Sediment & Erosion Control Plans (SECP)

An Irrigated Lands Regulatory Program
Grower Self-Certification Training






Curriculum Binder

Central Valley Water Quality Coalitions

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SOIL AND WATER CONSERVATION SOCIETY

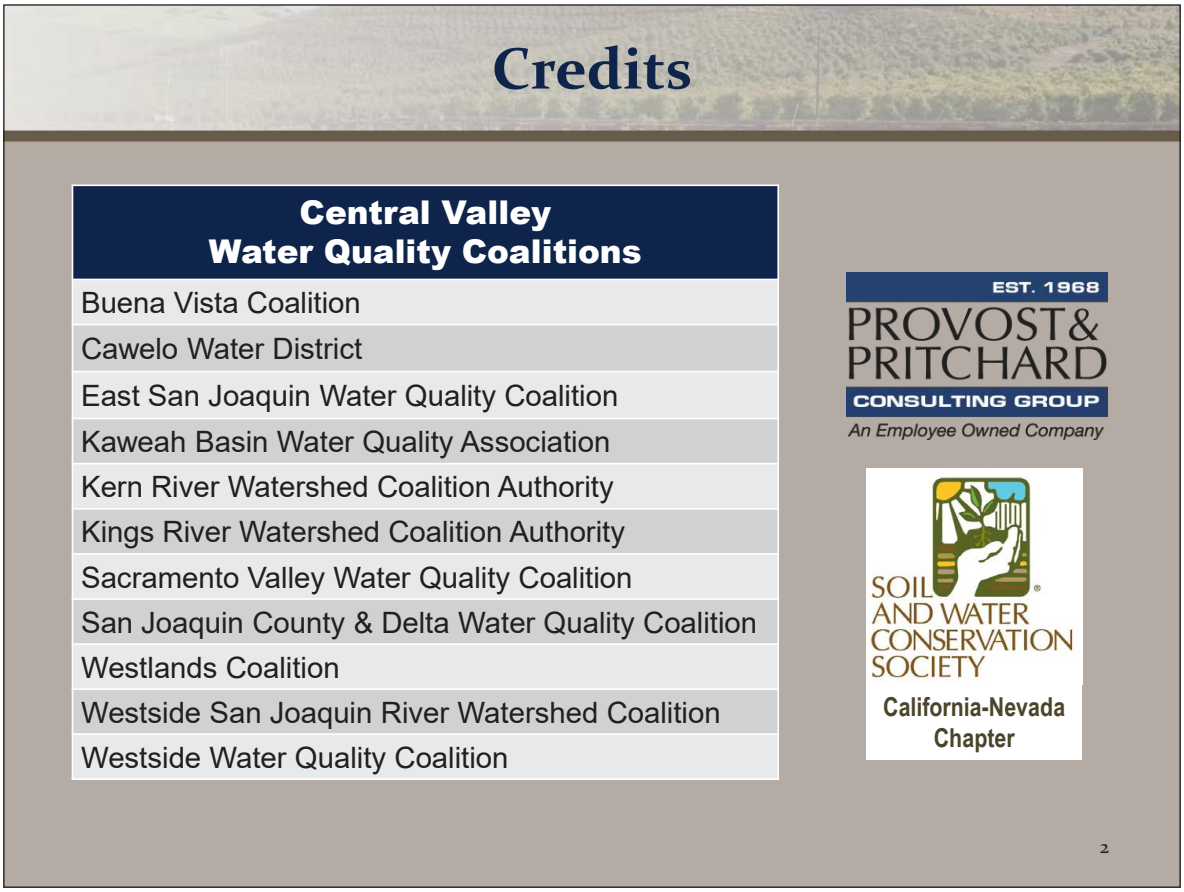
Section 1:
SECP Curriculum

Section 1: SECP Curriculum Index

Acronym Reference Sheet

Acronyms	
Acronym	**Definition**
APN	Assessor's Parcel Number
CASQA	California Stormwater Quality Association
CTA	Conservation Technical Assistance Program
DU	Distribution Uniformity
EQIP	Environmental Quality Incentives Program
FOTG	Field Office Technical Guides
GIS	Geographic Information System
ILRP	Irrigated Lands Regulatory Program
K	K-Factor or Soil Erodibility Factor
lbs	Pounds
m	Meter (3.28 Feet)
mm	Millimeter (0.04 inches)
NHD	National Hydrography Dataset
NRCS	Natural Resources Conservation Service
PAM	Polyacrylamide
RUSLE	Revised Universal Soil Loss Equation
SDEAR	Sediment Discharge and Erosion Assessment Report
SECP	Sediment and Erosion Control Plan
UCANR	University of California Agriculture and Natural Resources
USGS	United States Geological Survey
WDR	Waste Discharge Requirements


Irrigated Lands Regulatory Program (ILRP) Grower Self-Certification Training
Sediment & Erosion Control Plans (SECPs)

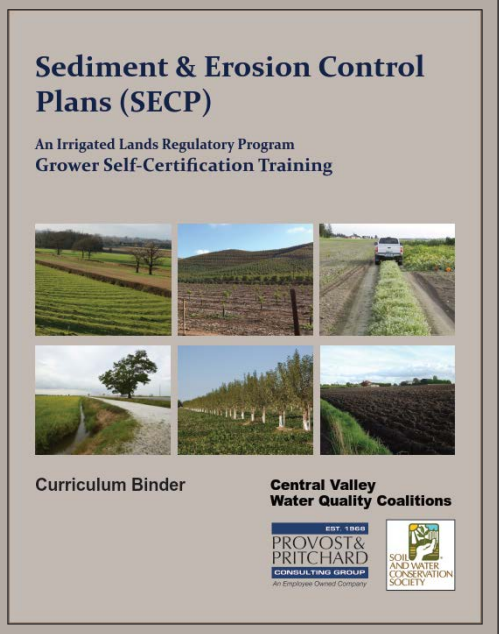


The Central Valley Water Quality Coalitions shown above hired Provost & Pritchard Consulting Group (Provost & Pritchard) as the primary technical consultant to develop this SECP Self-Certification Program. The coalitions also provided reviews of the content. The California-Nevada Chapter of the Soil and Water Conservation Society (CA-NV SWCS) also provided technical support for this curriculum.

The Central Valley Regional Water Quality Control Board (Regional Board) reviewed this curriculum and provided feedback to the coalitions and the technical team.

Contents of the Curriculum Binder

1. Hard copy of this presentation with the notes and acronym sheet;
2. NRCS District Conservationist Contact Resources;
3. SECP, NRCS, and CASQA Management Practice Code Linkage Sheet (covered in next slide);
4. NRCS and CASQA Practice Standards;
5. Blank & Example SECP Forms.



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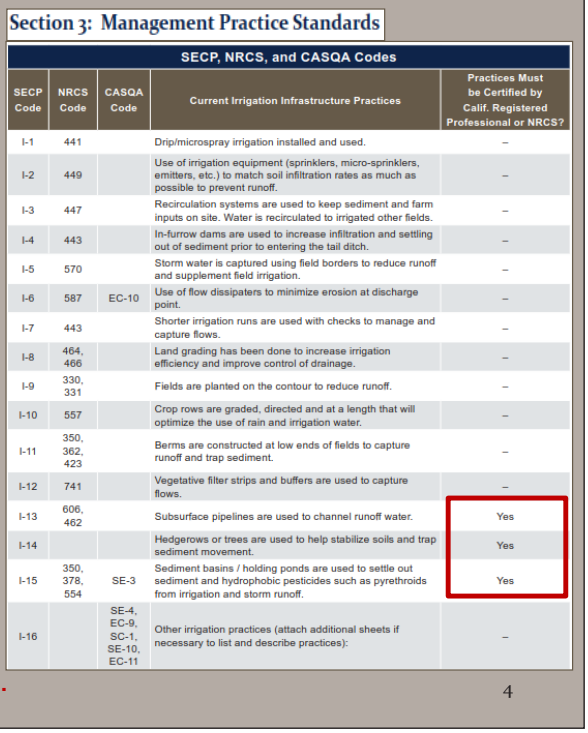
Binder Contents: Practice Standards

- **NRCS Conservation Practice Standards**
  - Info on why and where practices are utilized.
  - Establishes minimum quality criteria to achieve purpose.
  - Should be used to plan, design, or install.
  - Use State practices.
- **Binder Code Linkage Sheet**
  - Links ILRP SECP Management Practice Codes to NRCS and CASQA standards.
  - Specifies what practices require a professional to install/implement.



Section 3: Management Practice Standards

SECP, NRCS, and CASQA Codes				
SECP Code	NRCS Code	CASQA Code	Current Irrigation Infrastructure Practices	Practices Must be Certified by Calif. Registered Professional or NRCS?
I-1	441		Drip/microspray irrigation installed and used.	–
I-2	449		Use of irrigation equipment (sprinklers, micro-sprinklers, emitters, etc.) to match soil infiltration rates as much as possible to prevent runoff.	–
I-3	447		Recirculation systems are used to keep sediment and farm inputs on site. Water is recirculated to irrigated other fields.	–
I-4	443		In-furrow dams are used to increase infiltration and settling out of sediment prior to entering the tail ditch.	–
I-5	570		Storm water is captured using field borders to reduce runoff and supplement field irrigation.	–
I-6	587	EC-10	Use of flow dissipaters to minimize erosion at discharge point.	–
I-7	443		Shorter irrigation runs are used with checks to manage and capture flows.	–
I-8	464, 466		Land grading has been done to increase irrigation efficiency and improve control of drainage.	–
I-9	330, 331		Fields are planted on the contour to reduce runoff.	–
I-10	557		Crop rows are graded, directed and at a length that will optimize the use of rain and irrigation water.	–
I-11	350, 362, 423		Berms are constructed at low ends of fields to capture runoff and trap sediment.	–
I-12	741		Vegetative filter strips and buffers are used to capture flows.	–
I-13	606, 462		Subsurface pipelines are used to channel runoff water.	Yes
I-14			Hedgerows or trees are used to help stabilize soils and trap sediment movement.	Yes
I-15	350, 378, 554	SE-3	Sediment basins / holding ponds are used to settle out sediment and hydrophobic pesticides such as pyrethroids from irrigation and storm runoff.	Yes
I-16		SE-4, EC-9, SC-1, SE-10, EC-11	Other irrigation practices (attach additional sheets if necessary to list and describe practices):	–

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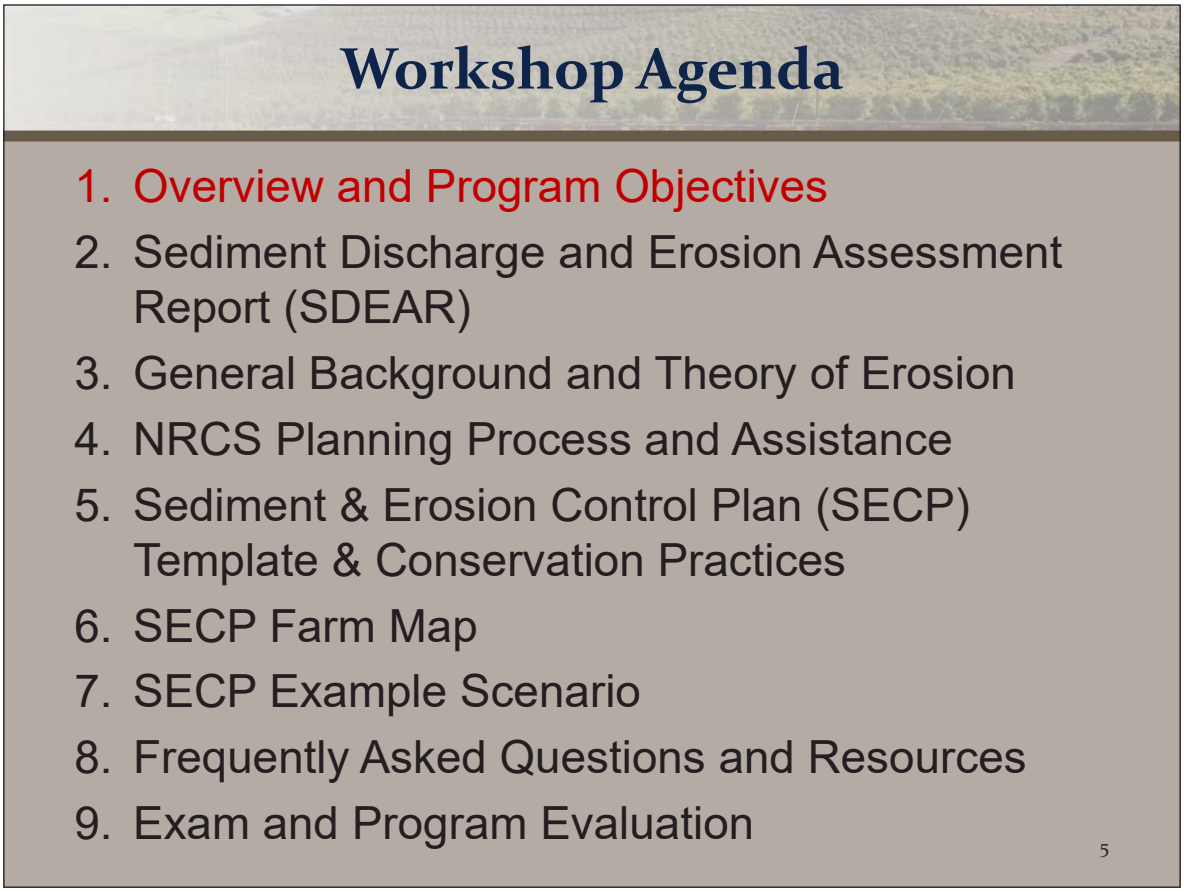
NRCS Conservation Practice Standards contain information on why and where practices are applied, and establishes the minimum quality criteria that must be met during the application of that practice in order for it to achieve its intended purpose(s).

State Conservation Practice Standards are available through the Field Office Technical Guides. Must use the conservation practice standard developed by the state in which you are working to insure that you meet all state and local criteria, which may be more restrictive than the national criteria. Some items in the standards are required, others are recommendations of suggestions.

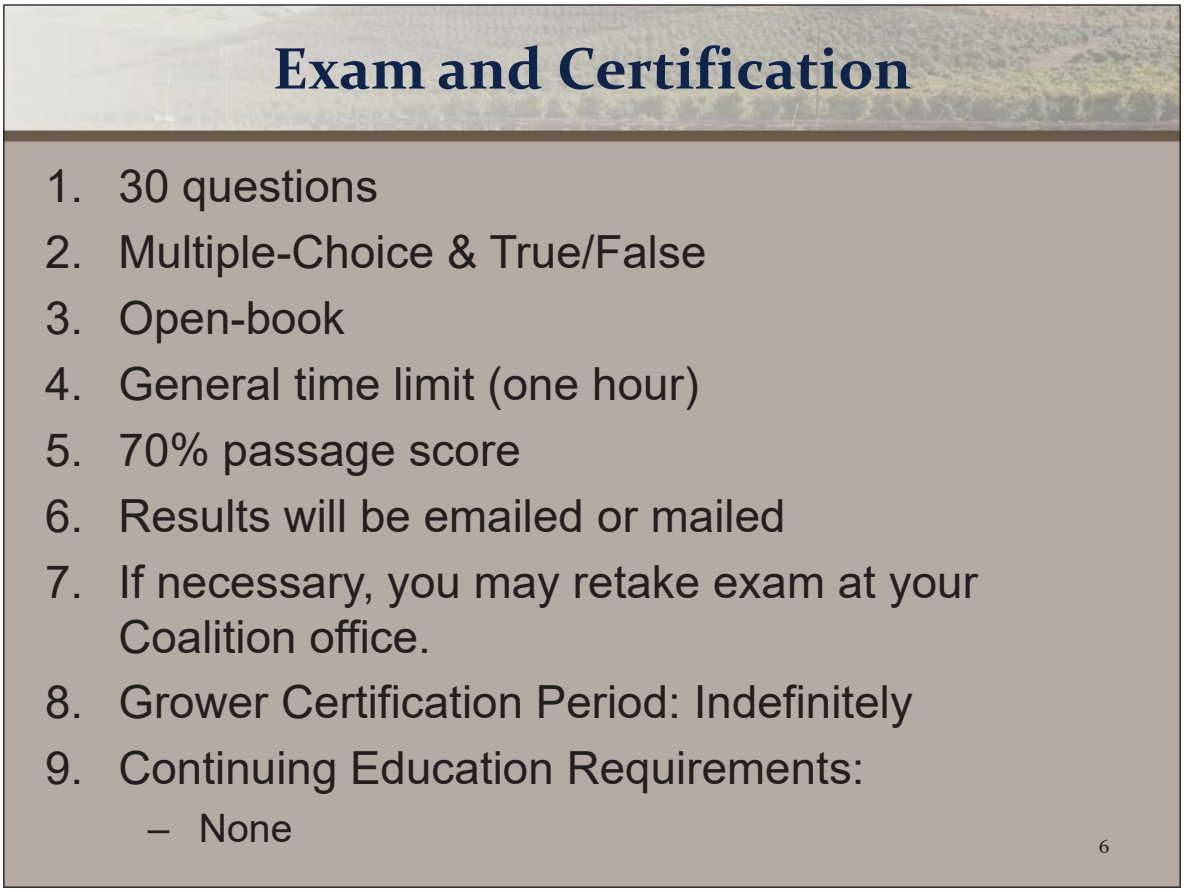
The binder includes a “code linkage sheet” that links the ILRP SECP Management Practice Codes (Section 2, page 4 of the SECP Template) to the NRCS Conservation Practice Standards and the California Stormwater Quality Association Best Management Practices. This linkage should make it easier to find more information about the management practices and specifics on design and implementation beyond the scope of this presentation. Note the columns of the table and generally understand the layout.

Installation or implementation of certain management practices will require an appropriately licensed engineer, scientist, or the NRCS. If any of these management practices are needed to control an erosion issue, it is necessary to contact the appropriate professional for assistance.



First on the Agenda is an overview of the objectives, as well as:

- Why this program is required
- Who it is required for
- What it is intended to accomplish
- When deadlines are


Exam and Certification
1. 30 questions
2. Multiple-Choice & True/False
3. Open-book
4. General time limit (one hour)
5. 70% passage score
6. Results will be emailed or mailed
7. If necessary, you may retake exam at your Coalition office.
8. Grower Certification Period: Indefinitely
9. Continuing Education Requirements:
– None
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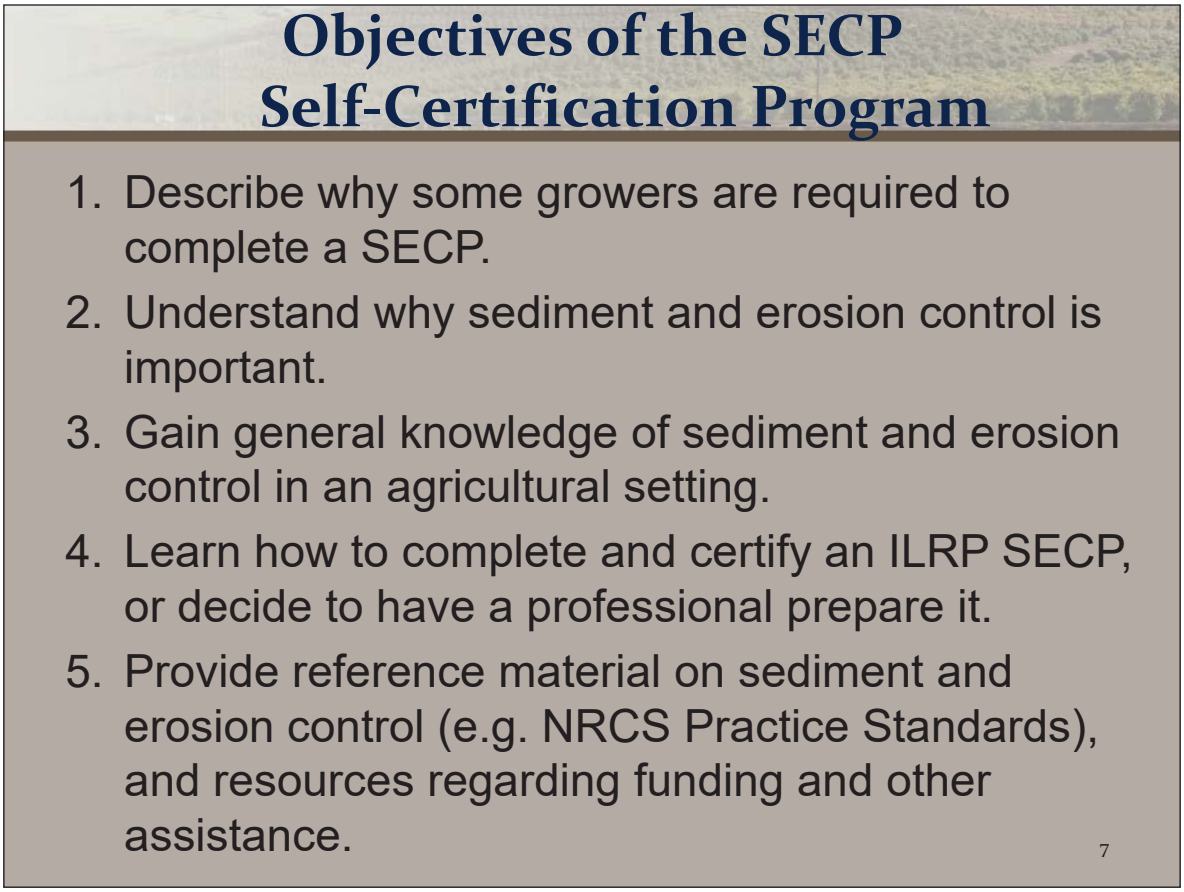


These are the overall high-level objectives of this SECP self-certification program.

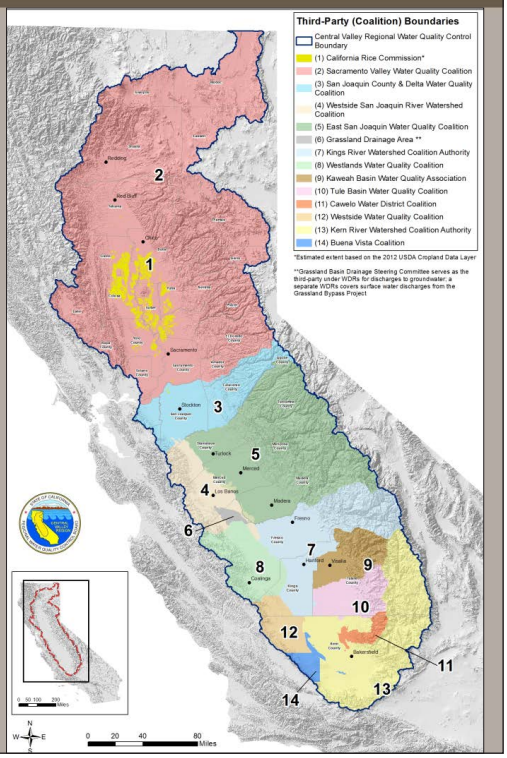
The Waste Discharge Requirements General Order for growers that are members of third-party groups (General Order) specifies the regulatory requirements of the Irrigated Land Regulatory Program (ILRP). There are eight General Orders for the Central Valley:

1. Eastern San Joaquin Watershed
2. Grassland Drainage Area
3. Rice Growers within the Sacramento Valley
4. Sacramento River Watershed
5. San Joaquin County and Delta Area
6. Tulare Lake Basin Area
7. Western San Joaquin River
8. Western Tulare Lake Basin Area.

Although there are eight General Orders, many of the regulatory requirements are similar, including the requirement for Sediment and Erosion Control Plans based on Sediment Discharge and Erosion Assessment Reports (SDEARs) completed by the water quality coalitions.

Central Valley Water Quality Coalitions

Sacramento/San Joaquin Coalitions – Rancho Cordova & Redding Office
East San Joaquin Water Quality Coalition
Sacramento Valley Water Quality Coalition
San Joaquin County & Delta Water Quality Coalition
Westside San Joaquin River Watershed Coalition
Tulare Lake Basin Coalitions – Fresno Office
Buena Vista Coalition
Cawelo Water District Coalition
Kaweah Basin Water Quality Association
Kern River Watershed Coalition Authority
Kings River Watershed Coalition Authority
Westlands Water Quality Coalition
Westside Water Quality Coalition



Why are Erosion & Sediment a Problem? – Grower Perspective

- **Excessive erosion may cause:**
  - Crop damage and loss ($$)
  - Removal of topsoil
    - Topsoil holds the most organic matter and contributes to soil fertility, water holding capacity, and infiltration.
  - Impacts on soil structure
  - Impacts on sustainability
  - Decreased property value
  - Potential neighbor relation issues
  - Recontouring of the land surface
  - Regulatory concerns

A Sediment & Erosion Control Plan (SECP) is beneficial for growers. It's not only about environmental issues or regulatory compliance concerns. It's good business. Sufficient sediment and erosion control AND prevention can:

- Reduce of ag inputs (water, fertilizer, energy, erosion expenses)
- Prevent loss of valuable topsoil, which contains the most organic matter that contributes to soil fertility and water holding capacity.
- Improve farm aesthetics
- Protect soil structure, which helps water movement, limits compaction, and growing conditions.
- Minimize pollution and protect water quality
- Minimize potential neighbor relation issues.
- Maintain or improve property values.
- Sustainability (improve competition in the market place), improved long-term crop quality
- Limit regulatory concerns such as fines and other enforcement actions and public relations issues.

As one example of the significance of erosion, previous studies of hillside vineyards in Napa and Sonoma Counties conducted by the USDA NRCS estimated that soil losses from these vineyards were up to 350 tons/acre/year, and averaged 50 tons/acre/year. The highest rates of soil erosion generally occurred during the first few years of vineyard development (USDA, 1985).

USDA. 1985. River basin study report: Hillside vineyards unit, Redwood Empire target area; Napa and Sonoma Counties, California. Davis: USDA, River Basin Planning Staff, Soil Conservation Service.

Why are Erosion & Sediment a Problem? – Regulatory Perspective

Excessive erosion may cause:

- Impaired **Water Quality**:
  - Potential impact of *beneficial uses;*
  - Movement of pollutants (pesticides, nutrients);
  - Suspended sediment alters general water chemistry (pH, temperature, DO):
    - Impairment of habitat for aquatic life and ecological concerns
    - Impairs downstream users.

From a regulatory standpoint, the water quality impairments induced by sediment discharge are of greatest concern.

Presentation Objective #2.

Figure Reference:

- http://ucce.ucdavis.edu/files/repository/calag/img5803p149.jpg
- http://ucce.ucdavis.edu/files/repository/calag/img5803p151.jpg

How Can SECPs Help?

- SECPs are designed to prevent, reduce, and mitigate sediment discharge and erosion issues.
- The accumulation of erosion control practices through SECP guidance protects water quality and may improve farm performance.

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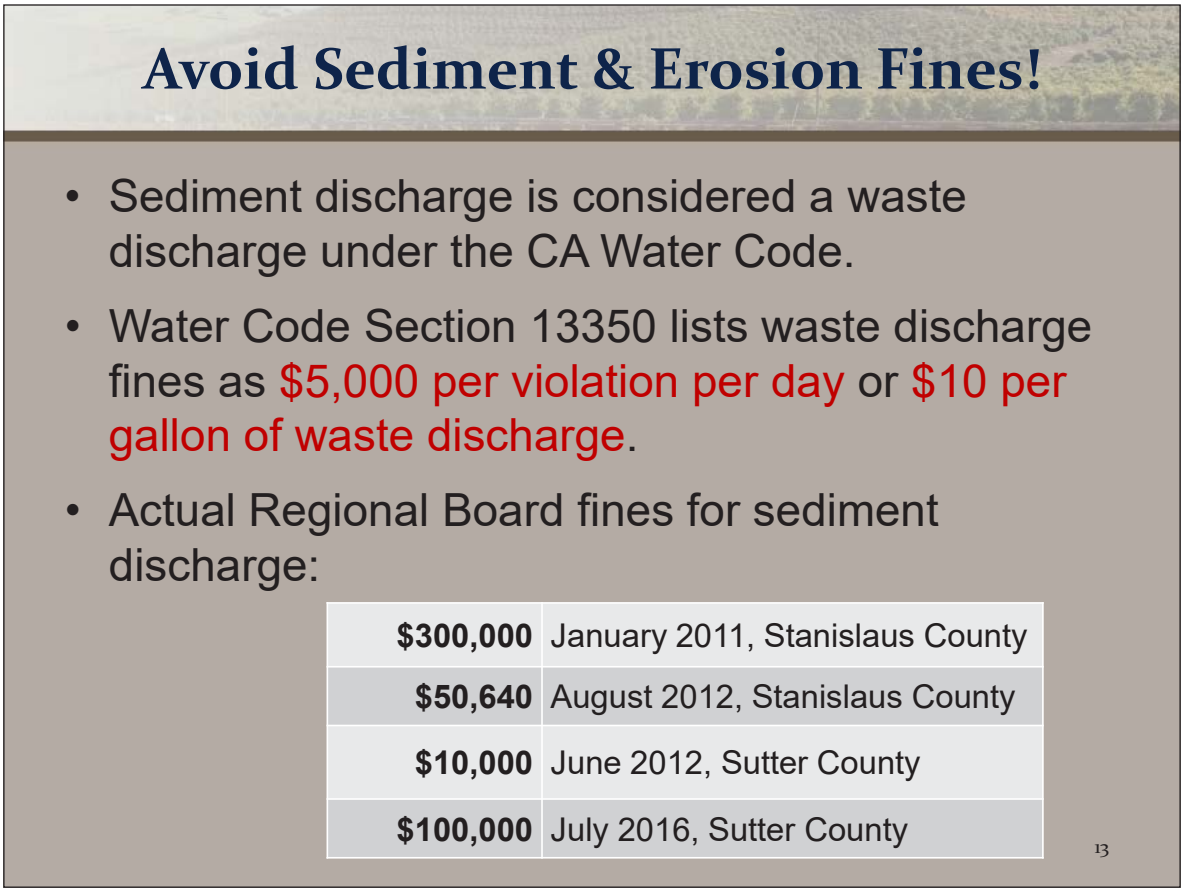
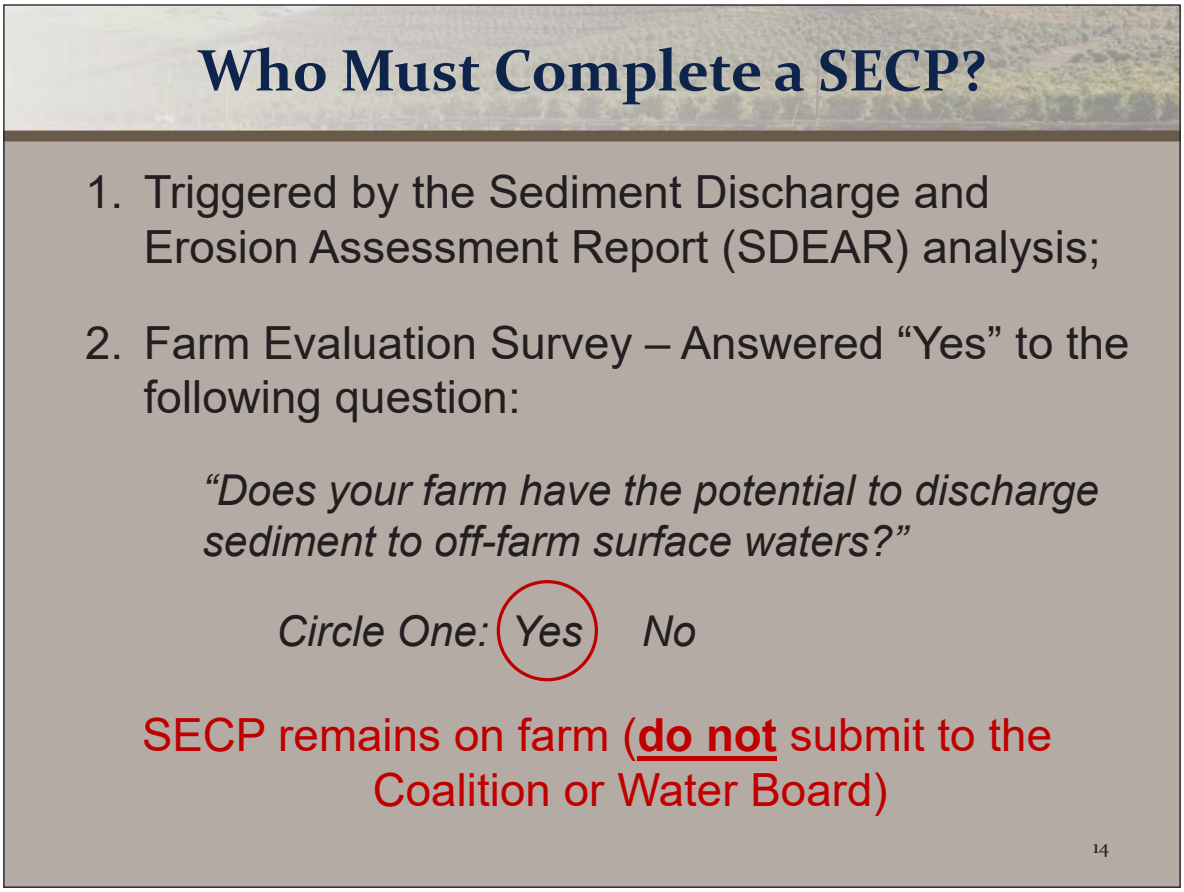
SECPs are not general coalition wide plans, they are customized to each farm. Soil lost via erosion is a loss to the grower as well. There are many value-added benefits to erosion control AND prevention.

Prevent erosion issues before they occur, when possible. Otherwise, treat erosion issues when they are small. After a SECP is complete, it's critical to:

- Monitor & Maintain
- Have a Backup Plan



An effective SECP and continued follow-up can help you avoid fines and the related public relations issues. The points on this slide highlight parts of the Water Code that dictate “waste discharge” issues. The fines listed in table are often negotiated down but that is never a guarantee.



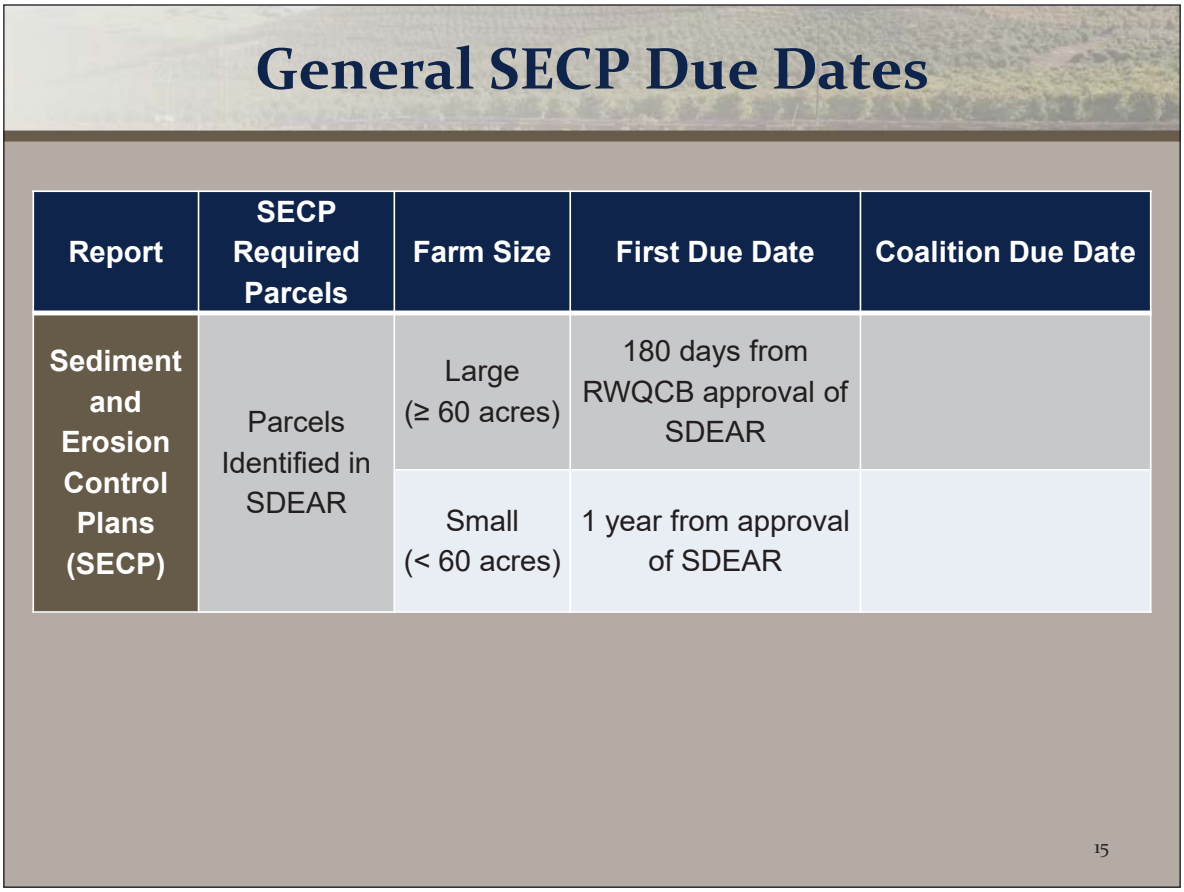
Analysis conducted in the SDEARs identified which parcels need to complete a SECP.

If the answer to the question, "Does your farm have the potential to discharge sediment to off-farm surface waters?" in one's Farm Evaluation Survey is yes, then it triggers the requirement to complete an SECP.

SECPs stay on farm along with other ILRP documents, such as the Nitrogen Management Plans and Farm Evaluation Surveys.

- They are NOT submitted to the Coalition
- They are NOT submitted to Water Board

Water Quality Coalitions will notify their members what parcels require SECPs. Not necessarily all parcels of a coalition membership.



This table lists the deadline requirements for completing an SECP, and demonstrates the deadline's relationship with the SDEAR.

SECP Template and Map

Page(s)	Contents
1-2	General and section instructions
3	General parcel and field information
4	Management practices and codes
5	General control practices comments
6	Site evaluation and recommendations
7	SECP certification

A SECP map is also required!

http://www.waterboards.ca.gov/centralvalley/water_issues/irrigated_lands/for_growers/forms_templates/secp/2015_1201_secp_temp_app2.pdf

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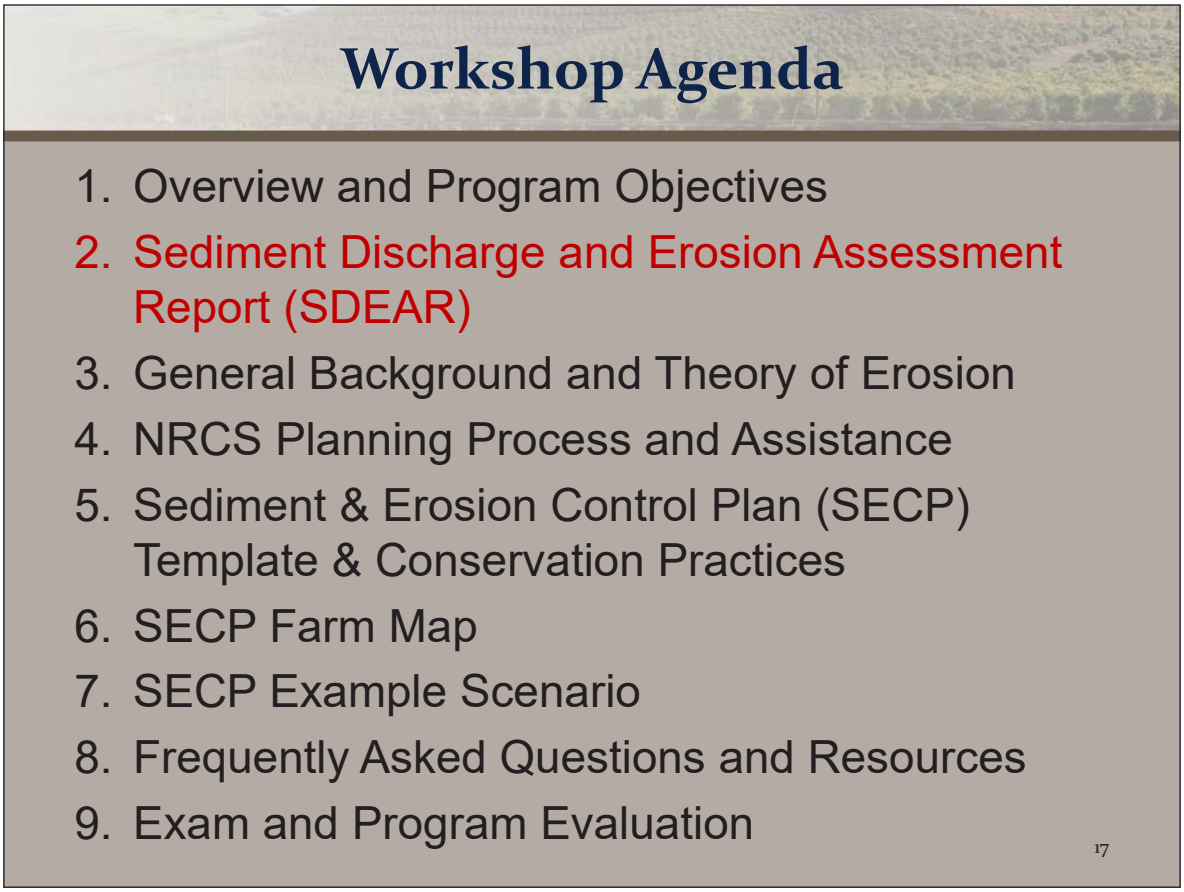
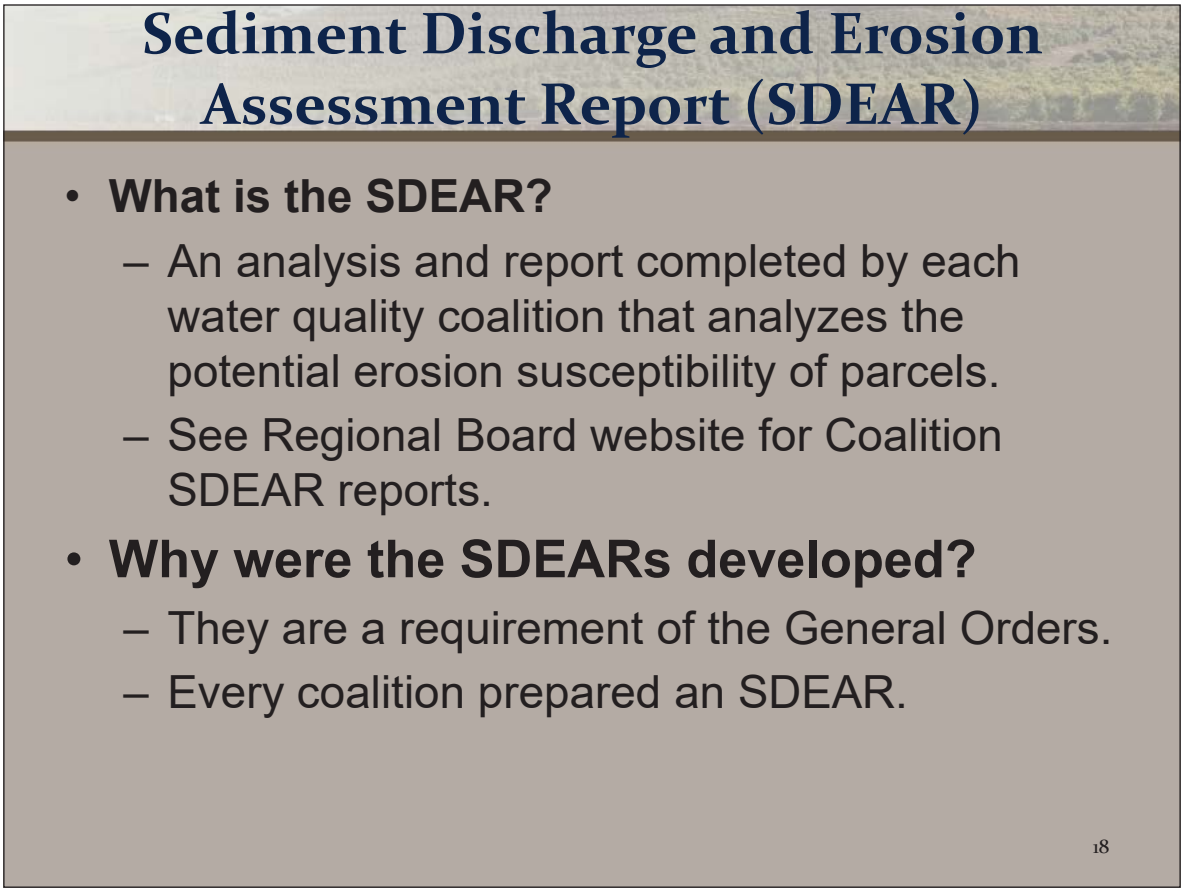
Refer to the blank copy of the SECP template.

A fillable pdf version of a SECP can be found on the Regional Board's website at the link on the slide. These sections will be explained in more detail throughout this presentation. A SECP is made up of two parts: the filled-out form and a SECP map.



We will now review what specific SDEAR criteria was used to identify your parcels as requiring an SECP. This section will clarify why some growers must complete an SECP, and others do not (Objective 1).



The General Order required Coalitions to develop the analysis that comprises the SDEAR. The SDEAR is an analysis of the POTENTIAL for erosion and sediment discharge by parcel.

Sediment Discharge and Erosion Assessment Report (SDEAR)

- **How did the SDEAR determine erosion potential?**
  - The SDEARs used the NRCS **R**evised **U**niversal **S**oil **L**oss **E**quation (**RUSLE**) and proximity to waterways to evaluate sediment discharge and erosion potential.

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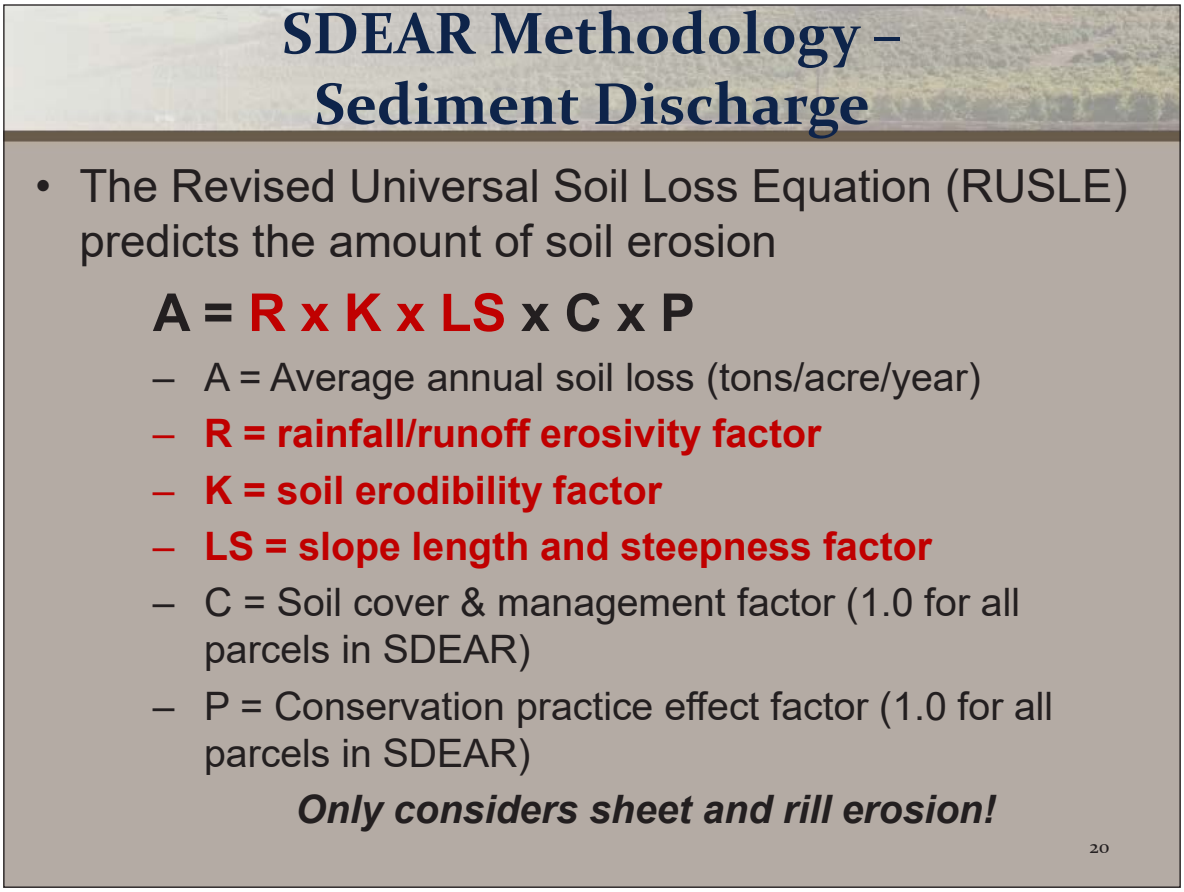
SDEARs establish who is required to complete a SECP. SDEARs evaluate **proximity to waterways** and **likelihood of erosion based on RUSLE**. RUSLE is a mathematical model that is described in more detail in the next slide.

