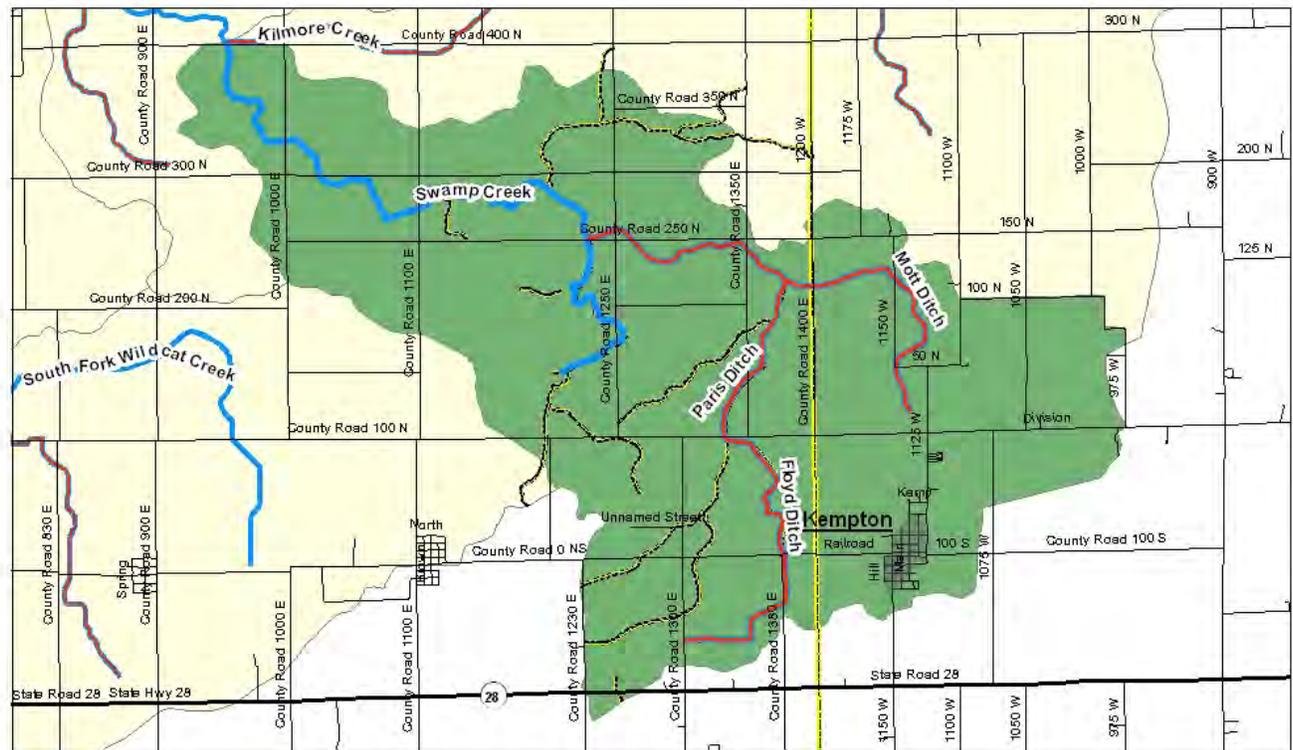


## 4.0 Subwatersheds of the South Fork Wildcat Creek Watershed

### 4.1 Swamp Creek (HUC: 051201070301)

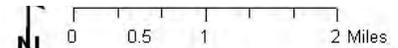
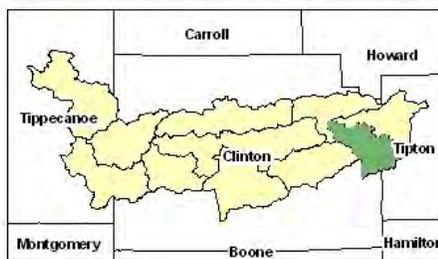
#### Land Use Information

The Swamp Creek subwatershed is the most southeasterly drainage area of the South Fork Wildcat Creek drainage. It drains approximately 11,075 acres of Clinton and Tipton County. There are roughly 14 miles of natural waterways within this subwatershed and includes Floyd Ditch, Paris Ditch, Mott Ditch, and the headwaters of Swamp Creek, which eventually empties into Kilmore Creek (Figure 23). Paris Ditch, Floyd Ditch and another small unnamed tributary are maintained as open drains. Almost eight miles of waterways are declared as impaired as a result of documented water quality problems occurring almost entirely in the upstream portions of this subwatershed.



#### Legend

-  Waterways
-  Impaired Waterways
-  Tile and Open Drains
-  County Boundary
-  Swamp Creek Watershed



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Clinton County Soil and Water Conservation District  
860 S. Prairie Ave.  
Frankfort, IN 46041

Figure 23. Swamp Creek Waterways and Drainage

Soils within the Swamp Creek subwatershed are largely hydric (Figure 24). Almost 50% of the lands can be classified as hydric soils. This greatly reduces the availability of suitable soils for on-site wastewater treatment facilities (i.e. septic systems) as well as creates drainage issues for agricultural production. Almost 30% of lands can be classified as Potentially Highly Erodible Lands (PHEL) by the NRCS. However, very few lands can actually be classified directly as Highly Erodible Lands (HEL) with only an estimated 58 acres within the entire subwatershed carrying this classification.

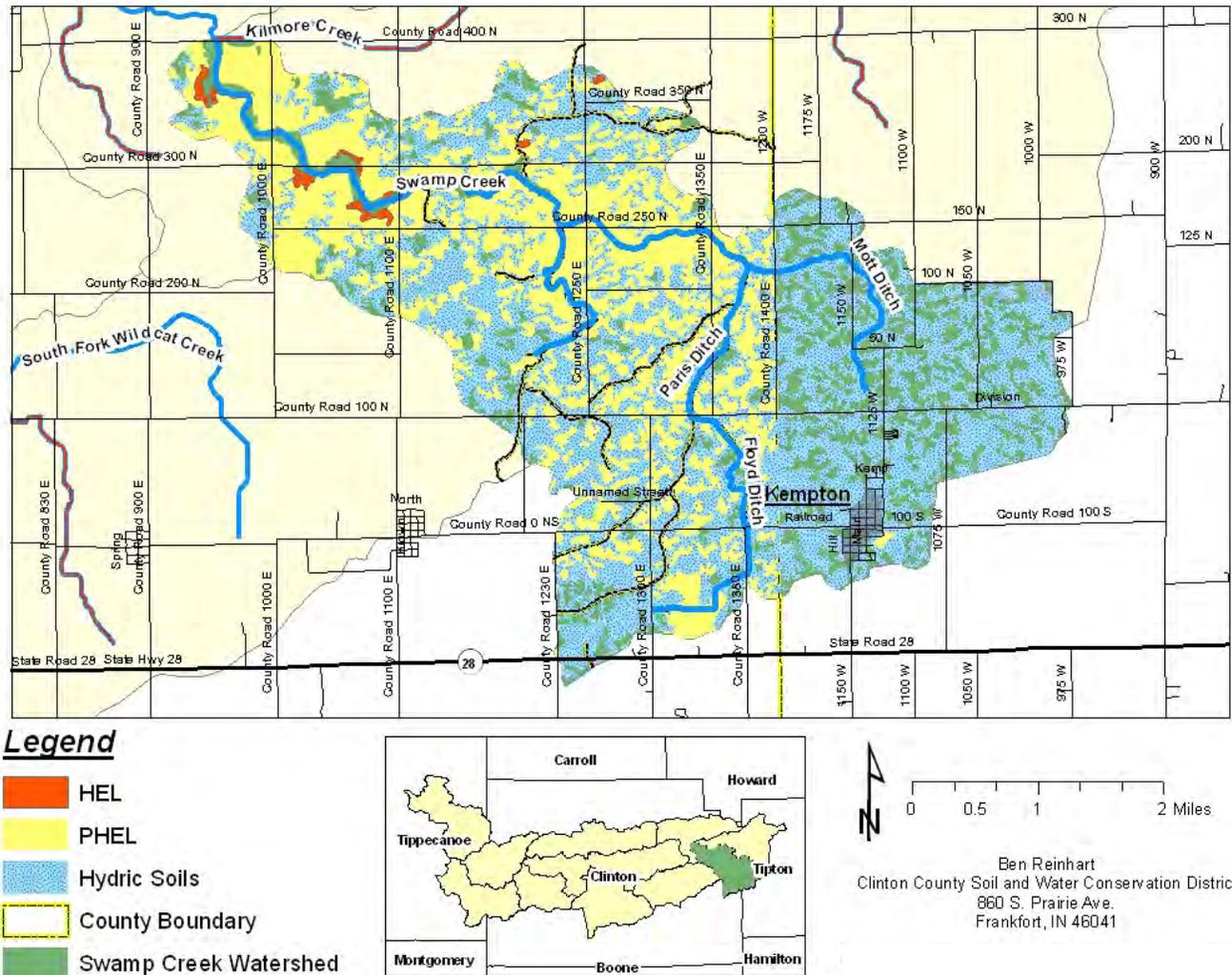


Figure 24. Swamp Creek Soils

Land use within the Swamp Creek Watershed is heavily dominated by cultivated crops (Figure 25). The sole area of development is Kempton, located within Tipton County. Other minor land uses include grassland areas, many of which are likely grazed or hayed. Wet, woody areas are also present likely due to the fact that many remain difficult to convert into cropland.

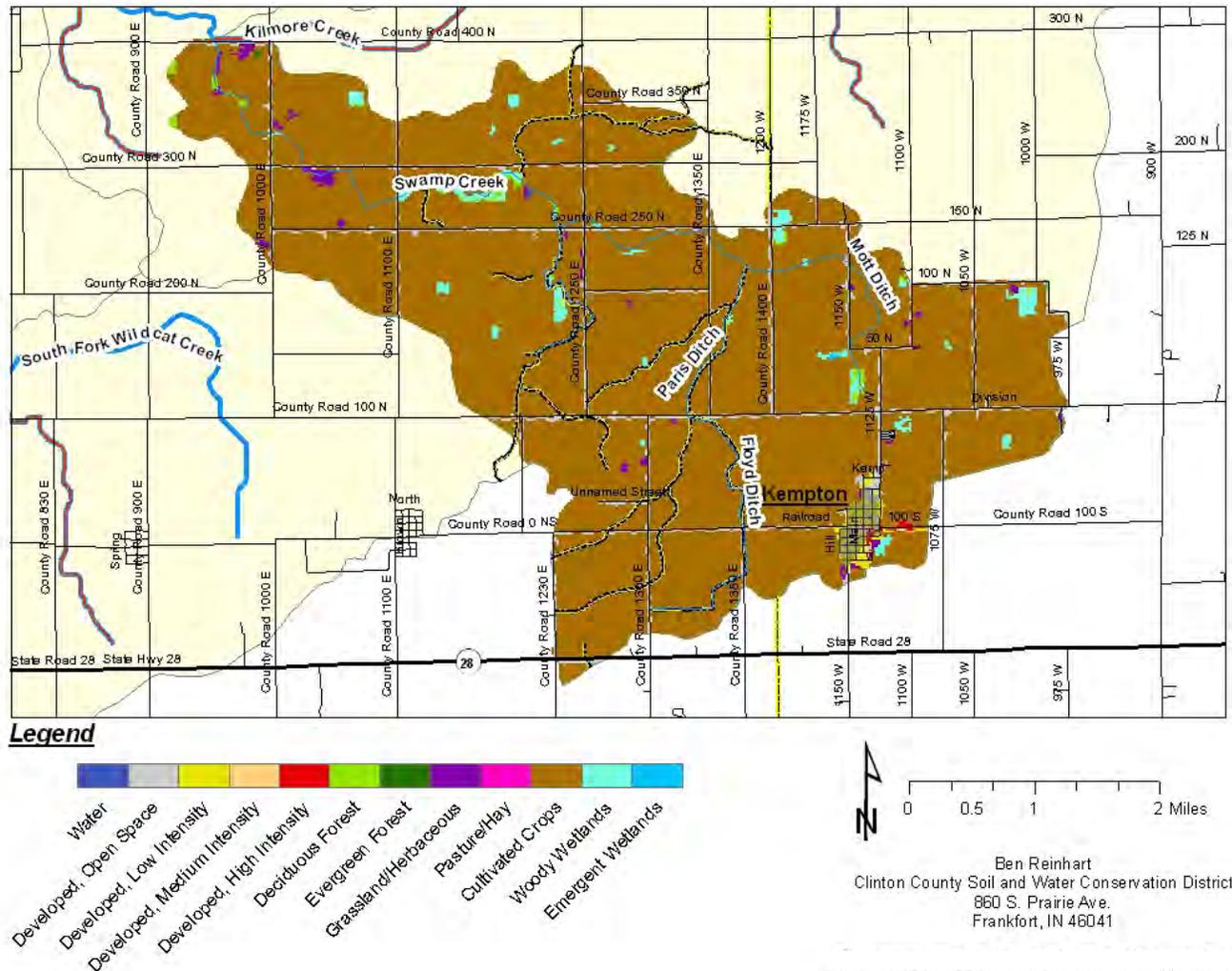


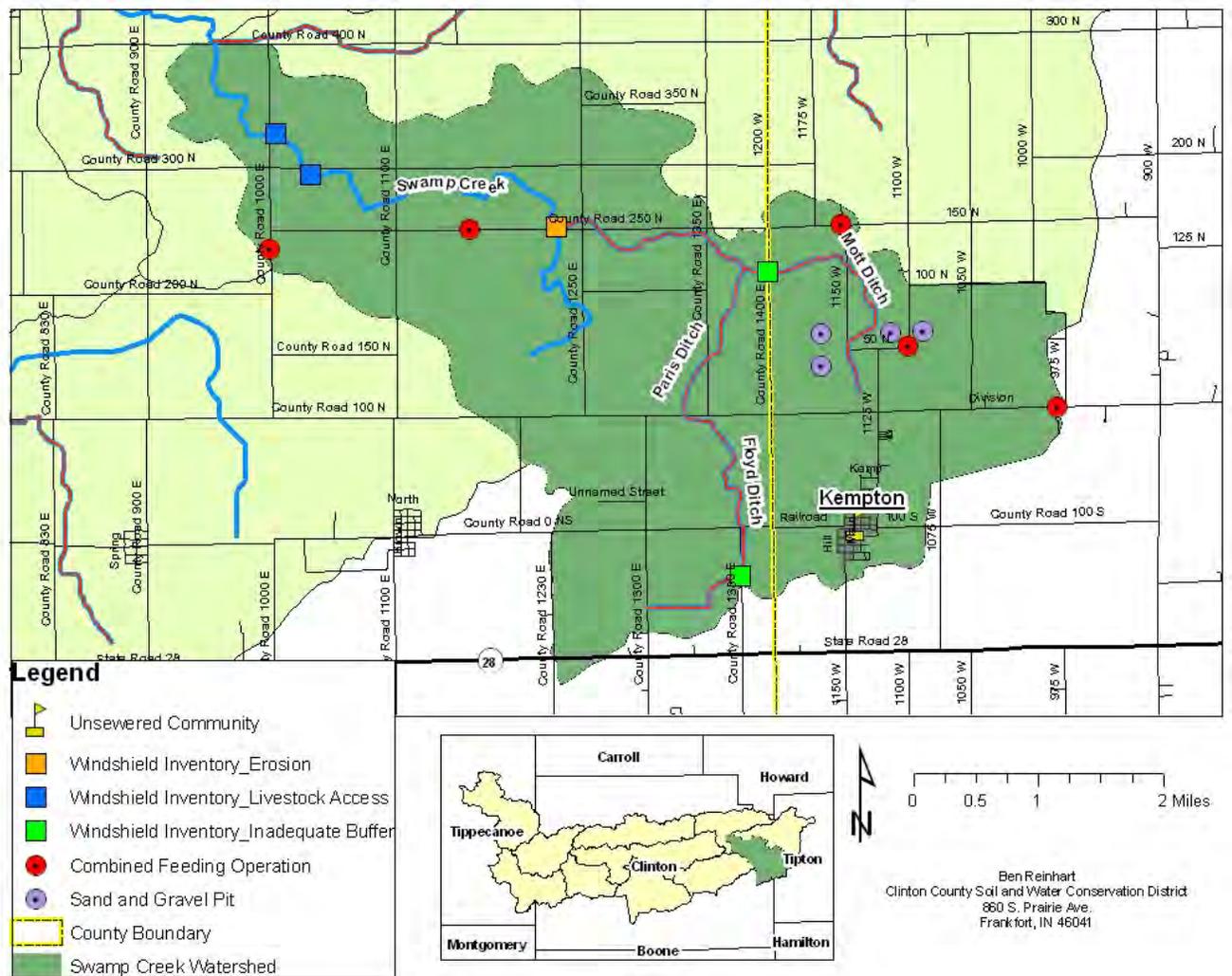
Figure 25. Swamp Creek Land Use

Watershed Inventories

**Windshield Survey & Source Identification**

The Swamp Creek subwatershed hosts five Confined Feeding Operations (CFO) of which only two are listed as active. One is located in Tipton County and Clinton County each. Two of the identified CFOs are classified as “Voided” while one is listed as “Expired”. Volunteers who participated in the Windshield Survey noted inadequate riparian buffers, particularly in upstream locations, as well as areas where livestock had free access to public water sources. The Town of Kempton, an unsewered

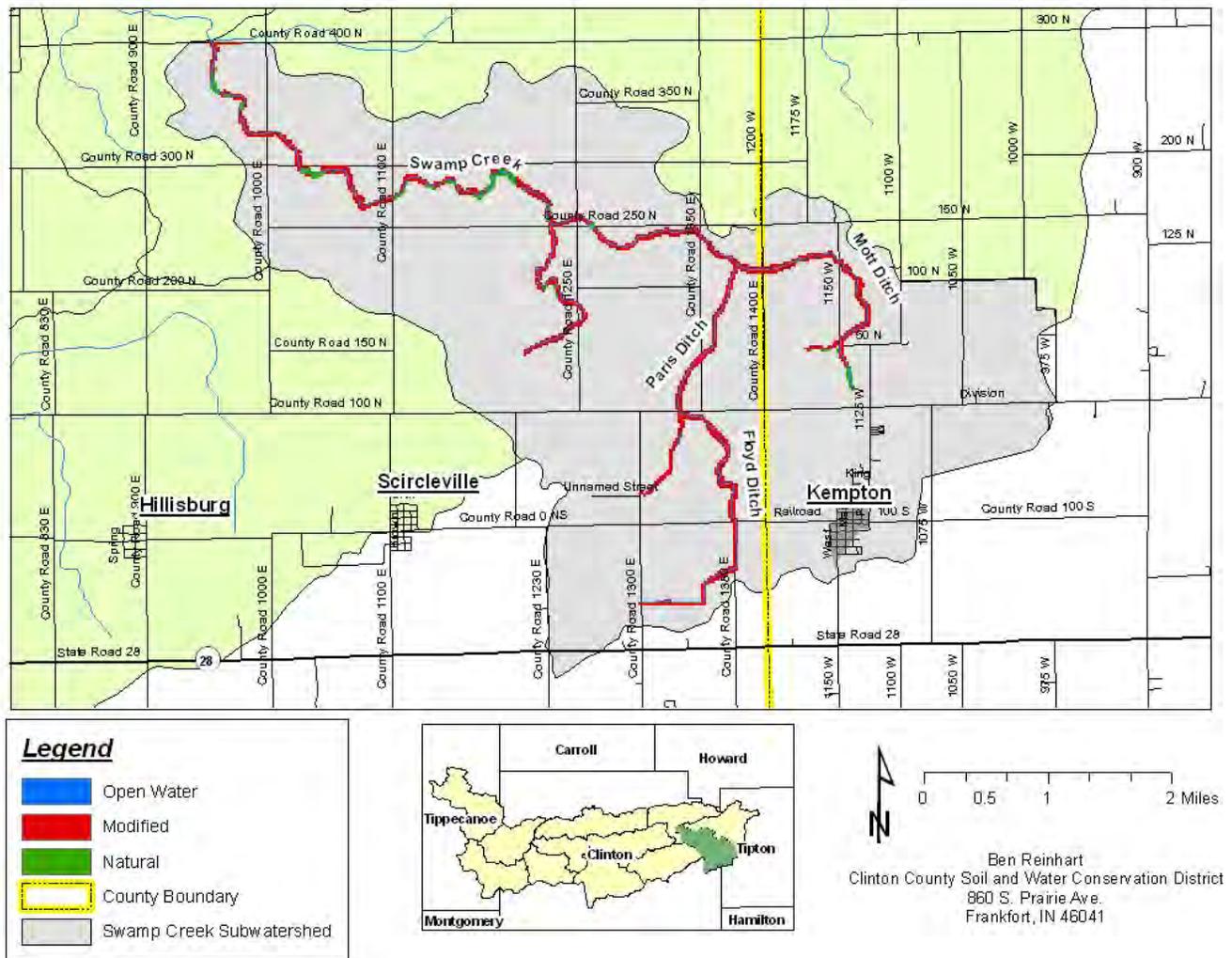
community, is located within the subwatershed and has been previously identified as a potential source of significant *E. coli* and nutrient loading (Figure 26).



