lands would continue to produce a significant portion of the lead load (73 percent) while making up only 19 percent of the urban land use.

Water Resources Objectives

Rural nonpoint source pollution is a significant contributor to the factors limiting the quality of existing uses in the Milwaukee River. The impact from existing urban runoff is not fully known. The pollution potential from new urban land uses is significant, but the water quality implications are not fully understood. Long-term degradation from urban runoff is possible. The pollution potential from future construction erosion is significant if it goes on uncontrolled.

The water resources objectives for the Nonpoint Source Control Program are to:

a. Protect the quality of the existing biological and recreational uses in the Milwaukee River and its perennial tributaries.

b. Protect sensitive and valuable wetlands from impacts of sedimentation, where the pollutant attenuation capacity of these areas is overloaded.

UNNAMED TRIBUTARY SUBWATERSHED

WATER RESOURCE CONDITIONS

The major stream located in this subwatershed is an unnamed tributary to the Main Branch (Upper) of the Milwaukee River. The perennial portion of this tributary originates in a wetland in Section 34 of Auburn Township, Fond du Lac County. The confluence with the Main Branch is located in Section 4 of Kewaskum Township, Washington County.

In addition to this main tributary, there is an additional unnamed stream which originates in a wetland located in Section 27 of Auburn Township. Both streams have been completely channelized for agricultural practices.

A stream classification was completed for both streams. Both streams under present limiting factors are classified as capable of supporting tolerant forage fish and partial body contact recreational activities. The maintenance of a balanced warmwater sport and forage fishery in the Milwaukee River may be aligned to successful spawning habitat provided by these streams and wetlands.

The most important problems impacting these two tributaries are bacterial contamination, macrophytes, channelization, low flow, and poor substrate. Control or elimination of the contributing nonpoint sources may improve the existing quality of the biological and recreational uses of these streams.

NONPOINT SOURCES OF POLLUTION

General Land Use: The general land use in this subwatershed is virtually all rural, with only two percent in urban land use. The rural land use distribution is shown in Table 16. Cropland in rotation makes up 43 percent of the rural land use, wetlands comprise 24 percent, and grasslands and ungrazed woodlands each comprise 15 percent.

Rural Sources: Table 29 shows the results of the rural nonpoint source inventory for this subwatershed.

Of the six barnyards draining to surface waters, one has a high pollution potential and two are of marginal concern. The remaining barnyards have a low pollution potential and are not a concern.

Sediment delivered to surface waters from rural land uses is estimated to be 42 tons per year. This accounts for 90 percent of the sediment load to lakes and streams in the subwatershed. The remaining load is associated with streambank erosion, which delivers an estimated five tons per year.

Croplands account for nearly all of the delivered sediment from uplands. It is estimated that 53 percent of the eroding uplands deliver soil to the surface water network. The remainder is buffered from the surface water

network. A small part of the buffering is due to riparian wetlands, which trap an estimated seven tons of sediment per year. Another important factor is the extensive internal drainage in the subwatershed. About 58 percent of all lands are internally-drained. Some of these areas support wetland vegetation, which together receive an estimated 22 tons of sediment per year.

The effects of sediment loading on riparian and non-riparian wetlands is not known, although they are expected to vary widely.

Urban Sources: The urban development in this subwatershed makes up about two percent of the inventoried lands, consisting of residential development. The pollutant loading from these areas is insignificant.

Water Resources Objectives

Limiting factors other than nonpoint source pollutants limit the uses in these streams. Although control of sediment and animal waste sources may provide limited enhancement to the stream, the other limiting factors will prevent nonpoint source controls from effecting a change in the potential uses of this stream.

The water resources objectives for the nonpoint source program are to:

a. Protect and enhance the existing recreation and aquatic life uses in the perennial tributaries.

b. Reduce the pollutant loading to downstream water bodies.

c. Protect valuable and sensitive wetlands from sediment deposition, where the assimilative capacity of the wetland is being overloaded.

SUBWATERSHED CONDITIONS FOR THE LOWER MAINSTEM REGION

This section presents the water resource conditions and nonpoint sources for each subwatershed in the Lower Mainstem Region of the East-West Watershed. Subwatersheds in this region include: Smith Lake (SL), Kewaskum (KW), Silver Creek (SW), Quaas Creek (QC), West Bend (WB), Daly Lake (DL), and Green Lake (GL).

