

## **Hydrilla Eradication Efforts in the Chowchilla River and Eastman Lake in Central California; a Success Story**

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Hydrilla is an invasive, non-native aquatic plant that is a serious threat to the water resources of the State. It reduces the storage capacity of lakes and ponds, impedes movement in streams and canals; clogs pumps and hydroelectric generators; degrades fish and wildlife habitat; and can even endanger public health by creating mosquito breeding habitat. Hydrilla can reproduce by stem fragments that root and form mature plants; turions that form in the leaf axils; and most troubling, tubers that form on the end of underground rhizomes in the spring and again in late summer through fall. These tubers can survive in the hydrosol for several years or more. Following the first introduction of hydrilla into California, in 1977 the California Legislature mandated that the CDFA Secretary initiate a detection program for hydrilla and to eradicate it wherever “feasible”. This mandate is stated in the California Code of Regulations.

The discovery of hydrilla in Eastman Lake and the Chowchilla River presented new challenges to the CDFA. Previous infestations had occurred primarily in locations that were easily accessible and where the water could be controlled. This infestation was the first to be seen in a free flowing seasonal river. The Chowchilla River originates in the Sierra Nevada foothills in Mariposa County. The three forks of the Chowchilla fill Eastman Lake, an 1800-acre reservoir owned by the U.S. Army Corps of Engineers. Eastman is used primarily for flood control, irrigation, recreation and wildlife preservation.

Hydrilla was first detected in Eastman Lake on June 20, 1989, during a routine survey by CDFA and Madera County Department of Agriculture personnel. Plant samples were collected, sent to the CDFA Diagnostics Lab and confirmed as dioecious hydrilla. Initially the infestation appeared to cover approximately 100 gross acres in the northern section of the lake. CDFA acted immediately to prevent hydrilla spreading to other local lakes or into the irrigation canals by requesting that the U.S. Army Corps of Engineers close off the northern portion of the lake to recreational activities on June 23. Just 5 days later the entire lake was placed under quarantine as many more plant sites were found along the eastern shore line.

While Eastman was being inspected, additional teams of Biologists were starting a delimitation survey to discover the full extent of the problem. When they discovered hydrilla in the Chowchilla River in a few easily accessible places upstream of Eastman Lake it was clear that personnel needed to follow the river upstream to find the source of the infestation. This was not as simple as it sounds. Since the Chowchilla flows completely through private land, property owners had to be contacted in order to gain access to the river. Most owners granted permission immediately but others had to be persuaded to allow people on their property. Government types aren’t exactly welcomed in many of the foothill and mountain areas of California, especially when questions are being raised about precious water resources. When the most upstream site of the

infestation was located in the West Fork of the Chowchilla River, 26 miles upstream from Eastman Lake, the entire West Fork of the river was closed, restricting all water related activities.

Right at the beginning of this project there were many who questioned the “feasibility” of eradicating hydrilla from the Chowchilla River. It flows through some extremely rugged terrain, with steep hills and deep canyons. Just getting to the water in many places involves driving on a rugged 4-wheel drive road, then hiking for a half mile or more on cattle trails through oak grassland or chaparral, sometimes through stands of poison oak. Biting and stinging insects, rattlesnakes, the occasional mountain lion or bear, the not so occasional wild pig, and even people with guns, add to the adventure of just getting to the water! Once in the river personnel are faced with the daunting task of staying upright on slippery rocks, or hacking through thick stands of cattails or willows. In the early years of the project, all of this was done while carrying a backpack sprayer with 40 pounds of liquid herbicide sloshing around! Weather is another big challenge. Summer temperatures in these foothill canyons can easily reach 105 degrees Fahrenheit and beyond, with hot afternoon winds that feel like they are right out of a blast furnace; winter days can be just as miserable with thick fog and wind chill down into the 20’s. In spite of these logistical environmental roadblocks, a Scientific Advisory Panel, convened in July 1989, concluded, “anything less than an eradication effort is unacceptable”. It was therefore deemed “feasible” to eradicate hydrilla from the Chowchilla River and Eastman Lake.

Work began immediately. Within a month after the initial detection, seasonal staff was hired to work with CDFG Biologists. The first step was mapping the river and lake. This was before we had GPS so the primary tools were a topo map, a compass and a good sense of direction. The river system was divided into 38 management units for ease of record keeping. While the river was mapped, several crews of three to four people surveyed foot by foot, looking at every pool and puddle. Hydrilla was found in every management unit, ranging from single plants to large masses filling entire ponded areas.

Chemical control was an essential tool early in the project, so any plants found were treated with Komeen, a copper based contact herbicide used to control the top growth of hydrilla plants. Crewmembers had to learn the terrain and river access points, and also how to use the herbicide, and how much to carry each day. By the second season crews were surveying the entire river every two weeks, treating as necessary. A number of heavily infested ponded sites were measured and treated a number of times with predetermined amounts of Komeen. During 1989, 1990 and 1991 an average of 450 gallons of Komeen per year were applied to ponded and slow moving water in the river.

