TABLE 24. Average Phosphorus Concentrations in Black Earth Creek Upstream and Downstream of the Cross Plains Wastewater Treatment Plant - April through September 1985.

Location	Mean Total Phosphorus (mg/l)	Mean Soluble Phosphorus (mg/l)
Upstream sites		
LF4	0.06	0.028
CTH P	0.07	0.019
LF6	0.06	0.025
Treatment plant effluent	6.5	5.6
Downstream sites		
LF7	0.16	0.131
LF8	0.11	0.086
Black Earth	0.11	0.073

2. Reductions in phosphorus sufficient to reduce rooted vascular plants would probably require reduction in sediments delivered to the stream, though at present the degree of response and required level of reduction are not quantifiable.

3. Control of filamentous algae may be amenable to reductions in phosphorus from point sources, but important questions remain about background levels of available phosphorus and whether in-stream levels could be reduced to below concentrations for filamentous algae. (3)

The in-stream impacts of phosphorus discharge from the Cross Plains treatment plant are not clear. Whether or not phosphorus removal should be required at the plant has not been

established.

Black Earth

The Black Earth wastewater treatment plant is located along Black Earth Creek immediately upstream of the confluence with Vermont Creek. It was constructed in 1971 and upgraded in 1983, and provides secondary treatment. The effluent requirements for the plant include limits of 30 mg/l for BOD and 30 mg/l for suspended solids. The wastewater treatment plant has adequate design capacity to serve the anticipated growth of the community for at least ten years. The current permit expires March 31, 1989. There are no industrial dischargers to the wastewater treatment plant. It is anticipated the reissuing of the permit will be delayed until June 1989. The reissued permit will probably expire in 1994. No concerns were identified relative to this wastewater treatment plant.

Mazomanie

The Mazomanie wastewater treatment plant is located along Black Earth Creek on the west side of the village and downstream of the confluence with Halfway Prairie Creek. It was constructed in 1972, and provides secondary treatment. The effluent requirements for the plant include limits of 30 mg/l for BOD and 30 mg/l for suspended solids. The wastewater treatment plant has adequate design capacity to serve the anticipated growth of the community for at least ten years. The current permit expires September 30, 1988. It is anticipated the reissuing of the permit will be delayed until June 1989. The reissued permit will probably expire in 1994. There are no industrial dischargers to the wastewater treatment plant. No concerns were identified relative to this wastewater treatment plant.

INDUSTRIAL WASTEWATER DISCHARGERS

Capitol Sand and Gravel

Capitol Sand and Gravel Company is the only industrial process water discharger to Black Earth Creek. It is located along Black Earth Creek just upstream of the major spring area east of the Village of Cross Plains. The discharge is a result of dewatering the sand and gravel pit.

During the monitoring of Black Earth Creek, the concern arose over the temperature of the discharge. Based on recent information, a new permit was issued to the Capitol Sand and Gravel Company on December 1, 1987. The new permit requires the

discharge not to exceed 60°F. To comply with this requirement, the intake for the dewatering pump will be lowered. The current permit expires June 30, 1992.

Future plans for the site call for residential development around the pond.

Other Industrial Sites

Other industrial operations located in the Black Earth Creek watershed may come under EPA's proposed federal stormwater permit program. For example, this permit program may include concrete products and home manufacturing operations in the watershed.

Fertilizer and pesticide distributors may come under existing regulations administered by the Department of Agriculture, Trade and Consumer Protection.

LANDFILLS

There are three active landfills in the Black Earth Creek Watershed:

1. Refuse Hideaway

Refuse Hideaway Landfill, located in the headwaters of Black Earth Creek between Middleton and Cross Plains, has been the focus of much attention during 1988. Contaminated wells were found in close proximity to the landfill. Currently, the landfill is being closed, and a remedial groundwater cleanup plan is being prepared by DNR's Bureau of Solid Waste Management.

The problem of pollutants being discharged from the landfill's settling basin was identified as part of this project. Very high COD concentrations were measured several times. The settling basin was pumped more than once to eliminate the pollutant discharge to a wetland adjoining Black Earth Creek. This source of pollutants was finally eliminated through the closing of the landfill.

2. Town of Berry

The Town of Berry landfill is located in an old gravel pit along an intermittent channel draining to an unnamed tributary joining Black Earth Creek upstream of the confluence with Garfoot

Creek. Recent investigations have found trout in this unnamed tributary. The permit for the landfill expires in September 1988. If the permit is reissued, it will be reissued for two years or less.

3. Village of Cross Plains

The Village of Cross Plains is located in the Brewery Creek subwatershed. The permit for the landfill expires in September 1988. If the permit is reissued, it will be reissued for two years or less.

CHAPTER 5: MANAGEMENT ACTIONS

The long term achievement and protection of a healthy and productive fishery in Black Earth Creek and its tributaries depend on both the continuing management of nonpoint sources, point sources and other activities in the watershed and fish habitat. This chapter describes the nonpoint source, fishery management and other management actions needed to meet the water resources objectives identified in Chapter 3. While the intent is for these management actions to be coordinated, they are presented on a program basis to help clarify roles and responsibilities.

Chapter 5 is divided into four parts:

1. Nonpoint source control activities;

2. Fishery management and related activities;

3. Coordination activities; and

4. Long-term base flow maintenance.

NONPOINT SOURCE CONTROL ACTIVITIES

The Nonpoint Source Activities are further divided into the following groups:

- Agricultural Lands Management Needs
- Stream Bank Management Needs
- Animal Lot Management Needs
- Manure Spreading Management Needs
- Construction Site Management Needs
- Urban Lands Management Needs

Agricultural Lands Management Needs

Cropland Management Needs

(DCLCD 1)

Best management practices through the Nonpoint Source Water Pollution Abatement Program and other county state and federal programs need to be applied on an estimated 11,528 critical acres to achieve the 75 percent reduction in soil erosion. The Dane County Land Conservation Department will assist the owners, managers and renters of the agricultural land in applying best management practices.

As summarized in Table 25, the water resources objectives stated in Chapter 3 identify a 50 percent reduction in sediment load as a target level of reduction. Most of these stream segments are in the headwaters or middle portions of the major streams. No specific level of sediment load reduction was identified for a number of stream segments in the lower portions of the streams. Instead, a consistent level of land management is identified which will result in a load reduction varying from about 30-to-50 percent.

Level of Reduction. For most stream segments, nearly all of the sediment is estimated to come from agricultural lands. Agricultural lands include croplands, pastures and grazed woodlots. Croplands are the major contributor of sediment. To achieve a 50 percent reduction in sediment reaching the stream, it is estimated about a 75 percent reduction in soil erosion is needed (based on the data analysis). The data analysis estimates a 75 percent reduction in soil erosion can be achieved in most subwatersheds.

Water Resources Problem	Primary Pollutant	Primary Sources	Management Action
Degradation of fish habitat	Sediment	Eroding croplands	Changes in rotations, reduced tillage, grassed waterways, etc.
		Eroding construction site	Ordinances
		Eroding stream banks	Fencing, riprap and shaping and seeding
			Habitat restoration
Dissolved oxygen depletion base flow conditions		Aquatic plant use	Habitat restoration
Dissolved oxygen depletion	oxygen demand (manure)	Runoff from animal lots	Barnyard runoff management
		Runoff from winter spread fields	Manure management plans and storage facilities

FIGURE 20. Black Earth Creek Problems, Pollutants Sources and Management Actions

A greater reduction in soil erosion rather than sediment is needed for two reasons. First, the data analysis is based on assumed tillage methods and rotations. Since it was not possible to collect information on each field, worse case assumptions were used. Therefore, the data analysis overestimates soil erosion. Second, to achieve a specific percent in sediment load to stream, researchers have generally concluded the percent reduction in soil loss on fields must be higher than the target percent reductions in sediment loads due to the physical transport of different sized soil particles.

TABLE 25. Sediment and Manure Load Reductions Needed to Achieve the Water Resources Objectives by Subwatershed

Stream Segments and Lakes Within Subwatershed	Sediment Reduction	Manure Reduction
Black Earth Cr. - Headwaters to Brewery Cr (HW)	50% based on subwatershed BG	50% based on subwatershed BG
Brewery Creek (BC)	50% based on subwatershed BG	50% based on subwatershed BG
Black Earth Cr. - Brewery to Garfoot (BG)	50%	50%
Garfoot Creek (GC)	50%	50%
Black Earth Cr. - Garfoot to Vermont (GV)	50%	50%
Vermont Creek (VC)	50%	50%
Black Earth Cr. - Vermont to Halfway Prairie (VH)	consistent level of management	consistent level of management
Indian Lake (IL)	none	none
Halfway Prairie Creek (HC)	50%	50%
Wendt Creek (MC)	50%	50%
Black Earth Cr. - Halfway Prairie to Blue Mounds (HB)	consistent level of management	consistent level of management

This target level of reduction should result in management of croplands consistent with cross compliance requirements of the Federal Food Security Act and the Wisconsin Farmland Preservation Program.

Critical Croplands. Chapter 3 identified critical agricultural land acres for each subwatershed. These critical acres correspond to areas with soil erosion rates of 7-to-10 tons/acre/year or greater as analyzed. Table 26 lists the critical cropland acres by subwatershed. Overall, these 11,528 acres comprise 18 percent of the land in the watershed.

