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Pest Management Update and Sampling: Insects and Weeds

Bob Curtis, ABC (Moderator)

David Haviland, UCCE-Kern County

Kris Tollerup, UCCE IPM Advisor

Emily Symmes, UCCE IPM Advisor

Brad Hanson, UC Davis

David Haviland, UCCE-Kern County

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Pest Management Update and Sampling: Insects and Weeds

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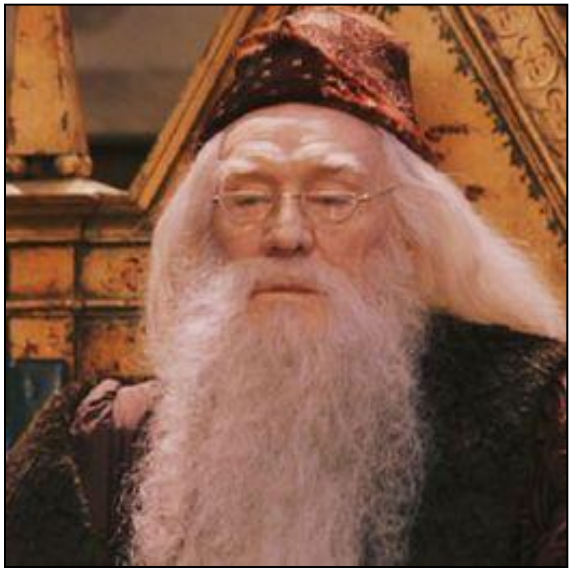
IPM for Almonds- making management decisions

“There will be a time when we must choose between what is easy and what is right”

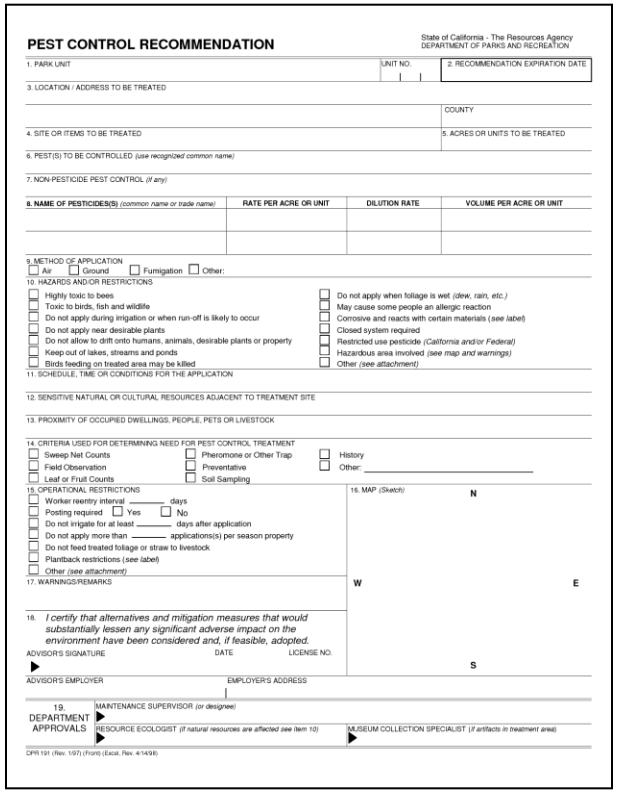


Dumbledore
Harry Potter and the Goblet of Fire

Monitoring programs are the basis for making treatment decisions

- Determine pest presence/population
- Determine beneficial organism presence/population
- Evaluate population growth/decline
- Determine the need to treat (treatment thresholds)
- Assist with treatment timing
- Assess treatment efficacy and need to retreat
- Compare populations from year to year

The vast majority of monitoring activities result in an informal ‘do not treat’ recommendation



PEST CONTROL RECOMMENDATION

State of California - The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

1. PARK UNIT | UNIT NO. | 2. RECOMMENDATION EXPIRATION DATE

3. LOCATION / ADDRESS TO BE TREATED | COUNTY

4. SITE OR ITEMS TO BE TREATED | 5. ACRES OR UNITS TO BE TREATED

6. PEST(S) TO BE CONTROLLED *(use recognized common name)*

7. NON-PESTICIDE PEST CONTROL *(if any)*

8. NAME OF PESTICIDES(S) *(common name or trade name)*	RATE PER ACRE OR UNIT	DILUTION RATE	VOLUME PER ACRE OR UNIT

9. METHOD OF APPLICATION
☐ Air ☐ Ground ☐ Fumigation ☐ Other:

10. HAZARDS AND/OR RESTRICTIONS
☐ Highly toxic to bees
☐ Toxic to birds, fish and wildlife
☐ Do not apply during irrigation or when run-off is likely to occur
☐ Do not apply near desirable plants
☐ Do not allow to drift onto humans, animals, desirable plants or property
☐ Keep out of lakes, streams and ponds
☐ Birds feeding on treated area may be killed
☐ Do not apply when foliage is wet *(dew, rain, etc.)*
☐ May cause some people an allergic reaction
☐ Corrosive and reacts with certain materials *(see label)*
☐ Closed system required
☐ Restricted use pesticide *(California and/or Federal)*
☐ Hazardous area involved *(see map and warnings)*
☐ Other *(see attachment)*

11. SCHEDULE, TIME OR CONDITIONS FOR THE APPLICATION

12. SENSITIVE NATURAL OR CULTURAL RESOURCES ADJACENT TO TREATMENT SITE

13. PROXIMITY OF OCCUPIED DWELLINGS, PEOPLE, PETS OR LIVESTOCK

14. CRITERIA USED FOR DETERMINING NEED FOR PEST CONTROL TREATMENT
☐ Sweep Net Counts ☐ Pheromone or Other Trap ☐ History
☐ Field Observation ☐ Preventative ☐ Other: _____
☐ Leaf or Fruit Counts ☐ Soil Sampling

15. OPERATIONAL RESTRICTIONS
☐ Worker reentry interval _____ days
☐ Posting required ☐ Yes ☐ No
☐ Do not irrigate for at least _____ days after application
☐ Do not apply more than _____ applications(s) per season property
☐ Do not feed treated foliage or straw to livestock
☐ Plantback restrictions *(see label)*
☐ Other *(see attachment)*

16. MAP *(Sketch)* N / W / E / S

17. WARNINGS/REMARKS

18. *I certify that alternatives and mitigation measures that would substantially lessen any significant adverse impact on the environment have been considered and, if feasible, adopted.*

ADVISOR'S SIGNATURE ▶ | DATE | LICENSE NO.