**Figure 26. Swamp Creek Source Investigation**

### Desktop Surveys

Within the Swamp Creek subwatershed, land use within floodplain and riparian areas consist primarily of cultivated crops or livestock pasture. Only about 10% of land area within designated riparian zones fall under the classification of “buffered” which includes wooded lands, herbaceous grasslands, and wetlands. Considering this, roughly 12 miles of primary waterways within the Swamp Creek subwatershed are unbuffered (Figure 27).



**Figure 27. Swamp Creek Riparian Lands Survey**

The Swamp Creek subwatershed generally hasn't seen many conservation practices installed with only 8.2% of the land area within the subwatershed seeing any type of documented conservation practices. This is compared with an 18.3% average across the rest of the South Fork Wildcat Creek drainage. The majority of the conservation acreage that has been established primarily focus on the crop rotation or residue and tillage management.

**Water Quality Data**

**IDEM 305(b)/303(d)**

A number of waterways within the Swamp Creek subwatershed are classified as being impaired (Figure 28). These waterways are classified as having "impaired biotic communities". Other waterways within the Swamp Creek subwatershed are declared as having insufficient data to adequately determine threats to other uses such as recreation and fishing.

## **Hoosier Riverwatch**

Within the Hoosier Riverwatch data, only one site was found to be located within the Swamp Creek subwatershed. This site included water quality chemistry and biological data from both 2001 and 2002. Aquatic habitat data was only found for 2002. The 2001 sampling occurred in August with weather being recorded as clear and sunny. The calculated Water Quality Index was around 70 which falls at the bottom range of "Good". The Pollution Tolerance Index scored a 27 which classifies as "Excellent". Sampling in 2002 was completed in May with Water Quality Index scores around 82. The Pollution Tolerance Index was much lower than the previous summer however. A Citizens Qualitative Habitat Index was calculated during 2002 with a score of 63. Generally, scores over 60 indicate habitat suitable for most warmwater species.

## **AIMS**

One sampling location on Swamp Creek showed *E. coli* levels slightly above accepted standards as part of a 1998 TMDL study. Habitat assessments done in 2008 across the Swamp Creek subwatershed generally showed increasing scores as sampling efforts moved downstream in the subwatershed. However, only the farthest downstream site on Swamp Creek showed scores above accepted standards. Only two sites (CR 1100E and CR 250N) within the subwatershed met accepted standards during biological assessments of fish communities with one of these being the site on Swamp Creek which hosted the highest habitat scores. The other site on a small tributary of Swamp Creek met biological standards despite low habitat scores. One site on Mott Ditch did show relatively high ammonia concentrations during a 2004 sampling event.

## **South Fork TMDL**

Water quality samples for total phosphorus were included from one site on Mott Ditch. Based on this sample, a reduction of 40% was required.

Water quality samples from Swamp Creek were included for Total Suspended Solids calculations. Based on this sample, a reduction of 32% was required.

One assessment location on Swamp Creek was used to estimate existing pollutant loads and calculate necessary reductions. It was noted that there was little water quality samples available but what was available showed considerable reductions of total phosphorus are necessary.

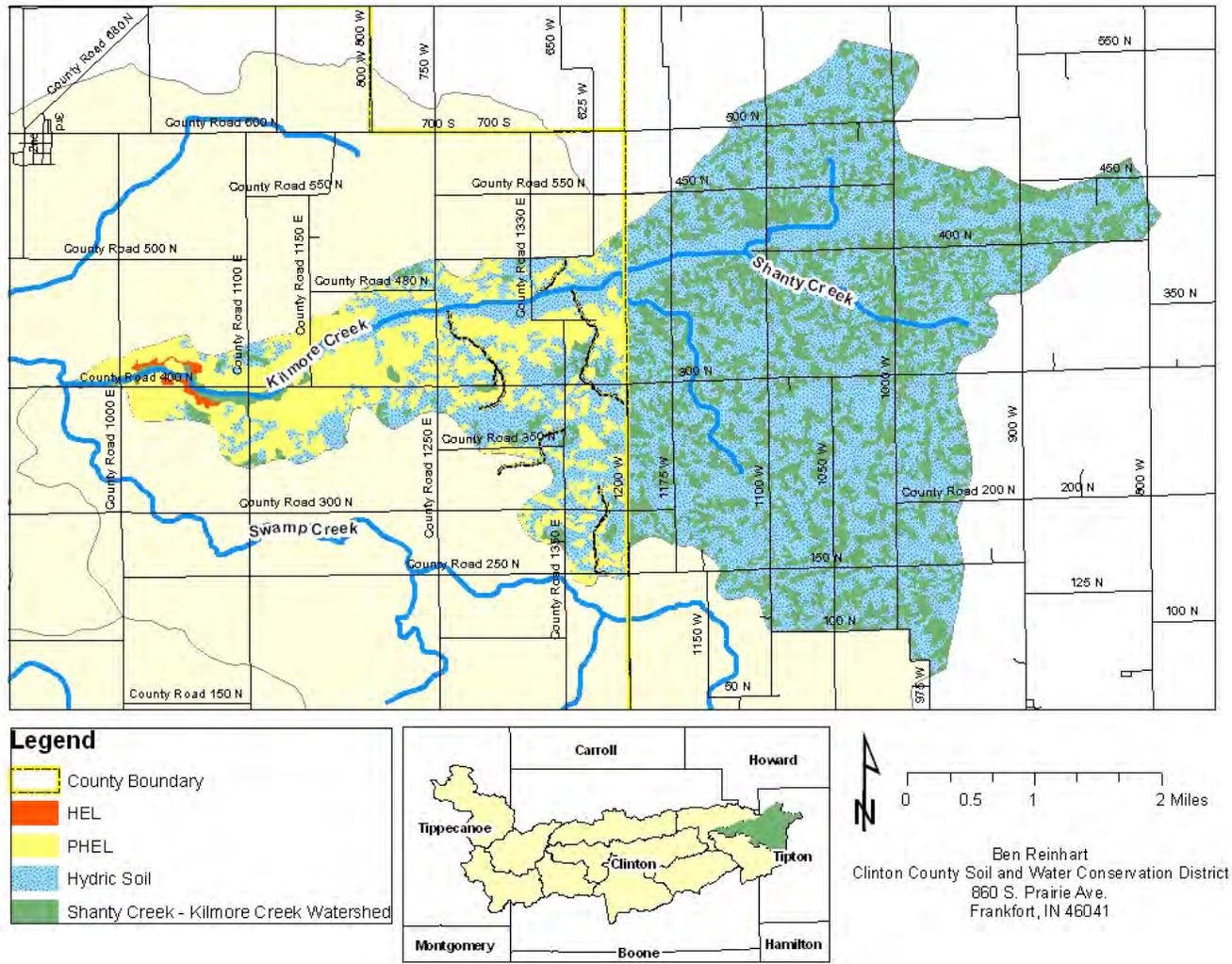
## **Kempton Area Source Identification Study**

The historical data combined with the additional sampling conducted by IDEM were conclusive that raw sewage was being discharged at the headwater of Mott Ditch. The effects of the discharge was most acute directly downstream, but had impairing impacts for most of Mott Creek and the mainstem of Swamp Creek. The study found elevated levels of ammonia, phosphorus, chloride, *E.coli*, and low Dissolved Oxygen as well as prolific algae growth and sludge accumulation. As the discharge became diluted in the stream, the downstream sampling points showed fewer impacts.



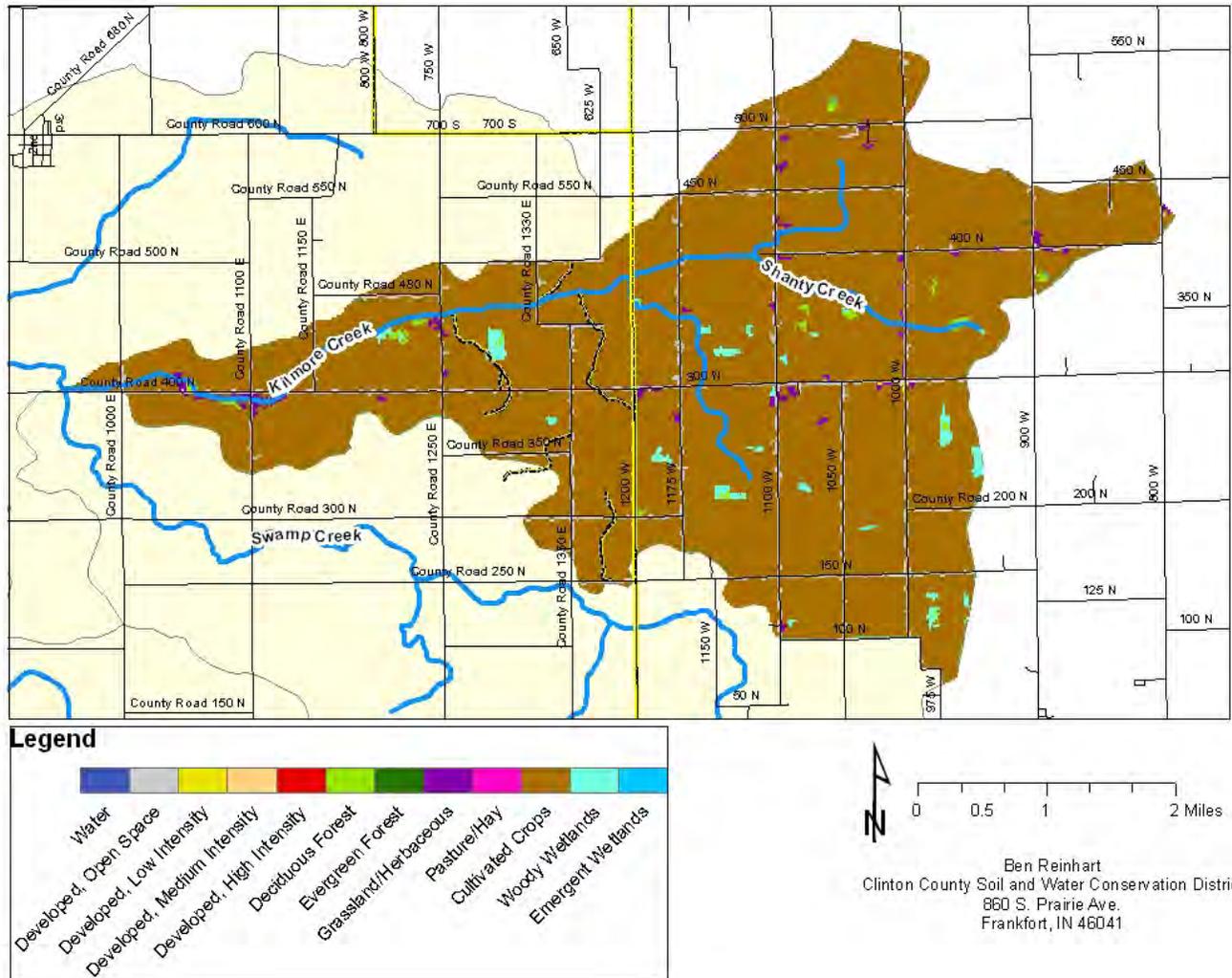


Soils characteristics within the Shanty Creek subwatershed are similar to that of nearby Swamp Creek subwatershed. Much of the area, approximately 54%, can be classified as somewhat hydric in nature (Figure 30). Lands that carry a classification of PHEL make up approximately 16% of the land area within the subwatershed. And finally, HEL lands are uncommon within this drainage with only about 30 acres being classified throughout the entire subwatershed.



**Figure 30. Shanty Creek-Kilmore Creek Soils**

The Shanty Creek-Kilmore Creek watershed lacks virtually any developed areas and is characterized by cropland (Figure 31). Grasslands are scattered throughout the drainage area and are most likely grazed or hayed. Also scattered throughout the watershed are fragmented patches of wooded areas, many of which contain wet or swampy areas.

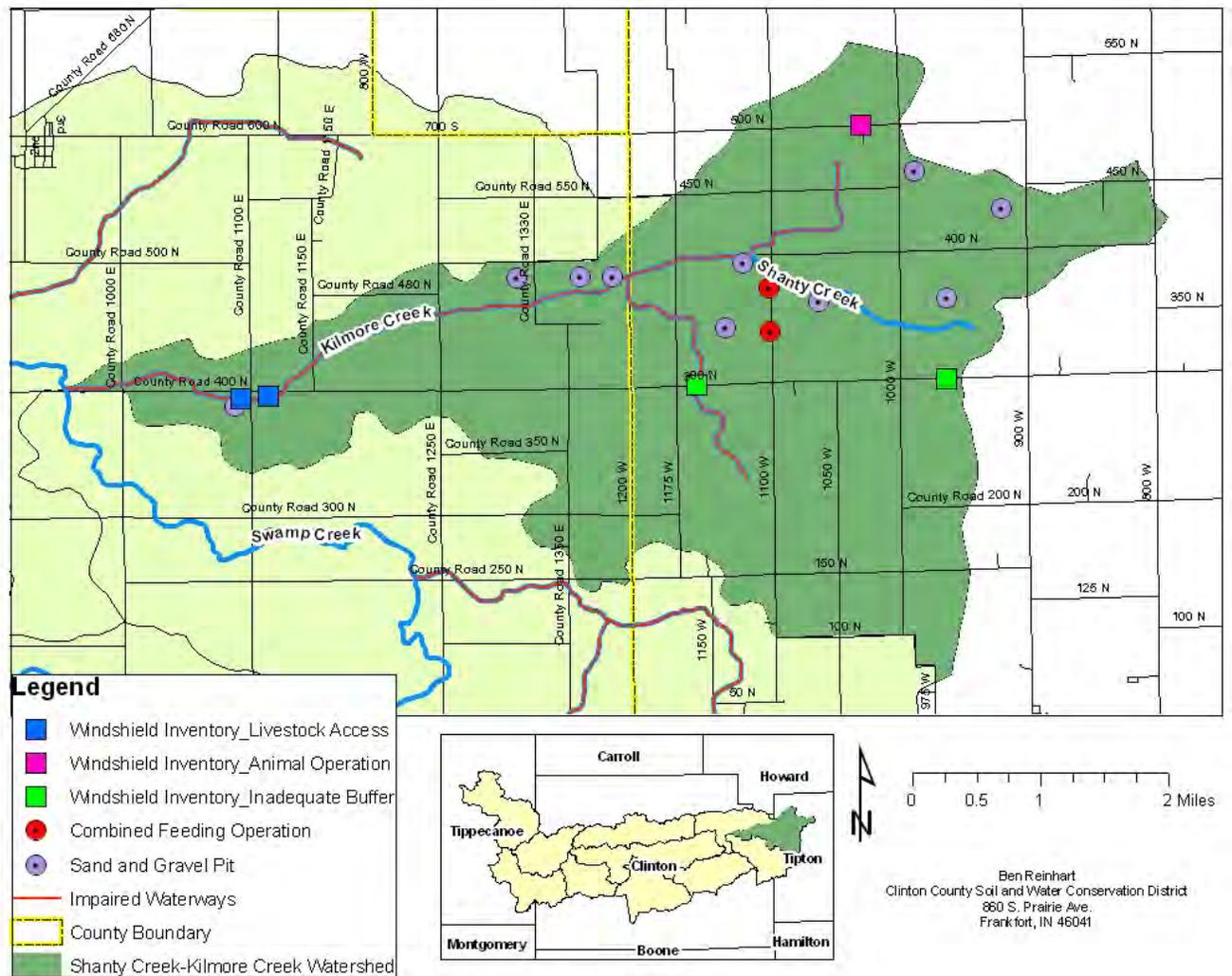


**Figure 31. Shanty Creek-Kilmore Creek Land Use**

Watershed Inventories

**Windshield Survey & Source Identification**

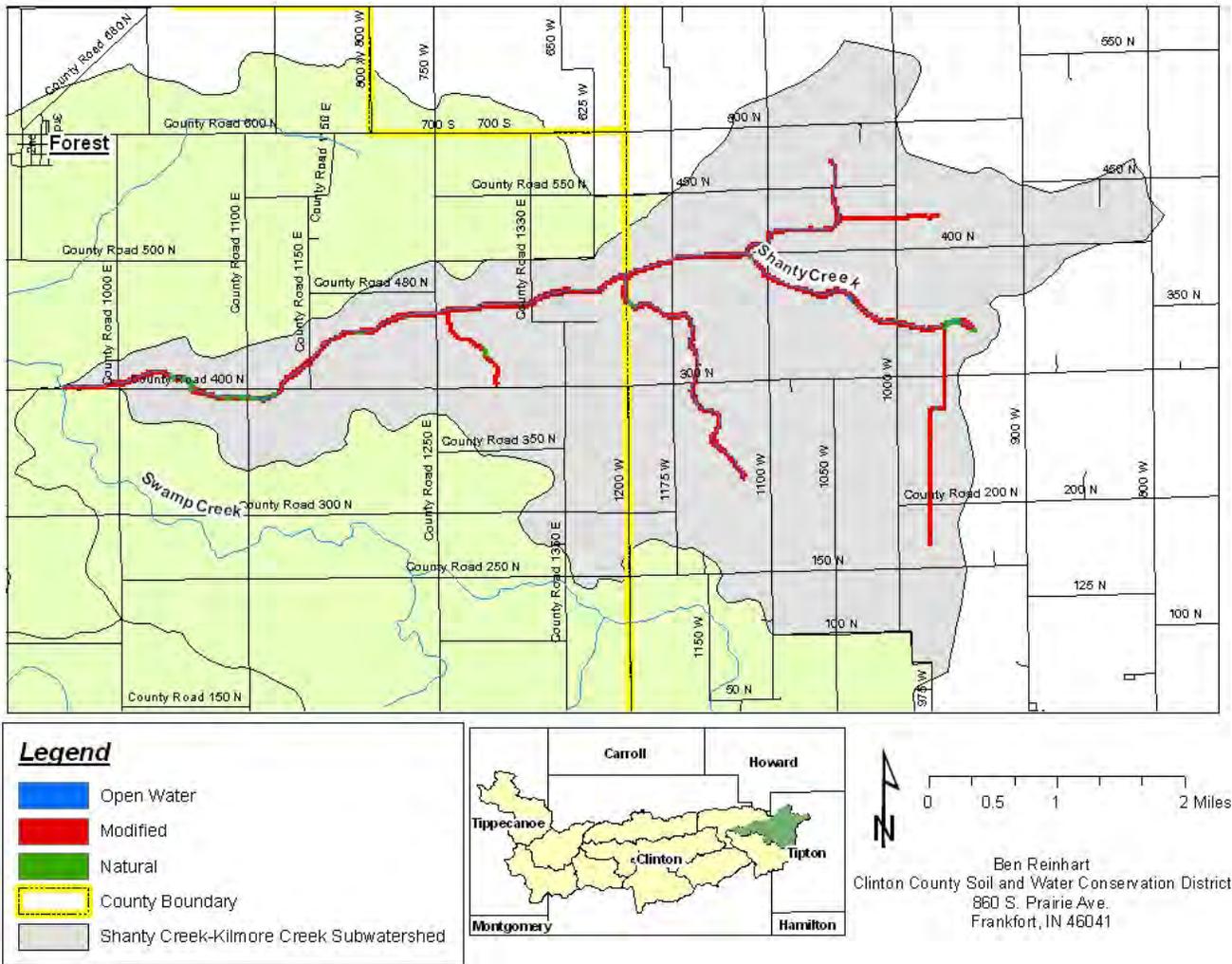
The Shanty Creek-Kilmore Creek subwatershed hosts two Confined feeding operations. Both CFOs are located within Tipton County and both are currently listed as “Active”. The windshield inventory identified one other “Animal Operation” also within Tipton County. Generally, Animal Operations identified during the windshield inventory represent smaller, hobby-sized farms where animals and livestock may be kept. Two locations were identified downstream in the drainage area where livestock may be contributing to water quality impairments due to free access to the stream (Figure 32). A number of old sand and gravel pits also exist in this drainage area. Most of these sites are less than an acre of size and do hold water. Some of these abandoned pits could represent sources of erosion and sediment loading, particularly those located directly adjacent to waterways.



