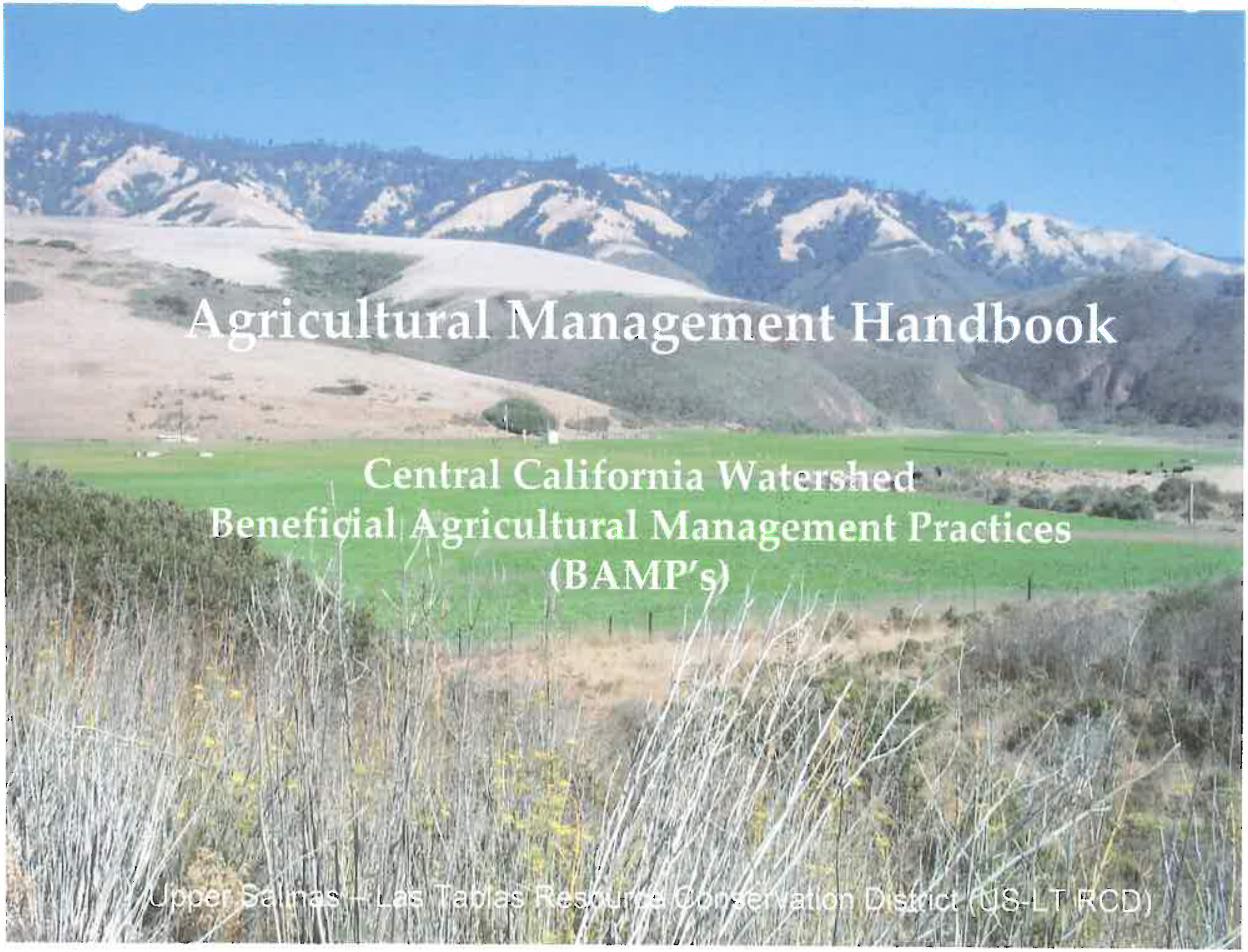

Agricultural Management Handbook

Central California Watershed Beneficial Agricultural Management Practices (BAMP's)

Upper Salinas – Las Tablas Resource Conservation District (US-LT RCD)

Agricultural Management Handbook
Central California Watershed
Beneficial Agricultural Management Practices (BAMP's)

Prepared By:

Upper Salinas – Las Tablas Resource Conservation District – US-LT RCD

In Cooperation with:

United States Department of Agriculture - Natural Resource Conservation Service USDA – NRCS

United States Department of Agriculture – Farm Services Agency USDA – FSA

Central Coast State Water Quality Control Board – SWQCB

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USDA – Farm Services Agency Staff
UCCE Staff

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Introduction

Agriculture is one of the largest and most important industries of the central coast of California. Since the time of the Chumash and Salinan indigenous cultures 10,000 years ago, we have been growing food to meet our needs. Properly managed, agriculture can provide food, employment, economic vitality, beautiful scenery, and sustain our natural resources. One of the strengths of U.S. Agriculture is the "willingness of farmers to adopt proven alternatives", practices that enhance production, improve economic return and conserve soil, water, energy, and biological resources.[1] The Upper Salinas-Las Tablas Resource Conservation District (US-LT RCD) has been working cooperatively with farmers and ranchers on the Central Coast since 1950 to find the best measures to accomplish these goals.

1 Board on Agriculture, National Research Council, "Alternative Agriculture," 1989.

This handbook is intended for use by all agricultural practitioners including landowners, land managers, governmental agencies, and local organizations involved in agriculture. Following is a partial list of agencies and organizations that assist farmers and ranchers:

- Upper Salinas-Las Tablas RCD (US-LT RCD), D.J. Funk at (805) 434-0396 Ext.4
- Natural Resources Conservation Service (NRCS), Margy Lindquist at (805) 434-0396 Ext.3
- Central Coast Conservation and Development Council (CRC&D), Jeff Rodriguez at (805) 772-5623
- Farm Services Agency (FSA) Jennifer Nelson at (805) 434-0396 Ext.2
- UC Cooperative Extension (UCCE), Royce Larsen at (805) 434-4106
- Cal Poly School of Agriculture, Rob Rutherford at (805) 756-1475
- San Luis Obispo County Ag Commissioner, Kris O'Connor at (805) 369- 2288
- San Luis Obispo County Farm Bureau, Joy Fitzhugh at (805) 543-3654
- Central Coast Vineyard Team, Bob Lilley at (805) 781-5910

CHAPTER I. COVER CROPS

COVER CROPS

What is a Cover Crop?

A cover crop is a groundcover that is grown between orchards and vineyards rows. Cover crops can also be used with vegetable or row crops. A good cover crop maintains or enhances soil conditions by improving soil tilth and infiltration. In addition, cover crops have the potential to harbor beneficial insects.

Cover crops have been used in California orchards and vineyards since the early 1900's. They are used primarily for erosion protection and soil improvement. The type of crop, method of irrigation, method of harvest, topography and soil type, all contribute to selecting the proper cover crop system.

Photo from Cover Crops in Orchards and Vineyards. UC Davis SAREP

Benefits of Cover Crops:

- Improvements in soil fertility
- Improvements in soil tilth
- Increased water infiltration
- Erosion control
- Dust control
- Insect control
- Temperature control
- Improvements in scenery

These benefits often interact. For example, cover crop roots encourage the growth of soil microbes, which produce polysaccharide gums that act as glues to bind particles together, which increases aggregation of soil particles. Aggregation improves soil tilth, aeration, and drainage of water.

Many orchards and vineyards are on sloping land where erosion is a critical concern. Cover crops can reduce or eliminate erosion by reducing water run-off, increasing water penetration and holding the soil in place.

Keeping dust to a minimum improves working and environmental conditions, principally during harvesting in nut orchards, improving air quality. It also reduces dust-associated insects such as colonies of mites.

Cover crops favorably modify the summer micro-climate in orchards and vineyards. Benefits include a cooler soil surface and increased relative humidity. Cover crops also reduce sunlight reflection which is important for table grapes.

Plus, a well-managed cover crop is aesthetically pleasing!

Photos from Cover Crops in Orchards and Vineyards. UC Davis SAREP

Important Considerations When Choosing Cover Crops:

Growers must use care in choosing a proper cover crop:

- Water and Nutrients:
  Certain cover crops may compete with trees or vines for water and nutrients. As a result, increased fertilizer and water applications may be needed.

- Weeds:
  Depending upon the type of ground cover, some noxious weeds may be more difficult to control.

- Plant residue:
  Plant residue may interfere with harvesting of fruit and nut crops. Selection of the proper cover crop and subsequent management can minimize this problem.

- Pests:
  Cover crops systems can be attractive to rodents and some insect pests. For example, Nematode populations may increase by using the wrong cover crop, especially during the summer.

- Temperature:
  Cover crops keep temperatures cooler in winter as well as summer. The threat of freezing in winter season can be minimized when the cover crop is kept mowed within tree or vine rows.

Photos from Cover Crops in Orchards and Vineyards. UC Davis SAREP

Cover Crop Types

Grass as cover crop

Grasses:

Grasses have fine, fibrous root systems that are very well suited to holding soil in place and improving soil structure. Grasses do not fix atmospheric nitrogen, but they can uptake large quantities from the soil. There are dwarf cultivars available that are slower growing and may be suitable for orchard and vineyard use.

Legumes as cover crop
Photos from Cover Crops in Orchards and Vineyards. UC Davis SAREP

Legumes:

Legume cover crops can fix nitrogen from the air, which supplies nitrogen to succeeding crop. It also protects the soil from erosion and adds organic matter. The amount of fixed nitrogen varies between species and generally, more legumes top growth means that there is more nitrogen fixed. Some legume species have aggressive tamp roots which can loosen compacted subsoil, but this requires more than one year's growth.

Alfalfa as cover crop
Photo by US-LT RCD

Non-Legume Broadleafs and Forbs:

Broadleaf crops cannot fix nitrogen from the air, but they can absorb large quantities from the soil. They also act as green manure in providing nutrients and a stable root system for soil building. Cover crops of this type are not winter-hardy, so additional control measures are not normally required. However, care should be taken to not allow them to go to seed because they can become a significant weed problem.

Contact your local RCD and NRCS offices for assistance in selecting a suitable cover crop for your conditions.

Strip Cover Management

Cover crops in orchard strips
Photo from Cover Crops in Orchards and Vineyards. UC Davis SAREP

Strip cover crop refers to the practice of growing cover crops in strips between tree or vine rows. Using only the middle space between rows to grow crops, mowing is easier and keep the tree and vine rows free of weeds that compete for water and nutrients. Also, tree trunks are kept dry, and rodent damage is minimized.

Management Systems:
A successful cover crop system must take into account existing or proposed orchard or vineyard operation. Plants which are useful under some conditions may be a liability under others. Selecting the system that best fits an existing or planned operation will lead to the proper selection species.

Nontillage Systems: Under this management, the cover crop is mowed instead of being disked into the ground. Nontillage reduces soil compaction and improves infiltration and it can be started in an existing or new orchard or vineyard. The management methods for this system are:

- Frequent clipping: Where the cover crop is clipped 4 to 7 times beginning in early spring. This is ideal for drag hose operations and is used with sprinkler, border, furrow and drip irrigation. It is used in nut, citrus, apple, apricot, olive, pear and prune orchards, and applicable for both wine and table grape vineyards. Frequent mowing eliminates the use of many deep-rooted, reseeding annual and perennial plants. Plants to use under this type of management are low growing, reseeding annuals and perennials.

- Infrequent clipping: The cover crop is infrequently clipped, usually in early spring for frost protection and in late spring for residue control. This is used with sprinkler, border, furrow and drip irrigation, but is not well adapted for drag hose irrigation. This system permits the use of deep rooted, reseeding annual or perennial plants. Reseeding annual cover crops require spring mowing to allow a crop of seed to mature for the next year's stand. This system can be used in nut, citrus, apple, apricot, olive, pear, prune orchards, and for both wine and table grape vineyards.

Tillage Systems: Under this management, the soil is cultivated some time during the year. The management methods for this system are:

- Annually fall seeded cover crop: Cover crops are disked in early spring, followed by either summer fallow until fall or volunteer summer annuals. Early tillage is used to turn under green manure crop and reduce danger of frost damage. This system can be used with border, furrow, or sprinkler irrigation in most orchards and vineyards. Frequent tillage is a disadvantage of this system. Only short season annual plants can be used and the soil is exposed for much of the year.

- Reseeding winter annual cover crop: Reseeding winter annuals are disked down in late spring, followed by either summer fallow or volunteer annuals, which are mowed, then disked down in the fall. The cover crop can be clipped until late spring to control height of the vegetation. This system works well with border, furrow, sprinkler and drip irrigation in citrus, all fruit and nut orchards, in raisin, wine and table grapes. Many reseeding, deep rooted annuals are ideal for this system.

Photo from Cover Crops in Orchards and Vineyards. UC Davis SAREP

- No winter cover: Winter cover is eliminated by cultivation or chemical control. This is followed by either volunteer summer annuals, annually summer seeded annuals, or reseeding summer annuals. The summer cover is used from mid spring until frost. This system works well with border, furrow, or sprinkler irrigation and is most frequently used in table grapes vineyards with possible use in citrus.

Cover Crop Plants

Care must be taken in selecting a proper cover crop plants and management system, in order to protect the soil from erosion and improve conditions in your property. Attached is a list of plants that you can use according to the conditions of your orchard or vineyard. Some of the plants recommended in this chapter are not California Natives, but they have been used as cover crop plants in this area. If you are interested in establishing cover crops with California native plants, please ask to your local plant nursery which plants are appropriate for your purpose before you buy them.

