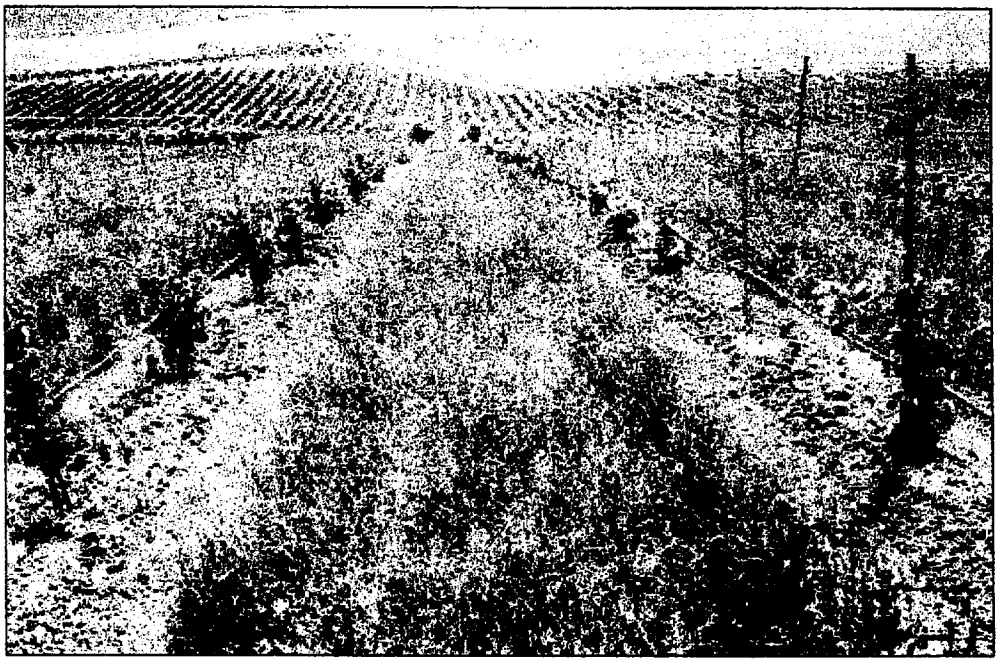
FARM WATER QUALITY PLANNING MANAGEMENT PRACTICE

Cover Crop
#340

University of California Cooperative Extension
Natural Resources Conservation Service



Cover Crops are grown in orchards, vineyards and where seasonal benefits of a cover crop are needed. They are used to control erosion, add organic matter and nutrients to the soil, improve soil tilth and increase infiltration and aeration of the soil. Cover crops have a filtering effect on movement of sediment, pathogens, and dissolved and sediment-attached pollutants.

Advantages	Disadvantages
• Perennial cover reduces cultural operation costs • Perennial cover reduces tillage • Reduces herbicide applications • May reduce some insect infestations • Easy to install and maintain • Reduces soil compaction • Minimizes root damage from cultivation • Can reduce size and cost of additional practices such as a sediment basin • Reduces water runoff • Reduces downstream sediments	• May lower minimum temperatures • Could harbor unwanted pests • May require mowing

Practice Costs

Cost Range:
$120-$420/acre

Practice Effectiveness for Reducing Water Quality NPS Pollution Potential

Erosion-sheet & rill	Erosion-streambank	Pesticides-leaching	Pesticides-dissolved in runoff	Pesticides-adsorbed to sediment	Nutrients-leaching	Nutrients-surface waters
moderate		slight	slight	moderate	negligible	slight

Empty boxes indicate information not yet collected for this practice

Additional sources of information regarding cover crops:

- Your local NRCS, UCCE, and RCD offices
- UC Sustainable Agriculture Research and Extension Program http://www.sarep.ucdavis.edu/
- UC Weed Research and Information Center http://wric.ucdavis.edu/
- The picture and some of the information in this management sheet has been taken from the Natural Resource Conservation Service (NRCS) Handbook of Conservation Practices practice #340. Contact your local NRCS office or visit http://www.nrcs.usda.gov for more information.

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE SPECIFICATION

340B - COVER CROP

I. SCOPE

The work shall consist of furnishing all materials and placing them on all designated areas to the limits as shown on the drawings, or as staked in the field, and performing cultural operations to grow the crop and to maintain the life of the stand.

II. MATERIALS

Seed

All seed shall be delivered to the site tagged and labeled in accordance with the California Agricultural Code, and shall be acceptable to the County Agricultural Commissioner.

Bag tag figures will be evidence of purity and germination. Time since date of seed test shall not exceed 9 months.

Seed shall be of a quality that weed seed shall not exceed 0.5% of the aggregate of pure live seed (PLS) (% germination x % purity) and other material.