ADVISOR'S EMPLOYER | EMPLOYER'S ADDRESS

19. DEPARTMENT APPROVALS
MAINTENANCE SUPERVISOR *(or designee)* ▶
RESOURCE ECOLOGIST *(If natural resources are affected see item 10)* ▶
MUSEUM COLLECTION SPECIALIST *(If artifacts in treatment area)* ▶

DPR 191 (Rev. 1/97) (Front) (Excel, Rev. 4/14/98)

Written recommendations require certification that monitoring was done and that treatments are warranted

- “I hereby certify that alternatives and mitigation measures that would substantially lessen any significant adverse impact on the environment have been considered and, if feasible, adopted.”
- Criteria for determining need for treatment:
  - Sweep net counts
  - Field observations
  - Pheromone or other trap counts
  - Presence of pest above treatment threshold
  - Pest levels increasing, no evidence of beneficials
  - Etc.

Monitoring for spider mites

- Goal is management of mites through biological control supplemented by insecticides
- The goal is NOT to manage spider mites through miticides supplemented by biological control

Monitoring for spider mites

- Prior to July 1, focus on hot spots
  - Edges, crotches of the tree
- Leaves should be random
- 15 leaves per tree
- At least 5 trees
  - More is better
- +/- for mites
- +/- for predators

Sixspotted thrips
Scolothrips sexmaculatus

Spider mite destroyer
Stethorus picipes

Minute Pirate Bug
Geocoris sp.

Treatment decisions

- Based on presence/absence sampling
  - Accounts for biological control
- If predators are present
  - Treat if 50% leaves infested
  - Don't treat if <30% infested
- If no predators are present
  - Treat if 26% infested
  - Don't treat if <20% infested

UC IPM
www.ipm.ucdavis.edu

Almonds—Webspinning Spider Mites Sampling

Supplement to UC IPM Pest Management Guidelines: Example Form

Directions:
1. Before July 1, monitor hot spot areas where mites develop first. After July 1, monitor the whole orchard by dividing it into sampling areas that can be treated separately.
2. Within each sampling area, sample a minimum of 5 trees. Select 15 leaves from each tree, randomly picking leaves from both the inside and outside of the canopy as you walk around it.
3. Using a hand lens, examine both sides of each leaf carefully. Look for spider mites and eggs, western predatory mites and eggs, sixspotted thrips, and other predators. Look closely since there may be only 1 to 2 mites or predators on a leaf.
4. Count the number of leaves on each tree with pest mites or their eggs, and the number of leaves with predators, and record below. Do not count individual mites or predators.
5. As you move from tree to tree, keep a running total of leaves with mites on the form. Once you have sampled 5 trees, compare your total to the numbers in the "Don't Treat" and "Treat" columns below.
6. If your numbers are the **SAME OR LESS** than the "Don't Treat" column, you can stop sampling. If your numbers are **AS MUCH OR MORE** than in the "Treat" column, stop sampling and treat. If your numbers are **IN BETWEEN**, continue sampling until a decision can be reached.

Date _____ **Grower/Orchard** _____

Tree number	Total number of leaves sampled	Number of leaves with mites (on each tree)	Total number of leaves with mites (on all trees)	Number of leaves with western predatory mite and/or sixspotted thrips	*If predators are present*		*If predators are absent*	
					Don't treat if total leaves with mites is:	Treat if total leaves with mites is:	Don't treat if total leaves with mites is:	Treat if total leaves with mites is:
1	15							
2	30							
3	45							
4	60							
5	75				≤ 27	≥ 40	≤ 12	≥ 24
6	90				≤ 33	≥ 48	≤ 15	≥ 28
7	105				≤ 39	≥ 55	≤ 18	≥ 31
8	120				≤ 45	≥ 62	≤ 21	≥ 35
9	135				≤ 51	≥ 69	≤ 23	≥ 39
10	150				≤ 57	≥ 76	≤ 26	≥ 43
11	165				≤ 63	≥ 83	≤ 29	≥ 46
12	180				≤ 70	≥ 90	≤ 32	≥ 50
13	195				≤ 76	≥ 97	≤ 35	≥ 54
14	210				≤ 82	≥ 104	≤ 38	≥ 57
15	225				≤ 88	≥ 111	≤ 41	≥ 61
16	240				≤ 94	≥ 118	≤ 45	≥ 65
17	255				≤ 101	≥ 125	≤ 48	≥ 68
18	270				≤ 107	≥ 132	≤ 51	≥ 72
19	285				≤ 113	≥ 139	≤ 54	≥ 75
20	300				≤ 119	≥ 146	≤ 57	≥ 79

(23 March 2009) Print copies of this form at www.ipm.ucdavis.edu/FORMS/

Produced by the UC Statewide IPM Program

Treatment decisions

UC IPM
www.ipm.ucdavis.edu

Almonds—Webspinning Spider Mites Sampling

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Date _____ **Grower/Orchard** _____

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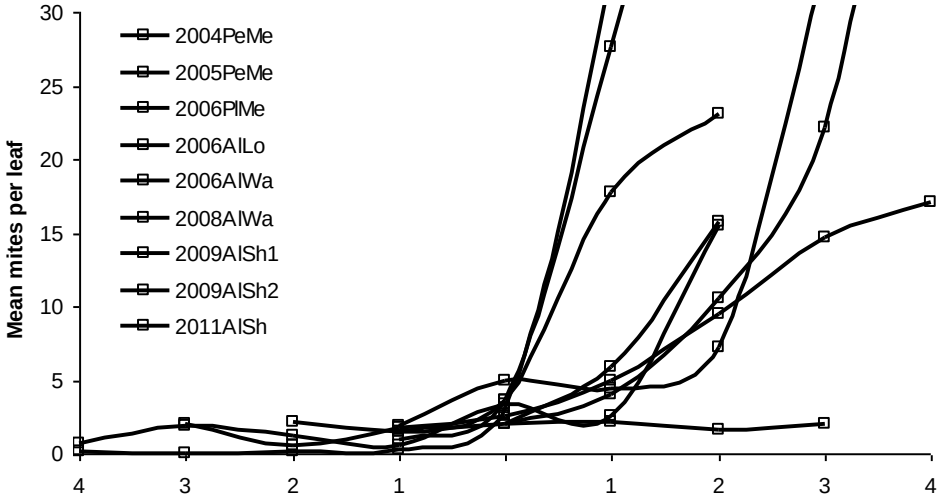
- Nine trials, six years
- In 8 out of 9 cases mites reached treatable levels within1 to 2 weeks after the threshold was reached
- Data suggest mite presence on 25% of leaves justifies a treatment



