Considerations for Future Lists

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As new ideas are introduced and in the general course of progress, it is natural for evaluation and reporting of water quality conditions to evolve. Since the introduction of the Integrated Report (IR) format in 2002, methods for evaluating the recreation use, the human health use (via fish contaminants) and public drinking water supply use have been systematically added to the traditional aquatic life use reporting.

This section identifies future reporting possibilities and the status of each. The potential future changes include reporting on more types of waters (wetlands, inland lakes, Lake Erie) or reporting on specific pollutants of interest (mercury).

I1. Wetlands

Ohio EPA's IR provides information on the overall condition of Ohio's water resources and identifies those waters that are not currently meeting water quality goals (Ohio EPA, 2016). It fulfills the requirements under the Clean Water Act (CWA) to report biennially on the current condition of Ohio's regulated waters [305(b) report] and to provide a list of impaired waters [303(d) list]. Given the sheer number of National Wetland Inventory [U.S. Fish and Wildlife Service, 2006-2007 (NWI)] mapped wetlands in Ohio (n = 134,736), it is not feasible to identify individual wetlands that are impaired as part of the 303(d) list, nor is it feasible to assess every individual wetland portrayed on the NWI mapping. Given the historic losses of wetlands in the state (Dahl, 1990), it would be problematic to attempt to list any of the remaining wetlands as impaired without giving consideration for the wetlands which have been eliminated from the landscape. The 2012 version of Ohio's IR (Ohio EPA, 2012) discussed a plan for incorporating wetland information into future reports, as general 305(b) information by using five primary items:

- identify historic wetland resources using Natural Resources Conservation Service (NRCS) digital soil survey data (USDA, 2012);
- identify existing wetland resources using NWI data (U.S. Fish and Wildlife Service, 2006-2007);
- perform a preliminary off-site wetland condition assessment using a Level 1 GIS tool;
- include information on past wetland field assessments within each 12-digit hydrologic unit code (HUC) [Seaber, Kapinos and Knapp, (1987)] watershed; and
- describe and summarize watershed specific field assessment work.

The 2014 report (Ohio EPA, 2014) was Ohio EPA's first attempt at implementing this plan. In 2013, Ohio EPA's Wetland Ecology Group (WEG) completed a study focusing on the inclusion of wetland information in the Total Maximum Daily Load (TMDL) process on the Middle Scioto watershed (Gara, Harcarik and Schumacher, 2013). This study provided the framework for incorporating wetland information into this reporting process. The focus of the study was twofold: 1) conduct a probabilistic survey of wetland condition for a current TMDL project in central Ohio using Level 2 [Ohio Rapid Assessment Method for Wetlands (ORAM)(Mack, 2001)] and Level 3 [Vegetation Index of Biotic Integrity (VIBI)(Mack, 2004; Mack and Gara, 2015)] assessment tools; and 2) develop a Geographic Information System (GIS)-based Level 1 assessment tool to estimate wetland condition within this survey area. The results of the Level 1 assessment were then compared to those obtained using the more detailed Level 2 and Level 3 field assessments. The Level 1 tool that was developed for the Middle Scioto TMDL study differed slightly from the proposed tool included in the 2012 IR (Ohio EPA, 2012). This updated assessment methodology is based on close statistical relationships between the individual metrics and detailed field assessments previously conducted by the WEG. For this reason, the updated Level 1 tool was used when characterizing wetland condition within each of Ohio's HUC12 watersheds. Additional information regarding the Middle Scioto TMDL and the Statewide Level 1 assessment data can be found in previous versions of the IR (Ohio EPA 2012; Ohio EPA, 2014; Ohio EPA, 2016).

Documented High-Quality Wetlands

Ohio EPA's section 401 water quality certification and isolated wetland permitting section requires applicants that seek to discharge dredged or fill material into wetlands to coordinate with the Ohio Department of Natural Resources' (ODNR) natural heritage database (NHD) to determine whether documented high-quality wetlands, or known occurrences of rare, threatened or endangered species are present in and around proposed impact sites. Many wetlands are identified in the current version of the NHD; however, the information currently available has not been updated in more than 10 years and is primarily based on the best professional judgement of previous ODNR staff without specific criteria for inclusion.

Recognizing a need for more up-to-date information to ensure proper identification and protection of high-quality wetlands, Ohio EPA, in consultation with a workgroup of wetland experts, has developed the following criteria for identifying these kinds of wetlands:

- The area is mapped on the NWI as emergent, scrub-shrub or forested – no open water habitats were included;
- The mapped wetland must be five acres in size or larger;
- At least a portion of the wetland is within the Ducks Unlimited's conservation and recreation lands (CARL) layer (Ducks Unlimited, 2008) or otherwise known to be protected by the State or another conservation organization; and
- There is evidence of high quality functions based on existing data including, but not limited to, NHD records of threatened or endangered species (ODNR, 2016) and/or Ohio EPA has determined the wetland to be Category 3 based on an Agency-approved assessment methodology such as ORAM (Mack, 2001), VIBI (Mack and Gara, 2015), VIBI-FQ (Gara, 2013) and/or Amph-IBI (Miccachion, 2011) data.

A total of 220 wetlands that meet the above criteria were identified. NWI Polygons that abut one another were joined together as a single wetland polygon and, in a few instances, NWI polygons that are not abutting one another were combined where a high degree of hydrologic interaction is likely based on aerial imagery interpretation (OSIP 2006-2007), topography and NRCS soil survey. In these instances, it is assumed that the wetland polygons would be considered within the same hydrogeomorphic classification and would be scored within a single scoring boundary using ORAM. Of the high-quality wetlands identified, 162 (73.6 percent) have not been assessed by Ohio EPA, but are identified in the NHD to be high-quality based on the presence of at least one threatened or endangered species; 19 wetlands (8.6 percent) have been determined by Ohio EPA to be category 3 wetlands using one of the above-mentioned methods; and 39 (17.7 percent) wetlands are considered to be high-quality wetlands based on both Ohio EPA categorical assessment and because of the recorded presence of at least one threatened or endangered species. A list of high-quality wetlands is included in Table I-1.

Significant Wetland Areas

Ohio EPA also attempted to identify significant wetlands and wetland complexes. Many of these areas are included in the high-quality wetlands list described in Section I1.1 above; however, size was the main criterion used to determine whether an area should be included on the significant wetland area list. Ohio EPA analyzed NWI polygons, aerial imagery and topographic maps to identify wetlands and wetland complexes that likely have a high degree of hydrologic interaction. Generally only areas which exceed 300 acres of mapped NWI wetlands are included in this list. The lone exception is Cedar Bog (approximately 296 acres) in Champaign County. A list of significant wetland areas is included in Table I-2.

Stream and Wetland Mitigation

Research by the Ohio EPA WEG identified site selection as one of the most important factors influencing the degree of success of restoration and mitigation projects. In order to facilitate improved site selection for projects, Ohio EPA created a mapping application that includes the following:

- The location of stream and wetland mitigation projects including permittee responsible sites with environmental covenants, mitigation banks, pooled mitigation areas, and in lieu fee sites approved by Ohio EPA.
- The location of wetlands from the National Wetland Inventory categorized by wetland condition using aerial imagery by Ohio EPA.
- Potential vernal pool restoration sites, as identified by Ohio EPA.
- In stream dams as identified by Ohio Department of Natural Resources.
- Reference data layers including predominantly hydric soils, Quaternary geology, Ohio woody plant distributions, conservation and recreation lands, and USGS topographic map wetlands.

This application is available to the public and can be used to identify potential future areas for projects or monitoring.

Assessment of Riparian Areas

In 2016 and 2018, Ohio EPA collected vegetation data from reference and restored riparian areas in order to better quantify the quality of non-wetland habitats that directly interact with aquatic ecosystems. Ohio EPA proposes further monitoring of riparian areas, particularly prior to restoration activity in order to improve restoration practices and maximize water quality improvement.

