

# Hydrilla in the Eno River Watershed

## Summary

Hydrilla is an aggressive submerged aquatic weed that is not native to North America. It can grow and reproduce quickly and its tubers can remain viable for at least 6 years. It has been identified as one of the biggest threats to the natural resources of Eno River State Park and has the potential to negatively impact fish and wildlife communities and recreation. It can grow throughout the entire river reducing fish habitat, out-competing native vegetation and impeding swimming, boating and fishing activities. If Hydrilla is not treated it will spread further downstream into Falls Lake. That will further the negative impact to natural resources and recreation and future costs of treating Hydrilla will increase. A Task Force made up of Federal, State, local government, and citizen representatives has begun an initial 2-year treatment within the Eno River State Park where a very low dose of liquid herbicide is metered into the Eno River from late spring through summer starting 2015. A second year of treatment began in May, 2016.

## What is Hydrilla (*Hydrilla verticillata*)?

- A submersed aquatic weed native to South Asia that is regulated at Federal and State levels. As a prohibited plant, it is illegal to culture, sell, trade, transport, etc.
- An invasive species that is able to grow and reproduce quickly:
  - Reproduces by fragmentation, production of subterranean turions a.k.a. “tubers”, and other turions known as “winter buds”. Hydrilla plants can produce tubers after just 6 weeks of growth. Tubers can remain viable in the sediment for at least 6 years. Winter buds are produced towards the end of the growing season. They are easily distributed by water movement since they break free and can also float along with senescing vegetation.
  - Mature Hydrilla can grow nearly 16’ in one day. A 10cm (≈4”) shoot grew 262’ of shoot tissue in 35 days.
- The variety of Hydrilla found in NC is monoecious. Hydrilla is a perennial plant. It dies back (senesces) in the fall and tubers sprout in the spring leading to the next crop.

## History of Hydrilla in the Eno River Watershed

- Hydrilla was first found in Lake Orange in the early 1990’s. Management began in 1994 by stocking the lake with triploid grass carp. For two decades Hydrilla was successfully managed there; however, it started to show up again in recent years. In 2014, Arrowhead Lake (due East of and flows into Lake Orange) was found to be infested. No historical records of Hydrilla management effort at Arrowhead Lake are known. The West Fork Eno Reservoir was confirmed to have Hydrilla in 2009. It is currently stocked with triploid grass carp and being successfully managed. Hydrilla has also been found in Corporation Lake, a drinking water impoundment along the Eno River just west of Hillsborough.
- The first documented sighting of Hydrilla in the Eno River State Park was in 2005.
- Limited Hydrilla survey/monitoring work has occurred annually from 2006-2012.
- A Task Force made up of Federal, State, local governments, and public interest groups came together in 2012.

- An organized survey was conducted in the fall of 2013 and found ≈25 miles of river containing Hydrilla at differing densities. The most infested extent encompasses ≈15 miles of river from the Lawrence Road bridge crossing over the Eno River in Hillsborough to Guess Road in Durham.

### **Potential Impacts**

- Hydrilla has been identified as one of the biggest threats to the natural resources of Eno River State Park and has the potential to negatively impact fish and wildlife communities and recreation. It can grow throughout the entire river potentially reducing fish habitat, out competing native riverweed and impeding swimming, boating and fishing activities.
- Hydrilla can harbor mosquitoes and impose public health issues due to the threat of mosquito-borne diseases.
- Hydrilla has been linked to Avian Vacuolar Myelinopathy (AVM), a syndrome that results in death for American coots and other waterfowl, as well as birds of prey, including the Bald Eagles that feed on AVM affected waterfowl.

### **Hydrilla Management**

The Eno River Hydrilla Management Task Force is made up of Federal, State, local government and citizen representatives. This group held a series of meetings over the last several years to work through Hydrilla management options and developed a plan for addressing the infestation of the Eno River. Available options include “no action”, physical removal, biological control, and herbicide treatment. Some of these options have been ruled out, and treating Hydrilla with herbicide(s) appears to be the most viable option. See details below:

#### No Action

- A “no action” response will allow uncontrolled spread of Hydrilla both within the river, the Falls Lake reservoir and into the Neuse River proper. Impacts to these natural resources will increase over time as will the future costs of treating Hydrilla.

#### Physical Removal

- Eno River State Park personnel evaluated the feasibility of controlling Hydrilla via hand removal in a 100’ reach of the river during the summer of 2011. Over 300 hours were spent pulling Hydrilla between July and early August. By September, there was no discernible difference between the area weeded out by volunteers and the areas directly upstream and downstream. Hand-pulling, or any other form of physical removal, is not a viable option for control because the entire plant including the tubers within the sediment would need to be removed. Additionally, all fragments broken from the plants during a physical removal activity could float downstream and grow into new plants exacerbating the problem.

