Management Approaches for the Control of Aquatic Plants

Prepared for
Conesus Lake Association

Funded by the
Livingston County Planning Department

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September 1999

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Introduction

This guide is designed to provide information on the ecological values and problems associated with aquatic macrophytes, to present methods used to control the troublesome species, and to provide suggestions on how to implement a lake management plan that would deal with macrophytes as legally and as safely as possible. A great deal of the aquatic plant, or macrophyte, information provided is focused on dominant plants found in Conesus Lake; therefore the methods suggested for controlling the plants are more applicable to bodies of water similar in size to Conesus Lake. Management approaches suggested include reduction of nutrient flow into the lake, mechanical and/or physical control, biological control, and chemical control. Finally, information is given on how to begin a lake management plan that will address the macrophyte problem, including the application process that might be required for certain types of action, and preparing for any rules and regulations that may accompany the plan. The overall goal of this manual is to aid lake owners (managers) in learning more about their choices when dealing with an aquatic plant problem, guide them on how to take action once a management plan has been selected, and prepare them for what to expect along the way. Since there is some variability in interpretation and application of regulations between regions and lakes, the information provided here is based on our best attempts to outline a general approach and review of techniques and regulations concerning macrophyte control in New York State.

Background Information on Aquatic Plants

Values vs. Problems

Aquatic plants are necessary for the maintenance and growth of all life forms in an aquatic community; they have tremendous value as part of a natural water ecosystem. The most important roles of aquatic plants are to oxygenate the water and absorb nutrients such as phosphorus and nitrogen. Many plants, such as the submerged and emergent types, also function to stabilize the sediments in and around the water, increase clarity of the water by reducing wave action, and shade and cool the water. Macrophytes

are essential for feeding, sheltering, and maintaining habitat for various organisms such as fish fry, insects, aquatic invertebrates, and planktonic organisms on which fish and other predators feed. In addition, plants that are part of an aquatic ecosystem provide crucial foraging and nesting habitat for birds and other animals.

However, when aquatic plants grow where they are not wanted, or interfere with recreational use, home owners, boaters and lake users refer to them as "weeds" - a term suggesting that the plants are valueless, troublesome or even noxious. Excessive, profuse growth of aquatic plants can have a detrimental effect on water quality and use. Fish reproduction and growth are hindered by the excessive amount of vegetation; plant decay depletes dissolved oxygen; stagnation in thick weed beds prevents reaeration and provides for a favorable environment for mosquito production; and fishing, boating, and swimming are unpleasant or impossible. Therefore, aquatic plant control techniques should be undertaken with the idea of inhibiting growth, but only when, where, and to the extent necessary for the expected use of the water. A note of caution is required. Efforts to eradicate aquatic plants are usually expensive. The control measures applied can lead to undesirable collateral effects and more often than not fail to achieve the desired mitigation.

Dominant Plants in Conesus Lake

Because species composition in lakes often change with time, current common species in Conesus Lake were determined this year and from a study conducted on Conesus Lake in 1991 (Makarewicz et al. 1991). Descriptions of the most abundant types of plants are included in this section.

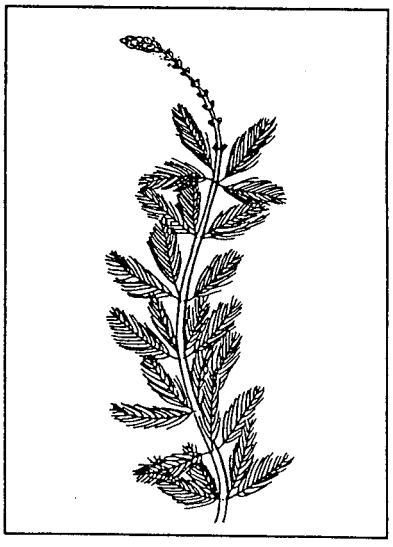
According to our 1999 summer survey of McPherson Cove, Eagle Point and the north end off Sand Point, Pebble Beach and Wilkins Creek the most abundant species of macrophytes in Conesus Lake are distributed along a gradient of depth from shore. In the 0.5 to 1-meter zone, the most abundant species were *Vallisneria americana* (eelgrass) and *Heteranthera dubia* (water stargrass); eelgrass was the most common. These are primarily the two species that wash up on beaches during times of heavy boat traffic, high winds, or toward the end of the growing season. The 1 to 3 meter zone contained mostly *Myriophyllum spicatum* (Eurasian watermilfoil), *Ceratophyllum demersum* (Coontail),

Elodea canadensis (common elodea), and *Potamogeton pectinatus* (curly pondweed); Eurasian watermilfoil and Coontail were the most common species in this zone. Watermilfoil dominates the 1-3 m depth zone along most coves and in the North and South regions of the Lake, forming expansive floating beds that are the primary obstacles to boat traffic and other recreational use. The third main zone for aquatic plant growth is the 3 to 4 meter zone, which during spring and early summer consisted primarily of *Potamogeton pectinatus*; later in the growing season *Ceratophyllum demersum* (coontail) prevailed in this zone.

The following types of plants, *Myriophyllum* sp., *Potamogeton* sp., *Chara* sp., *Nuphar* sp., and *Vallesnaria* sp., were found to be the dominating plant species in different areas in and around Conesus Lake by the study completed in 1991. The major areas of Conesus Lake that underwent research included: Long Point, McPherson Point, McPherson Cove, "No Name" Creek, and the North and South ends of the lake. *Myriophyllum* sp. seemed to be the dominating plant in Conesus Lake at that time, existing in all of the areas studied and outweighing all other plant species in Long Point, McPherson Point, McPherson Cove, and the South end. Pondweed, the second most prominent macrophyte, was abundant in and around "No Name" Creek, McPherson Cove, McPherson Point, and Long Point (Makarewicz et al.1991).

Potential Problems Associated with Dominant Plants

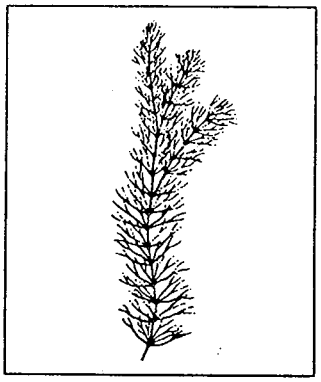
Myriophyllum spicatum -- Eurasian Watermilfoil



Watermilfoil is an aggressive, fibrous-rooted, submersed plant capable of existing in four to fifteen feet of water. Quickly moving to the surface of the water, milfoil shades out other plants and is potentially able to form beds across several acres of water particularly in areas of high nutrient loading. Because watermilfoil reproduces vegetatively, it is easily spread by plant fragments that often travel with boat propellers, trailers, and jet skis. As with many other submerged

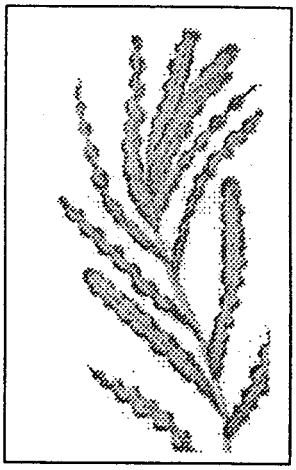
macrophytes, milfoil is commonly known to clog motorboat propellers and equipment, thus interfering with fishing, swimming, and other recreational activities. In addition, excessive amounts of watermilfoil can devastate the natural growth of native aquatic plants that may by supporting fish or other aquatic life.

Ceratophyllum demersum -- Coontail



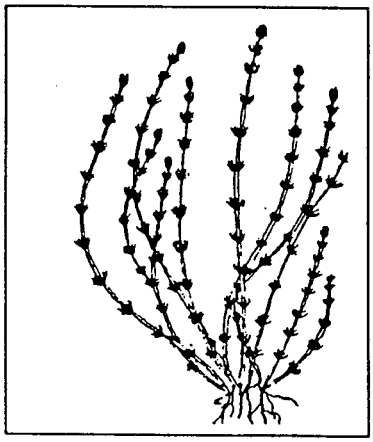
Coontail is a completely submersed macrophyte that rarely roots in the bottom sediments of the pond or lake in which it lives. Its leaves are threadlike and forked with tiny hooks along the edges, and the end of the stem forms a "coontail" which quickly aids in identification. Although dense mats of this plant cause problems by hindering certain recreational activities (e.g., fishing), it does offer valuable use as food for wildlife.

Potamogeton sp. -- Pondweed



Species of pondweed generally fall into one of two categories: those with completely submerged leaves and those with floating leaves. Floating leaves seem to cause the most problems; however, pondweed does not usually develop into large floating mats. Most species reproduce by seed or rootstocks and display distinct flower spikes at the water surface during the summer. *Potamogeton* sp. is often associated with the same typical recreational hindrances as watermilfoil and is mostly troublesome at depths of 2-10 feet.

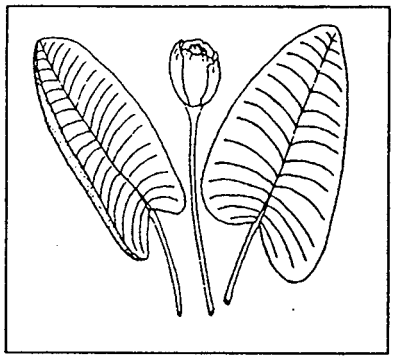
Chara sp. -- Muskgrass



Chara sp., an advanced form of algae with no true roots, attaches to the bottom sediments of a pond or lake and only grows up to two feet tall. Bristly or gritty to the touch, muskgrass usually grows in hard water and has a musky or skunky odor. The plant reproduces vegetatively

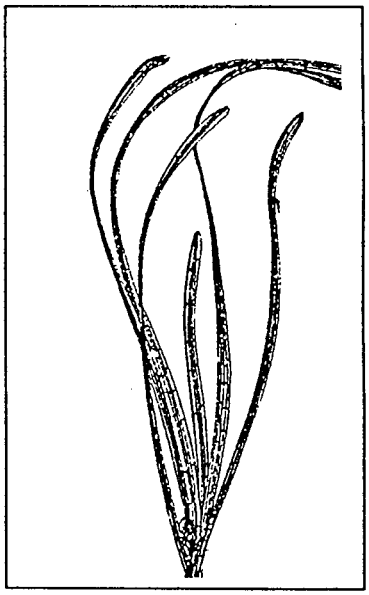
by tiny "seeds" and starts growing early in the spring. It is usually recommended to leave a *Chara* bed alone because the mat of plants protects against more troublesome macrophytes and interferes little with human use. Also, by leaving the plant alone, it is able to fulfill ecologically important roles including harboring aquatic insects, providing places for small fish and supplying food for waterfowl. This is one of the reasons why *Chara* is often the plant lake-owners hope will take over an area that has been eliminated of a more vexatious species such as watermilfoil.

Nuphar sp. -- Waterlilies, Spatterdock



Waterlilies are rooted plants that mature in water from one to several feet deep. Floating or emergent heart-shaped leaves and surface-dwelling yellow flowers characterize this plant which spreads by the extension of large, starchy rhizomes. Different types of *Nuphar* sp. are usually found to interfere with swimming, water skiing, and fishing.

Vallisnaria sp. -- Eelgrass, Wild Celery



With long, slender, ribbon-like leaves that can grow up to twelve feet long, eelgrass is almost completely submersed, displaying only the tips of the plant that float on the surface. *Vallesnaria* reproduce mainly by roots and tubers; although the plant also sends up a white flower that will retract by way of a characteristic recoiling stem once it has been fertilized. Large, thick beds of eelgrass can form, providing abundant food that will attract waterfowl. Like other submersed plants, eelgrass mainly interferes with human recreational activities.

For more information on plant identification, contact:

Robert L. Johnson of Cornell University, Section of Ecology and Systematics or
Bruce Gilman of Finger Lakes Community College, Department of Environmental Conservation/Outdoor Recreation

Control Strategies

Reduction of Nutrients

The best long-term method to control aquatic plants is to prevent excess nutrients, specifically phosphates and nitrates, from entering the water. Like agricultural crops, aquatic plant growth is stimulated by nutrients entering the lake. This section focuses on the process of eutrophication, the specific causes and locations of nutrients entering Conesus Lake, and the possible courses of action that can be taken to control the entry of nutrients into the lake.

