APPENDIX 4

A-4. HARMON CREEK

A-4.1 Watershed Description

Harmon Creek is in the central portion of the Upper Ohio North watershed, as shown in Figure A-4-1, and drains approximately 38.26 square miles (24,486.74 acres). Figure A-4-2 shows the land use distribution for the watershed. The dominant land use in the watershed is forest, which covers 75.98 percent of the watershed. Other important land use types are agriculture (11.78 percent), urban/residential land (9.14 percent), and barren/mining land (2.86 percent).

There are seven impaired streams in the Harmon Creek watershed, including Harmon Creek itself. Figure A-4-3 shows the impaired segments and the pollutants for which each is impaired.

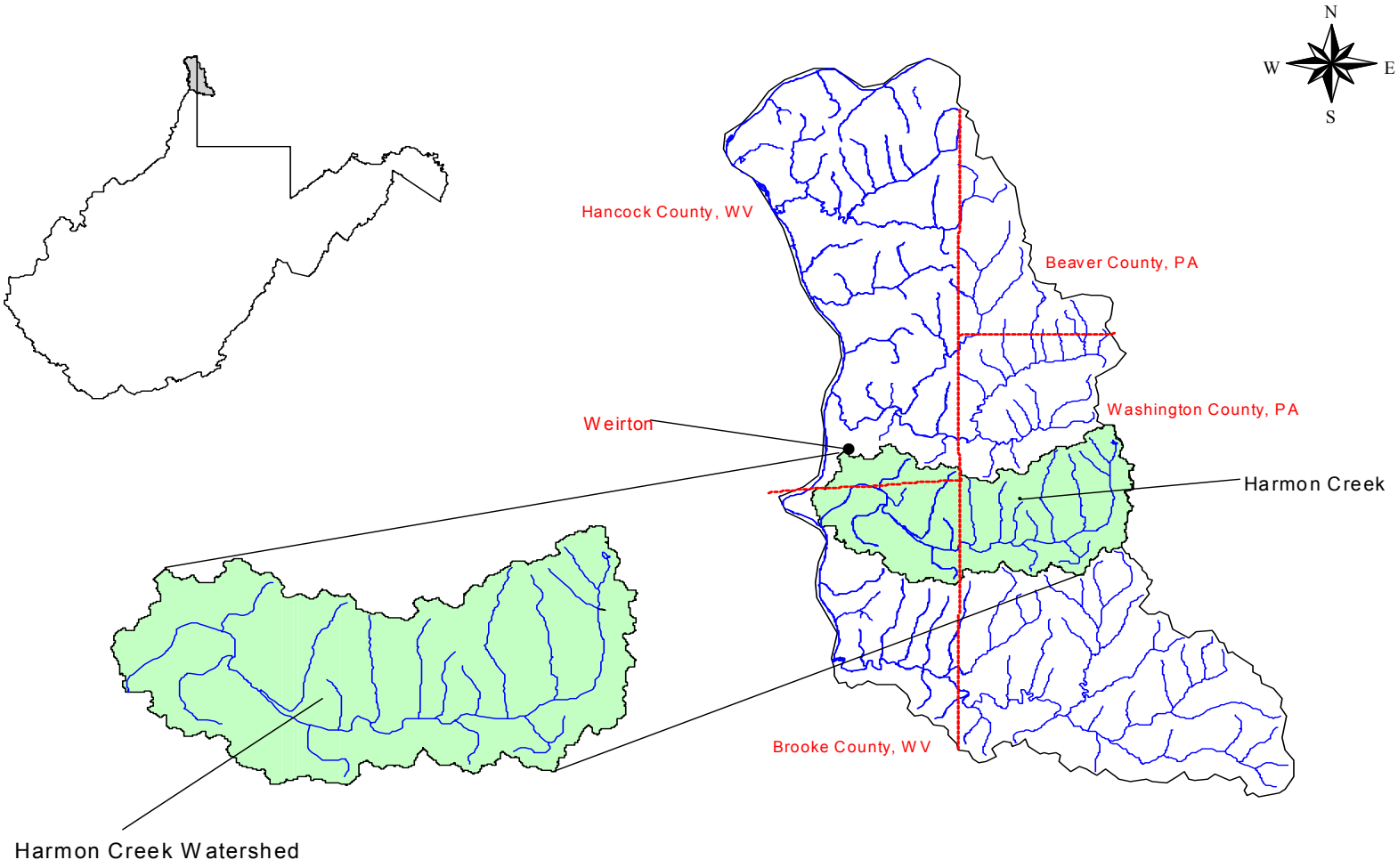


Figure A-4-1. Location of the Harmon Creek watershed

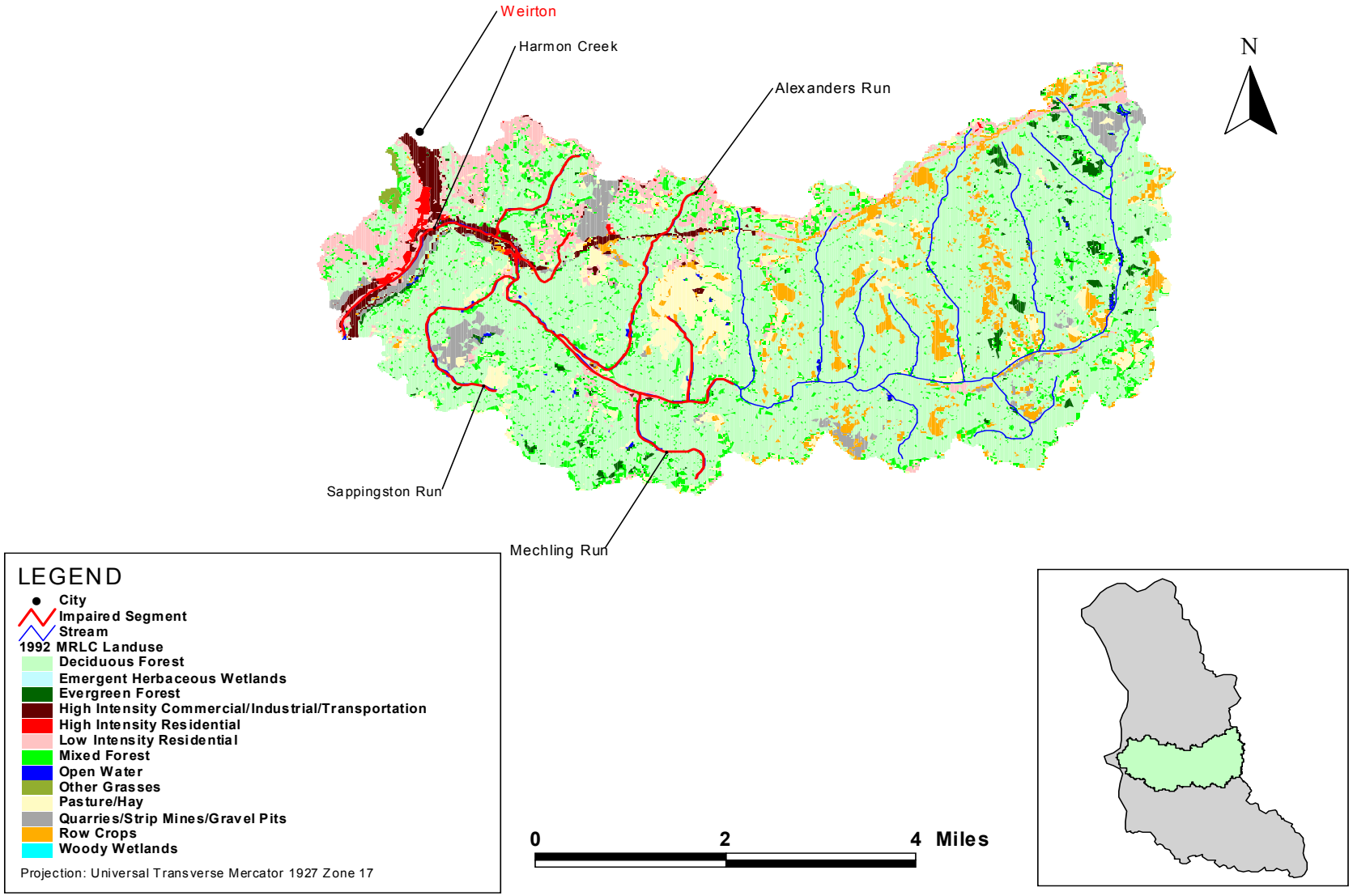
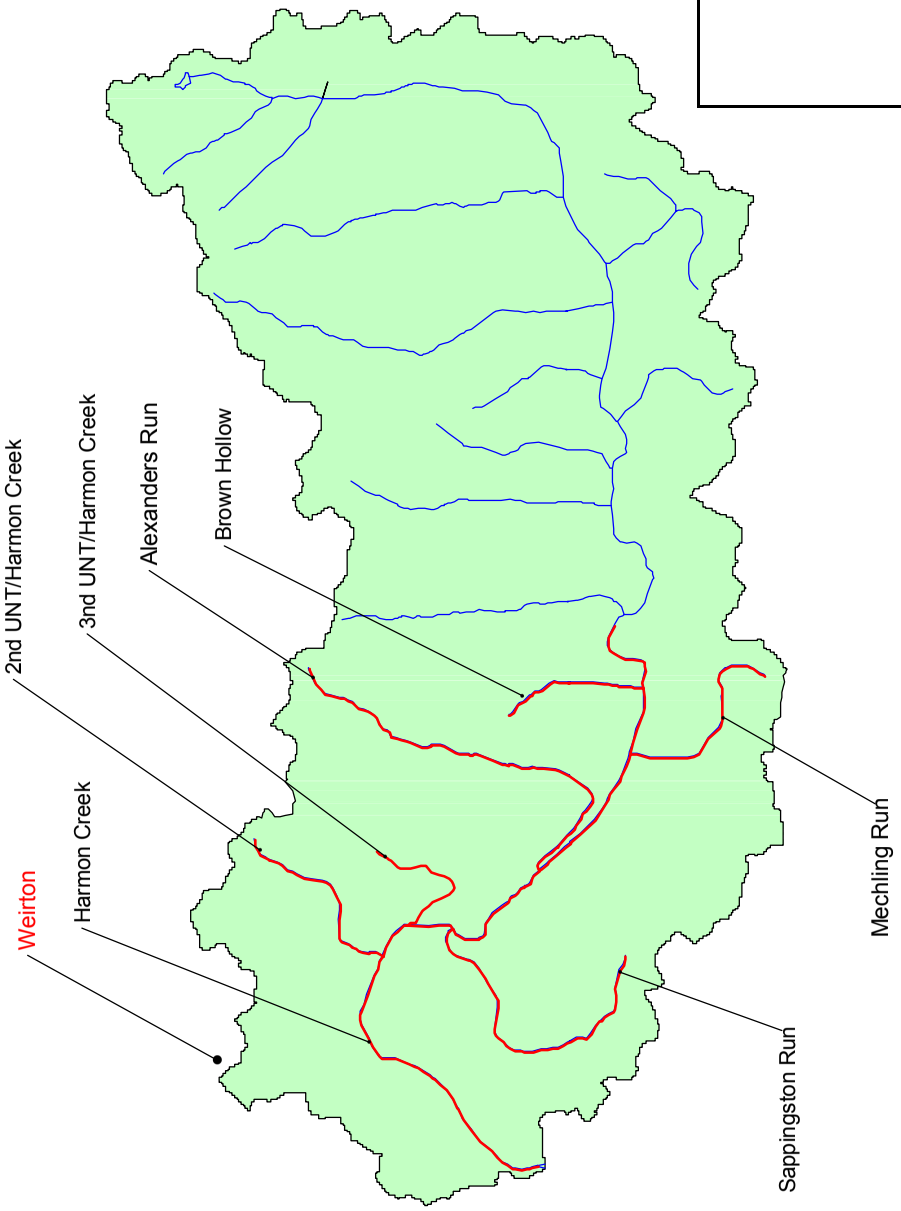


