A Nonpoint Source Control Plan for the Beaver Creek Priority Watershed Project

This plan was prepared under the provisions of the Wisconsin Nonpoint Source Water Pollution Abatement Program by the **Wisconsin Department of Natural Resources** and the **Trempealeau** and **Jackson County Land Conservation Departments.**

Watershed Plan Credits and Organization Information

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A NONPOINT SOURCE CONTROL PLAN
FOR THE
BEAVER CREEK PRIORITY WATERSHED PROJECT

The Wisconsin Nonpoint Source Water Pollution Abatement Program

July, 1987

Plan Prepared By:

Wisconsin Department of Natural Resources
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In Cooperation With:

Trempealeau County Land Conservation Department
Jackson County Land Conservation Department

Publication WR-198-87

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Carroll D. Besadny
Secretary

BOX 7921
MADISON, WISCONSIN 53707

July 15, 1987

File Ref: 3200

Mr. Keith Ferries, Chairman
Jackson County Board of Supervisors
Courthouse
Black River Falls, WI 54615

Mr. Earl Ryder, Chairman
Trempealeau County Board of Supervisors
Courthouse
Whitehall, WI 54773

Dear Mr. Ferries & Mr. Ryder:

I am pleased to be able to approve the Nonpoint Source Control Plan for the Beaver Creek Priority Watershed. As you know, the watershed encompasses portions of Trempealeau and Jackson Counties. Each of you is to be congratulated for your efforts in assisting in development of the plan and preparing for its implementation. The dedicated efforts on the part of your Land Conservation Committees and staffs have been indispensable in the preparation of the plan. I am especially impressed by the high degree of cooperation between your counties to reach the common goal of protecting and improving the water resources of the area.

The plan estimates total needs in the watershed to be $4,500,000 for installation of nonpoint source management practices, and 22 person years of effort to provide administration and technical assistance. Over the eight-year project, actual cost and personnel needs will, of course, depend on participation rates during the three-year sign-up period. The Department's Nonpoint Source Program will make funds available for additional county staff that may be needed to complete the project, and cost-sharing funds will be made available for the installation of management practices. Your personal attention in promoting participation of eligible landowners would be greatly appreciated.

Judging by the high level of interest shown by people living in the watershed, there is a great opportunity to achieve the water quality goals laid out in the plan. Enhancement and protection of Lake Marinuka and the many streams in the watershed are very worthwhile goals.

A Nonpoint Source Control Plan for the Beaver Creek Priority Watershed, including the detailed program for implementation contained therein, meets the intent and conditions of s. 144.25, Statutes, and NR 120, Wisconsin Administrative Code.

This priority watershed plan constitutes a revision to the Black River Areawide Water Quality Management Plan under Ch. NR 121, Wisconsin Administrative Code.

Sincerely,

C. D. Besadny
Secretary

P1002-11
cc: Charles Sutfin, USEPA, Chicago
Tom Davenport, USEPA, Chicago
James Lissack, WCD, Eau Claire
Secretary Howard Richards - DATCP
Senator Rodney Moen, 375 State Capitol
Rep. Terry Musser, 5B East State Capitol
Rep. Barbara Gronemus, 105 W. State Capitol

Trempealeau County Land Conservation Department
Courthouse Annex
Whitehall, WI 54773
(715) 538-2311

TO: John Pfender

FROM: Trempealeau County LCC

DATE: June 11, 1987

RE: Draft Beaver Creek Priority Watershed Plan

The Trempealeau County Land Conservation Committee has reviewed the Draft Beaver Creek Priority Watershed Plan.

This Committee finds the plan to be clear, concise and well organized. This Committee feels that this plan will prove to be a valuable tool in the implementation of the Beaver Creek Priority Watershed Project.

The Trempealeau County Land Conservation Committee approves this plan and accepts it as the document intended to guide our implementation efforts.

Sincerely,

Ernest Vold

Ernest H. Vold, Chairman
Land Conservation Committee

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SUMMARY

Introduction

The Beaver Creek Watershed is a 101,066 square mile drainage area located in the unglaciated region of west central Wisconsin. The north and south forks of Beaver Creek originate in western Jackson County, which contains 20 percent of the watershed area. The north and south forks of Beaver Creek flow into Trempealeau County where they combine at the Village of Ettrick to form the main stem of Beaver Creek. Beaver Creek and the remainder of its watershed are contained within Trempealeau County. The creek is impounded in the City of Galesville to form Lake Marinuka. Beaver Creek joins the Black River below Galesville (Figure 1).

The Beaver Creek Watershed was selected as a priority watershed project under the Wisconsin Nonpoint Source Water Pollution Abatement Program to protect and improve the many high quality trout streams and their associated forage fish communities. These waters are threatened by agricultural nonpoint source pollutants, notably sediment and animal wastes that are causing general habitat degradation. Other reasons for carrying out this project include reducing the impact of agricultural nonpoint pollutant sources on Lake Marinuka, which was recently rehabilitated through an Inland Lake Project by the Wisconsin Department of Natural Resources.

Developing the Priority Watershed Project Plan

This plan for the Beaver Creek Priority Watershed Project was developed jointly by the Wisconsin Department of Natural Resources, the Jackson and Trempealeau County Land Conservation Departments, and the U.S. Department of Agriculture-Soil Service Conservation Offices of Jackson and Trempealeau counties.

The Department of Natural Resources conducted a water resources appraisal to determine the conditions of streams in the watershed, the pollutants affecting these streams, and the potential for improving the streams through a nonpoint source pollutant control program. Appraisal techniques included fish surveys, macroinvertebrate sampling, a stream habitat evaluation, and aerial reconnaissance.

The Jackson and Trempealeau County Land Conservation Departments conducted an agricultural pollutant source survey, with financial assistance from the Department of Natural Resources, to identify the sources of sediment and animal wastes. This survey included an inventory of upland sheet and rill erosion covering 100 percent of the watershed, a streambank erosion inventory covering 72 percent of the streambanks in the watershed, and an inventory of all livestock operations. The livestock operation inventory was used to

determine the pollution hazard posed by the barnyards as well as to identify the need for controlling winterspread manure. This information was used to develop a pollution control strategy for the water resources of the Beaver Creek Watershed. This pollution control strategy, and the information and analysis upon which it is based, are the principal components of this watershed plan for the Beaver Creek Priority Watershed Project.

The pollution control strategy identifies 1) the level of pollutant control desired in each portion of the watershed; 2) the relative severity of individual agricultural pollutant sources in the watershed; and 3) provides criteria for developing a management category for each pollutant source located on the lands controlled by every individual landowner or operator.

These management categories are the key to project implementation. They define the most critical landowners in the watershed for each type of pollutant source, such as barnyard runoff and upland erosion, and they define the eligibility of landowners for cost sharing and technical assistance. This direction is important. It assures that the most critical landowners are contacted first for involvement in the project, and it identifies the package of management practices each of these people are likely to need.

The Land Conservation Department staff will refine the inventory findings and develop more specific management practice needs through conservation planning to be conducted with each critical landowner over the next three years.

Water Resource Conditions and Project Objectives

Water resources in the Beaver Creek Watershed can be divided into four regions. Information for each region is summarized below.

North Fork Beaver Creek: The area draining to the North Fork of Beaver Creek includes lands in the following subwatersheds: Upper North Fork, Lower North Fork, Washington Coulee, Joe Coulee, Bear Creek, UA(Creek 17-5), UB(Creek 9-13), UC(Creek 10-10), and UD(Creek 13-1 and 7-10).

This region contains the highest density of high quality trout waters. The North Fork is Class II brook and brown trout water. Of the 27 tributaries to the North Fork, 18 are Class I trout streams, four are Class II trout streams, one is a Class III trout stream, and four are forage fish streams.

South Fork Beaver Creek: The area draining to the South Fork of Beaver Creek includes lands in the following subwatersheds: Upper South Forks, Lower South Fork, German Coulee, Svenson Coulee, Borreson Coulee, Salzwedel Coulee, and Stensven Coulee.

This region contains mostly Class III trout waters and forage fish communities. Some high quality trout waters are present, however, including Class I and II trout waters in the Salzwedel Coulee Subwatershed, and Class I trout waters in the Borreson Coulee Subwatershed.

Mainstem Beaver Creek: The area draining to the mainstem of Beaver Creek can be divided into two sub-areas. Above Lake Marinuka, the drainage area includes lands in the following subwatersheds: Upper Beaver Creek Mainstem, Dutch Creek, Silver Creek, and an area designated as Subwatershed UE(Creek 23-5). Below the Lake Marinuka Dam, subwatersheds include Lower Beaver Creek Mainstem, and Little Tamarack Creek.

The upper mainstem of Beaver Creek is a Class II trout stream from Ettrick to Lake Marinuka. Tributaries include several Class I and II trout streams, and several forage fish streams. Lake Marinuka is a recently rehabilitated impoundment, offering good warmwater fishing and recreational boating opportunities. Sediment and nutrient loadings continue to affect Lake Marinuka.

The lower mainsteam of Beaver Creek is a warmwater fishery. Currently there are no impacts that significantly affect uses in the stream. The only major tributary is Little Tamarack Creek. Intermittent flow is the predominant limiting factor in this forage fish stream, although it carries a significant pollutant load to Beaver Creek and the Black River.

French Creek: This tributary to the upper mainstem of Beaver Creek enters the stream just below Ettrick. It is treated as a separate region because of its large size and the significance of its pollutant loadings to Beaver Creek and Lake Marinuka.

Most of the surface waters in this area support forage fish communities. There are, however, several Class I and II trout streams.

Most of the streams in these four regions suffer from some degree of instream sedimentation, turbidity, inadequate streambank cover, and inadequate instream cover. Effects of organic loading and nutrient enrichment are not documented, but may occur locally.

Most of these streams will improve within their present use classes, but will not change use classes with the advent of nonpoint source controls. A few streams, however, may experience improvements significant enough to result in changes in the use class.

The main project objectives for the water resources in this area are 1) the protection of the existing quality of the stream resources, and 2) a decrease in the pollutant loading from this area to Lake Marinuka. An additional objective for the lower mainstem of Beaver Creek is decreasing the pollutant loading to the Black River.

Pollutant Sources and Control Needs

Pollutant sources, desired levels of pollutant control, and the numbers of landowners in each management category for these pollutant sources are summarized in Table 1.

Table 1. Pollution Sources and Control Needs In The Beaver Creek Priority Watershed Project

Type of Pollution Source	Magnitude of Pollution Source	Level of Control Desired	Eligible Landowners	Ineligible Landowners
Barnyards Draining to Surface Waters	* 222 barnyards * 5,650 lbs. TP(1.)	70%	87	135
Barnyards Draining to Ground Waters	* 50 barnyards * 970 lbs. TP(1.)	Where needed to prevent problems at the most sensitive sites	24(2.)	26
Winterspread Manure	* 11,000 animal units * 80,000 tons manure winterspread annually	All livestock operators will be encouraged to avoid critical acres.	215	
	* 1,200 to 2,300 critical acres winterspread annually	Operators spreading in excess of 10 acres draining to Class I trout water, or in excess of 15 acres draining to other waters, will be targeted, and eligible for manure storage.	52	163
Upland Erosion	* 89,800 acres eroding * 306,000 tons soil loss/yr. * 70,000 tons sediment delivered/yr. to waterways	60%, or portion from lands losing at least 4 T/A/Y.	463	292
Streambank Degradation	* 1,300,000 feet of streambanks * 79,400 feet eroding * 5,300 tons sediment produced annually(3.)	All eroding streambanks will be controlled.	142	142

Table 1. Pollution Sources and Control Needs In The Beaver Creek Priority Watershed Project

ALL SOURCES	488	288

1. Total watershed loading of total phosphorus (TP), as determined for the 10 year- 24 hour rainstorm.

2. To be determined only after further investigation of barnyards situated in sensitive areas.

3. Includes only that amount determined by visual observation to be coming from streambanks. Materials scoured from streambeds or very low on the bank profile are not included.

Carrying Out the Priority Watershed Project

Roles: Meeting the pollutant control needs in the Beaver Creek Watershed will be a joint effort of many individuals and agencies.

Landowners: The most important role rests with landowners in the watershed, who will decide whether or not to become involved in this voluntary program. Landowners can participate directly in the program as well as encourage others to participate. Once this project is approved, landowners will have three years in which to enter into cost sharing agreements with their county representative, and five years in which to install the management practices specified on the agreement. The maintenance period for all practices is ten years from the date the last practice on the agreement is installed.

Practices eligible for cost sharing include:

1. Upland sheet and rill erosion control practices, such as contour cropping, strip cropping, field diversions, terraces, reduced tillage, woodlot fencing, and critical area seeding.

2. Upland gully erosion control practices, such as waterways and grade stabilization structures.

3. Animal waste control practices, such as barnyard runoff control systems, and long and short-term manure storage, and

4. Streambank protection practices. such as cattle fencing, shaping and seeding, and riprapping.

Cost share rates are 70% of the actual installation cost for most practices. Rates are lower for contour cropping, strip cropping, reduced tillage, and livestock exclusion from woodlots. Flat fee cost share rates have been developed by the Land Conservation Department for several practices, including contour cropping, strip cropping, reduced tillage, tree planting, and all fencing. The Land Conservation Departments will supply the landowners with technical assistance for planning, design, and certification free of charge.

Volunteer Groups: Assistance is planned from sportsmens' clubs, including the Ettrick Rod and Gun Club and Galesville Volunteer Trout Club. Club activities will include hosting information meetings; contacting landowners who need streambank fencing in order to explain the program and generate interest; helping to install streambank fencing; and coordinating trout stocking with watershed activities.

Land Conservation Departments: The Trempealeau and Jackson County Land Conservation Departments, on behalf of their county boards, will be responsible for locally implementing the watershed project. The LCD staffs, with assistance from the USDA-SCS, will contact critical landowners; develop conservation plans and cost share agreements with these landowners; provide technical design and certification for installation of practices; and conduct annual status reviews of landowners holding cost share agreements.

All cost share payments to landowners will be made through the respective Land Conservation Department offices. Although cost sharing will not be available through the Beaver Creek Priority Watershed Project to pay landowners for public easements, Trempealeau and Jackson counties will be coordinating available easement programs in the Beaver Creek Watershed to increase public access to trout streams.

Trempealeau County will assume the lead role in managing cost share funds. Each county, however, will maintain separate contracts with the Department of Natural Resources for the support of the county staff needed to conduct the watershed project. Each county is responsible for maintaining adequate financial records related to its cost share agreements and to the county staff hired for the project.

Jackson and Trempealeau counties will each track progress of the watershed project within their respective areas, and assist the Department of Natural Resources in developing annual progress reports.

Department of Natural Resources: The Department will provide financial support for the watershed project through general state revenues allocated to this program. All cost share monies needed to support cost share agreements will be provided by the Department. The Department will also provide funds needed by each county to hire staff needed to conduct watershed activities.

The Black River Falls Area Office of the Department will work closely with Land Conservation District staff to help meet project's water quality objectives. This office will provide assistance in assessing habitat improvement needs, and provide limited technical assistance to LCD staff and local sportsmens' groups in the design and construction of habitat structures.

The Department of Natural Resources will also be responsible for project evaluations. These include interim evaluations, which will identify progress towards pollution reduction goals, and a final evaluation to be based on actual water quality changes in five subwatersheds. These five subwatersheds will include French Creek, Bear Creek, Washington Coulee, Salzwedel Coulee, and Dutch Creek.

Staffing Needs and Budget: Carrying out the Beaver Creek Watershed project will require approximately 22 staff years over an eight-year period. Budgeting information for each county and the Department of Natural Resources as follows:

Jackson County: The estimated workload is five staff years over the eight-year project period. This will require from 0.5 to one person devoted to the project in any given year.

The county will need to support about 15 percent of this workload, or that amount needed to provide local administrative needs and maintain financial records. This is estimated to required about $20,000 in county funds for salary and fringe benefits over an eight-year period.

Trempealeau County: The estimated workload is 17 staff years over the eight-year project period. This will require about two people devoted to the project in any given year.

The county will need to support about 12 percent of this workload, or that amount needed to provide local administrative needs and maintain financial records. This is estimated to required about $53,000 in county funds for salary and fringe benefits over an eight-year period.

Department of Natural Resources: The Department of Natural Resources will provide local assistance aids to both counties sufficient to pay for the salary and fringe benefits of additional staff hired by the counties to work on watershed project activities. The Department can expect to support 85 percent of Jackson County's workload, and 88 percent of Trempealeau County's workload, provided these counties hire the needed staff. State contribution towards support of these staff will require an estimated $500,000 over the eight-year project period.

Practice Needs and Budget: In order to meet the water quality objectives of the Beaver Creek Project, the following types and quantities of practices will be needed:

Upland sheet and rill erosion control practices: It is estimated that 20,000 acres of practices will be required. These include 7,000 acres of contour cropping and strip cropping; 7,000 acres of reduced tillage (both alone and in combination with contour strips); 3,000 acres of woodlot fencing; and 3,000 acres of critical area seeding. Changes in rotation will be required, in addition to these practices, on 7,000 acres of land.

Gully erosion control practices: It is estimated that 250,000 feet of waterways and 160 structures will be needed.

Animal waste control practices: It is estimated that 87 barnyard runoff control systems and 46 manure storage units will be needed. Many other livestock operators should be able to avoid winterspreading critical acres with manure without using a storage structure.

Streambank protection practices: It is estimated that 100,000 feet of fencing; 60,000 feet of shaping and seeding; 23,000 feet of rip-rapping; and 90 livestock crossings will be required.

The total estimated cost of meeting the pollution control objectives of this watershed project is $4.5 million dollars. Assuming a 75 percent level of landowner participation, 2.3 million dollars in state cost share assistance will be required to match the $1.1 million in local funds supplied by landowners entering into cost share agreements.

About 55 percent of these monies will be spent on the control of upland sheet, rill, and gully erosion; 30 percent will be spent on controlling animal waste sources; and 15 percent will be spent on protecting streambanks.

Schedule of Implementation Activities

The schedule for implementation activities is summarized as follows:

Summer 1987: Trempealeau County, Jackson County, and the Department of Natural Resources will enter into the necessary grant agreements, thus making funds available to counties for technical staff support and to landowners for cost share assistance with practice installation.

Summer 1987-Fall 1988: Pre-project evaluation monitoring will be completed.

Summer 1987-Summer 1990: Landowners will be contacted by LCD staff, and cost share agreements will be signed during this three-year period. During the first year of this period, all critical landowners must be contacted at least once by LCD staff. Information and education activities will be most intensive during this period.

Summer 1987-Summer 1995: Management practices designated on cost share agreements will be designed and installed during this period.

Winter 1989 and Winter 1990: The Evaluation Monitoring Plan will be reviewed, based on landowner cooperation adjacent to established monitoring sites. If necessary, the monitoring plan will be modified.

Summer, Fall 1990: Interim evaluation will be completed.

Summer 1995: The watershed project will end.

Summer 1995- : Post project evaluation monitoring will be completed.

PREFACE

History of Water Resources Management Activities In The Beaver Creek Watershed

The Beaver Creek Watershed has a long history of landowners who have worked hard to conserve their soil and water resources. The story of these conservation efforts has been documented by the Trempealeau County Land Conservation District (Trempealeau County LCD, undated), and is summarized below.

The Beaver Creek Soil Conservation District, formed in 1937, was the first conservation district formed in Wisconsin. In 1940, this district became part of the newly formed Trempealeau County Soil Conservation District. Intense interest in conservation activities, primarily related to flooding, led to the formation by landowners of the Beaver Creek Watershed Association in 1953 and the French Creek Watershed Association in 1955. In 1963, the French-Beaver Creek Watershed Association was formed and a flood control plan developed. Although this plan was never funded due to its high cost, landowners continued their conservation activities.

Between 1970 and 1978, three different farmers in the watershed received recognition at the state level for conservation activities, with one farmer recognized for overall conservation efforts and two recognized for streambank protection work.

In 1975, the Lake Marinuka Protection and Rehabilitation District was organized for the purposes of dredging the lake, and reducing sediment and nutrient loading to the lake. During 1981-83, 525,000 cubic yards of sediment were dredged from Lake Marinuka(U.S. EPA, 1986).

During this same period, extensive streambank protection work and a limited amount of animal waste management and upland practices were installed in the Beaver Creek Watershed to reduce sediment and nutrient loading to the lake. This work was limited to lands within Trempealeau County, and occurred primarily along the main channel segments of Beaver Creek, the North Fork, the South Fork, and French Creek. Most of the emphasis was placed on stabilizing eroding streambanks. Through the Lake Rehabilitation Project, about 50 percent of the streambank stabilization work identified in the feasibility study was completed. In addition to the streambank work, limited work was done to control upland erosion and the runoff of animal waste. The Lake Marinuka Protection and Rehabilitation District provided almost $300,000 of local funds for cost sharing with landowners the cost of installing needed practices.

This proud history of land stewardship and strong conservation ethic continues today. Approximately 50 percent of the landowners in the Beaver Creek Watershed are cooperators with their respective county land conservation departments. In addition, the Ettrick Rod and Gun Club and the Galesville Volunteer Trout Club are very active in the watershed, and count many members of the farming community among their members.

Purpose and Approach of the Wisconsin Nonpoint Source Water Pollution Abatement Program

The Wisconsin Nonpoint Source Water Pollution Abatement Program was established by the state Legislature in 1978 for the purpose of protecting the state's waters from nonpoint source pollutants. A very limited number of watershed projects are selected by the Department of Natural Resources each year for participation in the program. The number of new watershed projects is determined by the Legislature. Once a watershed plan is prepared for a new project, landowners may voluntarily become involved in the cost share program for the control of pollutant sources on their lands.

The Nonpoint Source Water Pollution Abatement Program provides both technical and financial assistance to landowners and land operators for controlling both urban and rural nonpoint pollutant sources. These sources include poorly managed barnyards, eroding croplands, eroding streambanks, improperly stored or spread animal waste, eroding construction sites, and uncontrolled runoff from urban land uses such as streets, parking lots, and rooftops.

The program also supplies assistance to cities, counties, and villages, who are statutorily responsible for carrying out the watershed project activities specified in the watershed plan for their area. These activities include contacting critical landowners; developing conservation plans and cost share agreements; designing, installing, and certifying management practices; making cost share payments to landowners; and overall local project management and information and education activities.

The state of Wisconsin, through the Department of Natural Resources, provides watershed planning, project evaluation, and general project administrative services to the cities, counties, and villages throughout the planning and project implementation phases of each watershed project.

Priority watershed projects are delineated on the basis of hydrology, not on civil division. Typical watershed projects cover hydrologic units of roughly 100 to 250 square miles in area. To date, there are 32 priority watershed projects, including Beaver Creek, in various stages of planning and implementation throughout the state. Other priority watershed projects located near the Bear Creek Watershed include the Elk Creek Priority Watershed Project, located in Trempealeau County, and the Lower Black River Priority Watershed Project, located in Trempealeau and LaCrosse counties.

Over 28 million dollars have been dispersed through the Nonpoint Source Control Program to date, covering the cost share payments to landowners and the technical assistance needed by the cities, counties, and villages implementing these projects. Approximately 100 more projects will be needed in order to treat nonpoint pollutant sources in critical areas throughout Wisconsin.

The Selection of the Beaver Creek Watershed

The Beaver Creek Watershed was selected by the Department of Natural Resources in 1984 for inclusion in the Nonpoint Source Control Program. The selection of this project was aided by the efforts of the Trempealeau County and Jackson County Land Conservation Departments, the Town of Ettrick, the Lake Marinuka Rehabilitation District, and the Galesville Trout Club.

The Beaver Creek Watershed was selected because nonpoint pollutant sources were still considered to be having a significant effect on the water resources in the watershed, despite the long history of conservation efforts mentioned earlier. Pollutant sources of particular concern include streambank erosion; upland sheet and rill erosion; gully erosion; and animal waste from barnyards and improperly spread or stored manure.

Water resources at stake in the watershed include many high quality trout waters, which are used extensively by sports enthusiasts; the newly rehabilitated Lake Marinuka, a "crown jewel" for Trempealeau County; and ultimately, the quality of the Black River and the Mississippi River into which the Beaver Creek system flows.

Paramount among reasons for the selection of this watershed were the intense local support for the project, and the long history of farmers within the watershed "getting the conservation job done". Cost share funds were seen as a significant factor that would allow landowners in Beaver Creek to achieve new plateaus in environmental protection.

How This Watershed Plan Was Developed

This nonpoint source control plan, called the watershed plan, will serve as a guide over the next eight years of project implementation.

The watershed plan is the product of many people. Information about nonpoint pollutant sources in the watershed was collected by staff members of both the Jackson and Trempealeau County Land Conservation Districts, with assistance from the Jackson and Trempealeau County offices of the U.S. Department of Agriculture - Soil Conservation Service. This effort to inventory nonpoint pollutant sources was funded by the Department of Natural Resources.

The land management information collected during the watershed inventory was analyzed and interpreted by Bureau of Water Resources Management staff from the Wisconsin Department of Natural Resources in Madison. Water resources data were collected, analyzed, and interpreted by water resources management and fish management staff from the Department of Natural Resources' West Central District (headquartered in Eau Claire) and the Black River Falls Area Office.

The management strategy for the Beaver Creek Watershed, including the identification of water resources objectives and the approach for controlling critical nonpoint pollutant sources, was a cooperative effort by all of these people. Some specific acknowledgements appear at the end of the this preface, and a list of officials and participants is shown on the inside of the front cover of this plan.

The Role of This Plan In Managing The Water Resources of the Beaver Creek Watershed

This watershed plan documents the resource problems and causes within the Beaver Creek Watershed. As such, it is meant to serve as a reference document for those seeking information about the watershed project.

Most importantly, it is meant to guide the watershed management activities of staffs from the Department of Natural Resources, the Jackson and Trempealeau County Land Conservation Districts, and other management agencies. Cost share agreements developed for landowners under the Nonpoint Source Control Program must be in conformance with the guidelines specified in this plan. Similarly, funding agreements between the Department of Natural Resources and Trempealeau or Jackson County, for the purpose of transmitting cost share and local assistance funds, must be drafted and administered consistent with provisions in this watershed plan.

This plan, and the information it contains, will also serve as a basis for project evaluations against which annual work progress and, ultimately, water quality improvements will be measured. If needed, this plan can be amended during the course of the watershed project, provided the requirements of state law for the amendment of watershed plans are met.

Since the Nonpoint Source Control Program is limited in the management activities it can fund, the coordination of other management programs will be needed to fully realize the water quality improvements expected through the project. The following activities are outside the scope of the Nonpoint Source Control Program, but remain high priority areas for coordination:

1. Fish stocking and fish habitat restoration activities in high priority streams are conducted by the Department of Natural Resources and sportsmen's organizations,

2. Purchasing or leasing fishing easements along high priority streams by the county or by sportsmen's organizations,

3. Adequate sewage treatment provided by the Ettrick and Galesville sewage treatment plants,

4. Management of failing septic systems by the Trempealeau and Jackson County zoning offices, and

5. In-lake management activities for Lake Marinuka, conducted by the Lake Marinuka Inland Lake District.

Special Acknowledgements

As mentioned earlier, this watershed plan is the result of cooperation among many people. However, special recognition should be given to Warren Prinz (retired) and Gaylord Olson of the Jackson County Land Conservation District; Dave Appleyard, Mike Pleshek, and Hank Thompson (retired) of the Trempealeau

County Land Conservation Department; and Olin Femreite and Steve Rake of the USDA-Soil Conservation Service. These people were responsible for collecting land use data in the watershed, and assisting with the interpretation of these data.

Special recognition should also be given to some staff members of the West Central District and Black River Falls Area offices of the Department of Natural Resources. Jack Eslien and John Paddock of the West Central District identified water quality problems and water quality improvement goals for the many streams in the Beaver Creek Watershed. Jim Talley, Tim Babros and the fish management technical field staff of the Black River Falls Area Office conducted a major fish survey in the watershed over a two-year period. Efforts by these people included many hours collecting and interpreting file data and field data, and documenting results for use in this plan.

The analysis and interpretation of land resource data could not have been completed without the help of computer programmers and systems analysts in the Department of Natural Resources-Nonpoint Source and Land Management Section. Ken Baun has been responsible for developing and operating programs for analyzing upland erosion data, and Sarah Snowden and Mike Bohn had similar responsibilities relating to animal waste management data.

Roger Bannerman deserves special mention for his work over the past two years in developing a water resources appraisal approach. This approach was used in developing the appraisal for Beaver Creek.

Finally, thanks are due to co-workers in the Nonpoint Source and Land Management Section who reviewed drafts of this plan and provided useful criticism.