TABLE 26. Critical Agricultural Acres by Subwatershed

Subwatershed	Acres
Black Earth Cr. - Headwaters to Brewery Cr.	1,820
Brewery Creek	1,209
Black Earth Cr. - Brewery to Garfoot	937
Garfoot Creek	667
Black Earth Cr. - Garfoot to Vermont	1,217
Vermont Creek	2,158
Black Earth Cr. - Vermont to Halfway Prairie	660
Indian Lake	none
Halfway Prairie Creek	2,158
Wendt Creek	661
Black Earth Cr. - Halfway Prairie to Blue Mounds	131
Total	11,528

Best Management Practices. The best management practices applicable to croplands and other uplands are listed below. A complete list of best management practices eligible for cost sharing through the Wisconsin Nonpoint Source Water Pollution Abatement Program is included in Chapter 6.

croplands:

- changes in crop rotations to less intensive rotations
- change in cropping to permanent cover
- contour cropping
- contour strip cropping
- reduced tillage
- grassed waterways

pastures:

- pasture improvement
- grazing management

grazed woodlots:

- livestock exclusion

These practices are described in ss. NR 120.14 and NR 120.17 of the Wisconsin Administrative Code.

In addition, the Dane County Land Conservation Department will continue to use the land rental opportunities provided through the Federal Conservation Reserve Program to retire land from cropping for at least ten years.

The estimated number of each best management practice and the estimated cost share amounts are listed in Table 27. Cost share assistance will be provided through the Wisconsin Nonpoint Source Water Pollution Abatement Program and other county, state and federal programs.

All cost share agreements must include best management practices (or land rental through other programs) to control these critical sites.

TABLE 27. Estimated Cropland and other Upland Best Management Practices and Cost Share Amounts.

Best Management Practice	Number (1)	$/Unit	% Cost Share	$ Cost Share
change crop rotations or change to permanent cover	10,000 acres	NA	0%	$ 0
contour cropping	300 acres	NA	NA	0
strip cropping	1,500 acres	$24/acre	50%	18,000
reduced tillage	10,000 acres	(2)	NA	0
grassed waterways	100 acres (3)	$2100/ac	70%	147,000
pasture management	500 acres	NA	0%	0
livestock exclusion	1,500 acres (4)	$27.50/rod	50%	(5)
total				$ 165,000

(1) The acres of best management practices exceed the critical acres because the critical acres are portions of farm fields.

(2) No cost sharing is identified for reduced tillage because the equipment is relatively available. Proper use of the equipment will be stressed.

(3) Waterways are expressed in acres. An acre is about 1000 linear feet.

(4) Livestock exclusion is expressed in acres of overgrazed woodlot. Fencing to exclude cattle is expressed in rods.

(5) The Woodland Tax Program will be emphasized.

Stream Bank Management Needs

Approaches. To achieve the stream bank management needs identified to meet the water resources objectives, a number of different approaches are identified:

1. Limiting cattle access by fencing or other means is uniformly approached throughout the watershed. All cost share agreements through the Nonpoint Source Water Pollution Abatement Program must contain best management practices to limit cattle access.

   Stream Bank Fencing Needs (DCLCD 2)

2. Chapter 3 identifies two segments of Black Earth Creek as needing intensive management to rehabilitate fish habitat. They are:

   One, from the footbridge over Black Earth Creek east of the Village of Cross Plains downstream to CTH KP at the west end of the village.

   Two from South Valley Road downstream to the confluence with Vermont Creek.

   Rehabilitation of these segments is discussed further under the Fish Management section of this chapter. Structural stream bank erosion control such as riprapping will be pursued with the habitat work. Cost share agreements are encouraged to include these measures, but not required, since the erosion is not necessarily caused by the landowner's actions. Funding from the Nonpoint Source Water Pollution Abatement Program will be packaged with Trout Stamp, Dane County or interest group funds to provide financial assistance to the landowner.

   Intensive Habitat & Stream Bank Management Needs (DNR 1 & DCLCD 3)

3. Structural stream bank protection in other locations identified in Chapter 3 will be a combination of riprap, shaping and seeding and other practices. Again, cost share agreements through the Nonpoint Source Water Pollution Abatement Program are encouraged to include these practices, but not required since the erosion is not necessarily caused by the landowners actions.

   Structural Stream Bank Management (DCLCD 4)

TABLE 28. Stream Bank Protection Best Management Practices and Estimated Costs.

Best Management Practice	Number	$/Unit	% Cost Share	$ Cost Share
fencing	10,000 ft.	$ 1.75/ft.	70%	$ 12,250
riprap	7,000 ft.	20/ft.	70%	140,000
shaping and seeding	10,000 ft.	8/ft.	70%	56,000
total				$ 208,250

Criteria. Eroding stream banks must meet the following minimum criteria to be eligible for cost share assistance:

rate of recession: 0.1 ft./year

and

rate of recession times height: 0.3 ft^2/yr

Costs. Table 28 lists the estimated best management practices and costs for stream bank protection. Stream bank erosion is likely to change year-by-year. Therefore, the estimated amount is likely to change.

Animal Lot Management Needs

Animal Lot Management Needs

(DCLCD 5)

As shown in Table 29, manure-laden runoff from about 65 livestock operations needs to be controlled. Using the Wisconsin Modified Version of the ARS Feedlot Runoff Model, runoff from the operations needs to be controlled to no more than 5 pounds of phosphorus for the 10-year, 24-hour design storm. In addition, about four or five animal lots located in the floodplain needed to be controlled.

For most stream segments (described in the Chapter 3 discussion of water resources objectives by subwatershed) a 50 percent reduction in oxygen demanding pollutants was identified as a target level of reduction

to achieve the water resources objectives. For most stream segments nearly all of the oxygen demanding pollutants are estimated to come from manure including manure carried in runoff from animal lots, manure stacks and fields where manure is spread in the winter.

To achieve a 50 percent reduction in oxygen demanding pollutants reaching the stream, it is estimated about a 75 percent reduction is needed in manure from animal lots (based on the data analysis). The potential to achieve a reduction in the manure reaching the stream from winter spread fields is generally assumed to be less than that from animal lots. The probable reduction in manure from winter spread fields is in the range of 25-to-50 percent.

TABLE 29. Critical Animal Lots by Subwatershed

Subwatershed	Lots
Black Earth Cr. - Headwaters to Brewery Cr.	6 of 8
Brewery Creek	7 of 19
Black Earth Cr. - Brewery to Garfoot	5 of 11
Garfoot Creek	6 of 10
Black Earth Cr. - Garfoot to Vermont	3 of 10
Vermont Creek	8 of 14
Black Earth Cr. - Vermont to Halfway Prairie	4 of 10
Indian Lake	0 of 3
Halfway Prairie Creek	12 of 28
Wendt Creek	12 of 17
Black Earth Cr. - Halfway Prairie to Blue Mounds	0 of 5
Total	65 of 135

The data analysis estimates a 75 percent reduction in manure from animal lots can be achieved in most subwatersheds. The probable reduction in manure from winter spread fields is in the range of 25 to 50 percent.

The estimated number of best management practices and the estimated cost share amounts are listed in Table 30. A number of the animal lots may only be controlled by relocation of the lot. A "special" best management practice is described in Appendix B. Cost share assistance will be provided through the Wisconsin Nonpoint Source Water Pollution Abatement Program. All cost share agreements must include best management practices needed to control the critical sites.

Manure Spreading Management Needs

Manure Spreading Needs

(DCLCD 6)

Although the amount of manure from winter spread fields and identification of specific significant sites could not be calculated, the existence of high oxygen demand levels during trout hatch periods warrants control of this type of nonpoint source. To achieve the water resources objectives identified for Black Earth Creek and its tributaries, proper manure spreading and handling are needed.

Proper manure spreading necessitates a manure management plan for farms, prepared with the assistance of the Dane County Land Conservation Department. The manure management plan is to be based on the manure spreading guidelines of the University of Wisconsin Extension and adopted by the Soil Conservation Service. These guidelines are modified for slopes of 6-to-9 percent. Proper manure spreading on these slopes necessitates:

- contour farming
- minimum tillage with 30 percent cover
- planting hay

The results of the manure management plan will include an identification of the proper spreading periods, application rates and acceptable fields. Similar to changing crop rotations, much of the manure management

plan can be implemented without structural best management practices. However, due to physical characteristics of the land such as slope and proximity of the fields relative to streams and drainageways, structural practices such as manure storage facilities may be needed.

The estimated number of manure storage facilities and the estimated cost share amounts are listed in Table 30. Cost share assistance will be provided through the Wisconsin Nonpoint Source Water Pollution Abatement Program.

Dane County has a manure storage facility ordinance. No additions or changes to that ordinance are recommended in this plan.

TABLE 30. Animal Waste Best Management Practices and Estimated Costs.