Figure A-4-2. Land use distribution in the Harmon Creek watershed



Stream	Aluminum	Iron	Manganese	pH	Biological	Fecal Coliforms
Harmon Creek					X	X
2nd UNT/Harmon Creek						X
3nd UNT/Harmon Creek						X
Sappingston Run					X	X
Alexanders Run		X	X		X	X
Mechling Run						X
Brown Hollow					X	X

Figure A-4-3. Impaired waterbodies in the Harmon Creek watershed

A-4.2 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 Harmon Creek watershed are shown in Figure A-4-4. 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.

A-4.3 Metals and pH Sources

Alexanders Run has been identified as impaired pursuant to water quality criteria for iron and manganese. This section identifies and examines the potential sources of these pollutants. Sources can be classified as either point (specific sources subject to a permit) or nonpoint (diffuse, non-permitted) sources. Metals point sources are classified by the mining- and non-mining related permits issued by WVDEP. Metals nonpoint sources are diffuse, non-permitted sources such as abandoned or forfeited mine sites.

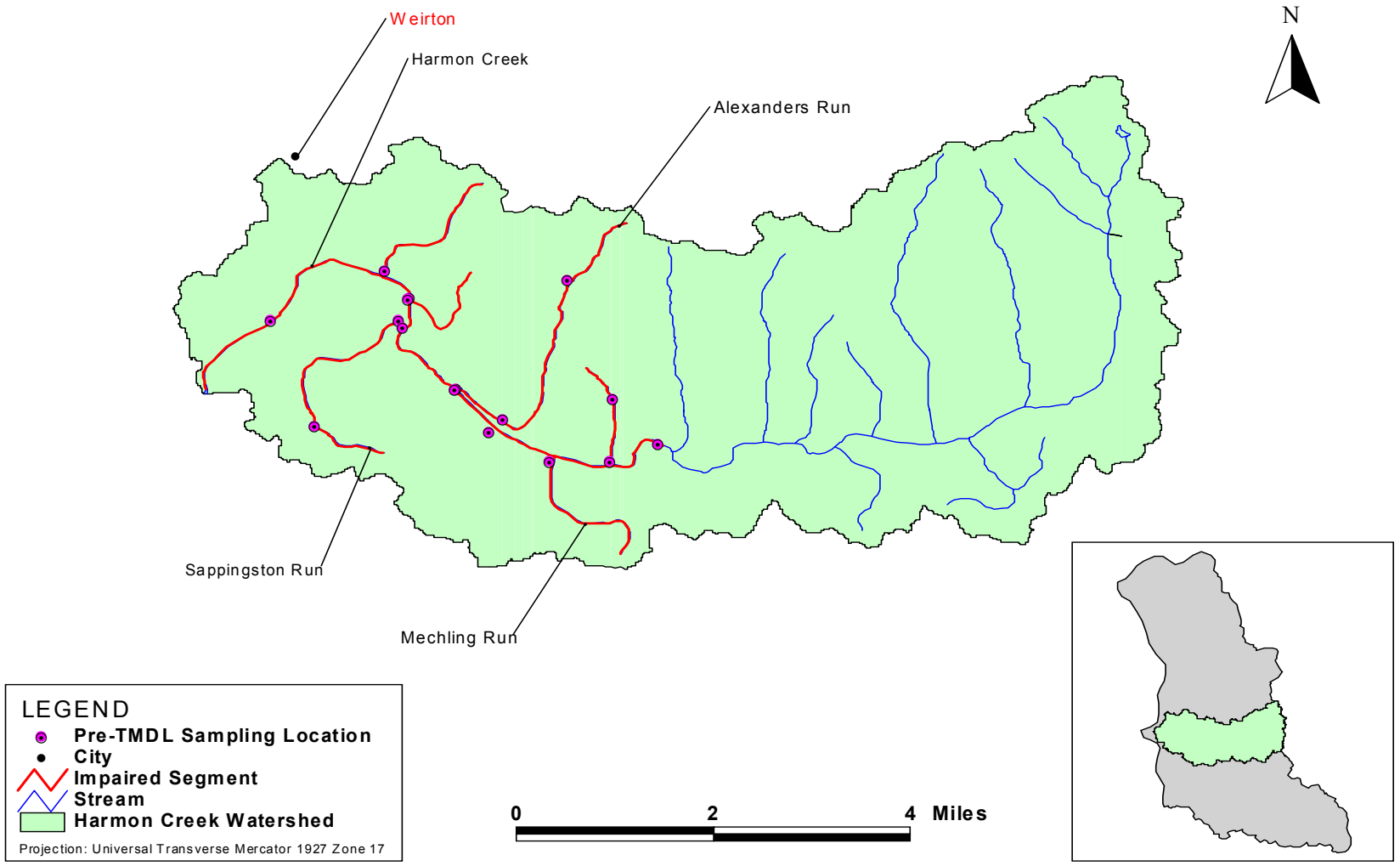


Figure A-4-4. Pre-TMDL monitoring stations in the Harmon Creek watershed

Pollution sources were identified using statewide geographic information system (GIS) coverage of point and nonpoint sources, and through field reconnaissance. As part of the TMDL process, WVDEP documented pollution sources by describing the pollution source in detail, collecting Global Positioning System data, and if necessary collecting a water quality sample for laboratory analysis. WVDEP staff recorded physical descriptions of the pollutant sources, such as the number of outfalls, the source of the outfalls, and the general condition of the stream in the vicinity of each outfall. These records were compiled and electronically plotted on maps using GIS software. This information was used in conjunction with other information to characterize pollutant sources.

