Delaware Division of Fish and Wildlife

Policy on the Use of Grass Carp for Aquatic Weed Control

Background

An over-abundance of aquatic vegetation has become a serious problem in Delaware's ponds. Most public ponds have been classified as highly eutrophic (high levels of nitrates and phosphates) indicating that aquatic vegetation abundance will be a long-term problem (Ritter 1981). Owners of private ponds have also reported problems with aquatic vegetation and advice on weed and algae control has become the most common request for technical assistance.

Three types of aquatic vegetation control are available to the pond owner: physical, chemical, and biological. Each method has both advantages and disadvantages that must be evaluated prior to selecting the most appropriate method for controlling aquatic vegetation in any pond. Mechanical or physical removal of plants from a pond has the advantage of removing nutrients bound in the plant material. However, it can be physically demanding to hand-pull or skim plant material from the surface and this method is only practical in small ponds. The Division has two large aquatic vegetation harvesters used in the public ponds, but they are relatively slow and more effective on floating mats of filamentous algae. A water level drawdown during the winter or partial draining of a pond to freeze and dry out plant material is a useful form of control for some species. However, these methods can be labor intensive, slow to achieve control, and often do not permanently remove the plant or algae species. The use of herbicides or algaecides is generally the quickest way to control aquatic vegetation, but there are limited products on the market and each product controls only specific aquatic vegetation. Herbicide/algaecide treatments are often short-term, expensive, and can limit other uses of a pond such as irrigation, livestock watering, or swimming.

Biological controls have some advantages over the use of other methods: longevity of the method once it has become established, constant cropping of the target vegetation, minimal impact on non-target organisms, and lower cost. The development of the triploid Grass Carp *Ctenopharyngodon idella*, a functionally sterile form of a vegetation-eating fish, encouraged many states to allow use of this species for aquatic vegetation control. However, this method also has some disadvantages. The species has preferred food items, control often takes 18 months or more after stocking and removal of plant species can adversely affect the habitat of typical pond fishes such as Bluegill and Largemouth Bass. Occasionally removal of the target plant species results in a shift in the plant community to algae or a rooted aquatic plant that Grass Carp will not eat. Therefore, this vegetation-eating fish is just one tool for vegetation control that can be useful in certain ponds.

The Division has allowed possession of Grass Carp for aquatic vegetation control since a permitting procedure was established in January 1990. Permits have been granted to pond owners whose ponds meet specific criteria developed by the Division following a review of scientific research and an evaluation of the species in Delaware waters. Permits have been and will continue to be granted only for triploid (functionally sterile) Grass Carp, certified as such by the U.S. Fish and Wildlife Service or by another agency approved by the Division.

Policy Guidelines

Permits for the possession of triploid Grass Carp will be granted to private pond owners whose ponds meet all of the following criteria:

1. The target aquatic plant is abundant over at least 40% of the pond's area and the target plant species has been documented as being consumed by Grass Carp (Table 1).

2. The pond is not a stormwater management basin. Stormwater basins are designed to hold water following storm events and improve water quality prior to release into a waterway. Triploid Grass Carp will not be allowed in any stormwater management basins as their presence may adversely affect the designated function of these water control features. In the event that vegetation causes problems within these basins, the owner(s) of the basin should work with personnel from DNREC's Sediment and Stormwater Section (302-855-1955; DNREC.Stormwater@state.de.us).

3. The emigration of Grass Carp from the pond can be prevented by acceptable physical barriers (openings no larger than one inch) which are in place prior to stocking. Any barrier required as part of a permit to possess Grass Carp must be regularly maintained to prevent the build-up of plant material or other detritus that could endanger the integrity of the structure.

4. For any pond larger than 10 surface acres, this barrier will have to be a permanent addition to the water control structure with the ability to remain intact during periods of high flow such as a 100-year flood. It must be constructed of materials with a life span of structural integrity of at least three years and openings no larger than one inch. Written permission for the installation of a fish barrier that may impact roads and/or bridges downstream of any pond must be obtained from the Delaware Department of Transportation and included with the application for a Grass Carp permit.

5. Division personnel shall be granted access to the pond, upon request, to evaluate the effectiveness of the Grass Carp stocking.

6. The Division will not permit the stocking of any Grass Carp into any areas known to contain rare, threatened, or endangered plants or animals on Federal or Delaware lists, any designated natural area, or any freshwater marsh or legally defined wetland.

7. As a signatory to the Chesapeake Bay Policy for the introduction of non-indigenous aquatic species, the Delaware Division of Fish & Wildlife modified its Grass Carp policy in October 1995 to address concerns of those groups, including the Maryland Department of Natural Resources, promoting the re-establishment of submerged aquatic vegetation in the Chesapeake Bay. Amendments to the Grass Carp policy include:

    a) There will be a moratorium on the introduction of triploid Grass Carp into systems that drain directly into Chesapeake Bay tributaries.

    b) For ponds that are within the floodplain, but have no direct connection to Chesapeake Bay Drainage streams, a triploidy check of 100% of all Grass Carp stocked will be required.

    c) For New Castle County ponds having a direct connection to Delaware River streams, a 100% triploidy check will be required.

    d) Triploid Grass Carp stocked into Kent and Sussex County ponds within the Delaware River drainage are subject to the standard certification procedures of the U.S. Fish & Wildlife Service (120 fish checked per shipment). New Castle County

ponds having no direct connection to Delaware River streams will also be subject to the standard certification procedure of the USFWS.
e) Any additional charges resulting from the 100% triploidy checks of Grass Carp shall be the responsibility of the permit holder.

