Environmental Geology of Franklin County

By

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Acknowledgments

Our thanks to our colleagues who prepared or suggested materials for inclusion.
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Introduction

This trip focuses on the geologic resources, geologic hazards, fluvial and glacial landforms, and general geologic controls on land use in Franklin County. It begins in the parking lot of the Ohio Department of Natural Resources at Fountain Square (off Morse Road, east of Northland Shopping Center). This first stop will examine the geologic substrate of Franklin County using the bedrock displays in the prairie area and the Earth Day monument. The next stop is the OSU campus area to inspect fluvial and wetlands sites and to discuss approaches to flood protection along the Olentangy River.

We will then cross the divide to the Scioto River where we examine the role of geologic resources in change at several sites providing examples of limestone quarry post-extraction land uses. As we proceed down river we will discuss water resources and waste disposal at the Dublin Road Water Plant; the Scioto River Flood Wall at the Franklinton Cemetery; recycling at Inland Products, the Frank Road Wastewater Treatment Facility, the former Franklin County Waste to Energy Facility, the now filled sand & gravel extraction/Lowendick construction and demolition debris landfill, the tire shredding site, and the golf course on a landfill. Dual resource extraction is one topic at the Martin Marietta Aggregates quarry; the other is impacts of resource extraction. It is the original site of the landmark Ohio ground water case, Cline vs. American Aggregates, where the effects of dewatering from that quarry on the regional ground water/surface water systems were resolved. We will briefly mention channelization of a stream at the Ag Roc quarry. In the Scioto Valley south of Columbus, sequential and simultaneous multiple land use is readily understood, particularly at the site of the former Hartman Farms. Once a section of the Ohio-Erie Canal Columbus Connector, here grapes have given way to gravel extraction, groundwater is removed in a major well field beneath forest and field, recharged, in part, by the newly formed extraction ponds. Surrounding the region, old gravel extraction sites have been recycled a third time. Now softball and golf events are hosted on top of solid waste. Time permitting, we will travel east past the kame/esker complex of St. Joseph Cemetery, the Ohio-Erie Canal locks near Lockbourne, and the Kurtz Brothers composting facility to Pickerington Ponds where we again will discuss land-use controversies.

Not all stops will be made on this trip. Be very aware of surrounding traffic in both rural and urban areas; obey all traffic laws.

Most stops will be made outside of facilities (closed on Sundays) for discussion and inspection at a distance. Other components of the trip will be “drive by” (seen from the window of stopped or moving vehicle, = WS). A few stops will be tours of a specific site. When completed, this field-trip guide will be designed for self-guiding by students and professionals.

Overview of Franklin County

Geography and Growth of Franklin County

Population: 1,068,978 (2000); 961,437 (1990)
Land area 540 square miles.
County seat: Columbus

Population Summary

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Business diversity is the core strength of the Greater Columbus economy. Home to five Fortune 500 companies and four Inc. 500 companies, Columbus thrives on a diverse mix of government, service, retail, and manufacturing. This base of industries has given Central Ohio economic prosperity and stability.

And, the region is a breeding ground for entrepreneurs. Nationally recognized companies such as Wendy’s International, Worthington Industries, CompuServe, Red Roof Inns, Longaberger, Bank One, and the Limited, were started and continue to flourish here.

As the state capital, Columbus is one of the fastest growing cities nationally. That growth is evident not only through the extensive development boom the region has experienced since the early 1980s, but also by the number of new businesses that start here each year. Local business starts increased from 3,792 in 1990 to 4,708 in 1995 with success rates of more than 88 percent annually. The hottest market in Ohio, Franklin County led the state in business starts in 1997.

As a result, Franklin County is a state leader in development. More than 10,000 building permits were issued in the county during 1996 and 1997. And these are creating multi-million dollar projects such as Polaris, Easton, Tuttle, downtown’s Arena District, and the corridors along U.S. 33 and State Route 23.

However, the region is more than growth and economic prosperity. Greater Columbus is home to a symphony orchestra, a ballet troupe, several art museums and a thriving theatre scene. The city also boasts several professional sports clubs including an NHL expansion team starting play in 2000, a popular MLS team, and minor league baseball and hockey teams. Columbus also hosts the Top Ten collegiate play of The Ohio State University Buckeyes.

http://www.morpc.org/

Franklin County Greenways

In early 1995 the Mid-Ohio Regional Planning Commission (MORPC) and the Franklin Soil and Water Conservation District (FSWCD) joined together to establish a greenways planning project for Franklin County. Chaired by Columbus City Councilman Rich Sensenbrenner, the primary goal of this effort is:

To forge a better understanding of and appreciation for the role waterways play in our environment, resulting in their long-term protection and water quality improvement.

Greenways: A Plan for Franklin County (1.16meg pdf) was published in 1997. The plan seeks to build on the often isolated efforts of communities throughout central Ohio in the areas of conservation, water quality protection and recreation. The project is guided by a Steering Committee with representation from over 20 local governments and numerous public and private organizations.

Short-term implementation strategies of the Greenways Plan include involvement of people in river stewardship by establishing interjurisdictional watershed protection groups, the establishment of a Greenways clearinghouse, and the encouragement of regional standards for river related land development and regulations. Several watershed protection groups have been formed over the past three years. Their advocacy, educational outreach and stream protection efforts have been significant. Franklin County Greenways functions as a clearinghouse for stream related information and the Model Watercourse and Scenic Byway Protection ordinances.
were developed to provide communities with tools for better watershed planning and policy making.

Darby Creek Watershed Stormwater Management Strategies and Standards for New Development
http://www.morpc.org/web/planning/greenways/greenways.html

Geologic Setting of Franklin County

All of Franklin County has been glaciated and is covered with unconsolidated glacial drift (tills and sorted deposits) from less than several feet to 300+ feet in thickness. Unsorted deposits of the last glaciation (the Wisconsinan) are mainly ground moraine, with a small area in northern Franklin County covered by the Powell End Moraine. River valleys are covered by alluvium, with terraces and outwash deposits of sand and gravel. Sorted esker and kame deposits are found in the eastern and southern drainage of the county; however, some of these deposits have been removed by mining.

Quaternary deposits are underlain by Devonian shales and carbonates, with Mississippian clastics to the east.


B 69. Minerals of Ohio, by Ernest H. Carlson. 155 p., 64 figs., 11 tables, 4 color pls.,

Quaternary geology of Ohio, compiled by Richard R. Pavey, Richard P. Goldthwait, C. Scott Brockman, Dennis N. Hull, E. Mac Swinford, and Robert G. Van Horn. Map, scale 1:500,000 (1 inch equals about 8 miles), 1999. Map will be sent folded unless $1.50 is included for a mailing tube. $10.00
INTRODUCTION

The ODNR Earth Day 1990 Monument is a geologic column consisting almost entirely of Ohio building stones. The monument is located at ODNR's Fountain Square complex on the north side of Columbus. It was built with donations, including material, time, and labor, from the mining and construction industries and the educational community of Ohio. The monument was designed by Ohio State University student Linda Gaertner and built by Ralph Styers, a central Ohio stone mason. A time capsule, to be opened on Earth Day 2040, was placed in the monument by former Ohio Governor Richard F. Celeste and former ODNR Assistant Director Charles E. Mauger on April 27, 1990, in celebration of the 20th anniversary of Earth Day. A ginkgo tree growing next to the monument was planted at the same time.

The monument celebrates the use of geologic materials in building Ohio. The mining of industrial rocks and minerals such as limestone, dolomite, gypsum, sandstone, shale, clay, sand, and gravel have been important since the early days of the state. In the canal-building era (1825 to 1850), much stone was supplied for aqueducts and locks; by 1850, stone was an important building material for public buildings. Other building materials made from native industrial rocks and minerals include brick, tile, ceramics, and glass.

The Ohio stones overlying the granite base are arranged in ascending stratigraphic order and range in age from Silurian to Pennsylvanian. A precast stone cap represents the Quaternary Period.

<table>
<thead>
<tr>
<th>Geologic Period</th>
<th>Rock Type</th>
<th>Donor</th>
</tr>
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<tbody>
<tr>
<td>Quaternary (1.6 million years ago to present)</td>
<td>capstone, a precast stone product manufactured and donated by R. W. Sidley, Inc. Thompson, Ohio</td>
<td></td>
</tr>
<tr>
<td>Pennsylvanian (325 to 286 million years ago)</td>
<td>Massillon sandstone, donated by The Briar Hill Stone Co., Glenmont, Ohio</td>
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<tr>
<td>Mississippian (360 to 325 million years ago)</td>
<td>Maxville Limestone, donated by Sidwell Bros., Inc., Zanesville, Ohio</td>
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<tr>
<td>Devonian (410 to 360 million years ago)</td>
<td>Buena Vista sandstone, donated by Waller Bros. Stone Co., McDermott, Ohio</td>
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<tr>
<td>Silurian (440 to 410 million years ago)</td>
<td>Berea Sandstone, donated by Cleveland Quarries Co., Amherst, Ohio</td>
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<tr>
<td>Precambrian (&gt;544 million years ago)</td>
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<td></td>
<td>Tymochtee Dolomite, donated by National Lime &amp; Stone Co., Findlay, Ohio</td>
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<td>Greenfield Dolomite, donated by Devon, Inc., Peebles, Ohio</td>
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<td></td>
<td>Cedarville Dolomite, donated by American Aggregates Corp., Phillipsburg, Ohio</td>
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<tr>
<td></td>
<td>Dayton Formation, donated by Piqua Minerals, Piqua, Ohio</td>
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<td></td>
<td>Brassfield Formation, donated by Piqua Minerals, Piqua, Ohio</td>
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</tr>
<tr>
<td></td>
<td>granite, donated by GE Superabrasives, Worthington, Ohio</td>
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STOP 1 A Fountain Square
Earth Day Monument and Prairie Rock Garden

OHIO DEPARTMENT OF NATURAL RESOURCES
EARTH DAY 1990 MONUMENT

Dennis N. Hull
Adams from 5 to 15 feet, is bluish gray to white and very fine for crushed aggregate and high-purity limestone for manufacture of portland cement. Precambrian rocks underlying Ohio have been seen only in core and well cuttings and represent an unexplored potential source of base and precious metals for future generations of Ohioans.

