1.0 TITLE PAGE

Final Report

Central Coast Vineyard Team

Water Stewardship Project
(Prop 50 Project)

Central Coast, California

Prepared For:
The Regional Water Quality Control Board
895 Aero Vista Drive, Suite 101
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CONTRACT #:
06-275-553-0

Date:

2.0 GRANT SUMMARY FORM

GRANT SUMMARY

Date filled out: October 30th, 2008

Grant Information:

1. Grant Agreement Number: 06-275-553-0

2. **Project Title:** Water Stewardship Project

3. Project Purpose – Problem Being Addressed:
   - Research effects on various management measures on water quality
   - Demonstrate management measures on additional demonstration sites
   - Extend project information to project and non-project ag operators
   - Document the adoption of integrated farming practices for project and non-project growers
   - Assist growers with Ag Waiver compliance
   - Document status of practices and lessons learned from previous project growers
   - Document progress and administration of overall project and adherence to grant requirements

4. Project Goals
   a. Short-term Goals: Evaluate vegetative road management treatments, filter strip length, reduced-risk weed management, demonstrate bait stations and water quality best management practices.
   b. Long-term Goals: Increased adoption of vineyard management practices that promote soil conservation, water quality, and reduced-risk pesticides.

5. Project Location:
Salinas, Santa Maria, San Antonio, Estrella, Monterey watersheds
   a. Physical Size of Project: Entire Region 3
   b. Counties Included in the Project: Monterey, San Luis Obispo, and Santa Barbara
   c. Legislative Districts: Assembly – 27, 28, 30, 33, 35 Senate – 12, 15, 19

6. Which SWRCB program is funding this grant? Please “X” box that applies.

☐ Prop 13 ☐ Prop 40 ☒ Prop 50 ☐ EPA 319(h) ☐ Other

Grant Contact: Refers to Grant Project Director.

Name: Kris O’Connor Job Title: Executive Director

Organization: Central Coast Vineyard Team Webpage Address: www.vineyardteam.org

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E-mail: kris@vineyardteam.org
Grant Time Frame: Refers to the implementation period of the grant. From: December 31, 2006 To: August 30th, 2009
Project Partner Information: Name all agencies/groups involved with project. University of California Cooperative Extension, Natural Resource Conservation Service, San Luis Obispo & Northern Santa Barbara Counties.
Nutrient and Sediment Load Reduction Projection: (If applicable) N/A

Please provide a hard copy to your Grant Manager and an electronic copy to your Program Analyst for SWRCB website posting. All applicable fields are mandatory.

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4.0 EXECUTIVE SUMMARY

In 2007, the Central Coast Vineyard Team received a grant from the State Water Board to improve compliance in vineyards with the Conditional Ag Waiver for Irrigated Lands, work with Central Coast winegrape growers on filter strip width, vegetative road management, weed management alternatives to simazine, use of beneficial habitats, cover crop evaluation, water quality Best Management Practice (BMP) demonstrations, bait stations demonstrations, public outreach and conduct project grower interviews.

Assisting with Conditional Ag Waiver compliance included hosting eight self-assessment workshops (using the Positive Points System and SIP™ Standards as self-assessment) throughout the central coast and working with growers to attain compliance. CCVT staff processed over 100 PPS evaluations, updated the online PPS system, returned results back to growers for their records.

Filter strip width evaluations took place at two Central Coast vineyards: Pomar Junction Vineyard (Templeton), and Paraiso Vineyard (Soledad). Filter strip flumes were constructed out of steel in San Luis Obispo, transported and implemented at the research sites in the fall of 2007. Runoff data was collected annually using a simulation of sheet flow to determine the effectiveness of different widths. Data collected included total runoff, and sediment concentration of runoff. Filter strip widths of 12 feet showed to be most effective at reducing the amount of runoff volume and the amount of sediment contained in that volume.

Weed management alternatives to simazine ware researched in Paso Robles at Sunnybrook Vineyard (owned and operated by E&J Gallo). Five treatments were compared in a randomized block design, replicated three times. These treatments include simazine (pre-emergent herbicide), chateau (pre-emergent herbicide), cultivation, cover cropping, and an untreated control. Data was collected monthly on weed species density, diversity and biomass. Annual collections included yield and canopy vigor. Chateau showed to have similar, if not better, weed control as the more high-risk simazine. Cultural methods showed varying amounts of control with greater diversity.

The use of beneficial habitats in vineyards was evaluated at Ridge Vineyard in the Santa Cruz Mountains. A habitat blend was incorporated into the vineyard as a cover crop at two different densities; every fourth row, every eighth row, and unplanted. Staff used pitfall traps and yellow sticky traps to collect insect population representations on a monthly basis. Traps were then sent to Cal Poly to identify insect families and their classification as a beneficial, pest, or neutral insect. Planting a habitat cover every fourth row showed to have a greater effect on encouraging beneficial insect populations in the vineyard. Ridge Vineyard expanded this practice to an addition 40 acres based on this study.

Cover crop evaluation took place at Pomar Junction Vineyard in Templeton using a previously constructed rain simulator and six erosion boxes set at a slight slope. Each box was made to run two tests during the same storm event, one with bare soil, and the other with a planted treatment. Data collection on the twelve treatments included total runoff, runoff sediment concentration, above-ground biomass, rooting depth, and percent cover. Several species showed to be suitable for the central coast, though site specific characteristics and goals should be reviewed before making a species recommendations.

Working with Central Coast winegrape growers to implement BMPs on their land focused on the use of cover crops, vegetative road management, and bait stations. CCVT worked with 12 vineyards to implement 15 BMP's over the course of two years. Tools were used like RUSLE and photo-documentation to assess the success of certain cover crops or vegetative road management species. Bait stations were weighed monthly to determine number of ant visits and many growers worked with CCVT to develop and implement Integrated Pest Management (IPM) strategies to gain control of the Argentine Ant and mealybug.

Public outreach included CCVT outreach events, community events, publications and newsletters, project presentations, articles, and website outreach. CCVT events reached cumulative attendance of 1,889 attendees representing 456,155 acres. Project staff attended a total of 34 events held in the community to talk with community members about CCVT project work and sustainable agriculture achieving over 114,085 impressions. Project information was distributed to 2,800 people through quarterly CCVT newsletters. Articles informing wine grape industry members and general ag audiences were published in 20 publications with circulations of approximately 100,000. Website visitation increased significantly over the course of the project; from less than 2,000 unique visitors in January 2007, to over 9,000 visitors in September 2009. The CCVT website is developing into one of the key outreach tools available in reaching industry, general ag, and community audiences.

In the fall of 2008, CCVT sent out project grower surveys to 53 growers that have been involved in projects since 2002. These projects include BIFS (Biologically Integrated Farming Systems), CWP (Clean Water Project), Cover Crops and Water Quality Project, Pesticide Mitigation Project, and Water Stewardship Project (present). Growers that provided input on their involvement with the Central Coast Vineyard Team represent 2,000 acres in four different counties; Santa Cruz County, Monterey County, San Luis Obispo County, and Santa Barbara County.

The following chapters provide detailed information on the previously mentioned tasks, including:

- Filter Strip Width Evaluation
- Vegetative Road Management
- Weed Management Alternatives to Simazine
- Effect of Beneficial Habitat Cover Crop Density on Insect Populations
- Evaluation of Common Cover Crop Species Using the Rain Simulator
- Water Quality Best Management Practice Demonstrations
- Bait Station Demonstrations
- Public Outreach
- Self-Assessment
- Project Grower Interviews

- 5.0 problem statement and relevant issues

Several watersheds in the Central Coast region are located in agricultural regions and are listed for sediment, nutrient, and pesticides. Vineyards represent a major agricultural land use and are often in hilly areas on soils susceptible to erosion. In addition, introduction of the invasive pest (vine mealybug) has influenced an increase in the use of organophosphates, which pose a possible threat to water quality. The Central Coast Vineyard Team (CCVT) has a 15-year history of helping growers adopt integrated farming practices using self-assessment (the Positive Points System, PPS™), in addition to field work demonstrating the costs and benefits of adopting specific practices. This project builds upon the Biologically Integrated Farming System project, which successfully helped growers reduce their reliance on organophosphates; the Clean Water Project, which demonstrated erosion control practices that reduced sedimentation on average by 15 ton/ac/year; the PRISM project helped growers minimize or eliminate their use of pesticides affecting water quality; and the Cover Crop Project which evaluates new cover crop species and compared modeled vs. measured erosion measurements for various treatments.

This project includes a research component that evaluates the effects of farming practices on water quality, and is consistent with Regional and Statewide priorities for funding. Growers need to understand the relationships between practices and water quality - this information can be quite persuasive and becomes an incentive for adopting new practices which in many cases cost more money. Because of CCVT's momentum and a growing membership base (300 members representing 60,000 acres), CCVT is receiving increasing requests for technical assistance and interest from growers wanting to implement and demonstrate new practices. This project allows staff to provide technical assistance and funding to establish additional demonstration sites, which will become the subject for newsletters, tailgate meetings, articles, and website content. that reach thousands of growers each year.

This project supports compliance with the Ag Discharge Waiver because the PPSconstitutes an accepted farm plan and CCVT programs qualify for water quality continuing education. CCVT spends considerable time assisting growers with completing necessary paperwork for the waiver. Programs that support waiver compliance are identified as a priority in Region 3. Local Regional Water Quality Control board (RWQCB) staff also identified the CCVT Positive Points System as a program to cooperate with and support in several of their staff documents – because of the PPS™ focus on the systems approach and its strong link to the grower community.

6.0 PROJECT GOALS

Objective 1. Quantify effect of various Best Management Practices (BMP's) on water quality and sedimentation on 6 replicated research plots. Practices to be researched include: filter strip specification, vegetative road management, alternative vineyard floor management practices to reduce Simazine use, use of ant bait stations and other reduced risk materials to reduce organophosphate (OP) use.

> **Outputs.** Water quality results for treated and control plots. Sedimentation estimates for treated and control plots. Costs for treated and control plots. Pesticide use for treated and control plots.
>
> **Outcomes.** Long term maintenance of practices on demonstration sites. Adoption of management measures by non-project growers. Improved water quality leaving research sites. Reduced average sedimentation of 10 ton/ac/year for sediment focused sites. Reduced OP applications of 50% for OP focused sites.

Objective 2. Demonstrate BMP's at 12 demonstration sites.

> **Outputs.** Sedimentation estimates for BMP's. Costs of BMP's. Management plans and narratives.
>
> **Outcomes.** Long term maintenance of practices on demonstration sites. Adoption of management measures by non-project growers. Improved water quality leaving research sites. Reduced average sedimentation of 10 ton/ac/year for sediment focused sites. Reduced OP applications of 50% for OP focused sites.

Objective 3. Extend information on various integrated farming methods and water quality issues to ag operators .

> **Outputs.** Field days (tailgate meetings), industry presentations, articles for trade publications, newsletters, fact sheets, website materials, community event participation, outreach statistic reports, outreach feedback forms.
>
> **Outcomes.** Adoption of management measures by non-project growers.

Objective 4. Document adoption of management practices by Central Coast vineyard operators.

> **Outputs.** Positive Points System workshops and evaluations
>
> **Outcomes.** Increased PPSscores for growers on a site over time. PPSsummary reports with overall scores, trends, participation, and acreage.

Objective 5. Document maintenance of management practices for past project growers.

> **Outputs.** Interviews and narratives of previous project growers.
>
> **Outcomes.** Improved understanding of project participation impact on changed farming practices and grower behavior over time.

7.0 PROJECT DESCRIPTION

7.1 FILTER STRIP WIDTH EVALUATION

Filter strips are areas of planted perennial vegetation that filter out sediment and contaminants from runoff, usually before it enters a stream or body of water. Some vineyards are in close proximity to riparian areas, ephemeral streams, or even the ocean. Ensuring that water coming offsite is clean is an imperative management practice, as these habitats contribute to vineyard biodiversity and environmental health.

Filter strip width is a variable that is relatively unknown to farmers, due to its interconnectedness with soil type, climate, and slope. Therefore, assessing at which width does a filter strip become most effective allows farmers to identify potential filter strip applications.

The filter strip width study includes two replicated trials. One trial is located at Sunnybrook Vineyard, Paso Robles (San Luis Obispo County) and the second is located at Paraiso Vineyards, Soledad (Monterey County). Both sites have a 9% uniform slope and soil was disked prior to planting the filter strip.

7.1.1 SUNNYBROOK VINEYARD

Sunnybrook Vineyard is a 500 acre vineyard owned and operated by E&J Gallo. Sunnybrook Vineyard is located on the East side of Paso Robles in San Luis Obispo County in the El Pomar district. E&J Gallo has been a long time supporter of the Central Coast Vineyard Team and is also the study site for the study on weed management alternatives to Simazine (see 7.3).

7.1.1.1 MATERIALS AND METHODS

Six steel plot frames (2 ft by 12 ft by 8 in) were sunk into the ground 4 inches deep in the fall of 2007. The down-slope end of the plot frames were constructed to funnel overland flow into a collection basin.

Figure 1. Plot frame implementation, Sunnybrook Vineyard, November 27th, 2007

Staff leveled and slightly compacted the area within the plot frames and planted Creeping Wild Rye (recommended by NRCS) at a seeding rate of 25 lbs/acre. Treatments include 12ft, 6ft, and 0ft planted widths of Creeping Wild Rye in 2008 and Six Week Fescue in 2009, replicated twice. Bare soil above each plot frame was raked for uniformity.

In April 2008 and 2009, the plots were prepped for testing filter strip width at full plant maturity. CCVT staff saturated the soil within the plots using microsprinklers then simulated surface run-on using a water tank with a split-valve at the bottom. The exiting water ran over a 2 ft by 2 ft piece of steel sheet metal at 4 liters per minute to create sheet flow onto the pre-saturated plots.

Figure 2. Plot frames at plant maturity in preparation for run-off evaluation, Sunnybrook Vineyard, April 2008

Each simulated run-on event consisted of 150 liters with 6 kilograms of suspended sediment (40 grams per liter). Runoff was collected at the down-slope end of the filter strip plots. A 100 mL sample of the collected run-off for each replicate was evaporated in a soil oven. Each sample of dry sediment was weighed to calculate the amount of sediment that 100 mL of run-off contained for each replicate.

7.1.1.2 RESULTS

Filter strip width evaluation results are represented in concentration of sediment in the flow that was collected at the down slope end of the plots.

The following photos show the clarity of water running off the filter strip plots at 12 ft, 6 ft, and 0 ft of planted cover on April 30th, 2008.

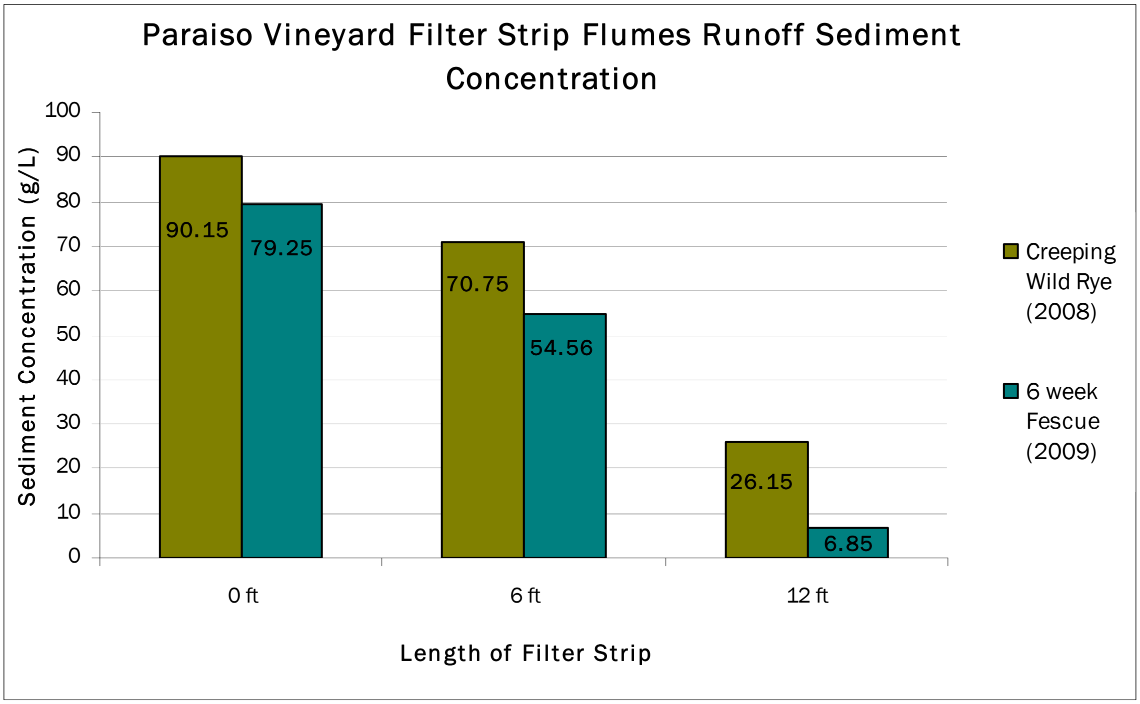
0 Feet Cover

6 Feet Cover

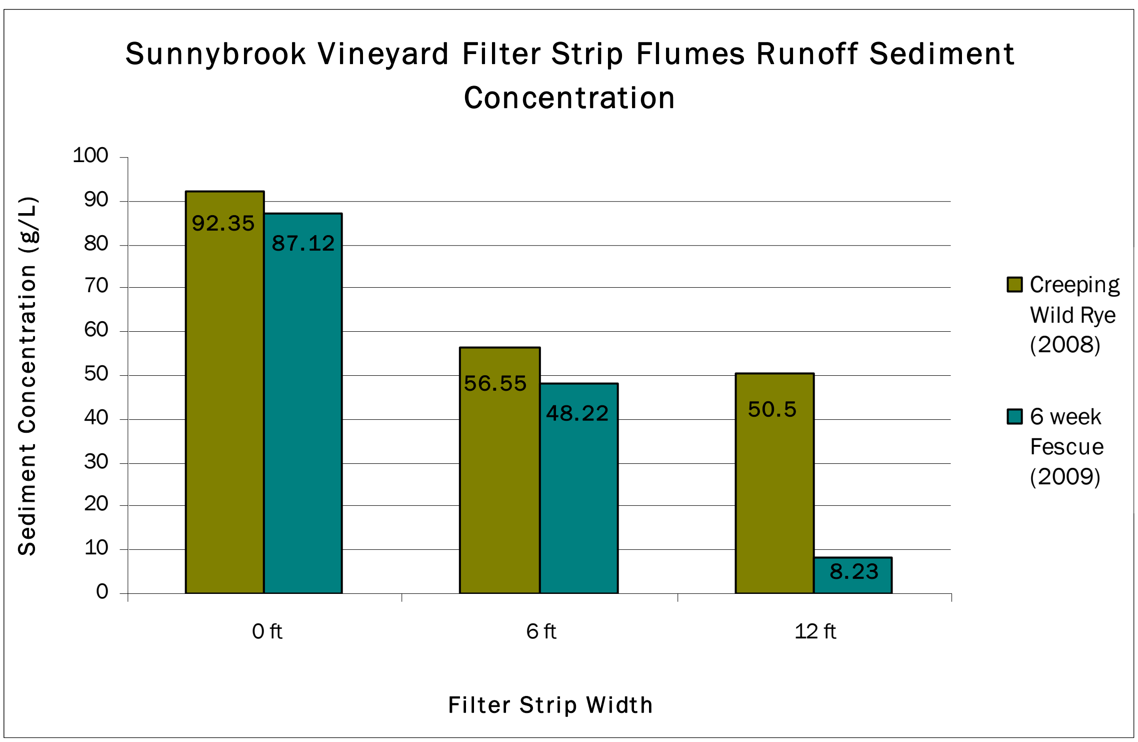
12 Feet Cover

Figure 3. water running off the filter strip plots at 12 ft, 6 ft, and 0 ft of planted cover on April 30th, 2008.

Sediment concentration varied greatly between all three treatments. Consistent with visual observation, the greater the filter strip width, the lower amount of sediment concentration was found in the runoff collection.



Graph 1. Sediment concentration of varying width of filter strips at Paraiso Vineyard, Soledad.



Graph 2 . Sediment concentration of varying width of filter strips at Sunnybrook Vineyard, Paso Robles.

6 Week Fescue had consistently lower sediment concentrations at both filter strip flume test sites. At Paraiso Vineyards, sediment concentration ranged from 6.85 g/L to 79.25 g/L on the 12 foot to With a low concentration of 6.85 g/L on the 12 foot filter strip width at Paraiso

Vineyard, compared to Creeping Wild Rye's low of 26.15 g/L on the 12 foot filter strip width at Paraiso Vineyard.

The following table shows the treatment's ability to filter out sediment from the solution originally ran through the filter strip flumes. Positive numbers show that the sediment concentration of the runoff was greater than that of the run-on solution and negative numbers show a decrease in sediment concentration from the original run-on solution.

Table 1. Comparison of Treatment Efficacy. Shows the treatment's ability to lower sediment concentration.

	Sunnybrook Vineyard (g/L)		Paraiso Vineyard (g/L)	
	Creeping Wild Rye	6 Week Fescue	Creeping Wild Rye	6 Week Fescue
0 ft	+52.35	+47.12	+50.15	+39.25
6 ft	+16.55	+8.22	+30.75	+14.56
12 ft	+10.50	-31.77	-13.85	-33.15

7.2 VEGETATIVE ROAD MANAGEMENT

Vineyard roads have the potential to produce significant amounts of erosion if not properly managed during wet winter months. By planting cover crops (non-economic crops often planted between vine rows) which help keep soil in place during heavy rains, CCVT staff demonstrated through a two-year comprehensive study, the benefits of using cover crops for road management.

Broadening the selection of road management cover crops to choose from and finding road cover crops which better fit the needs of local vineyards may encourage more growers to incorporate this tool as part of their management practices and ultimately increase the total vineyard acreage planted to cover crops. By conducting vineyard specific evaluations through this project, growers can incorporate new road cover crop selections with less risk.

Staff evaluated six (6) road cover treatments at two Central Coast Vineyards: Pomar Junction Vineyard in Templeton, and Salisbury Vineyard in San Luis Obispo.

At the end of the project, the following road cover crops were determined suitable for Central Coast vineyard roads, though site specific characteristics and goals should be determined before recommending a cover crop:

- Six Weeks Fescue
- Zorro Fescue
- California Barley

7.2.1 POMAR JUNCTION VINEYARD

Pomar Junction Vineyard is located on the westside of Templeton in the El Pomar growing region. Pomar Junction Vineyard is comprised of 86 acres of Viognier, Syrah, Zinfandel, Cabernet Sauvignon and Merlot. Pomar Junction Vineyard is committed to sustainable farming and a long time supporter of the Central Coast Vineyard Team. Areas of Pomar Junction Vineyard are planted on sloping terrains accessed by seasonal vineyard roads.

