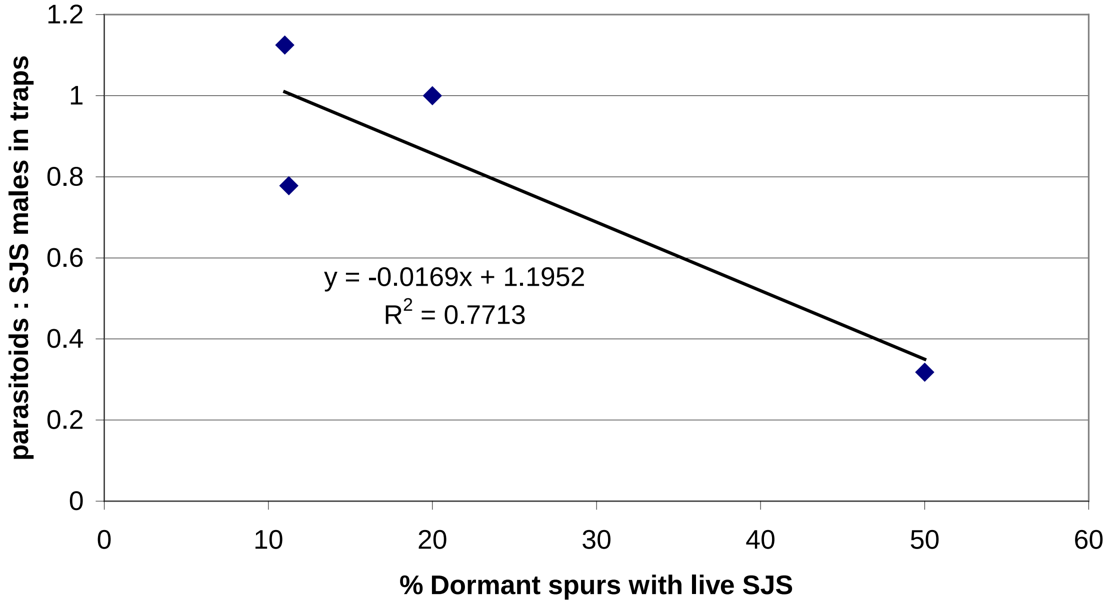
Figure 4. Ratio of male San Jose scale (SJS) to total number of parasitoid catches in SJS pheromone traps vs. dormant SJS in dormant spur the following dormant season. CalFed prune orchards, 2003



Cling peaches: Male SJS populations were quite low relative to parasitoids in 2002, but that trend was reversed in 2003 (Figures 1 and 2). These patterns were similar for prune and peach orchards, and may be explained, in part, by the different weather patterns in each year. 2003 had an unusually wet, cool spring.

Conclusions:

Dried plums and cling peaches: High numbers of SJS males relative to numbers of parasitoids were trapped in pheromone traps during spring, 2003, yet trap counts did not correlate with SJS infested fruit at harvest. However, a high ratio of parasitoids : male SJS in pheromone traps in spring, 2003 was correlated with dormant spur SJS counts the following dormant season.

Due to year to year variability in trap count data, the use of in-season pheromone trapping, while yielding valuable qualitative data on parasitoid populations in a block, does not appear to be a valid replacement for the dormant spur sampling currently in place. The traps are a good indicator of parasite populations and the dormant spur sample is a good predictor of SJS populations.

B. Use of pheromone traps and in-season fruit monitoring for PTB:

PTB can damage both dried plums and cling peaches by feeding in shoot tips, distorting growth and/or feeding on fruit causing serious fruit quality damage at harvest.

PTB has been traditionally controlled using a dormant spray (OP/pyrethroid + horticultural oil). Due to potential for such sprays to contaminate waterways and result in concentrations toxic to sensitive invertebrates, a minimal dormant spray program may be mandated. We wanted to determine if the extent of PTB harvest damage could be assessed in-season by fruit damage monitoring. The economic threshold for dried plum fruit damage in-season is 2% and for cling peaches, zero.

Dried plums: Pheromone traps were placed (one in each orchard) in April to obtain the biofix for initiation of PTB activity. Trap catches are not related to PTB fruit damage. So, at 400 day-degrees (DD) from the biofix (usually mid-late May) 1200 fruit (15 fruit from 80 trees) were examined at each site. A similar sampling (1000 fruit) was conducted again near harvest for evidence of PTB larvae and fruit damage.

Cling peaches: Pheromone traps were placed (one in each orchard) in April to obtain the biofix for initiation of PTB activity. Trap catches are not related to PTB fruit damage. So, 5 replications of 1000 fruit samples were taken from each site at 400 DD and 5, 100 fruit samples at harvest and examined for live PTB or PTB damage.

Results:

Dried plums: From 2002-2004, none of the prune orchards needed an in-season treatment for PTB this year, as in-season checks were below threshold and fruit showed no damage at harvest.

Cling peaches: From 2002-2004, none of the peach sites attained the threshold of 3-5 shoot strikes in May, June, or July and none sustained PTB damage at harvest. PTB was controlled with the dormant spray and in-season OFM sprays, which were used in the pheromone treated blocks to supplement the pheromone dispensers. Other blocks in the area had considerable problems with PTB. This program demonstrated the importance of monitoring to these growers that had unexpected PTB problems.

Conclusions:

Dried plums: PTB was a minimal problem in dried plums in the demonstration sites throughout the study (2002-2004). Determining the biofix for this insect pest then observing fruit at 400 DD from biofix appears to provide a valid assessment of PTB damage potential at harvest. Development of this strategy has potential to reduce rates of OP pesticides in dried plum production during the dormant season.

Cling peaches: PTB-infested fruit cannot be tolerated in cling peaches destined for canning. In each demonstration orchard, the PTB shoot strike threshold was never exceeded and no treatment was required. If pheromone mating disruption is able to effectively control OFM, growers may need to pay more attention to targeting PTB or using PTB mating disruption to control this pest.

C. Use of pheromone traps and in-season fruit monitoring for OBLR in dried plums and cling peaches:

OBLR larvae feed on leaves and buds during bloom, reducing yield potential. In summer, larvae feed on the fruit surface causing severe fruit quality damage and this damage may facilitate the spread of fruit brown rot infections.

Fruit evaluations: Treatment decisions are made based upon fruit evaluations. Pheromone traps were used to biofix initiation of OBLR activity in spring. Biofix occurred in early May, 2003 and late April, 2004. Beginning 690 day-degrees after the biofix of OBLR activity 1200 fruit (15 pieces of fruit from 80 trees) were evaluated each week for 3 weeks to determine best evaluation timing in each dried plum and cling peach site for presence of OBLR larvae or damage. At each dried plum and peach site, 1000 fruit were further examined in July and near harvest for evidence of OBLR larvae or damage. Fruit evaluations were made to determine treatment needs.

Results:

Pheromone trap counts: Substantial numbers of OBLR males were caught in pheromone traps in CalFed project peach and prune orchards in 2003 and 2004 –althought the trap counts were very different from orchard to orchard (Figures 4, 5, and 6).

Figure 5. Oblique Banded Leaf Roller Trap Catches per week for individual prune and peach Growers. CalFed Project. Yuba and Sutter Counties. 2003.

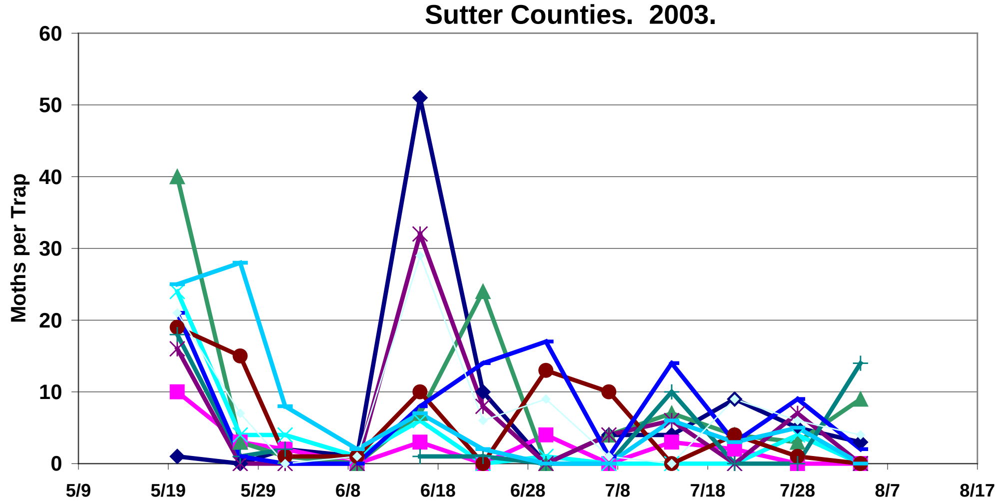


Figure 6. Oblique Banded leaf roller trap catches per week for peach growers. CalFed Project. Yuba and Sutter Counties. 2004.

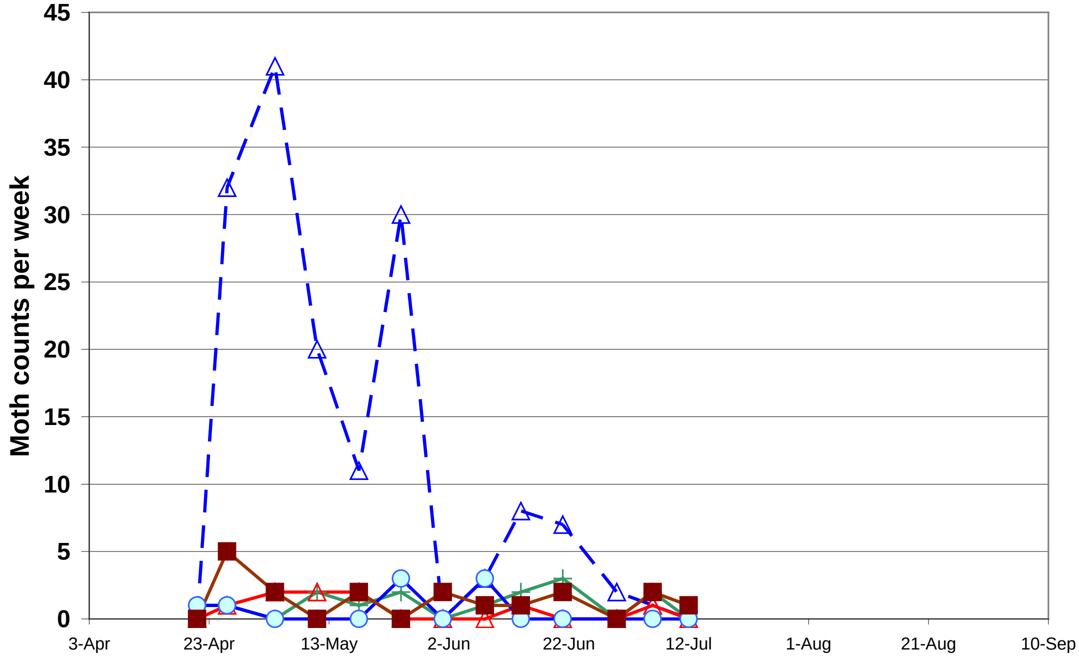
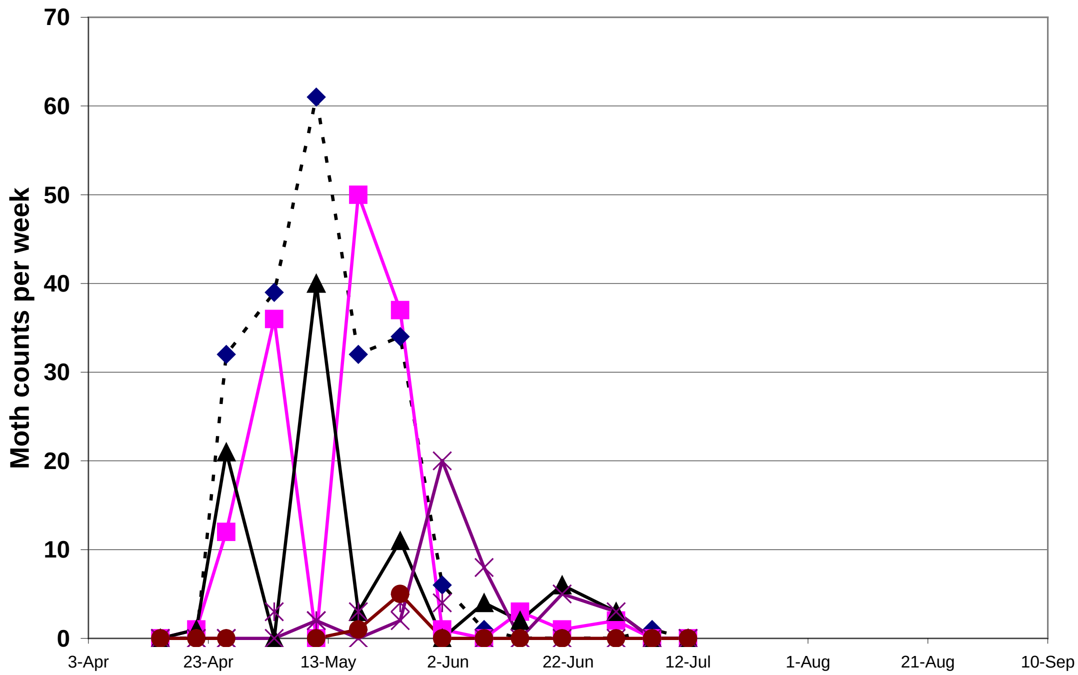


Figure 7. Oblique banded leaf roller trap catches per week for individual prune growers. CalFed Project. Yuba and Sutter Counties. 2004.



