

Management practices to comply with TMDLs for sediment and pesticides in surface water

The logo for the University of California Agriculture and Natural Resources. It features a white rectangular box with a yellow vertical bar on the left side. To the right of the bar, the text "University of California" is written in a dark blue serif font, and "Agriculture and Natural Resources" is written below it in a smaller, dark blue serif font.

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The background image shows a close-up of a large, rusted metal pipe discharging a thick, brown, sediment-laden liquid into a stream. The stream is surrounded by large, light-colored rocks. The water in the stream is also brown and turbulent. The overall scene suggests a problem with sediment discharge into a water body.

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Irrigation run-off can transport nutrients, sediment and pesticides into surface water



Tile drainage also transports nutrients and pesticides into surface water (Nitrate-N can range from 50 to 150 ppm)



Main strategies for minimizing water quality impacts of runoff

Improve irrigation management



Retain, infiltrate or reuse runoff



Treat runoff



Improving irrigation management

- Achieve a high application uniformity
- Optimize scheduling of irrigations
- Use improved irrigation technologies
- Train staff



Sprinklers are frequently used for establishment of vegetable and berry crops



Drip can be used for germination of seeded vegetables and transplanted strawberries

- **Single use thin-walled tape**
- **High application uniformity**
- **Eliminates wind effects on uniformity**
- **No sprinklers (labor savings)**
- **Water savings**
- **No run-off**



Overhead sprinklers are needed for irrigating high density leafy vegetables



Retention basin for runoff



Retention basin designed for reusing tail-water



Improve waterways to infiltrate and treat run-off



Ditch Vegetated with Red Fescue

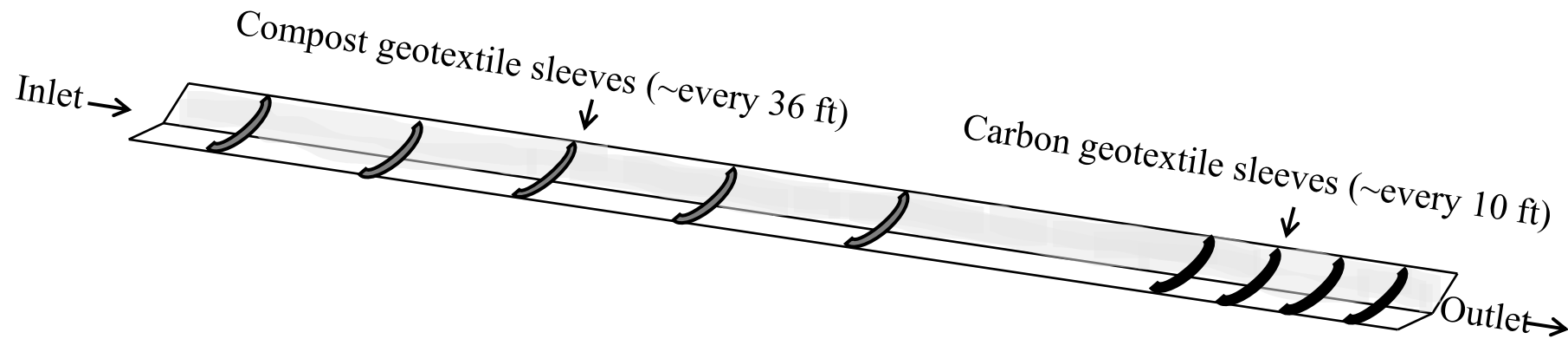


Pesticides in run-off have a range of solubilities

	Koc*
Neonicotinoid:	
Clothianidin	63
Imidacloprid	200
Organophosphate:	
Diazinon	1000
Chlorpyrifos	6070
Pyrethroid:	
Permethrin	100,000
Bifenthrin	240,000
DDT:	2,000,000

