A.2 STUDY AREA DESCRIPTION

A.2.1 Location / Size

Big Darby Creek and its tributaries drain 355,200 acres (555 square miles) of predominantly high quality agricultural landscapes across six counties: Champaign, Franklin, Logan, Madison, Pickaway and Union. The headwaters rise in Logan County, coursing through low hills; with the Little Darby and mainstem draining areas of more gentle relief downstream and to the confluence with the Scioto River at Circleville (Figure A.1). Selected reaches of the mainstem on the Franklin - Madison county border (as well as Hellbranch Run) drain landscapes under current or imminent development pressure from the expanding Columbus metropolitan region.

A.2.2 Climate

Climatological conditions of the Big Darby watershed have influenced the geology, soil development and the presence and distribution of flora and fauna. Ephemeral weather conditions (i.e., convectional storms, frontal precipitation, freeze-thaw cycles) in turn play a role in surface runoff and stream flows.

Central Ohio lies within a climatic region (i.e., Humid Continental - Koppen classification Cfa) which is influenced by the interaction of cold-dry Canadian air masses and warmer, more humid air masses from the Gulf of Mexico (Strahler 1963). The meeting of these conflicting air masses produces weather which may cause short and intense periods of precipitation or longer but less intense periods of precipitation.

Winter sees increased movement of cold dry Canadian air masses over the watershed while Spring brings an increase of warm wet air masses from the Gulf of Mexico. When these maritime air masses "collide" with lingering Canadian air, atmospheric conditions are more conducive to tornado production. These conditions are observed annually in the Big Darby Creek watershed

The Caribbean and Gulf "hurricane season" (normally late summer and early fall) may influence the Darby system's surface flow if tropical storms track inland while moving from south to north along the East Coast or north from the Gulf of Mexico. These incidences, though infrequent, are capable of dramatically raising stream levels.

The frequent incursion of maritime air masses (Gulf) during spring and early summer is reflected in the weather data recorded at Irwin, Ohio between 1991 and 1997. Heaviest precipitation occured in June and July, with an annual mean of 38.14 inches. Mean temperatures for this same period and site ranged between a monthly mean of 27 degrees (F) in February to 74.1 (F) in July.

While weather data for the Irwin station was not available for the year 2001 (personal communication, State Climatologist), precipitation during the months of January, February and

March at Bellefontaine and Marysville deviated markedly from expected numbers and those of years 2000, 2002 and 2003. Precipitation data from 2000 through 2003 are summarized in Table A.3.

Table A.3. Total monthly precipitation for the years 2000 -2003, Bellefontaine and Marysville stations

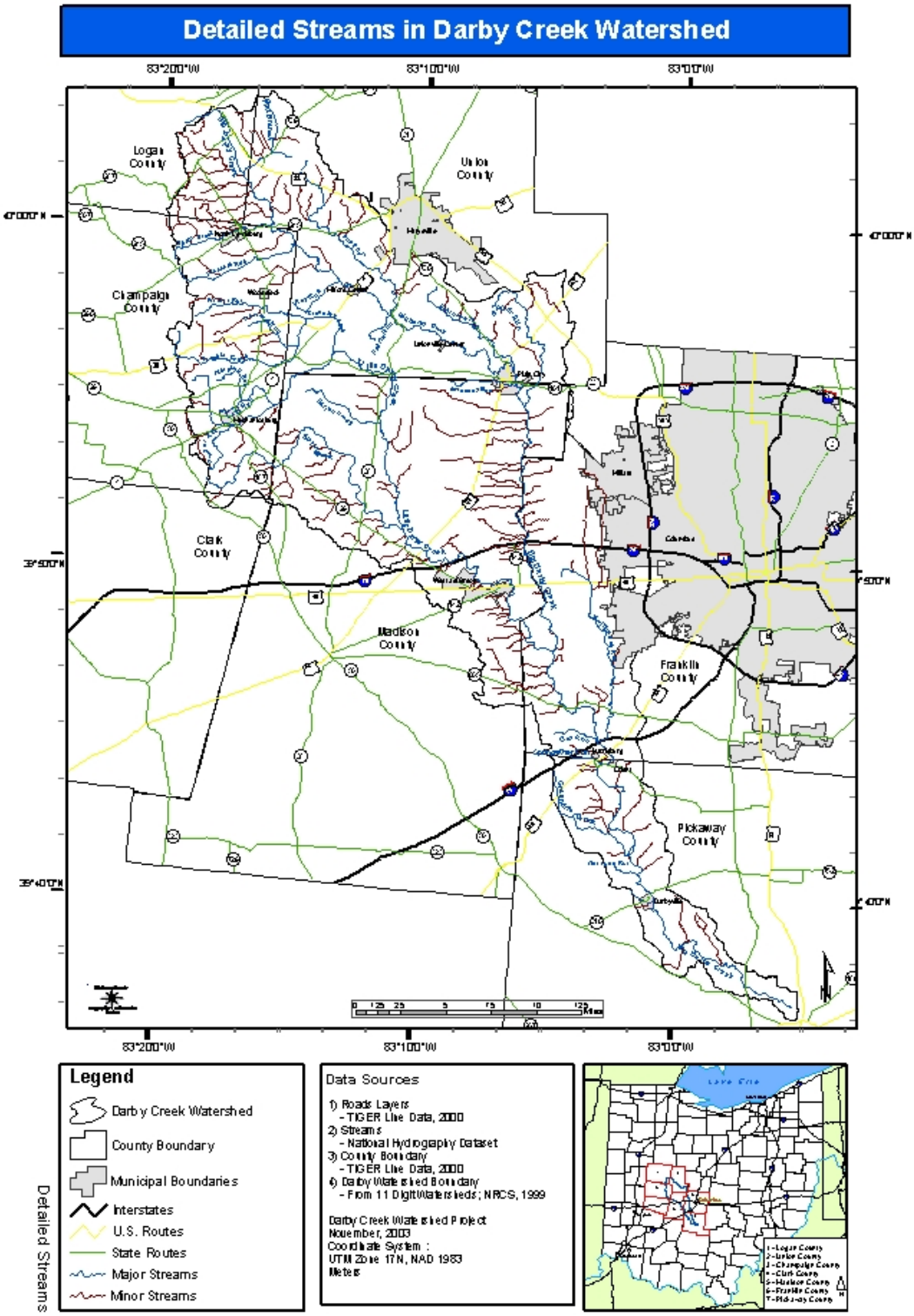
Bellefontaine

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	2.38	2.63	1.79	3.84	5.62	6.29	2.17	6.04	5.06	1.60	2.00	2.65
2001	0.94	1.64	1.25	3.84	6.97	4.26	3.37	4.29	4.18	5.22	2.64	2.88
2002	1.73	1.91	3.46	8.34	3.92	3.28	1.79	2.05	4.47	2.13	3.58	3.41
2003	1.75	3.33	2.99	2.56	5.71	3.71	N.A.	5.61	6.23	2.76	3.90	N.A.

Marysville

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	3.25	2.75	2.30	4.28	4.75	3.65	3.31	4.06	3.97	2.11	1.97	2.45
2001	1.02	1.41	0.86	4.26	6.11	2.84	3.14	5.64	3.53	4.87	3.75	3.19
2002	1.22	1.78	3.43	4.87	3.70	2.86	4.79	2.53	7.98	2.17	3.04	2.71

Figure A.1. Map of the Big Darby Creek watershed



A.2.3 Geology

All watersheds' drainage patterns, topography, soils and water chemistry are influenced by their underlying geology. The geology of the Big Darby Creek watershed is, in large part, the result of interactions between four successive glacial periods and the Teays River, a fluvial system which drained most of the region for millions of years prior to the Pleistocene Epoch (see Figure A.2). Glacial ice dammed the Teays system, depositing poorly draining sediments which filled its valley and created new drainage patterns as the dammed water eventually flowed over older drainage divides.

The glacial ice itself deposited materials ranging from fine silts to boulders. Glacial meltwater carried fines to lakes where they accumulated yielding highly impermeable beds. The retreating glacial front dropped materials, once icebound, which resulted in unconsolidated layers of till across the Central Ohio landscape. The meltwater, carved valleys into the till, leaving behind the present mainstem course of Big Darby Creek (The Nature Conservancy, 2003).

Substrates of the Big Darby Creek watershed reflect this geological history. Throughout the watershed, the substrates are derived of the calcareous-sedimentary parent materials seen in the region's bedrock. Igneous substrate constituents and glacial erratics also appear in the Darby system. They were carried to Ohio by the continental ice sheets.

A series of end moraines in the Big Darby Creek watershed resulted from the advances and retreats of the glaciers which influence the stream system itself and the watershed landscape in multiple ways. Among these are watershed topography and spring water contribution to tributaries and the mainstem. Indirect indications of ground water influence include the presence of obligate coldwater and coolwater taxa . Direct indications of ground water flow were low measured temperatures observed in Darby system stream segments by this study's field staff (personal communication: Marc Smith, Ecological Assessment Section, Ohio Environmental Protection Agency).