Brassfield Formation—The Brassfield Formation is the basal Silurian rock unit in western Ohio. Because it is more resistant to erosion than underlying Ordovician strata, the Brassfield commonly forms a ledge or scarp in its outcrop area in southwestern Ohio, southeastern Indiana, and north-central Kentucky. In Ohio, the unit ranges in thickness from 20 to 60 feet and in lithology from a coarsely crystalline, white to pink crinoidal limestone (in Miami County) to an argillaceous (clay-rich) grayish limestone interbedded with dolomite and shale (in Adams County). The Brassfield Formation (also called the Brassfield Limestone) was quarried in the early 1800's for foundation stone and in modern times has been mined for crushed aggregate and high-purity limestone for manufacture of portland cement.

Dayton Formation—The Dayton Formation is Silurian in age and closely overlies the Brassfield Formation in southwestern Ohio. The unit ranges in thickness from 5 to 15 feet, is bluish gray to white and very fine grained, and has a dolomitic composition. In earlier days, the Dayton was commonly quarried for foundation stone and was sawed into slabs for sills, caps, steps, and building stone. The old Montgomery County Courthouse in Dayton is built of the Dayton Formation (also called the Dayton Limestone). The Dayton has outstanding qualities as a building stone except for the presence of pyrite grains and clusters that weather as unsightly black or brown spots. The principal use of the Dayton Formation today is for crushed aggregate.

Cedarville Dolomite—The Cedarville Dolomite is Silurian in age and in southwestern Ohio is the uppermost unit of the Lockport Group. It is correlative with the Peebles Dolomite of southern Ohio and the Guelph Dolomite of northern Ohio. The Cedarville ranges in thickness from 0 to 100 feet, is white to gray to blue, massive bedded, and vuggy, and, like the Brassfield, is a common ledge former in southwestern Ohio. Many years ago, the Cedarville had limited use as a foundation stone, but today it is used almost exclusively for crushed aggregate and aglime.

Greenfield Dolomite—The Greenfield Dolomite is Silurian in age and is the basal unit of the Salina Group in western Ohio. It ranges in thickness from 0 to 80 feet and is argillaceous, olive gray to yellowish brown, and thin to massive bedded. The Greenfield is similar in appearance to the overlying Tymochtee Dolomite, but, unlike the Tymochtee, the Greenfield commonly contains breccia zones and lacks shale laminae. Today, the Greenfield is quarried primarily for crushed aggregate, but was used in the late 19th and early 20th centuries as a building stone in the City of Greenfield (Highland County).

Tymochtee Dolomite—The Tymochtee Dolomite is Silurian in age and also is a unit of the Salina Group. Similar to the underlying Greenfield Dolomite, the Tymochtee ranges in thickness from 0 to 140 feet and is olive gray to yellowish brown and thin to massive bedded. The distinguishing characteristic of the Tymochtee is the abundance of brownish-black to gray shale laminae. The Tymochtee Dolomite is used extensively for crushed aggregate.

Columbus Limestone—The Columbus Limestone is Devonian in age and is quarried as far south as Pickaway County, as far north as Kelleys Island, and extensively in between. The basal one-third of the Columbus is light-brown dolomite; the upper two-thirds of the Columbus is fossiliferous buff to gray limestone. The Columbus Limestone ranges in thickness from 0 to 105 feet, is thin to massive bedded, and commonly is coarse grained. The Columbus Limestone was used extensively as a building stone for construction of government buildings in Columbus during the early to mid-19th century, but today is used primarily for crushed aggregate and aglime. The Ohio Statehouse in downtown Columbus is constructed primarily of Columbus Limestone and is perhaps the finest example of the use of Columbus Limestone as a building stone.

Delaware Limestone—The Delaware Limestone is Devonian in age and, where present, directly overlies the Columbus Limestone. It ranges in thickness from 0 to 45 feet and is argillaceous, cherty, gray to blue to brown, and thin to massive bedded. Chert nodules are a common impurity in the Delaware, and freshly fractured surfaces commonly have a strong petroliferous odor. The Delaware Limestone is a durable building stone and was used extensively for this purpose throughout the 19th and early 20th centuries. Fine examples of Delaware Limestone can be seen in public buildings in the cities of Delaware, Marion, and Sandusky. The principal use of Delaware Limestone today is for crushed aggregate.

Berea Sandstone—The Berea Sandstone is Mississippian in age and crops out along a north-south trend from the Ohio River valley to the Lake Erie coast. It is light greenish gray to bluish gray on fresh surfaces but weathers to shades of yellow brown. The Berea is 15 to 155 feet thick, very fine grained to coarse grained, and thin to thick bedded. Beds are planar to lenticular to cross-bedded. The Berea has been quarried in Ohio for
use as a building stone since the beginning of settlement. In the late 1800's, the Berea gained international recognition as a grindstone resource (the Berea Grit). The carving and durability qualities of the Berea make it an extraordinary building stone. It was used extensively in the construction of major public buildings throughout the eastern United States and Canada. It commonly can be seen throughout much of central Ohio in buildings, railroad bridge abutments, canal locks, sidewalks, and curbs. The superstructure of Orton Hall on the campus of The Ohio State University is Berea Sandstone quarried from South Amherst, Ohio. The Berea Sandstone continues to be quarried for building stone in Erie County and is quarried in Huron County for crushed aggregate.

Buenavista sandstone—The Buenavista sandstone is Mississippian in age and is the Buenavista Sandstone Formation. It crops out in south-central Ohio and is quarried in the vicinity of McDermott (Scioto County). The Buenavista sandstone ranges in thickness from 60 to 100 feet, is gray to brown and fine grained, and contains some shale partings. It has excellent carving and durability qualities and for these reasons was used extensively as a building stone, especially in Cincinnati, during the early to mid-1800's. The principle use for the Buenavista sandstone today continues to be that of a building stone.

Maxville Limestone—The Maxville Limestone is Mississippian in age and is the youngest Mississippian rock unit present in Ohio. It is quarried in northeastern and southern Perry County and in southwestern Muskingum County. The Maxville Limestone is 0 to 42 feet thick where exposed and is gray to light tan, very fine grained, massive to nodular bedded, and fossiliferous. As a building stone, the Maxville has outstanding durability, uniformity, and beauty but has a reputation for being difficult to shape. The Muskingum County Courthouse in Zanesville is built of Maxville Limestone. The Maxville Limestone continues to be quarried for building stone but is used primarily for crushed aggregate.

Massillon Sandstone—The Massillon sandstone is Pennsylvanian in age and is a unit of the Pottsville Group. It currently is quarried in Coshocton, Perry, and Tuscarawas Counties. The Massillon sandstone ranges in thickness from 0 to 30 feet and is buff to light brown to burgundy, medium to coarse grained, in places conglomeratic, massive bedded, and somewhat friable (easily crumbled). The Massillon's great range of color and workability made it a popular building stone throughout the 19th and 20th centuries. It is still quarried as a building stone and also is used as a source for crushed landscape stone, foundry sand, glass sand, polishing/grinding sand, and industrial sand applications.

Precast stone product—The cap of the monument is a precast stone product manufactured in northeastern Ohio. The manufacturing process for precast stone products is: (1) create a mold, (2) coat the face of the mold with a concrete-hardening retardant, (3) pour concrete composed of ornamental aggregate into the mold, (4) allow the concrete to harden for a set time, (5) remove the mold, and (6) use water under high pressure to remove cement matrix from cast surfaces to expose ornamental aggregate. The aggregate in the monument's capstone includes glacial outwash erratics and pottery shards to represent the Ohio aggregate (sand and gravel) and ceramics industries that mine Quaternary-age deposits. The white quartzite pebbles of the precast cap are from the Sharon conglomerate. The Sharon conglomerate is the basal Pennsylvanian unit in Ohio and is the basal bed of the Pottsville Group. It is quarried in Geauga and Pike Counties and is used for crushed stone, golf course sand, foundry sand, glass sand, polishing/grinding sand, and industrial sand. The Sharon conglomerate has a patchy distribution because it was deposited in the lowest elevations of the eroded, underlying Mississippian surface. It is increasingly believed that the Sharon conglomerate of northern Ohio and the Sharon conglomerate of southern Ohio are derived from different source rocks and may be depositionally unrelated. Where present, the Sharon conglomerate ranges in thickness from 0 to about 10 feet and is buff to orangish brown, poorly sorted, and commonly weakly cemented.

