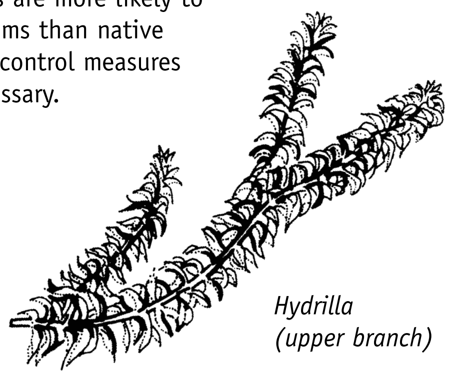
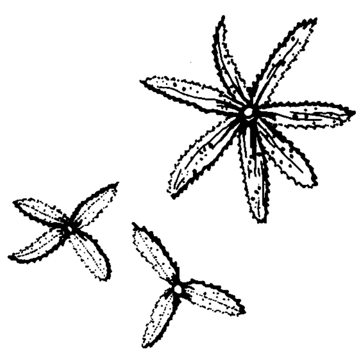
Alligatorweed

INTRODUCTION

Aquatic plants provide useful habitat for fish, invertebrates, aquatic mammals and birds. However, too much vegetation in a lake or pond can interfere with boating, fishing, swimming and other recreational activities. It can also hinder water movement, affect fish populations, and in some cases, reduce water quality. In general, exotic plants are more likely to cause problems than native species and control measures may be necessary.



Hydrilla (upper branch)



Hydrilla (individual whorls)

USEFUL INFORMATION

Stocking Permits
For a permit to stock triploid grass carp in a private pond, visit the Texas Parks and Wildlife Department Web site at **www.tpwd.state.tx.us/fish/infish/ponds/gcarp-intro.phtml** or call (800) 792-1112. Select 4 from the voice mail menu, then 4 again.

Regulatory Requirements
Enforcement of herbicide and pesticide laws is the responsibility of the Texas Department of Agriculture (TDA). Before applying herbicides, check with a TDA office to ensure compliance with federal and state rules. Even if the active ingredient is the same, it is illegal to use a product that is not registered for AQUATIC use. Use of herbicides containing 2,4-D requires a pesticide applicator's license.

To report herbicide misuse, call TDA's toll-free Pesticide Hotline at (800) TELL-TDA.

"Aquatic Vegetation Management in Texas: A Guidance Document" outlines procedures for developing and submitting treatment proposals for public water. This document is available in PDF form at **www.tpwd.state.tx.us/fish/infish/vegetation**
Proposals and questions should be addressed to:
Dr. Earl Chilton, Texas Parks and Wildlife Dept.
4200 Smith School Road, Austin, TX 78744
(512) 389-4652 earl.chilton@tpwd.state.tx.us

If a proposed herbicide treatment site is located within two miles of a drinking water intake, this must be noted in the treatment proposal. To find out where the public water intakes are located on a specific lake, contact the Texas Commission on Environmental Quality (TCEQ) at (512) 239-6020.

TEXAS PARKS & WILDLIFE

4200 Smith School Road
Austin, Texas 78744
(800) 792-1112 • (512) 389-4800
www.tpwd.state.tx.us

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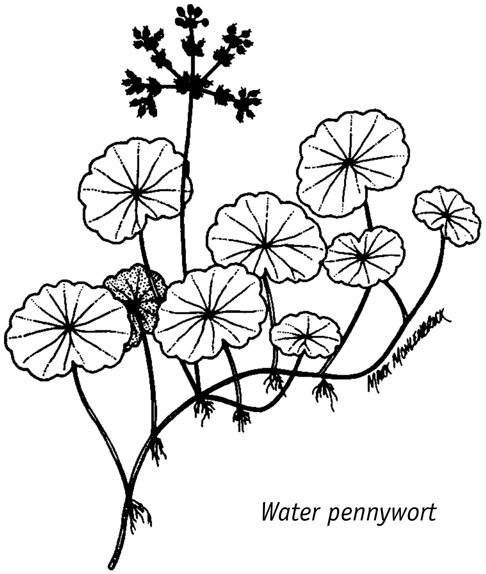
TEXAS PARKS AND WILDLIFE

Managing Nuisance Aquatic Plants

Water hyacinth

By Earl Chilton II, Ph.D.



