1998-0016

South Branch of the Pentwater River Watershed Non-point Source Pollution Program Watershed Plan

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In Cooperation with:
MDEQ Surface Water Quality Division
West Michigan Shoreline Regional Development Commission
Grand Valley State University – Water Resources Institute

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October 31, 1999

ACKNOWLEDGEMENTS

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The Oceana County Michigan State University Cooperative Extension Service provided information on a variety of agricultural issues and helped with watershed surveys involving road/stream crossing and macro invertebrate studies, and assisted in preparing this plan. Special thanks to County Extension Director, Norm Myers, and all Michigan State University Extension agricultural agents and staff.

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The Water Resources Institute at Grand Valley State University provided technical assistance, support of the project, and the development of the Decision Support System. Special thanks to Christy Heisler, Jean Conzelman and Rod Denning for their contribution of ArcView training, land use updating and the production of map products in the watershed plan.

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Special thanks to all the volunteers and Steering Committee members for technical assistance, support, information, and advise. I appreciate their involvement.

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PART I. EXECUTIVE SUMMARY OF PLAN

1.1 General Description of Watershed

The term watershed or catchment basin refers to the entire physical area or basin drained by a distinct stream or riverine system, physically separated from other watersheds by ridgetop boundaries (Doppelt et al., 1993). The South Branch of the Pentwater River is a small watercourse in northwest Oceana County, fed primarily from groundwater discharge areas and surface water runoff. The South Branch begins in the northeast part of Oceana County and travels in a northwest direction. Pentwater Lake receives all discharge from the South Branch Pentwater River and its tributaries before emptying into Lake Michigan. The watershed is approximately 57,014 acres (89.3 square miles) and covers a portion of nine townships including Pentwater, Weare, Crystal, Golden, Hart, Elbridge, Leavitt, Shelby, and Ferry. The South Branch contains 127 miles of rivers/streams/drains and consists of six major tributaries; Huftile Creek, Donaldson Creek, Waldron Drain, Cleveland Creek, Russell Creek, and Lambricks Creek plus other smaller creeks, drains, and ditches.

The watershed consists of four small communities including Pentwater, Hart, Mears, and Elbridge. The South Branch of the Pentwater River runs directly through the City of Hart and the Village of Pentwater. Watershed Land Uses are Agricultural (47.9%), Forest (30.5%), Open Field (14.0%), Urban (4.1%), Wetlands (1.7%), Water (1.5%), Barren/Sand Dune (0.2%), and Other (0.1%). Watershed development continues to grow; residents and landowners have shown great interest in improving water quality of the Pentwater River Watershed and have developed a very strong Steering Committee. The Committee will oversee the activities within the watershed and will decide on future plans.

The Michigan Water Quality Standards, established in 1994, are a set of rules describing the water quality to be achieved in Michigan's water bodies. The standards identify the minimal uses for which Michigan waters are to be protected (Sayles, 1996). The Water Quality Standards require that water bodies that do not meet the standards be improved to meet the standard, unless the degraded condition is due to natural causes. The Pentwater River Watershed Steering Committee was formed to educate and enhance community awareness of how to protect and improve water quality. The designated uses of the Pentwater Watershed are agriculture, cold water fisheries, warm water fisheries, partial body contact recreation, full body contact recreation, and indigenous aquatic life (Table 1).

Table 1. Michigan's Designated Uses

Designated Uses	Pentwater Watershed Uses
Agriculture	Yes
Navigation	No
Public Water Supply	No
Warm Water Fisheries	Yes
Cold Water Fisheries	Yes
Other Indigenous Aquatic Life	Yes
Partial Body Contact Recreation	Yes
Total Body Contact Recreation	Yes

1.2 Water Quality Statement

Remedial

Designated uses of the South Branch of the Pentwater River Watershed are: agriculture, cold water fisheries, warm water fisheries, indigenous aquatic life, total body contact recreation, and partial body contact recreation. These uses are impaired by excessive amounts of sediment deposited in the river and its tributaries. The suspected sources of sediment (see Table 2) are:

1) streambank erosion
2) cropland erosion
3) road ditch/stream intersections
4) unrestricted animal access to streams
5) breaching of Hart Dam in September 1986
6) construction sites/stashed earth piles

These six sources of sediment could be controlled as follows:

1) streambank erosion: water control basins/seepage basins, bank armoring (riprap, bio-engineering), current deflectors, obstruction removal, increased vegetation, upstream structures including side inlet structures
2) cropland erosion: increase use of conservation tillage methods, filter strips, erosion control structures, increased use of crop rotation, and cover cropping
3) road ditch/stream intersections: structures to provide a stable outlet
4) unrestricted animal access: fencing and animal crossing/watering structures
5) breaching of Hart Dam: sediment remediation using sand traps and similar structures
6) construction sites: filter fencing and grade stabilization.

Approximately 27,000 acres of the South Branch of the Pentwater River Watershed is agricultural. Nutrient deposits such as nitrogen and phosphorus as well as fecal coliform from agricultural and residential sources threaten designated uses. The suspected sources of nutrients and fecal coliform (see Table 2) are:

1) cropland runoff/leaching
2) residential lawns
3) unrestricted animal access to streams
4) impervious surfaces such as storm sewer
5) septic systems

These five sources of nutrients and fecal coliform could be controlled as follows:

1) cropland runoff/leaching: increase use of conservation tillage methods, filter strips, erosion control structures, increased use of crop rotation, nutrient management, and cover cropping
2) residential lawns: soil testing, water management, split application, and scouting
3) unrestricted animal access: fencing and animal crossing/watering structures
4) impervious surfaces: potential storm water ordinance
5) septic systems: partner with health department to solve problems.

Temperature warming is also a threat to designated uses. The suspected sources of temperature warming are:

1) dams (man-made, beaver, natural)
2) drains

These two sources of temperature warming could be controlled as follows:
1) dams: beaver trapping, dam removal
2) drains: prevention measures will be looked into at a later date.

Invasive species is another threat to the Pentwater River Watershed. The Pentwater River Watershed is very susceptible to invasive species because of the direct discharge into Lake Michigan. The invasive species identified within the watershed are listed in Table 8.

Hydrology will be a major focus of the watershed project. In order to achieve a stable river system, surface water must be controlled. Water control basins/seepage basins and vegetation establishment will be the primary practices used to correct excessive surface water runoff during large rains.

Project Objectives

The primary objective of this project is to protect and improve the South Branch of the Pentwater River Watershed through education and financial and technical assistance. The project will strive to correct damage caused by numerous sources over many years and prevent as much degradation as possible in the future. The second objective is to develop land use planning tools for local officials/residents. Planning tools will include guidebooks and workshops focusing on wise land use planning.

Table 2. Priority sources within watershed.

Pollution Source	Severe/High Priority	Moderate	Minor/Low Priority
Streambank Erosion	19 sites, 1560 ft	31 sites, 880 ft	39 sites, 1395 ft
Gullies/Rills Identified	5 sites	24 sites	15 sites
Field Runoff	*	*	*
Poor Access Roads	3 sites	2 sites	1 site
Golf Course Runoff	1 site	N/A	N/A
Unlimited Livestock Access	15 sites, 21,414 ft	N/A	N/A
Sand/Salt Deposition from Stock Piles	2 sites	N/A	N/A
Runoff From Lake/Stream Residents	*	*	*
Village/City Storm Water Runoff	*	*	*
Invasive Species	*	*	*
Road/Stream Crossings Inventoried As Of 10/20/99	11 sites	29 sites	*
Waldron Drain (Excessive Bank & Channel Erosion)	*	*	*

* Identified Source, but not quantified

1.3 Goals and General Activities of Project

The goal of the planning process is to develop a comprehensive nonpoint source watershed management plan which will identify, document, quantify, and prioritize nonpoint pollution sources in the Pentwater River Watershed. Past and current water quality data were used to determine the extent of water quality problems and field checks were completed to identify and inventory the critical areas. The primary goal of the Pentwater River Watershed Project is to protect surface water and groundwater from pollution sources. The watershed committee would like to maintain a healthy aquatic ecosystem by controlling invasive/exotic species, maintaining/improving cold water fisheries, maintaining agricultural uses, and maintaining a healthy aquatic ecosystem. The Pentwater River Watershed Project is designed to assist residents, agricultural producers, and anyone using the watershed to improve the water quality.

Long term goals will focus on wise land use planning and storm water ordinance. West Michigan Shoreline Regional Development Commission is putting together a planning guidebook to help local officials and residents make appropriate land use decisions. The guidebook will be completed by January 2000 and will provide demographic information, planning concepts/definitions, development principles to improve water quality, long range planning issues in the watershed, and how a GIS based system can be used locally.

A Steering Committee was formed prior to funding from the Section 319 grant. The committee is made up of 77 members (See Appendix O) and is the advisory board for the project manager. The Steering Committee meets every third month. The committee helped develop the goals and concerns of the watershed.

The Pentwater River Watershed Technical Subcommittee was formed to solve technical issues, which pose a threat to water quality in the Pentwater River Watershed. This subcommittee will focus on water quality monitoring, erosion and sedimentation concerns, nutrient concerns, identification of critical areas, and other related technical issues, such as the installment of Best Management Practices and Resource Management Systems.

In addition to the technical subcommittee, an information and education subcommittee and a coordinating committee was formed. The information and education committee has 10 members (See Appendix A) and was formed to prepare the Information and Education Plan and a watershed survey. The committee will also be responsible for volunteer work during watershed tours, watershed festivals, and other activities. The coordinating committee is composed of 7 members, each member representing an interest group within the watershed. This committee is responsible for project support and guidance throughout the projects entirety and long after.

The project has received a great deal of help from volunteers within the community. Volunteers have helped monitor for macro invertebrates, collect road/stream crossing data, and perform river cleanups. The volunteers show a great deal of interest and say they will continue to support the project. This data collected from volunteers will help the project manager determine areas of concern within the watershed.

Pollution concerns will be addressed using Resource Management Systems (RMS's). A Resource Management System contains a series of Best Management Practices that meets established water quality levels of treatment for the conservation, wise use, protection or improvement of soil, water, air, plants, and animals (MDNR-SWQD, 1991). Anticipated Best Management Practices include, but are not limited to the following: sediment basins, buffer/filter strips, integrated pest management, instream sediment traps, streamside

management (buffer zones), grassed waterways, nutrient management, watercourse crossings, stream bank stabilization, riprap, grade stabilization structures, agrichemical containment facility, conservation crop rotation, residue management, fueling facilities, and livestock exclusion.

1.4 Summary of Overall Cost Estimates of Project

The total costs of this project are as follows (Notice: Costs include all costs, including BMP costs that will not be funded by 319 funds):

Staffing Costs.....$140,040

Fringe Benefits.....$28,740

Supplies and Equipment.....$16,500

Travel.....$11,160

Other Direct Expenses..... $63,470

Indirect Cost.....$15,000

BMP Costs.....$733,213^

Contractual.....$15,000

Total $1,023,123*

^ BMP Costs include only those practices to be installed during 3 years of implementation. Overall BMP costs are presented in Table 9, page 62 (Total BMP Costs are $ 3,322,250).
* Total cost is only estimates for 3 years of implementation. This does not include costs for activities outside this time frame.

PART II. WATERSHED DESCRIPTION

2-1 *Location & Size*

The Pentwater River Watershed is located in west central lower Michigan in the northern portion of Oceana County (Figure 1) between Ludington and Muskegon. The Pentwater River flows from the east to the west as it discharges into Pentwater Lake and eventually into Lake Michigan. U.S. 31 stretches through the Pentwater River Watershed (Figure 2) and crosses the South Branch Pentwater River near Hart. The watershed includes diverse agriculture, forested, and wetlands to the east of U.S. 31; forested and residential to the west of U.S. 31. The watershed is approximately 57,014 acres in size and extends over a land area, which includes portions of nine townships, the City of Hart, and the Village of Pentwater (Table 3).

Table 3. Pentwater River Watershed Land Area. Data obtained from Grand Valley State University – Water Resources Institute, 1999.

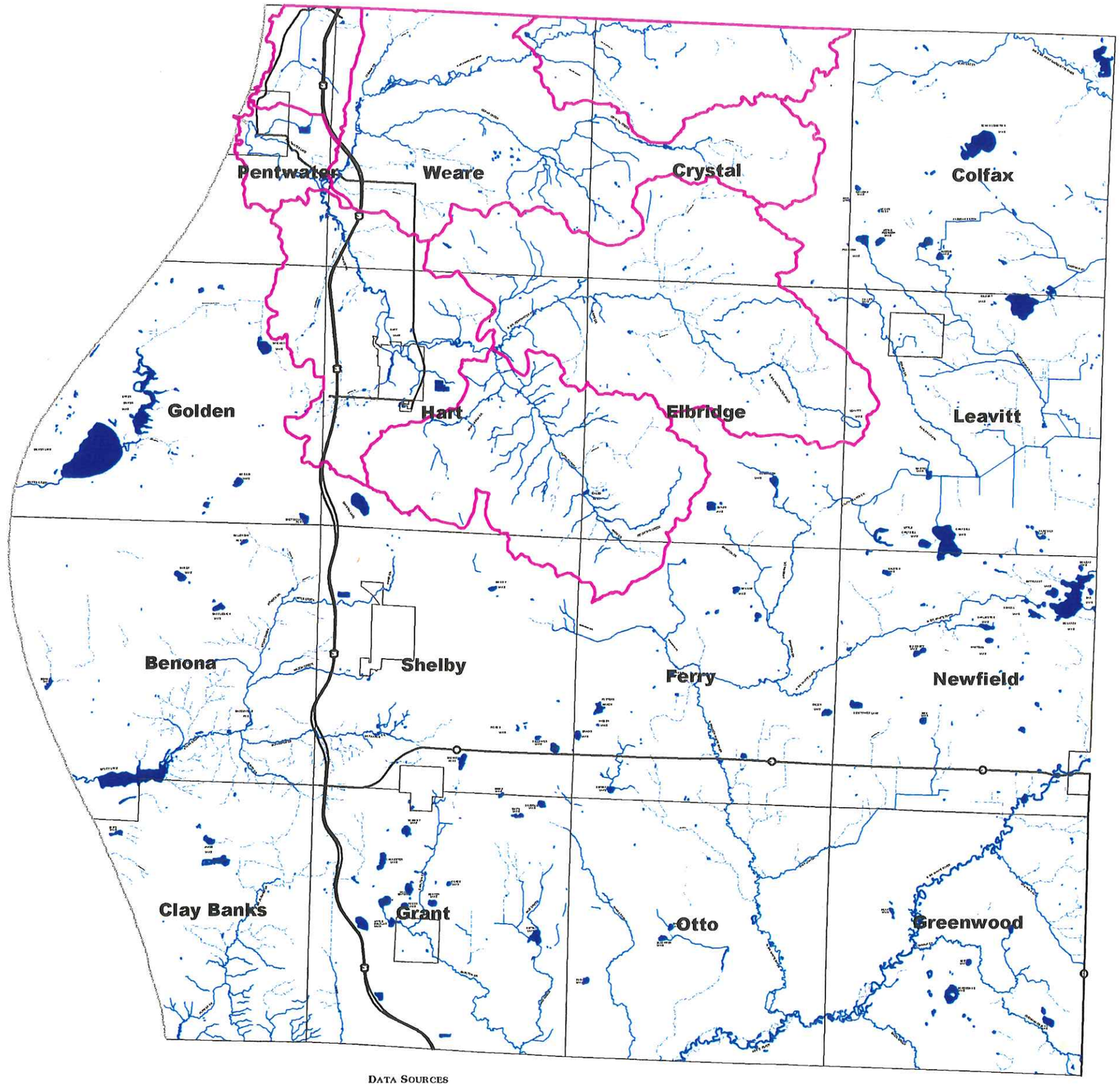
Oceana County Townships	Estimated Acres	Estimated % of Watershed	Estimated Square Miles
Crystal Township	5,342	9.37%	8.35
Elbridge Township	16,625	29.16%	25.98
Ferry Township	1,227	2.15%	1.92
Golden Township	2,085	3.66%	3.26
Hart Township/City of Hart*	21,616	37.91%	33.78
Leavitt Township	665	1.67%	1.04
Pentwater Township/Village of Pentwater*	3,827	6.71%	5.98
Shelby Township	692	1.21%	1.08
Weare Township	4,935	8.66%	7.71
Totals	57,014	100%	89.10

*** City of Hart = 861 acres, 1.35 square miles, 1.5% of Watershed**
Village of Pentwater = 794 acres, 1.24 square miles, 1.4% of Watershed

2-2 *Climate*

The climate in Oceana County is highly varied due to such factors as elevation, air drainage and the tempering influence of Lake Michigan. On the west side of the county along Lake Michigan, the period of frost-free days is several days longer than the eastern portion. On lowlands or plains, which are poorly drained, killing frosts have been recorded in late June and in early September, thus severely restricting the agricultural potential of these areas (Oceana County Steering Committee, 1992).

Index Map
Oceana County, Michigan
South Branch Pentwater River Watershed



Base Information

- Watershed Boundaries
- State/Federal Highways
- Lake Michigan Shoreline
- Township/City/Village Limits
- Rivers/Streams
- Lakes/Ponds
- Drains/Intermittent Streams

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N
W E
S

1 0 1 2 3 4 Miles

1:110000

Data Sources
Base Information: Michigan Department of Natural Resources, MIRIS, 1978.
Watershed Boundaries: Michigan Environmental Quality, 1997.

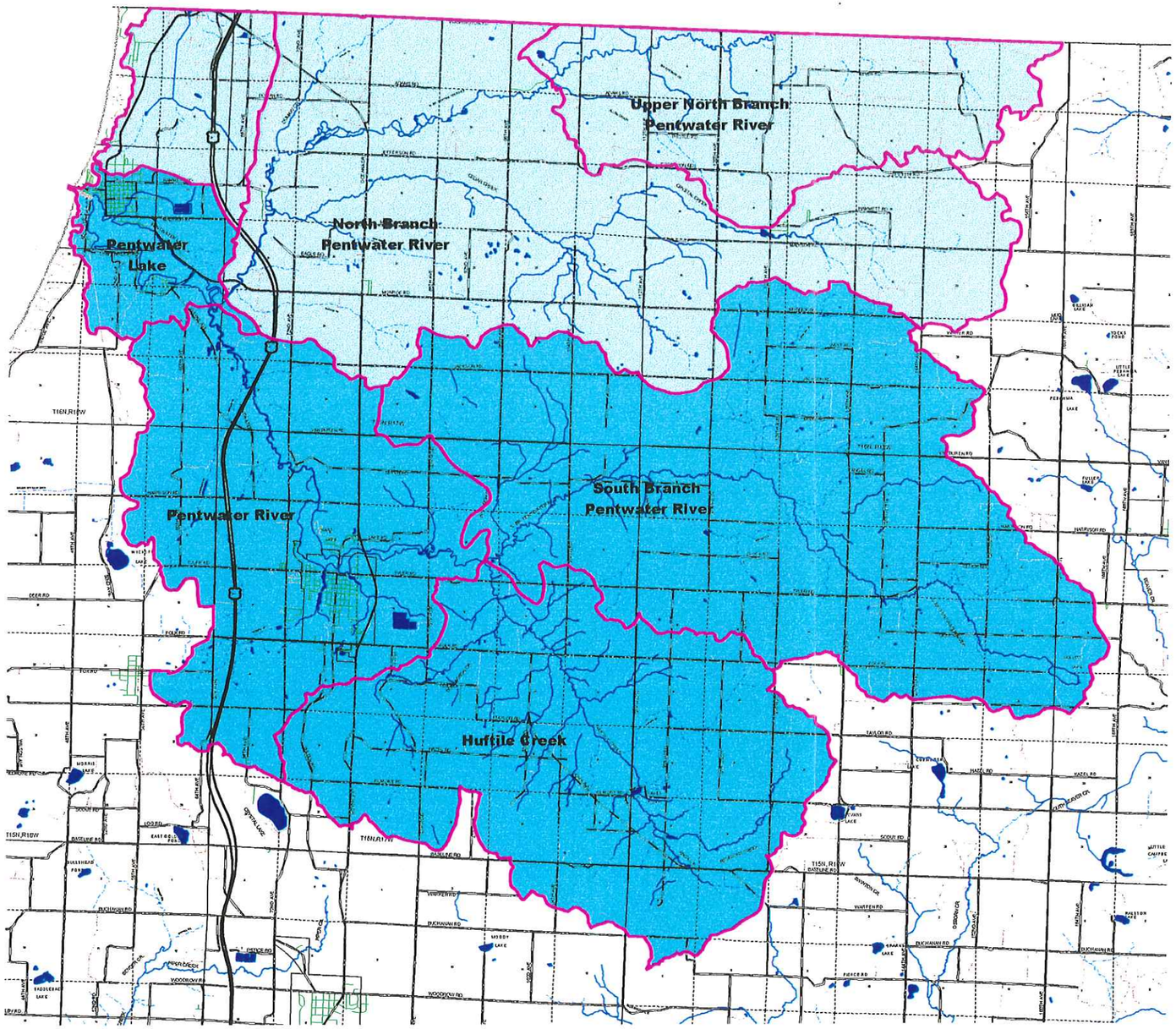
Robert B. Annis Water Resources Institute
Information Services Center
Grand Valley State University

Map Prepared: July 1999

Figure 1

Base Information

South Branch Pentwater River Watershed



Base Information

- Watershed Boundaries
- State/Federal Highways
- County Roads
- Minor/Residential Roads
- Lake Michigan Shoreline
- Township/City/Village Limits
- Section Lines
- Rivers/Streams
- Lakes/Ponds
- Drains/Intermittent Streams
- Two Tracks

- South Branch Pentwater River Watershed 319 Project
- Pentwater Watershed Outside of 319 Project

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Robert B. Annis Water Resources Institute
Information Services Center
Grand Valley State University

Map Prepared: July 1999

Figure 2

Data Sources
Base Information: Michigan Department of Natural Resources, MIRIS, 1978.
Watershed Boundaries: Michigan Environmental Quality, 1997.

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Normal temperatures can range from the twenties in the winter to high 80's in the summer. The length of the growing season ranges from 130 days on the east side of the county to 150 days along the shore of Lake Michigan.

Weather stations are located in Hart and at Hesperia on the Oceana-Newaygo County line. At Hart, average annual precipitation is 34.33 inches and at Hesperia it is 31.9 inches. The average annual snowfall for the county is nearly 90 inches. The record for snowfall in Hart was 145 inches the winter of 1977-1978.

Annual precipitation is usually sufficient to sustain agriculture, with adequate stream flows and ample groundwater supplies. However, excessive rainfall, an exceptional occurrence, can be severely damaging to muck crops and can cause heavy agricultural losses.

The prevailing winds vary from westerly in the winter to south westerly in the spring and summer. Fine sands and organic soils are very susceptible to wind erosion. The specialty crops that are grown in the county are asparagus, carrots, and celery, which are very susceptible to wind damage. This has become a serious resource-management problem and has led to silting of streams and drains along with degrading crop fields where soil is removed (Oceana County Steering Committee, 1992).

2-3 *Geology & Topography*

The bedrock beneath Oceana County is covered by a thick layer of glacial deposits formed by the complex action of the Lake Michigan Lobe of the Wisconsin glacial ice sheet. Glacial action resulted in five dominant features – moraines, till plains, lake plains, outwash plains and drainage ways (Oceana County Steering Committee, 1992).

The thickness of glacial drift (unconsolidated sediment) over bedrock ranges from a maximum of 600 feet in the northern part of the county to a minimum of 200 feet in the southern part. The bedrock is sedimentary that has been down warped toward the center of the state and forms the edge of a huge bowl-like structure called the "Michigan Basin". This bedrock formed during the Mississippian Period. It consists of the Coldwater shale formation on the west side of the county; the Napoleon-Marshall sandstone formation in the central part; and the Michigan gypsum formation on the east side of the county.

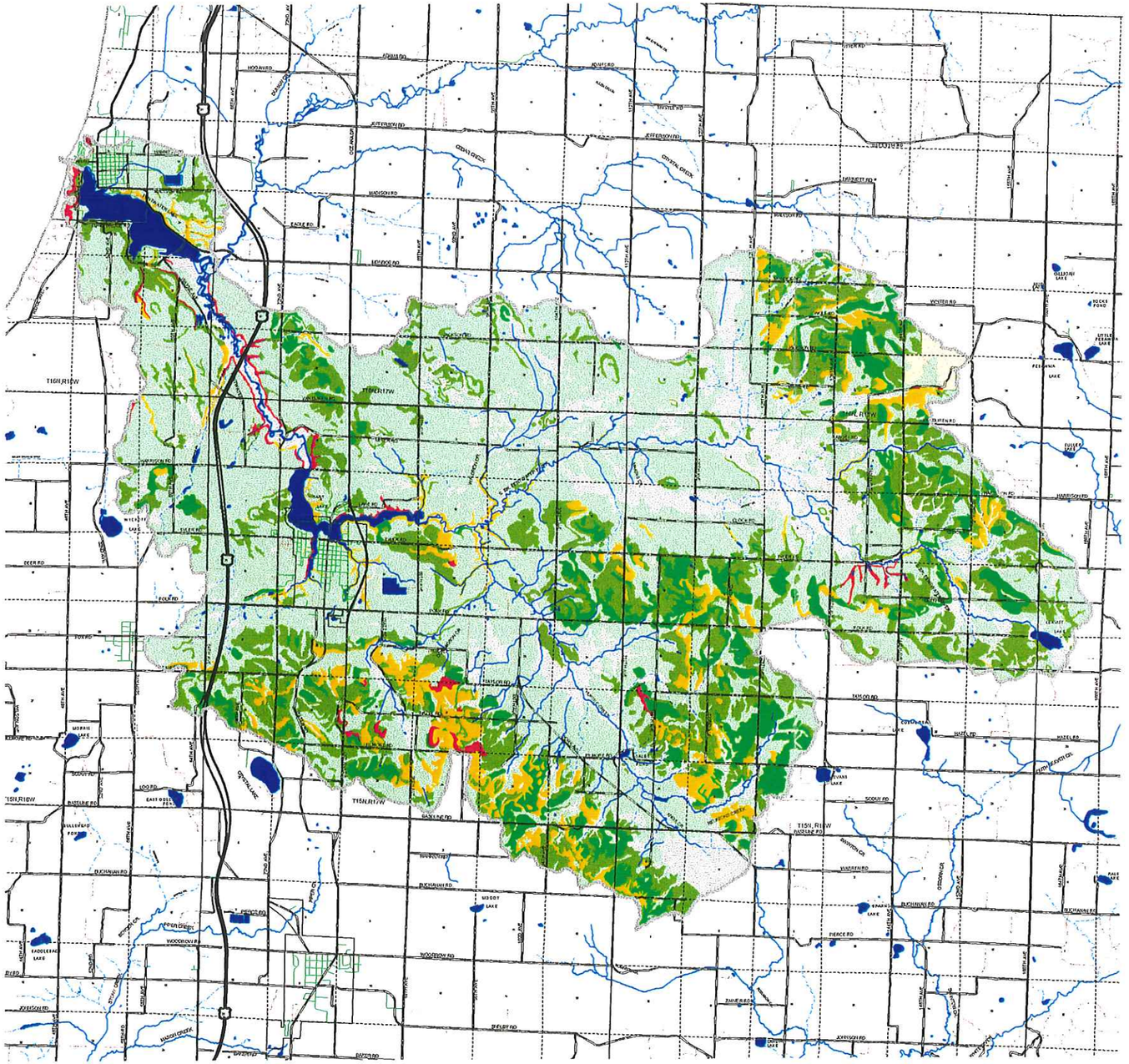
Part of a major moraine has been recognized in the county. The Port Huron moraine is a large morainic system that extends around the state roughly paralleling the coast. Within the county it generally lies in a northeasterly direction from around the town of New Era to east of Crystal Valley. The dominant feature of the moraine is three distinct ridges that contain some of the highest relief in the county and is dissected by outwash channels.

The till plains are located on the east and west sides of the end moraine. The largest till plain is in Leavitt Township. Other areas of till are located in Weare and Hart Townships. The major lake plain areas are directly east of the sand dunes, which includes a small area around Stony Lake in Benona Township and a larger area extending from the Silver Lake area north to the Mason County line encompassing the west part of the watershed. Figure 3 displays topographic slopes within the watershed.

The county elevations range from 580 feet (177 meters) above sea level along Lake Michigan shoreline to about 1,083 feet (330 meters) in Section 26 of Crystal Township, bordering the watershed boundary (Oceana County Steering Committee, 1992). The South Branch of the Pentwater River begins at Leavitt Lake (832 feet, 253.5 meters) and discharges into Pentwater Lake (584 feet, 178 meters).

TOPOGRAPHIC SLOPE

SOUTH BRANCH PENTWATER RIVER WATERSHED



BASE INFORMATION

- WATERSHED BOUNDARY
- STATE/FEDERAL HIGHWAYS
- COUNTY ROADS
- MINOR/RESIDENTIAL ROADS
- LAKE MICHIGAN SHORELINE
- TOWNSHIP/CITY/VILLAGE LIMITS
- SECTION LINES
- RIVERS/STREAMS
- LAKES/PONDS
- DRAINS/INTERMITTENT STREAMS
- TWO TRACKS

TOPOGRAPHIC SLOPE

- 0 - 6 %
- 6 - 12 %
- 12 - 18 %
- 18 - 35 %
- > 35 %
- HILLY OR ROLLING
- NOT RATED
- WATER

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W E
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1 0 1 2 3 MILES

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ROBERT B. ANNIS WATER RESOURCES INSTITUTE
INFORMATION SERVICES CENTER
GRAND VALLEY STATE UNIVERSITY

MAP PREPARED: JULY 1999

FIGURE 3

DATA SOURCES
BASE INFORMATION: MICHIGAN DEPARTMENT OF NATURAL RESOURCES, MIRIS, 1978.
SOILS INFORMATION: SOIL SURVEY OF OCEANA COUNTY, MICHIGAN, ISSUED APRIL 1996.
USDA NATURAL RESOURCES CONSERVATION SERVICE AND FOREST SERVICE.

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2-4 Soils

The South Branch of the Pentwater River Watershed is composed of a variety of soil textures (Figure 4). According to the Oceana County Soil Survey Manual (1996), approximately 72% of the soils are deep, well drained and excessively drained sands. Other soils range from soils with a moderate infiltration rate to soils having a very slow infiltration rate, known as clays (Table 4).

Hydrologic soil groups are used to estimate runoff from precipitation (Figure 6). Soils are assigned one of four soil groupings. The soils are grouped according to infiltration rate when thoroughly wet. The four groups are A, B, C and D (Soil Survey, 1996).

Group A soils (72% of watershed) have a high infiltration rate (low runoff potential) when thoroughly wet. These soils are mainly deep well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission, water holding capacity, etc.

Group B soils (13% of watershed) have a high infiltration rate when thoroughly wet. These are mainly moderately deep or deep, moderately well drained or well drained soils, which have moderately fine texture to coarse texture. Commonly known as sandy loams, the soils have a moderate rate of water transmission.

Group C soils (6% of watershed) have a slow infiltration rate when thoroughly wet. These consist of soils having a layer that slows the downward movement of water. These soils have a slow rate of water transmission.

Group D soils (8% of watershed) have a very slow infiltration rate (high runoff potential) when thoroughly wet. These soils are commonly known as clays that have a high shrink-swell potential, have a permanent high water table, have a clay pan or clay layer near the earth's surface, and have shallow soils with nearly impervious surfaces. Water transmission is very slow in this type of soil.

Table 4. Soils within the South Branch of the Pentwater River Watershed.

Map Symbol	Mapping Unit	Hydrologic Soil Group	Hydric Soil	Prime Farm-Land
10B	Perrinton loam, 2 to 6 % slopes	C		X
11A	Ithaca loam, 0 to 3 % slopes	C		X
12	Bono silt loam	D	X	X
13B	Marlette fine sandy loam, 2 to 6 % slopes	B		X
14B	Capac fine sandy loam, 0 to 4 % slopes	C		X
16B	Remus fine sandy loam, 1 to 6 % slopes	B		X
17B	Marlette-Fern complex, 0 to 6 % slopes	B		X
18B	Spinks-Gowdy loamy fine sands, 0 to 6 % slopes	A		
20B	Arkport-Chelsea complex, 0 to 6 % slopes	B		X
21A	Freesoil loamy very fine sand, 0 to 3 % slopes	C		X
22B	Gowdy loamy fine sand, 1 to 6 % slopes	B		X
23A	Arkona loamy fine sand, 0 to 3 % slopes	B		
24	Sickles loamy sand	B		
25B	Gowdy-Perrinton complex, 1 to 6 % slopes	B		X
26A	Arkona-Ithaca complex, 0 to 3 % slopes	B		

Table 4 (continued). Soils within the South Branch of the Pentwater River Watershed.

Map Symbol	Mapping Unit	Hydrologic Soil Group	Hydric Soil	Prime Farm-land
27B	Arkona-Del Rey complex, 0 to 4 % slopes	B		
28B	Fern loamy fine sand, 0 to 6 % slopes	B		
29A	Dixboro loamy very fine sand, 0 to 3 % slopes	B		X
30	Lamson muck	B	X	X
35B	Alvin-Spinks complex, 0 to 6 % slopes	B		X
36A	Del Rey silt loam, 0 to 3 % slopes	C		X
37A	Altmar loamy fine sand, 0 to 3 % slopes	B		
38B	Spinks-Okee complex, 0 to 6 % slopes	A		X
40B	Coloma-Toogood complex, 0 to 6 % slopes	A		
41	Granby mucky loamy sand, gravelly substratum	A		
42B	Spinks-Remus-Fern complex, 0 to 6 % slopes	A		
43B	Spinks loamy fine sand, 0 to 6 % slopes	A		
44B	Thetford loamy fine sand, 0 to 4 % slopes	A		
45B	Spinks-Benona complex, 0 to 6 % slopes	A		
46B	Grattan sand, dark subsoil, 0 to 6 % slopes	A		
48A	Saugatuck-Jebavy complex, 0 to 3 % slopes	C	X	
49B	Grattan sand, 0 to 6 % slopes	A		
50B	Covert sand, 0 to 6 % slopes	A		
51B	Pipestone fine sand, 0 to 4 % slopes	B		
52	Granby sand	A	X	
53B	Grattan sand, loamy substratum, 0 to 6 % slopes	A		
56B	Benona sand, deep banded, 0 to 6 % slopes	A		
57C	Nordhouse fine sand, 3 to 18 % slopes	A		
58	Kingsville mucky sand	A	X	
59B	Benona sand, 0 to 6 % slopes	A		
60B	Coloma sand, 0 to 6 % slopes	A		
61B	Epworth fine sand, 0 to 6 % slopes	A		
62B	Plainfield sand, 0 to 6 % slopes	A		
65	Sloan silt loam, frequently flooded	B		X
67	Cohoctah fine sandy loam, occasionally flooded	B		X
69	Algansee loamy fine sand, occasionally flooded	B		
70	Glendora mucky loamy fine sand,frequently flooded	D	X	
71	Houghton and Carlisle soils	D	X	
72	Adrian muck	D	X	
73	Palms muck	D	X	
75	Martisco muck	D	X	
77	Napoleon muck	D	X	
83	Histosols and Aquents, ponded	D	X	
86F	Dune land-Quartzipsamments complex, very steep	A		
87	Beaches	D		
88A	Udipsamments, nearly level	A		

Table 4 (continued). Soil within the South Branch of the Pentwater River Watershed.

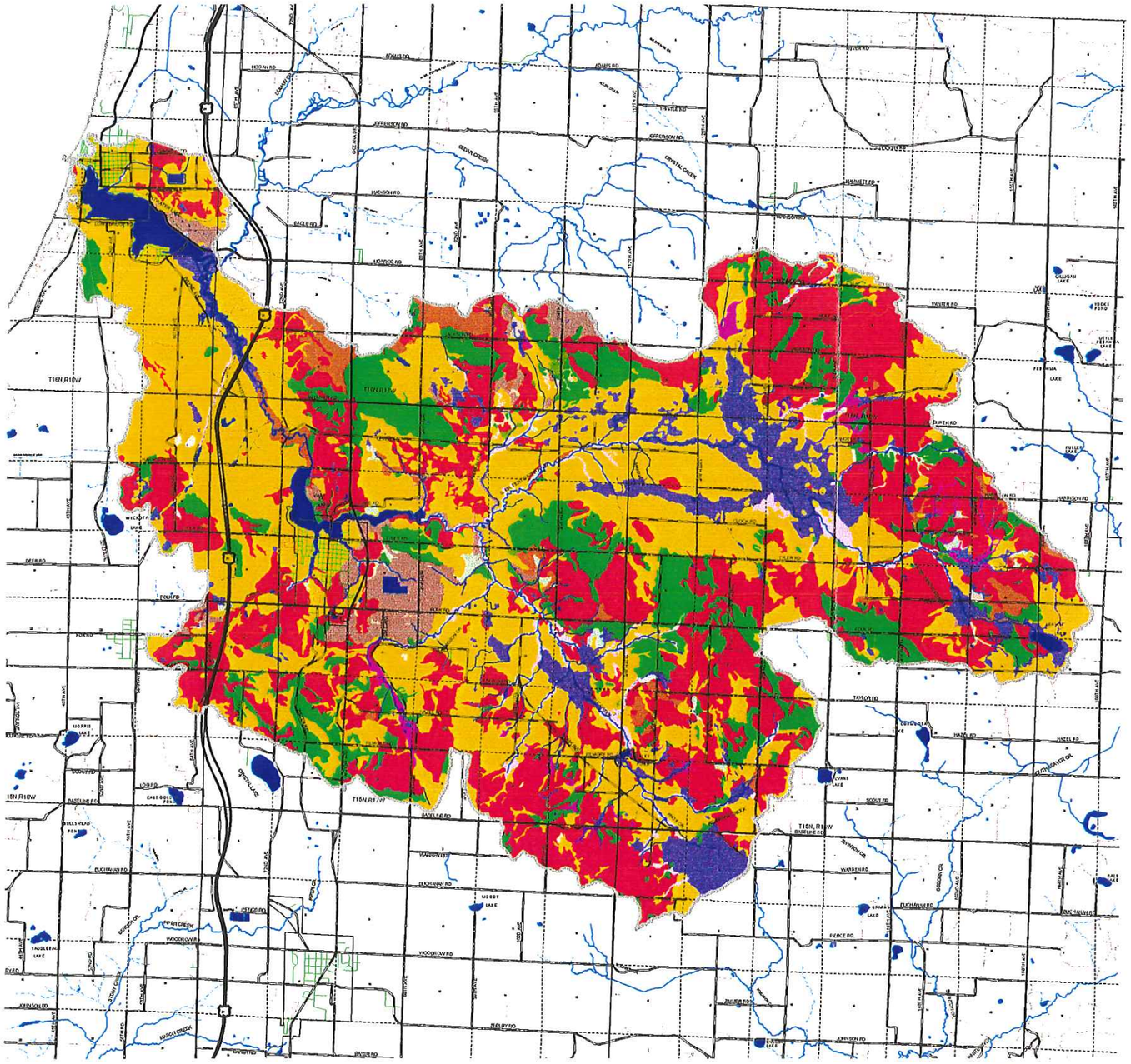
89A	Udorthents, nearly level	--		
91	Pits, sand and gravel	--		
92B	Chelsea fine sand, 0 to 6 % slopes	A		
96B	Spinks-Tekenink loamy fine sands, 0 to 6 % slopes	A		
97	Kerston and Carlisle mucks, frequently flooded	D	X	
98B	Spinks-Scalley complex, 0 to 6 % slopes	A		
W	Water	--	X	

Hydric soils are soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the root zone (Figure 5). This condition only supports the growth and regeneration of hydrophytic vegetation. Hydrophytic vegetation means a plant growing in water or a substrate that is at least periodically deficient in oxygen during a growing season as a result of excessive water content (National Food Security Act Manual, 1996).

According to the United States Department of Agriculture, Natural Resources Conservation Service, prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and is also available for these land uses: cropland, pastureland, rangeland, forest land, and other land, but not urban built-up land or water. Although many soils within the watershed are not prime farmland soils (Figure 11), many soils are suited for specialty crops such as asparagus, orchards and Christmas trees.

USDA Soil Texture

South Branch Pentwater River Watershed



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- Lakes/Ponds
- Drains/Intermittent Streams
- Two Tracks

USDA Soil Texture

- Complex
- Sand
- Fine Sand
- Loamy Sand
- Loamy Fine Sand
- Loamy Very Fine Sand
- Fine Sandy Loam
- Loam
- Silt Loam
- Muck
- Mucky Sand
- Mucky Loamy Sand
- Mucky Loamy Fine Sand
- Not Rated
- Water

DEFINITIONS:

USDA Soil Texture is defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. The basic textural classes, in order of increasing proportion of fine particles, are sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, and clay. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Muck = A dark colored, finely divided, well decomposed organic soil material.

Complex = A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately.

N
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1 0 1 2 3 Miles

1:75000

Data Sources
Base Information: Michigan Department of Natural Resources, MIRIS, 1978.
Soils Information: Soil Survey of Oceana County, Michigan, Issued April 1996.
USDA Natural Resources Conservation Service and Forest Service.

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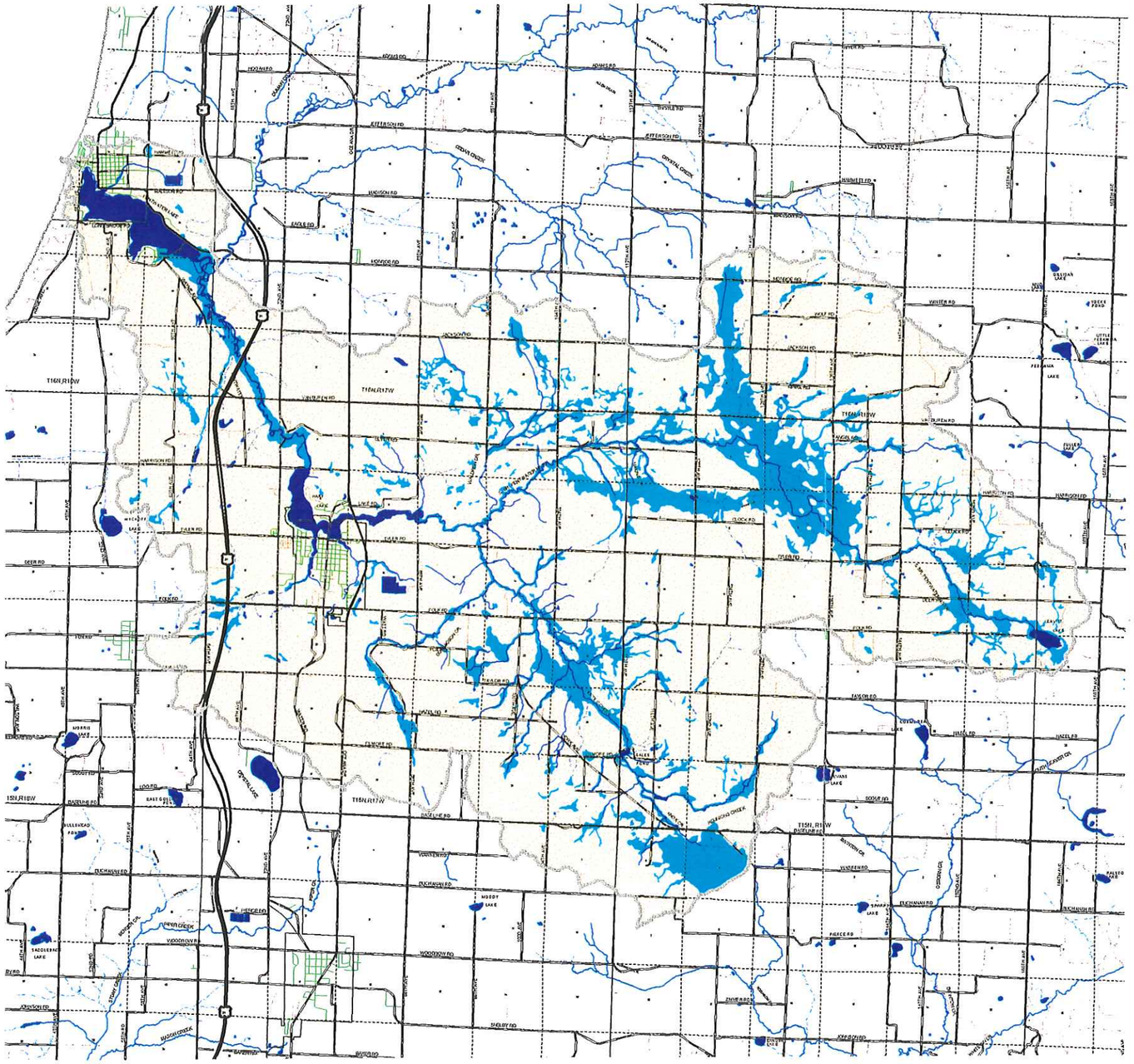
Map Prepared: July 1999

Figure 4



HYDRIC SOILS

SOUTH BRANCH PENTWATER RIVER WATERSHED

BASE INFORMATION

- WATERSHED BOUNDARY
- STATE/FEDERAL HIGHWAYS
- COUNTY ROADS
- MINOR/RESIDENTIAL ROADS
- LAKE MICHIGAN SHORELINE
- TOWNSHIP/CITY/VILLAGE LIMITS
- SECTION LINES
- RIVERS/STREAMS
- LAKES/PONDS
- DRAINS/INTERMITTENT STREAMS
- TWO TRACKS

HYDRIC SOILS

- HYDRIC
- NOT HYDRIC
- NOT RATED
- WATER

DEFINITIONS:

HYDRIC = A SOIL THAT IS SATURATED, FLOODED, OR PONDED LONG ENOUGH DURING THE GROWING SEASON TO DEVELOP ANAEROBIC CONDITIONS IN THE ROOT ZONE.

