OHIO STATE UNIVERSITY EXTENSION

Your Pond Update

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Autumn 2018- Aquatic Invasive Species and Your Pond/Lake

A couple weeks ago, I picked up a supply of the second print run of a new book for which I was a co-editor (Figure 1). The book, the Ohio Field Guide to Aquatic Invasive Species (Gabriel et al. 2018), is intended to be distributed free of charge to any Ohioans who spend time on/near water and might make use of it. This started my mental wheels a-turnin'. Thus…

Invasive Species Defined

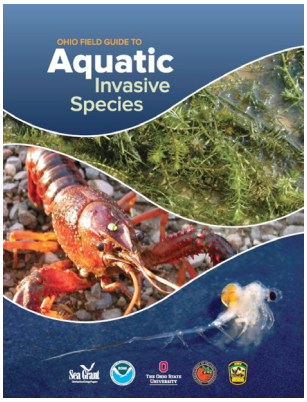

Figure 1. Ohio Field Guide to Aquatic Invasive Species (Gabriel et al. 2018).

A Regulatory Definition: Given my line of work, I tend to be specific in my use of technical terms. Regarding "invasive species," I default to the regulatory definition created by U.S. Executive Order 13112 (1999) and later refined by Executive Order 13751 (2016): an invasive species is "a non-native organism whose introduction causes or is likely to cause economic or environmental harm, or harm to human, animal, or plant health." Note that there are two important components to this definition: (1) that the species in question is not native to the place where it's considered invasive and (2) that the population does something that's considered damaging to human interests or values. "Invasive" is thus automatically a human judgement call; invasive species are any non-native species that happen to do something that we as a human society do not like. Perhaps obviously, *aquatic* invasive species (AIS) are those that depend upon the presence of surface water.

What about native organisms that can come to nuisance populations, like the common cyanobacteria that cause harmful algal blooms (e.g., *Microcystis* spp.)? Nuisances, yes, but not invasive. No native organism is ever considered invasive in applying the regulatory definition above.

What about organisms that are not native to the state but are not generally considered to be harmful to the environment or to human interests? For example, the Division of Wildlife stocks brown trout (*Salmo trutta*) to some of Ohio's few inland coldwater streams. Those fish aren't ever likely to be able to reproduce and create a self-sustaining population in Ohio. They also separate pretty well by niche from native stream residents without having too detrimental an effect on their prey populations. And they are deliberately stocked to create more diverse (and valuable) fishing opportunities for Ohio anglers. Without a convincing argument that brown trout are somehow damaging to human interests/values—even though brown trout are not native to Ohio—they are not considered invasive.

Alternative Ecological Definitions: Be aware that some professionals will use different ecological definitions of "invasive." For example, narrowing the definition, some only use "invasive" for organisms newly encroaching into (and potentially newly damaging) a landscape; i.e., only populations in the current act of invasion would be considered invasive. Once the population is established and comes to equilibrium with its non-native environment (i.e., once that population is *naturalized*), it would no longer qualify; e.g., common carp (*Cyprinus carpio*), established in North America since the late 19th century, would no longer be considered invasive using such a definition. The concept has ecological utility. However, if you can argue that the presence of common carp is in any way damaging to human interests in an ecological system (destroying aquatic vegetation, disturbing sediment to induce muddy water where clear water would better serve some function, etc.—by impairing habitat function for native organisms of some value), common carp do indeed qualify

as invasive by the regulatory definition I've provided above. I thus ordinarily fall on the "common carp remain invasive to North America" side of that debate.

Some professionals also broaden the definition of invasive to include any species—native species included—exhibiting a sudden, explosive population growth to the detriment of other species. While this concept again has ecological utility, it is also excluded from the regulatory definition above. I thus ordinarily fall on the "*Micorcystis* spp. are not invasive to Ohio" side of that debate.