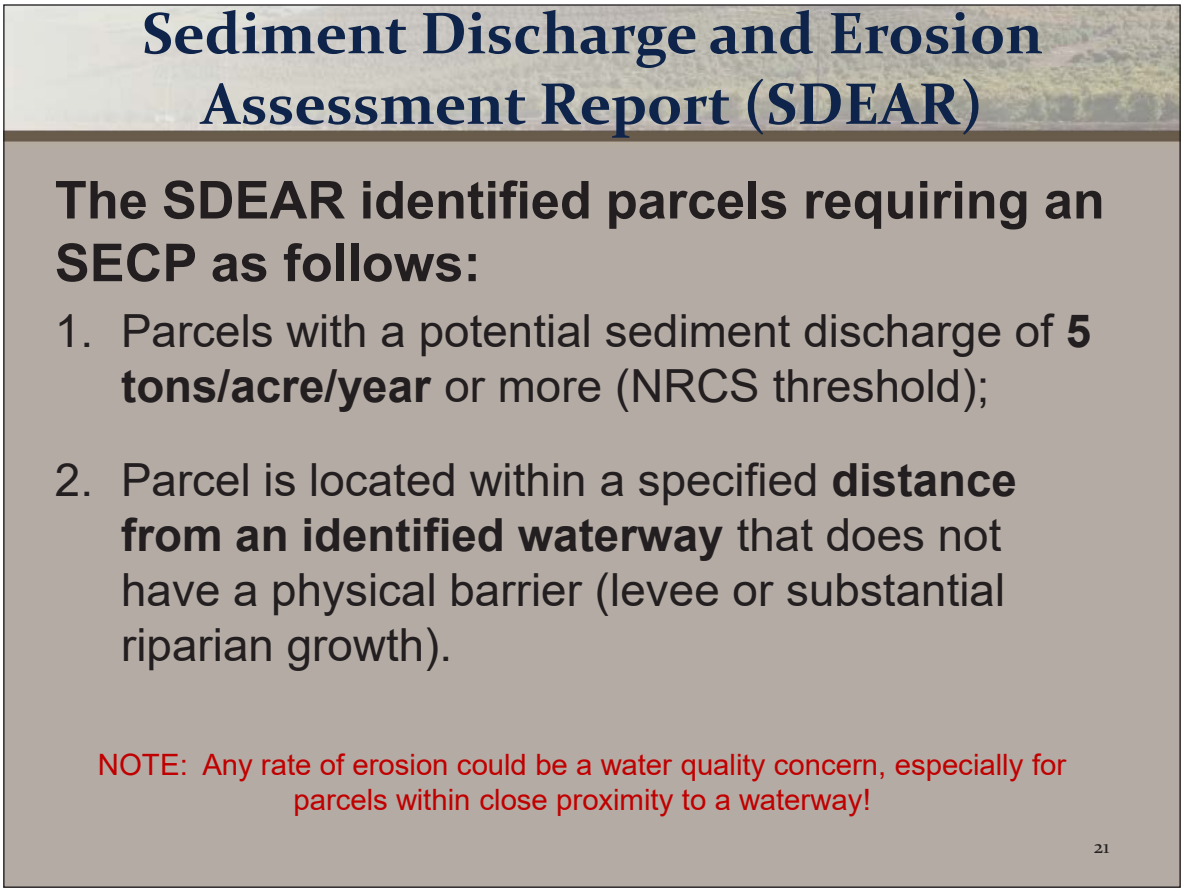
This picture shows sediment-laden runoff following a brief storm.



RUSLE does not consider irrigation induced erosion directly, but the Regional Board does for enforcement.

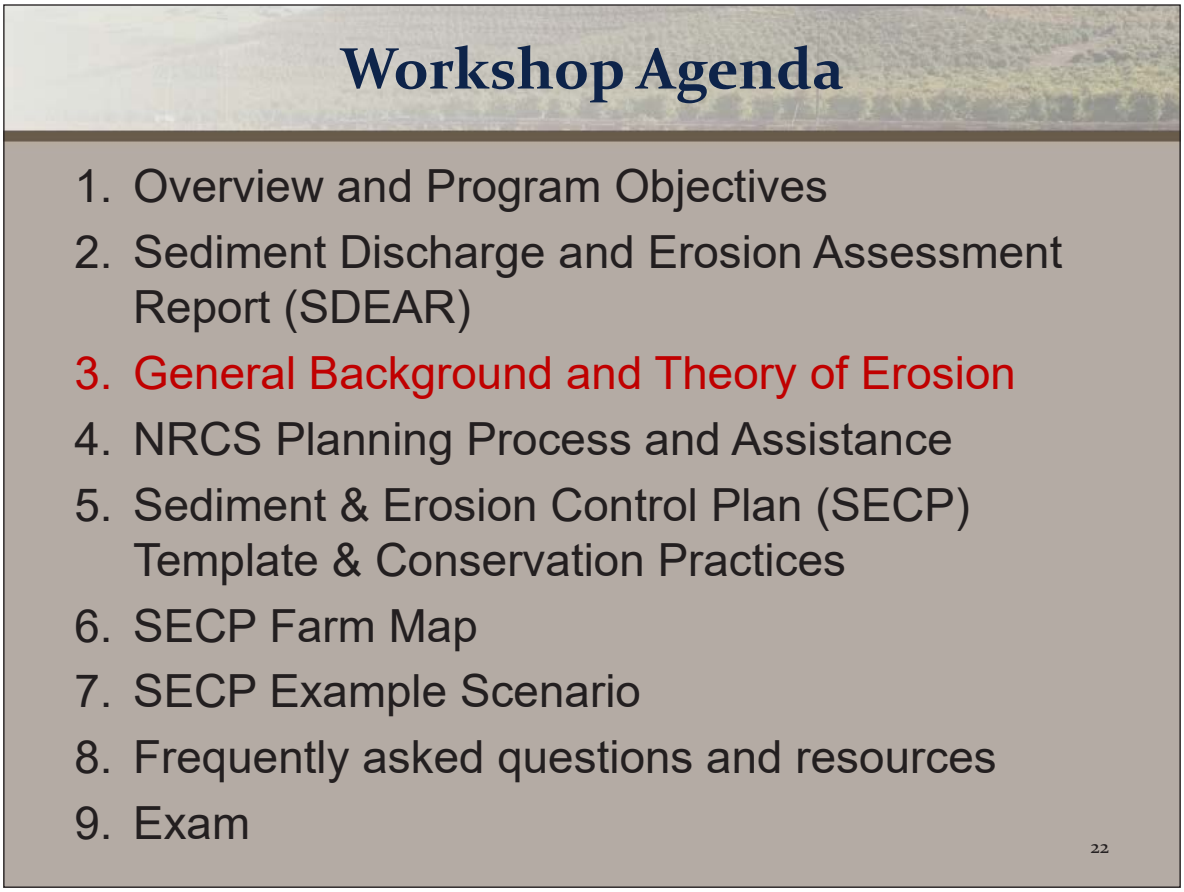
1. Red text indicates factors evaluated in the SDEAR analyses.
2. Original purpose was for agricultural activities as a result of the dust bowl era.
3. Certain other adjustments made for construction activities.
4. Used to estimate average annual soil loss in tons/per/year.
5. Only considers sheet and rill erosion.
6. Does NOT consider gully erosion, stream bank erosion, mass wasting (landslides)
7. A simplified approach that assumes static conditions.
8. Does not consider the unpredictable human element.
9. Its primary use is as a predictive tool to evaluate the relative difference in various land use options. It's not as useful for evaluating specific magnitudes of discharge, but it allows users to evaluate the relative differences between certain factors such as management practices.
10. A linear formula that is easy to work with and easy to remember.

- Note that only the R, K, and LS factors were considered in the SDEAR. Therefore, the SDEAR is more of a worst case scenario of bare soil with no conservation practices, or what could theoretically occur in between crops, etc.
- Evaluates the POTENTIAL for a parcel to discharge sediment, not necessarily what is currently happening.
- Only reasonable way to complete SDEAR analysis. Otherwise, coalitions would have to evaluate every parcel in their boundaries to account for C and P factors, which would be a massive effort.



RUSLE is used to predict which parcels have the potential to discharge 5 tons/acre/year of sediment. The specified distance is determined by each Water Coalition.

The 5.0 tons/acre/year threshold is the "T-factor" that the NRCS RUSLE model uses, and it was also the threshold utilized in the SDEAR analysis. However, erosion at rates of less than 5.0 tons/acre/year may still be significant, especially for parcels that are **adjacent or close proximity to a waterway**. Therefore, the 5.0 ton/acre/year is important to understand within the context of the RUSLE model and the SDEAR analysis, but it is not necessarily relevant as an indicator of acceptable rates of erosion. Any erosion could be a water quality concern!



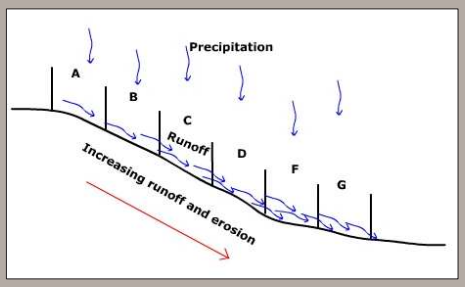
The next section covers how erosion occurs, what factors influence sediment discharge, and understanding erosion from a watershed perspective.

This section will provide general knowledge of sediment and erosion control in an agricultural setting (Objective 3).

General Background of Water Erosion

The Five Most Important Factors

1. Rainfall/runoff
2. Soil erodibility
3. Slope
4. Ground cover
5. Management Practices



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The greater the precipitation, the greater the capacity for runoff, erosion, and sediment discharge.

- Soil texture and structure dictates the likelihood that the soil will remain aggregated together, if it requires too much energy to move, or if it will easily be detached and transported after a rain event or over irrigation.
- Gravity related movement of water down slopes influence water erosion.
- Ground cover can alter the water velocity and promote the trapping and settling of suspended sediment. Ground cover also protects the soil from raindrop impact, which can destroy soil structure and move soil particles.

The red text indicates which factors the SDEAR evaluated. RUSLE can evaluate all 5 of these factors.

Figure reference:

- http://www.earthonlinemedia.com/ebooks/tpe_3e/soil_systems/hillslope_runoff_erosion.jpg
- http://4.bp.blogspot.com/_HBmm8SuiN3Q/TRmYNTvtmKI/AAAAAAAAABY/i4iYiUCJPFM/s1600/splash_erosionhhhh.jpg

General Background – Rainfall

- **Rainfall is one of the primary factors affecting soil erosion.**
  - The greater the intensity and duration of a rainstorm, the higher the erosion potential.
  - If the amount of precipitation exceeds the infiltration rate, runoff occurs.

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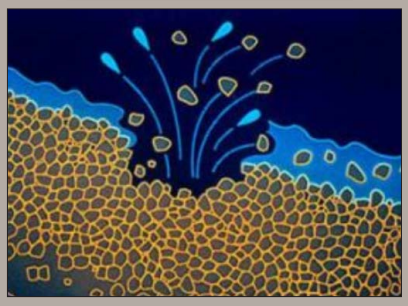
Note that irrigated lands are partially filling their soil's water holding capacity; thus, impacting the amount and/or speed of water infiltration and additional water holding capacity.

General Background – Rainfall

- The impact of raindrops on the soil surface can detach soil aggregates, destroy soil structure, and disperse soils.
- A single raindrop that hits unprotected soil at a speed of approximately 20 mph can displace soil particles by several feet or more in any given direction.



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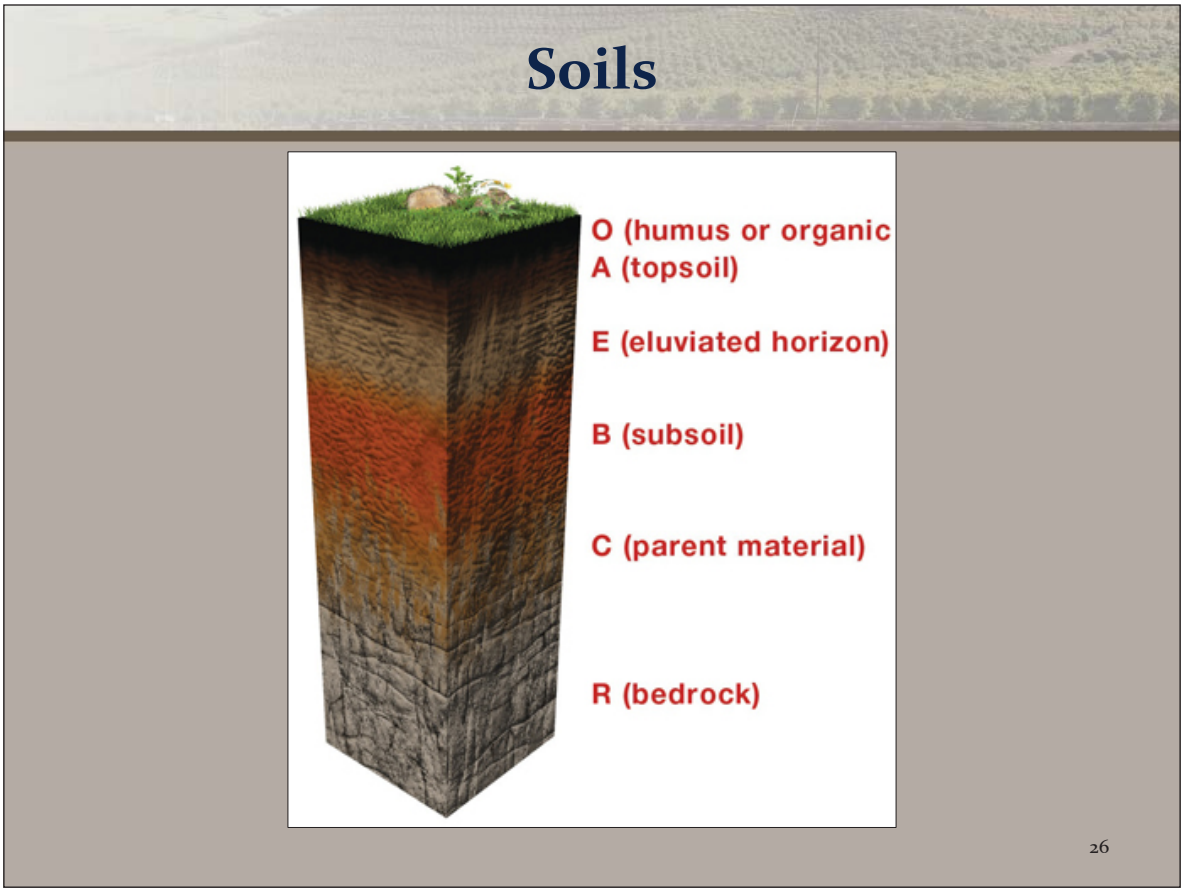
As soil structure is destroyed, soils can become dispersed, which reduces infiltration and increases runoff. The approximate speed of raindrops is about 20 miles per hour (mph).

Reference:

- http://wxguys.ssec.wisc.edu/2013/09/10/how-fast-do-raindrops-fall



Water erosion primarily removes fertile topsoil and exposes less fertile subsoil. The topsoil contains most of the organic matter, which provides soil nutrients, improves water holding capacity, and various other benefits.

Figure Reference:

- http://www.soils4kids.org/files/images/s4k/soil-profile.jpg

K-Factor of Soils

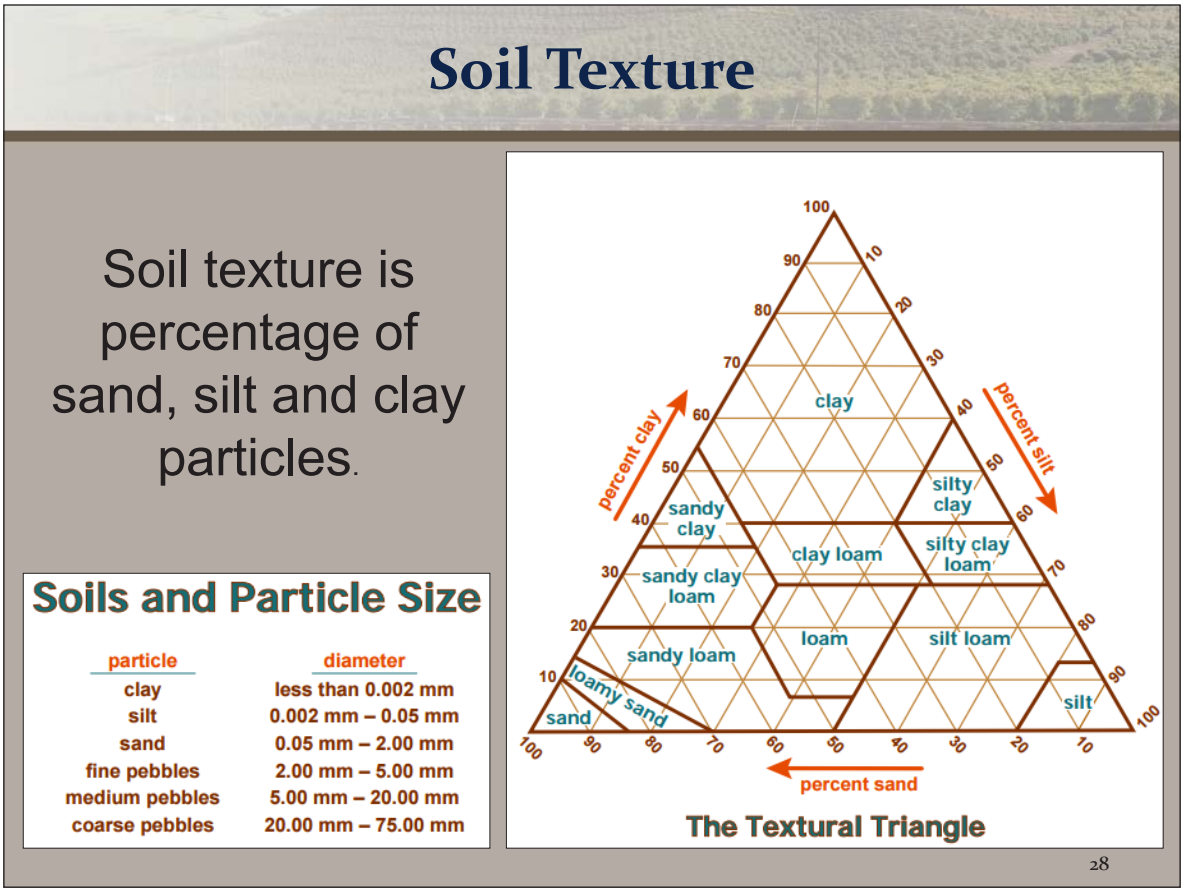
The NRCS Revised Universal Soil Loss Equation (RUSLE)

$$A = R \times K \times LS \times C \times P$$

- **K = soil erodibility factor**
  - Measures the susceptibility of soil particles to detach and transport by rainfall and runoff
  - Intrinsic property – based on soil type
  - High K = High Potential for Erosion
  - Low K = Low Potential for Erosion
  - Texture is the principal factor affecting K
    - Other properties include: Soil structure, organic matter, rock fragment content, and permeability

(O'Geen, Elkins, and Lewis, 2006) 27

- The RUSLE equation is developed by the NRCS and was used in the SDEAR to determine potential sediment discharge of each parcel.
- The K-Factor reflects the intrinsic properties of the soil. It does NOT include factors such as slope, rainfall amount or intensity, surface cover, or management practices. It is primarily based on soil type.
- K-Factors determined from NRCS Soil Survey data, or by particle size analysis



- Soil texture can be identified by the “feel” method, NRCS Web Soil Survey, or particle size analysis by a laboratory using a hydrometer (ASTM D-422 hydrometer analysis).
- To use Textural Triangle: Follow lines across until they intersect to determine soil texture. For example, a soil that is 30% clay, 30% sand, and 40% silt would be a clay loam.
- Note that only two particle size percentages are required to determine soil texture. The third can be determined from the two known percentages, as the total equals 100%.

Figure Reference:

- http://srel.uga.edu/outreach/kidsdoscience/soils-planets/soil-particle-size.pdf

K-Factor of Soils

Soil Texture	Particle Size Diameter (millimeters)	K-Factor	Relative Erodibility
Coarse-textured sandy soils	0.05 to 2.0	0.05 to 0.2	**Low** due to high infiltration resulting in low runoff, despite being easily detached. Larger particles also require more energy to move.
Medium textured silt loam soils	0.002 to 0.05	0.25 to 0.65	**Moderately** susceptible to detachment and produce moderate runoff.
High silt content	0.002 to 0.05	> 0.4	**Most erodible**, easily detached, tend to crust and produce high rates of runoff.
High clay content	< 0.002	0.05 to 0.15	**Low** due to the ability of clays to aggregate and resist detachment.

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(O'Geen, Elkins, and Lewis, 2006)

High K = Higher Erodibility
Low K = Lower Erodibility
Silty soils have the greatest potential for erosion.

At first, one may think clay soils are the most erodible, but this table briefly explains why that is not necessarily the case.

General Background – Web Soil Survey

- For information regarding soil maps, soil texture, site-specific K-factors, and more, visit the USDA's Web Soil Survey website at: www.websoilsurvey.nrcs.usda.gov

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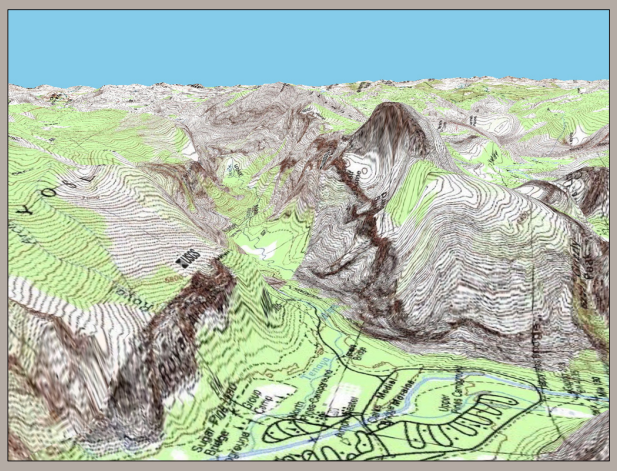
This image is of the homepage of Web Soil Survey. To begin the process, press "START WSS." The next image is an example of a soil map generated form Web Soil Survey. The numbers represent Map Unit Symbols, or certain soil types.

It is important to note that soil mapping, including the Web Soil Survey, is only done down to a 5 to 10 acre size generalization. Actual site-specific characteristics will vary. A soil scientist can verify the soils on a site.

General Background – Slope

- **Topography**
  - Measurement of elevation
- **Relief**
  - The difference between the highest and lowest elevations in an area
- **Slope**
  - Percent change in elevation over a certain distance



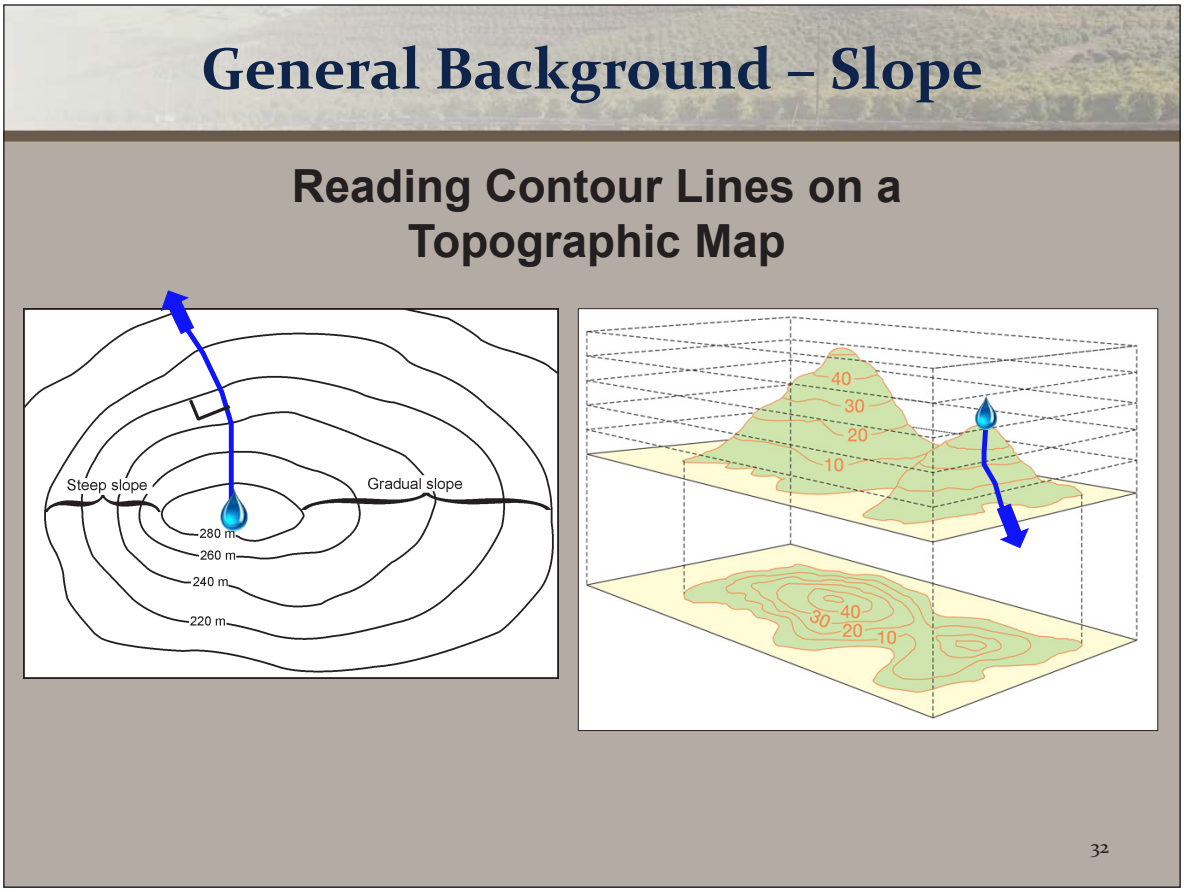
31

Topography, relief, and slope all describe the changes in elevation. The sharper the change in elevation, the greater the potential for erosion. Water moves downhill due to gravity.

Length of slope can be altered to manage fields. Relevant practices are in the next section.

Figure Reference:

- https://worldwind.arc.nasa.gov/graphics/screenshots/24.jpg



Contour lines describe the elevation of a site on a topographic map. The intervals between the contours can vary. In the image on the left, the interval is 20 meters. In the image on the right, the interval is 10 unknown units. Although the units are unknown, the trend is still increasing as the circles reach inward to develop the peak.

Contours can be useful features on SECP maps, because they describe the changes in elevation which is directly related to erosion potential. **Note that water moves downhill by gravity, and flows perpendicular (at right or 90 degree angles) to the contour lines, as noted by the blue lines on this slide.**

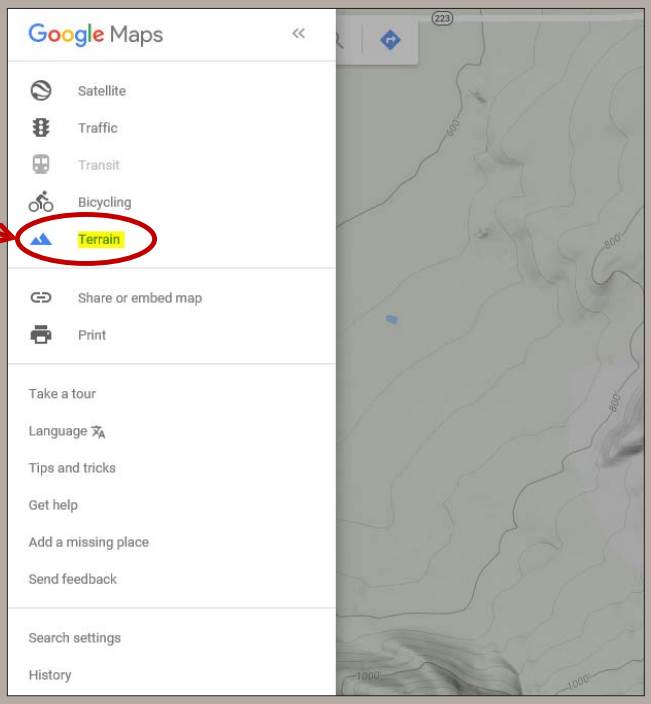
Figure References:

- http://4.bp.blogspot.com/-WiH8BdZr7gs/TxYzRdgA4TI/AAAAAAAAABU/0wWHG41oDYg/s1600/Reading-Contours-1.jpg
- cnx.org/resources/f66e1be85880d3f56b781b7250105865/Picture%201.png

General Background – Slope

Where to find a contour map:

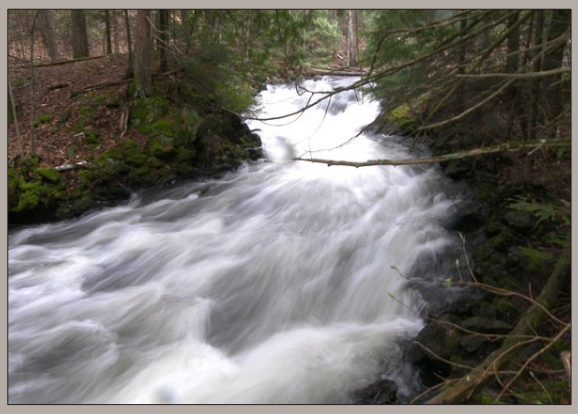
- Google Maps Terrain Feature
- USGS Quad maps
- Google Earth's Earth Point
- County GIS systems
- Consultants



Many resources exist to develop a map that contains contours. Several resources are listed here; however, for questions contact a consultant or local NRCS field office for more information.

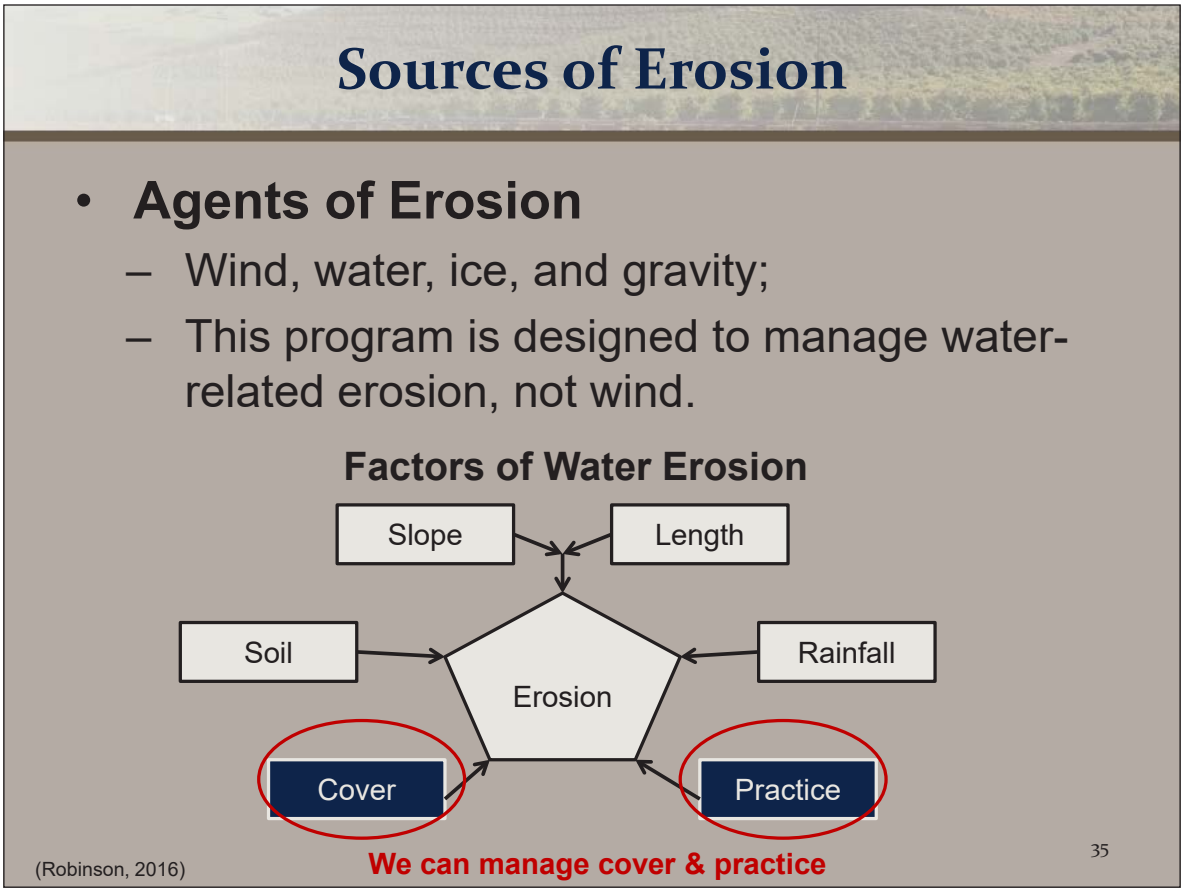
General Background – Water

- **Water Velocity**
  - Water moves downhill due to gravity.
  - Flow velocity is determined by two factors:
    1. Slope of the flow path
    2. Flow resistance (friction)

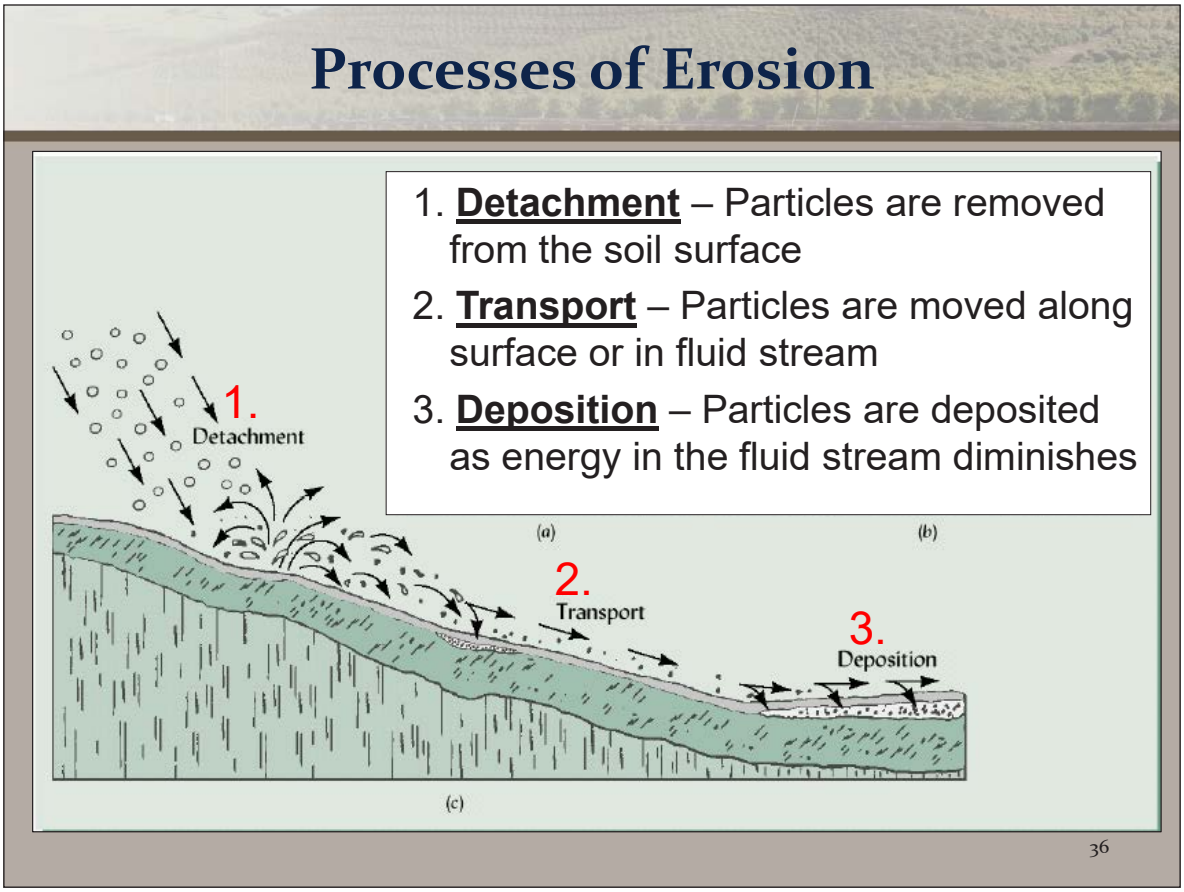


34

Many practices addressed in the following section cover tactics to manage both the flow resistance and slope of the land to minimize sediment discharge.



- Note that soil, slope, slope length, and rainfall are properties that we generally cannot manage.
- As a result, some ground will have a fundamental potential or lack of a potential for erosion, regardless of how we manage.
- As growers, we can manage cover and practices (management practices).



There are three processes of erosion: detachment, transport and deposition. Reminder from previous slide: A single raindrop that hits unprotected soil at a speed in excess of 20 mph can displace soil particles by several feet in any direction. That is illustrated in this image under the detachment process of erosion.

Figure Reference:

- http://nptel.ac.in/courses/104103020/module7/lec3/images/4.png

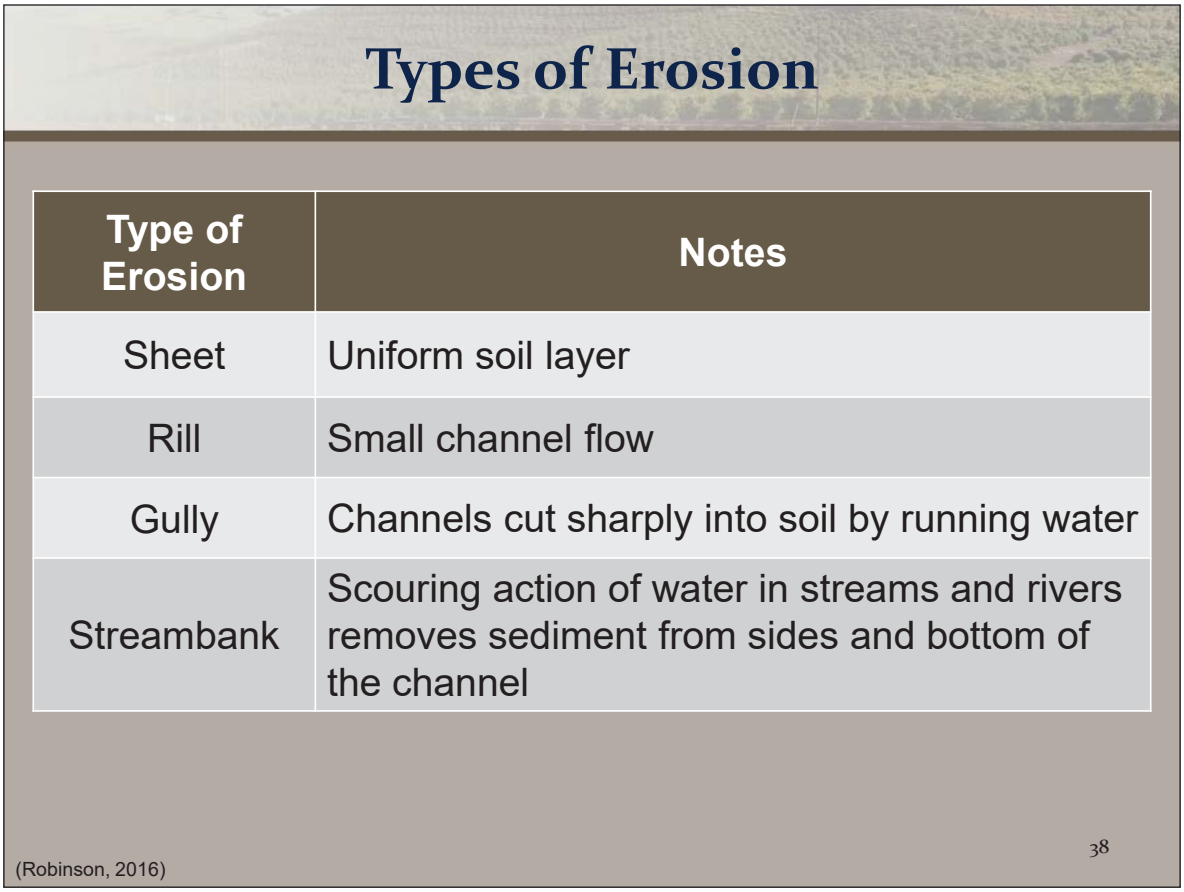
Erosion Control Principles

- Decrease raindrop impact;
- Decrease flow volume;
- Decrease flow rate;
- Reduce deposition off of the property.

37
(Robinson, 2016)

Sediment and erosion control practices are designed to use at least one of the following principles in addressing sediment discharge.

- http://www.landscapeonline.com/research/lasn/2011/02/img/ECT/ECT-6.jpg



There are four primary types of erosion: sheet, rill, gully and streambank. These are explained in greater detail in the following slides.

Types of Erosion: Sheet

- **Sheet:** Uniform soil layer.

1 millimeter (0.04 inches) of soil removed from 1 acre of topsoil via sheet erosion can discharge over 6 tons of sediment

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Sheet erosion is the most common yet most overlooked form of soil loss (O'Geen et al., 2005). **Sheet and rill erosion result in the most sediment discharge**.

Calculation: (1 mm soil) x (1 foot soil/305 mm soil) x (4,000,000 lbs of soil/acre-foot of soil) x (500 tons soil/1,000,000 lbs soil) = **6.56 tons soil/acre**.

- http://passel.unl.edu/Image/siteImages/Sheeterosion-LGjpg.jpg
- https://www.extension.iastate.edu/agdm/crops/html/images/a1-41/image2.jpeg

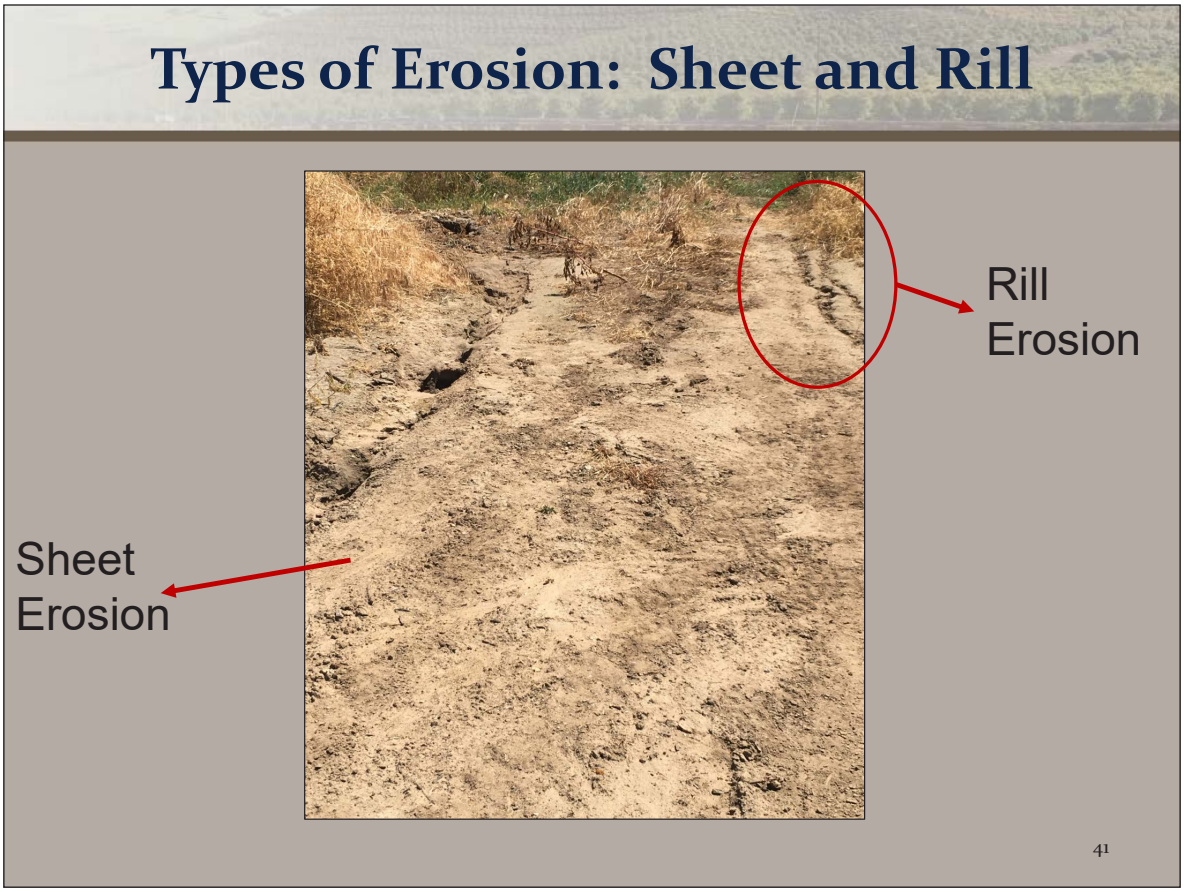
Types of Erosion: Rill

- **Rill:** Channel flow;
  - Occurs when water begins to concentrate in small channels and leads to gully erosion, larger and deeper rills.

40

Sheet and rill erosion account for most soil erosion in agricultural land.

- https://upload.wikimedia.org/wikipedia/commons/8/86/Rill_network_from_Tyrone,_Ireland.jpg



Difference between sheet and rill erosion. Sheet flow is uniform and rill flow is more channelized.

Types of Erosion: Gully

- **Gully:** Channels cut sharply into soil by running water;
  - Two types of gullies: Ephemeral & Classical.

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Rills can develop into gullies if not addressed soon enough.

- http://www.nrcs.usda.gov/Internet/FSE_MEDIA/nrcs144p2_027829.jpg

Ephemeral Gully

- **Ephemeral Gully**: Can be plowed and tilled across, depending on depth and width;
  - Transitory between rill erosion and classical gully erosion

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Ephemeral gullies can develop into classical gullies if they are not addressed soon enough. The image on the left depicts rill erosion developing into ephemeral gully erosion.

Figure Reference:

- http://milford.nserl.purdue.edu/weppdocs/overview/images/mangully.gif

Classical Gully

- **Classical Gully**: Advanced stage of channel erosion;
  - Gully is too wide and too deep to be tilled across.

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Not all classical gullies are this extreme. The general rule of thumb is if the gully is too wide and too deep to be tilled across, it is a classical gully. This type of erosion also hinders beneficial uses of the land in which they are disturbing.