Based on scientific knowledge of sediment/metal interaction and knowledge of soils in West Virginia, it is reasonable to conclude that sediments contain high levels of aluminum and iron, and, to a lesser extent, manganese. Control of sediment-producing sources may be necessary to meet water quality criteria for dissolved aluminum, total iron, and total manganese during critical high flow conditions.

A-4.3.1 Metals Point Source Inventory

As described in the main report, the National Pollutant Discharge Elimination System (NPDES) program, established under Clean Water Act sections 318, 402, and 405, requires permits for the discharge of pollutants from point sources. Metals and pH point sources can be classified into two major categories: permitted non-mining point sources and permitted mining point sources. There are no metals sources permitted to discharge into in Alexanders Run.

A-4.3.2 Metals Nonpoint Source Inventory

Nonpoint sources contribute to metals-related water quality impairments in Alexanders Run. Nonpoint sources are diffuse, non-permitted sources. Abandoned mine lands can be a significant source of non-permitted metals and pH impairment. Abandoned mines can contribute acid mine drainage, which produces low pH and high metals concentrations in surface and subsurface waters. Similarly, facilities that were subject to the Surface Mining Control and Reclamation Act of 1977 but forfeited their bonds or abandoned operations can be a significant mining-related non-permitted source. Various non-mining land disturbance activities can also be nonpoint sources of metals, delivering metals along with excess sediment to waterbodies. Examples of such land disturbance activities are agriculture, forestry, oil and gas wells, and the construction and use of paved and unpaved roads.

Abandoned Mine Lands and Bond Forfeiture Sites

WVDEP's Office of Abandoned Mine Lands identified locations of abandoned mine lands in the Harmon Creek watershed, which are shown in Figure A-4-5. There are no bond forfeiture sites in the Harmon Creek watershed.