Best Management Practice	Number	$/Unit	% Cost Share	$ Cost Share
lot runoff management - diversion & roof runoff management only	24	$ 4,000	70%	$ 67,000
lot runoff management - diversion, roof runoff management, settling basins, filter walls & filter strips or relocation	45	15,000	70%	430,000
long term manure storage facilities	10	15,000+	70% up to $10,000	150,000
short term manure storage facilities	20	10,000	70% up to $ 6,000	120,000
total				$ 767,000

Construction Site Management Needs

Sediment and other pollutants from construction sites need to be controlled to the level provided through the Model Construction Site Erosion Control Ordinance prepared by the League of Wisconsin Municipalities and the Department of Natural Resources. In addition, a handbook of best management practices for construction site erosion control is being prepared by the Department of Natural Resources. (Copies of both the Model Ordinance and a draft of the handbook of practices are available from the Department of Natural Resources, Nonpoint Source and Land Management Section.)

Construction Site Erosion Control

The City of Middleton has an ordinance which approximates the Model Ordinance. Enforcement of the ordinance needs to be upgraded.

(Middleton 1)

Construction Site Erosion Control

The Village of Cross Plains is considering an ordinance based on the Model Ordinance. The sensitivity of Black Earth Creek at Cross Plains, coupled with the past occurrences of fish habitat degradation from land disturbing activities within the village and the projected development enactment and enforcement of the ordinance, is needed to meet the water resources objectives of Black Earth Creek.

(Cross Plains 1)

Construction Site Erosion Control

Dane County needs to upgrade enforcement of their ordinance and expand their ordinance to include construction of residential buildings - particularly on lands within shoreland zoning areas, on lands classified as capability class 6 or greater, and on lands with curb and gutter drainage systems. Much of the anticipated development in the headwaters of Black Earth Creek is likely to be beyond incorporated limits.

(Dane Co. 1)

The Villages of Black Earth and Mazomanie are also encouraged to enact and enforce construction site erosion control ordinances.

Urban Lands (Storm Water) Management Needs

Presently, the City of Middleton's storm water management ordinance provides for relatively stringent management of runoff volumes and peaks for new development. The portion of Middleton's Industrial Park in the Black Earth Creek watershed is being developed in

accordance with that ordinance. The City of Middleton needs to continue to enforce the ordinance because the city and its industrial park continue to grow westward into the Black Earth Creek Watershed. As the knowledge on urban storm water management in Wisconsin increases, it may be necessary for the City of Middleton to modify its ordinance to provide better pollutant control. Better pollutant control for residential and possibly commercial land uses may be achieved through use of infiltration practices such as infiltration basins or trenches. Manufacturing activities, however, may require wet basins to better control heavy metals or toxic substances likely to be carried in runoff.

Storm Water Management Ordinance Enforcement N

(Middleton 2)

The Village of Cross Plains is considering storm water management provisions as part of its construction site ordinance. These provisions provide relatively stringent management of storm water runoff for new developments. Given the sensitivity of Black Earth Creek at Cross Plains and the projected development, enactment and enforcement of the ordinance is needed to meet the water resources objectives of Black Earth Creek.

Storm Water Management Plan

(Cross Plains

Development of the Enchanted Valley area of Cross Plains, however, provides a situation which is more complex than what can be handled through enforcement of the ordinance. Since the capacity of the existing drainageways and depressions are likely to be exceeded, an analysis is needed of probable volumes and rates of runoff and amounts of pollutants from new development. A storm water management plan based on this analysis also needs to be prepared. This plan needs to include the identification of the types and locations of best management practices to manage the storm water runoff.

The Department is most interested in having the analysis of an alternative for an infiltration basin. The basin should hold the entire runoff volume from at least a 2-year, 24-hour storm, assuming no infiltration in the basin. Given the projected residential land use and the sensitivity of the trout fishery to elevated temperatures, infiltration basins, swales and trenches are favored instead of permanent wet basins. The discharge from the infiltration basin during storms larger than the 2-year, 24-hour storm also needs to be analyzed to determine the size and type of cover for overflow conditions. The most probable location of the basin is within the designated environmental corridor.

Cost sharing for the storm water management plan will be available to the Village of Cross Plains, provided the construction site erosion control ordinance is enacted and enforced. The estimated state cost share amount is less than $25,000 (70 percent cost sharing). The Department of Natural Resources will assist in preparing a study design. The village will be responsible for hiring a consultant to conduct the analysis and prepare the plan. The Department will have to approve the storm water management plan.

Table 31 summarizes the estimated state financial assistance for implementing this project.

TABLE 31. Summary of Funds Needed for Cost Sharing, Staffing and Education Activities

Type of Nonpoint Source	Cost Share $
Uplands management	$ 165,000
Stream bank protection	$ 208,250
Animal waste management	$ 767,000
Urban study	$ 25,000
subtotal	$ 1,165,250
Staffing (see Chapter 6)	
Dane County Land Conservation Department	$ 225,000
Education (see Chapter 6)	$ 8,000
total	$ 1,398,250

FISH MANAGEMENT AND RELATED ACTIVITIES

The Master Plan for the Black Earth Creek Fishery identifies the need to manage the stream corridor and stream habitat along Black Earth Creek upstream of Mazomanie and along Garfoot and Vermont Creeks. This plan discusses specific segments for intensive management and priorities for land acquisition.

Intensive Management Segments

As identified above in the discussion of stream bank management, two segments of Black Earth Creek are identified for intensive management. The two segments are:

1. The footbridge over Black Earth Creek east of the Village of Cross Plains downstream to CTH KP at the west end of the village;

2. South Valley Road downstream to the confluence with Vermont Creek.

Cross Plains Segment. As discussed in Chapter 3, this stream segment experiences sedimentation and dissolved oxygen problems. The fish habitat is further degraded by past modifications to the stream and the remaining portion of a former dam.

Intensive Habitat & Stream Bank Management Needs

(DNR 1 & DCLCD 3)

The intent of the intensive management in this segment is to develop a specific plan for the segment that includes one or more of the following:

structurally narrowing the stream to scour sediment from the stream bed and decrease aquatic vegetation;

planting of trees to shade the stream and decrease aquatic vegetation;

planting of grasses along the stream to provide fish cover and food sources; and

stabilizing stream banks.

The plan will be prepared by the Department's fish manager and water resources staff. The projected date for this plan is sometime in 1989. The plan will involve the Village of Cross Plains, Trout Unlimited and

individual landowners. Where eroding banks need to be stabilized, cost share funds from the Nonpoint Source Water Pollution Abatement Program will be available. Trout Stamp Funds may also be available. The plan will identify the implementation period.

South Valley Road to Vermont Creek Segment. As discussed in Chapter 3, this segment of Black Earth Creek has recently experienced a fish kill. It is characterized as a broad and shallow stream with low but eroding banks and dense aquatic vegetation. Many of the deeper pools or holes in the streambed have filled in with sediment.

The intent of the intensive management in this segment is to restore fish habitat by using one or more of the following:

- structurally narrowing the stream to scour sediment from the stream bed and decrease aquatic vegetation;
- stabilizing stream banks, and
- installing "Lunker" structures to artificially create overhanging banks.

This stream bank/habitat work is being demonstrated on two sites in this segment. One site is immediately downstream (west) of South Valley Road. The other site is immediately (upstream) north of STH 14 at the north end of the Village of Black Earth. The work on the two demonstration sites will be completed in 1988. Funding from these demonstration sites is from:

- the Wisconsin Nonpoint Source Water Pollution Abatement Program, through the Department of Natural Resources
- Dane County Land Conservation Committee
- Trout Unlimited
- Madison Fishing Expo
- the Department of Natural Resources Fishery Management Program

The Soil Conservation Service is also involved through design assistance.

Land Acquisition

Land acquisition is a major management component of the fish habitat in portions of the Black Earth Creek Watershed. Land acquisition takes a number of forms including fee simple land purchase, long or short term easements or rent.

The Master Plan for the Black Earth Creek Fishery approaches land acquisition as a means of establishing a continuous management corridor. It identifies the need to acquire lands along:

- Black Earth Creek from Stagecoach Road southeast of Cross Plains downstream to Mazomanie
- Garfoot Creek
- Vermont Creek

Both the Department's Fishery Management Program and Trout Unlimited have been active in land acquisition within these identified areas.

About 48 parcels of land identified for acquisition have been ranked. The 48 parcels fall into five groups. The ranking of these groups in decreasing order of priority is as follows:

Land Acquisition Priorities

(DNR 2, DCLCD 7, & Others)

One, the major spring area of Black Earth Creek east of Cross Plains (2 parcels);

Two, along Black Earth Creek downstream from the major spring area to the confluence with Vermont Creek (17 parcels);

Three, along Garfoot Creek (4 parcels);

Four, along Vermont Creek; and

Five, along Black Earth Creek from the confluence of Vermont Creek downstream to Mazomanie.

Besides the use of Trout Stamp Funds or Trout Unlimited funds for easements, the Conservation Reserve Program through the U. S. Department of Agriculture provides an opportunity to rent "stream filter strip" lands for ten years. Private sources of funds may also be available for land acquisition.

COORDINATION

This watershed plan was developed through an integrated effort among several agencies, programs within agencies, interest groups and citizens. The data collection for stream water quality, fishery and watersheds are examples of coordinated efforts. Issuing of a new wastewater discharge permit for a sand and gravel operation is an example of coordinated decision making. This coordinated effort requires continuation for the implementation of this plan and successful, long-term preservation of the fisheries in Black Earth Creek.