A (Very) Brief Roster of Commonly Encountered Invasives in Ohio Ponds and Small Lakes

But before getting to discussion of a few common pond denizens, a couple relevant electronic resources of which I make frequent use are the U.S. Geological Survey's Nonindigenous Aquatic Species (NAS: https://nas.er.usgs.gov/) and the National Oceanic and Atmospheric Administration's Great Lakes Aquatic Nuisance Species Information System (https://www.glerl.noaa.gov/glansis/) databases. Each provides a tremendous amount of information regarding any AIS they address, including fact sheets of characteristics and range maps of reported sightings. You can report AIS sightings directly to the NAS database (https://nas.er.usgs.gov/SightingReport.aspx). You can also report AIS sightings from the field via the Great Lakes Early Detection Network (GLEDN) regional smart-phone app that I help manage/moderate (http://go.osu.edu/GLEDN); GLEDN reports are incorporated into the Early Detection and Distribution Mapping System for invasive species database (https://www.eddmaps.org/). In all cases, it helps to include location information and detailed, close-up photographs with a report. The GLEDN app will default to your phone's location when submitting.

Figure 2. Narrowleaf cattail (Gabriel et al. 2018).

Emergent Plants: Let's start on shore, considering first emergent plants and later moving out into deeper water. Easily, the most common invasive plants I encounter along pond shorelines are narrowleaf (*Typha angustifolia;* Figure 2) and hybrid (*T. x glauca*) cattails. Cattails—including the native broadleaf (*T. latifolia*)—all function pretty similarly in the shoreline environment. As aggressive colonizers, they are usually deliberately eradicated from small ponds that don't necessarily have the diversity of habitat to limit cattail spread naturally. Lake sites with more diverse habitat types may benefit from tolerating the presence of some limited cattail stands (especially the native), but they shouldn't be tolerated near earthen dams where cattails may attract burrowing muskrats (*Ondatra zibethicus*).

Ordinarily, cattails are best managed by the application of an appropriate systemic herbicide (especially glyphosate) with surfactant later in the summer (after the inflorescences—i.e., the eponymous cat's-tail-like brown flower spikes—are fully developed, but not yet gone to seed). Still, cattails are tenacious, and repeat treatments are often needed. Excavation or burning may be needed to bring really bad infestations in check. See Sojda and Solberg (1993) and Lynch (2002) for useful detail.

Lake sites and some ponds are commonly invaded by common reed (*Phragmites australis*), a tall emergent grass, often simply referred to by its Latin genus *Phragmites* or colloquially as "phrag" (Figure 3). *Phragmites* is tenacious and again will likely require repeat treatments and persistence to control. Well-timed applications of glyphosate can be effective. Imazapyr is even more effective on tenacious grasses, but its application comes with more severe restrictions.

Figure 3. Phragmites or common reed (Gabriel et al. 2018).

Submersed Plants: Moving out from shore and into our pond's deeper water, curly-leaf pondweed (*Potamogeton crispus*) is the submersed invasive plant I most commonly encounter in Ohio ponds (Figure 4). It can be differentiated from our native pondweeds in that curly-leaf has narrow and wavy leaves with very fine teeth along the margin (leaves are relatively broad in our native species with wavy leaves, and none of our natives feature toothed leaf margins). It can be difficult to target curly-leaf pondweed for treatment if it is interspersed with native pondweeds that you'd like to maintain because no herbicides are particularly selective among pondweed species.

Eurasian watermilfoil (*Myriophyllum spicatum*) is a super-common invasive to Ohio's small lakes and, perhaps a little less often, to ponds (Figure 5). Its leaves occur in whorls of (almost always) four around its stem and are deeply, pinnately divided causing the leaves to resemble feathers. There are usually 12 or more pairs of pinnae (leaflets) along the leaf. (Our native watermilfoils are rare and have leaves with fewer than 12 pairs.)

Brittle naiad (*Najas minor*) can be difficult to differentiate from Ohio's few common native naiad species (Figure 6). Naiads can be differentiated from pondweeds in general in having fine teeth along leaf margins, generally opposite branching of leaves (pondweeds will have mostly alternately branched leaves), and naiads often look bushier than pondweeds.