Recommended Cover Crop Plants

MANAGEMENT	ORCHARD OR VINEYARD TYPE	RECOMMENDED COVER CROP PLANTS
NON TILLAGE SYSTEMS		
Frequent Clipping	Citrus Fruit Apple Apricot Olive Pear Prune Nut Almond Walnut Pistachio Vineyard Table Wine	1. Blando Brome - Useful if height of clipping not below 2 to 4 inches. 2. Sub Clover, Bur Clover, or Black Medic - Can be sown alone or in mixture. 3. Annual Bluegrass - Best adapted species if mowing frequency and height limit use of above two.
Infrequent Clipping	Citrus Fruit Apple Apricot Olive Pear Prune Nut Almond Walnut Pistachio Vineyard Table Wine	1. Blando Brome - Best all around annual grass for this type of management. 2. Sub Clover, Bur Clover, or Black Medic - Can be sown alone or in mixture. 3. Rose and Crimson Clover - Taller than Sub or Black Medic by 3 to 5 inches. Rose reseeds more reliably than Crimson. Can be seeded with Sub Clover or Black Medic. 4. Wimmera 62 Ryegrass - Excellent for use on heavy soils where volume of material not a problem. Good where water tends to pond. 5. Lana Vetch - Use where large volume of legume needed. Not useful with more than 2 to 3 mowings before April 1. 6. Cucamonga Brome - Well adapted to sandy soils. One of earliest maturing grasses. 7. Narrowleaf trefoil - Low growing perennial legume. Use on soils with good moisture holding capacity. Summer moisture essential to plants. 8. Strawberry and Ladino Clover - Low growing and sod forming perennial legumes. Require more frequent moisture than trefoil, produce less forage. 9. Tall fescue, Creeping Red Fescue, Orchard Grass, and perennial Ryegrass - Can be sown alone or in mixes. Used for strip cover in apple or pear orchards on slopping land.
TILLAGE SYSTEMS		
Annually, fall seeded cover followed by summer fallow	Citrus Fruit Apple Apricot Olive Pear Prune Nut Almond Walnut Pistachio Vineyard Table	1. Cereal Rye - Tall growing, rapid development. 2. Barley - Most widely used for cover. 3. Annual Ryegrass - Leafy with a heavy, fibrous root producing system. 4. Purple Vetch - Use when a legume is desired. 5. Mustards - Tall growing, good tap root.

TILLAGE SYSTEMS	Continue.....	
Reseeding winter annual cover followed by summer fallow	Citrus Fruit All Nut All Vineyard All	1. Blando Brome - Best all around annual grass for this type of management. 2. Sub Clover, Bur Clover, or Black Medic - Can be sown alone or in mixture. Low growing. Best adapted to soils with good moisture holding capacity. 3. Rose and Crimson Clover - Annual legumes, taller than Sub or Black Medic by 3 to 5 inches. Either can be seeded with Sub Clover or Black Medic. 4. Wimmera 62 Ryegrass - Excellent for use on heavy soils where volume of material not a problem. Good where water tends to pond. 5. Lana Vetch - Use where large volume of legume needed. Not useful with more than 2 to 3 mowings before April 1. 6. Cucamonga Brome - Well adapted to sandy soils. One of earliest maturing grasses.
Reseeding winter annual followed by volunteer summer annuals	Citrus Fruit Apricot Peach Plum Vineyard Table Wine	1. Cereal Rye - Tall growing, rapid development. 2. Barley - Most widely used for cover. 3. Annual Ryegrass - Leafy with a heavy, fibrous root producing system. 4. Purple Vetch - Use when a legume is desired. 5. Mustards - Tall growing, good tap root.
Reseeding winter annual followed by volunteer summer annuals	Citrus Fruit Apricot Peach Plum Vineyard Table Wine	1. Cereal Rye - Tall growing, rapid development. 2. Barley - Most widely used for cover. 3. Annual Ryegrass - Leafy with a heavy, fibrous root producing system. 4. Purple Vetch - Use when a legume is desired. 5. Mustards - Tall growing, good tap root.
No winter cover followed by volunteer summer annuals	Citrus Vineyard Table Wine	1. Volunteer species
No winter cover followed by annually seeded summer annuals	Citrus Vineyard Table Wine	1. Sudan Grass 2. Grain Sorghum 3. California Blackeye Bean
No winter cover followed by reseeding summer annuals	Citrus Vineyard Table Wine	1. Watergrass 2. Foxtail Millet 3. Japanese Millet

References

For more information on Cover Crops, please contact your local RCD, NRCS and FSA offices at:
65 Main Street, Suite 107
Templeton, CA 93465
Phone #: (805) 434-0396 Ext. 2, 3 and 4.
Fax #: (805) 434-0284

The following references and websites offer information about Cover Crops:

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CHAPTER II. RANGELAND MANAGEMENT

RANGELAND MANAGEMENT

In America's West, rangeland is the dominant landscape, contributing significantly to the quality of life of residents and visitors alike. Millions of acres of rangeland have long been valued for livestock grazing and mining, but rangelands now are also prized for their recreation opportunities, wildlife habitats, watershed, cultural values, and scenery (BLM, 1997).

Photo by Chuck Pritchard

Rangeland ecosystems have evolved over thousands of years, adapting to the soils, climate and natural disturbance factors. Rangeland is land supporting indigenous or introduced vegetation that is either grazed or has the potential to be grazed and is managed as a natural ecosystem. Rangeland includes grassland, grazeable forestland, shrubland, pastureland and riparian areas (Public Land Management, 2003).

Good rangeland management assures sustained economic and social benefits without impairment of environmental quality.

Livestock Distribution

One of the prime objectives of range management is to distribute livestock to obtain uniform grazing. Livestock prefer to graze areas that are more accessible and close to water. Good grazing distribution means more of the available forage plants in a pasture are grazed, and overgrazing of the easily accessible plants is reduced. This results in a larger amount of range receiving proper grazing, and this may reduce the amount of supplemental feeding that is necessary. A rancher must look at each grazing unit to insure that the animals are grazing most of the plants.

Ranchland in Pozo area, San Luis Obispo, CA.
Photo by The Nature Conservancy SLO

Factors Affecting Distribution:

Proper management requires knowledge of the location. Several factors influence the way livestock graze an area. These include:

- **Water location:** Generally cattle drink water at least once a day and more often during high temperatures. The location of water supplies within a pasture has a significant effect on grazing patterns. Travel distances to water can affect livestock productivity.
- **Natural barriers:** In addition to fences, cliff faces, deep gullies, and rock outcrops influence the movement of livestock. Animals have trouble walking and grazing on steeper slopes and will avoid them.
- **Prevailing wind direction:** Animals do not like to graze into strong wind. Therefore, prevailing wind direction and intensity have an effect on grazing distribution.
- **Shaded or protected areas:** Animals seek shelter from the cold or heat and from high winds. Areas of a pasture that provide shelter with plant cover or the topography are used more during periods of temperature extremes or when the wind is high.
- **Exposure:** West-and-south-facing slopes are warmer and may be used more on cooler days or in the winter. East-and-north-facing slopes are cooler and may be used more on warmer days.

Cattle under Oak tree shade
Photo by US-LT RCD

• **Season of use:** Some areas of the pasture are more attractive to livestock because of the vegetation growing there. Animals seek the most palatable plants growing at the time. For example, they are attracted to cool-season plants during the spring and early summer. The location of the different plants within a pasture and the time of year often have an influence on the grazing pattern.

• **Salt or feed location:** Moving the location of salt or feed bunks may cause animals to increase grazing on lightly used areas of a pasture.

• **Fencing:** With the development of lower-cost fencing, adding fencing to control animal movement is now more practical. Small pastures improve distribution. Separating rugged terrain and gentle terrain will improve use on the steeper pastures. Fencing can be an effective tool in the management of livestock.

• **Trails:** Where natural barriers occur, the construction of trails or driftways can open up new areas of pasture grazing.

• **Pests:** When mosquito or fly populations are high, livestock can be driven to high ground where wind may reduce insect biting. Under these conditions, insects can influence grazing distribution. Use of cattle oilers and fly tags can reduce the impact of insects in most years.

• **Vegetation types:** Different species of grazers have preferences for certain vegetation types over others. This results in differences in the grazing pressure on different vegetation types within a pasture. Livestock will often prefer the vegetation type that best meets their nutritional needs. Livestock possess much more intelligence and memory than we give them credit for when it comes to selective grazing. Proper livestock management can result in the control of some types of noxious weeds and the enhancement of vegetation.

• **Palatability of Forage:** Forage palatability and animal preference are important factors governing range utilization. Also, they represent valuable tools in formulating grazing management practices, stocking rates and seeding mixes. Palatability can be an indicator of forage quality.

Feedlot
Photo by US-LT RCD

Goats confined in a parcel for grazing purposes
Photo by US-LT RCD

Methods to Control Distribution:

After the livestock distribution in a pasture is analyzed there are several methods to consider when attempting to change the animal's grazing habits.

- **Grazing system:** Every grazing system has an effect on livestock distribution. Concentrating livestock into large herds and rotating the herds through two or more pastures tends to improve grazing distribution for each pasture. Rotational grazing often improves the vegetation cover and wildlife habitat conditions. Soil erosion is reduced.

- **Water development:** In large pastures where areas are too far from water, the development of a new water supply may improve distribution.

- **Animal herding:** Drifting or herding animals from heavily used to lightly used pasture will redistribute the grazing pressure.

- **Brush Management:** When planning the management of large shrubs, leave clusters of them to provide necessary shelter. By locating these in predetermined areas, they will draw the stock during periods when shelter is needed and encourage grazing in nearby open areas. However, livestock will often avoid areas with thick brush and will forage in open prairie areas. Therefore, plan and evaluate the effects of brushy areas on livestock distribution.

- **Other Practices:** Waterspreading and fertilizing may also promote livestock distribution. Analyze any range practice before you apply it to insure that it will produce positive effect on grazing and will result in more plant and animal production.

Cattle concentration in a ranchland area
in East San Luis Obispo County, CA.
Photo by Chuck Pritchard

Horses confined in a corral
Photo by US-LT RCD

Planned Grazing Systems

A planned grazing system means managing when and how long grazing occurs in a planned sequence.

Livestock are selective in the plants they graze. They repeatedly graze the desirable plant and leave the less desirable plants. This weakens the more desirable plants and allows unwanted plants to thrive and multiply. Nearly all rangeland pastures also have areas where livestock concentrate such as around water, bedding grounds, and feed grounds. Under continuous use, these areas are often overgrazed.

Grazing and resting plants on rangeland in a planned sequence gives the better plants a chance to re-grow, compete, and multiply, thus gradually increasing the amount of desirable plants available per acre.

This improved range condition increases forage production, improves the habitat for wildlife, reduces erosion, and conserves water. By resting pastures, you also allow overgrazed areas to become more productive.

Cattle confined in corrals
Photo by US-LT RCD

Types of Planned Grazing Systems:

Planned grazing systems vary somewhat from ranch to ranch. Usually in a system, livestock from several pastures are combined into one herd and allowed to graze one pasture at a time. This tends to improve the grazing distribution. The design of the system varies because of the kind of livestock, available water, terrain and mixture of range sites, and the objectives of the operator. The following list present some of the basic systems.

• **Two-pasture, one herd:** A herd of livestock is rotated between two grazing units. Each year, the units are rested during a different part of the growing season; this benefits the entire plant community. This system takes advantage of the varying growth periods of the more important plants.

Zebras and cattle sharing the same pasture
Photo by US-LT RCD

Photo by US-LT RCD

• **Three- and four-pasture, one herd:** This system is similar to the one above except the herd is moved through more grazing units. Grazing and rest periods vary with three- and four-pasture systems, depending on the producer's objective and the time of the year. The length of each grazing period may be as short as 30 days or as long as 120 days. With some three-pasture systems, livestock are moved every four months; with some four-pasture systems, they are moved every three months. In some cases, livestock are rotated through each unit two or more times during the year.

• **High intensity, low frequency:** With this technique, one herd of livestock normally graze eight or more grazing units in a planned sequence. Livestock are moved into one unit and the others are allowed to rest. When the forage is grazed to the desired intensity, livestock are moved to the next unit. Livestock typically stay in a unit until proper use is reached, about 10 to 25 days. The slow moves allow long rest periods. This system provides excellent rangeland improvement, but individual livestock performance may decline.

• **Short duration grazing system:** This is similar to the high intensity, low frequency system, except that the speed of the rotation is adjusted according to the growth rate of the plants. During the peak of the growing season, livestock are moved rapidly with slower moves during the remainder of the year. A grazing cycle is completed about every 30 to 90 days. When the system is operated properly, good livestock performance and good rangeland improvement can be achieved.

• **Cell grazing system:** This system is also a short duration grazing system, but usually with 12 or more pastures in a cell. In cell grazing, the same basic principles of short duration grazing are used. It often uses a design of radiating fences to facilitate the movement of the livestock. In these cases, a water supply is normally located in the center of the cell and fences radiate out from the center forming pastures. Where livestock come to the center daily for water and minerals, they can easily be moved between pastures by opening and closing gates. Producers using cell grazing generally have electric fences to reduce fencing expense.

The kind of system or systems, will depend on present fencing and grazing unit layout, available water supplies, economics, existing range condition, kind and classes of livestock, long-range goals for rangeland improvement, and the time necessary to supervise operation. Rangeland greatly benefits from the graze-rest sequence provided through a properly managed planned grazing system.

Drought Conditions

Drought is defined by the Society for Range Management as "prolonged dry weather when precipitation is less than 75% of the average amount". In the southwest, it is not a question of if drought will occur, but rather when will it occur, how long will it last, and how to be prepared.

Drought is a normal part of virtually every climate on the planet, even rainy ones. This complex natural hazard has many effects that can be as expensive as floods and hurricanes.

Photo by Chuck Pritchard

Drought years create severe hardships for the livestock industry. Forage production is reduced, putting the amount of residual dry matter below minimum recommended threshold levels. Residual dry matter is the dry plant material remaining from previous year's growth that provides favorable micro-environments for early seeding growth, soil protection against erosion, soil organic matter, and a source of low-quality fall forage for livestock.

Livestock operators must plan for drought as a normal part of the range-livestock business. With good planning, good management, and good information, ranches can reduce the impacts of drought.

