

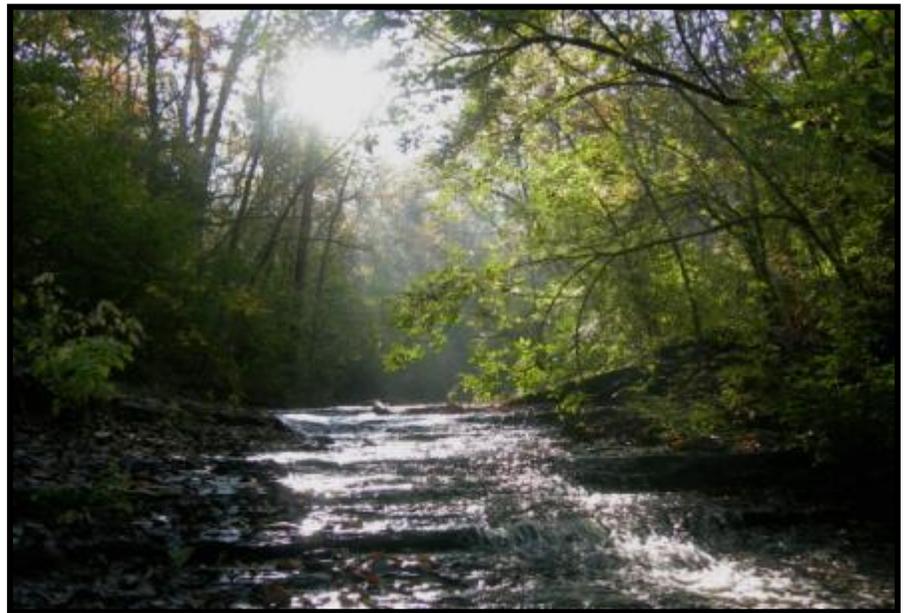


*State of Ohio*  
*Environmental Protection Agency*

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## **Restoring and Protecting the Olentangy River**

Hydrologic Unit Code 0506001-10-07



*Unnamed Tributary to the Olentangy River*  
*Camp Lazarus Boy Scout Reservation*

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**June 10<sup>th</sup>, 2010**

Nonpoint Source Program  
Russ Gibson, NPS Manager

# Introduction & Project Summary

**Waterbody Improved:** The Olentangy River within the city of Delaware was impaired due to lowhead dam structures, failing home septic systems and increased agricultural and urban stormwater runoff. Lowhead dams were barriers to fish migration and contributed to degraded water quality with their impounded pools. Failing home septic systems were contributing nutrients and elevated stormwater flows were contributing silt and sediment to the river. As a result of work completed under the Olentangy River Restoration Project nearly three miles of the previously non-attaining Olentangy River within and around the city of Delaware, Ohio are now in full attainment of its designated warmwater habitat aquatic life use.

**Problem:** Ohio EPA completed a Total Maximum Daily Load Study (TMDL) on the Olentangy River and found that the river was either partially attaining or not attaining its warmwater habitat designated aquatic life use in and around the city of Delaware. The highest magnitude causes of impairment include hydromodification by lowhead dams; nutrients from failing home sewage treatment systems (HSTS); and, sediment resulting from stormwater and agricultural runoff. The TMDL recommended that lowhead dam structures be removed, failing HSTS systems be repaired or replaced, and that agricultural and stormwater runoff be better managed. Additionally, due to rapid residential development being observed in the area, it was recommended in the TMDL that riparian buffers should be protected.