Portions of the Cable Moraine extend from north eastern Champaign County south to London then south east to Commercial Point (Figure A.2). Streams proximate to this glacial landform with anecdotal field evidence of ground water inflow include: Upper Big Darby Creek, Little Darby Creek, Clover Run, Gay Run, Hay Run, Pleasant Run, Smith Ditch, Spain Creek and Springwater Run.

A.2.4 Ecoregion

The Big Darby system drains portions of the Eastern Cornbelt Plains Ecoregion (Figure A.3). Common landscape features seen in this ecoregion are rolling till plains and local end moraines characteristic of glaciation. Wisconsin Age deposition is extensive and soils are better drained and loamier than most seen in Northwest Ohio. Beech forests were common on these Wisconsin soils with elm joining beech in wetter areas (Omernik, 1988).

Figure A.2. Glacial geology in west central Ohio

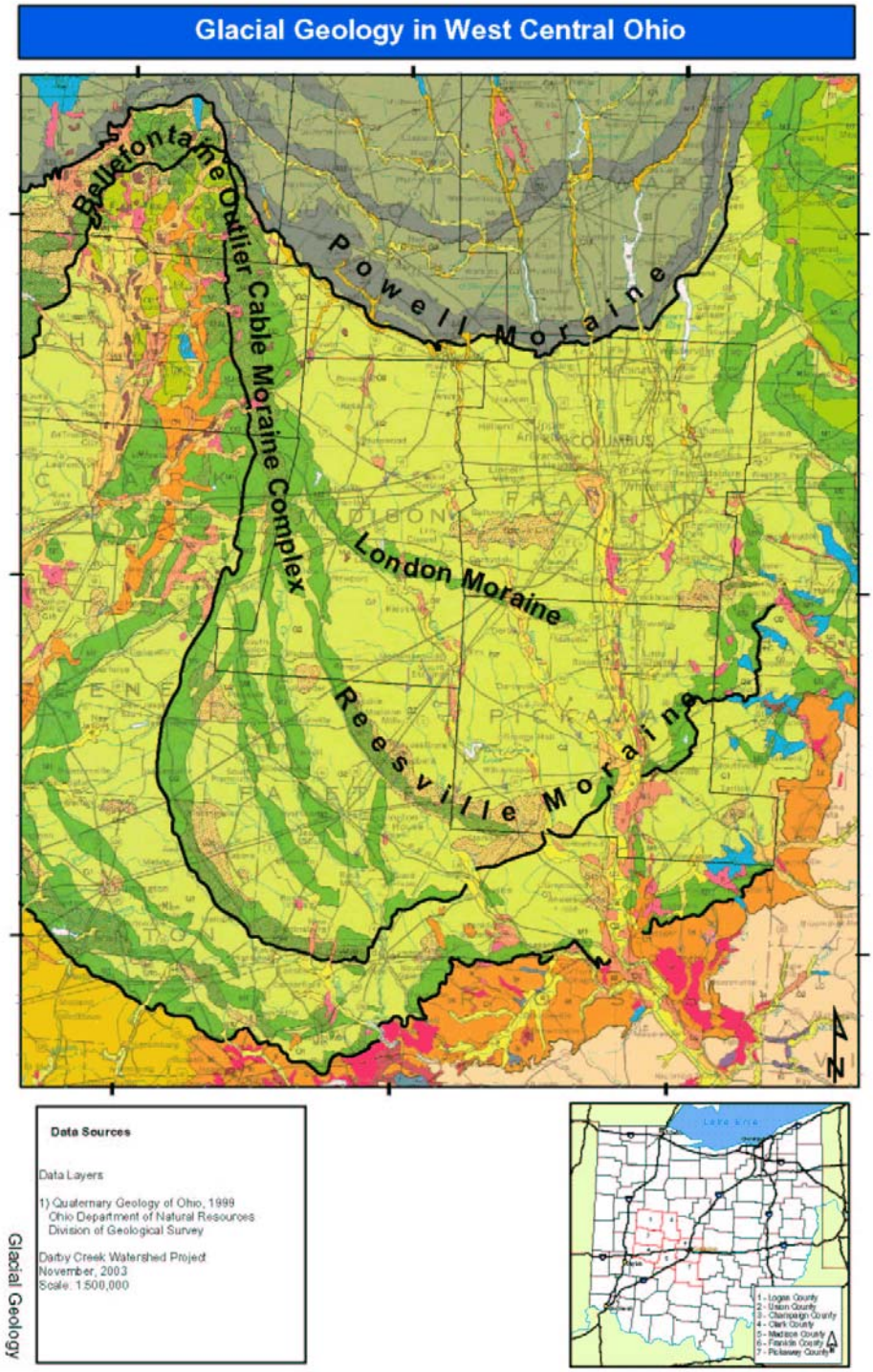
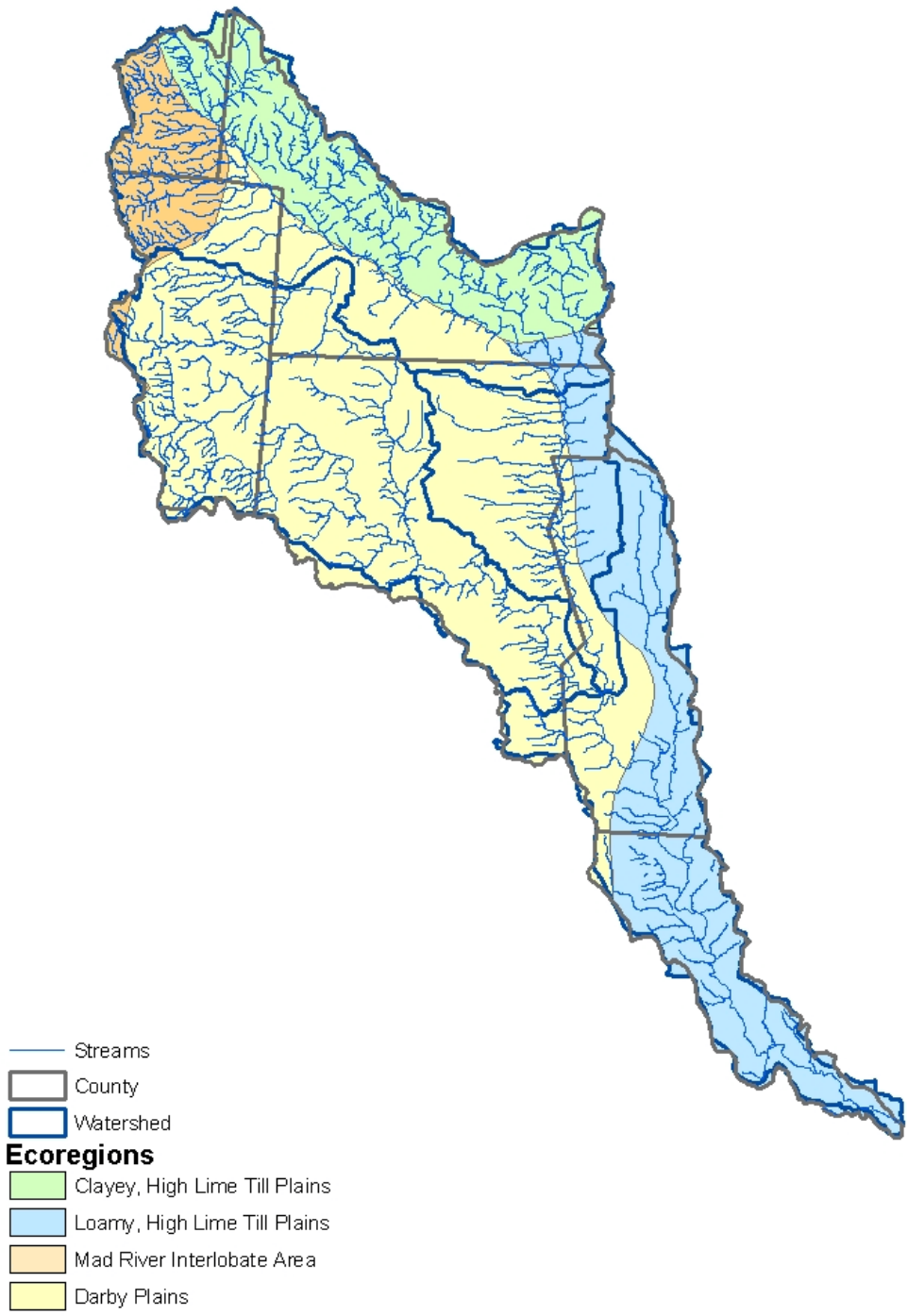


Figure A.3. Ecoregions of Ohio with subecoregions



Darby system tributaries in Union County drain two distinct subregions of the Eastern Corn Belt Plains. Near Milford Center, the tributaries flowing from the northwest to the mainstem drain clayey, high lime till plains with a higher requirement for artificial drainage than watershed portions further south. The tributaries that flow from the south to the mainstem in Union County drain the Darby Plains, an area of level to undulating landscapes characterized by productive crop and livestock farms (Omernik, Gallant 1988).

