Aquatic weeds and their control

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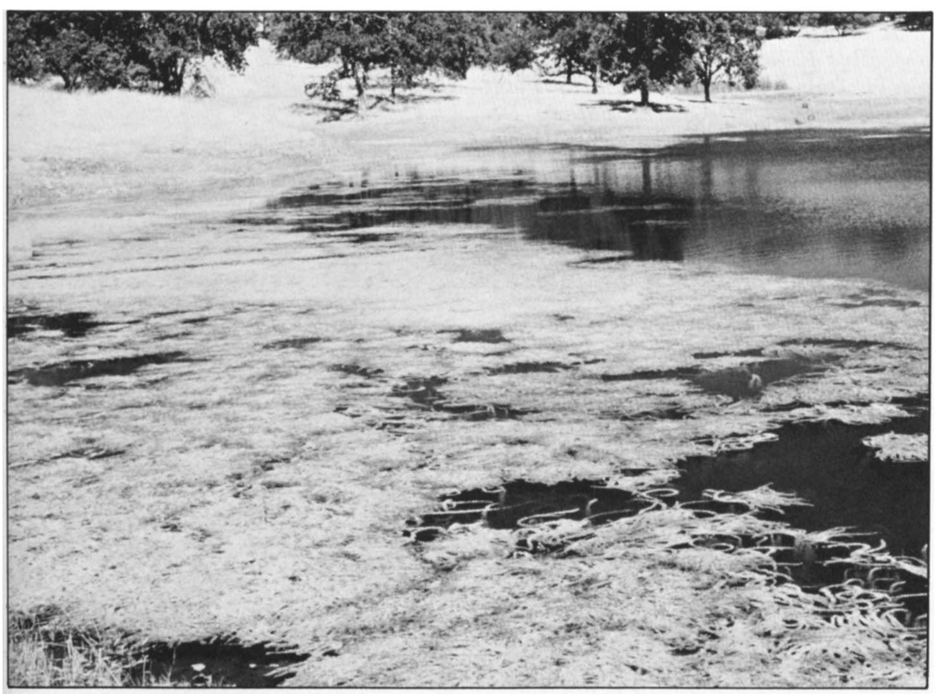
Like land plants, aquatic vegetation is a natural and necessary environmental component of the California flora. Aquatic plant species, numbering in the hundreds, occur in impoundments and waterways throughout the state from below sea level to over 6,000 feet.

The type and quantity of aquatic plant life providing food and cover in a pond, lake, or marsh have a strong influence on numbers and diversity of fish and wildlife. In a pond or lake, a moderate population of algae and higher plants provides habitat for aquatic insects eaten by fish and is used as escape cover by young fish. Aquatic plants are attractive outdoors and in household aquaria.

Weed scientists classify aquatic plants in terms of the environmental niches in which they are found. Emersed plants include the shallow-water marshland types like cattails (*Typha* spp.) and bulrushes (*Scirpus* spp.). Floating aquatics grow over the water surface and include plants such as California waterprimrose (*Ludwigia peploides* HBK), waterhyacinth (*Eichhornia crassipes* [Mart.] Solms), azolla (*Azolla* spp.), and common duckweed (*Lemna minor* L.). The deeper water category, the submersed plants, include American pondweed (*Potamogeton nodosus* Poir.), sago pondweed (*Potamogeton pectinatus* L.), coontail (*Ceratophyllum demersum* L.), and the milfoils (*Myriophyllum* spp.). Algae comprise the fourth category and include the microscopic plankton "bloom" algae and the filamentous colonial types.

The submersed group presents the greatest economic problems of weed control, although other types can create important problems also.

Submersed aquatic weeds clogging a canal—Glenn-Colusa Irrigation District.



Northern milfoil (Myriophyllum exalbescens) in a farm pond in El Dorado County.

Flow capacities

The maintenance of flow capacities of irrigation and drainage canals is an endless and expensive task wherever irrigated crop culture is practiced. Aquatic plants reach their most vigorous growth phase in the spring and summer, which coincides exactly with the maximum irrigation and recreational use of water. One federal agency reported that 30 percent of the total operation and maintenance costs for irrigation projects was devoted to the control of aquatic and canalbank weeds. Weeds restrict water flow below design capacity and cause the water level to rise, increasing seepage and, in severe cases, breaching. Very dense weed growth has been reported to result in a 97 percent reduction in flow rate.

Flow restrictions caused by rooted plants also produce accelerated silt deposition along canal bottoms, further compounding the task of delivering water to farms, municipal water treatment plants, and industries. Submersed plants and algae invade not only earthen structures but also concrete lined canals and reservoirs.

Even when the water has reached the user, fragments of rooted plants and algal masses can plug pump screens and sprinkler nozzles, and render drip-irrigation emitters nearly useless.

Controlling aquatic weeds

Although steep banks and a minimum of shallow water can reduce weed populations, especially in reservoirs and lakes, eliminating all aquatic plant growth requires exceedingly intensive management of open storage and conveyance installations. Therefore, canal design should allow for the very probable reduction in velocity and volume of flow caused by aquatic vegetation.

In the past, weeds were mechanically controlled by boat- or barge-mounted mowing machines or harvesters on reservoirs; by draglines for the removal of sediment and weeds in canals; and by V-knives, weighted cables, or anchor chains dragged back and forth to sever or tear loose offending growth. However, rising operational costs have limited mechanical weed control.

The U.S. Army Corps of Engineers has investigated the feasibility of employing laser energy to control aquatic weeds. Initial results offered promise on floating species such as waterhyacinth, but developmental time and costs suggest that practical field use of laser beams for weed control is, at best, well in the future.

Biological control was successful in the case of the introduction by the U.S. Department of Agriculture of alligatorweed flea beetle (*Agasicles hygrophila* Selman Bogg) for the control of alligatorweed (*Alternanthera philoxeroides* [Mart.] Griseb.) in southeastern states. Progress also has been made in the introduction of insects to control waterhyacinth. In California, the U.S. Department of Agriculture is developing methods of disseminating spikerushes (*Eleocharis* spp.), a native group of low-growing rushes that compete with problem species such as American and sago pondweeds but create less flow retardance. The use of snails in Florida initially showed promise but was later found to be a possible threat to young rice plants.

In recent years, tests of two species of exotic herbivorous fish have stirred interest. Tilapia (*Tilapia* spp.) from South America are currently used with some success for aquatic weed control in Imperial Valley canals. Tilapia are not permitted to be introduced north of the Tehachapi Mountains, however, and because they die when water temperatures are below approximately 55°F, they are not practical outside of tropical or warm desert regions. Research has been discontinued on the second and much larger fish, the white amur of Asia, because the fish is viewed as an environmental threat.

Aquatic herbicides are more efficient than hand pulling or mechanical control and are now used worldwide. However, few new aquatic herbicides have attained even the experimental stage in the past 20 years, owing to the enormous cost of ensuring their efficacy and safety to the environment and public. In any event, the market for aquatic herbicides is small compared to the market for weed control in crops. Typically an herbicide is registered for aquatic use after it has been sold for weed control in crops. Not all aquatic herbicides currently registered by the U.S. Environmental Protection Agency and the California Department of Food and Agriculture are approved for use in irrigation, livestock, and domestic waters. Because of numerous use restrictions it is important to select aquatic herbicides carefully to ensure that the intended use is approved (legal) and is compatible with the uses to be made of the water.

As increasing demands are made on the water resources of California, new concepts and approaches to vegetation management will be needed to provide effective, environmentally compatible, and energy-conserving answers to the increasingly complex problems of aquatic weed control.

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