**Project Highlights:** The Olentangy River Restoration Project required multiple partners and implementers. Highlights of the project through May, 2010 include:

- Removal of four lowhead dam structures in and around the city of Delaware
- Replacement and/or repair of 126 failing HSTS systems
- Fee simple acquisition of 60 acres of very high quality riparian and headwater areas
- Acquisition of conservation easements on 175 acres of high quality riparian and headwater areas
- More than 10,000 agricultural acres enrolled in the Scioto River CREP
- Development and implementation of the Olentangy River Construction Stormwater permit

**Results:** Prior to completion of these projects, the four monitoring sites in and around the city of Delaware were not in attainment of the river's warmwater habitat designated aquatic life use. Fish communities, (Index of Biological Integrity) were not performing at WWH standards; macroinvertebrate communities (Invertebrate Community Index) were not meeting standards and the physical habitat conditions (Qualitative Habitat Evaluation Index) were relatively poor.

Following completion of the projects, fish (IBI) scores for all monitoring sites improved to exceed warmwater habitat standards with two of the four sites meeting exceptional warmwater habitat expectations. The macroinvertebrate scores (ICI) showed the most dramatic increases, at some sites by more than 40%. Physical habitat conditions also increased considerably with all sites but the former River street dam site exceeding warmwater habitat expectations.

**Partners and Funding:** The city of Delaware, Delaware County General Health District, Preservation Parks, Ohio's Scenic Rivers, ODNR-Division of Soil & Water Resources, Ohio Department of Transportation and Ohio EPA were all partners critical to the success of this project. Local funding was provided primarily by US EPA and Ohio EPA, however the city of Delaware and ODOT contributed funds to successfully completing components of this project. A section 104(b)(3) grant in the amount of \$105,000 in supplemental federal funding was provided to the city of Delaware for dam removals. \$6.3 million in funding through Ohio EPA's Water Resources Restoration Program (WRRSP) was provided for land and conservation easement acquisition. \$110,000 in section 319(h) grant funding was awarded to the local health department for home septic work. \$405,000 in supplemental section 319(h) funding was awarded to ODNR-Division of Soil & Water Resources for the conversion of an agricultural ditch into a 2-stage channel. Additionally, \$70,000 in OEPA Surface Water Improvement funds were awarded to the city of Delaware for additional dam removal work to be completed in 2010.

**Ohio's Nonpoint Source Program:** The highest magnitude causes of impairment to Ohio's rivers and streams are nonpoint source and include hydromodification, habitat alteration, sediment and nutrients (in that order). Meeting these challenges is most effective by implementing a comprehensive nonpoint source management strategy that includes restoring impaired waters, protecting high quality waters and implementing efforts to reduce the amount of nonpoint source pollutants entering streams. Ohio EPA revised its nonpoint source program to align with these strategies in 2005.

Waters impaired by hydromodification and habitat alteration are being restored by removing lowhead dams and restoring streams using natural channel design methods to improve physical habitat conditions as well as to improve the stream's capacity to assimilate NPS pollutants. Such projects also substantially reduce sediment loadings to streams by stabilizing eroding streambanks and unstable stream channels. Since 2005, Ohio EPA has provided funding for projects that have successfully restored more than 10 miles of impaired streams and stabilized more than 4 miles of severely eroding streambanks.

We also recognize that restoring impaired waters is only effective if we are also successful at protecting and maintaining Ohio's high quality streams. We have expanded grant resources to local organizations for the acquisition of conservation easements on high quality land parcels along some of Ohio's best streams. Funding is derived from Ohio EPA's Water Resources Restoration Program (WRRSP), the Surface Water Improvement Fund (SWIF) and to a lesser extent from section 319(h) Clean Water Act grants. Since 2005, Ohio EPA has funded the acquisition of more than 2,500 acres of conservation easements.

The third component of Ohio's nonpoint source management strategy is to reduce nutrient and sediment loadings to streams from a variety of sources. We are effectively reducing agricultural NPS loadings by requiring projects that are highly targeted to small watersheds. Where problems have been specifically identified, we are making funds available from the SWIF and other sources to encourage the replacement of failing home septic systems. We have also greatly expanded financial support for improving urban stormwater management by encouraging the implementation of innovative stormwater demonstration projects in urban areas. For example, more than 20 innovative stormwater projects were recently funded under the Surface Water Improvement Grants Program.