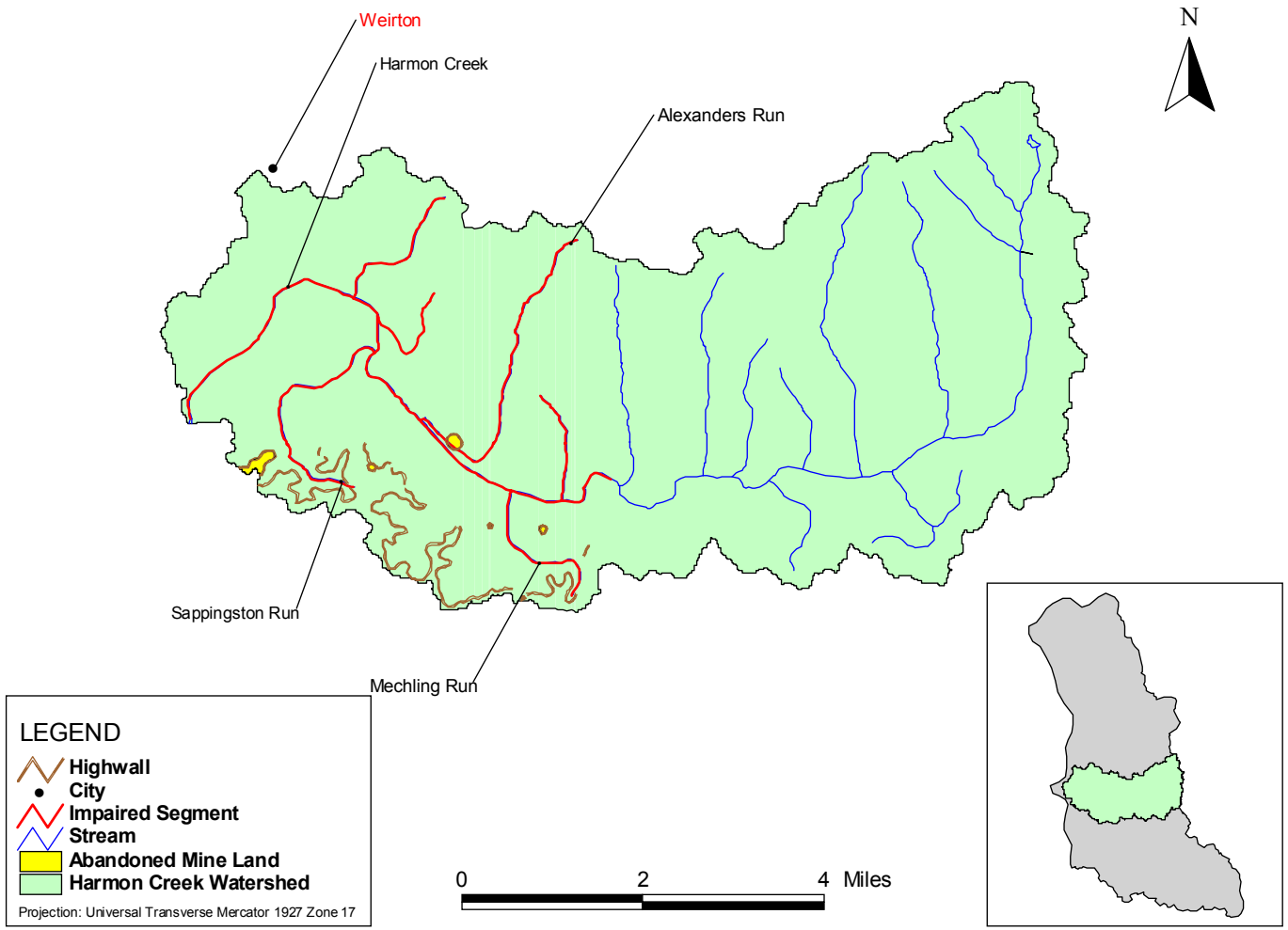


Figure A-4-5. Abandoned mine lands in the Harmon Creek watershed

Land Disturbance Activities

Land disturbance resulting from agriculture, forestry, oil and gas operations, and the construction and use of roads can contribute metals to streams. The areas related to these activities and the number of sites in the Harmon Creek watershed are discussed below.

Agriculture

Based on the Multi-Resolution Land Characteristics coverage, agricultural areas cover 2,884.82 acres (11.78 percent) of the Harmon Creek watershed.

Forestry

There are no active logging operations in the Harmon Creek watershed.

Oil and Gas Wells

Based on data from WVDEP's Office of Oil and Gas, there are no active oil and gas wells in the Harmon Creek watershed.

Roads

The length and area of paved and unpaved roads were calculated using the Census 2000 TIGER/Line files roads coverage for West Virginia. Table A-4-12 summarizes the length, area, and percentage of total watershed area for both paved and unpaved roads in the Harmon Creek watershed.

Table A-4-1. Road miles by type in the Harmon Creek watershed

Road Type	Road Distance (miles)	Road Area (acres)	Road Area as Percentage of Watershed
Total paved	123.77	267.30	1.09%
Total unpaved	64.02	124.16	0.51%

Sediment Sources

WVDEP issues a general NPDES permit (permit number WV0115924) to regulate sediment-laden stormwater flowing into streams from discharges associated with construction activities. Stormwater construction permits are issued for any construction activities with a land disturbance of greater than 1 acre. These permits require that the site have properly installed best management practices (BMPs), such as silt fences, sediment traps, seeding and mulching, and riprap, to prevent or reduce erosion and sediment runoff. Construction activities disturbing less than 1 acre are not subject to construction stormwater permitting and are uncontrolled sources of sediment.

Based on previous watershed modeling in West Virginia, which evaluated sediment/metal interactions and general soil properties, it was concluded that certain sediments contain high levels of aluminum and iron and, to a lesser extent, manganese. Land disturbance can increase sediment loading to impaired waters, and the control of sediment-producing sources might be necessary to meet water quality criteria for metals during high-flow conditions.

Three stormwater construction permits exist in the Alexanders Run subwatershed. WVDEP source-tracking information identified an active disturbed area in the headwaters of Alexanders Run. Runoff from barren land and disturbed sites can transport metals and total suspended solids. Sampling results during high flow events indicated that elevated levels of iron and total suspended solids were present in the stream. These elevated concentrations during high flow events may adversely affect the biological community.

