



Source: SD1

Pleasant Run Creek Watershed Characterization Report

Prepared for: Sanitation District No. 1 of Northern Kentucky



January 2009

This page is blank to facilitate double sided printing.

Table of Contents

1. Watershed Summary	1
2. Watershed Features	5
2.1 Physical and Natural Features	5
2.2 Land Cover Characteristics	9
2.3 Infrastructure Features.....	12
2.4 Sensitive Areas	16
2.5 Public Interest/Watershed Group Activities.....	21
3. Waterbody Uses	23
3.1 Designated Uses	23
3.2 Current Uses	23
4. Waterbody Conditions	25
4.1 303(d) Status and Pollutants of Concern	25
4.2 Monitoring Programs	25
4.3 Water Quality Data Analysis.....	26
4.4 Biological Conditions.....	28
5. Source Analysis	29
5.1 Watershed Source Analysis.....	29
6. Ranking	31
6.1 Results	31
6.2 Screening to Determine If Additional Data Are Needed.....	31
6.3 Source Prioritization.....	32
6.4 Watershed Ranking	33
7. References.....	35

List of Figures

Figure 1. Pleasant Run Creek Watershed	3
Figure 2. Average Monthly Precipitation and Air Temperature at the Cincinnati Northern Kentucky Airport (1957-2007).....	7
Figure 3. Pleasant Run Creek at Bromley Crescent Springs Road (RM 2.0).	8
Figure 4. Pleasant Run Creek at Oak Street (RM 0.3).....	8
Figure 5. 2007 Land Cover	10
Figure 6. Current and Predicted Future Land Cover.....	11
Figure 7. Sanitary Sewer, Combined Sewer and Storm Water Service Areas	13
Figure 8. Water Supply Features	20
Figure 9. 2006-2007 Base Flow Fecal Coliform Results Compared to the 400 cfu/100ml Criterion.....	27
Figure 10. 2006-2007 Base Flow <i>E. Coli</i> Results Compared to the 240 cfu/100ml Criterion	28
Figure 11. Monitoring Locations and Sources.....	30
Figure 12. Initial Year-Round WAT! Results for Fecal Coliform.....	33

List of Tables

Table 1. Aquatic Habitat and Biological Sampling	9
Table 2. Permitted Discharger	14
Table 3. Combined Sewer Overflow Points	14
Table 4. Sanitary Sewer Overflow Points.....	15
Table 5. Planned or Ongoing Infrastructure Improvement Projects	16
Table 6. Threatened Species and Species of Concern	18
Table 7. Summary of Water Quality Data	25
Table 8. Recent Bacteria Exceedances	26
Table 9. Summary of Potential Sources.....	29
Table 10. Watershed Ranking Considerations.....	31
Table 11. WAT! Watershed Rankings.....	34

1. WATERSHED SUMMARY

Watershed characterization reports are being developed for sixteen watersheds located in Northern Kentucky that lie within Sanitation District No.1's (SD1's) service area. The purpose of the watershed characterization reports is to describe the physical and natural features, land cover, infrastructure, waterbody conditions, potential pollutant sources and other features in each watershed. This information will allow SD1 and other interested parties to develop an understanding of important features, pollutant sources and water quality in the watersheds. This information will also assist SD1 and others in goal-setting, prioritization of improvement projects, and the assessment of the effectiveness of these projects. The watershed characterization reports meet the system characterization element for the receiving water that is required for a combined sewer overflow (CSO) Long-Term Control Plan (LTCP). Additionally, the Consent Decree requires that the Watershed Plans include elements of a LTCP.

The Pleasant Run Creek watershed is located within Kenton County in the North Study Basin (Figure 1). This creek originates north of Fort Mitchell and flows northward to the Ohio River, draining a predominantly developed watershed.

The Kentucky Division of Water (KDOW) has designated this creek and its tributaries for warm water aquatic habitat, primary contact recreation, secondary contact recreation and domestic water supply, at applicable points of withdrawal. This creek does not appear on the 303(d) list of impaired waterbodies (KDOW, 2008).

A comparison of recent data to applicable water quality criteria reveals elevated bacteria levels. Biological data are limited, but indicate good conditions at the one site assessed. An aquatic habitat assessment at this location indicates the site is partially supporting of aquatic habitats.

Potential pollutant sources in this watershed include: combined sewer overflows (CSOs), sanitary sewer overflows (SSOs), storm water runoff and septic systems. The potential for these sources to generate fecal coliform bacteria has been assessed using a Watershed Assessment Tool (WAT!)¹. The WAT! identifies the potential sources within a watershed and estimates their possible impact. It also allows SD1 to compare and rank the sixteen different Northern Kentucky watersheds.

The WAT! calculated a slightly higher than average fecal coliform loading potential for year-round conditions and a very low loading potential for base flow conditions. Overland runoff is predicted to be the dominant source under year-round conditions and septic systems are predicted to be the dominant source under base flow conditions.

The WAT! ranking is one of several factors that should be considered when prioritizing watersheds for improvement projects. Other factors include moderate public interest, the absence of any drinking water intakes or special designations, the location of portions of this watershed in Source Water Assessment and Protection Zone 2, and the identification of one aquatic-dependent threatened species in the watershed.

¹ The WAT! is still under development. All results presented here are for illustrative purposes only. The results are subject to change and should therefore not be relied on or considered definitive.

No additional data, beyond those already planned for collection are recommended to understand current conditions in the watershed. However, additional biological and habitat assessments would be useful in the future to assess improvements as projects are implemented. Additionally, an investigation of dry weather sources to determine whether the parcels potentially served by septic systems are truly on septic would be useful to better define fecal coliform loads during dry weather.

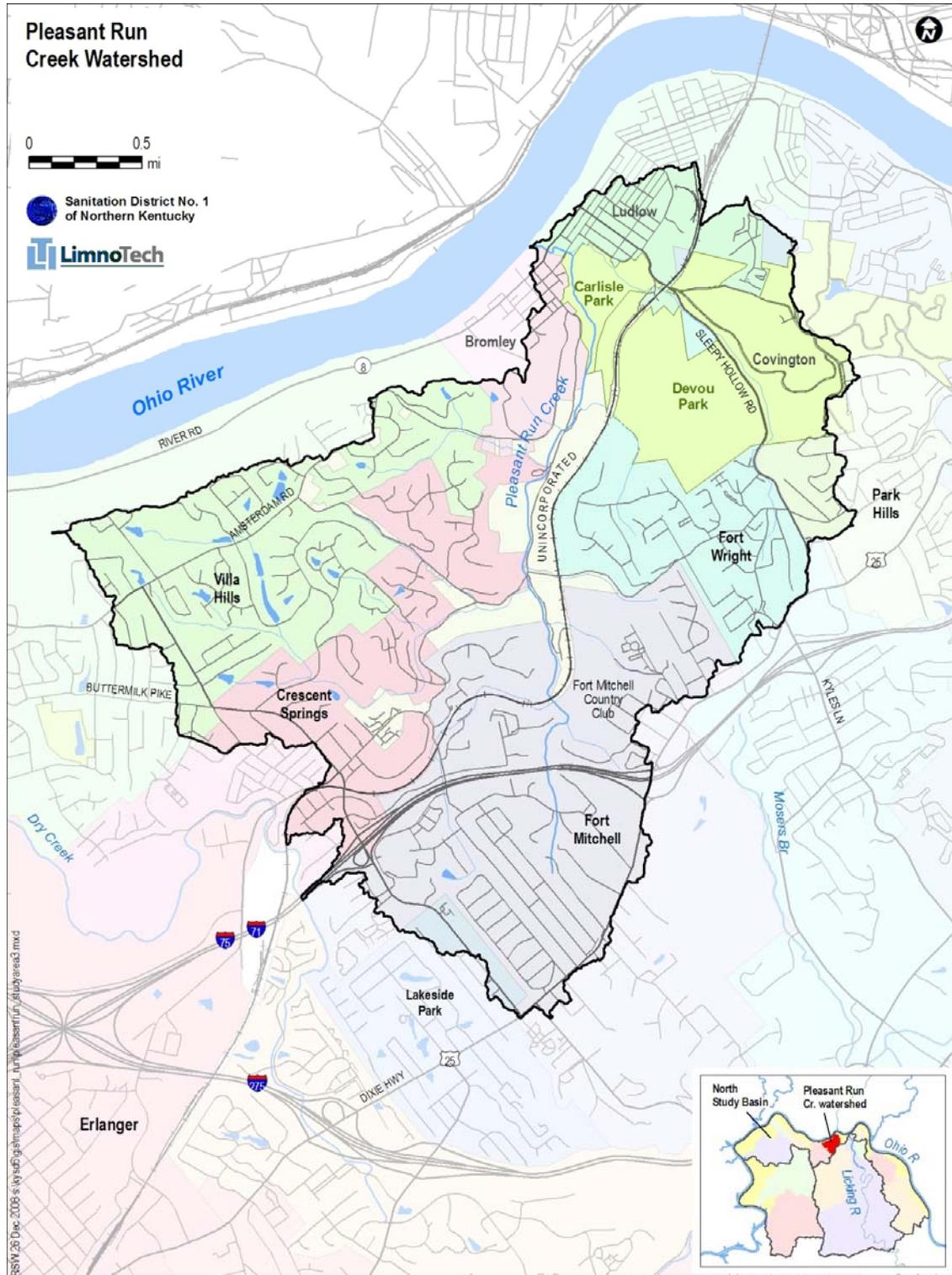


Figure 1. Pleasant Run Creek Watershed

This page is blank to facilitate double sided printing.

2. WATERSHED FEATURES

Pleasant Run Creek originates near Fort Mitchell and flows northward through Kenton County to the Ohio River, draining a 6.5-square mile watershed. This creek is approximately 3.3 miles in length and has several unnamed tributaries.

