Management Options for Agricultural Water Quality

University of California Cooperative Extension

County of San Diego

Presentation Outline

- **Irrigation**
- **Nutrients**
- **Erosion and Runoff**
- **Non-production Areas**

Irrigation

1. Irrigation uniformity and efficiency

- 1.1 Irrigation audit to determine efficiency and make changes
- 1.2 Schedule regular audits
- 1.3 If uniformity is low, consider converting to new irrigation system
- 1.4 Use pressure regulators

Irrigation

1. Irrigation uniformity and efficiency cont.

- 1.5 Use pressure compensating emitters
- 1.6 Compensate for pressure differences on slopes
- 1.7 Flow control nozzles on overhead systems
- 1.8 Similar flow rates in each watering zone

Irrigation

1. Irrigation uniformity and efficiency cont.

- 1.9 Group plants by size and water needs
- 1.10 Correlate flow rates with plant type, media infiltration rate and pot size
- 1.11 Use appropriate and uniform nozzle sizes
- 1.12 Use sprinkler heads with high uniformity rating

Irrigation

2. Maintain system regularly

- 2.1 Regularly inspect for leaks and repair
- 2.2 Regularly flush and unclog lines and emitters
- 2.3 Use and maintain appropriate filters
- 2.4 Maintain appropriate pressure
- 2.5 Regularly replace worn, outdated or inefficient system components

Irrigation

3. Avoid unnecessary or poorly placed watering

- 3.1 Space plants closely with overhead irrigation
- 3.2 Ensure every emitter is located in a plant or pot
- 3.3 Consolidate plants and shut off irrigation in unused areas

Irrigation

3. Avoid unnecessary or poorly placed watering cont.

- 3.4 Use overhead emitters with check-valves
- 3.5 Use on/off valve in hand watering systems
- 3.6 Check regularly to ensure spray delivers water to plants only

Irrigation

4. Irrigation rates and scheduling

- 4.1 Base irrigation scheduling on environmental conditions and plant moisture requirements
- 4.2 Adjust irrigation schedule to reflect weather, plant needs
- 4.3 Group plants according to moisture need

Irrigation

4. Irrigation rates and scheduling cont.

- 4.4 Avoid irrigation outdoors in wind
- 4.5 Use pulse irrigation
- 4.6 Check automatic time clocks regularly for accuracy and adjust

Irrigation

5. Training

- 5.1 Ensure that irrigation is only performed by trained personnel
- 5.2 Provide system maintenance and recordkeeping training
- 5.3 Provide in-house audit training
- 5.4 Keep records of training

Nutrients

1. Evaluation to optimize plant growth

- 1.1 Regularly monitor the quality of irrigation source water
- 1.2 Test well water regularly for contamination from fertilizers
- 1.3 Maintain records of irrigation source water quality
- 1.4 Consider nutrients already present when managing fertilizer application

Nutrients

1. Evaluation to optimize plant growth cont.

- 1.5 Regularly test soil for nutrients, soluble salts and pH
- 1.6 Test plant tissue for nutrients
- 1.7 Use data from soil/plants in fertilizer management

Nutrients

1. Evaluation to optimize plant growth

- 1.8 Use nutrient recommendations for your specific crop
- 1.9 Regularly test fertigation water
- 1.10 Maintain records of fertilizer use

Nutrients

2. Efficient fertilization and leaching

- 2.1 Incorporate solid fertilizers to optimize nutrient availability to roots
- 2.2 Use thoroughly composted compost and manure
- 2.3 Apply top-dressed fertilizers carefully to keep in pot
- 2.4 Mix and apply injected fertilizers carefully and at the correct rate

Nutrients

2. Efficient fertilization and leaching cont.

- 2.5 Calibrate fertilizer injectors
- 2.6 Use slow- or controlled-release fertilizers
- 2.7 Time fertilizers with environmental parameters and growth stage of plants
- 2.8 Flush excess salts from root systems by careful leaching

Nutrients

2. Efficient fertilization and leaching cont.

- 2.9 Use the electrical conductivity of root media to determine leaching practices
- 2.10 Set irrigation schedules to perform leaching at specific irrigation events
- 2.11 Measure amount of leaching and ensure only 10-15% of water runs out

Nutrients

3. Avoid fertilizer spills

- 3.1 Store fertilizers in structure that complies with government guidelines
- 3.2 Locate fertilizer storage far away from water conveyances
- 3.3 Include concrete pad and curb to contain spills and leaks
- 3.4 Equip fertilizer tanks with secondary containment

Nutrients

3. Avoid fertilizer spills cont.

- 3.5 Mix and load fertilizer on an impermeable surface
- 3.6 Regularly verify that fertigation equipment is calibrated and intact
- 3.7 Cover fertilizer while transporting and do not overfill
- 3.8 Take care not to spill fertilizer while transferring to applicator or storage

Nutrients

3. Avoid fertilizer spills cont.

- 3.9 Clean spills immediately
- 3.10 Use check valves on application equipment
- 3.11 Use backflow prevention
- 3.12 Dispose of fertilizer bags in covered trash bins

