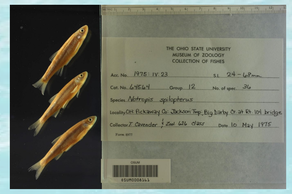
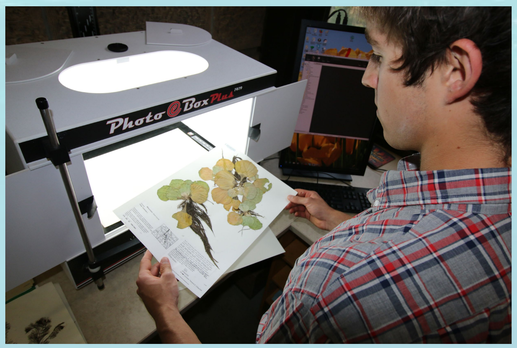
Documenting the Occurrence through Space & Time of Aquatic Non-indigenous Fish, Mollusks, Algae, & Plants Threatening North America's Great Lakes

A Thematic Collections Network (TCN) Funded by NSF's Advancing Digitization of Biodiversity Collections (ADBC)

Kenneth M. Cameron, Principal Investigator
Wisconsin State Herbarium, Department of Botany, University of Wisconsin – Madison
Email: kmcameron@wisc.edu

GREAT LAKES INVASIVES NETWORK





PROJECT OVERVIEW

One of the greatest threats to the health of North America's Great Lakes is invasion by exotic species, several of which already have had catastrophic impacts on property values, the fisheries, shipping, and tourism industries, and continue to threaten the survival of native species and wetland ecosystems. Additional species have been placed on watchlists because of their potential to become aquatic invasives. We have established a network of herbaria and zoology museums from among the Great Lakes states of MN, WI, IL, IN, MI, OH, and NY to better document the occurrence of these species in space and time by imaging and providing online access to the information on the specimens of the critical organisms. Several initiatives are already in place to alert citizens to the dangers of spreading aquatic invasives among our nation's waterways, but this project is developing complementary scientific and educational tools for scientists, students, wildlife officers, teachers, and the public who have had little access to images or data derived directly from preserved specimens collected over the past three centuries. This bi-national Thematic Collections Network of >25 institutions from eight states and Canada is presently digitizing >1.5 million historical specimens representing 2,550 species of exotic fish, clams, snails, mussels, algae, plants, and their look-alikes documented to occur in the Great Lakes Basin. To date, >800,000 voucher specimen records have been databased. As they become available, data will continue to be uploaded to the Great Lakes Invasives Symbiota portal (GreatLakesInvasvies.org) and ingested by the (iDigBio.org) national collections' resource.

PRIMARY OBJECTIVES

(1) To digitize ca. 1.5 million specimens from 2,550 species in 101 genera
(2) To harvest & organize significant data associated with collections
(3) To share specimen images and data with the greater scientific community
(4) To promote cross-collection efforts in the study of aquatic/invasive species
(5) To promote the use of collections data by educators and the public