2.1 PHYSICAL AND NATURAL FEATURES

The following sections describe key features of the watershed and creek, including hydrology, geology, topography, soils, climate, and habitat. These features are important because they affect land uses, and shape the chemical, biological, and hydrological characteristics of Pleasant Run Creek.

2.1.1 Hydrology

Pleasant Run Creek drains a highly developed watershed. This creek is shallow through most of its length, and during a site visit in January 2007, water depth was observed to range between 0.3 and 1.5 feet downstream of River Mile (RM) 2.0. Backwater effects from the Ohio River have been observed near the mouth of this creek.

In 1894 Pleasant Run Creek was impounded upstream of Oak Street, forming a large lake. An amusement park, Ludlow Lagoon, was built adjacent to the lake. The park flooded in 1913, and subsequent events led to the closing of the park. The lake was filled in 1967 and Carlisle Park now occupies a portion of this site (KCPL, 2008).

There is one active USGS continuous monitoring station in the watershed (03260015) Pleasant Run Creek at Oak Street near Ludlow, Kentucky. This station began operation in fall 2007 and has a drainage area of 6.4 square miles. Flows recorded at this station were not available at the time of this report. Located in the northern portion of the watershed, the community of Bromley is subject to periodic flooding (KCPC et al., 2006). This is supported by historical peak stream flow data recorded from two USGS gages for the period 1970-1989 (USGS, 2001).

The 100-year floodplain is generally restricted to the low-lying areas adjacent to Pleasant Run Creek upstream to RM 2.3, and the low-lying areas adjacent to an unnamed tributary that joins Pleasant Run Creek near RM 0.3. The floodplain upstream of RM 1.0, tends to be narrower and confined by steeper slopes.

2.1.2 Geology

The Pleasant Run Creek watershed is located in the Outer Bluegrass Physiographic² Region, which is underlain primarily by Ordovician-age interbedded limestone and shale (Ray et al., 1994). Although most of this watershed is underlain by bedrock with a moderate potential for karst development (Paylor and Currens, 2002), rocks in this region generally contain higher percentages of shale layers and do not develop extensive karst features (Ray et al., 1994)³.

² Physiographic regions are based on differences in geology, topography and hydrologic regime. The State of Kentucky is divided into five physiographic regions.

³ In areas with karst, an almost immediate connection between groundwater and surface water can exist, short-circuiting any attenuation of pollutant loads that might otherwise occur.

The mainstem of this creek cuts through the erodible shale found in the Kope formation. Groundwater yield varies depending on geological formation, and is generally much less available on hilltops and hillsides. Wells in the valley bottoms can yield 100-500 gallons per day; however, water is hard and may contain salt and hydrogen sulfide (Carey and Stickney, 2005).

2.1.3 Topography

The Pleasant Run Creek watershed is characterized by rolling hills and steep valleys. Stream channels are narrow near the headwaters, but widen as they approach the Ohio River. As the creek approaches the Ohio River (between Bromley and Ludlow), the slopes flatten and minor relief is observed.

The highest elevations in the watershed (919 feet) are found on the southeastern edge of the watershed, on hilltops near the Kyles Lane and Dixie Highway in Fort Wright. Elevations nearly as high are seen at the far western edge of the watershed, on a steep bluff above the Ohio River. The lowest elevation in the watershed (453.6 feet at normal Ohio River pool) occurs at the mouth of the creek.

2.1.4 Soils

The nature of soils and topography in a watershed play an important role in both the amount of runoff generated and the amount of soil erosion that can occur. Most (84%) of the soils in the Pleasant Run Creek watershed are classified as hydrologic soil group C (NRCS, 2006), meaning they have slow infiltration rates when thoroughly wetted.

Roughly 50% of the soils in the watershed are ranked “highly erodible”, and the remaining soils are ranked “fairly erodible” as indicated by an index for erodibility (NRCS, 2006). The erodibility of soils is important when soils are disturbed through activities such as land clearing for new development. As discussed in Section 2.2.2, this watershed, while currently well-developed, is expected to undergo additional development in the future.

2.1.5 Climate

The temperatures in this area are generally lowest in January and highest in July. Precipitation averages 41.2 inches annually, with the wettest months observed between March and July. Minimum precipitation is recorded in the fall and late winter as shown in Figure 2 (NCDC, 2008).

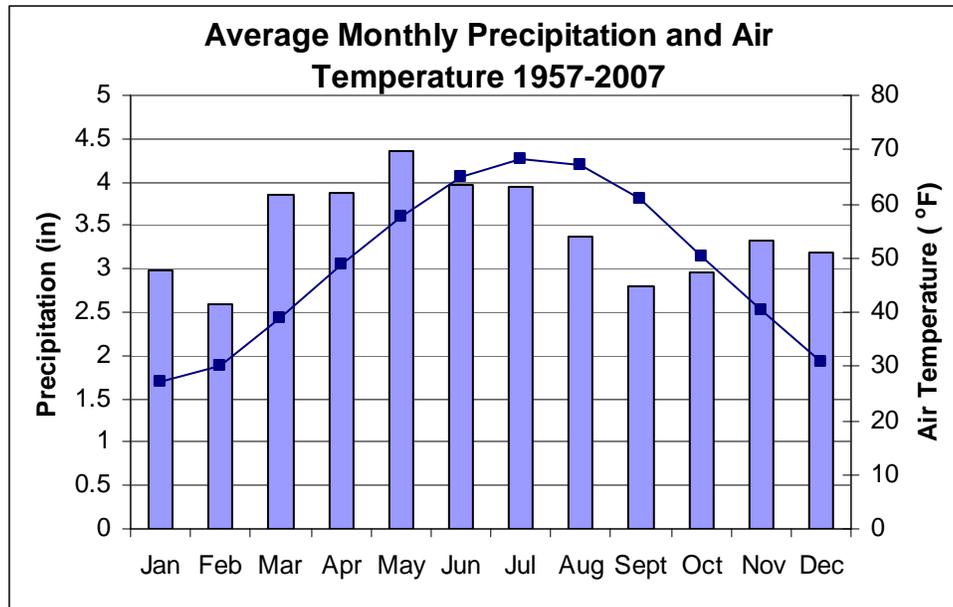


Figure 2. Average Monthly Precipitation and Air Temperature at the Cincinnati Northern Kentucky Airport (1957-2007)

2.1.6 Habitat

This watershed lies within the Outer Bluegrass ecoregion⁴, which is characterized by sinkholes, springs, entrenched rivers and intermittent and perennial streams (Woods et al., 2002). Wetlands are not common in this ecoregion and comprise less than 1% of this watershed. Streams typically have relatively high levels of suspended sediment and nutrients. Glacial outwash, which tends to be highly erodible, exists in a few areas in this ecoregion.

Pre-settlement conditions in this ecoregion consisted of open woodlands with barren openings (Woods et al., 2002) and vegetation was mostly oak-hickory, with some white oak, maple-oak-ash and American beech-sugar maple forests (Woods et al., 2002). As described in Section 2.2, natural habitats have been altered from pre-settlement conditions.

A 2007 visit to the area showed that in most places, the creek is generally low-gradient, less than 1.5 feet deep and has cobble substrate (Figure 3). Near its mouth, Pleasant Run Creek receives backwaters from the Ohio River (Figure 4).

Aquatic habitat⁵ was assessed at one site on Pleasant Run in 2004. Results from this survey indicate aquatic habitats are partially supporting of a diverse and productive ecosystem (Table 1).

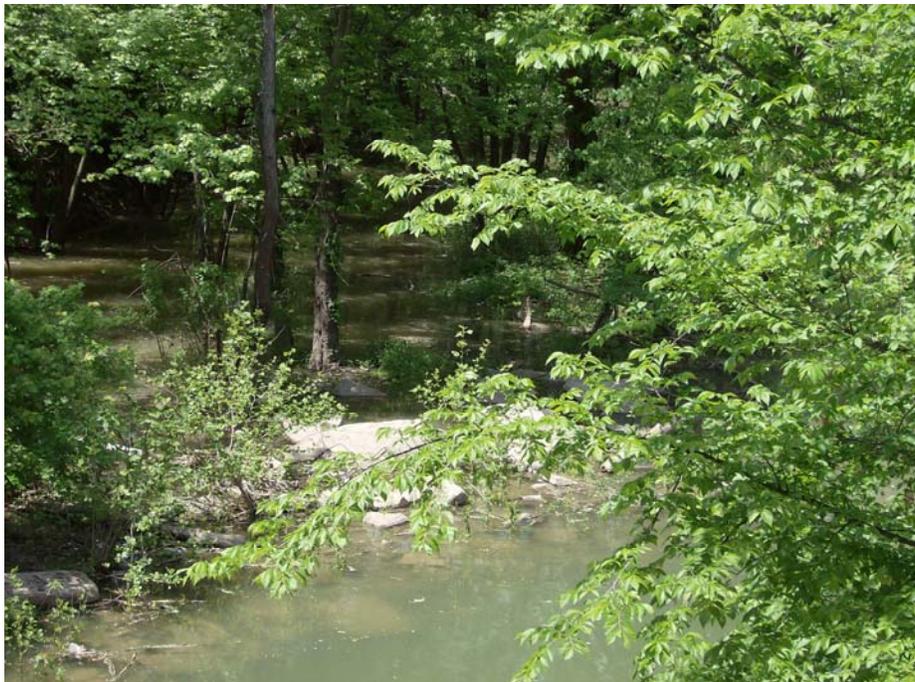
⁴ Ecoregions denote areas of general similarity in ecosystems and in the type, quality, and quantity of environmental resources (Woods et al., 2002).

⁵ This assessment was conducted using EPA-established protocols. KDOW rated several components of physical habitat within the stream such as epifaunal substrate, embeddedness, sediment deposition, channel flow status, bank stability and riparian vegetation zone width, among others.