Virtually all of the Big Darby system in Madison and Champaign counties (including Little Darby Creek) also drains the Darby Plains. Prior to the settlement of non-indigenous peoples, the Darby Plains were characterized by a distinct assemblage of oak forests, end moraine prairies, gravel filled preglacial valleys and seasonally wet areas.

Most of the Darby system flowing across Pickaway County drains the more loamy, high lime till plains of the Eastern Cornbelt. This nearly level terrain is generally better drained than portions of the watershed upstream in northwestern Union County.

A.2.5 Ground Water

Groundwater resources in the Big Darby watershed vary considerably (Figure A.4). The highest yields are seen in the Big Darby flood plain, extending from I - 70 south to the confluence with the Scioto River and the flood plain of Little Darby Creek, east of Mechanicsburg in Champaign County. These areas, most particularly the Big Darby flood plains, are underlain by the most extensive buried glacial valleys in the watershed (Figure A.2).

A.2.6 Soils

Soils result from the interaction of geological parent materials, flora, fauna, topography and climate over time. Climatic change and the resultant glaciation of what is now the Big Darby watershed have had a profound influence on the development of its soils. Within the Little Darby Creek subwatershed of the study area, soil associations particularly reflective of glacial influence are seen. The five dominant soil associations in order of prevalence are: 1) Kokomo-Crosby-Miamian, 2) Miamian - Celina - Crosby, 3) Brookston - Crosby - Celina, 4) Crosby - Miamian - Brookston, and 5) Blount - Glynwood - Morley (Figure A.5).

Reflective of the factors which led to their development, each soil and soil association type appears with varied frequency across different portions of the watershed Figure A.5). Each in turn exhibits varying physical characteristics (i.e., erosion potential, permeability) which may affect chemistry of the water column, as summarized in Table A.4 (personal communication, Natural Resource Conservation Service, Delaware County).

