Hydrilla can spread by plant fragments, underground stems, seed, leafbuds or buds on underground stems.

Cattail is an emersed plant which must be controlled by chemicals such as glysophate.

A VIRUS TO LIVE WITH

Research using a virus to biologically control a certain type of noxious blue-green algae has shown promising results, says an aquatic microbiologist with the Institute of Food and Agricultural Sciences (IFAS), at the University of Florida in Gainesville.

E. J. Phlips, Ph.D., a researcher in the Fisheries and Aquaculture Department, has isolated a virus effective in controlling one species of microcystus blue-green algae. He hopes to isolate a number of other viruses by the end of the year.

Phlips and his staff collect water samples from sewage systems, polluted lakes and waterways throughout the state searching for viruses which kill only blue-green algae. Phlips tests these viruses with the algae in his lab, since the two rarely exist together in the water.

Herbicides have been the most popular method for controlling aquatic fo-

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one that keeps weed pests restrained naturally. Many native plants have biological restraints that keep them from growing prolifically.

Years of research are required to ensure that the introduced organism does not become another dangerous pest. Most biological organisms will not eradicate the host plant, but will instead reduce the plant's potential to become a serious pest.

Insects and plant pathogens — Over the years, insects have proven to be the most popular biological control agents due to their high degree of host specificity.

The alligatorweed flea beetle *(Agasicles hygrophila)*, discovered in South America and introduced into the United States in 1964, is the best example of an extremely successful biocontrol program using insects.

The waterhyacinth has had several biocontrol agents to help reduce its prolific growth. However, unlike alligatorweed, these biocontrol agents don't appear capable of quickly controlling the plant. Two waterhyacinth weevils *(Neochetina eichhorniae, N. bruchi)*, the waterhyacinth mite *(Orthagalumna terebrantis)* and fungus *(Cercospora rodmanii)* can often be found associated with the plant.

Herbivorous fish — Numerous exotic fishes around the world are reported to consume aquatic vegetation.

Of the fishes examined to date, the grass carp appears to be the best candidate for aquatic plant control in a variety of situations and climates, and may provide the only practical control method for water bodies where herbicides cannot be used. This fish has provided excellent control of submersed plants, filamentous algae and small floating plants such as duckweeds.

The grass carp is used by Arkansas and other states for this purose in natural lakes and has been researched by a number of other states. Florida has conducted research and has approved the use of the triploid grass carp, which has three sets of chromosomes as opposed to the normal two sets and is thus sterile.

The three possible management strategies using grass carp:

1) complete vegetation removal within one to two years with a heavy stocking rate;

2) winter stocking, before the spring growth of weeds begins, using fewer fish to maintain a lesser amount of vegetation in the system and increasing the grass carp population as needed; and

3) integrated control using chemical treatments to obtain desired levels quickly and stock grass carp to maintain this level.

Chemical control

Controlling aquatic plants with herbicides is the most commonly used method of weed control. Chemical weed control has several advantages:

- Herbicides may be directly applied to undesirable vegetation, offering a high degree of selectivity and leaving desirable levels of vegetation.
- Pre-emergence application of appropriate herbicides can provide early weed control. This may be used to promote desirable vegetation without competition during critical early growth stages.
- Herbicides reduce the need for mechanical control which can increase turbidity and affect fish populations.
- Erosion may be reduced by promoting the lower growing grass species for cover.
- Many weeds, especially perennials, that cannot be effectively controlled by other methods are generally susceptible to herbicides.
- Routine use of herbicides under a maintenance program usually reduces the cost of weed control.

