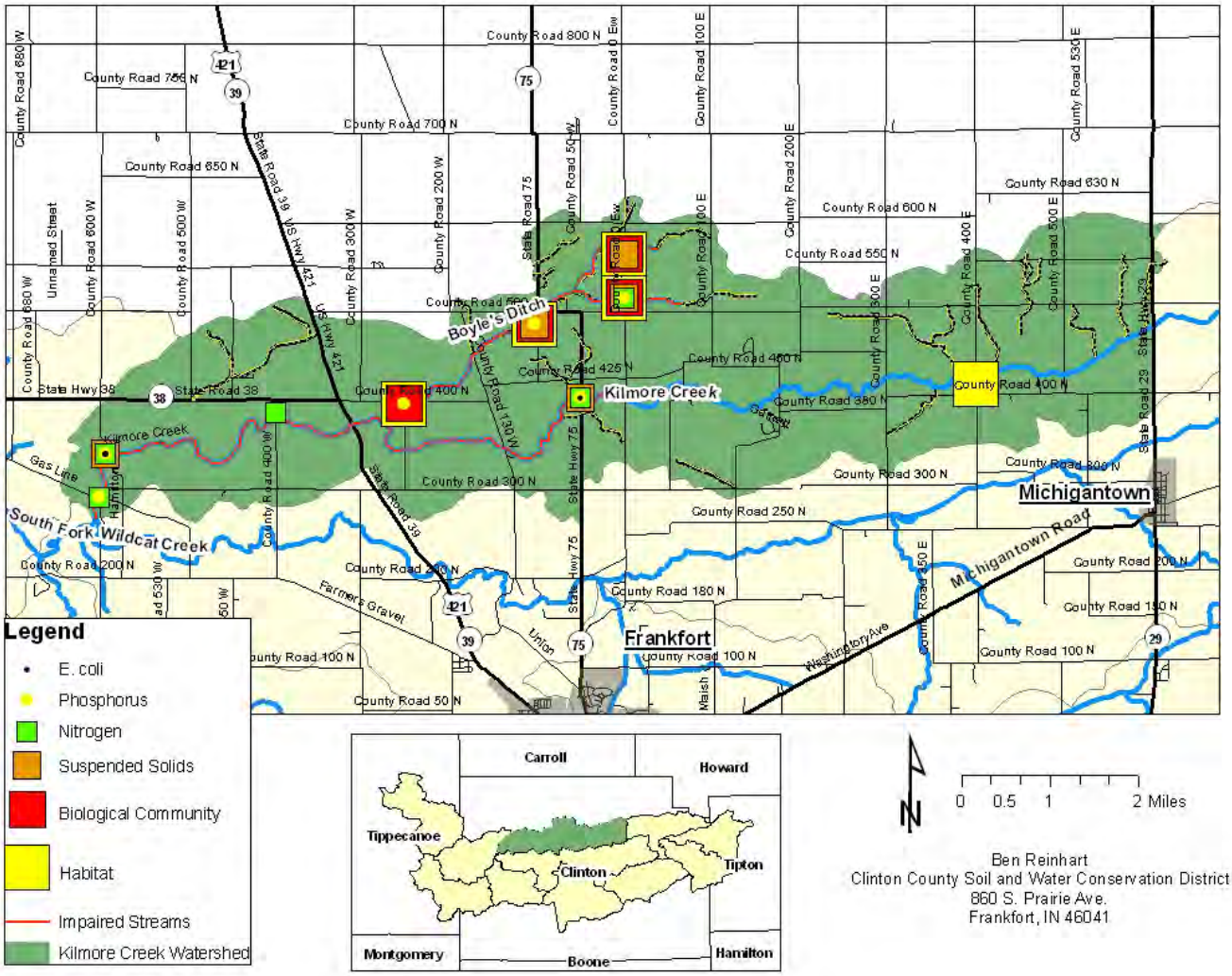

Figure 58. Kilmore Creek Water Quality Impairments

4.7 Spring Creek (HUC: 051201070307)

Land Use Information

The Spring Creek subwatershed is located directly west of the City of Frankfort, along the southern edge of the South Fork Wildcat Creek Watershed. This subwatershed drains approximately 10,210 acres in Clinton County. Primary waterways include Heavilon Ditch, Lick Run, and Spring Creek which ultimately empties into the South Fork Wildcat Creek just north of County Road 200 North (Figure 59). There are almost 14.5 miles of natural waterway within the Spring Creek subwatershed with only about three miles on Heavilon Ditch being listed as impaired. Portions of both Heavilon Ditch and Lick Run are classified as open drains, adding up to around 11.5 miles of maintained ditch.

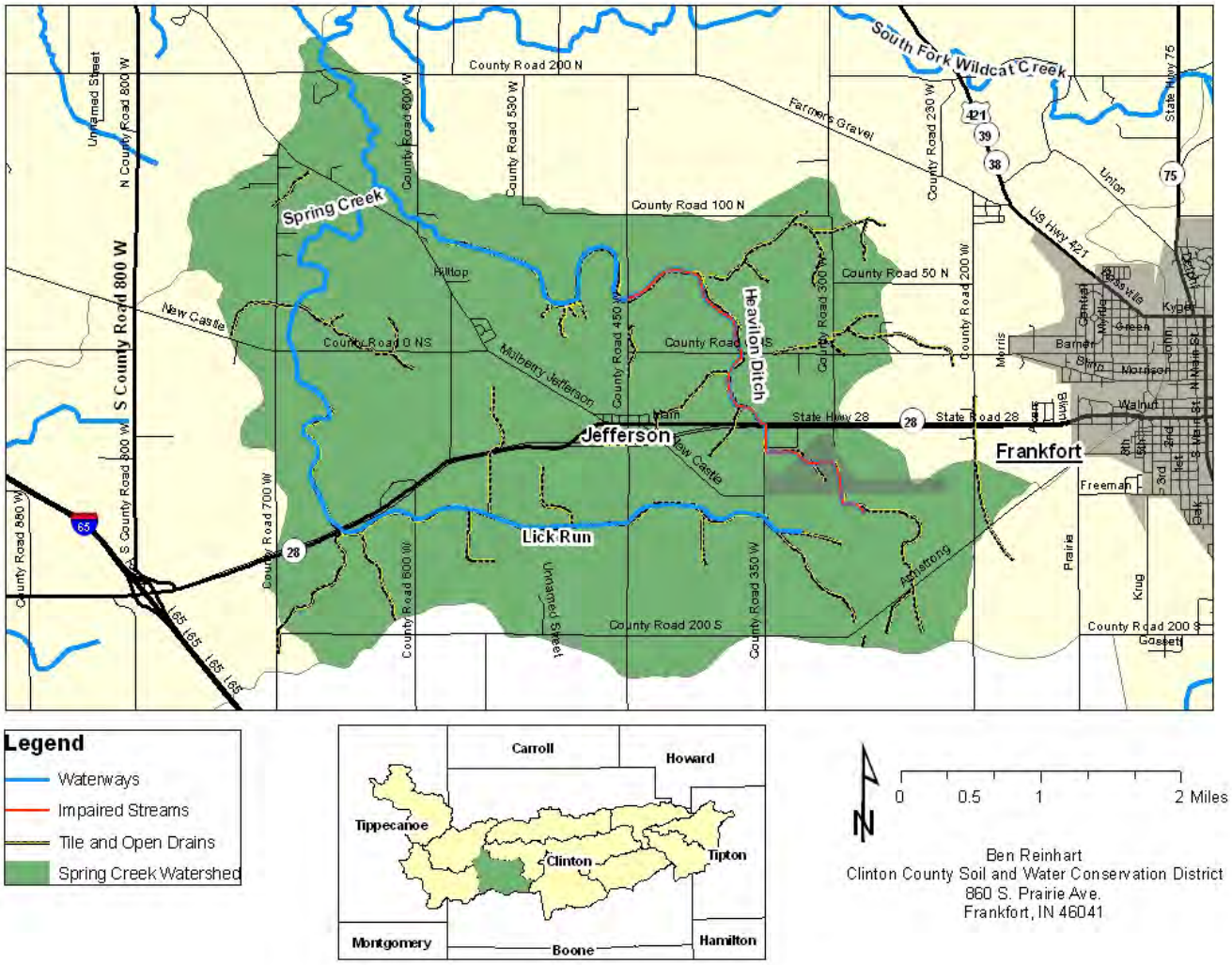

Figure 59. Spring Creek Waterways and Drainage

Roughly 39% of the lands within the Spring Creek subwatershed contain soils with hydric or somewhat hydric soil properties (Figure 60). Approximately 20% of the lands within the Spring Creek subwatershed can be classified as PHEL. Most of these lands occur along the primary waterways within the drainage area. Around 6% of the lands within the Spring Creek subwatershed can be classified as HEL with these areas occurring almost entirely in lower portions of the drainage area along Spring Creek.

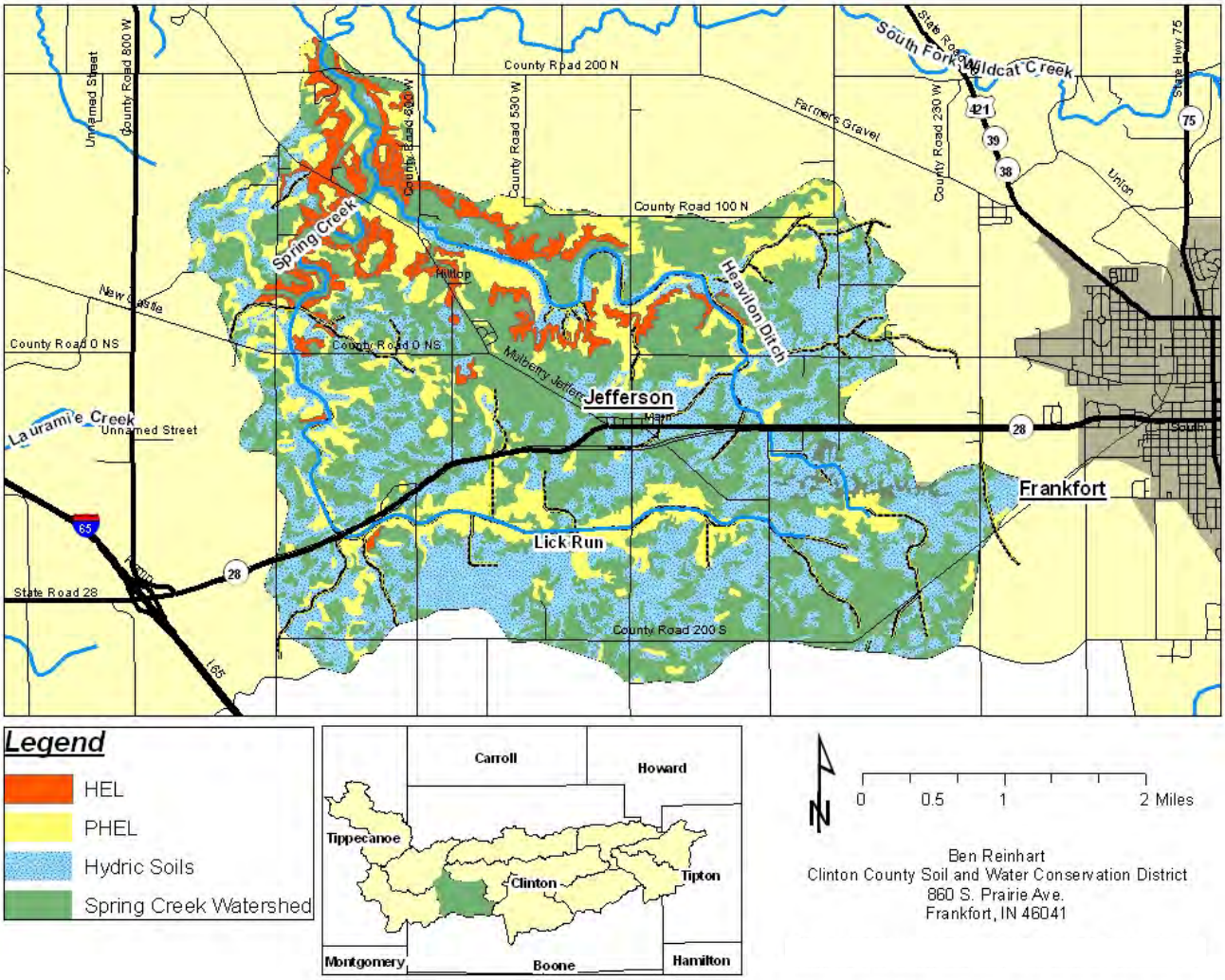

Figure 60. Spring Creek Soils

The dominating land use within the Spring Creek Watershed is cultivated cropland. However, this drainage area does see some developed areas represented by the Town of Jefferson, located on State Road 28 in the center part of the watershed, and sprawling development from the west side of Frankfort including various industries and the Frankfort Municipal Airport. Woodlands and pasture areas are common along waterways, especially in downstream portions of the Spring Creek Watershed (Figure 61).

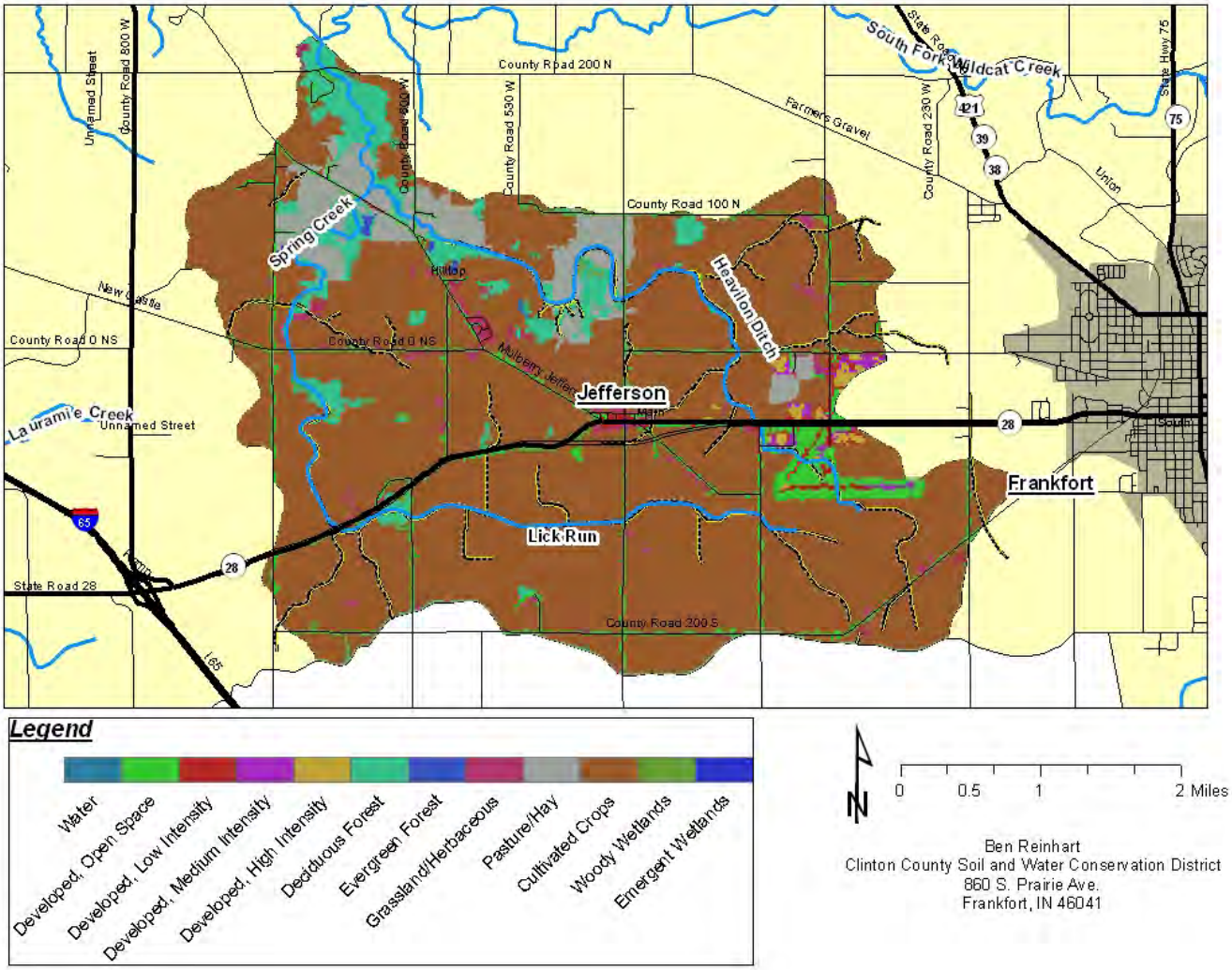

Figure 61. Spring Creek Land Use

Watershed Inventories

Windshield Survey & Source Identification

A total of three NPDES facilities permits and two pipe permits are located within the Spring Creek drainage area. One location, near the Frankfort Municipal Airport, is classified as a remediation site. C.F. Industries Inc., located in the western portion of the subwatershed, has recorded one effluent exceedance for oil and grease in January of 2009. Frito Lay has recorded three effluent exceedances for Total Suspended Solids with the most recent being in July of 2010. Of the two Confined feeding operations, only one is listed as Active. Six Underground Storage Tanks and six Leaking Underground Storage Tanks were identified in the subwatershed. During windshield inventories, volunteers noted a number of areas lacking adequate riparian vegetation, most notably in areas along Lick Run (Figure 62).