Next Steps

Ohio EPA has considered conducting periodic Level 2 and Level 3 field assessments on a random selection of wetlands within targeted HUC12 watersheds on a rotating basin schedule, like what is currently being done with Ohio EPA stream assessments. Initially the assessments could focus on significant wetland areas and high-quality wetlands that lack prior assessment data. Focusing on these areas will potentially give an understanding of wetland condition within the HUC12. Issues such as property access and staff resources will dictate the number of watersheds that can be surveyed, but as the number of field assessed HUC12s increases, a better understanding of the relationship between the Level 1 and Level 2/Level 3 characterizations will be illustrated. This understanding will be critical to the continued improvements to our ability to assess the ecological condition of wetlands using remotely sensed, landscape-level GIS data. Current staffing resource issues have prevented us from expanding the ecological monitoring program to include regular watershed-scale wetland surveys at this time and in the foreseeable future.

Table I-1 — List of high-quality wetland areas.

Site Name	Reason	Owner	Owner Type	Size (Acres)
Abshire And Graves Scenic River Area	NHD	ODNR	State	20
Akron Watershed Land	Cat 3/NHD	City of Akron	Local	5,013
Aquilla Lake WA	NHD	ODNR	State	673
Aquilla Lake	Cat 3	Private	Private	410
Arcola Creek	Cat 3/NHD	Lake County Metroparks	Local	30
Area K	Cat 3	ODNR	State	20
Arthur W Youngblood Watershed Area	NHD	City of Akron	Local	36
Ashcroft Preserve	NHD	Grand River Partners, Inc.	Private	516
ATV	Cat 3	Columbus and Franklin County Metro Parks	Local	9
Aurora Sanctuary NP	NHD	Audubon Society of Greater Cleveland	NGO	44
Aurora Wetlands II	NHD	Summit County Metro Parks	Local	30
Avoca Park	NHD	Great Parks of Hamilton County	Local	19
Baker Swamp	Cat 3/NHD	The Nature Conservancy	NGO	68
Bass Lake	NHD	Western Reserve Land Conservancy	Private	149
Bass Lake Preserve	NHD	Geauga County Park District	Private	22
Bath Nature Preserve	NHD	Bath Township	Local	6
Battaglia	NHD	Portage County Park District	Local	27
Battelle Darby Creek Metro	NHD	Columbus and Franklin County Metro Parks	Local	48
Bay Point	NHD	Natural Areas Land Conservancy	NGO	13
Beach City WA	NHD	ODNR	State	27
Beaumont Scout Reservation	NHD	Boy Scouts of America	NGO	266
Beaver Creek Preserve Easement	NHD	Beavercreek Wetlands Association	NGO	104
Beaver Creek SP	NHD	ODNR	State	24
Beaver Creek WA	NHD	ODNR	State	279
Beck Fen	NHD	The Nature Conservancy	NGO	147
Bedford Reservation	NHD	Cleveland Metroparks	Local	222
Berlin Lake WA	NHD	ODNR	State	328
Betsch Fen	NHD	The Nature Conservancy	NGO	26
Big Creek Reservation	NHD	Cleveland Metroparks	Local	20
Big Island WA	NHD	ODNR	State	1,160
Big Swamp Woods	Cat 3/NHD	Cleveland Museum of Natural History	Local	83
Bradley Woods Reservation	Cat 3/NHD	Cleveland Metroparks	Local	112
Browns Lake Bog	Cat 3/NHD	The Nature Conservancy	NGO	60
Buck Creek SP	NHD	ODNR	State	63
Burton Wetlands	Cat 3/NHD	Geauga Park District	County	9
Cackley Swamp	NHD	Appalachia Ohio Alliance	NGO	307
Calamus	Cat 3	Columbus Audubon Society	NGO	9
Campbell SNP	NHD	ODNR	State	49
Canal Corridor	NHD	Stark County Parks	County	66
Cascade Valley Park	NHD	Summit County Metro Parks	County	6
Cedar Bog NP	Cat 3/NHD	Ohio Historical Society	State	244
Cedar Point National Wildlife Refuge	Cat 3/NHD	U.S. Fish & Wildlife Service	Federal	1,853
Charles Mill Lake	NHD	Muskingum Watershed Conservancy District	Local	619
Chesterfield Swamp (Gleeson Family Nature Reserve)	NHD	Morrow County Park District	County	44
City of Ravenna Park	NHD	City of Ravenna	Local	67
Clark Lake WA	NHD	ODNR	State	21
Collier SNP	Cat 3	ODNR	State	21
Conneaut Township Park	NHD	Conneaut Township	Local	64

Site Name	Reason	Owner	Owner Type	Size (Acres)
Conneaut WA	NHD	ODNR	State	24
Cooper Hollow WA	NHD	ODNR	State	94
Cooperrider/Kent Bog SNP	Cat 3/NHD	ODNR	State	82
Cranberry Bog NP	NHD	ODNR	State	13
Crystal Lake	NHD	The Nature Conservancy	NGO	25
Culberson Woods SNP	Cat 3	ODNR	State	29
Daubel	NHD	Black Swamp Conservancy	Private	109
Davenport Pond and Wetlands	NHD	Appalachia Ohio Alliance	NGO	6
Delaware WA	NHD	ODNR	State	79
Dickason Run Swamp	NHD	Ohio Valley Conservation Coalition	NGO	47
E. Frohring	NHD	Western Reserve Land Conservancy (Easement)	Private	17
Eagle Creek NP	Cat 3	ODNR	State	358
East Harbor SP	NHD	ODNR	State	124
Edge of Appalachia	NHD	Cincinnati Museum of Natural History	Local	64
Eldon Russell Park	NHD	City of Akron	Local	40
Farley Property	NHD	Geauga County Park District	County	498
Firestone Metro Park	NHD	Summit County Metro Parks	County	109
Firestone/Yeagley WA	NHD	ODNR	State	81
Fish Creek WA	NHD	ODNR	State	53
Flatiron Lake Bog	NHD	The Nature Conservancy	NGO	37
Forrest Woods Nature Preserve	Cat 3/NHD	Black Swamp Conservancy	NGO	20
Fowler Woods NP	Cat 3	ODNR	State	48
Franklin Township Marsh	NHD	Ohio Valley Conservation Coalition	NGO	8
Furnace Run Park	NHD	Summit County Metro Parks	County	15
Gallagher/Springfield Fen SNP	NHD	ODNR	State	9
Garlo Heritage Nature Preserve	NHD	Seneca County Park District	County	40
Geneva SP	NHD	ODNR	State	25
Geneva Swamp	NHD	Cleveland Museum of Natural History	Local	285
Glade Wetland	NHD	The Nature Conservancy	NGO	7
Goll Woods SNP	NHD	ODNR	State	64
Goodyear	Cat 3	ODNR	State	77
Goodyear Heights Metro Park	NHD	Summit County Metro Parks	County	25
Gott Fen NP	Cat 3/NHD	ODNR	State	49
Grand River WA	NHD	ODNR	State	1,695
Grand River Terraces	Cat 3	Cleveland Museum of Natural History	NGO	105
Gray Birch Bog	NHD	Western Reserve Land Conservancy	NGO	16
Greendale Buttonbush	Cat 3	U.S. Forest Service	Federal	9
Griggs Reservoir Park	Cat 3	City of Columbus Parks and Recreation	Local	9
Hambden Orchard WA	NHD	ODNR	State	358
Hampton Hills Metro Park	NHD	Summit County Metro Parks	County	28
Harper Valley Preserve, Inc.	NHD	Grand River Partners, Inc.	Private	19
Harris Nature Preserve 1999	NHD	Black Swamp Conservancy	Private	179
Headlands Beach SP	NHD	ODNR	State	10
Herrick Fen	Cat 3/NHD	The Nature Conservancy	NGO	48
Hertrick	NHD	Grand River Partners, Inc.	Private	6
Hess	NHD	Western Reserve Land Conservancy	NGO	122
Highland Heights Park	NHD	City of Highland Heights	Local	6
Highlandtown WA	NHD	ODNR	State	14
Hinckley Reservation	NHD	Cleveland Metroparks	Local	98
Holden Arboretum	NHD	Holden Arboretum	Private	33

