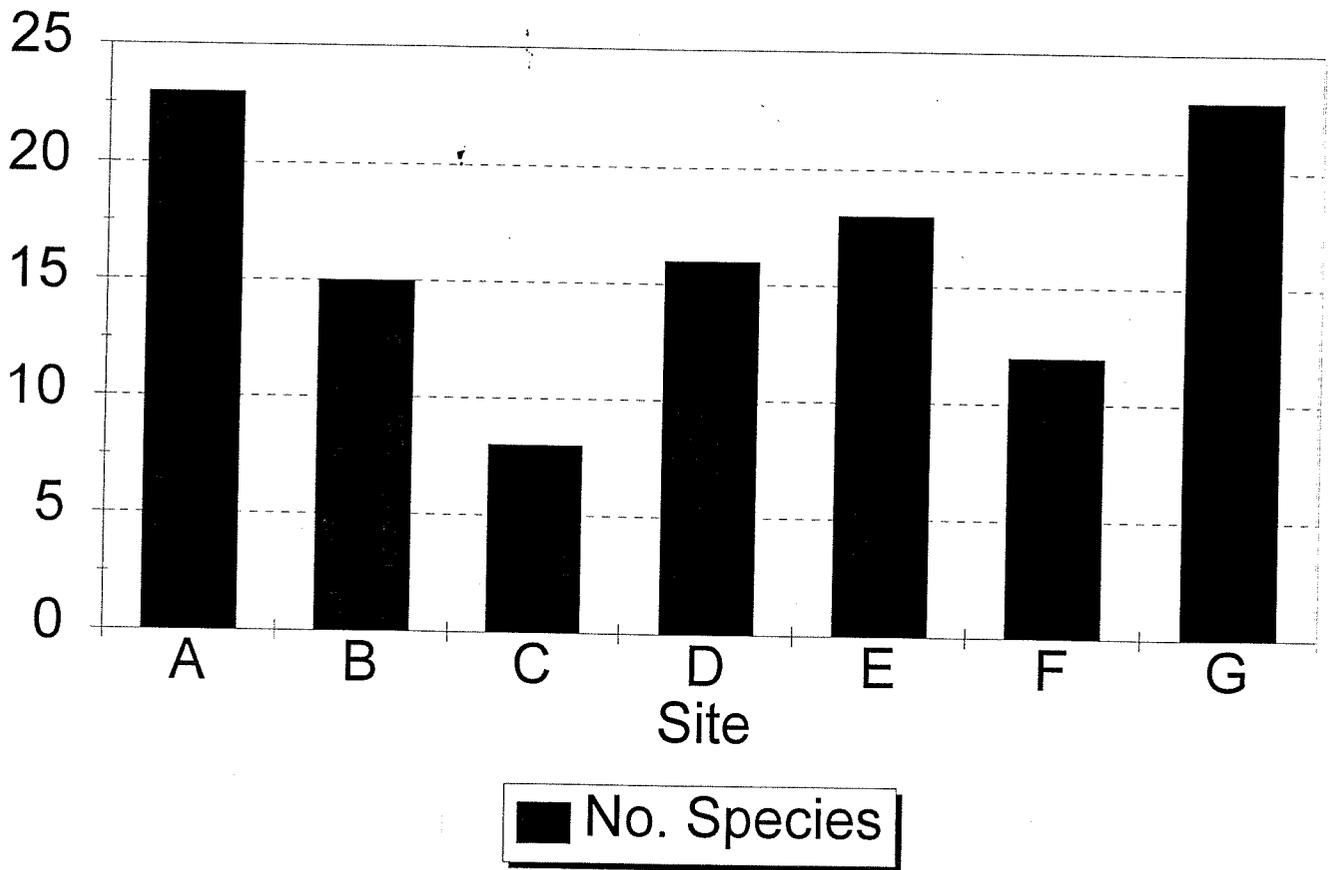
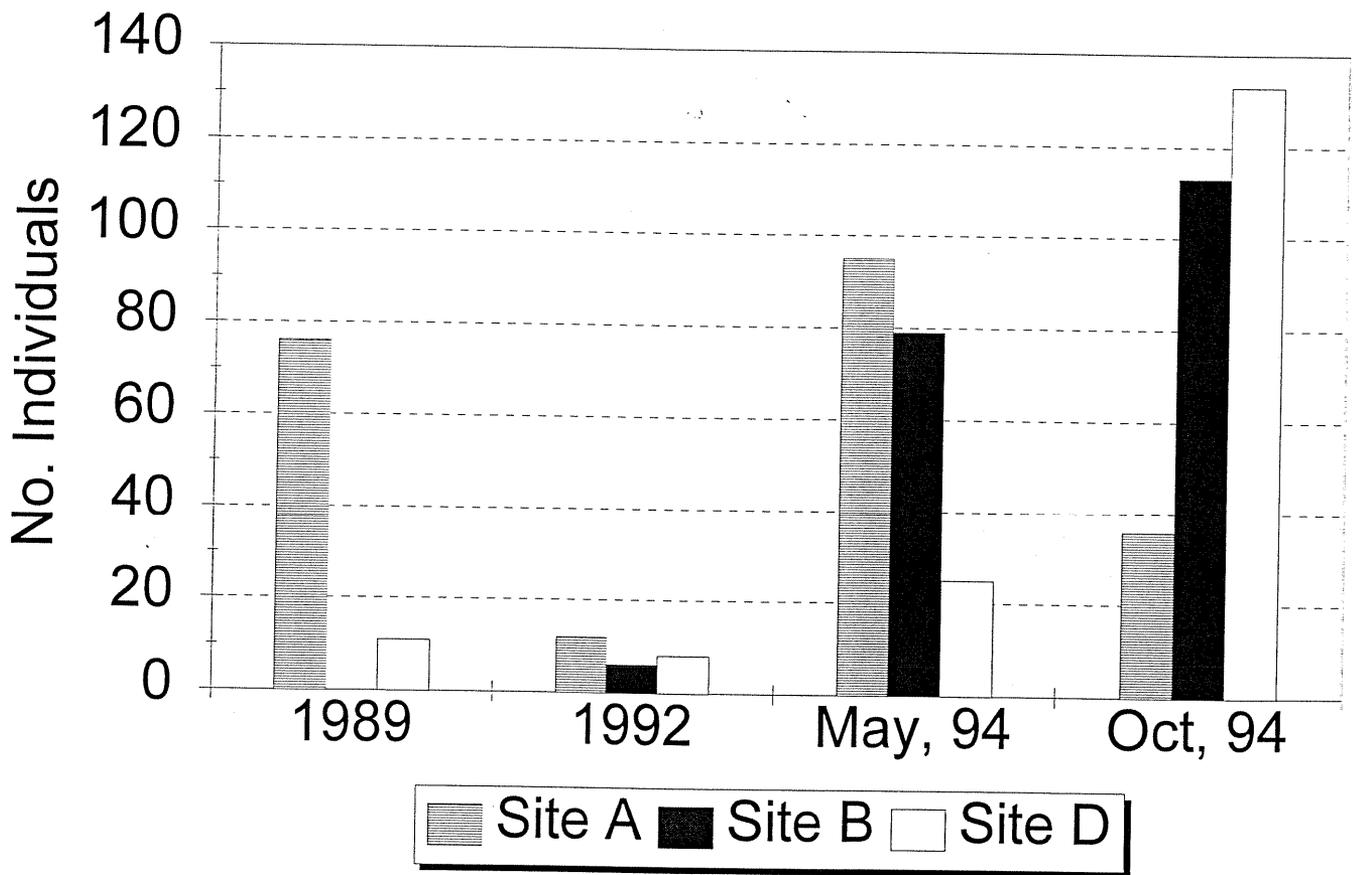


Figure 21: Brewery Creek Fisheries Data

Brewery Creek Fisheries Data

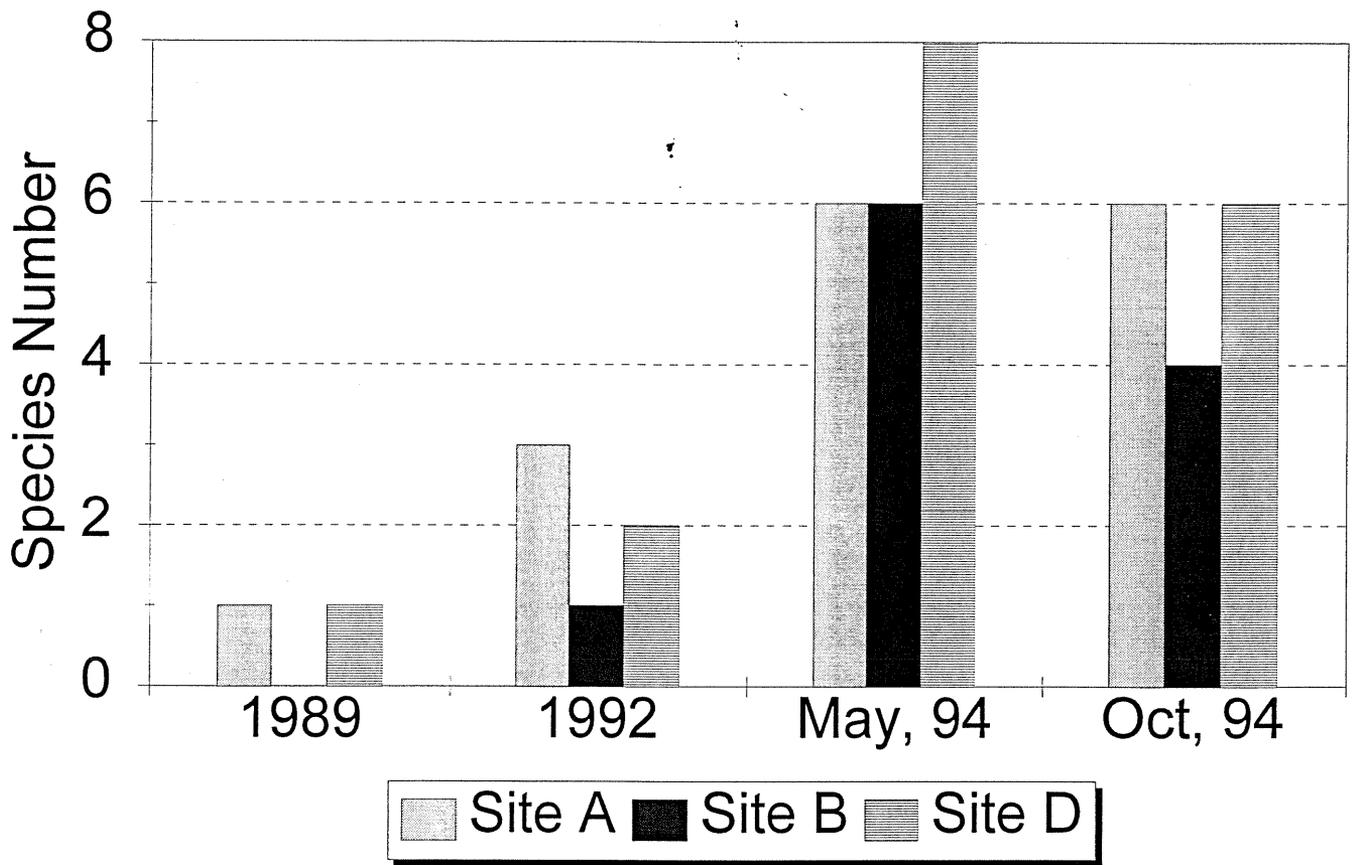


Site B was not sampled in 1989.

Figure 20: Brewery Creek Fisheries Data

Brewery Creek

Fisheries Data



Site B was not sampled in 1989.

