CONTROLLING ALGAE IN IMPOUNDED WATERS:

LAKES PONDS AND RESERVOIRS

Aquatic plants are an integral part of any aquatic environment. It is desirable not to upset the ecological balance in a body of water; consequently any control measures should be directed to combatting a specific plant problem. Algae growth in water causes many undesirable conditions: free - drifting planktonic types may clog nozzles or cause odors and tastes in the water, and filamentous types may clog pumps and nozzles and make swimming, boating or fishing difficult. Small amounts of Copper Sulfate in water can effectively control algae; however, it is important to understand that there is no way of controlling algae that is permanent. On rare occasions a single treatment may last for an entire season, but ordinarily algae must be destroyed two or more times between early spring and early fall.

FACTORS AFFECTING COPPER SULFATE DOSAGE.

Many factors influence the amount of copper sulfate required to control algae, but the main factors are (1) the kind and amount of vegetation to be destroyed, (2) the temperature of the water, (3) the water hardness, and (4) the amount of water flowing through the body of water.

Algae can be controlled much more easily and effectively if the chemical treatment is made soon after plant growth has started. If treatment is delayed until a large amount of algae is present much more copper sulfate will be required, complete control will be harder to obtain, and there is more likelihood of poisoning or suffocating fish.

In general, vegetation is harder to control with copper sulfate when water temperatures are low. Recommended dosages are based on water temperatures of $60^\circ F$ or above. Since copper has a tendency to combine with minerals in the water, more copper sulfate will react and be used up in hard water than in soft. For the same reason, water hardness also affects the dosage of copper sulfate which is safe for fish.

It is evident that a body of water that has a great deal of water flowing through it will require higher dosages of copper sulfate to kill algae than a body of water that is stagnant. If possible, the flow of water should be cut off before treatment. About 3 days after treatment, or when the plants

LAKES PONDS AND RESERVOIRS

CALCULATING THE AMOUNT OF WATER IMPOUNDED

Concentrates of copper sulfate in water are expressed in parts per million by weight (abbreviated ppm). This means that if a copper sulfate concentration of 1 ppm is needed to destroy a certain type of algae, then 1 pound of copper sulfate must be distributed for every million pounds of water in the pond. If a concentration of 1/2 ppm is desired in a pond containing 3 million pounds of water, then the amount of copper sulfate required is 3 x 1/2 or 1 1/2 pounds.

From these examples, we see that it is necessary to know the amount of water impounded in order to calculate the amount of copper sulfate to use for obtaining a desired concentration. The weight of water impounded can be readily calculated if the volume of water is known (1 gallon of water weighs 8 1/3 pounds), so the problem is simply a matter of calculating the volume of water in the pond.

The amount of copper sulfate needed to give desired treatment in standing water is generally calculated by multiplying the area in square feet by the average depth in feet to get volume in cubic feet, multiplying the volume by the weight of one cubic foot of water to obtain the total weight in pounds, then multiplying the weight by the recommended concentration expressed as a decimal fraction.

Calculating water volume involves the following steps:

1. Obtain surface area by measuring regularly shaped ponds, by mapping irregular ponds or by referring to previously recorded engineering data or maps.

2. Calculate average depth by sounding in a regular pattern and taking the mean of these soundings or by referring to previously obtained data.

3. Multiply surface area in feet by average depth in feet to obtain cubic feet, or

4. Multiply surface area in acres by average depth in feet to obtain acre feet.

Calculate water weight by:

1. Multiplying volume in cubic feet by 62.44 to obtain poundage of water contained, or

2. Multiplying volume in acre feet by 2,720,000 to obtain poundage of

LAKES PONDS AND RESERVOIRS
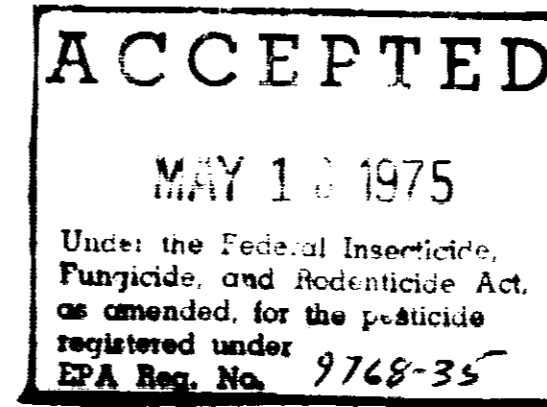
Calculate the amount of active ingredient needed to give recommended concentrations by multiplying the recommended concentration in parts per million, expressed as a fraction or decimal, by the water weight as follows:

