


# Orchard Water Quality Management



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Ventura County**



**Our Mission:** To serve California through the creation, development and application of knowledge in agricultural, natural and human resources

**In this brochure, you will find  
good Management Practices for  
orchard water quality management**

**Disclaimer**

It is not recommended that the suggested management practices in this brochure ever be used as a basis for law. We understand that every operation is unique and requires a site-specific assessment of: 1) Whether there is a need to implement further management practices, and 2) Whether recommended practices are in fact appropriate to a site. Not all the information needed to implement these measures is contained in this brochure.



# Index

Irrigation: Goals and Management Practices...	1
Tools for Irrigation Scheduling.....	2

Pest and Agricultural Chemicals:	
Goals and Management Practices.....	3
Integrated Pest Management.....	4

Erosion and Runoff:	
Goals and Management Practices.....	5-6
Cover Crops.....	7

Non-Production Areas:	
Goals and Management Practices.....	8

Why Should We Be Concerned About Water Quality?.....	9
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Online References and Contacts.....	10-11
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## Irrigation: Goals and Management Practices

- ☐ Conduct distribution uniformity (DU) tests of your irrigation system.
  - A DU between 90–100% indicates a uniform system for microirrigation systems.
  - Consider upgrades with  $DU < 90\%$ .
- ☐ Design or retrofit your irrigation system for improved irrigation uniformity and efficiency.
  - A uniform and efficient system reduces runoff, reduces leaching losses, and promotes plant health.
  - Use pressure regulators or pressure-compensating emitters in hilly areas.
- ☐ Regularly maintain your irrigation system so that it continues to operate efficiently.
  - ☐ Check for line breaks and plugged emitters.
  - ☐ Inspect and clean filters.
  - ☐ Flush the lines to remove sediment and clogs.
- ☐ Schedule irrigations (timing and amount) to meet plant needs.
  - ☐ Monitor soil moisture and evapotranspiration (ET) losses (see page 2).
  - ☐ Know crop rooting depth and soil type.
  - ☐ Observe trees for signs of water stress (i.e. yellowing or dropping leaves) only as a last resort.
- ☐ Provide appropriate training to irrigators in a language that they understand, and maintain records documenting training.



Convert to a microirrigation system, such as spinners, sprayers, or drippers, that distributes water more uniformly and with less runoff.

# Tools for Irrigation Scheduling

2



- **Tensiometers** measure soil moisture, or more specifically the suction of the soil as it varies with wetting and drying.
- Tensiometers are filled with water and have a gauge on top and a porous ceramic cup on the bottom. In dry soil, water is pulled out of the ceramic cup, and the gauge reading increases, reflecting high soil suction. In moist soil, water is taken up from the soil and the gauge reads lower.
- Several tensiometers uniformly spaced in a cropping area at depths commensurate with rooting depth can accurately characterize soil moisture conditions.

- **Soil moisture sensors** (including Watermarks) can be attached to a data logger (shown in photo), which automatically record soil moisture and temperature over time.
- An electrical current travels through the wires down into the sensor buried in the soil. The electrical resistance of the sensor changes with the soil moisture. The electrical signal is calibrated into centibars (cb) of soil suction.

**Measured tension at which you should irrigate:**  
avocado: 25-40 cb,  
citrus: 30-50 cb.



- **Atmometers** are used to measure evapotranspiration (ET) for a site. ET is a measure of the amount of water a plant removes from the soil.
- Different slope aspects and elevation in cropping areas affect ET rates.
- Calculate the water requirements of your orchard:  
<http://www.avocado.org/growers/irrigcalc.php>
- Crop coefficients for Ventura County are 0.65 for mature citrus, 0.85 for mature avocados, and 0.10 at planting for both. Contact Ben Faber with specific questions (see page 10).

- **Weather stations** can be used to monitor wind speed, temperature, ET, and soil moisture. However, installation and maintenance may be relatively expensive.