**Figure 32. Shanty Creek-Kilmore Creek Source Investigation**

### Desktop Surveys

The Shanty Creek-Kilmore Creek subwatershed ranks the lowest of any subwatershed in regards to the percentage of natural land types within floodplain and riparian buffer zones. Over 90% of lands near waterways can be classified as unbuffered (e.g. cultivated lands, livestock pasture, development, etc.) meaning virtually all stream miles within this subwatershed lack riparian buffers (Figure 33).



**Figure 33. Shanty Creek-Kilmore Creek Riparian Lands Survey**

Conservation practices within the Shanty Creek-Kilmore Creek subwatershed have been applied on almost 14% of the acreage compared against an 18.3% average across the South Fork Wildcat Creek drainage. A number of these areas have adopted practices such as Conservation Crop Rotation as well as residue and tillage management. There are some acres that have developed Pest and/or Nutrient Management Plans guiding their applications of chemicals and soil amendments.

*Water Quality Information*

**IDEM 305(b)/303(d)**

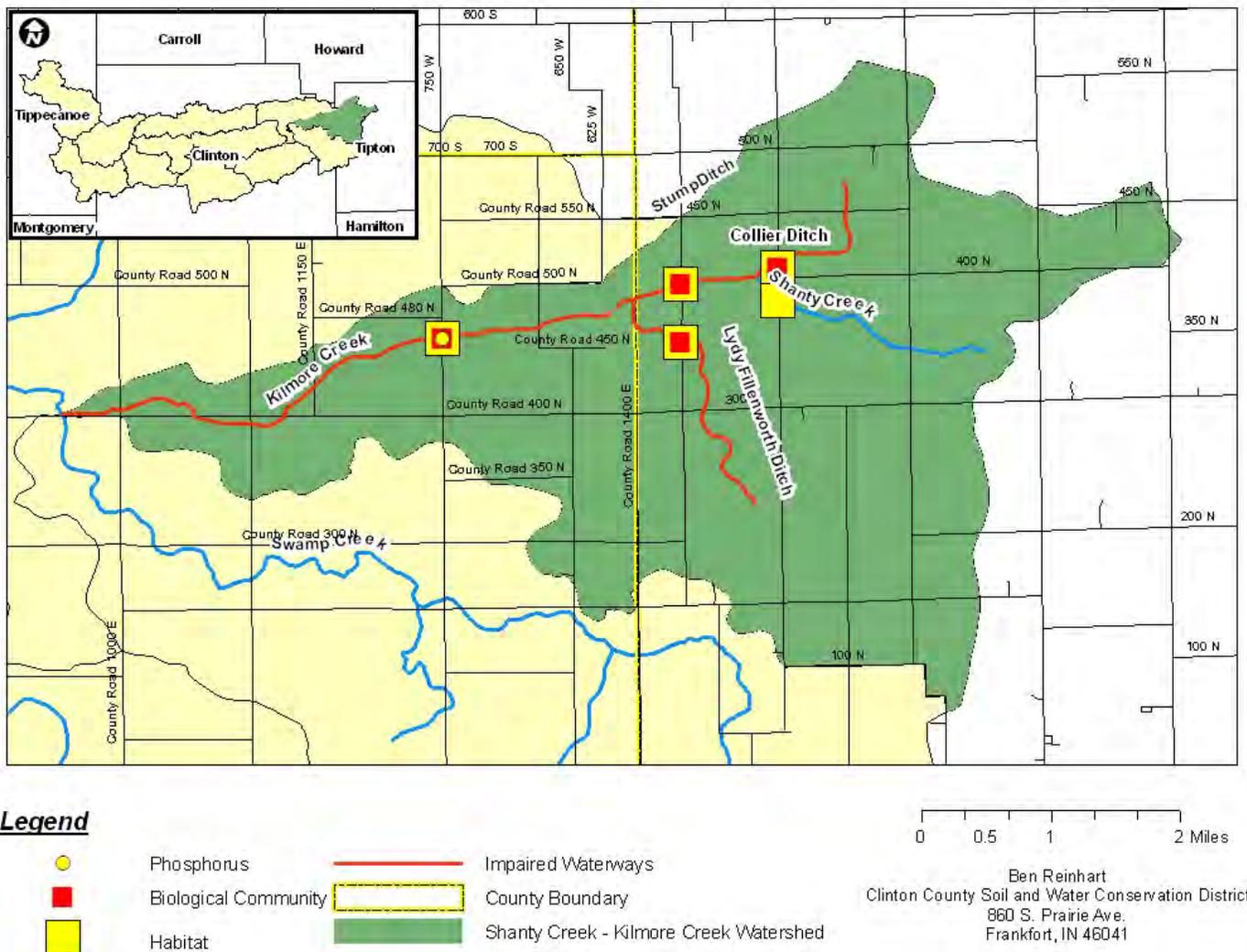
Virtually all waterways within the Shanty Creek-Kilmore Creek subwatershed are impaired (Figure 34). Similar to Swamp Creek, waterways located within the Shanty Creek-Kilmore Creek subwatershed are listed as having impaired biotic communities. Also similar to Swamp Creek, it is noted that insufficient data is present to assess some threats related to recreational and fishing uses.

**AIMS**

One site located on Kilmore Creek was sampled for *E. coli* in a 1998 TMDL. This site showed *E. coli* levels approaching but not exceeding accepted standard levels. Five sites were sampled in 2004 to evaluate habitat quality and biological communities. Sites were located on Collier Ditch, Shanty Creek, Kilmore Creek, and Lydy Fillenworth Ditch. No sites met accepted standards for habitat quality while one site on Shanty Creek at County Road 1100 West (Tipton Co.) met standards quality of fish communities. The sampling location on Collier Ditch showed the lowest levels for habitat quality and fish communities combined. Two sites, one on Kilmore Creek at County Road 1250 East and another on Shanty Creek at County Road 1175 West, had fish community scores approaching but not meeting accepted standards.

**South Fork TMDL**

One site within the Shanty Creek-Kilmore Creek area was included in the TMDL study. Sample data from this site showed a necessary reduction of around 6% for total phosphorus levels.



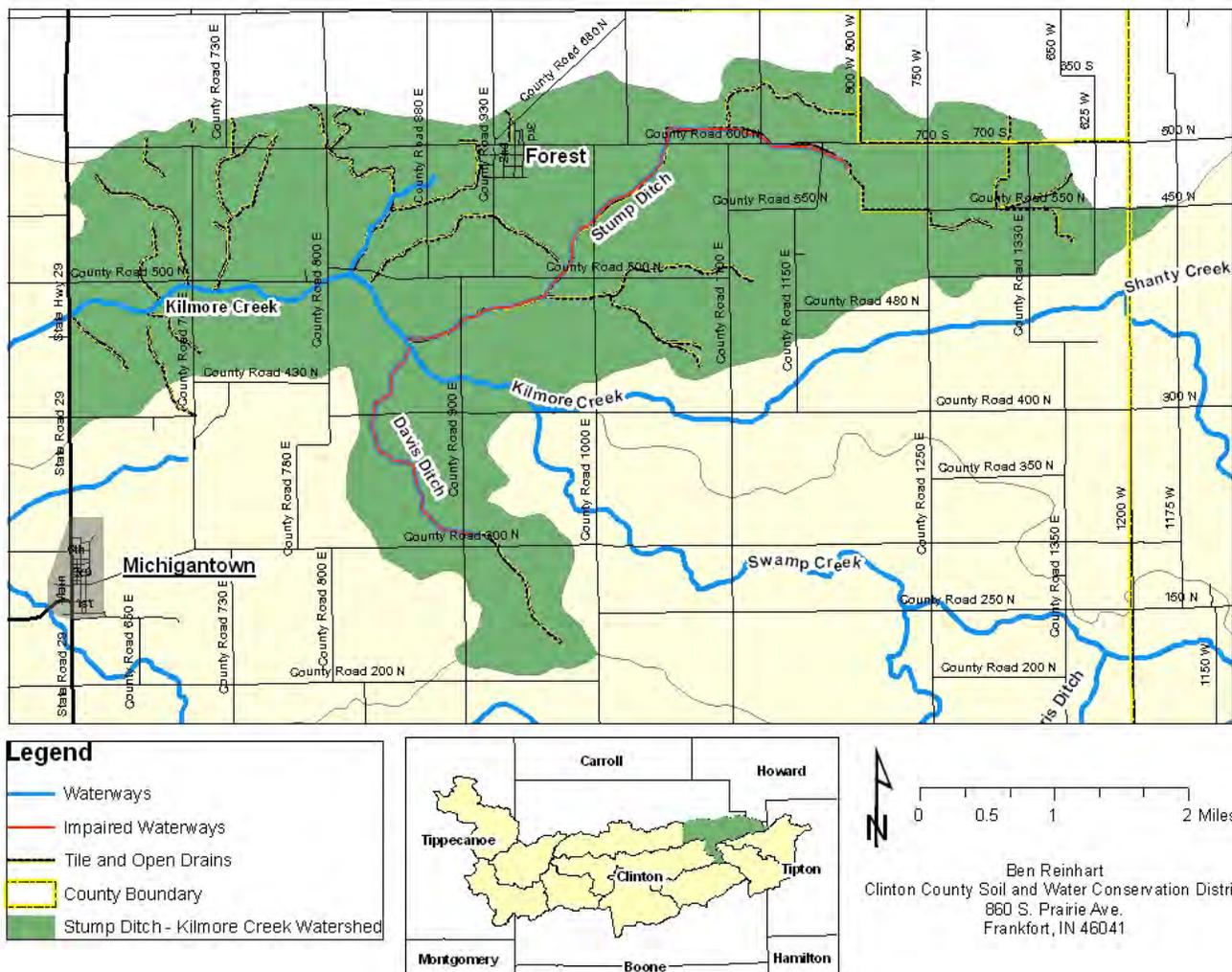
**Figure 34. Shanty Creek-Kilmore Creek Water Quality Impairments**

### 4.3 Stump Ditch - Kilmore Creek (HUC: 051201070303)

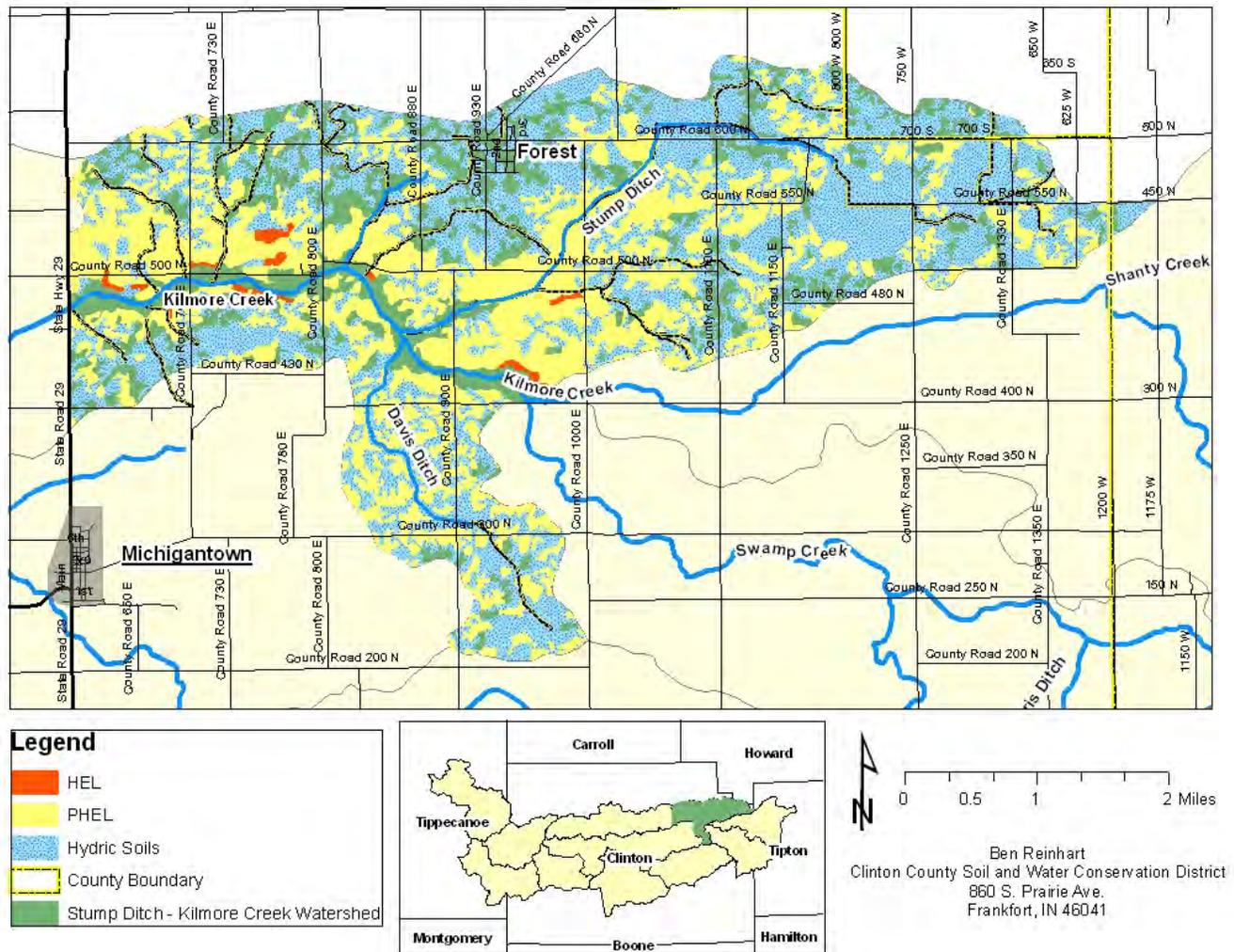
#### Land Use Information

The Stump Ditch-Kilmore Creek subwatershed lies along the northern boundary of the South Fork Wildcat Creek Watershed draining almost 10,587 acres. With its boundaries mostly within Clinton County, the Stump Ditch-Kilmore Creek subwatershed also drains a small, isolated corner of Howard County. This subwatershed contains just over 11.5 miles of natural waterways with over half (6.2 miles) being listed as impaired waterways (Figure 35). Waterways include Stump Ditch, Davis Ditch, and Kilmore Creek. Virtually all of Stump Ditch is managed as an open drain.

**Figure 35. Stump Ditch-Kilmore Creek Waterways and Drainage**



Slightly half of the land area (46%) within the Stump Ditch-Kilmore Creek subwatershed can be classified as having soil properties that are somewhat hydric in nature. Approximately 37% of lands within the drainage area can be classified as PHEL whereas only about 72 acres of land can be classified as HEL. The majority of the PHEL and HEL lands occur along the primary waterways (Figure 36).



**Figure 36. Stump Ditch-Kilmore Creek Soils**

Similar to many of the other subwatersheds across the South Fork Wildcat Creek drainage, the Stump Ditch-Kilmore Creek Watershed is almost entirely comprised of cultivated crops. Other relatively minor land uses included grasslands and wooded areas which are heavily fragmented and scattered throughout the area. The primary area of development within this watershed is represented by the Town of Forest along the northern boundary of the drainage area (Figure 37).