<u>Fruit evaluations – dried plums and cling peaches:</u> The treatment threshold for dried plums is 1% of the 1200 fruit sampled having OBLR larva and/or OBLR damage. The treatment threshold for cling peaches is one larvae or one damaged fruit for peaches.

Fruit evaluations, beginning at 690 day-degrees after the biofix were conducted at three-week intervals. It was found that 900-999 day-degrees from the July biofix was the best time to evaluate presence of OBLR larvae and/or damage. In 2004, the first biofix was used to determine sampling times. However, in both years, no significant OBLR larvae or damage occurred during the growing season in any of the observed orchards, despite the apparently high trap numbers in some blocks. Thus no treatment was recommended. At harvest all dried plum and peach orchard sites averaged less than one percent OBLR damage in both 2003 and 2004.

Conclusions:

OBLR pheromone traps have utility in determining biofix, but not in predicting damage at harvest. Fruit evaluations done at 900 – 999 DD following biofix appear to best measure potential for harvest damage. Hand thinning in peaches removes damaged fruit and leaves no fruit clusters within which OBLR can feed. In prunes, light crops, such as the 2004 crop, reduce the chance of OBLR damage due to lack of clustered fruit. Establishment of this monitoring protocol to predict OBLR damage (and thus the need to use OP's in season for OBLR control) gives dried plum growers an effective management tool.

D. Use of pheromone traps to monitor OFM and determine treatment needs – cling peaches only:

OFM is the key pest of cling peaches. Like PTB, it feeds on shoots and fruit, and there is a zero tolerance for fruit damage.

OFM is either controlled in-season with 2-4 pyrethroid insecticide sprays (it is resistant to organophosphates) and/or a pheromone disruption program. Both strategies have disadvantages. The insecticide program causes web spinning mite outbreaks while the pheromone program is more expensive and variable in efficacy. Also, recent research at UCB has shown pyrethroids in sediments in all rivers sampled. When faced with high pest populations, some growers use both pyrethroids and pheromones to try to control OFM.

Pheromone traps were used at project sites to monitor OFM moth flight and to time insecticide and/or pheromone applications for mating disruption. Four traps were placed at each of the 5 sites the last week in February. These were monitored weekly until harvest. Trap catch data were provided to project growers for treatment decisions based upon DD accumulations. Each week, shoot strikes and trap catches were recorded. Three to five shoot strikes per tree is considered the treatment threshold. At harvest, five replications of one hundred fresh fruit samples were taken to determine percent damage caused by OFM at each site.

Results:

Figure 8. Oriental fruit moth trap catches in CalFed project peach blocks, Yuba and Sutter Counties. 2003.

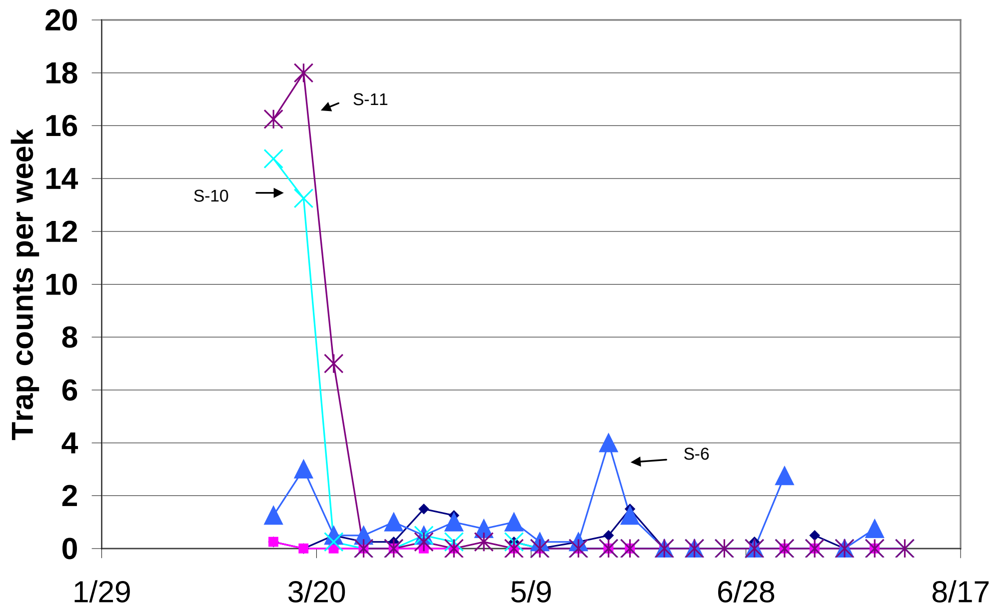


Table 1. Total OFM moth catches and coincident harvest fruit damage for the 2002-4 seasons.

Grower ID	Total No. Moths Trapped, 2002	Percent OFM damage @ harvest, 2002	Total No. Moths trapped, 2003	Percent OFM damage @ harvest, 2003	Total No. Moths Trapped, 2004	Percent OFM damage @ harvest, 2004
S-2	631	2.4	29	0.0	35*	0.6
S-4	0	1.6	1	0.0	0	0.0
S-6	655	1.6	75	0.0	1*	0.0
S-10	1568	2.0	117	0.0	101	0.8
S-11	2515	2.0	167	0.0	3	0.8

*In 2004, two new growers replaced those previously designated S-2 and S-6.

Trap counts and damage were down significantly from 2002 to 2003 and then again in 2004 (see Fig. 8 and Table 1). Grower S-4 has used pheromone disruption through out this orchard for several years, and had only one OFM moth "catch" all year in that block. Growers S-10 and S-11 used pheromone and pyrethroid sprays to successfully control very high OFP population. Grower S-2 and S-6 controlled OFM with pyrethroid sprays alone in 2002 and 2003, and in 2004 those growers were replaced by others who were willing to work and learn with OFM pheromones. Cling peach growers are allowed 2%

fruit damage at harvest. In 2002, all growers had 1.5% damage or higher, while in 2003 there was no damage. Damage was under 1.0% in all our samples in 2004 (See Table 1). By the end of our study, all growers we worked with were using pheromone mating disruption as the foundation of their OFM control programs.

Conclusions:

All growers had a recent history of extremely high OFM populations, but experienced excellent control in 2003 with either pyrethroids alone or pyrethroids and pheromone. Good control was achieved in 2004 with a combination of pheromone and pyrethroids. OFM populations were significantly reduced by the use of pheromone mating disruption (Table 1).

E. Spring prune aphid monitoring – dried plums only:

Dried plum aphids (MPA and LCPA) are the key pest(s) in dried plum production. When high aphid populations are present, damage has been correlated with crop loss due to fruit splitting and reduced vegetative growth. Limited vegetative growth can increase fruit dry away and overall drying costs.

Dried plum aphids are in-season pests easily controlled with a dormant OP/pyrethroid + oil treatment. A new, alternative aphid control program is oil sprays (2x) at bloom. This new program appears to provide sufficient control to avoid the need for subsequent in-season aphid control. When aphid control is omitted before petal fall (oils at bloom or insecticide + oil in the dormant or delayed dormant) there is strong potential for an in-season aphid outbreak. An effective in-season monitoring program is essential to successfully manage plum aphids in absence of conventional dormant treatments. In 2003 and 2004, the in-season “timed search” technique, developed in 2002, was used to monitor LCPA and MPA.

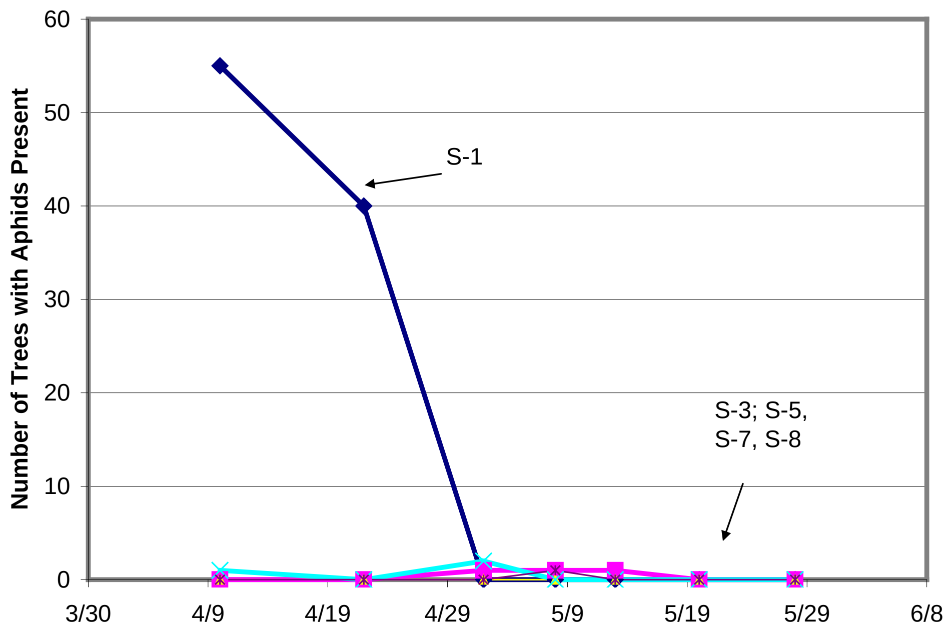
In 2004, several growers used reduced rates of synthetic pesticides to effectively control prune aphids before bloom, thereby eliminating residue issues and potential negative impacts on beneficial insects and mites. One grower tried 2x oil at bloom, while another tried 4% oil in a full bloom spray. A third grower sprayed only 4% oil in the dormant.

Results:

Aphid control was omitted in three of the five blocks prior to petal fall in 2003, and significant aphid populations eventually developed in all these orchards (see Figs. 9-10). Those growers used diazinon or Asana® (a pyrethroid) to control these large aphid populations in May or early June, but all growers waited until monitoring indicated that populations had built up to at or above treatment thresholds before spraying. The use of monitoring maximized spray efficacy and avoided additional sprays for aphid control that may be needed if control is applied too soon to a growing population. One grower applied Asana® + oil in the dormant season and had no aphid population in 2003. The fifth grower applied oil at green bud with a fungicide, and had no significant aphid population all season.