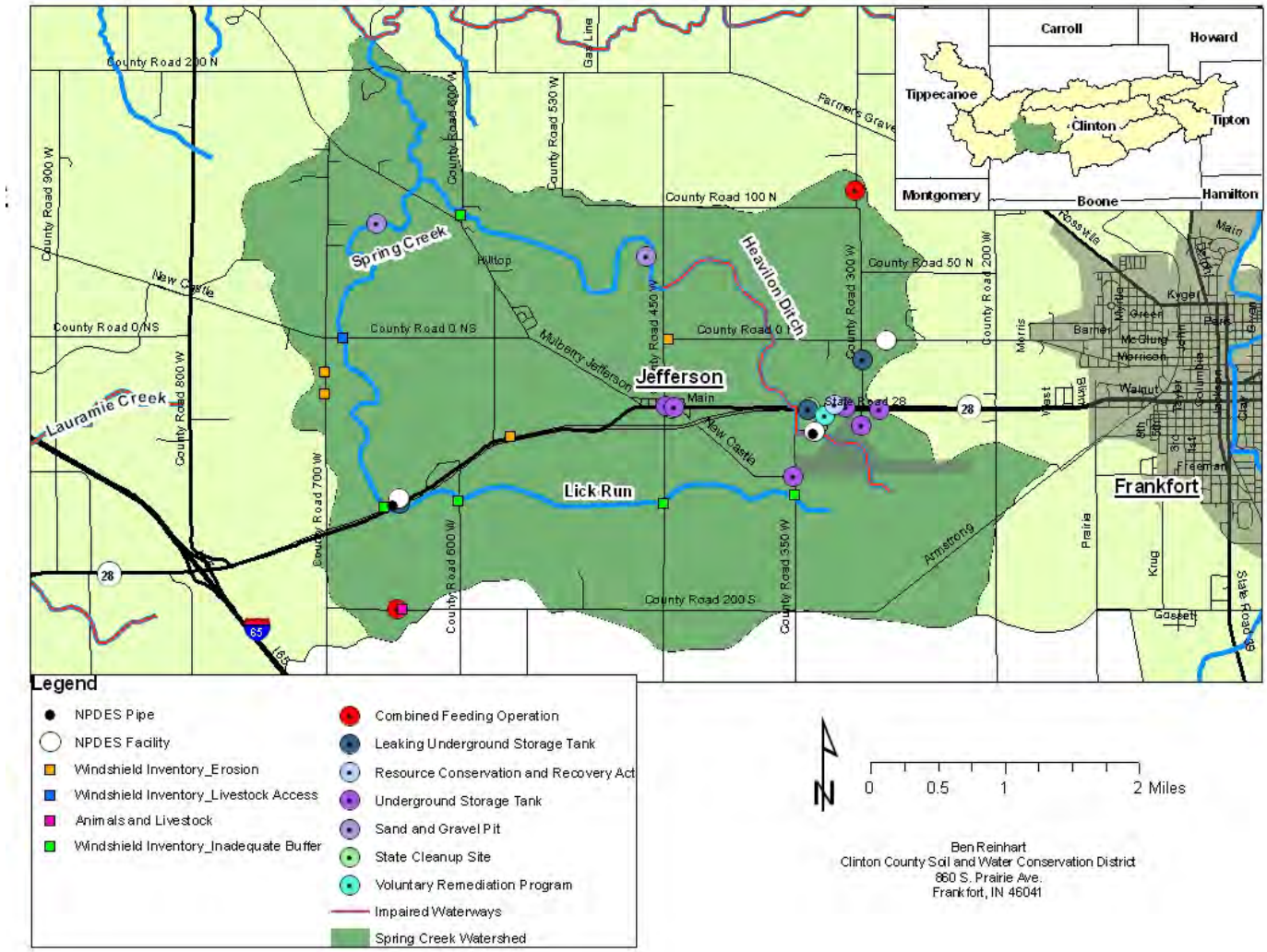

Figure 62. Spring Creek Source Investigation

Desktop Surveys

Around 74% of the land area within the designated floodplain and riparian zones consist of land cover types such as cultivated crops, livestock pasture, and/or developed areas. This makes up almost 11 miles of unbuffered waterways within the Spring Creek subwatershed. The majority of buffered waterways occur in the lower parts of the subwatershed along the main body of Spring Creek (Figure 63). A large part of this buffered area consists within Camp Cullom, a local nature park, which is located near the confluence of Spring Creek and the South Fork Wildcat Creek.

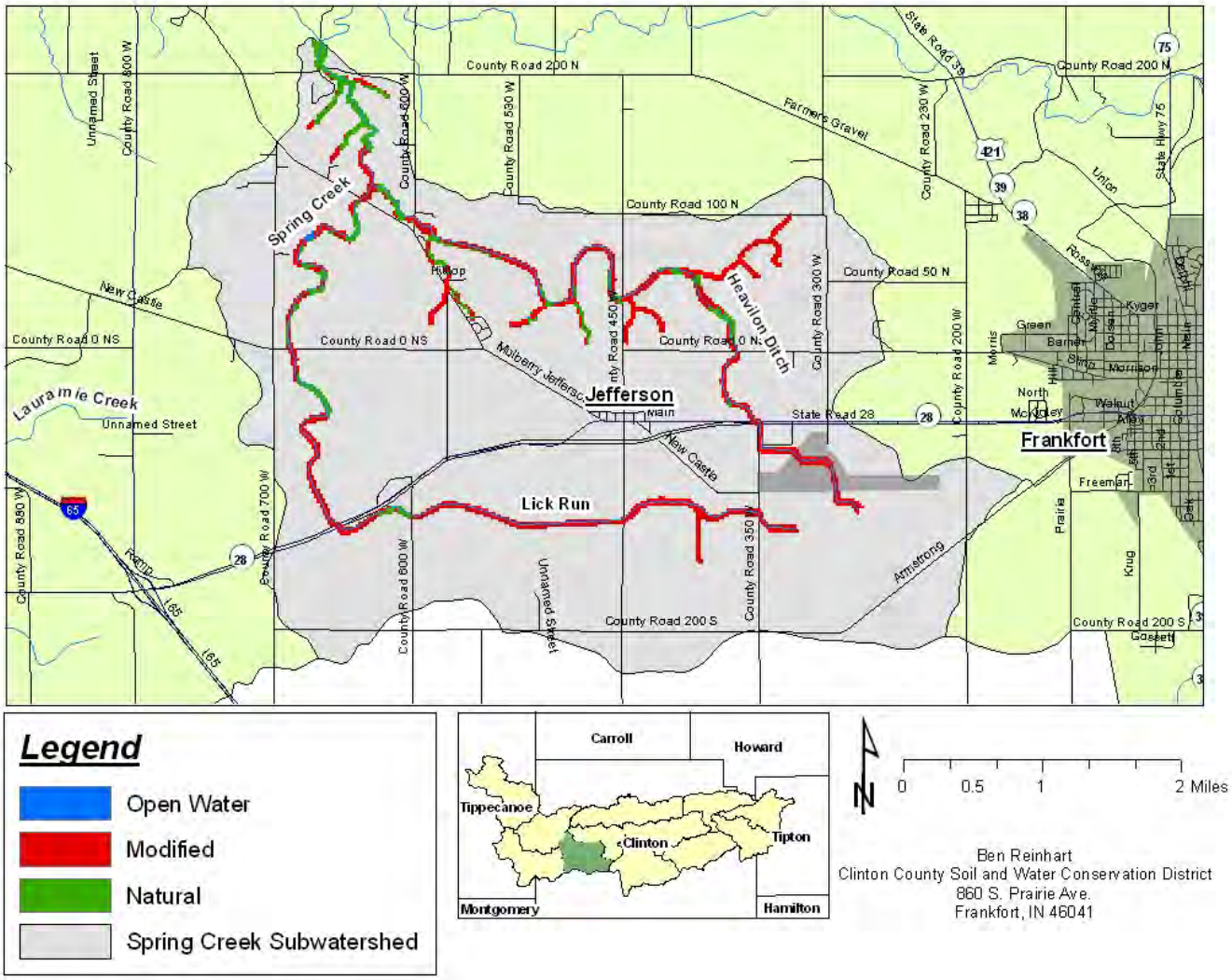

Figure 63. Spring Creek Riparian Lands Survey

The Spring Creek subwatershed ranks the highest of all subwatersheds in regards to the percent of land area having applied conservation practices. Just over 38% of the Spring Creek subwatershed has had conservation practices applied compared against an average of 18.3% across the South Fork Wildcat Creek drainage. The application of conservation practices has included primarily Conservation Crop Rotation, residue and tillage management, and a high occurrence of implemented Pest and Nutrient Management Plans.

Water Quality Information

IDEM 305(b)/303(d)

The headwaters of Heavilon Ditch are the only waterway within the Spring Creek subwatershed that is listed as part of the 2008 state 303(d) list (Figure 64). However, Heavilon Ditch is listed as having two impairments; one for impaired biotic communities and another for recreational uses. Spring Creek and Lick Run are mentioned in the 305(b) report as needing additional water quality data to adequately determine impairments but maintain fairly good water quality.

Hoosier Riverwatch

Two Hoosier Riverwatch sampling sites were located on Spring Creek with sampling being completed in 2001 and 2002. Sampling in 2001, completed during August at only one site, indicated average chemical and biological data with Water Quality Index scores at almost 68 and Pollution Tolerance Index of 13. Sampling in 2002 occurred at two sites in June. Water Quality Index scores at both sites were good to excellent with scores of 85 and 90. Biological and habitat data however varied between the two sites considerably with one site showing below average Pollution Tolerance Index and CQHEI scores while the other site showed above average scores.

SCLR Watershed Plan

Sampling done by IDEM in 1998 showed three sites as having *E. coli* levels higher than state standards. These sites included Heavilon Ditch, Lick Run, and Spring Creek. The highest *E. coli* levels were seen in Heavilon Ditch near the Town of Jefferson. At this same site, low dissolved oxygen levels were noted. However, since then Jefferson has been brought online with the City of Frankfort sewer and water systems.

AIMS

Six locations were sampled within the Spring Creek-Lick Run subwatershed for *E. coli* as part of a 1998 TMDL study. Sites on Heavilon Ditch, Lick Run, and Spring Creek showed *E. coli* levels exceeding accepted standards. The sampling location on Heavilon Ditch at County Road 0 showed the highest levels with a reading of 610 CFU/100mL. Two sites on Lick Run failed to meet accepted habitat quality standards during a 2004 sampling effort. Remaining sites on Spring Creek and Heavilon Ditch met habitat quality standards with the highest scores being recorded on Spring Creek at County Road 200 North in 1991 and again in 2004. Sites on Spring Creek, Heavilon Ditch, and Lick Run all met accepted standards for fish communities, again with the highest scores being recorded on Spring Creek at County Road 200 North. Three sites showed elevated levels of nitrate-nitrite above accepted standards during a 2003 sampling event. Two of these locations were on Lick Run at State Road 28 and Mulberry-Jefferson Road. Another site was located on Heavilon Ditch at County Road 350 West. Another location on Heavilon Ditch at County Road 0 showed levels approaching but not exceeding accepted standards. This site at Heavilon Ditch also showed somewhat elevated ammonia levels in 1998 and 2003.

South Fork TMDL

Sampling sites on Heavilon Ditch were used for *E. coli* load calculations, estimates for nitrate-nitrate loads, as well as total phosphorus. For *E. coli* Heavilon Ditch showed required reductions of 80% while for nitrate-nitrite reductions of 9% were seen. Necessary reductions for total phosphorus were 46%.

One assessment location was located on Heavilon Ditch. The Frito Lay Inc. discharge did not appear to contribute towards *E. coli*, nitrate-nitrite, or total phosphorus levels. Another important consideration is that part of the City of Frankfort's MS4 area drains to Heavilon Ditch.

Current Data

The Spring Creek subwatershed had one sampling location included as part of the South Fork Wildcat Creek Assessment. Evaluations of habitat at this location showed relatively high scores when compared

to other locations across the watershed. Biological sampling of macroinvertebrate communities also followed this trend with pollution-intolerant species being relatively abundant.

The sampling location near CR 200N exceeded target levels for *E. coli* during both high and low flow periods. Average total phosphorus, nitrate-nitrite, and TSS levels met target levels during high and low flows. Only one exceedance for total phosphorus and TSS was documented at CR 200N during the 2010-2011 sampling period and this occurred during a high-flow period.

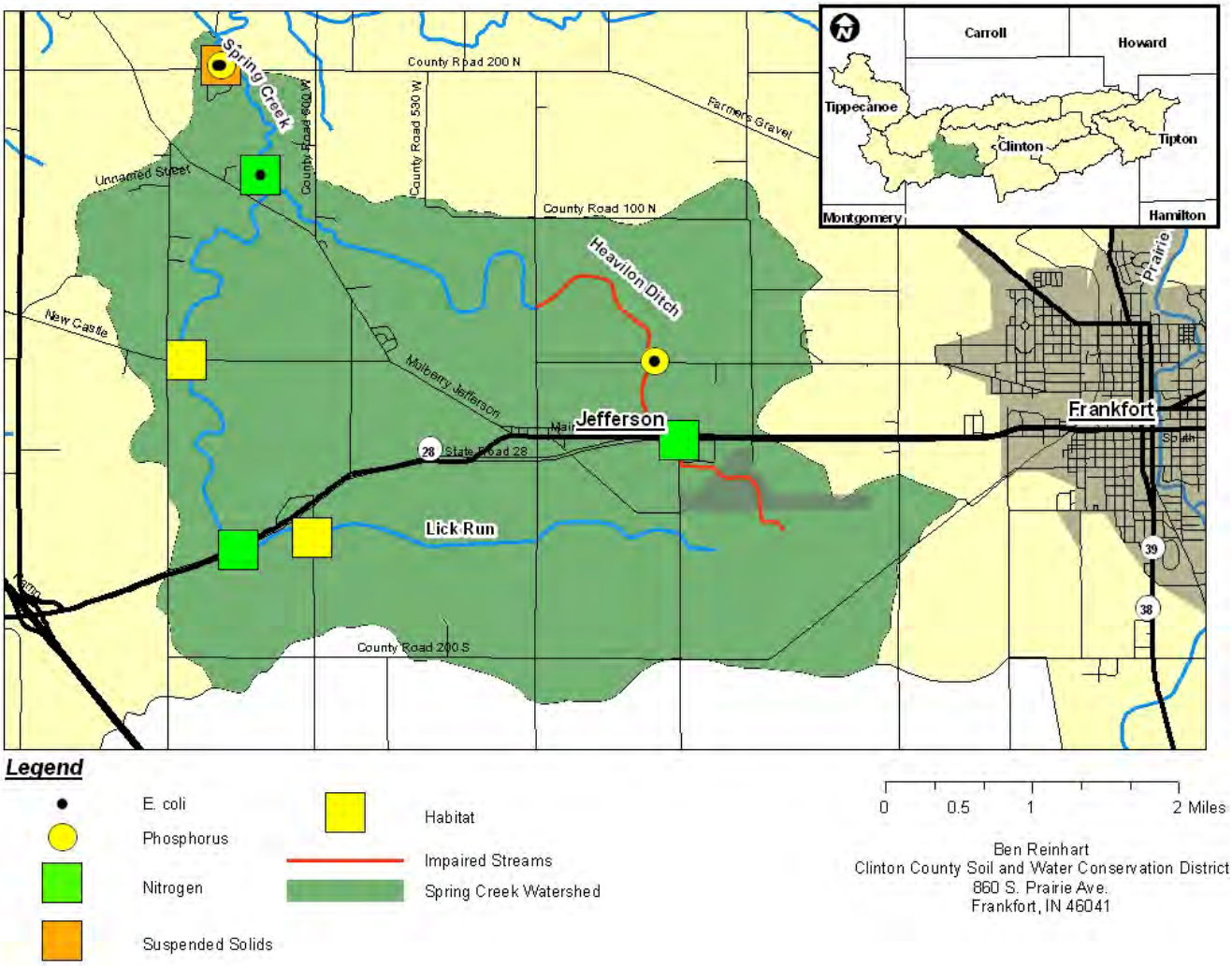

Figure 64. Spring Creek Water Quality Impairments

4.8 Jenkins Ditch – South Fork Wildcat Creek (HUC: 051201070308)

Land Use Information

The Jenkins Ditch-South Fork Wildcat Creek subwatershed runs east to west through the center of the South Fork Wildcat Creek Watershed. This subwatershed drains almost 22,800 acres making it

the largest subwatershed within the South Fork Wildcat Creek drainage. Over 26.5 miles of waterways run through the Jenkins Ditch-South Fork Wildcat Creek subwatershed being primarily made up of the South Fork Wildcat Creek and Jenkins Ditch (Figure 65). Of these 26.5 miles, 23.5 of them are listed as impaired waterways including virtually all stretches of Jenkins Ditch and the South Fork Wildcat Creek within the subwatershed boundary. The entire length of Jenkins Ditch is classified as an open drain by the Clinton County Surveyor.

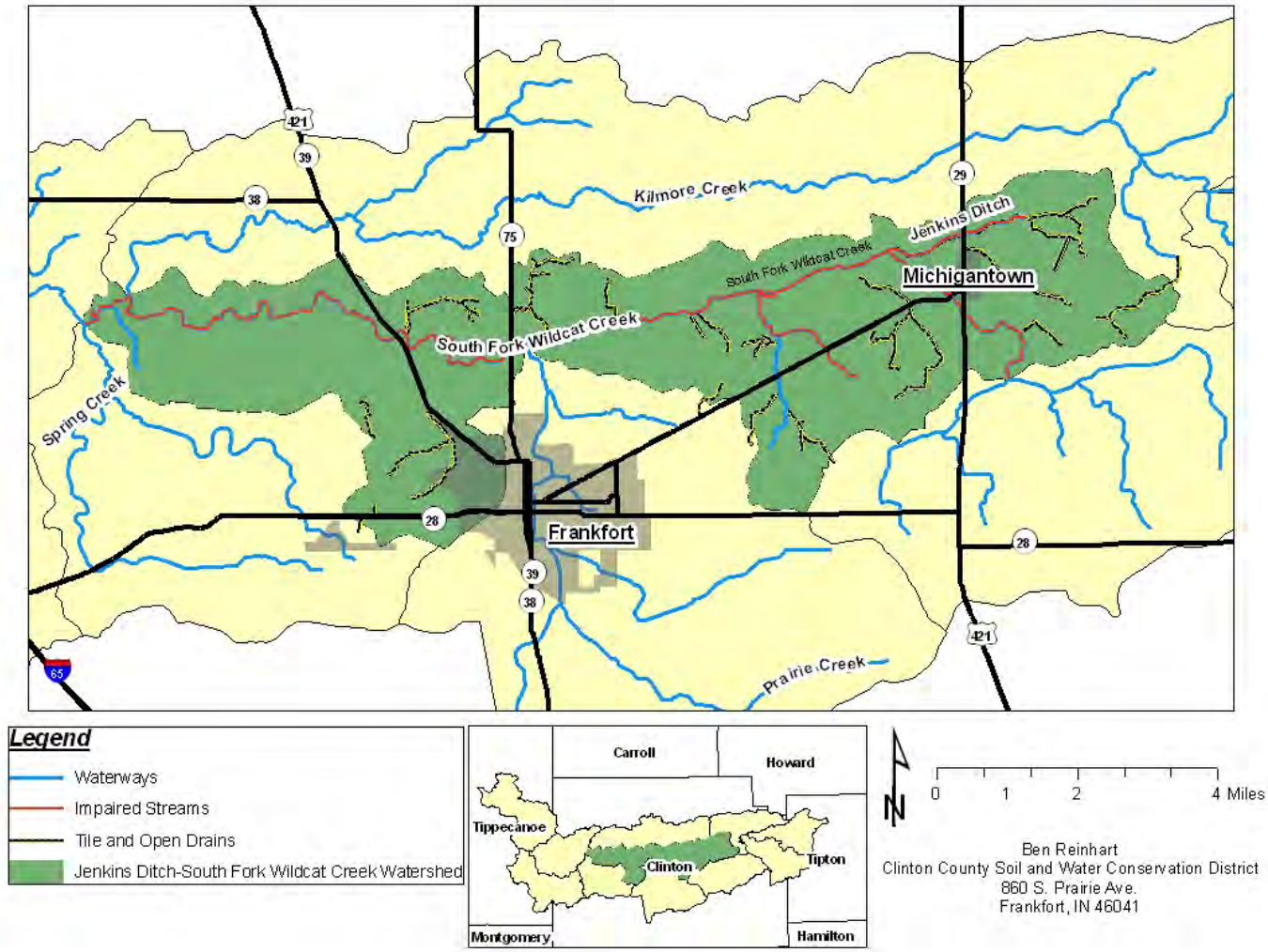

Figure 65. Jenkins Ditch-South Fork Wildcat Creek Waterways and Drainage

The Jenkins Ditch-South Fork Wildcat Creek subwatershed contains approximately 26% and 43% of lands that can be classified either as containing soils with hydric properties and/or PHEL, respectively. However, the majority of these lands occur in upper portions of the watershed (Figure 66). One exception to this is the area around Blinn Ditch which contains a concentration of lands that can be classified as having soils with hydric or somewhat hydric properties. Just over 5% of the land within this drainage area can be classified as HEL with most of these areas occurring in lower portions of the subwatershed along the South Fork Wildcat Creek.

