APPENDIX 16

A-16.   WATSON BRANCH

A-16.1   Watershed Description

Watson Branch is in the central portion of the Upper Kanawha watershed, as shown in Figure A-16-1, and drains approximately 0.61 square mile (391 acres). Figure A-16-2 shows the land use distribution in the watershed. The dominant land use is forest, which covers 92.03 percent of the watershed. Another important land use type is urban/residential (6.49 percent). All other land cover types account for less than 2 percent of the total watershed area.

There is one impaired stream, Watson Branch, in the watershed. Figure A-16-3 shows the impaired segment and the pollutants for which it is impaired.
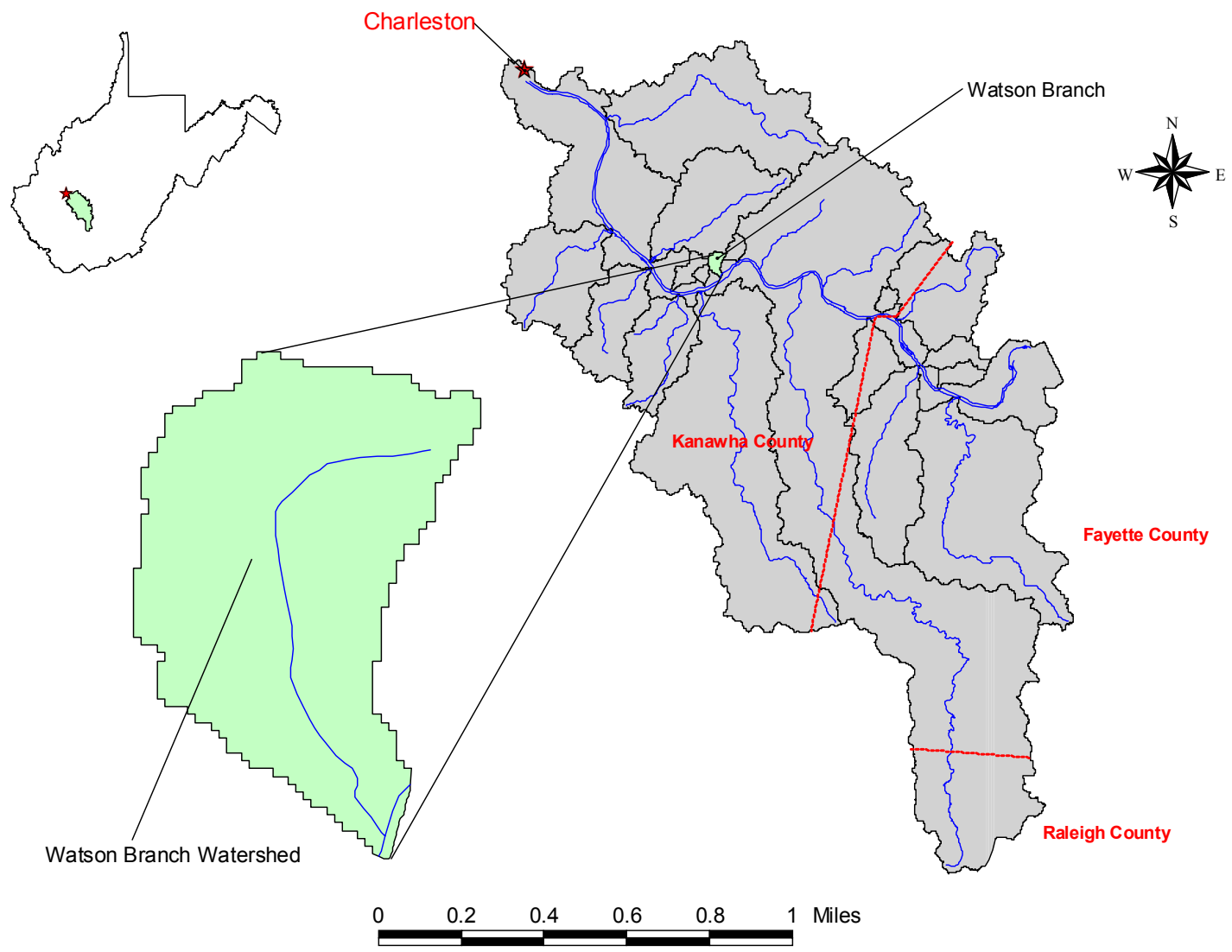
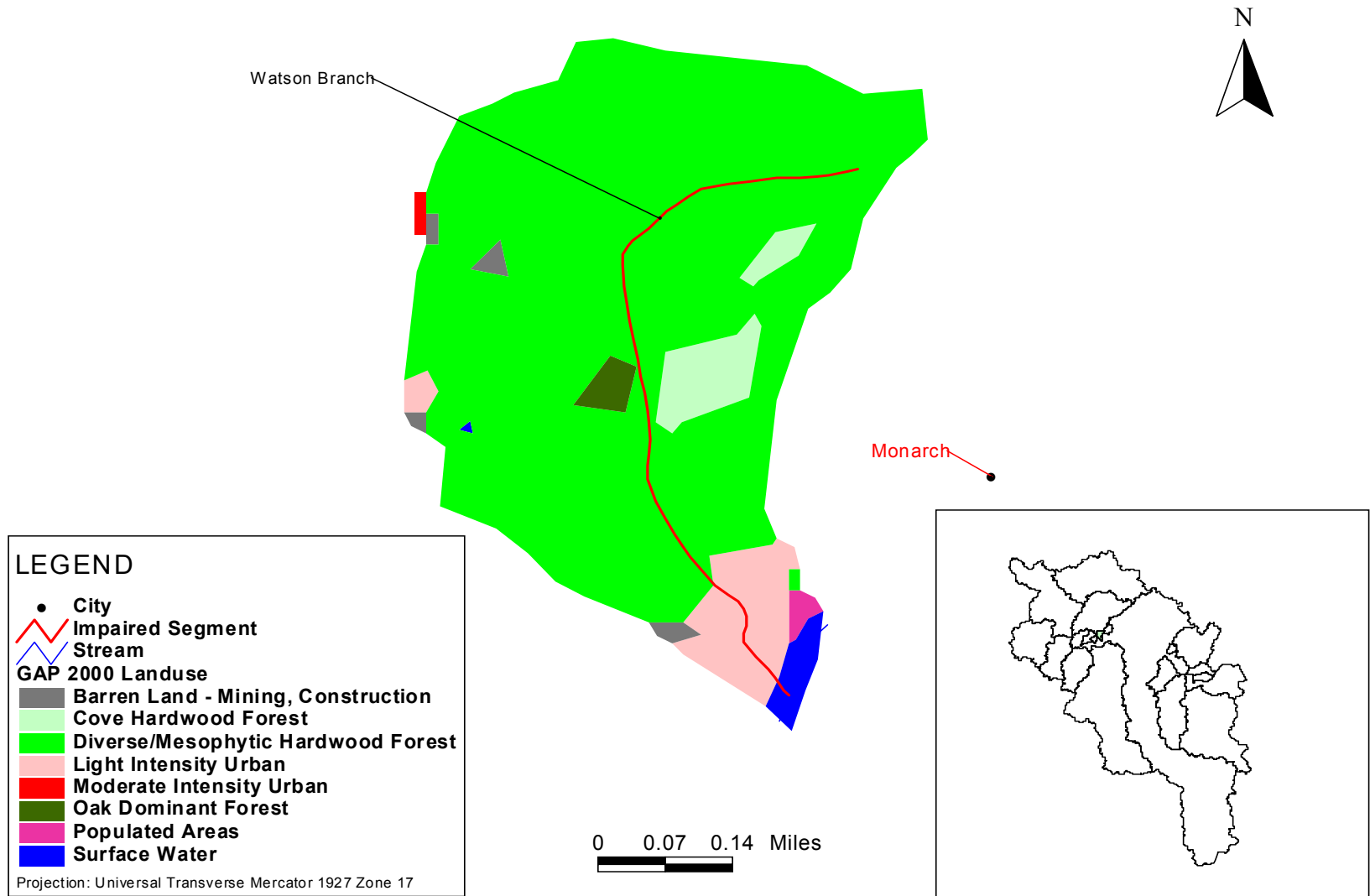**Figure A-16-1.** Location of the Watson Branch watershed