* Ratio of concentration in soil:water

Integrated Vegetated Ditch for Mitigating Soluble and Sediment Bound Pesticides

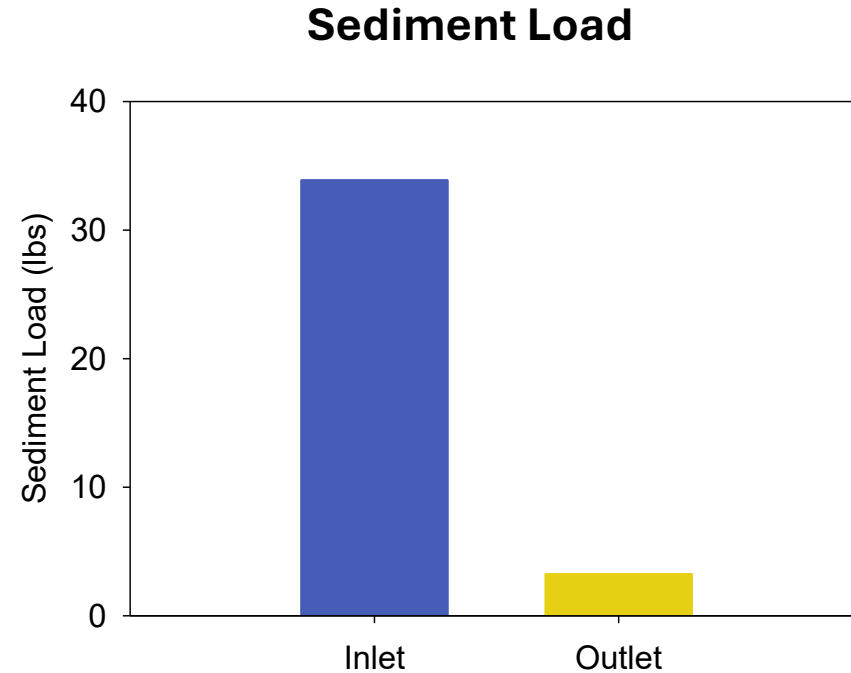
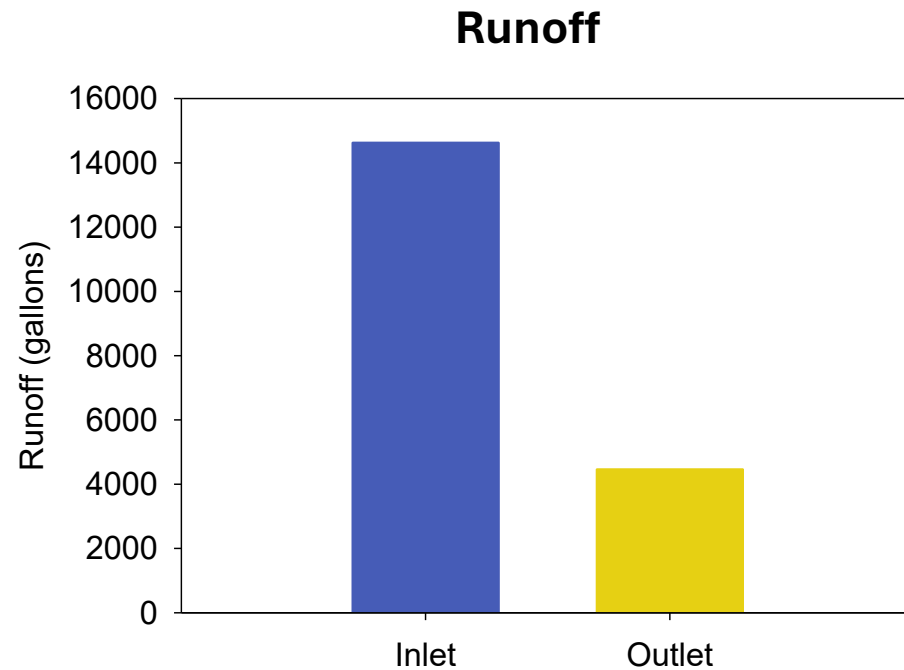


