Managing Your Irrigation System

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Presentation will be available at: http://ucanr.org/schwankl

Managing Your Irrigation System

- Sprinkler Systems
  - Determining application rate
- Microirrigation Systems
  - Determining application rate
  - Maintenance

Application Rate: What's the big deal?

- We provide tree water use (ET) information in units of "inches of water use per day (or per week……..)"

Application Rate: What's the big deal?

- We provide tree water use information in units of "inches of water use (per day or per week……..)".
- Need to know the system application rate in order to know **how long to run the system**.

Sprinkler Application Rate

REDUCING RUNOFF FROM IRRIGATED LANDS PUBLICATION 8216

Soil Intake Rates and Application Rates in Sprinkler-Irrigated Orchards

LAWRENCE J. SCHWANKL, UC Cooperative Extension Irrigation Specialist; **TERRY L. PRICHARD,** UC Cooperative Extension Water Management Specialist; **BLAINE R. HANSON,** UC Cooperative Extension Irrigation and Drainage Specialist

Available as a free download at:

http://anrcatalog.ucdavis.edu/SoilWaterIrrigation/8216.aspx

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Sprinkler Application Rate

- Sprinkler application rates usually given in units of "inches per hour".

- Works great with crop water use (ET) info. which is given in "inches per day" or "inches per week".

Sprinkler application rate:

$$i\ (\text{in/hr}) = \frac{96.3 \times (\text{nozzle discharge in gpm})}{\text{Spacing along lateral (ft.)} \times \text{Spacing between laterals (ft.)}}$$

Sprinkler Application Rate:

Table 2. Sprinkler discharge rates (gpm) for various nozzle sizes (in) and pressures (psi)

Pressure (psi)	Nozzle size (in)										
	3/32	7/64	1/8	9/64	5/32	11/64	3/16	13/64	7/32	15/64	1/4
20	1.17	1.60	2.09	2.65	3.26	3.92	4.69	5.51	6.37	7.32	8.34
25	1.31	1.78	2.34	2.96	3.64	4.38	5.25	6.16	7.13	8.19	9.32
30	1.44	1.95	2.56	3.26	4.01	4.83	5.75	6.80	7.86	8.97	10.21
35	1.55	2.11	2.77	3.50	4.31	5.18	6.21	7.30	8.43	9.69	11.03
40	1.66	2.26	2.96	3.74	4.61	5.54	6.64	7.80	9.02	10.35	11.79
45	1.76	2.39	3.13	3.99	4.91	5.91	7.03	8.30	9.60	10.99	12.50
50	1.85	2.52	3.30	4.18	5.15	6.19	7.41	8.71	10.10	11.58	13.18
55	1.94	2.64	3.46	4.37	5.39	6.48	7.77	9.12	10.50	12.15	13.82
60	2.03	2.76	3.62	4.50	5.65	6.80	8.12	9.56	11.05	12.68	14.44
65	2.11	2.88	3.77	4.76	5.87	7.06	8.45	9.92	11.45	13.21	15.03
70	2.19	2.99	3.91	4.96	6.10	7.34	8.78	10.32	11.95	13.70	15.59
75	2.27	3.09	4.05	5.12	6.30	7.58	9.08	10.66	12.32	14.19	16.14

Note: Metric conversions: 1 gal = 3.785 l; 1 in = 2.54 cm; 1 psi = 6.89 kPa

Sprinkler Application Rate

Nozzle Size

Sprinkler Application Rate

Pitot tube with pressure gauge

Determining Pressure

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Sprinkler Application Rate

Hose and bucket method

Sprinkler Application Rate

Catch Can Test

- Gives both application rate and application uniformity.

Managing Your Microirrigation System

Microirrigation Irrigation Scheduling

- Crop water use (ET) info. provided in units of "in/day".
- Microsprinkler and drip system applications measured in units of "gal/hour" (gph).

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Water use by the tree (gal/day)	=	Tree spacing (ft^2)	x	Tree water use (in/day)	x	0.623

Microirrigation Application Rate

- Sample the microsprinklers or drippers to get the gph per device.

