

BOAZ - RICHLAND COUNTY
STREAM CLASSIFICATION; MILL CREEK
FEBRUARY 28, 1985
PROPOSED WWTP CONSTRUCTION
SOUTHERN DISTRICT, DODGEVILLE AREA

Presently the Village of Boaz is serviced by private septic systems. Proposals have been made to construct a village wastewater treatment facility. If a facility is constructed which has a discharge to surface waters, Mill Creek would be the likely receiving stream.

Mill Creek originates in northwestern Richland County, flows through Boaz and enters the Wisconsin River west of Orion. The stream is 32 miles in length and has a gradient of 13 ft./mile. Flooding had been a severe problem in the past and led to the organization of a watershed association and initiation of a P.L. 566 watershed project.

The structures and stream straightening have reduced flood damage but has also detracted from the fishery quality of the stream, especially the loss of habitat and spawning areas. The land surrounding Mill Creek is primarily agricultural. Soil erosion and barnyard runoff probably impact the stream the most.

Ten miles of Mill Creek is considered trout water. Roger Kerr (Boscobel Fish Manager) considers CTH "E" in Boaz as the lower limit of trout water. The remaining 22 miles is considered a warm water fishery.

Species present include smallmouth bass, northern pike, catfish, panfish, rough fish, and forage fish. A dam located on the lower end of Mill Creek forms Balmoral Pond. Fish management feels that the dam impedes fish migration from the Wisconsin River.

The two major tributaries to Mill Creek are the East and West Branch of Mill Creek which enter the main stem just north of Boaz. Both streams are classified as trout water. All but two of the named tributaries in the watershed are currently managed as trout water. The trout streams include: Kepler Branch, Coulter Hollow, Babb Hollow, Hood Hollow, Pine Valley, Miller Branch, Ryan Hollow, Core Hollow, Fox Hollow, Dieter Hollow, and Hoosier Hollow Creek (Map #3).

A macroinvertebrate sample was taken from Mill Creek at Boaz (Map #1). The macroinvertebrate results are contained in Table 1.

Macroinvertebrates were collected in the riffle area with a D-frame net (1mm² mesh). The net was held downstream and the substrate above it was disturbed, dislodging the macroinvertebrates, which were then carried into the net by the current. The riffle sampled consisted of gravel-rubble, which provided for good macroinvertebrate attachment. After 100+ macroinvertebrates were collected, samples were deposited in a jar containing 95 percent ETOH for preservation and laboratory sorting.

Laboratory procedures consisted of completely mixing the macroinvertebrate sample and then evenly distributing it across a gridded tray. The sample was picked for a 100 count; or if there were

Map #1
Boaz
Stream Classification
Macroinvertebrate Sampling Site



not 100 organisms, until all the arthropods had been removed from the sample.

Chironomids were mounted on slides using Turttox CMCP 10 and identified to the lowest taxonomic level possible. A taxonomic list was prepared for the site and a biotic index value was assigned.

The Biotic Index used (which is an indicator of water quality) was developed by Dr. Hilsenhoff and is published in DNR Technical Bulletin Number 132. The Biotic Index is calculated from the formula:

$$B.I. = \frac{\sum (n \times a)}{N}$$

Where (n) is the number of individuals in each species or genus, (a) is the index value for that species or genus and N is the total number of individuals in the sample which have assigned biotic index values.

Dr. Hilsenhoff's biotic index values range from 0-5 with 0 indicating very intolerant organisms and 5 indicating very tolerant organisms. Water quality determinations from biotic index values are listed in Table II.

Table 1 Taxonomic list of macroinvertebrates for BZ 1

Date: 11/16/83 (Mill Creek) (Boaz Community Park)

