

levels. Therefore, we are uncertain, based on invertebrates, exactly how impaired the water quality may be due to pollution.

The Big Walnut Watershed has overall good to excellent habitat for aquatic life. The biggest concerns to habitat for aquatic life are lack of riparian vegetation and stream bank erosion. Nutrient enrichment also appears to be a problem in several locations based on the composition of species present. The complete Aquatic Macroinvertebrate Report can be referenced in Appendix F.

6.0 LAND USE

6.1 Land Use Composition by Subwatersheds

Land use in the Big Walnut Watershed is mostly rural or agricultural (Figure U1). Figures U2-U20 (Appendix A) show land use at a more usable scale for each priority 14-HUC subwatershed. The land use layer that was referenced was generated from the Central Indiana Water Resources Partnership (CIWRP) Pilot Studies by Indiana University-Purdue University Indianapolis Center for Earth and Environmental Science and Center for Urban Policy and the Environment (IUPUI-CEES and CUPE) (J. Wilson) 2003. The predominant land use is agriculture. Other major land use types within the watershed include forest and grasslands/suburban land. Residential/urban areas would compose a majority of the remaining land use. Table 17 defines acreage and percentages of each land use within the Big Walnut Watershed on an individual 14-HUC watershed level. For the most part, when looking at land use across the subwatersheds, percent of each subwatershed in a particular land use was considered more heavily than total acreage of a given land use. Since the water quality sampling strategy generally links water quality findings to a given subwatershed, it is more important to consider the land use characteristics of that subwatershed rather than total acreage when trying to understand the various land use influences.

6.1.1 Agricultural

With agriculture dominating the majority of the land use, many of the subwatersheds have similar acreages/percentages of such land use. Subwatersheds with greater than 70% of their acreage in active agricultural production include Subwatersheds J, P, Q, R, X, Y, Z, BB, and CC. Several of these subwatersheds are clustered in certain areas of the larger watershed. These areas can be generally described as the headwaters areas of Big Walnut Creek in Boone and Hendricks Counties, as well as the headwaters area of Deer Creek in Hendricks and Putnam County.

6.1.2 Forested

In general, forested land use increases in the southern portion of the watershed. Subwatersheds with the greatest percentages of forested land use include Subwatersheds C, E, G, K, M, V, and W. Most notable are Subwatersheds E and G (the most southern end of the mainstem of Big Walnut Creek and K (the most southern end of Deer Creek where Deer Creek enters Big Walnut Creek). The forested land use in these areas is clearly associated with steeper terrain and topography in this portion of the watershed. The local terrain and soils do not lend themselves to agricultural land use.