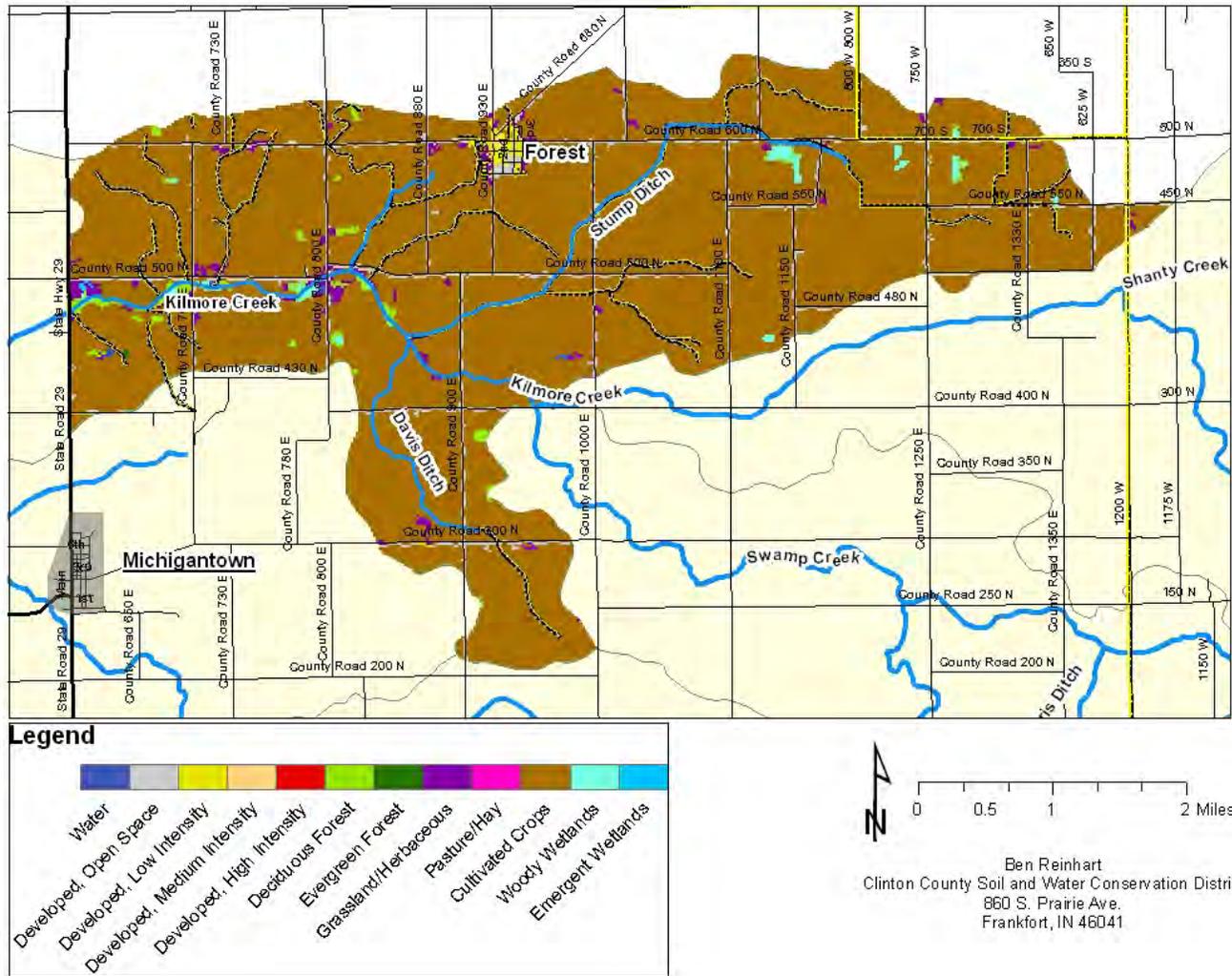
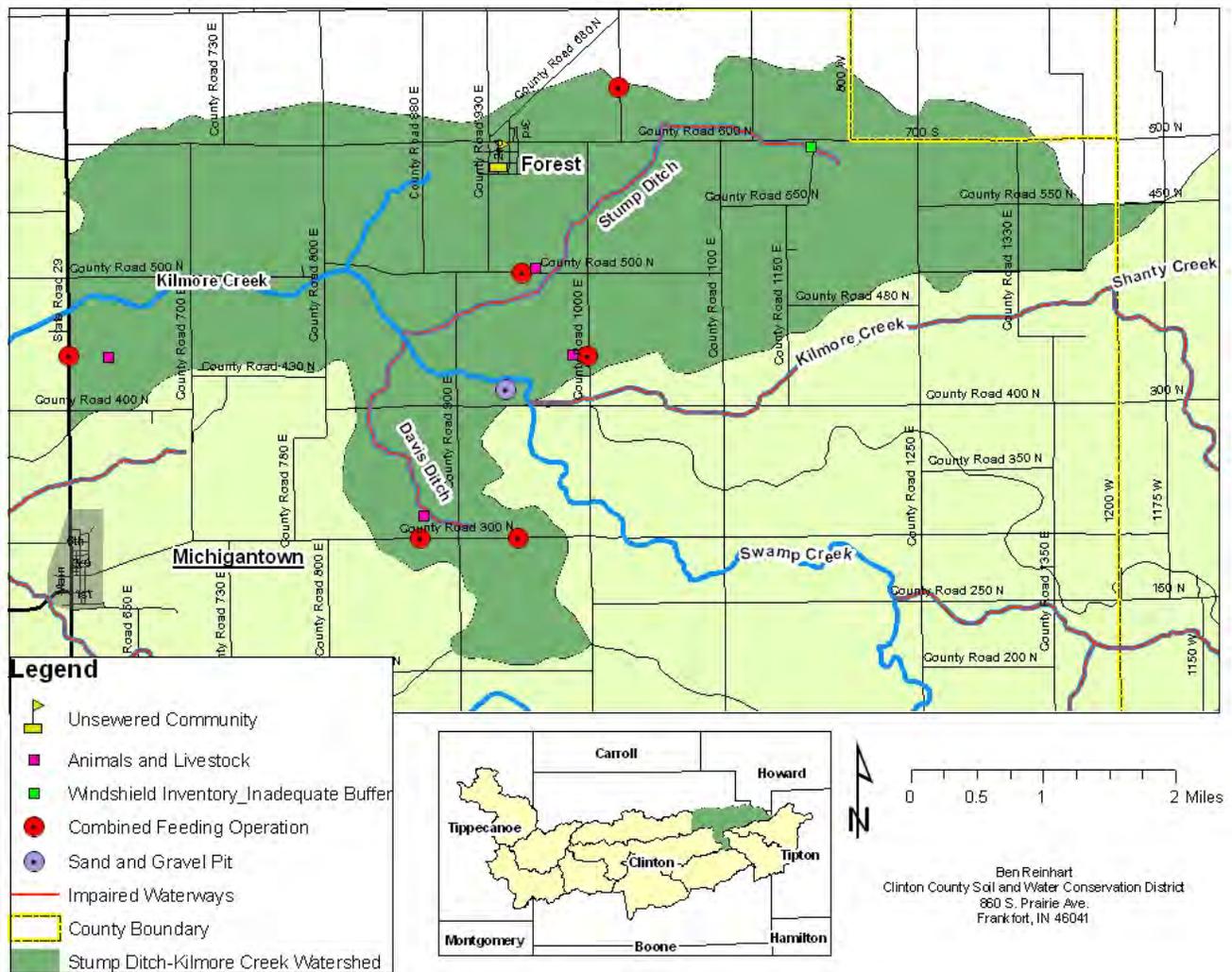


Figure 37. Stump Ditch-Kilmore Creek Land Use

## Watershed Inventories

### **Windshield Survey & Source Identification**

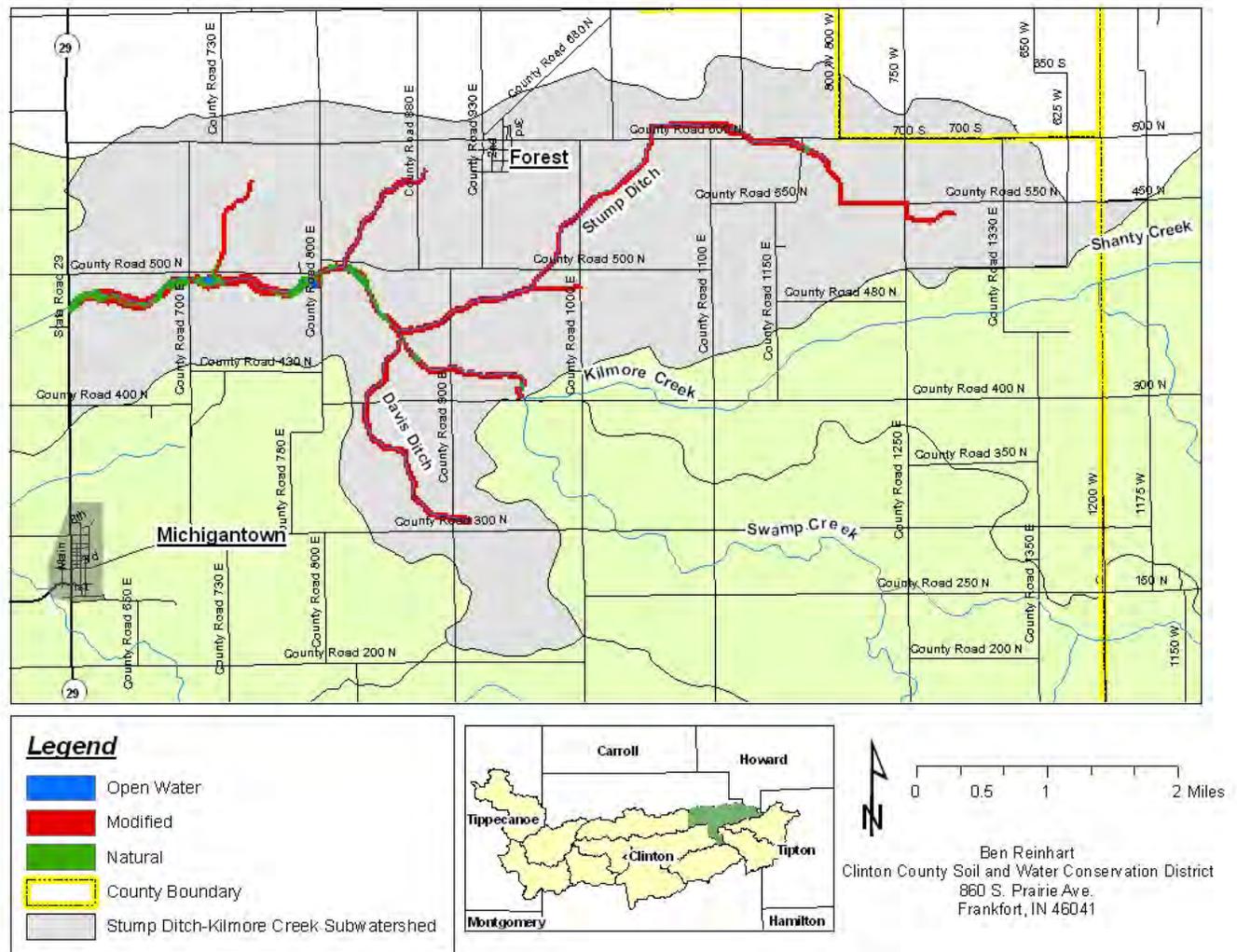
One unsewered community, the Town of Forest, is located within the Stump Ditch-Kilmore Creek drainage area. Also, six Confined feeding operations are located within the watershed boundaries with all of them being listed as Active (Figure 38). Volunteers from the windshield inventory indicated inadequate riparian zones being located primarily along Stump Ditch and other smaller tributaries of the main branch of Kilmore Creek.



**Figure 38. Stump Ditch-Kilmore Creek Source Investigation**

### Desktop Surveys

Approximately 17% of lands within the designated floodplain and riparian buffer zones can be classified as natural land types (e.g. wooded areas, grasslands, or wetlands). The remaining land areas within these designated zones consist of land uses such as cultivated fields and livestock pastures. Virtually all buffered land area occurs along the main body of Kilmore Creek while Stump Ditch and Davis Ditch are almost entirely unbuffered (Figure 39).



**Figure 39. Stump Ditch-Kilmore Creek Riparian Lands Survey**

The Stump Ditch-Kilmore Creek subwatershed ranks third lowest in regards to percent of subwatershed area receiving conservation practices with only 8.6%, compared to a 18.3% average across the South Fork Wildcat Creek drainage. The most common practices applied are Conservation Crop Rotation and residue and tillage management. The occurrence of developed Pest and/or Nutrient Management Plans is slightly more common within this subwatershed compared to others such as the Shanty Creek-Kilmore Creek and Swamp Creek subwatersheds.

Water Quality Information

**IDEM 305(b)/303(d)**

Within the Stump Ditch-Kilmore Creek subwatershed both Stump Ditch and Davis Ditch are listed as hosting impaired biotic communities (Figure 40). Other sections of Kilmore Creek itself are grouped into Category 2 which means that water quality is generally good but more data should be collected.

## **Hoosier Riverwatch**

As part of the Hoosier Riverwatch database only two sampling events were recorded in the Stump Ditch-Kilmore Creek subwatershed. Water Quality Index scores were pretty good with scores over 70. Habitat evaluations were quite low at these sites with scores of 28 and 36. Generally a score of 60 is considered conducive for warmwater species.

## **AIMS**

Two locations were sampled within the Kilmore Creek-Stump Ditch subwatershed for *E. coli* as part of a 1998 TMDL study. Neither site exceeded accepted standards. Sites on Kilmore Creek at County Road 500 North and upstream of 700 East exceeded accepted standards for aquatic habitat and fish communities. The highest scores were recorded at County Road 500 North during sampling events in 2003 and 2004. Sites on Davis Ditch, Stump Ditch, and upstream sites on Kilmore Creek did not meet accepted standards for habitat quality. Sampling locations on Davis Ditch and Stump Ditch also did not meet accepted standards for fish communities whereas all sites on Kilmore Creek met biological standards for fish communities with relatively high scores. The sampling location on Kilmore Creek at County Road 500 North showed some elevated nitrate-nitrite levels approaching accepted standard levels during sampling in 2003.

## **Current Data**

As part of the South Fork Wildcat Creek Assessment, two sampling locations were located within the Stump Ditch-Kilmore Creek subwatershed. Habitat analysis on Stump Ditch showed scores that were only slightly above accepted standards while macroinvertebrate sampling resulted in scores slightly below accepted standards. Similar analysis done upstream of the Kilmore Creek and Stump Ditch confluence showed habitat scores four points below accepted standards. Also, biological measurements of macroinvertebrate communities were not completed due to lack of adequate flow at the time of sampling.

Two sampling locations occurred within this drainage area, one on Stump Ditch and another on Kilmore Creek upstream of its confluence with Stump Ditch. While isolated exceedances occurred for nutrients and TSS (total suspended solids), average concentrations at both sites met this project's water quality targets except for *E. coli*. *E. coli* levels showed isolated exceedances during low flow sampling while routinely exceeding target levels during high flows. Measurements exceeding accepted target levels were documented during high flows for TSS, total phosphorus, and nitrate-nitrite. Average total phosphorus concentrations also approached target levels, and exceeded targets during isolated sampling events, during low flows at the Stump Ditch sampling site.

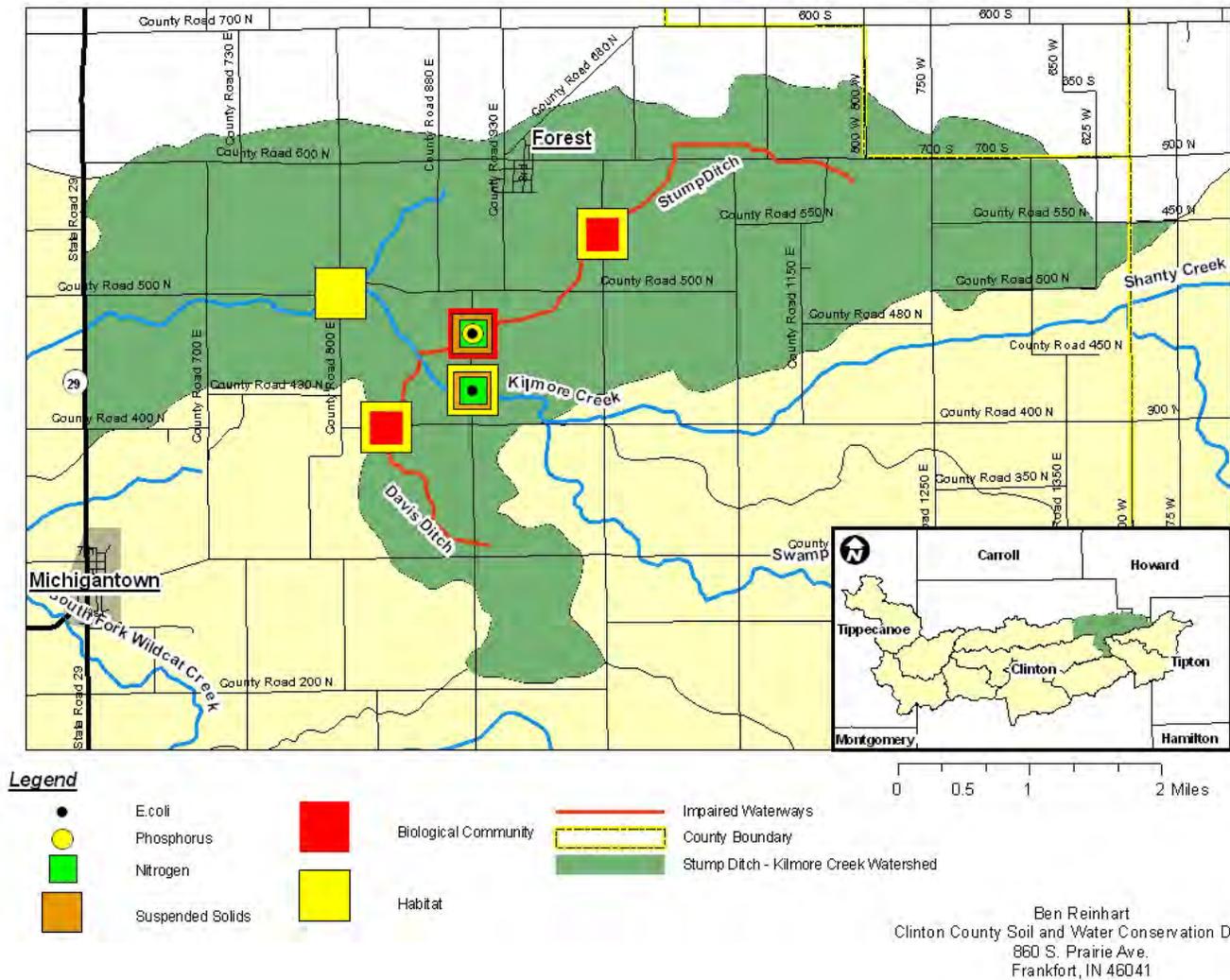
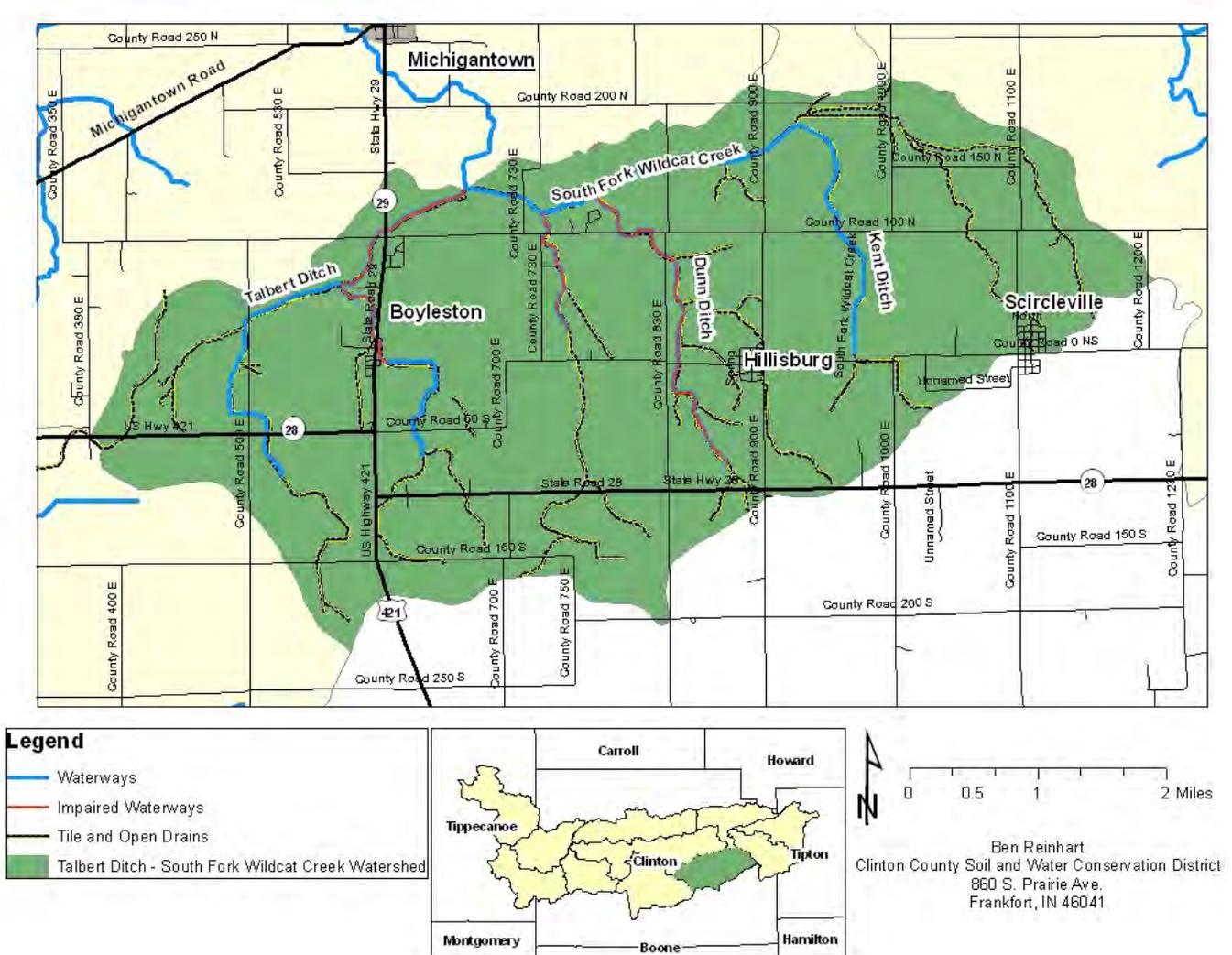


