

APPENDIX 5

A-5. KINGS CREEK

A-5.1 Watershed Description

Kings Creek is in the central portion of the Upper Ohio North watershed, as shown in Figure A-5-1, and drains approximately 49.61 square miles (31,749.90 acres). Figure A-5-2 shows the land use distribution for the watershed. The dominant land use in the watershed is forest, which covers 75.52 percent of the watershed. Other important land use types are agriculture (20.35 percent) and urban/residential (3.48 percent). All other land cover types account for less than 1 percent of the total watershed area.

There are six impaired streams in the Kings Creek watershed, including Kings Creek itself. Figure A-5-3 shows the impaired segments and the pollutants for which each is impaired.

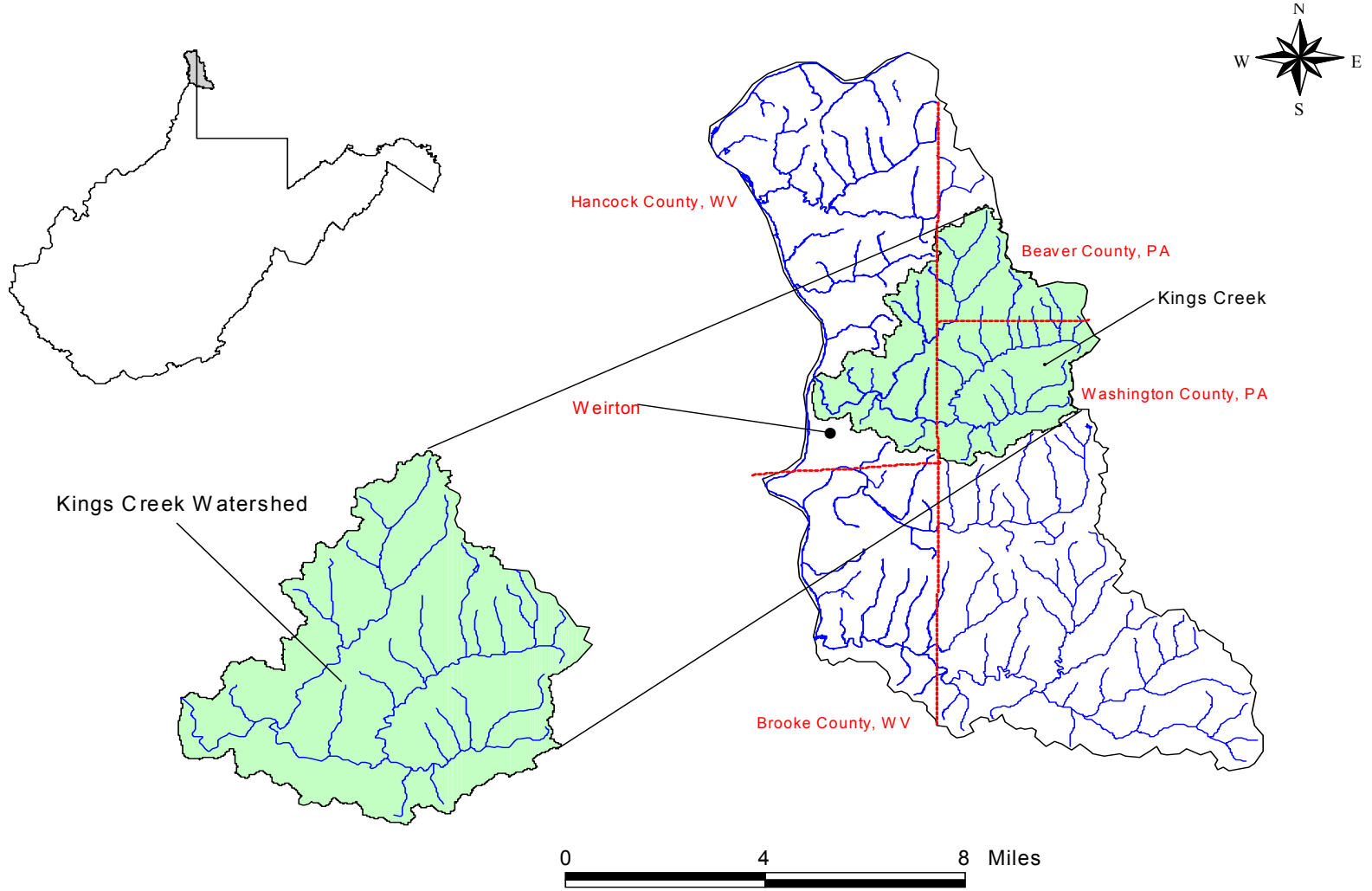


Figure A-5-1. Location of the Kings Creek watershed

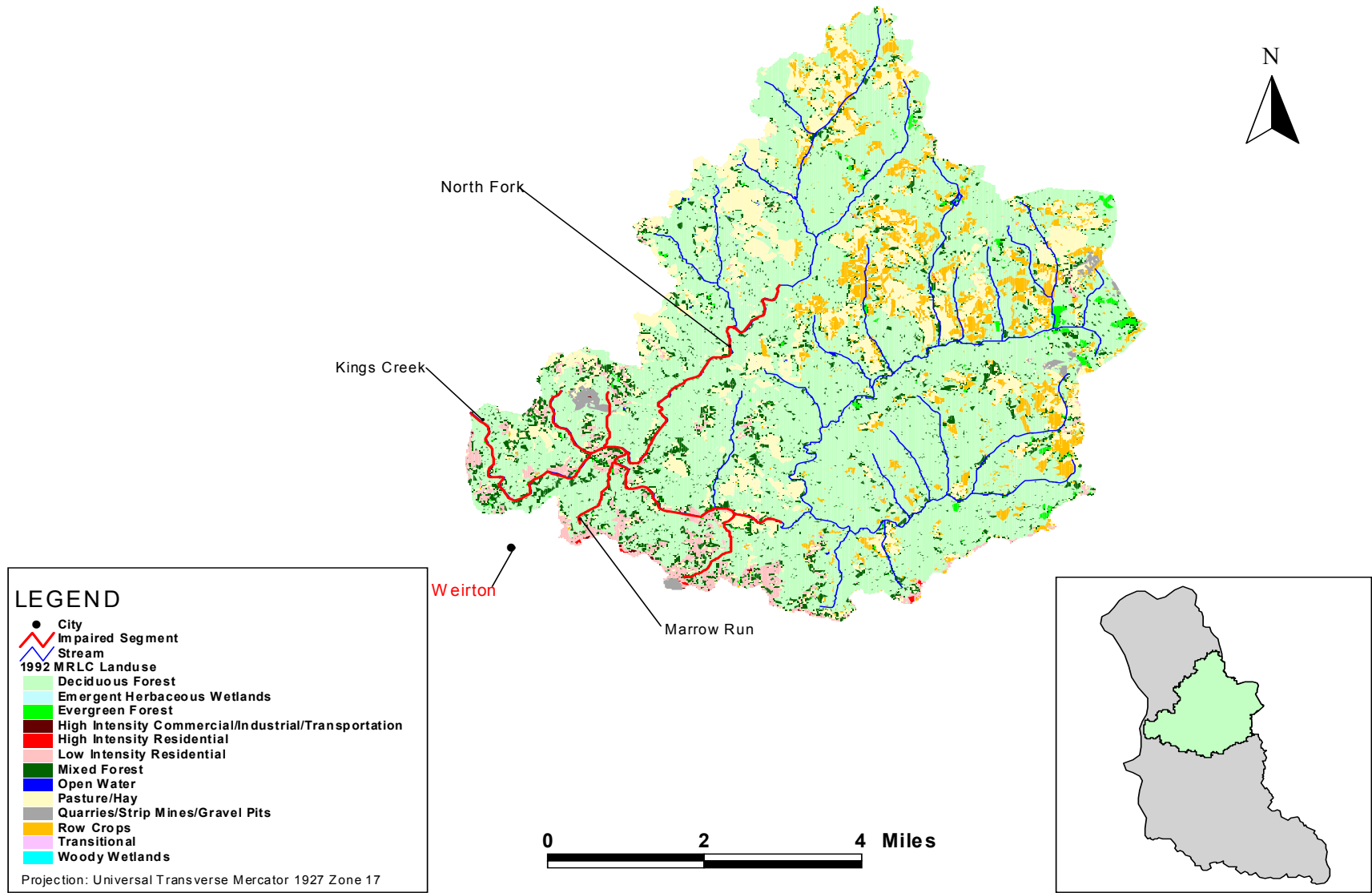
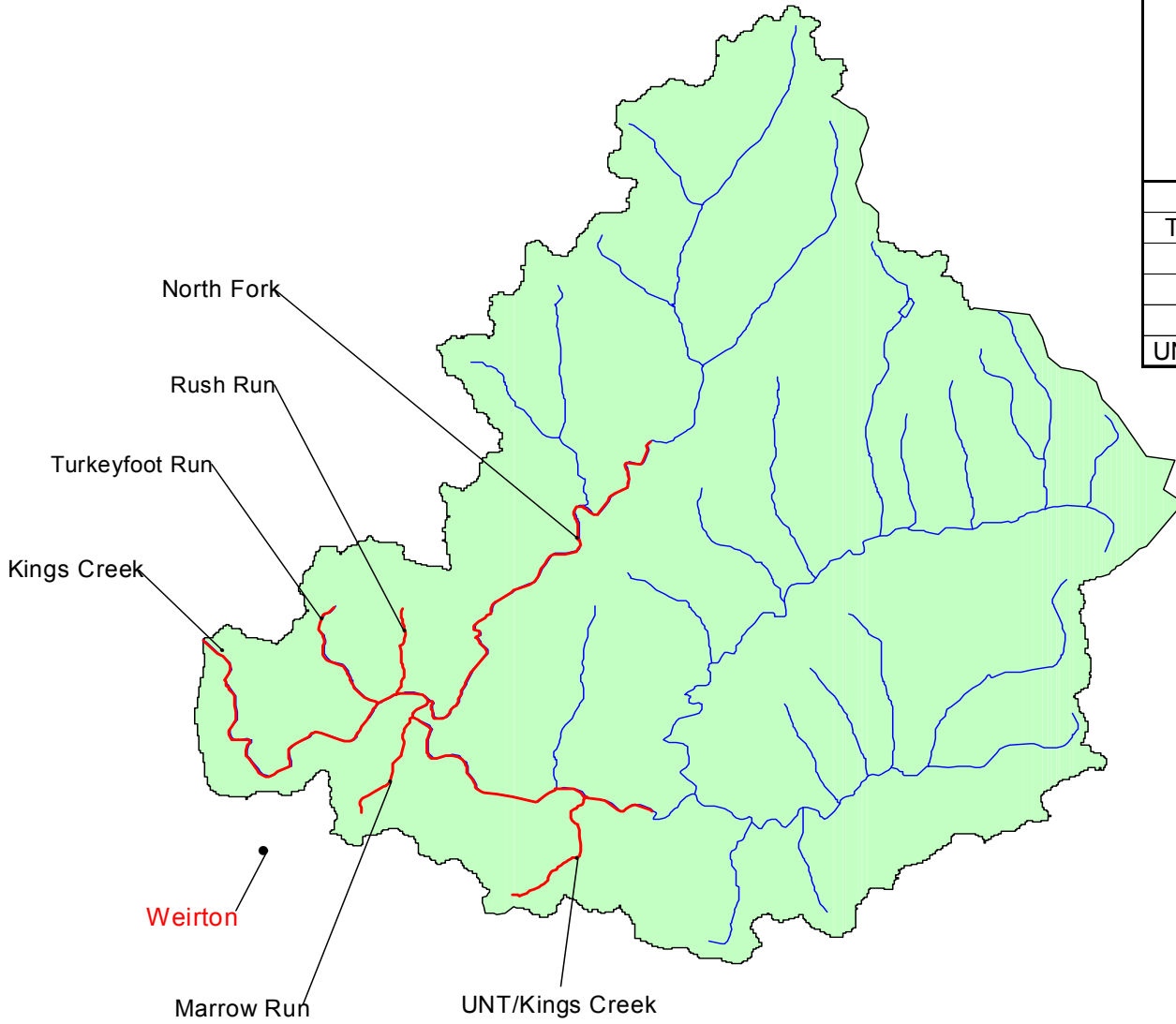


