

II. LAND USE

A. General Land Use Data

LAND USE DATA SOURCES

A number of land use layers currently exist within the Darby Watershed ranging in age from 1992 to 2001. The creation of accurate land use data is both time consuming and difficult. Five different land use layers currently exist for the watershed. The following figure summarizes the variety of land use data layers that currently exist for the Darby Watershed.

Figure 15: Land Use Data Sources	
<i>Name</i>	<i>Comment</i>
1992-94 National Land Cover Dataset <i>- U.S. Geological Survey (USGS)</i>	Most detailed land use data. <i>21 Land Use classifications</i>
1994 Land Cover - ODNR <i>Division of Real Estate and Land Management</i>	Statewide Dataset <i>7 Land use classifications</i>
1997 Forest Cover - Ohio EPA <i>Division of Surface Water - Modeling Group</i>	Created to analyze forest cover types and percents <i>4 Forest Cover Types</i>
1997 Land Cover - The Ohio State University <i>Department of City and Regional Planning</i>	Missing 400 acres near Circleville <i>13 Land use classifications</i>
1999 Land Cover - The Ohio State University <i>Department of City and Regional Planning</i>	Least Detailed data <i>6 Land Use classifications</i>
2001 Land Use - Cincinnati University <i>Geography Department</i>	In progress through contract with OEPA Only <i>'Urban' classification complete</i>
Hybrid Land Use - Ohio EPA <i>Division of Surface Water - Modeling Group</i>	USGS, Forest Cover, and Cincinnati 'Urban' data. <i>18 Land use classifications</i>

Each of the above datasets was collected through remote sensing and the use of a digital image processor, the Landsat Thematic Mapper. The Thematic Mapper collected electromagnetic radiation reflected from the earth's surface in 30 meter by 30 meter grids. Through a computer analysis each grid is classified into a general land cover category. A certain amount of error is assumed when classifying land use in this manner because a 30 meter by 30 meter area, though small, may have overlapping land uses. When this occurs that 30 meter by 30 meter cell must be analyzed through other methods to determine the correct classification or labeled as unclassified. In the case of the 1997 land use, approximately 400 acres were labeled as unclassified and for this analysis were removed from any calculations or maps.

HYBRID LAND USE

The Hybrid land use dataset was created to support Ohio EPA's work on the Darby Watershed TMDL. This dataset combined the urban classification from the University of Cincinnati's 2001 data, the detailed forest figures from 1997 Ohio EPA research, and lastly all remaining

classifications in the 1992-94 National Land Cover Dataset (See **Map 11**). Together this dataset had a total of 18 land use classifications. Several similar land use types were combined to form 10 different land use types to simplify discussion (See Figure 16). For example, there were several land use classifications for forest cover including woodland, mixed, coniferous, and deciduous which were all combined into the existing ‘Forest’ classification to aid in planning. The ‘shrub’ classification was separated from the ‘forest’ classification because it represented a considerable difference in canopy cover.

Figure 16: Hybrid Land Use

Category	Acreage	Percentage
Row Crops	225,853	63.51%
Forest	69,634	19.58%
Pasture/Hay	35,665	10.03%
Shrub	9,370	2.63%
Residential	9,274	2.61%
Commercial/Industrial/Transportation	2,481	0.70%
Urban/Recreational Grasses	1,895	0.53%
Open Water	856	0.24%
Wetlands	582	0.16%
Quarries/Gravel Pits	26	0.01%
Total	355,609	100%

In order to further illustrate the Hybrid land use, a data table was created illustrating the percent of each land use by subwatershed (See **Figure 17**). The total amount of agricultural land (Row Crops and Pasture/Hay) by subwatershed ranged from 53 percent along Big Darby between Little Darby Creek and Hellbranch Run to nearly 93 percent along Treacle Creek between Proctor Run and Little Darby Creek. Wooded lands ranged from almost 6 percent along the same stretch of Treacle Creek and over 36 percent in the headwaters of Big Darby Creek. Residential land uses ranged from .04% along the same stretch of Treacle Creek to nearly 14% in Hellbranch. Commercial land uses were nearly 10% in Flat Branch.

LAND USE CHANGE

In the past twenty years both Hellbranch in Franklin County and Flat Branch in Logan County experienced considerable land use change. The amount of residential and commercial land in these two subwatersheds is much higher than any other subwatersheds. For example, Flat Branch has a higher percent of commercial land use than all other subwatersheds combined which is attributed to Honda and related companies. Additionally, the percent of residential land in the Hellbranch subwatershed in 2001 was over twice that of the second most residential subwatershed. Figure 18 is part of the *Darby Creek Stormwater Management Strategies and Standards for New Development* created by Fuller Mossbarger, Scott, and May Engineers (2001). The following figure summarizes scientific research that explored the relationship of impervious surface created by development to declining water quality and aquatic habitat.

Figure 17: Subwatershed Land Use Statistics

Subwatershed Description	Total Acres	Row Crops	Pasture	Forest	Shrub	Wetlands	Residential	Urban Grasses	Commerical...	Water
Big Darby Headwater to Flat Branch (1901)	3,745	48.66%	9.73%	36.16%	3.57%	0.41%	0.45%	0.20%	0.73%	0.10%
Flat Branch (1902)	8,654	61.71%	4.50%	19.70%	1.74%	0.58%	0.59%	1.41%	9.56%	0.22%
Big Darby between Flat Branch to Milford Center (1903)	40,765	70.34%	8.20%	17.27%	2.03%	0.25%	1.01%	0.54%	0.17%	0.20%
Big Darby between Milford Center and Sugar Run (1904)	20,957	67.07%	9.54%	16.63%	2.44%	0.14%	1.90%	1.15%	0.84%	0.29%
Buck Run (1905)	19,023	54.23%	12.50%	27.12%	2.24%	0.20%	1.13%	1.14%	1.26%	0.19%
Robinson Run (1906)	6,984	44.29%	18.79%	31.23%	2.87%	0.04%	2.50%	0.00%	0.23%	0.04%
Sugar Run (1907)	12,417	57.86%	16.57%	20.03%	2.47%	0.08%	2.05%	0.00%	0.85%	0.09%
Big Darby between Sugar Run and I-70 (2001)	40,087	74.94%	8.56%	12.47%	2.53%	0.07%	0.77%	0.02%	0.22%	0.35%
Big Darby between I-70 and Little Darby (2002)	9,177	41.55%	14.43%	31.80%	3.90%	0.10%	6.83%	0.00%	0.80%	0.58%
Little Darby Headwaters to Treacle Creek (2101)	18,981	61.12%	9.63%	22.03%	3.20%	0.17%	1.92%	1.54%	0.25%	0.14%
Treacle Creek Headwater to Proctor Run (2102)	12,614	68.79%	9.83%	18.92%	2.21%	0.10%	0.06%	0.00%	0.02%	0.07%
Proctor Run (2103)	6,657	69.28%	7.36%	19.08%	2.46%	0.24%	0.61%	0.26%	0.50%	0.21%
Treacle Creek between Proctor Run and Little Darby (2104)	4,546	88.02%	4.63%	5.69%	1.32%	0.16%	0.04%	0.12%	0.02%	0.00%
Little Darby between Treacle Creek and Spring Fork (2105)	23,482	80.87%	6.13%	10.67%	2.00%	0.11%	0.20%	0.00%	0.00%	0.01%
Spring Fork (2106)	24,186	74.85%	7.76%	13.99%	2.30%	0.11%	0.91%	0.00%	0.04%	0.05%
Little Darby between Spring Fork and Big Darby (2107)	23,474	59.54%	10.21%	19.80%	2.91%	0.22%	6.25%	0.04%	0.87%	0.15%
Hellbranch Run (2201)	24,138	51.28%	13.02%	16.88%	2.65%	0.15%	13.94%	0.94%	1.07%	0.06%
Big Darby between Little Darby and Hellbranch (2202)	15,999	42.27%	10.88%	35.62%	4.45%	0.08%	4.17%	1.58%	0.43%	0.53%
Big Darby between Hellbranch and Darbyville (2203)	25,011	52.96%	12.32%	26.60%	3.30%	0.19%	2.47%	0.95%	0.78%	0.44%
Big Darby between Darbyville and Scioto River (2204)	13,993	61.88%	11.03%	22.33%	3.11%	0.21%	0.30%	0.27%	0.08%	0.80%
Watershed Totals	354,890	63.51%	10.03%	19.58%	2.63%	0.16%	2.61%	0.53%	0.70%	0.24%

Hybrid Land Use: Ohio EPA Division of Surface Water, 2004. Created through a combination of USGS NLCD Data, 1992-94, Ohio EPA Forest Cover Data, 1996-97, and the 'Urban' classification from the University of Cincinnati, 2001.

Figure 18: Research summary of relationship between impervious surface and water quality

Table 2. Recent Research Examining the Relationship of Urbanization to Aquatic Habitat and Organisms				
Watershed Indicator	Key Finding	Reference	Year	Location
Aquatic habitat	There is a decrease in the quantity of large woody debris (LWD) found in urban streams at around 10% impervious cover.	Booth, et al.	1996	Washington
Aquatic insects and fish	A comparison of three stream types found urban streams had lowest diversity and richness. Urban streams had substantially lower EPT scores (22% vs. 5% as number of all taxa, 65% vs. 10% as percent abundance) and IBI scores in the poor range.	Crawford & Lenat	1989	North Carolina
Insects, fish, habitat, water quality, riparian zones	Steepest decline of biological functioning after 6% imperviousness. There was a steady decline, with approx 50% of initial biotic integrity at 45% impervious area.	Horner, et al.	1996	Puget Sound Washington
Aquatic insects and fish	Macroinvertebrate and fish diversity decline significantly beyond 10-12% impervious area.	Klein	1979	Maryland
Fish, aquatic insects	A study of five urban streams found that as land use shifted from rural to urban, fish and macroinvertebrate diversity decreased.	Materson and Bannerman	1994	Wisconsin
Insects, fish, habitat, water quality, riparian zone	Physical and biological stream indicators declined most rapidly during the initial phase of the urbanization process as the percentage of total impervious area exceeded the 5-10% range.	May, et al.	1997	Washington
Aquatic insects and fish	There was significant decline in the diversity of aquatic insects and fish at 10% impervious cover.	MWCOG	1992	Washington, DC
Aquatic insects and fish	Evaluation of the effects of runoff in both urban and non-urban areas found that native species dominated the non-urban portion of the watershed, but accounted for only 7% of the number of species found at the monitoring stations located in urban areas. Benthic taxa were also found more in abundance in non-urbanized portions of the watershed.	Pitt	1982	California
Wetland plants, amphibians	Mean annual water fluctuation inversely correlated to plant and amphibian density in urban wetlands. Declines noted beyond 10% impervious area.	Taylor	1993	Seattle
Aquatic insects and fish	Residential urban land use in Columbus watershed caused a significant decrease in fish attainment scores at around 33%. For Cuyahoga watersheds, a significant drop in IBI scores occurred at around 8%, primarily due to certain stressors, which functioned to lower the non-attainment threshold. When watersheds smaller than 100mi ² were analyzed separately, the level of urban land use for a significant drop in IBI scores occurred at around 15%.	Yoder and Miltner	1999	Ohio
Aquatic insects and fish	All 40 urban sites sampled had fair to very poor index of biotic integrity (IBI) scores, compared to undeveloped reference sites.	Yoder and Miltner	1991	Ohio

Source: FMSM, 2001. *Darby Creek Stormwater Management Strategies and Standards for new development*, p.18

LAND USE CHANGE IMPACTS

The negative impacts of development and urbanization on water quality are well documented. Locally, landowners have noticed increased flooding frequency and intensity from upstream land use changes. Areas defined as 100 year floodplains are now flooded several times each decade. Drainage ditches and tile that were designed for agricultural drainage are now forced to receive excessive water that flows from additional roads, rooftops, septic systems, lawns, and parking lots. The larger streams that receive this water are then subject to additional flooding and erosion. In order to accommodate the additional water, stream channels must resize by widening and deepening. The following figure (19) from the *Darby Creek Stormwater Management Strategies and Standards for New Development* explains how increased impervious surface can affect water quality.