Figure 40. Stump Ditch-Kilmore Creek Water Quality Impairments

#### 4.4 Talbert Ditch – South Fork Wildcat Creek (HUC: 051201070304)

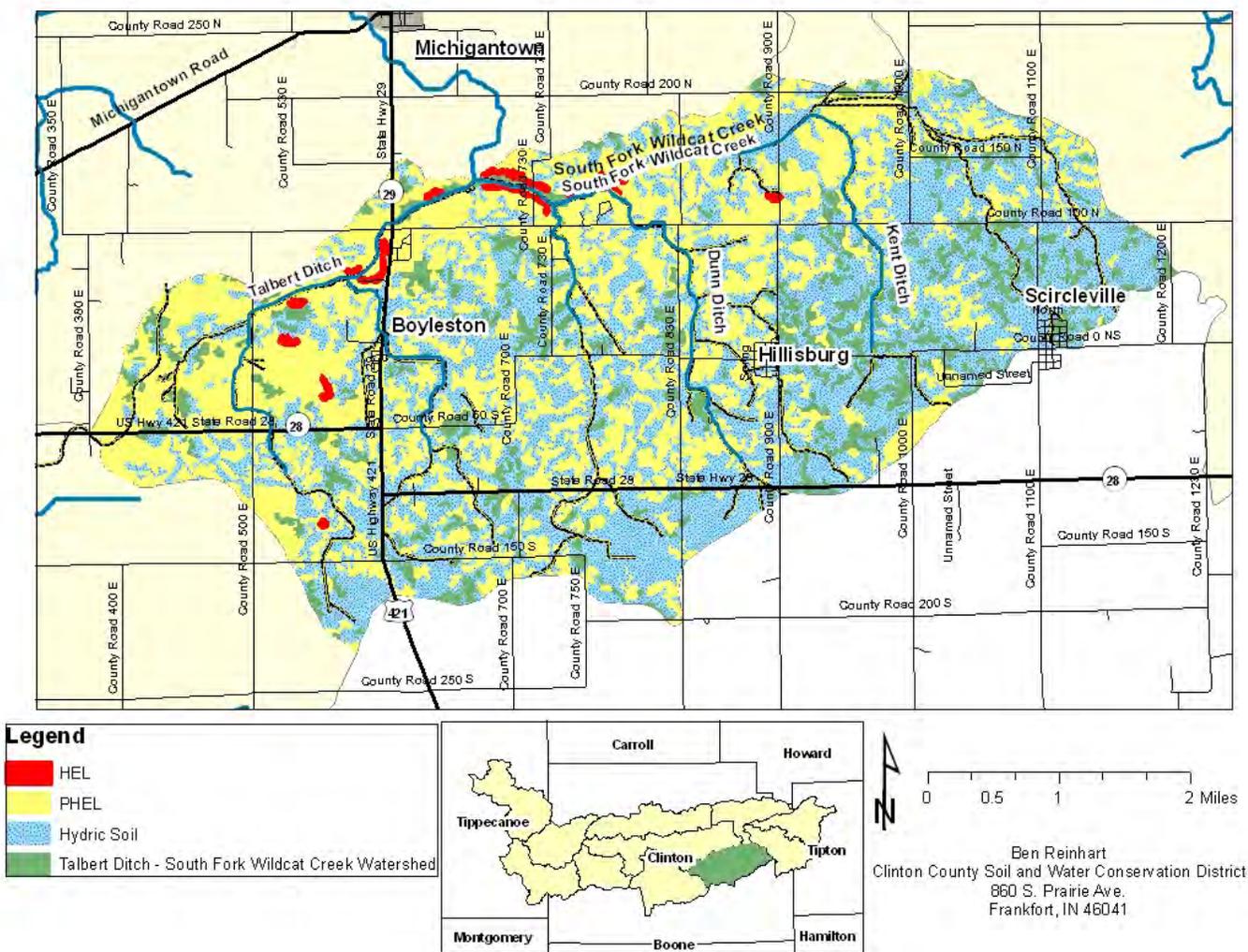
##### Land Use Information

The Talbert Ditch-South Fork Wildcat Creek subwatershed is located along the southeastern edge of the South Fork Wildcat Creek Watershed and makes up the headwaters of the South Fork Wildcat Creek. This subwatershed drains approximately 13,107 acres of east-central Clinton County. Of the 18 total miles of waterways, roughly one-third are declared as impaired waterways (Figure 41). Primary waterways located within this subwatershed include Talbert Ditch, Kent Ditch, Dunn Ditch, and the South Fork Wildcat Creek. Almost all of these waterways are also managed as open drains by the Clinton County Surveyor.



**Figure 41. Talbert Ditch-South Fork Wildcat Creek Watersheds and Drainage**

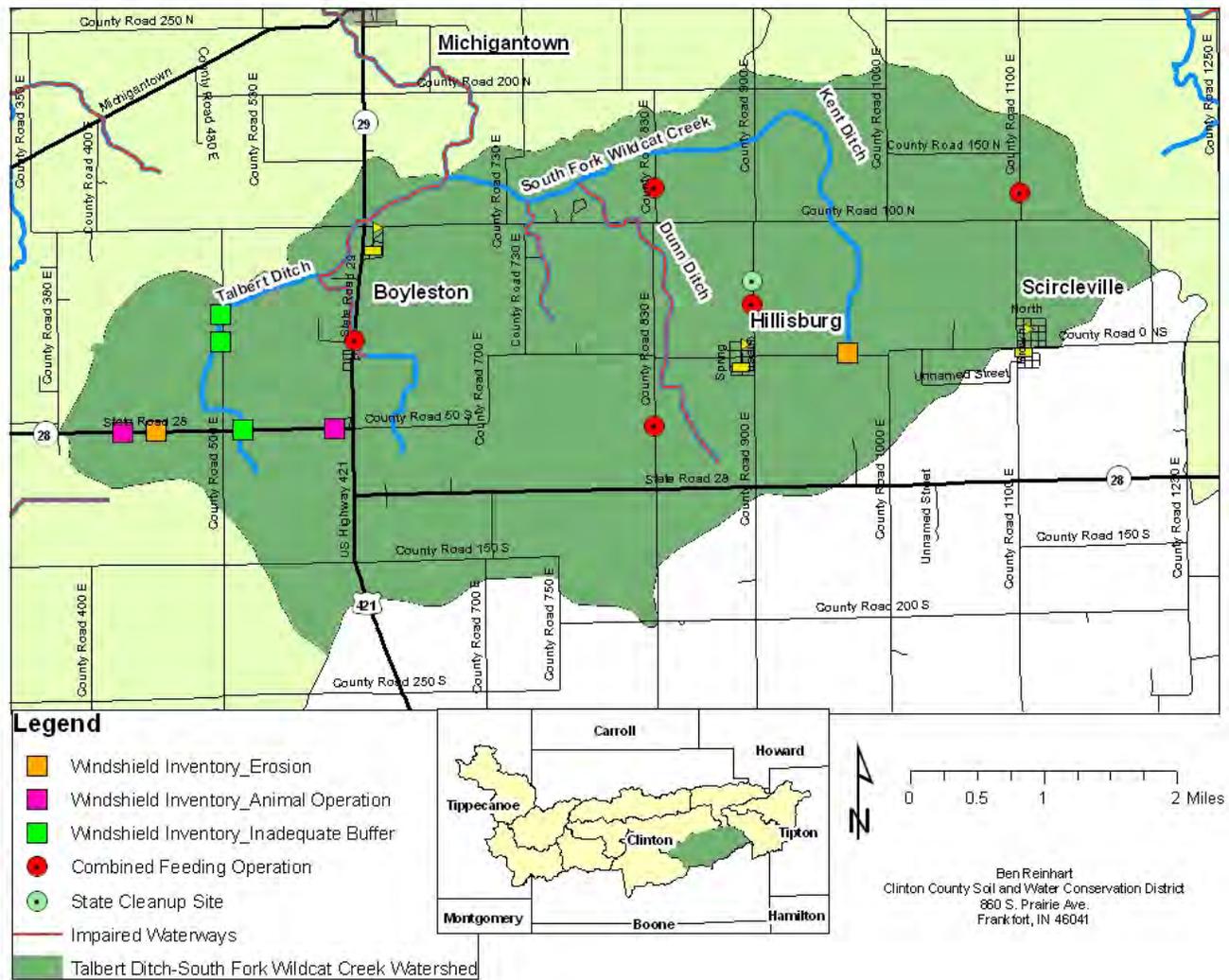
Similar to the other subwatersheds within the headwater areas of the South Fork Wildcat Creek Watershed, the Talbert Ditch subwatershed contains a high occurrence of soils with hydric properties (Figure 42). Almost 52% of land area within this drainage fall under this classification. Also common within the Talbert Ditch subwatershed are PHEL lands with almost 42% of lands carrying this classification. Only about 64 acres within this drainage area are considered to be HEL.



**Figure 42. Talbert Ditch-South Fork Wildcat Creek Soils**

The Talbert Ditch-South Fork Wildcat Creek Watershed contains scattered developed areas represented by the small developments of Boyleston, Hillisburg, and Scircleville. However, other low- to medium-intensity developments can be seen along State Road 29 south and east of Boyleston. The remaining areas of the watershed are dominated by cultivated crops with scattered grasslands and wooded areas (Figure 43).

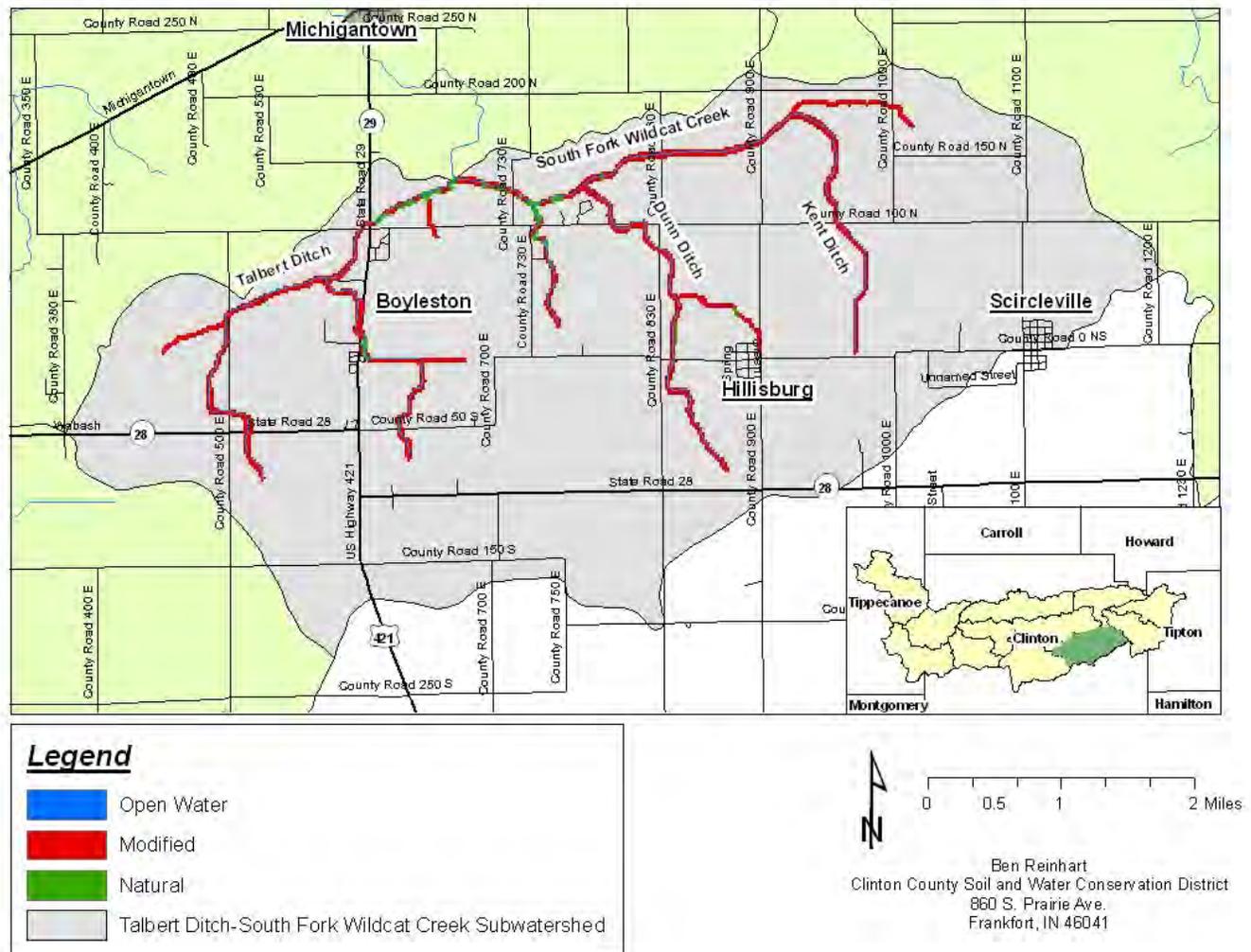




**Figure 44. Talbert Ditch-South Fork Wildcat Creek Source Investigation**

### Desktop Surveys

The Talbert Ditch subwatershed ranks as the second lowest in percentage of lands containing buffered areas along primary waterways. Only about 8% of floodplain and riparian zones contain natural land uses. These buffered areas are located primarily in lower sections of the drainage area. Virtually all remaining land area is focused on agriculture (Figure 45).



**Figure 45. Talbert Ditch-South Fork Wildcat Creek Riparian Lands Survey**

The Talbert Ditch-South Fork Wildcat Creek ranks second highest in regards to percent of the subwatershed area having applied conservation practices. Roughly 35.4% of lands within this subwatershed have had applied conservation practices compared to an average of 18.3% across the South Fork Wildcat Creek drainage. Much of the lands within the subwatershed have had a developed Pest and/or Nutrient Management Plan to help guide applications of various chemicals and soil amendments. Also, a number of acres have practiced various forms of residue and tillage management. There have been waste management practices applied as well within the subwatershed although less widespread than the previously mentioned conservation practices.

*Water Quality Information*

**IDEM 305(b)/303(d)**

Talbert Ditch-South Fork Wildcat Creek subwatershed contains three waterways listed as having impaired biotic communities (Figure 46). Also, one section of the South Fork Wildcat Creek is listed due to mercury and/or polychlorinated biphenyls (PCBs) being present in fish tissues. It has been determined

that insufficient data is present for other waterways in this subwatershed to detail threats to designated uses such as recreation and fishing.

### AIMS

2004 habitat assessments occurred at five locations throughout the Talbert Ditch-South Fork Wildcat Creek subwatershed. Only one of the five sites met accepted standards for aquatic habitat quality. This site was located on South Fork Wildcat Creek at County Road 730 East. Three of the five sites met standards for fish communities which included one location on Talbert Ditch and two sites on South Fork Wildcat Creek. One site on South Fork Wildcat Creek at County Road 830 East showed relatively high fish community scores despite lower habitat scores. Sites near Boyleston and Dunn Ditch did not meet accepted standards for either aquatic habitat quality or fish communities.

### South Fork TMDL

Two sites within the Talbert Ditch-South Fork Wildcat Creek subwatershed were utilized when assessing total suspended solids levels. Samples collected from Cripe Ditch and Walker Ditch showed necessary reductions of 32% and 14% respectively.

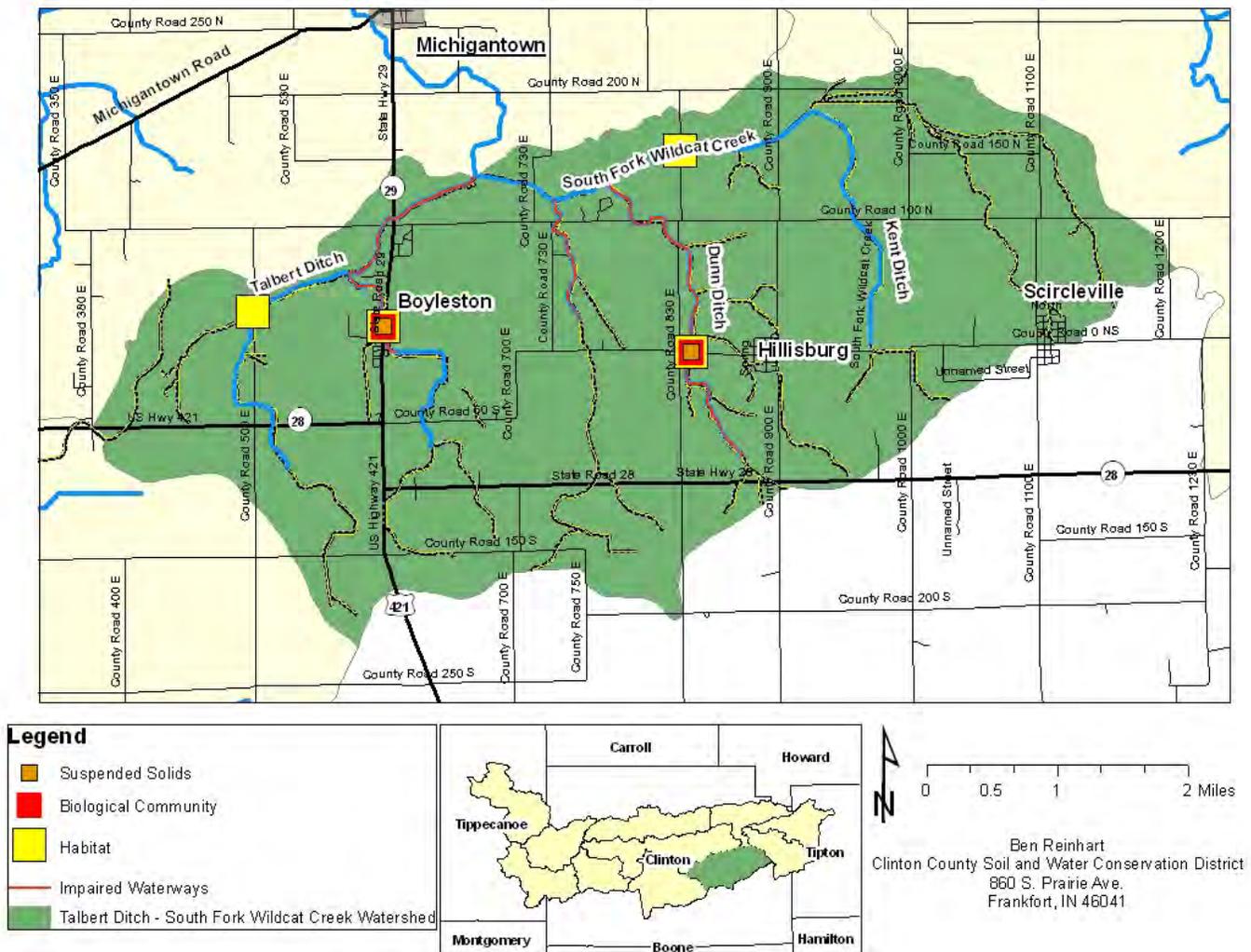


Figure 46. Talbert Ditch-South Fork Wildcat Creek Water Quality Impairments

## 4.5 Prairie Creek (HUC: 051201070305)

### Land Use Information

The Prairie Creek subwatershed lies along the southern boundary of the South Fork Wildcat Creek Watershed and contains the eastern two-thirds of the City of Frankfort (Figure 47). In all, Prairie Creek drains roughly 17,178 acres containing approximately 21 miles of waterways. The primary waterways include Mann Ditch and Prairie Creek. Virtually all of Mann Ditch and the section of Prairie Creek draining into the City of Frankfort are listed as impaired waterways. In total this adds up to roughly 10.8 miles of impaired waterways. All open waterways within the Prairie Creek subwatershed are classified as open drains.