Site Name	Reason	Owner	Owner Type	Size (Acres)
Honey Point WA	NHD	ODNR	State	11
I-480 Preserve	NHD	Western Reserve Land Conservancy	NGO	18
Indian Creek WA	NHD	ODNR	State	52
Irwin Prairie SNP	Cat 3/NHD	ODNR	State	213
Jackson Bog NP	NHD	ODNR	State	18
Jackson Lake SP	NHD	ODNR	State	101
Kendrick Woods NP	NHD	ODNR	State	31
Killbuck Marsh WA	Cat 3/NHD	ODNR	State	4,169
Killdeer Plains WA	Cat 3/NHD	ODNR	State	670
Kinnikinnick Fen	NHD	Ross County Park District	County	19
Kiser Lake SP	NHD	ODNR	State	23
Kitty Todd	Cat 3/NHD	The Nature Conservancy	NGO	302
Kuehnle WA	NHD	ODNR	State	12
Lake Katherine SNP	NHD	ODNR	State	40
Lake La Su An WA	NHD	ODNR	State	145
Lake Park	NHD	Coshocton City & County Park District	Local	19
Lake Rockwell	NHD	City of Akron	Local	106
Lakeshore Reservation	NHD	Lake County Metroparks	Local	6
Lawrence Woods NP	Cat 3/NHD	ODNR	State	14
Liberty/Owens Fen NP	Cat 3/NHD	ODNR	State	58
Little Portage WA	NHD	ODNR	State	281
Little Rocky Hollow NP	NHD	ODNR	State	7
Little Darby Terrace	Cat 3	ODNR	State	8
Magee Marsh WA	Cat 3/NHD	ODNR	State	1,968
Mallard Club Marsh WA	NHD	ODNR	State	389
Mantua Bog NP	NHD	ODNR	State	44
Marsh Wetlands WA/NP	Cat 3/NHD	ODNR	State	132
Maumee Bay SP	NHD	ODNR	State	160
Maumee SF	NHD	ODNR	State	260
McCracken Fen SNP	NHD	ODNR	State	52
Mentor Marsh NP	NHD	ODNR	State	798
Mercer WA	NHD	ODNR	State	48
Metzger Marsh WA	NHD	ODNR	State	703
Miami Whitewater Forest	NHD	Hamilton County Park District	County	38
Milan WA	NHD	ODNR	State	55
Mill Creek Park	NHD	Mill Creek Metroparks	County	356
Mill Hollow - Bacon Woods Park	NHD	Lorain County Metro Parks	County	370
Mill Stream Run Reservation - 1-71 Parcel	NHD	Cleveland Metroparks	Local	369
Mogadore Reservoir	NHD	City of Akron	Local	49
Mohawk Reservoir	NHD	Muskingum Watershed Conservancy District	Local	14
Morgan Swamp	Cat 3/NHD	The Nature Conservancy	NGO	589
Mosquito Creek WA	Cat 3/NHD	ODNR	State	1,431
Mud Lake Bog SNP	Cat 3/NHD	ODNR	State	26
Museum Lands	NHD	Cleveland Museum of Natural History	Local	75
Muzzy Lake (East)	NHD	City of Ravenna	Local	20
Myersville Fen NP	NHD	ODNR	State	12
North Fork Wetlands	NHD	Western Reserve Land Conservancy	Private	31
North Pond NP	Cat 3/NHD	ODNR	State	19
Northeast Ohio Wetlands, Inc.	NHD	Grand River Partners, Inc.	Private	34

Site Name	Reason	Owner	Owner Type	Size (Acres)
O'Shaughnessy Reservoir Park	Cat 3	City of Columbus	Local	12
Oak Openings Preserve Metropark	Cat 3/NHD	Metroparks of the Toledo Area	Local	23
Observatory Park	NHD	Geauga County Park District	Local	822
Old Woman Creek NERR/NP	Cat 3/NHD	ODNR	State	87
Orwell WA	NHD	ODNR	State	152
Ottawa National Wildlife Refuge	NHD	U.S. Fish & Wildlife Service	Federal	500
Oxbow Lake WA	NHD	ODNR	State	17
Pallister SNP	Cat 3/NHD	ODNR	State	61
Parkersburg WA	NHD	ODNR	State	109
Pater WA	NHD	ODNR	State	7
Pennline Bog	NHD	Cleveland Museum of Natural History	Local	199
Pickerel Creek WA	NHD	ODNR	State	832
Pipe Creek WA	NHD	ODNR	State	66
Poland Village Park	NHD	Village of Poland	Local	135
Pond Brook Conservation Area	Cat 3/NHD	Summit County Metro Parks	County	483
Portage Lakes SP	NHD	ODNR	State	249
Portage Lakes Wetlands NP	NHD	ODNR	State	26
Prairie Oaks Metropark	NHD	Columbus and Franklin County Metro Parks	Local	8
Prairie Road Fen NP	Cat 3/NHD	ODNR	State	11
Price Road Swamp	NHD	City of Akron	Local	207
Punderson SP	NHD	ODNR	State	42
Putnam Marsh	NHD	Erie Metroparks	Local	281
Pymatuning Creek Wetlands NP	NHD	ODNR	State	610
Pymatuning SP	NHD	ODNR	State	121
Ravenna Arsenal	NHD	USA	Federal	636
Ray	NHD	Geauga County Park District	Local	83
Resthaven WA	Cat 3/NHD	ODNR	State	1,096
Rocky River Reservation	NHD	Cleveland Metroparks	County	162
Rome SNP	NHD	ODNR	State	279
Rutherford	Cat 3	U.S. Forest Service	Federal	19
Salt Fork SP	NHD	ODNR	State	1,225
Salt Fork WA	NHD	ODNR	State	122
School Lands	NHD	Ravenna City School District	NGO	132
Secor Metropark	NHD	Metroparks of the Toledo Area	County	50
Seneca Lake	NHD	Muskingum Watershed Conservancy District	Local	38
Shawnee Lookout	NHD	Great Parks of Hamilton County	County	7
Shawnee SF	NHD	ODNR	State	137
Sheldon Marsh NP	Cat 3/NHD	ODNR	State	412
Shenango WA	Cat 3/NHD	ODNR	State	3,539
Showalter Bog	NHD	Portage County Park District	County	15
Silver Creek Fen	NHD	Western Reserve Land Conservancy	NGO	14
Singer Lake Bog	Cat 3/NHD	The Nature Conservancy	NGO	94
Slate Run Metropark	Cat 3	Columbus and Franklin County Metro Parks	Local	24
Spring Valley WA	NHD	ODNR	State	107
Springville Marsh NP	Cat 3/NHD	ODNR	State	233
Suawa	NHD	Grand River Partners, Inc.	Private	34
Sumner on Ridgewood	Cat 3	Concordia of Ohio (Easement)	Private	22
Swamp Cottonwood SNP	Cat 3	ODNR	State	5
Tinkers Creek NP	Cat 3/NHD	ODNR	State	473
Towner's Woods	NHD	Portage County Park District	County	16

Site Name	Reason	Owner	Owner Type	Size (Acres)
Township Lands	NHD	Oberlin College	Local	16
Triangle Lake Bog NP	NHD	ODNR	State	68
Tummonds NP	NHD	ODNR	State	135
Twinsburg Bog	NHD	Western Reserve Land Conservancy	NGO	72
Tycoon Lake WA	NHD	ODNR	State	67
Urbana Raised Bog	NHD	Champaign County Fairgrounds	County	14
USFWS Ottawa National Wildlife Refuge	NHD	U.S. Forest Service	Federal	2,391
USFWS Ottawa National Wildlife Refuge Navarre Division	NHD	U.S. Forest Service	Federal	413
Veteran's Memorial Park	NHD	Lake County Metroparks	County	27
Walnut Beach Park	NHD	City of Ashtabula	Local	63
Waterloo WA	NHD	ODNR	State	153
Wayne National Forest	Cat 3/NHD	U.S. Forest Service	Federal	856
West Branch Copperbelly Site	NHD	Boy Scouts of America	NGO	60
West Woods	NHD	Geauga County Park District	County	155
Westwinds Woods	NHD	Metroparks of the Toledo Area	Local	37
Wildlife Habitat Restoration Program Chamberlain	NHD	ODNR	State	38
Willard Marsh WA	Cat 3/NHD	ODNR	State	775
Willow Point WA	NHD	ODNR	State	299
Wills Creek Reservoir	Cat 3	Muskingum Watershed Conservancy District	Local	9
Yellow Creek SF	NHD	ODNR	State	9
Yoctangee Park and Annex	NHD	City of Chillicothe	Private	14
Zaleski SF	Cat 3/NHD	ODNR	State	726

Table I-1 Key			
HQW	High Quality Wetland	SF	State Forest
NERR	National Estuarine Research Reserve	SNP	State Nature Preserve
NGO	Non-governmental organization	SP	State Park
NHD	Natural Heritage Database	SW	Significant Wetland
NP	Nature Preserve	USFWS	U.S. Fish and Wildlife Service
NWR	National Wildlife Refuge	WA	Wildlife Area
ODNR	Ohio Department of Natural Resources	WEG	Wetland Ecology Group

Table I-2 — List of significant wetland areas.

