

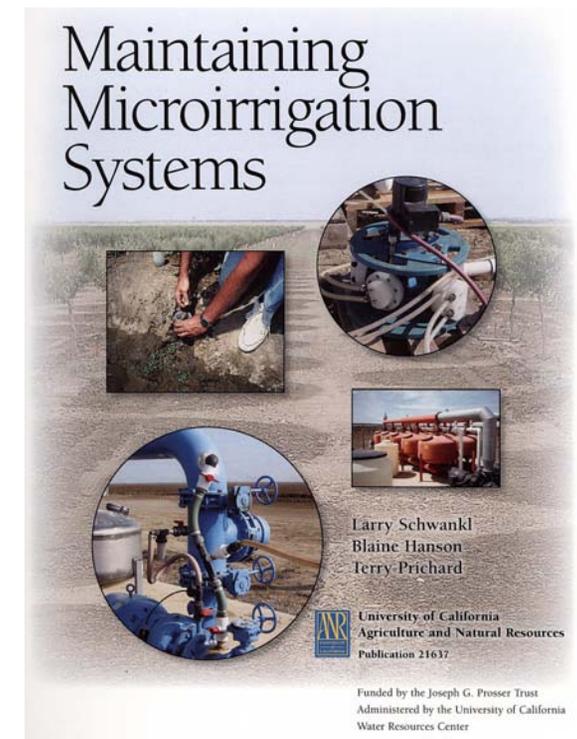
# **Maintaining Your Microirrigation System and Chemigating Uniformly**

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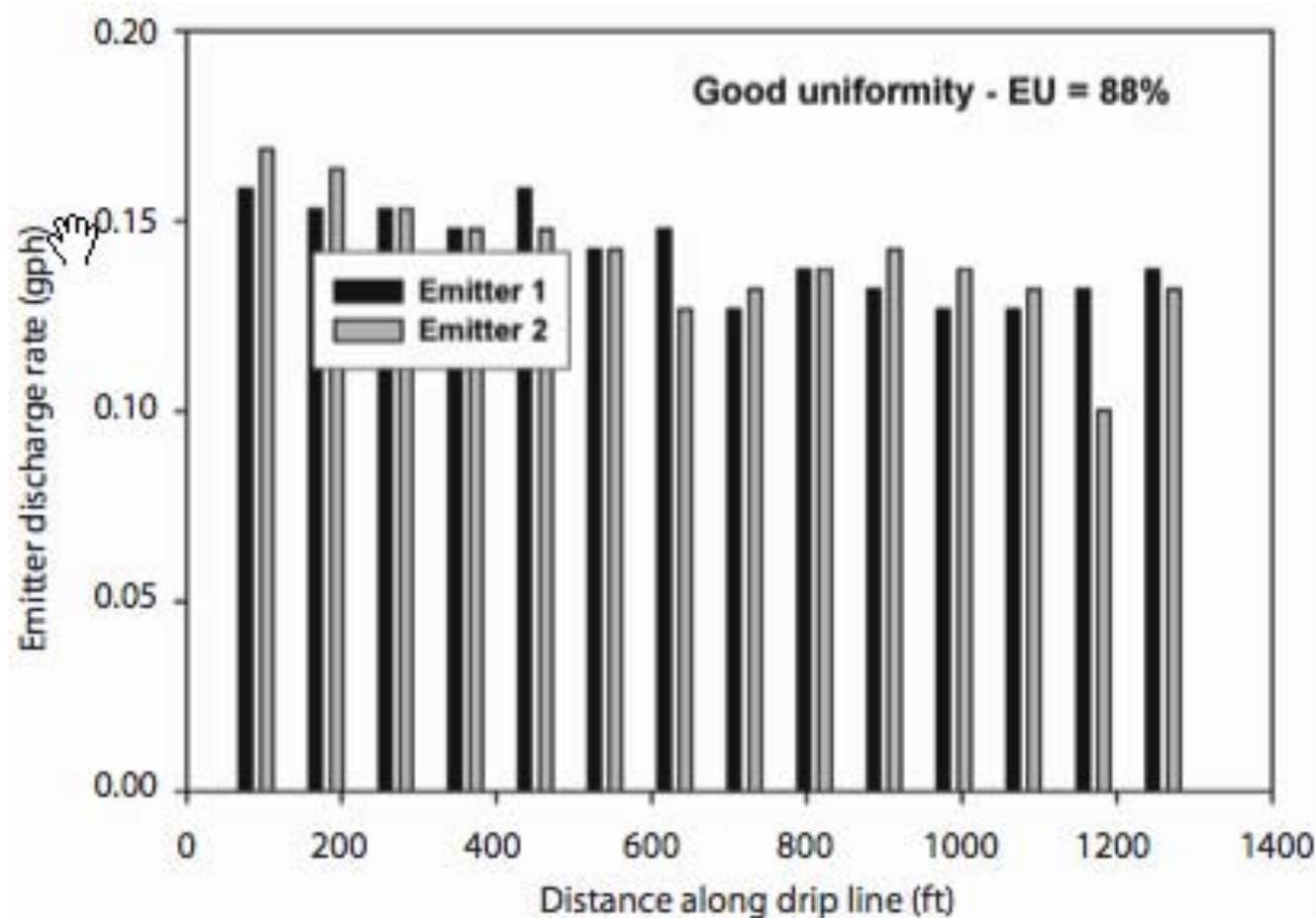
# Irrigation Uniformity:

- **If there is a lot of variability between emitter discharges: Especially if there appears to be little pattern to the variability, it *may* be caused by clogging.**