- Vegetation slows flow allowing time for suspended sediments to settle and run-off to infiltrate.
- Soluble pesticides bind to vegetation, compost and activated carbon socks

Geotextile Sleeves filled with biochar can remove soluble pesticides from runoff

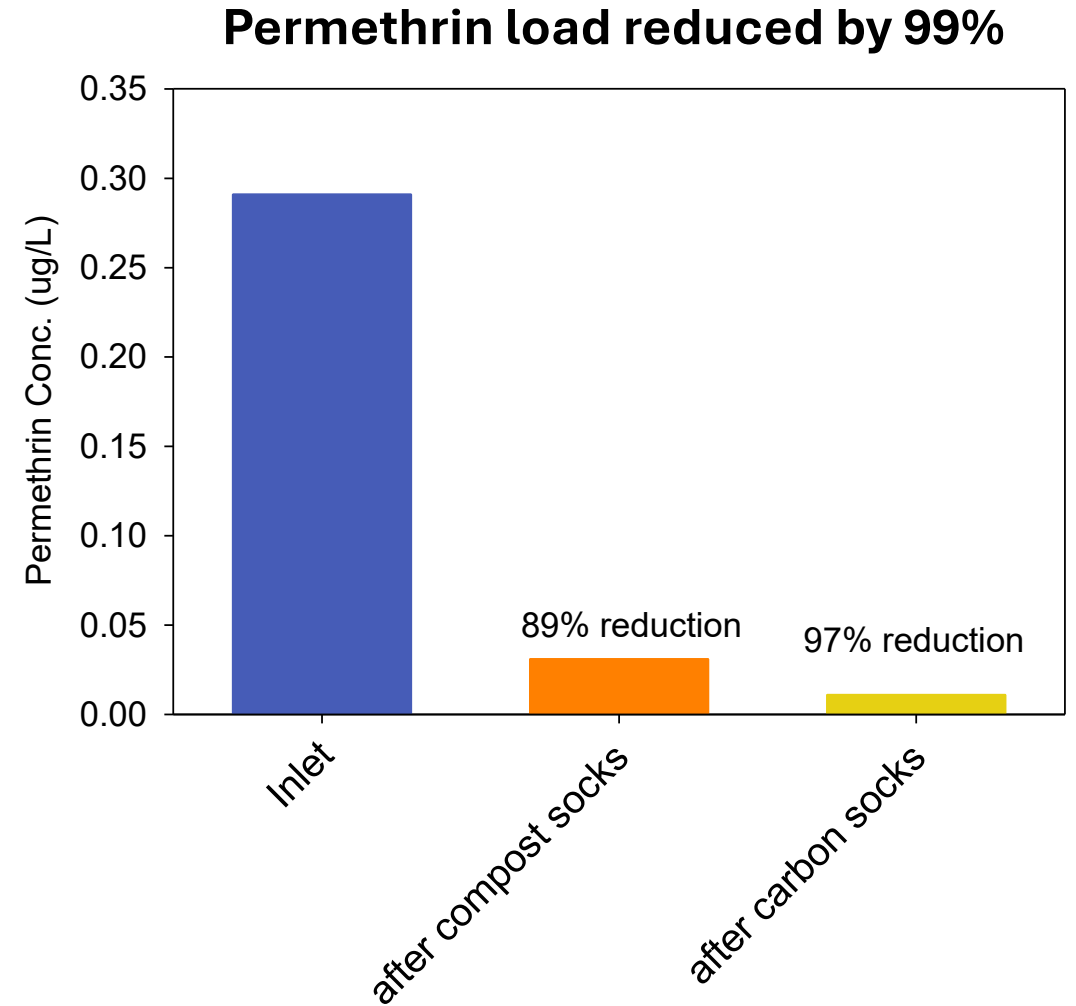
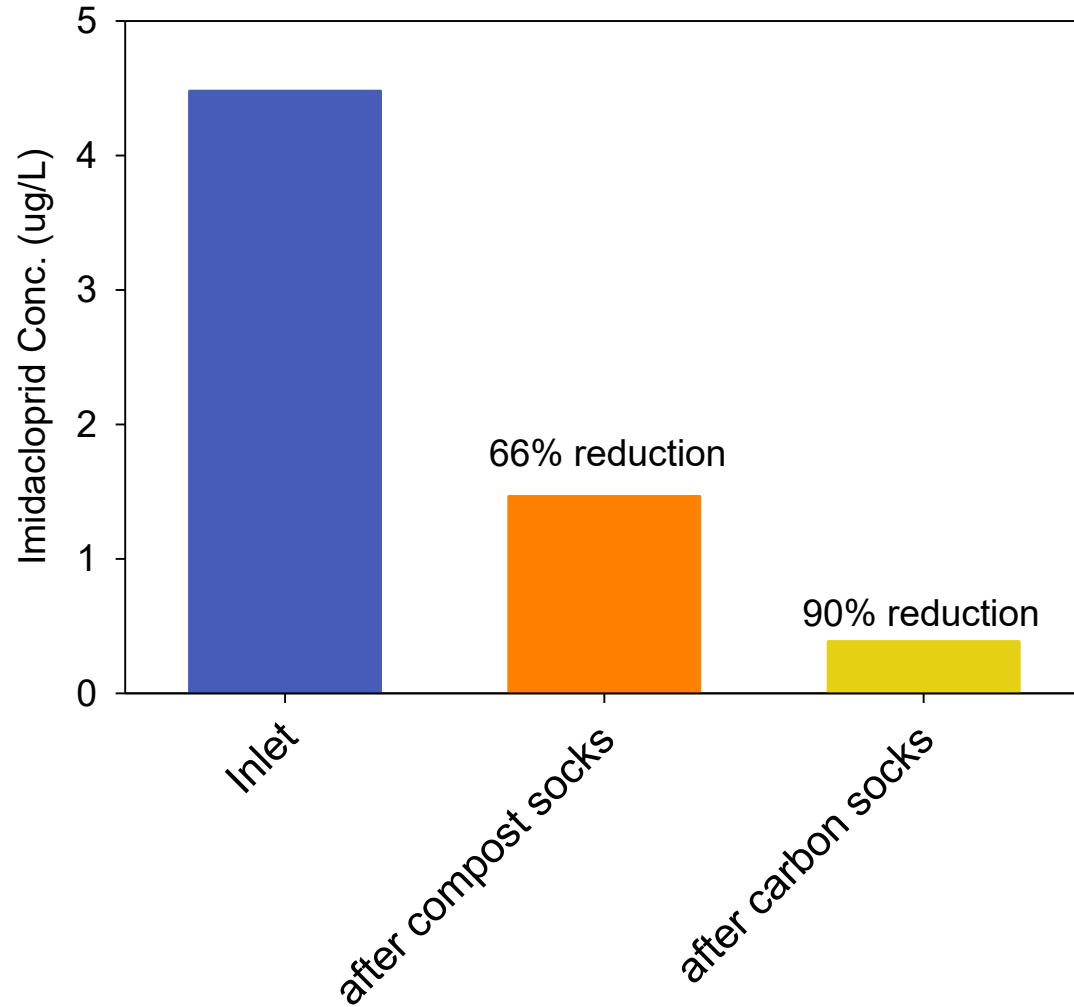


