# Natick Conservation Commission
# Public Hearing 3/19/09
# Middle Pond - Lake Cochituate

## Treatment of Non-Native Eurasian Watermilfoil at the Department of Conservation & Recreation Beach and Boat Ramp

### Proposed Herbicide Treatment at Cochituate State Park

- Treatment of up to five acres of Middle Pond (adjacent State Park access) for the control of Eurasian watermilfoil (*Myriophyllum spicatum*) with Reward (active ingredient Diquat dibromide)
- Maximum treatment area: 5 acres
- Volume of treatment area: 25 ac/ft
- Maximum label rate for use of Reward is 2 gals per surface acre with an average depth of 4 feet or greater
- Reward for this project will be applied below the maximum label rate and between 1-1.5 gals per acre, resulting in an in water concentration of approximately 0.185 – 0.28 ppm cation
- Maximum quantity of Reward to be applied: 7.5 gal
- The proposed management activities are consistent with the guidelines in the following documents:

  Final Generic Environmental Impact Report: Eutrophication and Aquatic Plant Management in Massachusetts (June 2004)

  Guidance for Aquatic Plant Management in Lakes and Ponds: As it Relates to the Wetlands Protection Act (April 2004 – DEP Policy/SOP/Guideline # BRP/DWM/WW/G04-1).

### Evergreen Wells

(Information from Natick telephone conversation with Anthony Coneau, Natick Public Works – Water & Sewer. 3/18/09 & conversation & e-mail from Greg Eldridge at Haley & Ward, Consulting Engineers 3/18/09)

- There are 3 wells in the Evergreen well field. Wells # 1 and #3 are active. Well # 3 is a replacement for Well #2. Wells # 1 and #2 were contaminated with VOC's but the Town built a water treatment plant and the water is treated for VOC's before it goes on-line to the users.

- Well #1 is a gravel packed well. The well is a total of 62 feet deep (screened below 42 ft) and has a pumping rate of approximately 1,100 gpm.
- Well #3 is a gravel packed well. The well is a total of 59 feet deep (screened below 44 ft) and has a pumping rate of approximately 1,800 gpm.
- The southeastern most extent of the treatment area is approximately 300 feet from the boundary of the Zone II Wellhead Protection Area
- Based on available data it is estimated that the closest point of treatment is over 900 feet from Evergreen Well #1

**Why Reward?**

- Reward is a widely used aquatic herbicide that is applied annually to thousands of lakes nationwide for control of aquatic weeds. It has been used in aquatic applications for over 40 years and is applied annually to over 300 lakes and ponds in Massachusetts and Connecticut alone.
- Reward is particularly effective for controlling Eurasian watermilfoil.
- Reward has been extensively studied and has been approved for use in aquatic systems by the USEPA and MADAR when applied in accordance with the product labeling.
- Reward has been specifically evaluated for its potential to contaminate groundwater and is approved by MA DEP's Office of Research & Standards for use in Zone II - Wellhead Protection Areas in Massachusetts
- Reward is effective for partial lake applications.
- Reward treatment is a recommended by The Practical Guide to Lake Management in Massachusetts where *"localized control of plants is needed to support localized use (e.g., swimming area)" (p.124)*
- Following application, Diquat is quickly absorbed by green plant tissue.
- Diquat not absorbed by plant material is shown to quickly and readily bond with sediments and suspended particulate matter.
- In natural environments, Diquat has a short half-life ranging between 1-4 days.
- Reward is effective when applied at very low concentrations ranging from 0.185 to 0.37 ppm. (1.0- 2.0 gals/ac) even in small spot-treatment applications
- Because of its chemical characteristics and extensive study of mobility there in negligible risk for infiltration of Diquat into Natick's nearby Evergreen Wells.
- According to Bob Wolff, New Hampshire Division of Pesticide Control, no Diquat residues were detected in the 46 wells (public & private) tested from 2000-2007 within the vicinity of treated waterbodies. In most instances tested wells were within 50-75 feet of the treated waterbody. (Personal correspondence Marc

Bellaud, Aquatic Control Technology, Bob Wolff, New Hampshire Department of Pesticide Control, 5/17/09.)