Figure A.4. Glacial groundwater yield in the Big Darby watershed

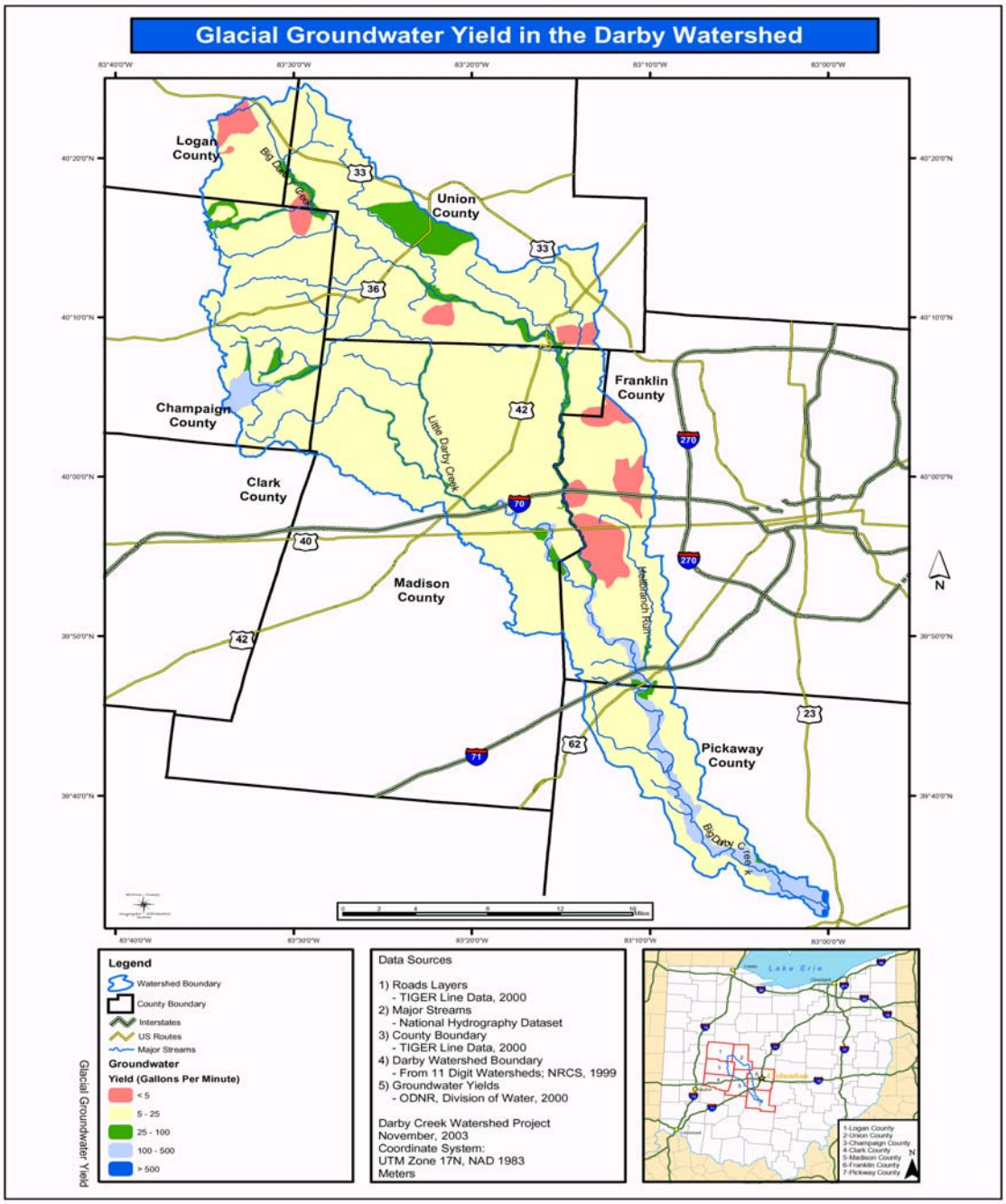


Figure A.5. Generalized soils map

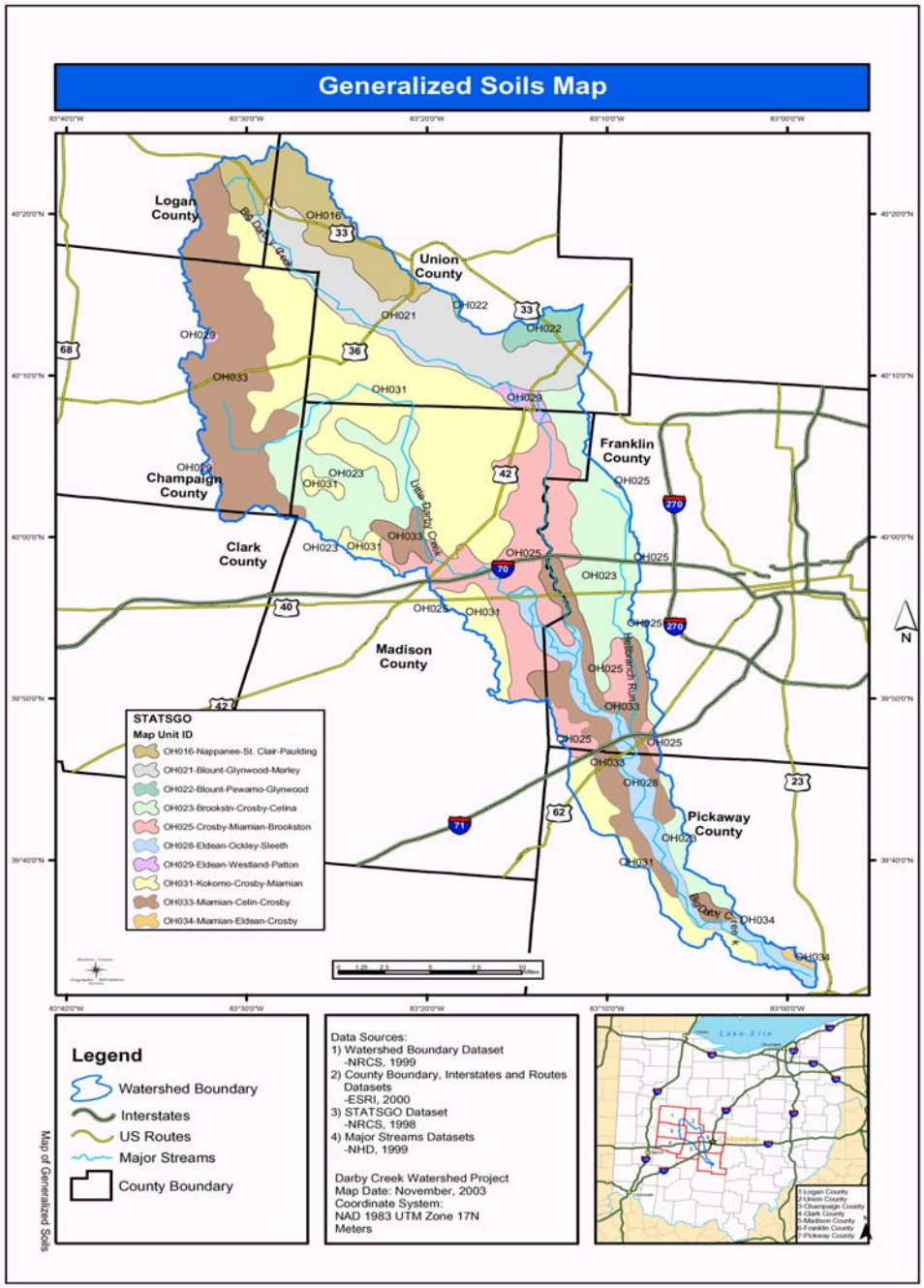


Table A.4. Dominant soil associations of the Big Darby Creek watershed by percentage of the watershed, general location and characteristics

Soil Associations	Percent of Watershed	Primary Location	Major Characteristics
Kokomo-Crosby-Miamian	27.9	Between Big and Little Darby Creeks, from Logan and Champaign Counties to Marysville and south to I-70.	Very poorly drained on flats, high water tables, seasonal wetness, Crosby requires artificial drainage. Seen on ground moraines.
Miamian-Celina-Crosby	20.3	Big and L. Darby source water areas in Logan and Champaign counties. Bordering the flood plain of Big Darby Creek . and Little Darby Creek. in Franklin and Pickaway Counties.	Well drained to moderately well drained. (Crosby requires artificial drainage.) Seen on level to gentle slopes.
Brookston-Crosby-Celina	16.3	Northern half of Hellbranch drainage in Franklin County. S.Western drainage area of Little Darby Creek in Madison County.	Brookston, a naturally wet soil found on uplands - very poor drainage.
Crosby-Miamian-Brookston	11.9	Big Darby Creek flood plain south of Plain City extending to I-70. Southern half of Little Darby Creek drainage in Madison County.	Somewhat poorly drained, prone to seasonal wetness. Miamian - well drained. Seen in the Darby Plains.
Blount-Glynwood-Morley	10.2	North side of Big Darby Creek. drainage between Logan County and Plain City.	Found on hills and slopes. Somewhat poorly drained to moderately well drained.

A.2.7 Tributaries

The Gazetteer of Ohio Streams listed the length of Big Darby Creek as 78.7 miles from its source in Logan County. The elevation at its source is recorded as 1170 feet. Twenty three named watercourses are listed by the Gazetteer between its confluence with the Scioto and the system headwaters. They include: Flat Branch, Little Darby Creek (Logan County) Pleasant Run, Hay Run, Prairie Run, Buck Run, Sugar Run (Union County), Robinson Run, Sugar Run, Threemile Run, Clover Run, Jumping Run, Lake Run, Howard Run, Proctor Run, Treacle Creek, Barron Creek, Spring Fork, Little Darby Creek, Hellbranch Run, Springwater Run, Greenbrier Run, Georges Creek, and the Big Darby Creek mainstem (Ohio Department of Natural Resources 2001). The current study evaluated all of those watercourses with the exception of Three Mile Run as well numerous other smaller unnamed tributaries (Figure A.1, Table A.5).

Table A.5. Stream characteristics and identified pollution sources within the 2002 Big Darby Creek study area.[1]

Stream	Length (miles)	Average Fall (feet/mile)	Drainage Area (square miles)	Non-point Source Pollution Categories	Point Sources
Big Darby Creek					
	78.7	6.8	556.6	Crop production, Livestock Pasture Urban Storm sewers Sanitary sewers Construction sites Surface runoff On site wastewater treatment systems Gravel mining	Flat Branch WWTP Darby Creek Golf Course Fairbanks School WWTP Plain City WWTP Suburbans MHP WWTP Wisslohican Sanitary Sewer District WWTP Battelle Memorial Inst. WWTP Lake Darby Estates WWTP Greentree MHP WWTP Darby Dan Farm WWTP Oak Hill MHP WWTP Darbydale Elementary WWTP Pickaway Correctional Institute WWTP Foxlair Farms MHP WWTP
Georges Creek					
	0.5	40.0	1.2	Urban Storm sewers Sanitary sewers Construction sites Surface runoff	
Greenbrier Creek					
	2.6	34.6	9.8	Urban Storm sewers Sanitary sewers Construction sites Surface runoff	
Springwater Run					
	0.6	13.3	3.46	Urban Storm sewers Sanitary sewers Construction sites Surface runoff	

Continued.

Table A.5. Continued

Stream	Length (miles)	Average Fall (feet/mile)	Drainage Area (square miles)	Non-point Source Pollution Categories	Point Sources
Hellbranch Run					
	12.8	11.2	35.56	Urban Storm sewers Sanitary sewers Construction sites Surface runoff Channelization On site wastewater treatment systems	Oakhurst Knolls WWTP Pleasantview School Timberlake Subdivision WWTP
Little Darby Creek					
	38.0	5.9	176.0	Crop production Urban Storm sewers Sanitary sewers Construction sites Surface runoff On site wastewater treatment systems Channelization	Mechanicsburg WWTP Fisher Cast Steel Jefferson Lodge MHP, WWTP Oakwood Acres WWTP B&B Motel WWTP West Jefferson WWTP
Spring Fork					
	12.0	7.2	38.3	Urban Crop production Livestock Construction sites	Green Meadows MHP WWTP
Barron Creek					
	4.8	8.3	6.30	Urban Crop production Construction sites On site wastewater treatment systems	
Treacle Creek					
	14.2	17.9	37.88	Urban Crop production Livestock Construction sites	
Proctor Run					
	6.0	21.4	10.52	Urban Crop production Livestock Construction sites	

Continued.

Table A.5. Continued.

Stream	Length (miles)	Average Fall (feet/mile)	Drainage Area (square miles)	Non-point Source Pollution Categories	Point Sources
Howard Run					
	3.2	23.1	2.72	Crop production Livestock	
Lake Run					
	4.1	17.8	7.02	Urban Crop production Livestock Pasture Construction sites	
Jumping Run					
	2.7	43.9	2.48	Urban Crop production Pasture Urban	
Clover Run					
	3.8	56.1	2.10	Crop production Pasture Urban Construction sites	
Threemile Run					
	5.3	17.4	5.34	Not evaluated in study	
Sugar Run (Madison Co.)					
	5.0	7.8	16.20	Crop production Livestock Pasture Urban Construction sites	
Robinson Run					
	3.2	10.6	11.84	Crop production Livestock Pasture Urban Construction sites	St. Johns Church WWTP Darby Meadows WWTP
Sugar Run (Union Co.)					
	4.4	8.9	4.30	Crop production Livestock Pasture Urban Construction sites	

Continued.

Table A.5. Continued.

Stream	Length (miles)	Average Fall (feet/mile)	Drainage Area (square miles)	Non-point Source Pollution Categories	Point Sources
Buck Run					
	6.8	5.7	29.98	Crop production Livestock Pasture Urban Construction Streambank mod	
Prairie Run					
	2.5	10.8	3.04	Crop production Livestock Pasture Urban Construction sites	
Hay Run					
	3.6	9.4	5.82	Crop production Livestock Pasture Urban Construction sites	
Pleasant Run					
	8.0	42.0	9.48	Crop production Livestock Pasture Urban Construction sites	
Little Darby Creek (Logan Co.)					
	4.5	41.1	7.22		
Flat Branch					
	4.7	4.5	14.46	Crop production Livestock Pasture Urban Construction sites Surface runoff Channelization	Honda E. Liberty WTP Honda Benton Rd. WTP

1. Ohio Environmental Protection Agency. 1994

A.2.8 Prairies / Wetlands

The prairies in what has been called Ohio's "Prairie Peninsula" have been known to Ohio botanists since the earliest days of the state. In the 1970s, the Prairie Survey Project sponsored by the Ohio Biological Survey attempted to identify and describe remnants of the once extensive prairies in west-central and north-central Ohio (Cusick and Troutman 1978).

The prairie complexes in the Darby Plains of Union, Madison, and Franklin Counties and further north in the Sandusky Plains represent the tip of the wedge of the Prairie Peninsula as mapped and described by Transeau (1935). These once extensive prairie and savannah complexes have largely disappeared from Ohio's landscape in the face of intensive ditching, tiling and agriculture except for a few relicts.