Microirrigation Management

Orchard Irrigation

Determining the Application Rate & Uniformity of a Microirrigation System

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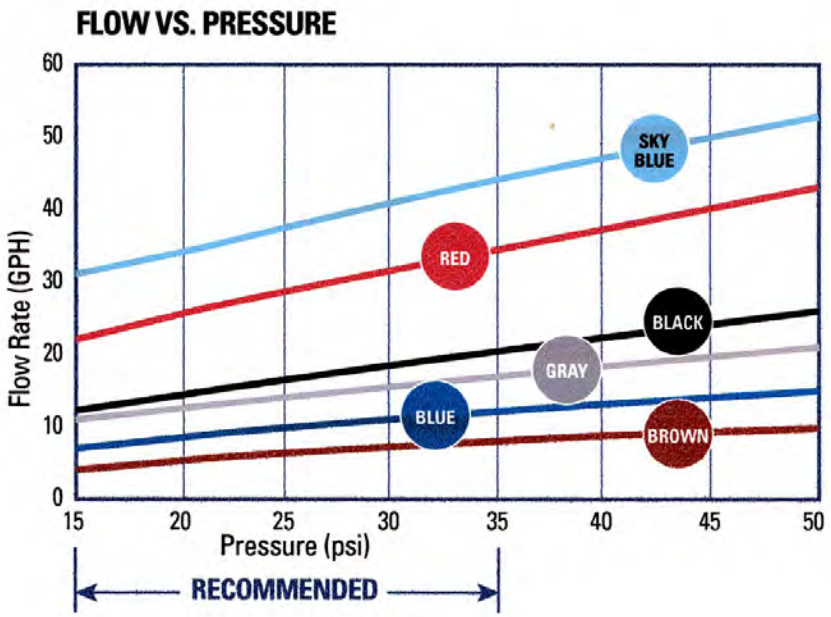
Microirrigation Management

- Pressure variations
- Clogging

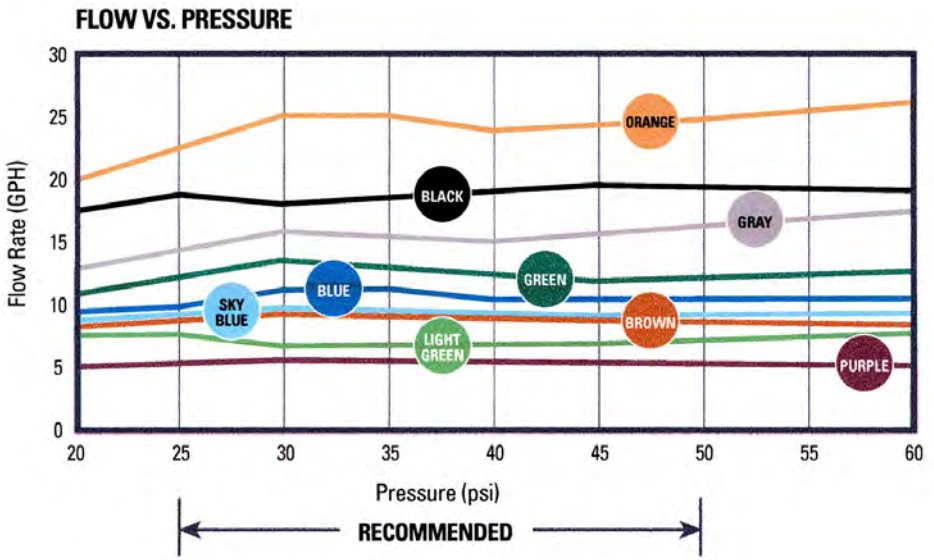
Microirrigation – Pressure variations

- Impact on application rate:

Non-pressure compensating Micro



Pressure compensating (PC) Micro

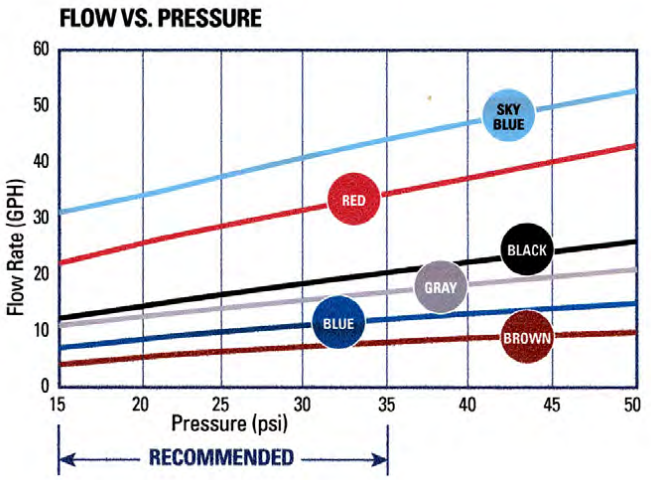


Microirrigation – Pressure variations

- Impact on application rate:
- Causes
  - Design issues

Microirrigation – Pressure variations

- Impact
- Causes
  - Design issues
  - Maintenance issues
    - Filters – if filters are dirty, there is greater pressure drop across them.



Maintenance of Microirrigation

Clogging is the greatest "threat" to microirrigation systems.