- During review of a permit application by CT DEP to chemically treat portions of Bantam Lake in Connecticut, transport of Diquat into several Community Wells was addressed by, Brad Robinson, Pesticide Program Supervisor - CT Department of Environmental Protection - Pesticide Division. In his response to the Department of Public Health Mr. Robinson stated on behalf of the Department of Environmental Protection that they "*feel that chances of Diquat reaching the well are extremely remote*"

  > *"Diquat is characterized by extraordinarily high binding potential, the chemical is not effective in muddy water or on weeds covered with sediment. The Herbicide Handbook of the Weed Sciences Society of America lists the $K_{OC}$ for Diquat as approximately 1,000,000 mL/g. As a point of reference EPA is concerned about the leaching potential of a chemical is the $K_{OC}$ is less than 500 mL/g. The binding is irreversible, and analysis for Diquat in soil may only be done if the soil is dissolved in strong acid to free the Diquat residue.* ***This very low leaching potential means that the chemical is unlikely to penetrate soil or sediment any farther than a centimeter.***"
  > (Correspondence: Brad Robinson, Connecticut Department of Environmental Protection – Division of Pesticides, Lori Matthews, Department of Public Health – Water Supplies. 12/15/08)

- In a 1994 Memorandum from Nicholas Anastas, MA DEP - Office of Research and Standards to Tara Gallagher, MA DEP – Office of Drinking Water Supply, on the use of Diquat in Zone II Wellhead Protection Areas it was concluded that:

  > *"Based on the strong adsorption of Diquat to soils, the limited tendency for Diquat to move in the environment, ant the relatively rapid photolytic degradation of Diquat in surface waters, Diquat is unlikely to contaminate drinking water supplies when as an aquatic herbicide according to label instructions."*

- Further, to the best of our knowledge there have been no instances of groundwater or drinking water contamination anywhere in the United States following an aquatic application of Reward.

According to the Washington State Department of Ecology's review of Diquat they determined:

> *"Overall, evidence indicates that Diquat at typical environmental concentrations bind strongly and irreversibly to most soils and sediments. This would normally raise concerns of potential ground water contamination. However, the binding is so tight that significant*

*desorption is unlikely and in those sediments where Diquat does not bioaccumulate, unbound Diquat is either degraded or diluted and removed by hydraulic processes common in water bodies which have a slowly moving mass of water. These processes include both lateral and vertical dispersion as well as advection from the general flow of the water body. It is unlikely that significant amounts of Diquat will be desorbed from the sediment due to an equilibrium shift in a short enough time period to adversely impact the use of water that has been treated with Diquat. It has been conjectured in a number of review articles that such an equilibrium shift could cause an adverse impact on a water body and its resident biota.* ***However, during more than 30 years of use in over 100 countries for every conceivable agronomic and aquatic practice and soil/sediment type, there has not been a single reported case of adsorbed Diquat residues being released from the sediment or otherwise reactivated.*** *(Dyson, J.S. and M.G. Takacs. 2000. Diquat: Occurrence and Safety in Aquatic Sediments .Zeneca Agrochemicals. Report Series."*
(Washington State of Ecology. "Final Risk Assessment for Diquat Dibromide".(2002): 111)

- The Washington Department of Ecology further concluded that the mobility of Diquat after treatment is of negligible concern.

*"Diquat exhibits variable adsorption and desorption to soil depending on individual soil parameters. In most soils, adsorption can be considered to be very high. Soil/water partition coefficients have been observed to vary from 15 L/Kg for sand sediment, 36-42 L/Kg for sand soil and ~2000 to ~10,000 L/Kg for sandy loam, sandy clay loam and loam soils. Sorption has also been seen to be very high for peat soil (17,000 L/Kg) and various sand/gravel sediment (30 to 1000 L/Kg), sand (1,000 to 10,000 L/Kg) and silty clay loam 10,000 to 60,000 L/Kg). Generally, if the soils/water distribution coefficient is greater than about five, a pesticide is generally considered to be immobile. Diquat is known to adsorb strongly to organo-clays, peat, muck, organic soils, humic substances, higher plants, liginin and cellulose. However, the greatest adsorption occurs on soils and sediments that have large amounts of lattice forming (expanding) clays like montmorillonite or bentonite. Less adsorption occurs on non-lattice forming (partially expanding and nonexpanding clays) like, vermiculite, mica, illite and kaolinite. In situations where typical use rates of Diquat are used (2.2 to 4.4 Kg c.e./ha = 0.375 to 0.75 ppm c.e.), Diquat will be immobile after adsorption to sediment or soil surfaces. Leaching of Diquat is likely to be negligible because of the strong adsorptive capacity of soils and sediments. pH does not appear to effect the bioavailability of Diquat."*

(Washington State of Ecology. "Final Risk Assessment for Diquat Dibromide".(2002): 110-111)