THE PRAIRIE ROCK GARDEN

A rock garden created from large slabs of the same rocks used to build the Earth Day Monument is located several hundred feet southwest of the monument in a Prairie that has been established between Buildings D and F of the ODNR complex. The slabs, like the stones in the monument, are arranged in ascending stratigraphic order and are lapped one on another to simulate the eastward dip of strata off the Cincinnati Arch and into the Appalachian Basin. The rock garden, completed in 1992, was designed by then Assistant State Geologist Robert G. Van Horn, who served on an interdivisional ODNR team charged with creating an environmental education area. A large erratic boulder at the east entrance to the prairie bears a plaque memorializing a 1995 ceremony dedicating the ODNR Environmental Education Area to former ODNR Director Frances S. Buchholzer. The boulder is similar in many respects to Precambrian-age tillite (glacial till that has become lithified or transformed into stone) of the Canadian Shield in Ontario, but in some respects is atypical of most tillites. For example, clasts in the prairie boulder appear to be of a single rock type instead of the multiple rock-type clasts seen in most tillites. The clasts in the prairie boulder are well rounded to angular, while most tillite clasts are rounded to subrounded. Many of the clasts in the prairie boulder show evidence of chemical reaction on their outer surfaces, a feature not observed in typical tillite clasts. The boulder's true identity thus remains open to question. The highly flattened, striated surfaces on two sides of the boulder are evidence that the boulder was subjected to grinding erosive forces at or near the base of the advancing Ice-Age glacier that entombed it.
Prairie rock garden.

Portions of this description were taken from the guidebook by Melvin and McKenzie (1992) noted below.

FURTHER READING


Compiled by Dennis N. Hull, February 2002
The Upland Organic Soils in the Neighborhood of the ODNR Complex

A portion of the building that houses the Ohio Geological Survey at the ODNR complex in northern Columbus has periodically sunk into the thick organic soils that underlay the northeast corner of the building. Sinking, never more than an inch, has cracked flooring and walls and led to the emplacement of concrete pillars, which were poured into auger holes, 30 feet deep. The pillars pass through the organic soils and into till which has a good bearing capacity. Cracking continued in parts of the building that were not remediated, but it has mostly stopped in recent years. An aerial photo of the site shows several acres of dark organic-rich Pewamo soils in the low-lying areas near the Survey’s building. Excavations show clayey and silty low-velocity fluvial/lacustrine sediments interlayered with thin to thick organic-rich deposits.

Two miles north of the ODNR complex, three houses were eventually leveled in late 2000 owing to structural damage from sinking into similar geologic materials (Figs. 1 and 2). Aerial photos show a late-glacial, closed linear depression of Pewamo soils upon which the houses were built (Fig. 3). The Ohio Survey investigated the factors that contributed to the damage, which developed after nearly 15 to 30 years of stability. Coring, laboratory testing, and topographic interpretation indicate that foundations rested on 7 to 15 feet of organic-rich peat, gyttja, silt, and clay (Fig. 4). In laboratory tests, deposits consolidated a relatively large amount with pressure, shrank 20% when dried, and swelled upon wetting to levels termed critical to very critical. Structural damage, however, was related primarily to shrinkage and not to swelling of the sediments, for example, support posts separated from beams, and a 6- to 8-inch void underlaid most of the basement slab of one house. The Palmer Hydrological Drought Index correlates fairly well with the 15- to 30-year delay of the onset of damage. Fifteen years of average to wet climate followed house construction, and damage was reported only during droughts. Roofs, drives, roads, and lawns cover much of the neighborhood and deliver potential ground water to storm sewers. Diminished local ground-water recharge dries the soil and in turn increases the load on underlying sediments by reducing the buoyant pressure. Desiccation shrinkage of surficial sediments and pressure consolidation of deeper organic sediments combined to cause irreparable damage to the houses. A solution to this type of foundation failure may be to establish a water drip system under and around houses in highly organic soils.

Figure Captions

Fig. 1. This photo appeared in the Columbus Dispatch of a homeowner in the Sharon Woods subdivision showing some of the damage to her basement.

Fig. 2. Before and after house demolition. The house sites are unassuming, but during initial site preparation thin fill was placed over the peaty soils.
Fig. 3. Before and after the Sharon Woods subdivision. The north-south linear depression with 1-5 acre pockets of deep organics is in the center-east portion of the photographs. One peaty area in the center-west remains a park, the others have been built over.

Fig. 4. Shrinkage and consolidation of organic rich sediments (organic rich silt shown here) were primarily responsible for damage to the houses.

Geologists dig in, map sinking soils
Stratigraphy at Sharon Woods, Columbus, Ohio

- Laminated
- Up to 14% organics
- "Very critical" potential volume change (PVC)
Olentangy River Wetlands Research Park (ORWRP) (most of this material available at http://swamp.ag.ohio-state.edu)

OSU’s Olentangy River Wetlands Research Park, under the direction of William Mitsch, is a research, teaching and outreach facility of The School of Natural Resources. ORWRP has been designed to be one of the nation’s most comprehensive wetland research and education facilities at a major university. It is located on a 30-acre site (352 Dodridge Road) owned by The Ohio State University, immediately north of the Columbus campus. Phase 1 of site development, which featured construction of two 2.5-acre deep-water marshes and a river water delivery system, was completed in 1994. Phase 2 which involved establishing the infrastructure for research and education of the site, including additional wetlands, experimental microcosms, and a visitors’ center, was completed in 1999. There are now more wetlands, a bike path, and ½ mile of boardwalks. The next phase includes completion of wetlands and site infrastructure plus a 9000-ft² wetland research building. Fund raising is underway for this next phase; a proposal (included in this field guide) to the US Army Corps of Engineers (USACOE) describes the plan and the importance of the research park.

Also known as the Buckeye Swamp, ORWRP promotes the concept that wetlands are the “kidneys” of the landscape for the flood control and water quality services they provide. They are also known as “nature’s supermarkets” because they support aquatic and terrestrial wildlife. Research at this site has provided data and concepts for the management and restoration of wetlands (for the 2001 National Academy of Sciences review of mitigation wetlands). Most recently wetlands have been proposed (Mitsch and others, 2001) to address aspects of the Gulf of Mexico “dead zone” or hypoxia zone where nitrogen and other nutrients overload the ecosystem and produce algal blooms and other problems.

For more information on ORWRP, check out the website http://swamp.ag.ohio-state.edu. From that site or the URLs here: swamp cam http://swamp.ag.ohio-state.edu/swamp%20camera01/swamp%20camera.html Buckeye Swamp Updates http://swamp.ag.ohio-state.edu/Updates.html, publications, and self-guided tours (map) http://swamp.ag.ohio-state.edu/orvtrail.html.

The USACOE has had a long-term role in river and wetland management, permits, and research. (Some of the following material is from the website - http://www.usace.army.mil/public.html#Civil). The Rivers & Harbors Act of 1899 was meant to prevent obstructions to navigation, although an early 20th century law also gave USACOE regulatory authority over the dumping of trash and sewage in rivers. The passage of the Clean Water Act in 1972 greatly broadened this role by giving the Corps authority over dredging and filling in the “waters of the United States,” including many wetlands. A major aspect of their Regulatory program is determining which areas qualify for protection as wetlands. In reaching these decisions, the Corps uses its 1987 Wetland Delineation Manual (available in PDF format http://www.saj.usace.army.mil/permit/87manual.pdf). In making decisions on whether to grant, deny or set conditions on permits, District commanders are required to consider "all factors in the public interest," including economic development and environmental protection. Numerous relatively minor activities in wetlands are covered by regional or nationwide general permits, allowing the regulatory staff to concentrate on more complex cases. Of the approximately 1,100 people who carry out this mission, about 70% have academic backgrounds in biology and environmental sciences.

For information on the flood plains and flood potential at the Wetlands on Dodridge Ave, see the FEMA Digital Q3 Flood Data displayed at the Web address below developed by scanning the existing Flood Insurance Rate Map (FIRM) hardcopy and capturing a thematic overlay of flood risks. NOTE: Digital Q3 Flood Data files contain only certain features from the FIRM hardcopy in effect at the time of scanning and do not replace the existing FIRM hardcopy maps These displayed maps should be considered an advisory tool for general hazard awareness, education, and flood plain management. The flood hazard maps displayed on this site are not the legal document for making a single site flood hazard determination. For more details see http://mapserver2.esri.com/cgi-bin/hazard.adol?z=c&c=-83.038062%2C40.015797&p=1&d=0&c=0&cd=p&Map.x=351&Map.y=112

STOP 2 Olentangy Wetlands on Dodridge Ave William J. Mitsch
Proposal

U.S. Army Corps of Engineers: Ohio State University Cooperation at the Olentangy River Wetland Research Park

William J. Mitsch
Director, Olentangy River Wetland Research Park

Why a Wetland Research Park?

Wetlands are shallow to intermittently flooded ecosystems that are more commonly known by such terms as swamps, bogs, marshes, and sedge meadows. They are revered as important parts of the natural landscape because of their functions in cleaning and retaining water naturally and in providing a habitat and food source for a wide variety of plant and animal species. It is estimated that more than half of the original wetlands in the lower 48 states have been lost to drainage and human development projects. Ohio and many Midwestern states have lost 80 percent or more of their original wetlands since pre-settlement time.