Every lake, reservoir, and pond has a life cycle, which starts when it is created and ends when it is dry land. Nutrients present in the water and soil cause plants and animals to grow in the water body. Death and decomposition of these organisms, combined with organic matter from surrounding trees and sediment from natural soil erosion, cause the lake to gradually fill over thousands of years until it is an upland forest community. This process is called eutrophication. The aquatic plants that build up in the lake, or any body of water, are part of this process.

In 1991, a study was undertaken in the Conesus Lake watershed that focused on nutrient loading, or the entry of nutrients, into the lake from specific areas (Makarewicz et al. 1991). Results concluded that South McMillan, North McMillan, and Hanna's Creeks contributed 57.5% of the phosphorus and 60% of the organic nitrogen entering the lake. Because controlling the entry of these two elements is very important for macrophyte suppression, and thus water quality, a nitrogen and phosphorus control program was recommended in 1991.

One of the major concerns of the study was with the south end of Conesus Lake—involving the Inlet, South McMillan, and North McMillan watersheds. Essentially undeveloped and unsewered at the time, these three watersheds contained over 50% of the drainage basin of Conesus Lake. The authors speculated that with development, an increase in nutrient loss and thus discharge into the lake, would cause an increase in macrophytes; therefore, control of the water movement in the area was recommended to significantly reduce non-point source pollution. Because the amount of nutrients in a water body is a function of soil fertility and the quantity of transporting water, management practices which included the prevention of surface runoff were suggested to decrease the magnitudes of sediment and chemical losses. One specific recommendation

included the use of buffer strips of forest or grass between the pollutant source and the water body as an effective way to intercept the nutrients. Other management methods offered included stormwater detention ponds and infiltration pits, diversion terraces or ditches, and changes in cropping and soil conservation practices. Overall, the researchers advised management practices designed for relatively large volumes of water involved in the process of intense runoff events (Makarewicz et al. 1991).

A more recent study, conducted from January 1999 to April 1999 (Makarewicz and Lewis 1999), has indicated that rivulets entering Conesus Lake in the southwest quadrant are also having a significant impact on the water quality of the lake. Land management practices in the area are believed to be the cause of the excessive amount of nutrients entering the lake from these rivulets, suggesting action to be taken either with the practice itself or with surface runoff. The authors have suggested that the high levels of phosphorus entering the lake would stimulate macrophyte growth locally and could potentially deteriorate the quality of the entire lake. It is important to mention that the study only monitored four of the hundreds of rivulets entering Conesus Lake, and that it is not known whether rivulets in other areas are similarly polluted as those that were studied (Makarewicz and Lewis 1999).

Our summer 1999 survey of macrophyte distribution has revealed that some of the most dense beds of watermilfoil can be on the northwest end of Conesus Lake. This area is immediately adjacent to Hannas creek, which has been identified by Makarewicz et al. (1991) as one of the principal contributors to nutrient loading in the lake. Other areas where significant loading of nutrients may be contributing to excessive growth of plants, particularly watermilfoil, include the cove areas south of Eagle Point, south of McPherson Point, and south of Orchard Point well into McPherson Cove.

Mechanical/Physical Control

Many different types of mechanical management techniques are available for the control of macrophytes. In many cases, the technique used depends on the type of plant to be managed. The methods reviewed in this manual include: harvesting the plants by machine or by hand, aerating the water, reducing the water level and drying the plants, screening the bottom and blocking out the necessary light and space, and removing the bottom sediments or dredging.

Harvesting

Operating a mechanical harvester, manually cutting, and/or hand pulling are the three common methods used when physically harvesting nuisance macrophytes. Although no harvesting method eliminates a macrophyte problem permanently, it can reduce the plant levels enough for recreation for a short period of time. This technique is often preferred over the use of chemicals.

Mechanical Harvester

A mechanical harvester is a large piece of equipment that can cut plants from five to ten feet below the water surface and may cut from 6-20 feet wide. After plants have been cut and collected on the harvester, they are brought to shore to be taken to a nearby composting disposal site. Cutting with the harvester may or may not be repeated during the summer, but a cut in the fall is usually highly recommended to slow the next spring's growth. It depends on the species of plants in a particular area on how quickly the weeds will grow back and whether a second cut in the summer is necessary. In some areas, the weeds will not grow back for eight weeks; in other areas, the weeds will grow back within two weeks. The amount of material harvested from year to year varies depending on the growth conditions that lead to excessive plant growth.

Immediate clearing of an area for boating or recreation is an obvious advantage of the harvester. Another advantage is that the harvester does not cut the lower portion of the plant keeping it available for habitat enhancement in the littoral zone. Harvesting can also be used in areas where chemical control is undesirable or not permitted. No foreign substances are added to the water and lake-owners have the option of utilizing the harvested plant material for agricultural use, or other purposes, when this is economically sound.

Despite the many benefits, there are disadvantages to the use of the mechanical harvester, including the cost. The initial investment and the operating costs are high, and in many cases, the harvesting process must be repeated. According to a recent workshop on the control of macrophytes, the price per acre to hire a harvester may range from $500-$800 dollars, excluding mobilization. Some Soil & Water Conservation Districts, which own their own equipment and use their own personnel, have reported costs of $200/day for operations. This does not include the cost of the equipment which can range from $80,000-$100,000. A harvester was used on Conesus Lake at one time in the early 1990's. The high cost of operating the machine, the relatively small area it cleared, and difficulties in establishing a shoreline site for removal, by truck, led to a decision to discontinue use of the equipment.

Another disadvantage to consider is that harvesters do not pick up every piece of vegetation they cut. Although 90% is collected on the conveyor, 10% of the plant material is left in the water. This leftover vegetation must be gathered by hand to prevent the possibility of spreading the plant to new areas. Otherwise, plants such as watermilfoil can regrow and spread vegetatively from plant fragments scattered in such a manner.

Harvesters may also impact fish and insect populations by removing the organisms in the harvested material. Consequently, potential biocontrol agents, such as fish and insects, would be suppressed by repeated harvesting. To address these concerns from 1988 to 1990 the Wayne County Aquatic Vegetation Control Program performed a study of the impact of mechanical harvesting on resident fish. The study revealed that only some small fish, mainly sunfish, get caught in the machines; very small fish slip

right through the belting and most other fish sense the vibration of the machine and swim away.

Indirectly addressing the issue of the loss of aquatic insects during harvesting, Tompkins County Planning and Cornell University performed a controlled harvesting experiment on Dryden Lake in July 1997 to determine the effects of harvesting on watermilfoil. Prior to harvesting, macrophyte biomass was sampled in both control and treatment plots. Strips were then harvested, leaving control plots immediately adjacent. In harvested areas, the watermilfoil biomass was reduced to about 25 percent that of controls. The macrophyte did not grow back immediately; however, by June 1998, there was essentially no difference between the harvested and the control plots. Although oxygen levels were not particularly affected by the harvesting, considerable quantities of insect herbivores were removed with the plants. This finding supported the fact that with time, harvesting would severely deplete the insect population in the area and reduce any positive effect the aquatic insects may exert on controlling watermilfoil.

Manual Cutting

Manually cutting aquatic weeds is similar to mowing a lawn. There are commercially available weed cutters, or cutters can be made at home. Homemade weed cutters can be constructed from a sturdy rake head tied to a rope in a "V" shape. The tool is thrown into the weeds and pulled to shore. After cutting, the plants are collected and removed to prevent recolonization of the area. This method will not eliminate the plants from the area entirely, but it will reduce the extent of their growth. For a large lake, manual cutting may only be feasible in small areas such as the dock or shoreline. This technique has very similar advantages and disadvantages as the use of a harvester. Although manual cutting is more time consuming than mechanical harvesting, the costs are considerably lower and no special equipment or protective clothing is required. In addition, no operating experience or permits are necessary, and the technique can be practiced under any conditions.

Hand Pulling / Root Removal

Hand pulling aquatic weeds is similar to weeding a garden. Nuisance plants are picked, roots and all, and removed from the area. This is best accomplished when the water is low, the sediment is soft, the plant species are shallow rooted, and the areas of infestation are small. Identification of the selected plants is important; it is highly recommended to leave the native or less troublesome plants intact and only remove the bothersome macrophytes. Many lake-owners find it helpful to replant native plants in areas where nuisance macrophytes have been removed. This will prevent shoreline erosion and inhibit the regrowth of the nuisance species. It is important to realize that the process may need to be repeated, and the disturbance of the sediment may result in murky water. As a result of the disturbed water, it may be difficult to see the remaining plants during removal.

For more information on mechanical harvesting, contact
Dr. James E. Skaley
Watershed Planning, Policy & Management
940 Dryden Rd., Ithaca NY 14850
Tel (607)256-1617 e-mail JESkaley@aol.com

Reducing Water Level / Drying Plants

The term water level drawdown refers to the physical reduction of the water level to such a depth that nuisance aquatic plants are exposed to drying. This process is usually accomplished in the winter, ideally between December and April, when the plants are susceptible to freezing or frost heaving. Experts recommend that the plants be exposed for at least four weeks, with the bottom mud layer frozen to a four-inch depth. If the drawdown is successful, initial plant growth the next spring will be severely hindered and subsequent growth delayed. Waterlilies, muskgrass, coontail, watermilfoil, and two species ofpondweed--large-leaf pondweed and fern pondweed--can be controlled by winter drawdown. Other species of pondweed have mixed results; some types are affected in certain areas but not in others. Furthermore, while muskgrass is susceptible to drawdown, it tends to recover quickly. In many cases, success depends on the weather conditions during the process; deep snow or heavy ice formation after draw down may result in inefficient weed control due to inadequate frost penetration.

In predetermining the duration of the drawdown, it is important to consider everything that may be affected by the reduced water level; for example, fish, and their spawning and feeding areas, may be affected by the reduction. In addition, there can be significant compaction of the exposed sediments, especially when the soils are high in organic matter. Compaction of the sediments will retard plant growth, but it will also affect fish, waterfowl, and their life cycle in the same manner. Because compaction is an irreversible effect of drawdown, damage to surrounding wetlands must be considered.

Reducing the water level will certainly have an effect on plant nutrient availability; however, without careful study it is impossible to predict the nature of the effects. Sediment oxidation and stabilization can combine to reduce nutrient availability; however, increased aeration can stimulate microbial action, which will in turn release nutrients. With this under consideration, a shift from rooted plants to an algal bloom could result from the reduction of the water level.

Winter drawdown is commonly used across New York State as an effective management tool for the control of nuisance macrophytes. In fact, it was declared that the draining of Cayuga Lake during the winter months of 1992 was a major factor influencing the depressed growth of macrophytes within the lake at depths of 1.5 meters or less. During that year, the New York State Department of Transportation drained the lake in excess of one meter in depth from summer lake surface elevations and exposed the aquatic plant material. This winter drawdown resulted in a considerable loss of many

aquatic macrophyte species and left the less troublesome macroalgae *Chara vulgaris* to take over much of the area (Hairston, Johnson, and Bouldin 1992).

Blocking the Sunlight or Screening Water / Concealing Bottom

To grow, plants need sunlight. The idea behind this approach is to prevent sunlight from penetrating to the bottom of the lake. Generally, there are two forms of screening used to control the growth of macrophytes in a body of water. First, a dye such as aquascreen, which floats on top of or within the water body, is used to block out sunlight and prevent photosynthesis. Because of the technical labeling of aquashade as a chemical requiring a permit by the Department of Environmental Conservation, details on aquashade dyes are included in the 'Chemical Control' section of this manual.

The second form of screening used involves a sheet of plastic, or other such material, placed on the bottom of the water body to cover or shield all the macrophytes in the area. Strong stakes, or 3-4 inches of sand, can be used to hold down the sheet. This form of management can only be used in small plots such as around docks and not in a whole lake. Use of a screen will result in a loss of habitat for benthic organisms and severely damage the littoral zone if extensively used along the shoreline. Ultimately, the placement of such barriers has not been proven as effective in aquatic plant control as other methods. As sediment builds up on the sheet, or gas pockets create tears, the troublesome plants may recolonize the area. In addition, while permits are not usually required for barriers placed around docks or boat launches, checking with the Regional DEC office to find out about a permit is highly recommended.