Runoff volume was reduced by 70% and sediment load was reduced by 90% in vegetated waterway



$$\text{Load (kg)} = \text{concentration (mg/L)} \times \text{volume (L)}$$

Pesticide concentration in run-off reduced by 90% to 97%



Sediment traps drop out sand before runoff enters vegetated ditch

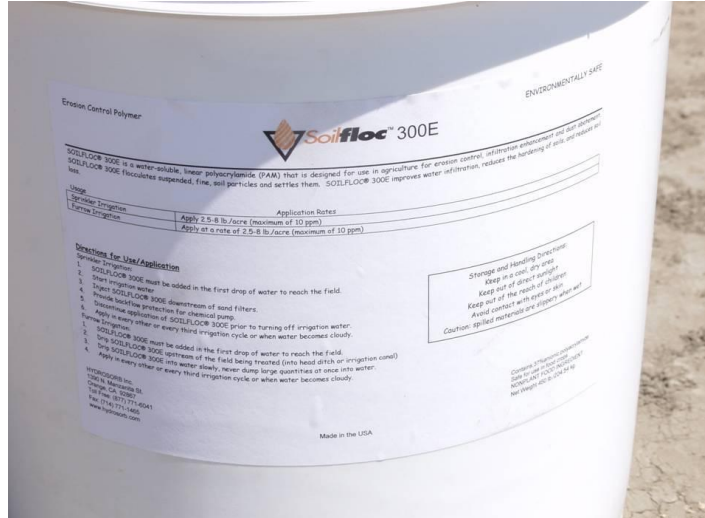


Polyacrylamide (PAM) can reduce soil erosion and suspended sediment in run-off

Linear PAM

- Water soluble
- Molecular weight: 12-15 Mg mol⁻¹;
- Charge: moderately anionic (15-20%)

PAM is available in liquid, tablet, and granular formulations



Well applicator treating granular (treats 1500 gpm)



PAM field trial







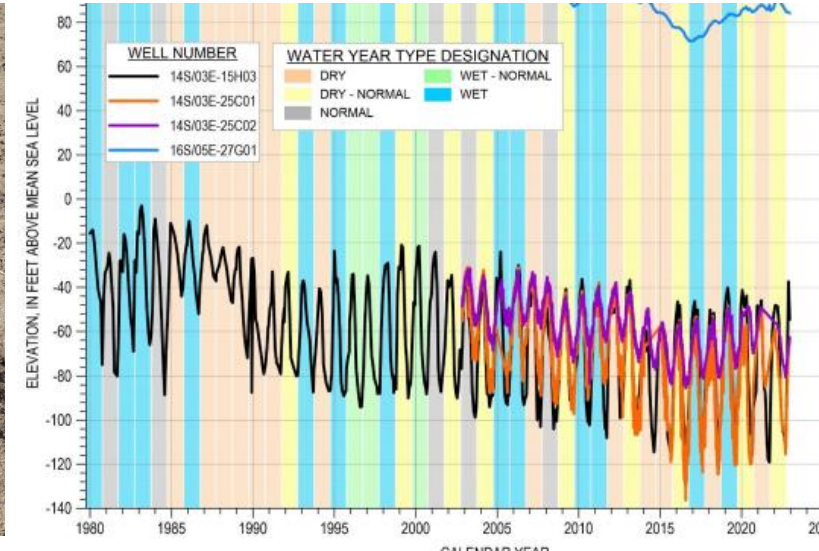
Intense Rainfall Events



Flooding



Erosion



Groundwater



**5% of the ground in the Salinas Valley is
cover cropped in the winter**

Low biomass cover crops for controlling storm water runoff

- Plant on beds and/or in furrows
- Early fall establishment before storm season begins
- Limit biomass growth (~0.5 tons dry matter/acre)
- Minimal additional tillage needed before planting



