Probable Grass Carp Stocking Scenarios

by
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Introduction

Aquatic plant managers are now in a dilemma. Historically, aquatic weed control whether by mechanical, chemical, or physical means has provided only temporary relief from aquatic weed infestations. Classical insect biocontrol is by its nature species specific and has not altered the overall structure of our aquatic ecosystems. In addition, the high cost of chemical and mechanical control has limited the extent to which these control methods are applied.

Consequently, fisheries and wildlife biologists have never been overly fearful of the aquatic plant managers ability to alter aquatic plant habitat on a long-term basis.

Grass Carp

Aquatic weed growth in Florida is more widespread than any other state because of the warm temperate to tropical climate and an abundance of shallow, naturally eutrophic water bodies. Authorities (Federal and State) have been managing water hyacinth since the 1890s and more recently have been faced with widespread expansion of the submersed weed hydrilla (introduced into the State in the 1950s). Hydrilla has become the major problem in Florida because of the high cost of mechanical or chemical control. In the mid-1960s, State agencies introduced and evaluated a *Tilapia* species for possible hydrilla control and by 1969 began to investigate the use of grass carp for control of submersed weeds.

In 1976, a grass carp symposium was held at the University of Florida, and the hope and fears of the participants regarding the use of this fish for weed control were evident.

It was hoped that the grass carp would prefer to feed on hydrilla, dislike and not significantly affect native submersed plants, have a life span of 5 to 10 years, minimally affect water quality, have no adverse effect on sportfish, and be easily removed from aquatic ecosystems.

On the other hand, many feared that the grass carp would reproduce, migrate or move great distances, remove all submersed vegetation, live for 20 to 30 years, create algae blooms and poor water quality, destroy sportfish production, and be impossible to remove from our waterways.

Over the ensuing 18 years, many of these hopes and fears have been addressed and answers attained. All were essentially covered in this symposium and proceedings. In the past two decades, well over 2,000 bodies of water (from 0.1 to 27,000 acres) have been stocked with grass carp in Florida, and research is continuing.

A review of plant populations and surveys of previously stocked lakes (>50 acres) in Florida indicates that in the majority of cases, the stocking of grass carp either totally eliminated submersed species or had no impact on them. Most biologists acknowledge that weed control will occur provided enough grass carp are stocked (and survive) to overcome the growth of the vegetation. The problem arises when the fish are stocked; there is no way known to determine survival 1 hr, 1 month, or 1 year after stocking. The answer to this problem some biologists believe is to stock with low rates of fish (3 to 5/acre?) and gradually increase stocking rates until weed control is achieved.

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Two Possible Scenarios

Given a 5,000-acre landlocked prime sportfishing lake plagued with hydrilla for 10 years. The annual expenditures for hydrilla control with herbicides average \$300,000/year. It is decided to stock the lake next year following herbicide treatment with four grass carp per acre at a cost of \$5/grass carp (5,000 acres × four fish × \$5/fish = \$100,000).

Scenario 1

The herbicide is applied in February and March, and excellent results are attained. The 20,000 grass carp are added in May, and heavy rains bring water levels for the summer up an additional 4 ft. Grass carp survival is near 100 percent, and the high water prevents hydrilla growth in the center 60 percent of the lake. The next year, water levels return to normal, and there are twenty thousand 10-lb grass carp in the lake capable of eating 10 to 15 lb of vegetation per day. Hydrilla tubers germinate and sprout above the hydrosoil and are immediately grazed by roving grass carp. By late summer of this second year post-stocking, hydrilla cannot regrow; it disappears as the grass carp feed on the 50 acres of maidencane in the lake. By the third year, the regrowth potential of hydrilla is further reduced because of less hydrilla tubers surviving (none produced now in 2 years) and the grass carp consume all submersed species and greatly reduce emergent species. After 5 years of nonexistent vegetation in the lake, sportfishing declines and brush piles are added to the lake to bring fish populations back into balance (if possible in a 5,000-acre lake). The lake remains plant free for 20 years, and revegetation is attempted to improve sportfishing, but is unsuccessful because there is a residual of 1/2 to 1 grass carp per acre. Finally, after 25 to 30 years, revegetation is successful, but hydrilla is reintroduced and more grass carp are added and Scenario 1 repeats itself.

Scenario 2

As in Scenario 1, the herbicide is applied in the spring of year 1, grass carp are added at four per acre as before, but because of little hydrilla (cover) in the lake, predation of the fish is heavy (60 percent) and only 1 to 1.5 grass carp/acre survive until year 2. Hydrilla regrowth is rampant by the second summer as low water promotes its growth and the grass carp have no impact on the vegetation. Herbicide treatment is again conducted in the spring of year 3, and an additional five fish to the acre are stocked. Predation is once again high. The herbicide did not work well, and the following summer (year 3), the lake is again covered with hydrilla. Herbicide is applied in the spring of year 4, and ten grass carp/acre are stocked. Water levels rise, the herbicide treatment is very effective, and now we return to Scenario 1, but with 8 to 12 surviving grass carp per acre, not the 4 as stocked in Scenario 1.

Discussion

Under both scenarios, we end up with a lake with very little emergent vegetation, possibly some *Nuphar* survives, and no submersed vegetation for 15-20-25 years. The annual cost of herbicide treatment is saved. If the lake historically supported a \$3 million/year sportfishery, will it continue to after 5-10-15 years with no or little vegetation? Our hopes are that the sportfishing will continue and water quality will not be adversely affected. A pertinent question was covered in Lawson Snyder's talk on grass carp removal from Clear Lake. Why did the residents of Clear Lake want the grass carp removed after 15 years? Will the residents of this hypothetical lake want the grass carp removed after 15 years? Will we be more efficient at removal in 15 years? What is the importance of aquatic vegetation to sportfish production? Wildlife? As with stocking rates of grass carp (no magic number exists for all water bodies), the management objections of large fish and wildlife management lakes are going to have to be well defined. There is no doubt that the grass carp can provide cost-effective weed control, and it is a strong and easy case to make. The question remains, however, that aquatic plant managers can now can provide long-term weed control, but do we know with a reasonable degree of confidence the long-term effects of an ecosystem with no submersed vegetation for 10-15-20 years?