TARGET TAXA

PLANTS		PLANTS (continued)		FISH (continued)	
Genus (2147)	Family	Genus (2147)	Family	Genus (290)	Family
Agrostis (36)	Poaceae	*Potamogeton (63)*	Potamogetonaceae	*Morone (4)*	Moronidae
Alnus (14)	Betulaceae	*Puccinellia (31)*	Poaceae	*Neogobius (1)*	Gobiidae
Alopecurus (16)	Poaceae	*Rorippa (28)*	Brassicaceae	*Notropis (91)*	Cyprinidae
Butomus (1)	Butomaceae	*Rumex (55)*	Polygonaceae	*Noturus (29)*	Ictaluridae
Cabomba (4)	Cabombaceae	*Salix (170)*	Salicaceae	*Oncorhynchus (11)*	Salmonidae
Carex (593)	Cyperaceae	*Solanum (104)*	Solanaceae	*Osmerus (1)*	Osmeridae
Chenopodium (51)	Chenopodiaceae	*Solidago (77)*	Asteraceae	*Perca (1)*	Percidae
Cirsium (95)	Asteraceae	*Sparganium (10)*	Sparganiaceae	*Perccottus (1)*	Odontobutidae
Conium (1)	Apiaceae	*Trapa (2)*	Trapaceae	*Petromyzon (1)*	Petromyzontidae
Echinochloa (20)	Poaceae	*Typha (4)*	Typhaceae	*Phenacobius (5)*	Cyprinidae
Egeria (1)	Hydrocharitaceae	*Veronica (34)*	Scrophulariaceae	*Phoxinus (6)*	Cyprinidae
Elchhornia (4)	Pontederiaceae			*Proterorhinus (1)*	Gobiidae
Epilobium (45)	Onagraceae			*Rutilus (1)*	Cyprinidae
Frangula (8)	Rhamnaceae	FISH		*Salmo (2)*	Salmonidae
Glyceria (18)	Poaceae	Genus (290)	Family	*Scardinius (1)*	Cyprinidae
Hydrilla (1)	Hydrocharitaceae	*Alburnus (1)*	Cyprinidae		
Hydrocharis (1)	Hydrocharitaceae	*Alosa (6)*	Clupeidae		
Hygrophila (6)	Acanthaceae	*Apeltes (1)*	Gasterosteidae	MOLLUSKS	
Impatiens (11)	Balsaminaceae	*Atherina (1)*	Atherinidae	Genus (113)	Family
Iris (52)	Iridaceae	*Babka (1)*	Gobiidae	*Bithynia (1)*	Bithyniidae
Juncus (123)	Juncaceae	*Benthophilus (1)*	Gobiidae	*Cipangopaludina (2)*	Viviparidae
Lupinus (165)	Fabaceae	*Carassius (1)*	Cyprinidae	*Corbicula (1)*	Corbiculidae
Lycopus (10)	Lamiaceae	*Channa (2)*	Channidae	*Dreissena (2)*	Dreissenidae
Lysimachia (42)	Primulaceae	*Clupeonella (1)*	Clupeidae	*Elimia (50)*	Pleuroceridae
Lythrum (13)	Lythraceae	*Cottus (33)*	Cottidae	*Gillia (1)*	Hydrobiidae
Marsilea (12)	Marsileaceae	*Ctenopharyngodon (1)*	Cyprinidae	*Lasmigona (9)*	Unionidae
Mentha (13)	Lamiaceae	*Cyprinella (30)*	Cyprinidae	*Monodacna(1)*	Cardiidae
Myosotis (12)	Boraginaceae	*Cyprinus (1)*	Cyprinidae	*Pisidium (13)*	Sphaeriidae
Myosoton (1)	Caryophyllaceae	*Enneacanthus (3)*	Centrarchidae	*Potamopyrgus (1)*	Hydrobiidae
Myriophyllum (14)	Haloragaceae	*Esox (4)*	Esocidae	*Radix (1)*	Lymnaeidae
Najas (8)	Najadaceae	*Gambusia (24)*	Poeciliidae	*Sphaerium (20)*	Pisidiidae
Nasturtium (5)	Brassicaceae	*Gymnocephalus (1)*	Percidae	*Valvata (8)*	Valvatidae
Nitellopsis (3)	Characeae (algae)	*Hypophthalmichthys (2)*	Cyprinidae	*Viviparus (3)*	Viviparidae
Nymphoides (7)	Menyanthaceae	*Knipowitschia (1)*	Gobiidae		
Pistia (1)	Araceae	*Lepisosteus (4)*	Lepisosteidae		
Pluchea (11)	Asteraceae	*Lepomis (13)*	Centrarchidae		
Poa (96)	Poaceae*	*Leuciscus (1)*	Cyprinidae		
Polygonum (80)	Polygonaceae	*Misgurnus (1)*	Cobitidae		

Genera (and their corresponding family) targeted by this effort. Lists were generated by querying NOAA's GLANSIS database http://www.glerl.noaa.gov. Genera with species not yet in the Great Lakes Basin, but on the 'Watchlist' are in blue. Our TCN targets ca. 2,550 species in 101 genera (parantheses are numbers of North American species within each genus).

