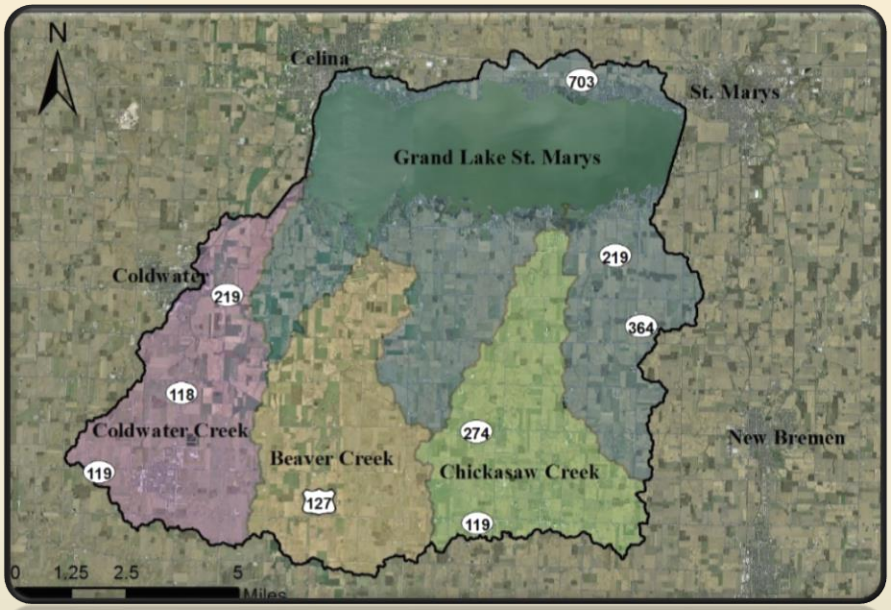
Grand Lake St Marys Water Quality Update – April 2021



Stephen J. Jacquemin

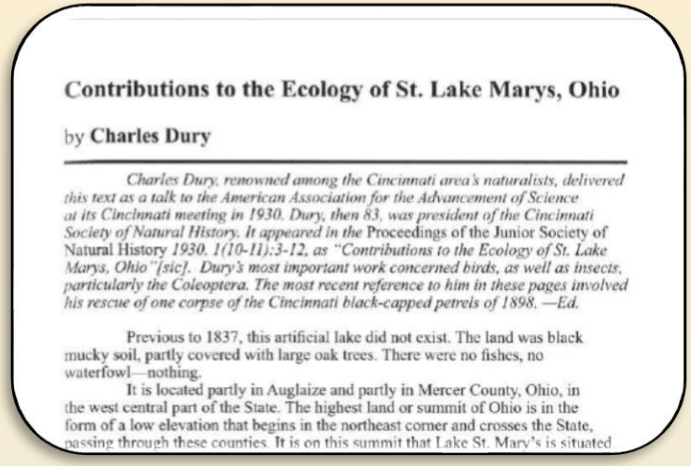
Wright State University – Lake Campus,
Agricultural and Water Quality Educational Center

Fish and Wildlife Education Series

The Fishes of Grand Lake St Marys

A History of GLSM Fishes

- Study of Ohio fishes originates from written accounts by English settlers in the mid-1700s
- Early 1800s - Constantine Rafinesque and others first began to document formal descriptions of taxa and distributions in the state (but not GLSM)
- GLSM first documented through anecdotal reports and presentations in the mid-1800s
  - Charles Dury (1867) – 'Cincinnati Naturalist'
- Agency based work began with US Commission of Fish and Fisheries (now US Fish and Wildlife Service) in the mid to late 1800s (until ~1884 when commercial fishing was still permitted)
- First formal scientific descriptions from Raymond Osburn's 1901 *The Fishes of Ohio* (limited GLSM)
- Ohio Division of Wildlife began surveys and active management in 1930s - continues today (Clark 1960)
- Formal scientific descriptions expanded in Milton Trautman's 1957 *The Fishes of Ohio*
- Forward to today . . . EPA, DNR, and WSU surveys



