Constructed Wetlands for Watershed Improvement and Habitat Restoration

Presented by

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2019 OHIO STORMWATER CONFERENCE 12th Annual

Metro Parks

May 10, 2019

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Engineers ■ Planners ■ Environmental Scientists

Overview of Today's Presentation

- Wetlands in Ohio
- Constructed Wetlands
- Columbus & Franklin County Metro Parks
- Case Studies:
  - Scioto Audubon Metro Park
  - Battelle Darby Metro Park
  - Prairie Oaks Metro Park
- Constructed Wetlands - Lessons Learned

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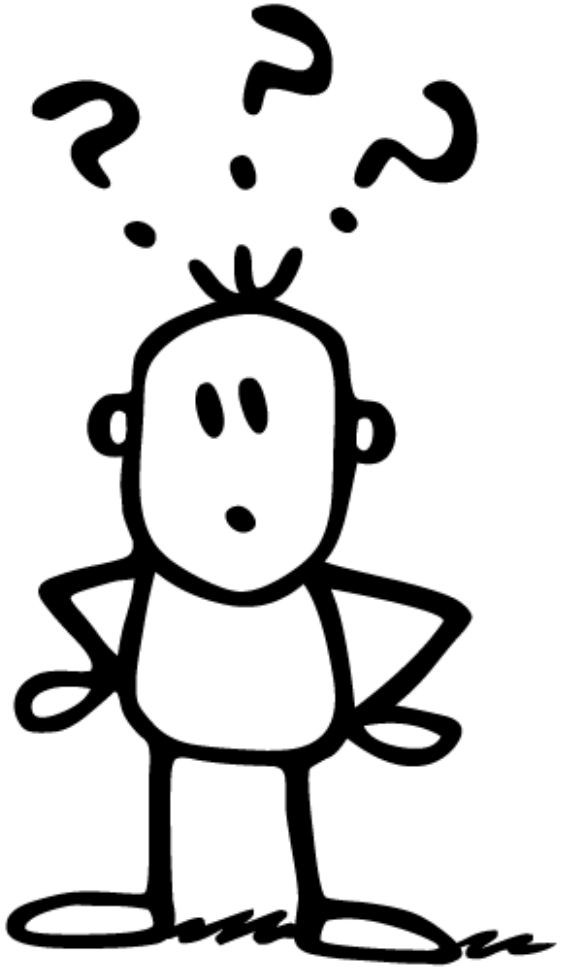
Wetlands in Ohio (Development vs. Regulation)



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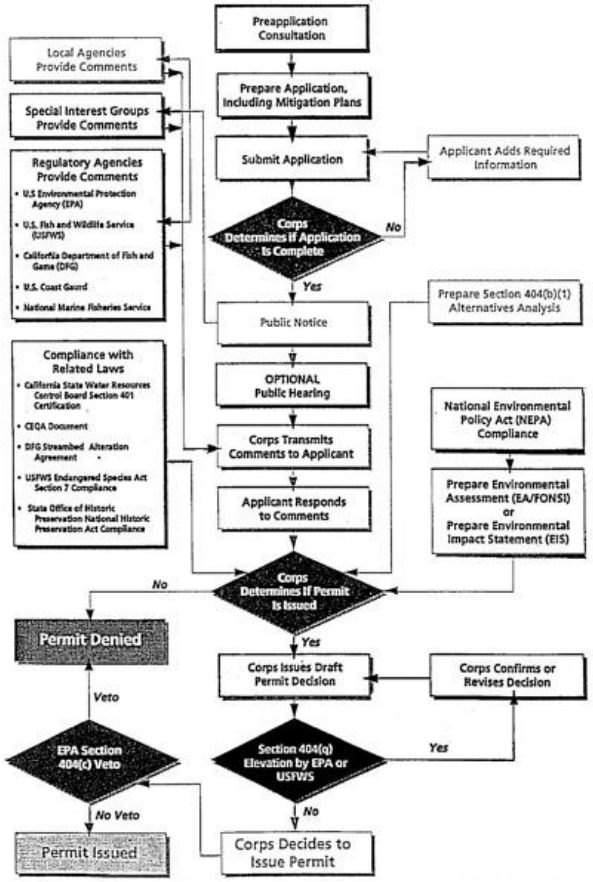
Wetlands in Ohio

(There is more to it than a permitting headache)

US Army Corps of Engineers.



