TABLE 8. Cropland Soil Erosion in the Garfoot Creek Subwatershed.

Erosion Rate	Tons/year	%
> 10 tons/acre/yr.	21,269	89
7-to-10 tons/acre/yr.	547	2
4-to-7 tons/acre/yr.	610	3
< 4 tons/acre/yr.	1,451	6
totals	24,044	100

Erosion Rate	Acres	%
> 10 tons/acre/yr.	610	34
7-to-10 tons/acre/yr.	57	3
4-to-7 tons/acre/yr.	121	7
< 4 tons/acre/yr.	998	56
totals	1,786	100

Eroding and Trampled Stream Banks (sediment and direct habitat impairment). Stream bank erosion along Garfoot Creek is minimal. Two sites where cattle have access were identified. Since the data on eroding stream banks were collected, the more significant of the two sites is being controlled by fencing. Trout Unlimited and the Dane County Land Conservation Department cooperated with the landowners in installing the fencing.

Animal Lots (oxygen demand and nutrients). Manure from animal lots and winter spread fields are the most probable source of oxygen demanding substances. Table 9 shows the number of animal lots and pollutant loads by range of phosphorus load. Locations of these animal lots are shown on Figure 9.

TABLE 9. Animal Lot Pollutant Loads for Garfoot Creek Subwatershed.

Phosphorus Load Range	Operations	Lbs.*	%
> 20 lbs. phosphorus **	0	0	0
15-to-20 lbs. phosphorus	2	32	42
10-to-15 lbs. phosphorus	1	15	19
5-to-10 lbs. phosphorus	3	21	27
< 5 lbs. phosphorus	4	9	12
Total	10	77	100

* Pounds for a 10-year, 24-hour storm

** Phosphorus is used as an indicator of the amount of manure reaching streams. The amount of BOD or COD is proportional to the amount of phosphorus.

Winter Spread Manure (oxygen demand and nutrients). Winter spread manure was not analyzed. However, based on the erodibility of the soils and the steepness of slopes, it is likely a number of the 10 livestock operations in this subwatershed are sources of manure to the stream from winter spread sites.

Nonpoint Source Control Needs to meet the Water Resources Objectives

To achieve the water resources objectives identified for Garfoot Creek, the nonpoint sources identified below must be controlled. Each type of source and its control need is briefly described and discussed.

1. Cropland Management Needs:

Erosion needs to be controlled on an estimated 667 acres of cropland.

The cropland analysis estimated over 90% of the erosional tons occurs on fields with very high or high erosion rates (greater than 10-to-15 tons/acre/year and 7-to-10 tons/acre/year). These very high/high erosion rates occur on about 667 of 1786 acres.

2. Stream Bank Management Needs:

Cattle access on the remaining site along Garfoot Creek needs to be restricted or eliminated.

Cattle access has degraded habitat in Garfoot Creek. One site remains to be controlled.

3. Animal Lot Management Needs:

The amount of manure from animal lot runoff needs to be reduced on 6 of the 10 operations.

Based on the simulation of runoff controls, it is estimated that a 75% reduction can be achieved by reducing the amount of phosphorus on the 6 of the 10 operations with estimated amounts of 5 or more pounds.

4. Manure Spreading Management Needs:

Manure spreading management plans need to be prepared for the 10 livestock operations to minimize the amount of manure entering the stream.

Although the amount of manure from this source and significant sites could not be identified, the existence of the very high oxygen demand levels during trout hatch periods warrants control of this type of nonpoint source.

Fishery Management and Other Resource Needs

1. Habitat Improvement Needs:

The impact of the ponds on Garfoot Creek needs to be evaluated to determine any management needs.

As stated above, there is a concern that the warm water discharged from the ponds may be adversely impacting the trout fishery. The temperature levels in the stream need to be evaluated to determine the magnitude of the impact, if any. Management needs will be determined after the evaluation is completed.