Sediment loading from stormwater runoff in the Olentangy River in Delaware County, Ohio

**Introduction:** Urban (or rapidly urbanizing) rivers and streams present particularly difficult challenges due to the increased flows and historic alterations that have been made to stream channels as flood control and/or urban development projects. This report summarizes actions that have been successfully implemented to restore several miles of previously non-attaining segments of the Olentangy River in and around Delaware, Ohio. The Olentangy River is one of Ohio's most threatened rivers as a result of rapid conversion of land uses from agricultural to suburban and residential uses. The success of these actions is a testament to the effective collaboration of federal, state and local governments, non-profit organizations, volunteers and other watershed stakeholders.

**Setting and Attributes of the Watershed:** The Olentangy River flows 93 miles from its source east of the city of Galion, Ohio through portions of Richland, Crawford, Marion, Morrow, Delaware and Franklin counties before emptying into the Scioto River in downtown Columbus. Upper reaches of the watershed flow through agricultural lands and small villages



22 miles of the Olentangy River in Delaware and Franklin counties have been designated state scenic rivers under section 1517 of the Revised Code.

such as Caledonia, Waldo and others before entering the 1159 acre flood control reservoir created by the US Army Corps of Engineers. Land use downstream is rapidly transitioning from agriculture to residential as the river flows through southern Delaware and northern Franklin counties. Delaware county is the fastest growing county in Ohio with rapid population growth and development activities. Flowing southward through the cities of Worthington and Columbus, the Olentangy is highly urbanized and has been modified through channelization, low head dams and other impacts from highway bridges and other structures. The Olentangy reaches its confluence with the Scioto in downtown Columbus immediately south of the Ohio State

University.

The Olentangy is home to 54 species of fish, including the state threatened Bluebreast and Spotted Darters, a variety of mussel species, including the state threatened Purple Wartyback, as well as an impressive assemblage of breeding bird populations and other wildlife. 22 miles of the Olentangy River (from Delaware Dam downstream to the city of Worthington) are designated as a state Scenic River under provisions of Section 1517 of the Ohio Revised Code.

In addition to its rich and diverse biological communities, the river also provides public drinking water supplies and recreational opportunities for many central Ohioans. The Olentangy River is located in the Eastern Corn Belt Plains Ecoregion of Ohio. Within the area covered by this report, the Olentangy River is assigned the Warmwater Habitat (WWH) aquatic life use

designation. Other segments of the river have been designated as Exceptional Warmwater Habitat (EWH).

**Watershed Efforts within the Olentangy Watershed:** A growing partnership of citizens, local watershed groups and state, federal and local government agencies have joined together to reduce the impacts of nonpoint and other forms of pollution within the Olentangy watershed. State endorsed watershed action plans have been developed for both the upper and lower sections of the watershed by Friends of the Lower Olentangy (FLOW) and the Olentangy Watershed Alliance. Stakeholders from the cities of Delaware and Columbus, the Ohio State University, ODNR's Scenic Rivers program, ODNR's Division of Soil & Water Resources, local soil & water conservation districts, and others participated in the development of these watershed plans. The plans were developed using section 319(h) grant funds and meet the required 9-elements designated by U.S. EPA.

Ohio EPA's Division of Surface Water completed a Total Maximum Daily Load Study (TMDL) for the Olentangy River in 2006 in response to growing threats to the watershed from habitat alteration, hydromodification, silt & sediments and nutrients. The TMDL process included intensive surveys of the physical, chemical and biological characteristics of the watershed that were completed in 2005. The Olentangy River TMDL was approved by U.S. EPA—Region 5 in 2007. Successful watershed planning efforts also required extensive local participation. Stakeholders who have been active in local planning efforts within the Olentangy watershed include:

