Dell Creek Priority Watershed Project Summary

Introduction

The purpose of the Nonpoint Source Control Plan developed for this project is to assess the nonpoint pollutants in the Dell Creek watershed and guide the implementation of control measures. Nonpoint source control measures and education are needed to meet very specific water resource objectives designed to protect and enhance the surface and groundwater in the watershed.

Nonpoint source (runoff) pollution cannot be easily traced to a single point of origin such as a point source effluent discharge from a wastewater treatment plant or industrial plant. Nonpoint source pollution occurs when rainwater or snowmelt flows across the land and picks up soil particles, organic wastes, fertilizers or other pollutants and carries them to surface and/or groundwater. These soil particles and organic wastes contain phosphorus and nitrogen, the same compounds found in commercial fertilizers. Soil particles also become sediment in the river channel and the receiving waters; Mirror Lake, Lake Delton, and the Wisconsin River. Nonpoint source pollution has lead to a general decrease in the water quality of all the surface waters within the watershed.

The Nonpoint Source Pollution Control Plan for the Dell Creek watershed was prepared by the Department of Natural Resources (DNR), the Department of Agriculture, Trade and Consumer Protection (DATCP), and the Sauk and Juneau County Land Conservation Departments (LCD). The DNR selected the Dell Creek watershed as a priority watershed project through the Wisconsin Runoff Management Program in 1994. The Dell Creek watershed project joins approximately 86 similar watershed projects statewide in which nonpoint source control measures are being planned and implemented. The Runoff Management Runoff Program, (formally called the Nonpoint Source Water Pollution Abatement Program) was created in 1978 by the Wisconsin State Legislature. The program provides financial and technical assistance to landowners and local governments to reduce nonpoint source pollution.

The project is administered on the state level by the DNR and DATCP. The Sauk County and Juneau County Land Conservation Departments will administer the project on the local level with assistance from the University of Wisconsin-Extension and the Natural Resource Conservation Service (U.S. Department of Agriculture). This plan is primarily used by and written for the County LCDs, DNR, DATCP, other local units of government, legislators, external program evaluators and the interested public.

General Watershed Characteristics

The Dell Creek watershed drains 133 square miles of land in Sauk and Juneau Counties in south central Wisconsin. The Dell Creek watershed is located in the Lower Wisconsin River Drainage Basin. This watershed drains into Lake Delton and the Wisconsin River. See map S-1.

Approximately 60% (80 square miles) of the Dell Creek watershed lies in Sauk County, and 40% (53 square miles) lies within Juneau County. The watershed was divided into seven smaller drainage basins, called subwatersheds, for the purpose of planning (see the watershed map for the subwatershed locations).

Dell Creek Subwatershed - Approximately 44 square miles (28,331 acres). This is the largest of the seven subwatersheds and is divided between Sauk County (80%) and Juneau County (20%). Dell Creek is the major surface water resource in the subwatershed. Water quality conditions range from "poor" to "good".

Mirror Lake Subwatershed - Approximately 24 square miles (15,442 acres). This subwatershed is located entirely in Sauk County and contains Mirror Lake and the 2,050 acre Mirror Lake State Park. Water quality conditions range from "poor" to "good".

Lake Delton Subwatershed - Approximately 9 square miles (5,807 acres). This subwatershed includes the urban areas of the village of Lake Delton and the portion of the Wisconsin Dells located west of the Wisconsin River. Lake Delton (270 acres) is the largest water body in the entire watershed and serves as the catchment basin for four (Dell Creek, Mirror Lake, Lake Blass, Lake Delton) of the seven subwatersheds. Water quality conditions are "poor".

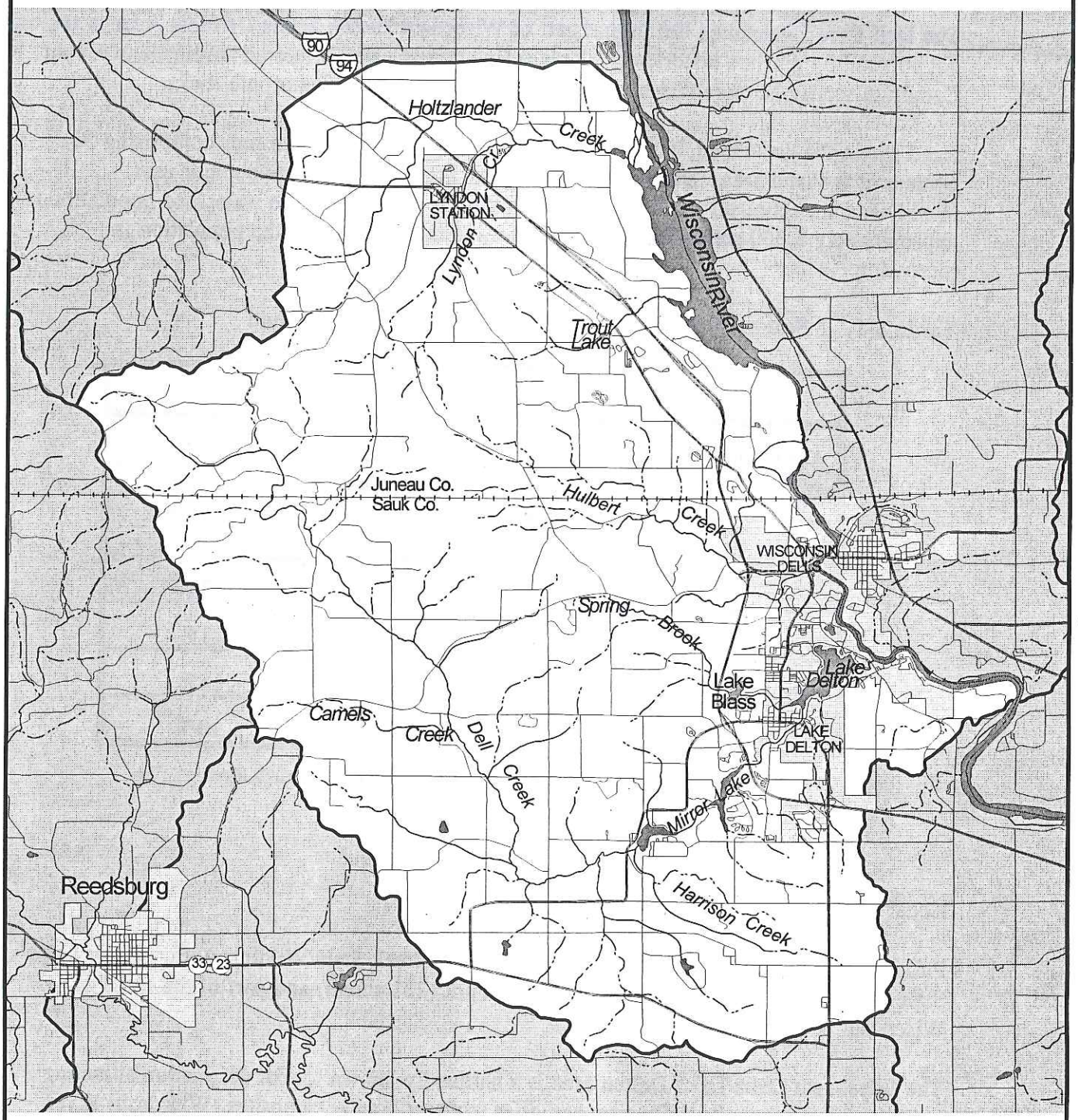
Lake Blass Subwatershed - Approximately 9 square miles (5,802 acres). This subwatershed is located entirely in Sauk County. Lake Blass (34 acre) is the largest water body in the subwatershed. Water conditions range from "very poor" to "good".

Lyndon Creek - Approximately 19 square miles (12,128 acres). This subwatershed is located entirely in Juneau County and contains the village of Lyndon Station. Surface waters within this subwatershed drain into the Wisconsin River. Lyndon Creek is the largest stream in the subwatershed. Water quality conditions range from "poor" to "very good".

Trout Lake - Approximately 10 square mile (6,556 acres). This subwatershed is located entirely in Juneau County. All tributaries within this subwatershed enter the Wisconsin River. Trout Lake (an impoundment on Gilmore Creek) is the largest water body in this subwatershed. Water quality conditions range from "poor" to "good".

Hulbert Creek – Approximately 15.5 square miles (9,934 acres). This subwatershed is divided equally between Sauk and Juneau Counties. Hulbert Creek flows through the city of Wisconsin Dells into the Wisconsin River. Water quality conditions range from "poor" to "fair".

Map S-1 Dell Creek Watershed



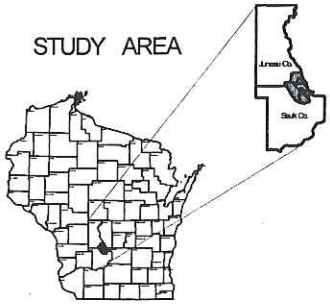
Intermittent Streams
Perennial Streams
County Boundary
Local Roads
Major Highways
Watershed Boundary
Open Water
Municipal Area

Mapscale 1:150,300

0 1 2 3 Miles

N

STUDY AREA



Wisconsin Department of Natural Resources
Water Division
Bureau of Watershed Management
October 1997

The Dell Creek watershed lies in that part of Wisconsin known as the Driftless Area, a region not covered by glaciers historically. This region consists of a dissected landscape of Upper Cambrian sandstone underlain by Precambrian igneous and metamorphic rocks.

Land use in the watershed, as shown in Table S-1, is mainly agricultural, comprising 51 percent of the land area. Dairy farming and cash cropping are the two major uses. Woodlands are abundant and cover 21 percent of the land area. The watershed population is approximately 6,300 residents. Trends in the watershed show that the population is increasing.

Table S-1. Summary of Land Uses in the Dell Creek Watershed

Land Uses	Acres	Percent
Agricultural	43,230	51%
pasture	4,544	5%
cropland	37,164	44%
farmstead	1,522	2%
Woodland	17,613	21%
Developed	14,905	18%
Wetland	8,252	10%

These are estimates based on WINHUSLE inventory data (extrapolated from a 20% inventory). The wetland estimates are of actual wetland acres, not cropped wet fields.
Source: DNR, Sauk & Juneau LCDs.

Local Information

Public land within the watershed includes the Dell Creek State Wildlife Area, Mirror Lake State Park (2,050 acres), Rocky Arbor State Park (221 acres), and part of the Dells of Wisconsin River State Natural Area.

The Wisconsin Dells/Lake Delton area is a nationally known tourist destination attracting 3 million visitors annually. Tourism activities include: hotels, campsites, Wisconsin River sightseeing trips, several water slides and go-kart establishments, and numerous golf courses and horseback riding stables. The travel and tourism industry resulted in an economic impact of $348 million on the state of Wisconsin in 1996.

The tourism industry originated in 1856 and centered around the Wisconsin River and other water resources in the Dells area. Today's expanded tourism industry continues to rely heavily on the water resources in the area. Implementation of the Dell Creek Priority Watershed Plan will serve as a tool to protect and enhance these valuable water resources.

Sources of Nonpoint Pollution

The Sauk and Juneau County LCDs collected data on agricultural lands, barnyards, and streambanks in the watershed. This data was used to estimate the pollutant potential of these nonpoint sources. The following is a summary of the inventory results.

Barnyard Runoff Inventory

- 73 barnyards were inventoried utilizing the BARNY model.
- An estimated 5,366 pounds of phosphorus are delivered to the streams in the watershed annually.

Streambank Erosion Inventory

- Approximately 65 miles of streambank were evaluated. Approximately ½ mile (less than 1%) had significant erosion.
- An estimated 120 tons of sediment is eroded from streambanks annually. This is less than 1% of the total sediment load for the watershed.
- An estimated 1,855 feet of livestock-trampled sites were identified.

Upland Sediment Inventory

- Soil erosion and sediment delivery rates were calculated using the WINHUSLE model. Approximately 42,000 acres, or around 50%, of the watershed land area were inventoried. The remainder of the watershed will be inventoried within four years.
- An estimated 13,886 tons of soil are being delivered by croplands to watershed lakes or streams on an annual basis. This is 98% of the total sediment load.

Wetlands Inventory

- The focus of the inventory was on wetlands that are present, or have been in the past. Data were gathered from NRCS maps, air photos, and the DNR wetland inventory maps. Of the estimated 8,252 acres of total wetlands, 7,410 acres are currently present, 680 acres are prior converted, and 162 acres are farmed in dry years.

Groundwater Inventory

- Of the 65 private wells in the watershed that were tested for nitrates, 83% tested over the Preventive Action Limit (PAL) of 2 mg/L and 54% of those were above the Enforcement Standard (ES) Health Advisory Level of 10 mg/L.

Urban Inventory

- Approximately 4,400 acres were inventoried utilizing the SLAMM model. Existing annual loads include: sediment (546 tons), phosphorus (1,296 lbs), and lead (2,161 lbs.). These loads are estimated to double as a result of development over the next twenty years.

- It is estimated that in the years between 1997 and 2017, construction site erosion will contribute approximately 1,800 tons per year of sediment (about 3 times the sediment load from existing development) to streams in the project area

Project Goals

The goal of the Dell Creek Priority Watershed Project is to protect, enhance and restore the surface and groundwater in the watershed area. Water quality improvement in this watershed will ultimately improve natural resources in the entire Dell Creek watershed.

Sediment Objective

To reduce overall sediment delivered to streams and lakes by 25%, the following will need to be achieved:

- Reduce sediment delivered to streams and lakes from agricultural uplands by at least 3,500 tons/year, or 25%.
- Reduce sediment delivered from existing urban areas by at least 100 tons/year, or 20%.
- Reduce sediment delivered from construction site erosion by at least 1260 tons/year, or 70%.
- A general reduction in sediment from streambanks.
- A general reduction in sediment from gullies.

Phosphorus Objective

To reduce overall phosphorus delivered to streams in the Dell Creek Priority watershed by 30%, the following will need to be achieved:

- Reduce phosphorus runoff from barnyards in the watershed by at least 2,864 pounds/year, or 53%.
- A general reduction in phosphorus from landspread manure.
- A 25% reduction in the phosphorus delivered to streams and lakes in the watershed due to soil erosion from agricultural uplands.
- A general reduction in phosphorus from urban areas.

Groundwater Objective

To protect and enhance the groundwater resource in the Dell Creek Watershed, the following will need to be achieved:

- Implement BMPs as appropriate to protect and enhance groundwater quality.
- Proper abandonment of unused wells as per NR 120 and NR 812.

Community Education and Action Objective

To develop community action that fosters positive change, promotes sustained long-term improvement and encourages protection of the Dell Creek watershed resources, the following will need to be achieved:

- Implement the developed educational program to move the watershed community residents from awareness to action.
- Facilitate the continued presence and enthusiasm of the citizens advisory committee to provide another vehicle of awareness and stewardship of the watershed over time.

Critical Sites

Nonpoint source pollutant reduction in the Dell Creek watershed project will be achieved mainly through voluntary participation. However, state statutes require that the nonpoint source control plan contain the necessary language to ensure the reasonable likelihood of achieving water quality goals and objectives. Landowners with sites that meet the established critical site criteria are required by law to address the specific sites by reducing the nonpoint source pollutant load to an acceptable level. Pollutant reduction can occur solely through the action of the landowner with guidance from county staff or through watershed cost-sharing participation. Each identified site will be field verified before receiving notification as a critical site, with the findings sent to the DNR. Landowners interested in receiving cost-share assistance for installing best management practices will need to sign a cost-share agreement with the Sauk County Land Conservation Department.

Notification of landowners with critical sites will begin when the Sauk and Juneau County staff identify individual fields for specific management categories on the FOCS/WINHUSLE database or through the BARNY computer model for barnyard sites. The highest ranked sites will be notified first until all landowners or operators with critical sites are notified. The notification will include the following information:

- The 36-month period in which landowners are eligible for full level of state cost-sharing, after which the cost-share rate decreases by 50 percent.
- The potential consequences of either Wisconsin Administrative Code Chapter NR 243 for animal waste, or s. 281.20(1)(3), or (5), for sediment delivery and groundwater

protection, that landowners may face if no action is taken. Some of these include a notice of discharge, requiring a WPDES permit, or issuing a notice of intent.

- The right to appeal the critical site designation through written request to the county Land Conservation Committee (LCC) within 60 days of receiving the notification letter. The LCC shall limit its appeal consideration to whether the critical site designation is consistent with critical site criteria established in the nonpoint source control plan.

Impact and Scope of Critical Sites

- Of the 73 barnyards inventoried, 7 were designated critical sites for control which will result in a minimum reduction of 28% of the barnyard phosphorus objective.
- Of the estimated 60,843 acres of cropland in the watershed, 438 acres have been designated as critical for sediment control which will result in 25% of the pollution reduction objective for sediment.

Management Actions

The Sauk County Land Conservation Department and the Juneau County Land Conservation Department staff will contact all landowners who are eligible to receive cost-sharing during the project's ten-year implementation. Management classifications are determined based on the level of pollution control needed to achieve water quality objectives in the watershed. Specific sites or areas within the watershed project are designated as either "critical", "eligible" or "ineligible". Designation as a critical site indicates that controlling that specific source is necessary if the pollutant reduction goals for the project are to be met. Nonpoint sources which are eligible, but not critical, contribute less of the pollutant load, but are included in cost-sharing eligibility to further insure that water quality objectives are met. Landowners with eligible sites need not control every eligible source to receive cost-share assistance.

The Sauk and Juneau County Land Conservation Departments will assist landowners in applying BMPs. Practices range from alternatives in farm management (such as changes in manure spreading and crop rotations) to engineered structures (such as clean water diversions, sediment basins, and manure storage facilities), and are tailored to specific landowner situations.

The Sauk County Land Conservation Department will administer all cost-share agreements with the participating landowners.

Landowner Eligibility

Barnyard Runoff

To maintain cost effectiveness, only those landowners with barnyard sites delivering more than 50 pounds of phosphorus to surface water on an annual basis will be eligible for a complete

barnyard runoff management system (37 yards). Landowners with barnyards delivering between 10 pounds and 50 pounds of phosphorus annually will be eligible to receive clean water management systems (25 yards).

Table S-2. Barnyard Runoff Pollution Reduction Objective: 53% (2,864 lbs. of Phosphorus)

Category	No. of Sites	Lbs. Reduced	% Reduced (Goal)	% Reduction (Total)
Critical Sites	7	806	28%	15%
Eligible	55	2,058	72%	38%
Ineligible	11	---	---	---
Total	73	2,864	100%	53%

Cropland Erosion

In appraising the condition of the streams in the Dell Creek watershed, sediment loading from eroding fields was found to be a major pollutant inhibiting the quality of the watershed ecosystem. Approximately 25% of the pollutant reduction objective for sediment will be achieved through critical sites designation and the subsequent installation of BMPs on cropland. All fields eroding at rates greater than "T" and delivering sediment to surface waters at rates greater than 1.75 tons/acre/year will be designated as critical. Those fields not designated as critical and eroding at rates greater than "T" or delivering sediment to surface waters at rates greater than or equal to 0.3 tons/acre/year will be eligible for cost-sharing practices.

Table S-3. Cropland Sediment Pollution Reduction Objective: 25% (3,500 tons)

Category	USLE/Sediment Delivery (tons/acre/year)	Acres	Sediment Reduced (tons)	Percent of Reduction
Critical Sites	> "T" and 1.75	438	856	25%
Eligible	> "T" or 0.3	20,833	2,644	75%
Ineligible	< 0.3	39,572	---	---
Total	---	60,843	3,500	100%

Gully Erosion

Because gully erosion has not been identified as a widespread problem in this watershed critical site designation will not be a component of control for these areas. However, all active gullies are a sediment source and will be eligible to receive cost-share assistance to abate the runoff of sediment into intermittent or continuous streams.

Streambank Erosion

All eroded streambanks contributing greater than 0.5 tons per year or which are degraded by cattle access and trampling will be eligible for cost-sharing of best management practices.

Project Implementation

Project Implementation is scheduled to begin in March 1998 and continued for a period of ten years. Implementation will consist of continuous educational programming for watershed residents, individual farm conservation planning, the signing of cost-share agreements, and practice installation.

Table S-4. Total Project Costs: Dell Creek Priority Watershed.

ITEM	RURAL COSTS		URBAN COSTS	
	State Share	Local Share	State Share	Local Share
Cost Share Funds: Practices	2,365,486	1,181,629	1,408,400	2,503,600
Cost-Share Funds: Easements	75,000	0	0	0
Local Assistance Staff Funding	2,350,000 (1)	550,000	100,000	386,000
Information & Education Direct	15,650	0	*	*
Other Direct (travel, supplies, etc.)	53,310	0	*	*
Engineering Assistance	10,000	0	**	**
Professional Services	10,000	0	40,800	17,200
Total	4,879,446	1,731,629	1,549,200	2,906,800
TOTAL STATE SHARE	6,428,646			

Source: DNR, DATCP, and the Sauk and Juneau County Land Conservation Departments
* Included with staffing
** Included with professional services
1) Includes Juneau County local assistance grant
Rural costs represents 75% participation
Urban costs represents 100% participation

Information and Education

The Sauk County Land Conservation Department will have lead responsibilities for the implementation of the information and education strategy. The University of Wisconsin Cooperative Extension (UWEX), the Department of Natural Resources (DNR) and the Department of Trade and Consumer Protection (DATCP) will provide supporting assistance. Education activities will be directed to all residents of the Dell Creek watershed. In addition to building awareness about the Dell Creek watershed project, the primary objectives of the education plan are:

- Increase awareness about soil conservation and conservation tillage. At least 50% of eligible farms will adopt high residue cropping systems. Growers unable to adopt high residue systems will be encouraged to establish stream buffers and adopt alternative farming techniques.
- Educate landowners on the economic benefits of legume and manure crediting and to increase the awareness of nutrient and pesticide plan implementation.
- Inform rural and urban watershed residents of the characteristics of healthy streams, the value of healthy streams, the reasons why local streams are degraded, and the solutions available to improve local streams.
- To encourage local government to minimize phosphorus, sediment and other pollution to streams and stormwater systems through the adoption of urban BMPs, wellhead protection, and construction site erosion control.

Conservation Planning and Contracting

Conservation planning and cost-share agreements for installing BMPs will be available to landowners throughout the implementation phase. Voluntary participation will be emphasized throughout the project. Sites determined as critical will be a priority. Other sites will be targeted for pollution control using ongoing inventory information. All practices on agreements must be installed before the project is scheduled to end. Landowners must maintain practices for at least 10 years from the installation of the final practice listed on the cost-share agreement.

Cost-share agreements are recorded with the register of deeds, and in the event of property being sold, the new landowner will be required to install and maintain the best management practices. Practices can be installed as soon as a landowner signs a cost-share agreement with the Sauk County Land Conservation Department.

Project Implementation Costs

The DNR will award grants to Sauk County for the cost-sharing of BMPs and educational activities. The DNR will also award grants to Sauk and Juneau Counties for staff support. Table S-4 includes estimates of the financial assistance needed to implement nonpoint source controls in the Dell Creek watershed, assuming a 75 percent participation rate of eligible landowners and a 100 percent participation rate on critical sites.

Project Evaluation and Monitoring

The evaluation strategy for the project involves collecting, analyzing, and reporting information to track the progress in three areas:

1. **Administrative:** This category includes the progress in providing technical and financial assistance to eligible landowners, and carrying out educational activities identified in the plan. The Sauk and Juneau County Land Conservation departments will track the progress in this area and report to the DNR and DATCP annually.

2. **Pollutant Reduction Levels:** The Sauk County and Juneau County Land Conservation Departments will calculate the reductions in nonpoint source pollutant loadings resulting from changes in land use practices and report to the DNR and DATCP at an annual meeting.

3. **Water Resources:** The DNR may monitor changes in water quality, habitat, and water resource characteristics periodically during the project and at the end of the project period.

CHAPTER ONE

Purpose, Legal Status and General Description

Wisconsin Nonpoint Source Water Pollution Abatement Program

The State Legislature created the Wisconsin Nonpoint Source Water Pollution Abatement Program in 1978. The goal of the Program is to improve and protect the water quality of streams, lakes, wetlands, and groundwater by reducing pollutants from urban and rural nonpoint sources. The 132-square-mile Dell Creek Priority Watershed, located in Sauk and Juneau Counties, was designated a "priority watershed" in 1994. The primary objective of this project is to reduce nonpoint source pollution loads and to enhance and protect the water quality of the streams, groundwater and lakes in the Dell Creek Priority Watershed. The Dell Creek watershed is part of the Lower Wisconsin River Basin.

Nonpoint sources of pollution in the watershed include: eroding agricultural lands, eroding streambanks and roadsides, runoff from livestock wastes and other agricultural practices, erosion from developing areas, and runoff from established urban areas. Pollutants from nonpoint sources are carried to the surface water or groundwater through rainfall runoff or seepage, and snowmelt.

The following is an overview of the Nonpoint Source (NPS) Priority Watershed program:

- The Department of Natural Resources (DNR) administers the program in cooperation with the Department of Agriculture, Trade and Consumer Protection (DATCP). Wisconsin is divided into 333 discrete hydrologic units called watersheds. These watersheds are assessed for water quality concerns as part of a comprehensive basin planning program. Watersheds with a high degree of water quality impairment from nonpoint sources of pollution become eligible for consideration as a priority watershed project. Currently, there are 130 eligible watersheds. Of these, 86 have been in the nonpoint source program; 24 are completed and 62 are active. As directed by the state legislature, all of these high ranking watersheds must be planned by 2015. Designation as a priority watershed project enables special financial support to local governments and private landowners in the watershed to reduce nonpoint source pollution.

- A priority watershed project is guided by a plan such as this one, prepared cooperatively by the DNR, DATCP and local units of government, with input from a local citizen's advisory committee. Project staff evaluate the conditions of surface water and groundwater, and inventory the types of land use and nonpoint sources of pollution throughout the watershed. The priority watershed plan assesses nonpoint and other sources of water pollution and identifies best management practices (BMPs) needed to control pollutants to meet specific water

resource objectives. The plan guides implementation of these practices in an effort to improve water quality.

- Upon approval by state and local authorities, local units of government implement the plan. Water quality improvement is achieved through mandatory and voluntary implementation of nonpoint source controls (BMPs) and the adoption of ordinances. Landowners, land renters, counties, cities, villages, towns, sanitary districts, lake districts, and regional planning commissions are eligible to participate.

- Technical assistance is provided to aid in the design of BMPs. State level cost-share assistance is available to help offset the cost of installing these practices. Eligible landowners and local units of government are contacted by the local staff to determine their interest in installing the BMPs identified in the plan. Signed cost-share agreements list the practices, costs, cost-share amounts and a schedule to install management practices. Municipal governments are also assisted in developing and installing BMPs to reduce urban pollutants.

- Informational and educational activities are developed to encourage participation.

- The DNR and DATCP review the progress of the counties and other implementing units of government, and provide assistance throughout the ten-year project. The DNR monitors improvements in water quality resulting from control of nonpoint sources in the watershed.

Legal Status of the Nonpoint Source Control Plan

The Dell Creek Priority Watershed Plan was prepared under the authority of the Wisconsin Nonpoint Source Water Pollution Abatement Program described in Sections 281.20 and 281.65 of the Wisconsin Statutes and Chapter NR 120 of the Wisconsin Administrative Code. It was prepared through the cooperative efforts of the DNR, DATCP, Sauk County and Juneau County Land Conservation Departments (LCDs), local units of government and the Dell Creek Citizen Advisory Committee.

This watershed plan is the basis for the DNR to enter into cost-share and local assistance grants with agencies responsible for project implementation and will be used as a guide to implement measures to achieve desired water quality conditions. If a discrepancy occurs between this plan and the statutes or the administrative rules, or if statutes or rules change during implementation, the statutes and rules will supersede the plan. This watershed plan does not in any way preclude the use by local, state or federal governments of normal regulatory procedures developed to protect the environment. All local, state and federal permit procedures must be followed. In addition, this plan does not preclude the DNR from using its authority under chapters 281, 283, 285, 289, 291, 292, 293, 295, and 299 of the state statutes to regulate significant nonpoint pollution sources in the project area.

This priority watershed plan was approved by DNR following approvals by the Land and Water Conservation Board (LWCB), and Sauk and Juneau Counties.

Amendments to the Plan

This plan is subject to the amendment process under NR 120.08(4) for substantive changes. The Department of Natural Resources will make the determination with the local sponsors if a proposed change will require a formal plan amendment.

Relationship of Nonpoint Source Control Plan to Stormwater Discharge Permit Program

Wisconsin's Pollution Discharge Elimination System (WPDES) Storm Water Permit Program is administered by DNR's Bureau of Watershed Management under Sec. 283 of the Wisconsin Statutes and Ch. NR 216 Wis. Admin. Code. This program is regulatory and not grant dependent and applies to certain classes of dischargers statewide as identified in NR 216. However, in some cases permit activities are similar to activities identified in the watershed plan. If this is true, then nonpoint source implementation grants can be used to fund permit activities. Examples include: construction site erosion control, stormwater ordinance development and stormwater management plans. Practices to control construction site erosion and stormwater runoff from new development are not eligible for cost-sharing. In industrial areas, cost-sharing is available as specified in NR 120.17 — only in the non-industrial parts of facilities where a problem has also been identified in the priority watershed plan.

Priority Watershed Project Planning and Implementation Phases

Planning Phase

The planning phase of the Dell Creek Priority project began in 1995. The following information gathering and evaluation activities were completed during this stage:

- Determine the conditions and uses of groundwater, streams, and lakes.
- Inventory types of land uses and severity of nonpoint sources affecting groundwater, streams and lakes.
- Evaluate the types and severity of other factors which may be affecting water quality. Examples include discharges from municipal wastewater treatment plants and natural or endemic stream conditions. (This has been completed through the ongoing integrated resource management planning efforts in the Lower Wisconsin River Basin).
- Determine nonpoint source controls and other measures necessary to improve and/or protect water quality.

- Prepare and gain approval of a program for local implementation of the project so that plan recommendations would be carried out.

Implementation Phase

The implementation phase of the Dell Creek Priority Watershed Project begins following review of the draft priority watershed plan, a public hearing, and approval by the DNR, LWCB, and the Board of Supervisors for Sauk and Juneau Counties. Public review during plan development occurred primarily through the efforts of the Dell Creek Citizen Advisory Committee.

During the implementation phase:

- DNR enters into local assistance agreements with local units of government that have implementation responsibilities identified in the plan. These agreements provide funds necessary to maintain the resources and staff required for plan implementation.

- In the rural portions of the watershed, the Sauk County and Juneau County LCDs will be responsible for contacting eligible landowners to determine their interest in installing best management practices identified in the plan.

- In the urban portions of the watershed, the DNR or its designee contacts local units of government to discuss in detail the required actions for implementing the plan recommendations. An important recommendation for these areas is the improvement in the application and maintenance of construction site erosion control practices for both individual sites and larger developments. State statutes require erosion control in both of these situations but the administration of these requirements and implementation of practices has varied.

  Local governments charged with implementation include the city of Wisconsin Dells, the villages of Lake Delton and Lyndon Station and nine different townships. The city of Wisconsin Dells, however, is the only one of these jurisdictions that is required to enforce these statutory requirements because of population criteria. Because there is not a requirement to enforce the erosion control requirements in the other jurisdictions compliance varies considerably. Much of the urban development, both residential and commercial, is located in these smaller jurisdictions.

  The village of Lake Delton has attempted to administer the requirements but incurred problems with staff continuity and other issues. Other jurisdictions do not have staff to administer these requirements.

  The project should monitor implementation and maintenance of these urban best management practices. Through this monitoring a determination could be made as to the extent of the problem. Project staff should use this monitoring information to assist the communities with the development of solutions. These may include more involvement

of the county level staff in the enforcement of these requirements. It may require the development and implementation of a county wide construction site erosion control ordinance and stormwater runoff control ordinance. If this is the proposed solution, implementation grants may be made available to the county.

- In rural areas, the landowner will sign a cost-share agreement with Sauk County that outlines the practices, costs, cost-share amounts and a schedule for installation of management practices. At Juneau County's request, all cost-share agreements will be routed through the Sauk County LCD. Practices are scheduled for installation after an agreement is signed. Practices must be maintained for at least 10 years. Easements must be perpetual.

  In urban areas, similar processes are used. In some cases, the local units of government and the DNR sign agreements for urban practices. In other cases the agreements will be between local units of government and their private landowners.

Location and Community Information

The Dell Creek watershed is a 132-square-mile drainage basin located in Sauk County and Juneau County, Wisconsin (map 1-1). Approximately 60% is located in Sauk County and 40% in Juneau County. The watershed is largely agricultural (51%). Approximately 18% of the land area is developed. The urban portions of the Dell Creek watershed includes the villages of Lyndon Station and Lake Delton, along with the western portion of the city of Wisconsin Dells. The remaining 31% of the watershed is comprised of woodlands, wetlands, and surface water. The Wisconsin Dells is well known as a tourist destination that was built on private boat tours that began in the 1880's. The area became recognized internationally as its scenic resources were displayed through the photography of Henry Hamilton Bennett. The Dell Creek watershed is within the Lower Wisconsin River Basin.

Civil Divisions

The Dell Creek Priority Watershed lies within Sauk and Juneau Counties. Incorporated areas in the watershed include a portion of the city of Wisconsin Dells and the villages of Lyndon Station and Lake Delton. Public land within the watershed includes the Dell Creek Wildlife Area, Mirror Lake State Park, and Rocky Arbor State Park. See map 1-1 for an illustration of the civil divisions.

Population Size and Distribution

The Dell Creek watershed population is estimated to be about 6,300 persons. The tourist population swells to 50,000 between May and September. Most of the watershed population lives in rural, unincorporated areas. Population growth rates in the watershed are increasing. All towns and villages have a growth rate over the past decade of two percent. Regional trends suggest that the watershed's population will continue to expand.

Land Uses

Map 1-2 and table 1-1 illustrate the various land uses in the Dell Creek watershed. Rural land uses predominate in the watershed. Agriculture is the most important land use, comprising 51 percent. Dairy farming and cash cropping are the two major agricultural uses. Woodlands are abundant and cover 21 percent of the land area. Developed land uses occupy approximately 18 percent of the watershed (table 1-1). Existing and projected urban land uses are listed in tables 1-2 and 1-3.

Table 1-1. Summary of Land Uses in the Dell Creek Watershed

Land Uses	Acres	Percent
Agricultural	43,230	51%
Pasture	4,544	5%
Cropland	37,164	44%
Farmstead	1,522	2%
Woodland	17,613	21%
Developed	14,905	18%
Wetland	8,252	10%
TOTAL	84,000	100%

Source: DNR & Sauk & Juneau LCD (based on WINHUSLE inventory).

Table 1-2. Urban Land Uses Within The Dell Creek Watershed: 1997.

Land Use Category	Lake Delton		Wisconsin Dells	
	Acres	%	Acres	%
Low Density Residential	560	16	38.3	4
Multi-Family (1-3 stories)	2.9	<1	0	0
Mobile/Trailer Park	103	3	7.1	1
Commercial Strip Development	119	3	85.7	9
Shopping Center	145	4	64.2	6
Light Industry	73	2	38.4	4
Freeway (ltd. access hwys)	230	7	39	4
Miscellaneous (institutional/gov.)	82.9	2	0	0
School	9.1	<1	0	0
Park (golf courses/playgrounds)	263	8	382	38
Cemeteries	6.5	<1	0	0
Open Space Undeveloped	1,412	41	292	29
Lakeshore Development	220	6	0	0
Hotel	240	7	61	5
1997 Total	3,466	100	1,007	100

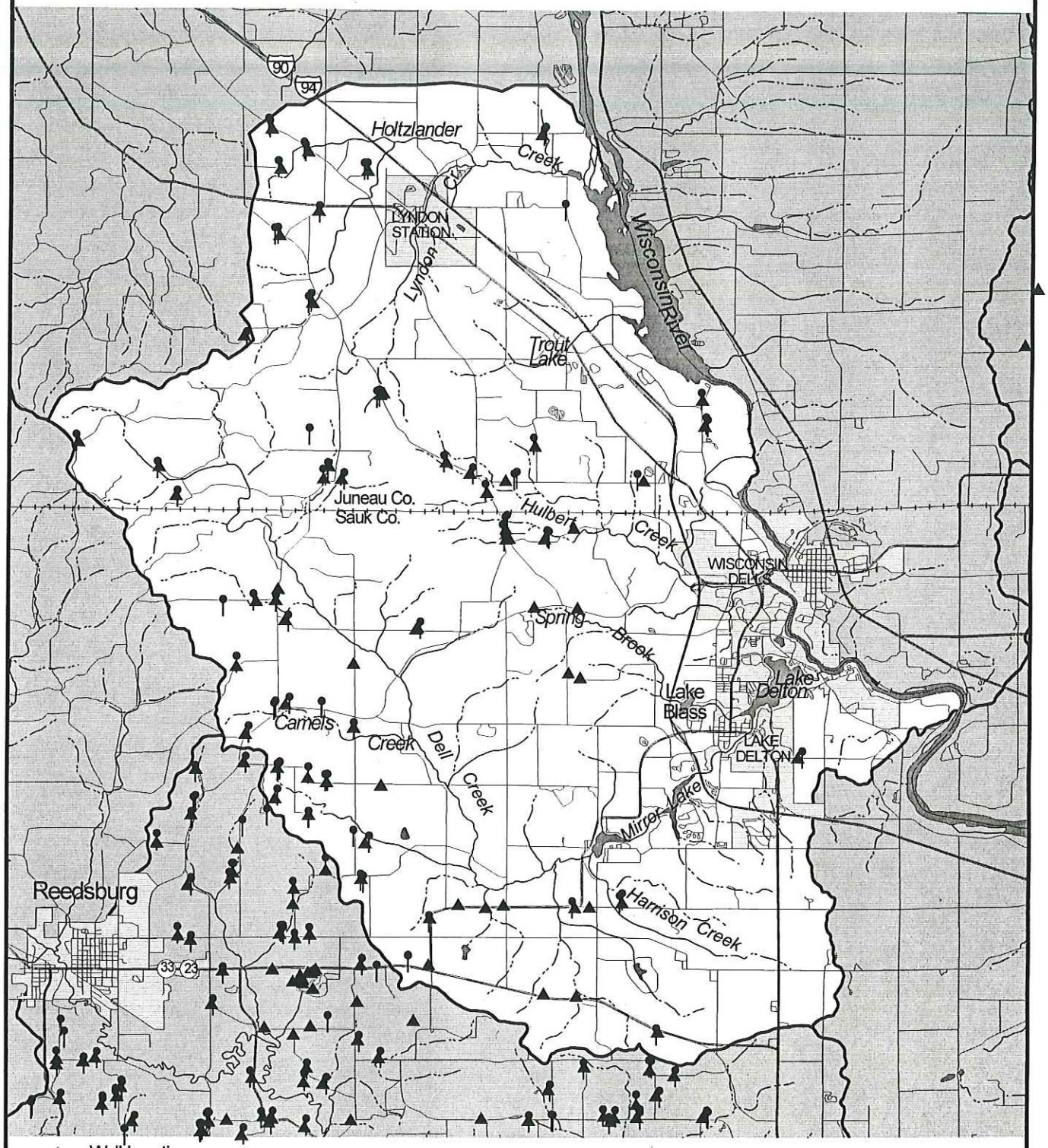
Source: DNR and Sauk County

Table 1-3. Projected Increases in Urban Land Use Within the Dell Creek Watershed, 1997 to 2017.