Figure A-5-2. Land use distribution in the Kings Creek watershed



Stream	Aluminum	Iron	Manganese	pH	Biological	Fecal Coliforms
Kings Creek						X
Turkeyfoot Run						X
Rush Run					X	X
North Fork						X
Marrow Run					X	X
UNT/Kings Creek						X

Figure A-5-3. Impaired waterbodies in the Kings Creek watershed

A-5.2 Pre-TMDL Monitoring

Before establishing Total Maximum Daily Loads (TMDLs), WVDEP conducted monitoring in each of the impaired streams in the Upper Ohio North watershed to characterize water quality and to refine impairment listings. Monthly samples were taken at 96 stations from July 1, 2001, to June 30, 2002. The locations of the pre-TMDL monitoring stations in the Kings Creek watershed are shown in Figure A-5-4. The parameters monitored at each site were determined based on the types of impairments observed in each stream. Streams impaired by metals and low pH were sampled monthly and analyzed for a suite of parameters (including total iron, dissolved iron, total aluminum, dissolved aluminum, total manganese, total suspended solids, pH, sulfate, and specific conductance). Monthly samples from streams impaired by fecal coliform bacteria were analyzed for this parameter, pH, and specific conductance. Benthic macroinvertebrate assessments were performed at specific locations on the biologically impaired streams during the pre-TMDL monitoring period. Appropriate monitoring suites were selected for streams with multiple impairments. For example, if a stream was impaired by metals and fecal coliform bacteria, the samples were analyzed for total iron, dissolved iron, total aluminum, dissolved aluminum, total manganese, total suspended solids, pH, sulfate, specific conductance, and fecal coliform bacteria. When conditions allowed, instantaneous flow measurements were also taken at the pre-TMDL sampling locations.

