Watershed Management Plan for Lake, Porter, and LaPorte Counties

Northwestern Indiana Regional Planning Commission

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This project has been funded wholly or in part by the United States Environmental Protection Agency under assistance agreement (C697575002) to the Indiana Department of Environmental Management. The contents of this document do not necessarily reflect the views and policies of the Environmental Protection Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

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Introduction – Watershed Project Overview

1.1 Background

The purpose of the Northwest Indiana Regional Watershed Plan is to develop a framework for water quality improvements and planning within Northwestern Indiana Regional Planning Commission's (NIRPC) planning area. The water quality problems and issues facing this region are sometimes complicated and need to be addressed in a holistic manner. Water quality problems can be linked to how the region has developed over the last century.

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1.1 Background

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their own watershed management plans. This study is unique in that it is addressing two rather large watersheds from a comprehensive vantage point.

The goals for this plan were to bring all of the stakeholders to the table and to commit to work together in establishing achievable management practices and protective goals. This plan will assist the State in water quality management planning, provide support for IDEM's Total Maximum Daily Load program (see next section), and provide guidance for the region's communities and the public.

1.3 Related Initiatives

1.3.1 Lake Michigan Coastal Program Nonpoint Pollution Control Plan

As a part of becoming a Coastal Zone state, the Indiana Lake Michigan Coastal Program (ILMCP) is required to complete a Coastal Nonpoint Source Pollution Management Plan (6217 plan). This plan is required by the National Oceanic and Atmospheric Administration (NOAA) and the USEPA. There is some overlap between this plan and the 6217 plan since they both address essentially the same geographic area. The plan will include a series of 5-year implementation plans. The plan's management measures address agricultural runoff; forestry runoff; marinas and recreational boating; channel modification; dams and erosion of stream banks and the shoreline; wetlands; riparian areas; and vegetated treatment systems. For more information go to www.in.gov/dnr/lakemich/issues/cprprogram.htm

1.3.2 Municipal Separated Storm Sewer Systems (MS4)

MS4 affects most communities within the three-county study area. The program requires communities to develop, implement, and enforce a stormwater management program that will reduce the discharge of pollutants. The program has six (6) control measures and should identify best management practices (BMPs) and measurable goals for each measure. The six (6) control measures are: 1) Public Education and Outreach, 2) Public Participation/Involvement, 3) Illicit Discharge Detection and Elimination, 4) Construction Site Runoff Control, 5) Post-construction Runoff Cont

pollution. This process is called Total Maximum Daily Loads (TMDL). IDEM defines a TMDL as "a process that leads to quantification of the amount of a specific pollutant discharged into a waterbody that can be assimilated and still meet the water quality standards (designated uses)." The waterbodies placed on the 5B list are impaired for Fish Consumption Advisories (FCA) for PCBs and/or mercury and do not require a TMDL.

River miles in a 14-digit watershed (a smaller sub-watershed than the 8-digit watersheds used for this plan) are designated as one waterbody. These waterbodies can be broken into smaller segments to properly reflect the water quality assessment. Each lake in a watershed is reported as a separate waterbody. A total of 60 waterbody segments are listed on the 2004 303(d) List for Impaired Waterbodies (303(d) List) for the Little Calumet-Galien (43 segments) and Kankakee River Basins (17 segments). Appendix III contains the Impaired Waterbodies lists including parameters of concern, some for multiple parameters, and the TMDL development schedule. For the sake of this management plan, the portion of Lake County which now drains into Illinois (the Chicago Basin) is included because during certain times of the year this area flows into the Little Calumet-Galien basin. Four waterbody segments from this basin are located within Indiana. Figure 1-2 indicates the 2004 303(d) impaired waterbodies.

Figure 1-2 2004 Section 303(d) Impaired Waterbodies

The following is a summary of these impairments for the Little Calumet-Galien:

- **Main Beaver Dam Ditch:** Impaired Biotic Community
- **Burns Waterway:** Fish Consumption Advisories for Polychlorinated Biphenyl (PCB) and Mercury, Impaired Biotic Community and *E. Coli*;
- **Little Calumet River West Branch:** Fish Consumption Advisory for PCB and Mercury, *E. coli*, and Cyanide;
- **Little Calumet River East Branch:** Fish Consumption Advisory for PCB and Mercury, *E. coli*
- **Dunes Creek**: *E. coli*, Impaired Biotic Community;
- **Deep River:** Impaired Biotic Community, siltation, and *E. coli*;
- **Grand Calumet River:** Fish Consumption Advisory for PCB and/or Mercury, Cyanide, oil and grease, Impaired Biotic Community, and Ammonia;
- **Lake Michigan Shoreline:** *E. coli* and Fish Consumption Advisory for PCB and Mercury;
- **Salt Creek**: Impaired Biotic Community and *E. coli*;
- **Trail Creek:** *E. coli*, Impaired Biotic Community, and Fish Consumption Advisory for PCB;
- **Galena River:** *E. coli* and Impaired Biotic Community;
- **Coffee Creek:** *E. coli*

The following is a summary of these impairments for the Kankakee River:

- **Cedar Creek:** Impaired Biotic Communities, FCA
- **Cobb Creek/Breyfogel Ditch:** Impaired Biotic Communities
- **Crooked Creek:** Impaired Biotic Communities
- **Dyer Ditch:** Impaired Biotic Communities
- **Kankakee River – Mainstem:** Impaired Biotic Communities, FCA, *E. coli*,
- **Bull Run Basin:** Impaired Biotic Communities
- **Singleton Ditch – Bruce Ditch/Bailey Ditch:** Impaired Biotic Communities
- **Singleton Ditch – Bryant Ditch:** *E. coli*
- **Kankakee River – Travis Ditch/Long Ditch:** *E. coli*
- **Cobb Ditch – Sievers Cree**k: Impaired Biotic Communities
- **Salisbury Ditch:** Impaired Biotic Communities
- **Little Kankakee River – Byron:** *E. coli*
- **Little Kankakee River – Mill Creek-Fish Lakes:** Impaired Biotic Communities
- **Lower Fish Lake:** FCA
- **Pine Creek – Horace Miller Ditch:** *E. coli*
- **East Branch Stony Run:** Nutrients, Total Dissolved Solids

1.4 <u>Watershed Advisory Group</u>

Northwestern Indivis watershed planning effort would not have

represent a long-term challenge to the northwest Indiana region. The Report also concluded with the Advisory Group that since all communities in northwest Indiana derive their drinking water from Lake Michigan, groundwater, or surface water and with water playing a vital role in our economic and environmental well-being maintaining, the quality of the region's water systems should be regarded as a very high priority.

The Advisory Group agreed to continue to partner with the Quality of Life Council as the watershed planning process moved forward.

1.7 Mission Statement

The Mission the Advisory Group developed is as follows:

To establish a watershed planning and management framework for the enhancement, restoration, and protection of water quality in Lake, Porter, and LaPorte counties through the facilitation of communication, education, and coordination among watershed stakeholders.

This mission statement reflects the concerns of the watershed stakeholders that coordination among stakeholders and awareness of watershed issues need to be addressed. The mission statement is used to

Chapter 2
Watershed Descriptions

2.1 Little Calumet-Galien Watershed

2.1.1 Overview

Figure 2-2 Hydrologic Unit Code-Basin Map

This basin is densely populated and includes most of the urbanized communities within Lake, Porter and LaPorte counties. Waterbodies within this basin ultimately flow into Lake Michigan. The northwestern part of the basin is one of the major industrial centers of the United States. Economic development and the sustainability of northwest Indiana were primarily dependent upon steel, petrochemical, energy generation, and other ancillary industrial development. Historically, northwest Indiana's most densely populated areas were near the industrial cores along Lake Michigan. Figure 2-3 shows the current urbanized areas in northwest Indiana and Figure 2-4 shows the project population change from 2000 to 2030.

Northwest Indiana saw a 4.2% growth rate from 1990 to 2000 based on U.S. Census information. In 2000, the population for Lake, Porter, and LaPorte Counties was 741,468. Of that, Lake County represented 484,564; Porter County represented 146,798; and LaPorte County represented 110,106. The most significant increase during the period was Porter County with a 13.9% growth rate. Given the current growth and population shift trends and the projections seen in Figure 2-4, new development appears to be moving south and east in this region, which will potentially put additional stress on the undeveloped portions of the watershed. The extensive urban and industrial development has had detrimental effects on the environment and surface water resources within the basin, including Lake Michigan. There are 77 NPDES (21 municipal, 56 industrial) permitted facilities in the Little Calumet-Gali