Removing Bottom Sediments / Dredging

Some aquatic plants, such as emergent and shallow submergent forms, can be controlled by deepening the water with dredges, draglines, or backhoes. These devices work to remove the nutrient-rich bottom sediments in which plants root. Generally, the result, the absence of macrophytes, lasts longer with dredging than with other techniques because this method does not need to be repeated annually. However, this approach can be extremely expensive when considering the special equipment necessary and the disposal of the material thereafter. Dredging can also devastate the aquatic ecosystem and is therefore only recommended for small areas within the water body such as the shoreline. Shorelines can be deepened to a point where the problem plants do not usually grow because of insufficient light. After removal of the bottom sediments, it will be several years before an area can support plant growth again. For this reason, a permit from the Department of Environmental Conservation and a permit from the Army Corps of Engineers may be needed for most deepening or dredging operations.

Biological Control

Biological control of aquatic plants involves the introduction of natural predators into an ecosystem to keep the growth of macrophytes in check. When considering the

introduction of a predator species, it is extremely important to minimize disruption of the natural ecosystem and the food web of the water body. This manual includes the prevailing thought on the biological control of macrophytes with special consideration for the control of aquatic plants in Conesus Lake and other similar-sized water bodies. Topics explored include the latest information on the use of sterile grass carp, aquatic moths, weevils, leaf beetles, crayfish, and a brief mention of the effectiveness of waterfowl.

Sterile Grass Carp, *Ctenopharyngodon idella*

Many types of aquatic plants can be controlled with the use of a certain kind of fish known as the grass carp, *Ctenopharyngodon idella*. Addressing the concern of overabundance of the carp in many areas, New York State mandated that any carp used in the control of macrophytes must be sterile, or of the triploid genotype. However, before any more details concerning the fish are mentioned, it is important to acknowledge the fact that grass carp are only allowed in water bodies that are less than five acres, contain no outlet, and generally accommodate only one owner. **Therefore, Conesus Lake does not meet the requirements needed for the use of sterile grass carp.** Grass carp are not permitted in lakes because they may lock up a large percent of all the nutrients in the lake ecosystem and only eat the nuisance macrophytes after their preferred vegetation is eliminated. Therefore, when the carp finally begin to feed on the nuisance macrophytes, these plants have already taken over the space relinquished by the favored plants and are growing in number.

Although the use of grass carp may not be appropriate for larger lakes such as Conesus, it is important to become familiar with one of New York State's more popular biological control methods. First of all, triploid grass carp grow quickly under a wide range of temperatures and can tolerate low dissolved oxygen levels as low as 0.4. Their feeding depends upon the temperature of the water body, the dissolved oxygen levels, and the plants present. Carp are selective grazers, which means that in mixed communities, carp will eat their favorite plants until they are all gone, as mentioned above. Generally, the smaller, younger fish eat algae, while the larger, older fish eat large macrophytes. To use sterile grass carp, a pond-owner must be able to show that the nuisance plants significantly impair use of the water and that there are no threatened or endangered plants and animals present. The owner must also provide evidence that the water body is not contiguous to regulated wetlands and it has been at least two years since the last stocking of grass carp. Once these conditions have been established, the owner must file for a special permit for the use of grass carp with the regional fisheries office. The guidelines for obtaining a permit are based on the volume and surface size of the pond and the type of plants present. Stock rates of grass carp for an area are based on the acreage and density of the plants present; therefore, a permit issued to a pond-owner is usually for a specific number of fish. The current price for sterile grass carp is $12-$15

dollars per fish. Assuming no predators are present, carp have good survival rates and usually live for about ten years.

When used carefully, grass carp can provide positive results on various troublesome plants. For example, when used for control of watermilfoil, grass carp significantly reduce plant biomass at 8-10 fish per acre and offer elimination at 15 fish per acre. The reductions are generally noticed by the end of the second summer. For the control of Curly leaf pondweed, moderate to high stocking rates (10-15 fish) are needed to render fair control of the plant. On the other hand, the use of grass carp for the control of species of *Chara* vegetation has provided no success to date in New York State. Whereas grass carp often provide very predictable results in New York State, this is not always the case in other states; the reasons are unknown. On a final note, it is very important to realize that a pond-owner can easily overstock grass carp and eliminate all the vegetation in a pond, so extreme caution is imperative in any area.

For more information on grass carp, contact:
Jim Balyszak of the Yates County Soil and Water Conservation District

Aquatic moth, *Acentria ephemerella*

Current research on insect biocontrol has discovered an effective technique for controlling Eurasian watermilfoil involving an aquatic moth, *Acentria ephemerella*. Herbivore surveys show that the aquatic moth exists throughout much of New York State, however, it only seems to achieve long-term suppression of watermilfoil in Cayuga Lake.

The aquatic moth spends the bulk of its life cycle as a caterpillar, feeding on milfoil throughout several instars until it pupates and reemerges as an adult about 45 days after hatching. Adult males emerge from the water to fly around and mate with adult females at the water surface, after mating, the adult females immediately lay egg masses on milfoil stems. Adult moths do not feed, and they will die immediately after mating and egg laying. The eggs take about 7-10 days to hatch into caterpillars, starting the cycle over again. Although some observations have been made of caterpillars feeding during the winter months, they usually overwinter in the stems of the milfoil plants. *Acentria ephemerella* is a naturalized insect that prefers milfoil in feeding trials but will also feed on other plants To date, there is no information indicating that the moth can severely damage the growth and persistence of other species besides watermilfoil.

Because of the moth's potential as an effective biocontrol agent, researchers set up a controlled experiment in Dryden Lake in 1998 to determine the amount of caterpillars needed to significantly reduce milfoil biomass. The team assembled enclosures 1/4-meter square large and to them added 27 milfoil stems and differing amounts of caterpillars. After six weeks, experimenters concluded that milfoil biomass was reduced by fifty percent in enclosures with 25 or more caterpillars. This experiment, combined with other observations, proved that the aquatic moth can be an effective long-term

biocontrol agent for Eurasian watermilfoil if it is able to become established in a water body. More research is needed however, to improve culturing techniques and our understanding on how to most effectively introduce the moth for control purposes.

Aquatic Weevil, *Euhrychiopsis lecontei*

Before the discovery of the aquatic moth, much of the insect biocontrol research focused on the aquatic weevil *Euhrychiopsis lecontei*. Weevils are a native species that began predation on Eurasian watermilfoil once it was introduced in the 1940's. Control is accomplished through the reproductive behavior of the female and the subsequent feeding of the larvae. Female weevils lay a single egg on the tip of the plant; when the larvae hatch, they feed down the plants, thereby inhibiting any further growth of the milfoil. However, the weevils stop feeding in late August or early September and begin leaving the water to overwinter on shore in the leaf litter. The weevils do not return to the water until late May when the milfoil plants have already undergone significant growth. Although very large numbers of weevils will significantly reduce milfoil biomass during the months of July and August, milfoil usually reestablishes itself for spring growth in late summer and early fall when the weevils have moved to shore. Therefore, when compared to the aquatic moth mentioned above, the moth appears to have the more efficient long-term biocontrol method; although further research is needed on the reproductive patterns and foraging behaviors of both of these insects.

For more information on these aquatic insects, contact:

Robert L. Johnson
Section of Ecology and Systematics
E150 Corson Hall
Cornell University Tel (607)257-2064 email pjv2@cornell.edu.
The Biocontrol of Eurasian Watermilfoil web site is located at
http://www.cadif.cornell/~pjv2/herb.html

Leaf Beetles, *Galerucella calmariensis* and *Galerucella pusilla*

Although more research is needed, it appears that two species of leaf beetle--*Galerucella calmariensis L.* and *Galerucella pusilla D.*--are capable of severely reducing the biomass of purple loosestrife when introduced into a population. The two species have similar life characteristics; in fact, the eggs and larvae of the two species are indistinguishable. In the spring, the female deposits batches of 2-10 eggs on the leaves and stems of the plant; and as soon as the young larvae hatch, they start to feed on the developing leaf buds. The beetles have been found to feed from the top to the bottom of the plant and pupate in the soil; adults overwinter in the leaf litter. The insects are host-specific and appear to crash in numbers once the loosestrife crop is eliminated or greatly reduced. However, before the population crashes, adults may disperse to a different, nearby population of purple loosestrife to continue the species. Leaf beetles can be reared at home or ordered by contacting suppliers such as Dr. Bernd Blossey of Cornell University.

For more information on the leaf beetle and the control of Purple Loosestrife, contact:

Dr. Bernd Blossey,
Department of Natural Resources
Fernow Hall, Cornell University
Ithaca, NY 14853 Tel (607)255-5314 email bb22@cornell.edu.
A web site is available at http://www.dnr.cornell.edu/bcontrol/weeds.htm

Crayfish, *Orconectes immunis*

Crayfish have long been studied as an ideal candidate for biological control of aquatic plants. In fact, in 1989, researchers experimented with crayfish in Conesus Lake to determine the effectiveness of the crayfish *Orconectes immunis* as a submerged macrophyte grazer. In this study, the scientists experimentally evaluated the ability of the crayfish to reduce macrophyte biomass while addressing two concerns: the density of crayfish needed to control aquatic plants, and the best time the crayfish should be introduced into the ecosystem for maximum control (Letson and Makarewicz 1991).

As for the density of the crayfish needed for effective control, researchers concluded that the crayfish significantly decreased macrophyte biomass when levels exceeded 140-150 grams of crayfish/m^2; this corresponds to approximately 88 crayfish/m^2 or about 88,000 crayfish/ha (356,275 crayfish/acre). Using crayfish as a biological control agent of macrophytes could be extremely expensive for a single acre; in 1991 crayfish prices were cited at about $2750 for 50,000 crayfish. This would put a single acre at a cost of about $19,595 (again, in 1991). Despite this high initial cost, researchers believed that the utilization of crayfish was feasible since only a single introduction of crayfish was needed for years of aquatic plant control; this method did not seem to require yearly maintenance as with other management practices. However, it is important to add that the crayfish in this experiment were protected from their predators, including fish, birds, mammals, and man Therefore, although crayfish appear to be an effective biological control of macrophytes, further study is needed to evaluate their success in the presence of predators (Letson and Makarewicz 1991).

It appeared that the maximum control of macrophytes, the second issue addressed, was achieved when the plants were not yet well developed, early in the growing season. However, if the crayfish eliminated all the vegetation at this time, their protective cover from predators would be removed Excessive predation would therefore decrease the ability of the crayfish to be an effective biological control for that growing season and the years to come.

Waterfowl and their Impact When Combined With Winter Drawdown

Waterfowl can be effective macrophyte control agents when used in conjunction with other management practices such as winter drawdown. For example, a 1992 report on Cayuga Lake noted that waterfowl considerably reduced the amount of aquatic plant material, such as stems, rhizomes, turions, tubers, and seeds, in the bottom sediments when the lake level was reduced. The Canada goose and several species of ducks

contributed to the significant loss of vegetative parts of plants such as *Potamogeton crispus* and *Vallesnaria americana*, their favorite types of food (Hairston, Johnson, and Bouldin 1992).

Chemical Control

Chemical control of macrophytes is usually regarded as a last resort to management because of the potential ecological impact imposed by the introduction of unnatural substances to the water body. There is also a lengthy legal process and an extensive body of precautionary measures that must be met to safely and effectively apply the chemical. First of all, any person(s) interested in the chemical control of macrophytes is advised to allow plenty of time for the process of deciding on an appropriate chemical and applying for the permit; it is highly recommended to involve an experienced professional to aid in this process. The amount of time and energy spent on this procedure depends on several items; one of the more basic is the size of the water body. For example, there are two different applications available to land owners dependent upon if the targeted area is less than or larger than one acre. Most of the information provided in this section is targeted at treating water bodies that are larger than one acre, although many of the terms and conditions are the same for small ponds.

When considering a chemical application, it is imperative to the identity the target populations. There are chemicals that target specific types of macrophytes while others, known as broad-spectrum chemicals, are effective on a variety of species. In different dosages, broad-spectrum chemicals can suppress or eliminate all types of vegetation within a water body.