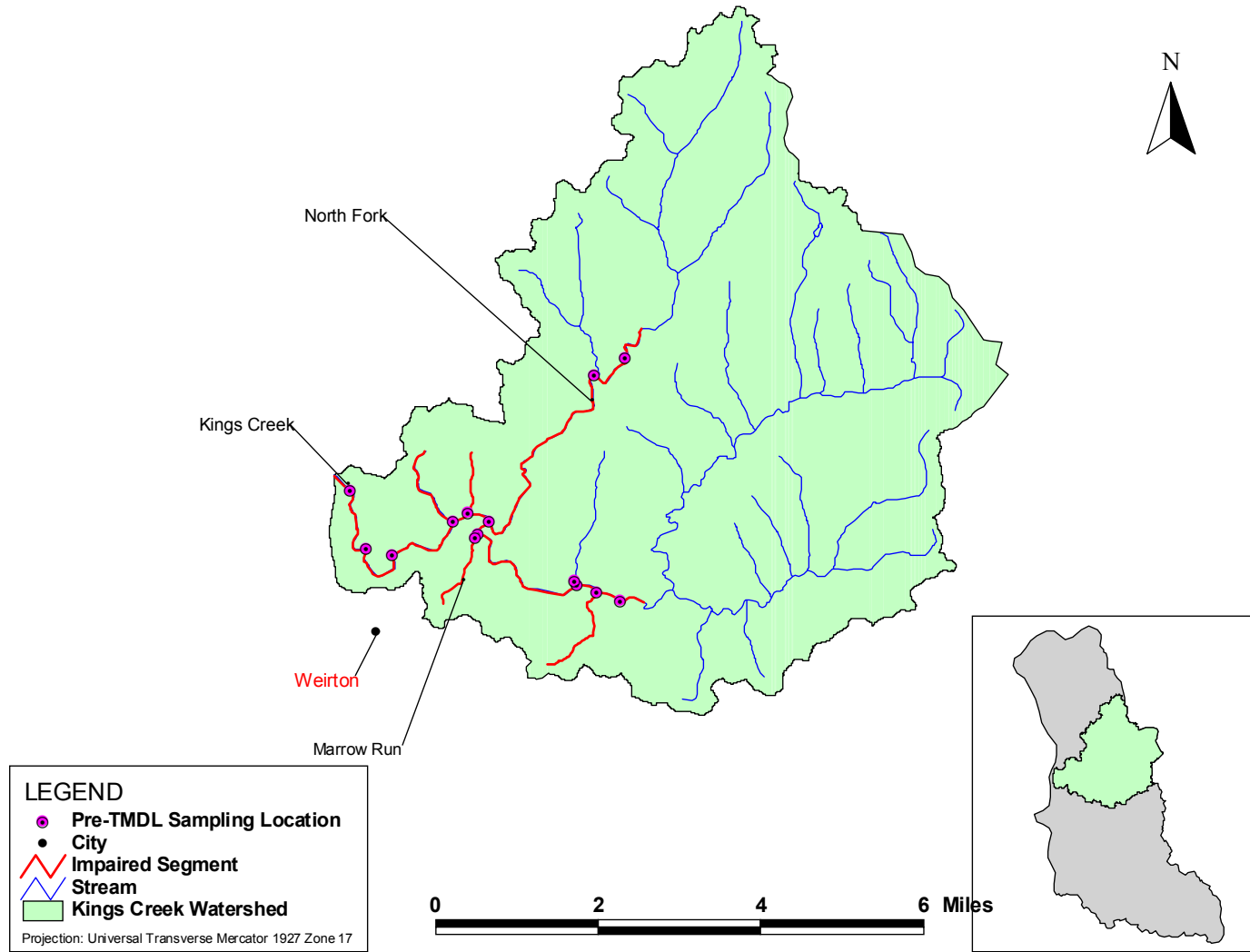


Figure A-5-4. Pre-TMDL monitoring stations in the Kings Creek watershed

A-5.3 Metals and pH Sources

No streams in the Kings Creek watershed have metals impairments or pH impairments that are addressed in this report.

A-5.4 Fecal Coliform Bacteria Sources

This section identifies and examines the potential sources of fecal coliform bacteria in the Kings Creek watershed. Sources can be classified as either point sources (specific sources subject to a permit) or nonpoint sources (non-permitted). Point sources of fecal coliform bacteria are classified by several different types of sewage permits and the point source discharges regulated therein. Nonpoint sources are diffuse, non-permitted sources.

A-5.4.1 Fecal Coliform Bacteria Point Sources

Permitted sources of fecal coliform bacteria that experience effluent overflows or that do not comply with permit limits can cause higher loadings of fecal coliform bacteria to receiving streams. In the Kings Creek watershed there are three discharge permits with fecal coliform limits; they are Home Aeration Units for sewage treatment. WVDEP source tracking identified potential improper operation of public sewer lines as a possible source of fecal coliform bacteria. One municipality in the watershed has a municipal separate storm sewer system (MS4): the City of Weirton.

USEPA's stormwater permitting regulations require municipalities to obtain permit coverage for all stormwater discharges from MS4s. These MS4 discharges must be considered in the TMDL as wasteloads. Because the City of Weirton has filed a Notice of Intent for MS4 permit issuance, and because of the lack of clearly defined MS4 drainage areas, the urban and residential land use area associated with the City of Weirton is assumed to be subject to MS4 stormwater permits. The source loading associated with stormwater runoff from the urban and residential land uses was included in the MS4 wasteload allocation for the City of Weirton.

A-5.4.2 Nonpoint (Non-permitted) Fecal Coliform Bacteria Sources

Pollutant source tracking by WVDEP personnel identified scattered areas of high population density without access to public sewers in the West Virginia portion of the Kings Creek watershed. Human sources of fecal coliform bacteria from these areas include sewage discharges from failing septic systems and possible direct discharges of sewage from residences (straight pipes). The West Virginia Bureau for Public Health estimates septic tank failure rates in this area to be 70 percent in the first 10 years (West Virginia Bureau for Public Health 2003). An estimated 219 people live in unsewered areas of the Kings Creek watershed. Figure A-5-5 shows the unsewered population in the watershed.