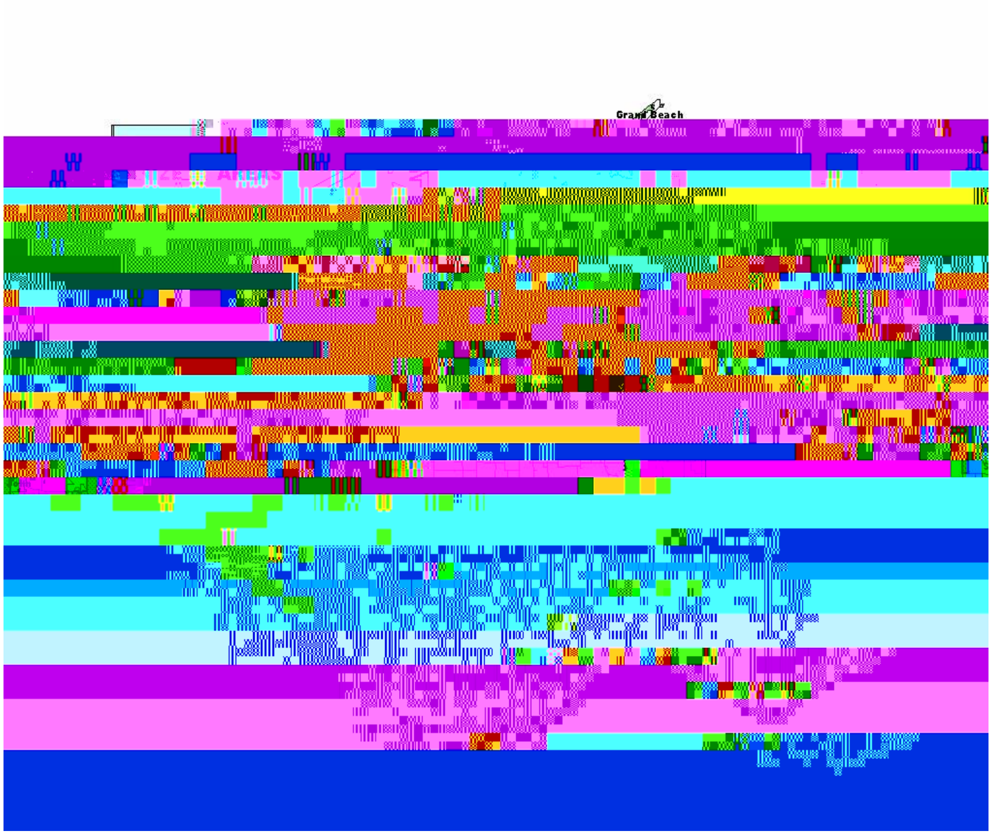


Figure 2-3 Census 2000 Urbanized Areas

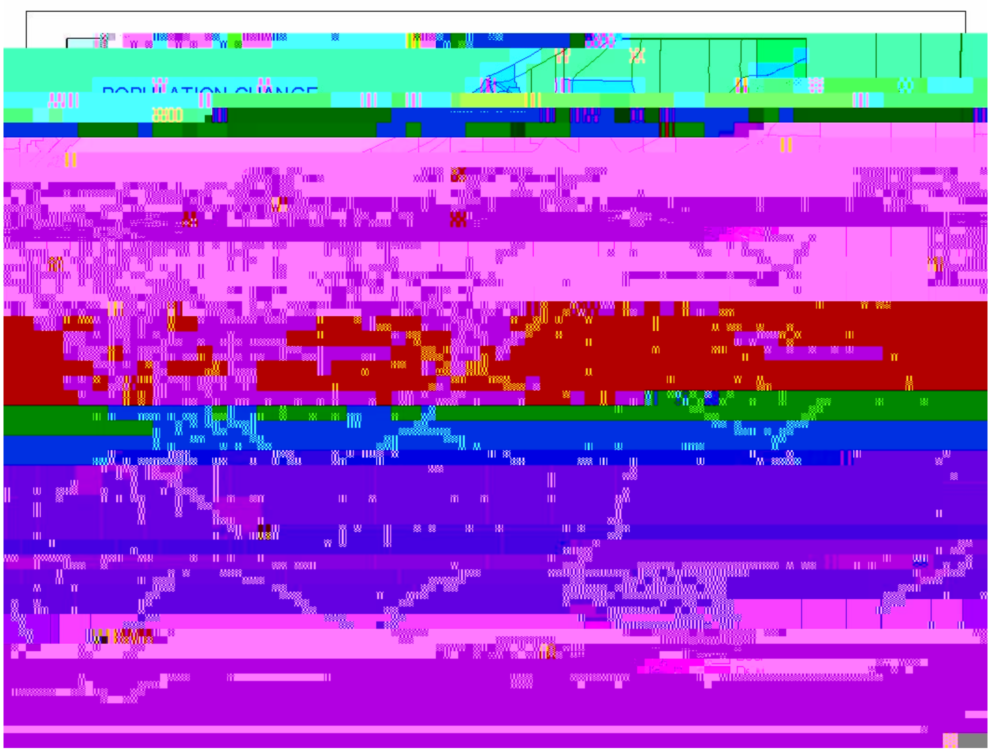


Figure 2-4 Population Change 2000 – 2030

The principal drainage network for the basin is formed by the Grand Calumet and Little Calumet Rivers, draining most of the western and central parts of the region (IDNR, 1994). Channelization and construction of canals have significantly altered the natural stream hydrology of the region (IDNR, 1994). Several smaller streams drain the eastern part of the Lake Michigan Region, including Trail Creek, Galena River, White Ditch, Spring Creek, Derby Ditch, and Dunes Creek (IDNR, 1994). The Galena River's headwaters are in LaPorte County and it has not been significantly impacted by human influence (IDNR, 1994). Trail Creek's drainage area is approximately 59.1 square miles within the region, making it a secondary draina

54 degrees Fahrenheit in autumn and 27 degrees Fahrenheit in winter (IDNR-ILMCP, 2001)

2.1.3 Natural History

The northern portion of the three-county section of the Little-Calumet Galien basin was once home to undisturbed sand dunes, with some of the tallest estimated to be 200 feet tall. The dune and swale ecosystems may be the most notable in northwest Indiana. This ecosystem was formed by the retreating of Lake Michigan and glaciers. Today it still is home to endangered and threatened species like the Karner Blue Butterfly. The dune area is extremely vulnerable to the blowing wind coming off Lake Michigan and very few plants live in the areas closest to the lake. Primarily, marram grass can be found growing in the foredune. As one moves further away from the lake, cottonwood trees, sumac and other sturdy grasses and plants can be found in the forested dunes. As one continues to move further away from the lake, more diverse flora and fauna can be found. Woodlands in the backdune area contain black and white oak trees, sassafras, blueberry, and bracken fern, among others. Wetlands, marsh, and shrub swamps can be found in many areas throughout the basin.

The Grand Calumet and Little Calumet Rivers once ran together as a single river, the Calumet River (IDNR, 1994). The Calumet River flowed westward into Illinois, made a hairpin turn at present-day Blue Island, and flowed back eastward into Indiana, where it eventually discharged into Lake Michigan at present-day Marquette Park Lagoon (IDNR, 1994). A second river formed when Native Americans constructed a new channel to Lake Michigan in Illinois in the early 1800s (IDNR-ILMCP, 2001). The Little Calumet

Michigan City in LaPorte County to Lake Street in Lake County, lay behind these dunes (NPS, 1988).

2.1.4 Public and Managed Lands

Appendix VI contains a listing of public and managed lands in Lake, Porter, and LaPorte counties.

2.1.5 Endangered Species

Appendix VII contains a listing of state and federal threatened and endangered species found within Lake, Porter and LaPorte Counties.

2.1.6 Soils

The Little Calumet – Galien Basin can be broken into two primary soil regions or areas. The Calumet Lacustrine Plain covers the northern part of the basin and a portion of the Valparaiso Moraine makes up the southern portion of the basin.

Sands are very permeable and thus precipitation (and any pollution they carry) might pass through the soils quickly to the groundwater below without much attenuation by microorganisms or physical or chemical processes. Clays and fine silts, on the other hand, would swell up when wet to retard the passage of water. Although this might keep pollution out of the groundwater, it would more likely pond on the surface (reaching the waterway as runoff), plus the shrinking and swelling action of the fine particles as they get wet and dry out would create localized ground movement, stressing foundations for roads and buildings. Both very permeable and relatively impermeable soils can often both be found in the same complex morainal area.

Calumet Lacustrine Plain – Northern Section

The Calumet Lacustrine Plain lies adjacent to the coastline of Lake Michigan. The northern part of this plain is characterized by alternating high ridges and flats that have a topography of gradual swales and swells (swells are slight rises in topography at 2 to 3 feet at the most). The high ridges are old, coarse-textured, eolian (wind-blown) sand dunes that are narrow, elongated and typically oriented parallel to the Lake Michigan coastline. Most of these ridges have been stabilized by woody vegetation or beach grasses. Brems, Oakville, and Plainfield soils are the dominant soils found on these sandy ridges.

Areas separating the high sand ridges are characterized by slightly depressional to nearly level soils formed in sandy glacial outwas

The soils in the northern part of the Calumet Lacustrine Plain generally have poor

When drained, the soils in this region are well suited to cultivated agricultural crops. Diversions, terraces, waterways, and minimum tillage help control surface runoff and erosion on these gently sloping to steeply sloping soils.

In general, only the well drained soils in the Valparaiso Morainal region are fairly well suited to on-site sewage disposal systems. Slope and permeability are the main limitations. Shrinking and swelling of the soil and seepage are additional limitations for building site development. Erosion needs to be controlled during and after construction. Special attention and design considerations should be addressed to eliminate or at least minimize soil limitations when using these areas for urban land uses.

South of the Calumet Lacustrine Plain is the Valparaiso Moraine Area, composed of an arc-shaped end moraine complex that parallels the southern shore of Lake Michigan from Illinois, through northwestern Indiana, and into Michigan. The morainal complex is made up of several terminal moraines of Wisconsinian age including the Valparaiso and Tinley Moraines, which mark terminal positions of the Lake Michigan (glacial) Lobe. The Valparaiso Morainal complex is about 150 ft. higher than the Calumet Lacustrine Plain and forms a major divide that separates drainage to the Mississippi River from drainage to the Saint Lawrence River by way of Lake Michigan. Elevations in the complex generally range from 700 ft. to 800 ft. and are as high as 950 ft. above sea level. The western end of the complex is wide and gently undulating, whereas the part of the complex east of Valparaiso is more hilly and rugged (Fenelon 1992).

