

These phosphates are relatively inexpensive, readily soluble in water, nontoxic, and effective at low injection rates.

### Pond Treatment

Algae problems which often occur with surface water sources such as a pond can be effectively treated with copper sulfate ( $\text{CuSO}_4$ ). Dosages of 1 to 2 ppm (1.4 to 2.7 pounds per acre foot) are sufficient and safe to treat algae growth. Copper sulfate should be applied when the pond water temperature is above 60° F. Treatments may be repeated at 2- to 4-week intervals, depending on the nutrient load in the pond. Copper sulfate should be mixed into the pond (i.e., sprinkled into the wake of a boat). The distribution of biocides into surface water must be in compliance with EPA regulations.

Copper sulfate can be harmful to fish if alkalinity, a measure of the water's capacity to neutralize acid, is low. Alkalinity is measured volumetrically by titration with  $\text{H}_2\text{SO}_4$  and is reported in terms of equivalent  $\text{CaCO}_3$ . Table 3 provides a reference for determining rates to add copper sulfate given different alkalinity levels. Repeated use of copper sulfate can result in the buildup to toxic levels for plants.

**Table 3. Copper Sulfate ( $\text{CuSO}_4$ ) Levels Safe for Fish**

Alkalinity Value ( $\text{CaCO}_3$ , mg/l)	Addition of Copper Sulfate
below 40	do not use
40-60	1.0 lb per acre-ft of water
60-100	1.3 lb per acre-ft of water
over 100	2.7 lb per acre-ft of water

(1 ppm = 2.7 lb per acre-ft)  
(Dupress and Huner, 1984)

### Injection Methods

Several types of injection systems, available commercially through irrigation equipment suppliers, are commonly used with micro irrigation: venturi, pressurized mixing tank, pump suction line method, and metering pumps (see Figures 5 through 8). Whichever method is used, there must be some way of controlling injection rates.

Figure 5 shows a venturi injector in which the injection rate depends upon the creation of a 'low' pressure area as water flows through a constriction in the line. Since injection is based on the pressure differential that results, the rate of injection depends on pressure, flow, and the level of solution in the supply tank.