# Microirrigation Systems - Clogging

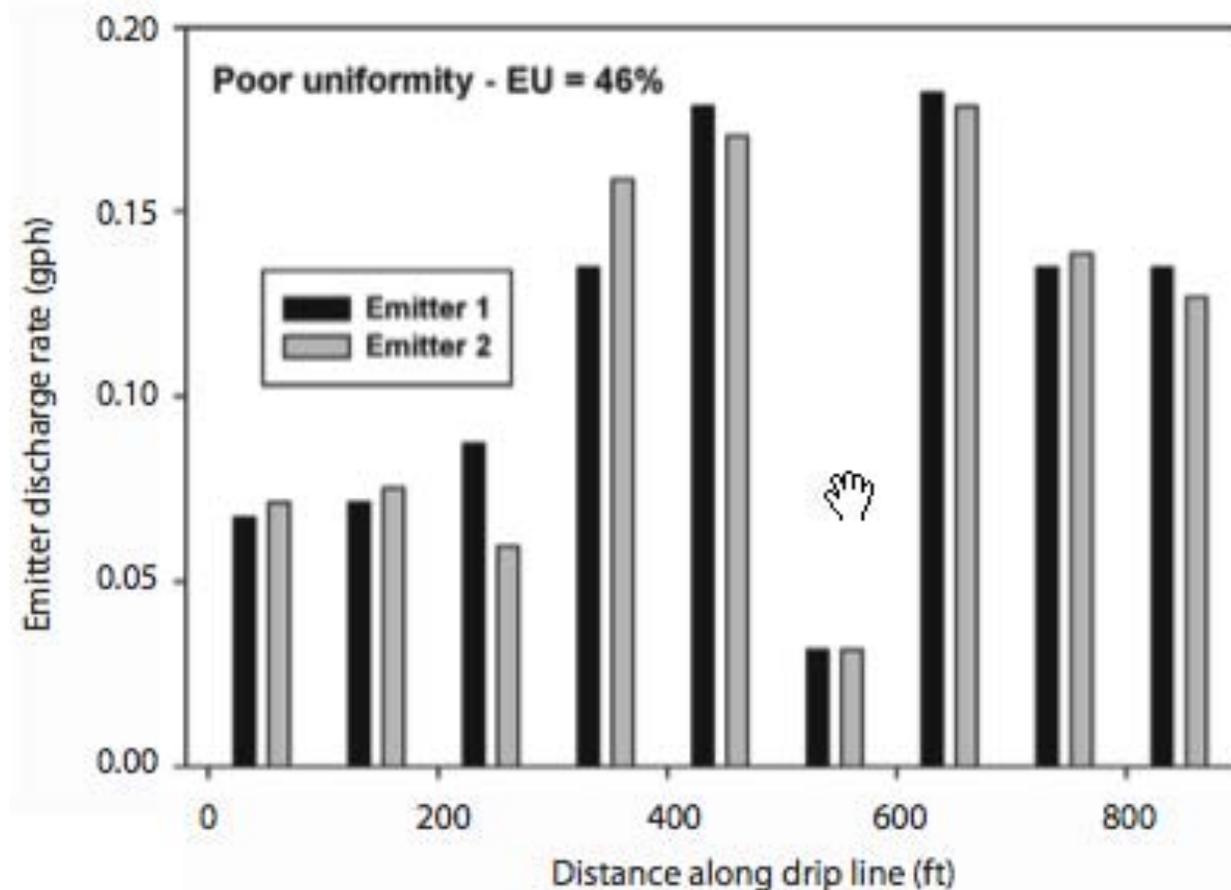
## Good system



**Figure 2.** Distribution of emitter discharge rates along a well-maintained drip line using surface water for irrigation. Chlorination was used to control biological growths. The decrease in discharge rate was due to pressure variation normally experienced in drip lines. An EU of 88% is considered to be good. The discharge rates of two adjacent emitters (emitter 1 and emitter 2) were determined at each measurement location along the lateral.

# Microirrigation Systems - Clogging

## Biological Clogging



**Figure 3.** Biological growths greatly reduced emitter discharge rates and uniformity along a 6-month-old drip line using surface water for irrigation. The water was filtered, but not chlorinated. The design emitter discharge rate was about 0.20 gph. The discharge rates of two adjacent emitters (emitter 1 and emitter 2) were determined at each measurement location along the lateral.