The locations of these subwatersheds, and the potential uses of the water resources that they contain, are shown on Map 2. The hydrologic flow connection between these subwatersheds is shown in Figure 1. Land use for each subwatershed is shown in Table 30.

The description of water resources conditions are based on findings contained in the Water Resources Appraisal and Stream Classification Reports (Mace, Bozek, Wakeman, Wawrzyn, 1986).)

The pollution reductions required to meet the water resources objectives presented in the following text, and the extent of needed nonpoint source practices required, are presented as part of Chapter IV.

KEWASKUM SUBWATERSHED

WATER RESOURCE CONDITIONS

The Milwaukee River is the major perennial stream present in this subwatershed. Two small perennial streams discharge to the Milwaukee River. They include Kewaskum Creek, which enters the Milwaukee River in the southwest part of Section 9, Kewaskum Township, and an unnamed tributary, which enters the Milwaukee River in the northeast part of Section 9.

Milwaukee River and Kewaskum Millpond: Habitat and other physical and chemical features along the Milwaukee River are suitable for sustaining a diverse and abundant population of intolerant forage and warmwater sportfish and other aquatic life, as well as full body contact types of recreation. Fish species currently listed on the state's Endangered, Threatened, or Watch lists include the striped shiner, longear sunfish, and greater redhorse.

The Milwaukee River is only partially meeting its potential use. Sedimentation, limited habitat, and excessive macrophyte growth are problems which limit optimum use. In addition, bacteria levels exceed recommended water quality standards for full body contact.

Kewaskum Creek: Kewaskum Creek drains a major portion of this subwatershed, and is tributary to the Milwaukee River just downstream of the Kewaskum Millpond.

Habitat and other physical features along Kewaskum Creek are suitable for sustaining intolerant to tolerant forms of forage fish and aquatic life , and partial body contact types of recreation.

Sedimentation, channelization, streambank degradation, and bacteria are the most important problems impacting this stream. Other limiting factors include the draining and filling of wetlands.

Unnamed Perennial Stream: Habitat and other physical features along this stream are suitable for sustaining intolerant forage fish and aquatic life communities, and partial body contact types of recreation.

Sedimentation and channelization limit habitat in this stream.

The maintenance of a balanced warmwater sport and forage fishery in the Milwaukee River may be aligned to successful spawning habitat provided by these streams and wetlands.

Nonpoint Sources of Pollution

General Land Use: This predominantly rural subwatershed contains the village of Kewaskum. Rural land use makes up 94 percent of the land area, while urban land uses in the village of Kewaskum and its immediately surrounding area make up six percent.

Table 30 shows the distribution of rural lands in the subwatershed. Croplands make up 59 percent of the rural lands, with most of this land in crop rotation. Woodlands and grasslands are both important land uses, combining to make up 34 percent of the rural land use.

Urban land use distribution in the Kewaskum Study Area is shown in Map 5. Low intensity land uses such as recreational and transportation lands make up 28 percent of the area.

Single family residential areas, a relatively low intensity land use, make up 48 percent of the area. Higher intensity land uses, including commercial, industrial, and institutional lands, make up 21 percent of the area. Quarries, which are displayed as industrial lands on Map 5 make up three percent of the area.

Most of the high intensity urban lands are within the incorporated limits of the village. This ranges from 73 percent of the non-extractive industrial lands to 95 percent of the commercial and institutional lands. A larger portion (63 percent) of the residential land use occurs outside the village limits. All of the quarry land occurs outside the village limits.

Rural Sources: Table 31 shows the results of the rural nonpoint source inventory for this subwatershed.

This subwatershed has the highest surface water pollution hazard from barnyard runoff in the entire East-West Watershed, contributing 25 percent of the watershed's barnyard pollutant load to lakes and streams. Of the 28 barnyards draining to surface waters, 19 have high to moderate pollution potential. Most of these drain to Kewaskum Creek and its tributaries, with others scattered near the headwaters of the unnamed perennial tributary. One of the barnyards draining to a pocket wetland has a high pollution potential. Three of the barnyards draining to shallow soils have high pollution potentials.

Eroding uplands are estimated to deliver 1,110 tons of sediment per year to surface waters. Over 95 percent of this comes from croplands, with those croplands in rotation the most important contributor. The distribution pattern for this delivered sediment shows that the perennial tributary on the north side of the village of Kewaskum receives about one-fourth of the sediment delivered from uplands while Kewaskum Creek receives slightly less than three quarters. Within the Kewaskum Creek drainage, delivery is fairly heavy throughout the system of perennial and intermittent streams. This