NOT HYDRIC = A SOIL THAT IS NOT SATURATED, FLOODED, OR PONDED LONG ENOUGH DURING THE GROWING SEASON TO DEVELOP ANAEROBIC CONDITIONS IN THE ROOT ZONE.

NOT RATED = INFORMATION IS NOT AVAILABLE.

WATER = SOIL IS COVERED BY WATER.

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GRAND VALLEY STATE UNIVERSITY

MAP PREPARED: JULY 1999

FIGURE 5

DATA SOURCES
BASE INFORMATION: MICHIGAN DEPARTMENT OF NATURAL RESOURCES, MIRIS, 1978.
SOILS INFORMATION: USDA NATURAL RESOURCES CONSERVATION SERVICE, MICHIGAN.
HYDRIC SOILS OF MICHIGAN, 1993.

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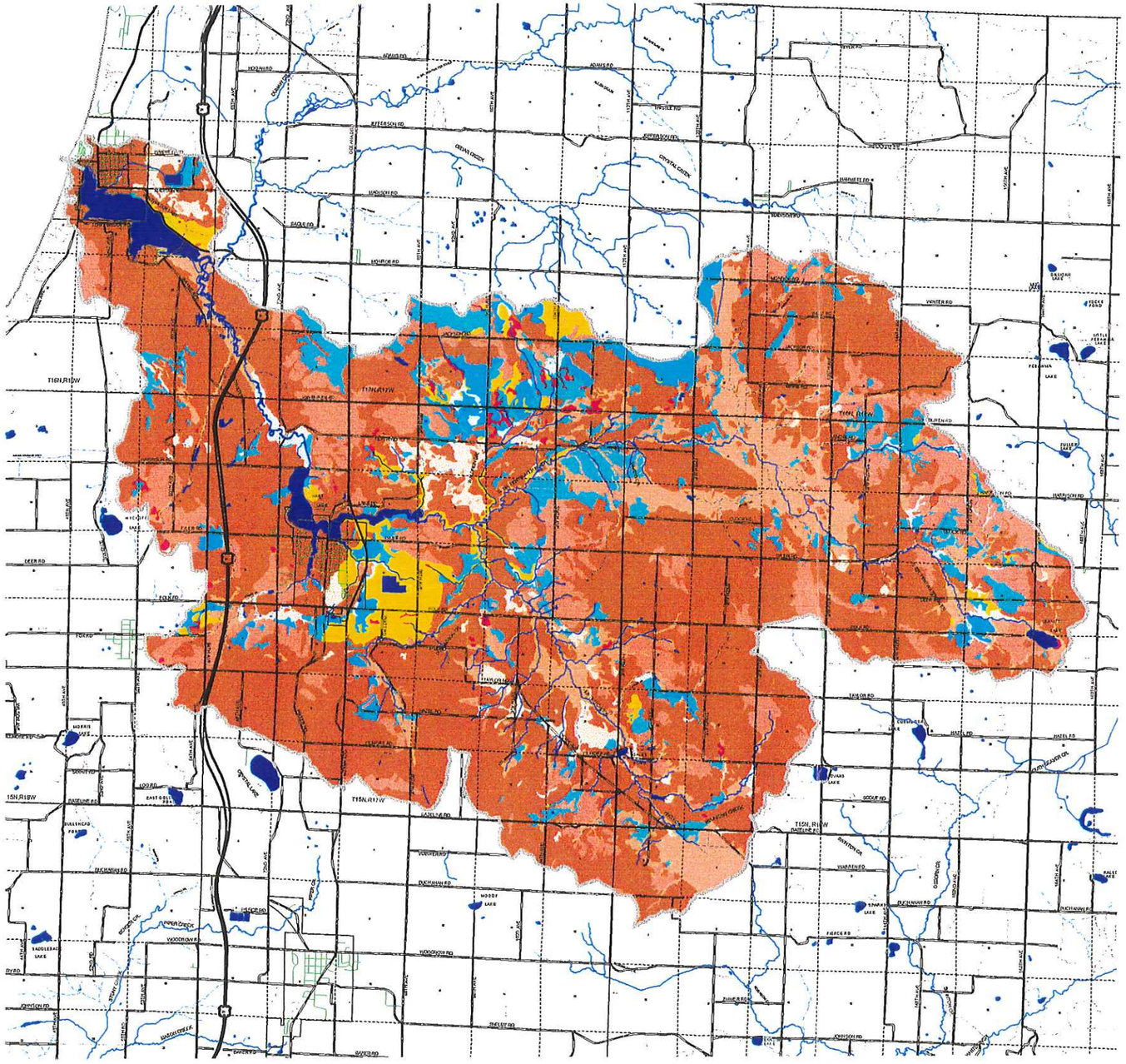
Hydrologic Soil Groups

South Branch Pentwater River Watershed



Base Information

- Watershed Boundary
- State/Federal Highways
- County Roads
- Minor/Residential Roads
- Lake Michigan Shoreline
- Township/City/Village Limits
- Section Lines
- Rivers/Streams
- Lakes/Ponds
- Drains/Intermittent Streams
- Two Tracks

Hydrologic Soil Groups

- A
- A or B
- A or D
- A, C, or D
- B
- B or C
- B or D
- C
- D
- Not Rated
- Water

DEFINITIONS:

Hydologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to infiltration of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

Group A = Soils having a high infiltration rate (low runoff potential) when thoroughly wet.

Group B = Soils having a moderate infiltration rate when thoroughly wet.

Group C = Soils having a slow infiltration rate when thoroughly wet.

Group D = Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet.

Not Rated = Information is not available.

Water = Soil is covered by water.

N
W E
S

1 0 1 2 3 Miles

1:75000

Data Sources
Base Information: Michigan Department of Natural Resources, MIRIS, 1978.
Soils Information: Soil Survey of Oceana County, Michigan, Issued April 1996.
USDA Natural Resources Conservation Service and Forest Service.

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Figure 6

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2-5 Agencies & Interest Groups Involved In Planning

STATEWIDE OR REGIONAL INVOLVEMENT

Natural Resources Conservation Service
Water Quality Specialist
Ruth Shaffer
Room 101, 1405 S. Harrison Rd.
East Lansing, MI 48823
(517) 337-6701 ext. 1206

Timberland Resource Conservation & Development
Phil Dakin, Coordinator
38 Applewood Drive N.W.
Sparta, MI 49345
(616) 887-5760

Michigan Department of Environmental Quality
Surface Water Quality Division (Nonpoint Source)
Charamy Butterworth
350 Ottawa Avenue NW
Grand Rapids, MI 49503
(616) 356-0210

Grand Valley State University
Water Resources Institute
Christy Heisler, Jean Conzelmann, Rod Denning
Allendale, MI 49401-9403
(616) 895-3722 or 895-3793

Michigan Department of Environmental Quality
Surface Water Quality Division (Nonpoint Source)
Karol Smith, I/E Coordinator
P.O. Box 30273
Lansing, MI 48909
(517) 241-7733

Michigan Department of Environmental Quality
Surface Water Quality Division
Gary Kohlhepp
P.O. Box 30273
Lansing, MI 48909
(517) 335-1289

Michigan Department of Natural Resources
Fisheries Division
Rich O'Neil, Fisheries Biologist
1757 E. Hayes
Shelby, MI 49455
(231) 861-5636

West Michigan Shoreline
Regional Development Commission
Chris Dingman, Senior Planner
137 Muskegon Mall
P.O. Box 387
Muskegon, MI 49443-0387
(231) 722-7878

OCEANA COUNTY INVOLVEMENT

Natural Resources Conservation Service
Mark Kelly, Resource Conservationist
1064 Industrial Park Dr.
Shelby, MI 49455
(231) 861-4967

Oceana Conservation District
Phyllis Peters, Administrator
Carrie Rollenhagen, Administrative Assistant
Jack Lake, Groundwater Technician
Seth Hopkins, Americorps
Craig Zeerip, Chairman
1064 Industrial Park Dr.
Shelby, MI 49455
(231) 861-4967

Farm Service Agency
1064 Industrial Park Dr.
Shelby, MI 49455
(231) 861-4967

Oceana County Road Commission
Bob Woodruff, Manager
Polk Rd.
Hart, MI 49420
(231) 873-4226

Michigan Farm Bureau
Pat Lause, Regional Representative
6280 E. Garfield Rd.
Hesperia, MI 49421
(231) 854-5885

Oceana County Farm Bureau
Phil Carter, President
210 E. Polk Rd.
Hart, MI 49420
(231) 873-4654

Oceana County Drain Commission
Cal Ackley, Drain Commissioner
District Court House
Hart, MI 49420
(231) 873-3887

Oceana County Health Department
Mark Hill
P.O. Drawer 72
Hart, MI 49420
(231) 873-2193

Oceana County Planning Commission
Peter Byl, County Planner
County Building
Hart, MI 49420
(231) 873-4530

Board of Commissioners
County Building
Hart, MI 49420
(231) 873-4489

Michigan State University Extension
Norm Myers, Director
210 Johnson
Hart, MI 49420
(231) 873-2129

Michigan State University Extension
Mira Danilovich, Horticulture Agent
210 Johnson
Hart, MI 49420
(231) 873-2129

Economic Development Corporation
Ron Steiner
314 N. State St.
Hart, MI 49420
(231) 873-7141

Township of Crystal
Connelly Bowling, Supervisor
1384 E. Jefferson Rd.
Hart, MI 49420
(231) 873-4111

Township of Elbridge
Walt Wheeler, Supervisor
2747 N. 144th. Ave.
Hart, MI 49420
(231) 873-3753

Township of Ferry
Jim Pease, Supervisor
3475 154th Ave.
Hesperia, MI 49421
(231) 861-5027

OCEANA COUNTY INVOLVEMENT CONT.

Township of Hart
James Jensen, Supervisor
454 W. Tyler Rd.
Hart, MI 49420
(231) 873-4121

Township of Leavitt
John Herremans, Supervisor
5009 E. Harrison
Walkerville, MI 49459
(231) 873-2517

Township of Pentwater
Daniel Ellinger, Supervisor
327 Hancock, P.O. Box 512
Pentwater, MI 49449
(231) 869-6231

City of Hart
Scott Huebler, City Manager
407 State St.
Hart, MI 49420
(231) 8732488

Township of Shelby
R. Wayne Bankert, Supervisor
4370 Buchanan Rd.
Shelby, MI 49455
(231) 861-5534

Township of Weare
Allen F. Aerts, Supervisor
1986 W. Monroe Rd.
Hart, MI 49420
(231) 873-4640

Township of Golden
Donald Walsworth, Supervisor
7369 W. Lake Rd.
Mears, MI 49436
(231) 873-2653

Village of Pentwater
Charles Bigelow, President
327 S. Hancock, P.O. Box 622
Pentwater, MI 49449
(231) 869-8301

BUSINESSES/INTERESTED PARTIES

Spring Lake Community Education
Dan Parker, Adopt*A*Stream Coordinator
345 Hammond Street
Spring Lake, MI 49456
(616) 846-3180

Michigan Department of Natural Resources
Jeff Greene, Wildlife Habitat Biologist
Paris Field Office
22250 Northland Dr.
Paris, MI 49338
(231) 832-5520

Hart Co-op
3 E. Main St.
Hart, MI 49420
(231) 873-2158

West Shore Community College
Hamdy Helal, Limnology Professor
3000 North Stiles Road
Scottville, MI 49454
(231) 845-6211

Hart Lake Association
Connie Cargill, Secretary
District Court House
Hart, MI 49420
(231) 873-3887

Pentwater Lake Association
Robert Shrauger
Pentwater, MI 49449
(231) 869-4808

Hart Waste Water Treatment Plant
Bob Keller
City Hall
407 State Street
Hart, MI 49420
(231) 873-2259

Hart High School
Joe Primozich, Science Teacher
300 Johnson St.
Hart, MI 49420
(231) 873-5691

US Forest Service
Tom Walter
P.O. Box Drawer D.
Baldwin, MI 49304

Jay McGhan
Zoning Administrator
2002 N. 100th Avenue
Hart, MI 49420
(231) 873-5817

2-6 Population

The South Branch Pentwater River Watershed and surrounding areas have shown slow population growth (Table 5). The county is experiencing urban growth mainly from Muskegon to the south and Ludington to the north. The county is also a major tourist area with Silver Lake and Pentwater being the most frequently visited areas. Data obtained from the West Michigan Shoreline Regional Development Commission (October, 1996). Figure 7 is a census of the population.

Table 5. Population. (Percent increases obtained by dividing 1970 population by 1996 population within each township. Approximate percent of township acreage within the watershed obtained using a GIS database. Approximate township population within the watershed obtained by multiplying 1996 population and approximate percent of township acreage within the watershed)

TOWNSHIP POPULATION									
YEAR	CRYSTAL	ELBRIDGE	FERRY	GOLDEN	HART	LEAVITT	PENTWATER	SHELBY	WEARE
1996 *	726	905	1,083	1,437	3,690	879	1,492	3,969	1,148
1990	658	820	1,033	1,302	3,455	804	1,422	3,692	1,041
1980	602	899	898	1,358	3,689	848	1,424	3,506	939
1970	453	799	719	871	3,664	773	1,154	3,352	695
PERCENT INCREASES									
	60.3%	13.3%	50.6%	65.0%	0.71%	13.7%	29.3%	18.4%	65.2%
ESTIMATED POPULATION WITHIN WATERSHED									
1996	109	679	32	101	3,506	18	895	79	172
1990	99	615	31	91	3,282	16	853	74	156
1980	90	674	27	95	3,505	17	854	70	141
1970	68	599	22	61	3,481	15	692	67	104
APPROXIMATE PERCENT OF TOWNSHIP POPULATION WITHIN WATERSHED									
	15.0%	75.0%	3.0%	7.0%	95.0%	2.0%	60.0%	2.0%	15.0%
APPROXIMATE PERCENT OF TOWNSHIP ACREAGE WITHIN WATERSHED									
	23.6%	72.2%	5.5%	11.1%	91.7%	4.2%	42.8%	3.6%	22.2%

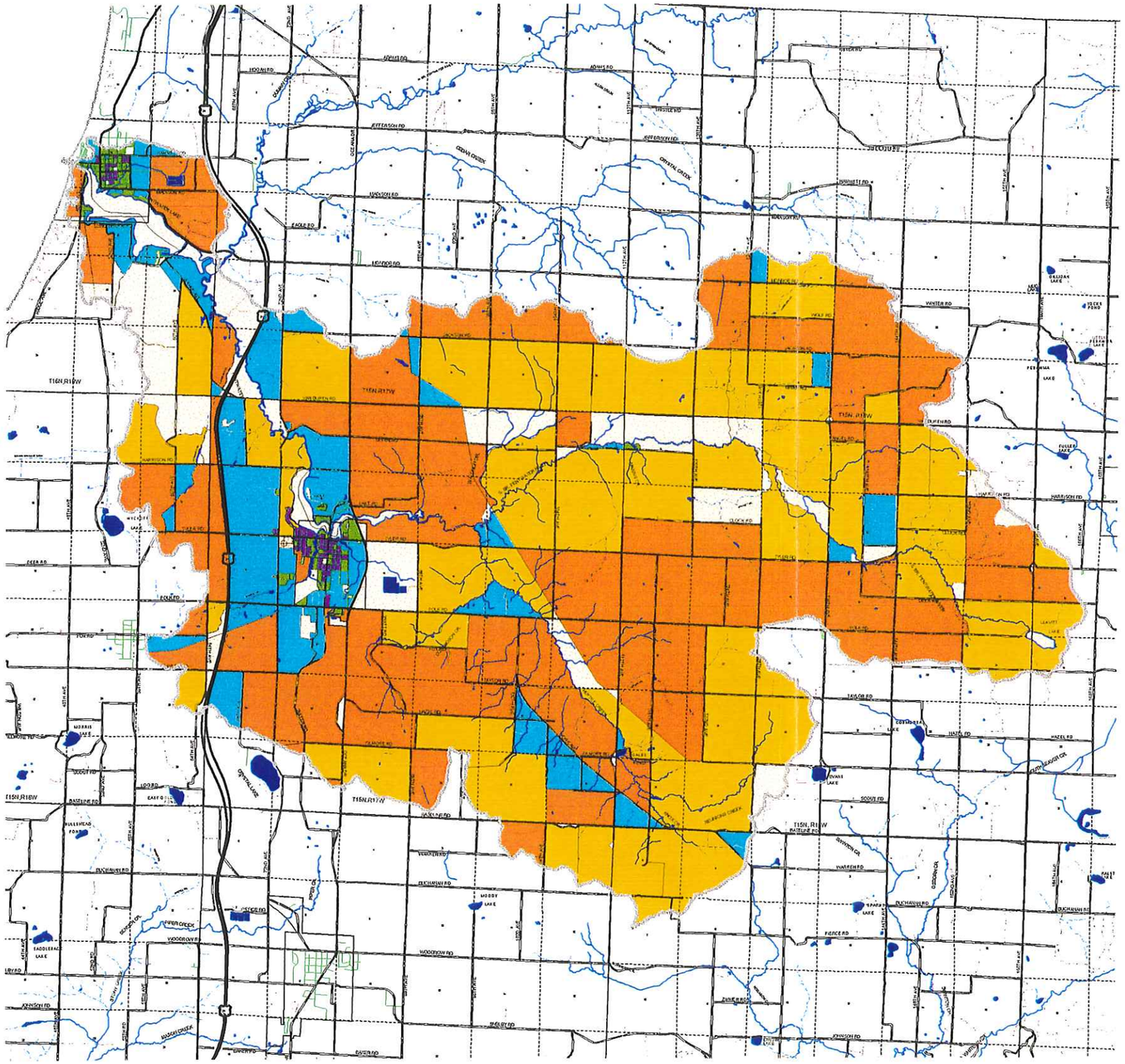
* U.S. Bureau of Census provided Population data. 1996 population data is an estimate.

2-7 Water Bodies

The South Branch Pentwater River begins at Leavitt Lake, which is a small lake with a surface area of approximately 65 acres. Leavitt Lake is located on the western edge of Leavitt Township. The river flows downstream where it first discharges into Hart Lake (240 acres) and then continues downstream where it eventually connects to the North Branch Pentwater River and discharges into Pentwater Lake (436 acres). The approximate length of the South Branch Pentwater River is 18 miles. Along the way, many streams and drains feed into the river (Figure 2). One major tributary of the river is the Huftile Creek, which extends almost five miles and picks up many smaller tributaries before meeting the South Branch.

Population Density

South Branch Pentwater River Watershed



Base Information

- Watershed Boundary
- State/Federal Highways
- County Roads
- Minor/Residential Roads
- Lake Michigan Shoreline
- Township/City/Village Limits
- Section Lines
- Rivers/Streams
- Lakes/Ponds
- Drains/Intermittent Streams
- Two Tracks

People Per Acre By Census Block

No Data	1.10 - 4.02
0.00 - 0.03	4.02 - 20.00
0.03 - 0.08	> 20.00
0.08 - 1.10	

DEFINITIONS:

Population Density = Total Population Per Polygon / Acres Per Polygon

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1 0 1 2 3 Miles

1:75000

Data Sources
Base Information: Michigan Department of Natural Resources, MIRIS, 1978.
Census Information: U.S. Census Bureau 1990 Census, United States Department of Commerce

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Information Services Center
Grand Valley State University

Map Prepared: July 1999

Figure 7

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Many tributaries are unnamed within the watershed, but are included in the total length. The total approximate length of rivers/stream/drains within the watershed is 127 miles (Table 6).

Besides Leavitt, Hart and Pentwater Lakes, many small ponds exist within the watershed. One notable pond, which has public access, is Gales Pond (approximately 8 acres) located in section 30 of Elbridge Township. Gales Pond is primarily used for fishing and boating. Pentwater Lake and Hart Lake also have public access sites. Both Pentwater and Hart Lakes are used for fishing, boating and swimming. The watershed is composed of eight county drains, according to an Oceana County Drain Map provided by the Oceana County Drain Office. The eight drains are Waldron Drain, Crystal Drain, Hart Drain, Flat Drain, Ferry Drain, Knox Drain, Weare Drain and Marsh Drain. Table 6 lists the drains, the approximate length of the drain and the discharge location (Township/Section) for each.

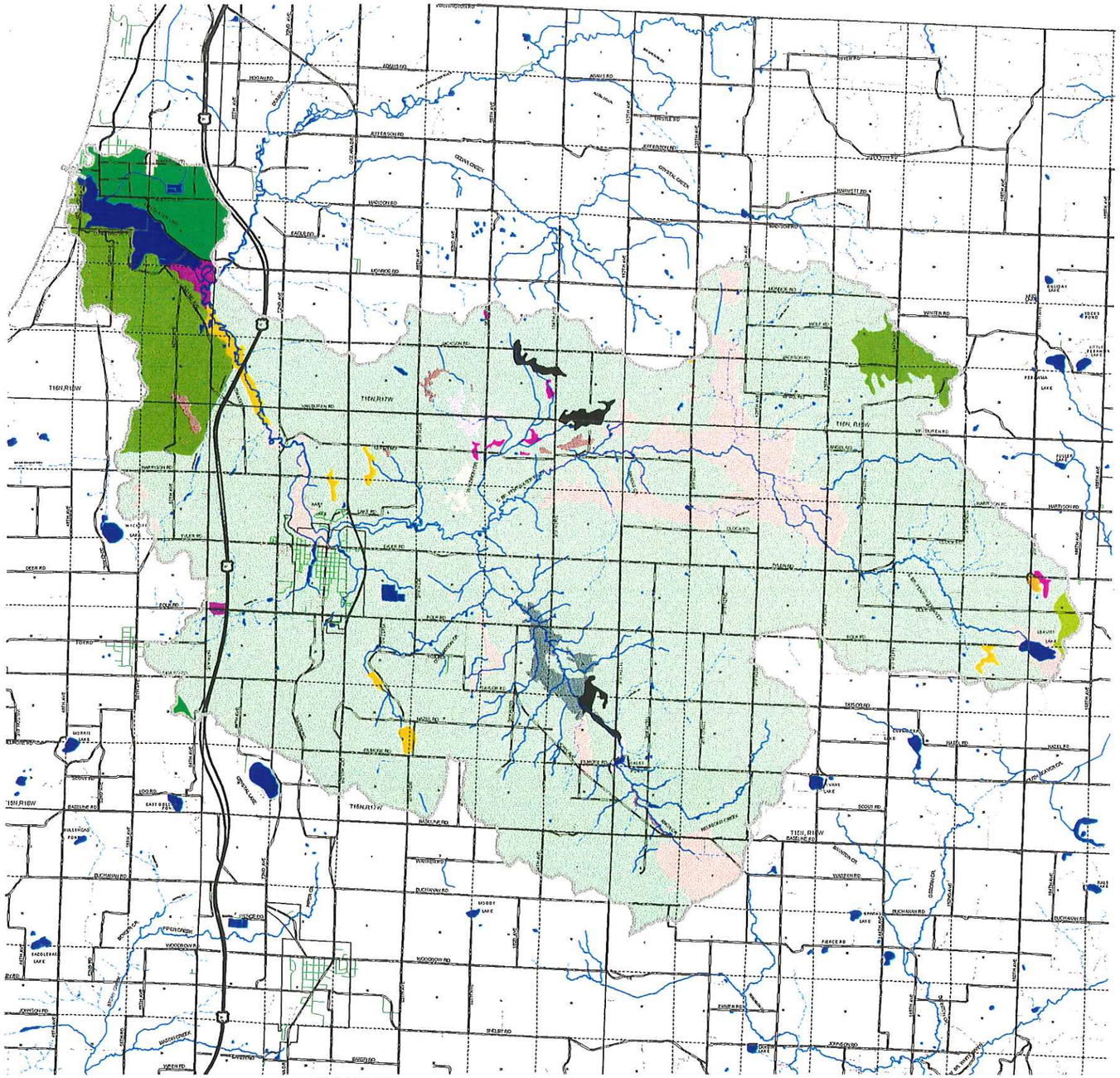
Table 6. Rivers, creeks and drains of the watershed. (Data obtained using a GIS database)

Rivers/Creeks/Drains	Approximate Length In Miles	Discharge Location (Twp./Sec.)
South Branch Pentwater River	18.00	Pentwater 25
Huftile Creek	4.75	Hart 10
Donaldson Creek	4.00	Hart 14
Cleveland Creek	4.50	Elbridge 5
Russell Creek	4.00	Hart 8
Lambricks Creek	3.50	Weare 31
Knox Creek	2.50	Elbridge 31
Reunions Creek	4.50	Elbridge 30
Hodges Creek	3.50	Hart 25
Makins Creek	.75	Elbridge 6
Chippewa Creek	2.00	Hart 8
Routley Creek	3.00	Elbridge 4
Waldron Drain	4.50	Hart 11
Crystal Drain	2.50	Crystal 29
Hart Drain	1.50	Hart 8, 19
Flat Drain	.25	Hart 6
Ferry Drain	.50	Ferry 5
Knox Drain	.50	Ferry 5
Weare Drain	1.50	Hart 3
Marsh Drain	1.00	Hart 2

2-8 Land Uses

Presettlement vegetation (Figure 8) in the South Branch of the Pentwater River Watershed was predominantly northern hardwoods, with some patches of forested wetlands and pine forests. Also, within the watershed, were some marshes and lowland hardwoods.

The watershed comprises approximately 57,000 acres. Presently, the watershed consists of approximately 47.9% agriculture, 30.5% forested, 14.0% open field, 4.1% urban, 1.7% wetlands, 1.5% water, 0.2% barren/sand dune, and 0.1% other. According to 1978 and 1996 land use information produced by Grand Valley State University of Michigan, the



PRESETTLEMENT VEGETATION

SOUTH BRANCH PENTWATER RIVER WATERSHED

BASE INFORMATION

- WATERSHED BOUNDARY
- STATE/FEDERAL HIGHWAYS
- COUNTY ROADS
- MINOR/RESIDENTIAL ROADS
- LAKE MICHIGAN SHORELINE
- TOWNSHIP/CITY/VILLAGE LIMITS
- SECTION LINES
- RIVERS/STREAMS
- LAKES/PONDS
- DRAINS/INTERMITTENT STREAMS
- TWO TRACKS

PRESETTLEMENT VEGETATION

- BEECH, SUGAR MAPLE, YELLOW BIRCH
- BEECH, HEMLOCK
- WHITE PINE, BEECH, RED MAPLE
- WHITE PINE
- WHITE BIRCH
- BLACK ASH
- LOWLAND HARDWOOD
- HEMLOCK
- BLACK SPRUCE
- CEDAR
- LOWLAND CONIFER
- ALDER, WILLOW, BOG BIRCH THICKET
- EMERGENT MARSH
- GREAT LAKES MARSH
- LAKE OR POND

DEFINITIONS:

PRESETTLEMENT VEGETATION REPRESENTS MICHIGAN'S NATIVE VEGETATION, AS IT APPEARED PRIOR TO WIDESPREAD EUROPEAN SETTLEMENT IN THE 1800s.

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GRAND VALLEY STATE UNIVERSITY

MAP PREPARED: JULY 1999

FIGURE 8

DATA SOURCES
BASE INFORMATION: MICHIGAN DEPARTMENT OF NATURAL RESOURCES, MIRIS, 1978.
VEGETATION INFORMATION: COMER, P.J., D.A. ALBERT, H.A. WELLS, B.L. HART, J.B. RAAB, D.L. PRICE, D.M. KASHIAN, R.A. CORNER & D.W. SCHUEN. 1995. MICHIGAN'S PRESETTLEMENT VEGETATION, AS INTERPRETED FROM THE GENERAL LAND OFFICE SURVEYS 1816-1856. MICHIGAN NATURAL FEATURES INVENTORY, LANSING, MI. DIGITAL MAP.

watershed is slowly developing into more residential areas and increasing the orchards and specialty crops (Figures 9 and 10). Specialty crops have increased dramatically from 6,290 acres to approximately 9,756 acres. Residential and other developed areas have increased by 300+ acres.

The watershed has very little prime farmland (Figure 11). However, many soils are well suited for orchards and specialty crops, such as asparagus and Christmas trees. Thus, more agricultural producers are converting many acres of land to specialty crops.

2-9 Stream Flows

No known stream flow data had been recorded before the start of this watershed project. However, data is now being collected for stream flows at nine locations on the watershed. For more information, see section 4.4 of this plan.

2-10 Channelization

Channelization is the straightening, deepening and smoothing of a water body, commonly known as dredging. This process is done to increase flow capacity. Channelization effects the ecology of the stream by decreasing riparian vegetation, increasing stream velocity, and decreases stream sinuosity, thus causing the banks to be less stable and more prone to erosion activity.

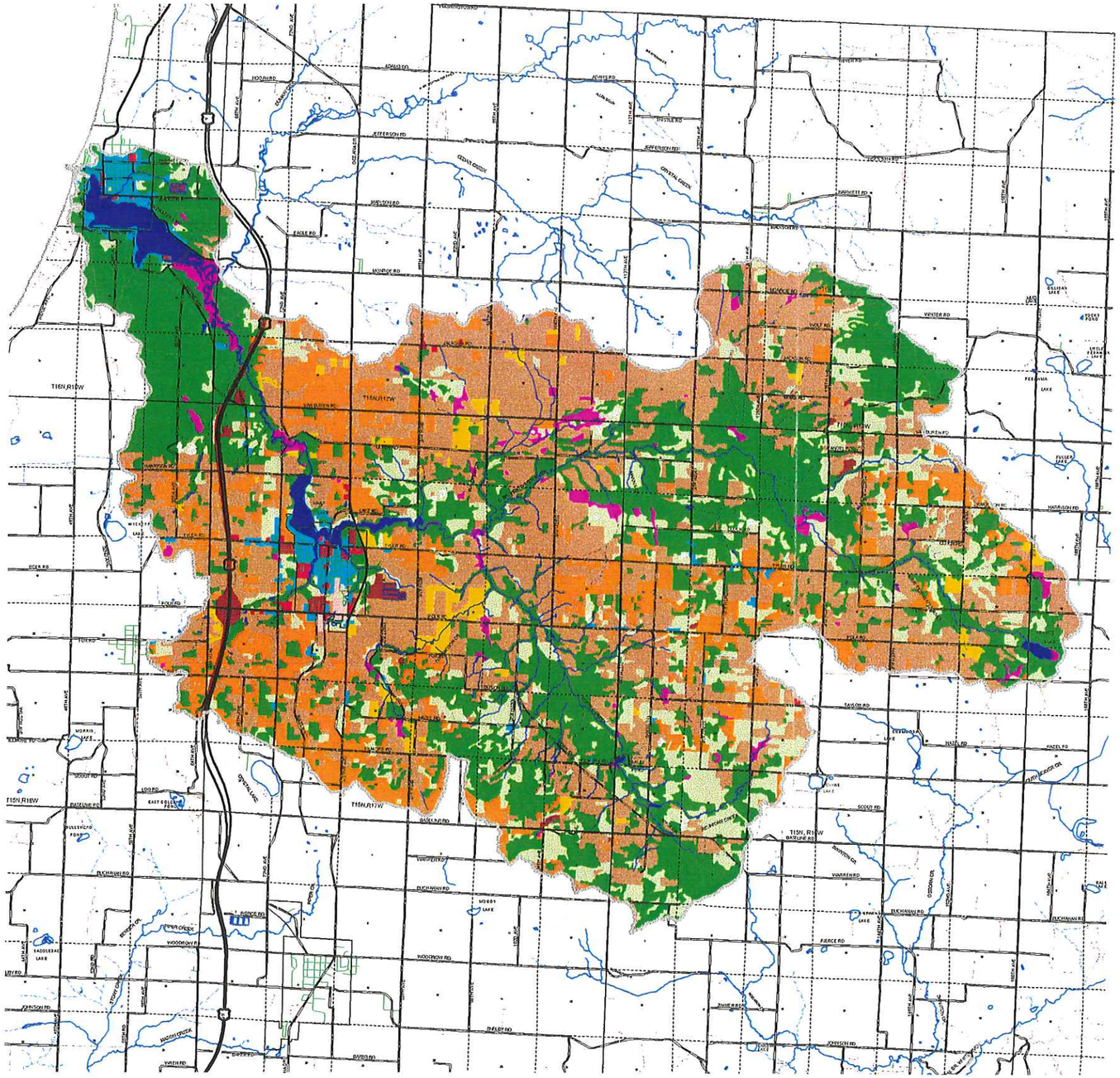
The South Branch Pentwater River watershed has experienced little channelization. According to an Oceana County Drain Map, acquired from the Oceana County Drain Office, approximately 12.25 miles of drains exist within the watershed (Table 5), which makes up about 9.6 percent of the watershed. Waldron Drain is the longest drain and appears to be a major contributor of sediment. Inadequate maintenance has created a lack of vegetation and the increase in surface water runoff; bank erosion appears to be having an impact on the stream. According to the drain office, no dredging will take place in the near future.

2-11 Special Resources

According to the Oceana County Element List provided by Michigan Natural Features Inventory (1997), threatened, endangered or rare species may exist within the South Branch Pentwater River (Table 7). The list should be used only as a reference, since conditions are constantly changing. Some observations were historically recorded and may not be completely accurate.

Oceana County is composed of numerous acres of federal land and many state, county and township parks. The watershed consists of state game areas including Pere Marquette State Forest and Pentwater River State Game Area. The County borders Lake Michigan and is blessed with many beaches. The South Branch experiences steelhead and salmon runs and provides great recreational opportunities. The parks, rivers and streams are also used for biking, hiking, canoeing, snowmobiling, hunting and wildlife viewing.

Another important resource to the watershed is the Pentwater Marsh. This marsh is a vital nursery area for fish and other aquatic life. The marsh has been extensively studied by



1978 Land Use/Cover

South Branch Pentwater River Watershed

Base Information

- Watershed Boundary
- State/Federal Highways
- County Roads
- Minor/Residential Roads
- Lake Michigan Shoreline
- Township/City/Village Limits
- Section Lines
- Rivers/Streams
- Lakes/Ponds
- Drains/Intermittent Streams
- Two Tracks

1978 Land Use/Cover

- Residential
- Commercial/Institutional
- Industrial
- Other Developed Areas
- Cropland
- Orchards or Other Specialty Crops
- Permanent Pasture
- Other Agricultural Lands
- Open Field
- Forest
- Water
- Wetland
- Barren/Sand Dune
- Transitional Land

Acres By Land Use/Cover

Residential	1,063.8
Commercial/Institutional	200.7
Industrial	92.0
Other Developed Areas	669.1
Cropland	20,579.0
Orchards or Other Specialty Crops	6,290.2
Permanent Pasture	977.0
Other Agricultural Lands	0.0
Open Field	7,556.3
Forest	17,787.5
Water	804.3
Wetland	988.3
Barren/Sand Dune	111.2
Transitional Land	0.0
Total Acres	57,119.4

N
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1 0 1 2 3 Miles

1:75000

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Information Services Center
Grand Valley State University

Map Prepared: July 1999

Figure 9

Data Sources: Base Information, Michigan Department of Natural Resources, MIRIS, 1978.
Watershed Boundaries, Michigan Environmental Quality, 1997.

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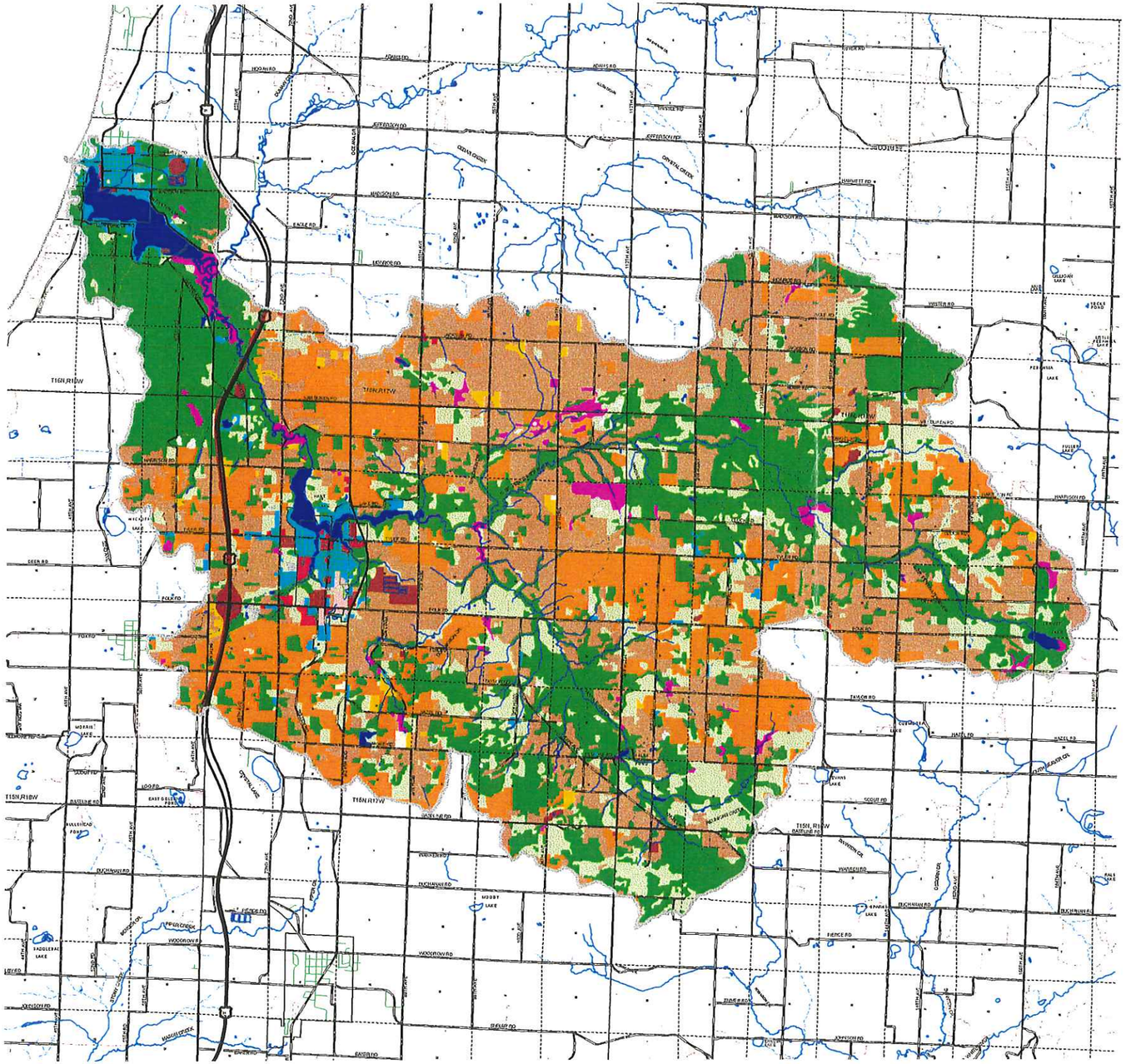

1996 Land Use/Cover

South Branch Pentwater River Watershed

Base Information

- Watershed Boundary
- State/Federal Highways
- County Roads
- Minor/Residential Roads
- Lake Michigan Shoreline
- Township/City/Village Limits
- Section Lines
- Rivers/Streams
- Lakes/Ponds
- Drains/Intermittent Streams
- Two Tracks

1996 Land Use/Cover

- Residential
- Commercial/Institutional
- Industrial
- Other Developed Areas
- Cropland
- Orchards or Other Specialty Crops
- Permanent Pasture
- Other Agricultural Lands
- Open Field
- Forest
- Water
- Wetland
- Barren/Sand Dune
- Transitional Land

Acres By Land Use/Cover

Residential	1,246.1
Commercial/Institutional	235.6
Industrial	95.7
Other Developed Areas	750.0
Cropland	17,195.1
Orchards or Other Specialty Crops	9,756.8
Permanent Pasture	377.1
Other Agricultural Lands	45.6
Open Field	7,989.8
Forest	17,435.8
Water	838.6
Wetland	985.0
Barren/Sand Dune	113.9
Transitional Land	54.3
Total Acres	57,119.4

N
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1 0 1 2 3 Miles

1:75000

Data Sources: Base Information, Michigan Department of Natural Resources, MIRIS, 1978.
Land Use/Cover Information based on aerial photo interpretation from aerial slides provided by the Farm Services Agency, U.S. Department of Agriculture, 1996.