Source: SDI

Figure 3. Pleasant Run Creek at Bromley Crescent Springs Road (RM 2.0)



Source: SDI

Figure 4. Pleasant Run Creek at Oak Street (RM 0.3)

Table 1. Aquatic Habitat and Biological Sampling

Stream	River Mile	Monitoring ^a			
		Habitat		Macroinvertebrates	
		Year	Ranking	Year	Ranking
Pleasant Run Creek	1.8	2004	Partially supporting	2004	Good

^a SD1 completed sampling in 2008. These data were not available at the time of this report, but will be included in future updates.

2.2 LAND COVER CHARACTERISTICS

Land cover and land use play an important role in the quantity and quality of runoff into receiving waters. Current and future land cover in the Pleasant Run Creek watershed are described below.

2.2.1 Current Land Cover

The Kentucky Division of Geographic Information, Commonwealth Office of Technology provided a GIS dataset showing 2005 Kentucky land cover. This dataset was updated and improved to approximate 2007 land cover conditions (Figure 5) using a variety of other datasets that represent current impervious conditions (roads, parking lots, buildings), open space lands (including parks), and surface waters.

This watershed is highly developed and contains portions of ten communities: Fort Mitchell, Villa Hills, Crescent Springs, Covington, Fort Wright, Ludlow, Bromley, Park Hills, Lakeside Park and Crestview Hills. Devou Park, located in the northeast portion of the watershed, provides a large open area in the Pleasant Run watershed. Other large open spaces in this watershed include the Fort Mitchell Country Club, Carlisle Park (formerly the Ludlow Lagoon site (section 2.1.1)), and several sports complexes and swim clubs.

The majority (69%) of the watershed is developed, resulting in an impervious cover of 18%. Aside from forest (28%), other land uses appear in only small amounts.

2.2.1.a Animal operations

There are no permitted concentrated animal feeding operations (CAFOs) or animal feeding operations (AFOs) located in this watershed (Kentucky Geographic Network, 2008, 2008a). There is little to no agricultural activity in this watershed and no evidence of livestock was found through a site visit and a review of Conservation District files.

2.2.1.b Septic Systems

SD1 estimates that there are very few parcels (<0.5% of all parcels) that are potentially serviced by septic systems.

Estimates of septic system failure rates are not available for Kenton County; however anecdotal reports from Health Department inspectors suggest that 10% of the septic systems may be operating improperly due to incorrect installation, lack of maintenance or age of the system (NKHD, 2008).

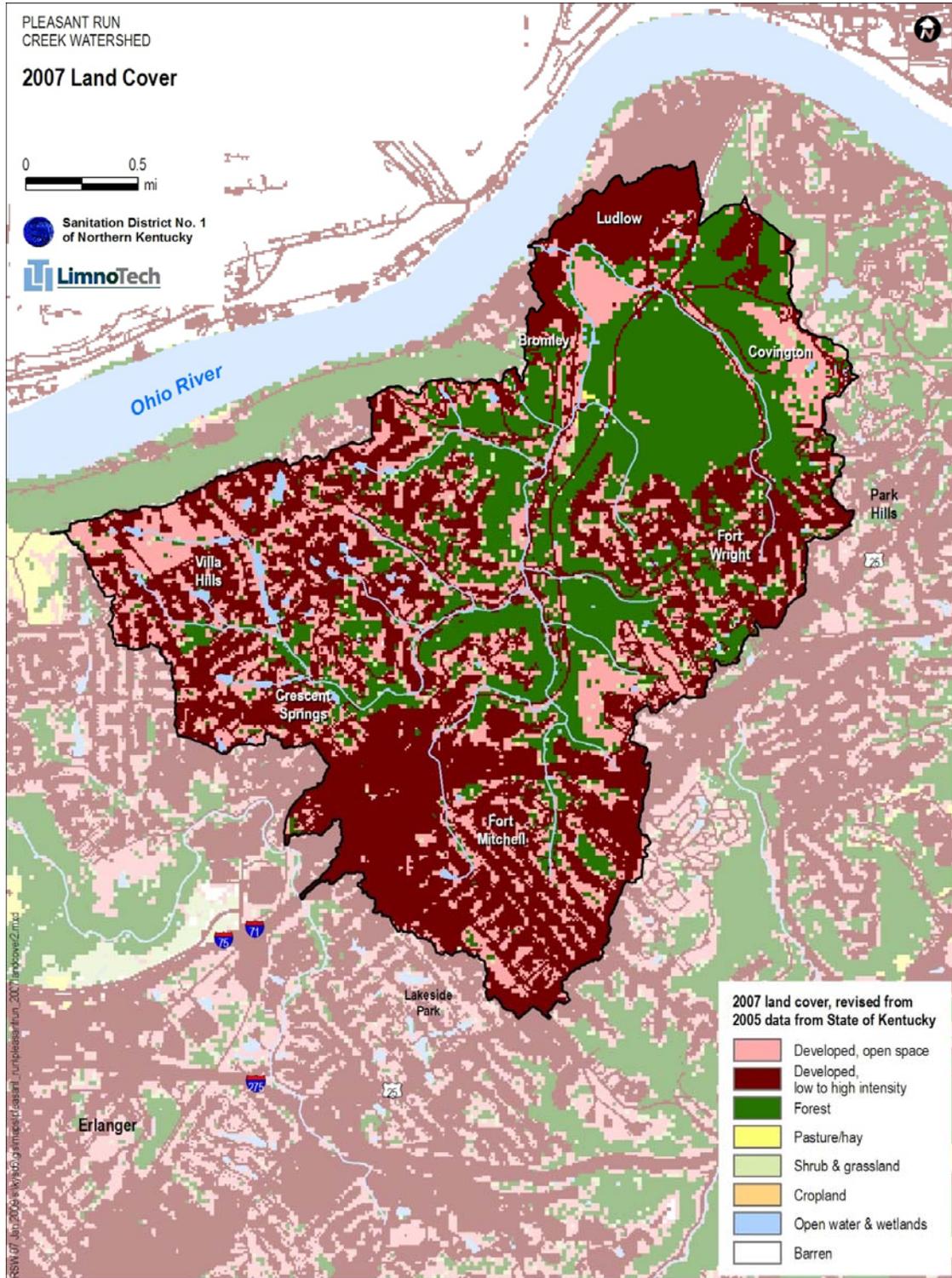


Figure 5. 2007 Land Cover

2.2.2 Future Conditions

The Pleasant Run Creek watershed is highly developed and additional development is predicted in the future, replacing land that is currently forested. Undeveloped lands are predicted to remain primarily on steep slopes adjacent to the creek or within parks.

Some pavement rehabilitation is planned for I-75, but no other major road construction, relocation or improvement projects were identified within the watershed (Kentucky Transportation Cabinet, 2006).

2.2.2.a Future land cover

Future land cover was developed by modifying 2007 land cover to reflect potential future conditions (roughly 2030) obtained from SD1 and the Northern Kentucky Area Planning Commission (NKAPC). It is predicted that developed lands will increase from 69% to 72% (Figure 6) and impervious surfaces in the watershed are predicted to increase from 18% to 19%.

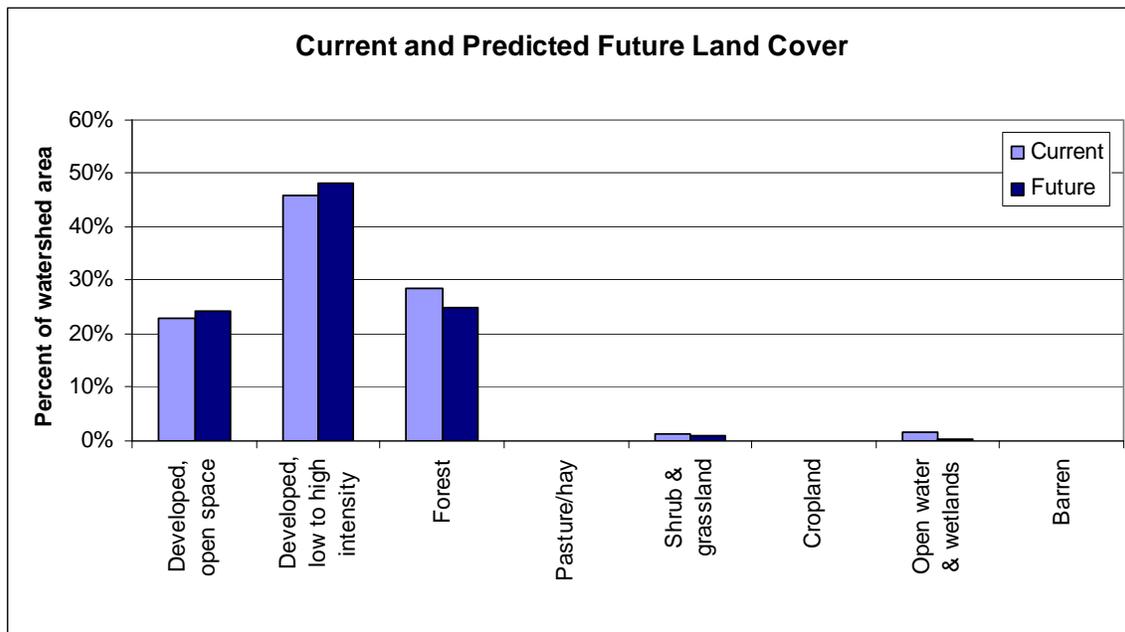


Figure 6. Current and Predicted Future Land Cover

2.3 INFRASTRUCTURE FEATURES

This section summarizes infrastructure features for this watershed⁶.

Approximately 86% of this watershed is located within SD1's sanitary sewer service area. This area contains approximately 70.6 miles of separate sanitary sewer lines.

