FINAL REPORT

FY11 Section 319(h) Buckeye Lake Nutrient Reduction Project
Federal Grant #C9-00E00782-0
State Grant #BUCK11

Buckeye Lake is one of five canal feeder lakes in Ohio that were constructed in the mid-1800's to provide water supply for the Ohio-Erie Canal. It is a heavily used recreational lake and is home to one of Ohio's more heavily visited state parks. The Buckeye Lake Nutrient Reduction Demonstration Project is an important component of Ohio's statewide nutrient reduction efforts since it serves as a demonstration on dealing with nutrient related issues at an inland lake. The foundation of the collaboration associated with this project is the preparation of a nutrient reduction strategy and plan. Project partners include Ohio EPA, Ohio DNR, Buckeye Lake for Tomorrow, Buckeye Lake State Park, the village of Buckeye Lake and the Fairfield County Soil and Water Conservation District.

Ohio EPA Final Progress Summary: Ohio EPA's primary responsibilities with the Buckeye Lake Nutrient Reduction Demonstration Project involve providing technical assistance, administering subgrants, and conducting two years of water quality monitoring including in-lake sampling, tributary sampling and the maintenance of an in-lake YSI Sondes unit. During the reporting period, Ohio EPA completed the following:

- Ohio EPA's NPS program staff has successfully executed 5 subgrants under the Buckeye Lake Nutrient Reduction Demonstration Project. Section 319 federal subgrant recipients include ODNR-Division of Parks & Recreation (2), Fairfield County SWCD, and Buckeye Lake for Tomorrow. A

Surface Water Improvement Fund (SWIF) subgrant was awarded to the Village of Buckeye Lake. SWIF funds are provided as a state match. Each of these subgrants was successfully implemented and closed out by Ohio EPA.

- Ohio EPA NPS Program staff conducted all of the processing of subgrant reports, payments, budgeting and all necessary grant administrative functions.
- Ohio EPA central district office (CDO) staff completed a Quality Assurance Project Plan
- Ohio EPA installed YSI water quality monitoring Sondes near the center of Buckeye Lake each year during the life of the grant. These meters collect water quality data including dissolved oxygen, turbidity, pH, temperature, conductivity and water depth. The Sondes collect and transmit data every fifteen minutes 24/7 via cell phone to a web page administered by Yellow Springs Installation on behalf of Ohio EPA. This metering station was installed with assistance from Buckeye Lake State Park staff. Data may be retrieved and viewed at www.livelakedata.com.
- Ohio's central office modeling and assessment staff conducted intensive tributary water quality monitoring during 2012 and 2013. Additional high flow and hydrologic monitoring were also conducted in 2014 and 2015, and data level loggers purchased with the grant were installed to monitor stream levels. The data was collated, assessed and used to complete a Bathtub and a Mass Balance model early in 2014. These data level loggers continue to be used to monitor tributary stream levels going into the lake. At Ohio EPA's expense central district office water quality staff are continuing in-lake monitoring at Buckeye Lake
- Ohio EPA central district office staff conducted two years of comprehensive in-lake water quality and sediment monitoring in 2012 and 2013.
- A draft Buckeye Lake Modeling Summary and Report was completed during FY2014. Findings from the modeling and data assessment indicate that:
    - The Feeder Creek contributes a significant majority of the external nutrient load to the lake.
    - Internal phosphorus cycling is the most significant source of nutrients during the summer months.
    - Nonpoint source and subsurface drainage from row crop agricultural land use represent the likely source of the majority of external nutrient inputs to the lake.
    - High flow events contribute the majority of nitrogen and phosphorus loads into the lake, highlighting the importance of installing practices that help to store and/or retain runoff and drainage waters.
    - In order to improve water quality and reduce HAB's both internal and external nutrient sources must be reduced.
- Ohio EPA modeling staff made several public presentations of their findings at Buckeye Lake including a presentation at the 2014 National Nonpoint Source Monitoring Conference in Cleveland, Ohio.
- Modeling staff participated in the public/stakeholder meeting conducted by Dr. Harry Gibbons and Shannon Brattebo from Tetratech.
- Modeling staff presented their findings to the management staff at the Ohio State Parks.
- CDO staff made Buckeye Lake presentations at several conferences including the annual Water Management Association of Ohio conference.

- Rick Wilson provided comprehensive technical assistance to Buckeye Lake for Tomorrow in the development and refining the draft nutrient reduction for Buckeye Lake.

#BUCK11-01: ODNR- Buckeye Lake State Park Final Progress Summary: Engaging Buckeye Lake State Park was a critical component to a successful effort to inform the public about the need to reduce nutrients in Buckeye Lake. This subgrant allowed ODNR to retrofit a heavily used boat launching parking area with pervious pavers and a treatment train bioswale that redirects runoff into a small wetland treatment area. Additionally, two rain gardens were constructed and installed to further demonstrate the value of such "green" stormwater management practices. This project is a cornerstone of the much larger effort needed to reduce nutrients flowing into Buckeye Lake. ODNR-Buckeye Lake State Park staff completed the following:

- Installed approximately 7,500 square feet of pervious pavers, a bioswale and constructed stormwater wetland to treat runoff prior to entering Buckeye Lake.
- Completed two large rain gardens and a bioswale passive treatment area to collect runoff from parking areas prior to entering the lake.
- Conducted a variety of public education and outreach activities highlighting the green stormwater management practices that were implemented at the park.

Retrofitting this heavily used boat launch area with pervious pavers and wetland treatment train was completed under provisions of #BUCK11-01.