ORDER	FAMILY	GENUS/SPECIES	NUMBER OF INSECTS (n)	BIOTIC INDEX VALUE (a)	a x n
COLEOPTERA	ELMIDAE	<u>Dubiraphia quadrinotata</u>	1	3	3
COLEOPTERA	ELMIDAE	<u>Optioservus fastiditus</u>	2	2	4
COLEOPTERA	ELMIDAE	<u>Optioservus</u> spp. (larvae)	14	2	28
COLEOPTERA	ELMIDAE	<u>Stenelmis crenata</u>	1	3	3
COLEOPTERA	ELMIDAE	<u>Stenelmis</u> spp. (larvae)	2	3	6
DIPTERA	ATHERICIDAE	<u>Atherix variegata</u>	1	2	2
DIPTERA	CHIRONOMIDAE	<u>Cricotopus</u> spp.	1	4	4
DIPTERA	CHIRONOMIDAE	<u>Eukiefferiella</u> spp.	2	2	4
DIPTERA	CHIRONOMIDAE	<u>Microtendipes</u> spp.	13	3	39
DIPTERA	CHIRONOMIDAE	<u>Orthocladus</u> spp.	1	3	3
DIPTERA	CHIRONOMIDAE	<u>Paratanytarsus</u> spp.	1	3	3
DIPTERA	EMPIDIDAE	all genera	1	3	3
DIPTERA	SIMULIIDAE	<u>Simulium vittatum</u>	4	4	16
DIPTERA	TIPULIDAE	<u>Antocha</u> spp.	21	2	42
EPHEMEROPTERA	BAETIDAE	<u>Baetis flavistriga</u>	2	2	4
EPHEMEROPTERA	HEPTAGENIIDAE	<u>Stenonema integrum</u>	2	1	2
EPHEMEROPTERA	HEPTAGENIIDAE	<u>Stenonema vicarium</u>	1	1	1
PLECOPTERA	PERLODIDAE	<u>Isoperla marlynia</u>	1	0	0
PLECOPTERA	PERLODIDAE	<u>Isoperla transmarina</u>	2	0	0
TRICHOPTERA	HYDROPSYCHIDAE	<u>Cheumatopsyche</u> spp.	18	3	54
TRICHOPTERA	HYDROPSYCHIDAE	<u>Hydropsyche betteni</u>	4	3	12
TRICHOPTERA	HYDROPSYCHIDAE	<u>Symphitopsyche bifida</u> (group)	2	3	6
TRICHOPTERA	HYDROPSYCHIDAE	<u>Symphitopsyche riola</u>	9	2	18
TRICHOPTERA	HYDROPSYCHIDAE	<u>Symphitopsyche slossonae</u>	7	2	14
TRICHOPTERA	HYDROPSYCHIDAE	<u>Symphitopsyche sparna</u>	6	1	6
AMPHIPODA	GAMMARIDAE	<u>Gammarus pseudolimneus</u>	2	2	4
Totals			121		281

$$\text{Biotic Index} = 281 / 121 = 2.32$$

Table II Water Quality Determinations from Biotic Index Values

<u>Biotic Index</u>	<u>Category</u>	<u>Evaluation</u>
0 - 1.75	Excellent	No Organic Pollution
1.76 - 2.25	Very Good	Possible Slight Organic Pollution
2.26 - 2.75	Good	Some Organic Pollution
2.76 - 3.50	Fair	Significant Organic Pollution
3.51 - 4.25	Poor	Very Significant Organic Pollution
4.26 - 5.00	Very Poor	Severe Organic Pollution

The macroinvertebrate sample taken at site BZ1 had a biotic index of 2.32, which indicated good water quality. The sample had a high diversity of macroinvertebrates with many different genera represented.

Table III contains a listing of trout from a stream shocking survey in Mill Creek above STH "14". The survey stretch was 12,210 ft. in length and is Station Number Nine (Map #2). A total of 68 brown trout (6.5" to 21.9") and 51 rainbow trout (6.5" to 12.4") were captured.

The stream was evaluated using the "Stream Classification Guidelines for Wisconsin" developed by Joe Ball. The streams habitat was assessed with the "Stream System Habitat Rating Form". The Stream System Habitat Rating Forms are located in the appendix.