Watson Branch

N

Monarch

LEGEND

● City

 Impaired Segment

 Stream

GAP 2000 Landuse

█ Barren Land - Mining, Construction

█ Cove Hardwood Forest

█ Diverse/Mesophytic Hardwood Forest

█ Light Intensity Urban

█ Moderate Intensity Urban

█ Oak Dominant Forest

█ Populated Areas

█ Surface Water

Projection: Universal Transverse Mercator 1927 Zone 17

0   0.07   0.14   Miles

Figure A-16-2. Land use distribution in the Watson Branch watershed

WATSON BRANCH

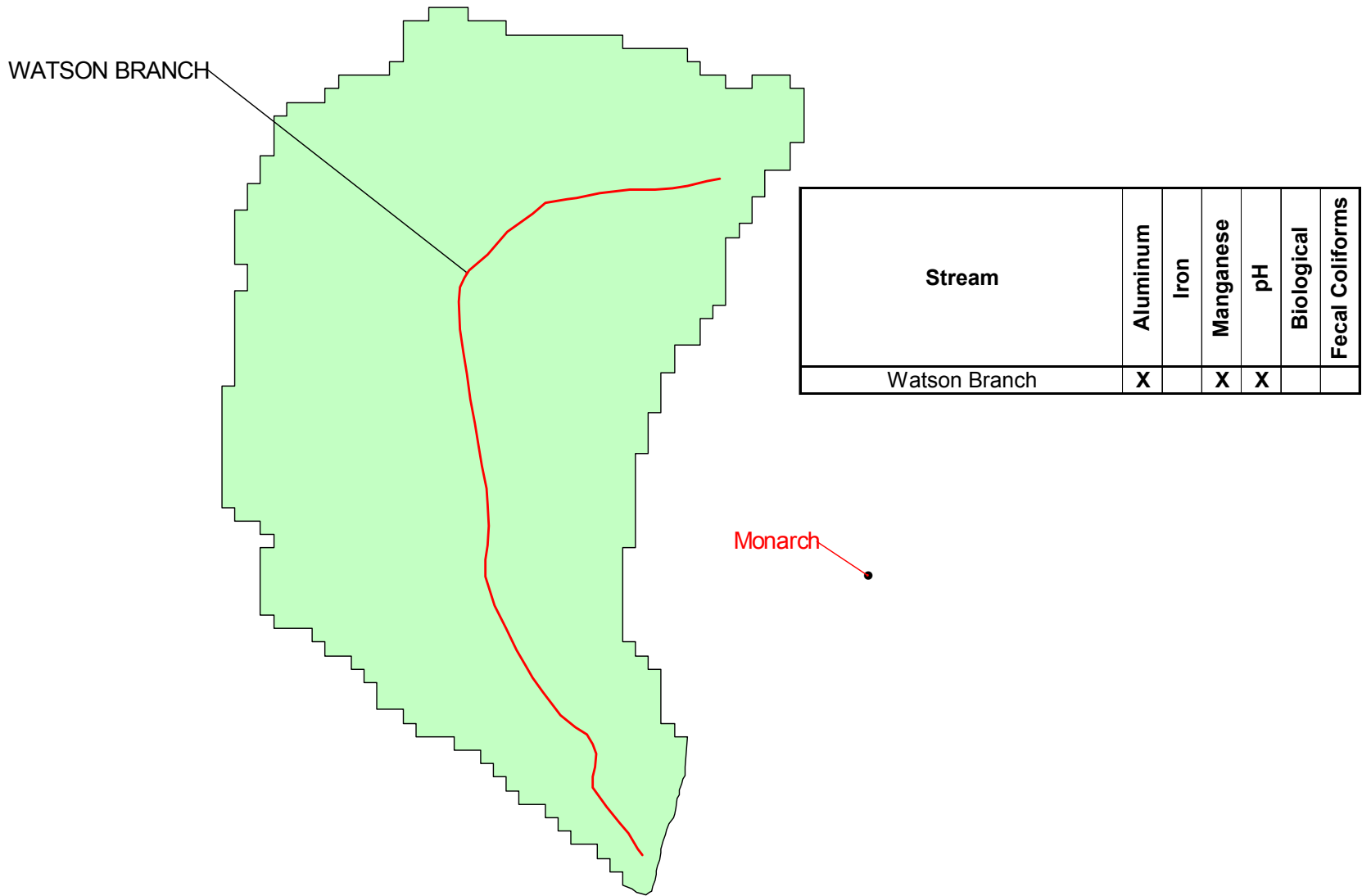| Stream	Aluminum	Iron	Manganese	pH	Biological	Fecal Coliforms
Watson Branch	X		X	X		