2.1.8 Water Use

The demand for water in the Little Calumet-Galien basin is influenced by a variety of factors, including socioeconomic character to the dunes, wetlands, marshes and other terrain that made it difficult to settle. In Porter County, dune ridges towered nearly 200 feet above Lake Michigan. There were interdunal ponds and blowouts up to a mile inland. In Lake County, a low ridge of dunes was along the lakeshore abutting wetlands of the Grand and Little Calumet rivers. The Great Marsh, which extended from Michigan City in LaPorte County to Lake Street in Lake County, lay behind these dunes (NPS, 1988). This left early settlement closer to the centers of these counties where there was fertile soil for farming. Many of these communities developed as rural, agricultural communities.

Early Industry and Development

With the founding of Michigan City, the Trail Creek Harbor began to see light boat traffic carrying both goods and passengers. By the 1840s, the Harbor was shipping cargo, making Trail Creek a major outlet for farm goods and for passengers who came up the Michigan Road. There were 13 grist mills on the banks of Trail Creek in the 1800s. In shipping volume, the Trail Creek harbor often exceeded that of Chicago and through the 1950s there were attempts to build major shipping facilities at Michigan City. On summer weekends, Chicagoans boarded steamers for day trips to Washington Park in Michigan City. The tourist trade began to decline in 1915 with the sinking of a Chicago steamer.

With the expansion of the railroad to northern Indiana in the mid-19th century many communities developed as commercial centers. Railroads allowed access to the growing Chicago market as well as others. This improved access to communities and spurred their growth. The construction of the Chicago-Detroit Road was used primarily by soldiers to deliver mail a couple of times a week and later became a stage coach route through the area. Stations developed along the Chicago-Detroit road as stage coach stops. The construction of the Michigan Road (US 421), which ran from Madison, Indiana to Michigan City brought settlement to LaPorte County (Historic Landmarks Foundation of Indiana, 1989). The opening of US Route 12 and the Lincoln highway (US 30) in the early twentieth century further connected northern Indiana with other parts of the nation. Industries began looking at the Lake Michigan corridor with its expanses of dunes, marshes, and undeveloped land in Lake County for steel and associated manufacturing uses. Gary, Hammond, East Chicago, and Whiting saw an influx in population during this period (1890-1920) with tens of thousands of workers for these new industries. As railroads and paved roads further developed in northwest Indiana, developed as lakeshore communities geared toward the urban market of Chicago (Historic Landmarks Foundation of Indiana, 1991).

Dune Development and Preservation

Early preservationists and environmentalists saw a need to protect the Indiana Dunes from development and their fight for a national park to provide that protection began in 1916. The impacts industry has had on the lakeshore and the northern part of the Little Calumet-Galien basin in Lake, Porter, and LaPorte counties are staggering. Sand mining of the dunes dates back to the early twentieth century, when Hoosier Slide, just west of Michigan City, was taken away in rail cars for use in making glass. Hoosier Slide was then the tallest dune at 200 feet. This site now is home to Northern Indiana Public Service Company's (NIPSCO) power generating station (NPS, 1988). More dunes were mined and the sand was taken to Chicago and other areas where it was used to fill in lower wet areas. These locations and those in which wetlands were drained gave way to industrial uses. Three ports were constructed in Lake (Indiana Harbor in East Chicago and Buffington Harbor in Gary) and Porter (Port of Indiana) Counties between 1916 and 1966 in addition to the already constructed and operational Trail Creek Harbor. The Indiana Harbor Shipping Canal was constructed to connect the Grand Calumet River to Lake Michigan. In the 1960s, Bethlehem Steel Corporation opened up a new steel mill in an area that was once a part of the Great Marsh. Two other steel mills and NIPSCO's Bailly Generating Station sprouted up around the Bethlehem Steel Burns Harbor plant with the construction of the Port of Indiana. This development occurred in the area referred to as the Central Dunes, which was thought to be the most spectacular stretch of the Indiana Dunes. For these reasons environmentalists pushed for the creation of a State Park in the dunes area, which was achieved in 1923. The fight for the creation of the National Lakeshore continued until it was finally created in 1966.

Historical Places

Just as the area has a rich natural history, there are many structures in the region listed on the National Register of Historic Places and the State Register of Historic Places including sites representative of the regions diverse history. A complete list can be found in Appendix V. Inventories of historic places for all three counties have been completed by the Historic Landmarks Foundation of Indiana.

Current Economic Trends

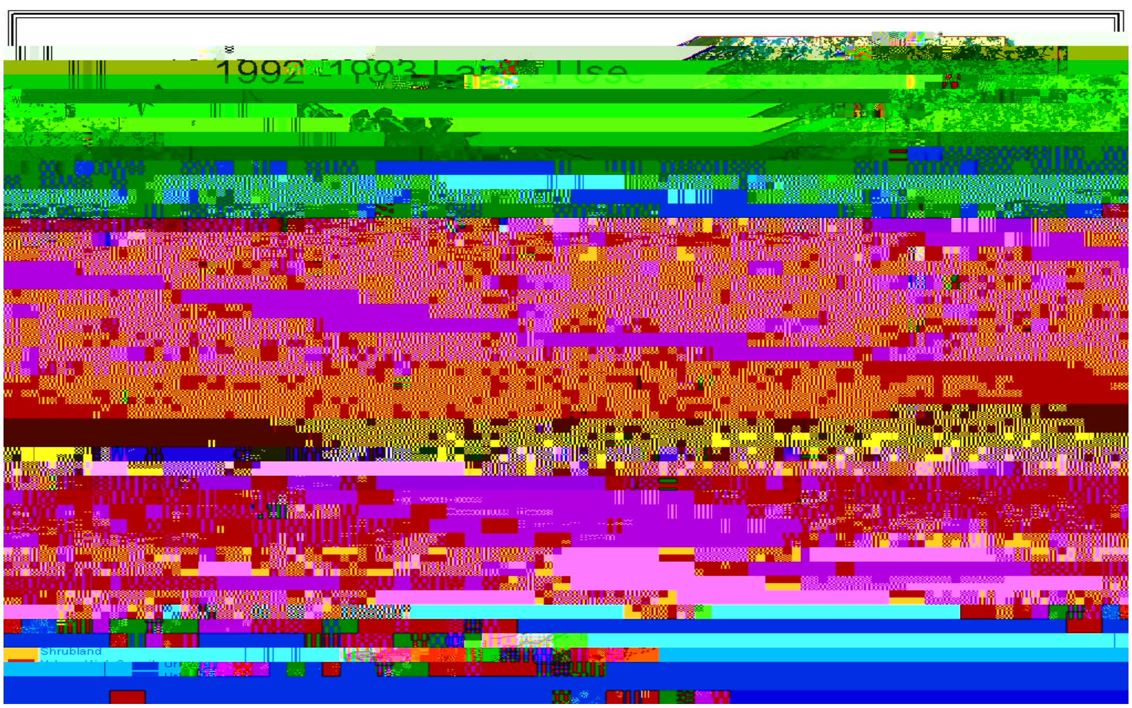
Economic trends also have affected northwest Indiana. The area was hit hard in 2003 when LTV, National, and Bethlehem Steel Companies filed for bankruptcy. Some of these companies were bought out; communities in the region began to consider diversifying their industrial bases. Northwest Indiana's industrial base also is affected by the lower costs of doing business overseas. Several companies have closed their doors and moved their operations outside of the country, leaving vacant buildings and an unemployed workforce. These trends continue as the industrial base continues to change and population growth continues to shift away from urban areas.

Current Land Use

Urban and industrial areas in northern Lake and Porter Counties and agricultural land in LaPorte County dominate the current landscape of the Little Calumet-Galien Basin. Remnants of natural prairies and wetland landscapes occur in isolated parcels in the basin. The Indiana Dunes National Lakeshore and the Indiana Dunes State Park in northern Lake and Porter counties contain the largest expanse of natural forest in the Little Calumet-Galien basin. In the Little Calumet-Galien basin, urban areas form an almost continuous complex across northern Lake county and northwestern Porter county. Other developed land areas in this basin include Crown Point in Lake County, Michigan City in LaPorte County, and Valparaiso, Chesterton, Portage, Porter, Dune Acres, Beverly Shores, Pines, Long Beach, Trail Creek, Burns Harbor, and Ogden Dunes in Porter County (IDNR, 1994).

Fifty-eight percent of the 972,800 acres of land that comprise Lake, Porter and LaPorte counties is farmland (IDNR, 1990). Of that, 90 percent is cropland (harvested crops, orchards, vineyards, nurseries and greenhouses), 4 percent is woodland (woodlots, timber production and Christmas tree production), and 6 percent is other (house lots, barn lots, ponds, roads and wasteland). The remaining 42 percent of land use is forest land, wetlands and urban development. In the Kankakee and the Little Calumet-Galien basins 8 percent and 29 percent respectively are developed urban land areas.

Figure 2-7 shows land use within Lake, Porter, and LaPorte Counties, as identified in the 1992-1993 GAP Analysis Program land use data.



number of lakes throughout the basin, but the water quality of the lakes is generally good (IDNR 1990). Figure 2-1 shows the three county area and important features of the region.