Before getting into the details of a chemical management plan, it is important to understand the advantages and disadvantages of using aquatic herbicides, as cited by the Army Corps of Engineers based on their extensive experimentation. First, depending on the chemical used and the frequency of the application, aquatic herbicide usage can be less expensive than other control methods. In addition, herbicides can be used for ponds and lakes of various sizes and are easily applied around underwater obstructions such as docks. However, the short-term and long-term effects of many chemicals are either unknown or have variable results in different water bodies and under different circumstances. **Some herbicides have swimming, drinking, and water use**

restrictions; and as mentioned above, non-targeted plants as well as nuisance plants may be adversely impacted by these chemicals. Depending on the herbicide used, it may take several days to weeks, or several treatments during the growing season, before the applied chemical controls the targeted macrophyte. Furthermore, fast-acting herbicides may quickly reduce oxygen levels within the water body, thereby resulting in fish and other aquatic life losses. To be most effective and avoid unwanted outcomes, knowledge of the herbicide and the specific stages of the target plant are necessary. Most importantly, safety precautions are essential in storing, handling, applying, and disposing of the chemical. It should be noted that many people have strong feelings against the usage of herbicides; therefore, it is beneficial to have the public involved and educated in the treatment process to avoid as many conflicts as possible.

Selecting a Chemical

There are only six chemicals in New York State legally available for use in aquatic macrophyte control. These six chemicals are Fluridone (Sonar), Glyphosate (Rodeo, Roundup), Endothall (aquathall), 2,4-D, copper sulfate, and Diquat Dibromide. Descriptions of the chemicals are included in the application packet sent by the Department of Environmental Conservation to lake-owners interested in using chemicals for aquatic plant control; a copy of the application packet can be found in the appendix of this manual. Also included in the appendix are two tables; Appendix 1 provides the responses of common aquatic weeds to the six chemicals, and Appendix 2 lists aquatic weed control use restrictions for each of the chemcials.

Many lake-owners have considered the use of dyes, such as Aquashade, for controlling the growth of aquatic macrophytes. Aquashade acts to restrain plant growth by inhibiting photosynthesis. The dye functions to filter out the necessary sunlight needed by plants to grow and is considered a plant growth regulator because it does not completely eliminate the plants. Aquashade can be used for an entire water body; this includes lakes and ponds of all sizes. However, it cannot be used for spot treatment because the dye disperses rapidly throughout the entire water body; as a result of dispersal, a lower concentration of the dye would be less effective. **Contrary to popular belief, dyes, such as Aquashade, require a permit for use; therefore an application must be filed with the DEC before they can be used.**

When considering which chemical may be right for a particular body of water, it is useful to explore any effects the chemical may have on the surrounding area. For example, the chemical may have a negative impact on irrigation or domestic water supplies, livestock, pets, waterfowl or other animals, and valuable vegetation such as trees. In some cases, lake-owners who are responsible for the application of a chemical must supply drinking water to all affected persons if water supplies are impacted.

It is also highly desirable to have a good understanding of the physical characteristics of the water body, especially the pH, total hardness, and temperature. These determinations can be made by private laboratories or through inexpensive kits. Knowledge of the water's physical characteristics and of the desired chemical is important because some chemicals are ineffective at certain temperatures, pH values, etc. Contacting professionals and/or comparing literature and product labels of chemicals will help to determine which compound is suitable for a certain water body. It is very important to make sure that the product is legal and approved by the Department of Environmental Conservation before it is considered for use.

The type of chemical needed depends on the type of macrophyte to be controlled. Liquid formulations of herbicides are almost always recommended for floating and emersed weeds. These plants require surface applications, and the spray mixture can be applied directly to them. Herbicide formulations for control of submersed weeds and algae in static water can be liquid, wettable powders, or granules. Liquid and dry powder formulations applied into the water are usually calculated in parts per million (*p*arts of active ingredient in chemical *p*er *m*illion parts of water, ppm). This means that the volume of water to be treated must be calculated.

Any chemical decided upon for use in aquatic plant control must be purchased through a certified pesticide dealer or business; the information about the licensed chemical supplier is almost always required as part of the application process for a permit. In addition, if the body of water is larger than one acre and has more than one landowner, a licensed pesticide applicator must be hired to apply the chemical. In many cases, the pesticide applicator should be contacted from the very beginning of the process and assist in completing the application for the permit. The licensed applicator will determine the volume of the water body and the dosages of the chemical needed. Some of the businesses will even assist the lake-owner in deciding which chemical will be the most appropriate for a specific water body.

Listed below are registered pesticide businesses, located in the DEC Region 8 and 9 areas, that can assist in aquatic control:

Parkway Tree Surgeons
7130 Heath Markham Rd.
Lima NY 14485
(716) 624-2750

J. J. & J Exterminating
Joe Schmidbauer
9450 Chestnut Ridge Rd.
Middleport, NY 14105

Upstate Applications
Robert Fahy
211 Washington St.
Wayland NY 14572
(716) 728-9299

AquaTech Environmental
David Adrian
(716) 941-6025

Applying for a Permit

The first step in applying for a permit is to contact the regional Department of Environmental Conservation office and request an application. A copy of the application packet sent by the DEC for using chemicals on a body of water larger than one acre is included as Appendix 4. The packet includes: a list of the major items required for a completed application, application form, instruction sheet, Part 327—regulations for control of aquatic vegetation, sample Riparian Owner/User Consent Letter, Certification of Notification of Riparian Owners and Users, and guidance for aquatic herbicides and diquat use. In the case of most chemicals, the DEC requires that it receive the permit application from a lake-owner at least 45 days prior to scheduled treatment. Since many chemicals are most efficient in the spring before excessive plant growth, it is highly recommended to begin the application process at least 6-12 months before the planned chemical application date. Completing an application can be a very time-consuming project when considering all the information that must be included with the form. The major items required for a completed application are listed below:

1. A completed application form and $50.00 application fee.
2. The relevant portion of the USGS quadrangle map of the water body or stream(s) proposed for treatment.
3. A detailed map of the water or stream system proposed for treatment with depth contours and identified features described in the application form and instructions.
4. A copy of the letter sent to all riparian owners/users of the water body or stream system proposed for treatment.
5. A list of all affected riparian owners/users to whom the consent letter was sent and proof in the form of post office receipt to confirm that the notice was mailed or proof of delivery service in the form of a receipt from the server.
6. A completed copy of the Certification of Notification of Riparian Owners and Users.
7. A copy of the water body association Board of Directors resolution authorizing the application for the permit, if you are completing the application for an association which is seeking a permit.
8. If the treatment is proposed by aircraft, a discussion of environmental preferability for aerial application.

(Other requirements and stipulations are included in the instruction sheet provided by the DEC)

For requirements 2 and 3, if current bathymetric maps detailing lake depths and contours are not available, a consultant can be hired to do the job. The consultant may also be able to save a step of the application process by determining the densities of the targeted macrophyte.

The Riparian Owner Consent Letter, mentioned in requirements 4-6, is an opportunity for riparian owners to show consent or objection to the treatment. In some cases, all the owners on a lake have to be notified; in other cases, only the owners within a 1/2 mile radius must be notified. For this reason, the letter should be sent out early in the process. It is also beneficial to allow extra time for any problems that may arise from seasonal and/or permanent addresses. Owners will have 30 days to respond and there may be a few negative responses received. Objectors must demonstrate significant economic or water use hardship for a permit to be denied. Dislike or apprehension of chemicals is not sufficient to inhibit a permit. For reasonable objections, a hearing may be conducted to determine whether the application will be detrimental to the lake or its owners.

Finally, as stated in the application packet, the regional DEC's Bureau of Pesticides Management office can assist lake-owners in completing the application process if help is needed.

DEC Reasons for Denial of a Permit

There is always the chance that the DEC will deny an applicant a permit to apply a chemical, even if he/she follows the regulations listed in Part 327 and the application is entirely complete. As stated by Region 6 DEC Permit Specialist, Tom Beschle, the most common reasons for denial are usually related with the individual applicant not following the instructions on the chemical label. The pesticide may not be legal in New York State, or the dosages may not be correct. Many of the labels on the chemicals restrict use when there is an outlet or if the area is too shallow. In this respect, the DEC will thoroughly compare the chemical label with the proposed area of treatment. This problem is usually the result of a private landowner attempting to apply a control agent to a pond. This is generally not a problem in lakes as a certified applicator has to be used to apply chemicals to a lake situation.

The DEC does not usually make the decision for a permit issuance alone. One of the reasons that the reply period for a permit issuance is so long is that the DEC pesticide specialist sends the application to other state departments or agencies, such as the fisheries units and health departments, for their consideration and input on the proposed chemical application. The DEC will then take into consideration any objections from

these departments, such as fish and wildlife impairment or water quality concerns, when making the final decision. For Region 8, the pesticide specialist, Gale Mordimer, will most likely review the application and decide upon permit issuance.

Potential Issues of Concern on Chemical Control of Aquatic Macrophytes in Conesus Lake

1. An applicant for a permit can be a landowner or an association of landowners.
2. Since Conesus Lake is larger than one acre and has more than one landowner, a licensed pesticide applicator must be hired to apply any chemical agent.
3. For application to occur, consent for usage has to be granted from all riparian owners and vested riparian users. Depending on the area to be chemically controlled, at a maximum, all landowners on the lake would have to give permission for chemical control. If no objection occurs after receiving a consent letter from the applicant, chemical control may be permitted. Also, a permit may be granted if the applicant demonstrates to the to the satisfaction of NYDEC that any nonconsenting riparian users will notsignificantly adversely affected by the use of the chemical.
4. NYSDEC will not permit chemical control unless aquatic plants are interfering with human activities such as swimming and boating.
5. Any treatment which would result in demonstrable harm to fisheries resources may be denied or conditioned as the situation warrants.
6. It is likely that for <u>some</u> chemical application, there would have to be no flows from the lake for a period of 14 days. This would appear to narrow the time of application to a period probably during the late summer.
7. SONAR may be used in lakes that cannot control outflow and is commonly used to control milfoil – a problem species in Conesus Lake. Whether or not SONAR can be used in Conesus Lake will apparently depend on the outflow rate. To be effective, SONAR requires a 30-day contact time and 60 to 75-day contact period is better. Unfortunately, SONAR does not work well in wind-swept lakes such as the Finger Lakes.
8. Swimming may be prohibited in treated waters for a period of 24 hours after application.
9. There are two drinking water intakes within Conesus Lake. No permit will be issued for chemical treatment of water supply waters if the resultant chemical concentrations at the water supply intake exceeds New York State Department of Health Drinking Water Standards. Any application for chemical control on Conesus Lake will probably be submitted to the New York Department of Health for review as well as NYSDEC.
10. Cost – To treat with SONAR at a concentration of 8 ppb, cost factors as high as $100 to $120 per acre are possible. With a surface area of 3,000 acres, the cost of applying a control agent to the entire surface area of Conesus Lake becomes very high.

Developing a Lake Management Plan

After all the alternatives available for the control of macrophytes are understood, the first task for a lake association or private pond-owner is to develop a lake management plan. This planning stage involves everyone who is affected by the aquatic plants or who owns part of the water body. It may or may not be an easy job to compromise and agree on an appropriate method; but there is help out there, and it is almost essential to talk to a professional at some point through the process. Most importantly, it is essential to follow the rules and regulations set out by such organizations as the Department of Environmental Conservation and the Environmental Protection Agency for several reasons. Apart from guarding the health and safety of humans, these regulations exist to protect our valuable and vulnerable water resources, so that they will remain a natural thriving ecosystem for many years to come.

More Useful Contacts and Web Sites

Water Resources Board - FL-LOWPA
Betsy Landre, Program Coordinator
309 Lake Street
Penn Yan, NY 14527 (315) 536-7488
http://www.nysfola.org

Federation of Lake Associations (FOLA)
New York State Federation of Lake Associations Inc.
2701 Shadyside Drive
Findley Lake, NY 14736
Tel/FAX (800) 796-FOLA or (716) 769-7815
http://www.nysfola.org

NYS DEC
Division of Water
50 Wolf Rd
Albany, NY 12233-3508 Lake Programs Dr. Jay Bloomfield Tel. (518) 457-0731
Mr. Scott Kishbaugh Tel. (518) 457-0734

University of Florida, Center for Aquatic and Invasive Plants
http://aquat1.ifas.ufl.edu/

http://www.wa.gov/ecology/wq/plants/index.html

http://www.apms.org/

http://www.saj.usace.army.mil/conops/apc/outside_sites.htm (The space in this address is a _ symbol)

http://www.execpc.com/~aqsys/weedid.html

http://www.capital.net/com/lga/links.html

http://www.cadif.cornell.edu/~pjv2/pondpage.html

http://www.fw.umn.edu/research/milfoil/milfoilbc.html

http://nas.nfrcg.gov/dicots/my_spica.html (The space in this address is a _ symbol)

http://www.conservation.state.mo.us/manag/aqgfloat.html

http://www.conservation.state.mo.us/manag/aqggrass.html

http://www.conservation.state.mo.us/manag/aqgalgae.html

http://www.ag.ohio-state.edu/~ohioline/a-fact/0004.html

http://www.extension.umn.edu/Documents/D/G/DG6955.html

http://www.state.nh.us/des/bb-1.htm

http://www.ext.vt.edu/pubs/waterquality/420-013/420-013.html

http://www.mnlakesassn.org/

http://invasives.fws.gov/

References

Hairston, N.G., R.L. Johnson and D.R. Bouldin. 1992. Mechanical harvesting effects on aquatic macrophyte community structure in Cayuga Lake. Report to the Seneca County Soil and Water Conservation District.