Curtis (1959, p. 262) defined prairie as "...an open area covered by low-growing plants, dominated by grasslike species of which at least one-half are true grasses, and with less than one mature tree per acre. Similar communities with more than one-half of their dominants in the sedge group are called sedge meadows, while areas with more than one tree per acre but with less than one-half of the total area covered by the tree canopy are called savannas." Curtis (1959) also defined a continuum of types of prairies from xeric to mesic to wet (hydric) prairies. His prairie community continuum included dry prairies, dry-mesic prairies, mesic prairies, wet-mesic prairies, wet prairies and sedge meadow.

As with the Sandusky Plains further north (Mack 2002), the Darby Plains was a wet prairie - mesic prairie - bur oak savannah complex that developed between the Powell, Cable and London Moraines (Figure A.6). The dominant soils of the Darby Plains is Kokomo (poorly drained mollisol) and Crosby (silt loam on slightly better drained knolls and shallow rises). This interwoven complex corresponds exactly to the Luray/Milford-Centerburg/Tiro complex in the well studied Sandusky Plains to the north. Mack (2002) and Whitney and Steiger (1988) showed that the this complex resulted in highly interwoven complex wet prairie, prairie sedge meadow, and prairie pothole marsh on the poorly drained soils, grading into mesic (tallgrass) prairie and bur oak savannah on the better drained knolls of till embedded in the poorly drained soils. The Darby Plains present identical conditions and had a similar complex of prairie and savannah (King 1981).

Sears (1926, p. 137) includes an early anecdotal description of the Darby Plains:

> ...a great portion of Madison County was originally covered with water most of the year. The first settlers called these lands barrens and looked upon them as utterly unfit for farming purposes...The prairies consisted of level stretches of country covered with sedge-grass, and dotted here and there with patches of scrubby burr-oak [sic] growing upon the highest points of land. The sedge-grass [sic] grew to enormous height, sometimes sufficient to hide man and horse when traveling [sic] through it...Nearly every autumn prairie fires swept over the country, destroying everything in their path...But...these fires grew less frequent...Timber on the east banks of the streams was always the largest, as these fires ran from west to east...The growth of burr-oak [sic] on the prairies was

> impeded by these periodical fires, and the greater amount of the present timber..has grown up since.

Little Darby Creek and its tributaries was completely embedded in the heart of the Darby Plains prairie-savannah complex. Flows out of this system would have been diffuse with many of the streams being low-gradient "prairie" streams. Anecdotal accounts like the one cited above, soil maps, and vegetation reconstructions make it clear that shallow ponded water and saturated soil conditions persisted throughout much of the year until late summer in the Darby Plains. Conversion of the region to agricultural uses would have significantly increased hydrologic loadings (as well as sediment and nutrient loadings) to all of the streams in the region. Selective restoration of wet prairie, prairie sedge meadow, and savannah would help restore hydrologic loadings and reduce sediment and nutrient inputs by retaining water on landscape.

Also of note on the Little Darby Creek are the many ground water expressions (i.e., seeps, springs, and saturated soils, etc.) and ground water driven ("slope") wetlands (Figures A.7 and A.8). Numerous fens and forest seeps are have been noted along stretches of the Little Darby. These typically occur on shallow slopes and terraces above the creek or at "breaks-in-the-slope" of the creek valley walls and the floodplain. This input of clean, cool ground water would have a positive impact and stream water quality throughout the year and would provide a buffering capacity to pollutant loadings. These slope wetlands exert a positive influence on the stream considerably greater than would be expected from their size.

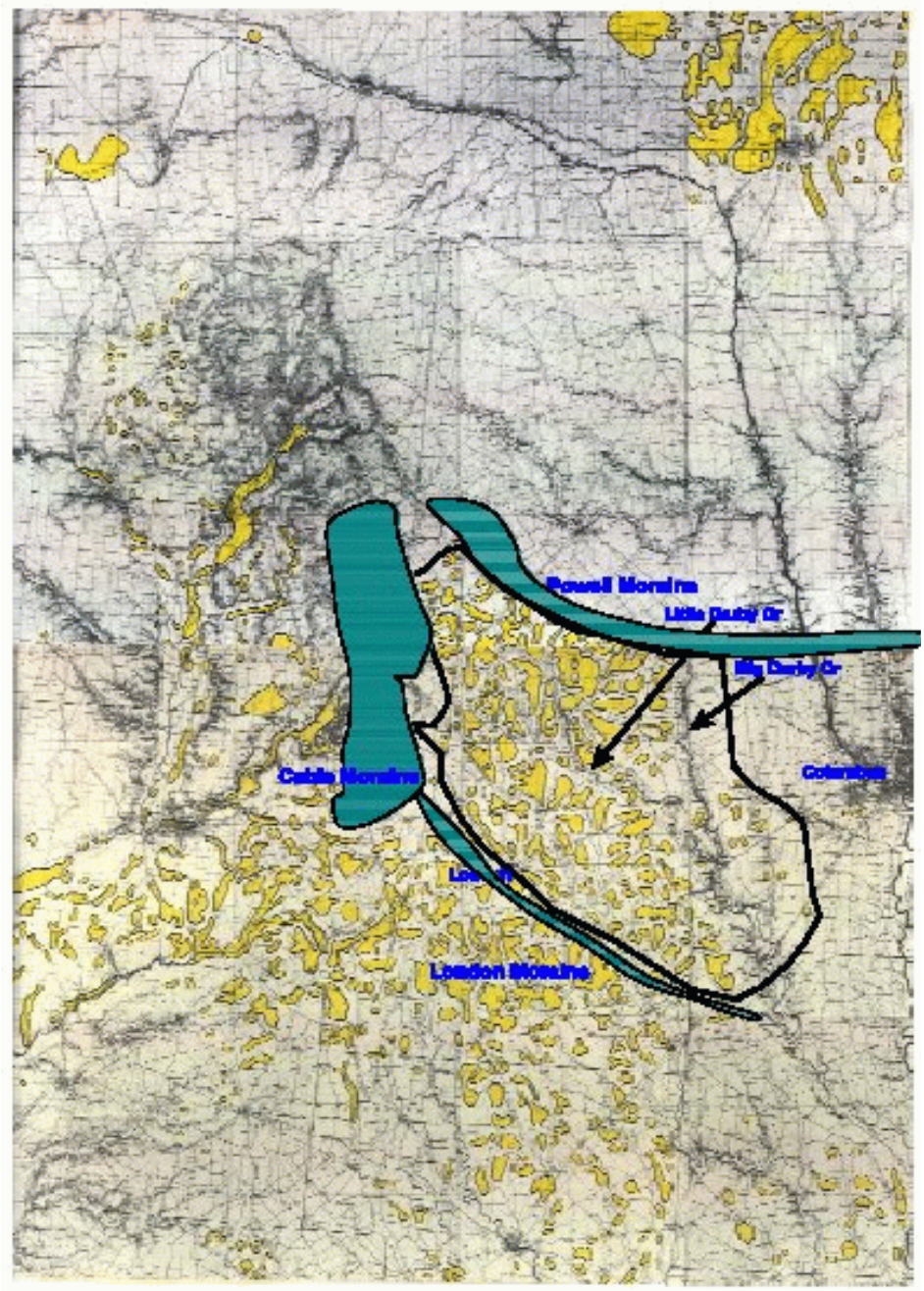


Figure A.6. Prairies of the "Virginia Military Lands" as mapped by Dobbins (1937) from scanned bitmap image of original pen and ink map, 1937 PhD. Dissertation, located at The Ohio State University libraries, Columbus, Ohio. Note how Little Darby Creek and its tributaries were completely embedded in the heart of the Darby Plains prairie-savannah complex.

