Art Barret, left, and Raymond Corning check lake prior to treatment.

Aquatic Weed Control

Potable Water Treatment

Portable water treatment for weed control is a ticklish problem. Any potential threat to users cannot be tolerated. Care must be exercised throughout the operation and chemicals selected with care.

A good example of treating a reservoir 1100 surface acres in size, used primarily as a recreation area and ultimately as a city water supply, is the Chickahominy Reservoir. Located in the lowlands of Virginia, it eventually provides water for both Newport News and Williamsburg.

Treatment was made to control elodea and open fishing lanes. The Virginia Commission of Game & Inland Fisheries was in charge of the technical operation. Directing the work and assessing results were Raymond V. Corning, supervising fish biologist, and Norville S. Prosser, district fish biologist.

Results far exceeded expectations. Some 200 surface acres were treated with 150 gallons of Potassium Endothal and 165 gallons of Diquat during a 3-day treatment period. An airboat with above water boom was used to apply the herbicides.

A strip treatment on 200 acres actually freed almost 900 surface acres of elodea infestation. Chemical applied at a combined rate of 1½ gallons per surface acre reduced infestation to the point that boats were able to operate in major fishing lanes within 11 days after application. By the 34th day after final treatment practically, the entire reservoir was cleared of elodea.

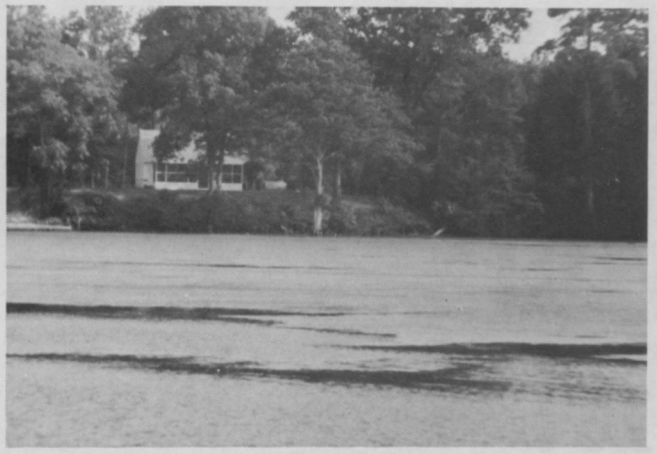
Though treatment concentrations were considered low even for the 200 acres treated, they proved strong enough to clear all but the uppermost reaches of the 1100 acres. However, live strands of elodea were found in practically all areas of treated sections. These lead Corning and Prosser to believe that growth may return to former levels within about two years, unless phytoplankton populations are able to keep regrowth down by shading. Thus, retreatment may likely be necessary.

Population Expansion

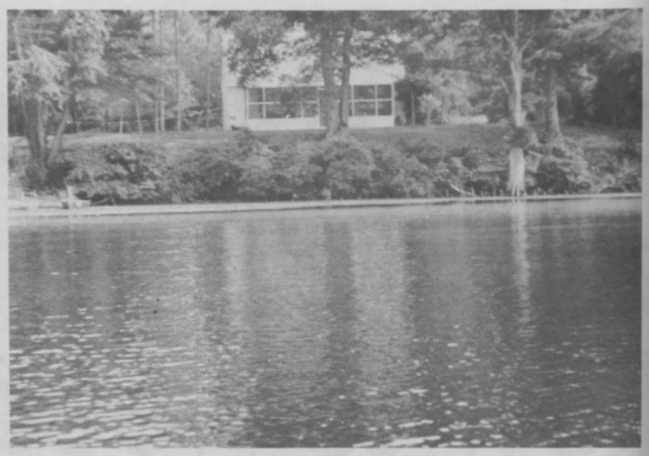
More people building homes in the upper reaches of the Chickahominy River drainage area led to a nutrient buildup in the reservoir. Adding to this were increased recreational use of the reservoir itself. Brazilian waterweed or true elodea *(Egeria densa)* became established. At the time of treatment, practically all portions with water 12 feet or more in depth were infested. Heavy growths of elodea pre-

In Brief:

Data for this report on potable water treatment was supplied by Raymond V. Corning, Supervising Fish Biologist and Norville S. Prosser, District Fish Biologist, Virginia Commission of Game and Inland Fisheries. The entire report will appear in the current Hyacinth Control Journal. For more specific details on both treatment and findings, the Journal may be purchased from the Hyacinth Control Society, P.O. Box 9087, Fort Lauderdale, Fla. 33310. Attention: Dr. Lyle Weldon.