Site Name	Size (acres)
Akron Watershed Land	6,303
Andover Township Wetlands	405
Ashtabula Wetlands	495
Atwater Wetlands	1,039
Auburn Wildlife Area	519
Bates Creek Wetland	1,008
Beach City Reservoir Wetlands	1,114
Beach City Wildlife Area	1,741
Big Island Wildlife Area /Little Scioto	1,713
Black Fork Mohican River Wetlands	1,045
Boggs Fork Wetlands	869
Bolivar Reservoir	722
Bridge Creek Wetland	604
Bristol Township Wetland	662
Cackley Swamp	413
Cambridge Wetlands	3,234
Canal Fulton Wetlands	1,152
Cedar Bog	296
Cedar Point Wildlife Area/Maumee Bay State Park	2,434
Charles Mill Lake	832
Chippewa Lake	568
Crooked Creek Wetland	990
Deacon Creek Corner Wetland	1,034
Deerfield Wetlands	851
Denmark Township Wetland	702
Dillon Wildlife Area/Dillon State Park	1,608
Dorset Wildlife Area	1,702
Dover Reservoir Wetlands	998
Eagle Creek Wildlife Area	2,181
Flatrock Creek Riparian	1,759
Fox Lake Wetlands	418
Friday Creek Wetland	1,008
Funk Bottoms Wildlife Area	2,545
Geauga Park District Rookery Wetland	636
Geneva State Park	422
Grand River Wildlife Area	11,030
Griggs Mill Creek Wetland	330
Hambden Orchard Wildlife Area	1,866
Indian Lake Inlet Wetlands	785
Jerome Fork Wetlands	399
Killbuck Creek	2,218
Killbuck Marsh Wildlife Area	5,046
Kiwanis Lake Wetlands	437
Lake Luna Wetlands	1,041
Lennox Center Wetlands	1,131
Linton Road Wetland	1,213
Little Portage River Wetlands	1,086
Magee/Metzger/Ottawa National Wildlife Refuge (West)	5,412
Marrian Road Wetland	617
Mecca Township Wetland	609
Mentor Marsh State Nature Preserve	869

Site Name	Size (acres)
Mill Creek Wetland	1,527
Mogadore Reservoir Wetlands	1,070
Monroe Center Wetlands	438
Montville Township Wetland	1,506
Morgan Swamp State Nature Preserve	747
Mosquito Creek (Warren) Wetlands	863
Mosquito Creek Wildlife Area	4,276
Moxley/Smith/Sanford/Other Private Clubs	1,211
Muskingum River (Dresden) Wetlands	1,270
New Lyme Wildlife Area	981
North Bend Road Wetlands	626
Oak Openings - Irwin Prairie	1,086
Ohio Brush Creek Wetlands	476
Orwell Wetlands	1,063
Ottawa National Wildlife Refuge (Central)/Toussaint Shooting Club/Other	3,138
Ottawa National Wildlife Refuge (Navarre)	848
Phelps Road Wetland	3,143
Plymouth Township Wetland	1,224
Pond Brook	1,230
Potter Creek Wetlands	712
Pritchard Wetlands	409
Raccoon Creek (Wellston) Wetlands	1,123
Raccoon State Forest Wetlands	749
Racoon Creek/Zaleski State Forest/Lake Hope State Park	1,374
Ray State Line Road Wetlands	480
Resthaven Wildlife Area	1,309
Richmond Center Wetland	816
Rittman Wetland	826
Rome State Nature Preserve	1,256
Salt Fork Wetlands	1,102
Sandyville Wetlands	1,648
Shedd Road Wetland	808
Sheffield Center Wetland	1,687
Sheldon's Marsh	923
Shenango Wildlife Area	4,999
Sixteen Valley Wetlands	464
Skull Fork Wetlands	468
Spring Pond Wetland	530
St. Mary's River Riparian	2,617
Stillwater Creek Wetlands	714
Symmes Creek Wetlands	1,328
Trumbull Creek Wetlands	764
Twitchell Road Wetlands	405
Upstream East Branch Reservoir	1,220
West Branch Huron River Wetlands	2,220
West Branch Mahoning River Wetland	1,162
Willard Marsh Wildlife Area	1,240
Willow Creek Wetlands	378
Willow Point	316
Wills Creek Reservoir/Conesville Coal	2,564
Windham Wetlands	897
Winous Point Shooting Club/Ottawa Shooting Club/Pickerel Creek Wildlife Area	9,358

Site Name	Size (acres)
Wolf Creek Wetlands	753
Yankee Run Wetlands	876
Champion Township Wetlands	533
Wildare Wetlands	564
Lake Cardinal Area Wetlands	359

I2. Mercury Reduction at Ohio EPA

Mercury is a persistent bioaccumulative toxic metal that is widely used in many products. Once mercury is released into the environment its toxicity, persistence and ability to travel up the food chain are important issues for human health and the environment. Ohio has a statewide health advisory for mercury from fish consumption for sensitive populations: women of childbearing age; and children 15 years old or younger (issued by the Ohio Department of Health).

U.S. EPA is allowing states to identify waters for a special 303(d) list category devoted to mercury issues (5M). While moving in this direction would be preferable as a way to focus on this important pollutant, Ohio EPA has decided that such a move is not possible for this report. At the same time, Ohio EPA is taking action to decrease mercury pollution and these efforts are summarized here.

Ohio Law

House Bill 443 was made law on Jan. 4, 2007. The law has the mercury product regulations created initially in House Bill 583 and Senate Bill 323, establishing sales bans for certain mercury products. Public and private schools through high school were not to purchase mercury, mercury compounds or mercury-measuring devices for classroom use as of April 6, 2007. Mercury thermometers and mercury-containing novelty items were not to be sold in Ohio as of Oct. 6, 2007. The sale of novelty items that have mercury cell button batteries were banned as of 2011. Mercury thermostats were not to be sold or installed as of April 6, 2008. There are exemptions to the sales bans.

Ohio Projects

Ohio EPA has worked in several areas seeking to reduce mercury emissions and increase awareness:

- identification of air sources of mercury, including identification of water bodies in the State impaired by mercury predominantly from atmospheric deposition, potential emissions sources contributing to deposition in the State and adoption of appropriate State-level programs to address in-state sources;
- identification of other potential multi-media sources of mercury, such as mercury in products and wastes and adoption of appropriate State-level programs (note that mercury-containing products may be a source of mercury to the air and other media during manufacturing, use or disposal);
- quantifying multi-media mercury reductions achieved by scrubber systems installed at Ohio power plants in response to a lawsuit filed by several northeastern states;
- adoption of statewide mercury reduction goals and targets, including percent reduction and dates of achievement, for air and other sources of mercury, as well as reduction targets for specific categories of mercury sources where possible;
- multi-media mercury monitoring, including water quality, air deposition and air emissions monitoring;

- implementation of Pollutant Minimization Programs by publicly owned treatment works with mercury variances to identify and reduce sources of mercury that discharge to their plants[1].
- investigating mercury in various types of wastewater, including:
  - primary materials industries, including primary metal production, oil refining and coal facilities;
  - facilities processing steel scrap (continuous casting and steel foundries);
  - publicly owned treatment works, which look at indirectly discharging industries through the pretreatment program and facility Pollutant Minimization Plan;
  - coal power plant wastewater from scrubbers, ash ponds and "Low Volume" wastewaters; and
  - other industries in interactive allocation segments to get an accurate accounting of mercury in the segments.
- working to control discharges from the state's one mercury cell sodium/chlorine plant[2].
- coordination across states, where possible, such as multi-State mercury reduction programs. Ohio EPA has had representatives in several organizations that work toward this goal.