7.2.1.1 MATERIALS AND METHODS

CCVT staff coordinated with University of California Cooperative Extension (UCCE), Natural Resource Conservation Service (NRCS), Cal Poly San Luis Obispo, industry specialists, and project growers in Fall 2007 to determine six vegetative road management treatments. The road cover crops were chosen based on Central Coast weather conditions, ability to grow in compact soil, and ability to establish early season root-growth to reduce erosion potential (Table 2).

Road cover crop descriptions are provided in *Table 2.* Species characteristics information is referenced from Cover Cropping in Vineyards (ANR publication 3338), unless otherwise noted.

Table 2

Species	Characteristics	Planting Rate (lbs/acre)	Cost Per Pound ($/lb)
California Barley	Short-lived bunchgrass that has adapted to very dry conditions. It is found in meadows, dried creek beds, and brush flats and slopes in Oregon and California.	20-25	$9.50
Idaho Fescue	Densley tufted perennial bunchgrass that is very closely related to sheep fescue. Drought tolerant, little to no growth in summer months, and very shade tolerant.	20	$15.00
Zorro Fescue	Early maturing, winter growing annual often used for erosion control in highly disturbed areas. *USDA NRCS*	20	$6.50
Creeping Wild Rye	Perennial grass with a rhizomatous growth form. Ideal for areas with low oxygen due to compaction or soil saturation. *USDA NRCS*	25	$48.00
Six Weeks Fescue	Low growing, early maturing hard fescue. Goes to seed by early spring. *USDA NRCS*	15	$15.00

The road cover treatments were planted in 12 ft by 12 ft plots on a uniformly sloping area on November 7th, 2007. Each treatment was replicated twice, leaving a 2 ft buffer between treatment plots. The trial layout is provided in Attachment B.

7.2.1.1.1 PHOTO DOCUMENTATION

Scheduled photo documentation was conducted from January through April of 2008. Photos were taken on a monthly basis, 29-31 days apart.

7.2.1.1.2 PERCENT COVER

Staff evaluated each of the six treatments for the percentage of soil covered over a period of five months (January-April). Data was collected by using a meter by meter quadrant constructed of PVC pipe and the quadrant was placed randomly within a plot. Staff photographed the area within the quadrant. Photos were taken of each treatment and replicate, and staff evaluated the photos using ImageJ. ImageJ is a public domain, Java-based image processing program developed at the National Institutes of Health. ImageJ transformed the digital image from a full color image to a binary image containing only black and white. It differentiated the soil from the cover crop and translated the image into a mean. Staff then used the mean output from ImageJ in an equation that produced the percent of soil that was covered by the planted road cover crop.

Depending on which color (black or white) represented the soil, one of two equations would be used to determine percent cover.

Equation 1: If soil = 0, then Percent Cover = (mean/255) x 100%

Equation 2: If soil = 255, then Percent Cover = 1 – (mean/255) x 100%

7.2.1.1.3 DRY MATTER PRODUCTION

All treatments were evaluated according to the total amount of growth achieved (dry matter). Dry matter data was gathered using a 0.25 meter^2 quadrant constructed of PVC pipe. The quadrant was randomly placed within each replicate and staff clipped the growth within the quadrant. Clippings were placed in paper bags and taken to the Cal Poly Earth & Soil Sciences Department. Bags were placed inside a soil oven heated to approximately 200˚F. The road cover crop growth was oven dried for a 48 hour period and then weighed (minus the weight of the paper bag) to determine dry matter production. Dry matter production data was collected on a monthly basis from January to April 2008.

7.2.1.1.4 INFILTRATION RATES

The twelve treatment plots were evaluated for their effect on the rate of infiltration, that is the rate at which the soil can absorb rainfall or irrigation. Infiltration rate data was collected by administering saturated test using an infiltrometer. The infiltrometer was placed into the treatment plot and both the inner and outer rings of the device were filled with water. This was repeated three times to allow for full soil saturation. A timer is set for fifteen minutes and the inner and outer rings are filled a fourth time. At the end of the fifteen minute infiltration period, the amount of water infiltrated was recorded in inches as indicated on the scale. The rate was then multiplied by four to calculate water infiltration in inches/hour. Infiltration rates were collected on a monthly basis from January to April.

Infiltration rates were gathered using this double-ring infiltrometer

7.2.1.1.5 SOIL LOSS ESTIMATION

Estimated soil loss was calculated using the Revised Unified Soil Loss Equation (RUSLE) once before treatment implementation (December) and once at plant maturity (March/April). RUSLE is an equation that estimates soil loss in tons/acre/year using six factors which include the rainfall-runoff erosivity factor (R), soil erodibility factor (K), slope length factor (L), slope steepness factor (S), cover management factor (C), and support practice factor (P). These factors are determined using data from years of erosion study and put into the following equation:

Estimated Soil Loss (tons/acre/year) = R x K x LS x C x P

In this study, we will be manipulating the C factor by increasing the amount of cover in each plot.

7.2.1.2 RESULTS

Vegetative road management treatment evaluation results include photo documentation, percent cover, dry matter production, and infiltration rates.

The following is sample photo documentation of Six Weeks Fescue from January through April 2008.

Pomar Junction Vineyard – Six Weeks Fescue, Replicate 1

January 11, 2008

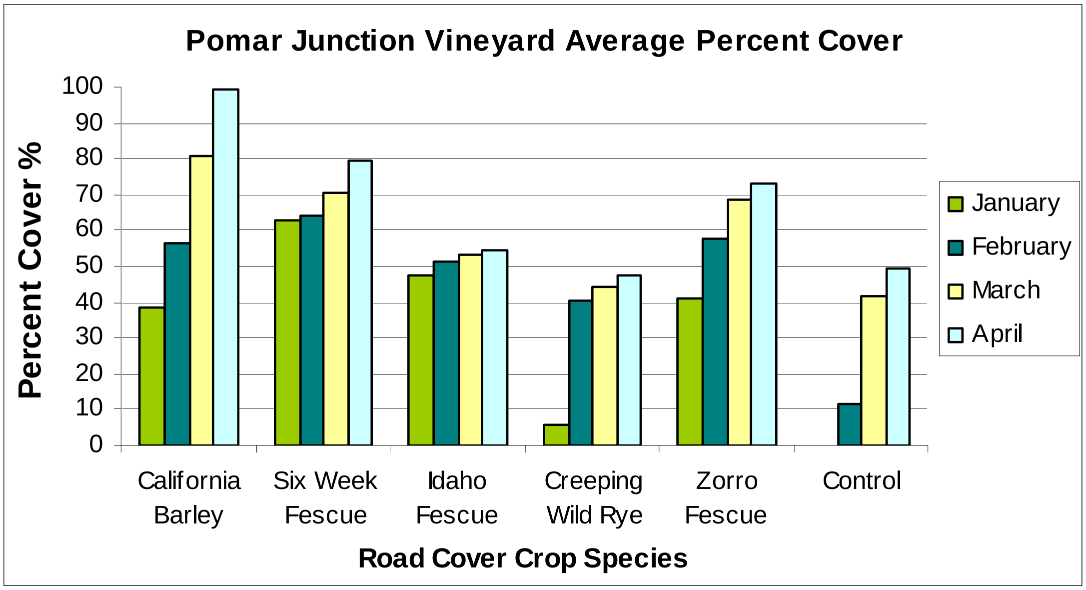
February 14th, 2008

March 12, 2008

April 13, 2008

Figure 4. Photo documentation of Six Weeks Fescue from January through April 2008.

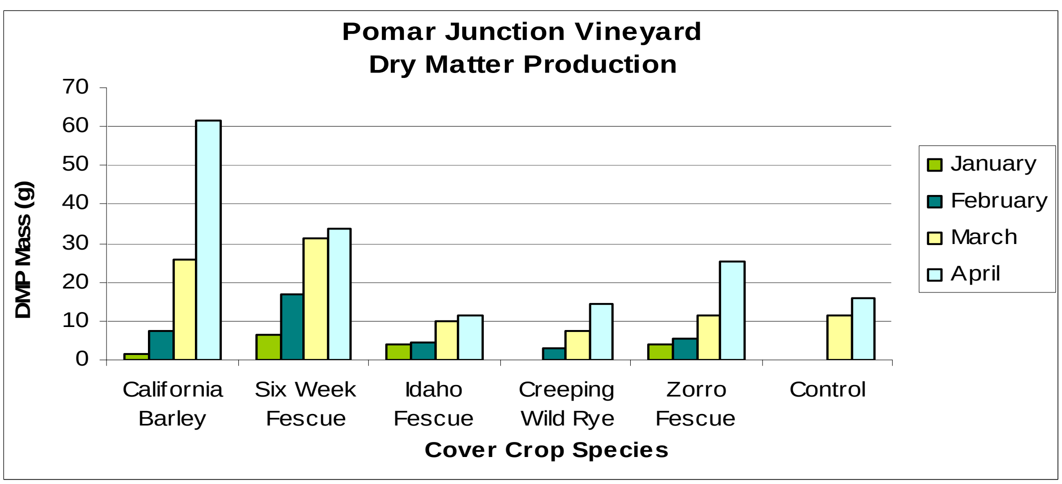
Percent cover (PC) data was collected on a January 11th, February 14th, March 12th, and April 13th in 2008 (Graph 3).



Graph 3. Average monthly percent cover (January – April 2008) at Pomar Junction Vineyard.

California Barley attained the highest percent cover (99.44%) in the late months followed by Six Weeks Fescue (79.62%). In the early months, when cover is most important, Six Weeks Fescue attained the greatest percent cover (62.60%) followed by Idaho Fescue (47.15%). Treatments that attained noticeably less percent cover included Creeping Wild Rye (5.7% - January, 47.15% - April), Control (0% - January, 49.45% - April). Weed pressure was evident in each plot. CCVT staff worked to eliminate weed species as to more accurately measure percent cover of the planted cover.

Dry Matter Production was collected on January 11th, February 14th, March 12th, and April 13th in 2008. *Graph 4* represents the data collection results.

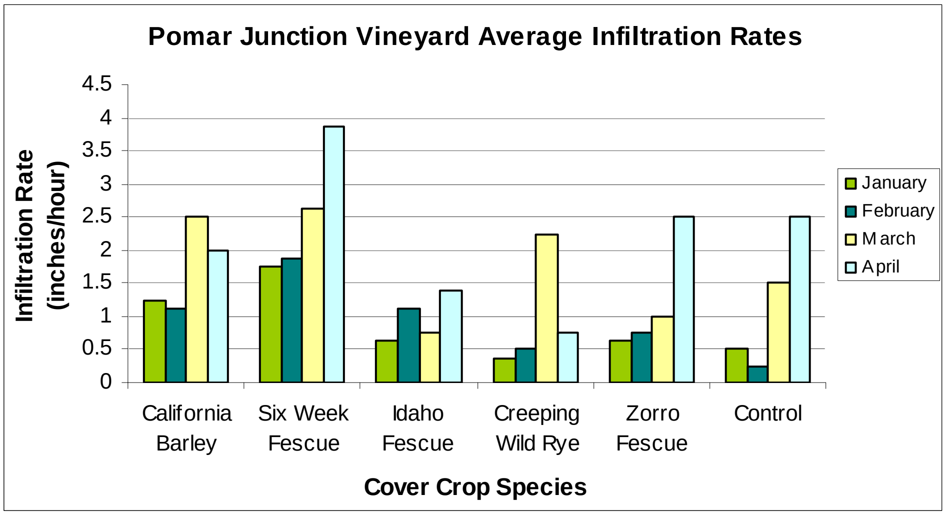


Graph 4. Average Dry Matter Production – (January – April 2008) at Pomar Junction Vineyard.

California Barley produced the most dry matter (Graph 4). The dramatic increase in April for dry matter production of California Barley was largely due to the development of grain heads that month which add significant weight. Six Weeks Fescue also exhibited the ability to produce a good amount of dry matter, especially in the early months when it is needed most.

Idaho Fescue produced the overall lowest amount of dry matter due largely to the nature of the plant, a thin, hard, dry grass.

Infiltration rates were collected on January 11th, February 14th, March 12th, and April 13th in 2008 (Graph 5).



Graph 5. Average Infiltration Rates (January – April 2008) at Pomar Junction Vineyard.

Infiltration rates are known to increase as a healthy root system increases. Six Weeks Fescue, with a high density and fibrous rooting system, best aided the soil in its ability to absorb water. Collection of infiltration rates had its share of inconsistencies. These inconsistencies could correlate with subsurface soil fractures, rocks below the test surface, or differentiation of compaction within a plot.

Soil Loss was estimated on January 19th and April 14th, 2008 using the RUSLE (Table 3).

Table 3. Pomar Junction Vineyard RUSLE calculations

Species	January Growth Soil Loss (Tons/Acre/Year)	April Growth Soil Loss (Tons/Acre/Year)	Soil Loss Difference (Tons/Acre/Year)
California Barley	1.358	0.037	1.321
Six Week Fescue	0.531	0.148	0.383
Idaho Fescue	6.297	1.976	4.321
Creeping Wild Rye	5.557	1.729	3.828
Zorro Fescue	1.235	0.259	0.976
Conrol	5.927	2.470	3.457

7.2.1.3 DISCUSSION & CONCLUSION

The winter of 2007-2008 included low, sustained temperatures and very little precipitation. Rain came early in the season, then ceased to return. Because of this, seeds germinated at a normal rate but overall plant growth was severely stunted due to lack of rain.

CCVT project staff found importance in not significantly altering the growing conditions from what could typically occur in a year of commercial vineyard production, regardless of peculiar weather patterns. Growers farm along varying years on an annual basis and producing in a drought is a common endeavor in California. Therefore, staff purposefully did not add additional irrigation to the study plots. Data collected in a drought year is equally as usable to a grower as data collecting in a year with normal precipitation rates.

Regardless of the lack of rainfall, three species showed to be well suited to the winter 2007-2008 conditions at Pomar Junction Vineyard. The well-suited species include:

- Six Weeks Fescue
- Zorro Fescue
- California Barley

The species' success was determined by the percent of soil covered, dry matter production mass, infiltration rates, and ability to reduce soil erosion (RUSLE). Early root and biomass establishment is key to keeping soil in place, especially with the early rains California receives.

In addition to discovering species that were suitable, there is value in determining species that did not perform well under the given conditions. The fact that producers can see first-hand a majority of the planted species did not thrive is a cost and time saving opportunity for them. The information of what did not appear to be well-suited is very useful to Central Coast vineyard managers and owners. Given this information, we have a better idea of which species should not be planted in the Templeton area, during winters with extreme temperature fluctuations and which are less tolerant of weed pressures. Research and demonstration projects reduce the risks associated with a grower adopting a new practice. The researching organization takes on the initial risks associated with new practices, in this case cover crop species selection, and demonstrates what works and what does not. A grower can then learn from the project and implement the successfully demonstrated practice with less risk, having learned from the research.

Additionally, staff discovered areas for improvement that could be made on the next phase of the trial. One improvement was to expand the plot area and increase replication of treatments. Additional data could relieve inconsistencies due to outlying data or collection error.

7.2.2 SALISBURY VINEYARD

Salisbury Vineyard (Avila Valley) is just southwest of San Luis Obispo in San Luis Obispo County. The vineyard is comprised of 40 acres of Pinot Noir, Chardonnay, Pinot Grigio, Syrah Noir, and newly planted Albariño. The vineyard is situated on sloped terrain and lies close to residential areas, creeks, and the ocean. With many erosion control practices already in use, Salisbury Vineyard is an ideal location to test road management practices on its steep roads.

7.2.2.1 MATERIALS & METHODS

CCVT staff coordinated with University of California Cooperative Extension (UCCE), Natural Resource Conservation Service (NRCS), Cal Poly San Luis Obispo, industry specialists, and project growers in Fall 2007 to determine six vegetative road management treatments. The road cover crops were chosen based on Central Coast weather conditions, ability to grow in compact soil, and ability to establish early season root-growth to reduce erosion potential.

The six selected species included:

- Six Weeks Fescue
- Zorro Fescue
- California Barley
- Creeping Wild Rye
- Idaho Fescue
- Control (unplanted)

See Table 2 for species characteristics and information.

The road cover treatments were planted in 12 ft by 12 ft plots on a uniformly sloping vineyard on November 13th, 2007. Each treatment was replicated twice, leaving a 2 ft buffer between treatment plots. The trial layout is provided in Attachment B.

7.2.2.1.1 PHOTO DOCUMENTATION

Scheduled photo documentation was conducted from January through April of 2008. Photos were taken on a monthly basis, 29-31 days apart.

7.2.2.1.2 PERCENT COVER

Each of the six planted treatments were evaluated for the percent of soil it covered over a period of four months (January – April, 2008). Materials and methods for percent cover measurements were the same as those used at Pomar Junction Vineyard in 2008 and are outlined in 7.2.1.1.2.

7.2.2.1.3 DRY MATTER PRODUCTION

Materials and methods were the same as those used at Pomar Junction Vineyard in 2008 and are outlined in 7.2.1.1.3.

7.2.2.1.4 INFILTRATION RATES

Materials and methods were the same as those used at Pomar Junction Vineyard in 2008 and are outlined in 7.2.1.1.4.

7.2.2.1.5 SOIL LOSS ESTIMATION

Materials and methods were the same as those used at Pomar Junction Vineyard in 2008 and are outlined in 7.2.1.1.5.

7.2.2.2 RESULTS

Road cover crop treatments evaluation results include photo documentation, percent cover, dry matter production, infiltration rates, and soil loss estimation.

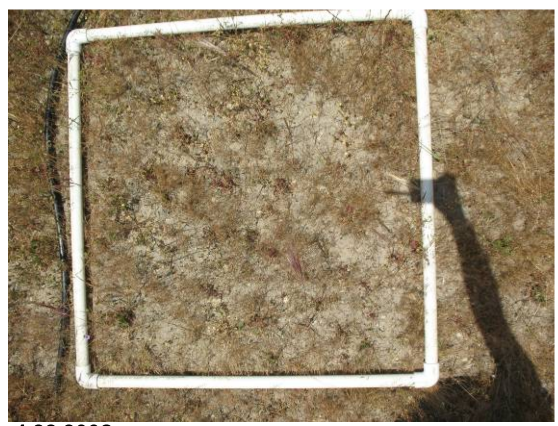
The following is sample photo documentation records for Zorro Fescue, Replicate 1 from January through April 2008. Full photo documentation records can be found in Attachment D.

Zorro Fescue, Replicate 1

1.11.2008

2.14.2008

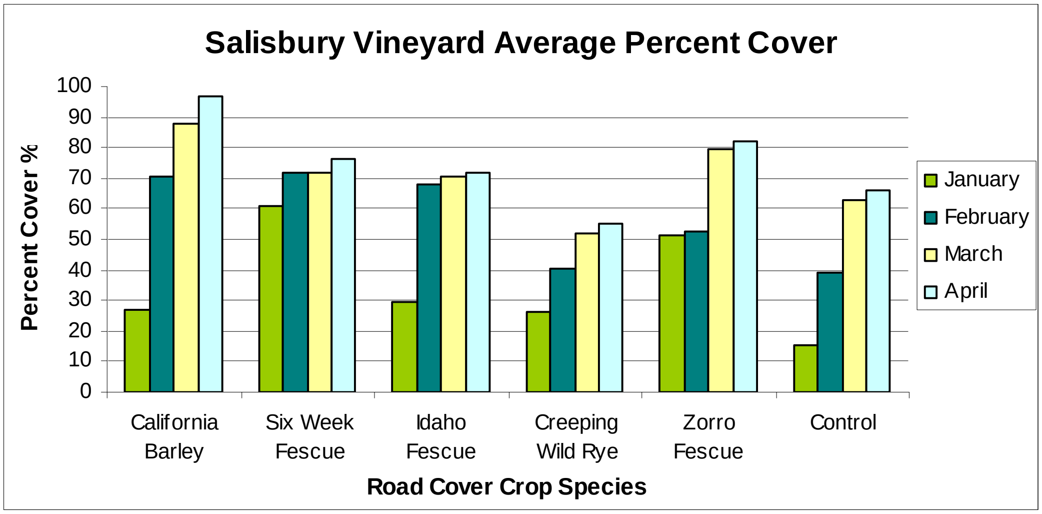
3.13.2008



4.23.2008

Figure 5. sample photo documentation records for Zorro Fescue, Replicate 1 from January through April 2008.

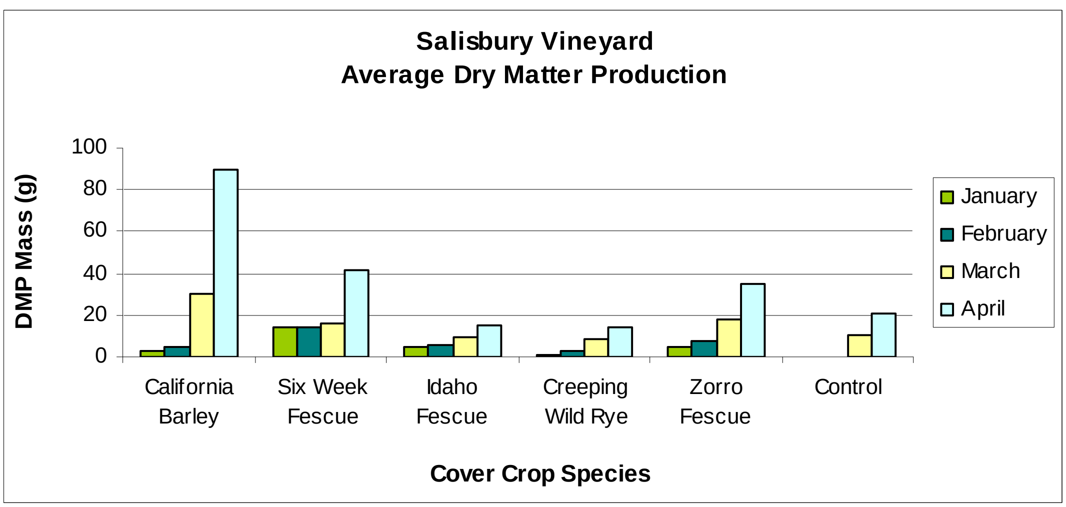
Percent cover (PC) data was collected at Salisbury Vineyard on January 11th, February 14th, March 13, and April 23, 2008. Graph 6 represents the data collection results.



Graph 6. Salisbury Vineyard Percent Cover, January – April 2008 demonstrates the cover achieved by each of the road cover crop treatments.