Before: heavy infestation of elodea.



After: same area one month later.

vented motor boat usage on side streams, coves and along shorelines during most of the summer months.

Studies were made by the Commission to determine one of three approaches to the problem of opening the lake. Corning lists these as (1) mechanical removal, (2) manipulation of habitat to provide unsuitable growing conditions, and (3) chemical treatment. The first was eliminated because elodea can easily recover and form new plants. Construction feature of the dam impoundment curtailed large scale water level manipulation, even if approved by the Newport News Department of Public Utilities. Chemical appeared the most practical approach and a strip treatment proposal was made.

Once the chemical approach was decided upon, many avenues of procedures had to be explored. Chemicals had to be selected which would biodegrade rapidly and present minimal hazards to humans and wildlife. The utilities department representatives were agreeable to shutting down their water supply pumping facilities at the reservoir if suitable short term biodegradeable herbicides were used. However, even though water from the Chickahominy Reservoir did not go directly into water lines but to a second reservoir located closer to Newport News, they were unable to cease pumping operations for much more than one week. Normal daily pumping rate is approximately 22 million gallons. Prolonged stoppage of pumping would have caused dangerously low water supplies.

Two Chemicals Used

Two chemicals were selected, both of which according to tests and labels would break down into non toxic forms in seven days or less. The Virginia Department of Health agreed to partial treatment on this basis since the potable water in Chickahominy Reservoir passed through two impounding reservoir areas before reaching the city. These provided the necessary seven days detention time.

One chemical was Diquat used with two pounds of Diquat cation per gallon and manufactured by the Ortho Division of Chevron Chemical Company. The other was Potassium Endothal with an equivalent of 3.0 pounds of endothal acid. This latter chemical is manufactured by the Agricultural Division of Pennsalt Chemicals Corporation. This was the first known use of Potassium Endothal for aquatic weed control used in a potable water supply reservoir.

The decision to use both chemicals in combination was made in order to take advantage of the relative prices existing in 1967. Selection of Diquat and Potassium Endothal produced the greatest coverage for the money available. (Diquat at the time was $32.50 per gallon. Potassium Endothal, $16.00 per gallon.) Diquat is a systemic weed killer, and Potassium Endothal a contact type. Killing action of Potassium Endothal is relatively slow and long exposure or useage in non flowing water is recommended.

Controlling characteristics of the two chemicals in combination were due to one or more of the following: (1) the amount of Diquat in the combination was large enough to provide elodea control, (2) a synergistic effect occurs when the two are combined, and (3) Diquat weakens the more resistant strands of elodea to the point that Potassium Endothal becomes effective.

Reasons (2) and (3) were thought to be the most plausible. Combining of two chemicals was based on research by James Parr, Pennsalt Chemical Corporation, which indicated elodea would be satisfactorily controlled by such a combination.

Custom Application

Bids were requested from known custom pesticide applicators. Aqua Weed Control, Inc., of Vienna, Va., and Orlando, Fla., was successful bidder at a total bid price of $4877.50 or $25.20 per acre foot of water surface to be treated. About one-sixth of the reservoir surface or 200 acres was treated at 1.5 gallons of mix per surface acre.

Application was made over a 4-day period beginning July 31, 1967. Art Barrett, president of Aqua Weed Control (Barrett now

operates National Weed Control Company at Orlando) used a 14-foot fiberglass hulled airboat, powered by a Corvair engine. About 5.4 surface acres were treated per hour.

Results

Areas treated the first and second days could be spotted on the fourth day of treatment by presence of dead duckweed. Strands of elodea were gathered from treated areas and showed discoloration and stem darkening on some strands.

Between three and nine days after treatment, elodea exhibited visible decay and reduction in abundance. A small fish kill was evident within a 16-acre test area long one shoreline. Death of fish was attributed to an oxygen sag caused by rapid decomposition of dead elodea. Some kill such as this was expected because of the size of the treated area and the luxuriant elodea growth. Heavily infested feeder creeks, even where less than half the total surface area was treated, showed some fish kill because of the marked oxygen sag. But the main fishing streams, Lacey and Johnson, experienced very light fish kill.