Figure Reference:

- http://milford.nserl.purdue.edu/weppdocs/overview/images/mngully2.gif

Types of Erosion: Streambank

- **Streambank:** Scouring action of water in streams and rivers removes sediment from sides and bottom of the channel.

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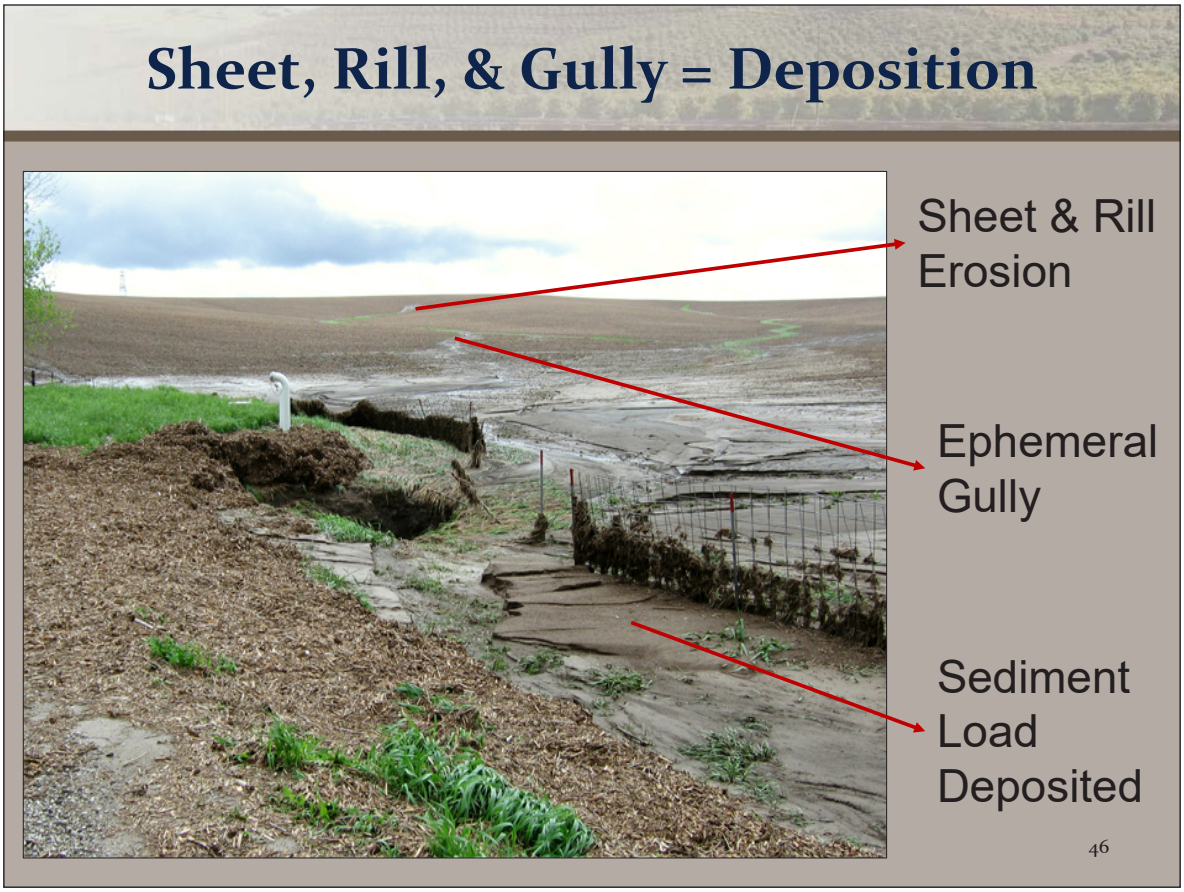
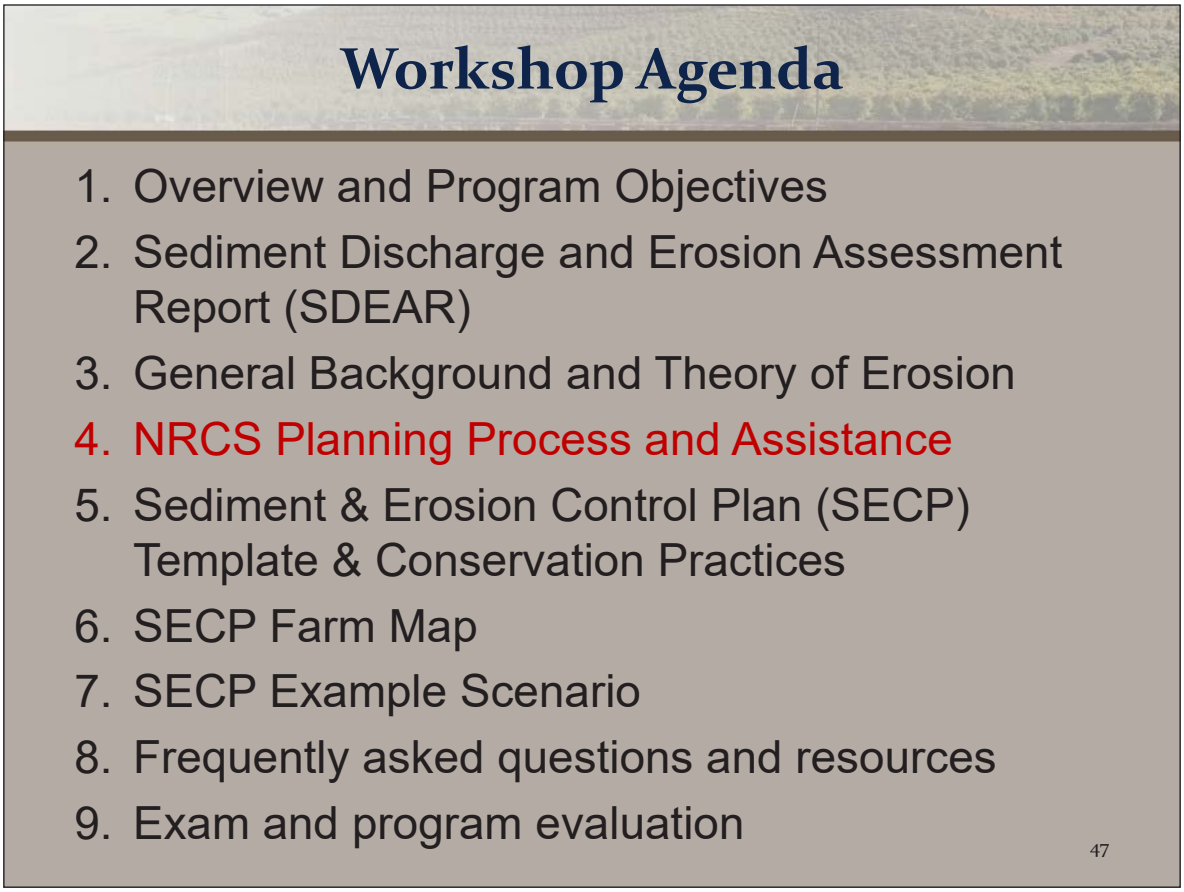
Streambank erosion can be identified by sharp cuts on a side or sides of a stream.

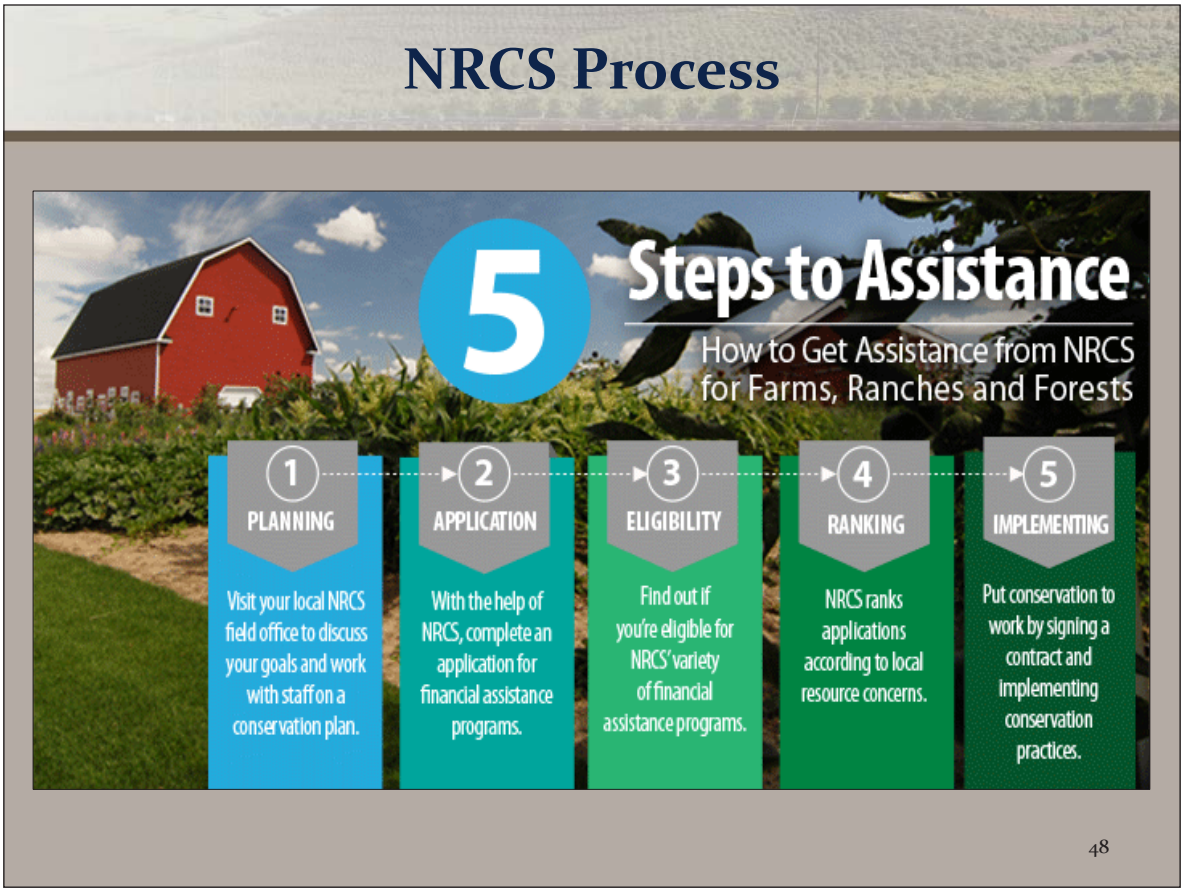
Figure Reference

- http://www.bceo.org/images/projects/ReilyMillvilleRdIndianCreek_08a.jpg


Sheet, Rill, & Gully = Deposition
Sheet & Rill Erosion
Ephemeral Gully
Sediment Load Deposited
46



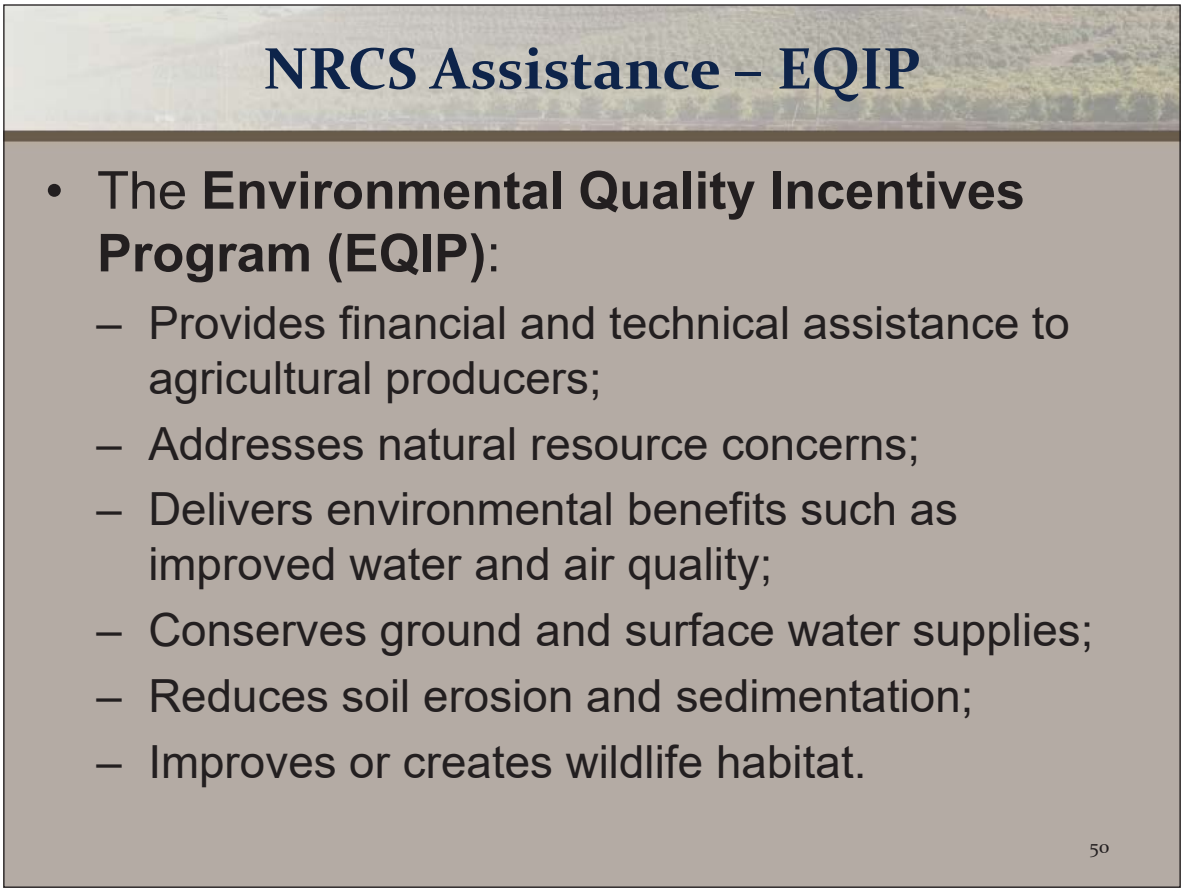
The NRCS is a valuable resource for assistance with understanding the types of erosion and implementation of management practices. This section provides resources regarding funding and assistance opportunities via the NRCS (Objective 5).



The NRCS is a valuable technical resource for sediment and erosion control support, and also funding and cost sharing opportunities. The NRCS develops Conservation Plans for growers that include detailed sediment and erosion control evaluations and plans. These plans can be followed by the grower to cover the ILRP SECP requirement, but the NRCS will not directly certify ILRP SECPs. The grower "certifies" the ILRP SECP by saying that they are following a Conservation Plan that the NRCS developed for them.

The 5 steps listed here demonstrate process of acquiring NRCS guidance.

Once a request or question is provided to the NRCS, they undergo a process of collection and analysis, decision support, application and evaluation.



For further questions regarding EQIP, contact an NRCS specialist.

NRCS Assistance – CTA

- NRCS delivers conservation technical assistance through its voluntary **Conservation Technical Assistance Program (CTA**).
- CTA is available to any group or individual interested in conserving our natural resources and sustaining agricultural production in this country.
- **See contact sheets in binder.**

USDA NRCS
U.S. Department of Agriculture
Natural Resources Conservation Service

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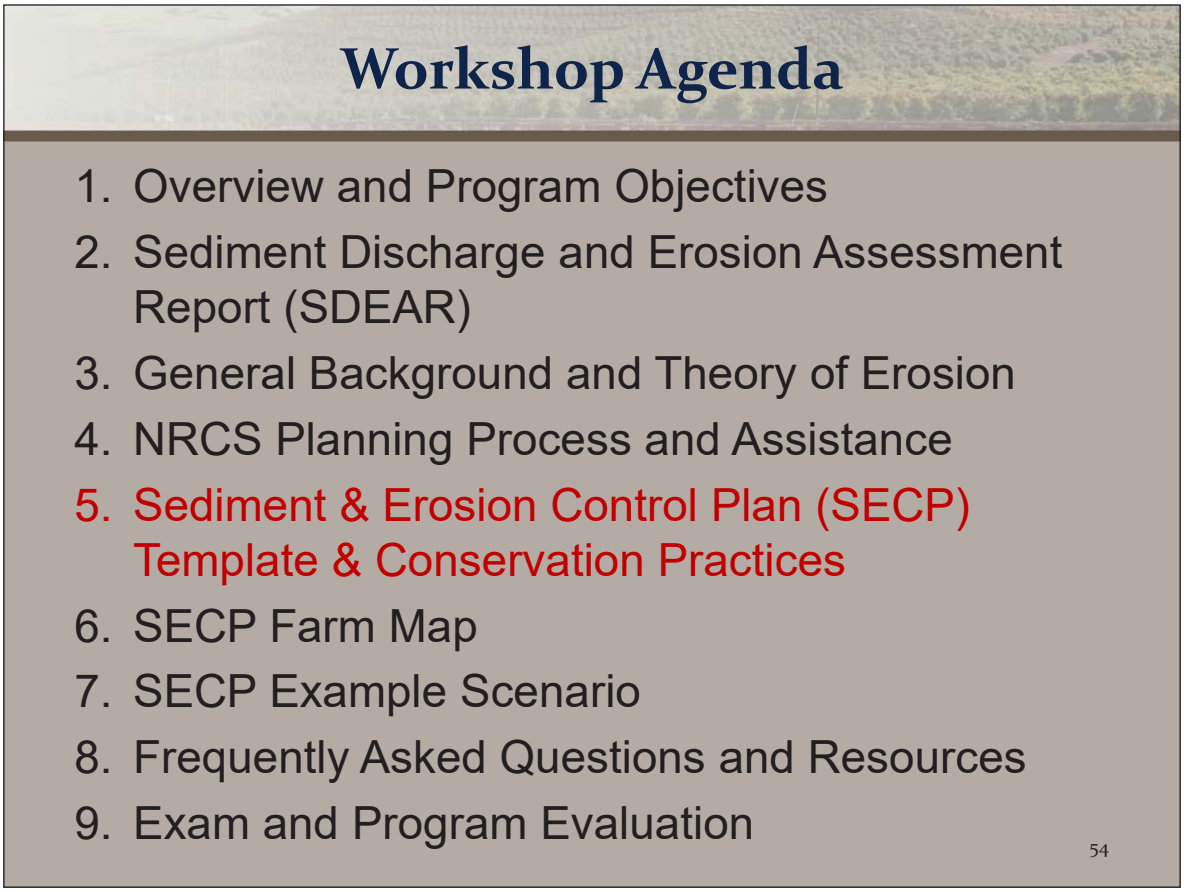
Programs exist that are designed to help growers implement management practices that protect natural resources, such as the practices contained in this curriculum.

NRCS Assistance Can Help Land Users

- Maintain and improve private lands and their management.
- Implement better land management technologies.
- Protect water quality and quantity.
- Maintain and improve wildlife & fish habitat.
- Enhance recreational opportunities on their land.
- Maintain and improve the aesthetics of private land.
- Explore opportunities to diversify agricultural operations.
- Develop and apply sustainable agricultural systems.

Figure References:

- http://blackwarriorriver.org/wp-content/uploads/2013/08/MillCreek.BWR_SW1.jpg
- https://www.nrcs.usda.gov/wps/portal/nrcs/photogallery/ia/soils/gallery/?cid=1711&position=Promo#18



Refer to the provided SECP template form and follow along with the form during this section.

This section is intended to be a general overview of the practices. More detail of application of some selected practices will come up in the scenario when Section 7 of the Agenda is addressed. For a better understanding of listed practices and more, the binder's NRCS and CSWQA standards section has more in-depth information and should be used for reference when implementing recommended practices or when evaluating a practice's sufficiency. Presentation Objective #3.

SECP – Irrigation Infrastructure Practices

Page 4 of SECP Template

2. On-farm Sediment and Erosion Management Practices:

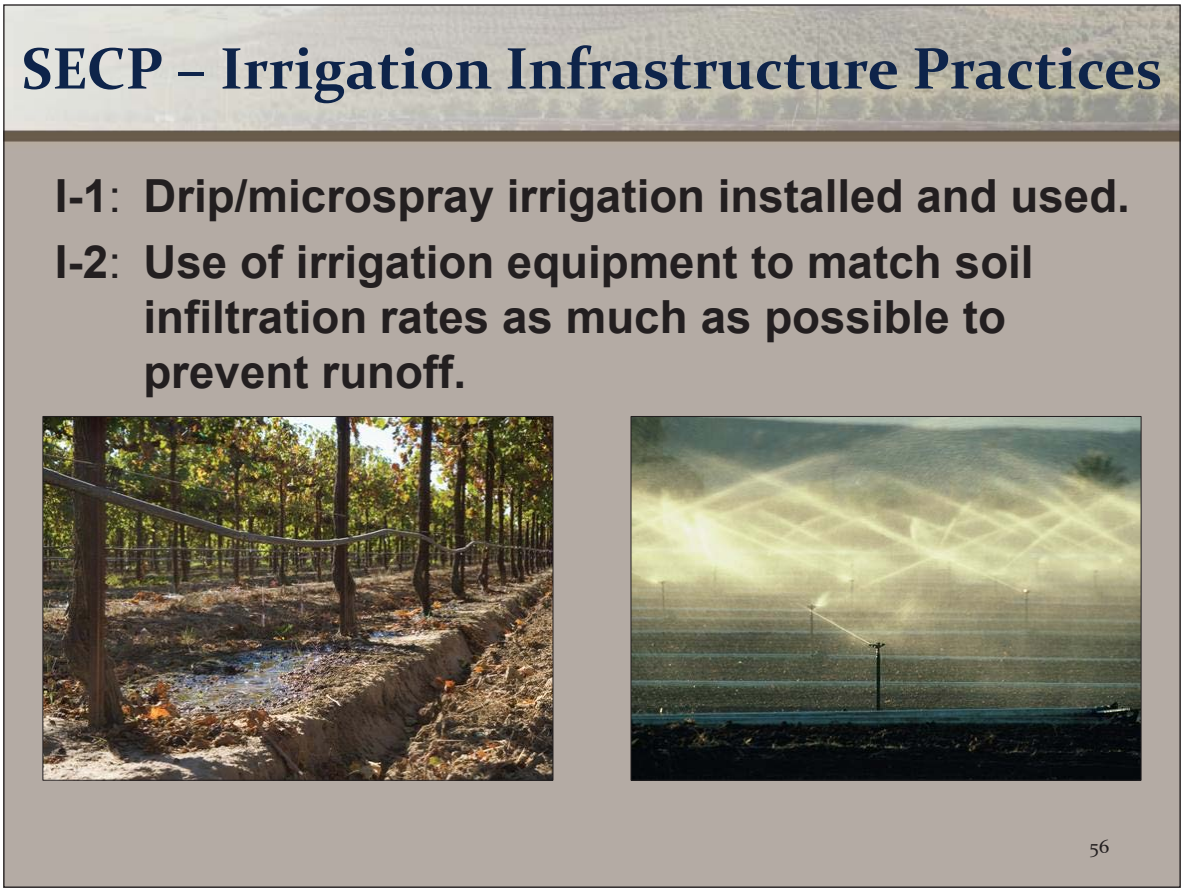
Use these Practice Codes to insert into the table in Section 3.

Management Practice Code	Inventory of Sediment and Erosion Control Practices
	Current Irrigation Infrastructure Practices
I-1	Drip/microspray irrigation installed and used.
I-2	Use of irrigation equipment (sprinklers, micro-sprinklers, emitters, etc.) to match soil infiltration rates as much as possible to prevent runoff.
I-3	Recirculation systems are used to keep sediment and farm inputs on site. Water is recirculated to irrigate other fields.
I-4	In-furrow dams are used to increase infiltration and settling out of sediment prior to entering the tail ditch.
I-5	Storm water is captured using field borders to reduce runoff and supplement field irrigation.
I-6	Use of flow dissipaters to minimize erosion at discharge point.
I-7	Shorter irrigation runs are used with checks to manage and capture flows.
I-8	Land grading has been done to increase irrigation efficiency and improve control of drainage.
I-9	Fields are planted on the contour to reduce runoff.
I-10	Crop rows are graded, directed and at a length that will optimize the use of rain and irrigation water.
I-11	Berms are constructed at low ends of fields to capture runoff and trap sediment.
I-12	Vegetative filter strips and buffers are used to capture flows.
I-13	Subsurface pipelines are used to channel runoff water.
I-14	Hedgerows or trees are used to help stabilize soils and trap sediment movement.
I-15	Sediment basins / holding ponds are used to settle out sediment and hydrophobic pesticides such as pyrethroids from irrigation and storm runoff.
I-16	Other irrigation practices (attach additional sheets if necessary to list and describe practices): 55

Note: The Management Practice codes (e.g. I-1, I-16, etc.) are the codes discussed in the following slides.

I codes are for Infrastructure, M codes are for general management practices and O codes are in a miscellaneous category.

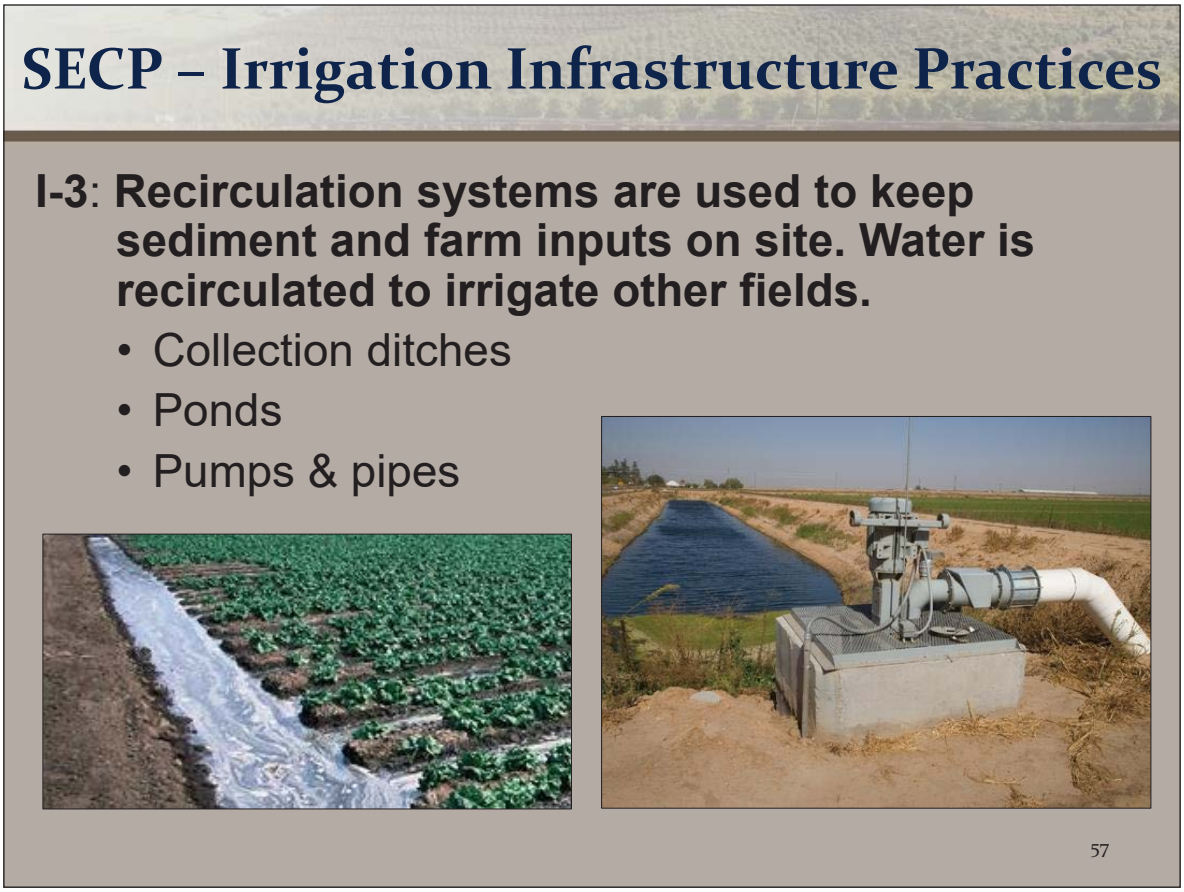
It is the trainer's discretion how much emphasis is placed on specific practices based on their likelihood of occurring in the region where the training is. However, it is important to note that all practices are subject to being included on the exam and some growers could manage land in various parts of the state.



I-1: Drip/microspray irrigation installed and used.
I-2: Use of irrigation equipment (sprinklers, micro-sprinklers, emitters, etc.) to match soil infiltration rates as much as possible to prevent runoff.

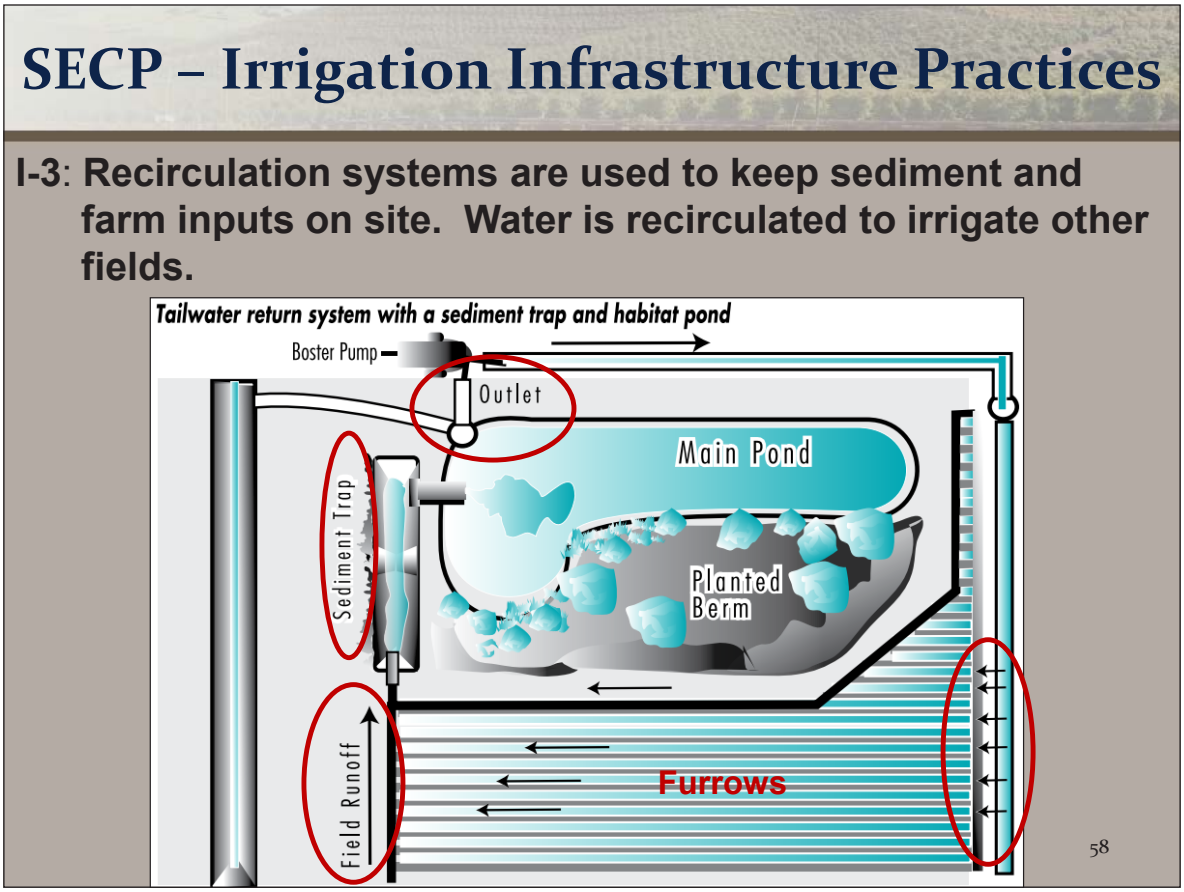
There are many benefits to microirrigation. In general, irrigation efficiencies can be higher than surface irrigation which can lead to greater yields. Distribution uniformity is also often better than surface irrigation, and there is less water lost to evaporation from water exposed to the air, a wetted soil surface, or from the plant canopy.

By scheduling irrigation equipment to match the soil infiltration rate, less irrigation water is lost to runoff; which minimizes input costs and minimizes the effects of irrigation related erosion.



I-3: Recirculation systems are used to keep sediment and farm inputs on site. Water is recirculated to irrigate other fields.

Runoff from agricultural fields is likely to contain suspended sediments. To prevent sediment discharge off of the field and possibly to a water body, irrigation recirculation systems can be used. This can reduce input costs and result in improved irrigation efficiency. Tailwater return systems can also help with irrigation scheduling and reduce the need for off-site water when properly sized and utilized.



I-3: Recirculation systems are used to keep sediment and farm inputs on site. Water is recirculated to irrigate other fields.

This slide contains an illustration of a hypothetical tailwater return system. Note the important components of this infrastructure practice: Furrows, capturing runoff, sediment trap, main pond (irrigation reservoir), and booster pump to return water back to the head of the furrows.

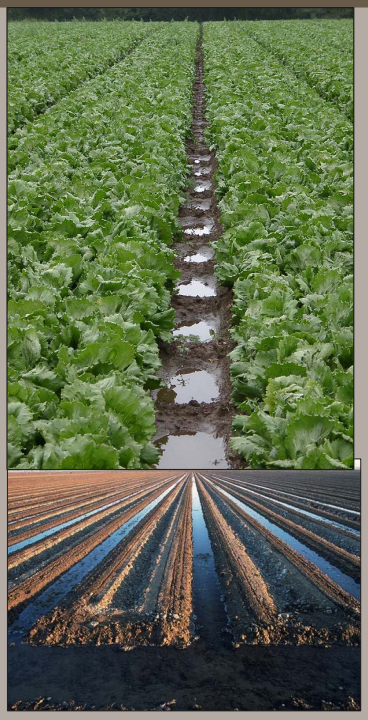
Figure Reference:

- BMP Handbook, Westside San Joaquin Valley and CURES
  http://www.curesworks.org/bmp/irrigTailwater.pdf

SECP – Irrigation Infrastructure Practices

I-4: In-furrow dams are used to increase infiltration and settling out of sediment prior to entering the tail ditch.

- Use dirt, plastic furrow dams, or plant material to help slow down water movement;
- Settles out sediment, before tailwater ditch;
- Can conserve water, increase infiltration, and distribution uniformity (**DU**).



(Long, Fulton, and Hanson, 2010).

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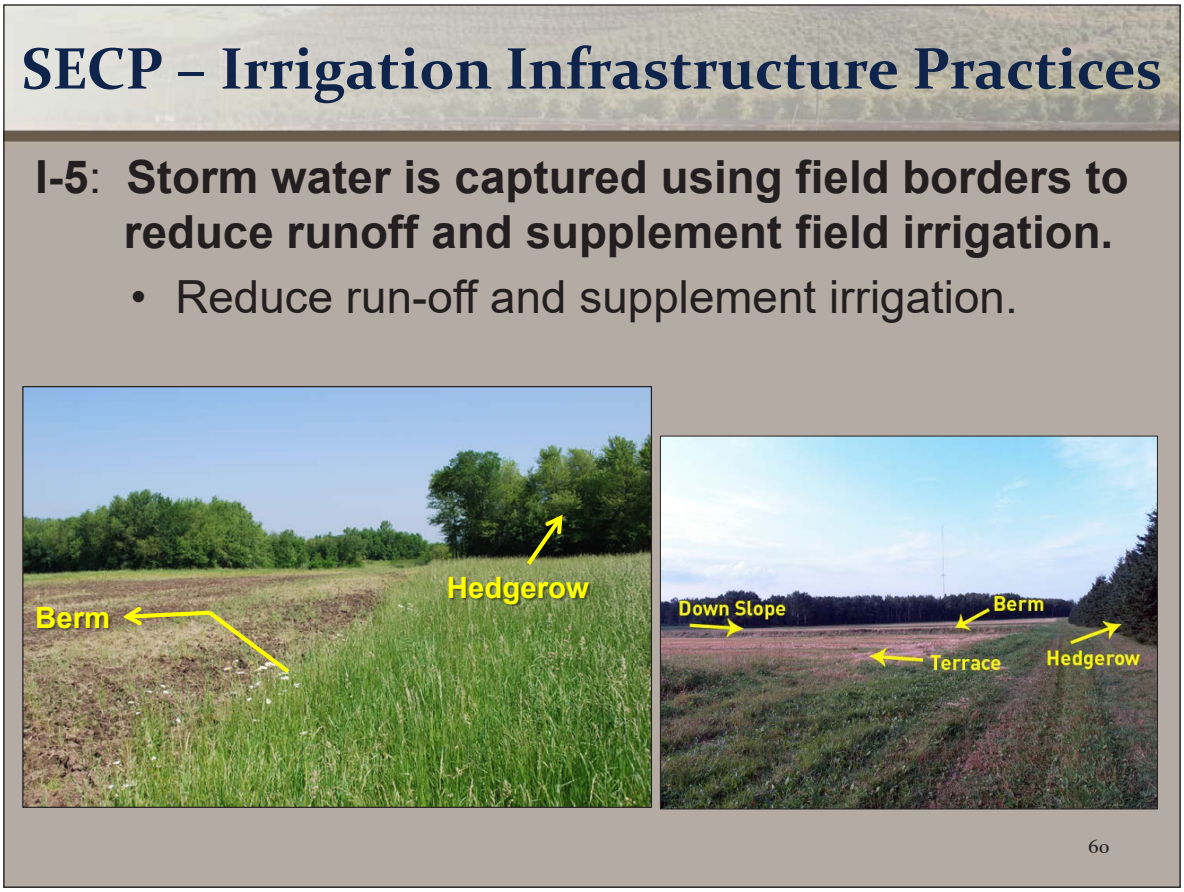
I-4: In-furrow dams are used to increase infiltration and settling out of sediment prior to entering the tail ditch.

In-furrow dams use the principle of slowing the velocity of the water to promote settling of suspended sediment prior to the irrigation runoff.



I-5: Storm water is captured using field borders to reduce runoff and supplement field irrigation.

By using field borders, water is physically trapped from leaving the field. Capturing this water and keeping it in the crop field can:

- Replenish the soil profile with moisture
- Leach salts
- Reduce runoff

Important to note that the success of this practice is dependent on how well it is maintained. The amount of sediment trapped will vary from field to field. Must consider how much land it will take to trap sediment (see Practice Standards, other technical references, NRCS, or a consultant).

Figure Reference

- http://swcd.mo.gov/buchanan/images/FieldBorders_001.JPG

SECP – Irrigation Infrastructure Practices

I-6: Use of flow dissipaters to minimize erosion at discharge point.

- Slow velocity of water, sediment falls out, water keeps flowing;
- If using riprap, fully cover the soil (avoid large gaps). May require geotextile lining or various sizes of rock.

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I-6: Use of flow dissipaters to minimize erosion at discharge point.

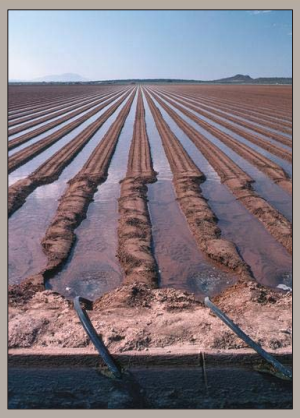
By using riprap or other flow dissipaters to slow the water velocity, suspended particles can settle and "clean" water can keep moving. We don't necessarily have to contain all stormwater on our fields, we need to remove the suspended sediment from the water prior to the sediment discharging out of the field. This is an important distinction.

Artificial swales can be developed to manage runoff by promoting infiltration, such as the image on the left. A swale is a low tract of land, that is especially moist.
Be mindful of which products to use. Ensure that flow dissipaters cover bare soil which will slows the water flow and minimize detachment and transport of sediment. If a swale is developed enough, it could be considered a "water of the state" by the California Department of Fish and Wildlife. If any questions or concerns arise regarding a potential water of the state, contact a consultant or NRCS specialist.

SECP – Irrigation Infrastructure Practices

I-7: **Shorter irrigation runs are used with checks to manage and capture flows.**

- Manage and capture flows;
- Improve Distribution uniformity (DU).



I-8: **Land grading has been done to increase irrigation efficiency and improve control of drainage.**

- Improve irrigation efficiency;
- Improve drainage.

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I-7: Shorter irrigation runs are used with checks to manage and capture flows.
I-8: Land grading has been done to increase irrigation efficiency and improve control of drainage.

Land grading/leveling impacts the slope. Water will have more energy to move down greater slopes than relatively flat ground. This will allow more opportunity for the water to infiltrate into the soil rather than pick up sediment and discharge off of the field.

SECP – Irrigation Infrastructure Practices

I-9: Fields planted on the contour to reduce runoff.

- Reduces runoff volume and velocity;
- Easier implementation of some cultural practices.
  - Not all cultural practices are made easier.

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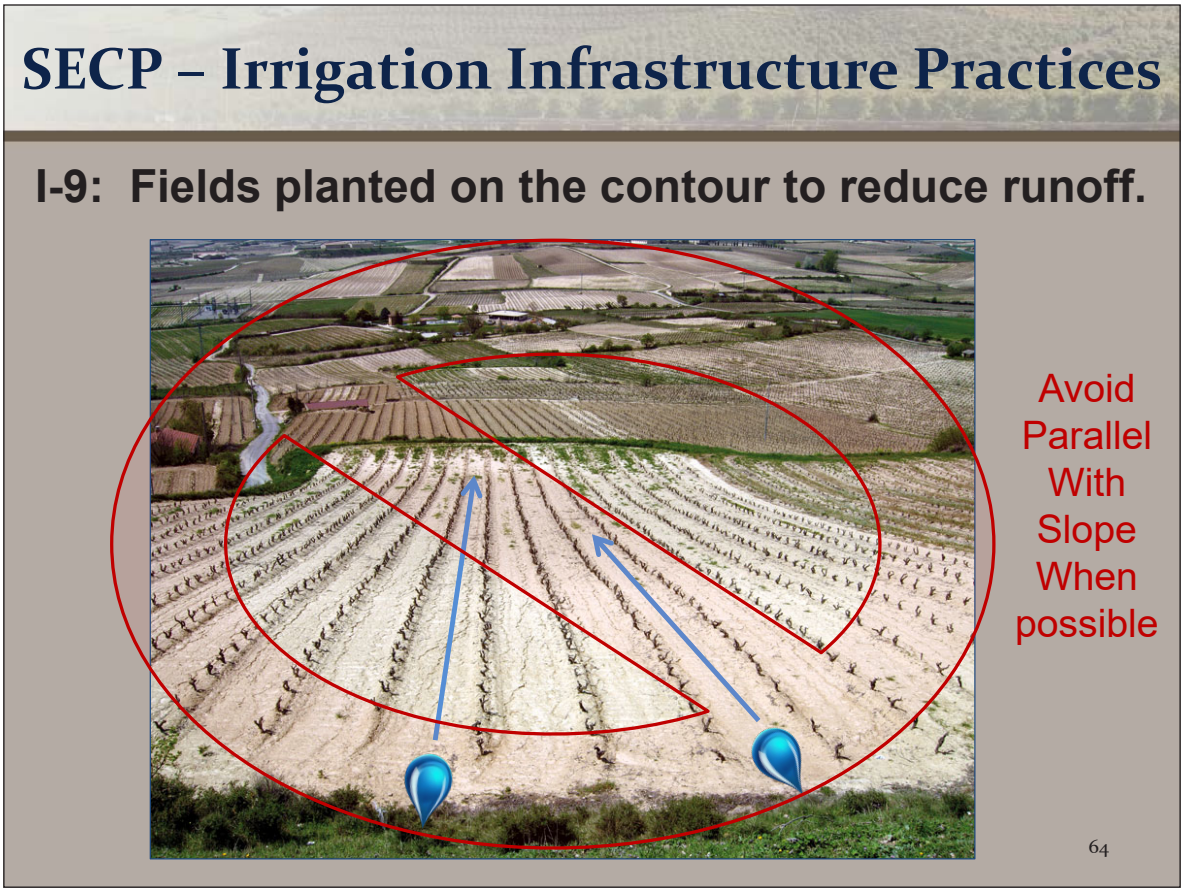
I-9: Fields are planted on the contour to reduce runoff.

- Can reduce erosion by 50% (Weesies, Schertz, and Kuenstler, 2002).
- This reduction can be further improved if you plant grass alleys between tree rows (Grismer, O'Geen, and Lewis, 2006).
- Planting on the contour can make some practices, such as cross discing, more difficult. Be sure to cater your plan to what makes the most sense for your fields and your practices.

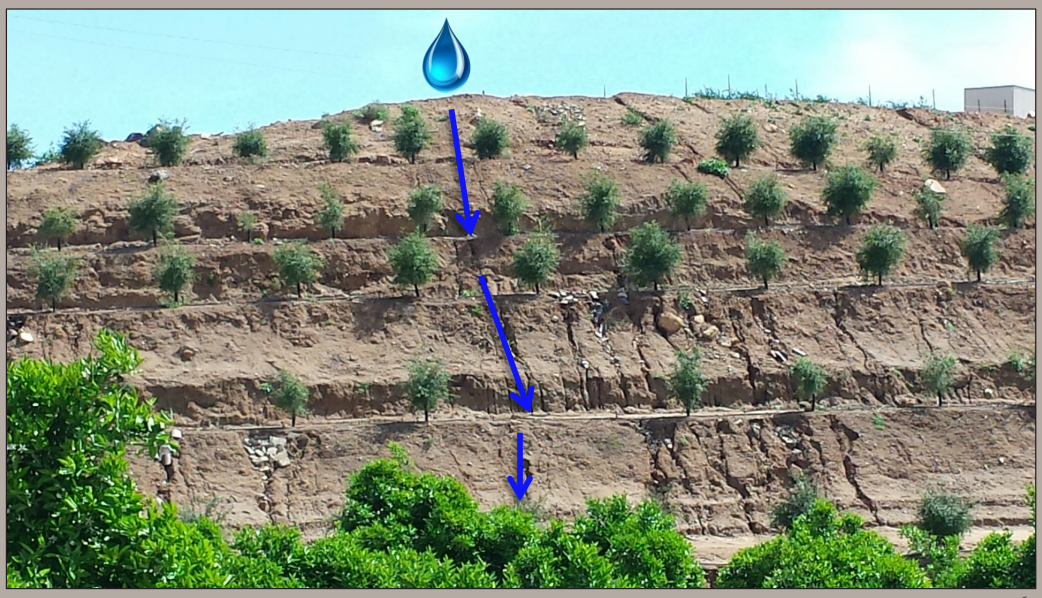


- This is the type of row configuration ("parallel with slope") we want to avoid if possible. Note that this isn't always an option, though. In that case, address sediment and erosion issues with other practices.
- Each row creates a direct drainage pathway which will concentrate flow, increase velocity as water moves downhill, which increases erosion and sediment discharge.
- This is one of the most critical sediment and erosion control practices. Decisions must be made in the planning process. Once crops are planted, no changing them. This could be decades for permanent crops.
- Must carefully consider row layout before planting and also the implication on irrigation system design, management logistics, spraying, etc.

SECP – Irrigation Infrastructure Practices

I-9: Fields planted on the contour to reduce runoff.

- Not always enough; also need other practices.



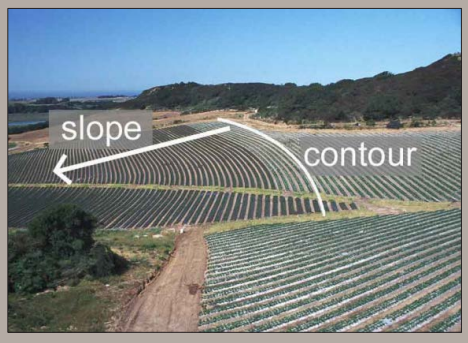
65

Some of these practices are not going to fully mitigate a sediment discharge and erosion issue. All of the scenarios are circumstantial and no practice is intended as “one size fits all.”