Figure 1a

Macroinvertebrate Data - OEPA

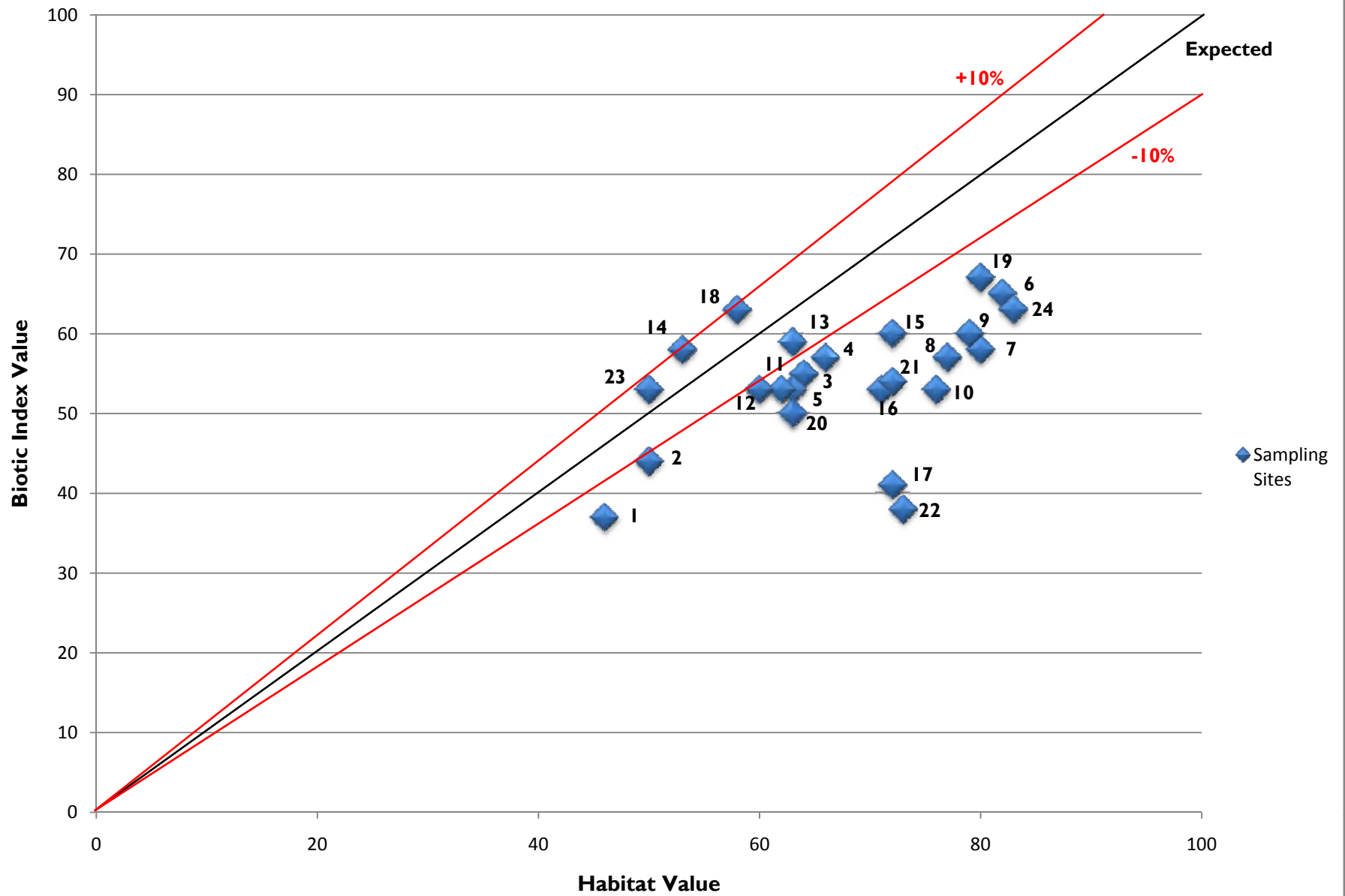


Table 17: Land Use								
Subwatersheds		Watershed Acreage	Acres of Agriculture	Percent Agriculture	Acres of Forest	Percent Forest	Acres of High Density Urban	Percent High Density Urban
A	Big Walnut Creek - Barnard	10027	6249.32	62.32%	2051.61	20.46%	0.00	0.00%
B	Big Walnut Creek - Dry Branch	8145	4360.21	53.53%	1389.16	17.06%	24.73	0.30%
C	Big Walnut Creek - Ernie Pyle Memorial Highway	8417	2714.11	32.25%	3476.97	41.31%	17.04	0.20%
D	Big Walnut Creek - Greencastle	14170	4020.17	28.37%	4336.05	30.60%	187.13	1.32%
E	Big Walnut Creek - Johnson Branch	9462	3125.95	33.04%	4184.78	44.23%	9.36	0.10%
F	Big Walnut Creek - Plum Creek/Bledsoe Branch	12122	6050.71	49.92%	2637.92	21.76%	21.48	0.18%
G	Big Walnut Creek - Snake Creek/Maiden Run	15537	4068.31	26.18%	7620.56	49.05%	8.70	0.06%
H	Clear Creek Headwaters (Putnam)	11125	6348.07	57.06%	1681.67	15.12%	13.08	0.12%
I	Clear Creek - Miller Creek	8778	5062.25	57.67%	1480.80	16.87%	17.49	0.20%
J	Deer Creek Headwaters (Putnam)	10573	7406.24	70.05%	1141.33	10.79%	18.91	0.18%
K	Deer Creek - Leatherwood Creek	5852	708.05	12.10%	3724.92	63.65%	0.00	0.00%
L	Deer Creek - Little Deer Creek	8798	4198.31	47.72%	1801.51	20.48%	80.45	0.91%
M	Deer Creek - Mosquito Creek	8094	2205.75	27.25%	3548.30	43.84%	61.52	0.76%