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SECTION ONE: INTRODUCTION TO THE WATERSHED PLAN

CHAPTER I. PLAN PURPOSE AND LEGAL STATUS

This plan was prepared jointly by the Department of Natural Resources, Jackson and Trempealeau County Land Conservation Committees and their staffs, and the Soil Conservation Service staff located in Jackson and Trempealeau counties. Within the Department of Natural Resources, nonpoint source program staff and staff from the fish management and water resources programs in the West Central District all participated in the preparation of this plan.

A. Purpose of the Watershed Plan

This plan has been prepared to guide implementation of the Beaver Creek Priority Watershed Project. This project is part of the Wisconsin Nonpoint Source Water Pollution Abatement Program.

This plan is divided into four sections:

1. Introduction (purpose and legal status);

2. Watershed Assessment;

3. Detailed Program for Implementation; and

4. Project Evaluation.

Following this brief introduction is the Watershed Assessment. The purposes of the watershed assessment portion of the plan are to:

1. identify the water quality or water resources problems in the Beaver Creek Watershed;

2. identify the water quality or water resources objectives for the lakes and streams in the watershed that can be achieved through a nonpoint source control project;

3. identify the level of pollutant control needed to achieve the objectives;

4. identify and rank the significant nonpoint sources; and

5. estimate the Best Management Practices that will achieve the pollutant control.

The purpose of the Detailed Program for Implementation portion of the plan is to outline a strategy to assist landowners and land operators in installing Best Management Practices to control the nonpoint sources. This strategy includes:

1. a cost share budget based on the estimated cost of the Best Management Practices and expected participation rates;

2. a schedule for implementation activities;

3. a description of information and education activities;

4. a summary of fiscal management procedures; and

5. an estimate of technical assistance needs for local units of government, principally Jackson and Trempealeau counties.

The purpose of the Project Evaluation portion of the plan is to identify procedures and schedules for determining project progress and accomplishment. This includes estimating pollutant load reductions due to the installation of Best Management Practices and measuring changes in water quality.

B. Legal Status of the Watershed Plan

This plan has been prepared under the authority of the Wisconsin Nonpoint Source Water Pollution Abatement Program described in s. 144.25, Wisconsin Statutes and Chapter NR 120 of the Wisconsin Administrative Code. This plan has also been prepared with the assistance of the newly created Lake Management Program as authorized in chapter 33, Wisconsin Statutes.

This plan is the basis for cost share and local assistance grants through the Nonpoint Source Water Pollution Abatement Program administered by the Department of Natural Resources. The Wisconsin Statutes and Chapter NR 120 of the Wisconsin Administrative Code, however, govern the conduct of the Nonpoint Source Water Pollution Abatement Program. In the event a discrepancy occurs between this plan and the statutes or the administrative rules or if the statutes or administrative rules are changed, the statutes and rules override this plan.

This plan, once approved through the procedures described in Chapter NR 121, Wisconsin Administrative Code, is an update of the Areawide Water Quality Management Plan for the Black River Basin.

SECTION TWO: THE WATERSHED ASSESSMENT

CHAPTER II. GENERAL DESCRIPTION OF THE BEAVER CREEK WATERSHED

CHAPTER III. INVENTORY PROCEDURES AND WATERSHED POLLUTANT LOADS

CHAPTER IV. DESCRIPTION OF SOURCE WATER RESOURCES AND PROBLEMS

CHAPTER V. NONPOINT POLLUTION SOURCE ASSESSMENT RESULTS

SECTION TWO: THE WATERSHED ASSESSMENT

CHAPTER II. GENERAL DESCRIPTION OF THE BEAVER CREEK WATERSHED

A. Size and Location

The Beaver Creek Watershed is a 101,066 acre drainage located in the driftless area of west central Wisconsin (Figure 1). Approximately 21,000 acres of headwater drainage are located in western Jackson County, with the remaining 80,000 acres of the watershed lying in southeastern Trempealeau County.

B. Communities and Civil Divisions

The principal urban communities include the City of Galesville (population 1,200) and the Village of Ettrick (population 457). Other small communities include Frenchville, Beaches Corners, Hegg, and Franklin. Civil townships represented in the watershed include Ettrick, Gale, Caledonia, Trempealeau, and Preston in Trempealeau County; and North Bend, Franklin, and Springfield in Jackson County.

C. Water Resources

The principal water resources in the Beaver Creek Watershed are also shown in Figure 1.

The main stream network in the watershed includes the North Fork and the South Fork of Beaver Creek, and the mainstem of Beaver Creek. The North Fork arises in Jackson County and converges with the South Fork at Ettrick in Trempealeau County. The North Fork is Class II trout water, and has many small, steep tributaries which are Class I and II trout streams. The largest tributaries to the North Fork are Bear Creek and Washington Coulee Creek.

The South Fork also arises in Jackson County, and is a Class III trout stream within Trempealeau County and a forage fish stream in Jackson County. Tributaries are fewer in this region and less suited for trout. Major tributaries to the South Fork include German Coulee, a forage fish stream, and Salzwedel Coulee, a Class II trout stream.

The mainsteam of Beaver Creek begins at Ettrick and flows southward toward its confluence with the Black River. Lake Marinuka is an impoundment located within the City of Galesville in the lower reaches of the mainsteam. Above Lake Marinuka, Beaver Creek is a Class II trout stream. Principal tributaries include French Creek, Silver Creek, Dutch Creek, and Abraham Coulee. The mainsteam of French Creek is mainly a forage fish stream, with limited areas of Class II trout water extant. Several of the tributaries to French Creek are Class I and II trout waters. Silver Creek is a forage fish stream, while Dutch Creek and Abraham Coulee Creek are both Class I trout streams.

Below Lake Marinuka, Beaver Creek has a warmwater fishery. Abraham Coulee, with a forage fishery, is the major tributary to this section of Beaver Creek. Although Little Tamarack Creek is a major system as well, it dries up prior to reaching Beaver Creek. The lack of flow limits the fishery in Tamarack Creek to forage fishes.

Lake Marinuka is the largest artificial lake in Trempealeau County. The 85-acre impoundment was dredged in 1981-83, and today is a significant recreational and aesthetic resource.

D. Topography and Soils

1. Topography

The Beaver Creek Watershed has drainage characteristics typical of Wisconsin's unglaciated areas. The topography is dissected, with high, narrow, irregular divides, steep bluffs, moderate slopes, and broad open valleys. Local relief within the watershed varies from 300 feet in Jackson County to 600 feet in the lower portions of the watershed. This local relief results in stream gradients which vary from 70 to 150 feet per mile in the headwaters of tributaries, 20 to 40 feet in the middle reaches of the main channels, but less than 10 feet per mile in the lower main channel reaches.

2. Soils

Soils in the watershed are derived from underlying sandstone, glacial loess, and outwash deposits. In the uplands, most soils are silt loams. Major soils in these areas include Fayette silt loam, Gale silt loam, Norden silt loam, and LaFarge silt loam. These soils are well drained, with subsoils of sandy loam and silty clay loam. The soil erosion hazard on these soils is generally severe.

Along stream terraces, the major soils include Ettrick silt loam, Meridian fine sandy loam, Downs silt loam, and Muscatine silt loam. These are well-to-poorly drained soils having subsoils of silt loam and sandy loam. The erosion hazard on these soils is moderate. Below Galesville, the soils along Beaver Creek consist of poorly drained wet alluvium with many marshy areas.

In the lower watershed, extensive valley deposits have been built up from eroded upland soils. Between 1867 and 1939, sediment accumulation is estimated to have been at a rate of 158 tons per square mile per year. The accumulation rate since 1939 has decreased. The scouring of previously deposited sediments from these valley bottoms is estimated to comprise a significant sediment source (Trempealeau County, undated).

Finally, soils in the southwestern portion of the watershed are loamy fine sands. These extremely porous soils have a high capacity for infiltration and percolation. Little Tamarack Creek, which flows into this soil region, cannot maintain its flow and disappears throughout much of the year before it reaches the mouth of its channel bed at the confluence with Beaver Creek.

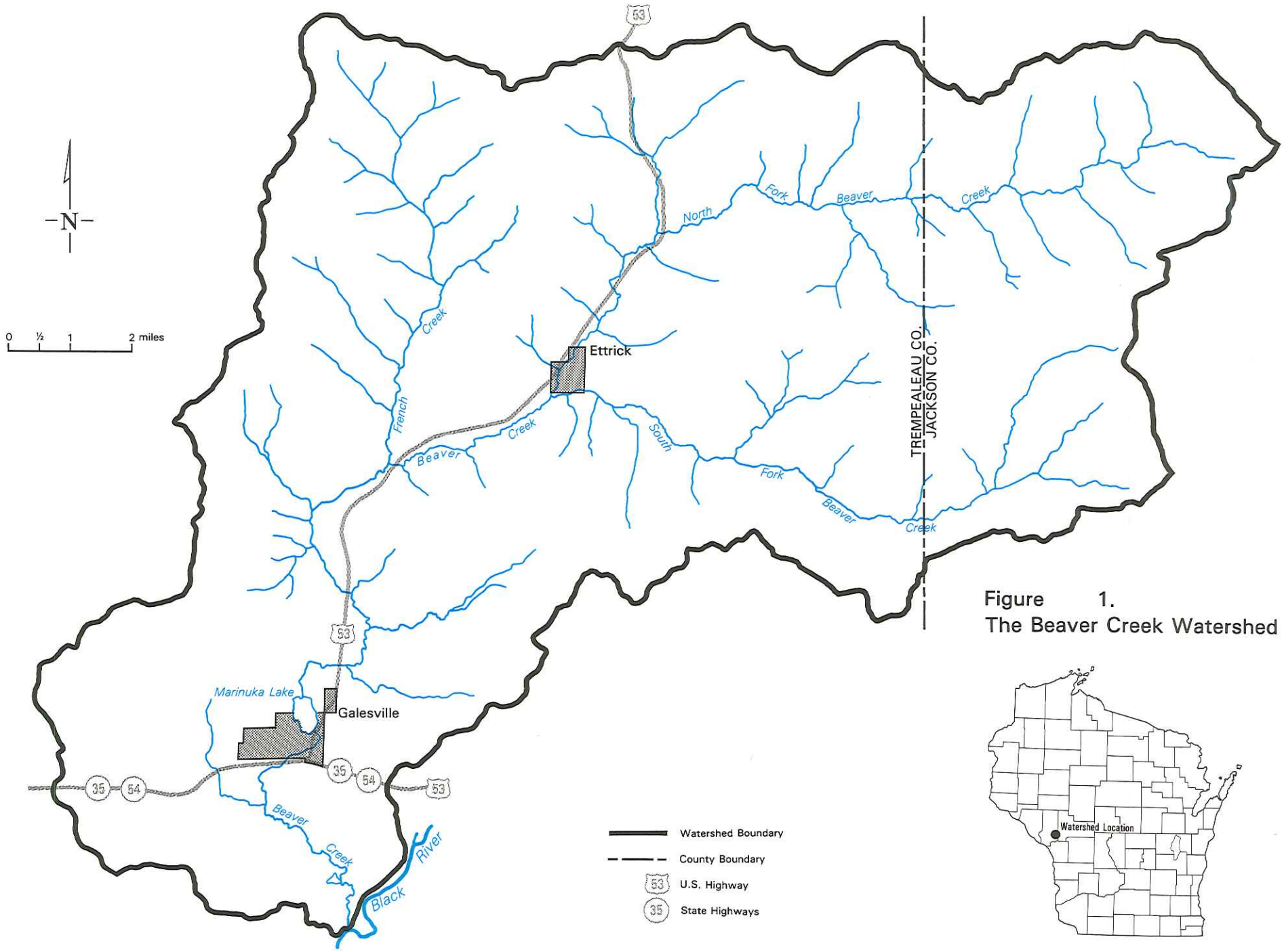


Figure 1.
The Beaver Creek Watershed

Other significant soil characteristics include the depth to bedrock, the depth of seasonally high groundwater, and the percentage of fine materials in the soil column. These characteristics affect the potential for nonpoint pollutants to reach the groundwater. During a process called attenuation, water polluted by various land use activities often can be "cleansed" (to different degrees) as it moves from the surface downward through soil layers before reaching the groundwater. Pollutants in the water react in different ways to a variety of physical and chemical properties of soils, determining both what quantity and which pollutants are removed from the water.

In the attenuation process, shallow soils provide less opportunity for pollutants to be attenuated by the soil environment before encountering groundwater or bedrock aquifers. Soils consisting of mainly large particles offer less resistance to the passing of pollutants. The percentage of soil passing a number 200 sieve is one measure of the resistance the soil will provide to the transport of pollutants. A large percentage of soil passing this size sieve indicates pollution attenuation capacity, whereas a small percentage indicates little resistance to pollutants.

Bedrock soils, or those with bedrock within 60 inches of the soil surface, include those in the Boone, Eleva, Gale, Hixton, LaFarge, Norden, Urne, and Stony Land series. Most of these soils are underlain by fine-grained sandstone bedrock. Boone, Eleva, and Stony Land soils have a relatively small percentage of fine materials in the surface layers, giving them little pollution attenuation capacity. Boone soils have the least attenuation potential and form areas sensitive to groundwater contamination given the right circumstances. Stony Land soils and Eleva soils are sensitive, but less so than Boone soils. The other bedrock soils are not of prime concern because a very high proportion of the profiles for these soils pass a number 200 sieve.

Seventeen soil types have seasonally high groundwater. Most, however, occur infrequently in the watershed. The most common of these are the Ettrick silt loam, the Huntsville silt loam, and the Muscatine silt loam. Combined, these form about two percent of the soils in the watershed. Seasonally high water is within zero to one foot in the Ettrick soil, within four to six feet in the Huntsville soil, and within one to three feet in the Muscatine soil. All of these silt loam soils have a high composition (70 to 100%) of fine materials in the surface layers.

E. Land Use

Table 2 shows the general land use composition in the watershed determined through this watershed study. Land use in the Beaver Creek Watershed is dominated by livestock and dairy agriculture. There are approximately 530 farms averaging 190 acres in size. All of the land in the Beaver Creek Watershed, with the exception of the Morgan Marsh and the South Beaver Creek Wildlife Area, is in private ownership (Trempealeau County, undated).

Table 2. Land Use Distribution in the Beaver Creek Priority Watershed Project[1]

Land Use	Acres	Percentage
Cropland	35,000	35
Pasture	15,700	16
Woodland	39,100	39
Other[2]	11,300	10
Total:	101,100	

[1] Based on inventory information collected as part of this watershed project, 1984-1986.
[2] Includes urban areas, highways, water surfaces, and farmsteads.

CHAPTER III. INVENTORY PROCEDURES AND WATERSHED POLLUTANT LOADS

A. Introduction

The purpose of this chapter is to describe the methods used to collect and analyze information about 1) the condition of the water resources in the watershed, and 2) the nonpoint pollutant sources responsible for threatening or degrading these water resources. Analytic results are presented in Section III of this watershed plan.

B. Scope of the Watershed Assessment

1. Introduction

A surface water resources appraisal was conducted on waterbodies throughout the watershed to determine the existing condition of the resources. Specifically, information was gathered and analyzed to determine:

a. water resource problems and their associated pollutants,

b. the existing and potential uses to which the various waterbodies are suited, and

c. the general level of pollutant load reduction needed to protect or improve uses of the surface waters.

This assessment formed the basis for the pollution control strategy detailed in Section III of this watershed plan.

The water resources appraisal was researched and prepared by staff of the Department of Natural Resources' West Central District between January 1985 and January 1986. Contributors to the appraisal included Land Conservation District (LCD) staffs from Trempealeau and Jackson counties, and staff from the Department of Natural Resources' Nonpoint Source and Land Management Section in Madison. A review of historical information, supplemented by the field work carried out during 1985 and the opinions of professional natural resources personnel, provided information for the appraisal.

Prior to compiling these data, stream identification numbers from all of the different field studies had to be cross-referenced. Figures 2 through 5 in Chapter IV provide the available identifiers for each stream in the watershed, and represent the distribution of water resources information used to appraise surface water resources.

2. Surface Water Assessment Methods

a. Introduction

A brief summary of the assessment methods used in this appraisal is included in the following paragraphs. More detailed information can be found in the full appraisal report prepared for the Beaver Creek Watershed (Eslien, 1986).

b. Historical Information

Historical data were researched to obtain information concerning the past condition of the watershed's water resources. Information was evaluated concerning fish populations, aquatic insect populations, habitat, and water chemistry. Sites for which historical data were available are shown in Figures 2 through 5.

c. Stream Habitat Evaluations

Stream habitat in some of the major tributaries to Beaver Creek was evaluated during 1985 using a modification of the procedure developed by Joe Ball of the DNR (Ball, 1982). Ball's method assigns a numerical score to each of several habitat characteristics, such as bottom substrate, channel configuration, pool/riffle ratio, and bank condition.

Although Ball's method includes a general assessment of watershed nonpoint source pollutant contributions, this was not included in the ratings conducted for this watershed project. This modification was made because nonpoint sources were evaluated in great detail as part of the nonpoint source assessment.

The criteria used in selecting stream sections for evaluation included accessibility, continuous streamflow, position in the watershed, and the presence of fish populations. Segments which were either too difficult to reach for further evaluation, or where low flows were the critical limiting factor, were not selected.

Each site evaluated was approximately 1000 feet in channel length. A final score was calculated for each site where the habitat rating was done, to determine overall habitat quality. Although the scores are numeric, they are used as general indicators of habitat quality, not as strict quantitative measures.

Figures 2 through 5 show the approximate locations of sites evaluated for habitat quality during 1985.

d. Aerial Reconnaissance

An aerial reconnaissance was performed during the winter of 1984-85 to determine which streams were free of ice cover. This information was valuable in assessing favorable conditions for trout, since an open stream indicates either that the stream is receiving an ample supply of spring water at above-freezing temperatures, or is a fast-flowing stream system.

Figures 2 through 5 show the streams for which this information was collected.

e. Fish Surveys

An intensive fish survey was conducted in the Beaver Creek Watershed during 1985-86. The two-year survey, which cost $42,000, was funded and conducted by the Department of Natural Resource's Fish Management Program. Sampling sites were selected and sampling was conducted by fish management staff of the Black River Falls Area Office according to standard fish management guidelines.

This fish survey has already resulted in changes to many of the classifications previously assigned to streams in the watershed.

Figures 2 through 5 show the approximate locations of the 1985-86 fish survey sites.

f. Biotic Index

The Hilsenhoff Biotic Index was calculated for 19 sites in the watershed. This index is an indicator of chemical water quality, principally the availability of dissolved oxygen (Hilsenhoff, 1982). This technique has limited application in the Beaver Creek watershed, because in many places substrate conditions are generally poor and affect the ability to develop and interpret a biotic index number.

g. Other Information

Information concerning stream substrate composition, types and abundance of aquatic insect populations, and riparian aquatic vegetation was collected as part of the habitat rating field work conducted during 1985. In addition, low flow characteristics of streams in the watershed were updated by the US Geological Survey in 1985.

C. Groundwater Inventory and Assessment

The Beaver Creek Priority Watershed Project was initiated primarily to protect and improve surface water resources. In general, groundwater contamination has not been perceived as a major problem in the watershed (John Paddock, DNR-WCD, personal communication).

This perception is confirmed to some extent by the limited nitrate nitrogen sampling conducted at water supply wells in Trempealeau County during 1980-1985. In general, nitrate nitrogen concentrations in water samples drawn from private wells and non-community public water systems in Trempealeau County are generally low (WDNR, 1980; Schmidt, 1985). Any "hot spots" of nitrogen contamination within the watershed have not been brought to the attention of the DNR to date.

Based on this limited information, it was decided that an extensive review of groundwater data would not be made for this watershed to determine if agricultural sources are contaminating groundwater. It is suspected that some contamination could be occurring, since cropland fertilization and animal waste management practices are well documented as potential sources of groundwater contamination (Jackson et al., 1986).

Therefore, in this plan the emphasis for groundwater assessment is placed on identifying those sites, for which information is available, that pose potential contamination threats.

D. Delineation of Subwatersheds and Analysis Areas

It is often difficult to identify the site-specific sources of nonpoint pollutants which are responsible for the water quality problems observed in the Beaver Creek Watershed. In some instances, there may be an obvious source for a water quality problem. However, in most cases, the effects of diffuse pollution sources are cumulative, and the causal relationships between specific sources and observed water quality impacts are obscured.

For this reason, nonpoint pollutant sources in the Beaver Creek Watershed were grouped geographically for purposes of data collection and analysis. In this way, all of the pollutant sources contributing pollutants to the same general geographic area could be analyzed as a group. This group analysis enabled the identification of the worst pollutant sources to any specific waterbody or set of waterbodies, so efficient pollutant control plan could be developed.

The geographic areas identified for the purpose of collecting and analyzing nonpoint source data are called subwatersheds. The Beaver Creek Watershed was divided into 24 subwatersheds. These subwatersheds are shown in Figures 2 through 5 in Chapter IV. The large number of subwatersheds was required because many of the small tributary streams to the main stem and main forks of Beaver Creek are either existing or potential trout waters. Separate subwatersheds were delineated around many of these streams in order to tie the nonpoint pollutant sources as closely as is practical to the valuable resources that they are affecting.

In determining the relative significance of a nonpoint pollutant source and the need for the control of that source, the source must often be analyzed as part of more than one geographic area. This is necessary, for example, when a source contributes pollutants to a tributary trout stream that eventually flows to Beaver Creek and on to Lake Marinuka. In such instances, the source must be included in two analysis areas: first as part of the subwatershed contributing runoff to the tributary trout stream, and also as part of the entire area contributing runoff to the lake.

Where a nonpoint pollution source was analyzed as part of more than one analysis group, its significance as a pollutant source was based on the analysis group giving it the "worst" rating. Table 3 lists the different analysis areas used in evaluating the relative severity of each pollutant source in the Beaver Creek Watershed.

E. Pollutant Source Assessment Methods and Results

1. Introduction

The Trempealeau and Jackson County Land Conservation Districts (LCD) collected field and office data necessary to identify and quantify the nonpoint pollutant sources in the Beaver Creek Priority Watershed Project. Data were collected according to procedures established by the Department of Natural Resources' Nonpoint Source and Land Management Section. The data were reviewed by LCD staff, and sent to the Nonpoint Source and Land Management Section for review, error checking, and analysis.

Data were collected and analyzed for pollutant sources in four major categories. These categories are: a) upland sheet and rill erosion, b) streambank erosion, c) barnyard runoff, and d) winterspread manure and manure stacks. Each type of pollutant source is discussed individually in this chapter.

2. Eroding Uplands

a. Importance of the Pollutant Source

Eroding uplands are of concern in this project because they are estimated to be a major contributor of sediment to Lake Marinuka and the streams of the Beaver Creek Watershed.

b. Impacts Caused by Eroded Sediment

The sediment from eroding uplands adversely affects these water resources in many ways. Suspended sediment can make it difficult for fish to feed, and can abrade fish gills, making the fish more susceptible to disease. The suspended sediment also causes the water to be warmer in the summer, and since warm water holds less oxygen than cold water, there is consequently less oxygen available to support fish and other biota.

Sediment that settles out to the stream or lake bottom can fill up pools in streams, thus destroying fish habitat, and can fill up the bays in lakes, promoting excess aquatic weed growth. Soil from croplands that enters the water can also contain nutrients and pesticides which can both increase the algae and weed growth in lakes and harm the aquatic life of a water body.

Table 3. Analysis Areas For The Beaver Creek Priority Watershed Project

Pollutant Source	Analysis Areas(1.)
UPLAND EROSION & BARNYARD RUNOFF	Subwatersheds analyzed individually: * BE,WA,JO,UA,UB,UC,UD,NU,NL,FR,BL,LT. Subwatersheds grouped for analysis: * BE,WA,JO,UA,UB,UC,UD,UE,NU,NL,SU,SL,GE,SV,ST, SM,SA,BU,DU,SI,FR,BO(2.) * SU+GE(3.) * SL+SV+ST+BO+SA+SM(4.) * BU+DU+UE+SI(5.)
MANURE SPREADING	Subwatersheds were not grouped for analysis.
STREAMBANK EROSION	Subwatersheds analyzed individually: * BE,WA,JO,UA,UB,UC,UD,UE,NU,NL,SU,SL,GE,SV,ST, SM,SA,BU,BL,LT,DU,SI,FR,BO.

1. A pollution source evaluated as part of more than one analysis area will be assigned an eligibility rating, or management category, based on the analysis area in which it has the greatest significance.
2. Represents the area draining to Lake Marinuka.
3. Represents the area draining to the Beaver Creek Wildlife Area.
4. Represents the area between the Beaver Creek Wildlife Area and Ettrick.
5. Represents the area draining to the upper mainstem of Beaver Creek, with the exception of French Creek.

c. Inventory Methods

Upland sheet and rill erosion is the movement of soil that results from overland flow. It is commonly measured in units of "tons per acre per year". This class of erosion does not include the streambank and gully types of erosion. Streambank erosion inventory and analysis methods are discussed later. Gullies were not inventoried due to lack of resources, but are anticipated to be important contributors of sediment. Gullies will be identified and assigned a significance rating during the implementation phase of this watershed project.

The Universal Soil Loss Equation (USLE) was used in this watershed to estimate the average annual sheet and rill erosion on each field. The data collected to estimate average annual soil loss included rainfall runoff, soil erosivity, land cover, present management practices, slope, and slope length.

The entire watershed was inventoried for upland erosion potential. On a parcel-by-parcel basis, USLE factors plus the location, landowner identification code, and present practice information were collected. A parcel was defined as a field with homogenous individual USLE factors which was bounded by landowner property lines and watershed or sub-watershed lines. The parcels generally ranged in size from five to 15 acres, although large blocks of woodland were often delineated up to 40 acres in size.

The upland sheet and rill erosion survey encompassed 89,800 acres of cropland, pasture, and woodlot. Soil loss was calculated on a total of 6,440 parcels.

d. Analysis Methods

The pollution potential of eroding uplands is a function not only of soil loss, but of the efficiency of the transport by which the eroded soil makes its way to a waterway.

Much of the eroded soil is deposited on downslope lands before it reaches a stream. However some of this "trapped" soil may move into the channel system with subsequent rainfalls. Once in the stream channel network, the sediment may become deposited within the channel or carried downstream. In the Beaver Creek Watershed, the amount of previously eroded soil that has been redeposited in valley bottoms is significant. This makes the evaluation of eroding fields based on their delivery of sediment to a specific point in the watershed very difficult, since overland delivery and channel deposition would need to be considered. Such tools were not used in this planning effort.

Since the actual delivery from individual fields within an area will vary greatly from the average, and since it is very difficult to calculate overland transport using computer models, no attempt was made to estimate delivered soil loss for each individual field. Instead, the average annual soil loss estimated for each field was used as a surrogate to estimate the pollution potential from uplands in the watershed.

Using the soil loss information, lands controlled by each landowner or operator in each analysis area were ranked according to the pollution potential. The pollution potential was determined for lands controlled by each landowner or operator by the portion of his or her total soil loss occurring above a specified target level, expressed in tons/acre/year. These rankings form the basis of implementing the watershed project, since they determine which landowners will be targeted for contact and hopefully eventual involvement in the cost sharing program.

In order to identify the appropriate target level to be used in this watershed, three different target levels were evaluated for their effectiveness in reducing the soil loss in each of the 24 subwatersheds. Target levels of three, four, and five tons/acre/year were evaluated according to the percent reduction in total soil loss that would be achieved in each subwatershed by applying practices to fields above the target level. A specified sequence of practices was identified in order to carry out this analysis.

Generalized delivery ratios, expressing the portion of eroded soil making its way to the stream network, can be estimated for subareas within a watershed (Maner, 1958). Such estimates were made for subwatersheds in the Beaver Creek Watershed, and are presented in Table 13 in Chapter V. These estimates are useful only in very broad application, such as in comparing delivered soil loss from uplands in an area to soil delivered from streambank erosion.

3. Streambank Erosion

   a. Importance of the Pollutant Source

      Streambank erosion is the cutting action of water on the banks, which results in the obvious bank failure along channels. This erosion is important because of its direct impact on fish habitat. Eroded banks provide little stability for the vegetation needed to shade streams; provide poor bank structure which results in fewer places for fish to take cover; and are a source of the sediment which blankets the stream bottom, filling in pools and destroying spawning habitat and aquatic insects.

b. Inventory Methods

A modification of the Land Inventory Monitoring Process, Phase II, developed by the USDA-SCS, was used to inventory streambank erosion. A total of 938,000 bank feet were inventoried. This represents approximately 72% of the banks lining perennial streams in the watershed.