# Microirrigation Systems - Clogging

## Chemical Precipitate Clogging

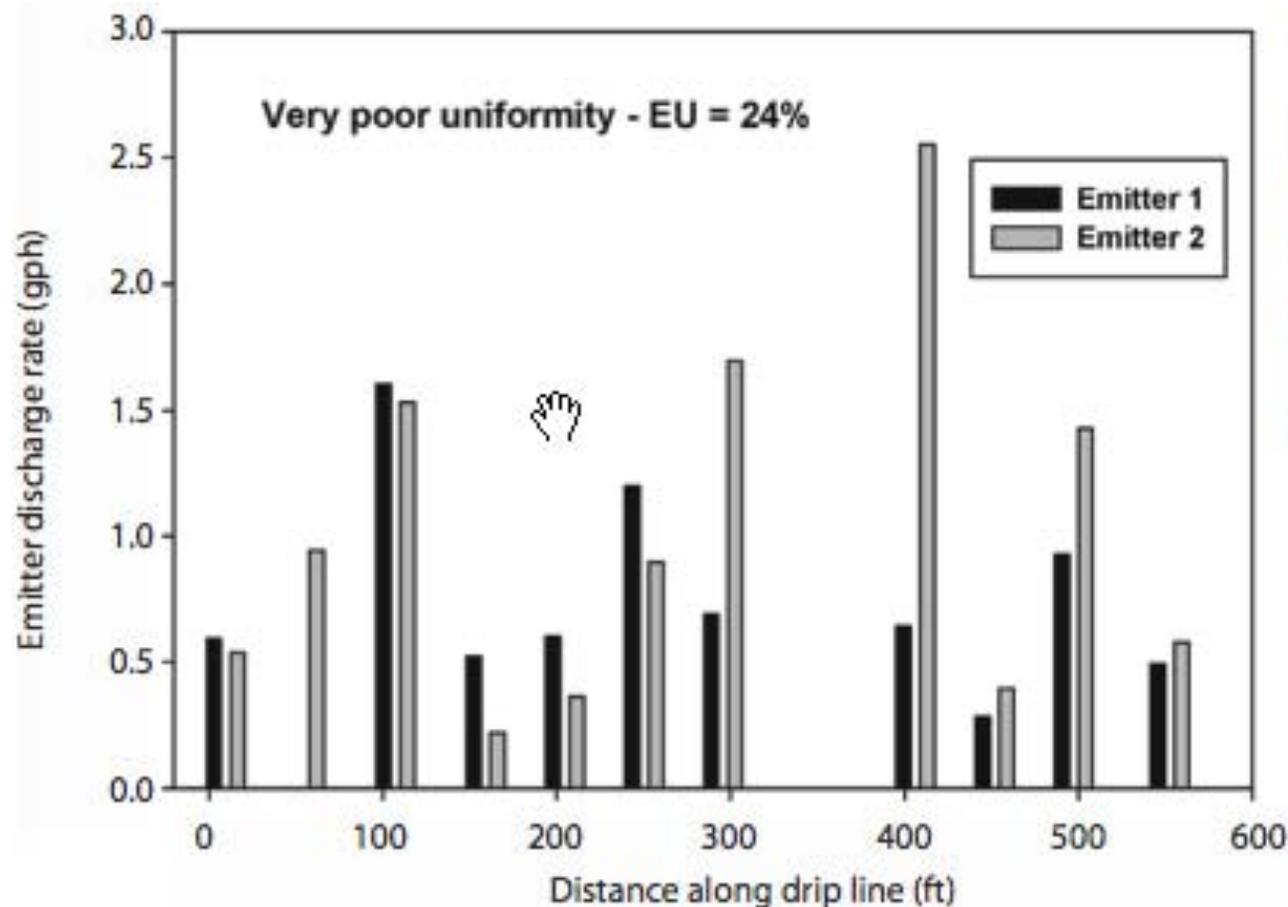
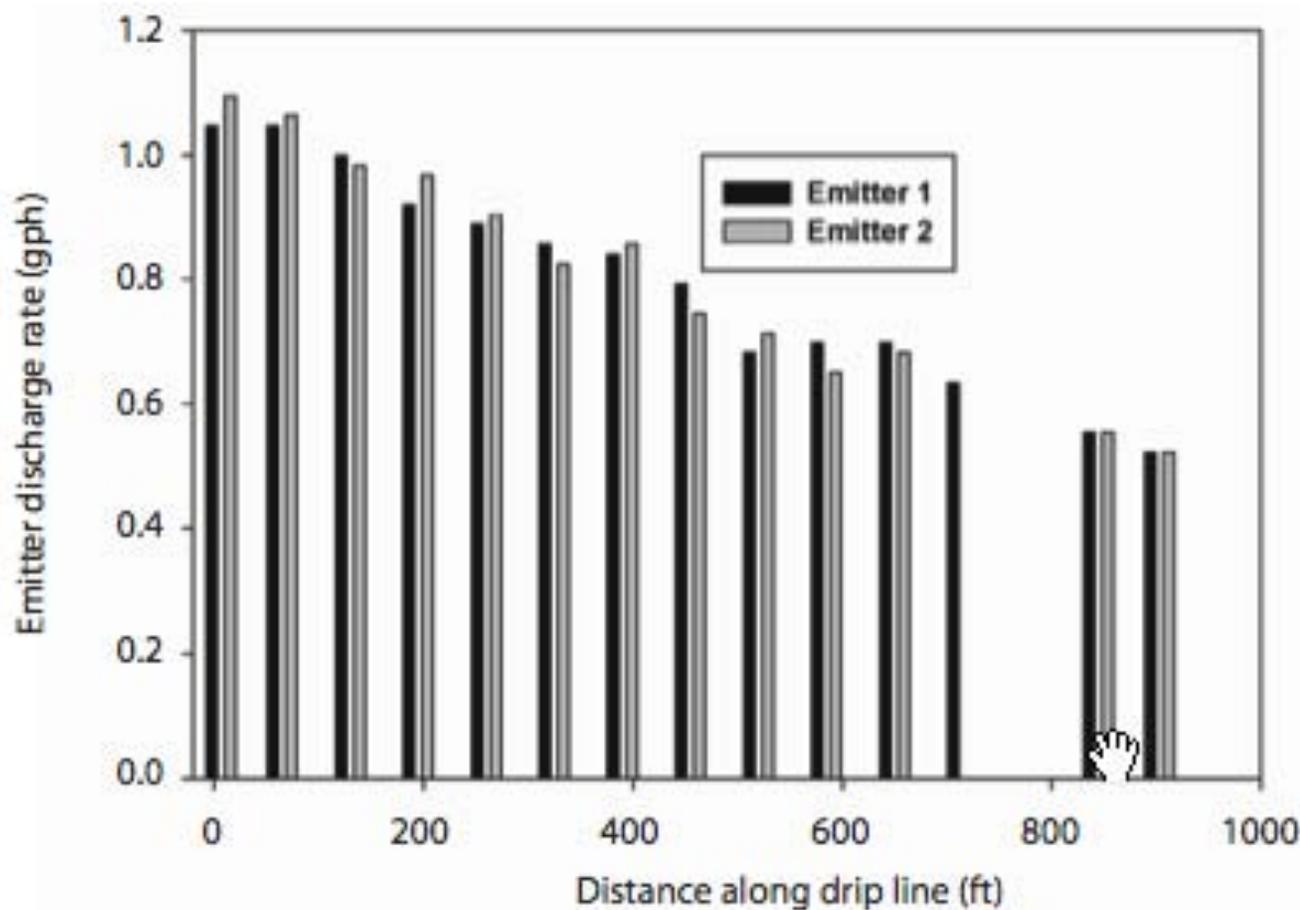