Ranch Management Recommendations:

- **Move cattle to pastures** with scattered blue oak to make more forage available to grazing livestock. In California, for areas of 20 inches of annual rainfall or less, early season forage production and total forage production generally are greater beneath the canopies of oak than in adjacent open areas.
- **Visually evaluate the available forage** remaining in each pasture. Map these areas into categories of high, moderate, and low forage following the guidelines for residual dry matter described in California Guidelines for Residual Dry Matter (RDM) Management on Coastal and Foothill Annual Rangelands (see references). Use these maps to locate supplemental feeding areas or use electric fencing to improve livestock distribution and to improve the efficiency use of existing forage or residual dry matter.
- **Use nitrogen fertilization** if any rain occurs. Careful nitrogen application produces a quick forage production response and increases the quantity of protein in the forage. For best results, apply nitrogen to open rolling sites. The benefit of fertilization may be limited in areas of less than 12 inches average annual rainfall.
- **Poisonous plants** become a bigger problem during drought. Locate all areas with poisonous plants and monitor them closely or exclude cattle from them if possible. When especially hungry, animals will eat poisonous plants that they otherwise would not consume.
- **Utilize pastures** with predominantly south and west aspects early in the grazing season. The forage of these areas will mature and dry earlier than the forage on north- and east-facing pastures. This grazing strategy will increase the period in which adequate amounts of green forage are available.
- **Swales** have deeper, more fertile soils with better water-holding capacities, and so are the highest-producing forage sites on annual rangeland. During the winter season, however, cold air can settle into the low areas , restricting plant growth. By placing temporary fences around large swales and restricting their use until temperatures warm up, you can give the plants a photosynthetic advantage, enabling them to produce nearer to their potential. Since plants of these areas are the last to mature and dry, your efforts to delay grazing of swales may further extend the period in which large amounts of high-quality forage are available.

Moving cattle in dry pastures
Photo by Chuck Pritchard

Moving cattle between pastures
Photo by Chuck Pritchard

- **High-quality, accessible water** is extremely important for both livestock and wildlife. When developing water sources, always carefully evaluate the potential impact to both terrestrial and aquatic habitats affected by the development. Where possible, make new developments accessible for any wildlife that may depend on the water source. Troughs can be designed to accommodate even the smallest of animals.

Supplemental Feeding Recommendations:

- **Supplemental feeding** is normally practiced to maintain herd performance as indicated in reproductive rates and weaning weights. During drought, ranchers provide additional supplemental feed to offset the reduced production of forage, and to provide additional protein and energy to livestock. Common protein-rich supplements include cottonseed, soybean, linseed, and safflower oil meals or products containing these feeds. Well-cured green alfalfa hays will provide adequate protein for all cases of livestock when fed in adequate amounts. Common high-energy feeds include grains such as barley, corn, milo, and wheat. Molasses is an excellent energy source, and also acts as a binder to keep dust down in ground and pelleted feed mixes. It also increases the palatability of feed mixes.

- **Liquid supplements** can be formulated to provide either protein or energy. These liquids are commonly used when low-quality dry forage production is available in adequate amounts. When drought conditions reduce forage production and substitute feed is required, these supplement forms are only recommended if they are provided along with low-quality roughage. Do not consider using liquid supplements if it would take more than 2 pounds of the supplements per cow per day to maintain desired livestock performance.

- **Feeding the standard daily requirements** every other day is more effective than a daily feeding of reduced amounts. Less-frequent, larger feedings allow the weaker animals as well as the stronger animals to get their fill. This practice will also save on labor costs.

Scarce dry pasture during summer season
Photo by US-LT RCD

Scarce dry pasture during summer season
Photo by The Nature Conservancy SLO

- **If animals are exposed to severe drought conditions** for some time, their maintenance requirements will decrease and a lower feed level will be adequate. Gradual reduction of feed levels is important as it will allow animals to adjust to the lower level with little pronounced effect. However, the condition of weak animals should not be allowed to decline, making them weaker, as greater quantities of feed will then be required to bring them back to good condition. Animals losing 15 to 25 percent of normal body weight are weak and will recover slowly. Animals that lose 30 percent or more of their normal body weight will probably die as a result.

- **Under normal feeding conditions**, animals retain some of the essential ingested minerals in their bones. During short deficiency periods these minerals can be depleted. Under most dry conditions cattle should receive calcium and phosphorus supplements. During prolonged drought it becomes even more important that cattle receive these two minerals. This is particularly important for young, growing animals, pregnant females, and lactating heifers and cows. Vitamin A is critical during drought. Dry feed contains very little vitamin A and you can provide it by having some green hay in the ration or by adding a stable form of vitamin A to the feed mix. Another option is injectable vitamin A. Fortunately, animals that have been on green pasture for some time usually will not experience vitamin A deficiency for 4 to 6 months when placed on a vitamin A deficient ratio.

- **During drought conditions** cattle may be fed a variety of other feedstuffs. Low-quality roughages such as cereal, straw, milo or corn stover, and cottonseed hulls are good sources of roughage. Poultry manure and litter are sources of nitrogen.

- **When feeding animals,** reduce the distance the animals must travel as much as possible. Walking in search of feed and water can use up as much as 30% of the energy a cow derives from feed. This factor must be balanced against the need to utilize existing range forage efficiently.

Dry grassland area
Photo by Chuck Pritchard

Dry grassland area
Photo by The Nature Conservancy SLO

- **Extremely cold weather** can also increase energy requirements. Under such conditions, roughages such as hay and straw should be fed, as animals will produce more body heat on these feeds than on concentrated feeds such as barley or corn.
- **Try not to buy weed-infested hay.** If you must use weedy hay, avoid areas with late spring moisture such as swales, seeps, springs, and streams. These late-season wet areas increase the risk of weed establishment. Monitor all feeding sites for weeds, and treat weedy areas to control infestations.

Livestock Management Recommendations During Drought:

In order to reduce the impact on grassland cover during drought period, we recommend the following measures:

- **Formulate a selling policy** to help you deal with classes of animals to sell and the rate at which you should place them on the market. Check all heifers and cows for pregnancy and cull those that are open, saving the most desirable and younger cows. By carrying those animals on minimal rations, you will be able to save valuable breeding stock and replenish the herd after the drought has broken.
- **Wean calves** as early as possible. This is important as it will allow heifers and cows to stay in better body condition. Weaning ages can be classified into three groups:
  * 6 months or older perform well on high-quality roughage.
  * 3 to 5 months can be raised on good-quality hay and grain.
  * 6 weeks to 3 months require diets higher in grains and a higher quality of hay.

  Do not hesitate to wean calves, regardless of age, in order to reduce stress on the cows.

Dry grassland area
Photo by US-LT RCD

Mother cow and calf
Photo by US-LT RCD

- **Group the herd** according to nutritional needs. This will allow for proper feeding of each group and provide an easier means of assessing livestock condition. The following is an order of priority, from highest to lowest:
  1. Calves under 3 months
  2. Lactating heifers
  3. Calves 3 to 6 months
  4. Lactating cows
  5. Heifers or cows in the last third of the gestation period
  6. Calves 6 to 12 months
  7. Calves older than 12 months
  8. Heifers or cows in early and mid pregnancy
  9. Bulls

  Groups low on the priority list can withstand longer periods of nutritional stress. These animals should be given lower priority in the feeding program. Those animals most likely to die during drought conditions are young calves and pregnant or lactating heifers and cows. These animals should receive the highest priority and be fed the best feed. Bulls should remain in fair condition, but just prior to the breeding season they need to be in good condition.

- **Observe all classes of livestock** for symptoms of internal and external parasites. Parasites are a more serious problem when cattle are under stress than under normal conditions. A good parasite control program is even more important during drought, but be sure your cattle have internal parasites before you treat, as deworming is expensive in terms of both labor and materials.

Dry grassland area waiting for rain
Photo by Chuck Pritchard

References

For more information on Rangeland Management, please contact your local RCD, NRCS and FSA offices at:
65 Main Street, Suite 107 • Templeton, CA 93465

Phone #: (805) 434-0396 Ext. 2, 3 and 4 • Fax #: (805) 434-0284

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- http://www.beefgraze.com
- http://www.cenevada@ucdavis.edu

CHAPTER III. EROSION IN AGRICULTURE

EROSION IN AGRICULTURE

Photo by US-LT RCD

Surface erosion, the process by which layers of soil are carried from one area to another, can have a disastrous effect on the state of agricultural produce and the environment. Through this process, valuable soil together with its nutrients can be lost and make it impossible for crops to grow. Sediment can clog streams and lakes. Soil is eroded in three ways: by wind, water or through tilling.

During erosion, the productive layer of "dirt", called the humus or topsoil, gets removed and the soil that remains becomes unproductive. Once the nutrients-filled layer is gone, few plants will grow. If erosion is left unattended, the land that remains will eventually become akin to a desert, incapable of sustaining plants. This process is called desertification, and it is often impossible to reverse for agriculture.

The key to minimizing soil erosion and saving agricultural land lies with the farmer and rancher. Beneficial Agricultural Management Practices (BAMPs) can be implemented to limit or contain soil movement from the land.

Grand Canyon Photos from National Park Service Digital Image Archives

A certain amount of erosion is natural. Erosion has been taking place for millions of years. However, soil in its natural environment, surrounded by natural vegetation, erodes very slowly over long periods of time. This type of erosion can be called **Geological Erosion.** A classical example of geological erosion is the Grand Canyon.

Dust Bowl Photo from US National Oceanic and Atmospheric Administration

Erosion begins to pose problems when human activities, such as construction and agriculture, alter the natural state of the environment in ways that drastically increase erosion rates. This type of erosion is called **Accelerated Erosion**. A classic example of the results of accelerated erosion is the Dust Bowl tragedy of the 1930's.

Stages of Erosion:

- **Sheet Erosion** is defined as the uniform removal of soil in thin layers from sloping land. Sheet erosion occurs when loose soil runs off with the rain.
- **Rill Erosion** is often the result of sheet erosion. While sheet erosion occurs in thin, uniform layers, rill erosion results from little streamlets of water carrying soil away from land with poor infiltration. Rills often form between crop rows and can be tilled under if addressed in their early stages.
- **Gully Erosion:** Gullies are larger than rills and cannot be fixed by tillage. Gully erosion is an advanced stage of rill erosion.

Types of Erosion:

Water Erosion: Raindrops can be a major problem for farmers when they strike bare soil. With an impact of up to 30 miles per hour, rain washes out seed and splashes soil into the air. Soil that has been detached by raindrops is more easily moved than soil that has not been detached. If the fields are on a slope, the soil is splashed downhill which causes deterioration of soil structure. Plants and close growing crops minimize raindrop impact as well as hold the soil together and act as a filter. The three pictures below are good examples of water erosion.

Wind Erosion: Wind erosion occurs mostly in flat, dry areas and along bodies of water with moist sandy soils. Wind erosion can remove soil and natural vegetation, causing dryness and deterioration of soil structure. Surface texture helps prevent damage caused by wind erosion.

Some soil types are more vulnerable to wind erosion than others. Mucks, sands, and loamy sands are easily detached and blown away by the wind, and thus are severely at risk for erosion. Sandy loams are also vulnerable to wind, but are not as susceptible as the previously mentioned soils. Regular loams, silt loams, clay loams and clays are at lower risk for damage by the wind. However, on wide level plains, there may be a loss of fine silts, clays and some organic matter.

Gully with check dams

Rill erosion

Gully erosion

Photos by US-LT RCD

Beneficial Agricultural Management Practices (BAMPs) To Control Erosion

There are several accepted BAMPs that are used frequently in controlling erosion risk factors for both wind and water. They range from better utilization of the natural environment to the construction of artificial devices, but all can be effective in minimizing potential damage. Some of these BAMPs include the following:

1. **Crop Rotation:** The successive planting of different crops in the same field over a period of years. Farmers using rotations typically plant a part of their land to each crop in the rotation (National Research Council).

   There are many reasons why crop rotation is an effective way to make farmlands more productive.

- If certain cover crops are planted in winter, erosion and runoff is prevented when the ground thaws, and nutrients are trapped in the soil and released to the spring crops.
- It can improve the overall efficiency of nitrogen uptake and utilization in the soil.
- The yield advantages of crops being rotated has been proven to be much higher than that of continuous crops
- There is evidence that conservation tillage systems which leave much of the prior crop residues on the soil surface are much better adapted to crop rotations than to that of continuous crops.
- Rotating crops provides greater yield advantages when using some form of conservation tillage.
- Residues from sod crops, corn, and soybeans influence certain soil physical properties that, in turn, influence soil drainage and aeration.
- Rotating crops can reduce the potential for serious insect and disease infestations associated with specific residues. This is especially important if continuous corn or soybeans is produced under conservation tillage, since residues are left on the surface year' round harbor insects and disease.

Strawberry field
Photo by USDA

Cabbage field
Photo by USDA

2. **Contour Cultivation:** On gently sloping land, contour cultivation, a special tillage practice carried out on the contour of the field, can reduce velocity of overland flow. Contour cultivation should not be carried out on steep slopes though, because it can make the erosion situation worse.

3. **Strip Cropping:** This is a technique in which alternate strips of different crops are planted in the same field. This BAMPs is used to control both wind and water erosion. There are three main types of this BAMP: Contour strip cropping, field strip cropping, and buffer strip cropping.

   In *Contour strip* cropping the crops follow a definite rotational sequence, and tillage is held closely to the exact contour of the field.

   In *Field strip cropping*, strips of uniform width are placed across the general slope of the land. When used with adequately grassed waterways, the strips may be used where topography is too irregular to make contour stripping practical.