Eleven days after the final day of treating, no elodea was visible in the lanes treated along the reservoir proper. All major fishing lanes and fishing spots were clear enough to allow free boat passage.

An inspection made much later—213 days after treatment—showed that no elodea could be dredged from either treated or untreated areas in water depths which exceeded 5½ feet. In water one to five feet in depth, occasional strands of live elodea could be dredged up. Dredged strands from these shallow area were four to 12 inches in length and showed no signs of new growth.

A mid-summer inspection in 1968—319 days after treatment—led to important findings. Extensive concentrations of phytoplankton were visible in all portions of the reservoir. Luxuriant growths of elodea averaging 29 to 38 inches in length were found in the uppermost part of the reservoir. However, this was far from the sites of the original treatment. Only a few strands of elodea could be dredged up in other areas of the reservoir and these were confined to water depths of 3½ feet or less. In these shallow areas, new growth averaged nine to 15 inches.

Conclusions

1. Clearance of major fishing lanes and favorite fishing sites in the main reservoir was relatively successful within 1½ weeks of treatment. The basic treatment rate was ¾ gallon Diquat and an equal amount of Potassium Endothal per surface acre.
2. Most creek sections were heavily infested with elodea and were treated at rates above the recommended 1½ gallons herbicide per surface acre. Elodea reduction in these sections was considered fair to good. Short term treatment success in the creek sections was not directly proportionate to an increase in application rates, implying factors other than concentration were involved.
3. Shallow protected coves and guts treated at the rate of 1½ gallons Diquat-Potassium Endothal per surface acre gave ineffective control initially, but by the 34th day nearly all of these regions had been cleared.
4. Herbicide applied in fishing lanes within Johnson and Lacey creeks exhibited an

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Potable Water Treatment

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erratic drift towards deeper water despite any visual evidence of water movement. Weed kill within the drift affected lanes was incomplete until approximately 30 days, but clearance of the deep water sections was more rapid.

5. Complete "dieoff" of elodea was not achieved except in the central portion of a large test area treated with Diquat applied at the rate of 1½ gallons per surface acre. Clearance in the central area was attributed more to increased effectiveness of large scale applications than to the use of pure Diquat.
6. Re-infestation of the treated areas within two years can be anticipated if the present phytoplankton population levels decline to the levels of pretreatment.
7. Coontail *(Ceratophyllum sp.)* may act as a replacement species for elodea, perhaps becoming as much of a nuisance as elodea in previous years.

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Trimmings

NEW GRASS VARIETIES. A number of new grass varieties are being readied for the market. Several were discussed at the just completed Midwest Turf Conference at Purdue and we'll report fully on them next issue. Among these are Sodco which is being promoted by the Agricultural Alumni Seed Improvement Association of Purdue. Prato was discussed by Howard Kaerwer of Northrup-King, Fylking by Doyle Jacklin of Jacklin Seed Company and Warren's A-series by Ben Warren. Warren announced a new low-cut bluegrass, A-29, which is new to the industry. Besides these, Kentuckians are promoting Kenblue and Washington State has released Couger.

* * *

ALLIGATOR WEED BEETLE. An Argentine beetle is doing a good job to date in checking alligator weed in California. Dr. Richard D. Goeden of the University of California, Riverside, reports that the beetles have kept the weed stripped of leaves at Whittier Narrows dam. Called Agasicles, the beetles were first released in 1967. The original 2000 have now multiplied to hundreds of thousands. Goeden says the beetles do extensive damage and curtail spread but he doubts they can eradicate alligator weed.

* * *

TOUGH TREES. Tree seedlings are being fumigated with air pollution agents at the University of Pennsylvania. The idea is to pick the survivors over a period of generations and multiply them for city street and highway use. They will replace many of the sensitive varieties now in use. Work is being done by Dr. Henry D. Gerhold. He is subjecting the new trees to sulfur dioxide and ozone.

* * *

POISON IVY SEASON. We just read a precaution about how you can pick up poison ivy rash without touching the plant. We who have burned brush have known this for a long time, or since we burned the first brush containing stems, roots, leaves, or berries of the plant. Actually, smoke from the burning plant can be more dangerous than the plant itself. Poisonous oils produced by the plant, according to the technical data, go up in smoke. And if this smoke contacts the skin or is inhaled, there will be irritation. This is usually true even for those lucky people who are resistant. Best bet is to kill it with a herbicide, and then bury the residue.