**Risks to Human Health**

- Reward will be applied my Aquatic Control's State licensed applicators. Diluted Reward will be applied through subsurface injection, eliminating concern for aerial drift or non-target impacts.
- *"In 1995 and 2002, EPA critically analyzed all available studies of Reward and Diquat and "has determined that Diquat dibromide products, labeled and used as specified in this Reregistration Eligibility Decision, will not pose unreasonable risks or adverse effects to humans or the environment. (Diquat RED, 1995)."*

  *In the 2002 Diquat Tolerance Reassessment Eligibility Decision (Diquat RED, 2002), EPA determined that:*

  - *"Acute dietary risks are well below the Agency's level of concern for all population sub-groups."*
  - *"Chronic dietary risk is not of concern for any population sub-group."*
  - *"Post-application recreational risks to golfers and swimmers in treated lakes were found to be not of concern, as well."*
  - *"The short term and chronic aggregate risks for adults and children are considered highly conservative and not of concern to the Agency."*
  - ***"Exposures from Diquat dibromide to surface or ground water sources for both terrestrial and aquatic uses are not of concern to the Agency. Diquat dibromide is essentially immobile in the environment, indicating that it will most likely be associated with the soil and sediment instead of water. Significant residues of Diquat dibromide are not expected to reach ground or surface water. Therefore, no risk mitigation measures are necessary to address drinking water risks from Diquat dibromide use."***
  - *"The mutagenicity database for Diquat dibromide indicates that this chemical has no mutagenic or genotoxicity activity (no ability to change the genetic makeup) and it is not a carcinogen."*
  - *"There is no evidence of endocrine disruption upon exposure to Diquat dibromide."*

  *"The carcinogenic potential of Diquat was evaluated by the EPA Health Effects Peer Review Committee, and this committee classified*

*Diquat into Group E (evidence of noncarcinogenicity), its most favorable classification (Diquat RED, 1995). EPA carcinogenic classification of pesticides can range from "A"-known, "B"-probable, "C"-possible, "D"-unable to determine, to "E"-unlikely a human carcinogen."*
(Personal correspondence to Gerald Smith, Aquatic Control Technology, from Jim Petta, Syngenta Professional Products, 1/9/07)

- Based on laboratory studies it is estimated that *"an adult would have to drink over 15,700 gallons a day for a lifetime, everyday at the EPA established limit in water 0.02 mg/L to absorb an amount of Reward equivalent to levels that caused no effects in animal studies."*
(Syngenta Professional Products. *Reward: Low Toxicity, Low to No Exposure = Low Risk.* Syngenta. 2001)

- Further Diquat is poorly absorbed in skin it is estimated that *"an adult human would need to swim continuously for 447 hour in water treated with maximum label rates to absorb and ingest an amount of Reward equivalent to levels that caused no effects in animal studies".*
(Syngenta Professional Products. *Reward: Low Toxicity, Low to No Exposure = Low Risk.* Syngenta. 2001)