In January, most road cover crop treatments had reached 20% cover, Six Week Fescue grew to a 60% cover in January and Zorro Fescue covered 51% of the plots. By April 2008, California Barley attained 97% cover and Zorro Fescue attained 82% cover, and Six Week Fescue had gone to seed and was already drying out. Weed pressure was severe in the plots at Salisbury Vineyard. Staff worked to eliminate interference with percent cover readings, though ultimately weed population may have increased percent cover readings by a small margin.

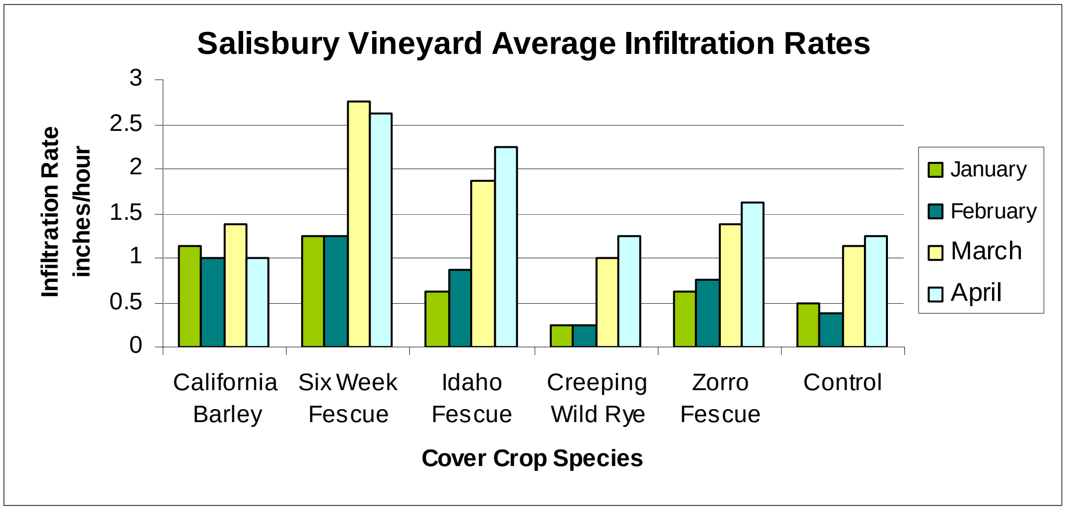
Dry matter production (DMP) data was collected on January 11th, February 14th, March 13, and April 23, 2008 (Figure 7).



Graph 7. Salisbury Vineyard Dry Matter Production, January – April 2008 represents the results from the data collected from January through April 2008.

The data displayed in Figure E shows California Barley producing the most dry matter. The dramatic increase in April for dry matter production of California Barley was largely due to the development of grain heads that month which add significant weight, as mentioned in the study at Pomar Junction Vineyard. Six Weeks Fescue also exhibited the ability to produce a good amount of dry matter, especially in the early winter months. Staff speculates that the competitive nature of Six Week Fescue with weeds due to early germination, allowed for more vigorous growth and dry matter production. Idaho Fescue produced the overall lowest amount of dry matter due largely to the nature of the plant, a thin, hard, dry grass.

Infiltration rates were collected on January 11th, February 14th, March 13th, and April 23rd, 2008 (Figure 8).



Graph 8. Salisbury Vineyard (Year 1) Average Infiltration Rates – January through April represents the results from the data collected from January through April 2008.

Infiltration rates increase as root biomass increases, allowing more percolation of water into the soil. The infiltration rates of all species increased dramatically from February 14th to March 13th, with the exception of California Barley with relatively uniform infiltration rates during the growing season. The treatment with the highest infiltration rates was Six Week Fescue, reaching 2.75 in/hr, then tapering down in April once the grass had begun to shut down. Creeping Wild Rye and the Control had the overall lowest infiltration rates, these treatments also had lower numbers for percent cover and dry matter production which are contributing factors to good soil infiltration.

Soil Loss was estimated on January 19 and April 14, 2008 using the RUSLE (Table 4).

Table 4. Salisbury Vineyard RUSLE calculations

Treatment	January Growth Soil Loss (Tons/Acre/Year)	April Growth Soil Loss (Tons/Acre/Year)	Soil Loss Difference (Tons/Acre/Year)
California Barley	2.861	0.045	2.816
Six Week Fescue	0.632	0.407	0.225
Idaho Fescue	2.710	0.632	2.078
Creeping Wild Rye	1.506	1.491	0.015
Zorro Fescue	1.340	0.196	1.144
Conrol	2.108	0.723	1.385

7.2.2.3 DISCUSSION & CONCLUSION

Salisbury Vineyard received very few, but very intense storms during the winter months. Early storms washed away germinating seeds and created small rills in some of the trial plots. Little rain occurred during the late winter and spring, severely stunting the overall growth of planted species.

Regardless of the lack of rainfall, three species showed to be well suited to the winter 2007-2008 conditions at Salisbury Vineyard. The well-suited species include:

- Six Weeks Fescue
- Idaho Fescue
- California Barley

The species' success was determined by the percent of soil covered, dry matter production mass, infiltration rates, and ability to reduce soil erosion (RUSLE). Early root and biomass establishment is key to keeping soil in place, especially with the early rains California receives.

7.3 WEED MANAGEMENT ALTERNATIVES TO SIMAZINE

Weed management in Central Coast vineyards generally relies on chemical and mechanical methods for control. Several applications of herbicides, or passes with a mechanized weeder are often needed throughout the season to adequately control weeds. Some of the chemicals used in the control of weeds are very effective in controlling a wide variety of species for a prolonged period of time. However, some of these weed management approaches can affect water quality in the Central Coast. There are a wide variety of herbicides and mechanical tools that can be used to control weeds. However, the appropriateness of a tool depends on the characteristics of the vineyard. Therefore, characterizing the effectiveness of different weed control strategies can assist growers in making effective management decisions. This could potentially lead to a reduction in the use of herbicides and cultivation equipment, ultimately saving the grower money and minimizing the agricultural inputs on the environment.

Simazine, a pre-emergent herbicide linked to ground water contamination, has been found in California drinking water sources since the early 1990's (Lam et al. 1994). The increased focus on Simazine is due to its potential threat to aquatic organisms and its increased usage in agricultural systems over the past few years.

Due to the potential toxicity of this material, CCVT project staff worked with participating growers to evaluate the effectiveness of alternative methods for the control of weeds in vineyards. The following report addresses the results and discuses their potential impacts on management practices in Central Coast vineyards.

7.3.1 SUNNYBROOK VINEYARD

This experiment consisted of five treatments and was arranged as a randomized complete block design with three replications. Each experimental unit consisted of four vine rows, with two additional adjacent vine rows as buffers. The 1.3 m wide strips under the vines in each experimental unit received one of the following weed control treatments: 1) pre-emergent herbicide Simazine, 2) pre-emergent herbicide flumioxazin, 3) cultivation with a Sunflower from Pelenc (Figure 9), 4) 'low growing mixture' vineyard cover crop seeds in 2006 and 2008 or an annual grass blend in 2009, and 5) no treatment control.

Figure 6. Sunflower from Pelenc under the vine-row cultivator.

7.3.1.1 MATERIALS AND METHODS

Simazine was applied at 2.7 lbs. active ingredient/acre in combination with glyphosate at 1.3 qts. active ingredient/acre and oxyfluren at 0.5 lbs. ai/acre. Chateau was applied at 6 oz. active ingredient /acre. in combination with glyphosate at 1.3 qts. active ingredient/acre and oxyfluren at 0.5lbs active ingredient/acre in February. The cultivation treatment was applied once in April. The cultivation equipment was also used in the preparation of the soil for cover crop treatment. The cover crop seeds were mixed with sand (50:50 ratio) and applied by hand at approximately 22 kgha-1 prior to a significant rain event in February. Table 5 and 6 shows the list of the species within the cover crop and their relative percent content within the mixture:

Table 5. List of species used in the under row cover crop cover crop treatment in Paso Robles, California in 2008.

Species	Percent of Mixture
Centaurea cyanus	4.6%
Eschscholzia californica	4.8%
Festuca rubra commutata	32.8%
Layia platyglossa	1.5%
Lotus corniculatus	7.6%
Nemophila menziesii	3.0%
Trifolium incarnatum	7.0%
Trifolium repens	13.9%
Trifolium subterraneum	18.2%
Vulpia microstachys	6.6%

Table 6. List of species included in the under row cover crop treatment in Paso Robles, California in 2009.

Species	Percent of Mixture
Festuca Idahoensis	50%
Vulpia myuros	50%

7.3.1.1.1 WEED DENSITY AND DIVERSITY

Weed density and number of species were sampled each month during the growing season using the 0.25 m^2 quadrant method. Four samples were taken from each experimental unit per month.

7.3.1.1.2 ABOVE GROUND WEED BIOMASS

Weed shoot biomass for each species was also taken using the 0.25 m^2 quadrant method. Four samples per experimental unit were collected on a monthly basis from April through October. Weed shoot samples were oven dried for 48 hours at 200°F, and weighed.

7.3.1.1.3 LIGHT INTERCEPTION

Light interception readings were taken prior to harvest in 2006, 2008, and 2009 using a AccuPAR LP-80 ceptometer. These readings show the percent of light penetrating the canopy as a result of the different treatments. The greater the percentage, the more light there is reaching the interior of the canopy.

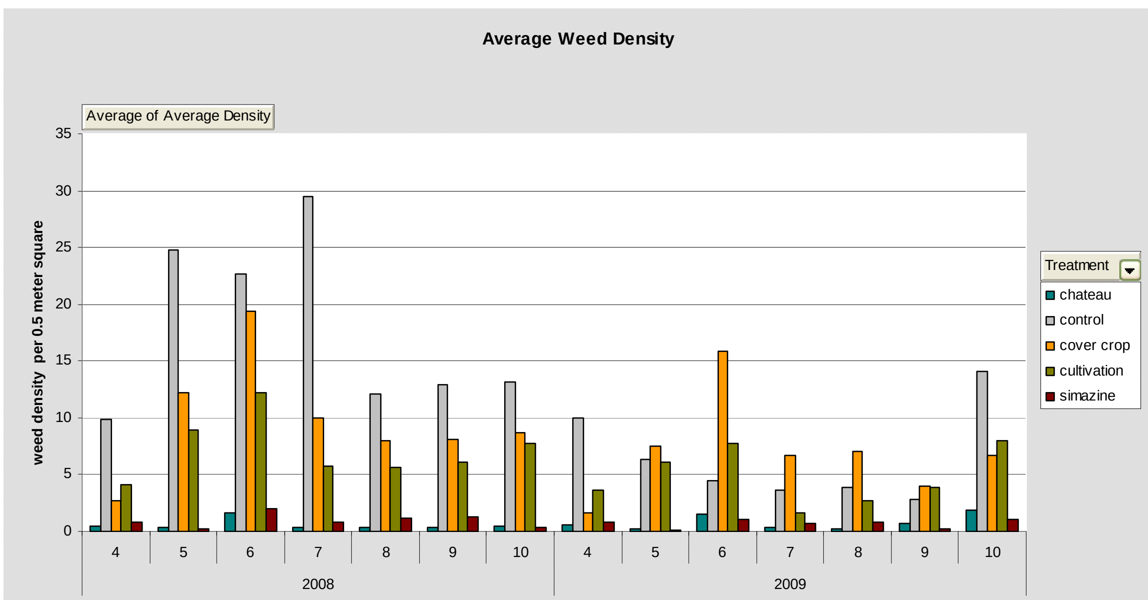
7.3.1.1.4 YIELDS

Staff weighed crop yields in October of each growing season. Fruit was harvested from one vine per treatment row chosen at random. Fruit from 16 vines per treatment has weighed to produce an average representing the changes in yield per treatment.

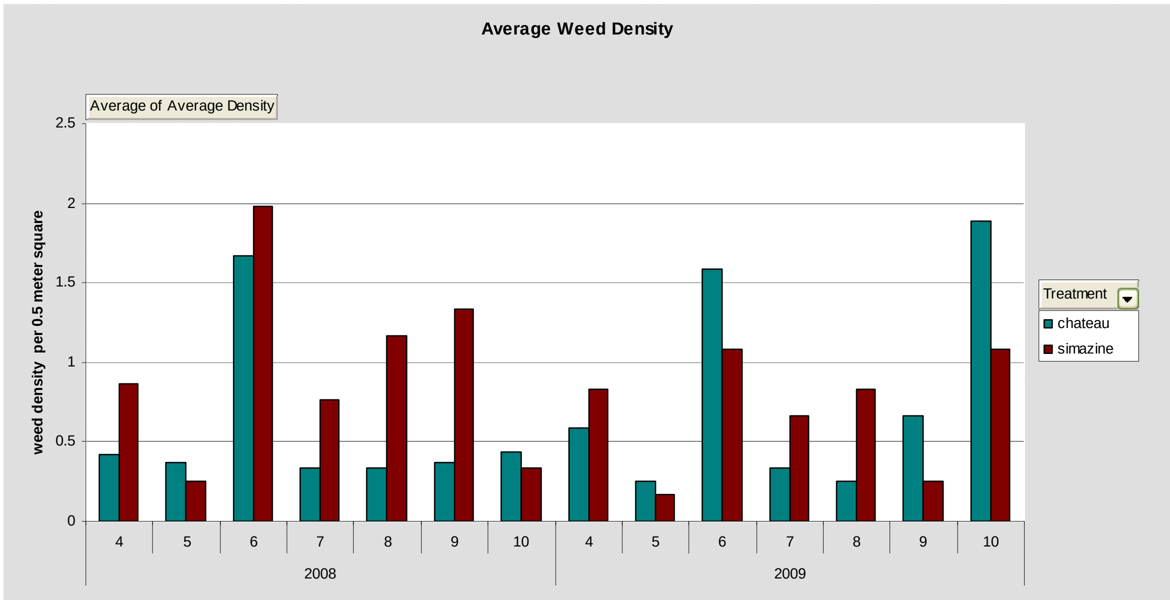
7.3.1.2 RESULTS

Staff evaluated four different weed control strategies and compared them to a weedy control. The data presented in Figure 10 represents the weed density for Simazine, Flumioxazin, under row cover crop, control, and a cultivation treatment. The two pre-emergent herbicides showed adequate control of weeds with an average well below five plants per $0.5m^2$. The control plots, where no weed abatement method took place, peaked in July 2008 near almost 30 plants per $0.5m^2$ and declined during the warmer summer months.

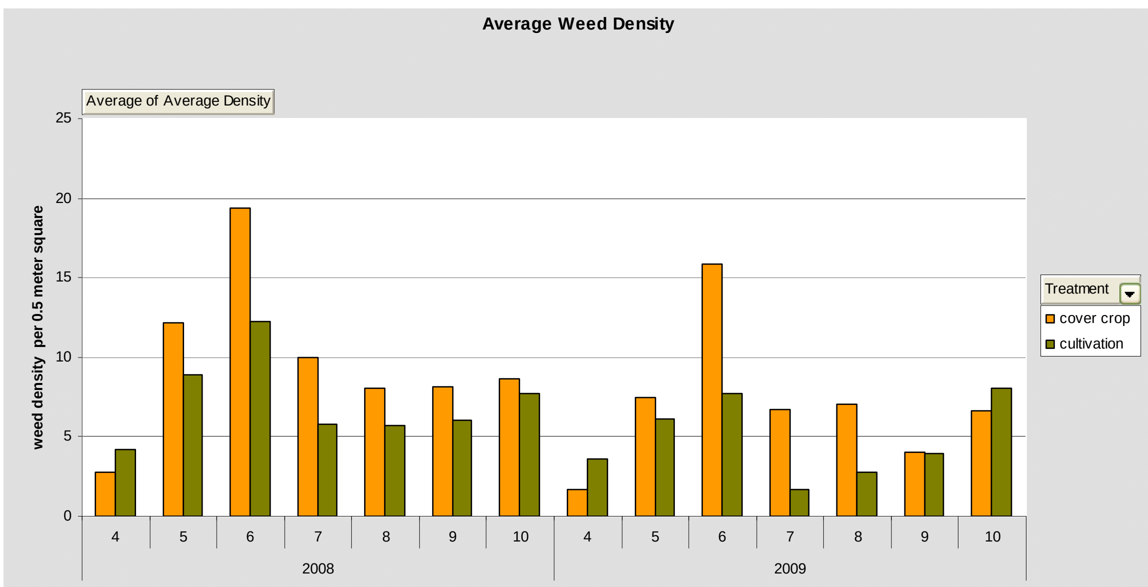
Weed populations were typically lower in the 2009 growing season. There are two factors that reason for lower weed densities in 2009; first being a year with a lower annual precipitation rate and second, the vines in this block were grafted over to a new variety in March 2009. A newly grafted vine is smaller and less vigorous, allowing for more sunlight to hit the soil beneath the vine row, decreasing the moisture content of the soil. The following graphs also show a decline in weed activity during the 2009 growing season.



Graph 9. Average Weed density determined using the 0.5m2 quadrat method at Sunnybrook Vineyards in Paso Robles, California in 2008 and 2009.

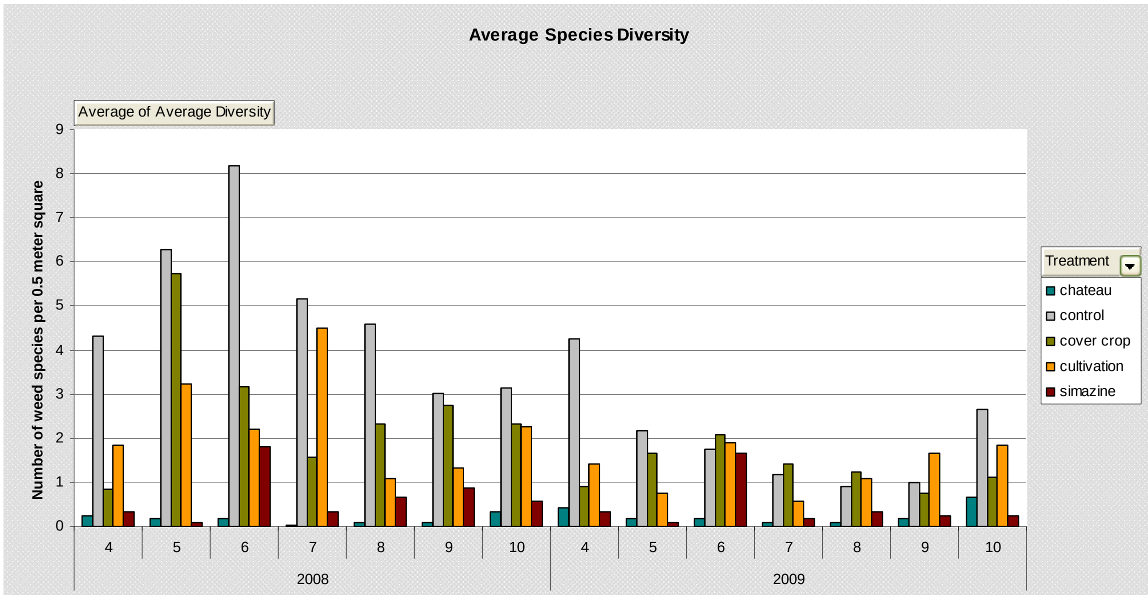


Graph 10. Average Weed density determined using the 0.5m² quadrat method of pre-emergent chemical weed control treatments; Chateau and Simazine at Sunnybrook Vineyards in Paso Robles, California in 2008 and 2009.

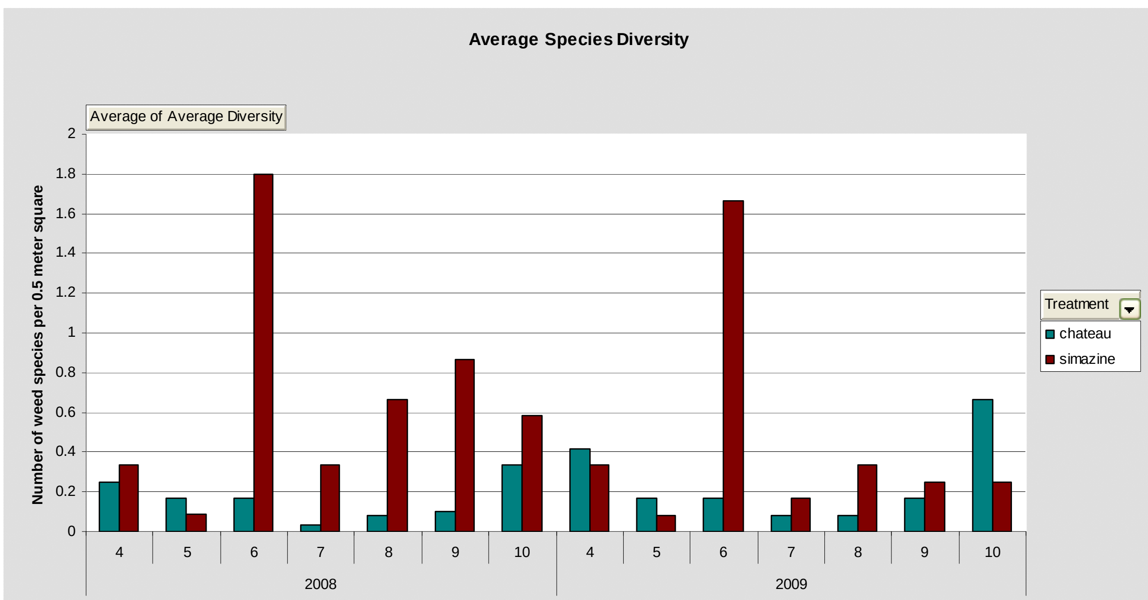


Graph 11. Average Weed density determined using the 0.5m2 quadrat method of cultural methods; under the vine row cover crop and cultivation at Sunnybrook Vineyards in Paso Robles, California in 2008 and 2009.

