surface water. Subsequent release, occurrence, and persistence of 2,4-DCP were observed. The seeded tap water systems indicated lower levels of the phenol for shorter periods of time than did the natural surface water systems. A field observation substantiated the seeded tap water system.

The following conclusions are made:

1. Commercial formulations of 2,4-D contain 2,4-dichlorophenol as an impurity. Liquid formulations contain more of the phenol than the granular forms.
2. The 2,4-dichlorophenol persists at concentrations high enough to affect odor levels of a natural surface water for at least 218 days as observed in the laboratory.
3. The persistence of 2,4-dichlorophenol in water was decreased to acceptable odor levels within 59 days by addition of a sewage seed as observed in the laboratory.
4. As observed in field and laboratory, threshold taste dilution values were not significantly affected by the 2,4-dichlorophenol impurities in 1 and 3 mg/1 dosages of 2,4-D.
5. As observed in the laboratory, threshold odor dilution values were significantly increased by the 2,4-dichlorophenol impurities in 1 and 3 mg/1 dosages of 2,4-D.

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Effects Of Water Pollution On Aquatic Vegetation

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In the past few years there has been a great increase in aquatic weed control activities in Florida. Involved in this are several state and federal agencies, each with its own particular need. Frequently, one agency in its activities fails to consider the needs or problems of other agencies. It is through such a society as this that mutual understanding can be brought about.

Recent publications dealing with the biological aspects of stream pollution have referred almost exclusively to the animal life in streams. A notable exception is the work of Fjerdingstad (1950). Even this excellent publication is confined to the algae. A survey of the literature covering biological aspects of stream pollution reveals little information regarding the larger aquatic plants.

The following remarks are based on personal experience only. There is no experimental evidence supporting this, with one or two exceptions.

For the sake of this discussion the effects of pollution on aquatic vegetation will be divided into two groups — non-lethal and lethal.

NON-LETHAL EFFECTS

The most significant problem in this category is that of the fertilizing effect of domestic sewage, certain industrial wastes, commercial fertilizers and the like. Here are available not only compounds of nitrogen, phosphorus and potassium but, in the case of domestic sewage and certain industrial wastes, trace elements and growth promoting substances such as vitamin B-12.

The water hyacinth shows the effects of such discharge as does no other higher aquatic plant. Mats of hyacinths in which the individual plants were thirty inches high, with little development of the root system, have been found in areas of enrichment with domestic sewage. When the receiving waters are not covered by mats of floating aquatic vegetation a rich bloom of unicellular algae usually develops. If this effect is produced in a lake there may be extensive kills of fish, production of offensive odors by the algae, an increase in production of blind mosquitoes or any combination of these manifestations.

Less clearly defined effects have been observed with regard to Bermuda-grass, alligator-weed, pickerel-weed, Salvinia and duckweed. The use of biological ponds for the removal of nutrients from domestic sewage and certain industrial wastes is being studied by the Florida State Board of Health at the present time.

Certain other effects which are more difficult to evaluate have been noted. The increased use of synthetic detergents in recent years and the fact that these detergents cannot be broken down by biological methods combine to produce extensive foaming if sufficient agitation occurs in the receiving stream. Where this foam covers growths of hyacinths there is a possibility than an inhibitory action affects plant growth. Frequently hyacinths thus affected are only three or four inches high and generally have a chlorotic appearance.

LETHAL EFFECTS

The most widely known and intentionally used lethal effects on aquatic vegetation are obtained with heavy metal ions, especially salts of copper and arsenic. Many of these heavy metals are toxic enough to kill virtually all plant and animal life in the receiving waters.

Petroleum products in general and heavy oils in particular are especially damaging to floating and emergent vegetation.

Kraft pulp mill effluent with its high hydrogen sulfide content will destroy not only vegetation in the stream but frequently trees along the edge of the stream.

Recently much publicity has been given to the deleterious effects of fluorides in connection with air pollution. Liquid wastes from one processing plant completely sterilized a section of a small river, with the exception of a single species of algae. The first visible effect of the waste in the stream in question was the rapid disappearance of a lush growth of Vallisneria.

Heat as a pollutant has only recently begun to receive the attention it deserves. An excellent study of the cooling water discharge from a generating plant and its effects on the Delaware River is approaching completion and should be available shortly. Preliminary information indicates that Elodea, Potamogeton and blue-green algae will tolerate water temperatures of slightly over 100°F. for at least brief periods.

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Submersed Weed Control With Aqualin* Herbicide

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July 9, 1962

In June, 1960, Southern Mill Creek Products Company, Inc., became a licensed applicator of the Aqualin herbicide process by Shell Chemical Company. There have been numerous studies and reports on Aqualin herbicide (active ingredient: acrolein) since it was first reported by van Overbeck, et al[2]. We have evaluated the performance of Aqualin herbicide both on an experimental and commercial basis. Our main interest, of course, is in commercial applications.

There are basically two methods of applying Aqualin herbicide (1) flowing water, in which the Aqualin herbicide is added to the water at one or more points and is carried through the canal by the current, and (2) static water such as ponds, lakes and non-flowing canals. In static water, the Aqualin herbicide must be distributed throughout the body of water by moving the equipment.

In Florida, nearly all of our underwater weed control work has been in ponds, lakes and static ditches. We have not treated

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many flowing canals, because many of the canals are used for water control and are static most of the time.

We have used two methods of applying Aqualin herbicide in our commercial work:

(1) Moving the equipment in a truck along the bank.

(2) Moving the equipment through the water in a boat.

In our initial work, we used a pump unit mounted on a four-wheel drive truck. This unit was connected to a boom that extended over the canal. Water was taken directly from the canal through the pump where Aqualin herbicide was metered into the water and discharged through another line on the boom back into the canal under the surface. For this method, we used a Gorman-Rupp Pump, with a metering system using standard orifice plates where the flow of Aqualin herbicide is regulated by the pressure drop across the plate.