SECP – Irrigation Infrastructure Practices

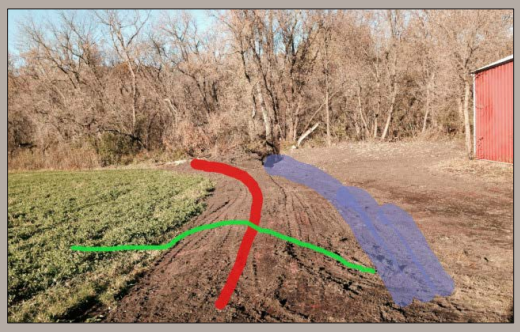
I-10: Crop rows are graded, directed and at a length that will optimize the use of rain and irrigation water.

- Not always a square or straight.



I-11: Berms are constructed at low ends of the fields to capture runoff and trap sediment.

- Capture runoff;
- Trap sediment.



I-10: Crop rows are graded, directed and at a length that will optimize the use of rain and irrigation water.
I-11: Berms are constructed at low ends of fields to capture runoff and trap sediment.

Field grading is an effective and commonly used method to maximize infiltration or direct runoff to an intentional location that will prevent sediment discharge and erosion issues (such as a sediment basin, culverts, vegetated ditches or filter strips, etc.).

Berms at the ends of fields can keep the water and suspended sediments on field and allow them to eventually settle. Recall, runoff water is allowed to leave the field; however, sediment qualifies as “waste discharge” under the California Water Code.

For more detailed information row arrangement, review the following reference:

RCDMC and MCACO 2014. Hillslope farming runoff management practices guide. Resource Conservation District of Monterey County and Monterey County Agricultural Commissioner’s Office. Pages 9-11. URL: http://www.rcdmonterey.org/pdf/rcdmc-hillslope-guide-rvsd-2.11.14.pdf

SECP – Irrigation Infrastructure Practices

I-12: Vegetative filter strips and buffers are used to capture flows.

- Slows water flow/velocity, allows suspended sediment to drop out;
- Use native vegetation, when possible; weeds may suffice;
- **Key elements**: slope, site prep, soil, width, vegetation, placement, maintenance, monitoring (Grismer and O'Geen, 2006);
- Width of 25-50 ft, depending on slope (see references in notes);
- Ensure filter is established prior to rainy season.

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I-12: Vegetative filter strips and buffers are used to capture flows.

Vegetative filter strips can be used to trap sediment both alive and dead; which provides their ability to minimize sediment discharge throughout CA. The vegetative filter should be established prior to the rainy season and the practice efficiency should be evaluated during a rain event, much like other practices.

The vegetation can trap sediment and promote settling prior to discharging off of the field or to a water body. Based on empirical studies, their trapping or removal efficiency frequently exceeded 90% of sediments, 50-80% of nutrients, and 44-100% of the herbicide atrazine (Grismer and O'Geen, 2006).

Buffer strips should be sized according to the individual characteristics of the site, taking into account the size of the area to be drained and slope of the land that they are located on. Width (flow length) of buffer strips could be 25-50 feet in width. Increased lengths enhance the treatment ability of the management practice by increasing detention time. However, lengths greater than 40-50 feet may result in channelized flow and may require additional flow dissipaters.

See NRCS Practice Standard I-12 and the following references for more information:

Grismer, M.E., A.T. O'Geen, D. Lewis. 2006. Vegetative filter strips for nonpoint source pollution control in agriculture. University of California Division of Agriculture and Natural Resources. Publication 8195. URL: http://anrcatalog.ucanr.edu/pdf/8195.pdf

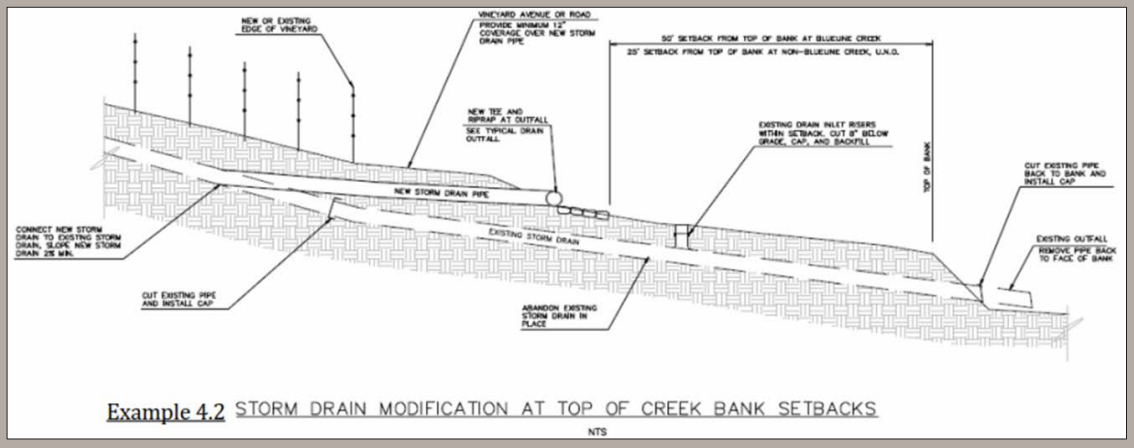
"General Specification B.7 of the California Central Valley Dairy General Order: Manure and process wastewater shall not be applied closer to 100 feet to any down gradient surface waters, open tile intake structures, sinkholes, ag or domestic well heads, or other conduits to surface waters, unless a 35-foot wide vegetated buffer or physical barrier is substituted for the 100 foot setback or alternative conservation practices of field specific conditions will provide pollutant reductions equivalent or better than the reduction achieved by the 100 foot setback."

Dare County Wisconsin Erosion Control and Stormwater Management Manual, 2nd edition. 2007. Dance County Land and Water Resources Department. Madison, Wisconsin. PDF page 197-199: Vegetated Buffer Strips. URL: http://www.danewaters.com/pdf/manual/ecsm_manual.pdf

SECP – Irrigation Infrastructure Practices

I-13: Subsurface pipelines are used to channel runoff water.

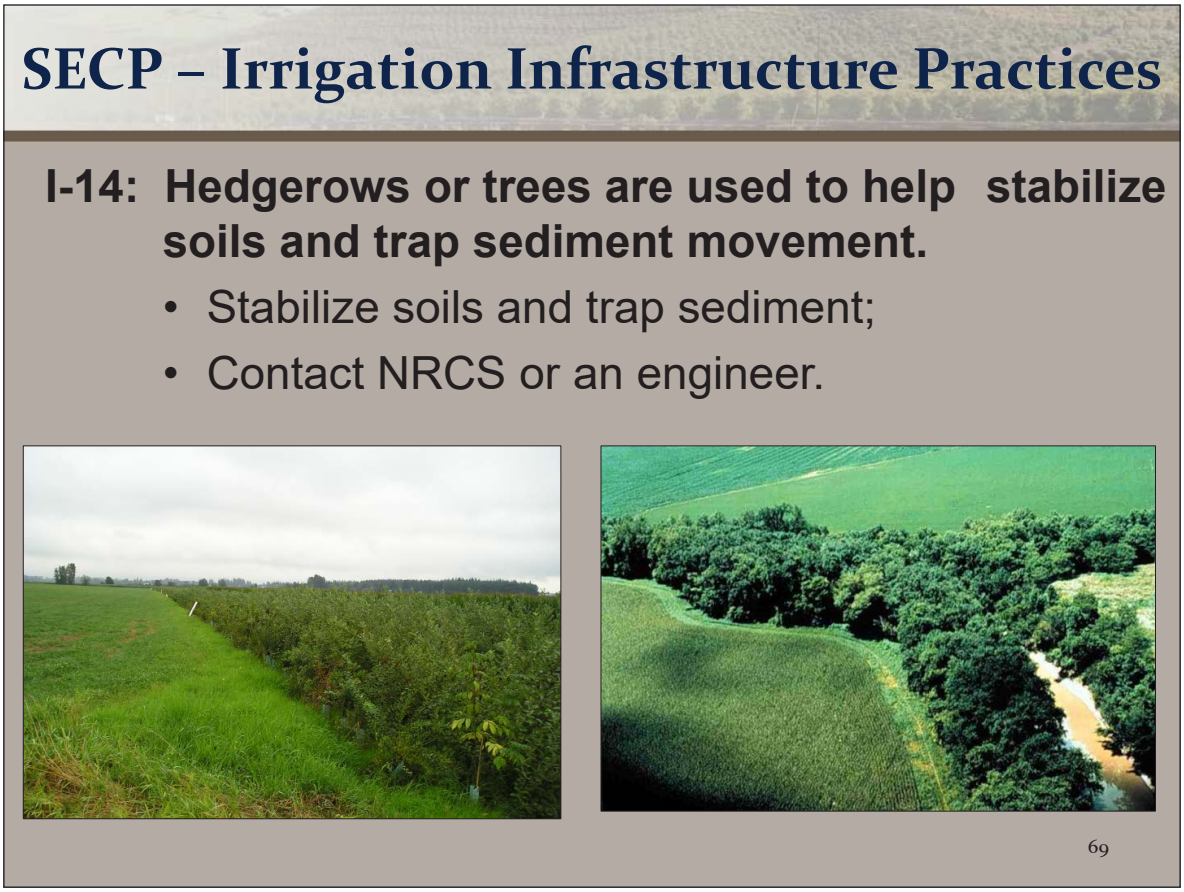
- Collect and channel runoff water;
- Contact NRCS or an engineer.



I-13: Subsurface pipelines are used to channel runoff water.

Emphasize the need for NRCS or an engineer considering that implementation and design requires engineering.

Subsurface pipelines can be used to direct drainage around agricultural fields which will minimize the potential to pick up agricultural constituents such as pesticides and nutrients and minimize erosion. Runoff can be channeled to underground settling basins, vegetated treatment areas, and other flow dissipaters. An example farm layout on slide 108 provides an example of this practice.



I-14: Hedgerows or trees are used to help stabilize soils and trap sediment movement.

The reasoning behind contacting the NRCS or an engineer for hedgerows is relevant to potentially sensitive habitat and practice effectiveness. Hedgerows provide wildlife habitat, increases soil organic matter, serves as a windscreen (wind erosion), delineates field boundaries, and potentially creates a "living fence."

Shrubs or other vegetation that provide ground cover are recommended for this practice. See NRCS Practice Standard Code 442 for additional information, and the following references:

- Earnshaw, S., 2004. Hedgerows for California agriculture. Community Alliance with Family Farmers. Davis, California. URL: http://caff.org/wp-content/uploads/2010/07/Hedgerow_manual.pdf
- Long, R.F., J.H. Anderson. 2010. Establishing hedgerows on farms in California. University of California Agriculture and Natural Resources. Publication 8390. Richmond, California. URL: http://ucfoodsafety.ucdavis.edu/files/26499.pdf
- http://ucanr.edu/sites/farmwaterquality/files/156393.pdf

SECP – Irrigation Infrastructure Practices

I-15: Sediment basin/holding ponds are used to settle out sediment and hydrophobic pesticides such as pyrethroids from irrigation and storm runoff.

- Settle out sediment and pesticides and regulate flows;
- Contact NRCS or an engineer.

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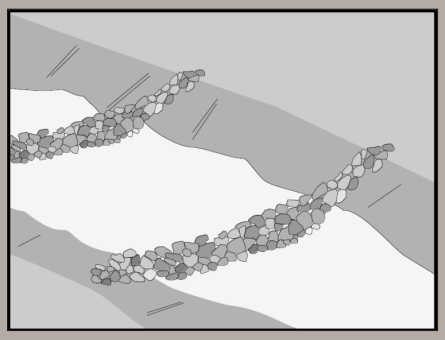
I-15: Sediment basins / holding ponds are used to settle out sediment and hydrophobic pesticides such as pyrethroids from irrigation and storm runoff.

The implementation and design of a sediment pond requires an engineer or NRCS specialist.

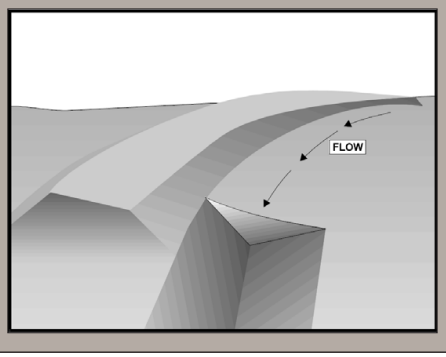
SECP – Irrigation Infrastructure Practices

I-16: Other Irrigation Infrastructure Practices

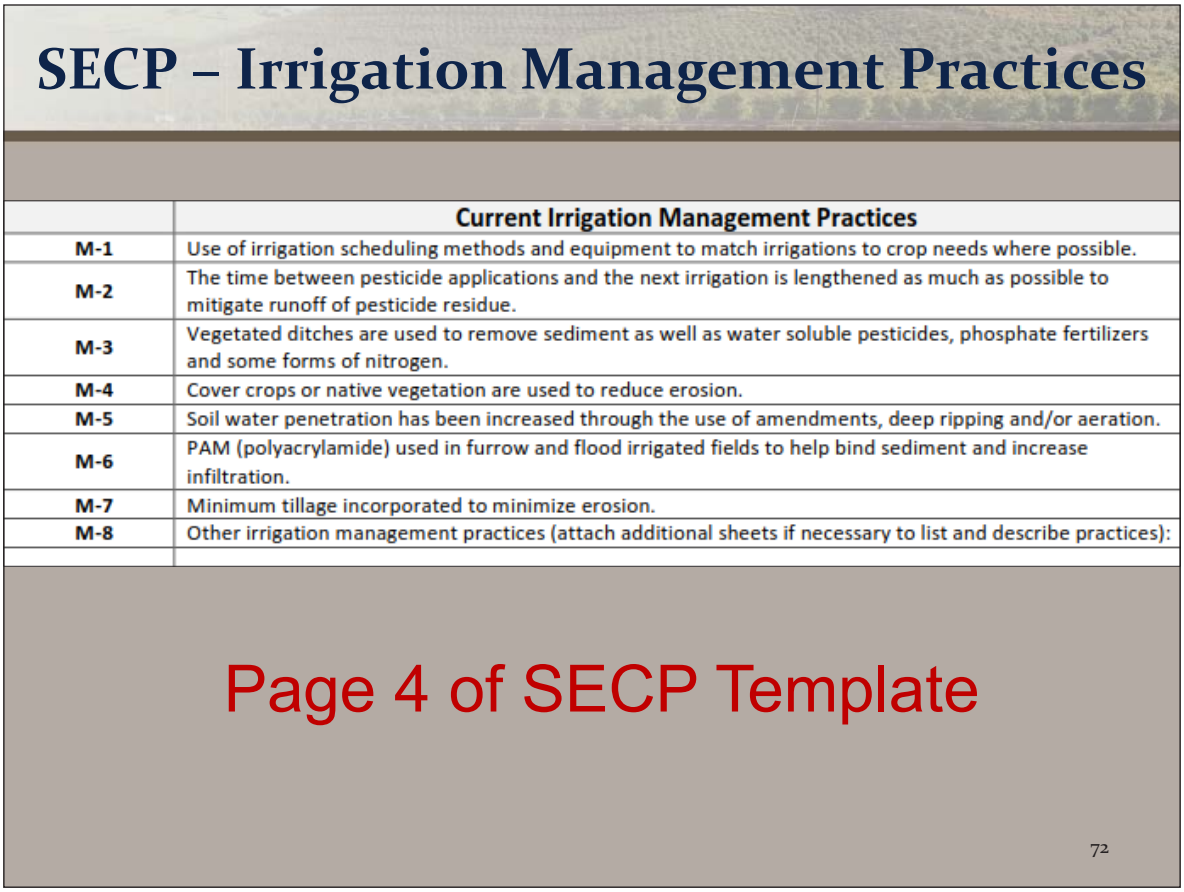
- **Check Dams**
  - Used to reduce effective slope of channel, reducing flow velocity;
  - Can use rock, gravel bags, sandbags, fiber rolls, etc.



- **Drainage Swales**
  - Shaped and sloped depression in soil surface, used to convey runoff to a desired location to promote infiltration or drainage direction.



Practices that can be sufficient at mitigating erosion issues are not limited to what is on the form. I-16 accounts for additional infrastructural practices used to minimize sediment discharge off of the property, that are not accounted for in the SECP form.



SECP – Irrigation Management Practices

	Current Irrigation Management Practices
M-1	Use of irrigation scheduling methods and equipment to match irrigations to crop needs where possible.
M-2	The time between pesticide applications and the next irrigation is lengthened as much as possible to mitigate runoff of pesticide residue.
M-3	Vegetated ditches are used to remove sediment as well as water soluble pesticides, phosphate fertilizers and some forms of nitrogen.
M-4	Cover crops or native vegetation are used to reduce erosion.
M-5	Soil water penetration has been increased through the use of amendments, deep ripping and/or aeration.
M-6	PAM (polyacrylamide) used in furrow and flood irrigated fields to help bind sediment and increase infiltration.
M-7	Minimum tillage incorporated to minimize erosion.
M-8	Other irrigation management practices (attach additional sheets if necessary to list and describe practices):

Page 4 of SECP Template

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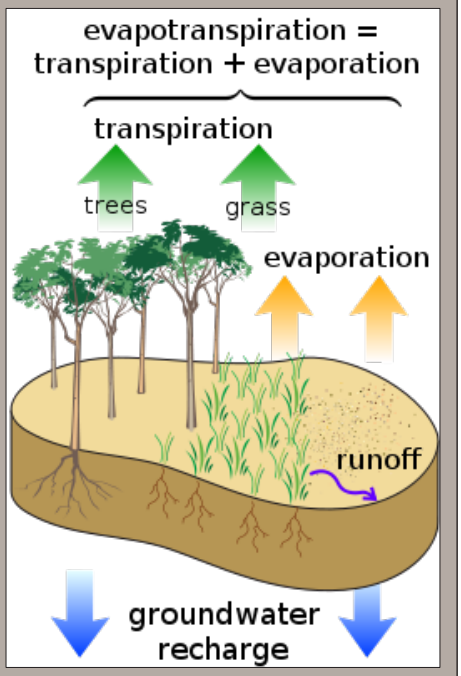
Stay on page 4 of the SECP template.

SECP – Irrigation Management Practices

M-1: Use of irrigation scheduling methods and equipment to match irrigations to crop needs where possible.

- Track evapotranspiration;
- Check book method;
- Use of moisture sensors.



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M-1: Use of irrigation scheduling methods and equipment to match irrigations to crop needs where possible.

Technology exists to track evapotranspiration (such as CIMIS and other weather stations), which is the collective water loss from a system via crop transpiration and evaporation. There are also multiple other methods and technologies to schedule irrigation, such as pressure bombs, soil moisture sensors, crop canopy temperature, etc.

SECP – Irrigation Management Practices

M-2: The time between pesticide applications and the next irrigation is lengthened as much as possible to mitigate runoff of pesticide residue.

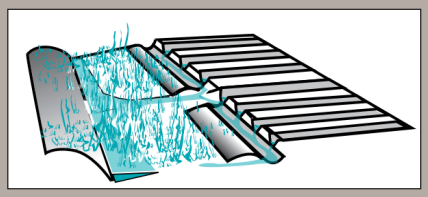
- Lengthen time between pesticide applications and the next irrigation or expected storm.

M-2: The time between pesticide applications and the next irrigation is lengthened as much as possible to mitigate runoff of pesticide residue.

SECP – Irrigation Management Practices

M-3: Vegetative Ditches are used to remove sediment as well as water soluble pesticides, phosphate fertilizers, and some forms of nitrogen.

- Removes sediment;
- Removes some pesticides & fertilizers.

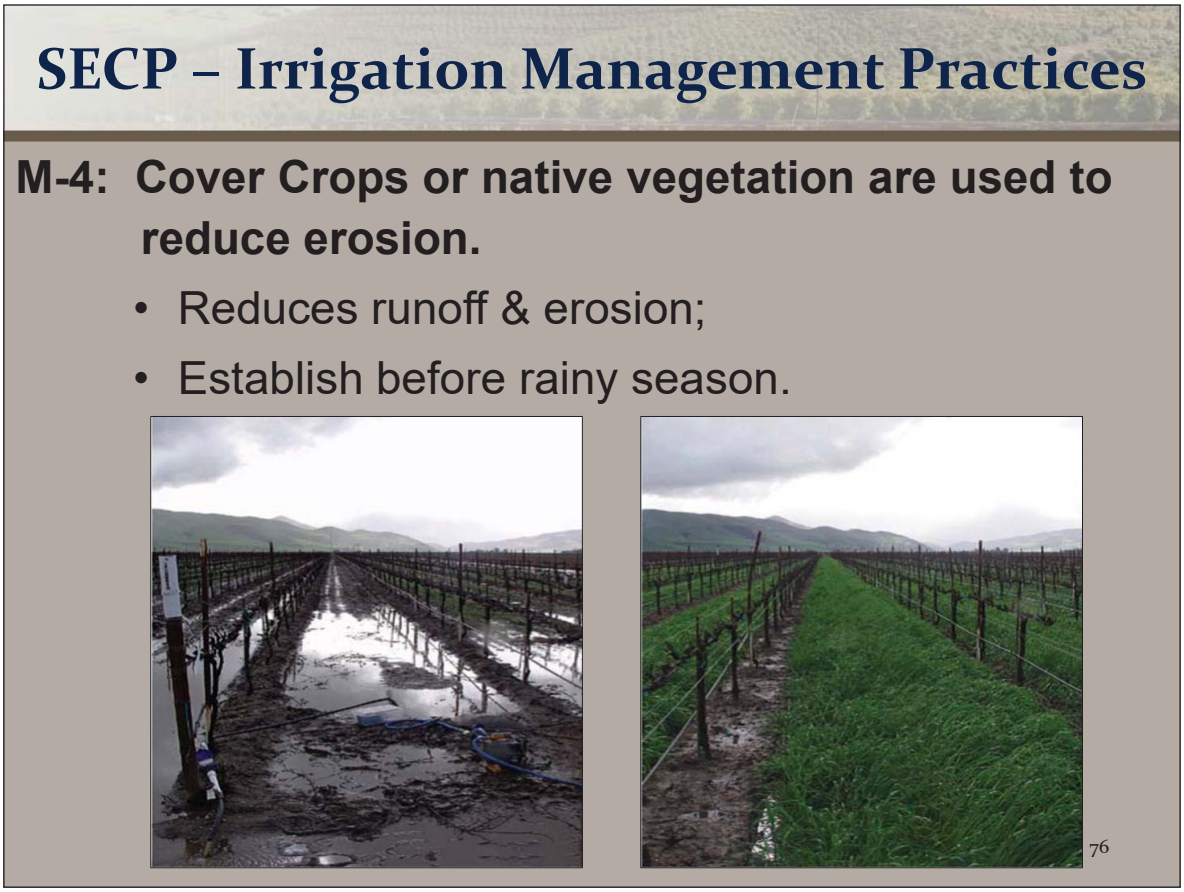


M-3: Vegetated ditches are used to remove sediment as well as water soluble pesticides, phosphate fertilizers, and some forms of nitrogen.

Vegetative ditches (also called grassed waterways or vegetated swales) slow the water velocity and trap sediment, allowing settling at a more efficient rate. The design of the ditch will affect its performance. Ditches with steep side slopes do not establish vegetation as well; therefore, are not as effective in settling sediment.

Designs vary, but typical large grassed waterway has a 10-foot wide bottom with 4:1 side slopes. Smaller vegetated ditches can have a 6-foot wide bottom with 4:1 side slopes. For additional details and information, see the following reference:

- Vegetated ditch/grassed waterway. BMP Handbook. Management practices for protecting water quality. Westside San Joaquin Valley. Coalition for Urban/Rural Environmental Stewardship (CURES). URL: http://www.curesworks.org/bmp/vegetatedDitches.pdf

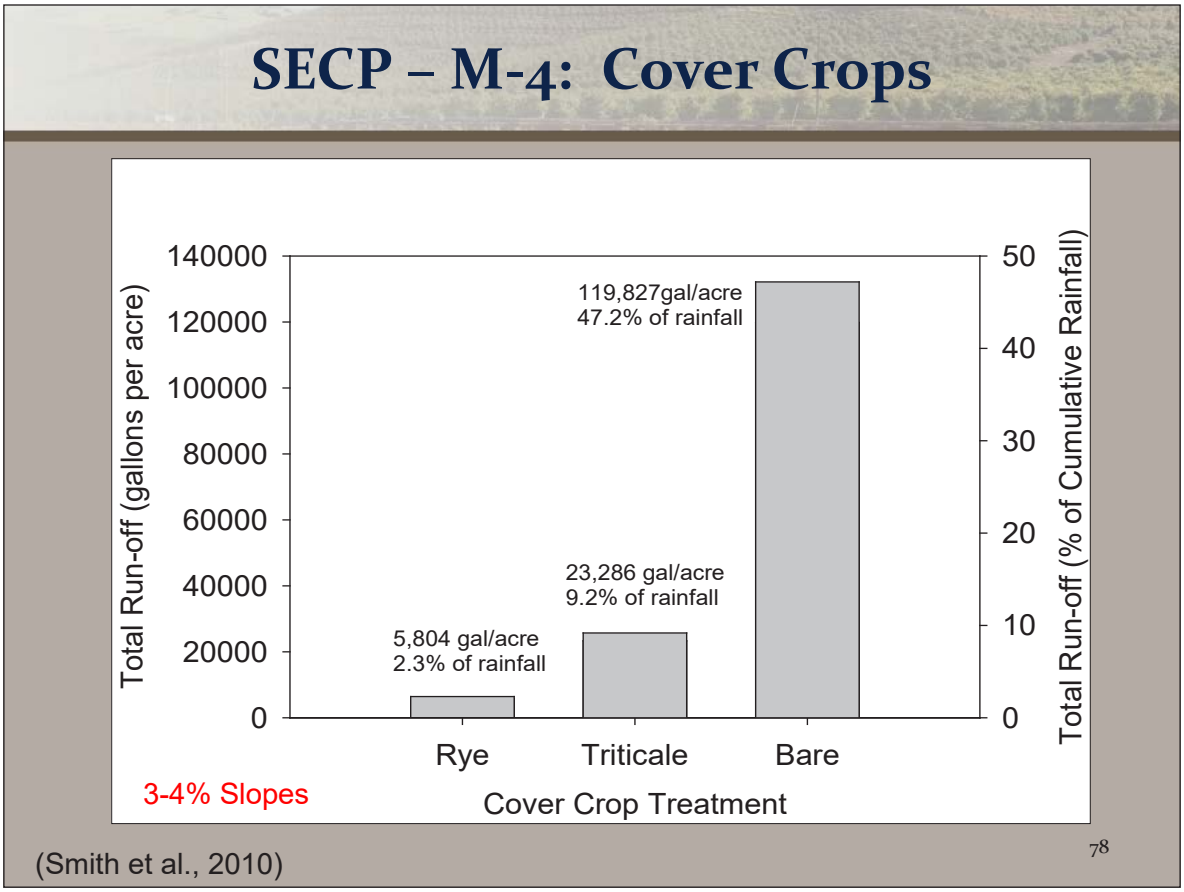


M-4: Cover crops or native vegetation are used to reduce erosion.

- In many situations, it is not practical or feasible to add soil amendments as an erosion control practice. Cover crops are a great alternative.
- They protect soil from raindrop impact, prevent the formation of surface crusts, increase infiltration rates, and intercept sediment-rich runoff.
- Also a great source of soil organic matter.
- Some summer and winter weeds can sometimes be managed like cover crops.
- It is important to consider nutrient and water competition, shade tolerance, crop height, maintenance practices such as mowing, and seed costs.
- Disadvantages include: water usage, invasive vegetation, pest habitat, some increase potential for frost damage, cost to establish and maintain.
- May only be possible to use after harvest in the fall/winter for some nut crops.

M-4: Cover crops or native vegetation are used to reduce erosion.

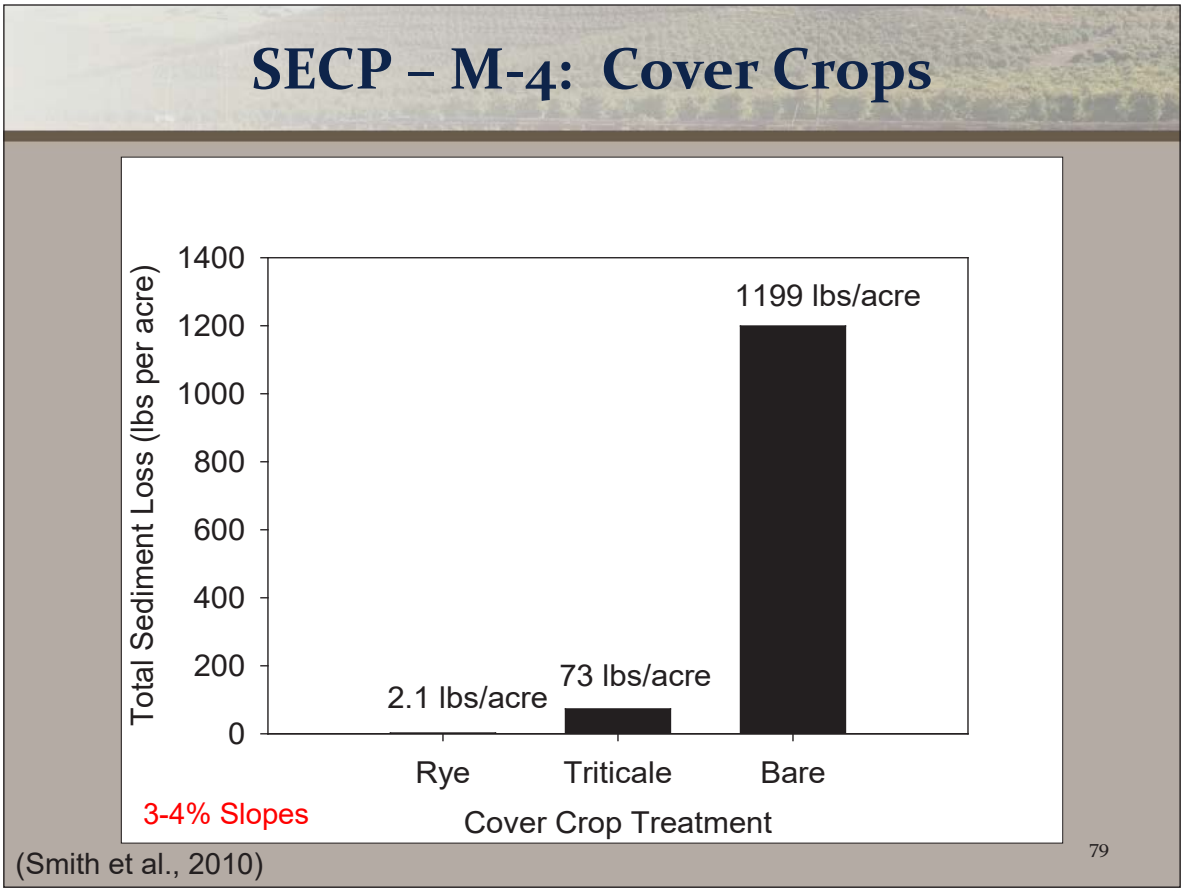
Another example of cover crops. Photos courtesy of the Dixon/Solano Resource Conservation District Water Quality Coalition.



Data from a Salinas Valley study titled: "Low residue cover crops minimize run-off, erosion, and nutrient loss from fallow vegetable fields."
Authors: Richard Smith, Michael Cahn, Aaron Heinrich, and Barry Farrara. 2010.

This study evaluated the run-off potential of bare soil vs. various cover crop treatments. This graph depicts the total runoff in gallons per acre that occurred on the treated fields (rye and triticale) compared to the bare field. The total runoff accounts for the water and suspended sediment.

As seen in the graph, the bare soil (no cover crop) treatment had much greater run-off than the rye or triticale fields. Almost half of the rainfall that fell ran-off from the bare soil. Only 2-9% ran-off of the rye and triticale fields.



Data from a Salinas Valley study titled: "Low residue cover crops minimize run-off, erosion, and nutrient loss from fallow vegetable fields."
Authors: Richard Smith, Michael Cahn, Aaron Heinrich, and Barry Farrara. 2010. See references slide.

This study evaluated the run-off potential of bare soil vs. various cover crop treatments. Be sure to carefully explain each axis, the units, etc. before going into the interpretation of this data.

As seen in the graph, the bare soil (no cover crop) field had much a much greater mass of sediment loss (1,199 lbs/ac sediment loss) vs. the rye (2 lbs/ac sediment loss) or the triticale (73 lbs/ac sediment loss) fields.

Data from a Salinas Valley study titled: “Low residue cover crops minimize run-off, erosion, and nutrient loss from fallow vegetable fields.”
Authors: Richard Smith, Michael Cahn, Aaron Heinrich, and Barry Farrara. 2010.

This study evaluated the run-off potential of bare soil vs. various cover crop treatments. Be sure to carefully explain each axis, the units, etc. before going into the interpretation of this data.

As seen in the graph, the bare soil (no cover crop) field had much a much greater mass of sediment loss (1,199 lbs/ac) vs. the rye (2 lbs/ac) or the triticale (73 lbs/ac) fields.

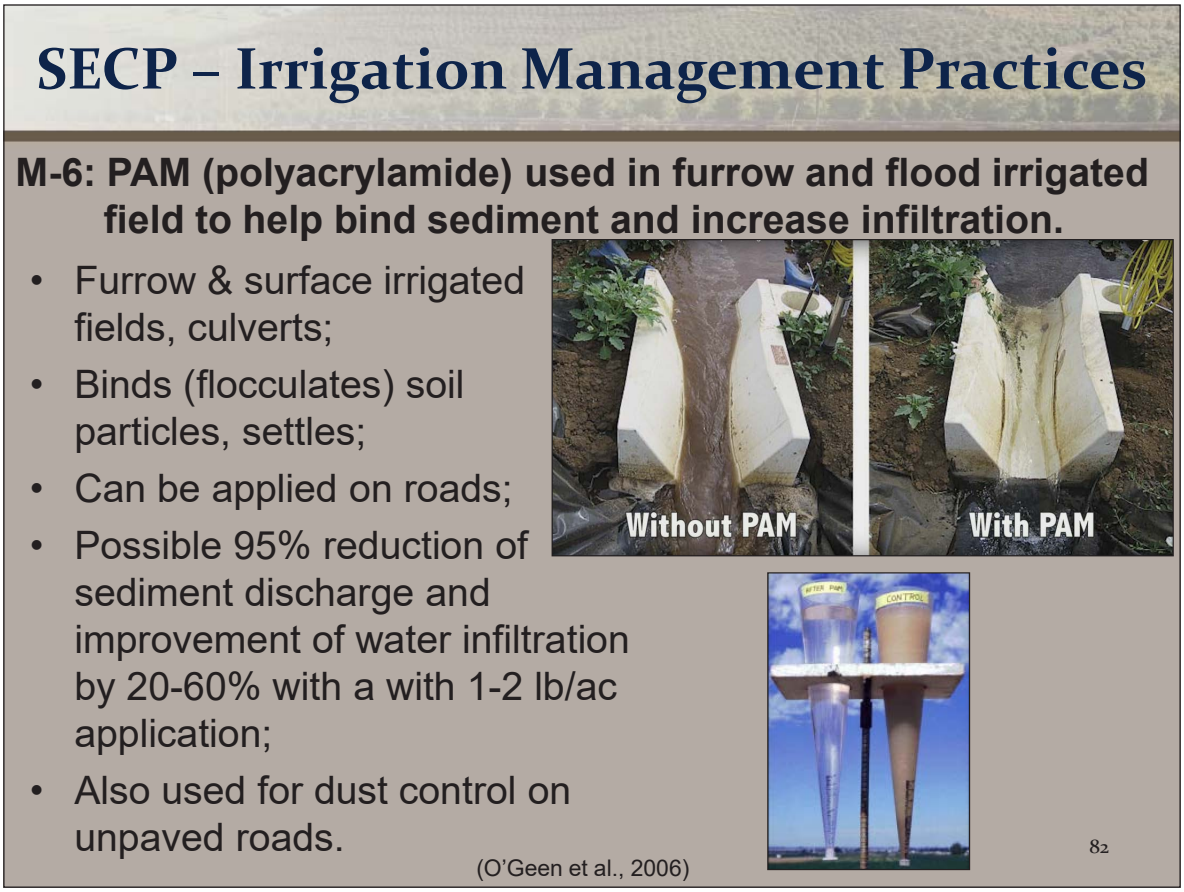
SECP – Irrigation Management Practices

M-5: Soil water penetration has been increased through the use of amendments, deep ripping, and/or aeration.

- Compost, gypsum, deep ripping;
- Increase water infiltration;
- Aeration of soil;
- Deep rip perpendicular to the flow path.

M-5: Soil water penetration has been increased through the use of amendments, deep ripping, and/or aeration.

- **Gypsum** enhances the physical properties of soil through the addition of calcium.
- It is a neutral salts that can improve soil aggregate stability with little or no effect on pH.
- It is very effective at reducing surface sealing and crusting and can promote water infiltration (Shainberg et al., 1989).
- Gypsum applied to alleviate soil surface crusting problems should be surface applied without incorporation (Singer, Munn, and Wildman, 1984).
- Gypsum is also used to help displace and remove sodium to improve soil structure.
- Application rates of 2-3 tons/ac/year are common for improving infiltration and soil tilth.
- Costs for gypsum may range from $41-85/ton depending on quality.
- Deep ripping the soil can loosen up compacted soils and hardpans, but also impacts soil structure. Only rip when necessary.
- **Compost and other organic matter** provides a slow pool of nutrients and also improves water holding capacity and infiltration.
- Deep ripping perpendicular to the flow path is similar to planting crops on the contour.



M-6: PAM (polyacrylamide) used in furrow and flood irrigated fields to help bind sediment and increase infiltration.

- Synthetic polymers such as anionic polyacrylamide (PAM) or polyvinyl alcohol (PVA) can be applied to the soil in irrigation water or as a spray to stabilize soil aggregates.
- Synthetic polymers can be effective aggregating agents in any soil texture.
- The polymers active like microscopic nets that are adsorbed onto soil aggregates. The nets provide structural support to aggregates and prevent their disintegration from the impact force of raindrops and shear forces associated with moving water (Sojka and Lentz, 1997).
- Possible to reduce sediment discharge in runoff up to 95% with a 1-2 lb/ac application of PAM, costing around $35/ac.
- Low application rates of PAM (between 0.5 and 0.75 lbs/ac) applied 3-5 times per year have been observed to dramatically reduce sediment runoff in sprinklers (Cahn et al., 2004).
- Most effective when applied to tilled soils where it stabilizes aggregates disrupted by tillage. Less effective in undisturbed soils where compaction and crusting may already exist.
- PAM is safe, and does not have negative effects on aquatic organisms, as long as agricultural grades of PAM with low levels of the acrylamide monomer are used.
- PAM rapidly degrades when exposed to sunlight and through decomposition by soil microorganisms.
- Can also be used around culverts and other discharge points.
- Also used for dust control on unpaved roads (http://cesantabarbara.ucanr.edu/files/75493.pdf)
- Application methods include: Dry granular PAM, liquid PAM, and solid blocks or cubes.

See the following URLs for additional information:

- http://www.curesworks.org/bmp/pam.pdf
- CASQA practice EC-13: http://www.ci.concord.ca.us/pdf/living/recycle/brochures/polyacrylamide.pdf

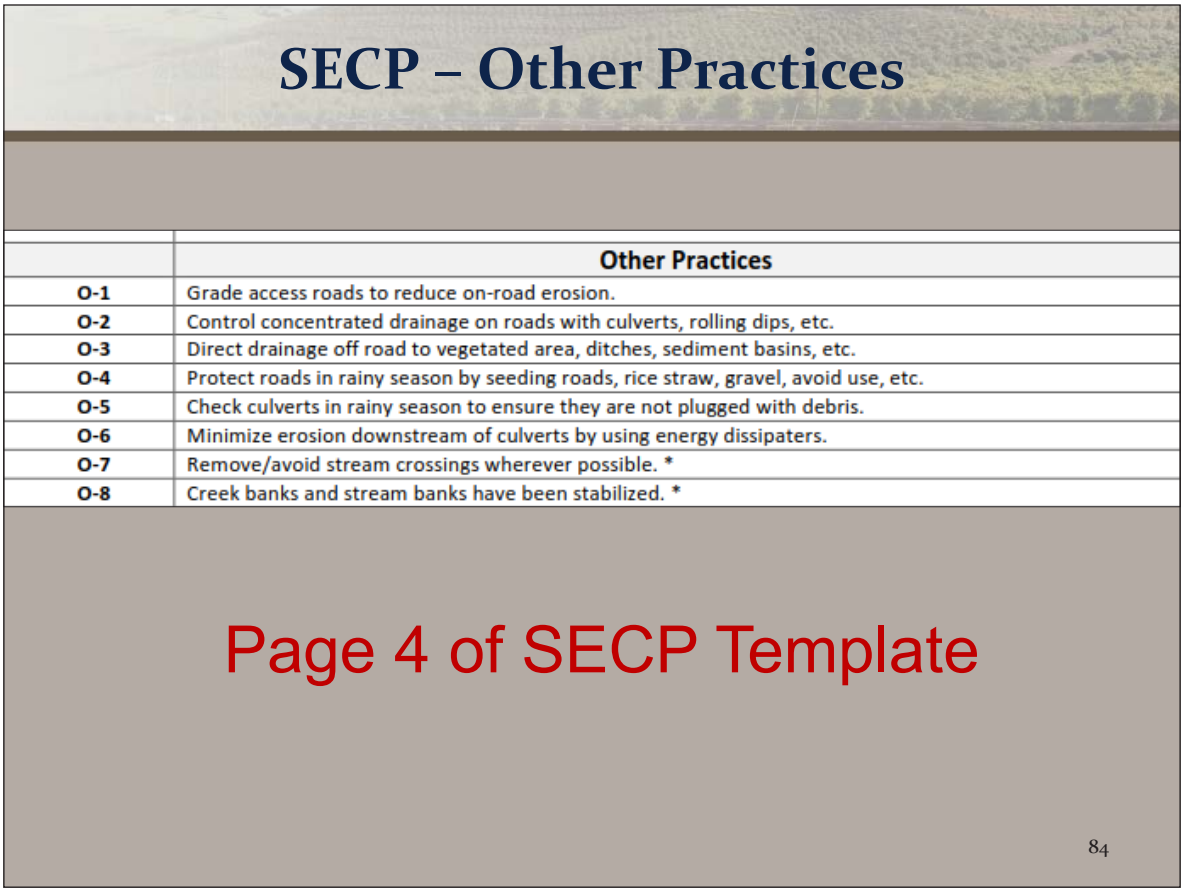
SECP – Irrigation Management Practices

M-7: Minimum tillage incorporated to minimize erosion.

- Avoid tilling late fall through early spring (storms);
- Especially on steep slopes;
- Decreases erosion on field by maintaining cover;
- If tilled, plant cover crop or mulch.

M-7: Minimum tillage incorporated to minimize erosion.

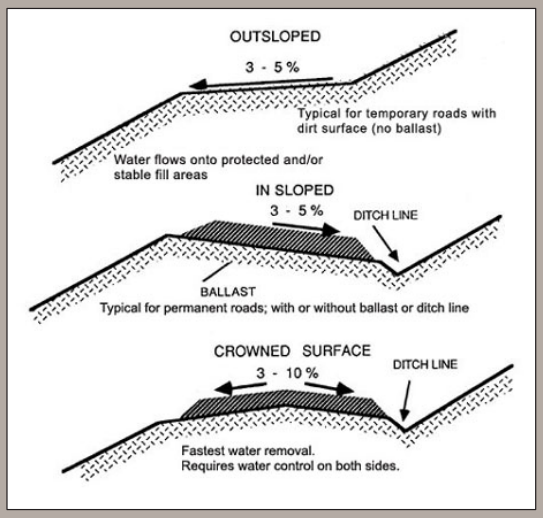
- Frequent tillage destroys soil aggregates and soil structure and promotes the loss of soil organic matter.
- Light and infrequent tillage can be beneficial as an erosion control practice to disrupt surface crusts and enhance infiltration, along with other practices.
- Increasing surface roughness through tillage can decrease the erosive energy associated with moving water.
- Research has shown that reduced tillage can reduce soil erosion by 60% (Cline and Hendershot, 2002).
- Ground that is not tilled also retains more nitrate-nitrogen in the root zone (Kanwar, Baker, and Laflen, 1985).
- Generally acceptable to let native vegetation or weeds grow and mow, as necessary.



Continue to follow on page four of their provided SECP

SECP – Other Practices

O-1: Grade access roads to reduce on-road erosion.



85

O-1: Grade access roads to reduce on-road erosion.

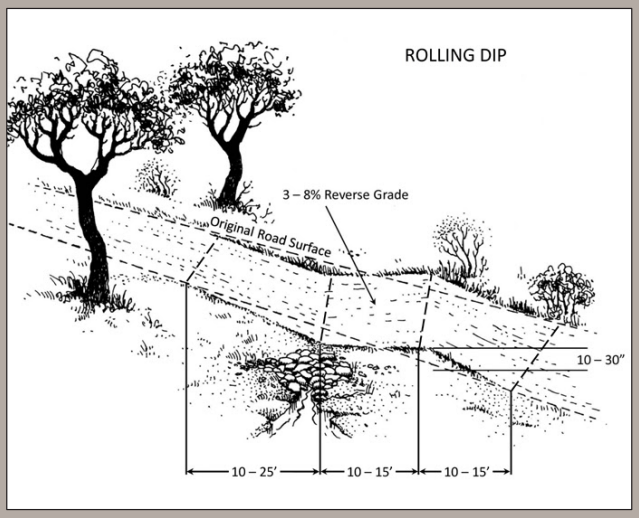
There are various methods of road grading that help manage stormwater runoff. It's possible to in-slope, out-slope, and crown roads depending on the site specific concerns. In-sloping roads may help keep runoff on the cropped field and off of the road. This will minimize run-off and erosion on the road. Out-sloped roads may help direct stormwater to an area such as a vegetative buffer strip.

Figure Reference:

- http://copenhaverconstructioninc.com/wp-content/uploads/2013/05/Picture-346.jpg

SECP – Other Practices

O-2: Control concentrated drainage on roads with culverts, rolling dips, etc.



86

O-2: Control concentrated drainage on roads with culverts, rolling dips, etc.

For more information on road designs for erosion control, contact the NRCS or an engineer.

Culverts are common in directing channelized flow to minimize sediment discharge potential.