2.2.2 Physical Setting

The Kankakee River Basin (HUC 07120001) is the sixth largest, 2,989 square miles, of the 12 water management basins in the State. The total basin includes most of Newton, Jasper and Starke Counties and one-half to two-thirds of Lake, Porter, LaPorte, St. Joseph, Marshall and Benton Counties. Overall, the Kankakee River drains 5,165 square miles in northeastern Illinois and northwestern Indiana. Within Indiana, the basin has an area of 2,989 square miles of which approximately 909 square miles are in Lake, Porter, and LaPorte Counties. Most of the northern part of the basin is bounded by the Valparaiso Moraine, which forms a major divide separating drainage to the Mississippi River from drainage to the St. Lawrence River. The major northern tributaries of the Kankakee River, which flow from the Valparaiso Moraine, are the Little Kankakee River, Crooked Creek, and Singleton Ditch (Figure 2-8). The current landscape of the Kankakee River Basin is dominated by agricultural crops and artificial drainage networks. Remnants of natural prairies, savannas and wetlands remain in isolated parcels. The City of LaPorte is the major urban center lying totally within the Kankakee basin. Large tracts of developed land also are found near smaller towns and around a few of the large lakes such as Cedar Lake in Lake County.

Figure 2-8 Kankakee River Basin

Normal annual precipitation at Kentland, Plymouth, Wheatfield, Valparaiso and South Bend averages 37.6 inches for the period 1951 – 1980 (IDNR, 1990). The presence of Lake Michigan alters the local climate in northwest Indiana. Although modifications of climate are most pronounced within a mile or two of the shore, several lake-effect features extend about 25 miles inland (IDNR, 1990). Annual snowfall in the northern part of the basin averages about 70 inches, which is twice the annual amount normally received in southern and western areas of the basin (IDNR, 1990). The normal annual temperature averages 50 degrees Fahrenheit. Normal seasonal temperature averages 49 degrees Fahrenheit in spring, 72 degrees Fahrenheit in summer, 53 degrees Fahrenheit in autumn, and 26 degrees Fahrenheit in winter (IDNR, 1990).

2.2.3 Natural History

The Kankakee valley was originally a Grand Marsh of more than 500,000 acres of river channel, lakes, marsh and marginal wetlands (KRBC, 1989). The Grand Marsh was extraordinary and known for its fertile hunting grounds. General Lou Wallace visited the area several times to hunt. John L. Campbell, in his 1883 report to the Indiana Governor stated "The Kankakee river is noted for its extreme crookedness…The water in the stream is remarkably clear and is of excellent quality for domestic purposes" (Campbell, 1883). Campbell's report recommended the straightening of the Kankakee River and draining of the Grand Marsh to improve drainage. Only a portion of the Grand Marsh would have been within this study area. The original river channel supported numerous varieties of wildlife. In the late 1800s, efforts were organized to drain the wetlands for agricultural production and channelization of the river was completed in 1917 (KRBC, 1989). This effort straightened the river and dredged the river making it deeper.

Much of the land in Lake, Porter, and LaPorte Counties adjacent to the river is used for agriculture. There remain some forested wetlands. Oak-Hickory forests and some prairie grasses can be found in the small sand hills that once were surrounded by wet prairies prior to the draining of the Grand Marsh (KRBC, 1989). Fish are prevalent in the Kankakee River and its tributaries (KRBC, 1989). Waterfowl, deer, pheasant, and quail also thrive in these habitats.

Once ditching began to drain the marsh, timber harvesting within and transport out of the marsh became popular. However, by the 1870s the freight transport of timber became an unsuccessful economic venture. In 1871, a massive forest and range fire burned out thousands of acres of marsh timber and grasses. Vegetation was burned down to the subsoil or to water level (IDNR et al, 1976). But as more and more acres of marsh land were ditched and drained, vast amounts of wildlife habitat were destroyed. Yet, as this process occurred, more and more acres of farmland were developed.

2.2.4 Public and Managed Lands

Appendix VI contains a listing of public and managed lands in Lake, Porter, and LaPorte counties.

2.2.5 Endangered Species

A complete list of Endangered and Threatened species found in Lake, Porter, and LaPorte Counties can be found in Appendix VII.

2.2.6 Soils

The Kankakee Basin can be broken into four major soil regions or areas. These regions are the Kankakee Floodplain, Kankakee Outwash Plain, Kankakee Lacustrine Plain, and Valparaiso Moraine.

Kankakee Floodplain

The Kankakee Floodplain region is an area that

2.2.8 Water Use

The demand for water in the Kankakee basin is influenced by a variety of factors, including socioeconomic characteristics, the physical environment, and hydrologic systems. Agricultural irrigation is the major withdrawal use in the Kankakee basin, constituting about one-third of all water withdrawals. In 1987, there were a total of 533 significant water withdrawal facilities representing about 570 wells and 230 surface water intakes registered in the basin. These facilities had a combined withdrawal capability of 25.2 billion gallons for 1987. Nearly equal amounts of water are withdrawn from surface water and groundwater sources within the basin. Energy production, the second highest

Timber harvesting in the marsh area became popular in the mid-1860s and in 1866, the Indian Island Sawmill Company was formed to log the valuable timbers (IDNR, 1976). Timbers were transported by a river steamer and some flat boats to Momence, Illinois. However, this was not a lucrative business for the area (IDNR, 1976). In the 1870s and 1880s, the marsh became a great recreation area for hunters and hunt clubs were built throughout the marsh (IDNR, 1976).

In 1889, the state program was in place to straighten and clean the Kankakee River from South Bend to the Indiana-Illinois state line, and by 1917, the ch17.R

Chapter 3
Urban & Rural Areas

3.1 Introduction

Development and land use in urban and rural areas in northwest Indiana are tied to many of the water quality problems facing the region. Many studies have been conducted on the water quality within the Little Calumet-Galien and Kankakee River watersheds. There are differing opinions on the results of these studies and, therefore, the water quality issues addressed in this plan focuses on the IDEM and USEPA approved 2004 Water Quality Impairments (303(d)) List and other issues identified through public meetings, the Watershed Advisory Group, and the Technical Teams.

Northwest Indiana's diversity is not just relate

issue is that this data should be presented and made available to the public. In some instances organizations working to promote improved water quality are not made aware of all the existing data or they have a difficult time in obtaining it. Given the available information, the group decided for this plan to focus on the sampling and testing conducted by IDEM. Appendix III contains a complete list of impairments and specific stream segment impairments. *E. coli* and impaired biotic communities usually are considered to be indicators of a water quality problem, however they are listed as impairments by IDEM and so this plan will address them as such.

3.2.2 Impaired Biotic Communities

Impaired biotic communities occur when biotic communities cannot continue to sustain themselves in a waterbody as they previously had due to a change in the system. Changes could include those to the water chemistry, water temperature, or loss of vegetation along the perimeter of the water body. Pollutants in the waterbody can affect water chemistry by altering natural systems like increasing pH or altering the biological or chemical oxygen demand in the system. Removal of vegetation along streams, creeks, ditches, and rivers can increase water temperature by reducing the shade that once was provided. Increased sediment loads also can negatively affect the organisms living in the waterbody.

3.2.3 Fish Consumption Advisories

Fish consumption advisories exist in several segments of the Little Calumet-Galien and Kankakee River watersheds due to the bioaccumulation of mercury and/or PCBs in fish. Since these pollutants also can accumulate in humans when these fish are consumed, possibly causing serious health problems, the advisories suggest limits to the amount of fish that should be consumed from these waterbodies. IDNR publishes an annual guide to the fish consumption advisory containing information on the human health impacts and the current advisories. High levels of mercury can be caused by municipal and industrial discharges, urban and rural runoff, and atmospheric sources. Municipalities and industrial wastewater dischargers are required to obtain NPDES permits from IDEM for these discharges. PCBs were used primarily in hydraulic fluids up until 1978, when production was halted. Today’s PCB problems are legacy issues.

3.2.4 E.Coli

The most common impairment identified in both the Little Calumet-Galien and Kankakee River watersheds is *E. coli* bacteria. *E. coli* is listed as an impairment by IDEM for many waterbody segments throughout northwest Indiana. High levels of *E. coli* lead to the closure of Lake Michigan beaches every summer along the southern tip of Lake Michigan. Beach closures are the most visible impact *E. coli* has on water quality. Ingestion of high levels of *E. coli* can cause human health problems such as headaches, fatigue, nausea, and diarrhea**.** The Indiana water quality standard for *E. coli* bacteria requires *E. coli* levels to not exceed 125 colony forming units (CFU) per 100 milliliters as a geometric mean based on not less than 5 samples equally spaced over a 30 day period or 235 per 100 milliliters in any one sample in a 30 day period. High levels of *E. coli* can be caused by nonpoint source runoff, failing septic systems, pump station overflows, leaking sewer lines, direct discharges from septic systems, runoff from livestock operations, wildlife, combined sewer overflows (CSO), and urban stormwater.

3.2.5 Cyanide

3.2.9 Total Dissolved Solids

Total Dissolved Solids are minerals, salts, metals, cations, or anions dissolved in water. This impairment can be caused by runoff from developed areas, road salts, fertilizers and pesticides, industrial waste and sewage, and organic sources.