U.S. FISH & WILDLIFE SERVICE

OHIO DEPARTMENT OF NATURAL RESOURCES DIVISION OF WILDLIFE

OhioEPA Ohio Environmental Protection Agency

OHIO HISTORY CONNECTION

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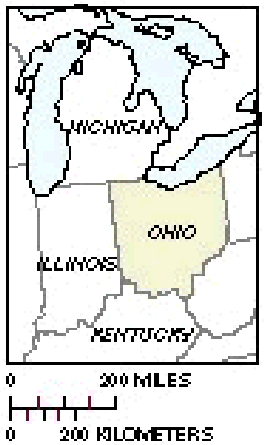
Wetlands in Ohio

Ohio Environmental Protection Agency

Division of Surface Water
September 2016

Ohio Wetlands

Since the late 18th century, 90 percent of Ohio's wetland resources have been destroyed or degraded through draining, filling or other modifications. Because of the valuable functions the remaining wetlands perform, it is imperative to ensure that all impacts to wetlands are properly mitigated.



HISTORIC WETLANDS	AREA IN ACRES	DATE DRAINED	SOURCE
Black Swamp	3,072,000	1859–1885	Ohio Dept. Nat. Res., 1968
Pickaway Plains	4,800	1821	Gordon, 1969
Scioto Marsh	16,000	1859, 1883	Gordon, 1969
Other marshes, Hardin County	9,000	1860's	Howe, 1900
Hog Creek Marsh	8,000	1868–1874	Gordon, 1969
Cranberry Marsh	1,000	Unknown	Gordon, 1969
Lake Erie Marshes	300,000	1936–1974	Bednarik, 1984
Dougan's Prairie	Unknown	1827	Middleton, 1917
TOTAL	3,410,800		

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Wetlands in Ohio

Water quantity and quality benefits

- Wetlands remove excess sediment, nitrogen, and phosphorus
- Wetlands prevent hypoxic ‘dead zones’ and harmful algal blooms
- Flood storage and runoff reduction

Habitat and wildlife benefits

- Wetlands provide a haven for rare and endangered plants
- 1/3 of all endangered species depend on wetlands for survival
- Fish spawning and nursery, waterfowl nesting, resting and feeding

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Constructed Wetlands

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Wetland Success

- Hydric Soils (NRCS Soil Survey)
- Hydrology (saturated or flooded during growing season)
- Plants (Hydrophytic)
- Managing wildlife and invasive plant challenges
- Public Use

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Why build or restore wetlands?

- Flood quantity storage and reduced runoff
- Groundwater aquifer recharge
- Filter impurities from runoff
- Shoreline erosion control
- Biodiversity of plants and wildlife
- Public recreation and/or education
- Carbon sequestration
- Mitigation