Figure 19: Summary of the Impacts of Urbanization

Table 1. Summary of the Impacts of Urbanization		
Urbanization Implications	Physical Effects	Impacts on Waterways
Increased Imperviousness	<p>Flashy Flows: Rainwater accumulates and runs-off of paved surfaces and rooftops quickly. It must go somewhere and is usually, intentionally or unintentionally, routed to watercourses to be carried away.</p> <p>Runoff occurs in bursts, rather than moderate flows that would result from water being slowed by vegetation or absorbed and released slowly through groundwater.</p>	<p>Large volumes of rapid stormwater runoff scour streambeds, eroding the banks away and causing the stream channel to widen and deepen. Expensive streambank stabilization and hydro-modification techniques are often used to prevent damage to property from flooding or erosion. These practices are cited by the EPA as a major source of stream impairment because of their destruction of stream habitat.</p> <p>Even before modification takes place, unnaturally low flows can cause fish barriers and habitat loss and unnaturally high flows can destroy healthy riffle-run-pool habitats and natural, protective meanders that are necessary for a healthy habitat and for stream bio-diversity.</p>

Figure 19: Continued from above

Table 1. Summary of the Impacts of Urbanization (continued)		
Urbanization Implications	Physical Effects	Impacts on Waterways
Increased Imperviousness	Decreases absorption of rainwater and pollutants such as excess fertilizers or sediment from exposed soil.	Forested buffers can filter pollutants and slow damaging flood events. Without them, there is often no protection for streams.
	Allows rapid runoff rather than infiltration that would feed groundwater.	Rapid runoff causes streambank erosion during flood events, but then severe drought conditions between rains that limit habitat viability.
	Decreases shade for waterway, allowing water temperatures to increase.	Many species do not survive in warmer-than-normal water temperatures.
	Decreases stable food sources such as woody debris that are needed for stream life.	Stream ecosystems rely on slow-releasing food sources like woody debris rather than feast-or-famine regimes caused by excess fertilizer runoff.
	Loss of habitat for many different kinds of plants and animals.	Many animals (migratory birds for example) rely on wooded stream corridors for habitat because connected habitats are more effective than fragmented ones.
Increased Pollutant Loads	Sediment from construction sites or other exposed soil clouds water and clogs spaces between rocks and cobbles.	Makes feeding and mating more difficult for fish because of reduction in visibility and reduced habitat for fish food since insects live in spaces between rocks. Degrades habitat for spawning because fish rely on spaces between rocks to safely lay and fertilize their eggs.
	Excess nutrients, commonly originating from lawns within the watershed can cause algal blooms which ultimately deprive water of oxygen.	Stream inhabitants need to breathe oxygen to live just like we do. When algae decomposes, it uses up the oxygen in the water, depriving insects and fish.
	Toxic pollutants: Automotive fluids and heavy metals from brakes come from roadways and parking lots. Detergents and many other substances result from uneducated use or improper design of storm sewers.	Many plants, insects, fish and other components of stream ecosystems cannot live in the presence of toxic substances. All cause increases in costs to treat drinking water; cost incurred downstream.

Adapted from Sturm, 2000 and Schueler, 1995

Source: FMSM, 2001. *Darby Creek Stormwater Management Strategies and Standards for new development, 13-14*

B. Residential

The amount of urban land in the Darby Watershed is small. The hybrid land use data illustrated that about 2.6 percent of the watershed is utilized for residential uses. The largest concentrated area of residential uses is in Hellbranch Run subwatershed with nearly 14 percent of the land dedicated to residential uses. Overall, Darby Creek Watershed remains a rural watershed with only pockets of urban land uses but an increasing number of single family homes with on-site septic systems now dot the landscape.

TOWNSHIPS/CITIES/VILLAGES

The majority of the towns, cities and villages in the watershed are small (See **Map 1**). The exceptions are the cities of Marysville, Hilliard and Columbus. In total, 32 towns, cities, or villages are within the Darby Creek Watershed. In addition to a large number of small towns and villages in the watershed, parts of 30 townships are within the watershed. See Figure 20 for a complete list of municipalities within the watershed.

Figure 20: Municipalities in the Watershed					
Number of Cities/Towns/Villages			Number of Townships		
<i>Champaign County</i>	4	Village of Mechanicsburg Village of N. Lewisburg Woodstock Middletown	<i>Champaign County</i>	4	Goshen Twp Rush Twp Union Twp Wayne Twp
<i>Franklin County</i>	7	City of Columbus City of Hilliard Alton Darbydale Galloway Georgesville Harrisburg	<i>Franklin County</i>	4	Brown Twp Norwich Twp Pleasant Twp Prairie Twp
<i>Logan County</i>	2	Middleburg E. Liberty	<i>Logan County</i>	3	Perry Twp Zane Twp Monroe Twp
<i>Madison County</i>	7	Village of Plain City Village of West Jefferson Amity Gillivan Lilly Chapel Plumwood Rosedale	<i>Madison County</i>	8	Canaan Twp Darby Twp Deer Creek Twp Fairfield Twp Jefferson Twp Monroe Twp Pike Twp Somerset Twp
		Darbyville			Darby Twp

<i>Pickaway County</i>	4	Derby Fox Orient	<i>Pickaway County</i>	4	Jackson Twp Muhlenburg Twp Scioto Twp
<i>Union County</i>	8	City of Marysville Allen Center Chuckery Irwin Milford Center New California Pottersburg Unionville Center	<i>Union County</i>	7	Allen Twp Darby Twp Jerome Twp Liberty Twp Mill Creek Twp Paris Twp Union Twp

POPULATION

The Darby Watershed was one of the last areas of the state that was developed in the 1800s and has maintained a relatively small population. According to block level (smallest spatial unit of census data) 2000 census data, the population of the watershed is approximately 70,900. No large city is lies entirely within the watershed. Only small percentages of Columbus, Hilliard, and Marysville lie within the watershed. The population density of the watershed is approximately one person for every five acres of land. For comparison, the population density in the state of Ohio is one person for every 2.3 acres. Additional population density comparisons are provided in the far left column of Figure 21 for portions of counties in the Darby Watershed.

<i>County</i>	<i>Total Acres</i>	<i>2000 Population</i>	<i>Percent of Land</i>	<i>Percent of People</i>	<i>Population Density Acre/Person</i>
Champaign	55,421	7,000	15.58	9.87	7.92
Clark	544	79	0.15	0.11	6.88
Franklin	53,825	30,396	15.13	42.85	1.77
Logan	16,838	1,014	4.74	1.43	16.61
Madison	110,117	13,286	30.97	18.73	8.29
Pickaway	35,780	8,240	10.06	11.62	4.34
Union	83,081	10,918	23.37	15.39	7.61
Totals	355,606	70,932	100	100.00	5.01

POPULATION CHANGE

The Darby Watershed lies mostly outside of Columbus, Ohio, and within the fastest growing region in Ohio. Between 1990 and 2000 Central Ohio grew by 15 percent as compared to 9 and 3 percent for regions around Cincinnati and Cleveland. Over the next 30 years, Central Ohio is expected to grow by 36 percent to over 2.15 million people (MORPC, 2004). Land consumption rates have increased considerably and are expected to continue for the next 30 years as

household size decreases and lot size and population increase. For example the City of Columbus’ population grew by 68 percent between 1950 and 2000, yet its land area increased by 390 percent. Currently, there is 0.42 acres of land for every person but that number is expected to increase to 0.69 acres by 2030 if current development trends continue. Sprawling subdivisions and increased land consumption is expensive to serve and maintain.

Many of these new residents will seek housing in suburban communities outside of Franklin County in Union, Madison, or Pickaway Counties. Statistics show that vehicle miles of travel increased by 31 percent between 1990 and 2000 whereas the population only increased by 15 percent. In the next 30 years the population is expected to increase by 36 percent, car trips by 44 percent, miles driven by 47 percent, and the hours driven by 66 percent. In western Licking County, just east of Columbus, the development pressures from the Columbus metropolitan area are placing a strain on their roads and emergency services. The city of Pataskala alone grew by 42 percent since 2000. The western portions of Licking County are expecting another 7,500 new homes in 2005. Most of statistics above were from a report completed by The Mid Ohio Regional Planning Commission and AIC Planning in August of 2004 for the seven county region of Central Ohio which included Madison, Union, and Pickaway Counties.

In addition to a more regional approach to population growth and land use change, Dr. Steven Gordon with the City and Regional Planning Department at the Ohio State University completed an analysis of stream health in the Darby Watershed based on population change in 2001. This report estimated the future population growth between 2000 and 2020 as seen in Figure 22.

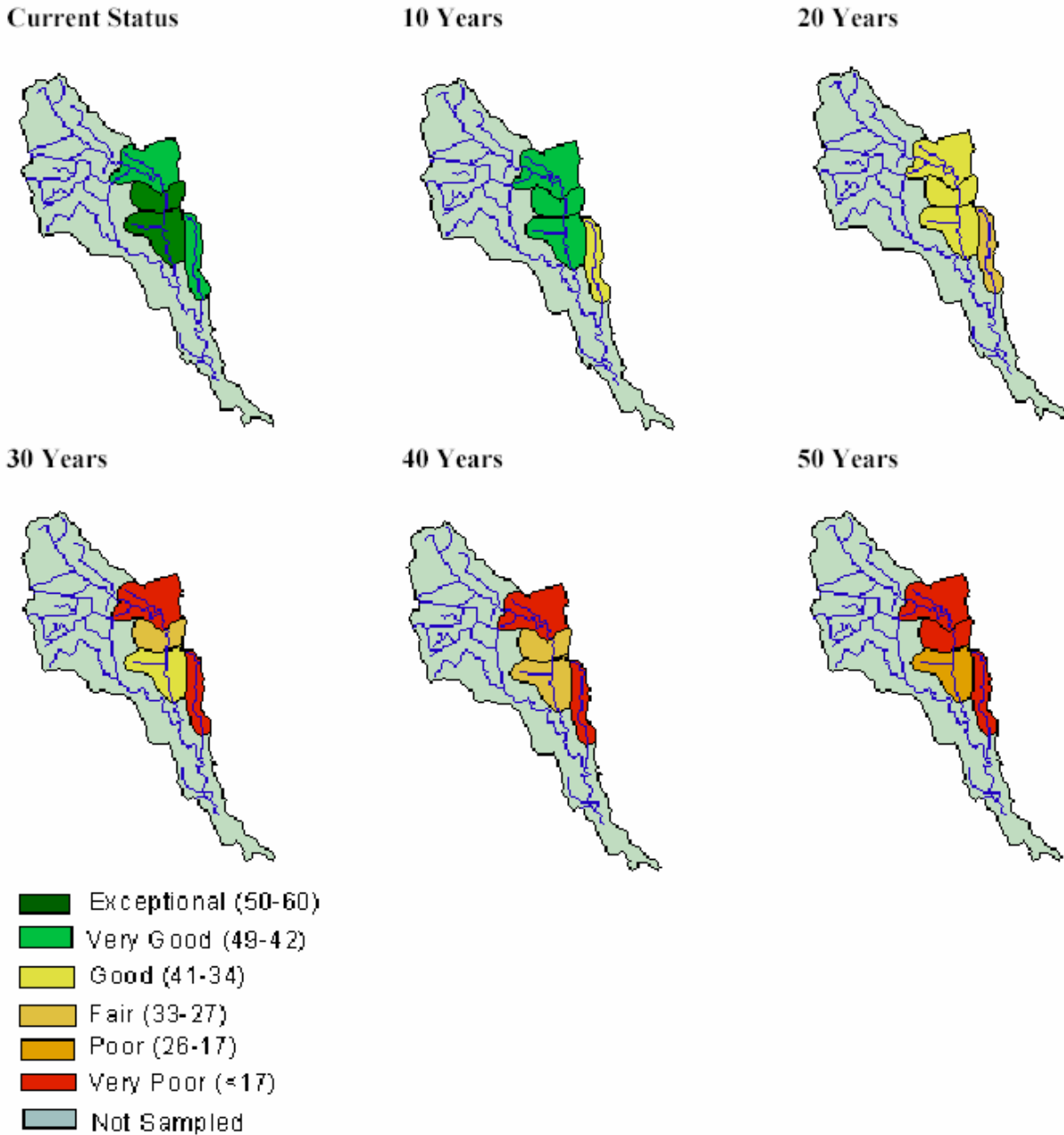
Figure 22: Percent Future Population Growth	
<i>Years</i>	<i>Percent Growth</i>
2000 - 2010	42.51%
2010 - 2020	48.67%
2000 - 2020	111.87%

Source: Gordon, Steve, et. al., 2001. *Development and Change in Big Darby Watershed*. Department of City and Regional Planning, OSU. pg. 47.