Water pennywort

IDENTIFYING THE PROBLEM

For effective control and management, the first step is to identify the plants. Aquatic plants fall into two broad categories: vascular plants and algae.

Vascular aquatic plants have built-in transportation systems for water and nutrients, just as familiar garden plants do. Vascular plants can be further divided into submergent, emergent, floating and marginal species. Submergent plants are usually attached to the bottom and most of the plant is underwater. Emergent plants are typically rooted in shallow water with the main body of the plant extending above the surface. Floating species are unrooted and free to drift with wind and current. Marginal species are rooted along the shoreline in heavily saturated soils or shallow water.

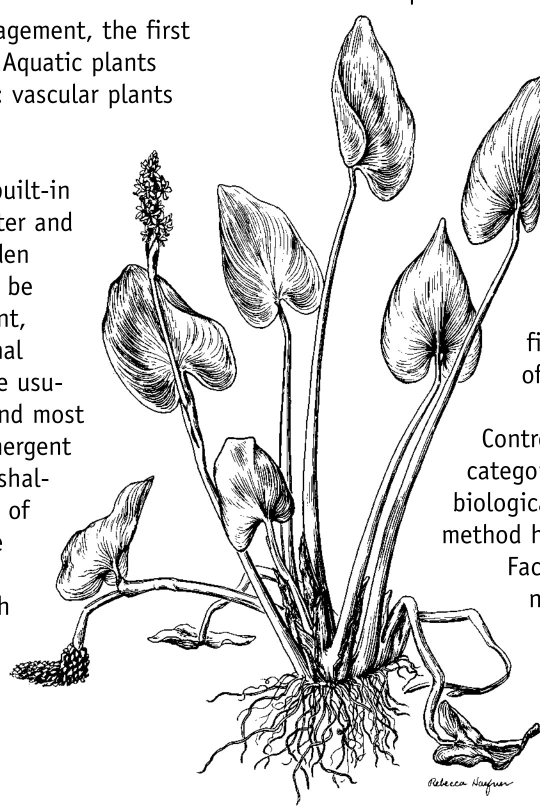
Algae include free-floating, single-celled species (phytoplankton) and filamentous species. Phytoplankton are usually beneficial; they form the base of many aquatic food chains. Filamentous algae grow in long strands that may resemble green cotton candy and are often referred to as pond scum or moss. Species such as chara (muskgrass) look like vascular, submergent plants, but are really algae. Chara has a distinctive garlic-like odor when crushed.

If you need help identifying plants in a private lake or pond, contact a commercial pond manager or your county extension agent. For plants in public water, contact a fisheries biologist at Texas Parks and Wildlife Department (TPWD).

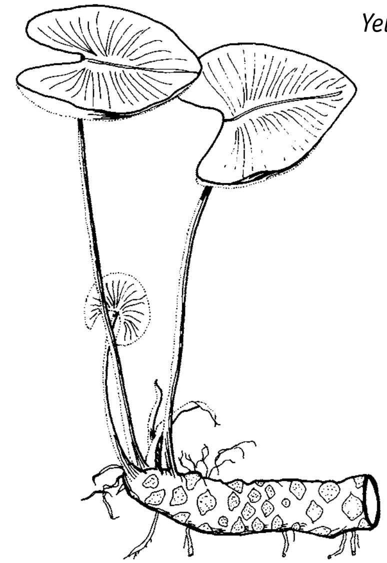
GAINING CONTROL

Management of nuisance aquatic vegetation in public water is regulated under the State Aquatic Vegetation Plan. Under the plan, a treatment proposal must be filed with the Texas Parks and Wildlife Department and the controlling authority for the lake or stream in question. Treatment proposals are not required for private water, but treatment with a restricted or limited-use herbicide requires certification from the Texas Department of Agriculture.