- City of Delaware, Ohio
- City of Columbus, Ohio
- Morrow County SWCD
- Delaware County SWCD
- Marion County SWCD
- Friends of the Lower Olentangy (FLOW)
- Olentangy Watershed Alliance (OWA)
- Ohio State University
- ODNR-Division of Soil & Water Resources
- ODNR-Scenic Rivers Program
- Ohio EPA—Division of Surface Water
- Ohio EPA—Division of Drinking and Ground Water
- Ohio Department of Natural Resources
- U.S. Department of Agriculture
- USDA-Natural Resources Conservation Service
- Columbus & Franklin County Metroparks
- Preservation Parks of Delaware County

**Action Items:** This report summarizes actions that have been implemented in the Olentangy River from Delaware Dam downstream to Delaware Run. The hydrologic unit code for this segment of the river is HUC 0506001-10-07 as it flows through Delaware County, Ohio. This particular HUC unit drains 28,883 acres.

Both the endorsed watershed action plans and the approved TMDL identify that the primary high magnitude causes of impairment in this section of the Olentangy River are habitat alteration, hydromodification, urban and agricultural runoff and failing HSTS systems. As a result, the endorsed watershed plans and the TMDL recommend removing all lowhead dams within the city of Delaware, replacing failing HSTS systems in southern portions of Delaware County, and more effectively managing agricultural and urban stormwater runoff. Consistent with these recommendations, the following actions have been completed (or will be completed during the summer and fall of 2010):

**Dam Removal Projects:** Seven lowhead dam structures were located within and/or near the city of Delaware in the Olentangy River. All have been recommended for removal. Four have been removed already; the remaining structures are scheduled for demolition and removal this summer or fall. A list of these structures follows:

- Main Road Dam
- Panhandle Road Dam
- Central Avenue Dam
- River Street Dam
- Stratford Road Dam
- US Route 23 Dam
- Dennison Dam

**Status of Recommended Actions:**

1. **Dennison Dam:** This structure was located downstream from the city of Delaware and was successfully removed in 2004 by the ODNR-Scenic Rivers Program using funds acquired through the Scenic Rivers License Plate Program. Total costs for this project were approximately \$40,000.
2. **US Route 23 Dam:** This particular structure is currently in a very degraded state. The city of Delaware is currently contracted to remove this structure during the summer or fall of 2010 under provisions of Surface Water Improvement grant project #10SWIF-SEP-01. Funding for this project is provided to the city from Ohio EPA's Surface Water Improvement Fund.
3. **Stratford Road Dam:** The Stratford Road dam has also been contracted for removal during the summer, fall of 2010 by the city of Delaware under provisions of #10SWIF-SEP-01. Funding for this project is from the Ohio EPA's Surface Water Improvement Fund.
4. **River Street Dam:** The River Street Dam was removed by the city of Delaware during 2006 as mitigation under Ohio's Scenic Rivers Law (ORC Sec. 1517). Total costs for this project were approximately \$40,000 and paid by the city.

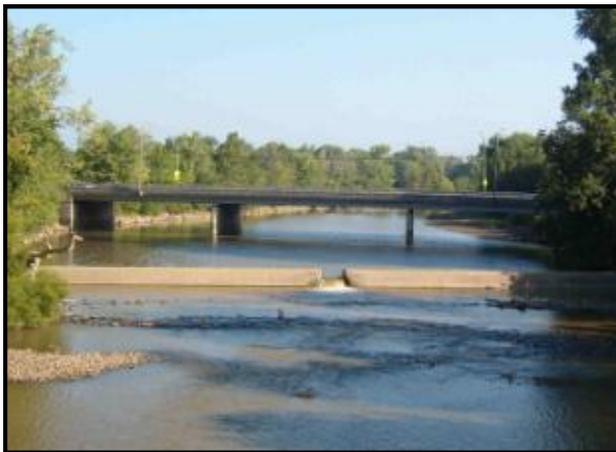


River Street Dam (above) was removed in 2006 by the city of Delaware as mitigation under Ohio's Scenic Rivers Law.

