Adirondack Park Agency Policy, Procedures & Guidance System	RASS - 1
Topic: Guidelines for Appropriate Use of the Aquatic Herbicides Containing the Active Ingredient Triclopyr to Manage Eurasian Watermilfoil, an Aquatic Invasive Plant	
_____ **Terry Martino, Executive Director**	**Effective Date:** **March 4, 2014**

I. Purpose and Applicability

Aquatic invasive species alter natural ecosystems by decreasing diversity and abundance of native species and by impairing public uses. Of these invaders, Eurasian watermilfoil (*Myriophyllum spicatum*, EWM) has had the greatest negative impact on native plant communities and the public's use and enjoyment in the Adirondack Park. Eurasian watermilfoil is highly sensitive to herbicides containing the active ingredient triclopyr (current registered trade names Renovate, Renovate OTF, Kraken Aquatic Herbicide, and Navitrol DPF Aquatic Herbicide).

Under New York State's Freshwater Wetlands Act and 9 NYCRR Part 578, the Adirondack Park Agency is responsible for review and approval of projects involving freshwater wetlands in the Adirondack Park. As such, an Agency permit is required for management of aquatic invasive vegetation involving the use of aquatic herbicides that will pollute or substantially impair freshwater wetlands.

In order to make a finding that an aquatic invasive species project is approvable, the Agency must determine that it will not have an undue adverse impact upon the natural, scenic, aesthetic, ecological, wildlife, historic, recreational or open space resources of the Park or upon the

ability of the public to provide supporting facilities and services made necessary by the project, taking into account the economic, social and other benefits that might be derived therefrom. In making this determination, the Agency must conclude that a project complies with the statutory and regulatory criteria set forth in Section 24-0801(2) of the Freshwater Wetlands Act (ECL Article 24, Title 8) and 9 NYCRR §§ 578.9 and 578.10.

The purpose of these guidelines is to provide guidance to the Agency, lake associations, state agencies and local municipalities, Adirondack Park Invasive Plant Program (APIPP), and others involved with management of aquatic invasive plants. The goal of any aquatic invasive species management strategy is to achieve long-term control of the target species, while avoiding or limiting impacts to freshwater wetlands and non-target organisms.

Furthermore, the intent of this document is to provide involved parties with a framework for project design. Designing proposals in accordance with these guidelines may increase the likelihood of staff recommendation for approval for projects presented to the Board and likelihood of project approval by the Board. However, these guidelines are neither law or regulation, and they do not represent a benchmark which determines approvability. Furthermore, the Agency understands that flexibility in treatment design is essential to achieve the common goal of effective Eurasian watermilfoil management.

II. Background

Deep water marsh and emergent marsh wetlands are an integral part of a healthy aquatic ecosystem and provide essential habitat for fish, macroinvertebrates, reptiles, amphibians, and wildlife. They are important in stabilizing lake sediment, storing and recycling nutrients, and improving water quality. Healthy wetland communities consist of a diverse assemblage of native aquatic vegetation. Non-native invasive species, such as Eurasian watermilfoil, compete with native plants, including New York State rare, threatened and endangered species, for available resources and can establish dense monocultures which can outcompete native plants, decrease plant diversity and diminish habitat for fish, macroinvertebrates, and other aquatic organisms. Dense EWM monocultures can also directly or indirectly impact aquatic organisms by changing lake nutrient dynamics, increasing water temperature, reducing fish spawning habitat

and feeding success of predatory fish, etc. Seasonal die-off of invasive plants, such as EWM, can lead to a decline in water quality, resulting in an increased frequency of algal blooms and low or no dissolved oxygen conditions. Widespread dense monocultures of invasive plants can also impact recreational activities such as swimming, boating and fishing.

Several aquatic herbicides, including Endothall, Fluridone, 2,4-D, Imazamox, Renovate, Kraken, etc. are approved for use in New York State[1]. For management of EWM, herbicides with the active ingredient triclopyr provide relatively fast-acting control, that is also highly selective (see appendix). Triclopyr is also a systemic herbicide which targets primarily plants classified as dicots; many native monocots such as pondweed, elodea, coontail, sedges and grasses etc. are not susceptible. Triclopyr enters a plant through its leaves and stems and translocate to the root system. The herbicide disrupts the plant's metabolism and kills the entire plant. Killing the entire plant, including root system, results in greater efficacy and thus may provide for a longer period of control of the target plant.