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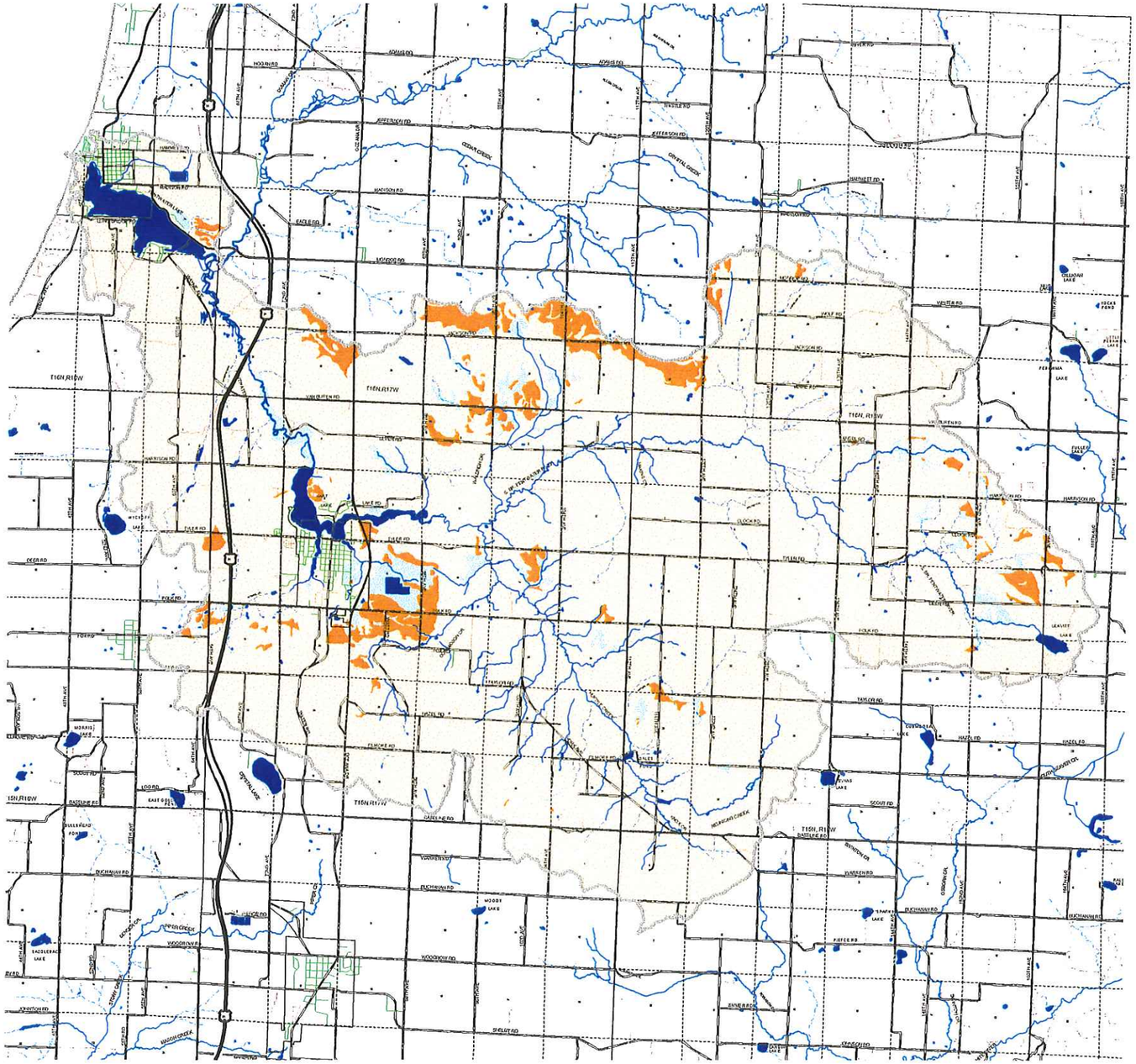
Information Services Center
Grand Valley State University

Map Prepared: July 1999

Figure 10



PRIME FARMLAND

SOUTH BRANCH PENTWATER RIVER WATERSHED

BASE INFORMATION

- WATERSHED BOUNDARY
- STATE/FEDERAL HIGHWAYS
- COUNTY ROADS
- MINOR/RESIDENTIAL ROADS
- LAKE MICHIGAN SHORELINE
- TOWNSHIP/CITY/VILLAGE LIMITS
- SECTION LINES
- RIVERS/STREAMS
- LAKES/PONDS
- DRAINS/INTERMITTENT STREAMS
- TWO TRACKS

PRIME FARMLAND (BASED ON SOILS)

- PRIME
- PRIME IF DRAINED
- NOT PRIME
- WATER

DEFINITIONS:

PRIME FARMLAND AS DEFINED BY THE U.S. DEPARTMENT OF AGRICULTURE, IS THE LAND THAT IS BEST SUITED TO FOOD, FEED, FORAGE, AND OILSEED CROPS. PRIME FARMLAND SOILS HAVE AN ADEQUATE AND DEPENDABLE SUPPLY OF MOISTURE FROM PRECIPITATION OR IRRIGATION, AND THE LEVEL OF ACIDITY OR ALKALINITY IS ACCEPTABLE. THEY HAVE FEW OR NO ROCKS AND ARE PERMEABLE TO WATER AND AIR. THEY ARE NOT EXCESSIVELY ERODIBLE OR SATURATED WITH WATER FOR LONG PERIODS AND ARE DO NOT FREQUENTLY FLOOD DURING THE GROWING SEASON. THE SLOPE RANGES MAINLY FROM 0 TO 6%.

N
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1 0 1 2 3 MILES

1:75000

DATA SOURCES
BASE INFORMATION: MICHIGAN DEPARTMENT OF NATURAL RESOURCES, MIRIS, 1978.
SOILS INFORMATION: SOIL SURVEY OF OCEANA COUNTY, MICHIGAN, ISSUED APRIL 1996.
USDA NATURAL RESOURCES CONSERVATION SERVICE AND FOREST SERVICE.

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MAP PREPARED: JULY 1999

FIGURE 11

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many researchers and found to be highly productive, supportive, and important for fish and wildlife preservation. The marsh is mostly comprised of emergent/wet meadow vegetation, edged with scrub-shrub vegetation, and at the outermost edges lined with lowland hardwoods (Kogge, 1997).

Table 7. Threatened, Endangered and Special Concern species within the South Branch of the Pentwater River Watershed. (Data obtained from the Michigan Natural Features Inventory)

Scientific Name	Common Name	Type	Federal Status	State Status
Accipiter gentilis	Northern goshawk	Animal		SC
Cirsium hillii	Hill's thistle	Plant		SC
Cirsium pitcheri	Pitcher's thistle	Plant	T	T
Clemmys insculpta	Wood turtle	Amphibian		SC
Eleocharis melanocarpa	Black-fruited spike-rush	Plant		SC
Gavia immer	Common loon	Animal		T
Geum triflorum	Prairie-smoke	Plant		T
Juncus biflorus	Two-flowered rush	Plant		SC
Juncus vaseyi	Vasey's rush	Plant		T
Lanius ludovicianus migrans	Migrant loggerhead shrike	Animal		E
Lycaeides melissa samuelis	Karner blue	Insect	E	T
Orobanche fasciculata	Fascicled broom-rape	Plant		T
Prunus alleghaniensis var davisii	Alleghany or sloe plum	Plant		SC
Rhexia virginica	Meadow-beauty	Plant		SC
Rhynchospora macrostachya	Tall beak-rush	Plant		SC
Sporobolus heterolepis	Prairie dropseed	Plant		T
	Frosted elfin	Insect		T

STATUS CODES: E = Endangered, T = Threatened, SC = Special Concern

2-12 Invasive Species

According to Great Lakes Information Network (1999), Oceana County has experienced invasion of many species within the last century. According to residents within the watershed, there is a great deal of concern with Zebra Mussels, Purple Loosestrife, Mute Swans, and Eurasion Watermilfoil. Others that may exist are Rusty Crayfish, Spiny Water Flea, Goby, Ruffe, Sea Lamprey, Curly-leaf Pondweed, and Flowering Rush (Table 8). Zebra Mussels are native to the Caspian Sea, are fingernail-sized and were first discovered to enter the Great Lakes in 1988. Purple Loosestrife is a wetland plant, which was introduced to the east coast of North America in the 1800's. Eurasian Watermilfoil was also introduced from Europe, and reached the midwestern states between the 1950's and 1980's.

Table 8. Invasive/Exotic species within the South Branch of the Pentwater River. Obtained from Great Lakes Information Network (GLIN).

Invasive Species	Type	Confirmation	Where Sited
Rusty Crayfish	Crustacean	S	
Spiny Water Flea	Crustacean	S	
Zebra Mussel	Mollusks	C	Pentwater Lake/Marsh
Goby	Fish	S	
Ruffe	Fish	S	
Sea Lamprey	Fish	C	Throughout Watershed
Curly-leaf Pondweed	Plant	C	Hart Lake/Pentwater Lake
Eurasion Watermilfoil	Plant	C	Hart Lake/Pentwater Lake
Flowering Rush	Plant	S	
Purple Loosestrife	Plant	C	Throughout Watershed
Mute Swan	Bird	C	Hart Lake, Pentwater Lake

Confirmation Codes: C = Confirmed, S = Suspected

The South Branch of the Pentwater River is very susceptible to invasive species because of the direct discharge into Lake Michigan. Many species are introduced into the Great Lakes by boat and eventually enter the watershed causing major problems for the watershed. A big surge of invasive species entered the Great Lakes after the St. Lawrence Seaway was opened. The invasive species often compete with native species causing shortages of food and will sometimes take over habitats in which natives live.

On July 9, 1999, EnviroScience, Inc., of Cuyahoga Falls Ohio, planted a total of 10,000 Eurasion Milfoil weevil larvae at three different locations on the lower South Branch of the Pentwater River and in the marsh, just east of Long Bridge Road. This was done under a grant to the Pentwater Lake Association from both the Michigan DEQ and DNR. The DEQ grant is paying for the planting and follow-up studies over the next 3 years. The DNR grant was for the cost of the larvae only. Follow-up data will be gathered and analyzed by West Shore Community College, under the direction of Dr. Hamdy Helal, Limnology Chair. The hope is that the weevils will proliferate and migrate into Pentwater Lake, to control the milfoil there. The larva was found, natively, in the marsh, but not in sufficient numbers to have any effect. Monthly surveys of the three sites by West Shore Community College are continuing.

PART III. WATER QUALITY ISSUES IN THE WATERSHED

3.1 Method of Inventory and Prioritization

The project manager inventoried the watershed mainly by walking and canoeing the stretches of the river, streams and drains. As problem sites were observed, they were marked on aerial photographs and eventually put into a GIS Support System. Bank erosion, gullies and domesticated animal crossing sites are mapped in figure 13. In addition, many road/stream crossings have been inventoried using a field data form (Appendix C). Each crossing within the watershed was visited (Figure 12). The following is a list of problem sites that were detected in the watershed:

Streambank Erosion
- Severe.....19 sites (1560 feet)
- Moderate.....31 sites (880 feet)
- Minor.....39 sites (1395 feet)

Gully/Rill Erosion
- Severe.....5 sites
- Moderate..... 24 sites
- Minor.....15 sites

Poor Access Roads
- .....6 sites

Golf Course Runoff
- .....1 site

Sand-Salt Deposition from Stock Piles
- .....2 sites

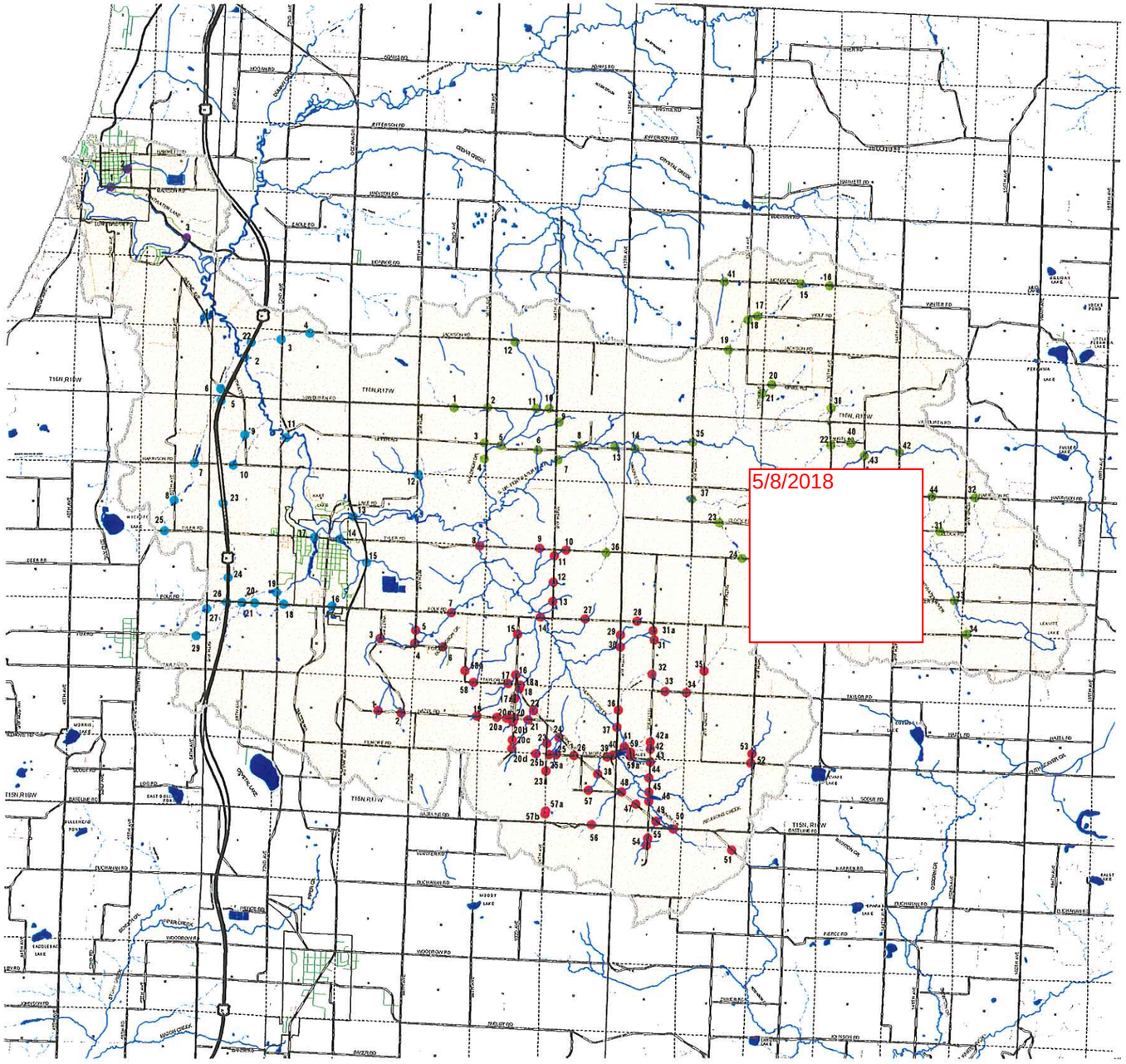
Road/Stream Crossings
- Ugly (Severe) .....11 sites
- Bad (Moderate).....29 sites
- Good .....88 sites

Unlimited Livestock Access To Streams
- .....15 sites (21,414 feet)

Each site was prioritized according to several variables. Bank erosion was rated according to height, length, soil type, apparent cause of erosion, condition trend, amount of vegetative cover, depth of river, and the velocity of the water. Gully/rill erosion was rated on the length, width, depth of site and the amount of field runoff. Road/stream crossings are rated using the field data form earlier mentioned. Other problems sites were prioritized according to the amount of disturbance to the river and its tributaries. Past cooperation with the landowner was considered for all problem sites, with the exception of road/stream crossings.

Road/Stream Crossings

South Branch Pentwater River Watershed



Base Information

- Watershed Boundary
- State/Federal Highways
- County Roads
- Minor/Residential Roads
- Lake Michigan Shoreline
- Township/City/Village Limits
- Section Lines
- Rivers/Streams
- Lakes/Ponds
- Drains/Intermittent Streams
- Two Tracks

Road/Stream Crossing Locations

- Huptile Creek
- Pentwater Lake
- Pentwater River
- South Branch Pentwater River

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Map Prepared: July 1999

Figure 12

Data Sources
Base Information: Michigan Department of Natural Resources, MIRIS, 1978.

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3.2 Existing and Potential Water Quality Issues

The designated uses of the South Branch of the Pentwater Watershed are: Agriculture, Cold Water Fisheries, Full Body Contact Recreation, Partial Body Contact Recreation, and Other Aquatic Life. Threatened uses of the watershed include cold water fisheries and other aquatic life. Agriculture, warm water fisheries, partial body contact recreation and full body contact recreation are potentially threatened. No uses are impaired at this time.

THREATENED USES

1. Cold Water Fisheries & Other Aquatic Life

Pollutants/Sources:

Sediment
- **Road/Stream Crossings**
- **Bank Erosion**
- **Domesticated Animal Crossings**
- **Wildlife**
- **Dam Breakage**
- **Field Runoff**
- **Watercraft/Motorized Vehicles**
- **Construction Sites/Stock Piles**

Nutrients
- **Residential Lawns**
- **Domesticated Animal Crossings**
- **Field Runoff/ Soil Leaching**
- **Impervious Surfaces**
- **Septic Systems**
- **Industries**
- **Wildlife**

Pathogens
- **Septic Systems**
- **Wildlife**
- **Domesticated Animal Crossings**

Pesticides
- **Field Runoff/ Soil Leaching**
- **Residential Runoff/ Soil Leaching**

Invasive/Exotic Species
- **Zebra Mussels**
- **Eurasion Watermilfoil**
- **Curly-leaf Pondweed**
- **Purple Loosestrife**

Temperature
- **Dams**
- **Drains**

Road/Stream Crossings are depositing a great deal of sediment, salts and other contaminants into the river and streams. According to an inventory of road/stream crossings within the watershed (Figure 12), multiple sites have been recorded as severe and moderate sites. Culverts and bridges are often installed improperly causing sediment deposition and elimination of fish passage because of fall from culvert to river/stream/drain, or simply an obstruction of some sort. The steering committee has discussed the possibility of replacing culverts or reconstructing slope and grades to eliminate sediment deposition and allow fish passage.

Bank Erosion is a major contributor to sediment deposition and nutrient inputs. Bank erosion includes stream bank erosion and cropland erosion. The most severe stream bank erosion sites exist mainly on the lower end of Donaldson Creek, the lower end of Waldron Drain, Russell Creek and the Pentwater River where many banks have been disturbed and lack sufficient vegetation (Figure 13). Much of the cropland erosion, including field runoff, exist on the two main drains, including Waldron Drain and Crystal Drain.

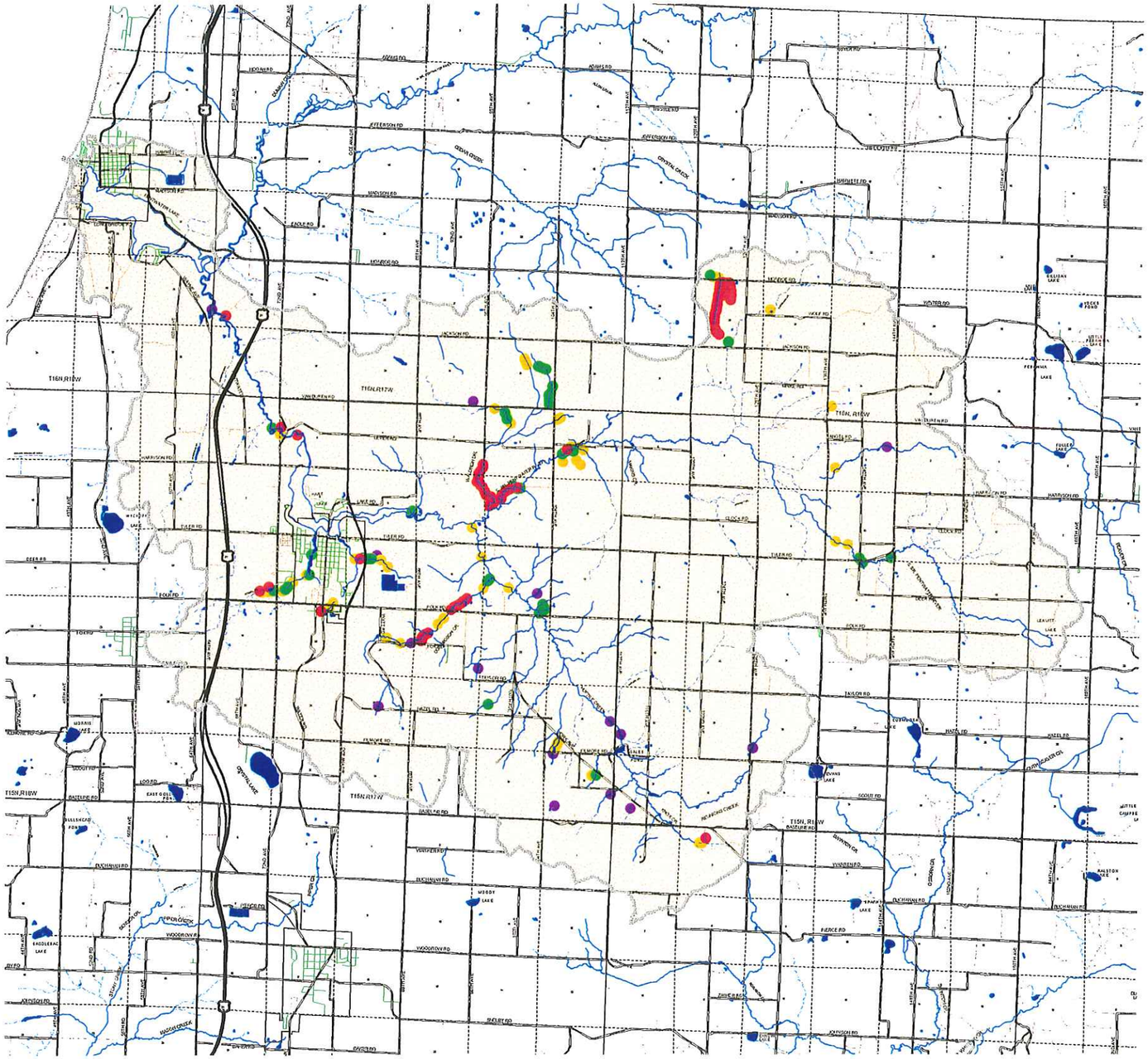
Domesticated Animal Crossings are having a major effect on the river and streams within the watershed. Animal crossings include small cattle herds and horses. Approximately 10 livestock access sites exist within the watershed and make up part of the critical sites (Figure 13). Livestock are causing bank erosion and are contributing to the nutrient and pathogen content within the river system. Restriction of cattle and horses is a major priority of the steering committee members and will be a focus.

Wildlife, mainly deer, have caused a noticeable amount of bank erosion along stream banks. In addition, nutrients and pathogens are deposited into water column from droppings. Nothing can be done to prevent these problems from wildlife other than limit the growth of the population.

The Breaching of Hart Dam in 1986 contributed a great deal of sediment to the South Branch of the Pentwater River. According to local residents and local agencies, the breakage of the dam washed sediment downstream causing the river to be a much lower quality river below the dam. The sediment widened the river, covered gravel and cobble, and caused the river to become shallower. With a wider and shallower river, temperatures will tend to increase.

Watercraft and Motorized Vehicles erode banks and deposit sediment. In addition, motorized vehicles leak gasoline, oil and other pollutants. Education tools can be used to decrease the misuse of these vehicles.

Field Runoff is providing sediment during runoff events that cause two major problems. Runoff is the transportation mechanism for sediment to be carried as sediment and deposited within the stream. This sediment not only impacts the fisheries of the river system, but provides excess nutrients and possibly pesticides to the stream, thus impacting water quality.



Bank Erosion Sites & Nutrient Sources

South Branch Pentwater River Watershed

Base Information

- Watershed Boundary
- State/Federal Highways
- County Roads
- Minor/Residential Roads
- Lake Michigan Shoreline
- Township/City/Village Limits
- Section Lines
- Rivers/Streams
- Lakes/Ponds
- Drains/Intermittent Streams
- Two Tracks

Bank Erosion Sites & Nutrient Sources

- Minor Bank Erosion & Gully Sites
- Moderate Bank Erosion & Gully Sites
- Severe Bank Erosion & Gully Sites
- Domesticated Animal Crossings

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Grand Valley State University

Map Prepared: July 1999

Figure 13

Data Sources
Base Information: Michigan Department of Natural Resources, MIRIS, 1978.
Bank Erosion Sites & Nutrient Sources Information: Oceana Conservation District

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Soil Leaching is the process where water moves through the soil. This water can transport water soluble nutrients / pesticides into the lower part of the soil below the plant root zone. Once the nutrients are out of the root zone, they are not available to the plants and can be transported deep enough to enter the groundwater.

Construction Areas contribute to sediment deposition by eliminating riparian vegetation and reshaping the landscape. Filter fences and educational strategies will be used to increase protection of the waterways.

Non-agricultural Runoff / Soil Leaching, such as golf courses and residential areas, contribute a great deal of nutrients and pesticides to the lakes and streams. Many residents and golf courses apply fertilizers and pesticides improperly and most often apply too much. Resource professionals will use education strategies to increase awareness on the subject. Figures 14a and 14b show the pesticide loss potential due to leaching and runoff respectively.

Impervious Surfaces increase the rate of runoff (direct discharge) and can deposit nutrients into the river system through storm sewers. With the increase in development, parking lots, driveways and additional roads are increasing the amount of impervious surfaces. The committee will take an active approach to educate the community and may help to develop a storm water ordinance.

Septic Systems are a potential threat to water quality. Many residents live on Pentwater Lake, Hart Lake or other waterbodies and run the risk of nutrient and pathogen inputs. The project will strive to educate the community with information and education efforts as well as using other resources such as the Home*A*Syst program. Figure 15 displays septic tank absorption.

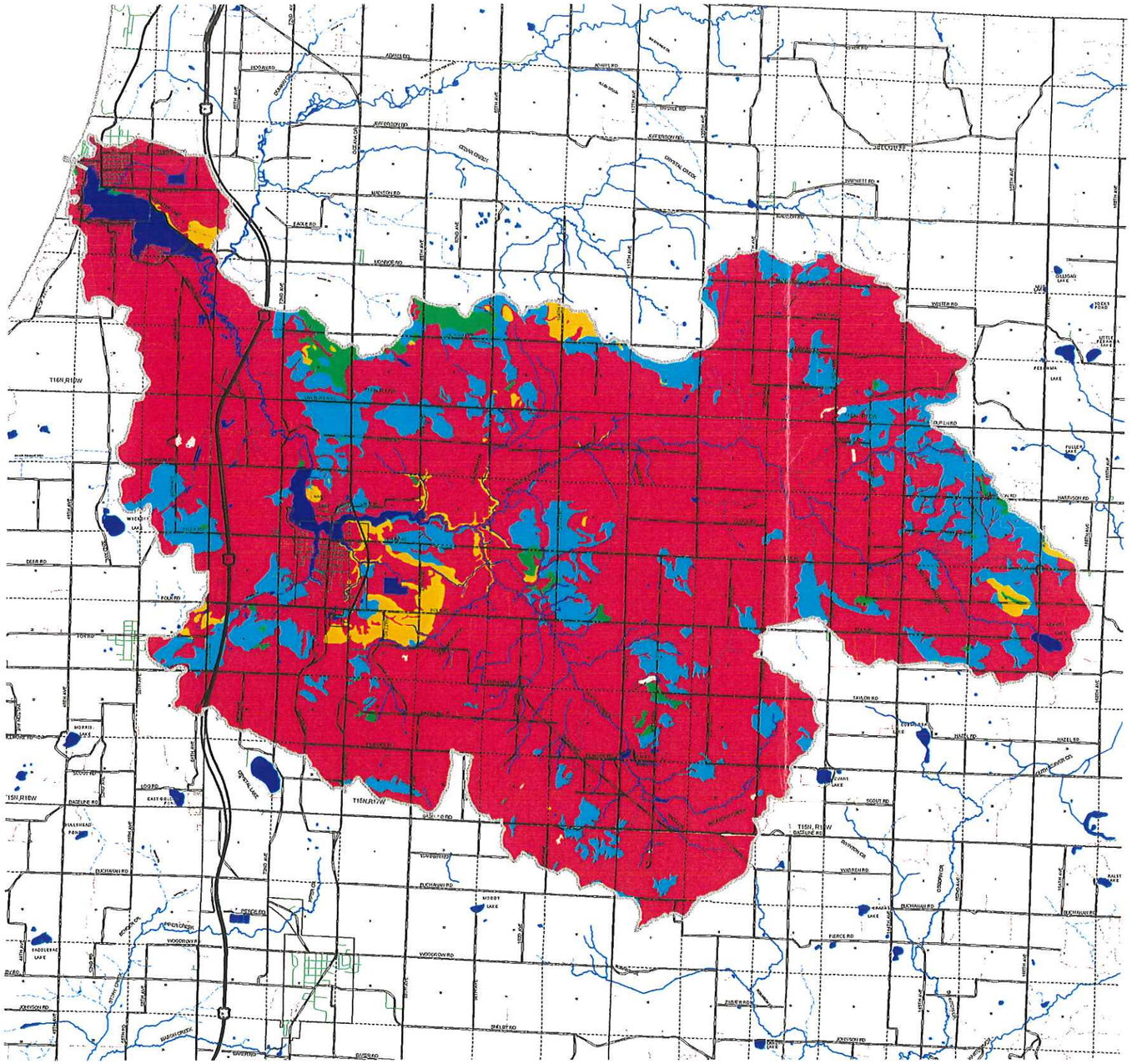
Industries within the area are common sources of nutrients within the watershed. According to area residents, fertilizers/nutrients have escaped into the water column. Proper management and education will help eliminate this source.

Dams and Drains normally contribute to warmer temperatures within the watershed. The watershed has many manmade, beaver and natural dams, which cause the water to hold up for a greater time, increasing the temperatures. Hart Dam is the largest dam within the watershed. The dam appears to be responsible for increased temperatures and large fluctuations of water levels downstream. Although the watershed does not have many drains, the ones that do exist contribute to temperature warming.

Sand and Salt Stock Piles are depositing a great deal of sediment into drains and streams. Relocating the piles and educational strategies will be used to increase protection of the waterways.

Pesticide Loss Potential Due To Leaching

South Branch Pentwater River Watershed



Base Information

- Watershed Boundary
- State/Federal Highways
- County Roads
- Minor/Residential Roads
- Lake Michigan Shoreline
- Township/City/Village Limits
- Section Lines
- Rivers/Streams
- Lakes/Ponds
- Drains/Intermittent Streams
- Two Tracks

Pesticide Loss Potential Due To Leaching (Based on Soils)

- Slight
- Moderate
- Severe
- Variable
- Not Rated
- Water

DEFINITIONS:

Slight = Low potential for soils to retain pesticides within the boundaries of the root zone.

Moderate = Medium potential for soils to retain pesticides within the boundaries of the root zone.

Severe = High potential for soils to retain pesticides within the boundaries of the root zone.

Variable = Potential varies from slight to severe due to the presence of more than one soil type.

Not Rated = Information is not available.

Water = Soil is covered by water.

The Pesticide Loss Potential Due To Leaching is the potential for pesticides to be transported by percolating water below the soil root zone. These pesticides have a potential to contaminate shallow and deep aquifers, springs and local water tables.

The soil properties and features considered are soil texture, surface layer thickness, organic matter content, structure, bulk density, permeability of soil or bedrock, restrictive layers, shrink-swell potential, depth to rock, depth to water table and slope.

N W E S

1 0 1 2 3 Miles

1:75000

Data Sources
Base Information: Michigan Department of Natural Resources, MIRIS, 1978.
Soils Information: USDA Natural Resources Conservation Service, Michigan. Technical Guide, Section II, Water Quantity & Quality Interpretations Soil Rating, 1993.

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Information Services Center
Grand Valley State University

Map Prepared: July 1999

Figure 14A

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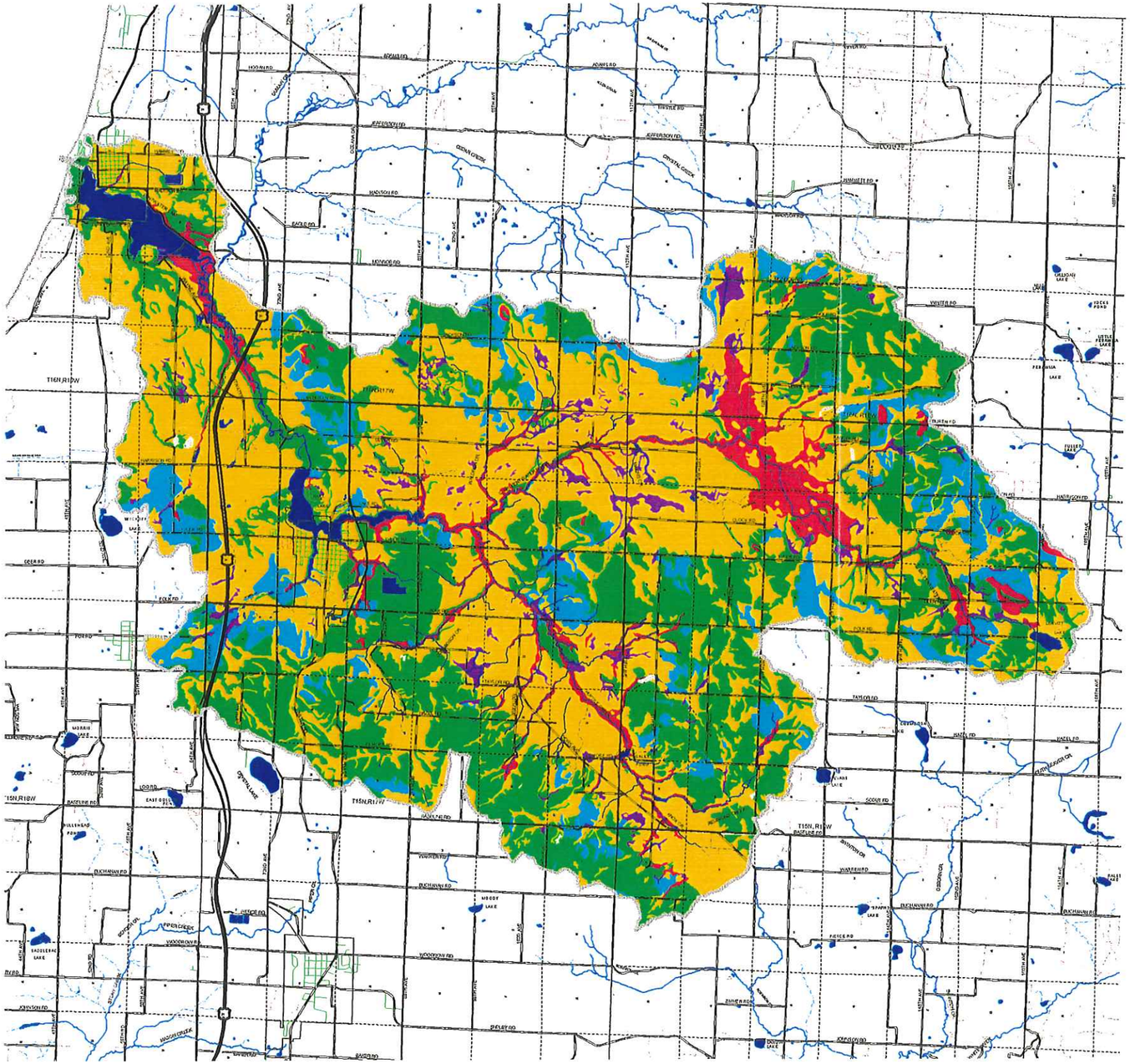
Pesticide Loss Potential Due To Runoff

South Branch Pentwater River Watershed



Base Information

- Watershed Boundary
- State/Federal Highways
- County Roads
- Minor/Residential Roads
- Lake Michigan Shoreline
- Township/City/Village Limits
- Section Lines
- Rivers/Streams
- Lakes/Ponds
- Drains/Intermittent Streams
- Two Tracks

Pesticide Loss Potential Due To Runoff (Based on Soils)

- Slight
- Moderate
- Severe
- Variable
- Variable/Note
- Not Rated
- Water

DEFINITIONS:

Slight = Low potential for soils to retain pesticides within the boundaries of the field where applied.

Moderate = Medium potential for soils to retain pesticides within the boundaries of the field where applied.

Severe = High potential for soils to retain pesticides within the boundaries of the field where applied.

Variable = Potential varies from slight to severe due to the presence of more than one soil type.

Variable/Note = Artificial drainage = Severe or high potential. Ponded with no artificial drainage = Slight or low potential.

Not Rated = Information is not available.

Water = Soil is covered by water.

The Pesticide Loss Potential Due To Runoff is the potential for pesticides to be transported by surface runoff beyond the field boundary where the pesticide is applied. These pesticides have a potential to contaminate surface waters such as lakes, ponds, streams and rivers.

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Data Sources
Base Information: Michigan Department of Natural Resources, MIRIS, 1978.
Soils Information: USDA Natural Resources Conservation Service, Michigan.
Technical Guide, Section II, Water Quantity & Quality Interpretations Soil Rating, 1993.

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Information Services Center
Grand Valley State University

Map Prepared: July 1999

Figure 14B

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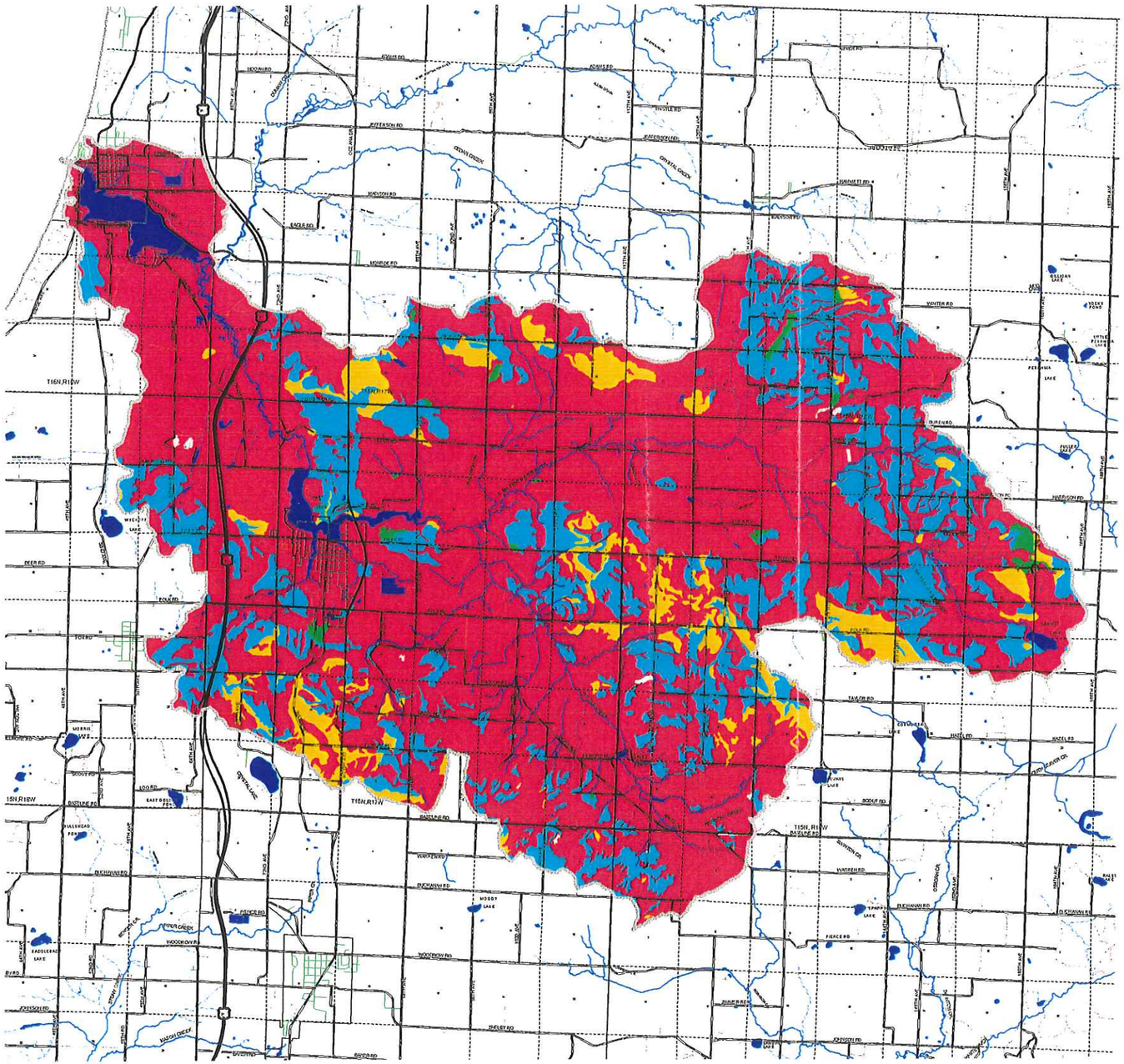
Septic Tank Absorption Field Suitablility

South Branch Pentwater River Watershed



Base Information

- Watershed Boundary
- State/Federal Highways
- County Roads
- Minor/Residential Roads
- Lake Michigan Shoreline
- Township/City/Village Limits
- Section Lines
- Rivers/Streams
- Lakes/Ponds
- Drains/Intermittent Streams
- Two Tracks

Septic Tank Absorption Field Suitability (Based on Soils)

- Slight
- Moderate
- Severe
- Variable
- Not Rated
- Water

DEFINITIONS:

Slight = Soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome.

Moderate = Soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations.

Severe = Soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Variable = Soil Properties or site features can fall anywhere in the range from slight to severe

Not Rated = Information is not available

Water = Soil is covered by water

Septic Tank Absorption Fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. Permeability, a high water table, depth to a cemented pan, and flooding affect absorption of the effluent.

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Data Sources
Base Information: Michigan Department of Natural Resources, MIRIS, 1978.
Soils Information: Soil Survey of Oceana County, Michigan, Issued April 1996.
USDA Natural Resources Conservation Service and Forest Service.

Robert B. Annis Water Resources Institute
Information Services Center
Grand Valley State University

Map Prepared: July 1999

Figure 15

USES WITH A POTENTIAL THREAT

1. Agriculture

Pollutants/Sources:

Pathogens
- **Domesticated Animal Crossings**
- **Wildlife**
- **Septic Systems**

Water Quantity
- **Golf Course Development**
- **Other Riverfront Development**

Flooding
- **Wetland Destruction**
- **Installation of Tiles**
- **Digging of Ditches**

Domesticated Animal Crossings, Wildlife and Septic Systems contribute pathogens to the water column and decrease the water quality. Several farms rely on stream water for watering their livestock. Educational practices and construction of exclusionary fencing with watercourse crossings will improve water quality for animal watering.

Golf Course Development and Riverfront Development is a concern that may affect the agricultural industry years from now. Development near rivers and streams could increase the water needed for irrigation, especially golf course development. The agricultural producers rely on water for many farm practices including irrigation. They may one day be limited to the amount of water they can pull.

Wetland Destruction and The Installation of Ditches and Tiles have increased the flooding within the watershed. During heavy rainfalls, the watershed experiences high water and often flooding due to the excess discharge of water from field drainage and impervious surfaces. Flooding can destroy crops or cause poor growing conditions. Tiling and ditching is done by the agriculture community to protect and improve cropland, however too much tiling often creates excess discharge.

1. Partial and Full Body Contact Recreation

Pollutant/Sources:

Fecal Coliform
- **Septic Systems**
- **Industries**
- **Domestic Animals**
- **Wildlife**

Fecal coliform is released from **septic systems, industries, domesticated animals and wildlife** within the watershed. Continued degradation of the water quality could result in an impaired designated use (See threatened use #1 for description of sources above).

3. Warm Water Fisheries

Pollutant/Sources:

Sediment
- **Road/Stream Crossings**
- **Bank Erosion**
- **Domesticated Animal Crossings**
- **Wildlife**
- **Dam Breakage**
- **Field Runoff**
- **Watercraft/Motorized Vehicles**
- **Construction Sites/Stock Piles**

Nutrients
- **Residential Lawns**
- **Domesticated Animal Crossings**
- **Field Runoff / Soil Leaching**
- **Impervious Surfaces**
- **Septic Systems**
- **Industries**
- **Wildlife**

Pathogens
- **Septic Systems**
- **Wildlife**
- **Domesticated Animal Crossings**

Pesticides
- **Field Runoff / Soil Leaching**
- **Residential Runoff / Soil Leaching**

Invasive/Exotic Species
- **Zebra Mussels**
- **Eurasion Watermilfoil**
- **Curly-leaf Pondweed**
- **Purple Loosestrife**

See threatened use #1 (Cold Water Fisheries) for description of sources above.

3.3 Description of High Quality Waters

The South Branch of the Pentwater River is generally considered a relatively high quality river. The river has many cold water tributaries and numerous groundwater seeps, keeping it a cold water fishery. The watershed has some nice areas of gravel beds and contains extensive woody debris supporting great habitats for fish and other aquatic life.

According to residents within the watershed and the project manager, the upper stretches of the river, including areas from Leavitt Lake to just beyond 136th Avenue are high quality fisheries consisting of gravel and low temperatures supporting many trout and abundant macro invertebrates. The stretch of river downstream from 104th Avenue to 96th Avenue is high quality as well with a good gravel bottom and nice riparian buffers. In addition, many small tributaries are high quality and support several trout and a great deal of other aquatic life. However, because of the rising growth within the watershed and more impervious surfaces, more erosion sites are present and more sediment is being deposited into the river and streams (Growth apparently correlates to the stream conditions).

3.4 Previous Watershed Studies

The following watershed studies have been identified:

1. **Eurasion Watermilfoil Study on Pentwater Marsh**
   - Milfoil being treated with weevil (Active study).
2. **Hart Lake Improvement Feasibility Study Report**
   - Completed in January 1999 by Progressive AE of Grand Rapids
3. **Donaldson Creek Studies**
   - Study performed by Rich O'Neil of the Michigan Department of Natural Resources (1998).
4. **Pentwater Lake, Marsh & Tributaries Study Report**
   - Completed in September 1997 by DEQ
5. **Oceana County Resource Plan**
   - Completed in November 1992 by Oceana County Steering Committee.
6. **A Biological And Water Chemistry Assessment Of Chippewa Creek (Staff Report)**
   - Completed in October 1992 by Michigan Department of Natural Resources.
7. **Non-Point Pollution Influences On Water Quality In Three Rural Watersheds (Progress Reports)**
   - Study performed by Fred Beavis (Grand Valley State University, Michigan) in 1989-1990.
8. **North West Michigan Erosion Study of River Basins**
   - Study performed by Jack Lake (Former Employee for Soil Conservation Service) in 1989-1990.