Contributions to the Ecology of St. Lake Marys, Ohio

by **Charles Dury**

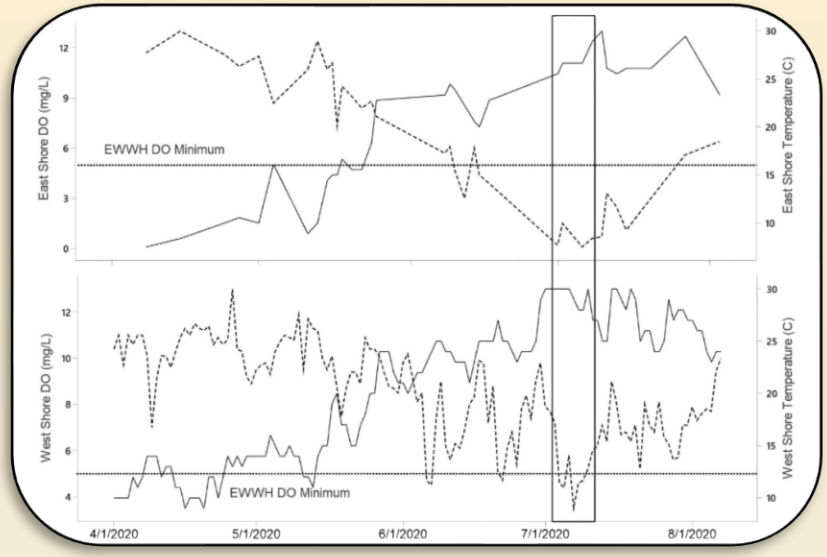
Charles Dury, renowned among the Cincinnati area's naturalists, delivered this text as a talk to the American Association for the Advancement of Science at its Cincinnati meeting in 1930. Dury, then 83, was president of the Cincinnati Society of Natural History. It appeared in the Proceedings of the Junior Society of Natural History *1930. 1(10-11):3-12, as "Contributions to the Ecology of St. Lake Marys, Ohio"[sic]. Dury's most important work concerned birds, as well as insects, particularly the Coleoptera. The most recent reference to him in these pages involved his rescue of one corpse of the Cincinnati black-capped petrels of 1898. —Ed.*

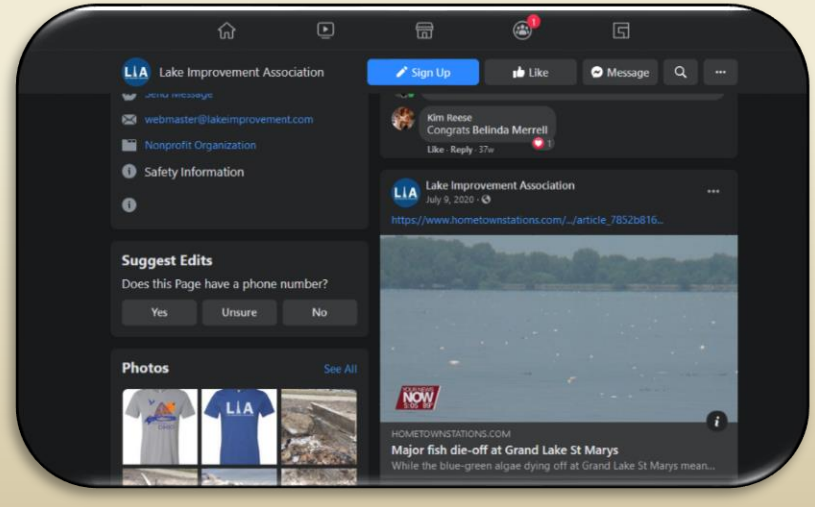
Previous to 1837, this artificial lake did not exist. The land was black mucky soil, partly covered with large oak trees. There were no fishes, no waterfowl—nothing.

It is located partly in Auglaize and partly in Mercer County, Ohio, in the west central part of the State. The highest land or summit of Ohio is in the form of a low elevation that begins in the northeast corner and crosses the State, passing through these counties. It is on this summit that Lake St. Mary's is situated