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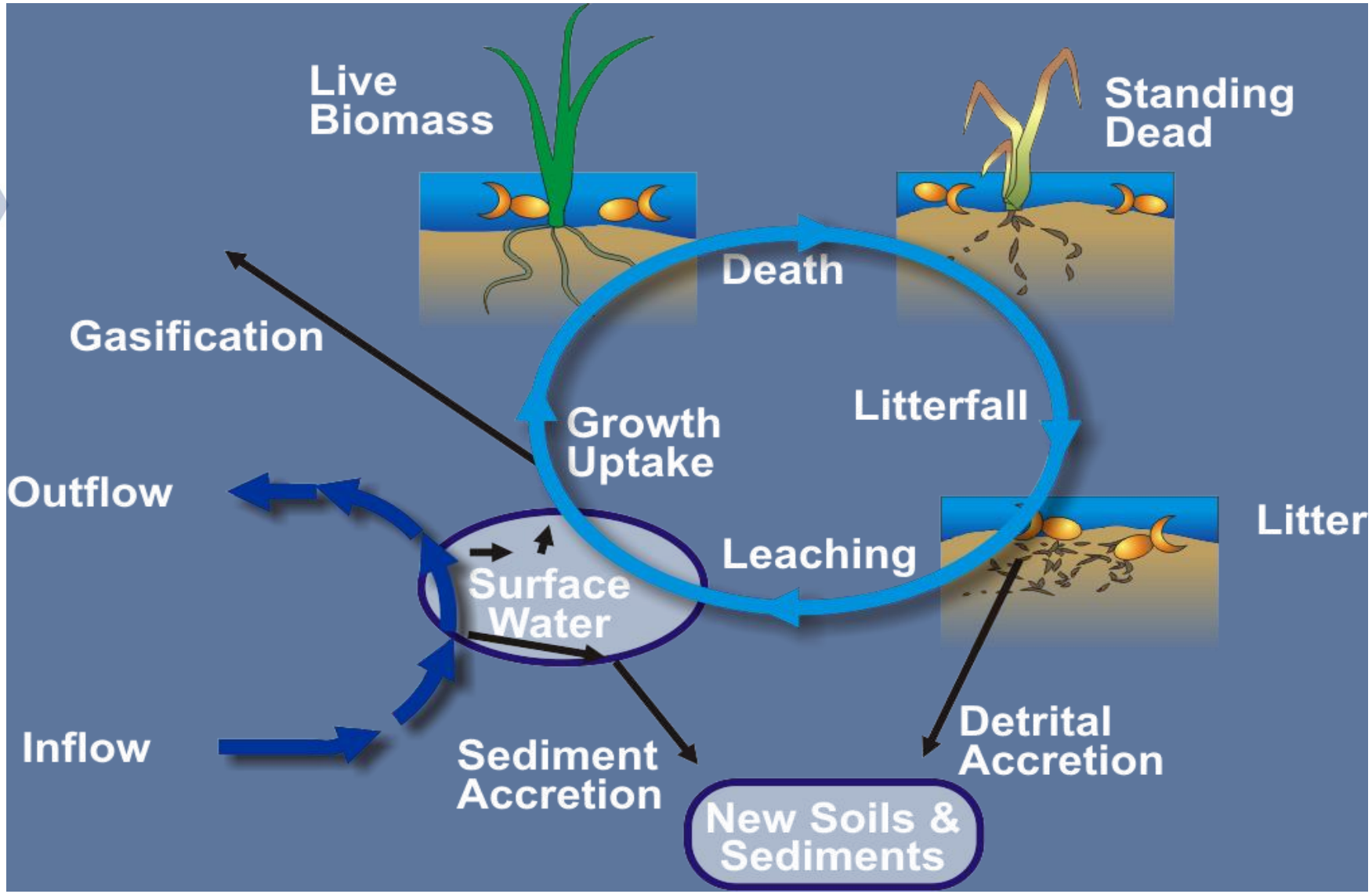
How Do Wetlands Work? (a life cycle of benefits)



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Establishing project objectives

- Stormwater Runoff Control
- Floodplain improvement
- Flood Water Storage
- Habitat Restoration
- Water Quality Improvement (Target parameters)
- Park for Public recreation and/or education
- Riparian Zone Restoration
- Mitigation