Table 1: Brewery Creek Water Column Metals Before and After Rehabilitation

Before					After				
Cd	Cu	Fe*	Pb	Zn	Cd	Cu	Fe*	Pb	Zn
Site A									
0.1	2	0.3	8	90	0.15	4	0.52	7	120
0.1	5	0.24	10	14.1	0.1	5	0.47	9	120
0.1	4	0.34	15	94	0.2	6	0.43	8	93
0.1			8	82	0.16	2.4	0.56	10	110
0.1					0.13	11	0.27	9	76
					0.2	8	0.71	15	110
					0.1	7	0.85	22	86
					0.1	2.9	0.36	14	84
					0.13		0.26	7.4	87
					0.2		0.5	8	
					0.2			7	
Before Site B					After				
1.6	12	22	16	2550	0.15	4	1.5	9	230
1.5	10	11.02	12	1220	0.18	6	1.4	7	200
1.5	8	15	18	1800	0.19	2.1	1.1	8.4	160
1.6			15	1600	0.2	6	1.5	14	190
				1600	0.2	7	1.5	25	170
					0.4	7	1.2	13	210
					0.26	4.1	1.1	6.6	240
					0.3	5	1.5	5	250
					0.5		1.6	7	280
Before Site D					After				
4.1	12	16	8	3210	0.8	5	2.3	9	640
0.7	20	9.58	21	2090	0.7	3	2.5	7	710
4.3	17	23	17	3700	0.9	7	2.4	7	780
4	21	22.5	18	3800	0.6	6	2.1	9	640
4.4	18	29	13	3900	0.5	6	2.6	18	620
	28	14.5		3600	0.5	4	2.3	14	670
		19		4900	0.4	8	1.7	11	510
					0.6	4	2.6	20	780
					1	4	3.3	16	910
					0.4				
					0.2				

Values expressed as ug/l except *Fe which is mg/l.

Table 2. Brewery Creek Fisheries Data

Date	Site	Species	Number	Date	Site	Species	Number
1989	A	<i>creek chub</i>	76	May, 94	D	<i>creek chub</i>	6
	D	<i>creek chub</i>	11			<i>common shiner</i>	2
1992	A	<i>creek chub</i>	9	Oct, 94	A	<i>redbelly dace</i>	4
		<i>redbelly dace</i>	1			<i>stoneroller</i>	4
		<i>stoneroller</i>	2			<i>white sucker</i>	1
		B	<i>white sucker</i>			6	<i>brook stickleback</i>
D	<i>creek chub</i>	7	<i>orange spot sunfi</i>			1	
	<i>redbelly dace</i>	1	<i>brook trout juv.</i>			1	
May, 94	A	<i>creek chub</i>	25			<i>brook trout</i>	4
		<i>stoneroller</i>	21			<i>creek chub</i>	12
		<i>white sucker</i>	16			<i>common shiner</i>	1
		<i>green sunfish</i>	3			<i>stoneroller</i>	1
		<i>sunfish hybrid</i>	3	<i>white sucker</i>	18		
		<i>brook trout juv.</i>	21	<i>fantail darter</i>	2		
	B	<i>brook trout</i>	5	<i>brook trout</i>	1		
		<i>creek chub</i>	32	B	<i>creek chub</i>	100	
		<i>stoneroller</i>	12	<i>white sucker</i>	10		
		<i>white sucker</i>	7	<i>johnny darter</i>	2		
	<i>green sunfish</i>	1	<i>brook trout juv.</i>	1			
	<i>johnny darter</i>	1	D	<i>creek chub</i>	67		
	<i>brook trout juv.</i>	22	<i>common shiner</i>	16			
	<i>brook trout</i>	5	<i>stoneroller</i>	34			
			<i>white sucker</i>	12			
			<i>fantail darter</i>	2			
			<i>brook trout</i>	11			

Brook trout were stocked.

BREWERY CREEK
AT MINERAL POINT

TRIENNIAL STANDARDS REVIEW
MINERAL POINT WWT

February, 1988

Roger Schlessner, SD

Bureau of Water Resources Management
Wisconsin Department of Natural Resources

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SUMMARY

Brewery Creek below the Mineral Point WWTP was originally classified as marginal surface waters (E) due to significant nonpoint source problems, i.e., mine waste runoff. This review indicates the existing classification is correct and should remain the same until significant nonpoint source problems can be corrected.

INTRODUCTION

This paper presents the results of an evaluation of the stream classification for Brewery Creek which is the receiving stream for the Mineral Point Municipal WWTP. The evaluation was conducted as part of the Triennial Standards Review.

The sites being reviewed are listed in NR104.05 (Appendix VII). These sites received a variance due to one or more of the following criteria:

- a. The presence of in-place pollutants
- b. Low natural stream flow
- c. Natural background conditions, and
- d. Irretrievable cultural alterations.

GENERAL DESCRIPTION

Brewery Creek is located in southern Iowa County and originates north of the Village of Mineral Point. It is approximately five miles in length and has a gradient of 46' per mile. Brewery Creek flows through Mineral Point where a large tributary enters it from the east and continues in a southerly direction until it meets Rock Branch where the combined waters are called Furnace Creek.

The reach included in this evaluation is a three mile stretch which extends from approximately 0.5 miles above the outfall to 1.8 miles below Ferndale Road. Land use in the study area consists of the village of Mineral Point, wooded areas, lightly pastured area, and idle land. A salvage yard is located a short distance upstream of the tributary which enters Brewery Creek within the village limits. A cheese factory within the village had been a problem in the past with a discharge of whey or wash water to a storm sewer. The factory had shut down for a year or more but has recently been sold to another cheese maker.

The major nonpoint source problem is from runoff of old mine waste piles. They are left from lead and zinc mining conducted in the late 1800's and early 1900's. Mine waste piles are located above the WWTP outfall as well as below it. Runoff contains very low pH's and high concentrations of heavy metals. The site has been submitted to EPA for consideration to the Superfund National Priority List. The site had a Hazard Ranking System score of 30.42.

The Q₂ is 1.2 cfs and the Q₇₁₀ is 0.68 cfs at the Jackson Street bridge which is located 1200' above the outfall.

Table 1 contains the actual flows at the site taken from the publication "Low-Flow Characteristics of Wisconsin Streams at Sewage Treatment Plants and Industrial Plants".

Table 1. Low-Flow Characteristics, Brewery Creek

Drainage Area <u>(mi²)</u>	Date	Discharge <u>(ft³/s)</u>
6.74	June 2, 1972	1.93
	August 10, 1972	1.53
	July 31, 1973	4.83
	October 9, 1975	2.75
	July 27, 1976	1.35
	September 14, 1976	1.06
	June 23, 1977	0.83

STREAM HABITAT

In the study reach, Brewery Creek has a depth of 2.5-3.5 feet in the pools and 3" to 5" in the riffles. Most of the stream banks are well vegetated with little bank erosion. Due to the mine waste runoff the land adjacent to the stream is not heavily pastured which helps in keeping the banks well vegetated.

Stream substrate is primarily gravel-rubble with a precipitate layer of reddish-orange mine waste over the top. The water column normally has an orange color under low flow, but during surface water runoff the water column becomes a very deep reddish-orange due to the roaster piles.

Overall, stream habitat is fair to good. Rock Branch, a stream which joins Brewery Creek, has similar characteristics and is presently managed as trout water.

WATER QUALITY

The major study conducted on Brewery Creek was done in 1979 (Appendix VIII). Low flow and runoff samples were taken along with waste pile cores to characterize the effects of mine waste on Brewery Creek.

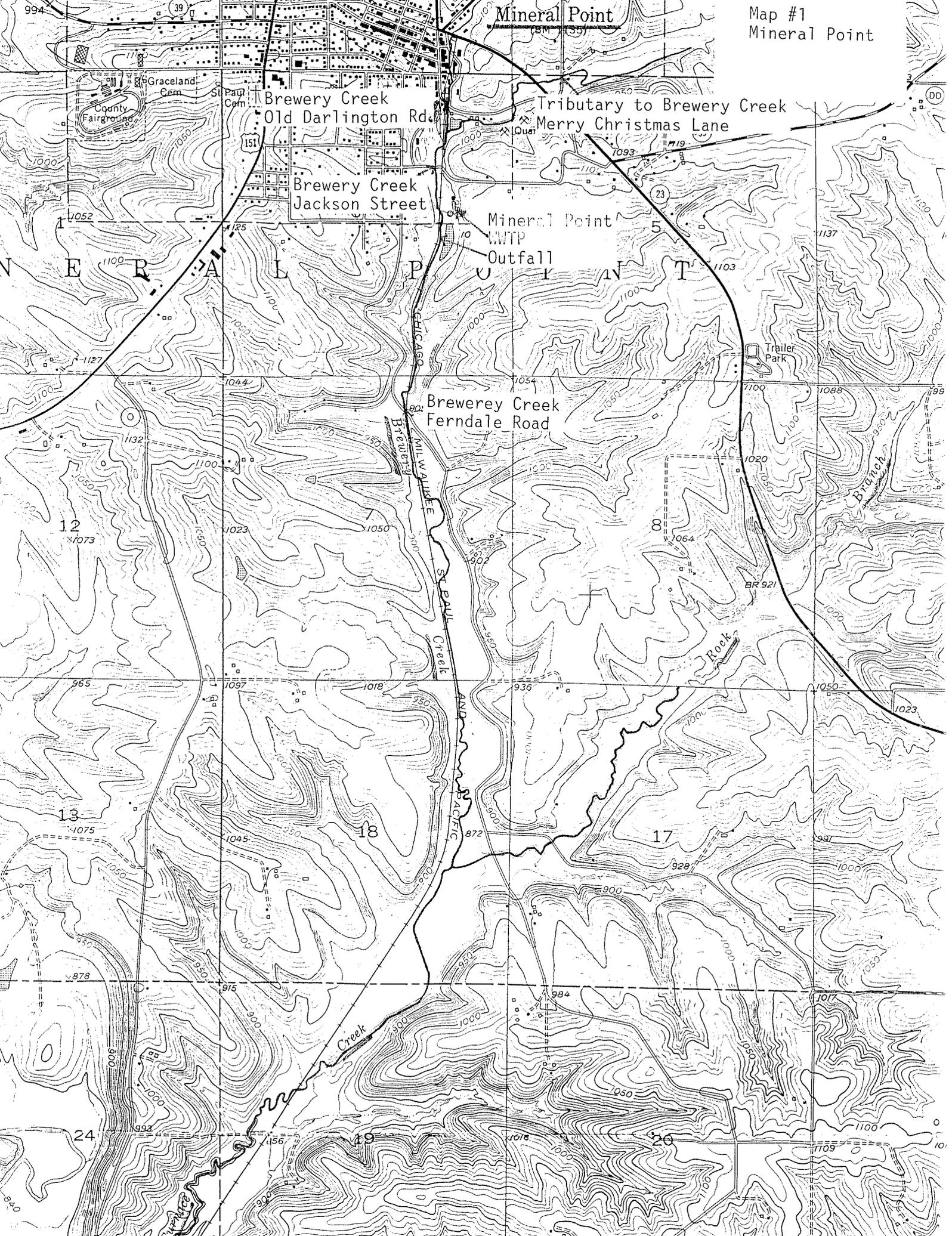
Levels of total zinc in Brewery Creek during runoff reached 6,600 ug/l. A tributary which flows to Brewery Creek was also sampled above and below the influence of a roaster pile. Total zinc above the pile during runoff was 40 ug/l and below the pile it was 44,000 ug/l.

Two surveys were conducted in 1974 (Appendix VI). A special stream study was conducted on March 26, 1974, to identify nonpoint sources and specifically sources of heavy metals. Water samples were collected and analyzed for zinc, lead, iron, and mercury as well as the usual wasteload allocation parameters. Dissolved oxygen dropped slightly below the outfall. BOD₅ and NH₃-N were elevated from the ambient conditions. Heavy metal samples were also elevated in the stream reach impacted by the mine waste.

A wasteload allocation study was also conducted on August 29, 1974. The upstream and downstream flows were measured at 4.7 and 5.0 cfs respectively. The flow from the STP was measured at 0.4 cfs. The effluent BOD₅ and NH₃-N was 14 mg/l and 4.2 mg/l respectively. Because of high stream flow the BOD₅ below the outfall remained the same as the ambient sample but the NH₃-N sample was somewhat elevated. Dissolved oxygen remained high throughout the study area never falling below 7.7 mg/l.