Two coordinative efforts need to continue. One is the interagency watershed work group consisting of staff from the Department of Natural Resources, Dane County Land Conservation Department, Department of Agriculture, Trade and Consumer Protection and other agencies. The other is the Black Earth Creek Watershed Association (BECWA), a citizen's group of landowners, elected officials and interest group members.

In addition, implementation of this watershed project will be coordinated with:

One, the Dane County Soil Erosion Control Plan by Dane County with assistance from the Wisconsin Department of Agriculture, Trade and Consumer Protection;

Two, the soil erosion control requirements of the Wisconsin Farmland Preservation Program administered by Dane County and the Wisconsin Department of Agriculture, Trade and Consumer Protection; and

Three, the soil erosion control requirements of the Federal Food Security Act of 1985 (1985 Farm Bill) administered by the Agricultural Stabilization and Conservation Service and Soil Conservation Service of the U. S. Department of Agriculture.

Watershed Work Group

A watershed work group was responsible for coordinating the development of this plan and coordinating implementation and demonstration activities prior to completion of this plan. The core of the watershed work

group consisted of these Department of Natural Resources an aquatic biologist; a fish manager; a water quality planner; and a nonpoint source specialist. It also involved staff from the U. S. Geological Survey, the University of Wisconsin and the Dane County Land Conservation Department. At various times, solid waste specialists, wastewater engineers and other Department staff were invited to participate.

Watershed Work Group

(DNR 3)

As described elsewhere in this plan, the work group dealt with a number of day-to-day issues such as changes to environmental corridors, coordination with other state agencies and location of monitoring sites. These day-to-day coordination needs will continue. However, other issues that may arise only once in five to ten years. Some of these issues are already identified. The day to day and periodic issues and activities include:

- reissuing of wastewater treatment plant permits;
- reissuing of landfill permits;
- expansion of state highway 14 between Middleton and Cross Plains;
- residential development of lands surrounding the Capitol Sand and Gravel Company site;
- location of high capacity municipal wells in the watershed;
- Chapter 30 permits for detention basins and other storm water management practices;
- review of changes to Sewer Service Area delineations;
- priority watershed education activities;
- coordination with fishery management master plans and project proposals; and
- coordination with wildlife management and other resource management programs.

The Department will use the watershed work group as an intra-agency coordination mechanism for the many Department Resource Management and Environmental Quality programs. The primary participants will be Southern

District staff. The Southern District Nonpoint Source Coordinator will serve as the Department work group coordinator.

The watershed work group will also serve as an interagency coordination mechanism. Staff of the Department and the Dane County Land Conservation Department will have the primary responsibility for coordinating activities. Other work group members include representatives from the Department of Agriculture, Trade and Consumer Protection, the Soil Conservation Service and University of Wisconsin - Extension.

Black Earth Creek Watershed Association (BECWA)

The Black Earth Creek Watershed Association (BECWA) was formed as a result of a public watershed association meeting held in 1986. Many people at the meeting stated their interest to form a citizen's group for the Black Earth Creek Watershed and aimed toward:

- furthering citizen involvement in pertinent issues and
- enhancing coordination between agencies, local governments, landowners and recreational users.

Two public watershed meetings were sponsored by BECWA. Topics presented at the June 1988 were:

- renovation of the railroad crossing the watershed;
- status of the Black Earth Creek Watershed Project;
- recent activities of the Dane County Land Conservation Department in the watershed;
- Cross Plains' proposed construction site erosion and runoff control ordinance;
- impact of Refuse Hideaway Landfill on the stream and fishery; and
- stream bank/fish habitat demonstration project.

BECWA has also been involved in a number of other activities such as placing watershed signs at key locations around the watershed.

BECWA Support

BECWA is a viable citizens group. State and local agencies should continue to support its activities by participating in its meetings and serving as advisors to BECWA's board of directors.

(DNR 3 & DCLCD 8)

LONG-TERM BASEFLOW MAINTENANCE

Base Flow Maintenance Need

Baseflow in the streams coming from the many springs is the "lifeblood" of Black Earth Creek and its tributaries. Without the cold, clean ground water feeding these streams, the trout fishery would not exist. The "recharge" area feeding the springs has not been mapped, but it is probably slightly larger than the watershed boundaries. Anticipated changes in the land use in portions of the watershed may have an impact on the amount of groundwater feeding Black Earth Creek.

(DNR 4, DCRPC 1 & Others)

The most critical groundwater recharge area is the Headwaters subwatershed of the watershed. As described in Chapter 3, this subwatershed is located in the "Golden Triangle" for development stretching from Middleton to Cross Plains to Verona. Urban development is very likely to increase the volume of runoff and decrease the amount of infiltration. Other threats such as new, high capacity public water supply wells in the subwatershed, will significantly impact the groundwater flow patterns. The impact is most likely seen first in the spring area near Twin Valley Road. In the long-term, the volume of discharge from the spring area east of Cross Plains is likely to decrease.

Currently, no program exists to evaluate the long-term impact of urbanization on the baseflow of streams. The long-term future of Black Earth Creek, however, may depend on the maintenance of infiltration and the proper location of high capacity wells. Land use planning and zoning needs to take into account base flow maintenance needs.

The Department should pursue a research study to obtain information on the extent of the recharge area to the Black Earth Creek springs, and to estimate the potential reduction in volume of water discharged from the springs. Future upgrades of the Sewer Service Areas for the Madison area (including Middleton) could analyze

issues relating to the type and density of development necessary to maintain base flow in Black Earth Creek. Also, the scope of future updates of the Dane County Groundwater Quality Plan could be expanded to permit evaluation of groundwater flow patterns and groundwater quantity considerations that relate to maintenance of base flow in Black Earth Creek.

PART 2: DETAILED PROGRAM FOR IMPLEMENTATION

CHAPTER 6: DETAILED PROGRAM FOR IMPLEMENTATION[1]

INTRODUCTION

The purpose of this chapter is to describe the procedures, schedules and activities local units of government will use to implement the Management Actions described in the Nonpoint Source portion of Chapter 5 of this priority watershed plan. Since the majority of the critical nonpoint sources are agricultural, and outside the jurisdictional boundaries of cities and villages, the majority of the implementation activities are statutorily the responsibility of Dane County.

All implementation activities will be conducted in accordance with section 144.25, Wisconsin Statutes, and Chapter NR 120, Wisconsin Administrative Rules. All grants described in this chapter will be between the Department of Natural Resources and the county, city or village, as appropriate.

ROLE OF DANE COUNTY LAND CONSERVATION COMMITTEE AND DEPARTMENT

Dane County has assigned the lead role for implementing the Black Earth Creek Priority Watershed Project to the Dane County Land Conservation Committee and the Dane County Land Conservation Department (LCD). The day to day implementation activities will be conducted by the Dane County Land Conservation Department. They will be assisted by:

the Soil Conservation Service (including staff from the Dane County Field Office, the Beaver Dam Area Office and the State Office in Madison);

the Department of Agriculture, Trade and Consumer Protection;

the University of Wisconsin - Extension (including staff working in Dane County and staff located at the University of Wisconsin - Madison);

the University of Wisconsin Land Information and Computer Graphics Facility;

other Departments within the Dane County government; and

the Department of Natural Resources.

---

1. Most of the information in this chapter is provided by the Dane County Land Conservation Department.

While implementing this watershed project, the Dane County LCD and the Soil Conservation Service staffs will coordinate watershed project activities with cross compliance activities of the Wisconsin Farmland Preservation Program and the Federal Food Security Act of 1985. The cross compliance provisions of those two programs require implementation of cropland erosion control plans to maintain program benefits such as tax credits or commodity assistance. In 1988, about 60% of the cropland in the Black Earth Creek Watershed is enrolled in the Wisconsin Farmland Preservation Program and subject to the cross compliance provisions.

COST SHARE ASSISTANCE ADMINISTRATION

Dane County will receive grant funds from the Wisconsin Nonpoint Source Water Pollution Abatement Program through the Department of Natural Resources for assisting with the installation of best management practices within its jurisdiction. The grant amount will be based on the cost estimates contained at the end of Chapter 5. As implementation of this project progresses, it may also be appropriate for the Department to also make grants to the cities and villages in the watershed. The grant administration requirements are described in Chapter NR 120, Wisconsin Administrative Code. A number of pertinent elements of grant administration are described below.

Eligible Best Management Practices and Cost Share Rates

Table 32 lists the best management practices eligible for cost sharing in this project and their cost share rates, as provided by administrative rule. Except for the special practice for animal lot relocation, these practices and their cost share conditions are further described in Chapter NR 120, Wisconsin Administrative Code. A description of the special practice for animal lot relocation is contained in Appendix B. The estimated number of each practice is presented in Chapter 5 of this plan.