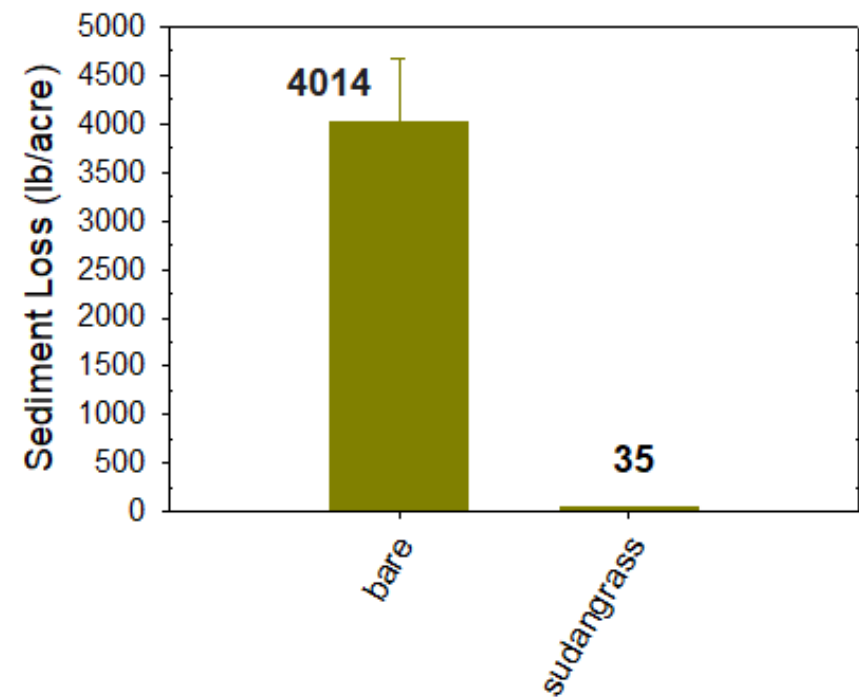
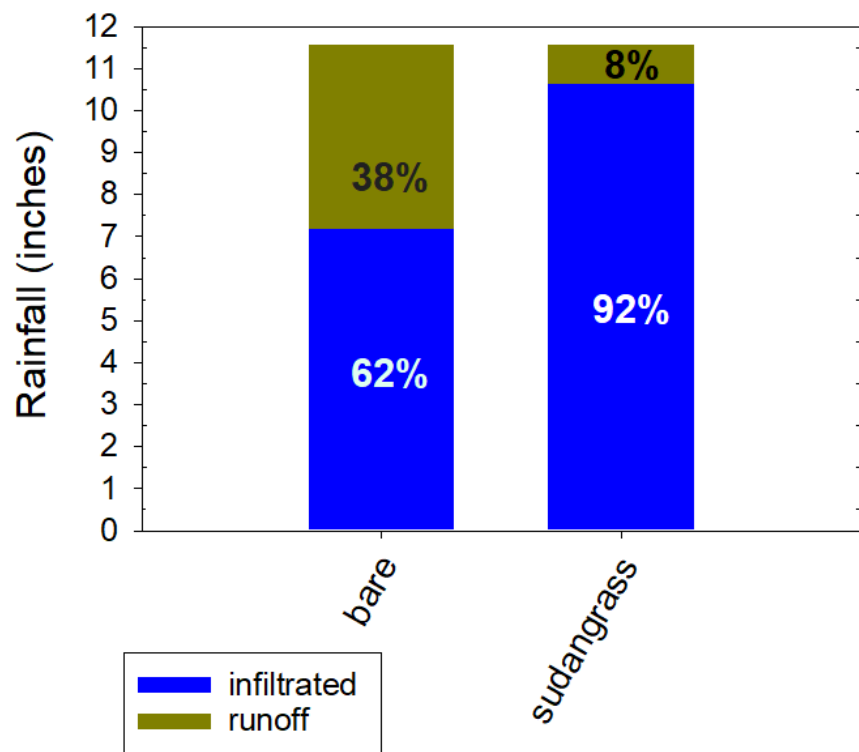
Low biomass winter cover crops for controlling storm water runoff



The Sudangrass treatment greatly reduced the concentration of suspended sediment in runoff



Sudangrass reduced runoff by 79% and sediment loss by 99% compared to bare fallow plots