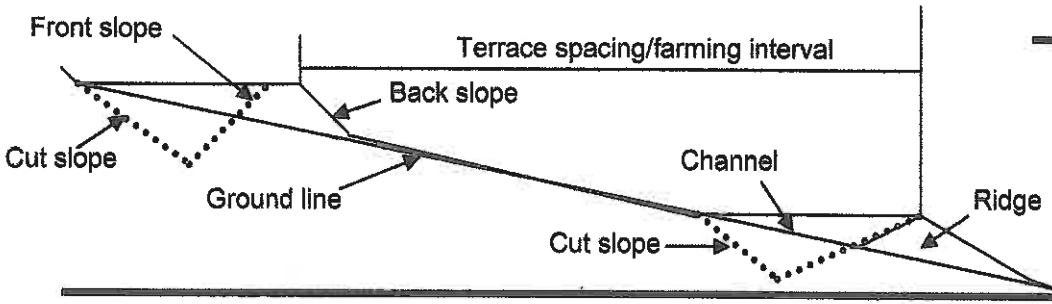
   The *Buffer strip cropping* technique can be employed by using strips of grass or legume crops laid out between contour strips of crops in irregular rotations. These strips may be even or irregular in width or placed on critical slope areas of the field.

Field strip cropping
Photo by NRCS

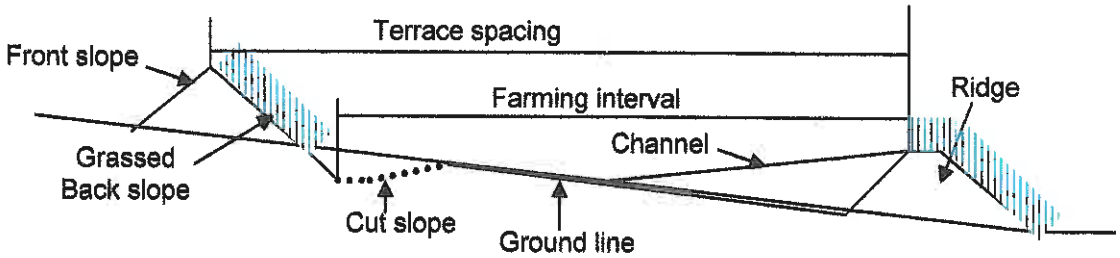
Buffer strip cropping
Photo by Cole from USDA Online Photography Center

4. **Terraces:** Constructing bench-like channels, otherwise known as terraces, enables water to be stored temporarily on slopes to allow sediment deposition and water infiltration.

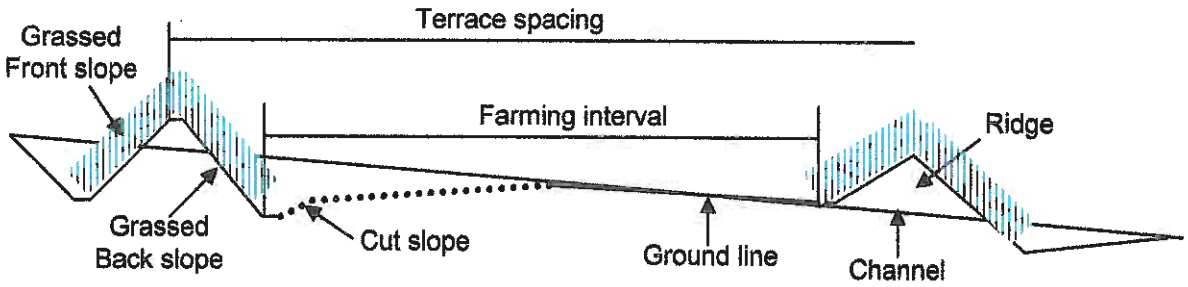
Terrace Cross Sections:



Broad – base Terrace



Grassed - back slope Terrace



Narrow - base Terrace

Designed by Libby Field

Grassed Waterway
Photo by Tim McCabe from USDA Online Photography Center

5. **Grassed Waterways:** When trying to reduce the possibility of severe gully erosion, grassed waterways provide a helpful solution. They force storm runoff water to flow down the center of an established grass strip and can carry very large quantities of storm water across a field without erosion. Grassed waterways are also used as filters to remove sediment, but may sometimes loose their effectiveness when too much sediment builds up in the waterways. To prevent this, it is important that crop residues, buffer strips, and other erosion control practices and structures be used along with grassed waterways for maximum effectiveness.

6. **Diversion Structures:** These BAMPs are channels that are constructed across slopes that cause water to flow to a desired outlet. They are similar to grass waterways and are used most often for gully control.

7. **Drop Structures:** These are small dams used to stabilize steep waterways and other channels. They can handle large amounts of runoff water and are effective where falls are less than 2.5 meters. In channel stabilization, drop structures such as straight drop spill way are constructed to direct the flow of water through a weir, into a stilling basin where the energy of the water is dissipated before it flows into the channel below. The straight drop spillway may be used with drops only up to ten feet. Chutes and flumes are used much in the same manner for steeper grades.

   A *weir* is some type of enclosure such as a fence or dam in a stream to raise the water level or to divert the flow.

8. **Riparian Strips:** These are buffer strips of grass, shrubbery, plants, and other vegetation that grow on the banks of rivers, streams and areas with water conservation problems. The strips slow runoff and catch sediment. In shallow water flow, they can reduce sediment and the nutrients and herbicides attached to it by 30% to 50%.

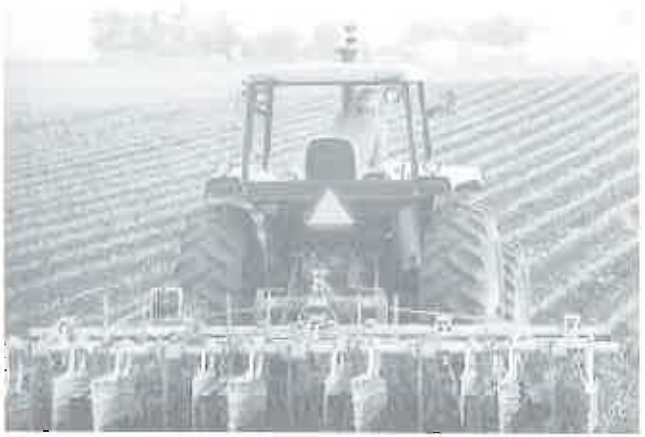
Riparian vegetation on river banks
Photo by USDA

Riparian vegetation on stream banks
Photo by US-LT RCD

Coconut strip to filter runoff water
Photo by US-LT RCD

Strip of grass to support soil and filtrate runoff water.
Photo by US-LT RCD

9. **Conservation Tillage:** Regular conventional tillage provides a smooth, unridged soil surface that can encourage serious runoff and erosion problems on sloping crop land. Instead, conservation tillage is any tillage planting system that leaves at least 30% of the field surface covered with crop residue after planting is completed and involves reduced or minimum tillage. Crop Residues absorb energy of raindrops to reduce the soil splash.



Tractor tillage
Photo by US National Archives

Crop residues
Photo by NRCS

There are several types of conservation tillage currently being used in the Midwest Corn Belt as effective BAMPs. They include:

- *No-till Planting:* This planting system prepares a seedbed 2 inches wide or less, leaving most of the surface undisturbed and still covered with crop residues. The result is a wetter, colder environment that protects the seeds and soil through the insulating effect of the surface residue.

- *Strip Rotary Tillage:* A strip four to eight inches wide and two to four inches deep in prepared by a rotary tiller, while the rest of the soil is left undisturbed. The soil is conserved because of the crop residues between the tillage strips.

- *Till Planting:* This plowing technique sweeps the crop residues into the area between the rows of crops. Soil density between these rows remains relatively high because of the absence of tillage. This soil is susceptible to be eroded by rain storm runoff.

-*Annual Ridges:* Also known as permanent ridges or ridge tillage, the annual ridges are formed by using a rolling disk bedder, and planting is done after only minor spring seedbed preparation. The extent of soil conservation depends on the amount of residue left and the row direction. Planting on the contour plus increased surface residues greatly reduce soil loss.

-*Chiseling:* This system does not turn the soil over, but rather leaves it rough and cloddy with plenty of crop residue remaining. The soil density and amount of covering depends on the depth, size, shape, spacing, and so of the chisel blades. The residue and rough, cloddy surface of the soil reduces raindrops impact and reduces runoff velocities thus reducing erosion.

- *Disking:* This system pulverizes the soil and gives great soil density. The effect is similar to that of chiseling with results also depending on the depth, size and spacing of the disk blades. The deeper the disking, the fewer the residues that remain on the surface.

Tillage practice for contour cultivation and grassed waterway in an agriculture field
Photo by USDA Online Photography Center

Economic Considerations

Erosion control can become a very economically involved process. With Beneficial Agriculture Management Practices (BAMPs) there may be no significant short-term economic returns to the individual farmer, but one must consider the broader view of the future welfare of the environment. Some techniques and structures are very expensive and may never pay for themselves entirely unless environmental benefits are considered. These practices are vital to agriculture, however, and are rendered significantly more affordable under cost sharing practices through the United States Department of Agriculture Natural Resource Conservation Service - USDA NRCS. Through Agricultural Conservation Programs, this federal agency provides a major incentive for farmers to install needed erosion control measures.

Soil erosion in vineyard without cover crops

Stream Bank erosion

Stream Bank erosion adjacent to agriculture field

Photos by US-LT RCD

AGRICULTURE **MARKETS**

SOIL =





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Government Involvement

Government involvement as well as involvement from other planning agency in preventing the effect of soil erosion is essential. In 1935 the Soil Conservation Service was established and changed to the Natural Resources Conservation Service - NRCS in 1994. It administers a broad program of assistance in soil and water conservation on the land in cooperation with Resource Conservation Districts. This service provides these kind of assistance at the request of farmers, ranchers, and other landowners:

1. Determining soil suitability guidelines based on the soil surveys for agriculture, housing, recreation, waste disposal, and road construction.
2. Recommending Best Management Practices for erosion control and water protection.
3. Designing sediment interception systems.
4. Designing water facilities such as farm ponds.
5. Planning recreational facilities.
6. Designing terrace, irrigation, and drainage systems.
7. Developing cropping systems to reduce erosion.
8. Recommending pasture plantings.
9. Developing range management guidelines.
10. Promoting wildlife and woodland conservation.
11. Supplying adapted planting materials for conservation planting.
12. Promoting surface mine reclamation guidelines.
13. Providing expertise on land use planning.

Gully erosion
Photo by US-LT RCD

References

For more information on erosion, The Erosion Control Handbook for San Luis Obispo County is available through the Upper Salinas – Las Tablas RCD and the County Planning and Building Dept.

Beneficial Agriculture Management Practices (BAMPs) are further discussed in this Handbook in the Chapters about Cover Crops, Ranch Management, Streambanks, and Shorelines Restoration, Management and Protection With Vegetation.

Please Contact Your Local RCD, NRCS, FSA Offices and the
San Luis Obispo Pollution & Erosion Reduction Center (SLOPERC):
65 Main Street, Suite 107
Templeton, CA 93465
Phone #: (805) 434-0396 Ext. 2, 3 and 4.
Fax #: (805) 434-0284

The following websites and references offer information about Erosion in Agriculture :

- National Research Council, Board on Agriculture, Committee on the Role of Alternative Farming Methods in Modern Production Agriculture. *Alternative Agriculture*. National Academy Press, Washington, D.C. 1989.
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- http://www.us-ltrcd.org

CHAPTER IV : STREAMBANK AND SHORELINE RESTORATION MANAGEMENT AND PROTECTION WITH VEGETATION

STREAMBANK AND SHORELINE RESTORATION, MANAGEMENT AND PROTECTION WITH VEGETATION

Photo by US-LT RCD

Riparian vegetation is the vegetation that grows on the banks of rivers and streams, on the shores of lakes is termed. This vegetation stabilizes and protects banks of streams, lakes, estuaries or excavated channels against scour and erosion. Riparian vegetation buffers act as a biofilter, playing a crucial role in reducing the amount of pollutants that enter water bodies. Restoration, management and conservation of riparian vegetation is imperative for water quality health.

Why Use Vegetation

Photo by Dave Highland, CDFG

Stabilizing and protecting streambanks from erosion with grasses, shrubs and tree vegetation provides excellent habitat for terrestrial and aquatic wildlife. These plants hold the soil with their intricate net of root systems, reduce water velocities and prevent the formation of strong eddies around large trees during flood flows. In addition, this vegetation has significant environmental, social and economic value.

The aquatic wildlife rely on a combination of shading and leaf drop by the plants. Shading protects fish species from thermal pollution which is when the water heats up too much for fish to thrive. Leaf litter provides a food source for the insects that young fish feed on.

Stabilizing and protecting streambanks from erosion with vegetation has multiple advantages:

- Prevents loss of land and damage to utilities, roads, buildings, or other facilities adjacent to the banks.
- Maintains the capacity of the stream channel.
- Controls channel bank erosion that would adversely affect downstream habitat and result in sedimentation of channels.
- Reduces sediment loads causing downstream damages and pollution.
- Improves the stream for recreational uses.