Map #2
Mill Creek
Fish Shocking Survey
Station Nine

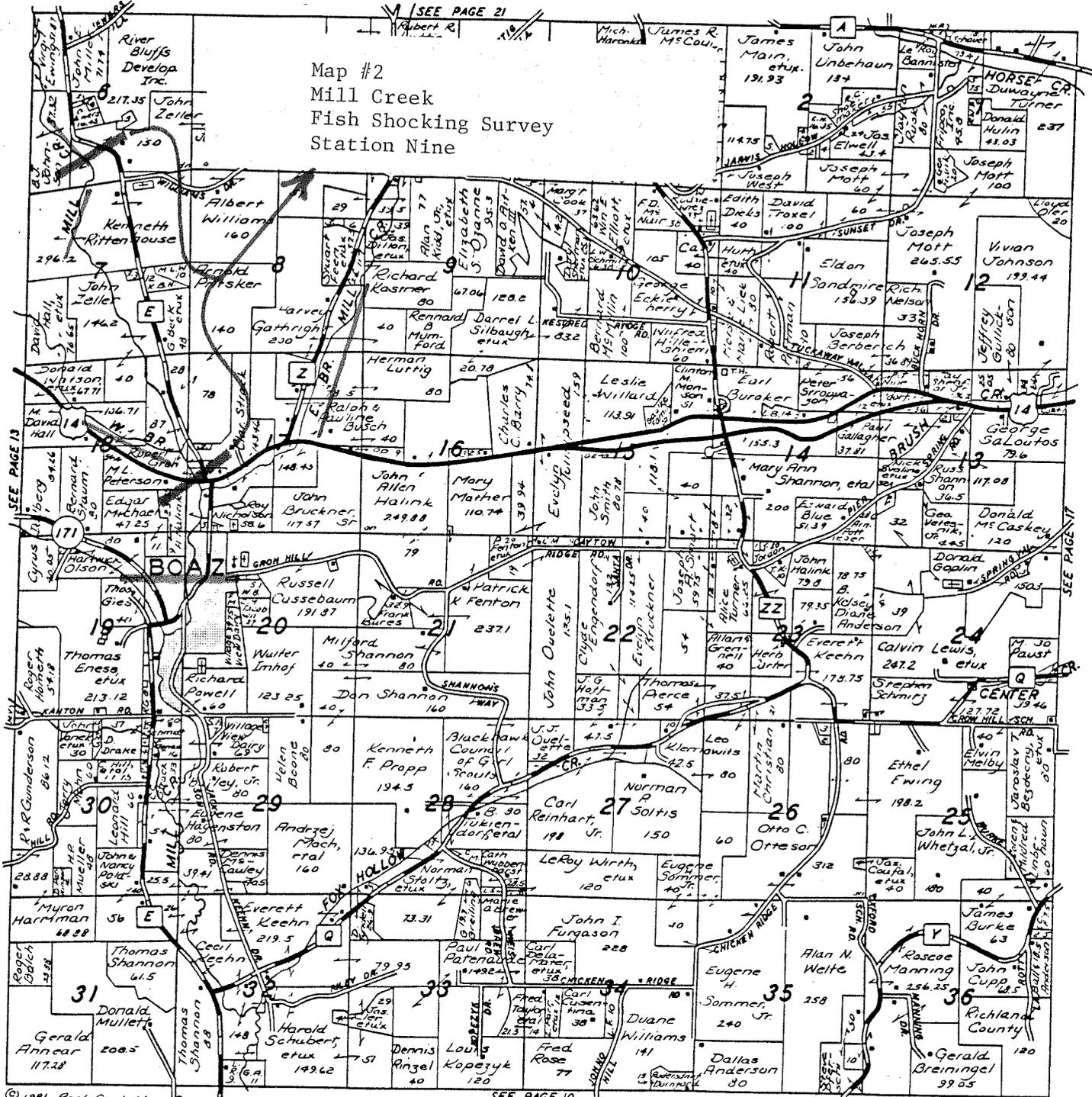


TABLE III

STREAM				INVESTIGATOR			
Mill Creek				Kerr			
Sampled:	LENGTH	WIDTH	AREA (ACRES)	STATION NO.	NO. PER ACRE	DATE	
	12,210 ft.	17 ft.	4.77	9	25	6-9-75	
SIZE RANGE	SPECIES						
	Brown Trout	Rainbow Trout					
1							
1.0 - 1.4							
1.5 - 1.9		Adipose					
2.0 - 2.4		Clip					
2.5 - 2.9							
3.0 - 3.4							
3.5 - 3.9							
4.0 - 4.4							
4.5 - 4.9							
5.0 - 5.4							
5.5 - 5.9							
6.0 - 6.4							
6.5 - 6.9	1		1				
7.0 - 7.4	3		1				
7.5 - 7.9	8		3				
8.0 - 8.4	5		8				
8.5 - 8.9	3		6				
9.0 - 9.4	4	1	3				
9.5 - 9.9	1	5	7				
10.0 - 10.4	1	6	4				
10.5 - 10.9	1	2	4				
11.0 - 11.4	1	2	6				
11.5 - 11.9	1		7				
12.0 - 12.4	4		1				
12.5 - 12.9	3						
13.0 - 13.4	2						
13.5 - 13.9	2						
14.0 - 14.4	3						
14.5 - 14.9	2						
15.0 - 15.4	1						
15.5 - 15.9							
16.0 - 16.4	2						
16.5 - 16.9							
17.0 - 17.4	2						
17.5 - 17.9							
18.0 - 18.4							
18.5 - 18.9	1						
19.0 - 19.4							
19.5 - 19.9							
20.0 - 20.4							
20.5 - 20.9							
21.0 - 21.4							
21.5 - 21.9	1						
22.0 - 22.4							
22.5 - 22.9							
23.0 - 23.4							
23.5 - 23.9							
24.0 - 24.4							
24.5 - 24.9							
25 + (give actual size)							
TOTAL	52	16	51	= 119			