5. **Central Ave Dam:** This structure was removed by the city of Delaware in 2008 under provisions of Ohio EPA funded project #05(h)L-662. Total costs for this project were \$100,000 and provided to the city by Ohio EPA under a grant from U.S. EPA—Region 5.
6. **Panhandle Road Dam:** Panhandle Road dam is located immediately north of the city of Delaware along U.S. Route 23. This structure is currently under contract to be demolished and removed during August, 2010 by the Ohio Department of Transportation (ODOT) for section 401 mitigation credit. Funding is provided by ODOT.



This site of the former Dennison Dam in the Olentangy River has completely recovered. The dam was removed in 2004 by ODNR's Scenic Rivers Program and served as the catalyst to remove all of the lowhead dam structures in the river..



Photos show the Central Avenue Dam in the city of Delaware before and after removal. Biological monitoring completed in 2009 demonstrates a remarkable recovery within this stream segment resulting from these nonpoint source projects such as this one.

**Home Septic Replacement:** Issues related to nutrients resulting from failing home sewage treatment systems were identified in both the endorsed watershed action plans as well as the approved TMDL for the Olentangy River. Under provisions of section 319(h) grant funded project #05(h)EPA-07, the Delaware County General Health District embarked upon a project to inspect and evaluate all discharging systems within Delaware County. Owners of systems found to be failing were ordered to repair and/or replace the system.

### **Status of Recommended Actions:**

This project was conducted for a period of three years. During that time, the Health Department conducted 3,952 HSTS unit inspections. Using both cost share funding provided under the section 319 grant and homeowner funding, 126 failing HSTS were either repaired and/or replaced throughout the watershed. The project was completed in 2008 and resulted in nitrogen load reductions of 5,436 pounds per year and phosphorus reduction of 2,068 pounds per year. The section 319 grant was closed on 09/05/08.

**Olentangy River Special Construction Stormwater Permit:** A third high magnitude cause of impairment identified in the Olentangy Watershed Action Plans and the approved TMDL are issues related to stormwater management. In response to recommendations within these documents, Ohio EPA implemented the revised Olentangy River Construction Stormwater permit identifying more stringent requirements for construction activities occurring within the Olentangy watershed. The permit also identifies more robust mitigation requirements for several related activities.



### **Status of Recommended Actions:**

The permit was first public noticed on March 12 2007 with a public comment period extended to May 7, 2008 to accommodate the public interest generated by the general permit. Revisions were made following the public comment period and the Olentangy River General Permit was issued as final in April, 2009. This permit requires stream setbacks necessary to protect the Olentangy River, enhanced mitigation and requirements implementation of many of the recommendations of the Olentangy TMDL. This permit serves as an effective tool for managing development and construction in the watershed in a more manageable and responsible manner.

Green stormwater practices such as illustrated above will become more commonplace in the Olentangy watershed as a result of the Olentangy River Special Construction Stormwater permit implemented in 2009 by Ohio EPA.

### **Scioto River Conservation Reserve Enhancement Program (CREP):**

Agricultural runoff from areas upstream from the city of Delaware has also been identified as a contributor to nonpoint source causes of impairment within the Olentangy River. The Scioto River Conservation Reserve Enhancement Program (CREP) is enrolling up to 70,000 acres of vulnerable riparian corridor and marginal farmlands into 15-year conservation set-asides under this program administered by the USDA-Farm Service Agency (FSA). The Olentangy River is included in the Scioto River CREP area. Nearly 20% of the acres currently enrolled in the CREP are within the Olentangy watershed.

