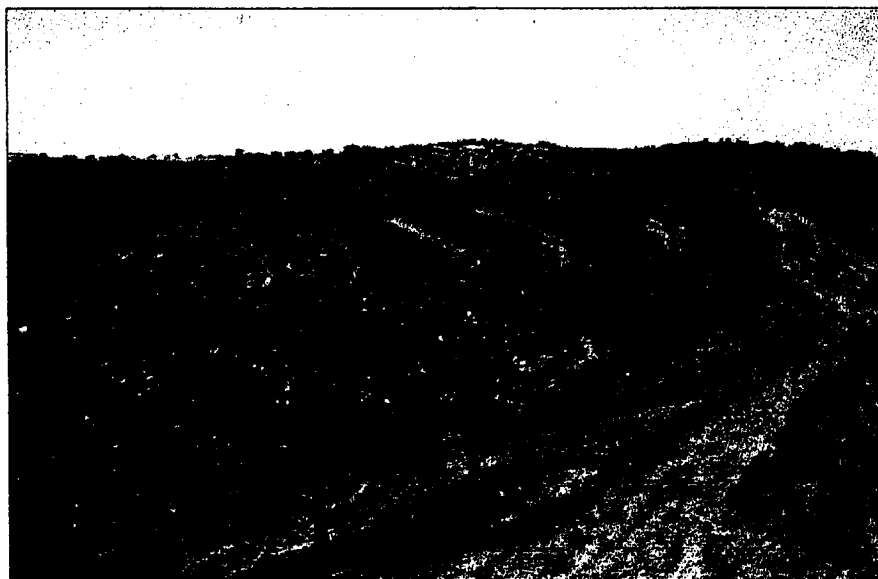


# FARM WATER QUALITY PLANNING MANAGEMENT PRACTICE

## Contour Orchard and Other Fruit Area #331

*University of California Cooperative Extension  
Natural Resources Conservation Service*



Contour orchard and other fruit area is the practice of planting orchards, vineyards, or small fruit so that all cultural operations are done on the contour. This practice can reduce soil and water loss, especially if a Cover Crop #340 has been established.

### **Advantages**

- May benefit equipment operation
- Reduced sheet, rill and gully erosion
- Reduced runoff and flooding
- Increased moisture retention

### **Disadvantages**

- Hazard for equipment operation on very steep slopes
- Not suitable for lands with heavy overland flows unless these flows can be diverted to safe outlets

**Practice Effectiveness for Reducing Water Quality NPS Pollution Potential**

<b>Erosion-sheet &amp; rill</b>	<b>Erosion-streambank</b>	<b>Pesticides-leaching</b>	<b>Pesticides-dissolved in runoff</b>	<b>Pesticides-adsorbed to sediment</b>	<b>Nutrients-leaching</b>	<b>Nutrients-surface waters</b>
slight to significant		<i>negligible</i>	slight	slight	negligible	slight

Empty boxes indicate information not yet collected for this practice

**Additional sources of information regarding contour orchard and other fruit area:**

UC Sustainable Agriculture Research and Extension Program <http://www.sarep.ucdavis.edu/>

UC Weed Research and Information Center <http://wric.ucdavis.edu/>

Picture from USDA-NRCS San Luis Obispo County

NATURAL RESOURCES CONSERVATION SERVICE  
CONSERVATION PRACTICE SPECIFICATION

**331 - CONTOUR ORCHARD AND OTHER FRUIT AREA**

**I. SCOPE**

The work shall consist of planting orchards, vineyards or small fruits so that cultural and harvesting operations can be accomplished on the contour.

**II. LAYOUT**

The layout of the orchard or fruit area to be planted shall conform to the drawings or plans, and comply with the grades and lines as shown and provide for non-erosive runoff from the planting area.

The layout will be determined to adhere with the restriction set by the source of water; such as surface irrigation, or by sprinkler and be as near to contour as possible.

**III. CULTURAL OPERATIONS**

On irrigated fields, furrow lengths will be according to the irrigation guide and as shown on the drawings.

For sprinkler or drip irrigated fields, the lengths of lateral lines will be according to the design of the irrigation system and as shown on the drawings.