3.2.10 Little Calumet-Galien Watershed Additional Impairments

In addition, the 2002 Little Calumet-Galien WRAS states that high levels of lead, copper, pesticides, and low dissolved oxygen (DO) have been found in the basin’s waterbodies. The 2001 DNR Little Calumet-Galien River Watershed Diagnostic Study included acidic pH, zinc, nitrogen, phosphorus, and total suspended solids. These studies raise questions on whether there are potential impacts from these pollutants on the watershed and warrant further study on the sub-watershed level.

3.2.11 Kankakee River Watershed Additional Impairments

In addition to the impairments listed above, the priority problems identified by the KRBC for this watershed are sedimentation, flooding, and development pressures. These are not 303(d) parameters, but are major concerns for the basin and so they will be addressed in this plan. Flooding will be discussed in more detail in Chapter 5, Hydromodification, and development pressures will be discussed more in depth below in the stressors section.

Sedimentation is a problem that has been identified by many stakeholders in the Kankakee River watershed. The problem is primarily associated with soil erosion. Though erosion occurs naturally it has been exacerbated by channelization and the impacts of how the land is used. Channelization will be discussed in Chapter 5, Hydromodification, and the impacts of agricultural practices will be discussed in Chapter 4, Agriculture Sources.

New development is increasing in this basin, much of which occurs in unincorporated areas of the three counties. As this development continues to shift into this basin, erosion will continue to increase sediment loads in the Kankakee River and its tributaries unless proper erosion control practices are implemented. Disturbed soils can be eroded by the wind. Vegetation planted along creeks, ditches, streams and rivers can protect soils from eroding. Trees fall into these waterbodies, disturbing soils and increasing erosion. New development usually means increased impervious area (i.e., areas that do not allow runoff to filtrate into the ground) and runoff is sent directly into ditches and drainage basins that eventually direct the water into creeks and rivers. This runoff can carry sediment from construction sites, unprotected soil on already developed sites, and other pollutants into waterbodies. More information on the impacts of development on the region’s watersheds is found in the stressor section of this chapter.

Since the channelization of the Kankakee River, the velocity at which the water moves has increased significantly, carrying the water and the sediment in it, faster and farther to the west. The Illinois section of the Kankakee River has more significant sedimentation problems. The Yellow River, which flows through Marshall and Starke Counties) enters the Kankakee River near the southwestern county line between LaPorte and Starke Counties carrying large amounts of sediment.

3.3 Problems, Causes, and Sources

Many of the causes of water quality degradation identified for northwest Indiana in this chapter are symptoms of sprawl. Characteristics of sprawl include development moving farther away from urban cores, increasing reliance on automobiles, and the loss of farmland or natural land to development at a rate that exceeds population growth for the area. Increased traffic congestion and travel times associated with sprawl factor into air pollution. Soil erosion and increased runoff from development can add additional stress to waterbodies. Infrastructure costs increase as roads and utilities need to be extended farther from the core of a community. Water quantity can become an issue as more consumers demand water. The loss of open space, or undeveloped land affects the water system as there is less natural infiltration and impervious surface area increases with development to unhealthy rates. The potential impacts already are being seen in northwest Indiana.

loading, and hydraulic loading. An increase in water usage over a period of time also can exceed the design capability of a system and result in failure.

The inherent properties of soils in Indiana also are limited with regard to supporting on-site sewage disposal systems. Severe limitations as described in the table below do not necessarily restrict the use of an on-site sewage disposal system, but is an indication that the soil conditions may not necessarily support a system without modification to the design.

Table 3-3 Wastewater Disposal Data by County

	Percent of Households with Onsite Wastewater Disposal (Septic)	Number of Households with Onsite Wastewater Disposal (Septic)	County Area (acres)	Density of Septic Systems (ac/septic system)	Percent of Area with Soils Having "Severe Limitations" for Septic Systems
Lake	10.0%	18,274	396,962	21.7	96.0%
LaPorte	43.0%	18,002	389,865	21.7	74.0%
Porter	31.0%	14,444	334,267	23.1	83.0%

Sources: 1990 U.S. Census
Natural Resources Conservation Service Soil Survey

Discharge of wastes associated with failing systems can introduce pathogens, parasites, bacteria, and viruses which can cause communicable diseases through indirect or direct body contact or ingestion of contaminated water. Pathogens pose a particular threat when sewage pools on soil surface or migrates to waters that are used for recreation.

In addition, nitrogen and phosphorous are pollutants associated with on-site sewage disposal systems. Nitrogen and phosphorous are nutrients that contribute to eutrophication and depletion of oxygen in surface waters. Excessive nitrate-nitrogen in drinking water can also cause metheoglobinemia in infants and complications for pregnant women. Livestock also can suffer health impacts from drinking water high in nitrate.

Technology associated with on-site sewage disposal systems has progressed over the years and continues to do so. In addition, state and local requirements for the installation of systems continues to be updated to ensure that the best available technology is used in the design and installation of systems. The issue is most often with existing systems' operation and maintenance.

3.3.4 General Sources (Including Household, Commercial, and Landscaping)

General sources of pollutants are those that are generated as the result of day-to-day activities by the public and businesses. The primary sources include household activities, lawn and garden care, turfgrass management, vehicle use and maintenance, illegal discharges, and pet and domesticated animal waste.

Everyday household activities generate numerous pollutants that may affect water quality. Common household waste includes, paint, solvents, lawn and garden care products, detergents and cleansers, and automotive products such as antifreeze and oil. A household product that contains hazardous substances becomes household hazardous waste once the consumer no longer has a use for it and disposes of it. These pollutants are typically introduced into the environment due to ignorance on the part of the user or the lack of proper disposal options. The public unknowingly assumes that storm drains discharge into sanitary sewers and dump materials into storm drains under the assumption that treatment will occur at the sewage treatment plant. Users commonly dump or dispose many of these products directly onto the ground, not realizing that the materials can be carried to surface waters by runoff or pollute groundwater if they leach through the soil. Hazardous waste from households is not regulated as hazardous waste under federal and Indiana laws.

Landscaping (e.g., homeowners, golf courses) can contribute to the pollutant loading of waterbodies within a watershed. For example, improper application or over-application of fertilizers and pesticides can impair surface waters. Over-application of nitrogen can contribute to water impairment either through entry into surface water bodies by runoff or it can pollute groundwater when it leaches through highly permeable soils. Improper disposal of lawn trimmings also can lead to increased nutrient levels in water runoff. Lawn trimmings deposited in street gutters can be washed into the storm sewer system and result in elevated nutrient loadings in the receiving waterbody.

Litter and debris can be significant contributors to the degradation of surface water and groundwater. Smaller materials can be carried by runoff and deposited in surface waters. Larger items such as refrigerators and air conditioners can impair water quality through the release of fluids into surface water and groundwater. These items also degrade the aesthetic and recreational value of surface waters and may be a hazard to some species of wildlife and aquatic organisms.

Domestic pet droppings have been found to be an important contributor of nonpoint source pollution. It has been shown that these waste materials can elevate fecal coliform and fecal streptococcal bacteria levels of waterbodies. This type of pollutant is most commonly associated with dogs. However, other urban animals such as domesticated or semi-wild ducks and Canadian geese can be major contributors to the nonpoint source problem in areas where their populations are high.

3.3.5 Contaminated Sites

Contaminated sites and sites with the potential to contaminate waterbodies and the water supply in northwest Indiana have been an issue of concern for some time and it continues to be an evolving issue. As development is moving away from the urban cores, more potential Brownfield sites will remain rather than be redeveloped with existing infrastructure. Brownfield sites typically are commercial, manufacturing, or industrial sites that are left behind when the owner relocates or closes the facility. These sites have the potential to pollute waterbodies in the regi

Critical Areas 1 – New Development

Objective 1A (Objective 1 in 6217 Coastal Plan)
Ensure the reduction of pollution and stormwater associated with new development and induced changes in hydrology

Action Items (Tasks)	Resources Needed	Responsible Entities	Example Activities and Relative Cost	Measure of Success/Indicator	Time Frame
(i) Ensure that post development average annual Total Suspended Solids loadings are no greater than predevelopment loadings (ii) Maintain post development peak runoff and average volume similar to pre-development levels	• Partnerships with local entities • Education & Outreach • Technical assistance o Pre-construction – Developers and local government o Post-construction – Public and other • Funding • Staff • Policy/Program guidance/structure	• Local Planning and Zoning • SWCDs • Drainage Boards • IDEM • IDNR • ACOE • Illinois-IN Sea Grant • Homebuilders Associations	Provide technical assistance and		

Critical Areas 1 – New Development

Objective 1B (Objective 2 in 6217 Coastal Plan)
Encourage sound planning principles, management, and mitigation measures to protect, enhance, and restore natural resources and reduce runoff to surface waters

Action Items (Tasks)	Resources Needed	Responsible Entities	Example Activities and Relative Cost	Measure of Success/Indicator	Time Frame
(i) Avoid conversion to the extent practicable of areas that are particularly susceptible to erosion and sediment loss; (ii) Preserve areas that provide important water quality benefits and/or are necessary to maintain riparian and aquatic biota (iii) Protect, to the extent practical, the natural integrity of waterbodies and natural drainage systems during site development	• Funding • Partnerships with: Local Watershed groups Local Entities State Entities Federal Entities Land trusts • Staff • Technical Support • Education & Outreach • Model ordinance language	• NIRPC • IDEM • IDNR • Sea Grant Planning with Power • Project WET • Hoosier Riverwatch • Indiana Local Technical Assistance Program • Indiana Conservation Districts • Planning & Zoning Boards • Drainage Boards	Regional planning/zoning to direct development away from sensitive areas ($$) Purchase conservation easements to protect sensitive water resources ($$/100 98p10.2( )TJ0 -1.153ith:		