Considerations

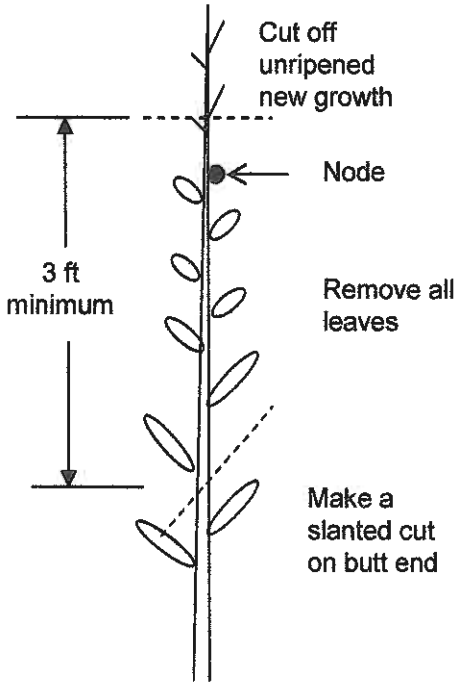
- Select plants to fit your specific soil, climate and condition.
- Existing natural vegetation should be protected on the undisturbed portions of banks, especially those areas subject to flooding.
- Livestock should be excluded from the planting area.
- Plantings should be carefully tied into the upstream bank so as not to allow the stream to cut around planting.
- Vegetation is successful at stabilizing slopes 2:1 or flatter. In some cases prior to planting you made need to grade eroded or steeper streambanks to a maximum slope of 2:1 (3:1 preferred).
- Willow roots are very invasive, so they should not be planted near septic systems and leach lines.
- Plants that do not take should be replanted.
- Keep plants in low bushy condition.
- High intensity storms can wash out even mature streambank vegetation.
- Proper installation and maintenance of streambank vegetation is extremely important.
- In combination with woody cuttings there are other conservation measures to consider for erosion control. These measures include a grass/legume cover, mulch, chips, bark or structural measures.
- Streambank erosion cannot always be controlled by vegetation. Please consult your local RCD and NRCS agency to discuss your specific needs.
- Any work conducted within stream and river channels may require to obtain necessary permits from regulatory agencies such as Army Corp of Engineer, California Department of Fish and Game, Regional Water Quality Control Board, County, City and/or Coastal Commission.

Riparian vegetation at the headwaters of the Upper Salinas River
Photo by US-LT RCD

Using Shrubs and Trees

Carefully selected shrubs and trees can be useful in controlling erosion of streambanks. While not a "cure-all" for every bank erosion problem, well designated plantings are a simple, low-cost and long-term solution in many situations.

Certain trees and shrubs can easily be establish from cuttings for streambanks protection in central California. Examples include Willow (*Salix sp.*), Cottonwood (*Populus sp.*), Califronia blackberry (*Rubes urcinus)*, California rose (*Rosa Californica*), quailbush (*Atriplex lentiformis*), and Mule fat (*Baccharis viminea*).



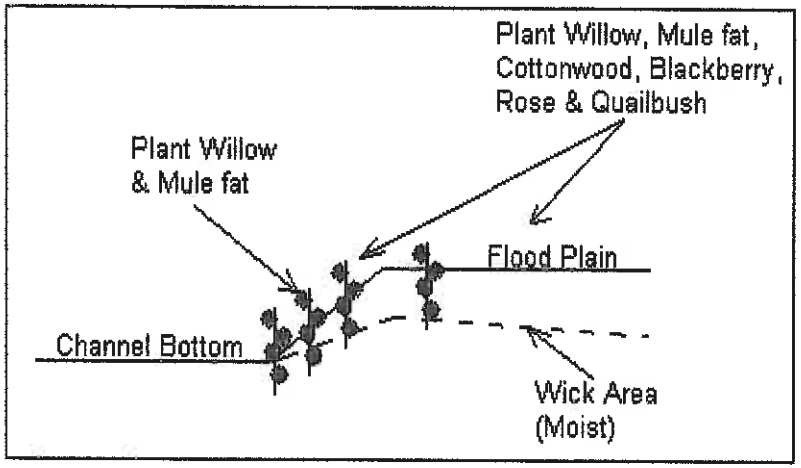
Use of Cuttings:

- Take cuttings from healthy, low-branching shrubs and trees in the general area. Cut off the unripened new growth at the end of the branch and discard.
- Then make a cutting at least 3 feet long with a diameter not greater than 2 inches at the butt end or less than ¼ inch at the tip.
- Remove any leaves after cutting.
- Do not allow the cuttings to dry out.
- Make a slanted cut at the butt end and a square cut at the tip end (see the figure). All cuts should be made with sharp tools.
- Willows and Cottonwood are deciduous ; they drop their leaves and become dormant in the winter. For best results, these species must be collected during the winter, placed in cool storage and planted in February or March before the plants break dormancy. * *Place cuttings in moist peat moss, sawdust or sand; keep cool and out of the sun.*
- Mule fat is an evergreen and can be collected and planted anytime as long as the soil is moist. However, optimum planting time is late winter to early spring before new growth starts. Quailbush is a semi-evergreen and will drop leaves in very cold weather.

Where to plant:

Cuttings should be planted only in a sunlit location where moisture will be available to the roots year-round.

- Plant Willow and Mule fat near the waterline on the streambank but not where they will be under water during the growing season. New cuttings can be drowned before establishment.
- Plant Quailbush, Cottonwood, Willow, Mule fat, Blackberry and Rose in the wick (moist) area on the bank and flood plain.
- Remember to contact the State Department of Fish and Game and other applicable agencies for approval of planting work conducted within stream and river channels.



How to plant:

- Plant the cuttings in prepared holes made with a probe bar or push them down into the saturated soils with the butt end down. Make sure there is no air around the cutting by running the probe down in the hole
- Leave 1 foot (with at least 2 nodes) above ground and a minimum of 2 feet below ground.
- Plant from 2 to 5 rows alternating the plants, using 3 foot spacing. Better survival result if the exposed tips are protected with tree grafting sealing compound.

Photo by US-LT RCD

California wildrose (*Rosa californica*)
Photo by www.msnucleus.org

California blackberry (*Rubus ursinus*)
Photo by www.plants.montara.org

Use rooted stock:

California blackberry and California rose can be established by planting rooted stock in the spring utilizing local rooted stocks when available.

- Transfer rooted stock preferably before leaves break dormancy.
- Plant in areas that retain soil moisture year-round. In precipitation zones of less than 16 inches, supplemental water may be needed for establishment.
- Do not plant in areas where rainfall is less than 10 inches.
- Select a healthy bush and dig up a clump of vines with well developed roots.
- Dig a hole approximately the depth of the roots on the shoot and a shovel width in diameter.
- Before planting, add water to the hole and let drain. Place the plant in the hole and fill half way with soil.
- Tamp soil, add water, and let drain. Fill the hole to the top with soil.
- Tamp down firmly.
- Use additional soil to make a watering basing around the plant. Fill basin with water.
- Also follow measures established by the permitting agency(ies).

Establishing Shrubs

- **Planting individual shrubs**, shrub willows and other shrubs can be put into the soil as cuttings, slips or stems. Willows can be planted as 1-year-old nursery grown rooted or as fresh hardwood cuttings purchased or gathered from local mother-stock plantings.
- **Fascine rolls** (or wattles) are bundles of willow, dogwood or poplar whips that are placed across the slope on the contours. They are set against the bank so that the parts which are to take root touch the ground above the water level and are able to get sufficient moisture. Covering them with earth improves the contact with the ground and retards the loss of moisture from the wood.
- **Brush layering** uses the same planting materials as fascine rolls however they are not tied together in bundles. They consist of layers of loose branches interlayered with soil. Generally, longer branches are used and a greater volume of planting material is required.
- **Combination with stone (riprap) facing** is useful in many places, the bank is not adequately protected by vegetation until the roots are fully developed, and temporary protection must be provided by inanimate materials. There is a wide choice of methods, including the planting of woody plants in the crevices of stone facing.
- **Maintenance of streambanks** is very important. They are always vulnerable to new damage. Repairs are needed periodically. Banks should be checked after every high water-event is over. Gaps in the vegetative cover should be fixed at once with new plants, and mulched if necessary. Fresh cuttings from other healthy plants on the bank can be used or they can be taken from mother-stocked plantings if they are available.

Photo by US-LT RCD

Channel Maintenance

Photo by US-LT RCD

- It is recommended that you contact your local RCD and NRCS office to evaluate the effect of sediment bars, snags, stump debris, trees and brush that may disturb the channel flow.
- Occasionally riparian vegetation overgrowth may occur, adversely affecting the natural flow of storm waters within the channel. In these instances, careful pruning of vegetation and/or the removal of woody obstructions may be warranted. This pruning and clearing of obstructions should be done under the supervision of your local RCD or NRCS office.
- Channel maintenance should be done before the rainy season. Permits from the California Department of Fish and Game, Army Corps of Engineers, San Luis Obispo County, local city planning department, and Regional Water Quality Control Board may be required to do stream maintenance or streambank work. Allow plenty of lead time in case a permit is needed.
- During major storms, promptly remove accumulated debris to prevent major damages during subsequent storms.
- The picture on the top is an example of a well vegetated stream banks and clear channel.

Keys to Identify Trees, Shrubs, and Groundcovers for Erosion Control
Suggested Plant List for Erosion Control in San Luis Obispo County

Primary Uses:
E: Erosion Control
G: Gully Control
L: Landslide Control
O: Ornamental
S: Screen
St: Streambank Erosion Control
W: Wildlife
Wn: Windbreak

Recommended Form of Planting:
Co: Container
Cu: Cuttings
Se: Seed
Se*: Seed must be planted in the fall or else scarified before planting

D: Deciduos **Ev:** Evergreen **N:** California Native Plant

Vegetative Soil Groups:
A: Choice of Plants NOT LIMITED BY SOILS: Soils are deep through very deep, moderately coarse through medium textured, moderately well through well-grained, moderately rapid through moderatily slow permeability. Soils in this group can have slight wetness and slight salinity or alkalinity.
B: Choice of Plants can Tolerate DROUTHINESS AND LOW FERTILITY: Soils are coarse through gravely medium textures, excessively drained, with less than 5 inches of available water holding capacity in the root zone.
C: Choice of Plants can Tolerate FINE TEXTURES: Soils are deep through very deep, moderately fine through fine textured, moderately well-drained, moderately slow through slow permeability.
D: Choice of Plants can Tolerate VERY SLOWLY PERMEABLE SUBSOILS: (Claypan) Soils are moderately well-drained, with slow or very slow subsoil permeability.
E: Choice of Plants can Tolerate WETNESS: Soils are somewhat poorly through very poorly drained. (Drained soils phases will be placed in appropriate group according to their present drainage status. Slight salinity and/or alkalinity may be present).
F: Choice of Plants can Tolerate SALINITY OR ALKALINITY: Soils are moderately through strongly saline or alkaline, and usually somewhat poorly or poorly drained.
G: Choice of Plants can Tolerate SHALLOW DEPTH: Soils are shallow through moderately deep, well-drained, over hardpan, bedrock or other fractured dense material.
H: Choice of Plants can Tolerate LOW pH: Soils are strongly through extremely acid: pH is less than 5.6
I : Choice of Plants can Tolerate TOXIC PROPERTIES OR SERIOUS NUTRIENT IMBALANCE: Soils are usually moderately through strongly affected by serpentine. Defined locally.
J: Choice of Plants DEPENDS UPON ON-SITE INVESTIGATION: Soils include those in the miscellaneous non-arable category, such as riverwash, stony or rocky upland, etc.

This list references both native and non-native plants. If you prefer to work exclusively with California native plants, please contact your NRCS and RCD Offices at (805) 434-0396 Ext. 3 and 4.

Suggested Plant List for Erosion Control in San Luis Obispo County

Trees

Common Name *Scientific Name*	Primary Uses	Resource Area	Site Limitations	Height Spread	E/D	Annual Growth	Remarks
Arizona Cypress *Cupressus arizonica*	E, Wn,W,S	C,I	1,2	20-40' 25-30'	E	Moderate	Drought tolerant, relatively resistant to deer and rabbit (Co)
Alder *Alnus*	E,G,L, St, W	C,I	1,2,4,5	30-60' 10-15'	D	Rapid	Gully and streambank protection invasive roots (Co, Se) N
Bishop Pine *Pinus muricata*	E,W,Wn	C,I	1,2,7	20-70' 20-35'	E	Rapid	Drought tolerant, disease free, easy to establish. (Co, Se*) N
Black Locust *Robinia pseudoacacia*	E,G,O,Wn	C,I	1,2	75' 15-25'	D	Rapid	Drought tolerant, hardy, thorny branchlets, aggressive roots, can spread by suckers. (Co, Se)
Elderberry *Sambucus Mexicana*	E,S,St,W	C,I	1,2	8-25' 8-20'	D	Rapid	Drought tolerant, invasive, greedy rootsystem. (Se*) N
Blue Oak *Quercus douglasii*	E,O,W	C,I	1,2	to 50' 30-50'	D	Slow	Bluish foliage, good in hot dry situations, beautiful tree. (Co. Se) N
California Laurel *Umbellularia californica*	E,G,L,O,S,W	C,I	1,2	20-25' 20-25'	E	Moderate	Excellent wildlife cover, drought tolerant, aromatic (Co, Se) N
Coast Live Oak *Quercus agrifulia*	E,O,S,W	C,I	1,2	20-70' 20-70'	E	Slow	Drought resistant, handsome tree (Co,Se) N
Common Olive *Olea europeae*	E,O,W	C,I	1,2,5,6	15-30' 10-20'	E	Slow	Drought tolerant, grows in shallow soil, full sun, messy fruit (Co)
Deodar Cedar *Cedrus deodara*	E,O,W,Wn	C,I	1,2,3,7	40-80' 20-40'	E	Rapid	Drought tolerant once established, pest free. (Co, Se)
Fremont Cottonwood Populus fremontii	E,G,St,Wn	C,I	1,2,4	40-60'+ 30-50'	D	Rapid	Tough, low maintenance; deep invasive roots, females produce messy cottony seed masses. (Co,Cu) N