Cost Containment Provisions

The Dane County Land Conservation Committee has chosen to use an Average Cost procedure as its primary method to contain cost of best management practices. Average costs are determined for units of materials or labor. The average costs to be used in the first year of the project are based on 1987-88 costs from the Dane County/SCS Sugar River Watershed Project. The average costs will be reviewed and updated at least annually. The Dane

TABLE 32. Eligible Best Management Practices and Cost Share Rates

Best Management Practice [1]	State Cost Share Rate
Contour cropping	50% or $6/acre
Contour strip cropping	50% or $12/acre
Field diversions	70%
Terraces	70%
Grassed waterways	70%
Reduced tillage	50% or $45/acre for continuous row croplands or $15/acre for crop rotations
Critical area stabilization	70% [3]
Grade stabilization structures	70% [3]
Stream bank protection	70% [3]
Barnyard runoff management	70%
Animal lot relocation [2]	70%
Long-term manure storage facilities	70%
Short-term manure storage facilities	70%
Livestock exclusion from woodlots	70%
Structural urban practices	70%

1 See Chapter NR 120, Wisconsin Administrative Code for full description of the best management practices and the cost share rates.

2 An alternative or special best management practices not contained in Chapter NR 120, Wisconsin Administrative Code. See Appendix B.

3. May be increased to 80% with county matching funds.

County Land Conservation Committee intends to use the following policy to govern cost share payments:

> Cost share payments will be based on the actual costs not to exceed the estimated cost share amount for the identified practice based on the calculated average costs without prior approval of the Land Conservation Committee.

For situations where an average cost procedure is inappropriate, Dane County will use either a bidding or maximum cost procedure. Examples of practices where bidding may be the most appropriate approach are stream bank riprapping and manure storage facilities. Dane County Land Conservation Department staff are responsible for determining when a bidding or maximum cost procedure is most appropriate.

For grants made to cities or villages, Wisconsin Statutes generally require bids as a cost containment procedure.

Fiscal Management Procedures

The Dane County Land Conservation Committee has identified the following fiscal management procedures for the Black Earth Creek Priority Watershed Project:

1. The landowner signs the cost share agreement.

2. The cost share agreement is reviewed and signed by the Land Conservation Committee chairman.

3. The original copy of the cost share agreement is filed in a watershed file by landowner by the staff of the Land Conservation Department (LCD). One copy of the agreement is mailed to the landowner; a second copy becomes part of the Long Term Agreement file; and a third and fourth copy is sent to the Department of Natural Resources. A fifth copy will be filed with the Register of Deeds, if required by Chapter NR 120, Wisconsin Administrative Code.

4. The best management practices are designed.

5. With the practice design in hand, the landowner arranges for a contractor to install the practice. Bids are required if determined by the Land Conservation Department staff.

6. The best management practice lay out is conducted by LCD or SCS staff when the contractor is scheduled to start.

7. Upon completion of installation, the best management practice is certified by LCD or SCS staff using the program form.

8. The original copy of the certification form is kept in the watershed landowner file. A copy of the certification form is kept in the LTA file.

9. The landowner submits all bills to the LCD.

10. The LCD project manager itemizes all bills and lists the invoice descriptions; amount approved for cost sharing; and cost sharing amount. Any problem bills are discussed with the landowner.

11. The total cost share amount is determined.

12. The practice verification form is completed.

13. The landowner signs a county voucher for cost share amount.

14. The bills with itemized costs and the voucher are approved by the LCC.

15. The voucher is processed by the County.

16. The voucher number, check number, amount, landowner, and date of check are filed in the watershed landowner file.

17. The check is issued in the landowner's name by County controller (amounts over $5,000 are approved by the County Board).

18. The date the LCC approved the payment is recorded on the bottom of cost share calculation & practice form.

TECHNICAL ASSISTANCE AND STAFFING NEEDS

Special Activities

There are three special technical assistance activities identified for implementing this plan:

one, manure management plans;

two, relocation of animal lots; and

three, intensive stream bank/habitat rehabilitation.

Each is briefly discussed below.

Manure Management Plans. Development and implementation of manure management plans is identified as a major component of this watershed plan. However, specific procedures for preparing manure management plans have not been developed. The Department of Agriculture, Trade and Consumer Protection and the Soil

Conservation Service (state office) will assist Dane County Land Conservation Department staff in developing, testing and implementing manure management plans for livestock operations in the watershed.

Relocation of Animal Lots. About five animal lots are located on the floodplain and present a significant potential for causing water pollution. Relocation of the animal lots is a viable option for controlling this pollutant source. Due to the complexity of the situations, a team approach is needed to determine the best relocation alternative. The team will include staff from the following agencies:

Dane County Land Conservation Department;

Soil Conservation Service;

Department of Natural Resources Nonpoint Source Water Pollution Abatement Program;

Department of Natural Resources Water Regulation and Zoning Program; and

Department of Agriculture, Trade and Consumer Protection.

Intensive Stream Bank/Habitat Rehabilitation

As described in Chapter 5, areas for intensive stream bank/habitat rehabilitation have been identified. Stream bank and fish habitat work will be integrated. Dane County Land Conservation Department and Department of Natural Resources staff will work together on these sites.

Staffing Needs

Table 6-6 shows the Dane County Land Conservation Department staff needs to implement Dane County's responsibilities in the Black Earth Creek Watershed. The table lists the staffing needs by two types of positions, a conservation planner and a conservation technician. The Dane County Land Conservation Department used the following assumptions used to estimate staff needs:

1. Due to two years of ongoing LCD activities in the Black Earth Creek Watershed, nearly all of the implementation will take place in a five year period instead of the eight year period generally used for watershed projects.

TABLE 33. Black Earth Creek Priority Watershed Project Staffing Projections

ACTIVITY	TOTAL	TOTAL HOURS PLAN	TOTAL HOURS TECH	1989 HOURS PLAN	1989 HOURS TECH	1990 HOURS PLAN	1990 HOURS TECH	1991 HOURS PLAN	1991 HOURS TECH	1992 HOURS PLAN	1992 HOURS TECH	1993 HOURS PLAN	1993 HOURS TECH
TOTAL	13,290	5,450	7,840	1,830	1,800	1,805	1,800	1,815	1,820	0	1,560	0	860
CROPLANDS													
CONSERVATION PLANS	2,680	2,000	680	700	150	700	150	600	380	0	0	0	0
AGREEMENTS PENDING	200	50	150	50	150	0	0	0	0	0	0	0	0
PRACTICE INSTALLATION	2,050	250	1,800	50	100	100	750	100	400	0	400	0	150
REVISIONS	1,000	200	800	0	0	0	0	200	150	0	500	0	150
ANIMAL WASTE													
ANIMAL WASTE PLANS	600	450	150	150	50	150	50	150	50	0	0	0	0
STORAGE FACILITIES	1,500	400	1,100	200	200	100	250	100	250	0	250	0	150
RUNOFF MGT.-SIMPLE	500	100	400	50	100	25	100	25	100	0	50	0	50
RUNOFF MGT.-COMPLEX	2,000	1,000	1,000	200	200	400	200	400	200	0	200	0	200
STREAM BANKS	400	100	300	30	60	30	60	40	60	0	60	0	60
INFORMATION & EDUCATION	400	300	100	100	30	100	40	100	30	0	0	0	0
PROGRAM MEETINGS	800	300	500	100	100	100	100	100	100	0	100	0	100
TRAINING	1,160	300	860	200	660	100	100	0	100	0	0	0	0

SOURCE: DANE COUNTY LAND CONSERVATION DEPARTMENT

PLAN = CONSERVATION PLANNER POSITION
TECH = CONSERVATION TECHNICIAN POSITION

2. About 35% of the approximately 11,000 critical acres already have conservation plans. Of the 65% remaining, 75% is assumed to be the rate of participation. Since the critical acres represent portions of farm fields, conservation plans must cover more than the critical acres. To adjust for this factor, a rate of 0.5 hours per acre is used. Using these assumptions, 2,680 hours are estimated for farm conservation plans. These hours include contact time.

3. Based on existing farm plans, about 25 cost share agreements can be signed shortly after the cost share grant is awarded. About eight hours are needed to complete work for these agreements.

4. Based on the number of acres of critical cropland, about 2,050 hours are needed for cropland practice installation.

5. About 60 animal waste plans will be developed at a rate of 10 hours per plan.

6. About 15 manure storage facilities will be designed and installed at a rate of 100 hours per facility.

7. About 20 "simple" (generally clean water diversions) barnyard runoff management systems will be designed and installed at a rate of 25 hours per site.

8. About 25 livestock operations requiring extensive or "complex" barnyard runoff management will be designed and installed at a rate of 80 hours per site.

Based on these assumptions, two additional staff will be needed. One position, a conservation planner, will be needed for 3 years. The second position, a conservation technician, will be needed for 5 years. In total, about 7.5 staff years is needed. At $30,000 per position per year, about $225,000 will be needed for staff salary and fringe benefits.

INFORMATION AND EDUCATION

The information and educational activities described below are a continuation of the activities started during the development phase of this project. Rural landowners are the primary focus of the educational activities. However, the activities also are directed toward urban landowners in the watershed and users of the water resources regardless of residence. Table 34 lists

TABLE 34. Educational Target Audiences and Corresponding Educational Activities.

Target Audience	Educational Activity
rural landowners/ land users	personal contacts
	newsletters
	town meetings
	feature articles in local newspapers
	Black Earth Creek Watershed Association (BECWA)
	stream side tillage and cover crop demonstration
	stream bank erosion rate demonstration
local policy makers	newsletters
	presentations to town boards
	presentations to county board supervisors
	BECWA
	tours
	construction site erosion control promotion
local residents	feature articles
	BECWA
	watershed signs

the target audience and corresponding activities. Each of the activities is described briefly.