Monarch

Figure A-16-3. The impaired waterbody in the Watson Branch watershed

A-16.2   Pre-TMDL Monitoring

Before establishing Total Maximum Daily Loads (TMDLs), WVDEP conducted monitoring in each of the impaired streams in the upper Kanawha watershed to better characterize water quality and to refine impairment listings. Monthly samples were taken at 339 stations throughout the Upper Kanawha watershed from July 1, 2001, through June 30, 2002. The locations of the pre-TMDL monitoring sites in the Watson Branch watershed are shown in Figure A-16-4. Monitoring suites at each site were 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 (e.g., 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. Appropriate monitoring suites were also 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. In addition, benthic macroinvertebrate assessments were performed at specific locations on the biologically impaired streams during the pre-TMDL monitoring period. When conditions allowed, instantaneous flow measurements were also taken at the pre-TMDL sampling locations.
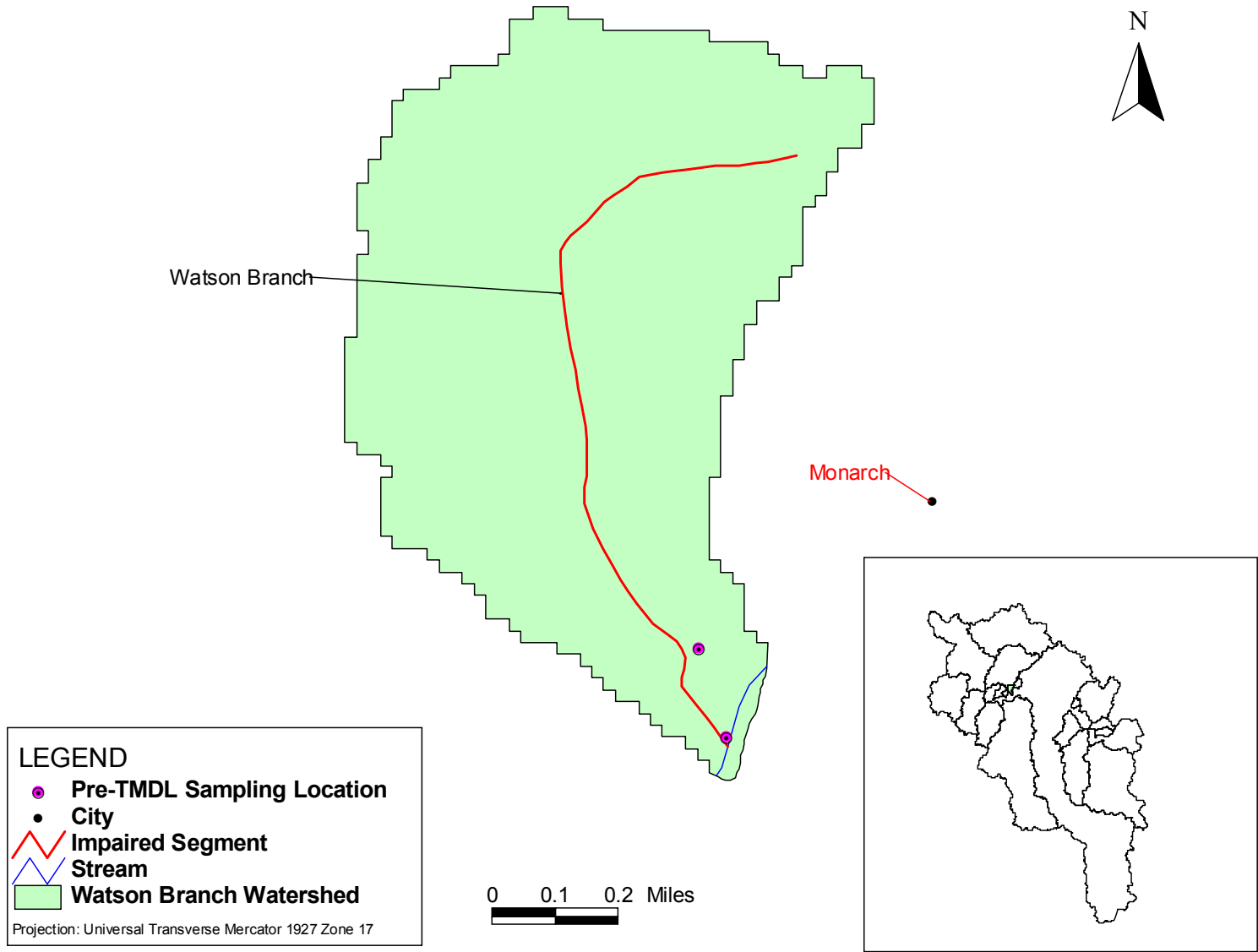
N