Critical Areas 1 – New Development

Objective 1C (Objective 3 in 6217 Coastal Plan)
Ensure that site-specific development designs protect, enhance, and restore natural resources and reduce runoff to surface waters

Action Items (Tasks)	

Critical Area 2 - Existing Development

Objective 2A (Objective 4 in 6217 Coastal Plan)
Ensure the decrease of pollution being discharged from existing residential and industrial facilities

Action Items (Tasks)	Resources Needed	Responsible Entities	Example Activities and Relative Cost	Measure of Success/Indicator	Time Frame
(i) Identify priority local and/or regional watershed pollutant reduction opportunities, e.g., improvements to existing urban runoff control structures (ii) Limit destruction of natural conveyance systems (iii) Where appropriate, preserve, enhance, or establish buffers along surface waterbodies and their tributaries.	• Funding (for BMPs) • Staffing • Model Ordinances • Technical Assistance • Education & Outreach	• IDNR • IDEM • Counties • Cities • SWCDs • Homeowners/Lake Associations • RC&Ds	Municipal stormwater BMP retrofits ($$$/acre) Technical		

Critical Area 2 - Existing Development

Objective 2B (Objective 7 in 6217 Coastal Plan)
Reduce the amount of nonpoint source pollution from everyday residential and commercial uses and activities

Action Items (Tasks)	Resources Needed	Responsible Entities	Example Activities and Relative Cost	Measure of Success/Indicator	Time Frame
(i) Properly store, use, and dispose of household hazardous chemicals, including automobiles fluids, pesticides, paints, solvents, etc.; (ii) Properly apply and dispose of lawn and garden care products and leaves and yard trimmings; (iii) Manage turf on golf courses, parks, and recreational areas with minimal application of pesticides and fertilizer; (iv) Properly operate and maintain onsite sewage disposal systems; (v) Stop the discharge of pollutants into storm drains including floatables, waste oil, and litter; (vi) Ensure commercial activities including parking lots, gas stations and other entities not under NPDES purview implement BMPs (vii) Properly dispose of pet excrement	Partnerships with o Solid Waste Districts o Park Districts o Private Entities o Sanitary Districts o City Services Model Ordinances Local Entities/IOSHA/IDEM Education/Outreach	• Cities/Towns/Park Districts/State Parks • State Chemist Office • Purdue Extension • Solid Waste Management Districts • Sanitary Districts • IDEM • Hoosier Riverwatch • Project WET	Provide household hazardous waste collection days ($$$) Public education and outreach ($) Technical assistance and outreach for property owners ($$) New ordinances and technical assistance for septic system management ($$)	• Amount of household hazardous waste collected annually • Decrease in the amounts of fertilizer and pesticide applied • Phosphorous and/or nitrogen loads • On-site sewage disposal system inspections • Decrease presence of floatables,	

Critical Area 3 - Failing On-site Sewage Systems

Objective 3A (Objective 5 in 6217 Coastal Plan)
Ensure state officials permit the use of best available technology for installation and maintenance of new onsite sewage disposal systems

Action Items (Tasks)

Critical Area 4 - Roads, Highways and Bridges

Objective 4D (Objective 11 in 6217 Coastal Plan)
Runoff management systems for existing roads, highways, and bridges should identify priority pollutant reduction opportunities and schedule implementation of retrofit projects to protect impacted areas and threatened surface waters

Action Items (Tasks)	Resources Needed	Responsible Entities	Example Activities and Relative Cost	Measure of Success/Indicator	Time Frame
(i) Identify priority and watershed pollutant reduction opportunities (e.g., improvements to existing urban runoff control structures)					

Chapter 4
Agricultural Sources

4.1 Introduction

The issues related to agriculture for the Little Calumet-Galien and Kankakee River watersheds are essentially the same, it is the degree at which some of the uses exist in each basin in addition to the topography, hydrology, and soils that establish the extent of the impact on the region's water quality. This chapter was developed and adapted based on the information obtained through discussions with Kankakee River watershed stakeholders, the Little Calumet-Galien Technical Team, and information found in the 6217 plan in an effort to provide a consistent approach to agricultural nonpoint pollution reduction.

The total land area for the three-county region is 968,532 acre (Table 4-1). 517,008 acres (53%) are considered agricultural land. Agricultural uses in the Kankakee River watershed represent a much larger percentage of the land use than in the Little-Calumet Galien. The majority of the agricultural land is in LaPorte County. The primary agricultural land use is row cropland which includes corn and soybean production. The balance of the land described as agricultural is primarily in hay and pasture which includes land used for recreational horses; perennial grass and legume cover; enrolled in the Conservation Reserve Program; or year-round vegetative cover while waiting to be developed.

Table 4-1: Agriculture Land Use Within the Three-County Region (1,000s acres)

Category	Lake	Porter	LaPorte	Total
Corn	62	65.4	117	244.4
Soybean	53.4	54.5	82.6	190.5
Winter Wheat	3.7	3	5.8	12.5
Hay	3.3	4.3	9	16.6
Cattle	2.7	5.2	15.9	23.8

Source: NRCS (www.nass.usda.gov.in accessed 9/2/05)

Agricultural uses contribute to nonpoint pollution problems throughout northwest Indiana. *E. coli*, nutrients (phosphorus and nitrogen), and impaired biotic communities are all associated with agricultural uses. Agricultural practices can impact water quality by farming up to waterbodies, allowing livestock to graze through waterbodies, and the application of pesticides and fertilizer. The issues of greatest concern to the Kankakee River Basin Commission include practices that contribute to or accelerate soil erosion and the erosion of streambanks.

4.2 Problems, Causes, and Sources

4.2.1 Erosion from Cropland

Erosion of soils is a significant issue, especially in the Kankakee River watershed. As described in the previous chapter, urban and rural areas contribute runoff that can contain soils. However, disturbed soils associated with agriculture may contribute more soil than uses associated with developed communities. When vegetation is cleared from land, soils become exposed to natural elements like wind and rain which cause erosion. Farming the banks of ditches, creeks, streams, and rivers can exacerbate erosion as well. The veto natura-0.totrows along these waterbodies is necessary to hold soils in place. The erosion of soils into waterbodies can impact biotic communities and lead to nutrient overloading. Storm events can further contribute to the problem by moving more sediment into waterbodies.

Soil erosion can be characterized as the transport of particlesa-0.toare detached by rainfall, flowing water, or wind. Eroded soil is either re-deposited in the same field or transported from the field in stormwater runoff. Sediment -0.toleaves the cropland and enters waterbodies becomes an agricultural nonpoint source pollutant. Sediment -0.tooriginates from cropland has a higher pollution potential than from other agricultural land uses. The topsoil of a crop field is usually richer in nutrients and other chemicals because of past fertilizer and pesticide applications, as well as nutrient cycling and biological activity. Unprotected cropland with slopesotreater than two percent may be the most susceptible to the erosive effects of rainfall and subsequent water movement over its surface. Table 4-2 shows the estimated number of acres of cropland within Lake, Porter, and LaPorte Counties with slopesoof two percent or treater by county.

WATERSHED MANAGEMENT PLAN
FOR LAKE, PORTER, AND LAPORTE COUNTIES

Monitoring nearby waterbodies should be considered by sub-watersheds to determine if negative water quality impacts associated with this type of use are occurring.

Facility Wastewater

Animal waste (manure) includes the fecal and urinary wastes of livestock and poultry; process water from milking parlors; and the feed, bedding, litter, etc. from livestock operations. Confinement operations concentrate animal wastes from large numbers of animals on feeding floors, concrete pits below animal housing units, lagoons, settling basins, and other temporary holding structures designed to store animal wastes until they can be applied to cropland. Unless adequate storage capacity is planned for the storage of animal wastes, overflows from confined animal facilities have the potential of contributing to offsite water quality problems. The potential for additional pollution problems is often compounded by rainfall, which if not handled properly, has the effect of adding volume to feeding floors and manure storage areas.

Wastewater from confined animal facilities often contains the following pollutants: oxygen demanding substances; nitrogen, phosphorus, and many other major and minor plant nutrients; organic solids; salts; bacteria, viruses, and other microorganisms; and sediments. When runoff, wastewater, and manure from confined feeding operations occur in surface waters, fish kills often result because of oxygen depletion or dissolved ammonia. Decomposing organic material in surface waters often results in the depletion of dissolved oxygen. The result is anoxic or anaerobic conditions. Under these conditions, the water has an unpleasant taste, odor, and appearance due to the accumulation of methane, sulfides, and amines. Domestic or recreational uses of the water are then rendered unsuitable. Because of the high nutrient and salt content of manure and runoff from confined feeding areas, eutrophication of waterbodies may be accelerated over time by the release of nutrients from solids. The potential also exists for groundwater pollution if inadequate storage/seepage of livestock wastes occurs.

Runoff

Water quality contamination from livestock wastes is most often affected by the method of application, timing, and the amount applied. Manure applied to the surface has the greatest potential for runoff. When livestock wastes are applied to frozen ground, the potential for runoff is even greater during rainfall or snow melt. When livestock manures are “knifed into” the soil, the potential for runoff and the pollution of surface water is reduced significantly.

Manure from livestock operations contains high numbers of pathogens. Runoff from cropland receiving livestock manure that has not been incorporated exhibits high numbers of bacteria. The result can be high coliform counts, stream advisories, and beach closings.