Letson, M. and J.C. Makarewicz. 1994. An experimental test of the crayfish as a control mechanism for submersed aquatic macrophytes. Lake and Reservoir Management. 20:127-132.

Makarewicz, J.C., T.W. Lewis, R. Dilcher, M. Letson and N. Puckett. 1991. Chemical analysis and nutrient loading of streams entering Conesus Lake, NY. Report to the Livingston County Planning Department. Available from Drake Memorial Library, SUNY Brockport, Brockport, NY.

Makarewicz, J.C. and T.W. Lewis. 1999. Soil and nutrient loss from sub-watersheds in the southwest quadrant of Conesus Lake. Report to the Livingston County Health Department and the Livingston County Planning Department. Available from Drake Memorial Library, SUNY Brockport, Brockport, NY.

Information also obtained from:

Cornell Cooperative Extension Publications

New York State Department of Environmental Conservation publications

New York State Federation of Lake Associations, Inc. publications

Penn State College of Agricultural Sciences Cooperative Extension publications

United States Department of Agriculture publications

Web sites included in this manual

A workshop on the control of Eurasian Watermilfoil (July 1999)

Appendix

Appendix 1. Responses of common aquatic weeds to herbicides

Appendix 2. Aquatic Weed Control Use Restrictions

Appendix 3. "1999 Guidance for Aquatic Herbicides" from Division of Fish and Wildlife and Marine Resources of NYSDEC.

Appendix 4. Application packet provided by the Department of Environmental Conservation. Includes "Sample riparian owner/user consent letter" and "Certification of notification of riparian owners and users"

Appendix 5. New York State Conservation Law 427(3). Part 327 Use of Chemicals for the Control or Elimination of Aquatic Vegetation.

Appendix 1

Response of common aquatic weeds to herbicides.

Aquatic group and weed	Aquatic Herbicides: copper complexes copper sulfate	2,4-D	diquat	endothall	fluridone	glyphosate
Algae						
planktonic	E	P	P	P	P	P
filamentous	E	P	E	G[1]	P	P
chara	E	P	G	G[1]	P	P
nitella	E	P	G	G[1]	P	P
Floating Weeds						
bladderwort	P	G[2]	E		E	
duckweeds	P	G[3]	G	P	E	
water hyacinth	P	E	E		P	G
watermeal	P	P	P-F		F-G	
Emersed						
alders	P	E	F	P	P	E
alligatorweed	P	F	P	P	G	E
American lotus	P	E	P	P	F	G
arrowhead	P	E	G	G		E
buttonbush	P	E	F	P	P	G
cattails	P	G	G	P	F	E
fragrant and white waterlily	P	E	P		E	E
frogbit	P	E	E			
maidencane	P	P	F		F	E
pickerelweed	P	G	G		P	F
pond edge annuals	P		G	P	F	E
sedges and rushes	P	F	F		P	G
slender spikerush	P		G		G	P
smartweed	P	E	F		F	E
spatterdock	P	E	P		E	G-E
southern watergrass	P	P			G	
torpedograss	P	P	P		F	G
watershield	P	E	P	P	G	G
water pennywort	P	G	G		P	G
water primrose	P	E	F	P	F	E
willows	P	E	F		P	E
Submersed Weeds						
broadleaf water-milfoil	P		E	E	E	P
coontail	P	G	E	E	E	P
egeria	P	P	G	F	E	P
elodea	P		E	F	E	P
eurasian water-milfoil	P	E	E	E	E	P
fanwort	P	F	G	E	E	P
hydrilla	F[4]	P	G	G	E	P
naiads	P	F	E	E	E	P
parrotfeather	P	E	E	E		F
pondweeds (Potamogeton)	P	P	G	E	E	P

E = excellent control; G = good control; F = fair control; P = poor control
[1]Hydrothol formulations only.
[2]Granular 2,4-D formulations.
[3]Liquid ester formulations only.
[4]Copper complexes.

Division of Fish and Wildlife & Marine Resources
Bureau of Habitat
April 15, 1999
Prepared by T. Sinnott

1999 GUIDANCE FOR AQUATIC HERBICIDES

The purpose of this memorandum is to provide guidance to all regional Fish, Wildlife and Marine Resources Staff who review aquatic vegetation control applications so they may be aware of the chemicals which are generally approved for use, the allowable dosages for each chemical, and other concerns and issues related to specific herbicides. General conditions for waters open to the public are also provided. The Pesticide Control Specialist in each region should have available copies of the labels for each pesticide formulation as registered with EPA and the Department of Environmental Conservation. Always consult the label to determine the amount of active ingredient in the chemical proposed for use.

Copper sulfate ($CuSO_4 \cdot 5H_2O$) For control of algae, copper sulfate can be applied to lakes or ponds at whatever dosage would result in a concentration of 0.3 ppm when dissipated to the bottom or to a depth of six feet, whichever is less (0.815 pounds per acre foot of water). For lakes deeper than six feet, only the upper six feet can be treated. Solid forms such as crystals or "snow" are not to be spread directly into water for algae control. Solid forms must be dissolved either by dragging bags behind a boat or by dissolving in water prior to applying by spraying. Best control of floating mats of filamentous algae is achieved by spraying a solution of copper sulfate on the surface at the proper dosage. 6NYCRR Part 327.6(a)(4) states that "The above [0.3 ppm] is based upon water of average alkalinity for the State (100 ppm or more). In softer waters, a reduced dosage may be required." The Bureau of Habitat has interpreted this limitation in the following manner: In water of 100 ppm hardness or greater, allow 0.3 ppm copper sulfate. If the hardness is between 50 - 100 ppm hardness, allow 0.2 ppm copper sulfate (0.543 pounds per acre foot of water). If the hardness is less than 50 ppm, allow only 0.1 ppm copper (0.272 pounds per acre foot of water). Water supply reservoirs may be treated without a permit, but applications must still comply with label conditions and applicable regulations. A two week separation period is required between a copper sulfate treatment and use of any other chemical. Repeat treatments are permitted at not less than 2 week intervals. Users of copper based products should be warned that much of the copper applied to the water will settle to the bottom and accumulate in the sediments. It may eventually cause toxicity to bottom-dwelling benthic organisms.

Cutrine, Cutrine Plus and other copper compounds are permitted in place of copper sulfate for algae control provided the dosage of elemental copper applied does not exceed the equivalent amount of elemental copper in a concentration 0.3 ppm copper sulfate for water with hardness greater than 100 ppm. As with copper sulfate, the

treatment is limited to the upper six feet. For ponds less than six feet deep, the total volume of copper applied must be correspondingly reduced. Elemental copper comprises 25.4% of copper sulfate pentahydrate, so a 0.3 ppm concentration of $CuSO_4 \cdot 5H_2O$ would contain 0.076 ppm elemental copper, or 0.2 pounds per acre foot. Cutrine has 0.76 pounds of copper per gallon, so 0.27 gallon per acre foot is permitted in the upper six feet of depth. The same guidance applied to copper sulfate in waters with hardness less than 100 ppm also applies to the use of cutrine. To achieve a copper concentration equivalent to 0.2 ppm copper sulfate in waters with hardness between 50 - 100 ppm, 0.18 gallons of cutrine should be applied per acre foot of water. To achieve a copper concentration equivalent to 0.1 ppm copper sulfate in waters with hardness less than 50 ppm, 0.09 gallons of cutrine should be applied per acre foot of water.

Cutrine Plus has 0.909 lb copper per gallon, and the dosage allowed is 0.23 gallon per acre foot. In waters with hardness between 50 - 100 ppm, the allowable dosage is 0.15 gallons per acre foot of water. In waters with hardness less than 50 ppm, the allowable dosage is 0.08 gallons per acre foot of water. For Cutrine and Cutrine Plus, this is less than the dosages recommended on the labels. All other requirements are the same as for copper sulfate. Cutrine Plus Granular is registered by EPA and New York but has never been permitted because the recommended dosage of 0.4 ppm of elemental copper is 5 times the copper concentration allowed by 6NYCRR Part 327.6(a)(4).

Recently a product similar to Cutrine called **Nautique** was registered in New York that is labeled for control of aquatic macrophytes. 6NYCRR identifies restrictions for copper sulfate when it is used to control algae, but the regulation does not prohibit the use of copper products to control macrophytes. The Programmatic EIS for the aquatic vegetation control program states: "Other chemicals containing copper which are registered for use in New York State have been permitted in the past at the same rate of dosage as has been permitted when using copper sulfate, since the cupric ion is the same toxic ingredient". When applied according to the label, Nautique has the potential of being applied at much higher concentrations than are currently allowed for copper sulfate. This product has not been reviewed by the Division of Fish, Wildlife and Marine Resources, and its' use as a macrophyte control is not addressed or covered by the aquatic vegetation control programmatic EIS. Furthermore, the Environmental Hazards section of the Nautique label explicitly states that "Trout and other species of fish may be killed at application rates recommended on this label." Nautique is currently only registered for control of five species of aquatic plants: *Hydrilla verticillata*, Egeria (Brazilian elodea), southern naiad, horned pond weed, and wedgeon grass. These particular plants are not widespread in New York, nor have they been targeted for control by herbicides in New York in the past. However, Egeria could easily be confused with Elodea canadensis, which is common in New York. Southern naiad (*Najas guadalupensis*) is related to *Najas minor* and *Najas flexilis*, and these species could be easily confused. If someone should request to use Nautique for macrophyte control, they should be required to demonstrate that the aquatic plant species targeted for control is in fact one of the five species identified on the label. The amount of Nautique to be applied

should be carefully evaluated along with the overall size of the treated area and the size of the lake or pond. If the final concentration of copper in the water column would exceed that allowed for copper sulfate, (0.076 mg/l of elemental copper) an EIS review might be necessary before Nautique could be used, since the use of copper to control aquatic macrophytes is not addressed in the aquatic vegetation control PEIS.

Diquat Dibromide Diquat applications may be permitted when: 1) the applicant owns or holds a lease for the entire shoreline of the water body to be treated, or consent has been granted from all riparian owners and vested riparian users (by not having objected after receipt of the consent letter from the applicant); and 2) there will be no outflow from the water body during the 14 days after Diquat application, and no adverse impacts to the water body or downstream water body will result from holding the water for 14 days. A permit must be denied when: 1) the applicant does not own or hold a lease for the entire shoreline and an owner or vested riparian user objects to the proposed treatment; or 2) there exists an outflow from the water body which the applicant cannot hold for 14 days following treatment. These conditions are derived from the Aquatic Use Directions on the federally-approved label that state: "For application only to ponds, lakes and drainage ditches where there is little or no outflow of water and which are totally under the control of the product's user". Diquat is not to be applied to waters less then 3 feet deep and must be applied by surface broadcast of a solution diluted in at least 200 parts water, in accordance with the NYS Special Local Needs Registration for Diquat.

Endothall There are several formulations of this herbicide which are particularly useful in controlling specific aquatic vegetation problems. Aquathol "K" uses the dipotassium salt of endothall in liquid form as its active ingredient and is especially effective for control of Najas spp, Potamogeton crispus, Ceratophyllum spp, and Zannichellia palustris. Aquathol Granular is the same chemical in granular form and provides a slow release of the active ingredient at the lake or pond bottom thus having less impact on the entire water column. Dosage should not exceed 3 ppm of active ingredient for entire pond or lake treatment or 4 ppm for spot or marginal treatments. Hydrothal 47 (Liquid) and Hydrothal 191 (Granular) contain dimethylalkylamine salts of endothall (acid). These chemicals can cause fish kills at dosages slightly above 0.3 ppm acid equivalent. They may be permitted for control of filamentous algae and in localized sites such as swimming areas and drainage ditches at dosages up to 0.2 ppm acid equivalent if fish are present. If no fish are present, the higher dosages up to 0.8 ppm may be allowed to provide longer lasting control. The lower dosage where fish are present may have to be repeated several times in a season when algal growth reappears.