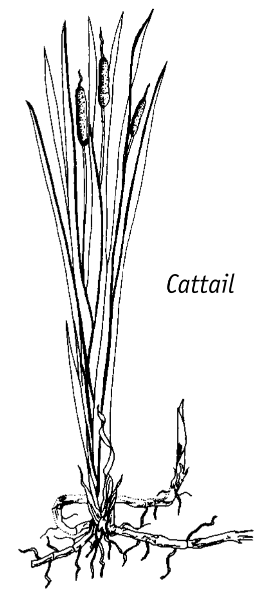
Control options fall into four basic categories: mechanical, environmental, biological and chemical (herbicides). Each method has advantages and disadvantages. Factors to consider include effectiveness, cost, availability, ease of application, potential environmental consequences and whether special permits are required.



Pickerelweed



Yellow cow-lily



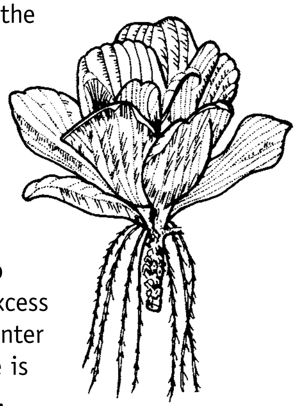
Cattail

Mechanical Control. Draglines, cutters, rakes, booms, mechanical harvesters and bottom barriers are common tools for vegetation management and control. Mechanical controls don't require the introduction of chemicals to the environment, and some people prefer them for that reason. On the other hand, mechanical methods tend to be labor-intensive and costly.

Large floating species such as water hyacinth can be removed by harvesting or shredding. Marginal plants can often be controlled by cutting, especially if cutting starts early in the growing season. Cutting machines may also be used on submergent and emergent vegetation, but regrowth may occur, making it necessary to cut several times in a single growing season. With species like hydrilla, which can grow from fragments, it's important to remove cuttings from the water; otherwise, fragments may grow in areas that were previously uninfested. In small areas, control may be achieved by pulling up young plants in the early spring.

Bottom barriers can inhibit the growth of submerged and emergent plant species. Semi-permeable material should be used in order to avoid a buildup of gases underneath the barrier that can lift it off the bottom.

Waterlettuce



Environmental Control. Reshaping the shoreline to eliminate long gradual slopes and reduce the amount of shallow water is one way to reduce shoreline vegetation. Shallow water is especially conducive to plant growth. It warms up first in spring, and sunlight reaches all the way to the bottom, inviting young plants to grow. Lowering the water to allow excess vegetation to dry out or freeze in winter can also be effective. This technique is used in some large, public reservoirs.

Shading is another way to slow plant growth. Plants can't make food without adequate sunlight. Commercially available dyes can be added to the water to inhibit light penetration. This technique should be used early in spring: dyes are less effective when plants are already growing close to the surface.

Fertilizing the pond can also limit light penetration. It stimulates the growth of phytoplankton, which intercept the light rays. Fertilizing has the added advantage of enhancing fish growth. The microscopic algae provide food for many invertebrates, which are eaten in turn by fish. Timing is important, however. Added nutrients can stimulate growth in undesirable plants if the water is allowed to clear, or if plants have grown close to the surface before fertilizer is applied. Therefore, fertilizing should be viewed as an ongoing process. Begin in the spring when water temperatures reach 60ºF. Continue as needed to keep underwater visibility at 18 inches or less through the growing season. Stop fertilizing in the fall when the water temperature drops below 70ºF. Granular or liquid fertilizers with a high phosphorus content can be used; a 10-34-0 formulation is suggested. Liquid fertilizers are easier to apply and may be up to four times more effective than granular varieties.

Biological Control. Stocking sterile triploid grass carp or white amur (*Ctenopharyngodon idella*) is a popular method of biological control. Young grass carp are voracious vegetarians. Under certain conditions, they have been known to eat 50% to 300% of their body weight per day. Feeding rates drop in older fish, but remain substantial at 25% per day or more. The grass carp's preferred food, hydrilla (*Hydrilla verticillata*), is one of Texas' most problematic submerged plant species. However, these fish will eat nearly anything green, and should be used with the understanding that they could potentially consume all the vegetation in a pond or lake. Because grass carp are included on the state list of harmful or potentially harmful exotic species, a permit from TPWD is required for stocking.

