AQUATIC WEED CONTROL

APPROPRIATE USES OF AQUATIC HERBICIDES

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WHY USE HERBICIDES?

THIS pertinent question faces many lake managers, but before we address it, let's consider some background on the need for managing aquatic vegetation regardless of the control technique used. It is generally accepted that aquatic plants play a beneficial role in the function and "health" of water bodies in a variety of ways: producing dissolved oxygen (DO), cycling nutrients, driving the food chain, dampening wave action and currents, lowering water turbidity, and providing habitat for fish and wildlife. However, the excessive growth of vegetation (and this is often caused by exotic weed species such as Eurasian water milfoil, Hydrilla, water hyacinth, etc.) can result in undesirable impacts to aquatic ecosystems. For instance, the normal nighttime respiration of an overabundance of submersed vegetation can severely deplete DO levels, particularly during summer months or other periods of elevated water temperatures. In addition, thick plant stands reduce light penetration and restrict water circulation patterns to the point of producing extreme temperature, pH and nutrient stratification in the affected water column. These major and other more subtle consequences of too many plants can have deleterious effects on the full range of aquatic organisms— fish, invertebrates, plants, etc. The result is often a reduction in the biodiversity of water bodies.

Once an overall management program has recognized a need for controlling a nuisance plant infestation and the specific target plant has been identified, the process of selecting the most appropriate vegetation control method can be undertaken. In many situations, the decision to use herbicides is based on the following advantages:

A) predictable efficacy over a defined time period and within a specific target location;

B) selective control of target vegetation;

C) well-characterized and minimal risks with respect to human health and the environment ; and

D) cost-effectiveness.

However, in today's climate of environmental awareness, non-chemical methods (e.g., biological, mechanical, and physical) should be considered as part of any comprehensive vegetation management assessment. An optional management policy considers all options. As is the case with chemicals, these techniques will have some limitations and some negative ecological impacts associated with their deployment.

CONDITIONS FOR HERBICIDE USE

As an example exercise, consider that the resource manager of a 500-acre lake is confronted with the submersed exotic, Eurasian water milfoil, which has recently infested 25 acres of a littoral zone in several covers and threatens encroachment into other areas. Where it is well-established in these coves, milfoil has created a typical thick stand with dense surface canopy, interfering with water use activities and displacing indigenous plants. Through a management plan process, a decision has been made to quickly and selectively remove milfoil from targeted treatment areas. Additional criteria for selecting an appropriate treatment method are that the control of milfoil be maintained for several growing seasons so that the native plant community can reestablish, and that the selected method be environmentally-safe and cost effective.

All potential control methods should be considered to achieve the management goal in the above example. Every operational method, including herbicides, can have some degree of environmental impact

CONDITIONS FOR HERBICIDE USE (CONT.)

associated with its use. These impacts can include injury or elimination of non-target vegetation, effects on water quality, and off-target treatment effects. In addition, all control methods should be evaluated with respect to efficacy and expense.

If weighed against problems associated with biological and mechanical/physical control under the conditions of this hypothetical management scheme, the use of herbicides would be the most suitable control technique for milfoil. However, there are some crucial issues that must be addressed when designing and implementing this type of chemical control program.

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Treatment of submersed plants is the most difficult of all chemical applications and , as such, requires particular attention to product and site-specific factors.

SELECTION OF APPROPRIATE HERBICIDES

It is imperative that the right herbicide, in its most suitable formulation, is chosen to satisfy the treatment objectives. Knowledge of a chemical's activity spectrum, that is which plant species are susceptible and which are tolerant, is of primary concern. Second, the concentration/exposure time (CET) relationship for controlling the target plant is needed. All of the registered aquatic herbicides are efficacious against milfoil; however, the activity range of these products against other plants is variable. Some products are broad spectrum in their action and can control submersed vegetation of all kinds, while others have a more narrow spectrum and can be used to control specific target plants selectively, or to handle closely related groups of plants. Activity spectrum information is generally provided on the herbicide label, or can be obtained from various herbicide use guides. Since herbicides are so specific in their activity, it is also critical to have an accurate taxonomic identification of that target plant. Verification of plant identifications can be provided by aquatic botanists or plant taxonomists and/or personnel for managing aquatic vegetation.

Each herbicide has a distinct combination of concentrations and exposure times that will allow it to control a particular plant, and precise information on aquatic CET relationship is currently being developed by many researchers. This is important because it is the rate of herbicides application (concentration) and the length of time that a herbicide is in contact with a target plant (exposure) that determines the efficacy (and cost-effectiveness) of a treatment. Some of the registered aquatic herbicides have relatively short, dose-dependent contact time requirements for controlling milfoil (hours), while others have much longer ones (days). Satisfying CET relationships is the most important factor in determining success or failure when treating a submersed species. Unlike emergent or floating vegetation where herbicides can be applied directly on the plant's surface, submersed treatments deliver herbicides into the aqueous medium surrounding target plants, where the compound is subject to the effects of bulk water movement. Once an herbicide's active ingredient is dissolved into the water, any movement of that water away from the target plant (caused by gravity flow, springs, tides, wind and thermal-induced currents, etc.) will impact CET relationships and efficacy.