Southern SJV experience of PCAs using monitoring and thresholds

- Spring 2013- Lots of mites and few beneficial organisms suggested that an aggressive approach to mite management was needed to prevent defoliation. Multiple miticide applications were made
- Summer 2013- Lack of mites and presence of beneficials led many growers to skip mite sprays at hull split
- Late winter 2014- Many growers concerned about mites again in 2014, especially due to dry winter, early heat, and tree stress from lack of irrigation
- Spring 2014- Monitoring showed elevated biological control, no need to treat
- Summer 2014- PCAs using monitoring and thresholds averaged one miticide application for the season

Kris Tollerup, UCCE IPM Advisor

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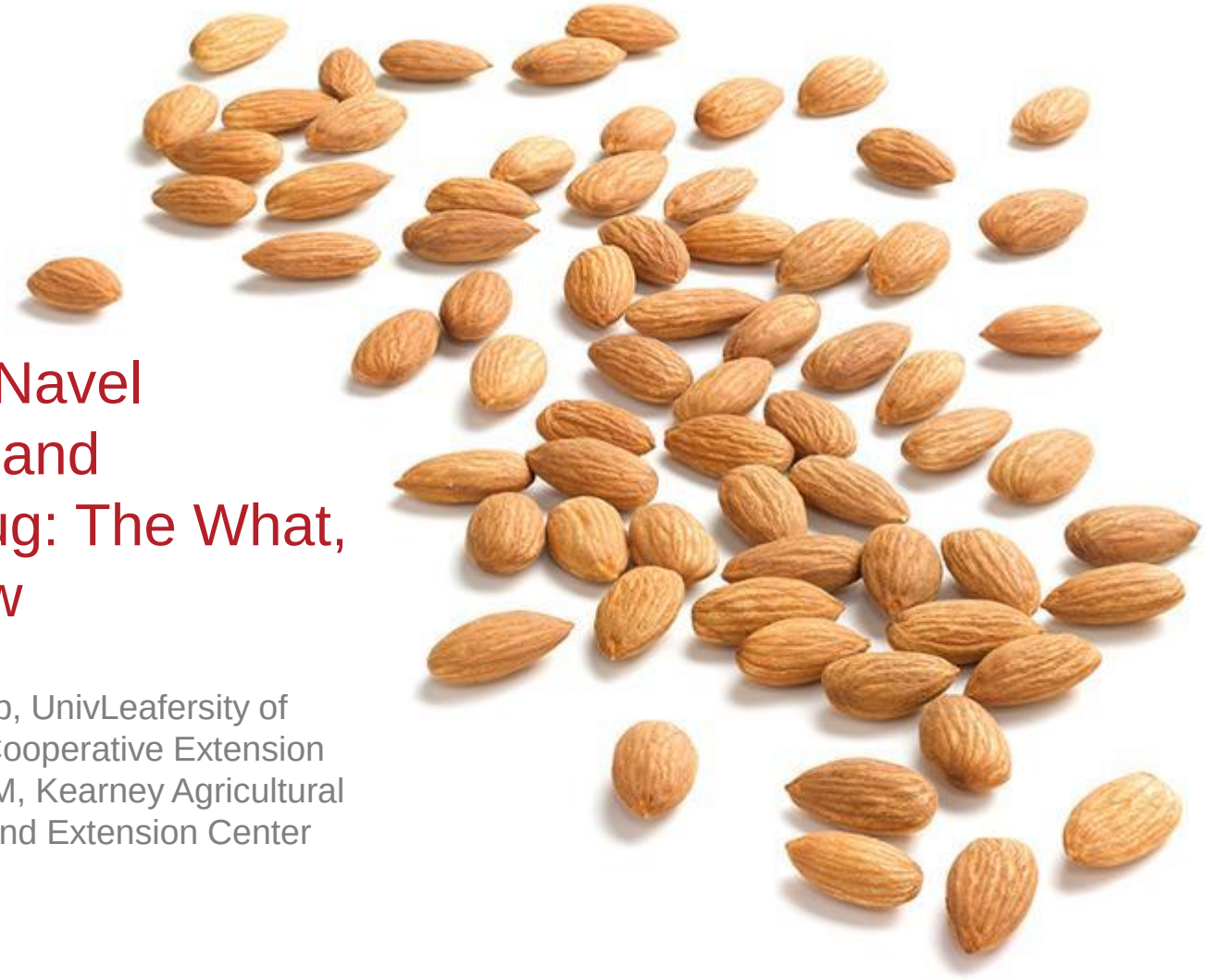

Sampling for Navel Orangeworm and Leaffooted Bug: The What, Why, and How

Kris Tollerup, UnivLeafersity of California Cooperative Extension Advisor, IPM, Kearney Agricultural Research and Extension Center

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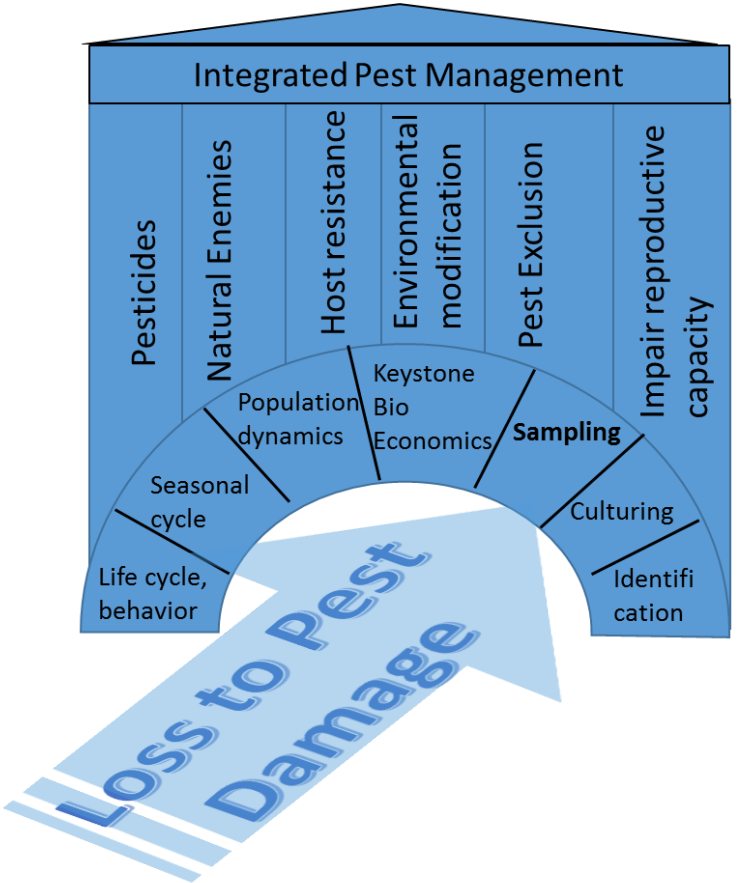
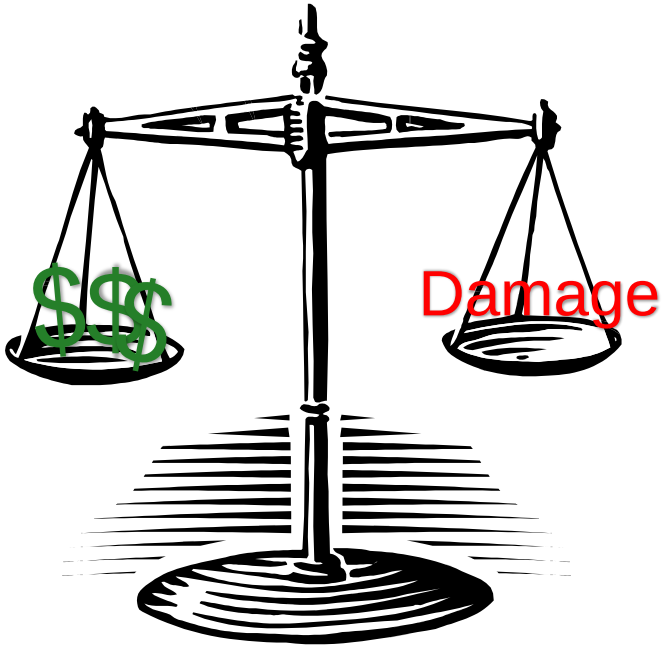
Sampling: The What