Another system we have used to meter Aqualin herbicide into this pump unit consisted of a flow meter connected to the suction side of the pump, or better through an eductor to the discharge side of the pump.

This same unit has been used in conjunction with a nurse tank mounted in the truck. We tried this system in order to eliminate variations in the flow of water through the pump caused by clogging of the strainer on the intake line, air leaks in the line, and other factors. The rough roadways usually encountered along canal banks made it difficult to maintain a constant flow of water through the pump. This type of equipment is limited to small areas, because of the size of the portable nurse tank.

Many of these same problems were encountered with the unit mounted in a boat. We decided to try some other method of application and experimented with a compressed gas unit as reported by Orsenigo and Hussey[1]. This unit was designed to meter the Aqualin herbicide directly into the water being treated. Aqualin herbicide is forced from the shipping drum by compressed gas through a direct reading flow meter into a discharge line mounted underwater on the stern of the boat. The discharge line was fitted with four evenly spaced nozzles to aid in distribution of the herbicide.

This type of equipment eliminated some of our problems, but created others. The major problem was adequate mixing of the Aqualin herbicide in the water. The difference in density resulted in some of the Aqualin herbicide being lost to the atmosphere before dissolving in the water. This action frequently resulted in a lower concentration of herbicide in the water than was required. Another problem was maintaining a tight system to prevent the release of Aqualin vapors in the boat and working area.

We have used air boats, outboard motor boats and inboard motor boats, and have found certain advantages in all types.

The outboard motor boat is more versatile because of its lightweight, however, weeds fouling the propeller can be a major problem. The inboard boat will give the best mixing, however, it is heavy and cannot be used in shallow water. The airboat, although heavy can be used in shallow water, and fumes are not as serious a problem.

In October, 1960, we applied Aqualin herbicide on a commercial basis to a number of large canals in Ft. Lauderdale. This treatment was made with the cooperation of Mr. Orville White, Supervisor of the Pest Control Department of Fort Lauderdale, and Mr. Paul Huber of Shell Chemical Company.

These canals had a heavy infestation of Elodea. They contained brackish water and were also affected by tidal movement. We wanted to make the treatment at 5 ppm, but actually achieved about 4.5 - 5 ppm. This rate proved satisfactory as evidenced by the fact that they are still free of weeds.

We have treated canals and lakes in different areas of the State with success. Our experience indicates that Aqualin herbicide can be an effective tool in the control of underwater weeds.

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Formation Of An Independent Tax Supported Weed Control District

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and
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Located on the lower gulf coast, Lee County, Florida, abounds with the natural resources that have made Florida famous as a world playground. Swimming at the many beaches, boating, fishing, hunting and similar sports and recreation connected with outdoor living are available to all who choose to live in this area. However, any tropical climate, such as that in South Florida, is conducive to production of a number of noxious aquatic weeds. In Lee County one of the most troublesome is Eichornia Crassipes usually known as water hyacinth. This prolific weed clogs farm ditches, canals, streams, and even the major river in the area, the Caloosahatchee together with all of its tributaries. A major infestation of water hyacinths during 1960 resulted in the Saturday Evening Post's including Fort Myers, the county seat of Lee County, in its "Face of America" series with the caption 'Watery Jungle". The story accompanying the two page color photograph stated — "In Florida — where these boats sit all forlorn in the Caloosahatchee River near Fort Myers, clearing hyacinths out of inland waters is a never ending job." To a county which derives some $30,000,000 of its income each year from the tourist industry, this publicity was at best undesirable.

For several years the State of Florida through a state agency, the Game and Fresh Water Fish Commission, has carried out control activities in our area. But, with a very limited budget, and with the entire state of Florida to cover, it seemed that their efforts in Lee County were inadequate to provide even the minimal control needed in the area. Continued complaints by tourists and local residents, who found it impossible to utilize expensive boats and motors, indicated that something, which could provide adequate control when and where it was needed, had to be attempted on the local level. With this in mind, the legislative delegation of Lee County, after consideration of several alternatives, decided to create a local taxing authority, specifically for the control of water hyacinths. In the interest of economy, it was decided to use an existing agency to carry out the program rather than set up an entire new organization. Accordingly, the legislative delegation appeared before the Board of Commissioners of the Lee County Mosquito Control District, outlined the problem, and requested that the Board consider serving in a dual capacity; that is as the Board of Commissioners of the proposed Lee County Hyacinth Control District. Since it appeared that no other local agency was nearly so well equipped as the Mosquito Control District to handle the complex problems of control of aquatic weeds. The Board agreed to accept the increased responsibility, if the legislature would authorize such a program and provide sufficient funds to make it successful. This was accomplished on June 12, 1961, when Governor Farris Bryant signed the bill creating the Lee County Hyacinth Control District, thereby making it law. The act under which the District now operates gives the Board several broad powers; such as, "all the powers of a body corporate, including the power to sue and be sued as a corporation in said name in any court". In addition, the District may hold real estate; contract; borrow money; and, unlike the Mosquito Control District, may carry liability insurance against cort actions.

Duties of the Board, simply stated, are also broad. "The Board shall perform all duties necessary for the control and eradication of hyacinths in said county". One interesting fact is that the law contains a provision authorizing the Board, if necessary for the accomplishment of the purpose of the act, to perform work outside the boundaries of the District. The Board holds regular monthly meetings, and administers the affairs of the District through a manager, or "Director". Each member of the Board receives compensation of $300.00 per annum for his services. Books and other financial records of the District are audited by the State auditing department in a manner similar to those of other county offices.

To finance the cost of the program, the Board is empowered

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