Ohio Resources

Many videos, fact sheets and presentations are available on Ohio EPA's website that relate to mercury. These include household mercury fact sheets; an introduction to mercury issues; a guide for dealing with mercury by school administrators; an informational sheet for building awareness of mercury in schools; information about mercury in industry; and suggestions for developing a community mercury reduction program. See ***epa.ohio.gov/ocapp/p2/mercury_pbt/mercury.aspx*** for more information.

Federal Rules

In 2017, U.S. EPA finalized technology-based pretreatment standards under the Clean Water Act to reduce discharges of mercury and other metals from dental offices into municipal sewage treatment plants known as publicly owned treatment works (POTWs). Ohio EPA is responsible for ensuring the rule is implemented. The rule requires dental offices to comply with requirements based on the American Dental Association's recommended practices, including the use of amalgam separators. Once captured by the separator, dental amalgam can be recycled. Removing mercury when it is concentrated and easy to manage, such as through low-cost amalgam separators at dental offices (average annual cost per dental office in 2016 is about $800), is a common-sense solution to managing mercury that would otherwise be released to air, land and water. You can find this rule and supporting documents at U.S. EPA's website: ***epa.gov/eg/dental-effluent-guidelines***.

[1] The facilities track implementation of mercury reduction measures and monitor influent and effluent mercury levels. They compile reduction information and submit annual progress reports to Ohio EPA.

[2] The current consent order includes reducing fugitive air emissions that have contributed to storm water discharges of mercury. The plant will be scrubbing cell emissions with water and sending those discharges to the plant's zero discharge process treatment system. The consent order also requires the company to track mercury mass balances through the facility and recycle where possible. This includes using collected storm water as process water make-up.

I3. Inland Lakes and Reservoirs

Ohio EPA initiated a renewed monitoring effort for inland lakes in 2008. This report assesses three beneficial uses that apply to inland lakes: recreation; public drinking water supply; and human health (via fish tissue). Ohio EPA is in the process of updating the water quality standards for inland lakes. For this Integrated Report, Ohio will use a two-tiered approach incorporating existing water quality criteria that apply to all waters of the state as well as a separate assessment that will explore the effects of systemic nutrient enrichment in the watershed and its impact on water quality, and ultimately on aquatic life in lakes and reservoirs, as a surrogate for the aquatic life beneficial use.

Background of Ohio's Inland Lake Water Quality Monitoring Program

Ohio EPA's work to assess lakes began in 1989 with a CWA Section 314 Lake Water Quality Assessment grant that supported the evaluation of 52 lakes. Various additional grants enabled the evaluation of 89 more lakes through 1995. An analysis and determination of beneficial use status for 447 public lakes (greater than five acres in surface area) was presented in Volume 3 of the 1982 through 1996 Ohio Water Resource Inventories [305(b) report]. In those reports, Ohio EPA developed a *Lake Condition Index* (LCI) using multiple metrics to characterize overall lake health which was applied to designated uses as well as general CWA fishable and swimmable goals. All lakes, with the exception of upground reservoirs, were considered EWH by rule in the earlier 305(b) reports.

After dedicated U.S. EPA funding for lakes monitoring ended, Ohio EPA monitored only 53 lakes over the next 10 years. The recently described LCI became obsolete with the passage of Ohio's Credible Data Law [House Bill 43 (amended), effective 10/21/2003]. This law requires that decisions on impairment for all surface waters (streams, lakes wetlands) be based solely on Level 3 credible data. Ohio's original LCI assessment process included a combination of Level 2 and Level 3 credible data to make impairment decisions.

Ohio EPA began researching ways to re-establish an inland lakes monitoring program in 2005. During the 2007 field season, Ohio EPA participated in the U.S. EPA-sponsored National Lakes Assessment (NLA). Ohio was assigned 19 lakes that were selected through a probability-based random selection process. The effort served as a precursor for a renewed lake sampling program in Ohio.

Status of Inland Lakes Program

In 2010 and subsequent IRs through 2018, Ohio EPA provided a proposed methodology for assessing inland lakes based on Lake Habitat (LH) use as a substitute for aquatic life use (ALU). The LH criterion were deemed overprotective of inland lakes, lacking realistic expectations of the largely artificial reservoirs in Ohio. Ohio EPA currently monitors select inland lakes using the strategy described in Section I3.2.1 below. Priority is being placed on lakes used for public drinking water or used heavily for recreation and suspected of being impaired for either of those uses. The objectives for monitoring inland lakes remain as follows:

- Track status and trends of lake quality
- Determine attainment status of beneficial uses
- Identify causes and sources of impaired uses
- Recommend actions for improving water quality in impaired lakes

A Methodology for the Assessment of Aquatic Life in Lakes

As in recent IRs, Ohio EPA has implemented a sampling strategy that focuses on evaluating the water quality conditions present in the epilimnion of lakes. The sampling target consists of an even temporal distribution of 10 sampling events collected during the summer months (multiple or single year). Details of the sampling protocol are outlined in the Inland Lakes Sampling Procedure Manual, available on Ohio EPA's webpage at: ***epa.ohio.gov/dsw/inland_lakes/index.aspx***.

The current ALU designation for all inland lakes in Ohio is exceptional warmwater habitat (EWH) except for upground reservoirs which are designated warmwater habitat (WWH). As stated earlier, the assignment of EWH and WWH to inland lakes has unclear origins giving reason to consider new standards for inland lake use designations. To evaluate lake condition using existing standards protective of aquatic life in Ohio lakes and reservoirs, the chemical parameters ammonia, dissolved oxygen, pH, total dissolved solids and various metals were analyzed. Statewide water quality outside mixing zone average (OMZA) criteria for these parameters are summarized in Table 35-1 of the Ohio water quality standards rule 3745-1-35 of the Ohio Administrative Code (***epa.ohio.gov/portals/35/rules/01-35.pdf***). Other important parameters for assessing lake condition include causative nutrient parameters (e.g. total phosphorus, total nitrogen) and biological response variables (e.g. chlorophyll-a).

For this 2020 IR, Ohio EPA has initiated a slightly modified approach to assessing lakes compared to previous Integrated Reports (IRs). First, statewide criteria are used to determine if there was any overt pollution of the lake as would be indicated by a greater than 10% exceedance of the appropriate statewide OMZA criteria for each lake (exception-outside mixing zone minimum (OMZM) for D.O.). Where criteria do not exist, a common approach to assessing relative lake condition is to compare lake water quality sampling data to regional and lake-type derived percentiles (e.g. 25th) of existing lake data. Certain chemical parameters (i.e. nutrient parameters) comprise the second tier where values below the 25th percentile of reference sites generally represent an acceptable condition.

Inland lake targets derived using this approach include: the 25th percentile for TN and TP (as causative variables), and the 25th percentile for chlorophyll-a (Chl. a) and the upper 75th percentile Secchi depth (as response variables). Data used to determine these targets were collected by Ohio EPA from Ohio inland lakes between 1989 and 2006 (Table I-3). Data for individual sites were expressed as medians prior to calculating percentiles.

A Methodology to Assess Inland Lake Water Quality in Ohio

An important distinction between assessment of aquatic life uses of rivers and streams in Ohio versus lakes is that the former relies on biological monitoring and a comparison of those results to the biological criteria as the assessment tool. Ohio does not have biological criteria that apply to lakes. As a result, the assessment methodology for the aquatic life use will rely solely on the results of chemical water quality sampling and a comparison of the results to the applicable numeric chemical criteria. This is an important difference to the weight-of-evidence approach traditionally used by Ohio EPA utilizing bio-criteria for the assessment of rivers and streams.

Methodology Preview: Inland Lakes Aquatic Life Assessment

The following protocol is intended to be used to determine the effects of toxic pollutants and nutrient enrichment on aquatic life in Ohio's inland lakes. This conceptual approach or something similar could be considered in future WQS rulemaking for inland lakes.