BIOLOGY

Two sections of Brewery Creek were sampled with a backpack fish shocker. The first site sampled was located upstream of Ferndale Road approximately 200 ft. (Map #1). The site was surveyed in October 1987 (Table III). The only fish captured were four creek chubs. Due to the mine waste runoff the fish were in poor shape. They had a bleached coloration and the scales readily fell off during handling. Also included is data from June 1976 (Table II) which was collected for the fish distribution study. Only two species of fish were captured which were both considered tolerant. The low numbers of fish and their physical condition indicate the severe impacts on the fishery.



A macroinvertebrate sample (Table IIIA) was also collected upstream of Ferndale Road. After 15 minutes of sampling only 35 macroinvertebrates were collected. Tipula spp. has commonly showed up in streams with mine waste runoff. It was surprising to find the high number of Hydropsyche betteni at the site. Less runoff during the summer may have contributed to higher numbers. Low diversity and low numbers indicate the water quality problems at the site.

The second site sampled for fish was located upstream of Old Darlington Road (Table IV), with 100 ft. of stream thread being surveyed. This site was also sampled for macroinvertebrates. It is located within the village boundaries and receives runoff from streets and residences via storm sewers or by direct runoff. This site is located above the influence of the roaster piles and the WWTP.

The only fish captured were creek chubs which are considered a tolerant fish. There were a high number of creek chubs present considering the small stream size and short distance surveyed.

The macroinvertebrate sample had an HBI of 6.038 which is indicative of fair water quality (Table IVA). Both the fishery and macroinvertebrates indicate the stream is impacted by some pollutant load.

In June, 1976 a fish survey was conducted for the fish distribution study on a tributary to Brewery Creek (Table V). This tributary ultimately joins Brewery Creek a short distance below Old Darlington Road. This site is located in a watershed which has much less runoff and is not impacted by pollutants normally associated with street and residential runoff. There was a good diversity of

fish which ranged from intolerant to tolerant species. The fish captured at this site is more indicative of what you would expect to find in a stream of this size and type in southwestern Wisconsin.

WWTP

Appendix II contains the 1987 DMR monthly averages for flow, BOD, and TSS. The Mineral Point WWTP according to the DMR's is well below their monthly permit limits of 20 BOD and 20 TSS. Only during the month of March were they close to the monthly limits when the BOD was 16 mg/l and TSS were 14 mg/l.

CLASSIFICATION

Based on this review of available chemical, physical, and biological data, Brewery Creek is properly classified as marginal surface waters (E) from the outfall downstream. If the severe nonpoint source problem is rectified, the classification should be reviewed and most likely changed to full fish and aquatic life. This section of stream has sufficient flow and habitat to maintain a balanced fish and aquatic life community.

TABLE: II List of fish for sampling site: Ferndale Road

DATE: 6/18/76 Twn 4N Rng 3E Sec. 7 1/4 1/4 NWNE STREAM: Brewery Creek

Station mileage: 1.38 County: 25

SOURCE OF DATA: 11 GEAR: B EFFORT: 06

CODE	COMMON NAME	FAMILY	GENUS/SPECIES	# FISH	TOLERANCE LEVEL
M20	GOLDEN SHINER	CYPRINIDAE	Notemigonus crysoleucas	1	Tolerant
N09	WHITE SUCKER	CATOSTOMIDAE	Catostomus commersoni	5	Tolerant

TABLE: III List of fish for sampling site: Ferndale Road

DATE: 10/1/87 Twn 4N Rng 3E Sec. 7 1/4 1/4 NWNE STREAM: Brewery Creek

Station mileage: 1.8E County: 25

SOURCE OF DATA: WQ GEAR: 3 EFFORT: 04

CODE COMMON NAME FAMILY GENUS/SPECIES # FISH TOLERANCE LEVEL

M50 CREEK CHUB CYPRINIDAE *Semotilus atromaculatus* 4 Tolerant

*** SOUTHERN DISTRICT BIOTIC INDEX REPORT ***

SAMPLE ID# 871001-25-01

PAGE 2

***	TAXA	***	TAXONOMIC	TOL	ORGANISM	ORGANISM			
		SPECIES	KEY	VAL	ID	COUNT	REP1	REP2	REP3
			USED						
TRICHOPTERA									
HYDROPSYCHIDAE									
HYDROPSYCHE		BETTENI	*1	6.00	04040201	27	0	0	0
COLEOPTERA									
ELMIDAE									
OPTIOSERVUS		FASTIDITUS	*2	4.00	07020501	1	0	0	0
STENELMIS		CRENATA	*3	5.00	07020601	2	0	0	0
DIPTERA									
TIPULIDAE									
TIPULA			*2	4.00	08141200	5	0	0	0
*** TOTALS: ***						35			
							0		
*** BIOTIC INDEX: ***						5.600			

Taxonomic Key Code References

- *1 HILSENHOFF 1981,86
- *2 HILSENHOFF 1981,82
- *3 HILSENHOFF 1981,85

TABLE: IV List of fish for sampling site: Old Darlington Road

DATE: 10/1/87 TwN 4N Rng 3E Sec. 6 1/4 1/4 NENE STREAM: Brewery Creek

Station mileage: 2.9E County: 25

SOURCE OF DATA: WQ GEAR: 3 EFFORT: 02

CODE COMMON NAME FAMILY GENUS/SPECIES # FISH TOLERANCE LEVEL

M50 CREEK CHUB CYPRINIDAE *Semotilus atromaculatus* 33 Tolerant

SOUTHERN District Biotic Index Report

HBI 6.038 Rep1 Rep2 Rep3
 Sample ID # 871001-25-02 Waterbody Name BREWERY CR.
 Water Temp (Celsius) Dissolved Oxygen (mg/l)
 Sample Location: NE NE S 6 T 4N R 3E Master Waterbody #
 Project Name TRIENNIAL STANDARDS REVIEW Storet Station #
 Ave. Stream Width (Ft.) at Site 3.5 Ave. Stream Depth (Ft.) at Site 0.2
 Collector SCHLESSER, R. Field # 02 Rep 1
 Measured Velocity (fps)
 Sorter RUST, P. Est. Velocity (fps)
 Est % of sample sorted 100 Moderate (0.5-1.5)
 Taxonomist DIMICK, J. Sampled Habitat
 Location Description UPS. OLD DARLINGTON RD. 1. Riffle

Est. Time Spent Sampling (Min.) 4

Sampling Device 1. D Frame

Substrate at Site Location (%)

0.0 Bedrock	10.0 Rubble	0.0 Sand	0.0 Clay	0.0 Muck
0.0 Boulders	70.0 Gravel	10.0 Silt	0.0 Detritus	10.0 Debris/Veg

Substrate Sampled (%) (Same as above Yes)

0.0 Bedrock	0.0 Rubble	0.0 Sand	0.0 Clay	0.0 Muck
0.0 Boulders	0.0 Gravel	0.0 Silt	0.0 Detritus	0.0 Debris/Veg

Aquatic Vegetation 8 % of Total Stream Channel at Sampling Site

Observed Instream Water Quality Indicators (Perceived WQ Fair)

	Not Present	Insig- nificant	Sig- nificant	Comments
Turbidity	1			
Chlorine or Toxic Scour	1			
Macrophytes	1			
Filamentous Algae		2		
Planktonic Algae	1			
Slimes	1			
Iron Bacteria	1			

Factors Which May Be Affecting Habitat Quality

Sludge Deposits	1		
Silt and Sediment		2	
Channel Ditching		2	
Down/Up Stream Impoundment	1		
Low Flows		2	
Wetlands		2	

Pollutant Sources

Livestock Pasturing	1		
Barnyard Runoff	1		
Cropland Runoff	1		
Tile Drains			
Septic Systems			
Stream Bank Erosion		2	
Urban Runoff			3
Construction Runoff			
Point Source (Specify Type)			
Other (Specify)			

SAMPLE ID# 871001-25-02

PAGE 2

TAXA	SPECIES	TAXONOMIC KEY USED	TOL VAL	ORGANISM ID	ORGANISM COUNT		
					REP1	REP2	REP3
ODONATA							
AESHNIDAE							
BOYERIA	VINOSA	*1	2.00	03010401	1	0	0
TRICHOPTERA							
BRACHYCENTRIDAE							
BRACHYCENTRUS	OCCIDENTALIS	*2	1.00	04010104	4	0	0
HYDROPSYCHIDAE							
HYDROPSYCHE	BETTENI	*3	6.00	04040201	6	0	0
LIMNEPHILIDAE							
POOR SPECIMEN		*3		04082100	1	0	0
COLEOPTERA							
ELMIDAE							
OPTIOSERVUS		*3	4.00	07020500	5	0	0
DIPTERA							
CHIRONOMIDAE							
BRILLIA		*4	5.00	08050300	2	0	0
CHAETOCLADIUS	SP.A	*4	5.00	08050503	2	0	0
CRICOTOPUS	NR.BICINCTUS	*4	6.00	08051301	3	0	0
EUKIEFFERIELLA	SP.B	*4	5.00	08052302	1	0	0
ORTHOCLADIUS	SP.A	*4	6.00	08054001	2	0	0
	SP.D	*4	5.00	08054004	4	0	0
	SP.E	*4	8.00	08054005	3	0	0
	POOR SPECIMEN	*4	6.00	08054006	1	0	0
THIENEMANNIMYIA		*4		08057000	5	0	0
TIPULIDAE							
HEXATOMA		*4	2.00	08140600	1	0	0
TIPULA		*4	4.00	08141200	11	0	0
ISOPODA							
ASELLIDAE							
ASELLUS	INTERMEDIUS	*5	8.00	10010101	33	0	0
*** TOTALS: ***					85	0	0
*** BIOTIC INDEX: ***					6.038		

Taxonomic Key Code References

- *1 WALKER 1953
- *2 HILSENHOFF 1985
- *3 HILSENHOFF 1981,86
- *4 HILSENHOFF 1981,85
- *5 WILLIAMS 1972

TABLE: V List of fish for sampling site: Merry Christmas Lane

DATE: 6/18/76

Twn 4N Rng 3E Sec. 5 1/4 1/4 NWNW

STREAM: Brewery Creek

Station mileage: 0.6E

County: 25

SOURCE OF DATA: 11

GEAR: B

EFFORT: 06

CODE	COMMON NAME	FAMILY	GENUS/SPECIES	# FISH	TOLERANCE LEVEL
M05	STONEROLLERS	CYPRINIDAE	Campostoma spp.	99	Intolerant
M06	CENTRAL STONEROLLER	CYPRINIDAE	Campostoma anomalum	4	Intolerant
M43	SOUTHERN REDBELLY DACE	CYPRINIDAE	Phoxinus erythrogaster	1	Intolerant
M45	BLUNTNOSE MINNOW	CYPRINIDAE	Pimephales notatus	4	Tolerant
M50	CREEK CHUB	CYPRINIDAE	Semotilus atromaculatus	94	Tolerant
N09	WHITE SUCKER	CATOSTOMIDAE	Catostomus commersoni	93	Tolerant
U01	BROOK STICKLEBACK	GASTEROSTEIDAE	Culaea inconstans	14	Tolerant
X10	FANTAIL DARTER	PERCIDAE	Etheostoma flabellare	99	Intolerant
X12	JOHNNY DARTER	PERCIDAE	Etheostoma nigrum	5	Tolerant



(Brewery Creek)

Upstream of old Darlington
Road and mine waste runoff.



(Brewery Creek)

Upstream of Old Darlington
Road and mine waste runoff.



(Brewery Creek)

Upstream of Old Darlington
Road and mine waste runoff.



(Brewery Creek)
Upstream of Jackson Street
and Mineral Point WWTP.