Based on 2003 results in these and other orchards in the region, an aphid control program prior to petal fall appeared to be necessary to avoid treating dried plums for aphid control in-season. [In-season synthetic pesticide spray(s) for aphid control (especially diazinon) leave residue on harvested fruit that limits market acceptance and often produces negative impact(s) on beneficial insects and mites that may necessitate expensive miticide sprays and produce further residue issues.] Both of the reduced rate prebloom sprays were very successful in controlling aphids at 50-75% lower pesticide rates than in other blocks in the study that received full rates. Oil at bloom was successful in one block where 4% oil was applied at bloom, but was not successful when 2x applications of 3% oil were applied at fast tractor speeds (3.3 mph). The grower noticed the lack of control, and sprayed out the block with 1 pint of diazinon (25% of the full rate) before we could monitor the block. Finally, the one block that received only 4% oil in the dormant did not have aphids in 2004, despite the fact that oil alone in the dormant does not control aphids. We conclude that this block did not have a significant aphid problem in 2004, but did in 2003, for reasons we can not explain.

Figure 9. Number of Prune Trees in an 80 Tree Sample Showing Any Leaf Curl Plum Aphid Presence. CalFed Project. 2003



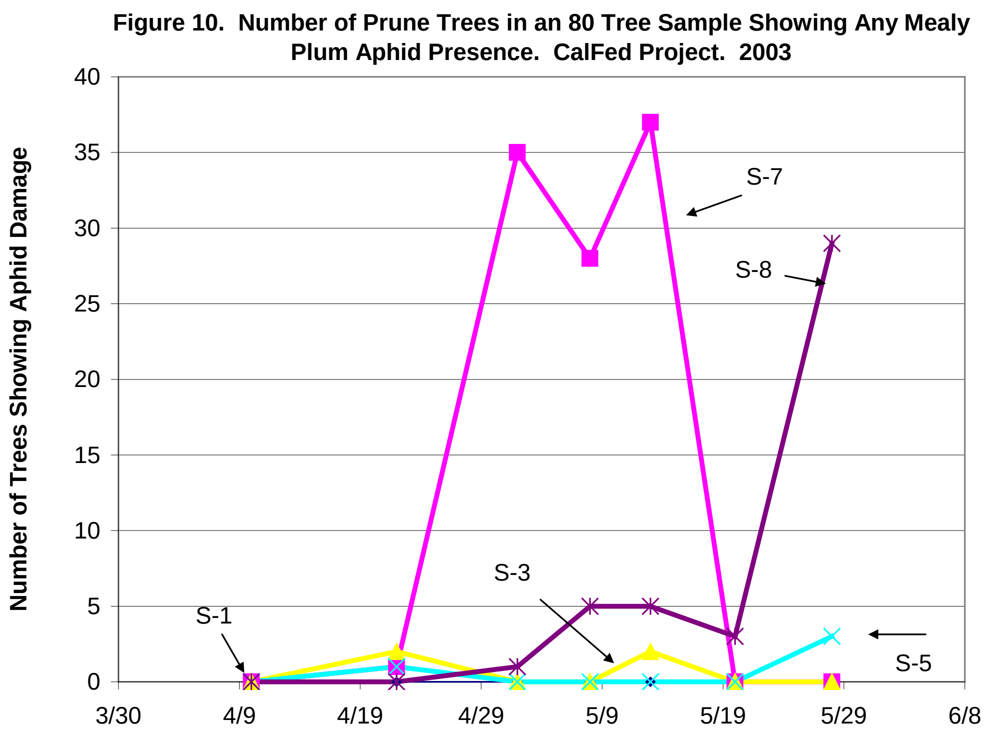


Table 2. Grower treatments in test plots in 2003 and 2004 for aphid control and the outcomes.

Grower	2003 Treatment	2003 results	2004 treatment	2004 results
KJ	None	Treated for aphids in season.	4% oil	No treatments needed.
NM	None	Treated for aphids in season.	None	Treated for aphids in season.
BG	12 oz Asana + 2 gallons of oil	No treatments needed.	12 oz Asana + 2 gallons of oil	No treatments needed.
JK/GB	None	Treated for aphids in season.	3 oz Asana +2 gallons of oil	No treatments needed
RD	4% oil at green bud	No treatments needed	4% oil at full bloom	No treatments needed.
RT	None	Treated for aphids in season.	2x 3% oil at bloom	Treated for aphids in season.

F. Prune rust monitoring – dried plums only:

Prune rust (*Tranzschelia discolor)* is a common in-season fungus disease pest of dried plums. It infects leaves throughout the summer under moist conditions and can cause defoliation, which is a concern when it occurs prior to harvest. In the 1997 Prune Research Report, Olson, Krueger, and Teviotdale reported that appearance of rust infection on leaves had no influence on fruit soluble solids and dry away. Teviotdale and Sibbett in the 1988 through 1996 Prune Research Reports have shown that post harvest defoliation from rust has no influence on fruit quality or productivity in subsequent crop years.

Previous research has shown rust treatments applied close to onset of rust infection are most beneficial and provide protection for about two weeks. In the absence of monitoring data, most dried plum growers apply prophylactic treatments of wettable sulfur in summer to prevent rust and subsequent defoliation.

The IPFP program developed a monitoring technique where 40 random trees are observed for the first signs of rust each week in the Sacramento Valley and every other week in the San Joaquin Valley beginning in early May. In 2003 and again in 2004, monitoring was started May 1st and continued through July 15th, 4 weeks prior to harvest. If rust was found, a treatment was recommended. If a rust treatment was applied, monitoring continued. If additional rust developed, more treatments would be recommended. Each dried plum orchard site was monitored for rust.

Results:

The spring of 2003 was unusually wet, and the first prune rust symptoms were observed in the first week of June. Growers applied sulfur sprays based on our monitoring results, but no pre-harvest defoliation occurred due to this disease. In 2004, the spring was unusually dry, but rust was first discovered, again in the same orchard, in early June. Growers applied sulfur based on our monitoring, but preharvest defoliation did not occur.

Conclusions:

Monitoring for prune rust and not treating when rust is not present is a valuable alternative to prophylactic sprays for this disease. Not only is there a potential to save money, un-needed sprays, where active ingredients may pose contamination problems, are avoided.

Goal #2. Demonstrate site management practices that mitigate surface runoff from tree fruit orchards including irrigation: management, use of filter strips, vegetation management etc.

Pesticide Runoff Studies:

YEAR 1, WINTER 2002-03

<u>INTRODUCTION, YEAR 1 STUDY</u>

A potential mitigation measure for off-site movement of organophosphates (OPs) applied to orchards in the dormant season is earlier treatment timing. It is assumed that drier soil conditions and lower probability of storm occurrence, typical situations early in most dormant seasons, would facilitate water infiltration and allow time for pesticides to be broken down by soil microbes before runoff-producing storms would occur later in the dormant season. Accordingly, this within-field treatment timing experiment was carried out in a Sutter County prune orchard.

The objective of the study was to evaluate the efficacy of applying dormant OP sprays earlier in the dormant season versus later as a means of reducing the amount of OP contained in runoff from the orchards. The premise of this study is two-fold. First, runoff is generally more apt to occur later in the winter dormant season when soils tend to become saturated by cumulative rainfall. Secondly, residual OP spray that falls to the ground during spraying is more apt to infiltrate into non-saturated soils with earlier season rainfall events; breakdown of OPs in soil is considered to be rapid.

MATERIALS AND METHODS, YEAR 1 STUDY

The study design incorporated four treatments including a control. Treatments occurred in each of 3 randomized complete blocks in a mature dormant prune orchard where trees are planted on berms approximately 20 feet apart (Figure 11).

For each of three treatments, a typical dormant spray with diazinon (4 pounds of pesticide in 100 gallons of water per acre) was simulated in order to control the size of the area sprayed and the total active ingredient and concentration applied within the replicated plots. The control plots received no diazinon spray. Simulated spraying involved the use of a gas-powered backpack sprayer to apply the diazinon spray directly to the ground within the target area of each plot. The amount of active ingredient and dilution of the spray that would typically be applied to an acre of orchard was reduced by the fraction realized from dividing the square meters in the target areas of the plots by the square meters in one acre. The rationale for spraying diazinon only on the ground instead of applying it to the trees and, by default to the ground, with a conventional air-blast sprayer was to 1) reduce the variance of volume and total active ingredient applied in the plots, 2) eliminate the potential for drift from one plot to the next, and 3) ensure that equal areas of ground are treated in all plots. In contrast, conventional spraying with an air-blast sprayer is much more difficult to control in terms of when spray is initiated and suspended, and the amount of material that adheres to the trees and/or drifts off-site are uncontrollable variables. It is fully recognized that applying all of the material to the ground results in a higher than normal ground residual, but no data exists to allow for calculating how much material would "typically" remain on the trees from conventional spraying. Therefore, the simulated spray can be viewed as representing a slightly worse case scenario.

Treatment #1. Control

A 50-meter long section of orchard floor was left unsprayed between two berms during the dormant season. From the time the study commenced, any rainfall runoff from the 50-meter section drained into an autosampling unit. All of the plots contained relatively equal resident vegetative cover.

Rationale: The concentration of diazinon monitored in the 50-meter sections of Treatment #1 served to demonstrate any background concentrations of diazinon that might exist; none was anticipated.

Treatment #2. Early Season Dormant Spray

A 50-meter long section of orchard floor was sprayed between two berms with diazinon relatively early in the dormant season. The date of spraying was January17, 2003.

Subsequent rainfall runoff from the 50-meter section drained into an autosampling unit. The plots contained resident vegetative cover comparable to that of Treatment #1.

Rationale: Previous studies suggest that the diazinon concentration of runoff can be reduced significantly by applying dormant sprays earlier in the dormant season. One reason is that residual diazinon on the ground is transported into the soil by rains occurring earlier in the dormant season when soils are not yet saturated and runoff is less likely to occur.

Treatment 3: Mid Season Dormant Spray
A 50-meter long section of orchard floor was sprayed between two berms with diazinon relatively mid way in dormant season. The date of spraying was February 4, 2003. Subsequent rainfall runoff from the 50-meter section drained into an autosampling unit. The plots contained resident vegetative cover comparable to that of Treatment #1.

Rationale: Comparisons can be made for diazinon concentration in runoff from mid-season dormant sprays versus early and late season sprays.

Treatment 4: Late Season Dormant Spray
A 50-meter long section of orchard floor was sprayed between two berms with diazinon relatively late in the dormant season. The date of spraying was February 24, 2003. Subsequent rainfall runoff from the 50-meter section drained into an autosampling unit. The plots contained resident vegetative cover comparable to that of Treatment #1.