Maximum deviation from the contour shall not exceed ten (10) percent of the field slope for a maximum distance of 200 feet.

Runoff water shall be safely conducted away from critical areas to a protected outlet.

**IV. OTHER REQUIREMENTS**

The owner, operator, contractor, or other persons shall conduct all work and operations in accordance with proper safety codes for the type of equipment and operations being performed with due regard to the safety of all persons and property.

NATURAL RESOURCES CONSERVATION SERVICE  
CONSERVATION PRACTICE STANDARD

**CONTOUR ORCHARD AND OTHER FRUIT AREA**

(acre)  
CODE 331

**DEFINITION**

Planting orchards, vineyards, or small fruits so that all cultural operations are done on the contour.

**PURPOSES**

To reduce soil and water loss, to better control and use water, and to operate farm equipment more easily.

**CONDITIONS WHERE PRACTICE APPLIES**

On sloping land where soil and water losses need to be controlled, especially if a permanent cover is not established.

**CRITERIA**

Selected fields shall have continuous slopes with a nearly uniform grade or are slightly concave.

Deviation from the contour is permitted up to 10 percent of the field slope for a maximum continuous distance of 200 feet.

If the tilled field slope is 10 percent, then the row grade could change to a 1 percent grade (1.0 ft. drop per 100 ft.) for 200 feet and then must return to contour. Using uniform row grades of 0.3 to 0.5 percent (0.3 ft. to 0.5 ft. drop per 100 ft.) would still fit this practice.

On irrigated land follow the irrigation guide for furrow length.

For sprinkler or trickle-irrigated plantings, the lengths of lateral lines will be determined during irrigation system design.

**CONSIDERATIONS**

Fields that are cut by gullies, have undulating topography, or are irregular are not suitable for this practice. Fields that have heavy overland flows from above are not suitable unless these flows can be diverted to safe outlets.

Avoid areas that have evidence of mass movement or have the potential for landslips.

A topographic survey will usually be needed to see if the desired planting pattern will fit the slopes. Also evaluate alternate patterns suitable for that crop. Also consider the equipment setups used by the grower.

Following the flat contour (same elevation) may not be desirable where slow drainage may increase disease problems and where furrows could fill with water and overtop the berms down the tree row or vine row to produce an erosive, avalanching down the slope.

Minimize the number of point rows by changing row grades within the allowable deviation and performing minor land smoothing.

On irrigated fields, locate the main irrigation pipelines and use them as control lines for staking out rows.

Provide safe outlets for runoff water due to rain or irrigation. Consider use of underground outlet and/or diversions.

Make provisions for protecting land that was disturbed or cleared from erosion until planting is established.

Provide protection for up and down hill farm roads during the rainy season using straw mulching alone or critical area planting. Avoid driving those roads during the rainy season.

**Endangered Species Considerations**

Determine if installation of this practice with any others proposed will have any effect on any federal or state listed Rare, Threatened or Endangered species or their habitat. NRCS's objective is to benefit these species and others of concern or at least not have any adverse effect on a listed species. If the Environmental Evaluation indicates the action may adversely affect a listed species or result in adverse modification of habitat of listed species which has been determined to be critical habitat, NRCS will advise the land user of the requirements of the Endangered Species Act and

recommend alternative conservation treatments that avoid the adverse effects. Further assistance will be provided only if the landowner selects one of the alternative conservation treatments for installation; or at the request of the landowners, NRCS may initiate consultation with the Fish and Wildlife Service, National Marine Fisheries Service and/or California Department of Fish and Game. If the Environmental Evaluation indicates the action will not affect a listed species or result in adverse modification of critical habitat, consultation generally will not apply and usually would not be initiated. Document any special considerations for endangered species in the Practice Requirements Worksheet.

Some species are year-round residents in some streams, such as, freshwater shrimp. Other species, such as steelhead and salmon, utilize streams during various seasons. Be aware that during critical periods, such as spawning, eggs in gravels, and rearing of young may preclude activities in the stream that may directly affect the stream habitat during those periods. For example there should be no disturbance of stream gravel beds that may have eggs in them. That could include any equipment in the stream or even walking in the stream or work upstream that may result in sediment depositing in the gravel beds. Document any special considerations for endangered species in the Practice Requirements Worksheet.