Simazine (Trade name Aquazine) Currently, no products containing simazine as the active ingredient are registered for outdoor use in New York state. Accordingly, no permit applications for simazine products should be approved.

2,4,5-TP (Silvex) No herbicides containing this active ingredient may be authorized due to the potential for dioxin contaminants.

2,4-D The toxicity of different formulations of 2,4-D to fish vary widely. In order to prevent toxicity to fish, the most toxic formulations should not be used. Therefore:

1. Granular formulation of the dimethyl and diethyl amines, salts, or iso-octyl ester may be used. Application rates of these granular formulations should not exceed 20 lb. active (acid equivalent) per acre (i.e. 100 lb/acre of a 20% active acid equivalent formulation), except that up to 40 lb. active (acid equivalent) per acre may be permitted for control of coontail and emergent aquatic vegetation using only granular formulations of dimethyl or diethyl amines or the salts of 2,4-D.

2. Liquid formulations of the dimethyl or diethyl amines, salts, or the iso-octyl ester of 2, 4-D may be permitted for the control of emergent aquatic vegetation at a rate of up to 4 lb. active per acre as . acid equivalent unless water depths in the control area exceed 2 feet and the plants targeted for control are an extremely dense stand. In the latter case, dosage rates of up to 8 lb-/acre as acid equivalent of the same formulations may be permitted.

3. 2,4-D should only be used for the control of milfoil, coontail, waterstargrass, and emergent vegetation.

Fluridone Fluridone is known commercially as Sonar, and is available in two formulations - a slow release pellet (SRP) and an aquatic suspension (AS). The AS formulation can only be used to treat Eurasian Watermilfoil and Duckweed. Swimming is prohibited in waters treated with the AS formulation for 24 hours following the treatment. The SRP pellets may be used to treat other species of vegetation, as identified on the label, but pellets cannot be applied in water less than two feet deep. The SONAR label also states that "for best results, treatment areas should be at least five acres in size." Fluridone is somewhat selective for Eurasian milfoil, and milfoil is one of the first aquatic plants to begin growing in the spring. In order to maximize its effectiveness, fluridone treatments specifically for milfoil should occur as early as possible in the season, preferably before May 15. A supplemental EIS covering the use of fluridone has been completed and approved by the Department of Environmental Conservation. To be effective, fluridone must be in contact with the target vegetation for an extended period of time. Recent label revisions have focused on the use of very low doses of fluridone, in the range of 10-20 parts per billion, coupled with a measuring system for rapidly determining the ambient concentration in water. With this system, repeat applications are made whenever the measuring system determines that the fluridone concentration is about to drop below efficacious levels. This process is likely to result in more selective control of Eurasian watermilfoil, while leaving native, indigenous species relatively unaffected. Since the overall water concentrations of fluridone are much lower, this is a preferable mode of application even if it goes beyond the recommended 15 May "treat by" date.

Glyphosate Glyphosate is an effective herbicide for controlling emergent and floating

vegetation. It must be applied to foliage in order to be absorbed. It is not effective against submerged vegetation because it is rapidly diluted and dissipated in the aquatic environment. Glyphosate should not be applied to vegetation ½ mile upstream of a drinking water intake in flowing water, or within ½ mile of a drinking water intake in a ponded water. Applications should be made to actively growing plants to maximize effectiveness, and spray nozzle settings must be set to avoid fine mists which are capable of drifting. A supplemental EIS covering the use of glyphosate has been completed and approved by the Department of Environmental Conservation.

Pond Restoration/Water Quality Improvement Products In the past few years, an increasing number of Pond Restoration or water quality improvement products have appeared on the market, such as *Algae-Tron, BacMan, Bacta-Pur, PondSaver, and POWER.* These products contain concentrated volumes of native soil bacteria that clarify water by "consuming" excess nutrients. These products were originally developed for use in hatcheries to clean up uneaten fish food and waste. Many of the modern products are marketed on the basis that they can control algae and suppress the growth of aquatic macrophytes. The EPA recently ruled that products that make pesticidal claims, such as "control" algae, or "suppress" aquatic plant growth, are in fact pesticides and must be registered. None of these products are currently registered as pesticides in New York. Current guidance from the EPA is that if products make specific claims to suppress or control the growth of algae or aquatic plants, then they should be considered as pesticides. They must be registered both by the EPA and New York State, and according to 6NYCRR Part 326.2(h) can only be applied by certified applicators with a permit. If the products do not make pesticidal claims, but only claim to clarify the water, or improve water quality, then they are not considered to be pesticides, can be applied by anyone, and a permit is not required. This guidance is consistent with the guidance being provided to regional pesticide control specialists. these products are not toxic or otherwise harmful to fish or aquatic invertebrates..

General Conditions in Waters Open to the Public

Waters open to the public include all of the larger lakes in the state where the bottom of the lake is state owned up to mean low water line. These include the Great Lakes (Erie, Ontario), Chautauqua Lake, Lake Champlain, Lake George, Oneida Lake and the Finger Lakes (except Hemlock). Other lakes where the ownership of the bottom may be uncertain are considered open to the public whenever there is any publicly-owned land touching the shoreline of the lake and such lands are not posted or regulated against general public access. In all such water open to the public, the following guidelines should be considered before recommending in favor of the issuance of a permit for use of chemicals in water to control aquatic vegetation:

a. Aquatic plants that are not interfering with human activities such as swimming and boating should not be treated. Previous guidance had

stated that:

> "Treatment for rooted aquatics (vascular plants) may not be done more than 200 feet from shore or in water over six feet deep."

6NYCRR Part 327 does not specify such a limitation, except as a specific condition regulating the use of diquat dibromide (6NYCRR Part 327.6(b)(5)) and 2,4-D (6NYCRR Part 327.6(c)(5). For permit applications requesting the use of these herbicides the older guidance is still applicable. Such a restriction cannot be specifically applied to endothall, fluridone, or glyphosate without a revision of 6NYCRR Part 327. Accordingly, in waters open to the public, herbicide treatments should be limited to areas where swimming, boating, and other human activities are adversely impacted because of excessive growth of aquatic vegetation. Herbicide treatments should not occur when the targeted aquatic vegetation is so deep as to not interfere with human activities, no matter how close to the shoreline the vegetation is located.

b. Undeveloped shorelines should not be treated.

c. Shorelines adjacent to publicly-owned lands may be treated only with concurrence of the agency having jurisdiction of such lands.

d. The number of treatments allowed in a single year is governed by the pesticide product label, except for diquat dibromide, for which there is a regulatory prohibition on consecutive treatments in the same season (6NYCRR 327.6(b)(6)).

e. Any treatment which would result in demonstrable harm to fisheries resources may be denied or conditioned as the situation warrants, however, the use of less than the labeled application rate is not an acceptable condition.

f. The use of an aquatic herbicide within a regulated wetland requires an Article 24 permit in addition to a pesticide permit. The Article 24 permit should address concerns and impacts specific to the wetland proposed for treatment.

Appendix 4

New York State Department of Environmental Conservation
Region 7 Bureau of Pesticides Management
1285 Fisher Avenue
Cortland, New York 13045-1090
(607) 753-3095, Ext. 232 (607) 753-8532 (FAX)

John P. Cahill
Commissioner

To Aquatic Permit Applicant:

The enclosed information package describes the procedures for submitting applications for aquatic permits to control aquatic vegetation, aquatic insects or unwanted fish. This information packet includes:

- an application form;
- an instruction sheet for completing the application form;
- Part 327, 328 or 329 regulations for control of aquatic vegetation, aquatic insects or unwanted fish, respectively;
- Sample Riparian Owner/User Consent Letter;
- Certification of Notification of Riparian Owners and Users; and
- guidance for aquatic herbicides and diquat use.

If you wish to make an application for an aquatic pesticide permit, please accurately complete an application, which should include appropriate items from the list below, and send complete application package to this office.

1. A completed application form and $50.00 application fee.
2. The relevant portion of the USGS quadrangle map of the water body or stream(s) proposed for treatment.
3. A detailed map of the water or stream system proposed for treatment with depth contours and identified features described in the application form and instructions.
4. A copy of the letter sent to all riparian owners/users of the water body or stream system proposed for treatment.
5. A list of all affected riparian owners/users to whom the consent letter was sent and proof in the form of a post office receipt to confirm that the notice was mailed or proof of delivery service in the form of a receipt from the server.
6. A completed copy of the Certification of Notification of Riparian Owners and Users.
7. A copy of the water body association Board of Directors resolution authorizing the application for the permit, if you are completing the application for an association which is seeking a permit.
8. If the treatment is proposed by aircraft, a discussion of environmental preferability for aerial application.

If you have further questions, please contact this office.

Bureau of Pesticides Management

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NYS Department of Environmental Conservation
Pesticides Management
317 Washington Street, Watertown, NY 13601-3787

APPLICATION FOR A PERMIT TO USE PESTICIDES
TO CONTROL AQUATIC PESTS

A $50 FEE MUST ACCOMPANY THIS APPLICATION
SUBMITTED A MINIMUM OF 45 DAYS PRIOR TO TREATMENT

John P. Cahill
Commissioner

1. Is the proposed treatment a repeat application? Yes No Old Permit #

2. Name of Application:
Address:

Phone#:

3. Body of Water to be Treated:

County: Town:

4. Pest to be Controlled:

5. Reason for Treatment:

6. Total area of Treated Water body:

Miles of Tributary Treated:

7. Size of treated area

8. Pesticide to be Used:
Name:
EPA Reg. #

9. Application Rate:
Lb/Acre:

10. % Active Ingredient:

11. Quantity of Chemical per Treatment:

12. Method of Application:

13. Number of Treatments:

14. Approx. Dates of Treatment:

15. Are other pesticide applications going to be made to this body of water:
Yes No If yes, supply details on a separate sheet.

16. New York State Certified Applicator Name:
I.D. #: Category/Subcategory: Business Reg.#

17. Have all riparian owners, both in the vicinity of the treatment area and downstream who may be required to restrict their water use as a result of this treatment:

a. approved of your plans ___ Yes ___ No
b. agreed to use restrictions ___ Yes ___ No

NOTE: Please attach a list of the riparian owners contacted and a sample of the letter used to notify them.

18. Can water level be controlled: ___ Yes ___ No
Estimated flow in C.F.S. during and after treatment:
Number of days flow can be restricted:

19. Name and location of any known water intakes in the area:

20. Do treatment areas include waters on lands under the control of the Department:
___ Yes ___ No If yes, specify.

I hereby affirm under penalty of perjury, that the information on this form is true to be best of my knowledge and belief. False statements made herein are punishable as a Class A misdemeanor pursuant to Section 210.45 of the Penal Law.