When we lose wetlands, we lose their ability to provide clean water, prevent floods and enhance biological diversity. Many organizations are calling for construction of new wetlands to clean up our streams, rivers, and lakes. The National Academy of Sciences has called for the restoration and creation of 10 million acres of wetlands in the United States by the year 2010. Five million acres of wetlands have been suggested as being necessary to help prevent the “dead zone” or hypoxia in the Gulf of Mexico from the Mississippi River basin. The National Academy of Sciences also found that so-called mitigation wetlands, those wetlands that are constructed to replace wetlands destroyed for development, leave a lot to be desired.

In order to solve such problems we need to know: 1) how wetlands work; 2) if we can create and restore them; and 3) the best approaches to creation and restoration of wetlands for solving habitat loss and water pollution problems. The Olentangy River Wetland Research Park is designed to answer these questions and be the most comprehensive long-term, large-scale wetland research facility on a major college campus in the USA.

Progress at OSU’s Wetland Site

The Olentangy River Wetland Research Park is located on a 30-acre site owned by the Ohio State University, immediately adjacent to the Columbus campus (Figure 1). The site has been developed in three phases:

Phase 1 — Construction of two experimental wetland basins “kidneys” and their water delivery system;
Phase 2 — Development of research and teaching infrastructure at the site including boardwalks, experimental mesocosms, greenhouses, additional wetlands, instrumentation for long-term research, and a visitor pavilion;
Phase 3 — Development and construction of a Wetland Research and Education building on the site.

Planning for the Wetland Research and Education Building began with the award of a $1.2 challenge million grant from the Ohio Board of Regents in 1999-2000 to a consortium of Ohio universities, led by Ohio State University. An architect was hired in July 2000 and the building is designed (Figures 2 and 3) and ready to build when sufficient funds become available.

The total cost for completing site infrastructure, the building, and a $1.5 million endowment of the site is $5.7 million (Table 1). We have been successful in raising about $3.2 million in private donations and pledges and state support since this project started.
The Ohio State University will provide the following opportunities for the U.S. Army Corps of Engineers for their support of this project.

Advantages to USACOE

The Ohio State University will provide the following opportunities for the U.S. Army Corps of Engineers for their support of this project.

• ACOE personnel, up to 15 per year, will be permitted to take, free of charge, our short courses, either Wetland Delineation or Wetland Creation and Restoration.
• The ACOE will be offered an attractive package from the University for having a permanent office in the new building.
• Visiting scientists and engineers from Vicksburg WES and other USACOE will have opportunities to come to Ohio State University to pursue graduate degrees in fields associated with wetland science, while having office space in the new building;
• USACOE Huntington District can use the facility as a Columbus “home” when they are involved in projects in Central Ohio.
• Our OSU and wetland consortium undergraduate and graduate students and visiting students and scientists will can be recruited to careers in the ACOE in wetland related fields. These students will be well trained in wetland ecology and engineering.
STOP 3  Olentangy River at OSU Hospital

Flood Control on the Olentangy River at OSU

This stop at the levee on the east side of the Olentangy River at the OSU Hospital parking lot is at profile 3-1 of the 1959 flood (Figure 3-1). During this flood the water reached 725.5 feet (Figure 3-2). This would place the water almost at Perry Street and on 12th Ave it would have been 800 feet east of the levee. The 1913 flood reached 734 feet, which would have been close to the back of the Biology Building across from Dentistry on 12th Ave.

The image from the soils map (Figure 3-3) shows that there are other areas at risk from flooding including the stadium and the Drake Union. The stadium is protected by the levee and the lower playing field by pumps and a slurry wall. The Union is part of the levee and the lower part is flood proofed with elevated electrical systems. Several feet of the lower floor (boat storage) have been flooded since it was constructed. Water on the flood plain field immediately south of Drake Union is often the first indication of flooding on the Olentangy.

The Olentangy was also channelized in many areas during the construction of 315. More modifications will likely occur with the construction of another entrance to the campus from 315.

As we head west on King Avenue, not the Tim Horton’s on the SW corner of the intersection with Olentangy River Road. This site was formerly a gas station that had contaminated soil and round water from leaking product. For many years clean-up equipment occupied the site next to Wendys.
STOP 4  Land Use on Scioto River: 5th Ave Quarries

Sequential Multiple Land Use on Scioto River (and Shrum Mound)

At the end of 5th Avenue on the west side of the Scioto River is a former limestone quarry that has been converted to offices and condominiums. This was the first of now many such conversions from this area of Marble Cliff north to Dublin. To the south are converted gravel pits that are surround by offices. These water front properties, which are relatively close to the center of town, are now very valuable. At one time the Ohio EPA occupied offices on the edge of “Broadcast Lake” to the south.

Campbell Park and Shrum Mound

On McKinley Ave, north of the T-junction with 5th Ave, is Shrum Mound, dated at about 2200 years BP. Many mounds existed in the Scioto drainage in the past. Some near Chillicothe have been rebuilt. Any speculation on the origin of the name Mound Street in Columbus?

A stratigraphic section for this general area of the Scioto (known as Marble Cliff near 5th Ave) is shown in Figure 4-1.
Limestone, light- to dark-grayish-brown to brown, fine- and medium-grained, argillaceous, fossiliferous; with much nodular chert; much interbedded brown shale in basal 2' 4".

Limestone, medium-brown, medium- and coarse-grained, fossiliferous; containing bone plates.

Limestone, light- and medium-gray, medium- and coarse-grained, fossiliferous; 2- in layer of nodular fossiliferous white chert at top.

Limestone, light-gray and grayish-brown, medium- and coarse-grained, fossiliferous.

Limestone, light-brown to yellowish-brown, fine-grained, dolomitic; abundant corals in upper part, brachiopods in lower part.

Limestone, light-brown, dolomitic; abundant nodular white chert.

Limestone, light-grayish-brown, coarse-grained, coarsely crystalline, fossiliferous.

Limestone, light- and medium-brown, fine- to coarse-grained, biozonal (mostly corals), some light-brownish-gray to white chert.

Limestone, medium-chocolate-brown, fine-grained, dolomitic; grading downward into dolomite, sandy to very sandy in lower part; upper part sparsely fossiliferous (including a few corals); scattered large masses of calcite crystals throughout unit; layer of nodular chert locally in uppermost three feet.

Dolomite, brown and gray, conglomeratic, very sandy.

Dolomite, medium- to dark brown, micro- to very finely crystalline, very finely laminated; containing much post-depositional conglomerate and numerous very fine crystal molds.

Figure 1-3. - Section exposed in the "Hobo" quarry of the Marble Cliff Quarries Co., Columbus. Basal 13 feet exposed in sump area.
STOP 5  Dublin Road Water Plant  Coulumbus Div. Water

Water Supply in Metro Columbus and Franklin County

(Most of this material is available on the WEBPAGE for the Columbus Division of Water http://columbuswater.com/)

Water Sources
"Columbus is in the heart of an area that abounds in small streams. By the building of judiciously located dams and storage reservoirs, it has been estimated that these streams could be developed into a water supply system sufficient ... for 2,500,000 people."
Charles Hoover, chief chemist, 1949

Most of Columbus' water supply is from surface water sources; 15% is from the wells in southern Franklin County. In 2001, the Columbus Division of Water delivered 52.0 billion gallons of drinking water, an average off 142.7 million gallons daily, to approximately one million residents of the Greater Columbus Area. The treated water is made available to the residents, businesses, and industries in Columbus and nearly all of Franklin County and parts of Delaware and Union Counties.

The Dublin Road Water Plant utilizes surface water from the Griggs and O'Shaughnessy Reservoirs on the Scioto River and serves downtown Columbus, western, and southwestern Franklin County. The Hap Cremean Water Plant utilizes surface water from the Hoover Reservoir on Big Walnut Creek and serves OSU and the northern half of Franklin County. The Parsons Avenue Water Plant utilizes groundwater from wells and serves southeastern Franklin County. (See map with Consumer Confidence Report 2001, in Appendix.)

Water supply and sewage treatment are essential for growth of urban regions and, with roads and road access, are controls that help guide growth. To meet the "needs" of Columbus, new water sources must be developed. Acquisition of new water resources has not been without regional conflict.

In the 1870s the City of Columbus was a state capital nestled between the banks of the Scioto and Olentangy Rivers. As with most thriving communities of those times, the availability of water played a crucial role in the growth and prosperity of Columbus. In 1904, the city began construction of Griggs Dam on the Scioto River just north of Columbus to provide for an adequate water supply. Julian Griggs, the City's chief engineer used a plan developed by Samuel Gray, an engineer from Providence, Rhode Island. The City hired John Gregory, a consulting engineer from New York, to coordinate the building of the dam. The dedication of the dam was in 1908.

Jerry O'Shaughnessy, began his career with the City of Columbus in 1870 as a ditch digger, digging the foundation for what was to become the new Columbus Waterworks. Following the 1913 Flood, O'Shaughnessy, then superintendent of Waterworks, fought efforts to add to the height of the Griggs Dam by urging the city to build an additional storage dam further north on the Scioto River, a more feasible solution. Unfortunately, Mr. O'Shaughnessy did not live to see completion of what was then said to be the "best inland city reservoir and dam in the United States." When O'Shaughnessy Dam was completed in 1925, Columbus had a water supply to serve a population of one half million - twice the city's size at the time.