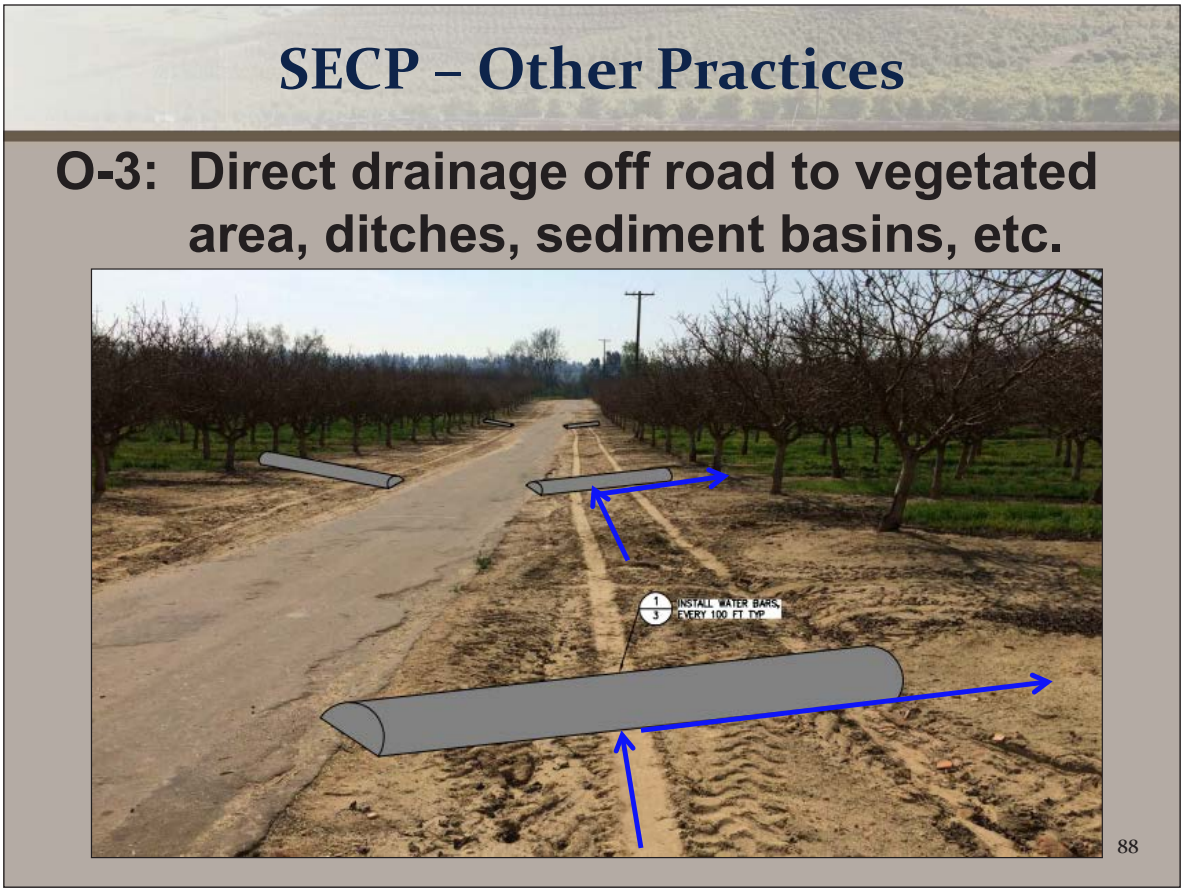
Water bars and rolling dips are ridges or ridge-and-channels constructed diagonally across a sloping road that is subject to erosion. The purpose is to limit the accumulation of erosive volumes of water on roads by diverting surface runoff at predesigned intervals. For more information, see the following reference:

Figure Reference:

- McCullah, J. Undated. City of Redding erosion and sediment control standards design manual. Western Shasta Resource Conservation District and City of Redding Department of Public Works. URL: http://www.swrcb.ca.gov/water_issues/programs/stormwater/docs/reddingcity/swmpapxk.pdf

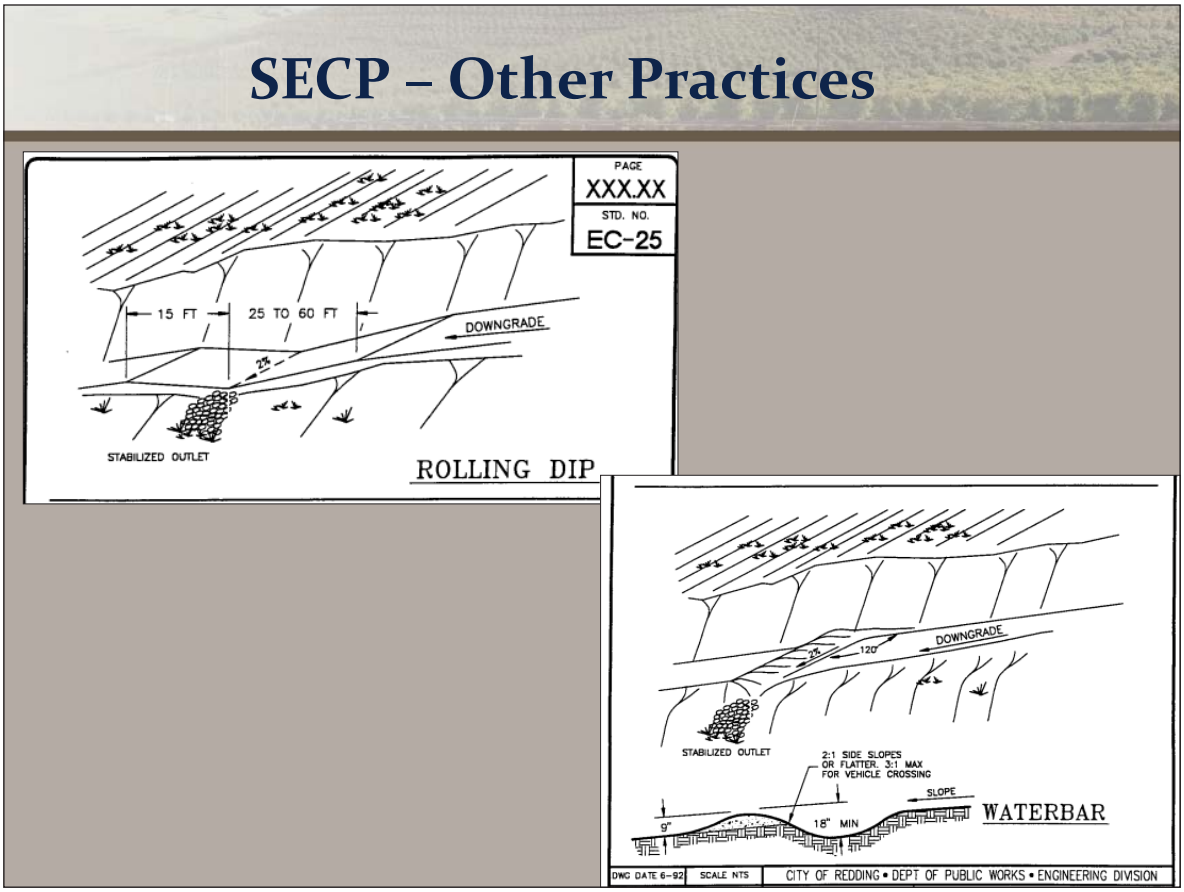
O-3: Direct drainage off road to vegetated area, ditches, sediment basins, etc.

The drainage can be directed into a sediment basin, farm-specific ditch, or irrigation for adjacent fields. Be sure to not send the drainage into a stream or other body that would send the sediment discharge off of the farm.



Note that the water is being sent into an adjacent field rather than the road.

*Slope matters when determining whether water bars are appropriate/how many, length, etc. to use. Design details matter– if the slope is steep, it will require more/longer waterbars or waterbars may be insufficient to effectively minimize sediment discharge.



Additional illustrations of rolling dips and water bars, from:

- McCullah, J. Undated. City of Redding erosion and sediment control standards design manual. Western Shasta Resource Conservation District and City of Redding Department of Public Works. URL: http://www.swrcb.ca.gov/water_issues/programs/stormwater/docs/reddingcity/swmpapxk.pdf

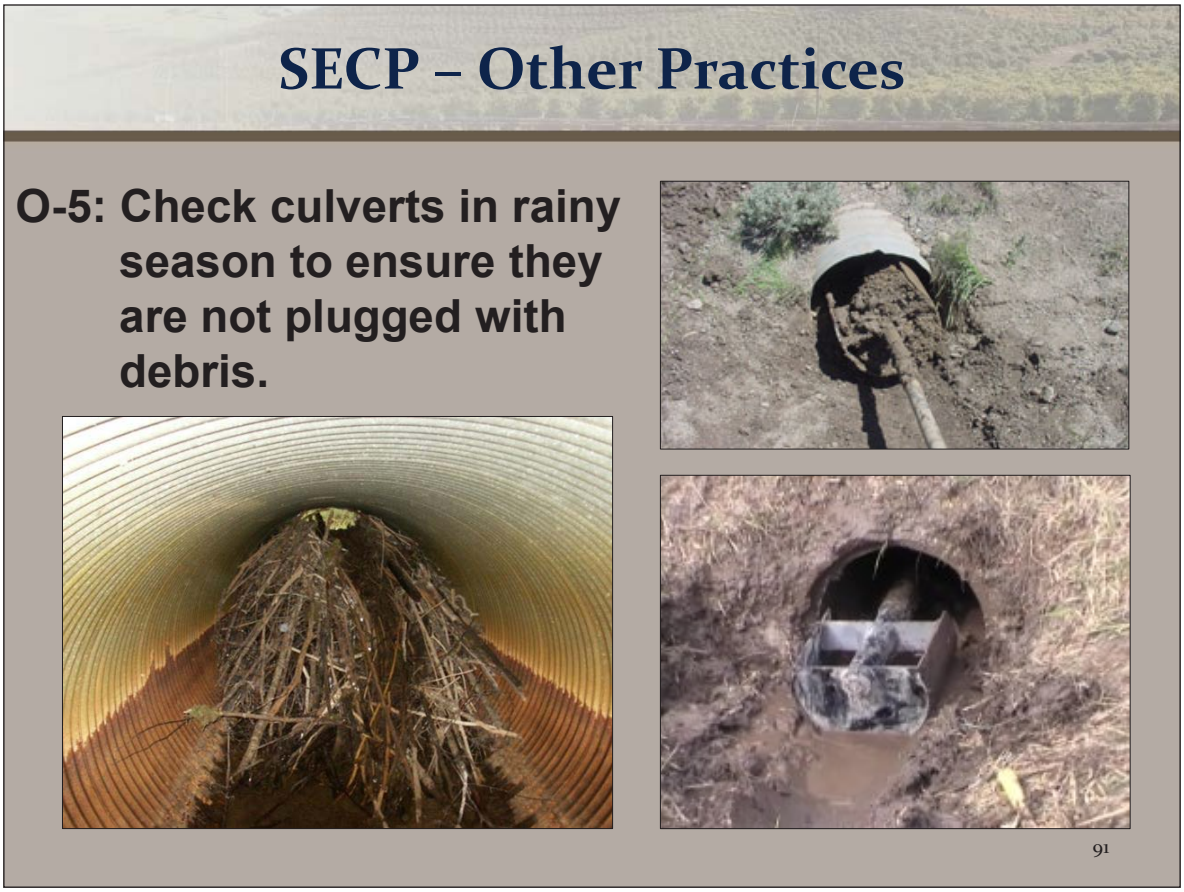
O-4: Protect roads in the rainy season by seeding roads, rice straw, gravel, avoid use, etc.

Gravel, decomposed granite, seeded roads, and other mulches:

- Protect the bare soil from raindrop impact
- Creates a torturous path that will slow the velocity of any runoff which will help settle suspended particles
- Increase infiltration
- May reduce some compaction.

Figure Reference:

- https://pawndero.files.wordpress.com/2009/09/path1.jpg



O-5: Check culverts in rainy season to ensure they are not plugged with debris.

Maintenance of culverts is an inexpensive way to ensure that water related infrastructure is performing up to their intended standard. If culverts are filled with sediment, the turbidity of the water coming out of the culvert is increased tremendously.

O-6: Minimize erosion downstream of culverts by using energy dissipaters.

By fanning the culvert opening, the water energy is spread which ultimately slows the velocity. Recall that slower water velocity is directly related to more efficient sediment settling.

The energy dissipater in the top right corner is properly fanned; however, the water would then flow on bare soil. Gravel could be used to protect the bare soil and further slow the water velocity. Organize rip rap and rock to minimize voids. Place filter fabric, gravel, or sand filter layer on bare soil before placing rip-rap to minimize soil movement into or through the rip rap.

Rip rap is a common material used to minimize channelized flows that could lead to erosion.

Figure References:

- http://www.hemaxlandscaping.com/riprap---culvert.html
- McCullah, J. Undated. City of Redding erosion and sediment control standards design manual. Western Shasta Resource Conservation District and City of Redding Department of Public Works. URL: http://www.swrcb.ca.gov/water_issues/programs/stormwater/docs/reddingcity/swmpapxk.pdf

SECP – Other Practices

O-7: Remove/Avoid Stream Crossings wherever possible

CAUTION – Local, State and/or Federal permits may be required prior to conducting work in certain surface waters. Do not proceed without the proper permits!

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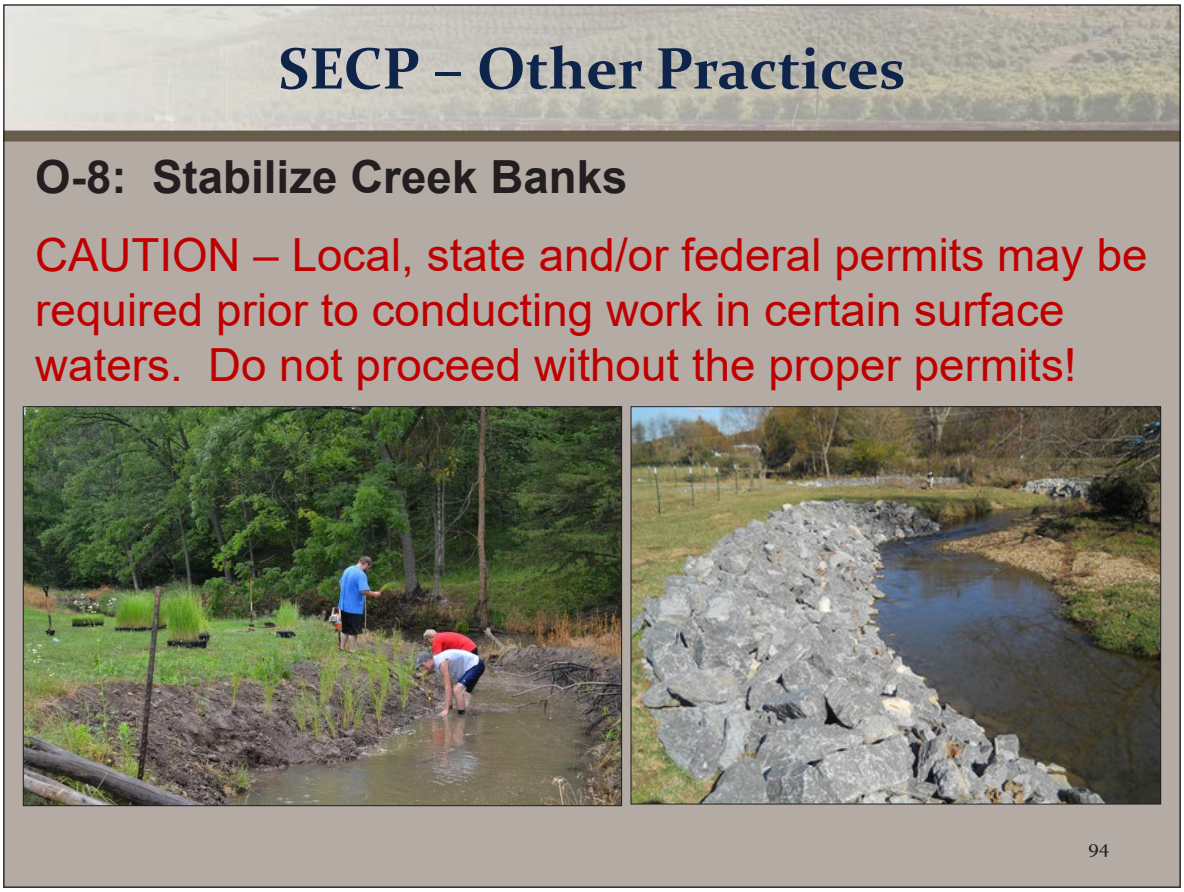
O-7: Remove/avoid stream crossing wherever possible.

If a grower is unsure if the surface water they may be interacting with is subject to permits, to contact a consultant or a NRCS specialist.

- http://www.mda.state.mn.us/protecting/conservation/practices/~/media/Images/protecting/practices/streamcross.ashx?w=300&h=214&as=1



O-8: Creek banks and stream banks have been stabilized.

If you are unsure if the surface water you are working with is subject to permits, contact a consultant or a NRCS specialist.

Otherwise, rip rap, armor, or vegetation can be used to stabilize a creek/stream bank.

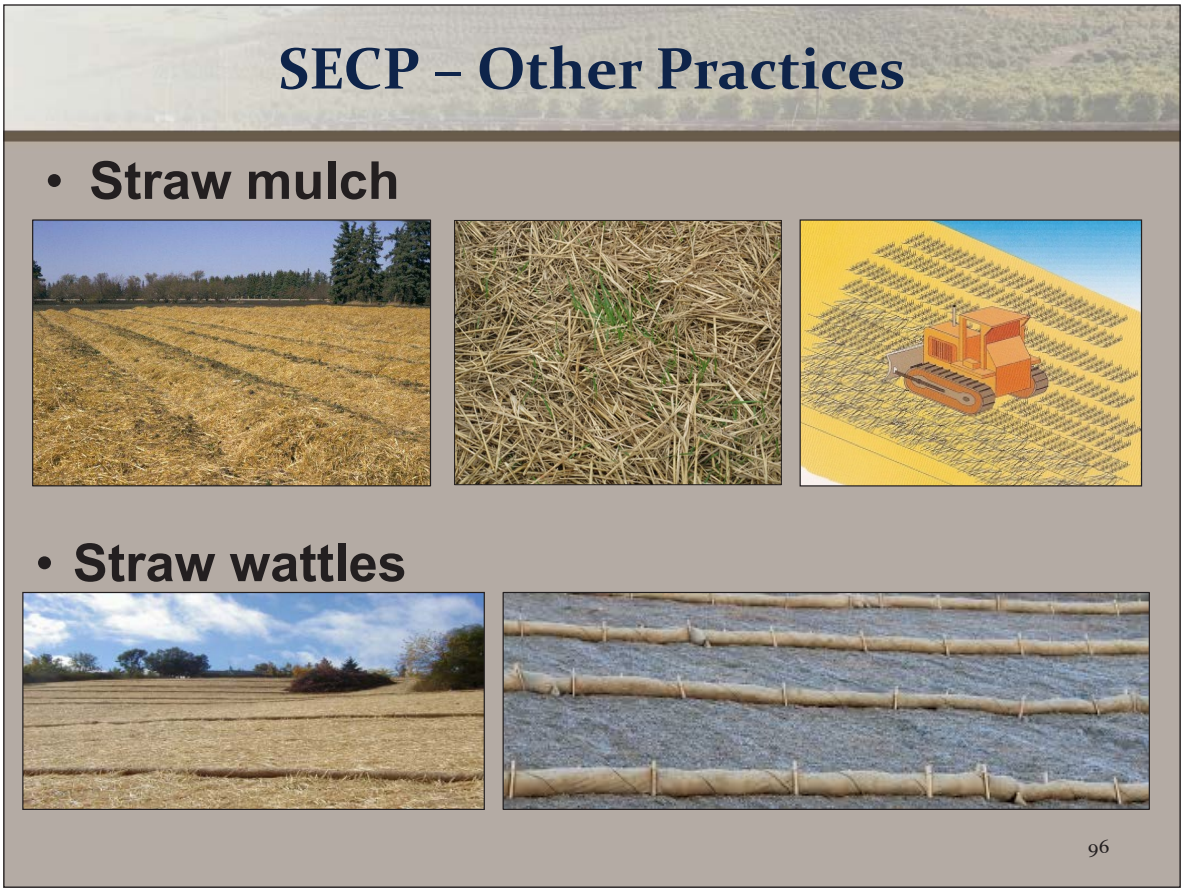
Altering a creak or stream bed: A creek or stream is defined by the Department of Fish and Game (CDFG) as any drainage way having a defined bed and bank. These features may be under the jurisdiction of the CDFG. One may not substantially alter or obstruct a creek or stream or its bank subject to state jurisdiction without first obtaining a Streambed Alteration Agreement from the CDFG. Activities which may require this prior to approval include the diversion of a stream or creek, construction of a discharge pipe within a creek or stream, depositing or disposing of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into a creek or stream, the placement of a culvert into a creek or stream or construction of a stream or creek crossing. For more info see:

- SCACO, 2013. Best management practices for agricultural erosion and sediment control. Sonoma County Agricultural Commissioner's Office. Santa Rosa, California. URL: http://www.sonoma-county.org/agcomm/pdf/bmp_handbook3.pdf
- http://www.prairieworksinc.com/wp-content/uploads/2013/03/Boyd629-4.jpg
- http://matchbin-assets.s3.amazonaws.com/public/sites/1037/assets/JV51_HCBCSoilStreamBankProtection.jpg

- Mulch can consist of organic or inorganic materials (O'Geen et al., 2006).
- Inorganic mulches: gravel, pumice, stone, sand.
- Should be anchored or "punched in" via tracking, discing, or other techniques. Also possible to cover with netting or geotextile, or spray with a chemical or organic tackifier.
- Organic mulches: Nondecomposed materials such as rice hulls, wood chips, leaves, sawdust, and straw.
- Protects soil from raindrop impact and compaction which destroys soil aggregates.
- Reduces water loss to evaporation.
- Effective weed suppressant practice that can reduce herbicide usage.
- Mulching is best suited for sprinkler or drip irrigated systems.
- Less effective for furrow irrigation because residues often float and clog furrows, impacting distribution of water (Prichard et al., 1989).
- Generally unsuitable for crops that are harvest off the ground (almonds), but other crops such as pistachios are seeing increased usage.
- Apply at rates of approximately 6 tons/acre or 275 pounds per 1,000 square feet. Can last from 6 months to 3 years.

For more information:

- McCullah, J. Undated. City of Redding erosion and sediment control standards design manual. Western Shasta Resource Conservation District and City of Redding Department of Public Works. URL: http://www.swrcb.ca.gov/water_issues/programs/stormwater/docs/reddingcity/swmpapxk.pdf



Straw mulch has the same benefits that are noted in the previous slide. Generally a temporary practice until a cover crop can be planted. Apply at a rate of 2 tons per acre or around 3 inches thick. Should see no soil once straw is applied. Rice straw is the cleanest available in terms of weed seeds. Straw must be anchored into the ground via tracking or crimping it to prevent losing straw from runoff and/or high winds.

Straw wattles are best used on a slope and in ditches to shorten the slope length. They should be installed perpendicular to flow and appropriately staked AND maintained for maximum effectiveness.

Straw mulch is most efficient with a stabilizing agent to prevent the straw from transporting off of the field, such as punching or tracking into the soil. In general, this type of mulching is usually a temporary or interim measure to be used in conjunction with other more permanent management practices. For more information:

- SCACO, 2013. Best management practices for agricultural erosion and sediment control. Sonoma County Agricultural Commissioner's Office. Santa Rosa, California. URL: http://www.sonoma-county.org/agcomm/pdf/bmp_handbook3.pdf

SECP – Other Practices

- **Hay bales**
  - Stake hay bales into ground;
  - Temporary practice;
  - Requires upkeep.

Straw bales intercept and catch sediment suspended in runoff. Generally a temporary measure that requires routine maintenance. They must be properly installed and staked into the ground. Poor installation can result in greater erosion issues.

For more information, see the following references:

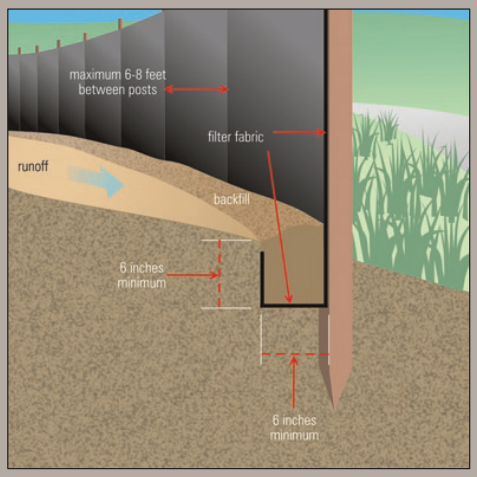
- SCACO, 2013. Best management practices for agricultural erosion and sediment control. Sonoma County Agricultural Commissioner's Office. Santa Rosa, California. URL: http://www.sonoma-county.org/agcomm/pdf/bmp_handbook3.pdf
- https://www.fws.gov/fire/ifcc/esr/Treatments/straw-damsi.htm
- http://des.nh.gov/organization/commissioner/pip/factsheets/sp/documents/sp-1.pdf
- http://projects.geosyntec.com/npsmanual/Fact%20Sheets/Straw%20or%20Hay%20Bale%20Barrier.pdf

Hydroseeding is a planting process that uses a slurry of seed and mulch. The vegetation that is grown here can be used to trap sediment and aid in settling prior to discharging off of the parcel. This practice is not common in agriculture in the Central Valley. May have to irrigate.

Hydroseeding is especially helpful at establishing vegetation on steeper slopes.

SECP – Other Practices

- **Silt fences**
  - Requires maintenance;
  - See binder for additional information.



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Installation of silt fences is a common practice used to mitigate sediment discharge of sheet flow.

Silt fences are **temporary** sediment control devices to trap suspended sediment and allow runoff water to leave the premises.

Permanent silt fences can also be used. In order for silt fences to work correctly, they must be properly installed, and routinely inspected and maintained. They often fail if no inspected.

For more information:

- McCullah, J. Undated. City of Redding erosion and sediment control standards design manual. Western Shasta Resource Conservation District and City of Redding Department of Public Works. URL: http://www.swrcb.ca.gov/water_issues/programs/stormwater/docs/reddingcity/swmpapxk.pdf

A variety of structures can be constructed to protect sediment from leaving the farm. Some structures are more sophisticated than others, and may require an engineer.

The images above show retaining walls and a possible berm.

SECP – Other Practices

- **Restoration**

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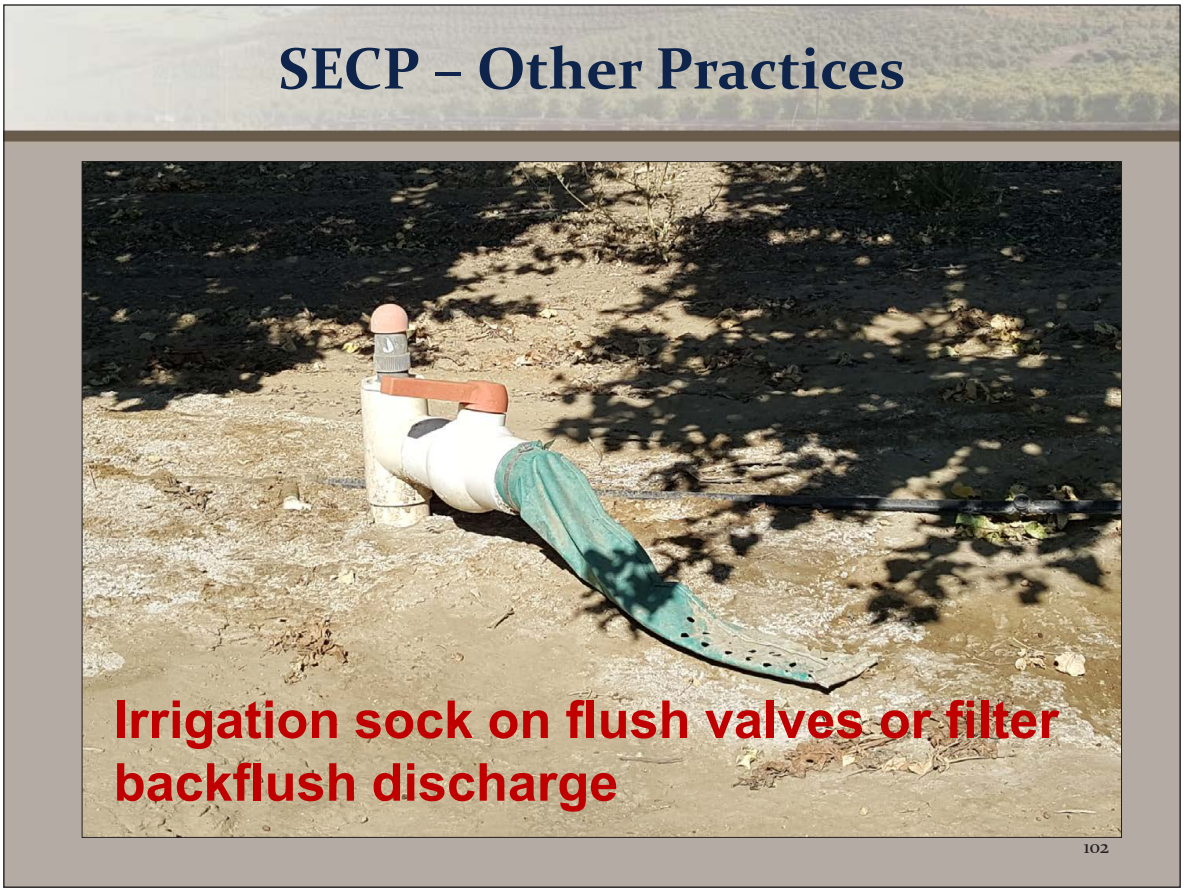
Restoration applies the same principles of erosion control as vegetative buffers and filter strips. The vegetation can trap sediment and promote settling of suspended sediment.

As seen in the image above, the stream was experiencing streambank erosion in the “Before” image. The vegetation that was planted in the restoration process helped protect the streambank as the roots supported the soil structure and the steams, leaves and grass slowed water velocity, protecting it from cutting into the streambank side.

Not every restoration effort is expected to be as overgrown.

Use of native vegetation is encouraged.

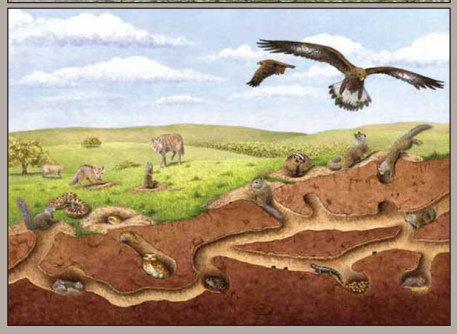


Here we see an irrigation sock attached to the flush valve with a hose clamp.

These socks work by discharging the water from numerous small orifices, rather than one large opening. The sock will want to blow off the valve, so be sure to attach it securely, such as with a hose clamp. Be sure to check regularly that the sock is still attached and in good, functioning condition

SECP – Other Practices

- **Rodent control**
  - Rodent (e.g. squirrel or gopher) burrows create channels that concentrate water flow.
  - Results in subsurface erosion; compromises structural integrity of roads, reservoirs, ditches, levees, dams, etc. Can lead to gullies.
  - Consider control via: exclusion, cultural practices, repellents, toxicants, fumigants, trapping, or shooting.
  - Some endangered species concerns.



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(Berentsen and Salmon, 2001)

Rodent burrows can provide conduits for concentrated flow. This can compromise structural integrity of roads, reservoirs, ditches, levees, and dams, which can lead to major erosion issues. Various control options are available.

For more information, visit:

- Marsh, R.E. 2005. Belding's California, and Rock Ground Squirrels. Internet Center for Wildlife Damage Management. http://icwdm.org/handbook/rodents/BeldingSquirrels.asp.
- Howard, W.E. 1954. Rodent control on California Ranges. Journal of Range Management. 6: 423-434. https://journals.uair.arizona.edu/index.php/jrm/article/viewFile/4574/4185
- Berensten A.R., T.P. Salmon. 2001. The structure of California Ground Squirrel burrows: control implications. Transactions of the Western Section of the Wildlife Society. 37:66-70. http://ucanr.edu/sites/Ground_Squirrel_BMP/files/99572.pdf
- http://riverpartners.org/img/riparian-ecology/ground-squirrel-ecology_600.jpg
- http://rodent-guys.com/gophers-moles-squirrels/wp-content/uploads/2012/06/GROUNDSQUIRREL_BURROW.jpg

SECP Example

What are the erosion concerns in this image? Which practices could control sediment discharge and erosion in this scenario?

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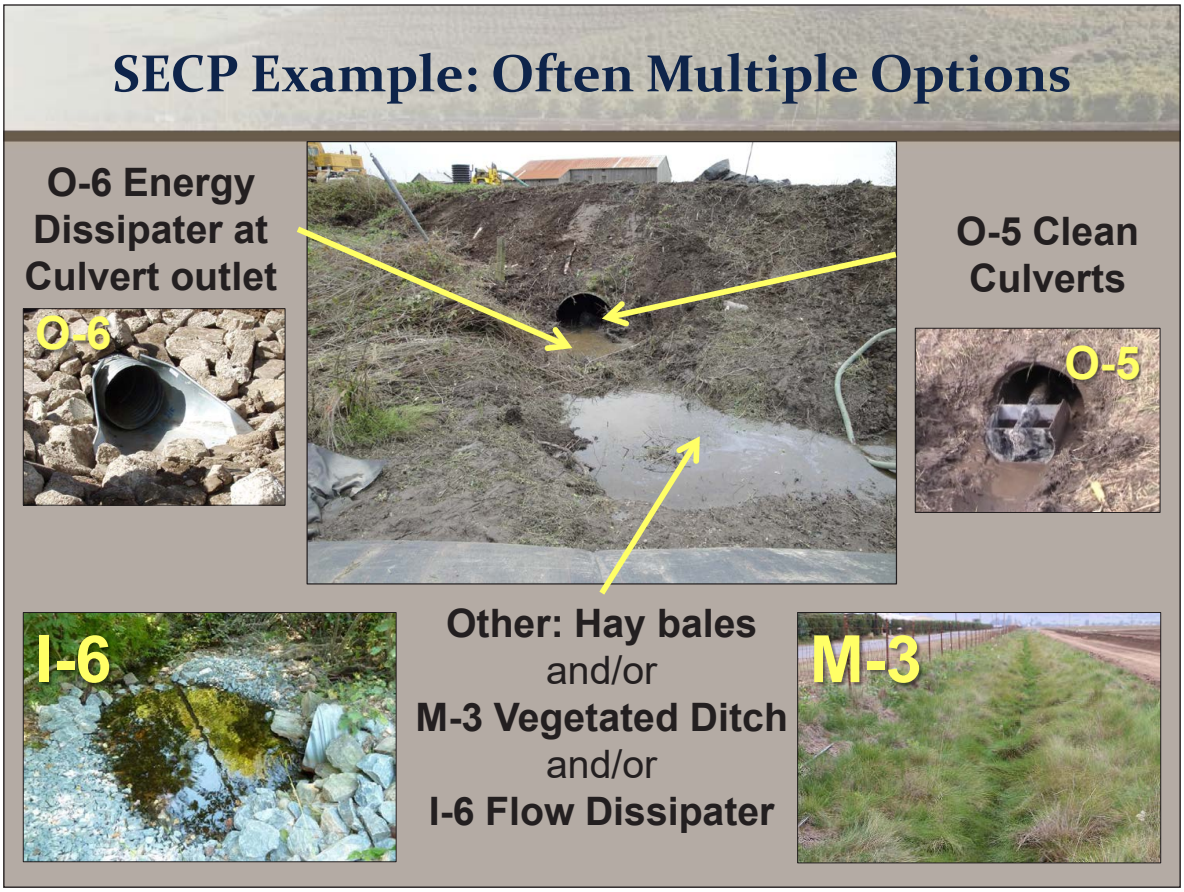
Refer to the SECP template forms to link the practices with their respective codes.

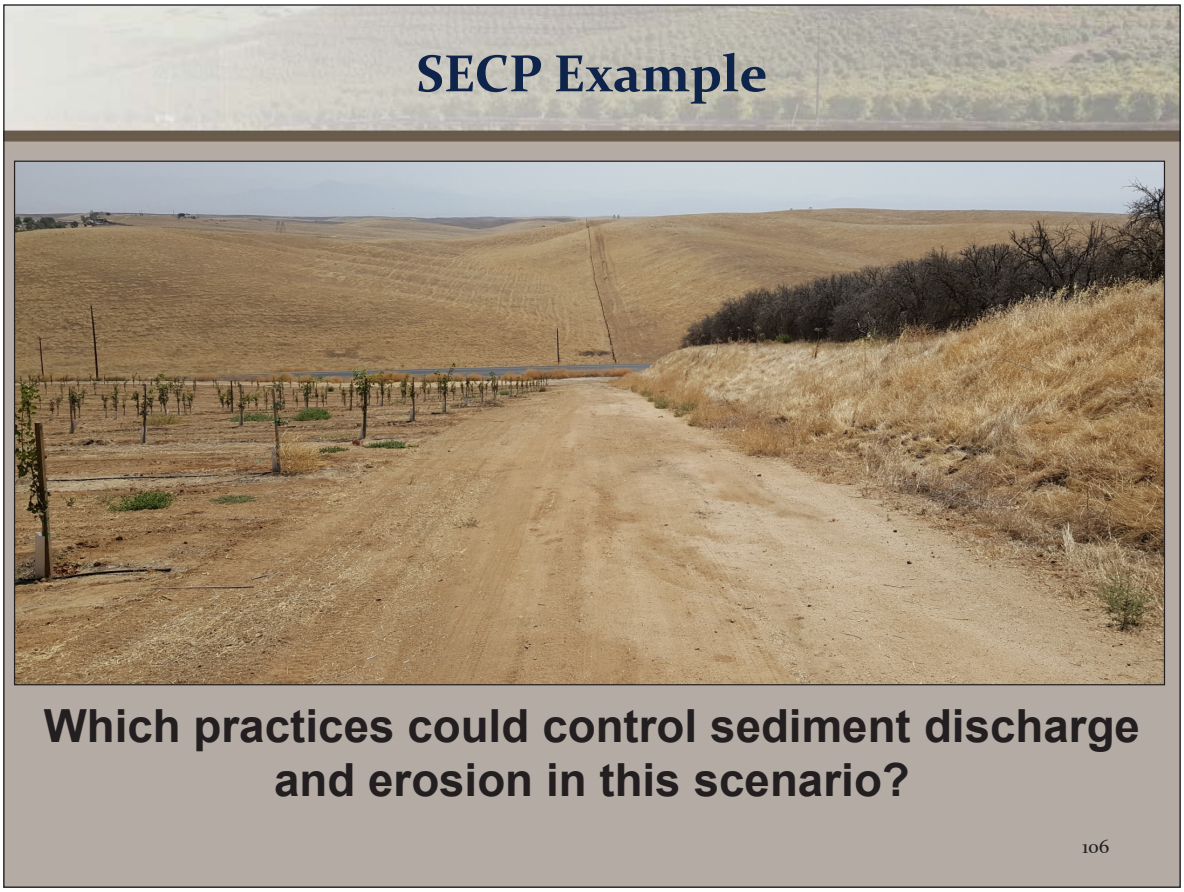
When would it be best to implement these practices? For example, if someone were to suggest a cover crop, it would be best to have the cover implemented prior to the rainy season.

How would a grower input this information the SECP form? (No site information is included, only expecting information regarding the practice code and implementation expectation).



Could any other practices be implemented in this scenario to address erosion concerns?

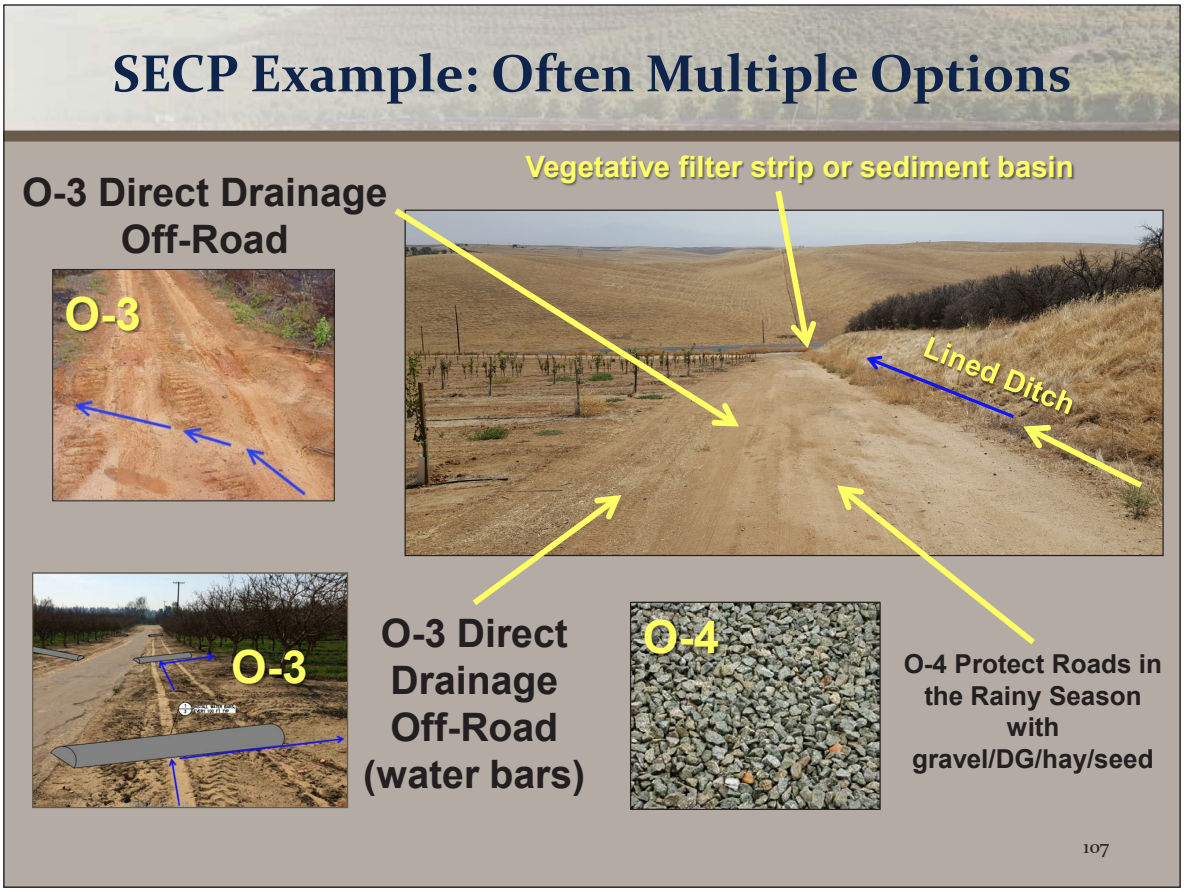
Important to note that there are usually multiple different options to address an erosion or sediment discharge concern. There isn't necessarily a right or a wrong solution, but some practices are often better than others in a given situation. **Multiple practices are often required to address a single issue.**



Refer to the SECP template forms to link the practices they are suggesting with the respective practice codes.

When would it be best to implement these practices? For example, if someone were to suggest a cover crop, it would be best to have the cover implemented prior to the rainy season.

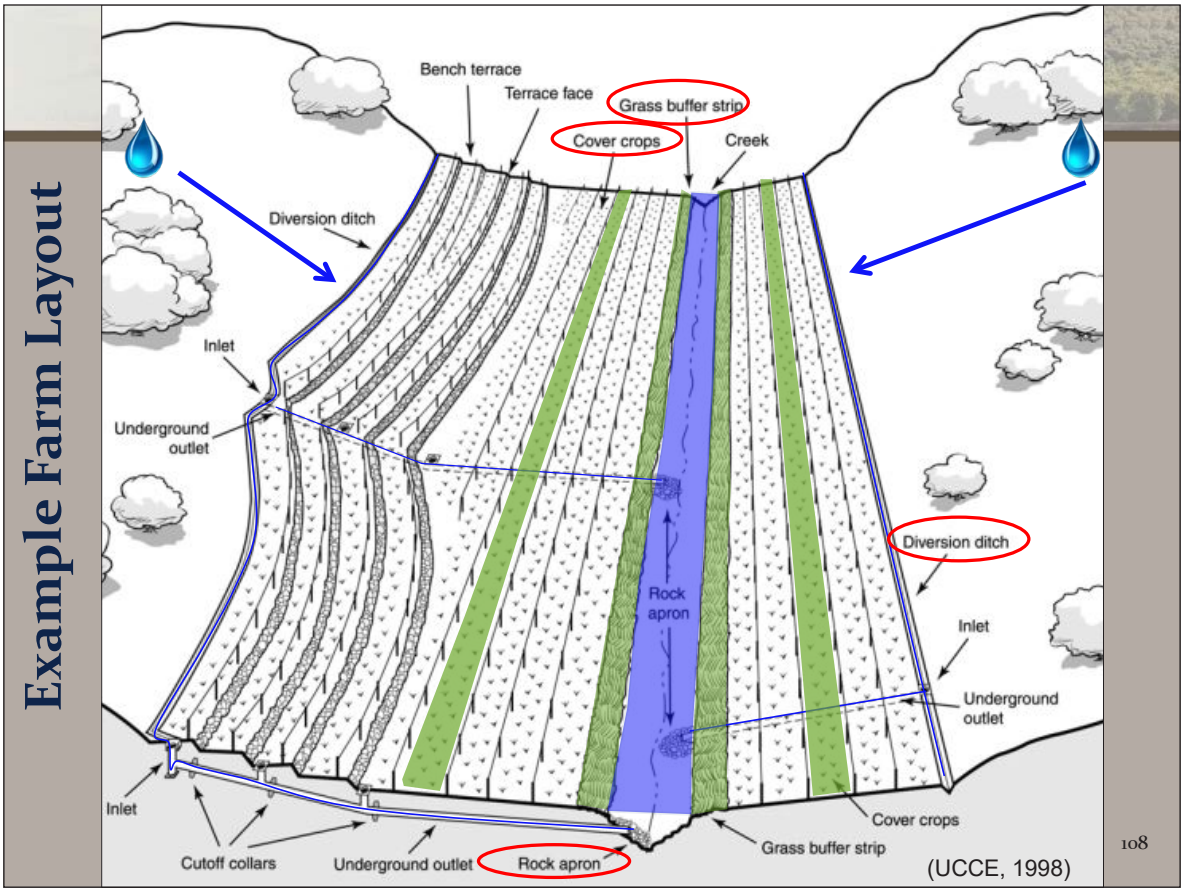
How would a grower input this information into their respective sheets? (No site information is included, only expecting information regarding the practice code and implementation timeline expectation).



Could any other practices be implemented in this scenario to address erosion concerns?

Important to note that there are usually multiple different options to address an erosion or sediment discharge concern. There isn't necessarily a right or a wrong solution, but some practices are often better than others in a given situation. **Multiple practices are often required to address a single issue.**

In this example, directing any runoff from the road with water bars into the cropped field could allow for flow dissipation and infiltration (supplemental irrigation), which will minimize erosion on the road. Another option could be to direct the water to a lined ditch (rip rap and gravel, geotextiles, hay bales, straw waddles, check dams, etc.). This ditch could lead to a sediment basin or other vegetative treatment area or recirculation system. A sufficient cover on the road, such as gravel, decomposed granite, hay, or seeded with vegetation would also help minimize erosion.



This is an example of a possible layout for a vineyard on hill slope adjacent to a creek. This example summarizes many of the management practices we have discussed in a realistic farm setting. The following features are illustrated (use laser to direct attention):

- Creek in the middle of the farm.
- Rows planted perpendicular to the slope (planted on a contour) and terraced.
- Cover crops within each row (some highlighted in green).
- Grass buffer/vegetative filter strip along creek banks (highlighted in green).
- Diversion ditches and inlets to redirect stormwater away from the vines and into the natural drainage (the creek). This prevents the stormwater from flowing across the fields and potentially moving sediment that may contain nutrients or pesticides or any other soluble constituents.
- Rock apron (also known as: rip-rap or armour) at discharge points (flow dissapater).

*Note: This is an idealized design. The assistance of the NRCS, RCDs, and/or an engineer would be required to design and implement this system. A permit would likely be required, considering the interactions with the creek.

SECP – Other Practices

For additional sediment and erosion control practice recommendations and support, contact a consultant or local NRCS specialist *(see the NRCS contact sheets in binder)*

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There are more sediment and erosion control practices that exist beyond the scope of this curriculum. Those practices can be valid for SECPs. For additional ideas or confirmation of the validity of various practices, contact a consultant or a local NRCS specialist.

SECP – Following Up

- Ideally, prevent erosion before it happens. Otherwise, treat when issues are small. Look beyond your property.
- Evaluate the performance of implemented practices, **especially during rain events.**
- Conditions on farm may change, many practices require maintenance, and the SECP may not function as planned.
- **Have a backup plan. Monitor and maintain!**

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- It's important to look beyond your property or fence line when evaluating erosion issues. Must have a wide prospective to understand potential issues on your farm.
- A SECP is not a one time task. It is more of an iterative plan that will require adjustment as the performance of certain management practices are evaluated. Some may work, some may not. Need to find what works best for your ground, and always need a backup plan.