Fertilizer

Unless otherwise specified on the Practice Requirements sheet, all fertilizer shall be Ammonium Phosphate Sulfate containing a minimum of 16% Nitrogen, 20% available phosphoric acid and 0% water soluble potash plus about 15% sulfur and be uniform in composition, dry and free flowing, pelleted or granular.

All fertilizer shall be labeled in accordance with applicable state regulations and bear the warranty of the producer for the grade furnished.

Inoculants

The inoculant for treating legume seeds shall be a pure culture of Nitrogen fixing bacteria prepared specifically for the plant species and shall not be used later than the date indicated on the container. A mixing medium, as recommended by the manufacturer or approved substitute, shall be used to bond the inoculant to the seed. For nonpellet inoculated seed, two times the amount of the inoculant recommended by the manufacturer shall be used and seed shall be sown within 24 hours.

For pellet inoculated seed, at least 30 pounds of inoculant shall be used per 1,000 pounds of raw seed and the seed shall be labeled to show the Lot Number, Expiration Date, and Percent Coat of the finished product. Pellet inoculated seed shall be kept cool and sown within 180 days.

Chemicals

All pesticides used in performing this practice shall be Federally, State, and locally registered and shall be applied strictly in accordance with authorized and registered uses, directions on the label, and other Federal or State policies and requirements. Chemical containers shall be properly stored and disposed of in a safe manner.

III. SEEDING MIXTURE AND PLANTING DATE

The seed(s) and rate(s) specified on the Practice Requirements sheet shall be used.

The seeding rate(s) shall be the weight exclusive of any coating material. Any legume seed used shall be inoculated. Based on bag tags, seeding rates shall be adjusted to insure the required amounts of pure live seed.

Planting shall be performed during the period that is specified on the Practice Requirements sheet.

IV. SEEDBED PREPARATION

The area to be planted shall be weed free and have a firm seedbed which has previously been roughened by scarifying, disking, harrowing, chiseling, or otherwise worked to a depth of 2 to 4 inches, except when planting no-till or otherwise specified on the Practice Requirements sheet. No implement shall be used that will create an excessive amount of downward movement of clods on sloping areas.

Seedbed preparation shall be suspended when soil moisture conditions are not suitable for obtaining a satisfactory seedbed.

V. FERTILIZING AND SEEDING

Fertilizing

Fertilizer shall be distributed uniformly over the seedbed at the rate of 250 pounds per acre unless a different amount is specified on the Practice Requirements sheet.

Fertilizer shall be applied in any way that will result in uniform distribution. The fertilizer shall be incorporated into the soil. Incorporation may be as part of the seedbed preparation, or as part of the seeding operation unless otherwise specified on the Practice Requirements sheet.

Seeding

Seed shall be drilled or broadcast by hand, mechanical hand seeder, or power operated seeder. Seed shall be incorporated into the soil, but not more than 1 inch deep unless otherwise specified on the Practice Requirements sheet.

Seeding shall be performed as nearly as practical across the slope unless otherwise specified on the Practice Requirements sheet.

VI. IRRIGATION

When specified, irrigation water shall be applied during the establishment period at the times and rates listed on the Practice Requirements sheet.

VII. ADDITIONAL CULTURAL OPERATIONS

Only one of the following subsections shall apply as specified on the Practice Requirements sheet.

A - Mowed Cover Crop Management

The types of equipment used and the cultural operations performed shall maintain a population of planted and/or desirable resident species not including any noxious weeds that provides at least 60 percent ground cover during the erosive period. The desirable resident species are those specified on the Practice Requirements sheet. Mowing shall control plant height. No tillage shall be performed except for injecting or banding fertilizer through knives.

Last mowing prior to seed maturity of annual species shall be performed prior to the date specified on the Practice Requirements sheet. Mowed height prior to seed maturity shall not be lower than the height shown on the Practice Requirements sheet.

Herbicides used shall not endanger the planted species except that tree and vine rows may be kept free of unwanted vegetation or when required for control of noxious weeds.

B - Disked Cover Crop Management

The types of equipment used and the cultural operations performed shall maintain a plant population of planted and/or desirable resident species not including any noxious weeds that provides at least 60 percent ground cover during the erosion period. The desirable resident species are those specified on the Practice Requirements sheet. Plant height may be controlled by mowing. No tillage shall be performed prior to seed maturity of annual species except for injecting or banding fertilizer through knives.

Herbicides used shall not endanger the planted species except that tree and vine rows may be kept free of unwanted vegetation or when required for control of noxious weeds.