(Brewery Creek)
Upstream of Jackson Street
and Mineral Point WWTP.



(Brewery Creek)
Upstream of Jackson Street
and Mineral Point WWTP.



(Brewery Creek)

Downstream of Jackson Street
and upstream of Mineral
Point WWTP.



(Brewery Creek)

Downstream of Mineral Point
WWTP, roaster waste pile
located along stream.



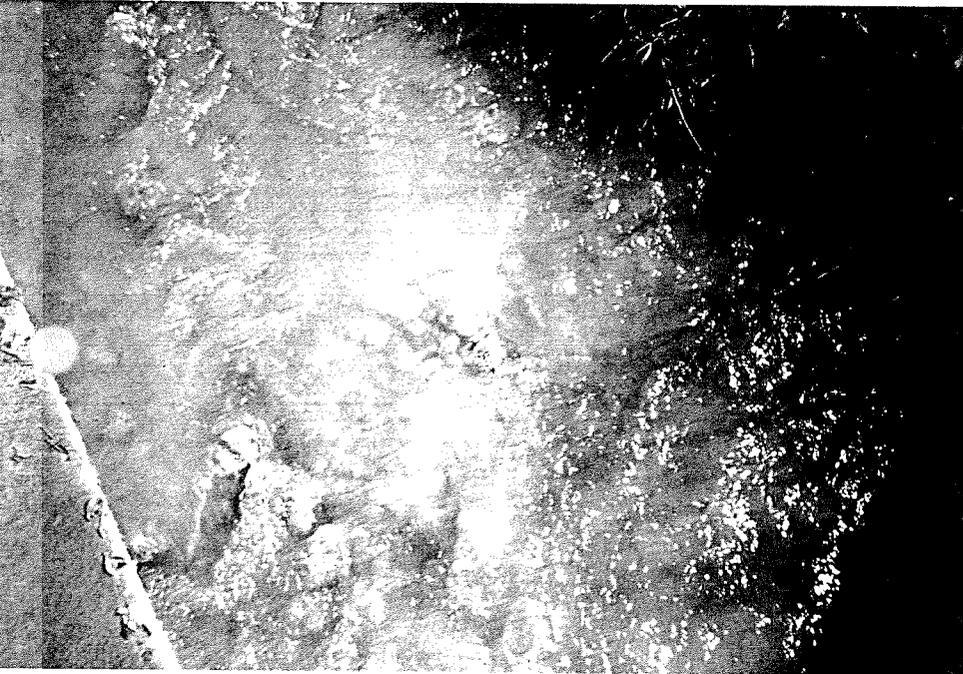
(Brewery Creek)

Upstream of Ferndale Road,
downstream of Mineral Point
WWTP, fish sampling area.



(Brewery Creek)

Upstream of Ferndale Road,
downstream of Mineral Point
WWTP.



(Brewery Creek)

Upstream of Ferndale Road,
downstream of Mineral Point
WWTP, macroinvertebrate
sampling site.



(Brewery Creek)

Downstream of Ferndale Road
and Mineral Point WWTP.

APPENDIX I

Stream Brewery Reach Location Ferndale Rd. Reach Score/Rating 129
 County Iowa Date 10/1/87 Evaluator R. Schlessler Classification Marginal*

*Due to the presence of in place pollutants

Rating Item	Category			
	Excellent	Good	Fair	Poor
Watershed Erosion	No evidence of significant erosion. Stable forest or grass land. Little potential for future erosion. 8	Some erosion evident. No significant "raw" areas. Good land mgmt. practices in area. Low potential for significant erosion. 10	Moderate erosion evident. Erosion from heavy storm events obvious. Some "raw" areas. Potential for significant erosion. 14	Heavy erosion evident. Probable erosion from any run off. 16
Watershed Nonpoint Source	No evidence of significant source. Little potential for future problem. 8	Some potential sources (roads, urban area, farm fields). 10	Moderate sources (small wetlands, tile fields, urban area, intense agriculture). 14	Obvious sources (major wetland drainage, high use urban or industrial area, feed lots, impoundment). 16
Bank Erosion, Failure	No evidence of significant erosion or bank failure. Little potential for future problem. 4	Infrequent, small areas, mostly healed over. Some potential in extreme floods. 8	Moderate frequency and size. Some "raw" spots. Erosion potential during high flow. 16	Many eroded areas. "Raw" areas frequent along straight sections and bends. 20
Bank Vegetative Protection	90% plant density. Diverse trees, shrubs, grass. Plants healthy with apparently good root system. 6	70-90% density. Fewer plant species. A few barren or thin areas. Vegetation appears generally healthy. 9	50-70% density. Dominated by grass, sparse trees and shrubs. Plant types and conditions suggest poorer soil binding. 15	<50% density. Many raw areas. Thin grass, few if any trees and shrubs. 18
Lower Bank Channel Capacity	Ample for present peak flow plus some increase. Peak flow contained. W/D ratio <7. 8	Adequate. Overbank flows rare. W/D ratio 8-15. 10	Barely contains present peaks. Occasional overbank flow. W/D ratio 15-25. 14	Inadequate, overbank flow common. W/D ratio >25. 16
Lower Bank Deposition	Little or no enlargement of channel or point bars. 6	Some new increase in bar formation, mostly from coarse gravel. 9	Moderate deposition of new gravel and coarse sand on old and some new bars. 15	Heavy deposits of fine material, increased bar development. 18
Bottom Scouring and Deposition	Less than 5% of the bottom affected by scouring and deposition. 4	5-30% affected. Scour at constrictions and where grades steepen. Some deposition in pools. 8	30-50% affected. Deposits and scour at obstructions, constrictions and bends. Some filling of pools. 12	More than 50% of the bottom changing nearly year long. Pools almost absent due to deposition. 20
Bottom Substrate/ Available Cover	Greater than 50% rubble, gravel or other stable habitat. 2	30-50% rubble, gravel or other stable habitat. Adequate habitat. 7	10-30% rubble, gravel or other stable habitat. Habitat availability less than desirable. 17	Less than 10% rubble gravel or other stable habitat. Lack of habitat is obvious. 22
Avg. Depth Riffles and Runs	Cold >1'	0 6" to 1'	6 3" to 6"	18 18" to 3"
	Warm >1.5'	0 10" to 1.5'	6 6" to 10"	18 18" to 6"
Avg. Depth of Pools	Cold >4'	0 3' to 4'	6 2' to 3'	18 18" to 2'
	Warm >5'	0 4' to 5'	6 3' to 4'	18 18" to 3'
Flow, at Rep. Low Flow	Cold >2 cfs	0 1-2 cfs	6 .5-1 cfs	18 <.5 cfs
	Warm >5 cfs	0 2-5 cfs	6 1-2 cfs	18 <1 cfs
Pool/Riffle, Run/Bend Ratio (distance between riffles ÷ stream width)	5-7. Variety of habitat. Deep riffles and pools. 4	7-15. Adequate depth in pools and riffles. Bends provide habitat. 8	15-25. Occasional riffle or bend. Bottom contours provide some habitat. 16	>25. Essentially a straight stream. Generally all flat water or shallow riffle. Poor habitat. 20
Aesthetics	Wilderness characteristics, outstanding natural beauty. Usually wooded or un-pastured corridor. 8	High natural beauty. Trees, historic site. Some development may be visible. 10	Common setting, not offensive. Developed but uncluttered area. 14	Stream does not enhance aesthetics. Condition of stream is offensive. 16
Column Totals:	<u>0</u>	<u>43</u>	<u>54</u>	<u>32</u>

Column Scores E 0 +G 43 +F 54 +P 32 = 129 = Score

<70 = Excellent, 71-129 = Good, 130-200 = Fair, >200 = Poor

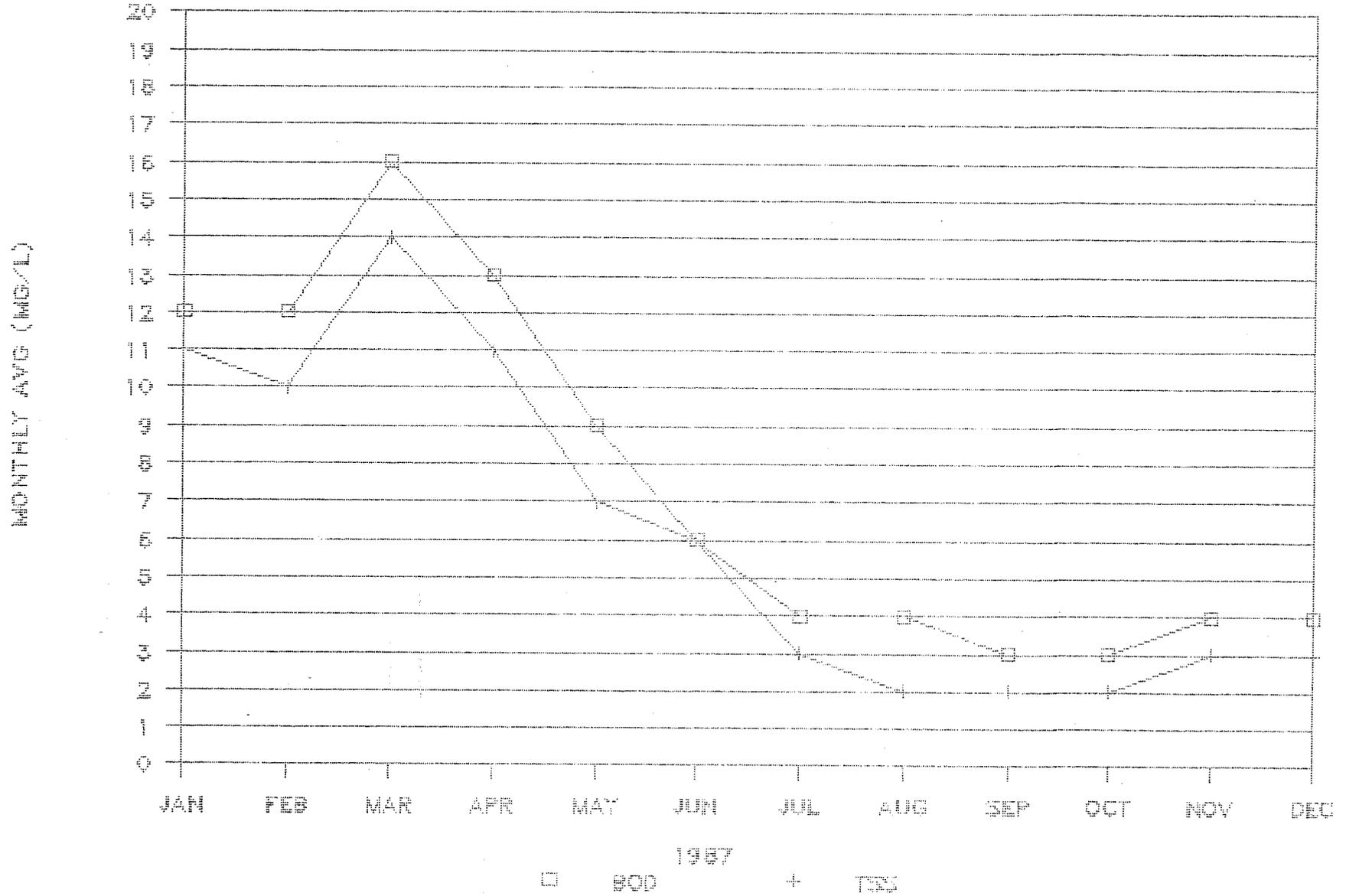
APPENDIX II

MINERAL POINT SEWAGE TREATMENT PLANT
EFFLUENT QUALITY 1987

	FLOW (MGD)	BOD (MG/L)	TSS (MG/L)	NH3-N (MG/L)	pH (MIN)	pH (MAX)
JAN	0.358	12	11			
FEB	0.385	12	10			
MAR	0.442	16	14			
APR	0.450	13	11			
MAY	0.403	9	7			
JUN	0.280	6	6			
JUL	0.296	4	3			
AUG	0.439	4	2			
SEP	0.322	3	2			
OCT	0.256	3	2			
NOV	0.263	4	3			
DEC	0.293	4	3			

MINERAL POINT WWTP

EFFLUENT QUALITY 1987



APPENDIX III

MINERAL POINT
IOWA COUNTY

July 15, 1975

The Mineral Point waste water treatment plant discharges to Brewery Creek, a tributary of the Pecatonica River. The 7Q10 on Brewery Creek above the treatment plant outfall is .23 cfs. Brewery Creek has two branches which form its headwaters on the near northeast side of Mineral Point. Both of these branches had been subjected to occasional non point sources of pollution of short duration in the past. The ambient water quality is very good and the branches contain small minnows and forage fish as well as an adequate benthic community. These two branches meet roughly 50 yards above the railroad tracks bridge, which is about 100 yards above the Market Street Bridge. At and below the railroad bridge, the stream comes in contact with large piles of mine tailings deposited there in the early 1900's. The stream from this point has a distinct red color ~~except~~ ^{with} heavy loads of suspended solids and heavy metals. The stream changes from one of high quality to one sterile of any kind of life. The non point sources of pollution present a very serious degradation of the water quality of the stream. Brewery Creek could have trout stream potential were it not for this degradation taking place. Brewery Creek flows through agricultural land with portions of the stream bank being semi-wooded and marshy.