- Bioeconomics: Relationships between pest number, host response to injury, and resultant economic loss.
  - Basic biology and ecology.
  - Sampling and identification



Sampling: The Why

- Identification of pest and associated damage.
- Provides estimation of pest population density.
- Provides decision-making tool i.e. treat / not treat information
  - Economic injury level
    - Some level of pest/damage is tolerated i.e. below on economic injury level.
    - Pest and crop dependent.
    - Can decrease as crop value increases.

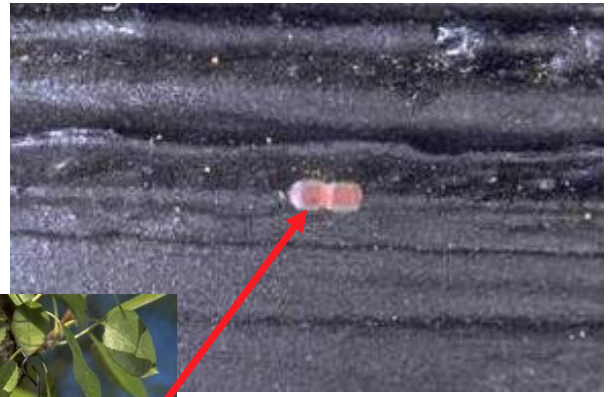


Sampling: The How for Navel Orangeworm

- Egg traps constructed from modified 50-dram vial filled 50% with almond meal plus 10% wt/wt crude almond oil. HOWEVER, food-grade almond meal works well.
  - Begin 1st week of April.
  - One trap / 10 acres or minimum of 4 / orchard.
    - Divide large acreage into sprayable blocks.
  - Hang traps at head-height
    - North side of tree (non-Pareil) & 1 to 3 ft inside canopy.
    - Avoid water hazard.
  - Check 2x / week until biofix
    - First of two consecutive dates on which eggs increase on 75% of traps.

Sampling: The How for Navel Orangeworm

- Continue monitoring traps, remove eggs as you continue.
- Replace bait each 4 weeks.
- Eggs are flat, laid primarily on ridges of trap
  - Eggs white when first laid then turn orange-red prior to hatching.
- Graph egg numbers on monitoring form provided by UC Pest Guidelines (http://www.ipm.ucanr.edu/PMG/C003/almond-orngwrmeggtrap.pdf.)
  - Biofix: Begin accumulation of degree-days.
  - Data provides information when new generation begins egg-laying.
  - Use data to verify degree-day calculation.



Sampling: The How for Navel Orangeworm

- Pheromone traps: Delta or white wing sticky trap baited with female synthetic sex pheromone.
- Hang in orchard mid-March
  - Use in conjunction with egg traps (For Now).
- Hang in tree at approximately head height.
- Count moths at least once per week.
- Change lure ~ 4 to 6 weeks.
- Change sticky card when “saturated”.
- Careful not to confuse meal moth for NOW.
- **Understanding of male NOW capture in progress**

Sampling: The How for Leaffooted Bug

Sampling: The How for Leaffooted Bug

- Beat trays
  - Easy to detect species in canopy.
  - Immediate information.
- Poles
  - 8-ft pole used to strike upper limbs
    - Count the number of LFB which fly.
- Damaged nuts, in tree and on ground
  - Indicates presences of LFB.
  - Can estimate percentage of damage nuts.
  - Confirm damage by cutting across damage area.
- Critical period to sample
  - March and April.
- Overwintering aggregations.

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Sampling: The How for Leaffooted Bug

- Limiting issues
  - No economic injury level.
    - Small population can cause substantial damage.
  - Pheromone not yet understood.
  - LFB part of large-bug complex.
    - Species change over the season.
    - Shell hardness differs; affects damage.
  - LFB is long-lived with 3 and a partial 4th generation per season.
- **Work to improve sampling is in progress.**

Any Questions?

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Emily Symmes, UCCE IPM Advisor