Land Use Category	1997		Planned Increment		Year 2017	
	Acres	% of Total	Acres	% Change	Acres	% of Total
Low Density Residential	598.3	13	516.4	86	1,115	14
Multi-Family (1-3 stories)	2.9	<1	2.6	90	5.5	<1
Mobile/Trailer Park	110.1	2	95.1	86	205.2	3
Commercial Strip Development	204.7	5	124.6	61	329.3	4
Shopping Center	209.2	5	144.4	69	353.6	5
Light Industry	111.4	2	73.8	66	185.2	2
Freeway (ltd. access hwys)	269	6	0	0	269	3
Miscellaneous (institutional/gov.)	82.9	2	75.4	91	158.3	2
School	9.1	<1	8.3	91	17.4	<1
Park (golf courses/playground)	645	14	312.9	49	957.9	12
Cemeteries	6.5	<1	0	0	6.5	<1
Open Space Undeveloped	1,704	38	1,757	103	3,461	44
Lakeshore Development	220	5	0	0	220	3
Hotel	301	7	229.8	76	530.8	7
Total	4,474	100	3,340	75	7,815	100

Source: DNR and Sauk County

Map 1-1. Dell Creek Priority Watershed Project



Well Locations
Barnyard Locations
Intermittent Streams
Perennial Streams
County Boundary
Major Highways
Local Roads
Municipal Area
Open Water

STUDY AREA

Wisconsin Department of
Natural Resources
Bureau of Watershed Management
November 1997

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W E
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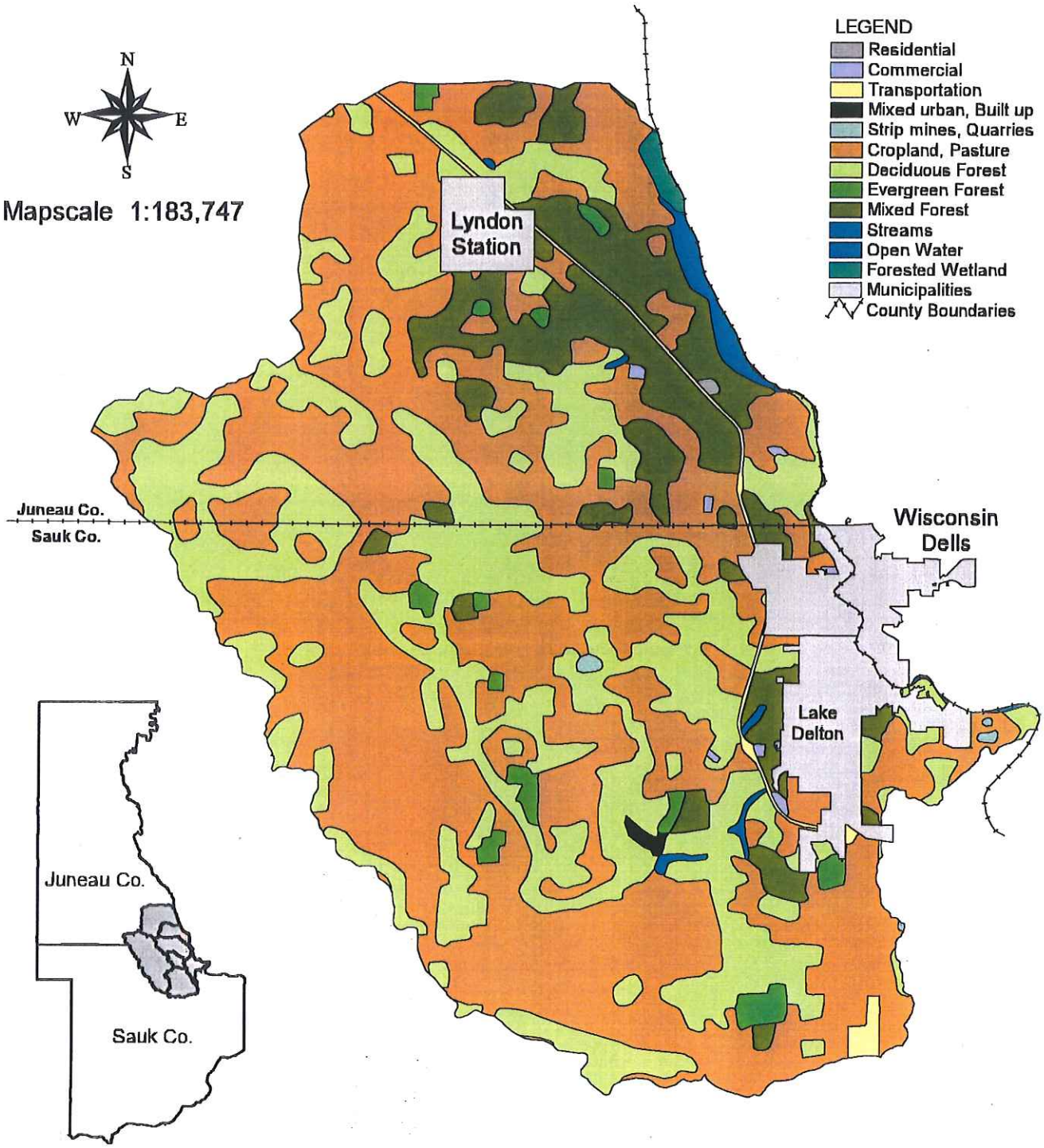
Mapscale 1:150,329

0 1 2 3 Miles

Map 1-2 Land Use within the Dell Creek Watershed



0 2 4 6 8 Miles

Source: Data taken from USGS Land Use and Land Cover dataset at 1:250,000 scale. Currency of source photos range from 1971 to 1982.

Wisconsin Department of Natural Resources
Water Division GIS Lab
October 1997

CHAPTER TWO
Watershed Conditions and Nonpoint Sources of Pollution

This chapter discusses the physical characteristics, existing conditions, nonpoint sources, objectives and management categories for the water resources in the Dell Creek Priority Watershed. Information is presented for each subwatershed and by pollution source.

Physical Setting

Climate and Precipitation

The frequency, duration and amount of precipitation influences surface and groundwater quality and quantity, soil moisture content, runoff characteristics, and the physical condition of waterways. The Dell Creek watershed lies in the continental zone which is characterized by winters which are long and relatively cold and snowy and summers which are mostly warm with periods of hot humid conditions. Mean annual precipitation for the region is about 33 inches of rain and melted snow; the majority falls in the form of thunderstorms during the growing season (May-September). Most runoff occurs in February, March, and April when the land surface is frozen and soil moisture is highest.

Geology

The Dell Creek watershed lies in that part of Wisconsin known as the Driftless Area, a region that was not covered by glaciers historically. This region consists of a dissected landscape of Upper Cambrian sandstone underlain by Precambrian igneous and metamorphic rocks. These Precambrian rocks are buried 400 to 850 feet beneath the Upper Cambrian sandstone.

Topography

The relief in the region is influenced by glacial activity. The portion of the Dell Creek watershed located in Juneau is within the Central Plain region. This area is composed of a broad glacial lake basin and generally has flat or gentle undulating topography, except for an occasional sandstone bluff. The portion of the Dell Creek watershed located in Sauk County consists of nearly level and gently sloping outwash terraces.

Soils

The majority of the soils in the Dell Creek watershed are moderately well drained to excessively drained, having a loamy or sandy surface layer and a loamy, sandy, or clayey subsoil underlain by sandstone bedrock or outwash sand.

The LaFarge-Norden-Gale, Eleva-Boone-Plainfield, Plainbo-Partridge, and Urne-LaFarge-Rozetta association soils comprise the majority of the area within the Lyndon Creek, Trout Lake, Hulbert Creek, Lake Blass, and Dell Creek subwatersheds. These soils are used for cultivated crops, pasture, and woodland. Since slopes in these areas range from 2 to 30 percent, the main concern in managing these soils is to control upland erosion.

There are two smaller areas; one located along Lyndon Creek near Lyndon Station and the other near the inlet to Mirror Lake, dominated by soil associations formed in lacustrine deposits. The Newson-Meehan-Dawson association encompasses the Lyndon Creek area. This association consists of nearly level and gently sloping, somewhat poorly drained to very poorly drained sandy and mucky soils on outwash plains and in basins of glacial lakes. The Briggsville-Mosel-Colwood association near Mirror Lake, is composed of nearly level and gently sloping, well drained, medium texture soils underlain by stratified lacustrine deposits. The major soils in both associations support woodland or wetland vegetation.

Water Resource Conditions and Goals

This section describes the general conditions of the surface and groundwater resources in the Dell Creek watershed. It describes the classifications used for Wisconsin's waters, then describes the surface water and recreational resources in the watershed. Descriptions of subwatersheds are also included and several tables provide summaries of the watershed's resources. Table 2-1 in the next section also serves as a useful summary of the surface water resources in each subwatershed. Groundwater resources and quality are also discussed.

Water Use Classifications

Surface water quality standards and criteria are expressions of the conditions considered necessary to support biological and recreational uses. Water quality standards for recreational and biological uses are contained in Chapters NR 102, NR 104, and NR 105 Wisconsin Administrative Code.

In addition to these standards, other criteria were used to assess the suitability of surface waters for recreational and biological uses. Data characterizing stream size and accessibility were used to help determine the suitability and types of recreation a stream is capable of supporting. Information on current recreational use of surface waters (provided by users at public access points and discussions with local officials) is also used to assess suitability of surface waters for recreation. Use classifications and supporting water quality standards used in evaluating water resource conditions are discussed below.

Biological Stream Use

Wisconsin streams are classified according to the biological uses desired for each stream. These classifications are listed for each stream in the water quality management plans developed for each basin in the subwatershed discussions. Stream classification determines allowable pollutant loads to the system. Resources are classified as one of the following:

COLD = Coldwater Communities include surface waters capable of supporting a community of coldwater fish and other aquatic life or serving as a spawning area for coldwater fish species.
WWSF = Warmwater Sport Fish Communities include surface waters capable of supporting a community of warmwater sport fish and/or serving as a spawning area for warmwater sport fish.
WWFF = Warmwater Forage Fish Communities include surface waters capable of supporting an abundant diverse community of forage fish and other aquatic life.
LFF = Limited Forage Fish Communities

Trout streams carry a separate designation found in "Wisconsin Trout Streams" (DNR Publication number. 6-3600(80)) and Outstanding/Exceptional Resource Waters, Wisconsin Administrative Code NR 102.20 and NR 102.11. Trout classes are:

Class I trout streams are high quality, and populations are sustained by natural reproduction.
Class II trout streams have some natural reproduction but may need stocking to maintain a desirable fishery.
Class III trout streams have no natural reproduction and require annual stocking of legal-size fish to provide sport fishing.

Table 2-1 summarizes the water resource classification and conditions for the Dell Creek watershed.

Recreational Stream Use

Recreational stream use classifications are described by a level of human body contact determined to be safe and reasonable. The system applies to all surface waters including those categorized as intermediate or marginal under the above referenced biological use classification system. Three designations are used under the recreational stream classification system. These designations are full body contact, partial body contact, and non-contact.

Full Body Contact. These waters are used for human recreation where immersion of the head is expected and occurs often. Recreation activities classified as full body contact include swimming, waterskiing, sailboarding and other similar activities.

Partial Body Contact. These waters are used for human recreation where immersion of the head is not frequent and contact is most often incidental or accidental. Recreational activities classified as partial body contact include boating, canoeing, fishing and wading.

Non-contact. These waters should not be used for human recreation. This category is used infrequently when extenuating circumstances such as high concentrations of in place pollutants, an uncontrollable pollution source, or other conditions dictate that contact with the water would be an unnecessary health risk.

Surface Water and Recreational Resources

For the purposes of this project, the Dell Creek watershed is subdivided into 7 individual subwatersheds. Each subwatershed conveys surface water to Dell Creek or the Wisconsin River. Major tributaries, associated streams, impoundments, and subwatershed divides are shown in map 2-1. See table 2-1 for the general conditions of major water resources in the Dell Creek Priority Watershed.

Subwatersheds in the Dell Creek Watershed

Lyndon Station	(LS)	
Trout Lake		(TL)
Hulbert Creek	(HC)	
Dell Creek	(DC)	
Lake Blass	(LB)	
Mirror Lake		(ML)
Lake Delton		(LD)

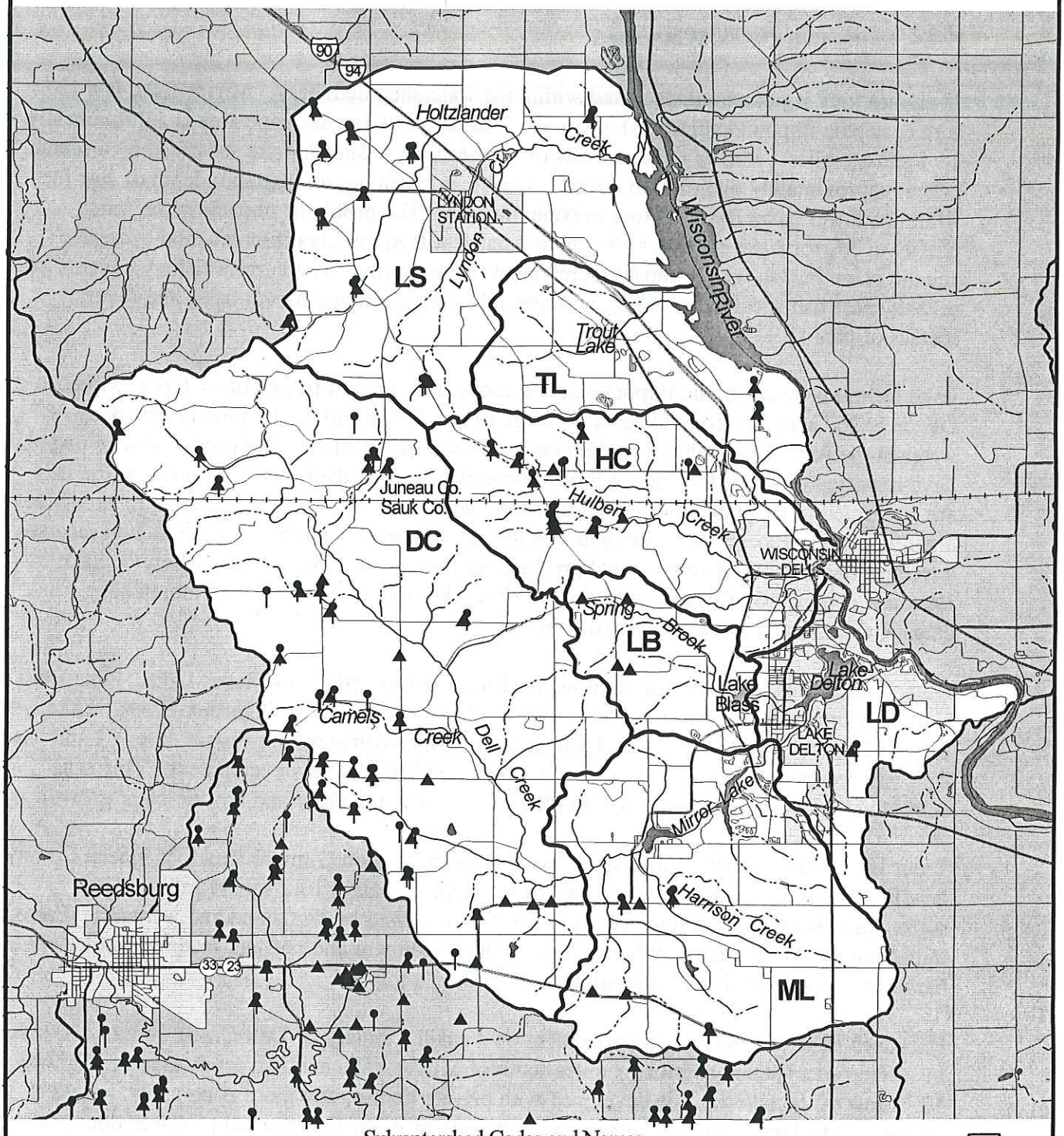
Streams

Dell Creek, Hulbert Creek, Lyndon Creek, and many named and unnamed tributaries make up the watershed drainage area. Perennial streams are defined as those that maintain a small continuous flow throughout the entire year. Perennial streams in the Dell Creek watershed have a combined length of approximately 65 miles. Dell Creek (11 miles) is the longest perennial stream in the watershed. Other perennial stream/creeks include Beaver, Camels, Springbrook, Holtzander, Tracy, Harrison, and Gilmore.

Portions of these streams have been designated as an Exceptional Resource Water (ERW). NR 102.11 of the Wisconsin Administrative Code defines ERW as: "surface water which provide valuable fisheries, hydrologically or geologically unique environmental settings, which are not significantly impacted by human activities."

Dell Creek and many of the other streams are not reaching their highest potential due to pollution from nonpoint sources and the lack of stream habitat in the watershed. The streams/creeks will be described in more detail in the subwatershed descriptions later in this chapter.

Map 2-1 Dell Creek Subwatersheds



Subwatershed Codes and Names

HC = Hulbert Creek
TL = Trout Lake
LC = Lyndon Creek
LB = Lake Blass
DC = Dell Creek
ML = Mirror Lake
LD = Lake Delton

Barnyard Locations
Well Locations
Intermittent Streams
Perennial Streams
County Boundary
Subwatershed Boundary
Local Roads
Major Highways
Watershed Boundary
Open Water
Municipal Area

Mapscale 1:150,329

0 2 4 Miles

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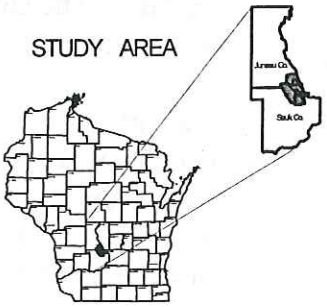
STUDY AREA



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Water Division
Bureau of Watershed Management
October 1997

Lakes in the Dell Creek Watershed

There are four impoundments located within the watershed boundary. Mirror Lake is a 137 acre eutrophic impoundment on Dell Creek. The Mirror Lake drainage area is approximately 24.1 square miles. Mirror Lake consists of two separate basins that are separated by a scenic gorge, approximately one mile in length. The upper basin has a maximum depth of five feet while the lower basin has a 19 foot maximum depth. The problems impacting the water quality of Mirror Lake include sediment and nutrient loading, algal blooms, and excessive aquatic plant growth which impact recreational opportunities. The current fishery consists of several sport fish species, including northern pike, walleye, largemouth bass, and several species of panfish.

Lake Delton is an eutrophic impoundment directly downstream from Mirror Lake. Lake Delton is 267 acres in size and has a drainage basin of 79.6 miles. It is the largest body of water in the watershed. Shoreline development and a past history of improper sewage disposal have impacted this lake for many years. Currently, most of the property owners on the lake are connected to the municipal wastewater treatment plant. Historic problems with excessive algal blooms have been a concern and still impact the users of the lake. Lake Delton receives a tremendous amount of recreational pressure from its users. The current fishery of Lake Delton is comprised of healthy populations of northern pike, walleye, largemouth bass, channel catfish, and many species of panfish.

Other named impoundments in the watershed include Lake Blass and Trout Lake. Lake Blass is an impoundment that was created in 1929 by the damming of Springbrook Creek. Lake Blass is 34 acres in size and has a drainage area of approximately 6.1 square miles. Land use is dominated by agriculture, woodland, wetlands, and residential development. This is a eutrophic lake that has a history of problems with excessive algae and aquatic plant growth.

Trout Lake is an eutrophic impoundment that was created on Gilmore Creek in Juneau County. It is 11 acres in size, having a drainage area of approximately 10.2 square miles. The surrounding land use is dominated by agriculture followed by woodland and wetlands. Factors impacting the water quality of Trout Lake include sediment and nutrient loading, timber harvesting, and hydrologic manipulation.

Buckhorn Lake is a shallow impoundment on a small tributary of Dell Creek roughly 30 acres in surface area located about two miles south of Mirror Lake and two miles west of Highway 12. Most of the lakeshore is developed with private homes, and there is no public access to the lake. The lake is deep enough to support a warm water fishery, and probably does not winter kill.

Lake of The Dells is a shallow impoundment approximately 13 acres in size and has a maximum depth of 8 feet. Located just north of village of Lake Delton, the lakeshore is undeveloped. While there is minimal public access, the duck boats run tours through the area. The shallow lake has historically had winter fishkills. The lake supports a fishery consisting of largemouth bass and panfish. The Department is currently negotiating for a scenic easement

around the entire lake as part of the Dells of the Wisconsin River State Natural Area. There is not much potential for improvement in water quality or fishery.

Table 2-1. General Condition of Streams and Lakes in the Dell Creek Priority Watershed.

Water Body	Biological Use		Problems Related to Nonpoint Source Pollution
	Current	Potential	
STREAMS/CREEKS			
Dell Creek	Cold Water Class II & WWFF	Enhance	Sed, Nutr
Beaver Creek	Cold Water Class II	Enhance	Sed, Nutr
Camels Creek	Cold Water Class II & WWFF	Enhance	Sed, Nutr
Hulbert Creek	Cold Water Class I & II & WWFF	Enhance	Sed, Nutr, Urb
Springbrook Creek	WWFF	Enhance	Sed, Nutr
Holtzander Creek	Cold Water Class III & WWFF	Enhance	Sed, Nutr
Tracy Creek	Cold Water Class III & WWFF	Enhance	Sed, Nutr
Lyndon Creek	Cold Water Class III & WWFF	Enhance	Sed, Nutr
Harrison Creek	Cold Water Class II & WWFF	Enhance	Sed, Nutr
Gilmore Creek	Cold Water Class I & II	Enhance	Sed, Nutr
LAKES			
Lake Delton	Eutrophic	Maintain	Sed, Nutr, Urb
Mirror Lake	Eutrophic	Maintain	Sed, Nutr
Blass Lake	Eutrophic	Maintain	Sed, Nutr
Trout Lake	Eutrophic	Maintain	Sed, Nutr
Buckhorn Lake	Eutrophic	Maintain	Sed, Nutr
Lake Of The Dells	Eutrophic	Maintain	Sed, Nutr, Urb

Sed = Sediment from agricultural fields
Nutr = Nutrients from agricultural fields
Urb = Sediment and nutrients from urban influences

Wetlands

Wetlands are valuable natural resources. They provide wildlife habitat, fish spawning and rearing areas, recreation, storage of runoff and flood flows and removal of pollutants. The majority of the wetlands in the watershed are located mainly along the riparian corridor of Dell Creek. These wetlands support furbearers and waterfowl populations and also provide

seasonal habitat for sport fish. A wetland and wildlife habitat inventory was done to identify existing and modified or converted wetlands for the purpose of protection from degradation or potential restoration. The focus of the inventory was on wetlands that are presently, or have been in the past, degraded through drainage, grazing, cropping, or other activities causing water storage loss, and build up of sediments. Data were collected on 8,252 acres of wetlands. Data were gathered from Natural Resource Conservation Service maps, air photos, and the DNR wetland inventory maps. Guidelines for wetland restoration, which will be a component of this project, are outlined at the end of this chapter. See table 2-2 for the Wetland Inventory Summary.

Recreation

The watershed's streams, wetlands, and lakes offer diverse and high-quality recreational opportunities. The most popular activities are fishing and boating. Other popular activities are wildlife observation, hiking, hunting, and trapping. Lake Delton is used for a wide range of recreational activities. It is of local importance because it draws many people and tourists. Recreational facilities on Lake Delton include swimming beaches, boat (duck) tours and rentals, water-ski shows, para-sailing, picnic areas, several boat docks and extensive recreational and private housing.

Table 2-2. Wetland Inventory Summary: Dell Creek Watershed.

Subwatershed	Wetland	Prior Converted	Farmed Dry Years	Total Acres
	Acres	Acres	Acres	
Lyndon Creek	2,599	458	97	3,154
Hulbert Creek	462	24	0	486
Trout Lake	570	7	4	581
Lake Blass	371	0	3	374
Mirror Lake	834	4	0	838
Lake Delton	74	26	0	100
Dell Creek	2,500	161	58	2,719
Total	7,410	680	162	8,252

Source: Sauk and Juneau County LCD.

Groundwater Resources

Groundwater is the main source of drinking water for both rural and urban citizens in the Dell Creek Priority Watershed. Groundwater is stored underground in pore spaces and cracks within the soil and rock layers aquifers. Since 1936, Wisconsin law has required well drillers to document well construction and rock and soil layers encountered during well installation. Information from geologic logs, driller construction reports, and United States Geological Survey (USGS) reports is included below. The principle aquifers within the watershed are: Cambrian age sandstone formations deposited 570-500 million years ago; coarse offshore sediment, eroded offshore sediment and stream sediment deposited during melting of the Green Bay Lobe of the Laurentide Ice Sheet during the last part of the Wisconsin Glaciation deposited 15,000 years ago; and modern stream sediment (Clayton and Attig, 1990).

The watershed includes the Upper and Lower Dells of the Wisconsin River and part of the Johnstown end moraine. The Johnstown end moraine is composed of sand and gravel which was deposited at the furthest extent of the last glacier. It is bordered on the north by sandy sediments deposited in glacial Lake Wisconsin.. The area to the north is known as the Central Sand plain. The western part of the watershed was never covered by glaciers and is in what is referred to as the driftless area. It is characterized by steep stream valleys and bedrock ridges.

Direction of Groundwater Flow

Local groundwater flow in the Dell Creek watershed roughly mirrors the topography of the land surface and flows "downhill" or down gradient toward the Wisconsin River and it's tributaries. Regional groundwater flow in the Dell Creek watershed is northeast toward the Wisconsin River.

Groundwater Quality

Groundwater quality in the Dell Creek watershed is generally considered good although a high percentage of wells sampled for the Dell Creek priority watershed appraisal had nitrate contamination. As part of the Dell Creek watershed groundwater appraisal, 65 wells were sampled for nitrate (NO_3) + nitrite (NO_2). Analytical results ranged from not detected to 41.6 parts per million. Of the samples collected, 54 (83%) exceeded the preventive action limit (PAL) of 2 mg/L and 29 (44.5%) exceeded the enforcement standard (ES) of 10 mg/L. As a comparison, approximately 50% of wells sampled exceed the PAL and 14% exceed the ES statewide. No specific sources of nitrate contamination can be traced to these results. However, the number of samples above the ES indicates that improperly constructed manure storage facilities and the over-application of manure and fertilizer upon croplands may be responsible for the elevated nitrate + nitrite levels. Based on this assumption, nutrient management cost-sharing should be recommended for farms within the watershed.

Table 2-3. Well Sampling Results for Nitrate.

Subwatershed	---- NITRATE ----					
	Number of Nitrate Samples		Number of Nitrate Samples		Number of Nitrate Samples	
	less than 2.0 mg/l	Percent	between 2.0 and 10.0 mg/l	Percent	greater than 10.0 mg/l	Percent
Mirror Lake	2	3	1	2	3	4
Hulbert Creek	1	2	2	3	8	12
Lake Blass	0	0	4	6	1	2
Lyndon Creek	3	4.5	4	6	4	6
Dell Creek	5	7.5	12	18.5	12	18.5
Trout Lake	0	0	2	3	0	0
Lake Delton	0	0	0	0	1	2
Totals	11	17	25	38.5	29	44.5

Source: Sauk County LCD, DNR

Enforcement Standard (ES) Health Advisory Level: The concentration of a substance at which a facility regulated by DILHR, DATCP, DOT or DNR must take action to reduce the concentration of the substance in groundwater.

Preventive Action Limit (PAL): A lower concentration of a contaminant than the Enforcement Standard. The PAL serves to inform DNR of potential groundwater contamination problems, establish the level at which efforts to control the contamination should begin, a provide a basis for design codes and management criteria.

No wells were sampled for atrazine using the triazine screen as part of this appraisal. Existing data show that 21 well samples have been analyzed using the triazine screen. Of those wells, two sample results exceeded the ES for atrazine plus metabolites of 3 parts per billion (ppb) and nine exceeded the PAL of 0.3 ppb. Sample analyses results ranged from not detected to 12.9 ppb.

No samples were collected for coliform bacteria or hazardous substances such as volatile organic compounds. Coliform bacteria can be a drinking water problem where septic systems, land spreading of manure, or barnyards are located upgradient (generally uphill) from a private well. Bacteria can enter the drinking water supply along the well casing of improperly constructed wells. In general, wells with high levels of bacteria can be rehabilitated.

Volatile organic compounds generally enter a well from nearby leaking underground gasoline or other fuel storage tanks and spills. Once these compounds are in the groundwater they are difficult to clean up. In general, the contaminated wells have to be abandoned and a new well drilled. Sites where these contaminants are present are listed below.

Water Supplies

Water supplies for domestic, agricultural, and industrial uses in the Dell Creek watershed are obtained from both private groundwater sources and municipal systems. Lake Delton's municipal system currently consists of 4 wells serving approximately 1400 people (Mid-State Assoc., 1992). The municipal wells are between 350 and 400 feet deep and draw water from the Cambrian sandstone aquifer. A wellhead protection plan has been written for wells #2, #3 and #4 (Lake Delton WHP Comm., 1994). The plan includes an educational program, water conservation program, a contingency plan, separation distances and ordinances, codes and protective covenants. The village of Lake Delton does not currently have a wellhead protection ordinance.

Wisconsin Dells municipal well number 5 is also within the Dell Creek watershed. It is approximately 350 feet deep and draws water from the Cambrian Sandstone Aquifer. The village of Lyndon Station has two municipal wells which are 200 and 400 feet deep and draws water from the Cambrian sandstone aquifer. Neither municipality has a wellhead protection plan.

Potential Groundwater Quality Problems

Previously identified potential groundwater quality problems in the Dell Creek watershed are listed below. These sites were listed in DNR Publication SW-144, *The Wisconsin Remedial Response Site Evaluation Report* (December 1991) which lists superfund sites, solid and hazardous waste disposal sites, leaking underground storage tank sites and reported spill sites.

High Priority Spill Sites

The Lake Delton Water Supplies site is located at T13N-R6E,SEC16. This site was originally included on the Inventory of Sites or Facilities which May Cause or Threaten to Cause Environmental Pollution but is being addressed under the spills law. The DNR Water Supply Section conducted a private well study near the intersection of State Highways 12 and 23 on the south side of Lake Delton. Forty-one private wells were sampled for volatile organic compounds. Contaminants detected included gasoline components as well as trichloroethylene and chloroform. Several sources of contamination were identified including an illegal landfill and two leaking underground storage tank sites. Contamination was detected in the sandstone aquifer. Based on the results of the study, the DNR issued health advisories covering six of the wells. Since that time, Lake Delton has installed a municipal well system.

An additional 14 high priority and 2 medium priority sites are located within the village of Lake Delton. Locations of these sites are available from the DNR.

Water Quality Conclusions and Recommendations

Conclusions:

1) Well samples analyzed as part of the groundwater appraisal indicate that a large percentage of the wells have nitrate contamination above the PAL and ES.
2) Existing well sample data for triazine and other pesticides indicates that pesticides are present in groundwater.
3) The village of Lake Delton has a wellhead protection plan but no wellhead protection ordinance. The municipalities of Wisconsin Dells and Lyndon Station have water supply systems but no wellhead protection plans.

Recommendations:

1) The village of Lake Delton should be encouraged to adopt a wellhead protection ordinance as the next step to protect the municipal groundwater supply.
2) The city of Wisconsin Dells and the village of Lyndon Station should be encouraged to adopt wellhead protection plans to protect their municipal water supplies.
3) Cost-sharing for nutrient and pest management should be available to all farms within the watershed.
4) All municipalities should encourage proper well abandonment.

Subwatershed Discussions

This section describes the physical and water quality conditions for each subwatershed in the Dell Creek Priority Watershed Project. Discussion for each subwatershed is divided into four parts: a general description, water quality conditions, the nonpoint source pollutants impairing the subwatershed, and the goals and objectives for the subwatershed. Table 2-4 summarizes this data.

Dell Creek Subwatershed (DC)

Description

The Dell Creek subwatershed is illustrated on map 2-2. This is the largest of the seven subwatersheds (28,331 acres); it contains three named streams (Dell, Beaver, and Camels Creek), and six unnamed perennial tributaries. This subwatershed has a drainage area that is approximately 44.3 square miles in size. The land use in this subwatershed is dominated by agriculture, with both cash cropping and dairy farming present, followed by woodland and wetlands. The Wisconsin Department of Natural Resources owns 2,144 acres in this subwatershed.

Water Quality Conditions

Dell Creek originates in southeastern Juneau County and flows south meandering through Sauk County before entering Mirror Lake. Dell Creek is 24.0 miles in length and has a gradient of 8 ft./mile. Ten and one-half miles of Dell Creek are classified as Cold Class II trout waters. Land use is dominated by agriculture followed by woodland and wetlands. Problems impacting the water quality of Dell Creek include sediment and nutrient loading from agricultural fields and barnyards, bedload sediment transport, lack of stable substrate, and lack of diverse habitat. Macroinvertebrate samples indicate "good" water quality. Water temperatures and dissolved oxygen levels are good and benefit cold water species. Sedimentation is a major problem in this subwatershed; there are segments having over three feet of fine sands and silts covering suitable substrate.

Beaver Creek (1.59 miles) originates in north central Sauk County and flows southwest through a large wetland before it enters into Dell Creek. This creek drains approximately 2,220 acres, and has a drainage area of 3.47 square miles. The gradient for Beaver Creek is 19 ft./mile. Land use is dominated by agriculture, wetlands, woodlands, and residential developments. Problems impacting water quality of Beaver Creek include sediment and nutrient loading from agriculture, bedload transport of sediment, lack of habitat, and the lack of stable substrate. Beaver Creek is very narrow and shallow, with a mean width of 3 to 4 feet and a mean depth of 3 to 6 inches. The fishery is classified as Cold Water Class II trout water. Overall water quality is "good", but suitable substrate (coarse substrate) is absent. The substrate is dominated by sand and silt which has covered areas of desirable substrate under two to three feet of sand. Camels Creek also originates in north central Sauk County where it

flows southeast before entering Dell Creek. It is 3.0 miles in length, drains approximately 2,500 acres and has a drainage area of 3.93 square miles. The gradient is 17 ft./mile. Land use is dominated by agriculture, followed by woodland, and wetlands. Problems impacting water quality include sediment and nutrient loading from agricultural fields and barnyards, destruction of springhead areas by livestock, streambank erosion, lack of habitat (pools and overhead cover), hydrologic manipulation, and overall depth. Camels Creek is classified as a Cold Class II trout fishery. The shifting sand substrate is a major problem that has covered most of the suitable substrates. Macroinvertebrate samples indicate "good" water quality.

There are several unnamed tributaries that drain into Dell Creek throughout its entire length. Some of these tributaries are perennial, while others are intermittent and only contain water during wet periods of the year. Most of the tributaries maintain a warm water forage fishery. Land use is dominated by agriculture, woodlands, wetlands, and developments. Some of the tributaries have impoundments on them. Most of these impoundments are small, with the largest being 15-20 acres in size. Problems impacting the water quality of these tributaries include sediment and nutrient loading from agricultural fields and barnyards, streambank erosion, low flows, high temperatures, and the lack of stable habitat.

Nonpoint Source Pollutants

1. The largest in area, stream miles, and pollution sources of all the subwatersheds examined, the Dell Creek subwatershed contains 34 animal lots which contribute 2,763 pounds of phosphorus [organic] annually. This represents an estimated 52% of the phosphorus from animal lots for the entire watershed.

2. The upland sediment delivery in the Dell Creek subwatershed is 5,955 tons, annually, or 43% of the entire watershed load. Cropland is the major source in this watershed, contributing 95% of the load.

Water Resources Goals and Objectives

The following goals and objectives are recommended for improving the surface water resources of the Dell Creek subwatershed (Dell Creek, Beaver Creek, and Camels Creek).

A. Reduce sediment and nutrient loading from agricultural fields and barnyard runoff to enhance overall water quality.

B. Maintain native grassland buffers, grassed waterways, and other woodland and wetland buffers to aid in nutrient and sediment retention.

C. Maintain proper construction site erosion control practices on areas where soil has been disturbed (residential, commercial, or highways) through proper planning, educational workshops, and proper installation of control structures.

Mirror Lake Subwatershed (ML)

Description

The Mirror Lake subwatershed is illustrated on map 2-3. This subwatershed is 15,442 acres in size, has a drainage area of 24.1 square miles, and is located entirely in Sauk County. The surface waters in this subwatershed consist of Mirror Lake, Harrison Creek, and 8 unnamed intermittent and perennial tributaries. Land use is dominated by agriculture followed by woodland and wetlands. This subwatershed contains a 2,050 acre State Park that surrounds the entire perimeter of Mirror Lake and several tributaries.

Water Quality Conditions

Mirror Lake is a 137 acre impoundment (19 feet maximum depth) on Dell Creek. The lake was first created when a dam was constructed in 1857 to provide power to an area feed mill. The watershed, or area draining into Mirror Lake, is about 65 square miles in size and largely agricultural. Mirror Lake consists of two separate basins that are separated by a scenic gorge, approximately one mile in length. Named tributaries feeding into Mirror Lake include, Dell and Harrison Creeks. Unnamed tributaries are found on both the north and south sides of the lake. Dell Creek is also fed by Camels and Beaver Creeks.

Mirror Lake is classified as an eutrophic lake. The problems impacting the water quality of Mirror Lake include sediment and nutrient loading from agricultural fields, algal blooms, and excessive aquatic plant growth which impact recreational opportunities. There is an abundance of aquatic plants (macrophytes) growing in the lake's headwater portion, where Dell Creek enters. Mirror Lake also experiences heavy summer growth of duckweed, a small floating leafed plant. Algal blooms are periodically present on the lake. An aquatic plant harvesting program initiated in response to this duckweed growth removes both aquatic plants and duckweed from the upper portions of the lake.

Mirror Lake is immediately upstream from Lake Delton and serves as a sink for sediment and phosphorus loadings from the Dell Creek subwatershed. Studies have estimated a 50% reduction in sediment loading between the inlet and outlet of Mirror Lake. Phosphorus (associated with suspended particles) also showed a 40% reduction between Mirror Lake's inlet and outlet. An additional 20% reduction in phosphorus occurs as a result of aquatic plant harvesting.

Mirror Lake's shoreline is largely undeveloped, and heavily wooded with only about 35 homes on the lake. The state of Wisconsin owns Mirror Lake State Park a 2,050 acre park with 144 camp sites and about 2.1 miles of lake shoreline. There are also two private campgrounds with about 650 sites and one restaurant/resort establishment. Two boat landings provide access to the lake. One landing is at Mirror Lake State Park, and the other is a township landing found on the northwest shore. Mirror Lake has a no-wake restriction on boats using the lake. The fishery consists of several sport fish species, including northern pike, walleye, largemouth bass, and several species of panfish. A small portion, approximately 1.5 miles of

Dell Creek, is located inside the boundary of the Mirror Lake subwatershed. This portion of Dell Creek is navigable by boat and motor. Overall width and depth are much greater near its confluence with Mirror Lake than upstream sites. Land use surrounding this portion of Dell Creek is dominated by agriculture, woodland and wetlands. Factors impacting water quality of this section of Dell Creek include sediment and nutrient loading from agricultural fields and barnyards in the upper reaches of Dell Creek, lack of stable substrate, beaver dams, slow velocities, sand dominated substrate, and bedload transport. Current fish species include white sucker, brown trout, northern pike, largemouth bass, and bluegills.