Figure 4. Iron and calcium carbonate precipitation greatly reduced emitter discharge uniformity along the drip line. The design emitter discharge rate was 0.5 gph. The discharge rates of two adjacent emitters (emitter 1 and emitter 2) were determined at each measurement location along the lateral.

# Microirrigation Systems - Clogging

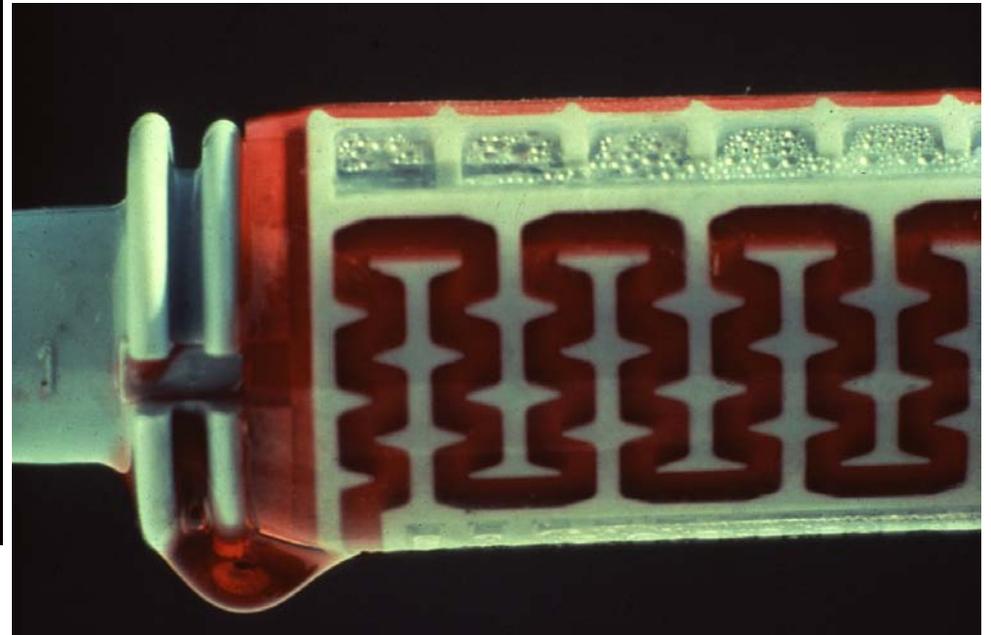
## No Line Flushing



**Figure 5.** Little or no flushing completely clogged emitters near the end of the drip line (gaps in the data near the end of the drip line) of a 2-year-old lateral. The discharge rates of two adjacent emitters (emitter 1 and emitter 2) were determined at each measurement location along the lateral. An excessive drip line length contributed to the large change in emitter discharge rates.

# Emitters:

**Clogging is the greatest “threat” to emitters.**



# **Clogging of Microirrigation Systems**

**Source: Physical Clogging - Particulates**

# **Clogging of Microirrigation Systems**

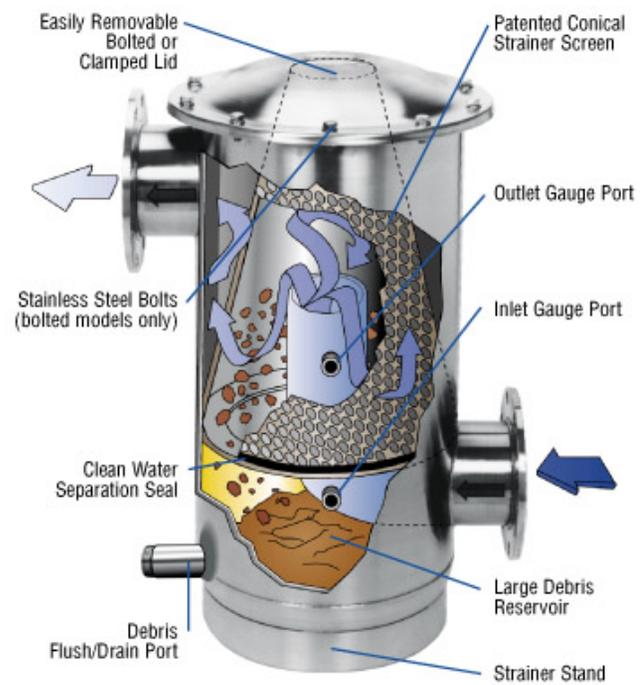
**Source: Physical Clogging - Particulates**

**Solution: Filtration**



# **Filters:**

- **Screen, disk, and sand media filters are all available.**
- **They can all filter to the same degree**  
**BUT**  
**they req. different frequency of cleaning.**