Mill Creek north of Boaz received a reach score of 101 and was considered to have good habitat. Mill Creek south of Boaz received a reach score of 119 and was also considered to have good habitat.

Recommendations

Mill Creek above CTH "E" in Boaz is presently managed as trout water. This segment of Mill Creek should be classified as Full Fish and Aquatic Life, trout water [FALT(A)].

Mill Creek below CTH "E" is presently managed as a warm water fishery. This segment of Mill Creek should be classified as Full Fish and Aquatic Life [FAL(B)].

Map #3
Mill Creek and Tributaries

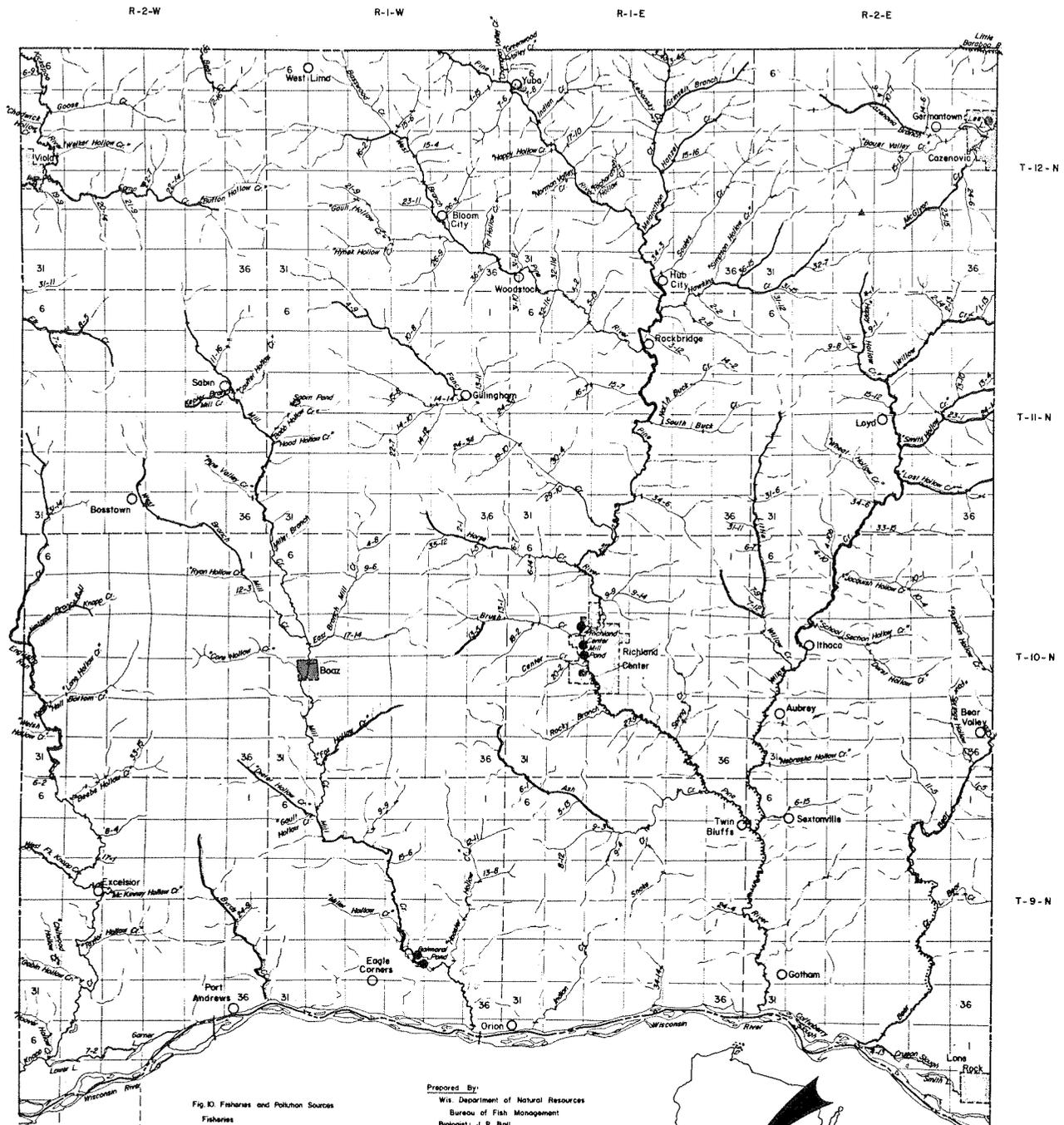


Fig. 10. Fisheries and Pollution Sources

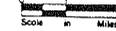
- Fisheries**
- Trout
 - Smallmouth bass
 - Panfish
 - Large-mouth bass, panfish, northern pike
 - Carfish, smallmouth bass, northern pike
 - Complex fishery
- Possible Sources of Pollution**
- Sewage treatment plants
 - Cheese factory and/or dairy
 - Other (meat, cannery, dumps)

19	6	5	2	1
	7	8	3	4
	10	9	14	13
	11	12	15	16

6	5	2	1
7	8	3	4
10	9	14	13
11	12	15	16

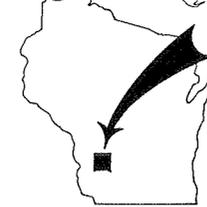
Numbering System for Watershed Labels

Prepared By:
Wis. Department of Natural Resources
Bureau of Fish Management
Biologist: J. R. Ball
Draftsman: E. A. Triggs & A. H. Phipps
Date: November, 1970



Data

- Population - 15,700 (1970 - projected)
- Total Area - 376,960 acres
- Water Area - 5,171 acres
- Miles of Stream - 490.2
- Area of Streams - 4,795 acres
- Number of Lakes - 9
- Area of Lakes - 185 acres
- Area of Farm Ponds - 191 acres



LAKES AND STREAMS
OF
RICHLAND COUNTY

- Legend**
- Intermittent flow
 - Bridge
 - Dam
 - Stream < 10' wide
 - Stream 10' - 20' wide
 - Stream 20' - 40' wide
 - Stream > 40' wide
 - County boundary
 - Civil town boundary
 - Corporate limits

Fig. 10. Fisheries & Pollution Sources

APPENDIX: Stream System Habitat Rating Form

Stream Mill Reach Location Above CTH "E" Reach Score/Rating 101/Good
 County Richland Date 11/16/83 Evaluator Roger Schlessler Classification "A"

STP - Proposed - Boaz

Rating Item	Category			
	Excellent	Good	Fair	Poor
Waterbed 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. 12	Heavy erosion evident. Probable erosion from any runoff. 16