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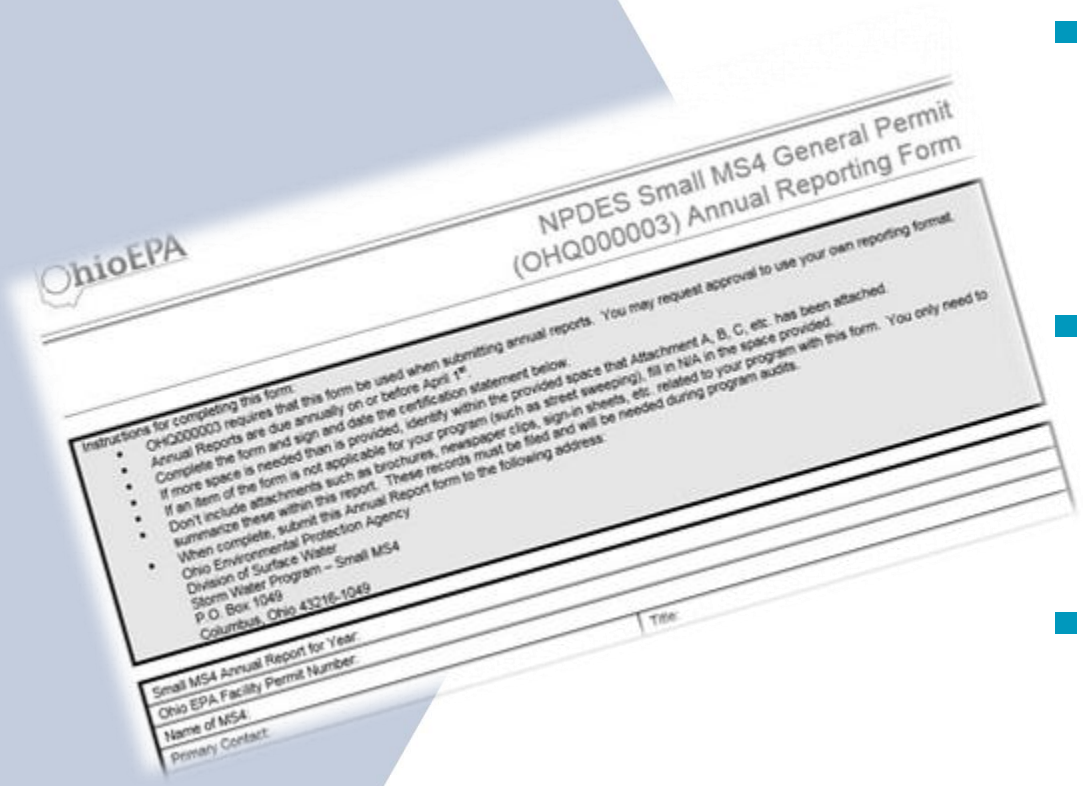
How Constructed Wetlands Can Help Meet MS4 Minimum Control Measures



- MCM #1 Public Education: fact sheets, signage, educational programs
- MCM #2 Public Participation: planting events, water quality and wildlife surveys
- MCM #6 Pollution Prevention: preventing pollutant runoff and flood management; water quality improvement

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Wetland Design Features (Configuration)

What is the wetland's purpose?

- Rectangular
  - Avoid short-circuiting
  - Low velocity
- Irregular/natural
  - Existing topography
  - Gentle side slopes

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Cell depth and side slopes

What is the wetland's purpose?

- Design objectives (target species)
- Stability (erosion potential)
- Drainage (ensure proper flood control)
- Cost (minimal cut/fill)

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Inlet/Outlet Features

What is the wetland's purpose?

- Treatment Wetlands:
  - Pipes and liners
  - Even Flow Distribution
  - Level Adjustment Capabilities
- Non-Treatment Wetlands:
  - Berms and spillways for non-treatment wetlands
  - Prevent off-site impacts (roads, neighbors)
  - Maintain existing off-site drainage

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Soils and Hydrology

- Identify hydric soil areas (soil survey and field sampling)
- Utilize existing topography to greatest extent possible
- Identify and interrupt field drainage tile

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Habitat Restoration

- Native plants
- Controlled succession
- Attractive to targeted wildlife species