Groundwater and surface water also are susceptible to pollution when the application rate of livestock waste to cropland exceeds the amount of nitrogen, phosphorus, and

WATERSHED MANAGEMENT PLAN
FOR LAKE, PORTER, AND LAPORTE COUNTIES

WATERSHED MANAGEMENT PLAN
FOR LAKE, PORTER, AND LAPORTE COUNTIES

Northwestern Indiana Regiona

of fish that are adapted to less oxygen or to warmer surface waters. Highly enriched waters will stimulate algae production, with consequent increased turbidity and color. Increased turbidity results in less sunlight penetration and availability to submerged aquatic vegetation (SAV). Since SAV provides habitat for small or juvenile fish, the loss of SAV has severe consequences for the food chain.

Nitrogen

Nitrogen is naturally present in soils but must be added to increase crop production. Nitrogen is added to the soil primarily by applying commercial fertilizers and manure, but also by growing legumes (biological nitrogen fixation), and incorporating crop residues.

The chemical form of nitrogen affects its impact on water quality. The most biologically important inorganic forms of nitrogen are ammonium (NH4-N), nitrate (NO3-N), and nitrite (NO2-N). Nitrate-nitrogen is highly mobile and can move readily below the crop root zone, especially in sandy soils. It also can be transported with surface runoff, but not usually in large quantities. Ammonium, on the other hand, becomes adsorbed to the soil and is lost primarily with eroding sediment. Even if nitrogen is not in a readily available form as it leaves the field, it can be converted to an available form either during transport or after delivery to waterbodies.

All forms of transported nitrogen are potential contributors to eutrophication in lakes, estuaries, and some coastal waters. In addition to contributing to eutrophication, excessive nitrogen causes other water quality problems. Dissolved ammonia at concentrations above 0.2 mg/L may be toxic to fish, especially trout. Nitrates in drinking water are potentially dangerous, especially to newborn infants. The U.S. Environmental Protection Agency has set a limit of 10-mg/L nitrate-nitrogen in water used for human consumption (*USEPA, 1989*).

Phosphorus

Phosphorus typically plays the controlling role in algae growth in freshwater systems. The phosphorus content of most soils in their natural condition is low and can be found in dissolved, colloidal, or particulate forms. Manure and fertilizers increase the level of available phosphorus in the soil to promote plant growth, but many soils now contain higher phosphorus levels than plants need.

Runoff and erosion can carry some of the applied phosphorus to nearby waterbodies. Dissolved inorganic phosphorus (orthophosphate phosphorus) is probably the only form directly available to algae. Particulate and organic phosphorus delivered to waterbodies may later be released and made available to algae when the bottom sediment of a stream becomes anaerobic, causing water quality problems.

Though the application of nutrients is a contributor to nonpoint source concerns, the Kankakee River Basin Commission does not identify this as a primary concern. Nitrates can be found in waterbodies, but they are not found in alarming proportions.

4.2.4 Pesticide Application to Cropland

The term *pesticide* includes any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest or intended for use as a plant regulator, defoliant, or desiccant. Herbicides, insecticides, fungicides, miticides, and nematicides all fall under the general term pesticides. The principal pesticidal pollutants that may be detected in surface water a

Sources of pesticide contamination include: atmospheric deposition; spray drift during the application process; misuse; and spills, leaks, and discharges that may be associated with pesticide storage, handling, and waste disposal.

Pesticide losses are generally greatest when rainfall is intense and occurs shortly after pesticide application, a condition for which water runoff and erosion losses also are greatest. Pesticides can be transported to receiving waters either in dissolved form or attached to sediment. Dissolved pesticides may be leached to groundwater supplies. Both the degradation and adsorption characteristics of pesticides are highly variable.

Though the application of pesticides is a contributor to nonpoint source pollution, the Kankakee River Basin Commission does not

4.3 Critical Areas

The Watershed Advisory Group and the Lake Michigan Coastal Program have identified the following critical areas, or priorities, for northwest Indiana:

1. **Row cropland with 2 percent or greater slopes** within a watershed of a stream or lake listed on the state's 303(d) list for impaired biotic communities and /or pathogens
2. **Confined Animal Facilities** with animal units well below the numbers that require Confined Feeding Operation Permits (20-300 animal units) but located with ½ mile of a perennial stream or a lake
3. **Nutrients applied to cropland** within a watershed of a stream or lake listed on the state's 303(d) list for impaired biotic communities and /or pathogens without reference to a nutrient management plan
4. **Pesticides applied to cropland** within a watershed of a stream or lake listed on the state's 303(d) list for impaired biotic communities and /or pathogens without reference to a pesticide management plan
5. **Livestock grazing** within ½ mile of a perennial stream or a lake of 10 or more animal units

4.4 Goal and Objectives

The Indiana Lake Michigan Coastal Program Nonpoint Pollution Control Plan and the Regional Watershed Plan for northwest Indian

Critical Area 1- Row Cropland With 2 percent or Greater Slopes

Objective (Objective 1 in 6217 Coastal Plan)
Minimize the delivery of sediment from agricultural lands to surface waters

Action Items (Tasks)	Resources Needed	Responsible Entities	Example Activities and Relative Cost	Measure of Success/Indicator	Time Frame
Work with landowners and operators to develop and apply the erosion control component of a conservation management system (CMS) on their cropland to reduce erosion	• More technical personnel • More funds for cost-sharing/ incentives • Educational resources for educating the public • Cooperation and support from agricultural agencies, organizations and other interest groups	• Natural Resource Conservation Service • Indiana Department of Natural Resources • Purdue Cooperative Extension Service • Indiana Department of Environmental •			

Critical Area 2- Confined Animal Facilities

Objective (Objective 2 in 6217 Coastal Plan)
Minimize the discharge of contaminants from facility wastewater and stormwater runoff

Action Items (Tasks)	Resources Needed	Responsible Entities	Example Activities and Relative Cost	Measure of Success/Indicator	Time Frame
Work with owners and operators of small confined animal facilities to design and implement animal waste storage and waste utilization systems	• Increased technical personnel • More funds for cost sharing/incentives • Educational resources for educating the public • Cooperation and support from agricultural agencies, organizations and other interest groups	• Indiana Department of Environmental Management • Natural Resource Conservation Service • Purdue Cooperative Extension Service • Indiana Department of Natural Resources • Soil and Water Conservation Districts	Inventory small animal feeding operations ($$) Provide technical assistance and outreach on manure management practices ($$) Provide grants for example facilities ($$$)	• Number of manure management plans developed which include the design of a system to collect, store, and properly utilize accumulated solids and wastewater from the confinement facility along with the runoff from storms up to and including 25 year, 24 hour frequency. • Number of animal waste storage facilities installed • Number of animal waste utilization	

Critical Area 3- Nutrients Applied to Cropland

Objective (Objective 3 in 6217 Coastal Plan)

Chapter 5

- Flow regulation
- Bridge and culvert construction
- Draining, filling
- Urbanization

The hydrology of northwest Indiana's two major watersheds has been severely altered from pre-settlement conditions. Both the Little Calumet-Galien and Kankakee watersheds have experienced channelization, diversions, dredging, and drainage of large expanses of marshland. These changes affect water quality. In Chapter 2, Watershed Descriptions, many of these issues were highlighted in the natural history and land use sections. This issue also is discussed specific to the Little Calumet-Galien watershed in the 6217 Coastal Plan and excerpts of that chapter are found below.

5.2 <u>Kankakee River Watershed</u>

The entire length of the Kankakee River has been channelized in Indiana by straightening and relocating the channel. The Kankakee River, pre-channelization, was a naturally meandering river through Indiana, with approximately 2000 bends upstream from Momence, Illinois (IDNR, 1990). Channelization of the Kankakee River was completed in the early twentieth century, by the beginning of World War I. Channelization of the Kankakee River through Indiana has reduced the river to one-third of its historic natural stream distance.

Most tributaries of the Kankakee River are manmade channels, particularly in downstream reaches that discharge into the river. Historically many of the larger tributaries of natural origin outletted into the Kankakee Marsh, however the marsh was drained by excavated ditches (IDNR, et al, 1976). These projects transpired between the late 1800s and early 1900s (IDNR, 1990). The Grand Kankakee Marsh covered over
orof the (m)87.(a)-402,000 acres with the main body varying from 3 to 5 miles in width from the 0015 Tw((rivdes The K)8.6(a)
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Camp Red Mill Lake Dam	46-8	21	21.69
Dingler Lake Dam	46-1	Approx. 16	10
Jack Ragle Low Head Dam	46-12	4.3	1
La Lumiere	46-11	15	15
Seven Springs Lake Dam	46-4	12	42.2
Seybert Lake Dam	46-3	6	1
Wallace Lake Dam	46-9	Approx. 15	38
Walton Lake Dam	46-10	8	19.44
Lakeside Estates Dam	46-13	17.2	2.5
Michigan City Golf Course	46-14	12	1

5.4.3 Wetland Loss

Wetland loss due to hydromodifications and urban development is significant in these watersheds. Historical wetlands estimates based on NRCS hydric soils determinations for Lake, Porter, and LaPorte Counties place one-time wetlands acreage at approximately 360,000 acres. 1986 inventories place the current amount of wetlands at approximately 63,000 acres, or about 82.5 percent loss of previous wetlands acreages in the region. Figure 5-1 represents the wetland change over time.