Harrison Creek is 5.0 miles in length and has a drainage area of 4.97 square miles. It is a tributary to Mirror Lake entering the lake in its western basin. Land use is dominated by agriculture, woodland, wetland, and residential development. Factors impacting the water quality of Harrison Creek include sediment and nutrient loading from agricultural fields and barnyards, streambank erosion, hydrologic manipulation, lack of stable substrate, and the lack of habitat. Macroinvertebrate samples indicate "good" water quality.

Nonpoint Source Pollutants

1. The Mirror Lake subwatershed contains 4 animal lots which contribute 469 pounds of phosphorus [organic] annually. This represents an estimated 9% of the phosphorus for the entire watershed.

2. The upland sediment delivery in the Mirror Lake subwatershed is 3,246 tons, annually, or 23% of the entire watershed load. Cropland is the major source in this subwatershed, contributing 95% of the load.

Water Resources Goals and Objectives

The following goals and objectives are recommended to improve the overall water quality of the Mirror Lake subwatershed.

A. Reduce sediment and nutrient loading from agricultural fields, barnyards, and feedlots to enhance overall water quality.

B. Protect streambanks of Harrison Creek through the establishment of riparian buffers and limiting livestock access.

C. Maintain native grassland buffers, grassed waterways, woodland, wetland, and upland buffers to aid in the retention of sediment and nutrients.

Lake Delton Subwatershed (LD)

Description

The Lake Delton subwatershed is illustrated on map 2-3. This subwatershed is 5,807 acres in size, has a drainage area of 9.1 square miles, and is entirely within Sauk County. The land use in this area is dominated by residential and commercial development. The Lake Delton subwatershed is similar to Mirror Lake's in that the rural portions are primarily agricultural. However, the shoreline around Lake Delton is heavily developed with individual homes, condominiums, resorts, and business enterprises. The lake and the village of Lake Delton and city of Wisconsin Dells are the center of a large tourism industry. Recreational use is extremely high. The surface waters in this subwatershed consist primarily of Lake Delton and Lost Canyon Creek.

Water Quality Conditions

Lake Delton is a 270 acre impoundment on Dell Creek, located just upstream from the Wisconsin River near the village of Lake Delton, Sauk County, Wisconsin. The lake was created in 1928 when a dam was created downstream from Mirror Lake. The lake has a watershed area of about 75 square miles and a maximum depth of 14 feet. It is an eutrophic lake and has periodic problems with algae blooms and duckweed growth. Shoreline development and a previous history of improper sewage disposal have impacted this lake for many years. Currently, most of the property owners on the lake are connected to the municipal wastewater treatment plant. Dell Creek is the major tributary to Lake Delton. Spring Brook Creek which has two small impoundments, Lake Blass and another at Spring Brook Campground, also flows into Lake Delton. Lost Canyon Creek is an intermittent tributary to Lake Delton. The current fishery of Lake Delton is comprised of northern pike, walleye, largemouth bass, channel catfish, and many species of panfish.

Lost Canyon Creek is approximately 3.5 miles in length and originates in the northeastern corner of Sauk County, Wisconsin. It is an intermittent tributary to Lake Delton entering in its southwestern corner. The stream baseflow is supplemented by numerous stormwater outfall basins. Land use is dominated by commercial/residential development, golf courses, roads and other impervious surfaces. Factors impacting the overall water quality of Lost Canyon Creek include sediment and nutrient loading, gully/streambank erosion, stormwater runoff from urban areas, lack of habitat, bacteria concentrations, intermittent streamflow, and construction site erosion.

Nonpoint Source Pollutants

1. The Lake Delton subwatershed contains one animal lot which contributes 56 pounds of phosphorus [organic] annually. This represents an estimated 1% of the phosphorus from animal lots for the entire watershed.

2. The upland sediment delivery in the Lake Delton subwatershed is 584 tons, annually, or 4% of the upland sediment load. Cropland is the major source in this subwatershed, contributing 91% of the load.

3. Sediment loading from urban areas includes an estimated 500 tons annually from existing developed areas, and a construction site erosion estimate of 30 tons/acre/year for a total urban sediment loading of 2000 tons.

4. The urban portion of the Lake Delton subwatershed delivers approximately 978 pounds of phosphorus [organic] annually to Lake Delton.

Water Resources Goals and Objectives

The following goals and objectives are recommended for improving the surface water resources of Lake Delton subwatershed.

A. Reduce sediment and nutrient loading from animal waste and construction site erosion.

B. Maintain proper construction site erosion control practices through proper planning, educational workshops, and installation of BMPs.

C. Maintain native grassland buffers, grassed waterways, woodland, and upland buffers to aid in the retention of sediment and nutrients.

D. Develop plans to address the urban issues impacting the surface waters such as; initiating buffer installations along lake shoreline, reduction in fertilizer use along lake properties, and improved street sweeping.

E. Reduce bacteria levels entering Lake Delton.

Lake Blass Subwatershed (LB)

Description

The Lake Blass subwatershed is illustrated on map 2-3. This subwatershed is approximately 5,802 acres in size, has a drainage area of 9.1 square miles, and is located entirely in Sauk County. Land use is dominated by agriculture, woodland, wetlands, and residential development. The surface waters in this subwatershed consist of one lake, one named stream and two unnamed tributaries.

Water Quality Conditions

Lake Blass is a 34 acre impoundment (16 feet maximum depth) located in Sauk County. This lake was constructed in 1929 when a dam was built on Spring Brook Creek. Lake Blass has a drainage area of 9.1 square miles draining approximately 5,824 acres, and is considered eutrophic. The area surrounding Lake Blass has been highly developed by private dwellings, a private camp, and a community center. Access to the lake is limited to a road side path. The fishery of Lake Blass is dominated by several species of panfish, largemouth bass, and northern pike.

Spring Brook Creek and its tributaries make up the remainder of the surface waters in this subwatershed. These streams drain into Lake Blass, then flow south, entering Lake Delton. Spring Brook Creek is 4.0 miles in length and has a drainage area of 6.31 square miles. Problems impacting the water quality of Spring Brook Creek include sediment and nutrient loading from agricultural fields and barnyards, low flows, elevated temperatures, low dissolved oxygen readings, hydrologic manipulation, and stormwater runoff from urban areas. Macroinvertebrate samples indicate "good" water quality. Spring Brook Lake was created by constructing a dam on Spring Brook Creek. This impoundment is eutrophic in nature and its fishery is dominated by panfish, northern pike, and largemouth bass. Macroinvertebrate samples indicate "fair" water quality. The streams in this area are impacted by elevated temperatures, low dissolved oxygen readings, low flow, and limited habitat.

Nonpoint Source Pollutants

1. The Lake Blass subwatershed does not contain any animal lots.

2. The upland sediment delivery in the Lake Blass subwatershed is 713 tons, annually, or 5% of the entire watershed load. Cropland is the major source in this subwatershed, contributing 91 percent of the inventoried load.

Water Resource Goals and Objectives

The following goals and objectives are recommended for improving the surface water resources of Lake Blass subwatershed.

A. Reduce sediment and nutrient loading from agricultural fields to enhance the overall water quality.

B. Maintain native grassland buffers, grassed waterways, woodland, wetland, and upland buffers to aid in the retention of sediment and nutrients.

C. Maintain proper construction site erosion control practices through proper planning, educational workshops, and installation of BMPs.

Lyndon Creek Subwatershed (LC)

Description

The Lyndon Creek subwatershed is illustrated on map 2-4. This subwatershed is approximately 12,128 acres in size, has a drainage area of 19.0 square miles, and is located entirely in the southeastern corner of Juneau County. This subwatershed contains the village of Lyndon Station. Land use is dominated by agriculture followed by wetland, woodland, and residential development.

Water Quality Conditions

Lyndon Creek subwatershed consists of three named streams (Tracy, Holtzander, and Lyndon) and six unnamed intermittent and perennial tributaries. Lyndon Creek originates in southeastern Juneau County. It is a tributary to the Wisconsin River that is 8.0 miles in length having a drainage area of 22.4 square miles. Factors impacting water quality of Lyndon Creek include sediment and nutrient loading from agricultural fields and barnyards, limited habitat, lack of stable substrate, and stormwater runoff from urban areas. The fishery of Lyndon Creek is comprised of walleye, northern pike, smallmouth bass, and panfish species. Water quality indices suggest "fair" water quality. The substrate of Lyndon Creek is dominated by fine sands, silt, and detritus.

Holtzander Creek originates in southeastern Juneau County. It is 6.0 miles in length and a tributary to Lyndon Creek. Land use is dominated by agriculture, followed by woodland, wetlands, and limited residential development. Problems impacting water quality include sediment and nutrient loading from agricultural fields and barnyards, lack of stable substrate, low flows, sand dominated substrate, and lack of habitat. Macroinvertebrate samples indicate "good" water quality.

Tracy Creek is 4.0 miles in length and a tributary to Holtzander Creek. Macroinvertebrate samples indicate "good" water quality. The land use in this area is dominated by agriculture followed by woodland and wetlands. Tracy Creek's water quality is impacted by similar problems as Holtzander Creek.

Nonpoint Source Pollution

1. The Lyndon Creek subwatershed contains 18 animal lots which contribute 811 pounds of phosphorus [organic] annually. This represents 15% of the phosphorus for the entire watershed.

2. The upland sediment delivery in the Lyndon Creek subwatershed is 1,940 tons, annually, or 14% of the entire watershed load. Cropland is the major source in this subwatershed, contributing 88% of the load.

Water Resources Goals and Objectives

The following goals and objectives are recommended for improving the surface water resources of Lyndon Creek subwatershed.

A. Reduce sediment and nutrient loading from agricultural fields and barnyards to enhance overall water quality.

B. Maintain native grassland buffers, grassed waterways, woodland, wetland, and upland buffers to aid in the retention of sediment and nutrients.

Hulbert Creek Subwatershed (HC)

Description

The Hulbert Creek subwatershed is illustrated on map 2-4. This subwatershed is approximately 9,934 acres in size and has a drainage area of 15.5 square miles in size. This subwatershed is divided almost equally between Sauk and Juneau Counties. Rocky Arbor State Park (221 acres) is located in the subwatershed. There are two unnamed perennial tributaries along with Hulbert Creek that make up the surface waters for this subwatershed. Hulbert Creek originates along the Sauk/Juneau County line and flows southeasterly through the city of Wisconsin Dells before draining into the Wisconsin River just downstream of the Wisconsin Dells dam. Land use is dominated by agriculture, woodland, wetland, and residential development.

Water Quality Conditions

Hulbert Creek is six miles in length and has a drainage area of 14.5 square miles. Problems impacting water quality of Hulbert Creek include sediment and nutrient loading from agriculture, feedlots, and barnyards, streambank erosion from cattle access, severe gully erosion, historical beaver problems, destruction of springhead areas, bedload transport of sediment, lack of desirable habitat, and stormwater runoff from the urban areas. Habitat seems to be limiting the stream's potential to support a better fishery. Substrates are dominated by sand and in many areas are embedded with over three feet of coarse sand. Historical signs of beaver problems are visible in many areas throughout its entire length. Runoff from barnyards and feedlots are also impacting the overall water quality of the stream. Sedimentation is contributing to the overall degradation of the stream. This is a result of streambank erosion caused by livestock and severe erosion of several gullies in its headwater areas.

Nonpoint Source Pollutants

1. There are 13 animal lots within the subwatershed which contribute approximately 1,024 pounds of phosphorus [organic] annually. This represents an estimated 19% of the phosphorus for the entire watershed.

2. The upland sediment delivery in the Hulbert Creek subwatershed is 1,157 tons, annually. This represents an estimated 8% of the total sediment loading to streams for the entire watershed. Cropland is the major source in this subwatershed, contributing 92% of the load.

3. The urban portion of the Hulbert Creek subwatershed delivers approximately 146 tons of sediment and 319 pounds phosphorus [organic] annually to Hulbert Creek.

Water Resources Goals and Objectives

The following goals and objectives are recommended for improving the surface water resources of Hulbert Creek subwatershed.

A. Reduce sediment and nutrient loading from agricultural fields, barnyards, and feedlots to enhance overall water quality.

B. Reduce sediment loading from gully erosion in the north fork of Hulbert Creek by a high level.

C. Maintain native grassland buffers, grassed waterways, woodland, wetland, and upland buffers to aid in the retention of sediment and nutrients.

D. Maintain construction site erosion control practices through proper planning, educational workshops, and installation of BMPs.

E. Stabilize headwater areas by protecting springhead areas.

Trout Lake Subwatershed (TL)

Description

The Trout Lake subwatershed is illustrated on map 2-4. This subwatershed is 6,556 acres in size, has a drainage area of 10.2 square miles, and is located entirely in Juneau County. The surface waters in this subwatershed consist of Gilmore Creek and Trout Lake. The land use is dominated by agriculture followed by woodland and wetlands.

Water Quality Conditions

Trout Lake is an impoundment that was created on Gilmore Creek. It is a drainage lake that is 11 acres in size and is considered to be eutrophic. Trout Lake is a private lake (licensed fish hatchery) that does not have public access. There are several private dwellings that are located adjacent to the lake. The current fishery consists primarily of two species of trout (brook trout and rainbow trout), largemouth bass, and several species of panfish. Gilmore Creek originates in southeastern Juneau County, Wisconsin. It is a tributary to Trout Lake and ultimately the Wisconsin River. Gilmore Creek is 3.5 miles in length and has a drainage area of 5.79 square miles. Land use is dominated by agriculture, woodland, wetlands, and limited residential development. Factors impacting the water quality of Gilmore Creek include sediment and nutrient loading from timber harvesting and runoff from agricultural lands, lack of habitat and stable substrate, and hydrologic manipulation. Macroinvertebrate samples indicate "good" water quality.

Nonpoint Source Pollution

1. The Trout Lake subwatershed contains 3 animal lots which contribute 243 pounds of phosphorus [organic] annually. This represents an estimated 5% of the phosphorus for the entire watershed.

2. The upland sediment delivery in the Trout Lake subwatershed is 291 tons, annually, or 2% of the entire watershed load. Cropland is the major source in this subwatershed, contributing 90% of the load.

Water Resources Goals and Objectives

The following goals and objectives are recommended for improving the surface water resources of Trout Lake subwatershed.

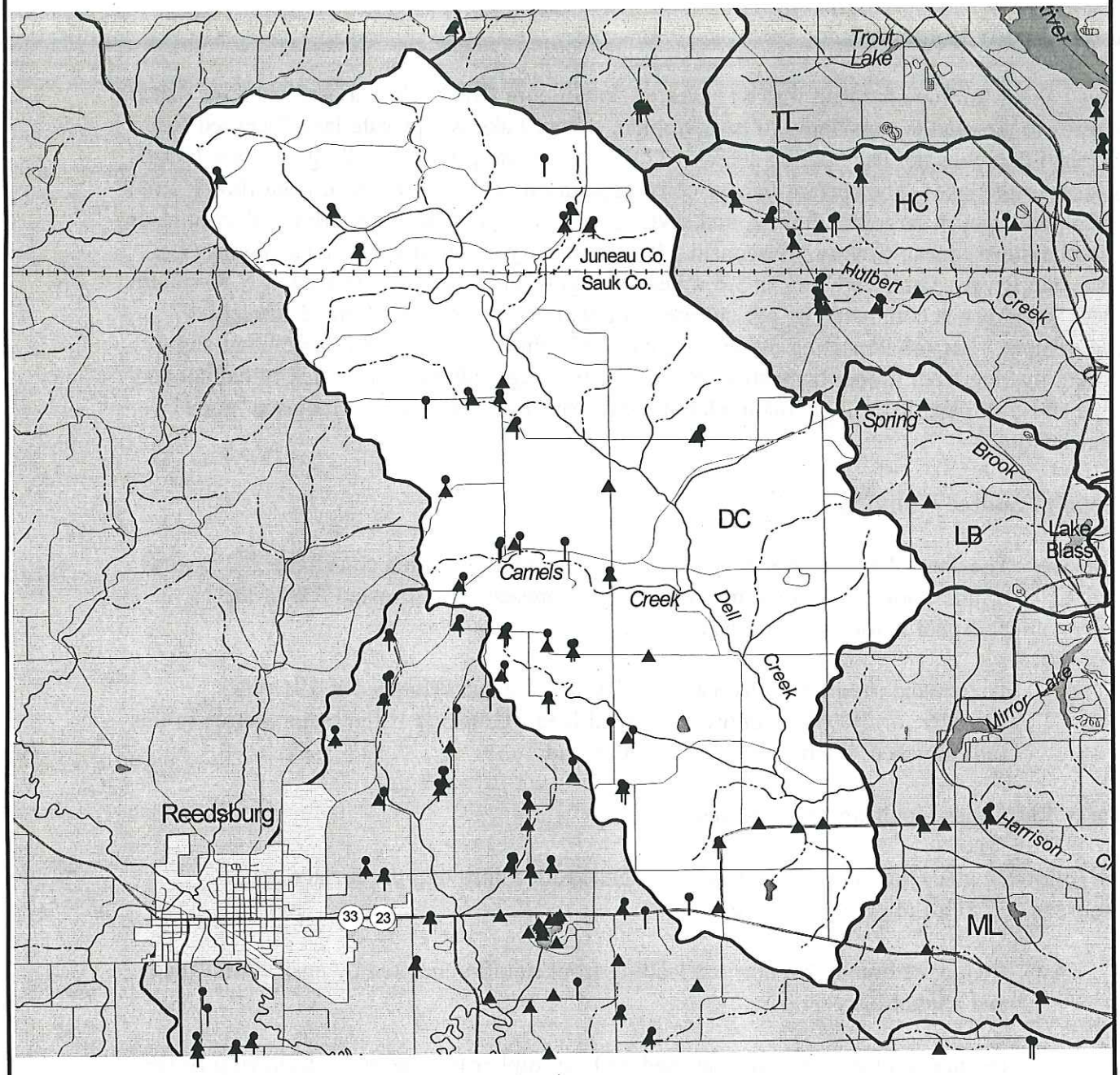
A. Reduce sediment and nutrient loading from runoff generated by agricultural fields and animal lots.

B. Reduce sediment and nutrient loading from timber harvesting by following BMPs designed to protect water quality.

C. Maintain native grassland buffers, grassed waterways, and other woodland and wetland buffers to aid in nutrient and sediment retention.

D. Enhance stream temperature below the Trout Lake dam by allowing drawdown from the base of the dam.

Map 2-2 Dell Creek Priority Watershed Project
Dell Creek Subwatershed



Legend

- Well Locations
- Barnyard Locations
- Major Highways
- Local Roads
- Municipalities
- Watersheds
- Streams
- Open Water
- Subwatershed Boundaries
- County Boundary

STUDY AREA

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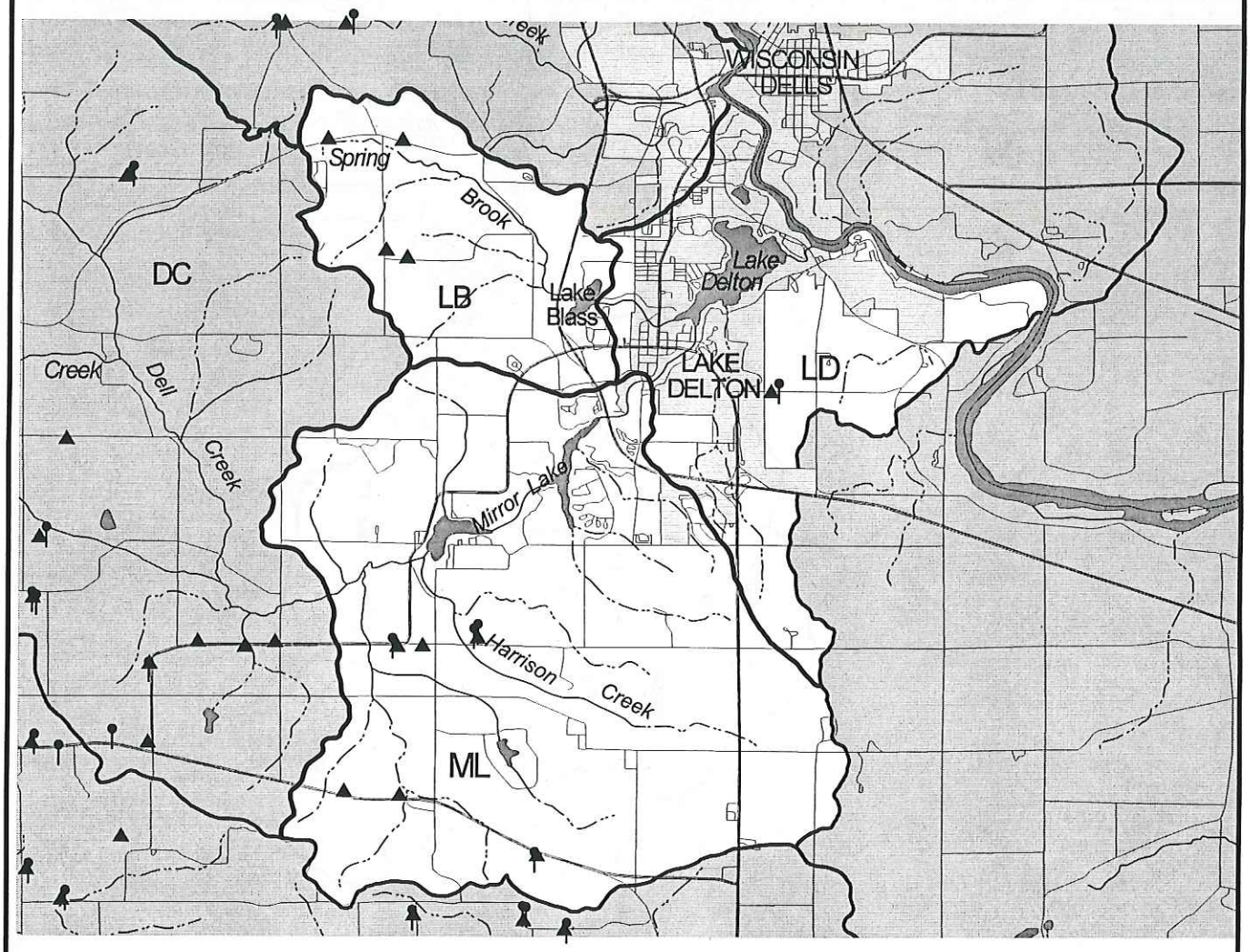
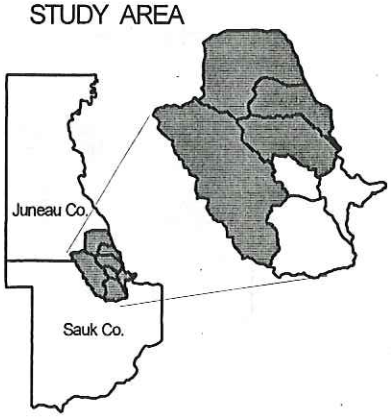
Map 2-3 Dell Creek Priority Watershed Project
Mirror Lake, Lake Delton, Lake Blass Subwatersheds



Legend
- Well Locations
- Barnyard Locations
- Major Highways
- Local Roads
- Municipalities
- Watersheds
- Streams
- Open Water
- Subwatershed Boundaries
- County Boundary

0 0.5 1 1.5 Miles

STUDY AREA



LB = Lake Blass
LD = Lake Delton
ML = Mirror Lake

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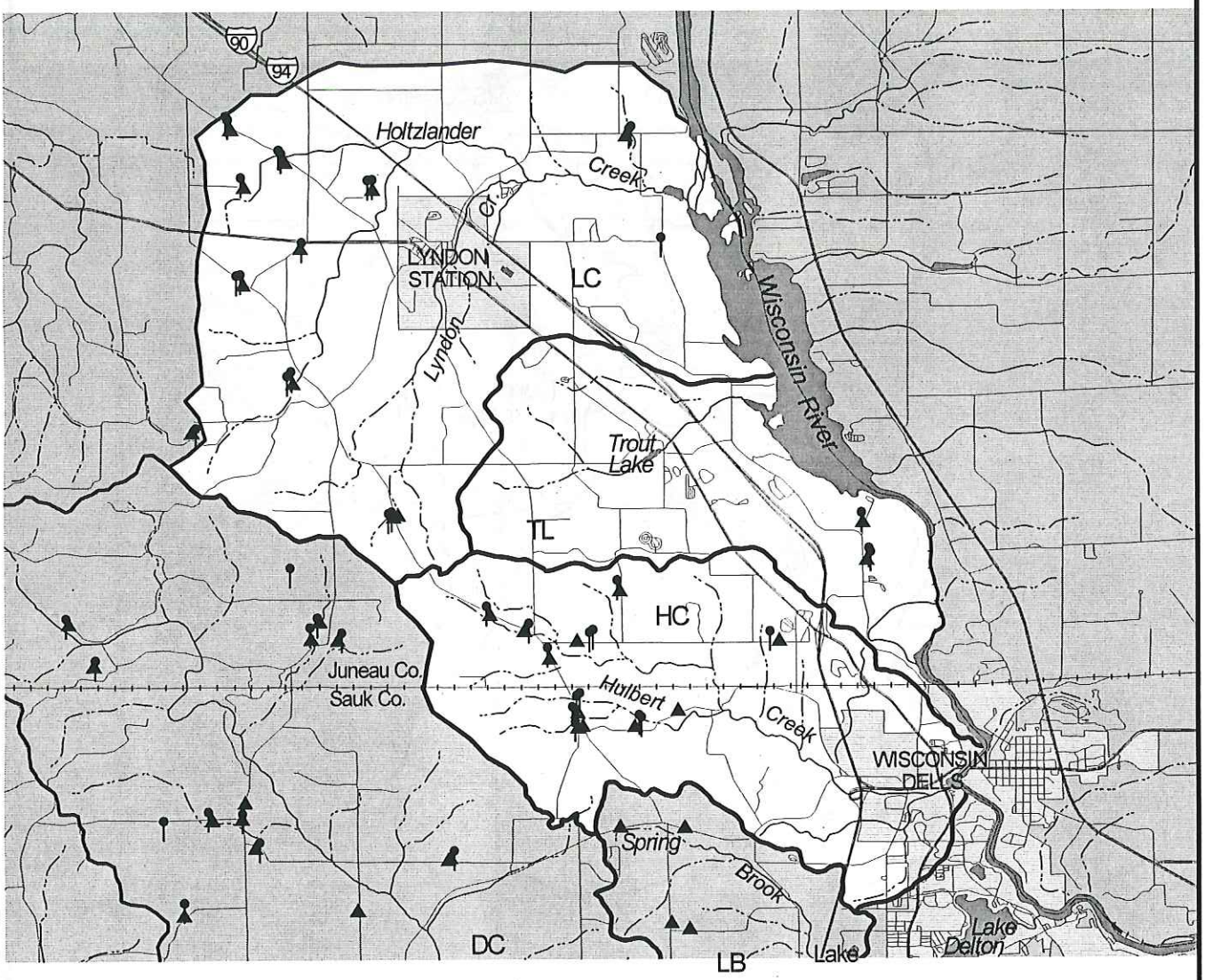
Map 2- 4 Dell Creek Priority Watershed Project
Lyndon Creek, Hulbert Creek, Trout Lake Subwatersheds



Legend
- Well Locations
- Barnyard Locations
- Major Highways
- Local Roads
- Municipalities
- Watersheds
- Streams
- Open Water
- Subwatershed Boundaries
- County Boundary

0 2 4 Miles

Study Area

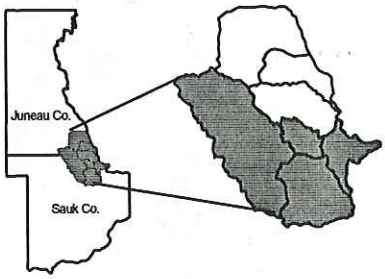


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Table 2-4. Water Resource Conditions, Problems, and Nonpoint Sources of Pollution in Dell Creek Subwatersheds.

Subwatershed	Stream or Lake	Fish & Other Aquatic Life[1]	Fishery IBI[2]	Habitat Rating[3]	Biotic Index Rating[4]	Problems/Limiting Factors[5]	Potential Sources of Pollution[6]
Dell Creek	Dell Creek	WWSF, COLD, FAL	Poor to Fair	Fair	Fair to Excellent	SED NUT HAB	CL BY BL
	Beaver Creek	COLD	-	Fair	-	SED NUT BED HAB	CL BY GY BL
	Camels Creek	COLD & FAL	Fair to Excellent	Fair	Good	SED NUT HYD	CL BY BL
Hulbert Creek	Hulbert Creek	COLD	Poor to Good	Poor to Fair	Good	SED NUT BED GUL BD HAB	CL BY BL UB
Lake Blass	Spring Brook Creek	FAL	Very Poor	Poor	Good	SED NUT FLO TEMP HYD URB DO	CL BY BL
	Lake Blass	Eutrophic	-	-	-	SED NUT PL	CL BY UB BL
	Spring Brook Lake	Eutrophic	-	-	-	SED NUT PL	CL BY
Lyndon Creek	Holtzander Creek	COLD	Poor to Fair	Poor to Fair	Good	SED NUT FLO HAB	CL BY BL
	Tracy Creek	FAL	-	Fair	Very Good	SED NUT FLO HAB	CL BY BL
	Lyndon Creek	COLD & FAL	Fair	Fair	-	SED NUT HAB URB	CL BY BL
Mirror Lake	Harrison Creek	FAL	Good	Poor to Fair	Good	SED NUT HYD HAB	CL BY BL
	Dell Creek	FAL	-	Fair	Good	SED NUT BD FLO BED	CL BY BL
	Mirror Lake	Eutrophic	-	-	-	SED NUT PL	CL BY BL
Lake Delton	Lake Delton	Eutrophic	-	-	-	SED NUT PL URB	CL BY UB
	Lost Canyon	Intermittent	-	Poor	-	FLO SED NUT URB BAC	BY UB
Trout Lake	Trout Lake	Eutrophic	-	-	-	SED NUT PL	CL BY
	Gilmore Creek	COLD	Fair to Poor	Fair	Good	SED NUT HAB HYD	CL BY

LEGEND:

1. Fish & Other Aquatic Life: - This column indicates the existing biological use supported by the stream as defined in NR 102 (04)(3) under fish and aquatic life uses. **COLD** = coldwater communities. **WWSF** = warmwater sport fish communities. **FAL** = warmwater forage fish communities.
2. Fishery IBI: - This column indicates fish assemblages for assessing biotic integrity and environmental health in coldwater streams based on fish habitat and communities present.
3. Habitat Rating: - This column indicates the relative quality and quantity of aquatic life habitat in the stream.
4. Biotic Index Rating: - This column indicates water quality condition based on Hilsenhoff Biotic Index which uses macroinvertebrates as an indicator of organic pollution.
5. Problems/Limiting Factors: **SED** - Sediment / **NUT** - Nutrient Enrichment / **HAB** - Habitat (limited) / **PL** - Aquatic Plants/Algae / **URB** - Urban Runoff / **BED** - Bedload Transport / **TEMP** - Temperature (warm) / **HYD** - Hydrologic Manipulation / **FLO** - Limited Streamflow / **BD** - Beaver Dams / **GUL** - Gully Erosion **DO** - Dissolved Oxygen Problems / **BAC** - Bacteria (MMFCC/100ml)
6. Potential Sources of Pollution **CL** - Cropland Erosion / **BY** - Barnyard Runoff / **BL** - Bedload Transport / **GY** - Eroded Gully / **UB** - Urban Runoff

CHAPTER THREE

Rural Inventory Results, Nonpoint Source Pollutants, and Cost-Share Eligibility Criteria

This section describes the nonpoint source inventories, objectives and cost-share eligibility criteria for each rural pollutant source. These sources include: barnyard runoff; agricultural nutrients; and sediments from upland areas, gully erosion, and streambank erosion.

Management Categories

Cost-share funds for installing pollutant control measures will be targeted at sites which deliver the highest levels of pollutants (urban runoff, barnyards, manure spreading, upland fields, streambank and shoreline erosion or streambank habitat degradation sites). Management categories define which nonpoint sources are eligible for financial and technical assistance; they are based on the amount of pollution generated by a source and the feasibility of controlling the source. Watershed staff can re-evaluate individual sites to determine appropriate eligibility designation. Specific sites or areas within the watershed project are designated as either "critical," "eligible," or "ineligible." Designation as a critical site indicates that controlling that source of pollution is essential for meeting the water quality objectives for the project. Nonpoint sources which are eligible but not critical contribute less of the pollutant load, but are included in cost-sharing eligibility to further insure that water quality objectives are met. Landowners with eligible sites need not control every eligible source to receive cost-share assistance.

Management category eligibility criteria are expressed in terms of tons of sediment delivered to surface waters from eroding uplands and streambanks; pounds of phosphorus [organic] delivered to surface waters; feet of streambank trampled by cattle; and pounds of heavy metals and organics from urban areas. Any newly created sources requiring controls after the signing of a cost-share agreement must be controlled at the landowners expense.

The Sauk and Juneau County LCDs will assist landowners in applying BMPs. Practices range from alterations in farm management (such as changes in manure-spreading and crop rotations) to engineered structures (such as diversions, sediment basins, and manure storage facilities). The practices are tailored to specific landowner situations.

Critical Management Category

Nonpoint sources included in this category contribute a significant amount of the pollutants impacting surface waters. State statutes require that the nonpoint source control plan contain the necessary language which addresses critical sites, thereby ensuring the reasonable likelihood of achieving water quality goals and objectives. Landowners with sites that meet the established critical site criteria are required by law to address those specific sites by

reducing the nonpoint source pollutant load to an acceptable level. Critical sites will address at least 25 percent of the pollution reduction goal.

Eligible Management Category

Nonpoint sources in this category contribute less pollutants which impair water quality. These sites are eligible for technical and cost-share assistance but are not as critical to reaching water quality objectives.

Ineligible Management Category

Sites, which do not contribute significant amounts of pollutants are not eligible for funding under the priority watershed project. Other DNR programs (e.g., wildlife and fisheries management) can, if warranted, assist county project staff to control these sources as part of the implementation of the integrated resource management plan for this watershed. Other local, state, or federal programs may also be applicable to these lands.

Rural Nonpoint Source Pollutants and Management Strategy

Barnyard Runoff

Runoff carrying a variety of pollutants from barnyards and other confined livestock areas is a major source of pollutants in the streams of the Dell Creek watershed. Barnyard runoff is detrimental because of high biological oxygen demand (BOD), chemical oxygen demand (COD), bacteria, phosphorus, ammonia, salts and sediment. Phosphorus is the nutrient of primary concern because it is most often the limiting nutrient in natural water bodies. Phosphorus is also the nutrient most amenable to control, and for this reason will be the target of most broad strategies for water quality management in the Dell Creek watershed project. Seventy-three animal lots are a source of 5,366 pounds of phosphorus per year (table 3-1). Most of the oxygen-demanding pollutants and nutrients associated with these operations drain via concentrated flow to creeks, lakes and wetlands.

The objective for barnyard runoff control is to reduce phosphorus loading to streams by an average of 53 percent. Individual subwatersheds have been identified by the Water Quality Appraisal as needing either a high, medium, or low level of improvement depending on how critical controlling barnyard runoff is to the protection of each water body. The appraisal performed by the DNR for these streams indicate to what degree which subwatersheds are affected by phosphorus runoff.

Barnyard sites contributing a phosphorus load greater than 180 lbs. on an annual basis will be designated as a critical site for control. An estimated 7 sites met this criteria in the watershed. Those landowners with an animal lot designated as a critical site for control are eligible for a full barnyard system. If the site owner is unable to manage the installation or operation of a complete barnyard system, or if the LCD determines that a complete system is not necessary to greatly reduce the phosphorus load from that site, the owner will only be required to divert

upland clean water and roof runoff away from the lot. Installation of these low-cost practices alone will provide significant pollutant load reductions in the Dell Creek watershed. State cost-sharing is available for those low-cost clean water diversions, and landowners of critical sites will also be eligible for a full barnyard system to achieve more phosphorus control if they wish to install them with state cost-sharing.

Barnyard sites that contribute between 50-180 lbs. will be eligible for either clean water only or full barnyard systems. Each site will be assessed and the individual landowner worked with to determine precise needs for their operation. Landowners with lots contributing greater than 50 lbs. of phosphorus annually, will be considered as eligible for cost-sharing, and essential for participation in the Dell Creek watershed if the phosphorus reduction objective is to be met. Landowners wishing to participate in the watershed project who have an animal lot that falls within this category may need to address their barnyard as a component of the cost-share agreement.

Barnyard sites contributing between 10 and 50 lbs. of phosphorus annually will only be eligible for clean water work. Barnyards contributing less than 10 lbs. of phosphorus are not eligible for cost-sharing for runoff control. These sites account for 15 percent of the total number of animal lots and only 54 lbs. of the annual phosphorus loading to the Dell Creek watershed.

Certain components of waste management systems (as specified in NRCS Std. 312), specifically those involving collection, handling and storage, require the preparation of a nutrient management plan (NRCS Std. 590) for the acreage that the waste may be spread on. Roof Runoff Management (NRCS Std. 588), Livestock Exclusion (NRCS Std. 472) and Clean Water Diversion (NRCS Std. 362) are practices that are exempt from this requirement. Operations eligible for waste management systems are also eligible for cost-sharing of nutrient management practices, specifically the development of both nutrient management and pest management (NRCS Std. 595) plans, soil testing and crop scouting. See "Nutrient and Pest Management" later in this chapter for additional details.

Internally Drained Barnyards

Internally drained barnyards drain to surface depressions or wetlands rather than directly to surface waters. Eligibility for internally drained animal lots is based on a site by site analysis where significant groundwater contamination is determined to be likely. None of the animal lots inventoried during the planning phase of this plan were categorized as being internally drained. Eligibility of internally drained animal lots not identified during the planning phase will be considered by county project staff, water resource management staff from the appropriate DNR Regional office, and staff from the DATCP.

Table 3-1. Barnyard Inventory Results and Eligibility Criteria.

Subwatershed	Inventory Results			Eligibility Criteria		
	Number of Barnyards	Pounds of Phosphorus	Percent of Total Barnyard Phosphorus	**Critical Sites** > 180 lbs. Phos.	**50-180 lbs. Phos.** Full Lots or Clean Water	**10-50 lbs. Phos.** Clean water only
				# Barnyards	# Barnyards	# Barnyards
Hulbert	13	1,024	19.1	2	3	5
Mirror Lake	4	469.1	8.7	2	0	2
Dell Creek	34	2,763	51.5	3	19	9
Lyndon Creek	18	811.2	15.1	0	5	9
Lake Delton	1	55.7	1.0	0	1	0
Trout Lake	3	243.1	4.6	0	2	0
Total	73	5,366	100	7	30	25

Barnyard Runoff Pollution Reduction Objective: 53%, or 2,864 lbs. of Phos.