Insects have been used to manage some plant species. For example, alligatorweed (*Alternanthera philoxeroides*), can often be controlled by the alligatorweed flea beetle (*Agasicles hygrophila*), which affects only this species. Insects are also available for control of hydrilla, water hyacinth, waterlettuce and giant salvinia. Effectiveness varies.

Chemical Control. Farmers have long used herbicides to control weeds in their fields, and there are herbicides that work on aquatic weeds, too. Copper sulfate has been in use since 1904. Chelated copper compounds are often preferred today, as they are slightly less toxic to fish and approved for use in drinking water. Organic herbicides became available for aquatic weed control in the 1940s with 2,4-D (2,4-dichlorophenoxyacetic acid), followed by diquat, endothall, glyphosate and fluridone. Each chemical is sold under several brand names. Only those brands registered and approved by the United States Environmental Protection Agency (U.S. EPA) for aquatic use may be legally used to control aquatic vegetation.

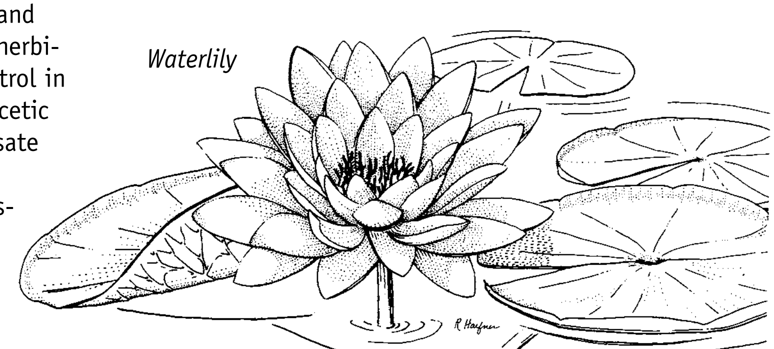
Herbicide is seldom a permanent solution. Many plants have seeds or tubers that are not killed by the chemical and live to sprout another day.

Most herbicides work best when plants are actively growing. They should be applied in the spring after water temperatures reach 60 to 70ºF. However, precautions must be taken in warmer months to prevent oxygen depletion. As treated plants decay, the level of dissolved oxygen in the water decreases. If it drops too low, a fish kill can result. To minimize this effect, severe infestations covering more than half the water body should be treated in stages. Treat about 1/4 of the water body at one time, and wait 10 to 14 days before treating the next section. It is best not to apply herbicides on cloudy days, when oxygen depletion is more likely.

Adjuvants and surfactants are commercially available compounds that help chemicals disperse more evenly and/or provide better leaf penetration. These additives should be used when recommended on the herbicide label.

Product specimen labels should be read carefully for water use restrictions, application rates, health and safety precautions, and applicability to the plant species being treated. Improper use of pesticides may endanger people, livestock, and fish and wildlife resources.