Trees, continued

Prepared by NRCS and US-LT RCD

Common Name *Scientific Name*	Primary Uses	Resource Area	Site Limitations	Height Spread	E/D	Annual Growth	Remarks
Golden Rain Tree *Koelreuteria paniculata*	E,O	C,I	1,2,5	20-35' 10-40'	D	Slow - Moderate	Fall foliage, pest free, needs irrigation when young, takes drought, wind, cold, heat. (Co)
Incense Cedar *Calocedrus decurrens*	E,S,W,Wn	C,I	1,2,6,7	20-40' 15-20'	E	Slow	Pest free, can be drought tolerant if watered when young. (Co) N
Interior Live Oak *Quercus wislizenii*	E,G,O,W	C,I	1,2,	20-70' 20-70'	E	Slow	Slower growing than *Quercus agrifolia* drought resistant.(Co, Se) N
Knobcone Pine *Pinus attenuata*	E,O,S,W	C,I	1,2	20-50' 10-25'	E	Rapid	Very drought resistant once established, easily grown from seed. (Co, Se). N
Maidenhair Tree *Ginkgo biloba*	E,O	C,I	1	20-30' 10-20'	D	Slow	Fall foliage, needs irrigation through dry season, pest free, plant males only, street tree. (Co)
Monterey Pine *Pinus radiata*	E,O,W,Wn	C,I	1,2,7	30-90' 30-50'	E	Rapid	Good foliage, easy to establish, attacked by pests. (Co, Se) N
Sweet Gum *Liquidamber styraciflua*	E,O,S	C,I	1,2	60' 20'	D	Moderate	Excellent street tree, pest free, needs irrigation, surface roots. (Co)
Sycamore *Platanus racemosa*	E,G,O,St	C,I	1,2,4	50-100' 30-50'	D	Rapid	Stream bank stabilization, drought and heat tolerant, attractive tree. (Co,Cu,Se*) N
Valley Oak or California White Oak *Quercus lobata*	E,O,W	I	1,5	70' 70'	D	Moderate	Large picturesque tree, drought tolerant. (Co,Se) N

Shrubs

Prepared by NRCS and US-LT RCD

Common Name *Scientific Name*	Primary Uses	Resource Area	Site Limitations	Height Spread	E/D	Annual Growth	Remarks
Brewer Saltbush *Atriplex lentiformis brewerii*	E,G,S,W	C	1,2,4,5	5-7' 6-8'	E	Rapid	Fire resistant, drought tolerant, good wildlife cover, similar to quailbush but without spines. (Co,Se)
Bush Lupine *Lupinus spp.*	E,O,W	C,I	1,2,6	4-6' 4-6'	D	Slow	Attractive flowers. (Co,Se) N
California Buckwheat *Eriogonum fasciculatum*	E,O,W	C,I	1	1-3' 2-4'	E	Moderate	Good shrub among rocks as a groundcover, drought tolerant once established, full sun and dry slopes, self seeding. (Co, Se) N
California Holly Grape *Mahonia pinnata*	E,O,W	C,I	1,2	3-5+' 3-4'	E	Moderate - Rapid	Heat and drought tolerant, hardy, very similar to Oregon Grape. (Co,Se*) N
California Wild Rose *Rosa californica*	E,O,S,W	C,I	1,2	3-10' 3-5'	E	Moderate	Good screen accent. (Co) N
Catalina Perfume *Ribes viburnifolium*	E,O,W	C	1,2	1-3' 3-12'	E	Moderate	Sun or half shade, drought tolerant once established, excellent ground cover under oaks where heavy watering is undesirable. (Co,Se) N
Christmas Berry (Toyon) *Heteromeles arbutifolia*	E,L,O,S, W,Wn	C,I	1,2	8-10' 6-8'	E	Moderate	Attractive berries, thrive with summer water, may get pear scale, fire retardant if kept moist, drought tolerant. (Co, Se) N
Common Snowberry *Symphoricarpos albus*	E,O,W	C,I	1,2	2-6' 2-4+'	D	Moderate	Best planted as thicket, requires moisture often spreads. (Co) N
Coyote Bush *Baccharis pilularis*	E,G,W	C,I	1,2,3,4,6	6-8' 6-8'	E	Rapid	Drought tolerant, plant male. (Co,Se) N
Dogwood *Cornus stolonifera*	E,G,O, St,W	C,I	1	6-15' 6-12'	D	Rapid	Prefers moist conditions, needs sufficient water, spreads, tolerates shade. (Co, Cu) N
Four-wing Saltbush *Atriplex canescens*	E,G,S,W	C,I	1,2,4,5	3-6' 4-8'	E	Rapid	Salt tolerant, drought tolerant, good for wildlife, fire resistant. (Co,Se) N

Shrubs, continued

Prepared by NRCS and US-LT RCD

Common Name *Scientific Name*	Primary Uses	Resource Area	Site Limitations	Height Spread	E/D	Annual Growth	Remarks
Hollyleaf Cherry *Prunus ilicifolia*	E,L,O,S,W	C,I	1,2	10-20' 6-10'	E	Moderate	Attractive foliage, makes good barrier, drought tolerant once established. (Co,Se) N
Hollyleaf Redberry *Rhamnus crocea sp ilicifolia*	E,O,S,W	C,I	1	5-12' 4-10'	E	Moderate	Drought tolerant, does well in direct hot, sunny areas. (Co, Cu)
Juniper *Juniperus spp.*	E,O,S,W	C,I	1,2,3,7	varies	E	Moderate	Hardy, attractive, drought tolerant. (Co)
Lantana *Lantana*	E,O	C	1,2,6	2-6' 3-8'	E	Rapid	Colorful, full sun, infrequent water. (Co)
Lemon Bottlebrush *Callistemon citrinus*	E,O,S,W	C	1,2,5	10-15' 6'	E	Rapid	Colorful flowers, full sun, drought tolerant but best with some water. (Co)
Lemonade Berry *Rhus integrifolia*	E,O,W	C	1,2	3-10' 3-10'	E	Moderate-Rapid	Drought resistant but best with summer water. (Co) N
Matilija Poppy *Romneya coulteri*	E,O,W	C,I	1,2	3-8' spread	E	Rapid	Drought tolerant, invasive; attractive, fragrant flowers, full sun. (Co, Cu) N
Mule Fat *Baccharis viminea*	E,G,St	C,I	1,2,4	4-6' 3-4'	E	Rapid	Easy to establish, water tolerant. (Co,Cu) N
Oleander *Nerium oleander*	E,O,S	C,I	1,2,3,5	15' 15'	E	Moderate	Flowers, hardy, drought tolerant, poisonous to eat, deer retardant. (Co)
Oregon Grape *Mahonia aquifolium*	E,O,S,W	C,I	1	4-6+' 3-4'	E	Moderate - Rapid	May need summer water, easily grown, look good all year, soil binder. (Co,Se*) N
Pride of Madeira *Echium fastuosum*	E	C	1,2	3-6' 3-6'	E	Moderate	Drought resistant, attracts bees. (Co)
Pyracantha *Pyracantha spp.*	E,O,S,W	C,I	1,2,3	8-10' 8-10'	E	Moderate	Fire blight damage, red berries, thorns. (Co)
Quail Bush *Atriplex lentiformis*	E,G,S,W	I	1,2,4,5	8-10' 8-12'	E	Rapid	Salt tolerant, drought tolerant, fire resistant, good wildlife cover, sometimes spiny. (Co,Se) N

Shrubs, continued

Prepared by NRCS and US-LT RCD

Common Name *Scientific Name*	Primary Uses	Resource Area	Site Limitations	Height Spread	E/D	Annual Growth	Remarks
Atriplex lentiformis				8-12'			good wildlife cover, sometimes spiny. (Co,Se) N
Rockrose *Cistus*	E,O,S	C,I	1,2	2-5' 2-6'	E	Rapid	Hardy, sun loving, drought and fire resistant. (Co)
Rosemary *Rosmarinus officinalis*	E,O,W	C,I	1,2	2-6' 4-8'	E	Moderate	Aromatic herb, endures heat, little water once established. (Co)
Red Clusterberry *Cotoneaster parneyi*	E,O,S,W	C,I	1,2	6-8' 6'	E	Rapid	Can be invasive, low maintenance, full sun, drought tolerant. (Co)
Sagebush Wormwood *Artemisia douglasiana*	E,O,W	C,I	1,6	2-10' 2-8'	E	Moderate	Drought tolerant, perennial shrub, aromatic, thrives on neglect, full sun.(Co)
Star Jasmine *Trachelospermum jasminoides*	E,O	C,I	2	1-2' 4-5'	E	Moderate	Can be spreading shrub, fragrant, attracts bees, needs water. (Co)
Sugar Bush *Rhus ovata*	E,O,W	C,I	1	3-10' 3-8'	E	Moderate - Rapid	Fire resistant if watered, drought tolerant. (Co) N
Willow *Salix spp.*	E,G,L, St,W	C,I	4	10-40' 10-40'	D	Rapid	Streambank protection. (Co Cu) N

Groundcovers & Fence Climbers

Prepared by NRCS and US-LT RCD

Common Name *Scientific Name*	Primary Uses	Resource Area	Site Limitations	Height Spread	E/D	Annual Growth	Remarks
Australian Saltbush *Atriplex semibaccata*	E,G,S,W	C,I	1,2,4,5	to 1' 1-6'	E	Rapid	Dense mat, fire resistant, drought tolerant. (Co,Se)
Bearberry Kinnikinnick *Arctostaphylos uva-ursi*	E,W	C,I	1	2-6' to 15'	E	Slow	Best with infrequent water. (Co) N
Califonia Blackberry *Rubus vitifolius*	E,G,O,St,W	C,I	1,2,3	3-6' spread	E	Rapid	Good to trail over concrete structures, hardy. (Co) N
California Fuschia or Hummingbird Flower *Zauchneria califomica*	E,O,W	C,I	1,2	1-3' spread	E	Rapid	Attractive flower, self-seeding, may need water, invasive. (Co, Se) N
Carmel Creeper *Ceanothus griseus horizontalis*	E,O,W	C,I	1,2,7	2' 8-12'	E	Rapid	Sun, drought tolerant, excellent bank cover. (Co) N
Dwarf Coyote Bush *Baccharis pilularis var.*	E,W	C,I	1,2,3,5	8-24" 6+'	E	Moderate	Valuable bank cover, grows in most soils and climates. (Co,Se) N
Garden Lippia *Phyla nodiflora*	E,O,W	C,I	1,2	2" spread	E	Rapid	Drought tolerant once established, low mat, attracts bees; excellent, tough groundcover. (Co)
Honeysuckle *Lonicera japanica halliana*	E,O,S,W	C,I	1,2,4	2-3' 20-30'	D	Rapid	Climbing cover for fences, needs irrigation, attracts bees, can become a weed, needs pruning to avoid fire hazard. (Co)
St. Johnswort *Hypericum calycinum*	E,G,O	C,I	1,2,4	1-2' Spread	E	Moderate	Sun or shade, attractive flowers, invasive if not confined, can stand some drought but best when watered. (Co)
Sonoma Manzanita *Arctostaphylos densiflora*	E,O,W	C,I	1,2,7,8	2-6' 4-6'	E	Moderate	Needs good drainage, attractive flowers, infrequent water. (Co) N

References

For more information on Streambanks And Shorelines Restoration, Management And Protection With Vegetation, Please Contact Your Local RCD, NRCS, FSA Offices and the San Luis Obispo Pollution & Erosion Reduction Center (SLOPERC):

65 Main Street, Suite 107
Templeton, CA 93465
Phone #: (805) 434-0396 Ext. 3 and 4.
Fax #: (805) 434-0284

The following websites and references offer information about Shorelines Restoration, Management And Protection With Vegetation :

- Cumberland County SWCD, Knox Lincoln SWCD, Maine Dept. of Environmental Protection, Maine Soil and Water Conservation Commission, Portland Water District, Time and Tide RC&D Area, US Environmental Protection Agency, and USDA Soil Conservation Service. *Vegetative Stream Bank Stabilization*. 5 pp. (Not Data).
- Land and Water.. City of Brookfield, WI. *Streambank Stabilization Project*. March/April 2004 61-63 pp.
- Upper Salinas and Las Tablas RCD, USDA. *Using Shrubs and Trees to Control Streambank Erosion*. March 1984.
- http://www.na.fs.fed.us/spfo/pubs/n_resource/stream/str_cov.htm
- http://www.fxbrowne.com/html/biocase.htm
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CHAPTER V. WILDLIFE UPLAND HABITAT MANAGEMENT

WILDLIFE UPLAND HABITAT MANAGEMENT

Photo by US-LT RCD

Wildlife Upland Habitat Management means retaining, creating or managing areas for wildlife food and shelter.

These areas are important to :

- Provide food and cover for wildlife
- Increase wildlife population
- Bring wildlife into new areas
- Provide soil protection from wind and water erosion
- Enhance the natural beauty of an area

Photo by NRCS

Choosing Suitable Areas:

- Overgrown brushlands
- Fence rows
- Streambanks
- Roadsides
- Field corners
- Eroding hillsides
- Areas that cannot be conveniently cropped or are in need of erosion protection.

Considerations:

- Location of food and cover in relation to water; need to develop additional water.
- Area of planned wildlife habitat improvement in relation to areas that are currently used by wildlife. Do not want to develop habitat that is far removed from current wildlife populations. They won't move to the area. Consider vegetated travel lanes to habitat area.
- Species of wildlife to be benefited.
- Food, cover and water needs of desired wildlife.
- Plants that provide maximum benefit to wildlife and land.
- Select plants that will grow in your area.
- Protect plants from destruction by livestock.
- Protect areas from fire, pesticides and destructive cultivation.
- Use of trees for nesting and winter cover.

Photo by F&WS

Establishing Woody Plants

Photo by NRCS

Small trees and shrubs are excellent sources of food and cover for upland wildlife such as deer, elk, rabbits, quail, and other local species. To improve upland habitat in areas where woody plants are scarce, several plant species can be established in fence rows and underutilized areas on urban, crop or range land.