## Pest and Agrochemicals: Goals and Management Practices

- **Minimize the need for pesticides:**

- ☐ Establish an integrated pest management (IPM) program to reduce pesticide use (see page 4).
  - A reduction in pesticide use can decrease the potential contamination of groundwater and surface waters
  - Reducing use of both conventional pesticides and reduced-risk pesticides should be considered.
- ☐ Use good sanitation and other preventative control techniques to avoid pest problems and maintain a healthy production environment.
- ☐ Use non-chemical control tactics to reduce overall pesticide use. Consider the effect on populations of natural enemies and pollinators when choosing a material.

- **When chemical pest control is necessary:**

- ☐ Read the pesticide label to assess a pesticide's potential for affecting water quality. Discuss water quality goals with your Pest Control Advisor.
- ☐ Consider application method, pesticide persistence, location (e.g. slope, soil type), and weather during and after application. The Pesticide Wise website at <http://www.pw.ucr.edu/> can be used to help you calculate the risk for your application.
- ☐ Avoid pesticide and fertilizer spills and leakage during all phases of transport, storage, and application.
- ☐ Ensure that runoff and sediment containing pesticide and other agricultural chemical residues remain on the property and do not move offsite in water or by wind.
- ☐ Never dispose of containers where they may contaminate water supplies or natural waterways. Consult your County Agricultural Commissioner for correct procedures for handling and disposal of large quantities of empty containers.
- ☐ The user is legally responsible for any damage due to misuse of pesticides. Responsibility extends to effects caused by drift, runoff, or residues.
- ☐ Provide organized pesticide handling training in a language that personnel clearly understand, and maintain records documenting training.



Store pesticides in a structure with a concrete pad and curb to contain spills and leaks. Locate pesticide storage and mixing areas as far away from water conveyances as possible.

A comparison of chemical control options can be found at the UC Davis IPM Online website (<http://www.ipm.ucdavis.edu/PMG/crops-agriculture.html>), selecting the crop, pest, and clicking "water quality compare treatments" button when available.



# Integrated Pest Management

4

## What is IPM?

Integrated pest management (IPM) is an ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties. Pesticides are used only after monitoring indicates they are needed according to established guidelines, and treatments are made with the goal of removing only the target organism. Pest control materials are selected and applied in a manner that minimizes risks to human health, beneficial and non-target organisms, and the environment.



Sticky traps (left) can be used for monitoring adult insect pests in orchards such as glassy-winged sharpshooter, thrips, and leaf miners.



Snails can cause severe problems in citrus orchards (left), where no-till weed control and sprinkler and low-volume irrigation create an ideal environment for snail development. Management of the brown garden snail is a four-step process that involves pruning tree skirts; banding tree trunks with copper foil or a basic copper sulfate slurry (above), taking care so that the copper doesn't end up as a contaminant in runoff; putting out poison bait; and making releases of the predatory decollate snails. Baits are toxic to the decollate snail so apply only to reduce pest snail populations to low levels before introduction of the decollate snail.

For more information on Integrated Pest Management, please visit [ucipm.ucdavis.edu](http://ucipm.ucdavis.edu)

## Erosion and Runoff: Goals and Management Practices

- ☐ Improve soil infiltration to reduce soil erosion and runoff.
  - ☐ Know the infiltration rate of your soil and erosion hazard potential.
  - ☐ Implement the Irrigation Goals and Management practices recommended in this brochure.
  - ☐ Minimize vehicle passes during spraying and harvest to minimize soil compaction.
  - ☐ Maintain a cover crop between rows (see page on Cover Crops).
- ☐ Reduce movement of runoff water and sediment and keep it on the property by using:
 

<input type="checkbox"/> mulch	<input type="checkbox"/> cover crops (see page 7)
<input type="checkbox"/> straw bales or wattles	<input type="checkbox"/> vegetated buffer areas
<input type="checkbox"/> graveled roads or water conveyance systems	<input type="checkbox"/> sediment traps
- ☐ Design and manage roads to prevent erosion and contaminated runoff (see page 6).
- ☐ Capture excess irrigation and storm runoff in detention areas or basins.
- ☐ Provide organized runoff management training in a language that personnel clearly understand and maintain records documenting training.