**Mesh size recommended by emitter manufacturer**





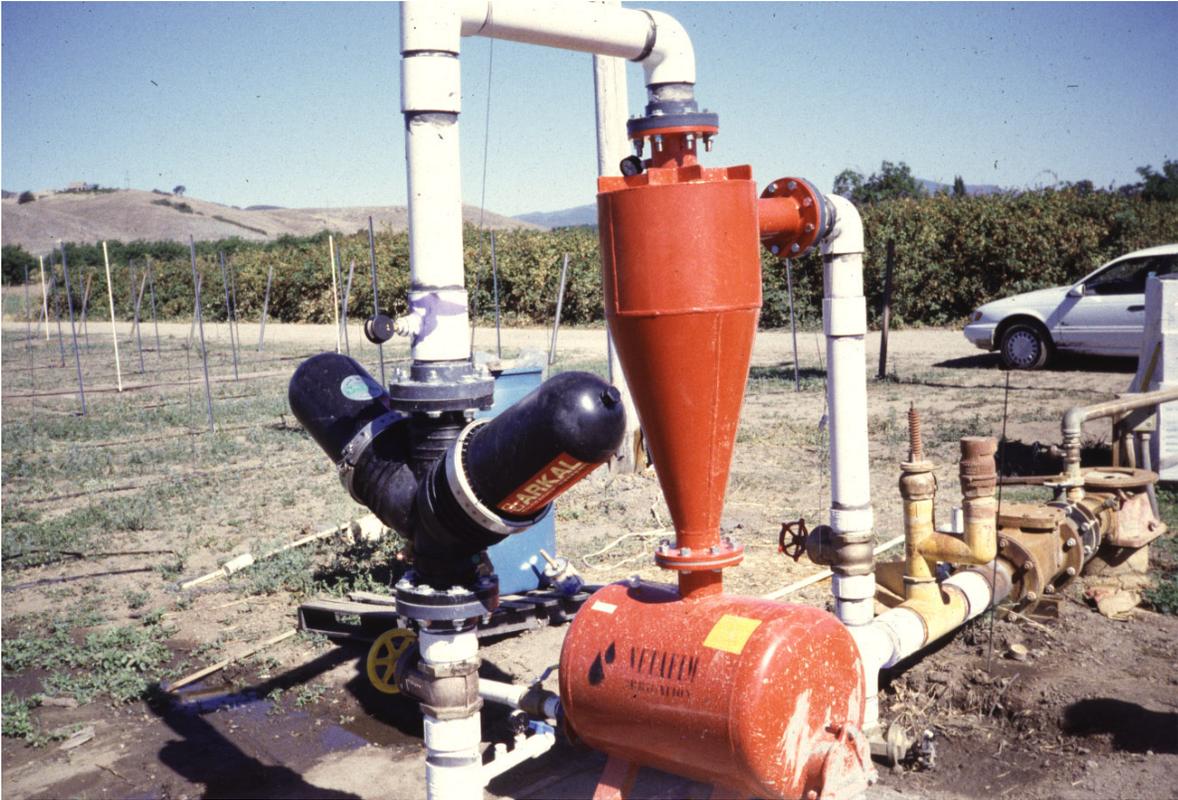
# Screen Filters



# Screen Filters

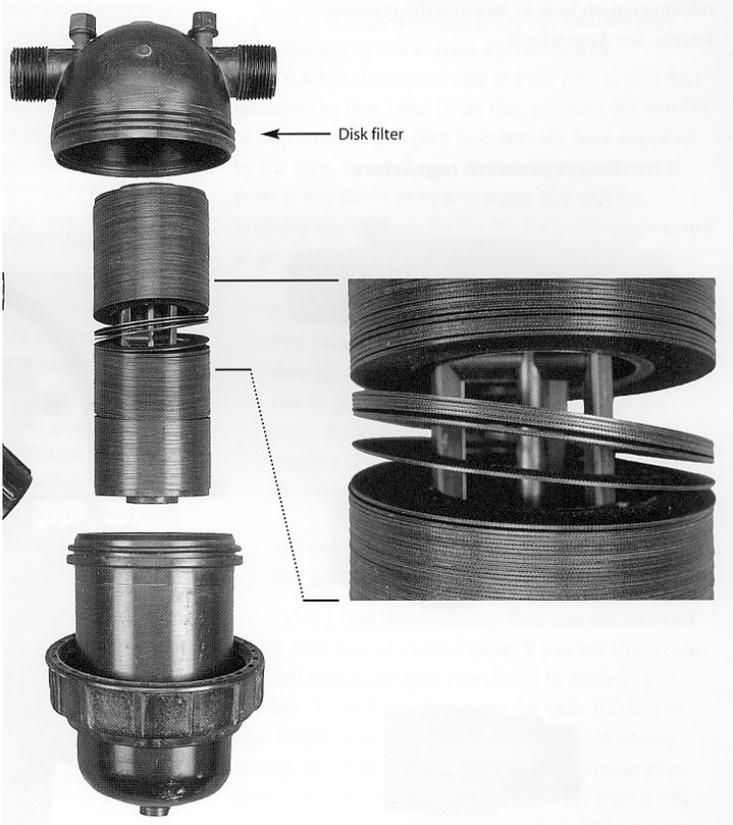
- The degree of filtration is measured by mesh size

<b>Soil Particle</b>	<b>Particle Diam (mm)</b>	<b>Mesh Size</b>	<b>Mesh Opening Size (mm)</b>
<b>Very coarse sand</b>	<b>1 - 2</b>		
<b>Coarse sand</b>	<b>0.5 - 1</b>	<b>20</b>	<b>0.711</b>
<b>Medium sand</b>	<b>0.25 - 0.5</b>	<b>40</b>	<b>0.420</b>
<b>Fine sand</b>	<b>0.1 - 0.25</b>	<b>100</b>	<b>0.152</b>
<b>Very fine sand</b>	<b>0.05 - 0.10</b>	<b>200</b>	<b>0.074</b>
<b>Silt</b>	<b>0.002 - 0.05</b>	<b>320</b>	<b>0.044</b>
<b>Clay</b>	<b>&lt; 0.002</b>		