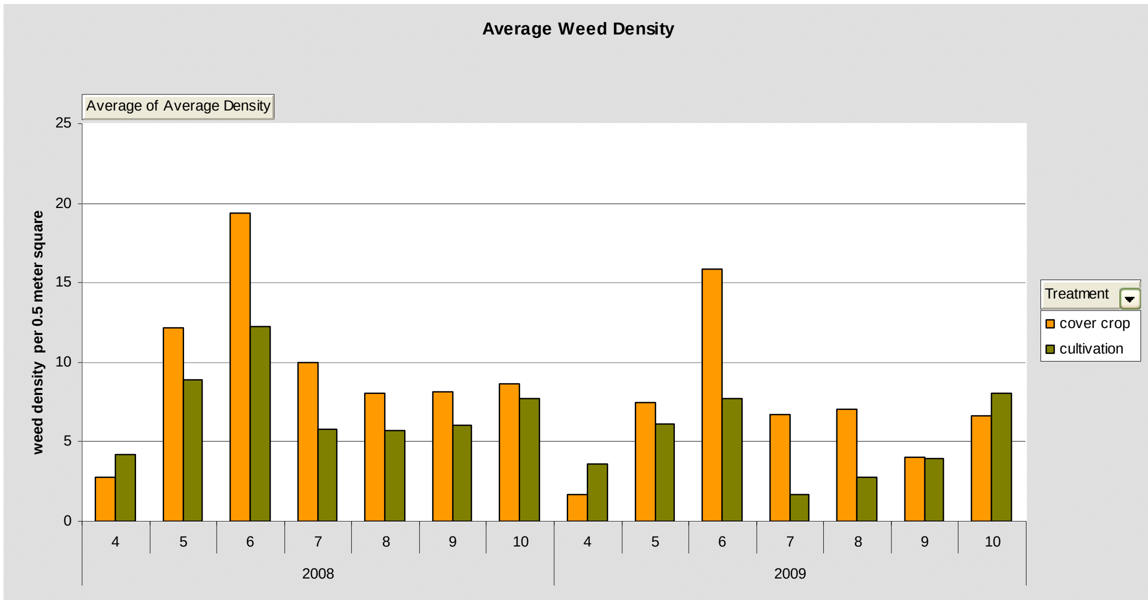
The pre-emergent herbicides effectively controlled more species of weeds throughout the season compared to the rest of the treatments (Figure 11). Simazine and Chateau both controlled weed species at a similar level until June (Month 6). After June, Chateau controlled more weeds than the Simazine treatment throughout most of the sampling season until the last sampling date. At this time the number of species controlled was relatively similar. The control treatment had the most number of species throughout most of the sampling season, followed by the cover crop treatment (Figure 12).



Graph 12. Weed species number determined using the 0.5m² method at Sunnybrook Vineyards in Paso Robles, California in 2008 and 2009.

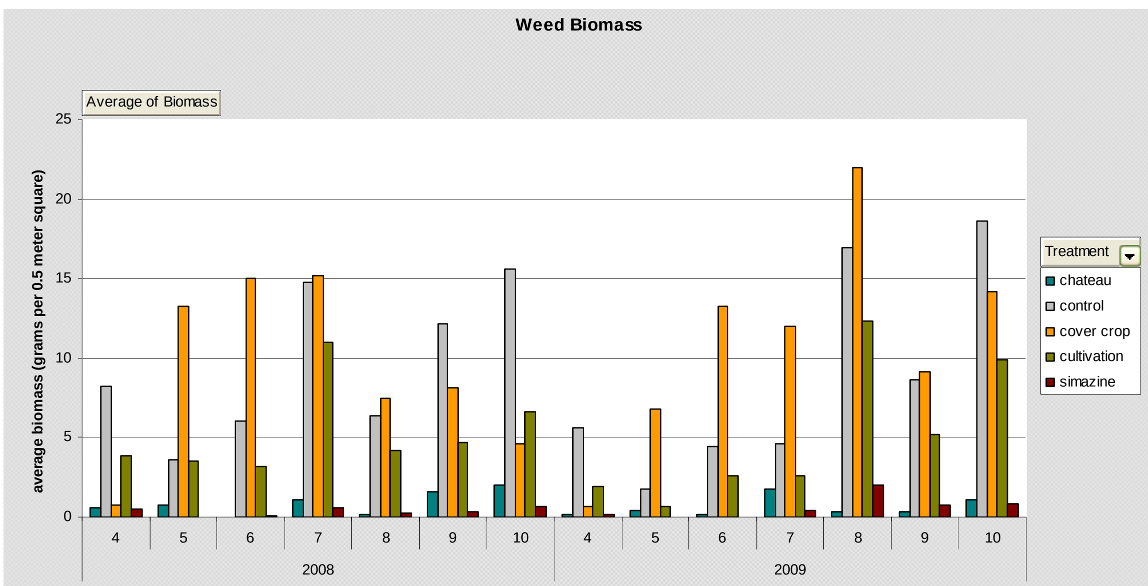


Graph 13. Weed species number determined using the 0.5m² method of pre-emergent chemical weed control treatments; Chateau and Simazine at Sunnybrook Vineyards in Paso Robles, California in 2008 and 2009.



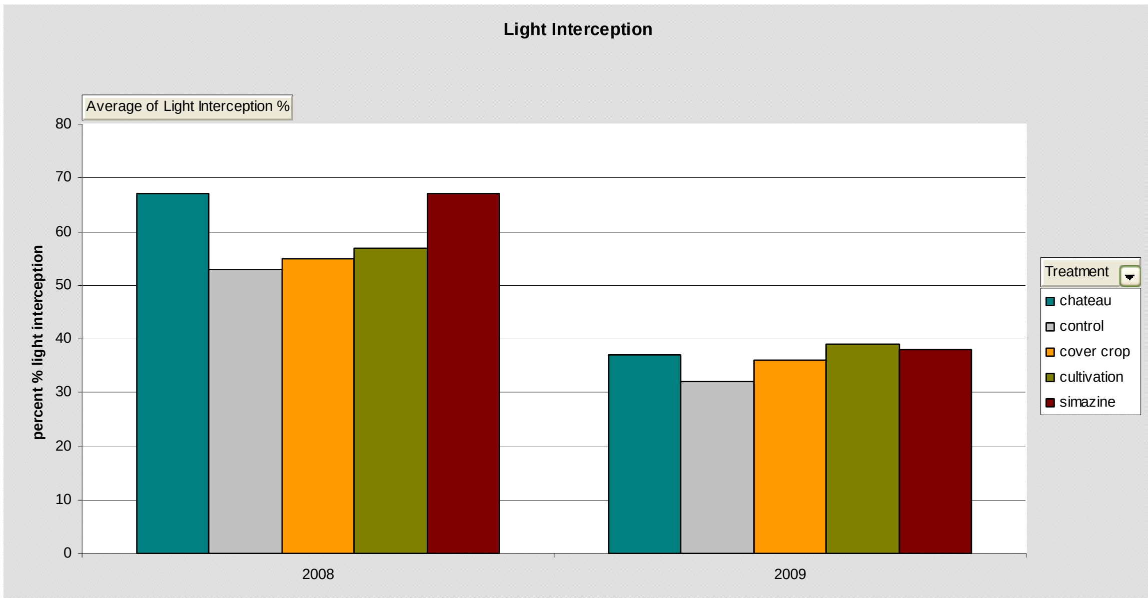
Graph 14. Weed species number determined using the 0.5m² method of cultural methods; under the vine row cover crop and cultivation at Sunnybrook Vineyards in Paso Robles, California in 2008 and 2009.

Weed biomass was measured as dry weight of weeds above ground per $0.5m^2$. Weed biomass from the weed control methods tested at Sunnybrook Vineyards (Figure 16) was greatest in the cover crop and the weedy control treatment. The cultivation treatment was intermediate. The Simazine and Chateau treatments had the least amount of weed biomass. The cultivation treatment was 2-4 times greater in weed biomass in comparison to the pre-emergent herbicide treatments. The weedy control and the cover crop had 4-8 times greater weed biomass than the weed control treatments.



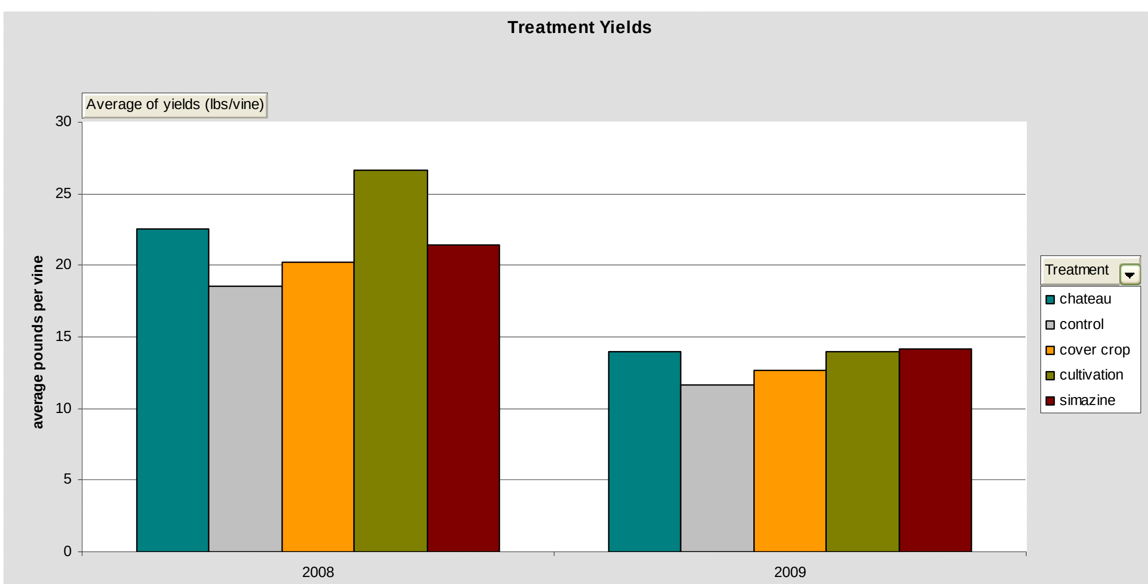
Graph 15. Weed Biomass determined using the 0.5m² quadrat method at Sunnybrook Vineyards in Paso Robles, California in 2008 and 2009.

Graph 16 shows the percent of light penetrating the canopy as a result of the different treatments. The greater the percentage, the more light there is reaching the interior of the canopy. Lower light interception readings are seen in 2009 due to the smaller grafted vines. In 2008, Chateau and Simazine had the greatest light interception, followed by the cultivation treatment, cover crop, then control. Less differences were shown in 2008 between the weed management treatments with the cultivation treatment intercepting the greatest amount of light followed by Simazine, Chateau, cover crop, then control.



Graph 16. Percentage vine leaf light interception for each management tactic at Sunnybrook vineyards in Paso Robles, California in 2008 and 2009.

In 2008, the cultivation treatment showed the greatest yields followed by Chateau, Simazine, cover crop, then control. In 2009, Chateau and Simazine had similar yields, followed by the cultivation treatment, cover crop, then control (Figure 17).



Graph 17. Yield per vine (lbs) in each treatment at Sunnybrook Vineyards in Paso Robles, CA in 2008 and 2009.

7.3.1.3 DISCUSSION AND CONCLUSION

Sunnybrook had some very interesting results. One of the more interesting results came from the cultivation treatment. A cultivation pass accurately timed controlled weed populations. The cultivation pass that took place removed a majority of the winter annuals that were there, while preventing the establishment and proper vegetative growth of germinating summer annuals.

The cover crop and weedy treatments maintained relatively high population and diversity levels throughout the season. These two treatments had a significant effect on grapevine yield at the end of the season (Figure 18). The stand of the weeds and the cover crop were likely competing with the vine for both water and nutrient during the demanding periods of the season. This ultimately led to the reduction in yield.

Many of the vineyards in the Central Coast are planted on hillside vineyards. Therefore, the potential for erosion is greater in these vineyards that would normally be planted on flat lands. An under row cover crop or winter weeds under the vinerow during the winter season may provide vegetative coverage that could potentially offer some level of erosion control during the rainy season.

Various values systems come into play when biodiversity is concerned. One grower may place a higher value on biodiversity than on producing a large crop. If this is the case, than an under row cover crop might be considered a highly desirable practice. However, having vegetation under the vine row makes it difficult to accurately deliver water and nutrients to the vine, which is essential in developing the flavor qualities needed for wine production. Another potential use for the under row cover crop could be to de-vigorate highly vigorous vines. Highly vigorous vines tend to produce wine grape with vegetative characteristics which tend to be undesirable flavors in wine. Furthermore, the under row cover crop provided an increased amount of light penetration into the canopy. Light is an important characteristic in the development of desirable flavor compounds within the grape (Smart 2001). The use of an under row cover crop might then be considered as a practice to increase the light penetration to the vine. This could potentially replace high-cost labor crews who are used to shoot and leaf thinning during the season.

There are many areas of weed management technically studied that could potentially lead to a reduction of chemical and mechanical inputs. The area underneath the vinerow sprayed with herbicides, the bandwidth, is generally determined by the width of the seeder used to grow a cover crop and by the width of the mower to mow the cover crop. If the bandwidth can be reduced without effecting the growth of the vine, the grower can reduce the herbicides applied thus reducing inputs. This practice could potentially reduce the risk of erosion on hillside vineyards. If the vegetative area is increased, then the potential for erosion could be reduced.

7.4 EFFECT OF BENEFICIAL HABITAT COVER CROP DENSITY ON INSECT POPULATIONS

In the summer of 2007, CCVT Staff, David Gates (Ridge Vineyard – Vice President, Vineyard Operations), and Caleb Mosley (Ridge Vineyard – Viticulturist) discussed the importance, expense, and effectiveness of planting a beneficial insect habitat as a vineyard cover crop. These blends can be upward of $20 per pound which can be extremely costly to integrate into a cover program, yet their potential to aid in balancing pest populations is immeasurable. Out of this discussion, three questions were raised:

- How do insect populations differ in a block where a beneficial insect blend is planted from a block that is not?
- How effective is an Insecta-Flora Blend cover crop at different planting densities?
- Do the beneficial insects that the insecta-flora cover attract make their way to the vine?

7.4.1 RIDGE VINEYARDS

The research was implemented in the fall of 2007 at Ridge's Monte Bello Vineyard in the Santa Cruz Mountains. Winegrapes have been farmed at Ridge's Monte Bello Vineyard since 1886 and is now home to 120 acres of Cabernet Sauvignon, Merlot, Petit Verdot, Cabernet Franc, Chardonnay, and Zinfandel. Soils consist of decomposing Franciscan rock mixed with clay, laid over fractured limestone. Santa Cruz Mountains have a cool, mountainous climate between the Mediterranean and Maritime zones, with annual rainfall ranging from 15 to 30 inches per year, averaging around 30 inches annually. The project area encompassed 7.1 acres on a south facing slope of planted Cabernet Sauvignon, Merlot, and Petit Verdot on 5C rootstock. Rows in this block are spaced at 8 feet and vines are spaced at 4 feet and were planted in 1998. The Monte Bello Vineyard has limited irrigation abilities, only using water to help establish young vines.

7.4.1.1 MATERIALS AND METHODS

The beneficial habitat study had three treatments: 1) habitat blend planted every 4th row, 2) habitat blend planted every 8th row, and 3) unplanted (Ridge uses a perennial grass cover program) using a Vari-Slice Positive Feed Native Grass Seed Delivery System seeder (Figure 19).

Figure 7 - Vari-Slice Positive Feed Native Grass Seed Delivery System seeder.

Table 7 – Beneficial habitat seed characteristics.

Low Profile Habitat Blend – LA Hearne			
Five Spot	0.24%	Prima Grand Clover	4.94%
White Yarrow	0.25%	White Clover	4.98%
Phacelia	0.25%	Persian Clover	4.99%
Sweet Alyssum	0.25%	Clare Sub Clover	8.91%
California Poppy	1.00%	Campeda Sub Clover	8.98%
Dwarf Cornflowers	1.98%	Red Clover	9.98%
Baby's Breath Elegance	2.00%	Crimson Clover	9.98%
Hard Fescue	4.83%	B.L. Trefoil	21.60%
Creeping Red Fescue	4.84%		

CCVT staff collected insect data on a monthly basis (June through August of 2008). Insect counts on the vineyard floor were gathered by pitfall traps. Clear plastic cups containing one ounce of isopropyl alcohol were sunk into the soil so that the lip of the cup was flush with the top of the soil (Figure 20). Ten pitfall traps were placed in each treatment and collected after a 24-hour period.

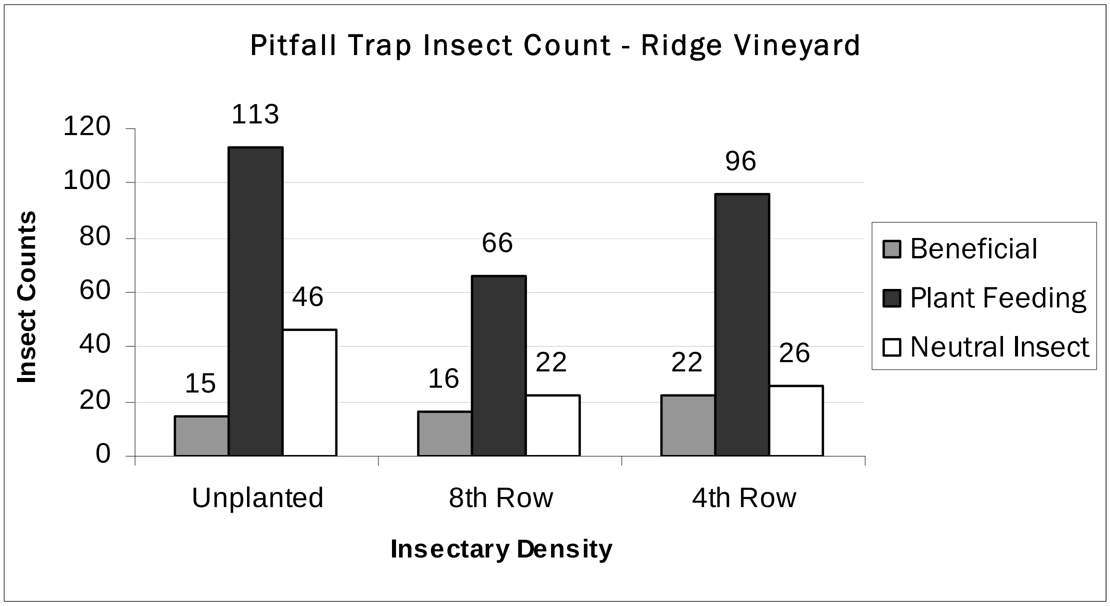
Insect counts in the vine canopy were gathered by placing yellow sticky traps within the trellis system (Figure 21). Ten of these traps were placed in each treatment and collected after a 24-hour period. Insect identifications (keyed out to family) for both the sticky and pitfall traps were completed by Cal Poly Entomology master's student, Brian Henriott under the direction of Dr. David Headrick.

Figure 8 – Insect Pitfall Trap

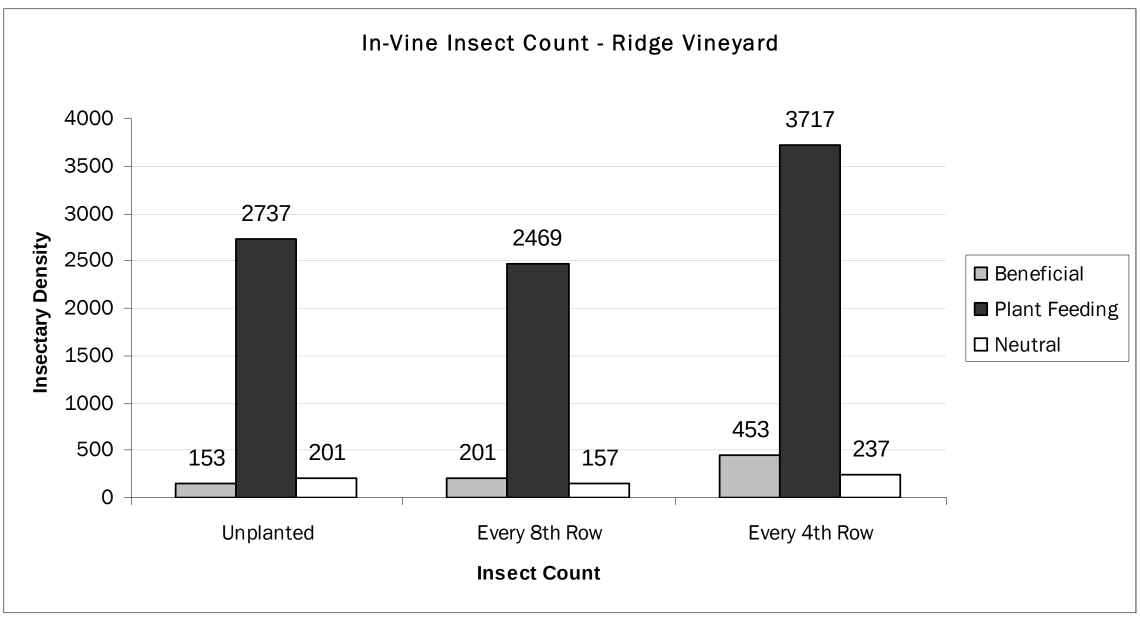
Figure 9 – Insect Yellow Sticky Trap

7.4.1.2 RESULTS & DISCUSSION

With any management practice, it is important that economic input produces a desired ecological output. Our question was, how much economic input would be necessary to build a beneficial habitat sufficient enough to alter pest populations. At a planting density of every fourth row, 16% (0.2 acres planted over 1.25 vineyard acres) of the project area was planted with the beneficial habitat blend. With a planting density of every eighth row, only 8% (0.1 acres planted over 1.25 vineyard acres) of the project area was planted with the beneficial habitat blend. With seed costs at $14 per pound and a seeding rate of 20 lbs/acre, there is potential to gain similar effectiveness at a lower cost (roughly saving $28 per vineyard acre).



Graph 18. Pitfall trap insect counts for unplanted, planting every 8th row, and planting every 4th row treatments.



Graph 19. In-vine (yellow sticky card) counts for unplanted, planting every 8th row, and planting every 4th row treatments.

Beneficial insects found in pitfall traps consisted mainly of beetles (ground, rove, lady, click), spiders (tube, tarantula, wolf) and some small reptiles including lizards and skinks. Pest species found in pitfall traps include aphids, leafhoppers, bark beetles, and ants. Vineyard floor insect populations showed a response to the three treatments. Beneficial insect populations were greatest when the habitat blend was planted every 4th row, decreased in treatment areas planted every 8th row, and declined further in the unplanted treatment. However, pest species did not follow the same trend. The unplanted area showed to have the greatest insect count for pests, followed by the every 4th row planting density, then every 8th row planting density (Figure 22).

In-vine (yellow sticky trap) beneficial insect species primarily included orb-weaving spiders, parasitic wasps, and lacewings. Pests found in vine canopy traps include, sharpshooters, leafhoppers, thrips, aphids, whitefly and seedbugs. Beneficial insect populations in the vine canopy follow the trend that a more dense beneficial habitat planting equals a greater amount of beneficial insects. Beneficial insect populations more than double in treatments planted every 4th row from the area planted every 8th row. Also, a greater percentage of the beneficial insects found in the every 4th row treatments were parasitoid hymenoptera. Pest populations in the vine canopy were largely inflated by thrips, accounting for nearly 90% of total collected pest species (Figure 23).