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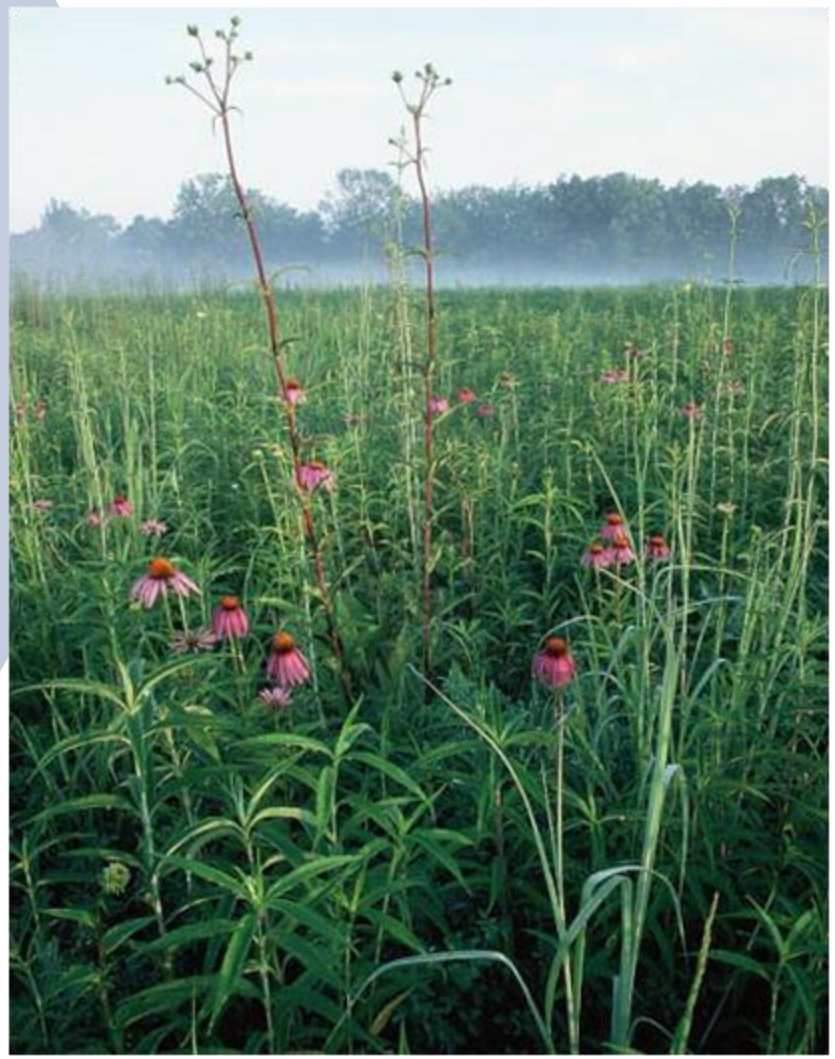
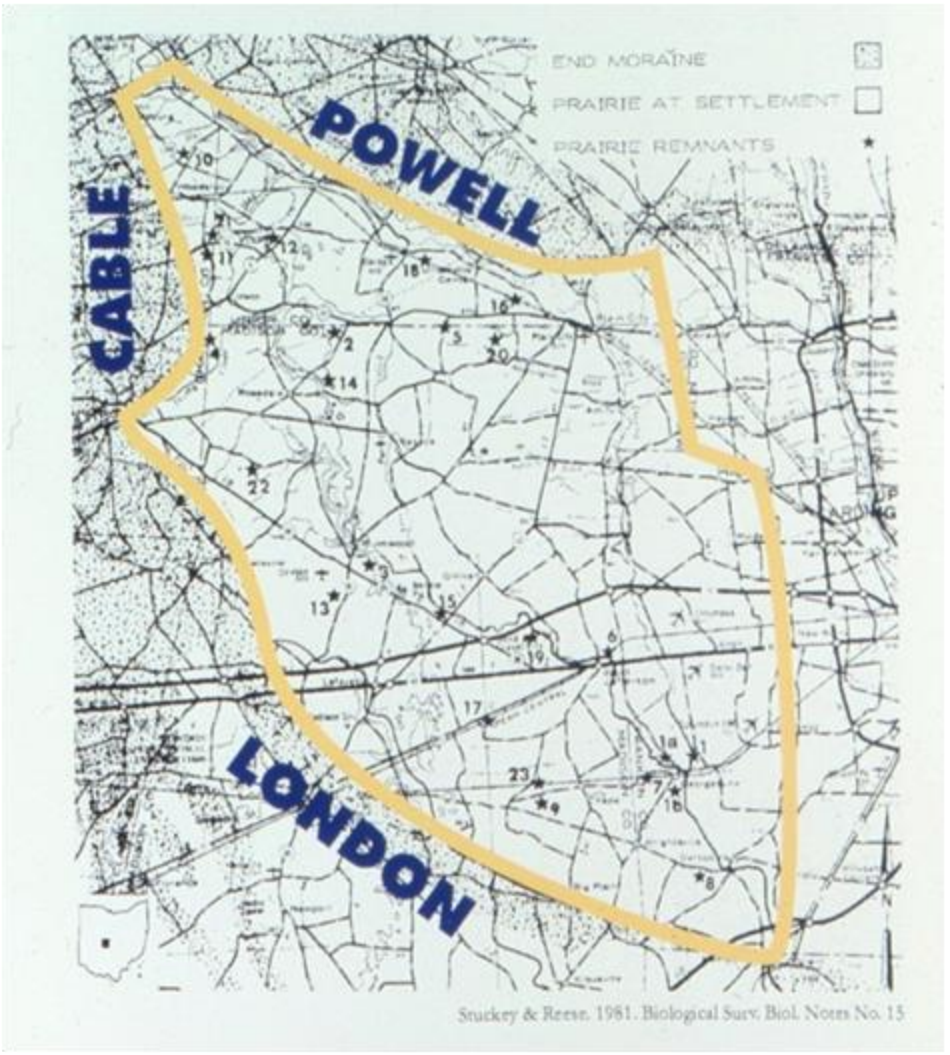
Prairie Restoration