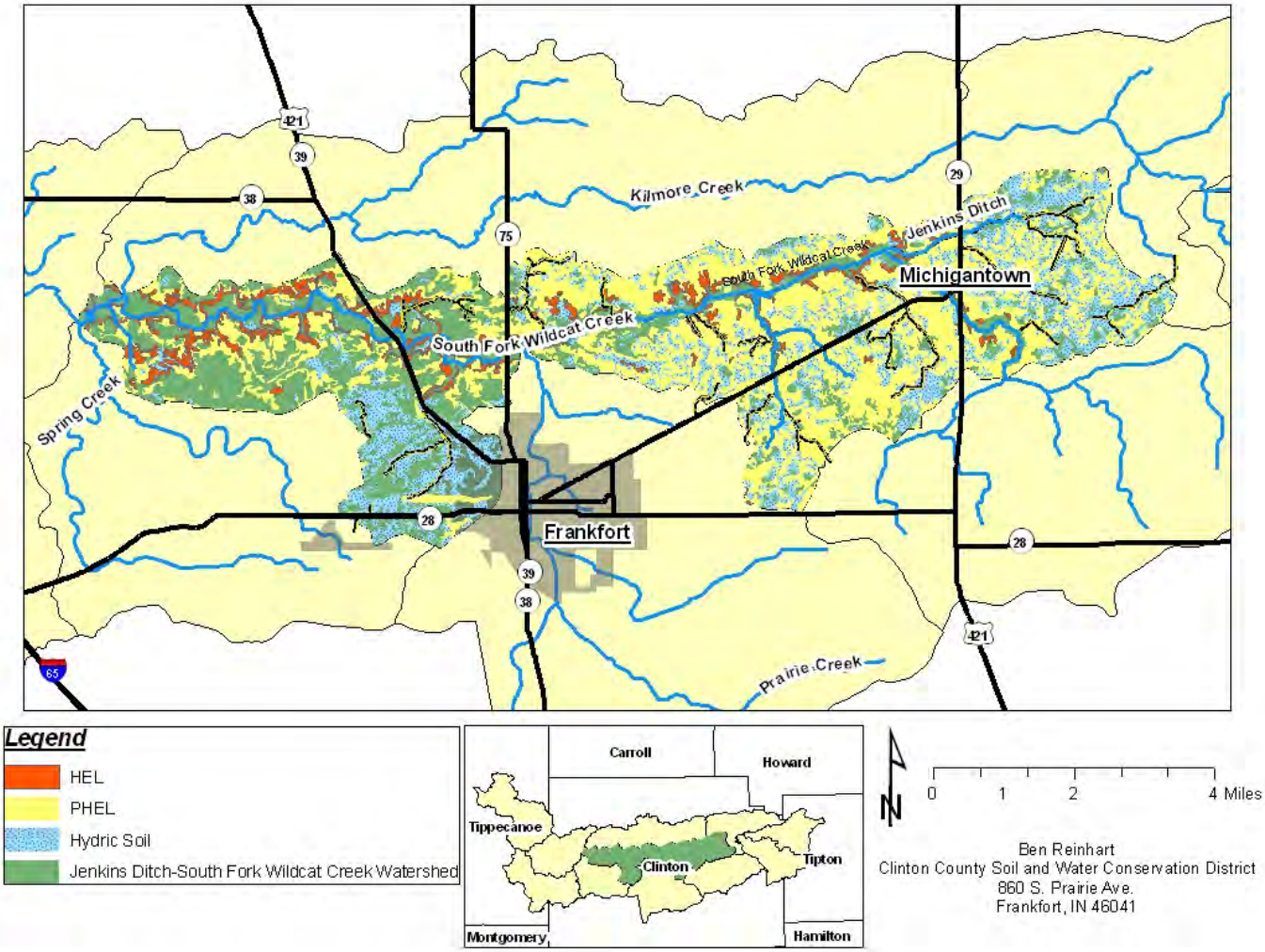

Figure 66. Jenkins Ditch-South Fork Wildcat Creek Soils

The Jenkins Ditch-South Fork Wildcat Creek Watershed is a diverse drainage area. Upstream of where Prairie Creek empties into the South Fork Wildcat Creek, the watershed contains little development outside of Michigantown and is heavily dominated by cultivated crops. Some wooded areas can be found scattered around with the majority of them being located alongside the South Fork Wildcat Creek (Figure 67). Downstream of the Prairie Creek and South Fork Wildcat Creek confluence you begin to see changes in land use. More development and industry can be seen on the west side of Frankfort and in proximity to Blinn Ditch. You also begin to see much more wooded lands and pasture adjacent to the South Fork Wildcat Creek.

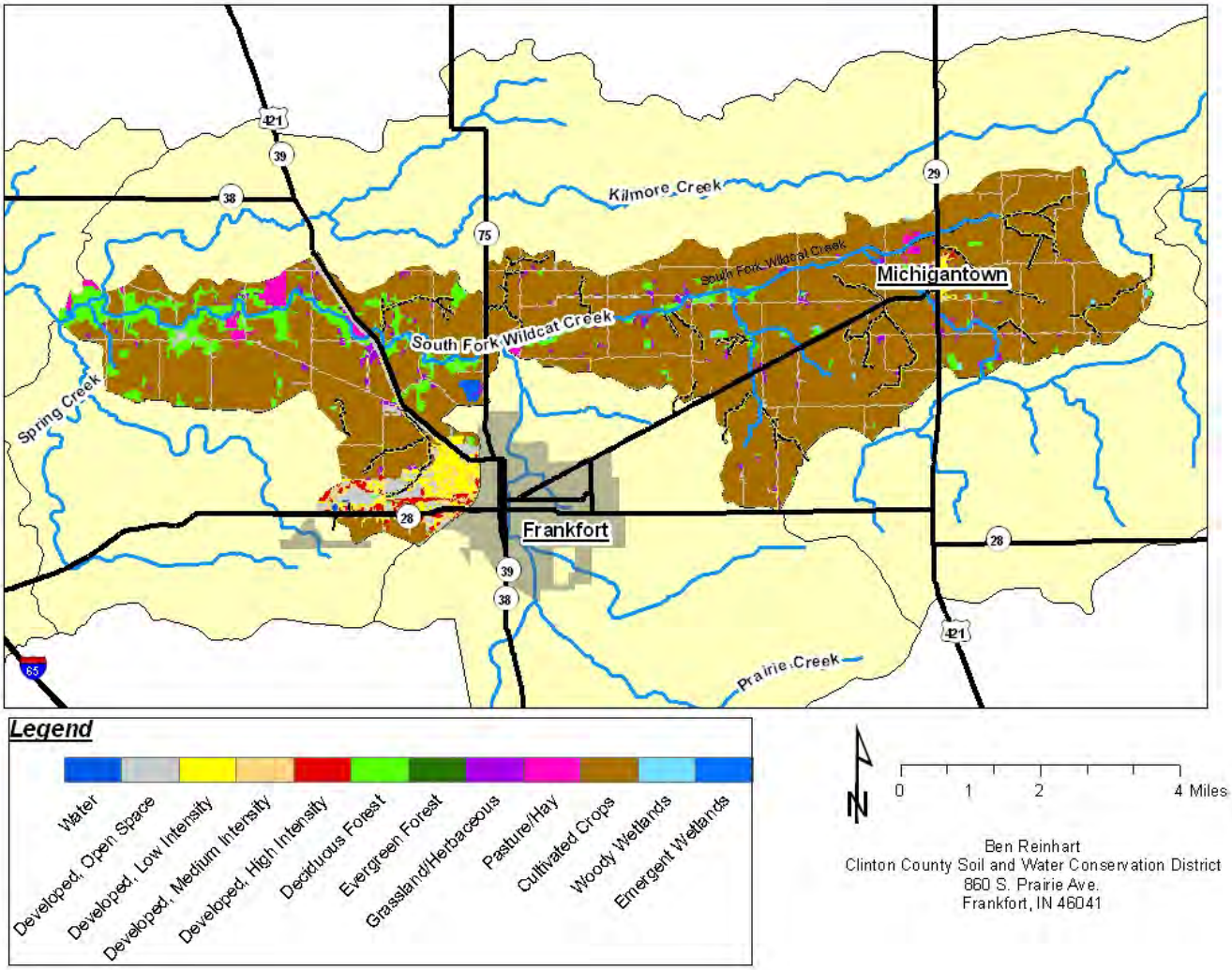

Figure 67. Jenkins Ditch-South Fork Wildcat Creek Land Use

Watershed Inventories

Windshield Survey & Source Identification

The Michigantown WWTP is the lone NDPES facility permit within the Jenkins Ditch subwatershed. There is also an NPDES pipe permit located in the western portion of the drainage area which is associated with the Frito Lay facility. The Michigantown WWTP has recorded four effluent exceedances with the most recent being for Ammonia in March of 2011. Currently, this site has been issued an official Notice of Noncompliance. A total of 11 Confined feeding operations were identified within the drainage area with six of these being listed as Active. Fourteen Underground Storage Tanks and 20 Leaking Underground Storage Tanks were located, primarily around the western side of Frankfort and Michigantown. Four Abandoned Landfills where identified with all of these occurring west of State Road 75. Volunteers completing the windshield inventory identified a number of areas of active erosion, small livestock and animal operations, and locations were livestock had free access to local public waters (Figure 68). The majority of these were located in the eastern, upstream portion of the Jenkins Ditch subwatershed.

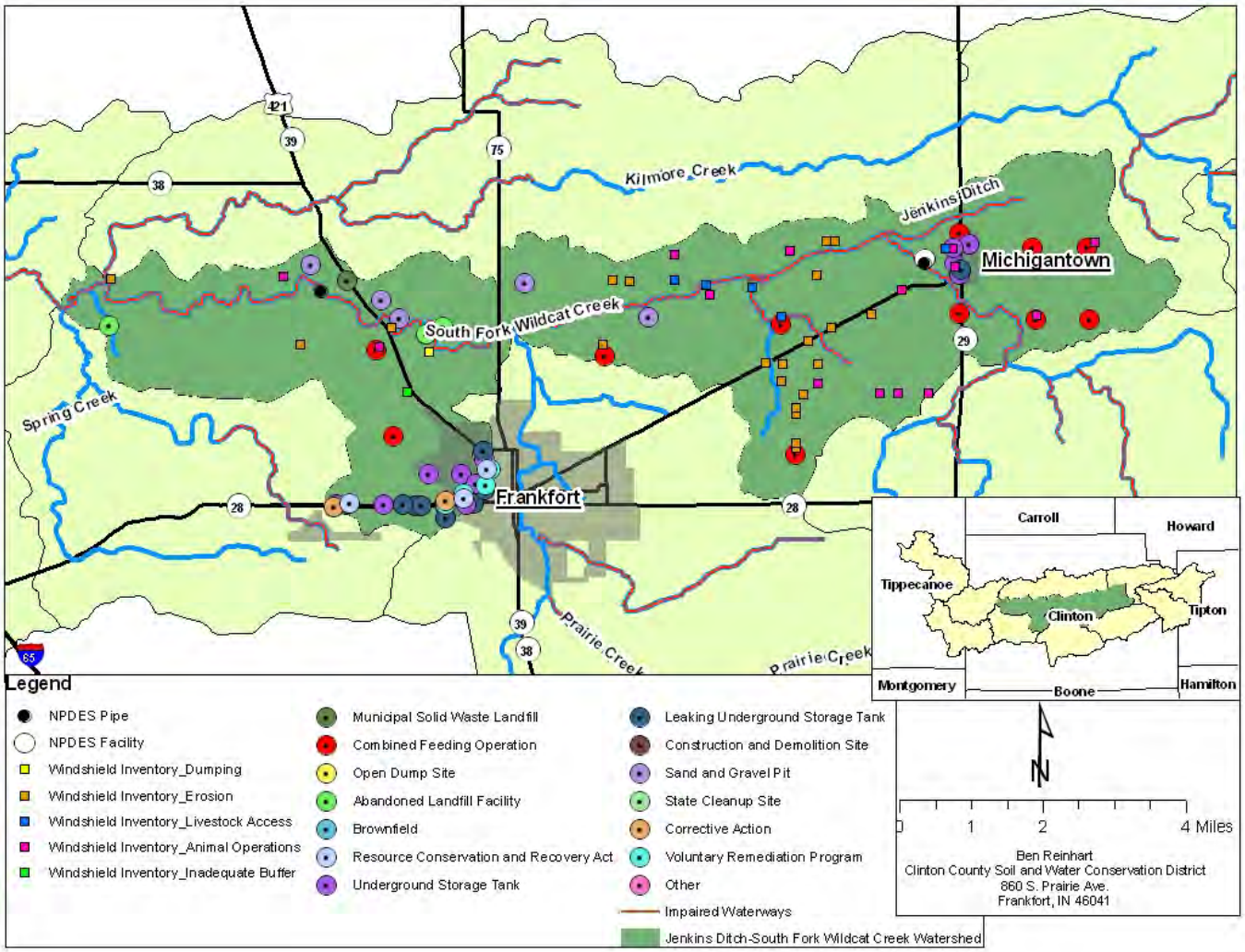

Figure 68. Jenkins Ditch-South Fork Wildcat Creek Source Investigation

Desktop Surveys

Around 44% of lands within the designated floodplains and riparian zone consist of land cover types compatible with use as buffer areas (e.g. wooded lands, grasslands, wetlands, etc.). This ranks as the fourth highest amount of all drainage areas of the South Fork Wildcat Creek Watershed. Areas of buffered waterways are much more common in lower portions of this subwatershed than more upstream locations such as waterways near Michigantown (Figure 69).

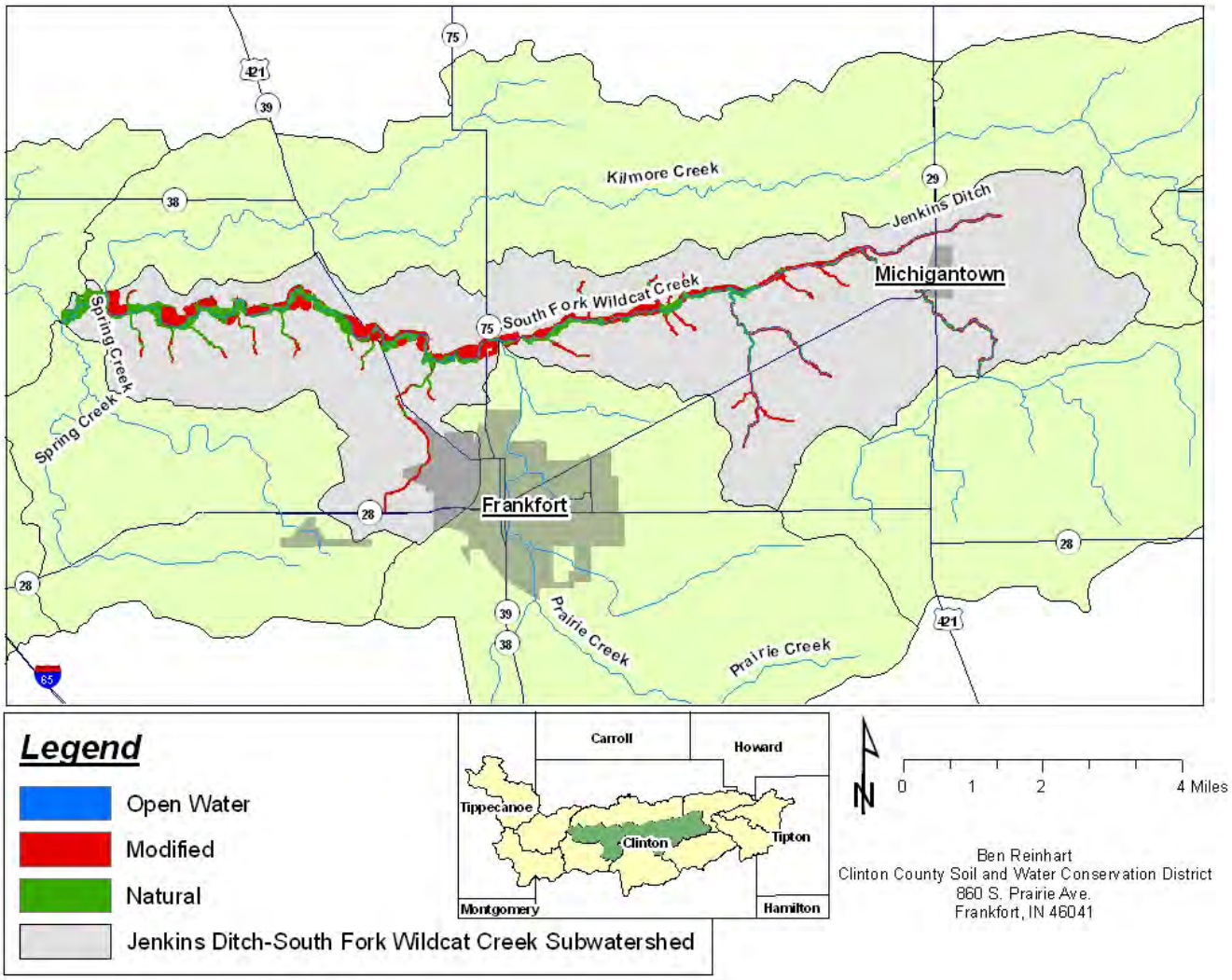

Figure 69. Jenkins Ditch-South Fork Wildcat Creek Riparian Lands Survey

The Jenkins Ditch-South Fork Wildcat Creek subwatershed falls slightly above average in regards to the percent of land area having applied conservation practices. Just over 20% of the subwatershed has seen implemented conservation practices compared to an average of 18.3% across the South Fork Wildcat Creek drainage. However, there has been almost double the number of individual practices applied within the Jenkins Ditch-South Fork Wildcat Creek subwatershed when compared against the average across all subwatersheds within the South Fork Wildcat Creek drainage. The majority of these applied practices are similar to other subwatersheds with Conservation Crop Rotation, residue and tillage management, and Pest and Nutrient Management Plans being implemented. However, waste management practices, filter and buffer strips, and habitat management practices are also documented.

Water Quality Information

IDEM 305(b)/303(d)

The Jenkins Ditch-South Fork Wildcat Creek subwatershed contains a number of impaired waterways (Figure 70). The main channel of the South Fork Wildcat Creek contains impairments to recreational

uses and well as the presence of mercury and/or PCBs in fish tissues. Waterways further upstream such as Jenkins Ditch contain impaired biotic communities.

South Fork Wildcat-Blinn Ditch Watershed Plan

Aquatic habitat was rated as "good" within the South Fork Wildcat Creek sites but began to decrease as sampling moved upstream into Blinn Ditch. However, habitat within Blinn Ditch was still classified as "fair". Macroinvertebrate studies showed a higher abundance of sediment-tolerant and algae-consuming organisms compared to more pollution-intolerant species such as caddisflies and mayflies. Within Blinn Ditch, scores were low given the available habitat and no glaring water quality impairments.

Atrazine levels were highly variable across all sites and time of sampling. There were a number of total phosphorus measurements seen exceeding accepted standards along the South Fork Wildcat Creek throughout the sampling period and across sites. Despite this, no phosphorus measurements exceeding standards were recorded on Blinn Ditch. Measurements for total suspended solids and nitrate-nitrite exceeding accepted standards were recorded during high flow events but were generally not seen as a significant problem during base flow.