7.4.1.3 GROWER DISCUSSION AND CONCLUSION

"The information gathered by the Central Coast Vineyard Team helped us to determine whether or not we would be expanding the breadth of our beneficial habitat cover crops in the Monte Bello vineyards. The data proved that there are vast differences in the insect populations at the different cover cropping densities. We decided to expand these cover cropping efforts to approximately 20 additional acres of our vineyards. The increase in beneficial insects was convincing enough to persuade us to expand, along with the fact that some of the plant feeding insects classified in the study we have never considered a threat to the health of the vine or the quality of the fruit. Parasitoid hymenoptera levels in the higher density plantings were encouraging as well. This insect has the potential to parasitize large numbers of malicious insects in vineyards and is a highly mobile and effective.

We had significant difficulties when calibrating the seeder when we began this experiment due to the extremely small size of seed in the habitat blend. In some instances, we prepared a seed bed and then spread the seed by hand to achieve more efficient distribution. Regardless of how the seed was spread, an impressive stand was established and many of the species retained their blooming flowers late into the growing season. The most impressive feat of this habitat blend was its ability to withstand the intense drought conditions in 2007 and 2008. Our current stand is very full, and some of the alyssum and California poppies have begun to encroach into the adjacent rows.

Not only does this cover cropping system provide significant benefits in terms of beneficial insect populations, it also helps to break up the species monoculture within a typical vineyard system. In the long term, a system with more species diversity (whether it be plant or insect) will stave off pest outbreaks and be less dependant on insecticides. It also helps to significantly beautify the vineyard. Visitors are always asking why we have flowers planted in the middle of our vineyards. This presents me with a great opportunity to explain our commitment to low input, sustainable farming practices. Our viticultural philosophy with all of our vineyards is to promote a natural balance within the vineyard. Utilizing this beneficial habitat cover crop is another great tool that we have to realize this goal."

7.5 EVALUATION OF COMMON COVER CROP SPECIES USING THE RAIN SIMULATOR

Staff evaluated twelve treatments for their erosion control capabilities. These species include: Crimson Clover/California Medic Mix, Zorro Fescue, resident weeds, Bell Bean/Purple Vetch Mix, Six Week Fescue, Annual Ryegrass, control (bare ground), Critical Coastal Mix (30% Cucamonga Brome, 25% California Oats, 20% Zorro Fescue, 10% Crimson Clover, 10% Common Vetch, 5% Low Profile Wildflower Mix), Rapid Cover Mix (45% Barley, 45% Annual Ryegrass, 10% Crimson Clover), Persian Clover, Insecta-Flora Blend, and Blando Brome.

Species evaluation occurred at Pomar Junction Vineyard in Templeton, owned and operated by the Merrill family. Six erosion boxes measuring 3 ft by 3 ft by 2 ft, were constructed to fit perfectly beneath the rain simulator at a slight slope. Each box was made to run two tests during the same storm event, one with bare soil, and the other with a planted treatment.

Figure 8. The rain simulator and six erosion boxes at Pomar Junction Vineyard, Templeton. Simulated rainfall events produced a 100 year storm for the area of study.

7.5.1 MATERIALS AND METHODS

Runoff from each storm event was collected through an aluminum flume fastened to the end of the treatment boxes and was measured every two minutes during a 60-minute storm. Each treatment had data collected on percent vegetative cover, total surface runoff volume, surface runoff sediment concentration, above-ground biomass and rooting depth.

7.5.1.1 RAIN SIMULATION

The rain simulator was built based on a design by Battany and Grismer in 2000 (Attachment G) and was used to simulate the storm events. The rainfall simulator (RS) allowed CCVT project staff to generate artificial storms in a controlled environment in order to obtain consistent data which, in turn, helped to quantify the potential a plant species has to reduce topsoil loss.

Simulated rainfall events mimicked one hour 100 year storm for the area where the study was conducted (roughly 10 inches per hour). Information on the storm intensity for the area was gathered from the National Oceanic and Atmosphere Association Atlas (NOAA) which can be accessed online at: http://hydrology.nws.noaa.gov/oh/hdsc/noaaatlas2.htm.

7.5.1.2 RUNOFF

Runoff from each storm event and were measured every two minutes during a 60-minute storm. Runoff was collected through an aluminum flume fastened to the end of the treatment boxes which funneled it into measuring devices.

7.5.1.3 ROOTING DEPTH

Ten plants from each treatment were pulled carefully from the plot to preserve the root structure. Roots were measured in length from soil surface to root apical maristem. Treatments composed of mixed species had ten samples taken from each species, then their root lengths were averaged.

Annual Ryegrass

Bell Bean

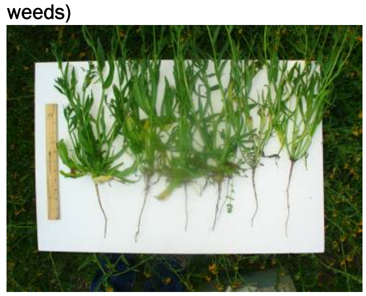
Crimson Clover

California Medic

Shepherd's Purse (from resident weeds)

Purple Vetch

Zorro Fescue

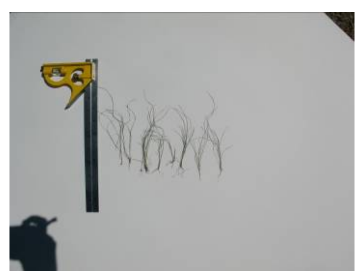


Fiddleneck (from resident weeds)

Blando Brome

Persian Clover

Insecta-Flora Blend



Six Week Fescue

Critical Coastal Mix

Rapid Cover Mix

7.5.1.4 BIOMASS

All treatments were evaluated for the amount of biomass, or dry matter, that they produced at plant maturation. The 1.5 ft by 3 ft treatment plot was clipped at the soil surface. Clippings were placed in paper bags and taken to the Cal Poly Earth & Soil Sciences Department. The bags were placed inside a soil oven heated to approximately 200˚F. The road cover crop growth was oven dried for a 48 hour period and then weighed (minus the weight of the paper bag) to determine dry matter production.

7.5.1.5 SEDIMENT CONCENTRATION

A 1L sample of the collected run-off for each treatment was evaporated in a soil oven. Each sample of dry sediment was weighed to calculate the amount of sediment (in grams) that 1L of run-off contained for each treatment.

7.5.1.6 EROSION BOXES

Erosion boxes were designed and constructed specifically for this experiment (Attachment H). They were made from pressure treated and coated wood and set at a 3% slope. Mesh covered holes lined the bottom to allow for drainage and channeled aluminum flumes were fastened to the down-slope end to gather and properly transport runoff to the collection devices.

7.5.1.7 PERCENT COVER

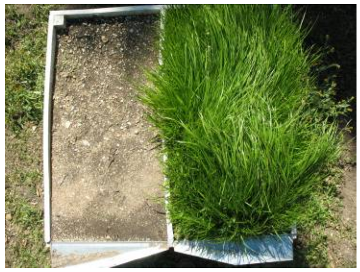
Staff evaluated each of the twelve treatments for the percentage of soil covered at plant maturation. Staff photographed 1.5 ft by 3 ft area in which the treatment was planted. Photos were taken of each treatment and staff evaluated the photos using ImageJ. ImageJ is a public domain, Java-based image processing program developed at the National Institutes of Health. ImageJ transformed the digital image from a full color image to a binary image containing only black and white. It differentiated the soil from the cover crop and translated the image into a mean. Staff then used the mean output from ImageJ in an equation that produced the percent of soil that was covered by the planted road cover crop.

Depending on which color (black or white) represented the soil, one of two equations would be used to determine percent cover.

Equation 1: If soil = 0, then Percent Cover = (mean/255) x 100%

Equation 2: If soil = 255, then Percent Cover = 1 – (mean/255) x 100%


Six Week Fescue


Annual Ryegrass


Bell Bean/Purple Vetch Mix


Crimson Clover/California Medic


Resident Weeds


Zorro Fescue


Blando Brome


Persian Clover

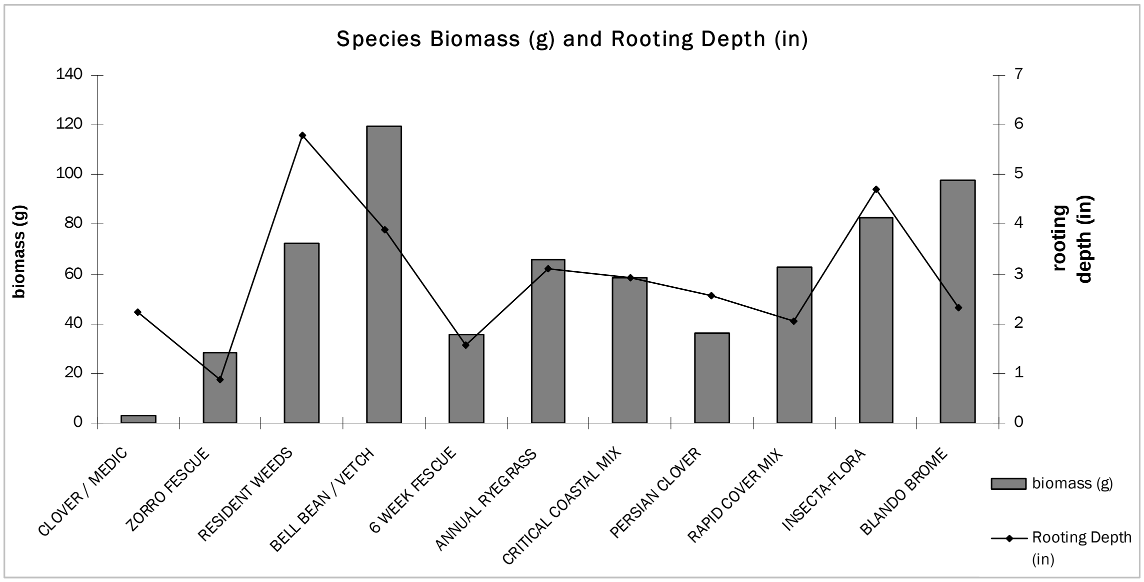

Critical Coastal Mix


Rapid Cover Mix


Insecta-Flora Blend

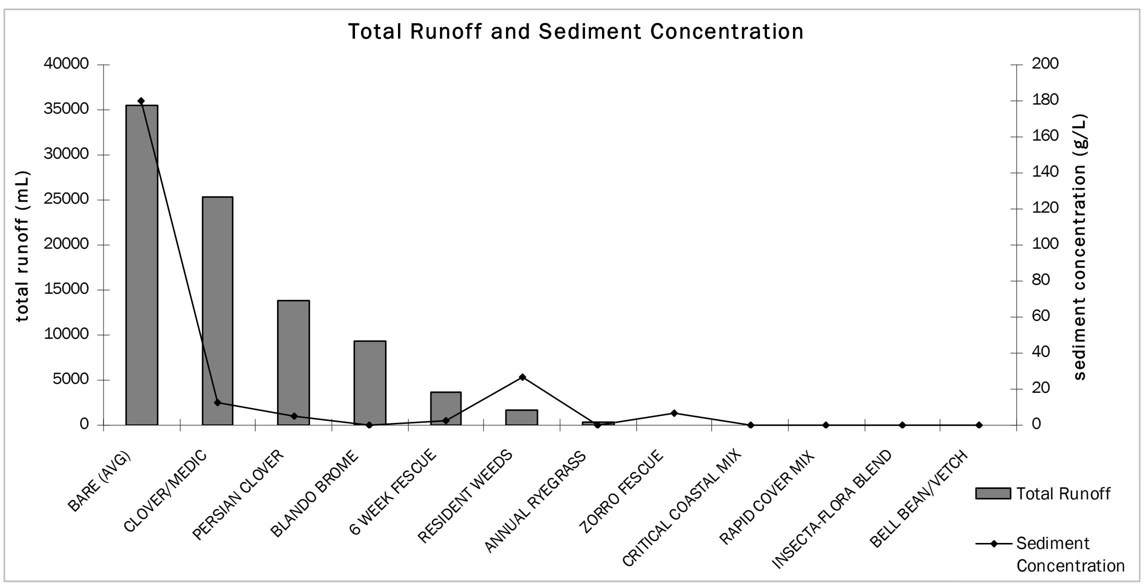
7.5.2 RESULTS AND DISCUSSION

Graph 19 shows rooting depth and biomass characteristics for each treatment. The Bell Bean/Purple Vetch Mix created the most above ground biomass with roots less than 4 inches in length. Rooting depth ranged from 0.89 inches to 5.805 inches for Zorro Fescue and resident weeds.



Graph 20. Species biomass and rooting depth.

Four of the twelve evaluated treatments yielded no surface runoff during the one hour storm: Critical Coastal Mix, Rapid Cover Mix, Insecta-Flora Blend, and the Bell Bean/Purple Vetch Mix. Bare soil surface runoff had the greatest sediment concentration at 179.6 g/L. Though the Crimson Clover/California Medic Mix experienced a lot of runoff, sediment concentration for this species was low at 12.7 g/L (Figure 25).



Graph 21. Total surface runoff and sediment concentration of runoff.

Table 6 shows a cost analysis, runoff sediment concentration, biomass, and rooting depth for each of the twelve treatments. Annual Ryegrass is relatively inexpensive and yields low sediment concentrations, a substantial biomass, and a rooting depth just below three inches. This species would be an inexpensive and effective way to reduce topsoil loss in a vineyard. Though the Critical Coastal Mix had no runoff and 100% cover, the cost to implement it at that seeding rate is far beyond the budget of vineyard operations.

Table 8. Cost analysis for each treatment.

Treatment	$ / lb.	lbs. / acre	$ / acre	% cover	runoff sediment concentration (g/L)	biomass (g)	rooting depth (in)
Bare Soil	$0	0	$0	0 %	179.62	0	0
Resident Weeds	$0	0	$0	94 %	26.70	72.6	5.81
Clover/Medic	$2.00	20	$40	92 %	12.70	3.1	2.22
Zorro Fescue	$6.50	12	$78	100 %	6.40	28.4	0.89
Bell Bean / Purple Vetch Mix	$0.42	100	$42	100 %	0	119.4	3.90
Six Week Fescue	$15.00	15	$225	99 %	2.21	35.8	1.58
Annual Ryegrass	$0.50	35	$18	100 %	0.01	65.7	3.10
Critical Coastal Mix	$5.00	75	$375	100 %	0	58.7	2.94
Persian Clover	$2.50	75	$188	92 %	4.98	36.1	2.56
Rapid Cover Mix	$1.20	190	$228	99 %	0	62.6	2.06
Insecta-Flora Blend	$5.00	11	$55	100 %	0	82.5	4.69
Blando Brome	$5.00	18	$90	100 %	0.13	97.5	2.33

7.6 WATER QUALITY BEST MANAGEMENT PRACTICE DEMONSTRATIONS

In the Fall of 2007, five growers volunteered to work with CCVT on implementing practices that would improve soil conservation and water quality. CCVT staff worked with industry professionals, UC Cooperative Extension, and NRCS to determine the most suitable species for the demonstration sites based on slope, rainfall, and soil type.

CCVT staff visited demonstration sites monthly to photograph growth, determine percent cover, and note the overall suitability of a specific cover species for its intended use. A RUSLE (Revised Unified Soil Loss Equation) evaluation was completed on each site prior to planting, estimating in tons/acre/year the amount of soil that would be lost if no cover crop was planted. In the Spring of 2008, at the point of maximum growth, staff performed a RUSLE evaluation to determine the effictiveness of the planted cover.

Table 7 and table 8 below show details of the demonstration sites and the estimated amount of soil saved. According to these calculations, it costs about $9.40 to save one ton of soil per year.

Table 9. BMP demonstration site details on five Central Coast Vineyards

Vineyard	BMP	Plant/Grass	Application Rate (lbs/acre)	Planting Date	Cost/lb	Acres	Total Cost
Bowker Vineyard	Plant California Barley on bare road and cover with straw.	California Barley	20 lbs/acre	11.26.2007	$20	0.25	$100
Faith Vineyard	Plant Creeping Wilde Rye on bare road.	Creeping Wild Rye	25 lbs/acre	11.14.2007	$21	0.62	$325.50
Premiere Coastal Vineyard	Plant Idaho Fescue on bare road and cover with straw.	Idaho Fescue	12 lbs/acre	11.30.2007	$15	0.4	$72
Ridge Vineyard	Plant Zorro Fescue on bare road and cover with straw.	Zorro Fescue	10 lbs/acre	11.7.2007	$6.50	0.8	$52
	Plant seed mix on south terraces and cover with straw.	Persian Clover/Zorro Fescue Mix	15 lbs/acre	11.7.2007	$5.25	1.3	$102.38
	Insectary cover crop on middle vineyard	Trefoil, Crimson Clover, Red Clover, Trikkala Sub Clover, Campeda Sub Clover, Clare Sub Clover, Persian Clover, White Clover, Prima Gland Clover, Creeping Red Fescue, Hard Fescue, Baby's Breath Elegance, Dwarf Cornflowers, California Poppy, Sweet Alyssum, Phacelia, White Yarrow, and Five Spot	11 lbs / acre	11.7.2007	$10	3.8	$418
Cal Poly Vineyard	Plant Six Week Fescue on bare road.	Six Week Fescue	15 lbs/acre	12.10.2007	$15	0.5	$112.50
	Plant Annual Ryegrass on bare road	Annual Ryegrass	35 lbs/acre	12.14.2007	$0.50	0.25	$4.37
					TOTAL	7.92	$11,867.75

Table 10. RUSLE evaluations for CCVT demonstration sites

Vineyard	BMP	RUSLE before BMP implementation (Tons/Year)	RUSLE after BMP implementation (Tons/Year)	Tons/Year Saved
Bowker Vineyard	Plant California Barley on bare road and cover with straw.	1.56	0.16	1.40
Faith Vineyard	Plant Creeping Wilde Rye on bare road.	1.21	0.40	0.81
Premiere Coastal Vineyard	Plant Idaho Fescue on bare road and cover with straw.	0.23	0.02	0.21
Ridge Vineyard	Plant Zorro Fescue on bare road and cover with straw.	47.92	2.01	45.91
	Plant seed mix on south terraces and cover with straw.	37.72	3.77	33.95
	Insectary cover crop on middle vineyard	20.16	0.14	20.01
Cal Poly Vineyard	Plant Six Week Fescue on bare road.	21.80	0.28	21.52
	Plant Annual Ryegrass on bare road	2.53	0.20	2.33
	TOTAL	133.13	6.98	126.14

7.6.1 BOWKER VINEYARD

Bowker Vineyard is located in Templeton, California and is farmed on some fairly steep slopes. CCVT staff worked with the grower and planted California Barley on a bare vineyard road to reduce erosion.

Figure 9. California Barley road planting

Before

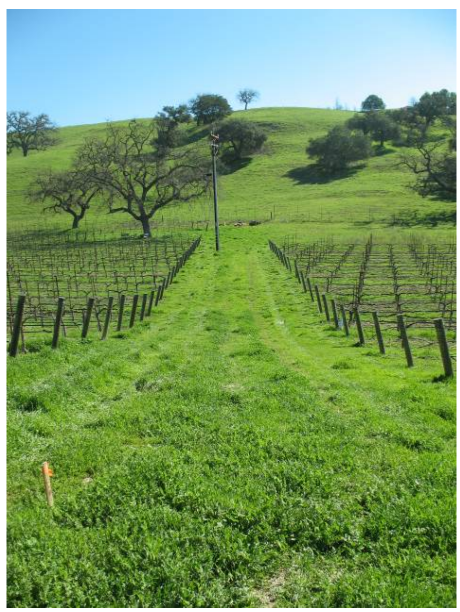
After

7.6.2 FAITH VINEYARD

Faith Vineyard is located in Los Olivos, California. The growers are very mindful of the impact their vineyard could potentially have on water quality. They approached CCVT to learn more about perennial vegetative management and as a team decided to plant Creeping Wild Rye on a bare vineyard road.

Figure 10. Creeping Wild Rye road planting

Before



After

7.6.3 PREMIERE COASTAL VINEYARD

Premiere Coastal Vineyard is located in Los Alamos, California. The vineyard is spread over a system of old dunes and has highly erosive soils. Many of their erosion problems lie at the properties border where neighboring land owners fail to mitigate for soil loss. CCVT staff met with the project grower and planned to plant a strip of Idaho Fescue on a bare road near the properties edge.

Figure 11. Idaho Fescue road planting

Before

After

7.6.4 RIDGE VINEYARD

Ridge Vineyard is located in the Santa Cruz Mountains, California. Farming grapes in the mountains requires an intense erosion control plan before the winter rains begin. Growers at Ridge and CCVT staff worked together to plan and implement management practices for typically problematic areas of the vineyard. In the fall of 2007, Zorro Fescue was planted on a bare road, a Persian Clover/Zorro Fescue mix was planted on newly cut terraces, and an insectary cover crop was planted at their middle vineyard.

Figure 12. Zorro Fescue Road planting

Before

After

Figure 13. Newly Cut Terraces

Before

After

Figure 14. Insectary Cover Crop

Before

After

7.6.5 CAL POLY VINEYARD

The Cal Poly Vineyard is located on the campus of California Polytechnic State University and is used as a student vineyard to learn about management and production of winegrapes. CCVT staff met with the vineyard operator to implement a vegetative management plan for their two vineyard roads that have a 4% slope. The goal was to mitigate soil loss and to integrate the project into the student curriculum. Implementation of Six Week Fescue on one bare road, and Annual Ryegrass on another occurred in the fall of 2007.

Figure 15. Six Week Fescue road planting

Before

After

7.7 BAIT STATION DEMONSTRATIONS

There are a wide variety of chemical solutions for the control of mealybug species in Central Coast vineyards. However, even if there are reduced risk insecticides available for the effective control of these species, biological and cultural control methods need to be practiced in order to make the reduced risk insecticide more effective. A sustainable approach to the management of any pest should not rely strictly on chemicals, even if there are a variety that can be used in rotation. In order to ensure the greatest longevity and success for the control of mealybugs, a diverse range of management strategies should be considered. The initial implementation of some of these strategies may be costly, however in the long term, these costs could balance out as the grower becomes more efficient in their use, and once these practices lessen the reliance on some of the more expensive chemical solutions.

The Argentine Ant can be extremely disruptive to integrated pest management systems. In return for honeydew secretions from mealybugs, these ants tend and protect mealybugs from their natural enemies. In order to effectively manage mealybugs to a point where they become less disruptive, Argentine Ants must be controlled. Once ants are controlled, the potential for biological control systems to be effective are greater than when the ants are present.