Parameters sampled with applicable and existing aquatic life outside mixing zone average (OMZA) WWH and EWH chemical numeric criterion:

- Comparison of the average dissolved oxygen content of the epilimnetic samples in a thermally stratified lake (or samples throughout the water column of an unstratified lake) to the OMZM WWH (4.0 mg/L) and EWH (5.0 mg/L) dissolved oxygen criteria considered protective of aquatic life (i.e. fish) in lakes. OMZM was considered more appropriate for instantaneous D.O. measurements. If more than 10 percent of the average dissolved oxygen values are below the OMZM criterion, lake conditions are stressful to aquatic life, a condition that is often associated with accelerated or unnatural nutrient enrichment (i.e., a *hypertrophic* condition) and is considered *impaired*.
- Comparison of the median pH value of the epilimnetic samples of a thermally stratified lake (or samples from throughout the water column of an unstratified lake) to the statewide OMZA pH criteria for WWH and EWH lakes. If more than 10 percent of the median pH values do not meet the OMZA criterion, lake conditions are stressful to aquatic life, and the lake is considered *impaired*.
- Comparison of individual sample concentrations for ammonia of lake samples collected, to the temperature and pH dependent OMZA numeric criterion. Lake conditions are stressful to aquatic life, and the lake is considered *impaired* if more than 10 percent of the individual samples exceed the OMZA numeric criteria.
- Comparison of individual sample concentrations for any TDS or metal parameter to the current applicable aquatic life outside mixing zone average (OMZA) numeric criterion. If more than 10 percent of the samples within an assessment period (multiple or single year) exceed the OMZA numeric criterion for metals, the lake would be considered *impaired* and placed on the 303d list requiring a TMDL study or 9-element plan to restore the lake to meet applicable WQS.

Table I-3 — Percentage of sampling events exceeding the statewide water quality criteria for the protection of aquatic life in WWH lakes.

WWH WQS statewide chemical Criteria													
Percentage of Samples Exceeding the OMZA WWH Criterion													
Lake/Reservoir	D.O. (mg/L)[1]	pH (SU)	NH3-N (mg/l)[2]	TDS Mg/L	As **µg/L**	Se **µg/L**	Cd[3]	Cr[3]	Cu[3]	Pb[3]	Ni[3]	Zn[3]	
Water Quality Standard	**<4.0**	**>6.5 <9.0**		**1500**	**150**	**5.0**							
Amicks Reservoir	10	0	0	0	0	0	0	0	0	0	0	0	
Bucyrus (Outhwaite) Reservoir	0	0	0	0	0	0	0	0	0	0	0	0	
Defiance Reservoir	0	0	0	0	0	0	0	0	0	0	0	0	
Norwalk Memorial Reservoir	0	10	0	0	0	0	0	0	0	0	0	0	
Raccoon Reservoir	0	0	0	0	0	0	0	0	30	0	0	0	
Swanton Reservoir	10	0	0	0	0	0	0	0	0	0	0	0	
Willard Reservoir	0	0	0	0	0	0	0	0	0	0	0	0	

[1] For dissolved oxygen, the OMZM (outside mixing zone minimum) criteria (4.0 mg/l) is applied since 24-hour data was not available. Dissolved oxygen criteria apply in the epilimnion of stratified lakes and throughout the water column in unstratified lakes.
[2]WQS 3745-1-35 table 35.5, OMZA 30-day average total ammonia-nitrogen criteria.
[3]Hardness dependent criteria.

Table I-4 — Percentage of sampling events exceeding the statewide water quality criteria for the protection of aquatic life in EWH lakes.

EWH WQS statewide chemical Criteria													
Percentage of Samples Exceeding the OMZA EWH Criterion													
Lake/Reservoir	D.O. (mg/L)[4]	pH (SU)	NH3-N (mg/l)[5]	TDS Mg/L	As **µg/L**	Se **µg/L**	Cd[6]	Cr[6]	Cu[6]	Pb[6]	Ni[6]	Zn[6]	
Water Quality Standard	**<5.0**	**>6.5 <9.0**		**1500**	**150**	**5.0**							
Amann Reservoir	14	0	0	0	0	0	0	0	0	0	0	0	
Attwood Reservoir	0	0	0	0	0	0	0	0	0	0	0	0	
Barberton Reservoir	0	0	0	0	0	0	0	0	0	0	0	0	
Caesar Creek Reservoir	38	0	0	0	NS	NS	NS	NS	NS	NS	NS	NS	
Lake Alma	0	0	0	0	0	0	0	0	0	0	0	0	
Lake Rupert	0	0	0	0	0	0	0	0	0	0	0	0	
Woodsfield Reservoir	60	0	0	0	0	0	0	0	5	0	0	0	

[4] For dissolved oxygen, the OMZM (outside mixing zone minimum) criteria (5.0 mg/l) is applied since 24-hour data was not available. Dissolved oxygen criteria apply in the epilimnion of stratified lakes and throughout the water column in unstratified lakes.
[5]WQS 3745-1-35 table 35.5, OMZA 30-day average total ammonia-nitrogen criteria.
[6]Hardness dependent criteria.
NS – Not sampled for those parameters

Table I-5 — Causative and response nutrient targets for Ohio inland lakes by lake type and ecoregion.

Parameter			Statewide	Ecoregional Targets[9]				
Lake type	Form[7]	Units[8]	Targets	ECBP	EOLP	HELP	IP	WAP
Chlorophyll a[10] (Response)								
Dugout lakes	T	µg/L	6.0	--	--	--	--	--
Impoundments	T	µg/L	--	14.0	14.0	14.0	14.0	6.2
Natural lakes	T	µg/L	14.0	--	--	--	--	--
Upground reservoirs	T	µg/L	6.0	--	--	--	--	--
Secchi disk transparency[10] (Response)								
Dugout lakes	--	m	2.60	--	--	--	--	--
Impoundments	--	m	--	1.19	1.19	1.19	1.19	2.16
Natural lakes	--	m	1.19	--	--	--	--	--
Upground reservoirs	--	m	2.60	--	--	--	--	--
Phosphorus[10] (Causative)								
Dugout lakes	T	µg/L	18	--	--	--	--	--
Impoundments	T	µg/L	--	34	34	34	34	14
Natural lakes	T	µg/L	34	--	--	--	--	--
Upground reservoirs	T	µg/L	18	--	--	--	--	--
Nitrogen[10] (Causative)								
Dugout lakes	T	µg/L	450	--	--	--	--	--
Impoundments	T	µg/L	--	930	740	930	688	350
Natural lakes	T	µg/L	638	--	--	--	--	--
Upground reservoirs	T	µg/L	1,225	--	--	--	--	--

[7] T = total.

[8] m = meters; mg/L = milligrams per liter (parts per million); µg/L = micrograms per liter (parts per billion); s.u. = standard units.

[9] ECBP stands for Eastern Corn Belt Plains; EOLP stands for Erie/Ontario Lake Plain; HELP stands for Huron/Erie Lake Plains; IP stands for Interior Plateau; and WAP stands for Western Allegheny Plateau.

[10] These targets apply as lake medians from May through October in the epilimnion of stratified lakes and throughout the water column in unstratified lakes.

The nutrient loading concept implies that a relationship exists between the quantity of nutrients entering a water body and its response to that nutrient input (Wetzel 2001). For this report, Ohio EPA will utilize this idea to identify a lake's nutrient status, and to define a benchmark that can be used to develop an action plan when chemical targets are exceeded. The above concept was used as an assessment tool to establish the following aquatic life use target guidelines (Table I-5):

- Response Parameters: Comparison of the median chlorophyll a concentration of the samples collected over the sample period (multiple or single season) to the applicable chlorophyll a targets for the type of lake and ecoregion in which the lake is located. High concentrations of chlorophyll a will often be reflected in a lower secchi depth or transparency reading. These response variables are used to help gauge the system response to nutrient enrichment in lakes. If median chlorophyll a concentration and secchi transparency exceed the applicable targets, these lakes are likely experiencing accelerated eutrophication (enriched) and should be managed as such.
- Causative Parameters: Total phosphorus and total nitrogen are common causative parameters that can cause accelerated nutrient enrichment in lakes. In this IR, Ohio EPA compared median total phosphorus and total nitrogen concentrations in samples collected over the sample period (multiple or single season) to the applicable causative targets for the type of lake and ecoregion in which the lake is located.