**Toxicology - Aquatic Organisms**

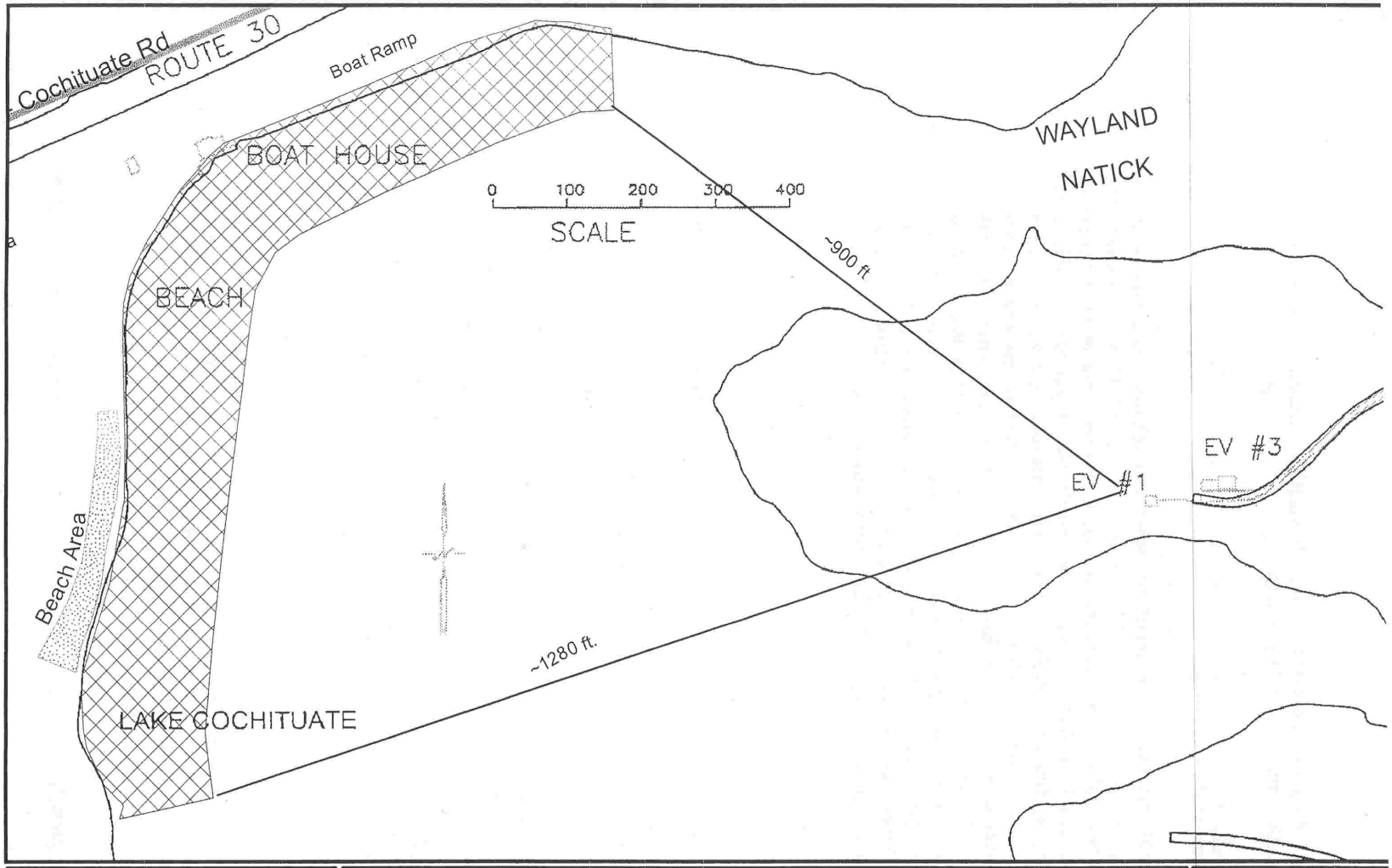
- When applied in accordance with label restrictions applications of Reward have proven to have little to no unreasonable adverse impacts on aquatic invertebrate or fish.

*"Except for the inability of Coho smolts to migrate downstream at concentrations within label rates, Diquat will generally have no significant acute or chronic impact on fish when applied rates recommended on the label are used. However, striped bass sac-fry, smallmouth bass sac-fry, and similarly sensitive species may be at risk after exposure to Diquat. It is also believed, that except for amphipods like Hyalella azteca and cladocerans like Daphnia spp. and Simocephalus spp., Diquat should not have significant impact on aquatic invertebrates typically present in treated water bodies. There appears to be virtually no tendency for Diquat to bioaccumulate in fish or invertebrates when exposed from contact with water treated with Diquat. Although laboratory data indicates that Diquat may be toxic to the more sensitive species of crustacean invertebrates (Hyalella, azteca and cladoerans), it is believed that other species of crustacean invertebrate will be substituted by fish as part of their diet so that there should be minimal impact to fish that typically use these species of invertebrates for food."*

(Washington State of Ecology. "Final Risk Assessment for Diquat Dibromide". (2002):139-140)

**Environmental Persistence**

- Although Diquat is generally considered biologically unavailable shortly after application and is generally non-detectable within 1-4 days of treatment, Diquat does bind with sediments and can persist for some time. In most instances Diquat is only detectable in soils for short periods following treatment and is generally broken down by photolysis and microbial breakdown, but in more extreme cases has been found to persist up to 1000 days. Although somewhat persistent in soils "*long-term field studies have nevertheless shown degradation rates of the order of 5-10% per year. This is greater than the rate required to prevent saturation of the deactivation capacity of soils". (Section 4.2.2 Environmental Health Criteria 39: Paraquat and Diquat. World Health Organization, Geneva, 1984).*"
(Personal correspondence: to Gerald Smith, Aquatic Control Technology, from Jim Petta, Syngenta Professional Products, 1/9/07)




**Lake Cochituate**
**Middle Pond**
Natick, MA

Evergreen Wells

| FIGURE: | SURVEY DATE: | MAP DATE: |
|---|---|---|
| -- | -- | 03/08/09 |

Legend:

Estimated extent of management area

EV #1 Evergreen Well number 1 (~900 ft from the northeastern most portion of the treatment area and ~1280ft from the southeastern most portion of the treatment area)

0 125 250 500 750 1,000 Feet

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