Category	No. of Sites	Lbs. Reduced	% Reduced (Goal)	% Reduction (Total)
Critical Sites	7	806 (1)	28%	15%
Eligible	55	2,058 (2)	72%	38%
Ineligible	11	---	---	---
Total	73	2,864	100%	53%

(1) This reduction is the control achieved through installing clean water work only.

(2) This reduction is using a 60% participation rate. It is a combination of 50% of those eligible for either option will install full lots and the other 50% will install clean water only. It also includes those eligible for clean water only practices to install them, at the 60% participation rate.

Agricultural Nutrients

The overall watershed goal is to reduce the amounts of nutrients, pesticides, and sediment that are being delivered to streams and lakes. Manure, fertilizers, and pesticides will be targeted for improved management through the adoption of a Nutrient Management Plan (NRCS standard 590) or a Pesticide Management Plan (NRCS standard 595).

Development of a Nutrient and Pesticide Management plan (NRCS standard 590 & 595) will give a landowner an opportunity to have an equal balance of enhancing water quality while maintaining a sustainable agricultural system that reduces excess nutrient and pesticide application and the cost associated with it.

Nutrient and Pest Management

Nutrient and pest management is recognized as one of only a few BMPs that can be applied for protection or improvement of both groundwater and surface water. Farmers can benefit from nutrient and pest management plans by taking nutrient credits for legumes and landspread manure. Commercial fertilizer applications are then adjusted to meet crop needs and can generally be reduced.

Every landowner is eligible for cost-sharing for nutrient management. Watershed wide this totals over 37,000 acres of eligible land for nutrient management.

Nutrient and pest management will be addressed with the development of both nutrient management and pest management plans which may include crop scouting. These plans may be prepared by crop consultants and must be consistent with NRCS Standard 590 and 595. Landowners will be eligible for up to three years of cost-sharing towards crop consultant fees, soil testing and residual nitrogen analysis, and manure nutrient analysis. A cost-sharing rate of 50 percent is available for all nutrient and pesticide management practices. A cost-share rate of 70 percent is available on spill containment systems. Only those sites mixing more than 50 pounds of active ingredient will be eligible. Eligibility for spill containment systems will also be considered by the watershed staff on the basis of cost-effectiveness. These plans will be submitted to and approved by the Sauk County Land Conservation Department. Records should be kept showing progress towards reducing the use of fertilizer and pesticides.

Manure Storage

Nutrient management will be a significant component of manure management systems, barnyards, and manure storage facilities. Cost-sharing eligibility for a grant for manure storage practices will be based on the development of a preliminary Nutrient Management Plan, developed in accordance with NRCS Standard 590. An operation is eligible if the nutrient management plan demonstrates that manure cannot be practically managed during periods of snow-covered, frozen and saturated conditions without the installation of storage practices. The nutrient management plan must also demonstrate the proper utilization of the manure can be achieved following installation of the intended storage practice.

Cost-sharing for storage facilities will be based on the least-cost facility that meets storage capacity needs and is in compliance with NRCS Std. 313 or 425. Additional options for managing manure without cost-share assistance include, properly sited unconfined manure stacks (in accordance with Std. 312); a reduction in the number of animals; the rental of additional lands suitable for winter spreading; or the hauling or broker of manure to a neighboring farm that can use the manure in accordance with a nutrient management plan.

Landowners receiving cost-sharing funds for manure storage practices are required to develop a nutrient management plan for all contiguous cropland acres and any additional acres that will receive manure applications resulting from these practices.

Manure Storage Ordinance

Surface water and groundwater resources are at risk when manure storage facilities are improperly located, designed, or constructed. Manure overflows and storage facility failures are a serious threat to aquatic life. Counties adopt manure storage ordinances to prevent ground and surface water pollution by assuring the proper design, construction, location, and management of permitted facilities. An ordinance must meet the guidelines adopted by DATCP and cite the applicable NRCS construction and management standards. Sauk County adopted a manure storage ordinance in 1990 and Juneau County adopted a manure storage ordinance in 1997. These ordinances require permits for the installation, modification and major repair of manure storage facilities.

Rural Construction Site Erosion and Stormwater Management

Cost for development and administration of ordinances designed to protect water quality maybe eligible for reimbursement. This eligibility is based on the assumption that the cost of preventing damage from erosion and sedimentation is more cost-effective than trying to correct the damage incurred. Water quality protection could be a part of subdivision ordinances, zoning ordinances, construction site erosion control ordinances and others.

Chapters 236 and 281.33 of the Wisconsin State Statutes gives cities, towns, villages, and counties the authority to control erosion from developing subdivisions and smaller developing parcels. These chapters establish minimum standards and procedures. The units of government within the watershed should investigate the development and administration of such ordinances.

Based upon inventory results these developing sites are a major contributor of sediment to the lakes and streams. The units of government involved may want to consider a cooperative arrangement to supply the staff needed to effectively administer these controls without overburdening any one community. All of the municipalities are encouraged to adopt construction site erosion control and stormwater management zoning ordinances.

Similar to erosion control, Wisconsin cities, villages, towns, and counties have the authority to adopt stormwater management zoning ordinances. A draft Model Stormwater Management Ordinance was developed by the DNR in 1995. This model ordinance is meant to be complimentary to the model construction site erosion ordinance prepared in 1987 by the DNR, in conjunction with the Wisconsin League of Municipalities.

It is recommended that the Wisconsin Construction Site Erosion Best Management Handbook (DNR Publication WR-222-93 Rev) and the Wisconsin Stormwater Manual Part 1 (DNR Publication WR-349-94) be used as a reference for any development that occurs in the Dell Creek Watershed.

All municipalities in Sauk and Juneau Counties are encouraged to adopt construction site erosion control and stormwater management ordinances.

Upland Sediment

Intensive agricultural practices have caused considerable amounts of eroded soil to reach streams, ponds, and wetlands in the Dell Creek watershed. Upland erosion is the major source of the sediments that are carried downstream, beyond individual subwatershed boundaries.

Upland sediment sources were evaluated through subarea sampling and extrapolated for the entire watershed (132 square miles). The results of this inventory are summarized in table 3-2. An estimated 13,886 tons of soil per year are delivered to streams in the watershed from croplands. Table 3-3 summarizes upland sediment loading by land use for all subwatersheds.

A 25 percent reduction in sediment delivery from eroding fields is targeted for agricultural lands. This would reduce the sediment load delivered to surface waters by approximately 3,500 tons/year. This translates into bringing those agricultural fields delivering sediment to streams at a rate greater than 0.7 tons/acre/year, down to 0.7 tons/acre/year. Soil erosion and sediment delivery rates are calculated using the Universal Soil Loss Equation (USLE) in addition to other hydrology information located in a sediment transfer model based on USLE (WINHUSLE) and the Field Offices Computing System (FOCS). A representative sample of roughly 50 percent of the entire watershed land area was completed at the time of plan writing and the results were extrapolated to the rest of the watershed; therefore, the county staff will need to continue the inventory throughout the first three or four years after plan approval to more thoroughly identify eligible and critical fields.

To be classified as "Critical", landowners' fields must be contributing greater than "T", or the tolerable soil loss in tons/acre/year, and be determined to deliver greater than 1.75 tons/acre/year of sediment reaching surface waters. Based on extrapolation of the inventory information, approximately 438 acres of cropland in the Dell Creek watershed meet the critical site criteria. Controlling these acres would reduce the sediment load delivered to surface waters by an estimated 856 tons per year. All critical site cropland fields will need to be reduced to "T" or less and deliver sediment to the stream at 1.75 tons/acre/year or less.

The remainder of the pollutant reduction goal will be controlled through eligible sites, which include an estimated 20,833 acres and will control 2,644 tons. Eligible classification includes those fields delivering sediment at a rate down to 0.3 tons/acre/year (Table 3-2).

Table 3-2. Eligibility Criteria for Upland Sediments.

Subwatershed	Inventory Results			Goal- 25% reduction in sediment delivered (3,500 tons)						
	Area (Acres)	Sediment delivered (tons/year)	Percent Contributed by Watershed	Critical Sites > T soil loss and > 1.75 sediment delivered (tons/acre/year)			Eligible Sites > T soil loss or > 0.3 sediment delivered (tons/acre/year)			Total % of goal from each subwatershed based on WINHUSLE
				# Acres	Target Tons Reduced	Percent Reduced (of goal)	# Acres	Target Tons Reduced	Percent Reduced (of goal)	
Lyndon Creek	9,460	1,940	14	47	98	3	1,948	373	11	14
Trout Lake	4,851	291	2	0	0	0	793	28	1	1
Hulbert Creek	7,450	1,157	8	86	126	4	1,873	250	7	11
Dell Creek	21,248	5,955	43	239	308	9	10,410	1,032	29	38
Mirror Lake	10,869	3,246	23	39	255	7	3,668	669	19	26
Lake Delton	3,484	584	4	2	40	1	874	201	6	7
Lake Blass	3,481	713	5	25	29	1	1,267	92	3	4
Total	**60,843**	**13,886**	**100**	**438**	**856**	**25**	**20,833**	**2,644**	**75**	**100**

Source: Sauk and Juneau County LCDs.

Table 3-3. Summary of Upland Sediment Loading By Land Use.

Subwatershed		Cropland	Farmsteads	Pasture	Woodland	Totals
Lyndon Creek	Acres	6,422	298	974	1,766	9,460
	Sediment	1,718	85	120	17	1,940
Trout Lake	Acres	2,750	300	227	1,574	4,851
	Sediment	263	22	4	2	291
Dell Creek	Acres	13,155	309	1,669	6,115	21,248
	Sediment	5,504	202	202	47	5,955
Hulbert Creek	Acres	4,935	187	444	1,884	7,450
	Sediment	1,065	43	19	30	1,157
Lake Blass	Acres	843	55	436	2,147	3,481
	Sediment	653	36	21	3	713
Mirror Lake	Acres	6,387	324	296	3,862	10,869
	Sediment	3,088	139	13	6	3,246
Lake Delton	Acres	2,672	49	498	265	3,484
	Sediment	534	18	31	1	584
Total	Acres	37,164	1,522	4,544	17,613	60,843
	Sediment	12,825	545	410	106	13,886

source: Sauk and Juneau County LCDs.

Gully Erosion

A field inventory of gully erosion was not done. Any significant gullies identified during implementation will be evaluated to determine if they are significant sediment sources and eligible for cost-sharing. If an on-site evaluation of an active gully leads local LCD staff to the conclusion that the installation of structural practices would not be cost-effective, the site will be deemed as ineligible for those specific practices. All active gullies will be eligible for critical area stabilization and seeding.

Soil erosion that occurs from gully activity on cropland will mainly be controlled through the installation of grassed waterways. In some instances, other Best Management Practices such as high residue management and/or the installation of structural practices, such as sediment and erosion control basins, may reduce or eliminate the need for grassed waterways.

Less noticed ephemeral gullies may be a significant part of the erosion problems. During runoff events, they both erode and aggrade; but after the runoff has dissipated, they may appear no different than the surrounding land, making them difficult to detect during an inventory. As part of their landowner contracts, LCD staff will consider upland areas on the farm, which may be susceptible to ephemeral gullies and examine options with the landowner for reducing sediment runoff from them.

Streambank Erosion

Streambank erosion contributes one percent of the total sediment load to surface waters in the Dell Creek Priority Watershed. Approximately 65 miles of streambanks were evaluated. Significant erosion has occurred and/or aquatic habitat and water quality were degraded along approximately 0.5 mile of streambank. An estimated 120 tons of sediment are eroding into streams annually. No critical sites were identified. See table 3-4 for the streambank inventory results. Eligible streambanks are those contributing greater than 0.5 tons per year. There are 50 sites that are eligible. Six of these sites are located on State of Wisconsin property, one site is located on Sauk County property, seven sites are located on Township of Delton property, and the remaining 36 eligible sites are under private ownership. If an on-site evaluation of an eroding streambank leads local LCD staff to the conclusion that the installation of structural practices to correct the problem would not be cost-effective, that site will be deemed as ineligible. Generally, streambank sites that are located within woodland or wetland areas are not accessible and the installation of structural practices would not be cost-effective.

Livestock Access

There are approximately 600 feet of streambanks with livestock access throughout the Dell Creek watershed. This contributes to stream habitat degradation by trampling of streambanks and removal of bank-stabilization vegetation. Once the banks are trampled, the stream channel widens; and once the vegetation is removed, the stream becomes warmer from the increased sunlight infiltration. The water becomes more turbid from livestock trampling of the streambed and added nutrient and sediment loading, which also increases the temperature. A

warm, turbid stream channel is unsuitable for many forms of aquatic life particularly sport fish. See table 3-5 for streambank eligibility criteria and additional information on streambank eligibility. Any trampled sites with livestock access will be eligible for cost-sharing. There will be no critical sites.

Table 3-4. Streambank Inventory Results: Dell Creek Priority Watershed Streambank Erosion and Degraded Habitat.

Subwatershed	Inventoried Streambank Length (feet)	Eroded Sites (feet)	Trampled Sites (feet)	Slumped Sites (feet)	Cattle Access (feet)	Total Sediment Loss Tons/Year	% Bank Degraded From E,T,S	% of Total Bank Erosion in Watershed
Dell Creek	57,012	415	55	385	95	41.1	1.5	30
Hulbert Creek	48,258	350	150	0	500	33.1	1	18
Lake Blass	23,632	150	0	0	0	3.3	0.6	5
Lake Delton	41,976	295	0	180	0	27.1	1.1	17
Lyndon Station	90,370	95	250	115	365	6.6	0.5	16
Mirror Lake	69,650	215	150	0	290	9	0.01	13
Trout Lake	13,398	0	0	0	0	0	0	0
Totals	344,296	1,520	605	680	1,250	120.2	4.71	100%

Source: Sauk County LCD

Table 3-5. Streambank Eligibility.

Eroding Streambanks

Management Category	Sediment Delivery	Target Reduction
Eligible	> 0.5 ton/year	< 0.5 ton/year
Non-Eligible	< 0.5 ton /year or in inaccessible areas where BMPs would not be cost effective	NA

Trampled Streambanks

Management Category	Description	Objective
Eligible	Trampled/Degraded Livestock Access	Vegetate & Limit Livestock Access
Non-Eligible	Vegetated No Livestock Access	NA

Shoreline Erosion

While shoreline erosion on Mirror Lake and Lake Delton is essentially a natural process caused by wind and wave action, it may be affected by water level fluctuations, human trampling, and shoreline land use practices. A shoreline erosion inventory was done during the summer of 1997. The Mirror Lake inventory showed that approximately 400 feet of shoreline had slight to moderate erosion. These eroded areas are associated with development which has occurred upon the bluffs comprising Mirror Lake's shoreline. The Lake Delton shoreline inventory indicated slight erosion. Much of this shoreline was found to be rip-rapped where there was development.

While the inventory does not identify shoreline erosion as a major sediment problem, there may be areas where shoreline habitat is being affected due to severe erosion. Specific sites will be evaluated by watershed staff to determine if they are significant sediment sources and eligible for cost-sharing. If an on-site evaluation of an eroding shoreline leads local LCD staff to the conclusion that the installation of structural practices to correct the problem would not be cost-effective, that site will be deemed as ineligible.

Pollutant Reduction Goals and Project Objectives for Rural Nonpoint Sources

Goals for water quality in the Dell Creek watershed were identified earlier in the chapter as protection, enhancement, and restoration of water resources. In rural areas these will be achieved through project objectives for sediment, phosphorus, and groundwater.

The following is a summary of reductions to be targeted for the entire watershed.

Sediment Objective: Reduce overall sediment delivered by 25%.
To meet this, the following is needed:

- 25% reduction in sediment reaching streams from agricultural uplands in all subwatersheds, or at least 3,500 tons/year
- Reduction of soil loss from streambanks contributing greater than 0.5 tons/year.
- Stabilization of gullies that provide a significant sediment source.

Phosphorus Objective: Reduce overall phosphorus load by 30%.
To meet this, the following is needed:

- 53% reduction in P from barnyards in all subwatersheds, or at least 2,864 pounds/year.
- 25% reduction in P from sediment delivered from uplands to all streams and lakes in the watershed.
- A general reduction in phosphorus from landspread manure.

Eligibility for Wetland Restoration and Easements

Wetland Restoration

Prior to European settlement, Wisconsin had an estimated 10 million acres of wetlands. Today, slightly more than 5.3 million acres remain. Many thousands of pre-development wetlands have been converted to cropland. Thousands more have been filled for highways and urban development.

Wetlands are an important part of our ecosystem. When water enters a wetland, the wetland acts as a purifier, cleaning the water before it exits. Wetlands do this by removing, retaining, and transforming nutrients, processing wastes, and trapping sediment. Wetlands are a principal conduit for rain water flowing to lakes and streams. Their importance to water

quality, water supply, flood control, erosion control, flora and fauna, and the food chain is significant.

Wetlands vary from areas with seasonally saturated soil conditions to areas with standing water year-round. Some of the diverse types of vegetation that can be found in wetlands include pond lilies, cattails, rush, black ash, and willow. Wetland restoration may include plugging or breaking up existing tile drainage systems, the plugging of open channel drainage systems, other methods of restoring the pre-development water levels of an altered wetland, and fencing of wetlands to exclude livestock. Restoration must be in accordance with NRCS Standard 657 - Wetland Restoration and wetland specialist recommendations. Native seed and plants will be used wherever possible and no reed canary grass will be planted.

Restoration of wetlands provides primary and secondary benefits to water quality:

- **Primary** - The use of wetland restoration as a best management practice for the purpose of controlling nonpoint sources of pollution. To control runoff pollution, the wetland must act as a sediment and nutrient filter, provide flood and stormwater attenuation and storage area, and provide infiltration.

- **Secondary** - Enhancement of fish and wildlife habitat. Wetlands provide essential habitat for fish, waterfowl, animals and plants, including endangered species.

At present, there is no targeted goal in this project to restore any wetland sites. However, the following two conditions must be met in order for wetland restoration to be cost-shared.

- All upland fields draining to the wetland must be controlled to a soil loss rate that is less than or equal to the soil's "T" value.

- Wetland restoration costs must be the **least-cost** practice to reach sediment reduction goals.

Cost-share eligibility for wetland restoration is divided into 3 categories:

1) Priority Restorations - Priority wetland restorations provide at least one of the water quality benefits as described in a. through d. below **and** provide essential habitat for fish, waterfowl, animals, or plants, including endangered species.

a. Cultivated hydric soils with tile or open channel drainage systems discharging to a stream or tributary. Wetland restoration will reduce the amount of nutrients and pesticides draining from the altered wetland to a water resource by establishing permanent vegetation and altering the drainage system.

b. Pastured wetlands riparian to streams, or tributaries. Eliminating livestock grazing within wetlands will reduce the organic and sediment loading to the wetland and adjacent

water resource, and reduce the direct damage to the wetland from the livestock. Livestock exclusion by fencing will control the pollutants and restore the wetland.

c. Wetlands down-slope or up-slope from fields identified as significant upland sediment sources. Restoration of wetlands in these situations may do two things: **1)** create a wetland filter which reduces the pollutants from an up-slope field(s) to a water resource; or **2)** reduces the volume and velocity of water flowing from an up-slope wetland to a down-slope critical field.

d. Wetlands providing water quality improvements through infiltration. Water stored in wetlands is filtered as it infiltrates to groundwater and increases base flow in streams.

Additionally, priority will be given to prior converted and farmed wetlands. **Prior converted** wetlands are those that have been drained, dredged, filled, leveled, or otherwise manipulated (including removal of woody vegetation) before December 23, 1985, for the purpose of making the production of an agricultural commodity possible. **Farmed wetlands** include potholes and seasonally flooded or ponded wetlands that were not fully converted prior to December 1985 and are cropped in dry years.

2) Eligible Restorations - Sites that do not meet the definition of a priority site yet offer significant water quality benefits such as providing storage of storm event runoff and flood flows that significantly improve the watershed hydrology or perform the function of a filter to delay, absorb, or purify contaminated runoff before it enters watershed streams or lakes.
3) Ineligible Restorations - Sites where existing physical characteristics or conditions are such that the potential for restoration would not be environmentally viable or economically feasible.

Wetland Restoration Permitting - County LCD staff, DNR, US Fish and Wildlife, or NRCS wetland restoration experts will assist landowners in plan development including assistance in obtaining permits. Permits may be needed from three sources.

- Federal (Army Corps of Engineers) Clean Water Act §404 - Prior converted wetlands are exempt from this permit.
- State (DNR) Clean Water Act §401 Water Quality Certification, Chapter 30 and 31, Stats.
- Local (County or Municipal Zoning Office).

Land Easements

Nonpoint source program funds may be used to purchase land easements in order to support specified best management practices. These practices, all of which involve the establishment of permanent vegetative cover, include:

- Shoreline Buffers: vegetative areas which minimize nonpoint source impacts and other direct impacts to streams;
- Critical Area Stabilization: stabilization efforts needed on sites that either erode at an excessive rate, or have high sediment delivery rates to surface water;
- Wetland Restoration: areas where wetlands are intentionally restored or enhanced in order to improve their ecological values, such as natural filters of surface water.

Easements may also be considered for protecting municipal wellheads if it can be established that vegetative cover will correct an existing groundwater quality threat. Although easements are not considered a best management practice, they can help achieve desired levels of nonpoint source pollution control in specific conditions. Easements are used to support best management practices, enhance landowner cooperation and more accurately compensate landowners for loss or altered usage of property. The benefits of using easements in conjunction with a management practice are: 1) riparian easements can provide fish and wildlife habitat along with the pollutant reduction function; 2) easements are generally perpetual, so the protection is longer term than a management practice by itself; and 3) an easement may allow for limited public access (depending on the situation). However, the primary justification of an easement must be for water quality improvement.

Easements should be considered in the following situations:

To exclude livestock from grazed wetlands or along eroding streambanks within the watershed. Easements are strongly recommended whenever:

- there is any grazing of wetlands.
- livestock density is so great that areas of unvegetated soil are within 60 feet of streams or intermittent streams.
- More than 600 feet of streambank are severely trampled and eroding.
- channel erosion is exacerbated by livestock grazing such that unvegetated streambanks are two feet or more in height.

When elimination of row cropping and the establishment of permanent vegetative cover will stabilize a critical area. Easements are strongly recommended whenever:

- Row cropping is occurring within 60 feet or less of streams or intermittent streams.
- Row cropping is being practiced on slopes greater than 6%.

When a barnyard or animal feedlot is located within the flood plain and: a) a permanent easement is the least-cost alternative to provide adequate pollution reduction or b) a permanent easement provides a greater level of pollution reduction than on-site engineering options at a price that is cost-effective when compared to the level of pollution reduction and the price of the available engineering options. Easements are strongly recommended whenever:

- Engineering options would require intensive management in order to continue to provide adequate pollution reduction.
- Surrounding land use is largely agricultural and it is anticipated that it will remain so for two decades or more.

Whether purchased by the Department or by the local project sponsor, easements are cost-shared at 100%. Easements must be perpetual if purchased by the department. If the county chooses to enter into an easement with the landowner, then the easement must be perpetual or for no less than 20 years.

Urban Inventory Results, Nonpoint Source Pollutants, and Pollution Reduction Goals

An urban nonpoint source inventory and analysis was conducted to identify the urban nonpoint source pollutants and to prioritize major and minor constraints to achieving water quality goals in the Dell Creek watershed. This section also presents the management needs and reduction objectives for each pollutant in the urban component of the project. It includes assessments for stormwater conveyance, sediment from construction site erosion and streambank erosion, and pollution prevention practices. The section ends with a summary of the pollutant reduction goals and project objectives for urban nonpoint sources.

Description of Urban Runoff

The principal water quality and quantity problems derived from urban runoff result from many factors including:

- Loadings of sediment, nutrients, heavy metals and other toxic materials.
- Stream channel modifications, including straightening and lining with concrete.
- Hydrologic disturbances, including flashy high flows and loss of base flow.
- Streambank erosion.

Urban runoff carries a variety of pollutants to surface water. Pollutants found in urban runoff include heavy metals (lead, copper, zinc, cadmium and chromium) and a large number of toxic organic chemicals (polychlorinated biphenols, polycyclic aromatic hydrocarbons, pesticides and many others). Other substances in urban runoff include sediment, nutrients, bacteria, and protozoans. The pollutants that are the focus of this watershed are sediment, phosphorus, and heavy metals (represented by lead).

Urban Pollutants

The delivery of pollutants to streams from existing urban areas depends on the types of urban land uses, the types of stormwater conveyance systems, and urban pollution prevention practices, such as street sweeping, yard waste collection, and waste oil recycling programs. Freeways, commercial and industrial areas have the highest unit/area/year pollutant loads, producing the most significant amounts of metals and other urban toxic pollutants. Medium density and multi-family residential areas also generate metals, sediment and phosphorus and include large impervious areas. Residential areas contain more lawn area than commercial areas, while commercial areas have more rooftop, street, and parking lot surfaces. Lawns can also contribute fertilizers and pesticides. Rooftop areas are important sources of zinc and atmospheric pollutants. Their connection to the storm drainage system may be direct or indirect, depending on the use of downspouts, grassed areas, drain tiles, etcetera.

Urban land uses and anticipated growth were summarized in tables 1-1, 1-2, and 1-3 in Chapter One. Existing urban land uses and their respective amounts and types of pollutant loads are shown in table 3-6. The greatest amount of urban land in the watershed is concentrated around the village of Lake Delton. Map 3-1 illustrates the various land uses within the village of Lake Delton. A portion of the city of Wisconsin Dells is also included in this project. Table 3-7 shows the pollutant loading from the two major urban areas in the watershed under existing land uses. The data were modified to reflect the reduction in loading due to the seasonal nature of tourism in the area. These data were generated using a spreadsheet version of the Source Loading and Management Model (SLAMM). Runoff coefficients used in that spreadsheet are the same as the unit area loads in table 3-6.

Runoff from new urban areas has the potential to further degrade lake and stream water quality unless stormwater management controls are incorporated during development.
Table 3-8 shows the increase in urban nonpoint source loading that will occur in the watershed if new urban source areas are not controlled. The village of Lake Delton is projected to nearly double in size over the next twenty years with a corresponding increase in pollutant load. The portion of the city of Wisconsin Dells included in the Dell Creek watershed will see a 16% increase in developed acres in the next twenty years. The only other urban area in the watershed is the village of Lyndon Station which is primarily low density residential with a small portion comprising commercial development. The pollutant loads from the village of Lyndon Station are not likely to exceed 6 tons of sediment, 13 pounds of phosphorus, and 10 pounds of lead on an annual basis.

Table 3-9 reflects the level of street sweeping and grass swale drainage in the watershed for the two principal communities. Standard street sweepers are able to remove large particles, but can remove only 5% of the pollutant load even at higher frequencies of sweeping. Swales designed to convey stormwater, rather than slow the flow to allow treatment, will have minimal effect on pollutant load. The loads reported in table 3-7 reflect existing control practices such as street sweeping and grass swales.

Map 3-1

VILLAGE OF LAKE DELTON INVENTORIED LAND USES

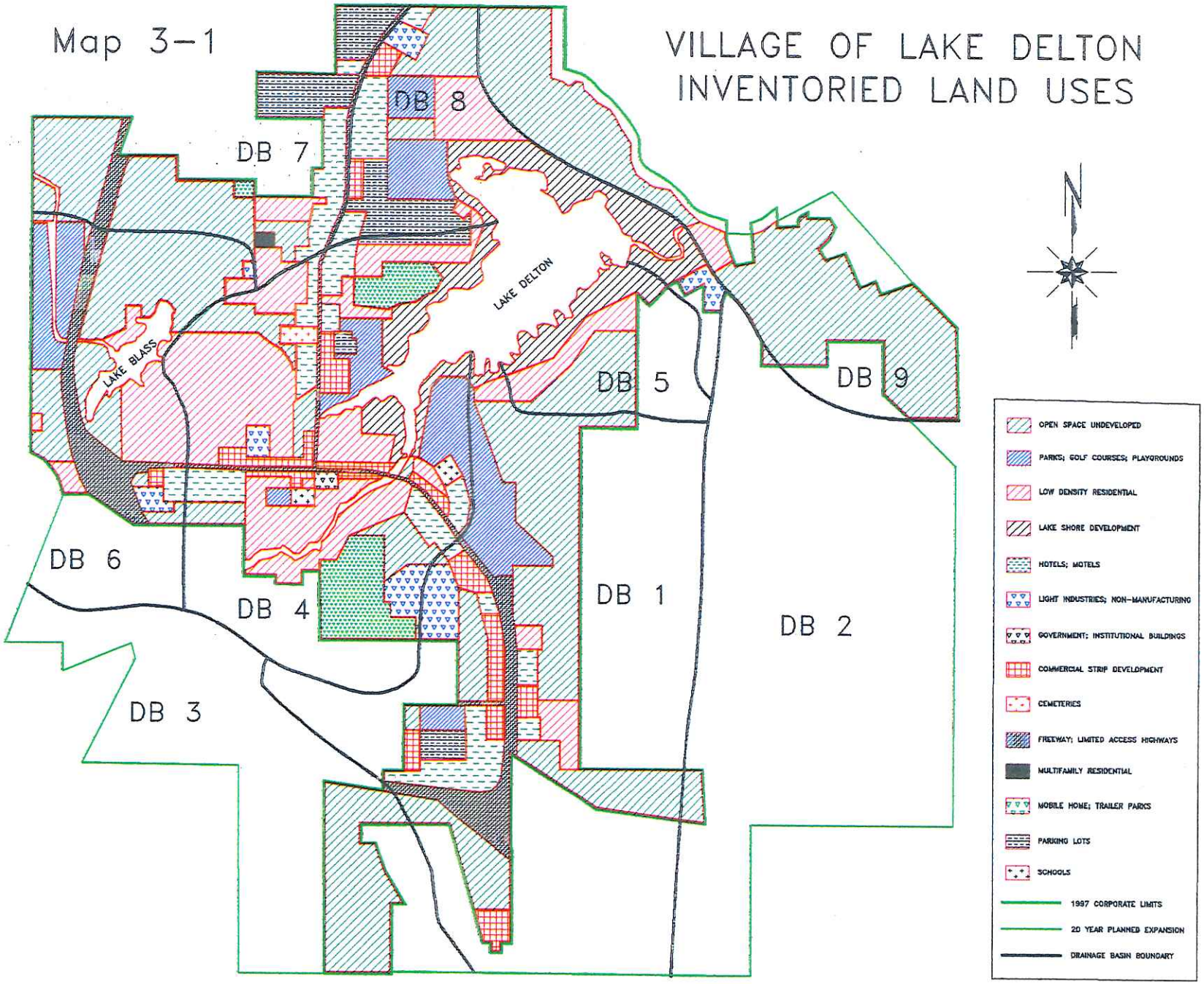

Table 3-6. Pollutant Generation Rates From Urban Land Use.

Land Use	Unit Area Load (pounds/acre/year)				
	Sediment	Phosphorus	Lead	Zinc	Other Concerns
Highways/Streets	600	0.9	1.9	2.5	volatile organics
Light Industrial	700	0.9	1.25	1.75	volatile organics
Commercial	1400	1.5	2.1	2.7	volatile organics
Shopping Centers	1400	1.5	2.0	2.0	volatile organics
Hotels	1400	1.5	2.1	2.7	volatile organics
Multi-Family Residential	420	1	0.7	0.8	pesticides
Low Density Residential	50	0.05	0.04	0.01	pesticides
Lakeside Development	50	0.4	0.04	0.01	pesticides
Mobile Home Parks	190	0.5	0.2	0.2	pesticides
Schools	190	0.5	0.2	0.2	pesticides
Institutional	700	0.5	0.6	1.1	pesticides
Open Space Parks/Cemeteries	25	0.01		.005	pesticides

Source: DNR

Table 3-7. Urban Land Use and Nonpoint Source Loads in the Dell Creek Watershed: 1997

Subwatershed	Urban Land Use		Sediment		Phosphorus		Lead[1]	
	Acres	%	Tons/Yr	%	Pounds/Yr	%	Pounds/Yr	%
Village of Lake Delton								
1	672.1	20	102.4	26	232	24	451.2	28
2	12.7	<1	0.128	<1	0.104	<1	0.051	<1
3	155	4	8.8	2	24	2	64.8	4
4	872.7	26	116.8	29	300	31	428.8	27
5	148.6	4	2.32	<1	17.6	2	0.96	<1
6	426.1	13	31.2	8	80.8	8	194.4	12
7	337.2	10	70.4	18	156	16	252.8	16
8	364.5	11	64	16	164	17	211.2	13
9	399.4	12	4	1	3.6	<1	1.68	<1
Subtotal	3388.3	100	400	100	978	100	1606	100
City of Wisconsin Dells								
1	853.8	85	112.55	77	247	78	452.3	81
2	153.4	15	33.7	23	71.65	22	103.2	19
Subtotal	1007.2	100	146.25	100	318.65	100	555.5	100

[1] Lead is used as an indication of metal loadings contributed from urban land uses.
Source: DNR SLAMM Spreadsheet (modified to reflect seasonal pollutant loading from tourist industry as 80% of total load)

Table 3-8. Projected 2017 Urban Land Use and Nonpoint Source Loading in the Dell Creek Watershed.

Subwatershed	Acres	Sediment - Tons/Year	Phosphorus - lbs/Year	Lead - lbs/Year
Village of Lake Delton - Dell Creek Subwatershed	6619	756	1716	2780
City of Wisconsin Dells - Hulbert Creek Subwatershed	1195.5	173	374.5	647

[1] Lead is used as an indication of metal loadings contributed from urban land uses.
Source: DNR SLAMM Spreadsheet (modified to reflect seasonal pollutant loading from tourist industry as 80% of total load)

Table 3-9. Grass Swale Drainage, Street Sweeping and Wet Ponds By Land Use For Municipalities in the Dell Creek Priority Watershed.

Municipality	Land Use	Acres	Percent Drained by Grass Swales	Estimated Infiltration Rate (in/hr)	Street Sweeping (sweepings/yr)	Wet Ponds
Lake Delton	Residential	886.5	90	1	12	None
	Commercial	503.6	10	1	40	None
	Industrial	73	50	1	12	None
	Open Space	1675.2	90	1	12	None
	Institutional	20	100	1	12	None
Wisconsin Dells	Residential	87.3	10	1	12	None
	Commercial	102.8	25	1	18	None
	Industrial	33.7	25	1	12	None
	Open Space	591	50	1	12	None
	Institutional	0		1	12	None

Source: DNR - provided to DNR in a municipal survey

Stormwater Conveyance

Description

Stormwater is most commonly conveyed to streams through a combination of storm sewers, roadside ditches, grassed swales, and ponds. Storm sewers transport runoff rapidly with no pretreatment or filtering of the runoff before it enters streams. Properly designed grassed swales generally reduce runoff volume because of infiltration, and sod vegetation serves to remove some pollutants from runoff before it flows into streams and storm sewer systems.

The types and amounts of pollutants transported by runoff depend on the way that pollutant-bearing surfaces are connected to the storm drainage system. For example, commercial parking areas and arterial streets deliver the highest concentrations of lead, asbestos, cadmium, and street sediment because normally these areas are drained by storm sewers that discharge directly to a stream or lake.

Reducing pollutant transport to surface waters involves reducing the amount of urban stormwater reaching streams, primarily from impervious surfaces. This is accomplished by increasing the infiltration of stormwater into the soil and ground layers. Stormwater infiltration on a suitable site can effectively reduce nonpoint pollution. In addition, infiltration can help stabilize the hydrology of small urban streams by replenishing groundwater, much of which is ultimately discharged to surface water. Infiltration can reduce bank erosion and the need for expensive, highly engineered drainage structures such as concrete lined channels. Infiltration practices can be used with wet detention ponds to supplement pollutant removal effectiveness or reduce pond size.

There are practices that increase on-site infiltration such as porous pavements, redirecting roof downspouts to grassed areas, and directing runoff water to infiltration trenches. These practices are generally most applicable to small source areas such as rooftops and parking lots. Grassed swale drainage systems can also be used to reduce runoff and erosion. Finally, infiltration basins can be located at the end of drainage outlets serving larger drainage areas.

Management Needs and Alternatives

In the Dell Creek watershed, management alternatives were considered for existing urban areas, and for future development. In existing urban areas, the following management alternatives were considered:

1) Increase effective street-sweeping to include large parking lots in the commercial strip area, with emphasis on pre- and post-season clean-up.
2) Use source area practices such as filter strips, on-site treatment units, downspout disconnections and grassed swales to control localized pollutant sources.
3) Detain and treat runoff using larger practices such as detention ponds to control stormwater pollutants from larger drainage basins or mixed land use areas.

For future development, the management alternatives to consider are:

1) Pollution prevention by siting structures and roads in non-sensitive areas and optimizing infiltration.

2) Detain and treat runoff using larger facilities while land is available and can be dedicated to permanent stormwater controls.

Hydrologic analyses have not been conducted to investigate the effect of management alternatives on reducing and preventing streambank erosion and bed scour, or on maintaining stream base flows. These studies will need to be conducted as part of future feasibility studies for nonpoint source control in established urban areas.

The analysis of management alternatives assumes that wet ponds will trap all sediment particles of 5 microns or larger. This will result in about an 80 percent control of suspended sediment and about a 60 percent control of phosphorus and heavy metals in urban runoff. The analysis assumes an infiltration rate of 1 inch per hour for infiltration basins and grassed swales. This is a moderate rate of infiltration that will provide less control of pollutants than wet detention ponds. Higher infiltration rates of about 2.5 inches per hour would provide increased control of pollutants. Existing levels of street sweeping and grassed swale drainage are accounted for in evaluating these alternatives.

Wet detention and infiltration practices should be located where land availability and soil conditions are suitable for providing a high level of control as determined by detailed feasibility studies. Infiltration basins or trenches may be used in combination with wet detention ponds which would provide groundwater recharge and base flow enhancement.

Feasibility studies will be needed to select the site specific infiltration and wet detention practices consistent with this watershed plan. The cost and complexity of studies will vary, depending on the availability of land for locating practices and the compatibility of the existing storm sewer networks with locating structures. Assistance available to communities under the priority watershed project to develop nonpoint source controls in established urban areas is presented in Chapter Four.

Objectives

The long-term management goal for all subwatersheds is to achieve a 20 percent reduction of pollutants from existing urban development and an 80 percent reduction from new development, for an overall reduction goal of 40%. All stormwater peak flow discharge rates from future development for 1, 2, and 10-year storms should not exceed pre-construction peak flow conditions. This requires wet detention (or a corresponding level of infiltration based on an equivalent amount of pollutant removal) for future development and a combination of source area controls and detention for existing development. Pollution prevention measures and information and education efforts should be implemented as part of the core program. Practices which serve both new and existing development are encouraged in areas where there

are significant land uses, such as commercial, industrial and high density residential development.

Analysis of stormwater management techniques shows that certain best management practices (BMPs), such as infiltration basins and stormwater detention ponds, can significantly reduce sediment and other pollutant loadings to lakes and streams. Adoption of stormwater management ordinances and use of stormwater management practices will be a priority in the implementation of this plan. Redeveloped urban areas should have stormwater quality and flow control practices included as part of the development.