The areas that were predicted to experience the greatest population growth increases (80% and above) according to this study are the Franklin County portions of the watershed and Allen Township in Union County.

At the time of this report, the current water quality status of the western side of Big Darby in Union and Madison County were both performing at the highest level of water quality, but through projections of growth the quality of the stream is expected to decrease dramatically similarly to what has occurred in the Hellbranch watershed (See Figure 23). Gordon finds a strong correlation between the increase in impervious surface (and population) and lower water quality scores (See Figure 18). Gordon suggests that smart growth techniques can reduce the effects, but not eliminate them (Gordon et. al., 2001. *Creating a Screening Tool for Identification of the Ecological Risks of Human Activity on Watershed Quality*. City and Regional Planning, OSU. pg. 36-39)

Figure 23: Unregulated Growth Scenario for Portions of Big Darby Creek Watershed



Source: Gordon et. al., 2001. *Creating a Screening Tool for Identification of the Ecological Risks of Human Activity on Watershed Quality*. City and Regional Planning, OSU. pg. 38

Since the Gordon studies of population change in the Darby Watershed, additional data has been released from the U.S. Census Bureau that has allowed for a more detailed analysis of population change in the watershed. **Map 12** and Figure 24 illustrate population change between 1990 and 2000 based on census blocks applied to the following municipalities. The numbers below indicate population values for only the Darby Watershed portions of the municipalities listed.

Figure 24: Population Change for Municipalities							
<i>Municipality</i>	<i>% Change</i>			<i>Municipality</i>	<i>% Change</i>		
	1990	2000			1990	2000	
Union County	8,222	10,918	33.8	Logan County	749	1,014	35.3
Allen Twp	887	1,430	61.3	Monroe Twp	14	13	-6.6
Darby Twp	1,180	1,481	25.6	Perry Twp	41	47	14.4
Jerome Twp	1,355	1,800	32.9	Zane Twp	694	953	37.4
Liberty Twp	75	123	64.3				
Mill Creek Twp	38	55	44.4				
Paris Twp	468	272	-42	Madison County	12,882	13,286	3.13
Union Twp	1,007	939	-6.8	Canaan Twp	2,304	2,486	7.9
City of Marysville	46	999	2,070	Darby Twp	875	839	-4.2
Milford Center Village	651	626	-3.8	Deer Creek Twp	135	81	-40
Unionville Center	238	309	29.8	Fairfield Twp	584	534	-8.6
Plain City	976	895	-8.3	Jefferson Twp	2,419	2,362	-2.4
				Monroe Twp	1,467	1,825	24.4
Franklin County	17,846	30,396	70.3	Pike Twp	506	531	4.9
Brown Twp	1,808	1,949	7.8	Somerford Twp	87	70	-19
Norwich Twp	1,201	943	-21.5	W. Jefferson Village	4505	4558	1.2
Pleasant Twp	5,813	6,048	4.0	Plain City Village	1302	1937	48.8
Prairie Twp	3,145	2,747	-12.7				
City of Hilliard	436	1,371	214.7				
City of Columbus	2,437	12,955	431.6	Champaign County	6,145	7,000	13.9
Lake Darby	2,666	4,057	52.2	Goshen Twp	1,332	1,567	17.6
Harrisburg	340	332	-2.3	Rush Twp	792	860	8.6
				Union Twp	248	265	6.7
Pickaway County	9,418	8,240	-12.5	Wayne Twp	514	654	27.1
Darby Twp	2,775	2,912	5.0	Village of Mechanicsburg	1,803	1,744	-3.3
Jackson Twp	314	336	7.0	Village of N. Lewisburg	1,160	1,594	37.4
Muhlenburg Twp	285	442	55.2	Woodstock Village	296	317	7.1
Scioto Twp	5,498	3,975	-27.7				
Darbyville Village	272	300	10.3	Total Watershed	55,342	70,932	28.2
Orient	273	269	-1.5				

Population growth and development in this region is largely dependent on access to central water and sewer because the soils in most of the watershed are not suitable for on-site wastewater treatment (See **Map 13**). In the late 1990s through 2002 the City of Columbus annexed sizeable portions of land within the Darby Watershed which spurred sprawling developments. Through the work of citizen action groups and concerned citizens, the City of Columbus placed a moratorium on extension of water and sewer areas along the western fringe of Columbus in November of 2002 for two years. In October of 2004 Columbus extended the moratorium through the end of 2005 to give communities adequate time to develop a multi-jurisdictional comprehensive land use plan. Additional details on this comprehensive plan can be found in section D. Planning.

HOUSEHOLD CHANGE

The number of households in the Darby Watershed is increasing at a faster rate than population growth. This phenomena is occurring all over the country as people pursue less dense communities, household ownership rates increase, and household size decreases. Figure 25 summarizes the housing change in the Darby Watershed between 1990 and 2000.

Figure 25: Housing Change 1990 to 2000

County	Homes 1990	Homes 2000	Percent Increase in Housing
Champaign	2,328	2,818	21.05
Clark	26	29	11.65
Franklin	6,239	11,682	87.26
Logan	277	393	41.76
Madison	4,593	4,922	7.16
Pickaway	1,530	1,749	14.29
Union	2,500	4,242	69.67
Totals	17,494	25,836	47.68

Figure 26: Comparison between Housing and Population Change between 1990 and 2000

County	Percent Increase in Housing	Percent Increase in Population
Champaign	21.05	13.91
Clark	11.65	-0.86
Franklin	87.26	70.32
Logan	41.76	35.28
Madison	7.16	3.13
Pickaway	14.29	-12.50
Union	69.67	32.79
Totals	47.68	28.17

Figure 26 above shows that there was nearly a 48 percent increase in households in 2000 over 1990 whereas the population increased by 28 percent. In Union County the population in the Darby Watershed increased by almost 33 percent but the number of homes increased by nearly 70 percent. The average household size of the new homes and population in Union County is 1.5 people per home. New home growth is expected to continue outpacing the population growth rate in the next thirty years as central Ohio continues to move outward (MORPC, 2004). The land use and infrastructure problems associated with sprawling style of development will be discussed in later portions of the watershed plan.

PUBLIC WATER SUPPLIES

Public water supplies in the watershed are all supplied by groundwater sources except for the city of Marysville which utilizes surface water from Mill Creek for two thirds of their drinking water supply. The Darby Creek watershed has no surface water removal for water supplies. The Ohio Environmental Protection Agency (OEPA) created a database providing the name and location of all public water supplies in the state. A total of 171 public water supplies exist in the watershed and have been documented in a series of maps by county in Appendix E. The location and name of each public water supply is provided on the maps.

The majority of the population within the Darby Creek Watershed uses groundwater as its source of water. Only the City of Marysville which serves residents in New California uses surface water from Mill Creek as their source of drinking water. No cities or villages utilize the Darby Watershed as a drinking water source.

ON-SITE WASTEWATER TREATMENT SYSTEMS

On-site wastewater treatment systems serve an estimated over 93 percent of the land and approximately 40 percent of the watershed people and homes (See Figure 27).

	<i>Total Acres</i>	<i>Total People</i>	<i>Total Homes</i>
On-Site Areas	331,500	28,141	10,339
Entire Watershed	355,600	71,456	25,813
Percentage On-Site	93.2%	39.4%	40.1%

A variety of systems exist in the watershed but the most common system is a septic system which treats domestic wastewater through soil-based leaching. In order for a septic system to function properly two feet of “useable” soil is needed to properly treat and remove all bacteria and viruses for wastewater. Very few “useable” soils exist in the watershed because the soils are limited by poor or excessive drainage, seasonably high water table, low soil permeability rates, and a variety of other limitations. Figure 28 below provides an overview by county of soil suitability for the placement of septic systems.

County	<i>Acres</i>	<i>Traditional or Mound</i>	<i>Mound only</i>	<i>Onsite w/ Irrigation</i>	<i>Non Suited (hydric)</i>
Champaign	277,120	1.9%	45.2%	29.1%	23.8%
Franklin	344,064	3.8%	18.1%	62.1%	16.0%
Logan	294,464	1.7%	35.0%	39.6%	23.7%
Madison	296,320	0.4%	16.1%	45.3%	38.2%
Pickaway	322,560	7.0%	45.5%	26.2%	21.3%
Union	277,760	1.4%	14.2%	54.2%	30.2%
Statewide	XXXXXX	6.4%	25.4%	49.1%	19.1%
Watershed Avg.	XXXXXX	2.7%	29.0%	42.8%	25.5%

Source: Mancl and Slater, 2002. *Suitability of Ohio Soils for Treating Wastewater*. The Ohio State University Extension. Appendix 1

County Health Departments attempted to overcome severe soil limitations through the installation of alternative systems such as aeration systems and sand filters. Aeration systems were designed to create an aerobic treatment system in which air would be incorporated into the holding tank to promote the growth of oxygen-using bacteria. Newer aeration systems then discharge into a small absorption field for additional treatment whereas older systems may discharge to tiles, ditches, or streams. In order to create the aerobic treatment process a mechanical device is necessary to pump or agitate the wastewater. Such systems require additional maintenance to ensure that proper treatment. There are approximately 1,076 **known** aeration systems in the watershed (See Figure 29).

Figure 29: Aerators by County	
<i>County</i>	<i>Known Aerators</i>
Champaign	10
Franklin	674
Logan	20
Madison	96
Pickaway	34
Union	242
Total	1076

Health Department officials from each county estimated there were an additional 10 to 25 percent more aeration systems existing in the watershed that were not yet documented.

As mentioned above sand filters have been installed in areas across the watershed that suffer from soil limitations due to high seasonal water table or low permeability rates. The installation of sand filters was a common practice in Union County in the past. Currently, the installation of sand filters is discouraged but still occurs under certain circumstances. As previously stated, two feet of “useable” soil is necessary to treat wastewater effectively. In situations where less than two feet of useable soil is available, sand is used in place of the soil to assist in the treatment process. However, sand does not effectively treat bacteria and viruses. Elevated bacteria levels were found throughout the watershed (See IV. Water Quality for additional information on Ohio EPA sampling results for bacteria). The exact number of sand filters in the watershed is not known at this time.

CENTRAL SEWER SYSTEMS

Approximately seven percent of the watershed has access to a centralized sewer system serving 60 percent of the total population. The remainder of the watershed is served by on-site wastewater treatment. Figure 30 below summarizes access to central sewer in the watershed.

