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Garden Tales from Delaware State University

Cleaning pond water with native plants

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DOWNSTATE — Plants are grown for a variety of reasons. Some are used as ornamentals to beautify landscapes, while others are more functional, serving to feed populations of people, to feed animals in their natural habitats and to preserve the environment. Most plants grow on land, but aquatic plants can float in the water like water fern and duckweed, or have submerged roots like water lilies and water hyacinth. These plants can serve a special function for fish and other aquatic organisms.

Aquaculture production facilities could benefit from the filtering properties of such plants. These facilities depend on the quantity and health of the fish being harvested. Facility operators usually increase feed of manufactured foods to accelerate fish growth. However, the fish only retain 30 percent of the phosphorus and 50 to 70 percent of the nitrogen from the feed. The resulting fish waste often leads to eutrophic conditions, or oxygen depletion, in the pond. Most current solutions involve optimizing nutrients in fish diets instead of finding ways to handle the excess amount of nutrients produced by the organisms. Aquatic plants may help in this regard.

At Delaware State University

in the College of Agriculture and Related Sciences, we are using aquatic plants, along with freshwater mussels, in catfish ponds to test how well these organisms remove excess nutrients such as nitrogen and phosphorus from water. The project is being conducted at the Aquaculture Research Facility on the DSU campus.

We have introduced three aquatic plant species to the catfish ponds — Swamp Hibiscus (*Hibiscus moscheutos*), Seashore Mallow (*Kosteletzkya virginica*), and Lizard's Tail (*Saururus cernuus*). These native Delaware plants were chosen because they adapt well to the environment and because they are effective in removing nitrogen and phosphorus through their roots like land plants. These species grow well as they pick up nitrogen and phosphorus through their roots in the soils that are exposed to water.

In the DSU research project, water from the catfish production ponds is supplied to these native aquatic plant species. Incoming and outgoing water from the plants is tested for nitrogen and phosphorus removal. In 12 of the catfish (*Ictalurus punctatus*) ponds, there are also various sizes and numbers of mussels, which are used to compare nutrient removal from those ponds.

Freshwater mussels (*Elliptio complanata*), like other bivalves, are an inexpensive method for removing suspended solids and dissolved nutrients, nitrogen and phosphorus from water. These characteristics make them an ideal candidate for use as a biological filter in aquaculture systems, much like the plants being used. This type of system may not only clear up the ponds, but may also provide additional crops and income for farmers.

This pilot-scale research/demonstration system monitors plant, mussel, and fish growth, water quality, plant nutrient uptake, and operation costs. By the end of the fall season, we should have results on this project, which we will use to develop an economic analysis for aquaculture farmers.

Editor's note: Garden Tales is a weekly column presented by the Claude E. Phillips Herbarium in the Department of Agriculture and Natural Resources at Delaware State University. For more information on this article, or other aquaculture activities at DSU, contact assistant professor/Extension Specialist Dr. Dennis McIntosh at 857-6456 or assistant professor Dr. Gulnihal Ozbay at 857-6476.