For each erosion site, the length, height, and lateral recession rate were estimated. These data were used to estimate the average annual volume of soil lost from each erosion site. The volume of sediment was then multiplied by the estimated density of the streambank soil to obtain an estimate of the tons of soil lost from the site each year. Information on location, landowner identification, and cattle access was collected along with these data for each site.

c. Analysis Methods

The stream reaches containing erosion sites were delineated on U.S. Geological Survey (USGS) 7½ minute series topographic maps. A stream reach was defined as that portion of a stream flowing within one landowner's property. The relative potential for achieving water resources benefits as a result of managing each individual's erosion problem was determined. This potential was based on two main factors: 1) the percent of an individual's stream reach that is eroded and could be improved through streambank erosion controls, and 2) the tons of sediment produced by the site.

The first factor was based on the fact that bankside habitat is limiting the fishery along many stream reaches (Eslien, 1986). In general, an improvement of less than 10% in the feet eroded was considered to represent a relatively small gain, while 10 to 20% represented a medium gain, and over 20% represented a significant gain.

The second factor was based on the fact that streambank erosion is a source of sediment with 100% delivery to streams. Streambank sediment is generally coarse, and can have significant localized impacts. The relative significance of streambank soil loss was determined for each subwatershed based on the decisions made for upland erosion, since upland erosion is the predominant source of sediment in the watershed. In doing this, the delivery ratio for upland soil loss was factored into the determination so that it took less streambank erosion to equal the severity of an upland site.

These factors were modified by the position of the reach of stream in the watershed. Sites on upper reaches of the tributaries were given added emphasis for two reasons. First, these are the areas used by trout for spawning, and eroded banks destroy the spawning habitat and smother or abrade the eggs. Second, the higher stream gradients in these areas result in a

greater scouring capability of suspended sediment. This has the added impact of abrading the sensitive gill membranes of fish, and scouring sensitive aquatic insects that provide a source of food for the trout.

4. Barnyard Runoff

a. Importance of the Pollutant Source

Runoff water from barnyards can carry manure to surface waters. The manure contains several components that can adversely affect water quality and aquatic life. Ammonia contained in the animal wastes can be toxic to fish and other aquatic life. Organic matter contained in the manure decomposes in the waterways, contributing to depletion of the oxygen which fish and other aquatic life need to survive. Nutrients in the manure, particularly nitrogen and phosphorus, promote nuisance algae and weed growth in surface waters. Finally, the bacteria found in livestock manure can be harmful not only to other livestock drinking the water, but to humans using the water for recreation.

b. Inventory Methods

A computer model developed by the Agricultural Research Service (ARS) (Young et al., 1982) and modified by the Wisconsin Department of Natural Resources was used in the Beaver Creek Watershed to determine the relative pollution potential of each barnyard.

This model simulates the mass loading of total phosphorus and chemical oxygen demand (COD) reaching a channel from each barnyard. The information to run this model was collected on all of the barnyards in the watershed. The data required by this model includes the types and numbers of livestock; the size of the yard; the physical characteristics of the area which contributes surface runoff waters to the yard; and the physical characteristics of the area through which the runoff waters leaving the barnyard flow before becoming channelized. In addition to the information needed to run the model, it was also noted if the barnyard was located in the floodplain.

c. Analysis Methods

Each barnyard with a hydrologic connection to surface waters was ranked within the appropriate analysis areas by using the phosphorus load generated by the barnyard runoff model. The phosphorus load estimated by the model was used to rank each barnyard to determine its relative potential to pollute surface waters. The 10-year, 24-hour rainfall event was used in the model runs.

Barnyards located in the floodplain were identified as potential management concerns, regardless of the pollutant loading estimated by the ARS model.

5. Manure Spreading

a. Importance of the Pollutant Source

Livestock wastes spread on the land can be a water quality concern if the wastes are applied to sensitive areas during critical times of the year. The periods when the ground is snowcovered or frozen are critical times because spread manure cannot be promptly incorporated into the soil, making the manure more available for transport to waterways during the period of spring snowmelt. Sensitive areas include floodplains and lands of six percent or greater slope. The impacts from this runoff are the same as those previously mentioned in the barnyard runoff discussion.

b. Inventory Methods

Information collected for the upland erosion and the barnyard runoff inventories was combined and used to estimate the pollution potential posed by each livestock operator who spreads manure on lands in the watershed. Data elements used in the winterspreading analysis are discussed below. The presence of unconfined manure stacks was noted during the inventory, and was simply used to indicate where stack locations should be checked to make sure a contamination potential does not exist.

c. Analysis Methods

This analysis is basically statistical in nature. The following two characteristics of each livestock operation were estimated:

1) the estimated number of critical acres winterspread with manure each year, and

2) the excess, or shortfall, of safe acres on which to winterspread, given the volume of manure generated and the characteristics of the land available for spreading.

Critical acres are defined as those with slopes greater than six percent, or floodprone as indicated by soil type.

The first step in this evaluation was to estimate how much land was required by each livestock operation to dispose of the manure generated over a 180 day period, which consists of the frozen ground period. The amount of manure generated by each operation was determined based on the animal type and number of animals. The number of acres required for manure disposal was calculated for each operation assuming a spreading rate of 25 tons per acre per year.

To calculate the first characteristic (the estimated number of critical acres winterspread with manure each year), it was assumed that each livestock operator used only his own land as a place to winterspread manure. It was also assumed that all of his cropland acres were considered accessible for spreading, except when acres were in the hay portion of a crop rotation. Using these assumptions, the number of critical acres spread each winter were estimated by multiplying the operator's need (in acres), by the proportion of his spreadable land that had characteristics making it unsafe for spreading. Where a livestock operator had land in more than one subwatershed, the number of critical acres apportioned to each subwatershed was statistically determined.

To calculate the second characteristic (the excess or shortfall of acres safe to winterspread with manure), the number of safe acres was divided by the number of acres needed. This produced a "Needs Ratio". Needs ratios of less than 1.0 indicate that there simply is not enough safe land for winterspreading manure. Ratios greater than 1.0 indicate that enough good land is available, and, if accessible, could be used to safely dispose of manure during the winter.

The first characteristic was used to rank each landowner within the appropriate analysis area. The second characteristic was used to estimate the need for manure storage as a means to safely utilize animal waste.

F. Nonpoint Pollutant Sources For Groundwater

1. Inventory Methods

Many pollutant sources potentially can contaminate groundwater, including cropland fertilization, cropland pesticide applications, failing septic systems, and poor animal waste management, just to name a few. Because the Beaver Creek Watershed was not developed as a groundwater protection project, collecting information on all potential sources of groundwater contamination was not thought necessary, given the difficulty of collecting and interpreting this type of information. A complete groundwater susceptibility map was not prepared for the watershed.

However, information collected during the barnyard survey indicated that some livestock operations are located in areas where the groundwater is vulnerable to contamination. A modified evaluation process was developed to identify the livestock operations of greatest concern. It must be recognized that these areas vulnerable to contamination from livestock wastes may also be vulnerable to other sources such as cropland fertilization and septic systems.

2. Analysis Methods

Site characteristics considered the most important in determining the vulnerability of groundwater to pollution from animal waste sources include 1) the amount of fine materials in the soil profile and 2) the depth to groundwater or a groundwater-bearing formation. Fine materials represent a capacity for the soil to adsorb pollutants, and, in some cases, to delay infiltration of soluble pollutants long enough for plant uptake. Separation distances (depth to groundwater) are important because they govern the extent to which these processes can occur.

A third important factor is the location of the pollutant source with respect to groundwater recharge and discharge areas. Sources in groundwater discharge areas, such as along valley bottoms, have less opportunity to contaminate water supply wells since contaminated groundwater is discharged relatively quickly to surface waters. Sources in upland areas have more of an opportunity to cause contamination in downgradient wells because the contaminants will travel farther before reaching a discharge area.

A summary of characteristics affecting groundwater contamination potential from animal wastes in the watershed follows:

Soils: In general, soils in the Beaver Creek Watershed are loams and silt loams. These soils provide conditions for good pollutant attenuation. Mechanisms include the adsorption of potential groundwater pollutants on the soil particles, and the detention of soluble pollutants, such as nitrate, thus allowing for greater plant uptake and less leaching to the groundwater. However, loamy sands and sandy alluvial soils cover about four percent of the watershed. These soils provide poor pollutant attenuation, especially of nitrogen.

Soils having seasonally high groundwater cover about 10% of the watershed. Most of these soils occur along the valley bottoms, although about three percent of these soils occur on valley benches and terraces.

Bedrock: Bedrock in the watershed is comprised almost entirely of weakly to strongly cemented sandstone. A combination of sandstone and sandy limestone underlies less than two percent of the watershed soils. Approximately 60% of the soils in the watershed are underlain by bedrock at depths exceeding five feet. In many cases, the bedrock is far deeper than five feet. About 40% of the soils have bedrock within five feet of the surface. The vulnerability of groundwater to contamination in these areas will vary depending on the nature of the soil itself. Sand and loamy sand bedrock soils cover four percent of the watershed; bedrock soils with considerable fractions of silt and clay cover the remaining 96% of the watershed.

Table 4. Preliminary Site Characteristics Used To Indicate Low Groundwater Contamination Potential From Concentrated Animal Waste Sources[1]

Characteristic	Animal Lot	Temp. Manure Stack	Solid Manure Storage Structure	Runoff From Lot, Stack, or Structure
Feet to Groundwater or Bedrock	>3	>5	>3-5	>2[2]
%Soil Passing #200 Sieve	>50% for at least 1 foot,	>50% for at least 3 feet,	>3 feet having >50%,	>50% for at least 1 ft,
	or	or	or	or
	>25% for at least 3 feet	>25% for at least 5 feet	>5 feet having >25%	>25% for at least 2 feet[3]

Animal Herd Size — Animal herd size should be considered as a factor, although criteria need to be developed.

Management — The frequency of lot scraping should also be considered as it will affect the availability of total nitrogen and the form of nitrogen found under the barnyard.

Location — Sources located in discharge areas or floodplains are generally less of a concern for water supply wells than sources located in upland areas.

[1] The separation distance and soil mechanical analysis criteria were considered together in determining site vulnerability. Both conditions had to be met to consider a site to have low vulnerability.

[2] As determined in the first 100 feet of vegetated buffer for overland flow or 300 feet of vegetated buffer for channel flow.

[3]. If runoff ponds for extended periods in an unvegetated area, a groundwater hazard may exist even if the separation distances and soil characteristics are met.

Groundwater Supply: The sandstone is the principal aquifer in the uplands. In the lowlands, the unconsolidated surficial aquifer is also used for water supply. Groundwater depths vary widely, from less than three feet to about 250 feet.

Preliminary site criteria were developed in order to assess the groundwater contamination hazard posed by sources of animal waste. These criteria are based in part on groundwater protection design criteria required under the SCS Technical Guide for the construction of animal waste control practices. The barnyard inventory was then referenced to identify where barnyards are either located on, or drain to, sensitive areas. These barnyards could then be identified as potential management concerns.

Table 4 shows the preliminary criteria used to determine if a concentrated source of animal waste poses a serious threat to groundwater supplies. Animal herd size is not quantified as a criterion in the table, but this factor does need to be considered since it influences the nature and location of the nitrogen contamination at the barnyard site (Bowen, 1987). Also, the contamination hazard posed by the barnyard itself or by runoff from the barnyard is affected by management of the lot surface, and scraping from the yard becomes an important consideration.

These criteria were applied to soils in the watershed having bedrock or seasonally high groundwater within five feet to determine which soils have a high groundwater contamination potential. Barnyards located in sensitive areas could then be identified.

CHAPTER IV. DESCRIPTION OF SURFACE WATER RESOURCES AND PROBLEMS

A. Introduction

This chapter summarizes surface water resource conditions and problems in the Beaver Creek Watershed. Most of the information presented in this section is based on the Beaver Creek Watershed Water Resources Appraisal Report (Eslien, 1986).

Information is presented as regional summaries, which provide overviews of surface water conditions and problems in the watershed. This information supports conclusions concerning existing uses of these surface waters, and the environmental factors that affect the ability of the resource to support these uses.

The detailed water quality data used to develop these conclusions can be found in the appraisal report.

B. Regional Surface Water Resource Summaries

1. Regional Summary: North Fork Beaver Creek

a. Introduction

The North Fork portion of the Beaver Creek Watershed includes the mainstem of the North Fork and many tributaries. Named tributaries include: Washington Coulee Creek, Little Creek, Joe Coulee Creek, Bear Creek, Columbus Creek, and Legue Coulee Creek.

All unnamed tributaries were assigned stream numbers for this project. Data were collected and assessed for the following creek numbers: 119540, 119530, 119520 (also identified by the DNR as Creek 10-10), 119510, 119490 (also identified by the DNR as Creek 17-5), 119470, 119460 (also identified by the DNR as Creek 13-1 in Trempealeau County and as Creek 7-10 in Jackson County), 119350, 119340, 119320. Creek number 9-13 was not assigned a separate number during this study, but was evaluated as part of this project.

The condition of water resources in this region are summarized in Table 5. Figure 2 shows the location of these streams.

b. Mainstem

The mainstem of the North Fork is approximately 14 miles long. It originates in western Jackson County and terminates at its confluence with the South Fork at the Village of Ettrick. It flows through the Morgan Marsh State Wildlife Area, a small wetland one mile west of the Village of Franklin. The stream gradient averages about 17 feet per mile, ranging from 50 feet per mile in the upper portion to five feet per mile in the lower portion.

Table 5. The Existing Use Classifications and Limiting Factors for Waterbodies in the Beaver Creek Priority Watershed Project: Region I, North Fork Beaver Creek and Tributaries

Subwatershed	Stream	Present Use Classification	Potential Use Classification	Factors Limiting Use
NL	North Fork Beaver Creek (from Ettrick to Jackson County line)	Class II brook trout water	same	1. in-stream sedimentation 2. turbidity 3. inadequate stream bank cover 4. inadequate in-stream cover
NU	North Fork Beaver Creek (from Jackson County line east	Class II brook trout water	same	1. in-stream sedimentation 2. inadequate stream bank cover 3. inadequate in-stream cover
NU	Trib. No. 119540	Class I brook trout water	same	1. in-stream sedimentation 2. inadequate stream bank cover 3. decreased number and depth of pools
NU	Trib. No. 119530	Class I brook trout water	same	1. degradation of adjacent seeps and springs 2. in-stream sedimentation 3. decreased number and depth of pools
UC	Trib. No. 119520 (Creek 10-10)	Class I brook trout water	same	1. in-stream sedimentation 2. decreased number and depth of pools 3. inadequate stream bank cover 4. inadequate in-stream cover
NU	Trib. No. 119510 (Creek 16-2)	Class I brook trout water	same	1. in-stream sedimentation 2. decreased number and depth of pools
UB	Creek 9-13	Class I brook trout water	same	1. in-stream sedimentation 2. inadequate in-stream cover 3. inadequate stream bank cover
NU	Little Creek (Creek 17-2)	Class I brook trout water	same	1. in-stream sedimentation 2. inadequate stream bank cover, especially in downstream segment
UA	Trib. No. 119490 (Creek 17-5)	1.5 miles are Class I brook trout water	same	1. inadequate in-stream cover, especially in Creek 5-3 2. inadequate streambank cover, especially in Creek 5-3 and downstream portion of Stream 17.5 3. in-stream sedimentation 4. decreased number and depth of pools, especially in Creek 5-3
UA	Trib. No. 119490 (Creek 5-3)	0.5 miles are Class II brook	Class I brook trout water	
NU	Columbus Creek (Creek 18-4)	Class I brook trout water	same	1. in-stream sedimentation 2. inadequate stream bank cover, especially in upstream segment 3. degradation of adjacent seeps and springs 4. inadequate in-stream cover, especially in downstream segment 5. decreased number and depth of pools

Subwatershed	Stream	Present Use Classification	Potential Use Classification	Factors Limiting Use
NL	Trib. No. 119470, upper	probably a forage fishery	same	1. inadequate stream bank cover 2. inadequate in-stream cover 3. in-stream sediment 4. decreased number and depth of pools
NL	Trib. No. 119470, lower (Creek 13-3a)	Class I trout	same	
UD	Trib. No. 119460 (Creek 13-1/7-10)	Class I brook trout water	same	1. inadequate in-stream cover, especially in upper and middle parts of stream 2. degraded adjacent seeps and springs 3. decreased number and depth of pools 4. in-stream sedimentation, especially in upstream segments
WA	Washington Coulee	Class I brook trout water (2 miles) in Trempealeau Co.	Class I brook trout water	1. in-stream sedimentation, especially in downstream segment 2. decreased number and depth of pools 3. inadequate stream bank cover 4. increased water temperatures in downstream segment, from tile drains
WA	Washington Coulee	Class I brook trout water (1.3 miles) in Jackson County	same	
WA	Trib. No. 119440 (Creek 14-16)	Class III trout		
JO	Joe Coulee	Class I brook trout water	Class I brook trout water	1. in-stream sedimentation in the downstream segment 2. inadequate stream bank cover in the downstream segment 3. inadequate in-stream cover in the downstream segment
NL	League Coulee	Class I trout	same	1. in-stream sedimentation 2. degradation of adjacent seeps and springs 3. decreased number and depth of pools 4. inadequate in-stream cover
BE	Bear Creek	Class I brook trout water (3.2 miles)	same	1. in-stream sedimentation 2. inadequate in-stream cover, especially downstream 3. inadequate stream bank cover, especially downstream
NL	Trib. No. 119350	Forage fishery	same	1. in-stream sedimentation 2. inadequate stream bank cover
NL	Trib. No. 119340	Forage fishery	same	1. in-stream sedimentation 2. inadequate stream bank cover
NL	Trib. No. 119320	Forage fishery	same	1. in-stream sedimentation 2. inadequate stream bank cover

Subwatershed	Stream	Present Use Classification	Potential Use Classification	Factors Limiting Use
BE	Trib. No. 119390 (Creek 7-4)	Class I trout		
BE	Creek 8-14	Class I trout		
BE	Creek 4-4	Class II trout		
BE	Creek 4-9	Class II trout		
NU	Creek 8-9	Class I trout		
NU	Trib. No. 119400 (Creek 15-5)	Class II trout		

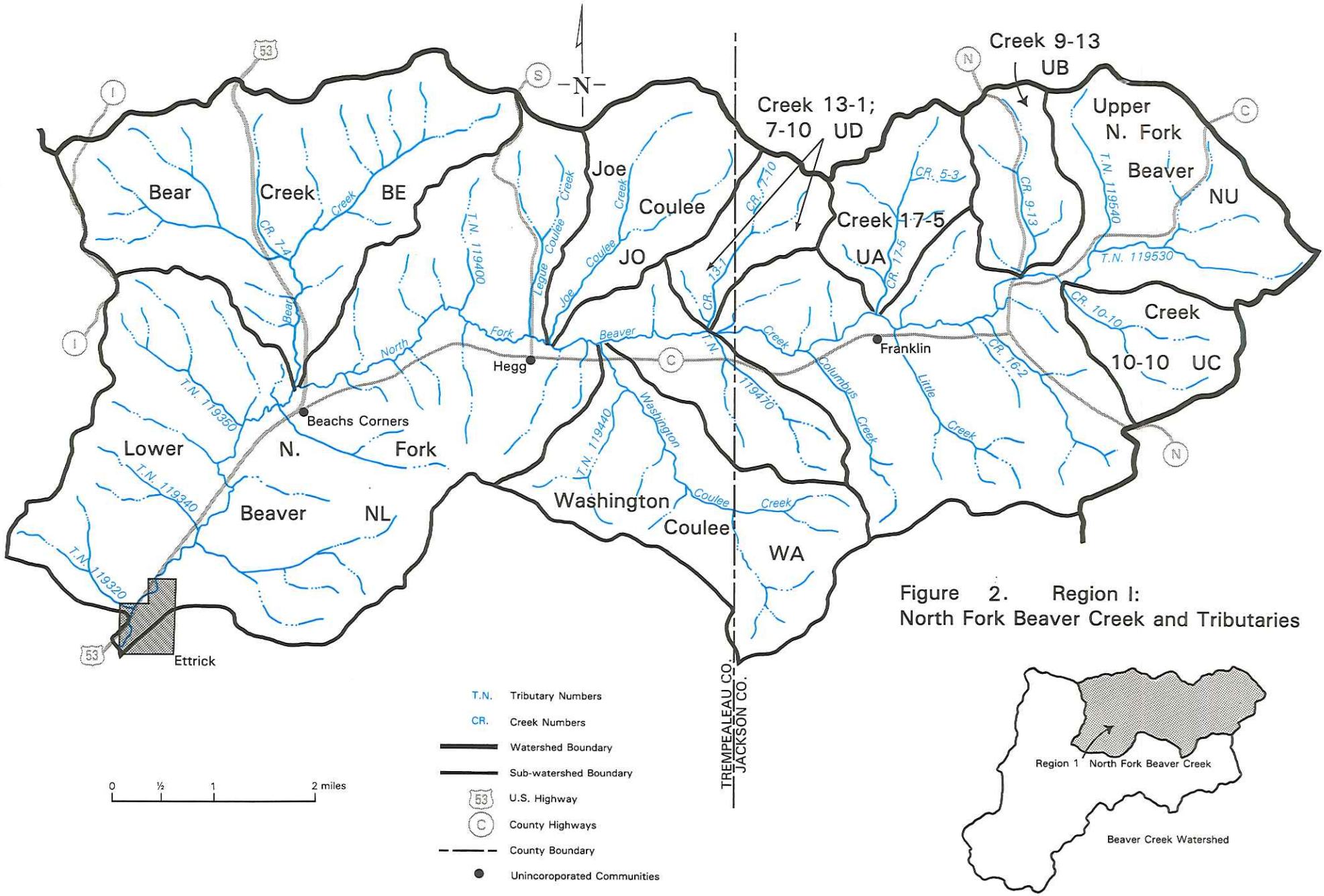


Figure 2. Region I:
North Fork Beaver Creek and Tributaries

Low flow depths range from 0.3 feet in the upstream portions to 1.3 feet near Ettrick. Widths vary from an average of four feet in the upstream area to 23 feet near Ettrick. The substrate is primarily sand and silt, although gravel comprises up to 10% of the substrate in some areas.

Stoneflies, mayflies, caddisflies, freshwater shrimp, and crayfish are all present throughout the North Fork, indicating that dissolved oxygen concentrations are high. These macroinvertebrates are most prevalent in the upper reaches above the Village of Franklin.

The entire North Fork is classified as Class II brook trout water. However the 1985 fish survey found white sucker to be the most common species, comprising 37% of the fish collected. It was represented at nearly all collection stations, but was most common in downstream portions. It was the only rough fish species collected from the North Fork.

Brook trout, the second most common species, represented 18% of the fish population. In fact, trout numbers are greater in the upper one-half of the North Fork than in any other main channel reach. These trout increased in numbers upstream. Densities of young-of-the-year brook trout reveal that natural reproduction may be occurring in the upper reaches of the North Fork.

Fish cover is generally poor. Undercut banks are generally scarce and unstable, and few rocks or boulders are present. Fallen trees and snags are limited, but where they do occur have been found to harbor most of the trout collected during recent surveys. Most fish were found in the state wildlife area, possibly due to the better bank cover.

c. Tributaries

Most of the tributaries to the North Fork are short, shallow, spring-fed streams. Most of the tributaries have steep gradients of 50 to 70 feet per mile in their upper portions, and flatten out to less than 20 feet per mile as they enter the valley bottom of the North Fork. Average gradients for most streams are between 40 and 70 feet per mile, except for Bear Creek, Washington Coulee Creek, Legue Coulee Creek, and Joe Coulee Creek. These creeks approach the valley bottom sooner and have average gradients of only 25 feet per mile.

In general, gravel is the underlying substrate in these tributaries, with more gravel exposed in the steeper upper reaches than in the flatter, lower reaches where it is often buried completely with sand and silt. Many pools, important as trout habitat, are clogged with silt.

Table 6. The Existing Use Classifications and Limiting Factors for Waterbodies in the Beaver Creek Priority Watershed Project: Region II, South Fork Beaver Creek and Tributaries.

Subwatershed	Stream	Present Use Classification	Potential Use Classification	Factors Limiting Use
SL	South Fork Beaver Creek (from Ettrick to Jackson Co. line)	Class III trout water	same	1. in-stream sedimentation 2. turbidity 3. inadequate in-stream cover 4. inadequate stream bank cover
SU	South Fork Beaver Creek (from Jackson Co. line east)	Forage fishery	Class III trout water	
GE	German Coulee	Forage fishery	same	1. in-stream sedimentation, especially in downstream segment 2. inadequate in-stream cover
SV	Svenson Coulee	Forage fishery	unknown	1. in-stream sedimentation
BO	Borreson Coulee (119260; Creek 2-12)	Class I trout	same	1. in-stream sedimentation 2. decreased number and depth of pools 3. degraded adjacent springs and seeps 4. reduced flows
SA	Salzwedel Coulee	Class II trout water	same	1. in-stream sedimentation 2. inadequate in-stream cover 3. decreased number and depth of pools
SA	Trib. No. 119230 (Creek 34-15)	Class I trout		
ST	Stensven Coulee	Forage Fishery	same	1. in-stream sedimentation 2. inadequate in-stream cover 3. inadequate stream bank cover

Most of these streams are brook or brown trout water, with the presence of young-of-the-year fish indicating natural reproduction. Some of the streams have historically been designated as trout water, such as Washington Coulee Creek, Joe Coulee Creek, Bear Creek, and stream 119460. Many of the streams, however, were formerly regarded as forage fish streams, and were only recently designated as trout streams. These changes were either based on improvements in stream conditions that have occurred over the last 20 years, or on field data collected as part of the watershed project.

Generally, these tributaries contain greater amounts of cover, gravel, and undercut banks with overhanging vegetation than the North Fork mainstem.

In general, the flow is limiting to resident fish populations in the upper reaches of these tributaries, although these same areas provide seasonal spawning habitat. In the middle and lower reaches, where flows are adequate, inadequate bank and instream cover and habitat siltation are limiting the fish population. Where substrate has been adequate for collecting aquatic insects, an analysis of the types and numbers present indicates that dissolved oxygen concentrations are generally high.

2. Regional Summary: South Fork Beaver Creek

a. Introduction

This portion of the Beaver Creek Watershed includes the mainstem of the South Fork, and five main tributaries. These tributaries include: German Coulee Creek, Svensen Coulee Creek, Borreson Coulee Creek, Salzwedel Coulee Creek, Stensven Coulee Creek, and Smikrud Coulee Creek.

Table 6 summarizes the condition of the water resources in this region. These streams are shown in Figure 3.

b. Mainstem

The mainstem of the South Fork is approximately 11 miles long, originating in western Jackson County and terminating at its confluence with the North Fork at the Village of Ettrick. It flows through a large wetland area near Buckholz Corners, just inside the Jackson County boundary. This wetland area is reportedly growing towards the east as deposited sediment slows streamflows, raises the streambed, and floods additional land.

The stream gradient of the South Fork averages about 16 feet per mile. Gradients in the extreme upper branches within Jackson County are 50 to 70 feet per mile. These gradients flatten out to about 30 feet per mile in the reach above the wetland area. Most of the South Fork, however, has a very low gradient of 10 feet per mile.

Stream widths range from an average of one foot in the upstream area to 20 feet near Ettrick. Historically the substrate has been unstable, comprised of mostly sand and silt. Recent substrate surveys conducted during 1984-85 indicate little change. Sand comprises 50% or more of the substrate throughout most of the stream, with silt and hardpan making up most of the remaining substrate. Gravel exists only infrequently. It comprises about 10% of the substrate in the portion of the South Fork just below the confluence with Salzwedel Coulee Creek, and is not found elsewhere.

Aquatic insects are present throughout the stream, but are rarely abundant. Most taxa are considered scarce.

The portion of the South Fork in Trempealeau County is currently classified as Class III trout water while the portion in Jackson County is limited to forage fish. The 1985 fish survey found white sucker and bluegill to be the most common species, comprising 97% of the fish collected. Small numbers of brook and brown trout were collected, but comprised only three percent of the population. The presence of unmarked yearling trout in the mainstem of the South Fork indicates that there is some natural reproduction occurring in the subwatershed, but more data is needed for confirmation.

Fish cover is very poor. Undercut banks are generally scarce and unstable. Few rocks or boulders are present, and in fact are lacking in many areas. Fallen trees and snags are limited. Pools are generally silted in, but comparison of recent data with historical data indicates that these pools may respond very well to bank work which increases stream velocities.

c. Tributaries

The tributaries to the mainstem vary in length from about one mile (Svenson Coulee Creek and Borreson Coulee Creek) to about three miles (German Coulee Creek, Salzwedel Coulee Creek and Stensven Coulee Creek). In general, gradients are very steep (80-100 feet per mile) in the extreme headwater reaches of these streams, dropping quickly to about 20 feet per mile.