Figure 30: Central Sewer Access			
	<i>Total Acres</i>	<i>Total People</i>	<i>Total Homes</i>
Sewered Areas	12,358	43,315	15,497
Entire Watershed	355,608	71,456	25,836
Percentage Sewered	3.48%	60.6%	60.0%

Central sewer service is concentrated along the northern and eastern boundaries of the watershed in the Union, Madison, and Franklin Counties. A number of small subdivisions and mobile home parks have individual wastewater treatment facilities, or package plants. Several of these package plants have violated Ohio EPA point source permits in recent years and are pollution sources (See Part IV, NPDES Permits). The City of Columbus receives wastewater from several satellite systems, four of which are in the Darby Watershed; Timberlake, Young Estates, Hilliard, and Village Park. When a rainfall event occurs the Columbus sewer lines are often too full to receive additional water from the satellite systems. This causes these systems to utilize their sanitary sewer overflows (SSOs) which allows water to escape the full sewer lines into area ditches, streams, streets, or people’s homes. These sewer overflows occur

during most rain events and contribute pollution to streams and ditches in Franklin County. Only the city of Columbus has a permit with Ohio EPA because it is the end discharger. No record of violations exists for the satellite systems. Ohio EPA is now working to create permits for SSOs (OEPA, 2005). All areas in the watershed served by centralized sewer are illustrated in **Map 13** and in Figure 31.

Figure 31: Areas Served by Central Sewer in the Watershed						
Name	People	Homes	Acres	County	Violation*	Number
					Other Notes	
Columbus Metro Area	14,305	5,820	3,024.64	Franklin	Discharge to Scioto	
West Jefferson	4,302	1,694	668.92	Madison	Yes	110
Lake Darby Estates	4,057	1,359	1,324.28	Franklin	Yes	9
Pickaway Correctional Institute	3,667	5	1,246.63	Pickaway	No	0
Plain City	2,884	1,221	933.11	Union	Yes	12
Darbydale (to be complete 2005)***	1,773	684	424.80	Franklin	Not yet operating ***	
Mechanicsburg	1,744	761	661.50	Champaign	Yes	128
North Lewisburg	1,594	699	598.78	Champaign	Yes	287
Marysville	1,514	458	1,203.02	Union	Discharge to Mill Cr.	
Village Park	800	269	80.58	Franklin	No permit see above	
Timberbrook Subdivision	750	278	171.71	Franklin	Yes	121
Green Meadows Mobile Home Park	687	256	45.75	Madison	Yes	256
Clark Lake Shore **	648	240	259.51	Pickaway	Yes	60
Milford Center	626	241	226.25	Union	Tied to Marysville	
Timberlake	539	189	151.20	Franklin	No permit see above	
Fox Lair Mobile Home Park **	439	166	37.19	Pickaway	Yes	65
New California	341	119	324.04	Union	Tied into Marysville	
Woodstock	317	105	173.86	Champaign	Tied to N. Lewisburg	
Darbyville	300	102	309.41	Pickaway	Yes	8
Oakhurst Knolls	300	106	63.37	Franklin	Yes	20
Orient	269	102	79.42	Pickaway	Tied into PCI	
Canaan Community Mobile Homes	250	95	33.91	Madison	Yes	361
Jefferson Lodge Mobile Home Park	229	122	37.87	Madison	Yes	111
Young Estates	213	79	36.09	Franklin	No permit see above	
Big Darby Mobile Home Park	168	66	12.76	Pickaway	No Discharge	
Dot-Mar Mobile Home Park **	Included in Darbydale data			Pickaway	Yes	285
Suburbans Mobile Home Park	151	73	53.55	Madison	Yes	94
Greentree Mobile Home Park	128	65	13.05	Madison	Yes	94
Kimberley Woods	97	35	37.89	Union	Tied to Marysville	
Darby Meadows	89	25	25.85	Union	Yes	85
Picket Fences Mobile Home Park	41	21	3.94	Madison	Yes	141
Wissalochichan Sewer District	33	21	12.64	Madison	Yes	45
Crottinger Estates	30	11	28.10	Union	Yes	180
Reflections Subdivision	30	10	54.86	Union	Onsite wetlands	
Totals : 33 Areas Served	43,315	15,497	12,358			

*Violations were from 1/2000 to 3/2005, **Will be tied into Upgraded plant at Pickaway Correctional Institute
 ***New Darbydale plant will eliminate failing – Pleasant Acres, Community Gardens, and Oak Hills Mobile Homes

Higher density development in the watershed is largely influenced by access to centralized sewer systems. The Hellbranch watershed is working to develop a plan to address the further extension of water and sewer service into the Hellbranch watershed in a manner that best protects the water resources of that area. When this is complete, future development can be expected in this region. Additionally, Union and Logan counties are working to install a regional wastewater treatment plant to serve four communities and several industrial companies that serve Honda. The initial flow of the plant is expected to be around 300,000 gpd, but the plant is going to be sized to handle 700,000 gpd. With this additional capacity new development is expected in the headwaters of the Darby Watershed.

The communities of Plain City, West Jefferson, Marysville, and Columbus have completed a 201 Plan through the Ohio EPA. A 201 defines the current service areas for centralized water and sewer. In addition it defines a 20 year service area that the community plans to service (See **Map 14**).

C. Agriculture

GENERAL STATISTICS

The landscape of Darby Watershed is predominately agricultural. Land in the Darby Watershed is some of the most productive land in the state for corn and soybeans (See Figure 32). Much of the watershed is composed of land that is rated as prime farmland or prime when adequately drained. Glacial activity left a layer of fertile topsoil that, with the proper drainage, is well-suited for agriculture. The identification and protection of prime farmland is important to the agricultural community. A series of 4 maps has been created illustrating a detailed look at prime farmland in the watershed (see *Prime Farmland* section below). According to the 1997 USDA Agricultural census, 73 percent of land in the 6 county area was farmed. This figured dropped to 71 percent in the 2002 Agricultural Census. The Hybrid Land Use data in **Figure 16** estimates a total of 73.5 percent agricultural land in the Darby Watershed. Approximately 85 percent of all cropland in the six county area is utilized for corn and soybeans. The data in the following Figures 32-38 are for the entire county listed and is not specific to the boundaries of the Darby Creek Watershed. (**Note:** In the following tables, “D” was used so that information regarding individual farms would not be disclosed.)

Corn Production	2001 Rank	2002 Rank	2003 Rank
<i>Madison</i>	3	2	4
<i>Champaign</i>	4	15	13
<i>Pickaway</i>	6	1	5
Soybean Production	2001 Rank	2002 Rank	2003 Rank
<i>Madison</i>	2	6	4
<i>Pickaway</i>	5	10	6
<i>Union</i>	10	15	22

Source: Ohio Department of Agriculture, 2001, 2002, and 2003 Ohio Agricultural Statistics

<i>County</i>	<i>1999</i>	<i>2003</i>	<i>Percent Change</i>
<i>Champaign</i>	186,600	186,800	0.11%
<i>Franklin</i>	74,300	62,700	-15.61%
<i>Logan</i>	173,300	173,200	-0.06%
<i>Madison</i>	224,900	219,500	-2.40%
<i>Pickaway</i>	229,700	225,800	-1.70%
<i>Union</i>	217,900	174,600	-19.87%

Source: Ohio Department of Agriculture, 1999 and 2003 Ohio Agricultural Statistics

Figure 34: Irrigated Farms by County

County	2002		1997	
	Farms	Acres	Farms	Acres
Champaign	23	9,919	14	4,580
Franklin	59	5,428	44	2,287
Logan	15	3,118	6	(D)
Madison	22	8,331	13	1,075
Pickaway	20	7,223	14	4,348
Union	30	2,915	21	2,338

Source: USDA, Agricultural Census, 1997, 2002

Figure 35: Farm Data by County

County	Avg. Farm Size	Percent of Land in Farms
Champaign	222	75.7%
Franklin	145	23.6%
Logan	213	76.7%
Madison	337	82.5%
Pickaway	348	85.6%
Union	239*	87.3%*

Source: USDA, Agricultural Census, 2002
*Based on Ohio Dept. of Ag., 2002 Statistics

Figure 36 summarizes information from the U.S. Agricultural Census of 2002 for each county inside the watershed. Figure 37 compares the difference in farm size and total number of farms between the 1997 and 2002 data. Again, this data is not specific to the boundaries of the Darby Watershed.

Figure 36: Average Farm Size by County

Farm Size	Champaign		Franklin		Logan		Madison		Pickaway		Union	
	farms	%	farms	%	farms	%	farms	%	farms	%	farms	%
Acres												
1-9	127	13.6%	149	26.6%	89	8.4%	55	7.5%	91	11.5%	116	11.4%
10-49	303	32.3%	201	35.8%	349	33.1%	221	30.3%	245	31.0%	345	33.8%
50-177	259	27.6%	105	18.7%	357	33.8%	161	22.1%	166	21.0%	266	26.1%
180-499	137	14.6%	62	11.1%	139	13.2%	129	17.7%	131	16.6%	146	14.3%
500-999	57	6.1%	29	5.2%	70	6.6%	101	13.8%	72	9.1%	71	7.0%
1000+	54	5.8%	15	2.7%	51	4.8%	63	8.6%	86	10.9%	77	7.5%
Totals	937	100.0%	561	100.0%	1055	100.0%	730	100.0%	791	100.0%	1021	100.0%

Source: USDA, Agricultural Census, 2002

Figure 37: Percent Change between 1997 and 2002 Agricultural Census

Farms by Size	Champaign	Franklin	Logan	Madison	Pickaway	Union
Acres	% Change	% Change	% Change	% Change	% Change	% Change
1-9	29.59%	144.26%	30.88%	14.58%	46.77%	58.90%
10-49	50.75%	57.03%	70.24%	55.63%	54.09%	86.49%
50-177	8.82%	-8.70%	1.42%	-0.62%	-10.27%	-3.97%
180-499	-14.38%	10.71%	-10.90%	-14.00%	-10.27%	-7.59%
500-999	-34.48%	3.57%	2.94%	7.45%	-1.37%	-8.97%
1000+	3.85%	-21.05%	10.87%	-11.27%	10.26%	92.50%
Number Farms	12.08%	37.84%	17.88%	9.45%	12.52%	25.89%
Ave. Size of Farm	-16.23%	-26.02%	-10.88%	-14.25%	-8.42%	Same size

Source: USDA, Agricultural Census, 1997 and 2002

The data in figure 33 and 37 both illustrate the changing landscape in Darby Watershed. In figure 33 both Union and Franklin County had a significant drop in the amount of land that was planted in soybeans, corn, wheat, and hay. Both of these counties are also experiencing the most intense development pressure from the Columbus Metropolitan area and the city of Marysville. The fragmentation of the landscape by rural housing sprawl creates a hardship for the agricultural community by increasing transportation time and costs and complicating planting and harvest on smaller fields. In the watershed the average farm size has decreased considerably in only 5 years as seen in figure 37. Some possible contributions to the smaller average farm size are increased population, fragmentation of the landscape, and diversification of the agricultural community.

Figure 38 compares the amount and types of fertilizers or chemicals applied in each county for the years of 1997 and 2002.

Figure 38: Fertilizers and Chemicals Applied						
<i>County</i>	<i>Year</i>	<i>Commercial Fertilizer (Tons)*</i>	<i>Manure (Tons)</i>	<i>Insect (Units)</i>	<i>Vegetation (Units)</i>	<i>Disease (Units)</i>
Champaign	2002	135,402	6,456	27,066	135,930	2,381
	1997	144,745	na	31,233	136,612	2,531
Franklin	2002	41,174	5,580	3,606	33,746	276
	1997	56,646	na	7,713	47,890	78
Logan	2002	150,689	7,562	16,408	174,092	1,948
	1997	121,111	na	20,012	109,038	958
Madison	2002	192,794	4,478	29,217	167,067	1,752
	1997	184,610	na	35,885	193,588	3,379
Pickaway	2002	183,753	12,778	42,324	154,908	d
	1997	203,355	na	34,700	172,572	155
Union	2002	161,509	8,378	12,556	168,153	75
	1997	124,796	na	15,908	133,858	994

Source: USDA, Agricultural Census, 2002

*1997 Data did not include Lime

** Insect data also includes Nematodes

Number of Farms

The U.S. EPA in 1996 estimated the watershed to have a total of 1,200 farms. In order to find out an approximate total number of farms in the Darby Watershed today, one could use the number of acres each county has in the watershed based on county percentages for land in farms and average farm size. Figure 39 provides the approximate number of farms and acres farmed in the Darby Watershed.