Waterbed Nonpoint Source	No evidence of significant source. Little potential for future problem. 4	Some potential sources. (roads, urban area, farm fields). 8	Moderate sources. (Small wetlands, tile fields, urban area, intense agriculture). 12	Obvious sources. (Major wetland drainage, high use urban or industrial area, feed lots, impoundment). 20
Bank Erosion, Failure	No evidence of significant erosion or bank failure. Little potential for future problem. 6	Infrequent, small areas, mostly healed over. Some potential in extreme floods. 9	Moderate frequency and size. Some "raw" spots. Erosion potential during high flow. 15	Many eroded areas. "Raw" areas frequent along straight sections and bends. 18
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 flows 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. 12	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. 12	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. 10	More than 50% of the bottom changing nearly year long. Pools almost absent due to deposition. 20
Bottom Substrate	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
Average Depth at Rep. Low Flow	Greater than 24 inches. 0	12 inches to 24 inches. 6	6 inches to 12 inches. 18	Less than 6 inches. 24
Flow, at Rep. Low Flow	Warm water >5 cfs. Cold water >2 cfs. 0	Warm water 2-5 cfs. Cold water 1-2 cfs. 6	Warm water 0.5-2 cfs. Cold water 0.5-1 cfs. Continuous blow. 18	Less than 0.5 cfs. Stream may cease to flow in very dry years. >25. Essentially a straight stream. Generally all flat water inches or shallow riffle. Poor habitat. 24
Pool/Riffle, Run/Bend Ratio	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 inches or shallow riffle. Poor habitat. 20
Aesthetics	Wilderness characteristics, outstanding natural beauty. Usually wooded or unpaved 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 Total Without Effluent —
 Column Total With Effluent —
 Add Column Scores Without Effluent, E 4 +G 25 +F 72 +P 0 = Reach Score
 Add Column Scores With Effluent, E _____ +G _____ +F _____ +P _____ = Reach Score
 0 = Excellent, 71-129 = Good, 130-200 = Fair, >200 = Poor