Key Take-Aways #1

- **Avoid –** Sediment discharges to water bodies
- **Caution –** Crop removal and bare soil during the rainy season
- **Caution –** Slopes, soils, storms
- **Do it Right –** New field layout
- **Follow up –** Conditions change

Avoid – It may be OK to discharge stormwater offsite that has been treated with various sediment and erosion control practices. The important thing to note is that a discharger is not allowed to "pollute" or impair water quality, regardless of the number of erosion control practices that are in place.

Caution – Bare soil has a great capacity for detachment. Be mindful of crop removal and consider cover methods. Slopes, soil types and rain event potential should all be considered when designing an SECP.

Do it right – It can be cheaper to be proactive than reactive.

Follow-Up – It is best to follow-up on the performance of erosion control measures when they are the most tested, particularly during a rain event.

Key Take-Aways #2

- Complex Erosion Issues – Contact NRCS, respective coalition, or a consultant.
- Incentive Payments – Contact NRCS.
- SECP – Complete SECP & keep on-farm.
- Erosion Problems – Keep sediment out of water bodies. Don't necessarily have to stop all water discharge, but need to settle out suspended sediment first.

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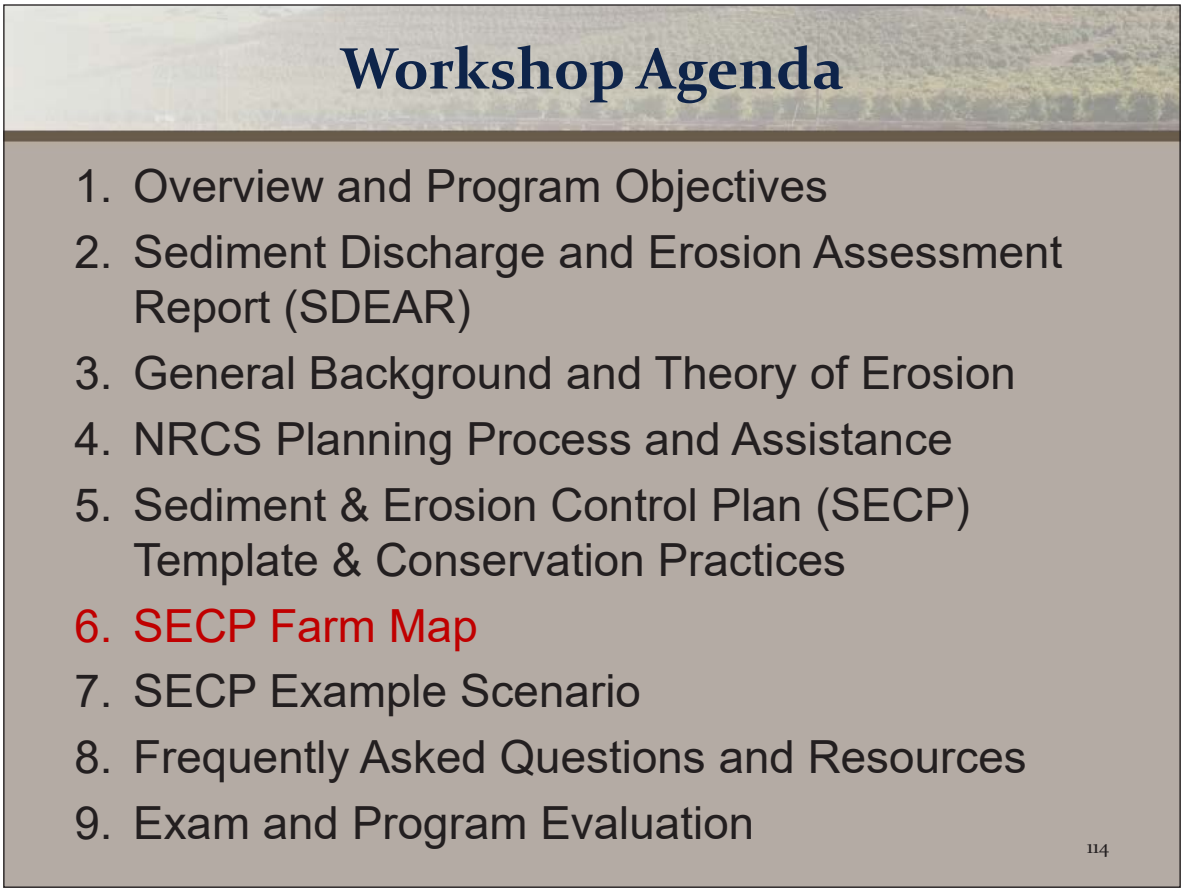
Figure Reference:

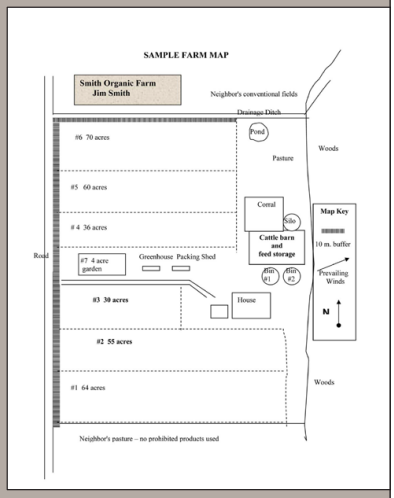
- http://soilerosion.net/image/hillslope_rills.jpg
- http://mediad.publicbroadcasting.net/p/wnpr/files/styles/x_large/public/201407/NASA_Goddard_Photo_and_Video.jpg



Introduction of the SECP farm map. It is a requirement for a completed SECP, and is referenced throughout the form when noting the Location ID (Objective 4).

SECP Farm Map

- SECP requires a map that identifies the locations of sediment and erosion control practices.
  - **Map can be hand drawn!!**
  - **Map stays on-farm with SECP form;**
  - Available resources include:
    - Farm Evaluation Survey map;
    - Existing ranch maps;
    - NRCS Farm/Inventory Maps;
    - Google Maps – Terrain Feature;
    - Google Earth;
    - County GIS systems;
    - Coalition and/or a consultant;
    - **See additional references on making farm maps in slide notes.**



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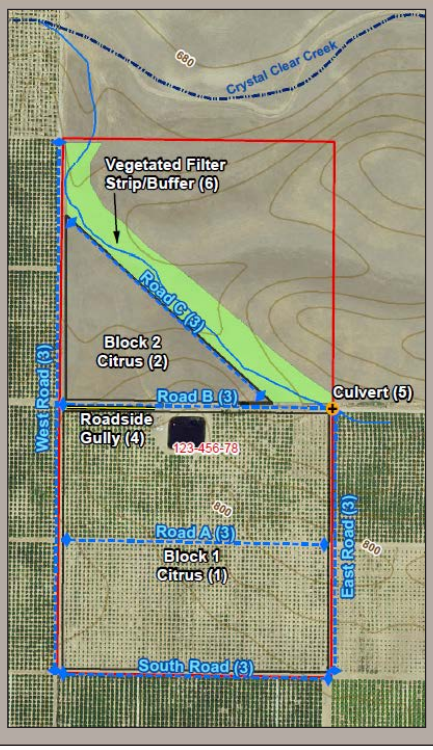
Note that the use of the existing Farm Evaluation Survey maps would likely be the easiest map to use for a SECP. A grower could make a copy of the map that they use with their Farm Evaluation and then add to it for the SECP. Existing farm maps that many growers use are a great option, too. If neither or those options will work, then are various other ways to develop a map, such as aerial imagery, Google Earth, the water quality coalition, or a consultant.

See the following references and links for more information on developing Farm/Ranch Maps:

- Fallon, J., J. Harper. 2002. Reference: Farm maps. Publication 8061. Farm Water Quality Planning (FWQP) Reference Sheet 7.4. University of California Division of Agriculture and Natural Resources. Oakland, California. URL: http://anrcatalog.ucanr.edu/pdf/8061.pdf
- George, M.R. 1996. Rangeland watershed program water quality planning guide No. 3: Developing a ranch map. Davis: University of California, Department of Agronomy and Range Science. URL: http://ucce.ucdavis.edu/files/repository/112792.pdf
- Padgett-Johnson, M. 2002. Reference: Developing a farm map. Publication 8092. Farm Water Quality Planning (FWQP) Reference Sheet 7.5. University of California Division of Agriculture and Natural Resources. Oakland, California. URL: http://anrcatalog.ucanr.edu/pdf/8062.pdf

SECP Farm Map

- **Map Requirements:**
  - Assessors Parcel Number (APN);
  - Location ID(s);
  - Parcel(s) outlines;
  - Field outlines.
- **Optional:**
  - Crop type;
  - Contour lines;
  - USGS National Hydrography Dataset (NHD) flowlines;
  - Aerial photo of field.



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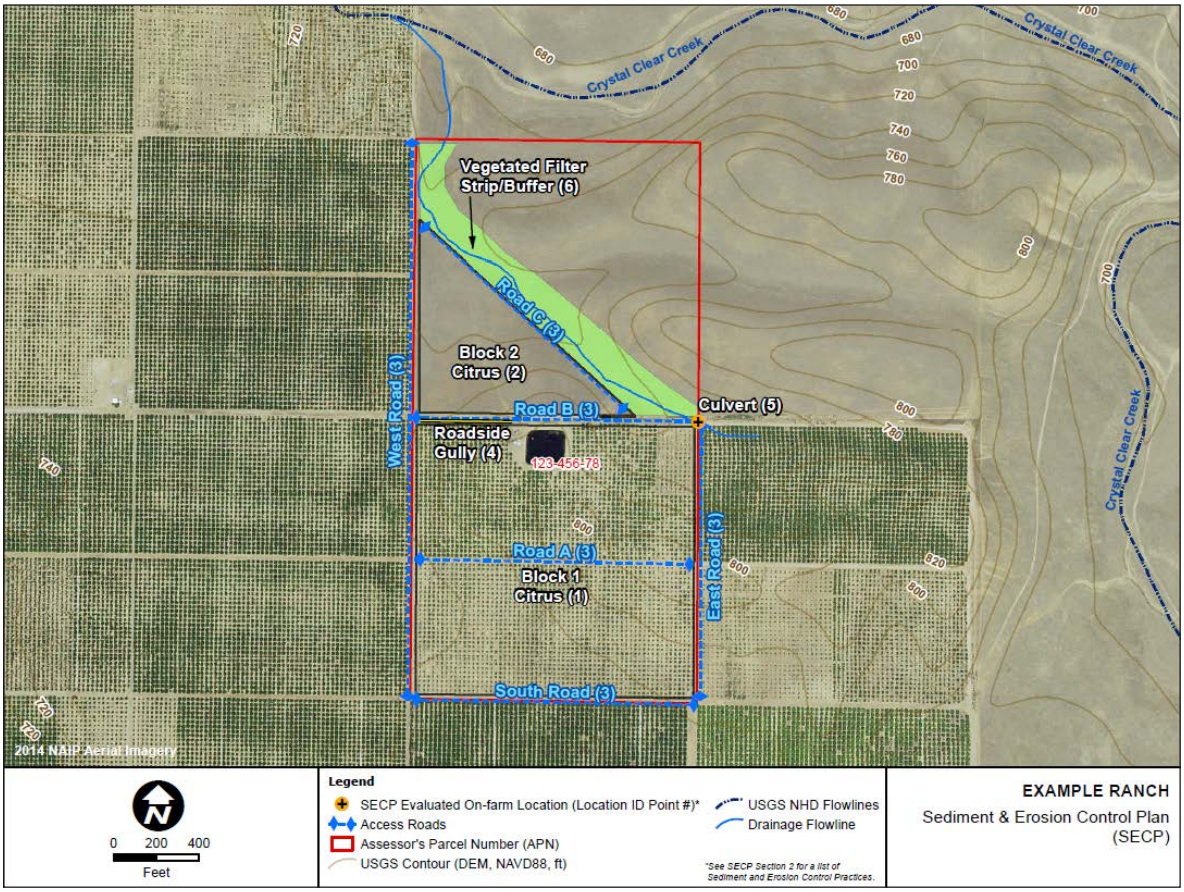
Location ID is the number noted on the farm map to link a practice with a location. Contour lines and flowlines are not required, but recommended, when possible.

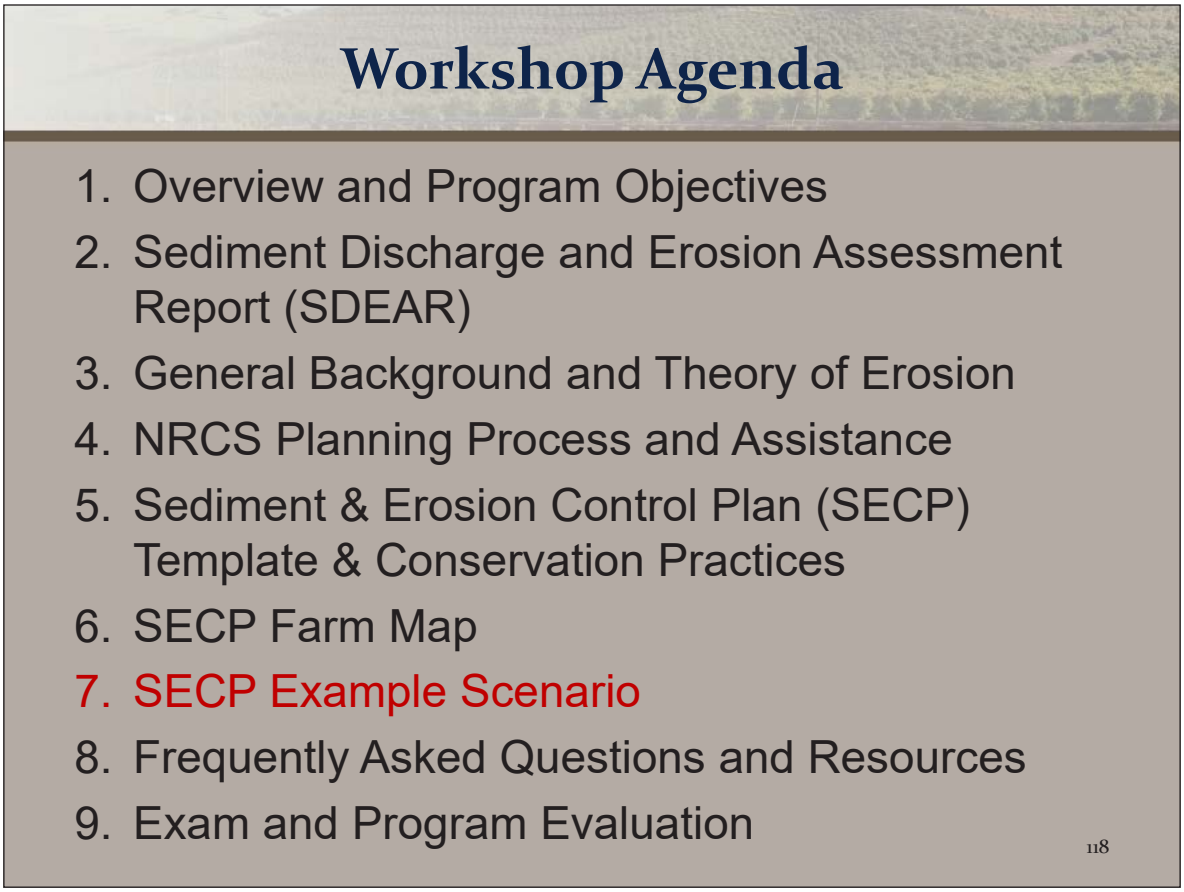
Note that the flow direction of all water features:

- Crystal Clear Creek flows east to west
- The drainage area flows southeast to northwest, and then north.



Example of a SECP Map. This is the complete map for the example scenario we are about to go through.

Note all the important features labeled: APN and border, Field names and borders, Roads, Evaluated locations, Legend


Workshop Agenda
1. Overview and Program Objectives
2. Sediment Discharge and Erosion Assessment Report (SDEAR)
3. General Background and Theory of Erosion
4. NRCS Planning Process and Assistance
5. Sediment & Erosion Control Plan (SECP) Template & Conservation Practices
6. SECP Farm Map
7. SECP Example Scenario
8. Frequently Asked Questions and Resources
9. Exam and Program Evaluation
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Objective 4

SECP Example Scenario

Sediment and Erosion Control Plan (SECP) Template

Member Name: _____

1. **General Information:**
   Provide the required information where indicated.

Parcel (APN)	Field ID(s)

General Information Comments:

_____

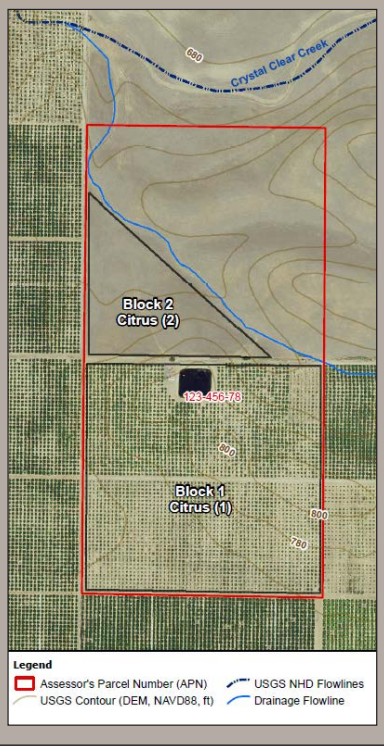
_____

_____

_____

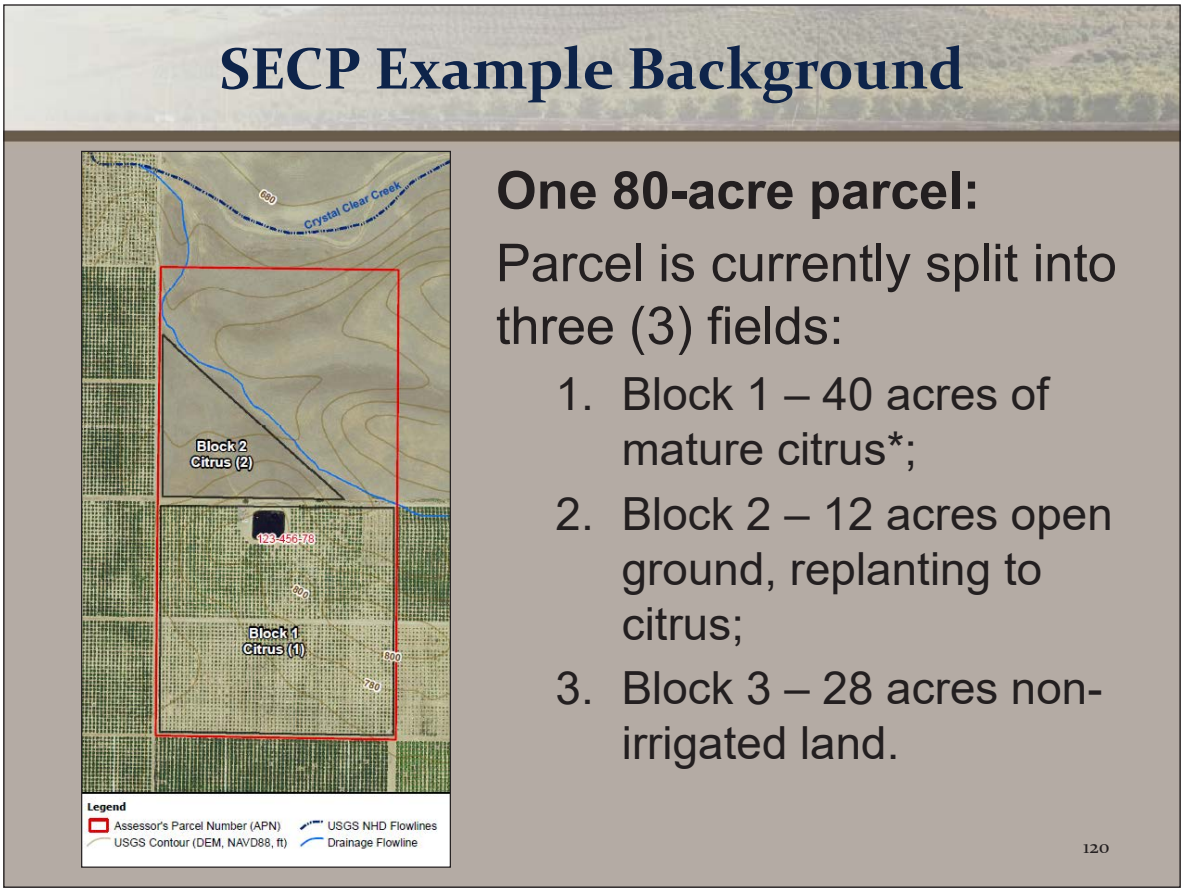
Name of Person Completing the Template:

_____



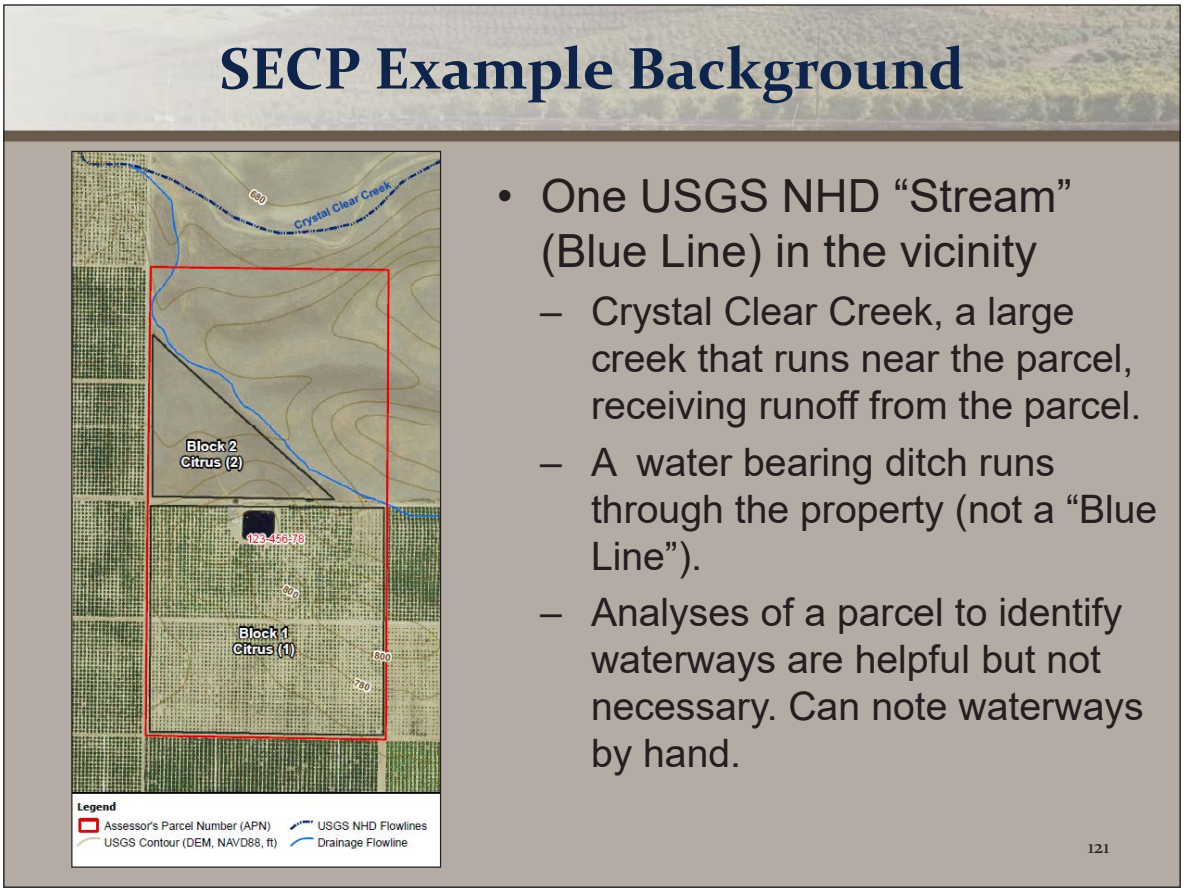
On the left is Section 1 of the SECP form. This section covers general information about the parcels/ fields, the member, and identifies who is completing the plan.

The right is the first stage of the SECP map. The information currently on the map should all be identified in Section 1 of the form. SECP boundaries are based on parcels. If a grower has 20 parcels, and only 4 required SECPs, then only the 4 would be evaluated. The whole farm may not require sediment and erosion control.



Important information about the parcel that makes up Example Farm. This parcel is split into multiple fields.

***Note that although the cropping for this scenario is citrus, all the same concepts and processes used in this presentation apply for other permanent crops such as almonds, walnuts, and vines. It may be helpful to visualize the permanent crop that you grow rather than citrus throughout this scenario. The general process of completing a SECP is the same, and would even be similar for row crops, as well.**



One USGS NHD blue line flows near the parcel.

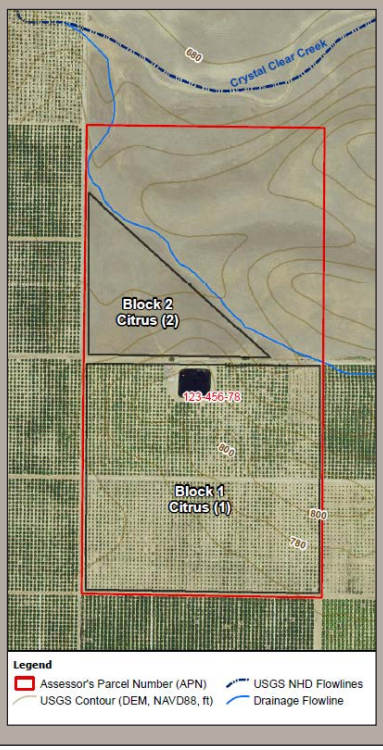
United States Geological Survey – National Hydrography Dataset

NHD blue lines are NOT required. They were used in this analysis to demonstrate the water bodies in the field. It is helpful to note where any waterways are, considering they provide direct transportation for sediment discharge. This can be done by simply marking them by hand on the map.

SECP Example Background

1. Block 1 – 40-acre Citrus

- Micro-irrigation;
- Evapotranspiration is tracked for irrigation scheduling;
- No-till;
- Pesticide and fertilizer application is well-timed with respect to irrigation;
- Tree rows planted North-South;
- Irrigation regulating reservoir present.

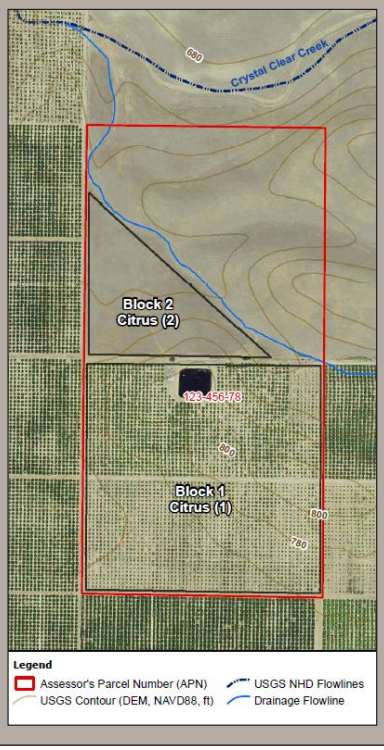


Important farm management information for Block 1. This information will be used to evaluate current sediment and erosion control practices.

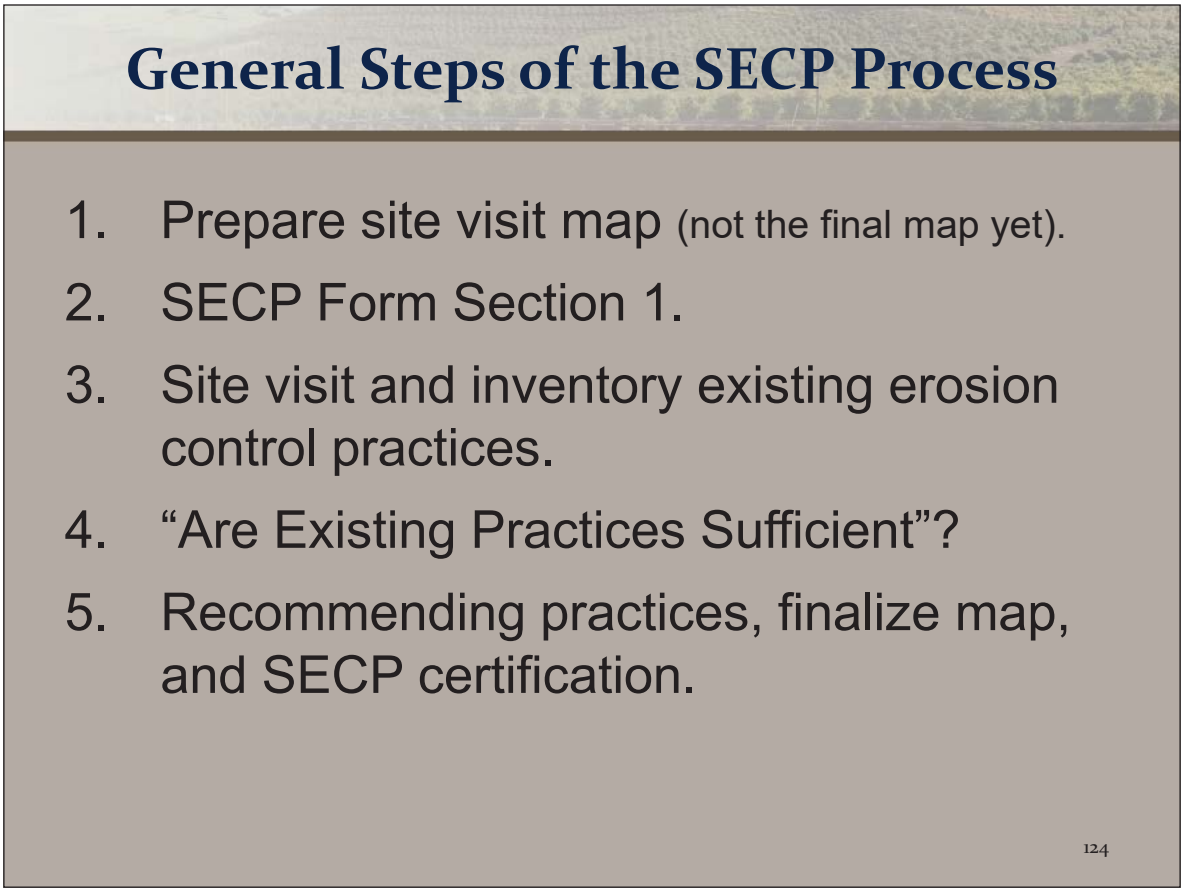
SECP Example Background

2. Block 2 – 12 acres Open Ground

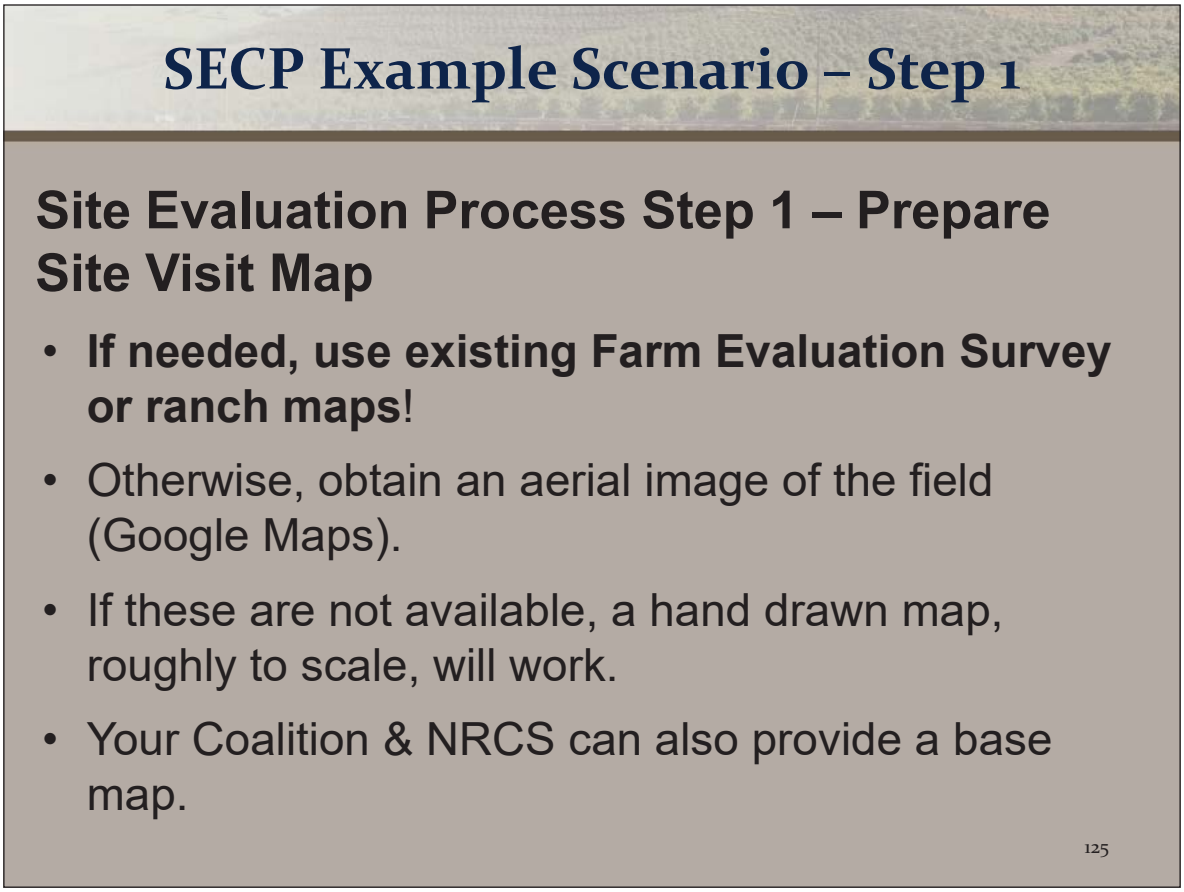
- Previously planted with citrus, aged orchard removed within the year;
- In the process of preparing for planting new citrus.



Important farm management information for field E2. This information will be used to evaluate current sediment and erosion control practices.



The five general steps of completing a SECP are shown in this slide. We will review each of these steps in the subsequent slides.



First step of completing the SECP. Multiple options for obtaining/creating a map.

This is an aerial of Example Farm, obtained from Google Maps. The SECP map for Example Farm will be built on this aerial.

SECP Example Scenario – Step 1

- Draw APN boundary/boundaries on the map;
- Label map with corresponding APN(s);
- If known, draw any flow or drainage lines on the map,
  - Not necessary to complete the plan, but a good idea to know where they are;
- If available, draw any contour lines on the map,
  - Not necessary to complete the plan, but helpful when visualizing changes in topography.

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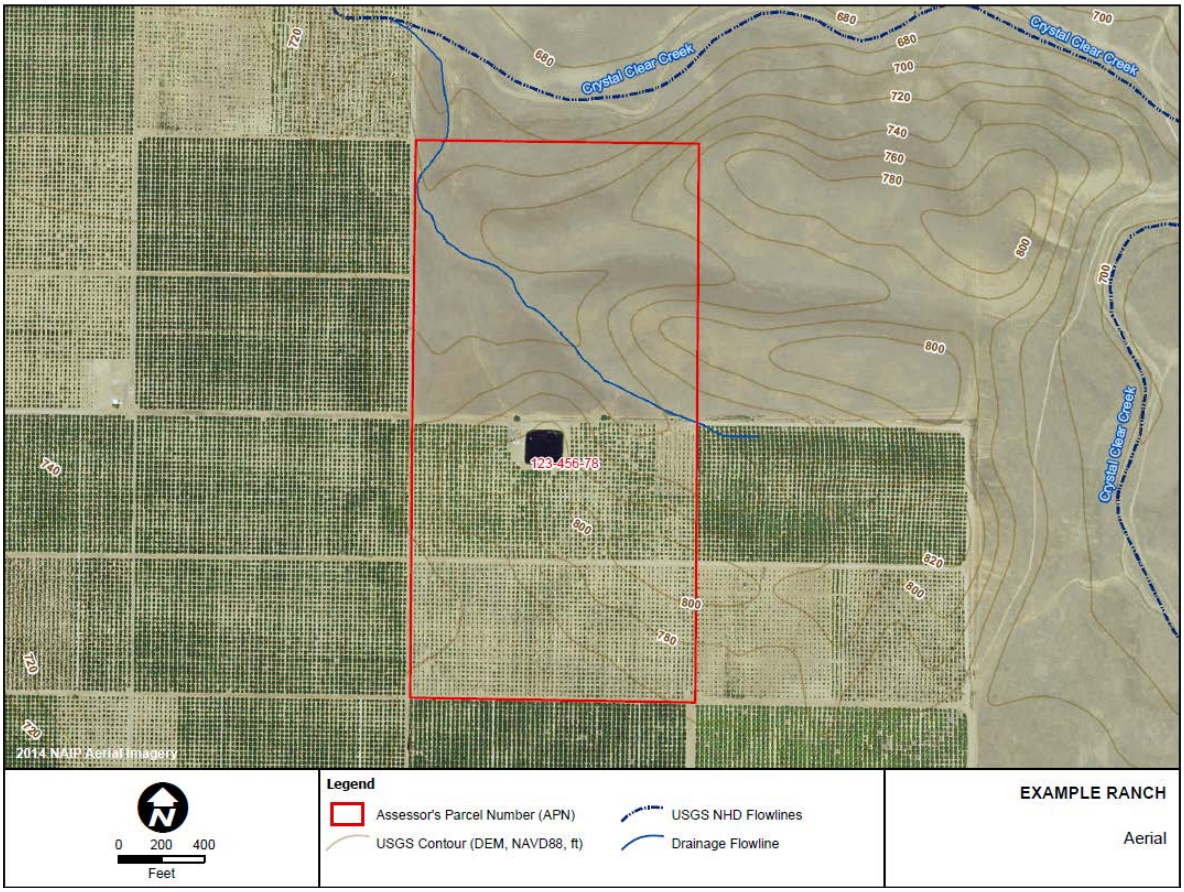
If deciding to include the optional drainage lines, consider how gravity/topography dictate where the surface water will flow. Draw arrows pointing from higher elevation to lower elevation.



Note the contours and blue line for Crystal Clear Creek. In this case, the blue line was developed using the USGS's National Hydrography Dataset to identify waterways of the US. This is not a requirement and can be noted by even writing in on the map where streams occur on or off the property. Pointing out waterways is helpful because adjacent waterways experiencing sediment loading is one of the primary reasons behind the need for SECPs.

Crystal Clear Creek, in this case, could experience sediment loading from this parcel indirectly as sediment could be transported off of the property via runoff and enter the water body. Note the flow directions of these blue lines.

Soils and/or USGS flow line data can be obtained and used in conjunction with Google Earth.

SECP Example Scenario – Step 1

- Draw field boundary/boundaries on the map;
- Label map with corresponding field name(s) or ID(s),
  - It is a good idea to include a map legend,
    - The legend will become more important and site locations are evaluated.
  - If possible, include a scale on the map:
    - If the map includes an aerial image from Google Maps, a scale can be found in the bottom right corner of the screen.

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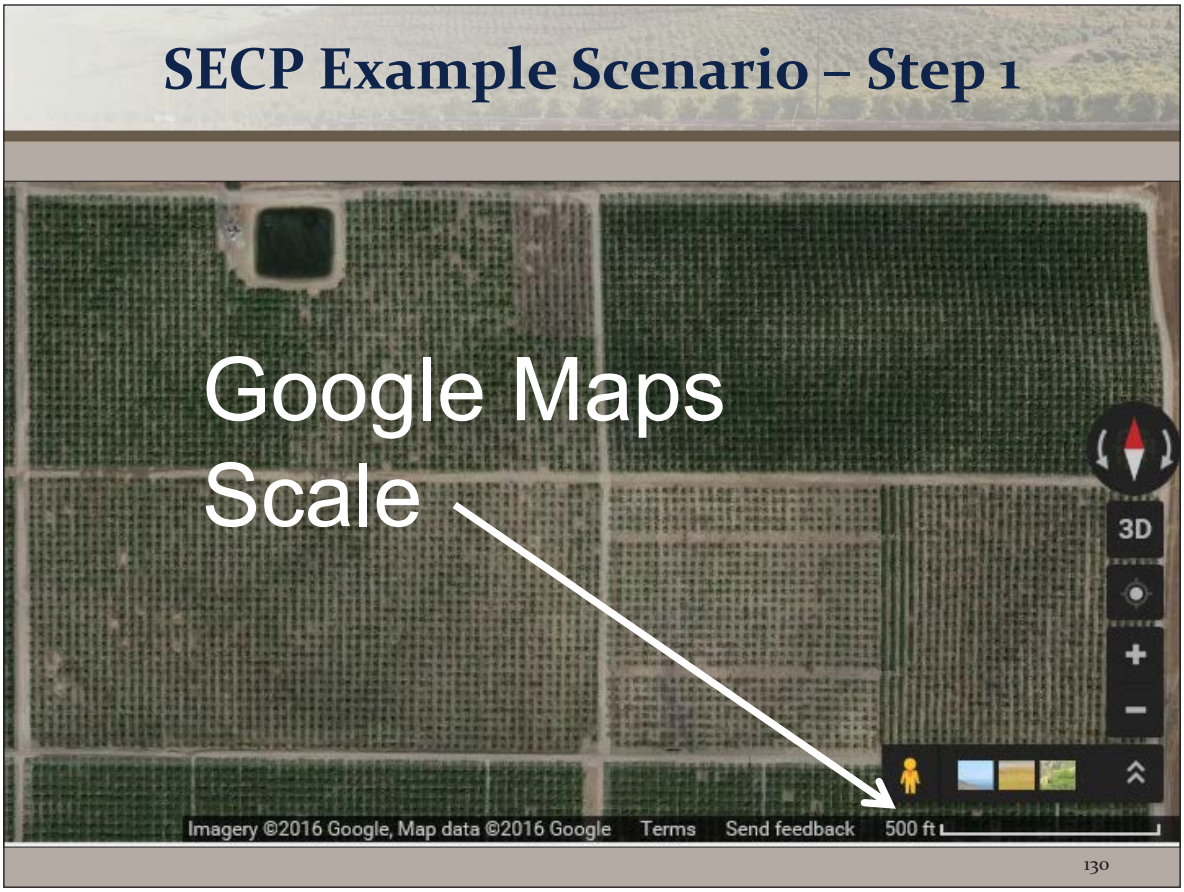
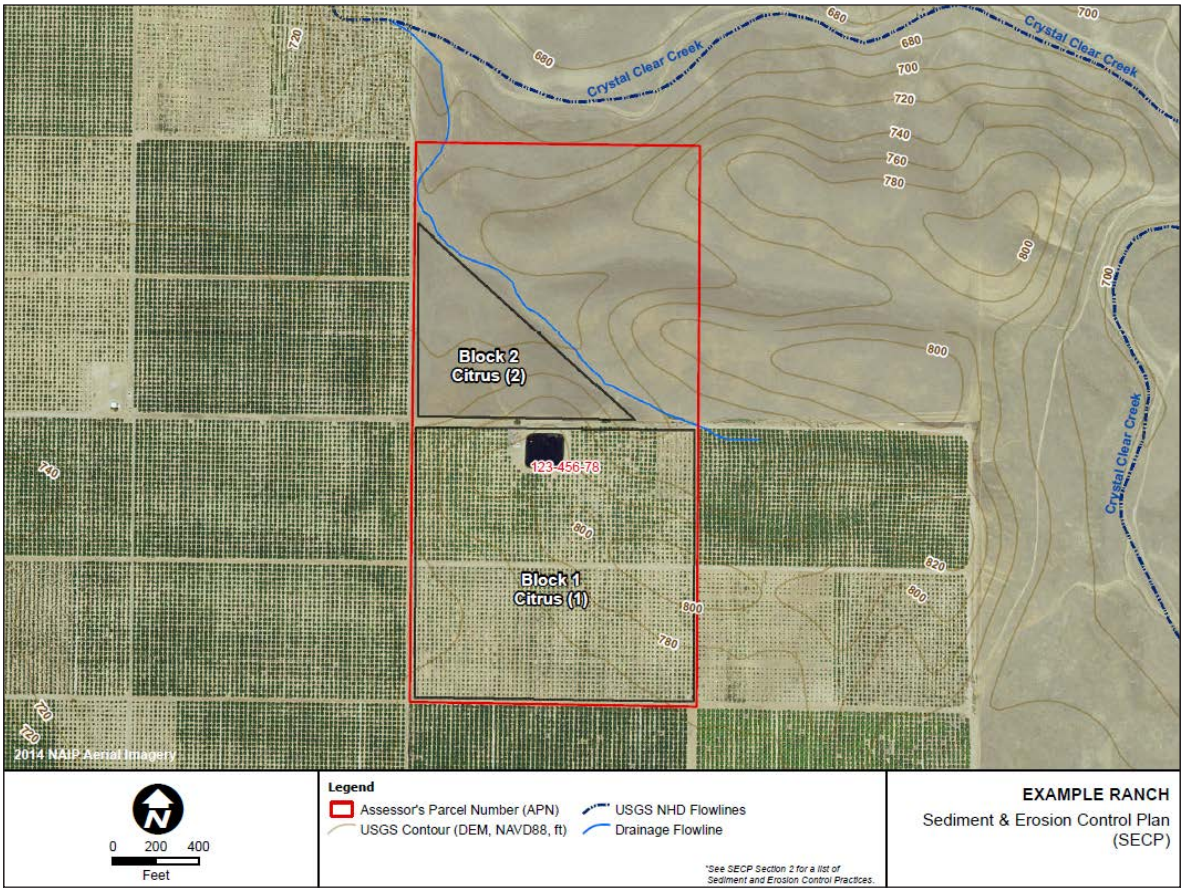
There are multiple options for screen clipping, if you choose to use an aerial imagine online to develop your site map, such as:

- Microsoft Windows Snipping Tool & Screen Shot Tool.
- Pressing the “Ctrl” plus “Print Screen” keyboard buttons in Windows.
- Pressing the “Cmd” plus “Shift” plus “4” keyboard buttons on a Mac.



Scale can be found at bottom right corner of Google Maps. If separate screen clips are used for the aerial image and the scale, ensure the map extents has not been changed and clips are not altered when combined to make the map.



Now we have a preliminary map we can use to mark location ID points. These are points that we will evaluate during the site visit.

SECP Example Scenario – Step 2

Site Evaluation Process Step 2 – SECP Form Before the Site Visit

- Some parts of the form can be completed before going into the field.
- Start by filling out the member and parcel information.

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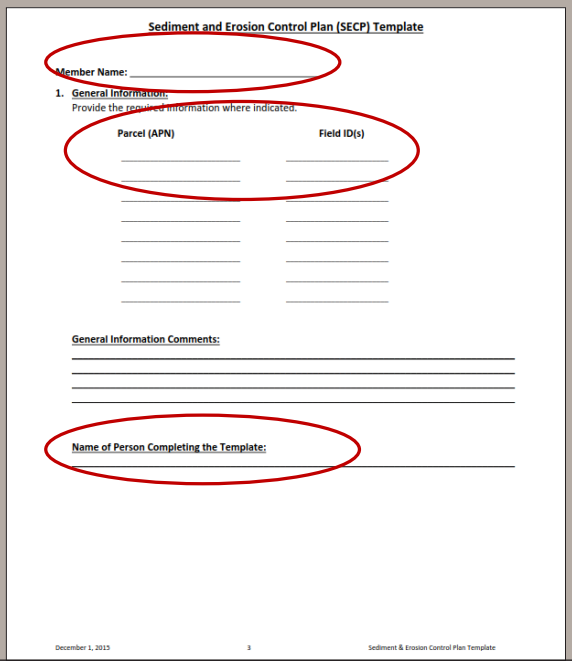
SECP Example Scenario – Step 2

Step 2 – SECP Form Section 1

Page 3 of SECP form



Sediment and Erosion Control Plan (SECP) Template

Member Name: _____

1. General Information:

Provide the required information where indicated.