N	Deer Creek - Owl Branch	9727	2920.66	30.03%	3036.53	31.22%	279.68	2.88%
O	Deweese Creek	7006	1771.74	25.29%	2254.57	32.18%	72.81	1.04%
P	East Fork Big Walnut Creek - Lower	8909	6295.25	70.66%	723.43	8.12%	12.25	0.14%
Q	East Fork Big Walnut Creek - Ross Ditch	8975	7733.63	86.17%	201.17	2.24%	10.51	0.12%
R	Hunt Creek	6880	5103.54	74.18%	535.64	7.79%	0.00	0.00%
S	Jones Creek	8704	5106.92	58.67%	1291.30	14.84%	0.00	0.00%
T	Limestone Creek	8366	3247.13	38.81%	2929.24	35.01%	23.55	0.28%
U	Little Walnut Creek - Headwaters	7780	3436.25	44.17%	2233.96	28.71%	0.00	0.00%
V	Little Walnut Creek - Leatherman Creek	7303	2178.18	29.83%	3372.25	46.18%	0.00	0.00%
W	Little Walnut Creek - Long Branch	6991	2318.59	33.17%	3103.23	44.39%	0.00	0.00%
X	Main Edlin Ditch - Grassy Branch	5622	4906.08	87.27%	54.26	0.97%	3.81	0.07%
Y	Main Edlin Ditch - Smith Ditch	9377	8584.39	91.55%	110.45	1.18%	0.00	0.00%
Z	Middle Fork Big Walnut Creek	8681	6576.4	75.76%	216.71	2.50%	14.42	0.17%
AA	Owl Creek	10343	5590.94	54.06%	2089.77	20.20%	9.20	0.09%
BB	Ramp Run - East Fork Outlet	8219	6082.55	74.01%	559.66	6.81%	0.00	0.00%
CC	West Fork Big Walnut Creek Headwaters	7065	6459.83	91.43%	47.70	0.68%	0.00	0.00%
DD	West Fork Big Walnut Creek - Lower	10107	6756.92	66.85%	923.01	9.13%	5.59	0.06%
	Totals	271155	141586.45	52.22%	62758.46	23.14%	891.71	0.33%