In 1945, much to the surprise of our city planners, Columbus was nearing the limits of its water supply. Post World War II growth of population had increased demand for water equal to a normal 15 year period; and in January 1945, the watershed froze for three and one half months producing the longest drought Columbus had ever known. This prompted plans for a dam on the Big Walnut Creek. In September 1955, the dam was dedicated "Hoover Dam" in memory of brothers, Charles and Clarence Hoover, who both served the City of Columbus Waterworks.
In the late 1960s it became apparent that an additional water supply would be needed. A study of Southern Franklin county found a large underground water supply between the Scioto River and Big Walnut Creek. Construction began on four large Ranney Collector Wells that ranged from 68 to 109 feet deep with laterals totaling more than 6,000 feet reaching into the aquifer. These wells supply an average of 20 million gallons of water daily to residents in southern Franklin County. Today, the three reservoirs provide 85% of the more than 130 million gallons used daily.

The Scioto River begins as a small creek about 80 miles north in Hardin County, northwest of Kenton, Ohio. Rolling through woods and farmlands, this river remains a main water source for Columbus. The Griggs and O'Shaugnessy Reservoirs, located on the Scioto River, have a combined storage capacity of 6.2 billion gallons, holding only a small percentage of the water that flows through Columbus, and providing water for downtown, west and northwest Franklin County. Family picnics, fishing, boating, and water skiing in the recreation area surrounding and including both reservoirs are enjoyed by thousands every summer.

Big Walnut Creek forms about 20 miles northeast of Columbus and feeds Hoover Reservoir. This reservoir can hold 20.8 billion gallons of water; it supplies water for the entire northeast portion of Franklin County and provides a beautiful recreation area for boating and fishing. The rest of the world is recognizing something that our leaders in Columbus have known for decades, the most important part of the water treatment process is protection of our water sources. The Division resumed responsibility and management of the reservoirs in 1994. Our Watershed Management Team is responsible for overseeing the land management, boat safety, and public education regarding protection of drinking water sources. In 1996, the Ohio Environmental Protection Agency (OEPA) approved the Wellfield Protection Plan.

**General Water Treatment Process** (see Figure at http://columbuswater.com/process.htm)

Water is pumped into the treatment plant from the reservoir or stream through [1] rotating Screens [2]. Alum is added to cause flocculation [3]. After rapid mixing (20-40 minutes), the water remains in [4] the settling basin while sedimentation of floc occurs (2-4 hours). The sediment (sludge) is pumped from the bottom of the pools and stored in holding lagoons to dry. The softening process [5] involves the addition of sodium carbonate and hydrated lime to remove calcium and magnesium ions that are responsible for water hardness. This process takes an additional 2-4 hours. For each pound of chemical used in the treatment process, two pounds are removed. After an additional sedimentation process [6], carbon dioxide is added to lower the pH level to approximately 7.5. Water is held in a [7] stabilizing basin for another 2-4 hours. Water then flows through large dual media rapid sand filters made up of layers of gravel, sand, and anthracite coal [8]. Addition [9] of chlorine to disinfect the water, fluoride to protect teeth and a corrosion inhibitor take place at the end of the process before water enters [10] large underground clearwells to be held until needed by the community [11]. When ground water is used, neither screening nor initial sedimentation is needed.

**Water Treatment in Columbus**

In 1903, $46,000 was provided for an initial testing facility to analyze the drinking water and wastewater. These experiments resulted in the construction of the Scioto Water Purification Plant and Pumping Station on Dublin Road which was completed in 1908. This major project became known internationally as "The Columbus Experiment" and was the first water plant to combine filtration and water softening. This plant replaced the first water supply system placed in operation May 1, 1871 which consisted of a well and the Westside Pumping Station built at the confluence of the Scioto and Olentangy Rivers.

Two brothers, Clarence Hoover, chief chemist and bacteriologist of sewage treatment, and Charles Hoover, chemist in charge of the water plant, were instrumental in inventing methods of water and wastewater treatment that are still used today. They helped to shape water treatment and were committed to continuously improving treatment methods. Charles Hoover is credited with the co-discovery of a water softening process using lime and soda ash. Their efforts reduced the number of deaths resulting from typhoid in the early 20th century.
VERTICAL TURBINE PUMPS & MOTORS

GROUND

RIVER

WATER LEVEL

AQUIFER

PUMP SUCTION

LATERAL ISOLATION VALVE

LATERAL SCREENS

BOTTOM SEAL

PUMP COLUMN

REINFORCED CONCRETE CAISSON

DISCHARGE PIPING

PUMP HOUSE

RANNEY COLLECTORS by: Ranney

Ranney Christensen Company
Ranney Division
In the 1940s, along with plans to construct a reservoir on Big Walnut Creek, came the design for a new water treatment plant. This plant would produce almost double the amount of water being supplied by the Scioto River Plant and the recently added Nelson Road Water Plant.

In June of 1956, the Big Walnut Water Treatment Plant located on Morse Road was completed with a capacity to treat 50 million gallons of water daily. The population of metropolitan Columbus at the time was approximately 620,000. In 1969, expansion increased the Morse Road plant's treatment capacity to 130 million gallons a day as Columbus grew to a population of almost 900,000.

Shortly thereafter, construction began on additional treatment facilities. In 1975, a new water plant was completed on the original grounds of the Scioto Water Purification Plant and Pumping Station. This plant is known as the Dublin Road Water Plant. In 1979 in southern Franklin County, results of geological and hydrological testing led to the development of the wellfield and the construction of the Parsons Avenue Water Plant.

In 1996, the Division of Water provided an average of 134 million gallons of drinking water daily to the more than one million residents, businesses, and industries that make up the Greater Columbus Area. The Morse Road Water Plant (renamed the Hap Cremean Water Plant in 1988) provided an average of 67 million gallons daily; the Dublin Road water plant provided 47 million; and the Parsons Avenue Water Plant provided 20 million. These water plants are constantly upgraded to meet the demands of this growing community and new regulations. A new automated system for process control and additional underground clearwells were installed at the Hap Cremean Water Plant. The clearwell expansion increased the plant's storage capacity by 50 million gallons. At the Parsons Avenue Water Plant, additional wells will soon be added to increase the supply source.

These three plants are the strength that supplies quality water to the Greater Columbus Area. Water drawn from the reservoirs and wells must undergo a complex treatment process and meet stringent Federal and State EPA standards before it can be distributed to the public.

**Water Quality** (See the Consumer Confidence Report (CCR), 2001, in the Appendix.)

The two water quality concerns noted in reports are nitrate and lead. The hardness of Columbus water averages about 123 ppm which is in the hard range (121 – 180 ppm). (See Appendix for Acronyms.)

**Nitrate and Newborns:** Infants below the age of six months who drink water containing nitrate in excess of the MCL (10 ppm) could become seriously ill and if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome.

Nitrate levels may rise quickly for short periods of time because of rainfall or agricultural activity. Local television, radio and print media will be notified within 24 hours if the level of nitrate in drinking water rises above 10 ppm. The media will similarly be notified once the level decreases back below 10 ppm. If you are caring for an infant, you should ask advice from your health care provider.

**Lead and Homes:** Some older homes may have lead water pipes. Lead pipes are usually a soft dull, dark gray colored metal and can be easily gouged with a sharp object. Infants and young children are typically more vulnerable to lead in drinking water than the general population. It is possible that lead levels at your home may be higher than at other homes in the community as a result of materials used in your home's plumbing (some older types of solder and some fixtures). Corrosion of plumbing is the listed source for the 1 in 50 home samples that are above the Action Level (15 ppb). The MCL is 0. See CCR, 2001, in the Appendix.

If you are concerned about elevated lead levels in your home's water, you may wish to have your water tested. Additionally, flush your tap water for 30 seconds to 2 minutes before using it. A free booklet about lead in drinking water is available from the Columbus Division of Water (614-645-6186).

Coliform bacteria has been a concern in some reservoirs. A few years ago, before the Upper Scioto West Interceptor sewer line was installed from Dublin to Griggs Dam, sewage overflows from Dublin,
produced occasional advisories to avoid contact with the Scioto River water. In April 2001, The Dublin Road Water Treatment Plant had one sample out of 126 that tested positive.

The Columbus Division of Water performs thousands of tests each year to ensure drinking water quality. Many substances, for which the Division tests, never appear in this report because they are not found in the drinking water. For example, there are 51 volatile organic chemicals as well as arsenic, MTBE, and ammonia (just to name a few) which are NOT found in your drinking water.

Additional information is available from the Safe Drinking Water Hotline at 1-(800)-426-4791.

EPA websites:
Water Quality Criteria and Standards http://www.epa.gov/waterscience/standards/

Water Quality Monitoring
Columbus has been a leader in water quality since the 1900s when the Hoover brothers researched water treatment methods to reduce typhoid which was prevalent during that time. As a result of their research, Columbus gained national prominence in the water industry. Water quality monitoring has always been a part of the treatment process at the Columbus Water Treatment Plants, but up until the 1970s, there were few federal standards. After the establishment of the Environmental Protection Agency (EPA), The Safe Drinking Water Act (SDWA) was enacted by Congress. In the late 1970s, the Division of Water initiated plans for a water quality research laboratory. This new laboratory would permit the Division to conduct appropriate applied research, maintain high monitoring standards for raw and treated water quality and greatly improve our ability to comply with future federal and state EPA water regulations. In 1984, the Water Research Laboratory was completed. With the addition of the Research Lab, the Columbus Division of Water had the ability to perform independent monitoring, research of new treatment methods, and provide water analyses of the watershed, distribution system and respond to the customer’s water quality concerns. In 1989, the name was changed to the Water Quality Assurance Laboratory.