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Columbus & Franklin County Metro Parks

- A public agency (MS4) serving the citizens of Central Ohio by providing a regional system of clean, safe, natural area parks.

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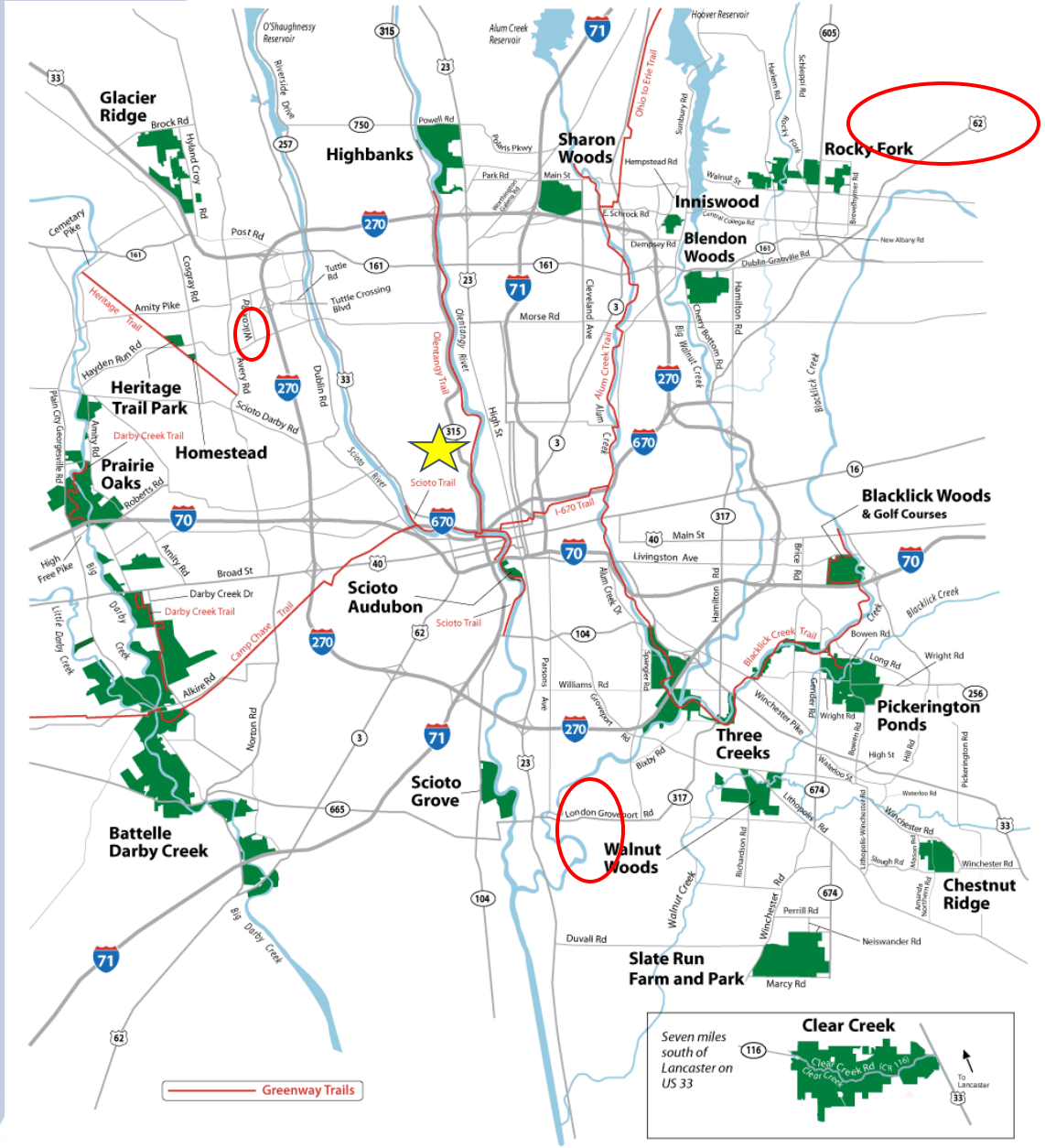