Lake communities responding to a EWM infestation typically consist of lake volunteers with little to no funding. Management efforts are generally financed by the local municipality, private donations, or fund raising efforts by volunteers. As a result, these communities often conclude that the least expensive control is the most desirable management strategy. Aquatic herbicides can provide a cost effective management option for large dense beds of EWM. However, widespread use of herbicides may not be an acceptable alternative to the general public. Furthermore, unless careful consideration is given to the appropriateness of an herbicide and, if appropriate, to the application strategy, there may be unacceptable impacts to non-target native plants and animals, including NYS protected species.

III. Agency Guidance

A. General Guidance

Aquatic herbicides containing the active ingredient triclopyr can be used to manage EWM in Adirondack

[1] The New York State Department of Environmental Conservation is responsible for approving the use of herbicides in the state and is also responsible for certifying the pesticide applicators responsible for undertaking herbicide treatments.

waterbodies when the project is designed to avoid or minimize impacts to freshwater wetlands, especially to non-target native flora and fauna. The applicant should demonstrate in the project application that there has been a lakewide management program using non-chemical options, such as hand harvesting or benthic barriers, prior to applying for an Agency permit for aquatic herbicide use. The non-chemical control effort should be a multi-year activity and must be documented by the applicant (i.e. by providing the number of acres hand harvested or matted per year, amount of plant material hand harvested per site, number and size of the benthic barriers, etc.). In order to achieve the greatest level of success it is recommended that the herbicide treatment be limited to areas where large, dense or moderately dense EWM beds need to be reduced to levels which will allow non-chemical control to continue in the future. Further, management of the area after treatment must include a long-term strategy to use non-chemical options to prevent recolonization by EWM or other invasive species.

The applicant should also demonstrate that all alternatives have been evaluated and the EWM cannot be controlled by non-chemical means or without undesirable non-target impacts, has the potential to continue to spread rapidly due to existing habitat (i.e. extent of littoral area, suitable substrate, etc.), and may outcompete and eliminate diverse assemblages of native vegetation or protected plant species. It should also be demonstrated that the use of triclopyr will restore habitat and that failure to respond to the infestation could result in loss of native plant diversity and a viable functioning wetland community.

B. Limiting Non-target Impacts

An acceptable aquatic herbicide program limits non-target impacts of susceptible native flora and fauna. Areas with scattered to trace amounts of EWM should not be treated if dominated by protected or susceptible native plants and a cost effective non-chemical control option is available which will achieve the same management outcome for the applicant and provide better protection to susceptible flora or fauna.

It is recommended that the following treatment considerations be evaluated for purposes of eliminating or reducing impacts to freshwater wetlands and non-target organisms:

1. Timing of Herbicide Application

In most situations, triclopyr should be applied early in the spring when target plants are actively growing and herbicide uptake is at a maximum. Eurasian watermilfoil initiates productivity and metabolic activity at an earlier time than native plants[1]. Since triclopyr is highly selective for EWM and other dicots, completing the treatment in spring, when EWM is typically the first emergent plant, may reduce impact to other native dicots which are still dormant.

Treating in the spring allows a targeted application when the EWM biomass is low and when many other plants have not yet emerged. This early season control reduces the potential for suppressed or depleted dissolved oxygen concentrations which can occur during mid to late summer treatments when vegetation is at the height of the growing season. Furthermore, spring treatments occur before the lake becomes stratified thus allowing the lake to remain well oxygenated during plant degradation.

2. Size of Treatment Area

In most Adirondack waterbodies, partial lake or spot treatments are more desirable than whole lake treatments since there is less impact to native aquatic plants, animals and the aquatic ecosystem.

It is recommended that the treatment area be greater than five acres in size and consist of dense and moderately dense EWM beds. Areas with scattered to trace amounts of EWM adjacent to the dense beds should not be included as part of the treatment area, since these areas can be hand harvested.