In one of the most modern water quality research laboratories in the water supply industry, certified personnel perform thousands of tests each year and provide data regarding water quality, treatment, and microbiological testing. This ongoing testing and research assures that Columbus drinking water will be of the highest quality, currently meeting all SDWA standards.

Distribution System
In 1871, the first public water supply was pumped through cast iron water lines to a community with the population of less than 32,000. Today water is moved through more than 3300 miles of concrete, ductile and cast iron pipe. The average diameter of the water lines installed have changed in size from 3/4" to 24" lines in the early 1900s, to 6" through 66" lines. The record and map room sections of the Engineering Department keep detailed records of every water line, fitting, tap and hydrant in the city section. The booster stations have pumps controlled by computers. Control room operators can check the levels of all 30 water tanks. Any large water main breaks can be detected by increased usage in that area of the system. This system also tracks the amount of water leaving each water treatment plant. All new waterlines must be chlorinated before they can be placed into service. Once a line passes pressure testing, which verifies it does not leak, the chlorination of the line is performed. Water samples are taken at the site and cultured in the Water Quality Assurance Laboratory. Two consecutive samples taken 24 hours apart must be microbe free before the line is placed in service.

WEB SITES
Ranney Collector Wells
http://www.bennettandwilliams.com/collect.htm
How a Ranney Method® Well Works plus diagrams
http://www.laynechristensen.com/ranney_group.html
Franklinton Cemetery and Flood Wall, Souder Ave

Franklinton Cemetery and Franklinton (West Columbus) Flood Wall

(39 57 47 N  83 01 20 W)

Franklinton, Ohio – 1st Major Settlement in the Area

This cemetery stop is convenient for discussing land use changes over the past 200 years and the floodwall and levee system designed to protect this “peninsula” or bottomland on the west side of the Scioto River. Inspection of the site reveals the answers to the following questions. This was the site of an early church (denomination? _______________); the monument in the cemetery is to the founder of Franklinton, Lucas Sullivant. When did he die and where is he buried now? _______________. Some of the gravestones mark revolutionary war veterans. Why are they not strongly weathered? _______________. The brown gravestones are possibly Berea (?) The markers in the cemetery date from __________. An historical plate is visible at the south entrance to the site.

Lucas Sullivant surveyed parts of central Ohio in 1795-96. In 1797 he acquired 6,000 acres, laid out a town named Franklinton (after Benjamin Franklin). This was the first major settlement in the area. It thrived with the National Road (1833) and the railroad (1850s), but geologically it was a poor choice for long-term settlement. Selection of the riverside makes sense, as rivers provide many services – transportation, water supply, and waste disposal. (According to Schneider, Rickert, and Spieker, 1973, Water is, in a sense, both artery and vein to urban life.) Eventually flooding in this area caused losses and migration to higher ground in Columbus, east of the Scioto, and to the Hilltop, to the west. As you stand in the cemetery, try to visualize the modifications by humans in the area in the last 200 years. Also speculate on the changes to come by 2100, about 600 years after Chris Columbus arrived in the New World, and the land management challenges, if any for the future.

Looking west from the west gate of the cemetery we see a significant drop in McKinley Ave. River level is not much below the level of McKinley Ave here; flood maps show flooding in this low area in 1959 (see Figure 6-1). The hill behind the cemetery to the east and south is part of a railroad embankment and a levee. The flood of 1959 was the most recent major flooding (See USGS HA-52, from which Figures 6-1 and 6-2 were taken).

Franklinton, which celebrated its bicentennial in 1997, is now looking forward to development as a result of the coming flood protection and change in FEMA flood status. The nearby bridge connecting Souder Ave with Route 33 (Dublin Road, near the post office) has also helped to open access to other parts of the city, immediately to the north.

The West Columbus (Franklinton) Floodwall (this material is available at http://utilities.ci.columbus.oh.us/sewers_drains/franklinton_floodwall.htm )

A 7.2-mile long floodwall on the west side of the Scioto River in downtown Columbus (in Franklinton) will protect approximately 6200 structures (5550 residential and 650 commercial) and 2800 acres to an approximate 500-year frequency flood. The estimated project cost is $127 million, with Federal share at a max of 75% and min of 50% (current estimate $95 million) and City share at a max of 50% and min of 25% (current estimate $32 million). According to a press
release by D. Pryce, the public safety of 17,000 residents is at risk until the floodwall is completed.

**Schedule:** Completion in January 2003 (includes floodwalls, levees, gate closures, pump station and generators). Minor site work will continue into mid-2003. Construction of the Wall (with its art) is seen on the west side of I-71 (en route to the next stops).

**Flood zone designation:** The Corps of Engineers and the City of Columbus have submitted a request to the Federal Emergency Management Agency (FEMA) to have the floodplain maps redrawn. The floodwall will allow flood insurance to either be greatly reduced or in most locations, eliminated entirely. FEMA is evaluating the request and will hold a public hearing this winter, at which time new preliminary Flood Insurance Rate Maps (FIRMs) will be available for review. After the FEMA sends the City a formal notification of acceptance of new maps, the City can process all zoning clearances and building permits.

See the current FEMA map for the area at [http://mapserver2.esri.com/cgi-bin/hazard.adol?z=c&c=83.016520%2C39.953584&x=193&y=97](http://mapserver2.esri.com/cgi-bin/hazard.adol?z=c&c=83.016520%2C39.953584&x=193&y=97)  
**Map Notes:** The FEMA Digital Q3 Flood Data displayed on this Web site is developed by scanning the existing Flood Insurance Rate Map (FIRM) hardcopy and capturing a thematic overlay of flood risks. Digital Q3 Flood Data files contain only certain features from the FIRM hardcopy in effect at the time of scanning and do not replace the existing FIRM hardcopy maps. (see map in the Appendix)

**Phases currently under construction (2002):**
Phase IIIB – Floodwall and levee from Greenlawn Avenue to Harmon Avenue: 35% complete. The contractor is finishing the Greenlawn Avenue stop log gate closure and continues installing floodwall along I-71. Pump station construction is underway.


**Phases that will begin construction in 2002:**
Reliable Power – Installation of back-up generators at 5 pump station locations

The 1959 flood profiles and their locations for the Scioto and Olentangy rivers are shown in foldouts, Figures 3-2 and 3-1, respectively. The Souder bridge is now at profile #132 on the map. The 1959 flood map shows water on Most of McKinley Ave, within 950 feet of the Souder / McKinley intersection.
Flood Hazard Map

Map Centerpoint: -83.01527, 39.95823
Map Produced: Sat Mar 16 12:24:57 2002

ESRI/FEMA Project Impact
Hazard Information and Awareness Site
http://www.esri.com/hazards
STOP 7  Gravel Pits, Landfills, and Playing Fields (along I-71)

Sequential Multiple Land Use in Scioto River Valley

This is a “traveling stop” or CW along I-71. Berliner Park is on the east side of the freeway. The Scioto River valley contains many outwash deposits that were mined for sand and gravel (still being extracted at several sites in the Columbus area). The region has now been converted to playing fields, in many cases placed on landfills that filled up the holes in the ground formed by aggregate extraction. Would this be acceptable sequential multiple use of land today? Old topographic maps of Columbus would be very useful in tracing the history of changing land use here.

STOP 8 A  Recycling Corridor - Jackson Pike (Wastewater Plant)

Inland Products, Wastewater Treatment Plant

Inland Products provides the service of recycling grease from hamburgers and other fats and waste from meats. Several decades ago, three men died while cleaning the inside of one of their tanks. They were overcome by methane gas. What is the product made from this waste produced by our food supply system? Where is the ultimate disposal of this material?

The Waste Water treatment facility south of Inland Products is the smaller, older of the two plants we will pass on this trip. What are the byproducts of such a facility?
STOP 8B Recycling Corridor - Jackson Pike (Trash Plant)

Franklin County Waste to Energy Plant (closed) and Martin Marietta Quarry

The Waste to Energy plant was the answer to Columbus' solid waste problems. It would dispose of trash and produce electricity (with help from coal). Explosions of propane tanks improperly disposed of caused some problems. Dioxin from low temperature incineration of waste and other toxics emitted were the main factors that resulted in closing the operation. Other factors included air pollution from coal, maintaining the proper mix of solid waste and coal, low BTU value of wastes, and costs. The site has been for sale or lease. No deal has yet been made, although there have been offers. Loss to the city? $100,000,000?

Adjacent to the site is the Martin Marietta Quarry. It has produced aggregate from both sand and gravel and from limestone. This is minimal disruption of the surface by using two resources, one below the other. Several pre-stressed concrete operations are located along Jackson Pike to make use of these resources. This site is on strike with the rocks at Marble Cliff, and thus should have the same rocks being mined.

Mining does have an impact on groundwater as was demonstrated here when pumping of the very deep quarry in bedrock resulted in a cone of depression that dewatered wells in the area.

STOP 8 C Recycling Corridor - Jackson Pike (Phoenix Golf Links)

Former Columbus Sanitary Landfill and Phoenix Golf Links.
(3413 Jackson Pike, Grove City. 614-539-3636)

This former sanitary landfill has been converted to a golf course. There are few water hazards on it. Why? There also is a small power plant located on the east side, north of the entrance. What are the byproducts of this recycling system.