Roughly five percent, 100 to 200 square miles, of the total land area of the Kankakee River watershed (which lies within all or portions of 9 counties in Indiana and drains 2,989 square miles) is covered by 17,000 to 27,000 wetlands. Of that, approximately four percent are one acre or smaller; 42 percent are between one acre and 10 acres; 42 percent are between 10 acres and 40 acres; and 12 percent are greater than 40 acres (IDNR, 1990). In comparison, approximately 11 percent, 65 to 68 square miles, of the total land area of the Little Calumet-Galien Watershed (which lies within portions of 3 counties in Indiana and encompasses approximately 604 square miles) is covered by 7,242 wetlands. Of that, about 40 percent are one acre or smaller; 48 percent are one acre to 10 acres; 10 percent range from 10 to 40 acres; and 2 percent are greater than 40 acres (IDNR, 1994).

The region’s hydrology also has been impacted by urbanization and hydromodification, as described above. Additional changes include draining and filling of vast acreages of wetlands while native soil surfaces have been replaced with impermeable, urban surfaces. The rich habitat types within the watershed wetland areas are particularly susceptible to degraded water quality. While wetlands often are referred to as the “kidneys” of a natural system due to their ability to filter, contain, and transform nutrients, excessive levels of nutrients tend to drive biologically diverse wetland plant communities toward weedy species. As a result, emergent marshes tend to become dominated by invasive species like narrow leaved cattail or phragmites; sedge meadows are replaced with reed canary grass; and bottomland forests are replaced with sandbar willow and box elder. Animal diversity tends to decline as plant diversity declines.

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FOR LAKE, PORTER, AND LAPORTE COUNTIES

In the Kankakee River watershed, there are two primary tributaries that contribute significant amounts of sediment to the Kankakee River due to streambank erosion. The confluence of the Yellow River into the Kankakee River is at the LaPorte County border. The Yellow River is partially channelized upstream which increases its flow and as it flows through highly erodible soil in Starke County it carries a large amount of sand into the Kankakee River. Even though this occurs outside of the study area, it is important to note the occurrence as it does ultimately affect Lake, Porter, and LaPorte Counties.

In Lake County, streambank erosion occurs along drainage ditches and streams that empty into the Singleton Ditch. The Singleton Ditch was originally dug to drain the marsh that covered much of southern Lake County. The Singleton Ditch has been channelized and today the sediment flows into Illinois and into the Kankakee River.

WATERSHED MANAGEMENT PLAN
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Critical Area 1 – Channelization

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ntial effects of proposed channelization on instream and riparian habitats

asks)	Resources Needed	Responsible Entities	Example Activities and Relative Cost	Measure of Success/Indicator	Time Frame
tal prior to	Technical consultant	Owners of properties affecting channel County Drainage Board	Environmental Assessment ($$)	Percentage of proposed projects with environmental assessments	1 to 5 years

jective 1 in 6217 Coastal Plan)
channelization to reduce undesirable impacts

asks)	Resources Needed	Responsible Entities	Example Activities and Relative Cost	Measure of Success/Indicator	Time Frame

le impact8 13.001 67.98 water Tc- volume, rate,433io

Critical Area 1 – Channelization

Objective 1C (Objective 1 in 6217 Coastal Plan)
Develop an operation and maintenance program with specific timetables for existing modified cha

Critical Area 2 – Wetland Loss

Objective 2A (Objective 5 in 6217 Coastal Plan)
Protect wetlands and riparian areas

Action Items (Tasks)	Resources Needed	Responsible Entities	Example Activities and Relative Cost	Measure of Success/Indicator	Time Frame
• Inventory wetlands • Develop site plans that minimize disturbance of high quality wetlands and riparian areas • Investigate land protection measures for high quality wetlands and riparian areas	• Funding • Technical Assistance • Educational • Land Trusts	• IDEM • IDNR • SWCD • US Army Corps of Engineers • USDA • US Fish & Wildlife	Create and field check wetland maps ($$) Develop ordinances requiring wetland protection and mitigation ($) Investigate creation of regional wetland mitigation banks in disturbed areas ($$)	No net loss of wetlands and riparian areas	1-5 years

Critical Area 2 – Wetland Loss

Objective 2B (Objective 6 in 6217 Coastal Plan)
Restore and enhance wetlands and riparian areas

Action Items (Tasks)	Resources Needed	Responsible Entities	Example Activities and Relative Cost	Measure of Success/Indicator	Time Frame
Inventory wetlands Assess quality of wetlands and riparian areas Develop restoration plan for designated wetlands and riparian areas	• Funding • Technical Assistance • Educational Assistance	• IDEM • IDNR • SWCD • US Army Corps of Engineers • USDA • US Fish & Wildlife	Create and field check wetland maps ($$) Develop ordinances requiring wetland protection and mitigation ($) Investigate creation of regional wetland mitigation banks in disturbed areas ($$)	Increase in quantity and quality of wetlands and riparian areas	1-5 years

Critical Area 3 – Dams

Objective 3A (Objective 2 in 6217 Coastal Plan)
Construction and maintenance of dams must comply with MS4 guidelines

Action Items (Tasks)	Resources Needed	Responsible Entities	Example Activities

Critical Area 3 – Dams

Objective 3C (Objective 3 in 6217 Coastal Plan)
Develop and implement a program to manage dams to minimize problems caused by excess water withdrawal

Action Items (Tasks)	Resources Needed	Responsible Entities	Example Activities and Relative Cost	Measure of Success/Indicator	Time Frame
• Dialogue with any industry or group withdrawing waters from dammed pools	• Technical assistance • Funding	• Owners of Dams and agencies withdrawing water from pools • IDNR-DOW	Program development ($$)	Improved water quality	1 to 2 years

Critical Area 4 – Streambank and Shoreline Erosion

Objective 4A (Objective 4 in 6217 Coastal Plan)
Stabilize streambanks with vegetative materials

Action Items (Tasks)	Resources Needed	Responsible Entities	Example Activities and Relative Cost	

Critical Area 4 – Streambank and Shoreline Erosion

Objective 4B (Objective 4 in 6217 Coastal Plan)
Protect streambank and shoreline features with the potential to reduce nonpoint source pollution

Action Items (Tasks)	Resources Needed	Responsible Entities	Example Activities and Relative Cost	Measure of Success/Indicator	Time Frame
Reduce nonpoint source pollution utilizing protective vegetation to trap soil and sediments and utilize nutrient in growth cycle	• Funds for designing and implementing (bioengineering) plantings along streambanks and shorelines • Local agencies and interest groups to monitor progress of growth and to watch for damaged areas which need maintenance	• Owners of the property • IDNR-DOW • Local interest groups	Identify areas of high streambank erosion potential and property owners ($) Provide technical assistance and local match for 319 and other grant sources for erosion control projects ($$	• No loss of streambanks • Improved water quality	2 to 5 years

Chapter 6
Adoption and Evaluation

6.1 Plan Adoption

This plan and any amendments will be approved by NIRPC's Environmental Management Policy Committee and then adopted by the full NIRPC Commission. It will be consistently reviewed for updates every five (5) years with a comprehensive review every 15 years. Amendments and changes may be made more frequently as laws change or new information becomes available that will assist in providing a better outlook on the Little Calumet-Galien and Kankakee River Watersheds within northwest Indiana. The responsibility for overseeing implementation of the plan falls on the Watershed Advisory Group housed at NIRPC.

Additionally, as the 5-year action steps for implementation of objectives are adopted for the Indiana Lake Michigan Coastal Program Nonpoint Pollution Control Plan they will be sent to the Watershed Advisory Group for review and adoption as an amendment to this plan.

Total Maximum Daily Loads (TMDLs) are scheduled for various waterbodies throughout the implementation time of this plan. As these TMDLs are developed, NIRPC will track and participate in the process. When TMDLs are completed, information and recommendations pertinent to this plan will be integrated into this document.

6.2 Subwatershed Plan Development

This plan was developed to provide a framework for subwatershed plan development. In order to develop detailed subwatershed plans that meet the USEPA/IDEM criteria for watershed plans, the following steps should be followed. (Detailed guidance is available through IDEM's Watershed Management Section - http://www.state.in.us/idem/water/planbr/wsm/index.html):

Task	Relationship to Regional Watershed Plan
Define Watershed	Look at Chapter 2 for existing efforts and use the watershed description as a general description. The subwatershed group should provide more detail for their subwatershed including summarizing any additional subwatershed information or data.
Identify Problems & Causes	Reference and build upon appropriate sections from Chapters 3-5
Identify Sources	Reference and build upon appropriate sections from Chapters 3-5 including providing details on each source (e.g., number of acres of corn) and an estimate of existing loads especially for the Kankakee River watershed were many details were not available for this framework plan.
Identify Critical Areas	Reference and build upon appropriate sections from Chapters 3-5 including the development of load estimates.
Set Goals and Indicators	Build upon the goals and objectives presented in Chapters 3-5 with numeric goals and objectives and corresponding indicators. This should include estimates of load reductions (or target loads) needed to meet water quality standards for each pollutant or target parameter.
Choose Measures/ BMPs	Develop specific management measures/actions by subwatershed for the specific problems, causes, and sources noted including: the identification of tasks, funding sources, estimated load reductions, time frame, responsible parties, and resource needs (i.e., technical assistance and financial). In addition, the planned order of implementation of the measures should be outlined.
Monitor Effectiveness	Develop schedule of milestones and monitoring plan for specific subwatershed.

6.3 Evaluation

Evaluation provides a feedback mechanism for periodically assessing the effectiveness of