A-4.4 Fecal Coliform Bacteria Sources

This section identifies and examines the potential sources of fecal coliform bacteria in the Harmon 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-4.4.1 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 occasional higher loadings of fecal coliform bacteria in receiving streams. In the Harmon Creek watershed there is one discharge permit with fecal coliform limits: it is for a Home Aeration Unit for sewage treatment. Broken sewer lines, pump failures, and manhole overflows were identified as causes of known sewage spills in the watershed. 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-4.4.2 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 Harmon 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 (WV Bureau for Public Health 2003). An estimated 265

people live in unsewered areas of the Harmon Creek watershed. Figure A-4-6 shows the estimated 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. WVDEP source-tracking personnel identified several small feedlots and one large farm in the West Virginia portion of the watershed. 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.

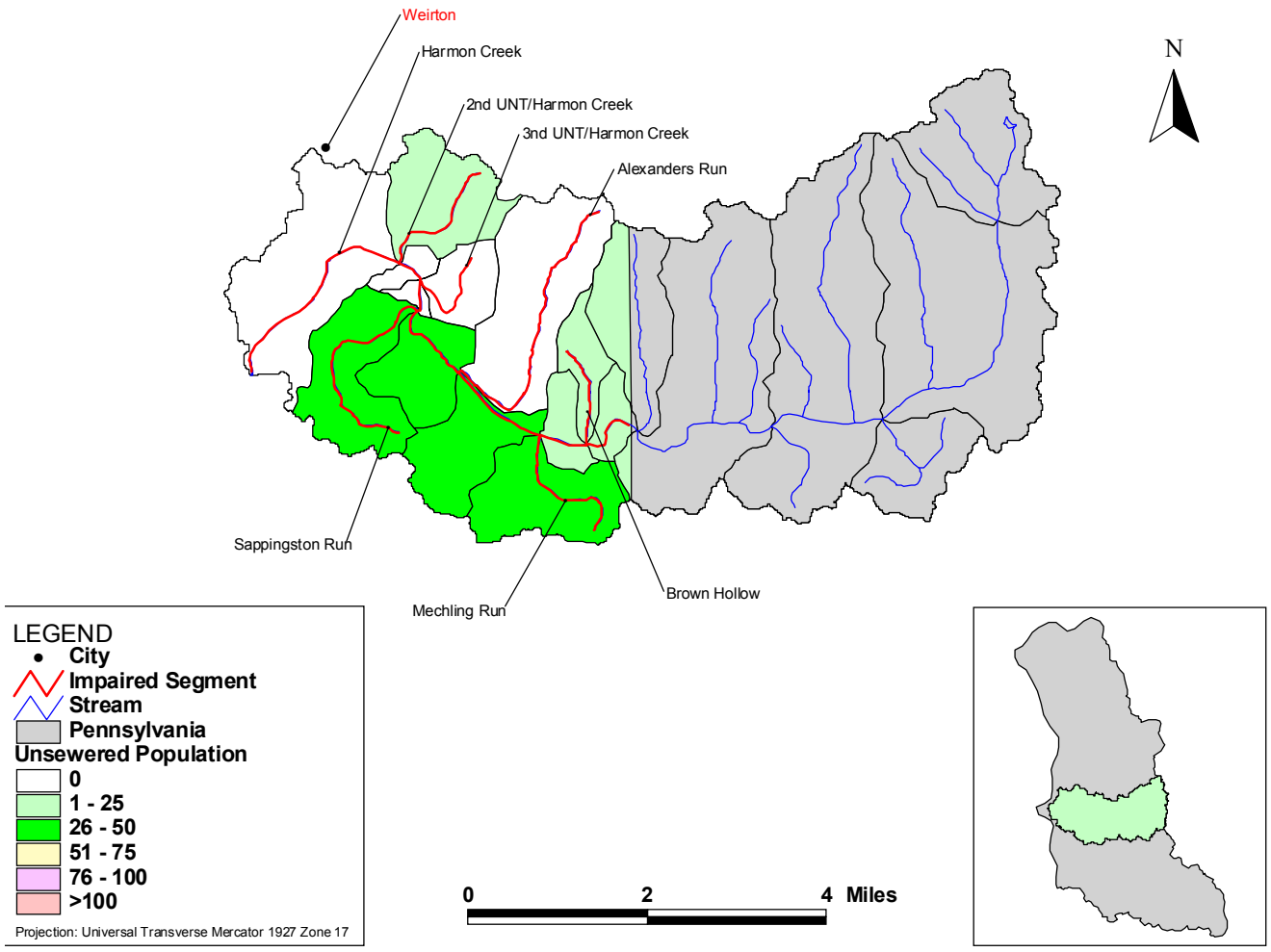


Figure A-4-6. Unsewered population in the Harmon Creek watershed

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.

