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Using Grass Carp to Control Aquatic Plants

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Aquatic plants are an essential component of a well-functioning aquatic ecosystem, but often reach levels of abundance that some pond owners consider excessive. In these situations, they look for methods to control the problem plant species. One commonly used technique is to stock grass carp (also known as white amur), a non-native, plant-eating fish that will reduce the abundances of some aquatic plants. However, grass carp are not the “silver bullet” in terms of aquatic plant management given their preferences for specific types of plants that can limit their usefulness. The species can be an important tool, but the pond owner needs to consider the grass carp’s plant preferences, what plant species are causing problems, and his or her management goals for the pond before making a decision about whether to stock them.

Legal Concerns

In Ohio, it is only legal to sell or stock triploid grass carp because triploidy in fish results in their sterility. Stocking diploid grass carp could result in successful reproduction and their escape from a pond or lake could result in ecological damage to natural aquatic plant communities in adjacent areas. Triploid fish have three sets of chromosomes whereas a normal grass carp has two sets of chromosomes. Triploid grass carp are produced in hatcheries by shocking eggs (temperature or pressure) just after fertilization. Each fish is tested to ensure triploidy prior to its sale.

Regulations governing grass carp vary from state to state so non-Ohio readers must consult their state’s appropriate regulatory agency prior to stocking grass carp. There are states that do not allow stocking of grass carp, others that require the pond owner to buy them from the regulatory agency, and there are states that allow stocking of either diploid or triploid grass carp.

Grass Carp Biology

Grass carp are plant eaters native to large rivers of eastern Asia. They are a member of the minnow family, a family of fishes found throughout much of the world including the United States. Grass carp were first introduced into the United States in 1963 as a method of controlling aquatic plants since there are no large North American fish species that are primarily plant eaters. Grass carp grow quickly in waters containing large amounts of preferred plant species, often attaining weights of 10–12 pounds in 2–3 years. While triploid grass carp generally live about 10–12 years, some do live to 25 years and attain weights up to 30–35 pounds.

Plant consumption can approach 100% of their body weight per day when water temperatures are between 70°F and 86°F. Consumption declines as waters cool below 70°F and grass carp eat only small amounts of plants below 50°F. Body size also affects consumption rates as fish larger than 10 pounds generally only eat 20–30% of their body weight, even during periods of optimal temperatures.

Plant Preferences

Like all animals, aquatic or terrestrial, grass carp have food preferences. Generally, control by grass carp will occur for only those plants that grass carp prefer. The pond owner should be hesitant to use grass carp for controlling plants that are not highly preferred. While grass carp may consume less preferred plants, they do so only after preferred plants are gone and then only consume small amounts of the less preferred plants. Table 1 provides a summary of common Ohio aquatic plants and whether grass carp prefer them and can be expected to control them.

When to Stock—Stocking Rates

When to Stock: Stocking of any fish species should be done under conditions that minimize stress to the fish. Stress is a leading cause of disease in fish and can cause significant mortality. Stressors include handling,

transport, and sudden exposure to a change in water temperature. The stress associated with these stressors is enhanced in warmer water, so it is recommended that stocking occur when water temperatures are less than 65°F. In Ohio, the best months for stocking fish, including grass carp, are April and most of May or October and November. No matter when grass carp are stocked, every effort should be made to minimize the difference in water temperature between the hauling tank or transport bags and the receiving pond water. As a rule-of-thumb, the difference should not exceed 5°F, preferably less. This may require slow additions of pond water to the hauling tank. If oxygenated plastic transport bags are used, floating the bags in the pond or lake for several hours is an easy way to equilibrate the temperatures.

Stocking Rates: Many factors can influence recommended stocking rates, including preference by grass

Table 1. Common Ohio aquatic plants that can pose problems for pond and small lake owners.

Plants are grouped by preference as food and the potential for grass carp to control them. Other aquatic plants can be found in Ohio, but preference by grass carp is not known. The letter “S” refers to submerged plant species, “E” refers to emergent species, “F” refers to floating or floating-leaved species, and “A” means the plant is an algae.