This bioswale/rain garden captures runoff from a large heavily used parking area and diverts it to a vegetated bio-filter. This project was also completed under provisions of BUCK11-01

#BUCK11-02: Buckeye Lake for Tomorrow (BLT) Final Progress Summary: Buckeye Lake for Tomorrow (BLT) is a 501(c)(3) nonprofit organization committed to improving the water quality within the lake. Ohio EPA provided BLT with a section 319 subgrant in the amount of $80,000 to coordinate public awareness and outreach activities and to develop a Buckeye Lake Nutrient Reduction Strategy. During the reporting period BLT's subgrant funded activities resulted in the completion of the following deliverables:

- Completion and submittal of the Buckeye Lake Nutrient Reduction Strategy
- Conducted two public meetings attended by approximately 100 homeowners
- Conducted 6 workshops for lakefront homeowners and others within the watershed
- Issued 4 press releases, prepared, printed and distributed 4 brochures and 1 newspaper insert
- Established and is maintaining a project specific web page

- Conducted a "Get the Carp Out" Derby during June 2013. More than 5,000 pounds of carp were removed from Buckeye Lake this summer as a result of this project.
- Conducted a nutrient reduction workshop on March 1, 2013 with students from Ohio State School of Environment and Natural Resources.
- Presentations were made to Licking, Walnut and Thorn Townships; Fairfield, Licking and Perry counties; the villages of Thornville, Buckeye Lake and Millersport to raise local government awareness of progress being made with the Nutrient Reduction Project.

Under provisions of Project #Buck11-03 Lakefront homeowners and others within the watershed were eligible to acquire rain barrels at nominal costs. As a result of this project more than 145 rain barrels were installed.

Automated water quality monitoring stations in Buckeye Lake provide updated conditions every fifteen minutes 24 hours a day. Such real time data is extremely valuable in understanding changing conditions within the lake.

#BUCK11-03: Fairfield County Soil and Water Conservation District Final Progress Summary: The Fairfield SWCD is serving as the most direct link to the agricultural community within the Buckeye Lake watershed. They also have performed critical outreach to lakefront and watershed homeowners through their Rain Barrel Initiative that is funded through a subgrant from Ohio EPA. The primary activity and deliverable from this subgrant is the GPS mapping and characterization of more than 75 stream miles within the watershed. Deliverables and reported activities completed as of this reporting period include:

- Completed GPS mapping and watershed characterization of more than 77 stream miles within the Buckeye Lake watershed.
- Distributed and installed 200 rain barrels through a cost-share program with lakefront homeowners and other residential properties within the Buckeye Lake watershed.
- Planted 200 acres of cover crops.
- Conducted 1 public meeting, 1 field day and 8 rain barrel workshops.
- Developed and issued 10 press releases highlighting progress under this initiative.
- Installed one project specific sign and information kiosk.

#BUCK11-04M: Village of Buckeye Lake Stormwater Demonstration Final Progress Summary: The most recently engaged partner in the Buckeye Lake Nutrient Reduction Project is the Village of Buckeye Lake. $73,300 in state Surface Water Improvement grant funding was awarded to help the village address the flow of siltation and other nonpoint source stormwater runoff from village-controlled locations into Buckeye Lake. This was done by demonstrating several green stormwater practices including pervious pavement, rainwater harvesting, rain gardens and sediment filters. During the grant period, the village of Buckeye Lake completed the following activities:

- Installed 1,701 square feet of permeable pavement at their village hall facility.
- Installed 4 rainwater harvesting and reuse systems on village properties.
- Replaced 2 catch basins with sediment skimmers.
- Conducted public education and outreach activities.

#BUCK11-05M: Nutrient Reduction via Goose Control with Dogs Final Project Summary: A second grant in the amount of $5,475 was awarded to the ODNR-Division of Parks & Recreation to conduct a Goose/Gull Management Pilot Project at Buckeye Lake beaches. In addition to high levels of nutrient flowing into Buckeye Lake during wet weather there has historically been high numbers of Canada Geese (and some gulls). This project contracted with an organization who is skilled at ridding public areas of Canada Geese and Gulls using trained dogs such as German Shepherds and Border Collies to harass and chase off unwanted birds from Swimming areas. During the grant period ODNR-Buckeye Lake staff completed the following:

- 105 days of Canada Goose/Gull control activities with specially trained dogs.
- Installed 2 project specific signs at three different beaches informing park visitors of the activity
- Conducted project specific education and outreach activities

Final Results of the Goose Management Efforts: The contractor began herding geese in mid-May. By July 19th, the contractor had completed 60 visits to three park beach locations - Buckeye Lake, Liebs Island, and Fairfield Beach and recorded the following results. Buckeye Lake beach - geese were found on land 84% of the time with an average flock size of 38 geese; Liebs Island - geese were found on land 72% of the time with an average flock size of 45 geese; Fairfield Beach - geese were found on land 48% of the time with an average flock size of 40 geese.

Between July 19 and August 20 the contractor made 45 visits to each location. At the Buckeye Lake location geese were found 53% of the time with an average flock size of 35 geese. This was a 31% reduction in geese sightings and 8% reduction in average flock size from early July. At the Liebs Island location geese were found 60% of the time with an average flock size of 38 geese, a 12% reduction in geese sightings and 15% reduction in average flock size from early July. At Fairfield Beach geese were found 41% of the time with an average flock size of 48 geese, a 7% reduction in geese sightings and 20% increase in average flock size from early July. Since August 10th geese have been found only 5 times at all locations on a given day. The overall trend from this data shows that the dogs are effective in controlling the nuisance geese populations.

Over the course of 90 days the average flock size was reduced from 40 geese down to 8 at the Buckeye Lake location, from 138 down to 5 at Liebs Island, and 65 down to 0 at the Fairfield Beach Location. In addition, a nearly 60% reduction in the number of times geese were located at each beach was recorded. These changes are illustrated on the graph below.