APPENDIX: Stream System Habitat Rating Form

Stream Mill Reach Location Below CTH "E" Reach Score/Rating 119/Good

County Richland Date 11/16/83 Evaluator Roger Schlessler Classification "B"

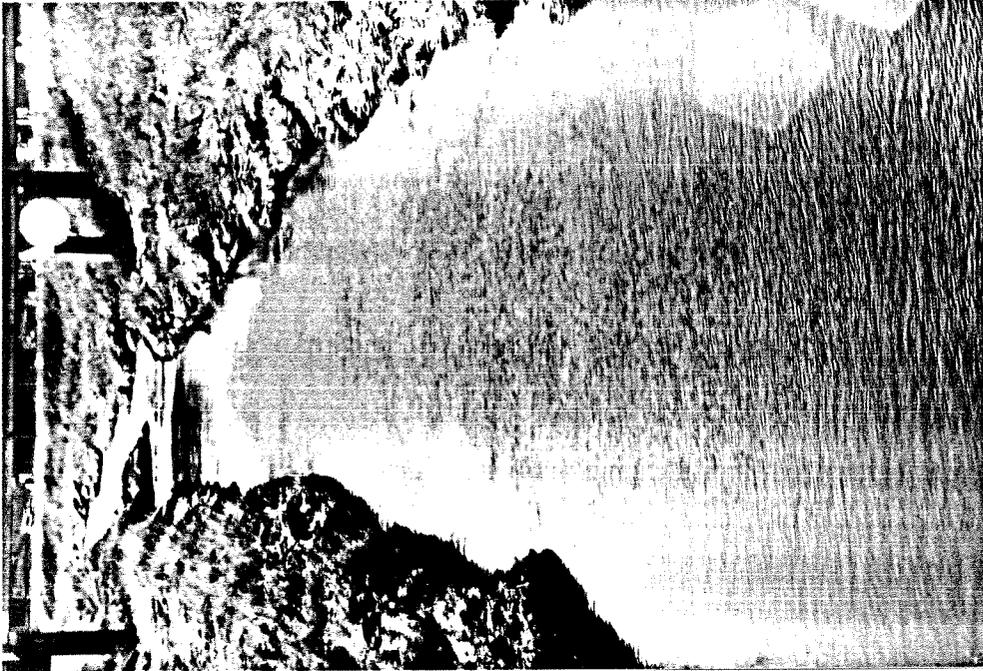
STP - Proposed - Boaz

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. 10	Heavy erosion evident. Probable erosion from any runoff. 12 14
Watershed Nonpoint Source	No evidence of significant source. Little potential for future problem. 4	Some potential sources. (roads, urban area, farm fields). 8	Moderate sources. (Small wetlands, tile fields, urban area, intense agriculture). 8	Obvious sources. (Major wetland drainage, high use urban or industrial area, feed lots, impoundment). 12 16
Bank Erosion, Failure	No evidence of significant erosion or bank failure. Little potential for future problem. 6	Infrequent, small areas, mostly healed over. Some potential in extreme floods. 9	Moderate frequency and size. Some "raw" spots. Erosion potential during high flow. 9	Many eroded areas. "Raw" areas frequent along straight sections and bends. 11 15
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. 9	<50% density. Many raw areas. Thin grass, few if any trees and shrubs. 12 16
Lower Bank Channel Capacity	Ample for present peak flow plus some increase. Peak flows 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. 10	Inadequate, overbank flow common. W/D ratio >25. 13 14
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. 9	Heavy deposits of fine material, increased bar development. 14 16
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. 8	More than 50% of the bottom changing nearly year long. Pools almost absent due to deposition. 14 16
Bottom Substrate	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. 7	Less than 10% rubble, gravel or other stable habitat. Lack of habitat is obvious. 11 12