Watson Branch

Monarch

LEGEND

- ⦿ **Pre-TMDL Sampling Location**
- • **City**
- **Impaired Segment**
- **Stream**
- **Watson Branch Watershed**

Projection: Universal Transverse Mercator 1927 Zone 17

0   0.1   0.2   Miles

Figure A-16-4. Pre-TMDL monitoring stations in the Watson Branch watershed

A-16.3   Metals and pH Sources

This section identifies and examines the potential sources of metals and pH impairment in the Watson Branch watershed. Sources can be classified as either point sources (specific sources subject to a permit) or nonpoint sources (diffuse sources). Metals and pH point sources are classified by mining- and non-mining-related permits. Metals and pH nonpoint sources are diffuse, non-permitted sources such as abandoned or forfeited mine sites.

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

Based on scientific knowledge of sediment/metal interactions and knowledge of West Virginia's soils, 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-16.3.1   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. Metals point sources are not present in the Watson Branch watershed.

A-16.3.2   Metals Nonpoint Source Inventory

Nonpoint sources are diffuse, non-permitted sources. Abandoned mines can create acid mine drainage, which contributes low pH and high metals concentrations to surface and subsurface waters; therefore, abandoned mine lands can be a significant non-permitted source of metals and pH impairment. Facilities that were subject to the Surface Mining Control and Reclamation Act of 1977 and forfeited their bonds or abandoned operations can be a significant mining-related non-permitted source. Non-mining land disturbance activities can also be a nonpoint source of metals, causing metals to enter waterbodies as a component of sediment. Examples of such land disturbance activities are agriculture, forestry, oil and gas wells, and the construction and use of roads.