Most streams are spring-fed, although lack of sufficient flow is a limiting factor in many of the streams. Other limiting factors include a general lack of instream habitat, and unstable sand and silt substrates. Unfortunately the few places where gravel was found occurred in reaches where streamflow is limiting. These conditions lead to streams suitable mainly to forage fish.

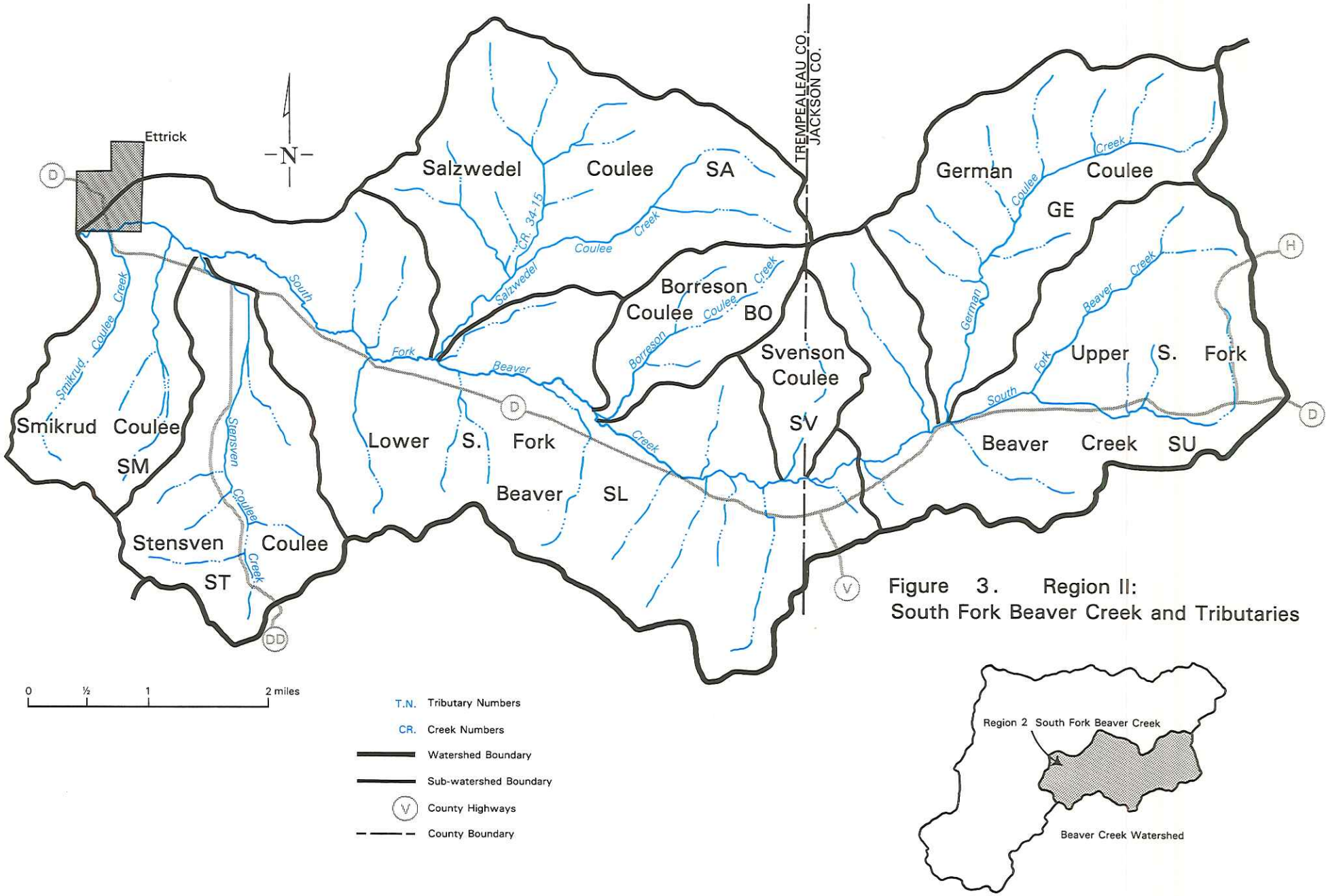


Figure 3. Region II:
South Fork Beaver Creek and Tributaries

The main exception to these conditions is Salzwedel Coulee Creek and its tributaries. Better flow, more widespread gravel substrate, and better bank and instream cover allow this stream to seasonally support trout. In addition, mayflies and caddisflies, which indicate high dissolved oxygen concentrations, are found in the stream. The stream is currently designated a Class II trout stream, and some of its tributaries are classified as Class I trout streams.

German Coulee Creek has some of the attributes of Salzwedel Coulee Creek, but an evaluation of its potential to support more than a forage fishery has not been possible due to lack of data. It is generally felt, however, that it has reached its highest use designation.

3. Regional Summary: Main Stem of Beaver Creek

a. Introduction

The main stem of the Beaver Creek Watershed includes the mainstem of Beaver Creek, including Lake Marinuka, and all of the tributaries to Beaver Creek with the exception of French Creek (see the following regional summary). Named tributaries in this region include: Abraham Coulee Creek, Flood Coulee Creek, Dutch Creek, Creek 14-13, Silver Creek, and Little Tamarack Creek. All unnamed tributaries were assigned stream numbers for this project. Data were collected and assessed for the following stream numbers: 118980, 118950, and 118870.

The condition of water resources in this region are summarized in Table 7. These waterbodies are shown in Figure 4.

b. Mainstem Above Lake Marinuka

This segment of Beaver Creek stretches 10 miles from the Village of Ettrick, where the North Fork and South Fork converge, to Lake Marinuka at Galesville. The stream gradient averages about seven feet per mile and stream widths average about 40 feet. Stream depths and flows are sufficient to support some trout and warm water fishes.

The stream substrate, sampled recently at six stations between Galesville and Ettrick, was dominated by sand, with lesser amounts of silt and hardpan. Only trace amounts of gravel were found at a few of the sampling locations. In-stream cover is generally poor throughout this reach. In addition, although streambanks are less eroded and undercut than shown in previous surveys, streambank cover is generally inadequate in many areas. Where trees have fallen into the channel, the stream has responded by carving deeper pools. The cover provided in these areas generally attracts a more diverse community of fish and wildlife.

Table 7. The Existing Use Classifications and Limiting Factors for Watersheds in the Beaver Creek Priority Watershed Project: Region III, Mainstem Beaver Creek and Tributaries.

Subwatershed	Stream	Present Use Classification	Potential Use Classification	Factors Limiting Use
BU	Beaver Creek (main stem)	Class II trout water between Ettrick and Lake Marinuka	same	1. in-stream sedimentation 2. inadequate stream bank cover 3. inadequate in-stream cover 4. turbidity
BL	Beaver Creek (main stem)	Warm water fishery between Lake Marinuka Dam and mouth	same	1. no limiting factors noted
BU	Abraham Coulee, upper lower	 Class I trout Class I trout	 same same	1. in-stream sedimentation 2. inadequate stream bank cover 3. inadequate in-stream cover
BU	Trib. No. 118980	Forage fishery	unknown	1. in-stream sedimentation 2. inadequate stream bank cover upstream of Hwy T bridge
BU	Trib. No. 118950 (Creek 16-6a)	Class III trout	unknown	1. in-stream sedimentation 2. inadequate stream bank cover
BU	Flood Coulee	Forage fishery	unknown	1. in-stream sedimentation 2. inadequate stream bank cover
UE	Trib. 118930	Class II trout water	same	1. in-stream sedimentation
SI	Silver Creek	Forage fishery	unknown	1. in-stream sedimentation 2. inadequate stream bank cover 3. inadequate in-stream cover
BL	Trib. No. 118870	Forage fishery	unknown	1. in-stream sedimentation 2. inadequate stream bank cover
BL	Little Tamarack Creek	Forage fishery	same	Lack of sufficient continuous flow
BU	Trib. No. 118960,118970 (Creek 17-1)	Class II trout		
DU	Trib. No. 118920 (Creek 14-13)	Class II trout		
DU	Dutch Creek (Trib. 118910)	Class I trout	same	1. in-stream sedimentation
DU	Creek 5-6	Class I trout		

Mayflies, stoneflies, freshwater shrimp, and caddisflies were recently noted at several of the sampling stations, indicating high dissolved oxygen conditions.

This portion of Beaver Creek is a Class II trout stream. Fish sampling over the past 20 years has revealed the presence of brook trout, brown trout, and a variety of warmwater fishes including bluegill, crappie, carp, and suckers.

As discussed earlier, Lake Marinuka is an impoundment on Beaver Creek. The impoundment was created as a 240 acre impoundment in 1867, but sedimentation caused by heavy upland and streambank erosion has caused severe water quality problems over the years. The open water area was reduced to 135 acres by 1935, and to 70 acres by 1978. Extensive weed beds, rooted in the soft sediments, severely restricted recreational uses of the lake.

The impoundment was dredged in 1935, and again in 1981-83. The latter dredging was part of a comprehensive lake management project, aimed at controlling the principal sediment and nutrient sources to Lake Marinuka as well as conducting in-lake rehabilitation measures.

Little data is available concerning the water quality of Lake Marinuka since the latest dredging project was completed. Additional control of nutrients and sediment remains an objective for the Beaver Creek Priority Watershed Project. This will help maintain water quality in the impoundment.

c. Tributaries Above Lake Marinuka

Streams tributary to the mainstem above Lake Marinuka are a mixture of forage fish streams and trout waters. For most of these streams, little is known about the potential improvement in water quality that might result from nonpoint source controls in their drainages.

Many changes in classification have been made in these tributaries as a result of information collected through this watershed study. Originally, Dutch Creek had the only recognized trout waters. Now, recognized trout waters have been expanded to include tributaries to Dutch Creek, Abraham Coulee and its tributaries, and streams 17-1 and 16-6a.

The most information is available for Dutch Creek. Dutch Creek is a Class I trout stream in its lower 2.8 miles, with several Class I and II trout streams as tributaries. Stream gradients are about 100 feet per mile in the headwater areas, and about 20 feet per mile in the downstream three miles. Historically, surveys have recorded brook and brown trout in the stream, and substrate comprised of 30% gravel and 70% sand, silt, and clay.

The creek was surveyed in 1984-85. The stream had good flow, and a substantial proportion of gravel in the substrate, although sand and silt are still common components. Good bank cover was found at some of the sites surveyed, and fallen trees had created pools and in-stream cover.

Macroinvertebrates were common, and caddisflies, which need highly oxygenated water to thrive, were abundant. In general, the main limiting factor is sedimentation in the downstream reaches.

d. Mainstem Below Lake Marinuka

The mainstream below Lake Marinuka is almost five miles long, stretching from the dam at Lake Marinuka to the confluence of Beaver Creek and the Black River.

Little data is available on this stretch of Beaver Creek; what is available was collected 15 years ago. These data indicate that near the dam, the substrate was mainly gravel and rubble with less than 25% sand and silt. Macroinvertebrates were common and mayflies were abundant. Below this area, the stream flows through wetlands all the way to its mouth. This stretch of Beaver Creek supports mainly warmwater fish.

e. Tributaries Below Lake Marinuka

Tributaries below Lake Marinuka include stream number 118870 and Little Tamarack Creek. Both streams are considered suited for only forage fish.

Little Tamarack Creek has perennial streamflow only above State Highway 35. As the stream crosses under the highway, it begins to lose flow in the sandy soils. During most of the year, the stream channel has no flow. However, there is considerable evidence that during periods of spring snowmelt flows are considerable all the way to Beaver Creek. This evidence includes a well defined channel, rock headwalls on culverts at several road crossings below State Highway 35, and attempts by road crews and individual landowners to stabilize culverts and divert flows from channel banks. A drop pool exists at the confluence of Beaver Creek and Little Tamarack Creek, indicating recurring hydrologic activity.

For the purposes of this watershed project, the Little Tamarack Creek Subwatershed is considered to be hydrologically connected to Beaver Creek.

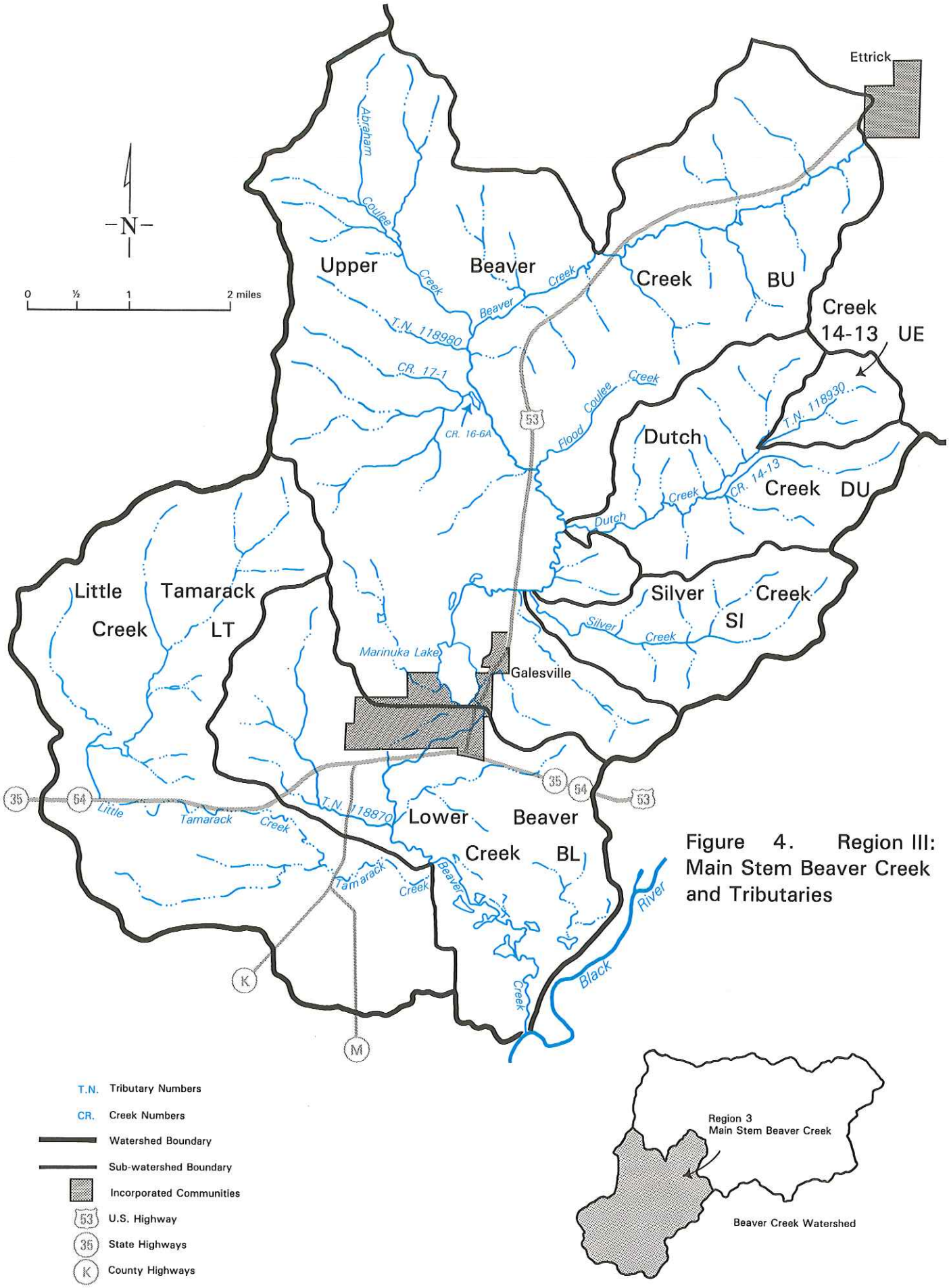


Figure 4. Region III: Main Stem Beaver Creek and Tributaries

4. Regional Summary: French Creek

a. Introduction

The French Creek portion of the watershed includes French Creek and its tributaries. Named tributaries include Mason Coulee Creek and Linderud Coulee Creek. Unnamed tributaries for which data were evaluated include stream numbers 119130, 119110, 119090, and 119060.

A summary of water resource conditions in this region is presented in Table 8. These streams are shown in Figure 5.

b. Mainstem

The mainstem of French Creek is nine miles long, and enters Beaver Creek between Ettrick and Galesville. While the extreme headwater reaches have gradients of 80 to 100 feet per mile, most of the stream has low gradients. The stream flattens out rapidly to gradients of 30 to 40 feet per mile, and maintains a gradient of 10 to 20 feet per mile for over 50% of its length. The upper portion of French Creek is narrow with steep banks; the lower half is generally shallow and wide.

Eight survey stations were established on the mainstem of French Creek during 1985. Overall, the upper portions of French Creek have greater amounts of exposed gravel in the substrate. Above tributary 119110, the composition of the substrate ranged from 35% gravel/rubble (near tributary 119110) to 80% gravel/rubble in the headwater reaches. Sand comprised the next most common substrate component at these sites.

Feeder springs were noted in these upper reaches. Macroinvertebrate populations were abundant, including mayfly and caddisfly species. Stream width and depth were good for supporting trout, although bank erosion was moderate and both stream bank and instream cover were lacking. Unmarked brook trout were found in this portion of French Creek during the 1985 survey.

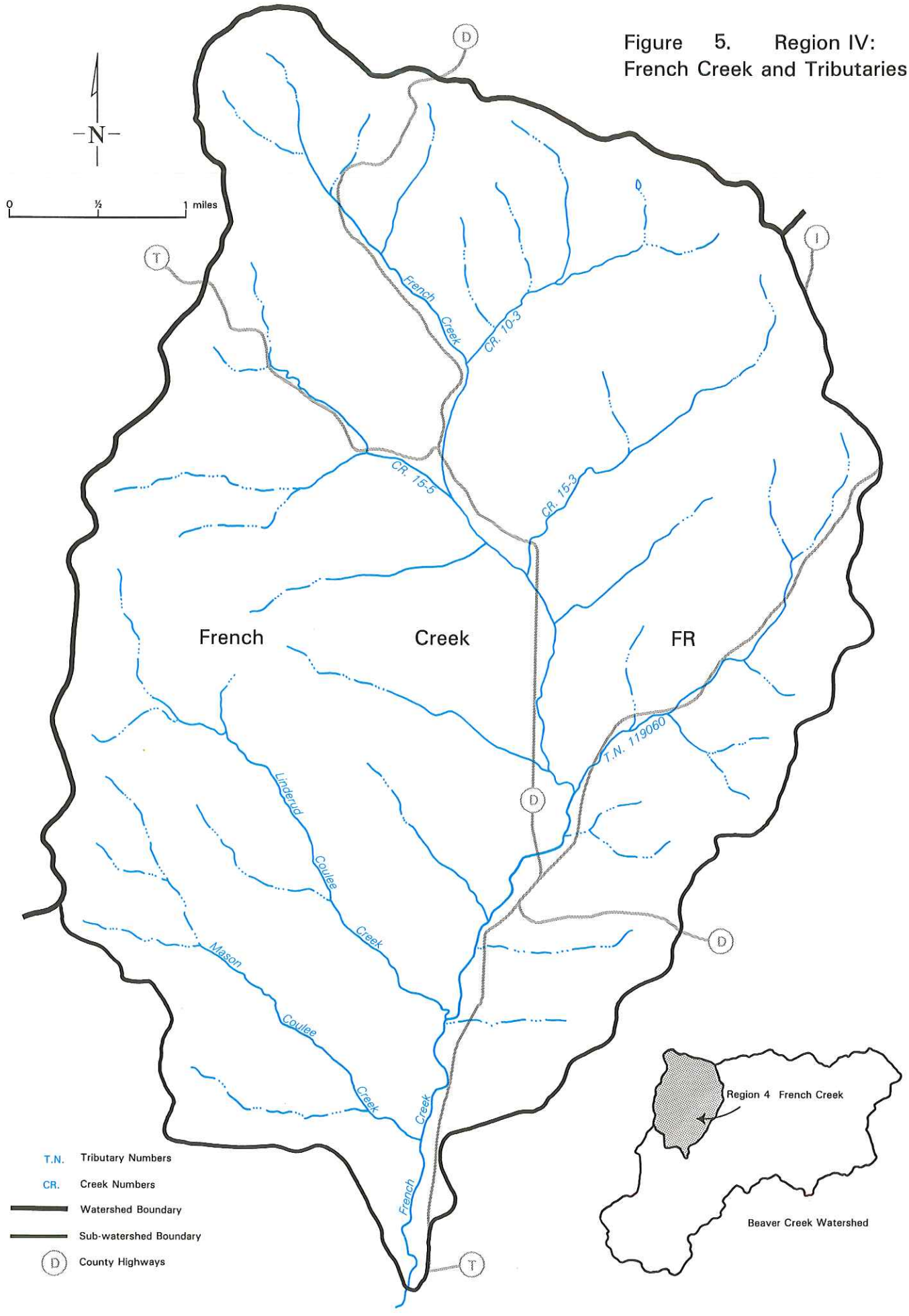
Below tributary 119110, the habitat varied greatly in quality. Along most of the stream, bank erosion is moderate to severe, the stream is relatively wide, shallow and warm, and the substrate is predominantly sand with silt comprising the next most common component.

However, in areas between Linderud Coulee Creek and stream number 119080, where the streambank has been protected, the creek is narrower and deeper, and the underlying gravel substrate has been revealed through scouring. The biota has responded in these areas, with the survey finding mayflies and caddisflies to be common, indicating good dissolved oxygen concentrations. In

Table 8. The Existing Use Classifications and Limiting Factors for Watersheds in the Beaver Creek Priority Watershed: Region IV, French Creek and Tributaries

Subwatershed	Stream	Present Use Classification	Potential Use Classification	Factors Limiting Use
FR	French Creek (main stem)	Class II brook trout water (Wayside Ln. Bridge to headwater)	Class I trout water	1. in-stream sedimentation, especially in downstream segment 2. inadequate in-stream cover in the downstream segment
FR	French Creek (main stem)	Forage fishery (Wayside Ln. Bridge to mouth	Class III trout water	3. inadequate stream bank cover in the downstream segment 4. number and depth of pools decreased
FR	Trib. No. 119130/119140 (Creek 10-3)	Class II trout	Class II trout water	1. in-stream sedimentation 2. inadequate in-stream cover
FR	Trib. No. 119110 (Creek 15-5)	Class II trout	Class II trout water	1. in-stream sedimentation 2. inadequate stream bank cover
FR	Trib. No. 119090 (Creek 15-3)	Class I trout	same	1. in-stream sedimentation 2. inadequate stream bank cover
FR	Trib. No. 119060	Forage fishery	same	1. in-stream sedimentation 2. inadequate stream bank cover
FR	Linderud Coulee, lower (Creek 34-2)	Forage fishery	same	1. in-stream sedimentation 2. inadequate stream bank cover
FR	Linderud Coulee, upper (Creek 34-2)	Class I trout	same	
FR	Mason Coulee	Forage fishery	same	1. in-stream sedimentation 2. inadequate stream bank cover

Figure 5. Region IV: French Creek and Tributaries



addition, unmarked brook trout were found in these areas. This response in the middle portion of French Creek is probably due to streambank protection. To what extent the lowermost portions of the creek would respond to streambank protection is unclear.

c. Tributaries

Based on the available information, the following generalizations can be made concerning these tributaries. The tributaries are very shallow, lack protective vegetative canopies, and consequently have very warm temperatures. The substrate is predominantly sand in the lower reaches, while upper reaches contain more gravel. Streambanks are eroded, and bankside cover is poor. Fish populations are limited to forage species.

CHAPTER V. NONPOINT POLLUTION SOURCE ASSESSMENT RESULTS

A. Introduction

The results of the pollutant source assessment are discussed in the next section of this chapter. Where appropriate, the results are discussed for individual subwatersheds. The names of the subwatersheds are often abbreviated, so the subwatersheds are listed here with the appropriate abbreviations for future reference:

BE	Bear Creek	BL	Lower Beaver Creek
BO	Borreson Coulee	BU	Upper Beaver Creek
DU	Dutch Creek	FR	French Creek
GE	German Coulee	JO	Joe Coulee
LT	Little Tamarack	NL	Lower North Fork Beaver Creek
NU	Upper North Fork Beaver Creek	SA	Salzwedel Coulee
SI	Silver Creek	SL	Lower South Fork Beaver Creek
SM	Smikrud Coulee	ST	Stensven Coulee
SU	Upper South Fork Beaver Creek	SV	Svenson Coulee
UA	Creek 17-5	UB	Creek 9-13
UC	Creek 10-10	UD	Creek 13-1, 7-10
UE	Creek 14-13	WA	Washington Coulee

Following the assessments results discussions, the water resources objectives for the watershed are discussed in detail in the third section of this chapter.

B. Pollutant Source Assessment Results

1. Barnyard Runoff

Barnyards are a source of animal waste that produces nutrients, oxygen demand, and pathogens that can pollute surface waters.

Although a comparison of the pollution potential associated with barnyards versus winterspread manure has not been made for the Beaver Creek Watershed, it is expected that barnyard runoff is more significant than the runoff of field-spread manure as a source of phosphorus and other pollutants to surface waters. This was estimated to be the case in the Wisconsin drainage to the Great Lakes, where the relative importance of animal waste sources was figured to be about 66% barnyards and stacks, and 33% winterspreading (Moore, 1979).

The barnyard survey for this project recorded 262 animal yards. These barnyards were placed into two separate groups for analysis purposes. The first group consists of barnyards hydrologically connected to surface waters. This group includes 212 barnyards, or 81% of those surveyed. The second group consists of barnyards which are not hydrologically connected to surface waters. This group

Table 9. The Relative Pollution Potential of Barnyards Draining To Surface Waters In The Beaver Creek Priority Watershed Project

Sub-watershed	Number of Barnyards	POLLUTION POTENTIAL (phosphorus load, lbs.) minimum	maximum	median	total	Lbs. TP X 1,000 per stream mile
BE	10	2	312	9.00	515	7.4
BO	1				3	(see SL)
BL	6	0	24	1.00	32	.7
BU	27	0	203	5.00	434	2.0
DU	2	0	1	0.50	1	<.1
FR	41	0	609	51.00	2906	11.4
GE	3	1	71	4.00	76	1.7
JO	9	0	105	23.00	318	12.2
LT(2.)	11	0	65	8.00	234	6.7
NL	30	0	21	4.00	197	.8
NU	12	0	12	1.50	33	.3
SA	5	1	18	5.00	36	.6
SI	9	0	225	2.00	254	9.1
SL	16	0	125	5.00	239	4.5
SM	4	3	77	39.50	158	(see SL)
ST	2	3	8	5.50	11	(see SL)
SU	9	0	8	3.00	24	.5
UA	2	20	23	21.50	43	2.7
UB	1				5	.3
UC	3	0	1	0.00	1	.1
UD	3	0	9	8.00	17	1.4
WA	6	3	45	12.00	114	2.9
TOTAL WATERSHED	212	0	609	6.00	5651	4.2

TP = Total Phosphorus

1. Phosphorus load was determined using the ARS Model for a 4.3 inch rain.

2. Includes those barnyards that drain to the creek above Highway 35.

includes 50 barnyards, or 19% of those surveyed. The remainder of this section discusses the barnyards that are hydrologically connected to surface waters. The other 50 yards are discussed elsewhere in this chapter.

As is typical of most priority watershed projects, most of the pollutant loading in the Beaver Creek Watershed is contributed by relatively few of the barnyards. For example, half of the pollutant load from barnyards in the Beaver Creek Watershed can be removed by treating less than 10% of the barnyards. And 75% of the barnyard pollutant load could be reduced by treating only 20% of the barnyards. Above this point, the additional pollution control achieved by treating additional barnyards becomes less and less significant, and it becomes difficult to justify spending public monies to achieve the small amount of additional pollution control. This same phenomenon occurs within the individual subwatersheds of Beaver Creek as well.

Table 9 shows the distribution of barnyards and barnyard pollutant loadings within the watershed.

Based on the data in Table 9, several facts become evident in the watershed. First, the French Creek Subwatershed is the area with the highest potential for barnyard pollutants in the watershed. It contains the greatest number of barnyards that drain to surface waters; the single most significant barnyard in the entire watershed; and the highest median pollutant loading. In fact, the barnyard pollution potential from this one subwatershed comprises about 50% of the barnyard pollution potential for the entire watershed. This is significant in considering the effects of French Creek on the water quality in Beaver Creek and Lake Marinuka.

In addition, the barnyard pollution density for the French Creek Subwatershed is the second highest of any subwatershed, almost three times the watershed average. This, as well as the other factors, indicates the relatively high pollution hazard posed by barnyards to French Creek itself.