Summer 2020 Fish Mortality Event

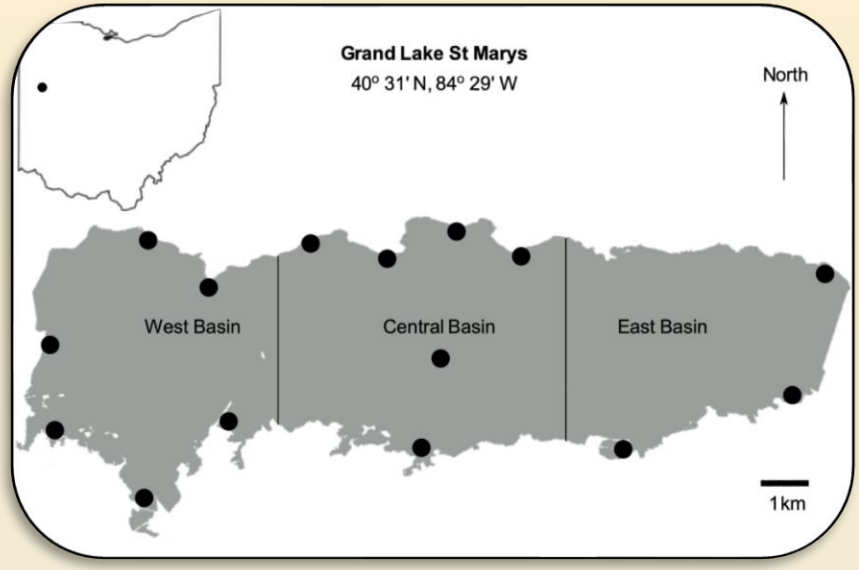
- On the evening of July 6th, 2020, a widespread fish mortality event began on Grand Lake St. Marys (GLSM) that persisted into the morning of July 10th, 2020.
- Ohio Administrative Code Water Quality Standard (OAC 3745-1), which applies to all lakes and reservoirs (except storage reservoirs) in the state, stipulates that dissolved oxygen (DO) levels should not fall below 5 to 6 mg/L
- Intermittent exposure to low DO can be tolerated by a wide variety of freshwater fishes but prolonged exposure to less than 3mg/L results in a combination of behavioral modifications (e.g. gulping air at the surface, reduction in activity, etc.), physiological changes (e.g. changes in gill condition), and/or mortality in most taxa
- Summer 2020 event presented a unique opportunity to conduct a full scale fisheries survey in the modern era