Abandoned Mine Lands and Bond Forfeiture Sites

Based on the identification of a number of abandoned mining activities in the Watson Branch watershed, abandoned mine lands are a significant non-permitted source of metals and pH impairment. WVDEP's Office of Abandoned Mine Lands identified locations of abandoned mine lands in the Watson Branch watershed. In addition, source-tracking efforts by WVDEP's Division of Water and Waste Management identified and characterized three abandoned mine sources (sources can include discharges, seeps, portals, culverts, refuse piles, diversion ditches, and ponds). The locations of abandoned mine lands are shown in Figure A-16-5. There is one bond forfeiture site in the Watson Branch watershed.
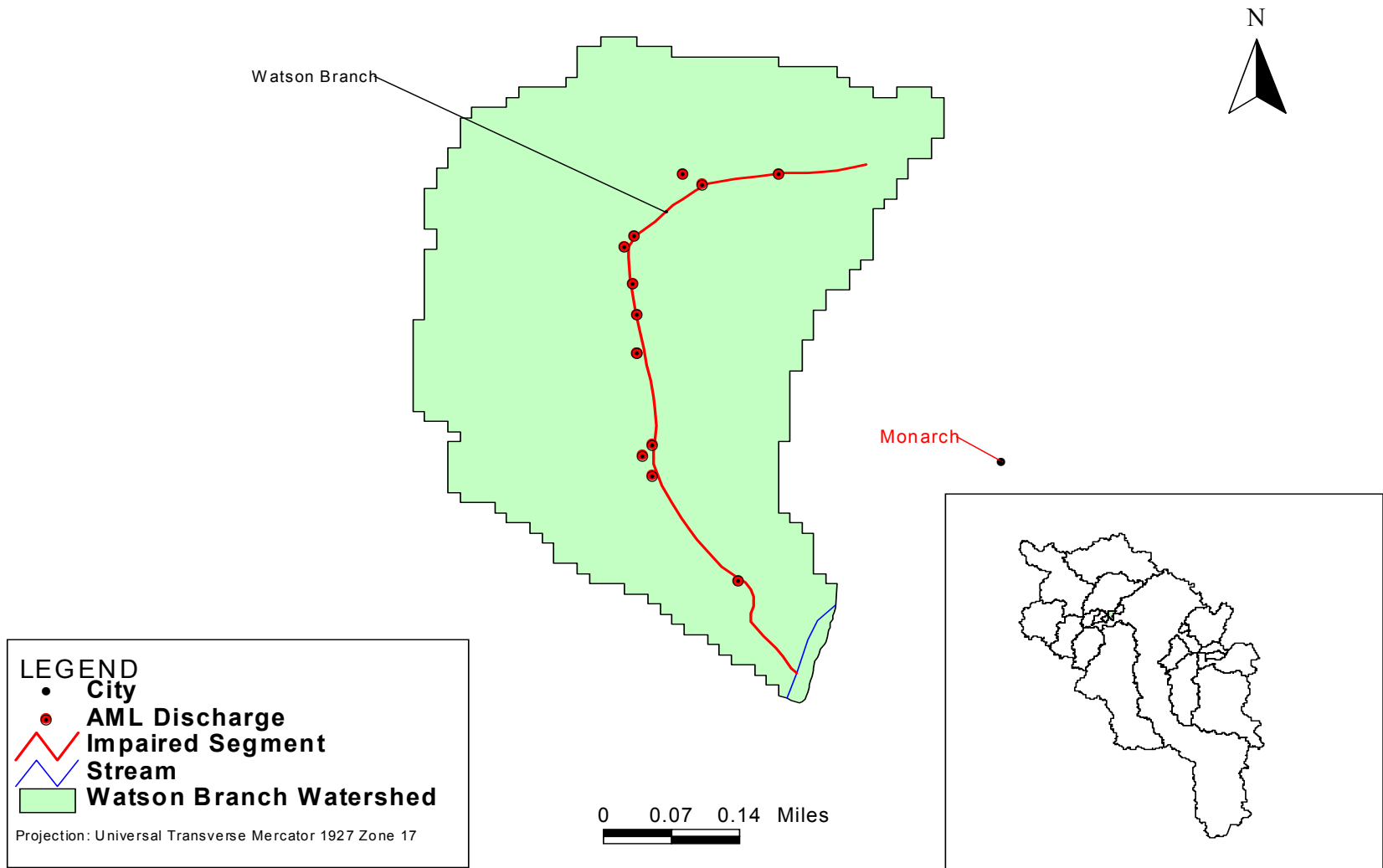
Figure A-16-5. Abandoned mine lands and the bond forfeiture site in the Watson Branch watershed

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 Watson Branch watershed are discussed below.

Agriculture
Based on the GAP 2000 land use coverage, there are no agricultural areas in the Watson Branch watershed.