- 27,000+ acres
- 19 park areas
- In 7 counties
- Over 230 miles of nature trail and greenway
- 2,000 acres of restored prairie
- 1500 acres of restored wetlands

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Columbus & Franklin County Metro Parks

- Conservation
  - Goal: Manage the natural, environmental and cultural resources entrusted to us.
  - Objectives:
    - Acquire land and protect bodies of water, riparian corridors, and diverse or endangered plants and wildlife.
    - Environmental restoration and management efforts

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Columbus & Franklin County Metro Parks

- Habitat Management
- A number of techniques are used to achieve habitat goals, including: mowing, prescribed burning, allowing natural succession to occur and invasive plant control.

Columbus & Franklin County Metro Parks

- Wildlife Management
- Activities that encourage or discourage population growth. Includes nest boxes and platforms for bluebirds, martins, bats and ospreys, and species reintroduction such as mussels, wood frogs, bobwhite quail and bison.

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Rare Species

Barn Owl

Spotted Darter

Little Gray Polypody

Indiana Bat

Buck Moth

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Surveys and Research

Cerulean Warbler

Luna Moth

Aphrodite Fritillary

Tippecanoe Darter

Spangled Skimmer

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Case Studies in Constructed Wetlands

- Scioto Audubon Metro Park
- Battelle Darby Metro Park
- Prairie Oaks Metro Park

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Columbus and Franklin County Metro Parks: Whittier Peninsula

- Revitalize an abandoned industrial center and reduce environmental impacts of storm water discharges.

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Columbus and Franklin County - Grange Insurance Audubon Center and Scioto Audubon Park

- Stormwater Management (LID BMPs)
- Constructed Wetlands
- Trails

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Scioto Audubon Metro Park Constructed Wetlands

- Stormwater Quantity Control
- Flood Mitigation/Storage
- Stormwater Quality Improvement
  - Solids
  - Heavy Metals
  - Nutrients

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Battelle Darby Creek Metro Park

- Wetlands, Wet Prairies and Wildlife
- Converted agricultural land to wetlands, wet prairies, and uplands to preserve the watershed and attract wildlife.
- Flood reductions and water quality improvement for Big Darby

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Battelle Darby Creek Metro Park

- Kuhlwein Road Wet Prairie
- 800 acres
- Removed from agricultural production
- Abandoned field tile drainage
- 500 acre wet prairie
- Berm to protect adjacent land owners
- Planted areas with prairie grasses and wildflowers harvested from the area