Information and educational activities will be reviewed annually.

Personal Contacts

Personal contacts are considered the most effective way to convey information about the project and about best management practices to rural landowners and land users. Throughout the last two years, Dane County Land Conservation Department (LCD) and Soil Conservation Service staff have been contacting landowners in the watershed. They will continue to make personal contacts during the first three project years. Time for this activity is included in the staffing needs estimates.

Newsletters

As shown in Table 34, newsletters will be used to convey information to landowners/land users and policy makers. University of Wisconsin - Extension (UWEX) will assist the LCD in preparing the newsletters. Newsletter articles will cover the range of topics associated with the project. Members on the multi-agency work group described in Chapter 5 will assist in preparing articles.

Dane County LCD estimates 14 newsletters will be prepared over a six year period. Three or four newsletters are planned during each of the first four project years, and two newsletters each year during the fifth and sixth project years. Costs for UWEX assistance will be covered by a multi-project grant from the Nonpoint Source Water Pollution Abatement Program. Dane County LCD costs for mailing, estimated at $1500, will be covered through the nonpoint source program Local Assistance Grant Agreement between the Department and the Dane County LCD.

Town Meetings

Dane County LCD is using town meetings as a means of conveying information on the Federal Food Security Act Programs and Wisconsin Farmland Preservation Program to rural landowners/land users. Information on the watershed project will be incorporated into these meetings. Time for this activity is included in the staffing needs estimates.

Feature Articles in Local Newspapers

Feature articles will continue to be used as a means of informing both urban and rural residents of the watershed

project's activities. Much of the time for this activity is supplied by the local newspapers. Dane County LCD time for this activity is included in the staffing needs estimates.

Black Earth Creek Watershed Association

As described in Chapter 5, the Black Earth Creek Watershed Association (BECWA) is an ongoing group of residents, interest group members, community leaders and elected officials formed to further the quality of Black Earth Creek and its watershed. It was formed as a suggestion voiced during the first public meeting on the Black Earth Creek Watershed Project to provide a local link between the many interests in the watershed. BECWA has sponsored a number of watershed meetings. In addition, BECWA has completed a watershed sign project aimed at making people aware of their presence in the watershed.

It is expected BECWA will continue to assist in information and educational activities in the watershed. Nonpoint Source Water Pollution Abatement Program funds will be made available to BECWA for future projects, such as the watershed sign project.

Presentations to Town Boards and County Board Supervisors

Town board members and county board supervisors are recognized as local leaders in the watershed. Dane County LCD staff and other watershed work group members will periodically make presentations to these elected officials to keep them informed. The Dane County LCD will schedule tours for these officials to see first hand nonpoint sources and best management practices.

Stream side Tillage and Cover Crop Demonstration

The Dane County LCD will conduct a stream side tillage and cover crop demonstration. The purpose of the stream side tillage and cover crop demonstration is to investigate and demonstrate potential best management practices on lands adjacent to streams and channels where participation in the Conservation Reserve Program or installation of filter strips is unlikely. The demonstration will focus on selected croplands with low soil loss (less than tolerable soil loss levels) but due to their location have a high potential of sediment delivery to the stream. Removal of crop residue for silage is common on these croplands. The demonstration will take place throughout the first, second and third project years.

Chisel plowing and winter cover crops are the two potential best management practices identified to date. Chisel plowing, which roughens the soil surface, will increase infiltration of spring

runoff. Winter wheat or other winter cover crops will provide protection of soil from erosion and may trap sediment from upslope fields. Silt fences will be installed at sites with and without practices to visually measure reductions in the amount of sediment being carried in runoff from the fields. About $3,000 is needed for silt fence materials and winter cover crop seed. Results of this demonstration will be reported in the watershed newsletter.

Stream Bank Erosion Rate Demonstration

The Dane County LCD will place stakes parallel to selected eroding stream banks to measure the rate of recession. The horizontal distance between the stakes and the top of the eroding bank will be measured periodically to determine the rate of recession. The results of the measurements will be reported in the watershed newsletter.

Construction Site Erosion Control Promotion

Construction site erosion control will be promoted in cooperation with county and state level activities. Educational materials will be made available to municipal and county government staff, elected officials, interested citizens, developers, contractors and others. Displays for home shows and other educational approaches will be considered.

Other Education Activities

It is anticipated other education needs and opportunities will be identified during implementation of this plan. The inter-agency watershed work group will assist in identifying, developing and implementing additional educational activities.

PART 3: EVALUATION PLAN

CHAPTER 7: EVALUATION AND MONITORING

INTRODUCTION

This chapter briefly summarizes the plan for evaluating and monitoring the accomplishments of the Black Earth Creek Priority Watershed Project. The project will be evaluated with respect to:

pollutant load reduction through best management practice installation and

water resources changes.

EVALUATION OF POLLUTANT LOAD REDUCTIONS

Land Management - Rural. As described in Chapter 5, this plan calls for:

a 50% reduction in the sediment from construction sites, croplands and other sources entering the streams and

a 50 % reduction in the manure and organic matter entering the streams.

Two models, the WIN (Wisconsin Nonpoint) model and the Wisconsin Modified ARS model, are the primary tools the Department will use to determine the degree of accomplishment. The WIN model will be used to estimate the reduction in sediment from rural agricultural lands to Black Earth Creek and its tributaries by the installation of best management practices. As the project progresses, the Wisconsin Modified ARS model will be used to evaluate the reduction of manure from barnyards to the stream. This model was also used to estimate the pollutant load reduction from the watershed's barnyards. It may not be practical to apply the WIN model on the entire watershed. Thus, a representative subwatershed may be used to assess the reduction in the amount of sediment reaching the streams. In addition, Dane County Land Conservation Department's geographic information system data bases will also be used to determine reductions in pollutant and sediment delivery to streams in the watershed.

Land Management - Urban. This plan calls for Cross Plains and other communities to enact construction site erosion control ordinances and for Middleton to upgrade enforcement of their existing ordinance. Instead of using a quantitative method for

evaluation, the status of construction site erosion control in each community will be described. In addition, this plan calls for the preparation of a storm water management plan for the Enchanted Valley area of Cross Plains.

EVALUATION OF WATER RESOURCES

To evaluate the water quality in Black Earth Creek, as a result of installation of best management practices and other measures, several water quality measurements and monitoring activities will be conducted. A brief summary is provided below and a more detailed description of this monitoring effort will be prepared in spring 1989.

Dissolved Oxygen (DO) - Each year, the Department will monitor DO during the month's high macrophyte respiration (June, July and August) at three sites on Black Earth Creek. At each of these sites, DO will be monitored for both event and baseflow conditions. These sites are:

1) CTH P east of Cross Plains;

2) South Valley Road; and

3) at the USGS monitoring station upstream of the Village of Black Earth.

In addition, the improvement in DO levels afforded by in-stream habitat improvement will also be monitored at specific sites.

Temperature - Temperature measurements at baseflow and event conditions will be taken in conjunction with the DO measurements as explained above.

Hilsenhoff Biotic Index (HBI) - The Department will collect aquatic insects at the same sites that were sampled prior to preparation of this plan. The relative abundance of different species will be counted to determine the quality of the stream using the HBI method.

Flow Station - To interpret the water quality data, the USGS flow station at CTH P needs to be reestablished and maintained during the evaluation phase of the project. This will cost approximately $1000 to install and $3100 (non-USGS share) to operate annually. This station will also aid in the measurement of long-term baseflow conditions (described below).

Intensive Habitat Management Segments. As described in Chapter 5 of this plan, two segments of Black Earth Creek were selected for intensive habitat improvement. These two segments will also be the focus of intensive evaluation monitoring. Intensive evaluation monitoring is needed to accurately measure water quality changes before and after installation of best management practices and fish habitat structures. Since the watershed is so large, intensive monitoring must focus on key segments of the stream. These intensive habitat management segments are described below.

1) From the foot bridge over Black Earth Creek east of the Village of Cross Plains downstream to CTH KP at the west end of the village:

The meadow upstream Cross Plains. Sediment from the Headwaters subwatershed has reduced the water quality in this low gradient reach of the stream. Although most of the flow originates from springs and although the water quality is good, sedimentation and excessive aquatic plant growth have caused dissolved oxygen levels to drop below standards for trout water. Evaluation monitoring in this reach will involve DO sampling before and after implementation of best management practices and proposed habitat improvement techniques which increase current velocity, aeration and shading. DO sampling will be performed annually during June, July and August, the most critical months for DO concentrations because of high macrophyte growth and respiration. Hilsenhoff Biotic Index samples will be taken every spring and fall at the CTH P bridge as mentioned above.

Below Brewery Creek downstream to CTH KP. Brewery Creek is a major source of sediment and organic enrichment to Black Earth Creek. Sedimentation and the resulting loss of habitat can affect both fish and macroinvertebrate populations. As described above, this segment of Black Earth Creek will receive intensive habitat improvement. This intensive, in-stream habitat improvement, plus the reduction of sediment and organic material delivery to the stream should result in an increase in the population of brown trout and macroinvertebrates. Before and after implementation of the plan, Department Fish Managers will estimate the population of brown trout in this reach by electrofishing. In addition, the Department will conduct a study of the quantitative change of macroinvertebrate density to the improvements in aquatic habitat.

