disposal. Numerous inspections to the site by IDEM and the BCHD have revealed pipes discharging to the adjacent ditch. Surface runoff and leaching are also believed to be problems. Petroleum waste is believed to be the biggest concern of contamination. The BCHD is continuously working with the owner to improve the conditions of the site.

The Hendricks County Health Department provided information stating that over 1000 of the septic systems within the Big Walnut Creek Watershed do not have documented records. Many of these systems are concentrated around the towns of North Salem, Lizton, and Jamestown. Septic systems with documentation are typically 20 years old or less. Several complaints have been received by the health department in scattered locations throughout the Hendricks County portion of the watershed.

6.5 Future Land Use

Putnam County is currently working on a new comprehensive plan for the county as the current plan is out of date. The majority of the land in Putnam County under the current plan remains unchanged. Proposed areas of development include residential, nature preserve, and commercial.

Zoning in Boone County within the area of the Big Walnut Watershed is predominantly general agriculture. Some county zoning is in place around the smaller towns such as Jamestown and New Brunswick. Zoning categories in these areas include low-density single-family residential, low-density single and two family residential, high-density multifamily residential, local business, general business, and light industry. Boone County is also currently updating their county comprehensive plan.

Hendricks County released their most current comprehensive plan in early 2007. Future land use for the area in which the Big Walnut Watershed is proposed as agricultural with some commercial development. Several small towns with mixed uses are located in these areas. Figures W1-W19 (Appendix A) illustrate land use via 2005 aerial photography within each priority 14-HUC watershed of the Big Walnut.

7.0 FIELD EVALUATIONS

7.1 Indiana Smallmouth Conservation Float Survey

On May 26th, 2007 a group of volunteers from the Indiana Smallmouth Conservation (ISC) surveyed a 15 mile portion of Big Walnut Creek by canoeing and kayaking the creek. The trip was from US 36 east of Bainbridge south to county road 100S southwest of Greencastle. The group documented their trip by taking GPS points and photographs of areas of concern. Streambank erosion and lack of buffer on agricultural fields was the biggest issue found by the group. The group also noted areas of farm field erosion and field tile drains.

The ISC also surveyed a southern stretch of Big Walnut Creek over several weekends in October 2008. This section was from Greencastle to the southern portion of the watershed. The main purpose of this trip was to pinpoint logjams, severe agricultural erosion areas, and other areas where the heavy June rains caused major flooding damage to the landscape.

Appendix G shows several maps of the areas that the ISC group surveyed. It also includes a photo journal of some of the poor land use practices and deteriorated areas.

7.2 Windshield Survey

Windshield surveys were conducted in all 30 14-digit HUC subwatersheds of the Big Walnut Watershed in early 2008. The surveys were conducted by driving all accessible roads in the watershed. The drives were performed with help from staff of the Boone, Hendricks, and Putnam County SWCDs. Large 24 inch by 36 inch maps of each individual 14-digit HUC watershed showing aerial photography, NWI features, and environmental issues were used as guides for the surveys.

The windshield surveys were carried out in order to gain a greater understanding of happenings within the Big Walnut Watershed. In addition, they were used to confirm items that GIS map layers illustrated and note items that were not visible using GIS. Items that were looked at during the surveys included, but were not limited to the following items:

- ✓ Confirmation of aerial land use categorization
- ✓ Field erosion/gullies
- ✓ Denuded pasture areas
- ✓ Livestock in or with access to streams
- ✓ Notable wet spots (wetland restoration sites and/or flooding concerns)
- ✓ Lack of buffers – farmed/mown to edge of streams
- ✓ No-till versus conventional tillage
- ✓ Bank erosion at stream crossings
- ✓ Culvert constriction at road crossings
- ✓ Buffer width
- ✓ Environmental site confirmation (open dumps, NPDES pips, CAFOs, etc.)
- ✓ Additional CFOs
- ✓ NWI confirmation

Handwritten notes and GPS points were recorded on the large field maps in locations where areas of concern were identified. These locations and findings were then incorporated into the project GIS. Photographs of streams and other locations were also taken to document some of the findings. Figure X shows all of the points where one or more of the above listed items were documented.

Concerns within the subwatersheds resulting from the windshield surveys were narrowed to the most common observations, namely livestock access to streams and lack of stream/ditch buffers. The other items on the list which were looked at had very few to no occurrences. The minimal number of occurrences of these issues also does not represent a significant water quality impacts on the Big Walnut Creek Watershed.