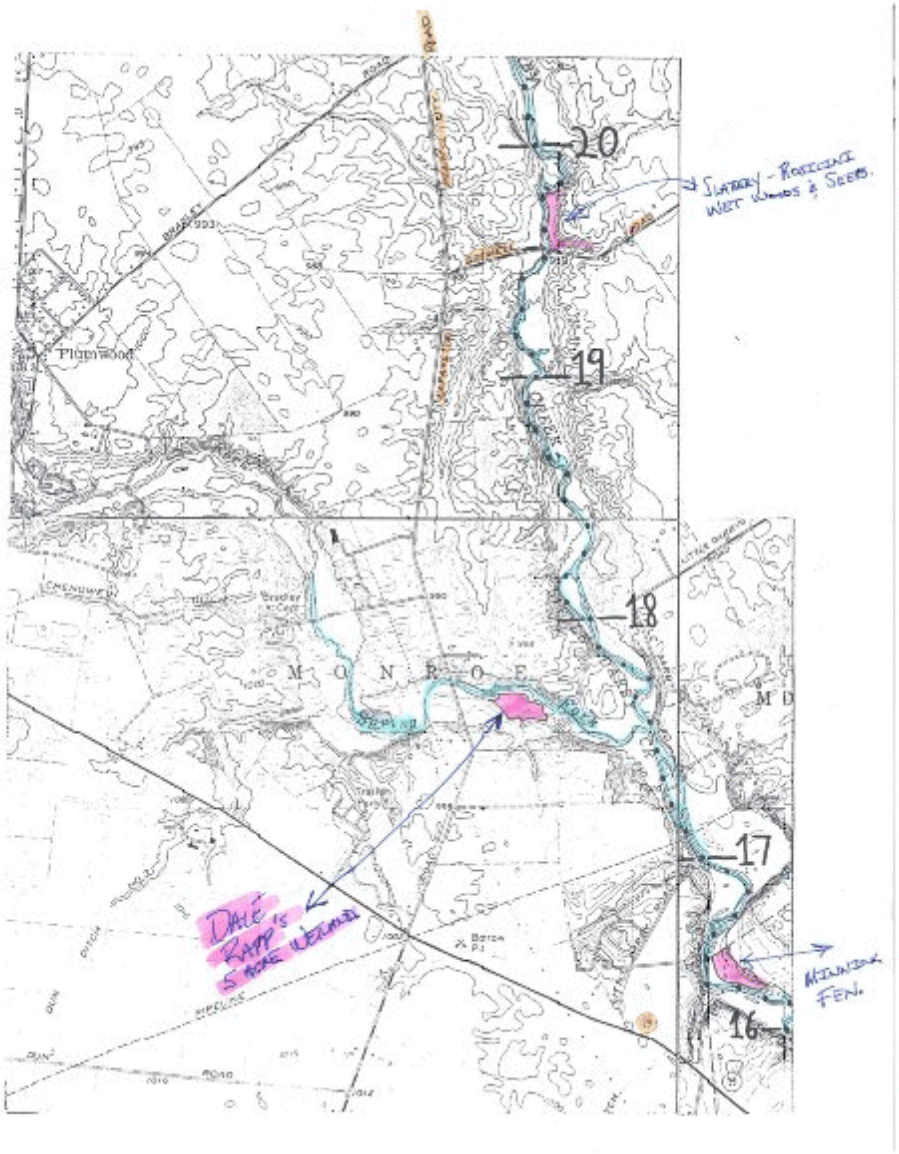


Figure A.7. Map of some fens and forest seeps on a portion of the Little Darby Creek. Map prepared by Steve Flint, formerly of Ohio Chapter of the Nature Conservancy.

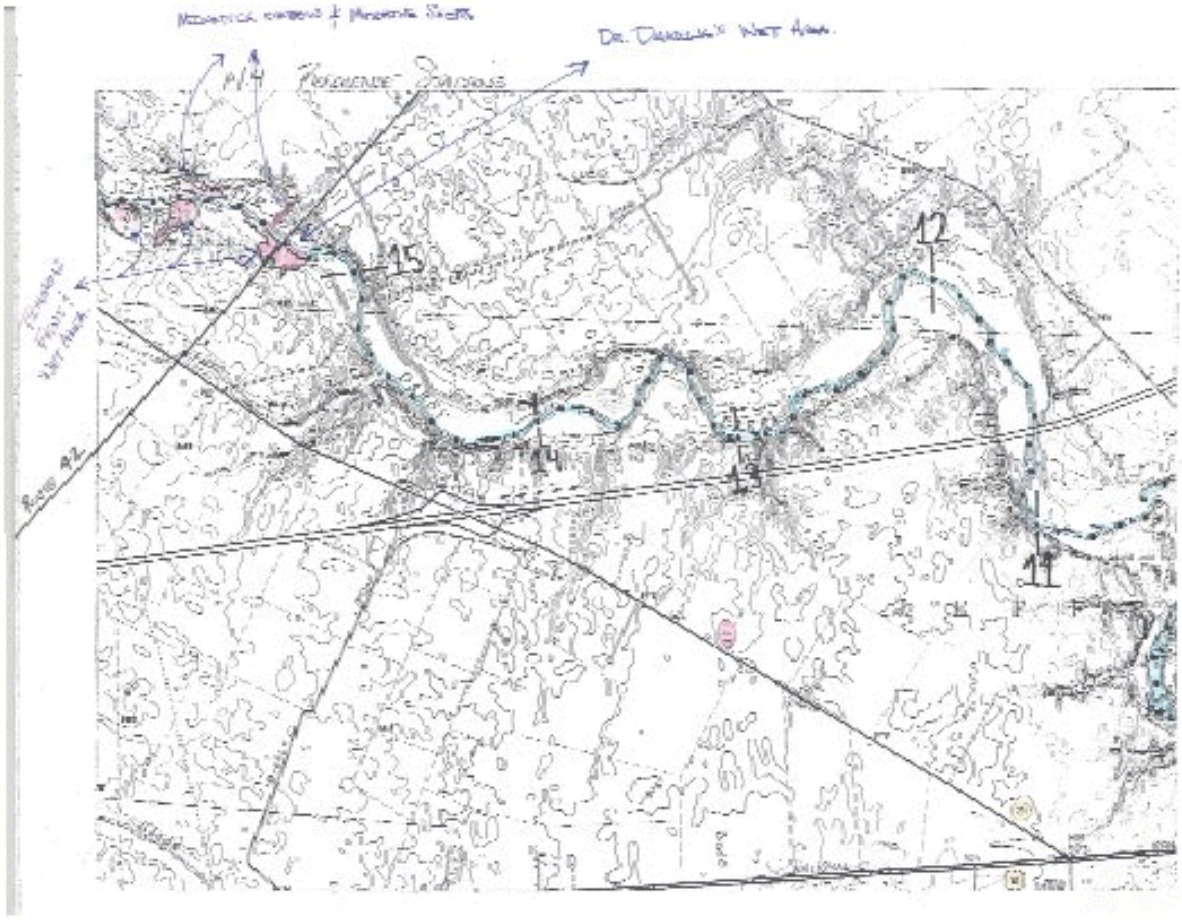


Figure A.8. Map of some fens and forest seeps on a portion of the Little Darby Creek. Map prepared by Steve Flint, formerly of Ohio Chapter of the Nature Conservancy.

A.2.9 Land Use

Though residential, industrial and commercial land uses are expanding, agriculture is still the dominant land use in the study watershed. Maps compiled from Landsat data in years 1994 and 1997 by ODNR and The Ohio State University, respectively, show watershed agriculture land use ranging between 86.90% and 63.33%. This discrepancy is attributable to the inclusion of "open urban" land uses, which include parks, lawns, golf courses and similar grassy areas within the 1994 Agriculture category. The more detailed and accurate land use classifications of 1997 identify additional land use types such as mixed urban and sparse woodland. (Approximately 1,600 acres near Circleville, Ohio was not assessed for the 1997 compilation.) Under this categorization scheme, agricultural use comprises approximately 63% of the total. When combined with wooded lands (14%) and herbaceous-shrub land cover (14%) the total is 91% (Gordon, S.I. 1994).

The maps reveal distinct land use distributions within the watershed (Figure A.9). Comparatively denser patterns of heavily wooded acres are present in Union County north of the mainstem and in the hilly headwater areas of Logan and Champaign counties. These woodlands are more commonly encountered outside of the riparian corridor and flood plain.

Within Madison County and south of the mainstem in Union County, the watershed acres are more intensively farmed. Here, wooded acreage is concentrated in the flood plains and riparian corridors. This pattern of wooded acreage concentrated in the flood plains and riparian corridor continues along the mainstem in Franklin and Pickaway counties to the confluence with the Scioto River.

Concentrations of urban, residential and commercial land uses are found along the U.S. Route 33 corridor in Logan County and western Union County, proximate to the Honda manufacturing complex; at North Lewisburg which is drained by Spain Creek; and Mechanicsburg which is drained by Little Darby Creek in Champaign County. Plain City and West Jefferson, both in Madison County show concentrated urban land uses and drain to the mainstem and Little Darby Creek, respectively (Figure A.9).

Transportation land uses contrast with urban and mixed urban uses which co-mingle surface types (lawns and small landscaped areas), capable of capturing surface runoff to the Big Darby system. Transportation land uses offer less contrast among surface types, showing a greater prevalence of impervious surface among most examples: limited access highways (U.S. Route 33), state routes, county roads, parking lots. Concentrated impervious surfaces are notable for their role in rapid introduction of pollutants to the water column.

Transportation comprises more than 8% of all land use in several Big Darby sub-watersheds: Big Darby Creek (High Free Pike to above Little Darby Creek), 9.99%; Flat Branch, 9.43%; Big Darby Creek below Hellbranch Run to Darbyville, 8.31%; Hellbranch Run, 8.01%.