A-4.5 Stressors of Biologically Impaired Streams

The Harmon Creek watershed has four biologically impaired streams for which TMDLs have been developed. These streams are identified in Table A-4-2 along with the primary stressors of the streams' benthic communities and the TMDLs required to address these impairments. Please refer to the main report for a description of the stressor identification process.

Table A-4-2. Primary stressors of biologically impaired streams in the Harmon Creek watershed

Stream	Primary Stressors	TMDLs Required
Harmon Creek	Organic enrichment	Fecal coliform bacteria
Sappingston Run	Organic enrichment	Fecal coliform bacteria
Alexanders Run	Organic enrichment Iron toxicity (secondary)	Fecal coliform bacteria Iron
Brown Hollow	Organic enrichment	Fecal coliform bacteria

The iron TMDLs presented in Table A-4-3 address the iron toxicity biological stressor. The fecal coliform TMDLs presented in Table A-4-5 are surrogates for the organic enrichment biological stressor. Please refer to sections A-4.3 and A-4.4 for source information.

A-4.6 TMDLs for the Harmon Creek Watershed

A-4.6.1 TMDL Development

TMDLs and source allocations were developed for impaired streams in the Harmon Creek watershed. A top-down methodology was followed to develop these TMDLs and allocate loads to sources. Headwaters were analyzed first because they frequently 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 iron, manganese, and fecal coliform bacteria are shown in Tables A-4-3 through A-4-5. The TMDLs for iron and manganese are presented as annual average loads, in terms of pounds per year. The TMDLs for fecal coliform bacteria are presented as annual average loads, in terms of the number of colonies per year.

A-4.6.2 TMDL Tables: Metals

Table A-4-3. Iron TMDLs for the Harmon Creek watershed

Major Watershed	Stream Code	Stream Name	Metal	Load Allocation (lb/yr)	Wasteload Allocation (lb/yr)	Margin of Safety (lb/yr)	TMDL (lb/yr)
HARMON CREEK	WVO-97-B	Alexanders Run	Iron	883	NA	46	929

NA = not applicable.

Table A-4-4. Manganese TMDLs for the Harmon Creek watershed

Major Watershed	Stream Code	Stream Name	Metal	Load Allocation (lb/yr)	Wasteload Allocation (lb/yr)	Margin of Safety (lb/yr)	TMDL (lb/yr)
HARMON CREEK	WVO-97-B	Alexanders Run	Manganese	170	NA	9	179

NA = not applicable.

Table A-4-5. Fecal coliform bacteria TMDLs for the Harmon 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)	Pennsyl-vania Allocation (counts/yr)
HARMON CREEK	O-97	Harmon Creek	Fecal coliform	2.35E+14	1.36E+13	1.30E+13	2.59E+14	9.68E+13
HARMON CREEK	O-97-0.7A	2nd UNT/Harmon Creek	Fecal coliform	9.30E+12	NA	4.90E+11	9.79E+12	NA
HARMON CREEK	O-97-0.9A	3rd UNT/Harmon Creek	Fecal coliform	4.61E+12	NA	2.43E+11	4.86E+12	NA
HARMON CREEK	O-97-A	Sappingston Run	Fecal coliform	9.34E+12	NA	4.91E+11	9.83E+12	NA
HARMON CREEK	O-97-B	Alexanders Run	Fecal coliform	1.07E+13	NA	5.62E+11	1.12E+13	NA
HARMON CREEK	O-97-C	Mechling Run	Fecal coliform	9.93E+12	NA	5.23E+11	1.05E+13	NA
HARMON CREEK	O-97-D	Brown Hollow	Fecal coliform	4.51E+12	NA	2.38E+11	4.75E+12	3.32E+11

NA = not applicable; UNT= unnamed tributary.