Nutrients

4. Training

- 4.1 Train in how and when to fertilize
- 4.2 Train in how and when to leach
- 4.3 Train in fertilizer transport, storage and disposal
- 4.4 Train in fertilizer spill management
- 4.5 Keep records of training

Erosion and Runoff

1. Evaluate water quality of runoff

- 1.1 Inventory chemicals used in your operation
- 1.2 Regularly sample runoff water
- 1.3 Analyze runoff water for pH, EC, N, P, etc
- 1.4 Compare water quality against local and state water quality standards
- 1.5 Keep water quality records

Erosion and Runoff

2. Maximize soil infiltration and water-holding capacity

- 2.1 Incorporate organic amendments in sandy soil to improve water capacity
- 2.2 Incorporate organic amendments in clayey soil to improve infiltration
- 2.3 Use mulches or cover crops
- 2.4 Test media for water holding capacity
- 2.5 Use wetting agents in media

Erosion and Runoff

3. Retard and/or retain runoff water

- 3.1 Determine where and how much erosion and runoff is generated
- 3.2 Establish barriers or buffers between production areas and waterbodies/ditches
- 3.3 Convert paved or bare soil to vegetation
- 3.4 Use polyacrylamide to remove sediment in runoff

Erosion and Runoff

3. Retard and/or retain runoff water cont.

- 3.5 Use windbreaks/shelterbelts in areas prone to wind erosion
- 3.6 Contain runoff from upslope or upstream properties
- 3.7 Keep records of runoff management

Erosion and Runoff

4. Manage hilly/sloped areas

- 4.1 Use terraces
- 4.2 Use mulch on hilly or steep areas
- 4.3 Use vegetation (cover crops, buffer strips, grassed swales, etc)

Erosion and Runoff

4. Manage hilly/sloped areas cont.

- 4.4 Use berms
- 4.5 Use proper irrigation in hilly production and non-production areas
- 4.6 Use proper pest and nutrient management in hilly areas

Erosion and Runoff

5. Design/Manage nursery roads

- 5.1 Design new roads to avoid erosion
- 5.2 Use waterbars on roads with gradients exceeding 8%
- 5.3 Use filter strips between roads and waterways
- 5.4 Inspect and clean culverts during winter rains
- 5.5 Seal or water unpaved roads

Erosion and Runoff

6. Collect excess runoff

- 6.1 Use retention basins to store excess runoff
- 6.2 Use captured water to irrigate non-crop areas
- 6.3 Use captured water to irrigate cropped areas

Erosion and Runoff

7. Manage greenhouse roof runoff

- 7.1 Direct roof runoff to avoid flow across areas where contaminants will wash into water
- 7.2 Direct roof runoff to pervious areas
- 7.3 Reuse collect roof runoff for irrigation

Erosion and Runoff

8. Training

- 8.1 Provide training to runoff management
- 8.2 Make staff aware of all drainage conduits and ditches on property
- 8.3 Label all stormwater and sewer conduits with signs
- 8.4 Keep records of training

Non-Production Areas

1. Prevent dry or wet weather runoff

- 1.1 Clean indoor walkways, loading areas, etc using “dry” methods, or contain runoff from wet cleaning

- 1.2 Periodically clean outdoor areas using “dry” methods, or contain runoff from wet cleaning

Non-Production Areas

2. Maintain vehicles and their storage

- 2.1 Regularly maintain vehicles to detect/prevent leaks
- 2.2 Ensure wash runoff from vehicles stays on property
- 2.3 Properly dispose of collected fluids
- 2.4 Drain and properly dispose of fluids from vehicles no longer in use

Non-Production Areas

2. Maintain vehicles and their storage cont.

- 2.5 Locate vehicle maintenance and storage away from surface water
- 2.6 Clean maintenance and storage areas to avoid oil and grease buildup
- 2.7 Clean spills immediately

Non-Production Areas

3. Locate/maintain fuel tanks

- 3.1 Locate fuel tanks away from surface waters
- 3.2 Check and maintain fuel tanks to prevent leaks
- 3.3 Perform fueling activities carefully
- 3.4 Clean spills immediately

Non-Production Areas

4. Keep nursery free of debris/trash

- 4.1 Maintain property free of debris/trash
- 4.2 Provide adequate number of maintained waste containers
- 4.3 Keep containers in good condition and closed
- 4.4 Keep waste indoors or covered outdoors

Non-Production Areas

5. Maintain restrooms

- 5.1 Provide adequate restrooms and portable toilets where needed
- 5.2 Ensure proper plumbing in restrooms
- 5.3 Locate portable toilets away from surface water
- 5.4 Regularly maintain restrooms and toilets

Non-Production Areas

6. Training

- 6.1 Train personnel in waste disposal and restroom maintenance
- 6.2 Train personnel in spill cleaning
- 6.3 Train personnel in recycling
- 6.4 Train in disposal of batteries, paint, etc
- 6.5 Keep records of training