2. Land Acquisition Needs:

<u>Specific lands adjoining Garfoot Creek within this subwatershed need to be acquired to protect the trout waters.</u>

Land acquisition along Garfoot Creek has been an ongoing activity for many years. Lands have been acquired by fee simple purchase or by easement. Additional lands need to be acquired by fee simple purchase, rent or easement to further protect the trout waters. Four parcels have been identified for acquisition. Lands in this subwatershed rank third in priority for the Black Earth Creek watershed.

See also the discussion of base flow protection in Chapter 5 of this plan.

BLACK EARTH CREEK - GARFOOT TO VERMONT SUBWATERSHED - GV

Subwatershed Description

The Black Earth Creek - Garfoot to Vermont Subwatershed consists of the direct drainage area to Black Earth Creek between the confluences of Garfoot Creek and Vermont Creek, and includes 8.9 square miles of the Black Earth Creek Watershed. No major tributaries enter Black Earth Creek between Garfoot and Vermont Creeks. Consequently, the main water resource of concern is the mainstem of Black Earth Creek.

The subwatershed is mainly rural in nature except for the Village of Black Earth at the extreme western (downstream) end of the subwatershed. Overall the land use is:

agriculture	61%
woodlands	26%
wetlands	3%
incorporated (urban)	5%
other	6%

Other includes roads and scattered residences.

Water Resources Conditions

As shown on Figure 10, the upstream-most segment of Black Earth Creek in this subwatershed fully supports a naturally reproducing brown trout fishery (FALT(A) - Class I). Near South Valley Road the classification of Black Earth Creek changes from a class I coldwater sports fishery to a class II coldwater sports fishery. This stream stretch receives a large sediment load but lower stream temperatures from Garfoot Creek.(12) Population estimates done by fisheries management staff in 1985 found 538 trout or 71.7 lbs. of trout produced per acre of stream in this stretch.(5) In 1986, population estimates in the same area showed 658 trout and 101 lbs. of trout per acre of stream.(6) This stretch of Black Earth Creek produces less trout per acre than upstream stretches of the creek.

The segment of Black Earth Creek downstream of South Valley Road was the location of a fish kill in June 1988. Dissolved oxygen levels dropped to 3 mg/l during the early morning due to oxygen use by aquatic vegetation. Dissolved oxygen levels violating standards were also monitored in July and August of 1988. High water temperatures of 22.8^{o}C were measured in August 1987.

Filamentous algae and macrophytes are abundant. The stream has widened and become shallower over the years and cattle access occurs at some locations along this stream stretch.(12) As a result, habitat for aquatic organisms and trout is degraded. This section of the stream also receives water from the outlet of Salmo Pond which has been measured up to 30 ^{o} C.(18)

Very substantial sedimentation problems in this stream segment occur at many locations in the stream such as the Department land and along a private property (site of demonstration project) both north of STH 14 north of the Village of Black Earth. As measured in the summer of 1987, sedimentation in the creek adjacent to the demonstration site is quite dramatic. The Anderson's have lost a substantial portion of their stream bank to stream bank erosion (more than 1 foot per year rate of recession). As shown in Figure 11, 5-1/2 feet of sediment is deposited in a former pool near the opposite shore. Water depth in this area does not exceed 1.5 feet. This site was stabilized in the summer of 1988.(19)

On February 22, 1985, USGS collected a BOD sample at the automated monitoring site on Black Earth Creek near Black Earth during a runoff event. At the time, rain fell on frozen ground with manure visible on fields and barnyards. The level of BOD in this sample was 21 mg/l. Department staff are concerned that this level of BOD in spring runoff could adversely impact the trout hatch in Black Earth Creek. During the major storm on July 25, 1985, the BOD was 6.8 mg/l. Finally, dissolved oxygen levels have dipped below the 6.0 mg/l standard for dissolved oxygen in trout streams on multiple occasions in summer months.(15) Higher stream temperatures and resuspension of organic material in the stream after rainstorms are suspected of contributing to the decrease in dissolved oxygen.

<u>Water Resources Objectives</u>

To improve the coldwater sports fishery from a Class II to a Class I stream by:

1. reducing sediment and oxygen demand (manure) loading from this subwatershed and upstream subwatersheds by 50% and

2. installing instream habitat improvements to narrow and deepen the stream and to reduce filamentous algae and macrophyte growth.