Stormwater runoff is another potential nonpoint source of fecal coliform bacteria in both residential/urban and rural areas. Runoff from residential areas not subject to stormwater permits can be a significant source, delivering bacteria present in litter and in the waste of pets and wildlife to the waterbody. Rural stormwater runoff can transport significant loads of bacteria to streams from livestock pastures, livestock and poultry feeding facilities, and manure storage and

application. In the West Virginia portion of the Kings Creek watershed, WVDEP source-tracking personnel identified isolated areas of pastures that could convey surface runoff to the stream. Stormwater runoff from agricultural areas is more prevalent in the Pennsylvania portion of the watershed, while runoff from both agricultural and residential areas occurs in the West Virginia portion of the watershed.

A certain “natural background” contribution of fecal coliform bacteria can be attributed to deposition by wildlife in forested areas. Accumulation rates for fecal coliform bacteria in forested areas were developed using reference numbers from past TMDLs, incorporating wildlife estimates obtained from WVDEP’s Division of Natural Resources. Although wildlife contributions of fecal coliform bacteria were considered in modeling, they were not found to be a significant source.

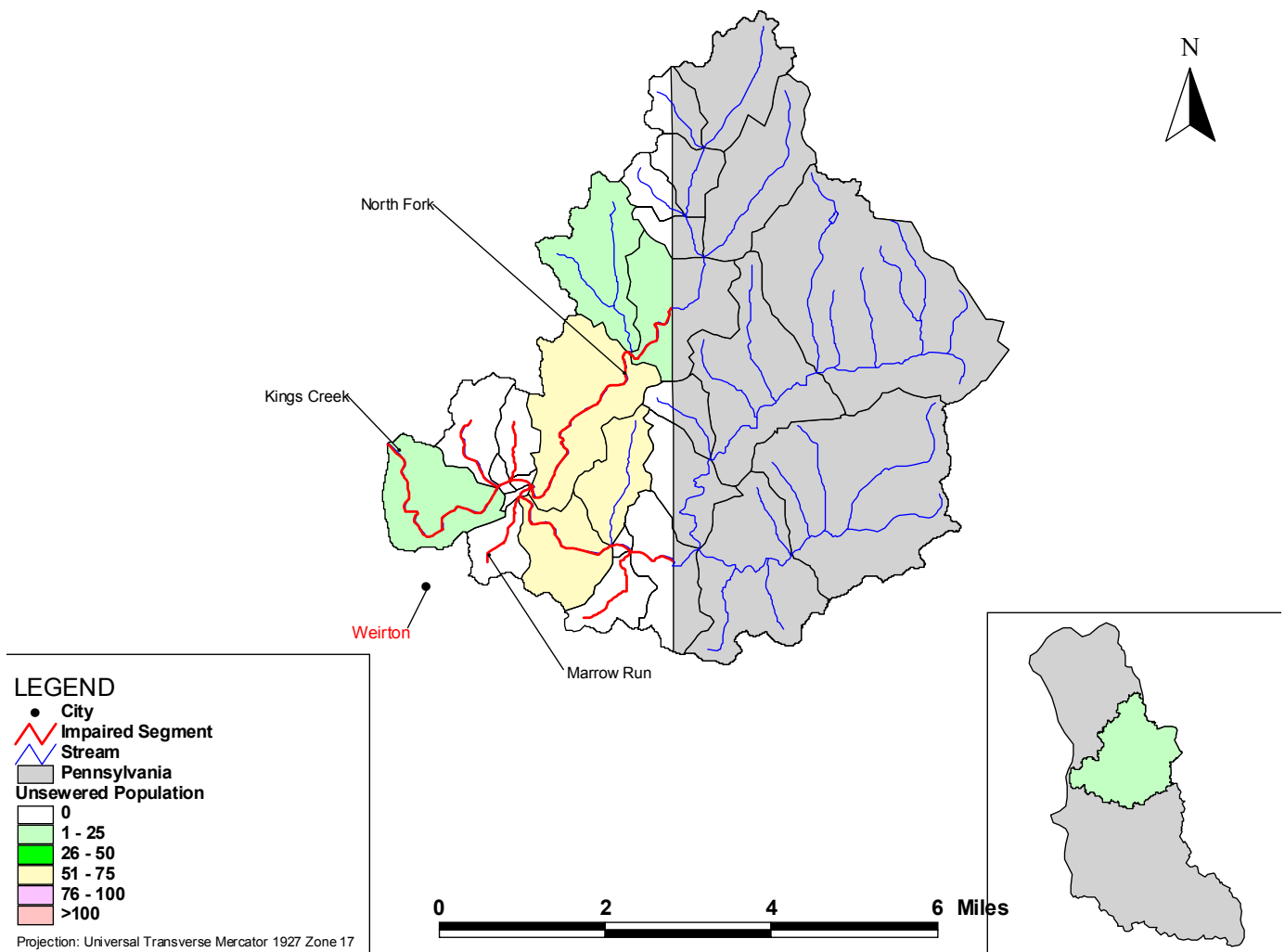


Figure A-5-5. Unsewered population in the Kings Creek watershed

A-5.5 Stressors of Biologically Impaired Streams

The Kings Creek watershed has two biologically impaired streams for which TMDLs have been developed. These streams are identified in Table A-5-1 along with the primary stressors to the streams' benthic communities and the TMDLs required to address the impairment. Please refer to the main report for a description of the stressor identification process.

Table A-5-1. Primary stressors of biologically impaired streams in the Kings Creek watershed

Stream	Primary Stressors	TMDLs Required
Rush Run	Organic enrichment	Fecal coliform bacteria
Marrow Run	Organic enrichment	Fecal coliform bacteria

The fecal coliform TMDLs presented in Table A-5-2 are surrogates for the organic enrichment biological stressor. Please refer to section A-5.4 for source information.