PART IV. STREAM MONITORING

4.1 Instream Survey

The Pentwater River Watershed Committee has many volunteers collecting data on the South Branch and its tributaries. Currently, 13 sites are sampled on the South Branch and 7 sites are sampled on the North Branch of the Pentwater River Watershed (Figure 16). The program is funded through the Department of Environmental Quality (DEQ) where volunteers monitor the stream by getting in the stream and sample benthic macro invertebrates, assess stream habitat and record the information on a form provided by DEQ (See Appendix E). Benthic invertebrates are identified to Order, in the field if possible. Invertebrate orders are noted as rare (< 10 individuals) or common (> 10 individuals). Habitat evaluations require volunteers to note substrate types, riparian vegetation, aquatic plants and algae, bank stability, and habitat types (riffles, runs, pools, logs, rocks, etc.). Surrounding landuses are noted, potential pollution sources and causes of degradation are also noted. The Surface Water Quality Division and the Oceana Conservation District provide training to the volunteers and have conducted a Quality Assurance Program to ensure data quality. Results for fall 1998 and spring 1999 are given in Appendix E.

4.2 Road Stream Crossing Inventory

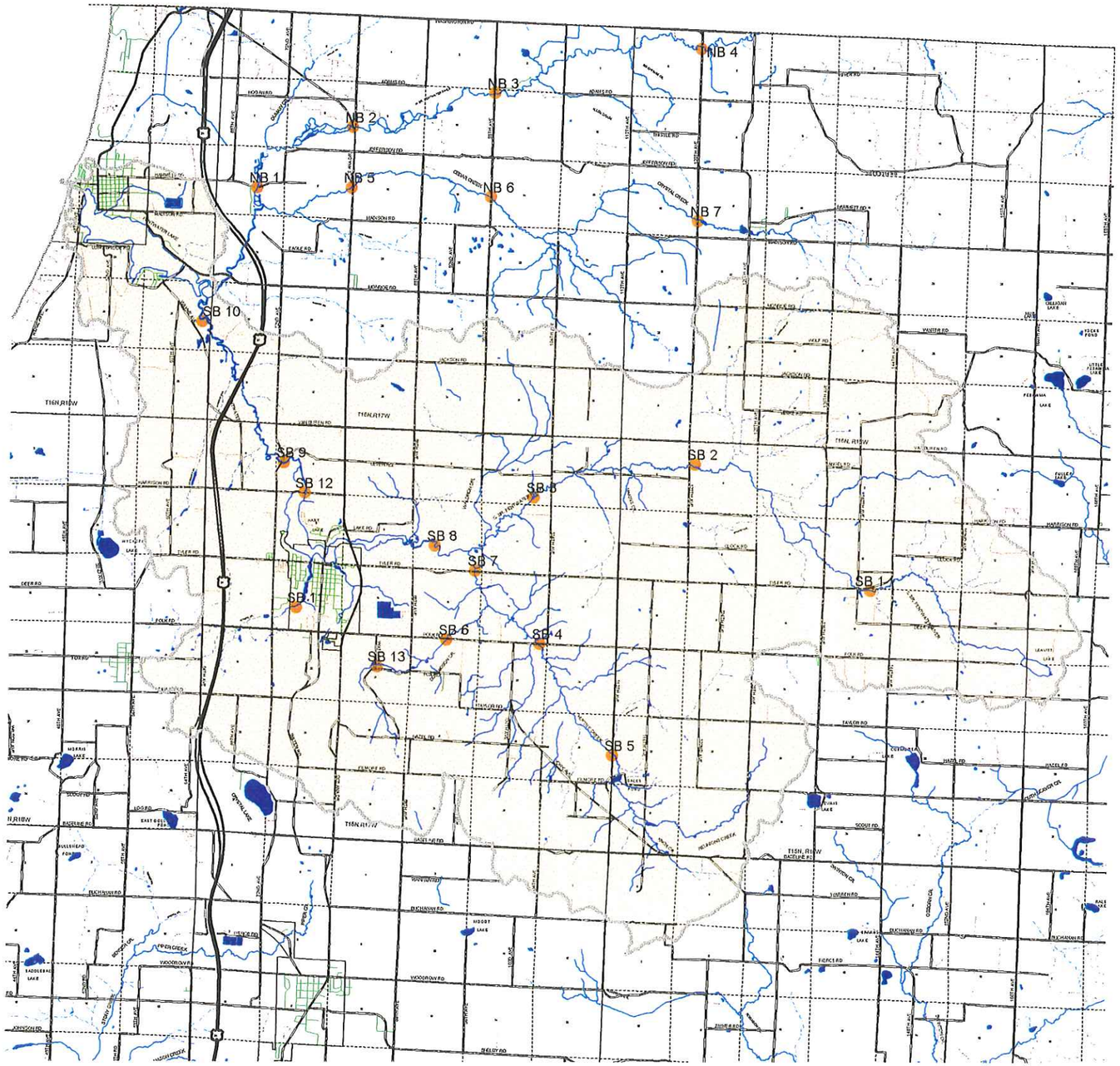
Volunteers have been inventorying road/stream crossings throughout the watershed (Figure 12). The inventory consists of road data, culvert or bridge description, stream characteristics, erosion problems, site sketch, location of site and rating of site (See Appendix C). Road data includes road surface material, maintenance, location of low point, approaches, vegetation and various road measurements. Culvert descriptions include various measurements, condition of culvert and material of culvert. Stream characteristics include width, depth, current speed, substrate type and fish passage. Michigan State University Extension, NRCS, Americorps members, Oceana County Road Commission Representatives, and the Conservation District have participated in the inventorying. One hundred and twenty eight road/stream crossings have been inventoried and rated.

4.3 Temperature Gauges

As part of the stream monitoring exercises, temperature gauges have been placed throughout the watershed to monitor temperatures of the river/stream/drain (Figure 17). Gauges were installed before and after primary tributaries entered the South Branch of the Pentwater River. This was done to examine the temperature effects of tributaries within the watershed. This is important because the Pentwater River is considered a cold water stream, which supports cold water fisheries. Water temperature is a key factor influencing the distribution and abundance of both fish and aquatic invertebrates (Seelbach et. al. 1997). Temperatures are recorded at the top of the hour every hour (results are given in Appendix G).

MACROINVERTIBRATE SAMPLING SITES

SOUTH BRANCH PENTWATER RIVER WATERSHED



BASE INFORMATION

- WATERSHED BOUNDARY
- STATE/FEDERAL HIGHWAYS
- COUNTY ROADS
- MINOR/RESIDENTIAL ROADS
- LAKE MICHIGAN SHORELINE
- TOWNSHIP/CITY/VILLAGE LIMITS
- SECTION LINES
- RIVERS/STREAMS
- LAKES/PONDS
- DRAINS/INTERMITTENT STREAMS
- TWO TRACKS

MACROINVERTEBRATE SAMPLING LOCATIONS

DEFINITIONS:

SB = SOUTH BRANCH PENTWATER RIVER WATERSHED

NB = NORTH BRANCH PENTWATER RIVER WATERSHED

N

W E

S

1 0 1 2 3 MILES

1:75000

DATA SOURCES
BASE INFORMATION: MICHIGAN DEPARTMENT OF NATURAL RESOURCES, MIRIS, 1978.
SAMPLING SITE INFORMATION: PROVIDED BY OCEANA CONSERVATION DISTRICT

ROBERT B. ANNIS WATER RESOURCES INSTITUTE
INFORMATION SERVICES CENTER
GRAND VALLEY STATE UNIVERSITY

MAP PREPARED: JULY 1999

FIGURE 16

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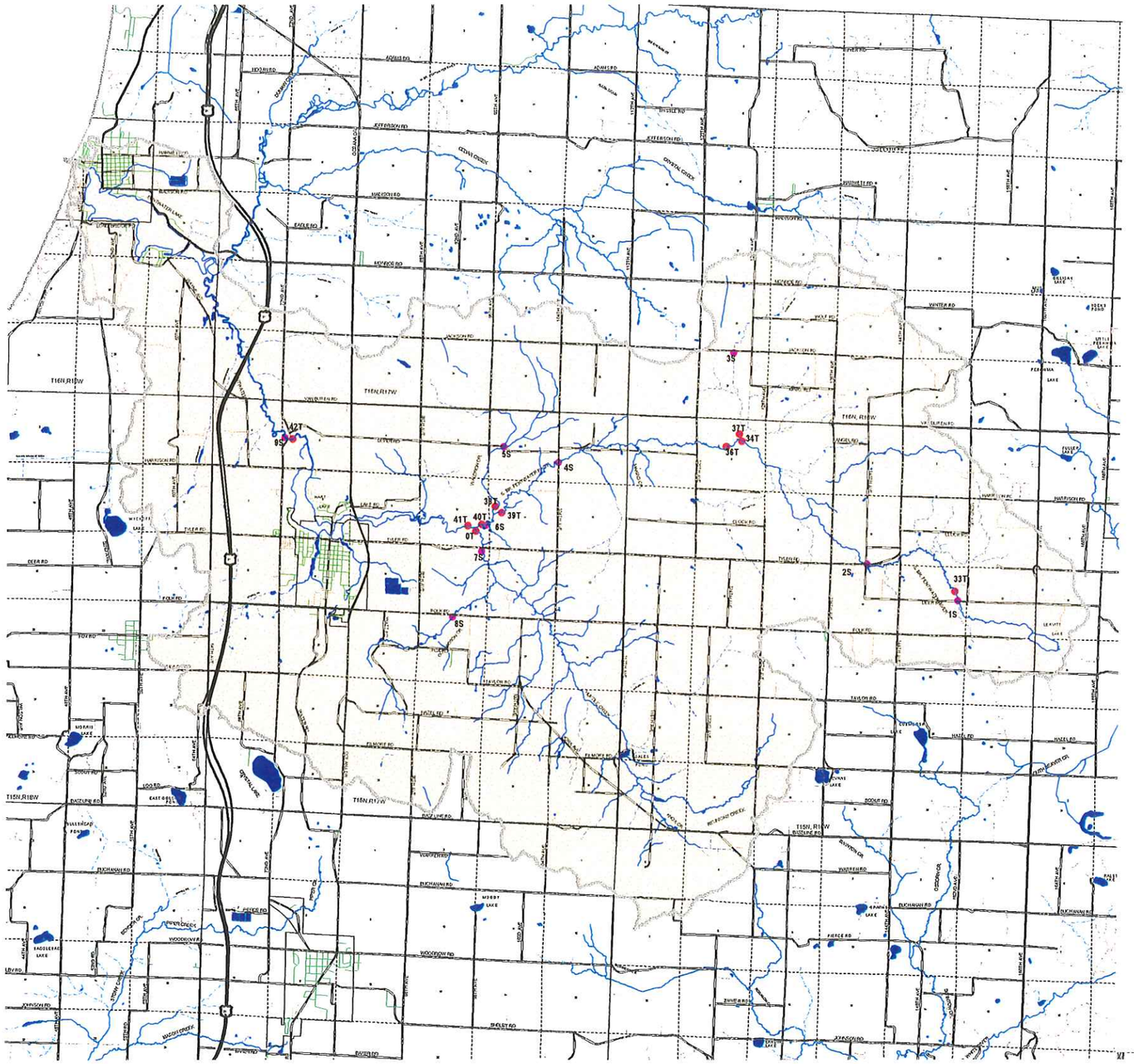
Temperature & Staff Gauge Sites

South Branch Pentwater River Watershed



Base Information

- Watershed Boundary
- State/Federal Highways
- County Roads
- Minor/Residential Roads
- Lake Michigan Shoreline
- Township/City/Village Limits
- Section Lines
- Rivers/Streams
- Lakes/Ponds
- Drains/Intermittent Streams
- Two Tracks

- Temperature Sites
- Staff Gauge Sites

DEFINITIONS:

Numbers represent gauge identification.
T = Temperature
S = Staff Gauge

N
W E
S

1 0 1 2 3 Miles

1:75000

Robert B. Annis Water Resources Institute
Information Services Center
Grand Valley State University

Map Prepared: July 1999

Figure 17

Data Sources
Base Information: Michigan Department of Natural Resources, MIRIS, 1978.

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The following is a list of locations for temperature gauges:

Temperature Gauge Locations

1. Pentwater River and Deer Road intersection
2. Pentwater River before joining Cleveland Creek
3. Cleveland Creek before joining Pentwater River
4. Pentwater River after joining with Cleveland Creek
5. Pentwater River before joining with Waldron Drain
6. Waldron Drain before joining with Pentwater River
7. Pentwater River after joining with Waldron Drain and before joining with Huftile Creek
8. Huftile Creek before joining with Pentwater River
9. Pentwater River after joining with Huftile Creek
10. Pentwater River and 72nd Avenue intersection

4.4 Staff Gauges

Staff gauges were installed throughout the watershed to record water levels of the river/stream/drain (Figure 17). Water level readings were taken as often as possible, to see the fluctuation of water flow. With increasing development, more land is being put into impervious surfaces, such as roads, parking lots, agricultural fields, and lawns. Also, more dredging is taking place. This increases the discharge of water into the river system during rain storms, causing the system to be very unstable. Instability causes raising and lowering of the water levels, which causes the banks to erode and sediment to be deposited. Staff gauge results are shown in Appendix F.

Staff Gauge Locations

1. Pentwater River and Deer Road intersection
2. Pentwater River and Tyler Road intersection
3. Cleveland Creek and Jackson Road intersection
4. Pentwater River and 104th Avenue intersection
5. Waldron Drain and Lever Road intersection
6. Pentwater River and 96th Avenue intersection
7. Huftile Creek and Tyler Road intersection
8. Donaldson Creek and Polk Road intersection
9. Pentwater River and 72nd Avenue intersection

PART V. GOALS AND DESIRED USES OF WATERSHED

5.1 Goals of the Watershed

The watershed residents would like to protect the watershed from further degradation of water quality, as development and disturbance continues. In order to protect the watershed, the partners must take an active part in educating the community on water quality issues and watershed management. Primarily, the watershed committee would like to protect surface water and groundwater from pollution sources. In addition, the committee would like to sustain agricultural uses, aquatic and wildlife habitat, and recreation uses. Presently the water within the watershed is used for irrigation, fishing, canoeing, boating, swimming, domesticated animal watering, and wildlife habitat.

The watershed committee would like to maintain a healthy aquatic ecosystem. To maintain such an ecosystem, the committee would like to control invasive/exotic species, such as Eurasion watermilfoil, Zebra mussels and Purple loosestrife. Secondly, maintaining/improving cold water fisheries is a high priority of the committee. Some residents claim the fisheries is declining and moving towards a warm water fishery. Thirdly, it is desired to maintain agricultural uses, such as irrigation, watering of domesticated animals and other such uses. Finally, to contain a healthy aquatic ecosystem the watershed committee would like to maintain a healthy recreational environment for boating, swimming, etc.

5.2 Specific Pollutant Reduction Goals

Control Invasive/Exotic Species

a. Research for ideas and ways to control invasive/exotic species.
b. Organize educational workshops to educate/inform the public on invasive/exotic species and how to prevent further introduction.
c. Search for funding to control invasive/exotic species.
d. Produce and distribute educational literature to schools, businesses and residents.

Maintain/Improve Cold Water Fisheries

a. Repair 3,835 feet of streambank erosion
b. Repair 40 road/stream crossing sites
c. Install 20 miles of buffer strips
d. Install 10 water control basins/seepage basins
e. Install 700 acres of additional cover crops
f. Implement 1,000 acres of crop residue management
g. Create and maintain 3 sediment traps
h. Conduct workshops for county officials/residents and other interested parties to present planning guidebook.

Maintain Agricultural Uses

a. Work with MSU-Extension Service and Farm Bureau to ensure continued use of the watershed for irrigation, watering, and other agricultural uses.

Maintain A Healthy Recreational Environment

a. Conduct workshops with Health Department to teach septic system maintenance.
b. Install 22,000 feet of livestock fencing
c. Develop 60 nutrient/pesticide management plans

5.3 Preventing Water Quality Degradation

The watershed project will prevent further degradation of water quality by encouraging the implementation of best management practices and educating the public on watershed management. The steering committee will follow the information and education plan guidelines (See Appendix A) to develop an understanding among the watershed residents of the importance of watershed management. Brochures, posters, videos, tours and presentations are just some of the activities that will be used to deliver education to the local communities.

The watershed project will implement many best management practices to help control nonpoint pollution. Buffer strips, grassed waterways, seepage basins, exclusionary fencing, vegetated chutes, grade stabilization structures, bank armoring with riprap and/or bioengineering, conservation tillage, crop residue management and current deflectors are some of the practices that will be used during the project. The committee is also interested in the possibility of remediation of sediment, which has been deposited mainly from the breaching of Hart Dam back in 1986. Because of this situation the river is very shallow and wide, while gravel beds have been covered by the sediment. Sand traps or sediment collection practices will need to be used to capture sediment that is slowly moving downstream towards Pentwater Lake.

PART VI. DETERMINATION OF CRITICAL AREAS

6.1 Surface Water

Determination of critical areas plays an important part of watershed management. Critical areas are those areas, which have the greatest potential to deliver sediments, nutrients or other pollutants to surface water and groundwater. With the help of partner agencies, the project manager defined critical areas using four categories (Figure 18b). Moderate risk and high risk categories are those areas, which are critical and will be most apt to contribute pollution to the South Branch Pentwater River and its tributaries. The following categories are included:

1) **Very low risk**: Non-agricultural areas greater than ¼ mile from river/stream/drain/lake.

2) **Low risk**: Agricultural areas greater than ¼ mile from river/stream/drain/ lake having less than high leaching potential and less than high runoff potential.

3) **Moderate risk**: a) Non-agricultural areas less than ¼ mile from river/stream/drain/lake. b) Agricultural areas greater than ¼ mile from river/stream/drain/lake with a high leaching potential or a high runoff potential. c) Urban areas less than ¼ mile from river/stream/drain/lake.

4) **High risk**: a) Urban areas less than ¼ mile from river/stream/drain/lake. b) Agricultural areas less than ¼ mile from river/stream/drain/lake.

~ Urban areas = residential, commercial, industrial, etc.
~ Non-agricultural areas = woodland and open field.
~ Agricultural areas = christmas tree plantations, orchards, asparagus, tilled crops and pastures.

6.2 Groundwater

The surface water flows of the South Branch of the Pentwater River are dependent upon groundwater discharge directly into the river from many feeder streams and seeps. These groundwater seeps are the primary reason that the river system is able to support and maintain a cold water fisheries resource.

To protect the surface waters of the Pentwater River, one must consider the impact of the groundwater resources. The South Branch of the Pentwater River Watershed is composed predominantly of sandy soils overlying areas of sensitive glacial drift lithology, creating sensitive groundwater aquifers. The combination of soils within the watershed and the fact that many portions of the watershed are used for very intensive fruit and vegetable production create a potential for groundwater contamination. Many of the crops grown

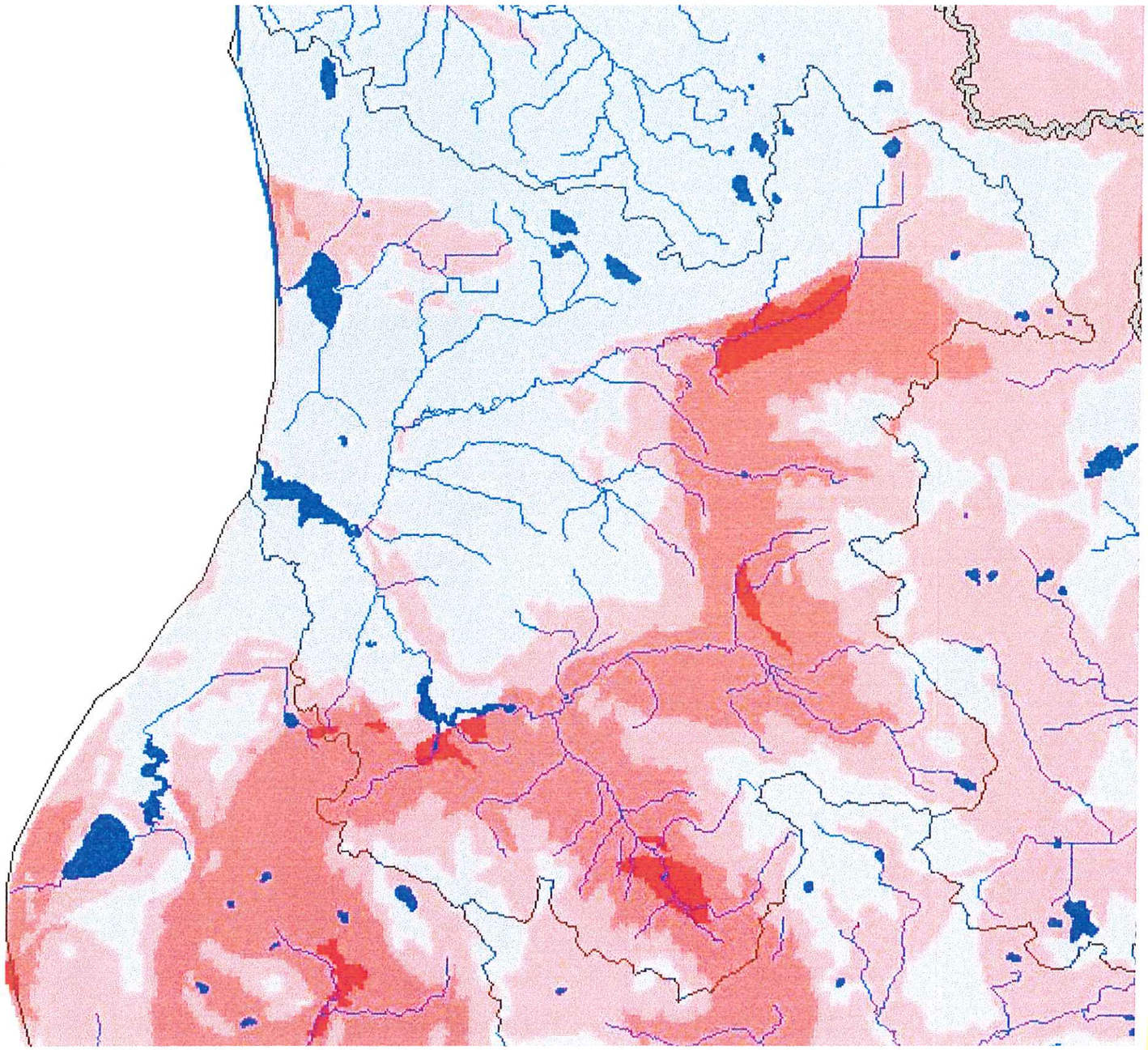
require multiple applications of fertilizer and pesticides to produce a quality crop. Potential contamination could also develop in residential or built-up areas of the watershed.

Areas within the watershed have very fast groundwater velocities (Figure 18a) according to data provided by Michigan Department of Natural Resources – Fisheries Division. The velocities give an indication of the length of time it would take groundwater to migrate to the river system after infiltrating through the soil. If the groundwater were to become contaminated by fertilizer, pesticides, or any other source, the surface water resources of the Pentwater River could be jeopardized by these contaminates being discharged to the surface waters at seep areas.

With this understanding of the relationship between the soils, subsurface geology, and landuse patterns, the entire watershed should be considered a critical area for groundwater.

Ground Water Velocity
Oceana County, Michigan

South Branch Pentwater River Watershed



- Very fast
- Fast
- Moderate
- Slow
- Very Slow

N

Data Sources:
Institute For Fisheries Research, 1998.

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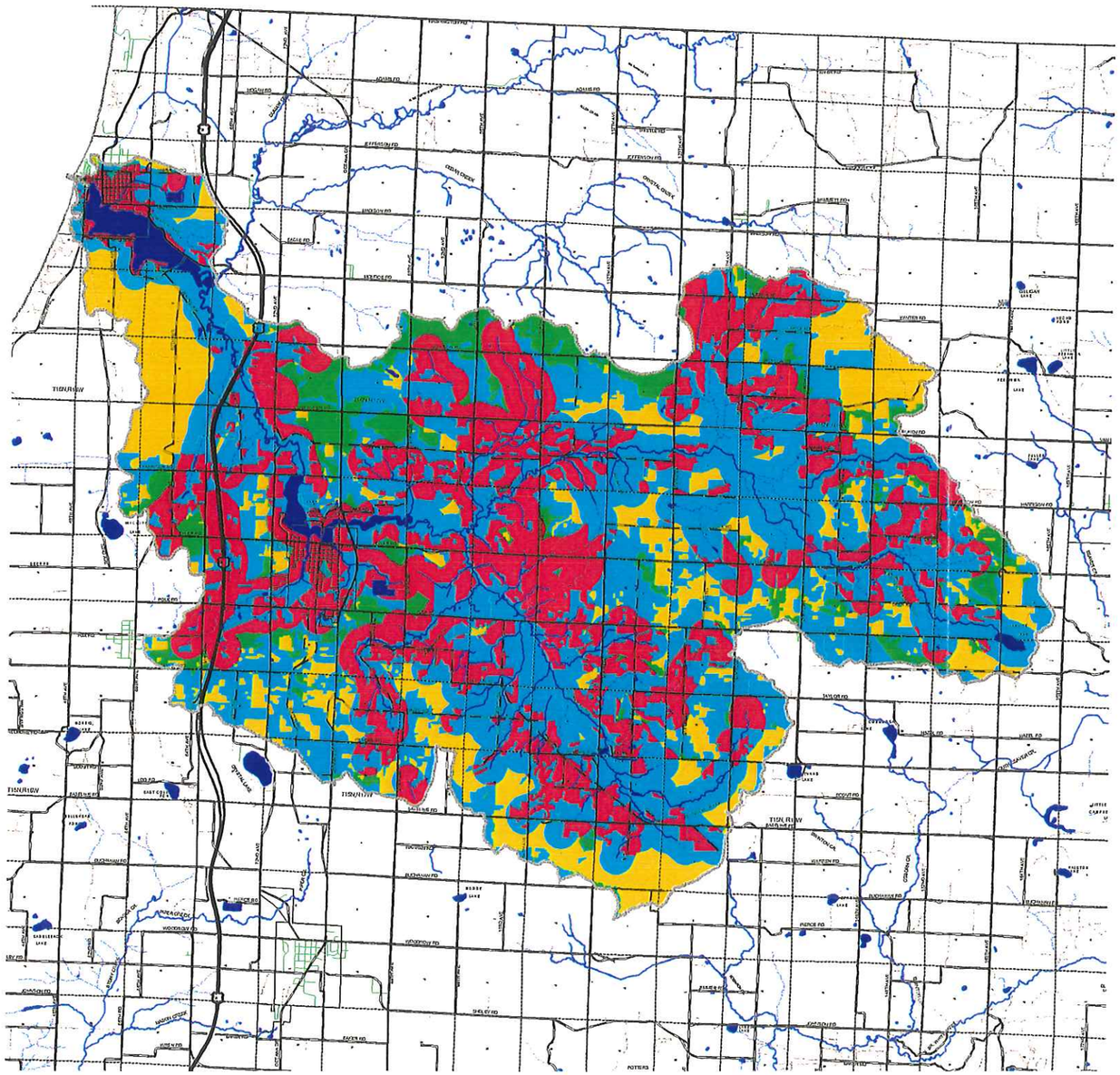
Figure 18A



CRITICAL AREAS

SOUTH BRANCH PENTWATER RIVER WATERSHED

BASE INFORMATION

- WATERSHED BOUNDARY
- STATE/FEDERAL HIGHWAYS
- COUNTY ROADS
- MINOR/RESIDENTIAL ROADS
- LAKE MICHIGAN SHORELINE
- TOWNSHIP/CITY/VILLAGE LIMITS
- SECTION LINES
- RIVERS/STREAMS
- LAKES/PONDS
- DRAINS/INTERMITTENT STREAMS
- TWO TRACKS

CRITICAL AREAS

- VERY LOW RISK
- MODERATE RISK
- LOW RISK
- HIGH RISK

DEFINITIONS:

VERY LOW RISK: NON-AGRICULTURAL AREAS GREATER THAN 1/4 MILE FROM RIVER/STREAM/DRAIN/LAKE.

LOW RISK: AGRICULTURAL AREAS GREATER THAN1/4 MILE FROM RIVER/STREAM/DRAIN/LAKE HAVING LESS THAN HIGH PESTICIDE LEACHING POTENTIAL AND LESS THAN HIGH PESTICIDE RUNOFF POTENTIAL.

MODERATE RISK: NON-AGRICULTURAL AREAS LESS THAN 1/4 MILE FROM RIVER/STREAM/DRAIN/LAKE.

AGRICULTURAL AREAS GREATER THAN 1/4 MILE FROM RIVER/STREAM/DRAIN/LAKE WITH A HIGH PESTICIDE LEACHING POTENTIAL OR A HIGH RUNOFF POTENTIAL.

URBAN AREAS GREATER THAN 1/4 MILE FROM RIVER/STREAM/DRAIN/LAKE.

HIGH RISK: URBAN AREAS LESS THAN 1/4 MILE FROM RIVER/STREAM/DRAIN/LAKE.

AGRICULTURAL AREAS LESS THAN 1/4 MILE FROM RIVER/STREAM/DRAIN/LAKE.

N
W E
S

1 0 1 2 3 MILES

1:75000

DATA SOURCES
BASE INFORMATION: MICHIGAN DEPARTMENT OF NATURAL RESOURCES, MIRIS, 1978.
CRITICAL AREA DEFINITIONS: OCEANA CONSERVATION DISTRICT

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INFORMATION SERVICES CENTER
GRAND VALLEY STATE UNIVERSITY

MAP PREPARED: JULY 1999

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FIGURE 18B

PART VII. PROPOSED IMPLEMENTATION ACTIVITIES

7.1 Short Term/Long Term Goals of Project

The short term goals of the watershed project are to protect the surface water and groundwater from pollution sources that degrade the water quality. This project will aim to get the large landowners, waterfront residents, and others to work together to protect the watersheds water quality. The Steering Committee will have a big responsibility in getting these ideas out to the rest of the public. The project manager, Conservation District, and other partner agencies must educate the Steering Committee and others on the tools of watershed protection.

The long term goals will be to educate townships, cities, villages, county commissioners, other officials, and local residents on wise land use planning. West Michigan Shoreline Regional Development Commission (WMSRDC) is putting together a land use planning guidebook, which will help to make sound planning decisions (Will be completed by January 2000). The guidebook will include demographic information, planning concepts/definitions, development principles to improve water quality, long range planning issues in the watershed, and how a GIS based system can be used locally. WMSRDC will be asked to help with other planning procedures throughout the project. The committees will strive to get local governments to commit towards a stormwater ordinance. There has been some concern on stormwater drains, the project will address these issues. In addition, the project will strive to maintain the protection of the watershed through the installation of Best Management Practices.

7.2 Staff Needed for Implementation Activities

To perform implementation activities, the project will need support from many partners and staff members. The Natural Resources Conservation Service will provide technical assistance. The Resource Conservationist for Oceana County will contribute the most time, while engineers, other conservationists and technicians will provide some assistance as well. Staff from the Oceana Conservation District will assist the project manager throughout the project, offering technical expertise and assistance. District staff will administer the implementation phase and will provide support with BMP construction projects, newsletters, meeting coordination and information & education activities. The Oceana County Road Commission will engineer and provide labor for repairing road/stream crossing sites. The Drain Commission Office will be called upon to help with drain repair such as bank stabilization and inlet structures. The Michigan Department of Environmental Quality (MDEQ), MDNR and Michigan State Extension Service will provide assistance with demonstration projects, newsletters, workshops and presentations. Adopt*A*Stream coordinator will assist the manager with stabilization projects using students from local schools. Volunteers from the area will continue to be used for stream monitoring, stream cleanups, festivals and demonstration projects. Cost-share assistance will be provided by the United States Department of Agriculture with programs like the Conservation Reserve Program, Environmental Quality Incentives Program and others.

7.3 Proposed Best Management Practices (BMP's) and Their Descriptions

BMP's are common conservation practices that are used to prevent or reduce nonpoint source pollution. The following practices are those that are most likely to be used during implementation for the watershed project. Descriptions are from the Natural Resources Conservation Service Technical Guide, Section IV. (Note: Sand Traps and part of pond/seepage basin descriptions are not from the Technical Guide, but were developed from common knowledge)

Access Road
A travelway constructed as part of a conservation plan.

Agrichemical Containment Facility
An impermeable barrier and containment placed or constructed on the ground where agrichemical storage, loading, mixing and cleanup occurs.

Conservation Cover
Establishing and maintaining perennial vegetative cover to protect soil and water resources and land retired from agricultural production.

Conservation Crop Rotation
Growing crops in a recurring sequence on the same field.

Cover and Green Manure Crop
A crop of close-growing grasses, legumes, or small grain used primarily for seasonal protection and soil improvement. It usually is grown for 1 year or less, except where there is permanent cover as in orchards.

Critical Area Planting
Planting vegetation such as trees, shrubs, vines, grasses, or legumes on critical areas. (Does not include tree planting mainly for wood products.)

Diversion
A channel with a supporting ridge on the lower side constructed across the slope.

Filter Strip
A strip or area of vegetation for removing sediment, organic matter and other pollutants from runoff water and waste water.

Fish Stream Improvement
Improving a stream channel to make a new fish habitat or to enhance an existing habitat.

Fueling Facility, Above Ground Storage
The construction of an impermeable barrier and installation of facility protection and safety devices, where on-farm above ground fuel storage and transfer occurs.

Grade Stabilization Structure
A structure used to control the grade and head cutting in natural or artificial channels.

Grassed Waterway or Outlet
A natural or constructed waterway or outlet shaped or graded, and established in suitable vegetation as needed for the safe disposal of runoff.

Heavy Use Area Protection
Protecting heavily used areas by establishing vegetative cover, by surfacing with suitable materials, or by installing needed structures.

Nutrient Management
Managing the amount, form, placement and timing of applications of plant nutrients.

Pest Management
Managing agricultural pest infestations (including weeds, insects and diseases) to reduce adverse effects on plant growth, crop production and environmental resources.

Pond/Seepage Basins
A water impoundment made by constructing a dam or embankment, or by excavating a pit or "dugout." Ponds/Seepage Basins can help prevent excess surface water runoff, thus making the watershed more stable with less flashiness.

Recreation Area Improvement
Establishing grasses, legumes, vines, shrubs, trees, or other plants or selectively reducing stand density and trimming woody plants to improve an area for recreation.

Recreation Trail and Walkway
A pathway prepared especially for pedestrian, equestrian, and cycle travel.

Residue Management, Mulch Till
Managing the amount, orientation, and distribution of crop and other plant residue on the soil surface year-round, while growing crops where the entire field is tilled prior to planting.

Residue Management, No-Till and Strip Till
Managing the amount, orientation, and distribution of crop and other plant residue on the soil surface year-round, while growing crops in previously untilled soil and residue.

Riparian Buffer Strips
An area of trees, shrubs and other vegetation located in areas adjacent to and upgradient from water bodies.

Sand Trap
An excavation of river bed to collect sand for removal. Removal of sand is done to deepen the river channel resulting in more gravel and better habitat for fish and other aquatic life.

Streambank Protection
Stabilizing and protecting banks of streams, lakes, estuaries, or excavated channels against scour and erosion by vegetative or structural means.

Stream Channel Stabilization
Stabilizing the channel of a stream with suitable structures.

Tree/Shrub Establishment
To establish woody plants by planting or seeding.

Waste Management System
A planned system in which all necessary components are installed for managing liquid and solid waste, including runoff from concentrated waste areas, in a manner that does not degrade soil, water, air, plant or animal resources.

Waste Utilization
Using agricultural or other wastes on land in an environmentally acceptable manner while maintaining or improving soil and plant resources.

Water and Sediment Control Basin
An earth embankment or a combination ridge and channel generally constructed across the slope and minor watercourses to form a sediment trap and a water detention basin.

Watercourse Crossing Repair or Establishment
A practice that repairs, replaces or constructs a crossing to limit the sediment discharge into a watercourse.

Wetland Restoration
A rehabilitation of a drained or degraded wetland where the soils, hydrology, vegetative community, and biological habitat are returned to the natural conditions to the greatest extent possible.

Windbreak/Shelterbelt Establishment
Linear plantings of single or multiple rows of trees or shrubs established for environmental purposes.

7.4 Best Management Practices Cost Estimates

Table 9. Total cost estimates for watershed management of the watershed. Includes best management practices that should be applied in order to sustain a healthy environment. Funding for best management practices include 319 funds, local match, and other funds (other funding will come from USDA, DEQ, DNR, foundations, organizations, etc.) The watershed project will implement as much as possible, with the understanding that much of the following activities will need to continue after the project ends.

BMP	Quantity	Cost/Unit	Cost-share	319 Funds	Other Funds	Local Match	Total Cost
Access Road	5000 ft.	$10/ft.	50%	$ 5,000	$ 20,000	$ 25,000	$ 50,000
Agrichemical Containment Facility	60 sites	$25,000ea	75%	$ 45,000	$ 1,080,000	$ 375,000	$1,500,000
Conservation Cover	200 acres	$80/acre	$40/acre	$ 3,000	$ 5,000	$ 8,000	$ 16,000
Conservation Crop Rotation	500 acres	$10/acre	50%	--------	$ 2,500	$ 2,500	$ 5,000
Cover and Green Manure Crop	700 acres	$20/acre	50%	--------	$ 7,000	$ 7,000	$ 14,000
Critical Area Planting	25 acres	$2,000/ac.	75%	$ 10,000	$ 27,500	$ 12,500	$ 50,000
Diversion	2,000 ft.	$1.25/ft.	50%	$ 625	$ 625	$ 1,250	$ 2,500
Filter Strip	10 miles	$500/mile	75%	$ 2,000	$ 1,750	$ 1,250	$ 5,000
Fish Stream Improvement	5 sites	$2,000ea.	50%	--------	$ 5,000	$ 5,000	$ 10,000
Fueling Facility, Above Ground Storage	25 sites	$2,000 each	75%	--------	$ 37,500	$ 12,500	$ 50,000
Grade Stabilization Structure	44 sites	$1,500ea	75%	$ 16,500	$ 33,000	$ 16,500	$ 66,000
Grassed Waterway or Outlet	15 acres	$2,000/ac.	75%	$ 7,500	$ 15,000	$ 7,500	$ 30,000
Heavy Use Area Protection	4 sites	$3,000ea	50%	--------	$ 6,000	$ 6,000	$ 12,000
Nutrient Management	22,500ac.	$10/acre	75%	$ 18,750	$ 150,000	$ 56,250	$ 225,000
Pest Management	36,000ac.	$20/acre	75%	$ 20,000	$ 520,000	$ 180,000	$ 720,000
Pond/Seepage Basins	5 sites	$2,500ea	50%	$ 750	$ 5,500	$ 6,250	$ 12,500
Recreation Area Improvement	4 sites	$5,000ea	75%	--------	$ 15,000	$ 5,000	$ 20,000
Recreation Trail and Walkway	2 sites	$2,000ea	50%	--------	$ 2,000	$ 2,000	$ 4,000
Residue Management, No-Till and Strip Till	1,000ac.	$10/acre	$5/acre	$ 2,500	$ 2,500	$ 5,000	$ 10,000

Table 9 (continued). Total cost estimates for the watershed.

BMP	Quantity	Cost/Unit	Cost-Share	319 Funds	Other Funds	Local Match	Total Cost
Riparian Buffer Strips	10 miles	$3,500/mi	75%	$ 3,750	$ 30,000	$ 1,250	$ 35,000
Sand Trap/Sediment Removal	3 sites	$15,000ea	50%	$ 11,250	$ 11,250	$ 22,500	$ 45,000
Streambank Protection	3835 feet	$50/ft.	75%	$ 20,000	$ 123,750	$ 48,000	$ 191,750
Stream Channel Stabilization	3 sites	$1,500ea.	50%	-------	$ 2,250	$ 2,250	$ 4,500
Tree/Shrub Establishment	100 acres	$140/acre	50%	-------	$ 7,000	$ 7,000	$ 14,000
Waste Storage Facility	3 sites	$35,000ea	75%	$ 10,000	$ 68,750	$ 26,250	$ 105,000
Waste Utilization	2,000 ac.	$25/acre	75%	$ 7,500	$ 30,000	$ 12,500	$ 50,000
Water and Sediment Control Basin	10 sites	$1500ea	75%	$ 1,125	$ 10,125	$ 3,750	$ 15,000
Watercourse Crossing Repair or Establishment	10 sites	$5,000ea.	50%	-------	$ 25,000	$ 25,000	$ 50,000
Windbreak/Shelterbelt Establishment	20 acres	$500/acre	50%	$ 1,000	$ 4,000	$ 5,000	$ 10,000
Totals				$ 186,250	$ 2,248,000	$ 888,000	$3,322,250

Table 10. Implementation schedule for Best Management Practices (May 1, 2000 – April 30, 2003). Best Management Practice funding will come from 319 funds, local match, and other funding sources such as USDA, DEQ, DNR, foundations, organizations, etc. All practices will have a cost share rate (See Table 9) and may be an ongoing activity, such as conservation cover, nutrient management, etc.

BMP	Year 1	Year 2	Year 3	Total Cost
Access Road	$ 10,000	$ 10,000	$ 10,000	$ 30,000
Agrichemical Containment Facility	$ 25,000	$ 50,000	$ 25,000	$ 100,000
Conservation Cover	$ 3,500	$ 3,500	$ 3,000	$ 10,000
Conservation Crop Rotation	$ 1,500	$ 1,500	$ 2,000	$ 5,000
Cover and Green Manure Crop	$ 5,000	$ 5,000	$ 4,000	$ 14,000
Critical Area Planting	$ 5,000	$ 2,500	$ 2,500	$ 10,000
Diversion	$ 1,000	$ 1,000	$ 500	$ 2,500
Filter Strip	$ 2,500	$ 1,500	$ 1,000	$ 5,000
Fish Stream Improvement	$ 4,000	$ 3,000	$ 3,000	$ 10,000
Fueling Facility, Above Ground Storage	-------	$ 10,000	$ 10,000	$ 20,000
Grade Stabilization Structure (Severe, Moderate)	$ 15,000	$ 20,000	$ 9,000	$ 44,000
Grassed Waterway or Outlet	$ 5,000	$ 5,000	$ 5,000	$ 15,000
Heavy Use Area Protection	$ 4,000	$ 4,000	$ 4,000	$ 12,000
Nutrient Management	$ 15,000	$ 15,000	$ 10,000	$ 40,000
Pest Management	$ 20,000	$ 20,000	$ 15,000	$ 55,000
Pond/Seepage Basin	$ 1,000	$ 2,500	$ 1,500	$ 5,000
Recreation Area Improvement	$ 3,000	$ 4,000	$ 3,000	$ 10,000
Recreation Trail and Walkway	$ 2,000	$ 1,000	$ 1,000	$ 4,000
Residue Management, No-Till and Strip Till	$ 1,000	$ 1,000	$ 1,000	$ 3,000
Riparian Buffer Strips	$ 4,000	$ 2,000	$ 2,000	$ 8,000
Sand Trap/Sediment Removal	$ 12,500	$ 7,500	-------	$ 20,000
Streambank Protection (Sever, Moderate)	$ 40,000	$ 40,000	$ 30,000	$ 110,000
Stream Channel Stabilization	$ 1,500	$ 1,500	$ 1,500	$ 4,500
Tree/Shrub Establishment	$ 1,500	$ 1,500	$ 2,000	$ 5,000

Table 10 (continued). Implementation schedule for Best Management Practices (May 1, 200 – April 30, 2003).