Just north of the golf course is a tire shredding plant. Major problems have occurred from stored tires. These include fires and habitat for mosquitoes. Of what use are the shredded tires?
STOP 9  Stream Channelization, AgRoc Quarry

Landscape Modification for Resource Extraction

At this site on the west side of I-71, Big Run was channelized and moved to make aggregate resources accessible. So far, no problems with this change have been discovered.

We will not be near this site today.

STOP 10  Multiple Land Use Hartman Farms (Olen Gravel, Route 23)

Simultaneous and Sequential Multiple Land Use on Scioto River: Hartman Farms, Olen Gravel Corporation, Columbus Well Field

The Hartman Farms may provide the ultimate example in multiple resource use in this part of Ohio. At one time it was a thriving farm with many vineyards and fruit trees. The well drained sandy soil was a definite factor. From the gravel aggregate is now made. In the gravel, groundwater is stored, protected and filtered, most recently in the South Well Field. The lakes produced by the mining of gravel will store water and will provide waterfront property and possibly useful recreational sites and wildlife habitat, as seen north of Frank Road at the Haul Road.

Of course the area also provided wilderness resources and agricultural sites to the Native Americans, and wood for the pioneers.

The materials? Spangler Hill is a classic kame. Olen Gravel is excavating in river terrace and eventually in floodplain.

Unfortunately there are few places to pull off and turn around easily in this area. Stops will depend on the size of the group.

STOP 11  Glacial Legacy and St Joseph’s Cemetery, Route 23/Rowe Rd

Eskers, Kames, Shorelines, and Cemeteries in Glaciated Terranes

St Josephs and Fernwood Cemeteries make use of the well drained and easily excavated soil and regolith. Cemeteries provide useful clues to mapping glacial deposits. Are they in outwash, eskers, kames or old beach or bar deposits? Check out Geology along Highway 23 for clues to the nature of the deposits in St Josephs.
Following the lead of Milwaukee and their waste product known as Milorganite, Columbus now exports one of its waste water by-products to the community. Is also used on non-food gardens and trees to fertilize and improve the soil. What other byproducts are obtained from the sewage treatment plant? What advances or improvements could be made in handling this waste stream? Why do communities seem to grow or expand up river? Do they?

What impact do sewage treatment plants have on growth of a community. How does Columbus control growth in Franklin County?

What is the expected size of the Columbus Metro area in 2100? Has anyone projected that far?

What will the Big Darby Creek Watershed look like in 2100? Will it have better water quality and recreational resources than today?

Is there a connection between Population and wildlife habitat? If so is it well recognized?
There are two locks in good condition on the west side of Canal Road, NE of Lockbourne. The rock type is sandstone, possibly the Black Hand of Mississippian age. You will find traces of the canal along Rowe Road as you approach Lockbourne from the west, off SR 23 south of St. Josephs and Fernwood Cemeteries. There are also locks on the west side of Walnut Creek as you enter Lockbourne. Note that there was an aqueduct across Walnut Creek to carry canal traffic across the river.

When Ohio became a state in 1803, there was little access for farmers to markets outside the state. Most goods were sent to New Orleans, a huge market, where large supply meant low prices. The construction of the Erie Canal in New York State in the early 1800s opened the Ohio country to the much more lucrative New York market, if only goods could be sent to Lake Erie. This was the prime motivation for the construction of the two canal systems in Ohio that connected the Ohio River to Lake Erie and places in between. The locks in Lockbourne were built (in the late 1820s) to lift boats toward the Portage summit south of Akron along the Ohio-Erie Canal, connecting Cleveland and Portsmouth. A description of locks from Gieck (1988, pages 12 and 13):

"A lock was essentially a rectangular stone channel .... ninety feet long, fifteen feet wide, and up to twenty feet deep. It served as a hydraulic elevator to raise or lower boats to a new level. The typical lift at each lock was eight to ten feet.

A pair of heavy wooden "whaler gates" closed the lock at each end. These could be opened and closed manually by means of long handles, called "sweeps," constructed of heavy timber. The gates were hinged so they opened upstream. When closed, their top edges formed a "V" with the point facing upstream so that the pressure of the "head" of water against the gates kept them closed."

In each gate were valves that, when opened, allowed water to go into or out of the lock or, when closed, to keep it in or out. Traversing a lock took about 15 minutes. During the process, 13,000 cubic feet (about 100,000 gallons) of water were lost downstream. Locks could handle up to 100 boats per day, requiring at least 1,500 cubic feet of water per minute. It was necessary to provide this water from above the summits along the canal. In central Ohio, this was provided by Buckeye Lake. Buckeye Lake was formed by the damming of the source of the Licking River and surrounding swamp. Speed limit on the canals was about 4 mph.

Canals in Ohio were used from the 1820s into the 1850s, when railroads became common. Parts of the canal were still in use at the turn of the century (1910s) in the Cleveland area until a flood ended their usefulness.

Reference:

Gieck, Jack, (1988), A Photo Album of Ohio's Canal Era, 1825 -- 1913, The Kent State University Press,
310 pp.
STOP 14  Kurtz Brothers Groveport Compost Facility (Rohr Road)

Recycled Products of Yard Waste

Kurtz Bros. is a company based in Cleveland and under contract with the Solid Waste Authority of Central Ohio (SWACO) to accept yard waste and compost it. The yard waste is ground up and placed in long windrows. Temperature and moisture content are monitored. The rows are turned periodically to add air, or air is blown through the piles. After a few months the compost and mulch is sold by bag or bulk.

The facility has a raised berm and a settling pond to contain all materials on site. The quality of the water in the settling pond is monitored. At times during the year and in certain meteorological conditions, odors are apparent in the area of these facilities. When the disposal of yard waste in sanitary landfills in Ohio was restricted in the 1990s (to save valuable landfill space), these facilities became essential for disposal of yard waste from major brush and tree removal jobs. On site composting is encouraged for small amounts where space is available in large yards.

Another Kurtz Brothers site is located on Roberts Road, in the Upper Arlington Municipal Garage area. The website http://www.nailadumper.com/disposal.htm#yard provides the following information on yard waste and detailed information on recycling in Franklin County.

The state discourages disposal of yard wastes in sanitary landfills. Residents from communities in Franklin County can take their leaves, grass and brush to Kurtz Brothers Compost Facilities, 2850 Rohr Rd., Groveport, and 4120 Roberts Rd., Upper Arlington. For locations and hours of operation, call 491-0868. For information about home composting, call The Authority at 871-8105.
STOP 15  Pickerington Ponds Metro Park (Bowen Road)  FSWCD

Pickerington Ponds Wetlands Wildlife Refuge Metro Park

Introduction

Located in SE corner of Franklin County and the NW corner of Licking County, the Park is in an area undergoing urbanization (Figure 15-1). Conversion from agricultural land and increased use of groundwater could change the hydrologic characteristics of the region. Such changes would impact the wildlife and their wetland habitat that are the base for this Metro Park. Some of the concerns about this suburban development include: density and proximity of development, water table lowering from increased pumping in current and new well fields, decreased water from septic tank drain fields, decreased area of ponds, change of habitat, increased discharge of nitrate-rich (?) groundwater, surface runoff with fertilizers and pesticides from lawns and oil, heavy metals, and salt from roadways. Most of these concerns arise because of the geologic setting – a glaciated landscape with kame gravels and a buried bedrock valley, also containing highly permeable glacial deposits. As a result of these concerns Franklin County Metro Parks requested the Franklin Soil and Water Conservation District (FSWCD) to evaluate the hydrology and geology of the park.

For the purpose of this trip, much of the material here is taken directly from that report “Preliminary Evaluation of Pickerington Ponds Metro Park Soils and Water”, dated August 10, 1998, and prepared by FSWCD.

Additional information on the Metro Park (from the Metro Parks web site) is at the end of this FSWCD material.

Growth

According to the FSWCD, the area has been the subject of other studies, including one by the City of Columbus Department of Development, The Southeast Plan. In this plan, Columbus indicates that the central sewer lines being supplied to the area by Columbus, will support an average of 12 people per acre over the 11.4 square miles included in the plan. Pickerington and Canal Winchester probably will continue to develop densities that are comparable to the newer growth areas in their corporation boundaries. It is the FSWCD’s understanding that Violet Township, Fairfield County, is planning a building density of approximately one (1) to two (2) homes per acre in the area near the Ponds (Watts, 1998).

Geologic Setting

The park is located on the boundary between the Central Lowlands Province and the Appalachian Plateau. Beneath the park is a deep buried valley that began as a part of the Teays drainage system (Groveport – Cambridge Rivers), Figure 15-2. This valley has been reused repeatedly during the multiple glaciations that occurred in Central Ohio during the Pleistocene and has significant deposits of sand and gravel in some sections. The successor to this buried valley, known as the Newark River or Newark Valley (Stout et. al, 1943), is home to a number of municipal water systems. Upstream from where the Newark River turned south (at the Franklin/Pickaway County Line beneath the current Scioto River), there are a number of well fields in Franklin and Fairfield counties. They begin at Lockbourne, include the Rickenbacker Port Authority, Obetz, Groveport, and Canal Winchester in Franklin County. In Fairfield County, Pickerington, Violet Township, Baltimore and Thurston all have wells in the valley. In Licking County, the valley underlies Buckeye Lake. Hebron, Heath and the City of Newark have their well fields in the trunk valley. Alexandria and Granville have their wells in side tributaries to the Newark River.