AIMS

A number of sites between 1991 and 1998 were sampled within the Jenkins Ditch-South Fork Wildcat Creek subwatershed for *E. coli*. A total of 23 water quality samples across seven sampling locations were recorded showing exceedances of accepted *E. coli* standards. The highest *E. coli* levels were recorded at areas on the South Fork Wildcat Creek at County Road 200 North and 600 West. Evaluations of habitat quality and fish communities were completed at 15 sites with most sampling efforts being completed in 2004. Sites on Jenkins Ditch and a tributary of South Fork Wildcat Creek at County Road 250 North failed to meet accepted standards for habitat quality and fish communities. Locations with the highest quality habitats included sites on the South Fork Wildcat Creek at County Road 200 North, 300 West and 580 West as well as a smaller tributary at County Road 600 West. Locations with the highest quality fish communities also matched these sites. Sampling efforts on the South Fork Wildcat Creek at County Road 200 North consistently showed elevated nitrate-nitrite levels from 1991 to 2007 as well as higher ammonia levels compared to other local stretches. A sampling location on the South Fork Wildcat Creek at County Road 500 West showed similar trends to a lesser extent.

South Fork TMDL

Two sampling sites were located within the Jenkins Ditch-South Fork Wildcat Creek subwatershed to contribute to *E. coli* load estimates. Reductions were estimated at 65% downstream of Prairie Creek and 62% upstream of Prairie Creek. The sampling site upstream of Prairie Creek was also used for load estimates of total suspended solids. Based on that sample a reduction of 57% was required.

One sampling location, near the confluence of Kilmore and South Fork Wildcat Creeks, was used for total phosphorus estimates. Based on these samples reductions of 69% are necessary.

Two assessment locations were located within the subwatershed boundaries. *E. coli* loads and reductions were calculated at sampling locations below and above the Prairie Creek confluence. The

remaining parameters were calculated only at a site above the Prairie Creek confluence. It was noted that the Frankfort WWTP and CSO could be contributing to high *E. coli* loads. Unfortunately, no water quality data was available to estimate *E. coli* loads for the Frankfort CSO. The Michigantown WWTP has historically discharged effluent that has consistently exceeded their allowable *E. coli* tolerances. Also, at the time of this study, the Michigantown WWTP had no permit levels for nitrate-nitrite or phosphorus so estimates on actual pollutant loads in effluent was not available. Part of the Frankfort MS4 (~6.5% of drainage area at this point) also may be impacting water quality downstream of the Prairie Creek confluence.

Frankfort Area Source Identification Study

Frito Lay Inc. which was suspected of being a potential source of elevated phosphorus levels showed effluent below the 0.3mg/L target which may be in part due to recent upgrades for their treatment facilities.

Another suspected source of pollutants was the large junkyard located at the confluence of Prairie Creek and South Fork Wildcat Creek. There were many compounds detected both upstream and downstream of the junkyard but few were actually above detectable limits. No significant link could be established between any toxic organic compounds or metal compounds and the large junkyard.

Current Data

Four total locations for the South Fork Wildcat Creek Assessment were within the Jenkins Ditch-South Fork Wildcat Creek subwatershed. One of these sites, located on Blinn Ditch, was sampled only for aquatic habitat and biological communities and served as a replacement location for Site 3 (Stump Ditch) where biological sampling was not completed due to lack of flow. The site farthest upstream, near Michigantown, showed scores for habitat quality and biological community only slightly above accepted standards. Site 13 was located just upstream of the Prairie Creek and South Fork Wildcat Creek confluence. This site showed an improvement of habitat quality but lower quality biological community which can indicate problems with low water quality. Site 14 farther downstream showed a relatively drastic increase in habitat scores while only a marginal increase in biological index scores. The replacement site on Blinn Ditch did not achieve standards for habitat quality. Macroinvertebrate communities at Blinn Ditch scored just above accepted biological standards.

All three sampling locations on the South Fork Wildcat Creek exceeded *E. coli* and TSS target levels during high flows. Site 14 also exceeded *E. coli* loads during low flow periods. Average nitrate-nitrite levels were seen approaching, periodically exceeding, target levels during high flows at all three locations. Average high flow concentrations of total phosphorus exceeded target levels at Site 13 and 14.

At the request of the Steering Committee, three additional sampling events took place on the South Fork Wildcat Creek downstream of an old landfill site, north of Frankfort. This site was previously noted during watershed inventories as a source of trash and debris being exposed through bank erosion. The committee also wanted to document if any nutrient or chemical leaching was occurring from past land filled materials. Average concentrations for TSS and nitrate-nitrite exceeded target levels. Also, total phosphorus samples were seen approaching target water quality standards during both high and low flow periods. However, while still an eyesore, nutrient and sediment levels during sampling dates were

similar to upstream locations and impairments are likely inherited from upstream sources rather than entirely driven by the landfill site.

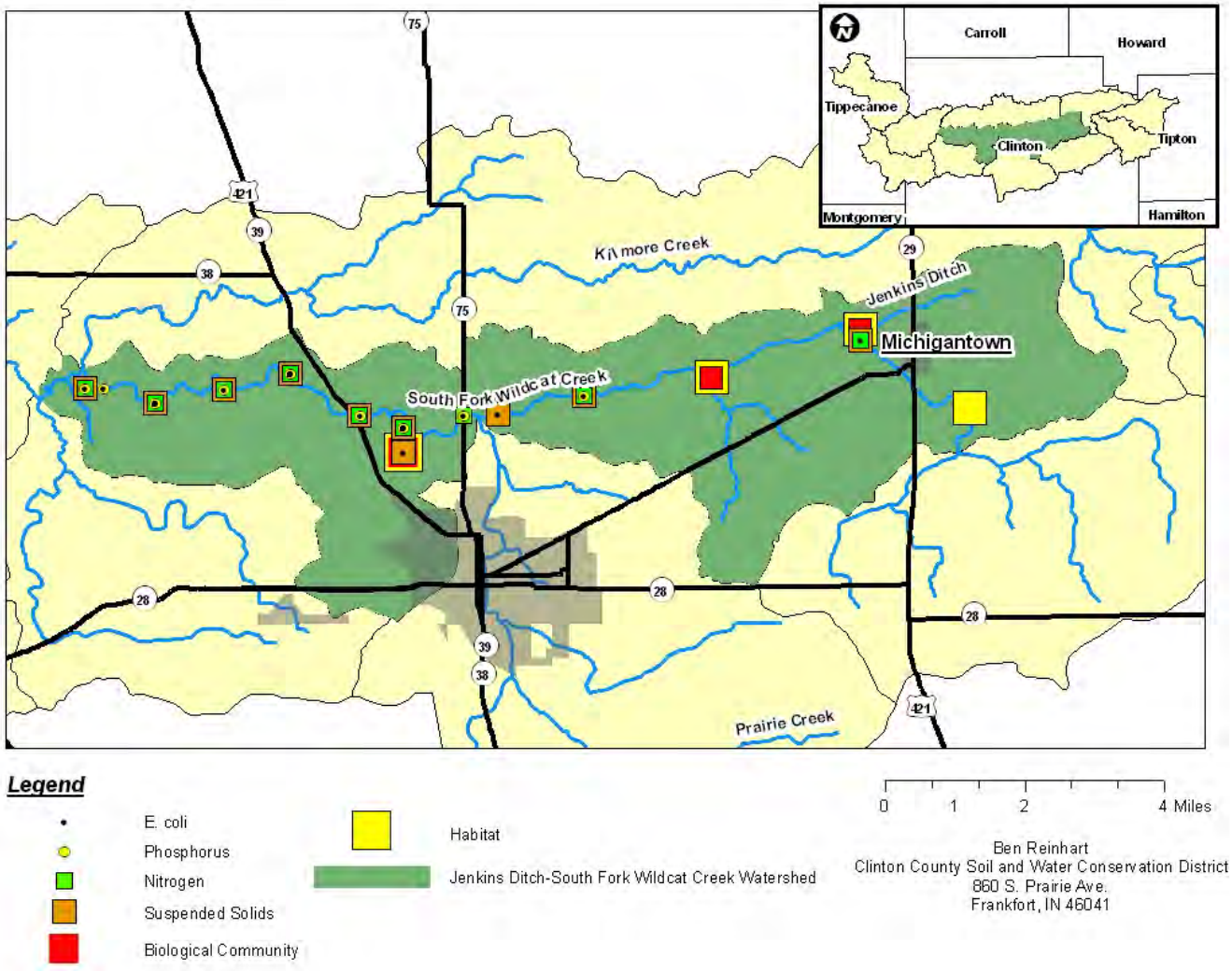

Figure 70. Jenkins Ditch-South Fork Wildcat Creek Water Quality Impairments

4.9 Lauramie Creek (HUC: 051201070309)

Land Use Information

The Lauramie Creek subwatershed lies in the southwest corner of the South Fork Wildcat Creek Watershed and drains almost 15,100 acres of west-central Clinton and southeastern Tippecanoe County. Within this area, approximately 18 miles of waterways, including Hentz Ditch, McClellan Fickle Ditch, Anderson Ditch, and Lauramie Creek, drain towards Lauramie Creek's confluence with the South Fork Wildcat Creek (Figure 71). Virtually all of these waterways have been declared as having impaired water quality. The majority of the tributaries and headwater areas of Lauramie Creek are classified as open drains.

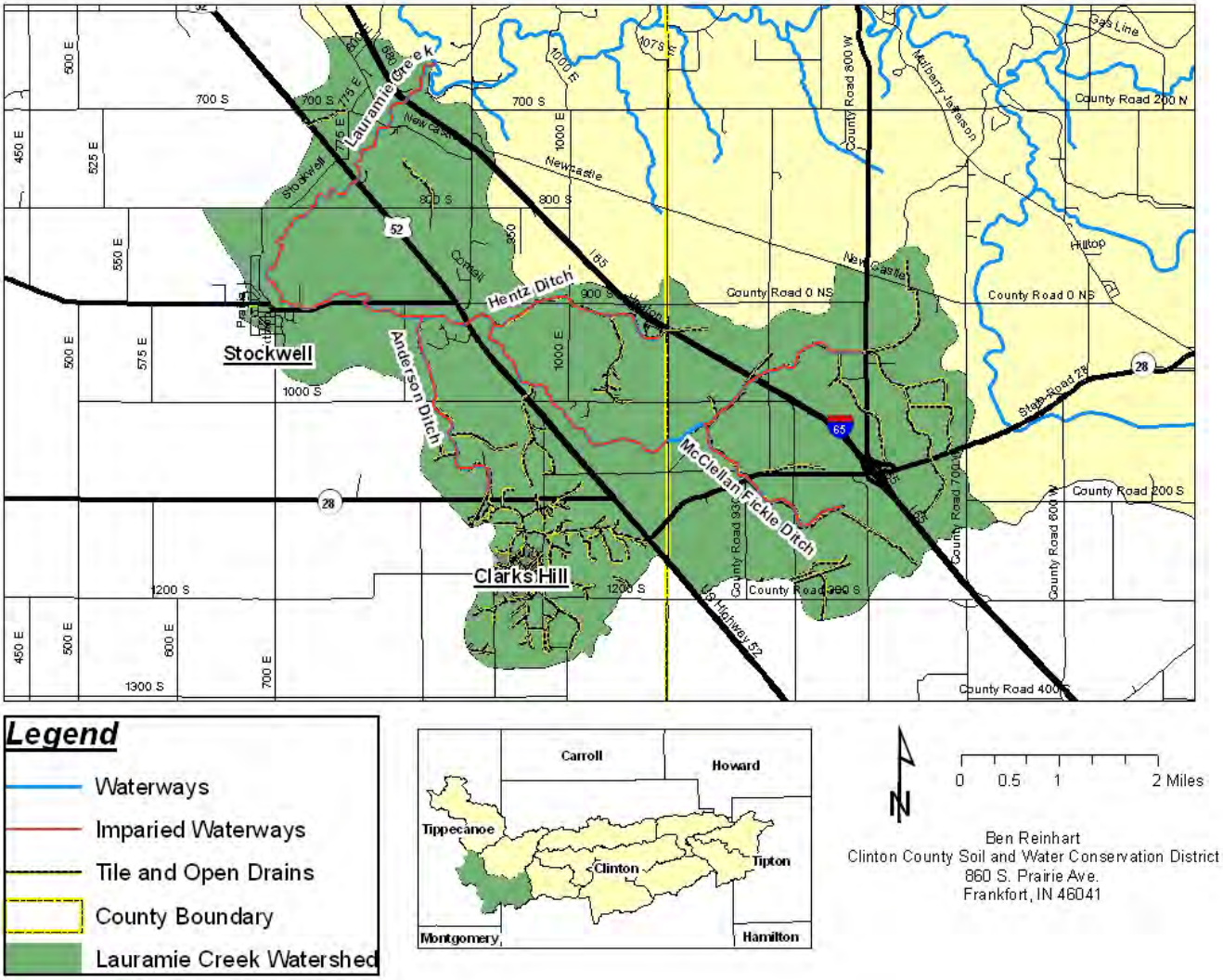

Figure 71. Lauramie Creek Waterways and Drainage

Roughly 36% of lands within the Lauramie Creek subwatershed can be classified as having soils with hydric or somewhat hydric properties. These areas are much more common in upper portions of this drainage (Figure 72). A very low percentage of lands are classified as PHEL (4.5%) and second highest percentage of lands classified as HEL (13%). Virtually all of these areas occur along the primary waterways within the Lauramie Creek subwatershed. The relatively high occurrence of HEL to PHEL lands may be attributed to differing classification systems between Clinton and Tippecanoe County. However, these lands also do generally have greater changes in topography when compared to other subwatersheds in the South Fork Wildcat Creek Watershed. This change in elevation creates sloping lands which are generally considered more erosive than the flatter lands seen within other areas.

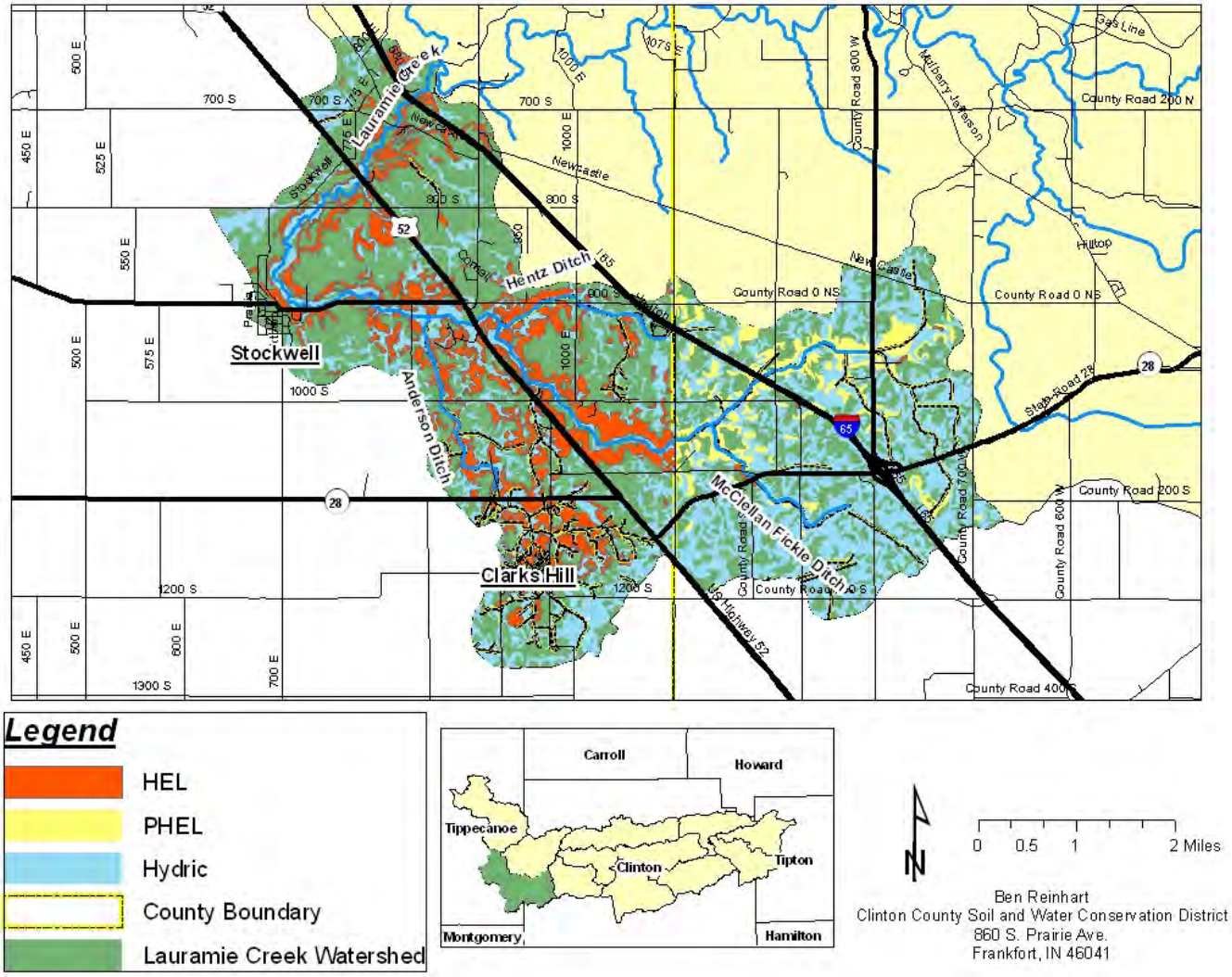

Figure 72. Lauramie Creek Soils

The Lauramie Creek Watershed contains primarily cultivated cropland. Developed areas are located around places such as Clarks Hill, Stockwell, and small establishments along well-traveled transportation routes. Woodlands and pasture/grasslands are scattered throughout the drainage area and are common along downstream sections of Lauramie Creek (Figure 73).