Forestry
Active logging operations are not present in the Watson Branch watershed.

Oil and Gas Wells
There is one active oil and gas well in the Watson Branch watershed, the location of which is shown in Figure A-16-6. Based on the survey by WVDEP's Office of Oil and Gas, it is estimated that 0.16 acre (0.04 percent) of the Watson Branch watershed is disturbed by the active well site (including areas associated with access roads).
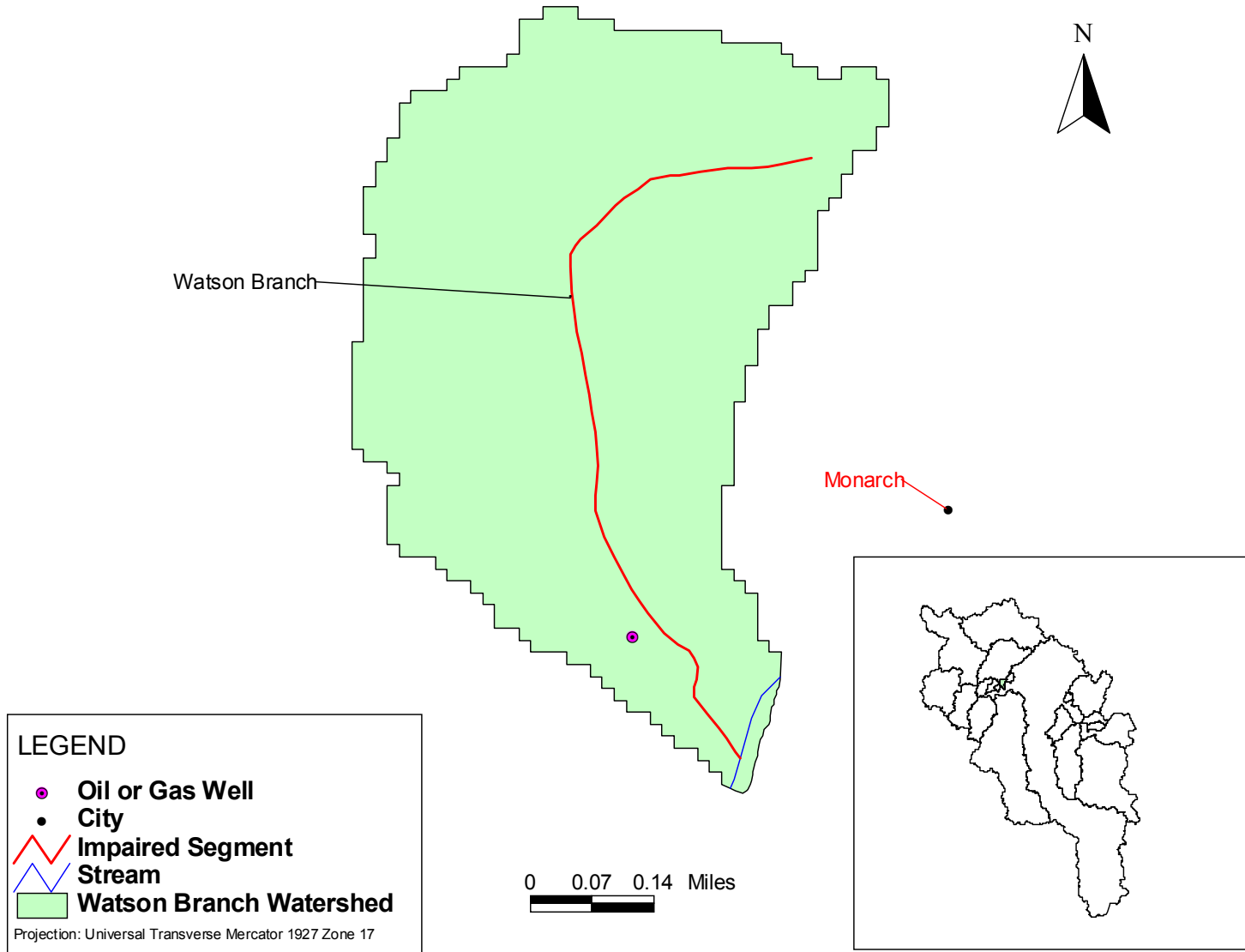
Figure A-16-6. Oil and gas wells in the Watson Branch watershed