Table 17: Land Use (cont)							
Subwatersheds		Acres of Medium Density Urban	Percent Medium Density Urban	Acres of Grasslands/ Suburban Lands	Percent Grasslands/S uburban Lands	Acres of Excavation	Percentage Excavation
A	Big Walnut Creek - Barnard	0.00	0.00%	1516.15	15.12%	0.00	0.00%
B	Big Walnut Creek - Dry Branch	1.67	0.02%	2256.26	27.70%	0.00	0.00%
C	Big Walnut Creek - Ernie Pyle Memorial Highway	22.41	0.27%	1904.68	22.63%	0.00	0.00%
D	Big Walnut Creek - Greencastle	634.93	4.48%	4695.70	33.14%	0.00	0.00%
E	Big Walnut Creek - Johnson Branch	13.38	0.14%	1884.95	19.92%	0.67	0.01%
F	Big Walnut Creek - Plum Creek/Bledsoe Branch	114.24	0.94%	3087.19	25.47%	0.00	0.00%
G	Big Walnut Creek - Snake Creek/Maiden Run	78.59	0.51%	3497.94	22.51%	0.00	0.00%
H	Clear Creek Headwaters (Putnam)	344.32	3.10%	2246.72	20.20%	0.00	0.00%
I	Clear Creek - Miller Creek	17.24	0.20%	2079.20	23.69%	2.97	0.03%
J	Deer Creek Headwaters (Putnam)	61.24	0.58%	1855.63	17.55%	0.00	0.00%
K	Deer Creek - Leatherwood Creek	5.93	0.10%	1235.78	21.12%	0.60	0.01%
L	Deer Creek - Little Deer Creek	9.46	0.11%	2556.40	29.06%	6.21	0.07%
M	Deer Creek - Mosquito Creek	40.90	0.51%	1911.60	23.62%	13.71	0.17%
N	Deer Creek - Owl Branch	172.85	1.78%	3025.46	31.10%	15.59	0.16%
O	Deweese Creek	378.35	5.40%	2064.77	29.47%	334.58	4.78%
P	East Fork Big Walnut Creek - Lower	25.44	0.29%	15.92	0.18%	28.78	0.32%
Q	East Fork Big Walnut Creek - Ross Ditch	32.69	0.36%	864.46	9.63%	2.10	0.02%
R	Hunt Creek	0.00	0.00%	1113.69	16.19%	0.00	0.00%
S	Jones Creek	2.29	0.03%	2099.53	24.12%	0.00	0.00%
T	Limestone Creek	1.99	0.02%	1950.26	23.31%	85.91	1.03%
U	Little Walnut Creek - Headwaters	0.00	0.00%	2026.72	26.05%	0.00	0.00%
V	Little Walnut Creek - Leatherman Creek	0.00	0.00%	1659.68	22.73%	0.00	0.00%
W	Little Walnut Creek - Long Branch	0.00	0.00%	1524.70	21.81%	0.00	0.00%
X	Main Edlin Ditch - Grassy Branch	0.00	0.00%	643.28	11.44%	0.00	0.00%
Y	Main Edlin Ditch - Smith Ditch	0.00	0.00%	597.07	6.37%	3.12	0.03%
Z	Middle Fork Big Walnut Creek	88.07	1.01%	1534.22	17.67%	22.56	0.26%
AA	Owl Creek	105.51	1.02%	2027.68	19.60%	4.46	0.04%
BB	Ramp Run - East Fork Outlet	0.00	0.00%	1533.32	18.66%	0.00	0.00%
CC	West Fork Big Walnut Creek Headwaters	0.00	0.00%	539.43	7.64%	0.00	0.00%
DD	West Fork Big Walnut Creek - Lower	121.58	1.20%	1997.19	19.76%	11.77	0.12%
	Totals	2273.08	0.84%	55945.58	20.63%	533.03	0.20%

6.1.3 Residential/Urban

The watershed area in general does not contain much impervious area. Areas with extensive impervious land cover have been shown to undergo degradation in water quality and the ability to support biotic stream life. For the purposes of considering water quality impacts associated with impervious area, percent land use in high-density residential and medium-density residential categories were used as surrogate indicators of areas with higher impervious surface. It is important to note that comparisons of acreages in each land use category is a relative comparison among other subwatersheds in the Big Walnut project area, not that acreages or percentages that are labeled or discussed as 'large' or 'high' are actually notably so when compared across the state or to other communities.

Subwatersheds with relatively larger percentages of high-density residential land use include Subwatershed D, L, and N. All three of these areas are influenced by the City of Greencastle. Subwatersheds with high percentages of medium-density residential land use include some of those mentioned above associated with Greencastle (Subwatersheds D and N), as well as Subwatersheds H, O, Z, and AA. These subwatersheds are influenced by Heritage Lake, suburban growth southwest of Greencastle, north Salem in Hendricks County, and the Van Bibber mobile home community around Van Bibber/Glenn Flint Lake.