Approximately 14% of this watershed is within SD1's combined sewer area. This area contains approximately 12.5 miles of combined sanitary sewers lines.

The entire Pleasant Run Creek watershed lies within SD1's storm water service area. The storm water system is comprised of approximately 51.8 miles of streams and channels and approximately 44.8 miles of pipes.

The extent of the sanitary sewer, combined sewer and storm water service area in this watershed is shown in Figure 7.

⁶ SD1 is undertaking a characterization and assessment of the sewer system, and overflows identified herein are subject to change. Information on the sanitary and storm water system in Section 2.3 was queried from SD1's geodatabase accessed on November 21, 2008.

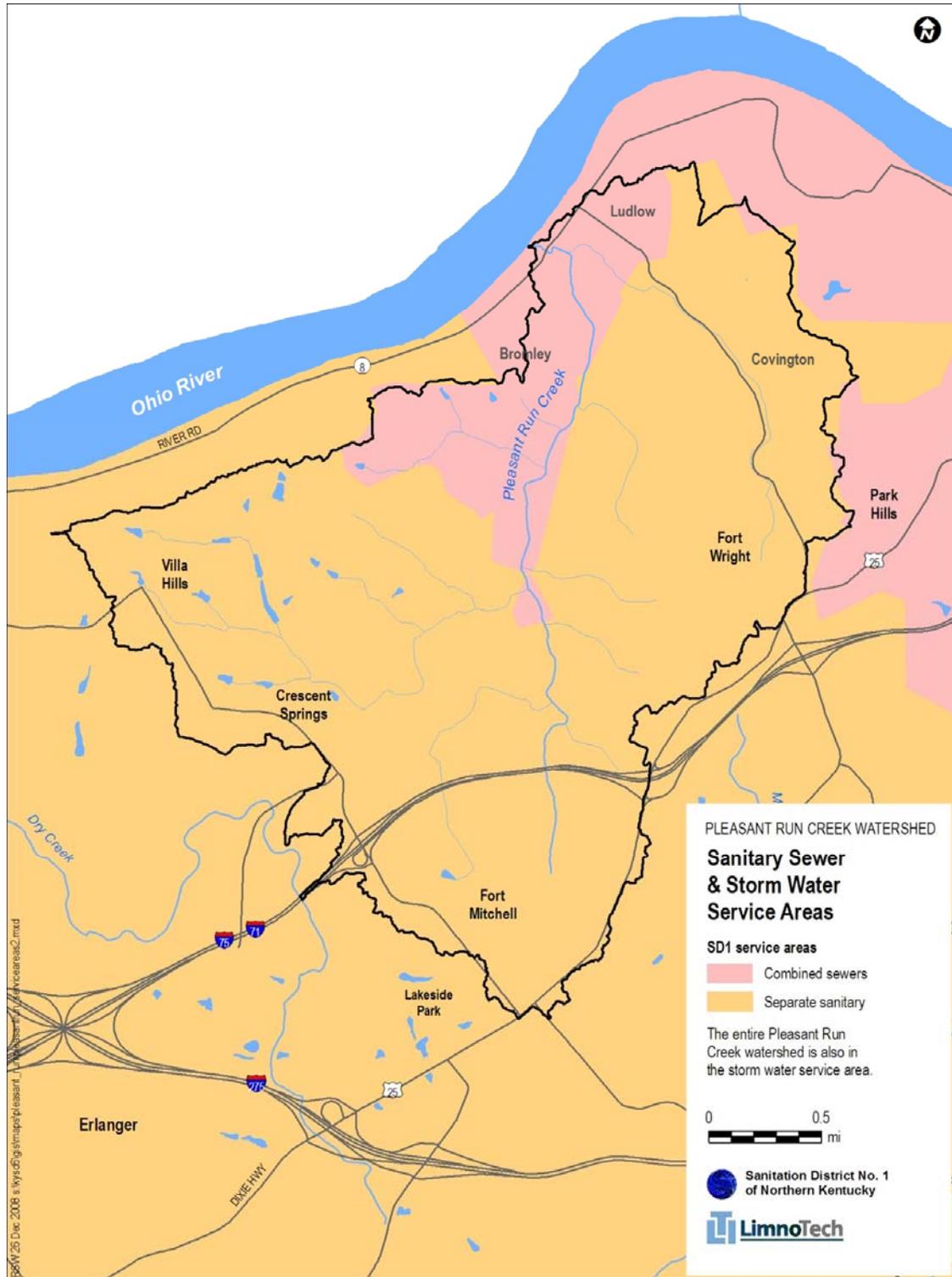


Figure 7. Sanitary Sewer, Combined Sewer and Storm Water Service Areas

2.3.1 Point Sources and Infrastructure

The occurrence of KPDES-permitted discharges, sewer overflows and storm water discharges is discussed below.

2.3.1.a KPDES dischargers

One KPDES-permitted discharger is located in the Pleasant Run watershed (Table 2). The discharger holds an individual permit for storm water runoff. Permitted CSOs are not included in this tally and are discussed separately.

Table 2. Permitted Discharger

Receiving Water	KPDES ID	Facility Name	Outfall	Permit Type	Outfall Description	Permit Violations
Pleasant Run Creek	KY0001406	BP Pipelines North America Inc.	0011	Minor	Storm water runoff	Oil and grease, TSS

Based on a review of recent effluent monitoring data (January 2007 to June 2008), it was observed that this permitted discharger has violated its permit limits for total suspended solids, and oil and grease.

2.3.1.b Sewer overflows

There is one permitted combined sewer overflow (CSO), located near the mouth of Pleasant Run Creek (Table 3). The other CSO^b is located near the intersection of Main and Highwater Road.

Table 3. Combined Sewer Overflow Points

Manhole ID	Common Name	Direct Discharge to Waterbody?	Typical Year Spill Frequency (Number) ^a	Typical Year Volume (MG) ^a
1730259	KPDES outfall 75	Pleasant Run Creek	31	2.99
1730262 ^b		Pleasant Run Creek	0	0.00

^a The results presented were generated by models based on SD1's current understanding of the collection system infrastructure. These models are predictive tools and are based on numerous variables and assumptions on the characteristics of the collection system, and may differ from actual field conditions. These models are subject to change based on improved knowledge of the system, improvements to the system, and changes in land use and development. These results are subject to change and should therefore not be relied on or considered definitive.

^b This is a "to be permitted" CSO, i.e., SD1 has (or will) identified this location for KPDES permitting.

There are 11 SSOs in the Pleasant Run Creek watershed, which are primarily located in the southern and eastern portions of the watershed. SSOs are listed in Table 4.

Table 4. Sanitary Sewer Overflow Points

Manhole ID	Direct Discharge to Waterbody?	Typical Year Spill Frequency (Number) ^a	Typical Year Volume (MG) ^a
1680001	Pleasant Run Creek	6	0.07
1690043	Pleasant Run Creek	2	<0.01
2290001	Pleasant Run Creek	1	0.02
1730104	Pleasant Run Creek	1	0.01
1620001	Pleasant Run Creek	0	0.00
1560019	No ^b	0	0.00
1560016	No ^b	0	0.00
1560074	No ^b	0	0.00
1600113	No ^b	0	0.00
1730110	No ^b	0	0.00
1700025	No ^b	0	0.00

^a The results presented were generated by models based on SD1's current understanding of the collection system infrastructure. These models are predictive tools and are based on numerous variables and assumptions on the characteristics of the collection system, and may differ from actual field conditions. These models are subject to change based on improved knowledge of the system, improvements to the system, and changes in land use and development. These results are subject to change and should therefore not be relied on or considered definitive.

^b Greater than 50 feet from waterbody.

2.3.1.c Storm water discharges

Storm water outfalls are located throughout most of the Pleasant Run Creek watershed with the highest concentration in the western portion of the watershed. In addition to storm water outfalls, there are approximately 26 suspected illicit activity points (SIAs), which are located throughout the watershed. SIAs are locations where there was possible evidence of illicit discharges during SD1's storm water mapping project (2001-2002). These locations are being further investigated to determine if they are recurring.

A storm water outfall covered by an individual KPDES permit is discussed in Section 2.3.1.a.

2.3.2 Recently Completed Infrastructure Projects

Several infrastructure projects completed in 2006 and 2007 have the potential to reduce wet-weather collection system overflows in this watershed. These projects either reduce infiltration and inflow, increase conveyance capacity, or increase treatment capacity/efficiency at the Dry Creek Wastewater Treatment Plant:

- Beechwood Outfall Sewer – completed 2007
- Large Diameter Sewer Assessment Program – Phase III – completed 2007

In addition, the Highwater Sewer Assessment Project was completed in 2005. This project involved extending sewer lines, giving eleven properties the opportunity to connect to sewer service.

2.3.3 Planned or Ongoing Infrastructure Improvement Projects

One infrastructure project is ongoing in this watershed. This is the elimination of the Riverwatch pump station, which will eliminate the risk of pump station overflows at this location.

Project information is presented in Table 5.

Table 5. Planned or Ongoing Infrastructure Improvement Projects

Capital Improvement Project Title	Goals	Anticipated Start Date	Anticipated Completion Date	Project Total
Riverwatch pump station elimination	Eliminate Riverwatch pump station	2008	End of 2008	To be determined

2.4 SENSITIVE AREAS

The federal CSO Control Policy (USEPA, 1994) states EPA's expectation that a permittee's Long-Term Control Plan (LTCP) give the highest priority to controlling CSOs in sensitive areas. The CSO Control Policy indicates that sensitive areas include:

- Waters designated as Outstanding National Resource Waters (ONRW);
- Waters with threatened or endangered species and their habitat;
- Waters with primary contact recreation, such as bathing beaches;
- Public drinking water intakes and their designated protected areas;
- National Marine Sanctuaries (NMS) and
- Shellfish beds.