<i>County</i>	<i>Farmed Acres</i>	<i>Number of Farms</i>
Champaign	41,954	189
Franklin	12,699	88
Logan	12,916	61
Madison	81,544	270
Pickaway	30,628	88
Union	72,573	304
Totals	261,429	998

The result is approximately 1,000 farms in the Darby Watershed. The Agriculture Census identified several irrigated farms in the six county area. Irrigated farms are typically those that grow fruit, vegetables, and sod. The total number of irrigated farms in each county is listed in Figure 34. Lastly, four organic farms are located in Madison and Franklin Counties.

Livestock

The watershed includes a number of larger livestock operations, but only two with over 1,000 head or more. Both of these operations are located in Pickaway County. In addition, Pickaway county has a total of six swine and seven beef operations. Madison County has nine sheep, 17 dairy, nine beef, six exotic, and 13 horse operations. Logan County has three dairy and one beef operations within the watershed. Franklin County has one large feed lot of 500 beef cattle and between 19 and no more than 30 other livestock operations. Figure 40 lists county data on livestock totals. Figure 41 lists the total number of nutrient management plans in the Darby Watershed. A growing number of residents in the watershed own several horses, llamas, or other animals on lots too small to properly treat the amount of animal waste produced. (Problems associated with these actions will be discussed in the **Subwatershed Plans** section.)

<i>County</i>	<i>Cattle</i>	<i>Milk Cows</i>	<i>Hogs and Pigs</i>	<i>Sheep</i>
Champaign	11,800	1,900	19,200	1,000
Franklin	2,000	*	4,400	1,400
Logan	12,700	3,600	22,200	2,400
Madison	9,100	4,500	22,000	1,400
Pickaway	10,500	2,000	30,000	1,100
Union**	2,135	1,870	3,450	120

All Data from January, 2004 except hogs from January, 2003

*Counties with less than 1,000 head were not published

**Specific to Darby Watershed

Source: Ohio Department of Agriculture, Ohio Agricultural Statistics, 2003

Figure 41: Nutrient Management Plans	
<i>County</i>	<i>Number</i>
Champaign	Not Available
Franklin	0
Logan	4
Madison	9
Pickaway	7
Union	3

Source: NRCS, 2002

AGRICULTURAL SOILS

Prime Farmland

The following sections summarize prime farmland in the 11 digit subwatersheds of the Darby Watershed. With proper drainage and flood protection nearly 90 percent of soils in the Darby Creek Watershed are prime (See Figure 42). However, only about 20 percent of prime soils are rated prime without drainage. Removal of water in drainage ditches from agricultural fields is critical in maintaining high productivity. The large amount of prime farmland and extensive drainage account for the high intensity and productivity of agriculture in the Darby Watershed.

Figure 42: Darby Creek Watershed Prime Soils		
<i>Farmland Rating</i>	<i>All Land Percent</i>	<i>Agricultural Land Percent</i>
Not Prime	10.05%	6.68%
All Prime	21.00%	18.51%
Prime If Drained	65.91%	72.64%
Prime if protected from flooding	0.13%	0.16%
Farmland of Local Importance (Union County)	2.01%	1.71%
Prime if drained and protected from flooding during the growing season	0.33%	0.23%
Water and other soils	0.57%	0.07%

The farmland ratings in Upper Big Darby and Little Darby Creek are similar with between 13 and 16 percent of soils rated as “all prime” and between 70 and 77 percent as “prime if drained.” In the Middle Big Darby subwatershed over 90 percent of agricultural land is rated “prime if drained.” In the Lower Big Darby a considerably higher percentage of soils are rated all prime compared to the other watersheds (See Figure 44). These statistics emphasize the importance of drainage to the productivity of agricultural land in the Darby Watershed. For maps and a detailed look at all the soils (not just agricultural land) in the watersheds described below please see Appendix C.

Figure 43: Farmland Ratings by Major Subwatershed for Agricultural Land

<i>Watershed</i>	<i>Not Prime</i>	<i>All Prime</i>	<i>Prime if Drained</i>	<i>Farmland of Local Importance</i>	<i>Prime if drained and protected from flooding</i>	<i>Other Soils</i>
Headwaters Big Darby	8.13%	16.35%	69.76%	5.32%	0.26%	0.18%
Middle Big Darby	1.48%	8.07%	90.45%	0.00%	0.00%	0.00%
Lower Big Darby	5.04%	38.75%	55.34%	0.82%	0.05%	5.04%
Little Darby Creek	8.53%	13.52%	77.40%	0.09%	0.42%	0.04%

Highly Erodible Soils

The highly erodible factor was derived from soil surveys from each county. Detailed maps (four) and descriptions of this factor are available in Appendix A. The following figure summarizes the erodibility of soils on agricultural land.

Figure 44: Erodibility of Agricultural Land by Major Subwatershed

<i>Watershed</i>	<i>Highly Erodible</i>	<i>Not Highly Erodible</i>	<i>Potentially Erodible</i>	<i>Water and Other Soils</i>
Headwaters Big Darby	12.50%	60.10%	27.07%	0.32%
Middle Big Darby	0.43%	81.33%	18.10%	0.15%
Lower Big Darby	1.48%	61.24%	36.74%	0.54%
Little Darby Creek	6.00%	61.37%	32.46%	0.17%

The Headwaters of Big Darby had the most highly erodible soils with over 12 percent followed by Lower Big Darby with 6 percent. Middle Big Darby and Little Darby had the least amount of highly erodible (See Figure 6). For more detail on the erodibility of all soils in each watershed below see Appendix A.

SOIL CONSERVATION

Conservation Tillage (No-Till)

Tillage of cropland is an important factor in soil erosion. The Natural Resource Conservation Service (NRCS) takes transects of each county to determine the tillage practices used with each crop (See Figure 45). For the year 2002, the range in conservation tillage was a low of 24 percent (in Union County) and a high of 52 percent (in Madison County) for corn. The percentage of conservation tillage used for soybeans is considerably higher than for corn. The range of conservation tillage for the six counties was a low of 65 percent in Logan County and a high of 83 percent in Champaign County. The average for Ohio soybean production was 67 percent using conservation tillage and 33 percent using conventional tillage.

Figure 45: Conservation Tillage by County		
Corn		
<i>County</i>	<i>Conservation Tillage (>30% residue)</i>	<i>Conventional/Other Tillage (<30% residue)</i>
Champaign	34%	66%
Franklin	47%	53%
Logan	45%	55%
Madison	52%	48%
Pickaway	32%	68%
Union	24%	76%
Ohio Average	33%	67%
Soybeans		
<i>County</i>	<i>Conservation Tillage (>30% residue)</i>	<i>Conventional/Other Tillage (<30% residue)</i>
Champaign	83%	17%
Franklin	72%	28%
Logan	65%	35%
Madison	67%	33%
Pickaway	75%	25%
Union	75%	25%
Ohio Average	67%	33%

Source: NRCS, 2002

Farmers have changed their farming practices as needed to take residue management into account. Residue management helps reduce soil and wind erosion, increases soil organic matter, and improves the soil structure and water infiltration. Leaving as little as 10 percent residue cover on a field can reduce erosion by as much as thirty percent. Leaving 30 percent residue cover on a field can reduce erosion by 65 percent. In the more rolling portions of the watershed in Union, Logan, and Champaign Counties a winter cover crop is important in reducing the amount of soil that leaves fields.

CONSERVATION PRACTICES IN WATERSHED

History of Hydrologic Unit Area

In 1991 the USDA recognized the Darby Watershed as a Hydrologic Unit Area (HUA). The HUA designation increased funding available to agencies involved in the watershed such as the NRCS and the Ohio State University Extension. Approximately \$600,000 in cost-share funds was administered to farmers by the Farm Service Agency (FSA) between 1991 and 1995 to implement conservation and best management practices. The major improvements in the watershed through 1996 include:

- Between 1991 and 1996 conservation tillage (no-till) in the watershed increased from 45,000 acres to approximately 111,000 acres.
- In 1996, sediment entering the stream from farms was reduced from the historical average of 125,000 tons/year to 100,000 tons/year.
- Nutrient and pest management plans were applied on 14,650 acres
- 136 filter strips were installed
- 191 acres of grassed waterways were planted
- 17,783 feet of fencing were installed along the Darby and its tributaries
- 321 acres of trees were planted
- 14 water and sediment control basins were installed.

Source: U.S. EPA, 2000

It is clear that from 1991 to 1996, conservation practices increased, thus improving water quality. However, the overall success of this program is not entirely clear because the extent to which farmers converted to conservation practices may have been part of a widespread trend across the region and not the HUA program. In addition, improvements in conservation practices were varied across the watershed.

Agricultural Districts

Land that is in agricultural production has the ability to be included in an agricultural district in Ohio. Agricultural districts provide farmers protection against nuisance suits over farm operations, deferment of tax assessments on land to build sewer and water lines, and allow for additional review if land is taken by eminent domain for a public purpose. Agricultural districts are established by the individual landowner filing an application to the county auditor. The figure below lists the approximate acreage of agricultural districts in the Darby Watershed as collected in 2001-02.

Figure 46: Agricultural Districts	
<i>County</i>	<i>Total Acres</i>
Champaign	10,133.41
Franklin	0
Logan	2,022.59
Madison	10,287.91
Pickaway	13,760.00
Union	14,450.00

Conservation Reserve Program (CRP)

An additional USDA program, CRP, began in 1985 and was expanded in 1996. This program was designed to protect soil and water quality through direct payment to farmers that removed eligible cropland from environmentally sensitive lands for 10 years and established resource-conserving cover on the land. Figure 47 summaries CRP data from 1990-1992.

Figure 47: List of Acres Enrolled in CRP in the Darby Watershed 1990-1992

County	# Acres in Watershed	CRP Eligible lands (Ac.)	Enrolled through 1990	Enrolled through 1991	Enrolled through 1992	Total	Percent of Eligible
Champaign	56,898	19,000	1,767	1,815	855	4,437	23%
Franklin	57,175	1,250	550	1,547	95	2,192	175%
Logan	18,267	9,150	1,500	510	328	1,338	15%
Madison	116,010	30,400	1,500	1,173	605	3,278	11%
Pickaway	40,529	2,050	363	483	454	1,300	63%
Union	82,757	27,650	400	2,538	1,223	4,161	15%
Total	371,668	89,500	5,080	8,066	3,560	16,706	19%

*Greater than 100% for Franklin County is because of a change in CRP sign-up rules that permitted any land in the hydrologic unit to be eligible; Franklin County was designated a hydrologic unit in 1991.

Source: Gordon and Simpson, 1994, Table 2.3

Eligibility for soils in CRP was based on fields with two-thirds or more highly erodible cropland. By 1992, approximately 16,706 acres were enrolled in the CRP program which was roughly 19% of all soils eligible for the program. The present CRP enrollment in the Darby Watershed was generated several years ago from FSA and NRCS as illustrated in Figure 48 and new contracts between 2001 and 2004 are represented in Figure 49.

Figure 48: Present Enrollment in CRP

County	Acreage
Champaign	1,570
Franklin	571
Logan	172
Madison	1,060
Pickaway	864
Union	1,500* - 2,286*
Total	5,737 - 6,523

* The fluctuation in acreage reflects the different estimates provided by the FSA and NRCS, 2001

Figure 49: New CRP Contracts in Darby Watershed

County	2001	2002	2003	2004
Champaign	No Data Submitted			
Franklin	8.4	70	120.2	10.6
Logan	4	6	5.5	11
Madison	No Data Submitted			
Pickaway	393	366	394	461
Union	13.5	14	19	72
Totals	418.9	456	538.7	554.6

Source: NRCS, 2005

Environmental Quality Incentives Program (EQIP)

This program is another USDA program designed to help farmers improve their livestock operations and implement conservation practices. The EQIP contract ranges from one to ten years and provides farmers with cost-shares to implement conservation practices. The program provides cost-sharing to farmers of up to 75 percent of the cost of conservation practices for up to three years to encourage farmers to carry out management practices that may not otherwise be implemented without an incentive. New farmers may be eligible for cost shares up to 90 percent. Figure 50 summarizes the EQIP Contracts in the Darby Watershed between 1998 and 2001.