**Status of Recommend Actions:** Sign-ups for the Scioto CREP within the Olentangy watershed have been very vigorous. Through 6/1/10, more than 12,300 acres have been enrolled in the Scioto CREP within the Olentangy watershed. Following is a county-by-county listing of CREP sign-ups in and upstream from the city of Delaware:

- Marion County—8,955 acres
- Morrow County—1,443 acres
- Delaware County—800 acres
- Crawford County—1,143 acres

Successful CREP sign-ups and participation by the agricultural community within the Olentangy watersheds is a direct reflection on the work of the various local soil & water conservation districts in the watershed, ODNR’s Division of Soil & Water Resources and the Olentangy River watershed coordinator. County-by county annual nonpoint source pollutant load reductions estimated from the practices installed under this program include:

County	Nitrogen (lbs/year)	Phosphorus (lbs/year)	Sediment (tons/year)
Marion	14,371	7,734	3,232
Morrow	5,486	2,946	1,527
Crawford	3,116	1,675	800
Delaware	2,449	1,316	647
<b>TOTALS</b>	25,422	13,671	6,206

As a result of the extended length of sign-up and land retirement (15-years) associated with the Scioto River CREP, we anticipate seeing continued reductions in nutrient and sediment loadings to the Olentangy River for at least the 15 year period in which marginal lands are out of production.

**Protection of Critical High Quality Habitat:** As indicated previously in this report, effective management of nonpoint source pollution in rapidly developing urban watersheds such



This direct tributary to the Olentangy River is permanently protected as a result of the acquisition of a conservation easement on Camp Lazarus within Delaware County.

as the Olentangy also requires the protection of existing high quality riparian areas and important headwater areas. Land conservation and preservation initiatives within this segment of the Olentangy River have been ongoing for many years. For example, Ohio’s Scenic Rivers program holds many acres of conservation easements in the Scenic River portion of the watershed. Ohio EPA has also been instrumental in protecting two extremely important land parcels in recent years. Land acquisition using Ohio EPA’s Water

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Resources Restoration Sponsorship Program (WRRSP) has proven critical in preventing conversion of high quality areas into housing and/or other developments.

### **Status of Recommended Actions:**

**Camp Lazarus Conservation Easement Acquisition:** WRRSP funding in the amount of nearly \$2.4 million was provided to the Preservation Parks of Delaware County to enable the acquisition of conservation easements on 175 acres of high quality riparian and headwater areas in Camp Lazarus. The camp is owned by the Boy Scouts of America and was threatened with sale to a developer for residential development. The project was completed in 2006 and protects very quality forested riparian property as well as considerable lengths of headwater tributary streams.

**Big Run Preserve Acquisition:** More than \$3.9 million was provided to the Preservation Parks of Delaware County by Ohio EPA's WRRSP for the fee simple acquisition of 60 acres within the Big Run subwatershed. This important high-quality parcel was scheduled to be converted to residential development at the time of acquisition in 2006. More than 8,500 linear feet of headwater tributary streams within this segment of the Olentangy watershed are now permanently protected.

**Monitoring Results:** Comprehensive monitoring and bio-assessment of the Olentangy River was completed in 2005 as part of the TMDL process. In anticipation of the actions summarized in this report, Ohio EPA's Ecological Assessment Unit (EAU) completed additional highly targeted baseline monitoring in 2006. Additional fish monitoring was completed in autumn 2008 as part of a media event. Ohio EPA biologists at that time observed improvements in the quality of the fish species that were collected compared to baseline monitoring results prior to removal of the dam. The map included in Appendix A of this report depicts the monitoring sites and their proximity to dam removal areas:

In 2009, a nearly three-mile section of the Olentangy River within the city of Delaware was assessed by Ohio EPA's EAU staff, evaluating fish and macroinvertebrate biological communities and the quality of the physical habitat supporting those communities. The study was undertaken to assess conditions in the Olentangy upstream, within, and downstream from three low head dam impoundments following removal of two of these dams. Results have been impressive with the following observations:

- In 2005, prior to the River Street dam removal, the fish community within its dam pool (Rm 25.8) included no pollution intolerant species while in 2009, 5 pollution intolerant species (black redhorse, silver shiner, stonecat madtom, brindled madtom, and banded darter) were collected in the newly free-flowing reach. Index of Biotic Integrity (IBI) scores



Ohio EPA biologists sample for fish near the former site of the Central Ave. Dam in Delaware.

improved from 34 in 2005 to 46 in 2009. Total number of fish species collected at this site increased from 16 different species in 2005 to 23 different species in 2009.