BMP	Year 1	Year 2	Year 3	Total Cost
Waste Management System	$ 10,000	$ 10,000	$ 10,000	$ 30,000
Waste Utilization	-------	$ 10,000	$ 10,000	$ 20,000
Water and Sediment Control Basin	$ 1,000	$ 1,000	$ 1,000	$ 3,000
Watercourse Crossing Repair or Establishment	$ 5,000	$ 5,000	$ 5,000	$ 15,000
Windbreak/Shelterbelt Establishment	$ 1,000	$ 2,000	$ 2,000	$ 5,000
Totals	$ 200,000	$ 241,000	$ 174,000	$ 615,000

7.5 Resources to Provide Cost Share Assistance

The Oceana Conservation District will apply for additional funding throughout the project to enhance the accomplishment within the watershed. The district will seek funding from a variety of agencies, organizations and foundations. The following are just some of the possible sources for funding:

1. United States Department of Agriculture
    a. Conservation Reserve Program (CRP)
    b. Wetlands Reserve Program (WRP)
    c. Environmental Quality Incentives Program (EQIP)
    d. Wildlife Habitat Incentives Program (WHIP)
    e. Forestry Incentives Program (FIP)

2. Department of Environemental Quality (DEQ)
    a. Stream Monitoring
    b. Stream Cleanups
    c. Additional Funding When Available

3. Department of Natural Resources (DNR)
    a. Recreational
    b. Fisheries
    c. Additional Funding When Available

4. Oceana Community Foundation – Hart, Michigan
    - Promotes educational activities

5. Mott Foundation – Flint, Michigan
    - Promotes conservation of freshwater ecosystems

6. Frey Foundation – Grand Rapids, Michigan
    - Promotes environmental understanding and action

7. Michigan River Network – Conway, Michigan
    - Promotes Michigan River Protection

8. Great Lakes Aquatic Habitat Fund – Conway, Michigan
    - Promoting efforts to protect aquatic habitats

9. Other local organizations such as Adopt*A*Stream, Trout Unlimited, Ducks Unlimited, and Pheasants Forever.

7.6 Landowner Interest

The project has great support from many landowners within the watershed. Some landowners have stated they would like to implement best management practices on stream bank erosion sites and cattle fencing/access sites. Members from the Pentwater Steering Committee have been a great help in promoting the watershed project. With support from Michigan State University Extension Service and Farm Bureau, this project will be very successful. Already, MSU-Extension has participated in Steering Committee Meetings, Information and Education Meetings, and stream monitoring. In addition, MSU-Extension has introduced the watershed project manager to numerous agricultural producers within the watershed. The producers were very conservation friendly and wanted to help in any way they could. Farm Bureau has been very active in developing a strategy for Information and Educational activities (See Appendix A). According to the response of a survey that was sent out, many residents are interested in watershed management. Almost 300 residents answered the survey (about a 5.3% response rate); many stated they would be willing to volunteer for the project (See Appendix H).

PART VIII. AGENCIES NEEDED FOR IMPLEMENTATION

Adopt*A*Stream. The coordinator has organized several bank stabilization projects in the watershed. He will continue to gather volunteers for further project activities, such as installation of best management practices.

*City of Hart.

*Crystal Township.

*Elbridge Township.

Farm Bureau. The regional representative has been very active in Information and Education planning. He will continue to attend I & E meetings, representing agricultural producers.

*Farm Services Agency (FSA), The County Executive Director and Farm Services will provide assistance on cost-share within the watershed.

*Ferry Township.

Friends of the Pentwater. Hart High School has monitored four sites in the watershed for macro invertebrates. They will contribute their time to stream monitoring and will participate in implementation of best management practices.

*Golden Township.

Hart Lake Association.

*Hart Township.

*Leavitt Township.

*Michigan Department of Agriculture (MDA), The Ground Water Stewardship Program will work with the Conservation District to install practices and improve the quality of the groundwater. This program organizes Clean Sweep, gives many presentations on water quality and implements many best management practices.

*Michigan Department of Environmental Quality (MDEQ). A representative from the Surface Water Quality Division will be the administrator of the project. She will provide technical assistance and will make sure the watershed project meets goals and deadlines.

*Michigan Department of Natural Resources (MDNR). A representative from the Fisheries Division has presented a great deal of watershed management data to the Steering Committee. He will continue to play an active role on the Steering Committee. He will provide technical assistance throughout the project.

*Natural Resources Conservation Service (NRCS). The Resource Conservationist has helped the project manager with stream monitoring, stream inventorying, and technical support. He will provide technical training to the project manager. He will also review conservation plans as needed and will play a major role in implementation of best management practices.

*Oceana Conservation District. The Conservation District will be the lead agency for the watershed project. The district has provided administrative and technical support. They will provide oversight of the grant, office space, matching funds and technical training.

*Oceana County Board of Commissioners. The Board of Commissioners are the policy-makers of the county. The project manager has presented watershed issues to the board. The commissioners support the project and will be asked to provide assistance.

*Oceana County Drain Commission. The Drain Commissioner has participated in Steering Committee Meetings and will play an important role in the watershed project.

*Oceana County Economic Development Corporation. The Executive Director is very active with the Steering Committee, Coordinating Committee and Information/Education Committee. He supports the project and will continue to provide assistance throughout the project.

Oceana County Farm Bureau.

*Oceana County Health Department. The Environmental Specialist has attended Steering Committee Meetings and is an important resource for the project. He will assist in water quality analysis and technical expertise.

*Oceana County MSU-Extension. The County Extension Director is very involved with the watershed project. He participates in stream monitoring, the Steering Committee and the Information/Education Committee. He will continue to provide technical support throughout the project. MSU-Extension focuses on agricultural education.

*Oceana County Road Commission. The Road Commission has participated in Steering Committee Meetings and has completed many road/stream crossing inventories. The Road Commission will be asked to apply for Clean Michigan Initiative Grant money to repair road/stream crossings within the watershed.

Pentwater Lake Association.

*Pentwater Township.

*Shelby Township.

Timberland RC & D. RC & D has offered assistance on the Pentwater Watershed Project. They will be available for technical assistance throughout the project.

Trout Unlimited. A local representative is a member of the Steering Committee and has helped with stream cleanups. He supports the project and will be available for assistance.

*Village of Pentwater.

*Weare Township.

West Michigan Hacklers. West Michigan Hacklers are a fly tying group, which will provide support for the project. A representative is very active in the Steering Committee, Coordinating Committee, Information/Education Committee and stream monitoring.

*Has legal authority to assist in implementation

PART IX. PROJECT SCHEDULE

Activity	Date
1. Submit Watershed Plan	Oct. 1999
2. ID implementation agencies and companies	Oct. 1999
3. Begin Transition Phase and I/E Strategy	Oct. 1999
4. Begin notifying landowners, who have problem sites, about the cost share that will be available.	Oct. 1999
5. Public evaluation of project	Jan. 2000
6. Apply for Clean Michigan Initiative implementation funding.	Feb. 2000
7. Develop strategy for continued watershed management	2000-2003
8. Sign up for Cost Share Money (April of each year)	2000-2003
9. Design and plan structures for Best Management Practices	April 2000-Feb. 2003
10. Apply I & E Activities	April 2000-March 2003
11. Install Resource Management Systems	April 2000-Feb. 2003
12. Hold Steering Committee Meetings quarterly	April 2000-Feb. 2003
13. Hold Coordinating Committee Meetings monthly (Representative from each interest group)	April 2000-Feb. 2003
14. Continue river monitoring for macro invertebrates, water temperatures and water level fluctuations.	April 2000-March 2003
15. Review project progress	2000-2003
16. Survey citizens within the watershed to determine the increase of watershed awareness	March 2003
17. Prepare Final Report on Watershed Management Plan	Jan.-March 2003
18. Hold Public Meeting to review project outcomes	March 2003

X. PUBLIC PARTICIPATION PROCESS

Watershed residents have been very helpful with the project thus far. At this time the project has numerous volunteers for stream monitoring and road/stream crossing inventory. Steering Committee members have been very supportive of the project, giving suggestions and support for the project. The committee is composed of over 70 members from local agencies, businesses, lake associations, interest groups and other individuals throughout the watershed (See Appendix O). Newsletters are composed and sent to area resident to update them on watershed issues and activities.

The Steering Committee has played a major role in developing this plan. They presented their concerns of the watershed and helped develop the goals of the project. The committee has had the opportunity to comment on the plan. Any conflict of interest is voted on, in hopes to keep the landowners, waterfront residents, and others involved throughout the projects entirety and long after.

The project will need continued participation from local residents and businesses to make the implementation process successful. Steering Committee Meetings will be held quarterly, and a subcommittee (Coordinating Committee) meeting will be held every month. The meetings will allow residents to give additional suggestions and present concerns they might have. Newsletters will continue to be conducted every quarter to discuss watershed activities. The watershed committee is working with the local newspaper (Oceana Herald-Journal) to develop a watershed column, which will be present in every weeks paper.

The project manager will continue to utilize volunteers for monitoring processes and inventorying of road/stream crossings. Volunteers will be asked to collect macro invertebrates, monitor stream gauges, check for erosion sites, and take measurements of the river/stream/drain, etc. Volunteers will also provide stream cleanups where needed.

Additional activities to involve the public are the following:

1. Watershed Tours
2. Watershed Festival
3. Brochures/Signs/Posters
4. Clean Sweep Promotion
5. Classroom Presentation/Other School Activities
6. Promotional Materials (T-shirts, Hats)
7. Awards Program/Dinners
8. Watershed Survey

XI. PROJECT EVALUATION CRITERIA

The procedures used to evaluate project success will provide feedback, ensuring the efficiency of further management long after the project is completed. These procedures will be very important for the Conservation District and other agencies as they look into continuing further watershed studies within the county. The following are the evaluation criteria to be used:

1. Stream Monitoring
2. Committee Meetings
3. Surveys
4. Participation of Landowners
5. Best Management Practice Follow –ups
6. Conservation Plans

Stream Monitoring will continue within the watershed. Data will be collected throughout the project for macro invertebrates, temperatures, and water levels. Macro invertebrates will be collected at 13 sites within the South Branch of the Pentwater River. Ratings are given to each site based on the number and type of species within the water column at the particular site. As the monitoring proceeds, the sites will be compared to the previous years data for the same site, thus helping to determine an increase or decrease of water quality. Data loggers have been placed at 10 locations within the watershed to collect temperatures at the top of every hour. Staff gauges have been placed at 9 locations; readings are taken 1-2 times a month for six of the gauges and almost every day at the other three. The three gauges where readings are taken every day are located just upstream from Hart Lake and just downstream from Hart Lake; residents within the watershed are collecting the readings to determine whether the Hart Lake Dam is working efficiently. Data collected for temperatures and water levels will be compared throughout the project. The monitoring process will help determine whether the watershed is warming/cooling and/or rising/lowering.

Steering Committee Meetings will be held every quarter and Coordinating Committee Meetings will be held every month to help keep the project on line. Performing reports and updates to give to committee members will ensure the project manager to meet project goals and objectives. This will also allow members to comment and suggest their ideas, thus keeping residents involved, which will in turn make the project much more successful. MDEQ is a member of the committees and will ensure project success.

A survey has been conducted to evaluate the residents on their thoughts, opinions and basic knowledge of the watershed, previous to implementation. Surveys will also be sent out following three years of implementation, which will again ask the residents on their thoughts of the watershed. The survey will then be compared to help determine success of the project.

Another evaluation procedure will be to record the participation rate of landowners within the watershed. As the project manager begins to meet with landowners, to ask for participation with the project, records will be kept describing the landowners thoughts and willingness to cooperate.

Best Management Practices (BMP) follow-ups will be done during implementation, to determine effectiveness of each particular practice. With help from the Natural Resources Conservation Service (NRCS), efficiency will be determined and changes/adjustments will be made accordingly. Pictures will be taken of sites before and after Best Management Practices are installed.

Conservation Plans will be written for landowners needing BMP installation. Plans are completed using the Field Office Computing System (FOCS) of NRCS. Plans require soil loss evaluations. Using USDA's Revised Universal Soil Loss Equation (RUSLE), sediment load changes can be determined. In addition, before and after effects will be evaluated. A Resource Conservationist from NRCS will help determine soil loss.

PART XII. PROJECT COST ESTIMATES (YEARS 1, 2, & 3)

	Grant Funds	Local Match	Total
Staffing Cost:			
Project Coordinator (6240 hours @ $16.00/hr.)	$ 99,840		$ 99,840
Administrator (1800 hours @ $14.00/hr.)	$ 25,200		$ 25,200
Conservation District Assistance (300 hours @ $12.00/hr.)		$15,000	$ 15,000
	$125,040	**$15,000**	**$140,040**
Fringe Benefits:			
Project Coordinator (25% of salary)	$ 24,960		$ 24,960
Administrator (15% of salary)	$ 3,780		$ 3,780
	$ 28,740		**$ 28,740**
Supplies and Equipment:			
Project Materials ($2,000/yr.)	$ 3,000	$ 3,000	$ 6,000
Office Supplies ($3,500/yr.)	$ 2,500	$ 8,000	$ 10,500
	$ 5,500	**$11,000**	**$16,500**
Travel:			
36,000 miles @ $.31/mile (10,000 miles/yr.)	$ 11,160		$ 11,160
	$ 11,160		**$ 11,160**
Other Direct Expenses:			
Information & Education	$ 52,470		$ 52,470
Training	$ 1,500	$ 700	$ 2,200
Printing	$ 3,400	$ 600	$ 4,000
Postage	$ 3,200	$ 800	$ 4,000
Meeting Expenses	$ 300	$ 500	$ 800
	$ 60,870	**$ 2,600**	**$ 63,470**
Indirect Costs:			
Phone, Rent, etc.	$ 15,000		$ 15,000
	$ 15,000		**$ 15,000**
BMPCosts:			
(Years 1, 2, & 3)	$186,250	$546,963	$733,213
	$186,250	**$546,963**	**$733,213**
Contractual:			
GVSU, WMSRDC, etc. (Maps, Land use planning)	$ 15,000		$ 15,000
	$ 15,000		**$ 15,000**
Totals	**$447,560**	**$575,563**	**$1,023,123**

PART XIII. ACRONYMS

BMP	Best Management Practices
CRP	Conservation Reserve Program
DSS	Decision Support System
EQIP	Environmental Quality Incentive Program
FIP	Forestry Incentive Program
FSA	Farm Service Agency
GIS	Geographical Information System
GVSU	Grand Valley State University
K – Factor	The susceptibility of a soil to sheet and rill erosion by water
MDEQ	Michigan Department of Environmental Quality
MDNR	Michigan Department of Natural Resources
MSUE	Michigan State University Extension
NPS	Non-point Source Pollution
NRCS	Natural Resources Conservation Service
OCD	Oceana Conservation District
RC & D	Resource Conservation & Development
RMS	Resource Management System
RUSLE	Revised Universal Soil Loss Equation
T - Factor	An estimate of the maximum average annual soil erosion by wind and water that can occur without effecting crop productivity over a sustained period.

USDA	United States Department of Agriculture
WHIP	Wildlife Habitat Improvement Program
WMSRDC	West Michigan Shoreline Regional Development Commission
WRI	Water Resources Institute
WRP	Wetlands Reserve Program

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Appendix A

APPENDIX A

Information and Education Plan

The watershed committee formed an Information and Education (I&E) subcommittee to develop an I&E Plan for the watershed project. The subcommittee consists of partner agencies and individuals within the watershed, which gives the committee a variety of ideas and concerns. The committee has discussed several topics and ideas including target audiences, messages, and methods of delivery. The members also discussed objectives of the plan, concerns of each audience and activities. Members of the committee include the following:

Ron Steiner – Economic Development Commission, Pentwater Lake Association
Connie Cargill – Drain Commission
Dorothy Schramm – Pentwater Lake Association
Joe Primozich – Hart High School Science Teacher
Norm Myers – Michigan State Extension Director
Pat Lause – Farm Bureau Regional Representative
Charamy Butterworth – Grant Administrator for MDEQ
Mark Kelly – NRCS Resource Conservationist
Phyllis Peters – Oceana Conservation District Administrator
Rick Pitts – Watershed Planner (Oceana Conservation District)

Mission Statement

Our mission is to inform and educate the watershed residents, businesses, government agencies, visitors and organizations about the recreational, industrial and agricultural uses provided by the rivers; so that they will value and protect it.

I & E Objectives

1) Inform the public of the cost share practices available.
2) Increase public awareness of problems within the watershed and promote ideas for protecting the watershed.
3) Promote ongoing participation of watershed residents long after project ends.
4) Develop partnerships among stakeholders by sharing ideas, resources, and facilitating cooperative activities to increase awareness of watershed management.

I & E Activities

	Quantity/Cost
Watershed Festival A festival will be held to get the community interested and involved in water quality issues. Activities such as fish shocking, groundwater demos, macroinvertebrate collection, fly tying, canoe trips and others will be available for participation. The Conservation District and volunteers will organize the festival.	3/$4500
Clean Sweep Promotion (Brochures) Clean Sweep is a successful program in the area, which is organized by groundwater technicians. Clean Sweep is a collection day of hazardous wastes from agricultural producers and other county residents. Brochures will be contracted out. The Conservation District, MSU-Extension, MDA, Farm Bureau and volunteers will organize and coordinate the activity.	4500/$1800
Watershed Tours/Poster Contest Tours will be held to educate the public about watershed management. Plans are to have at least one tour per year. Topics of interest may be bank stabilization, conservation tillage, manure management, buffer strips, etc. After the tour, students/kids will be asked to make a poster showing what they learned on the tour. The Conservation District will organize and coordinate the activity.	3/$1500
Watershed Brochures Brochures will be produced to explain the watershed goals and objectives. Brochures will also be produced to explain best management practices and ways each individual, organization, business or agency can help to prevent watershed problems. Brochures will be sent out in the mail, placed at a variety of stores and will be available at rest areas. This will be contracted out.	2500/$1000
Watershed Signs Signs will be placed at watershed boundaries to promote watershed management. The committee would like to place signs at the edge of the watershed to grab the attention of residents and visitors explaining that they are entering a watershed. The signs will be contracted out and will be sponsored by local businesses.	6/$400
Posters Posters of watershed issues will be placed at local stores, rest areas, businesses and agencies. The poster will promote the watershed project and will offer tips on watershed management. This will be contracted out.	50/$400
Adopt-A-Stream This program is currently active in the watershed. The program will do cleanups, gather volunteers, perform bank stabilization project and help promote the project as well. Adopt-A-Stream program coordinator and the Conservation District will coordinate the projects.	3/$1200

Public Meetings — 18/$900

Meetings will be held to inform the public on erosion control, buffer strips and other best management practices. Discussion will include public input. Many presentations will be given by professionals on topics such as invasive species, stream monitoring for macroinvertebrates, discussions on Home*A*Syst program, and others as well. The Conservation District will organize and coordinate the meetings.

Newsletters — 10,800/$7920

These will be distributed throughout the watershed. Events, accomplishments, problems and educational material will be included in the newsletters. Newsletters will be sent out quarterly throughout the life of the project. The Conservation District will be responsible for producing and sending out the newsletter.

Classroom Presentations — 6/$300

The watershed project manager will visit local schools to give presentations on water quality and watershed management. Topics such as stream monitoring, best management practices and contamination sources will be discussed.

Development of Web Page — 1/$500

A web page will be developed to extend information to those who have access to the internet. Project updates, upcoming activities and water quality issues are some of the items to be included. This will be contracted out.

Site Cleanups — 6/$2400

Scheduled cleanups will be held throughout the watershed. Schools, organizations, businesses, and residents will be approached to volunteer their time and efforts. Adopt*A*Stream will play a major role in gathering volunteers.

Other Promotional Materials (T-Shirts, Hats, etc.) — 150/$2250

Hats, t-shirts, pens, etc., which will contain a logo produced for the watershed, will be purchased and disbursed. Materials will be given to volunteers to thank them for their contribution. Items will be available at the Oceana Conservation District.

Land Use Planning & Ordinance Development — 3/$6000

Workshops and meetings will be held to educate township planning officials, agricultural producers, and other interested parties on the influence that land use activities have on groundwater and surface water. The Conservation District, with help from local experts, will coordinate the workshops and meetings.

Newspaper Articles — 156/$3900

The Conservation District and a contracted writer will write articles for a local newspaper every week. Articles will discuss watershed issues and upcoming events.

Awards Program/Dinners — 6/$9000

The Conservation District will develop a program to award cooperators within the watershed. The district will also hold dinners to thank volunteers for their contribution.

Demonstration Plots — 15/$1500

Plots will be developed within the watershed by the Conservation District to show best management practices. Agricultural producers, lake residents and other landowners within the watershed will be the focus audience.

Tire Collection — 3/$3000

Flyers will be sent out by the district to promote a collection day once a year. The district will work with the transfer station to set up a day, time and place for tire drop off.

Information Booklet — 1000/$3000

An information booklet about watershed management will be produced for lake residents and landowners along the Pentwater River and its tributaries. The booklet will be published by a local printing shop.

Plastic Bag Distribution — 500/$1000

Plastic bags with the Pentwater River Watershed logo, including a description of intended use, will be distributed throughout the watershed to local sporting goods stores, bait shops, rest areas, gas stations, etc. Bags will be intended for trash cleanup for those who plan to use the watershed. This will be contracted out.

TOTAL **52,470**

Target Audiences, Partners and Resources

Target Audience: Agricultural Producers (Farmers)

Concerns:
1) Sediment and nutrients from cropland erosion
2) Nutrients and Fecal Coliform from livestock access to rivers and streams
3) Contamination from crop protection materials
4) Loss of wetlands from wetland drainage
5) Fecal Coliform and nutrient discharge from septic systems
6) Lack of vegetation along drains, causing warmer temperatures and erosion activity.
7) Construction of dams causing warmer temperatures.

Activities:
1) Enhance partnership with the Conservation District, NRCS, MSU Extension, Farm Bureau, etc.
2) Develop educational tools and demonstration plots to show best management practices such as grassed waterways, buffer strips, riprap, vegetated chutes and exclusionary fencing.
3) Inform producers to comply with GAAMPS (Generally Accepted Agricultural and Management Practices), in cooperation with Extension Service, to measure on-farm nutrient inputs and outputs.
4) Promote Farm*A*Syst, which is a program offered by local Conservation Districts, to review septic system maintenance, pesticide/fertilizer storage and handling, management of drinking water, etc.
5) Work with Farm Bureau and MSU-extension in developing land use planning workshops for watershed protection efforts.
6) Hold Groundwater Stewardship Tour to educate residents on surface water, groundwater and their relationship.
7) Continue to promote Buffer Strip Program through Conservation District and NRCS.
8) Promote Clean Sweep, Recycling Program, Hazardous Waste Drop-off events and other activities, through newsletters, newspaper articles and brochures.

Target Audience: Lake Residents/Riparian Landowners

Concerns:
1) Fertilizers and Pesticides from lawns and gardens
2) Nutrients from leaf burning and septic systems
3) Contamination from household hazardous wastes
4) Watercraft activity, which causes bank erosion on shoreline and enhances oil, gas, and other chemical contents within the water
5) Invasion of exotic species such as Mute Swans, Eurasion Watermilfoil and Zebra Mussels

Activities: 1) Promote Home*A*Syst Program offered by the Conservation District to review stormwater management, yard and garden management, soil testing, drinking water well management and septic system maintenance.
2) Attend Lake Association meetings to update the residents on the status of the project and ways they can help or contribute.
3) Provide technical assistance to residents regarding lakefront property management, buffer strip installation, native plantings and invasive species management.
4) Write newsletter articles and newspaper articles regarding lake activities and waterfront practices.
5) Promote household hazardous waste drop-off and tire collection days.
6) Supply lakefront/riparian landowners with an information booklet on watershed management.

Target Audience: Non-farm Residents

Concerns: 1) Fertilizer and pesticides from lawns and gardens
2) Household hazardous wastes
3) Nutrients from septic systems

Activities: 1) Develop newsletters, brochures and newspaper articles to inform residents about watershed activities, buffer practices, erosion control and native plantings.
2) Present Home*A*Syst to residents to discuss groundwater and surface water issues regarding stormwater management, yard and garden management, drinking water well management and septic system maintenance.
3) Provide watershed tour to discuss best management practices.
4) Promote household cleanups of hazardous wastes and hold tire collection day.
5) Provide riverfront residents with an information booklet on watershed management.

Target Audience: Businesses/Developers/Excavators

Concerns: 1) Sediment deposition from construction sites and unstabilized banks.
2) Hazardous waste spills.
3) Fertilizer and pesticide release from storage or lawn treatment.

Activities: 1) Develop partnerships with local businesses/developers/excavators to increase awareness on erosion, fertilizer use, pesticide use and other hazardous chemicals.

2) Seek sponsorship for local events to increase awareness.
3) Send out newsletters and brochures concerning buffer strips, construction site management, and applying best management practices.

Target Audience: Local Government

Concern: Lack of awareness among decision-makers, citizens, village officials and township officials about water quality issues and activities.

Activities: 1) Attend city, village and township meetings to discuss best management practices and land use planning.
2) Get decision-makers to attend watershed meetings and activities.
3) Conduct workshops to inform officials/decision-makers on keeping watershed healthy.
4) Work with officials to develop an emergency plan.
5) Distribute educational packets to townships, cities and villages.
6) Hold workshop to discuss planning guidebook (produced by WMSRDC), Decision Support System, and ordinance development.

Target Audience: Road and Drain Commissions

Concerns: 1) Lack of communication between decision makers, engineers and general laborers.
2) Improper placement of culverts and bridges.
3) Improper construction of ditches.
4) Improper stockpiling of sand/salt.
5) Lack of awareness.

Activities: 1) Identify and rate all road/stream crossings within the watershed.
2) Inform them of training's and educational workshops, which will help them with problem solving of related issues.
3) Hold mini-workshop to show good versus bad construction and maintenance sites that effect surface water quality.

Target Audience: Schools and Youth Clubs (Boy/Girl Scouts, 4H, etc.)

Concern: 1) Lack of information and educational materials on watershed issues and water quality.
2) Lack of understanding among students, club members, teachers and club leaders.

Activities: 1) Perform river cleanups.
2) Work with Adopt*A*Stream constructing erosion control structures and river monitoring exercises.
3) Perform stream monitoring for macroinvertebrates with students and club members.
4) Provide tours and watershed festival to give hands-on experience.
5) Visit classrooms to present Home*A*Syst Program and other water quality information.
6) Hold poster contest.

Target Audience: Civic Organizations (Garden Clubs, Optimist Clubs, etc.)

Concern: Lack of awareness of watershed issues and management.

Activities: 1) Work with MSU-extension to provide training materials to lawn and garden care clubs.
2) Develop newsletters and write articles to inform clubs on native plants programs, buffer strips, and other best management practices.
3) Attend meetings to give presentations and updates on watershed project.

Target Audience: Visitors/Tourists

Concern: Lack of awareness of watersheds and water quality issues.

Activities: 1) Install informative signs at watershed boundaries.
2) Place posters and brochures at rest areas, gas stations and other stores to educate on water quality.
3) Place plastic trash bags, with information about watershed, at local sporting goods/bait stores and recreational outfitters.

Target Audience: General Public

Concern: Lack of awareness of watershed and water quality issues.

Activities: 1) Develop awards program for volunteers and cooperators within the watershed.
2) Write newspaper articles for the local newspaper describing watershed issues and concerns.
3) Continue to send out newsletters to local communities within the watershed.

4) Hold workshops and public meetings to inform and educate the public on invasive species within and around the watershed.
5) Continue participation of Adopt*A*Stream Program.
6) Hold workshop, to discuss the pros and cons of dams.
7) Survey the public to assess the knowledge of residents within the watershed.
8) Hold watershed festival to get community involved and interested in water quality issues.
9) Produce brochures to explain watershed goals and objectives.
10) Install informative signs at watershed boundaries.
11) Place posters and brochures at rest areas, gas stations, etc. to inform the public on watershed management.
12) Develop web page to extend information to those who have access to the internet.
13) Promotional materials will be given to volunteers to thank them for their contribution.
14) Develop a program to award cooperators within the watershed.
15) Hold tire collection day.

Resources/Partners

The following agencies, organizations, etc. will assist the project manager and help the project meet goals and achieve its objectives.

A. Farm Organizations
    1. Oceana County Farm Bureau
    2. Grange
    3. Mason/Oceana Horticulture Society
    4. Pompsters
    5. United States Department of Agriculture
    6. Oceana Conservation District
    7. MSU-Extension
    8. Michigan Department of Agriculture
B. Environmental
    1. Michigan Hydro Relicensing Coalition (MHRC)
    2. Federation of Fly Fishers (West Michigan Hacklers)
    3. Americorps
    4. Trout Unlimited
    5. Pheasants Forever
    6. Adopt*A*Stream
    7. Michigan Department of Environmental Quality
    8. Michigan Department of Natural Resources
C. West Michigan Shoreline Regional Development Commission
D. Local Newspapers
    1. Oceana Herald Journal
    2. Ludington Daily News
    3. Muskegon Chronicle
E. Local Businesses
F. Service Clubs
    1. Master Gardeners
    2. Optimist Clubs
    3. Rotary Clubs
G. Local Government
    1. Road Commission
    2. Drain Commission
    3. Townships
    4. Cities/Villages
    5. County Commissioners

INFORMATION & EDUCATION IMPLEMENTATION SCHEDULE

Oceana Conservation District
Pentwater River Watershed Project
1064 Industrial Park Drive
Shelby, MI 49455

ACTIVITY	QUANTITY	COST	TOTAL COST	IMPLEMENTATION
Watershed Festival	3	$1500 each	$4500	July, 2000,2001,2002
Clean Sweep Promotion	3	1500 flyers @ $.40 each x 3	$1800	May, 2000,2001,2002
Watershed Tours	3	$500 each	$1500	September, 2000,2001,2002
Watershed Brochures	2500	$.40 each	$1000	July, 2000
Watershed Signs	6	$67 each	$400	September, 2000
Posters	50	$8 each	$ 400	January, 2001
Adopt*A*Stream	3	$400/project	$1200	May, 2000 - April, 2002
Public Meetings	18	$50 each	$ 900	November, 2000,2001,2002
Newsletters	12/1200 copies each printing	$.30 each + $.25 postage	$7920	June, 2000 - May 2003
Classroom Presentations	6	$50 each	$ 300	October, 2000 - May, 2003
Development of Web Page	1	$500	$ 500	December, 2000
Site Clean-ups	6	$400 each	$2400	May, 2000 - September, 2002
T-Shirts & Hats for Volunteers	150	$15 each	$2250	June, 2000

Land Use Planning & Ordinance Development	3	$2000 per workshop	$6000	January, 2001 October, 2001 January, 2002
Newspaper Articles	156	$25 each	$3900	May, 2000 - May, 2003
Awards Program/Dinners	6	$1500 each	$9000	May, 2000 - May, 2003
Demonstration Plots	15	$100 each	$1500	May, 2000 - May, 2003
Tire Collection	3	$1000 each	$3000	May, 2000 - May, 2003
Information Booklet	1000	$3 each	$3000	May, 2000 - May, 2003
Plastic Bag Distribution	500	$2 each	$1000	May, 2000 - May, 2003
TOTALS:			$52,470	

i&ebud.wpd

Appendix B

Oceana SWCD receives watershed grant

The Oceana Soil & Water Conservation District was selected to receive a two-year grant for watershed planning in the south branch of the Pentwater River Watershed from the Michigan Department of Environmental Quality (MDEQ).

The $110,000 grant will allow the SWCD to develop a full-fledged plan for the 53,000 acre watershed, identifying the resource concerns of the residents. The watershed plan also will include the best alternatives for the problems.

The reason the SWCD applied for the south branch of the Pentwater River was the fact that it is still a high quality trout stream, but several problems have been identified as affecting the water quality. The main culprit has been sediment covering the gravel bottom so that the trout are unable to spawn. There are many potential sources of the sediment and they should be identified during the planning process.

This project is unique in the State of Michigan for two reasons. First, a steering committee of residents in the watershed was established two years ago. This group will be the main decision makers for how the project will proceed. People interested in this project, should contact the SWCD office or a director and let them know of their interest.

The second reason this project is unique, is that the SWCD will work with the West Michigan Shoreline Regional Development Commission (WMSRDC) and Grand Valley State University to take the completed watershed to the next logical step. A computer program will be utilized to incorporate the watershed plan into a potential land use planning tool for the three townships and two communities in the watershed.

In the past, watershed plans and land use planning decisions have not been connected. In the real world, they can not be separated. The SWCD staff feels if long-term resource management on an area wide basis is to be successful this next step must be taken.

This past summer two working groups were developed to gather information about the watershed with the help of volunteers. The two groups will collect information about the condition of existing road/stream crossings and sampling the river itself for insect indicators of past water quality.

Those with any ideas they would like to see incorporated into the project, it is not too late. Call or write the Oceana Soil and Water Conservation District for more information.

Herald-Journal 2-13-97

Group interested in improving watershed

A group of Oceana County residents are looking for ways to improve the quality of the South Branch of the Pentwater River watershed. Much of northern and central Oceana County is included in the watershed area, according to USDA District Conservationist Mark Kelly, who chaired the meeting.

The group has met twice and plans another meeting Feb. 27, though no time or place has been set. Those interested in attending may call Kelly at 861-4967.

At the Jan. 28 meeting, about 50 people heard a presentation from Tony Groves, an engineer who worked on improving Hamlin Lake's water quality. He described the steps taken to handle water quality issues similar to those in the Pentwater River watershed.

The weed problem on Hart Lake and possible formation of a lake board was discussed Jan. 28 (see related story). Hart Lake falls within the south branch of the Pentwater River watershed.

At the first meeting in November, the group identified the following 16 watershed concerns:

-Eurasian Water Millfoil
-Maintaining water quality standards
-Relicensing hydroelectric plants
-Enforcing existing zoning and land use laws
-Planned development
-Long term trends
-Agricultural uses/rights
-Access/non-access
-Fisheries population
-Biodiversity
-Private property rights
-Erosion
-Keyhole subdivisions
-Lack of data
-Urban runoff

Other concerns added Jan. 28 were:

-Shoreline management (lawn care, septic)
-Geographic information (land use and cover, slope, soils information)
-Land use planning and zoning (environmentally sensitive areas, storm water management, watershed council)
-wetlands protection (detailed mapping, local protection measures)
-Agriculture management (soil conservation district, stream bank preservation, ag stabilization and conservation service)
-Forest land
-Conservation
-In-lake water quality monitoring (trend analysis, invader species impact, identify pollution sources)

Six individuals present volunteered to serve on a Pentwater Watershed Committee to preserve the natural resources of the watershed. ◊

The Herald-Journal 1-23-97

Water quality meeting scheduled; Hart City meeting time changed

Water quality in Oceana County will be the subject of a meeting scheduled for 7 p.m. Jan. 28 at the Oceana County Courthouse, circuit courtroom.

The Hart City Council meeting scheduled for 7:30 p.m. Jan. 28 has been moved back to 7:45 p.m. so that interested council members may attend the water quality meeting.

The meeting is the second in a series concerning the water quality of the South Branch of the Pentwater River Watershed. Much of northern and central Oceana County is included in the watershed area. The weed problem on Hart Lake will be included in the discussion Jan. 28, according to Hart City Councilman Lyle Gale.

"We are combining two meetings," said Gale, who is Hart City Department of Public Works chairman. "We want to be ready this spring to address the weed problem on Hart Lake."

A speaker from Hamlin Lake Association (Mason County) is scheduled to discuss how water quality issues were handled in that area, Gale added. The public is invited to the meeting. ◊

Oceana Herald Journal July 30, 1998

Restoring the river

Clean up deemed a success

The first of hopefully several clean ups of the South Branch of the Pentwater River was a success, according to clean up co-coordinator Joe Primozich.

A crew of about 10 volunteers worked Monday afternoon cleaning the river from Hart Dam to 72nd Avenue bridge.

"I was just floored," said Primozich about the amount of garbage they found. "Just about anything imaginable was found picked up and thrown away. A bath tub

the many items cleaned out of the river bottom. Primozich said most of the items got into the river when the dam broke in 1986.

The clean up effort included five boats and/or canoes with a group of volunteers wading down river and picking up garbage. Volunteers were Ted Borgeld, Glenn Jacobs, Karlyn and Ted Hempfling, Tom Wakeman, Marvin Bishop, Todd Helms, Jeff Powers and Zack Bakker. Co-coordinating the clean up were Primozich and Oceana Conservation District officer Rick Pitts.

Primozich said volunteers hope to make the river a better fishery. "We hope to improve the recreational appeal to tourists," said Primozich.

On top, the South Branch of the Pentwater River silently flows slowly. The next picture below is Zack Bakker and Todd Helms walking down river with a canoe full of garbage. Powers and Helms are from Hart. Above, a piece of scrap metal lays along the river bed. This piece of metal is just a portion of what volunteers found on Monday. To the left, is a boat full of garbage picked by volunteers.

— Herald-Journal photos by Bobbi VanderLeest

Norm Wright from Great Northern Turtles in Traverse City displays a 75-pound alligator snapping turtle to Oceana County sixth-grade students during a visit to a local farm.

Special to The Chronicle
• Sally DeFreitas

Local students get lesson in conservation

By Sally DeFreitas
CHRONICLE CORRESPONDENT

OCEANA COUNTY — Sixth-grade students from five Oceana County schools spent a day at Cabin Creek Farm recently where they took soil samples, collected water bugs and met a 75-pound alligator snapping turtle.

About 380 students and teachers from Hart, Shelby, Pentwater, New Era Christian and Walkerville Schools participated in the event, which was sponsored by the Oceana Conservation District.

The students divided into groups and moved through a series of learning stations scattered around the property.

Woodland areas on the farm provided the ideal setting for a hands-on tree identification experience led by forester Brian Lindeman, and for observation of wildfowl habitat with conservation technician Lynda Herremans.

Students walked a two-track road to the creek where watershed technician Rick Pitts showed them how to collect water samples and insects from the river. Wildlife biologist Tom Nederveld led a "stomp through the swamp" and explained why wetlands are so important to our ecology.

Other presentations dealt with soil erosion, water quality, insect control and power line safety.

During the day's final session, students met an assortment of snakes and other reptiles that included a 75-pound alligator snapping turtle, native to the southern United States. The reptiles belonged to Great Northern Reptiles of Traverse City and were brought to the farm by Norm Wright.

Wright told students that the alligator snapping turtle lives on fish and gains a pound of weight a year, so the creature they were seeing could live as long as 200 years and grow to 200 pounds.

Steve and Phyllis Peters raise asparagus and beef cattle on Cabin Creek Farm which is located north and east of Shelby on Baseline Road.

Phyllis Peters is administrator of the Oceana Conservation District with offices in Shelby.

Watershed project in transition

The Pentwater River Watershed project that was implemented in May is still in it's transitional phase, according to Dick Pitts, Watershed Planner from the Oceana Conservation District.

Pitts attended the Oceana County Board of Director's Planning and Environmental Services Committee meeting Dec. 22 with an update on the watershed project.

A watershed includes all the water that flows to a certain point, in this case, Pentwater Lake. The Pentwater River watershed includes Upton Creek, South Branch Pentwater River, Donaldson Creek, Russell Creek, Cleveland Creek, and Waldron Drain.

It's a five year project, said Pitts. The first few years is for the planning and transitional phases. During the transition phase, Pitts will contact landowners along the watershed to find out any problems they may have. Interested landowners are requested to participate in the effort, said Pitts.

The watershed project may affect more than just property owners on the water, said Pitts. Owners of fields that may have runoff into the water or have property around ditches or storm drains may be contacted for the implementation project.

The project is a 75 percent cost share with the landowners. The Soil and Conservation District contributes 75 percent of the share, landowners are responsible for the other 25 percent. The landowner can use labor as their portion of the cost share.

Anyone who sees a problem on their property or has a concern about the watershed can call Pitts at the Oceana County Conservation office at 861-4967.

Erosion and sedimentary problems are also studied during the transition phase.

According to Pitts, some sedimentary problems occurred when the Hart Dam broke in 1986. With enough interest, a sediment basin could be installed, he said. This would prevent some of the sediment from washing down to the Pentwater Lake.

The Soil and Conservation District (SCD) received a two year grant for the project, if enough public interest is received, the SCD will apply for an additional three year grant for the implementation phase.

Actual projects will be done during the implementation phase. This is when structures will be built where needed for erosion problems, and any contamination problems will be solved, said Pitts.

AmeriCorps workers help clean up Oceana

Oceana Herald
May 13, 1999

AmeriCorps members from around the state spent two days in Oceana County as part of an AmeriCorps clean up project.

The 130 members and staff were from Saginaw, Charlevoix, Ann Arbor, Grand Rapids and other points. This year, the Michigan Community Service Commission didn't have staff time to put a project together so AmeriCorps offered its help, according to a press release.

The projects, worked on by the AmeriCorps May 6 included clean up of Camp Miniwanca.

Most of the work was performed May 7 at various places around Oceana County. This included clean up at Silver Lake State Park. AmeriCorps volunteers were assisted by the park staff.

Also included in the May 7 clean-up was the Pentwater Pathways. Along with the AmeriCorps crew were the Pentwater Lake Association and Ski Trail group, the Michigan Coalition for Clean Forests and the Department of Natural Resources Paris field office.

New Era Elementary was on the list of clean up May 7, for work on the nature trail, lab clearing and refurbishing. New Era fifth graders were on hand, taking part in the clean-up. Also, the AmeriCorps team and the fifth graders worked on the baseball diamond and the backstop.

Work on the Pentwater Watershed was done May 7, also. Rick Pitts from Oceana Conservation District and the watershed study group cleaned the south branch of the Pentwater River from Hart dam south to 72nd Street, using four boats and a canoe. Approximately five students from Hart High School and Hart High School Advanced Biology teacher Joe Primozich pitched in to help clean up with the AmeriCorps team.

The AmeriCorps also assisted the U.S. Forest Service on the White River clean-up project May 7.

Workers braved the wind and the rain both days of the clean-up. ◊

OCD plans July 27 cleanup

The Herald-Journal
7-16-98

The Oceana Conservation District (OCD) is planning a summer cleanup Monday, July 27 of the Pentwater River's south branch.

On a recent canoe excursion, OCD watershed planner Rick Pitts spotted numerous cans, old tires, and trash scraps that appear to remain from the 1986 collapse of the earthen dam wall.

"Anything that isn't supposed to be there, we're going to get out of the river," Pitts said.

The clean-up is scheduled to begin at Hart dam and go to 72nd Avenue. Volunteers will drift in the river in boats and wade in shallow water collecting trash. The trash will be deposited in dumpsters.

Students and local fishermen have already volunteered to help, but Pitts said more hands are always needed and always welcomed.

A back-up date tentatively is scheduled for July 28. Anyone wishing to volunteer or needing further information may call Rick Pitts at 861-4967, or Joe Primozich at 873-4712. ◊

DNR speaker at free seminar

The Oceana Conservation District's Pentwater River Watershed Committee will host a seminar that is free and open to the public.

The district will have guest speaker Rich O'Neal from the Michigan Department of Natural Resources give a presentation on water temperature and its affect on fish populations, streams, clams and the river in general.

The program will be Wednesday, Aug. 18, at 7:30 p.m. in the basement meeting room of the Huntington Bank in Hart. ◊

Pentwater River Watershed update

By Rick Pitts
Watershed Planner

The south branch Pentwater River Watershed Project is well under way.

The project is a five year, three step process including planning, transition and implementation. The grant began in May of 1998 and plans to continue through the year 2003.

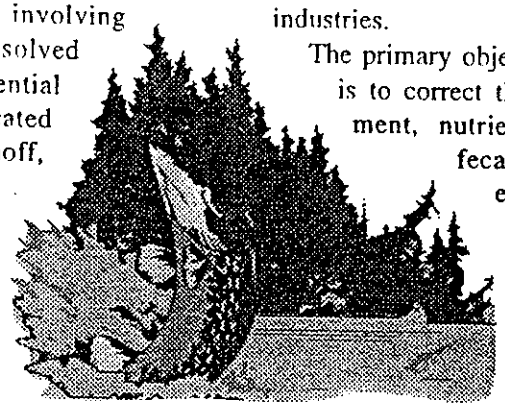
Project manager, Rick Pitts, has inventoried the river and its tributaries. With help from steering committee members, the manager has identified non-point sources of pollution existing within the watershed.

The sources are as follows:

1. Sediments - road/stream crossing, bank erosion, domesticated animal crossing, wildlife crossings, field runoff and Hart Lake dam breakage.

2. Nutrients involving depletion of dissolved oxygen - residential lawns, domesticated animals, field runoff, impervious surfaces, septic systems and industries.