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

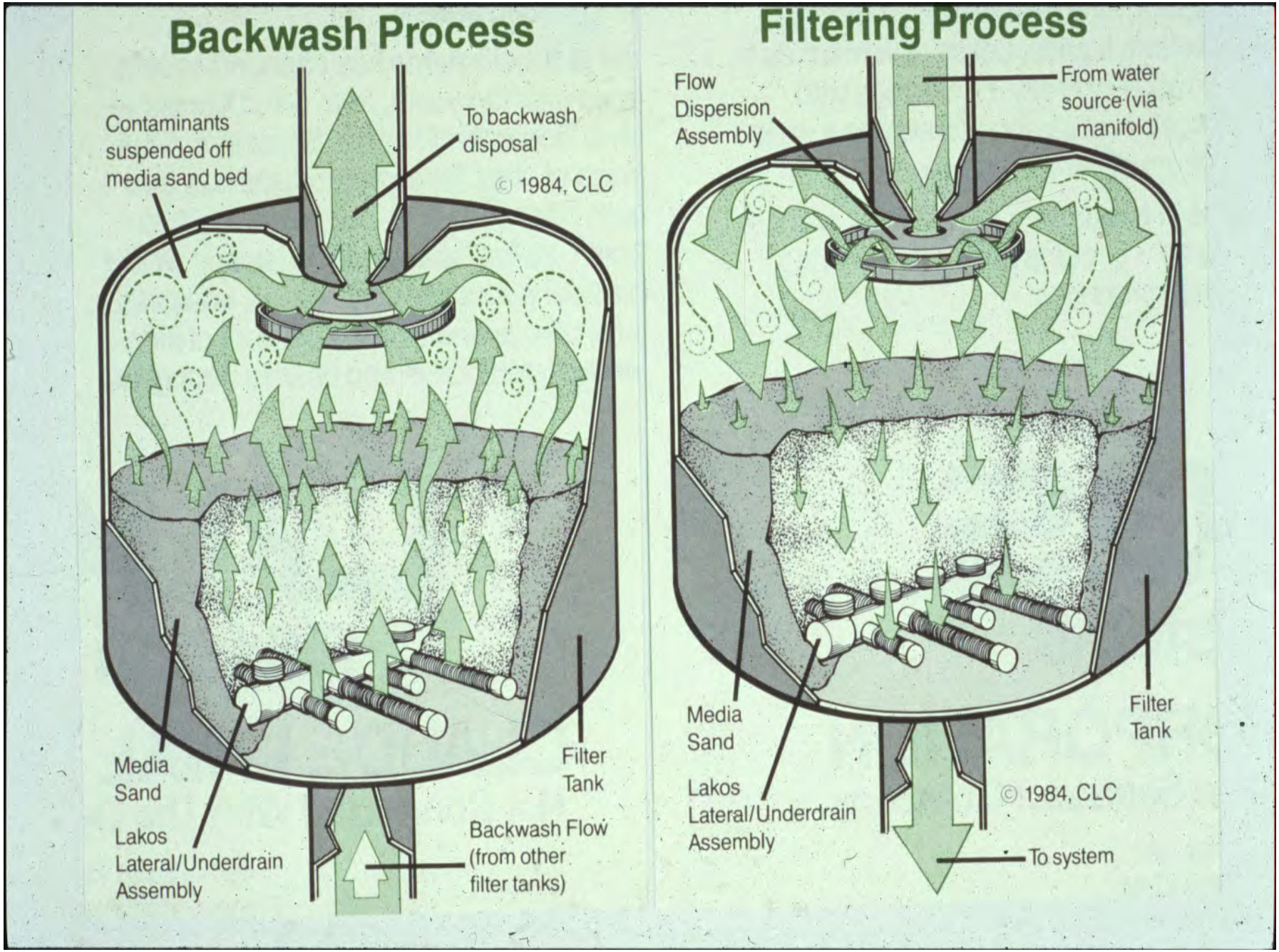
BUT

they req. different frequency of cleaning.