**Unlined detention basins capture irrigation and stormwater runoff allowing it to evaporate and percolate slowly into the ground. These are useful in situations where pollutants in the collected water do not come into contact with ground water.**



## Erosion and Runoff Management continued...

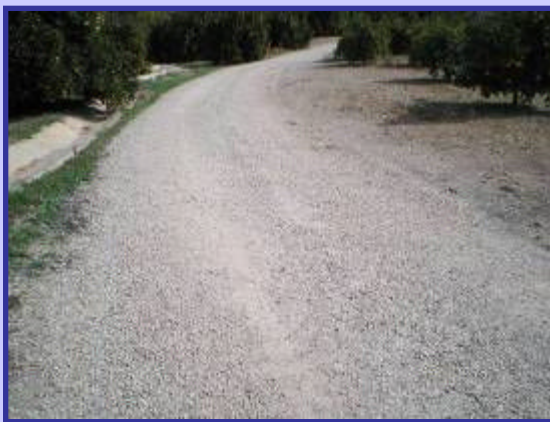
6



**Mulches** provide a coarse medium for water to infiltrate quickly and can slow runoff water.

- Shown on the left: mulched road.
- Mulch may suppress weed growth, provided the source material is relatively weed-free.
- Mulch may conserve water by slowing evaporation from the surface.

**Straw Wattles** capture sediment and spread water rather than concentrating it.



**Gravel** can be spread on roads to eliminate dust and retain sediment. However, this can be a relatively expensive project for an orchard.

## Cover Crops

**Cover Crops** provide seasonal coverage to reduce soil erosion and compaction, suppress weed growth, and increase soil organic matter. **Common cover crops** include grasses (rye, barley, ryegrass, oats) and legumes (vetch, clover, cowpea). These are relatively inexpensive and also the most researched. These annual plants are often selected, although some prefer perennials or native grasses.



- Cover crops are good filters: they slow runoff, reduce erosive energy, allow sediments to drop out of suspension, and utilize excess nutrients.
- Use the proper planting material appropriate to the site use, e.g. hardy grasses should be planted on roads subject to vehicular compaction.
- When choosing a cover crop species consider: dormancy, growth habit and speed, and cover crop water needs.
- Cover crops can act as weeds if not controlled. They can be controlled with mowing or herbicides.

## Non-Production Areas: Goals and Management Practices

8

- ❑ Ensure that all non-production areas do not contribute to dry or wet weather runoff. These include walkways, driveways, packing areas, loading areas, and parking areas.
- ❑ Maintain vehicles, trucks, and tractors and their storage areas so that they do not leak fluids into ground or surface waters.
- ❑ Locate and maintain fuel tanks so that they do not leak, spill, overflow, or leach into ground or surface water.
- ❑ Keep the property free of debris and trash so that it does not clog storm drains or flow to waterways and beaches.
- ❑ Maintain restrooms to avoid spills and leakage of fecal coliform from human waste into the municipal stormwater or waterways. Fecal coliform at high levels causes beach closures and poses serious human and animal health hazards.
- ❑ Provide organized training sessions in waste, sanitation, and spill management for all personnel in a language that they clearly understand, and maintain records documenting training.



Fuel tanks should be located where they will not leak into groundwater or surface water.



## **WHY SHOULD WE BE CONCERNED ABOUT WATER QUALITY?**

Agriculture uses 43% of the state's stored water, much of it for irrigation. Limiting the impacts of agriculture on the quality of surface waters and groundwater is critical to the future viability of agriculture, as is ensuring adequate water supplies.

The Clean Water Act is the principal federal law governing surface water quality. In California, The Porter-Cologne Act of 1969 established a comprehensive program to protect both surface water quality and groundwater, granting the authority of the State Water Resources Control Board and nine Regional Water Quality Control Boards to administer many of the Clean Water Act's provisions.

The Los Angeles Regional Water Quality Control Board has adopted a Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands within the coastal watersheds of Ventura and Los Angeles counties. If you own or operate irrigated crop lands and wastewater drains from your property to waters of the state, you are a discharger, and must be covered by the conditional waiver or submit a report of waste discharge and apply for a discharge permit. Dischargers may form groups or apply individually for coverage under the waiver. Almost 80,000 acres are represented in the Ventura County Agricultural Irrigated Lands Group (VCAILG) that comprises almost 1200 individual participants in major watersheds within the county. Members pay fees for group monitoring and reporting requirements. They also must receive at least 8 hours of related education credit. For more information about VCAILG, contact the Farm Bureau of Ventura County.