3. Warming temperatures - Increased number of dams and drains has caused water temperatures to increase.



4. Fecal Coliform - septic systems, domesticated animals, wildlife and industries.

The primary objective of the project is to correct the sources of sediment, nutrients/pesticides and fecal coliform from entering the flows of the Pentwater River Watershed. The second objective is to educate the community so this watershed can continue to meet all the designated uses, which include the following: agriculture, cold water fisheries, full body recreation, partial body recreation, navigation and other aquatic life.

The goals we would like to achieve during this project are:

1. Maintain a healthy aquatic ecosystem
2. Control invasive aquatic species
3. Improve cold water fisheries
4. Maintain agricultural uses
5. Maintain healthy recreational environment

If you have any questions or would like to participate in stream monitoring, please call the Oceana Conservation District at (616) 861-4967. ◊

Cleaning the south branch of Pentwater River

By Rick Pitts
Watershed Planner

While canoeing the stretch of the Pentwater River from Hart Lake to 72nd Avenue this past summer, Hart High School teacher Joe Primozich and I spotted numerous tires, cans and other trash particles laying on the bottom of the river.

Much of this trash appeared to be remains from the 1986 collapse of the dam. Joe and I were amazed to see this much trash and developed a clean-up day for July 27,1998.

Many volunteers gathered to help including local fishermen, Hart High School students and others living within the watershed. Volunteers drifted the river with boats and canoes, depositing the trash in a dumpster on 72nd Avenue. The volunteers worked all afternoon collecting old school desks, sinks, barrels, tires, and many pieces of scrap metal. Four or five boats loaded with trash was collected that afternoon.

A second clean-up will be scheduled for this summer to accumulate the rest of the trash.

We at the Oceana Conservation District would like to thank those involved including Primozich, Ted Borgeld, Glenn Jacobs, Karlyn and Ted Hempfling, Tom Wakeman, Marvin Bishop, Todd Helms, Jeff Powers, Zach Bakker, The City of Hart, White Lake Landco., and the transfer station. People interested in river clean-up or who would like to participate in any of the volunteer monitoring programs, please call the conservation district at (616) 861-4967. More hands are always needed and always welcomed.

Watershed project selects coordinating committee

By Rick Pitts
Watershed Planner

A subcommittee was developed to assist the steering committee for the south branch of the Pentwater River Watershed Project.

The subcommittee is made up of seven members with each member representing an interest group. Selected members and their interest groups to represent are:

Kim Tate— Oceana Conservation District; Ron Steiner— Village of Pentwater; Bob Keller— City of Hart; David Yeager— Agriculture; Stan Hallack— Industrial/Commercial; Dorothy Schramm— Recreation; Joe Primozich— Education

Each member is responsible for the following:

• Communicating with their interest group members and bringing any comments or concerns to the committee for discussion.

• Attending each steering committee and coordinating committee meeting. If one is unable to attend a meeting, they are responsible for finding an alternate to represent the interest group.

• Making sure meetings are accomplishing agenda items including public comments.

• Making sure the project manager is accomplishing the goals of the steering committee.

• Suggesting solutions, alternatives, etc. to issues that exist involving the Pentwater River Watershed Project.

People with questions or concerns are asked to contact one of the members of the coordinating committee or contact the district at (616) 861-4967. The coordinating committee meets the third Wednesday of each month. ◊

Oceana Herald July 23, 1998

Volunteers needed to clean Pentwater River

Volunteers are needed to clean up Pentwater River's south branch Monday.

According to co-coordinator Joe Primozich, volunteers are needed from 1 to 7 p.m. Boats will be launched from the east side of the Hart Lake dam by the gate. Boats and canoes will start by the dam and travel downstream to 72nd Avenue bridge. Primozich said volunteers will be done and off the river by 9 p.m.

Hart City and Hart Township are splitting costs to place a dumpster at 72nd to dump garbage, according to Primozich.

The Oceana Conservation District is helping organize the clean up. Volunteers will drift in the river in boats and wade in shallow water collecting trash.

Primozich said volunteers should plan to dress to wade the river and bring gloves. Garbage bags will be provided.

Anyone wishing to volunteer or needing further information may call Rick Pitts at 861-4967 or Primozich at 873-4712. If it rains Monday, the clean up will be scheduled for Tuesday. ◊

Biologist reports healthy, clean watershed

By Sally DeFreitas
CHRONICLE CORRESPONDENT

PENTWATER

After a summer of hiking, canoeing and bug collecting along several miles of Oceana County waterways, watershed technician Rick Pitts describes the Pentwater River watershed as "pretty clean and healthy."

Pitts, who is employed by the Oceana Soil Conservation District, has spent the past several months doing visual and scientific assessments of the rivers and streams that feed the Pentwater River.

A watershed is the area of land from which runoff, caused by rain or snow, drains into a river or lake. The boundaries of a specific watershed can be identified by locating the highest points of land surrounding the waterbody. Streams function as the "arteries" of the watershed, draining the land as they flow from higher to lower elevations.

Pitts said he did most of the assessment on foot, except for one canoe expedition from Hart Lake to Pentwater Lake, a trip he does not recommend for recreational purposes. "Dry summer, low water and lots of portages," is how he summed up the July adventure that he shared with Hart High School teacher Joe Primozich.

Pitts said the biggest threats to water quality he encountered during his trips were at road and stream crossings,where bridges, culverts and auto traffic create conditions favorable to erosion.

In farm areas, two problems emerged that could contribute to erosion and pollution: a lack of buffer area between cropland and waterways; and the pasturing of cattle along rivers. He said he also found areas where stream banks had been eroded by high water levels.

Working from aerial photographs taken in 1996, Pitts is updating 1978 land use maps of all nine townships included in the 57,000-acre watershed area.

He also is feeding data into a computer software program called Geographic Information System, that will produce maps and provide specific information related to watershed sites.

Pitts said when he finishes this program, the information will be available to any one who wants to stop by the Shelby office.

AmeriCorps projects to focus on environment

SHELBY — AmeriCorps members and supervisors from around the state will be in Oceana County May 6-17 for a set of environmental service projects. AmeriCorps program members from Charlevoix, Grand Rapids, Detroit, Ann Arbor, Saginaw and other locations will stay at AYF/Miniwanca in Shelby.

AmeriCorps and WYF staff will organize the volunteers into teams and explore the west Michigan dune ecology.

Friday morning, the teams tackle service projects with the help of local and state site staff. Clean up projects include Pentwater Pathways, where the Department of Natural Resources will have a dumpster, and Pentwater Lake Association. Cross County Ski members will help direct efforts. Silver Lake State Park will host a team as will Oceana Parks and Recreation.

TO HELP:

• Anyone who wishes to join the AmeriCorps members during the service projects should call (616)861-2262 for schedules and information.

Rick Pitts of Pentwater Watershed Study will lead a team from the base of the Hart Dam out to 72nd Street using canoes and waders. U.S. Forest Service staff will direct a project on the White River. New Era's fifth graders will partner with a team to work on Shelby School's Nature trail and labs beside the school. The Farm, a new addition to Ludington's Bridges Psychological Testing Center, will host a team to clear paths at their new facility in Benona Township.

In prior years, AmeriCorps members around the state have gathered for one large project each year. When that could not be scheduled this year, RSAI AmeriCorps, serving Mason, Lake and Oceana counties, from AYF Miniwanca decided to offer a smaller version of the project.

AmeriCorps alums and specialists who will help include Seth Hopkins, from Mason-Lake Soil Conservation District, and Chansy Vongphasouk, former RSAI AmeriCorps member now employed by the Department of Environmental Quality office in Cadillac.

Richard Dusseau of the AmeriCorps staff is heading up the project.

Pentwater River Project is what we make of it

By Rick Pitts
Watershed Planner

Do you find yourself asking "Why do I need to change the way I have been going things for years?" Sometimes it is hard to incorporate new ideas or change the way we are, but sometimes we need to.

A year from this May, the Oceana Conservation District will begin implementation on the South Branch of the Pentwater River Watershed. The district will contact landowners/residents, which may have erosion problems or pollution concerns such an nutrient or pesticide runoff. Implementation practices will be a 75 percent cost share to those landowners, which choose to incorporate these practices. This is completely voluntary, and any information about your property will remain confidential.

I believe this project is a win-win situation whether you are a large landowner, a small riverfront/lakefront owner, homeowner, renter or visitor to the area. This project can greatly benefit your life style.

As a large landowner, the project will help you be more cost effective, decrease the amount of soil loss or nutrient loss, eliminate concern of meeting Right-to-Farm objectives and help keep your groundwater and surface water clean. Cost share can be used for such practices as exclusionary fencing of domesticated animals, buffer strips, grassed waterways, manure management, vegetated chutes and bank stabilization to eliminate bank erosion and soil loss.

As a riverfront/lakefront owner, the project will help eliminate nutrient loss and deposition, which increases algal blooms. The project will decrease erosion of your banks, deposition of sediment and will keep your surface water and groundwater much cleaner.

As a homeowner, renter, or visitor, the project will help with land-use planning studies, amendments to zoning ordinances, storm water and erosion control ordinances, and will help the community begin to take proactive measures to development. And as stated for the others, the project will help keep your groundwater and surface water clean.

In addition to the above-mentioned benefits, we can begin to improve habitat for fish, macro invertebrates, and other aquatic life. We can also pursue the control of invasive species, such as Zebra mussels, Purple Loosestrife and Eurasian watermilfoil.

So before we make any judgments about the watershed project, lets open our minds and see what the watershed project has to offer for each one of us. With your help, we will make this one of the most successful watershed projects in Michigan. But remember, this is YOUR PROJECT, we will pursue only those items that the community, as a whole, would like to see incorporated. If you would like to be a member of the steering committee, which gives direction to this project, or have any concerns, please call the Oceana Conservation District at (616) 861-4967, ext. 3.0

Appendix C

PENTWATER RIVER
ROAD/STREAM CROSSING
FIELD DATA FORM

DATE_____ Field ID. #_____

LOCATION:

Stream Name:_____ Road Name:_____
Township:_____ Section:_____ T___N R___W
Type of Crossing:
_____ bridge
_____ single culvert
_____ twin culvert
_____ other _____

Land Ownership: (us / ds)
_____ private _____
_____ state _____
_____ USA _____
_____ other _____

ROAD DATA:

Width at Crossing _____ ft
Road Surface _____ paved
_____ gravel
_____ sand

Maintenance: _____ seasonal
_____ year around

Location of Low Point:
_____ at stream
_____ other _____
_____
_____

Existing drainage control features:
_____ None
_____ Present and Functional
_____ Need repair _____

APPROACHES: (looking down stream)

	left	*right*
Length	_____ ft.	_____ ft.
Slope	_____ 0%	_____
	_____ 1-5%	_____
	_____ 6-10%	_____
	_____ >10%	_____

Ditch / Shoulder Vegetation
_____ none _____
_____ partial _____
_____ heavy _____
_____ G or W _____

Average width of grade, including shoulders and ditches_____ ft.

CULVERT DESCRIPTION:

Length _____ ft.
Diameter _____ in.
Material _____ galvanized
_____ concrete
_____ other

Condition_____ good
_____ fair
_____ poor

Flow through culvert: _____ clear
_____ obstructed

STREAM CHARACTERISTICS:

	upstream	*downstream*
Ave. Width	_____ ft.	_____ ft.
Ave. Depth	_____ ft.	_____ ft.
Ave. Current	_____ slow	_____
	_____ mod.	_____
	_____ fast	_____

Predominant Substrate type:
_____ sand _____
_____ snd/grav _____
_____ gravel _____
_____ muck _____
_____ other _____

EMBANKMENT:

	inlet	*outlet*
Fill above culvert	_____ ft.	_____ ft.
bank slopes	_____ Vertical	_____
	_____ 1 : 1	_____
	_____ 1.5: 1	_____
	_____ 2 : 1	_____
	_____ >2: 1	_____

Adjacent Wetlands: _____ Yes
_____ No

Fish Passage _____ Yes/No _____

CONDITIONS AND TREATMENT

Erosion and Other Problems: Streambank, road embankment, culvert outlet or inlet, shoulder, ditch, fish passage, other:

(please list)____

____

____

Recommended Treatment: Approach elevations, pavement, drainage control, replace culvert, extend culvert, increase embankment fill, or other.

(please list)____

____

____

Crossing Rating:

____ Good ____ Bad ____ Ugly

Reason for recommendation:________________________________

____

PHOTOS: film number:_____ frames:____________________________

= =

SITE SKETCH

= =

Observer(s)____

Appendix D

Domesticated Animal Crossings are a common source of nutrients and fecal coliform.

Residential lawns on the rivers edge cause bank erosion and are also a source of nutrients.

Lack of buffers cause bank erosion, warmer temperatures, sediment deposition and nutrient inputs.

Sand and salt enter the river from stock piles such as this one.

Road crossings sometimes erode away causing sediment deposition and a hazard to road users.

Gullies such as this one causes sediment deposition and loss of productive land.

Inconsistent hydrology and lack of forest buffers can cause bank erosion.

A great deal of sediment deposition exists throughout the watershed, especially downstream from the Hart Dam.

A large erosion site exists in the Pentwater Marsh. The site deposits a great deal of sediment.

Appendix E

Volunteer Stream Survey Form

Section 1: General Information

Stream Name: Station Number:

Location: County:

Township: Sec: T R

Date: Time: Investigators:

Section 2: Weather Conditions

( ) Sunny ( ) Partly Cloudy ( ) Cloudy ( ) Rain

Any Precipitation In the Last 5 Days? ( ) Yes ( ) No If Yes, Approximate Amount:

Air Temperature (F) (C): Water Temperature (F) (C):

Section 3: Stream Habitat

Average Stream Width (ft): Average Stream Depth (ft):

Surface Water Velocity (ft/sec): Estimated Flow (width x depth x velocity):

Has the Stream Been Channelized? ( ) Yes ( ) No

Dominant Watershed Soil Type: ( ) Clay ( ) Loams/Sand ( ) Organic

Water Clarity/Coloration: Water Odor:

Trash In Stream/Along Banks? ( ) Yes ( ) No

Trash/Debris In Trees Above Stream? ( ) Yes ( ) No

Substrate (Rank relative abundance - 1 most common, etc. Leave blank if absent)	Obvious siltation?	Substrate Embeddedness
Clay:	( ) Yes	( ) Completely (100%)
Silt:	( ) No	( ) Mostly (75%)
Sand:		( ) Halfway (50%)
Gravel (.25-2"):		( ) Little/None (0-25%)
Cobble (2-10"):		
Boulder (>10"):		

Riparian Vegetation (Rank relative abundance - 1 most common, etc. Leave blank if absent)

Trees:
Shrubs:
Herbaceous Plants:
Grass:
Bare:
Other (please describe):

Stream Shading

( ) 75-100%
( ) 50-74%
( ) 25-49%
( ) 0-24%

Bank Erosion

( ) Extensive
( ) Moderate
( ) Little/None

Estimated Width of Riparian Vegetation (ft):

Stream Habitat

( ) Riffles
( ) Runs
( ) Pools
( ) Eddies

Woody Debris

( ) Abundant
( ) Common
( ) Rare
( ) None

Dams Present: ( ) Yes ( ) No If Yes: ( ) Man-made ( ) Beaver

Aquatic Plants: ( ) Periphyton ( ) Filamentous Algae ( ) Macrophytes

Are Any Of These Plants Very Abundant? ( ) Yes ( ) No

Surrounding Land Use: (Rank relative abundance - 1 most common, etc. Leave blank if absent)

Woodland: Wetland: Open Field:
Farmland: Residential: Commercial:
Other (please describe):

Does the Road Ditch Discharge Directly To the Stream At the Crossing? ( ) Yes ( ) No

Any Obvious Pollution Sources? ( ) Yes ( ) No

If Yes, Please Describe:

Other Observations:

Attach Photos To Survey Form (downstream, upstream, and others of interest)

Section 4: Benthic Macroinvertebrates

All types of habitats should be sampled. Spend approximately 30 minutes collecting invertebrates, then identify and fill out the sheet below.

Describe the types of habitats and substrates from which invertebrates were collected:

Use letter codes (R = 1-10, C = 11 or more) to record the approximate numbers of organisms in each taxa found in the stream reach.

Group 1 Sensitive	Group 2 Somewhat-Sensitive	Group 3 Tolerant
_____Beetle adults (Coleoptera)	_____Beetle larvae (Coleoptera)	_____Aquatic worms (Oligochaeta)
_____Caddisfly larvae (Trichoptera)	_____Clams (Pelecypoda)	_____Blackfly larvae (Diptera)
_____Hellgrammites (Megaloptera)	_____Cranefly larvae (Diptera)	_____Leeches (Hirudina)
_____Mayfly nymphs (Ephemeroptera)	_____Crayfish (Decapoda)	_____Midge larvae (Diptera)
_____Gilled Snails (Gastropoda)	_____Damselfly nymphs (Odonata)	_____ Pouch snails (Gastropoda)
_____Stonefly nymphs (Plecoptera)	_____Dragonfly nymphs (Odonata)	_____True Bugs (Hemiptera)
_____Water penny (Coleoptera)	_____Scuds (Amphipoda)	
	_____Sowbugs (Isopoda)	
	_____Alderfly larvae (Megaloptera)	

Group 1	Group 2	Group 3
____# of R's * 5.0 = ____	____# of R's * 3.0 = ____	____# of R's * 1.1 = ____
____# of C's * 5.3 = ____	____# of C's * 3.2 = ____	____# of C's * 1.0 = ____
Group 1 Total = ____	Group 2 Total = ____	Group 3 Total = ____

Total Stream Quality Score (sum of totals for Groups 1-3) = _____

____Excellent (>48) ____Good (34-48) ____Fair (19-33) ____Poor (<19)

During the sampling and evaluation, did you observe any fish or wildlife? ( ) Yes ( ) No

If yes, please describe (if possible):

Pentwater River Volunteer Monitoring Results

Substrate	10/98 Total	5/99 Total
Clay:	1	1
Silt:	1	3
Sand:	16	14
Gravel:		1
Cobble:		
Boulder:		
Siltation		
Yes:	16	16
No:	3	3
Substrate Embeddedness		
Complete:		1
Mostly:	6	9
Halfway:	11	6
Little/None:	2	3
Riparian Vegetation		
Trees:	8	11
Shrubs:	1	6
Herbaceous:	2	
Grass:	7	2
Bare:		
Stream Shading		
75-100%:	2	2
50-74%:	8	6
25-49%:	6	7
0-24%:	3	4

Bank Erosion

Extensive:	3	3
Moderate:	4	8
Little/None:	12	8

Stream Habitat

Riffles:	13	11
Runs:	19	18
Pools:	13	14
Eddies:	5	5

Woody Debris

Abundant:	2	4
Common:	10	13
Rare:	7	3

Land Use

Woodland:	12	10
Wetland:	5	3
Open Field:		2
Farmland:	2	3
Residential:		1

Road Ditch Discharge Directly To the Stream?

Yes:	6	10
No:	13	9

Obvious Pollution Sources

Yes:	3	4
No:	16	15

Benthic Macroinvertebrates

Group 1 Sensitive		Group 2 Somewhat-Sensitive		Group 3 Tolerant	
		Fall 1998			
Beetle adults:	7	Beetle larvae:	1	Aquatic worms:	6
Caddisfly larvae:	19	Clams:	5	Leeches:	2
Hellgrammites:	3	Cranefly larvae:	7	Midge larvae:	5
Mayfly nymphs:	18	Crayfish:	7	Pouch snails:	13
Gilled Snails:	4	Damselfly nymphs:	14	Sowbugs:	7
Stonefly nymphs:	12	Dragonfly nymphs:	4	True Bugs:	13
Water penny:	1	Scuds:	16	Other Diptera:	8
Blackfly larvae:	8	Alderfly larvae:	0		
		Spring 1999			
Beetle adults:	9	Beetle larvae:	3	Aquatic worms:	10
Caddisfly larvae:	19	Clams:	9	Leeches:	4
Hellgrammites:	2	Cranefly larvae:	7	Midge larvae:	10
Mayfly nymphs:	20	Crayfish:	9	Pouch snails:	12
Gilled Snails:	8	Damselfly nymphs:	11	Sowbugs:	8
Stonefly nymphs:	11	Dragonfly nymphs:	7	True Bugs:	9
Water penny:	1	Scuds:	18	Other Diptera:	3
Blackfly larvae:	11	Alderfly larvae:	3		

Fall 1998

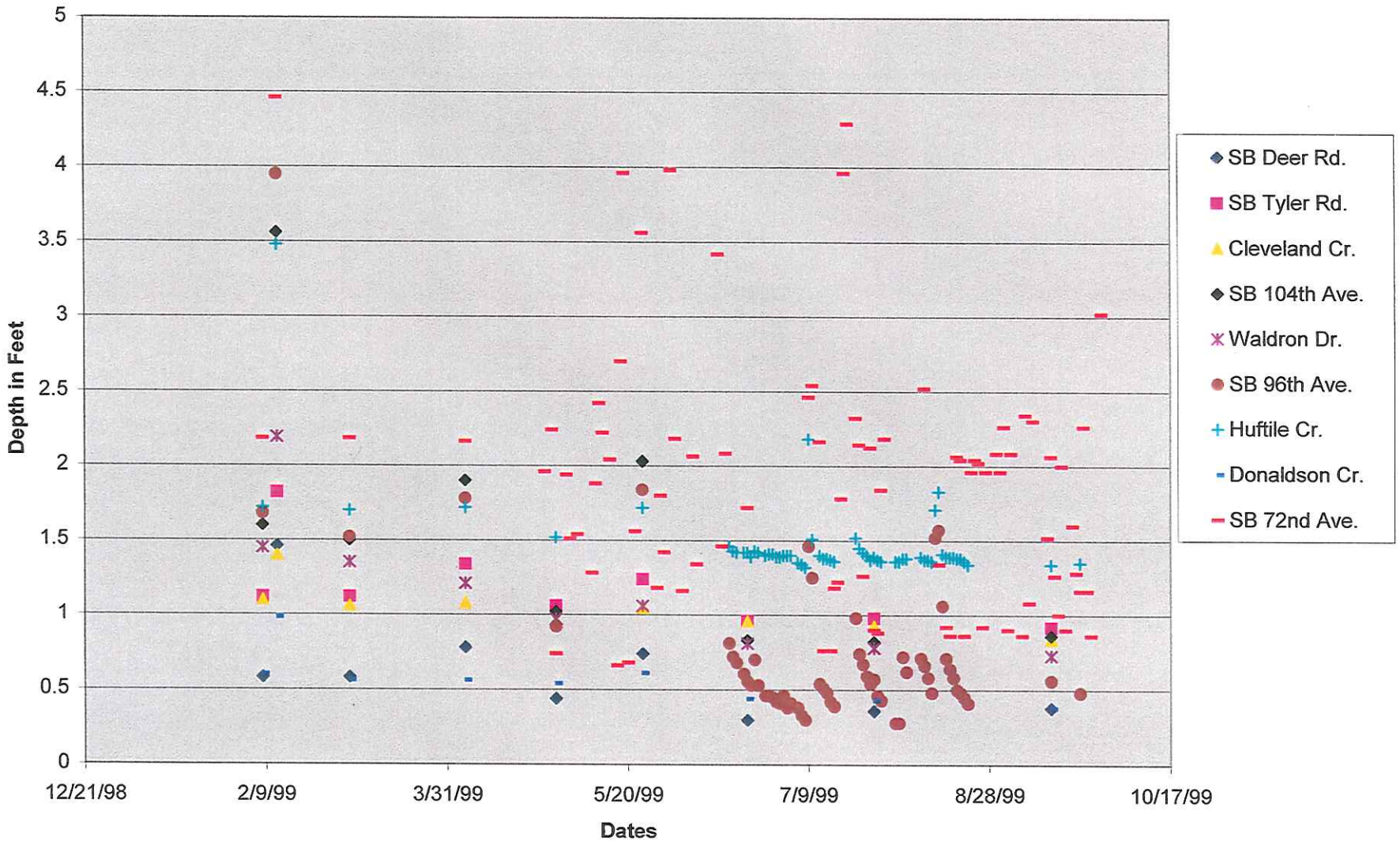
Excellent: 0	Good: 5	Fair: 12	Poor: 2

Spring 1999

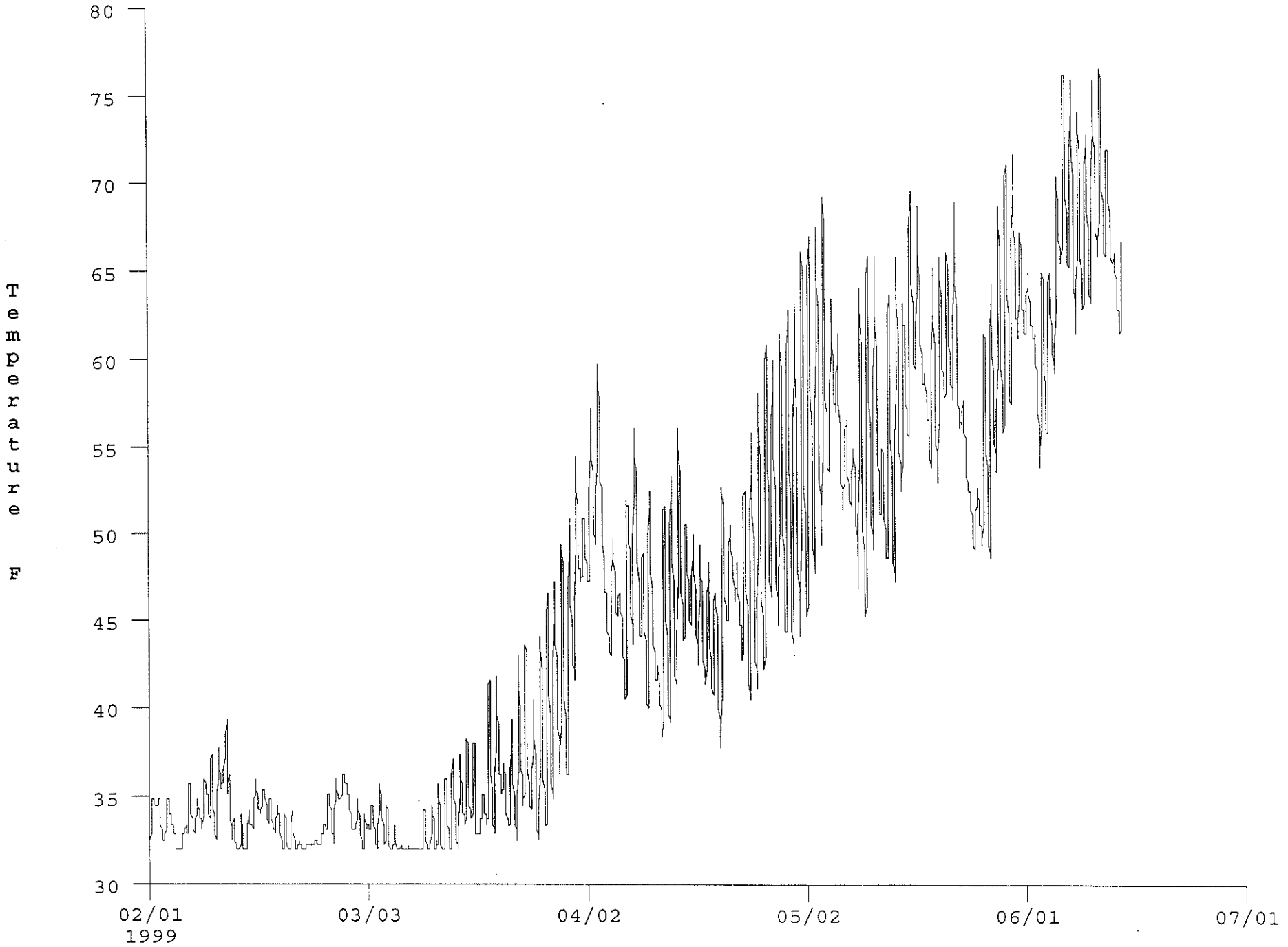
Excellent: 0	Good: 7	Fair: 12	Poor: 0

Appendix F

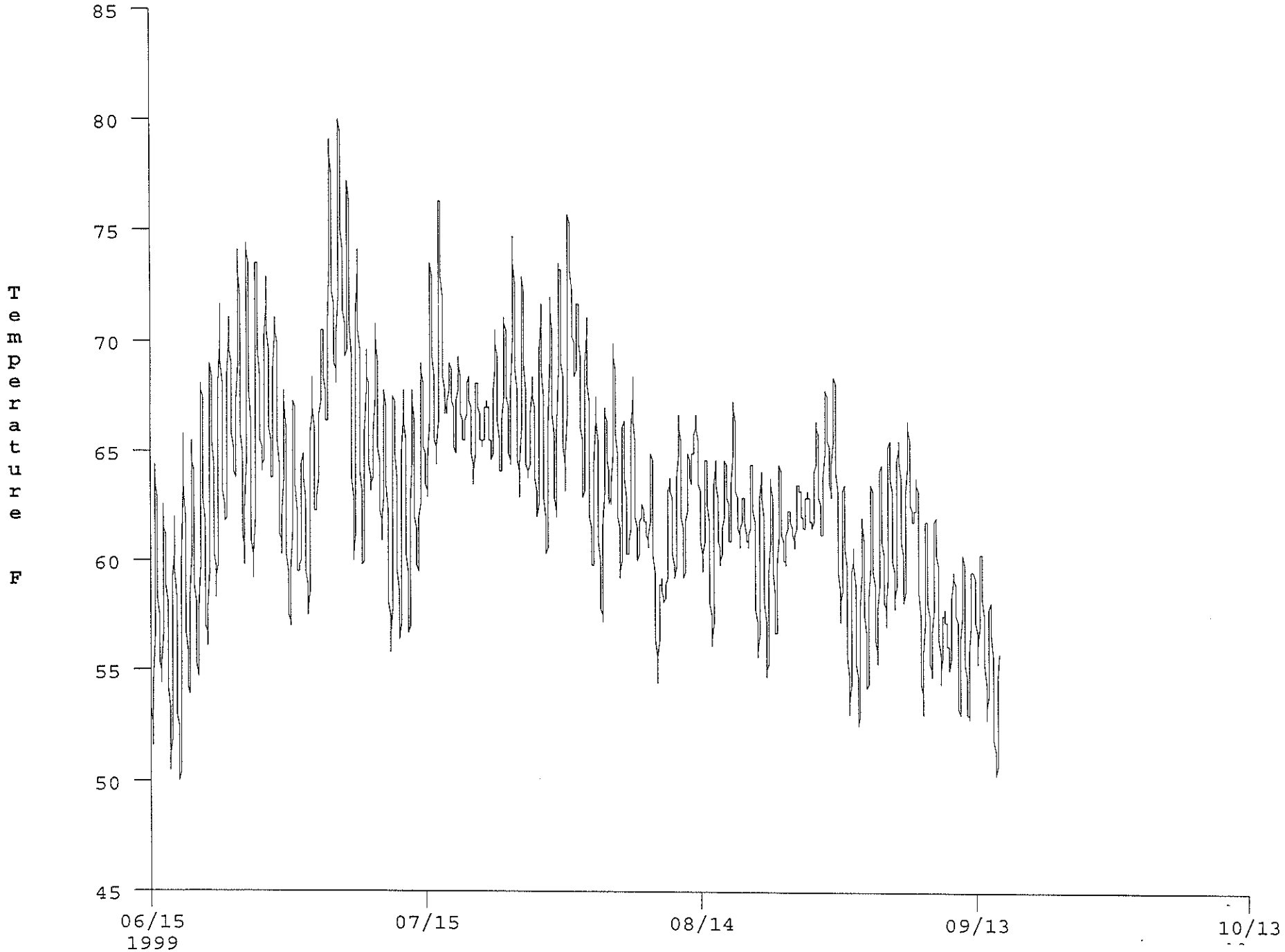
Staff Gauge Readings for the South Branch of the Pentwater River Watershed



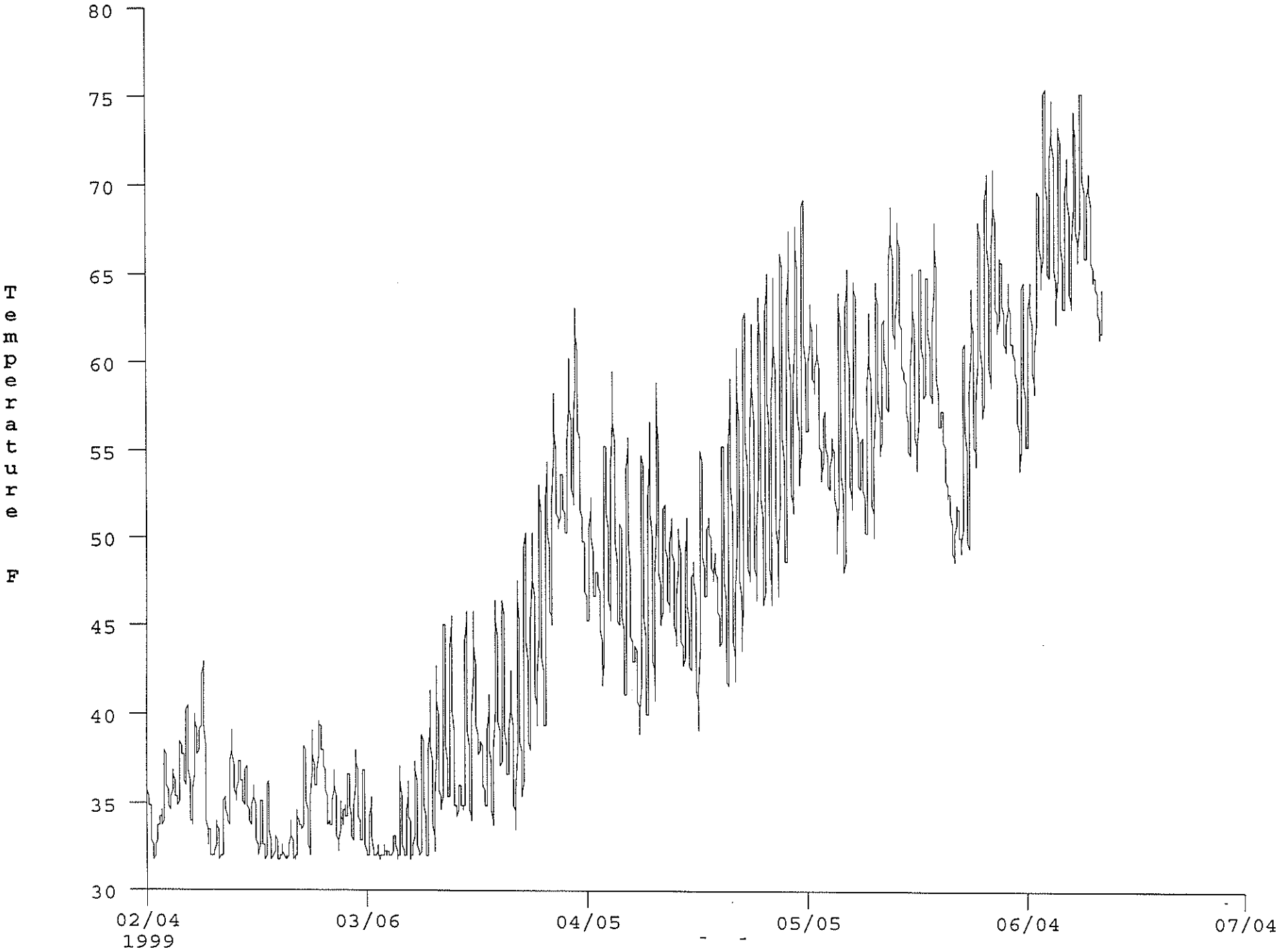
Appendix G



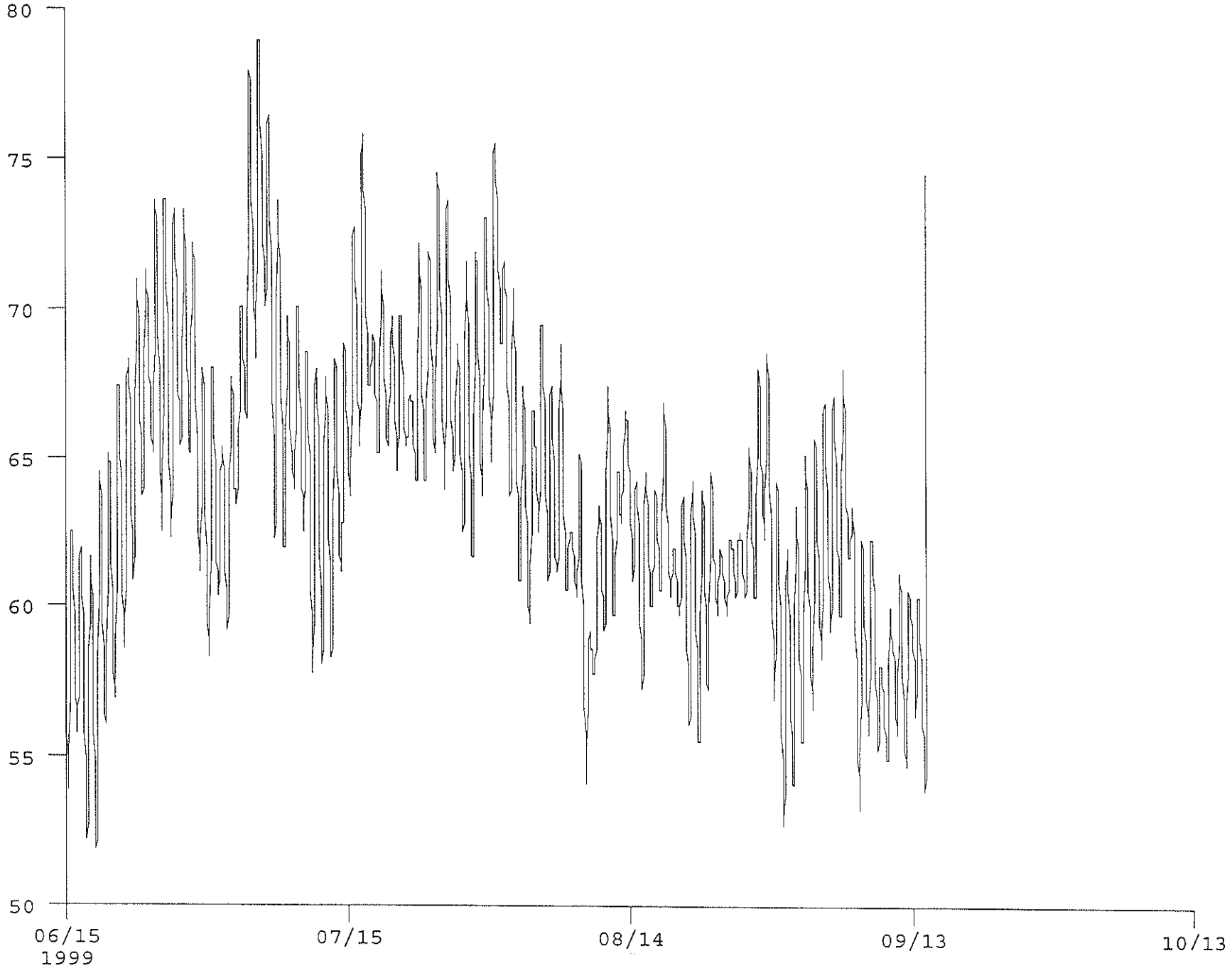
Temperature readings for South Branch at Deer Road crossing from 2/1/99 to 6/14/99.



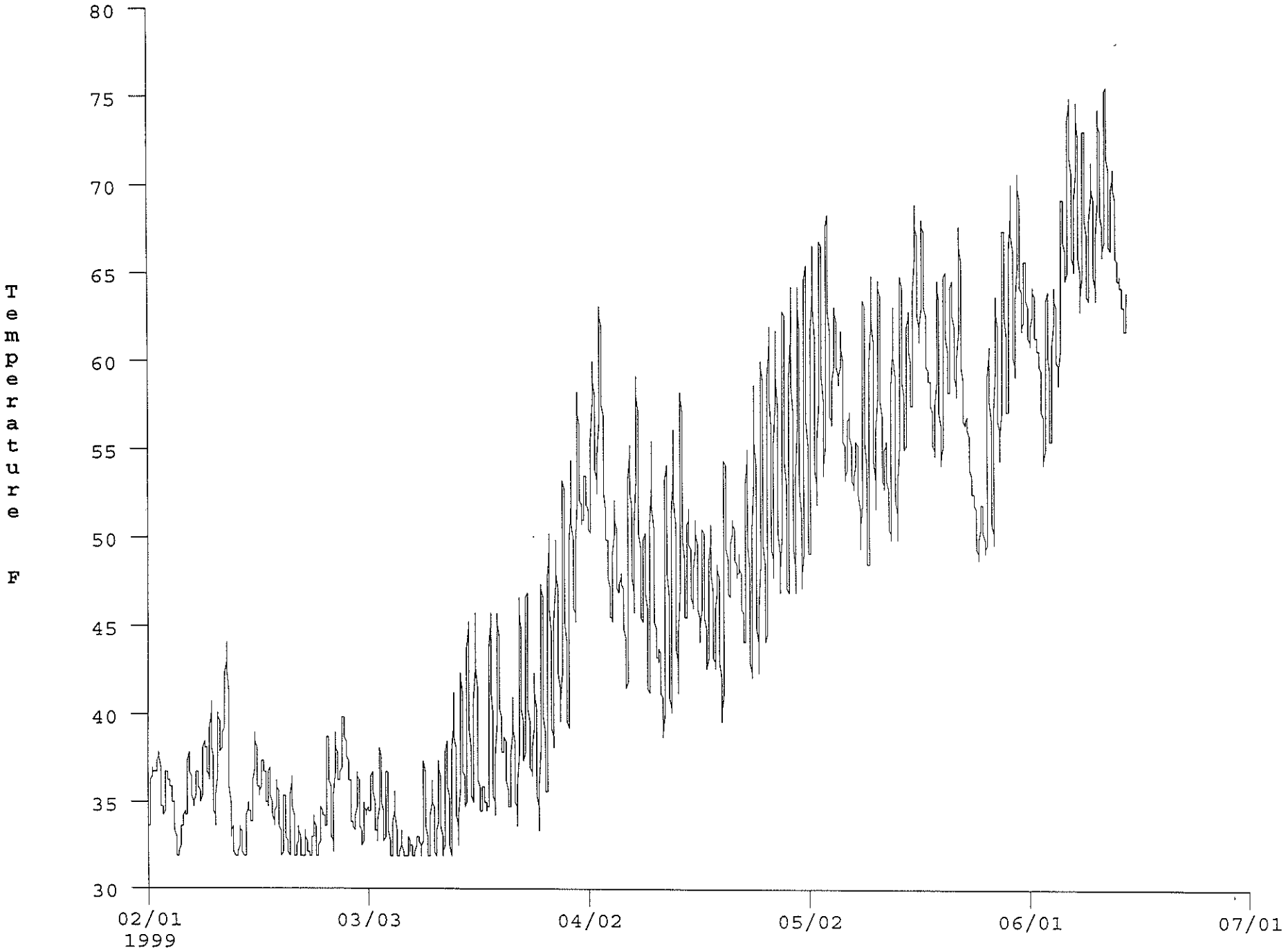
Temperature readings for South Branch at Deer Road crossing from 6/15/99 to 9/15/99.