The village of Lake Delton has a stormwater utility for the purposes of water quantity and water quality control. A stormwater utility allows for a self-sustaining method of financing stormwater control. A utility, a special taxing authority or the use of performance bonds are options available to the city of Wisconsin Dells as well. The NPS program will participate in administrative costs associated with initial establishment of local funding programs such as stormwater utilities as well as in the evaluation of alternatives for local financing of stormwater management programs.

Construction Site Erosion

Description

Construction sites are those areas in any phase of construction where soils are disturbed through grading or excavation. Construction sites in the project area entail new development and renovation or redevelopment. The renovation and redevelopment activities include utility replacement, street replacement, bridge reconstruction, or rehabilitation of commercial, industrial, or residential areas.

Construction site erosion is a major water quality concern in the watershed. Uncontrolled construction site erosion can devastate aquatic communities in lakes receiving sediment-laden runoff. The reduced capacity of stormwater conveyance systems resulting from sedimentation can cause localized flooding. Importantly, water quality improvements occurring through implementation of nonpoint source control practices for existing urban areas can be negated by construction site erosion pollution sources. Predicting rates of construction site erosion is difficult. However, erosion rates exceeding 75 tons/acre/year can occur. This rate of erosion is greater than occurs on the most severely eroding croplands and 65 times the sediment loading rate from existing commercial and industrial areas. Often the proximity of construction sites to storm sewers or other drainage ways serving urban areas results in nearly all of the sediment being delivered to streams. A 70 percent reduction goal of construction related sediment exists for this watershed.

Management Needs and Alternatives

The reduction goals for this source of sediment will be met by two means:

1. Developing/Enforcing a construction site erosion control ordinance.
2. Installing best management practices to control 70% of the sediment delivered from a construction site.

Construction site erosion control throughout most of the watershed project area is critical to achieving sediment reduction goals. It is expected that the rate of construction activity will remain steady in the future. Without a commitment to controlling sediment from these sites, construction site erosion will remain a serious deterrent to desired water quality and aquatic life in the watershed project area.

Average annual sediment loading to streams from construction erosion for 1997 to 2017 conditions was determined by multiplying the amount of land planned for construction by an average of 30 tons per acre per year. This rate of erosion and sediment control is based on observed land development patterns and generalized climatic conditions. It is estimated that in the years between 1997 and 2017, construction erosion will contribute about 1800 tons per year of sediment (about 3 times the sediment load from existing development) to streams in the project area.

Enforcing state and local ordinances can be an effective means to reduce construction site erosion and its adverse water quality impacts. In 1986, the DNR and the League of Wisconsin Municipalities cooperatively developed a model ordinance for the control of construction site erosion (DNR, 1987). It contains provisions for planning, designing, installing and maintaining erosion control practices. It also contains guidance for administering and enforcing the ordinance.

Each of the municipalities in the project area has ordinance requirements for controlling construction site erosion and sedimentation. In addition, developers are governed by state regulations (Ch. 281 Wis. Stats.) set forth by the Department of Commerce for erosion control on sites with one and two family dwellings; and the DNR Wisconsin Pollutant Discharge Elimination System (WPDES) permit regulations for sites greater than five acres (Wis. Admin. Code, Ch. NR 216, Subchapter III) . The village of Lake Delton currently has a construction site erosion control ordinance in place. The city of Wisconsin Dells does not.

Despite these regulations, several potential impediments to effective erosion control exist. For example, developers sometimes perceive erosion control as an add-on cost and not a built-in cost of construction, enforcement is often done only in response to complaints, maintenance of erosion control practices is often poor, sedimentation basin designs consume large areas where vacant land is scarce, unnecessary grading and excavation is commonplace, soil is routinely tracked onto roads because preventative measures are not a high priority for builders, and there is often confusion about who is responsible for installing and maintaining erosion control practices.

Local ordinances must meet the applicability and content requirements of NR 120.16 dealing with erosion control. The "Model Construction Site Erosion Control Ordinance," developed cooperatively by the DNR and the League of Wisconsin Municipalities (DNR, 1987), and suggested changes to the model ordinance (set forth by Mr. James H. Schneider, League Legal Counsel, in the March 1989 issue of "The Municipality") will be used as guides to determine adequacy of ordinances. Erosion control practice standards and applicability criteria should be consistent with those set forth in the *Wisconsin Construction Site Best Management Practice Handbook* (DNR, 1989).

The following is a list of specific recommendations that units of government and developers should address in developing an effective construction site erosion control program.

- Municipalities should review (and modify where needed) their existing ordinances to assure effective penalties for non-compliance and responses to concerns of citizens, inspection staff and developers.

- Municipalities should evaluate staffing and training needs for effective ordinance administration and enforcement.

- Municipalities should evaluate their permit fee schedule to investigate ways to raise revenue to support effective enforcement activities.

- Developers and contractors need to know what is expected of them, and they need better access to technical information through seminars and other educational activities and materials.

- Erosion control inspectors need specific guidelines for documenting ordinance violations in order to provide for more consistent and effective legal action.

An erosion control information and education strategy is described in Chapter Five.

Objectives

High priority items to improve compliance include more consistent issuance of citations, hiring of additional inspection staff where needed, new fee structures to cover the cost of increased staffing, and more effective court action when ordinance violations occur.

Because of the gaps in state agency regulations, construction erosion control is best accomplished through a local erosion control ordinance, locally administered building codes, practice standards and application guidelines, an effective administrative program and effective enforcement. Training programs are needed for staff administering ordinances and developers who are responsible for installing and maintaining the erosion control practices.

To meet this objective the village of Lake Delton received a nonpoint source grant in 1997 to conduct a construction site erosion control demonstration at a site that included a building and

parking lot. A site for that demonstration was identified initially, but the development plans changed. Lake Delton is still looking for a suitable site. The village also received a local assistance grant to hire a municipal engineer to review construction site erosion control plans and enforce the construction site erosion control ordinance. This position has still not been filled. Because of the significant sediment load due to construction in this watershed, a major emphasis of this plan is to enforce existing ordinances and control erosion using approved best management practices.

Urban Streambank Erosion

Description

Streambank erosion is caused primarily by channelization, upstream modifications, and the changing stream hydrology, which is characterized as "flashy" and having increasing volumes and peak flows. This exposes and erodes the banks, destroying the natural conditions needed for healthy aquatic communities. Also, the channel is scoured during heavy rainfall events, displacing in-stream cover such as rocks and logs and flushing away aquatic life as well. Any urban streambank that is being considered for restoration work will be evaluated for eligibility by the Sauk County LCD on a site-by-site basis during the implementation phase of the watershed project.

Management Needs and Alternatives

For watershed planning purposes, it is assumed that streambank stabilization techniques will control all or nearly all of the potentially eroding sediment at sites where BMPs are installed. In addition, peak flow reduction through application of upstream detention or other BMP may also be needed to reduce streambank erosion.

The decision to stabilize eroding streambanks is based primarily on the rate at which sediment is being released into streams by the cutting action of stream flows. Secondary considerations include stream channel obstructions and riparian habitat degradation.

Options to control streambank erosion include structural controls such as riprap, shaping and seeding, fiber rolls and other bioengineering techniques. Less intrusive measures such as brush cutting to increase light penetration and vegetation establishment may also be effective. Foregoing control all together may be necessary if the corrective action or cost needed to install practices offsets the benefits to the stream.

If concrete channels, dams and other in-stream structures deteriorate or are removed, newly exposed streambanks may begin to erode. When this occurs, the DNR and the appropriate unit of government will jointly evaluate the severity of the erosion and assign the site a management recommendation. Eligibility of these sites for technical and financial assistance will be evaluated on a case by case basis. Easements are also encouraged as a means of controlling streambank erosion.

Urban Shoreline Erosion

A shoreline inventory was conducted on Lake Delton during the summer of 1997. The inventory indicated slight erosion. Much of the shoreline was found to be rip-rapped where there was development.

While the inventory does not identify shoreline erosion as a major sediment problem, there may be areas where shoreline habitat is being affected due to severe erosion. Specific sites will be evaluated by watershed staff to determine if they are significant sediment sources and eligible for cost-sharing. If an on-site evaluation of an eroding shoreline leads local LCD staff to the conclusion that the installation of structural practices to correct the problem would not be cost-effective, that site will be deemed as ineligible.

Pollution Prevention Practices

Description

Pollution prevention practices are conducted to remove pollution at its source and prevent the need for treatment once they enter the resource. Practices include street sweeping, yard waste collection, recycling programs, and a variety of behavioral changes.

These factors affect the amount of pollutants from urban surfaces carried to lakes and streams by runoff. Street sweeping removes some of the particulate pollutants from street and parking lot surfaces before they can be transported to surface waters. Repeated street sweeping of commercial and industrial areas in the early spring, to remove winter accumulation of sand and street dirt, and in the fall, to remove leaves, provides the greatest benefit. The potential for lawn care chemicals to be carried by runoff to nearby streams and drainageways is also a concern. Fertilizer residues can enrich surface waters with nutrients and promote algae growth. Pesticides can add to toxic pollution.

Many benefits can be gained through changes in lifestyle by urban residents such as reducing the amount of automobile traffic and adopting erosion control practices. There are many actions individuals can take; the following is a partial list:

- Reduce or eliminate the use of galvanized roof materials and gutters, a primary source of zinc in urban runoff. Revise municipal building codes where possible.

- Remove pet wastes immediately from lawns, sidewalks, and streets to reduce bacterial contamination of urban runoff. Enforce local pet waste ordinances and familiarize pet owners with good pollution prevention practices.

- Control the timing and reduce the amount and type of fertilizer and pesticide applications in all areas. Market phosphorus-free fertilizer.

- Dispose of automobile waste fluids such as radiator water and engine oil appropriately, keeping them out of the storm sewer system. Set up municipal recycling programs for antifreeze and waste oil. Create partnerships with car dealerships and auto maintenance shops in the watershed project area.

- Remove street dirt, leaves and debris from catch basins, streets and parking lot surfaces through municipal street maintenance and leaf collection programs.
- Control development and redevelopment through zoning which, in part, considers on-site suitability for stormwater management practices to meet water quality, habitat, and flood prevention objectives.

- Control construction site erosion.

- Minimize use of street de-icing compounds.

- Reduce the amount of motorized traffic through use of shuttle busses or public transportation.

- Reduce the areal extent of parking lots.

Objective

Encourage the use of pollution prevention practices, such as those listed through local programs. The goal ties together closely with the information and education component of the project.

Urban Toxic Pollutants

Description

One of the most important means for improving water quality in the Dell Creek Priority Watershed is to reduce the concentrations of toxic materials in urban runoff. Three pollutants (sediment, phosphorus, and lead) were chosen to characterize the type and severity of urban nonpoint pollution. Two subwatersheds, Lake Delton and Hulbert Creek contribute most of the estimated sediment, phosphorus, and lead loading to lakes and streams coming from urban sources in the watershed.

There is public concern over the potential for accumulation of toxic constituents by fish and other organisms in wet detention ponds and their subsequent export into surrounding ecosystems. This is an area needing further investigation.

The management alternatives analysis indicates that structural BMPs for nonpoint source control in established areas are needed to achieve the previously described pollutant reduction goals. In addition, each community will be expected to conduct the "core" activities of the

plan described in Chapter Four, including urban pollution prevention and educational activities.

The Lake Delton/Wisconsin Dells area is dominated by commercial development which exists to support a summertime tourist industry. Car traffic and the pollutants associated with this activity are heaviest between Memorial Day and Labor Day. The corresponding impervious surfaces, such as streets and parking lots, are in proportion to this heavy traffic rather than reflecting the population of the municipalities. A small town becomes a small city during this time. The infrastructure to support this activity exists year round resulting in a high percent imperviousness for such a small population. Pollutant deposition is washed off over a longer time than the tourist season alone. This is why the pollutant loads were modified to 80% of a year round prediction. As indicated in table 3-6, commercial development has the highest unit area loads, and in these municipalities commercial development represents 15% of the land uses, exceeded only by open space and low density residential development.

Pollutant Reduction for Urban Nonpoint Sources

A summary of the reduction objectives:

- Reduce pollutant loading (sediment and toxics) from future urban development in the Dell Creek Watershed Project Area by 80% by 2017.
- Achieve a 20% (or at least 100 tons/year) level of sediment and toxic pollutant reduction for existing specialized land uses with potential for high impacts on water quality, including but not limited to high traffic areas, and commercial lands.
- Achieve a 70% level of sediment reduction from construction sites, or at least 1260 tons/year.
- Reduce phosphorus loading in urban areas.

The adequacy of these objectives will be reviewed after five years (or sooner if future water quality data indicate a need for revision as determined by the watershed project Technical Advisory Committee).

Other Pollution Sources

Many pollution sources contributing to surface water quality degradation in the watershed are typically not addressed by the priority watershed project. Control of these pollution sources occurs through other state and county regulatory programs, as described below.

Municipal Waste Water Treatment Systems

The village of Lake Delton and the city of Wisconsin Dells share a municipal wastewater treatment plant that discharges to the Wisconsin River. The treatment system was upgraded in

1991 and is operating well within its design capacity (2.83 million gallons/day). The system uses an activated sludge-extended aeration treatment system. The village of Lyndon Station's municipal wastewater treatment system is comprised of a stabilization lagoon and absorption pond which discharges to groundwater.

Private Sewage Systems

Septic systems consist of a septic tank and a soil absorption field. Septic systems fail due to soil type, location of system, or poor design or maintenance such as tanks which go unemptied. Pollutants from septic system discharges are nitrates, bacteria, viruses and hazardous materials from household products. Sandy soils and shallow depth to bedrock does restrict the development of private septic systems in the watershed. The majority of private septic systems within the watershed consists of at-grade earthen mounds.

Counties have been using the Wisconsin Fund since 1981. The Wisconsin Fund is a Private Sewage System Replacement Grant Program offering financial assistance designed to help eligible homeowners and small business operators offset the costs of replacing a failing septic system. The program is administered by the Sauk County Planning and Zoning Department and by the Juneau County Planning and Zoning Department. The grant program applies to principle residences and small businesses built prior to July 1, 1978, and is subject to income and size restrictions. Seasonal homes are not eligible for participation in this program. Interested individuals should contact their county zoning department for more information.

Solid Waste Disposal Sites

The DNR's Registry of Waste Disposal Sites in Wisconsin indicates that there are 6 disposal sites in the Sauk Co. portion and 4 disposal sites in the Juneau Co. portion of the watershed.

Petroleum Storage: Underground Storage Tank (UST) Sites

The Wisconsin Remedial Response Site Evaluation Report (DNR publication number SW-144-91) lists the sites identified through the UST program. There are 16 active sites listed within the watershed.

CHAPTER FOUR
Implementation

Introduction

This chapter identifies the means for implementing the management actions for nonpoint source pollution control described in the previous chapter. The success of this priority watershed project depends on the aggressive implementation of these nonpoint source pollution control strategies. This chapter identifies:

- The best management practices (BMPs) needed to control nonpoint sources of pollution as described in Chapter Two;
- The cost containment policies;
- The cost-share agreement procedures;
- Schedules for implementing the project, including the critical sites notification schedule;
- The critical site designation appeal process;
- The estimated project budget for cost-sharing, staffing, and other support.

Agricultural Best Management Practices (BMPs)

BMPs Eligible For Cost-Sharing And Their Rates

Best management practices for rural nonpoint sources of pollution control are identified in NR 120. Design and installation of all BMPs must meet the conditions listed in NR 120. Generally these practices use standard specifications included in the NRCS Field Office Technical Guide. In some cases additional specifications may apply. The applicable specifications for each BMP can be found in NR 120.14.

If the installation of BMPs destroys significant wildlife habitat, NR 120 requires that habitat will be recreated to replace the habitat lost. The DNR Regional Wildlife Specialist or a designee will assist the LCD in determining the significance of wildlife habitat and the methods used to recreate the habitat. Every effort shall be made during the planning, design, and installation of BMPs to prevent or minimize the loss of existing wildlife habitat. Wildlife habitat restoration components of the practice are cost-shared at 70%.

The cost-share rates for each BMP and the practices eligible for cost-sharing are listed in tables 4-1 and 4-2.

Table 4-1. Rural Practices with Flat Rates for State Cost-Share Funding.

BEST MANAGEMENT PRACTICE	MAXIMUM FLAT RATE
Contour Farming	$ 9.00/ac[1]
Contour Stripcropping	$ 13.50/ac[1]
Field Stripcropping	$ 7.50/ac[1]
High Residue Management	$ 18.50/ac[2]
Cropland Protection Cover	$25.00/ac[2]

[1] Wildlife habitat restoration components of this practice are cost-shared at 70 percent.
[2] Cost-shared up to three years.

Following is a brief description of the most commonly used BMPs. More detailed descriptions can be found in NR 120.14 and NR 120.186.

Barnyard Runoff Management - Structural measures to redirect surface runoff around barnyards and feedlots, and that collect, convey or temporarily store and filter polluted runoff from lots. May include: diversions; gutters; engineered lots; filter strips. *Eligibility criteria:* Based on inventory results and pollutant reduction goals. See Chapter Three and Table 3-1.

Roofs for Barnyard Runoff Management and Manure Storage Facilities - Roofs for barnyard runoff management and manure storage facilities are a roof and supporting structure constructed specifically to prevent rain and snow from contacting manure. *Eligibility criteria:* Available in situations where a roof is a cost-effective means to reduce the volume of polluted runoff.

Cattle Mounds - Cattle mounds are earthen mounds used in conjunction with feeding and dry lot operations and are intended to provide a dry and stable surface area for cattle. *Eligibility criteria:* Available when they replace dry lots or loafing areas that are a source of runoff pollution when they act as a clean water diversion.

Manure Storage Facility - A structure for safely storing manure for a period of time (greater than 30 days) needed to reduce the impact of the manure as a nonpoint source of pollution. *Eligibility criteria:* Available where the facility is needed to store and properly spread manure according to a management plan, including where manure currently must be applied during the winter months on fields that have a high potential for runoff.

Manure Storage Facility Abandonment - The proper abandonment of leaking or improperly sited, designed and constructed manure storage systems. The practice includes proper removal and disposal of wastes, liner materials, and saturated soil, as well as shaping, filling, and seeding of the site. *Eligibility criteria:* Available where a structure: is too near or below the groundwater level; fills with groundwater; leads into the bedrock; has documented reports of discharging manure into surface or groundwater due to structural failure; and has evidence of structural failure.

Nutrient Management - The proper amount, form, placement and timing of all crop nutrient applications in order to maximize crop production efficiency and to prevent pollution of surface and groundwater. Includes soil testing, proper manure allocation procedures and full legume and manure crediting. *Eligibility criteria:* A requirement of all manure storage and complete (i.e., not clean water only systems) barnyard runoff system contracts. Also available as a stand-alone practice for livestock farmers who want to improve their nutrient management practices.

Milking Center Waste Control Systems - A milking center waste control system is a piece of equipment, practice or combination of practices installed in a milking center for purposes of reducing the quantity or pollution potential of the milkhouse wastes. *Eligibility criteria:* Based on a site evaluation conducted by watershed technicians.

Livestock Exclusion from Woodlots - The exclusion of livestock from woodlots to protect the woodlots from grazing by fencing or other means. *Eligibility criteria:* Based on severity of soil erosion or damage to the woodlot as determined by site evaluation.

Barnyard Abandonment or Relocation - Relocation of an animal lot from a critical site, such as a floodway, to a suitable site to minimize the amount of pollutants from the lot to surface or groundwater. *Eligibility criteria:* Available in unusual circumstances where severe site limitations preclude the use of barnyard runoff control BMPs.

For the following BMPs, eligibility criteria is based on the upland inventory and soil erosion and sediment delivery reduction goals. See Chapter Three and Table 3-2:

Contour Farming - The farming of sloped land so that all tillage, crop care and harvesting operations are done on the contour.

Contour Stripcropping - Growing alternating strips of grain crops and forages on the contour.

Field Diversions - A channel constructed across the slope with a supporting ridge on the lower side that divert excess water to a safe outlet.

Terraces - A system of engineered ridges and channels properly spaced and constructed on the contour to reduce slope and prevent erosion in the channel.

Grassed Waterways - A natural or constructed bowl-shaped drainageway with established sod-forming grasses that prevent gully formation.

High Residue Management - A variety of crop production practices that maintain crop residues from previous crops on the soil surface (with a minimum of 30% cover after planting).

Cropland Protection Cover (Green Manure) - Cropland protection cover are close-growing grasses, legumes or small grain grown for seasonal soil erosion protection and soil improvement.

Intensive Grazing Management (Rotational Grazing) - Dividing pastures into smaller sections, or paddocks, and rotating livestock to new paddocks regularly creating high stocking rates for short periods. Forage quality and productivity are maximized by allowing forages to rest and regrow. Pastures managed in this way develop a healthy, dense sod that greatly reduces soil and manure runoff. *Eligibility criteria:* Same as for cropland, plus: abandonment of an animal lot that adversely effects water quality; sites which have streambank erosion or habitat degradation; and, sites which exclude livestock from woodlands, wildlife or recreational areas.

Pesticide Management - The proper handling, application and disposal of pesticides, including the rate, method and timing of application to minimize the amount of pesticides used and entering surface and groundwater. This practice includes Integrated Pest Management (IPM) methods, such as scouting, weed mapping and record keeping. *Eligibility criteria:* Available to crop farmers who want to improve their pest and pesticide management practices.

Critical Area Stabilization - The planting of suitable vegetation on nonpoint source sites and other treatment necessary to stabilize eroding lands. *Eligibility criteria:* Used on specific sites where an evaluation by a watershed technician has confirmed a significant NPS water quality problem but where more conventional BMPs (e.g., conservation tillage, grassed waterways, etc.) are not adequate or appropriate.

Grade Stabilization Structure - A structure used to reduce the grade in a channel to protect the channel from erosion or to prevent the formation or advance of gullies. *Eligibility criteria:* Used on specific sites where an evaluation by a watershed technician has confirmed a significant NPS water quality problem but where more conventional BMPs (e.g., conservation tillage, grassed waterways, etc.) are not adequate or appropriate.

Agricultural Sediment Basins - A structure designed to reduce the transport of sediment of other pollutants eroded from agricultural fields to surface waters and wetlands. *Eligibility criteria:* Used on specific sites where an evaluation by a watershed technician has confirmed a significant NPS water quality problem but where more conventional BMPs (e.g., conservation tillage, grassed waterways, etc.) are not adequate or appropriate.

Shoreline and Streambank Stabilization - The stabilization of streambanks and lakeshore from erosion, and the protection of fish habitat and water quality from uncontrolled livestock access. *Eligibility criteria:* Based on inventory results and pollutant reduction goals. See Chapter Three and Tables 3-4 and 3-5.

Shoreline Buffers - A permanently vegetated area immediately adjacent to lakes, streams, channels and wetlands designed and constructed to manage critical nonpoint sources or to filter pollutants from nonpoint sources. *Eligibility criteria:* Based on site evaluation by watershed staff.

Lake Sediment Treatment - Lake sediment treatment is a chemical, physical, or biological treatment of polluted lake sediments. Treatment does not include dredging. Sources of pollution to the lake must be controlled prior to treatment of lake sediments.

Wetland Restoration - The construction of berms or destruction of tile lines or drainage ditches to create or re-create conditions suitable for wetland vegetation. *Eligibility criteria:* See pages 52-54 for details.

Easements - Easements are specific, legally binding restrictions on land titles. Easements are purchased to provide permanent protection to designated areas. *Eligibility criteria:* See pages 54-56 for details.

Structural Urban Best Management Practices - These practices are source area measures, transport systems and end-of-pipe measures designed to control stormwater runoff rates, volumes and discharge quality. These practices will reduce the amount of pollutants carried in runoff and flows destructive to stream habitat. They include: infiltration trenches; porous pavement; oil water separators; sediment chambers; sand filtration units; grassed swales; infiltration basins and detention/retention basins. *Eligibility criteria:* Based on inventory results and eligibility criteria. See Chapter Four, pages 85-95.

Land Acquisition - The purchase of land or the interest in land which is contributing or will contribute nonpoint source pollution or for the construction of an urban structural practice.

Well Abandonment - Chapters NR 811 and NR 812, Wisconsin Administrative Codes, require proper abandonment, by permanent filling of unused wells. *Eligibility criteria:* For any unused well in the watershed.

Table 4-2. Maximum State Cost-Share Rates for Rural Best Management Practices.

BEST MANAGEMENT PRACTICE	STATE COST-SHARE RATE
Nutrient and Pesticide Management	50%
Pesticide Handling Spill Control Basins	70%
Livestock Exclusion from Woodlots	50%
Intensive Grazing Management	50% [1]
Manure Storage Facilities	70% and 50% [2]
Manure Storage Facility Abandonment	70%
Field Diversions and Terraces	70%
Grassed Waterways	70%
Critical Area Stabilization	70% [3]
Grade Stabilization Structures	70%
Agricultural Sediment Basins	70%
Shoreline and Streambank Stabilization	70% [3]
Shoreline Buffers	70% [3]
Wetland Restoration	70% [3]
Barnyard Runoff Management	70%
Animal Lot Abandonment or Relocation	70%
Roofs for Barnyard Runoff Management and Manure Storage Facilities	70%
Structural Urban BMPs	70% [4]
Milking Center Waste Control	70%
Cattle Mounds	70%
Land Acquisition	50% [5]
Lake Sediment Treatment	70%
Well Abandonment	70%

1 To a maximum of $2,000 per watering system.

2 Manure storage is cost-shared at 70% for the first $20,000, 50% for the remaining cost, not to exceed $35,000.

3 Easements may be entered into with landowners identified in the watershed plan in conjunction with these BMPs. See Chapter Two for an explanation of where easements may apply.

4 The maximum cost-share rate for storm sewer rerouting and removal of structures necessary to install structural urban BMPs is 50%.

5 Cost-sharing is available to acquire land for the construction of an urban structural practice or to acquire land which is contributing or will contribute nonpoint source pollution.

Interim Best Management Practices

Under some circumstances, practices may be recommended that are not included on the BMP list. Administrative Rule NR 120.15 provides for alternative practices where necessary to meet the water resource objectives identified in the watershed plan. The DNR may identify in the nonpoint source grant agreement the design criteria and standards and specifications where appropriate, cost-share conditions, and cost-share rates for each alternative best management practice.

Practices Not Cost-Shared

Practices not cost-shared, but which shall be included on the cost-share agreement if necessary to control the nonpoint sources, are listed below (as listed in NR 120.17):

- That portion of a practice to be funded through other programs.
- Practices previously installed and necessary to support cost-shared practices.
- Changes in crop rotations.
- Changes in location of unconfined manure stacks involving no capital cost.
- Non-stationary manure spreading equipment.
- Practices needed for land use changes during the cost-share agreement period.
- Minimum levels of street sweeping and leaf collecting.
- Operation and maintenance of cost-shared BMPs.
- Practices already installed,with the exception of repairs to the practices which were rendered ineffective due to circumstances beyond the control of the landowner.
- Practices required to control sources which were adequately controlled at the time the cost-share agreement was signed, but which are producing an increased amount of pollutant loading to the surface or groundwater, counter to the water resource objectives of the watershed plan, due to the landowner's change in land management.
- Practices whose purpose is to accelerate or increase drainage of land or wetlands, except where drainage is required as a component of a BMP.
- Practices normally and routinely used in growing crops and required for growing crops or feeding livestock.

- Activities covered under the Wisconsin Pollution Discharge Elimination System (WPDES) Program or covered in other ways by Chapter 283 of Wis. Statutes, except urban nonpoint sources that must be controlled to obtain a WPDES permit if control of the sources is identified in the priority watershed plan and the sources are not required to obtain coverage under a WPDES stormwater permit for discharges associated with an industrial activity, as defined under ch. NR 216.

- Livestock operations which: have applied for and are eligible for WPDES permits, have been issued WPDES permits, have greater than 1,000 animal units, or are greater than 1,000 animal units and have been issued a notice of discharge.

- Septic system controls or maintenance.

- Dredging activities.

- Silviculture activities except as necessary for site stabilization.

- Practices to control spills from commercial bulk storage of pesticides, fertilizers, petroleum and similar materials.

- Activities and structures intended solely for flood control.

- Activities required as part of a license for a solid waste management site.

- Activities funded through state or federal grants for wastewater treatment plants.

- Active mining activities.

- Pollution control measures needed during building and utility construction and stormwater management practices for new developments.

- Pollution control measures needed during construction of highways and bridges.

- Other practices or activities determined by DNR as not necessary to meet the objectives of the program.

Cost-Share Agreement Administration

Cost-share funding is available to landowners and local units of government for a percent of the costs of installing BMPs to meet project objectives. This funding is distributed to landowners by the LCD from a Nonpoint Source grant provided by the DNR. The LCD receives additional grant money from the DNR to support its staff and other administrative responsibilities. Cost-share agreements are binding contracts between landowners and the LCD. To qualify for cost-sharing funds, landowners must meet eligibility criteria defined in the previous chapter. Cost-share agreements (CSAs) may be signed within ten years after

formal approval of the watershed plan and are filed as part of the property deed. Agreements may be amended throughout the ten-year project period. Extensions of the sign-up period must be initiated by the LCD and approved in writing by the DNR.

Practices included on cost-share agreements must be installed within the nonpoint source grant period. Practices must be maintained for a minimum of ten years from the date of installing the final practice listed within the cost-share agreement.

Local, state, or federal permits may be needed prior to installation of some BMPs. Areas in which a permit is generally required include zoned wetlands and the shoreline areas of lakes and streams. These permits are needed whether the activity is a part of the watershed project or not. The cost-share recipient is responsible for acquiring the needed permits prior to installation of practices.

Local units of government are responsible for enforcing compliance of cost-share agreements to which they are a party. Where DNR serves as party to an agreement with a unit of government, the DNR will take responsibility for monitoring compliance. The responsible party will insure that BMPs installed through the program are maintained in accordance with the operation and maintenance plan for the practice for the appropriate length of time.

Cost Containment

Cost Containment Procedures

Chapter NR 120 requires that cost containment procedures be identified in this plan to control the costs of installing BMPs. The cost containment procedures to be used by Sauk County are described below.

Cost-share payments will be based on actual installation costs. If actual installation costs exceed the amount of cost-sharing determined by the bidding procedure, the amount paid to the grantee may be increased with approval from the Land Conservation Committee. Appropriate documentation regarding the need for changes will be submitted to the DNR. The cost containment procedure to be used is described in the County's bidding procedure. Copies of the bidding procedure can be obtained from the county LCD. If the procedure changes, the DNR should be notified.

Bids and Average Costs

All structural BMPs costing more than $2,500 are to be bid according to the Sauk County's LCD bidding procedure. Conservation practices estimated to cost less than $2,500 are subject to average cost. Nonstructural BMPs are subject to average costs to verify cost containment.

Flat Rates

BMPs using flat rates are shown in table 4-1. The rates shown are the state's share of the practice installation costs. Sauk and Juneau County have established flat rates for the landowner's labor and machinery. See Sauk County's or Juneau County's policy for these rates.

Rural Implementation Schedule

Landowner Contact Schedule

- During the first 12 months of the implementation period, landowners with sites defined as "eligible" or "critical" nonpoint sources will receive a newsletter from the county LCD explaining the project and how they can become involved.

- County LCD staff will continue to make annual contacts with eligible landowners until the landowners have made a definite decision regarding participation in the program.

- County staff will contact all eligible landowners not signing cost-share agreements by personal letter six months prior to the end of the cost-share sign-up period to encourage participation.

Sediment Delivery Inventory Completion Schedule

- Approximately 50% of the watershed's upland fields remain to be inventoried as of plan approval. Each year, the LCD staff will complete the inventory on 25% of the remaining uplands. At this rate, the inventory will be completed within four years of plan approval.
- As part of the annual inventory work, LCD staff expect to identify fields that meet the criteria for critical sites. The LCD staff will verify all critical sites identified each year and report to the DNR as explained in the critical site notification process below.

Critical Site Notification Process

Project staff will begin to contact the highest-ranked critical sites for verification immediately after plan approval and complete the contacts within six months. Highest-ranked sites are defined as those that make up the top 25% of the inventoried critical site load. The DNR may allow up to three 90-day extensions beyond the six-month period to allow the counties sufficient time to verify that all sites meet the critical site criteria. To receive an extension to the deadline, the county must request an extension from the DNR in writing, and include reasons to support the extension.

The county plans to request extensions to the deadline for the start of the notification process in order to have funding available for cost-sharing for six months prior to the deadline date. Before the deadline date, the project staff will send a report to DNR that states whether each

site meets the critical site criteria or has changed status according to Sec. NR 120.09(6), Administrative Code. The reasons for these conclusions will be included. Documentation of site visits and additional information will be maintained at the appropriate LCD offices and will be available for inspection upon request.

At the time of critical site verification, any uninventoried sites on the same farm must be inventoried. This would determine all critical sites on a farm so the landowner would receive only one critical site notice and avoid the possibility of a notification of a barnyard critical site notice one year and another for uplands years later. Following receipt of the report, the DNR has 60 days to send critical site notification letters to the landowners.

Each site will be verified before receiving notification as a critical site, with the findings sent to the appropriate DNR Regional office. Landowners interested in receiving cost-share assistance for the installation of Best Management Practices will need to sign a cost-share agreement with the Sauk County LCD. At Juneau County's request, landowners in Juneau County will sign cost-share agreements with Sauk County.

The start of the notification process for landowners with critical sites identified in the inventory will begin 6 months following plan approval and will continue through the completion of the inventory. On-site visits will be conducted within a 6 month period. The purpose of the visit will be to verify that the location still meets the criteria for critical sites. The highest ranked critical sites, based on estimated pollutant contribution, will be verified and notified first.

The notification letters will be sent out by DNR regional staff and will include the following information:

- The 36-month period in which landowners are eligible for the full level of state cost-sharing, after which the cost-share rate decreases by 50 percent.

- The potential consequences that a landowner faces if no action is taken. The DNR has the authority to issue a WPDES permit following a Notice of Discharge for critical sites caused by animal waste (Wis. Admin. Code Ch. NR 243). For all other critical sites, DNR has the authority to issue an order requiring the landowner to take necessary actions to protect water quality (Sec. 281.20 (1)(3) or (5), Wis. Stats.)

- The right to appeal the designation of a critical site through a written request to the County Land Conservation Committee within 60 days of receipt of the notification letter. See also "Appeal Process" section.

At the time of notification, critical site landowners have 3 years to sign a cost-share agreement at the rates given in NR 120. After 3 years the available cost-share rates are cut in half.

The annual cycle for critical site notification after meeting the first deadline described in NR 120.09(1) will be as follows:

- April-July: Conduct site visits and verification work.
- August 1: Send report to DNR implementation coordinator.
- November 1: DNR sends notification to critical site landowners.

The county LCD staff will complete the verification of remaining critical sites at a rate of 25% per year according to an annual cycle. Critical site notification will be completed by December 2002.

Critical Site Appeals Process

The owner or operator of a site designated as a critical site may appeal the critical site designation to the Land Conservation Committee of the county in which the site is located. If the site is located in more than one county, the appeal goes to the LCC of the county which contains the largest portion of the site. The site owner or operator, now called the appellant, must write to the LCC and ask for an informal hearing. The appeal request must be received by the LCC within 60 days of the day that the notification letter was received by the owner or operator.

The Land Conservation Committee shall:

- provide the appellant with a hearing and give reasonable notice of the hearing to the appellant, the DNR and the DATCP.
- conduct the hearing as an informal hearing.
- hold the hearing in a place that is convenient for the appellant.
- Note: most formal hearings follow the procedures outlined in Chapter 68.11(2), Wis. Stats. The Critical sites appeals hearings are explicitly exempted from the procedures of Chapter 68.11.

The appellant and project staff will present information about the site so that LCC members may make a decision. Representatives of DNR and DATCP must be informed of the date of the informal hearing and may attend the hearing. DNR is required to submit a report and recommendation to the LCC within 60 days after the hearing. DATCP has the option to submit a report and recommendation within 60 days.

The LCC shall provide a decision, in writing, within 45 days of receiving:

1) the DNR and DATCP reports and recommendations,
2) the notification by the DNR and DATCP that no report or recommendations would be submitted, or
3) the conclusion of the 60-day period following the hearing.

The LCC may support or overturn the designation of the site as a critical site. To make its decision, the LCC shall consider whether or not the critical site designation is consistent with the critical site criteria established in the project's priority watershed plan. The LCC shall also consider whether governmental representatives made serious mistakes in their verification of the site conditions or management of the site. Loss of profit is not grounds for support of an appeal. Violations by, or appeals granted to, other appellants shall not justify support of an appeal.

The owner or operator of a site designated as a critical site may request a review of the LCC decision by filing a written request with the Land and Water Conservation Board within 60 days after receiving the decision of the county LCC.

The owner or operator of a site designated as a critical site may request a contested case hearing under Chapter 227 to review the decision of the Land and Water Conservation Board by filing a written request with the DNR within 60 days after receiving an adverse decision by the LWCB.

Urban Implementation Program

The following discussion provides guidance on how the urban nonpoint source control program will be implemented. It presents the "core" activities that provide a base for the urban program. In addition, more complex, "segmented" activities are presented. Eligibility for financial assistance is also described in this section.

Core Elements of the Urban Management Program

The core elements of the urban nonpoint control program include measures that can be implemented easily and without study or significant expenditures. Adopting a core program is the first step in the implementation process. This show of commitment is required in order to receive financial assistance through the watershed program. It is required only where the municipality receives funds for its own use, such as where the municipality installs, owns, and operates a management practice. It does not apply to those instances where the municipality acts as a grantor, passing cost-share funds through to private landowners. Individual landowners within the municipality may receive funds before the municipality has agreed to conduct the core program.

The basic elements of the core program are:

- Develop, adopt and enforce a construction erosion control ordinance as outlined in the recommendations in Chapter 3. The ordinance should cover clearing, grading, and excavation conducted prior to the issuance of a building permit. The municipality must also commit to enforcing the erosion control provision of the Uniform Dwelling Code.

- Develop and implement a community specific program of urban housekeeping practices to reduce urban nonpoint source pollution. Each community should carry out a regular street sweeping program to sweep streets at least twice a year, once each in the spring and the fall, including fall leaf collection. Other practices might include regulating pet wastes, changing the timing and scheduling of leaf collection, or other strategies to reduce polluted runoff.

- Implement an information and education program containing the elements and achieving the goals of the urban information and education strategy.

Local Responsibilities and Timing for the Core Program

The following is a schedule for implementing the core elements of the urban nonpoint source control strategy for this project. In order to receive technical and financial assistance, communities must commit within the first three years of the project to implement the core program.

To implement the Core program each municipality should:

- Identify in writing an authorized representative for the local unit of government.
- Adopt a construction site ordinance, develop administrative procedures and determine staff needs to enforce a construction erosion control ordinance in the municipality within 2 years of implementation.
- Develop and implement a community specific program of urban housekeeping practices which reduce urban nonpoint pollution. The content of the community specific program and a schedule for implementation will be negotiated by the local unit of government and the DNR.
- Prepare and submit annual work plans for staff and activities.
- Apply for local assistance grants from DNR to support core activities.
- Implement an information and education strategy consistent with this plan.
- Prepare and submit to DNR tracking reports specified in Chapter 7.
- Participate in the annual watershed project review meeting.