Other facts evident from this analysis include:

a. relatively high median pollutant loadings in other subwatersheds, including JO, SM, and UA,

b. relatively high total pollutant loadings from other subwatersheds including JO, BE, and BU,

c. relatively high pollution densities in other subwatersheds including JO, BE, LT, and SI.

Two other factors were considered besides the results of the barnyard runoff model in evaluating the significance of barnyards as pollutant sources. First, the potential of the barnyard as a sediment source

was considered. Four barnyards were identified as sources of concern. Also, five barnyards were identified to be in the floodplain. All five of these are of concern.

2. Manure Spreading

Manure spread on fields is a source of nutrients, oxygen demand, and pathogens, just as barnyards are. Winterspread manure is considered to have the highest pollution potential if it is spread on lands over six percent slope or on lands in a floodplain. In these instances, the manure is particularly susceptible to runoff since it has not been incorporated into the soil, and is subjected to water of high erosive potential.

Although a comparison of the pollution potential associated with barnyards versus winterspread manure has not been made for the Beaver Creek Watershed, it is expected that winterspread manure is relatively less significant than barnyard runoff as a source of phosphorus, and possibly, for other pollutants. As mentioned earlier, this was estimated to be the case in the Wisconsin drainage to the Great Lakes, where the relative importance of animal waste sources was figured to be about 33% winterspreading and 66% barnyards and stacks (Moore, 1979).

The general picture of winterspreading in the Beaver Creek Watershed can be shown with illustrated basic statistics. One factor to be considered in looking at the pollution potential of winterspreading is the supply and demand for land upon which to winterspread. There are 268 livestock operations in the watershed that together contain 11,000 animal units. (An animal unit [a.u.] is equivalent to one head of beef or slaughter cattle weighing about 1,000 pounds.) The animal unit is used to compare the pollution-producing capability of different animals. As an example dairy cattle are equivalent to 1.4 a.u., young stock are equivalent to 0.4 a.u. and pigs are equivalent to 1.4 a.u.

During the winter months, these animals produce about 80,000 tons of manure. Based on a spreading rate of 25 tons per acre per year, there is a need for about 3,000 acres to accommodate winterspreading the manure generated in the watershed.

Although there are 7,400 acres in the watershed that could be spread with manure in any one year, not all of these acres are environmentally safe. Only 3,300 of these 7,400 acres are flat enough (less than six percent slope) or far enough from floodplains to be considered safe for winterspreading. Although on paper the overall need is matched with the overall availability of safe land, there is a distribution problem. Roughly 75% of the livestock operators, representing 75% of the animal units, do not have adequate safe acres on their own lands to accommodate their winterspreading needs.

Table 10. Summary of Winter Manure Spreading Information For The Beaver Creek Priority Watershed Project (1.)

County	Number of Anim. Units	Acres Needed For Winter Spreading (2.)	Number of Acres Available			Estimated Number of Critical Acres Spread
			Suitable	Not Suitable(3.)	Total	
Tremp.	9,210	2,700	3,030	3,510	6,540	940 to 1,920
Jackson	1,830	550	290	560	850	270 to 370
TOTAL	11,040	3,250	3,320	4,070	7,390	1,210 to 2,290

1. Data does not include the Little Tamarack Creek Subwatershed. Landowners in this subwatershed are eligible for assistance.

2. Based on a manure generation period of 6 months, and an application rate of 25 T/A/Y.

3. Includes lands on slopes over 6%, and lands having floodplain soils.

Table 10 summarizes the pollution potential posed by winterspreading manure in the watershed. In developing this summary, a detailed analysis was performed for each livestock operation. For each operation, the herd size was used to estimate manure generation for the winter period. The land use data were used to determine the amount of available land for each operator to spread on, and the proportion of his or her available land that is unsuitable for winterspreading. Based on this information, and an assumed application rate of 25 tons per acre per year, estimates were made of the number of critical acres spread per landowner per winter. Accessibility of land parcels was not evaluated, and will need to be assessed during implementation.

In Jackson County, there is an overall shortage of safe acres for winterspreading, with 550 acres needed and only 290 acres suitable. In Trempealeau County, the two figures are more even, with 2,700 acres needed and 3,030 acres suitable.

Because the acres that are safe for spreading are not always owned by the people who need them, some critical acres are estimated to be winterspread with manure each year. The estimated critical acres winterspread with manure, based on a summation for each animal operation, ranges from 270 to 370 acres annually in Jackson County and from 940 to 1,920 acres annually in Trempealeau County. For the entire watershed, it is estimated that from 1,200 to 2,300 critical acres are winterspread annually.

The purpose of this analysis is to guide efforts to control winterspreading of manure so that water quality impacts are minimized. Additional effort will be required during implementation to determine the severity of this pollutant source for each landowner, and to determine the appropriate level of assistance for each landowner. However, the above analysis provides a good framework within which landowners can be evaluated during implementation.

3. Upland Sheet and Rill Erosion

This upland erosion analysis addresses three topics. First, it summarizes the nature and extent of the upland erosion which is a potential source of sediment to waterbodies in the project area. Second, it addresses the relative importance of upland erosion as an overall source of sediment, and third, it addresses the evaluation of target levels to be used as design standards for the control of upland erosion, and consequently the reduction in stream-borne sediment emanating from this source.

The upland sheet and rill erosion survey encompassed 89,800 acres of cropland, pasture, and woodlot. This land area was divided into 6,440 parcels. Cropland parcels are typically less than 10 acres, while woodlots and pastures having low erosion potentials range up to

80 acres. The slope definitions used in this discussion are as follows: A (0-2%); B (2-6%); C (6-12%); D (12-20%) and E (greater than 20%).

Table 11 summarizes the land use and soil loss data for the Beaver Creek Watershed. Continuous and rotated row croplands comprise a significant portion of the land use, and contribute the bulk of the soil loss. Average soil loss rates on these lands are very high. Pasture and grazed woodlots combined form about 25% of the land use, but do not contribute significantly to the soil loss. Ungrazed woodlots form a significant portion of the land use, but pose no significant potential as sources of sediment.

The extent of steeply sloped lands (see following paragraph), and the role they play as potential sediment sources, was evaluated by looking at lands equal to or exceeding E slopes (those greater than 20% slope). It is currently the policy of the Trempealeau County Land Conservation Committee to discourage the use of these lands for growing crops due to their high erosion potential.

About 50% of the land in the Beaver Creek Watershed, or 44,700 acres, is located on slopes equal to or greater than E slopes. Most of the ungrazed woodlots, grazed woodlots, and pasturelands are found on these slopes. For example, 86% of the ungrazed woodlots, 85% of the grazed woodlots, and 52% of the pastures are on these slopes. As shown above, these land uses do not, by and large, pose an erosion problem in the watershed at this time.

Only one percent (140 acres) of the continuous row crops are found on these steep slopes, but 11% (2,800 acres) of the rotated row crops are grown on these lands. Soil loss contributions from these steeply sloped croplands is significant. The estimated average annual contribution from continuous row cropland on these slopes is 13,200 tons, and while contribution from rotated row cropland on these slopes is 43,400 tons. Together, croplands on these slopes lose nearly 57,000 tons of soil per year, or nearly 20% of the total annual soil loss for the watershed.

Soil loss target levels represent the level of control necessary to reduce delivered sediment to acceptable levels. The selection of target levels allows an evaluation of what the watershed project can achieve, and an identification of which landowners are most critical.

Three initial soil loss target levels were chosen for analysis. These were three, four, and five tons per acre per year (T/A/Y). A generally acceptable sequence of Best Management Practices was determined and applied to each parcel of land until the target level was achieved. The resultant reduction in soil loss was then calculated.

Table 11. Summary of Land Use and Soil Loss In The Beaver Creek Priority Watershed Project

	Continuous Row Crop	Rotated Row Crop	Pasture	Grazed Woodlot	Ungrazed Woodlot	TOTAL
ACRES						
Number	9500	25,500	15,700	5,200	33,900	89,800
%	11%	28%	17%	6%	38%	
TONS						
Number	95,400	168,000	12,200	17,300	12,800	306,000
%	31%	55%	4%	6%	4%	
TONS/ACRE	10	7	<1	3	<1	3

1. Data is for lands inventoried for upland erosion in Jackson and Trempealeau Counties.

The sequence for applying Best Management Practices was determined jointly by the Jackson and Trempealeau County LCC staffs, based on 1) experience with what landowners will accept, and 2) county soil erosion control policies where policies are consistent with meeting water quality goals. The practice application sequence used for planning purposes was:

a. On A-C slopes, the first practice applied was contour cropping, followed (if necessary) by conservation tillage, followed (if necessary) by the incorporation of contour strips into the conservation tillage.

b. On D slopes, the first practice applied was contour cropping, followed (if necessary) by contour strips, followed (if necessary) by conservation tillage in the grain portion of the strips.

c. On E slopes or greater, only critical area seeding or tree planting was applied, consistent with the county's policy of encouraging landowners to remove these steep areas from production (Trempealeau County, 1984.)

Where soil erosion still exceeds the target level after the application of the suggested sequence, changes in crop rotation may be considered.

Table 12 presents the results of this analysis for each subwatershed, and for the watershed as a whole. Only the results of using the four tons per acre per year (T/A/Y) target are shown. It was found that there was little incremental benefit in controlling soil loss in most subwatersheds by strengthening the erosion control target from four to three T/A/Y.

Soil loss reductions achievable with these practices applied to lands losing over four T/A/Y range from about 20% to 60% in the different subwatersheds. In subwatersheds with Class I trout waters (NU, JO, WA, BE, UA, UB, UC, UD, UE), reductions range from 35% to 56% with a median value of 48%. In the remainder of the subwatersheds, reductions range from 19% to 60%, with a median value of 54%. For the entire watershed, a 53% reduction is achievable using the four T/A/Y target level.

Table 13 shows the average delivery ratios calculated for the different subwatersheds using the Maner method (Maner, 1958). Delivery ratios for the subwatersheds draining to the North Fork of Beaver Creek range from 25% to 40%. Delivery ratios for subwatersheds draining to the South Fork range from 30% to 70%, and those draining to the mainstem range from 20% to 40%.

Table 12. Soil Loss Reductions Achievable In The Beaver Creek Priority Watershed Project Assuming A Target Soil Loss of Four Tons/Acre/Year (1.)

	SOIL LOSS REDUCTION							
Sub-watershed	Tons Before	Tons After	Soil Loss Reduction	% Reduction	Tons > Cut	Ac. > Cut	Soil Loss Reduction w/o Resid.	% Reduction w/o Resid.(2.)
SU	12219	5547	6672	55%	295	217	6967	57%
GE	5737	2937	2800	49%	288	87	3088	54%
SV	2863	1142	1721	60%	207	18	1928	67%
SL	28317	12625	15692	55%	2829	1006	18521	65%
NU	10018	6507	3511	35%	274	161	3785	38%
UB	1996	1047	949	48%	48	39	997	50%
UA	3628	1774	1854	51%	468	126	2322	64%
UD	3363	1463	1900	56%	355	117	2255	67%
JO	2633	1697	936	36%	69	97	1005	38%
UC	1448	811	637	44%	4	3	641	44%
NL	40275	17981	22294	55%	2438	793	24732	61%
WA	6039	3400	2639	44%	287	192	2926	48%
BL	20970	10201	10769	51%	4633	483	15402	73%
LT	18242	9880	8362	46%	725	374	9087	50%
BO	1017	822	195	19%	7	6	202	20%
SA	5835	3506	2329	40%	298	155	2627	45%
ST	4017	1932	2085	52%	276	89	2361	59%
BU	59108	24698	34410	58%	4584	1403	38994	66%
UE	416	196	220	53%	24	24	244	59%

Table 12. Soil Loss Reductions Achievable In The Beaver Creek Priority Watershed Project Assuming A Target Soil Loss of Four Tons/Acre/Year (1.)

	SOIL LOSS			REDUCTION				
DU	10505	4799	5706	54%	1119	274	6825	65%
FR	47643	21230	26413	55%	1912	1140	28325	59%
SI	5427	3663	1764	33%	674	246	2438	45%
BE	13482	6337	7145	53%	948	258	8093	60%
TOTAL	305200	144381	160819	53%	22746	7306	183565	60%

1. Includes lands in both Jackson and Trempealeau Counties.

2. Residuals refer to tons eroding above the cutoff after practices applied.

Table 13. Estimated Sediment Delivery Ratios For Upland Sheet and Rill Erosion In The In The Beaver Creek Priority Watershed Project.

Area	Estimated Sediment Delivery Ratio (1.)
North Fork Beaver Cr.	10%
Upper North Fork	25%
Lower North Fork	5% to 10%
Bear Cr.	25%
Joe Coulee	35%
Creek 13-1/7-10	40%
Creek 17-5	40%
Creek 9-13	40%
Creek 10-10	40%
Washington Coulee	40%
South Fork Beaver Cr.	10%
Upper South Fork	30%
Lower South Fork	5% to 10%
German Coulee	30%
Svenson Coulee	70%
Stensven Coulee	50%
Borreson Coulee	60%
Salzwedel Coulee	40%
Smikrud Coulee	40%
French Creek	25%
Beaver Creek	20%
Dutch Creek	40%
Silver Creek	40%

1. Delivery ratios based on the Maner Equation (Maner, 1958).

Since these delivery ratios express the proportion of the eroded soil estimated to be delivered at the subwatershed mouth, they really express two occurrences: one, the delivery of soil from field to stream, and two, the delivery of soil from the point of stream entry to the stream's mouth. Therefore, the delivery ratios listed are probably underestimates for the upper segments of many of these streams.

Based on the average annual soil loss from upland sheet and rill erosion, and the estimates of rates at which this eroded soil is delivered to waterways, the importance of upland erosion can be compared with streambank erosion as a source of stream-borne sediment. Such an analysis leads to the conclusion that new upland sheet and rill erosion is responsible for about 90% to 95% of the delivered sediment in each subwatershed, while streambank erosion is responsible for only five to 10% of the delivered sediment.

These figures do not account for the erosion of sediment that has been previously deposited in valley bottoms, however. This source of sediment is estimated to be significant. When valley bottom sediment is combined with streambank erosion, these sources may contribute up to half of the sediment load to Lake Marinuka (Wisconsin Department of Natural Resources, 1977).

It is estimated that the nutrients which are attached to eroded upland soil total roughly 70% to 80% of the nutrient load delivered to waterbodies in the watershed.

4. Streambank Erosion

Table 14 shows the percentage of the streambanks inventoried for erosion in each subwatershed. Approximately 937,000 feet of streambanks were inventoried for erosion. This comprehensive effort covered about 72% of the streambanks in the watershed. The coverage in each subwatershed varied from a low of about 48% to a high of 100%.

Table 15 gives information concerning the extent of the streambank erosion problem in each subwatershed. Overall, approximately 79,400 feet, or less than 10% of the streambanks in the watershed, are seriously eroding. The extent of erosion is greatest in subwatersheds NL, SL, and UB, where it approaches 20% of the streambanks. The remaining subwatersheds have eroded streambanks along five to 10% of the streams.

Table 15 also provides information about the mass loading of sediment from streambank erosion. The sediment production from the eroding sites in the watershed totals about 5,300 tons per year. Sediment production varies greatly between subwatersheds as follows:

a. Less than 100 tons per year in subwatersheds: GE, JO, SU, UA, LT, WA, UC, and UD.

Table 14. Extent of Streambank Inventory Work Completed As Part Of The Beaver Creek Priority Watershed Project.

Sub-watershed	Feet of Perenniel Streambank	Feet of Streambank Inventoried	% of Streambank Inventoried
BE	70000	62600	89%
BL	49500	45400	92%
BU	173700	89700	52%
DU	40000	30200	76%
FR	256000	160400	63%
GE	44000	36200	82%
JO	26000	26000	100%
LT	35000	34800	99%
NL	156000	75300	48%
NU	132000	121500	92%
SA	64000	33600	53%
SI	28000	27900	100%
SL	79200	71300	90%
SU	50000	45000	90%
UA	16000	14400	90%
UB	14600	14600	100%
UC	14000	14000	100%
UD	12000	13600	113%
WA	40000	21100	53%
	1300000	937600	72%

b. Between 100 and 500 tons per year in subwatersheds: BE, BL, BU, FR, SA, and UD.

c. From 500-1000 tons per year in subwatershed NU.

d. Over 1000 tons per year in subwatersheds: NL, and SL.

As discussed earlier, the sediment production from streambank erosion is estimated to be far less than that delivered from upland erosion. Based on a comparison of delivered sediment from upland erosion sources and the mass of sediment produced by streambank erosion, it is estimated that upland erosion contributes 90%-95% of the sediment and bank erosion contributes five to 10%.

The relative importance of streambank erosion as a sediment source varies between subwatersheds as follows:

a. Less than five percent of the total delivered sediment load to streams in subwatersheds: FR, WA, JO, UD, UA, GE, SU, DU, SI, and NL.

b. From five to nine percent of the delivered sediment in subwatersheds: BE, UC, and BL.

c. From 10-15% of the delivered sediment in subwatersheds: UB, NU, SA, and SL.

These estimates do not consider the resuspension of sediments previously deposited in the streambeds, which is a source known to be significant, particularly in portions of streams with low gradients where previously eroded materials are temporarily deposited.

Finally, Table 15 shows the role that unrestrained cattle may have in the development of erosion problems in the watershed. Overall, unrestricted cattle access to streams is associated with about 60% of the feet of streambank eroded, and with about 50% of the eroded tons of sediment. Although these statistics vary by subwatershed, the proportion of the problem associated with cattle access is significant with only a few exceptions.

Although these figures show the streambanks to be relatively stable, two important considerations remain. First, inadequate streambank cover is frequently cited in the water resources assessment as a factor limiting the improvement of the trout population throughout the watershed. Second, although streambank erosion is not the principal source of the total sediment load to streams in the watershed, it is a continuing source of the coarse-grained sediments that blanket the substrate in streams throughout the watershed. With each ton of delivered sediment representing approximately three-fourths of a cubic yard of deposited material, the impacts of streambank erosion can be considered to be important.

Table 15. Streambank Erosion Inventory Results For The Beaver Creek Priority Watershed Project

Sub-watershed	Stream	% of Streambanks Eroded	Feet Eroded	Tons Eroded	CATTLE ACCESS (% Eroded Feet)	(% Eroded Tons)
BE	Bear Creek	5.4%	3395	226	31%	45%
BL	Beaver Creek Below Lake Marinuka	11.3%	5135	387	31%	31%
BU	Beaver Creek, From Ettrick to Galesville	6.6%	5965	301	26%	20%
DU	Dutch Creek	6.1%	1845	130	100%	100%
FR	French Creek		3560	223		
	Mason Coulee		485	29		
	Linderud Coulee		1685	80		
	Trib. 119110		180	14		
	Trib. 119090		900	12		
	Trib. 119060		485	22		
	(TOTAL)	(4.5%)	(7295)	(380)	54%	42%
GE	German Coulee	6.9%	2490	23	95%	68%
JO	Joe Coulee	5.5%	1440	28	67%	43%
LT	Little Tamarack Creek	5.7%	2000	87	35%	44%
NL	North Fork Beaver Cr., Ettrick to county line	19.4%	14600	1076	32%	22%
NU	North Fork Beaver Cr., above county line		4975	256		
	Little Creek		1600	76		
	Columbus Creek		760	34		
	Trib. 119540		965	49		
	Trib. 119530		2280	145		
	Trib. 119510		605	29		
	(TOTAL)	(9.2%)	(11185)	(589)	99%	97%
SA	Salzwedel Coulee	8.1%	2710	208	3%	2%
SI	Silver Creek	< 1%	150	8	100%	100%

Table 15. Streambank Erosion Inventory Results For The Beaver Creek Priority Watershed Project

Sub-watershed	Stream	% of Streambanks Eroded	Feet Eroded	Tons Eroded	CATTLE (% Eroded Feet)	ACCESS (% Eroded Tons)
SL	South Fork Beaver Creek from Ettrick to county line	19.8%	14145	1542	48%	53%
SU	Trib. 119300		760	40	79%	18%
UA	Trib 119490(Creek 17-5)	7.3%	1050	20	100%	100%
UB	Creek 9-13	17.5%	2555	119	100%	100%
UC	Trib 119520(Creek 10-10)	6.4%	890	41	63%	40%
UD	Trib 119460 (Creek 13-1/7-10)	4.4%	600	9	100%	100%
WA	Washington Coulee	5.5%	1165	82	13%	1%
ENTIRE WATERSHED		8.5%	79375	5293	58%	46%

Table 16. The Sensitivity of Soils to Groundwater Contamination from Concentrated Sources of Animal Waste.

Soil Type	Prevalence(2.)	Separation and Soil Composition Criteria(1.) BnYd	TeSt	ManSto	Runoff	Location Criteria
Bedrock Soils						
Boone Lmy Snd	2% parcels (5 by)	Y	Y	Y	Y	Upland
Eleva Snd Lm	2% parcels (6 by)	Ym	Y	Y	N	Upland
Gale Sil Lm	8.7% parcels (10 by)	N	Ym	N	N	Upland
Hixton Lm	10% parcels (no by)	N	Ym	N	N	Upland
LaFarge Sil Lm	7.7% parcels (1 by)	N	Ym	N	N	Upland
Norden Sil Lm	1.2% parcels (1 by)	Ym	Ym	Ym	N	Upland
Stony Land	1.4% parcels (no by)	Y	Y	Y	N	Upland
Urne Complex	5.7% parcels (1 by)	Ym	Y	Ym	N	Upland
Seasonal High Groundwater Soils						
Boaz Sil Lm	1.7% parcels	Y-N	Y	Y-N	Y-N	Valley Bottoms
Ettrick Sil Lm	3.3% parcels	Y	Y	Y	Y	Valley Bottoms
Houghton Muck	.8% parcels	Y	Y	Y	Y	Valley Bottoms
Huntsv'le Sil Lm	1.7% parcels	N	Y-N	N	N	Valley Bottoms
Kato Sil Lm	.1% parcels	Y	Y	Y	Y	Terraces
Lawson Sil Lm	1.1% parcels	Y-N	Y-N	Y-N	Y-N	Terraces
Loamy Alluvium	.8% parcels	Y-N	Y-N	Y-N	Y-N	Valley Bottoms
Muscatine Sil Lm	1.5% parcels	Y-N	Y	Y-N	Y-N	Benches
Palms Muck	.5% parcels	Y	Y	Y	Y	Valley Bottoms
Sandy Alluvium	.6% parcels	Y	Y	Y	Y	Valley Bottoms
Shiffer Lm	.04% parcels	Y-N	Y	Y	Y-N	Bench/Terraces
Trempealeau	.04% parcels	Y-N	Y	Y	Y-N	Bench/Terraces
Wallkill Sil Lm	.13% parcels	Y	Y	Y	Y-N	Valley Bottoms
Whitehall Sil Lm	.13% parcels	N	Y	N	N	Terraces

(1.) Separation distance to groundwater or bedrock, and the % soil passing a #200 sieve were criteria used. Table 4 presents values used for these criteria. Concentrated sources of animal waste include:

BnYd (barnyards)
TeSt (temporary manure stacks)
ManSto (manure storage facilities Type III)
Runoff (runoff from these sources)
Y = soil is sensitive, Ym = soil is marginally sensitive,
N = soil is not sensitive, and Y-N indicates changing sensitivity as seasonal high groundwater fluctuates.

(2.) Prevalence indicates the % of the 8,135 parcels inventories for land use that had the soil type. The number in ( ) is the number of barnyards inventoried on the soil type.

5. Barnyards and Manure Stacks as Related to Groundwater Protection

The results of this analysis are shown in Table 16.

The soils of concern are the bedrock soils. All are located in upland areas. The bedrock soil of greatest concern is the Boone Loamy Sand, which cannot meet any of the safety criteria listed in Table 4. The sources of animal waste located on this soil represent a groundwater pollution hazard. This soil type comprised two percent of the parcels inventoried, and five barnyards are either located on the soil type or drain to it.

The Eleva Sandy Loam contributes to environmentally sensitive conditions. It provides somewhat better conditions for pollutant attenuation than the Boone Loamy Sand, because it has a slightly higher composition of finer materials in the soil profile. The sources of animal waste located on this soil remain a concern, however. This soil comprised two percent of the parcels inventoried, and has six barnyards located on it.

The Stony Land and Urne Complex soils are next in producing environmentally sensitive conditions. Stony Land soils comprised 1.4% of the inventoried parcels, and Urne soils comprised 5.7%. Only one barnyard was identified to be located on, or drain to, these soils.

Although animal waste sources located on Gale, Hixton, LaFarge, and Norden soils pose some threat due to the shallow bedrock, these soils are all silt loams and have a high proportion of fine materials in the soil profile. The greatest threat is probably posed by manure stacks that stand for long periods on earthen lots. The Gale, Hixton, and LaFarge soils comprised 8.7%, 10%, and 7.7% of the parcels inventoried. The Norden soil comprised only 1.1%. There are 10 barnyards located on the Gale Silt Loam soils, and one each on the LaFarge Silt Loam and the Norden Silt Loam.

In general, soils with high groundwater in the Beaver Creek Watershed are not as environmentally sensitive as the group of bedrock soils. The reason is two-fold. First, of the 14 soil types identified with seasonally high groundwater, seven are located in valley bottoms near streams which act as groundwater discharge areas. Most of these soils are silt loams and mucks, with a very high composition of fine materials.

Second, of the seven soil types that occur on valley benches and terraces higher up in the landscape, all are heavy silt loam soils. The groundwater contamination potential of these soils generally changes based on the depth to seasonal high groundwater. The Boaz, Lawson, Muscatine, Shiffer, Trempealeau, and Whitehall silt loams are of concern only when the seasonal high groundwater comes within

three feet of the surface. The contamination potential of the Whitehall soil is relatively low, because seasonally high groundwater is generally between four and six feet, providing a separation distance that should allow for significant pollutant attenuation.

The Kato Silt Loam is an exception to the general environmental sensitivity of these soils. Located higher on the landscape seasonally high groundwater is within one foot. Sources on this soil may pose a hazard. However, the soil comprises less than 0.1% of the parcels inventoried and no barnyards were determined to be on it.

C. Water Resources Objectives

Surface water resources objectives of the Beaver Creek Priority Watershed Project include protecting the water quality of Lake Marinuka, and either maintaining or improving the use potential of the watershed's streams. These objectives will be accomplished by reducing the loads of pollutants associated with the factors recognized to be limiting or threatening uses in the lake and streams.

These basic objectives, and the limiting factors that must be alleviated to achieve them, are summarized in Tables 5, 6, 7, and 8 of this watershed plan.

The groundwater objectives of this project are limited. Where sources of animal waste are confirmed to pose a significant threat to groundwater, the objective will be to reduce that pollution potential.

D. Pollution Control Strategy

1. Priority Management Area

The Priority Management Area of the priority watershed project is that area within which pollutant sources are eligible for cost sharing, provided they meet the eligibility criteria specified in this watershed plan. In the Beaver Creek Watershed, all areas within the watershed boundary are considered to be within the Priority Management Area.

2. Management Categories

The basic approach in developing a pollutant control strategy is to assign each pollutant source in the watershed a management category. The management category is based on the relative significance of the pollutant source, and as such determines the eligibility status of the source for cost sharing.

The definition of individual pollutant sources varies, as follows:

a. For barnyards: each barnyard represents a separate pollutant source.

b. For winterspread manure: the total critical acres spread per year by a landowner within the analysis area comprises a pollutant source.

c. For upland erosion: the total acreage on a farm that is eroding soil within the analysis area in excess of the target level is defined as a pollutant source.

d. For streambank erosion: the streambanks lining an individual's property within the analysis area are considered an individual pollutant source.

Analysis areas were explained earlier in this watershed plan.

Management categories are developed based on 1) the pollutant load reduction desired in an analysis area and 2) the relative significance of the pollutant source in that area.

Pollutant sources designated through this planning process to be in Management Category I are eligible for cost sharing. In fact, these sources are so significant that they must be controlled as part of any cost share agreement developed through this watershed project. Pollutant sources designated to be in Management Category II are also eligible for cost sharing. Although it is desirable to control the sources in this management category, the landowner has the option to include the necessary controls on a cost share agreement developed through this program. Pollutant sources in Management Category III are relatively insignificant, and are not eligible for cost sharing.

Many landowners will have more than one pollutant source, and these sources may be in different management categories. A complete record of pollutant sources and their assigned management categories has been compiled for the Beaver Creek Watershed, and will be used by LCD staff to guide implementation in this watershed project.

The development of management categories for pollutant sources in the Beaver Creek Watershed is described below.