These six criteria were evaluated individually. None of the waters have been designated by the State of Kentucky as Outstanding National Resource Waters (401 KAR 10:030), and no National Marine Sanctuaries have been designated within the project study area (NOAA, 2008). There are no known commercial shellfish beds within the Pleasant Run Creek watershed, nor is shellfish harvest for consumption by private individuals known to occur. The remaining three criteria are discussed below.

2.4.1 Threatened and Endangered Species or Their Designated Critical Habitat

Threatened and endangered species, species of concern and their designated critical habitat within the Pleasant Run Creek watershed area were identified by contacting the Kentucky State Nature Preserves Commission (KSNPC). KSNPC identified one threatened species, Kirtland's snake (*Clonophis kirtlandii*) (Table 6) that relies upon aquatic habitats (KSNPC, 2007).

Kirtland's snake inhabits prairie wetlands and stream riparian areas. The main cause of Kirtland's snake population declines is human activities, especially housing development and habitat alteration (NatureServe, 2007).

The northern leopard frog is an amphibian that inhabits various aquatic habitats including slowly flowing areas in creeks and rivers, springs, the nearshore area of lakes, bogs, fens, herbaceous wetlands, riparian areas and grasslands (NatureServe, 2007). This frog is a state species of special concern. Threats to the northern leopard frog include habitat loss,

commercial overexploitation and competition with introduced species (NatureServe, 2007).

Although not reliant upon aquatic habitats, two state species of concern, the sixbanded longhorn beetle and redback salamander, are listed for the watershed. This six banded longhorn is dependent upon climax forest where it feeds primarily on sugar maple (Perry et al., 1974; Schweitzer, 1989). The redback salamander, a woodland species, is sensitive to localized habitat loss due to timber harvest and habitat degradation (NatureServe, 2007).

Table 6. Threatened Species and Species of Concern

Taxonomic Group	Scientific name	Common name	Status ^a	Last Observed	Habitat(s)	Identified Threats
Insects	<i>Dryobius sexnotatus</i>	Sixbanded longhorn beetle	Federal – SOMC State - Threatened	N/A	Hardwood forests ^c	Habitat loss
Amphibians	<i>Plethodon cinereus</i>	Redback salamander	State – Special Concern	1983	Woodlands ^b	Habitat loss, habitat degradation ^b
Amphibians	<i>Rana pipiens</i>	Northern leopard frog	State - Special Concern	1930	Ponds, wetlands, grasslands, stream riparian areas	Habitat loss, non-native species, commercial overexploitation ^b
Reptiles	<i>Clonophis kirtlandii</i>	Kirtland's snake	Federal - SOMC State - Threatened	1960	Prairie wetlands, stream riparian areas	Habitat loss ^b

^aSpecies of Management Concern (SOMC) is a Federal/ESA Designation

^b NatureServe, 2007

^c Perry et al., 1974; Schweitzer, 1989

2.4.2 Primary contact recreation waters

Kentucky does not have a tiered approach for primary contact recreation (PCR). This means that the State has designated that all PCR waters should be suitable for full body contact recreation during the recreation season of May 1 through October 31 (401 KAR 10:001E). However, the State water quality standards do not define full body contact recreation, so the bacteria criteria that have been developed are based on the presumption that people will ingest the water and could therefore become ill if the water was sufficiently contaminated with bacteria.

Pleasant Run Creek and its tributaries are designated for PCR. It is not clear whether or not swimming activity occurs in the creeks, as public surveys regarding that information are unavailable. No public swimming beaches were identified in the watershed. Additional data will be gathered about uses of the creek.

2.4.3 Public drinking water intakes or their designated protection areas

There are no public drinking water intakes from surface waters in this watershed. The nearest public drinking water intake from surface waters is located on the Ohio River near Louisville, Kentucky.

Source Water Assessment and Protection (SWAPP) zones for the Ohio River intakes are determined by the Ohio River Valley Water Sanitation Commission (ORSANCO). SWAPP zones are not used in a regulatory sense, but are delineated to identify potential contaminants upstream of water intakes and are used to support identification of sources potentially impacting the intakes. ORSANCO has determined that this entire watershed lies within SWAPP Zone 2, reflecting the fact that this watershed is more than 25 miles upstream of the Louisville intake.

Drinking water supply features are shown in Figure 8.

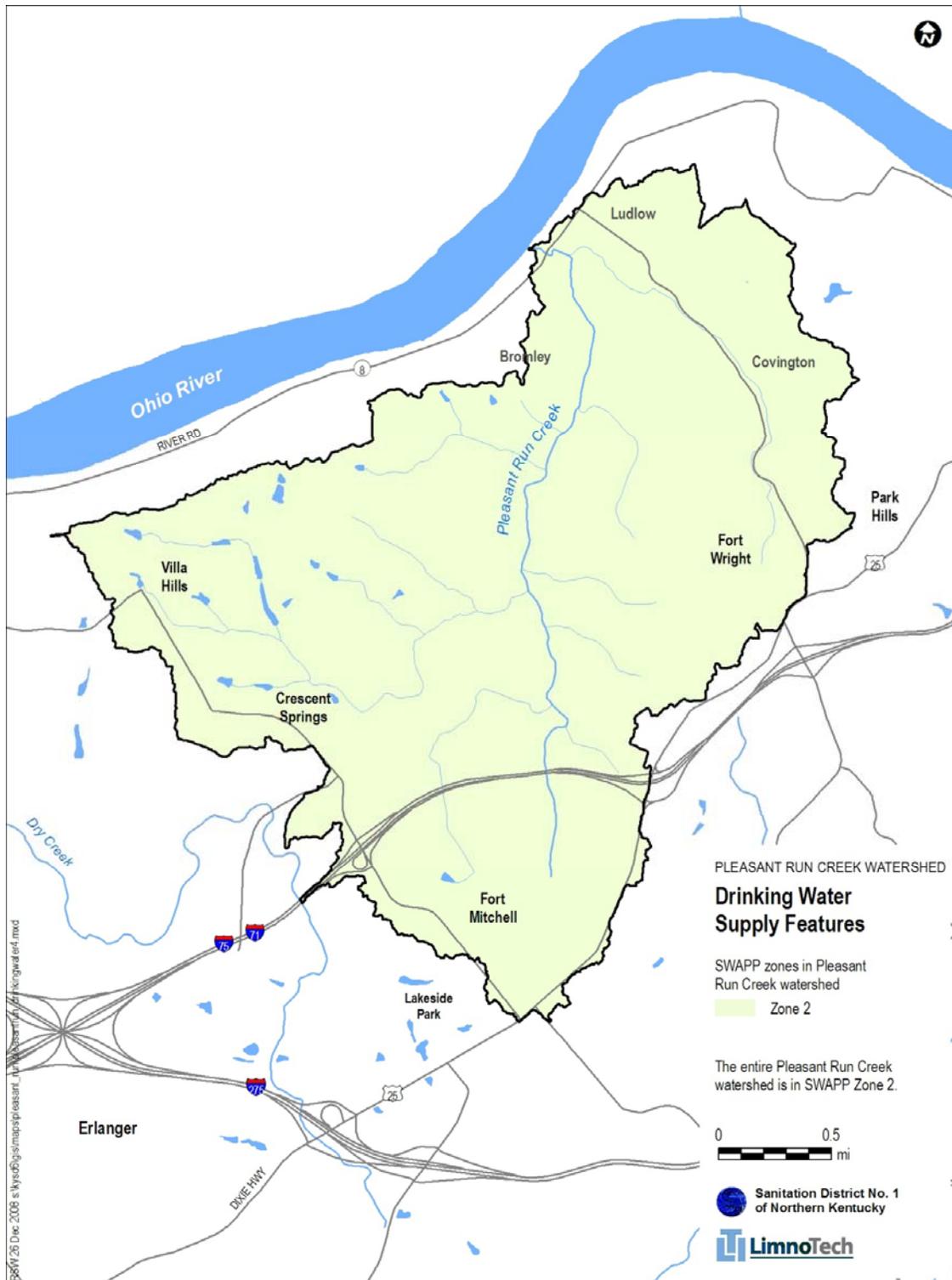


Figure 8. Water Supply Features

2.5 PUBLIC INTEREST/WATERSHED GROUP ACTIVITIES

Public interest in this watershed is gauged through sampling by the Licking River Watershed Watch at two locations, and good attendance at public meetings related to Devou Park improvements. As such, public interest in this watershed is rated moderate.

The Master Plan for Devou Park was approved July 2008. This plan includes initiatives to improve the parkway through the park, park entrances, roads, shelters, and trails (http://www.covingtonky.com/index.asp?page=devou_master_plan_final). In addition to these initiatives, the plan includes strategies for stream restoration within Devou and Carlisle Parks, bank stabilization efforts and greenway enhancements.

This page is blank to facilitate double sided printing.

3. WATERBODY USES

This section describes designated and current uses for Pleasant Run Creek and its tributaries.

3.1 DESIGNATED USES

Pleasant Run Creek and its tributaries are designated for warm water aquatic habitat, primary contact recreation, secondary contact recreation and domestic water supply, applicable at existing points of public water supply withdrawal (401 KAR 10:026). These are defined below.

- **Warm water aquatic habitat** means any surface water and associated substrate capable of supporting indigenous warm water aquatic life.
- **Primary contact recreation** waters means those waters suitable for full body contact recreation during the recreation season of May 1 through October 31.
- **Secondary contact recreation** waters means those waters that are suitable for partial body contact recreation, with minimal threat to public health due to water quality.
- **Domestic water supply** means surface waters that with conventional domestic water supply treatment are suitable for human consumption through a public water system as defined in 401 KAR 8:010, culinary purposes, or for use in any food or beverage processing industry; and meet state and federal regulations under the Safe Drinking Water Act, as amended, 42 U.S.C. 300f - 300j.