Signature of Applicant_____ Date _____

FOR DEPARTMENT USE ONLY
PERMIT #

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF SOLID AND HAZARDOUS MATERIALS
BUREAU OF PESTICIDES MANAGEMENT
1285 FISHER AVENUE, CORTLAND, NY 13045
(607) 753-3095, EXT. 232

APPLICATION FOR AN AQUATIC PERMIT

For Department Use Only
Application Number _____
Water Body Name _____
Fee Submitted _____
Type of Application _____
Repeat ____ # _____ New ____

1. New application?: _____ Yes _____ No Repeat application?: _____ Yes _____ No. Prior Permit No. _____
2. Name of applicant _____
3. Applicant street address _____
4. Applicant mailing address _____
5. City & State _____ 6. Zip Code _____ 7. Telephone No. _____
8. Name of authorized person signing the application (if Item 2 is an organization) _____
9. Is the applicant a (check): _____ Riparian Owner _____ Lessee _____ Association of Riparian Owners/Lessees _____ NYS Department of Environmental Conservation representative _____ Other (specify) _____
10. Copy of Board of Directors Resolution attached (check) _____
11. Uses of water proposed for treatment (check): _____ Swimming _____ Irrigation _____ Watering Livestock _____ Public Water Supply _____ Private Water Supply _____ Fishing _____ Other (specify) _____
12. Name of water body or streams and U.S.G.S. Quadrangle(s) where water bodies are located _____
13. Water body location: Town _____ County _____
14. Total acreage of water body _____ 15. Acres to be treated _____ 16. Number of areas in water body to be treated _____
17. Does the water body have an outlet? _____ Yes _____ No. The outlet location must be provided on the detailed map of the water body.
18. If yes to 17, give estimated flow during the time of treatment in cfs _____
19. Can applicant control water level during and for the required period of time after treatment? _____ Yes _____ No
20. If yes to 19, how will this be achieved? _____
21. Miles of streams to be treated _____ 22. Number of streams proposed for treatment _____
23. Name and location of any public and private water supply intakes within the treatment area _____
    NOTE: All public and private water supply intakes must be located on the detailed map.
24. Are there any regulated freshwater or tidal wetlands in the water body or streams?: _____ Yes _____ No _____ Unknown
    NOTE: All regulated freshwater and tidal wetlands must be located on the detailed map.
25. Purpose of treatment (specific species to be controlled) _____
26. Specify fish to be stocked (a Department Stocking Permit is required) _____
27. Chemical Requested (Product Name) _____ 28. EPA Registration No. _____
29. Active ingredient _____ 30. % Active ingredient _____

31. Application rate _____ 32. Total amount of product per application _____

33. Date(s) of treatment (month/day/year) _____

34. Method of application _____

35. Type of application equipment _____ 36. If aircraft, FAA Number _____

37. If the proposed treatment involves an aircraft, please answer the following. Does the aircraft:
    a. have a leakproof distribution system?: _____ Yes _____ No
    b. have a positive shutoff to prevent dribble?: _____ Yes _____ No
    c. have positive pump pressure to apply chemicals at the prescribed rate?: _____ Yes _____ No
    d. comply with pertinent Civil Air Board Regulations, including licensing, as well as New York State regulations?: _____ Yes _____ No

38. Are there or will there be other applications proposing to treat this water body or stream system this year?: _____ Yes _____ No. If yes, provide dates of treatment _____

39. If yes to 38, specify products proposed for use _____
and proposed dates of application _____

40. Name of pesticide business performing application _____

41. Address _____ 42. City _____

43. State _____ 44. Zip Code_____ 45. Telephone No. _____ 46. Business Registration No. _____

47. Name and certification ID number of applicator performing the application _____

The applicant guarantees that the chemicals proposed for use will be employed in conformance with all conditions of the permit; agrees to meet all conditions of the permit, if a permit is issued; accepts responsibility for the accuracy of all statements present on this application; accepts responsibility for all damage resulting from the improper use of the listed chemicals; and accepts legal responsibility for the representations made in obtaining approvals or releases, or the failure to obtain approvals or releases from affected riparian owners/users.

48. Signature of individual identified in Item 2 or 9 above _____

49. Title _____ 50. Date _____

THE FOLLOWING DOCUMENTS MUST BE ATTACHED TO THIS APPLICATION IN ORDER FOR THE APPLICATION TO BE CONSIDERED COMPLETE FOR PURPOSES OF REVIEW:

- **A check in the amount of $50.00 made payable to the Commissioner, DEC.**
- If the applicant is an association of riparian owners/lessees, a copy of the Board resolution in support of the proposed treatment.
- A list of all affected riparian owners who may be required to restrict their usage of the water as a result of the proposed treatment and who must approve the proposed treatment, must be attached to this application. The Certificate of Notification of Riparian Owners and Users must be attached.
- A copy of the letter describing the proposed treatment and associated water use restrictions that has been sent to all affected riparian owners/users identified in Item 9 must be attached to this application.
- A copy of the U.S.G.S. quadrangle containing the water body or stream(s) proposed for treatment must be attached to this application.
- A detailed map of the water body, stream or stream system, showing water depth contours, location of all public and private water supplies, water body outlets, and freshwater or tidal wetlands, must be attached to this application.
- If proposing to apply an aquatic pesticide by aircraft, a discussion of environmental preferability for aerial application is required. The environmental preferability discussion must be submitted with this application.

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF SOLID & HAZARDOUS MATERIALS
BUREAU OF PESTICIDES MANAGEMENT

INSTRUCTIONS TO COMPLETE AQUATIC PESTICIDE PERMIT APPLICATION FORM

The following numbered directions correspond to the numbered blocks on the Aquatic Pesticide Permit Application form. Please read the instructions carefully and complete the application form accordingly. If all information is not provided, or if the information is not correct, the application will be returned to the Applicant for correction. Application review will not begin until a complete, accurate application has been received by the Department.

1. Check whether your application is for a new treatment or a repeat treatment (identical to previous year). If there are any changes to your application from the previous year, you should check the new application block. Put in your prior permit number from the previous year, if applicable.

2. The name of the applicant proposing the treatment should be provided. If the application is being prepared for an organization, the applicant should be the organization.

3.-7. The address and telephone number of the applicant must be provided.

8. If the applicant in block 2 is not an individual, please provide the name of the person authorized to submit the application for the applicant.

9. Check the appropriate block to identify whether the applicant is a riparian owner or lessee, or an organization, agency or other entity.

10. Check to affirm that a copy of the Lake Association Board of Directors' Resolution authorizing the treatment is attached.

11. Check all known uses of the water proposed for treatment.

12. Provide the names of all water bodies proposed to be treated. Indicate unknown if the name(s) are not known. Specify the U.S.G.S. Quadrangle(s) on which the water bodies are located.

13. Provide the Town and County of the water body location.

14. Provide the total acreage of the water body, if the proposed treatment is for a lake, pond or similar water body.

15. Indicate the number of acres of the water body to be treated.

16. If the entire water body is not going to be treated, indicate the number of areas in the water body that is proposed for treatment.

17. Specify whether the water body has an outlet and show the location of the outlet on the detailed map of the water body.

18. If the answer to Question 17 is "yes", provide the estimated flow from the outlet during the time of treatment in cubic feet per second (CFS).

19. The applicant must indicate whether the water level in the water body can be controlled during and for the required period of time after treatment.

20. If the answer to Question 19 is "yes", the applicant must describe how the water level can be controlled.

21. If the proposed treatments for a stream or stream system, provide the miles of streams requested for treatment.

22. Indicate the number of streams in the treatment area to be treated.

23. The name(s) and location(s) of every private or public water supply intake within the treatment area must be provided. If necessary, use additional 8 ½" x 11" sheets to complete the list.

24. Check off either Yes, No or Unknown. Please make sure that all regulated freshwater and tidal wetlands are located on the detailed map.

25. The purpose of the treatment must be specified. The target insect species, vegetation species or fish species must be specified.

26. If the water body or stream is to be stocked, the fish species that will be stocked must be specified.

27. Provide the product name of the chemical proposed for use.

28. Provide the EPA Registration Number for the pesticide product proposed for use.

29. Specify the active ingredient in the pesticide product proposed for use.

30. Specify the percent active ingredient in the pesticide product proposed for use.

31. Specify the proposed application rate in parts per million or gallons per acre.

32. Specify the total amount of product per application that is proposed to be applied.

33. Specify the proposed date(s) of treatment. These must be the dates contained in the notification notice sent to all riparian owners. If dates change for any reason, the riparian owners must be renotified of the date change. The DEC Regional Office must be notified of the exact dates at least seven (7) days prior to treatment, if the dates change from those authorized in the permit.

34. Specify the method of pesticide application (e.g. ground equipment, application from boat, etc.).

35. Type of application equipment must be specified (e.g. boom sprayer from boat, etc.)

36. If application is proposed by aircraft, provide the FAA number.

37. Information must be provided about the aircraft and the aircraft application equipment, including leakproof distribution system, positive shutoff, positive pump pressure and compliance with Civil Aeronautics Board Regulations and Licensing and New York State regulations.

38. If the applicant is aware of any other proposed or approved treatments to the water body or stream(s), or is proposing to apply other chemicals to the same water or stream(s), the applicant must specify this information.

39. If the answer to Question 38 is "yes", specify the products to be used and the dates of treatment.

40.-46. Provide the name, address and business registration number of the pesticide business conducting the pesticide application.

47. Provide the name and certification ID number of the applicator performing the pesticide application.

48. The application must be signed by an authorized individual, such as a riparian owner, an authorized representative of the a lake association, or an authorized agency employee.

NOTE: The individual signing the application must be the individual identified either under Item 2 or Item 8 in the application form.

49. The authorized individual's title, if a representative of a lake association or employee of an agency, must be provided.

50. The date the application was completed must be provided.

NOTE: SUBMIT APPLICATION AND CHECK IN THE AMOUNT OF $50.00, made payable to COMMISSIONER, DEC, to: NYSDEC, Bureau of Pesticides Management, 1285 Fisher Avenue, Cortland, NY 13045; Telephone (607) 753-3095, Ext. 232

TO EXPEDITE PROCESSING, PLEASE ASCERTAIN THAT THE REQUIRED DOCUMENTS HAVE BEEN ATTACHED TO THE APPLICATION, AS OUTLINED ON THE BACK OF THE APPLICATION.

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF SOLID & HAZARDOUS MATERIALS
BUREAU OF PESTICIDES MANAGEMENT

SAMPLE RIPARIAN OWNER/USER CONSENT LETTER

Dear Riparian Owner:

The _____
(Name of Lake Association, Riparian Owner or Agency)

proposes to conduct an application of the following chemical(s) _____

to the following waters _____ on the following dates
(Name of water body or streams to be treated)

_____.
(List all dates of proposed treatments)

A copy of the pesticide product label(s) has been attached to this notice.

As an affected riparian owner/user, you have the right to consent or object to the restrictions of water use resulting from the proposed treatment. The water use restrictions associated with the use of the above chemical(s) are checked below:

_____ Swimming and bathing are prohibited for _____
_____ Fishing is prohibited for _____
_____ Livestock watering is prohibited for _____
_____ Irrigation or spraying of agricultural crops is prohibited for _____
_____ Use of water for human consumption is prohibited for _____
_____ Other _____
(Specify)
_____

Your have twenty-one (21) days to respond to this notice. If you wish to object to the proposed treatment(s), please file a written document stating your objection to the proposed treatment and the water use restrictions resulting from the treatment.

Send your comments to the person listed below:

Name of Contact Person: Richard Rima, Pesticide Control Specialist II
NYS Dept. Of Environmental Conservation
Region 7 Bureau of Pesticides Management
Address: 1285 Fisher Ave., Cortland, NY 13045
Telephone Number: (607) 753-3095, Ext. 232

If you wish further information about the treatment, or wish information on the exact dates of the pesticide application, please contact the following person:

Name of Contact Person:_____
Telephone Number: _____
Hours Contact Person is Available: _____

If you do not respond to this notice, your lack of response will be considered to be consent to the proposed treatment. If you have any questions, please contact the Department representative listed above.

Aquatic\samprips (5/97)

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF SOLID & HAZARDOUS MATERIALS
BUREAU OF PESTICIDES MANAGEMENT

CERTIFICATION OF NOTIFICATION OF RIPARIAN OWNERS AND USERS

TO: Bureau of Pesticides Management
New York State Department of Environmental Conservation

RE: Aquatic Pesticide Permit Application of: _____
(Name of applicant as it appears on Aquatic Pesticide Permit Application)

CHECK ALL APPROPRIATE STATEMENTS

_____ All owners of real property abutting the body of water proposed to be treated pursuant to the above-referenced Aquatic Pesticide Permit Application, a list of whom is attached to this letter, have been notified by letter of the proposed pesticide permit. This list includes property owners abutting the outflow from this body of water, if the water is not to be held in the treated water body for the period of time during which use of the water is restricted. Such letters were mailed or personally delivered on: _____. A copy of the letter is attached.

_____ A review of the appropriate real property tax records indicates that no person other than the applicant owns any real property abutting the water body proposed to be treated pursuant to the above-referenced Aquatic Pesticide Permit application.

_____ A person or persons not owning abutting real property possesses a vested legal right to use of the water body proposed to be treated All such persons have been notified by letter of the proposed pesticide permit. A list of such persons, and the nature of their right to use of the water proposed to be treated is attached. Such letters were mailed or personally delivered on: _____. A copy of the letter is attached.

