WEED CONTROL IN IRRIGATION AND ORNAMENTAL PONDS

W. B. McHenry
Extension Weed Scientist
University of California, Davis

Man-made irrigation and ornamental ponds are typically designed and constructed in a manner that inadvertently guarantees on-going maintenance of unwanted aquatic vegetation. Submersed vegetation is excluded in deep water because insufficient light intensity reaches the bottom to support plant life. Most man-made water bodies as much in consideration of construction costs are far too shallow to exclude underwater plant growth. Lined ponds such as home garden goldfish ponds excluded rooted vascular plants but algae remain as the major problem.

It is difficult to predict the minimum depth that will exclude or minimize submersed species at the designing stage, but very often depths of approximately 15 feet are required. If the light transmission is reduced as with naturally occuring or introduced dyes, or through stimulation of plankton algae, the weed limiting depth will be greatly reduced.

The slope of the shoreline above and below the waterline has a great influence on the appearance and extent of emersed aquatic plants such as cattail (Typha spp.), hardstem bulrush (Scirpus acutus), umbrella sedge (Cyperis eragrostis), and smartweeds (Polygonum spp.). A steeply angled shoreline limits growth--and maintenance--to a narrow band of a few feed in width. An extensive shallow zone of a few inches to approximately 2 feet will encourage extensive occurrence of emersed species. This latter condition merges more toward a marshland setting that offers far better conditions for waterfowl and other marsh birds--and possibly mosquitos as well.

Control measures include depth and shoreline profile (angle) considerations at the design stage or during pond reconstruction, occasional draining and drying during the summer months, or the use of herbicides that have been specifically tested and registered for plant control in aquatic environments. In small ornamental landscape ponds hand-cleaning may be the most convenient. There are currently no biological control methods in California employing plant-eating fish, insects, etc. (except in Southern California where the fish Tilapia has some limited use) for the control of native California aquatic weeds.

The use of manure or artificial fertilizers to stimulate plankton algae (the existence of a dense population of microscopic algae is often referred as an algae "bloom") is a method of altering the aquatic environment, a biological control measure of a sort, to reduce light penetration. This method is best reserved for ponds where the yield of warm water fish species if the primary management goal. Fertilized ponds often become excessively populated with submersed and emersed weeds when for one reason or another the proper shading doesn't prevail. Quantities of stringy filamentous algae may also develop rapidly after fertilizer application thereby degrading the aesthetic value of a pond or lake.

Aquatic herbicides are not a panacea for pond management problems forced by serious limitations in pond or lake design. Depth considerations and light intensities in water have already been discussed.

Herbicide choices for irrigation and livestock water--

The herbicides currently registered for use in managing submersed aquatic weeds in irrigation ponds are relatively short-lived in their longevity of control--6 to 8 weeks. Diquat and endothall are contact herbicides, not translocated. Since nearly all submersed vascular weeds are perennial, they regrow after being top-killed. The recovery time for submersed species depends on water temperature--slower growth with cold temperatures, more rapid growth when its water is warm. Diquat and endothall applications in irrigation water carry time delay restrictions on using treated water for irrigation or livestock use. As with any pesticide, the product label should be read thoroughly and use restrictions noted and followed carefully.

To control excessive algae, copper sulfate (blue stone) has been used for 80 years or longer. It is effective at concentrations of from 0.5 to 1 ppm (parts per million) in waters that contain low concentrations of carbonate and bicarbonate minerals (below perhaps 20 ppm total carbonate-biocarbonate). At 40- to 60 ppm carbonate-bicarbonate and higher, a condition common to well water in the central valley and elsewhere, the copper precipitates out rapidly and algae escape copper toxicity. Tests by both Cooperative Extension and U.S.D.A. researchers indicate the organic chelated forms of copper to be no more efficaceous than copper sulfate in resisting the lowered algae control efficiency under high carbonate-bicarbonate alkalinity.

Table 1. AQUATIC HERBICIDES REGISTERED FOR AGRICULTURAL USES (IRRIGATION AND FOR LIVESTOCK WATERING

LAKES, PONDS COMMON NAME	LABEL NAME	USES		FISH TOLERANCE
		ALGAE	VASCULAR	
COPPER CHELATED	ALGAETROL 76,	YES	NO	YES[1/]
	CUTRINE PLUS,	YES	NO	YES[1/]
	KOMEEN,	YES	NO	YES[1/]
	WEEDTRIN PLUS (COPPER + ENDOTHALL)	YES	YES	YES[1/]
COPPER SULFATE	COPPER SULFATE	YES	NO	YES[1/]
DIQUAT	ORTHO AQUATIC WEED KILLER	NO	YES	YES[1/]
ENDOTHALL, AMINE SALT	HYDROTHOL 191, HYDOUT	YES	YES	NO
ENDOTHALL, POTASSIUM SALT	AQUATHOL K, AQUATHOL (GRAN)	NO	YES	YES

1/ CAUTION - TROUT AND SALMON VERY SENSITIVE

Herbicide choices for ornamental ponds (non-irrigation and livestock uses)-

In addition to diquat and endothall derivatives for vascular submersed weeds and copper forms for algae control, there are four additional compounds that have varying utility, but with greater use restriction. These herbicides are dichlobenil (Casoron 10G), a granular 2,4-D (Aqua-Kleen), fenac (Fenatrol), and a specifically registered use of simazine (Aquazine). These four are <u>not</u> cleared registration-wise for irrigation or livestock water.

Table 2. AQUATIC HERBICIDES REGISTERED FOR WATER HAVING NON-AGRICULTURAL USES

LAKES, PONDS COMMON NAME	LABEL NAME	USES ALGAE	USES VASCULAR	FISH TOLERANCE
DICHLOBENIL	CASORON 10G	YES (CHARA)	YES	YES
2,4-D (GRANULAR)	AQUA-KLEEN*	NO	YES (MILFOIL)	YES
FENAC	FENATROL	NO	YES	YES
SIMAZINE	QUAZINE	YES	YES	YES

* RESTRICTED-USE PESTICIDE: PERMIT REQUIRED

Safety of herbicides to fish-

All of the herbicides mentioned here possess a wide margin of safety to fish with the exception of the amine derivative of endothall (Hydrothol 191 and Hydout) and copper-containing algaecides in the presence of trout or salmon). Copper has a workable margin of safety to warm water fish. In simazine's appropriately labelled form-Aquazine-this product possesses a far wider safety margin and is effective on both submersed vascular weed species and most common forms of planktonic and filamentous algae.

There is a secondary hazard in employing aquatic herbicides to fish however, that should be appreciated. Any rapid plant kill in a body of water causes a depression in the level of dissolved oxygen. Generally this is a transient condition and typically does not sufficiently depress the oxygen to hazardous levels. Worst case conditions that can bring about fish suffocation would be a kill of a very dense population of vascular plants or algae, warm water (inherently lower levels of oxygen present), and an overcast sky follow herbicide application.

In summary, pond or reservoir pre-construction planning should, where feasible, give consideration to depth and shoreline profile to minimize aquatic weed control measures and costs after the pond is in use. Specific herbicides registered for aquatic vegetation management are useful, but care must be exercised in selecting and employing herbicides appropriate with the uses made of the water.