Figure 50: EQIP Contracts 2001 - 2004				
	2001	2002	2003	2004
County	Acres	Acres	Acres	Acres
Champaign	518	X	X	X
Franklin	67	0	0	42
Madison	1	X	X	X
Logan	0	0	0	0
Pickaway	0	0	72.2	233.7
Union	0	1	0	0
Totals	585	1	72.2	275.7

X – No data submitted

Source: NRCS, 2001, 2005

Darby Low Interest Loans

The Ohio EPA’s Water Pollution Control Loan Fund (WPCLF) offers landowners below market interest rate loans for agricultural practices and equipment to improve water quality. The Darby Watershed has had an active low interest loan program since the spring of 1995. There have been a total of 81 low interest loans. Figure 51 defines which counties have enrolled in the program and Figure 52 explains the types of practices utilized.

Figure 51: Low Interest Loan Program Statistics		
County	Number of Loans	Average Loan Amount
Union	20	\$34,107
Logan	11	\$45,848
Madison	22	\$31,577
Franklin	4	\$25,875
Pickaway	13	\$29,751
Champaign	11	\$42,013
<i>Averages</i>	13.5	\$34,982
Total	81	\$2,833,568

Source: Ohio EPA, 2004

Figure 52: Darby Creek Watershed Loan Interest Loan Program 1996 - 2003			
<i>Practice</i>	<i>Number of Practices</i>	<i>Loaned Amount</i>	<i>Percent of Total Loans</i>
No Till Planters	53	1,749,804	56.51%
Other Conservation Planters	19	732,948	23.67%
Chemical Sprayers	12	7,671	0.25%
Manure Management (Bobcats, manure tanks, Agitator)	14	247,505	7.99%
Land Conservation (Trees, Waterways, Filter Strip)	4	270,314	8.73%
Electronic Tools (GPS, Computers)	5	4,515	0.15%
Cultivators	3	23,000	0.74%
Dryer	3	30,500	0.99%
Other (Loan Fees)	15	30,000	0.97%
Totals	128	3,096,257	100%

Source: Ohio EPA, 2004

Conservation Reserve Enhancement Program (CREP)

CREP is a new program through USDA which provides enhanced incentives for landowners interested in setting aside eligible cropland or marginal pasture land along riparian areas. This program is for the entire Scioto Watershed which includes the Darby Watershed. Eligibility for the program requires that the land was cropped 4 out of 6 years between 1996 and 2001 or is marginal pasture land **along streams**. Land within the 100 year floodplain, within a 200 foot buffer of the stream, and adjacent highly erodible soils are all eligible. There are approximately 25,000 acres of land within the Darby Watershed that are eligible for this program.

This program is very similar to the existing CRP program but pays between 150 and 200 percent of soil rental rates for various conservation practices. The four major conservation practices that will be installed in this program are cool season grasses, warm season grasses, tree plantings, and wetlands. Additional bonuses and incentives are available depending on the practice. The Farm Service Agency (FSA) and NRCS are working to enroll landowners in this program which started in the middle of February, 2005 and will continue through the end of 2007. For additional information on this program see your local FSA or NRCS office representative.

D. Forested Lands

FOREST LAND USE DATA

Forested regions in the watershed comprise nearly 20 percent of land in the watershed (See Figure 16). Much of the virgin forests in Ohio have been cleared for agricultural purposes and were reduced to small isolated woodlots. In the Darby Watershed, as much as seventy-five percent of forested land is located in isolated tracts less than twenty-five acres in size. Despite the fact that few large tracts of forested land remain, a thin forested strip was retained along

much of the stream banks. The forested lands and river corridor that exist today still retain a high level of plant and animal diversity. Contiguous tracts of forested land serve as excellent habitat, particularly along stream corridors. The forest cover for individual subwatersheds ranges from 6 percent to 36 percent according to the hybrid land use data layer (See Figure 17).

FOREST COVER CANOPY AND TYPE

The type of forest cover in the Darby Watershed varied from sparse woodland stands to dense mature forests. In 1997, Ohio EPA researchers explored the type of cover and the percentage of canopy for different forest types in the watershed. Wooded areas along streams are important because they filter sediment and nutrients, convert nutrients, and are a source of carbon and detritus for aquatic life (White and Williams, 2000). The continuity of this habitat as well as width is important in the overall quality of the stream. White and Williams explain that wide zones of riparian cover are most beneficial, but narrow-width regions, 15 feet or less, also demonstrate significant benefits toward water quality (White and Williams, 2000). In June and July of 1997 satellite imagery was collected to analyze the reflectance of different land covers. Approximately 75 sites were identified and tested for accuracy. The forest vegetation was summarized into four different classes and are described below in Figure 53.

Figure 53: Forest Cover Types and Canopy Percentages		
<i>Land Cover Type</i>	<i>Canopy Cover (Percent)</i>	<i>Description</i>
Forest	60 – 100	Trees > 5m w/crowns interlocking.
Woodland	25 – 60	Open stands of trees usually >5m w/crowns not touching.
Sparse Woodland	10 - 25	Trees usually >5m in height w/widely spaced crowns.
Shrub	> 25	Shrubs or trees usually 0.5 - 5m in height.

Source: Adapted from -White, Dale and Williams, David. 2000. *Assessment of Land Use and Land Cover and Riparian Corridor using Satellite Remote Sensing*. Ecological Risk Assessment Project, pg. 6.

The following figure defines only the forest vegetation in the watershed. Non-forested land uses are not considered in the values below.

Figure 54: Summary of Forest Vegetation in Watershed		
<i>Land Cover Type</i>	<i>Canopy Cover</i>	<i>Percent of Forest Vegetation</i>
Shrub	>25	47
Sparse Woodland	10 - 25	21
Woodland	25 - 60	18
Forest	60 - 100	14
Total		100

Source: *White and Williams, 2000*

The purpose of this research was to be able to analyze the forested vegetation in the riparian corridor of the Darby Watershed. The research concluded that within a 120 foot on either side of the stream approximately 50 percent of the vegetation was wooded vegetation and the other 50 percent was non-wooded.

WILDLIFE HABITAT INCENTIVE PROGRAM (WHIP)

WHIP is a voluntary program for people interested in developing or improving both aquatic and land wildlife habitat primarily on private lands. NRCS provides the technical assistance for landowners and provides up to 75 percent cost-share to establish and improve wildlife habitat. The WHIP contracts with NRCS typically last between 5 and 10 years. A variety of practices are eligible for this program including prairie restoration, wetland creation, and stream buffer protection. Of the 4 counties reporting data in the past four years Franklin and Union County have contracted a total of 47 acres and 5 acres of land respectively.

E. Gravel Pits

The Darby Creek Watershed contains several gravel pits. Gravel pits when placed too close to a stream can have negative impacts on downstream water quality. Union County has none in the watershed. Shelly Materials is located near East Liberty in Logan County. Moore's Excavating Company and D and W Sand and Gravel are both located in Champaign County close to the edge of the watershed boundary. Tuffco Sand and Gravel is near Plain City in Madison County. Olen Corporation, located in Franklin County, is also on the Big Darby Creek but was shut down in 2003 and will be converted into a park by Franklin County Metroparks. Pickaway County has the highest number of sand and gravel pits. Darby Creek Excavating is in Muhlenburg Township, Roy M. Roush, and George Jingle Construction are all in Darby Township. See **Map 15** for gravel pit locations and the material mined.

F. Wetlands

WETLAND LAND USE DATA

In the Darby Watershed, no significant wetlands or negative impacts have been identified (ODNR, 1992). Wetlands comprise 852 acres of all land in the Darby Watershed according to the USGS National Land Cover Dataset and roughly 2,354 acres according to the Ohio Wetland Inventory in 1987. Many of the remaining wetlands are scattered wooded tracts and are privately owned. However, a number of small wetlands exist along the river and tributary corridors providing excellent habitat and food for many species of birds, reptiles and mammals as well as buffering the stream from potentially harmful impacts that often result from development and agricultural practices.

WETLAND RESERVE PROGRAM (WRP)

The USDA created the Wetland Reserve Program (WRP) a voluntary program aimed at the restoration and protection of wetlands on private property (U.S. EPA, 2000). Figure 55 lists the number of acres and new contracts in the Darby Watershed. The U.S. EPA (2000) estimated approximately 300 acres in WRP. This number has raised considerable in the past 6 years to 858 acres, in part, to some large wetlands in the Franklin County Metroparks, but many more acres could be included in this program through existing and constructed wetlands (NRCS, 2002).

Figure 55: Wetland Reserve Program Enrollment		
<i>County</i>	<i>Total Acres</i>	<i>Riparian Acres</i>
Champaign	72.8	72.8
Franklin	246.4	246.4
Logan	0.0	0.0
Madison	318.6	301.5
Pickaway	172.6	172.6
Union	2.0	0.0
Total	858.5	839.4

Source: NRCS, 2002, 2005

G. Parks, Preserves, and Historical Sites

A large number of entities have set aside land in the watershed for parks and preserves. **Map 16** illustrates the lands that have been set aside for parks or preserves in the Darby Watershed. ODNR Scenic Rivers Department is working to create a database of all lands set aside for preservation. To this date ODNR has calculated that there are over 9,200 acres set aside in parks, nature preserves, and permanent easements.

PUBLIC PARKS AND RESERVES

Battelle-Darby Creek Metro Park

Battelle-Darby Creek Metro Park is located in southwest Franklin County located off of US 40 west of Columbus on Darby Creek Drive. The park is 6,571 acres in size and is located at the confluence of the Little and Big Darby Creeks. The park which opened in 1959 is now the largest Metro Park in the state. Prairie and wetland restoration projects have been ongoing activities within the park. A total of 10 prairie habitats and 5 wetland sites exist. In addition, the park conducts a streamside classroom program in which the park naturalists present interpretive programs on the Darby Creeks. The park offers miles of hiking trails and has a canoe access parking lot off of Alkire Road just east of Gardner Road.

Franklin County Metroparks have recently considered the possibility of building a bike path connecting Prairie Oaks and Batelle Darby Parks. The trail would be approximately 6 miles long.

During the first half of 2005, Franklin County Metroparks is working to create master plan for their parks within the Darby Watershed. This plan will include management plans and acreage goals in the watershed.

Prairie Oaks MetroPark

Prairie Oaks Metro Park is 1,635 acres, opened in November of 2003 and is located in western Franklin and northeastern Madison counties. Prairie Oaks is an excellent example of the diversity of species represented in the Darby Creek Watershed. The park also features some of the largest burr oak and sycamore trees in the state that date to pre-European settlement. In total, 330 acres of grassland and prairie were restored in 2000 and another 400-500 acres are planned for restoration. During 2001-2002 the park constructed 4 wetlands. The parks active role in re-creating grassland, prairie, and wetland environments has created a unique local ecosystem that is home to many rare species (ODNR, 2003).

Bigelow Cemetery State Nature Preserves

Bigelow Cemetery, ½ acre, was dedicated as an interpretive state nature preserve in 1978 to protect the remaining healthy colonies of prairie grasses and wildflowers that during one time covered the Darby Plains. An example of the type of prairie vegetation that is represented in the preserve is listed in the table below.

Figure 56: Bigelow Cemetery State Nature Preserve	
<i>- Significant Plant Species -</i>	
<i>Big Bluestem</i>	
<i>Indian Grass</i>	
<i>Purple Coneflower</i>	
<i>Gray-headed Coneflower</i>	
<i>Scurf Pea</i>	
<i>Whorled Rosinweed</i>	
<i>Rough-leaved Goldenrod</i>	
<i>Royal Catchfly</i>	

Source: ODNR, 1992; pg. 65

The Ohio Division of Natural Areas and Preserves maintains a management program designed to protect the historic tombstones and prairies species. The ½ acre preserve is located in Madison County, eight miles west of Plain City and a half mile south on Rosedale Road off of SR 161. A short trail system and parking is available.