3. Barnyards

Although nutrient enrichment and oxygen depletion do not appear to be major concerns in the watershed's streams, nutrient reduction is a goal for Lake Marinuka and the reduction in pathogen transmission is a goal throughout the watershed. Barnyard runoff control will therefore be an eligible practice.

Management categories for barnyards are defined as follows:

Management Category I: Barnyards in this category include those contributing the top 40% of the barnyard phosphorus load in each of the analysis areas. However, barnyards must have loads of at least six pounds to be in this management category. This

Table 17. The Number of Barnyards In Each Of Three Management Categories For Surface Water Protection In The Beaver Creek Priority Watershed Project

County	Management Categories I	II	III	County Total
Trempealeau	25	51	162	238
Jackson	5	6	21	32
WATERSHED TOTAL	30	57	183	270

category also includes barnyards located in the floodplain that have significant contamination potential, regardless of the pollutant load estimated using the ARS Model.

Management Category II: Barnyards in this category include those contributing the next 30% (from 40 to 70% on the ranking list) of the barnyard phosphorus load in each analysis area. This also includes barnyards determined to be important sediment sources, and the barnyards located in the floodplain that can be considered moderate pollutant sources, regardless of the pollutant load estimated using the ARS Model.

Management Category III: Barnyards in this group are the remaining yards in each analysis area.

Management categories for barnyards located in floodplains will be developed only after considering such factors as livestock numbers, frequency of lot scraping, flooding frequency, and the cost of control options available.

As with all pollutant sources, those that are ranked as part of more than one analysis area will be assigned the management category indicating the greatest need for control. For example, if a source is placed in Management Category I based on one analysis area and in Management Category II based on a different analysis area, the source will be assigned to Management Category I for cost sharing purposes.

Table 17 shows the number of landowners in each management category for barnyard runoff controls.

4. Manure Spreading

Although nutrient enrichment and oxygen depletion do not appear to be major concerns in the watershed's streams, nutrient reduction is a goal for Lake Marinuka and reduction in pathogen transmission is a goal throughout the watershed.

A comparison of the pollutant potential associated with barnyards versus winterspread manure has not been made for the Beaver Creek Watershed. However, it is expected that winterspread manure is relatively less significant than barnyard runoff as a source of phosphorus and other pollutants.

In general, it will be the project goal to eliminate winterspreading on critical areas, including lands in the floodplain or on slopes over six percent.

There are several ways to accomplish this goal. In all cases, a waste utilization plan needs to be developed. In some cases, short or long-term storage will be needed to follow the waste utilization plan. However, these practices will be cost shared only where the actual number of critical acres being winterspread is significant.

Where storage is needed to avoid spreading critical acres, but the actual number of critical acres spread is not considered significant, cost sharing will not be made available.

Two important factors were considered in developing a manure management strategy for the watershed:

a) The number of critical acres winterspread with manure that are needed in order for a livestock operation to be placed in a particular management category, and

b) The conditions under which storage should be considered a justifiable part of a waste utilization program for each landowner.

The data base was evaluated to determine the estimated number of critical acres winterspread by each livestock operation in each subwatershed. The estimated critical area spread for each operation was derived by multiplying the acreage needed for winterspreading by the percent of the available acres deemed to be critical due to slope limitations or inclusion in the floodplain. The estimated number of critical acres spread for the operations ranged from zero to 40 acres. The median value was only six acres, however, and 90% of the operations are estimated to winterspread fewer than 20 critical acres each year.

The criteria used for determining management categories are as follows. The management categories estimated for each landowner as part of this planning effort will serve principally to direct landowner contacts during implementation. The actual number of critical acres spread will be determined after talking with the landowner.

Management Category I: Livestock operations are placed in this category if the actual number of critical acres spread within the Beaver Creek Watershed is at least 40 acres. Livestock operations in this category also include those with at least 15 critical acres actually spread on lands draining to a Class I trout stream.

Management Category II: Livestock operations are placed in this category if the actual number of critical acres spread within the Beaver Creek Watershed is 15 to 39 acres. Livestock operations in this category also include those with at least 10 to 14 critical acres actually spread on lands draining to a Class I trout stream.

Management Category III: All other livestock operations are placed in this category for purposes of managing winterspread manure.

Livestock operations in Management Category I are eligible for cost share assistance, and must have the winterspreading controlled as part of any cost share agreement developed through this project. The control of winterspreading for operations in this management category may not require storage. If the needs ratio is high, indicating that there is adequate land for safely winterspreading manure, then storage should not be needed. In these cases, a good spreading plan and a change in procedures may be all that is required.

Livestock operations in Management Category II are eligible for cost share assistance, but control of the winterspreading is not required as part of the cost share agreement developed through this program. The same approach as Management Category I for the need for storage applies in this category.

Livestock operations in Management Category III are not eligible for cost share assistance. However, where practical, project staff should offer the livestock operator help in developing a spreading plan that avoids using the critical acres during the winter months.

The Jackson County and Trempealeau County LCD staff will develop criteria for determining whether or not specific lands are to be considered accessible by the landowner for winterspreading manure.

Table 18 lists the number of landowners in each management category based on these categories, and the data available to date.

The pollutant potential posed by unconfined manure stacks has not yet been fully assessed. Most livestock operations generate a stack of manure during the period of spring snownmelt when it is too wet to get out to the fields. The pollutant potential posed by these stacks is a function partly of 1) the size of the stack, 2) its location with respect to direct and tributary runoff, and 3) overland flow buffer characteristics between the stack and conveyance channel.

The final assessment of the need to control manure stacks will be made during implementation. The first management options considered should be relocation of the stack to a safe area, or treating the stack as part of an eligible barnyard runoff control system.

5. Upland Sheet and Rill Erosion

The water resources appraisal for the Beaver Creek Watershed identifies sediment deposition and turbidity as major impacts affecting the public uses of Lake Marinuka and the streams throughout the watershed. The upland erosion and sediment delivery analysis indicates that upland erosion is an important source of sediment causing these problems. The control of upland erosion is therefore important in reducing the sedimentation that has reduced the quality of many trout streams throughout the watershed, and which continues to fill Lake Marinuka.

Table 18. Number of Landowners In Each of Three Management Categories For Manure Management In The Beaver Creek Priority Watershed Project (1.)

	Management Categories (2.)			
County	I	II	III	TOTAL
Trempealeau	6	36	144	186
Jackson	6	4	19	29
TOTAL	12	40	163	215

1. Does not include 12 operations in the Little Tamarack Creek Subwatershed, although landowners in this subwatershed are eligible for assistance.

2. Landowners in Management Category I must manage their winterspreading to avoid critical lands in order to get cost sharing on other management practices.
These landowners may receive assistance to install storage units as needed to manage winterspreading of manure.

Landowners in Management Category II may agree to manage winterspreading, but it is not required as a condition to get cost sharing on other practices.
These landowners may receive assistance for storage units as needed to manage winterspreading of manure.

Landowners in Management Category III may agree to manage winterspreading, but it is not required as a condition to get cost sharing on other practices.
These landowners will not receive assistance for storage units as needed to manage winterspreading of manure, but may receive assistance in waste utilization planning.

Although water quality problems related to nutrient enrichment are not a serious concern in watershed streams, as discussed earlier nutrient reduction is still an important part of the control strategy for Lake Marinuka. Upland erosion typically supplies a significant portion of the agricultural phosphorus to waterways. In the Beaver Creek Watershed, it is estimated that 70 to 80% of the agricultural phosphorus comes from upland erosion. The control of upland erosion will therefore have an additional benefit in significantly reducing the phosphorus transport to Lake Marinuka and watershed streams.

The development of management categories for upland sheet and rill erosion reflects the importance of this sediment source. A relatively large portion of the soil loss occurring over the target level of four T/A/Y is placed into Management Category I. Management categories are as follows:

Landowners contributing the top 70% of the cumulative soil loss in each analysis area were placed in Management Category I.

Management Category II is subdivided into three subclasses:

For subwatersheds having Class I trout water, the remainder of the landowners with soil loss over four T/A/Y were placed in Management Category IIa.

For all other analysis areas, only the landowners contributing the next 20% of the soil loss over four T/A/Y were placed in Management Category IIa.

The remaining 10% were put in Management Category IIb.

Landowners with all their lands eroding less than four T/A/Y are placed in Management Category III.

Table 19 shows the numbers of landowners in each management category for upland erosion.

6. Streambank Erosion

Management categories are assigned to each stream reach where erosion occurs. Each reach consists of all erosion sites that are owned by the same individual on a single stream.

Management categories are based on the need to 1) control the mass loading of coarse-grained sediment to streams, and 2) to improve the bankside habitat for fish. The management categories also recognize the need for particularly stringent controls where the waterbodies are classified as Class I trout waters, and in the Class II portion of the North Fork.

A secondary goal is the control of sediment to Lake Marinuka, since sediment delivered to the lake from eroding streambanks is considered second in importance to that delivered from eroding uplands.

Table 19. The Number of Landowners In Each of Four Management Categories For Upland Erosion In The Beaver Creek Priority Watershed Project

	Management Categories				
County	I	IIa	IIb	III	County Total
Trempealeau	128	129	123	261	641
Jackson	27	37	19	31	114
WATERSHED TOTAL	155	166	142	292	755

Characteristics used to evaluate the significance of erosion occurring along each stream reach include:

1. the total mass, in tons per year, produced by the stream reach,

2. the number of feet eroded,

3. the percentage of the stream reach that is eroded, and

4. the sensitivity of the resource, with trout stream classification indicative of relative sensitivity.

Management categories are defined as follows:

Management Category I: In general, stream reaches in this category are characterized as follows:

1. Class I trout water, and Class II trout water in the North Fork Beaver Creek and the mainstem Beaver Creek above its confluence with French Creek, where the mass loading is at least 10 tons/year, or at least 200 feet are eroded, or at least 10% of the stream reach is eroded.

2. remaining streams in the watershed where the mass loading is at least 20 tons/year, or at least 500 feet are eroded, or at least 20% of the stream reach is eroded.

All other areas of streambank erosion are placed in Management Category II.

Exceptions were made where site-specific habitat evaluation information indicated the need for modification of this approach. For example, erosion along the northern and middle portions of French Creek was treated more seriously, since past water quality data indicate that past streambank protection measures may have been instrumental in producing the changes seen in the habitat and the fish population.

The proportions of the mass loading and feet of erosion that will be included in each management category are shown in Table 20. The numbers of landowners included in each management category are shown in Table 21.

Cattle access to streams and feeder springs must be sufficiently restricted through the use of streambank fencing, cattle crossings, cattle watering ramps, or other measures, as a part of any cost share agreement developed through the Beaver Creek Priority Watershed Project.

Table 20. The Proportion of the Streambank Erosion Problem Included In Each Management Category In The Beaver Creek Priority Watershed Project

Sub-watershed	MANAGEMENT CATEGORY I				MANAGEMENT CATEGORY II			
	No. Feet	% Feet	Number Tons	% Tons	No. Feet	% Feet	Number Tons	% Tons
BE	3355	99%	210	93%	40	1%	16	7%
BL	3685	72%	285	73%	1450	28%	102	27%
BU	3340	56%	196	65%	2625	44%	106	35%
DU	1825	99%	129	99%	20	1%	1	1%
FR	4460	61%	249	66%	2835	39%	131	33%
GE	2150	86%	5	22%	340	14%	18	78%
JO	1390	97%	25	89%	50	3%	3	11%
LT	1620	81%	70	80%	380	19%	17	20%
NL	12770	87%	1010	94%	1830	13%	66	6%
NU	10870	97%	580	98%	315	3%	9	2%
SA	1600	59%	151	73%	1110	41%	57	27%
SI					150	100%	8	100%
SL	13155	93%	1499	97%	990	7%	43	3%
SU	460	61%	35	88%	300	39%	5	12%
UA	1050	100%	20	100%				
UB	2555	100%	119	100%				
UC	890	100%	41	100%				
UD	600	100%	9	100%				
WA	1115	96%	80	99%	50	4%	1	1%
ENTIRE WATERSHED	66890	84%	4713	89%	12485	16%	583	11%

7. Barnyards and Manure Stacks as Related to Groundwater Protection

A case-by-case review will be made during implementation of the 24 barnyards located on, or draining to, bedrock soils. Review priorities will be as follows:

First priority for review will be given to the five barnyards located on or draining to the Boone Loamy Sand.

Second priority for review will be given to the six barnyards located on the Eleva Sandy Loam.

Third priority for review will be given to the two barnyards located on the Norden Silt Loam and the Urne Complex.

Last priority for review will be placed on the 11 barnyards located on the Gale and LaFarge Silt Loam soils. These barnyards on the Gale and LaFarge soils are only of concern if manure is stacked on earthen areas over an extended period of time.

Reviews may include the following components:

1. sampling of upgradient and downgradient water supply wells for nitrogen concentrations.

2. soil analysis to determine the mechanical characteristics of the soil.

3. animal herd size and barnyard management.

Low cost control alternatives may be cost shared based on the hazard potential indicated by the site criteria presented in this plan. However, if site conditions would require use of high cost practices, such as complete runoff containment and storage or covering of a barnyard, the feasibility and cost of groundwater monitoring will be investigated prior to making a cost sharing decision.

Following verification of site conditions and the evaluation of any additional information collected during the site investigation, the appropriate LCD office will contact the Department of Natural Resources. The Department of Natural Resources and the LCD staff will jointly develop management categories for these pollution sources.

Control practices will be identified jointly by DNR, SCS, and the LCD staff. The criteria in Table 20 are not intended to be design criteria, but rather criteria for problem identification. Design criteria will be separately determined unless adequately specified in NR 120.

Table 21. The Number of Landowners In Each Management Category For Streambank Erosion In The Beaver Creek Priority Watershed Project.

County	Management Category I	Management Category II	Total
Trempealeau	66	47	113
Jackson	21	8	29
Entire Watershed	87	55	142

Table 22. The Number of Landowners In Each Of Four Management Categories For Surface Water Protection In The Beaver Creek Priority Watershed Project (1.)

County	Management Categories I	II or IIa	IIb	III	County Total
Trempealeau	184	134	80	261	659
Jackson	42	30	18	27	117
WATERSHED TOTAL	226	164	98	288	776

1. Each landowner is represented by the source on his land having the highest management category. Possible sources include: barnyard runoff, winterspread manure, upland sheet and rill erosion, and streambank degradation or erosion.

8. Summary

Table 22 shows the numbers of landowners in each management category. Where a landowner has more than one pollution source, the assigned category is the one indicating his other highest pollutant potential.

SECTION THREE:

A DETAILED PROGRAM FOR IMPLEMENTATION

CHAPTER VI: IMPLEMENTATION PROGRAM AND AGENCY AND PUBLIC INVOLVEMENT

CHAPTER VII: INFORMATION AND EDUCATION PROGRAM

CHAPTER VIII: PROJECT ADMINISTRATION OF COST SHARE FUNDS

CHAPTER IX: PROJECT ADMINISTRATION OF LOCAL ASSISTANCE FUNDS

CHAPTER X: NEEDS AND COSTS

SECTION THREE; A DETAILED PROGRAM FOR IMPLEMENTATION

CHAPTER VI. IMPLEMENTATION PROGRAM INTRODUCTION AND AGENCY AND PUBLIC INVOLVEMENT

A. Introduction

This portion of the plan serves as a guide for implementing the recommendations identified in the Watershed Assessment. This Implementation Plan identifies:

1. the tasks necessary to implement the recommendations in the Watershed Assessment,
2. the agencies and units of government responsible for carrying out those tasks,
3. the time frame for completion of those tasks,
4. the type and amount of staff needed,
5. the cost of carrying out the project, and
6. the information and education program.

The general procedure used for achieving the water quality objectives identified in the Watershed Assessment is through the voluntary installation of corrective land management practices to control the critical nonpoint sources. Cost share funds are provided to landowners to cover a percentage of the costs of installing the practices. In addition, funds are made available to the local agencies to cover the accelerated work effort required to cover the accelerated work effort required to carry out their responsibilities.

B. Project Participants and Their Roles

1. Landowners and Land Operators

Landowners or operators, including individuals, partnerships, corporations, municipalities, or persons holding title to, or having an interest in land, may enter into cost share agreements with the appropriate city, county or village for the purpose of controlling nonpoint sources of pollutants. State agencies may also enter into cost share agreements to control nonpoint source pollutants on land owned or operated by the state.

Landowners and operators who have been identified as having critical pollutant sources will be approached by representatives of the Jackson and Trempealeau County Land Conservation District Offices. If interested in participating, the landowner or operator will need to assist the LCD staff in preparing a conservation plan; help identify the practices that are affordable and will work best to

control the pollution sources; locate contractors and schedule practice installation; assist the LCD staff in monitoring practice installation; arrange and make payment to the contractor; and maintain the practices according to terms of the cost share agreement.

2. Management Agencies

Management agencies include cities, counties, and villages within the watershed project area.

The responsibilities for management agencies involved in the priority watershed program are summarized below:

1. Assist with the recommended development of the watershed plan,

2. Recommend revisions to the plan to allow for necessary changes as the project is implemented.

3. Carry out education and information programs about nonpoint sources and the land management needs within the watershed project area,

4. Administer the cost sharing element of the project including sign-ups, agreement approvals, authorization of payments, and record keeping,

5. Certify the installation, operation, and maintenance of Best Management Practices,

6. Coordinate and control cost share monies with local cost sharing sources,

7. Report to DNR on project progress and recommended project modifications,

8. Screen applications for variances of the established cost sharing rates, and

9. Determine priority for assistance among grant applications.

For unincorporated areas, the Jackson and Trempealeau county boards will serve as the management agencies for their respective counties. These counties are being represented by their respective Land Conservation Committees (LCCs).

The City of Galesville and the Village of Ettrick are the identified management agencies for nonpoint source responsibilities within their respective incorporated limits. The cities and villages are singled out because the county's authority does not extend into incorporated

areas. No nonpoint source pollutant control needs have been identified in these incorporated areas to date, however. Together these units of government are able to provide project cost share funding to landowners and install practices on public lands.

In the event that a city, county, or village wishes to enter into a cost share agreement on land it owns or operates, the Department of Natural Resources must be contacted and may eventually be designated as the administrator for the cost sharing agreement.

The Trempealeau County Land Conservation Committee, acting for the Trempealeau County Board, was selected as the Lead Management Agency for the Beaver Creek Priority Watershed Project. Trempealeau County will be responsible for coordinating activities with Jackson County, and if found necessary, with the City of Galesville and the Village of Ettrick. In addition, Trempealeau County will have the general responsibility for coordinating watershed activities with other natural resource programs described later in this chapter.

Trempealeau County will enter into the Nonpoint Source Grant Agreement with the Department of Natural Resources. This agreement will allow the Department to provide cost sharing monies to the project. The Nonpoint Source Grant funds will be deposited in an account established and maintained by Trempealeau County. Trempealeau County will administer the project funds for all of the management agencies according to procedures specified in Chapter VIII of this plan. In the event that practices are needed within the City of Galesville or the Village of Ettrick, these municipalities may enter into separate Nonpoint Source Grant Agreements directly with the Department of Natural Resources.

Trempealeau County, Jackson County, and if necessary the City of Galesville and the Village of Ettrick will each enter into Local Assistance Grant Agreements with the Department of Natural Resources as necessary to obtain financial support from the Department for hiring additional staff to carry out the activities of the watershed project.

3. Cooperating Agencies

The management agencies will receive assistance from the other agencies listed below:

a. Soil Conservation Service (SCS): This agency of the U.S. Department of Agriculture works through the local Land Conservation Committee for the counties. The SCS provides technical assistance for installing conservation practices. It will aid the county in planning, designing, layout, supervision, and certification of practice installations.

b. University of Wisconsin Extension (UW-EXT): UW Extension will provide limited assistance in planning, coordinating and conducting public information, education, and participation efforts. Extension will also assist the counties in the development of watershed tours, workshops, and newsletters.

c. Department of Natural Resources (DNR): The Department has the overall administrative responsibility for the Wisconsin Nonpoint Source Water Pollution Abatement Program, of which the Beaver Creek Priority Watershed Project is a part. The DNR is responsible 1) for the allocation of funds to the project, 2) for water quality and fish surveys, and 3) for evaluation of the watershed project.

4. The Integration of the Nonpoint Source Program with Other Natural Resource Management Efforts

Soil and Water Conservation: With the passage of the 1986 Federal Food Security Act, both the Federal Government and the State of Wisconsin have conservation cross-compliance in effect. Thus, landowners must follow an LCC approved soil erosion control plan for their croplands if they wish to maintain eligibility for the various public tax dollars distributed through such federal agricultural programs as the Farmer's Home Administration program (FmHA) and the Agriculture Conservation program (ACP), and through the state's Farmland Preservation program.

The Trempealeau County Land Conservation Department will distribute informational materials to Beaver Creek Watershed landowners that stress the conservation compliance mandates of the federal and state governments. It is estimated that 87% of the Beaver Creek Watershed landowners benefit directly from monies received through these public programs. Therefore the LCD anticipates exceptional results in controlling excessive cropland soil losses within the Beaver Creek watershed.

Fish Resource Management: Local Fisheries Manager: The LCD has been informed that the Department of Natural Resources will be stationing a Fisheries Manager in the Trempealeau County Courthouse in early summer, 1987. This Fisheries Manager will service both Trempealeau and Buffalo Counties. Primary responsibilities of this manager will be active involvement with both Beaver Creek and Waumandee Creek priority watershed projects.

The Trempealeau County LCD staff will work closely and cooperatively with this fisheries manager to 1) develop and assess the trout habitat improvement needs within the watershed; 2) set short and long-range objectives for improving habitat for specific fish species along specific stream stretches; and 3) develop a methodology to meet these objectives.

Stream protection will be discussed in greater detail under sportsmen's club involvement.

There is an identified need for in-stream trout habitat development within several stream reaches in the Beaver Creek Watershed. The LCD anticipates a coordinated effort between the fish manager, the Wisconsin Conservation Corps, and the local sportsmen's groups in the construction of in-stream trout habitat structures. In addition, a concentrated effort will be made to place 12 to 18 fish cribs into Lake Marinuka to improve lake habitat for Marinuka's warm water fishery.

Also, James Talley, the DNR Area Fisheries Manager, has informed the LCD that a strain of Flathead Catfish will be released into Lake Marinuka to diversify and improve the lake's warm water fishery.

Finally, the LCD will coordinate an effort to secure long-term access easements within the watershed based on the Fisheries Manager's recommendations. This will be discussed in greater detail elsewhere in this chapter. Briefly, the LCD anticipates utilizing long-term conservation easements available through DNR programs in conjunction with FmHA's Debt Reduction Program to provide needed public access to the surface water resources of the Beaver Creek Watershed.

Fisheries Management: Sportsman's Club Involvement: Since the main cause of habitat destruction is excessive livestock access to streams, the LCD will coordinate an effort to protect the streams through stream fencing.

This coordinated effort will involve the LCD staff, the Fisheries Manager, the Ettrick Rod & Gun Club and the Galesville Volunteer Trout Club. The members of the two sportsmen's groups will be 1) the means of contacting landowners; 2) providing information pertaining to the need to protect streams from cattle access; and 3) providing information concerning the role of the watershed project in cost sharing the practices needed to control cattle access. In effect, this would amount to local people working with local land users to protect a common resource. The members of these organizations have indicated that they may be willing to "adopt" certain stream stretches and would maintain fencing along these critical stream segments.

The sportsmen's clubs have agreed to host six to nine public informational meetings at which information pertaining to the objectives and goals of the Beaver Creek Priority Watershed Project will be presented. These meetings will be held during the three-year contracting phase of the project. Once again, this will demonstrate local support of a local project.

The LCD anticipates a coordinated effort among the Fisheries Manager, the LCD staff and the Sportsmen's Clubs in the stocking of trout reared by the sportsmen's clubs. This would involve activities such as securing public access, improving habitat, and securing landowner cooperation.

The sportsmen's groups will also play a major role in securing public access easements. This is discussed in greater detail in the following paragraphs.

Public Access: The Beaver Creek Watershed has the potential to become an excellent trout fishery resource. The field investigations conducted in 1986 by the DNR Fish manager indicate that the trout fishery has demonstrated a tremendous improvement since the surface water inventory was conducted by the DNR in 1970. It is presumed that this improvement is due to the soil and water conservation efforts of the watershed's landowners through such programs as the DNR Inland Lakes Rehabilitation Project and the ACP.

Presently, most public access to the trout streams occurs on unposted private property. The LCD intends to facilitate the development of greater public access by encouraging landowner involvement in the long-term DNR Public Access Easements program. The LCD intends to coordinate an effort between the DNR, the LCD and the local sportsmen's groups to encourage the increased use of long-term public access easements available through DNR programs. The DNR Fisheries Manager will target stream stretches for this effort. The LCD staff and the members of the local sportsmen's groups will then contact targeted landowners to provide easement information and to encourage landowner participation.

Similarly, selected landowners will be encouraged to provide public access through the FmHA's Debt Reduction Program. For example, the LCD will work cooperatively with the Trempealeau County FmHA staff to identify landowners who may be interested in reducing their debt load to FmHA by deeding back acreage adjacent to targeted stream stretches, as well as environmentally sensitive areas adjacent to targeted stream stretches. These sensitive areas would include wetlands, steep erodible croplands, and significant wildlife acreages.

The Trempealeau County LCC has indicated a desire to target available conservation aids monies into the Beaver Creek Watershed to improve fish and wildlife habitat upon those lands secured for public access purposes.

Wildlife Habitat Improvement: Through public access easements, stream protection, and the federal Conservation Reserve Program (CRP), habitat for all species of wildlife should be dramatically improved.

The Wisconsin Conservation Corps (WCC) will be utilized extensively to provide stream protection through fencing projects; to improve habitat through grass, tree and wildlife shrub plantings; to improve migratory waterfowl habitat through the construction and placement of wood duck boxes; and to stabilize eroding streambanks through the planting of willow.

The LCD will encourage rod and gun clubs to release pheasants on those lands where improved habitat will allow carry-over pheasants to survive the winter and reproduce.

CHAPTER VII. INFORMATION AND EDUCATION PROGRAM

A. Introduction

The information and education program for the Beaver Creek Priority Watershed Project will mainly involve a continuation of the program which started in the Beaver Creek Watershed over three-quarters of a century ago. A detailed account of this history is located in the preface of this plan.

The approach to be used for this project will involve the cooperation of the local sportsmens' groups, specifically the Ettrick Rod & Gun Club and the Galesville Volunteer Trout Club, whose memberships includes project landowners. These landowners realize the impact that they have on their surroundings, and have taken active roles participating in the activities of their local sportsmens' clubs.

It is felt that these organizations have the willingness and capability to conduct a program to keep their neighbors informed and educated about soil and water conservation goals and activities, and to actually assist landowners in working with the LCD to get cost share agreements signed, become involved with the DNR's stream easement program, and to assist with labor for streambank fencing and maintenance.

B. Target Groups for Information and Education

The target groups for the information and education program include:

1. Landowners in management categories I, II, IIa, and IIb, as identified in the assessment,
2. The general public,
3. Presidents of the board of directors of local lending institutions, and
4. Contractors.

C. Specific Information and Education Activities

1. Tours

Tours of existing management practices throughout the counties are needed to demonstrate the structural aspects of the Best Management Practices to be used in the Beaver Creek project. These tours will also allow prospective participants to hear from landowners how the maintenance of practices fits into his or her own management system. In many instances this contract will prove to be the "make-or-break" point as to whether or not an individual will voluntarily become a project participant.

The demonstration practices installed on the Steve Parmenter farm through the Nonpoint Source Control Program will be used to educate owners and operators of critical lands in the Beaver Creek Watershed. Practices that will be demonstrated on this farm include contour strip cropping, conservation tillage, grassed waterways, livestock exclusion from woodlots, critical area stabilization, and animal lot runoff management.

2. Landowner Contacts and Information Packets

Landowners in Management Category I, II, and IIa will be personally contacted by LCD staff and informed about the project, what funding is available, and how to receive technical assistance. In addition to these contacts to be made by LCD staff, landowners along particularly valuable stretches of stream (as identified by the DNR Area Fish Manager) will be contacted by volunteers from the Ettrick Rod & Gun Club in order to develop an interest list. Additions to this interest list could also develop the conservation compliance mandates of the Conservation Reserve Program, Sod/Swamp Buster Program, and the Farmland Preservation Program.

An information packet will be developed that can be given to each landowner contacted. The packet will explain the watershed project, cost share rates, and available practices, and will provide some technical information concerning relevant management practices.

3. Newspaper and Radio Announcements

The general public will be updated on the project status periodically via newspaper articles and radio announcements.