Results

Table I-6 describes the assessment status of the Aquatic Life Use designation for 14 lakes sampled by Ohio EPA in 2017-2018 based on the protocol outlined in the previous section.

Table I-6 — Application of the Aquatic Life Assessment Methodology to lakes sampled in 2017-2018.

Response and Causative Nutrient Targets				*Results - Median Values			
Lake/Reservoir	District	Ecoregion9	Lake Type	Chl. a (µg/L)	T-P (µg/L)	T-N (µg/L)	Secchi (m)
Amann Reservoir	CDO	ECBP	DPI	64	143.0	1830	0.5
Amick Reservoir	CDO	ECBP	UP	9.7	18.6	885	1.5
Attwood Reservoir	SEDO	WAP	DPI	21.0	21.0	539	1.0
Barberton Reservoir	NEDO	EOLP	DPI	37.1	54	770	0.8
Bucyrus (Outhwaite) Reservoir	NWDO	ECBP	UP	1.8	5.0	982	3.8
Caesar Creek Reservoir	SWDO	ECBP	DPI	26	22.1	1330	1.1
Defiance Reservoir	NWDO	HELP	UP	34.7	602.0	1450	0.7
Lake Alma	SEDO	WAP	DPI	5.2	9.1	455	2.3
Lake Rupert	SWDO	WAP	DPI	11.7	19.1	440	1.6
Norwalk Memorial Reservoir	NWDO	ECBP	UP	29.8	57.8	1613	0.7
Raccoon Reservoir	NWDO	HELP	UP	2.89	16.0	1230	3.0
Swanton Reservoir	NWDO	HELP	UP	13.7	36.3	3236	1.2
Willard Reservoir	NWDO	ECBP	UP	2.16	10.8	159	5.1
Woodsfield Reservoir	SEDO	WAP	DPI	11.4	20.8	501	2.1

Summary of Findings

Three Ohio reservoirs sampled during the 2017-2018 sampling season experienced D.O. exceedances: Amann Reservoir, Caesar Creek Reservoir and Woodsfield Reservoir (Table I-4). Amann Reservoir is a shallow dammed impoundment that feeds Amicks Reservoir, an upground drinking water source for the city of Galion. Woodsfield Reservoir is also a dammed impoundment used as a water supply for the City of Woodsfield in Eastern Ohio.

Amann Reservoir is enriched and experiences high temperatures during the day. Due to its physical nature and external nutrient inputs, Amann Reservoir likely develops extreme diel D.O. swings during the summer months. Although slightly deeper and more shaded, the same can be said about Woodsfield Reservoir. Algal blooms were observed by Ohio EPA DSW staff at Amann and Woodsfield Reservoirs during the 2017 sampling season.

Caesar Creek is a deep U.S. Army Corps reservoir in southwest Ohio mainly used for flood control but is also utilized as a drinking water source and for recreation. The maximum depth of Caesar Creek Reservoir approaches 100 feet. During the summer sampling period in 2018, the reservoir experienced low D.O. in the epilimnion during 38% of the sampling events. This indicates that anoxia was occurring at the bottom of the reservoir and it was severe enough that it migrated through the metalimnion, affecting available oxygen even in the epilimnion.

Based on the aquatic life assessment methods provided in this IR, Amann, Woodsfield and Caesar Creek Reservoirs are considered *impaired* due to exceedance of the EWH aquatic life D.O. criteria that applies to all waters except for upground reservoirs (Table I-4). None of the upground reservoirs experienced greater than 10% exceedances of WWH D.O. criteria during the 2017-2018 sampling seasons (Table I-3).

Raccoon Creek Reservoir, a drinking water source for the City of Clyde did exhibit a copper exceedance in 30% of the sampling events, likely an indicator of copper sulfate used for algae control. The distribution of the micronutrients (i.e. metals) in lakes is very complex and poorly understood, however ionic concentrations of micronutrients is usually very small in aerated surface waters (Wetzel 2001). Copper exceedances of greater than 10 percent reveal unnatural conditions that could adversely affect aquatic life in Ohio lakes and reservoirs.

Future Rule Development for Inland Lakes in Ohio

U.S. EPA has been working on draft 304(a) lake numeric nutrient criteria based in part on the results from the National Lakes Assessment (NLA) program. Through this study, U.S. EPA has established some ecoregional relationships regarding nutrients, in particular chlorophyll *a*. However, U.S. EPA recognizes the difficulty in assigning a one-size-fits-all approach for nutrient criteria. Currently, states are proceeding with different methods of regulating their lakes with the understanding that U.S. EPA is expected to release a draft proposal of lake nutrient criteria in January 2020. At this time, Ohio EPA would look at the appropriateness of incorporating U.S. EPA's metrics into a new inland lake assessment methodology.

I4. Future Lake Erie Monitoring and Assessment

Ohio EPA recognizes the need to develop a sustainable, long-term plan to monitor Lake Erie, both to support Ohio's water resource and to support assessment of the lake ecosystem objectives identified in the Great Lakes Water Quality Agreement (GLWQA). Long-term monitoring will need to provide data to evaluate water quality trends, assess the effectiveness of remedial and nutrient reduction programs, measure compliance with jurisdictional regulatory programs, identify emerging problems and support implementation of the remedial action plans in Ohio's four Areas of Concern (more information about Areas of Concern is available in Section C1 of this report).

Ohio EPA evaluates the results of the monitoring efforts funded by the Great Lakes Restoration Initiative (GLRI) and other funding sources. Tracking Lake Erie tributary nutrient loads at continuous nutrient load monitoring stations are part of this strategy. These stations are monitored by United States Geological Survey (USGS) and Heidelberg University's National Center for Water Quality Research (Figure I-1 and Figure I-2). With those partners and the Ohio Lake Erie Commission, Ohio EPA developed the Expanded Water Monitoring Report in October 2019 (see ***lakeerie.ohio.gov/LakeEriePlanning/OhioDomesticActionPlan2018.aspx*** to download this report and its supplemental data spreadsheet). This report shows the loading and flow weighted mean concentration results for all tributary monitoring sites back to 2008, where data is available.

Ohio EPA continues to monitor Lake Erie via its monitoring program. Monitoring plans and data summaries can be found on Ohio EPA's webpage (***epa.ohio.gov/dsw/lakeerie/index#125073721-nearshore-monitoring***). Summer chlorophyll concentrations at ambient stations on an annual basis will be one component, as will measuring physical profiles at transect locations used to track hypoxia/anoxia in the hypolimnion of the Central Basin. Mayfly and phytoplankton biological indicator data were included in Ohio EPA's 2019 Lake Erie monitoring, however electrofishing bioindicators (i.e. IBI and MIwb) were not. This is because Ohio EPA is developing new aquatic life use assessment methodology.

In 2020, Ohio EPA will participate in the National Coastal Condition Assessment. This U.S. EPA-organized survey occurs every five years covering the Nation's coastal waters. It addresses two key questions: What percent of the Nation's coastal waters are in good, fair and poor condition for key indicators of water quality, ecological health and recreation? Also, what is the relative importance of key stressors such as

nutrients and contaminated sediments. Results for previous surveys are available at the following website: ***epa.gov/national-aquatic-resource-surveys/what-national-coastal-condition-assessment***

For the assessment of algae impacts and attainment of designated uses in relation to algae, Ohio EPA continues to collaborate with universities and other agencies to determine appropriate monitoring locations, frequencies and parameters, as well as how that data collection can be sustained. Researchers from the University of Toledo, Bowling Green State University and The Ohio State University/Stone Laboratory continue to collect supplemental data that Ohio EPA will use to evaluate algae impacts. Algal bloom remote sensed/satellite data as interpreted by the National Oceanic and Atmospheric Administration (NOAA) will also continue to be used by Ohio EPA for assessment purposes, as detailed in Section F.4 of this report.