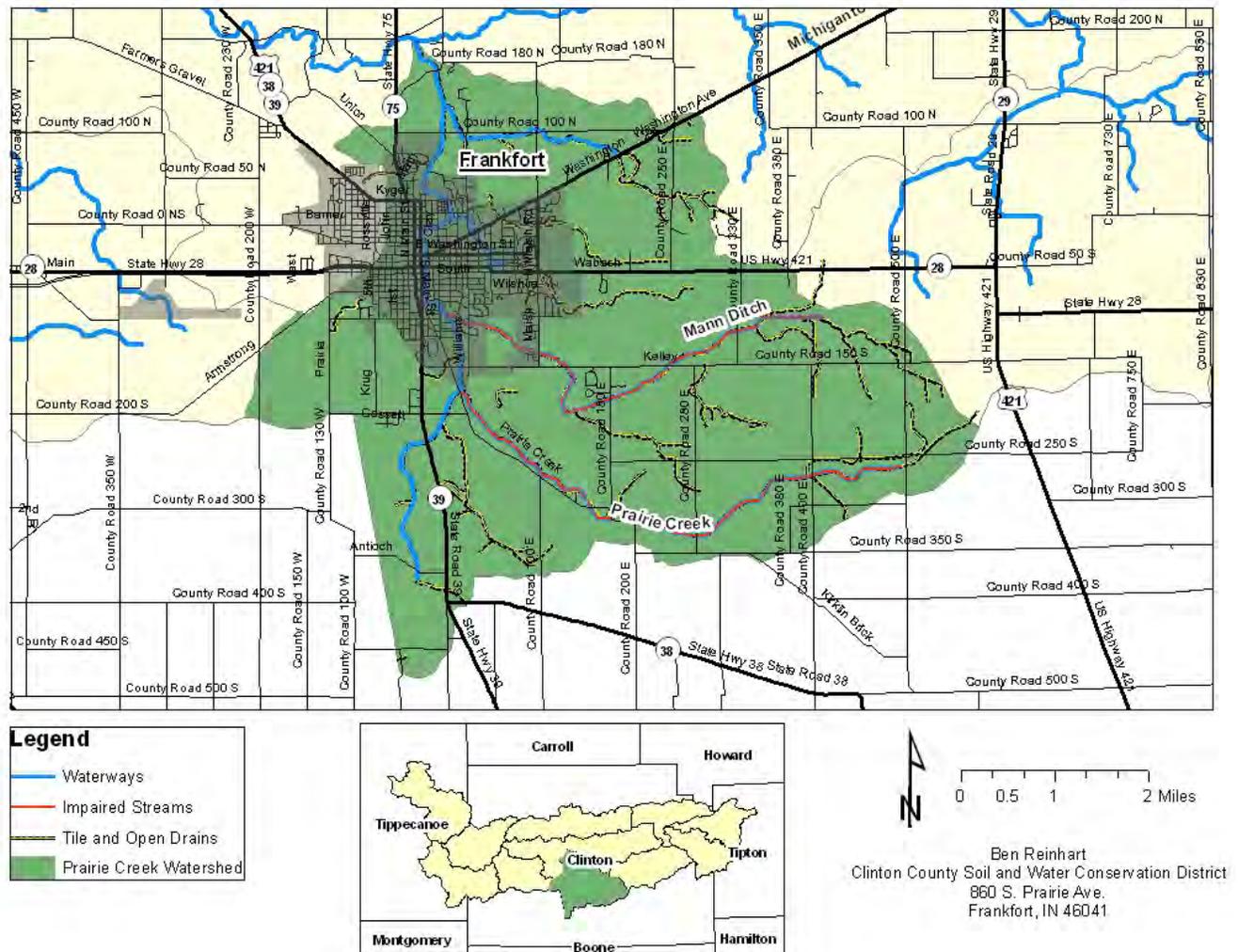
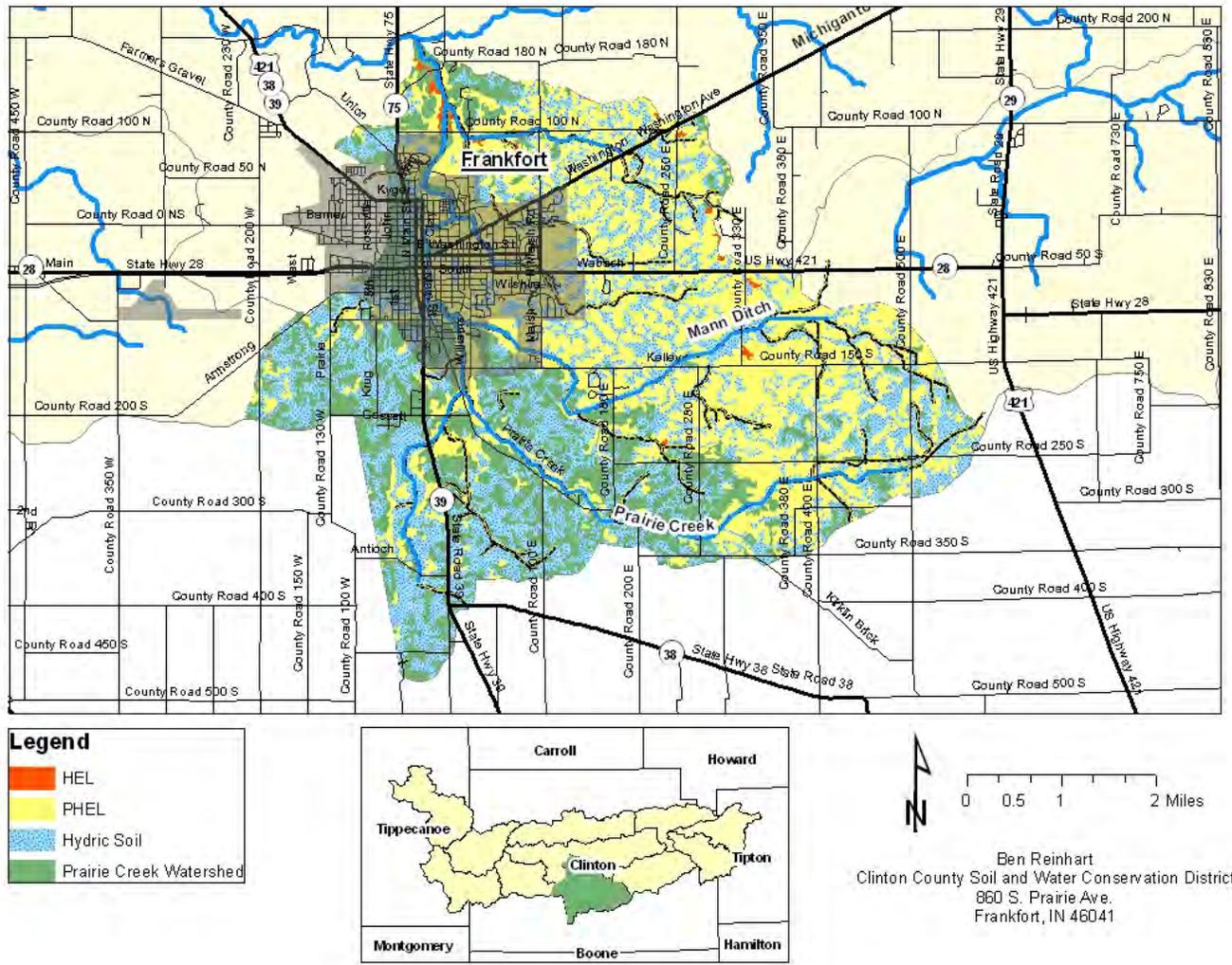


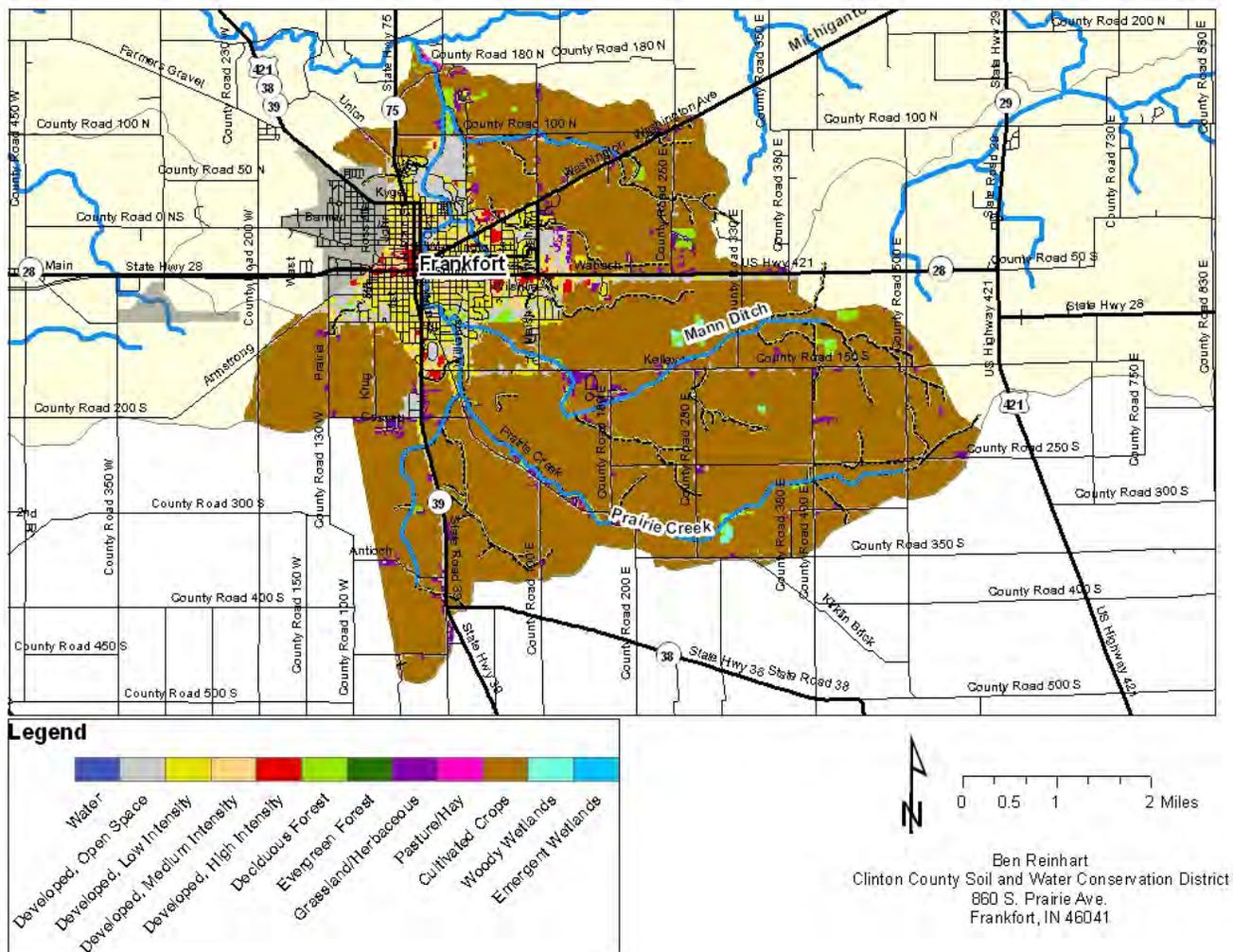
Figure 47. Prairie Creek Waterways and Drainage

Roughly 40% of lands within the Prairie Creek subwatershed can be classified as either having soil with somewhat hydric properties and/or PHEL (Figure 48). The vast majority of lands classified as PHEL are focused on the eastern part of the drainage area whereas soils with somewhat hydric properties are relatively common throughout the entire Prairie Creek drainage area. A relatively low amount of HEL area is found within this subwatershed with only about 56 acres total be listed.



**Figure 48. Prairie Creek Soils**

The Prairie Creek Watershed contains the majority of developed areas associated with the City of Frankfort. Much of this development is located directly in or adjacent to the city limits. However, additional areas along well-traveled county roads and highways are also becoming more developed with time (Figure 49). The remaining areas within this drainage constitute cultivated cropland with small scattered acreages of woodlands and grassland areas.



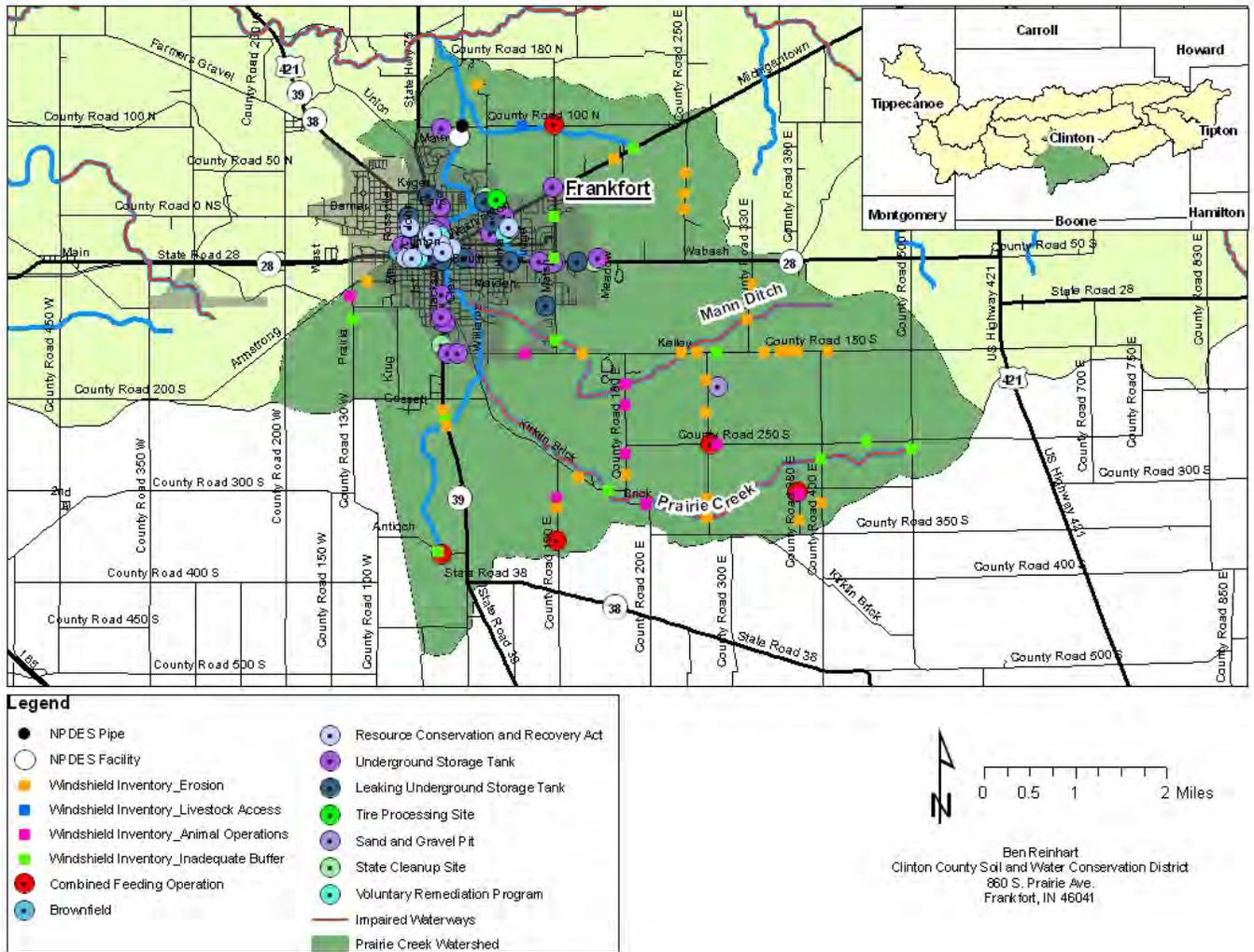
**Figure 49. Prairie Creek Land Use**

### Watershed Inventories

#### **Windshield Survey & Source Identification**

The Frankfort Municipal Wastewater Treatment Plant (WWTP) and the City of Frankfort’s combined sewer system are both active NPDES permits within the Prairie Creek subwatershed. The Frankfort WWTP has recorded seven effluent exceedances in the past three years where water being released from the facility exceeded certain state water quality standards. Exceedances were noted for *E. coli*, Ammonia, and Phosphorus with the most recent exceedances occurring in November 2010 and March 2011 for Ammonia and Phosphorus, respectively. The Frankfort plant also recorded sewer bypasses during 2005 and 2006 totaling an estimated two million gallons. A total of five Confined feeding operations are located within the Prairie Creek subwatershed. However, two of these CFOs have voided permits and two have expired permits. There are 28 Underground Storage Tanks (UST) with another 34 that have been identified as Leaking Underground Storage Tanks (UST/L). Virtually all of these sites are located within the City of Frankfort.