6.2 Riparian Habitat, Floodplains, and Wetland Soils

Watershed scientists have known for decades the critical role floodplains and wetlands play in overall water quality protection and quantity control. Floodplains, National Wetland Inventory (NWI) wetlands, and hydric soils, are shown in Figures F1-F21 (Appendix A) and summarized in Tables 1 and 2 (pgs 10 & 13).

All of the subwatersheds have some acreage of wetlands, however, Subwatersheds H, AA, D, and G, all have greater than 25 acres of mixed wetland types within their boundaries. If the percentage of wetland acres is looked at none of the subwatersheds wetland acre percentage is greater than 0.40% of the total land acreage. Subwatershed C has the greatest acreage of forested wetland. Subwatershed C is part of the area along the Big Walnut Creek Corridor with much of the land protected in nature preserves and other forms of land conservation.

Several of the subwatersheds have high percentages of floodplain relative to their total acreage. Subwatersheds E, G, T, and X are some examples of subwatersheds like this. Subwatersheds with the most acres of floodplain include D, E, G, and H all with greater than 3000 acres of floodplain.

The subwatersheds in part or all of Boone County, Subwatersheds Q, X, Y, Z, CC, and DD, all have the greatest acreage and percentage of hydric soils. This is because the NRCS is currently reclassifying soils throughout the State of Indiana and Boone County was one of the first counties to be done. Most of the Subwatersheds in Putnam County will not have much hydric soil because of the topography of the county.

6.3 Agricultural Practices

Transect data collected by the Putnam County SWCD and NRCS was analyzed for the Putnam County portion of the Big Walnut Watershed. Information collected for transect data includes

information such as present crop, previous crop, tillage practice, and several other items relating to soil.

The data analyzed shows 261 points within the watershed. Of the 261 points within the watershed, seven still show conventional tillage practices. No till practices show up as 180 of the points. The remaining points collected are either practices of mulch tillage, reduced tillage, or unknown/not applicable. Figure V shows the path of transect data collected for Putnam County.

Further conversation with the SWCD and NRCS personnel stated that most of the conventional tillage in Putnam County occurs in the northern part of the County, outside of the watershed. Subwatershed N, as well as the northern and western portions of Subwatersheds A and C are also areas where conventional tillage is still practiced, but these areas are not areas where transect data is collected.

In addition to transect data for Putnam County, data was received for Boone and Hendricks Counties as well. Boone County shows 67 points within the Big Walnut Creek Watershed. Of the 67 points, 16 points are no till practices. Conservation practices are represented as 28 of the points. The remaining 23 points are either practices of mulch tillage, reduced tillage, or unknown/not applicable. Hendricks County sampled 261 points within the Big Walnut Creek Watershed. Unfortunately, tillage information was not collected for the sample points.

6.4 Septic Areas & Sewer Utilities

Septic discharge is a concern of the county health departments of the Big Walnut Creek Watershed. This is because the majority of the homes in the watershed are in rural areas where sewer utilities are not available. The county health departments are working to help educate septic owners and installers on the proper do's and don'ts of septic systems.

The county health departments were contacted to find out if they were aware of septic system problems within the watershed. The Putnam County Health Department, who is currently working on a mapping septic system data into a GIS layer, noted several areas of concern. They have problems on a regular basis throughout the watershed. Areas with recent problems which have been repaired, or are in the process of being repaired include Ivanwald, Roachdale, Heritage Lake, and Morton. Their biggest problem areas are the Applewood Subdivision and the Van Bibber area.

The Boone County Health Department stated that the area of the county located in the Big Walnut Creek Watershed is a low diversity area and not much is known about septic concerns for that area.