Several requirements must be met to successfully establish and use plants:

- Proper selection of species
- Proven seeding and planting techniques
- Adequate maintenance
- Protection from grazing

Examples of Enhancement

Quail (*Callipepla californica*):

- **Food:** Plant Lana Vetch (*Vicia villosa spp dasycarpa*), wheat (*Triticum aestivum*), safflower (*Carthamus tinctorius*), and sorghum/milo (*Sorghum vulgare spp subglabrescens*) to supplement the natural food supply.
- **Escape Cover:** Quail need scattered clumps of dense ground cover to escape predators. Hedgerows of rose (*Rosa californica*), blackberry thickets (*Rubes urcinus)*, and quail bushes (*Atriplex lentiformis*) are examples. Well constructed brush piles make good substitutes but must be renewed every three to five years.
- **Roosting Cover:** Quail roost in trees or tall shrubs and need protection during cold, wet periods of the year. Evergreen tress such as live oak and Arizona cypress are good examples as are shrubs such as Holly leaf cherry and Toyon.
- **Water:** The California valley quail is reported to range from ½ to 1 mile for water while mountain quail may go 2 miles to water. If water is not available, a suitable substitute such as a guzzler must be supplied for them.

Photo by www.nhptv.org

Mule deer (*Odocoileus hemionus*) and Tule elk (*Cervus elaphus nannoides*):

Photo by NRCS

- **Food:** Mature stands of timber, including oaks, shade out most of the under-story of shrubs, forbs and grasses that provide deer food and must be opened up by harvesting or selective thinning. Mature brush stands provide little deer feed because most growing tips are out of reach of the deer and the canopy shades out forbs and grasses. Brush stands can be opened up to create openings for forbs and grasses and to get new seedlings and sprouts started at ground level for deer to eat. In open grassland, hedgerow plantings and tree plantings will provide better food conditions for deer.
- **Cover:** Good deer habitat has a diversity of cover types: Trees, brush and open grassland.
- **Water:** The development of water for deer at 1-mile intervals and at sites with suitable food and cover vegetation is the optimum.

Relationships between Wildlife and Trees, Shrubs and Vines:

Almost all plants benefit wildlife in some manner, trees, shrubs and vines provide food and cover, essential elements for the wildlife survival. Much of this vegetation is not available at nurseries and must be started from seed or cuttings taken from the wild.

Before planting Trees, Shrubs and Vines, you should consider:

- If possible, before setting out young plants, seeds or cuttings, it would be best to observe adult plants growing in natural conditions. By noting where and how they grow best, and by trying to duplicate the same conditions, a higher survival may be obtained.
- Plants may vary in size and growth pattern if they are started in high fertility soil, have better moisture conditions, and are not crowed by other plants or grasses.
- Most dry area or drought tolerant plants require little or no moisture during the summer months. Frequent watering can actually weaken or drown them during this normal dry period.
- All plants, especially young ones should be considered vulnerable to browsing and grazing by animals or girdling by rodents. Be prepared to install a protective fence or provide other protection at the first sign of damage.

Planting Trees or Shrubs for Wildlife Enhancement

1. Dig the hole no deeper than necessary, approximately the depth of soil in the container and twice the diameter of the can
2. Before planting, add water to the hole and let drain.
3. Make a 50/50 mixture of the loose planting soil and organic matter (humus, pre-moistened peat moss, or potting soil). To this planting mix add about 1/8 lb. of fertilizer for gallon size plants and twice that amount for five gallon size plants. Fill the bottom four inches of the hole with the above mixture, mound and firm.
4. Cut the can and gently remove plan and attached potting soil. Loosen the roots on the bottom to encourage rapid rooting.
5. Place plant in hole and fill half way with planting mixture. Be sure that crown of plant lies above grade. Tamp mixture, add water, and let drain.
6. Fill the hole to top with planting mixture being careful not to cover the crown. Tamp down firmly. Use additional soil to make watering basin around the plant. Be sure that water drains away from the trunk. Water thoroughly and continue to water at frequent intervals until plant is well established.

By Better Homes and Gardens

LIST OF PLANTS THAT PROVIDE WILDLIFE HABITAT

Symbols:
D: Decidious
E: Evergreen

F: Fair
G: Good
O: Outstanding
P: Poor

Note: This list references both native and non-native plants. If you prefer to work exclusively with California native plants, please contact your NRCS and RCD Offices at (805) 434-0396 Ext. 3 and 4.

Plant Name Comon and Scientific	Soil Moisture	California's Native	Food	Cover	Evergreen or Decicious	Remarks
Acacia (*Acacia longifloia*)	Well drained	No		O	E	If left unpruned, provides excellent wildlife cover. Produces abundant seeds but food value unknown. Medium sized tree or very large bush. Suitable West of Coast Range.
Acacia (Acacia retinoides)	Well drained	No		O	E	Same as above
Bladder pod (*Isomeris arborea*)	Dry to semi-moist, needs good drainage	Yes	G	G	E	Plant does well in semi-arid locations.
California blackberry (*Rubus vitifolius*)	Moist areas	Yes	G	O	E	Produces good food supply and excellent wildlife cover. Vine, has thorns.
California buckwheat (*Eriogonum fasiculatum*)	Dry to semi-moist well drained soils	Yes	F	G	E	Excellent quail nesting cover. Seeds taken by birds. Small bush. Plant does well in arid locations.
Coffee berry (*Rhamnus californica*)	Dry to moist	Yes	F	F	E	Limites berry producer. Bush.
Common Fig (*Ficus carica*)	Dry to semi-moist	No	O	G	D	Fruit utilized by all wildlife. Trees left unpruned make good ground cover for all wildlife.
Common Olive (*Olea europea*)	Well drained, tolerates dry areas	No	G	O	E	Olives taken by birds. Trees left unpruned make excellent roosting and ground cover. Dense foliage.
Cotoneaster (*Cotoneaster sp.*)	Needs drainage and occasional watering	No	G	O	E	Berries abundant, excellent food for birds late fall and winter. Bush or small tree has no thorns.

Continue...

Symbols:
D: Decidious
E: Evergreen

F: Fair
G: Good
O: Outstanding
P: Poor

Plant Name Comon and Scientific	Soil Moisture	California's Native	Food	Cover	Evergreen or Decicious	Remarks
Eucalyptus (*Eucalyptus globules*)	Well drained. Dry to semi-moist	No		G	E	Produces heavy cover. Birds may use for roosting cover. Thick foliage medium-sized tree. Hardiness from 17° to 22°.
Flowering currant (*Ribes malvaceum*)	Dry well-drained soils	Yes	G	F	D	Moderate fruit producer. Hardy shrub, no thorns.
Flowering Gooseberry (*Ribes speciosum*)	Semi-moist to moist, needs drainage	Yes	F	F	E	Moderate fruit producing, tall shrub, has thorns.
Holly leaf cherry (*Prunus ilicifolia*)	Dry to semi-moist	Yes	F	G	E	Fruit taken by birds. Large bush or small tree.
Huckleberry (*Vaccinium ovatum*)	Moist	Yes	G	G	E	Moderate fruit producer. Does well in shade. Small bush.
Hybred domesticated blackberry (Rubus sp.)	Semi-moist to moist, needs drainage	?	E	G	E	Hybred blackberries may not be as hardy as the wild species but they produce abundant fruit and cover. Vine, both thorn and thornless varieties.
Mulberry (*Morus sp.*)	Dry to semi-moist	No	G	G	D	Grows to a large tree. Abundant fruit, utilized by birds and animals.
Pyracantha (*Pyracantha sp.*)	Needs drainage and occasional watering	No	O	O	E	Berries abundant, excellent food for birds late fall and winter. Bush or small tree has thorns, can get to be a pest.
Redberry (*Rhamnus crocea*)	Dry to semi-moist	Yes	F	F	E	Moderate fruit producer, not all plants produce. Medium to large size bush ot tree.

Continue...

Symbols:
D: Decidious
E: Evergreen

F: Fair
G: Good
O: Outstanding
P: Poor

Plant Name Comon and Scientific	Soil Moisture	California's Native	Food	Cover	Evergreen or Decicious	Remarks
Salt or Quail bush (*Atriplex lentiformis*)	Dry to semi-moist, well drained	Yes	P	O	E	Heavy cover of large bushes provides cover and nesting cover. Hs some food value for wildlife. May need some protection from browsing animals. Does well in dry alkaline areas.
Sercice berry (*Amelanchier pallida*)	Moist areas	Yes	G	F	D	Limited berry producer but readuly taken by wildlife. Bush.
Snow berry (*Symphoricarpos albus*)	Semimoist	Yes	F	F	D	Often killed or damaged by browsing animals. Bush.
Thimbleberry (*Rubus parvaiflorus*)	Moist areas near streams and springs	Yes	G	G	D	Produces moderate food supply. Tolerates shade and supplies good cover for small wildlife. More of a small bush than vine.
Western Choke cherry (*Photinia arbutifulia*)	Needs drainage, tolerates dry areas	Yes	G	G	E	Produces moderate aupply of berries late fall and winter utilized by birds. Large bush.
Wild rose & Multiflora rose (*Rose sp.*)	Moist	Yes	P	G	D	Rose hips taken by wildlife. Plants tolerate short flooding. Does poorly in shade. Multiflora rose has been used for fence rows in the eastern States with good results and needs moisture in San Luis Obispo County. Can get to be a pest.

References

For more information on Wildlife Upland Habitat Management, please Contact Your Local RCD, NRCS And FSA Offices At:
65 Main Street, Suite 107
Templeton, CA 93465
Phone #: (805) 434-0396 Ext. 3 and 4.
Fax #: (805) 434-0284

The following websites and references offer information about Wildlife Upland Habitat Management :

- http://www.sierratel.com/miamilo/flamstat.htm
- http://www.ces.ncsu.edu/nreos/forest/steward/www18.html
- http://www.vdof.org/
- http://www.dfg.ca.gov/whdab/cwhr/pdfs/VOW.pdf
- http://www.centralcoast.wilds.com/references.html
- http://www.conserveonline.org
- http://www.ca.blmgov/caso/wf.map.html

CHAPTER VI. USE OF CONTROLLED BURNING FOR WILDLIFE HABITAT IMPROVEMENT

USE OF PRESCRIBED BURNING FOR WILDLIFE HABITAT IMPROVEMENT

Fire at Hwy 58 in Creston, San Luis Obispo County, CA
Photo by US-LT RCD

Before using prescribed burning on any property, ranchers and landowners should contact the California Department of Forestry – CDF and the Air Pollution Control District - APCD for permits, recommendations and guidance to the specific area to be burned.

Managing for wildlife involves the maintenance and enhancement of the food, water and cover components, necessary for healthy populations. The use of prescribed burns is a successful management tool to help control weeds, reduce plant litter, recycle nutrients, and improve health and vigor of the native plant communities.

In all uses of prescribed fire, there are consistent management requirements. These include measurable objectives, qualified personnel, quantified ranges of conditions under which burns will be conducted, a description of actions which will be taken if these conditions are exceeded, a monitoring and documentation process and a review and approval process.

What is prescribed fire?

Prescribed fire is the controlled application of fire to the land to accomplish specific land management goals. Ignitions may be either human- or naturally caused. Benefits include:

- **Reducing fuel build-up:** Dead wood, overcrowded, unhealthy trees, and thick layers of pine needles can all contribute to catastrophic wildfires.
- **Prepares the land for new growth**: When excess vegetation or needle layers are burned off, nitrogen and other nutrients are released into the soil and become available for new plants to grow.
- **Helps certain plants/trees germinate:** Many native plant and forest communities have adapted to fire for their germination and growth. Seed contact with bare soil (such as that exposed by a fire) is necessary for some species to naturally regenerate. (some pine species for example.)
- **Naturally thins overcrowded forests:** Thinned forests can recover faster and are more resistant to insect and disease attacks. Currently, most of mature forests in California are overcrowded, resulting in a lack of vigor and health.
- **Creates diversity needed by wildlife:** Fire creates a varied land and vegetation pattern that provides diverse habitat for plants and animals. Grazing wildlife benefit from new growth as shrubs produce succulent edible leaves when resprouting after a fire.

Trees and grasses after fire
Photo by US-LT RCD

What about the smoke?

Controlling where the smoke will go is an important part of every prescribed burn. Before each burn, land managers look carefully at what they plan to burn and the proximity of houses, roads, and other smoke sensitive sites to the planned burn area. The burn prescription is then written to mitigate negative impacts of smoke, especially to individuals who may be smoke-sensitive. Smoke, however, is a natural byproduct of fire and some amounts are unavoidable. Periodic prescribed burns prevent heavy fuel accumulation that would send a larger amount of smoke into the air should an uncontrolled wildfire occur.

Grasses sprouted quickly after fire
Photo by US-LT RCD

What is a burn prescription?

A burn prescription helps ensure that the objectives of the burn are met, as well as addressing safety issues. Land managers determine if the resource would benefit from a slow, consuming fire versus a hotter fire. The burn prescription determines the environmental conditions necessary for meeting resource objectives in a safe, effective manner. The prescription includes how the fire will be ignited and contained and what resources, such as fire trucks and personnel, must be on site before burning may begin. Burning permits are completed when required.

Who does the burning?

Prescribed burns are conducted by trained fire management professionals who have studied fire behavior and fire control techniques. These prescribed burn professionals help ensure the safety of the burn crew, nearby residents, and property.

What can a homeowner expect?

Prescribed fire provides many important benefits, but some short-term undesirable aspects may also exist.

- **Smoke:** Fire management professionals make great efforts to reduce smoke impacts; however, some smoke will be unavoidable.
- **Smell:** A campfire smell may be present for several days after the burn.
- **Scorching:** Some scorching of lower tree branches (or even the entire tree) is to be expected. After the fire some needles will turn orange and eventually drop from the tree.
- **Weeds:** Weeds commonly invade disturbed areas and can be expected at burned sites.
- **Barren look:** Immediately after a burn, the treated site may appear charred and lifeless. This temporary condition will be replaced by the resprouting of grasses, forbs, shrubs, and seedling trees.

Prescribed fire can improve wildlife habitat. Old, dense stands of trees, brush and bushes are almost impenetrable and provide limited food for wildlife. With controlled burning, these stands can be opened for wildlife travel, and seedlings and sprouting shrubs provide excellent source of food and cover.