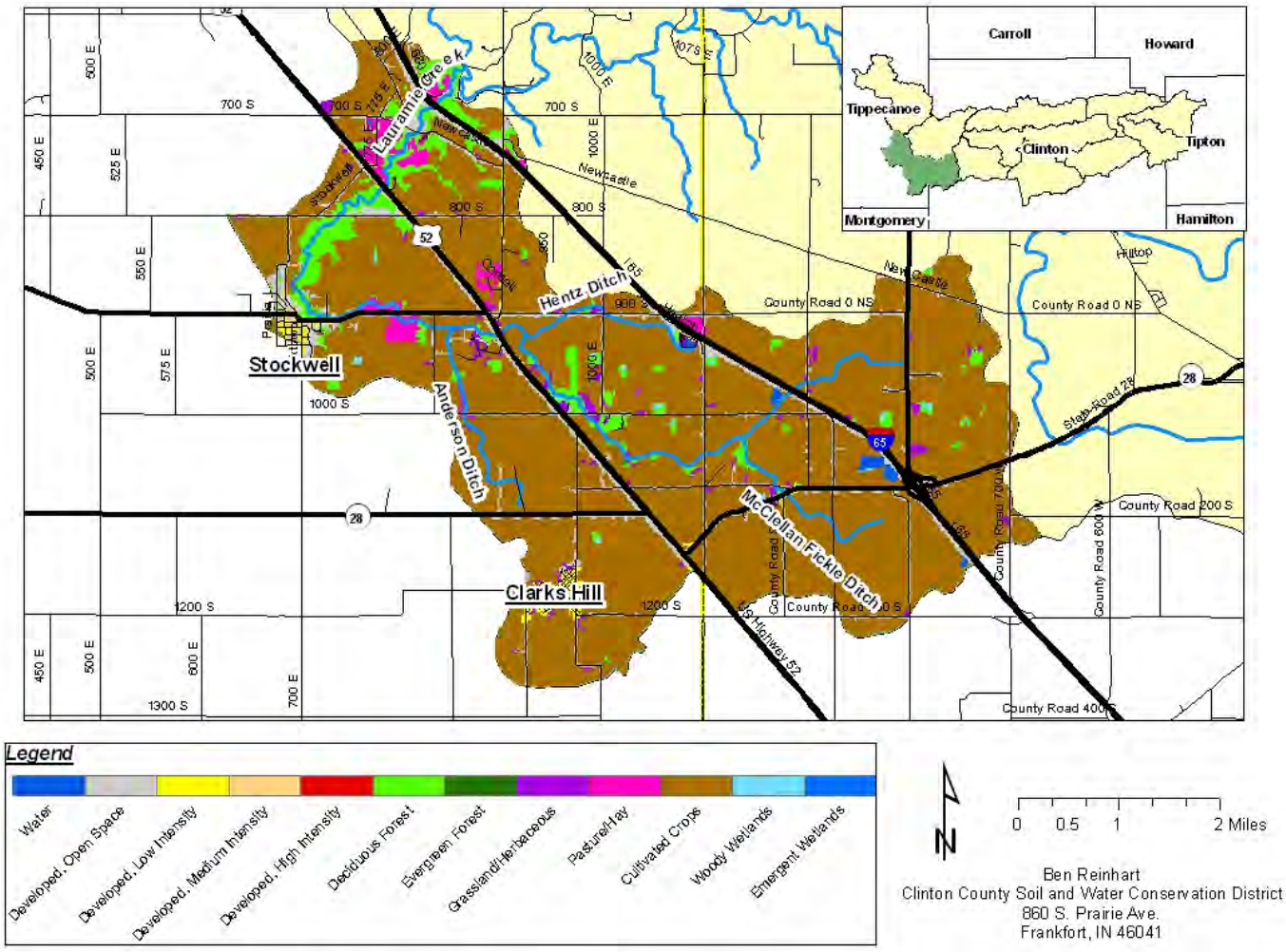

Figure 73. Lauramie Creek Land Use

Watershed Inventory

Windshield Survey & Source Identification

One NPDES facility and pipe permit lies within the Lauramie Creek subwatershed. The Wainwright Middle School has recorded eight effluent exceedances for Ammonia, Total Suspended Solids, and Biochemical Oxygen Demand (BOD). BOD is a measure of the required amount of dissolved oxygen needed within the stream to properly function. The most recent exceedances recorded were for Ammonia in late 2010 and early 2011. Three of the four Confined feeding operations identified were listed as Active. Five Underground Storage Tanks and six Leaking Underground Storage Tanks were located within the drainage area. The majority of these were identified around the developments of Stockwell and Clarks Hill as well as Interstate 65. During windshield inventories, volunteers identified a general lack of adequate riparian vegetation in upstream portions of Lauramie Creek as well as areas where livestock had access to public waterways (Figure 74).

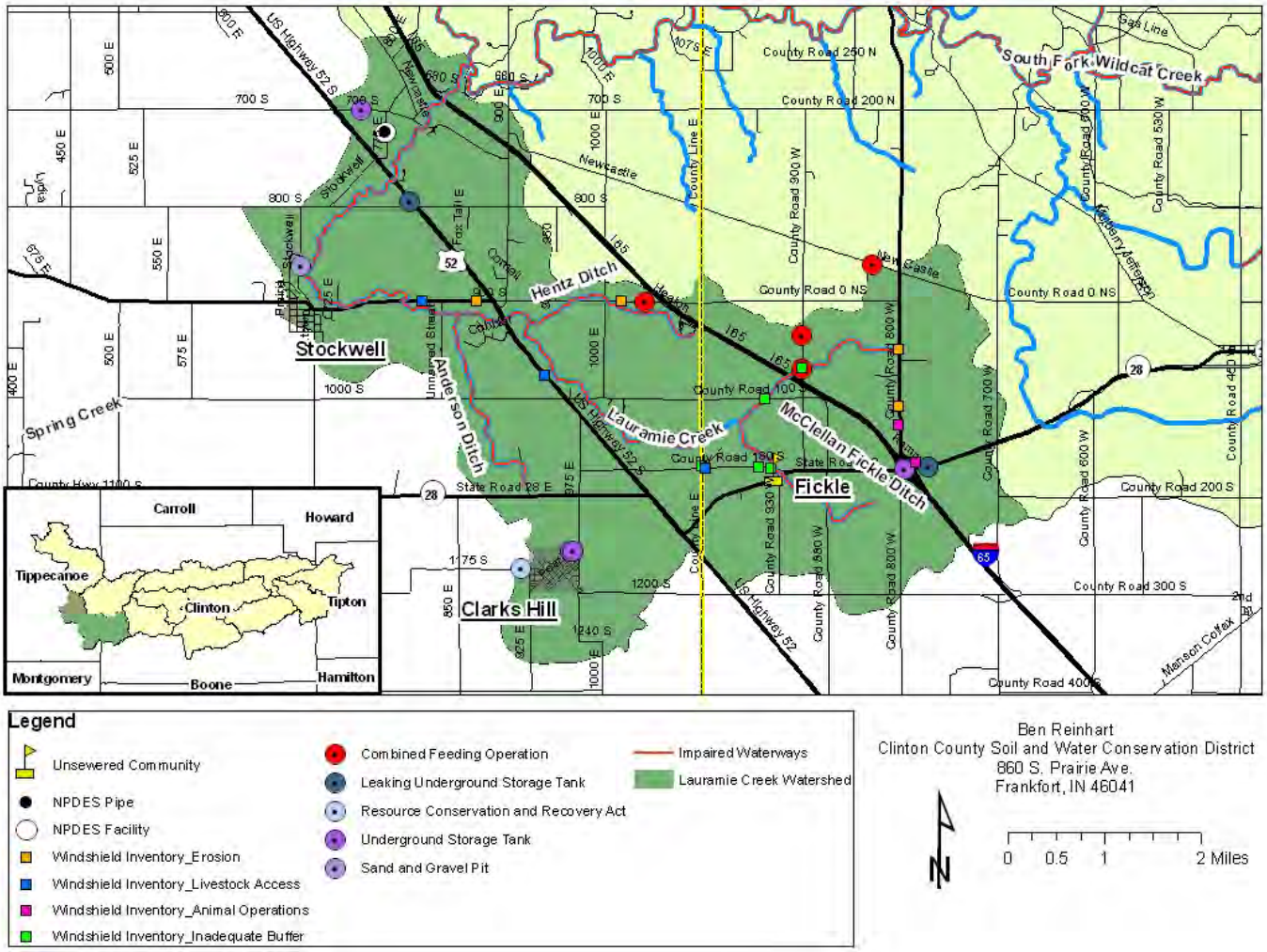

Figure 74. Lauramie Creek Source Investigation

Desktop Surveys

Approximately 40% of lands within the designated floodplain and riparian zones consist of natural land cover types such as wooded areas, grasslands, or wetlands. The remaining land areas are made up of more managed cover types such as cultivated fields, livestock pastures, or developed areas. Similar to some other subwatersheds, the majority of buffered waterways are located in lower sections of the drainage area while more upstream segments remain unbuffered (Figure 75).

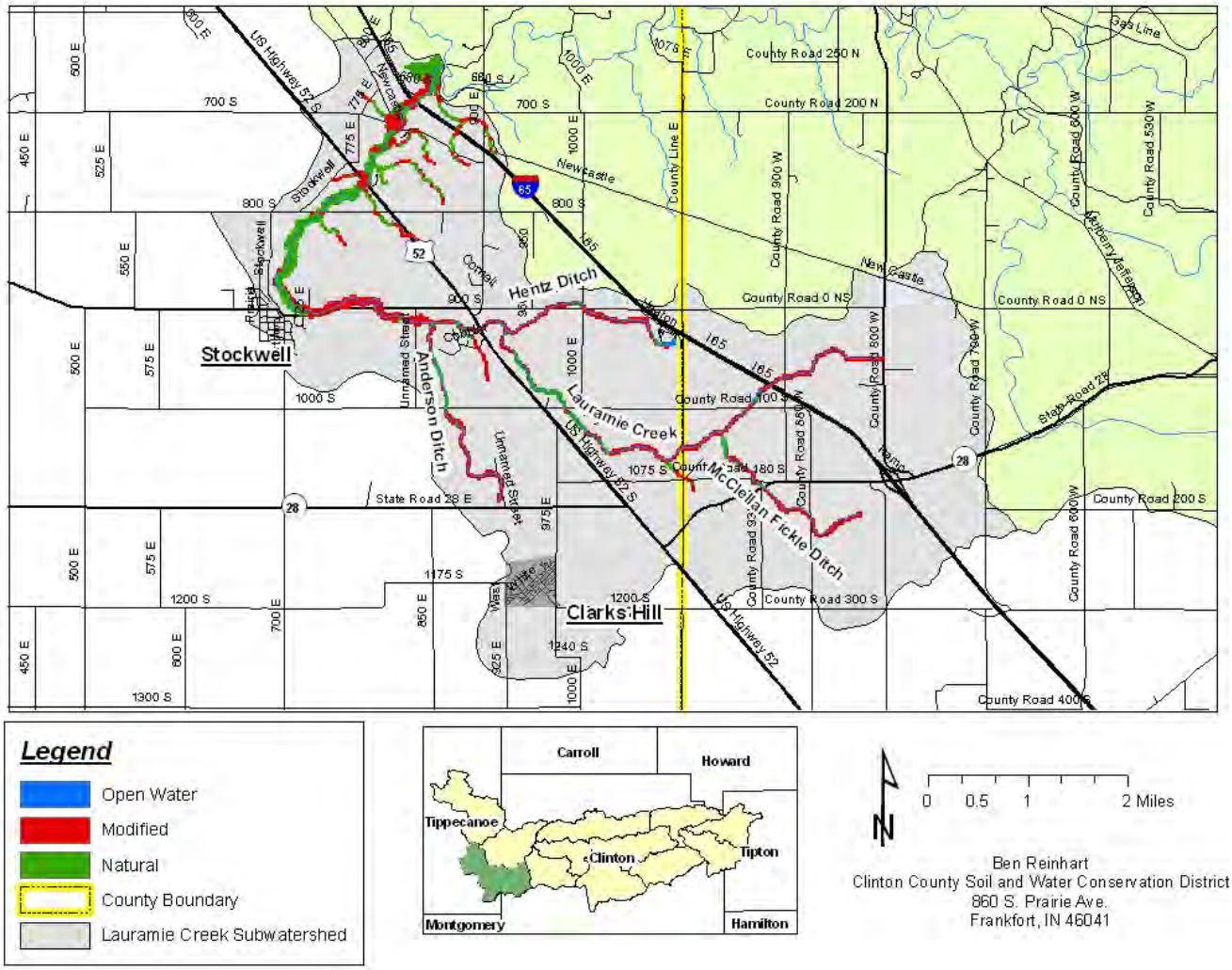

Figure 75. Lauramie Creek Riparian Lands Survey

The Lauramie Creek subwatershed is slightly below average in regards to the percent land area having had conservation practices applied. Roughly 17% of the land area within the subwatershed has seen applied practices compared to an average of 18.3% across the South Fork Wildcat Creek drainage. Including the normal practices such as Conservation Crop Rotation, residue and tillage management, and Pest and Nutrient Management Plans, habitat management practices such as Upland Wildlife Habitat have been applied during the last five years.

Water Quality Information

IDEM 305(b)/303(d)

Virtually all waterways within the Lauramie Creek subwatershed are listed as being impaired on the state 303(d) list (Figure 76). Both the McClellan-Fickle Ditch and the Clinton County portion of Lauramie Creek carry two impairments; one being impaired biotic communities and another being impaired recreational uses. The remaining waterways within the Lauramie Creek subwatershed are impaired for full contact recreational use.

Hoosier Riverwatch

Three sampling sites from the Hoosier Riverwatch database were found within the Lauramie Creek subwatershed. These sites contained water chemistry data from 2002-2005. Many of these sampling events showed high *E. coli* counts.

Lauramie Creek Watershed Plan

During 2003 IDEM conducted a TMDL study for the Lauramie Creek Watershed to evaluate *E.coli* loadings. Sampling results showed that, at every one of their sampling locations, 30-day geometric means exceeded Indiana water quality standards. Every site was more than twice the target level and a number of them were much higher than that. IDEM suggested field tiles, livestock with access to waterways, manure applications, and failing septic systems as likely contributors to elevated levels of *E. coli*.

A baseline water quality study was conducted in 2005 with one wet weather and one dry weather sampling period at seven locations throughout the Lauramie Creek drainage. Low oxygen levels were recorded during June of 2005 (dry weather period) on Hentz Ditch and Lauramie Creek near County Line Road as well as County Road 800 South. Phosphorus levels were found to be high at locations on JB Anderson Ditch, Hentz Ditch, and Lauramie Creek at County Road 725E. Forty-three percent of samples exceeded the Indiana water quality standard with Ammonia. However, only the JD Anderson Ditch, just downstream of Clarks Hill, exceeded ammonia standards during both wet and dry weather sampling periods. Also, a sampling location on Lauramie Creek downstream of the Lauramie Township Regional Sewer District plant showed ammonia levels above or approaching water quality targets during wet and dry weather sampling periods. Seventy-one percent of samples exceeded water quality standards for *E. coli* further supporting the 2003 IDEM-led TMDL study of *E. coli* issues in the watershed. Habitat evaluations ranged from poor to average across the sites with scores generally improving as sampling moved downstream.

AIMS

During 1998, six sites were sampled for *E. coli* at various areas throughout the Lauramie Creek subwatershed. Two sites on Lauramie Creek, one at U.S. 52 and another further downstream at County Road 900 South, showed extremely high *E. coli* levels. Another sampling location on Anderson Ditch, at County Road 1000 South, recorded levels exceeding accepted *E. coli* standards. Also in 1998, an agricultural ditch near Wainwright Middle School reported nitrate-nitrite levels exceeding accepted standards. The final discharge of the Clarks Hill POTW (Publicly Owned Treatment Works) showed elevated ammonia levels. In 2004, nine sites were evaluated for habitat quality and fish communities. Sites on Hentz Ditch, McClellan Fickle Ditch, and Lauramie Creek at County Road 900 West failed to meet accepted standards for habitat quality. However, the site on Hentz Ditch at County Road 900 South upstream of Stockwell did show relatively high scores for fish communities. Sampling locations on Lauramie Creek at County Road 800 and 900 South scored highest in both habitat quality and fish communities.

South Fork TMDL

Six sampling locations within the Lauramie Creek subwatershed were used for *E. coli* loads and calculations. Samples collected from Anderson Ditch had the lowest required reduction (60%). Other sites including Hentz Ditch, McClellan Fickle Ditch, and Lauramie Creek showed high reduction requirements between 72% and 88%. One sample collected from an agricultural ditch off of Lauramie Creek showed necessary reductions of 97%.

Water quality data from McClellan Fickle Ditch and Anderson Ditch was included on calculations for total phosphorus. Anderson Ditch showed necessary reductions of 31% while McClellan Fickle Ditch showed reductions of 48% being needed.

Sites from Lauramie Creek and Anderson Ditch were used in calculations for total suspended solids. Lauramie Creek had required reductions of 59% while Anderson Ditch required reductions of 36%.

One assessment location was included within the Lauramie Creek subwatershed. High levels of phosphorus, total suspended solids, and *E. coli* were most likely caused by agricultural runoff, livestock access to waterways, and streambank erosion. Failing on-site wastewater facilities (i.e. septic systems) may also be contributing but additional sampling is needed to better characterize these pollutant sources. Also, it was noted that any discharges from the Clarks Hill Municipal WWTP were well below allowable levels of *E. coli* and total suspended solids.

Current Data

Two sampling locations as part of the South Fork Wildcat Creek Assessment were located within the Lauramie Creek subwatershed. The most upstream sampling location achieved both habitat and biological standards. The downstream sampling location showed a relatively high quality habitat and biological community.

Water chemistry and *E. coli* were sampled at the most downstream location. Average *E. coli* levels exceeded water quality standards during both high and low flow periods. However, total phosphorus, nitrate-nitrite, and TSS levels were documented below water quality standards.

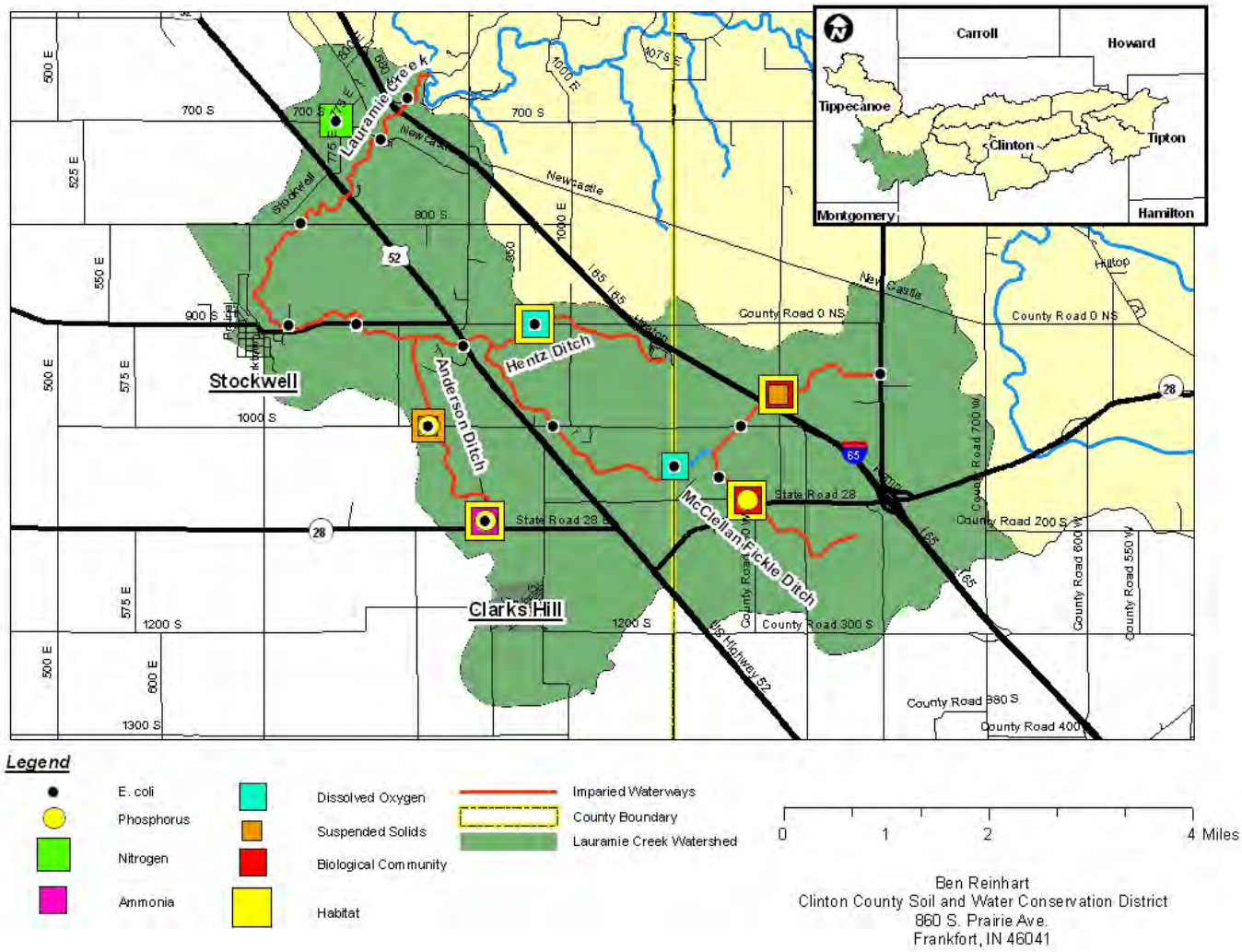

Figure 76. Lauramie Creek Water Quality Impairments

4.10 Town of Dayton – South Fork Wildcat creek (HUC: 051201070310)

Land Use Information

The Town of Dayton-South Fork Wildcat Creek subwatershed is the most downstream drainage area in the South Fork Wildcat Creek Watershed. This subwatershed area lies almost entirely in Tippecanoe County draining over 18,800 acres. Containing over 37.5 miles of waterways, the Dayton subwatershed contains the most natural waterways of any subwatershed in the South Fork Wildcat Creek drainage (Figure 77). Most of these miles lie along the main body of the South Fork Wildcat Creek. However, there are a number of smaller unnamed tributaries within the subwatershed that empty into the South Fork Wildcat Creek. Twenty-seven of these stream miles are listed for impaired water quality. Most of these impairments are documented along the South Fork Wildcat Creek itself, while other impairments have been documented within a larger tributary northeast of Dayton.

