

categories: surface or ground water. Each of these water sources produce specific plugging characteristics.

Algal and bacterial growth are major problems associated with the use of surface water. Whole algae cells and organic residues of algae are often small enough to pass through the filters of an irrigation system. These algal cells can then form aggregates that plug emitters (Haman, 1987c). Residues of decomposing algae can accumulate in pipes and emitters to support the growth of slime-forming bacteria. Surface water can also contain larger organisms such as moss, fish, snail, seeds, and other organic debris that must be adequately filtered to avoid plugging problems. Chemical precipitation is normally not a major problem when using surface water.

Groundwater, on the other hand, often contains high levels of minerals in solution that can precipitate and form scale. Water from shallow wells (less than 100 ft) often will produce plugging problems associated with bacteria; chemical precipitation is more common with deep wells (Knapp et al., 1986). Physical plugging problems are generally less severe with groundwater.

## **Physical**

Sources of physical plugging problems include particles of sand and suspended debris that are too large to pass through the openings of emitters. Sand particles, which can plug emitters, are often pumped from wells. Water containing some suspended solids may be used with micro irrigation systems if these suspended solids consist of clay-size particles, and flocculation does not occur. Research has shown that using water with over 500 ppm suspended solids did not cause emitter plugging as long as the larger particles were filtered (Pitts, 1985).

Under some conditions, however, clay will flocculate and form aggregates causing plugging. Unflocculated clay and silt-sized particles are normally too small to plug emitters. Turbidity is an indicator of suspended solids, but turbidity alone is not an accurate predictor of the plugging potential of a water source. Turbidity should be combined with a laboratory filtration test to measure plugging potential (Gilbert and Ford, 1986).

## **Biological**

A micro irrigation system can provide a favorable environment for bacterial growth, resulting in slime buildup. This slime can combine with mineral particles in the water and form aggregates