Although in the past, the HBI has been the primary tool for point and nonpoint source pollution studies, the HBI alone is not as effective and precise in measuring changes in benthic communities to changes in substrate in comparison to changes in water quality. Quantitative sampling can show productivity changes as a response to habitat change and/or population shifts from silt-tolerant species to species requiring gravel/rubble substrates. For each sample, an HBI will also be determined since it represents a longtime standard tool for water quality assessment. A habitat assessment including taking cross-sections of sediment depth and aquatic macrophyte coverage was taken before plan implementation as a part of the resource appraisal process and will be conducted after the project is complete.

2) From South Valley Road downstream to the confluence with Vermont Creek:

Demonstration Sites. At the demonstration site north of the village of Black Earth, the Department will conduct fish population studies, quantitative macroinvertebrate sampling, a habitat assessment, DO, temperature, and the HBI as is described above under the site below Brewery Creek.

Fish Population Estimates - In intensive habitat management segments described above, the trout fishery will be analyzed for: length frequency; age-length; age frequency; total mortality; condition factor; and size of the total population. This study will use electrofishing and the mark-recapture method will be used to obtain the above information. The surveys will be conducted during spring and fall 1989-91.

Long-term Baseflow Maintenance - This plan points out that the quality and quantity of the groundwater-fed springflow is the "life blood" of Black Earth Creek and its tributaries. As part of this evaluation plan, a study of the extent and nature of this recharge area will be pursued through an interagency groundwater budget study (including USGS and possibly Dane County participation). To aid this study, the USGS flow station mentioned above should be re-established at the CTH P bridge in Cross Plains.

TABLE 35. Timetable for Evaluation Monitoring Activities

Activity	1989	1990	1991	1992	1992	1993	1994	1995
U. S. Geological Survey under contract with DNR								
Flow	X	X	X	X	X	X	X	X
Nutrients, Sediment and BOD	X	X	X	X	X	X	X	X
Dissolved Oxygen	X	X	X	X	X	X	X	X
DNR Water Resources Management								
Temperature	X	X	X	X	X	X	X	X
Quantitative Benthic Samples				X				X
Hilsenhof Biotic Index				X				X
Habitat Assessment	X			X				X
Hours	250	50	50	250	50	50	50	250
DNR Fisheries Management								
Fish Population	X	X	X	X	X	X	X	X
Hours	200	200	200	200	200	200	200	200

BIBLIOGRAPHY

BIBLIOGRAPHY

1. Baumann, Jim. 1986. Interim Conclusions on Black Earth Creek Watershed Project.

2. Baumann, Jim. 1987. Personal Observatons.

3. Baumann, Jim. 1986. First Draft. Base Flow Phosphorus Concentrations During the Aquatic Vegetation Growing Season.

4. Brynildson, Oscar M. and John W. Mason. 1975. Influence of Organic Pollution on the Density and production of Trout in a Wisconsin Stream. Technical Bulletin 81. Wis. DNR.

5. Brynildson, Clifford. 1985. Biological characteristics of the trout population in Black Earth Creek, Dane County, September, 1985. Wis. DNR.

6. Brynildson, Clifford. 1986. Population estimates and other biological characteristics of the wild brown trout in Black Earth Creek, Dane County, October, 1986. Wis. DNR.

7. Day, Elizabeth A, Grzebieniak, Gayle P. Osterby, Kurt M. and Clifford L. Brynildson. 1985. Surface Water Resources of Dane County. lake and stream classification project, second edition. Wis. DNR.

8. Kreft, Dawn. 1984. USDA Soil Conservation Service Intern. Handwritten report on stream bank erosion and other nonpoint sources of pollution in BLack Earth Creek.

9. Lembcke, Roy A. 1986. Operations assistance project report for Cross Plains wastewater treatment plant. Wis. DNR.

10. Madsen, J.D., Adams, M.S. and W. Kleindl. 1986. The aquatic macrophyte community of Black Earth Creek, Wisconsin. Department of Botany and Institute for Environmental Studies. University of Wisconsin-Madison.

11. Marshall, Dave. 1986. Black Earth Creek macroinvertebrates. Wis. DNR.

12. Marshall, Dave. 1986. Black Earth Creek watershed appraisal reports for Brewery Creek, Wendt Creek, Halfway Prairie Creek, Vermont Creek, Garfoot Creek and the Black Earth Creek Headwaters. Wis. DNR.

13. Marshall, Dave. 1987. Black Earth Creek habitat assessment. Wis. DNR.

14. Tusler, Mark. 1985. Low Dissolved Oxygen Survey, May 8, and July 1985. Wis. DNR.

15. U.S.G.S. 1987. Provisional data subject to revision for four monitoring stations: Brewery Creek in Cross Plains, Black Earth Creek at County Highway P, Garfoot Creek upstream of KP and Black Earth Creek at Black Earth.

16. Water Resources Management Workshop. 1986. Black Earth Creek : A watershed study with management options. IES Report 129. Institute for Environmental Studies, University of Wisconsin-Madison.

17. Wis. DNR. 1987. Lower Wisconsin River Basin Areawide Water Quality Management Plan.

APPENDICES

APPENDIX A:

DATA COLLECTION AND ANALYSIS METHODS

WATER RESOURCES

Introduction

A number of methods were used to assess the existing and potential water resources conditions including:

- Hilsenhoff Biotic Index (aquatic insect);
- continuous and minimum-maximum dissolved oxygen;
- temperature;
- substrate sediment depth;
- aquatic vegetation;
- fish population;
- chemical concentrations; and
- user perceptions.

Each of these methods are discussed briefly below.

Hilsenhoff Biotic Index (aquatic insect)

Biotic index samples were collected at sites throughout the Black Earth Creek Watershed. The Hilsenhoff Biotic Index is a measure of degree or organic pollution in a stream. It is presumed to be most responsive to dissolved oxygen conditions in the stream. The method assigns tolerance and intolerance factors to different insects collected in the stream. Based on the number of pollution intolerant and tolerant found species at each site, a biotic index value is calculated. There are no water quality standards based on Hilsenhoff Biotic Index values. The following table shows the magnitude of organic pollution relative to Hilsenhoff Biotic Index values (prior to the recent revision to a 10-point scale).

Biotic Index Water Quality Degree of Organic Pollution

Biotic Index	Water Quality	Degree of Organic Pollution
0.00 - 1.75	Excellent	No organic pollution
1.76 - 2.25	Very good	Possible, slight organic pollution
2.26 - 2.75	Good	Some organic pollution
2.76 - 3.50	Fair	Significant organic pollution
3.51 - 4.25	Poor	Very significant organic pollution
4.26 - 5.00	Very poor	Severe organic pollution

References:

Hilsenhoff, William A.
1982. Using a biotic index to evaluate water quality in streams, Wisconsin Department of Natural Resources Tech. Bull. No. 132.

Reports:

Marshall, Dave
1986. Black Earth Creek macroinvertebrates, Wisconsin Department of Natural Resources

Continuous and Minimum-Maximum Dissolved Oxygen

Dissolved oxygen concentrations directly influences the health of fish and other aquatic life. The water quality standards for Wisconsin are 5.0 mg/l for streams classified as full fish and aquatic life. The water quality standards for Wisconsin are 6.0 mg/l at any time for streams classified as trout streams and 7.0 mg/l during spawning season for streams classified as trout streams. While these standards identify minimally desired conditions, draft EPA documents have recommended higher minimum levels during hatch periods for trout. Concentrations of 3.0 mg/l or less are often lethal for many fish species. Concentrations between 3.0 and 6.0 mg/l may result in reductions in trout growth.

During 1985, 17 sites were monitored by DNR on about a three to five week basis to determine the most likely minimum and maximum dissolved oxygen concentrations in Black Earth Creek and its tributaries. In addition, USGS monitored two sites in 1985 and 1986 on a continuous basis. All of these sites were located upstream of the village of Black Earth.

In addition, dissolved oxygen measurements were made in August 1987 within feet of several springs just east of Cross Plains to determine the impact of the discharge from low oxygenated springs on Black Earth Creek at CTH P.

References:

Chapter NR 102, Wisconsin Administrative Rules
1985. Water quality standards for Wisconsin surface waters.

Environmental Protection Agency
1985. Ambient water quality criteria for dissolved oxygen: Freshwater aquatic life, draft.

Reports:

Field, Stephen J., and Graczyk, David J.
1988. Hydrology, aquatic macrophytes, and water quality in Black Earth Creek and its tributaries, Wisconsin, U. S. Geological Survey, draft.

Tusler, Mark
1985. Minimum-maximum dissolved oxygen survey, Wisconsin Department of Natural Resources

Temperature

Temperature is one of the major factors influencing trout waters. Generally, trout waters should have a temperature of less than 22°C. Temperature readings were taken in conjunction with all dissolved oxygen measurements. There are no water quality standards for temperature.