A-5.6 TMDLs for the Kings Creek Watershed

A-5.6.1 TMDL Development

TMDLs and source allocations were developed for impaired streams in the Kings Creek watershed. A top-down methodology was followed to develop these TMDLs and allocate loads to sources. Headwaters were analyzed first because they have a profound effect on downstream water quality. Loading contributions were reduced from applicable sources in these waterbodies and TMDLs were developed. Refer to section 7.4 of the main report for a detailed description of allocation methodologies used in the development of the pollutant-specific TMDLs. These TMDLs represent a successful scenario for which detailed load allocations were developed for specific nonpoint source categories in the West Virginia portion of the watershed. The loadings associated with the individual nonpoint source categories were aggregated and presented in this TMDL report as a gross load allocation for Pennsylvania. This TMDL report does not prescribe specific load or wasteload allocations for the contributing area of Pennsylvania. Instead, it allows Pennsylvania and its stakeholders to determine appropriate and necessary source reductions.

The TMDLs for fecal coliform bacteria are shown in Table A-5-2 and are presented as annual average loads, in terms of the number of colonies per year.

A-5.6.2 TMDL Tables: Fecal Coliform Bacteria

Table A-5-2. Fecal coliform bacteria TMDLs for the Kings Creek watershed

Major Watershed	Stream Code	Stream Name	Parameter	Load Allocation (counts/yr)	Wasteload Allocation (counts/yr)	Margin of Safety (counts/yr)	TMDL (counts/yr)	Pennsylvania Allocation (counts/yr)
KINGS CREEK	O-98	Kings Creek	Fecal coliform	3.76E+14	1.09E+12	1.98E+13	3.95E+14	2.30E+14
KINGS CREEK	O-98-0.5A	Turkeyfoot Run	Fecal coliform	8.06E+12	NA	4.24E+11	8.48E+12	NA
KINGS CREEK	O-98-0.7A	Rush Run	Fecal coliform	4.10E+12	NA	2.16E+11	4.32E+12	NA
KINGS CREEK	O-98-A	North Fork	Fecal coliform	4.35E+13	NA	2.29E+12	4.58E+13	1.08E+13
KINGS CREEK	O-98-A.5	Marrow Run	Fecal coliform	3.27E+12	1.09E+12	2.06E+11	4.57E+12	NA
KINGS CREEK	O-98-C	UNT/Kings Creek	Fecal coliform	3.45E+12	NA	1.81E+11	3.63E+12	NA

NA = not applicable; UNT = unnamed tributary.