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**Farm Water
Quality Planning**

*A Water Quality and
Technical Assistance Program
for California Agriculture*

This FACT SHEET is part of the **Farm Water Quality Planning (FWQP)** series, developed for a short course that provides training for growers of irrigated crops who are interested in implementing water quality protection practices. The short course teaches the basic concepts of watersheds, nonpoint source pollution (NPS), self-assessment techniques, and evaluation techniques. Management goals and practices are presented for a variety of cropping systems.



Management Goals and Management Practices:

Sediment Management Goals and Management Practices for Strawberries

DANIEL MOUNTJOY is Area Resource Conservationist, USDA-NRCS Monterey County.

This fact sheet includes management goals and management practices for reducing soil erosion at its source and capturing sediment before it can enter waterways and cause water quality problems downstream.

The development of a comprehensive farm plan for sediment management on strawberry farms involves a sequence of seven Management Goals (MGs):

- MG 1. Evaluate current rainfall, irrigation, and storm water runoff patterns on the farm to identify erosion problem areas and their causes.
- MG 2. Develop a farm layout plan that minimizes the slope of furrows and prevents disturbances to unstable slopes.
- MG 3. Manage uncropped areas of the farm to reduce runoff and prevent soil erosion.
- MG 4. Coordinate your efforts to control sources of runoff, erosion, and sediment with those of neighboring landowners.
- MG 5. Protect unpaved farm access roads and other heavy-use or uncropped areas from concentrated flows of water.
- MG 6. Detain or filter eroded sediment and runoff before they leave the farm.
- MG 7. Evaluate and maintain sediment management goals and recommended practices.

Each Management Goal can be accomplished through a customized set of the Management Practices (MPs) listed under each Management Goal below. Management Goals 1 through 4 and 7 are the least costly and will help reduce the costs of measures 5 and 6.

The best strategy for preventing sediment loss, water pollution, and damage to the strawberry crop and farm soil resources is to develop a system of practices, with backup practices in case one strategy fails. Prevention and a good backup plan are cheaper than middle-of-the-night repairs and cleanup in the spring.

Many of the specific Management Practices require some hydrology or engineering calculations to avoid potential damage from large storms. This publication provides Natural Resources Conservation Service (NRCS) practice names and numbers for practices that have NRCS construction standards and specifications. Please consult your local NRCS office for free assistance with developing these practices.

MG 1. Evaluate current rainfall, irrigation, and storm water runoff patterns on the farm to identify erosion problem areas and their causes

MP 1.1. Identify locations on farm where rainfall or irrigation runoff causes soil loss or soil deposition.

MP 1.2. Identify upstream causes of accelerated runoff and erosion, with special attention to off-farm sources, steeply sloped furrows, shallow soils, areas where large areas of crop runoff is concentrated on a single road, timing of plastic mulch placement, and failure of existing management goals such as plastic-lined channels.

MP 1.3. Review current management goals and identify which cultural practices are effectively controlling runoff and erosion processes.

MG 2. Develop a farm layout plan that minimizes the slope of furrows and prevents disturbances to unstable slopes

MP 2.1. Perform land smoothing before listing to remove irregularities on the land surface so that water will not be trapped or concentrated in low spots (NRCS Land Smoothing #466).

MP 2.2. Use survey instruments or hand levels to set furrow slopes for each planting block with the following goals (NRCS Row Arrangement #557):

- MP 2.2.1. Avoid low spots within a furrow run where water will accumulate.
- MP 2.2.2. Where furrow slopes vary within a single field block, seek an average slope to minimize extreme slopes in part of the field.
- MP 2.2.3. Avoid furrow slopes in excess of 3 percent at the top of a field since runoff from these furrows will increase surface flow along the entire length of the field road. Furrows with slopes in excess of 3 percent will cause less damage if they are located only at the bottom of the field.
- MP 2.2.4. If the furrow slope exceeds 5 percent in part of a block, break the block into two blocks and set the furrow slope to less than 3 percent in each new block.
- MP 2.2.5. Follow the contour of the land where bedding, fumigation, and spraying equipment will allow.
- MP 2.2.6. Use furrow layout to direct water away from the steepest farm roads.
- MP 2.2.7. Avoid concentrating runoff from two field blocks onto a single roadway unless you can provide adequate runoff through an underground outlet or lined channel.