#### Biological Control Agent

- Sterile triploid grass carp have proven to be a cost-effective method of Hydrilla management in ponds and reservoirs in NC. Grass carp have not been used to manage Hydrilla in a flowing river in North Carolina. These are herbivorous fish that feed on submersed vegetation. Grass carp are typically purchased at 12” length and they can grow to be 36”. Most of the grass carp will not live to reach that potential; annual attrition of a grass carp population is 20%-30%. Grass carp prefer Hydrilla over most of the aquatic vegetation that is native to NC. However, a few of

the native submersed vegetation species would also be considered to be a preferred food source, like Naiads and Pondweeds. It is unknown as to where riverweed, native and common in the Eno River, ranks on the grass carp's food (palatability) list. Stocking enough grass carp to remove Hydrilla without negatively impacting the native aquatic vegetation community may be difficult. The loss of riverweed could negatively impact the population of panhandle pebblesnails in the Eno. Additionally, the nomadic nature of this fish species questions the likelihood that a sufficient fraction of the population would remain in the Eno River to provide adequate control. The North Carolina Wildlife Resources Commission performed a study of the movement of 24 sterile triploid grass carp in the Eno River (see Monitoring below).

### Herbicide Treatment

- There is a short list of herbicide products that are effective at controlling Hydrilla and are labeled for use at this type of site. The Eno River Hydrilla Management Task Force has been considering products containing either the active ingredient fluridone or endothall.
- These herbicides are US EPA-approved for use in aquatic ecosystems at appropriate dosages, including in sources of drinking water. The herbicides are not known to be persistent in the environment, nor are they known to bio-accumulate.
- Multiple studies have been conducted which provide insight to how non-target organisms would likely respond to the different proposed herbicides.
  - North Carolina State University has conducted toxicity tests on riverweed and found that this plant was not significantly impacted by either herbicide.
  - North Carolina State University has conducted toxicity tests on some mollusk species, including the panhandle pebblesnail using fluridone and endothall. Results from those tests indicate that the herbicide concentrations which would be applied during a treatment regime would not be acutely toxic to these organisms.
- Based on published studies and the NCSU toxicology studies no direct adverse effects to aquatic invertebrates are anticipated at the proposed/targeted concentrations of these herbicides.
- Past use of fluridone for Hydrilla management in flowing or high exchange systems has occurred in a number of states including Florida, California, and New York. Formulations of this herbicide that are currently on the market include pelleted and liquid products. A Hydrilla removal project that is similar to the Eno River scenario is Cayuga Lake, Tompkins County, New York. Tompkins County Cooperative Extension has developed web resources that provide an effective overview of New York's recent efforts to eradicate Hydrilla from Cayuga Lake using injection of fluridone herbicide as well as summary information on other Hydrilla management/eradication efforts. The website can be accessed here:  
<http://ccetompkins.org/environment/invasive-species/hydrilla>.
- The Task Force initiated a 2-year pilot study treatment within the Eno River State Park. A dose of liquid herbicide product is metered into the Eno River from late spring through summer. The proposed management activity began in 2015 and is continuing in 2016.

## **Monitoring**

### Water Quality Monitoring

- Throughout the duration of the proposed herbicide treatment, water samples were tested according to an established schedule to insure that the concentrations of herbicide in the river were within EPA-approved limits, as well as appropriate for management of the Hydrilla infestation.

### Hydrilla Monitoring

- Watershed-wide Hydrilla monitoring will be performed annually. The Task Force is attempting to study the entire Eno River Watershed to determine the exact extent of the infestation and to inform future control efforts. In 2016 surveys are focusing on the upper watershed.

### Biological Monitoring

- Surveys were conducted on fish, crayfish, and mussel communities at five sampling sites along the Eno River in 2013 and 2014. These surveys will be used as pre-treatment base line data. After the start of the herbicide treatment in 2015 sampling will continue for another three years to evaluate any changes that occur within these aquatic communities. Results from 2015 have found no adverse effects on native fauna.

### Sterile Triploid Grass Carp Movement Study

- The objective of this study is to evaluate the movements of stocked grass carp in a riverine system. The stocking density was not based on a level required to effectively control Hydrilla.
- In June of 2014 a total of 24 sterile triploid grass carp were implanted with internal sonic telemetry tags and stocked into the Eno River in downtown Hillsborough, NC.
- A total of 12 sonic receivers have been deployed into the Eno River to track the movements of these fish. The sonic tags send out signals at regular intervals and if a fish is within range of a receiver the device will record the time, date, and individual tag ID number.
- Fish were tracked for one year to determine if they moved upstream or downstream or if they remained in the vicinity of where they were originally placed in the river. Of the 24 fish only 5 remained alive or retained their tags for the duration of the study. While the numbers of fish are too low to draw definitive conclusions, initial results are encouraging in that the 5 fish remained in the river presumably feeding on Hydrilla.

## **2015 Results**

Hydrilla shoot length was significantly reduced and density was reduced by over 90% in the treatment areas. There were no adverse effects to native fauna or public health and little disruption to recreational use of the river. During the course of treatment some yellowing of water willow was found; this was not unexpected. Treatment was suspended in July to assess the impacts to water willow and riffle weed. Follow up monitoring determined that both species recovered to pre-treatment levels. The cause of the yellowing could not be determined as elevated water temperatures can cause similar effects.

## **2016 Plan Modification**

The Task Force modified the treatment plan for 2016 to go from a single injector site to the use of two injector sites. Having two injector sites will allow the operator to maintain herbicide concentrations more evenly throughout the treatment area. The treatment plan is otherwise identical to what was done in 2015.