Segmented Elements of the Urban Management Program

The "segmented" elements of the urban nonpoint source program include those requiring further study or site-specific investigations prior to implementation. Recommendations from Chapter 3 that are not included in the core element description are considered segmented elements. Examples include construction of a wet detention pond to capture runoff from an industrial park, source control practices such as filter strips or infiltration devices at parking lots, and the development of a stormwater plan and ordinance. Detailed engineering studies will be required for some of these practices.

The municipalities may implement the segmented activities any time after expressing commitment to implement all of the core activities listed above. Cost-sharing will be available throughout the ten year implementation period of the project.

Importantly, the higher costs of implementing this portion of the urban management program will require municipalities to budget expenditures over the course of several years. Best management practices implemented under this portion of the program likely will include detention ponds, infiltration and filtration devices, and other structural means for reducing pollution. Segmented program activities may also include stormwater management planning and stormwater ordinance development.

Segmented activities will include engineering feasibility studies and other site-specific assessments for existing and new development. The results will determine the best as well as the most economical means for reducing pollutant sources in a community.

The basic elements of the Segmented program can include:

- Conduct detailed engineering studies to determine the best means to implement community specific nonpoint source control measures in existing developed areas.
- Design and install structural best management practices for existing urban areas with completed engineering studies.
- Develop management plans for planned urban development.
- Adopt and enforce a comprehensive stormwater management ordinance consistent with the state model stormwater ordinance under preparation.
- Conduct as needed, detailed financing and implementation studies which determine the means to pay for administering an urban nonpoint program in each community.

Local Responsibilities and Timing for the Segmented Program

The following is a schedule for the segmented elements of the urban control strategy:

- Identify the high priority segments the community wishes to pursue in the existing and planned urban areas.
- Enter into local assistance and nonpoint grants as appropriate to secure state funding support for segmented activities.

- Conduct engineering feasibility studies for control practices in existing urban development. The type and manner of practice installation will be guided by these studies.
- Prepare stormwater management studies in planned areas which identifies the type and location of practices.
- Adopt, administer and enforce a comprehensive stormwater management ordinance for planned urban development.
- Enter into cost-share agreements for eligible BMPs.

For practices installed and maintained by private individuals, the cost-share agreement is between the landowner and the local unit of government. The local units of government will be required to:

- Design or contract for the design of best management practices and verify proper practice installation. Involve the DNR in pre-design and pre-construction conferences as outlined in NR 120.
- The city will reimburse those landowners for the eligible amount of cost-sharing and in turn request reimbursement from the DNR for practices installed by private landowners.
- Monitor landowner compliance with provisions of the cost-share agreement.
- For practices installed and maintained by the local unit of government, the cost-share agreement is with the DNR.
- Practice maintenance is the responsibility of the grant recipient.
- Submit information needed for project evaluation to DNR.

Communities can implement the segmented elements of the urban management strategy any time following the development and initial implementation of the Core program. However, cost-sharing will be limited to those elements of the segmented program completed within the ten-year implementation period. Some townships and lake districts may be eligible for cost-share funds to implement the urban recommendations.

Stormwater Management Ordinances

A municipal stormwater management ordinance is intended to manage the long-term, post-construction stormwater discharges from land development activities. The best way to do this is to address stormwater management problems and needs through the preparation of a comprehensive stormwater management plan for subwatershed areas. These plans would include performance standards for stormwater management measures for all land development activities. If plans have not been developed and approved by a governing body, then a stormwater management ordinance will set forth generic stormwater management standards.

The DNR, through the nonpoint program, will fund stormwater management planning for new development and for existing development that requires more detailed study than provided during the priority watershed planning process. This program would also recommend that a governing body develop a stormwater management ordinance for all areas not included in

stormwater management plans and as an appropriate enforcement mechanism for areas with plans.

The DNR is required to develop a state model stormwater ordinance. That ordinance is currently in draft form. When an approved state model ordinance is available, Priority Watershed Plans will begin to require, as part of the core program, the passage of ordinances. Until then, it is only a recommendation.

Project Participants: Roles and Responsibilities

The following discussion presents the roles and responsibilities of landowners, land operators, local units of government, DNR, and UWEX in implementing the urban management recommendations.

Local Units of Government

Cities, villages, and towns play a prominent role in the implementation of the urban portion of the priority watershed project. These and other eligible units of government, such as lake districts, are allowed to apply for local assistance and nonpoint source grants directly with the Department of Natural Resources. The municipalities will provide the local share of the design and installation of BMPs and the operation and maintenance costs.

They may also conduct planning and administrative services such as stormwater planning, and engineering feasibility investigations, as well as the development, administration and enforcement of construction site erosion and stormwater management ordinances. Lastly, these governmental entities will develop and conduct urban housekeeping and information/education programs.

The local unit of government may develop cost-share agreements with individual landowners for the installation of BMPs, and provide technical and financial assistance to individuals with funds obtained from the state nonpoint source program. If the governing entity enters into a cost-share agreement with a private landowner, the individual landowner will pay the local portion of the installation cost, consistent with the cost-share guidelines. Or, the unit of government may delegate the signing of CSAs with landowners to the county through an agreement with them.

Department of Natural Resources

The Department will provide administrative and financial support to the municipalities and others who apply for grants through the urban portion of the program. Urban grants will be awarded to local units of government to fulfill the goals and objectives outlined in Chapter 3. Several nonpoint source specialists are housed in the South Central Region and the Lower Wisconsin River Basin Geographic Management Unit (GMU) to provide guidance to towns, cities, villages and lake districts in interpreting and implementing this plan. The DNR maintains a staff of stormwater management engineers and technical specialists who are

available to provide guidance and plan review directly to municipal staff. The DNR will also provide assistance in development of ordinances and other project implementation activities, review designs for urban BMPs, and approve stormwater management plans.

University of Wisconsin-Extension

UWEX has on its staff a Basin Educator for the Lower Wisconsin River Basin. At the time of watershed plan approval, this new position had not yet been filled. The person may assist in the Dell Creek Watershed project. In addition, UWEX county staff may assist the project. Furthermore, UWEX sponsors training courses in construction site erosion and stormwater management. DNR provides financial assistance to local units of government for sending staff and administrators to appropriate training sessions.

Sauk and Juneau County Land Conservation Department

The LCDs will be responsible for the following activities in the urban area:

- Assist municipalities in the development of construction site erosion control and stormwater management ordinances.
- Develop and implement the recommended information and education program outlined in Chapter 5 of this plan.
- Provide assistance in the development of grant applications, cost-share agreements, project schedules, and progress tracking.

State Funding for Urban Best Management Practices

Best Management Practices (BMPs) Eligible for Cost-Sharing and their Rates

Structural urban best management practices are those practices identified in NR 120 to be the most effective mechanisms available to reduce urban nonpoint sources of pollution. Eligible practices and cost-share rates for urban practices are shown in table 4-3.

Structural urban best management practices are source area measures, transport system and end-of-pipe measures designed to control stormwater runoff rates, volumes and discharge quality. These practices will reduce the amount of pollutants carried in runoff and the flows that can be destructive to stream habitat. These measures include, but are not limited to, such practices as infiltration devices, oil water separators, sediment chambers, sand filtration units, grassed swales, and detention/retention basins.

Street sweeping (several passes for each curb mile) is recommended as early in the spring as possible to collect the debris, sediment and associated pollutants generated during the winter months and continuing through late fall. Sweeping in residential areas where there is heavy tree canopy as well as in commercial and industrial areas, spring through fall, is expected to provide continued reduction in pollutant loads.

Table 4-3. Maximum State Cost-Share Rates for Urban Best Management Practices.

BEST MANAGEMENT PRACTICE	STATE COST-SHARE RATE (maximums)
Critical Area Stabilization	70%[1]
Grade Stabilization Structures	70%
Streambank Stabilization	70%
Shoreline Buffers	70%[1]
Wetland Restoration	70%[1]
Structural Urban Practices	70%[2,3]
High Efficiency Street Sweeping	[4]

1 Easements may be used in conjunction with these practices.

2 Applies only to practices to control pollutants from existing urban surfaces. Existing urban surfaces are considered to be those in existence prior to the date the DNR approves this watershed plan. Eligible land uses include commercial and industrial, parking lots, streets and other land uses resulting in the runoff of high pollutant loads. Modifications to existing ponds to control runoff from areas that have a portion of non-significant land uses may also be eligible, but a feasibility study would need to determine this.

3 Cost-share grants up to 50% can be made for associated costs including land acquisition, storm sewer re-routing and structure removal.

4 This is an interim best management practice not listed in NR 120, of the Wisconsin Administrative Code. Street sweeping, using high-efficiency sweepers is currently being piloted in the Osceola Creek Watershed Project. The results of that evaluation will determine the acceptable cost-share rates for this and other watershed projects.

Design Criteria and Performance Standards for Urban Practices

Design and installation of the best management practices must meet the conditions listed in NR 120. Practice standards and specifications for critical area stabilization, grade stabilization structures, streambank stabilization, shoreline buffers and wetland restoration can be found in NR 120 and the Natural Resources Conservation Service's "Field Office Technical Guide".

NR 120.14(22) requires that the DNR participate in the process of selecting urban structural BMPs for site-specific application. The DNR role includes participation in a pre-design process, reviewing preliminary practice designs, and review and approval of final practice designs. The guidelines in this section are presented to facilitate the urban practices design, through the nonpoint source program.
The following preliminary standards should be used to guide the design of individual practices. These preliminary standards will be superseded by standards developed as part of the model ordinance for stormwater, which the DNR is preparing.

- Wet detention ponds in existing and planned urban areas should be designed to control 80 percent of the incoming suspended sediment load. This will be achieved

by trapping the 5 micron particle size. This will provide approximately 60% control of the annual lead and phosphorus load from lands draining to the pond. Where retro-fitted, ponds should be located to control runoff primarily from the significant land uses. Where planned as part of new development, ponds should be located to control runoff from all land uses.

Wet detention ponds in existing urban areas should help reduce stream velocities to speeds that do not erode banks or scour habitat. Wet detention ponds in planned urban areas should maintain peak flows for the 2-year, 24-hour storm at pre-development levels.

- Infiltration devices in existing and planned urban areas should infiltrate the first half inch of runoff. Flows in excess of the first half inch should be directed away from the infiltration device. Where retro-fitted, these devices should be located to control runoff primarily from the significant land uses. In locating practices, infiltration rates should be carefully considered as these are prime determinants of the pollution control efficiency and the long term operation of infiltration practices, particularly in non-residential areas.

It is important to note the inclusion of pretreatment and groundwater monitoring in the practice design for infiltration devices. Providing pretreatment for these devices will greatly reduce the frequency of clogging and maintain infiltration for longer periods of time before needing maintenance. Pretreatment could include a sediment trap, a wet detention pond, or a grass filter strip. Selected practices should be equipped with groundwater monitoring wells to track contaminant movement.

Infiltration devices in existing urban areas should contribute to reducing stream velocities to speeds that do not erode banks or scour habitat. Infiltration devices in planned urban areas should maintain peak flows for the 2-year, 24-hour storm at pre-development levels.

- Filtration devices should be designed to control the first half-inch of runoff from contributing areas similar to infiltration devices. These should be located to control runoff primarily from the significant land uses for existing development.

- Stream corridor buffers and streambank stabilization are designed to reduce streambank erosion and provide filtering of overland flow to the stream.

Using Easements and Land Acquisition to Support Urban Pollution Control Practices

Easements may be used to support wetland restoration, critical area stabilization and shoreline buffers in urban areas in order to reduce the water quality impacts of stormwater runoff. Use of these practices as stormwater runoff control measures, and the use of easements to support these practices, must be reviewed on a case-by-case basis by the DNR. The same general rules set forth for the use of easements in rural areas also apply to urban stream reaches.

The department may also provide grants to a governmental unit that is eligible for a nonpoint source grant under s. NR 120.12 to acquire land or an interest in land for the construction of an urban structural practice, or if the land is contributing or will contribute nonpoint source pollution. The requirements are listed in NR 120.186. The maximum allowable state cost-share rate for acquisition of property is 50% of the acquisition cost of the property. The maximum allowable state cost-share rate for appraisals for the acquisition of property is 100% of the cost of the appraisal.

Funding for Local Staff Assistance

Table 4-4 shows the types of local management activities that are supported by the state. The state funds these activities through local assistance grants. These grants may be used to support additional staff hired or contracted for by local units of government. Support for most activities is cost-shared at 50-100%, since local governments cover only certain staff support costs. These cost-share rates are maximums. Many of these activities may only be cost-shared at a 70% rate due to the availability of funds. Support for local staff to administer and enforce local ordinances is only meant to augment funds collected through local permit fees. State support will only be made available to provide that portion of the staff costs remaining after the use of permit fees. In many cases, ordinance administration and enforcement will be self-supporting.

Table 4-4. Urban Implementation Strategy Measures Eligible for State Funding Under Local Assistance Grants.

ACTIVITY	SUPPORT RATE (maximums)
Development of Construction Erosion Control Ordinances	100%
Development of Storm Water Management Ordinances	100%
Engineering Feasibility Studies for Existing Urban Areas; Storm Water Planning Studies for Planned Urban Areas[1]	100%
Design and Engineering for Structural Best Management Practices to Control Existing Significant Land Uses	100%
Staff for Enforcing Construction Erosion and Storm Water Management Ordinances[2,3]	50%
Additional Staff Needed for Accelerated Street Sweeping[4]	[4]
Development of Alternative Financing and Administration Strategies	100%
Information and Education Activities	100%

1 Funding not available for components dealing exclusively with drainage and flooding.

2 Funding limited to three years. Level of staffing based on a work plan submitted by local units of government and approved by the DNR.

3 DNR covers only that portion of the local staff support that cannot be met through local permit fees. Formula used is total cost of enforcement minus fees collected up to 50% of the total costs of enforcement. The intent is that a community will develop a fee structure so as to cover all costs by the time DNR funding ends.

4 State cost-share rates for street sweeping will be negotiated on a case-by-case basis. Grants for accelerated sweeping on significant land uses during the late spring through to early fall period may be limited to demonstration and research projects, initially, until the effects can be monitored.

Activities and Sources of Pollution Not Eligible for State Funding Assistance

Priority watershed cost-share funds can not be used to control sources of pollution and land management activities specifically excluded in NR 120.17. The following is a partial list of ineligible activities most often inquired about for cost-sharing in urban areas.

- Operation and maintenance of cost-shared best management practices (BMPs).
- Construction site erosion control practices.
- Structural BMPs for new urban development. New urban development is defined as that for which construction activity commences after the DNR approves this plan.
- BMPs installed prior to signing cost-share agreements.
- Most activities covered under the Wisconsin Pollution Discharge Elimination System (WPDES) Program.
- On-site septic system controls or maintenance.
- Dredging activities.

- Activities and structures intended primarily for flood control.
- Base levels of street sweeping (will be defined on a case-by-case basis).

Cost-Share Budget

Costs of Installing Rural BMPs

The quantity and type of management practices that are required to meet the water quality objectives of this project are listed in table 4-5. The capital cost of installing the BMPs are listed for a 100% landowner participation rate. Units of measurement and cost per unit for the various BMPs are also included.

The capital cost of installing the rural best management practices is approximately $4.73 million, assuming 100% participation. At 75% participation the capital cost is $3.55 million.

- State funds necessary to cost-share this level of control would be approximately $2.37 million.
- The local share provided by landowners and other cost-share recipients would be approximately $1.18 million.

Easement Costs

Chapter Three identifies where nonpoint source program funds can be used to purchase easements and land. The estimated cost of purchasing easements and land is shown in table 4-5. At 75% participation, the estimated purchase price of easements on eligible lands would be $75,000. Easements are funded at 100% and will be purchased by the State of Wisconsin.

Table 4-5. Estimated Rural BMP Cost-Share Budget Needed To Meet Water Quality Goals in Dell Creek Watershed. (page 1 of 2)

BMP	Number/ Unit	Cost/ Unit	Total Cost	75% Part. State Cost	75% Part. Local Share	Hours/ Unit	Total Hours
Upland Control							
Change in Crop Rotation	8,000/acre	NA	0	0	(1)	0.25	1,500
Contour Cropping	1,000/acre	9	9,000	6,750	(1)	0.35	263
Contour Strip Cropping	8,500/acre	13.5	114,750	86,063	(1)	0.6	3,825
High Residue Mgmt. (2)	10,000/acre	18.5	185,000	138,750	(1)	0.25	1,875
Cropland Protection Cover (2) (Green Manure)	1,200/acre	25	30,000	22,500	(1)	0.05	45
Intensive Grazing Mgmt. (Rotational Grazing)	15/each	3,500	52,500	19,688	19,688	15	169
Critical Area Stabilization	300/each	800	240,000	126,000	54,000	1	225
Grass Waterways	40/each	2,500	100,000	52,500	22,500	24	720
Diversions or Terraces	5,000/lin. ft.	4	20,000	10,500	4,500	0.1	375
Grade Stabilization	25/each	5,000	125,000	65,625	28,125	70	1,313
Agricultural Sediment Basin	10/each	7,500	75,000	39,375	16,875	90	675
Shoreline Buffers	50/acre	400	20,000	10,500	4,500	3	113
Nutrient Management (2)	36,000/acre	6	216,000	31,500	13,500	0.04	1,080
Nutrient and Pest. Mgmt. (2)	12,000/acre	10	120,000	81,000	81,000	0.04	360
Spill Control Basin	6/each	10,000	60,000	45,000	45,000	40	180
Wetland Restoration	24/each	2,500	60,000	31,500	13,500	34	612
Livestock Exclusion, Woods	33,000/lin. ft.	1	33,000	17,325	7,425	0.02	495
Upland Subtotal			1,460,250	784,576	310,613		13,825

Table 4-5. Estimated Rural BMP Cost-Share Budget Needed To Meet Water Quality Goals in the Dell Creek Watershed (continued). (page 2 of 2)

BMP	Number/ Unit	Cost/ Unit	Total Cost	75% Part. State Cost	75% Part Local Share	Hours/ Unit	Total Hours
BARNYARD RUNOFF CONTROL and MANURE STORAGE							
Complete System	37/each	25,000	925,000	485,625	208,750	110	3,053
Roof Gutters	25/each	2,000	50,000	26,250	11,250	8	150
Clean Water Diversions	25/each	3,500	87,500	45,937	19,688	22	413
Roofs for barnyards	2/each	25,000	50,000	26,250	11,250	8	12
Barnyard Abandonment or Relocation	2/each	70,000	140,000	73,5000	31,500	100	150
Manure Storage Facility (3)	25/each	62,000	1,550,000	656,250	506,250	110	2,063
Manure Storage Facility Abandonment	2/each	15,000	30,000	15,750	6,750	40	60
Cattle Mounds	6/each	1,800	10,800	5,670	2,430	15	68
Milking Center Waste Control	20/each	7,500	150,000	78,750	33,750	40	600
Barnyard Subtotal			2,993,300	1,413,982	831,618		6,569
STREAMBANK EROSION CONTROL							
Shape and Seeding	700/lin. ft.	10	7,000	3,675	1,575	0.15	79
Fencing	5,000/lin.ft.	1	5,000	2,625	1,125	0.10	375
Rock Rip-Rap	1,200/lin. ft.	30	36,000	18,900	8,100	0.5	450
Bio-Bank Stabilization	300/lin. ft.	25	7,500	3,938	1,688	0.5	113
Crossing	50/each	2,000	100,000	52,500	22,500	18	675
Remote Watering System	5/each	2,000	10,000	5,250	2,250	15	57
Streambank Subtotal			165,500	86,888	37,238		1,749
MISCELLANEOUS							
Well Abandonment	16/each	600	9,600	5,040	2,160	20	240
Easements	100/acres	1,000	100,000	75,000		8	600
SUBTOTAL			109,600	80,040	2,160		840
TOTAL			4,728,650	2,365,486	1,181,629		22,983

(1) Local Share consists of labor and equipment costs. Also see flat rates in Table 4-1.
(2) High Residue Management, Cropland Protection Cover, and Nutrient and Pest Management are cost-shared per acre over a three year period. Number of acres shown represents three times the eligible acres.
(3) Manure storage is cost-shared at 70% for the first $20,000 of cost and at 50% for the remaining cost, not to exceed $35,000.
Source: Wisconsin DNR, DATCP, and Sauk and Juneau Counties.

Cost of Installing Urban BMPs

Activities for Existing Urban Areas

The village of Lake Delton currently has a local assistance grant for an urban demonstration project for construction site erosion control. They also have a grant to assist with the enforcement of an existing construction site erosion control ordinance. The grant is intended to fund part of a staff engineer to conduct training and inspections and to enforce the ordinance at construction sites. This funding is only for the first three years, and is based on the village increasing building permit fees or some other fee system to support this staff person's activities. The total grant for Lake Delton for 1997 was $43,075. The city of Wisconsin Dells does not currently have a construction site erosion control ordinance. They must commit to ordinance development and enforcement along with general information and education activities and good housekeeping practices before any additional money will be available for construction of BMPs. The village of Lyndon Station should also consider elements of the core program for their participation in the watershed project.

Table 4-6 shows the cost of preparing detailed engineering feasibility studies. These studies will be needed before practices are designed and installed to control runoff from existing urban areas. These studies are projected to cost $24,000. It is expected that DNR will pay for a large portion of these costs. It is assumed that most of the work associated with activities in this table will be contracted out to private consulting engineers. The consulting fees are included as part of the budget estimate. If county staff have the appropriate licenses required to compete for this work, and if there is no conflict with county regulations, the county may also submit proposals to the municipality to complete the work, in a competitive process.

Table 4-6 also shows the cost of constructing wet detention ponds on 33% of the significant land uses, such as commercial and industrial development. The cost for installing these ponds in densely urbanized areas is estimated at $400,000 per surface acre of pond. The total cost to achieve the 20% reduction goal from significant land uses is $2 million.

Activities for Planned and Developing Urban Areas

At full build out, the urban areas will increase by 3,419 acres. Stormwater management plans allow a community to plan for the stormwater problems associated with that growth. Plans are estimated at $10/acre for new development. The planning cost would equal $34,190 to plan for the anticipated future growth. If all new development were to be served by detention ponds, then 35 acres of pond surface would be required to meet the 80% reduction of solids from new urban development. At a cost of $50,000/acre of pond the cost of $1.75 million would be borne locally, since priority watershed project funds are not used for practices in areas of new development.

The cost of controlling construction site erosion is estimated at $250/acre for practice design and installation. Lake Delton estimates a growth rate of 50 acres per year and Wisconsin Dells, 10 acres per year. This amounts to a cost of $15,000/year for construction site

practices, or $150,000 for the 10 year life of the project. This cost would be paid locally by the developer.

Alternative Funding Sources

A substantial portion of the estimated costs of implementing this plan's urban management recommendations is for the construction of stormwater management practices in existing and planned urban areas to control pollutants generated by a wide variety of activities. It is clear that the nonpoint program will not be able to fund all the work needed to meet the goal in the project's time frame. The purpose of this analysis is to determine where the nonpoint dollars should best be spent. The priorities of the program are to encourage the adoption of construction site erosion control ordinances and/or their continued enforcement, to develop stormwater management plans and/or stormwater management ordinances to reduce the pollutant contribution from new development, to conduct an information and education effort to prevent pollution or control the sources of pollution and to look for low-cost/low-technology solutions.

This plan endorses continued investigation into source control alternatives as well as development of alternatives for internalizing local pollution control costs. Alternatives such as the creation of local utility districts to finance the local share of these estimated costs should be investigated by the respective municipalities. The DNR will help finance studies through the priority watershed program.

Urban Cost-Share Budget

Table 4-6 summarizes the total cost of implementing the urban portion of the Dell Creek Priority Watershed Project, to obtain the water quality goals. The total project cost is estimated to be $4.46 million.

In existing urban areas, the local share of the project costs will be provided in general by municipal governments. The overall state support rate for existing urban areas is about $1.5 million; for planned and developing urban areas it is about $32,000. The local share of the project cost in the planned areas is expected to be paid for primarily by individual landowners and developers.

Table 4-6. Estimated Urban BMP Cost-Share Budget Needed To Meet Water Quality Goals.

PROJECT ELEMENT	STATE SHARE	LOCAL SHARE	TOTAL COST
Developing Urban Areas			
Urban Demonstration (CSEC Practices)	$8,400	$3,600	$12,000
Construction Site BMPs	$0	$150,000	$150,000
Planned Urban Areas			
Stormwater Management Plans	$24,000	$10,000	$34,000
Stormwater Management BMPs	$0	$1,750,000	$1,750,000
Existing Urban Areas			
Feasibility Studies	$16,800	$7,200	$24,000
Structural BMPs	$1,400,000	$600,000	$2,000,000
Estimated Staffing			
Urban Staffing	$100,000	$386,000	$486,000
TOTAL	$1,549,200	$2,906,800	$4,456,000

Source: DNR

Budget and Staffing Needs

Rural Budget and Staffing Needs

Table 4-7 lists the total estimated staff needed to implement the project assuming a 75 percent level of participation by eligible landowners. Approximately 70,951 staff hours are required to implement this plan. This includes 8,868 staff hours to carry out the information and education program.

Currently, three positions are being funded on the Dell Creek watershed project. The LCD and agencies will determine the need for additional staff based on an annual workload analysis.

The estimated cost for staff at the 75% participation rate is $2,900,000. An estimated $2,350,000 of these costs will be paid by the state through the Local Assistance Grant Agreement over the ten years of the project.

The total state funding required to meet the rural nonpoint source pollution control needs at a 75 percent level of landowner participation is presented table 4-9. The estimated cost to the

state is $4,879,446. The estimated cost to landowners and others is $1,731,629 for a total project cost of $6,611,075. This figure includes the capital cost of practices, staff support, and easement costs as presented above.

Table 4-7. Estimated Staff Hours Needed to Meet the Water Quality Goals in the Watershed for 10 Years of Project Implementation.

Activity	Staff Hours	
	Sauk County	Juneau County
Project and Financial Management	10,000	1,000
Information and Education Program	8.868	
Inventory and Planning*	15,100	3,800
Practice Design and Installation Control		
Upland Sediment Control	13,825	
Animal Waste Management	6,569	
Streambank Erosion Control	1,749	
Easements and Well Abandonment	840	
Monitoring BMP Operation and Maintenance	5,000	
Training	4,000	200
Total:	65,951	5,000
Estimated Staff Required Per Year	3.8	0.3
Hours Per Year	6,595	500

Source: DNR, DATCP, and Sauk County and Juneau County LCDs.

* Inventory and Planning includes: Inventory, Landowner Contacts, Conservation Planning and Plan Revisions, Cost-Share Agreement Development and Amendment, and Progress Tracking.

Urban Budget and Staffing Needs

Funding is provided for local implementation of many of the core and segmented activities through a Local Assistance Grant from the Department. Activities eligible for funding include development and implementation of a construction site erosion control ordinance, development of a stormwater ordinance, and design of stormwater management practices.

It is estimated that $100,000 in state funds and $386,000 in local funds will be needed to implement the urban plan recommendations. Table 4-8 indicates specific staffing needs, on an

hourly basis, for the villages of Lake Delton, Lyndon Station and the city of Wisconsin Dells to achieve the urban water quality goals.

Table 4-8. Urban Staffing Needs for Municipalities

ACTIVITY	UNIT	HOURS
Erosion Control Inspection	800 hrs/yr (Lake Delton) 100 hrs/yr (Wi. Dells, Lyndon Station)	1000 hrs.yr
Conduct Training, Seminars, Public Meetings & Presentations	40 hours/yr (based on two 20 hour presentations/yr.)	40 hrs/yr
Administration	80 hrs/yr (Lake Delton) 20 hrs/yr (Wi. Dells, Lyndon Station)	120 hrs/yr
TOTAL		1160 hrs/yr

Source: DNR

Table 4-9. Total Cost Estimates For The Dell Creek Priority Watershed.

ITEM	RURAL COSTS		URBAN COSTS	
	State Share	Local Share	State Share	Local Share
Cost Share Funds: Practices	2,365,486	1,181,629	1,408,400	2,503,600
Cost-Share Funds: Easements	75,000	0	0	0
Local Assistance Staff Funding	2,350,000 (1)	550,000	100,000	386,000
Information & Education Direct	15,650	0	*	*
Other Direct (travel, supplies, etc.)	53,310	0	*	*
Engineering Assistance	10,000	0	**	**
Professional Services	10,000	0	40,800	17,200
Total	4,879,446	1,731,629	1,549,200	2,906,800
TOTAL STATE SHARE	6,428,646			

Source: DNR, DATCP, and the Sauk and Juneau County Land Conservation Departments
* Included with staffing
** Included with professional services
1) Includes Juneau County local assistance grant
Rural costs represents 75% participation
Urban costs represents 100% participation

Grant Disbursement and Project Management Schedule

Implementation of the Dell Creek watershed project shall begin upon both approval of this plan and receipt of the Nonpoint Source grant. The plan must be approved by the DNR, the Sauk and Juneau County Boards, and the Wisconsin Land and Water Conservation Board.

The project implementation period is ten years. Conservation planning and the signing of cost-share agreements will occur throughout the implementation phase. Practices listed on any cost-sharing agreement must be installed before the end of the implementation phase. The implementation phase of this project is scheduled to conclude in 2008.

The initial Nonpoint Source grant will cover the cost of practices over the entire ten-year implementation phase. The amount of the Nonpoint Source grant is calculated based on 75 percent participation by eligible landowners; see table 4-5 for a detailed explanation. This grant may be amended due to changes needed for time of performance, funding levels, or scope of work.

Local Assistance grants will be disbursed annually to Sauk County and Juneau County to cover the costs of personnel, operating expenses, and equipment. The DNR will evaluate an annual workload analysis and grant application submitted by Sauk and Juneau Counties.

The municipalities in the watershed will apply for local assistance grants and nonpoint source grants directly with the Department. The implementation period is ten years, so projects at municipalities must be completed by 2008. The grants can be amended to reflect changes in the practice or timing of a project. The municipality will request reimbursement for activities conducted under the terms of the grant.

CHAPTER FIVE
EDUCATIONAL STRATEGY

This chapter outlines an education strategy designed to promote adoption of water quality best management practices (BMPs) by Dell Creek watershed residents, businesses, organizations and local governments. It is also designed to develop community-wide support for the need to protect and improve lakes, rivers, streams and wetlands in the watershed. This strategy is an adaptable guide and is intended to be evaluated and updated as needed. The ability to accomplish the strategy is based on having an adequate number of staff that can devote time to the personal delivery of the strategy, particularly the one-on-one contact time with landowners, contractors, developers and elected and career government staff and adequate funding for educational activities.

I. EDUCATIONAL MISSION

To promote understanding of, and solutions to, nonpoint source water pollution problems in the Dell Creek watershed concurrent with the Dell Creek Priority Watershed Project.

II. BACKGROUND ON EDUCATIONAL STRATEGY DEVELOPMENT

A. Design Study

The Dell Creek Citizen Advisory Committee (CAC) provided the initial input in the development of this educational strategy. Watershed project staff and CAC members created the educational design study, which served as the basis for this strategy. Many individuals of local town, village, city and county government also contributed. This educational strategy drew additional information from several different evaluations in Wisconsin related to non-point water quality issues. One was the Executive Summary of the Recommendations for Improving the East River Priority Watershed Urban Education Campaign, it states:

"all information and education campaigns should begin with long-term awareness building activities. These activities should deliver simple messages through many different channels-making the message ubiquitous. We should also promote simple, inexpensive, and visibly effective activities that reduce non-point source pollution, and drop the term nonpoint source pollution. Furthermore, reducing runoff will require many people to adopt new life styles. Most of our focus group participants learned about environmental issues from their children or grandchildren. Therefore, by taking our message into the schools, we are teaching future generations how to reduce runoff and are also teaching about water quality."

These findings as well as similar findings from the Branch River Information & Education Evaluation will help guide the educational activities for the general public. The Dell Creek plan strives to augment this campaign and to move beyond awareness by focusing additional resources on specific target audiences and BMPs. This strategy is intented to increase citizen's ***knowledge*** about water quality issues and develop ***skills*** to address these issues and will lead to their taking ***action*** for water quality.

The findings of the *Farm Practices Inventory* (FPI) conducted for the Narrows Creek-Baraboo River Priority Watershed Project, and many other watersheds throughout the state, guides the livestock and cropland management educational portions of this strategy. The FPI, produced by the UW-Madison Environmental Resources Center, is an assessment of farmers' nutrient and pesticide management practices. The intent of the assessment is to gain an understanding of the practices farmers are currently using for fertilizer and pesticide management. The results of the assessment helped staff determine the best methods to both improve profitability and protect water quality. The survey also provided insight to potential obstacles for adopting water quality BMPs generally.

The Sauk County Land Conservation Department has successfully completed one priority watershed project (Crossman Creek-Little Baraboo River) and has another in implementation (Narrows Creek-Baraboo River). Experience from these two projects serve as another invaluable guide for the Dell Creek Project. Two surveys conducted in these watershed projects were used to guide this educational strategy. One was *"A Farmer Assessment of Barnyard Runoff Control Systems Installed Through the Crossman Creek-Little Baraboo River Priority Watershed Project."* The portions of this survey that asked watershed contract holders about satisfaction with their barnyard runoff control systems and the work of the Sauk County LCD are most helpful. The other survey was *"A Landowner Assessment of the Narrows Creek-Baraboo River Priority Watershed Project."* This survey asked eligible landowners their opinions of the watershed project and their reasons for not participating, as well as their assessment of watershed educational efforts.

B. Educational Activities Prior to Plan Approval

Many educational programs and activities have already been implemented in the Dell Creek Watershed. They are summarized here to illuminate how this strategy was developed. Primarily these have been to create awareness about the project, to build cooperation among groups and individuals, and to work on demonstration projects. To date the following activities have been undertaken: designed and installed five watershed boundary signs with the help of the Dell Creek CAC and others; designed six boat landing signs with a water quality message for boaters, to be used on Lake Delton and Mirror Lake; started a Water Action Volunteer (WAV) pilot (see below); assisted the village of Lake Delton in getting a grant from the DNR to help them increase enforcement of their construction site erosion control ordinance; wrote many news releases about the watershed project; wrote three watershed project newsletters; held many one-on-one contacts with landowners, local government officials and others; completed a farm demonstration project along Harrison Creek; held a Fishing Clinic at

Mirror Lake State Park; began a Citizen's Advisory Committee (CAC); received CAC assistance with designing educational strategy; held a watershed project logo contest.

III. WATERSHED PROJECT GOALS

Two different aspects of the watershed planning process were used to develop the educational strategy. The first was the water quality goals developed for the Dell Creek project. The second was the need to impact the general population regarding the project, local water resources and the effect of polluted run-off on the watershed. These two facets of the project guided the selection of target audiences and educational objectives. The water quality goals are focussed on pollution reduction, while the educational goals are focused on the watershed citizenry.

A. Summary of Runoff Reduction Goals:

- Barnyard runoff reduction goals are to reduce phosphorus loading by 53% (2,864 lbs./year).
- 25% reduction (3,500 tons/year) of sediment delivery from uplands.
- Reduce soil loss from streambank sites contributing greater than 0.5 tons/year.
- Reduce pollutant loading from future urban developments by 80%.
- Reduce by 20% sediment and toxic pollutants loads from existing areas with high potential for impacting water quality.
- Reduce by 70% sediment loading from construction site erosion.

B. Goals Used to Guide Educational Design Study and Strategy:

- Water quality will improve significantly in the Dell Creek watershed.
- Citizens and visitors of the Dell Creek watershed will better appreciate the area's water resources and will be willing to protect and improve water resources wherever they work, live and recreate.
- Individuals, groups and organizations involved with the Dell Creek Priority Watershed Project will understand the impacts, the causes and solutions of non-point source water pollution and will communicate this knowledge to others.
- Local citizens will view water quality problems as solvable, the solutions as desirable and worthy of work and resources.
- All facets of the community will work cooperatively to improve water quality, understanding that today's actions are important to the local economy and the resource, and that the benefits of the project will be seen well into the future.

IV. EDUCATIONAL OBJECTIVES

The following educational objectives resulted from the design study and include general educational objectives for all citizens and educational objectives targeted at specific audiences:

A. Educational Objectives for General Audiences

1. Watershed residents and visitors to the area will be able to describe the water resources of the area, will understand the contribution of the water resources to the history and culture of the area, will express an appreciation of the resources, and a willingness to protect and improve water quality.
2. Watershed residents will be able to explain the purpose of the Dell Creek Priority Watershed Project.
3. Watershed residents will know who to contact concerning the watershed project, what the project's timeline is, and the benefits of a successful project to themselves and to the community.
4. Watershed residents will be able to describe the most important sources and impacts of nonpoint source pollution on the environment, economics and health.
5. Watershed residents will be knowledgeable of the best management practices that reduce NPS pollution.
6. Watershed residents will be able to implement the BMPs appropriate to their homes, farms and businesses.
7. Watershed residents will understand and will be able to express the concern that many small individual actions from both rural and urban areas causes water quality problems and that many individual actions are necessary to improve water quality.

B. Educational Objectives for Urban Audiences

1. Watershed land and business owners will be knowledgeable of the economics of NPS controls and will recognize that water quality protection and business profits are not only compatible but a desirable business practice.
2. Local government officials and staffs will be knowledgeable of the local ordinances that concern NPS pollution.
3. Local government officials and staffs will encourage appropriate compliance with these ordinances (i.e., construction site, stormwater management and manure storage ordinances).
4. Real estate developers and builders will know the purpose for construction site erosion control ordinances.
5. Real estate developers and builders will know how to develop effective construction site erosion control plans.
6. Real estate developers and builders will install and maintain effective erosion controls.

C. Educational Objectives for Agricultural Audiences

1. Watershed farm and ag-business owners will be knowledgeable of the economics of NPS controls and will recognize that water quality protection and business profits are not only compatible but a desirable business practice.
2. Agronomists and crop consultants will work with their watershed farm owner/operator clients to develop and implement whole-farm crop nutrient management plans.
3. Farmers will learn how sediment is transported to local streams, lakes and rivers and becomes a major source of water pollution, and the relationship of sediment delivery to soil erosion from farmland.
4. Farmers will implement soil conservation plans to reduce soil erosion and sediment delivery to nearby surface waters.
5. Well owners will be able to assess potential risks to their drinking water supplies and be able to implement solutions.

D. Educational Objectives for Youth Audiences

1. Teachers, 4-H and Youth Development, and youth leaders will understand and be able to use water quality information in their classes or with their participants.
2. Youth will take responsible action concerning water quality in the Dell Creek watershed.

E. Educational Objectives for Visitors and Tourist Audiences

1. Visitors will know about water quality issues and solutions and will be able to use this knowledge in their communities and homes.

V. EDUCATIONAL ACTIVITIES

The following is not a definitive list of the educational activities for the ten years of this project. Rather, it should be used more as a guide to the kinds of activities that will be used to achieve the educational objectives. Because it is not possible to know with a high degree of certainty what resources will be available for staff and educational programming, and because many of the activities depend on as yet unknown levels of community leadership for them to be successful, it cannot be known at the outset what specific activities will be appropriate.

The following educational activities are categorized by target audience. They are further arranged by which educational objectives it is intended to satisfy. Each activity is described by OUTCOME (whether it is primarily designed to increase awareness, knowledge, teach a skill, or lead to action concerning the watershed project and nonpoint source water pollution), WHEN and how often the activity will be undertaken, WHO will lead the activity and the PRIORITY of the activity (is it considered a high, medium or low priority). Section VI. describes each activity in more detail.