Reports:

Field, Stephen J., and Graczyk, David J.
1988. Hydrology, aquatic macrophytes, and water quality in Black Earth Creek and its tributaries, Wisconsin, U. S. Geological Survey, [draft].

Tusler, Mark
1985. Minimum-maximum dissolved oxygen survey, Wisconsin Department of Natural Resources

Substrate Sediment Depth

Substrate sediment depth was measured to determine the areal extent and magnitude of sediment covering the substrate of streams. Transects across the streams were measured about every 100 to 300 yards depending on the variability of conditions in the stream. Black Earth Creek from upstream Cross Plains to below the confluence with Garfoot Creek and Vermont Creek was surveyed. No water quality standards exist for sediment deposition.

Reports:

Marshall, Dave
1986. Black Earth Creek watershed appraisal reports for Brewery Creek, Wendt Creek, Halfway Prairie Creek, Vermont Creek, Garfoot Creek and the Black Earth Creek headwaters.

Aquatic Vegetation

In 1985, University of Wisconsin Water Resources Management graduate students studied the aquatic vegetation in Black Earth Creek upstream of the Village of Black Earth. The study was designed to determine:

the distribution of plant growth and species;

the extent tree canopy cover influences plant growth;

the current capability of the stream to support masses of aquatic vegetation both upstream and downstream of the Cross Plains wastewater treatment plant;

the contribution of macrophytes to nocturnal depletion of oxygen in the stream; and

whether phosphorus is the key element controlling the productivity of the aquatic vegetation in the stream.

Study areas within the stream were selected for determining biomass. Tissue samples of the aquatic plants were also collected. A riparian cover study was also conducted.

Reports:

Born, Steve et. al.
1986. Black Earth Creek: A Watershed Study with Management Options, Institute for Environmental Studies, University of Wisconsin - Madison.

Madsen, J.D., Adams, M.S. and W. Kleindl.
1986. The aquatic macrophyte community of Black Earth Creek, Wisconsin. Department of Botany and Institute for Environmental Studies. University of Wisconsin - Madison.

Fish Population

The Department surveyed the fish population in Black Earth Creek by shocking the stream several times since the restoration of the fishery began in 1950. The majority of the surveys were conducted in the fishery study area just upstream of Cross Plains to a short distance downstream of Salmo Pond.

Recent reports:

Brynildson, Clifford.
1985. Biological characteristics of the trout population in Black Earth Creek, Dane County, September, 1985. Wis. Department of Natural Resources.

Brynildson, Clifford.
1986. Population estimates and other biological characteristics of the wild brown trout in Black Earth Creek, Dane County, October, 1986. Wis. Department of Natural Resources.

Brynildson, Oscar M. and John W. Mason.
1975. Influence of Organic Pollution on the Density and production of Trout in a Wisconsin Stream. Technical Bulletin 81. Wis. Department of Natural Resources.

Chemical Concentrations

Phosphorus, nitrogen and suspended sediment information was collected at a number of sites upstream of the village of Black Earth. The Department collected samples at 14 locations on two dates for determining the phosphorus loads and "decay" in that section of Black Earth Creek. USGS collected water samples

during both runoff events and base flow conditions at four automated monitoring stations. In addition, USGS collected additional runoff event and base flow samples at a number of other sites. All samples collected by USGS were analyzed for total phosphorus, total nitrogen, nitrate+nitrite, ammonia and suspended sediment.

Samples were also collected at the outfall of the Cross Plains wastewater treatment plant and the Refuse Hideaway Landfill.

Reports:

Baumann, Jim.
1986. Draft. Base Flow Phosphorus Concentrations During the Aquatic Vegetation Growing Season. Wis. Department of Natural Resources.

Field, Stephen J., and Graczyk, David J.
1988. Hydrology, aquatic macrophytes, and water quality in Black Earth Creek and its tributaries, Wisconsin, U. S. Geological Survey, [draft].

User Perceptions

The perceptions of residents and anglers represent a meaningful set of information for complementing and comparing the other water resources information that is briefly described above. Surveys were conducted by the University of Wisconsin - Madison Water Resources Management Workshop graduate students. Questions were asked on fishing satisfaction, perceptions of water resources problems, and fish management alternatives.

Report:

Born, Steve et. al.
1986. Black Earth Creek: A Watershed Study with Management Options, Institute for Environmental Studies, University of Wisconsin - Madison.

NONPOINT SOURCES

Introduction

Data was collected and analyzed for three types of nonpoint sources:

1. animal lots;
2. uplands including croplands; and
3. stream banks.

Each of these methods are discussed briefly below.

Animal Lots

Data were collected on the physical characteristics of all animal lots in the Black Earth Creek by Soil Conservation Service staff assisting the Dane County Land Conservation Department. Data were collected on: the herd size; size of the animal lot; the drainage area to the lot; and the overland flow vegetated areas downslope of the animal lots. The data were analyzed using a modified version of the Agricultural Research Service Feedlot Runoff Model. Phosphorus was selected as the parameter to best indicate the relative manure load from each animal lot.

Data were also collected on the depth of soil to groundwater or bedrock, the method of manure storage and the method of manure spreading.

Uplands

Data were collected on all uplands including croplands, woodlands and pastures using satellite imagery, digitized soil surveys and other information such as existence of management practices. Using Geographic Information System computer software, soil erosion rates were calculated using the Universal Soil Loss Equation. A full description of the data compilation and analysis process, including assumptions used, is contained in Chapter 3 of the Dane County Soil Erosion Control Plan.

Reference:

Ventura, Steve.
1988. Dane County Soil Erosion Control Plan, Dane County Land Conservation Committee.

Stream Banks

Data on eroding or trampled stream banks were collected by staff from the Department of Natural Resources, graduate students of the University of Wisconsin - Madison Water Resources Management Workshop and the Soil Conservation Service. The entire length of Brewery Creek, Garfoot Creek and Black Earth Creek from Stagecoach Road downstream to Mazomanie were evaluated. Other stream segments were "spot checked" for varying levels depending on the gradient and land use along the stream. Data were collected on the height, length and rate of recession of the eroding banks. Banks trampled by cattle, regardless of the rate of erosion, were also identified.

APPENDIX B: ALTERNATIVE PRACTICE

ANIMAL LOT RELOCATION. (a) Description. 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 animal lot to surface or ground waters.

(b) Conditions:

1. Cost sharing may be provided for:

   a. Construction of fences and other items necessary to confine the livestock on the new site.

   b. Removal of fences and other obstructions, and the establishment of permanent vegetation on the existing site necessary to stabilize the site to be abandoned.

   c. Reconstruction or replacement of buildings and other structures necessary for the relocation of the animal lot subject to limitations provided in guidance by the Department.

   d. Proper abandonment of wells abandoned as a result of the relocation of the yard.

2. Wells shall be properly abandoned.

3. A plan for relocation shall be approved by the Department, in writing, prior to initiation of relocation.

(c) Standards and specifications.

1. Sediment generated from the relocation of the animal lot shall be controlled consistent with guidelines prepared by the department.

2. Wells shall be properly abandoned in accordance with the requirements of ch. NR 112, Wis. Adm. Code.

3. SCS field office technical guide standards and specifications as of December 1988:

   a. 393 - filter strip;

   b. 362 - diversion;

   c. 558 - roof runoff management;

d. 342 - critical area planting;

e. 561 - heavy use area protection;

f. 382 - fencing;

g. 412 - grassed waterway;

h. 468 - lined waterway or outlet;

i. 484 - mulching;

j. 620 - underground outlet; and

k. 350 - settling basin.

APPENDIX C: GEOGRAPHIC INFORMATION SYSTEM APPLICATIONS

prepared by Peter Thum

Many federal, state and local agencies contributed toward the production of the Black Earth Creek watershed analysis. The Dane County CONSOIL Project (Conservation of Natural Resources through the Sharing of Information Layers) provided financial and technical support to explore the application of Geographic Information System (GIS) technology for nonpoint source pollution abatement planning. GIS research conducted as part of the Black Earth Creek watershed project included:

1. Conversion of watershed resource data layers into digital format;

2. Estimation of soil erosion across the entire watershed using a GIS adapted version of the USDA-SCS Universal Soil Loss Equation (USLE);

3. Computation of various barnyard runoff model input parameters;

4. Sediment delivery routing using GIS digital elevation models and the Wisconsin Nonpoint Model (WIN); and

5. Groundwater contamination susceptibility and contaminant source database mapping.

Those GIS software programs used in the study included ARC/INFO and Oddyssey operating on the University of Wisconsin - Madison DEC VAX Cluster, and pcARC/INFO running on an IBM/PS2 Model 80. A pcARC/INFO microcomputer demonstration was developed and used at conferences and seminars to help explain GIS watershed planning concepts.

The watershed maps included in this plan were produced through the CONSOIL Project using ARC/INFO software. The maps were initially designed using the ARCPLOT System Map Composer and later converted into ADOBE Postscript color separate files using an ARC/INFO translation program. Final map negatives were produced off of the U. S. Geological Survey Water Resources Mapping Division's Linetype 300 Film Printer at a 1200 line per inch resolution.

PRIORITY WATERSHED PROJECTS IN WISCONSIN

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

8343
WR/REV 3-88