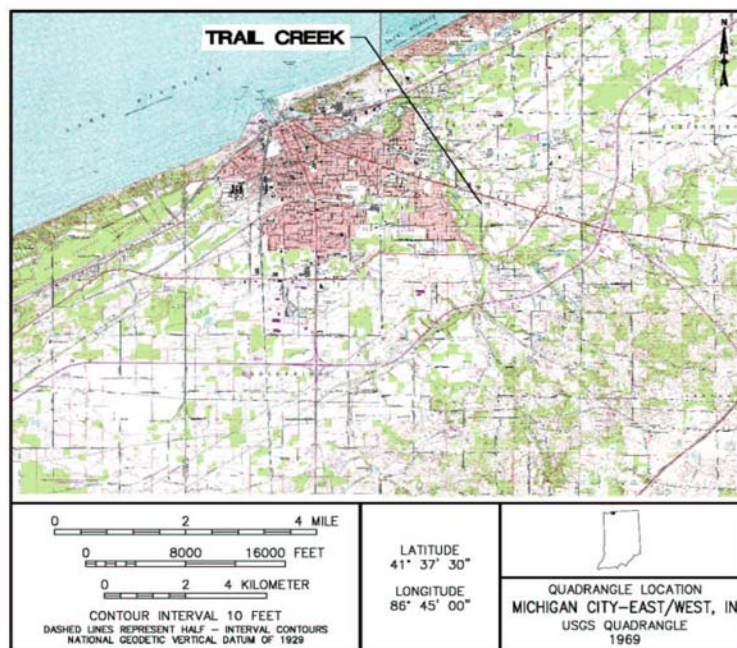


Section 2.0 BACKGROUND INFORMATION

2.1 SETTING AND LAND USE

The Trail Creek watershed in LaPorte County (Figure 2-1) is located within the Lake Michigan Basin in northwestern Indiana, one of 12 major watersheds or groups of watersheds entirely or partially within Indiana. According to IDEM (2000), each of the 43 miles of Lake Michigan shoreline within the Lake Michigan Basin fully supports aquatic life. However, the shoreline only partially supports recreational uses due to periodic beach closings caused by elevated levels of *E. coli* bacteria, such as at Michigan City's lakefront park and marina where Trail Creek discharges into Lake Michigan.



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**FIGURE 1
SITE LOCATION AND LOCAL
TOPOGRAPHY**

The watersheds along the Indiana shore of Lake Michigan include a combination of dense-to-moderate residential, various levels of industrial, major shipping, and recreational land use as well as open water estuarine wetlands (*i.e.*, the Indiana Dunes State Park and the Indiana Dunes National Lakeshore). The Trail Creek watershed (Figure 2-2; approximately 37,824 acres) is comprised of three sub-watersheds (the Main, East, and West Branches) that include various percentages of developed, agricultural, forested, water (reservoir), and transitional (*e.g.*, forested/agricultural grading into developed, quarries) land uses. The estimated sizes (in acres) and percentages of land use for each Trail Creek sub-watershed are detailed in Table 2-1 below.