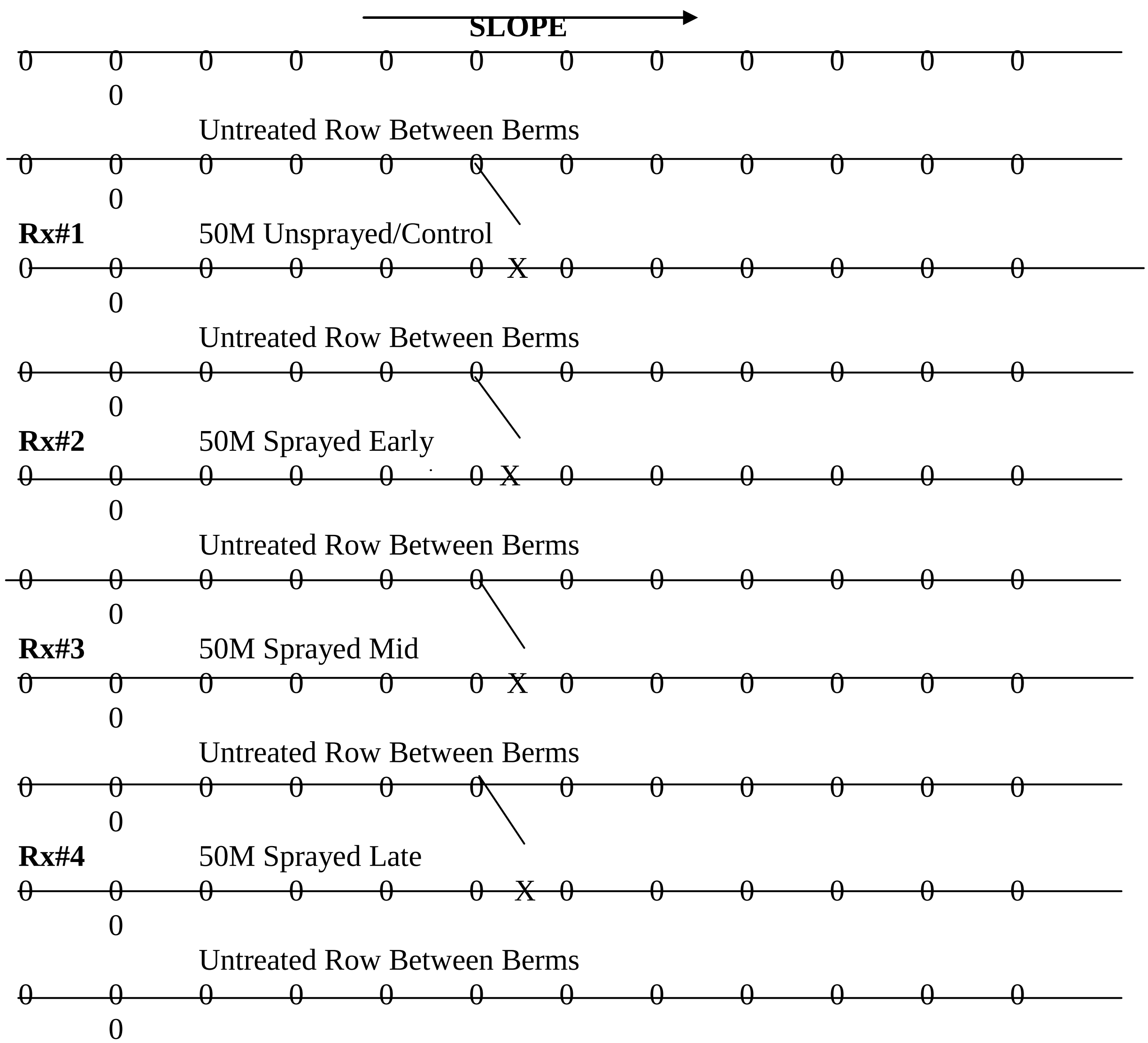
Rationale: Comparisons can be made for diazinon concentration in runoff from late-season dormant sprays versus early and mid-season sprays.

Following each significant storm event (usually about one inch of rain per episode):
1. Runoff volume measurements were taken at each sampler unit.
2. Composited water samples were collected at each sampler unit for diazinon analysis.

Water sampling stations consist of an autosampler placed between berms. At the low end of sample areas, earthen dams are built diagonally across the area between the berms. Each dam isolates runoff to the defined area and directs the runoff water to one side where a 19-liter plastic bucket is buried in the soil. The runoff water is pumped out of the bucket through a flow meter to a T-fitting that diverts ~99% of the water back into the row downslope of the dam, and 1% to a Nalgene® tub providing a composite sample for chemical analysis. The water samples were transported to the laboratory on ice and then frozen at -20^{o}C prior to applying the QAPP-approved chemical analysis.

Figure 11: Orchard Study Schematic. Example of one block of a randomized complete block design for 3 replicates of each of 4 treatments.

X = autosampler unit **Diagonal lines represent earthen dams** **0 = Trees on Berms**



Diazinon in runoff water samples was extracted into ethyl acetate by one of two methods: solid phase extraction (for clean samples, e.g. rain water) or liquid-liquid extraction (for samples with sediment). The solvent extracts were analyzed by gas chromatography and compared to analytical standards to determine the concentration of diazinon present in the original sample.

RESULTS, YEAR 1 STUDY

Water samples were collected from 3 different storm events: 1/22/03-1/23/03 (between Early and Mid spraying); 2/16/03-2/17/03 (between Mid and Late spraying); and 3/15/03 (after the final spray was applied) (Table 3).

Diazinon concentrations in runoff samples collected during the 3 rainfall events were not significantly different from one another (Figure 12). Volume of runoff did not differ on average between the first 2 runoff events, although the runoff during the third event was somewhat reduced relative to the other 2 events (Figure 13). There was considerable variation between individual plots in terms of runoff volume across the orchard, possibly due to differences in soil type. In general plots 1, 2 and 3 of our 12 plots, which are co-located on one side of the orchard, all had significantly lower runoff than did the other plots, possibly due to those areas having slightly sandier soil conditions.

Table 3. Dates of spray treatments and runoff samples collected

Date	Event
January 17	Early season spray applied
January 22	Rain Event 1A collections
January 24	Rain Event 1B collections
February 2	Middle season spray applied
February 16	Rain Event 2 collections
February 28	Late season spray applied
March 15	Rain Event 3 collections

Figure 12. Diazinon concentration in runoff (ppb)

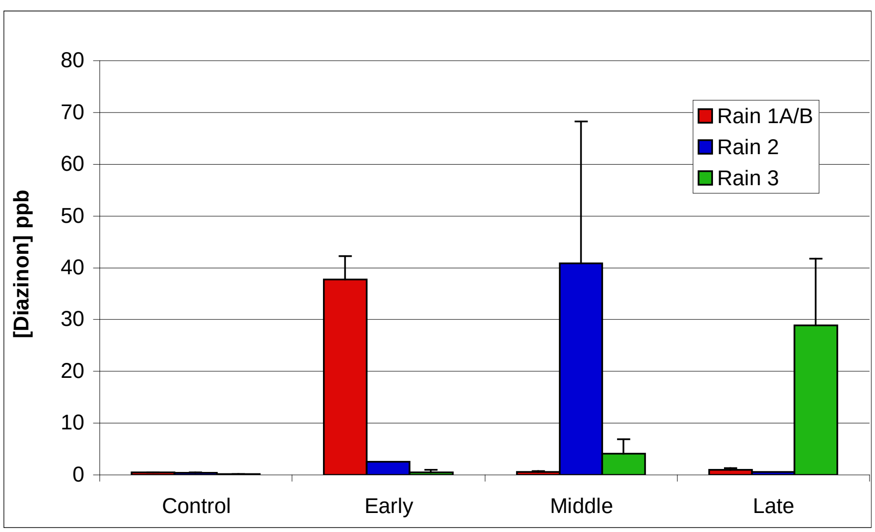
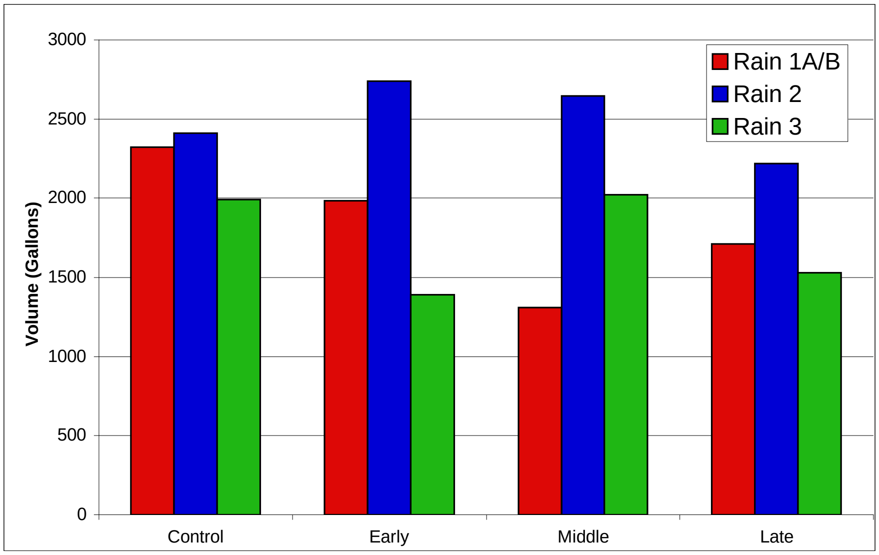


Figure 13. Volume of runoff (gallons)

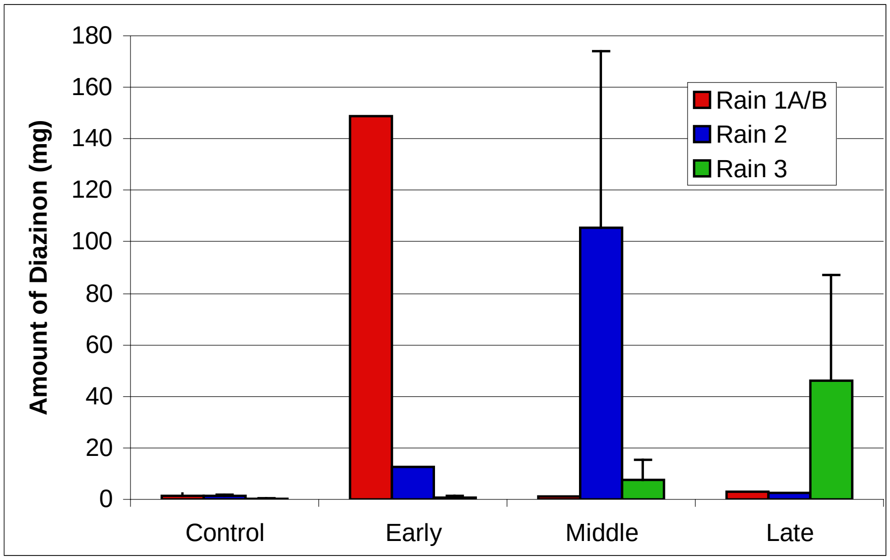


Mass of diazinon in runoff from the treated plots was found predominately in samples resulting from the first rain event after a given treatment. Little mass of diazinon was found in either untreated control plots or in plots where the pesticide had been applied a month or more prior to the event and where a rainfall event had already occurred which resulted in runoff.

DISCUSSION, YEAR 1 STUDY

Contrary to our results from the study done the previous year when the mass of diazinon in runoff was significantly lower in the early spray plots, this year's study had a roughly equivalent mass of diazinon being measured from runoff from the rainfall events that followed a each treatment. In the previous year, runoff was only generated during one large rain event that occurred after all treatments had been applied, so there was both a drier soil condition during the earlier part of the dormant season and a much greater amount of time between the 2 earlier application timings and when rainfall sufficient to result in runoff finally occurred. In the winter of 2002-03, the period of time between spray treatment and next rain event ranged from 5 days to 19 days. The actual time between application and rainfall sufficient to result in runoff was 5-7 days for the early spray, 12 days for the middle spray, and 19 days for the late spray. The diazinon mass in runoff shown in Figure 14 is inversely related to the time between application and rainfall, and is consistent with the loss of available diazinon that might be anticipated due to degradation of the diazinon. The degradation could be due to normal chemical breakdown and/or breakdown by micro-organisms in the soil.

Figure 14. Mass of diazinon (mg) measured in runoff from each treatment



YEAR 2, WINTER 2003-04

INTRODUCTION, YEAR 2 STUDY

A within-field water quality runoff study was completed during the winter of 2003-2004. The first objective of the study was to evaluate the efficacy of taking into account the existing degree of soil saturation prior to applying dormant OP sprays as a means of reducing the amount of OP contained in rainfall runoff from orchards. The premise of this study is that runoff is more apt to occur when soils are more saturated and therefore more likely to move residual OP off-site with that runoff. The second objective is to determine the efficacy of applying a light sprinkler irrigation soon after applying dormant OP sprays as a means of enhancing OP infiltration into non-saturated soils where breakdown of OPs is considered to be rapid.

MATERIALS AND METHODS, YEAR 2 STUDY

The study design incorporated six treatments. Treatments occurred in each of 3 non-randomized fully replicated blocks in a mature dormant prune orchard where trees are planted on berms approximately 20 feet apart (Figure 15).

For each of the treatments, a typical dormant spray with diazinon (4 pounds of pesticide in 100 gallons of water per acre) was simulated in order to control the size of the area sprayed and the total active ingredient and concentration applied within the replicated plots. The control plots received no diazinon spray. Simulated spraying involves the use of a gas-powered backpack sprayer to apply the diazinon spray directly to the ground within the target area of each plot. The amount of active ingredient and dilution of the spray that would typically be applied to an acre of orchard is reduced by the fraction realized from dividing the square meters in the target areas of the plots by the square meters in one acre. The rationale for spraying diazinon only on the ground instead of applying it to the trees and, by default to the ground, with a conventional air-blast sprayer is to 1) reduce the variance of volume and total active ingredient applied in the plots, 2) eliminate the potential for drift from one plot to the next, and 3) ensure that equal areas of ground are treated in all plots. In contrast, conventional spraying with an air-blast sprayer is much more difficult to control in terms of when spray is initiated and suspended, and the amount of material that adheres to the trees and/or drifts off-site are uncontrollable variables. It is fully recognized that applying all of the material to the ground will result in a higher than normal ground residual, but no data exists to allow for calculating how much material would “typically” remain on the trees from conventional spraying. Therefore, the simulated spray can be viewed as representing a worse case scenario.