Over a two-year period, CCVT project staff and the cooperating growers built 150 PVC ant bait stations (Attachment J) and placed them at a density of 10 bait stations per acre on seven different demonstration vineyards. In each of the ant bait stations, a 2.84L bottle filled with 50% Gourmet Liquid Ant Bait (GLAB) and 50% water, was placed inverted on a bed of rocks placed in a soccer cone. The rocks and the soccer cone acted as a feeding platform for the ants. The GLAB solution is a boric acid solution that is used in the control of Argentine Ants. The low toxicity of this material ensures that the material is taken by the worker ants back to the nest and fed to the brood (newly hatched ant larvae). The material targets the newly hatched brood ensuring that the next population will be reduced through the reduction in the reproductive generation. Because the reproductive stages are targeted, and there is one reproductive cycle per year, it takes several years before there is a noticeable decrease in the population of ants in the vineyard.

Bait stations were installed in the vineyards in April of 2008 and 2009, then were pulled from the vineyard after harvest in October as to prolong the life of the PVC. During the 2008 growing season, these bait stations were implemented into the management practices of the demonstration vineyards. CCVT staff gained valuable grower feedback after harvest regarding their efficacy, management, and whether the demonstration grower would be expanding the practice into other infested blocks or vineyards.

In 2009, CCVT project staff approached the question of efficacy and implemented a monthly weighing program to determine the number of ant visits to each station. According to Reierson et al., 1998, each gram of bait removed from the station correlates to 3,300 ant visits. Project staff assigned each bait station a unique ID number before they were placed into the vineyard. On a monthly basis, they were weighed and the difference between the monthly data sets was used to determine the number of ant visits during that period. For example, bait station number H09 at Hahn Vineyard weighed 3260.195 grams in June 2009 and 2976.699 grams in July 2009. The difference between these weights is 283.496 grams which (multiplied by 3,300 ant visits per gram) correlates to 935,536 ant visits during that period.

Three bait stations were also placed in areas of no ant activity to determine how much of monthly weight loss is due to evaporation. During a three month period, staff found that a less than 3% of the total weight was lost due to evaporation processes.

Figure 16.Constructed PVC Ant Bait Station

7.7.1 ZABALA VINEYARD

Zabala vineyards is located in Soledad, California and neighbors one of Monterey County's rivers, the Arroyo Seco. With such close proximity to a water body, the vineyard manager was concerned about using chemical methods to treat for Argentine Ant and mealybugs, which have had populations in the vineyard since 2005.

In April of 2008, CCVT staff supplied the grower with enough materials for 20 bait stations, covering two acres. Bayer Crop Science donated an imidacloprid active ingredient bait called *Vitis* which was placed inside the bait stations.

Grower feedback from this demonstration noted that though he thought the PVC stations were effective in controlling Argentine Ant populations, the initial cost to expand the practices to other infected areas was too high. Bait stations range from about $18 - $20 each, so per acre costs can be upwards of $200, depending on density. Zabala Vineyards has adopted a gradual approach to implementing this management practice into their vineyard by constructing fifty bait stations annually, enough to cover 5 acres.

7.7.2 LOS ALAMOS VINEYARD

Los Alamos Vineyard is located in Los Alamos, California in Santa Barbara County. Argentine Ants and mealybug populations have been present in six vineyard blocks since 2004. In April of 2008, CCVT staff supplied the grower with enough materials for 20 bait stations, covering two acres, in two separate blocks. Bayer Crop Science donated an imidacloprid active ingredient bait called *Vitis* which was placed inside the bait stations.

The project grower noticed the ants taking to the bait within one week of their implementation and visitations persisted throughout the growing season. The decision was made to expand the use of bait stations to “hot spots” of high infection within the six vineyard blocks were Argentine Ant and mealybug pressures have persisted throughout the years.

7.7.3 SALISBURY VINEYARD

Salisbury Vineyard is located in the Avila Valley, just southwest of San Luis Obispo in San Luis Obispo County. The vineyard is comprised of 40 of Pinot Noir, Chardonnay, Pinot Grigio, Syrah Noir, and newly planted Albariño. The vineyard is situated on sloped terrain and lies close to residential areas, creeks, and the ocean. Because of this, alternative practices to pest control are crucial to keep from impairing local water bodies.

In April of 2008, CCVT staff supplied the grower with enough materials for 20 bait stations, covering two acres on a south facing slope. Bayer Crop Science donated an imidacloprid active ingredient bait called *Vitis* which was placed inside the bait stations.

Grower feedback indicated that plans to maintain the use of the 20 bait stations would continue. However, the cost to expand the practices was not economical for this grower.

7.7.4 CAL POLY/GALLO VINEYARD

The Cal Poly/Gallo Vineyard is located in San Luis Obispo, California. The vineyard is broken up into three large blocks based on soil type. The southern block consists of serpentinitic soils with extremely high clay content which creates crevices ideal for ant populations. Mealybugs have also been present in this vineyard for the past three years.

Bait stations were placed in this vineyard in April of 2008 and 2009 in two separate demonstration blocks. In 2009, 21 bait stations were uniquely labeled and placed into the vineyard at a rate of seven bait stations per acre. On a monthly basis, CCVT staff weighed the bait stations to determine the number of ant visitations for the previous month.

Figure 17. Ants visiting a bait station at the E&J Gallo-owned Cal Poly student vineyard in San Luis Obispo

7.7.5 SIERRA MADRE VINEYARD

Sierra Madre Vineyards east of Santa Maria, had a recent outbreak of vine mealybug in several of their blocks. The population of the mealybugs at this site has been exacerbated by the population of Argentine Ants. The cooperating grower at this site approached CCVT with a desire to implement a management practice to control the Argentine Ants. The information that CCVT provided the cooperating grower was the strategy using the ant bait stations.

In 2008, CCVT provided the grower with instructions on how to build the PVC bait station and materials to construct 30. These stations were implemented throughout a three-acre vineyard block.

The grower's opinion on this management strategy was that the bait stations were relatively easy to build and put out in the field. The initial costs of his stations were high because the end caps that he was able to source out were high. This growers irrigation distributor charged more than CCVT project staff had experienced in the past as a common price for the PVC products needed for the stations. However, his opinion is that the bait stations are relatively indestructible, so he should be able to use them for some time. The cooperating grower liked the activity of ants around the station and continued to observe activity throughout the growing season.

In April 2009, the project grower planned to expand the use of bait stations into neighboring vineyard blocks. CCVT staff constructed 15 additional bait stations, assigned them a unique identification number and weighed them monthly from May through September to determine ant activity.

7.7.6 HAHN ESTATES

Hahn Estes is located in Soledad, California west of the Salinas Valley in the Santa Lucia foothills. The grower approached CCVT about sustainable methods for controlling ant and mealybug populations. Ant populations at Hahn Estates consisted not of the more common Argentine Ant, but the Gray Ant. This ant is just as disruptive to mealybug integrated pest management systems and little is known about its susceptibility to bait stations.

In 2009, CCVT staff constructed 16 bait stations, assigned them a unique identification number and weighed them monthly from May through September to determine ant activity. In August, Associates Insectary donated one thousand predatory beetles, *Cryptolaemus montrouzieri*, to release within the bait station project block. Mealybug destroyers (Cryptolaemus montrouzieri) (MBDs) are a very effective predator against a variety of mealybug species. A characteristic of the mealybug destroyer's juvenile stage is that they produce a smell that is very similar to the mealybug species that it feeds on. The Argentine Ant (Linepithema humile) and mealybug complex makes it very difficult for biological control systems to take effect. Mealybug species produce honeydew when they feed. This honeydew is an excellent food source for Argentine Ants that reside in the vineyard. The excess honeydew produced by the mealybugs is consumed by Argentine Ants. Due to the food source produced by the mealybugs, the Argentine Ants protect them from predators and parasitoids. The advantage that MBDs have over other predators and parasitoids is that it's juvenile stage is ignored due to the aforementioned physical properties.

CCVT staff, along with vineyard scouts, marked mealybug infested areas within the project block and released MBDs accordingly.

Figure 18. A mealybug destroyer approaches a mealybug on a grapevine leaf at Hahn Estates Vineyard in Soledad.

Figure 19. CCVT project staff releases mealybug destroyers into mealybug "hot spots" within the project block.

7.7.7 RIDGE VINEYARD

Ridge Vineyard is located in the Santa Cruz Mountains and is a unique farming environment, set on steep slopes and subject to intense storms. Mealybug populations have been present in the vineyard since 2006 and the grower has been using cultural methods to keep them from spreading into additional blocks. They began using commercial bait stations in 2007, but found that their design was labor intensive as it did not hold much bait and were easily knocked over by wind or equipment. CCVT partnered with Ridge to implement an Integrated Pest Management (IPM) plan for their ant and mealybug populations.

In 2009, staff constructed 20 bait stations , assigned them a unique identification number and weighed them monthly from May through September to determine ant activity. The project area consisted of two acres on a steep, east-facing slope. In July and August, CCVT staff along with the project grower released MBDs into previously scouted and flagged areas of concentrated mealybug populations. The beetles released in July were able to attack the mealybug eggs, rendering lower summer populations. The MBD release in August focused on eliminating the surviving adults.

Figure 20. A Mealybug Destroyer attacks a mealybug egg sack

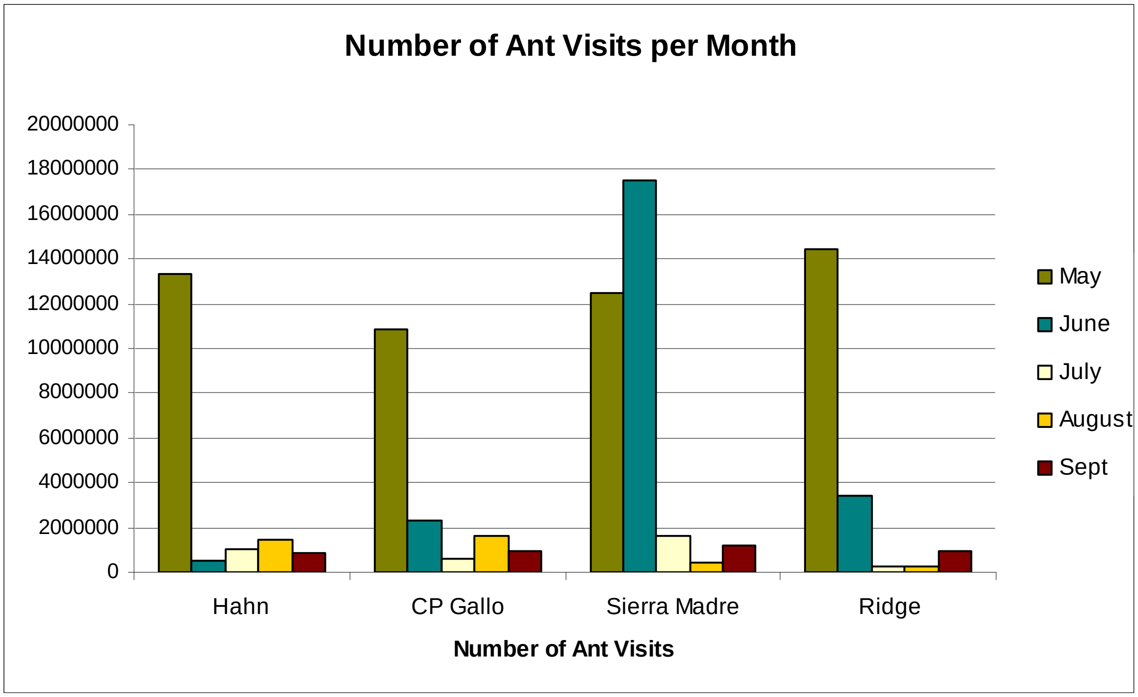
Figure 21. Mealybug Destroyers come in vials for release in vineyards

Figure 22. Mealybug Destroyers predate on mealybug egg sacks and adult mealybugs in the vine canopy.

7.7.8 RESULTS AND DISCUSSION

Using bait stations as an IPM strategy for mealybug control needs to be implemented in the vineyard for several years before pest populations are significantly affected. It is key that during the first year, the grower is knowledgeable about the level of ant activity at the bait stations. Grower feedback indicated that there was vibrant ant activity at the bait stations within 24-hours of their implementations.

Project staff recorded weights of bait stations in 2009 to determine the volume of ants taking to the bait. According to Reierson et al., 1998, each gram of bait removed from the station correlates to 3,300 ant visits.



Graph 22. Number of Ant Visits per Month.

As shown in graph 21, when the bait stations are first introduced into the vineyard, ant activity is high. This could be caused by an ant pheromone that is present in the bait, attracting large numbers of ants. In June, ant activity decreases significantly. This trend could be caused by the ants moving up into the vine to feed on mealy-bug produced honeydew, warm weather causing ant colonies to feed and forage less, or bait concentration being at a level high enough to kill initial foragers.
To really understand the process of ant population control, this project should be implemented over a three-year period. At this time, if a significant decrease in ant visits persists, it could be assumed that the populations have been affected.

Grower feedback from this project was positive. They thought the bait stations were durable, effective in dispensing the bait, and easy to manage around. Though the initial investment is high, bait stations can last for several years and be replaced as they crack or become brittle.

Below is feedback from the grower at Ridge Vineyard regarding the implementation of bait stations in the Santa Cruz Mountains:

At Ridge Vineyards in the Santa Cruz Mountains, we have been utilizing ant bait stations for the past two growing seasons. We noticed a small infestation of Grape Mealybugs in a cordon trained, spur pruned block of Merlot in the summer of 2006. The following spring, we placed ant bait stations in the vineyard at a very low density and conducted our first release of Mealybug Destroyer beatles (Cryptoleamus montrouzieri). The ant bait stations helped to depress the population of the Argentine Ant, which in turn allowed the Mealybug Destroyers to voraciously attack the Grape Mealybug egg masses and crawlers. We noticed no new areas of infestation the following year. With the help of Gaylene Ewing, Project Technician *with the Central Coast Vineyard Team, we increased our ant bait station density and once again released Mealybug Destroyers. During harvest, our scouts kept an eye out for the Grape Mealybugs in the clusters and on the vegetative portions of the vine. Barely any were found, and once again the smaller population had not spread to a new area of the vineyard. This program of ant control coupled with beneficial insect releases has proven to be an effective and low impact method to control Grape Mealybugs. If the infestation in a vineyard is found early enough, the populations can be controlled by utilizing these two practices.*

8.0 PUBLIC OUTREACH

CCVT has established outreach and education programs reaching growers both within and beyond the Central Coast. This program reaches a large audience well beyond its membership or project participants. Not only does CCVT conduct independent educational meetings, they also frequently coordinate with other local and statewide winegrape organizations (i.e., Paso Robles Wine Country Alliance, San Luis Obispo Vintners and Growers, Monterey County Vintners and Growers, Central Coast Wine Growers Association, Santa Barbara Vintners and Growers, California Sustainable Winegrowing Association, Santa Cruz Mountains Vintners and Growers Association, and the California Association of Winegrape Growers). In addition, CCVT has established working/educational relationships with Farm Bureaus, watershed groups, and the Five County Farm Bureau Watershed Coalition, so there are opportunities to reach growers of other agricultural commodities. Finally, these educational events will provide continuing education credits to help growers meet their 15 hour requirement for the ag waiver.

Public outreach is separated into six categories:

- CCVT Hosted Outreach & Education Events
- Community Outreach
- UCCE Publication & CCVT Newsletters
- Articles
- Website

CCVT hosted two project-specific field days attended by Central Coast wine grape growers in 2008 and 2009, as well as two Sustainable Ag Expos which reached a broader audience of California agriculture. Total field day and Expo cumulative attendance totaled 766 attendees representing 296,199 cumulative acres.

Project staff attended thirty-four community based events reaching approximately 114,085 community members throughout the funding period.

Project information was distributed through quarterly CCVT Newsletter publications as well as at CCVT hosted educational events throughout the Central Coast.

Articles informing wine grape industry members and general ag audiences were published in twenty-two publications with circulations of approximately 180,000.

Website outreach was significantly improved during the funding period; visits to www.vineyardteam.org grew each year and visitor numbers increased during key events such as the Sustainable Ag Expo and the Earth Day Food & Wine Festival and during the CCVT's tailgate and workshop season.

8.1 CCVT HOSTED OUTREACH & EDUCATION EVENTS

CCVT organized and facilitated a total of forty-five tailgates and workshops from 2007 through 2009. These events had a cumulative attendance of 1,889 participants representing 456,155 acres. Many CCVT outreach events repeated three times, one in each San Luis Obispo, Santa Barbara, and Monterey County. This allows for the information to be more available to growers and reaches more growing regions.

Project information was presented on May 3rd, 2007 at Sunnybrook Vineyard in Paso Robles. The tailgate focused on methods for weed control as an alternative to Simazine. Growers gathered at the research site where handouts, posters, and project staff disseminated project data to participating growers. With the meeting held at the research site, growers were able to see first-hand the effects of the five different treatments on weed populations.

Additionally, project information was presented at the Monterey County Annual Meeting on June 14th, 2007 and at the Sustainable Vineyard Tour on May 15th, 2008. Project staff presented on filter strip width, beneficial insect habitat plantings, cover crop suitability, and bait stations at these meetings.

On March 17th, 2009 CCVT hosted a Water Quality and CCVT Project Update at Pomar Junction Vineyard in Templeton. Project staff presented information from all field demonstration and research projects that took place during the project period. Pomar Junction Vineyard was the site of three replicated trials on vegetative road management and a cover crop suitability trial using the rain simulator and erosion boxes. Participants received a packet of information regarding CCVT projects including data on filter strip widths, vegetative road management, beneficial insect habitats, alternative weed management, and bait stations as well as a cost analysis on these.

In 2008, CCVT began a transition from using the Positive Points System™ to the SIP™ Vineyard Certification Standards as a self-assessment tool. The SIP™ standards were developed over a period of almost four years. CCVT completed the standards and incorporated hundreds of comments from an extensive, facilitated peer review involving governmental, environmental, social, agricultural, and academic representatives. In general, using the SIP™ standards as a self assessment tool provides growers with a more updated and comprehensive approach to guide growers to adopting practices that protect both human and natural resources.

The 2007 Sustainable Ag Expo (SAE) was held on November 2 – 3rd at the Paso Robles Event Center. It was attended by over 300 participants representing a variety of crops, as well as ranching and livestock operations from across California, representing 120,132 acres. In addition, a breakout session was offered in Spanish focused on irrigation management. Over thirty Spanish speaking employees participated in the irrigation seminar.

The 2008 SAE was held on November 13 – 14th at the Monterey Fairgrounds. It was attended by approximately 350 participants including row-crop farmers, ranchers, orchard farmers, and many other farming operations representing approximately 144,828 acres. The expo featured an extended agenda, indoor and outdoor tradeshow featuring sustainable products and companies, and a new panel on sustainability initiatives in the marketplace.

All SAE agendas are included in Attachment K.

Event	Location	Attendance	Acres Represented	Date
PPSWorkshop	Soledad, CA	4	1,152	1.16.2007
PPSWorkshop	Lompoc, CA	15	2,092	1.17.2007
PPSWorkshop	Paso Robles, CA	51	6,923	1.18.2007
Exploring Organic Methods 1: Fertility & Pest Control	Templeton, CA	54	12,000	2.20.2007
Vineyard Nutrient Management	Templeton, CA	54	1,400	2.28.2007
Exploring Organic Methods 2: Weed Control	Templeton, CA	37	10,350	3.13.2007
Spanish Pesticide Handler and Label Review	Santa Ynez, CA	28	1,200	3.27.2007
Spanish Pesticide Handler and Label Review	King City, CA	6	200	3.28.2007
Spanish Pesticide Handler and Label Review	Paso Robles, CA	16	800	3.29.2007
Communicating Sustainability in the Tasting Room	Buellton, CA	10	NA	4.10.2007
Communicating Sustainability in the Tasting Room	Paso Robles, CA	18	NA	4.12.2007
Sustainable Winegrowing Self Assessment Workshop	Templeton, CA	62	1,2000	4.13.2007
Exploring Organic Methods 3: Certification	Paso Robles, CA	16	867	4.18.2007
CCVT Research Site Visit: Pesticide Mitigation	Paso Robles, CA	36	6,594	5.3.2007
Vineyard Floor Management: From Cover Crops to Irrigation	Los Alamos, CA	36	1,726	5.15.2007
Vineyard Floor Management: From Cover Crops to Irrigation	Paso Robles, CA	30	6,084	5.17.2007
Beneficial Insect Rodeo	Santa Maria, CA	18	6,430	6.5.2007
Beneficial Insect Rodeo	Templeton, CA	31	3,440	6.6.2007
DPR Pesticide Management Tour and Demonstration	San Luis Obispo, CA	30	NA	6.11.2007
Monterey County Annual Meeting	Salinas, CA	14	9,610	6.14.2007
Oak & Wildlife Habitat Restoration	Templeton, CA	22	2,883	6.20.2007
Certified Sustainably Grown	Paso Robles, CA	60	15,000	6.28.2007
Communicating Sustainability in the Tasting Room	Cupertino. CA	28	NA	9.27.2007
Sustainable Ag Expo	Paso Robles, CA	300	120,132	11.1.2007
Water Quality on the Central Coast	Paso Robles, CA	34	5,309	12.14.2007
PPSWorkshop	Los Alamos, CA	7	1,332	1.15.2008
PPSWorkshop	Paso Robles, CA	20	634	1.16.2008
PPSWorkshop	Soledad, CA	6	3,200	1.17.2008
Irrigation Management	Lompoc, CA	23	1,900	2.19.2008
Irrigation Management	Salinas, CA	14	4,234	2.20.2008
Irrigation Management	Paso Robles, CA	26	2,865	2.21.2008
Spanish Pesticide Handler Safety Training	Paso Robles, CA	42	NA	3.12.2008
Spanish Pesticide Handler Safety Training	Los Alamos, CA	23	NA	3.13.2008
Communicating Sustainability	Paso Robles, CA	22	9,000	3.18.2008

Communicating Sustainability	Los Olivos, CA	7	78	3.19.2008
Communicating Sustainability	Salinas, CA	6	6,805	3.20.2008
Sustainable Vineyard Tour	Cupertino, CA	20	1,566	5.15.2008
Small Farm Equipment Demonstration	Templeton, CA	61	2,600	5.29.2008
Sustainable Ag Expo	Monterey, CA	350	144,828	11.13.2008
Pruning Diseased Vines and Frost Protection	Paso Robles, CA	77	14,032	12.16.2008
Self-Assessment Workshop	Paso Robles, CA	40	3,851	1.13.2009
Self-Assessment Workshop	Arroyo Grande, CA	5	690	1.20.2009
Vine Health & Balance/Nutrient Management and Composting	Paso Robles, CA	43	5,138	2.25.2009
Water Quality and CCVT Project Update	Templeton, CA	54	25,930	3.17.2009
Spanish Workshop: Pest and Disease I.D.	Paso Robles, CA	49	NA	4.23.2009
TOTAL	45	1,889	456,155	

8.2 COMMUNITY OUTREACH

CCVT staff attended a total of 34 events held in the community to talk with community members about CCVT project work and sustainable agriculture. Through meeting attendance and community involvement, CCVT had approximately 114,085 impressions. The following table lists the events, dates, locations, and estimated attendance.