### **Water Quantity**

Planting orchards and fruit areas on the contour generally requires a bench or terrace to be constructed to provide access to the growing trees or shrubs. The bench or terrace may reduce surface runoff and increase the opportunity for infiltration. Either inward sloping or outward sloping benches may be appropriate.

Inward sloping benches reduce runoff. The reduction depends on the amount of surface storage and the intake rate of the soil.

Where outward sloping benches are constructed for drainage purposes, runoff may be more or less than from the unbenched condition. The degree of reduction will depend on the angle of the outward slope and the amount of cover on the bench at the time of runoff, and depends on the amount of storage, the intake rate of the surface soils, and the amount of water received (either rainfall or irrigation).

Reduced surface runoff may increase the opportunity for increased infiltration. Soil moisture may be increased; providing additional water for transpiration.

Where transpiration is less than available soilwater, excess infiltration may percolate below the orchard root zone. Excess irrigation water may increase the percolating water supply.

1. Effects the water budget, especially effects on volume and rates of runoff and infiltration.
2. Decreases in surface runoff and increases in infiltration with any benches or terraces constructed to provide access to growing plants. Consider the type of bench or terrace (inward sloping versus outward sloping), width, degree of slope, and vegetative cover at the time of runoff.

### **Water Quality**

Contour orchards and fruit areas may reduce erosion, sediment yield, and pesticide concentration in the water lost. Where inward sloping benches are used, the sediment and chemicals will be trapped against the slope. With annual events, the bench may provide 100 percent trap efficiency.

Outward sloping benches may allow greater sediment and chemical loss. The amount of retention depends on the slope of the bench and the amount of cover. In addition, outward sloping benches are subject to erosion from runoff from benches immediately above them.

Contouring allows better access to fields, permitting maintenance that reduces additional erosion. Immediately after establishment, Contour Orchards may be subject to erosion and sedimentation in excess of the non-contoured orchard for the first year.

Contour Orchards may require more fertilization and pesticide application than did the vegetation that covered the slopes before orchards were started.

Sediment leaving the site may carry more adsorbed nutrients and pesticides than did the sediment before the benches were established from uncultivated slopes.

If Contour Orchards replaced other crop or intensive land use, the increase or decrease in chemical transport from the site may be determined by examining the types and amounts of chemicals used on the prior land use as compared to the Contour Orchard condition.

Soluble pesticides and nutrients may be delivered to and possibly through the root zone in an amount proportional to the amount of soluble pesticides and nutrients applied, the increase in infiltration, the

chemistry of the pesticides and nutrients, organic and clay content of the soil, and amounts of surface residues.

Percolating waters below the root zone may carry excess solutes or may dissolve potential pollutants as they move. In either case, these solutes could reach ground water supplies and/or surfaces downslope from the Contour Orchard area. The amount depends on soil type, surface water quality, and the availability of soluble materials (natural or applied).

1. Effects on erosion and the movement of sediment, and soluble and sediment-attached substances carried by runoff.
2. Effects of increased volumes of soluble nutrients, pesticides, and salts contained in infiltrating water. Comparison should be made to non-contoured orchards on sloping ground or to the present land use if not now in orchard.

#### **PLANS AND SPECIFICATIONS**

Plans and specifications are to be prepared for each field. List the planned grades for tree and vine rows and the allowable deviation from the contour for the planting pattern on each field.

Specify the furrow lengths and grades in irrigated fields based on the Irrigation Guide and irrigation system design.

Indicate location of water disposal measures.

Include erosion control measures for any up and down hill farm roads and to protect the planting during the establishment period.

#### **OPERATION AND MAINTENANCE**

Maintenance needed for this practice includes performing all cultural operations on the contour between tree or vine rows, periodic inspection and repairs to runoff water outlets, protecting up and downhill farm roads from erosion, and maintaining adequate vegetative cover to control erosion.