A. ACTIVITIES FOR GENERAL AUDIENCES

1. *Watershed residents will understand and will be able to express the concern that many small individual actions from both rural and urban areas cause water quality problems and that many individual actions are necessary to improve water quality.*

▸ **No specific activities--theme incorporated into other educational activities**

2. *Watershed residents will know and be able to explain the purpose of the Dell Creek Priority Watershed Project.*

ACTIVITY	OUTCOME	WHEN	WHO	PRIORITY
news release	awareness	4-6/yr	uwex/lcd	H
newsletter	awareness	2-3/yr	uwex/lcd	H
presentation	awareness	4-6/yr	uwex/lcd	H
one-on-one with landowners	awareness	continuous	lcd/uwex	H
logo and message for store windows	awareness	1998	cac/ business	L
take part in local events	awareness	as arise	lcd/cac	L

3. *Watershed residents will be able to describe the water resources of the area, will understand the contribution of the water resources to the history and culture of the area, will express an appreciation of the resources, and a willingness to protect and improve water quality.*

ACTIVITY	OUTCOME	WHEN	WHO	PRIORITY
"We Support Water Quality" campaign	knowledge	2000-2004	business/ cac	M
presentations	knowledge	4-6/year	uwex/lcd	H
written piece(s) on watershed history	knowledge	as needed	uwex	L

4. *Watershed residents will know who to contact concerning the watershed project, what the project's timeline is and the benefits of a successful project to themselves and to the community.*

ACTIVITY	OUTCOME	WHEN	WHO	PRIORITY
news releases	knowledge	4-6/year	uwex/ lcd	H
newsletters	knowledge	2-3/year	uwex/ lcd	H
direct mail to eligible landowners	knowledge	1998	lcd	H
brochure	knowledge	1998	uwex	M

5. *Watershed residents will be able to describe the most important sources and impacts of nonpoint source pollution on environment, economics and health.*

ACTIVITY	OUTCOME	WHEN	WHO	PRIORITY
targeted presentations	knowledge	4-6/year	uwex/ lcd	H
take part in local events	knowledge	as arise	lcd/ uwex	L
targeted NPS materials	knowledge	1998	uwex	M

6. *Watershed residents will be knowledgeable of the best management practices that reduce NPS pollution.*

ACTIVITY	OUTCOME	WHEN	WHO	PRIORITY
Info packet for use with contacts	knowledge	1998	uwex/lcd	M
Make water quality publications accessible	knowledge	1998	uwex	M
targeted presentations	knowledge	4-6/year	uwex/lcd	H

7. *Watershed residents will be able to implement the BMPs appropriate to their home/farm/business.*

ACTIVITY	OUTCOME	WHEN	WHO	PRIORITY
One-on-one with eligible landowners	skill	continuous	lcd	H
targeted presentations	skill	4-6/year	uwex/lcd	H

B. ACTIVITIES FOR URBAN AUDIENCES

1. *Watershed business owners will be knowledgeable of the economics of NPS controls and will recognize that water quality protection and business profits are not only compatible but a desirable business practice.*

▸ **Not a specific set of activities--theme incorporated into other educational activities**

2. *Local government officials and staffs will be knowledgeable of the local ordinances that concern NPS pollution.*

ACTIVITY	OUTCOME	WHEN	WHO	PRIORITY
Local officials update	knowledge	as needed	uwex	M
one-on-one with local officials	knowledge	continuous	lcd/cac	H
targeted presentations	knowledge	4-6/yr	uwex/lcd	H

3. *Local government officials and staffs will encourage appropriate compliance with these ordinances (i.e., construction site, storm water management and manure storage ordinances).*

ACTIVITY	OUTCOME	WHEN	WHO	PRIORITY
develop materials and procedures @ permitting	action	1998	dnr/uwex	H

4. *Real estate developers and builders will know the purpose for construction site erosion control ordinances.*

ACTIVITY	OUTCOME	WHEN	WHO	PRIORITY
work with village of Lake Delton on CSEC I&E	action	1998	dnr/lcd	H

5. *Real estate developers and builders will know how to develop effective construction site erosion control plans.*

ACTIVITY	OUTCOME	WHEN	WHO	PRIORITY
host stormwater & CSEC workshop(s)	skill	1999	uwex	H
send out notification of CSEC training	skill	as offered	uwex	M

6. *Real estate developers and builders will install and maintain effective CSE practices.*

ACTIVITY	OUTCOME	WHEN	WHO	PRIORITY
assist village with CSEC ordinance enforcement	action	on-going	dnr/lcd	H

C. ACTIVITIES FOR AGRICULTURAL AUDIENCES

1. *Watershed farm and ag-business owners will be knowledgeable of the economics of NPS controls and will recognize that water quality protection and business profits are not only compatible but a desirable business practice.*

▸ **No specific activities--theme incorporated into other educational activities**

2. *Agronomists and crop consultants will develop and work with their watershed farm owner/operator clients to implement whole-farm crop nutrient management plans.*

ACTIVITY	OUTCOME	WHEN	WHO	PRIORITY
one-on-one w/agronomists	action	1998-2000	uwex	H
on-farm demonstration	knowledge	1999	uwex/ag	H
UWEX NPM program workshops	action	1999	uwex	M

3. *Farmers will learn how sediment is transported to local streams, lakes and rivers and becomes a major source of water pollution, and the relationship of sediment delivery to soil erosion from farmland.*

ACTIVITY	OUTCOME	WHEN	WHO	PRIORITY
soil conservation workshops	skill	2000	lcd/nrcs/ uwex	M
one-on-one soil conservation planning	skill	continuous	lcd/nrcs	H

4. *Farmers will implement soil conservation plans to reduce soil erosion and sediment delivery to nearby surface waters.*

ACTIVITY	OUTCOME	WHEN	WHO	PRIORITY
on-farm demonstration	knowledge	2000	lcd/ farmer	H

5. *Well owners will be able to assess potential risks to their drinking water supplies and know how to implement solutions.*

ACTIVITY	OUTCOME	WHEN	WHO	PRIORITY
Farm*A*Syst and Home*A*Syst	action	2000	FAS staff	M

D. ACTIVITIES FOR YOUTH AUDIENCES

1. *Teachers, 4-H and Youth Development and youth leaders will understand and be able to use water quality information in their classes or with their participants.*

ACTIVITY	OUTCOME	WHEN	WHO	PRIORITY
host annual workshops	skill/action	1999-2001	uwex	H
work w/teachers on lesson plans	skill/action	as requested	uwex	M

2. *Youth will take responsible action concerning water quality in the Dell Creek watershed.*

ACTIVITY	OUTCOME	WHEN	WHO	PRIORITY
WAV program	action	on-going	wav coord.	H
Adopt-a-Lake Program	action	1999	uwex	H
school presentations	action	2/year	uwex	M

E. ACTIVITIES FOR VISITOR and TOURIST AUDIENCES

1. *Visitors will know about local water quality issues and solutions and will be able to implement BMPs at their residence.*

ACTIVITY	OUTCOME	WHEN	WHO	PRIORITY
handout for people in line at attractions	awareness knowledge	1998	uwex/lcd	H
restaurant and business flyers or signs	awareness knowledge	2000	cac/businesses	M

VI. EXPLANATION OF EDUCATIONAL ACTIVITIES

Assist Village of Lake Delton with Construction Site Erosion Control (CSEC) enforcement -- The village currently has a construction site erosion control ordinance but does not have effective enforcement procedures in place. The watershed project will assist the village to effectively enforce this ordinance that addresses a major source of sediment delivery in the urban portion of this watershed. The permitting process is the one sure point of contact with developers and builders. The watershed project will work with the village of Lake Delton to develop materials to be used when CSEC plans are permitted. This will consist of information explaining the ordinance as well as the erosion controls measure that can be used.

Citizens Advisory Committee (CAC) -- The Citizens Advisory Committee will continue to meet on a regular basis. LCD staff will provide assistance to the CAC for minutes, meeting space scheduling and mailings. The CAC will develop its own agendas and actions. The CAC will help insure that local views, concerns and involvement are included in the implementation of the watershed plan. The CAC will consist of local government officials, representatives of conservation groups, farm organizations and interested citizens.

Water Action Volunteers (WAV) and Adopt-A-Lake -- These are two state sponsored programs that encourage people to learn and take action for state waters. Water Action Volunteers (WAV) focusses on streams and rivers and recommends such actions as collecting stream critters to determine water quality, storm drain stenciling, and river cleanups. Adopt-A-Lake is an inter-generational program teaming an adult sponsor with a youth group or class. Together they learn about a local lake and develop actions to help improve the lake. The Dell Creek Project will host workshops for both of these projects.

Dell Creek is one of two pilot projects in the state doing citizen monitoring. Approximately five sites per year are monitored for dissolved oxygen, temperature, habitat, macroinvertebrates and turbidity. Volunteers include teachers, community members and students.

Direct mail to eligible landowners -- Landowners will be sent personal letters explaining their eligibility and other information about the watershed project at the beginning of the sign-up period. In addition to being a good way to get information to landowners, it also helps watershed staff begin to make contacts.

Farm*A*Syst and Home*A*Syst -- The Farm*A*Syst and Home*A*Syst programs focus on preventing water pollution in rural America. These programs utilize a series of worksheets to identify potential risks to drinking water supplies. Besides doing a risk assessment, the program helps users develop an action plan to reduce identified risks. Farm*A*Syst is designed for farms while Home*A*Syst is designed for rural non-farm residences.

Handouts for people in line at tourist attractions -- These brochures will be made accessible for people waiting in line and at other locations at tourist attractions in the Wisconsin Dells and Lake Delton area. They will contain information about runoff pollution problems in the Dells area, and describe actions that can be taken at home or at work to reduce runoff pollution.

Host annual teacher workshops -- Workshops will be offered to area teachers and youth group leaders. These will consist of WaterWatchers Workshops, Project WET (Water Education for Teachers) and Project WILD. The WaterWatchers workshop uses the four guidebooks developed by Dane County UW-Extension to learn about streams, rivers and watersheds. Project WET and Project WILD are national programs that provide more than 200 activities for teachers, youth group leaders and interested citizens on water and wildlife. Together these three programs provide a great foundation of activities and local information for educators.

Information packets for use with contacts -- These are customized packets for farm, rural non-farm, lake, and urban residents containing detailed information about local water resource, runoff pollution problems and the Watershed Project. These packets will be used when making landowner contacts.

Make water quality publication accessible -- Published water quality publications from UWEX, DNR and others will be provided to schools, libraries, organizations and other locations where they will be accessible to the public.

Local officials updates -- Local governments will be provided updates concerning stormwater, construction site erosion and other urban NPS issues and will be kept current on state-wide activities and events on these issues.

Logo and message for store windows -- Posters or displays will be used at participating businesses showing their support for the watershed project.

Media releases -- The LCD staff will develop media releases regarding pollution prevention activities or concerns at least twice each year. Releases will also go to newspapers and radio prior to major events such as the kickoff, field days, community cleanups, workshops, etc. This activity is designed to increase awareness about the Dell Creek project. Media releases will be used to inform the public about all project schedules and events. Media releases will be a primary way to reach the general public.

Newsletter -- Newsletters are two or four pages in length focussing primarily on the rural area of the watershed. The newsletters will be sent out 2 or 3 times a year. The newsletters will be a vehicle for explaining the project, for increasing problem recognition and solution acceptance among landowners and operators and to help celebrate the positive accomplishments being made through the watershed project.

One-on-one contact with target audiences -- LCD staff will make one-on-one visits with every eligible landowner in the watershed. Conservation Specialists and Agriculture Extension Agents will visit rural landowners and operators. The LCD and Extension staff will distribute appropriate written materials to landowners during these visits and promote Farm/Home*A*Syst packets where drinking water concerns are expressed. Area agronomists will also be the focus of one-on-one efforts in the area of developing whole-farm nutrient plans for watershed farmers. This includes working with farmers on manure spreader calibrations and variety of nutrient management planning and implementation issues. Watershed staff will meet with local officials and citizens on a regular basis. Watershed staff may occasionally meet with small groups of municipal or government staff, bankers, zoning officials in formal and informal face-to-face meetings. Valuable information can be shared in these meetings and questions answered. The dynamics of a small group allows for the free flow of questions and helps to be sure that everyone is hearing the same information completely and accurately.

On-Farm Demonstrations -- Practices to reduce runoff pollution from farm fields and yards will be demonstrated on participating watershed farms where the practices have been

implemented and used successfully by the farmer to show others how the practices work and how other farmers can benefit from adopting them.

School field trips/Presentations -- Local schools districts will be offered fields trips and in-class presentations about water quality issues and the watershed project.

Soil conservation workshops -- Workshops will be offered to area farmers to assist them in putting in place effective soil erosion plans and to learn about sediment delivery controls. This may include field days or on-farm demonstrations.

Stormwater and CSEC workshops -- Local government officials and staffs, local developers and contractors will be offered workshops on CSEC and Stormwater management. This may coincide with a state-wide conference offered by UWEX in Wisconsin Dells.

Targeted Presentations -- A series of presentations or workshops will be tailored to specific audiences and objectives. This is a primary vehicle used to teach specific skill sets to people in the watershed. Such presentations typically last two to four hours and may have one or more watershed staff or other specialists presenting. This provides the opportunity to present technical information; to develop an awareness for area water quality problems; to increase knowledge of the impacts on economics, environment and society; and to increase knowledge of available solutions. Presentations will be offered to local officials, farmers, agricultural audiences, and community group members. Regular meetings of area Lake Associations, village, town and county governments, farmer cooperatives and civic groups, as well as watershed project sponsored public meetings, will serve as the venues for these presentations.

Take part in local events -- whenever possible watershed staff will participate in area events (e.g. Wo-Zha-Wa Days, etc.) to promote the watershed project.

UWEX NPM program workshops -- The UWEX's Nutrient and Pest Management Program (NPM) offers workshop that can be tailored for watershed farmers and agronomists. A workshop covering the Dell Creek watershed will be offered to increase understanding of and better implementation of whole-farm nutrient plans.

"We support water quality" campaign -- Local businesses will take part in a campaign that shows how they are doing their part to contribute to improving water quality and supporting the watershed project.

Written articles on history -- These will be used to generate an awareness about the unique cultural and natural history of the area to foster a better appreciation of the water resources.

Work with teachers on lesson plans -- Local teachers will be invited to take part in workshops to help them develop and update their environmental education programming.

VII. IMPLEMENTATION TEAM

The education strategy was developed by the University of Wisconsin Extension (UWEX) Water Quality Educator, the Sauk and Juneau County Land Conservation Departments (LCDs) staff with assistance from the watershed project's Citizen Advisory Committee (CAC), UWEX Area Water Quality Specialist, the Wisconsin Department of Natural Resources, the Department of Agriculture, Trade and Consumer Protection (DATCP) and the Land Conservation Committee (LCC) of the Sauk and Juneau County Boards of Supervisors.

The UWEX Water Quality Educator and the Sauk County LCD will take lead responsibility for implementing this I&E strategy. The UWEX, DNR, and DATCP will provide supporting assistance. The entire implementation team will work with and seek support from the CAC, local units of government, organizations, businesses and individuals. As this plan is being drafted, the DNR is undergoing a major reorganization to become centered around 23 river basin areas, or Geographic Management Units (GMU). The Dell Creek watershed is in the Lower Wisconsin River Basin. Basin teams are being formed to address critical resource management issues in each GMU. A UWEX Basin Educator, with a substantial role in water quality was newly hired as this plan was going to print.

Staffing and Budget Needs for Educational Activities

The cost of implementing this educational strategy is approximately $15,000 and is further explained on table 5-1.

Table 5-1. Staffing and Budget Needs for Educational Activities

Activity	Year(s)	Staff Hours	Cost/ Activity (dollars)	Total Cost (dollars)
CSEC education	1998-2001	80 + 16[1]	ns	ns
CSEC Demonstration	1999	120 + 24	750	750
Citizen Advisory Committee (CAC)	1998-2001	96 + 96	ns	ns
WAV	1998-2005	256[2]	100	1,000
Adopt-A-Lake	2000	48[2] + 16	300	300
Direct Mailings	1998-2003	96 + 16	400	2,400
Farm*A*Syst & Home*A*Syst	2000	32[2] + 8	300	300
Informational Materials for Tourists	1999-2001	192	1,000	1,000
Annual Teacher Workshops	1999-2001	24[2]	ns	ns
Informational Materials for Landowners	1998-2001	80 + 16	ns	ns
Local Officials Updates	all	128 + 16	ns	ns
Logo and Message for Store Windows	1998-99	200 + 16	500	500
News releases	all	480 + 80	ns	ns
Newsletter	all	960 + 160	200	2,000
One-on-one contacts	all	2080	ns	ns
Soil Conservation Workshops	2000	36 + 36	300	300
Stormwater and CSEC Workshops	1999	24 + 8	200	200
Targeted Presentations	all	900	50	3000
Promote Project at Local Events	all	160	100	500
On-Farm Demonstrations	1999-2001	320 + 96	400	1,200
Nutrient Management Education	all	1040 + 144	ns	ns
UWEX NPM Program Workshops	1999	32[2]	200	200
"We Support Water Quality" campaign	2000-2004	600 + 80	2,000	2,000
Written Articles on Local History	all	40	ns	ns
Work with teachers on lesson plans	request	16[2]	ns	ns
TOTAL		8868[3]	na	$15,650

1 Hours provided by UWEX I&E Coordinator (left figure) + provided by LCD staff (right figure)
2 Lead for activity provided by outside group or individual, hours shown for watershed staff support.
3 UWEX - 7632 hours, LCD - 828 hours, OTHER - 408 hours
ns = no significant budget needs (i.e., primarily staff time).

CHAPTER SIX

Integrated Resource Management Program

Introduction

The purpose of this chapter is to identify existing state, federal and local resource management programs which provide benefits for water quality and/or fish and wildlife resources in the Dell Creek watershed. Watershed staff will work to coordinate the efforts of these programs to provide the best possible management of land and water resources in the watershed. This comprehensive approach will facilitate consideration of the various goals and objectives for all the programs in which the landowner participates. Each of these activities is described below.

Fisheries and Wildlife Management

Watershed best management practices (BMPs) affecting stream habitat, such as streambank protection, shoreline buffer strips and easements, should be implemented in a manner that preserves and enhances the management goal of providing a quality fishery in the Dell Creek watershed. Specifically, all streambank protection BMPs should be installed using large diameter-sized rock below the water line. Rock riprap should be installed and sized so that the placement and size of rock will positively benefit fish habitat. Vegetative shoreline erosion control using emergent aquatic vegetation for habitat enhancement should be used where applicable. Wildlife habitat components should also be incorporated into vegetative filter strips along streams or in upland areas.

Shoreline erosion control measures will be installed in a manner beneficial to fisheries and wildlife habitat. Staff from DNR Bureau of Fisheries Management and Habitat Protection and Bureau of Wildlife Management personnel will be consulted for input in the design of streambank and shoreline protection BMPs to maximize benefits to the fish and wildlife communities. In cooperation with counties, DNR staff will review placement of agricultural sediment basins, provide technical assistance when the installation of BMPs will require the removal of obstructions or other wildlife habitat and propose measures to minimize impact on wildlife habitat, and assist in resolving questions concerning effects of agricultural nonpoint source BMPs on wetlands.

Wetland Restoration

Restorable wetlands have not been identified in the Dell Creek watershed. The general guidelines for wetland restoration, easement acquisition and shoreline buffers to protect existing wetlands should be followed. Wetlands that are important wildlife habitats will be identified in consultation with DNR Wildlife Management and Watershed Management personnel. Shoreline buffer easements may be acquired adjacent to these wetlands to offer better protection from sedimentation and other nonpoint source pollution.

Groundwater Management

Wells provide a direct conduit for pollutants to reach groundwater resources. Preventing well contamination and sealing abandoned wells are important steps for protecting these resources. If not properly sealed, abandoned wells can directly channel contaminated surface water or shallow groundwater into deeper drinking water aquifers, bypassing the normal purifying action that takes place as surface water slowly percolates downward. Abandoned wells are a significant threat to groundwater quality in the Dell Creek watershed.

Project staff will encourage all landowners to properly seal abandoned wells. Information on the proper abandonment procedures will be provided to landowners when abandoned wells are located.

Well Abandonment

The Farm Services Agency (FSA) provides cost-share assistance to Dell Creek watershed farm operators to properly seal abandoned wells to protect groundwater resources. Well abandonment is also an eligible cost-share practice under NR 120.

Wisconsin Well Compensation Grants

Wisconsin's Well Compensation grant program provides financial assistance to replace or treat private wells contaminated with heavy metals, pesticides, solvents or gasoline. Contaminated wells must exceed state or federal drinking water standards. Replacement of wells contaminated with bacteria or nitrate are not eligible for cost-sharing, with the exception of livestock wells contaminated with more than 40 ppm of nitrate. DNR district water supply personnel should be consulted for more information concerning income limits and other eligibility requirements. Eligible landowners will be encouraged to apply for well replacement funds through the Wisconsin Well Compensation Grant Program.

Private Sewage System Maintenance and Rehabilitation

Poorly sited or improperly functioning private sewage systems have the potential to contaminate groundwater and surface waters in the Dell Creek watershed. Pollutants from sewage system discharge includes bacteria, viruses, household chemicals, nitrates and phosphorus. Many sewage systems located in riparian areas are out-dated and installed in soils which do not adequately filter pollutants due to the poor filtering ability of the soil and/or a high water table. Failing sewage systems in riparian areas are a special concern since pollutants can enter the surface waters with minimal filtering. Sewage system failure is often due to poor maintenance, primarily a failure to pump septic tanks on a regular basis.

It is also recommended that Sauk and Juneau Counties adopt an "update at date of sale" policy to require the proper inspection, update and/or replacement of septic systems when homes are sold.

Wisconsin Fund

The Private Sewage System Replacement & Rehabilitation Grant Program (Wisconsin Fund) provides financial incentives to protect and improve groundwater quality in Wisconsin. The Wisconsin Fund provides funds to update private sewage systems installed before 1978. To be eligible the septic system must have been inspected by the Sauk or Juneau County Sanitarian and determined to be failing by discharging waste to the groundwater or surface water. Only permanent residences qualify, and there are income restrictions. Applications for Wisconsin Fund assistance are made through the Sauk or Juneau County Planning and Zoning Department. Watershed staff will inform watershed residents about the benefits of the Wisconsin Fund grant program and encourage eligible landowners to apply.

Riparian Zones

Any sites impacted by cattle access that are identified during the implementation phase of the project should be protected with BMPs. Sensitive riparian areas can be acquired through easements so they receive lasting protection. Watershed staff will promote the protection of riparian areas where possible.

Stewardship

The Stewardship program enables the purchase of land or easements to protect sensitive environmental areas. The streambank protection program under stewardship is an important additional means of protecting water quality. Under this program, the DNR could obtain an easement on both sides of streams in the watershed (generally 66 feet wide on each side). If needed, the DNR will financially support the fencing of the stream to protect it from livestock access.

Forestry Programs

Private forest lands, which account for roughly 17,600 acres within the Dell Creek watershed, are important producers of forest products in Sauk and Juneau Counties. Private forest lands also contribute to the quality of water resources and fish and wildlife resources in the watershed. Financial assistance is available for forest management and soil and water resource protection through the Stewardship Incentive Program (SIP), the Managed Forest Law Program (MFL) and other forest stewardship programs. Additional information can be found in DNR publication FR-093-95, *Wisconsin Forestry Best Management Practices For Water Quality*, developed by DNR Bureau of Forestry.

Stewardship Incentive Program

The Stewardship Incentive Program (SIP) was developed to stimulate enhanced management of forest lands by cost-sharing approved management practices. SIP provides cost-share funding of up to 75% for practices that provide soil and water protection. The SIP program applies to nonindustrial private forest land of 10 acres or more on forested or forest related

(i.e., prairie, wetlands) lands. Practices that are cost-shared by SIP include: development of a landowner forest stewardship plan; site preparation and tree planting; timber stand improvement; windbreak and hedgerow establishment; soil and water protection and improvement; riparian and wetland protection and improvement; fisheries habitat enhancement; wildlife habitat enhancement; and forest recreation enhancement.

Managed Forest Law

The goal of the Managed Forest Law (MFL) program is to encourage long-term sound forest management. MFL is a tax incentive program for industrial and nonindustrial private woodland owners who manage their woodlands for forest products while also managing for water quality protection, wildlife habitat and public recreation. In return for following an approved management plan, property taxes are set at a lower rate than normal. At a later time when the landowner receives an income from a timber harvest, some of the deferred tax is collected in the form of a yield tax. Management plans are based on the landowners objectives. These plans may address harvesting, planting, thinning, release and soil erosion on a mandatory basis while addressing other practices such as wildlife and aesthetic activities on a voluntary basis.

Forest Improvement Program

Another forest stewardship program available to watershed landowners include the Forest Improvement Program (FIP). This program provides funding for the establishment of timber stands. Watershed staff and DNR Foresters will encourage eligible forest landowners in the Dell Creek watershed to participate in Forest Stewardship Programs to benefit water resources and forest habitat. Protection of soil and water resources should be addressed in all SIP and MFL plans.

Inland Lakes Program

Wisconsin Lakes Management Program

Wisconsin's 15,000 inland lakes are under increasing pressure from the activities of people who live and recreate near them. Increasing development and recreational use of lakes has led to user conflicts, the introduction of exotic species and the disruption of lake ecology. Land use changes in lake watersheds has resulted in the nutrient enrichment of many Wisconsin lakes, leading to nuisance growth of aquatic plants and algae, sedimentation and the loss of native plant communities. The Wisconsin Lakes Management Program is a cooperative program between the Wisconsin DNR, UW-Extension, the Wisconsin Association of Lakes (WAL), and lake organizations to assist local governments and the inland lake management organizations in the long-term management and protection of their lakes. The Wisconsin Lakes Management Program provides technical assistance, information and education to lake groups and lake residents, and planning, protection, and implementation grants to qualified lake organizations and local units of government.

Organizing Lake Groups

Lake groups range from informal groups of concerned property owners to lake districts which have the power to levy taxes against property owners for the operation of lake management programs. Most of the DNR grant programs designed to help lake residents become better lake stewards require that the lake organizations meet certain minimum standards relating to membership, dues and by-laws. At a minimum, a lake group must be a legal lake association incorporated under Chapter 181 Wisconsin Statutes.

In addition to the ability to apply for lake assistance grants, qualified lake organizations have much to offer lake residents. A unified lake association or lake district can lobby towns for changes in zoning laws and lake use restrictions and may join the Wisconsin Association of Lakes, which lobbies at the state-level for lake stewardship, cooperatively with the DNR, to express their concerns and the opportunity to educate residents about proper lake stewardship. Many Wisconsin counties have formed county lake associations to further assist in these efforts.

Self Help Monitoring Program

The goal of the Self Help Monitoring Program is to educate lake property owners about lake ecology and water quality while building a long-term information base on a large number of Wisconsin lakes. The Self Help Monitoring Team consists of volunteers who collect lake water quality data on a regular basis to track lake health and guide Wisconsin's Lake Management Program.

Lake Management Planning Grant Program

The Wisconsin Lake Management Planning Grant Program was developed to provide financial assistance to qualified lake organizations or local governments to collect and analyze data concerning the physical, chemical and biological health of their lakes. Grant money can also be used to investigate watershed conditions, review ordinances and conduct social surveys to gauge local concerns and perceptions as they relate to lake use and water quality. The end product of most lake management planning grants is a comprehensive lake management plan which addresses local concerns and analyzes alternatives for lake and watershed management. The DNR pays 75% of the cost of the planning project, not to exceed $10,000 during each two-year state budget period. The grant recipient pays the remaining 25% of the project cost.

Water Quality Trend Monitoring

Lake management planning grants are available through the Wisconsin DNR to conduct water quality trend monitoring on Wisconsin lakes. In many cases, previous Environmental Protection Agency (EPA) and DNR funding research projects may have provided a wealth of baseline water quality information on lakes on their tributaries. Continuing water quality trend monitoring is an important step in evaluating the effectiveness of watershed management techniques and adjusting lake management activities. Project staff will encourage lake

organizations to apply for additional lake management planning grants to continue water quality trend monitoring of lakes and inlets during the implementation phase of the priority watershed project.

Lake Protection Grant Program

Through the Lake Protection Grant Program qualified lake organizations can apply for funds to carry out a variety of lake protection projects. The state-share is 75%. Eligible projects include the purchase of lands critical to a lake ecosystem, restoration of important wetlands and the development of regulations and ordinances designed to protect and enhance lake water quality. Funding is limited to $200,000 per grant. Qualified lake organizations will be encouraged to apply for lake protection grant funding where applicable.

Coordinating Regulations, Permits, and Zoning

Best management practices that address shoreline erosion such as riprap or vegetative shoreline stabilization will require permits from the DNR. Any BMP which effects wetland form or function may require permits form the DNR, Sauk or Juneau County Zoning offices and the US Army Corps of Engineers.

The watershed staff will work closely with the DNR Floodplain and Shoreland Management staff, the Sauk or Juneau County Zoning Departments and the US Army Corps of Engineers to assure that necessary permits are received prior to the installation of shoreline stabilization practices.

In an attempt to protect the use, enjoyment and water quality of our lakes and streams the state, federal and local government regulates some activities on riparian properties. Activities that disturb or remove the natural vegetation surrounding our lakes and streams reduce the buffering capacity of the area and often drastically increase erosion, sedimentation and nutrient runoff. Many lakefront property owners, particularly those who are purchasing waterfront property for the first time, are not aware of these regulations or the need for them.

Coordination With State and Federal Conservation Compliance Programs

The Dell Creek watershed project will be coordinated with the conservation compliance features of the Wisconsin Farmland Preservation Program (FPP) administered by DATCP, and the Federal Food Security Act (FSA) administered by the Natural Resource Conservation Service. DATCP will assist the LCD and the NRCS offices to identify landowners within the watershed that are subject to the compliance provisions of FPP and FSA. Conservation Farm Plans were completed for all landowners in FSA by December 31, 1989.

Implementation and amendment of these conservation plans will be necessary during the implementation phase of the watershed project. Watershed project staff will inform FPP and NRCS staff of changes in plans resulting from management decisions and the installation of needed BMPs for nonpoint source pollution abatement.

Archaeological Sites: Coordination with State and Federal Historic Preservation Laws

Projects using state and federal funding, assistance, licenses and permits are required by law to consider the effects of their actions on archaeological and historical sites and historical structures. The watershed project is a joint cooperative effort between federal, state, and county agencies as well as the private landowners who volunteer to participate in the program. As a result, the federal Historic Preservation Act of 1966, as amended, and the state historic preservation statute, s. 44.40, Wis. Stats., have been blended to produce a cultural resource management program which is compatible both to preserving cultural sites and implementing the watershed project.

These areas will need special consideration when structural best management practices are being considered. Settling basins, manure storage structures, and streambank or shoreline shaping and riprapping are likely practices that may impact archaeological sites. As discussed above, state and federal laws require preservation of archaeological resources within the framework of the NPS Program.

Before finalizing the cost-share agreement with the landowner, project staff should review the maps showing known archaeological and historic sites. If a known site occurs in the vicinity of a proposed BMP, this does not necessarily mean the BMP needs to be moved or altered. In some cases, the specific location of the BMP will not actually be near enough to the location of the known site to warrant further review. Project staff should visit the area and conduct a "pre-review" to ensure that the ***specific*** location of the proposed BMP will not disturb the known archaeologic or historic site. Instructions and Cultural Resource Site Review Documentation forms are available in the Implementation Manual.

If it is too difficult to determine through a pre-review, or if it appears that the known site would indeed be disturbed, contact the DNR to set up a formal Archaeological or Historic Site Review of the area. Any costs incurred as part of a site review ***will not be passed on to the landowner.*** The DNR's Nonpoint Source Pollution Abatement Program will pick up the costs of professional historic and/or archaeological site reviews. In some cases, a representative from the U.S. Natural Resources Conservation Service (NRCS) may conduct the review.

Practices of concern:

ARCHAEOLOGICAL SITES: Field Diversions, Streambank/Shoreline Stabilization, Sediment Retention, Erosion or Water Control Structures, Grade Stabilization Structures, Agricultural Sediment Basins, Terraces, Structural Urban Practices, Wetland Restoration.

BUILDINGS: Barnyard Runoff Management Systems, Animal Lot Relocation, Manure Storage Facilities, Roofs for Barnyard/Manure Storage Facilities.

Endangered and Threatened Resources

Information on threatened and endangered resources was obtained from the Bureau of Endangered Resources of the DNR. Endangered resources include rare species and natural communities. It should be noted that comprehensive endangered resource surveys have not been completed for the entire Dell Creek Priority Watershed. The lack of additional occurrence records does not preclude the possibility that other endangered resources are present in the watershed. In addition, the Bureau's endangered resource files are continuously updated from ongoing field work. There may be other records of rare species and natural communities which are in the process of being added to the database and so are not listed in this document.

Rare Species

Rare species are tracked by Wisconsin's Natural Heritage Inventory of the Bureau of Endangered Resources. Species tracked by the inventory include those that are listed by the U.S. Fish and Wildlife Service or by the state of Wisconsin.

Wisconsin Endangered Species

An endangered species is one whose continued existence as a viable component of this state's wild animals or wild plants is determined by the DNR to be in jeopardy on the basis of scientific evidence. Wisconsin endangered species within the watershed are:

Ophisaurus attenuatus, western slender glass lizard;
Terrapene ornata, ornate box turtle;
Fusconaia ebena, ebony shell mussel;
Quadrula fragosa, winged mapleleaf mussel;
Acris crepitans blanchardi, Blanchard's cricket frog

Wisconsin Threatened Species

A threatened species is one which, if not protected, has a strong probability or becoming endangered. Wisconsin threatened species within the watershed are:

Vireo bellii, Bell's vireo;
Platanthera flava var herbiola, pale green orchid;
Agalinis gattingeri, roundstem foxglove;
Buteo lineatus, red shoulder hawk;
Simpsonaias ambigua, salamander mussel

Wisconsin Special Concern Species

A special concern species is one for which some problem of abundance or distribution is suspected in Wisconsin, but not yet proven. The purpose of this category is to focus attention on certain species **before** they become endangered or threatened. Wisconsin special concern species within the watershed are:

Sturnella neglecta, western meadowlark;
Atrytonopsis hianna, dusted skipper butterfly;
Mitoura grynea, olive hairstreak butterfly;
Chlosyne gorgone, gorgone checker spot butterfly;
Hesperia metea, cobweb skipper butterfly;
Satyrium titus, coral hairstreak butterfly;
Gnaphalium obtusifolium var saxicola, cliff cudweed;
Primula mistassinica, bird's-eye primrose;
Solidago sciaphila, shadowy goldenrod;
Asplenium trichomanes, maidenhair spleenwort;
Carex backii, Rocky Mountain sedge;
Dryopteris fragrans var remotiuscula, fragrant fern;
Lycopodium porophilum, rock clubmoss;
Triphora trianthophora, nodding pogonia;
Onosmodium hispidissimum, marbleseed;
Calylophus serrulatus, yellow evening primrose;
Calamagrotis stricta ssp inexpansa, New England northern reed grass
Calamagrotis stricta ssp stricta, northern reedgrass;
Euphyes conspicus, black dash butterfly
Utricularia geminiscapa, hidden-fruited bladderwort;
Scleria triglomerata, whip nutrush;
Neurocordulia molesta, smoky shadowfly dragonfly;
Neurocordulia yamaskanensis, stygian shadowfly dragonfly;
Stylurus amnicola, riverine clubtail dragonfly;
Stylurus notatus, elusive clubtail dragonfly;
Macromia taeniolata, royal river cruiser dragonfly;
Ceratophyllum echinatum, prickly hornwort;
Stylurus plagiatus, russet-tipped clubtail dragonfly;
Eleocharis wolfii, wolf spikerush;
Eleocharis englemannii, englemann spike-rush;
Juncus vaseyi, vasey rush.

If specific locational or other information is needed about these species or natural communities, contact the Bureau of Endangered Resources, DNR. **Please note** that the specific location of endangered resources is sensitive information. Exact locations **should not** be released or reproduced in any publicly disseminated documents.

Natural Areas

Natural areas are sites that contain high quality examples of natural communities.
The Dells of the Wisconsin River State Natural Area lies partially within the Dell Creek watershed. In addition, the following public areas are within the watershed: Dell Creek Wildlife Area, Mirror Lake State Park and Rocky Arbor State Park.

CHAPTER SEVEN
Project Evaluation

This chapter summarizes the plan for evaluating the progress and effectiveness of the Dell Creek Priority Watershed Project. The evaluation plan includes these components:

- Administrative review
- Pollution reduction evaluation
- Water resource monitoring

Information on the first two components will be collected by the Sauk and Juneau County LCDs and reported on a regular basis to the DNR and the DATCP. Reporting is done on a grantee basis, rather than by total watershed. The project team will meet early in the year throughout the implementation phase to review and evaluate the accomplishments of the preceding year. Additional information on the numbers and types of practices on cost-share agreements, funds encumbered on cost-share agreements, and funds expended will be provided by the DNR's Bureau of Community Financial Assistance. The Water Resource Monitoring plan follows guidance established by DNR's Bureau of Watershed Management to select specific sites in the watershed to monitor resource quality changes.

A final report will be prepared for the Dell Creek Priority Watershed Project within 18 months of the end of the grant period. This report will include information on landowner participation, project management, grant management, technical assistance, and any Signs of Success sites completed within the watershed. It is developed to evaluate progress, provide documentation on attainment of water quality and pollutant load reduction objectives, evaluate BMP effectiveness, and provide recommendations on key areas needing improvement in the NPS program. Watershed staff will prepare the final report.

Administrative Review

The first component, the administrative review, will focus on the progress of Sauk and Juneau Counties and other units of government in implementing the project. The project will be evaluated with respect to accomplishments and financial management.

Accomplishment Reporting and Annual Review

The Sauk and Juneau County LCDs will provide the following data to the DNR annually:

- Pollutant load reductions
- Planned and completed conservation systems
- Information and education accomplishments, including demonstrations
- Program participation status including number of municipal grantees and frequency and type of contacts with rural cost-share eligible landowners

- Status of nutrient management planning in the watershed project
- Status of verification of critical sites
- Status of implementing the schedule of notification for landowners with critical sites
- Status of implementing the contact strategy for landowners with critical sites
- Status of easement acquisition and development

Likewise, participating local units of government implementing the urban nonpoint source management program meet periodically with DNR staff to review progress. The DNR and local units of government will jointly evaluate the urban implementation program. Urban grantees, including the city of Wisconsin Dells and the villages of Lake Delton and Lyndon Station, will provide the following data to the DNR annually:

- Status of stormwater management ordinances, planning, and enforcement
- Urban housekeeping accomplishments such as street sweeping, storm sewer and catch basin cleaning, and leaf and brush collection
- Status of stormwater planning and implementation for new development
- Status of stormwater management feasibility studies and implementation for existing urban areas
- Streambank erosion control
- Information and education activities
- Status of construction site erosion control ordinances or amendments, planning and enforcement
- Acres of existing (1997 survey year) urban development, by land use, draining to storm-water management practices for controlling water quality
- Acres of new (post-1997 survey year) urban development, by land use, draining to storm-water management practices for controlling water quality

Accomplishment data are summarized in the biennial *Joint Program Evaluation Report of the Nonpoint Source Water Pollution Abatement Program and the Soil and Water Resource Management Programs* prepared by DNR and DATCP. Accomplishment data are also presented and discussed annually at the LWCB meeting and at watershed review meetings held for projects in implementation.