8. The stocking rate for triploid Grass Carp is limited to fifteen fish (8 to 11 inch) per surface acre of pond. It is recommended that Grass Carp no smaller than 10 inches be stocked into ponds with established populations of Largemouth Bass and/or Chain Pickerel to limit predation on the stocked fish.

Permitting Procedures

Upon receipt of the original request from a landowner or legal representative, an informational packet will be provided containing the Grass Carp policy, the Grass Carp briefing report, and a permit application. Following return of the signed application signifying agreement with the policy and the desire to proceed with the application process, a site inspection of the pond will be conducted by a Division biologist to determine if the aquatic vegetation species and coverage meet the policy guidelines. The inspection will also determine if any modifications to the water control structure are necessary to prevent the escape of Grass Carp. If the pond meets the above criteria, a permit for a specific number of Grass Carp will be granted and signed by the Director of the Division of Fish and Wildlife, contingent upon the necessary modifications to the water control structure. A follow-up inspection may be required to verify the completion of any alterations prior to ordering, shipment, and stocking of the triploid Grass Carp.

The Division must be notified prior to any shipment of triploid Grass Carp to Delaware by the permittee or vendor. Each permit-holder will be furnished with a list of approved triploid Grass Carp dealers and should contact an approved dealer to determine the shipping date and verify certification of the shipment the USFWS. A copy of the Certificate of Triploidy and the shipping invoice must be forwarded to the Division for inclusion with the permit application file. The Division may seize any shipment of fish not accompanied by a Certificate of Triploidy from the USFWS. The fish dealer shall ship the triploid Grass Carp directly to the buyer according to the arrangement agreed upon between the dealer and the permittee. The Division shall assume no responsibility for guaranteeing live transport and delivery, survival at stocking, or effectiveness of the stocked fish.

Special Considerations with Grass Carp

It is important to remember that aquatic vegetation control with triploid Grass Carp is not guaranteed and may take an extended period of time. If the desired result (vegetation coverage reduced to less than 40%) is not achieved following two growing seasons, a permit for supplemental stocking may be granted by the Division via the same process as for the original stocking or the use of another control method may be recommended. Although some types of floating plants are on the approved list (Table 1), control of these species is generally less successful. Control of algae has also been variable depending on the species involved. Occasionally control of the target aquatic vegetation by Grass Carp allows another plant species, less desirable to Grass Carp, to take over the plant community in the pond (Cassani 1996).

Triploid Grass Carp will live for many years in a pond. However, restocking may be advisable in five to seven years as their feeding efficiency declines with age. Division personnel have learned that once Grass Carp are stocked, they are very difficult to capture. The only totally effective method for removal of Grass Carp is to rotenone (poison) the entire pond and this would require coordination with a certified pesticide applicator. This fact alone necessitates a cautious, well-planned approach to stocking. Observations at several Division research ponds have indicated that

predation on Grass Carp by birds and other predators can be a problem in maintaining adequate numbers of fish to provide vegetation control. Please remember that fish-eating migratory birds such as herons, ospreys, and eagles are protected by Federal and State laws.

Results with Grass Carp have been variable, ranging from no control to total eradication of aquatic vegetation. It is important to realize that total elimination of aquatic vegetation can adversely affect gamefish populations. Therefore, it is the Division's policy to promote aquatic vegetation control practices that achieve a desired level of control short of total eradication. The stocking guidelines herein are based on our current state of knowledge, but may be adjusted as we gain more experience with the use of these herbivorous fish as a form of biological control of nuisance aquatic vegetation.

Literature Reviewed and Cited:

Cassani, J.R., editor. 1996. Managing aquatic vegetation with Grass Carp, A Guide for Water Resources Managers. American Fisheries Society, Bethesda, MD.

Clugston, J.P. and J.V. Shireman. 1987. Triploid Grass Carp for aquatic plant control. U.S. Fish & Wildlife Service Leaflet 8. Washington, D.C.

Martin, C. C. 1996. Evaluation of triploid Grass Carp in Delaware, 1986 – 1995. Annual Report Federal Aid Project F-41-R-7, Delaware's Freshwater Fisheries Management Program. DE Division of Fish & Wildlife, Dover.

Ritter, W.F. 1981. Survey and classification of Delaware's public lakes. University of Delaware for Division of Fish & Wildlife (EPA). Newark, DE.

Wiley, M.J. and R. W. Gorden. 1984. Biological control of aquatic macrophytes by herbivorous carp. Part 1. Executive Summary. Final Report Federal Aid Project F-37-R. Illinois Natural History Survey, Aquatic Biology Technical Report 1984 (10).

Table 1. List of aquatic vegetation* known to be consumed by Grass Carp.

Aquatic Vegetation Type	Common Name	Scientific Name	Comments
Submersed Plant	Coontail	*Ceratophyllum* spp.	
	Pondweeds	*Potamogeton* spp.	
	Naiad	*Najas* spp.	
	Water milfoil	*Myriophyllum* spp.	*not all species*
	Waterweed	*Elodea* spp. or *Egeria densa*	
	Hydrilla	*Hydrilla verticillata*	
	Eelgrass or wild celery	*Vallisneria americana*	
	Widgeon grass	*Ruppia maritima*	
	Liverwort	*Riccia* spp.	
	Coontail	*Ceratophyllum* spp.	
Floating Plant	Duckweed	*Lemna spp.*	limited control
	Watermeal	*Wolffia spp.*	limited control
Algae	Cladophora		
	Pithophora		
	Chara		
	Nitella		
	Rhizoclonium		
	Spirogyra		control results variable

**From: Clugston and Shireman 1987; Wiley and Gorden 1984; Grass carp permit files (Delaware 1990 to 2005)*