Event	Location	Attendance	Date
San Luis Obispo Farmer's Market	San Luis Obispo, CA	900	3.1.2007
San Luis Obispo Farmer's Market	San Luis Obispo, CA	900	3.15.2007
Santa Barbara Farmer's Market	Santa Barbara, CA	1,000	3.17.2007
San Luis Obispo Farmer's Market	San Luis Obispo, CA	1,000	3.29.2007
Templeton Farmer's Market	Templeton, CA	600	3.31.2007
Los Osos Farmer's Market	Los Osos, CA	300	4.2.2007
Santa Barbara Farmer's Market	Santa Barbara, CA	1,100	4.7.2007
Los Osos Farmer's Market	Los Osos, CA	500	4.9.2007
San Luis Obispo Farmer's Market	San Luis Obispo, CA	1,200	4.12.2007
Barrels in the Plaza	San Luis Obispo, CA	700	5.1.2007
Water Fest 2007	Atascadero, CA	300	5.5.2007
Paso Robles Wine Festival	Paso Robles, CA	5,000	5.19.2007
Atascadero Wine Festival	Atascadero, CA	1,000	6.23.2007
Grape Escape Day	Paso Robles, CA	35	8.3.2007
San Diego Bay Food & Wine Festival	San Diego, CA	20,000	11.18.2007
Cal Poly Wine Festival	Santa Margarita, CA	1,000	4.26.2008
Barrels in the Plaza	San Luis Obispo, CA	700	5.1.2008

Water Fest 2008	Atascadero, CA	300	5.3.2008
Slow Food Nation	San Francisco, CA	60,000	8.30.2008
PRWCA Tasting with Halter Ranch	Santa Monica, CA	700	2.14.2009
Templeton Farmer's Market	Templeton, CA	600	3.14.2009
Cambria Farmer's Market	Cambria, CA	400	3.20.2009
Templeton Farmer's Market	Templeton, CA	600	3.21.2009
Cambria Farmer's Market	Cambria, CA	400	3.27.2009
Templeton Farmer's Market	Templeton, CA	600	3.28.2009
Cambria Farmer's Market	Cambria, CA	400	4.3.2009
Templeton Farmer's Market	Templeton, CA	600	4.4.2009
Paso Robles Business Expo	Paso Robles, CA	1,500	4.8.2009
Templeton Farmer's Market	Templeton, CA	600	4.11.2009
Paso Robles High School Earth Day	Paso Robles, CA	2,000	4.21.2009
Cal Poly Wine Festival	Santa Margarita, CA	2,200	4.25.2009
Paso Robles Wine Festival	Paso Robles, CA	6,000	5.16.2009
Sustainable Brands Conference	Monterey, CA	500	6.2.2009
TOTAL	34	114,085	

8.3 NEWSLETTERS

CCVT Newsletters disseminated project and other relevant information to approximately 2,800 recipients on a quarterly basis throughout the course of the project. CCVT newsletters contained a variety of topics including ag waiver notifications and reminders, erosion control issues, pest management issues, Sustainable Ag Expo information, tailgate meeting announcements, project results and findings, grower testimonies and interviews along with other useful information. Full copies of CCVT Newsletters distributed during the funding period can be found in attachment L.

8.4 ARTICLES

Information CCVT programs was published in the following wine grape trade and general grower publications. Full articles can be found in Attachment R.

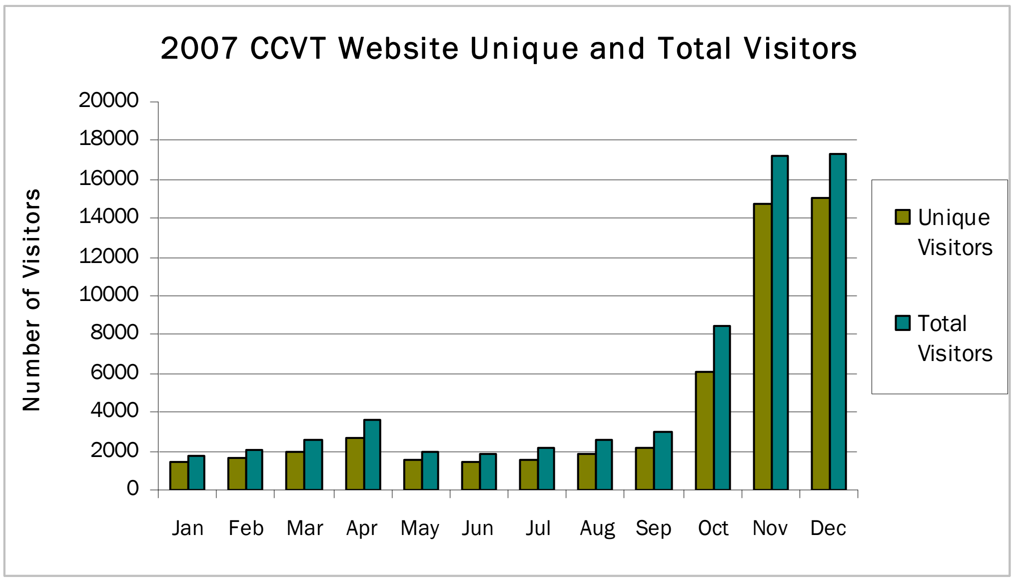
Article Title	Publication	Date of publication
CCVT Yields Creative Results	Behind the Wines	January 15th, 2007
Sustainable Agriculture Q & A	Behind the Wines	March 1st, 2007
Central Coast Growers Study Best Ways to Use Cover Crops	Ag Alert	June 13th, 2007
Central Coast Vineyard Team Hosts Oak Regeneration	Mighty Oaks	August 1st, 2007
Cover Crop Suitability in Central Coast Vineyards	CAPCA Advisor	August 1st, 2007
Central Coast Vineyard Team Tackles Runoff Issue	Western Farm Press	August 18th, 2007
Sustainable Winegrowing Promoted with CCVT Calendar	Wine Business Monthly	January 1st, 2008
Pilot Program for Certified Sustainable Vineyards	California Vineyard	January 8th, 2008
Pilot Program	Wine Business Monthly	January 10th, 2008
Fourth Annual Ag Expo Provides Interactive Environment	Farm Focus	July 1st, 2008
Vineyard Sustainability Now Certified	Wines & Vines Online	July 29th, 2008
Sustainability Audits on the Central Coast	Wines & Vines	September 1st, 2008
Ag Expo Will Cover a Lot of Ground	Wines & Vines Online	November 3rd, 2008
Good Stewards of the Land	Wine Business Monthly	February 1st, 2009
Central Coast Vineyard Team Receives Prestigious Green Award from Central Coast Magazine	Wine Business Monthly	February 2nd, 2009
White, Red and Green All Over	Vintages	March 1st, 2009
Sustainable Agriculture and the Central Coast Vineyard Team	Reign of Terroir	March 24th, 2009
Sustainable Certification Programs	Wine Business Monthly	July 1st, 2009
Evaluation of Common Vineyard Cover Crops	Paso Robles Wine Country News	November 1st, 2009
Effect of Beneficial Habitat Cover Crop Density on Insect Populations at Ridge Vineyard, Santa Cruz Mountains	CAPCA Advisor	December 1st, 2009
TOTAL	20	

8.5 WEBSITE

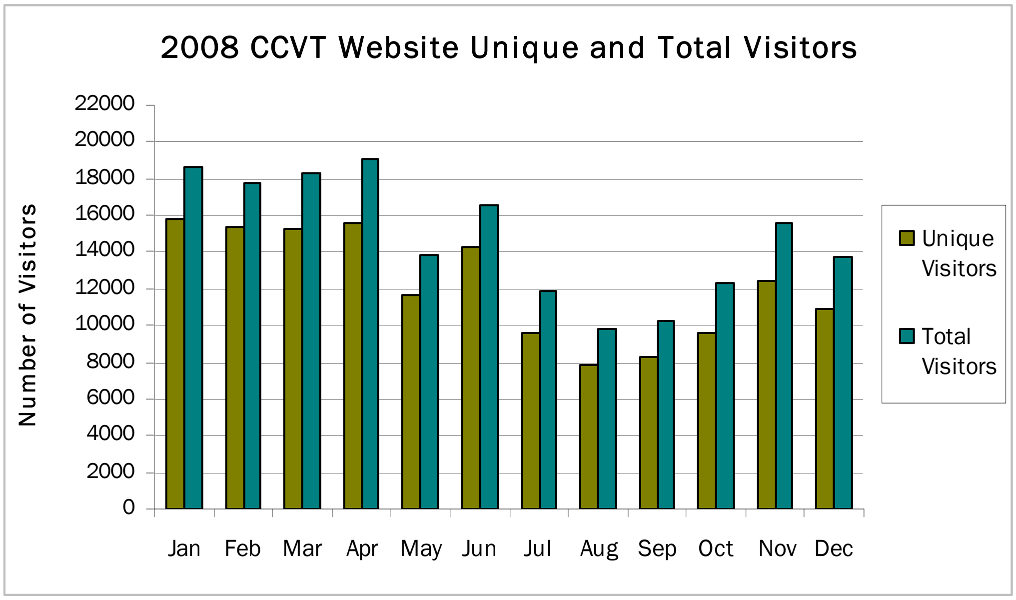
Throughout the funding period, CCVT made a number of updates and improvements to www.vineyardteam.org. In October 2007, CCVT received a Google Ads grant that significantly increased website traffic, both in unique and total visitors.

The event calendar was updated continually with information on educational events including those hosted by CCVT and events held by other industry organizations. This interactive calendar is one of the most highly visited pages on vineyardteam.org and provides information on meeting titles, speakers, continuing education qualifications, the ability for attendees to RSVP online, and a map of the meeting location. Any resources directly linked to an event, such as a PowerPoint presentation or handout, can also be uploaded to this page and made available to attending growers.

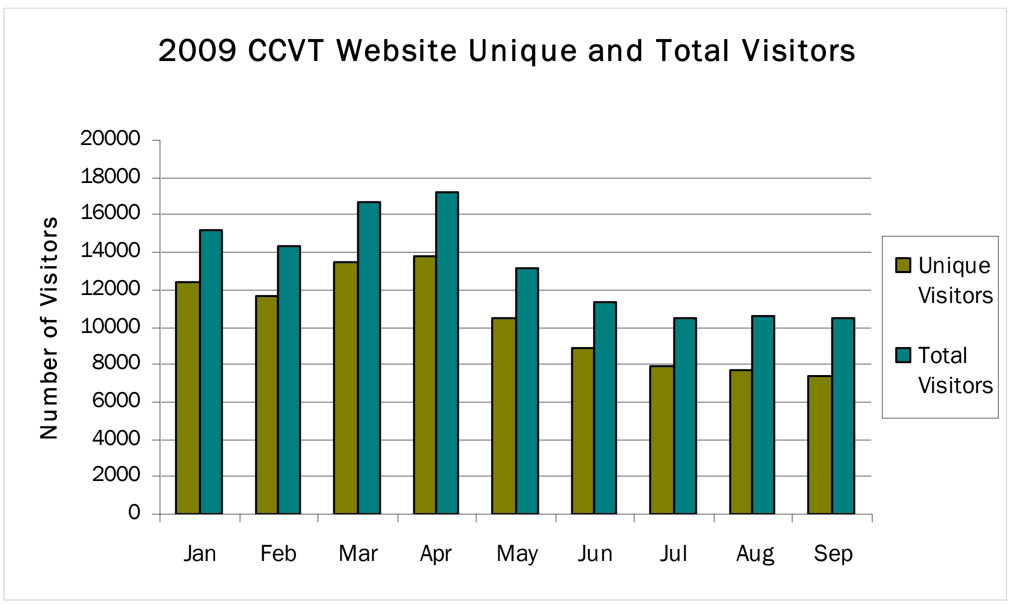
Updates also included online PDF versions of all CCVT newsletters with a brief outline of the newsletters' content. Website visitors are able to browse through CCVT newsletters, select one that is most relevant to their search, and read the documents online or print it, if necessary. Other resources were made available through the development of the Resource Library so growers can research information on sustainable winegrowing. The library includes information on Viticulture Management, Soil Management, Irrigation and Wells, Erosion & Runoff Control, Air Quality and Energy, Social Equity, Pest Management, and Continuing Education. Resources include books, articles, websites, handouts, presentations and more.



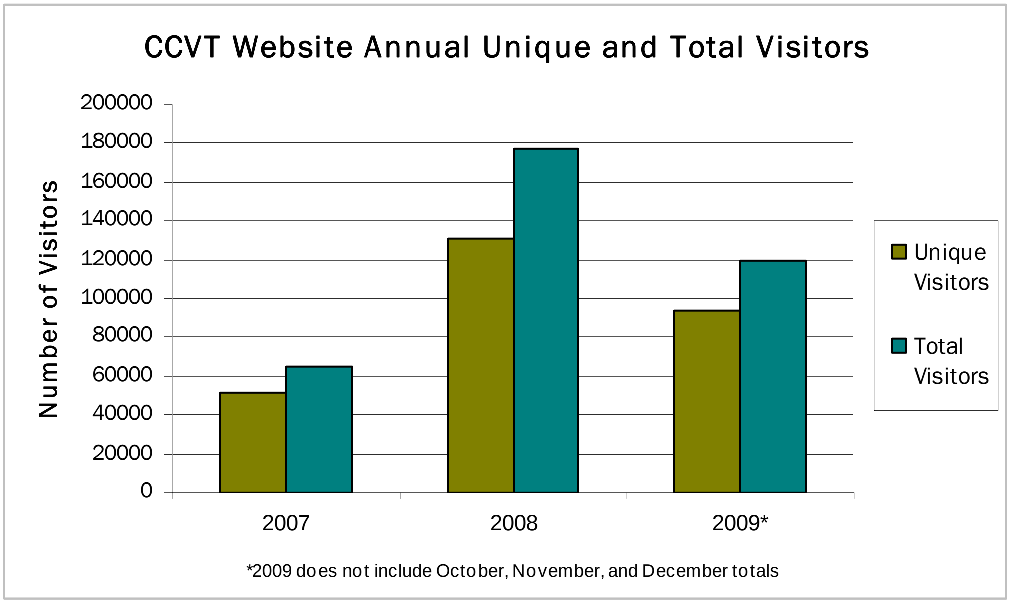
Graph 23. 2007 CCVT Website Unique and Total Visitors shows an increase over the course of a year. Significant growth occurred in October, correlating to the received Google Ads grant.



Graph 24. 2008 CCVT Website Unique and Total Visitors shows website traffic spikes correlating to two annual events; Sustainable Ag Expo, and the Earth Day Food & Wine Festival. Continued high visitor numbers from January through June correlates to directly to the outreach and education season where most of CCVT's educational meetings take place.



Graph 25. 2009 CCVT Website Unique and Total Visitors shows number of visitors from January through September of 2009. An increase in website visits occurred in the spring leading up to the Earth Day Food and Wine Festival.



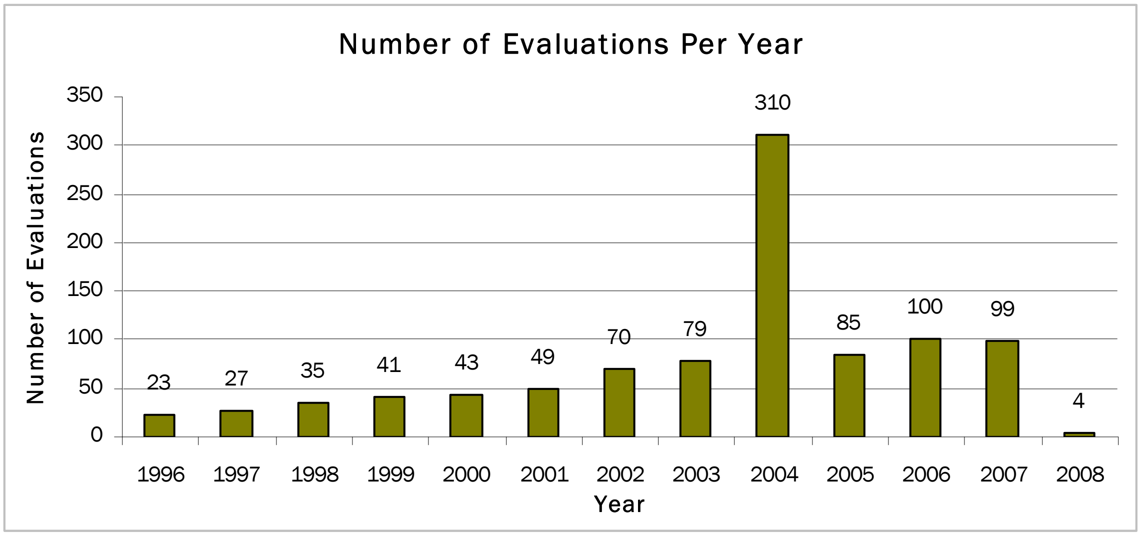
Graph 26. 2007-2009 Annual Unique and Total Visitors compares data on website visits during the project period. Note that 2009 data does not include the months of October, November and December as this report was prepared prior to these months.

Overall, CCVT website visitation seems to consistently increase over time; from less than 2,000 unique visitors in January 2007, to over 9,000 visitors in September 2009. With more interactive tools available for users and more frequently updated information, the CCVT website has become the primary tools in keeping the industry informed on projects and programs.

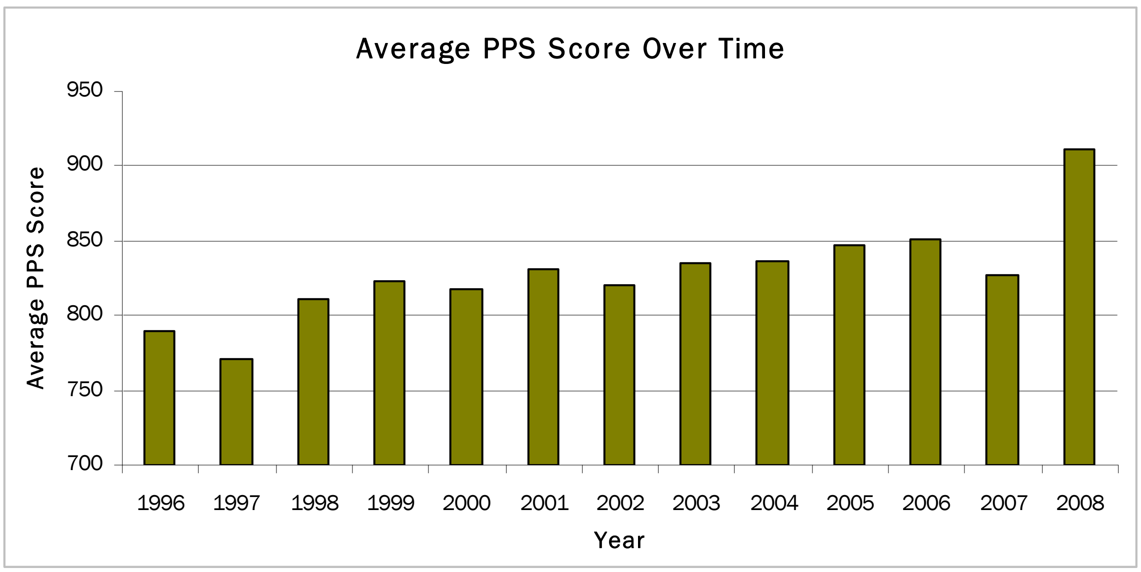
9.0 POSITIVE POINTS SYSTEM (PPS™) ANALYSIS

CCVT holds a minimum of three self-evaluation workshops every January to help growers complete their PPS™ evaluation for the previous growing season. The PPS™, along with a Future Farm Plan qualify as a grower's farm plan for the Regional Water Quality Control Boards Ag Discharge Waiver Program. This piqued PPS™ participation in 2004 as growers used to the PPS™ to attain compliance with the Ag Waiver. The number of PPS™ evaluations collected and analyzed increased from 79 to 310 from 2003 to 2004 (Graph 26). Increased participation also elevated the amount of acreage affected by the PPS™ (Graph 27). In general, average annual PPS™ scores experienced a steady increase over time, with an average score of 789 in 1996 and 826 in 2007.

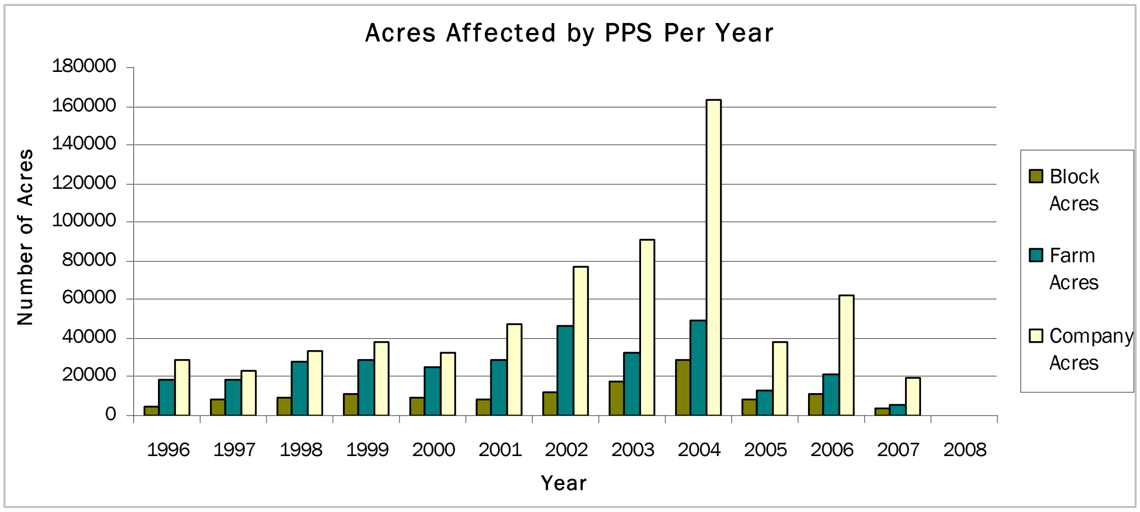
In 2008, CCVT began a transition from using the Positive Points System™ to the SIP™ Vineyard Certification Standards as a self-assessment tool. The SIP™ standards were developed over a period of almost four years. CCVT completed the standards and incorporated hundreds of comments from an extensive, facilitated peer review involving governmental, environmental, social, agricultural, and academic representatives. In general, using the SIP™ standards as a self assessment tool provides growers with a more updated and comprehensive approach to guide growers to adopting practices that protect both human and natural resources. Because of this, the number of PPS™ evaluations for the 2008 growing season severely decreased as growers moved toward adopting the SIP™ standards as a new self-assessment tool.



