

SINCE Alligatorweed, *Alternanthera Philoxeroides*, was first found in Tulare County in December, 1965, many agencies and persons have contributed considerable knowledge and time to its control. This native of South America, which has given weed control specialists in the United States headaches for nearly 80 years, is now under intensive eradication in Tulare County.

Potential losses from Alligatorweed were disclosed locally from L. W. Weldon's paper (1960) on investigations of this pest in southern states. Extensive correspondence also was collected and researched by Murray Pryor (California Department of Agriculture), and many other interested agencies who were familiar with this extremely hard to control member of the Amaranth family.

With the two newly completed large flood control and recreation lakes only a few miles from both infestations (Porterville and Visalia), game and pan fish could be endangered. Infestations could reduce oxygen supplies enough to kill many of these and raise predatory fish populations.

Also, decaying mats of Alligatorweed produce hydrogen sulfide, which is highly toxic to fish and other organisms. Recreation in other ways could be hampered. The diversity of agriculture in the San Joaquin Valley, which is dependent upon receiving water through various channels, could be impaired with the great restrictions to water flow caused by uncontrolled Alligatorweed.

One grower on the end of an infested ditch says his delivery of water had been reduced by 80% since the weed invaded this channel. This is no longer a problem with the control now obtained on the same ditch. Mosquitoes thrive in Alligatorweed infested waterways and their control is difficult.

The capabilities of plant growth are staggering. One measured plant produced 56 feet of lateral foliage growth in one season. Nearly four tons of root growth per acre can accumulate in the top four inches of soil. The fleshy roots can penetrate three or more feet into the soil.

The very botanical nature of this perennial pest can cause apprehensions. Its hollow, crisp stems are very buoyant, break off readily and float downstream to create new infestations. Nodes occur every two to eight inches and quickly produce roots or foliar growth. The thickened deeper roots can propagate new plants from very small portions.

Now You See It . . .

Alligator Weed Vanishing Act Tulare County, Calif.



Porterville, Calif., ditch before and after treatment . . .



Visalia ditch before and after . . .

... Now You Don't

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... with oil and Vapam or paraquat and Vapam.



... the same story.

Fortunately, Alligatorweed's small, white, sepaled flowers produce no viable seeds in the United States. Several hundred thousand acres have been taken over in the southern states with millions of dollars spent on research and controls.

Joint Eradication Effort

When the urgency of needed action was determined in 1966, the California Department of Agriculture (Weed and Vertebrate Pest Control), and the Tulare County Agricultural Commissioner's Office launched a concentrated effort to eradicate Alligatorweed within its new boundaries.

Surveys of more than 300 miles of waterways disclosed 72.6 acres (29 miles) of infested channels and a small amount creeping into irrigated cropland. In 1966 the first Eradication Agreement was formulated to conduct field trials and find a solution. Cooperation was very good from the beginning. Vince Schweers, Tulare County Farm Adviser, who first discovered the weed in Tulare County, and Bob Dunbar, Tulare County Agricultural Commissioner's Office, conducted trials with materials known to show promise in the southern states.

W. B. McHenry, University of California at Davis, started greenhouse evaluations with many herbicides. Murray Pryor and Les Haworth, California Department of Agriculture, and many other competent weed specialists also began eager test plotting.

The ditch companies, a water conservation district, ranchers, irrigation districts, and the cities of Visalia and Porterville built access roads, shifted water schedules and anything else needed to further enhance testing. Technical and field assistance was given by various chemical company representatives. T. C. Fuller, California Department of Agriculture staff botanist, contributed his time and knowledge.

Large-Scale Field Testing

More than 350 field test plots with various chemicals and combinations thereof have been applied. The soil sterilants were all investigated with sodium-chlorate at 1,200 pounds per acre showing the best results. Diuron at more than 100 pounds per acre resulted in yellowing of Alligatorweed. Most translocative materials were tried, amitrole, and dicamba looking fair.

Tarping with black polyethylene for 92 days reaching temperatures of 160 degrees only gave chlorotic whitening with recovery after re-



Crews spray a pond on the Miller and Mueller ranch near Visalia. Areas were staked in 200 sq. ft. plots to help assure rate application. Result: clean pond.

removal of the plastic. Growth regulators and fertilizers were looked into. Fumigants were encouraging. Methyl bromide under tarps worked well where there was no water in the root zones. Carbon bisulfide injections proved too hazardous because of flammability, and, like methyl bromide, proved too time consuming and ineffective on large scale operations.

Many adjuvants were tried in combinations and singly.

Successful Combination Found

The need for materials that would be safe to use in and on the waterways was always foremost in mind. Finally, Vapam or VPM and paraquat were used in combination as a foliar drench. Spray rates were one quart vapam, one pint paraquat, and eight ounces surfactant in 25 gallons of water per 100 square feet. This combination showed excellent results within a very short period

of time, the Vapam affecting root zones and paraquat the foliar portion. All agencies involved decided to begin eradication operations with this combination of materials, yet keep up investigations to improve the project. A deviation from label authorization was obtained for the use of the formulation.

In November 1967, county, state, and irrigation district spray crews began treatment in the three Porterville area waterways and three Visalia systems along with a pond on the Miller and Mueller Ranch in the Visalia area.

Commercial pest control operators were contracted to treat (under project supervision) the Miller and Mueller Ranch. This consisted of a 500-gallon nurse rig and two 500-gallon spray rigs with seven men. Areas were staked off into 100 square foot plots and rigs calibrated to spend five minutes per plot.

In heavily infested areas a mat

of foliage nearly two feet deep was encountered, penetration was slow and difficult. This prevented, in some cases, incomplete contact with all foliar portions of the plant and new plants formed from the nodes. Burning the top growth a few days after treatment reduced regrowth tremendously by destroying the nodes previously not harmed. Overall results were unbelievably successful.

Frost damages all foliar portions of Alligatorweed except the nodes. Tests conducted at the Bureau of Plant Pathology greenhouse at Ivanhoe showed new plant growth in four days from apparently frost-killed nodes. Paraquat and Vapam were applied at temperatures ranging from 30 degrees to 90 degrees effectively, although volatility and loss of gas was increased at higher temperatures. Optimum results are achieved from 65-75 degrees.

In 1968 the use of high emulsion-type weed oil was perfected as a substitute for paraquat. This resulted in even greater penetration of foliage and a substantial reduction in cost. The rate of materials was now one gallon weed oil, one quart Vapam, two ounces surfactant in 25 gallons water applied on 100 square feet.

Quarantine Regulation Obtained

The hazard of new infestations was reduced by obtaining from the Bureau of Plant Quarantine an "Alligatorweed Eradication Area" regulation. (Section 3960, Title 3, California Administrative Code). This regulation proclaimed the entire County of Tulare an area of eradication, making it possible to regulate movement of soil or other articles which may be exposed to or infested with Alligatorweed; also to conduct visual inspections and make repeated treatments on properties, water channels, and other places or things for Alligatorweed.

The vapam-oil spray plus burning gives control nearing 95%. The remaining regrowth is being retreated by spraying and in areas where penetration is difficult (steep banks and soil types), "pot holing" is employed. This is done by digging a basin, or loosening the soil around individual plants and filling with spray mixture. In some areas five pounds per acre diuron is added to the mix to control annual weeds, making it easier to find any regrowth.

The biggest problem at present is waiting for dry channels, as all treating has to be done when ditches are dried up.