Figure 4. Curly-leaf pondweed (Tom Hilliard 2017; inset: Gabriel et al. 2018).

Figure 5. Eurasian watermilfoil (Gabriel et al. 2018).

Figure 6. Brittle naiad (Gabriel et al. 2018).

The submersed species I've discussed are most commonly controlled with targeted spot treatments of endothall (especially dipotassium salts of endothall as the formulation less toxic to fish) or whole-water treatments of fluridone. Spot treatments of diquat dibromide can be effective on naiads and watermilfoils, but less so on pondweeds. For detail, see Lynch (2009a). There is also a brand new herbicide approved for aquatic applications, florpyrauxifen-benzyl, that is highly selective for watermilfoils, leaving many other submersed plants (like native pondweeds) largely unharmed. Sterilized (i.e., triploid) grass carp/white amur (*Ctenopharyngodon idella*) can be effective in grazing on any of the submersed plant species discussed here; however, grass carp have somewhat lower preference for watermilfoils (Lynch 2009b). For more information on managing plants in ponds, see Braig (2017). I'm also working to update that fact sheet (Lynch 2009a) as I type this seasonal newsletter to you, so watch for the update to materialize in the next few months.

A General Word to Herbicide Applications: Regarding the control measures discussed above, of course, only consider herbicides specifically labeled for aquatic applications for use on targets in or near the water. Do not use a product intended for terrestrial applications even if it uses the same active ingredient as a different aquatic-approved product; the other ingredients (the adjuvants) are different and could be harmful to aquatic life or human use of the water. Always follow label instructions. Give special attention to water-use restrictions on product labels. Hire a licensed applicator for common/shared property or if you are personally uncomfortable/unable to comply with label requirements.

Fishes: Finally, out there freely swimming our open waters, the only invasive fish I'll mention as the scourge of pond, small-lake, and wetland management is common carp (Figure 7). Notorious, big, bottom-feeding (i.e., benthivorous) fish, ubiquitous in their invasion of U.S. waters, their aggressive and messily indiscriminate springtime spawning activity can destroy aquatic vegetation and leave ponds muddy, preventing the penetration of sunlight so vegetation isn't likely to return (at least to small ponds and deepwater marshes over silty substrates). The resultant muddy water can also reduce the ability of predatory pond fish to sight feed, ruining growth rates (and, ultimately, size) of both largemouth bass (*Micropterus salmoides*) and bluegills (*Lepomis macrochirus*).

Your best bet for dealing with carp is preventing their invasion to begin with. Maintain divides between ponds and natural streams; reduce the likelihood of flooding to ponds wherever possible. If a small pond is hopelessly lost to large carp, all fish can be killed with a toxicant (specifically, rotenone: only licensed pesticide applicators may apply rotenone) and the fishery begun anew by restocking desirable fishes. Removing carp from larger and larger lake sites—often with connections to streams and other refuge—is rarely practical.

Figure 7. A common carp captured near Ohio State University's Stone Laboratory on Lake Erie (Eugene Braig 2013).

AIS Identification Assistance

These and many more species are described in the new field guide I'd mentioned, the inspiration for this entire article, the Ohio Field Guide to Aquatic Invasive Species (Figure 1). Electronic copy is available for download from obvious links on these pages: http://ohiodnr.gov/ais, https://ohioseagrant.osu.edu/products/4j7wz/ohio-field-guide-to-ais, or https://senr.osu.edu/extensionoutreach/ponds-fisheries-aquatics/aquatic-invasive-species-committee. Limited hard copies are available from the Ohio Division of Wildlife (http://wildlife.ohiodnr.gov/about-contacts/contact-information), Ohio Sea Grant at the Ottawa County Extension office (https://ottawa.osu.edu/home), or from me...if you happen to ask me politely when we cross paths while I'm programming around the state. I'm eager to share. Cheers!

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