January 2011

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Project Area 2007

Kuhlwein Road Wet Prairie

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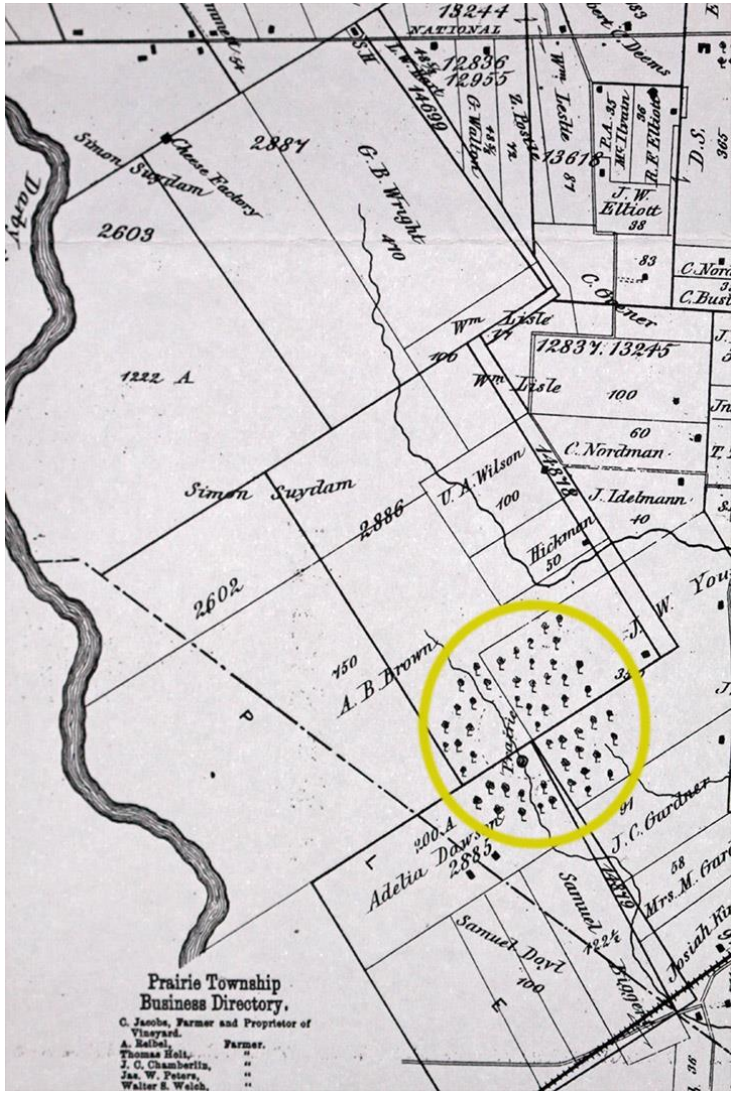
Project Area 2013

Kuhlwein Road Wet Prairie

Franklin County and Columbus 1872



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Kuhlwein Road Wet Prairie

2007

2013

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Kuhlwein Road Wet Prairie

2018

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Kuhlwein Road Wet Prairie

2018

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Battelle Darby Creek Metro Park

Darby Dan Wetland Restoration

- 175 acre site
- Racetrack Restoration
- Removed/plugged field tile
- Wetland restoration
- Vernal pools
- Native vegetation

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Darby Dan Wetland Restoration

2018

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Battelle Darby Creek Nature Center

- Constructed wetlands, bioretention, native vegetation, green roof, and underground detention

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Battelle Darby Creek Metro Park Nature Center

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2018

Battelle Darby Creek Nature Center

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Prairie Oaks Metro Park

Wet Prairie Restoration

- Maintain off-site drainage
- Coordinate with County
- Convert agricultural land to wet prairies and savanna
- New catch basins and piping for off-site drainage

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Prairie Oaks Metro Park

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Prairie Oaks Metro Park

2018

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Wetland Success

- Hydric Soils (NRCS Soil Survey)
- Hydrology (saturated or flooded during growing season)
- Plants (Hydrophytic)
- Managing wildlife and invasive plant challenges
- Public Use

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Constructed Wetlands - Lessons Learned

- Work with the topography and soils
- Plant Selection (Natives preferred; seed bank)
- Controlling invasive species
- Plant and wildlife

- Getting enough water (drainage area to wetland comparison)
- Managing runoff before the vegetation is established
- Maintenance/management is required

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Concerns with Constructed Wetlands

- Getting Plants Established

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Concerns with Constructed Wetlands

- Algae Growth
- Natural Decomposition of Plant Material

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Concerns with Constructed Wetlands

- Erosion/Management
  - Proper design for the concentration of runoff
  - Construction erosion controls (before vegetation is established)

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Concerns with Constructed Wetlands

- Wildlife impacts (Muskrat, Beaver)
- Mosquitoes

Dragonfly

Beaver dam

Muskrat

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Thank You

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QUESTIONS?

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