RECOMMENDATIONS

Brewery Creek should be classified continuous fish and aquatic life for its entire length. However, it is economically unfeasible to require the Town of Mineral Point to design for tertiary treatment if the non point sources of pollution cannot be remedied to an equal degree compatible to continuous fish and aquatic life standards. The mine waste debris appears to be the main issue and a study should be conducted to determine a feasible solution if any exist. If there exists no alternative method to remedy this problem, then Brewery Creek should be classified under the agricultural classification and allowed to discharge at those limits. The above recommendations represent a concurrence of opinion of the stream classification team who are as follows:

Bob Bate, District Engineer; Gene Van Dyck, Area Fish Manager; and Tom Bainbridge, Stream Classification Coordinator.


Tom Bainbridge
Stream Classification Coordinator

TB:lg

APPENDIX IV



State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

L. P. Voigt
Secretary

BOX 450
MADISON, WISCONSIN 53701

April 21, 1975

IN REPLY REFER TO: 3420

Mr. Max Koletzke
Lakeland Engineers, Inc.
125 W. Doty Street
Madison, Wisconsin 53703

Dear Mr. Koletzke:

We have received a recommendation from our Water Quality Evaluation Section concerning the level of treatment to be provided at the upgraded Mineral Point sewage treatment plant. After review, we concur with that recommendation.

Accordingly, you should complete facilities planning and prepare plans and specifications based on achieving an effluent containing a maximum carbonaceous BOD₅ of 30 mg/l and a minimum dissolved oxygen content of 6.0 mg/l.

If you have any questions, please contact me.

Very truly yours,
Bureau of Water Quality

Robert M. Krill, P.E., Chief
Municipal Wastewater Section

RMK:bh
cc: Southern District
Dick Wedepohl

APPENDIX V

B. FINAL EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning on the effective date of this permit and lasting until March 31, 1987 the permittee is authorized to discharge from outfall serial number 001.

Samples taken in compliance with the monitoring requirements specified below shall be taken at the polishing pond discharge.³

There shall be no discharge of visible or floating solids in other than trace amounts.

During any 30 consecutive days, the average effluent concentrations of BOD₅ and of total suspended solids shall not exceed 15% of the average influent concentrations, respectively.

EFFLUENT PARAMETERS	EFFLUENT LIMITATIONS					MONITORING REQUIREMENTS	
	Quantity-kg/day(lbs/day)		Other Limitations (Specify Units)			Sample Frequency	Sample Type
	Average	Maximum	Minimum	Average	Maximum		
BOD ₅ (monthly)	21(46.4)	-	-	20 mg/l	-	3xWeekly	Grab
BOD ₅ (weekly)	31.6(69.6)	-	-	30 mg/l	-	3xWeekly	Grab
Suspended Solids (monthly)	21(46.4)	-	-	20 mg/l	-	3xWeekly	Grab
Suspended Solids (weekly)	31.6(69.6)	-	-	30 mg/l	-	3xWeekly	Grab
pH (daily)	-	-	6.0	-	9.0	Daily	Grab
Dissolved Oxygen(daily) ²	-	-	4.0 mg/l	-	-	3xWeekly	Grab
Residual Chlorine (daily) ²	-	-	-	-	0.5 mg/l	Daily	Grab
Fecal Coliform (monthly) ²	-	-	-	#/100 ml	-	1xWeekly	Grab

¹Based on a design flow of 0.278 MGD.

²At such time as effluent limitations for fecal coliforms and chlorine residual are finally promulgated in the Wisconsin Administrative Code, this permit may be modified to incorporate either the final limitations or interim limitations and a compliance schedule to achieve the final limitations. In the interim, continuous disinfection shall be provided.

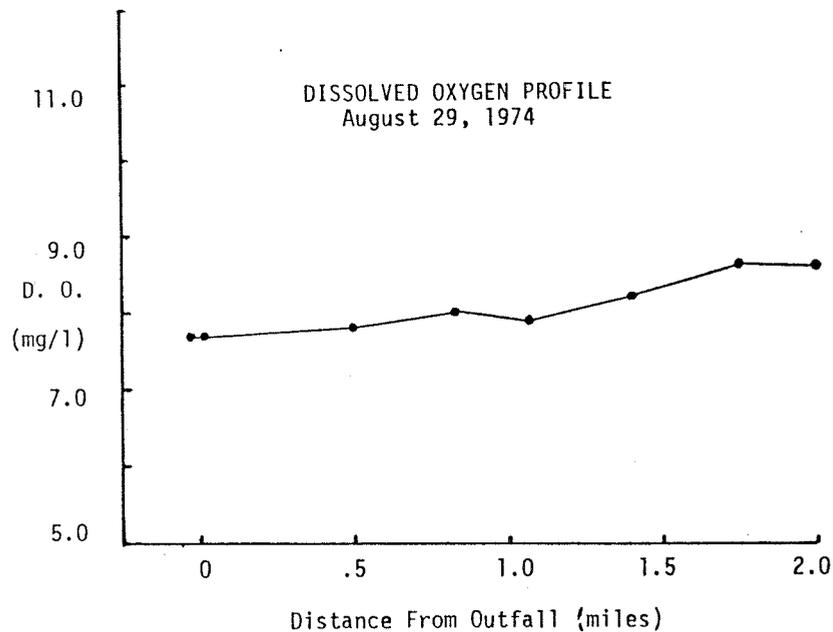
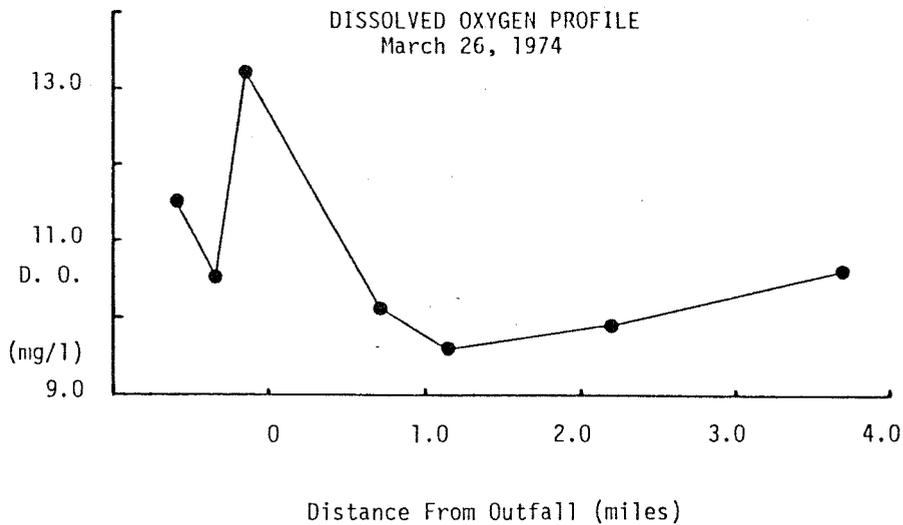
³At times of the year when algae problems are high, permittee may bypass the polishing pond and 24-hour composite samples for BOD₅ and suspended solids should be taken at the filter discharge.

APPENDIX VI

BREWERY CREEK AT MINERAL POINT

March 26, 1974

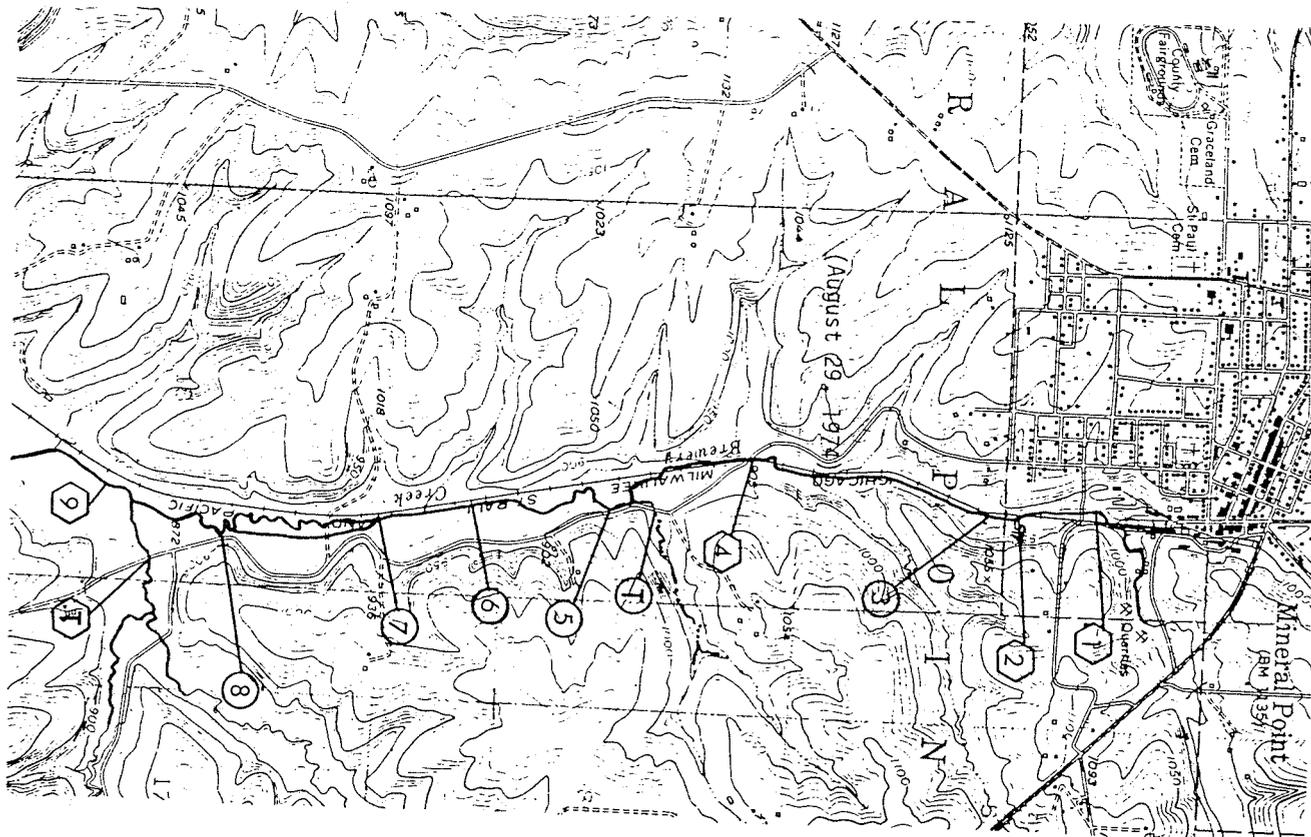
Station Number	Distance From Outfall (miles)	Temp (°C)	D. O. (mg/l)	pH (SU)	BOD ₅ (mg/l)	FCC	Susp	Total	NH ₃ -N (mg/l)	NO ₂ -N (mg/l)	NO ₃ -N (mg/l)	Zinc (mg/l)	Lead (mg/l)	Iron (mg/l)	Mercury (mg/l)
							Solids (mg/l)	Org-N (mg/l)							
1A	-.58	4.0	11.5	8.0	9.0	270	9	6.0	.76	.016	2.5	.2	.011	.32	<.0002
1B	-.35	4.0	10.5	8.0	4.1	40	13	34	.37	.016	2.3	.07	.004	.32	<.0002
1C	-.17	4.0	13.2	7.2	<8	<10	45	41	.08	.015	2.5	1.7	.003	12.0	<.0002
2	0			7.8	130	<100									
3	.71	5.0	10.1	7.2	11	60	71	1.03	2.05	.029	1.9	4.9	.94	20.0	<.0002
4	1.15	5.0	9.6	7.3	9.2	220	71	1.06	2.10	.028	1.9	4.2	1.1	20.0	<.0002
5	2.21	6.0	9.9	7.6	<8	90	50	.70	.91	.027	1.8	3.4	.40	14.0	<.0002
Trib	2.85	6.0	13.5	8.3	1.6	40	25	.48	.10	.013	2.2	.03	.30	.28	<.0002
6	3.69	5.0	10.6	7.9	<8	150	43	.60	.05	.023	1.9	1.6	.11	6.1	<.0002