Water weight = 2,720,000 pounds
Recommended concentration = 2 ppm

$$\frac{2}{1,000,000} \times 2,720,000 = 2 \times 2.72 = 5.44 \text{ pounds of copper sulfate}$$

or

.000002 x 2,720,000 = 2 x 2.72 = 5.44 pounds

or

Using the constant 2.72 as the weight of chemical necessary to give 1 ppm in 1 acre foot, multiply the constant by the recommended concentration and multiply the product by the number of acre feet in the pond as follows:

acre feet = 1
recommended concentration = 2 ppm
constant 2.72
2.72 x 1 x 2 = 5.44 pounds of copper sulfate.

APPLYING COPPER SULFATE FOR ALGAE CONTROL

From what has already been said, it is clear that care should be used in determining the amount of copper sulfate to apply, particularly in water used to produce fish. Equal care should be used in weighing out the correct amount of copper sulfate needed to obtain the desired results.

Copper sulfate is available in large crystals similar to those of rock salt, and also in very fine crystals about like table salt. Each form has its particular uses in algae and weed control. For controlling algae it is most practical to spray the algal growths with copper sulfate that has been dissolved in water. For this purpose, the finely ground form is most satisfactory, since it dissolves very quickly in water. For treating large areas of water it is sometimes easiest to place the required weight of copper sulfate in a burlap bag, which is then towed behind a boat until the infested area has been thoroughly covered and all the copper sulfate has been dispensed.

It is the total weight of dry copper sulfate added to the pond which determines

LAKES PONDS AND RESERVOIRS

When algae has been destroyed by treatment with copper sulfate much of the oxygen in the water is used up as the dead plant matter decays. If there is too much dead vegetation in the water the depletion of oxygen can cause fish suffocation. If algae (and weeds) cover more tha half the water area, treat 1/3 to 1/2 the surface at one time and wait 10 to 14 days between treatments. Treat the water along the shore first and move outward in bands to allow fish to move into untreated areas. If treated water is to be used as a source of potable water, the metallic copper residual must not exceed 1 ppm (4 ppm copper sulfate pentahydrate).
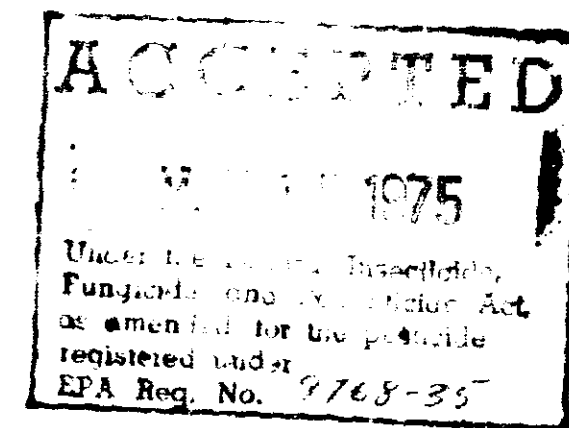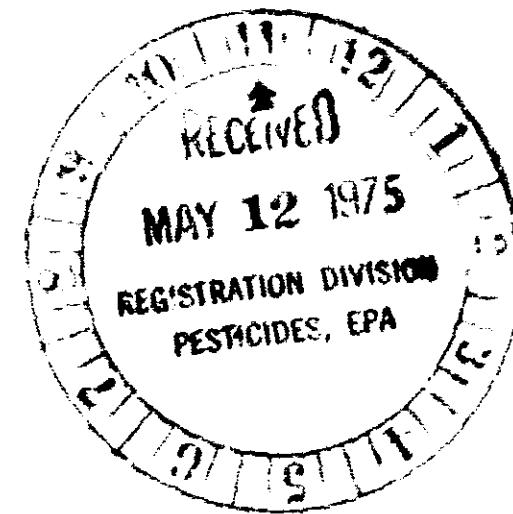
COPPER SULFATE SOLUTION

ACTIVE INGREDIENT: CopperSulfate Anhydrous 11.5%
INERT INGREDIENTS: 88.5%
(Copper expressed as metallic 4.6%)
100.0%

CAUTION: KEEP OUT OF THE REACH OF CHILDREN.
HARMFUL IF SWALLOWED.