Average Depth at Rep. Low Flow	Greater than 24 inches. 0	12 inches to 24 inches. 6	6 inches to 12 inches. 18	Less than 6 inches. 24
Flow, at Rep. Low Flow	Warm water >5 cfs. Cold water >2 cfs. 0	Warm water 2-5 cfs. Cold water 1-2 cfs. 6	Warm water 0.5-2 cfs. Cold water 0.5-1 cfs. Continuous blow. 18	Less than 0.5 cfs. Stream may cease to flow in very dry years. 24
Pool/Riffle, Run/Bend Ratio	5-7. Variety of habitat. Deep riffles and pools. 4	7-15. Adequate depth in pools and riffles. Bends provide habitat. 6	15-25. Occasional riffle or bend. Bottom contours provide some habitat. 16	>25. Essentially a straight stream. Generally all flat water inches or shallow riffle. Poor habitat. 20
Aesthetics	Wilderness characteristics, outstanding natural beauty. Usually wooded or unpastured corridor. 8	High natural beauty. Trees, historic site. Some development may be visible. 10	Common setting, not offensive. Developed but uncluttered area. 10	Stream does not enhance aesthetics. Condition of stream is offensive. 14

Column Total Without Effluent —
Column Total With Effluent —

add Column Scores Without Effluent, E 0 + G 6 + F 113 + P 0 = Reach Score
add Column Scores With Effluent, E _____ + G _____ + F _____ + P _____ = Reach Score

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



Boaz Stream Classification

Mill Creek, upstream of
CTH "E".



Boaz Stream Classification

Mill Creek,
Macroinvertebrate sampling
site.



Boaz Stream Classification

Mill Creek, North of Boaz,
Land Use.



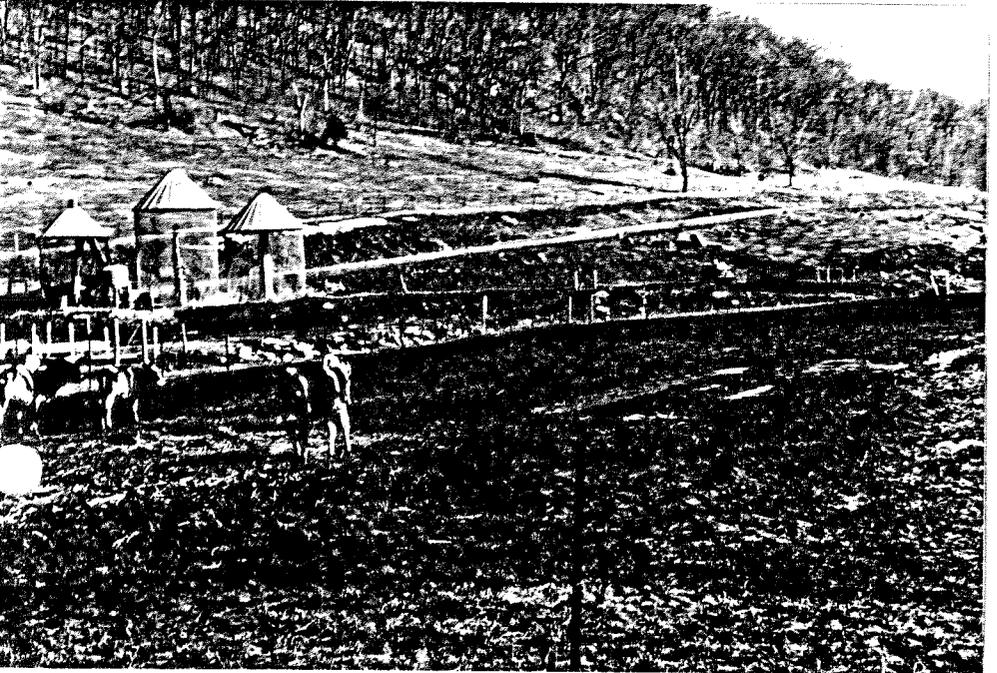
Boaz Stream Classification

East Branch of Mill Creek,
Grade stabilization
structure.



Boaz Stream Classification

Mill Creek, Below Pine
Valley Road.



Boaz Stream Classification

Nonpoint source adjacent
to Mill Creek.