The Boone County Health Department (BCHD) did provide information on a junkyard that was noted while driving the watersheds during windshield surveys. The junkyard is a well documented problem of Boone County. The junkyard has been the complaint of neighbors for many years. There have been several illegal open burning incidents, along with numerous permit and compliance violations. Violations are primarily focused on oil and tire storage and

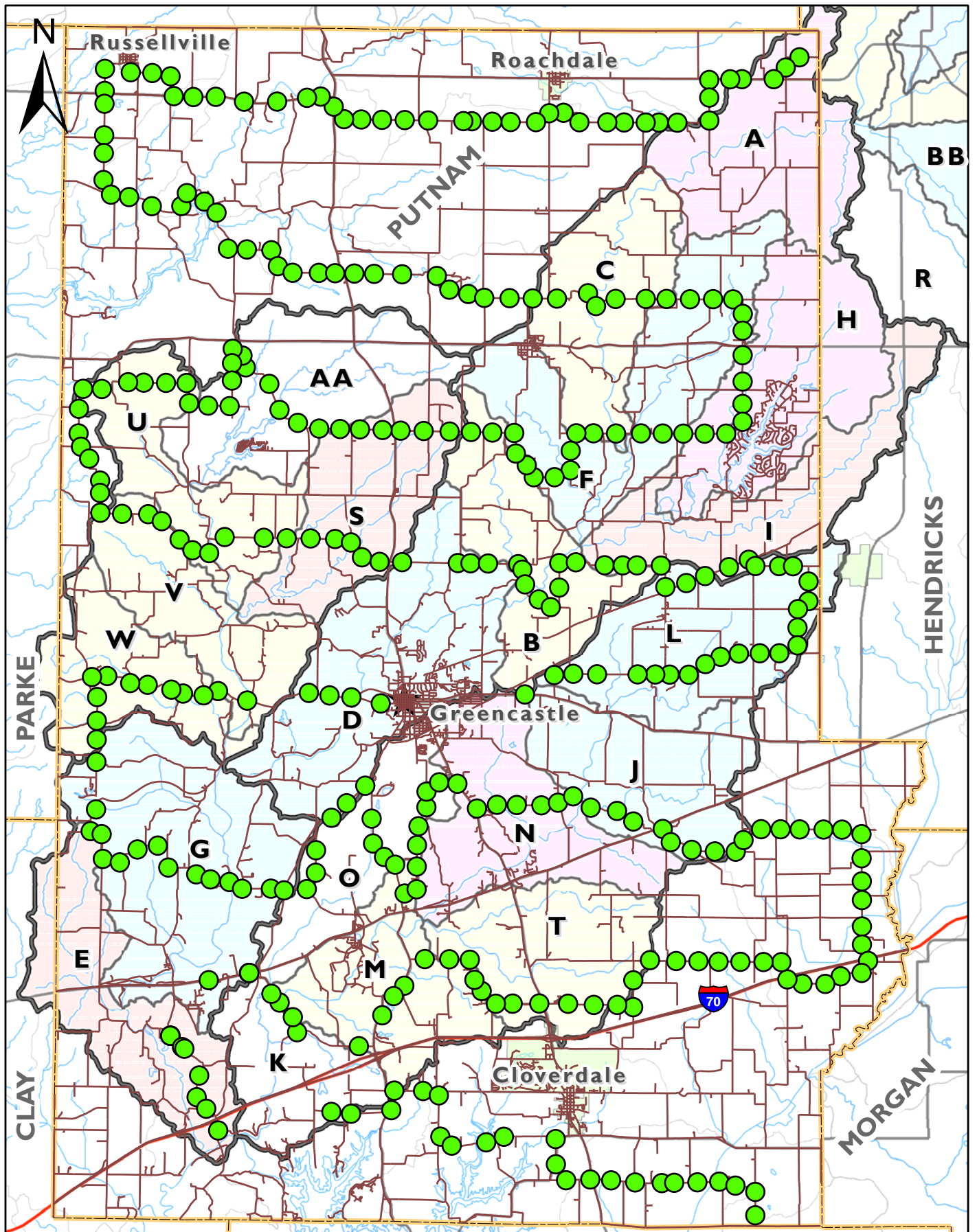


Figure V - Tillage Transect Data

Big Walnut Creek Watershed

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

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.