Graph 27. 1996 through 2008 number of evaluations per year.

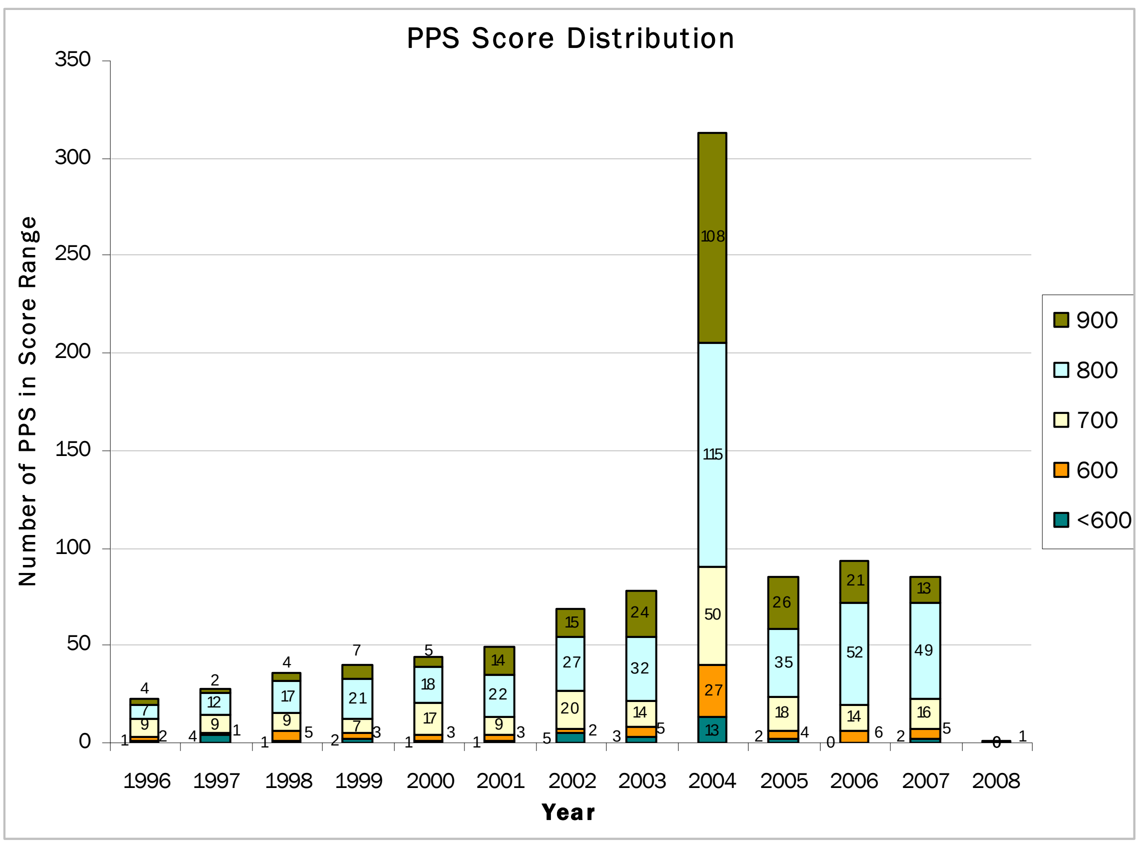


Graph 28. 1996 through 2008 Average PPS scores over time.



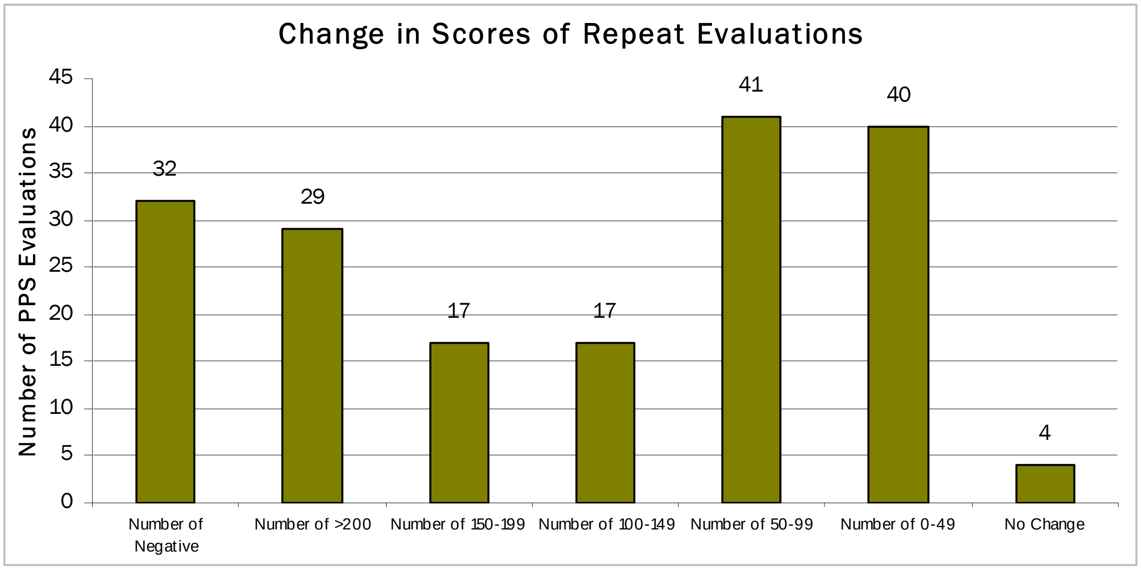
Graph 29. 1996 through 2008 acres affected by PPS.

Growers completing the PPS™ have, on average, typically scored over an 800 since 1998. The few growers that completed their PPS™ evaluations in 2008 scored high, showing a dramatic increase in average PPS™ score for 2008. Graph 29 shows that 60% or more of the participating growers score an 800 or above, with very few growers scoring below 600 points.

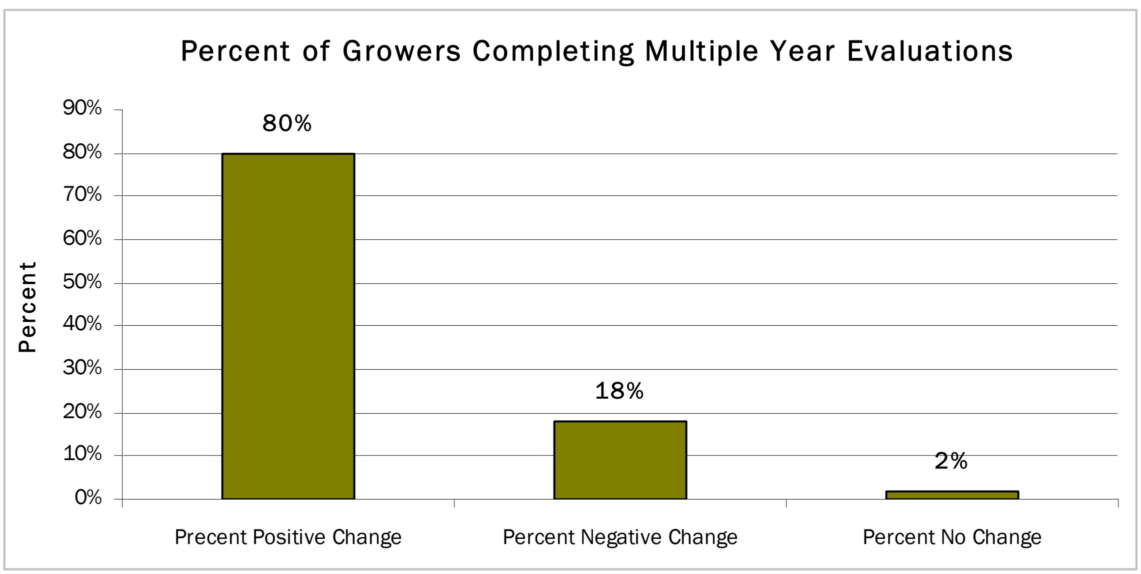


Graph 30. PPS™ score distribution 1996 through 2008.

Of the 681 blocks that have been evaluated since 1996, 180 have been evaluated for multiple years. Analyzing the changes specific to these blocks allows us to assess the management practices adopted at a particular site. Of the blocks that have completed multiple year PPS™ evaluations, 80% of them have seen a positive change in their score (Graph 30). 45% of repeat evaluations saw increases in their scores from 1-99 points. Increasing PPS™ scores on a particular block over time indicates the adoption of new practices. Growers agree that the process of self-evaluation helps bring several issues to the forefront and helps remind growers of ways they can improve their management.



Graph 31. Change in scores of repeat evaluations.



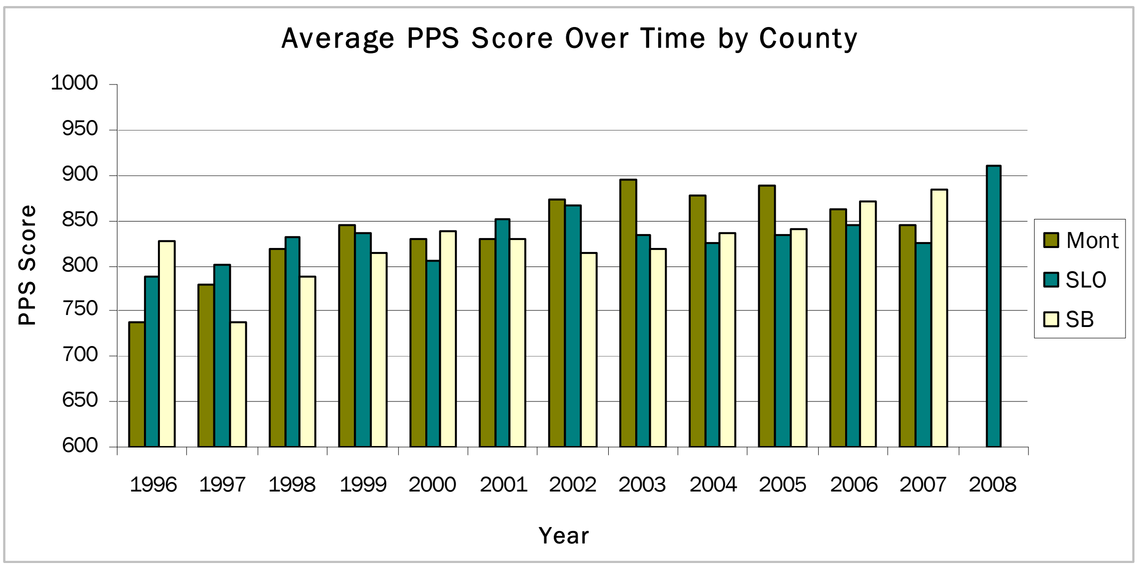
Graph 32. Percent of growers completing multiple year evaluations.

9.1 PPS™ COUNT ANALYSIS

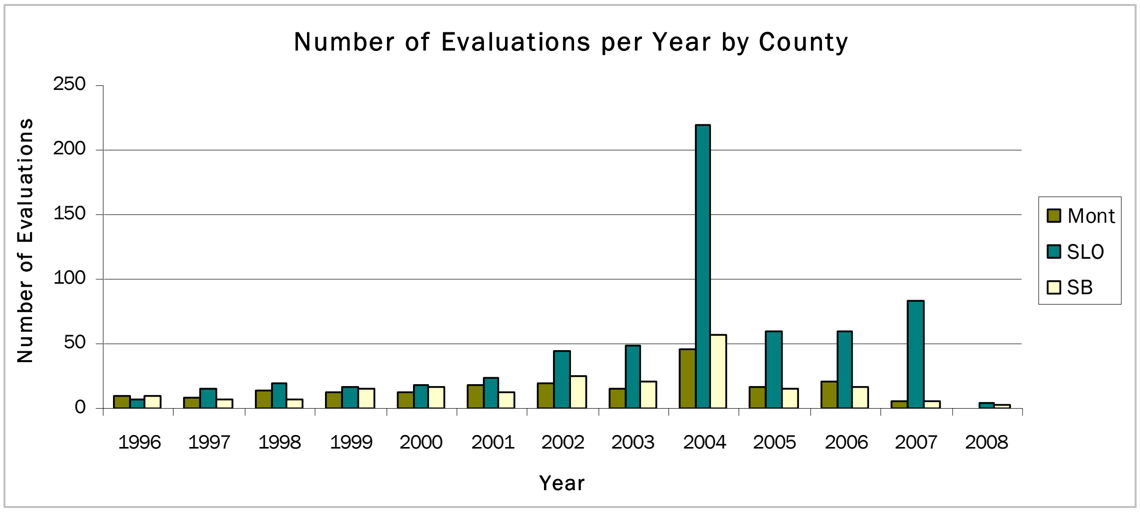
CCVT is able to look at the different scores of growers in different counties. Each county is unique in the was that winegrapes are grown. For example, Monterey County (Mont) comparatively has large acreage, but only a handful of management companies farm these winegrapes. Alternatively, San Luis Obispo (SLO) County has a significant number of acres planted to winegrapes, but there are a large number of growers farming this land.

The different growing regions and diverse farming styles are going to lead to dissimilar PPS™ scores. In Graph 32, it can be seen that Monterey county consistently completes the lowest number of evaluations annually, and Graph 32 shows that Monterey County participation acreage is greater, especially from 1996 through 2002.

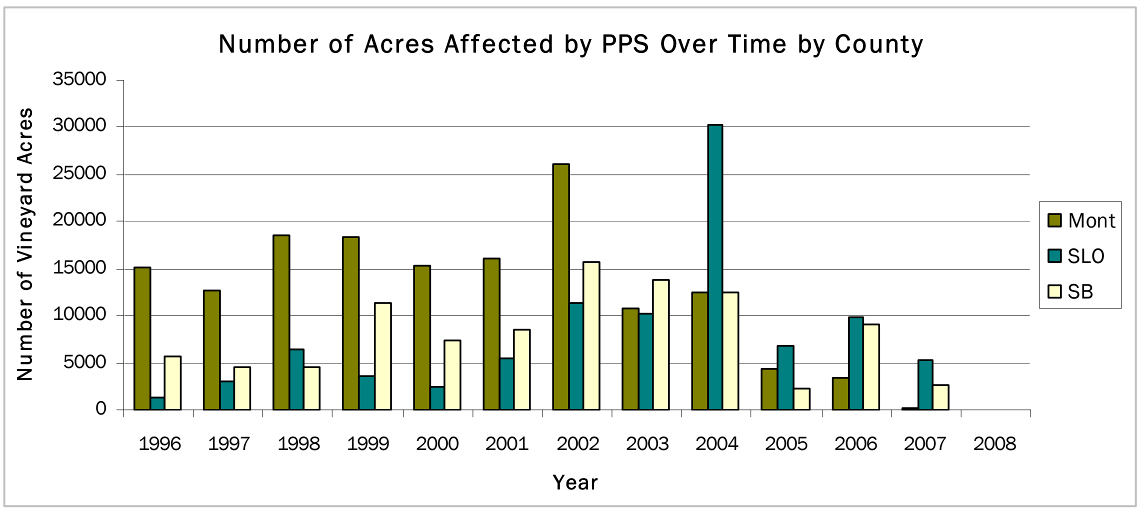
Generally, Monterey County has been highly affected in terms of acreage by the PPS™ (Graph 34), however in the past few years, several of the large management companies who have used the PPS™ in the past have not done so recently. SLO county has become the most impacted county in terms of acreage by the PPS™ (Figure 33). This is likely due to the fact that the location of the organization is in SLO County and our presence in this area is greater, thus resulting in a larger participation in this area. Also, this county has highly involved regional associations, keeping growers up to date on requirements and management practices.



Graph 33. 1996 through 2008 Average PPS scores over time. by county.



Graph 34. 1996 through 2008 number of evaluations per year by county.



Graph 35. 1996 through 2008 number of acres affected by PPS over time by county.

9.2 SIP™ CERTIFICATION STANDARDS AS SELF ASSESSMENT

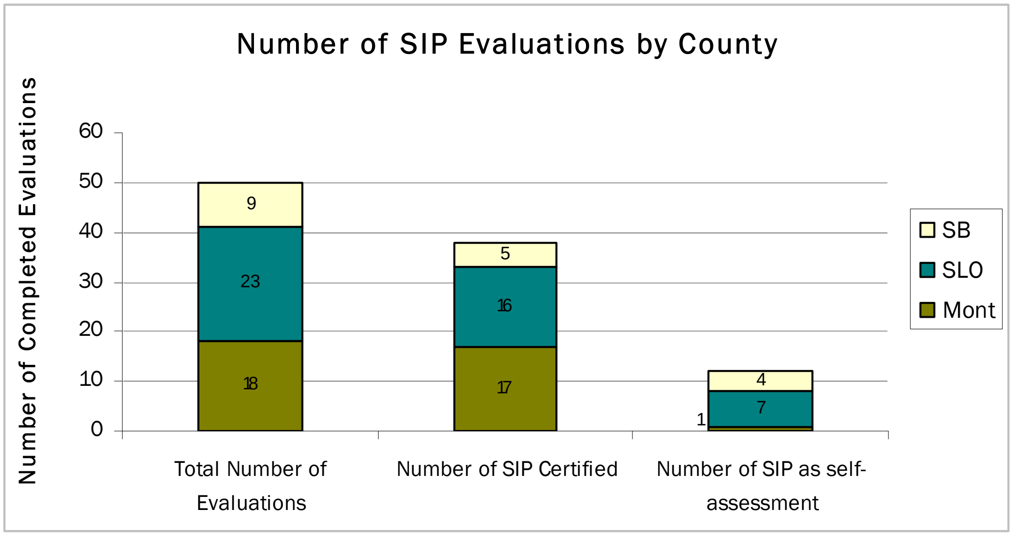
In 2008, CCVT transitioned from using the PPS™ to the Sustainability in Practice (SIP™) Vineyard Certification standards as a self assessment tool. Over a period of almost four years, CCVT completed the standards and incorporated hundreds of comments from an extensive, facilitated peer review involving governmental, environmental, social, agricultural, and academic representatives.

The standards include ten chapters:

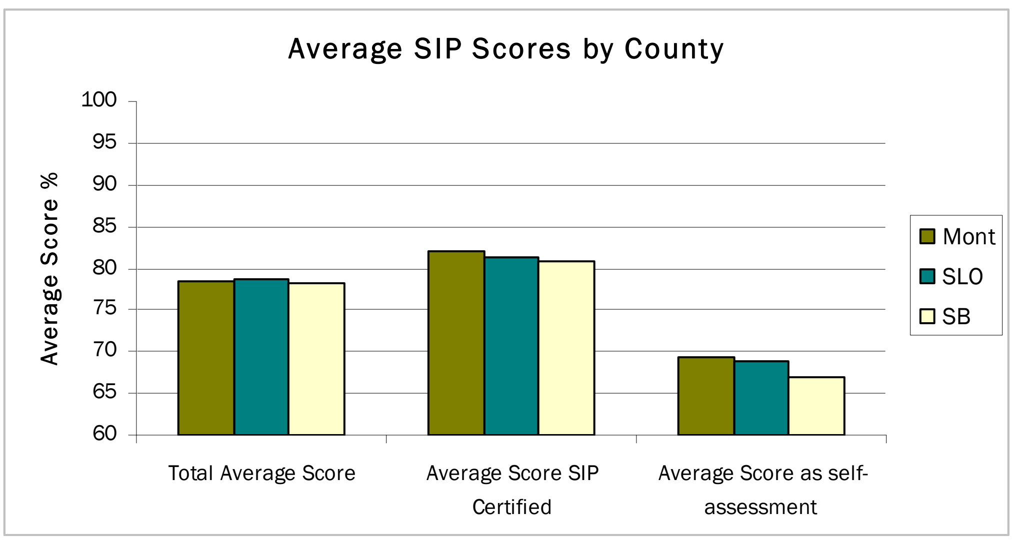
1) Conservation and Enhancement of Biological Diversity
2) Vineyard Acquisition/Establishment and Management
3) Soil Conservation and Water Quality
4) Water Conservation
5) Energy Conservation and Efficiency
6) Air Quality
7) Social Equity
8) Pest Management

9) Continuing Education
10) Product Assurance and Business Sustainability

In January of 2009, CCVT held a series of workshops to work with growers on filling out their SIP™ Self Assessments (SSAs). Fifty evaluations were completed representing over 10,000 vineyard acres on the Central Coast.



Graph 36. Number of SIP Evaluations by County.



Graph 37. Average SIP Scores by County

10. PROJECT GROWER INTERVIEW

In the Fall of 2008, CCVT sent out project grower surveys (Attachment Q) to 53 growers that have been involved in projects since 2002. These projects include BIFS (Biologically Integrated Farming Systems), CWP (Clean Water Project), Cover Crops and Water Quality Project, Pesticide Mitigation Project, and Water Stewardship Project (present).

Growers that provided input on their involvement with the Central Coast Vineyard Team represent 2,000 acres in four different counties; Santa Cruz County, Monterey County, San Luis Obispo County, and Santa Barbara County.

Through project grower surveys, CCVT learned that project information was shared with other growers outside their company, was a factor in current decision making, and increased understanding of farming practices related to demonstration and/or studies done at project vineyards. Over 80% of growers agreed that Information they learned through project work is a factor in current decision making and 87% of project growers agree that project involvement increases understanding of farming practices related to demonstration and/or studies done at their vineyard. 50% of growers involved in project work expanded the practices into 18 additional vineyard blocks consisting of 633 acres.

Growers also provided feedback on working with CCVT staff and project management. Project growers agreed communications received from CCVT staff were clear and thorough, consistent project data was received from CCVT staff, data collected at project vineyards was useful and that CCVT staff was knowledgeable, helpful and easy to work with. Growers were asked to rate if CCVT adequately outreached project information to the winegrape industry and most agreed that project outreach was sufficient, however when asked to rate if CCVT adequately outreached project information to the non-ag community, growers felt like there was room for improvement.

Being involved as a CCVT project grower is learning experience that raises awareness of vineyard operations outside the project realm. Table 8 shows specific management practices that have been incorporated into project vineyards as a result of CCVT involvement.

Table 11. Sustainable Management Practice Incorporation

Sustainable Management Practice	% of project growers incorporating practice
Decrease in the use of organophosphates	36%
Decrease in the use of Category-1 materials	36%
Adoption of cover crops or modification of cover	71%
Beneficial insectary plantings	36%
Use of low-risk pesticides	43%
Planting a road cover	50%
Specific pest monitoring	43%
Use of beneficial insects/natural enemies	36%
Placement of owl boxes within the vineyard	36%
Alternate row spraying	21%
Adoption of irrigation management strategies	29%
Use of ant bait stations	21%
Creating or preserving habitat diversity	43%