3. Sequestration Curtains

Sequestration curtains or limnocurtains are impermeable membrane barriers typically constructed of polyvinyl chloride or similar material. Sequestration curtains can significantly reduce the dilution and dispersal of the herbicide by restricting the flow of water into and out of the treatment area. Restricting herbicide movement reduces lethal exposure to susceptible native plants outside the target area.

[1]New York State Department of Environmental Conservation. 2007. Use of the Aquatic Herbicide Triclopyr Renovate® in the State of New York. Supplemental Environmental Impact Statement.

It may allow for a lower rate of application (concentration), and herbicide efficacy may be improved as the effects of herbicide movement or rapid dissipation is reduced. Using an herbicide concentration below the maximum label strength can reduce non-target impacts both within and outside the treatment area.

In order to function properly it is recommended that curtains extend from the lake surface to the bottom and completely enclose or surround the treatment area. If treating an embayment, the curtains should extend from shoreline to shoreline. Recycled curtains must be decontaminated to ensure that there is no additional non-native species introduction.

The Agency recognizes that sequestration curtains may not be appropriate for all circumstances. For example, it may be impractical in instances where the employment of a curtain is technically difficult to deploy and/or there are no susceptible protected plants in the vicinity which may be impacted.

C. Herbicide Concentration Monitoring

An aquatic herbicide can be dispersed by wave and wind action and can be diluted and degraded by water exchange and natural processes. Post-treatment monitoring of herbicide residue provides information on target concentration success, degradation or dilution of herbicide to non-lethal levels, herbicide movement, and compliance with label restrictions (i.e. potable water restriction, irrigation ban, etc.).

As part of any herbicide application, the Agency requires a detailed herbicide monitoring plan. Because the circumstance surrounding each treatment is unique, the plan should be customized to provide spatial and temporal understanding of herbicide movement and persistence. To reduce the need for overlapping sampling requirements by the Agency and the New York State Department of Environmental Conservation, where possible, the Agency will apply water use restriction concentrations in the sampling requirements. Sampling plans proposed by the applicant should be based upon input from the Agency and the New York State Department of Environmental Conservation.

As part of the permit application a detailed monitoring plan will be required for each treatment site. The following is provided as guidance for sample frequency: “The first round

of sampling will begin 12 hours after treatment and will continue at a minimum, 24 hours, day 3 and day 7 after treatment. Sampling at all sites will continue weekly thereafter until triclopyr concentrations drop below 50 ppb which is the NYS potable water restriction (Supplement Labeling (Chapter 24(c)Special Local Need)). One additional round of sampling will be completed at one downstream and one upstream site in order to verify when concentrations fall below 1 ppb, at which time the restriction on using treated lake water for irrigation purposes may be lifted." Additional sample sites should be chosen to identify areas of concern, such as, high occurrence of native dicots and/or rare, threatened or endangered species susceptible to the herbicide.

Outlet Monitoring - Additional sampling sites may be required downstream of the treatment area if the application point is located near the outlet and wetland vegetation is present downstream.

D. Long-term Management

As outlined previously, triclopyr should be used for partial lake or spot treatment in areas with dense or moderately dense EWM beds to reduce populations to levels that can be managed long-term using non-chemical controls. A successful long-term lake-wide integrated pest management strategy includes the use of non-chemical options to achieve a long-term objective of no herbicide or herbicide minimization for the entire water body. Areas treated with an aquatic herbicide require monitoring and aggressive physical management (i.e. hand harvesting) or other non chemical control in order to prevent EWM from becoming the dominant plant again. Areas with scattered EWM plants located adjacent to a treatment area that will not be treated should also be aggressively managed using hand harvesting or benthic barrier techniques in order to eliminate a likely source of EWM recolonization. Finally, aquatic herbicide treatments should be considered as no more than a single component of a long-term integrated pest management plan.

E. Post-treatment Aquatic Plant Surveys

Aquatic plant community composition will change after a chemical treatment, and treated areas which previously consisted of dense biomass of EWM will begin to repopulate with native plants. In order to evaluate the effectiveness of the treatment and impacts to non-target organisms the Agency will require an aquatic plant post-treatment survey

and report within one year of the treatment. The survey should be conducted by an independent third party consultant and comparable to the pre-treatment survey. The final report should include an analysis comparing pre- and post-treatment aquatic plant community composition, including details of any non-target impacts.

