TREATMENT WITH GLYPHOSATE

How it Works

Glyphosate is a systemic, broad spectrum herbicide. Its mode of action is to disrupt the plant's shikimic acid metabolic pathway. Shikimic acid is a precursor in the biosynthesis of aromatic amino acids. The disruption in the pathway prevents the synthesis of aromatic amino acids and the metabolism of phenolic compounds. The net effect is that the plant is unable to synthesize protein and produce new plant tissue. Glyphosate penetrates the cuticle of the plant and moves to the phloem where it is translocated throughout the plant, including the roots. Its aquatic formulation is effective against most emergent or floating-leaved plant species, but not against most submergent species. Rainfall shortly after treatment can negate its effectiveness, and it readily adsorbs to particulates in the water column or to sediments and is inactivated. It is relatively non-toxic to aquatic fauna at recommended doses, and degrades readily into non-toxic components in the aquatic environment. The maximum concentration for treated water is typically about 0.7 mg/L, but a dose of no more than 0.2 mg/L is usually recommended.

The most common aquatic use of glyphosate is for control of emergent and floating leaf species, in particular water lilies (*Nuphar* spp*., Nymphaea* spp.), reed grass (*Phragmites* spp.), purple loosestrife (*Lythrum salicaria*) and cattail (*Typha* spp.). Glyphosate is not effective for control of submerged macrophytes because it is water soluble and the concentration after dilution would be insufficient to damage a submergent plant. It is, however, recommended for control of many wetland and floodplain species that include trees, shrubs and herbs. Glyphosate effectiveness is greater in soft water. Additives such as ammonium phosphate are recommended for hard water glyphosate applications, and non-ionic surfactants are often recommended to increase overall effectiveness.

Because it is a broad spectrum herbicide, glyphosate should be expected to impact non-target emergent or floating leaf plants if the spray contacts them. Control of the spray can therefore greatly limit impacts to non-target vegetation. The LC50 levels for fish species vary widely, perhaps due to variations in formulations tested (i.e., with or without surfactant). Most applications would result in aquatic concentrations far lower than any toxic threshold.

Glyphosate is used to control emergent vegetation and to create open areas for waterfowl or human use. Invertebrates do not appear to be harmed directly by the herbicide, but may be impacted by the alteration of vegetation Glyphosate has a low order of toxicity in the case of acute exposure in mammals. Rat LD50s are >5,000 mg/kg. LC50 values for various types of fish are also high.

Glyphosate is a common terrestrial herbicide that is also used on emergent and floating leaved aquatic plants but not submergent forms. This herbicide is translocated throughout susceptible species and can kill the whole plant. Uptake is dependent on features of the exposed plant surface and exposure time. It is washed off by rain, but requires only a few hours of contact time.

Benefits

- Effective on emergent vegetation
- Kills entire plant for susceptible species
- Selective by area and vegetation type (emergent/floating vs. submergent)

Detriments

- Ineffective against submergent species
- Precipitation (rain) interferes with uptake

Information for Proper Application

- Mapping of aquatic vegetation with accurate identification of all species and general appraisal of relative abundance and overall cover/biomass
- Inventory of aquatic biota using the targeted vegetation

- Weather forecast; application shortly before storms is not advised, as rain will wash the herbicide off target vegetation
- Treatment plan to include dose, areas treated, expected alteration of plant community, and follow-up activities
- Knowledge of use restrictions after treatment
- Monitoring program for assessing effectiveness and impacts

Factors Favoring the Use of this Technique

- Overall floating or emergent vegetative density is excessive over a large portion of the lake, negatively affects habitat and water uses, and is not amenable to alternative control methods
- Localized control of floating or emergent plants is needed either to support localized use (e.g., swimming area) or as follow-up to alternative controls

Performance Guidelines

- Map the floating leaved and emergent plant community and note density and distribution of target and non-target species
- Application must be performed by licensed applicators
- Apply glyphosate product in accordance with label instructions and restrictions; justify dose, location and timing of treatment
- Apply directly to target plants or areas to maximize selectivity
- Do not apply if rain or strong wind is expected within several hours
- Monitor water quality before and after treatment, with emphasis on oxygen and nutrient levels, if more than 10% of lake is treated
- Monitor plant community features before and after treatment

Possible Permits

- WPA permit through local Conservation Commission/DEP
- Review by NHESP (further action if protected species are present)
- License to Apply Chemicals from DEP

Impacts Specific to the Wetlands Protection Act

- Protection of public and private water supply – Detriment (prohibition within one quarter mile of surface drinking water supplies due to toxicity), but generally neutral where allowed
- Protection of groundwater supply - Neutral (no interaction)
- Storm damage prevention – Neutral (no significant interaction)
- Prevention of pollution – Generally neutral (no significant interaction), but could be a detriment if plant die-off causes low oxygen at the bottom of the lake
- Protection of land containing shellfish – Neutral (no significant interaction)
- Protection of fisheries – Possible benefit (habitat enhancement) and possible detriment (food source alteration, loss of cover)
- Protection of wildlife habitat – Possible benefit (habitat enhancement) and possible detriment (food source alteration, loss of cover)

Cost Considerations

Glyphosate treatments typically cost $500 to $1000 per acre