Details of the reporting requirements are contained in DNR Publication WR-223-97, "An Evaluation Plan for the Soil and Water Resource Management Program and the Nonpoint Source Water Pollution Abatement Program" which is reviewed every two years by DATCP and DNR and revised as necessary.

The Field Offices Computing System (FOCS) is a computer data management system that has been developed by the U.S. Natural Resources Conservation Service (NRCS). The NRCS, the DNR and the DATCP use FOCS to meet the accomplishment reporting requirements of all three agencies. The Sauk and Juneau County LCDs will use FOCS to collect data for

administrative accomplishments, and will provide the information to the DNR and the DATCP for program evaluation.

Financial Expenditures

Sauk and Juneau County LCDs and other participating units of government will provide the following financial data to the DNR on an annual basis:

- Number of landowner cost-share agreements and amendments signed
- Amount of money encumbered in cost-share agreements and amendments
- Number of landowner reimbursement payments made for the installation of best management practices (BMPs), and the amount of money paid
- Staff expenditures (salary, travel, training, equipment, materials and supplies)
- Other project expenditures (information and education, professional services, easements, etc.)
- Interest earned and spent
- Administrative expenditures (single purpose audits, deed recording, etc.)

Time Spent On Project Activities

The LCD will provide time summaries to DATCP for each employee by project on an annual basis.

Nonpoint Source Pollutant Load Reduction

Key sources of pollution and reduction goals were identified in Chapter 3. For purposes of evaluation, these have been divided into "primary" and "secondary" goals. Success at achieving primary goals will be more heavily weighted during the evaluation of projects than will success at achieving secondary goals, although all goals are important.

In the Dell Creek Watershed, primary pollutant load reduction goals were established for: sediment from uplands, construction sites, existing urban development and future urban development and for phosphorus from barnyards and cropland. Secondary pollutant load reduction goals were established for: sediment from streambanks and gullies; phosphorus from winter spreading of manure and urban areas; and urban toxics.

Cropland Sources

Sauk and Juneau County LCDs will use WINHUSLE (Wisconsin Nonpoint Source) computer model in FOCS to estimate sediment loads. The inventoried load from cropland is 13,886 tons of sediment per year. The reduction goal is 25% or at least 3,500 tons of sediment. The reduction goal for phosphorus is also 25%.

Streambank Sources

Watershed staff will estimate changes in streambank sediment erosion. A tally will be kept of landowners contacted, the amount of streambank sediment (in tons) being generated at the time of contact, and changes in erosion levels estimated after installing BMPs. The inventoried load is 120 tons of soil per year.

Barnyard Runoff

Sauk County and Juneau County LCDs will use the BARNY model to estimate phosphorus reductions. The inventoried load from 73 barnyards is 5,366 lbs/year of phosphorus with a reduction goal of 53% or at least 2,864 pounds/year.

Construction Sites

Local units of government participating in the urban implementation program will report annually to the DNR on the number of construction sites served by adequate erosion control practices, number of construction sites receiving appropriate permits, and any amendments to construction site erosion control ordinances that affect sediment loads associated with these sources. The reduction goal for sediment from construction sites is 70% or at least 1260 tons/year.

Urban Areas

Local units of government will report annually to the DNR on any activities that may result in changes in urban pollutant loadings. Such activities include acres of existing and new urban land, by land use, served by new stormwater BMPs; new urban lands, by land use, not served by storm-water BMPs; and other information requested by the DNR concerning BMP characteristics. A 20% reduction in sediment from existing urban development is the goal, or at least 100 tons/year. In addition, a 20% reduction in toxic pollutants from urban areas is desired.

Water Resource Monitoring

Limited funds and the intensive staffing needed to properly evaluate water quality changes prohibits monitoring each watershed individually. Instead, two types of evaluation monitoring are being conducted on a state-wide basis: Whole Stream Monitoring and Signs of Success. The goal of the monitoring activities is to determine the progress the Nonpoint Source Program is making towards improving the quality of Wisconsin's water resources. Monitoring activities were developed to answer five questions about the water resource objectives and the pollution reduction goals:

1) Do the levels and types of best management practices recommended in the watershed plans achieve the water resource objectives?

2) Do the types and levels of best management practices recommended in the watershed plans achieve the pollutant reduction goals?

3) Does any level of practice installation below 100% achieve the water resource objectives or the pollutant reduction goals?

4) Do we need to adjust the pollutant load reduction goals to achieve the water resource objectives?

5) Can we use simple environmental indicators in many of the watershed projects to provide some early evidence that the practices might achieve the water resource objectives and pollutant reduction goals?

A team of experts from state and federal agencies, and the University of Wisconsin was formed to develop and direct the evaluation monitoring activities at the Whole Stream Monitoring and Signs of Success sites.

Whole Stream Monitoring Sites

Criteria were developed to select and monitor twelve streams around the state. The stream sites represent the five major types of fishery found in agricultural and urban parts of priority watersheds, and they also represent three of the five eco-regions in the state. The five fishery types are: high gradient cold water sport fishery, high gradient warm water sport fishery, high gradient warm water forage fishery, low gradient warm water forage fishery, and low gradient cold water sport fishery. A storm sewer outfall is also being monitored. The three eco-region types represented are the Southeastern Wisconsin till plains, the Driftless area, and the North Central Hardwood Forest.

All but one of the stream sites drains a small area (about ten square miles or less). The schedule involves two years of monitoring before any best management practices are installed, five years of monitoring during the practice installation phase, 2 years of monitoring during the response period, and two years of monitoring during the post-practice installation phase, for a total of eleven years of monitoring.

State-of-the-art chemical and physical monitoring is being done at all the stream sites. State-of-the-art biological monitoring will be done at eight of the twelve streams. Results of the monitoring will be used to determine how well the best management practices achieve the pollution reduction goals and objectives. Improving the fish community is the most important water resource objective for all the streams.

A total of about $5,000,000 would be needed for the stream monitoring, if the work is carried out over a period of eleven years. The success of the evaluation monitoring activities depends on the installation of all the best management practices at the Whole Stream Monitoring Sites.

Signs of Success

Signs of Success (SOS) is short-term monitoring designed to provide some early evidence that better land management does make a difference. One site is being sought for each watershed project. Signs of Success will focus on one practice such as barnyard runoff controls, manure storage, or streambank fencing that is expected to have an early effect on the adjacent stream.

Monitoring will take place over a two-year period; the year before and the year after a practice is installed. Expected positive improvements will be on those sites where degraded habitat has occurred. Habitat sampling and photographs will be used to indicate the benefit of the practice. Limited chemical monitoring and fish sampling will be done at some sites.

The cost of the Signs of Success program is $100,000 if fully implemented. The results of the Signs of Success monitoring will be featured in educational materials such as local newsletters and newspapers and the statewide newsletter "Fields and Streets."

SOS sites for Dell Creek are still being identified and will be established shortly after the implementation stage begins.

Single Source Monitoring

Single source monitoring evaluates the environmental benefits of selected agricultural and urban best management practices. In contrast to the whole stream monitoring, each practice is monitored individually. Results from the single source sites are used to determine how each practice can contribute towards achieving the pollutant reduction goals for a priority watershed. Cost information is also collected to compare the cost-effectiveness of each practice. Single source monitoring will compliment the whole stream monitoring by helping to explain the role of each practice in the water quality changes observed at whole stream monitoring sites.

Watershed managers have been asked about the types of practices they would like to be evaluated. Practices selected for the agricultural areas include barnyard systems, clean water diversions for barnyards, streambank protection, rotational grazing, and riparian buffers. Practices needing evaluation for urban runoff control include wet detention ponds, infiltration devices, high efficiency street sweeping, conservation design, and proprietary devices, such as the Stormceptor. A total of about 15 practices will be tested.

Monitoring has been completed for one type of agricultural practice and three urban practices. Pollutant reduction values have been determined for barnyard systems installed in two different barnyards. One barnyard is in the Sheboygan River Watershed and the other is in the Black Earth Creek Watershed. Monitoring has been started on a rotational grazing site and a streambank protection site. The urban practices that have been tested include a wet detention pond, a Stormceptor, a multi-chamber conservation design and the installation of an infiltration trench.

All the data for the agricultural practices is collected in the adjacent stream at locations directly above and below the practice. Anywhere from two to six years of data collection is required to evaluate the agricultural practices. Monitoring is started before the practice is installed and continues for at least one year after the installation is completed. Approximately $30,000 a year is needed to monitor each agricultural practice. Pollutant reduction values are determined for the conventional pollutants, such as sediment and phosphorus.

Samples to evaluate the urban practices are collected in the stormsewer pipe that flows into and out of the practice. About two years of data is collected to test each practice. Monitoring is begun after the practice is installed and continues for about 30 runoff events. The cost of monitoring each urban practice is about $45,000 each year. Pollutant reduction values are determined for both conventional and potentially toxic pollutants.

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Glossary

ACUTE TOXICITY:
Any poisonous effect produced by a single short-term exposure to a chemical that results in a rapid onset of severe symptoms.

ADVANCED WASTEWATER TREATMENT:
The highest level of wastewater treatment for municipal treatment systems. It requires removal of all but 10 parts per million of suspended solids and biological oxygen and/or 50 percent of the total nitrogen. Advanced wastewater treatment is also known as "tertiary treatment."

ALGAE:
A group of microscopic, photosynthetic water plants. Algae give off oxygen during the day as a product of photosynthesis and consume oxygen during the night as a result of respiration. Therefore, algae effect the oxygen content of water. Nutrient-enriched water increases algae growth.

AMMONIA:
A form of nitrogen (NH_3) found in human and animal wastes. Ammonia can be toxic to aquatic life.

ANAEROBIC:
Without oxygen.

AREA OF CONCERN:
Areas of the Great Lakes identified by the International Joint Commission (IJC) as having serious water pollution problems.

AREAWIDE WATER QUALITY MANAGEMENT PLANS (208 PLANS):
A plan to document water quality conditions in a drainage basin and make recommendations to protect and improve basin water quality. Each basin in Wisconsin must have a plan prepared for it, according to section 208 of the Clean Water Act.

ANTIDEGRADATION:
A policy stating that water quality will not be lowered below background levels unless justified by economic and social development considerations. Wisconsin's antidegradation policy is currently being revised to make it more specific and meet EPA guidelines.

AVAILABILITY:
The degree to which toxic substances or other pollutants are present in sediments or elsewhere in the ecosystem and are available to affect or be taken up by organisms. Some pollutants may be "bound up" or unavailable because they are attached to clay particles or are buried by sediment. Oxygen content, pH, temperature and other conditions in the water can affect availability.

BACTERIA:
Single-cell, microscopic organisms. Some can cause disease, but others are important in organic waste stabilization.

BASIN PLAN:
See "Areawide Water Quality Management Plan".

BENTHIC ORGANISMS (BENTHOS):
Organisms living in or on the bottom of a lake or stream.

BEST MANAGEMENT PRACTICE (BMP):
The most effective, practical measures to control nonpoint sources of pollutants that runoff from land surfaces.

BIOACCUMULATION:
The uptake and retention of substances by an organism from its surrounding medium and food. As chemicals move through the food chain, they tend to increase in concentration in organisms at the upper end of the food chain such as predator fish, or in people or birds that eat these fish.

BIOASSAY STUDY:
A test for pollutant toxicity. Tanks of fish or other organisms are exposed to varying doses of treatment plant effluent. Lethal doses of pollutants in the effluent are then determined.

BIOCHEMICAL OXYGEN DEMAND (BOD):
A measure of the amount of oxygen consumed in the biological processes that break down organic matter in water. BOD_5 is the biochemical oxygen demand measured in a five day test. The greater the degree of pollution, the higher the BOD_5.

BIODEGRADABLE:
Waste that can be broken down by bacteria into basic elements. Most organic wastes such as food remains and paper are biodegradable.

BIOTA:
All living organisms that exist in an area.

BUFFER STRIPS:
Strips of grass or other erosion-resisting vegetation between disturbed areas and a stream or lake.

BULKHEAD LINES:

Legally established lines that indicate how far into a stream or lake an adjacent property owner has the right to fill. Many of these lines were established many years ago and allow substantial filling of the bed of the river and bay. Other environmental laws may limit filling to some degree.

CARCINOGENIC:

A chemical capable of causing cancer.

CATEGORICAL LIMITS:

All point source discharges are required to provide a basic level of treatment. For municipal wastewater treatment plants this is secondary treatment (30 mg/1 effluent limits for SS and BOD). For industry the level depends on the type of industry and the level of production. More stringent effluent limits are required, if necessary, to meet water quality standards.

CHLORINATION:

The application of chlorine to wastewater to disinfect it and kill bacteria and other organisms.

CHLORORGANIC COMPOUNDS (CHLORORGANICS):

A class of chemicals that contain chlorine, carbon and hydrocarbon. This generally refers to pesticides and herbicides that can be toxic. Examples include PCB's and pesticides such as DDT and dieldrin.

CHRONIC TOXICITY:

The effects of long-term exposure of organisms to concentrations of a toxic chemical that are not lethal, but are injurious or debilitating in one or more ways. An example of the effect of chronic toxicity is reduced reproductive success.

CLEAN WATER ACT:

See "Public Law 92-500."

COMBINED SEWERS:

A wastewater collection system that carries both sanitary sewage and stormwater runoff. During dry weather, combined sewers carry only wastewater to the treatment plant. During heavy rainfall, the sewer becomes swollen with stormwater. Because the treatment plant cannot process the excess flow, untreated sewage is discharged to the plant's receiving waters, i.e., combined sewer outflow.

CONFINED DISPOSAL FACILITY (CDF):

A structure built to contain and dispose of dredged material.

CONGENERS:
Chemical compounds that have the same molecular composition, but have different molecular structures and formula. For example, the congeners of PCB have chlorine located at different spots on the molecule. These differences can cause differences in the properties and toxicity of the congeners.

CONSERVATION TILLAGE:
Planting row crops while only slightly disturbing the soil. In this way a protective layer of plant residue stays on the surface. Erosion rates decrease.

CONSUMPTION ADVISORY:
A health warning issued by DNR and DHFS that recommends people limit the fish they eat from some rivers and lakes based on the levels of toxic contaminants found in the fish.

CONTAMINANT:
Some material that has been added to water that is not normally present. This is different from a pollutant, which suggests there is too much of the material present.

CONVENTIONAL POLLUTANT:
Refers to suspended solids, fecal coliform, biochemical oxygen demand, and pH, as opposed to toxic pollutants

COST-EFFECTIVE:
A level of treatment or management with the greatest incremental benefit for the money spent.

CRITERIA:
See water quality standard criteria.

DDT:
A chlorinated hydrocarbon insecticide that was banned because of its persistence in the environment.

DHFS:
Wisconsin Department of Health and Family Services.

DIOXIN (2,3,7,8-tetrachlorodibenso-p-dioxin):
A chlorinated organic chemical which is highly toxic.

DISINFECTION:
A chemical or physical process that kills organisms that cause disease. Chlorine is often used to disinfect wastewater.

DISSOLVED OXYGEN (DO):

Oxygen dissolved in water. Low levels of dissolved oxygen cause bad smelling water and threaten fish survival. Low levels of dissolved oxygen often result from inadequate wastewater treatment. The DNR considers 5 ppm DO necessary for fish and aquatic life.

DREDGING:

Removal of sediment from the bottom of water bodies.

ECOSYSTEM:

The interacting system of biological community and its nonliving surroundings.

EFFLUENT:

Solid, liquid or gas wastes (byproducts) that are disposed on land, in water or in air. As used in the RAP, effluent generally means wastewater discharges.

EFFLUENT LIMITS:

The DNR issues WPDES permits establishing the maximum amount of pollutant to be discharged to a receiving stream. Limits depend on the pollutant and the water quality standards that apply for the receiving waters.

EMISSION:

A direct (smokestack particles) or indirect (busy shopping center parking lot) release of any contaminant into the air.

ENVIRONMENTAL PROTECTION AGENCY (USEPA):

The federal agency responsible for enforcing federal environmental regulations. The Environmental Protection Agency delegates some of its responsibilities for water, air and solid waste pollution control to state agencies.

ENVIRONMENTAL QUALITY INCENTIVE PROGRAM (EQIP):

A federal cost-sharing program to help landowners install measures to conserve soil and water resources. Funds are targeted to priority areas to achieve the maximum environmental benefit per dollar spent. EQIP is administered by NRCS.

ENVIRONMENTAL REPAIR FUND:

A fund established by the Wisconsin Legislature to deal with abandoned landfills.

EPIDEMIOLOGY:

The study of diseases as they affect populations rather than individuals, including the distribution and incidence of a disease mortality and morbidity rated, and the relationship of climate, age, sex, race and other factors. EPA uses such data to establish national air quality standards.

EROSION:

The wearing away of the land surface by wind or water.

EUTROPHIC:
Refers to a nutrient-rich lake. Large amounts of algae and weeds characterize a eutrophic lake (see also "Oligotrophic" and "Mesotrophic").

EUTROPHICATION:
The process of nutrient enrichment of a lake loading to increased production of aquatic organisms. Eutrophication can be accelerated by human activity such as agriculture and improper waste disposal.

FACILITY PLAN:
A preliminary planning and engineering document that identifies alternative solutions to a community's wastewater treatment problems.

FECAL COLIFORM:
A group of bacteria used to indicate the presence of other bacteria that cause disease. The number of coliform is particularly important when water is used for drinking and swimming.

FISHABLE AND SWIMMABLE:
Refers to the water quality goal set for the nation's surface waters by Congress in the Clean Water Act. All waters were to meet this goal by 1984.

FLOURANTHENE:
A polyaromatic hydrocarbon (PAH) with toxic properties.

FLY ASH:
Particulates emitted from coal burning and other combustion, such as wood burning, and vented into the air from stacks, or more likely, collected by electrostatic precipitators.

FOOD CHAIN:
A sequence of organisms where each uses the next as a food source.

FURANS (2,3,7,8-tetra-chloro-dibenzpfurans):
A chlorinated organic compound which is highly toxic.

GREEN STRIPS:
See buffer strip.

GROUNDWATER:
Underground water-bearing areas generally within the boundaries of a watershed, which fill internal passageways of porous geologic formations (aquifers) with water that flows in response to gravity and pressure. Often used as the source of water for communities and industries.

HABITAT:
The place or type of site where a plant or animal naturally lives and grows.

HAZARDOUS WASTE:
Waste that has been found to be fatal to humans or animals in low doses, or is otherwise capable of causing or significantly contributing to an increase in serious irreversible, or incapacitating reversible, illness.

HEAVY METALS:
Metals present in municipal and industrial wastes that pose long-term environmental hazards if not properly disposed. Heavy metals can contaminate ground and surface waters, fish and other food stuffs. The metals of most concern are: arsenic, barium, cadmium, chromium, copper, lead, mercury, selenium and zinc (see also separate listings of these metals for their health effects).

HERBICIDE:
A type of pesticide that is specifically designed to kill plants and can also be toxic to other organisms.

HYDROCARBONS:
Any chemical of a large family of chemicals containing carbon and hydrogen in various combinations.

INCINERATOR:
A furnace designed to burn wastes.

INFLUENT:
Influent for an industry would be the river water that the plant intakes for use in its processing. Influent to a municipal treatment plant is untreated wastewater.

IN-PLACE POLLUTION:
As used in the RAP, refers to pollution from contaminated sediments. These sediments are polluted from past discharges from municipal and industrial sources.

INTERNATIONAL JOINT COMMISSION (IJC):
An agency formed by the United States and Canada to guide management of the Great Lakes and resolve border issues.

ISOROPYLBIPHENYL:
A chemical compound used as a substitute for PCB.

LANDFILL:
A conventional sanitary landfill is "where solid waste is disposed on land by utilizing the principles of engineering to confine the solid waste to the smallest practical area, to reduce it to the smallest practical volume, and to cover it with a layer of earth or other approved material as required." Hazardous wastes frequently require various types of pretreatment

before they are disposed of, i.e., neutralization, chemical fixation, or encapsulation. Neutralizing and disposing of wastes should be considered a last resort. Repurifying and reusing waste materials or recycling them for another use may be less costly.

LC-1:
The concentration that results in 1% mortality of the test animal populations exposed to the contaminant.

LC_{50}:
Lethal concentration for 50% of the test population exposed to a toxicant substance.

LD_{50}:
Lethal dose for 50 percent of the test population exposed to a toxicant substance.

LEACHATE:
The contaminated liquid which seeps from a pile or cell of solid materials and which contains water, dissolved and decomposing solids. Leachate may enter the groundwater and contaminate drinking water supplies.

LOAD:
The total amount of materials or pollutants reaching a given local.

MACROPHYTE:
A rooted aquatic plant.

MASS:
The amount of material a substance contains causing it to have weight in a gravitational field.

MASS BALANCE:
A study that examines all parts of the ecosystem to determine the amount of toxic or other pollutant present, its sources, and the processes by which the chemical moves through the ecosystem.

MESOTROPHIC:
Refers to a moderately fertile nutrient level of a lake between the oligotrophic and eutrophic levels. (See also "Eutrophic" and "Oligotrophic.")

MILLIGRAMS PER LITER (mg/1):
A measure of the concentration of substance in water. For most pollution measurement this is the equivalent of "parts per million".

MITIGATION:
The effort to lessen the damages caused, by modifying a project, providing alternatives, compensating for losses or replacing lost values.

MIXING ZONE:
The portion of a stream or lake where effluent is allowed to mix with the receiving water. The size of the area depends on the volume and flow of the discharge and receiving water. For streams the mixing zone it is one-third of the lowest flow that occurs once every 10 years for a seven day period.

NONPOINT SOURCE POLLUTION (NPS):
Pollution whose sources cannot be traced to a single point such as a municipal or industrial wastewater treatment plant discharge pipe. Nonpoint sources include eroding farmland and construction sites, urban streets, and barnyards. Pollutants from these sources reach water bodies in runoff, which can best be controlled by proper land management.

NPS:
See nonpoint source pollution.

NRCS:
Natural Resource Conservation Service.

OLIGOTROPHIC:
Refers to an unproductive and nutrient-poor lake. Such lakes typically have very clear water. (See also "Eutrophic" and "Mesotrophic.")

OUTFALL:
The mouth of a sewer, drain, or pipe where effluent from a wastewater treatment plant is discharged.

PATHOGEN:
Any infective agent capable of producing disease. It may be a virus, bacterium, protozoan, etc.

PELAGIC:
Referring to open water portion of a lake.

PESTICIDE:
Any chemical agent used to control specific organisms, such as insecticides, herbicides, fungicides, etc.

PH:
A measure of acidity or alkalinity, measured on a scale of 0 to 14 with 7 being neutral and 0 being most acid, and 14 being most alkaline.

PHENOLS:

Organic compounds that are byproducts of petroleum refining, textile, dye, and resin manufacture. High concentrations can cause taste and odor problems in fish. Higher concentration can be toxic to fish and aquatic life.

PHOSPHORUS:
A nutrient that, when reaching lakes in excess amounts, can lead to overfertile conditions and algae blooms.

PLANKTON:
Tiny plants and animals that live in water.

POINT SOURCES:
Sources of pollution that have discrete discharges, usually from a pipe or outfall.

POLLUTION:
The presence of materials or energy whose nature, location, or quantity produces undesired environmental effects.

POLYCHLORINATED BIPHENYLS(PCBs):
A group of 209 compounds, PCBs have been manufactured since 1929 for such common uses as electrical insulation and heating/cooling equipment, because they resist wear and chemical breakdown. Although banned in 1979 because of their toxicity, they have been detected on air, land and water. Recent surveys found PCBs in every section of the country, even those remote from PCB manufacturers.

POLYCHLORINATED ORGANIC COMPOUNDS:
A group of toxic chemicals which contain several chlorine atoms.

PRETREATMENT:
A partial wastewater treatment required from some industries. Pretreatment removes some types of industrial pollutants before the wastewater is discharged to a municipal wastewater treatment plant.

PRIORITY POLLUTANT:
A list of toxic chemicals identified by the federal government because of their potential impact in the environment and human health. Major dischargers are required to monitor all or some of these chemicals when their WPDES permits are reissued.

PRIORITY WATERSHED:
A drainage area about 100,000 acres in size selected to receive Wisconsin Fund money to help pay the cost of controlling nonpoint source pollution. Because money is limited, only watersheds where problems are critical, control is practical, and cooperation is likely are selected for funding.

PRODUCTIVITY:

A measure of the amount of living matter which is supported by an environment over a specific period of time. Often described in terms of algae production for a lake.

PUBLIC LAW 92-500 (CLEAN WATER ACT):
The federal law that sets national policy for improving and protecting the quality of the nation's waters. The law set a timetable for the cleanup of the nation's waters and stated that they are to be fishable and swimmable. This also required all dischargers of pollutants to obtain a permit and meet the conditions of the permit. To accomplish this pollution cleanup, billions of dollars have been made available to help communities pay the cost of building sewage treatment facilities. Amendments in the Clean Water Act were made in 1977 by passage of Public Law 95-217, and in 1987.

PUBLIC PARTICIPATION:
The active involvement of interested and affected citizens in governmental decision-making.

PUBLICLY OWNED TREATMENT WORKS (POTW):
A wastewater treatment plat owned by a city, village or other unit of government.

RAP:
See Remedial Action Plan.

RECYCLING:
The process that transforms waste materials into new products.

REMEDIAL ACTION PLAN:
A plan designed to restore beneficial uses to a Great Lakes Area of Concern.

REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RF/FS):
An investigation of problems and assessment of management options conducted as part of a superfund project.

RESOURCE CONSERVATION AND RECOVERY ACT OF 1976 (RCRA):
This federal law amends the Solid Waste Disposal Act of 1965 and expands on the Resource Recovery Act of 1970 to provide a program that regulates hazardous wastes, to eliminate open dumping and to promote solid waste management programs.

RETRO-FIT:
The placement of an urban structural practice in an existing urban area, which may involve rerouting existing storm sewers and/or relocating existing buildings or other structures.

RIPARIAN:
Belonging or relating to the bank of a lake, river or stream.

RIPRAP:
Broken rock, cobbles, or boulders placed on the bank of a stream to protect it against erosion.

RULE:
Refers to Wisconsin administrative rules. See Wisconsin Administrative Code.

RUNOFF:
Water from rain, snowmelt, or irrigation that flows over the ground surface and returns to streams. Runoff can collect pollutants from air or land and carry them to receiving waters.

SECONDARY IMPACTS:
The indirect effects that an action can have on the health of the ecosystem or the economy.

SECONDARY TREATMENT:
Two-stage wastewater treatment that allows the coarse particles to settle out, as in primary treatment, followed by biological breakdowns of the remaining impurities. Secondary treatment commonly removes 90% of the impurities. Sometimes "secondary treatment" refers simply to the biological part of the treatment process.

SEDIMENT:
Soil particles suspended in and carried by water as a result of erosion.

SEICHES:
Changes in water levels due to the tipping of water in an elongated lake basin whereby water is raised in one end of the basin and lowered in the other.

SEPTIC SYSTEM:
Sewage treatment and disposal for homes not connected to sewer lines. Usually the system includes a tank and drain field. Solids settle to the bottom of the tank. Liquid percolates through the drain field.

SLUDGE:
A byproduct of wastewater treatment; waste solids suspended in water.

SOLID WASTE:
Unwanted or discharged material with insufficient liquid to be free flowing.

STANDARDS:
See water quality standards.

STORM SEWERS:
A system of sewers that collect and transport rain and snow runoff. In areas that have separated sewers, such stormwater is not mixed with sanitary sewage.

SUPERFUND:

A federal program that provides for cleanup of major hazardous landfills and land disposal areas.

SUSPENDED SOLIDS (SS):
Small particles of solid pollutants suspended in water.

SYNERGISM:
The total effect is greater than the sum of the individual effects. For example, the characteristic property of a mixture of toxicants that exhibits a greater-than-additive cumulative toxic effect.

TACs:
Technical advisory committees that assisted in the development of the Remedial Action Plan.

TERTIARY TREATMENT:
See advanced wastewater treatment.

TOP-DOWN MANAGEMENT:
A management theory that uses biomanipulation, specifically the stocking of predator species of fish to improve water quality.

TOTAL MAXIMUM DAILY LOADS (TMDLs):
The maximum amount of a pollutant that can be discharged into a stream without causing a violation of water quality standards.

TOXIC:
An adjective that describes a substance which is poisonous, or can kill or injure a person or plants and animals upon direct contact or long-term exposure. (Also, see toxic substance.)

TOXIC SUBSTANCE:
A chemical or mixture of chemicals which, through sufficient exposure, or ingestion, inhalation of assimilation by an organism, either directly from the environment or indirectly by ingestion through the food chain, will, on the basis of available information cause death, disease, behavioral or immunologic abnormalities, cancer, genetic mutations, or development of physiological malfunctions, including malfunctions in reproduction or physical deformations, in organisms or their offspring.

TOXICANT:
See toxic substance.

TOXICITY:
The degree of danger posed by a toxic substance to animal or plant life. Also see acute toxicity, chronic toxicity and additivity.

TOXICITY REDUCTION EVALUATION:
A requirement for a discharger that the causes of toxicity in an effluent be determined and measures taken to eliminate the toxicity. The measures may be treatment, product substitution, chemical use reduction or other actions that will achieve the desired result.

TREATMENT PLANT:
See wastewater treatment plant.

TROPHIC STATUS:
The level of growth or productivity of a lake as measured by phosphorus content, algae abundance, and depth of light penetration. (See also "Oligotrophic," "Mesotrophic," "Eutrophic..")

TURBIDITY:
Lack of water clarity. Turbidity is usually closely related to the amount of suspended solids in water.

UNIVERSITY OF WISCONSIN-EXTENSION (UWEX):
A special outreach and education branch of the state university system.

VARIANCE:
Government permission for a delay or exception in the application of a given law, ordinance or regulation. Also, see water quality standard variance.

VOLATILE:
Any substance that evaporates at a low temperature.

WASTELOAD ALLOCATION:
Division of the amount of waste a stream can assimilate among the various dischargers to the stream. This limits the amount (in pounds) of chemical or biological constituent discharged from a wastewater treatment plant to a water body.

WASTEWATER:
Water that has become contaminated as a byproduct of some human activity. Wastewater includes sewage, washwater and the water-borne wastes of industrial processes.

WASTE:
Unwanted materials left over from manufacturing processes, refuse from places of human habitation or animal habitation.

WASTEWATER TREATMENT PLANT:
A facility for purifying wastewater. Modern wastewater treatment plants are capable of removing 95% of organic pollutants.

WATER QUALITY AGREEMENT:
The Great Lakes Water Quality agreement was initially signed by Canada and the United States in 1972 and was subsequently revised in 1978 and 1987. It proves guidance for the management of water quality, specifically phosphorus and toxics, in the Great Lakes.

WATER QUALITY LIMITED SEGMENT:
A section of river where water quality standards will not be met if only categorical effluent standards are met.

WATER QUALITY CRITERIA:
A measure of the physical, chemical or biological characteristics of a water body necessary to protect and maintain different water uses (fish and aquatic life, swimming, etc.).

WATER QUALITY STANDARDS:
The legal basis and determination of the use of a water body and the water quality criteria, physical, chemical, or biological characteristics of a water body, that must be met to make it suitable for the specified use.

WATER QUALITY STANDARD VARIANCE:
When natural conditions of a water body preclude meeting all conditions necessary to maintain full fish and aquatic life and swimming, a variance may be granted.

WATERSHED:
The land area that drains into a lake or river.

WETLANDS:
Areas that are inundates or saturated by surface or groundwater at a frequency and duration sufficient to support a variety of vegetative or aquatic life. Wetland vegetation requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs and similar areas.

WISCONSIN ADMINISTRATIVE CODE:
The set of rules written and used by state agencies to implement state statutes. Administrative codes are subject to public hearing and have the force of law.

WISCONSIN FUND:
A state program that helps pay the cost of reducing water pollution. Funding for the program comes from general revenues and bonds and is based on a percentage of the state's taxable property value. The Wisconsin Fund includes these programs:

Point Source Water Pollution Abatement Grant Program - Provides grants for 60% of the cost of constructing wastewater treatment facilities. Most of this program's money goes for treatment plant construction, but three percent of this fund is available for repair or replacement of private, on-site sewer systems.

Nonpoint Source Water Pollution Abatement Grant Program - Funds to share the cost of reducing water pollution. Nonspecified sources are available in selected priority watersheds.

Solid Waste Grant Program - Communities planning for solid waste disposal sites are eligible for grant money. $500,000 will be available each year to help with planning costs.

WISCONSIN NONPOINT SOURCE WATER POLLUTION ABATEMENT GRANT PROGRAM:

A state cost-share program established by the State Legislature in 1978 to help pay the costs of controlling nonpoint source pollution. Also known as the nonpoint source element of the Wisconsin Fund or the Priority Watershed Program.

WISCONSIN POLLUTANT DISCHARGE ELIMINATION SYSTEM (WPDES):

A permit system to monitor and control the point source dischargers of wastewater in Wisconsin. Dischargers are required to have a discharge permit and meet the conditions it specifies.

Priority Watershed Projects in Wisconsin: 1996 - 1997

Year Selected-Map Number	Large-scale Priority Watershed Project	County(ies)
79-1	Galena River ♦	Grant, Lafayette
79-2	Elk Creek ♦	Trempealeau
79-3	Hay River ♦	Barron, Dunn
79-4	Lower Manitowoc River ♦	Manitowoc, Brown
79-5	Root River ♦	Racine, Milwaukee, Waukesha
80-1	Onion River ♦	Sheboygan, Ozaukee
80-2	Sixmile-Pheasant Branch Creek ♦†	Dane
80-3	Big Green Lake ♦	Green Lake, Fond du Lac
80-4	Upper Willow River ♦	Polk, St. Crox
81-1	Upper West Branch Pecatonica River ♦	Iowa, Lafayette
81-2	Lower Black River ♦	La Crosse, Trempealeau
82-1	Kewaunee River ♦	Kewaunee, Brown
82-2	Turtle Creek ♦	Walworth, Rock
83-1	Oconomowoc River ♦	Waukesha, Washington, Jefferson
83-2	Little River ♦	Oconto, Marinette
83-3	Crossman Creek/Little Baraboo River ♦	Sauk, Juneau, Richland
83-4	Lower Eau Claire River ♦	Eau Claire
84-1	Beaver Creek ♦	Trempealeau, Jackson
84-2	Upper Big Eau Pleine River ♦	Marathon, Taylor, Clark
84-3	Sevenmile-Silver Creeks ♦	Manitowoc, Sheboygan
84-4	Upper Door Peninsula ♦	Door
84-5	East & West Branch Milwaukee River	Fond du Lac, Washington, Sheboygan, Dodge, Ozaukee
84-6	North Branch Milwaukee River	Sheboygan, Washington, Ozaukee, Fond du Lac
84-7	Milwaukee River South	Ozaukee, Milwaukee
84-8	Cedar Creek	Washington, Ozaukee
84-9	Menomonee River	Milwaukee, Waukesha, Ozaukee, Washington
85-1	Black Earth Creek	Dane
85-2	Sheboygan River	Sheboygan, Fond du Lac, Manitowoc, Calumet
85-3	Waumandee Creek	Buffalo
86-1	East River	Brown, Calumet
86-2	Yahara River - Lake Monona	Dane
86-3	Lower Grant River	Grant
89-1	Yellow River	Barron
89-2	Lake Winnebago East	Calumet, Fond du Lac
89-3	Upper Fox River (Ill.)	Waukesha
89-4	Narrows Creek - Baraboo River	Sauk
89-5	Middle Trempealeau River	Trempealeau, Buffalo
89-6	Middle Kickapoo River	Vernon, Monroe, Richland
89-7	Lower East Branch Pecatonica River	Green, Lafayette
90-1	Arrowhead River & Daggets Creek	Winnebago, Outagamie, Waupaca
90-2	Kinnickinnic River (Milwaukee Basin)	Milwaukee
90-3	Beaverdam River	Dodge, Columbia, Green Lake
90-4	Lower Big Eau Pleine River	Marathon
90-5	Upper Yellow River	Wood, Marathon, Clark
90-6	Duncan Creek	Chippewa, Eau Claire
91-1	Upper Trempealeau River	Jackson, Trempealeau
91-2	Neenah Creek	Adams, Marquette, Columbia
92-1	Balsam Branch	Polk
92-2	Red River - Little Sturgeon Bay	Door, Brown, Kewaunee
93-1	South Fork Hay River	Dunn, Polk, Barron, St. Croix
93-2	Branch River	Manitowoc, Brown
93-3	Soft Maple/Hay Creek	Rusk
93-4	Tomorrow/Waupaca River	Portage, Waupaca, Waushara
94-1	Duck Creek	Outagamie, Brown
94-2	Apple/Ashwaubenon Creeks	Outagamie, Brown
94-3	Dell Creek	Sauk, Juneau
94-4	Pensaukee River	Shawano, Oconto
94-5	Spring Brook	Langlade, Marathon
94-6	Sugar/Honey Creeks	Walworth, Racine
95-1	Pigeon River	Manitowoc, Sheboygan
95-2	Middle Peshtigo/Thunder Rivers	Marinette, Oconto
95-3	Fond du Lac River	Fond du Lac, Winnebago
95-4	Lower Rib River	Marathon
95-5	Kinnickinnic River (St. Croix Basin)	St. Croix, Pierce
95-6	Lower Little Wolf	Waupaca
95-7	Pine & Willow Rivers	Waushara, Winnebago

Year Selected-Map Number	Small-scale Priority Watershed Project	County(ies)
SS-1	Bass Lake ♦	Marinette
SS-90-1	Dunlap Creek	Dane
SS-90-2	Lowes Creek	Eau Claire
SS-90-3	Port Edwards - Groundwater Prototype ♦	Wood
SS-91-1	Whittlesey Creek	Bayfield
SS-91-2	Spring Creek	Rock
SS-94-1	Osceola Creek	Polk

Year Selected-Map Number	Priority Lake Project	County(ies)
PL-90-1	Minocqua Lake ♦	Oneida
PL-90-2	Lake Tomah	Monroe
PL-91-1	Little Muskego, Big Muskego, Wind Lakes	Waukesha, Racine, Milwaukee
PL-92-1	Lake Noquebay	Marinette
PL-92-2	Lake Ripley	Jefferson
PL-93-1	Camp/Center Lakes	Kenosha
PL-93-2	Lake Mendota	Dane, Columbia
PL-93-3	Hillsboro	Vernon
PL-94-1	St. Croix County Lakes Cluster	St. Croix
PL-94-2	Upper St. Croix/Eau Claire River	Douglas
PL-95-1	Big Wood Lake	Burnett, Polk
PL-95-2	Rock Lake	Jefferson
PL-95-3	Horse Creek	Polk, St. Croix

♦ Project completed
† Sixmile-Pheasant Branch is being redone as part of the Lake Mendota project (PL-93-2).