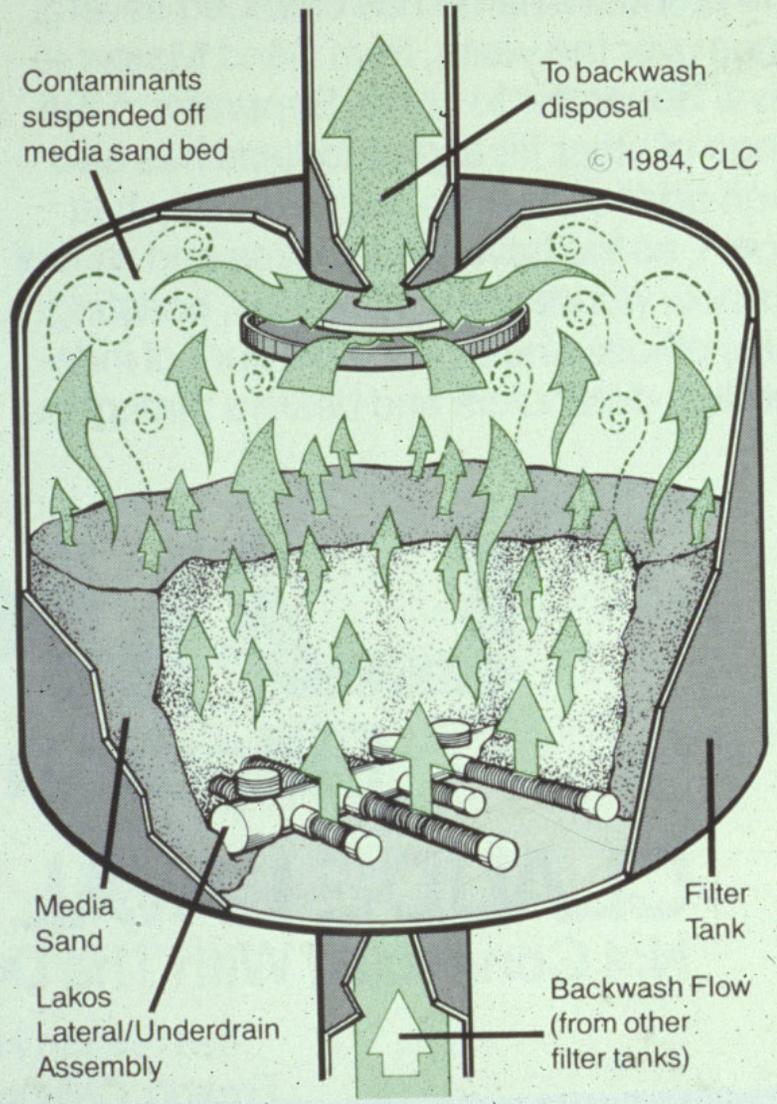
**Also rated by mesh size**

# Disk Filters

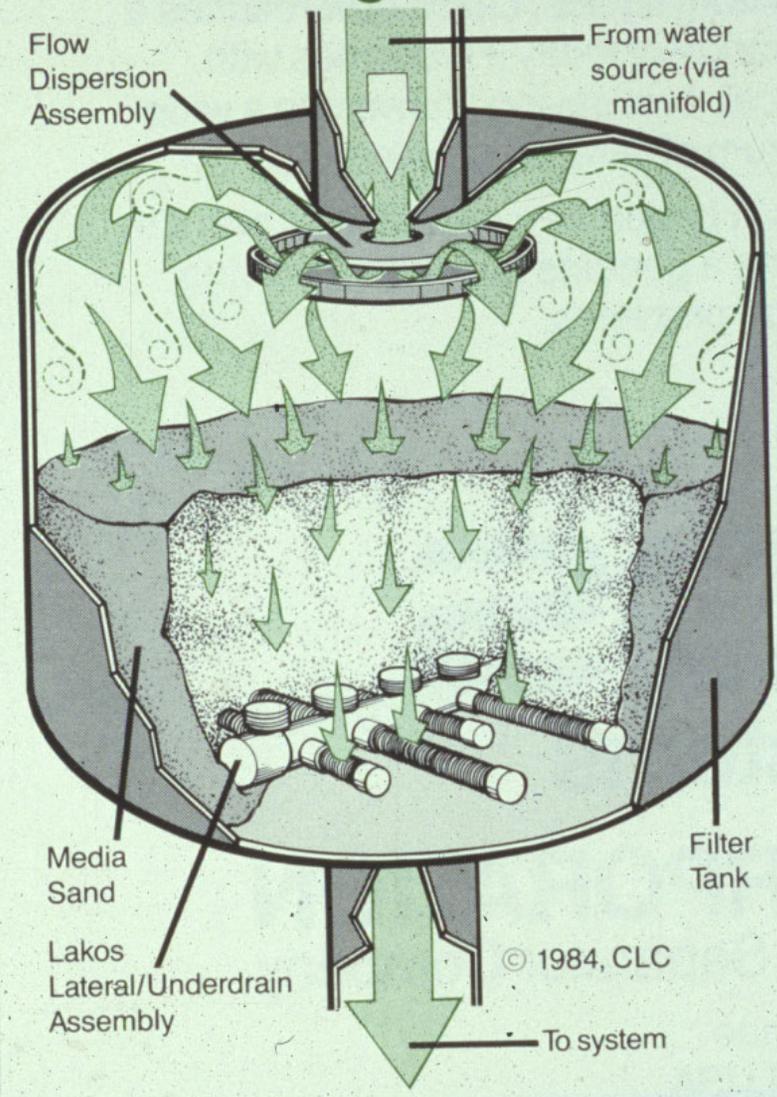




# Backwash Process

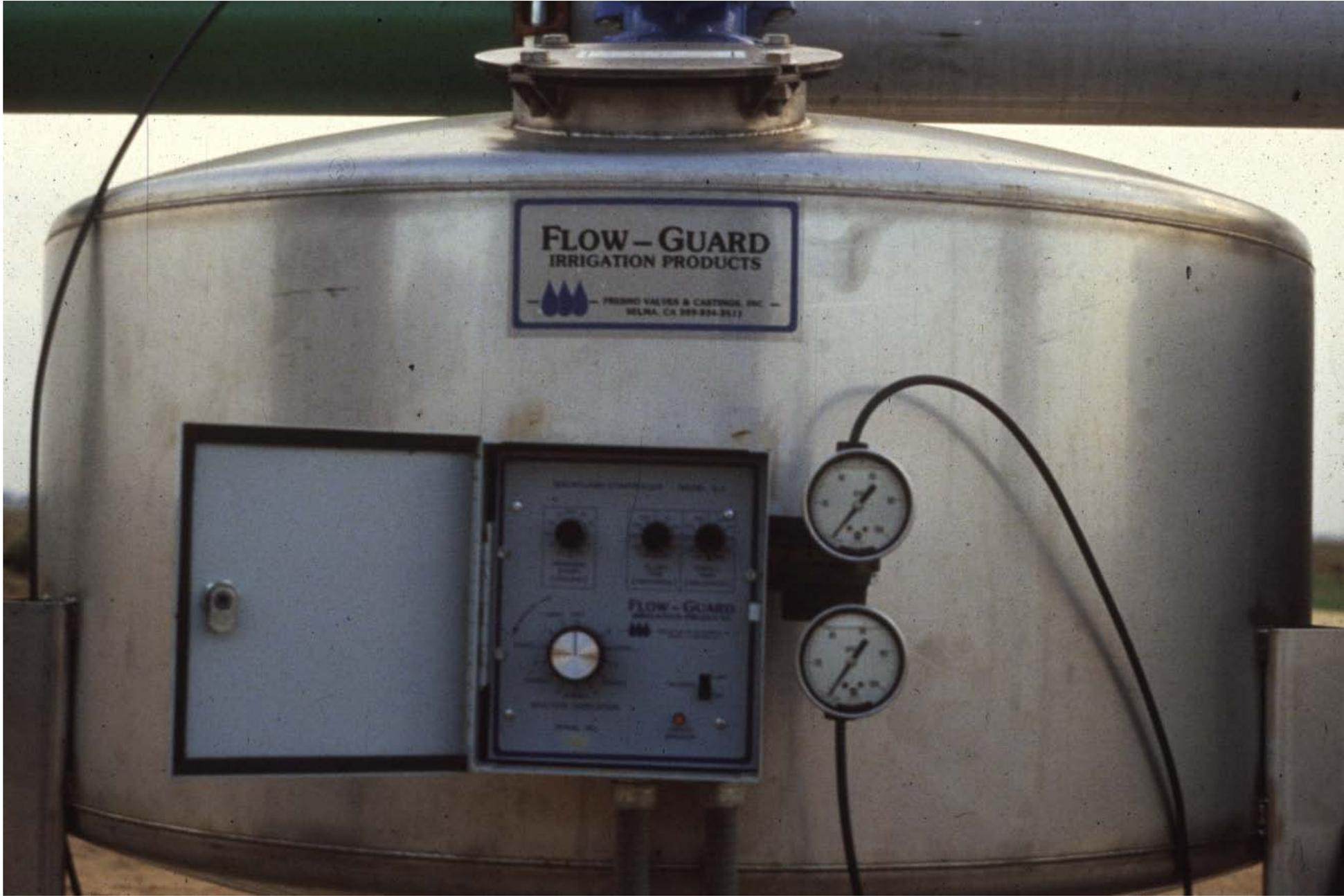


# Filtering Process



# Sand Media Filters

Media Designation Number	Material	Mean Effective Sand Size		Filtration Quality
		(mm)	(in.)	(mesh)
8	crushed granite	1.50	0.059	100-140
11	crushed granite	0.78	0.031	140-200
16	crushed silica	0.66	0.026	140-200
20	crushed silica	0.46	0.018	200-230
30	crushed silica	0.34	0.013	230-400



# **Clogging of Microirrigation Systems**

## **Source: Chemical Precipitates**

- **Lime (calcium carbonate) and iron are the most common problems.**





# **Chemical Precipitate Clogging of Microirrigation Systems**

## **Water quality levels of concern:**

- **Calcium: pH > 7.5 and 2.0 meq/l (120 ppm) of bicarbonate**
- **Iron: pH > 4.0 and 0.5 ppm iron**
  - **Special water sample reqd.**

# **Clogging of Microirrigation Systems**

**Source: Lime**

**Solution: pH Control (Acidification)**

**+**

**filtration**

# Dealing with Iron Precipitation:

## 1. Precipitate iron in a pond / reservoir



# Dealing with Iron Precipitation:

1. Precipitate iron in a pond / reservoir

**2. Chemicals (e.g. phosphonic acid, phosphonate) may keep iron in solution**

- Maintenance, not clean-up products

# **Clogging of Microirrigation Systems**

**Source: Biological Sources**



# **Clogging of Microirrigation Systems**

**Source: Biological Sources**

**Solution: Filtration (usually media filters)**

**+**

**Biocide**

# Biological Clogging

Acid may deter  
but not eliminate

biocide

chlorine    copper

# Chlorine

- Sources:
  - Liquid - sodium hypochlorite.
  - Solid - calcium hypochlorite.
  - Gas chlorine.



