in 25 gallons of water for 1,000 sq. ft.) would be equivalent to that used in these experiments.

Conclusions

Larvae of the fungus gnat **Bradysia impatiens** (Joh.) were found to feed on the fine roots of Kentucky bluegrass **Poa pratensis** (Linn.) and Creeping red fescue (**Festuca rubra** (Linn.). It was noted that a moist seedbed and the presence of fungus mycelium were necessary for a fungus gnat infestation. Satisfactory control was obtained by use of chlordane in amounts equivalent to recommended rates. Conditions favorable for fungus gnat injury to turfgrass grown out-of-doors are believed to occur less frequently than in the greenhouse; however, chlordane applied at standard rates should provide good control.

References

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* As determined by Joseph Troll, Department of Agronomy, University of Massachusetts.

** As determined by R. R. Shaw, Department of Entomology, University of Massachusetts.

Golf Course Ponds and Lakes

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Small bodies of water on a golf course contribute to the beauty of the course and in some cases may be involved in the strategy of play. A good "water" hole adds to the interest of a golf course.

Some ponds are completely man made, having been created by the golf course builder who needed a source of soil for constuction purposes. Others, of course, may occur naturally or may have been formed by the damming of a water course through the club property.

The building of a lake must be based upon some of the conditions of the surrounding area. Usually, about 25 acres of watershed will provide enough runoff for a one-acre pond. However, this figure will vary with amount and distribution of rainfall, degree of slope, kind and amount of vegetation and other factors which in fluence the runoff characteristics of an area. Runoff water from an area covered by close growing vegetation is to be preferred over that from areas which may be cultivated. Turfed areas allow relatively little silt to be moved by runoff water.

If ponds are large enough to permit effective management they may be stocked with fish. At country clubs, a stocked lake provides an added form of recreation for members. About ⅓ acre is the minimum size lake suitable for stocking with fish. On the other hand the management of lakes larger than 3 acres in size becomes a rather large job.

Fertilization of ponds has come to be an accepted practice. It has been demon-

Table 1

CHEMICAL CONTROL OF THE COMMON EMERGENT AND FLOATING PLANTS

Plant	Control Mixture
Water hyacinth (Eichhornia) Lotus (Nelumbo)	40 percent amine salt of 2,4-D at rate of 1½ gallons of 2,4-D amine salt solution plus ½ gallon of emulsifiable oil to 100 gallons of water per surface acre to be sprayed. Use pressure sprayer.
*Cattails (Typha) Bulrush (Scirpus) Water lilies (Nuphar, etc.) except spatterdock or yellow water lily. Other broad-leaved emergent plants	40 percent amine salt of 2,4-D at the rate of 2½ gallons of 2,4-D amine salt solution plus 2 gallons of emulsifiable oil to 100 gallons of water per surface acre to be sprayed. Use pressure sprayer.
Spatterdock or yellow water lily.	2,4,5-T (4 pounds acid equivalent) at the rate of 2 gallons 2,4,5,-T plus 1 gallon emulsifiable oil plus 100 gallons of water per surface acre to be sprayed. Use pressure sprayer.

*Cattails also can be controlled by using 25 pounds of Dalapon (sodium salt 85%) mixed with 100 gallons of water. This mixture is sufficient for spraying 1 acre of cattails.

strated that pond fertilization increases the production of fish, reduces the growth of algae, and eliminates some of the undesirable aquatic weeds.

Walker (3) advocates the use of floating fertilizer distributors. These consist of inverted 5-gallon cans. These cans are partially filled with water soluble fertilizer (Walker found 16 20-0 to be preferable) and depend upon trapped air to