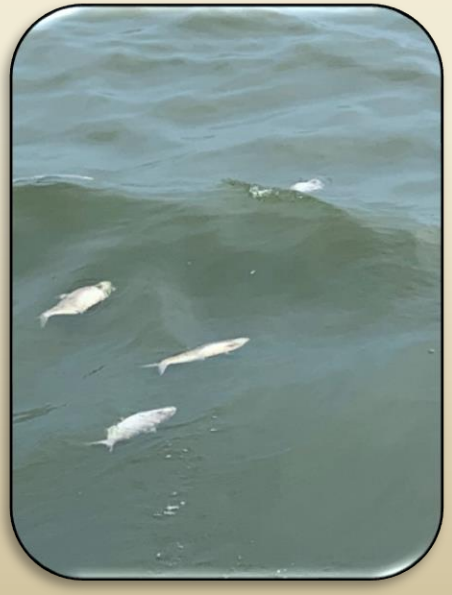




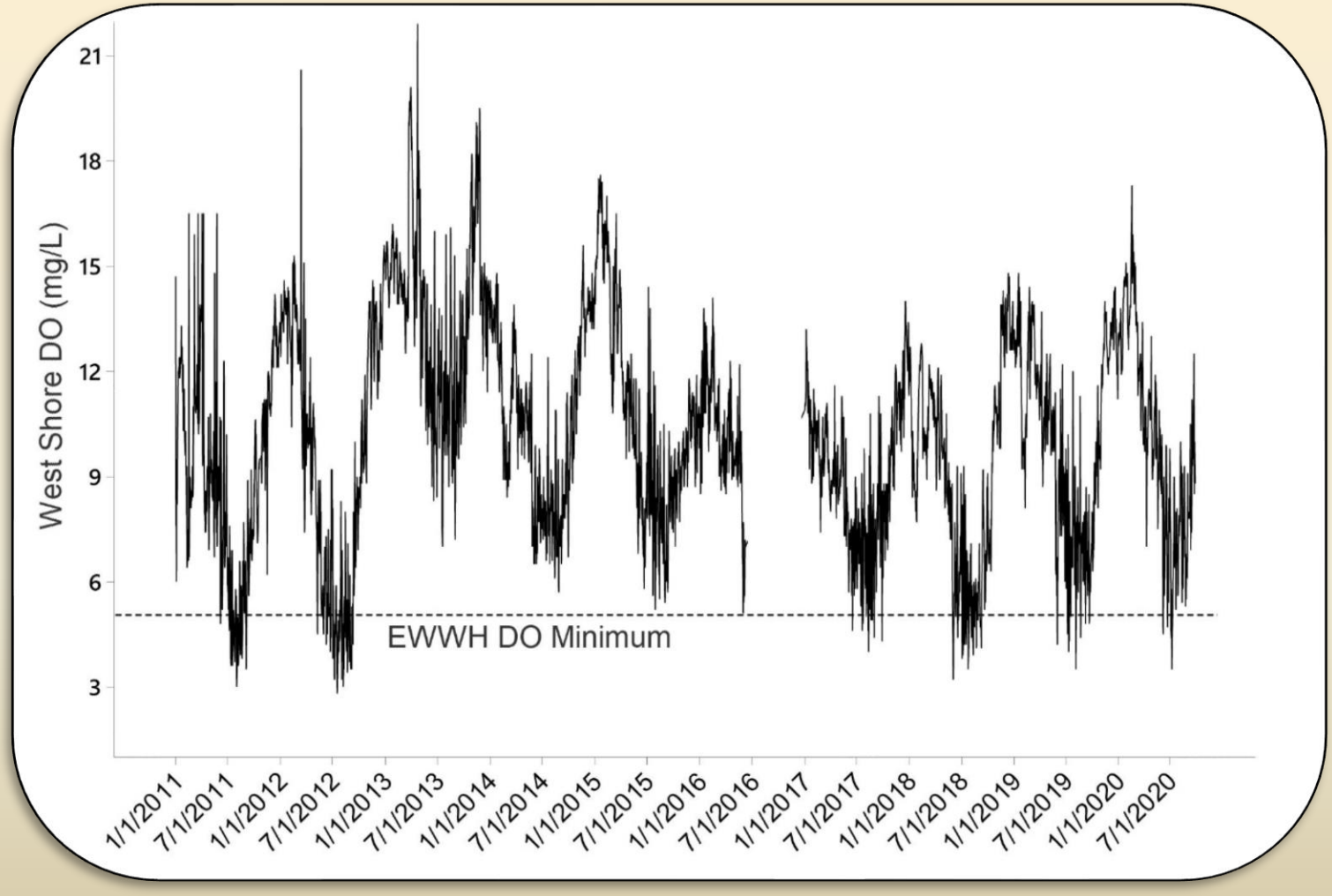
2020 Summer Fisheries Survey

- Conducted with Dr. Mark Cubberley (WSU-Lake Campus)
- Fishes killed by low DO were surveyed by boat along shoreline and open water transects over two-days (7/8-9/2020)
- Fourteen shoreline segments and one open water transect ranging from 1.5 to 3 km were conducted where fishes within 25m of shore (defined in this study as shoreline) or 25m of either side of the boat (open water) were documented
- Summer 2020 shoreline segments covered roughly 35% of the lake shore while the open water transect covered about 0.5% of the open water area
- Overall, a total of 12,351 individual fish, representing 25 unequivocal taxa, were identified and counted





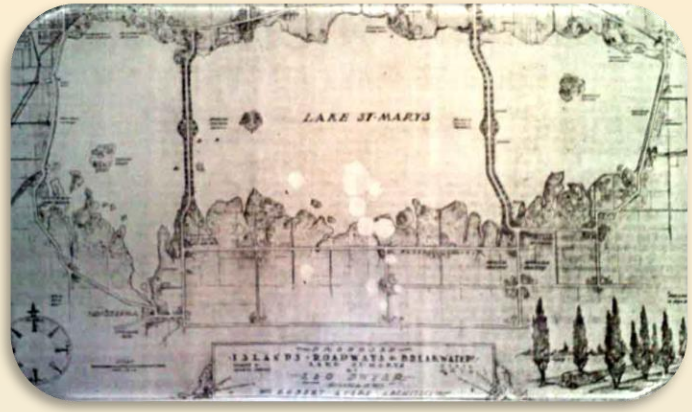
A Decade of Seasonal Fluctuation in DO Levels



* Long term DO data from Celina WTP – *Special Thank You To These Persons For Helping With This Project*