3.2 CURRENT USES

An assessment of available information found the following:

- Aquatic habitat has been assessed at one location in 2004 and was rated as “partially supporting,” of a diverse and productive aquatic ecosystem.
- Biological conditions have been assessed at one location in 2004 and the macroinvertebrate MBI score for this site indicates the stream is in good health.
- A statewide fish consumption advisory was issued on April 11, 2000 due to low levels of organic mercury found in fish taken from Kentucky waters (KDOW, 2007).
- There are currently no swimming advisories for waterbodies in this watershed. However, KDOW and the Division of Public Health Protection and Safety in the Cabinet for Health and Family Services recommend against swimming or other full-body contact with surface waters immediately following heavy rainfall events, especially in dense residential, urban and livestock production areas (KDOW, 2007a).
- No fishing access sites were found in the watershed (<http://kygeonet.ky.gov/kdfwr/viewer.htm>).
- There are no surface drinking water intakes in this watershed.
- There are no active public water supply groundwater wells in this watershed (KDOW, 2008a; KDOW, 2007b).

This page is blank to facilitate double sided printing.

4. WATERBODY CONDITIONS

This section describes monitoring programs and observed water quality and biological conditions in this watershed.

4.1 303(d) STATUS AND POLLUTANTS OF CONCERN

Pleasant Run Creek is not listed on Kentucky's 303(d) list of impaired waters (KDOW, 2008).

4.2 MONITORING PROGRAMS

Water quality data have been collected in this watershed by KDOW, USGS and SD1. Data currently compiled by SD1 from known monitoring programs are presented in Table 7, however, only data which have been fully analyzed are discussed in Section 4.3 Water Quality Data Analysis. Available data exist for the main stem of Pleasant Run Creek, as well as an unnamed tributary to Pleasant Run.

Data not included in this report will be reviewed and included in subsequent updates.

Table 7. Summary of Water Quality Data

Entity	Dates	Parameters Sampled	Sampling Locations ^b	Number of Samples
KDOW	2004	Alkalinity, chloride, dissolved oxygen (DO), hardness, pH, conductivity, sulfate, total organic carbon (TOC), total suspended solids (TSS), temperature, nutrients	Pleasant Run Cr. RM 1.8	1 sample (7/9/2004)
SD1	2006	Fecal coliform, E. coli, DO, pH, conductivity, turbidity, temperature	Pleasant Run Cr. RM 0.3, 2.0	2 samples from baseline survey (10/3/2006 & 10/23/2006)
SD1	2007	Fecal coliform, E. coli, carbonaceous biological oxygen demand (5-day), DO, pH, conductivity, TSS, temperature, turbidity, nutrients	Pleasant Run Cr. RM 0.3, 2.0	1 sample from baseline survey (8/15/2007)
SD1	2008 ^a	Fecal coliform, E. coli, carbonaceous biological oxygen demand (5-day), DO, pH, conductivity, TSS, temperature, turbidity, nutrients	Pleasant Run Cr. RM 0.3, 2.0, Unnamed Trib RM 0.8 of Pleasant Run Cr RM 0.4	1 sample from baseline survey (8/28/2008)
SD1	2008 ^a	Fecal coliform, E. coli, carbonaceous biological oxygen demand (5-day), DO, pH, conductivity, TSS, temperature, turbidity, nutrients, metals and hardness	Pleasant Run Cr. RM 0.3, 2.0, Unnamed Trib RM 0.8 of Pleasant Run Cr RM 0.4	3 wet weather events in May and June
USGS	2007-present ^a	Gage height, precipitation, DO, DO % sat, pH, conductivity, temperature	Station No. 03260015 (Pleasant Run Cr. RM 0.3)	15-minute intervals

^aData not analyzed in Section 4.3

^b RM = River mile

4.2.1 Future Sampling

SD1 plans to continue monitoring this watershed during base flow conditions with at least one survey per year. The three sampling locations are: Pleasant Run Creek at RM 0.3, 2.0 and RM 0.8 of an unnamed tributary to Pleasant Run Creek, which enters at RM 0.4. Typical analyses will include bacteria, nutrients, solids, oxygen-demanding constituents and physical parameters.

Additionally, surveys to assess the degree of stream hydromodification are currently underway by SD1.

The USGS will continue to operate the stage gage, measure flow and water quality (physical parameters) at RM 0.3 (03260015). This station is operated and funded via a cooperative agreement between USGS and SD1.

4.3 WATER QUALITY DATA ANALYSIS

Water quality data for Pleasant Run Creek are limited at this time to results from SD1's base flow sampling program and samples collected by KDOW in July 2004.

4.3.1 Historical Data

Historical data, in this case the 2004 data, have been analyzed to identify past water quality problems in this watershed. No criteria violations were observed.

4.3.2 Recent Data

Recent water quality data were available for two locations in Pleasant Run Creek (RM 0.3 and 2.0). These two locations were sampled for both fecal coliform (6 samples total) and *E. coli* (6 samples total). A comparison of data collected by SD1 to current water quality criteria revealed exceedances of the fecal coliform and *E. coli* bacteria criterion (Table 8). Measurements for parameters not shown met the respective water quality criteria. Recent data collected at the USGS station are being reviewed and will be included in the next update of this report.

Table 8. Recent Bacteria Exceedances

Stream	River Mile	Parameters exceeding criteria			
		Fecal coliform bacteria		<i>E. coli</i> bacteria	
		# samples	% of samples exceeding criteria ^a	# samples	% of samples exceeding criteria ^a
Pleasant Run Creek	0.3	3	33%	3	33%
Pleasant Run Creek	2.0	3	33%	3	33%

^a There are no instances where 5 samples were collected from a single location within a 30-day period. Therefore the comparison to the geometric mean portion of the fecal coliform and *E. coli* criterion, which requires a minimum of 5 samples taken during a 30-day period, is not possible. Comparisons were, however, made to the part of the criteria that reads, "Content shall not exceed 400 colonies/100 ml in 20 percent or more of all samples taken during a 30-day period for fecal coliform or 240 colonies/100ml for *E. coli*." Even this comparison is conservative as the criterion was meant to be applied to a dataset of five or more samples collected over a 30-day period.

4.3.2.a Bacteria

Bacteria sampling was conducted in the Pleasant Run Creek watershed by SD1 during three baseline surveys in 2006-2007. All bacteria samples were collected during base flow conditions. As shown in Figure 9, elevated base flow concentrations of fecal coliform were observed in two of the six Pleasant Run Creek samples. The maximum base flow fecal coliform concentration of 1,550 cfu/100 ml was recorded in Pleasant Run Creek at RM 0.3. As shown in Figure 10, a similar pattern was observed for *E. coli*, with elevated levels in two of the six base flow samples. The maximum *E. coli* concentration, 1,302 cfu/100 ml was recorded at River Mile 2.0.

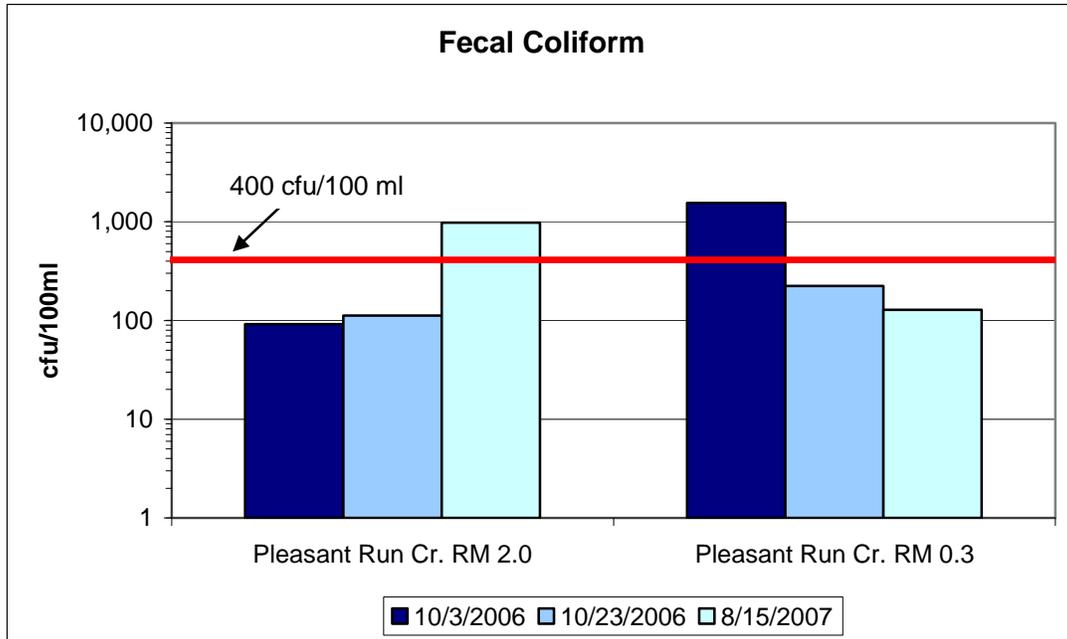


Figure 9. 2006-2007 Base Flow Fecal Coliform Results Compared to the 400 cfu/100ml Criterion