Smith Cemetery State Nature Preserve

In 1982, Smith Cemetery was dedicated to the Ohio Department of Natural resources to manage and protect as a state nature preserve. Maintenance of the one acre park is performed to help protect the prairie vegetation and the historic tombstones. An example of the type of prairie vegetation that is represented in the preserve is listed in the table below.

Figure 57: Smith Cemetery State Nature Preserve	
<i>- Significant Plant Species -</i>	
<i>Prairie False Indigo</i>	
<i>Big Bluestem</i>	
<i>Little Bluestem</i>	
<i>Indian Grass</i>	
<i>Prairie Cord Grass</i>	
<i>Purple Coneflower</i>	

Source: ODNR, 1992; pg.; 65

Smith Cemetery Preserve is located two miles west of Plain City on SR 161, 1 mile south on Kramer Road which then becomes Converse Chapel Road, and then ¼ mile west on Boyd Road. The preserve is on the north side of the road and has a short trail (ODNR, 2003,).

Milford Center Prairie State Nature Preserve

The preserve is located south of Milford Center in a powerline right-of-way. The preserve is 1 ½ miles long, totaling seven acres, and is a significant prairie remnant in the Darby Plains. The preserve is located 2 and half miles south of Milford Center, a half mile west on Connor Road off of SR 4.

SCENIC RIVERS

The goal of Scenic River programs both at the State and National level is to maintain and enhance a river's current natural condition and provide for public use in a way that does not compromise the stream's natural value. The attention gained from such designations is important in drawing attention to a stream and enhancing its protection. It is important to note that the designation of the Big and Little Darby Creeks as both State and National Scenic Rivers does not mean they are "river parks." This idea implies that the rivers are publicly owned lands for recreational use. Recreational use is expected but the management and protection of natural and cultural values is emphasized. Such protection does not require public purchase of land because other methods of protection can be utilized through zoning, restrictions on development in floodplains, donations of development rights to land trusts, and easements. Through such methods, the land owner retains ownership of the land but plays a proactive role in the protection of the stream.

Ohio State Scenic River

In 1968, Ohio passed the nations first scenic river act in an attempt to protect high quality streams for future generations. Currently 11 Ohio River systems and 20 individual stream segments are designated as State Scenic Rivers. A State Scenic River is defined as a waterway which still retains its natural character for the majority of its length. Scenic rivers retain most of their natural characteristics at a time when many rivers reflect the negative impacts of human activities.

The Scenic Rivers Act provides three categories for river classification: wild, scenic and recreational. These criteria examine the stream's length, adjacent forest cover, biological characteristics, water quality, present use and natural conditions. Portions of Big and Little Darby Creeks were designated State Scenic Rivers on June 22, 1984 and October 3, 1994. Approximately 84.5 miles (84 percent of total stream length) were included in the designation. Big Darby Creek was designated from the Champaign-Union County line downstream to the US Route 40 bridge and from the northern boundary of Battelle-Darby Creek Metro Park to the confluence with the Little Darby Creek downstream to the Scioto River. Little Darby Creek was designated from the Lafayette-Plain City Road bridge downstream to the confluence with Big Darby Creek. Approximately 20.0 miles out of 43.6 miles (45.8 percent) of Little Darby Creek were designated. Logan and Champaign Counties along with landowners on a portion of the stream adjacent to Darby Dan Farms did not desire to be designated as a State Scenic River.

National Scenic River

In March of 1994, parts of Big and Little Darby Creeks were designated as a component of the National Wild and Scenic River System for a total of 82 miles. The Big and Little Darby Creeks, Little Beaver Creek in eastern Ohio, and the Little Miami are the only rivers in the state designated under the National Wild and Scenic River Act. The focal point of the Act is to protect rivers in free-flowing condition with outstanding remarkable values (fish, geologic, historic, cultural, scenic and others). The “Scenic Rivers” designation for the Big and Little Darby Creeks was created because the Darby has a number of unique species and is a free-flowing system that lacks impoundments and has a streambank that is largely primitive and undeveloped.

The Big Darby Creek is designated as a National Scenic River from the Champaign-Union County line downstream to the Conrail railroad trestle and from the confluence with the Little Darby Creek downstream to the Scioto River. For Little Darby Creek from the Lafayette-Plain City road Bridge downstream to within 0.8 mile from the confluence with Big Darby Creek.

Designating the Big and Little Darby Creeks as Scenic Rivers gave the Director of the Ohio Department of Natural Resources the power of review and approval over proposals for public projects within the designated boundaries of the Scenic River. ODNR may also acquire property along the rivers for recreational or preservation purposes. The state of Ohio can purchase easements to aid in preserving scenic integrity while allowing for continued uses such as farming. Figure 58 summarizes the total amount of easements ODNR holds in the Darby Watershed.

Figure 58: ODNR Scenic River Easements	
<i>Location</i>	<i>Acres</i>
Big Darby Creek	146.11
Little Darby Creek	69.84
Total	215.95

Source: ODNR Scenic Rivers, 2005

The Scenic River corridor extends one thousand feet from normal waterlines parallel to the stream on either side of the creek. The boundaries along the river average no more than a quarter mile from each bank, equivalent to 320 acres per mile. This has been defined as a sufficient width to preserve, protect, and develop the natural character of the river. Most rivers have flexible boundaries to accommodate specific features and river values.

HISTORICAL LOCATIONS OR FEATURES

Historical Architecture

Historical structures are recognized at both a state and national level. The State of Ohio has 353 sites designated as historical locations in the Darby Watershed. A high concentration of state historical locations are centered around the villages of Plain City, Mechanicsburg, and Milford Center and scattered along U.S. 40. The highest concentration of the historical structures is in the village of Mechanicsburg which has a total of 112 state and national sites. A large number of sites are scattered throughout eastern Madison and western Franklin County in the Darby Watershed. Appendix E lists historical structures for the Darby Watershed by county.

Darby watershed has 25 structures recognized on the National Registry (See Figure 59). A detailed listing of the structure and name is included in Appendix F.

Figure 59: National Registry Sites	
<i>County- Municipality</i>	<i>Number</i>
Champaign - Mechanicsburg	20
Union – North Lewisburg	1
Union – Marysville	1
Union – Irwin	1
Madison – Plain City	2
Total	25

Archeological Sites

Archeological sites are also recognized by the State of Ohio. No specific information regarding archeological sites could be presented in this document because of the sensitive nature of the locations. The Ohio Historical Society was able to provide some summary information regarding the number of such locations in the Darby Watershed, summarized in Figure 60.

Figure 60: Archeological Sites in Darby Watershed	
<i>County</i>	<i>Number</i>
Champaign	11
Franklin	165
Logan	35
Madison	64
Pickaway	39
Union	88

Source: *Ohio Historical Society, 2004*

H. Planning and Zoning

ZONING

In the Darby Watershed most communities have some type of zoning in place to control the allocation and development of land. However, communities are not required to have zoning regulations. The Ohio State University Extension Agency of Community Development outlined the “purpose and nature” of zoning in Figure 61 as listed below.

Figure 61: Benefits of Zoning
<ul style="list-style-type: none"> • Use land for its most suitable purpose. • Protect or maintain property values. • Promote public health and safety. • Protect the environment. • Manage traffic. • Manage density. • Encourage housing for a variety of lifestyles and economic levels. • Manage aesthetics. • Provide for more orderly development. • Help attract business and industry.
Zoning Ineffectiveness to:
<ul style="list-style-type: none"> • Prohibit farm buildings or farming decisions. • Assure competent administration of the zoning requirements • Assure that land uses will be permanently retained as permitted under the zoning resolution. • Guarantee the structural soundness of buildings.

Adapted from: Stamm, John. 1999. Ohio State University Extension.

Zoning can be a powerful tool to control and plan for future changes in communities, but is often under utilized or not properly updated. It is important for communities to recognize the importance of zoning.

Agricultural Zoning

Agricultural Zoning is a special form of zoning that allows farmers and rural communities to protect and maintain agricultural regions instead of just individual farms as with Agricultural Districts. Protection of land for agricultural purposes is a legitimate zoning objective under the state planning statutes as described in the Ohio Revised Code (Hudkins, 1999). Agricultural Zoning ordinance can be used to prevent the fragmentation of farms, the conversion of land to non-farm uses, and land-use conflicts. A well-written Agricultural Zoning ordinance can protect agricultural producers from non-farm activities as well as residential zoning can protect housing areas from industrial factories (Hudkins, 1999). Agricultural Zoning, much like agricultural districts, clearly defines the use of a parcel in the hope of reducing conflicts that may arise

between farm and non-farm residents. Agricultural Zoning limits the density of development and restricts non-farm uses of the land (Rohrer, 1999). Agricultural lands can be zoned a number of different ways. For example an A-1 designation may allow one home per 20 acres whereas A-2 land may require 15 acres for each home. The density designations will vary from community to community. In order for a community to enact agricultural zoning, a public hearing is held before a zoning resolution can be passed by local governmental officials. The Madison County Comprehensive Plan, Zoning, and Farmland Preservation reverts all unincorporated areas to the A-1 or agricultural category. Madison County is the only county in the watershed that has zoned land as agricultural or A-1 land. All other counties place agricultural and rural land into a U-1 category or rural residential as in Franklin County.

Residential Zoning

Much of the land in the Darby Watershed has few zoning limitations except in Madison County. Madison County defines all land in unincorporated areas as agricultural land and focuses residential development to the cities and villages served by central water and sewer. However, most of Union, Champaign, Logan, and Pickaway Counties have a U-1 zoning designation which simply defines the land as rural. These areas have little protection from residential development except for a minimum lot size. Typically between 1 and 1.5 acres of useable land is required for the placement of a single family residence with an on-site septic system in rural portions of the watershed. In Franklin County the minimum lot size is 2.5 acres of useable land for the placement of residential unit on rural land. This form of development fragments the landscape, can cause travel on main roads to be dangerous with the increased number of driveways, detracts from the rural nature of a region, and costs money. In addition most soils in the watershed are not suitable for the placement of septic systems which can negatively impact water quality.

Residential zoning is currently being updated in several townships as mentioned in the county narratives below. The time and community effort placed into reworking zoning regulations is important in maintaining the resident's desired lifestyle and community.

COMPREHENSIVE PLANS

Land use planning is one of the best tools to guide growth toward achieving economic benefits and protecting environmental quality. A comprehensive plan is an all-inclusive look at current and future conditions within a jurisdictional boundary. Topics typically analyzed in a comprehensive plan are the adequacy of roads, schools, and other infrastructure, identification and protection of environmental resources, and future land use. A comprehensive plan is adopted by some form of local government and is then adopted into local law. The plan is then to be used as guidelines for the future development of the community (Conglose, 1999). Five of the six counties the Darby Creek Watershed have comprehensive plans but only a handful of townships, villages, and cities have enacted a comprehensive plan. Figure 62 below displays the current status of comprehensive planning efforts in the Darby Watershed.