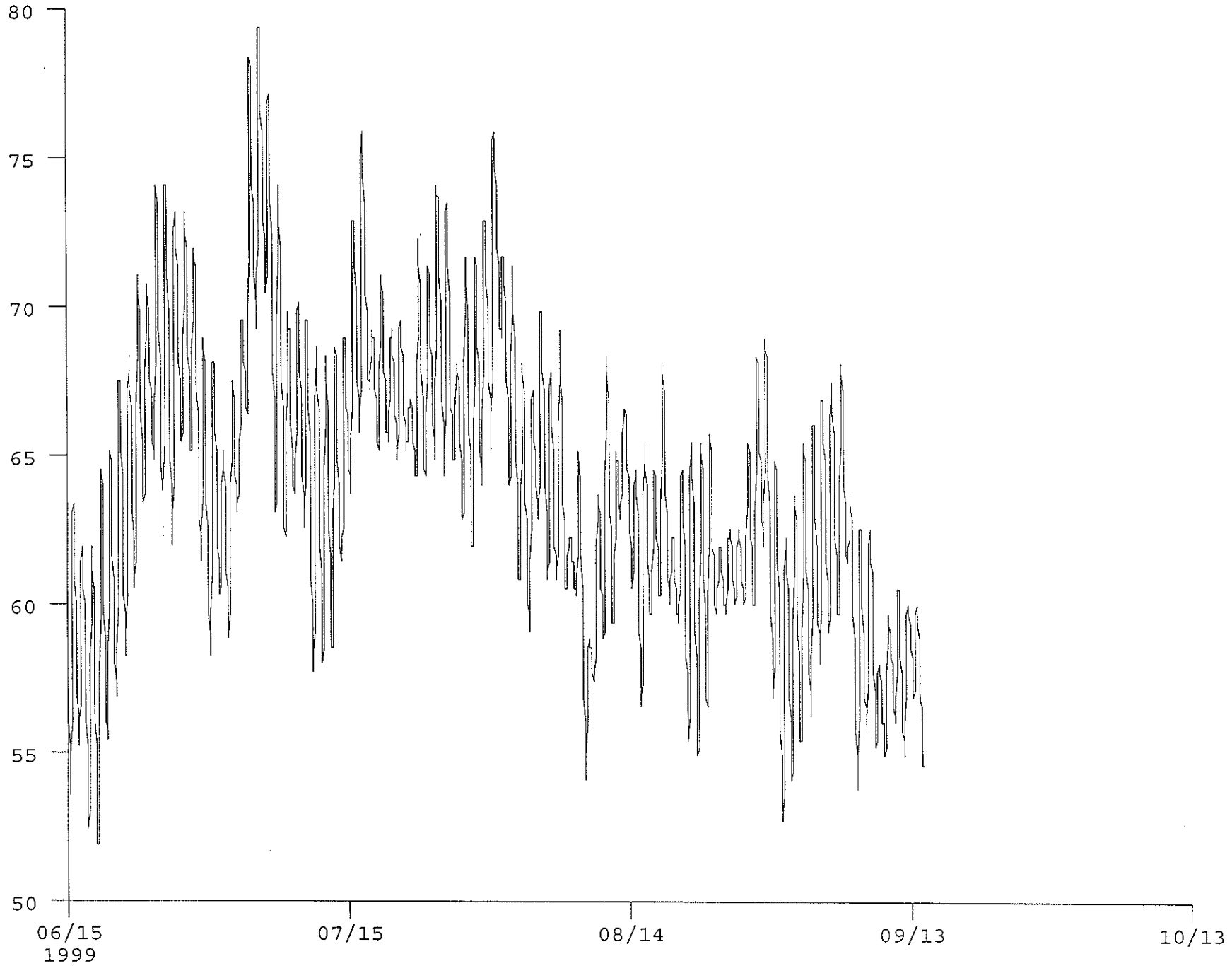
Temperature readings for South Branch, before joining Cleveland Creek, from 2/4/99 to 6/14/99.



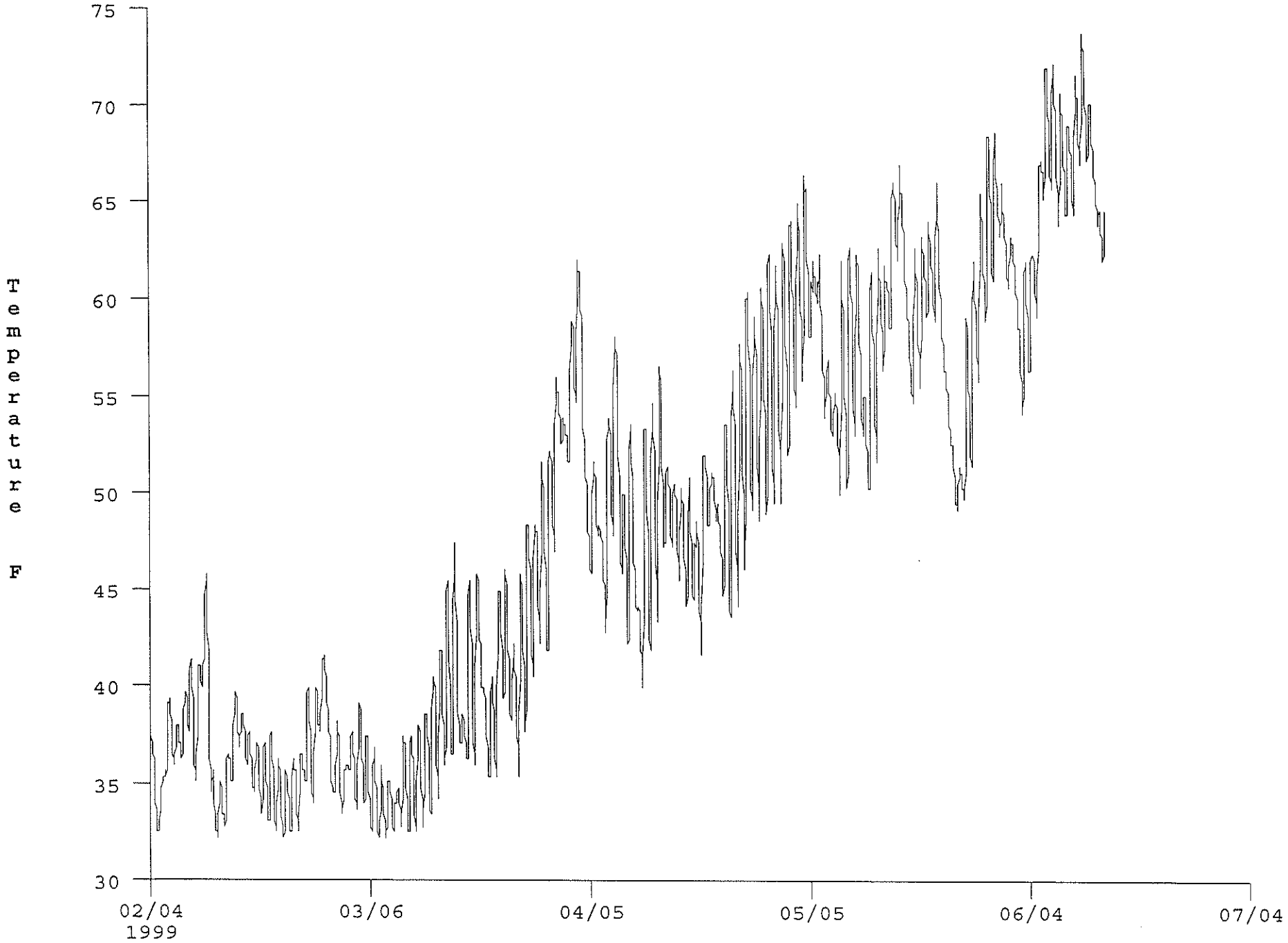
Temperature readings for South Branch, before joining Cleveland Creek, from 6/15/99 to 9/14/99.



Temperature readings for South Branch, after joining with Cleveland Creek, from 2/1/99 to 6/14/99.



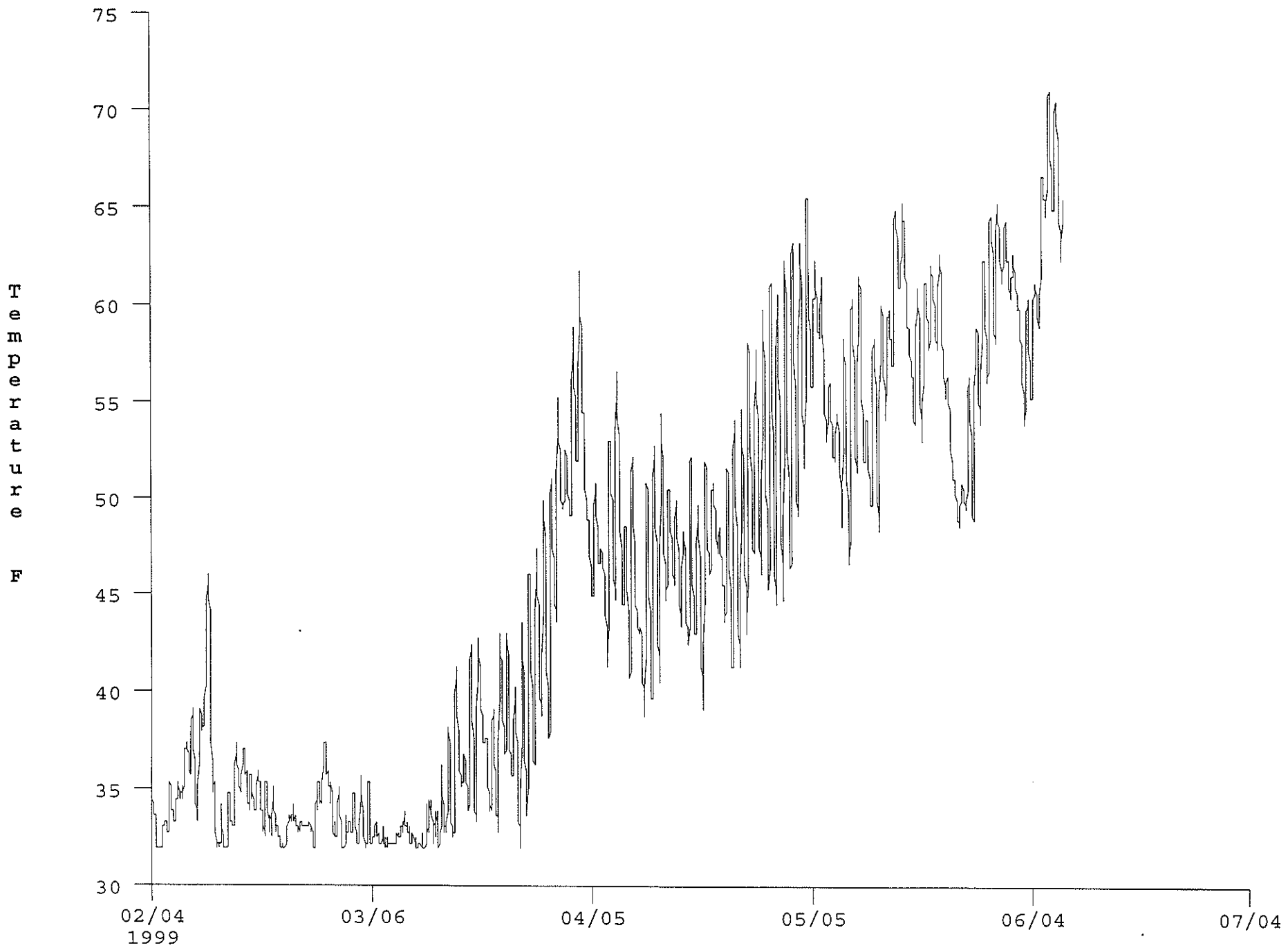
Temperature readings for South Branch, after joining with Cleveland Creek, from 6/15/99 to 9/14/99.



Temperature readings for Cleveland Creek, before joining South Branch, from 2/4/99 to 6/14/99.

No Data Recorded.

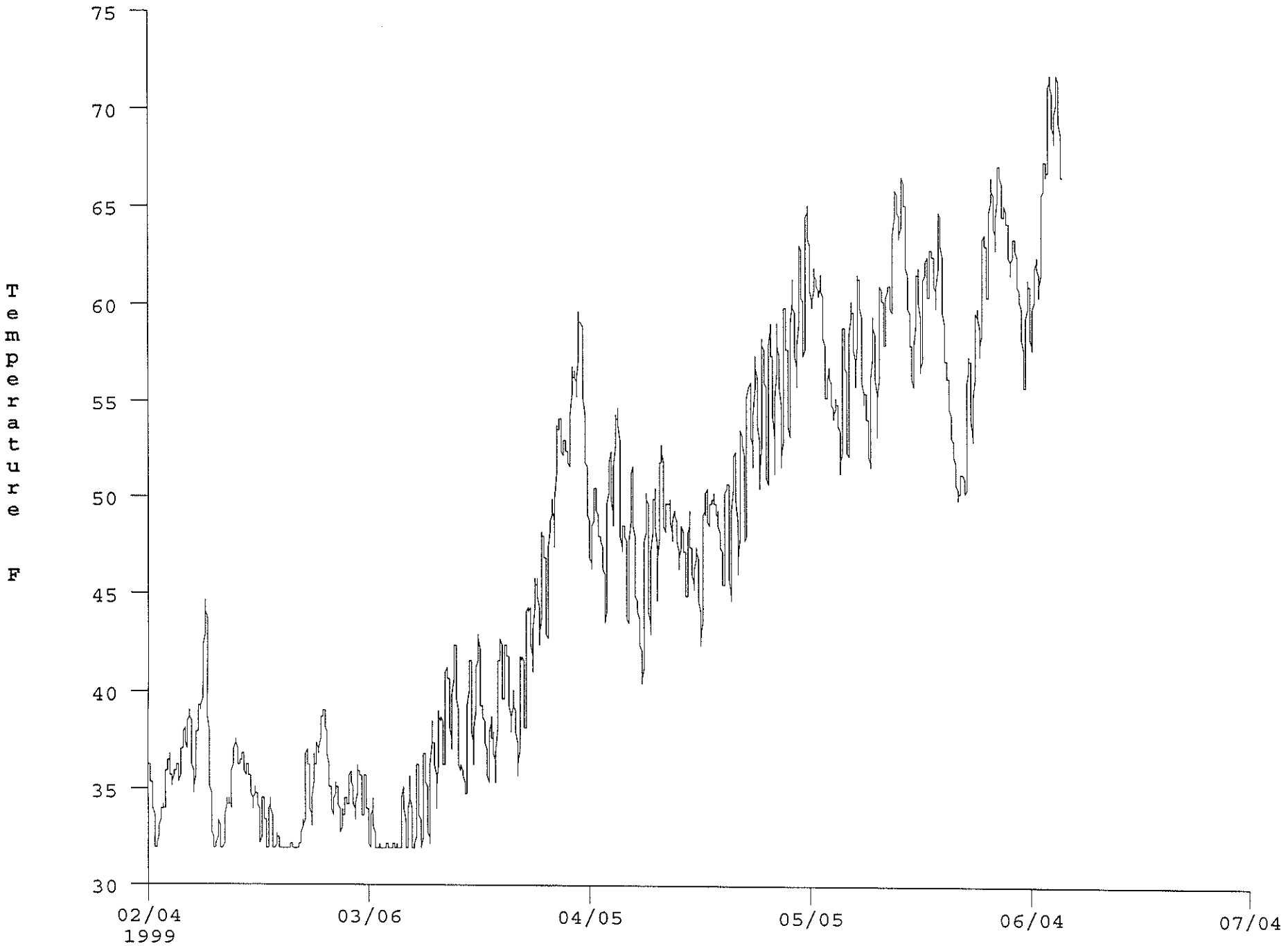
Data was not recorded for Cleveland Creek, before joining with South Branch, from 6/15/99 to 9/14/99 (Gauge Malfunction).



Temperature readings for Waldron Drain, before joining with South Branch, from 2/4/99 to 6/8/99.

No Data Recorded.

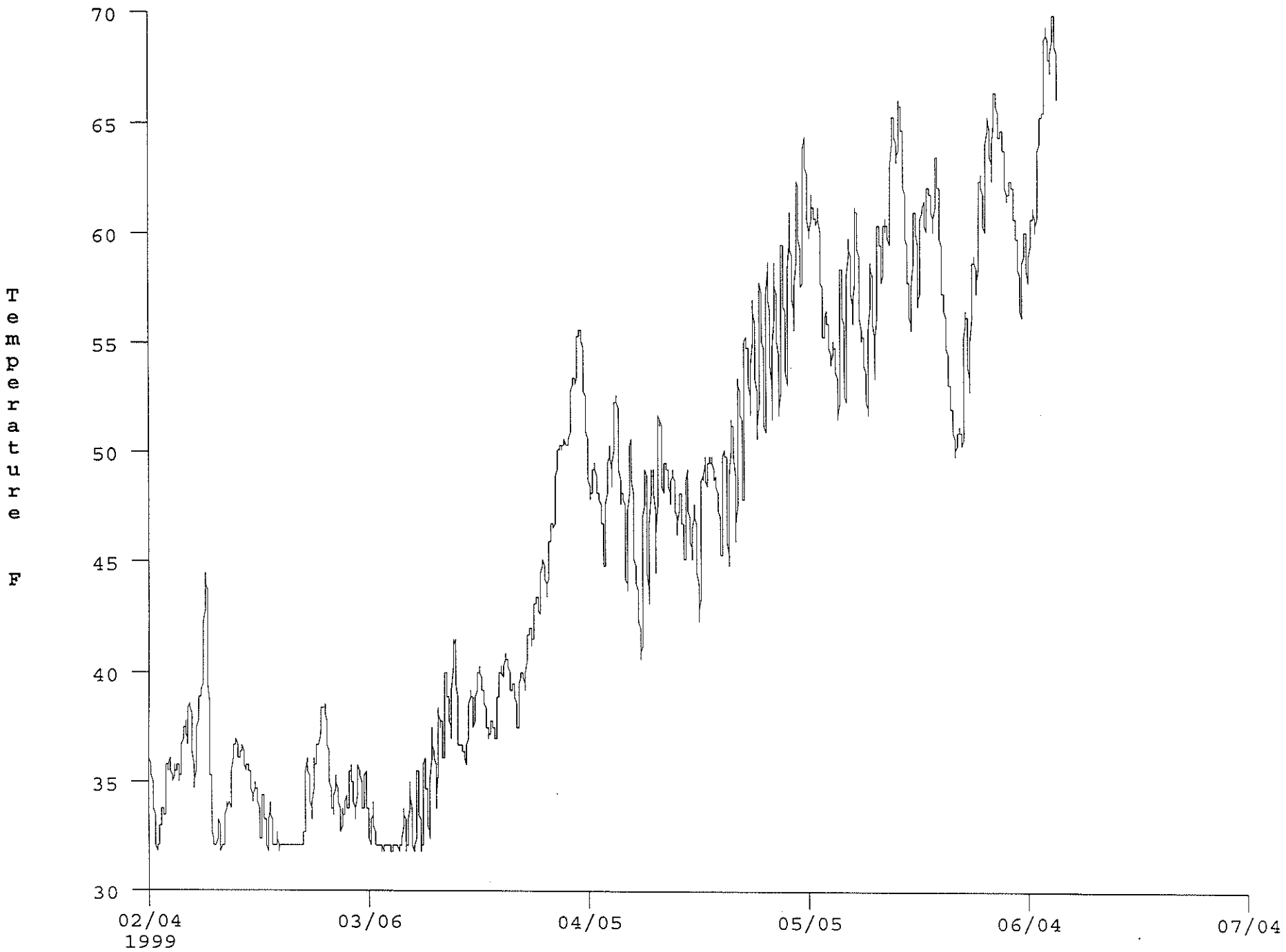
Data was not recorded for Waldron Drain, before joining South Branch, from 6/15/99 to 9/14/99 (Gauge Malfunction).



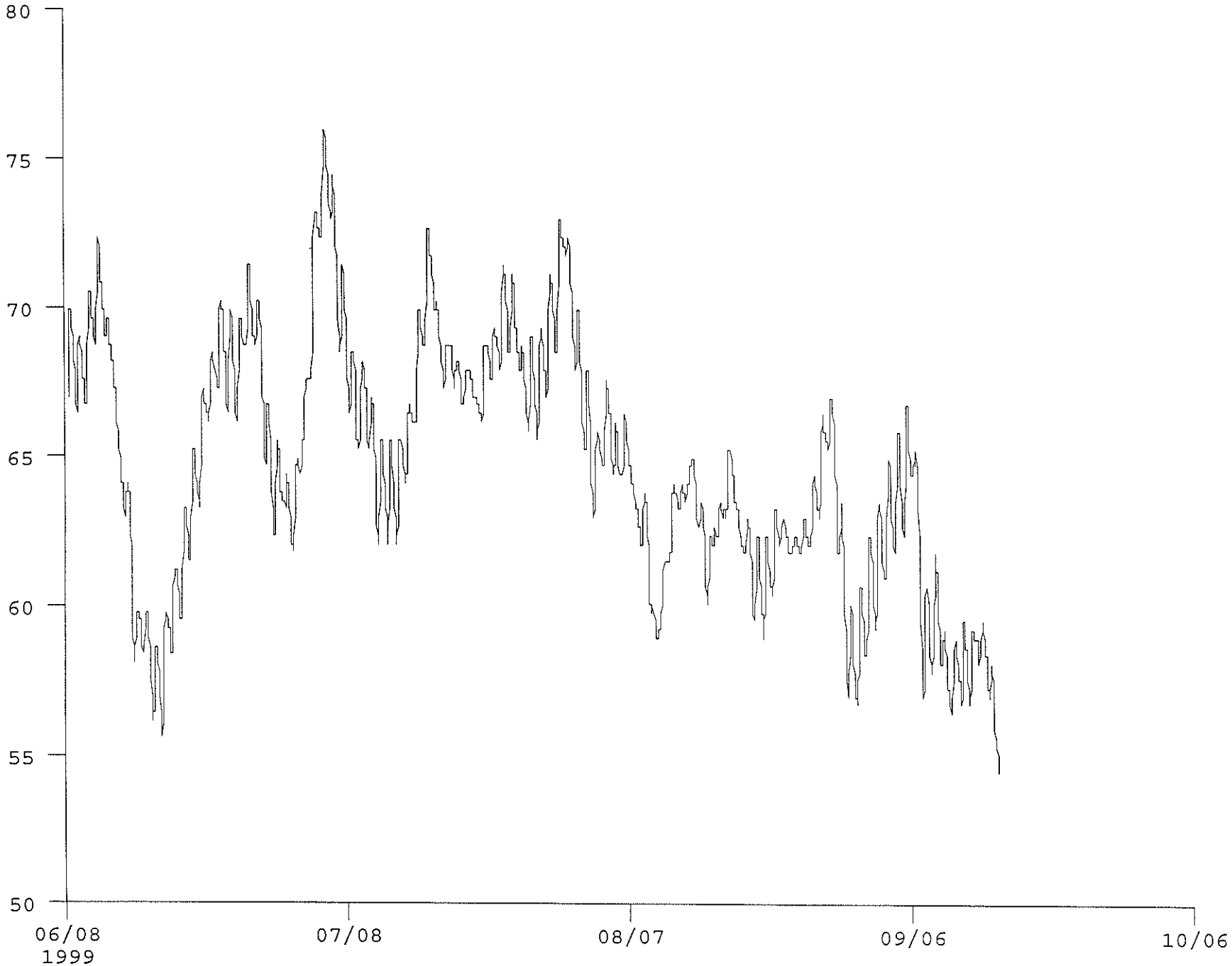
Temperature readings for South Branch, before joining with Waldron Drain, from 2/4/99 to 6/8/99.

No Data Recorded.

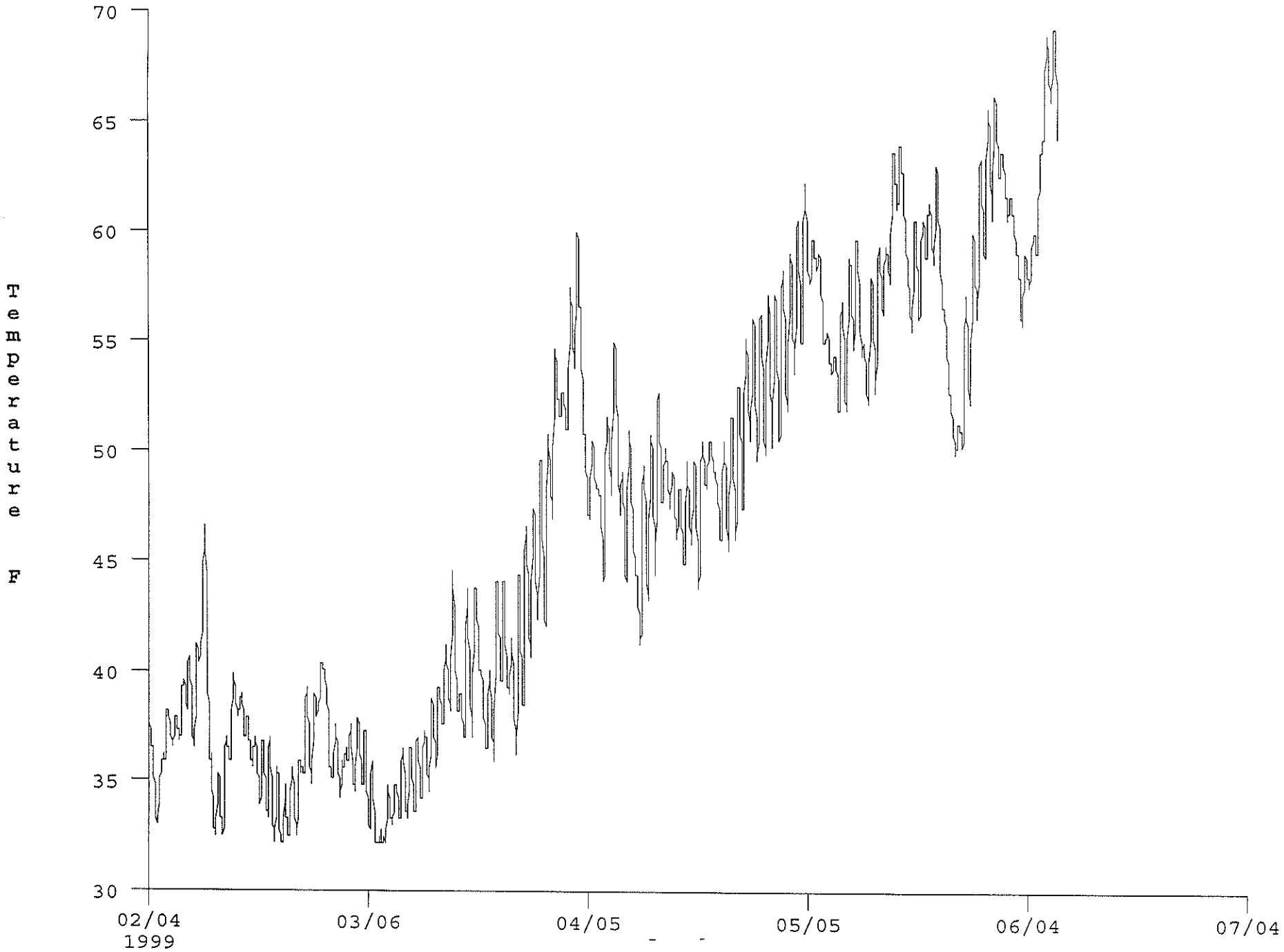
Data was not recorded for South Branch, before joining Waldron Drain, from 6/15/99 to 9/14/99 (Gauge Malfunction).



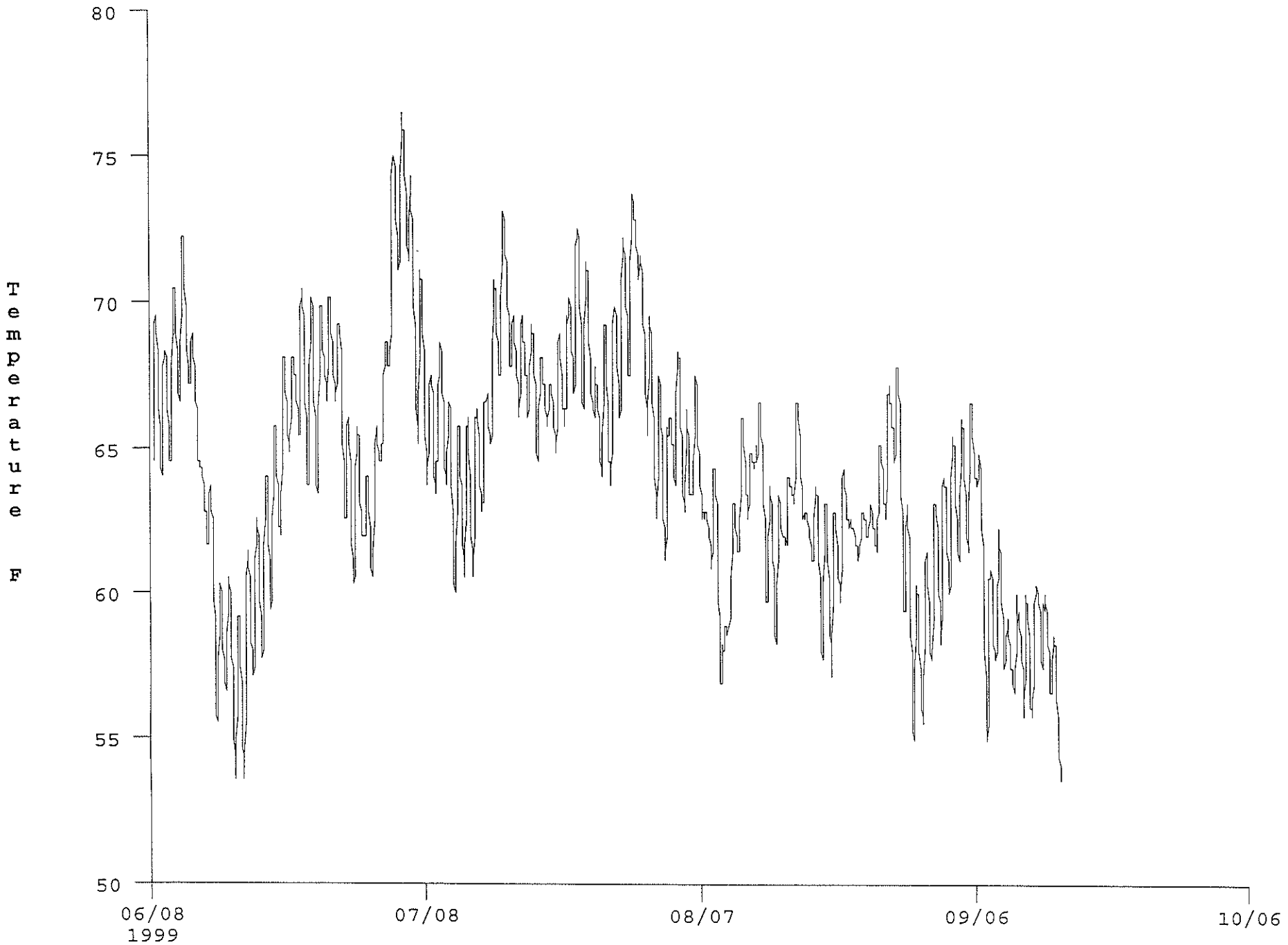
Temperature readings for South Branch, after joining with Waldron Drain and before joining with Huftile Creek, from 2/4/99 to 6/8/99.



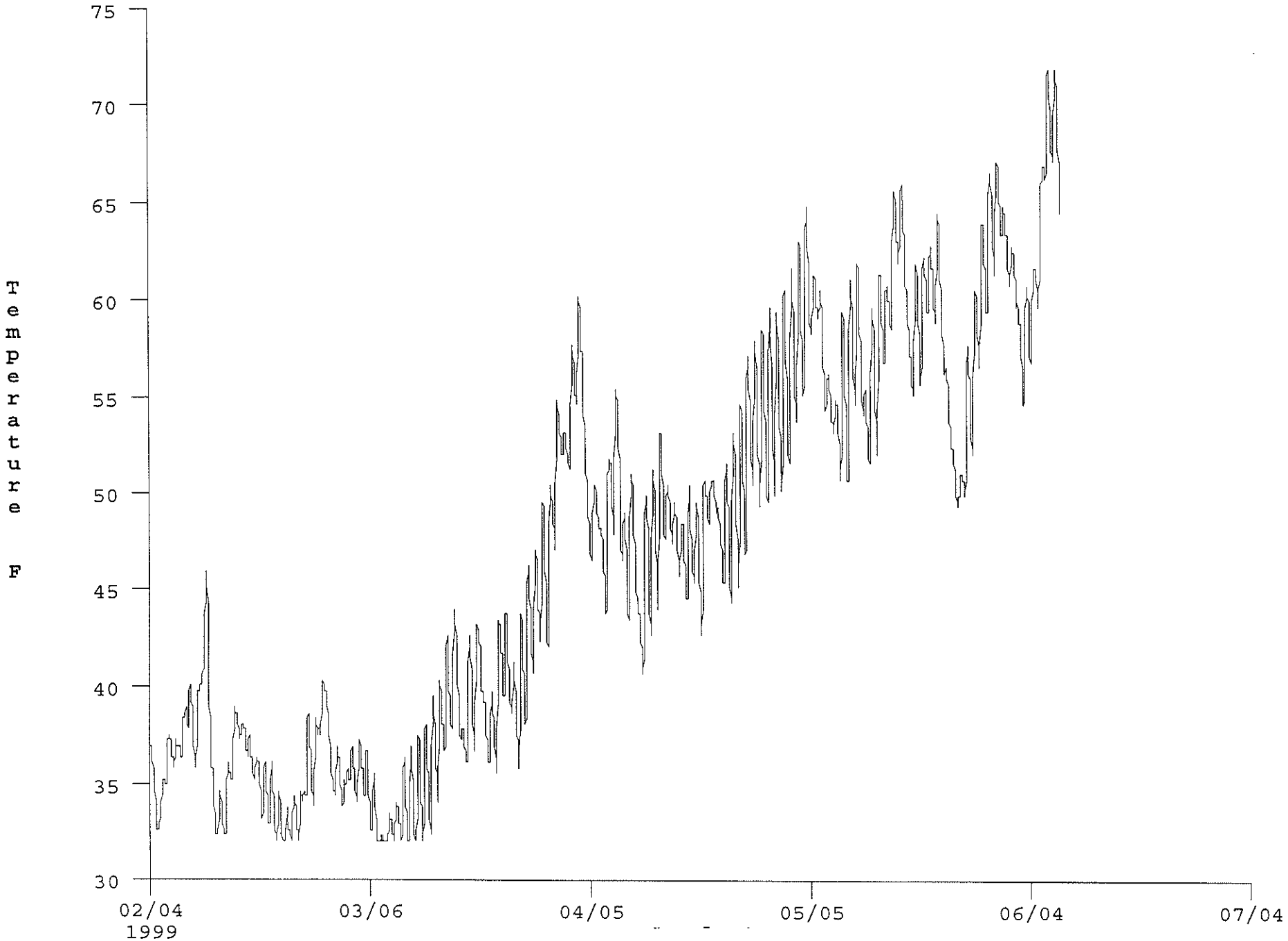
Temperature readings for South Branch, after joining with Waldron Drain and before joining with Huftile Creek, from 6/8/99 to 9/15/99.



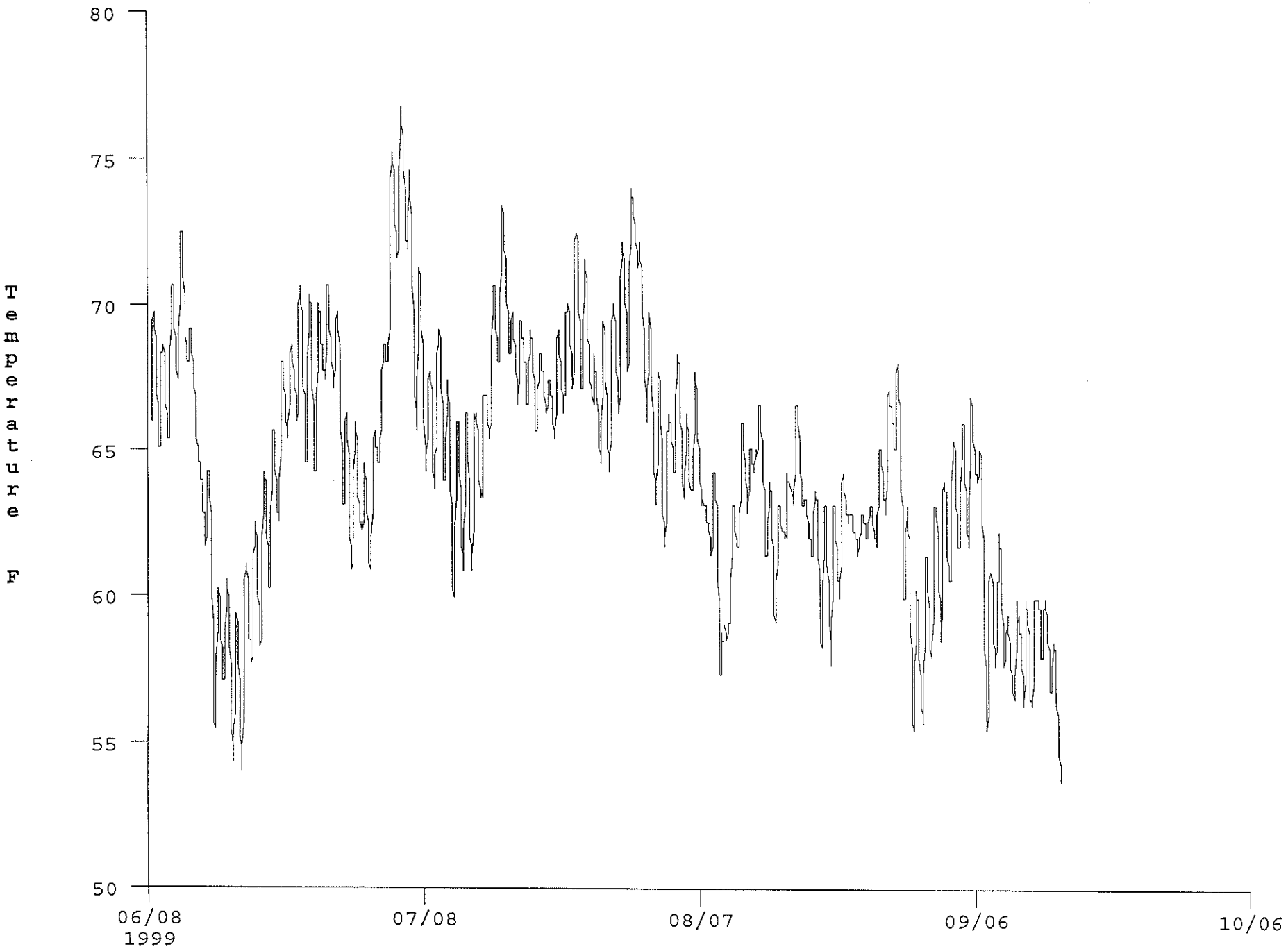
Temperature readings for Huftile Creek, before joining with South Branch, from 2/4/99 to 6/8/99.



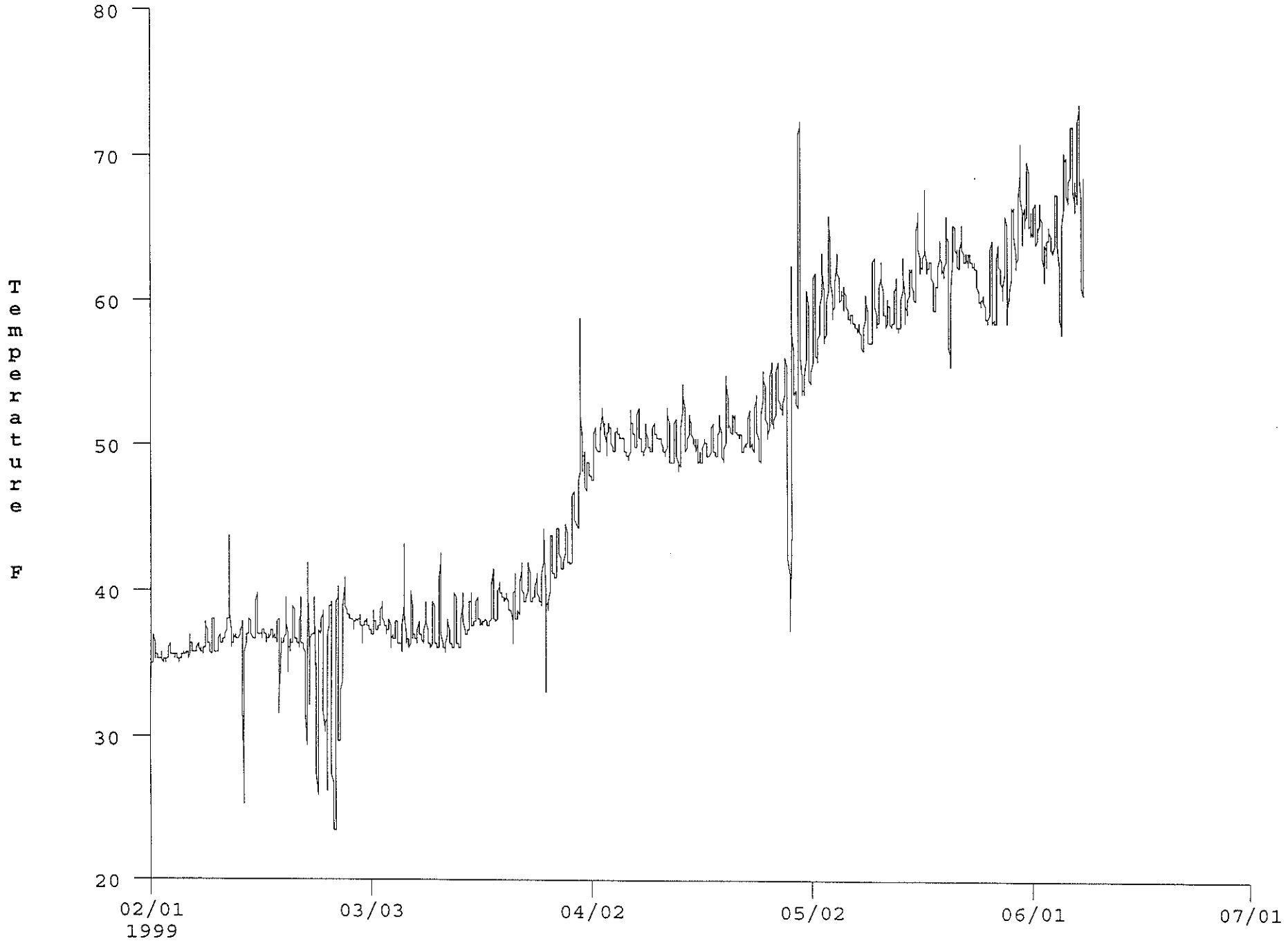
Temperature readings for Huftile Creek, before joining with South Branch, from 6/8/99 to 9/15/99.