Screen Filters

Disk Filter & Sand Separator

Sand Media Filters


Backwash Process
Contaminants suspended off media sand bed
To backwash disposal
© 1984, CLC
Media Sand
Lakos Lateral/Underdrain Assembly
Filter Tank
Backwash Flow (from other filter tanks)
Filtering Process
Flow Dispersion Assembly
From water source (via manifold)
Media Sand
Lakos Lateral/Underdrain Assembly
Filter Tank
© 1984, CLC
To system

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

Clogging of Microirrigation Systems

Source: Lime

Solution: pH Control (Acidification)

+

filtration

Dealing with Iron Precipitation:

1. Aerate and 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

Biolgical Clogging

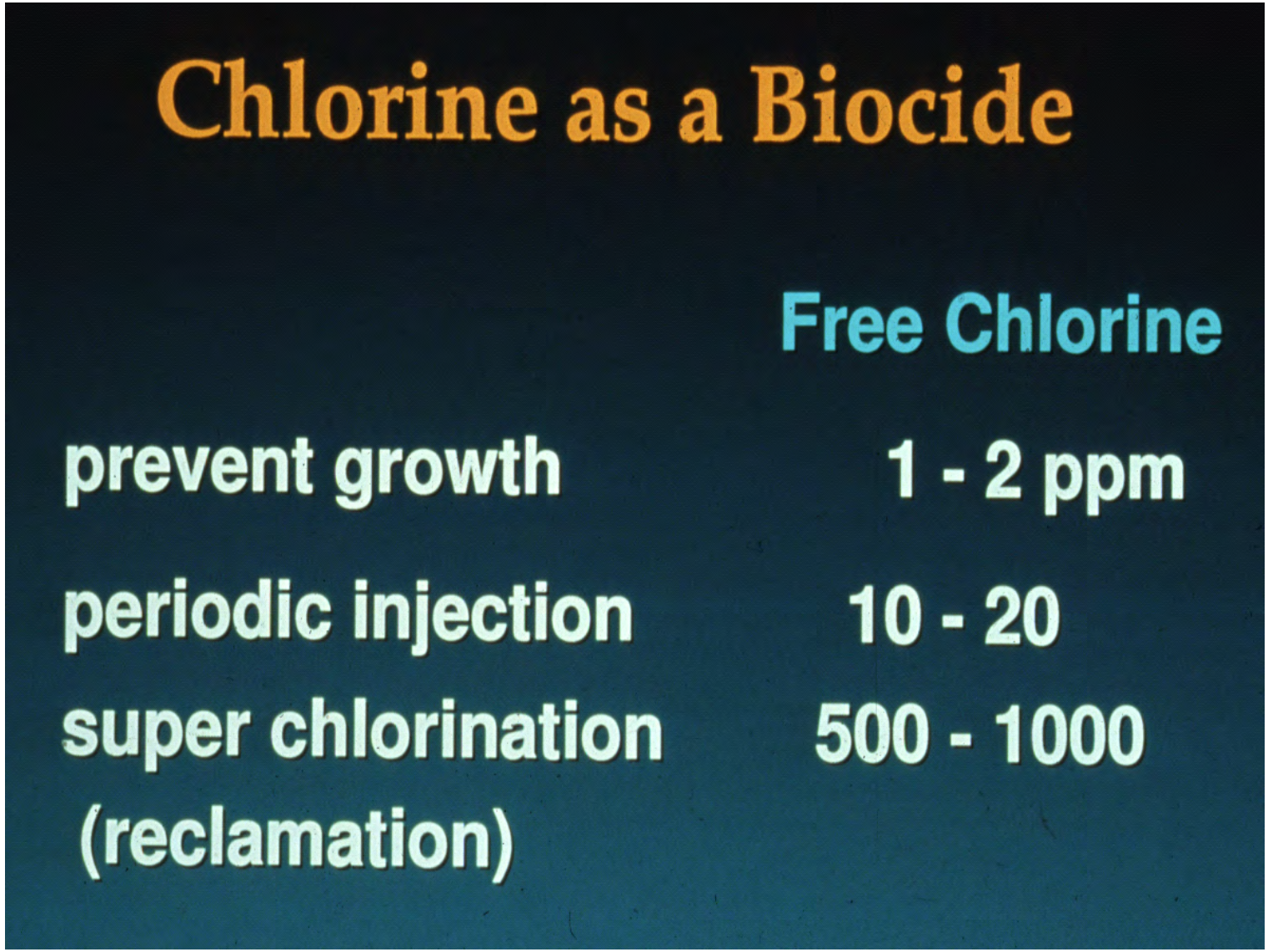
Acid may deter
but not eliminate

biocide

chlorine copper

Chlorine

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



Test for chlorine using a pool / spa test kit

Chlorine as a Biocide

	Free Chlorine
Continual to prevent growth	**1–2 ppm**
Periodic injection	**10-20 ppm**

Test for chlorine using a pool / spa test kit

Chlorine: Injection Rates

- Sodium hypochlorite (liquid)
  - Example: household bleach w/ 5.25% active chorine.

Chlorine injection rate (gal/hr) = System flow rate (gpm) x Desired Cl Conc. (ppm) x 0.006 ÷ 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

- 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 and handouts go to:

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