In addition to the Conditional Waiver requirements there are TMDLs in Ventura County that restrict pollutant loads from agricultural operations. For example, in the Calleguas Creek watershed, there are nutrient, historic pesticides, toxicity, salt and metal TMDLs that affect agriculture. There are also storm water regulations that may apply to agricultural operations in Ventura County, and regulations that restrict use of pesticides in groundwater protection areas established by the California Department of Pesticide Regulation.

Use of good management practices is a positive opportunity for growers to demonstrate environmental stewardship of their land. University of California academics are working to provide the research-based information and training tools required for the implementation of technologies and practices to protect water quality. To learn more about University of California programs to address water quality issues, contact your farm advisor.



## Online References and Contacts

### Online References

#### IRRIGATION MANAGEMENT

Orchard Water Requirements: <http://anrcatalog.ucdavis.edu/pdf/8212.pdf>

Irrigation Scheduling

CIMIS (California Irrigation Management Information System):

<http://www.cimis.water.ca.gov/cimis/welcome.jsp>

California Avocado Commission Irrigation Calculator:

<http://www.avocado.org/growers/irrigcalc.php>

#### PEST MANAGEMENT

U.C. IPM website – Avocado:

<http://www.ipm.ucdavis.edu/PMG/selectnewpest.avocado.html>

U.C. IPM website – Citrus:

<http://www.ipm.ucdavis.edu/PMG/selectnewpest.citrus.html>

Pesticide Selection: <http://anrcatalog.ucdavis.edu/pdf/8119.pdf>

U.C. IPM website: <http://www.ipm.ucdavis.edu/>

#### EROSION AND RUNOFF MANAGEMENT

Sediment Management Goals in Orchards:

<http://anrcatalog.ucdavis.edu/pdf/8219.pdf>

Cover Crops in Orchards:

<http://www.sarep.ucdavis.edu/ccrop/CCPubs/CCSelectionAndManagement.html>

Cover Crops to Scavenge Nitrogen in Orchards:

<http://www.sarep.ucdavis.edu/news/1/v5n3/sa-4.htm>

Nonpoint Sources of Pollution in Agriculture:

<http://anrcatalog.ucdavis.edu/pdf/8055.pdf>

Developing a Nonpoint Source Pollution Program:

<http://anrcatalog.ucdavis.edu/pdf/8087.pdf>

Evaluating Water Quality: <http://anrcatalog.ucdavis.edu/pdf/8118.pdf>

Soil Erosion in Agriculture: <http://anrcatalog.ucdavis.edu/pdf/8196.pdf>

Vegetated Filter Strips: <http://anrcatalog.ucdavis.edu/pdf/8195.pdf>

#### SELF-ASSESSMENT QUESTIONNAIRES FOR EVALUATING SUSTAINABLE MANAGEMENT PRACTICES

Avocado self-assessment questionnaire:

[http://www.farebureauvc.com/pdf\\_forms/AvocadoSurvey.pdf](http://www.farebureauvc.com/pdf_forms/AvocadoSurvey.pdf)

Citrus self-assessment questionnaire:

[http://www.farebureauvc.com/pdf\\_forms/CitrusSurvey.pdf](http://www.farebureauvc.com/pdf_forms/CitrusSurvey.pdf)

#### U.C. ANR PUBLICATIONS

<http://anrcatalog.ucdavis.edu>



**AVOCADO HANDBOOK**

Diseases, Economics, Fertilization, Fire, Frost Control, Harvesting,  
Horticulture, Irrigation, Pest Control:

[http://œventura.ucdavis.edu/Agriculture265/Avocado\\_Handbook.htm](http://œventura.ucdavis.edu/Agriculture265/Avocado_Handbook.htm)

**CITRUS WEBSITE**

Disease, Insects, Weeds:

<http://œventura.ucdavis.edu/Agriculture265/Citrus.htm>

**COMPLETE U.C. ANR FARM WATER QUALITY PLANNING HANDOUTS**

<http://anrcatalog.ucdavis.edu>

click on free publications and click on farm water quality planning

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