- a brief description of the fishery management and other resource needs.

The discussion of water quality conditions includes information on dissolved oxygen levels in Black Earth Creek and its tributaries. The water quality standards contained in section NR 102.02, Wisconsin Administrative Code, for dissolved oxygen are:

- 7.0 mg/l for trout waters during the spawning season;
- 6.0 mg/l for trout waters at all other times; and
- 5.0 mg/l for warm water fishery streams.

Dissolved oxygen levels of 3.0 mg/l or less are often fatal to trout and other fish. Dissolved oxygen levels between 3.0 and 6.0 mg/l are considered to be detrimental to the health and growth of trout. The discussion on water quality conditions also mentions biochemical oxygen demand (BOD). BOD is a measure of the amount of potential dissolved oxygen use as organic matter decays in a stream. There are no water standards for BOD. Normal levels in a stream are about 5.0 mg/l or less. BOD levels of 10 to 30 mg/l represent typical municipal wastewater treatment plant discharges.

The discussion of water resources conditions also mentions temperature. The water quality standard for temperature in trout streams states,

> "There shall be no significant artificial increases in temperature where natural reproduction is to be protected" (s. NR 102.02(3)(e)1, Wisconsin Administrative Code).

The amount of pollutants were analyzed for three types of nonpoint sources:

- eroding croplands (sediment and nutrients);
- eroding and trampled stream banks (sediment and direct habitat impairment); and
- animal lots (oxygen demand and nutrients).

In addition, pollutants from the following nonpoint sources are discussed, but could not be quantified, or could only be quantified to a lesser degree:

- winter spread manure (oxygen demand and nutrients);
- construction sites (sediment and nutrients); and
- urban lands (sediment and nutrients).

A brief description of the methods for nonpoint source data collection and analysis is contained in Appendix A.

To keep the discussions of nonpoint source control needs brief and avoid redundancy among subwatershed discussions, a more detailed discussion of both the land management needs relative to the water resources objectives and the specific best management practices and other management needs is contained in Chapter 5.

Due to insufficient information, the impact of pesticides, heavy metals and toxic substances on the fisheries could not be addressed as part of this plan. Presently, there is insufficient information on ground water quality throughout this watershed to identify management actions for that water resource. A supplemental project to identify ground water contamination sources in the Black Earth Creek Watershed has been proposed as part of the CONSOIL Project.

BLACK EARTH CREEK HEADWATERS TO BREWERY CREEK SUBWATERSHED (HW)

Subwatershed Description

The Black Earth Creek Headwaters to Brewery Creek subwatershed (HW) covers 14.3 square miles of the Black Earth Creek Watershed. The Jamestown End Moraine forms the eastern boundary of the subwatershed. The subwatershed extends westward to the western edge of the ground moraine running southeast to northwest just east of the Village of Cross Plains. The headwaters of Black Earth Creek flow through the coarse aggregate outwash plain formed by the outflow channel of glacial Lake Middleton. The major spring area feeding Black Earth Creek is located at the western edge of the ground moraine in the outwash plain. Except for a small spring area in the eastern end of the subwatershed, this portion of Black Earth Creek receives very little ground inflow until it meets the major spring area just east of Cross Plains. As a result, the baseflow conditions in the stream are very low.

Land use in the subwatershed is mostly rural in nature. Overall the land use is:

agriculture	54%
woodlands	31%
wetlands	3%
incorporated (urban)	2%
other	10%

The other category includes a landfill, sand and gravel operations and scattered residential developments. More intensive land uses are increasing in area such as Middleton's industrial park. Also an existing sand and gravel operation is planning to expand its operations. (See Chapter 4 of this plan for more information on the Refuse Hideaway Landfill and Capital Sand and Gravel operation.)

Water Resources Conditions

Discussion of the water resource conditions in this subwatershed is organized by two main stream divisions: Headwaters to Stagecoach Road and Stagecoach Road to County Highway "P". Besides making the discussion more focused, this organization is supported by major distinctions in the water resource

characteristics of these two sections of Black Earth Creek.

A. Headwaters to Stagecoach Road. This portion of the stream has been uniformly ditched and straightened (Sec. 11, T7N, R7E). In this area the stream flows mainly through cropland. Stream flow does not increase during low flow periods in this segment which indicates that the stream receives limited flow from groundwater discharge. Springs near Twin Valley Road offer the only groundwater input in the entire segment. Macroinvertebrate populations indicate good water quality in this segment, but resuspension of fine sediments has been observed by Department of Natural Resources (Department) staff in the field. As shown in Figure 3, this segment supports a Full Fish and Aquatic Life classification (FAL C), however isolated wild brown trout have been found in this segment on occasion. Habitat is limited in this area because of historic hydrologic modifications, such as ditching or stream straightening.

B. Stagecoach Road to County Highway "P". Also as shown in Figure 3, this segment of Black Earth Creek supports a fully reproducing brown trout fishery (FALT(A) - Class I). However, this area is not without adverse water resource impacts. Downstream of Stagecoach road the stream has few riffles and a low gradient. From the first farm bridge below Stagecoach Road to CTH P, the stream is narrow and deep with some riffles down to 100 yards below the snowmobile bridge. The stream is braided and shallow from the first paved ditch on the east end of Cross Plains to 25 yards above CTH bridge. Substantial sediment trapping occurs here. Aquatic plants have rooted in the silt depositions and increase fluctuations in dissolved oxygen. Cattle access to the stream has widened the stream in spots. Bank erosion is not significant here, but fish habitat has been negatively impacted.

The discharge of the Capital Sand and Gravel operation has dramatically increased the temperature of the stream. The operation pumped water from the top of its pond and discharged warmed surface water to the stream. Department staff have measured an increase of 3.5^{o} C in the stream below the discharge site. (See Chapter 4 for a brief description of the permit changes for this operation.)

Dozens of springs enter the stream in this segment. Even the temperatures are cool, the groundwater entering the stream is not fully saturated with oxygen. The substantial flows and cooler temperatures of the groundwater influx in this stream segment positively impacts water quality. Fish and aquatic life can be enhanced by increasing aeration potential to increase naturally low groundwater levels and to reduce macrophyte