Using registered herbicides for aquatic plant control is a widely employed technique for both private and public waters. Treatments can be applied with a 1-gallon pump sprayer for a spot treatment, a helicopter or airboat for a whole lake treatment or anything in-between. Treatment objectives could be the control of a single invasive plant species or a broad spectrum control of numerous species.

All herbicides listed have undergone EPA review and are approved for aquatic use in Arkansas, when used in accordance to the instructions included on the label. There are approximately 300 herbicides registered in the U.S., but only 15 of these are labeled for aquatic use.

Like all pesticides, herbicides have three names: a trade name, a common name and a chemical name. An example of this is the common herbicide Rodeo. Rodeo is the trade name, the common name is glyphosate and the chemical name is N-(phosphono-methyl) glycine, isopropylamine salt. In this publication, the common name will be used the majority of time.

All herbicides come with a label. Included on the label is the product form and instructions for safe handling and effective use. It cannot be stressed too strongly that the label is the law, and not using herbicides according to the labeled directions can have legal ramifications for the applicator.

Often included is a listing of species that are controlled by the chemical and sometimes the extent of the control. If the target species is not included on a particular label, the herbicide may still be used as long as the herbicide is labeled for use at the desired site of application, though effectiveness may be unknown.

Herbicide Types

Herbicides can be classified in several ways. One way is by their activity in the plant: systemic or contact. This classification refers to whether or not the herbicide is translocated, or moves within the plant. Whether the herbicide moves within a plant or not has implications on its effectiveness, application and how quickly it acts upon the plant.

Contact herbicides do not move and will cause death to only those parts of the plant they contact. Contact herbicides also tend to cause more rapid injury to treated plants but require more complete spray coverage of all plant tissue during application. If a contact herbicide is used on submersed plants, the chemical must remain in the treatment area long enough for the entire plant to be exposed to a lethal concentration. Since contact herbicides tend to cause rapid plant death, in areas with dense plant populations and warm water, the decomposing plant tissue can lead to a low dissolved oxygen fish kill. Care must be taken to treat only 33-50% of a pond or have supplemental aeration available.

Systemic herbicides are mobile in plant tissue and move through the plant's vascular tissue to their action site. This gives them the ability to affect all parts of the plant, not just those parts they contact. One implication is effects on the plant take longer to become apparent. Additionally, complete plant coverage may not be necessary to attain control. Finally, with correct timing, some herbicides will be stored within the plant's root tissues. The following season, as sugars move upward in the plant, the herbicide moves with it, leading to a second season of control.

Contact Herbicides	Systemic Herbicides
Copper and Copper products	2,4-D
Diquat	Glyphosate
Endothall	Fluridone
Carfentrazone	Triclopyr
Sodium Carbonate Peroxyhydrate	Imazapyr
Flumioxazin	Imazamox
	Penoxsulam
	Bispyribac Sodium
	Topramazone

Adjuvants

Herbicides that are applied as a foliar treatment will include a recommendation to include an adjuvant. The two most common are a crop oil and some kind of nonionic surfactant. While different in chemistry, they serve the same function. Both of these reduce the surface tension of the herbicide solution and increase the herbicide coverage and penetration into plant stems and leaves. A third type of adjuvant often used in aquatic plant control acts as a "sinker" when added to a spray solution. When the solution is sprayed onto the water surface, the "sinker" will help carry the herbicide down through the water column, into the weeds growing on the pond bottom.

Why Treatments Fail

Oftentimes a herbicide treatment for a submersed plant will not have the desired results. Sometimes this results from inaccurate plant identification, leading to incorrect herbicide selection. Another cause is using the herbicide under suboptimal conditions. For example, selecting diquat for a submersed plant in a muddy pond. Diquat binds with suspended particles, rendering it inactive. Water temperature can also affect effectiveness. As a general rule, most herbicides shouldn't be used when the water temperature is below 50-60°F. While still growing, reduced plant metabolism may prevent sufficient herbicide uptake.

However, the most common reason is some form of dilution. Every plant and herbicide has a unique concentration and exposure time relationship. If the exposure time is reduced or the concentration is lower than required, the treatment will fail. Exposure time can be shortened by increased degradation due to bacteria, sunlight, high pH or a water current carrying the herbicide away, to list some examples. Inaccurately estimating a pond's volume can also reduce the herbicides' target concentration. The end result of these things is that plants are not exposed to a concentration of herbicide sufficient to lead to plant control. Please take the time to carefully read the label and correctly estimate the water body's size and conditions prior to an herbicide application.