Table 2

TOXICITY OF INSECTICIDES TO FISH

	Concentration p.p.m.	Mortality
1. INORGANICS		
Arsenic Trioxide (sodium arsenite)	2, 6	no reaction by bass, bluegill, crappie, goldfish
	10	33% loss
	20	100% loss after 36 hours
	250	100% loss after 16 hours
Copper Sulphate	1	toxic to yellow and white perch
	10	toxic to goldfish, minnows
2 BOTANICAL INSECTICIDES		
Nicotine	3.3	toxic to fish
Pyrethrum	0.33	death in 3-4 hours
Rotenone	0.5 to 1.0	100% loss
3. CHLORINATED HYDROCARBONS		
Aldrin	0.01	10% loss
	0.02	50% loss, goldfish
	0.032	80% loss
	0.033	100% loss, fingerling trout
Benzene Hexachloride (BHC, 666, HCH, Lindane)	0.05	100% loss, brown and rainbow trout
	0.1	50% loss, bass and bluegill fingerlings
Chlordane	0.05	50% loss in 4 days, goldfish
	0.125	100% loss, goldfish
DDD	0.03	toxicity threshold, bluegill
	1	50% loss, goldfish
	2	100% loss, goldfish
DDT	0.1	100% loss in 12 hours
	0.01	a few fish will survive
	0.005	many fish will be killed
Dieldrin	0.006	50% loss, bass
	0.01	50% loss, bluegill
	0.016	50% loss, brown trout
	0.04	50% loss, golden shiners
	0.006 to 0.25	50% loss, goldfish
Dinitro Compounds		
DNOC	30	probable threshold for rainbow trout
DNOCHP	3 to 5	100% loss, all fish
Endrin	0.0003	50% loss, bass, bluegill, goldfish
	0.0015	50% loss, golden shiners
Heptachlor	0.05 to 0.5	some loss
Isodrin	0.0025	50% loss, bass
	0.006	50% loss, bluegill and golden shiners
	0.0015	50% loss, goldfish
Methoxychlor	0.063	60% loss, goldfish
	0.25	100% loss, goldfish
	0.2	100% loss, bluegill and black bass
Toxaphene	0.1 to 1	100% loss in 9 hours, brown trout
	0.025 to 0.05	80% loss in 48 hours, brown trout
	0.005 to 0.01	killed 1-inch rainbow and brown trout
	0.02	lethal to silverling, minnows, spotfin shiners, creek chubs, dace
	0.01	threshold for bluegills
	0.2	100%loss in 45 hours, bluegill and bass fingerlings, goldfish
4. ORGANIC PHOSPHATES		
Malathion	0.1	toxic to salmon fingerlings
Parathion	0.2	threshold, bluegill fings.
	2.0	100% loss, goldfish
TEPP	0.3	toxic to bluegills
5. SOLVENTS AND ADDITIVES		
Detergents	5	lethal to sticklebacks, carp

keep them afloat. A small anchor of some sort keeps the can in a inverted position. Holes are punched in the submerged part of the can and dissolved fertilizer may diffuse into the surrounding water. Broadcast fertilizer applications were found to encourage aquatic weeds in some cases but the fertilizer distributed by the specially made floats showed some herbicidal effects. This effect was due partially to a large increase in plankton bloom with consequent shading but there also appeared to be some direct toxicity in the case of 16-20-0 fertilizer.

Walker also found that pelleted simazin and a dalapon—2,4-D mixture did not injure fish or fish food species. He found that simazin controlled most submerged weeds. Pelleted herbicides have been longer lasting and more effective than liquid materials.

Weed control is one of the difficult phases of pond management and consequently, a great deal of attention has been given to the matter. Table 1 is taken from Texas Agricultural Extension Service Bulletin B-213 (1).

Algae is a troublesome plant in many ponds. Copper sulfate at a rate of 0.5 to 2 parts per million is a standard treatment. Dichlone has come to be used to a considerable extent, though its use is not as common as that of copper sulfate. To treat at the rate of 0.5 p.p.m., 4.15 lbs. of copper sulfate should be dissolved in each million gallons. The 2 p.p.m. rate requires 16.6 lbs. of copper sulfate for each million gallons.

It is recommended that only about ¼ of a pond be treated at one time. Fish may then move to an untreated area. In a few weeks the other sections may be treated.

Because of the widespread use of insecticides and the toxicity of these materials to fish, care must be taken to prevent the introduction of insecticides into stocked lakes. Rudd and Genelly (2) have published data to indicate the relative toxicity of insecticides to fish species. Their findings are shown in Table 2.

Most state agricultural experiment stations or extension agencies have literature relating to pond management. This information is usually prepared from the standpoint of farm ponds, but it will be adaptable to some extent to ponds on golf courses. Making use of available information will help to make your pond a source of greater pleasure with less trouble.

References

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New Laboratory Facility At UCLA Aids Research

The U.S.G.A. Green Section Research and Education Fund, Inc. makes numerous grants for the purpose of supporting research in turfgrasses. These funds become much more useful when the institution to which they are granted is equipped with adequate facilities for carrying out fundamental studies. The Department of Ornamental Horticulture at the University of California at Los Angeles has recently built and put into use six "phytotrons" which are a part of a rather elaborate greenhouse and laboratory facility.

The following release by the Department of Ornamental Horticulture describes this facility:

"A new laboratory facility has been added to the UCLA campus at 300 Veteran Avenue. This building is dedicated to the quest for knowledge in plant science with particular reference to the ornamental plants. Within this building are facilities which will allow the conduct of studies in plant genetics and in the physiology and biochemistry of ornamental plants.

"The heart of the installation is six controlled environment rooms for plant growing. Each of these rooms will be supplied with dirt-filtered, smog-filtered, washed air at a controlled temperature and humidity. All air from the room will be circulated through an air-conditioning