BREWERY CREEK AT MINERAL POINT

August 29, 1974

Station Number	Distance From Outfall (miles)	Time	Temp (°C)	D. O. (mg/l)	Width (feet)	Average Depth (feet)	Average Velocity (FPS)	Area (ft ²)	Flow (CFS)	Filtered BOD ₅		Total Org-N (mg/l)	NH ₃ -N (mg/l)	NO ₂ -N (mg/l)	NO ₃ -N (mg/l)	Susp Solids (mg/l)	pH (SU)
										BOD ₅ (mg/l)	INH (mg/l)						
1	-.01		15.0	7.7	9.0	1.21	.43	10.9	4.7	3.7	1.6	.22	.05	.012	2.5	50	7.4
2	0	11:40	21.0	12.0					.4	14	3.7	4.5	4.2	.065	.11	50	8.1
3	.006	11:41	14.5	7.7						3.7	1.6	.66	.38	.02	2.2	55	7.6
4	.50		15.0	7.8	6.0	.97	.86	5.8	5.0	3.1	1.2	.63	.92	.046	2.0	72	7.5
Trib			14.0	8.4				(Est).2		2.5		.15	.03	.008	2.85	72	8.0
5	.83		14.8	8.0						3.7	1.6	.61	.75	.041	2.0	66	7.8
6	1.07		16.0	7.9						6.1	2.9	.60	.71	.049	2.0	70	7.8
7	1.40		12.5	8.2						4.3	2.8	.42	.70	.053	2.0	58	7.9
8	1.74		17.0	8.6						3.7	1.6	.49	.49	.053	2.1	67	7.9
Trib			19.0	9.7	7.5	.40	1.13	3.0	3.4	4.3		.72	.07	.017	2.25	95	8.3
9	2.0		17.0	8.6	10.5	.68	1.42	7.12	10.1	3.7	2.0	.62	.21	.037	2.2	89	8.1



APPENDIX VII

Chapter NR 104

INTRASTATE WATERS — USES AND
DESIGNATED STANDARDS

NR 104.01	General (p. 33)	NR 104.07	Variations and additions applicable in the Lake Michigan district (p. 44)
NR 104.02	Surface water classifications and effluent limitations (p. 34)	NR 104.08	Variations and additions applicable in the north central district (p. 48)
NR 104.03	Classification of surface waters and antidegradation (p. 37)	NR 104.09	Variations and additions applicable in the west central district (p. 49)
NR 104.04	Provision for changes (p. 38)	NR 104.10	Variations and additions applicable in the northwest district (p. 52)
NR 104.05	Variations and additions applicable in the southern district (p. 38)		
NR 104.06	Variations and additions applicable in the southeast district (p. 41)		

Note: Chapter NR 104 as it existed on September 30, 1976 was repealed and a new chapter NR 104 was created effective October 1, 1976.

NR 104.01 General. (1) "It is . . . the goal of the state of Wisconsin that, wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish and wildlife and provides for recreation in and on the water be achieved by 1983. . ." s. 147.01(1)(b), Stats. The long-range goal of Wisconsin water quality standards is, therefore, to permit the use of water resources for all lawful purposes. Surface waters which because of natural conditions are not conducive to the establishment and support of the complete hierarchy of aquatic organisms shall not be degraded below present levels, but shall be upgraded as necessary to support assigned uses. Most surface waters within the state of Wisconsin already meet or exceed the goals specified above. However, certain waters of the state may not meet these goals for the following reasons:

- (a) The presence of in-place pollutants,
- (b) Low natural streamflow,
- (c) Natural background conditions, and
- (d) Irretrievable cultural alterations.

(1m) Where it is determined that one or more of these factors may interfere with the attainment of the statutory objectives, a variance from the criteria necessary to achieve those objectives is provided.

(2) Surface waters within the boundaries of the state shall meet the standards for fish and aquatic life and recreational use with the variances and additions listed below in ss. NR 104.05 to 104.10. A system is provided within which small streams and other surface waters which cannot support high quality uses are granted a variance from the high quality criteria.

(3) Effluent limitations specified in this chapter shall be achieved by industrial, private and municipal dischargers by July 1, 1983 unless an earlier date is otherwise provided in a permit issued under s. 147.02, Stats. Municipal dischargers eligible for state or federal grant-in-aid

shall achieve the specified effluent limitations upon completion of construction or modification of facilities approved by the department of natural resources subsequent to adoption of this chapter unless otherwise provided in a permit issued under s. 147.02, Stats.

History: Cr. Register, September, 1976, No. 249, eff. 10-1-76; am. (1), Register, December, 1977, No. 264, eff. 1-1-78.

NR 104.02 Surface water classifications and effluent limitations. (1) HYDROLOGIC CLASSIFICATION. "Surface waters" as defined in s. NR 102.01(7), may be classified according to their hydraulic or hydrologic characteristics. For purposes of this chapter, surface waters will be classified by the department into one of the following categories:

(a) *Lakes or flowages*. This classification includes bodies of water whose current is more or less stagnant or which lacks a unidirectional current.

(b) *Diffused surface waters*. This classification includes any water from rains, intermittent springs or melting snow which flows on the land surface, through ravines, etc., which are usually dry except in times of runoff. This category does not include waters at the land surface in the vicinity of agricultural or wastewater irrigation disposal systems.

(c) *Wellands*. This classification includes areas where water is at, near, or above the land surface long enough to be capable of supporting aquatic or hydrophytic vegetation and which have soils indicative of wet conditions.

(d) *Wastewater effluent channels*. This classification includes discharge conveyances constructed primarily for the purpose of transporting wastes from a facility to a point of discharge. Drainage ditches (including those established under ch. 88, Stats.) constructed primarily for the purposes of relieving excess waters on agricultural lands shall not be construed as effluent channels. Modifications made to natural watercourses receiving wastewater effluents for the purpose of increasing or enhancing the natural flow characteristics of the stream shall not be classified as effluent channels.

(e) *Noncontinuous streams*. This classification includes watercourses which have a defined stream channel, but have a natural 7-day Q_{\cong} flow of less than 0.1 cfs and do not exhibit characteristics of being perpetually wet without wastewater discharges.

(f) *Continuous streams*. This classification includes watercourses which have a natural 7-day Q_{\cong} flow of greater than 0.1 cfs or which exhibit characteristics of a perpetually wet environment, are generally capable of supporting a diverse aquatic biota and flow in a defined stream channel.

Note: The application of this classification system is not dependent on the the navigability properties of the watercourse, but is dependent upon the quantity-quality relationships of the surface water.

(2) WATER QUALITY CLASSIFICATION. (a) Whenever the goals as specified in s. 147.01(1)(b), Stats., cannot be attained because of conditions enumerated in s. NR 104.01(1), a variance may be provided. Variances from a specific water quality criteria may be given in s. NR 104.05 et. seq. or a variance under one of the categories provided in this chapter may be specified.

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(b) Practices attributable to municipal, industrial, commercial, domestic, agricultural, land development, or other activities shall be controlled so that waters regardless of their hydrologic and water quality classifications meet the general aesthetic and acute toxicity conditions in s. NR 102.02(1).

(3) VARIANCE CATEGORIES. (a) Surface waters not supporting a balanced aquatic community (intermediate aquatic life):

1. Applicability. This category of variance may be applied to either the continuous or noncontinuous stream hydrologic classification.

2. Surface water criteria. The following water quality criteria shall be met in all surface waters included in this variance category:

a. Dissolved oxygen shall not be less than 3 mg/l.

b. Ammonia nitrogen (as N) at all points in the receiving water shall not be greater than 3 mg/l during warm temperature conditions nor greater than 6 mg/l during cold temperatures to minimize the zone of toxicity and to reduce dissolved oxygen depletion caused by oxidation of the ammonia.

c. The pH shall be within the range of 6.0 to 9.0.

d. Other substances may not exceed concentrations determined in accordance with s. NR 102.02(1).

3. Effluent criteria. a. The effluent limitations determined necessary to meet the surface water criteria listed above are enumerated in table 1.

Parameter	Table 1			Other (mg/l)
	Monthly Average (mg/l)	Daily Maximum (mg/ l)	Weekly Average (mg/l)	
BOD ₅	15	30	-	-
Total Suspended Solids	20	30	-	-
NH ₃ -N (May-October)	-	-	3	-
NH ₃ -N (November-April)	-	-	6	-
Dissolved Oxygen	-	-	-	4 (minimum)

b. Unless otherwise specified in table 1 above, effluent limitations for sewage treatment works shall be as adopted in ch. NR 210.

c. In addition to the effluent limitations enumerated in table 1 above, effluent limitations for these and any other substance necessary to protect assigned uses shall be met.

(b) Marginal surface waters: 1. Applicability. This variance category may be applied to the continuous or noncontinuous stream hydrologic classification, except that is shall be applied to all surface waters classified as effluent channel, wetland or diffuse surface water.

2. Surface water criteria. The following surface water quality criteria shall be met in all surface waters included in this variance category:

a. Dissolved oxygen shall not be less than 1 mg/l.

b. The pH shall be within the range of 6.0 to 9.0.

c. Other substances may not exceed concentrations determined in accordance with s. NR 102.02(1).

3. Effluent criteria. a. The effluent limitations determined necessary to meet the surface water criteria listed above are enumerated in table 2.

Parameter	Monthly Average (mg/l)	Weekly Average (mg/l)	Other (mg/l)
BOD ₅	20	30	-
Total Suspended Solids	20	30	-
Dissolved Oxygen	-	-	4 (minimum)

b. Unless otherwise specified in table 2 above, effluent limitations for sewage treatment works shall be as adopted in ch. NR 210.

c. In addition to the effluent limitations enumerated in table 2 above, effluent limitations for these and any other substance necessary to protect assigned uses shall be met.

(4) OTHER CLASSIFICATIONS AND EFFLUENT CRITERIA. (a) *Surface waters significant to the environmental integrity of the state or region.* Under all hydrologic categories, the department reserves the right to require other effluent limitations, including allocation of wasteloads for organic material, toxicants and chlorine residuals if it is determined that the specified surface water is important to the overall environmental integrity of the area. In waters identified as trout streams, located in scientific areas or wild and scenic areas, providing endangered species habitat or of high recreational potential, effluent criteria will be evaluated on a case-by-case basis.