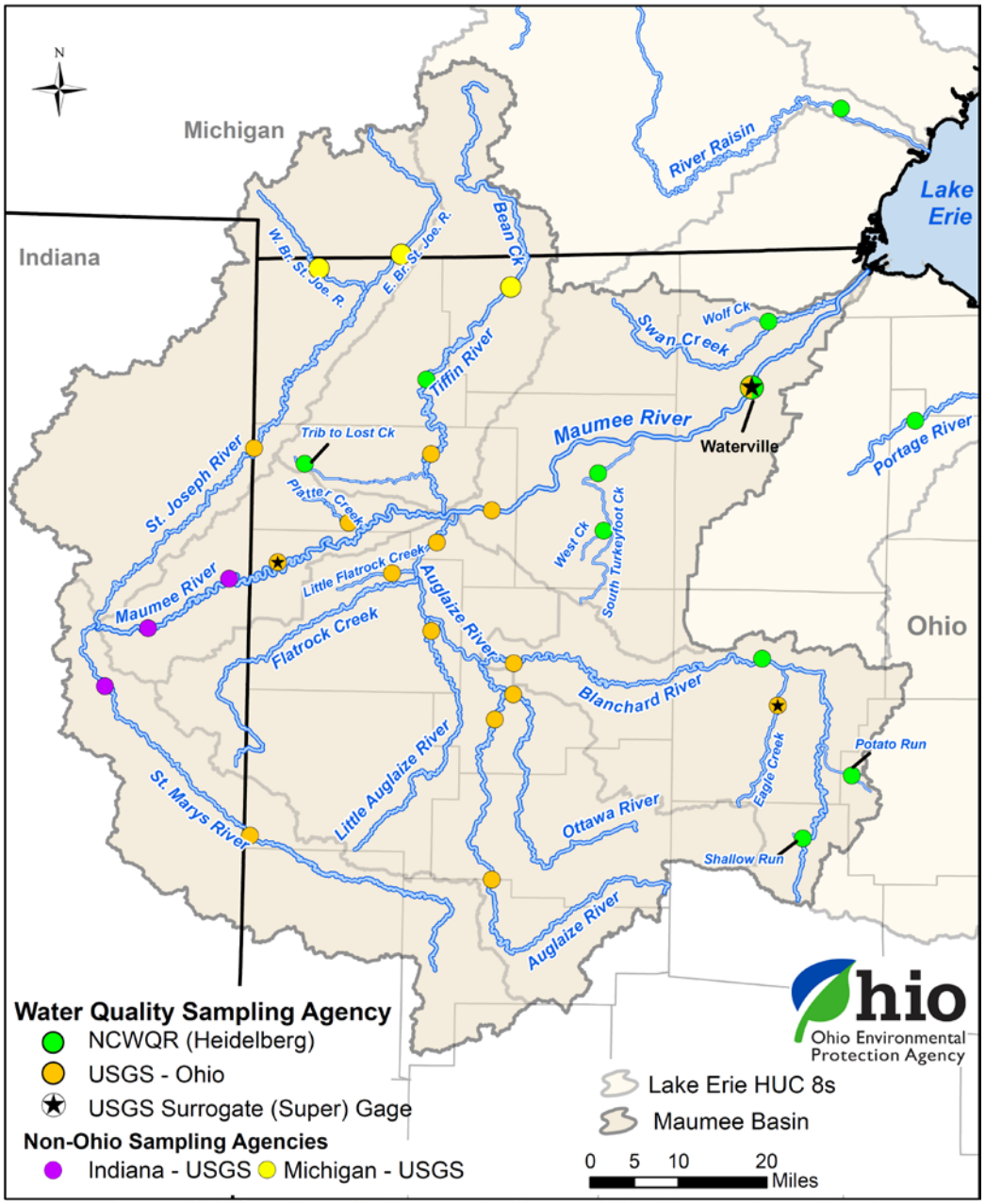

Figure I-1 — Western Lake Erie Basin tributary nutrient load monitoring sites by sampling agency.

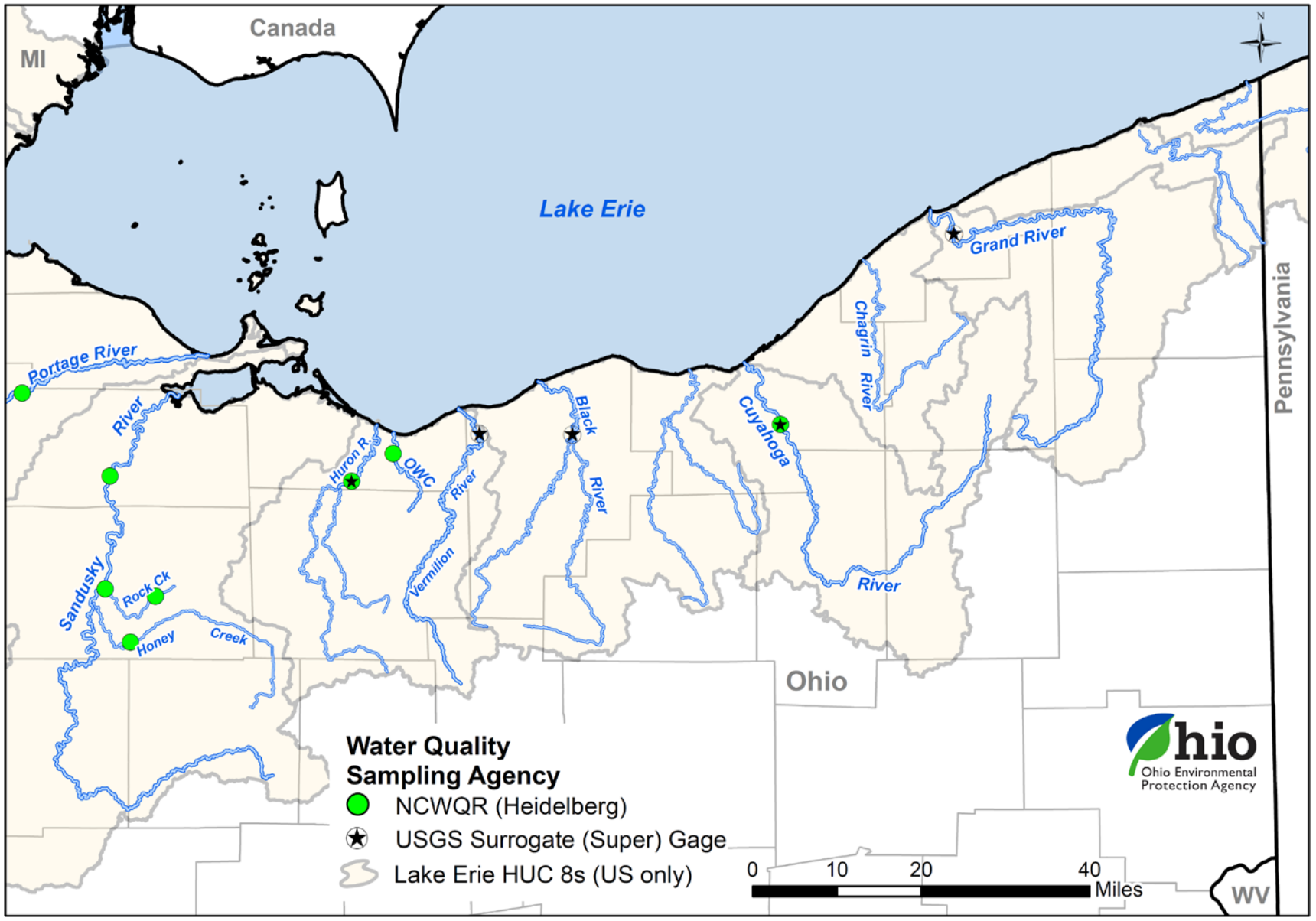

Figure I-2 — Sandusky Bay and Central Lake Erie Basin tributary nutrient load monitoring sites by sampling agency.

Methodology Preview: Lake Erie Aquatic Life Use Assessment Methodology Developments

The Ohio State University's Ohio Sea Grant College Program has agreed to assist Ohio EPA in leading a panel of experts to advise the state on the development of aquatic life use metrics for Lake Erie. This includes developing the state's first set of metrics to be applied to the three open water assessment units and redefining metrics for the four shoreline assessment units. At the publishing of this IR, this effort has just begun.