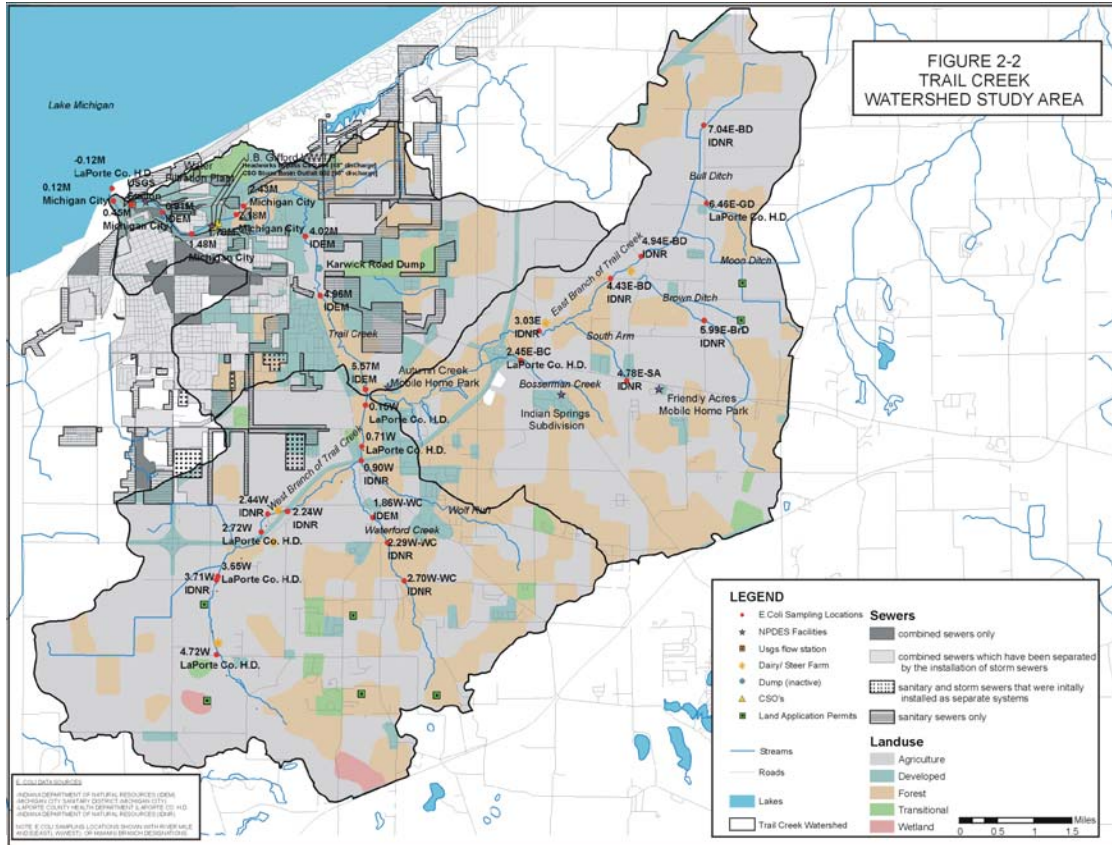


Table 2-1 Land Use in the Trail Creek Watershed

SUB-WATERSHED (total acres)	Agriculture acres / % land use	Forest acres / % land use	Transitional acres / % land use	Developed acres / % land use
East Branch (13,875)	8,115 / 58.4%	4,987 / 35.9%	89 / 0.64%	684 / 4.9%
Main Branch (8,595)	2,311 / 26.9%	1,853 / 21.6%	358 / 4.2%	4,072 / 47.4%
West Branch (15,194)	9,205 / 60.6%	4,126 / 27.6%	398 / 2.62%	1,465 / 9.6%

2.2 GENERAL CHARACTERISTICS OF THE TRAIL CREEK WATERSHED

The Trail Creek watershed drains approximately 59.1 square miles within LaPorte County (NIRPC, 1993) and has numerous, relatively small tributaries, lake and pond overflow, and spring source headwaters. Tributaries include Waterford Creek and Wolf Run in the West Branch and Bull Ditch, Brown Ditch, South Arm, Bosserman Creek, and Moon Ditch in the East Branch. Contributing lakes include Dingler Lake, Ohms Lake, and Browdy Lake. According to the Northwestern Indiana Regional Planning Commission (NIRPC, 1993), Trail Creek flows through 14.5 linear miles, has a hydraulic gradient of 6.4 feet per mile upstream from Springland Avenue in Michigan City, and is one of the few streams in Indiana that drain into Lake Michigan.

As stated in NIRPC (1993), soils within the Trail Creek basin are comprised of mostly loose sandy soils of beach deposit of eolian origin to sandy and loamy soils of lacustrine origin. As a result of their high sand content, basin soils are highly transmissive with good drainage despite nearly level to flat topography with slopes ranging between 0 and 2% (United States Department of Agriculture, 1978). The dominant soil types directly adjacent to Trail Creek include sandy/silty clay, sandy silt, or sandy loam, which are poorly to moderately well-drained soils (NIRPC, 1993).

At one time, there were approximately 5,400 acres of wetlands present within the Trail Creek watershed with 4% being water bodies (NIRPC, 1993). Wetlands provide flood control and maintain water quality. Over the last 10 years, the disappearance of wetlands as a result of development, agriculture, and/or reclassification has become a national trend. Trail Creek is also designated a salmonid stream, and, therefore, requires a more stringent set of water quality standards than for general use streams (NIRPC, 1993).