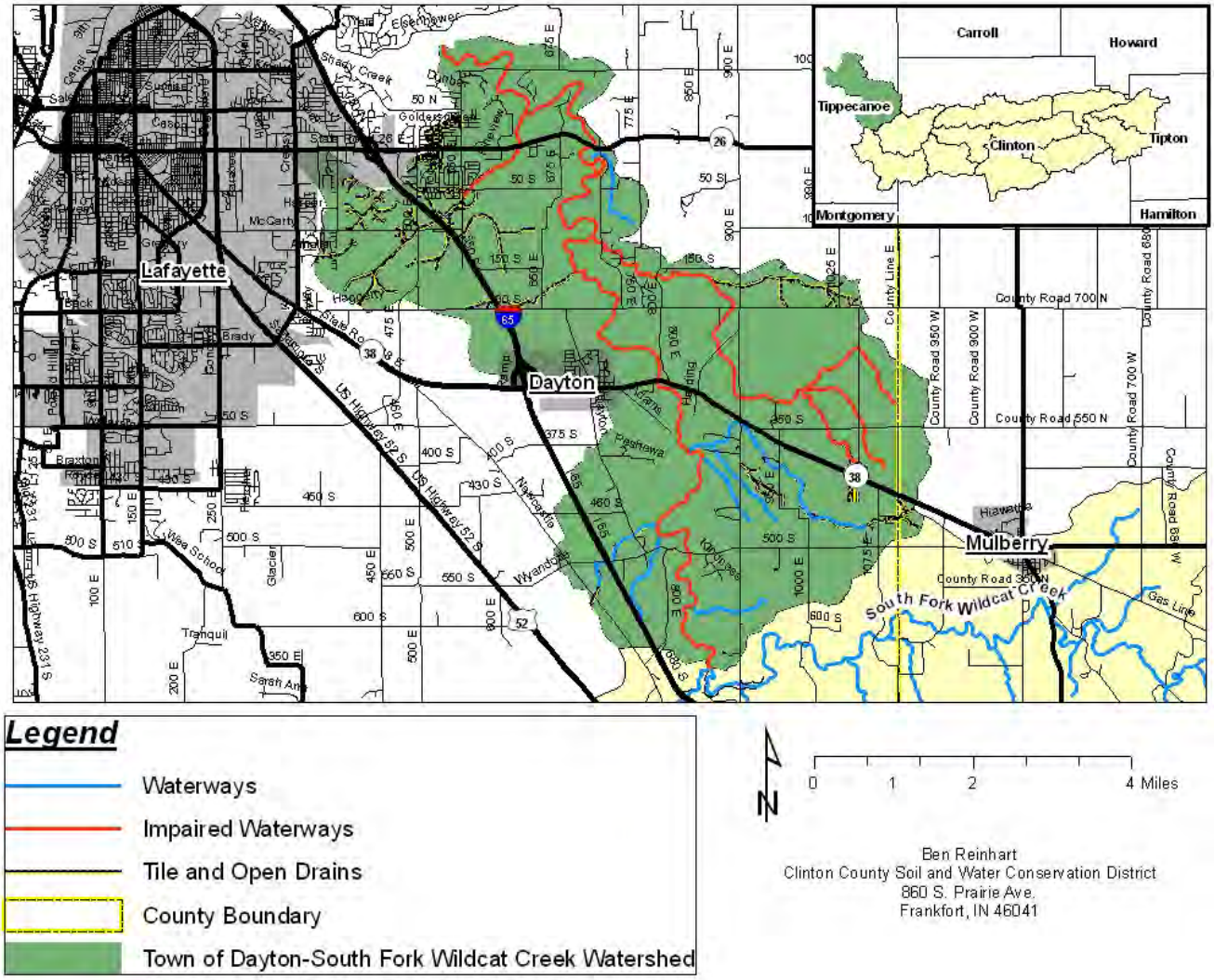

Figure 77. Town of Dayton-South Fork Wildcat Creek Waterways and Drainage

The Dayton subwatershed contains the lowest percentage of land classified with hydric soils (15%) and/or PHEL (2%) but the highest percentage of land classified as HEL (18%). Again, some of this may be attributed to differing classification systems between Clinton and Tippecanoe County (Figure 78). However, lands within the Dayton subwatershed are characterized by greater changes in topography when compared to other subwatersheds in the South Fork Wildcat Creek Watershed. This may help in explaining the increased occurrence of erodible lands and the lack of widespread hydric soils.

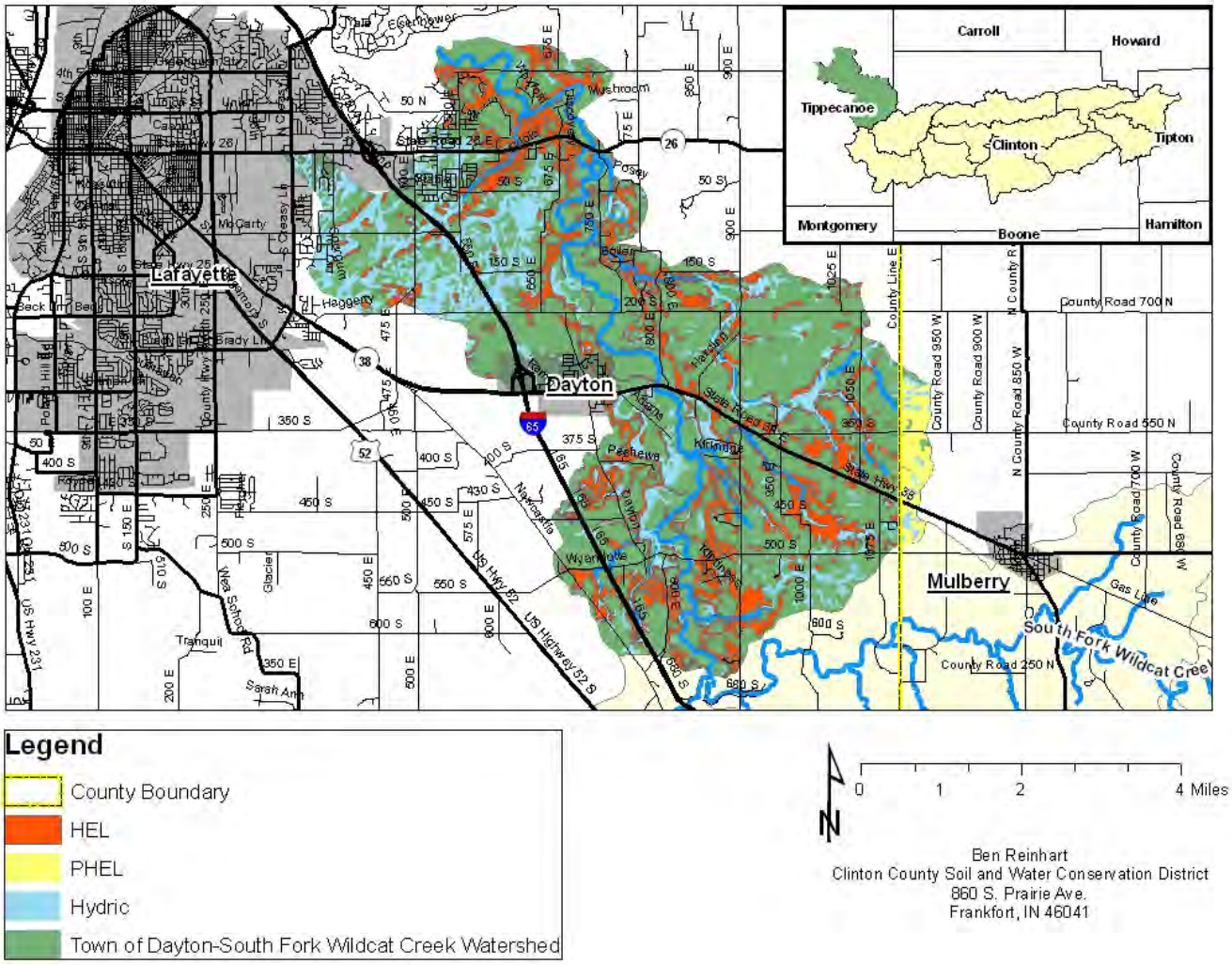

Figure 78. Town of Dayton-South Fork Wildcat Creek Soils

The most common land use in the Town of Dayton-South Fork Wildcat Creek Watershed is cultivated cropland. However, there are a number of acres of wooded lands and pasture in this watershed. These two land use types are commonly seen along the primary waterways in the drainage area (Figure 79). Developed land uses can be seen in and around the Town of Dayton and east of Lafayette along major travel routes such as Interstate 65.

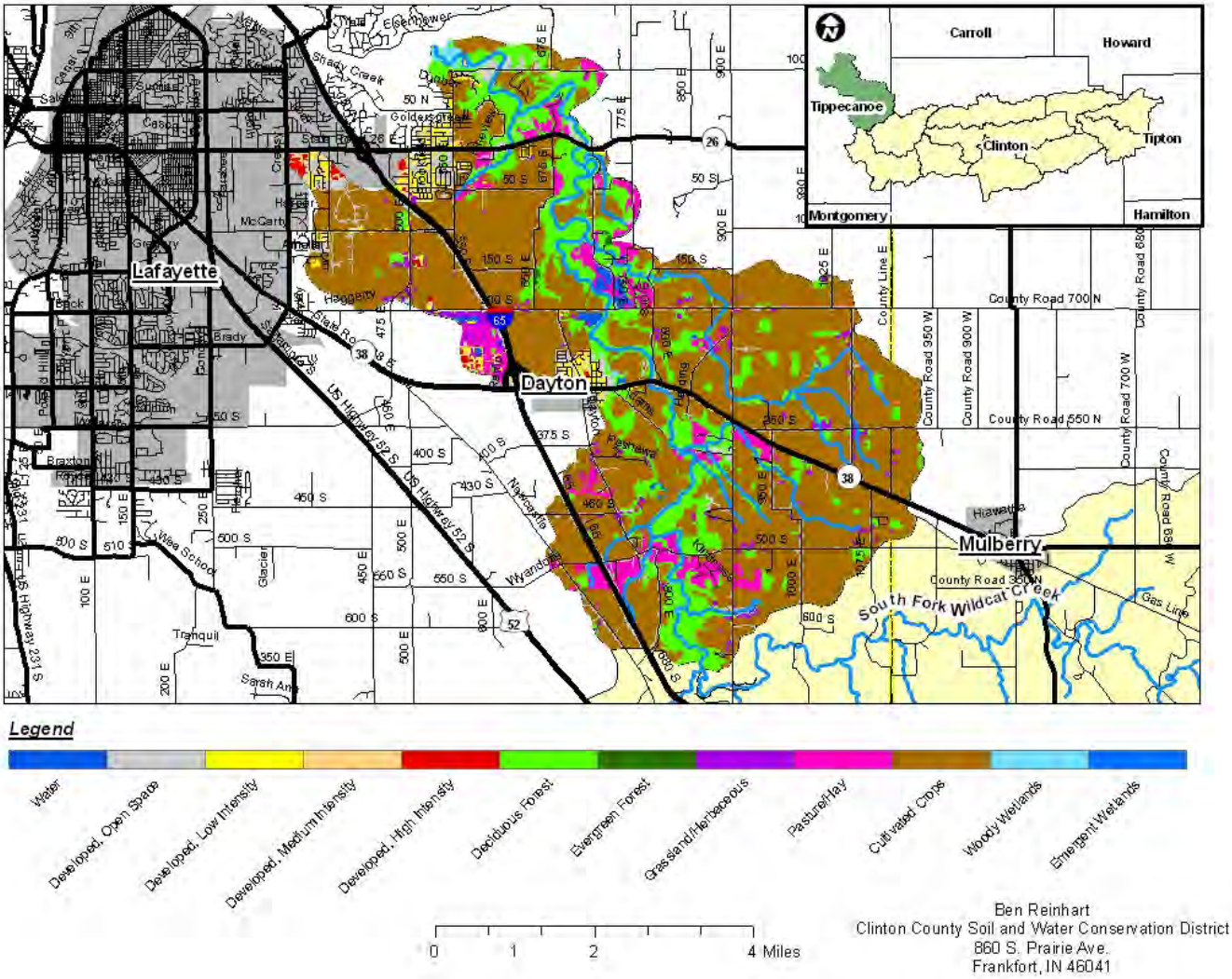

Figure 79. Town of Dayton-South Fork Wildcat Creek Land Use

Watershed Inventories

Windshield Survey & Source Identification

Only one of the three identified Confined feeding operations were listed as Active. Four Underground Storage Tanks and one Leaking Underground Storage Tank were identified primarily around the outskirts of Lafayette. Two locations were identified that fall under the Resource Conservation and Recovery Act which regulates hazardous waste and non-hazardous solid waste (Figure 80). One Abandoned Landfill Facility was located along the main channel of the South Fork Wildcat Creek near State Road 26. Volunteers completing a windshield inventory noted a few locations of actively eroding areas as well as small livestock and animal operations upstream in the Dayton subwatershed.

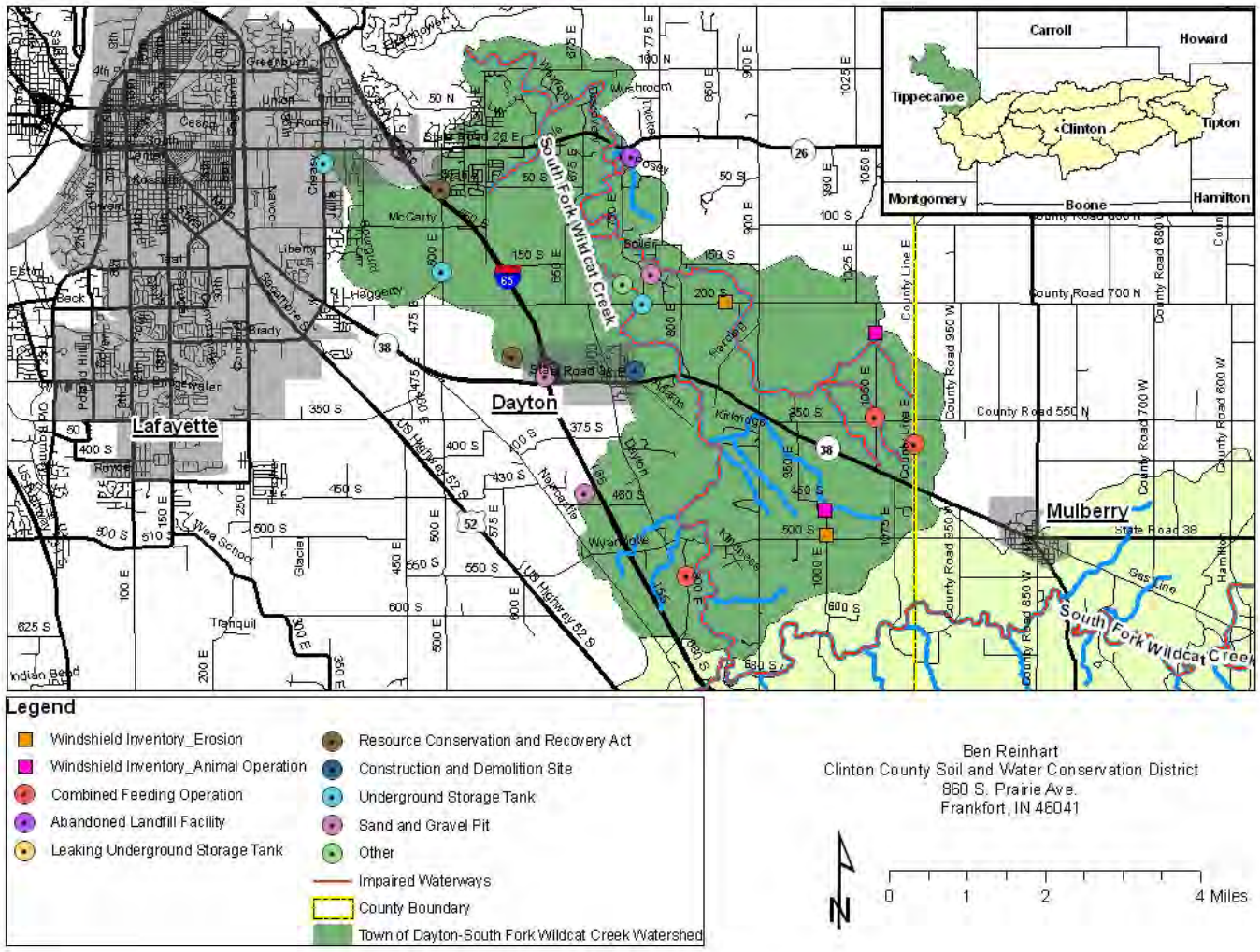

Figure 80. Town of Dayton-South Fork Wildcat Creek Source Investigation

Desktop Surveys

Approximately 57% of land areas within the designated floodplain and riparian zones contain natural land uses. This ranks as the highest among all subwatersheds. The remaining areas consist of cover types such as cultivated crops, livestock pasture, or developed areas. Many areas along the main body of the South Fork Wildcat Creek are buffered while natural land cover types are patchier along local tributaries (Figure 81).