To prevent the undesirable buildup of excessive litter, grass stands will require periodic burning. Ideally prescribed burning could be used annually on 20% to 33% of the acreage so that some portions are always freshly burned while other areas have one or more years grass growth.

Acreage should be divided with fireguards so that the size of burns is kept relatively small. The desired effect should resemble a patchwork quilt or mosaic design. Since woody vegetation is critical to wildlife, fireguards or fire retardants should be used to protect areas where brush or trees are becoming established.

In order to favor the growth of forbs, burning should be conducted as early as possible after frost. Late winter burning encourages grass and discourages forbs.

Controlled burning of old fields and pastures on a periodic basis improves grass and brush habitat for wildlife. Fire removes accumulated dead plant materials and releases nutrients. The lush herbaceous growth following fire provides browse and cover for deer, grouse and rabbits and attracts insects and songbirds who feed on them.

Photo by US-LT RCD

A long-term prescribed burning program will improve the overall health and condition of the plant communities at the site, and improve the condition of the wildlife habitat as well.

Remember: Before any burning is done, contact the CDF and APCD for permits, recommendations and guidance specific to the area to be burned.

References

For more information on Prescribed Burns, please contact your local California Department of Forestry and Fire Protection at:
1-800-834-2876
Your local Air Pollution Control District at:
(805) 781-5912

Also, contact your local RCD, NRCS And FSA Offices At:
65 Main Street, Suite 107
Templeton, CA 93465
Phone #: (805) 434-0396 Ext. 3 and 4.
Fax #: (805) 434-0284

The following websites and references offer information about Prescribed Burns:

- http://www.fire.ca.gov/resourcemanagement/vegetationmanagement.asp
- http://www.firewise.org/co/rxfire.html
- http://www.agecoext.tamu.edu/commodity/crp/six/crpdale.htm
- http://www.ces.ncsu.edu/nreos/forest/steward/www18.htm
- http://www.UniversityofNewHamshireCooperativeExtension.edu
- http://www.rfets.gov/eddie/ecology/ecologyprogram/main.asp
- http://www.lamr.colostate.edu/~montrose/rxfire_4_brush.htm
- http://www.slocleanair.org

CHAPTER VII. NOXIOUS WEEDS

NOXIOUS WEEDS

Arundo or Giant reed Weed *(Arundo donax)* Photo By US-LT RCD

What Is A Noxious Weed?

Noxious weeds are plant species that have been designated "noxious" by law. The word "noxious" simply means injurious, and all listed weeds are deleterious by definition. Weeds are undesirable plants that infest either land or water resources and cause physical and economic damage.

The term "weed" means different things to different people. In the broadest sense, it is any plant growing where it is not wanted. Weeds can be native or non-native, invasive or non invasive, and noxious or not noxious. Legally, a noxious weed is any plant designated by a Federal, State or county government as injurious to public health, agriculture, recreation, wildlife or property. A noxious weed is also commonly defined as a plant that grows out of place. Noxious weeds are spreading like biological wildfire and are out of control in many areas of North America.

Are Invasive Plants The Same As Noxious Weeds?

No. Invasive plants include not only noxious weeds, but also other plants that are not native to this country. The BLM considers plants invasive if they have been introduced into an environment where they did not evolve. As a result, they usually have no natural enemies to limit their reproduction and spread. Some invasive plants can produce significant changes to vegetation, composition, structure, or ecosystem function.

There are an estimated 18,000 native plant species in United States. In addition, 25,000 exotic plant species have been introduced; approximately 5,000 of these have become establish in natural and managed ecosystems. Many of these introduced species are now serious pests in U.S. pastures and rangelands.

Noxious weeds plants were introduced into California from Europe and other areas across the globe. These plants have been disseminated in cropland, rangeland, and wildland areas in San Luis Obispo County.

Negative Impacts Associated With Noxious Weeds:

- They can displace native plants
- They can affect threatened and endangered species
- They can alter normal ecological processes such as nutrient and water cycling
- They can alter water flow and availability to wildlife
- They can decrease wildlife habitat and reduce wildlife forage
- They can alter thermal and escape cover
- They can reduce territorial space necessary for wildlife survival
- They can reduce recreational value
- They can increase soil erosion and stream sedimentation
- They can reduce biodiversity
- They can alter the functioning of riparian areas
- They can disrupt agricultural activities in vineyards, orchards, and row crops.
- They can reduce the productivity of pastures and rangeland causing a reduction in usable land.
- They are very invasive weeds and they have been spreading rapidly over the past 100 years.

(*Ludwigia uruguayensis* Camb. Hara)

(*Datura innoxia* Mill.)

Photos by US-LT RCD

Categories of Weeds:

Weeds can be divided in two categories, annuals and perennials.

- **Annual weeds** are plants that produce a seed crop in one year and then die. They are very well adapted to succeed in highly unstable and unpredictable environments brought about by frequent tillage, drought, or other disturbance. They put more of their life cycle into making seed for the next generation. This survival strategy serves plants in disturbed environments well, since their environment is likely disturbed again. The annual weed plant must make a crop of seed as soon as possible before the next disturbance comes. Annual plants also yield more seed than do perennial plants, which is why humans prefer annual over perennial crops for grain production. Tillage operations used to establish annual crops plants also create a desirable environment for annual weeds. Annual weeds are very successful because they have long-lived seed, variable seed dormancy habits, rapid vegetative growth, high seed production, some seeds produce even in harsh conditions and the sprouting requirements are adaptable to many environments.

- **Perennial weeds** prosper in less-disturbed and more stable environments. They are more common under no-till cropping systems. Perennial weeds put some energy into preserving the parent plant while producing a modest amount of seed for future generations. After a field is converted from conventional tillage to no-till, the weed population generally shifts from annual to perennial weeds. Similar to the annual weeds, perennial weeds are very successful because they have seed dormancy, long-lived seed and competitiveness. Also, some perennials have perennating parts such as stolons, bulbs, tubers, and rhizomes. These parts allow the parent plan to regenerate if damaged and to produce new plants from the parent plant without seed. Additionally the perennating parts serve as food storage units that also enhance survival. These stored-food reserves allow for the rapid regrowth perennial weeds are known for.

(Vicia sativa L.)

(*Centaurea solstitialis* L.)

Photos by US-LT RCD

(*Brassica nigra*)

Equisetum arvense L.

The Root Cause of Weeds

When a piece of land is left fallow, it is soon covered over by annual weeds. If the field is left undisturbed for a second year, briars and brush start to grow. As the follow period continues, the weed community shifts increasingly to perennial vegetation. By the fifth year, the field will host large number of young trees in a forest region, or perennial grasses in a prairie region. This natural progression of different plant and animal species over time is a cycle known as *succession.*

Weeds are evidence of nature struggling to bring about ecological succession. When native vegetation is cleared to establish annual crops, the cropland is holding back natural plant succession. To better understand this process, think of succession as a coil spring. Managing cropland as an annual monoculture compresses the spring – leaving it straining to release its energy as a groundcover of weeds. In contrast, biodiversity perennial grassland or forest is like the coil spring in its uncompressed condition – a state of relative stability with little energy for drastic change. Biodiversity leads to more stability for the ecosystem as a whole.

Control Methods for Noxious Weeds:

A noxious weed action plan should be developed in order to consider all available resources and tools. The integrated utilization of diverse noxious weed control methods should focus on the most economical and effective. Anything that weakens the weed, prevent spreading, or prevent seed production can be a valuable tool.

Types of Weeds Control Methods:

- **Biological Control:** By organisms such as insects, pathogens and grazing animals and competition such as replanting, grazing management and forest canopy management.

✓ *Organisms:*
Insects are the primary introduced biological control tool being used against noxious weeds. However, it may take a few years for the insect population to multiply to a sufficient level for effective weed control. Therefore the perimeter of infestations should be chemically controlled to prevent the spread of the weeds while the insects are multiplying.

- *Pathogens* are disease causing organisms including fungi, bacteria, viruses, etc. This area of weed control warrants more exploration.
- *Grazing animals* are being used successfully to help suppress weed growth and seed development.

✓ *Competition:*

- *Replanting competitive plants* in areas where noxious weeds have been controlled can help reduce reestablishment of the weeds from residual seed. Replanting also helps reduce soil erosion.
- *Graze management* is a valuable tool for controlling weed establishment and growth. Overgrazing will favor the growth of weeds while taller grasses shade the soil and provide competition against weeds.
- *Forest Canopy management* provides a balance of large tree and understory plants to compete with noxious weeds for light, water, and nutrients.

(*Phalaris aquatica*)

- **Cultural Control:** By prevention, mowing, cultivation and fire.
  - *Prevention* is the best way to avoid having a problem. Preventing infestation is far more economical than trying to control an established noxious weed problem. Most noxious weeds have entered the United States as crop seed contaminants. Planting certified seed provides cheap insurance against weed introduction. Utilization of certified weed free forage can aid preventing weed introductions on range and forest lands. Cleaning equipment prior to moving to a new location reduces weed seed movement.
  - *Mowing* at the right stage of plant development can prevent flowering and subsequent seed production.
  - *Cultivation* by machine or hand, or even hand pulling can control weeds.
  - *Fire* has been used for disease and weed seed control for many years in the grass seed industry.

- **Chemical Control:** By selection and treatment.

✓ *Select for:*

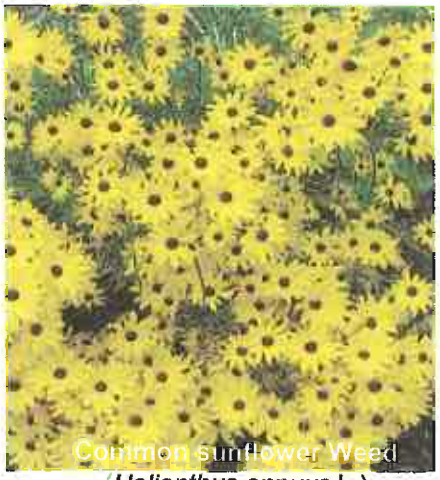
- *Effectiveness* for control of a weed can vary considerably between herbicides. When selecting a herbicide, be sure that the target weed and intended use is on the label. A herbicide efficacy chart can provide valuable information when selecting a chemical.
- *Least Environment Impact* chemicals should be selected that will target the weed with little or no effect to non-target organisms or water quality. Select a chemical that will do an effective job and will not persist but will break down rapidly in the environment.
- *Economics* plays a part in selecting a practical herbicide. Just because an herbicide is expensive doesn't mean that it couldn't be more economical. Number of treatments may be reduced if effectiveness is better for specific weed species. Personal and environmental safety and the rate of chemical per acre must also be considered.

(Silybum marianum L.)
Photo By US-LT RCD

- *Treatment:*
General application may be required if a large area is infested with noxious weeds.
Spot treatments are used when the noxious weeds infestation is sporadic or in small areas. It is recommended that the perimeter of the weed patch is sprayed to control small, undetected seedlings.

What Can You Do?

- Educate yourself and help to educate your friends and neighbors about weed problems.
- Learn about your particular weed species. Be able to identify the weed in its different life stages and determine the best method and the best time of the year to control it.
- Don't contribute to the problem. Most people are not aware that they could actually create or facilitate a new weed infestation.
- Noxious weeds can be spread into uninfested areas through contaminated hay, seeds, or nursery stock. Weed seeds can also become lodged into vehicle tires, equipment, and even boots and clothing, and then spread into new areas. Clean all after each use.
- Always check your vehicle for plants or seeds when leaving an infested area.
- Be aware when moving soil, compost, or equipment and remember that some seeds can be viable for 10 years or more.
- Do not introduce unknown plants or seeds into your county.
- There are also certain plants that are known to be invasive that are still sold in nurseries. Ask your nursery if the landscape plants you are purchasing could escape from your yard and create a problem for the agricultural industry or the environment.
- Closely monitor areas of bare ground and other disturbed spots on your property, as this is often where noxious weeds establish their foothold.
- Don't transport firewood, if you take firewood with you when camping, you don't know what you are taking with it. Use the wood near your campsite.



(*Helianthus annuus* L.)
Photo by USDA Online
Photography Center

- Never dump aquarium-water, plants or pets into wetlands, waterways or storm drains. Use the toilet or sink, or a spot in the yard far from open water.
- Empty stray water from your canoe, dive gear and other outdoor equipment before heading for home.
- Wash and brush dogs after trips to the water or woods.
- Keep your eyes open. If you notice a plant that seems out of place, report its location and sighting to the San Luis Obispo County Department of Agriculture at (805) 781-5910.

REMEMBER:

"Weed control is an annual task, NOT a one-year miracle". Prepare yourself for a long-term commitment to weed management. Even with a successful control program, there will be viable seeds in the soil for a number of years. Be certain to monitor for missed plants or reinfestations after your initial control efforts. Reestablish desired plants species to replace your unwanted weeds. If you leave areas of bare ground, you will only have more weeds return.

"An ounce of prevention is worth a pound of cure". It is always easier to solve the problem in the early stages. A small infestation will likely develop into a major one if left unchecked.

"Understand your different weed control options". Most successful weed control programs utilize numerous control methods, combining several into an effective, integrated approach. Early detection, integrated weed management strategies, and diligent follow-up are all keys to a successful program.

Mixture of weeds in a ranchland area
Photo by US-LT RCD

References

For more information on Noxious Weeds, please Contact Your Local RCD, NRCS and FSA Offices At:
65 Main Street, Suite 107
Templeton, CA 93465
Phone #: (805) 434-0396 Ext. 2, 3 and 4.
Fax #: (805) 434-0284

The following websites and references offer information about Noxious Weeds :

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- www.weedawareness.org/IMPACTA.html
- http://wric.ucdavis.edu/yst/yst.html
- http://www.state.sd.us/doa/das/IWM.html
- http://pep.wsu.edu/hortsense/weedterms.html
- http://www.co.boulder.co.us/penspace/resources/weeds/weeds_mech.html

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