7.2.1 Buffers

Buffers are important to waterways as they work to filter nutrients and reduce sediment from entering the waterways. Buffers are effective at reducing pollutant loads if they are at least 25 feet from the top of bank; although, 70 feet is preferred/ideal, with a maximum typically of 100 feet. These widths are recommended by the NRCS, but vary by site. A simple rating system of 'very poorly buffered' and 'moderate to poorly buffered' was developed to gauge the relative condition or presence of buffers observed during the windshield survey. The 'moderate to poorly buffered' subwatersheds were defined as such when the number of observations of buffers less than 20 feet ranged from four to seven in a given subwatershed. 'Very poorly buffered' subwatersheds are those where the number of observations of buffers less than 20 feet was eight or more instances in the same subwatershed. 'Very poorly' or 'moderately to poorly' buffered subwatersheds were noted in 7 of the 30 subwatersheds (Figure Y).

Very Poorly Buffered Subwatersheds – "Orange"

Two of the subwatersheds, Main Edlin Ditch and Big Walnut Creek – Plum Creek, have high numbers of observations of little to no buffers.

- Main Edlin Ditch – Smith Ditch – Subwatershed Y
  This subwatershed is dominated by agricultural production. The majority of the fields are in conservation tillage; however, fields are worked and planted as close as possible to the edge of waterways.

- Big Walnut Creek – Plum Creek/Bledsoe Branch – Subwatershed F
  This subwatershed is primarily agricultural, but also has a high percentage of grassland/suburban land and forest. Most of the buffer problems in this subwatershed are associated with small tributaries that do not show up as blue lines on the maps.

Moderately to Poorly Buffered Subwatersheds – "Blue"

Five subwatersheds were observed to have a moderate number of instances of little to no buffer. Not surprisingly, some of the subwatersheds with moderate to poor buffers cluster together in the larger watershed. The moderate to poorly buffered subwatersheds all cluster around or near the very poorly buffered subwatersheds. All of the below watersheds have land uses that are primarily agriculture based. The buffer problems are a result of farming practices that come up to the edge of waterways.

- Clear Creek – Headwaters (Putnam) – Subwatershed H
- Clear Creek – Miller Creek – Subwatershed I
- East Fork Big Walnut Creek – Ross Ditch – Subwatershed Q
- Main Edlin Ditch – Grassy Branch – Subwatershed X
- West Fork Big Walnut Creek – Headwaters – Subwatershed CC