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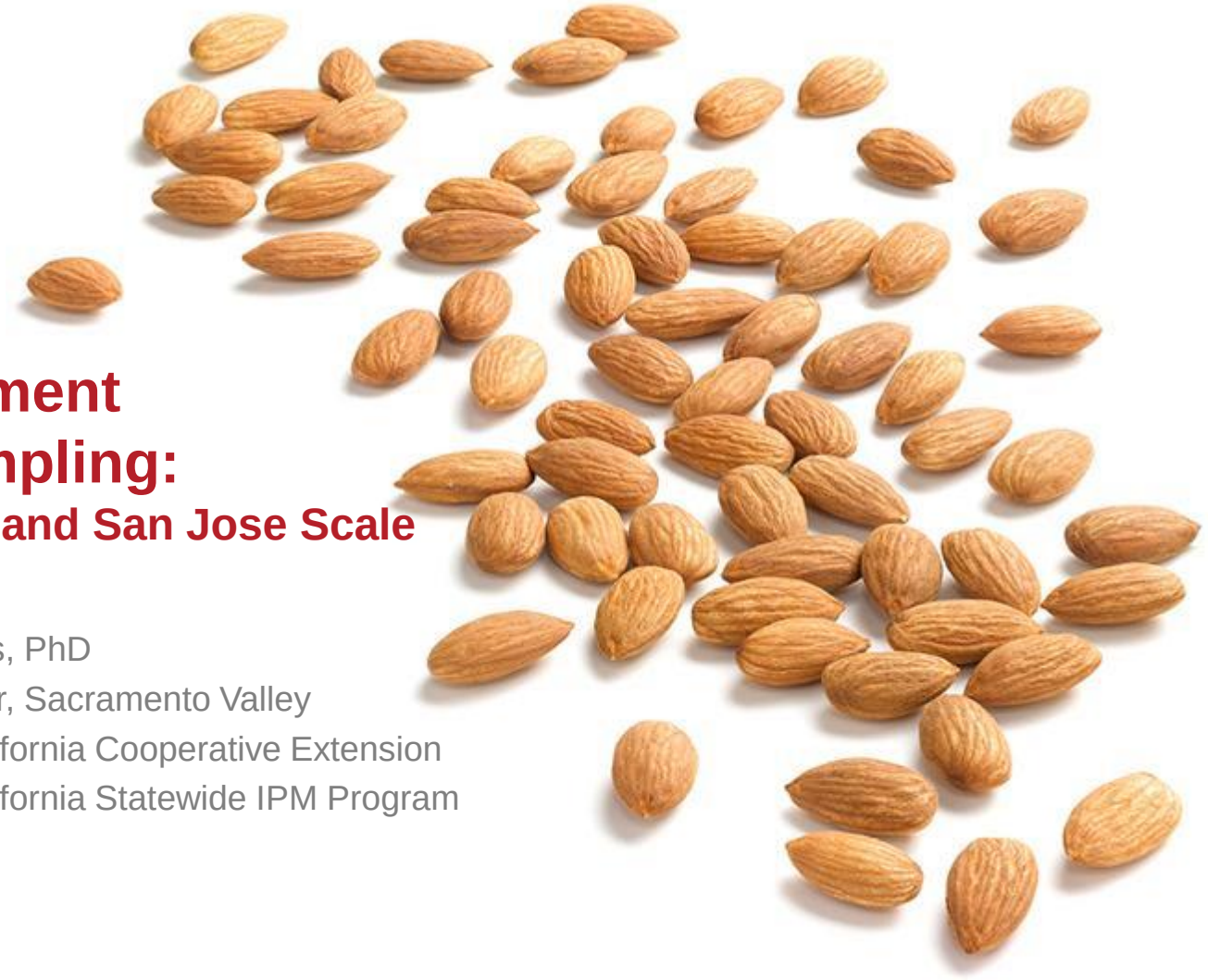

Pest Management Update & Sampling:

Peach Twig Borer and San Jose Scale

Emily J. Symmes, PhD
Area IPM Advisor, Sacramento Valley
University of California Cooperative Extension
University of California Statewide IPM Program

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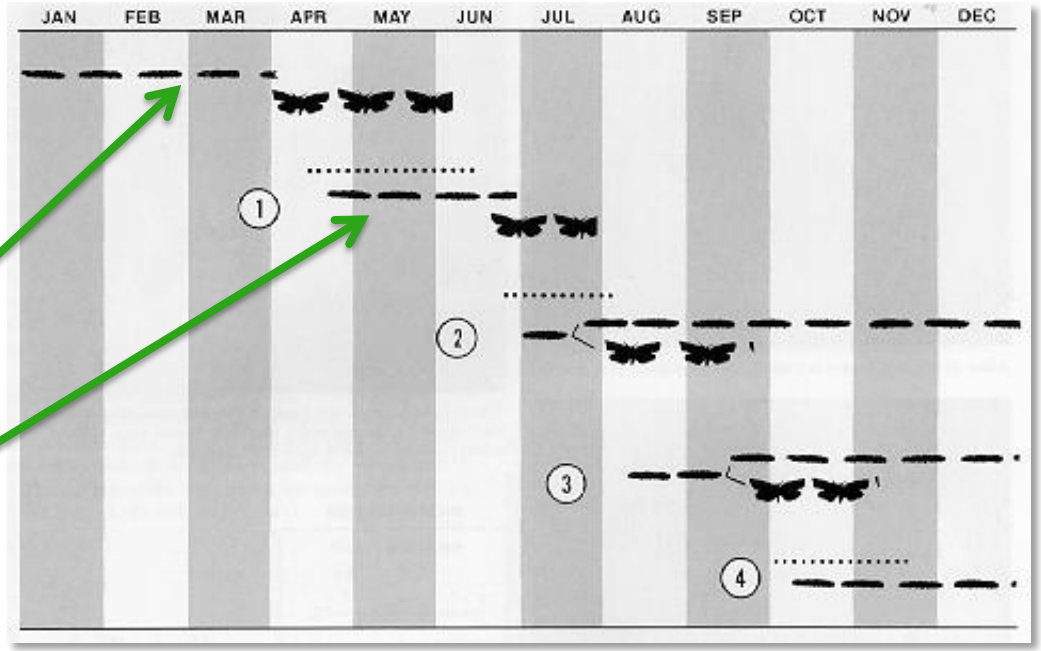
Peach Twig Borer

Treatment Options:

Dormant treatment

Bloom Bt treatment

Spring treatment



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PTB Bloom Monitoring – Hibernacula

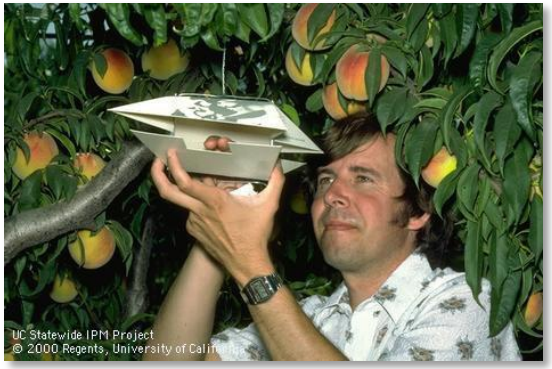
- Weekly beginning at popcorn stage
- Examine 10 hibernacula per orchard
  - Limb crotches or bark cracks, especially 2-3 year old wood
  - Cut small wedges of bark around hibernacula
  - Pinch bark to open hibernacula looking for presence of larva
- Bt treatments for moderate to high PTB populations
  - 20-40% larval emergence
  - 7-10 days later or 80-100% larval emergence
  - Third possible at 80-100% if emergence is spread out