Figure 62: Comprehensive Plans		
<i>County</i>	<i>Municipality</i>	<i>Year of Implementation</i>
Champaign	Champaign County	1993, update in progress
Champaign	Village of North Lewisburg	2003
Franklin	Brown Township	1998, 1992, update in progress
Franklin	Pleasant Township	2002
Franklin	Prairie Township	2003
Franklin	City of Columbus	1993
Franklin	City of Hilliard	2000
Logan	Logan County	1996, currently updating w/LUC*
Madison	Madison County	1995, update in progress
Madison	West Jefferson	1998, update in progress
Madison/Union	Village of Plain City	2003
Pickaway	none	none
Union	Union County	1999
Union	Darby Township	2003
Union	Liberty Township	In Progress
Union	Jerome Township	In Progress
Union	Allen Township	In Progress

* Logan, Union, and Champaign Regional Planning Commission

SUBDIVISION REVIEW PROCESS

Each county in the watershed has a subdivision review process. Madison County follows a different set of guidelines which will be discussed in following sections. Through the subdivision review any development with 6 or more lot splits from one parcel must meet the approval of the subdivision review board. The subdivision review board is typically made up of a Township representative, County Board of Health, County Soil and Water Conservation District, and County Engineer. This process provides guidelines to developers on site location, soils limitations, and design standards which address stormwater, erosion and sediment controls, and greenspace requirements. The farmland preservation plan for each county is considered with each subdivision request.

The subdivision review process is not required for minor lots splits of 5 acres or less on the original parcel in all counties but Madison. A review may be required if these lots are not located along an existing road infrastructure or the proposed lots splits are contrary to zoning regulations. Madison County reviews all lot splits to determine if the lot split follows the County Land Use Plan and meets the site, soil, and design standards which ensure proper stormwater controls, drainage, erosion and sediment controls, and greenspace requirements.

COUNTY PROFILES ON LAND USE CHANGE

The Darby Watershed represents a large variety of land use practices which vary in each county. The following sections will inventory county development as related to land use planning.

Logan County

The portion of the Logan County in the Darby Watershed is expected to experience continued large lot residential development with onsite wastewater treatment as industrial facilities continue to expand and locate near Honda along the SR 33 corridor and along SR 287. In the Darby Watershed portion of Logan County there was a 35 percent increase in people between 1990 and 2000 based on U.S. Census data. Most of the area is classified as U-1 or rural land which limits residential lot size to one acre of usable land for the placement of an onsite septic system. Zane township recently contacted the Logan, Union, and Champaign (LUC) Regional Planning Commission to update their 1987 zoning regulations (See Appendix F).

Currently, wastewater from Midwest Express, NEX, CTS, Harding Machine, and the TRC are all served by one treatment plant located on Big Darby Creek just upstream from Flat Branch. Recently, Logan and Union Counties have agreed to construct a new wastewater treatment plant that will serve Middleburg in the Darby Watershed in addition to communities outside of the watershed such as East Liberty and possibly Raymond and Peoria. This new wastewater treatment plant will eliminate the need for the existing wastewater plant on Big Darby by taking the wastewater from each of the companies listed above to the new plant. The proposed plant will likely begin construction between 2006 and 2008 and will discharge into Mill Creek.

Union County

In the past 10-20 years Union County has experienced a considerable increase in residential development within city or village boundaries and on large lots in rural portions of the County. In the Darby Watershed portion of Union County, the population increased by 33% between 1990 and 2000 based on U.S. Census data. Proximity to developing regions of the Columbus metropolitan area and local industry have attracted many new residents to rural portions of the county. In response to the changing landscapes in the county, several municipalities have begun or completed comprehensive plans (See Figure 57) to allocate future growth within in the County.

The LUC (Logan, Union, and Champaign Counties) Regional Planning Commission has emphasized the 22 principles established for development within the Darby Watershed by the Central Ohio Regional Forum in 2001. The 22 principles in this document focus on maximizing the protection of the Darby Creeks through stream buffers and stormwater controls. Higher density development in Union County is largely controlled by the City of Marysville which also provides sewer services to Milford Center, New California, and industry along U.S. 33.

Marysville has limited remaining capacity and is currently working to upgrade their current wastewater treatment system to accommodate increased demand.

Residential development in Union County is expected to continue in the form of large lot developments served by on-site septic systems. Recently, the County Prosecutor removed the required zoning change for subdivisions on U1 land served by on-site septic systems. Now a zoning change is not required for a multiple home lot split with homes served by on-site septic systems.

Townships within the Darby Watershed of Union County have begun to take a proactive stance on the type, style, and amount of allowable development. Darby Township recently completed a comprehensive plan in 2003 designed to manage the future allocation of land use in the township. Currently Darby Township is discussing the future density of development within the township. Jerome Township, in southeast Union County is in the middle of completing a comprehensive plan and updating their zoning codes. Allen township on the western edge of the county has contracted with BBH Planners to complete a comprehensive plan in the next several months. And Liberty Township is currently working with the LUC Planning Commission to develop a comprehensive plan. The townships have all updated their zoning codes in the past 5 years. The zoning codes as illustrated in Appendix F display a variety of lot sizes and road frontages.

Champaign County

Champaign County is more separated from the growth pressures experienced by other counties in the watershed, but is still experiencing steady residential growth associated with manufacturing and industrial jobs in the region. The population of the Champaign County portion of the Darby Watershed grew by 14 percent between 1990 and 2000 based on U.S. Census data. Champaign County recently completed an update of their comprehensive plan in March of 2004. This plan serves all of the unincorporated areas within the county. The village of North Lewisburg completed their comprehensive plan in 2002. Currently there are no plans for expansion of central sewer in North Lewisburg, Woodstock, or Mechanicsburg. Most of Champaign County in the watershed is classified as U-1, or rural agricultural land. Residential development is expected to continue in the form of large lots with on-site wastewater treatment on land zoned as U-1 (See Appendix F). Goshen Township is currently working to update their 1996 zoning regulations and are considering agricultural zoning through the assistance of the Logan, Union and Champaign (LUC) Regional Planning Commission

Madison County

Madison County like many other counties in the watershed requires at least 1.5 acres of land for the placement of a new residential unit. However, Madison County differs from other counties in that all requests for new development must be sent to the county Subdivision Review Board instead of an individual township's zoning committee. Any development proposal has to meet the requirements of the subdivision review board before the land can be considered for development. In 1963 the entire county was zoned and most of the county was defined as

Agricultural land or A-1. In Madison County, in order to create a lot split on A-1 land the parcel must be 20 acres or greater. Any parcel 20 acres or larger that is requesting a lot split must be the “mother parcel” or a parcel on file with the Madison County Recorder before May 1, 2002. On any parcel twenty acres or larger, two conditional lot splits are permitted for the placement of a single-family residential unit. The smallest lot size for the placement of on-site septic systems is 1.5 acres of useable land. Once a lot split has occurred on a parcel, the parcel is no longer permitted any further lot splits even if the parcel remains over 20 acres in size. The various zoning codes are defined in Appendix F. The development requirements in Madison County represent the strong belief in farmland preservation. Madison County is preparing to complete an update of their comprehensive land use plan in 2005.

In recent years Madison County has experienced small population growth in comparison with other areas in central Ohio. The population of the Madison County portion of the Darby Watershed increased by only 3% between 1990 and 2000 based on U.S. Census data. This small population increase emphasizes the importance of strong countywide land use planning. There is a large amount of development pressure in northwest portions of the County in Darby and Canaan Townships. The close proximity to Columbus coupled with higher property values has created strong development pressure in this area.

Madison County is nearing completion of their county-wide water quality management plan referred to as a Section 208 plan which is submitted to Ohio EPA and then to US EPA in accordance with the Clean Water Act. In December of 2002, the City of Columbus prepared a 208 plan for the Scioto River Basin which included Madison County. Madison County Commissioners asked Ohio EPA to be removed from this plan to create their own 208 water quality management plan that focused on the agricultural nature of the county and the desire to control growth. The 208 plan gives Madison County and its municipalities the legal ability to define the management entities for water and sewer within the county and block service areas from outside the county. It includes a set of prescribed and recommended actions to improve water quality.

Pickaway County

Pickaway County does not have a comprehensive plan nor do any of its municipalities in the Darby Watershed. Darby Township recently approved a Land Use Plan and updated their zoning codes. Appendix F summarizes the zoning codes and any planning efforts for each township in the watershed. This plan does little to protect the riparian corridor from future development in a township that is expected to experience considerable growth after the improvement of wastewater infrastructure. The minimum lot size in the county for the placement of an on-site septic system is approximately 1 acre. Besides Darby Township, development in the Darby Watershed is expected to occur in the 1-2 acre lots with on-site septic systems. Because of improvements in wastewater infrastructure, Darby Township is expected to experience higher density development. Before 2008 Pickaway County Commissioners have planned to introduce a waste water project to include the unincorporated village of Derby, perhaps the Village of Harrisburg, and two mobile home parks on Darby Creek Road and additional residential development in the area.

Franklin County

A number of comprehensive plans and zoning efforts exist in the western portions of Franklin County. Many of these plans specifically address buffer widths, stormwater, and floodplains along the Darby and its tributaries to protect existing conditions along many streams and to restore those along Hellbranch Run. For example the City of Columbus initiated the Hellbranch Run Watershed Protection Overlay, which established the “stream corridor protection zone, mandates no-net loss of flood storage capacity, standards for minimizing storm water generation, and prohibits disturbance of natural vegetation in stream corridors.” Appendix F summarizes the complex and overlapping sets of zoning code regulations and comprehensive planning recommendations. In addition to individual municipality comprehensive plans and zoning codes there are three multi-jurisdictional planning groups working to protect water resources within the Darby Watershed. The next three paragraphs are a summary of the groups actions as recorded in the City of Columbus’s, Big Darby Accord, Request for Proposal (October, 2004)

Hellbranch Watershed Forum

The Hellbranch Watershed Forum was created by a cooperative agreement signed May 22, 2002 by elected officials of Franklin County; the cities of Columbus, Hilliard, and Grove City; and Brown, Norwich, Pleasant, and Prairie townships. The Forum was organized to develop collaboratively consistent stormwater policies and regulations, develop a pilot restoration project, and cooperate in and support a watershed plan for responsible development and stewardship of the watershed. Assisting the Forum in this work is the U.S. Army Corps of Engineers, Huntington District. The Hellbranch Watershed Action Plan is expected to be complete by fall, 2005.

Environmentally Sensitive Development Area (ESDA) External Advisory Group

The EPA-approved *Columbus Metropolitan Facilities Plan Update* (“208 Plan”) establishes the goal “to protect critical water resources, especially in the Darby Watershed.” This plan designates an Environmentally Sensitive Development Area (ESDA) that includes most of the Big Darby watershed in Franklin County. The plan recognizes that while “the City of Columbus will ultimately provide centralized service within a portion of it, no service whatsoever shall be provided within the ESDA until the following conditions are met for the area to be served:

- Riparian buffer restrictions are in place;
- Comprehensive stormwater management planning has occurred;
- Conservation development restrictions are in place which involve the concept of clustering development to preserve tracts of open space, including farmland; and
- Adequate public facilities, including roadways, exist or are planned to support any proposed development.”

The Big Darby Accord – Mission Statement (Expected Completion Dec. 31, 2005)

The Big Darby Accord consists of local governments within the Franklin County area of the Big Darby Creek watershed. The mission of the Big Darby Accord is to cooperatively develop a multi-jurisdictional plan and accompanying preservation and growth strategies, capable of implementation, oversight and enforcement, which are designed to:

- Preserve, protect and improve, when possible, the Big Darby Creek watershed's unique ecosystem by utilizing the best available science, engineering and land use planning practices;
- Promote responsible growth by taking measures to provide for adequate public services and facilities and promote a full spectrum of housing choice, as well as adequate educational, recreational and civic opportunities, for citizens of each jurisdiction and for Central Ohio;
- Create a partnership that recognizes the identity, aspirations, rights, and duties of all jurisdictions and that develops methods of cooperation among the partners through means which include the cooperative utilization of public services and facilities; and
- Capitalize on the results of other efforts by considering local comprehensive plans, as well as the work of the Environmentally Sensitive Development Area External Advisory Group, the Hellbranch Forum, the 21st Century Growth Policy Team and other local planning and zoning efforts, in the development of the plan.

The three efforts above represent collaborative and pro-active planning efforts that have great potential to improve water quality at a regional level. The outcomes of these planning efforts will be important for the overall success of the Darby Watershed. For additional detailed information on current zoning and planning efforts in Franklin County and other municipalities please consult Appendix F.