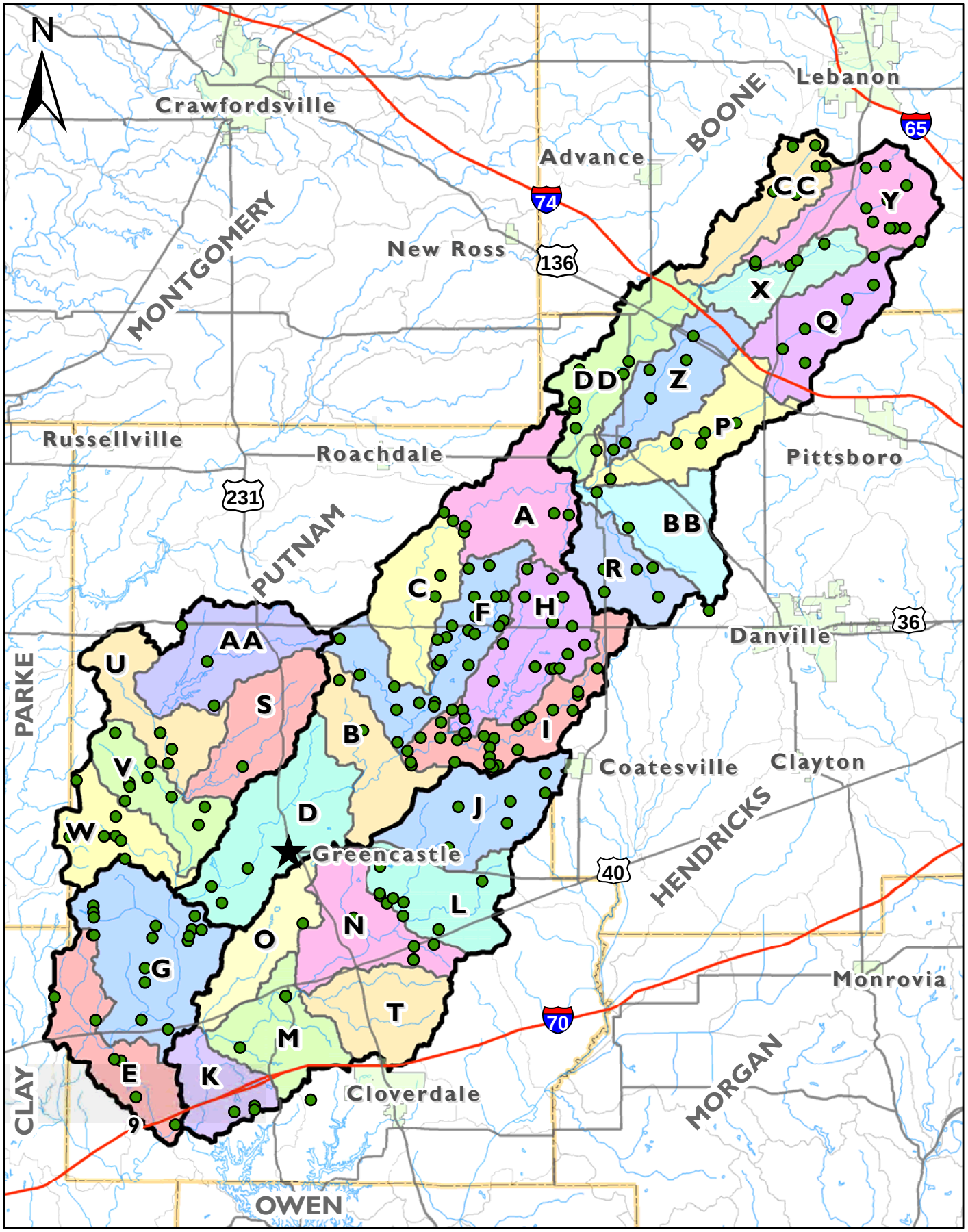
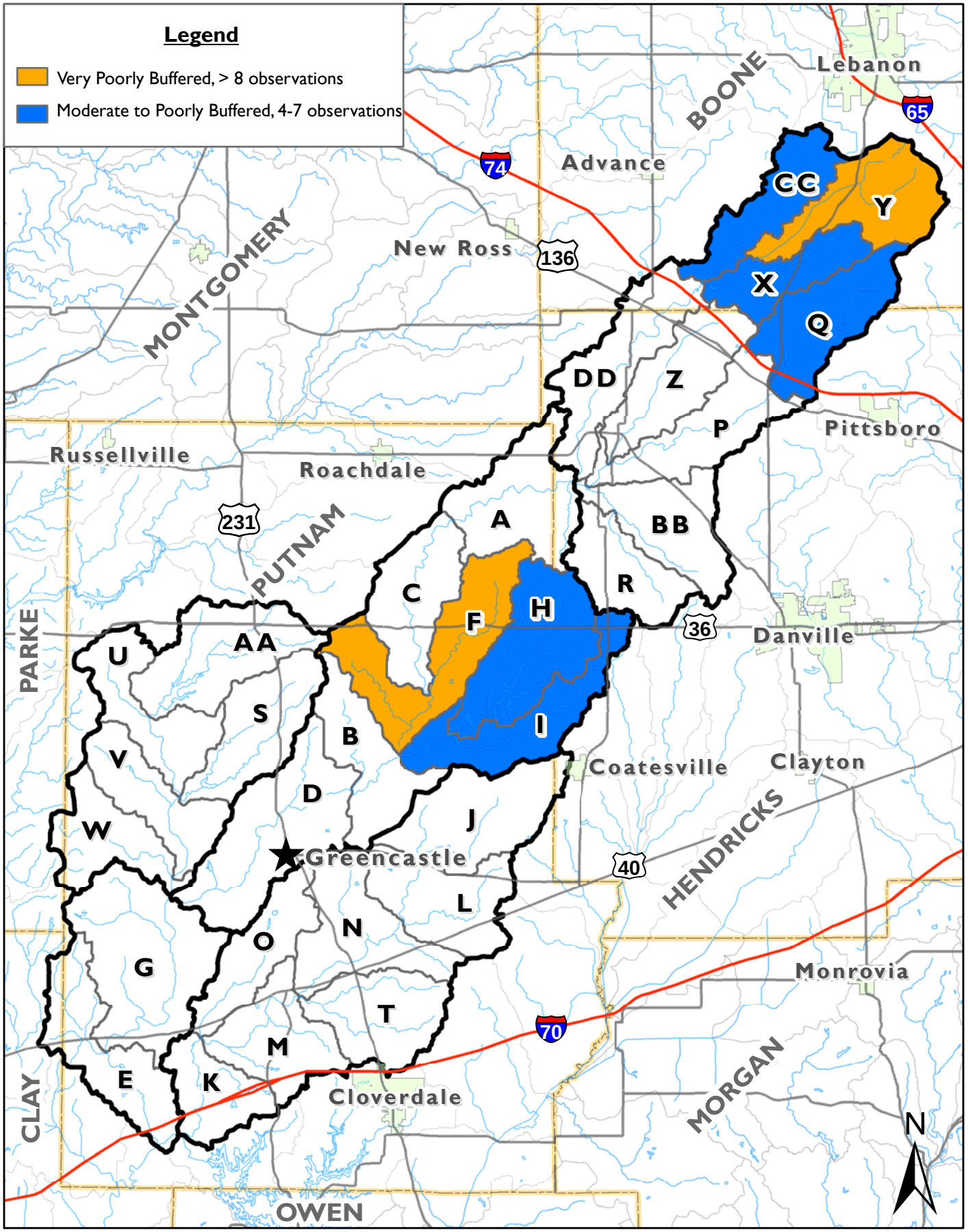