Trail Creek stream flow (based on U.S. Geological Survey measurements near the Trail Creek discharge to Lake Michigan [Gage No. 04095300]; Hydrologic Unit Code 04040001) ranged between approximately 84 and 294 cubic feet per second (cfs) in 1998 with an average of 131 cfs; between 67 and 318 cfs in 1999 with an average of 125 cfs; between 45 and 396 cfs in 2000 with an average of 114 cfs; and between approximately 34 and 144 cfs in 2001 with an average of 93 cfs.

Trail Creek is subject to frequent flow reversals at the mouth due to the natural seiche action of Lake Michigan (NIRPC, 1993). The flow reversals result in water level fluctuations of one to two inches according to Environmental Resources Management (ERM, 1992). Based on written correspondence with the U.S. Geological Survey (USGS, 2002), the backwater effect from Lake Michigan might extend at least 2 miles upstream due to the channel thalweg gradient being so gradual. In addition, the backwater effect from Lake Michigan may not be affected by lake level. Flow reversals may extend some distance upstream also.

2.3 PRESENT AND FUTURE GROWTH TRENDS IN AREA

Based on U.S. Census Bureau data (2000), the population of Michigan City is 32,900 and has decreased 3.2 % from 1990 to 2000. The population of the Town of Trail Creek is 2,296 and has decreased 7% from 1990 to 2000. The population of LaPorte County has increased 2.8% from 107,066 in 1990 to 110,106 in 2000. For the purposes of this study, the population within the Trail Creek watershed is assumed to remain relatively constant in the near future.

2.4 POLLUTANTS OF CONCERN AND LIST STATUS

According to the NIRPC (1993), Trail Creek has historically been associated with numerous water quality problems caused by inadequately treated sewage, combined sewer overflows (CSOs), industrial discharges, and chemical spills, which have also resulted in periodic fish kills. Trail Creek sampling for bacterial contamination has typically been performed by IDEM, the LaPorte County Health Department, and the Michigan City Sanitary District. In general, water quality data provided by these agencies from 1998 through 2001 show increasing *E. coli* concentrations ranging between 0.5 and 15,000 colony forming units per 100 milliliters (cfu/100 mL) in 1998 (average of 765 cfu/100 mL), 0.5 and 15,000 cfu/100 mL in 1999 (average of 839 cfu/100 mL), 0.5 and 29,000 cfu/100 mL in 2000 (average of 1,233 cfu/100mL), and 120 and 203,000 cfu/100 mL in 2001 (average of 6,642 cfu/100mL). The bacterial water quality target established by the Indiana Water Pollution Control Board (327 IAC 2-1-6 Section 6(d)) for *E. coli* is 125 cfu/100 mL as a geometric mean based on not less than five samples equally spaced over a 30-day period and 235 cfu/100 mL in any one sample in a 30-day period.

Section 303(d) of the Clean Water Act requires states to identify waters that do not or are not expected to meet applicable water quality standards with federal technology based standards alone. States are also required to develop a priority ranking for these waters taking into account the severity of the pollution and the designated uses of the waters. Once the listing and ranking of the waters is completed, the states are required to develop TMDLs for these waters in order to achieve compliance with the water quality standards. Trail Creek was included in IDEM's 2002 303(d) List of Impaired Waterbodies with 15 Year Schedule (original order) with a priority (List# 37, 14 digit HUC 04040001070030) and severity (medium) ranking for the parameters of concern polychlorinated biphenyls (PCBs) and mercury (fish consumption advisory for both; air pollution is suspected source), cyanide, and *E. coli*. This TMDL addresses the E.Coli impairment for Trail Creek only and impairments caused by other parameters will be completed at a later date. Indiana's 2002 303(d) list was approved by the U.S. EPA on September 30, 2003.

Trail Creek was originally listed with a TMDL Development Schedule between the years 2000 and 2004. Recent IDEM guidance (IDEM, 2002) indicates a 2003 final TMDL date. The TMDL Development Schedule corresponds with IDEM's basin-rotation monitoring schedule to take advantage of all available resources for TMDL development. Listed dates are suggestions based on current water quality monitoring strategy and may change depending on public input, available resources, or as different methods for TMDL development are perfected.