# Chlorine:

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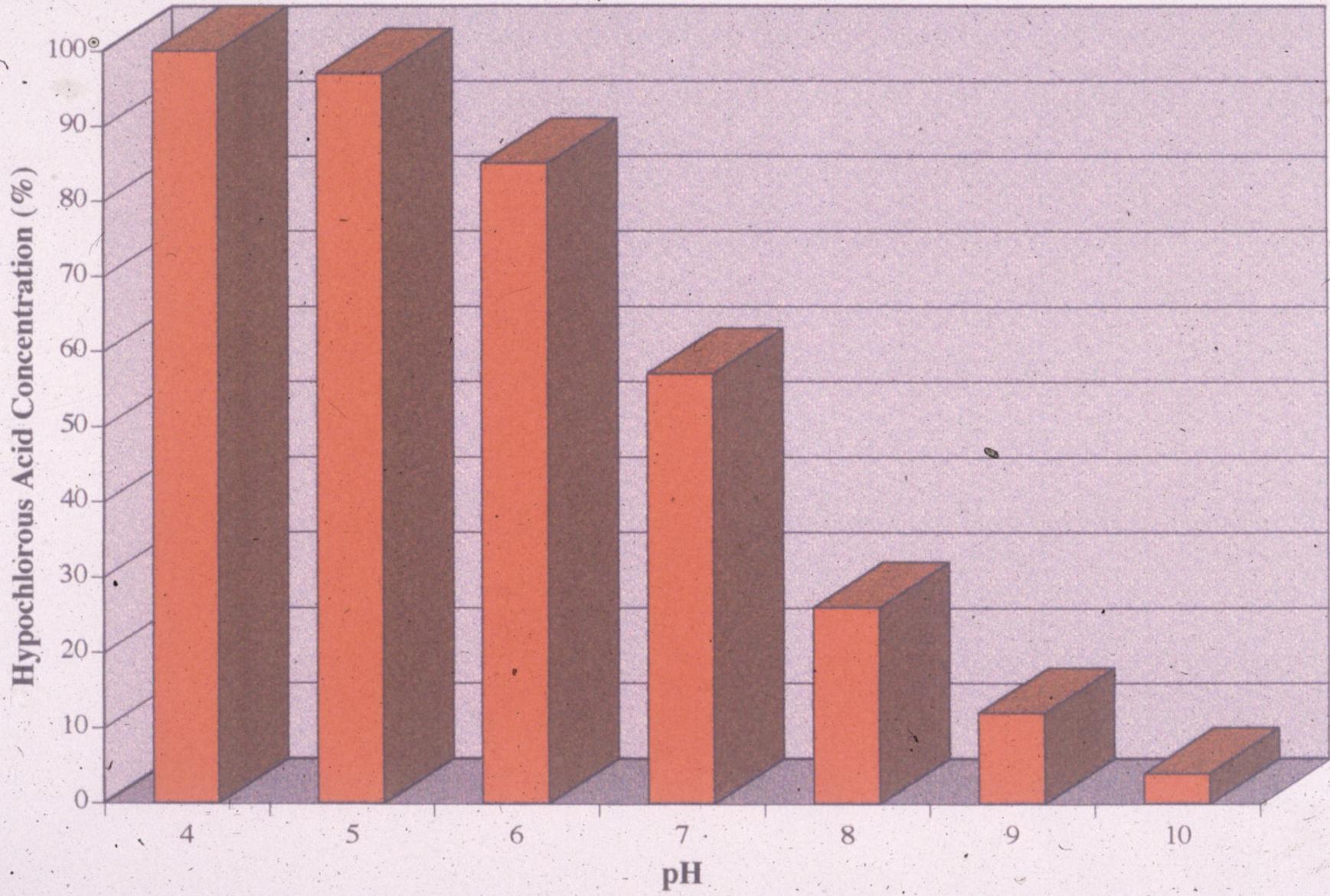
## ■ Sources:

- Liquid - sodium hypochlorite.
- Solid - calcium hypochlorite.
- Gas chlorine.

## ■ When add chlorine source to water:

- Forms hypochlorous acid + hypochlorite.
- Hypochlorous acid is more powerful biocide.
- If pH is lower (acidic), more hypochlorous acid is present - better biocide.

## pH Effect on Hypochlorous Acid Concentration



# **Chlorine as a Biocide:**

## **Free Chlorine**

**Continual Injection**

**1-2 ppm**

**Periodic Injection**

**10-20 ppm**

**Contact time is important – inject for at least a few hours. Longer is better.**

**Test for chlorine using a pool / spa test kit**

# Chlorine: Injection Rates

## ■ Sodium hypochlorite (liquid)

- Example: household bleach w/ 5.25% active chlorine.

$$\text{Chlorine injection rate (gal/hr)} = \frac{\text{System flow rate (gpm)} \times \text{Desired Cl Conc. (ppm)} \times 0.006}{\text{Strength of Cl soln (\%)}}$$

## ■ Calcium hypochlorite (solid)

- 65-70% available chlorine.
- 12.8 lbs. of calcium hypochlorite added to 100 gallons of water forms a 1% solution.
- Use above formula.

# **Flushing of microirrigation systems:**

- **Silts and clay particles pass through even the best filters.**



# Flushing

- Silts and clay particles pass through even the best filters.
- **Need to flush the system - mainlines, submains, and laterals (in that order).**

# Flushing

- Silts and clay particles pass through even the best filters.
- Need to flush the system - mainlines, submains, and laterals (in that order).
  - **Flush laterals by hand or use automatic flushing end caps.**





# Questions?

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**For Powerpoint presentation go to:**

**<http://schwankl.uckac.edu>**