If mowing is performed prior to seed maturity of annual species, the last mowing shall be prior to the date specified on the Practice Requirements sheet. Mowed height prior to seed maturity shall not be lower than the height shown on the Practice Requirements sheet.

C - Unmowed and Nondisked Management

Cultural operations performed shall maintain a population of planted and/or desirable resident species not including any noxious weeds that provides at least 60 percent ground cover during the erosive period. The desirable resident species are those specified on the Practice Requirements sheet. No mowing shall be performed except when required for control of noxious weeds or for a designated firebreak. No tillage shall be performed except for injecting or banding fertilizer through knives.

Herbicides used shall not endanger the planted species, except when required for control of noxious weeds.

VIII. OTHER REQUIREMENTS

Other details for the establishment and maintenance of the plants including, but not limited to, the need for livestock and traffic control shall be applied when specified on the Practice Requirements sheet.

Measures and methods that enhance fish and wildlife values, protect visual resources, and maintain key shade, food, and den trees shall be performed when specified on the Practice Requirements sheet.

Operations shall be done in such a manner that erosion and air and water pollution are minimized and held within legal limits.

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 regards to safety of all persons and property.

NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

COVER CROP
(Acre)
CODE 340

DEFINITION

Grasses, legumes, forbs, or other herbaceous plants established for seasonal cover and conservation purposes.

PURPOSES

- Reduce erosion from wind and water
- Increase soil organic matter
- Manage excess nutrients in the soil profile
- Promote biological nitrogen fixation
- Increase biodiversity
- Weed suppression
- Provide supplemental forage
- Soil moisture management

CONDITIONS WHERE PRACTICE APPLIES

On all lands requiring vegetative cover for natural resource protection

CRITERIA

General Criteria Applicable To All Purposes

Plant species, seedbed preparation, seeding rates, seeding dates, seeding depths, and planting methods will be consistent with approved local criteria and site conditions.

The species selected will be compatible with the nutrient management and pest management provisions of the plan.

Cover crops will be terminated by harvest, frost, mowing, tillage, and/or herbicides in preparation for the following crop.

Herbicides used with cover crops will be compatible with the following crop

Cover crop residue will not be burned

Provide supplemental fertilization to account for expected crop need and considering existing fertility or nutrient deficits.

Additional Criteria to Reduce Erosion From Wind and Water

Cover crop establishment, in conjunction with other practices, will be timed so that the soil will be adequately protected during the critical erosion period(s).

Plants selected for cover crops will have the physical characteristics necessary to provide adequate protection.

The amount of surface and/or canopy cover needed from the cover crop shall be determined using current erosion prediction technology.

Additional Criteria to Promote Biological Nitrogen Fixation

The specific Rhizobia bacteria will either be present in the soil or the seed will be inoculated at the time of planting legumes.

Nitrogen credits from legume cover crops will be accounted for in the nutrient management plan.

Additional Criteria to Manage Excess

Nutrients in the Soil Profile

Cover crops will be established and actively growing before expected periods of high precipitation that can cause leaching.

Cover crop species will be selected for their ability to absorb large amounts of nutrients from the rooting profile of the soil.

The aboveground biomass will be removed from the field for maximum nutrient removal efficiency.

Additional Criteria to Increase Soil Organic Matter

Cover crop species will be selected on the basis of producing high volumes of organic material to maintain or improve soil organic matter.

Where applicable, the NRCS Soil Conditioning Index (SCI) procedure will be used to determine the amount of biomass required.

The cover crop will be terminated as late as feasible to maximize plant biomass and still prepare the seedbed for the subsequent crop.

Additional Criteria to Increase Biodiversity

Cover crop species shall be selected that, have different maturity dates, attract beneficial insects, serve as a trap crop for damaging insects, and/or provide food and cover for wildlife habitat management.

Additional Criteria for Weed Suppression

Species for the cover crop will be selected for their chemical or physical competition with weeds.

Cover crops residues will be left on the soil surface to maximize allelopathic (chemical) and mulching (physical) effects.

For long-term weed suppression, perennials and/or biennial species can be used.

Additional Criteria to Provide Supplemental Forage

Species selected will have desired forage traits, be palatable to livestock, and not interfere with the production of the subsequent crop.

Forage provided by the cover crop may be hayed or grazed as long as sufficient biomass is left for resource protection.

Additional Criteria for Soil Moisture Management

Terminate growth of the cover crop sufficiently early to conserve soil moisture for the subsequent crop.

Cover crops established for moisture conservation shall be left on the soil surface until the subsequent crop is planted.

In areas of potential excess soil moisture, allow the cover crop to grow as long as possible to optimize soil moisture removal.

CONSIDERATIONS

The cover crop should be terminated as late as feasible to maximize plant growth and still prepare the seedbed for the subsequent crop.