MP 2.3. Locate farm access roads between field blocks to follow lowest water-concentrating swales, along highest ridge lines, and as needed where furrow angles change (NRCS Access Road #560).

MP 2.4. Avoid cultivation or road construction on slopes greater than 25 percent.

MG 3. Manage uncropped areas of the farm to reduce runoff and prevent soil erosion

MP 3.1. Cover crops can be used to protect bare soil from erosion during fallow cycles and to build up soil organic matter as a crop rotation. Cover crop roots, along with the incorporated residue later on, will increase infiltration and prevent erosion. Legume cover crops will also improve soil fertility and lessen your reliance on commercial fertilizers (NRCS Cover Crop #340).

MP 3.2. Plant bare soil and disturbed areas of the farm such as cut banks, field margins, and abandoned slopes with a dense cover of vegetation to control erosion and suppress weed growth. A mix of species should be selected to accomplish quick establishment but also provide long-term coverage, attract beneficial insects, and compete against weed species (NRCS Critical Area Planting #342).

MP 3.3. A hedge of shrubs can be established along field margins or between field blocks to reduce wind effects, protect slopes from erosion, and attract beneficial insects. A mix of species should be selected to extend the shrubs' flowering seasons over the strawberry growing period (NRCS Hedgerow Planting #422).

MP 3.4. A row of trees or large shrubs can be established to serve as a wind break, reduce spray drift, and intercept insect and weed seed disbursement. This planting can also help protect steep slopes, stabilize stream or ditch banks, and reduce soil saturation in low-lying areas (NRCS Tree/Shrub Establishment #612).

MP 3.5. Manage existing gullies on the farm by controlling concentrated runoff with a combination of management, vegetative, and structural measures to prevent the advance of the gully. Prevent head cutting through the installation of a grade stabilization structure (NRCS Grade Stabilization Structure #410, Diversion #362, Critical Area Planting #342, Underground Outlet #620, Row Arrangement #557).

MG 4. Coordinate your efforts to control runoff, erosion, and sediment with those of neighboring landowners

MP 4.1. Work with neighboring landowners, when possible, to reduce runoff sources and impacts of soil erosion and sedimentation downstream or on adjacent lands. Erosion problems can often be solved without great expense if neighboring landowners are involved.

MG 5. Protect unpaved farm access roads and other heavy-use or uncropped areas from concentrated flows of water

MP 5.1. Thoroughly compact all backfill in irrigation pipeline trenches along farm roads.

MP 5.2. Grade road surfaces to slope slightly toward the center line of the road rather than into ditches alongside roads where erosion can threaten crops.

MP 5.3 Seed all road surfaces with annual or perennial grasses prior to winter rains (NRCS Critical Area Planting #342).

MP 5.4. Mulch seeded roads to protect soil surface from rainfall impact, slow surface runoff, protect grass seeds from drying out, and prevent bird predation. Apply at a rate of 50 bales of weed-free straw per acre of road surface or one bale per sixty linear feet of fifteen-foot-wide road. Crimp straw into the soil using an open disk or ring-shank roller (NRCS Mulching #484).

MP 5.5. Install diversion at the top of the field to direct runoff from adjacent land uses onto roadways that have sufficient protection to handle the extra flow or divert runoff and dissipate its velocity of flow into an area with established perennial vegetation (NRCS Diversion #362). This arrangement may require a filter strip to dissipate flow (NRCS Filter Strip # 393).

MP 5.6. Construct a hillside bench, terrace, or earthen embankment midway up the field to intercept runoff from roadways, reduce the length of the slope, and divert the flow across the slope to a safe outlet (NRCS Diversion #362).