(b) *Surface waters classified for fish and aquatic life.* 1. Streams. Where flowing streams or rivers are specified to achieve fish and aquatic life criteria, wasteload allocation for organic material, toxicants and chlorine residuals shall determine effluent criteria necessary to achieve that standard.

2. Lakes and flowages. Effluent characteristics for discharges to lakes or flowages shall be based upon an evaluation of water quality necessary to protect fish and aquatic life taking into account mixing zone and nutrient removal criteria.

3. Minimum effluent criteria. If it can be reasonably demonstrated that the quality of the surface water is independent of a wastewater discharge, effluent limitations established under ss. 147.04 and 147.06, Stats., shall apply.

(c) *Wastewater treatment lagoons.* Effluents from fill-and-draw wastewater treatment lagoons or domestic waste stabilization ponds discharging to waters receiving a variance in this chapter may be permitted to vary from the limitations specified in table 1 or 2 provided the following conditions are met:

1. The discharge occurs only during the spring and fall of the year when the flow in the receiving water is normally high, and the temperature is low. The rate of discharge shall not exceed that specified in a permit under s. 147.02, Stats., or where no rate is indicated, the allowable discharge quantities shall be determined by the department based upon current evaluation of the receiving water.

2. In lieu of the previous conditions, the discharge from a fill-and-draw lagoon may occur at any time provided the rate does not exceed the assimilative capacity of the receiving water as specified in a permit under s. 147.02, Stats.

3. The dissolved oxygen in the effluent is maintained at a level greater than or equal to 4 mg/l, and the permitted rate of discharge shall be such that the dissolved oxygen and ammonia nitrogen criteria necessary to sustain fish and aquatic life are maintained in the stream during the period of discharge.

4. The effluent limitations do not exceed those established under ss. 147.04 and 147.06, Stats.

(5) **CHANGES IN CLASSIFICATION.** Surface waters which exhibit changing hydrologic and quality characteristics shall be classified accordingly. Effluent criteria for upstream discharges shall be based upon the most critical downstream classification and shall be specified by the department either on the basis of justified inference or by the application of a wasteload allocation analysis. Any subsequent changes in a stream's morphology or potential may necessitate the reevaluation of the classification.

History: Cr. Register, September, 1976, No. 249, eff. 10-1-76; am. Tables 1 and 2, (2), (3) (a) 2a and d, (3) (b) 2a and c, (4) (c), Register, December, 1977, No. 264, eff. 1-1-78; am. (3) (a) 2a, Register, June, 1978, No. 270, eff. 7-1-78; am. (1) (c), Register, June, 1984, No. 342, eff. 2-1-84; r. (3) (a) 2. b. to d., (b) 2. b. and c., renum. (3) (a) 2. e. to g. and (3) (b) 2. d. and e. to be (3) (a) 2. b. to d. and (3) (b) 2. b. and c. and am (3) (a) 2. g. and (3) (b) 2. c., am. (3) (a) 3. a. and (3) (b) 3. a., Register, October, 1986, No. 370, eff. 11-1-86.

NR 104.03 Classification of surface waters and antidegradation. In no case shall the effluent criteria specified herein cause degradation of surface water quality below present levels. Surface waters which, because of their hydrologic classification, are permitted to receive a new effluent of a quality specified in NR 104.02 shall not receive such effluent unless it has been affirmatively demonstrated to the department that such degradation is necessary to protect the public health or to maintain or restore the environmental integrity of a higher value resource. In no case shall a new effluent interfere with or become injurious to any assigned uses made of or presently possible in any surface water.

History: Cr. Register, September, 1976, No. 249, eff. 10-1-76; am. Register, December, 1977, No. 264, eff. 1-1-78.

NR 104.04 Provision for changes. The surface waters specified in this chapter are not intended to be an exclusive listing nor do the specified effluent criteria purport to meet the 1983 water quality goals set forth in ch. 147, Stats. Additions to or deletions from these listings may be made based upon the accumulation of information necessary to make such determination and in accordance with the requirements of ch. 227, Stats.

History: Cr. Register, September, 1976, No. 249, eff. 10-1-76.

NR 104.05 Variances and additions applicable in the southern district. Subject to the provision of NR 104.04, intrastate surface waters in the southern district counties of Columbia, Dane, Dodge, Grant, Green, Iowa, Jefferson, Lafayette, Richland, Rock and Sauk shall meet the criteria for fish and aquatic life and recreational use with exceptions and additions as follows:

Register, October, 1986, No. 370

(1) ADDITION. The public water supply standard shall be met on the Wisconsin river in section 8, township 10 north, range 7 east.

(2) VARIANCE. Surface waters in the southern district subject to a variance under NR 104.02(3) are listed in table 3.

TABLE 3
SOUTHERN DISTRICT

Surface Water (Facility Affected)	Reach Description	Hydrologic Classification	Applicable Criteria (1)	Effluent Limitations (2) Effluent limitations to be determined
1. Goose Lake Tributary (Arlington)	Tributary upstream from Goose Lake	Noncontinuous	II	B
2. Tributary - East Branch Pecatonica River (Barneveld)	From the Barneveld STP downstream to the East Branch Pecatonica River	Noncontinuous	II	B
3. Williams Creek (Blue Mounds)	From the Blue Mounds STP downstream to the east line of Sec. 14, T6N, R5E	Noncontinuous	I	A
4. Sanders Creek (Boscobel)	From the Boscobel STP downstream to the Wisconsin River	Continuous	I	A
5. Allen Creek (Brooklyn)	Upstream from Butts Corner Road	Continuous	I	A
6. Kummel Creek (Brownsville)	From Brownsville STP downstream to CTH "HH"	Noncontinuous	I	A
7. Spring Brook and Tributary (Clinton)	Tributary from the Clinton STP to Spring Brook	Effluent ditch	II	B
8. Tributary - Dead Creek (Clyman)	Spring Brook in Clinton Township	Continuous	II	NA
9. West Branch Pecatonica River (Cobb)	Tributary from Clyman STP downstream to Dead Creek	Noncontinuous	II	B
	From the Cobb STP downstream to confluence with an unnamed tributary NE $\frac{1}{4}$, NW $\frac{1}{4}$, Sec. 2, T5N, R1E.	Continuous	I	A
10. Door Creek (Cottage Grove)	Door Creek upstream from STH 12 & 18	Noncontinuous	I	A
	From STH 12 & 18 downstream to Lake Kegonsa	Continuous	I	NA
11. Coon Branch (Cuba City)	Upstream from westerly tributary approximately 1 mile above STH "11"	Noncontinuous	II	B
	Downstream from above tributary to confluence with Galena River	Continuous	I	NA
12. Mud Creek and Tributary (Deerfield)	Tributary from Deerfield STP to confluence with Mud Creek	Effluent ditch	II	B
	Mud Creek from above tributary downstream to confluence with Koshkonong Creek	Continuous	I	

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13. Indian Creek and Tributary (Dickeyville)	Tributary from Dickeyville STP to confluence with Indian Creek	Noncontinuous	II	NA
	Indian Creek from above tributary downstream to confluence with Platte River	Continuous	I	A
14. Dodge Branch (Dodgeville)	Upstream from a point approximately 3,500 feet downstream from STH "191"	Noncontinuous	I	A
15. Tributary - North Branch Crawfish River (Fall River)	Tributary from the Fall River STP downstream to the North Branch Crawfish River	Noncontinuous	II	Effluent limitations to be determined
16. Gregory Branch (Fennimore)	Upstream from STH "61"	Continuous	I	A
17. Tributary - Rock River (Hidden Meadows Mobile Home Park)	Tributary from the Hidden Meadows Mobile Park STP discharge downstream to the Rock River	Noncontinuous	II	B
18. Big Spring Branch (Highland)	Upstream from the North line of Sec. 19, T7N, R1E	Noncontinuous	I	A
19. Pedler Creek (Iowa Co. Nursing Home)	From the Iowa Co. Nursing Home STP downstream to the confluence with an unnamed tributary, SE $\frac{1}{4}$, SE $\frac{1}{4}$, Sec. 34, T6N, R2E	Noncontinuous	I	A
20. Tributary - Wildcat Creek (Iron Ridge)	From the Iron Ridge STP downstream to Wildcat Creek	Noncontinuous	II	B
21. Tributary & Rock River Tributary (Ixonian San. Dist.)	From the Ixonian San. Dist. STP downstream to the juncture with the Rock River Tributary	Noncontinuous	II	B
	Rock River Tributary from above tributary to confluence with Rock River	Continuous	II	NA
22. Tributary - Menominee River (Jamestown San. Dist. #2)	From Jamestown San. Dist. #2 STP to the Menominee River	Diffused surface water	II	B
23. Dead Creek (Juneau)	Upstream from CTH "M"	Effluent ditch	II	B
	From CHT "M" to St. Helena Rd.	Continuous	I	NA
24. Sinnipee Creek (Kieler San. Dist. #1)	From Kieler lagoon outfall to Bluff Road	Continuous	I	A
25. Rock Creek (Lake Mills)	From the Lake Mills STP downstream to CTH "V"	Noncontinuous	I	A
	From CTH "V" to Harper's Mill Pond	Continuous	I	NA
26. Tributary - Pigeon Creek (Lancaster)	Tributary from Lancaster STP downstream to south line of section 10	Continuous	II	Effluent limitations to be determined
	Tributary from above point downstream to confluence with Pigeon Creek	Continuous	I	determined
27. Tributary - Baker Creek (Lebanon San. Dist.)	From Lebanon STP downstream to Baker Creek	Noncontinuous	II	B
28. Little Platte River (Livingston)	From Livingston STP downstream to New California Road	Noncontinuous	I	A
29. Tributary-East Branch Rock River (Lomira)	Tributary upstream from confluence with East Branch Rock River.	Noncontinuous	I	A
30. (Madison Metro Sewerage Commission)	From the STP outfall aerator to the Oregon Branch	Effluent ditch	II	Effluent limitations to be determined

31. Brewery (Furnance) Creek (Mineral Point)	Brewery Creek upstream from confluence with Mineral Point Branch	Continuous	II	B (Note: the above limitation shall remain in effect until significant nonpoint source problems can be corrected)
32. Tributary - Blue River (Montfort)	From the Montfort STP downstream to the Blue River	Continuous	I	A
33. Little Grant River (Mount Hope)	From the Mt. Hope STP downstream to the west boundary of Sec. 10, T5N, R4W	Noncontinuous	I	A
34. West Branch Sugar River (Mt. Horeb)	From Mt. Horeb STP downstream to CTH "JG".	Continuous	I	A
35. Tributary - Austin Branch (Orchard Manor)	Drainage from Orchard Manor outfall to Austin Branch	Diffused surface waters	II	Effluent limitations to be determined
36. Oregon Branch - Badfish Creek (Oregon)	From the Oregon outfall downstream to juncture with the Madison Met effluent ditch	Noncontinuous	II	Effluent limitations to be determined
	From this point downstream to CTH "A"	Continuous	I	
37. Swan Creek and Tributary (Orfordville)	Tributary from Orfordville STP outfall to Swan Creek.	Effluent ditch	II	NA
	Swan Creek from confluence with above tributary to Dicky Road.	Noncontinuous	I	A
38. Tributary - Blake Fork (Patch Grove)	Tributary from the Patch Grove STP downstream to Blake Fork	Noncontinuous	I	A
39. Tributary - Honey Creek (Plain)	From the Plain STP downstream to Honey Creek	Continuous	I	Effluent limitations to be determined
40. Randolph Branch - Tributary	From the Randolph STP downstream to Beaver Creek Tributary	Noncontinuous	II	Effluent limitations to be determined
Beaver Creek (Randolph)	Tributary to Beaver Creek upstream from Beaver Creek	Noncontinuous	I	to be determined
41. Tributary-Beaver Dam River (Reeseville)	Tributary from Reeseville STP to confluence with Beaver Dam River	Noncontinuous	I	A
42. Conley - Smith Creek (Ridgeway)	From the Ridgeway STP downstream to the south boundary of Sec. 14, T6N, R4E	Noncontinuous	I	Effluent limitations to be determined
43. Tributary - Rocky Run Creek (Rio)	From the Rio STP downstream to Rocky Run Creek	Noncontinuous	II	B
44. Tributary - Narrows Creek (Sauk Co. Health Care Center)	From the Sauk County Health Care Center STP downstream to Narrows Creek	Noncontinuous	I	A
45. Duck Creek and Tributary (Sullivan)	Tributary from the Sullivan STP to Duck Creek	Effluent channel	II	Effluent limitations to be determined
	Duck Creek from the effluent ditch downstream juncture with northerly drainage ditch in Sec. 5, T6N, R16E	Noncontinuous	I	to be determined
46. Koshkonong Creek (Sun Prairie)	Koshkonong Creek upstream from first bridge above Sun Prairie STP	Noncontinuous	II	Effluent limitations to be determined
	Koshkonong Creek from above location to CTH "T".	Continuous	II	to be determined
47. Badger Mill Creek (Verona)	Badger Mill Creek from road at Verona STP downstream to STH "69".	Continuous	I	A