Deep-rooted species provide maximum nutrient recovery.

Consider that grasses utilize more soil nitrogen, and legumes utilize both nitrogen and phosphorus.

Avoid cover crop species that attract potentially damaging insects.

Seek cover crop species that support beneficial insects.

Acceptable benefits, for most purposes, are usually accomplished when the plant density is at least 25 stems per feet, the combined canopy and surface cover is at least 60 percent, and the above ground (dry weight) biomass production is at least 2700 lb/acre.

Cover crops may be used to improve site conditions for establishment of perennial species.

Cover Crop - Mowed

Plants provide long-term cover and are managed by mowing to maintain at least 60 percent ground cover during the erosive period. Mowing to a 3-4 inch height at the beginning of the frost season can reduce cold temperature damage in orchards and vineyards. Mowing intervals must allow adequate seed production by annual species. Tree and vine rows are generally kept weed free with herbicides or other means to minimize competition and allow soil warming. Selected plants need to complement the Integrated Pest Management (IPM) program being used. Mowed cover crops greatly reduce dust during harvest operations, especially almonds and walnuts, and improve the infiltration rate of water.

Cover Crop - Disked

Plants provide long-term cover and are managed by disking after seed production to maintain at least 60 percent ground cover during the erosive period. Mowing at the beginning of the frost season may be performed to a 3-4 inch height to reduce cold temperature damage in orchards and vineyards. Tree and vine rows may be kept free of plants with herbicides or other means to reduce competition and allow soil warming.

Cover Crop - Unmowed and Nondisked

Plants provide long term cover on lands left idle for several years and are managed as natural stands without mowing or tillage to maintain at least 60 percent ground cover during the erosive period.
Firebreaks shall be considered and mowed firebreaks used where feasible. Wildlife needs shall be considered when selecting plants. Control of noxious weeds may require mowing parts of the field for a few seasons.
The horizontal indentations left by tracked equipment provides a suitable seedbed on steep slopes.
Control of noxious weeds by mowing should be evaluated as an alternative to use for herbicides.

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

The practice may decrease runoff and increase infiltration and available soil moisture because of the increased period of vegetation. Increased organic material may increase water-holding capacity. Transpiration may increase because of increased water use by vegetation. Soil moisture may increase because of an increased ability to trap snow where climatically feasible.

1. Effects on the water budget, especially on volumes and rates of runoff, infiltration, evaporation, transpiration, deep percolation, and ground water recharge.

2. Effects of vegetation on soil moisture.

Water Quality

Erosion, sediment and adsorbed chemical yields could be decreased in conventional tillage systems because of the increased period of vegetal cover. Plants will take up available nitrogen and prevent its undesired movement. Organic nutrients may be added to the nutrient budget reducing the need to supply more soluble forms. Overall volume of chemical application may decrease because the vegetation will supply nutrients and there may be allelopathic effects of some of the types of cover vegetation on weeds. Temperatures of ground and surface waters could slightly decrease.

1. Filtering effects of vegetation on movement of sediment, pathogens, and dissolved and sediment-attached substances.

2. Effects of growing and decaying vegetation on nutrients in the root zone.

3. Effects on erosion and the movement of sediment, pathogens, and soluble and sediment-attached substances carried by runoff.

PLANS AND SPECIFICATIONS

Plans and specifications will be prepared for each field and include seedbed preparation, date of seeding, seed mixture, fertilization, management, and time and manner of incorporating the crop into the soil.

When seed will be planted more than one inch deep, indicate the depth on the Practice Requirements sheet. When seeding on graded, irrigated fields will not be performed across the slope, indicate this on the Practice Requirements sheet.

Use aerial seeding on steep sites and on other sites where full coverage is needed.

On fields judged to contain a good seed supply of desirable species, do not specify any seeding mixture on the Practice Requirements sheet. Fertilizer must still be specified on the Practice Requirements sheet unless existing fertility of the field is judged adequate.
On Conservation Reserve Program fields in MLRAs and locations not restricted to perennials, specify Cover Crop - unmowed and non-disked. Also list the desirable resident species on the Practice Requirements sheet that will qualify as part of the minimum 60 percent ground cover. Do not list any noxious weeds.

OPERATION AND MAINTENANCE

Maintenance needed for this practice includes mowing at the beginning of the frost season to minimize danger to trees and vines, allowing long term cover crops to set seed, maintaining adequate vegetative cover during the critical erosion period, controlling noxious weeds, and timing operations to minimize impacts on wildlife.
Firebreaks will be installed each season to protect unmowed and nondisced long-term cover on lands left idle and managed as natural stands.