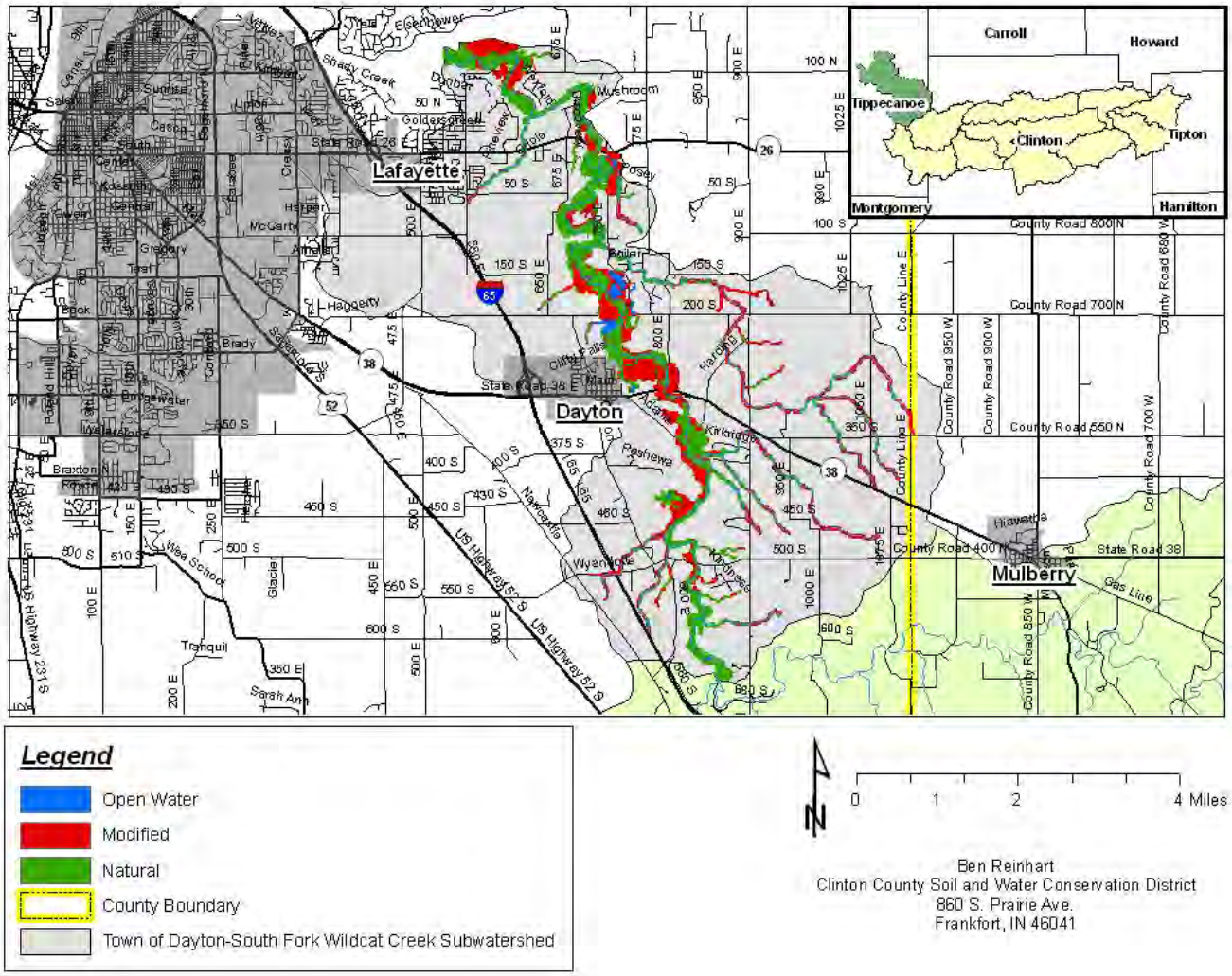

Figure 81. Town of Dayton-South Fork Wildcat Creek Riparian Lands Survey

The Dayton subwatershed is below average when it comes to the percent land area having applied conservation practices. Around 10% of this subwatershed has seen implemented conservation measures compared to an 18.3% average across the South Fork Wildcat Creek drainage. Of those conservation practices that have been applied, Conservation Crop Rotation, residue and tillage management, and Pest and Nutrient Management Plans have been the most common. Other conservation practices that seem to be implemented more frequently with the Dayton subwatershed are the use of conservation cover and cover crops, pasture and livestock management, and habitat management practices.

Water Quality Information

IDEM 305(b)/303(d)

Much of the waterways within the Dayton subwatershed are declared impaired as part of IDEM's 2008 report (Figure 82). The main channel of the South Fork Wildcat Creek contains impairments to

recreational uses and well as the presence of mercury and/or PCBs in fish tissues. Tributaries of the South Fork Wildcat Creek are listed as having impaired biotic communities.

Hoosier Riverwatch

There are a couple different sampling events within the Hoosier Riverwatch database ranging from the fall of 2002 to the summer of 2006. Water Quality Index scores fluctuated from 67 to 79 which is about average. Pollution Tolerance Index scores also stayed average with ratings of Fair and Good.

AIMS

Nine sites were sampled within the Dayton subwatershed in 1998 for *E. coli* levels. One site located on the South Fork Wildcat Creek at S.R. 26 showed extremely high levels, exceeding accepted standards. Fourteen sampling efforts were recorded, documenting habitat quality and biological (fish and macroinvertebrate) communities, within the Dayton subwatershed between 1991 and 2004. Higher scores for both habitat quality and biological communities were seen on the South Fork Wildcat Creek compared to local tributaries. However, tributary sites located at County Road 900 East and 1000 East did show relatively high quality fish communities despite average habitat quality. In 2008, nitrate-nitrite levels approaching but not exceeding accepted standards were recorded on the South Fork Wildcat Creek at S.R. 26.

South Fork TMDL

Two sampling sites within the Dayton subwatershed were used for *E. coli* load calculations. Based on these calculations, the site located upstream of the Middle Fork Wildcat Creek confluence required only a 16% reduction while the site downstream of the confluence required an 80% reduction.

Samples for total phosphorus were collected downstream of the Middle Fork Wildcat Creek confluence and upstream of a local tributary. Phosphorus reductions above the local tributary were 6% while load reductions required below the Middle Fork Wildcat Creek confluence were 30%.

Total suspended solids were calculated at one site on the South Fork Wildcat Creek below the Middle Fork Wildcat Creek confluence. Based on samples from this location, reductions of 85% are required.

Two assessment locations were included within the Dayton subwatershed. It was noted that a number of NPDES facilities and two MS4 areas discharge upstream of these sampling locations which may explain some of the elevated pollutant loads, especially during high flows.

Current Data

As part of the South Fork Wildcat Creek Assessment, two locations were included in the Dayton subwatershed. Habitat and macroinvertebrate sampling at Site 12, which is an unnamed tributary of the South Fork Wildcat Creek, showed relatively high quality aquatic habitat and biological communities. Pollution-intolerant macroinvertebrates were particularly abundant at this site. Similar sampling done on the main channel of the South Fork Wildcat Creek showed some of the highest habitat scores in the watershed. However, biological scores were only slightly above the accepted standards.

The sampling location near S.R. 26 showed average concentrations exceeding target levels for *E. coli*, total phosphorus, and TSS during high flow periods. Nitrate-nitrite levels were documented exceeding target levels during these high flow periods as well. All low flow concentrations fell below water quality targets.

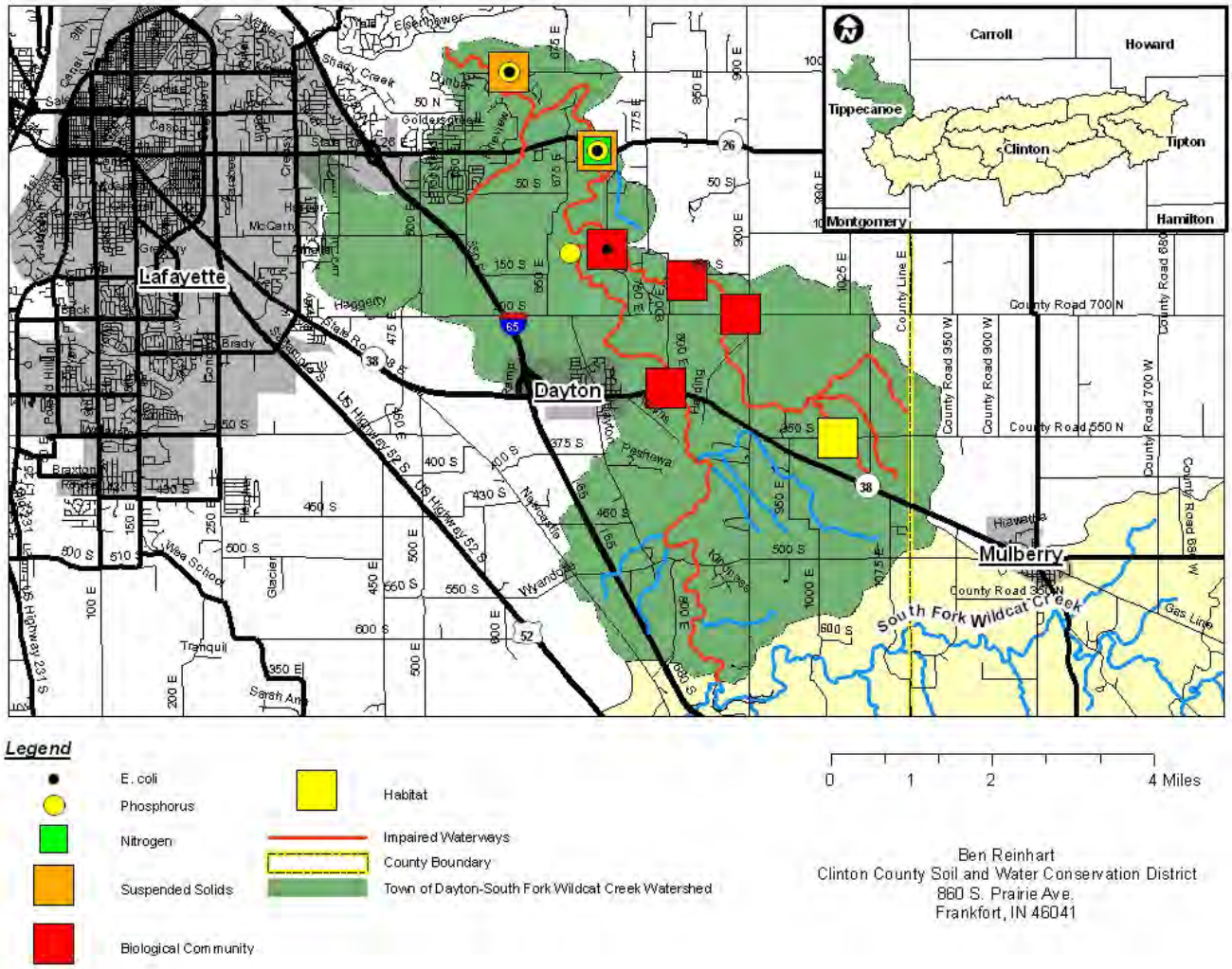

Figure 82. Town of Dayton-South Fork Wildcat Creek Water Quality Impairments

4.11 Town of Mulberry – South Fork Wildcat Creek (HUC: 051201070311)

Land Use Information

The Town of Mulberry-South Fork Wildcat Creek subwatershed drains approximately 13,325 acres of west-central Clinton County and southeastern Tippecanoe County. There are just over 21 miles of natural waterways within this subwatershed such as the South Fork Wildcat Creek and several unnamed tributaries (Figure 83). Of the total stream miles throughout the subwatershed, roughly 10.5 miles of South Fork Wildcat Creek has been documented as having impaired water quality.

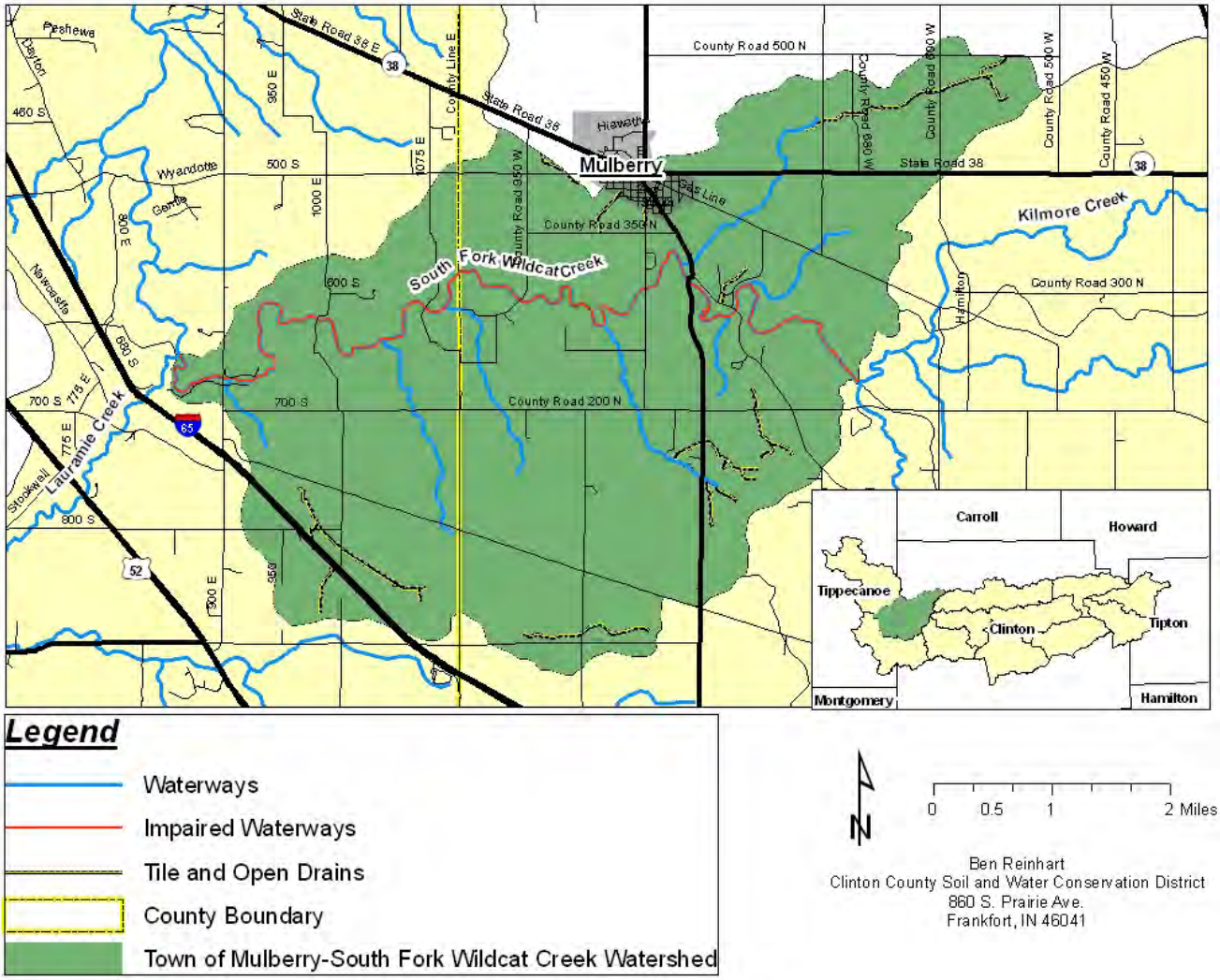

Figure 83. Town of Mulberry-South Fork Wildcat Creek Waterways and Drainage

Lands within the Town of Mulberry subwatershed show the second lowest occurrence of hydric soil properties (19%) and the third highest occurrence of HEL areas (12%). Approximately 25% of lands within the drainage area can be classified as PHEL. The majority of the HEL/PHEL lands occur along the major waterways and floodplains of the Mulberry subwatershed (Figure 84). This can most likely be attributed to steeper slopes which are more likely to erode during precipitation events.

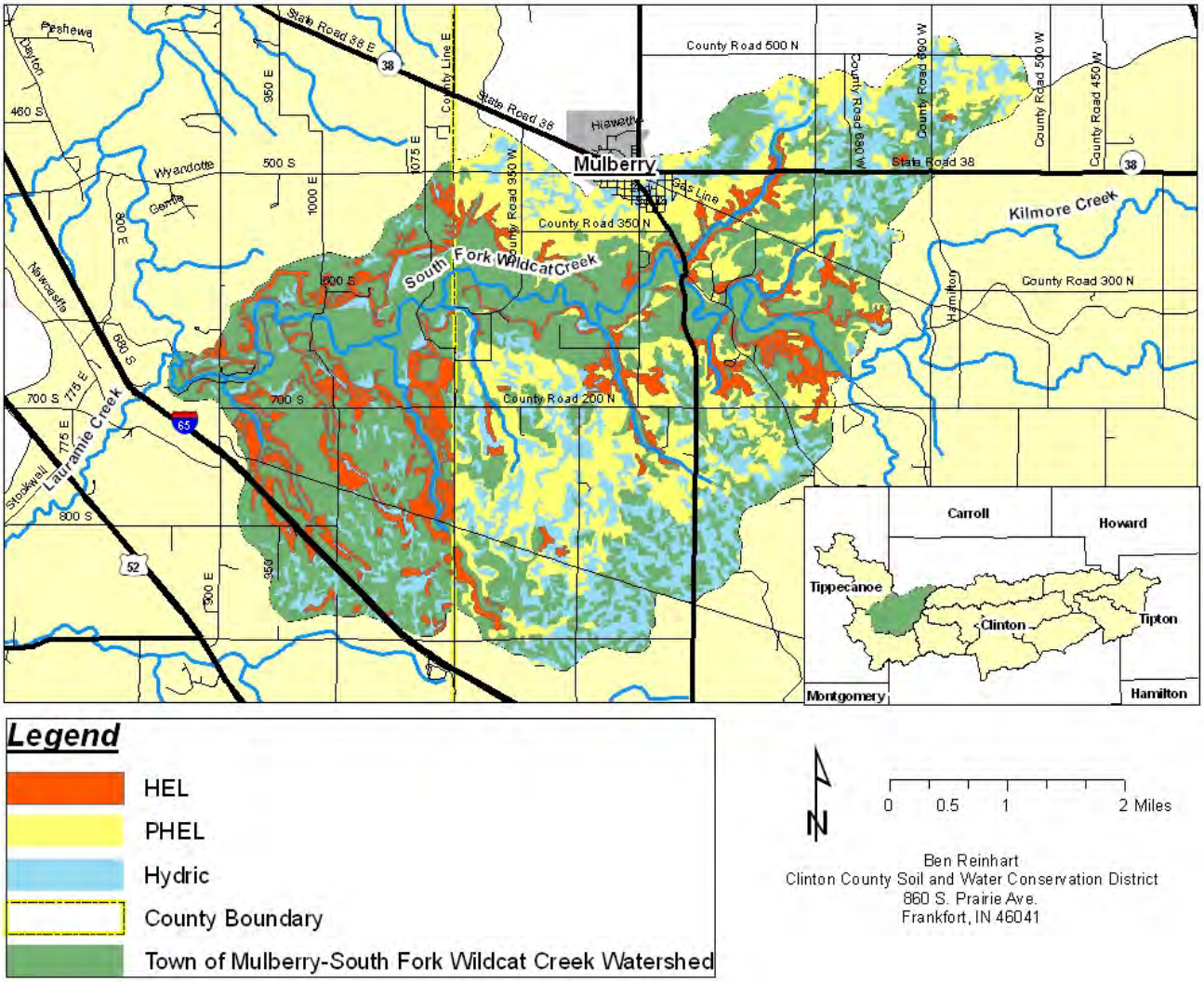

Figure 84. Town of Mulberry-South Fork Wildcat Creek Soils

The majority of development seen can be attributed to the Town of Mulberry and residential developments along the South Fork Wildcat Creek south of Mulberry. The remaining land uses along the primary waterways in the watershed are largely wooded areas and pasture lands. Other woodlands are scattered throughout the remaining areas but mostly these lands are dominated by cultivated crops (Figure 85).