Rainfall events were simulated events. By utilizing controlled sprinkler irrigations, it was anticipated that a far greater degree of data reliability could be achieved since, unlike natural rainfall events, it can be assured that sufficient “rainfall” occurs to cause runoff. Furthermore, field samples can be collected in a more timely fashion, any sampling equipment failures can be corrected immediately without collections being compromised, and fewer replications will be needed to offset such potential equipment failures.

Treatment #1. Existing soil moisture (control)
Early in the dormant season, a 50-meter long section of orchard floor was be sprayed with diazinon between two berms. Within four days of pesticide application, artificial rainfall was applied until runoff was achieved. Runoff from the 50-meter section drained into an autosampling unit. Runoff volume was recorded and water samples were collected. All of the plots contained relatively equal resident vegetative cover.

Treatment #2. Semi-saturated soil
Early in the dormant season, a 50-meter long section of orchard floor was sprinkler irrigated to achieve approximately 50% soil saturation. Shortly thereafter, the area was sprayed with diazinon between two berms. Within four days of pesticide application, artificial rainfall was applied until runoff was achieved. Runoff from the 50-meter section drained into an autosampling unit. Runoff volume was recorded and water samples were collected. The plots contained resident vegetative cover comparable to that of Treatment #1.

Treatment 3: Saturated soil
Early in the dormant season, a 50-meter long section of orchard floor was sprinkler irrigated to achieve nearly 100% soil saturation. Shortly thereafter, the area was sprayed with diazinon between two berms. Within four days of pesticide application, artificial rainfall was applied until runoff was achieved. Runoff from the 50-meter section drained into an autosampling unit. Runoff volume was recorded and water samples were collected. The plots contained resident vegetative cover comparable to that of Treatment #1.

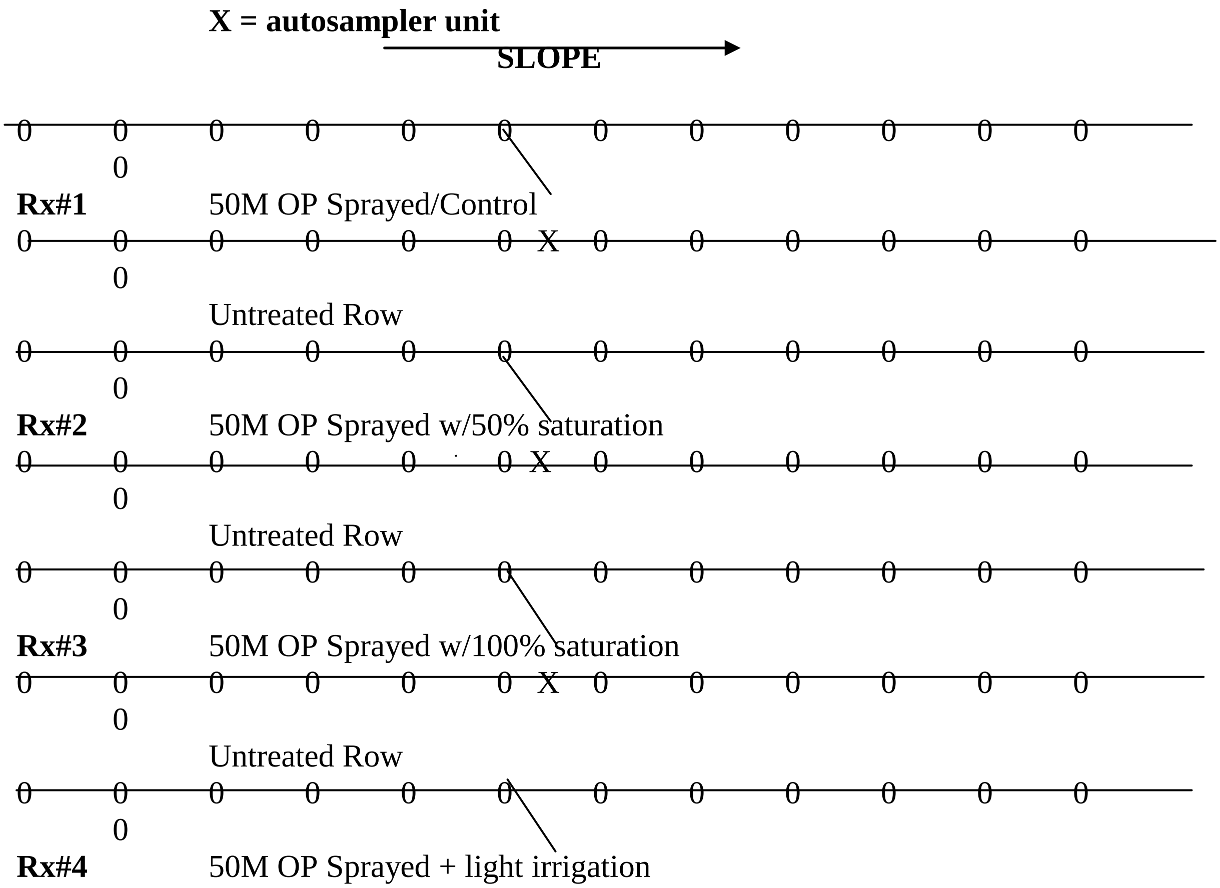
Treatment 4: Existing soil moisture + post-spray irrigation
Early in the dormant season, a 50-meter long section of orchard floor was sprayed with diazinon between two berms. Within two days of pesticide being applied, a light sprinkler irrigation was also applied. Within another two days, artificial rainfall was applied until runoff was achieved. Runoff from the 50-meter section drained into an autosampling

unit. Runoff volume was recorded and water samples were collected. All of the plots contained relatively equal resident vegetative cover.

Treatment 5: Semi-saturated soil + post-spray irrigation
Early in the dormant season, a 50-meter long section of orchard floor was sprinkler irrigated to achieve approximately 50% soil saturation. Shortly thereafter, the area was sprayed with diazinon between two berms. Within two days of pesticide being applied, a light sprinkler irrigation was applied. Within another two days, artificial rainfall was applied until runoff was achieved. Runoff from the 50-meter section drained into an autosampling unit. Runoff volume wa recorded and water samples were collected. All of the plots contained relatively equal resident vegetative cover.

Treatment 6: Saturated soil + post-spray irrigation
Early in the dormant season, a 50-meter long section of orchard floor was sprinkler irrigated to achieve nearly 100% soil saturation. Shortly thereafter, the area wa sprayed with diazinon between two berms. Within two days of pesticide being applied, a light sprinkler irrigation was applied. Within another two days, artificial rainfall was applied until runoff was achieved. Runoff from the 50-meter section drained into an autosampling unit. Runoff volume was recorded and water samples were collected. All of the plots contained relatively equal resident vegetative cover.

Figure 15: Orchard Study Schematic. One block of 6 treatments replicated in each of 3 blocks.



0 0 0 0 0 0 X 0 0 0 0 0 0
0
Untreated Row
0 0 0 0 0 0 0 0 0 0 0 0
0
Rx#5 50M OP Sprayed w/50% saturation + light irrigation
0 0 0 0 0 0 X 0 0 0 0 0 0
0
Untreated Row
0 0 0 0 0 0 0 0 0 0 0 0
0
Rx#6 50M OP Sprayed w/100% saturation + light irrigation
0 0 0 0 0 0 X 0 0 0 0 0 0
0

RESULTS AND DISCUSSION, YEAR 2 STUDY

The results for this study were unfortunately compromised by one very basic but unforeseen circumstance. Contrary to the grower's recollections of the study site as one that typically produces runoff during major storm events, it was not until we had produced unrealistic amounts of simulated rainfall (in excess of 7 inches) that runoff occurred sufficient to yield samples for all treatments. In the meantime, virtually all of the OP that had been applied to the plots had infiltrated and was picked up in the runoff that ultimately occurred. This circumstance effectively nullified any differences between treatments. There were no discernable statistical or even trend differences between any of the treatments.

During the pre-saturation periods, the existence of standing water was used as an indication of a pending runoff condition, but it became evident during the simulated rainfall event that standing water was able to percolate at a rate nearly equivalent to that of the precipitation rate. In other words, the soil in the orchard had a much greater infiltration capacity than was anticipated. The grower's recollections of runoff were apparently at times late in previous winters when the soil had become saturated as a result of an entire winter's worth of rainfall accumulation. In contrast, our study was executed early in the winter season, and even though there had been nearly two inches of natural rainfall shortly before we began, the soil was nowhere near saturation.

It is important to note that not all negative data is bad data. This study clearly demonstrates what many researchers and growers have suspected for years. Orchards grown on leaching soils that do not typically experience runoff unless there has been a lot of heavy rain late in the dormant season are unlikely contributors to pesticides moving offsite and finding their way into surface waters.

YEAR 3, WINTER 2004-05

INTRODUCTION, YEAR 3 STUDY

A within-field water quality runoff study was completed during the winter of 2004-2005. The objective of the study was to evaluate the efficacy of taking into account the existing degree of soil saturation prior to applying dormant OP sprays as a means of reducing the amount of OP contained in rainfall runoff from orchards. The premise of this study is that runoff from major storm events is more likely to occur when soils are more saturated thereby making it more likely that residual OP will move off-site with that runoff. Applying OP sprays when soils are less saturated will likely increase OP infiltration into soils and reduce the amount of OP present in runoff that occurs during later storm events.

MATERIALS AND METHODS, YEAR 3 STUDY

The study design incorporated three treatments. Treatments occurred in each of 3 randomized fully replicated blocks in a mature dormant prune or peach orchard where trees are planted on berms approximately 20 feet apart (Figure 16).

For each of the treatments, a typical dormant spray with diazinon (4 pounds of pesticide in 100 gallons of water per acre) was simulated in order to control the size of the area sprayed and the total active ingredient and concentration applied within the replicated plots. Simulated spraying involves the use of a gas-powered backpack sprayer to apply the diazinon spray directly to the ground within the target area of each plot. The amount of active ingredient and dilution of the spray that would typically be applied to an acre of orchard is reduced by the fraction realized from dividing the square meters in the target areas of the plots by the square meters in one acre. The rationale for spraying diazinon only on the ground instead of applying it to the trees and, by default to the ground, with a conventional air-blast sprayer is to 1) reduce the variance of volume and total active ingredient applied in the plots, 2) eliminate the potential for drift from one plot to the next, and 3) ensure that equal areas of ground are treated in all plots. In contrast, conventional spraying with an air-blast sprayer is much more difficult to control in terms of when spray is initiated and suspended, and the amount of material that adheres to the trees and/or drifts off-site are uncontrollable variables. It is fully recognized that applying all of the material to the ground will result in a higher than normal ground residual, but no data exists to allow for calculating how much material would “typically” remain on the trees from conventional spraying. Therefore, the simulated spray can be viewed as representing a worse case scenario.