For chemical aquatic weed control agents, see the accompanying chart. **LM**

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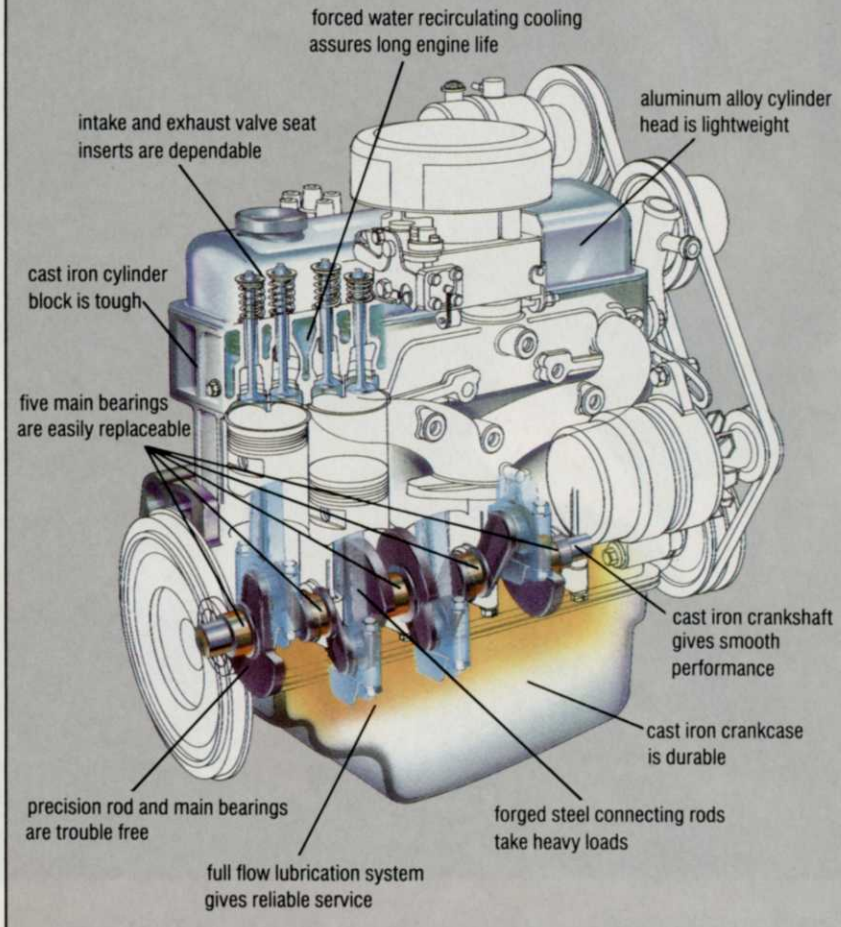

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A VIRUS TO LIVE WITH

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liage, but Phlips says, "Viruses are a more attractive alternative because they are specific to algae."

Phlips has conducted his research for the last six months with the help of a $20,000 grant from the U.S. Department of Agriculture, part of a larger grant for the Center for Aquatic Weed Control. Similar research has been conducted in the Great Lakes region and New England with promising results, Phlips adds.

His studies have been directed in part toward lyngbya, one type of blue-green algae found in Florida. "It forms a very dense, thick mat on the bottom of lakes, produces a bad odor and is reputed to produce toxic substances," Phlips said.

Algae breeding grounds are enhanced by sewage, runoff and industrial waste dumpage into lakes and canals. Light intensity, rainfall, temperature, carbon dioxide and oxygen levels also affect the algae. Phlips hopes viruses will biologically control the algae and replace or reduce the present use of herbicides and harvesting.

"A lot of blue-green algae are tolerant of herbicides, so a high concentration is used to achieve effective control," Phlips said. "Herbicides are also general in their action, so they kill off good blue-green algae with the bad," he said.

He has been examining existing viruses specific to certain harder-to-control blue-green algae. "It remains to be seen how many more we will find and how effective they will be," Phlips notes.

After isolating a virus, Phlips says, the next step is to determine the dose requirement and longevity of the virus.

"Our ultimate goal is to establish a collection of the major bloom-forming species of blue-green algae," Phlips says, "and use this as a basis for work on the development of biocontrol technologies."

He and other Center researchers have also been experimenting with controlling algae by controlling the nutrient input in lakes and also by controlling the lake environment, done by either adjusting the pH, oxygen content or the presence of competing species, such as herbivorous fish. Further studies on Florida lakes are necessary before the effectiveness of these methods can be assessed. **LM**