Figure X - Windshield Survey Waypoints

Big Walnut Creek Watershed

Boone, Clay, Hendricks, Parke, & Putnam Counties, Indiana



0 2 4 8 12 Miles

Figure Y - Poorly Buffered Areas
Dec 2007- March 2008
Big Walnut Creek Watershed
Boone, Clay, Hendricks, Parke, & Putnam Counties, Indiana

7.2.2 Livestock Access to Streams

Livestock with access to streams have been documented as a concern because they deposit fecal material in or near streams making them potential source of *E. coli*. The livestock also walk over stream banks causing stream bank erosion and deposition of sediment into streams or increases in total suspended solids (TSS). Livestock in or with access to streams was noted in 27 of the 30 subwatersheds. A simple rating system of 'frequent' and 'moderate' was developed to gauge the relative frequency of livestock with access to streams. Six of the subwatersheds have 'frequent' numbers of observations (greater than eight) of livestock with access to streams. Eight of the subwatersheds have 'moderate' numbers of observations (greater than five but less than eight) (Figure Z). Figure Z also depicts the location of Confined Feeding Operations (CFOs) in each subwatershed. This environmental feature was included to assist in better understanding of livestock concentrations in the watershed relative to the locations where livestock were observed in the stream.

Frequent Livestock in the Stream Subwatersheds – "Purple"

- Big Walnut Creek – Plum Creek/Bledsoe Branch – Subwatershed F
- Big Walnut Creek – Snake Creek/Maiden Run – Subwatershed G
- Clear Creek – Miller Creek – Subwatershed I
- Deer Creek – Little Deer Creek – Subwatershed L
- Deer Creek – Owl Branch – Subwatershed N
- West Fork Big Walnut Creek – Lower – Subwatershed DD

These watersheds have a combined total of nine CFOs

Moderate to Frequent Livestock in the Stream Subwatersheds – "Tan"

- Big Walnut Creek – Greencastle – Subwatershed D
- Clear Creek – Headwaters (Putnam) – Subwatershed H
- Deer Creek – Headwaters – Subwatershed J
- Hunt Creek – Subwatershed R
- Jones Creek – Subwatershed S
- Limestone Creek – Subwatershed T
- Little Walnut Creek – Long Branch – Subwatershed W
- Ramp Run – East Fork Outlet – Subwatershed BB

These watersheds have a combined total of thirteen CFOs

8.0 SELECTION OF CRITICAL AREAS (PRIORITY SUBWATERSHEDS)

A variety of criteria were used to develop Critical Areas (i.e. Priority Subwatersheds) in the larger watershed. Nutrient and sediment loads were calculated using concentration and flow data from each site for each of the sample sites on each sample date and then compared against values recognized by water quality professionals to be indicative of healthy conditions. In addition to relative load information, the subwatersheds were scored against information collected during windshield surveys such as lack of buffered streams present and cattle with access to the streams, as well as the presence of NPDES dischargers, significant water users,