Roads

The length and area of paved roads were calculated using the Census 2000 TIGER/Line files roads coverage for West Virginia. Information on unpaved roads from TIGER was supplemented by digitizing any unpaved roads on topographic maps that were not included in the TIGER shapefile. Table A-16-1 summarizes the length, area, and percentage of total watershed area of both paved and unpaved roads in the Watson Branch watershed.

Table A-16-1. Road miles by type in the Watson Branch watershed

Road Type	Road Distance (miles)	Road Area (acres)	Road Area as Percentage of Watershed
Total paved	0.38	1.19	0.30%
Total unpaved	4.50	6.60	1.69%

A-16.4   Fecal Coliform Bacteria Sources

There are no fecal coliform impairments in this watershed.

A-16.5   Stressors of Biologically Impaired Streams

There are no biological impairments in this watershed.

Note: Table numbers A-16-2 and A-16-3 are omitted in this appendix for the purpose of maintaining uniformity of TMDL table numbers throughout the Upper Kanawha appendices.

A-16.6   TMDLs for the Watson Branch Watershed

A-16.6.1   TMDL Development

TMDLs and source allocations were developed for the impaired stream in the Watson Branch 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.

The TMDLs for manganese, aluminum, and pH are shown in Tables A-16-5 through A-16-7. The TMDLs for manganese and aluminum are presented as annual loads, in terms of pounds per year. They are presented as average annual loads because they were developed to meet TMDL endpoints under a range of conditions observed throughout the year.

As stated in section 7.4.1 of the main report, a surrogate approach was used to develop pH TMDLs. It was assumed that reductions in metals concentrations to TMDL endpoints would result in compliance with the pH water quality standard. To verify this assumption, the Dynamic

Equilibrium In-stream Chemical Reactions (DESC-R) model was run for an extended period under TMDL conditions—conditions where TMDL endpoints for metals were met. A median equilibrium pH was calculated based on the daily equilibrium pH output from the DESC-R model. The result, shown in Table A-16-7, is the TMDL for the pH-impaired stream in the watershed. Refer to the Technical Report for a detailed description of the pH modeling approach.

A-16.6.2 TMDL Tables: Metals

Table A-16-4. Iron TMDLs for the Watson Branch watershed

There are no iron impairments in this watershed.

Table A-16-5. Manganese TMDLs for the Watson Branch watershed

Major Watershed	Stream Code	Stream Name	Metal	Load Allocation (lb/yr)	Wasteload Allocation (lb/yr)	Margin of Safety (lb/yr)	TMDL (lb/yr)
WATSON BRANCH	K-62	Watson Branch	Manganese	1,637	NA	86	1,723

NA = not applicable.

Table A-16-6. Aluminum TMDLs for the Watson Branch watershed

Major Watershed	Stream Code	Stream Name	Metal	Load Allocation (lb/yr)	Wasteload Allocation (lb/yr)	Margin of Safety (lb/yr)	TMDL (lb/yr)
WATSON BRANCH	K-62	Watson Branch	Total Aluminum	1,796	NA	95	1,891

NA = not applicable.

Table A-16-7. pH TMDLs for the Watson Branch watershed

Major Watershed	DNR Stream Code	Stream Name	Parameter	pH* (Under TMDL conditions)
WATSON BRANCH	K-62	Watson Branch	pH	7.33

*Predicted pH assumes that all metals (aluminum, iron, manganese) meet TMDL endpoints.

A-16.6.3   TMDL Tables: Fecal Coliform Bacteria

Table A-16-8. Fecal coliform TMDLs for the Watson Branch watershed

There are no fecal coliform impairments in this watershed.

A-16.6.4   TMDL Tables: Sediment

Table A-16-9. Sediment TMDLs for the Watson Branch watershed

There are no sediment impairments in this watershed.