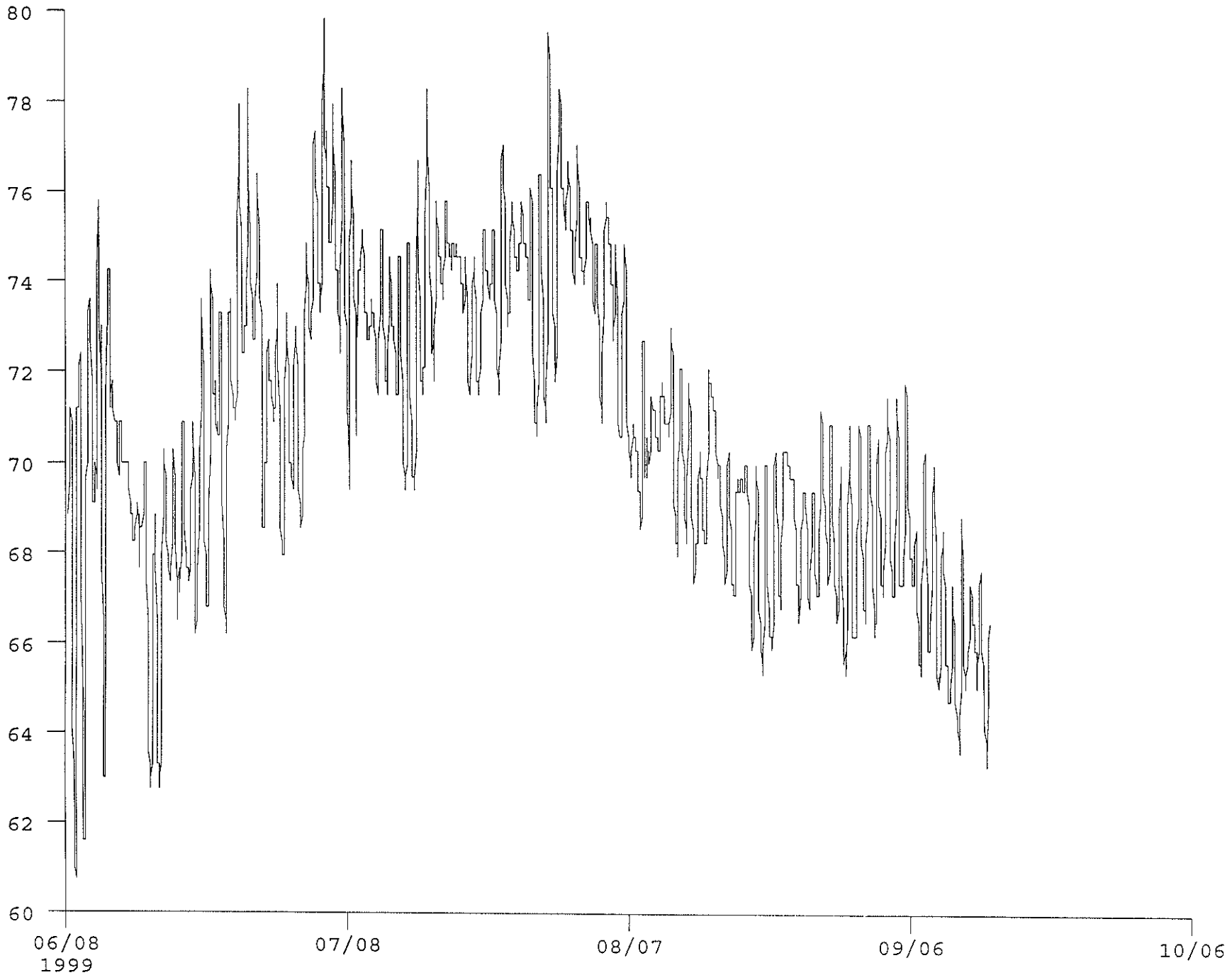
Temperature readings for South Branch, after joining Huftile Creek, from 2/4/99 to 6/8/99.



Temperature readings for South Branch, after joining Huftile Creek, from 6/8/99 to 9/15/99.



Temperature readings for South Branch at 72nd Avenue crossing from 2/1/99 to 6/8/99.



Temperature readings for South Branch at 72nd Avenue crossing from 6/8/99 to 9/14/99.

Appendix H

South Branch of the Pentwater River Watershed Survey Results

Surveys were distributed to residents containing a Hart, Mears or Pentwater address. 293 residents responded to the survey. Below are the results.

1. Are you familiar with the land area that drains into the Pentwater River?
   Yes 252 No 41

2. What are your current activities with regard to the Pentwater River Watershed?
   a. 116 Fishing
   b. 9 Irrigation of crops
   c. 64 Swimming
   d. 26 Drainage
   e. 61 Watering lawn/garden
   f. 88 Canoeing or boating
   g. 18 Drinking water for livestock or pets
   h. 106 Drinking water from well
   i. 86 Household water supply
   j. 136 Viewing wildlife/nature
   k. 72 Hunting
   l. 57 Mushrooming
   j. 4 None

3. Please provide your opinion of the overall water quality of the Pentwater River Watershed?
   Excellent 9 Good 111 Fair 62 Poor 10

4. Compare to 10 years ago, how much better or worse is the Pentwater River Watershed in the following areas?

	Much Worse	Worse	Same	Better	Much Better	No Opinion
Fishing	15	53	53	25	2	35
Hunting	2	22	61	18	5	49
Swimming	15	22	65	13	3	42
Canoeing/Boating	11	32	80	8	3	36
Observing Wildlife	3	27	76	34	9	23
Water Quality	15	37	59	25	13	24
Streambank Erosion	11	30	60	14	1	45
Littering	19	48	64	28	6	29
Drinking Household Supply	6	15	82	5	1	46

5. Rank the following sources according to their degree of importance, where you think most of the problems originate in the watershed?

		High	Medium	Low
a.	Faulty septic systems	70	66	41
b.	Household chemicals	27	68	63
c.	Storm water runoff	51	71	47
d.	Soil erosion from farmlands	58	69	50
e.	Livestock access to streams	30	56	80
f.	Construction site erosion and runoff	29	60	78
g.	Agriculture fertilizer pesticides & other chemicals	101	55	20
h.	Lawn & garden fertilizer, pesticides and other chemicals	92	57	26
i.	Abandoned underground fuel tanks	28	41	96
j.	Soil erosion from road crossings	22	71	76
k.	Urban sprawl	54	51	71
l.	Factories	18	28	113
m.	Pond development along streams	5	39	107
n.	Excavation/clear cutting along drains	29	57	73
o.	Invasive species (plants/animals)	67	61	43

6. Is there a specific problem affecting the watershed that is of greatest concern to you?

Yes 116 No 84 .

Concerns include:

Brush/trees in creek	12 .
Erosion	14 .
Tree cutting/Development along streams	15/41 .
Contaminated drinking water	21 .
Landfill	16 .
Others	* .
All	2 .

*

Invasive plants and animals	8 .
Seaweed/algae in Pentwater Lake/River	7 .
Farm runoff	5 .
Fertilizer	4 .
Septic tanks on lake	4 .
Homes too close to water	2 .
Disappearance of frogs	2 .
Lawn and garden chemicals	2 .

Other concerns include: high iron, RV park, less ducks, more geese and swans, irrigation, sea walling, siltation, bank erosion below dam, lack of cows make brush too thick, up and down water level below dam, no setback requirements streamside, runoff into Hart Lake and illegal dumping.

7. Rate your level of concern for the water quality of the Pentwater River and its tributaries?

Very Concerned 69 Concerned 69 Somewhat Concerned 61

Not At All Concerned 14 .

8. Please indicate your watershed priorities on each of the following issues:

	High Priority	Moderate Priority	Low Priority	Not A Priority
Planning Development	106	71	15	13
Environmental Education	99	80	17	6
Farmland Preservation	99	76	19	7
Hunting and Fishing	90	63	29	10
Land Owners' Rights	108	58	19	5
Parks and Recreation	51	94	37	9
Preserving Woodlands	117	55	9	10
Preserving Wetlands	120	46	20	7
Recycling	100	66	18	11
Water Quality	161	29	1	2
Wildlife Preserves	87	59	28	13
Invasive Species Control	101	55	22	12

9. Who do you think is responsible for protecting the Pentwater River Watershed? Circle all that apply?

1. Citizens 179 2. Local Government (twp., village, etc.) 155 .
3. State Government 130 4. Federal Government 69 .

10. If cost were not a factor, of the following management practices, which ones Would you like to learn more about for your property? Circle all that apply.

a. Conservation tillage, crop residue management 26
b. Grassed waterway 23
c. Managing riparian (streamline) area 50
d. Animal waste management 23
e. Pasture management 22
f. Wildlife habitat management/wetland restoration 81
g. Integrated crop management 11
h. Structures for erosion or water control 42
i. Septic system maintenance 70
j. Composting 44
k. Lawn care 52
l. Invasive species control 85

11. Would you volunteer your services to help this project; such as stream monitoring for aquatic insects or river cleanups?

Yes 58 No 24 Depends 118

12. Where do you look to find reliable information about water quality and protection Practices? Circle all that apply.

Local Newspapers	111
TV/Radio	50
University or Extension Services	77
Magazines	42
Local Organizations	73
Workshops/Seminars	18
FSA/NRCS/Soil Conservation	66

13. Where do you live?

Farm	32
Rural, non farm	101
Within village limits	76

14. How many acres do you own?

20 or less	159
21-100	33
more than 100	11

15. How many people live in your household?

1-2	165
3-4	35
5 or more	9

16. What is your age?

Under 25	2
26-35	10
36-45	15
46-55	41
Over 55	143

17. What is your occupation?

Retired	123
Teacher	10
Farmer	14
Business	37
Other	35

Appendix I

Pentwater Lake Association
6152 W. Longbridge Rd.
Pentwater, MI 49449
(616) 869-4808

May 17, 1999

Oceana Conservation District
1064 Industrial Park Dr.
Shelby, MI 49455

Attention: Mr. Rick Pitts, Project Manager

Dear Rick:

As you know the Pentwater Lake Association has endorsed the Pentwater River Water Watershed Project since its proposal stage. We strongly endorse the project and our membership has participated consistently in this most worthwhile project.

You also know that there is strong support in the community. While we would like greater participation, and will continue to work to achieve that, there has been consistent participation by all of the significant stake holders within the project.

We are confident that the watershed project will achieve its goals including the diminution, if not elimination, of point source and non-point source pollution, while at least preserving, if not improving, water quality, bio-diversity, habitat protection and rallying a community together to achieve these worthwhile environmental objectives. Likewise, while preserving the environment, we can protect economic interests and grow the economy consistent with the preservation and enhancement of the environment.

We will continue to work with you and the Watershed Project to achieve these goals and objectives. If anything further is desired to not hesitate to contact me. Thank you.

Sincerely,

Bob Shrauger

MICHIGAN STATE
UNIVERSITY
EXTENSION

July 7, 1999

Michigan Department of Environmental Quality
Surface Water Quality Division
P.O. Box 30273
Lansing, MI 48909

Dear MDEQ:

I am writing to you in support of the South Branch of the Pentwater River Project in Oceana County. As County Extension Director of Oceana County, I have worked closely with the Project Manager, Mr. Rick Pitts, and have served as an advisor to the Steering Committee during its goal setting process.

The South Branch of the Pentwater River is a valuable resource to the farmers of Oceana County, serving as a major source for irrigation water and as an integral part of our agricultural drainage system. The farmers in the watershed are very much interested in protecting these uses and in insuring that the River continues to be a quality resource for recreation and other non-farm uses. During the last twenty years, agriculture in the watershed has made a number of changes that have benefited the river system including lowering fertilizer rates, institution of Integrated Pest Management (IPM) practices, adoption of cover crops and reduction of tillage.

Many of our education programs have water quality and soil stewardship as their major focus. We look forward to continuing and enhancing these educational efforts as part of this project.

Sincerely,

Norm Myers
Oceana County Extension Director

NM/kw

OCEANA COUNTY

Cooperative
Extension Service

210 Johnson
Hart, Michigan
49420
616/873-2129
FAX: 616/873-3710

Oceana Conservation District
1064 Industrial Park Drive
Shelby, Michigan 49455
Phone 231-861-4967

June 14, 1999

Rick Pitts, Watershed Planner
Oceana Conservation District
1064 Industrial Park Drive
Shelby, MI 49455

Dear Rick:

As co-sponsor of the Pentwater River Watershed Project, the Oceana Conservation District fully supports the implementation grant proposal. This project addresses the District's highest priority of maintaining and/or improving water quality in Oceana County. The current participation from landowners, agencies and other interested groups has made this project successful and exciting.

The District will support the project by providing the use of any necessary equipment. Collaboration with the District's other technical programs will also allow for a greater impact in improving the water quality of the watershed. We will participate in the project through committees, workshops and any other activities.

Again, with the success of the Pentwater River Watershed Project through its planning stages, we support the approval of the implementation grant.

Sincerely,

Craig Zeerip

Craig Zeerip
Chairman

Oceana Conservation District
1064 Industrial Park Drive
Shelby, Michigan 49455

May 30, 1999

Gentlemen:

As a volunteer for the Pentwater Watershed Project Project I have found this project both interesting and rewarding. I continue to donate my time because I feel that public awareness and education are the key to maintaining the balance that must exist between modern society and the ever increasing fragility of the ecosystem.

The Oceana Conservation District has been very knowledgeable and helpful in training new volunteers to reach their goal of monitoring the health of the Pentwater River Watershed. After performing some additional training for the boys in his Scout Troop, my son Ryan took the troop into the field for one sampling last fall and then wrote the results up as part of his Eagle Project for the Boy Scouts. The study provided not only valuable data for the Conservation District, but provided the opportunity for my son to develop his leadership skills, and the other boys to be exposed to the concept that one person can, indeed, make a difference in the world we live in. And we had a great time, too!

Thank you for the opportunity to be of service.

Sincerely,

Paul O'Grady

Paul O'Grady

May 24, 1999

Oceana Conservation District
1064 Industrial Park Drive
Shelby MI 49455

Attn: Rick Pitt

Dear Mr. Pitt:

The City of Hart's Wastewater Treatment Plant supports the Pentwater River Watershed Project. Once the the project is complete we can use the data to better serve the needs of the wastewater treatment plant. We believe the first step to protecting the water resources is education. We have a beautiful and healthy watershed today. With pojects like yours we shall be able to maintain the watershed for futher use and enjoyment.

Sincerely,

Robert Keller
Superintendent
City of Hart
Wastewater Treatment Plant

Phone (616) 869-6231

Fax (616) 869-4340

Township of Pentwater

327 Hancock Street
P.O. Box 512
Pentwater, Michigan
49449

May 12, 1999

Oceana Conservation District
1064 Industrial Park Dr.
Shelby, MI 49455

We are very pleased with the endeavors of the Oceana Conservation District's staff and volunteers in the Pentwater River Watershed Project.

The Pentwater Township Board wholeheartedly supports the efforts of the Pentwater River Watershed Project in their effort to preserve and protect one of our community's natural resources for future generations.

Regards,

Daniel Ellinger
Supervisor

Barbara Burke
Clerk

Janice Siska
Treasurer

Terry Cluchey
Trustee

Mike Flynn
Trustee

HART TOWNSHIP
OCEANA COUNTY
MICHIGAN

3234 LEVER ROAD
P.O. BOX 740
HART, MI. 49420
PHONE (616) 873-2734
FAX (616) 873-0711

May 26, 1999

Mr. Rick Pitts
Oceana Conservation District
1064 Industrial Park Drive
Shelby, MI 49455

Dear Mr. Pitts:

The Hart Township Board is pleased with the Pentwater River Watershed Project, and is in total support of this worthwhile project.

The prospect of a clean and productive watershed will, undoubtedly, be an asset to our community.

Sincerely,

Tim Tariske

Tim Tariske
Hart Township Clerk

TT/ms

Theodore A. Borgeld
P.O. Box 629
Hart, Michigan 49420

May 25, 1999

Oceana Conservation District
1064 Industrial Park Drive
Shelby, Michigan 49455

Oceana Conservation District:

As a member of Trout Unlimited and a resident of Oceana County I am pleased that there has been implementation of a Watershed Committee for the Pentwater River. I realize it takes a great deal of effort and community support to make a project of this sort successful. Your committee should be proud of their present actions to organize, investigate and work to protect this valuable public resource.

I hope the Department of Environmental Quality continues funding and helps in implementation of additional possibilities regarding your efforts.

Keep up the good work!

Sincerely,

Ted Borgeld

Spring Lake Public Schools

345 Hammond Street
Spring Lake, MI 49456-2096

Central Office: (616) 846-5500
Superintendent: (616) 847-7919
Fax: (616) 846-9830

May 18, 1999

Oceana Conservation District
1064 Industrial Park Dr
Shelby MI 49455

To Whom It May Concern:

The Adopt•A•Stream program is pleased to work with the Pentwater River Watershed project. This is the third 319 program that Adopt•A•Stream has been involved with and I have found all of them to have a positive effect on the environment.

The Adopt•A•Stream program has done one bank stabilization with the Pentwater project so far this spring and will schedule several more for the fall.

I feel the staff members have a good handle on the watershed's major problems, and a good plan to attack them.

I will be pleased to organize volunteers to help the watershed meet their goals in the future.

Sincerely,

Dan Parker

Dan Parker, Coordinator

Oceana Conservation District
1064 Industrial Park Drive
Shelby MI 49455

May 18, 1999

To Whom It May Concern,

Since the implementation of the Pentwater River Watershed Project I have witnessed an extraordinary cooperation between various community members (business owners, retirees, farmers, men, women, young and not so young) for the common purpose of protecting our Pentwater River Watershed.

In the beginning I had my reservations about how this committee would work, as often times special interests clash. However, since we've been meeting, we've all been able to see one another's point of view a little clearer. I would like to offer my support on behalf of this worthwhile project.

Thank you for including the Pentwater River Watershed Project in your future plans.

Sincerely,

Stan Hallack

Stan Hallack
Certified Crop Advisor
Self-employed Farmer

P.O. Box 168
Hart MI 49420
(616) 873-7141

Oceana County EDC

May 17, 1999

Oceana Conservation District
1064 Industrial Park Dr.
Shelby MI 49455

To Whom It May Concern:

The Oceana County Economic Development Corp. (EDC) firmly supports an ongoing Pentwater River Watershed Project, through the current Title 319 Grant, and beyond, on a permanent basis. A clean and healthy watershed is vital to the economic development and quality of life of the entire area. Improving a watershed is one thing EVERYONE can agree on, and is a strong community builder. Each of us has a stake, and it is a reminder we are all connected by water

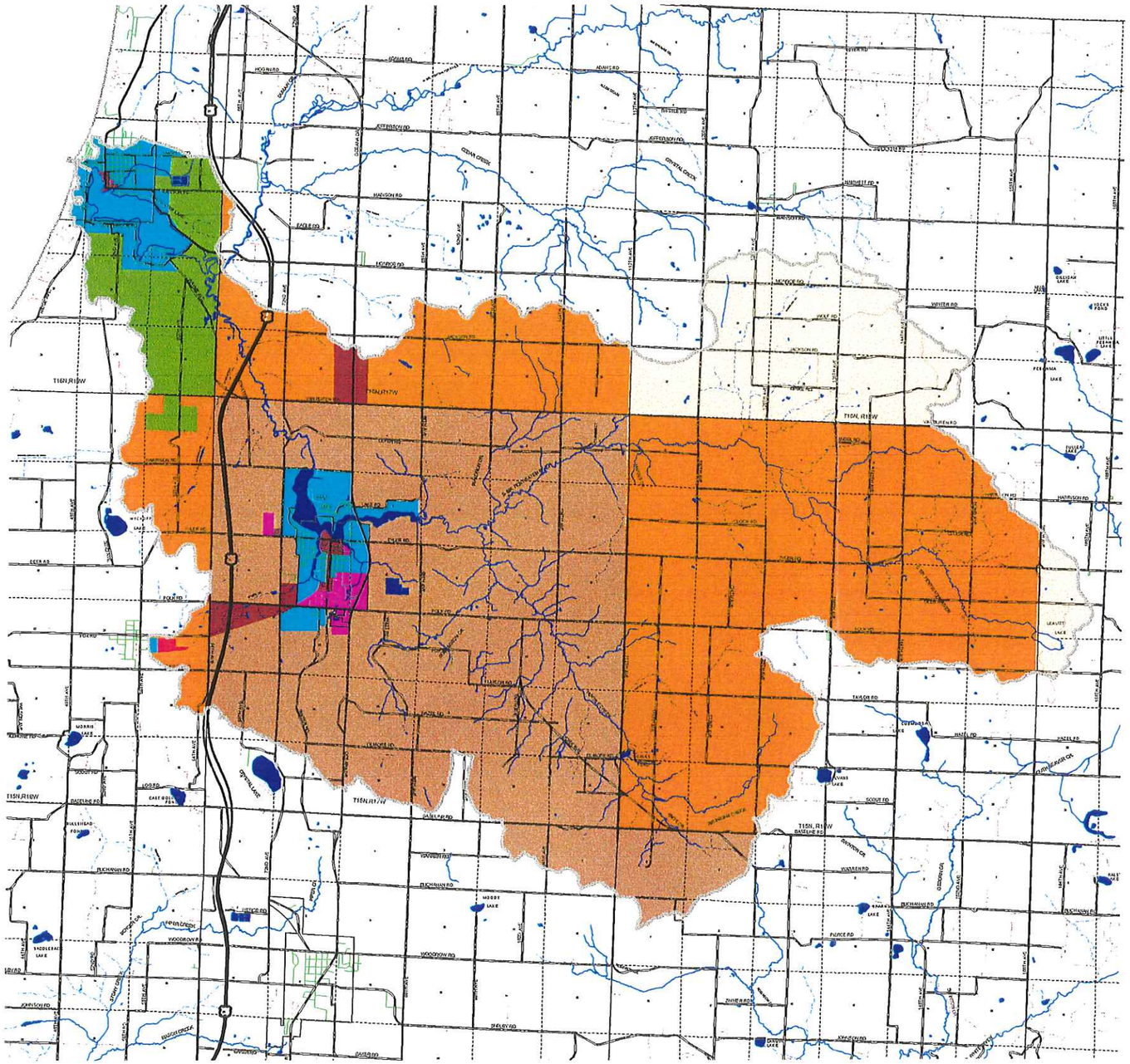
Sincerely,

Ron Steiner
Executive Director
Oceana County EDC

Appendix J

Zoning Districts

South Branch Pentwater River Watershed



Base Information

- Watershed Boundary
- State/Federal Highways
- County Roads
- Minor/Residential Roads
- Lake Michigan Shoreline
- Township/City/Village Limits
- Section Lines
- Rivers/Streams
- Lakes/Ponds
- Drains/Intermittent Streams
- Two Tracks

Zoning Districts

- Agriculture
- Agricultural/Residential
- Residential
- Commercial
- Commercial/Industrial
- Industrial
- Forestry/Recreation
- No Zoning
- Water

DEFINITIONS:

Ferry Township: 1997 (master plan in process)
Golden Township: 1997
City of Hart: 1982 (zoning ordinance being updated)
Hart Township: 1998
Village of Pentwater: 1994
Pentwater Township: 1973 (zoning ordinance being updated)
Weare Township: 1989
Shelby Township: 1989 (zoning ordinance being updated)
Elbridge Township: Zoned Agricultural/Residential (1 residence/acre)
Crystal Township: No zoning (land division ordinance)
Leavitt Township: No zoning

Note: Zoning district categories have been generalized for purposes of presentation.

N
W E
S

1 0 1 2 3 Miles

1:75000

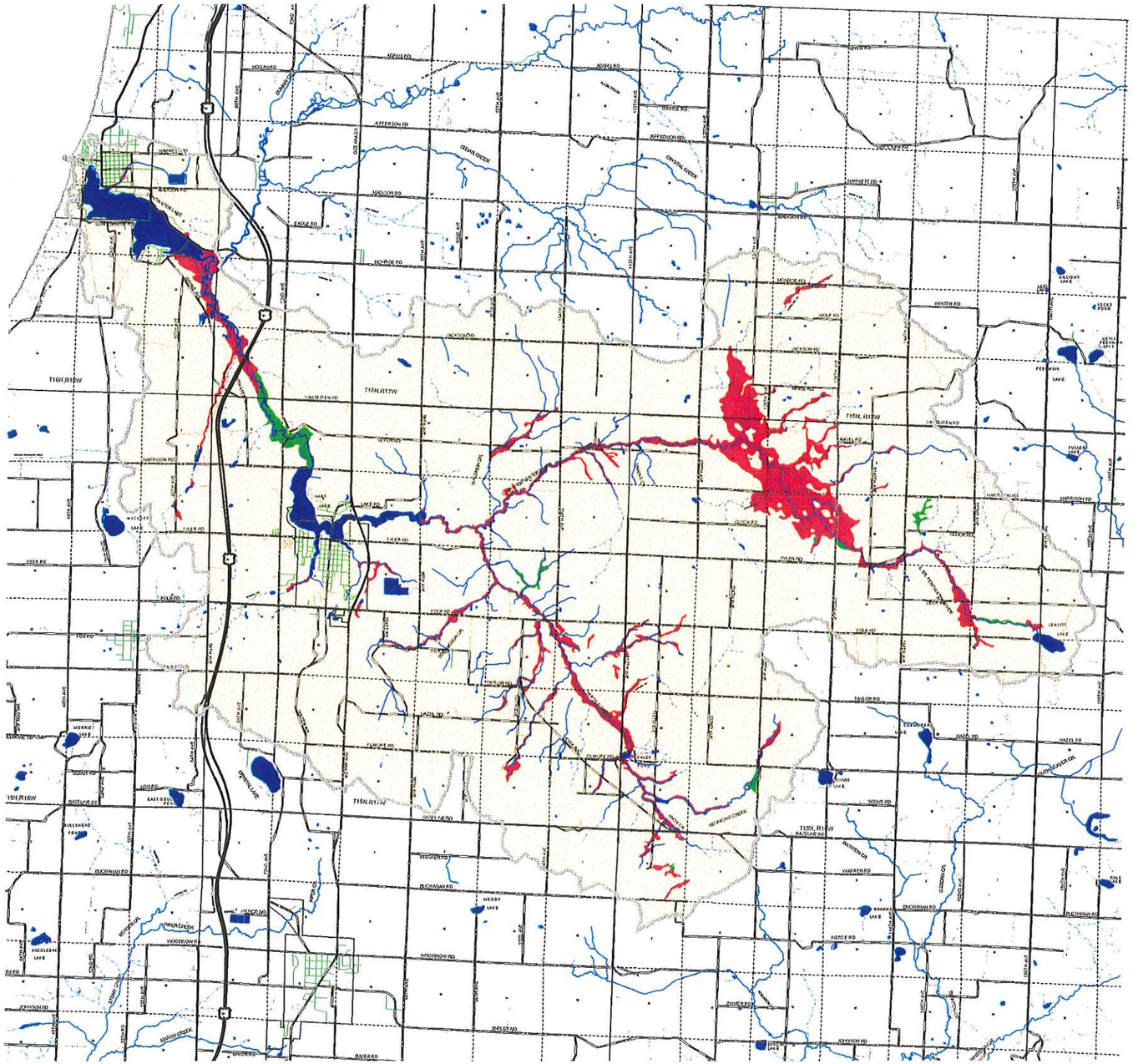
Data Sources
Base Information: Michigan Department of Natural Resources, MIRIS, 1978.
Zoning Information: West Michigan Shoreline Regional Development Commission and individual townships.

Robert B. Annis Water Resources Institute
Information Services Center
Grand Valley State University

Map Prepared: July 1999

Figure 19

Appendix K



Flooding Frequency

South Branch Pentwater River Watershed

Base Information

- Watershed Boundary
- State/Federal Highways
- County Roads
- Minor/Residential Roads
- Lake Michigan Shoreline
- Township/City/Village Limits
- Section Lines
- Rivers/Streams
- Lakes/Ponds
- Drains/Intermittent Streams
- Two Tracks

Flooding Frequency (Based on Soils)

- Frequent
- Occasional
- None
- Water

N

W E

S

1 0 1 2 3 Miles

1:75000

Data Sources
Base Information: Michigan Department of Natural Resources, MIRIS, 1978.
Soils Information: Soil Survey of Oceana County, Michigan, Issued April 1996.
USDA Natural Resources Conservation Service and Forest Service.

Robert B. Annis Water Resources Institute
Information Services Center
Grand Valley State University

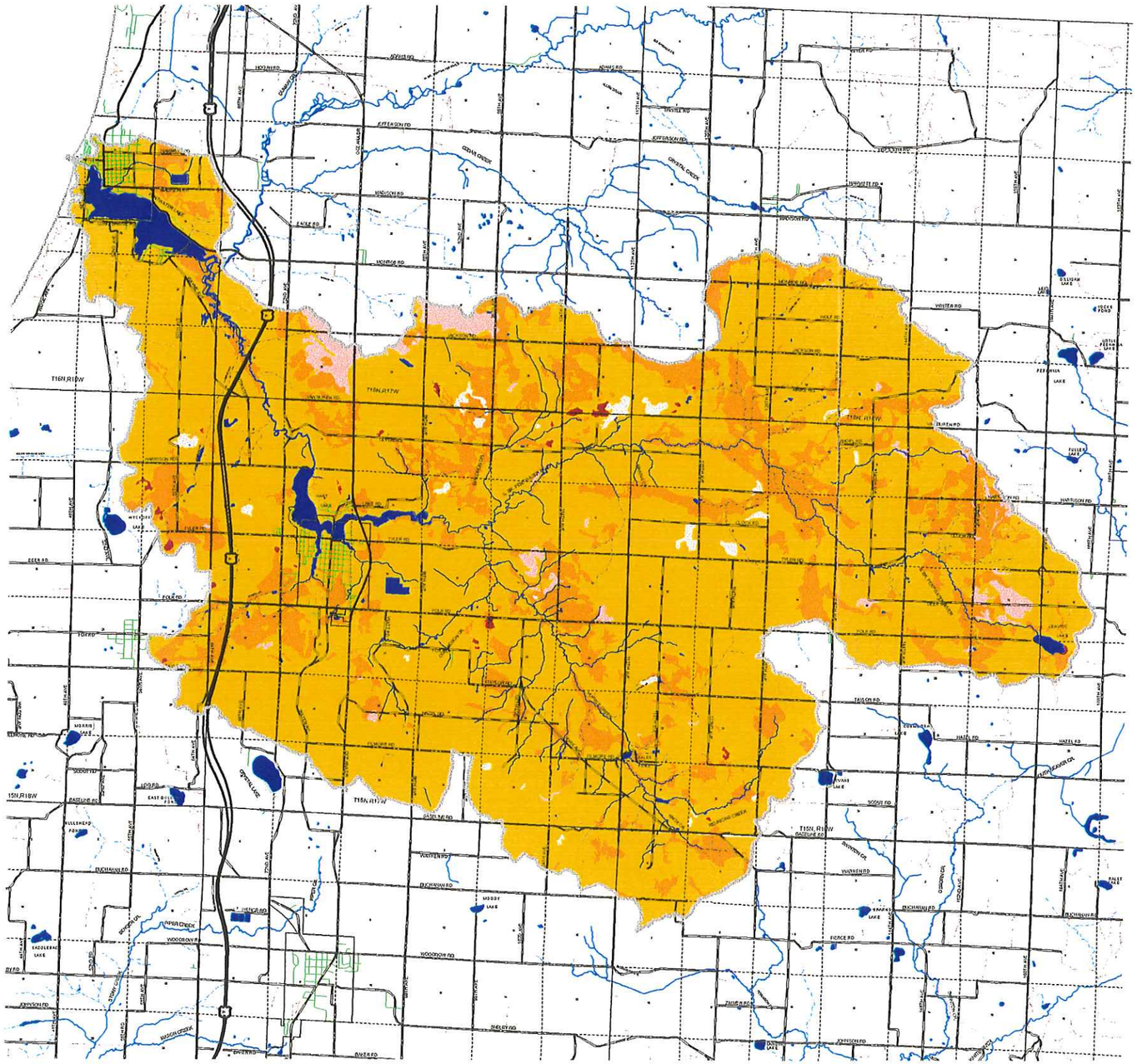
Map Prepared: July 1999

Figure 20

Appendix L

Erosion Factor T

South Branch Pentwater River Watershed



Base Information

- Watershed Boundary
- State/Federal Highways
- County Roads
- Minor/Residential Roads
- Lake Michigan Shoreline
- Township/City/Village Limits
- Section Lines
- Rivers/Streams
- Lakes/Ponds
- Drains/Intermittent Streams
- Two Tracks

Erosion Factor T

- 2
- 3
- 4
- 5
- Not Rated
- Water

DEFINITIONS:

Erosion Factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

N
W E
S

1 0 1 2 3 Miles

1:75000

Data Sources
Base Information: Michigan Department of Natural Resources, MIRIS, 1978.
Soils Information: Soil Survey of Oceana County, Michigan, Issued April 1996.
USDA Natural Resources Conservation Service and Forest Service.

Robert B. Annis Water Resources Institute
Information Services Center
Grand Valley State University

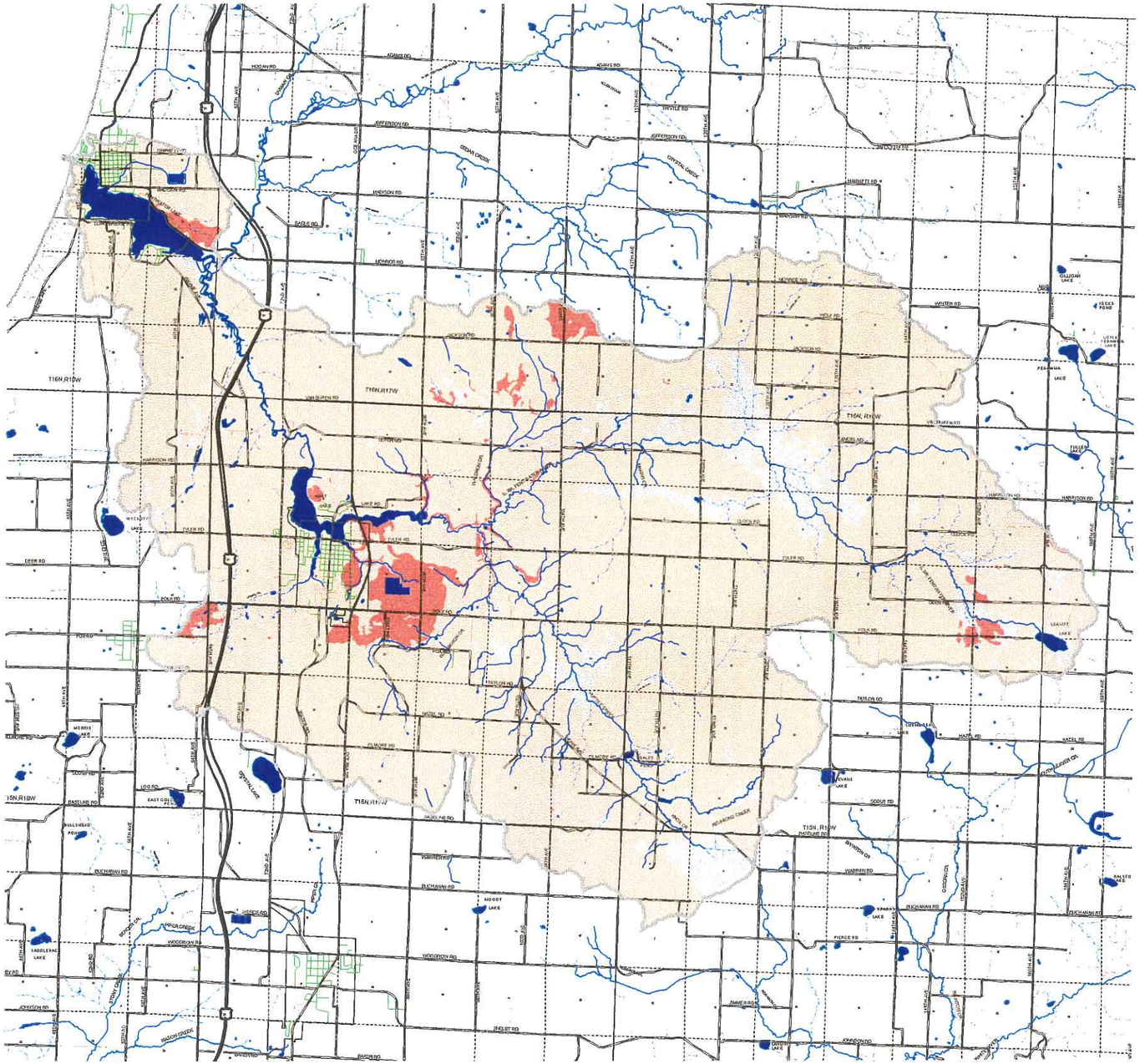
Map Prepared: July 1999

Figure 21

Appendix M

Erosion Factor K

South Branch Pentwater River Watershed



Base Information

- Watershed Boundary
- State/Federal Highways
- County Roads
- Minor/Residential Roads
- Lake Michigan Shoreline
- Township/City/Village Limits
- Section Lines
- Rivers/Streams
- Lakes/Ponds
- Drains/Intermittent Streams
- Two Tracks

Erosion Factor K

- 0.15 - 0.29
- 0.30 - 0.43
- Not Rated
- Water

DEFINITIONS:

Erosion Factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4%) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

N
W E
S

1 0 1 2 3 Miles

1:75000

Data Sources
Base Information: Michigan Department of Natural Resources, MIRIS, 1978.
Soils Information: Soil Survey of Oceana County, Michigan, Issued April 1996.
USDA Natural Resources Conservation Service and Forest Service.

Robert B. Annis Water Resources Institute
Information Services Center
Grand Valley State University

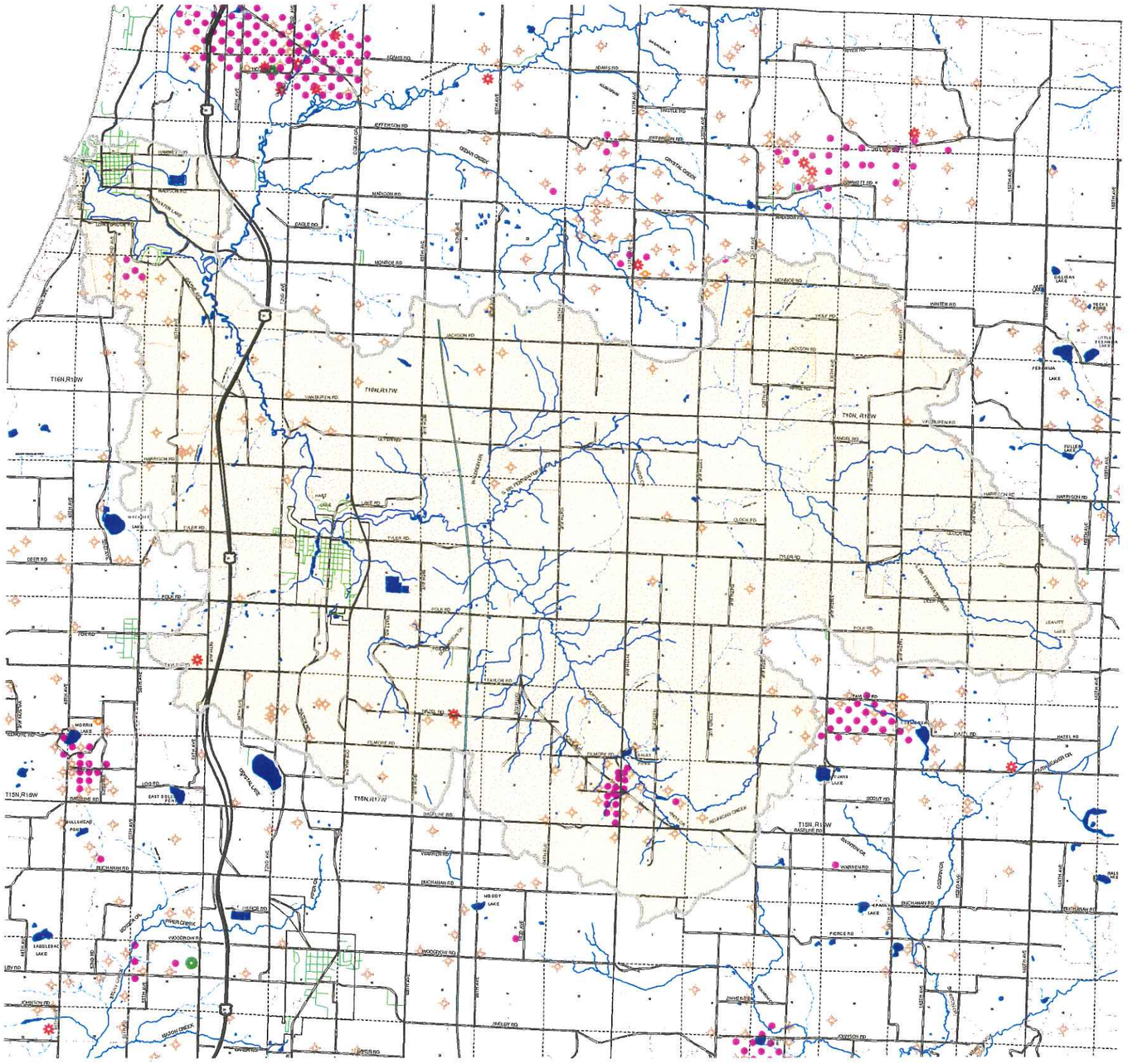
Map Prepared: July 1999

Figure 22

Appendix N

Oil and Gas Wells

South Branch Pentwater River Watershed



Base Information

- Watershed Boundary
- State/Federal Highways
- County Roads
- Minor/Residential Roads
- Lake Michigan Shoreline
- Township/City/Village Limits
- Section Lines
- Rivers/Streams
- Lakes/Ponds
- Drains/Intermittent Streams
- Two Tracks

Oil and Gas Wells

- Gas Wells
- Oil Wells
- Oil/Gas Pipelines
- Other Well Types
- Dry Hole
- Brine

N

W E

S

1 0 1 2 3 Miles

1:75000

Data Sources
Base Information: Michigan Department of Natural Resources, MIRIS, 1978.
Oil and Gas Well Information: Michigan Department of Natural Resources, MIRIS.

Robert B. Annis Water Resources Institute
Information Services Center
Grand Valley State University

Map Prepared: July 1999

Figure 23

Appendix O

CALVIN ACKLEY
HART, MI

JANET BROWN
SHELBY, MI

CONNIE CARGILL
HART, MI

MIRA DANILOVICH
HART, MI

TIMOTHY VANDERLAAN
HART, MI

TROY & SUE MARSHALL
HART, MI

R. ALLEN COX
MEARS, MI

HAMDY HELAL
SCOTTVILLE, MI

HARRY HOLLADAY
HART, MI

NEIL HOLLADAY
HART, MI

CHUCK PISTIS
GRAND HAVEN, MI

TOM & BARB ALTLAND
HART, MI

CHARAMY BUTTERWORTH
GRAND RAPIDS, MI

JAN CHRISTIANSEN
HART, MI

CHRIS DINGMAN
MUSKEGON, MI

BRUCE VANDERHOOF
MEARS, MI

MICHAEL SORENSEN
HART, MI

STAN HALLACK
HART, MI

ERIC HERRYGERS
HART, MI

GLENN JACOBS
HART, MI

NORM MYERS
HART, MI

KAREN AULISIO
WALKERVILLE, MI

CHERYL CARGILL
HART, MI

DAMON CRUMB
PENTWATER, MI

LYLE GALE
HART, MI

KAREN RASKEY
HART, MI

KATHY GRANTZ
SHELBY, MI

DON HANNIGAN
HART, MI

MARK HILL
HART, MI

ROBERT KELLER
HART, MI

RICK O'NEAL
SHELBY, MI

DOUG PIDER
HART, MI

MARY SANFORD
HART, MI

HENRY KUIPERS
HART, MI

MIKE POWERS
HART, MI

JIM SCHRAMM
PENTWATER, MI

DOROTHY SCHRAMM
PENTWATER, MI

RON ROTTSCHAFER
PENTWATER, MI

VINCE GREINER
HART, MI

MICHAEL KRUER
SCOTTVILLE, MI

SUE WYGANT
MANISTEE, MI

KEN LINDSTROM
PENTWATER, MI

JOE PRIMOZICH
HART, MI

RON STEINER
PENTWATER, MI

TIM TARISKE
HART, MI

OCEANA COUNTY ROAD
COMMISSION
HART, MI

NEIL MARSHALL
LUDINGTON, MI

MARK TROMMATER
HART, MI

ROGER BOWEN
SHELBY, MI

JIM MACGREGOR
PENTWATER, MI

JOHN COLEY
MEARS, MI

VIC MODENA
PENTWATER, MI

MILT PUGSLEY
PENTWATER, MI

HUGH STEININGER
PENTWATER, MI

WALT WHEELER
HART, MI

RICK OOMEN
HART, MI

TED BORGELD
HART, MI

FRED TUBBS
HART, MI

LEW CARLSON
LUDINGTON, MI

DONALD VANZILE
PENTWATER,, MI

PAUL JENSEN
PENTWATER, MI

PAUL O'GRADY
PENTWATER, MI

JIM SCHRAM
PENTWATER, MI

PEG SCHRAM
PENTWATER, MI

TOM WALTER
BALDWIN, MI

TIM LONGCORE
HART, MI

BILL NUSBAUM
MEARS, MI

KIM TATE
SHELBY, MI

PHYLLIS PETERS
SHELBY, MI

GERALD STRONG
PENTWATER, MI

R. WAYNE BANKERT
SHELBY, MI

ELLEN VARTIAN
HART, MI

DAVID YEAGER
HART, MI

BOB SHRAUGER
PENTWATER, MI

MARK KELLY
SHELBY, MI

GVSU
ALLENDALE, MI

JAY MCGHAN
HART, MI

SALLY DEFREITAS
HART, MI

GERALD GREINER
HART, MI

RICK PITTS
SHELBY, MI