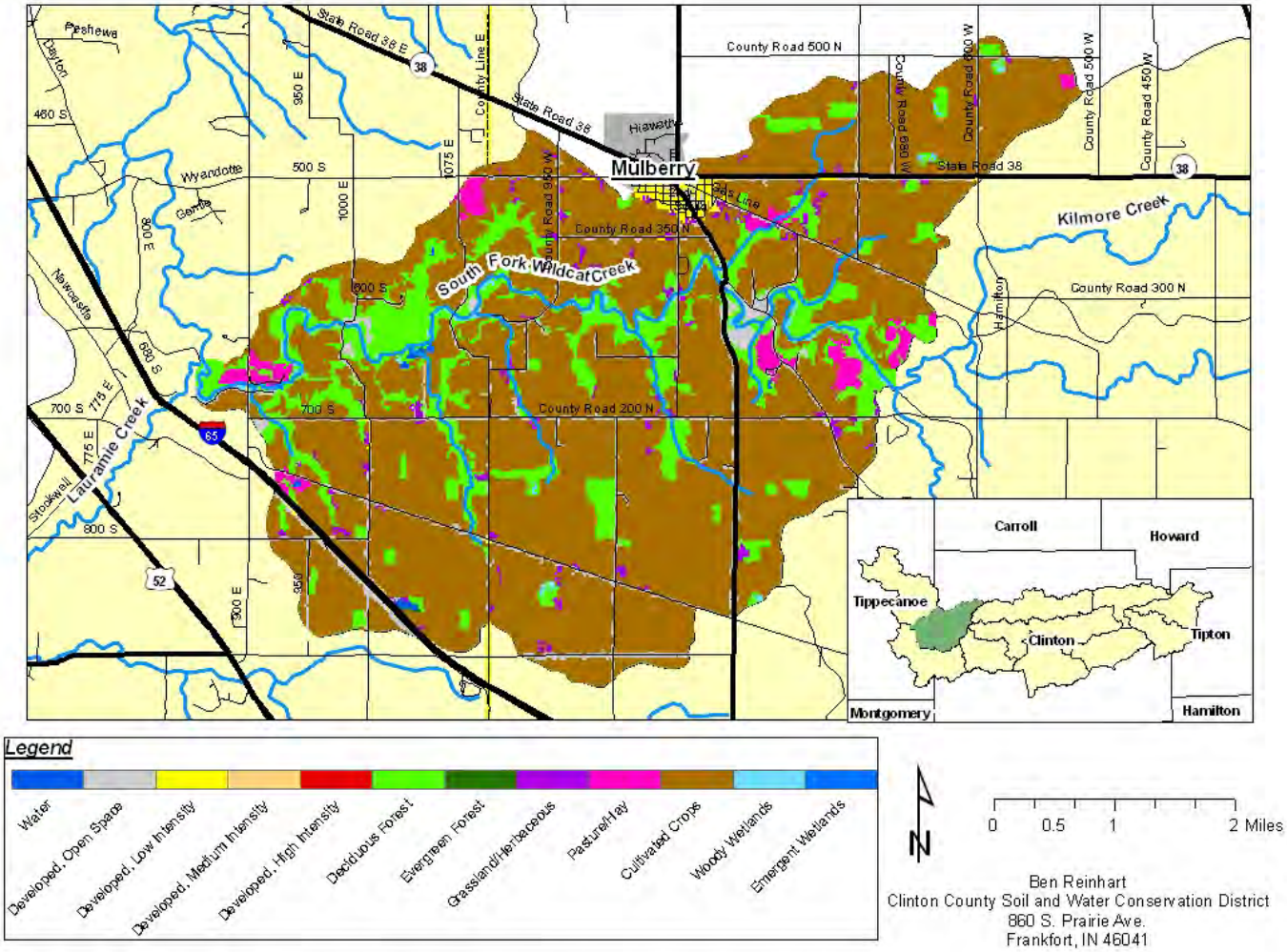

Figure 85. Town of Mulberry-South Fork Wildcat Creek Land Use

Watershed Inventories

Windshield Survey & Source Identification

Two NPDES facility permits and one pipe discharge permit were identified within the Mulberry subwatershed. The Mulberry Municipal WWTP has recorded four effluent exceedances for Chlorine, Biochemical Oxygen Demand, and Total Suspended Solids. The most recent exceedances were recorded for chlorine and Total Suspended Solids in May of 2009. Also, eight overflows in the Sanitary Sewer System were recorded between 2005 and 2010 totaling an estimated discharge of 175,000 gallons. A total of eight Confined feeding operations were identified within the drainage area with all but one being listed as Active. During the windshield inventory, volunteers identified isolated locations of actively eroding areas, small livestock and animal operations, and areas where livestock had free access to local waterways (Figure 86).

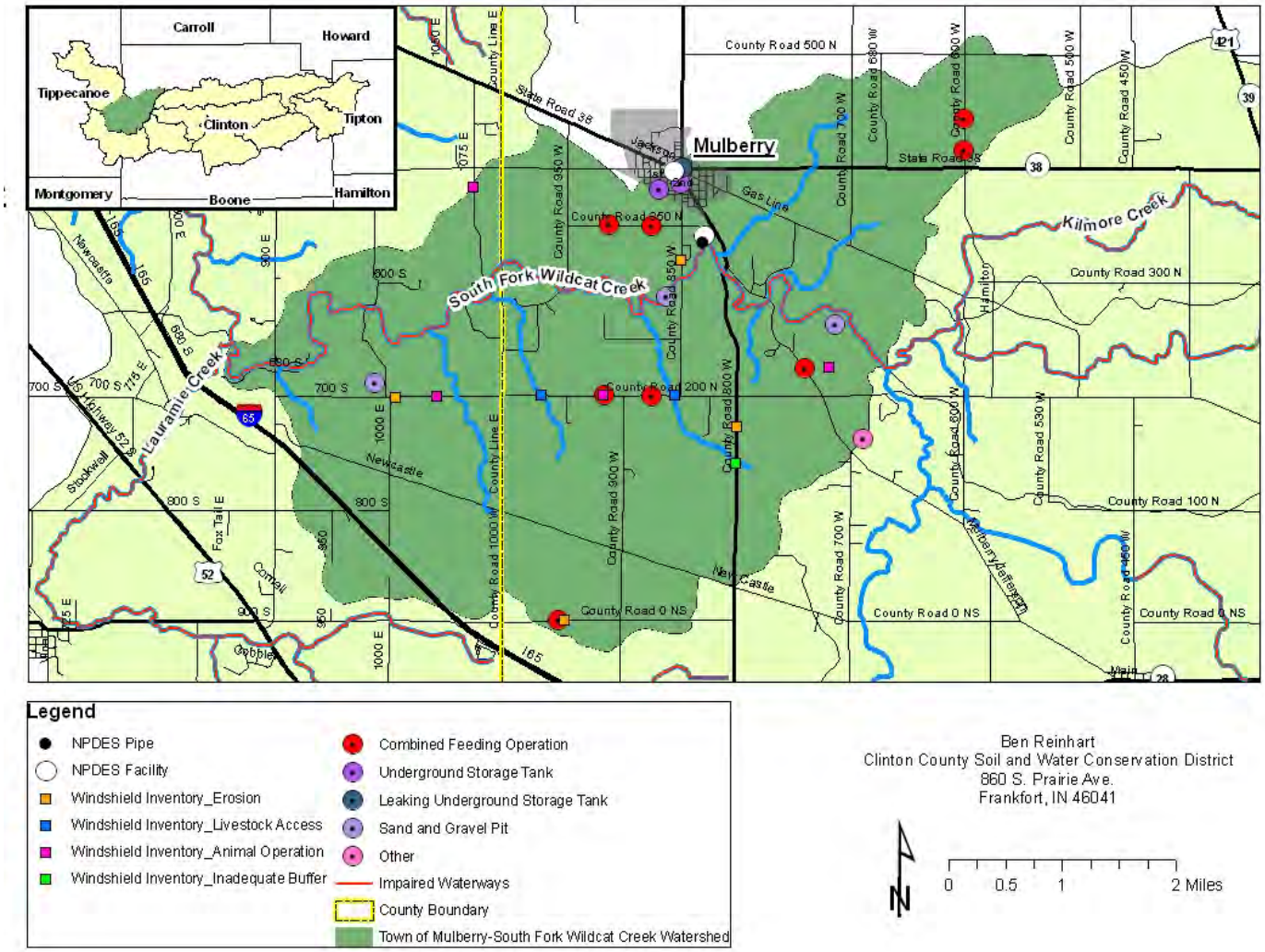

Figure 86. Town of Mulberry-South Fork Wildcat Creek Source Investigation

Desktop Surveys

The Mulberry subwatershed ranks second highest among all subwatersheds in regards to natural buffers along primary waterways. Roughly 53% of land areas within the designated floodplain and other riparian areas consist of natural land uses. Only about six miles of primary waterways remain unbuffered (Figure 87).

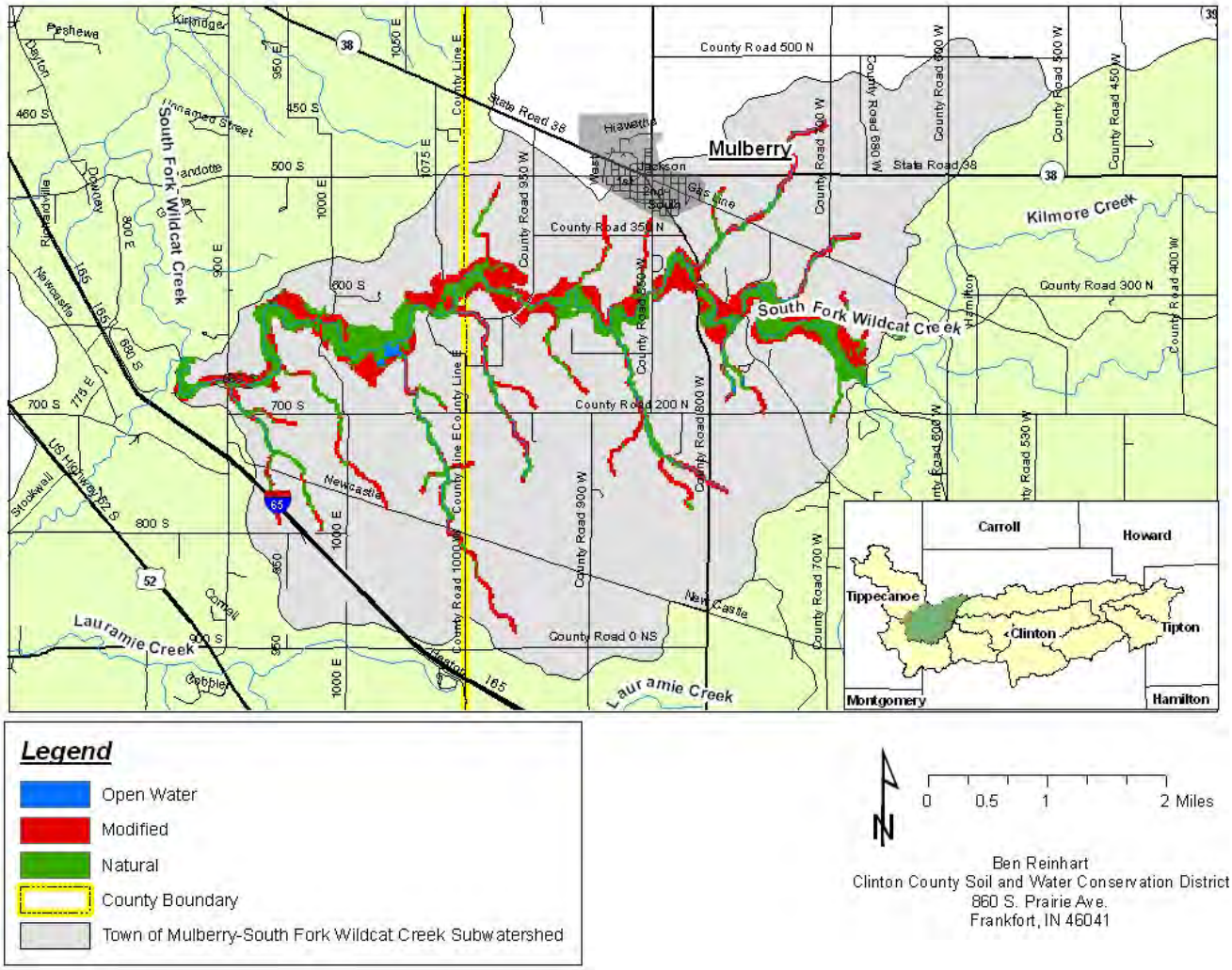

Figure 87. Town of Mulberry-South Fork Wildcat Creek Riparian Lands Survey

The Mulberry subwatershed is right around average in regards to the percent of land area having applied conservation practices. Just fewer than 18% of the lands within the Mulberry subwatershed have had conservation practices applied compared to an 18.3% average across the South Fork Wildcat Creek drainage. As in most other subwatersheds, Conservation Crop Rotation and residue and tillage management are the most common practices applied to acres within the Mulberry subwatershed. The development and implementation of Pest and Nutrient Management Plans are somewhat less common. Also, a number of areas are listed for installed field borders.

Water Quality Information

IDEM 305(b)/303(d)

Within the Mulberry subwatershed, primarily just the main channel of the South Fork Wildcat Creek is listed as being impaired (Figure 88). This section of the South Fork Wildcat Creek is impaired due to the presence of mercury and/or PCBs in fish tissues.

Hoosier Riverwatch

One sampling site from the Hoosier Riverwatch database was found within the Mulberry subwatershed. Sampling was completed in October of 2000 with scores from the Water Quality Index, Pollution Tolerance Index, and CQHEI showing average to above average conditions.

AIMS

One sampling location, sampled in 1998 on South Fork Wildcat Creek at Mulberry-Jefferson Road, exceeded *E. coli* standards. Thirteen sites were sampled within the Mulberry subwatershed for habitat quality and fish communities in 2004. All sites met accepted standards for habitat quality and fish communities. The highest habitat scores were seen on the South Fork Wildcat Creek at Mulberry-Jefferson Road and County Road 1000 East. The highest fish community scores were seen on the South Fork Wildcat Creek at Mulberry-Jefferson Road and County Road 850 West. Extremely high nitrate-nitrite levels were seen at the discharge of the Mulberry POTW during a 1998 sampling.

Current Data

One sampling location from the South Fork Wildcat Creek Assessment was located within the Mulberry subwatershed. This site recorded good scores on both habitat and biological evaluations.

Average concentrations exceeded target levels for *E. coli*, total phosphorus, and TSS during high flow periods at this location. Also, average low flow concentrations for total phosphorus and *E. coli* as well as high flow concentrations for nitrate-nitrite were seen approaching, and periodically exceeding, target water quality standards.

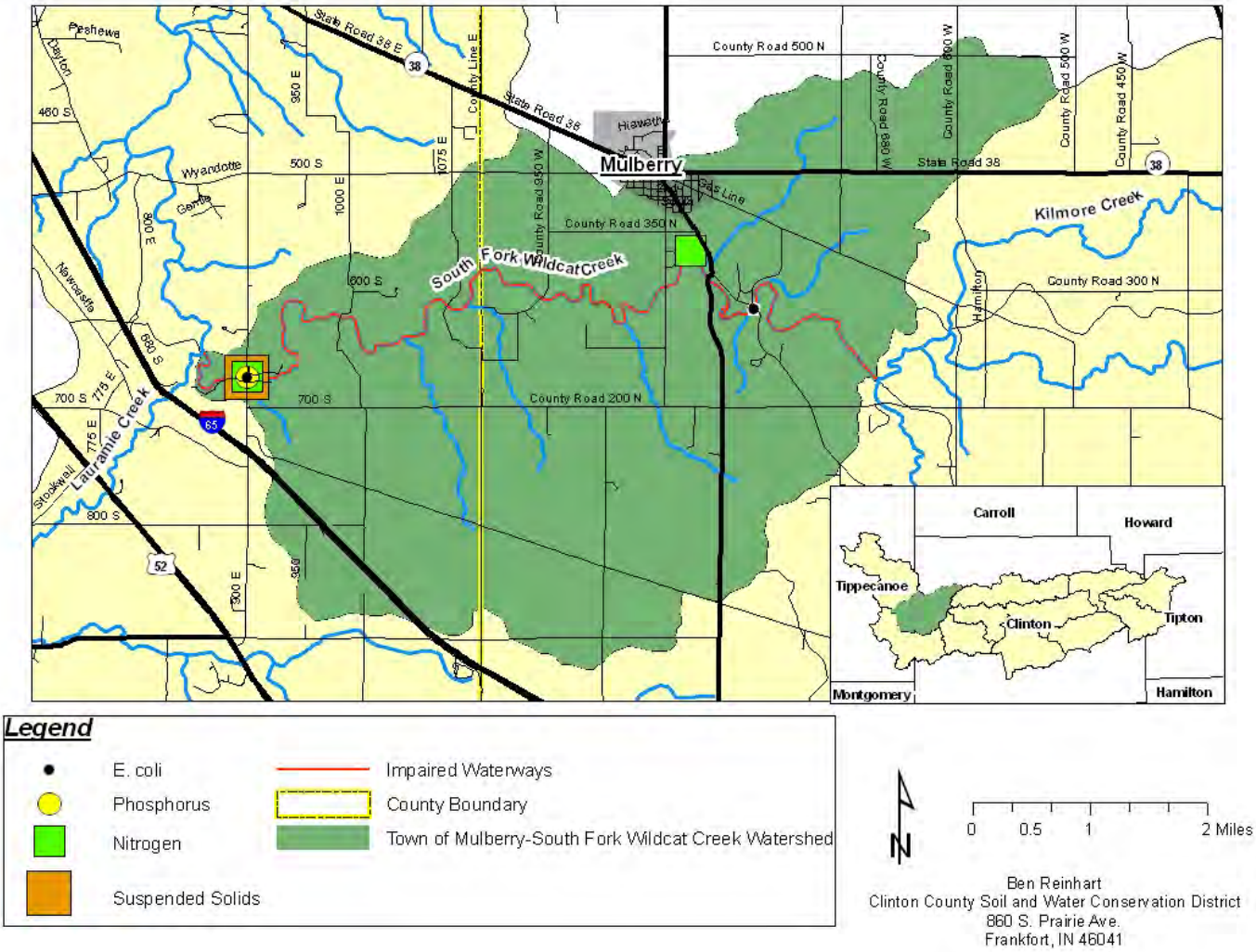

Figure 88. Town of Mulberry-South Fork Wildcat Creek Water Quality Impairments

5.0 REVIEW OF WATERSHED PROBLEMS AND CAUSES

5.1 SUMMARY OF WATER QUALITY

Total Suspended Solids (TSS)

Total Suspended Solids includes anything in the water column that can be filtered out (e.g. sediment, sewage, leaf litter or organic residues, algae, etc.). Many times sediment and other residues are carried away by water during storm events through surface runoff. To determine the potential of this surface runoff, each subwatershed was graded on the amount of Highly Erodible Land (HEL) and Potentially Highly Erodible Land (PHEL) which is based on soil type and land slope. When combining these two categories into an Erodibility Score for each subwatershed, HEL lands were weighted by a factor of two to assume a higher erosion risk. The Kilmore Creek subwatershed ranked first among all subwatersheds for erodible lands. This is also supported by the number of documented impairments for TSS from recent and historic water quality sampling (Figure 89).