High Preference—Control Likely		Weak Preference—Little or No Control	
Bladderwort (<i>Utricularia vulgaris</i>)	S	American lotus (<i>Nelumbo lutea</i>)	F
Curly-leaf pondweed (<i>Potamogeton crispus</i>)	S	Arrowheads (<i>Sagittaria</i> spp.)	E
Elodea (<i>Elodea Canadensis</i>)	S	Bulrushes (<i>Schoenoplectus & Scirpus</i> spp.)	E
Flatstem pondweed (<i>P. zosteriformis</i>)	S	Cattails (<i>Typha</i> spp.)	E
Leafy pondweed (<i>P. foliosus</i>)	S	Eelgrass (<i>Vallisneria americana</i>)	S
Muskgrasses (<i>Chara</i> spp.)	A	Filamentous algae (many species)	A
Sago pondweed (<i>Stuckenia pectinata</i>)	S	White water lily (<i>Nymphaea odorata</i>)	F
Small pondweed (<i>P. pusillus</i>)	S	Rushes (<i>Juncus</i> spp.)	E
Southern naiad (<i>Najas guadalupensis</i>)	S	Smartweeds (<i>Polygonum</i> spp.)	E
Slender naiad (<i>N. minor</i>)	S	Spikerushes (<i>Eleocharis</i> spp.)	E
Stoneworts (<i>Nitella</i> spp.)	A	Watermeals (<i>Woliffia</i> spp.)	F
Watercress (<i>Nasturtium officianale</i>)	S	Yellow pond-lily (<i>Nuphar lutea</i>)	F
Water stargrass (<i>Heteranthera dubia</i>)	S		
Moderate Preference—Partial Control		<p>Table 1 illustrates clearly that grass carp prefer submerged plants and the two algae (<i>Chara</i> and <i>Nitella</i>) that closely resemble submerged plants. Conversely, grass carp do not prefer emergent plants and most importantly, the various species of filamentous algae. Filamentous algae are the most prominent aquatic plant problem in Ohio ponds and small lakes.</p>	
Coontail (<i>Ceratophyllum demersum</i>)	S		
Duckweeds (<i>Lemna & Spirodela</i> spp.)	F		
Northern watermilfoil (<i>Myriophyllum sibiricum</i>)	S		
Eurasian watermilfoil (<i>M. spicatum</i>)	S		
Long-leaf pondweed (<i>P. nodosus</i>)	F		
Large-leaf pondweed (<i>P. amplifolius</i>)	S		

carp for the plant species of concern, severity of the problem, length of growing season, and size of the water body. These factors are why recommended stocking rates vary so much across the United States. In Ohio ponds and small lakes (< 5 acres), recommended stocking rates are 8–10 per acre if the water body is covered 60% or more with preferred plant species, 6–8 per acre if coverage is 40–60%, 4–6 per acre if coverage is 20–40%, and 2–3 per acre for any coverage less than 20%. In ponds where the problem plants are moderately preferred by grass carp, increasing the stocking rate by 50% might be required to control the plants to a desired coverage level. Although grass carp may occasionally eat plants that are weakly preferred, they generally do not provide control of those plants and should not be stocked into ponds and lakes where the only problem is a plant that grass carp prefer not to eat.

Potential Concerns

Habitat Impacts: The importance of aquatic plants to the pond and lake owner is largely dependent on their goals. Owners who manage for swimming, irrigation sources, and even aesthetics often prefer not to have aquatic plants and manage to reduce or eliminate them. Grass carp stockings are compatible with those goals. Owners who are managing for fish and wildlife resources as well as those pond owners who desire a natural aquatic community should be cautious about stocking grass carp. Their ability to eat and control many aquatic plant species changes the structure and function of the aquatic ecosystem. An absence of submerged aquatic plants changes the predator-prey interactions—not only between different fish species but also between fish species and the rest of their food web. Many migratory waterfowl and shorebirds rely on submerged plants to provide food, either the plants themselves or the myriads of invertebrates that inhabit the plants. Grass carp have the potential to significantly alter a water body's habitat, both in terms of quantity and quality.

Those pond and lake owners who desire quality fishing should also be cautious about stocking grass carp. Typical pond fish species, such as largemouth bass and bluegills, did not evolve in structureless water bodies. Research has demonstrated that pond and small-lake fish communities function best when submerged plants provide 5–20% coverage. Lower percentages favor establishment of quality panfish fisheries and 15–20% coverage is recommended for

balanced fish communities. Any amount over 20% begins to impede largemouth bass predation success and can cause panfish stunting. While it is theoretically possible that grass carp stocking rates could be adjusted to provide for some desirable level of submerged plants, fisheries managers have come to realize that does not occur in practice. Many managers now consider grass carp not to be an option when trying to maintain desirable levels of submerged plants.