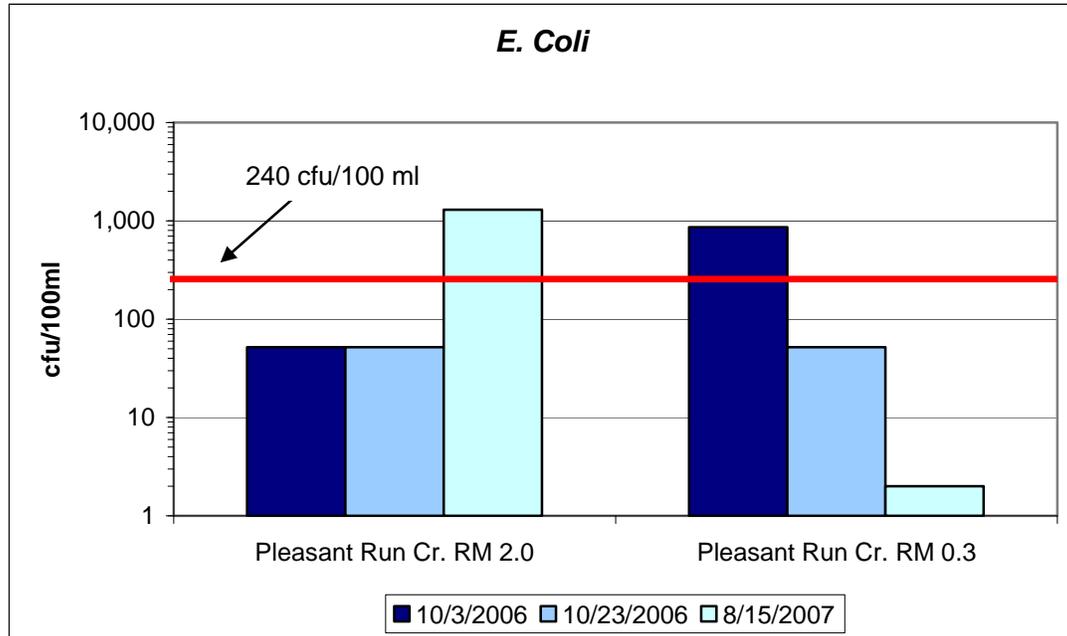


Figure 10. 2006-2007 Base Flow *E. Coli* Results Compared to the 240 cfu/100ml Criterion

4.4 BIOLOGICAL CONDITIONS

Macroinvertebrate communities are susceptible to water quality and habitat degradation, and data from these communities are used as a tool to detect changes in habitat and water quality and assessing stream health (KDOW 2008b). KDOW sampled macroinvertebrates at one site in Pleasant Run Creek in 2004 (Table 1). The MBI score⁷ for this site indicated that the stream was in good health.

⁷ The macroinvertebrate data collected by KDOW were used to calculate the Kentucky macroinvertebrate biotic index (MBI). The MBI compiles attributes of the macroinvertebrate community such as taxa richness, pollution tolerant species and pollution intolerant species. Additional metrics are added depending on the stream size and/or ecoregion.

5. SOURCE ANALYSIS

This section summarizes potential pollutant sources in the Pleasant Run Creek watershed to provide information related to recent observed impairments. Conclusions are based on the watershed characterization and available water quality data.

5.1 WATERSHED SOURCE ANALYSIS

Potential sources of bacteria were identified within the Pleasant Run Creek watershed. These sources are summarized in Table 9 and their locations are shown in Figure 11. Although all of the recent exceedances were observed during base flow conditions, all potential sources are included in this summary.

Table 9. Summary of Potential Sources

	Pleasant Run Creek
Recent observed impairment=>	Bacteria
SSO ^a	11
CSOs ^a	2
KPDES storm water outfall ^b	1
Septic systems	Very few
Storm water runoff	Urban
Watershed improvements	Riverwatch pump station planned for elimination in 2008. Stream restoration and bank stabilization projects planned in Devou Park

^aSD1 is undertaking a characterization and assessment of the sewer system, and sources are subject to change.

^bExcludes CSOs

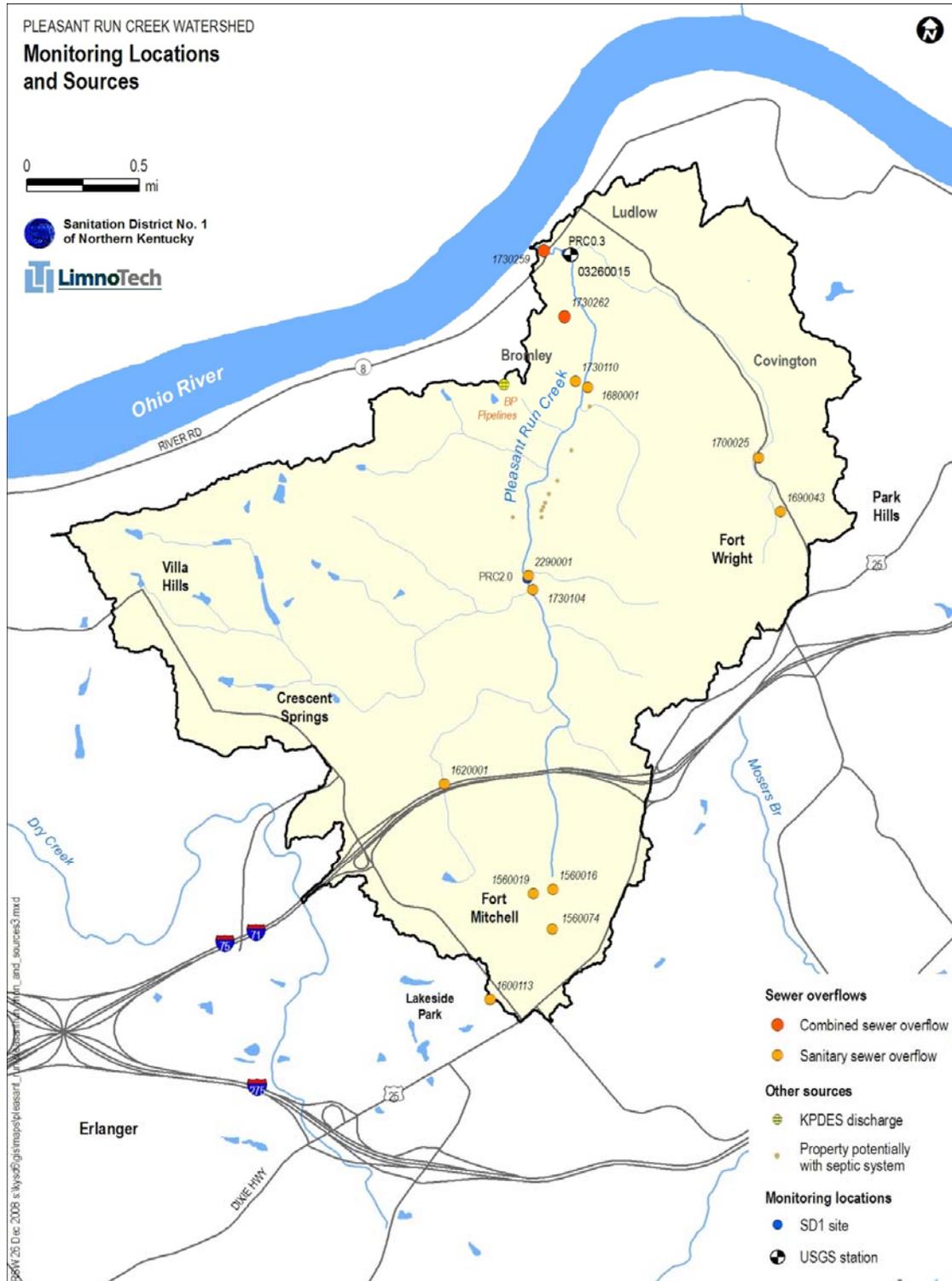


Figure 11. Monitoring Locations and Sources

6. RANKING

6.1 RESULTS

The WAT! is a tool that assesses the potential for point and nonpoint sources to generate fecal coliform, total solids and total phosphorus pollutant loads. WAT! was developed for these three pollutants because data to support modeling were readily available and they are representative indicators of potential water quality conditions. Calibration of the WAT! tool for total solids and total phosphorus is planned, and results should be available in future reports. Results for fecal coliform are discussed below.

This analysis was conducted for each of the sixteen watersheds located within SD1's study area. In addition to assessing pollutant loading potential by source, the WAT! also assesses pollutant loading potential by watershed, which allows for ranking and comparisons among the sixteen watersheds.

WAT! results⁸ indicate that under year-round conditions, the Pleasant Run Creek watershed has a slightly higher than average ranking (analogous to load) for fecal coliform, relative to the sixteen identified watersheds in SD1's jurisdictional area.

In addition to WAT! results, other factors such as presence of public drinking water features, presence of aquatic-dependent threatened and endangered (T&E) species, special designations, and public interest may affect watershed prioritization. These and other ranking considerations are summarized in Table 10.

Table 10. Watershed Ranking Considerations

CSO (#)	SSO (#)	Public Drinking Water	Aquatic-dependent T&E Species ^a (#)	Public interest	Special designation	WAT Rank, year-round conditions ^b
						Bacteria
2	11	SWAPP Zone 2 (due to Louisville intake)	1	Moderate	None	6 of 16

^a There is also one terrestrial species that is threatened and a species of management concern (a federal designation). Additionally there is one aquatic-dependent and one terrestrial species of State-special concern.

^b The WAT! is still under development. All results presented here are for illustrative purposes only. The results are subject to change and should therefore not be relied on or considered definitive.

6.2 SCREENING TO DETERMINE IF ADDITIONAL DATA ARE NEEDED

Sufficient data and information are currently available or planned for collection to support a reasonable understanding of current water quality conditions in the Pleasant Run Creek watershed.

⁸ WAT is still under development. All results presented here are for illustrative purposes only. The results are subject to change and should therefore not be relied on or considered definitive.

6.2.1 Data Gap Analysis

Considering the recently completed biological, aquatic habitat, and storm flow sampling, as well as the planned continuation of base flow sampling, no data gaps were identified. However, additional biological and habitat assessment in the future would be useful to assess improvements as projects are implemented.