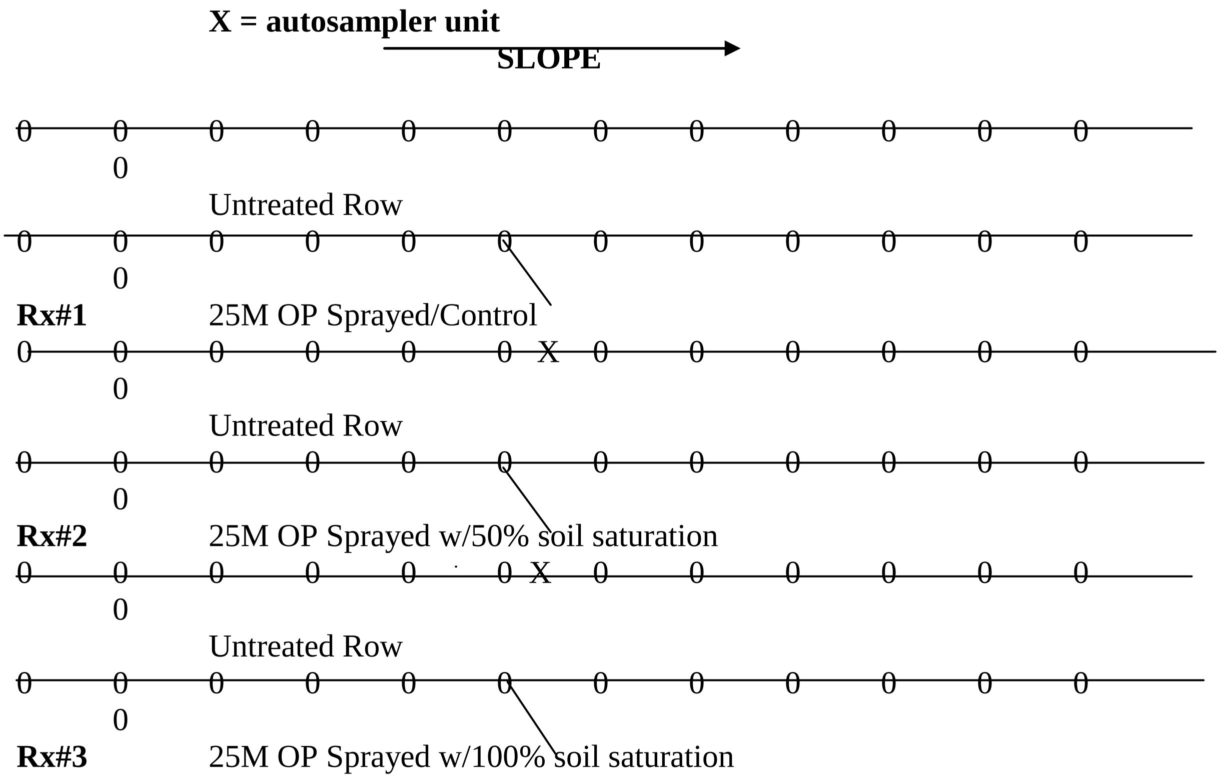
Rainfall events were simulated events. By utilizing controlled sprinkler irrigations, it is anticipated that a far greater degree of data reliability can be achieved since, unlike natural rainfall events, it can be assured that sufficient “rainfall” occurs to cause runoff. Furthermore, field samples can be collected in a more timely fashion, any sampling equipment failures can be corrected immediately without collections being compromised, and fewer replications will be needed to offset such potential equipment failures.

Treatment #1. Existing soil moisture
Early in the dormant season (12/4/04), 25-meter long sections of orchard floor were sprayed with diazinon between two berms. On 12/6/04, artificial rainfall was applied (2.91 inches) until runoff was achieved. Runoff from the 25-meter sections drained into autosampling units. Runoff volumes were recorded and water samples were collected. All of the plots contained relatively equal resident vegetative cover.

Treatment #2. Semi-saturated soil
Early in the dormant season, 25-meter long sections of orchard floor were sprinkler irrigated (0.7 inches on 12/3/05) to achieve approximately 50% soil saturation. Shortly thereafter (12/4/04), the areas were sprayed with diazinon between two berms. On 12/6/04, artificial rainfall was applied (2.91 inches) until runoff was achieved. Runoff from the 25-meter sections drained into autosampling units. Runoff volumes were recorded and water samples were collected. The plots contained resident vegetative cover comparable to that of Treatment #1.

Treatment 3: Saturated soil
Early in the dormant season, 25-meter long sections of orchard floor were sprinkler irrigated (1.4 inches from12/2-12/3/04) to achieve nearly 100% soil saturation. Shortly thereafter (12/4/04), the areas were sprayed with diazinon between two berms. On 12/6/04, artificial rainfall was applied (2.91 inches) until runoff was achieved. Runoff from the 25-meter sections drained into autosampling units. Runoff volumes were recorded and water samples were collected. The plots contained resident vegetative cover comparable to that of Treatment #1.

Figure 16: Orchard Study Schematic. Example block of 3 treatments replicated in 3 blocks.



0 0 0 0 0 0 X 0 0 0 0 0 0
0
Untreated Row
0 0 0 0 0 0 0 0 0 0 0 0
0

On 12/4/04, prior to diazinon being sprayed, 5 soil core samples were collected from each plot to allow for determination of soil moisture at the time of spraying. Percent soil moisture was determined based on a wet weight/dry weight ratio.

RESULTS, YEAR 3 STUDY

As of the writing of this DRAFT Final Report (February 14, 2005) analytical data is not yet available. Completion of sample analysis is anticipated by early March 2005. When the laboratory data is finished, it will be subjected to statistical analyses that will allow for the development of the discussion and conclusions that can then be included in the finished Final Report.

Irrigation management:

Situation: Research has established the amount of water a mature, full canopied dried plum tree could use with unlimited water availability. However, previous dried plum research has determined that reducing irrigation at certain times of the season (typically amounting to up to 40% of total annual potential water use) has no economic effect on production and quality. Reducing irrigation saves money and water, reduces pesticide runoff and results in a lower fruit dry away ratio (fresh fruit weight : dry fruit weight) and lower drying costs to growers. Drying costs account for 30-40% of total cost of dried plum production.

To achieve the goal of reduced irrigation and maximum economic productivity, we utilized a monitoring technique that determines tree-water status (midday stem water potential or SWP). We determined the midday SWP by using a “pump up” pressure chamber. A plastic/foil envelope is used to cover a lower canopy leaf for at least 10 minutes. The bagged leaf is then placed in the chamber with only the petiole sticking out. Air is forced into the chamber by pumping the device up and down (similar to a tire pump) until water is forced out of the petiole. The amount of pressure that it took to force the water out of the leaf, measured in bars, is the SWP. Pressure bomb readings for irrigation have not been determined for cling peaches.

Evaluation: Five trees were monitored weekly in each orchard. The number of sampled trees was reduced from 10 to 5 in 2003 because previous experience in the study blocks allowed more confidence that individual tree values were representative of the block. Irrigation was only recommended when SWP reached the target values (see Figures 17 and 18).

Figure 17.

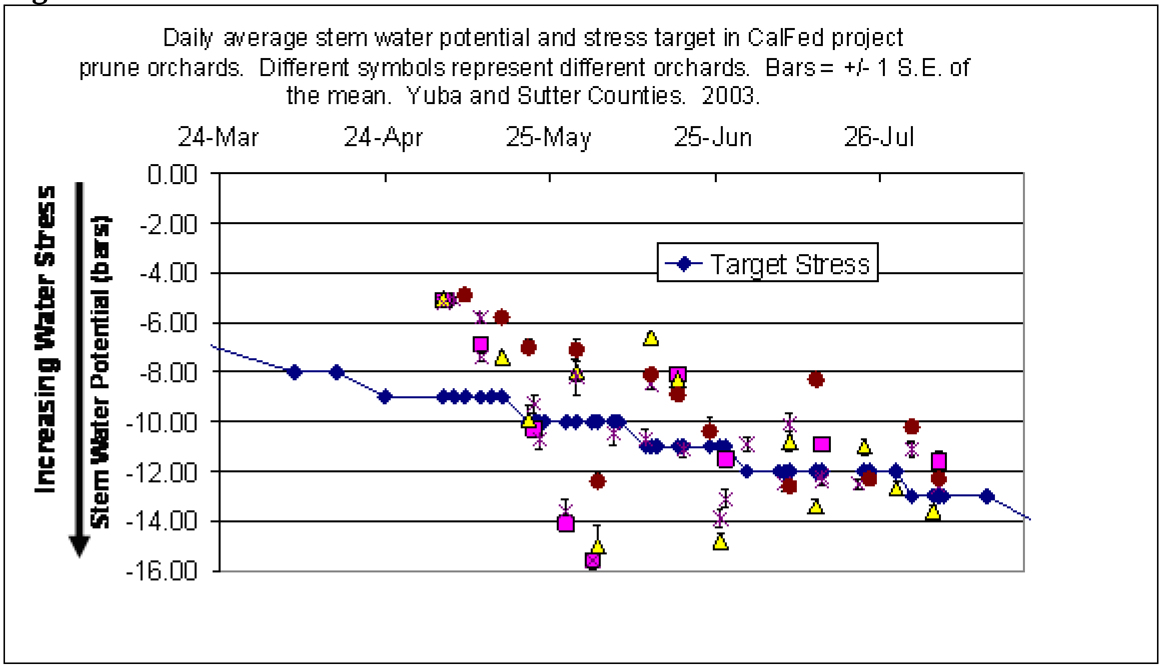
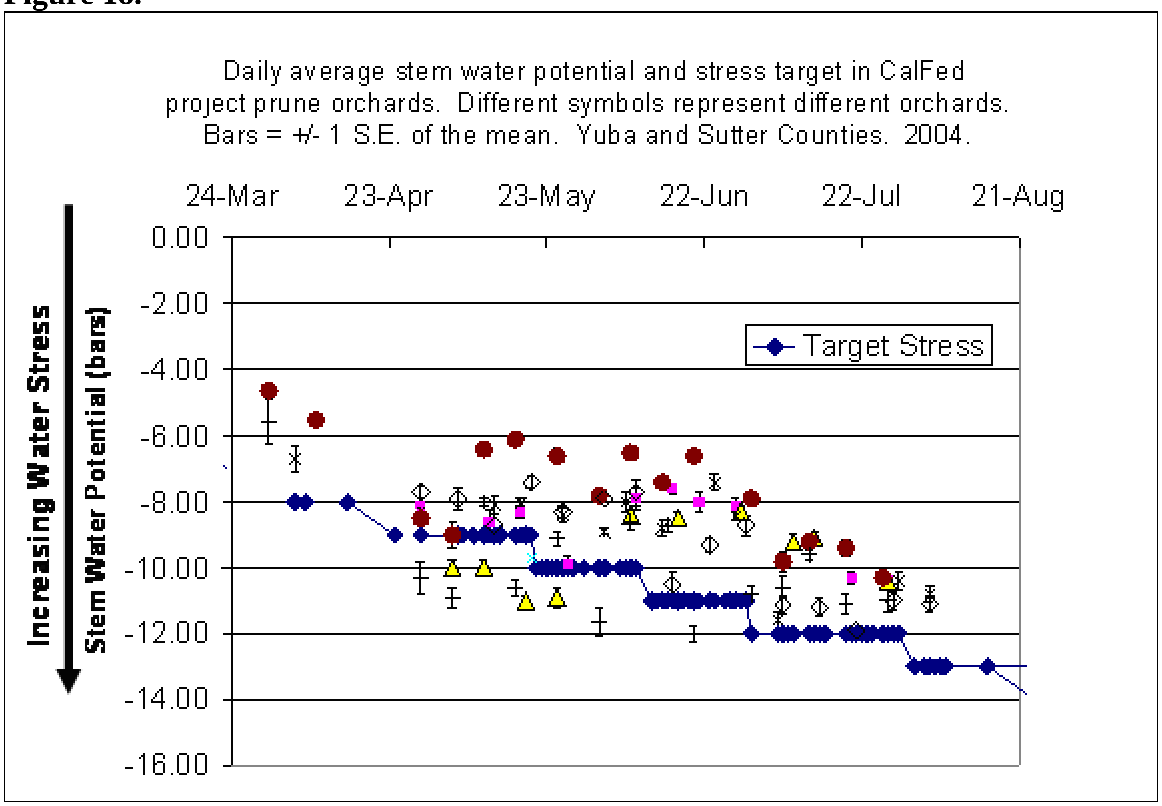


Figure 18.



Results: Demonstration data were collected in 2002. The following two years of the study, dried plum growers were given the results on a weekly basis. Several used this information to schedule irrigation and, particularly, to objectively evaluate their long-standing practices. Significant reductions in water use occurred in blocks with micro-jet irrigation systems, which allowed them flexibility in timing irrigation. Growers with flood irrigation used these results to adjust timings of irrigation, but generally did not reduce total water use during the season.