_____ To my knowledge, no person other than the applicant possesses any vested legal right to use the water body proposed to be treated pursuant to the above-referenced Aquatic Pesticide Permit application.

SIGNED: _____
Print or Type Name _____
DATE: _____
If applicant is not an individual, relationship to applicant: _____

False statements made on this document are punishable under §210.45 of the Penal Law.

Aquatic\notifripa (5/97)

PART 327

USE OF CHEMICALS FOR THE CONTROL OR ELIMINATION OF AQUATIC VEGETATION

(Statutory authority: Conservation Law, § 427[3])

Sec.

Historical Note

Part (§§327.1-327.6) filed Aug. 22, 1962; repealed, new filed March 28, 1966; renum. Part 607, Sept. 1966; new (§§ 327.1-327.8) filed April 28, 1972 eff. May 1, 1972.

§ 327.1 Permit required.

(a) No person, individual, public or private corporation, political subdivision, government agency, municipality, industry, copartnership, association, firm, trust or estate, or any other legal entity whatsoever, shall use chemicals for the control or elimination of aquatic vegetation in any waters of the State without having applied for and obtained a written permit to do so from a designated permit-issuing official, except as specified in subdivision (c) of this section.

(b) Such permit may be issued for the use of chemicals in the control or elimination of aquatic vegetation, subject to such limitations as may be considered necessary to safeguard water quality. For the protection of riparian uses, no such permit shall be issued except where the applicant has certified that the affected riparian users have agreed to temporary curtailment of their uses incidental to treatment or unless the applicant demonstrates to the satisfaction of the commissioner that any nonconsenting riparian users will not be significantly adversely affected by the use of the chemicals subject to such limitations as are set forth in the permit. Such limitations shall prescribe what chemical or chemicals may be applied to the waters under stipulated conditions to protect the public health, safety or welfare, and terrestrial and aquatic life or the growth and propagation thereof, other than aquatic vegetation intended to be controlled or eliminated.

(c) Such permit, however, shall not be required: for the use of copper sulfate for the purpose of algae control by a duly constituted water supply agency in its water supply waters; or for chemical control of aquatic vegetation in ponds or lakes having no outlet to other waters and which lie wholly within the boundaries of lands privately owned or leased by the individual making or authorizing such treatment.

Historical Note

Sec. filed Aug. 22, 1962; repealed, new filed March 28, 1966; renum. 607.1, Sept. 1966; new filed April 28, 1972; amd. filed April 10, 1973 eff. immediately.

§ 327.2 Permit-issuing officials.

The Commissioner of Environmental Conservation or his designated representatives, may issue permits in accordance with the policy and procedures set forth in this Part.

Historical Note

Sec. filed Aug. 22, 1962; repealed, new filed March 28, 1966; renum. 607.2, Sept. 1966; new filed April 28, 1972 eff. May 1, 1972.

§ 327.3 Policy.

(a) It is recognized that:

(1) Owners of lands through which water passes or which are bordered by waters have certain vested riparian rights to the use of these waters.

(2) The provisions of article 12 of the Public Health Law safeguard uses of waters through the maintenance of water quality standards assigned by classification.

(3) Use of chemicals for controlling aquatic vegetation may result in need for temporary curtailment of certain water uses.

(b) In considering the use of such chemicals it is the intent that:

(1) Permits shall be granted under such limitations as will protect to the greatest extent possible all terrestrial life, aquatic life other than aquatic vegetation intended to be controlled or eliminated, all public and domestic water supplies and irrigational, recreational, agricultural and industrial water uses.

(2) The permit issuing official shall not make recommendations on the method, use, general handling, efficiency of the chemicals and treatment operation or other aspects involving responsibilities of the applicant, except as may be related to the public health and conservation programs and to avoid adverse effects on water uses.

(3) Regardless of conformity with other limitations, no permit shall be issued for chemical treatment of water supply waters, if the resultant chemical concentration at the water supply intake will exceed New York State Department of Health drinking water standards.

Historical Note

Sec. added, filed Aug. 22, 1962; repealed, new filed Mar. 28, 1966; renum. 607.3; new filed April 28, 1972 eff. May 1, 1972.

§ 327.4 Permits and permit issuance.

(a) *Permits.* The Commissioner of Environmental Conservation or his designated representative:

(1) may issue permits for the use of any chemical listed as an authorized chemical (see § 327.6) and conforming with specifications relating to purpose, dosage, area to be treated, method of application and other limitations provided herein;

(2) may issue special permits for operations relating to the control of aquatic vegetation by State and Federal agencies, which permits are subject to conditions and limitations consistent with other provisions of this Part;

(3) may issue special permits for controlling aquatic vegetation involving chemicals, dosages, methods or areas other than those provided for herein, provided such issuance will not be at variance with these regulations and the regulations relating to restricted use pesticides.

(b) *Applicant and applications.* (1) The applicant shall be a riparian owner, or a lessee of a riparian owner or an association of such persons.

(2) The applicant shall submit an application on a form provided by the department. It shall be accompanied by a scale drawing or map including depth soundings adequate to determine: the size and depth of the treatment area; the concentration of the chemical within the area and conformity to the limitations set forth herein; the location and type of weed beds (submerged, emergent); the location of inlets and outlets in relation to the treatment area; the location of water users relative to the area and along the outlet; and any further information required by the permit-issuing official.

(3) Applications that involve public water supply waters or their tributaries will be referred to the State Department of Health for approval before a permit is issued.

(4) The applicant shall certify: that the listed chemical will be employed in conformance with all the conditions specified in the permit issued; that he obtained agreements to the treatment from water users as set forth in his application whose use may be restricted; that he agrees the issuance of the permit be based on the assumed accuracy of all statements presented by him; that he is legally responsible for damage resulting from the application of the chemical, or from the inaccuracy of any computations or from improper application of the chemical; and

that he assumes full legal responsibility for the accuracy of all representations made in obtaining approvals or releases, and for any failure to obtain approval or releases from the persons likely to be adversely affected.

(5) The commissioner, or his designated representative, shall reject the application and issue no permit when the application involves a State-stocked trout water and it is deemed that the proposed control or elimination of aquatic vegetation would adversely affect the trout habitat in such water.

(c) *Permits—additional provisions.* (1) Each permit shall be issued in terms that indicate:

(i) that its issuance is based on the statements, agreements and restrictions made or accepted by the applicant in his application;

(ii) the approximate date of treatment;

(iii) the permissible concentration of chemical and the maximum dosage to be applied in the treatment area and the methods of application to be used;

(iv) any restrictions imposed on the use of waters during and following the application and the duration of those restrictions;

(v) other requirements in the treatment procedure including demarcation of the treatment area by buoys or markers, or posting against use of the waters by the public;

(vi) the application of chemicals shall be deemed to be in violation of the provisions of the Conservation Law and article 12 of the Public Health Law, if the applicant fails to comply with the permit terms.

(2) Permits shall require and be issued upon the condition that prior actual notice of date or dates of treatment and water-use restrictions be given to all affected riparian users and known users.

(3) A copy of the required scale drawing or map submitted with the application shall be attached to and become part of the permit.

(4) No permit shall be construed as conveying to the applicant any right to trespass upon the lands of others to perform the permitted work, or authorizing the treatment of waters lying on or passing through the property of others without their consent or relieving the applicant of any legal necessity to obtain such consent before treatment. Nor shall any permit be construed as authorizing the impairment of any right, title or interest in real or personal property held by or vested in a person not a party to the permit.

(d) *Suspensions or revocation of permits.* A permit may be suspended or revoked by the permit-issuing official at any time upon notice to the applicant upon one or more of the following grounds:

(1) False or inaccurate statements in the application or accompanying papers.

(2) Change in any condition by reason of which treatment may impair the quality of the waters for the best usages assigned to them or endanger the public health, safety or welfare.

(3) Failure to abide by the terms of the permit or the application for the permit.

Historical Note

Sec. added, filed Aug. 22, 1962; repealed, new filed Mar. 28, 1966; renum. 607.4; new filed April 28, 1972 eff. May 1, 1972.

§ 327.5 Violations.

Failure to abide by the terms of the permit or the application of chemicals without a permit shall be deemed to be in violation of the provisions of the Conservation Law and article 12 of the Public Health Law.

Historical Note

Sec. added, filed Aug. 22, 1962; repealed, new filed Mar. 28, 1966; renum. 607.5; new filed April 28, 1972 eff. May 1, 1972.

§ 327.6 Authorized chemicals and specifications.

(a) *Copper sulfate for algae.* (1) Active ingredient. $CuSO_4 \bullet 5H_2O$.

(2) Purpose. Authorized for algae control.

(3) Periods of treatment. Generally, May to September. Treatments later than Labor Day will require special authorization.

(4) Dosage. Not to exceed 0.3 ppm $CuSO_4 \bullet 5H_2O$ in the upper six feet of depth in ponds or lakes with over two acres of surface area. Not to exceed 0.3 ppm $CuSO_4 \bullet 5H_2O$ in the total volume of ponds with two acres or less of surface area. The above is based on water of average alkalinity for the State (100 ppm or over). In softer waters, a reduced dosage may be required.

(5) Method of application. No permit shall be issued for the direct broadcasting of crystals or "snow". Copper sulfate should be applied as a liquid using spray equipment or as a solid placed in a burlap bag dragged behind a boat.

(6) Repeat treatments. Shall not be authorized at any interval of less than two weeks.

(7) Water-use restrictions. Bathing and livestock watering shall be prohibited for at least 24 hours following a treatment.

(b) *Diquat for submerged and emergent vegetation.* (1) Active ingredient. Diquat dibromide—6, 7-dihydrodipyrido (1, 2-a:2), (1-c)-pyrazidinium dibromide.

(2) Purpose. Authorized for the control of emergent plants having leafy growth lying flat on the water surface and for the control of aquatic plants growing beneath the water surface.

(3) Periods of treatment. Generally spring and late summer. Treatment after September 1 may require special authorization.

(4) Dosage. Maximum application is two gallons (35.3%A.I) per surface acre of water.

(5) Treatment area. Shall not extend beyond 200 feet from shore or beyond a maximum depth of six feet, whichever gives the greatest distance from shore.

(6) Repeat treatments. No permit shall be issued for a second treatment within the same season.

(7) Water-use restrictions. Treated waters shall not be used for irrigation, bathing, fishing, or by man or animals for drinking or food processing for a period of 14 days after treatment.

(c) *Low-volatile esters, salts and amines of 2,4-D for emergent vegetation.* (1) Active ingredient. Calculated as 2,4-dichlorophenoxy acetic acid.

(2) Purpose. Authorized only for the control of emergent plants having a large part of their leafy growth projecting above or lying flat on the water surface.

(3) Periods of treatment. Restricted to late spring or early summer when the chemical is most effective.

(4) Dosage. Use of chemical solutions for dosage of up to eight pounds active ingredient per acre may be permitted in the treatment of dense stands. Use of pellets for subsurface application requires special authorization.

(5) Treatment area. Shall not extend beyond 200 feet from shore or beyond a maximum depth of six feet, whichever gives the greater distance from shore.

(6) Water use restrictions. Use of the waters for irrigation shall be prohibited for a period sufficient to permit the decay of the phytotoxicity. The treated waters and those waters affected by the treatment shall not be used for other purposes during the treatment and for at least 24 hours thereafter.

Historical Note

Sec. added, filed Aug. 22, 1962; repealed, new filed Mar. 28, 1966; renum. 607.6; new filed Apr. 28, 1972; amd. filed Apr. 10, 1973 eff. immediately. Substituted new (b).

§ 327.7 Other chemicals.

In addition to the authorized chemicals and specifications, permits may be issued for other chemicals and specifications, without the necessity of adding them to the list, when it is evident that their use will conform with the intent and purpose of the law and these regulations. Only chemicals labeled for the intended use, registered in the State of New York and not in conflict with the regulations relating to restricted use pesticides may be authorized for use pursuant to this section.

Historical Note

Sec. added, filed April 28, 1972 eff. May 1, 1972.

§ 327.8 General.

The listing of a chemical as an authorized chemical, or any authorization for its use, in or pursuant to these regulations does not imply that it is recommended by the Department of Environmental Conservation for controlling or eliminating aquatic vegetation.

Historical Note

Sec. added, filed April 28, 1972 eff. May 1, 1972.