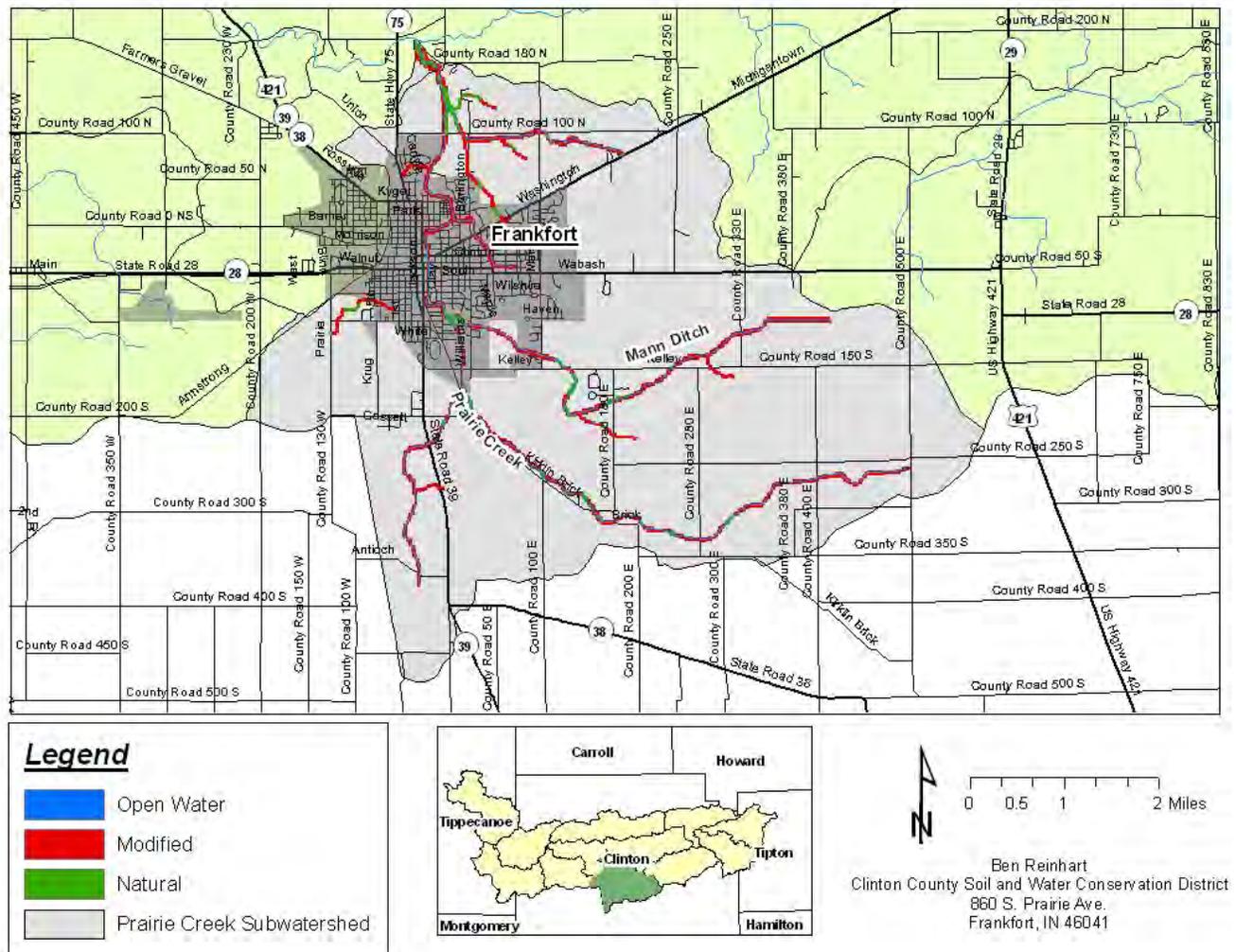
Volunteers that participated in the windshield inventory identified a number of locations within the drainage area where active erosion was occurring (Figure 50). Also noted throughout areas of the subwatershed were small, hobby-sized farms where livestock or animals were being raised and a general lack of riparian vegetation along many of the waterways.



**Figure 50. Prairie Creek Source Investigation**

### Desktop Surveys

Approximately 17% of land area within the designated floodplains and riparian zones were natural land cover types such as wooded areas, grasslands, and wetlands. The remaining lands within the designated zones consisted of land cover types that focused on some type of disturbance such as cultivated crops, livestock pasture, or development. This amounted to almost 18 miles of unbuffered waterways (Figure 51). Virtually all areas within the City of Frankfort appeared to not have suitable land cover types for riparian buffers. One exception to this was one area located east of Clay St. and south of Harvard St. in Frankfort.



**Figure 51. Prairie Creek Riparian Lands Survey**

The Prairie Creek subwatershed ranks the lowest of all subwatersheds within the South Fork Wildcat Creek drainage area for applied conservation practices. Only 6.9% of the land area within the Prairie Creek subwatershed has had conservation practices applied on them. Some of this may be explained by the presence of a highly developed area in the City of Frankfort occurring within the subwatershed and acknowledging that NRCS conservation programs are for the most part only applicable to working agricultural lands. However, the land use within the Prairie Creek subwatershed is still largely agriculture. The primary conservation practices occurring within this subwatershed are Conservation Crop Rotation and residue and tillage management.

Water Quality Information

**IDEM 305(b)/303(d)**

Both Mann Ditch and the headwaters of Prairie Creek are listed for impaired biotic communities (Figure 52). The remaining waterways within the Prairie Creek subwatershed are documented as having too

little water quality data to determine detailed impairments on other designated uses such as recreation and fishing.

### **Hoosier Riverwatch**

Four separate sampling points from the Hoosier Riverwatch database were located within the Prairie Creek subwatershed. Three of these sites were located on Prairie Creek and one site was located on Mann Ditch. Sampling on Prairie Creek and Mann Ditch was completed in the late summer/fall of 2001 and 2002. Water quality at these sites was considered average with habitat scores in Prairie Creek falling below 60 which is the score considered conducive for general warmwater species. Pollution Tolerance Index scores at Mann Ditch were found to be very low which would indicate an impaired biotic community.

### **Stream Reach and Characterization Report**

Habitat scores showed average to good habitat for aquatic organisms. Generally, habitat increased in quality with increasing distance downstream from Frankfort. Sampling of fish and macroinvertebrate communities also followed this trend with slightly higher quality communities being found farther away from Frankfort. Despite these differences, no significant changes of aquatic communities were seen downstream of the Frankfort CSO. Sedimentation was suspected to be the most likely cause in relatively low fish and macroinvertebrate communities across all sites. One concerning finding was a relatively high occurrence of tumors on collected fish samples. However, this finding was seen both above and below the Frankfort CSO.

### **AIMS**

Two sampling locations within the Prairie Creek subwatershed exceeded *E. coli* standards during a 1998 sampling effort. Both sites were located on Prairie Creek at County Road 150 South and Kyger Street. Evaluations of habitat quality and fish communities were completed in 2004 at 10 sites within the Prairie Creek subwatershed. The highest quality sites, in terms of habitat quality and fish communities, were found on Prairie Creek at County Road 150 South and upstream of Green Street. Many of the sampled tributaries of Prairie Creek failed to meet accepted standards for habitat quality. A sampling location on Mann Ditch at County Road 150 South and on Prairie Creek at County Road 180 East did not meet accepted standards for fish communities. One location at the discharge from the Frankfort Wastewater Treatment Plant showed nitrate-nitrite levels exceeding accepted standards during a 1998 sampling event. Two other sites on Prairie Creek at County Road 150 North showed nitrate-nitrite levels approaching but not exceeding accepted standards during 1998 and 2004 sampling events.

### **South Fork TMDL**

Water quality data from sites on both Prairie Creek and Mann Ditch were utilized in calculations for total suspended solids. These sites required reductions of 33% and 39% respectively.

### **IDEM Frankfort Area Watershed of the South Fork Wildcat Creek Source Identification Study**

Results did show elevated phosphorus levels most likely originating from the Frankfort WWTP. Discharge from the Frankfort WWTP tested more than three times higher than the accepted standard of 0.3mg/L total phosphorus. This contributed to elevated phosphorus levels downstream to CR 580W on

South Fork Wildcat Creek. Even higher levels were seen downstream of the Frankfort WWTP later during the summer. Water levels were lower which means less water for diluting discharged effluent and higher in-stream phosphorus levels.

Despite high phosphorus levels, no gross increase of algae or other aquatic plants were seen during sampling efforts. These plants can sometimes grow out of control in high-phosphorus environments and can impair local aquatic habitats. Also, no explicit impairments for dissolved oxygen or direct inputs of sewage or waste were seen. Ultimately, this led IDEM to determine that there was no significant nutrient impairment within the drainage area.

### **Current Data**

Three sampling locations were included as part of the South Fork Wildcat Creek Assessment. Two sites were located upstream of the City of Frankfort while one sampling location on Prairie Creek was located downstream of Frankfort, prior to the confluence with South Fork Wildcat Creek. Both upstream locations (Prairie Creek and Mann Ditch) scored slightly below accepted standards for aquatic habitat. Mann Ditch scored slightly above accepted standards during macroinvertebrate sampling, but contained a large abundance of sediment-tolerant organisms while a low occurrence of more pollution-intolerant species. The Prairie Creek site downstream of Frankfort showed average habitat quality, achieving accepted standards, while macroinvertebrate scores were just above accepted standards. Macroinvertebrate communities here were dominated by sediment-tolerant species such as midges.

Water chemistry and *E. coli* were sampled downstream of Frankfort prior to the confluence with South Fork Wildcat Creek. This location routinely exceeded target levels for both total phosphorus and *E. coli* during both high and low flows. Average nitrate-nitrite levels were documented to be approaching target levels during high and low flow events. Average TSS also was found to be approaching target levels during high flows.

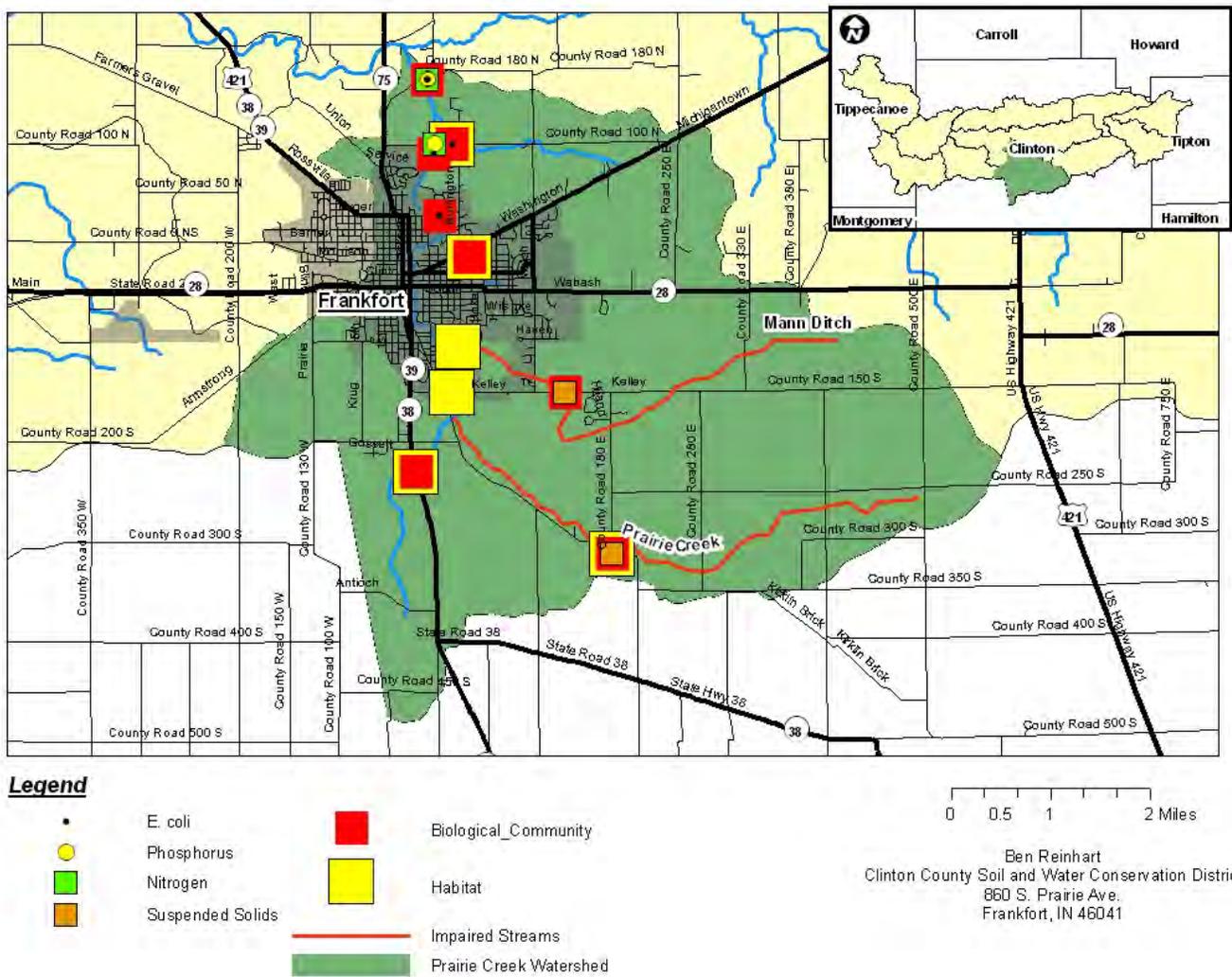
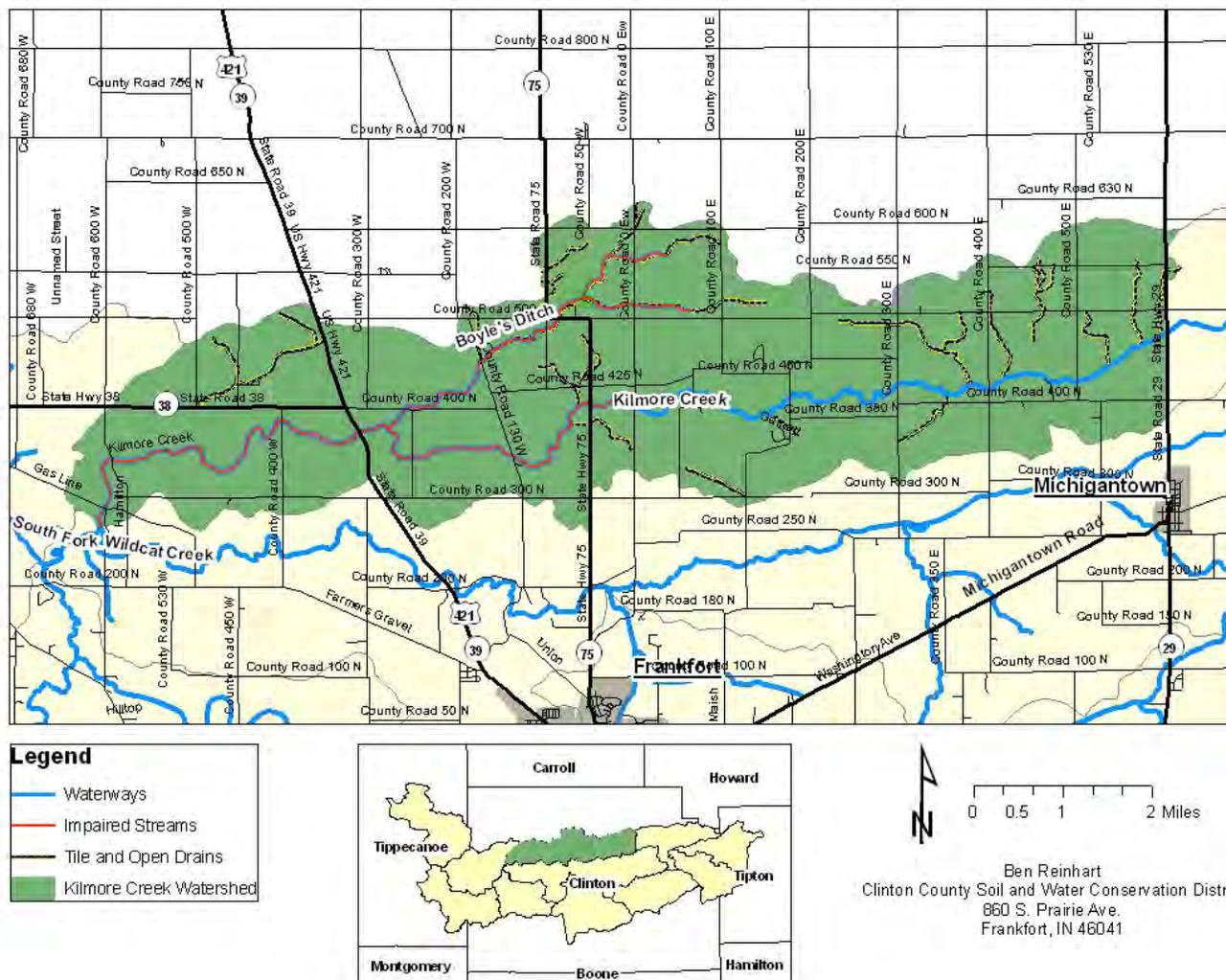


Figure 52. Prairie Creek Water Quality Impairments

## 4.6 Kilmore Creek (HUC: 051201070306)

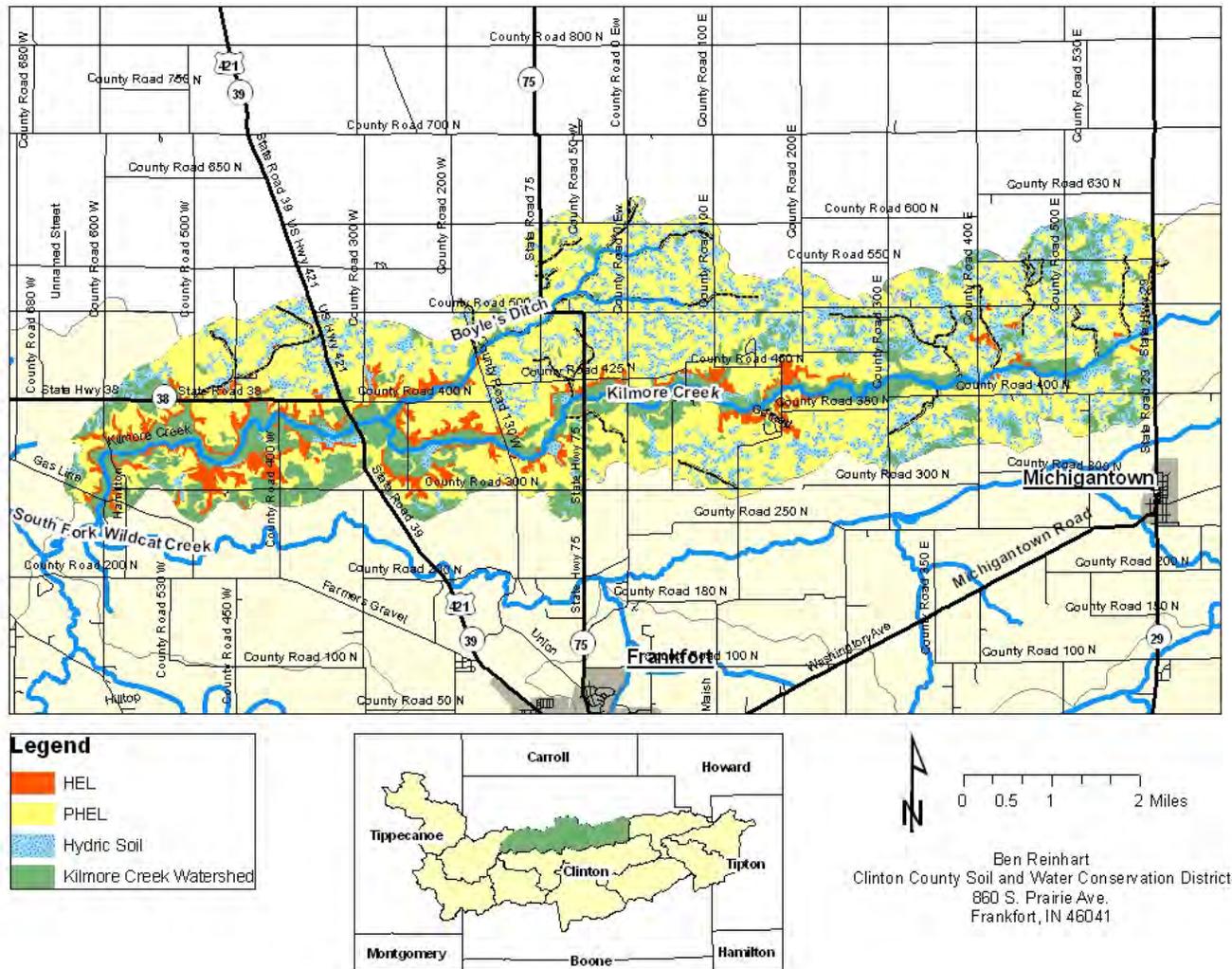
### Land Use Information

The Kilmore Creek subwatershed is located along the northern edge of the South Fork Wildcat Creek Watershed and drains approximately 17,410 acres of central Clinton County. The primary waterways include Kilmore Creek and Boyles Ditch making up around 21.5 miles of natural waterways (Figure 53). Almost 14.3 miles of waterways in the Kilmore Creek subwatershed are listed as impaired waterways including all of Boyles Ditch and downstream portions of Kilmore Creek. The headwater areas of Boyles Ditch are classified and managed as open drains.