The Franklin County portion of the Big Darby Creek watershed exhibits, arguably, the most intensive development pressure in the study area, due to its proximity to Columbus' expanding

western fringe. Concentrations of actively expanding residential and related land uses are seen along Hellbranch Run including the Hilliard - Rome Road - Interstate 70 intersection, as well as the Hubbard Road developments north of U.S. Route 40.

In southwestern Franklin County and northwestern Pickaway County similar, though older, concentrations are seen along the mainstem at Darbydale, Harrisburg and Orient.

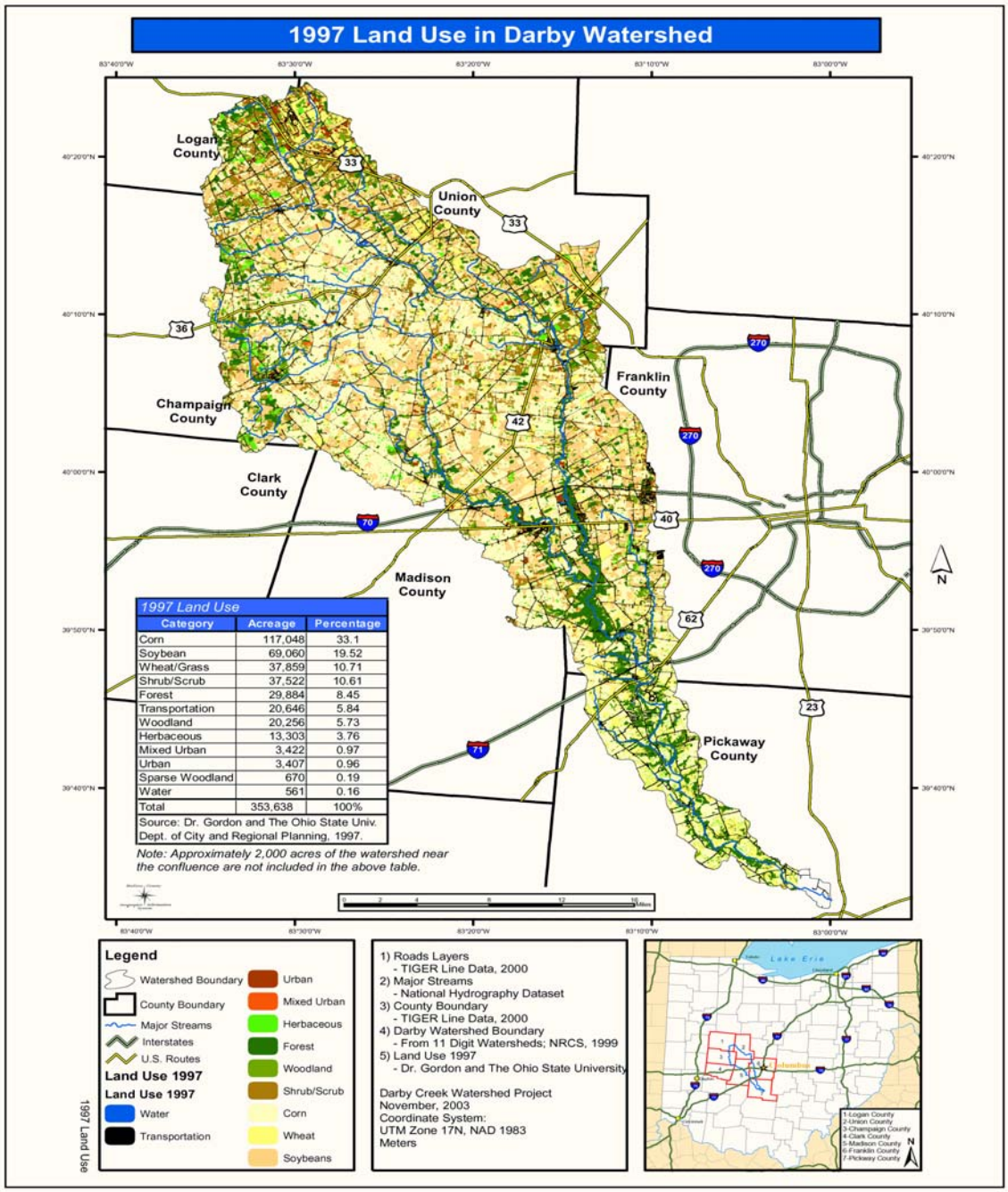


Figure A.9. 1997 land use in Darby Creek watershed

Table A.6. Surface area coverages of land use practices in the Big Darby Creek watershed, 1997.

Type	**Acreage**	**Percentage**
Corn	117048	33.1
Soybeans	69060	19.52
Wheat-Grass	37859	10.71
Shrub - Scrub	37522	10.61
Forest	29884	8.45
Transportation	20646	5.84
Woodland	20256	5.73
Herbaceous	13303	3.76
Mixed Urban	3422	0.97
Urban	3407	0.96
Sparse Woodland	670	0.19
Water	561	0.16
Total	**353638**	**100%**

A.2.10 Protected Lands

Figure A.10 and its table indicate the location and acreage of known protected tracts within the Big Darby watershed. The largest assemblage of protected watershed riparian corridor land is held by Columbus and Franklin County Metroparks in south western Franklin County. The Nature Conservancy ranks second in acreage holdings, followed by a variety of other entities which include electric power companies, townships and individuals. (Current efforts by these holders to obtain-protect additional riparian acreage are not detailed in this report.) These protected riparian holdings are significant due to the well documented relationship between water quality, biological integrity and vegetated riparian corridor. Protective easements obtained by the Franklin Soil and Water Conservation District are discussed below.

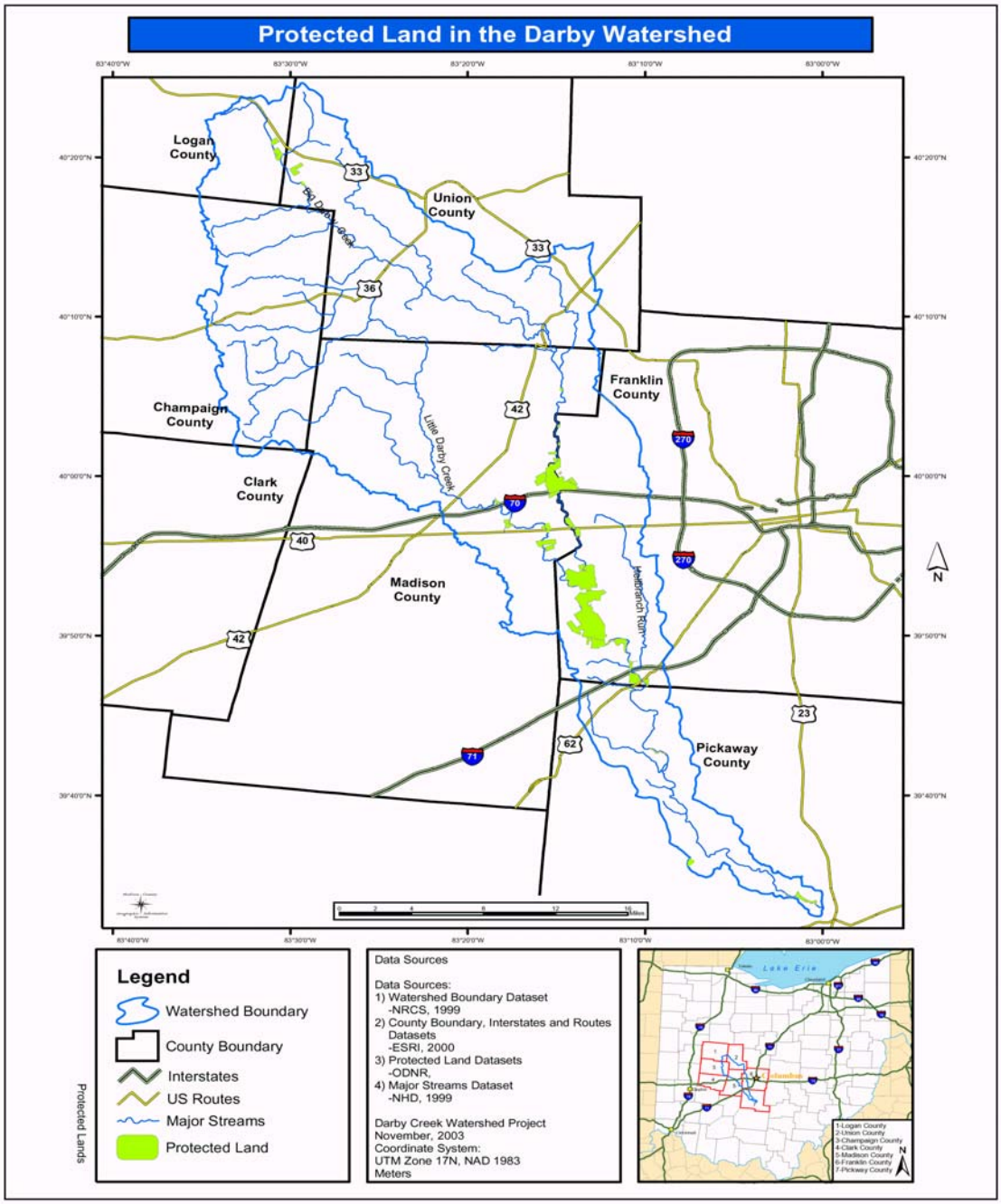


Figure A.10. Protected land

A.2.11 Watershed Protection Funding Mechanisms - Non Point Source Pollution

In 1995, the Ohio Environmental Protection Agency developed a means of funding watershed protective agricultural practices. This program, the Watershed Pollution Control Loan Fund (WPCLF) Linked Deposit, has supported a variety of agricultural best management practices (BMPs). Most of the funding has been used to purchase conservation tillage equipment, but other items and practices have also been funded. These include: manure management equipment, livestock exclusion fencing, filter strips, grassed waterways, computerized soil mapping, GPS equipment and software, yield monitors, windbreaks and fertilizer storage areas with spill containment. Between 1995 and December of 2002, Linked Deposit loans in the Big Darby Creek watershed totaled $2,701,468 (Table A.7).