Orchard Nutrition:

Dried plum orchards are usually fertilized with nitrogen (N) annually. Nitrogen can be a surface water contaminant. Fertilizer N is often applied in the spring, following bloom, yet the recommended timing for leaf sampling for nutrient analysis is in the summer (July). Consequently, current year leaf analysis results do not influence the current year decision making process for at least part, if not all, of the annual fertilizer N application(s).

We sampled dried plum leaves in early May and July in to evaluate the feasibility of developing a spring index for dried plum tree N status that might affect spring N fertilization decisions. Leaves were analyzed for both N and potassium (K), as growers often treat potassium deficient prune trees with foliar applications of potassium nitrate (see Tables 4 and 5).

Table 4. Results of early (May) dried plum leaf analysis for nitrogen (N) and potassium (K) taken May 26-30, 2003 and May 12-14, 2004. Only K was sampled in 2004.

Grower	Leaf N, 2003	Leaf K, 2003	Leaf K, 2004
Kulwant Johl	3.52	1.41	1.58
Neil Mitchell	3.20	1.95	1.76
Jinder Khagura	2.48	2.01	2.93
Ram Dhanota	3.54	2.84	1.67
Pete Righero	3.16	1.97	1.98
Robin Thandi	2.64	1.85	1.86

Red=probable need to add potassium, yellow = watch and observe orchard to determine if nitrogen is needed, and green = no need for additional fertilizer this season.

Table 5. Results of mid-summer (July) dried plum leaf analysis for nitrogen (N) and potassium (K), 2003 and K, only, 2004.

Grower	Leaf N, 2003	Leaf K, 2003	Leaf K, 2004
Kulwant Johl	2.21	1.40	2.31
Neil Mitchell	1.99	2.13	No data
Jinder Khagura	1.96	1.88	3.98
Ram Dhanota	2.59	2.94	3.20
Pete Righero	2.58	2.24	1.68
Robin Thandi	2.54	1.56	3.72

Red=deficient by UC standards, yellow = marginal level, and green = adequate level by UC standards.

There was very little correlation between spring and summer leaf N levels (see Figure 19), but a strong relationship between leaf K levels from spring to summer (see Figure 20) in 2003. Early season leaf N analysis was discontinued in 2004, due to the poor results in 2003, but potassium was continued in 2004. Unfortunately, the extremely low crop of 2004 may have affected the relationship between May and July potassium levels in 2004 and the correlation of the straight line = 0.2577 (data not presented). Early season leaf K analysis may have some value to growers seeking to avoid potassium deficiency in the current growing season. Interpretation of leaf K analysis results is confounded by differences in crop load from block to block as well as current season potassium fertilization either via foliar sprays or fertigation. This test does have some value for growers with marginal potassium fertilization programs who are trying to determine if additional fertilization (sprays or fertigation) are needed in the current year.

Figure 19.

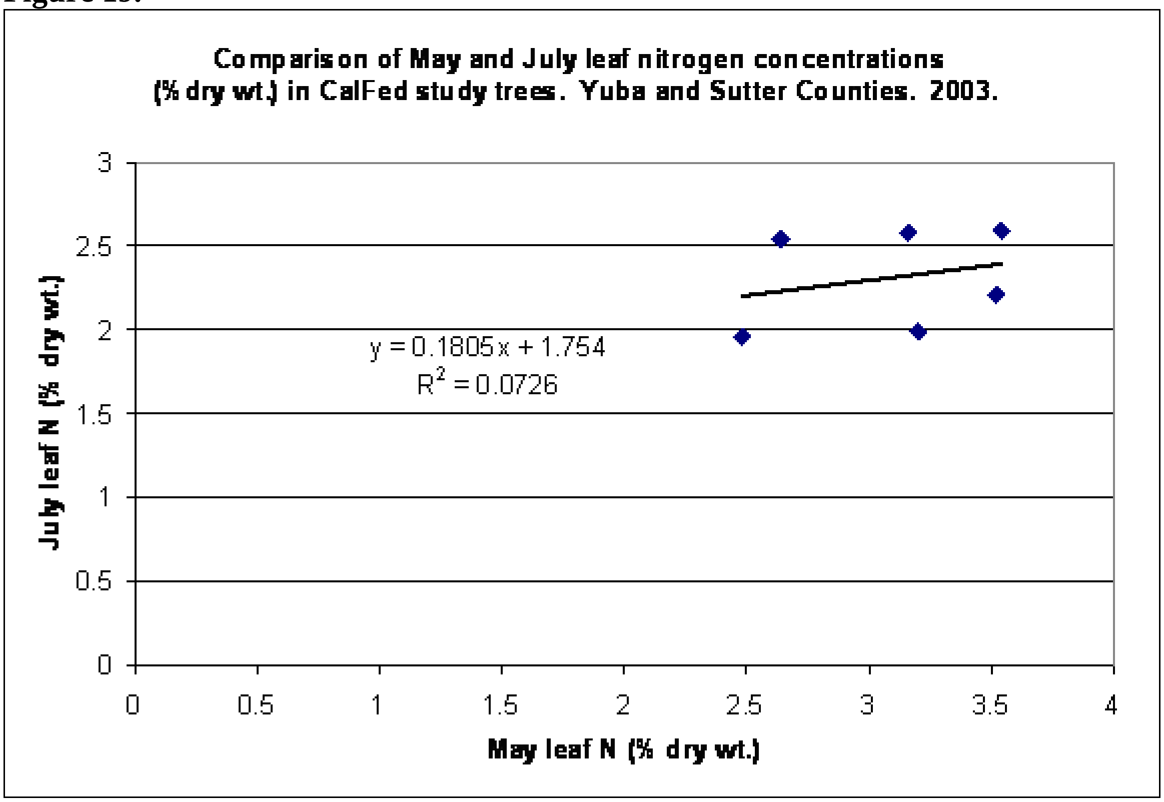
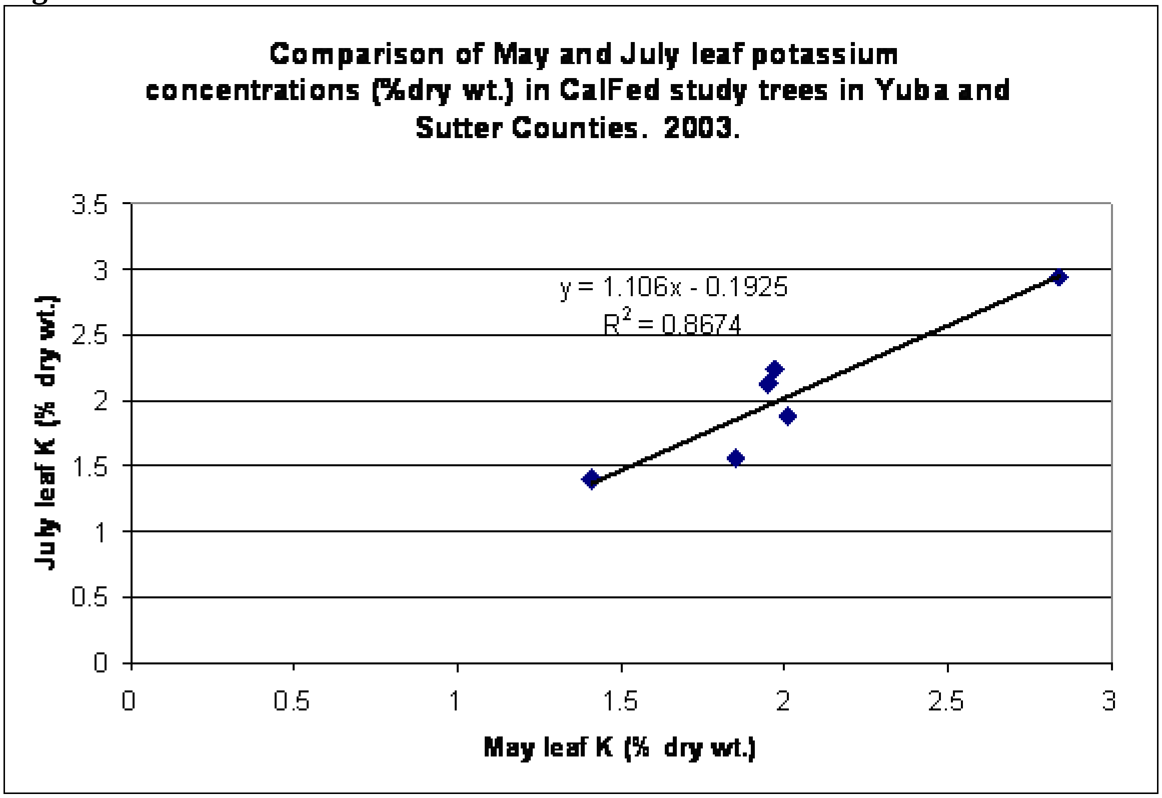


Figure 20.



Goal #3. Communication of project goals.

Efforts included: grower classroom and field meetings, personal grower consultation, grower newsletters, mass media targeting the grower community, internet websites available to growers, and coordination with outreach efforts of other reduced risk pesticide projects. Communicating goals and progress is an important component of this project and specifically targets implementation. We conducted the following efforts to make dried plum and cling peach growers aware of innovations developed within this project.

- **Grower classroom and field meetings**

  Dried plums

  - IPFP management 2/14/02
  - Statewide dried plum day 3/15/02
  - Dried plum field scout meeting 5/17/02
  - Aphid control field meeting 5/20/02
  - Glenn Co. water stewardship 5/22/02
  - 3rd orchard field day 6/27/02
  - Tree fruit pest management 9/5/02
  - Orchard dormant spray meeting 12/5/02
  - Yuba/Sutter dried plum day 2/26/03
  - Prebloom dried plum orchard management 3/3&4/03
  - Postbloom dried plum management 4/8&9/03
  - IPFP Binder Meeting 5/29/03

  - Reference date dried plum orchard management 5/6&7/03
  - Summer dried plum orchard management 6/10&11/03
  - Prebloom dried plum orchard management 7/15&16/03
  - Fall field meetings (5) 11/10-14/03
  - UCCE/Sutter Ag Comm. dormant meeting 12/2&9/03
  - Yuba/Sutter dried plum day 3/3/04
  - Yuba/Sutter IPFP spring field day 4/29/04
  - Glenn County IPFP field day 5/13/04
  - Yuba/Sutter IPFP fall field day 9/23/04
  - UCCE/Sutter Ag Comm. dormant meeting 12/7&9/04
  - Yuba/Sutter winter pruning/IPFP field day 12/14/04

  Peaches
  - Peach pest management 5/31/02
  - 8th annual cling peach day 1/20/02
  - Dormant spur meeting 11/22/02
  - Dormant spur meeting 12/6/02
  - 9th annual cling peach day 1/31/03
  - Dormant spur meeting 12/2/03
  - Dormant spur meeting 12/9/03
  - UCCE/Sutter Ag Comm. dormant meeting 12/7&9/04
- **Grower newsletters**
  - Ca Dried Plum News 4/1/02
  - IPFP newsletter #124 5/1/02
  - IPFP newsletter 6/1/02
  - IPFP newsletter 9/1/02
  - IPFP newsletter #127 1/03
  - IPFP newsletter 9/03
  - IPFP newsletter 11/03
  - IPFP newsletter 4/04
  - IPFP newsletter 6/04
  - IPFP newsletter 10/04
- **Other mass media**
  - Calif. Grower Magazine
  - Western Fruit Grower Sept/Oct, 03
  - Western Fruit Grower March, 05
- **Internet websites**
  - Gary Obenauf (http://www.agresearch.nu/)
  - UC IPM (www.ipm.ucdavis.edu)
  - UCCE Sutter/Yuba Counties (http://cesutter.ucdavis.edu)
  - (http://cesutter.ucdavis.edu/newsletterfiles/newsletter656.htm)
- **Coordinated outreach efforts**
  - WSRD management team meetings.

Goal #4. Evaluate changes in pesticide use due to project's goals.