PROGRESS TO DATE

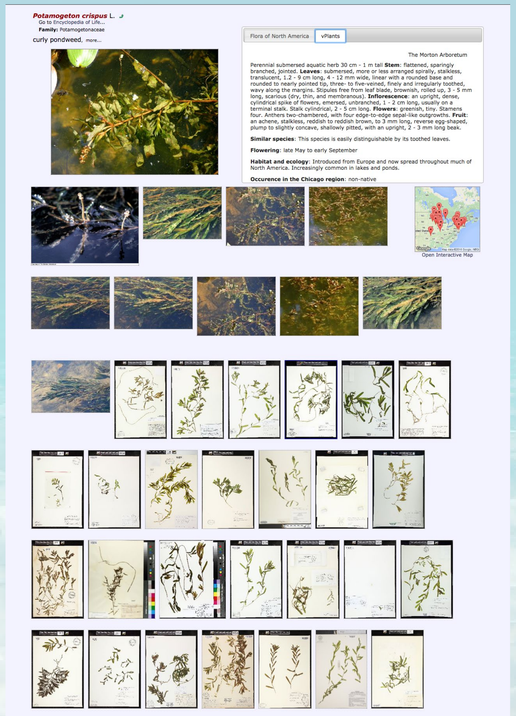
Plant Collections	Specimens	Imaged
Central Michigan University	3742	3711
Eastern Michigan University Herbarium	1625	1502
Field Museum of Natural History	62462	53497
Friesner Herbarium, Butler University	2321	2183
Grand Valley State University	4336	4277
Illinois Natural History Survey	48010	20124
University of Illinois Herbarium	9379	9306
J. F. Bell Museum – Univ of Minnesota	84191	39299
Michigan State University	18172	18063
Morton Aboretum	15905	13704
New York Botanical Garden	147009	141829
Ohio State University Herbarium	394	394
University of Michigan Herbarium	75829	67808
University of Wisconsin-LaCrosse	4449	3412
University of Wisconsin-Milwaukee	7326	7297
Miami University	17721	17685
Wisconsin State Herbarium at UW-Madison	93662	91175
Canadensys Network - Canada	122,816	14,278
TOTAL	**581,354**	**367,178**

Fish Collections	Specimens	Imaged
Field Museum of Natural History - Fish	4855	1497
Illinois Natural History Survey – Fish	29371	3663
J. F. Bell Museum of Natural History – Univ of MN	10685	3298
Ohio State University Museum of Biological Diversity	9120	9084
University of Michigan Museum of Zoology	34434	48
University of Wisconsin-Madison Zoological Museum	4431	2658
Total	**92,896**	**20,248**

Mollusk Collections	Specimens	Imaged
Field Museum of Natural History - Mollusks	6438	0
Illinois Natural History Survey - Mollusks	5716	0
Ohio State University Museum of Biological Diversity	2376	2350
University of Michigan Museum of Zoology	22351	414
University of Wisconsin-Madison Zoological Museum	531	137
Total	**37,412**	**2,901**

The collaborative effort is entering its third year of digitization. In addition to being databased and photographed, each digitized specimen will be georeferenced.

SPECIES PAGES



Users who visit the Great Lakes Invasives portal can search the database for specimen records, map all occurences, read desciptions, download spreadsheets, and/or view color images of historical museum specimens as well as photographs taken in the field.

COLLABORATING INSTITUTONS

LLINOIS
Field Museum of Natural History
Morton Arboretum
University of Illinois, Champaign-Urbana

INDIANA
Butler University
University of Notre Dame

MICHIGAN
Central Michigan University
Michigan State University
University of Michigan
Michigan Small Herbaria Initiative

MINNESOTA
University of Minnesota

NEW YORK
New York Botanical Garden
New York State Museum

OHIO
Miami University
Ohio State University
Ohio University

WISCONSIN
University of Wisconsin-LaCrosse
University of Wisconsin-Milwaukee
University of Wisconsin-Madison
University of Wisconsin-Steven's Point

CANADA
Université de Montréal Biodiversity Centre

http://greatlakesinvasives.org