A Strange and Storied History of GLSM Fishes

- Comprehensive fisheries surveys are difficult and very rare
  - This mostly results from collection gear bias or collector bias with intent for particular species
- Using the 2020 survey and recent WSU near data as a modern reference point to compare to past surveys and observations (see Clark, 1960 and ODNR Stocking Reports) – We know that the total number of recorded species over the past century from GLSM is **57**
- 30 species are known to occur in the lake today
  - Most common are Shad, Carp, Drum
  - Least common are Northern Pike, Flathead Catfish
- State stockings have contributed to this total species number – including several non-native sport fish (Rainbow Trout, Striped Bass)
  - In total – at least 26 different taxa have been stocked
- Recent stocking efforts focus on native Perch, Walleye (recently switched to Saugeye)



A Strange and Storied History of GLSM Fishes

- Specific to historical records, of the 52 taxa noted in a comprehensive 1960 report, 25 are no longer found in the lake. Majority of these can still be found in surrounding watersheds
- Overall, lake gained several taxa (Flathead, Mosquitofish, Drum) w/ time
- BUT - lost many more taxa (numerous Sucker and Minnow AND more sensitive Darters) w/ time
- Changes in fish assemblage over the past century is a function of habitat degradation in the watershed – including the streams and lake

  (Subject of a future presentation in the series)

1900-1960

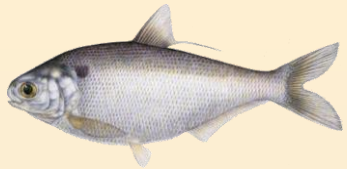
Taxa	Stocking
American Eel	No
Hornyhead Chub	No
Blacknose Dace	No
Pugnose Minnow	No
Redfin Shiner	No
Common Shiner	No
Mimic Shiner	No
Suckermouth Minnow	No
Silverjaw Minnow	No
Central Stoneroller	No
Northern Hogsucker	No
Golden Redhorse	No
Tadpole Madtom	No
Grass Pickeral	No
White Bass	Yes
Longear Sunfish	No
Warmouth	Yes
Rock Bass	Yes
Smallmouth Bass	Yes
Blackside Darter	No
Log Perch	No
Sand Darter	No
Johnny Darter	No
Fantail Darter	No
Greenside Darter	No

1960-2020

Taxa	Stocking
Gizzard Shad	Yes
Common Carp	Yes
Goldfish	No
Spotfin Shiner	No
Bluntnose and Fathead Minnow	Yes
Golden Shiner	Yes
Creek Chub	Yes
Sand Shiner	No
White Sucker	No
Quillback	No
Channel Catfish	Yes
Yellow, Brown, and Black Bullhead Catfish	Yes
Northern Pike	Yes
Brook Silverside	No
Blackstripe Topminnow	No
White and Black Crappie	Yes
Green Sunfish	Yes
Bluegill	Yes
Pumpkinseed Sunfish	Yes
Orangespotted Sunfish	No
Largemouth Bass	Yes
Yellow Perch	Yes
Walleye	Yes

Taxa	Stocking
Flathead Catfish	Yes
Rainbow Trout	Yes
Mosquitofish	No
Striped Bass	Yes
Saugeye	Yes
Freshwater Drum	No

TODAY






Taxa	Stocking	Occurrence
Gizzard Shad	Yes	Historical and Recent
Common Carp	Yes	Historical and Recent
Goldfish	No	Historical and Recent
Spotfin Shiner	No	Historical and Recent
Bluntnose and Fathead Minnow	Yes	Historical and Recent
Golden Shiner	Yes	Historical and Recent
Creek Chub	Yes	Historical and Recent
Sand Shiner	No	Historical and Recent
White Sucker	No	Historical and Recent
Quillback	No	Historical and Recent
Channel Catfish	Yes	Historical and Recent
Yellow, Brown, and Black Bullhead Catfish	Yes	Historical and Recent
Northern Pike	Yes	Historical and Recent
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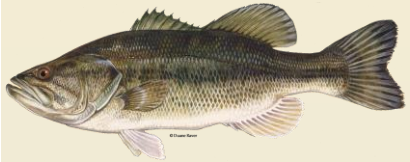
Yellow Perch	Yes	Historical and Recent
Walleye	Yes	Historical and Recent
Flathead Catfish	Yes	Recent
Rainbow Trout	Yes	Recent
Mosquitofish	No	Recent
Striped Bass	Yes	Recent
Saugeye	Yes	Recent
Freshwater Drum	No	Recent





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