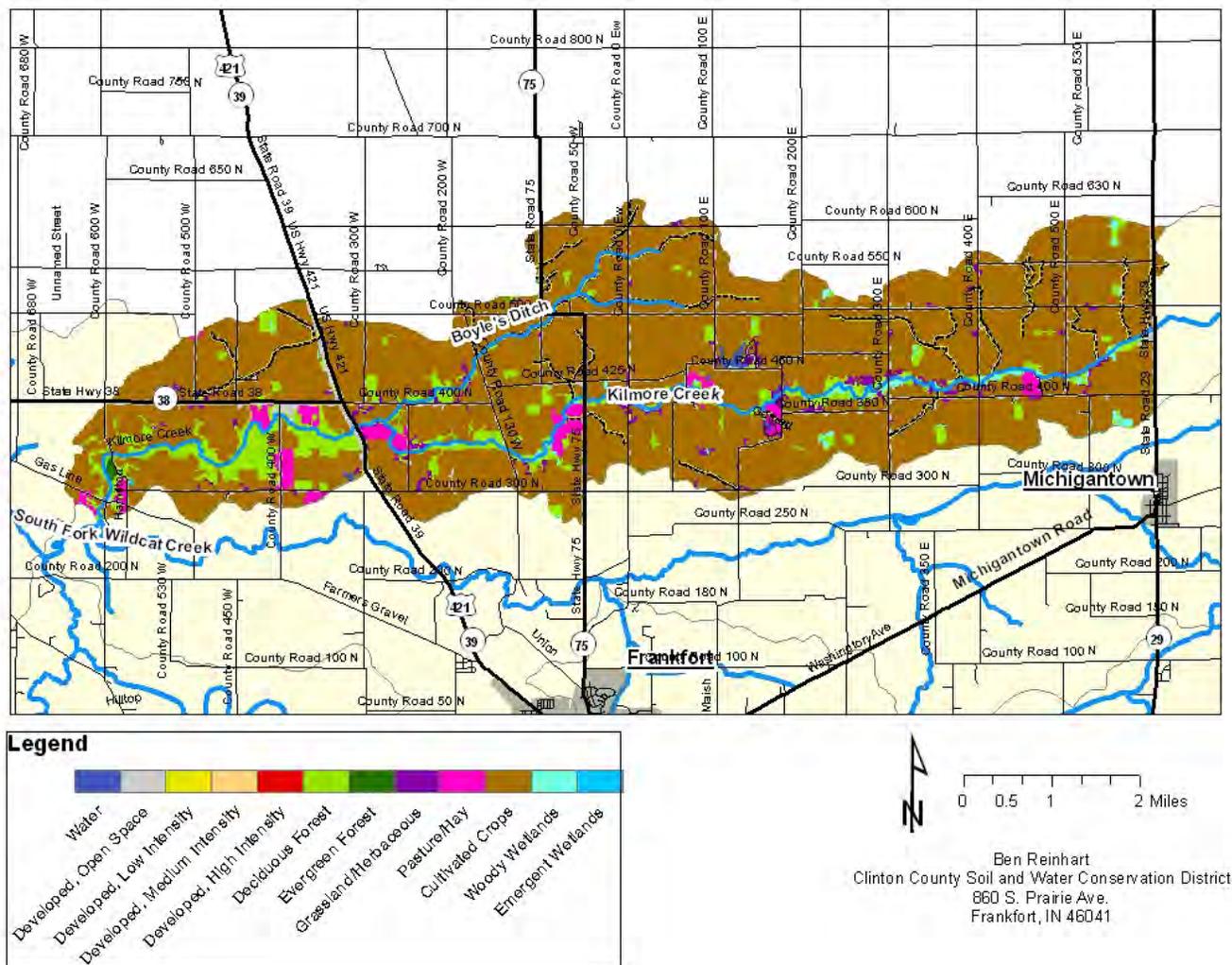
**Figure 53. Kilmore Creek Waterways and Drainage**

The Kilmore Creek subwatershed contains the third fewest number of lands (21%) with soil properties that are hydric in nature. However, the Kilmore Creek subwatershed maintains the highest occurrence of lands being classified as PHEL (56%). Approximately 6% of land area within this drainage area can be classified as HEL with the majority of this land being located along Kilmore Creek in lower portions of the watershed (Figure 54).



**Figure 54. Kilmore Creek Soils**

The Kilmore Creek Watershed contains very few developed areas. Deciduous woodlands and pasture areas are common along the Kilmore Creek, especially in downstream sections of the drainage area (Figure 55). The remaining, and dominating, land use across the Kilmore Creek Watershed is cultivated cropland.

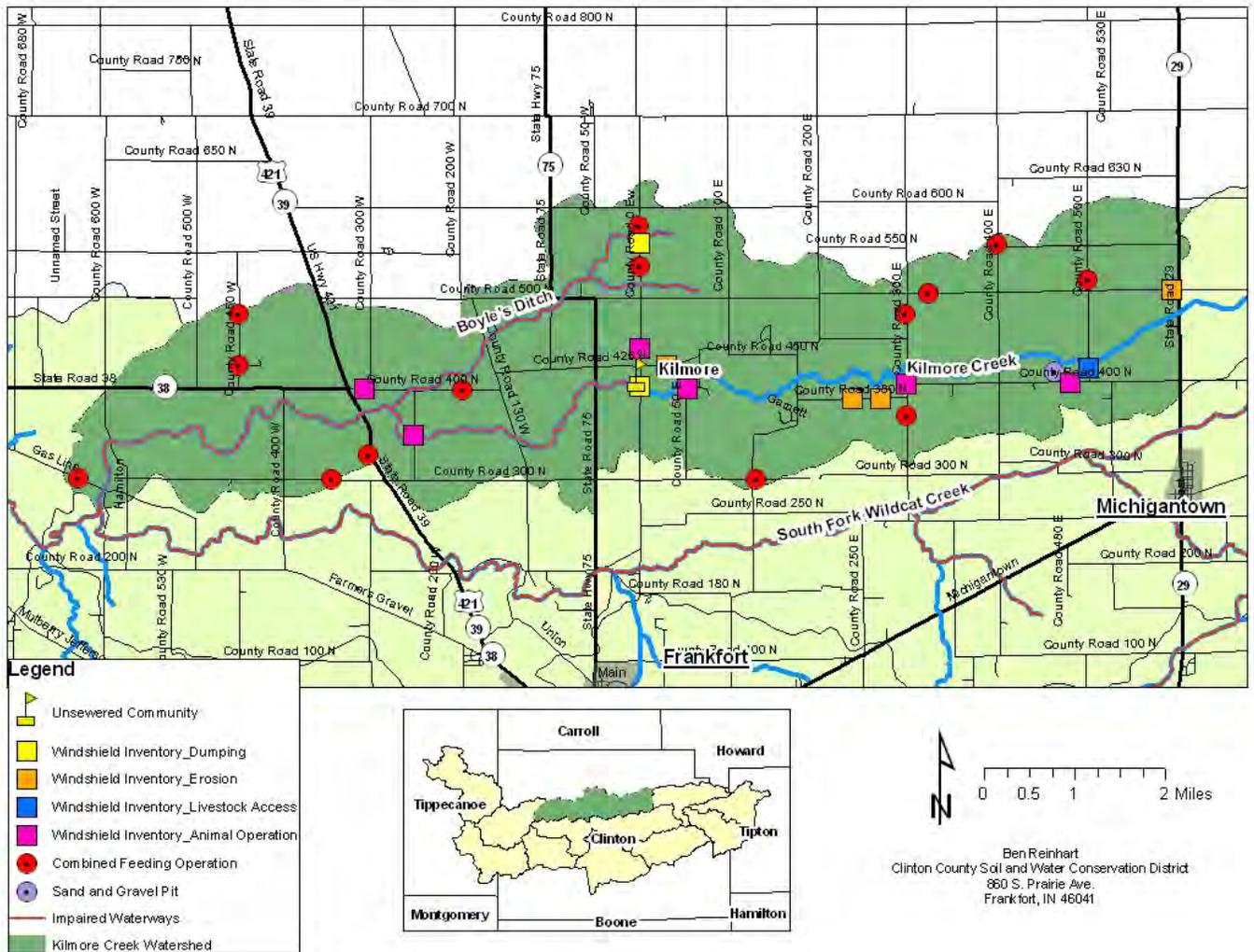


**Figure 55. Kilmore Creek Land Use**

### Watershed Inventories

#### **Windshield Survey & Source Identification**

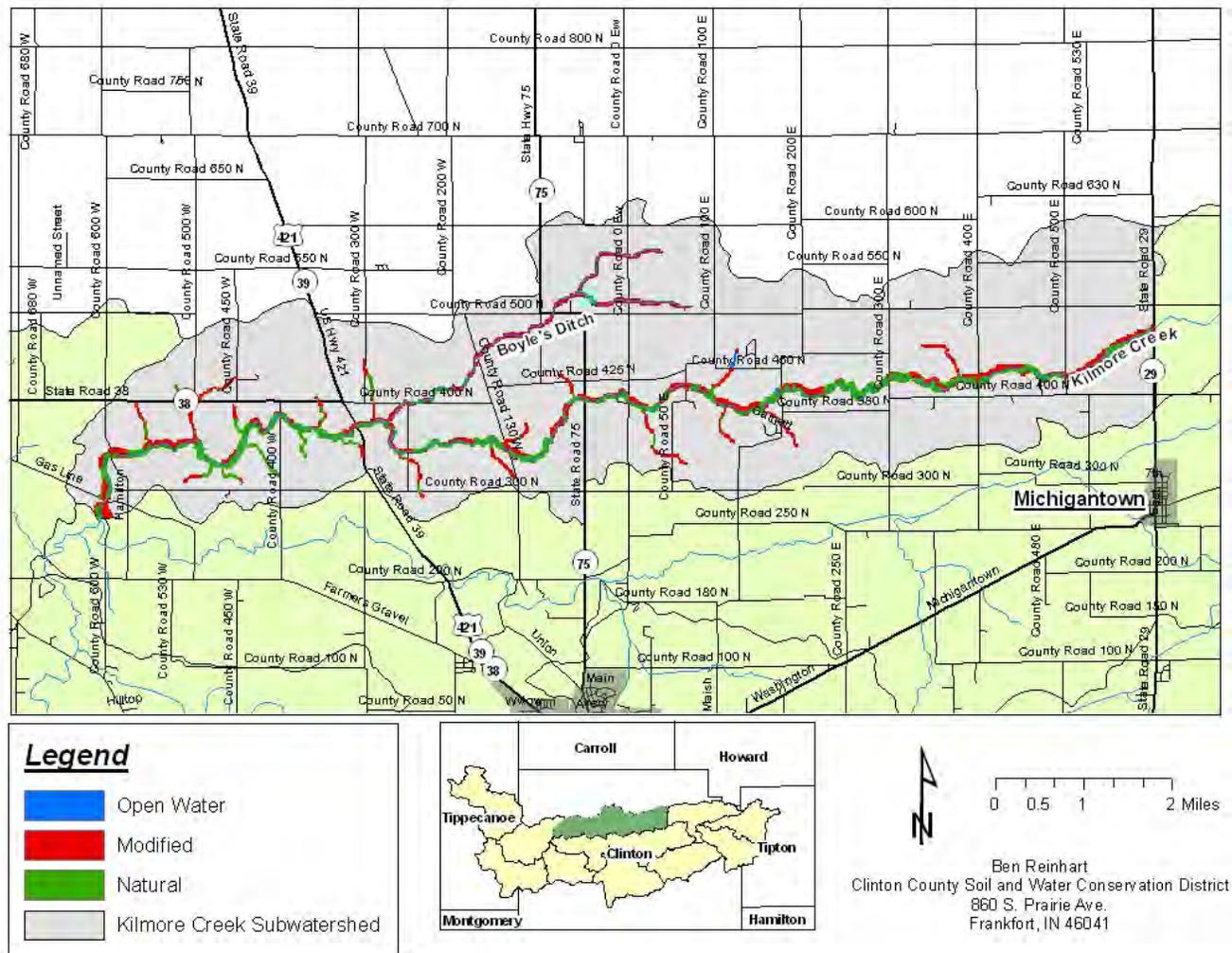
A total of 14 Confined feeding operations were located within the Kilmore Creek drainage area. Six CFOs are listed as Active, seven are voided, and one is marked as Expired. A number of other smaller, unregulated livestock or hobby farms were identified within the subwatershed during windshield inventories (Figure 56). Other issues noted during the volunteer windshield inventory included actively eroding sites, livestock access to waterways, and areas of trash dumping. Many of these were identified in upstream reaches of Kilmore Creek and Boyle's Ditch. One unsewered community, Town of Kilmore, was also identified.



**Figure 56. Kilmore Creek Source Investigation**

### Desktop Surveys

The Kilmore Creek subwatershed ranks third among all subwatersheds for the amount of natural land uses within the designated floodplain and riparian zones. However, the majority of these natural cover types are located along the main body of the Kilmore Creek. Upstream tributaries, such as Boyles Ditch, remain largely unbuffered (Figure 57).



**Figure 57. Kilmore Creek Riparian Lands Survey**

The Kilmore Creek subwatershed ranks third highest among all subwatersheds for the percent land area having applied conservation practices and ranks highest in terms of the total number of individual practices applied. Almost 26% of the land area in this subwatershed has seen conservation practices applied compared to an average of 18.3% across the South Fork Wildcat Creek drainage. Practices seen within other subwatersheds such as Conservation Crop Rotation and residue and tillage management are common within the Kilmore Creek subwatershed. However, a large portion of the applied practices also focus on Pest and Nutrient Management Plans, waste management practices, and pasture and livestock management.

### Water Quality Information

#### **IDEM 305(b)/303(d)**

Boyle’s Ditch is listed as being impaired for recreational uses and as well having impaired biotic communities (Figure 58). Kilmore Creek is listed for impairments to recreational uses (i.e. high *E. coli* levels).

## **Hoosier Riverwatch**

Three sampling sites were found in the Hoosier Riverwatch database for the Kilmore Creek subwatershed. Water Quality Index scores were consistently above 70 which indicates relatively good water quality. Pollution Tolerance Index scores varied widely from 2001-2006. However, average scores were around 19 which indicate a good biological community. Habitat evaluations were consistently high with an average CQHEI score of 84

## **Kilmore Creek-Boyle's Ditch Watershed Plan**

Habitat along Kilmore Creek was classified as "good" habitat for aquatic organisms. However, scores began to decrease as sampling moved farther upstream Boyle's Ditch. Macroinvertebrate studies showed that pollution-intolerant caddisflies and mayflies were relatively diverse within Kilmore Creek relative to other local waterways. These studies showed lower scores within Boyle's Ditch but this is most likely due to the lack of adequate habitat.

Atrazine levels were highly variable across all sites and time of sampling. Boyle's Ditch showed wide variations in dissolved oxygen levels throughout the sampling periods, generally seeing low levels during late summer and fall. Overall, the water quality within Kilmore Creek was within accepted standards. Deviations of these standards almost always occurred within Boyle's Ditch and/or during high flow periods.

## **AIMS**

One sampling location on Kilmore Creek at County Road 600 West recorded *E. coli* levels exceeding accepted standards in a series of 1998 sampling events. 2004 evaluations of habitat quality and fish communities sampled at eight sites within the Kilmore Creek subwatershed. Sites on Boyle's Ditch failed to meet accepted standards for habitat quality and biological (fish and macroinvertebrates) communities. The site on Kilmore Creek at CR400E failed to meet habitat quality standards but showed higher scores for fish communities, exceeding accepted standards. Higher scores for habitat quality and fish communities were recorded across remaining Kilmore Creek sampling locations.

## **South Fork TMDL**

*E. coli* samples from two separate sites within the Kilmore Creek subwatershed were used. Based on available samples, load reductions required at these sites were 34% for the most upstream site and 45% downstream.

Nitrate-Nitrite samples were available at two separate sites within the Kilmore Creek subwatershed. Based on available samples, load reductions required were 17% in Boyle's Ditch and 23% in Kilmore Creek.

Measurements for total phosphorus were compiled from two separate sampling sites within the Kilmore Creek subwatershed. Based on these samples a 32% reduction was required in Boyle's Ditch while a 25% reduction was noted in Kilmore Creek.

Samples for total suspended solids were collected from two sites along Boyle's Ditch. These samples required reductions of 32% and 52%.

Two separate assessment locations were used within the Kilmore Creek subwatershed to estimate existing pollutant loads and calculate necessary reductions. Total phosphorus, nitrate-nitrite, and total suspended solids were calculated based on data from Boyle's Ditch. *E. coli* calculations were made based on data from Kilmore Creek upstream of its confluence with the South Fork Wildcat Creek. Much of the water quality impairments were believed to originate mostly from agricultural runoff, livestock access to waterways, and streambank erosion however IDEM recommended additional sampling to further address pollutant sources.

### **Current Data**

Two sampling sites were located within the Kilmore Creek subwatershed; one upstream and downstream of Boyle's Ditch. Upstream of Boyle's Ditch, aquatic habitat surveys classified the area as "fair". This was mostly due to a lack of an adequate riparian buffer. Biological sampling of macroinvertebrates also indicated only a marginal biological community with scores barely achieving accepted standards. However, these results changed drastically downstream of Boyle's Ditch. Habitat scores at this site was the third highest within the entire study and macroinvertebrate scores were the highest score across the watershed with various stoneflies, mayflies, and caddisflies being relatively abundant. This is likely a function of both improved water quality and riparian habitat along the main stem of Kilmore Creek compared to the Boyle's Ditch tributary.

Both sampling locations exceeded *E. coli* levels during high and low flows. Also, both sites exceeded TSS levels during high flows. Average nutrient levels (i.e. phosphorus and nitrogen) met target levels but were documented as periodically exceeding those targets during high flow periods.



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.