

## **Hydrilla: an Aquatic Weed Threat to the Delta and Bay**

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Hydrilla (*Hydrilla verticillata*) is the only “A” rated submerged aquatic noxious weed in California and the Legislature has charged the California Department of Food and Agriculture (CDFA) to survey and eradicate it from the State (California Food and Agriculture Code Section 6048). As an “A” rated weed, CDFA is charged with the responsibility to 1). Properly identify this weed, 2). Exclude entry of this weed into the State, 3). Establish interior quarantine in all infested counties that contain infested water bodies, 4). Survey all high hazard water bodies in the State for this weed, 5). Eradicate it wherever it is practical, 6). Educate the public to clean hydrilla from boats and boat motors and report the weed if sighted, and 7). Sponsor research on the ecology and control of hydrilla.

The CDFA Integrated Pest Control Branch (CDFA-IPC) is charged with managing the State’s Noxious Weed Programs, including hydrilla eradication. In the CDFA-IPC’s Strategic Plan, the first item is “to prevent establishment the establishment of hydrilla in California.” An important aspect of this is preventing new infestations, such as new infestations in the Sacramento-San Joaquin River Delta and San Francisco Bay. CDFA-IPC discharges this responsibility in cooperation with other Federal, State, County and private organizations such as the U. S. Department of Agriculture’s Exotic and Invasive Weed Control Program, the U. S. Army Corps of Engineers, the U.S. Bureau of Reclamation, the California Department of Boating and Waterways, the University of California, the local County Agricultural Commissioners, and Yolo County Flood Control and Water Conservation District.

The Sacramento-San Joaquin River Delta is the most important water body in the State, with 47 percent of all the runoff water in California moving through the Delta. It provides water for residential, industrial, and agricultural uses in both the North and South State areas. The Delta supports approximately 120 fish species, and approximately 750 plant and animal species (CALFED Bay-Delta Program 2001). In addition, it is the largest wetland habitat in the western United States (CALFED Bay-Delta Program 2001). Any blockage of this water flow by hydrilla would impede navigation, clog water control structures, choke hydroelectric generators, imperil native plant, fish, and animal life and diversity; and raise the cost of water delivery to users.

Hydrilla is classified as a noxious weed because of its invasive and hard-to-control nature. Hydrilla spreads through plant fragments, tubers, and turions. The tubers can stay viable in the hydrosol for up to 10 years (Encyclopededia, 2001). In addition, hydrilla has a rapid growth rate, forms large, submerged mats, and is a fierce competitor for sunlight in the water column (Langeland 1996). And last, because hydrilla is not indigenous to California, there are no natural predators to keep its spread in check.

The CDFA-IPC Hydrilla Eradication Program began in 1976 after hydrilla was found in Lake Ellis in Marysville, California. Since then, hydrilla has been found in 17 counties in the State and eradicated from several water bodies in 13 of these counties, including Lake Ellis. However, active eradication projects are on-going in water bodies that could potentially drain into the Sacramento Delta through the Sacramento River, the San Joaquin River, or Cache Creek and other tributaries (see Figure). These projects are: 1). Two infested ponds near the Sacramento River near Redding in Shasta County, 2). Several infested ponds and an infested canal in Yuba County near Oregon House, 3). Clear Lake in Lake County, 4). One pond along Bear Creek in Calaveras County, 5). Eastman Lake and the first 26 miles of the Chowchilla River upstream from the lake in Madera and Mariposa Counties, and 6). Several ponds in Tulare County above Lake Success (California Department of Food and Agriculture 2001.). All of these infestations could infest the Delta either through direct hydraulic connection (water flow) or by way of infested boats, boat trailers, boat motors, livewells, trucks, fishing gear, clothing, etc. Of these active projects, the closest and most direct hydraulic connection to the Delta is the infested pond along Bear Creek in Calaveras County, which drains into Disappointment Slough and from there into the San Joaquin River near Stockton.