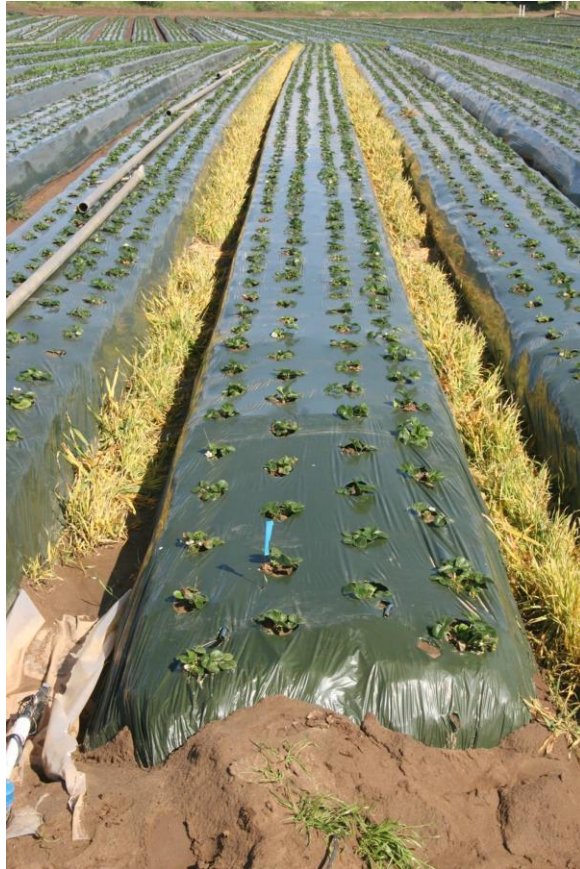
Low biomass cover crops can be incorporated into the beds using a Lilliston cultivar or bed disks



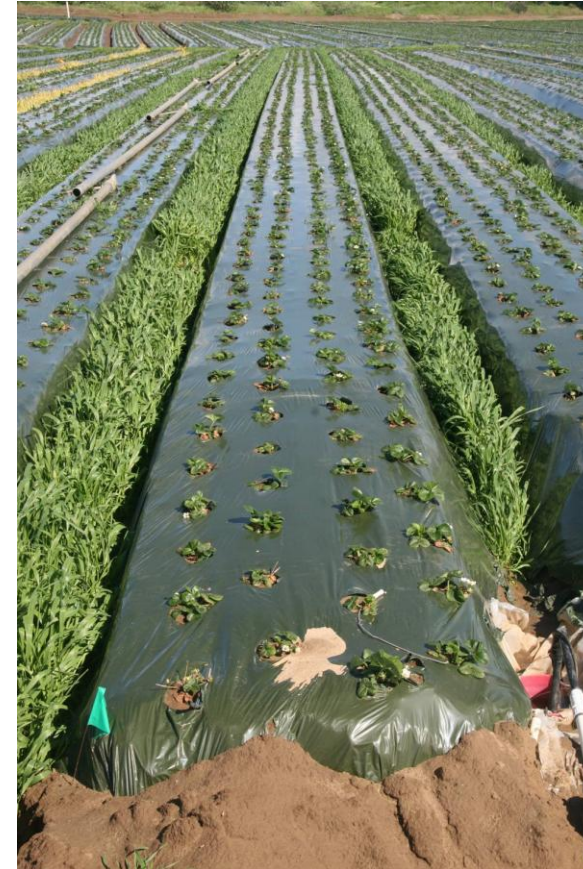
Low biomass cover crops in strawberry

- 80% Reduction in Sediments
- 40% to 60% reduction in Total P and Total N

Barley + Poast herbicide



Trios (Triticale)



Summary

Strategies for controlling runoff and impacts to surface water quality

Irrigation runoff:

- Improved irrigation management
- Drip crop establishment
- Retention basins
- Vegetated waterways/ditches
- Biochar socks
- Polyacrylamide (PAM)
- Denitrification bioreactors

Stormwater runoff:

- Furrow bottom cover crops
- Vegetated waterways/ditches
- Retention basins/sediment traps
- Weirs