MP 5.7. Replace existing ditches or eroding channels with a perennial grassed waterway or lined waterway to convey runoff from cropped areas, diversions, terraces, or roadways.

- MP 5.7.1. A grassed waterway is appropriate where slope and expected channel velocities do not exceed the ability of perennial vegetation to prevent erosion. The waterway should be shaped and graded to accommodate the expected runoff (NRCS Grassed Waterway #412).
- MP 5.7.2. A lined channel may be necessary where vegetation and soil type are susceptible to erosion. An erosion-resistant lining of rock or other permanent material will protect the channel bottom and lower banks from peak flows (NRCS Lined Waterway or Outlet #468).

RP 5.8. Where surface flow of runoff on farm roads is expected to exceed 3 cubic feet per second, install one of the following conveyance systems:

- MP 5.8.1. *Temporary plastic-lined channels.* Use new 4 or 6 mil plastic keyed into the soil along sides and top edge by at least 12 inches. Lap subsequent sheets over the top of the lower sheets by 3 feet. Inspect frequently during the rainy season for tears or undermining.

- **MP 5.8.2. *Underground outlet drains.*** Underground outlet drains are appropriate where road locations are permanent and concentrated surface flow is a chronic erosion problem. Contact NRCS or your local Resource Conservation District (RCD) for proper sizing of corrugated black plastic pipe, frequency of surface riser inlets, and construction techniques (NRCS Underground Outlet #620).

MG 6. Detain or filter eroded sediment and runoff before they leave the farm

- MP 6.1.** Where water exits the farm, construct a long level earthen sill to disperse water evenly onto adjacent land or into a natural or constructed channel. This practice prevents concentrated flows that can cause gullyng (NRCS Structure for Water Control #587).
- MP 6.2.** Where runoff from cropped areas and roadways can be dispersed evenly, plant a vegetative buffer strip between cropped areas or a filter strip along the lower edge of the farm. Vegetated strips should be at least 15 feet wide and planted with a close-growing grass or legume combination to detain soils and nutrients and protect the soil from erosion (NRCS Filter Strip #393).
- MP 6.3.** In locations where erosion is expected and sediment is known to leave the farm, construct a basin at the base of the field to intercept sediment-laden runoff. Basins can be designed to provide vehicle passage along the berm and can serve as parking or turning areas after the rainy season. Consult with a hydrologist, engineer, or NRCS/RCD specialist to determine the volume needed for the basin to contain the expected sediment load and to determine the pipe outlet size (NRCS Sediment Basin #350).
- MP 6.4.** In locations where sediment and excess runoff may cause gullyng or flooding problems downstream, construct a water and sediment control basin. Similar to a sediment basin, this basin is large enough to detain peak rainfall runoff as well as sediment. The detained water is released slowly after the storm. This practice is useful where plastic bed mulch is expected to increase runoff from the property. Consult with a hydrologist, engineer, or NRCS/RCD specialist to determine the optimum design (NRCS Water and Sediment Control Basin #638).

MG 7. Evaluate and maintain sediment management goals and recommended practices

- MP 7.1.** Evaluate the management goals and recommended practices implemented for sediment management during future runoff periods to ensure proper operation and function. Correct deficiencies as needed. Remove accumulated sediment annually or as needed from basins and spread it onto field areas.

FOR MORE INFORMATION

You'll find detailed information on many aspects of field crop production and resource conservation in these titles and in other publications, slide sets, CD ROMs, and videos from UC ANR:

Nutrients and Water Quality, slide set 90/104

Protecting Groundwater Quality in Citrus Production, publication 21521

Sediments and Water Quality, slide set 91/102

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University of California
Agriculture and Natural Resources
Communication Services
6701 San Pablo Avenue, 2nd Floor
Oakland, California 94608-1239
Telephone: (800) 994-8849 or (510) 642-2431
FAX: (510) 643-5470
E-mail inquiries: danrcs@ucdavis.edu

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