The buried valley can be quite deep; in places there are 300 to 400 feet of Pleistocene materials filling the old bedrock valley. Most of those deposits are Late Wisconsinan in age (Szabo, 1998). However, there are remnants of the older Minford silts which were deposited in Glacial Lake Tight when
DEEP STAGE
POST-KANSAKAN OR PRE-KANSAKAN STAGE

WILBER STOUT, KARL VER STEEG, AND G. F. LAMB
1943

TEAYS STAGE DR.

BY
WILBER STOUT, KARL VER STEEG, AND
1943
GROUNDWATER YIELD POTENTIAL FOR PICKERINGON AREA
CITY OF PICKERINGON WHPP
PICKERINGON, OHIO

Figure 8

100-500 GPM
25-100 GPM
0-25 GPM
PUBLIC OR INDUSTRIAL WELL

LEGEND
early glacial events dammed up the north flowing Teays River (at least 710,000 years ago) (Angle, 1995, Szabo, 1998). The damming resulted in a series of stream reversals that produce the drainage patterns that are seen today in Central Ohio. The major water supplies are, for the most part, in Late Wisconsinan sands and gravels (associated with the Boston and the Caesar glacial advances) and the earlier Lockbourne sands and gravels which represent a number of pre-Late Wisconsinan glacial and interglacial events. (Figure 15-3).

These water supplies, however, count on recharge from the surface soils and streams to regenerate their stored water. In the area of Pickerington Ponds, the surface deposits are from the Darby glacial advance which occurred just over 17,000 years ago (Weatherington, 1978). The ponds are in a kame and kettle landscape. It is the same age as and similar in setting to the Hartman Farms where the City of Columbus South Well Field is located and the Raccoon Creek Valley where Alexandria and Granville have their well fields. The ice sheet, which deposited the Darby/Centerburg Tills in Franklin and Licking counties, was responsible for these areas. During the retreat, the ice remained stagnant for some time in the old valley and melted, leaving sand and gravel hills (kames) and depressions (kettles) that filled up with water. The stratigraphy from borings is given in Figure 15-4. The top number in the figure is the site, the second number is the depth to the first sand or gravel layer, and the third is the thickness of the sand or gravel to the base of the hole—a ‘+’ sign indicating it may be thicker. Logs of borings south of the Ponds and south of Figure 15-4 have gravel thicknesses of 25 feet. Borings for the new Pickerington Well Field have sand and gravel 130 feet in thickness. Some of the kame gravels appear to overlie thick gravels in a buried valley. Depending on the connection, there may be a potential for lowering the water table of the region, including that of the kames and the ponds.

The late 1800s brick farmhouse just southwest of the Pond is built on top of a 46-foot high kame, a hill of sand and gravel left behind by the melting Darby ice. The area is mapped in pink on the State of Ohio Glacial Map. After the ice retreated, the landscape was a marshland with ponds and hills of sand and gravel. Until the advent of agricultural tile drainage, much of this area was not suitable for agriculture. It was a wetland used by migrating waterfowl, much as the ponds are today.

Pickerington Ponds Are Fens

Pickerington Ponds are actually fens, controlled by the regional ground water elevations. Fens are formed in alkaline settings where the sand and/or gravel or underlying bedrock is predominately carbonate materials (limestone and dolomite). The pH of the water in a fen is above 7.0 and the vegetation requires a neutral or alkaline environment. Cedar Bog just south of Urbana, one of the most famous glacial remnant natural wetlands and ponds in Ohio, is actually a fen. A bog, which supports acid-loving vegetation, is formed in a geologic setting where the sand and/or gravels or the underlying bedrock is acid in nature, typically sandstones and shales in Ohio. The pH of the water in the pond and surrounding wetlands is below 7.0. The geologic distinction between a fen and a bog is totally dependent on pH and the vegetation is supports. The name fen is not related to the interconnectedness or lack of interconnectedness of the body of water with the surrounding water table. That connection is completely dependent on the geomorphological setting.

Soils

The soils that formed in this setting are among the most permeable that are found in the two counties. Sheet 55 from the Franklin County Soils Map is given in Figure 15-5. In Franklin (McLoda and Parkinson, 1980) and Fairfield (Steiger and Griffin, unpublished) counties, the upland kame areas have soils that are, for the most part, in B hydrologic group. They include the Eldean silt loam, Gallman silt loam, loamy substratum, Kendallville silt loam, Ockley silt loam, and Thackery silt loam. Some small portions of the uplands also have Amanda silt loam, Cardington silt loam, Bennington silt loam, Celina silt loam and Miamian silt loam which are classified as a C hydrologic group. The low areas, the old marshes and ponds, also have very permeable soils which are limited for infiltration only by their current saturation. For the most part, the low areas are Kokomo silty clay loam, Patton silty clay loam and Westland silty clay.
loam which are B hydrologic group soils and Pewamo silty clay loam, Crosby silt loam, and Rockwell silt loam, which are C hydrologic group when drained. Patton soils have a lacustrine clay and silt parent material and have formed on the sites of old glacial lake beds. Crosby, Kokomo, and Pewamo have an apparent high water table in spring and recharge groundwater through the clayey Darby till. They are rated as Prime Farmland (high productivity) soils when drained.

**Surface Drainage**

The main pond now has an overflow drain from the southwest margin that connects with South Fork of Georges Creek, near a stone tile location that drained from the ponds in 1875. An open outlet now also drains from the ponds, where an 1894 outlet existed (open ditch, 750 feet south of the 1875 structure). The control for the drain is beneath the path in the Bowen Road Observation site. The water level in the ponds is lowered in the fall to increase the shore space for migrating birds. Two tile drains are under the main pond, and other tile drains connect the small ponds to the south with the main pond. The subsurface tile system worked until the 1950s when an old peat deposit, now under the main pond began to burn. The tile system broke and the marsh and water table ponds returned. The hydraulic connection of the ponds was demonstrated in the late 90s when Metro Parks tried to drain the main pond for management purposes and the other ponds also were lowered. The connections are partly due to the tile drains. The connection to the surrounding kames was seen as springs drained from them into the lowered water level of the ponds.

Drainage in the area is also to Tussing Ditch which is in Franklin County south of the Ponds and to other drains in Fairfield County.

**Some Conclusions and Recommendations from the Report**

- The ponds receive local surface run off, groundwater discharge, and tile drainage.
- Capacity pumping for the wells currently in place at Pickerington’s Diley Well Field could produce a 4-ft drawdown under the main pond. The ponds would act as recharge to the groundwater system. The static level at the well field is 778 ft AMSL; which is close to the 778.8 ft elevation at the spillway for the main pond. Other scenarios suggest an 8 foot drop at the ponds. Maintaining the ponds and water for the well fields are important objectives for groundwater and Park management.
- Installation of sanitary sewers could reduce recharge to the ponds, as could sump pumps in housing in the area.
- One suggestion is the purchase of land (by Metro Parks) north of the ponds and retain it for agriculture in order to maintain recharge. They have purchased additional land in past few years, holdings now extend to Long Road and west of Georges Creek. The park totals about 1200 acres.
- No basements in new homes should have perimeter drains lower than the 778.8 foot level.
- Relocation of Wright road is recommended to reduce harmful materials in runoff.
- Farms in the watershed should adopt appropriate manure management and fertilizer/pesticide applications.

Controversies have arisen between developers and those concerned about possible impacts of development. How serious are the potential problems? How can they be addressed.

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From the Metro Parks Web Site ---

Franklin County Metro Parks have 10 locations on more than 13,000 acres. City parks number 166 locations on 5,400 acres including three reservoirs, five golf courses, 10 swimming pools and 25 recreation
centers. There are bicycle and walking paths and one of the largest number of softball players in the country, participating in city leagues.

Pickerington Ponds Wetlands Wildlife Refuge features observation areas for waterfowl and shorebirds. Location: Wright Road, 1 1/2 miles east of Gender Road, Pickerington. Pickerington Ponds Metro Park opened in 1989.

**Bowen Road Observation Area:** This park's concentration of pond, wetland, woodland and field creates an ideal site for birdwatchers. From songbird to hawks and owls, game birds to waterfowl, they can find abundant opportunities here to nest-rest-and-eat. A covered observation deck help keep visitors dry during a rainy autumn - just the sort of weather that attracts migrants using the pond as a haven from the storm. Two all-weather spotting scopes are permanently mounted on the deck. An uncovered boardwalk and paved nature trail provide additional wildlife viewing.

**Wright Road Observation Area:** A gravel lot favors birdwatching from the comfort and cover of your own car window. Daily Sightings: More than 260 species of birds have been seen at Pickerington Ponds. A daily recorded message provides the public with each day's sightings.

**Murals:** In May 1993, students from Pickerington Elementary School created a mural of tiles that depict their observations at this park. Again in 1997, more than 650 students from Pickerington and Tussing elementary schools created four more murals surrounding the restroom. Visitors can see both installations at the Bowen Road Observation Area.

**Watershed:** Pickerington Ponds also provides a measure of protection to the land around it. Drainage areas help filter ground water, and the health of the adjacent environments can be gauged by the abundance and types of species found in wetlands like this one.

http://www.metroparks.net/pickerington.htm

http://www.metroparks.net/

http://www.columbus.org/