In terms of source assessment, an investigation to determine whether the parcels potentially served by septic systems are truly on septic would be useful to better define fecal coliform loads during dry weather.

6.3 SOURCE PRIORITIZATION

The sources identified through the process of watershed characterization have been quantified using the WAT!. WAT! has been applied for a five-year period (1992-1996 climatological conditions), to quantify fecal coliform contributions by source. Together the characterization and WAT! results help inform source prioritization for improvement or elimination.

6.3.1 WAT Results

The relative fecal coliform load generated by source is shown in Figure 12. These WAT! results incorporate predicted sewer overflow volumes from infrastructure model simulations for 1992-1996 climatological conditions⁹. Flow estimates are available for one of the CSOs and six of the SSOs in this watershed.

Under year-round conditions, the largest source of fecal coliform bacteria is storm water runoff. Septic systems are not a significant contributor to the total annual bacteria load; however, during base flow conditions they are estimated to contribute the majority of the fecal coliform load.

⁹ The results presented were generated by models based on SD1's current understanding of the collection system infrastructure. These models are predictive tools and are based on numerous variables and assumptions on the characteristics of the collection system, and may differ from actual measured field conditions. These models are subject to change based on improved knowledge of the system, improvements to the system, and changes in land use and development. These results are subject to change and should therefore not be relied on or considered definitive.

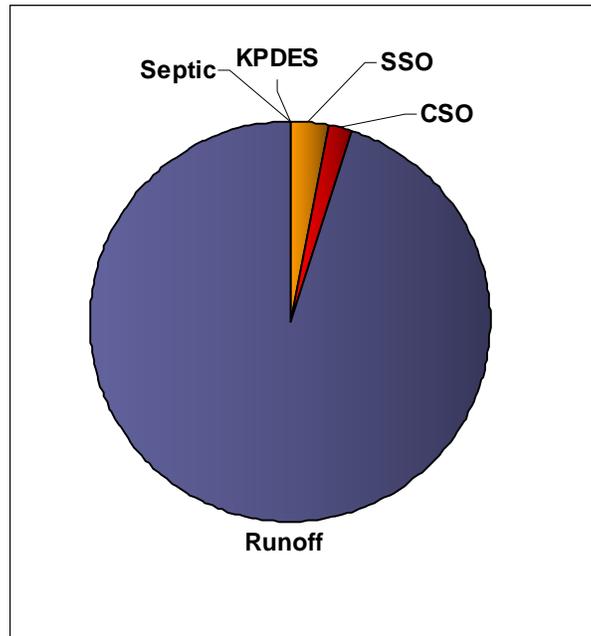


Figure 12. Initial Year-Round WAT! Results for Fecal Coliform

WAT! is still under development. All results presented here are for illustrative purposes only. The results are subject to change and should therefore not be relied on or considered definitive.

WAT! results should be considered preliminary as ongoing work may affect the WAT! source analysis and rankings. Work is currently ongoing to refine the bacteria contribution from septic systems.

6.4 WATERSHED RANKING

The WAT! produced a ranking, by watershed for sixteen watersheds, based on their potential to generate fecal coliform loads over a 1-year period. The water quality impact score (analogous to load) for each of the sixteen watersheds was used as a ranking metric. Additional detail on the ranking is available in the WAT! documentation.

The WAT! produces rankings of the watersheds for both base flow and year-round conditions. By separating base flow conditions, the impacts of dry weather sources on stream conditions can be differentiated from the combined impact of dry and wet weather sources. The ranking of the Pleasant Run Creek watershed during year-round and base flow conditions is provided in Table 11.

Table 11. WAT! Watershed Rankings

	Rank for Year-Round Conditions ^{a,b}	Rank for Base flow Conditions ^{a,b}
Fecal coliform	6	14

^a Rank ranges from 1 to 16. A rank of 1 indicates a high water quality impact score, which is analogous to load. The lowest rank possible is 16.

^b WAT is still under development. All results presented here are for illustrative purposes only. The results are subject to change and should therefore not be relied on or considered definitive.

The WAT! analysis for both total solids and total phosphorus will be presented in future reports upon completion of the WAT! calibration. Future monitoring programs will further populate and refine WAT! results and rankings, aiding in characterization of potential sources.

7. REFERENCES

- Carey, D. I. and Stickney, J. F., 2005. Groundwater Resources of Kenton County, Kentucky. Kentucky Geological Survey County Report 59, Series XII, ISSN 0075-5567.)
- Kenton County Planning Commission (KCPC), Northern Kentucky Area Planning Commission and Northern Kentucky Area Planning Commission Student Advisory Committed. 2006. Comprehensive Plan Update 2006-2026 An Area-wide Vision for Kenton County.
- Kenton County Public Library (KCPL), 2008. Genealogy & Kentucky History: Lagoon Amusement Park. Accessed 12/15/08.
<http://www.kenton.lib.ky.us/genealogy/history/ludlow/article.cfm?ID=101>
- Kentucky Administrative Regulations (KAR). 2008. Title 401 Natural Resources and Environmental Protection Cabinet Department for Environmental Protection. Chapter 10. Regulation 001E. Statement of Emergency Regulation. Definitions for 401 KAR Chapter 10.
- Kentucky Administrative Regulations (KAR). 2008. Title 401 Natural Resources and Environmental Protection Cabinet Department for Environmental Protection. Chapter 10. Regulation 026. Designation of Uses of Surface Waters.
- Kentucky Administrative Regulations (KAR). 2008. Title 401 Natural Resources and Environmental Protection Cabinet Department for Environmental Protection. Chapter 10. Regulation 030. Antidegradation Policy Implementation Methodology.
- Kentucky Commonwealth Office of Technology, 2005. 2005 Kentucky Land Cover. Obtained in November, 2007.
- Kentucky Division of Water (KDOW), 2007. Fish Consumption Advisories in Kentucky. www.water.ky.gov/sw/advisories/fish.htm Last modified 7/25/2007. Accessed 2/24/2008.
- Kentucky Division of Water. 2007a. Swimming Advisories in Kentucky. URL: <http://www.water.ky.gov/sw/advisories/swim.htm>. Last modified 11/8/07.
- Kentucky Division of Water, 2007b. Personal communication on status of domestic and public water wells. December 2007.
- Kentucky Division of Water, Kentucky Environmental and Public Protection Cabinet (KDOW). 2008. 2008 Integrated Report to Congress on the Condition of Water Resources in Kentucky. Volume II. 303(d) List of Surface Waters. Final. May, 2008.
- Kentucky Division of Water (KDOW), 2008a. Kentucky Drinking Water Watch Database Version 1.2. Accessed March 2008.
- Kentucky Division of Water (KDOW), Natural Resources and Environmental Protection Cabinet. 2008b. Standard Methods for Assessing Biological Integrity of Surface Waters in Kentucky. February.

- Kentucky Geographic Network, 2008. April 9, 2008.
<http://kygeonet.ky.gov/geographicexplorer/explorer.jsf>
- Kentucky Geographic Network, 2008a. August 11, 2008.
<http://kygeonet.ky.gov/geographicexplorer/explorer.jsf>
- Kentucky State Nature Preserves Commission (KSNPC). 2007. Natural Heritage Program Database Review. Data Request 07-097. February 14.
- Kentucky Transportation Cabinet. 2006. Kenton County Six-Year Plan Projects. FY-2006 thru FY-2012.
- National Climatic Data Center (NCDC), NOAA Satellite and Information Service. 2008. Data obtained for Cincinnati Northern KY Airport, Covington/Cincinnati, KY, United States. WBAN 93814.
- National Oceanic and Atmospheric Administration (NOAA). 2008. National Marine Sanctuaries. <http://sanctuaries.noaa.gov/welcome.html>. Revised February 7, 2008. Accessed February 11, 2008.
- NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.1. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: April 23, 2007 and May 15, 2007).
- Northern Kentucky Health Department (NKHD), 2008. Personal communication February 2008.
- Natural Resources Conservation Service (NRCS), 2006. SSURGO/GIS format. [online] <http://datagateway.nrcs.usda.gov/>
- Paylor, R.L. and J.C. Currens. *Karst Occurrence in Kentucky*. University of Kentucky, Kentucky Geological Survey. 2002.
http://kgsweb.uky.edu/olops/pub/kgs/mc33_12.pdf. Accessed on May 21, 2007.
- Perry, R.H, R.W. Surdick and D.M. Anderson. 1974. Observations on the biology, ecology, behavior, and larvae of *Dryobius sexnotatus* Linsley (Coleoptera: Cerambycidae). *Coleopterists Bulletin* 28(4): 169-176.
- Ray, J.A., Webb, J.S., O'Dell, P.W. (Kentucky Department of Environmental Protection, Division of Water, Groundwater Branch), 1994. Groundwater Sensitivity Regions of Kentucky.
- Schweitzer, D.F. 1989. A review of category 2 Insecta in USFWS Regions 3, 4 and 5. The Nature Conservancy, Boston.
- United States Environmental Protection Agency (USEPA). April 19, 1994. Combined Sewer Overflow (CSO) Policy. *Fed. Regist.* Vol. 59 pg. 18688.

United States Geological Survey (USGS). 2001. Summary of Significant Floods in the United States, Puerto Rico, and the Virgin Islands, 1970 Through 1989. Water Supply Paper 2502. <http://www-ks.cr.usgs.gov/Kansas/pubs/reports/wsp.2502.ky18.pdf> and <http://www-ks.cr.usgs.gov/Kansas/pubs/reports/wsp.2502.html>

Woods, A.J., J.M. Omernik, W.H. Martin, G.J. Pond, W.M. Andrews, S.M. Call, J.A. Comstock, and D.D. Taylor. 2002. Ecoregions of Kentucky. Color poster with map, descriptive text, summary tables, and photographs, U.S. Geological Survey (map scale 1:1,000,000), Reston, VA.