SITE-SPECIFIC TREATMENT FACTORS

With the success of submersed treatments dependent upon dose and contact time, an adequate knowledge of a site's specific water movement regime is highly desirable. This information can be acquired from stream and tide gagging stations, weirs, discharge gates, and water-exchange measurement techniques such as electronic flow meters, acoustic velocity meters, and tracer dye dispersions studies. Once water-exchange characteristics in the treatment are understood, herbicide formulations, application equipment and technique, and timing or sequence of application can take advantage of water movement properties. For example, the surface application of liquid herbicides would be an appropriate technique in slow-moving or quiescent waters, when the water column is isothermal and plants are below the surface. Isothermal conditions will allow for a more complete mixing of herbicides throughout the water column, thereby reducing concentration "hot-spots" and the erratic efficacy that can result when water-column temperatures are stratified. In contrast, subsurface injection of liquid herbicides, or use of granular or pellet formulations, would be more appropriate to penetrate dense, "topped-out" stands of submersed plants that have created temperature-stratified environments, or in areas of greater water exchange.

The use of site-specific application strategies can maximize efficacy against target plants and minimize efficacy against target plants and minimize the occurrence of negative environmental impacts, while also aiding prediction of off-target movement of herbicide residues.

Another very important site-specific consideration involves the regulation and legal use of herbicides. When it comes to legality, the herbicide label is the law. Pesticide labels are issued by the U.S. Environmental Protection Agency (USEPA) after they evaluate the results of demanding laboratory, greenhouse, and field testing procedures conducted under Federally-mandated Good Laboratory Practice research standards. To insure protection of the aquatic ecosystem, pesticides receiving a Federal aquatic label must undergo the most stringent level of evaluations that are in existence for non-crop sites. States can also impose local use restrictions greater than those listed on the Federal label. Prior to using any herbicide in and around water, always consult the local authorities tasked with the regulation of aquatic pesticide use. In most instances when developing chemical strategies for managing aquatic vegetation, it is advantageous to solicit the services of an experienced and reputable aquatic pesticide applicator, certified by the State.

Use restrictions contained in the labeling information of each herbicide are designed to ensure that chemical residues occurring from the application of a product result in negligible risk to humans and the environment. These use restrictions often include such items as maximum allowable treatment rates in or near areas used for swimming, fishing, and livestock-watering or in water otherwise used for irrigation and domestic purposes. These use restrictions often affect treatment strategy for a given site. However, some constraints can be mitigated by using the lowest effective application rate, by increasing required treatment set-back distances from water intake structures or discontinuing use of these structures for an appropriate time period, and by scheduling applications in conjunction with low water-use and recreational activity periods.

HUMAN HEALTH AND ENVIRONMENTAL SAFETY

There are two simple and basis factors to recognize when considering the safety of aquatic herbicides: 1) products that have been granted an aquatic label are safe to use in and around water; and 2) pesticides that are potentially harmful to humans and other non-target animals when used in and around water do not have aquatic labels. The weight of the scientific evidence plainly demonstrates that when aquatic herbicides are used according to label instructions, there are no direct effects on the health and safety of non-target mammals, birds, reptiles, amphibians, fish, invertebrates, etc. It is worth noting that as the currently-labeled aquatic herbicides are being moved through the USEPA-mandated pesticide re-registration, all of them will probably survive this examination process and be reissued with aquatic labels. Furthermore, most of these reissued labels will show significant reductions to their current use restrictions. And keep in mind that re-registration has required a full review of the historic data package on these products, plus the evaluation of new rate and effect data at levels that were technologically unattainable a few years ago. Clearly, these less-restrictive labels are a testament to the safety of aquatic herbicide, most of which were developed prior to 1980.

Future of Aquatic Herbicides

The continued use of aquatic herbicides will be directly related to our commitment to manage our increasingly critical and valuable water resources. Federal and state natural resource agencies, environmental organizations, and interested parties in the private sector are working cooperatively to reverse the degradation and loss of irreplaceable native habitats across the U.S. cause by non-indigenous species. Many of these exotic invaders are aquatic and wetland weeds, and they are infesting new areas in every region of the country. At present, and for the foreseeable future, the prudent and responsible use of herbicides for effective and selective control of these plant pest species is an important option. Though research and development efforts, chemical methods can be fine tuned to continue o provide an environmentally-compatible way of managing aquatic ecosystems.