- Similar improvements were noted in the Central Avenue Dam pool (RM 26.0). In 2005 only one pollution intolerant species (black redhorse) was collected. Just a little over a year following the removal of the dam, sampling in 2009 collected five pollution intolerant species (black redhorse, silver shiner, stonecat madtom, brindled madtom, and banded darter). Fish species increased from 21 in 2005 to 28 in 2009. Similarly IBI scores increased from 38 in 2005 to 48 in 2009.

Macroinvertebrate communities showed significant improvement with the removal of the Central Avenue and River Street dams. The William Street site (near the former River Street dam pool) improved from an Invertebrate Community



Aquatic macroinvertebrates such as this dobsonfly larva are important indicators of water quality.

Index (ICI) score of 32 in 2005 (pre-removal) to an ICI of 52 in 2009. Most significantly, total taxa richness of macroinvertebrates collected during sampling increased from 54 to 94. The number of sensitive taxa increased from 15 to 42. The Central Avenue sampling site improved from an ICI of 26 in 2005 to an ICI of 44 in 2009. Total taxa richness of macroinvertebrates collected at this site increased from 53 to 81 with the number of sensitive taxa increasing from 17 to 39 species.

The table below provides aquatic life use attainment status from all of the sites in the city of Delaware where post-project monitoring was completed by Ohio EPA:

Aquatic Life-Use Status and Monitoring Results for the Olentangy River before and after completion of dam removal activities within the city of Delaware, Ohio. All monitoring was completed by Ohio EPA—Ecological Assessment Unit staff.

Sample Location River Mile	Aquatic Life Use Designation	Aquatic Life Use Attainment Status	Index of Biotic Integrity (IBI)	Modified Index of Well-Being (MiWB)	Invertebrate Community Index (ICI)	Qualitative Habitat Evaluation Index (QHEI)
<b>Olentangy River 2005</b>						
28.2	WWH	NON	30	6.1	20	55.5
27.5	WWH	PARTIAL	42	7.1	42	81
26.0	WWH	PARTIAL	38	9.5	26	45.5
25.8	WWH	PARTIAL	34	8.6	32	49.0
<b>Olentangy River 2009</b>						
27.5	WWH	FULL	46	9.4	54	70.0
26.0	WWH	FULL	48	8.8	44	62.5
25.8	WWH	FULL	46	9.1	52	54.4
25.4	WWH	FULL	48	9.0	52	63.0

**Conclusion:** A well designed assessment of water quality problems through the TMDL and watershed planning processes combined with state, local and federal commitment to implement well-reasoned recommendations substantially improved water quality and eliminated nonpoint source causes of impairment within the Olentangy River in and around Delaware, Ohio. Fish communities improved, resulting in a reappearance of multiple species of pollution intolerant fish in each of the former dam pools. Macroinvertebrate communities increased dramatically with all monitoring sites meeting warmwater (or exceptional warmwater) habitat standards. Physical habitat is already showing dramatic measurable improvements as well. All project sites are now meeting the river's designated warmwater habitat aquatic life use.

Urban streams such as the Olentangy present unique challenges. By implementing the watershed approach and engaging key stakeholders in the area, measurable water quality restoration was made possible with relatively modest funding. Nonpoint source management projects need not be large to be effective. However, their success is dependent upon actions being focused on known problems and in concert with local interests and concerns. Continued enjoyment of the water quality benefits derived from the Olentangy River Restoration Project will be dependent upon continued local stewardship and ongoing actions to protect and maintain the Olentangy River.

# Appendix A

## Olentangy River Monitoring and Dam Removal Sites

DSW/EAS 2010-5-8

Olentangy River/City of Delaware Dam Removals

May 1, 2010

Figure 1. Sampling locations in the Olentangy River, Delaware, 2005 and 2009.