In the meantime, work at Eastman Lake was progressing. In 1989 mats and individual plants of hydrilla were detected, marked with bamboo stakes, and removed by hand. Plant site areas were netted to catch any fragments that might break off. Project officials also started a chemical treatment program. Komeen was applied to pre-measured sections of the lake using a custom boom sprayer system with weighted down dragger hoses to get the material down into deep water, and a spray gun for the more shallow areas along the shoreline. In the years 1990 through 1992, 1000 to 2000 gallons of

Komeen were applied to the lake per year, during regularly scheduled treatments. In addition to the Komeen treatments, in 1990 the upper lake delta area was fumigated with Vapam. This area was heavily infested with hydrilla and held a massive reserve of tubers. Vapam is a soil fumigant that kills tubers, roots and stems of plants in the soil. The lake water level was drawn down to dry the sandy soil of the delta. Private contractors brought in sprinkler irrigation pipes to apply the Vapam to the area. This treatment was highly successful, as very few plants were later found in the treated area.

Along with the herbicide treatments, personnel were hand-removing plants. The herbicides eliminated the huge mats, so by 1990 individual plants could be counted. Crewmembers literally waded, swam and even snorkeled in the water of the river and lake to look for plants. And not only did we have to find hydrilla plants, but find and identify them among many other aquatic plants, often in deplorable water conditions. When plants were found they were gently pulled out of the soil, often still attached to the tuber from which they grew. When tubers broke off they were removed by sifting the soil material through hardware cloth welded inside a metal ring. This became known as the “shovel and sift” method. When large numbers of plants were found in one area, we would shovel and sift, then use suction dredges to remove more tubers from the soil. Dredging requires a lot of manpower, not only to get the equipment to the site, but also to simply look through the material to find the tubers. Use of our four-inch intake dredge was highly successful at the site of the source of the infestation, where in the span of five weeks in 1991, approximately 35,000 tubers were removed.

Up through 1996, this routine continued: survey, pull plants, shovel and sift, treat and dredge, and survey again. Plant numbers declined dramatically. In 1993 over 6,000 plants were removed; by 1997 we saw a major drop to 562. In 1997 we were given a new weapon – Sonar. Sonar is a selective systemic aquatic herbicide that causes the breakdown of chlorophyll. At the end of 1998 we saw another major drop in plant numbers – down to 49! We frankly did not expect that dramatic a reduction in one season. We ascribe this to several factors: effective use of Sonar, hand removing plants, which prevented the production of new tubers, and the fact that the existing tuber bank was being exhausted. Hand removal became our primary tool and only two plants were found in 2002!

While all this work was conducted in the lake and river, additional detection work was done in a corridor two miles wide on both sides of the river. All stock ponds, fire ponds, and creeks within that corridor were thoroughly checked. The Middle and East Forks of the Chowchilla River, and the outflow from Eastman Lake were also surveyed. No hydrilla was ever found in any other body of water in the area.

A bio-control agent, a weevil called *Bagous affinis*, was released in the river, but unpredictable water flows made the attempt impractical. Besides, as a tool for this project the very nature of bio-control is inconsistent with the mandate to eradicate all hydrilla plants.

Mother Nature did help us, however. Several periods of drought during the project years left many sections of the river dry for much of the season. Even if hydrilla plants

sprouted they did not have the opportunity to grow and produce new tubers before the water evaporated or disappeared underground.

The dry years also helped to reopen Eastman Lake by leaving dormant tubers high and dry above the water level. Even after a small number of plants appeared in July 1992, CDFA officials were so confident that the hydrilla was well under control they worked with officials from the U.S. Army Corps of Engineers and the State Department of Fish and Game to open the west shoreline for fishing in August 1992. Hundreds of happy anglers lined up elbow to elbow along the shoreline to catch those bass that had been growing undisturbed for three years. In 1995 almost the entire lake was opened to all forms of water activities. A small portion of the lake remains closed today to protect nesting bald eagles that moved in when the lake was closed.

We are excited that zero hydrilla plants have been found in the Chowchilla River and Eastman Lake system since 2002. Native aquatic vegetation is thriving in the river, enticing wildlife in the region. However, because the plants found in 2002 were located approximately 20 miles upstream from Eastman Lake, the entire system must still be considered infested, and the river remains under quarantine. In 2004 and 2005 each management unit of the river was surveyed at least two times and Eastman Lake was thoroughly checked four times. Sonar herbicide treatments were completed in 2005. In 2006 and again last summer the river system was surveyed once and we are cautiously optimistic that our hard work will be rewarded by one more year of negative hydrilla finds, the minimum required before eradication can be declared.

The first key element to successfully eradicating hydrilla is early detection and rapid response. The Chowchilla River/Eastman Lake infestation was estimated to be about four years old, and while portions of the river were thickly infested, the amount found in the lake was not yet completely out of control. Irrigation and recreational activities would have been severely impacted if CDFA had not acted immediately. Another key element in eradication is a complete commitment to the project by all parties involved. And in this respect the Chowchilla project really stands out. CDFA made a full time commitment to attacking this problem, supplying not only financial resources, but a dedicated staff as well. The U. S. Army Corps of Engineers, Madera and Mariposa County Departments of Agriculture and other agencies continue to supply financial and logistical support. But it is not only the financial resources that made this project a success; it is the legion of dedicated people who have made the difference. People who were willing to immerse themselves in algae covered water that was pretty disgusting; willing to encounter dead animals, fish, and smelly rotting vegetation and endure being literally covered in hydrilla plants! People who used every tool - swimming, snorkeling, using herbicides, hand pulling, dredging, and surveying again and again - to eliminate hydrilla. And that is the final key point – hydrilla cannot be ignored, it requires constant attention. To be successful, we cannot afford to turn our backs on current projects and we must be vigilant, always looking for new infestations, finding them early, and acting on them quickly. Only by doing so can we keep the vital water resources of the State of California free of this noxious pest.