

may pass before the nuisance plant masses sink away.

- Since each herbicide kills several or many kinds of plants, beneficial species may be killed along with the nuisance plants.
- Localized treatment is difficult. Even ponds that appear placid have currents that can carry poison from a problem area to an area with plant beds that should be preserved.
- There is risk of harm to other life in the pond and surrounding area.

Due to increasing knowledge and concern about risks of toxic chemical use, various products have been prohibited by State and Federal authorities. The list of permissible substances is much shorter now than a few years ago. Full consideration of other alternatives in aquatic plant control is advised before resorting to chemical treatment.

To use plant poisons effectively and with least hazard to other life, the kind of plant must be identified, the proper chemical obtained, the volume of the pond calculated, and the proper dosage applied. A list of chemicals presently allowed in Michigan for pond vegetation control and the plants they control can be obtained from your county Extension Office or from the MDNR Inland Lake Management Unit, Land and Water Management Division, Box 30028, Lansing, MI 48909. You should obtain an updated copy of this list each spring since the recommendations can change. Using chemicals other than on this list may be illegal and dangerous! Only use chemicals labeled for use in lake and ponds so you have complete instructions on their use and any special precautions to take when applying the chemical to water for weed control.

Dosage rates will be shown on the product label. These should be closely followed. **Do not overtreat!** Avoid the idea that "if a teaspoonful is called for, then a whole shovelfull will do the job better." This not only wastes money, but may cause plant decay so rapid that dissolved oxygen is depleted and fish suffocate—or the chemical overdose may poison fish and other life. Distribute the chemical evenly

over the area to be treated, whether using spray, powder or granular plant poisons. Too much applied in one place increases the risk of killing fish and other organisms. Most plant poisons work best when water temperature is above 65°F (18°C).

Carefully follow safety precautions printed on the product label. Don't let the chemical reach crops and other desirable plants or trees. Choose a calm day for treatment in order to avoid wind drift. Don't use the treated water for irrigation, agricultural sprays, livestock watering or swimming until a period has elapsed as advised on the label. Recommended waiting periods before various pond uses are included with the annual list of approved chemicals available from the county Extension offices or the MDNR. Don't eat fish from the pond for 3 days after treatment, or longer if stated on the label. Bathe and change clothes following use. In case of contact, immediately flush skin or eyes with much water for at least 15 minutes. Call a doctor immediately and have the chemical label with you for quick reference. Thoroughly wash spray equipment after each use. Dispose of all empty containers and clean up all spills. Take care that insecticide contamination of the pond does not occur from previous use of the sprayer for insect control.

**Copper sulfate** has been widely used to kill algae and is commonly available from agricultural supply outlets which sell it for other purposes. They generally don't provide instructions for its use as an algicide. No copper sulfate or other copper-based chemicals should ever be used in trout ponds. Neither should copper sulfate be applied extensively in other fishing ponds, even though it is frequently described as suitable for use in human drinking water supplies or where fish will be consumed. The high copper content can harm fish food organisms and fish reproduction. Copper sulfate is difficult to use properly. Its effects vary greatly depending on water hardness and other factors. In extremely softwater ponds, very little copper sulfate may kill the algae—but also kill the fish. In a very hard water situation, it may take much more copper sulfate to kill the algae, yet the danger to fish may be much

less. Never apply more than the dosage listed on the label.

Copper sulfate is best applied by dissolving the crystals in water and spraying on the surface or by placing them in a burlap bag and pulling it through the pond until dissolved. Simply throwing copper sulfate crystals into the water results in accumulations on the bottom where it may poison fish food organisms while having little effect on the algal problem.

If you wish to poison algae with copper, the risk may be lowered somewhat by using **chelated copper**. It is available as a product (trade-name "Cutrine") well-labeled with instructions for use, and it achieves the same algicidal effect as copper sulfate with a much lower concentration of copper. This is less likely to harm fish and other pond life.

Chara algae can be particularly hard to control with toxic chemicals, because it often has a crust of lime (calcium carbonate or "scale"). Therefore chara should be chemically treated only in the spring before a heavy crust forms. Copper sulfate is not advised for control of chara. The amount needed to kill this plant would be hazardous to other pond life. Cutrine and Hydra-thol 47 may be more effective on chara.

### Biological Control

Controlling aquatic vegetation with plant disease organisms or by plant-eating fish, waterfowl or other animals has been tried in many parts of the world but holds little promise at present for Michigan conditions. The plant-eating Asiatic grass carp (*Ctenopharyngodon idella*), euphemistically called "white amur" by its promoters, has been legalized in some states. In addition to eating problem plants, it eats beneficial plants that are used as breeding habitat for pike and muskies, that serve as cover for young gamefishes and that are food for wildlife, especially waterfowl. Since the grass carp will not eat all aquatic plants and algae, the plants it won't eat will grow in place of the plants that it will eat. Recent studies show that the total amount of plant material remains the same after grass carp are stocked; only the types of plants change. Con-