Waterlily



Category	AQUATIC PLANT	2,4-D*	Diquat	Endothall	Fluridone	Glyphosate	Imazapyr	Triclopyr	Copper Sulfate	Chelated Copper
		HERBICIDES								
EMERGENT SPECIES	Alligatorweed	–	–	–	G	G	E	E	–	–
	American lotus	–	–	–	G	G	–	G	–	–
	Parrot feather	–	–	–	–	–	G	E	–	–
	Pickerelweed	G	–	–	–	–	G	G	–	–
	Smartweed	–	–	–	G	E	G	G	–	–
	Waterlily	E	–	–	G	E	G	E	–	–
	Water pennywort	–	E	–	–	–	E	E	–	–
	Water primrose	–	–	–	G	E	F	E	–	–
	Waterwillow	E	–	–	–	–	F	G	–	–
	Yellow cow-lily	G	–	–	G	E	F	E	–	–
SUBMERGENT SPECIES	Bladderwort	E	E	–	E	–	–	–	–	–
	Brazillian elodea	–	–	E	E	–	–	–	–	–
	Bushy Pondweed	–	E	E	E	–	–	–	–	–
	Coontail	G	E	E	E	–	–	–	–	–
	Elodea	–	E	–	E	–	–	–	–	–
	Fanwort	–	–	–	E	–	–	–	–	–
	Hydrilla	–	–	E	E	–	–	–	F	G
	Parrot feather	–	E	E	G	–	–	E	–	–
	Pondweed	–	E	E	E	–	–	–	–	–
	Watermilfoil	E	E	E	E	–	–	E	–	–
	Water stargrass	E	–	E	–	–	–	–	–	–
FLOATING SPECIES	Duckweed	–	E	–	E	–	F	–	–	–
	Salvinia	–	E	–	E	E	–	–	–	–
	Water hyacinth	E	E	–	–	E	E	E	–	–
	Waterlettuce	–	E	–	–	E	E	–	–	–
MARGINAL SPECIES	Black willow	–	–	–	–	G	G	E	–	–
	Bulrush	–	–	–	–	E	G	G	–	–
	Cattail	–	G	–	G	E	E	–	–	–
	Giant reed	–	–	–	–	G	G	–	–	–
	Torpedograss	–	–	–	G	G	G	–	–	–
ALGAE	Chara	–	–	E	–	–	–	–	E	E
	Nitella	–	–	E	–	–	–	–	E	E
	Filamentous species	–	–	E	–	–	–	–	E	E

E = Excellent Control G = Good F = Fair

Adapted from product label recommendations. Other plant species could be affected. Exercise care when non-target plants are present. Individual products and labels can vary. Follow individual product recommendations to determine effectiveness and application rate. Label information and recommendations are subject to change. Read and follow all product label recommendations and restrictions. Herbicide listings in this publication do not constitute an endorsement by Texas Parks and Wildlife Department. This listing does not include all available aquatic herbicides and formulations.

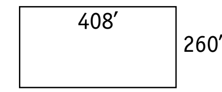
* In certain counties, 2,4-D, both ester and amine formulations, are regulated under Texas Agriculture Code, Chapter 75 and Special Provisions (Section 11.2). Consult with the Texas Department of Agriculture prior to using any 2,4-D product.

ESTIMATING POND SIZE

The following formulas can help determine the amount of water to be treated. An acre-foot of water is one surface acre one foot deep. Surface acreage multiplied by average depth, in feet, equals the volume in acre-feet. One part per million (ppm) of herbicide equals 2.7 pounds per acre-foot.

If a pond is **rectangular** in shape, the length in feet would be multiplied by the width in feet. The total number of square feet should be divided by the number of square feet in one acre (43,560).

Example:



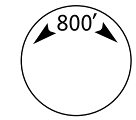
Pond length = 408 ft.
Pond width = 260 ft.

$$\text{Surface acres} = \frac{\text{Length (in feet) x Width (in feet)}}{43,560}$$

$$\text{Surface acres} = \frac{408 \text{ x } 620}{43,560} = \frac{106,080}{43,560} = 2.44$$

If the pond is **circular**, the distance around the shoreline (perimeter or circumference) of the pond should be measured in feet. That number should be multiplied by itself and then divided by 547,390.

Example:



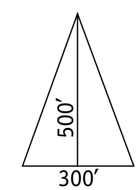
Shoreline distance = 800 ft.

$$\text{Surface acres} = \frac{\text{Shoreline (ft.) x Shoreline (ft.)}}{547,390}$$

$$\text{Surface acres} = \frac{800 \text{ x } 800}{547,390} = 1.17$$

If the pond is **triangular**, the base and height should be measured.

Example:



Base = 300 ft.
Height = 500 ft.

$$\text{Surface acres} = \frac{\text{1/2 (base x height)}}{43,560}$$

$$\text{Surface acres} = \frac{1/2 \text{ x } 300 \text{ x } 500}{43,560} = 1.72$$

To determine average depth, make a series of soundings by dropping a weighted line to the bottom in straight rows across the pond 30 to 50 feet apart. Add the depth measurements together and divide by the number of soundings. Begin and end each row with the zero measurement at the shoreline and include these in the total number of soundings made.