4. Informing Lending Institutions

Presidents of the board of directors of the local lending institutions will each receive a personal letter to inform them about the project, its intended goals, eligible practices for cost sharing, and most importantly, the cost share rates.

5. Contractor's Meeting

Every winter, the Trempealeau County LCD either holds a contractor meeting or distributes printed information to contractors through the mail to discuss new aspects of engineering work that will be involved in the installation of conservation practice during the next construction season. This is very important because there are several watershed projects in progress in the immediate area and each one has some significant differences that the contractors must know about.

6. Ready-Reference Books and Slide Set

As an aid to the conservation planner, a book containing pictures of installed Best Management Practices will be provided by each county. The practices depicted will be both vegetative and structural in nature.

A slide set showing local problems and how they were solved using Best Management Practices will be prepared and shown at public meetings.

These ready-reference picture books and the slide set are designed to show the need for control of nonpoint source pollutants and the alternative Best Management Practices that are available. Since the "before" and "after" pictures will all be local in nature, it is hoped that the landowners will be more receptive to these new ideas.

The primary responsibility for preparing these items will lie with the Trempealeau County LCC since the "before" and "after" photos will be of areas in the Elk Creek and Lower Black River priority watershed projects.

D. Assistance From Sportsmens' Clubs

Specific activities that the sportsmens' clubs could be involved in, but certainly are not limited to, might be:

1. to host six to nine public information meetings over the three-year contract writing period,

2. to contact landowners along stretches of stream selected by the DNR Fisheries Manager to discuss public access easements,

3. to coordinate trout and pheasant stocking with Beaver Creek contracts and CRP enrollment,

4. to initiate a stream fencing project throughout the watershed,

5. to provide volunteer labor and materials for trout habitat improvement projects,

6. to provide stream fencing maintenance labor, and

7. to contact eligible landowners to inform them about the project, discuss eligible practices and develop an interest list for the conservation planner/contractor from the LCD.

E. Special Demonstration Project

The Department of Natural Resources, the Trempealeau and Jackson County LCDs, and the Soil Conservation Service will develop a demonstration project in the Beaver Creek Watershed to evaluate alternative streambank stabilization techniques that are designed to meet fish habitat improvement needs. These agencies will identify sites in the watershed

Table 23. Direct Cost Budget For The Beaver Creek Priority Watershed Project Information and Education Program.

Activity	Cost/ Activity		YEAR 1	2	3	4	5	6	7	8	ACTIVITY BUDGET
Newsletters	$600	Number	4	4	4	2	2	2	2	2	
		Cost	$2,400	$2,400	$2,400	$1,200	$1,200	$1,200	$1,200	$1,200	$13,200
News Releases	$25	Number	4	4	4	2	2	2	2	2	
		Cost	$100	$100	$100	$50	$50	$50	$50	$50	$550
Barnyard Tour	$200	Number	1	1	1						
		Cost	$200	$200	$200						$600
Tillage Tour	$200	Number		1	1						
		Cost		$200	$200						$400
Reference Books	$100	Number	4								
		Cost	$400								$400
I&E Packets	$2	Number	600								
		Cost	$1,200								$1,200
Public Meetings	$50	Number	3	3	3						
		Cost	$150	$150	$150						$450
Slide Program	$160	Number	2								
		Cost	$320								$320
		YEARLY BUDGET	$4,770	$3,050	$3,050	$1,250	$1,250	$1,250	$1,250	$1,250	$17,120

where these techniques are to be evaluated, and identify the practice designs to be used. The demonstration project will consider both the draft SCS Standard and Specification "Fish Stream Improvement", and designs currently being employed in streams under the direction of the DNR Fish Manager in La Crosse.

The demonstration practices will be installed under cost share agreements developed between interested landowners and the appropriate county. The maintenance period for these demonstration practices will be waived, as allowed under NR 120.13(6)(d). All other cost share conditions will apply.

F. Staffing and Budget Needs

Tables 23 and 24 show the costs and local staff support needed to conduct the information and education program for this project. The costs incurred by management agencies to conduct these activities will be reimbursed by the DNR. Staffing will also be supported through the appropriate local assistance agreements.

Table 24. Staffing Needs For The Beaver Creek Priority Watershed Project Information & Education Program.

Activity(1.)	Hours/ Activity	Years To Be Done	STAFF HOURS PER YEAR																TOTAL HOURS PER ACTIVITY
			*	1		2		3		4		5		6		7		8		
				T	J	T	J	T	J	T	J	T	J	T	J	T	J	T	J	
Newsletter	40	Years 1-8		120	40	120	40	120	40	60	20	60	20	60	20	60	20	60	20	880
News Releases	2	Years 1-8		8		8		8		2		2		2		2		2		34
Barnyard Tour	32	Years 2,3		8	24	24	8	24	8											96
Tillage Tour	120	Years 2,3				80	40	80	40											240
Reference Books	8	Year 1		16	16															32
I&E Packet Set	40	Year 1		40	40															80
Public Meetings	27	Years 1-3		72	9	72	9	72	9											243
Slide Program	80	Year 1		72	8															80
		TOTAL HOURS		336	137	304	97	304	97	62	20	62	20	62	20	62	20	62	20	1685

1. See data table for I&E Budget, for number of each activity to be completed in each year.

* T = Trempealeau County
J = Jackson County

CHAPTER VIII. PROJECT ADMINISTRATION OF COST SHARE FUNDS

A. Eligible Practices and Cost Share Rates

Cost share funding is available to landowners or land operators for a percentage of the cost of installing eligible Best Management Practices. These practices are designed to control the critical nonpoint pollutant sources identified in this plan to be significantly affecting water resources in the project area.

Practices eligible for cost sharing under the Nonpoint Source Control Program are listed in NR 120, along with maximum state cost share rates allowable for each practice. It is possible that some practices other than those specified in NR 120 will be required if unusual circumstances are encountered.

NR 120 does provide for the development of alternative practices. These practices must receive approval from the Department of Natural Resources prior to their inclusion on cost share agreements. In any case, each Best Management Practice installed under the Nonpoint Source Control Program must meet the conditions and specifications specified for that practice in NR 120.

For certain areas within the project, local, state, or federal permits may be needed in order to install some of the management practices. The land areas most likely to require permits are the zoned wetlands of a county and the shoreline of streams and lakes. These permits are required regardless of whether the activity is associated with the watershed project or not. The Planning and Zoning Office or the Land Conservation Office in each county should be consulted to determine if any permits are required in specific cases.

Brief descriptions of some of the common Best Management Practices that will be used in the Beaver Creek Priority Watershed Project are included here. A more detailed description of the practices, and the conditions under which they are cost shared, is given in NR 120.

Contour Strip Cropping - Contour crop stripping involves growing crops on the contour of the land in alternated swaths that generally consist of corn, oats, and hay. Contour strip cropping can be used for fields that are currently in hay-row crop rotations which have high levels of erosion. This situation normally applies to dairy operations.

Reduced Tillage Systems - Reduced tillage systems include a number of different planting, tilling, and cultivating methods, all which are designed to leave a vegetative residue on the surface of the soil after planting. This residue reduces both soil erosion and nutrient/pesticide runoff from croplands.

In order to prevent the increased runoff of chemicals that can occur with reduced tillage systems, special conditions are placed on the application of fertilizers, herbicides, and insecticides.

Table 25. The Cost Share Rates Available For Best Management Practices In The Beaver Creek Priority Watershed Project.

Practice	Basic Cost Share Rates (1.)	Ancillary Cost Share Rates (2.)
Contour Cropping	$4/acre	50%
Strip Cropping (includes field strips)	$8/acre	50%
Field Diversions	70%	
Terraces	70%	
Waterways	70%	
Reduced Tillage	$15/acre(one year only)	50%
Critical Area Stabilization		
Tree Planting	$80/1000 trees	70%
Other	70%(3.)	
Grade Stabilization (dams and toe walls)	70%	
Livestock Exclusion, Woodlots		
3-strand, barb(4.)	$6/rod	50%
1-strand electric(4.)	$2/rod	50%
Shoreline Protection		
Rip-rap	70%	
Shape & Seed	70%	
Fencing:3-strand, barb(4.)	$8.40/rod	70%
Fencing:1-strand electric(4.)	$2.50/rod	70%
Cattle or machine crossing	70%	
Barnyard Runoff System	70%	
Long-term Manure Storage	70%(5.)	
Short-term Manure Storage	70%(6.)	

1. These are the basic rates established by Trempealeau and Jackson counties. Where in-kind labor is used as part of the local share, the county will establish and revise annually rates for crediting work.
2. Additional work needed to establish the practice, such as tiling or obstruction removal, may also be eligible for cost sharing. For practices with flat fee rates, additional work will be cost shared at the rates below.
Mulching where needed will be cost shared at at an additional $60/acre.
3. Cost sharing for critical area seeding may not exceed $150/acre.
4. Fence Standards: 12-1/2 guage wire, posts may be either steel or treated wood (3 inch top width minimum).
5. Cost share may not exceed $10,000. Pump or equipment may be cost shared up to 50%, but may not exceed $5,000.
6. Cost share may not exceed $6,000. Pump or equipment may be cost shared up to 50%, but may not exceed $3,000.

Grassed Waterway - A grassed waterway is a constructed water course that is shaped, graded, and established in a suitable vegetative cover as needed to prevent erosion by runoff waters. This practice can be used to stabilize small gullies on croplands.

Critical Area Stabilization - Critical area stabilization involves planting suitable vegetation, such as trees or permanent grass, on highly erosive areas. These areas may include roadsides, gullies, intermittent stream channels, and steeply sloped lands.

Streambank Protection - Streambank protection involves several measures designed to stabilize and protect the banks of streams against erosion. Specifically this practice could include fencing to control livestock access to streams, riprap, livestock or machinery stream crossings, and shaping and seeding of eroded banks.

Livestock Exclusion from Woodlots - Livestock exclusion provides for the protection of woodlots through fencing or other means, especially for areas on steep slopes.

Barnyard Runoff Management - Barnyard runoff management involves a system designed to reduce the quantity of manure-related pollutants carried by runoff water to streams and lakes. The systems include the prevention of surface water from running through the livestock concentration area, and the safe distribution or containment of waters leaving the barnyard area.

Manure Storage - This category involves structures for the temporary storage of manure. Manure storage allows the farm operator to time manure spreading so runoff to surface waters is minimized.

The practices and cost share rates applicable in the Beaver Creek Priority Watershed Project are shown in Table 25. The practices and rates listed in Table 25 have been established by the Jackson and Trempealeau County Land Conservation Committees, consistent with guidance in NR 120. Changes to this table may be made, consistent with restrictions in NR 120, if needed to meet the objectives of the watershed plan. Such changes require mutual agreement between the DNR and the appropriate county.

B. The Cost Share Agreement

To obtain cost share monies, the cost share recipient must enter into a cost share agreement. The cost share agreement is a legal contract between the landowner and the appropriate city, county, or village.

The cost share agreement includes 1) the number and types of practices that are needed, 2) the estimated installation dates, 3) the estimated practice costs, 4) the cost share percentage rate, and 5) the estimated cost share reimbursement amount due to the landowner. The agreement also lists practices which are needed to meet water quality objectives but are not cost shared under the Nonpoint Source Control Program, such as crop rotations.

Representatives of the Trempealeau and Jackson County Land Conservation Departments will actively solicit the involvement of landowners in the watershed. Landowners or operators will be contacted based on the severity of their pollutant sources as determined by survey information collected by LCD staff during the preparation of this plan. During these contacts, and subsequent conservation planning, survey information will be updated if necessary. The landowner or operator will be appraised of the pollutant sources on his or her land, and which control practices are eligible for cost sharing. At this time, the landowner will be encouraged to enter into a cost share agreement for control of his nonpoint pollutant sources.

Landowners or operators will have three years to enter into cost share agreements once the Beaver Creek Priority Watershed Project begins. Once the landowner enters into a cost share agreement, he or she has up to five years to complete the installation of all practices on the cost share agreement. Once practices are installed, the landowner or operator is responsible for maintaining all practices for the time period specified in the cost share agreement.

The following policies pertain to developing cost share agreements in the Beaver Creek Priority Watershed Project, and augment the specific requirements stated in NR 120:

1. Only those pollutant sources determined to be in Management Category I, II, IIa, or IIb are eligible for cost sharing through the Beaver Creek Priority Watershed Project. Pollutant sources in Management Category I must be controlled as part of any cost share agreement that is developed. Pollutant sources in categories II, IIa, and IIb may be included on the agreement at the landowner's option, although the inclusion of such practices will be strongly encouraged by the project staff working with the landowner. Pollutant sources in Management Category III are considered insignificant, and are not eligible for cost sharing.

2. Cost share agreements developed under this watershed project will reflect the data and management categories developed as part of the watershed inventory, unless changes in the data are justified as a result of data verification conducted during landowner visits or conservation planning. Changes in data will be documented on landowner tracking sheets. Changes in Management Categories will be consistent with criteria specified in this plan for each pollutant source in the subwatershed of concern, and will also be documented on the landowner tracking sheets. These tracking sheets will be submitted to DNR with the signed cost share agreements.

C. Fiscal Management Procedure

The following fiscal management procedure will be used in administering the cost share funds used in the Beaver Creek Priority Watershed Project:

1. Trempealeau County will sign the Nonpoint Source Grant Agreement (Form 3400-108) with the Department of Natural Resources, and will set up a project account.

2. Trempealeau County will set up a project ledger in accordance with NR 120 and the requirements of the Nonpoint Source Grant Agreement.

3. Trempealeau County will request advanced monies from the Department of Natural Resources (Form 3200-54). The Department will issue a check for the advanced monies, which Trempealeau County will place in the project account. The county will update the ledger.

4. Trempealeau County will enter into an agreement with Jackson County, specifying the intent of Jackson County to abide by the provisions of the Nonpoint Source Grant Agreement. The letter of intent will also be signed by other management agencies (villages, cities) should they develop cost share agreements with landowners or operators within their jurisdictions.

   Following the landowner contacts, and landowners agreeing to participate in the project, the planning necessary to develop a cost share agreement will be done. (Each management agency, including Jackson County, Trempealeau County, and any cities or villages, will contact and plan with landowners or operators residing within their respective jurisdictions.)

5. Trempealeau County, Jackson County, or the appropriate city or village will develop a cost share agreement (Form 3400-68) or cost share agreement amendment (Form 3400-68A) with their respective landowners or operators. The appropriate management agency will develop a file for the cost share recipient.

   If the cost share agreement exceeds $50,000 in state share, the management agency developing the agreement will notify Trempealeau County, and will send the cost share agreement along with supporting materials to the Department of Natural Resources for approval.

   If there is a need to develop standards and specifications for a practice on the cost share agreement, pursuant to NR 120.15, the management agency developing the agreement will notify Trempealeau County and will submit the request for standards and specifications to the Department of Natural Resources.

6. Following Department of Natural Resources' approval (only if required), the cost share agreement or cost share agreement amendment will be signed by the landowner or operator.

7. The cost share agreement or amendment will be reviewed and signed by the management agency working with the landowner. One copy with original signatures will be kept in a cost share agreement file developed by, and filed with, the management agency. One copy with original signatures will be filed with the register of deeds for the jurisdiction of the management agency. One copy with original signatures will be retained by the landowner or operator. One copy of the cost share agreement or amendment will be sent to Trempealeau County, and one copy will be sent to the Department of Natural Resources.

8. Trempealeau County will update the project ledger.

9. Using approved plans and designs developed by the appropriate management agency, the grant recipient will arrange for a contractor to install the practice. Trempealeau County, Jackson County, and any city or village will monitor this phase to assure that the cost containment provisions for the management agency are complied with. Cost containment provisions are specified elsewhere in this section of the plan.

   Where actual cost share payments for an individual practice will exceed the estimated cost share amount by $500 or more, or where the total cumulative over-run on an agreement will be $500 or more, the appropriate management agency will develop a cost share agreement amendment with the landowner or operator. Copies will be sent to Trempealeau County, which will update the project ledger, and to the Department of Natural Resources.

10. Following practice installation, Trempealeau County, Jackson County, or the appropriate city or village will certify the practice complete, using the Practice Certification Form (Form 3400-53). One copy with original signatures will be left with the landowner, and one will be placed in the landowner's file.

11. The landowner or operator will submit bills, or evidence of paid bills, for the certified practice to the management agency with which he has entered into the cost share agreement.

12. The management agency will review the bills and approve them for payment. All bills will be placed in the landowner's file.

13. Vouchers for payment, accompanied by the practice certification forms, will be sent by the applicable management agency to Trempealeau County.

14. Trempealeau County will issue a check to the landowner or operator covering the state share of the completed, certified practice. Checks sent to landowners or operators residing in the jurisdictions of other management agencies will have a form letter attached signed by the appropriate management agency. A copy of the check will be mailed to the appropriate management agency for inclusion in the landowner's file.

15. Trempealeau County will update the project ledger.

16. Trempealeau County will periodically submit a request for reimbursement to the Department of Natural Resources for replenishment of the project account. The reimbursement request will include Form 3400-54, and copies of all certification forms for practices included on the reimbursement request.

17. The Department of Natural Resources will review the reimbursement request and issue a check to Trempealeau County for the appropriate amount. Trempealeau County will update its project ledger.

D. Cost Containment Provisions

The following provisions are designed to control the costs for installing practices in the Beaver Creek Priority Watershed Project. Where special circumstances warrant, practice costs may justifiably exceed the costs determined by the provisions stated below. In no case, however, may the cost share payment made exceed the flat fee specified elsewhere in this plan, nor may it exceed the actual cost of the installation times the applicable cost share rate specified in this plan.

1. For the purpose of estimating costs associated with the development of cost-share agreements, the following techniques will be used:

   The flat fee payment schedule used for cost sharing will be used to estimate costs for the following practices:

   1. Woodlot fencing
   2. Stream fencing
   3. Tree planting
   4. Contour strip cropping
   5. Reduced tillage
   6. Contour cropping

   "Average Unit Cost" will be used to estimate costs for all other practices.

2. Actual installations of practices which were estimated using "Average Unit Cost" on the Cost Share Agreement will be cost shared based on the following procedures:

   The lowest accepted bid, or bids within five percent of the lowest bid, will be used for the following practices:

   1. Barnyard runoff control
   2. Erosion control dams
   3. Rock chutes
   4. Toe walls
   5. Streambank riprap

   This procedure is detailed the Trempealeau County bidding procedure policy.

   "Average Unit Cost" will be the only required Cost Containment Procedure for the following practices:

   1. Waterways
   2. Diversions
   3. Crossings
   4. Critical area stabilization

Landowners are, however, encouraged to seek at least two bids for their own benefit.

CHAPTER IX. PROJECT ADMINISTRATION OF LOCAL ASSISTANCE FUNDS

A. Purpose

Local assistance funds are those monies awarded by the DNR under the Nonpoint Source Control Program to cities, counties, and villages, or their agents, for the purpose of supporting local activities necessary to carry out a priority watershed project. These funds are limited to those needed to support additional staff (direct hire or professional services contract) and to cover direct costs incurred as a result of conducting watershed activities. Existing staff and normal operating costs are not intended as eligible for support.

The need for local assistance funds is established annually through a work planning process. This work planning process is a joint effort involving the DNR and each city, county, and village responsible for project implementation. The work plan identifies 1) the amount of work needed to meet the objectives of the watershed project, 2) the estimated workload that will develop, and 3) the need for additional staff to carry out these activities. This workplan is the basis for developing a local assistance grant agreement between the DNR and each management agency for support of watershed activities. The initial workplans will be developed based on estimated needs identified in this watershed plan. As scheduled workloads develop as a result of signing cost share agreements, the annual workplans will be based on a combination of information in the watershed plan and the actual scheduled technical workload.

In the Beaver Creek Priority Watershed Project, the DNR will develop work plans and local assistance grant agreements with both Jackson and Trempealeau counties. Agreements with the City of Galesville and the Village of Ettrick are not seen as needed at this time.

B. Eligible Activities

Activities eligible for support include all of those listed in Table 26, except for project and financial management activities. Local project and financial management activities are provided by cities, counties, and villages in watershed projects as the "local share" required under NR 120. However, if a management agency is participating in more than one priority watershed project, a portion of the project and financial management activities may be eligible for support.

C. Eligible Costs

The eligible costs associated with priority watershed project implementation activities include 1) salaries and fringe benefits for staff hired or contracted to work on the watershed project; 2) direct costs associated with watershed activities such as travel expenses, information and education materials, and special equipment, materials, and supplies needed to conduct the project but which are not commonly provided by local agency offices; 3) professional services contracts that may be needed to complete watershed activities; and 4) other eligible direct costs consistent with NR 120.

Table 26. The Estimated Local Technical Assistance Workload For Completing The Beaver Creek Priority Watershed Project (1.)

Activity	Watershed Project Needs	County	Need	Work-Load Factor	Estimated Work Rate (Hrs/unit)	County Workload	TOTAL PROJECT WORKLOAD (Hours)	Project Years When Work Will Be Done
Project and Financial Management		Trem.		1.00	500 hr./yr.	4,000	5,600	Years 1-8
		Jack.		1.00	200 hr./yr.	1,600		
Information/Education	(2.)	Trem.		.75		1,245	1,650	Years 1-8
		Jack.		.75		405		
Pre-Contact Office Inventory, Landowner Tracking Sheets	390 indiv.	Trem.	318	1.00	1 hr./indiv.	318	390	Years 1-3
		Jack.	72	1.00		72		
Landowner Contacts	390 indiv.	Trem.	318	1.00	6 hrs./indiv	1,908	2,340	Years 1-3
		Jack.	72	1.00		432		
Conservation Planning and Cost Share Agreement Development including pre-design	20,000 acres	Trem.	17,000	0.75	.25 hr./acre	3,200	3,800	Years 1-3
		Jack.	3,000	0.75		600		
Cost Share Agreement Status Reviews, BMP Maintenance Checks	372 indiv.	Trem.	300	0.75	1 hr./indiv.	225	279	Years 1-8
		Jack.	72	0.75		54		
Practice Design & Installation/Certification								

Table 26. The Estimated Local Technical Assistance Workload For Completing The Beaver Creek Priority Watershed Project (1.)

Activity	Watershed Project Needs	County	Need	Work-Load Factor	Estimated Work Rate (Hrs/unit)	County Workload	TOTAL PROJECT WORKLOAD (Hours)	Project Years When Work Will Be Done
Contour Cropping	2,830 ac.	Trem.	2,800	0.75	.3 hr./acre	630	640	Years 1-8
		Jack.	30	0.75		10		
Strip Cropping	4,240 ac.	Trem.	3,660	0.75	.3 hr./acre	825	955	Years 1-8
		Jack.	580	0.75		130		
Reduced Tillage	3,270 ac.	Trem.	2,460	0.75	.2 hr./acre	370	490	Years 1-8
		Jack.	810	0.75		120		
Reduced Tillage & Strips	3,960 ac.	Trem.	2,880	0.75	.5 hr./acre	1,080	1,490	Years 1-8
		Jack.	1,080	0.75		410		
Critical Area Stabilization	2;800 ac.	Trem.	2,450	0.75	.3 hr./acre	550	630	Years 1-8
		Jack.	350	0.75		80		
Livestock Exclusion (Woodlots)	2,660 ac. (10,120 rods)	Trem.	9,820	0.75	.2 hr./rod	1,470	1,520	Years 1-8
		Jack.	300	0.75		50		
Changes In Rotation	7,420 ac.	Trem.	6,720	0.75			included in con. planning figure	Years 1-8
		Jack.	700	0.75				
Grassed Waterways	230 ac.	Trem.	180	0.75	20 hr./acre	2,700	3,450	Years 1-8
		Jack.	50	0.75		750		

Table 26. The Estimated Local Technical Assistance Workload For Completing The Beaver Creek Priority Watershed Project (1.)

Activity	Watershed Project Needs	County	Need	Work-Load Factor	Estimated Work Rate (Hrs/unit)	County Workload	TOTAL PROJECT WORKLOAD (Hours)	Project Years When Work Will Be Done
Grade Stabilization Units	160	Trem.	120	0.75	55 hr./unit	4,900	6,550	Years 1-8
		Jack.	40	0.75		1,650		
Barnyard Runoff	87 systems	Trem.	76	0.75	70 hr./unit	3,990	4,570	Years 1-8
		Jack.	11	0.75		580		
Long-Term Manure Storage	34 units	Trem.	25	0.75	70 hr./unit	1,310	1,780	Years 1-8
		Jack.	9	0.75		470		
Short-term Manure Storage	11 units	Trem.	1	0.75	70 hr./unit	70	630	Years 1-8
		Jack.	10	0.75		560		
Rip-Rapping	1,390 rods	Trem.	1,375	0.75	1.2 hr./rod	1,240	1,255	Years 1-8
		Jack.	15	0.75		15		
Shape and Seed	3,640 rods	Trem.	2,475	0.75	1 hr./rod	1,860	2,730	Years 1-8
		Jack.	1,165	0.75		870		
Fencing	6,060 rods	Trem.	3,640	0.75	1.2 hr./rod	550	910	Years 1-8
		Jack.	2,420	0.75		360		
Livestock Crossing/ Watering Ramp	90 units	Trem.	55	0.75	6 hr./unit	250	410	Years 1-8

Table 26. The Estimated Local Technical Assistance Workload For Completing The Beaver Creek Priority Watershed Project (1.)

Activity	Watershed Project Needs	County	Need	Work-Load Factor	Estimated Work Rate (Hrs/unit)	County Workload	TOTAL PROJECT WORKLOAD (Hours)	Project Years When Work Will Be Done
		Jack.	36	0.75		160		
						Trem. 32,690	TOTAL: 42,070	
						Jack: 9,380		

1. The workload factor represents the level of participation for each activity. Activities preceding landowner committment to signing a cost share agreement assume 100% participation of landowners with at least one pollution source in Management Category I, II, or IIa. Activities that require landowners to sign a cost share agreement assume 75% participation of landowners with at least one pollution source in Management Category I, II, or IIa.

2. See Table 24.

CHAPTER X. NEEDS AND COSTS

A. Best Management Practice Needs and Budget

1. Introduction

Table 27 shows the estimated number and costs of the Best Management Practices (BMP) needed to achieve the water quality objectives of the Beaver Creek Priority Watershed Project.

2. Methods for Estimating BMP Needs

The following methods were used to develop the information shown in Table 27:

a. The practice estimates for contour cropping, strip cropping, reduced tillage, reduced tillage with strips, critical area stabilization, and changes in rotation are based directly on the upland sheet and rill erosion survey and analysis. The practice quantities listed in Table 27 are the estimated needs for treating eroding lands for landowners in Management Categories I, IIa, and IIb for upland erosion.

b. The practice estimate for woodlot fencing is also based on the upland sheet and rill erosion survey. The number of acres eroding above the target level was translated into a practice need as follows:

The number of feet of fencing needed per grazed woodlot was estimated assuming square woodlots 25 acres in size, needing fencing along one and a half sides. The number of woodlots was estimated by dividing the total acreage of eroded woodlots by the average woodlot size. The feet needed per woodlot was then multiplied by the number of woodlots to convert acres into total feet of fencing needed.

c. There was no survey data collected upon which to base needs for grassed waterways or grade stabilization structures. These practice estimates were derived by county staff based on past experience.

d. The need for barnyard runoff systems is based directly upon the barnyard runoff survey and analysis. The practice needs reflect treating the barnyards of all landowners in Management Category I and II for this source.

e. The needs for long-term manure storage, short-term manure storage, and additional waste utilization planning are based directly upon the inventory and analysis. The estimates were derived as follows:

Table 27. The Estimated Quantities and Costs of Best Management Practices Needed To Protect Surface Water Quality In The Beaver Creek Priority Watershed.

Best Management Practice	Estimated Quantity	Average Cost/Unit	Total Cost	Cost Share Rate	Estimated Cost Share Need: 100% Participation	Estimated Cost Share Need: 100% Participation
UPLAND SHEET & RILL EROSION						
Contour Cropping	2,830 ac.	$8/ac.(1.)	$22,600	$4/ac.(2.)	$11,300	$8,500
Strip Cropping	4,240 ac.	$16/ac.(1.)	$67,800	$8/ac.(2.)	$33,900	$25,400
Reduced Tillage	3,270 ac.	$30/ac.(1.)	$98,100	$15/ac.(2.)	$49,000	$36,800
Reduced Tillage & Strips	3,960 ac.	$46/ac.(1.)	$182,200	$23/ac.(2.)	$136,700	$102,500
Critical Area Stabilization	2,800 ac.	$140/ac.	$392,000	70%	$275,000	$206,000
Livestock Exclusion (Woodlots)	2,660 ac. (167,000 ft.)	$.73/ft(3.)	$121,900	.36/ft.(2.)	$61,000	$45,800
Changes In Rotation	7,420 ac.	no cost			no cost	no cost
GULLY EROSION						
Grassed Waterways	250,000 ft.	$2/ft.	$500,000	70%	$350,000	$262,500
Grade Stabilization Units	160 units	$7,500	$1,215,000	70%	$850,500	$637,900
ANIMAL WASTE						
Barnyard Runoff	87 systems	$7,500	$652,500	70%	$456,750	$342,560
Long-Term Manure Storage	34 units	$14,300(4.)	$486,200	70% ($10,000 max.)	$340,000	$255,000
Short-term Manure Storage	11 units	$8,600(4.)	$94,600	70% ($6,000 max.)	$66,000	$49,500

Table 27. The Estimated Quantities and Costs of Best Management Practices Needed To Protect Surface Water Quality In The Beaver Creek Priority Watershed.