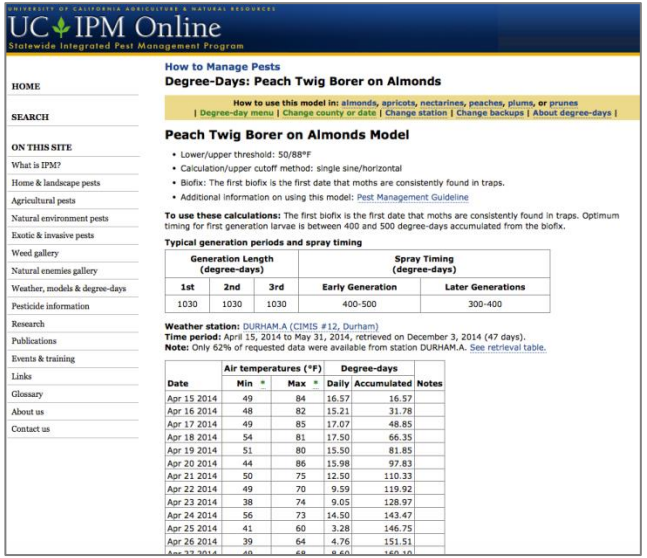
PTB Spring Monitoring – Shoot Strikes

- Weekly beginning mid April
- Walk through orchard and cut down any shoot strikes
- Slice into shoot strikes to determine PTB or OFM
- Threshold
  - 4 or more shoot strikes per tree in mature orchard

PTB – Spring Monitoring for Treatment Timing

- Pheromone traps
- Hang by March 20 (south) and April 1 (north)
- 1 trap/20 acres, minimum 2/orchard
  - Uniform
  - Additional traps in hot spots
  - Shade
  - 6-8 ft high
  - 1-3 ft inside canopy
  - North tree quadrant
  - Minimum 5 trees from edge
- Check 2x/week until biofix
  - First date moths are consistently caught
- If shoot strike monitoring indicates treatment, begin accumulating DD and treat accordingly depending on material





UC IPM Online
Statewide Integrated Pest Management Program

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ON THIS SITE
What is IPM?
Home & landscape pests
Agricultural pests
Natural environment pests
Exotic & invasive pests
Weed gallery
Natural enemies gallery
Weather, models & degree-days
Pesticide information
Research
Publications
Events & training
Links
Glossary
About us
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How to Manage Pests

Degree-Days: Peach Twig Borer on Almonds

How to use this model in: almonds, apricots, nectarines, peaches, plums, or prunes
| Degree-day menu | Change county or date | Change station | Change backups | About degree-days |

Peach Twig Borer on Almonds Model

- Lower/upper threshold: 50/88°F
- Calculation/upper cutoff method: single sine/horizontal
- Biofix: The first biofix is the first date that moths are consistently found in traps.
- Additional information on using this model: Pest Management Guideline

To use these calculations: The first biofix is the first date that moths are consistently found in traps. Optimum timing for first generation larvae is between 400 and 500 degree-days accumulated from the biofix.

Typical generation periods and spray timing

Generation Length (degree-days)			Spray Timing (degree-days)	
1st	2nd	3rd	Early Generation	Later Generations
1030	1030	1030	400-500	300-400

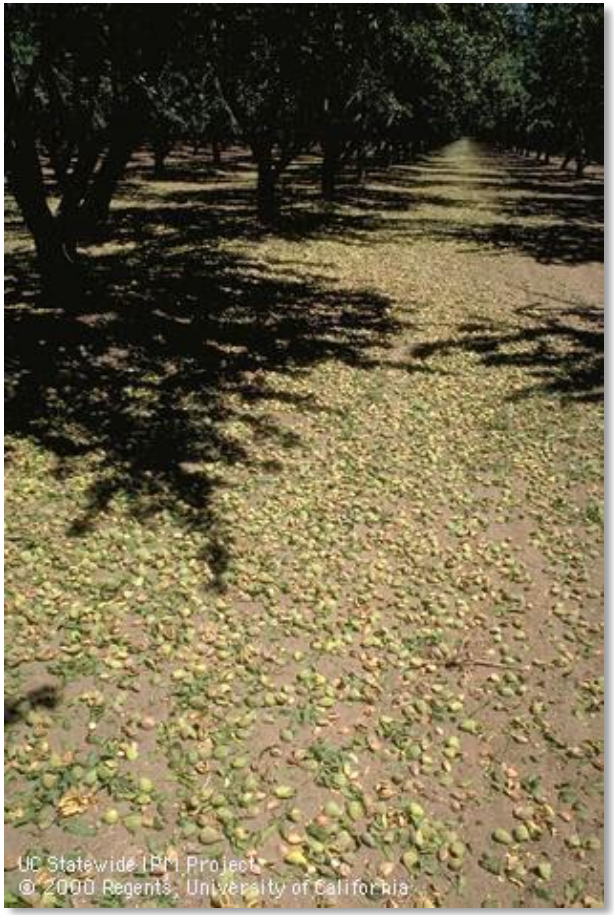
Weather station: DURHAM A (CIMIS #12, Durham)
Time period: April 15, 2014 to May 31, 2014, retrieved on December 3, 2014 (47 days).
Note: Only 62% of requested data were available from station DURHAM A. See retrieval table.

Date	Air temperatures (°F) Min *	Max *	Degree-days Daily	Accumulated	Notes
Apr 15 2014	49	84	16.57	16.57	
Apr 16 2014	48	82	15.21	31.78	
Apr 17 2014	49	85	17.07	48.85	
Apr 18 2014	54	81	17.50	66.35	
Apr 19 2014	51	80	15.50	81.85	
Apr 20 2014	44	86	15.98	97.83	
Apr 21 2014	50	75	12.50	110.33	
Apr 22 2014	49	70	9.59	119.92	
Apr 23 2014	38	74	9.05	128.97	
Apr 24 2014	56	73	14.50	143.47	
Apr 25 2014	41	60	3.28	146.75	
Apr 26 2014	39	64	4.76	151.51	

PTB – Harvest Samples

- Establish orchard history to help inform treatment decisions
- Check efficacy of management program

- Collect & crack out 500 nuts per block
- Identify pest infestation



PTB – Harvest Samples

	PTB	OFM	NOW	ANT
Kernel	Shallow channels & surface groove on kernels	Shallow channels & surface groove on kernels	Deep chewing in nut	Scraping or peeling of kernel skin, deep hollowing of nut, “sawdust” present
Frass	None	Reddish brown; very little	White; often a lot	No
Webbing	No	No	Yes	No
Boring	No	No	Yes	Hollowing

San Jose Scale – Dormant Spur Sampling

- 1X/year
- 35-50 trees (random) per orchard or plot
- 100 spurs total
  - 2-3 spurs (random) from inside of each tree canopy near main scaffold
- Clip spur off at base
  - Include old spur wood along with past season's growth
- Sequential sample
- Examine 20 spurs at a time
  - Count live SJS
  - Note level of parasitization