F. Legal Effect

This policy is not intended to set forth a fixed general principle to be rigidly applied. Rather, its tenets are to be utilized solely as guidance and will be applied only after taking into account the specific facts and circumstances pertaining to each specific aquatic invasive species management project.

Appendix: Impact on Triclopyr to Common Aquatic Plants in New York

Aquatic Plant	Dicot (D) or Monocot (M)	Susceptibility to Triclopyr	Status
Emergent Species			
Hydrocotyle spp. (pennywort)	**D**	**high**	**Native**
Ludwigia spp. (waterprimrose)	**D**	**high**	**Native**
Lythrum salicaria (purple loosestrife)	**D**	**high**	**Invasive**
Phragmites spp (reed grass)	**M**	**medium**	***P. australis* (common reed) is Invasive**
Pontedaria cordata (pickerelweed)	**D**	**high**	**Native**
Sagittaria spp (arrowhead)	**M**	**medium**	**Native**
Scirpus spp (bulrush)	**M**	**low**	**Native**
Typha spp (cattails)	**M**	**low**	**Native**
Floating Leaf Species			
Brasenia schreberi (watershield)	**D**	**medium**	**Native**
Lemna spp (duckweed)	**M**	**low**	**Native**
Hydrocharis spp (European frog-bit)	**M**	**Unknown**	**Invasive**
Nuphar spp (yellow water lily)	**D**	**medium**	**Native**
Nymphaea spp (white water lily)	**D**	**medium**	**Native**
Trapa natans (water chestnut)	**D**	**medium**	**Invasive**
Submergent Species			
Ceratophyllum demersum (coontail)	**D**	**low**	**Native**
Cabomba caroliniana (fanwort)	**D**	**low**	**Invasive**
Chara spp (muskgrass)	Macro-algae	**low**	**Native**
Elodea canadensis (common waterweed)	**M**	**low**	**Native**
Egeria densa (Brazilian elodea)	**M**	**low**	**Invasive**
Heteranthera dubia (water stargrass)	**M**	**medium**	**Native**
Hydrilla verticillata (hydrilla)	**M**	**medium**	**Invasive**
Myriophyllum aquaticum (parrotfeather)	**D**	**high**	**Invasive**
Myriophyllum sibiricum (northern watermilfoil)	**D**	**high**	**Native**
Myriophyllum spicatum (Eurasian watermilfoil)	**D**	**high**	**Invasive**
Myriophyllum heterophyllum (Variable milfoil)	**D**	**high**	**Invasive**
Megalondonta beckii (water-marigold)	**D**	**high**	**Protected**
Najas flexilis (bushy pondweed)	**M**	**low**	**Native**
Najas guadalupensis southern naiad	**M**	**low**	**Native**
Potamogeton amplifolius (largeleaf pondweed)	**M**	**low**	**Native**
Potamogeton diversifolius water-thread pondweed	**M**	**low**	**Native**
Potamogeton crispus (curly-leafed pondweed)	**M**	**low**	**Invasive**
Potamogeton epihydrus (ribbon-leaf pondweed)	**M**	**low**	**Native**
Potamogeton gramineus (variable-leaf pondweed)	**M**	**low**	**Native**

Potamogeton illinoensis (Ilinois pondweed)	**M**	**low**	**Native**
Potamogeton natans (floating leaf pondweed)	**M**	**low**	**Native**
Potamogeton praelongus (white-stem pondweed)	**M**	**low**	**Native**
Potamogeton pusillus (small pondweed)	**M**	**low**	**Native**
Potamogeton robbinsii (Robbins' pondweed)	**M**	**low**	**Native**
Potamogeton zosteriformis (flat-stem pondweed)	**M**	**low**	**Native**
Ranuculus longirostris (white-water crowfoot)	**D**	**low**	**Native**
Stuckenia pectinatus (Sago pondweed)	**M**	**low**	**Native**
Utricularia spp (bladderwort)	**D**	**low**	**Native**
Vallisneria americanum (eelgrass)	**M**	**low**	**Native**

Table based upon the New York State Department of Environmental Conservation. 2007. Use of the Aquatic Herbicide Triclopyr Renovate® in the State of New York. Supplemental Environmental Impact Statement.