Best Management Practice	Estimated Quantity	Average Cost/Unit	Total Cost	Cost Share Rate	Estimated Cost Share Need: 100% Participation	Estimated Cost Share Need: 100% Participation
Waste Utilization Planning	158 plans(5.)	No cost			no cost	no cost
SHORELINE/SPRING DEGRADATION						
Riprap	23,000 ft.	$15/ft.	$345,000	70%	$241,500	$181,100
Shape and Seed	60,000 ft.	$4/ft.	$240,000	70%	$168,000	$126,000
Fencing	100,000 ft.	$.24/ft.(6.)	$24,000	$.17/ft.(2.)	$16,800	$12,600
Livestock Crossing/ Watering Ramp	90 units	$575/unit	$51,800	70%	$36,300	$27,200
TOTAL PRACTICE COSTS			$4,494,000		$3,093,000	$2,320,000

1. Based on a back-calculation of flat fee rate divided by cost-share rate.
2. Flat fee rate established by Trempealeau and Jackson Counties, and. approved by DNR.
3. Assumes use of a three-strand barbed wire fence.
4. Based on a back-calculation of the maximum cost-share divided by the cost share rate.
5. Does not include plans required as part of a barnyard runoff system or a manure storage structure.
6. Assumes use of a one-strand electric wire.

1) The need for long-term storage is assumed for those landowners in Management Category I or II who have needs ratios of less than 0.6. This means that the available land upon which manure spreading can be safely conducted is less than 60% of the land needed by the landowner for safe disposal.

2) The need for short-term storage is assumed for those landowners in Management Category I or II who have needs ratios between 0.6 and 1.2. This means that the available land upon which manure spreading can be safely conducted is between 60% and 120% of the land needed by the landowner for safe disposal.

3) The need for waste-utilization planning represents the additional need above and beyond the planning that will be required as part of installing manure storage systems. The need is assumed for all landowners in Management Category I or II for this source who have needs ratios greater than 1.2. In addition, the need for waste utilization planning includes all landowners who have critical acres, but who are in Management Category III based on the low number of critical acres estimated to be spread annually.

f. The need for streambank protection is based directly upon the streambank erosion survey and analysis. The needs are difficult to assess, due to the many factors that dictate whether or not a site can be controlled. For planning purposes, the estimates were derived as follows:

1) The number of feet needing fencing is based on two numbers. The lower limit is based on the feet of eroding bank which have cattle access. This figure is 46,000 feet in the Beaver Creek Watershed. The upper limit represents the total feet in all of the stream reaches that have cattle access at some point. This equals 294,000 feet in the watershed. Based on these numbers, 100,000 feet of fencing was estimated to be needed. This estimate was apportioned between the two counties based on the inventory data.

2) All streambank sites with estimated lateral recession rates equal to or greater than 0.5 feet per year were assumed to need riprapping. In addition, sites equal to or greater than six feet in height were assumed to need riprap to stabilize the toe and to cut back on the grading needed, regardless of the lateral recession rate.

3. All streambank sites with estimated lateral recession rates less than 0.5 feet per year and less than six feet in height were assumed to need shaping and seeding.

Cattle crossings were estimated based on an assumption that one crossing would be needed per stream reach having cattle access, unless the need for more crossings was identified as part of the streambank erosion inventory.

All estimated practice costs are based on information provided by county staff.

B. Local Staffing Needs

1. Staffing Needs

Table 26 shows the estimated staffing needs required to implement the Beaver Creek Priority Watershed Project. The workload is based on:

a. contacting all landowners having at least one pollutant source in Management Category I, II, or IIa, and,

b. developing cost share agreements that cover 75% of the pollution sources in the watershed eligible for cost sharing. This includes sources in Management Categories I, II, IIa, and IIb.

This level of pollution control for the Beaver Creek Watershed will require an estimated 40,000 hours of local staff time, or the equivalent of about 22 full-time staff years of effort.

2. Project Tasks

Part of this estimated workload is certain to develop as long as county staff are available to perform the tasks. This includes the workload associated with project management; information and education activities; pre-contact office review of inventory data (including setting up landowner tracking sheets); and landowner contacts.

However, the actual development of the workload associated with conservation planning and cost share agreement development, practice design, practice installation and certification, and annual cost share agreement status reviews and practice maintenance checks is less certain, since it depends on the actual degree of landowner participation.

G. Beaver Creek Project Tracking

The purpose of project tracking is to provide a basis for evaluating the progress made towards meeting both work goals and pollutant reduction goals.

In order to track progress in meeting annual work goals, each county will establish a reporting form that shows the progress made each quarter towards meeting the objectives identified through the annual work planning process. The report will be submitted quarterly to the DNR by each county as part of the county's request for reimbursement of eligible local assistance costs.

The reporting forms should address progress made in landowner contacts, information and education activities, conservation planning and cost share agreement development activities, and scheduled practice design, installation, and certification activities.

SECTION FOUR:

THE PROJECT EVALUATION

CHAPTER XI: BEAVER CREEK PROJECT EVALUATION

SECTION FOUR: THE PROJECT EVALUATION

CHAPTER XI. BEAVER CREEK PROJECT EVALUATION

A. Introduction

Two evaluations will be prepared for the Beaver Creek Priority Watershed Project. An interim evaluation, based on pollutant control practices included on signed cost share agreements, will be prepared jointly by DNR and the counties at the end of three years. That is when the period expires for entering into cost share agreements. The master tracking file maintained by the Department of Natural Resources, and the annual reports submitted by the counties, will serve as a basis for this report.

The final evaluation, based on actual changes in water quality, will be conducted in two phases. Pre-project evaluation monitoring will be conducted by the DNR at several selected sites in the watershed. At appropriate times either during or after the eight-year project period is over, the same sites will be re-evaluated to measure changes in the water resource. The DNR will be responsible for preparing this report. These two evaluations are discussed in this chapter.

B. The Interim Evaluation

The interim evaluation will be based on the level of pollutant load reduction expected to occur as a result of installing practices on signed cost share agreements. This evaluation will be based on the following indicators of accomplishment:

1) Barnyard Runoff: the percentage of the phosphorus load from barnyards in Management Category I and II that is to be controlled through the installation of the practices designated on cost share agreements; and the percentage of the total phosphorus load from all barnyards that will be controlled through practices designated on the cost share agreements.

2) Manure Spreading: the percentage of the critical acres winterspread with manure on operations in Management Category I and II that is to be controlled through practices listed on cost share agreements;

3) Upland Erosion: the percentage of the soil loss targeted for control that is to be controlled through practices listed on cost share agreements;

4) Streambank Protection: the percentage of the tons in Management Category I and II; percentage of feet in Categories I and II included on agreements.

C. Final Evaluation

1. Introduction

An evaluation monitoring plan was prepared by the West Central District of the Department of Natural Resources (Eslien, 1987). The purpose of this monitoring plan is to lay out the methods and procedures by which the water quality impacts of the Beaver Creek Priority Watershed Project can be assessed.

The water quality evaluation will be based on a) changes in stream habitat, b) changes in stream macroinvertebrate populations, and c) changes in the stream fish communities. Although the evaluation monitoring plan proposes a continuous monitoring station at the inlet to Lake Marinuka, this component of the monitoring evaluation is not being committed to at this time. Further discussion about this station is needed prior to making a decision.

Sites will be selected in areas where the chance for water quality improvement is greatest, based on the severity of existing pollution sources and the potential of the stream for improvement. Knowing the eventual location of management practices to be installed through the project would aid in the location of monitoring sites, however, it will not be possible to predict the degree of cooperation in each subwatershed. Some flexibility may be required to adjust the evaluation monitoring plan so that monitoring evaluation stations are not located in areas where there is minimal landowner cooperation.

2. Methods and Materials

a. Ball Stream System Habitat Evaluation

This method, initially developed by Joe Ball of the Department of Natural Resources, incorporates observations made of a stream's physical aspects. Individual numerical scores are assigned the various habitat rating items such as bottom substrate and lower bank deposition. The Ball habitat evaluation system, used in this context, determines the physical/morphological aspects of the stream. Although scores assigned to a stream segment are numeric, the real value lies in their relativity.

The method will be modified for this watershed evaluation by eliminating elements 1 and 2 from the habitat rating procedure, consistent with recommendations by the Department of Natural Resources' Monitoring Evaluation Workgroup. These two elements, which address the severity of nonpoint pollution sources affecting a site, will be evaluated as a separate step using the more detailed information from the nonpoint source surveys. A mathematical adjustment will be made to Ball's original rating scheme to compensate for the deletion of these two elements. The new rating system will be as follows:

<51 points = Excellent
51-105 points = Good
106-173 points = Fair
>173 points = Poor

The modified Habitat Rating Form and the supporting field data forms that will be used to record detailed site information are included in the evaluation monitoring plan (Eslien, 1987).

b. Macroinvertebrate Sampling

Macroinvertebrates will be sampled, identified, and a Hilsenhoff Biotic Index calculated as an indicator of water quality conditions (Hilsenhoff, 1982). The Hilsenhoff Biotic Index detects stresses in the macroinvertebrate community that are caused by depressed oxygen conditions or toxic substances.

Because of the nature of the impacts from nonpoint source pollutants in the Beaver Creek Watershed, the sampling and interpretation of results must be done with extreme care. This is because streams in the Beaver Creek Watershed are not affected as much by organic wastes or dissolved oxygen depletion as they are from sediment deposition or hydraulic scour. Many streams have a paucity of good habitat, be it vegetative cover, rock and rubble substrate, or stable stream banks. In many streams, the water is of excellent quality but macroinvertebrate habitat is wanting. If care is not taken, inadequate habitat may be misinterpreted as the cause of a degraded invertebrate community. This sampling will generally be restricted to stream segments below severely polluting barnyard or manure runoff.

The detailed procedures for collecting macroinvertebrate samples are specified in the evaluation monitoring plan prepared by the District.

c. Fish Surveys

The post-implementation fish survey will be conducted on representative streams, using the same procedures as in the 1986 survey. The 1986 fishery inventory investigations were conducted on the French-Beaver Creek watershed to evaluate: 1) land use impacts on physical stream characteristics and habitat, 2) existing fish population and community structure, 3) fishery use potential, and 4) the need for habitat protection and/or restoration. Investigations were performed as part of the inventory phase of this priority watershed project.

The results serve to identify areas within the watershed where cost shared Best Management Practices would yield the greatest benefit to trout populations. The data also serve to a limited extent as a pre-implementation fish population and community structural data base. The survey procedures are outlined in the DNR Fish Manager's Handbook.

3. Site Selection

a. Number of Monitoring Sites

Ideally, monitoring stations would be installed on each subwatershed stream since it can not be predicted which subwatersheds will benefit from implementation of Best Management Practices. However, this would require limiting each subwatershed to one monitoring station due to the expense of survey work. The monitoring methods used are more subjective than objective, and increasing the number of stations in a stream is required to make an accurate assessment of stream conditions.

The monitoring evaluation effort will therefore be aimed at fewer subwatersheds, within which more intensive monitoring will be conducted. The selected streams will each have two to five monitoring sites, thereby allowing for more subtle water quality and habitat evaluation.

b. Site Location Criteria

A systematic approach was used in determining where monitoring sites are to be installed. Monitoring site location criteria are listed as follows:

1) Land Use Categories: Pollutant sources were classified during the planning process according to their severity. The Evaluation Monitoring Plan (Eslien, 1987) summarizes this data by subwatershed. The number of sources in Management Category I and II were used to indicate the severity of the pollution potential.

2) Current Stream Classification: This watershed plan lists the existing and potential use classes of streams in the watershed. Class II and III trout streams and forage fish streams are given priority for evaluation monitoring since these are most likely to achieve higher classification if habitat and water quality improve.

3) Access: Monitoring time constraints requires the selection of easily attainable access to sites.

In order to select the subwatersheds for monitoring, the subwatersheds were ranked according to the land use and stream classification criteria listed above. The rankings were then cross-referenced in order to select the best subwatersheds (Eslien, 1987). Table 28 presents the selected subwatersheds.

Table 28. Results of the Subwatershed Ranking for Evaluation Monitoring.

Stream	Number of Critical Pollution Sources	Stream Classification
French Creek (Portion)	129	II, Forage
Bear Creek (Portion)	42	II
Washington (Portion)	26	III
Salzwedel	20	II
Dutch (Portion)	19	II

Each property owner for each selected stream or stream portion was reviewed for severity of land use. Those having a high degree of severity were located on a plat map in relation to stream location. Monitoring sites were then located on or near those properties. Site locations and the impacts to be monitored are detailed in the Evaluation Monitoring Plan, along with a map of site locations (Eslien, 1987). Table 29 summarizes the sites to be monitored, the nonpoint pollutant sources having the most direct impacts on the sites, and the evaluation techniques to be used. These sites are located in Figure 6. More detailed maps and site descriptions can be found in the evaluation monitoring plan (Eslien, 1987).

Although 19 macroinvertebrate samples were collected in 1986, seven additional samples will be needed to identify specific subwatershed barnyard impacts. All pre-project fish monitoring was completed in 1986.

Table 29. Sites and Selected Monitoring Parameters

Stream	Site I.D	Adjacent Sources Affecting Site(1.)	Evaluation Method(2.)
French Creek	1FR	BY, UE, SBE	H,M,F*
	2FR	BY, UE	H,M,F*
	3FR	BY, UE, SBE	H,M,F*
	4FR	BY, UE	H,M,F*
	5FR	BY, UE, SBE	H,F*
	6FR	UE, SBE	H,M,F*
	7FR	BY, UE	H,F*
Bear Creek	1BE	BY, UE, SBE	H,F*
	2BE	BY, UE	H,M,F*
Washington Creek	1WA	BY, UE, SBE	H,M,F*
	2WA	BY, UE	H,F*
Salzedal Creek	1SA	UE, SBE	H,F*
	2SA	BY, UE	H,F*
	3SA	UE	H,F*
Dutch Creek	1DU	UE, SBE	H,F*
	2DU	UE	H,F*

1. Abbreviations used in this table are: BY - barnyard runoff; UE - upland erosion; and SBE, streambank erosion. The names and locations of upstream landowners that own critical sources affecting these monitoring sites are identified in the Evaluation Monitoring Plan (Eslien,1987).

2. Abbreviations used in this table are: H - habitat evaluation; M - macroinvertebrate sampling; and F - fish monitoring.

Pre-project monitoring marked by an asterisk(*) was completed during 1986. All other pre-project monitoring will be done in 1987. The entire complement of studies will be repeated after practices have been installed.

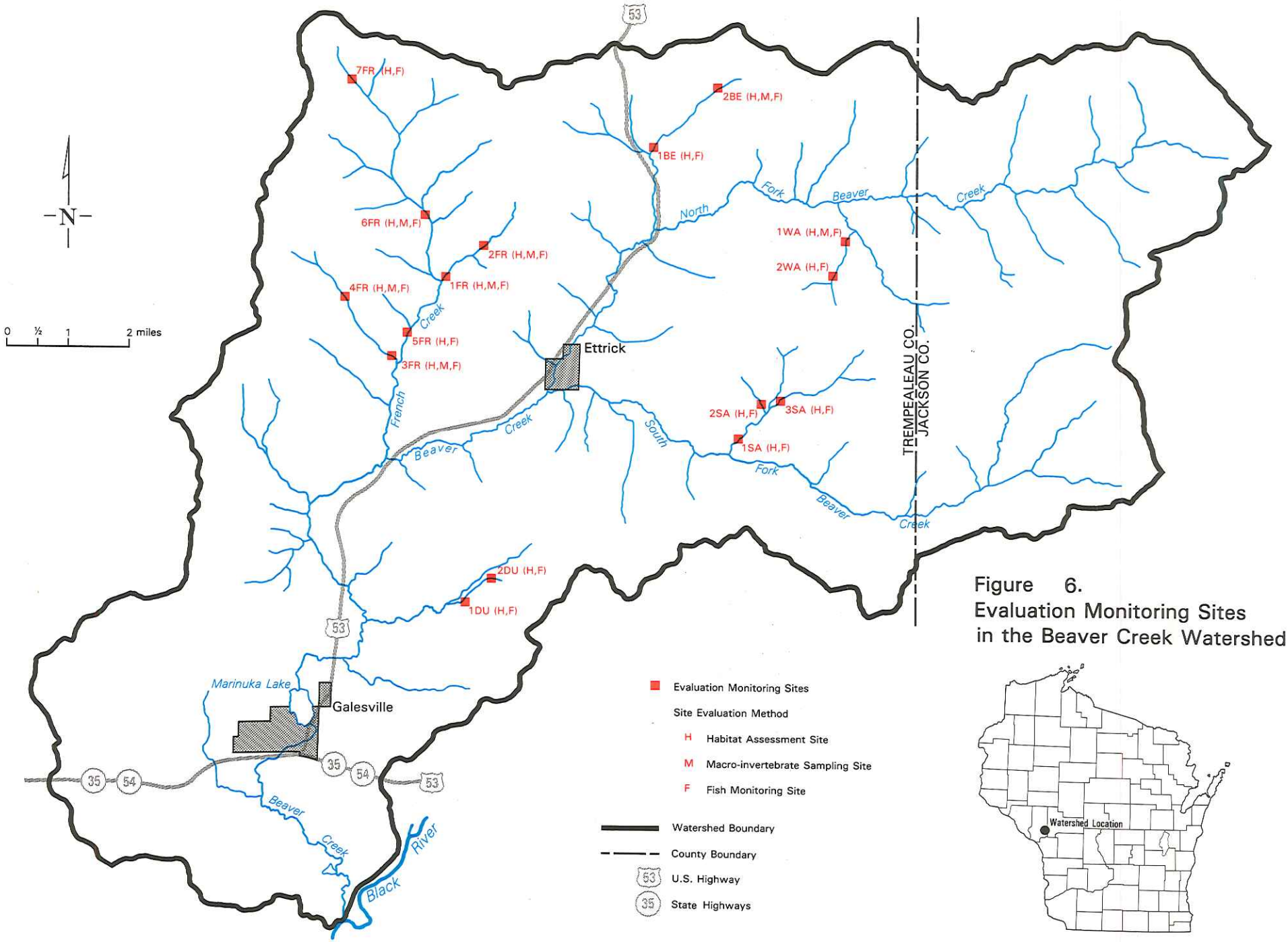


Figure 6.
Evaluation Monitoring Sites
in the Beaver Creek Watershed

4. Evaluation Monitoring Schedule

It is imperative that the evaluation monitoring effort be initiated prior to installation of Best Management Practices in order to ascertain background water quality conditions in the subwatersheds. The pre-implementation monitoring will be conducted in the summer and fall of this year (1987). After the second and third year of sign-ups, this evaluation monitoring plan will be reviewed by county LCD staff and DNR staff, and adjusted if necessary.

D. Schedule of Project Activities, Including Evaluation

The schedule for project activities is summarized as follows:

Summer 1987: Trempealeau County, Jackson County, and the Department of Natural Resources will enter into the necessary grant agreements, thus making funds available 1) to counties for technical staff support and 2) to landowners for cost share assistance with practice installation.

Summer 1987-Fall 1988: Pre-project evaluation monitoring will be completed.

Summer 1987-Summer 1990: Landowners will be contacted by LCD staff, and cost share agreements will be signed during this three-year period. During the first year of this period, all critical landowners must be contacted at least once by LCD staff. Information and education activities will be the most intensive during this period.

Summer 1987-Summer 1995: Management practices designated on cost share agreements will be designed and installed during this period.

Winter 1989 and Winter 1990: The Evaluation Monitoring Plan will be reviewed, based on landowner cooperation adjacent to the established monitoring sites. If necessary, the monitoring plan will be modified.

Summer, Fall 1990: Interim evaluation will be completed.

Summer 1995: The watershed project will end.

Summer 1995- : Post project evaluation monitoring will be completed.

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BEAVER CREEK PRIORITY WATERSHED PROJECT PLAN

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PRIORITY WATERSHED PROJECTS IN WISCONSIN

Map Number	Project	County(ies)	Year Project Selected
79-1	Galena River	Grant, Lafayette	1979
79-2	Elk Creek	Trempealeau	1979
79-3	Hay River	Barron, Dunn	1979
79-4	Lower Manitowoc River	Manitowoc, Brown	1979
79-5	Root River	Racine, Milwaukee, Waukesha	1979
80-1	Onion River	Sheboygan, Ozaukee	1980
80-2	Sixmile-Pheasant Branch Creek	Dane	1980
80-3	Green Lake	Green Lake, Fond du Lac	1980
80-4	Upper Willow River	Polk, St. Croix	1980
81-1	Upper West Branch Pecatonica River	Iowa, Lafayette	1981
81-2	Lower Black River	La Crosse, Trempealeau	1981
82-1	Kewaunee River	Kewaunee, Brown	1982
82-2	Turtle Creek	Walworth, Rock	1982
83-1	Oconomowoc River	Waukesha, Washington, Jefferson	1983
83-2	Little River	Oconto	1983
83-3	Crossman Creek/Little Baraboo River	Sauk, Juneau, Richland	1983
83-4	Lower Eau Claire River	Eau Claire	1983
84-1	Beaver Creek	Trempealeau, Jackson	1984
84-2	Upper Big Eau Pleine River	Marathon, Taylor, Clark	1984
84-3	Seven Mile-Silver Creeks	Manitowoc, Sheboygan	1984
84-4	Upper Door Peninsula	Door	1984
84-5	East & West Branch Milwaukee River	Fond du Lac, Washington, Sheboygan, Dodge	1984
84-6	North Branch Milwaukee River	Sheboygan, Washington, Ozaukee	1984
84-7	Cedar Creek	Washington, Ozaukee	1984
84-8	Milwaukee River South	Ozaukee, Milwaukee	1984
84-9	Menomonee River	Milwaukee, Waukesha, Ozaukee, Washington	1984
85-1	Black Earth Creek	Dane	1985
85-2	Sheboygan River	Sheboygan, Fond du Lac, Manitowoc, Calumet	1985
85-3	Waumandee Creek	Buffalo	1985
86-1	East River	Brown	1986
86-2	Yahara River — Lake Monona	Dane	1986
86-3	Lower Grant River	Grant	1986

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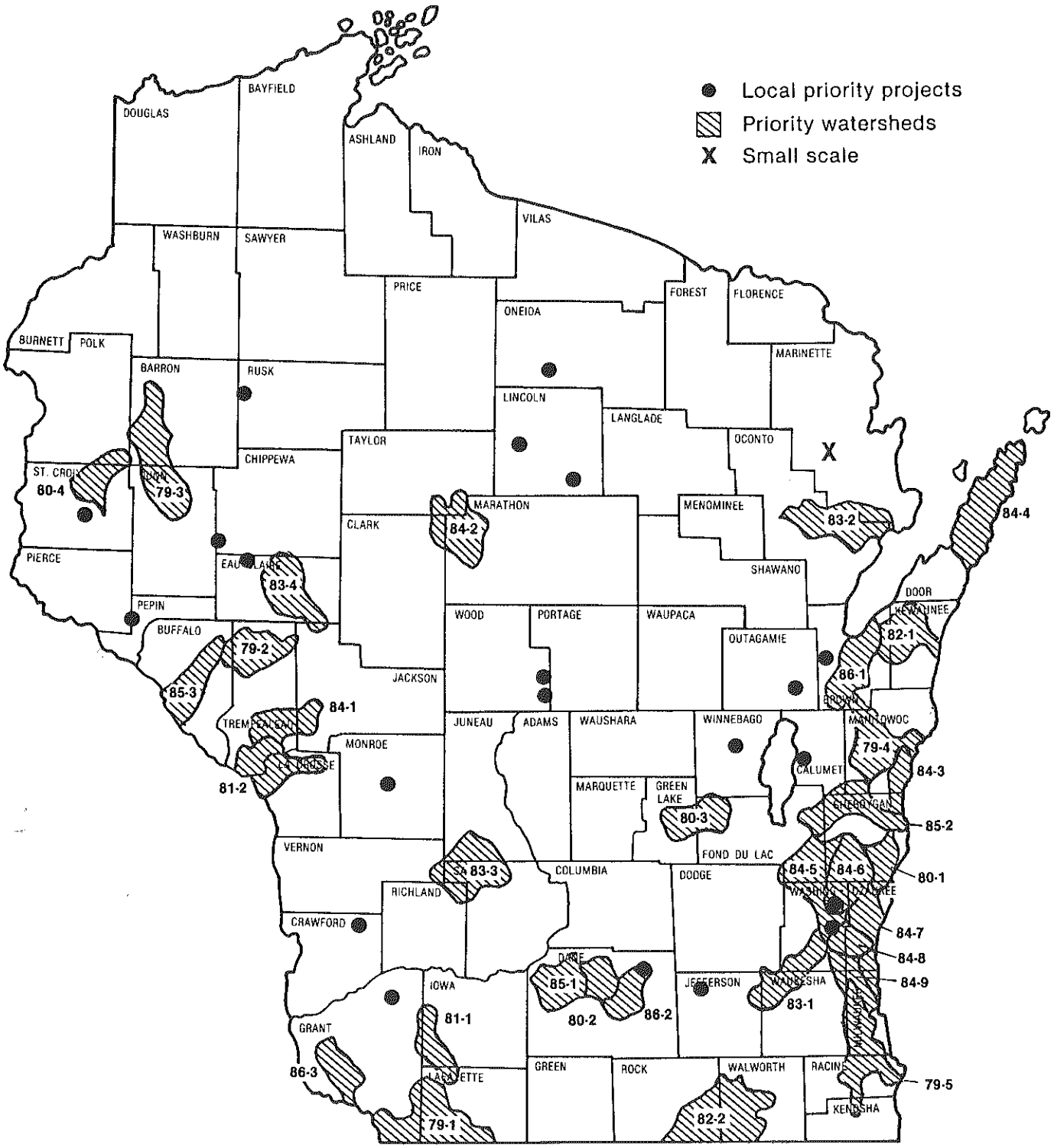
Local priority projects
Priority watersheds
Small scale
DOUGLAS
BAYFIELD
ASHLAND
IRON
VILAS
WASHBURN
SAWYER
PRICE
FOREST
FLORENCE
ONEIDA
MARINETTE
BURNETT
POLK
BARRON
RUSK
LINCOLN
LANGLADE
OCONTO
TAYLOR
CHIPPEWA
ST. CROIX
80-4
79-3
MARATHON
84-2
MENOMINEE
83-2
84-4
CLARK
PIERCE
EAU CLAIRE
83-4
SHAWANO
DOOR
KEWAUNEE
82-1
PEPIN
WOOD
PORTAGE
WAUPACA
OUTAGAMIE
BUFFALO
79-2
86-1
85-3
JACKSON
84-1
BROWN
TREMPEALEAU
JUNEAU
ADAMS
WAUSHARA
WINNEBAGO
MANITOWOC
79-4
MONROE
LA CROSSE
CALUMET
84-3
81-2
MARQUETTE
GREEN LAKE
80-3
SHEBOYGAN
85-2
VERNON
FOND DU LAC
83-3
COLUMBIA
DODGE
84-5
84-6
80-1
RICHLAND
WASHINGTON
OZAUKEE
CRAWFORD
84-7
DANE
84-8
IOWA
85-1
JEFFERSON
WAUKESHA
84-9
80-2
86-2
83-1
81-1
GRANT
86-3
LAFAYETTE
GREEN
ROCK
WALWORTH
RACINE
79-5
79-1
82-2
KENOSHA


OUR MISSION:
To protect and enhance our Natural Resources —
our air, land and water;
our wildlife, fish and forests.
To provide a clean environment
and a full range of outdoor opportunities.
To insure the right of all Wisconsin citizens
to use and enjoy these resources in
their work and leisure.
And in cooperation with all our citizens
to consider the future
and those who will follow us.
Wisconsin
Dept. of Natural Resources