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48. Tributary - Mur- Tributary from Oakwood State Camp Noncontinuous II B
 phy Creek (Wis- STP downstream to Murphy Creek
 consin
 Department of
 Health & Social
 Services - Oak-
 wood State
 Camp)

- (1) Criteria I requires the maintenance of surface water criteria specified in NR 104.02(3)(a)2.
 Criteria II requires the maintenance of surface water criteria specified in NR 104.02(3)(b)2.
 (2) Effluent limitation A requires those limits specified in NR 104.02(3)(a)3.
 Effluent limitation B requires those limits specified in NR 104.02(3)(b)3.
 NA—Not applicable

History: Cr. Register, September, 1976, No. 249, eff. 10-1-76; am. table 3, r. (3), Register, December, 1977, No. 264, eff. 1-1-78.

NR 104.06 Variances and additions applicable in the southeast district. Subject to the provisions of NR 104.04, intrastate surface waters in the southeast district counties of Kenosha, Milwaukee, Ozaukee, Racine, Walworth, Washington and Waukesha shall meet the criteria for fish and aquatic life and recreational use with exceptions and additions as follows.

(1) VARIANCE. Surface waters in the southeast district subject to a variance under NR 104.02(3) are listed in table 4.

(2) OTHER VARIANCES. (a) The following surface waters in the southeast district shall meet the standards for fish and aquatic life except that the dissolved oxygen shall not be lowered to less than 2 mg/l at any time, nor shall the membrane filter fecal coliform count exceed 1,000 per 100 ml as a monthly geometric mean based on not less than 5 samples per month nor exceed 2,000 per 100 ml in more than 10% of all samples during any month:

1. Underwood creek in Milwaukee and Waukesha counties below Ju-neau boulevard.
2. Barnes creek in Kenosha county.
3. Pike creek, a tributary of Pike river, in Kenosha county.
4. Pike river in Racine county.
5. Indian creek in Milwaukee county.
6. Honey creek in Milwaukee county.
7. Menomonee river in Milwaukee county below the confluence with Honey creek.
8. Kinnickinnic river in Milwaukee county.
9. Lincoln creek in Milwaukee county.

(b) The following surface waters in the southeast district shall meet the standards for fish and aquatic life except that the dissolved oxygen shall not be lowered to less than 2 mg/l at any time, nor shall the membrane filter fecal coliform count exceed 1,000 per 100 ml as a monthly geometric mean based on not less than 5 samples per month nor exceed 89DF at any time at the edge of the mixing zones established by the department under s. NR 102.03 (4):

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APPENDIX VIII

MINERAL POINT
IOWA COUNTY

July 15, 1975

The Mineral Point waste water treatment plant discharges to Brewery Creek, a tributary of the Pecatonica River. The 7Q10 on Brewery Creek above the treatment plant outfall is .23 cfs. Brewery Creek has two branches which form its headwaters on the near northeast side of Mineral Point. Both of these branches had been subjected to occasional nonpoint sources of pollution of short duration in the past. The ambient water quality is very good and the branches contain small minnows and forage fish as well as an adequate benthic community. These two branches meet roughly 50 yards above the railroad tracks bridge, which is about 100 yards above the Market Street Bridge. At and below the railroad bridge, the stream comes in contact with large piles of mine tailings deposited there in the early 1900's. The stream from this point has a distinct red color ~~except~~ ^{with} heavy loads of suspended solids and heavy metals. The stream changes from one of high quality to one sterile of any kind of life. The nonpoint sources of pollution present a very serious degradation of the water quality of the stream. Brewery Creek could have trout stream potential were it not for this degradation taking place. Brewery Creek flows through agricultural land with portions of the stream bank being semi-wooded and marshy.

RECOMMENDATIONS

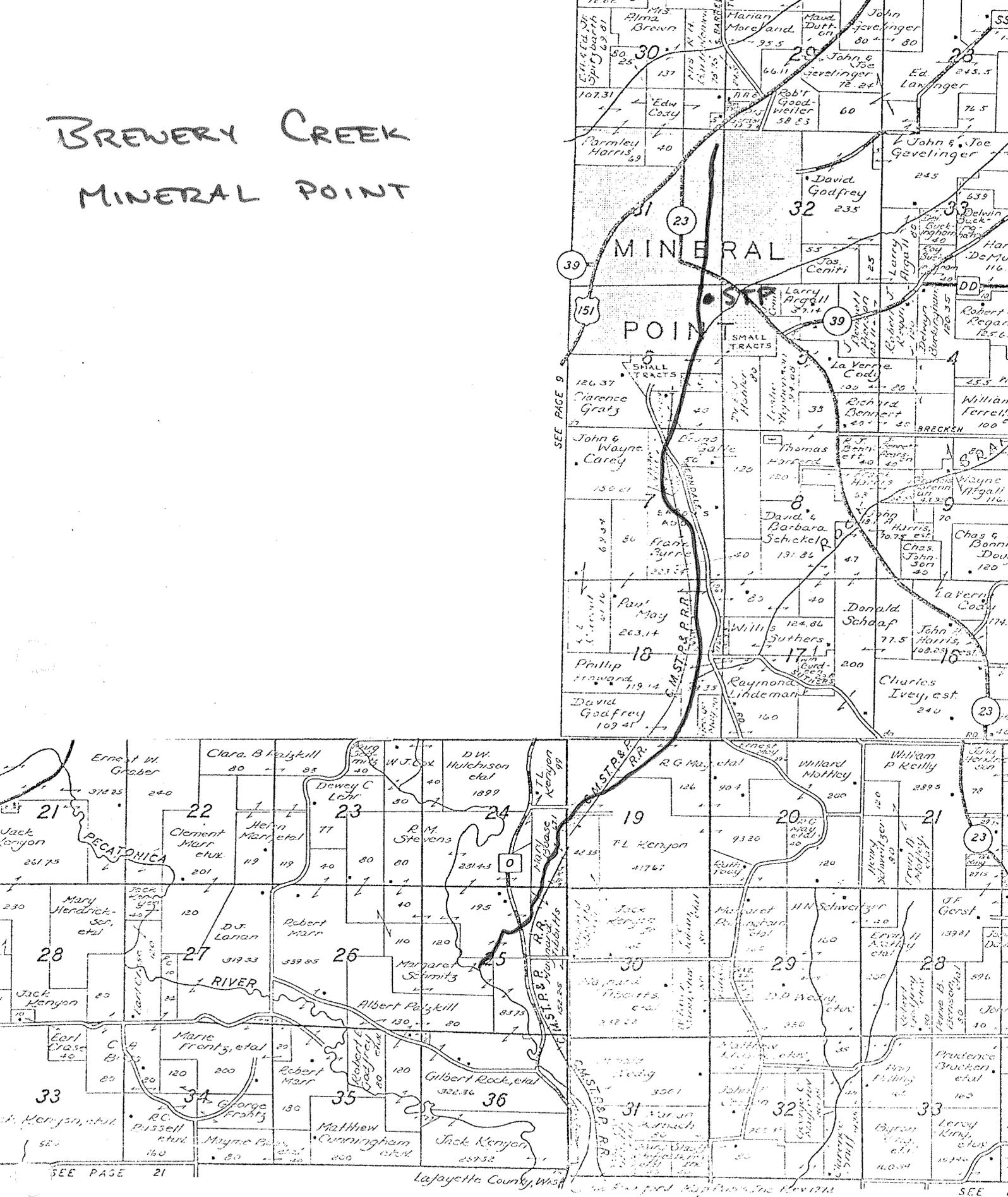
Brewery Creek should be classified continuous fish and aquatic life for its entire length. However, it is economically unfeasible to require the Town of Mineral Point to design for tertiary treatment if the nonpoint sources of pollution cannot be remedied to an equal degree compatible to continuous fish and aquatic life standards. The mine waste debris appears to be the main issue and a study should be conducted to determine a feasible solution if any exist. If there exists no alternative method to remedy this problem, then Brewery Creek should be classified under the agricultural classification and allowed to discharge at those limits. The above recommendations represent a concurrence of opinion of the stream classification team who are as follows:

Bob Bate, District Engineer; Gene Van Dyck, Area Fish Manager; and Tom Bainbridge, Stream Classification Coordinator.


Tom Bainbridge
Stream Classification Coordinator

TB:lg

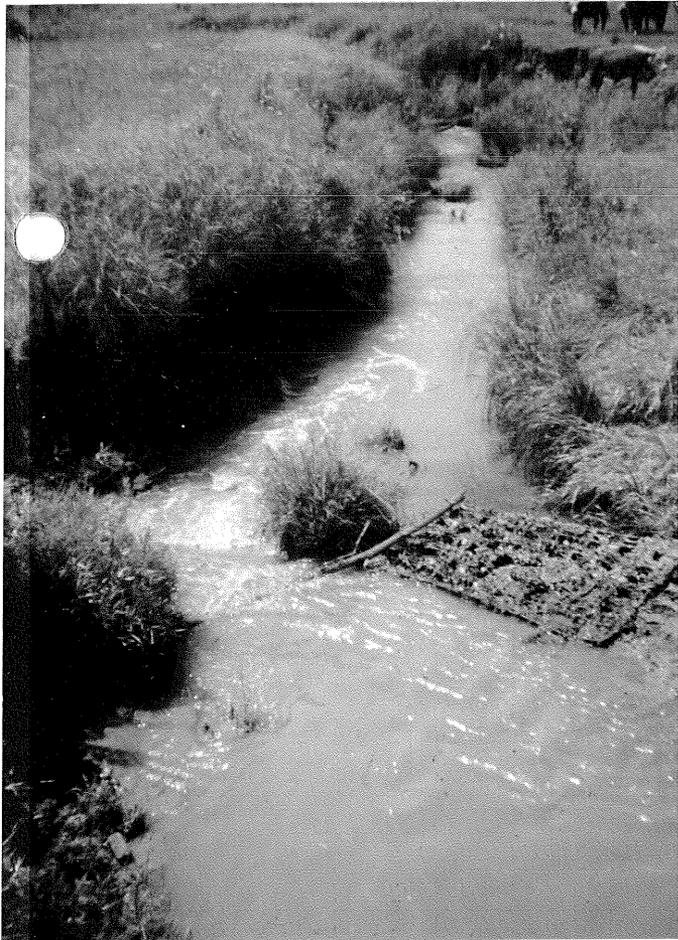
BREWERY CREEK MINERAL POINT



Lafayette County, Wis.

Map prepared by J. H. ... May 1911

SEE



↑ MINERAL POINT - First Town
Bridge Below STP.

▶ MINERAL POINT - First Town
Road Bridge Above STP.



↑ MINERAL POINT - First Town
Road Bridge Below STP.

↓ MINERAL POINT - Junction of
East and West Branches.





Juncture of EAST + WEST
Br. of Brewery Cr.



1st Town Rd Bridge above
S.T.P.



1st Town Rd Br. below
S.T.P.