These active sites are surveyed by CDFA-IPC personnel for hydrilla at least three times per year in order to determine if the infestation is spreading, stable or decreasing. In addition, all water bodies within approximately 5 miles or more of each active site are surveyed by CDFA-IPC personnel several times per year in order to determine if they remain hydrilla free. In order to help the survey and detection effort, CDFA-IPC personnel also conduct training for other agencies and groups on the recognition and identification of hydrilla and where to report it if found (the local County Agricultural Commissioner). These agencies and groups include the California Department of Fish and Game, local County Agricultural Departments, Irrigation Districts, Pest Control Advisors, botanical and native plant societies, golf course managers, and irrigation managers. The assistance of these agencies and groups is essential to the survey and detection effort in order to assure that all water bodies in the State are surveyed at some level. CDFA-IPC personnel follow up on all reported hydrilla sightings from the public or from the local Agricultural Commissioners in order to confirm identity. In addition, hydrilla brochures describing the plant are given to County Agricultural Commissioners, marinas, bait and tackle shops, and other interested parties for distribution to the public.

The hydrilla infestation at the active hydrilla sites is decreasing. For example, the number of infested ponds near Redding has declined to 2 in year 2001 from the 17 originally infested and the number of plant finds in Clear Lake has declined to 41 in year 2001 from 208 in year 1997. In the Eastman Lake/Chowchilla River complex, the number of plants found has declined from uncountable in 1992 to 6,500 in year 1993 to only five in year 2001 and the number of tubers has declined from 35,451 in year 1991 to 1,400 in year 2000.

CDFA-IPC uses an Integrated Pest Management approach to hydrilla eradication. Eradication methods include manual removal and dredging; drawdown and drainage; screens to prevent movement of plant fragments, tubers, or turions; and chemical control. The herbicides used are primarily a liquid copper ethylenediamine complex, liquid fluridone and fluridone slow release pellets. (In Imperial County, but not in the waterways associated with the Delta, CDFA-IPC and the Imperial Irrigation District also use the triploid grass carp as a biological control agent for hydrilla.)

Each year, personnel from CDFA-IPC conduct a survey of the Sacramento-San Joaquin Delta and the lower reaches of the tributary rivers for hydrilla. The presence of other aquatic weeds is also noted. In the years 2000/2001, this survey included Suisun Bay, Middle River, Old River, Franks Tract, Potato Slough, White's Slough, Disappointment Slough, the Stockton Deepwater Channel, Victoria Channel, the Grant Line Canal, Cache Creek, Bear Creek, the Sacramento River, the Feather River, and the San Joaquin River. The survey is made in late fall when hydrilla plants and mats are easiest to detect. No hydrilla has ever been found in the Delta, though other non-native, aquatic pest plants, such as *Egeria densa*, *Cabomba caroliniana*, and water hyacinth (*Eichhornia crassipes*) have been found, sometimes in large numbers. If hydrilla were ever to be found in the Delta, early detection of an incipient infestation by way of this annual survey would be essential to eradicating hydrilla before it became permanently established and began to spread.

In summary, the CDFA-IPC Hydrilla Eradication Program is succeeding at eliminating hydrilla from infested water bodies, and is succeeding in keeping the Sacramento Delta and San Francisco Bay hydrilla free.

#### REFERENCES:

California Department of Food and Agriculture, 2001. CDFA Hydrilla Program: Annual Progress Report for 1999 and 2000. California Department of Food and Agriculture, 1220 "N" Street, Room A-357, Sacramento, California 95814  
<http://www.cdffa.ca.gov/phpps/ipc/hydrilla/annualreport.htm>

CALFED Bay-Delta Program, 2001. Ecosystem Restoration Program, Draft Stage 1 Implementation Plan, August 2001. CALFED Bay-Delta Program, 1416 "9<sup>th</sup>" Street, Room 1155, Sacramento, California 95814  
[http://www.calfed.water.ca.gov/stage1\\_2002\\_psp.htm](http://www.calfed.water.ca.gov/stage1_2002_psp.htm)

Encycloweedia, 2001. Hydrilla, Egeria, and Elodea. California Department of Food and Agriculture, 1220 "N" Street, Room A-357, Sacramento, California 95814  
<http://pi.cdffa.ca.gov/weedinform/HYDRILLA2.html>

Langeland, K.A. 1996. *Hydrilla verticillata* (L.F.) Royle (Hydrocharitaceae), "The Perfect Aquatic Weed". *Castanea* 61:293-304  
<http://aquat1.ifas.ufl.edu/hydcirc.html>

Figure. Active hydrilla projects in the CDFA Hydrilla Eradication Program where the water could potentially drain into the Sacramento-San Joaquin Delta and San Francisco Bay.