DIRECTIONS:
FOR THE CONTROL OF ALGAE IN IMPOUNDED WATERS, LAKES, PONDS AND RESERVOIRS:

See Thatcher Chemical Company brochure on copper sulfate for algae control for detailed instructions. Apply at the lowest rate that will effectively control algae. Each pound of Copper Sulfate Solution contains 0.18 pound of copper sulfate pentahydrate. **To determine the pounds of Copper Sulfate Solution requi**re the number of pounds of copper sulfate necessary to treat the water, using the the Thatcher Chemical Company brochure. Divide the pounds of copper sulfate will give the number of pounds of Copper Sulfate Solution required. Fo mount of copper sulfate is two pounds, then the amount of Copper S lbs. divided by 0.18 or 11.1 lbs. of liquid. If it is desired, the a quired can be calculated to gallons; however, it should be recog sulfate per gallon of solution will vary slightly with the tem at ate Solution will contain slightly more copper sulfate at low te sp rat e). At 65°F, each gallon of Copper Sulfate Solution contains 1.7 poun s o of solution, and weighs 9.3 pounds per gallon. **To determine the g ors of** tio required: Calculate the number of pounds of copper sulfa ry g the procedure given in the Thatcher Chemical Company brochure. Divide the c t sulfate required by 1.7 pounds per gallon to obtain the gallons of liquid re u eo F amp, if the calculated amount of copper sulfate is two pounds, the amount of C Sulfa olution required, in gallons, is 2 lbs. divided by 1.7 lbs. per gallon or 1.2 gallons of liq.

WA NIN Trout and certain other species of fish may be killed at the application rates recommended cially in soft or acid waters; however, fish toxicity generally decreases when the water hardness creases. Consult your State Fish and Game Agencies before applying this product, especially to public waters.

When algae has been destroyed by treatment with copper sulfate much of the oxygen in the water is used up as the dead plant matter decays. If there is too much dead vegetation in the water the depletion of oxygen can cause fish suffocation. If algae (and weeds) cover more than half the water area, treat 1/3 to 1/2 the surface at one time and wait 10 to 14 days between treatments. Treat the water along the shore first and move outward in bands to allow the fish to move into untreated areas. If treated water is to be used as a source of potable water, the metallic copper residual must not exceed 1 ppm (4 ppm copper sulfate pentahydrate).

TO CONTROL ALGAE AND THE POTOMOGETON PONDWEEDS, LEAFY AND SAGO, IN IRRIGATION SYSTEMS:

The amount of Copper Sulfate Solution required for treating ditches or streams can be calculated only after the water flow in cubic feet per second is found by means of weir or other measuring device. Use the continous application method selecting proper equipment to supply Copper Sulfate Solution as follows: For **algae** control begin the continuous addition of Copper Sulfate Solution when water is first turned into the system and continued throughout the irrigation season applying ½ to 1 lbs. per cubic foot per second per day. (7½ fluid ounces to 15 fluid ounces per cubic foot per second per day.) For **leafy and sago** pondweed control, use the same continuous addition system applying 9 to 14 lbs. per cubic foot per second per day. (1 gallon to 1½ gallons per cubic foot per second per day.)

Note: For best control of leafy and sago pondweed, it is essential to begin copper sulfate additions when water is first turned into the system or ditch to be treated and continued throughout the irrigation season. Copper sulfate becomes less effective as the bicarbonate alkalinity increases. Its effectiveness is significantly reduced when the bicarbonate alkalinity exceeds about 150 ppm as $CaCO_3$. Should copper sulfate fail to control pondweeds satisfactorily, it may be necessary to treat the ditch with either a suitable approved herbicide or use mechanical means to remove excess growth. In either case resume copper sulfate addition as soon as possible.

DO NOT REUSE CONTAINER.   **DESTROY WHEN EMPTY.**