To date, we have been able to change little in the way of grower practices relating to dormant sprays and OP usage in dried plum and peach orchards in Yuba and Sutter Counties. Reduced rates of insecticides for dormant aphid control have been adopted by at least one collaborating grower, and efforts are ongoing to convince others to reduce their dormant insecticide rates. Additional use of pheromones for OFM control will hinge on the questionable long-term effectiveness of the less expensive, but high resistance risk pyrethroid materials for OFM control. The information generated in the project provides growers and PCAs with information needed to take steps to reduce OP's use.

PUR data has indicated reductions of the use of OP's over the last several years for the dried plum and cling peach industries but this trend has not necessarily been reflected in the CalFed project area. We went back to the growers we were working with to try to figure out why this area was different and decided there were several contributing factors such as a high pest pressure area and the reduced risk with a dormant application. We have taken measures to address this issue via early dormant season applications and reduced rates on pesticides used.

VII. Other Funding Sources:

Additional grant support was solicited and secured from several sources. Listed below are sources of each additional grant that was used to support this project:

California Environmental Protection Agency/Department of Pesticide Regulation/Pest Management Alliance (CalEPA/DPR/PMA)
University of California/Sustainable Agriculture Research and Extension Program/Biologically Integrated Farming Systems (UC/SAREP/BIFS)
United States Department of Agriculture/Cooperative States Research, Education and Extension Services (USDA/CSREES)
United States Department of Agriculture/Natural Resources Conservation Service (USDA/NRCS)
United States Environmental Protection Agency (USEPA/Region 9)
State Water Resources Control Board (SWRCB)

VIII. Future Plans:

Future plans include continued efforts to implement the monitoring, treatment thresholds and reduced rates of pesticides researched and validated by the IPFP project. Efforts will also be made to encourage clientele to use the November timing for their dormant aphid control program. These plans also include finishing the third edition of the "Integrated Prune Farming System Decision Guide" and disseminating new sections to farm advisors that have copies of the guide's second edition for sale in their office. The new sections will be placed in the guide to bring them up to date. This will be done in time for two spring meetings where topics relative to IPFP will be discussed. Those that already have the guide will be able to pick up the new sections to include in their existing guide.

IX. Matching Funds:

Matching funds were estimated to be better than $650,000.

X. Literature Cited/Reports complementing the project:

1. 2002 Prune Research Reports
    a. Reducing Input of Dormant Sprays/Barry Wilson
    b. Prune Aphids: Fall Migration, Biological Control and Impact on Prune Production/Nick Mills
    c. Environmentally Sound Prune Systems/Bill Olson
    d. Prediction on Model of Blossom Blight Brown Rot in Prunes/Themis Michailides
    e. Mealy Plum Aphid and Leaf Curl Plum Aphid Pheromone Development/Barry Wilks

2. 2003 Prune Research Report
    a. Reducing Input of Dormant Sprays/Barry Wilson
    b. Prune Aphids: Fall Migration, Biological Control and Impact on Prune Production/Nick Mills
    c. Environmentally Sound Prune Systems/Bill Olson

3. 2004 Prune Research Report
    a. Reducing Input of Dormant Sprays/Barry Wilson
    b. Prune Aphids: Fall Migration, Biological Control and Impact on Prune Production/Nick Mills
    c. Environmentally Sound Prune Systems/Bill Olson

4. Implementation of Best Management Practices to Mitigate OP Pesticide Runoff, State Water Resources Control Board, 319h Program, Contract # 01-108-255-0, March 2005

Satellite Projects:

These projects were added to the overall program for the 2003-2004 season.

1. Alternative Defoliants:

Early (Sprayed by October 1) defoliation has potential as an alternative aphid control material. Loss of leaves, the aphid food source, prior to aphid arrival in the orchard, may serve as habitat modification and reduce or eliminate overwintering aphid populations in the defoliated block. However, the standard defoliant – zinc sulfate, applied as a foliar fertilizer – is applied in high amounts to affect defoliation. There is some concern that this application is not environmentally sustainable. Zinc is a heavy metal. Identification of environmentally sustainable alternative defoliants to zinc sulfate may be of value to the prune industry.

Several defoliation treatments were established in the fall, 2003 using nursery trees. Nursery stock was purchased and used to test new defoliants to avoid the risk of damaging a grower's crop while testing new defoliant rates and materials. Defoliants were applied on October 1, and degree of tree defoliation evaluated October 15. Trees were "lifted" in December, 2003 and placed in cold storage until February or April, 2004 when they were planted in grower orchards. Spring regrowth was evaluated several times following planting in February or April. Results were similar regardless of planting timing. Trees defoliated by October 15 grew poorly or died the following spring. While mature trees may not have died, these results suggest that early defoliation may have a negative impact on tree performance the spring following early defoliation. In addition, prune trees are not dormant in early October, and releafing and shoot regrowth occurred following defoliation in the nursery situation where trees were regularly irrigated. TFall regrowth following early defoliation could further reduce resources available for tree and fruit growth the following year.

Table 6. Alternative materials and reduced zinc sulfate rates were tested against the grower standard – 20# zinc sulfate in 100 gallons of water. All sprays were applied to dripping with handgun applications. The following results were obtained:

Treatment	% defoliation on October 15	**Fall regrowth after defoliation?**	**Spring, 2004 plant growth?**
Control	None	None	OK
6.5%* Urea	None	None	OK
Zinc sulfate (20#/100 gal water)	100%	Yes	Dead
Zinc sulfate (10#100 gal water)	100%	Yes	Dead
Zinc sulfate (10#/100 gal water + 1% urea	100%	Yes	Dead
Zinc sulfate (10#/100 gal water + 0.5% NIS[1.]	100%	Yes	Dead
Zinc sulfate (10#/100 gal water + 1%* urea + 0.5% NIS[1.]	100%	Yes	Dead
Sodium chlorate (0.9375%*)	100%	Yes	Dead
Sodium chlorate (1.875%*)	100%	Yes	Dead
Pyraflufen ethyl (0.00067%*)	10%**	NO	Dead
Pyraflufen ethyl (0.00134%*)	10%**	NO	Dead

*w/w
**no defoliation, but 6-10” shoot tip die back
[1.]Non-ionic Surfactant (v/v)

2. Oil on Prunes:

Horticultural oil is an effective insecticide, especially for control of low to moderate populations of San Jose scale (SJS) in the dormant period. Oil is not a potential water contaminant when applied during the dormant period, and as such is a viable replacement for OP’s in prune pest management of SJS. In addition, many growers use oil in the dormant period to advance bloom and “tighten” the bloom period. However, ‘French’ prune is extremely sensitive to oil (phytotoxicity) during the dormant period. This sensitivity is reduced when there is adequate moisture in the soil and during the delayed dormant period. The specific mechanism of oil damage in prune has not been elucidated. This satellite project was initiated to accumulate more information on the relationship between oil use and prune physiology in ‘French’ prune.

Oil was applied in dilute volume (handgun spray at a rate of 400 gpa) to six prune trees per application date on the following days:

- October 30
- Nov. 19
- Dec. 9
- Jan 12
- Feb 5
- March 9
- Control

Orchard environmental conditions (temperature, relative humidity, and soil moisture at 6”, 12”, and 18” depths were measured continuously beginning on December 18, 2003.

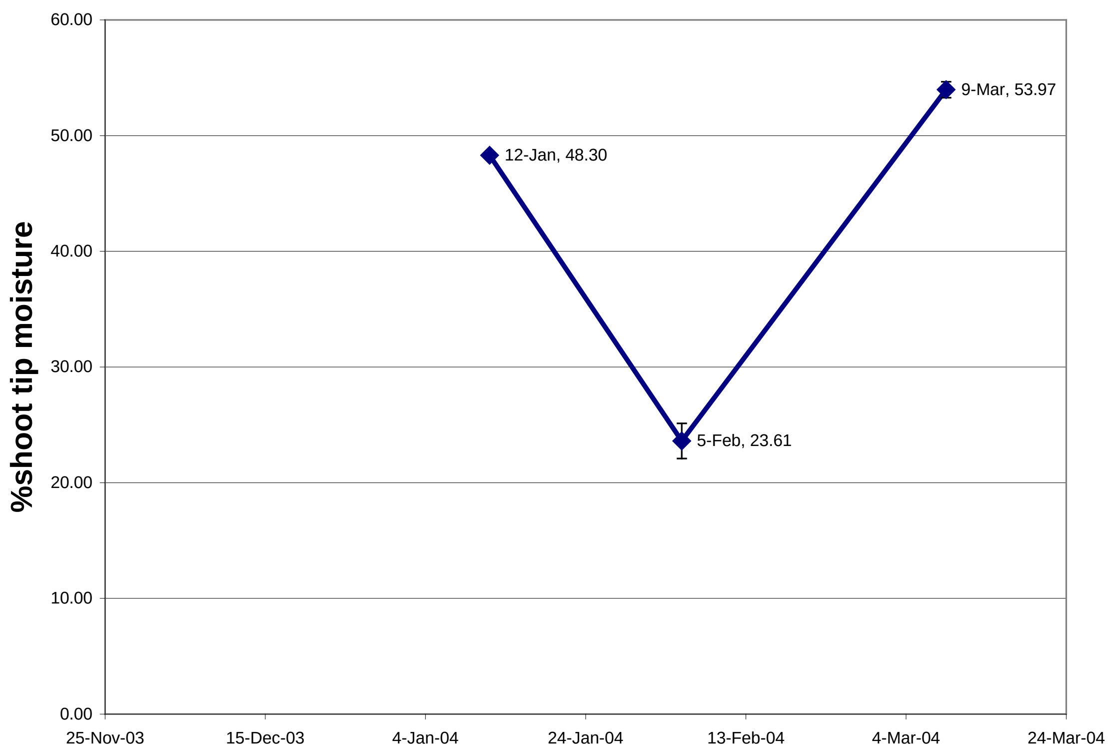
Six terminal shoots (6” in length) were sampled from six trees on: January 12; February, 5; and March 9, 2004. Shoots were oven-dried at 70oC for a week, and then dry weight and % moisture determined.

At harvest, bloom was rated and the affect of oil application timing on bloom timing was rated.

Results: Despite a reduction in % twig moisture on February 12 (Figure 21), no phytotoxicity (“oil burn”) was observed in any of the treatments. The trees treated with oil on Dec. 9 and Jan. 12 bloomed 1-3 days earlier than the other treated and control trees. Oil treated trees that bloomed early appeared to have increased fruit set due to cooler temperatures during their bloom conditions during that time.

This work will be continued in 2005.

Figure 21. ‘French’ prune shoot moisture (% dry weight basis) at three different dates in winter, 2004.



Summary of Work Completed

Reporting Period: 4-1-02 to 3-31-05

Contract No. 4600001690
Project Name: Implementation of Best Management Practices to Mitigate OP Pesticides Runoff
Contractor Name: Agricultural Research Consulting
Project Director: Gary L. Obenauf

Summary of Work Completed

Task	Deliverable by Subtask No. *	Due Date	% of Work Complete	Date Submitted
1. Administration	1.a Project Oversight	12/31/04	100%	5/1/05
	1.b Formation of Management Team	04/10/02	100%	04/10/02
	1.c Coordination with other Programs	12/31/04	100%	12/31/04
	1.d Identification of Study Area	01/07/02	100%	01/07/02
2. Demonstration Orchards	2.a Identify Growers	03/01/02	100%	03/01/02
	2.b Set Up Demonstration Orchards	03/01/02	100%	03/01/02
	2.c Monitor Pest	12/31/04	100%	02/18/05
3. Dissemination of Information	3.a Newsletters, meetings and etc.	12/31/04	100%	02/18/05
	3.b Coordination with SRWP & CURES	12/31/04	100%	02/18/05
4. Monitoring	4.a Monitoring Plan	12/31/04	100%	10/01/04
	4.b Coordinate with watershed and other demonstration sites	12/31/04	100%	02/18/05
	4.c Chemical Monitoring	12/31/04	100%	05/01/05
5. Evaluation/Reporting and Presentations	5.a Quarterly Progress Reports	03/31/05	100%	02/18/05
	5.b Draft Final Report	03/31/05	100%	02/18/05
	5.c Final Report	03/31/05	100%	05/1/05

* All deliverables were sent to the RWQCB contract manager with the quarterly report or separately.