SJS black cap stage

Parasitized SJS

SJS – Dormant Spur Sampling Thresholds

# of Spurs	# of SJS infested spurs (not parasitized)
20	0: Stop sampling – no treatment necessary 1-3: Examine 20 more spurs ≥ 4: Stop sampling – treatment recommended
40	1: Stop sampling – no treatment necessary 2-5: Examine 20 more spurs ≥ 6: Stop sampling – treatment recommended
60	≤ 3: Stop sampling – no treatment necessary 4-7: Examine 20 more spurs ≥ 8: Stop sampling – treatment recommended
80	≤ 5: Stop sampling – no treatment necessary 6-8: Examine 20 more spurs ≥ 9: Stop sampling – treatment recommended
100	< 10: No treatment necessary ≥ 10: Treatment recommended

SJS – Dormant Spur Sampling Form

UC IPM
www.ipm.ucdavis.edu

Almonds—Dormant Spur Sampling

Supplement to UC IPM Pest Management Guidelines: Example Form

Directions:

1. To monitor for San Jose scale (SJS), European fruit lecanium (EFL), and mites, clip off 2 to 3 spurs randomly from each of 35 to 50 trees in the orchard, for a total of 100 spurs.
2. Using a hand lens or microscope, examine spurs for scales and mite eggs.
3. On the form below, note presence or absence of each pest on each spur for the first 20 spurs. Add up totals after every 20 spurs (including previous samples) and compare to treatment decision guidelines below. Continue as needed using page 2.

Grower/Orchard:_____ **Date**_____

Spur number	Live SJS	Parasitized SJS	EFL	Mite eggs
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
Total				
Treatment threshold	4 or more	Information only	4 or more	

Treatment decisions:

- If either SJS- or EFL- infested spurs are less than 4 but more than 0, examine another 20 spurs and record on chart to the right.
- If 4 or more unparasitized scales of one species are found, treat.
- If no samples with scale are found, stop sampling.
- Treat for mites if 20% or more spurs are infested.

Spur number	Live SJS	Parasitized SJS	EFL	Mite eggs
Totals from prior sample				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				
Total				
Treatment threshold	8 or more	Information only	6 or more	

Treatment decisions:

- If grand total of SJS- or EFL-infested spurs is less than 6 but more than 1, look at another 20 spurs and record on the chart to the right.
- If 6 or higher, stop sampling and treat.
- If 1, stop sampling.
- Treat for mites if 20% or more spurs are infested.

Spur number	Live SJS	Parasitized SJS	EFL	Mite eggs
Totals from prior sample				
41				
42				
43				
44				
45				
46				
47				
48				
49				
50				
51				
52				
53				
54				
55				
56				
57				
58				
59				
60				
Total				
Treatment threshold	12 or more	Information only	8 or more	

Treatment decisions:

- If grand total of SJS- or EFL-infested spurs is less than 8 but more than 3, look at another 20 spurs and record on the chart on page 2.
- If 8 or higher, stop sampling and treat.
- If 3 or less, stop sampling.
- Treat for mites if 20% or more spurs are infested.

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Grower/Orchard_____ **Date**_____

Almond—Dormant Spur Sampling (continued)

Spur number	Live SJS	Parasitized SJS	EFL	Mite eggs
Totals from prior sample				
61				
62				
63				
64				
65				
26				
67				
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
Total				
Treatment threshold	16 or more	Information only	9 or more	

Treatment decisions:

- If grand total of either SJS- or EFL-infested spurs is less than 9 but more than 5, look at another 20 spurs and record on chart to the right.
- If 9 or higher, stop sampling and treat.
- If 5 or less, stop sampling.
- Treat for mites if 20% or more spurs are infested.

Spur number	Live SJS	Parasitized SJS	EFL	Mite eggs
Totals from prior sample				
81				
82				
83				
84				
85				
86				
87				
88				
89				
90				
91				
92				
93				
94				
95				
96				
97				
98				
99				
100				
Total				
Treatment threshold	20 or more	Information only	10 or more	

Treatment decisions:

- If grand total of either SJS- or EFL-infested spurs is 10 or more, treat.
- If less than 10, no treatment is recommended.
- Treat for mites if 20% or more spurs are infested.

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SJS – Spring Monitoring for Treatment Timing

- Pheromone traps
  - Detect male emergence
  - Detect presence of parasitoids
- 3-4 traps/block
- Hang by February 25 (south) & March 15 (north)
  - Uniform
  - Additional traps in hot spots
  - Shade
  - 6-7 ft high
  - North or east tree quadrant
  - Minimum 5 trees from edge
- Check 2X/week until biofix
  - First date males are consistently caught
- If spur samples indicated treatment, begin accumulating DD and treat accordingly depending on material

SJS – Spring Monitoring for Treatment Timing

- Sticky tape
  - Monitor crawler emergence to time treatments if warranted
- Wrap clear plastic tape around scaffold limbs
- If spur samples indicated treatment, begin accumulating DD and treat accordingly depending on material

Thank you & Questions?