Parcel (APN)	Field ID(s)

General Information Comments:

_____

_____

_____

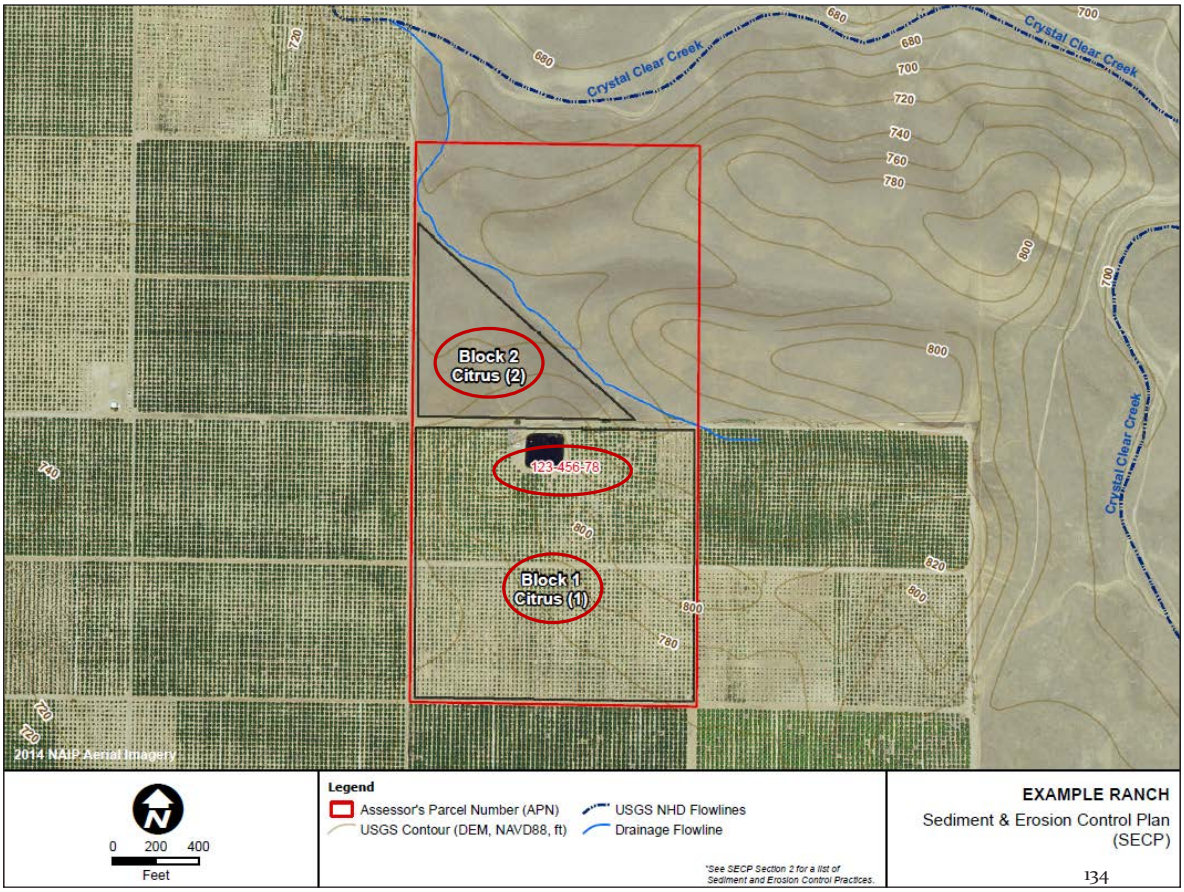
_____

Name of Person Completing the Template: _____

December 1, 2015 3 Sediment & Erosion Control Plan Template

133

Now it is time to start filling out the form. Everything on this page can be filled out before going into the field. Circled information should already be labeled on the map.



Circled in red is the information we need to fill out section one of the SECP.

SECP Example Scenario – Step 2

Filling out the form – Before the site visit

Sediment and Erosion Control Plan (SECP) Template

Page 3 of SECP form

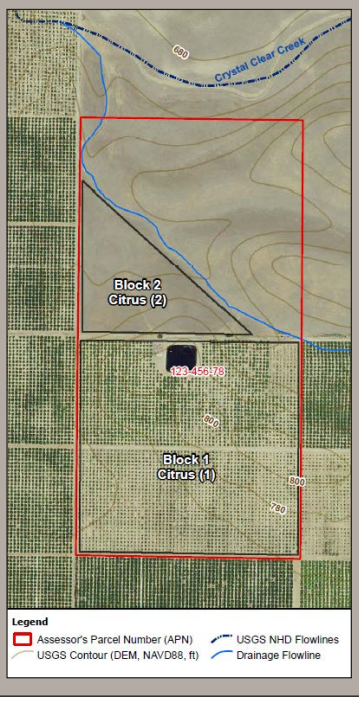
Member Name: John and Jane Smith

1. **General Information:**
   Provide the required information where indicated.

Parcel (APN)	Field ID(s)
123-456-78	Block 1, Block 2

General Information Comments:
Block 2 is currently a bare field, recently deep ripped and prepared for planting of citrus trees in Spring 2017.

Name of Person Completing the Template:
John Smith

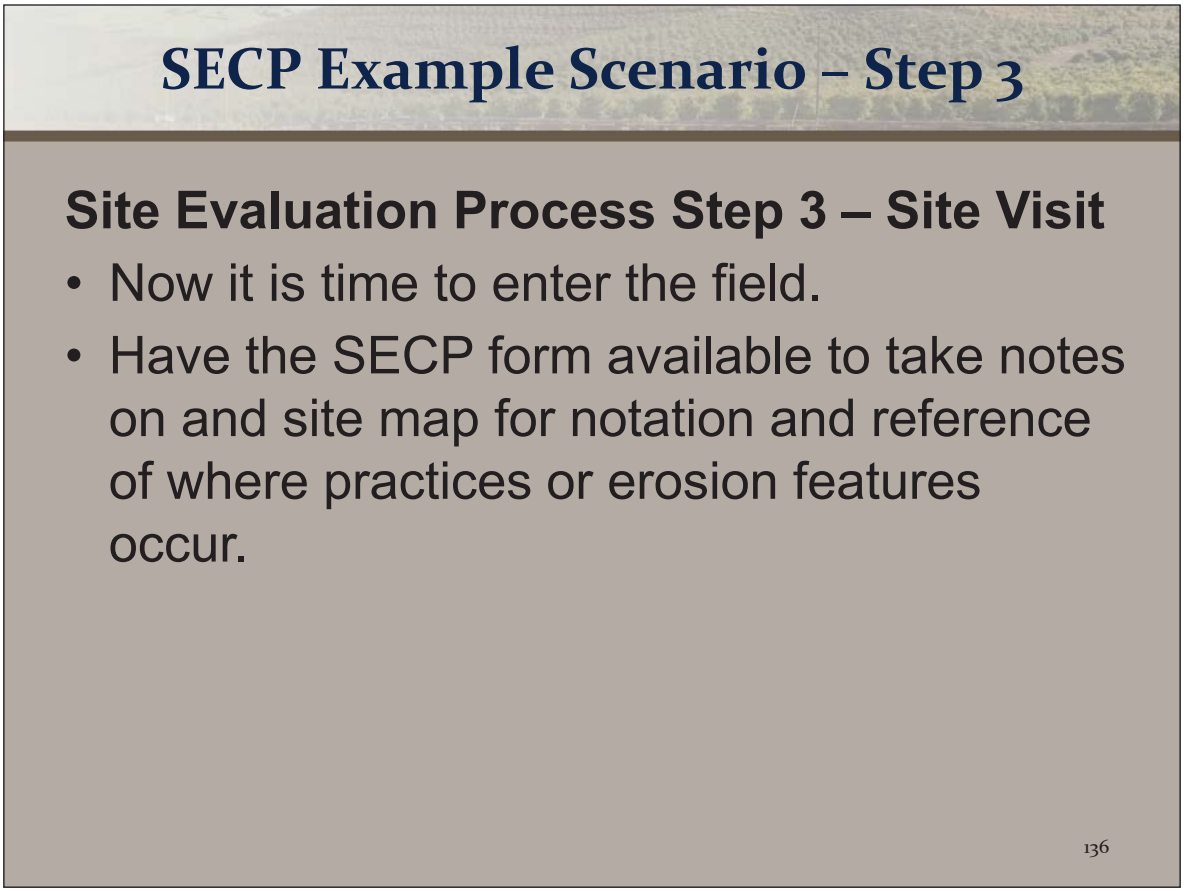


Section 1 is now filled out for Example Ranch.

In the General Information Comments section, make note of any information concerning the parcel that you feel is relevant to the SECP.

Common information to include: planting planned for the near future.

The depth of information provided is to the grower's discretion. However, it is important to note that documentation of activity with the SECP and any noteworthy information can especially come in handy when evaluating past practices as conditions change and in the case that the SECP is audited by the Water Board. In general, we don't want to provide too much information, but we want to have a representative, comprehensive plan.



Images of the two portions of the SECP are noted in the next slide.

The easiest way to follow along with this portion of the scenario is to have Section 2 and Section 3 of the form and the map out for reference.

SECP Example Scenario – Step 3

Review the Management Practice Table in Section 2 (Page 4)

2. On-farm Sediment and Erosion Management Practices:
Use these Practice Codes to insert into the table in Section 3.

Management Practice Code	Inventory of Sediment and Erosion Control Practices
	Current Irrigation Infrastructure Practices
I-1	Drip/microspray irrigation installed and used.
I-2	Use of irrigation equipment (sprinklers, micro-sprinklers, emitters, etc.) to match soil infiltration rates as much as possible to prevent runoff.
I-3	Recirculation systems are used to keep sediment and farm inputs on site. Water is recirculated to irrigate other fields.
I-4	In-furrow dams are used to increase infiltration and settling out of sediment prior to entering the tail ditch.
I-5	Storm water is captured using field borders to reduce runoff and supplement field irrigation.
I-6	Use of flow dissipaters to minimize erosion at discharge point.

Will fill in the relevant current practice codes and their Location IDs in the table in Section 3 (Page 6)

Evaluated On-farm Locations	Location ID Point	Evaluation Date	Current Practice ID Code (if any)	Existing Practices Sufficient	Recommended Practice ID Code	Planned Implementation Date

Can take notes on Section 2 table of where the practices occur, then fill out Section 3 later or fill out Section 3 as you go. Find the process that works best for you.

Recommended that the audience has three items out side-by-side during the rest of this scenario:

1. **SECP map**
2. **Page 4 of SECP (Practice Codes)**
3. **Page 6 of SECP (site evaluation table)**

SECP Example Scenario – Step 3

- **Block 1 – 40-acre Citrus Grove**

Existing Irrigation Infrastructure Practices

– Micro-irrigation I-1, I-2

I-1	Drip/microspray irrigation installed and used.
I-2	Use of irrigation equipment (sprinklers, micro-sprinklers, emitters, etc.) to match soil infiltration rates as much as possible to prevent runoff.

– Tree rows planted North-South I-9

I-9	Fields are planted on the contour to reduce runoff.

– One reservoir (no erosion concerns)

Evaluated On-farm Locations	Location ID Point	Evaluation Date	Current Practice ID Code (if any)	Existing Practices Sufficient	Recommended Practice ID Code	Planned Implementation Date
Block 1 (Citrus; general practices)	1	05/25/2016	I-1, I-2, I-9 (some slopes)			

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Review important information for field Block 1, making note of any information that relates to management practices in the Irrigation Infrastructure section of the table in section 2 of the SECP Template.

SECP Example Scenario – Step 3

- **Block 1 – 40-acre Citrus Grove**

Existing Irrigation Management Practices

– Evapotranspiration is tracked for irrigation scheduling M-1

M-1	Use of irrigation scheduling methods and equipment to match irrigations to crop needs where possible.

– Pesticide application is well-timed with respect to irrigation M-2

M-2	The time between pesticide applications and the next irrigation is lengthened as much as possible to mitigate runoff of pesticide residue.

Evaluated On-farm Locations	Location ID Point	Evaluation Date	Current Practice ID Code (if any)	Existing Practices Sufficient	Recommended Practice ID Code	Planned Implementation Date
Block 1 (Citrus; general practices)	1	05/25/2016	I-1, I-2, I-9 (some slopes), M-1, M-2			

139

Review important information for field Block 1, making note of any information that relates to management practices in the Irrigation Infrastructure section of the table in section 2 of the SECP Template.

Note that Block 2 is not evaluated for existing practices, because it is not currently managed.

SECP Example Scenario – Step 3

- **Block 1 – 40-acre Citrus Grove**

Existing Irrigation Management Practices

- Natural Mulch on the field reduces erosion M-4
- Deep-ripped prior to planting and gypsum applied to field M-5
- No-till M-7

M-4	Cover crops, native vegetation, and/or natural mulch are used to reduce erosion.
M-5	Soil water penetration has been increased through the use of amendments, deep ripping and/or aeration.
M-7	Minimum tillage incorporated to minimize erosion.

Evaluated On-farm Locations	Location ID Point	Evaluation Date	Current Practice ID Code (if any)	Existing Practices Sufficient	Recommended Practice ID Code	Planned Implementation Date
Block 1 (Citrus; general practices)	1	05/25/2016	I-1, I-2, I-9 (some slopes), M-1, M-2, M-4 (native vegetation, natural mulch), M-5 (gypsum applied, deep ripped prior to planting), M-7 (no-till)			

140

Review important information for field Block 1, making note of any information that relates to management practices in the Irrigation Infrastructure section of the table in section 2 of the SECP Template.

Note that Block 2 is not evaluated for existing practices, because it is not currently managed.

SECP Example Scenario – Step 3

- **Block 2 – 12-acre Bare Field**

  Existing Irrigation Management Practices

  – The field has been deep-ripped to increase infiltration M-5

M-5	Soil water penetration has been increased through the use of amendments, deep ripping and/or aeration.

Evaluated On-farm Locations	Location ID Point	Evaluation Date	Current Practice ID Code (if any)	Existing Practices Sufficient	Recommended Practice ID Code	Planned Implementation Date
Block 1 (Citrus; general practices)	1	05/25/2016	I-1, I-2, I-9 (some slopes), M-1, M-2, M-4 (native vegetation, natural mulch), M-5 (gypsum applied, deep ripped prior to planting), M-7 (no-till)			
Block 2 (Bare Fields, soon to be citrus; general practices)	2	05/25/2016	M-5 (field has been deep ripped)			

141

Start with completing the first four columns in the table in Section 3 of the SECP. All of these columns pertain to existing practices and conditions. It may be easiest to bring the form into the field and complete these columns as you go. Another option is to take detailed notes and complete the columns later.

The location ID Points are consecutive numbers. Farm Block 1 is Location ID Point “1”. Other identified locations will be 2,3,4,…up to as many practices as are identified.

Block 2 have been deep ripped so M-5.

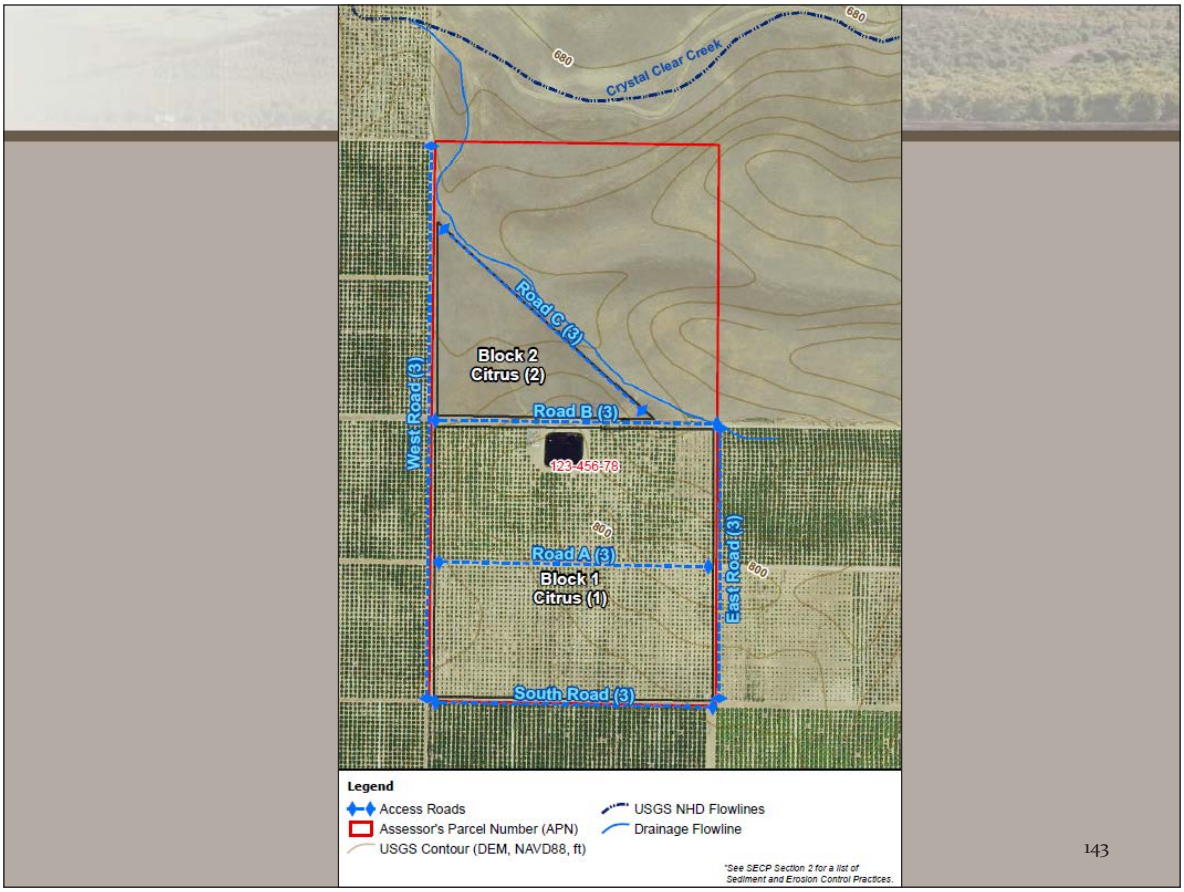
SECP Example Scenario – Step 3

- Next, we examine all roads on the property.
- Identify the roads in the table in Section 3 of the SECP form.
  - All roads can be covered under ONE location ID Point **IF** they have similar conditions and practices.
  - Roads should be shown and labeled on the map.
  - Use names that work for you.

142

Ensure you have the SECP form with you to help identify management practices.

Even if a road stays completely on-farm, **sediment discharge from that road can enter surface waterways via indirect transport mechanisms.**



This slide shows the map with the farm roads marked. If any county roads are within the map extents, mark those roads as well.

It is important to evaluate the roads thoroughly. Roads are common locations for erosion problems. Roads should also be evaluated thoroughly because they frequently align with field and/or APN borders. This is important because this will be where sediment leaves the property, if erosion problems are occurring.

SECP Example Scenario – Step 3

- As you drive the roads:
  - Make note of any management practices currently utilized;
  - Note the locations of any sites that need further evaluation:
    - Culverts,
    - Discharge points,
    - Stream crossings,
    - Gullies,
    - Etc.

144

More common locations are listed in Section 3 of the SECP Template. This is not an exhaustive list. Be sure to include any other locations that require attention.

Sloping the road towards the fields may minimize erosion on the road. It prevents water from concentrating on the road and directs it back to the field. Water in the field is more likely to spread out and infiltrate in to the ground than is water on a compacted road. However, there is some risk that runoff from the field could collect along the side of the road and form a rill or gully. Always consider if other management practices are needed to address potential concentrated flow concerns.

Covering the road with decomposed granite protects the road from the impact of rain drops. It is also less likely to erode because the particles are larger than soil particles. Decomposed granite is also porous, helping the water to infiltrate into the ground.

SECP Example Scenario – Step 3

	Other Practices
O-1	Grade access roads to reduce on-road erosion.
O-2	Control concentrated drainage on roads with culverts, rolling dips, etc.
O-3	Direct drainage off road to vegetated area, ditches, sediment basins, etc.
O-4	Protect roads in rainy season by seeding roads, rice straw, gravel, avoid use, etc.
O-5	Check culverts in rainy season to ensure they are not plugged with debris.
O-6	Minimize erosion downstream of culverts by using energy dissipaters.
O-7	Remove/avoid stream crossings wherever possible. *
O-8	Creek banks and stream banks have been stabilized. *

Evaluated On-farm Locations	Location ID Point	Evaluation Date	Current Practice ID Code (if any)	Existing Practices Sufficient	Recommended Practice ID Code	Planned Implementation Date
Block 1 (Citrus; general practices)	1	05/25/2016	I-1, I-2, I-9 (some slopes), M-1, M-2, M-4 (native vegetation, natural mulch), M-5 (gypsum applied, deep ripped prior to planting), M-7 (no-till)			
Block 2 (Bare Fields, soon to be citrus; general practices)	2	05/25/2016	M-5 (field has been deep ripped)			
Farm Roads	3	05/25/2016	O-1 (into field), O-4 (DG)			

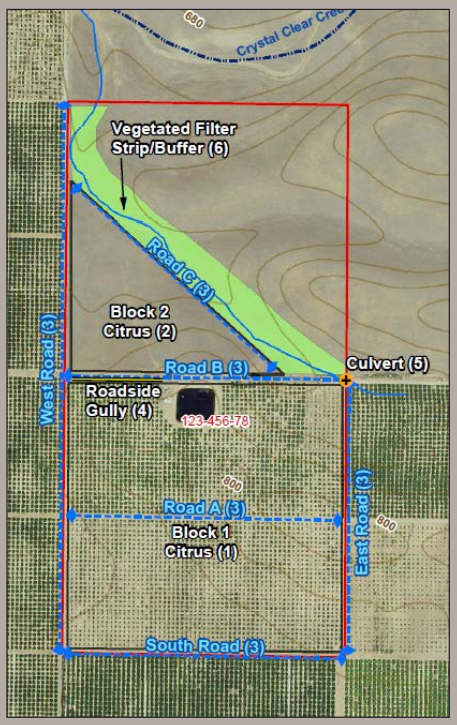
Mark the table next to the appropriate practice to indicate which codes will be entered in the table in Section 3.

Now fill out the Current Practices column for Farm Roads. Include notes about any practice ID codes that need clarification.

The addition of the notes in parenthesis are not required; however, they can be helpful when referencing the practices as the SECP needs further evaluation.

SECP Example Scenario – Step 3

- Locations you identified as needing further evaluation:
  - Roadside gully,
  - Culvert,
  - Vegetated filter strip/buffer.



148

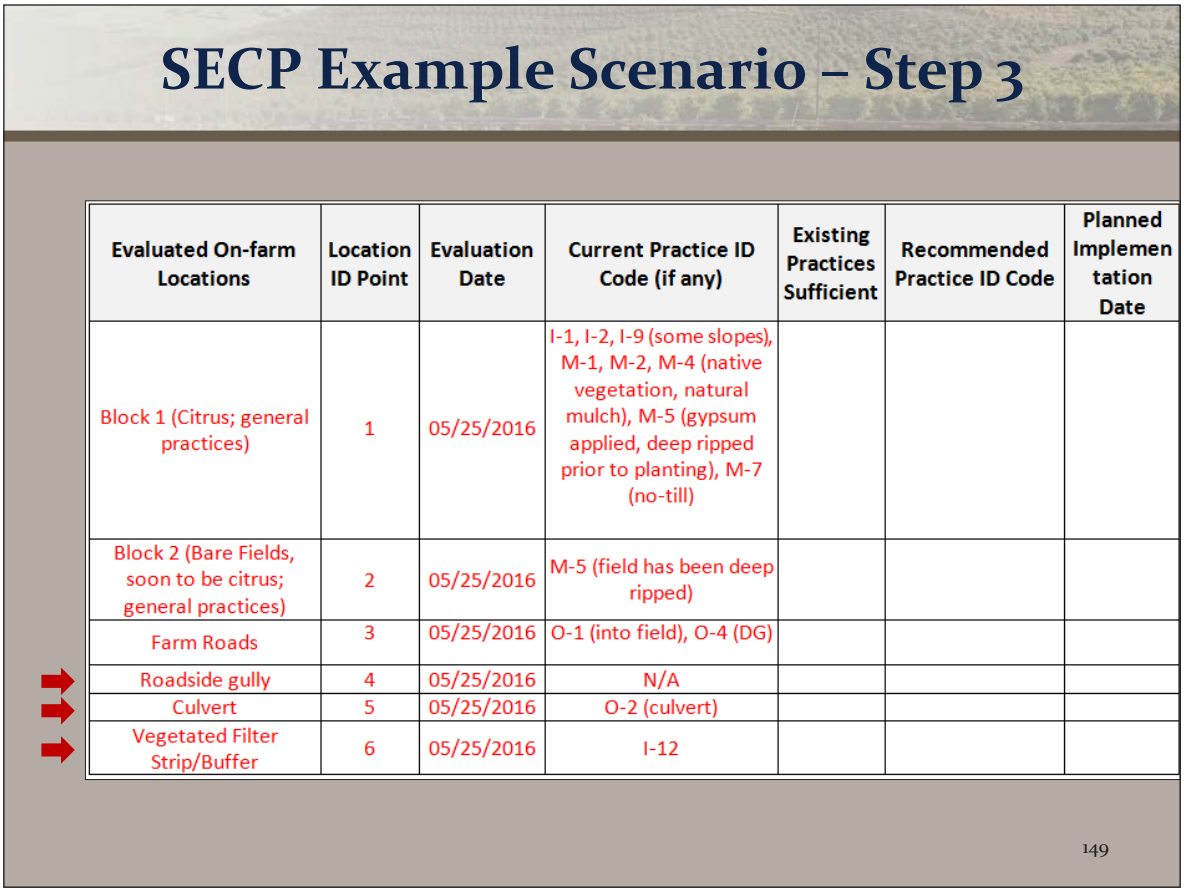
These are the locations we identified throughout the field as needing evaluation. Identifying a location as needing further evaluation does not necessarily mean a sediment discharge or erosion problem is occurring.

For example, a clean culvert with no indication of erosion should be noted in the plan, but no additional sediment and erosion control practices would be needed.

*Recall, the map requirements are:

- Assessors Parcel Number (APN)
- Location ID(s)
- Parcel(s) Outlines
- Field Outlines

The descriptions next to the Location IDs (Found in parenthesis) are added and recommended for clarity; however, are not required.



Evaluated On-farm Locations	Location ID Point	Evaluation Date	Current Practice ID Code (if any)	Existing Practices Sufficient	Recommended Practice ID Code	Planned Implementation Date
Block 1 (Citrus; general practices)	1	05/25/2016	I-1, I-2, I-9 (some slopes), M-1, M-2, M-4 (native vegetation, natural mulch), M-5 (gypsum applied, deep ripped prior to planting), M-7 (no-till)			
Block 2 (Bare Fields, soon to be citrus; general practices)	2	05/25/2016	M-5 (field has been deep ripped)			
Farm Roads	3	05/25/2016	O-1 (into field), O-4 (DG)			
Roadside gully	4	05/25/2016	N/A			
Culvert	5	05/25/2016	O-2 (culvert)			
Vegetated Filter Strip/Buffer	6	05/25/2016	I-12			

Once the locations have been identified, put them in the table in Section 3 of the SECP. Note the Location ID points are consecutive numbers, as required by the SECP rules at the beginning of the form.

SECP Example Scenario – Step 3

Filling Out the Form – Site Evaluation

- A roadside gully has formed:
  - This gully has been caused by storm water runoff;
  - Gully drains **directly** into the unnamed creek.

Currently no existing management practices are in place to prevent erosion.

The gully can be seen on the side of the road. This gully is at a fairly steep hill, which means the water will be flowing fast.

Focus on gully downhill, near top right of picture

SECP Example Scenario – Step 3

Filling Out the Form – Site Evaluation

- A culvert is currently plugged O-2:
  - Water flows around the culvert, across the road, causing erosion on the road;
  - When the culvert was active, it caused erosion at its downstream discharge point.

Three culverts we noted on the property. Make note of the condition of each culvert and any signs of erosion. Note the practice code for any current erosion control practices in place. A culvert exists, which would provide it O-2; however, it would best to award credit for O-2 after it is active again.

It can clearly be seen that the culvert is plugged and will not allow water to flow through and when it was active it was causing considerable erosion and discharge.

SECP Example Scenario – Step 3

Filling Out the Form – Site Evaluation

- Vegetated Filter Strip/Buffer I-12:
  - Currently native vegetation is in-tact;
  - Area was not deep ripped with the rest of the field (green area on map).

152

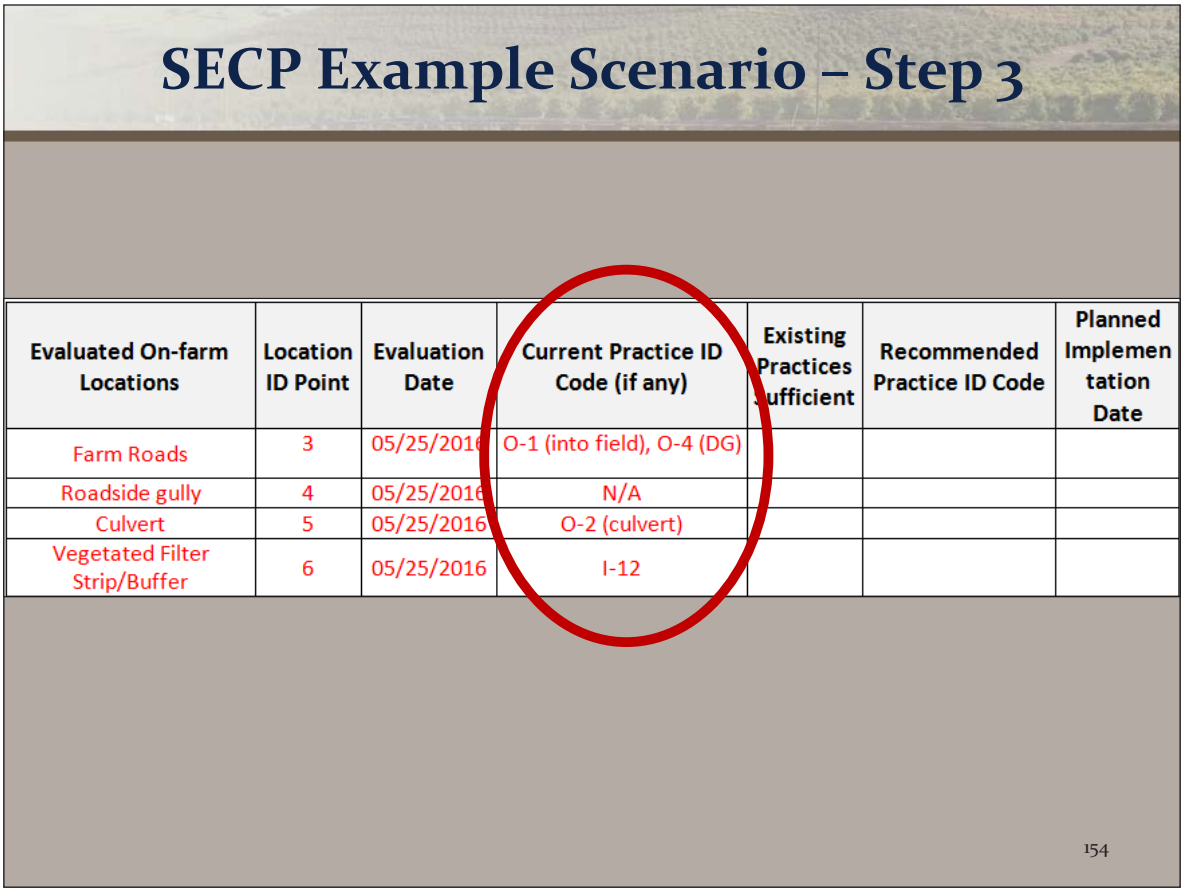
As seen before, a drainage creek flows along the northeast border of Block 2. As Block 2 was ripped and being prepared for planting, a buffer area along the creekwas left alone. Before the field was ripped, native vegetation protected the soil from erosion. This native vegetation is still intact along the creek.

This corresponds to practice code I-12. Make a note of this.

Note the vegetation is currently dead. Dead vegetation still provides excellent erosion protection when it is thick like it is here.

SECP Example Scenario – Step 3

- Vegetated Filter Strip/Buffer I-12:
  - Hypothetical example of a different area of the buffer in winter.

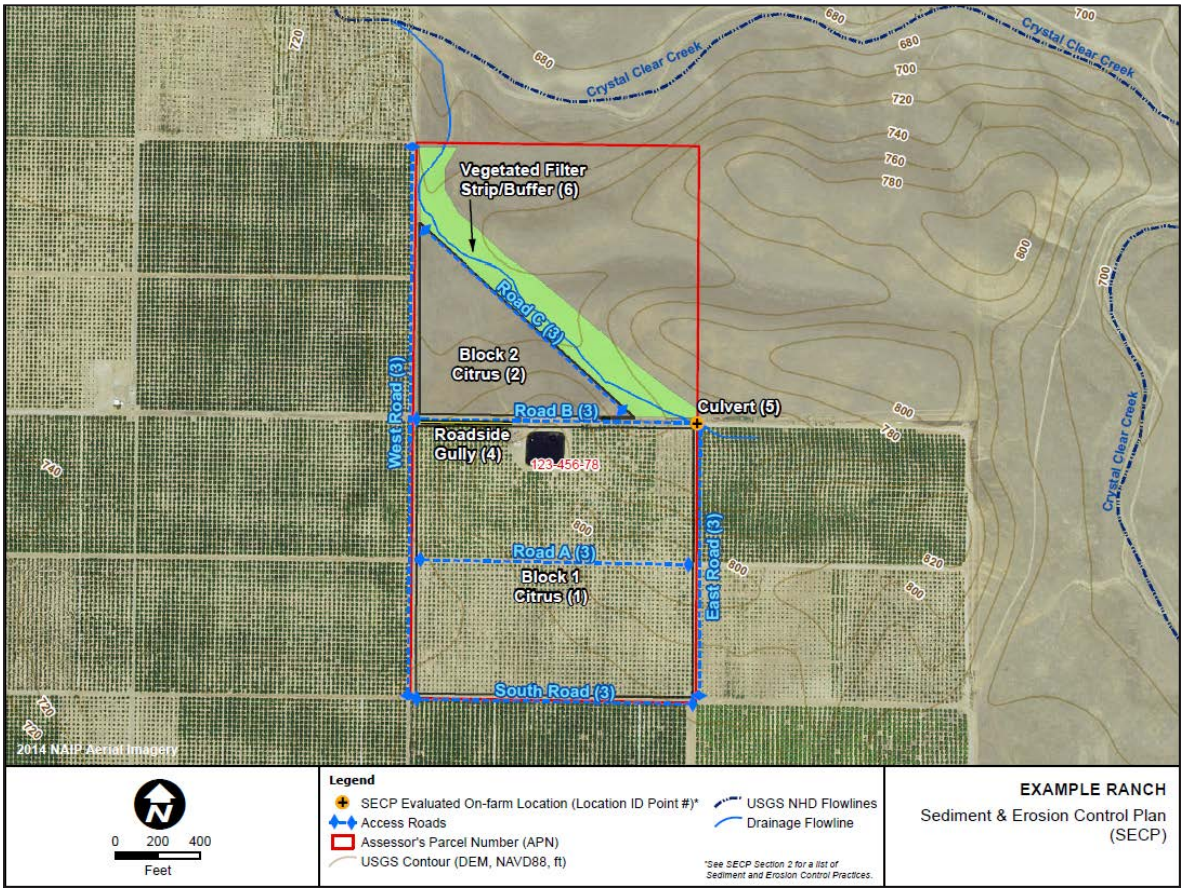


SECP Example Scenario – Step 3

Evaluated On-farm Locations	Location ID Point	Evaluation Date	Current Practice ID Code (if any)	Existing Practices Sufficient	Recommended Practice ID Code	Planned Implementation Date
Farm Roads	3	05/25/2016	O-1 (into field), O-4 (DG)			
Roadside gully	4	05/25/2016	N/A			
Culvert	5	05/25/2016	O-2 (culvert)			
Vegetated Filter Strip/Buffer	6	05/25/2016	I-12			

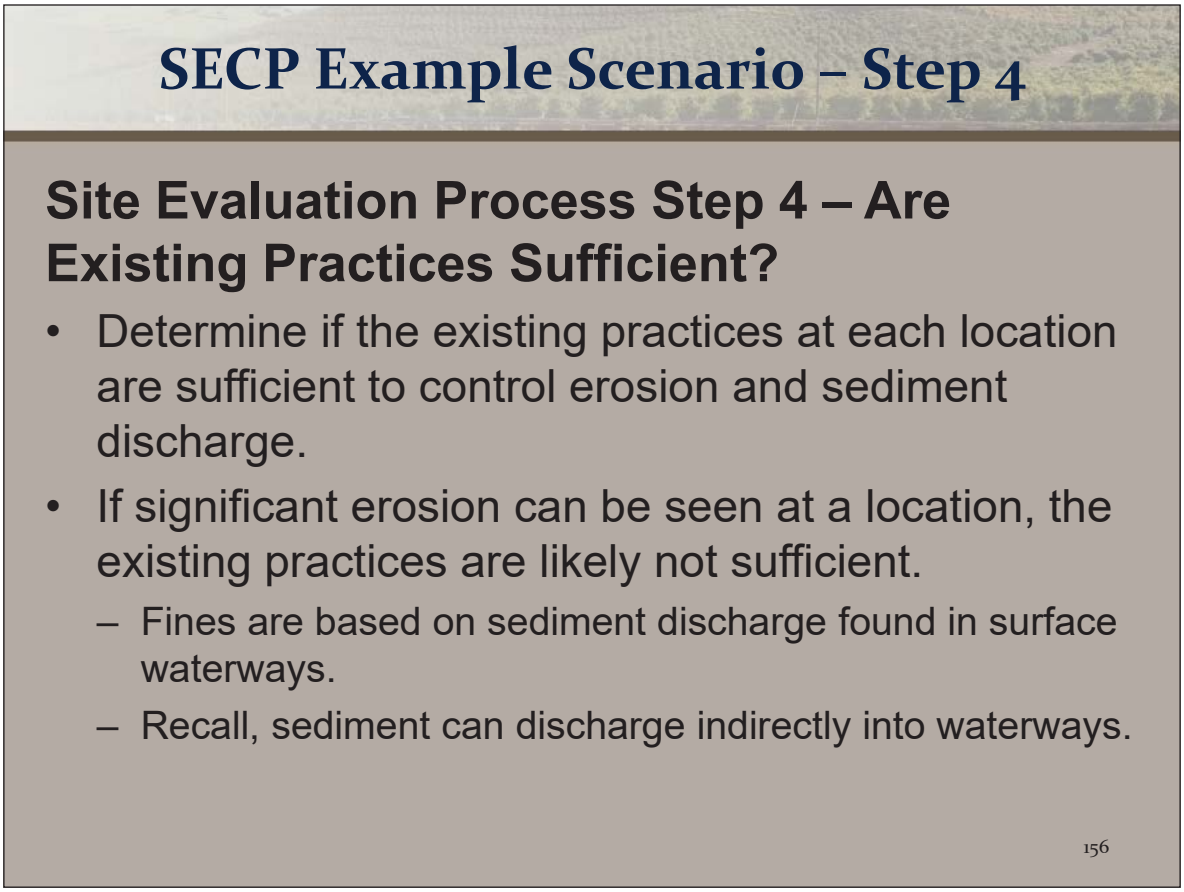
154

Now that each location has been evaluated, indicate any current erosion control practices in the table in Section 3 of the form.



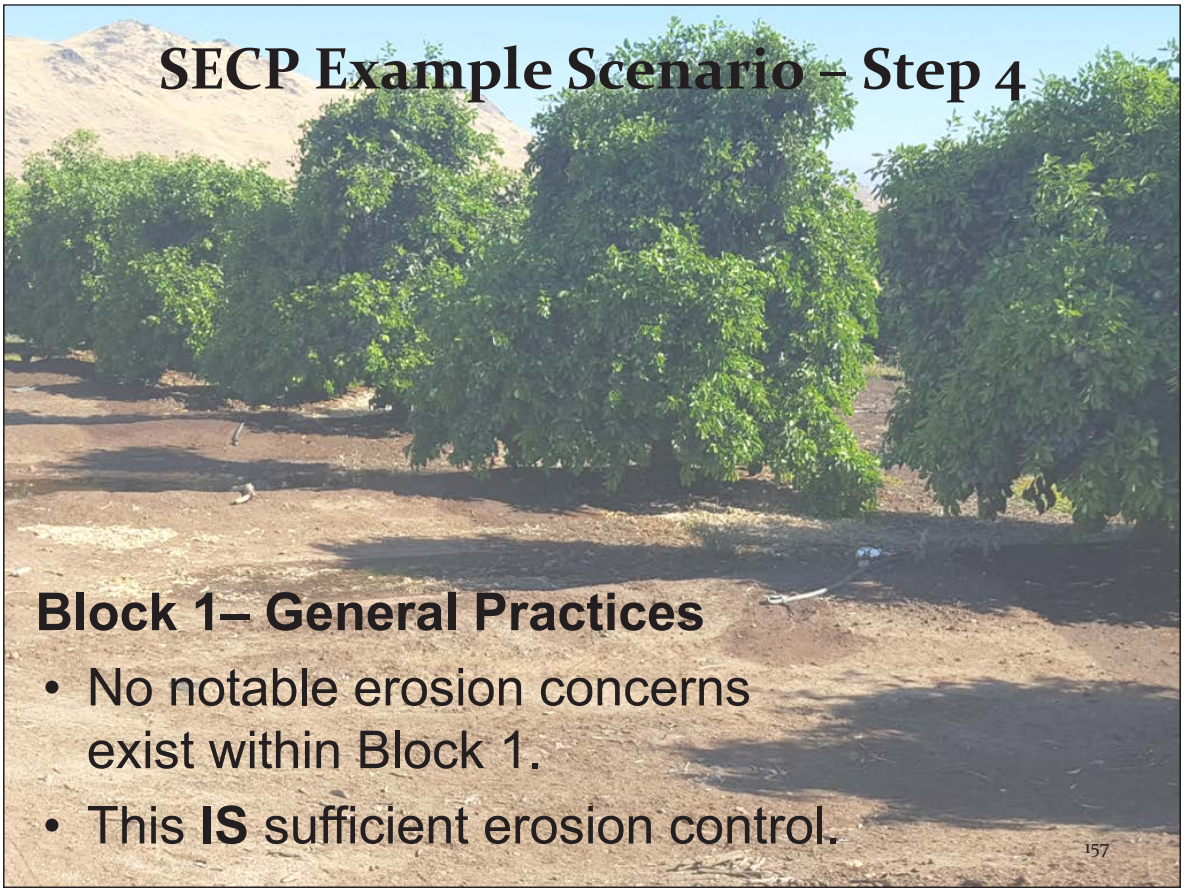
Now that all of the locations have been identified, mark them on the map. Label each point with its name and Location ID Point for clarification.

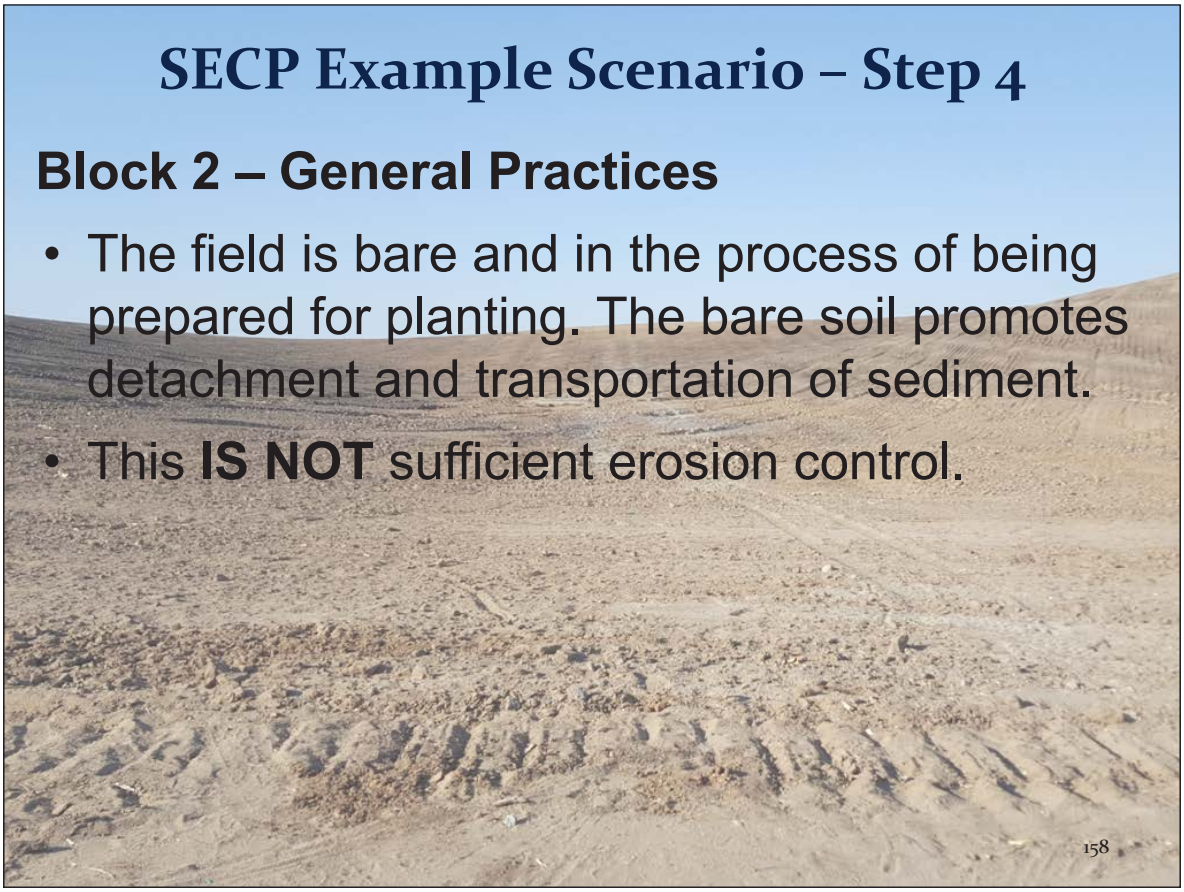
This is the Complete SECP Map.



Discuss sediment discharge as related to the threshold of 5 tons/acre/year. This was the threshold used in the SDEAR, but it is extremely difficult to quantify in the field, and there is no guarantee that regulatory enforcement would use that threshold. The determination would likely be more visually-based.

Ultimately, we want the minimal amount of sediment discharge as possible, but even if utilizing multiple management practices, there may still be some, especially during extreme storm events.