Impacts on Other Fish Species: Grass carp are not egg and fry predators of other fish species. In ponds and lakes devoid of aquatic plants, grass carp will begin to sift through organic sediments and may on a rare occasion disrupt incubating eggs of other species. Submerged aquatic plants do provide critical nursery areas for fry and small fish, and grass carp can impact their survival by eliminating or reducing the amount of suitable nursery habitat.

New Ponds: Newly constructed ponds typically do not develop diverse aquatic plant communities for several years and many may not develop plant abundances considered problematic by the owner based on his or her goals. Grass carp should not be stocked into new ponds until plant abundance exceeds the owner's tolerance and the owner can document that the problem plant species are those likely to be controlled by grass carp.

When to Expect Results: Grass carp are stocked at a relatively small size of 8–12 inches. While this size eats continuously, the overall amount eaten by these fish is substantially less than that eaten by larger grass carp. The pond owner must exercise patience, allowing 3–4 years before determining if control is occurring.

Supplemental Stockings: A pond owner may wish to stock additional grass carp 3–4 years after the initial stocking if plant control is less than desired. Supplemental stockings may also be needed if deaths are evident or a high water event allows grass carp to leave the pond. Grass carp are attracted to moving water and will leave through overflow devices and emergency spillways. A grate should be installed over overflow pipes in ponds and lakes stocked with grass carp. Keep in mind that these grates can collect debris and therefore should be checked regularly to ensure proper water discharge. Common sources of mortality are winter and summer low-oxygen events and fish-eating birds (herons, egrets). Occasionally, poor water quality in a pond or lake can cause stress and lead to

disease problems. As mentioned previously, stress associated with stocking during warm weather can also cause significant mortality.

Supplemental stocking will eventually be needed in water bodies where grass carp survive into old age. Normal mortality will decrease numbers of grass carp present and plant control begins to be less evident. A pond or lake owner should consider replacing natural mortality losses about 6 years after the initial stocking. Stocking rate should be one-quarter of the original number stocked and repeated every 3–4 years.

Algal Blooms: Ponds and lakes that have high abundances of submerged plants can experience planktonic or filamentous algae blooms if those plants become substantially reduced or eliminated. Those submerged plants store nutrients long-term, reducing their availability to non-rooted algae species. Grass carp can increase the amount of nutrients available to algae by not only eliminating the long-term storage of those nutrients in plants but also by releasing the nutrients into the water via excrement. Grass carp do not increase the overall amount of nutrients in the water body, but can elevate their concentration in the water column and increase availability to potentially problematic algae species. The likelihood of an algae bloom increases if the pre-stocking level of submerged plants was high and the amount of submerged plants controlled was correspondingly high.

Swimming: Although grass carp can grow to large sizes and appear intimidating to swimmers, they pose no risk and will move away from human activities. Indeed, ponds and lakes used regularly for swimming

can continue to have plant problems in areas used by swimmers because grass carp will avoid those areas, even after swimmers leave.

Removal: Pond and lake owners who experience negative impacts associated with grass carp may wish to remove them to alleviate damage to fish and wildlife habitat or if an unwanted algae bloom can be attributed to them. Removing grass carp is not an easy task. They will jump over a seine and are not easily caught with fishing gear. One good method to remove them is using bow-fishing equipment on still, summer days when they often swim just under the surface.

Summary

Triploid grass carp can be a useful tool in managing nuisance aquatic plants in ponds and small lakes but the pond owner must realize there are caveats to their use. These include grass carp's preference for certain plant species, their compatibility with the owner's management goals, and their potential to alter fish and wildlife habitat. The owner must be patient as control can take several years to be realized and also be willing to occasionally stock more small grass carp to replace losses that may occur over time. Successful management of aquatic plants is easiest to achieve when an integrated approach is used with grass carp being one of the tools. Other tools include nutrient management, possible use of pond dyes, aeration, and the wise use of aquatic herbicides and algaecides to manage aquatic plants and algae that grass carp will not consume. OSU Extension fact sheets on these alternative methods can be found online at <http://ohioline.osu.edu>.

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