Table A.7. WPCLF Linked deposit loan awards by county: 1995 - 2002

County	**Number of Loans**
Champaign	10
Franklin	4
Logan	11
Madison	21
Pickaway	13
Union	19

The current (2002) development of countywide home sewage management plans by Madison and Pickaway counties will provide eligibility for WPCLF loans that could finance replacements and upgrades of home systems in the Big Darby Creek watershed.

In 2001 the Franklin County Soil and Water Conservation District was awarded a 319 grant of $190,604 for riparian conservation efforts in the Hellbranch Run subwatershed. The key elements of this project include acquisition of riparian easements and the establishment of riparian vegetative buffers. Local matching funds will increase the project total to $347,286. As of December 2003, this project had established more than 230 acres of conservation easements and 20 acres of stream buffer. Nine thousand tree seedlings had been planted. Fifteen Hellbranch watershed landowners had participated. This project continued in 2004. Active easement acquisitions and buffer establishment were proceeding during the writing of this report.

A.2.12 Local Government Structure - Land Use Planning

There is no single unifying governmental entity for the watershed; rather a patchwork of many local governmental units which include six counties, eight small cities, twenty seven townships, unincorporated townships within counties, and special organizational units. The land development process is influenced by a multitude of entities. Such an arrangement requires a

coordination of action for effective watershed protection. This coordination could be characterized as a challenging goal that has not yet been reached (Table A.8).

Watershed protection at the county level may include: land use and related planning, zoning (when not exercised by townships), subdivision approval, control of on-site sewage systems and building permit and well approval.

Very different land uses may be found (in relatively similar settings) across watershed counties and townships due, in part, to the contrasts between zoning codes, general plans (where they exist) and the vigorousness of their application and inspection to ensure compliance.

The Mid Ohio Regional Planning Commission, a quasi-governmental body established under state law, maintains an influential advisory position on zoning, subdivision and planning decisions for member counties. Franklin County has long been a member of MORPC utilizing a variety of its services. The communities of London, Marysville and West Jefferson are participating members; although Madison, Pickaway and Union counties are not (personal communication: Mid Ohio Regional Planning Commission). The City of Columbus has increased its land use planning activity in its portion of the watershed along with the increase in development and public interest in the watershed's protection.

Table A.8. Watershed townships with comprehensive land use plans

County	Townships - Plan or County Plan	Townships - Plan in Progress	Townships - Zoning Code
Franklin	Pleasant (2002) Brown (1999) Washington(1993) [1]	Prairie	
Logan[3]	Perry Zane		Perry Zane
Madison[3]	Canaan Darby Jefferson Monroe Pike		
Pickaway	Darby		Darby Jackson, Muhlenberg Scioto
Union	Darby [2] Jerome [2] Union [2]	Jerome	All with exception of Jackson.
Champaign	Goshen Rush		Goshen Rush

[1] Township zoning updated in 2000.
[2] Adopted Union County comprehensive plan.
[3] County comprehensive plan.
[4] County plans - zoning under discussion. Possible revision in Champaign, Logan and Union (11/02.)

A.2.13 Conservation Programs - Practices

Numerous federal and state agricultural programs address soil conservation, erosion and water quality protection through the installation of best management practices (BMPs) on the agricultural landscape. The Big Darby Creek watershed presents a mosaic of these practices. Across the watershed the utilization of specific BMPs varies dependent on physical attributes such as soil type, slope and specific "on farm" considerations. Frequency of BMP application also varies in part with local traditions and the interaction between local agricultural service providers, (i.e., NRCS, county SWCD offices, FSA and Ohio State Extension) and watershed land owners and farmers.

In 1991 the United States Department of Agriculture (USDA) chose Darby Creek as one of 70

Hydrologic Unit Areas. During the period of its existence, USDA agencies and Ohio State University Extension worked with other entities to forward a Hydrologic Plan for the watershed. The project's efforts were focused on reduction of sediments moving to the stream system and the protection and restoration of the riparian corridor. During its life, this effort resulted in an variety of watershed protective actions that included: a 208% increase in conservation tillage, sediment reduction estimated at 35,000 tons/year, 389 acres of trees planted along the stream system, nutrient and pest management plans for 14,654 watershed acres, 21,688 feet of livestock exclusion fencing, 3,000 feet of stream bank protections and 174 acres of filter strips (WRP), urban sediment control plans for 1000 watershed acres and the installation of fourteen water and sediment control basins (WASCOBS). Table A.9 summarizes watershed conservation practices.

Table A.9. USDA Darby hydrologic unit area conservation practices:1991-1998[a]

Practice	Required Maintenance Period to Receive Payment	Units Reported Accomplished
Tree Planting	10 years	389 acres
Filter Strips	3 - 5 years	17 acres (94,743') 80' average width
Fencing	10 years	21,688 lineal feet
Wildlife-Upland	none	242 acres
Wildlife-Wetland	none	17 acres
Wetland Restoration	none	20 acres
Wetland Reserve Program	30 year, perpetual easements	58,080 lineal feet
Conservation Reserve Program (pasture and hayland)	10 years	5,186 acres
Streambank Protection	none	2,595 lineal feet
Conservation Tillage	1 year	39,282 acres
Grass Waterways	10 years	194 acres

[a] as reported by Ohio State University Cooperative Extension Service

Funds from the Conservation Reserve Program (CRP) were first allocated to the Big Darby Creek watershed in 1985. The Conservation Reserve Program provides direct payments to landowners to remove environmentally sensitive acres from active cropping for a extended period of time and to subsidize the establishment of erosion preventive vegetative cover. Table A.10 provides details of recent enrollment by county in the CRP programs.

Table A.10. Acres of land enrolled in CRP in the Big Darby Creek watershed by county, 1990 - 1992

County	Water-shed Acres	CRP Eligible Acres	Enrolled through 1990	Enrolled through 1991	Enrolled through 1992	Total	Percent - Eligible Acres
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%**

More recent figures for estimated CRP watershed enrollment were generated by the U.S. Fish and Wildlife Service in 2003 (Table A.11).

Table A.11. Acres of land enrolled in CRP in the Big Darby Creek watershed by county, 2002

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 USDA, Environmental Quality Incentives Program (EQIP) applies cost share dollars with the intent of improving livestock operation and implementing conservation practices which may benefit water quality. Between 1998 and 2001, EQIP contracts were present in all but two Big Darby Creek watershed counties (Table A.12).

Table A.12. USDA EQIP contracts in the Big Darby Creek watershed by county, 1998-2002

	2001		2000		1999		1998	
County	**Acres**	**No.**	**Acres**	**No.**	**Acres**	**No.**	**Acres**	**No.**
Champaign	518	7	487.5	2	0		0	
Franklin	67	2	0		200	1	0	
Madison	1	1	0		0		0	
Logan	0		0		0		0	
Pickaway	0		0		500	2	0	
Union	0		0		0		0	

Available conservation tillage (i.e., No Till) data for Big Darby Creek watershed counties in 2002 show a difference between corn and soybean acres, with soybean acres showing considerably higher No Till application than corn. Data from the NRCS indicates a range between 24% and 52% for watershed county corn acreage. The range for soybeans is notably higher, between 65% and 83% (Table A.13).

Table A.13. Percentage of corn and soybean acreage utilizing the No Till Cropping Practice in Big Darby Creek watershed counties, 2002.

County	Percentage of Corn Acres	Percentage of Soybean Acres
Champaign	34%	83%
Franklin	47%	72%
Logan	45%	65%
Madison	52%	67%
Pickaway	32%	75%
Union	24%	75%