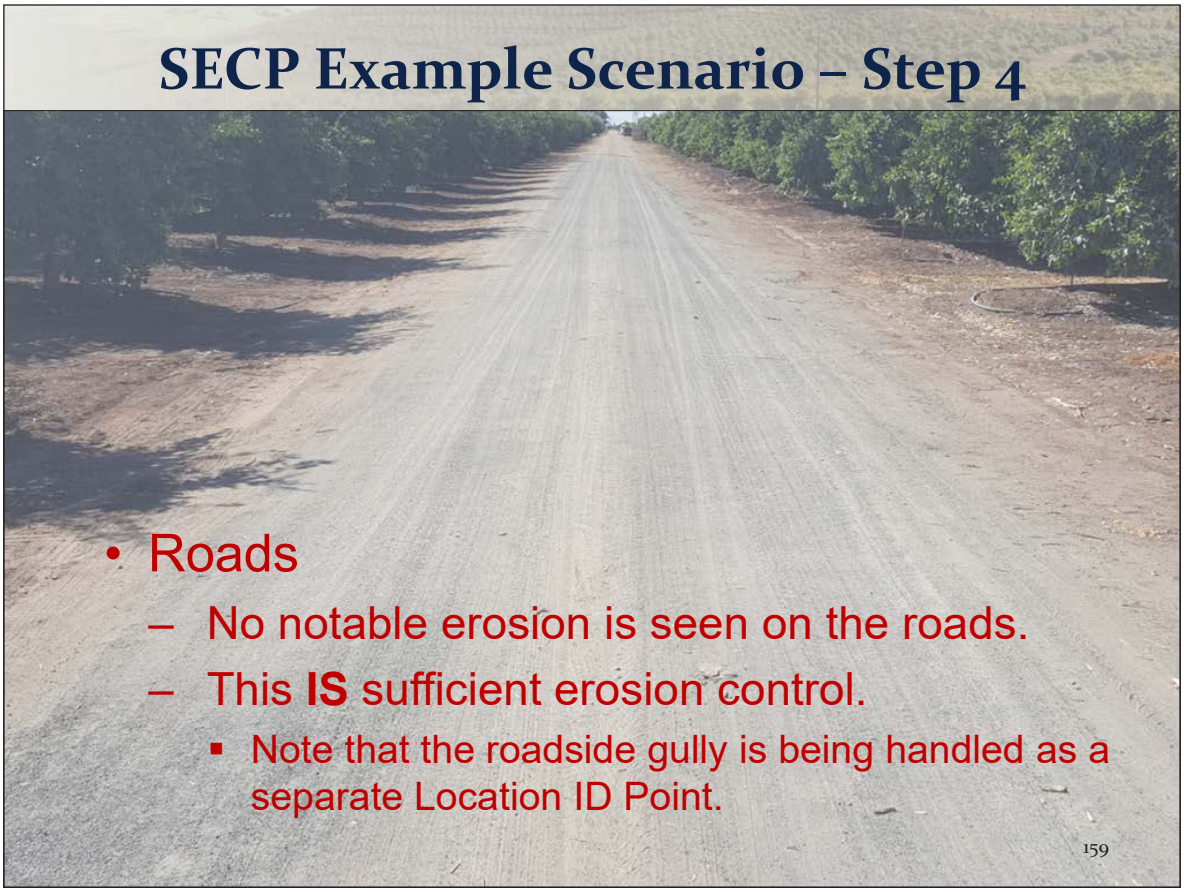

SECP Example Scenario – Step 4
Block 1– General Practices
• No notable erosion concerns exist within Block 1.
• This IS sufficient erosion control.
157



Block 2 has not been planted yet and the planned micro-irrigation system is not installed yet. There are no current erosion control practices.

Since Block 2 is currently bare soil, the potential for erosion throughout the winter is huge! The current practices are NOT sufficient.

This photo illustrates how the RUSLE model was used to evaluate parcels in the SDEAR analyses, that is, no cover on the soil to evaluate the theoretical POTENTIAL of sediment discharge regardless of cropping or management.



The current erosion control practices on the roads are seen to be sufficient protection.

SECP Example Scenario – Step 4

- Culvert 1 is currently plugged:
  - Water flow around and is eroding the road,
  - When active, considerable erosion occurred,
  - This **IS NOT** sufficient erosion protection.

SECP Example Scenario – Step 4

- **Vegetated Filter Strip/Buffer**
  - This was left in-tact with existing vegetation protecting the creek from eroding.
  - The existing vegetation will also filter out sediment already in the runoff water.
  - This **IS** sufficient erosion control.

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SECP Example Scenario – Step 4

Evaluated On-farm Locations	Location ID Point	Evaluation Date	Current Practice ID Code (if any)	Existing Practices Sufficient	Recommended Practice ID Code	Planned Implementation Date
Block 1 (Citrus; general practices)	1	05/25/2016	I-1, I-2, I-9 (some slopes), M-1, M-2, M-4 (native vegetation, natural mulch), M-5 (gypsum applied, deep ripped prior to planting), M-7 (no-till)	YES		
Block 2 (Bare Fields, soon to be citrus; general practices)	2	05/25/2016	M-5 (field has been deep ripped)	NO		
Farm Roads	3	05/25/2016	O-1 (into field), O-4 (DG)	YES		
Roadside gully	4	05/25/2016	N/A	NO		
Culvert	5	05/25/2016	O-2 (culvert)	NO		
Vegetated Filter Strip/Buffer	6	05/25/2016	I-12	YES		

162

The Existing Practices Sufficient column is now filled out for the fields and other evaluated locations.

SECP Example Scenario – Step 5

Site Evaluation Process Step 5 – Recommending Practices and Certifying SECP

- Only needed where existing practices are not sufficient.
- Decide on a reasonable implementation timeline for each recommended practice.
  - Magnitude of erosion and sediment discharge concern.
  - Cost and effort to implement practice.
- Can include additional sediment and erosion control practices if needed.
- For practices requiring immediate attention with a delayed implementation deadline, set an **interim** practice to mitigate and prevent sediment erosion in the meantime.

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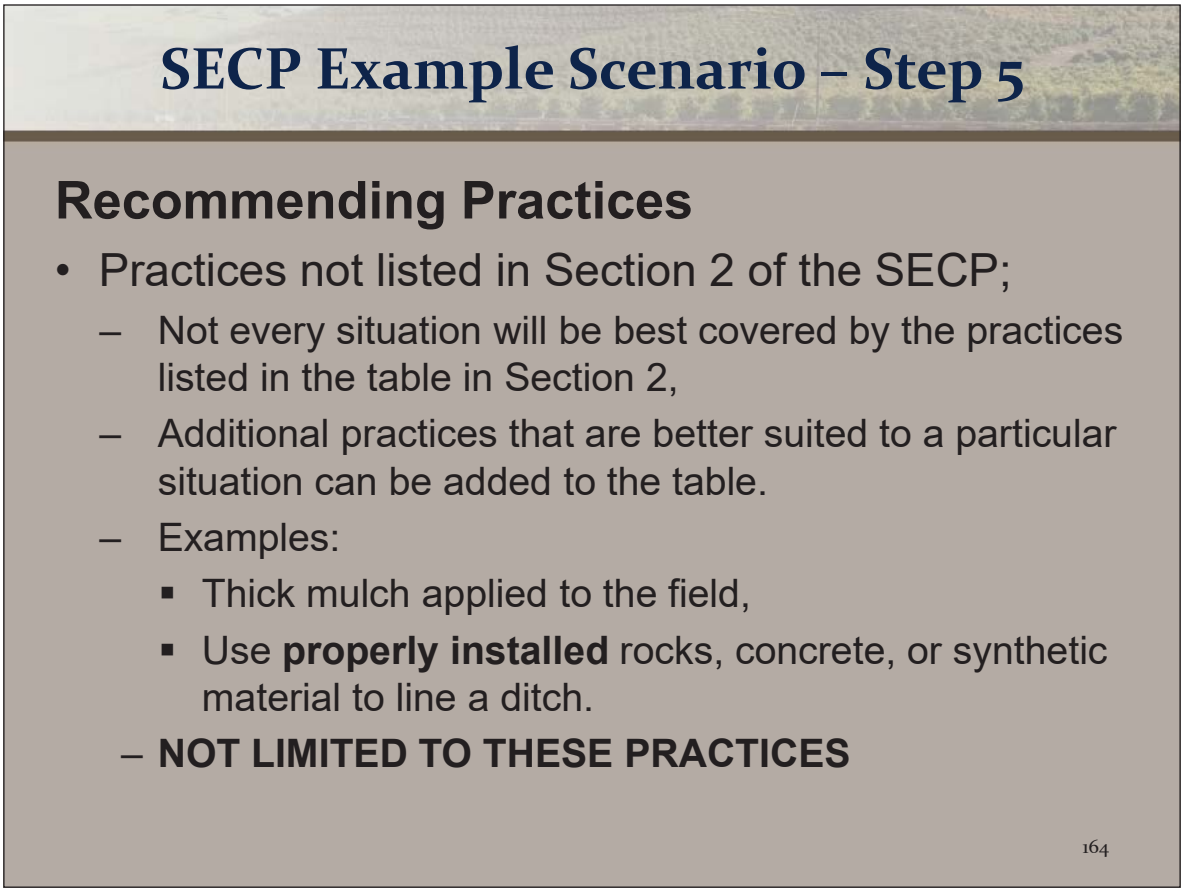
Factors in determining timeline

Effort = design requirements and construction efforts

In general, we want to implement practices before the next rainy season, when possible. So the rain season provides perspective on possible implementation dates. If the implementation timeline will extend beyond the rainy season or more than a year, the grower needs to have some established justification for that timeline (waiting on funding, etc.). If erosion issues are occurring due to irrigation runoff, practices should be implemented to correct as soon as possible, regardless of rain season. Other major milestones to consider when deciding on implementation times could include:

- Ripping, discing, etc. (tillage)
- Planting/harvesting
- Pruning
- Installation of irrigation systems, wells, etc.
- Beginning of irrigation season
- Any other major field activities.



Refer to previous slides with additional practices listed/shown.

Refer to practices in binder.

SECP Example Scenario – Step 5

Block 2 – Irrigation Management Practices

- **Recommendation(s):**
  - Establish or maintain cover crop to protect the bare soil (M-4), AND/OR
  - Cover the field with a thick mulch, punched into ground (M-8), AND/OR
  - Apply PAM to bind soil and prevent sediment discharge (M-6).
- **Implemented by October 2016** (Before rainy season)

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Bare soil has a huge potential for erosion, especially when the land is as steep as it is in Block 2. Erosion protection is necessary during the winter. This plan gives two options for erosion protection. The first, and best option would be to plant a cover crop on the field. This process can be expedited by using the Other Practice of hydroseeding. Another option that is good for areas that do not get enough winter rain to sustain a cover crop is to cover the field with a thick mulch, punched into the ground. PAM could also be applied to bind the soil and prevent sediment from leaving with discharge on this field; however, this option would likely be the last priority sole-option considering most will likely runoff. All three of these options should provide sufficient erosion protect.

Here is an example of a field covered in a thick mulch.

SECP Example Scenario – Step 5

Block 2 – Irrigation Infrastructure Practices

- **Recommendation(s):**
  - Micro-irrigation system installed when young citrus is planted (I-1, I-2)
  - Plant young citrus trees perpendicular to the land slope (I-9)
- **Implemented Spring 2017 when young citrus trees are planted**

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Since Block 2 are currently bare and waiting to be planted, some planning is necessary. The field will have a micro-irrigation system installed which accounts for practices I-1 and I-2, drip micro irrigation installed and irrigation application rate matches soil infiltration rate, respectively.

Block 2 has varying topography throughout. Because of this, the trees should be planted perpendicular to the slope of the land.

SECP Example Scenario – Step 5

Roadside Gully (4)

- **Recommendation(s):**
  - Place rip rap at the start of the gully and gravel within the gully to prevent further erosion form occurring (I-6)
- **Implement by October 2016**

The roadside gully formed because the water velocity increased as the hill steepened. Gravel in the existing gully will protect the gully from eroding further. Riprap at the start of the downslope will help to dissipate excess energy as water begins to flow downhill.

Other practices could be used, such as grassed waterways. Determine the potential recommendations that make the most sense for your farm, field, topography, climate, etc. Each SECP is intended to be custom-fit to the farm.

The image on the left is to indicate the size of gravel used to fill in between the riprap. Ensure that no rebar is within the riprap. Also note that the ditch lined with old concrete pipe on the right may not be sufficient to prevent erosion in the ditch. Other gravel sizes may be needed to fill in large gaps that expose bare soil and the ditch may need to be lined with a geotextile fabric before placing the rip-rap into the ditch.

SECP Example Scenario – Step 5

Culvert (5)

- **Recommendation(s):**
  - Regularly check to ensure culvert is not plugged (O-5)
  - Place rip rap downstream of culvert for energy dissipation, where possible (O-6)
- **Implement by October 2016**

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All culverts should be checked regularly and cleaned when necessary.

Water often discharges from culverts at a higher velocity than the soil downstream can handle. Riprap should be placed downstream of the culvert to protect the soil from erosion.

SECP Example Scenario – Step 5

Vegetated Filter Strip/Buffer (6)

- **Recommendation(s):**
  - Leave the vegetated filter strip/buffer along the unnamed creek I-12
    - This will help to trap sediment and capture flows.
- **This is an on-going process.**

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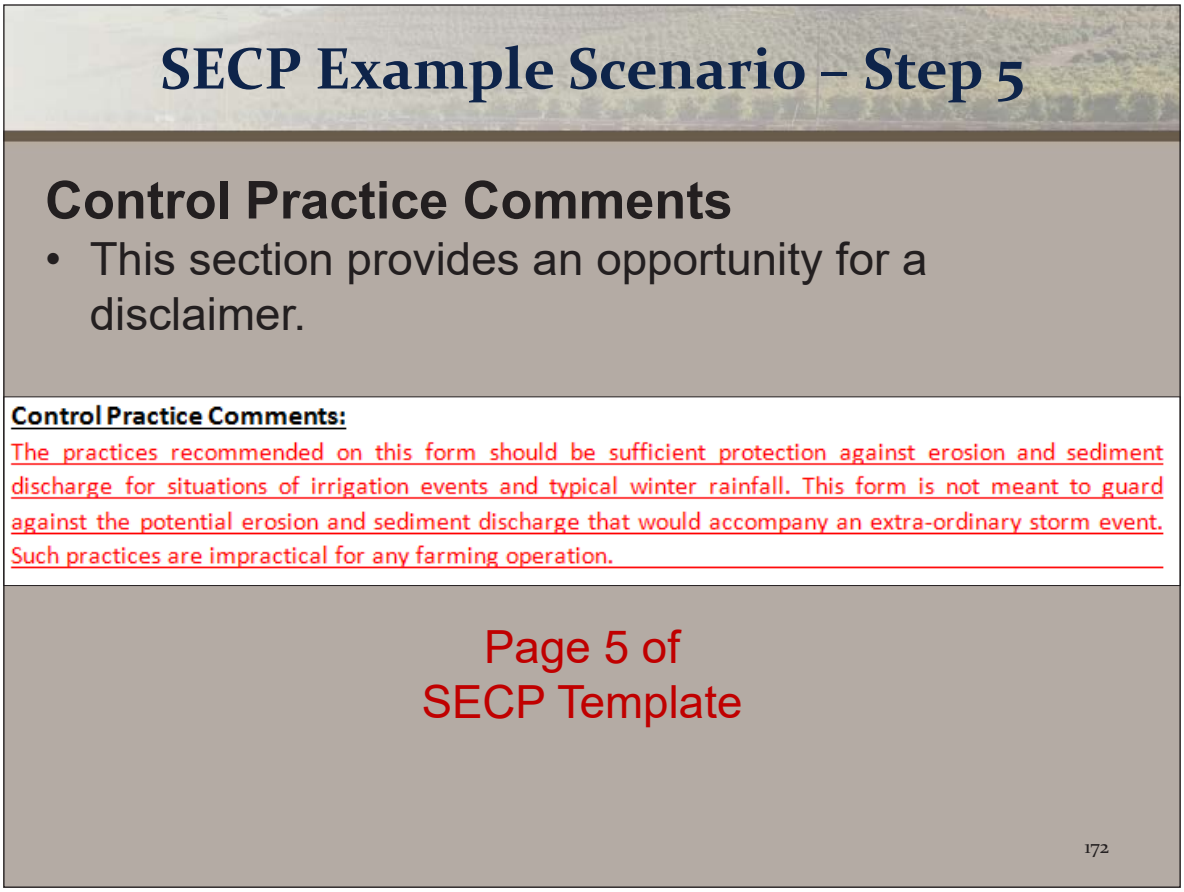
The vegetated filter strip/buffer needs to maintained. If during normal farming operations, the buffer is seen to be receding/ disappearing, efforts must be made to rehabilitate the buffer area.

The buffer protects the creek from eroding, helps to filter out sediment and pesticides that may already be in the water running off the fields, and protects the bare soil from raindrop impact.

Evaluated On-farm Locations	Location ID Point	Evaluation Date	Current Practice ID Code (if any)	Existing Practices Sufficient	Recommended Practice ID Code	Planned Implementation Date
Block 1 (Citrus; general practices)	1	05/25/2016	I-1, I-2, I-9 (some slopes), M-1, M-2, M-4 (native vegetation, natural mulch), M-5 (gypsum applied, deep ripped prior to planting), M-7 (no-till)	YES	N/A	N/A
Block 2 (Bare Fields, soon to be citrus; general practices)	2	05/25/2016	M-5 (field has been deep ripped)	NO	M-4 (cover crop planted) or M-8 (thick mulch applied to the field) or M-6 (use of PAM), I-1, I-2, I-9 (perpendicular to slope)	October 2016 (cover), Spring 2017 (planted)
Farm Roads	3	05/25/2016	O-1 (into field), O-4 (DG)	YES	N/A	N/A
Roadside gully	4	05/25/2016	N/A	NO	I-6 (rip rap & gravel)	October 2016
Culvert	5	05/25/2016	O-2 (culvert)	NO	O-5 (clean out culvert), O-6 (rip rap at downstream end of culvert)	October 2016
Vegetated Filter Strip/Buffer	6	05/25/2016	I-12	YES	I-12 (maintenance)	Ongoing

Now that all locations have been evaluated, and we have determined the recommended practices and implementation timelines for the problem areas, we can finish filling out the table in Section 3 of the SECP.



Here we see the Control Practice Comments portion of the form filled out for Example Ranch. This is a good place to make note of the level of erosion control that can be expected from the recommended practices. This scenario recommended practices that will provide sufficient protection from typical winter storm events and regular irrigation. These control practices will not provide protection against a 100-year storm. It would not be feasible to recommend this level of erosion protection.

Row Crop Example

Field Characteristics

- Row Crop
- Furrow Irrigation
- Stream at the low end of the field
- Field graded
- Soil amendments applied to field

Evaluated On-farm Locations	Location ID Point	Evaluation Date	Current Practice ID Code (if any)	Existing Practices Sufficient	Recommended Practice ID Code	Planned Implementation Date
Block 1 (Row Crops)	1	05/25/2016	I-8 (field graded), M-5 (Soil Amendments Applied)			

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The field was graded prior to planting. This qualifies the field for practice code **I-8: Land grading has been done to increase irrigation efficiency and improve control of drainage.**

Soil amendments are applied to the field regularly, qualifying the field for practice code **M-5: Soil water penetration has been increased through the use of amendments, deep ripping and/or aeration.**

The following slide evaluates its sufficiency.

In this scenario, this field was evaluated first. Therefore, the Location ID is “1.”

Row Crop Example

Evaluating Existing Sufficiency

- Field runoff has carried sediment into an adjacent stream.
- The existing practices are **NOT** sufficient.

Evaluated On-farm Locations	Location ID Point	Evaluation Date	Current Practice ID Code (if any)	Existing Practices Sufficient	Recommended Practice ID Code	Planned Implementation Date
Block 1 (Row Crops)	1	05/25/2016	I-8 (field graded), M-5 (Soil Amendments Applied)	NO		

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Evaluating existing practice:

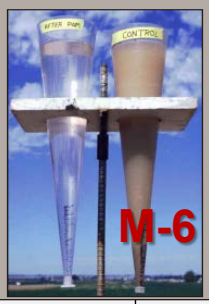
- **I-8: Storm water is captured using field borders to reduce runoff and supplement field irrigation, and**
- **M-5: Soil water penetration has been increased through the use of amendments, deep ripping and/or aeration.**

These practices help to increase infiltration of water into the soil; however, runoff from the field is still seen to be carrying sediment from the field, into an adjacent stream at the low end of the field. Therefore, the existing sediment and erosion control practices are NOT sufficient.

Row Crop Example

Recommended Practices

- I-3 Use a recirculation system
- I-4 In-furrow dams
- I-7 Reducing run lengths
- M-6 Use of PAM
- Any others?



Evaluated On-farm Locations	Location ID Point	Evaluation Date	Current Practice ID Code (if any)	Existing Practices Sufficient	Recommended Practice ID Code	Planned Implement ation Date
Block 1 (Row Crops)	1	05/25/2016	I-8 (field graded), M-5 (Soil Amendments Applied)	NO	I-3 (Recirculation System), I-4 (In-furrow Dams) I-7 (Shorter runs), M-6 (PAM)	October 2017

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Potential recommended practices are as follows.

- **I-3: Recirculation systems are used to keep sediment and farm inputs on site. Water is recirculated to irrigate other fields.**
- **I-4: In-furrow dams are used to increase infiltration and settling out of sediment prior to entering the tail ditch.**
- **I-7: Shorter irrigation runs are used with checks to manage and capture flows.**
- **M-6: PAM (polyacrylamide) used in furrow and flood irrigated field to help bind sediment and increase infiltration.**
- **Discuss any other potential recommended practices that would be appropriate for this scenario.**

Following the completion of the form, it is important to evaluate the sufficiency of the newly implemented practices. It is best to evaluate during rain events, when the practices are most tested.

Almonds Example

Field Characteristics

- Almonds
- Undulating slopes within field
- Berm at the head of the field
- Storm water drains into a river

Evaluating Existing Sufficiency

- Sediment is discharging from the field into a river

The existing practices are **NOT** sufficient

Evaluated On-farm Locations	Location ID Point	Evaluation Date	Current Practice ID Code (if any)	Existing Practices Sufficient	Recommended Practice ID Code	Planned Implementation Date
Block A (almonds)	1	06/23/2016	I-11 (Berm at the head of the field)	NO		

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Evaluating existing practice:

- **I-5: Berms are constructed at low ends of fields to capture runoff and trap sediment.**

A berm exists at the north end of Block A. This berm is sufficient at preventing sediment discharge into the north borders of the field; however, additional field borders or other management practices are needed to prevent runoff from leaving in other directions of the field. Therefore, Irrigation practice I-5 is NOT sufficient at preventing sediment discharge for Block A.

Almonds Example

Recommended Practices

- I-5 Add field borders around entire field
- I-13 Consider installing subsurface pipelines with I-15 sediment basin
- I-14 Plant hedgerow
- I-16 Other – Install staked hay bales
- Any others?

Evaluated On-farm Locations	Location ID Point	Evaluation Date	Current Practice ID Code (if any)	Existing Practices Sufficient	Recommended Practice ID Code	Planned Implementation Date
Block A (almonds)	1	06/23/2016	I-11 (Berm at the head of the field)	NO	I-5 (field borders around field), I-13 (subsurface pipeline), I-5 (Sediment basin), I-14 (plant hedgerows), and I-16 (Staked bay bales)	October 2017

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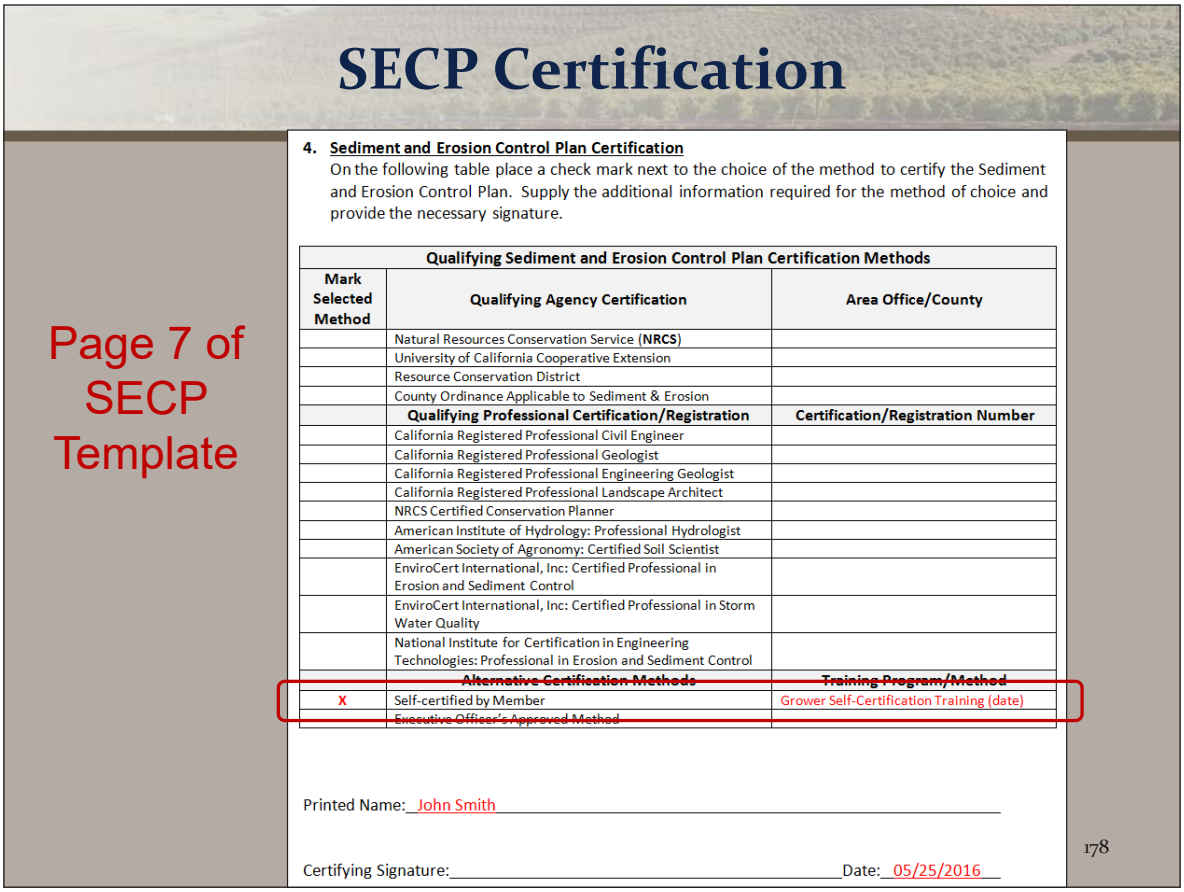
Potential recommended practices are as follows. Ideally, all management practices should be established before the rainy season. If any practices cannot be established before then, interim practices to protect the soil from detachment and protect the field borders from allowing sediment discharge should be implemented in the meantime.

- **I-5: Storm water is captured using field borders to reduce runoff and supplement field irrigation.**
- **I-13: Subsurface pipelines are used to channel runoff water.**
- **I-14: Hedgerows or trees are used to help stabilize soils and trap sediment movement.**
- **I-15: Sediment basins / holding ponds are used to settle out sediment and hydrophobic pesticides such as pyrethroids from irrigation and storm runoff.**
- **I-16: Other irrigation practices – Hay bales**
- **Discuss any other potential recommended practices that would be appropriate for this scenario.**

Following the completion of the form, it is important to evaluate the sufficiency of the newly implemented practices. It is best to evaluate during rain events, when the practices are most tested.



SECP Certification

Page 7 of SECP Template

4. Sediment and Erosion Control Plan Certification

On the following table place a check mark next to the choice of the method to certify the Sediment and Erosion Control Plan. Supply the additional information required for the method of choice and provide the necessary signature.

Qualifying Sediment and Erosion Control Plan Certification Methods		
Mark Selected Method	**Qualifying Agency Certification**	**Area Office/County**
	Natural Resources Conservation Service (**NRCS**)	
	University of California Cooperative Extension	
	Resource Conservation District	
	County Ordinance Applicable to Sediment & Erosion	
	Qualifying Professional Certification/Registration	**Certification/Registration Number**
	California Registered Professional Civil Engineer	
	California Registered Professional Geologist	
	California Registered Professional Engineering Geologist	
	California Registered Professional Landscape Architect	
	NRCS Certified Conservation Planner	
	American Institute of Hydrology: Professional Hydrologist	
	American Society of Agronomy: Certified Soil Scientist	
	EnviroCert International, Inc: Certified Professional in Erosion and Sediment Control	
	EnviroCert International, Inc: Certified Professional in Storm Water Quality	
	National Institute for Certification in Engineering Technologies: Professional in Erosion and Sediment Control	
~~Alternative Certification Methods~~		~~Training Program/Method~~
X	Self-certified by Member	Grower Self-Certification Training (date)
	~~Executive Officer's Approved Method~~	

Printed Name: John Smith

Certifying Signature: _____ Date: 05/25/2016

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The last page of the SECP template is a table for certifying your SECP. After attending this training program and passing the test, you will be qualified to certify your own SECP. In this case, the form should be filled out as shown on this slide, and signed.

This self-certification program only qualifies you to certify your own plan, not others.
An important point to remember is this training did not cover every erosion issue you may come across. If your field contains complex erosion problems, it is recommended you seek help from a professional **with sediment discharge and erosion control experience.** Simply having a certification license listed above is not sufficient, as stated in the SECP instructions Section 4, #2.

The table above shows the list of professionals qualified to certify a Sediment and Erosion Control Plan.

SECP Certification

- Self-certification valid indefinitely.
- How long is a certified plan valid?
  - Valid until conditions in the field change.

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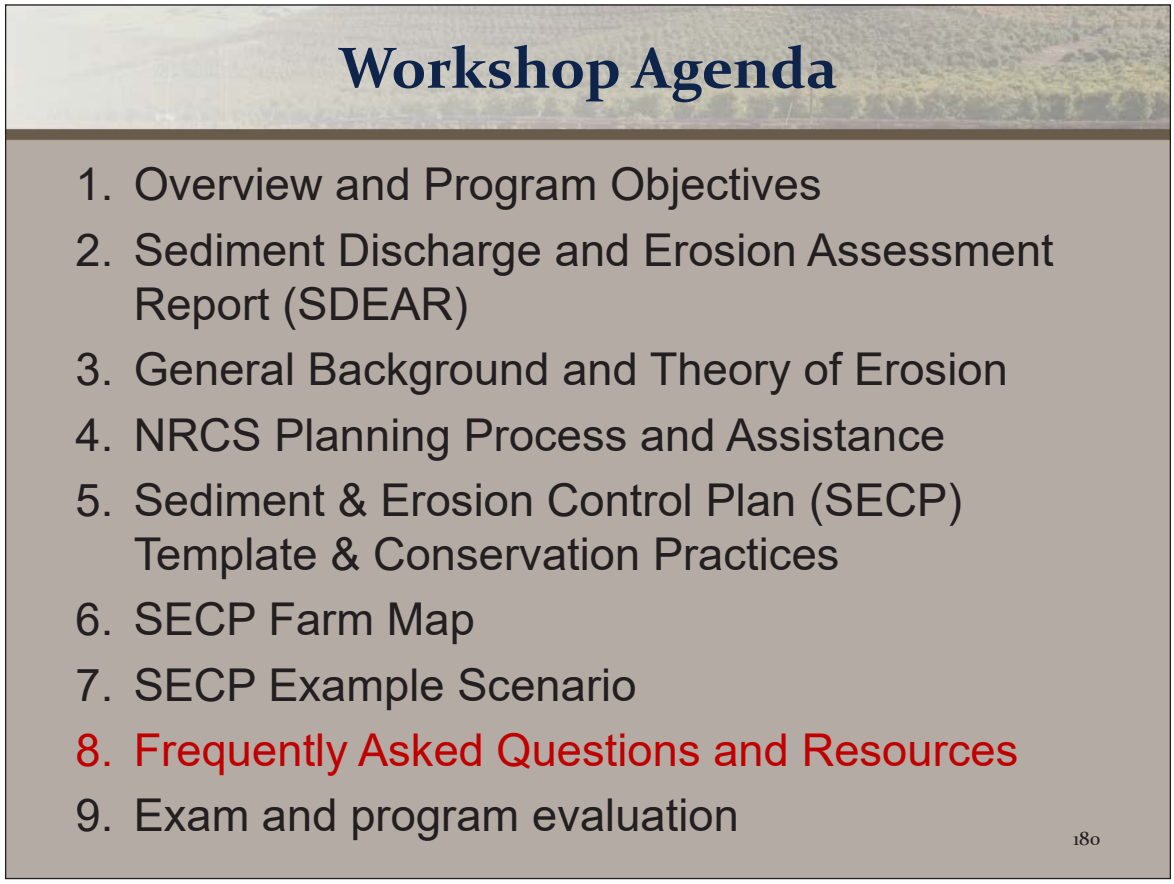
- SECP should be updated if conditions substantial changes, such as pushing over aging trees, planting a cover crop for a year, then replanting different permanent crop.
- Major concerns once trees are pushed over and ground is cleared, usually in the winter.

Need to have a plan in place for this to minimize sediment and erosion potential during that time.


Workshop Agenda
1. Overview and Program Objectives
2. Sediment Discharge and Erosion Assessment Report (SDEAR)
3. General Background and Theory of Erosion
4. NRCS Planning Process and Assistance
5. Sediment & Erosion Control Plan (SECP) Template & Conservation Practices
6. SECP Farm Map
7. SECP Example Scenario
8. Frequently Asked Questions and Resources
9. Exam and program evaluation
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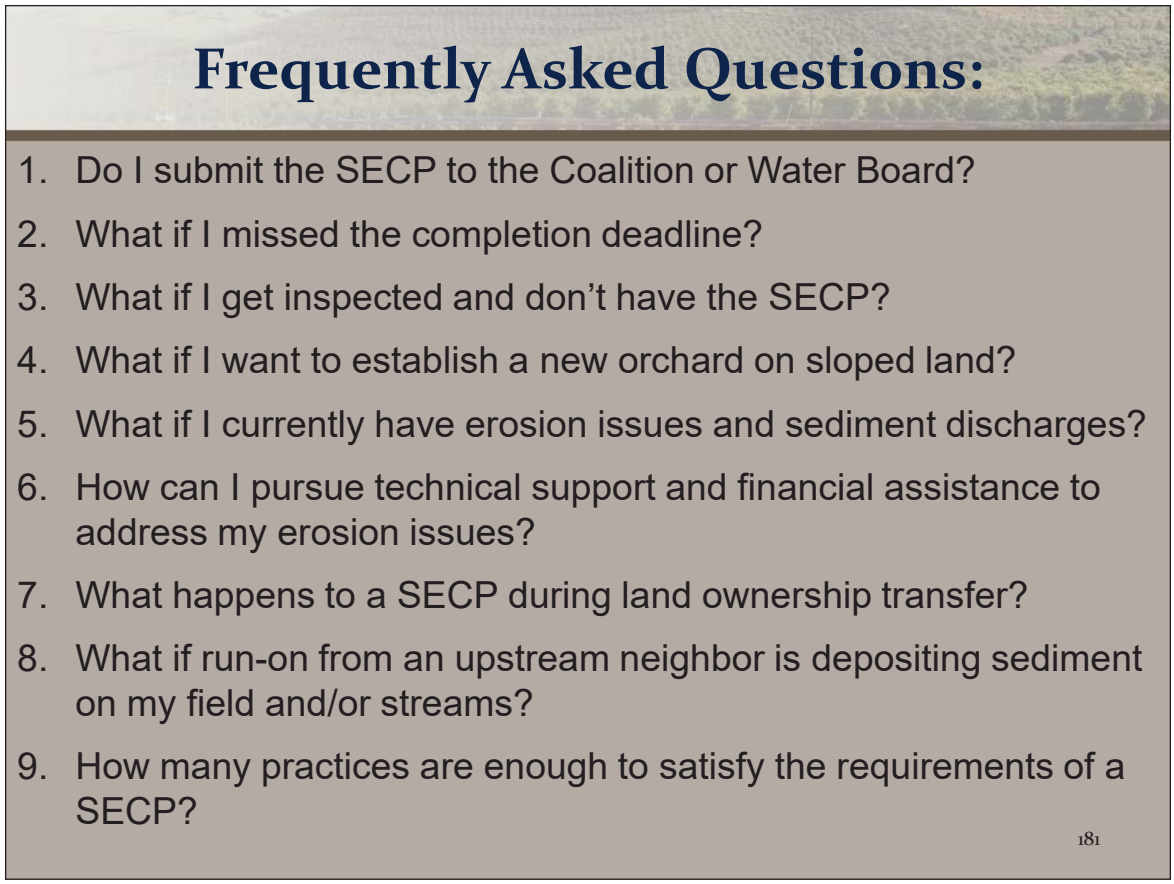
Objective #5



1. Neither. The SECP remains on farm with other ILRP documents.
2. Message from Water Board is get them done ASAP. Won't be a big issue as long as there is no active discharges, but could face enforcement if there are any issues regardless of status of SECP.
3. If required to have a SECP and it is not complete or available, then you would be out of compliance. Having a completed SECP isn't a get out of jail free card. The plan must actually work to eliminate any significant erosion issues.
4. Plant perpendicular to the slope and contact an NRCS specialist or consultant for additional advice, considering the sloped land and bare soil greatly increases the risk of sediment discharge.
5. Address all notable existing sediment discharge issues with interim measures until the recommended practices can be implemented.
6. Contact a consultant for technical support or NRCS specialist for technical support and/or financial assistance opportunities.
7. As long as land use is generally the same, the plan stays with the land; however, the land owner is ultimately responsible, not the person leasing. It is recommended to have a clause in a leasing agreement to abide by the conditions set in the SECP. Member name should be changed on the SECP with the transfer and the Coalition should be notified under the circumstances of selling a parcel. Additional certification issues may arise. For example, if a seller was self-certified and the buyer of the parcel is not, this could lead to the plan requiring recertification. Contact your coalition if these issues arise.
8. Document with descriptions, dates and photographs. Speak with your neighbor upon noticing the sediment deposition, to prevent neighbor-relation issues.
9. There is no predefined or set number of management practices that will mitigate an erosion issue or satisfy the requirements of a SECP. Educated judgment must be used to make this subjective determination. From a regulatory perspective, it is best to err on the side of caution to prevent potential enforcement actions.

General Sediment and Erosion Resources

- SECP Self-Certification Binder
- Water Quality Coalitions
- NRCS Field Offices *(see contact sheets in binder)*
- NRCS & CASQA Practice Standards *(see binder)*
- University of California Cooperative Extension (UCCE)
- Resource Conservation Districts (RCDs)
  - Contact Info: www.carcd.org/rcd_directory0.aspx
- Consultants
- Websites (some described in the following slides)

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The NRCS and CASQA standards included in the binder contain information regarding implementation, benefits, and general practice standard information for the practices noted in this curriculum and others. Use the code linkage sheet that prefaces the standards to relate the ILRP SECP Management Practice Code to the NRCS and CASQA Practice Standards.

General Resources: UC Farm Water Quality Planning Program

- **University of California (UC) Farm Water Quality Planning Program**
  http://ucanr.edu/sites/farmwaterquality/
- Coordinated effort by the UC Division of Ag and Natural Resources and the USDA NRCS. Central Coast.
- Goal: Improve water quality education in irrigated agriculture.
- Management Practice Sheets:
  http://ucanr.edu/sites/farmwaterquality/Management_Practices/
- Water Quality Fact Sheets:
  http://ucanr.edu/sites/farmwaterquality/Fact_Sheets/
- Water Quality Links
  http://ucanr.edu/sites/farmwaterquality/Links/

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The Farm Water Quality Planning program was a coordinated effort by the University of California Division of Agriculture and Natural Resources (UC ANR) cooperating with the USDA Natural Resource Conservation Service (NRCS). The goal was to improve water quality education to the irrigated agriculture industry in California.

Farm Water Quality Courses and workshops were held for nearly seven years for growers in the Central Coast of California. The program wrapped up in 2007, but the website contains numerous resources that are very relevant to sediment and erosion control in the Central Valley, as linked above. Photos are from the program website.

General Resources: Web Links

- **CURES** BMP Videos (http://www.curesworks.org/bmp/bmpVideos.asp) and BMP handbook/brochures (http://www.curesworks.org/bmp/bmpHandbook.asp)
- **NRCS** Web Soil Survey (for soil maps and various soil data and information): www.websoilsurvey.nrcs.usda.gov
- **NRCS** Field Office Technical Guides (FOTG) by County: https://efotg.sc.egov.usda.gov/efotg_locator.aspx
- **UCANR** Additional Reading - "Understanding Soil Erosion in Irrigated Agriculture": http://anrcatalog.ucanr.edu/pdf/8196.pdf
- **UCANR** Additional Reading - "Orchard Floor Management Practices to Reduce Erosion and Protect Water Quality": http://anrcatalog.ucanr.edu/pdf/8202.pdf
- **UCANR** Additional Reading - "Erodibility of Agricultural soils, with Examples in Lake and Mendocino Counties": http://fruitsandnuts.ucdavis.edu/files/68962.pdf
- **UC Davis** Soil Resources Lab: https://casoilresource.lawr.ucdavis.edu/

Cures
Coalition for Urban/Rural Environmental Stewardship
www.curesworks.org

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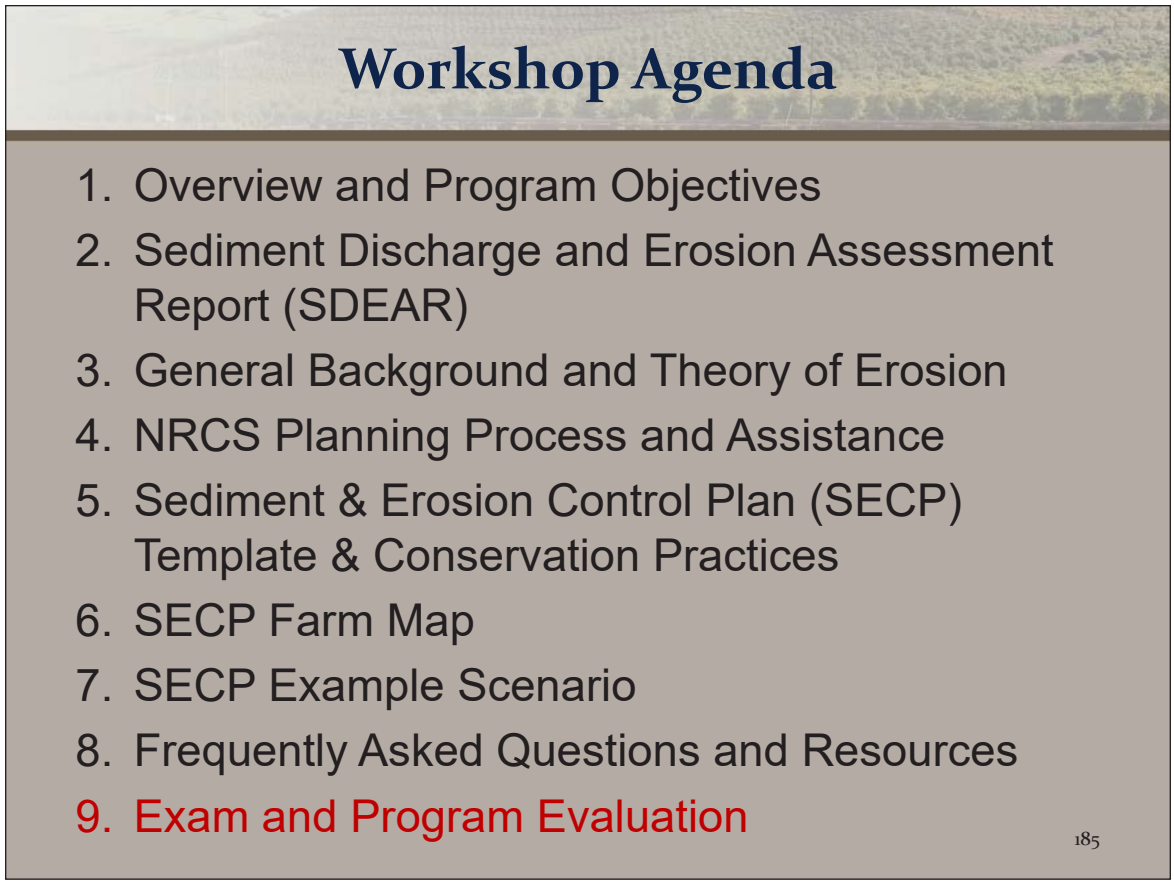
The Coalition for Urban/Rural Environmental Stewardship (CURES) has completed several projects funded by the USDA and CA Dept. of Food and Agriculture (CDFA) related to the "best management practices" for sediment and erosion control (among others). The links in this slide contain videos on topics such as: buffer zones, vegetated waterways, irrigation tailwater recirculation systems, and PAM. Additional topics in the BMP Handbook "Management Practices for Protecting Water Quality" include the following: irrigation scheduling, drop/microsprinkler irrigation systems, constructed wetlands, manure applications, and others.

The Field Office Technical Guides contain a wealth of technical information about the NRCS Process.

The UC Davis Soil Resources Lab contains information on research on many aspects of soil science and water quality, and many web-based tools (e.g. Google Earth SoilWeb app) and resources. The articles linked provide an excellent introduction and overview of sediment and erosion issues.



The final portion of the SECP Self Certification Program is the exam.

Exam and Certification

1. 30 questions
2. Multiple-Choice & True/False
3. Open-book
4. General time limit (one hour)
5. 70% passing score

6. Results will be emailed or mailed.
7. If necessary, you may retake exam at your Coalition office.
8. Certification Period: Indefinitely
9. Continuing Education Requirements:
   - None. Indefinite certification

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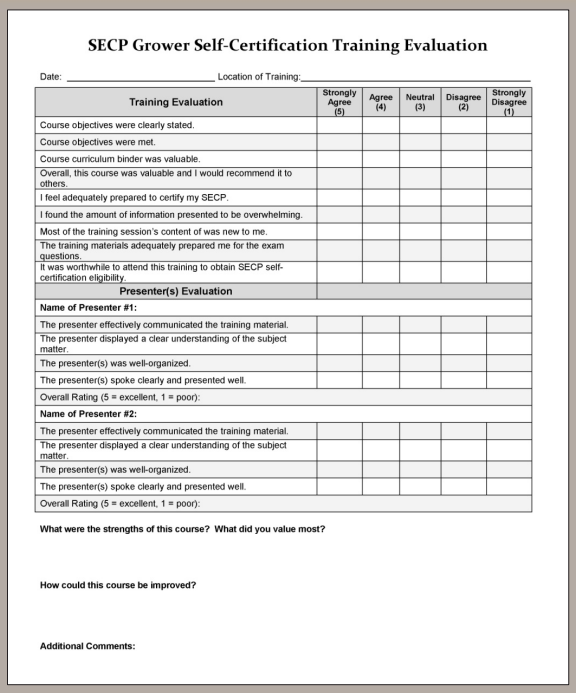
Program Evaluation Form and Feedback

- Please complete program and speaker evaluation form before leaving.
- Provide any thoughts or comments on how this program could be improved.
- We value your input!



SECP Grower Self-Certification Training Evaluation

Date: _____ Location of Training:_____

Training Evaluation	Strongly Agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly Disagree (1)
Course objectives were clearly stated.					
Course objectives were met.					
Course curriculum binder was valuable.					
Overall, this course was valuable and I would recommend it to others.					
I feel adequately prepared to certify my SECP.					
I found the amount of information presented to be overwhelming.					
Most of the training session's content of was new to me.					
The training materials adequately prepared me for the exam questions.					
It was worthwhile to attend this training to obtain SECP self-certification eligibility.					
Presenter(s) Evaluation					
Name of Presenter #1:					
The presenter effectively communicated the training material.					
The presenter displayed a clear understanding of the subject matter.					
The presenter(s) was well-organized.					
The presenter(s) spoke clearly and presented well.					
Overall Rating (5 = excellent, 1 = poor):					
Name of Presenter #2:					
The presenter effectively communicated the training material.					
The presenter displayed a clear understanding of the subject matter.					
The presenter(s) was well-organized.					
The presenter(s) spoke clearly and presented well.					
Overall Rating (5 = excellent, 1 = poor):					

What were the strengths of this course? What did you value most?

How could this course be improved?

Additional Comments:

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Please provide any thoughts you may have. It would also be useful to know what management practices you would like to know more about or if too much time was spent on any certain topics.

Questions?

Coalition: **Contact Name:** **Address:**	**Tel:** **Fax:** **E-mail:** **Website:**

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