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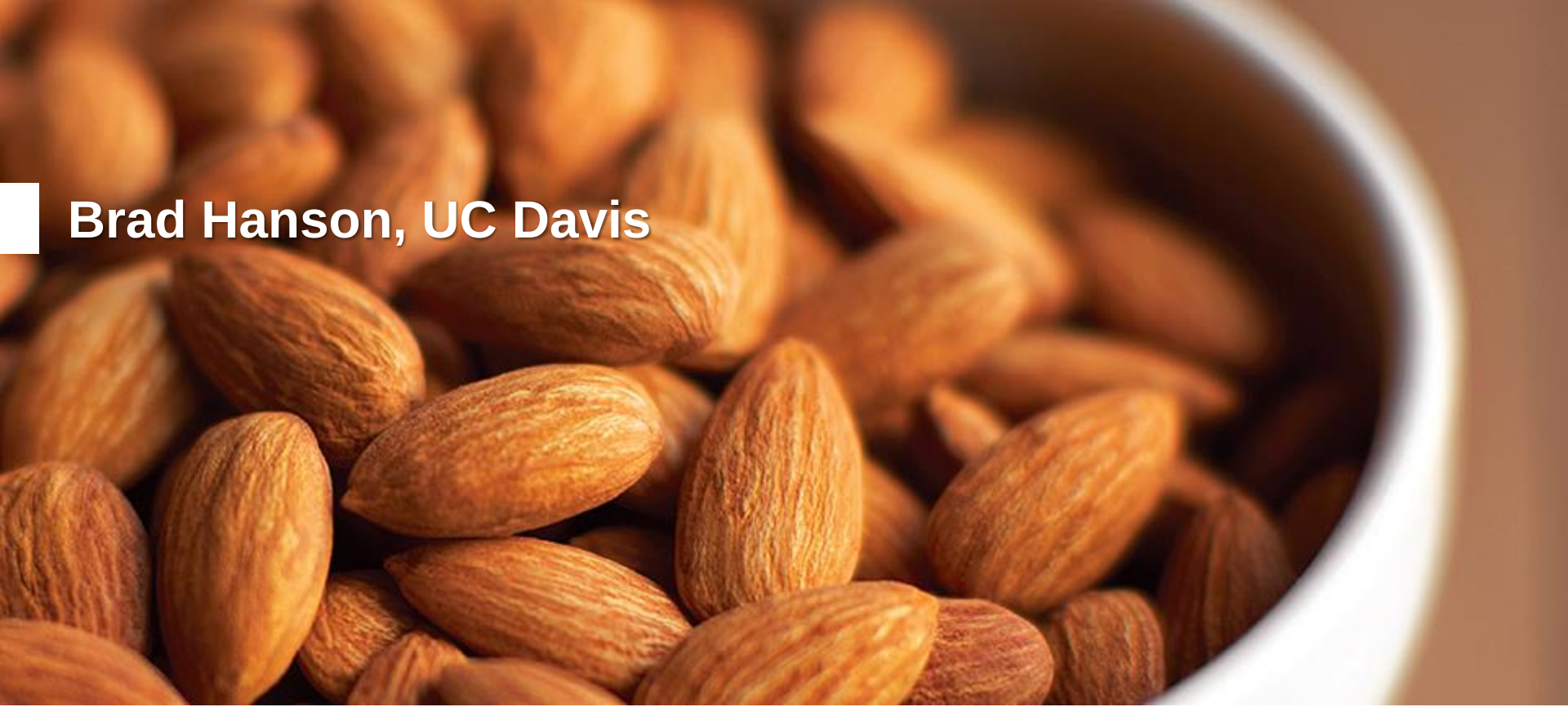

Brad Hanson, UC Davis

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Orchard Sampling for Pest Management - Weeds

Brad Hanson

UC Davis Weed Science Program

Orchard weed scouting

- Helps us select the right tools for the job at hand

Why orchard scouting matters for weed managers

- Basing control decisions on actual weed problems
  - Control the weeds you KNOW you have (or will have)
- Avoid ineffective treatments
  - Using the wrong tool for the job wastes time and money
  - Escapes will likely have to be retreated or controlled in some other way
- Avoid overtreatment
  - Wastes money and time
  - Puts a higher than necessary load of pesticide in the environment
  - Crop safety concerns?
- Identify new weed problems when they are small
  - New invasive species, resistant biotypes, etc.
  - Can use more intensive control strategies on the pockets that need it rather than field-wide

Orchard weed scouting practices

- Weed identification
- Keeping records and mapping
- Scouting within a field
- Scouting several times per season
- Comparing records over several years
- Evaluate, adjust, and refine weed management programs

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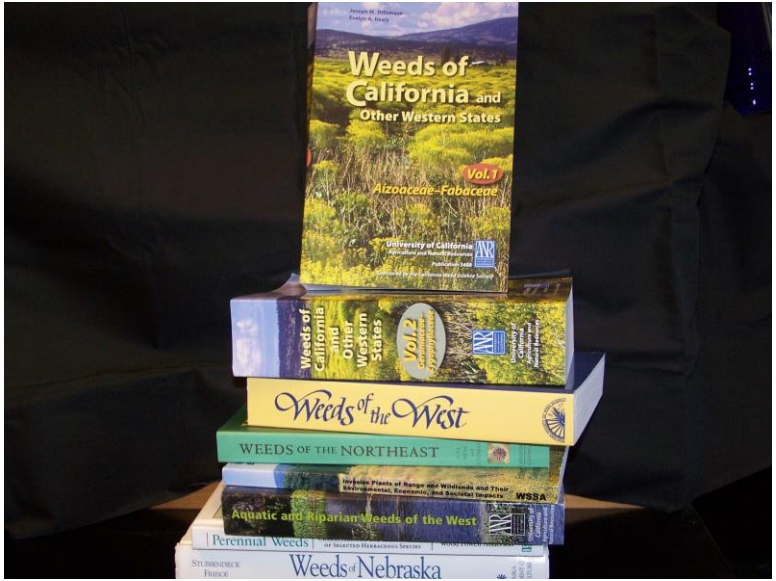
Weed identification

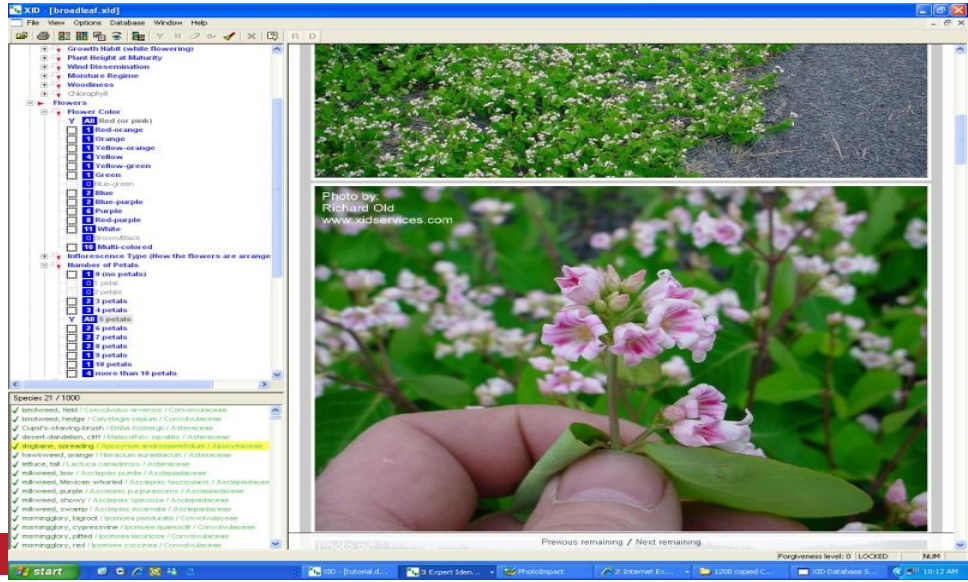
- Unknown weeds cannot be properly managed
  - No technique controls all weed species
  - Not all weeds cause equal damage (thresholds)
  - Species respond differently to control strategies
    - Even variants within a species (ie. herbicide resistant biotypes)



A number of weed ID books are available. Also many pamphlets and extension publications from public and private sources.

Weed ID - Software

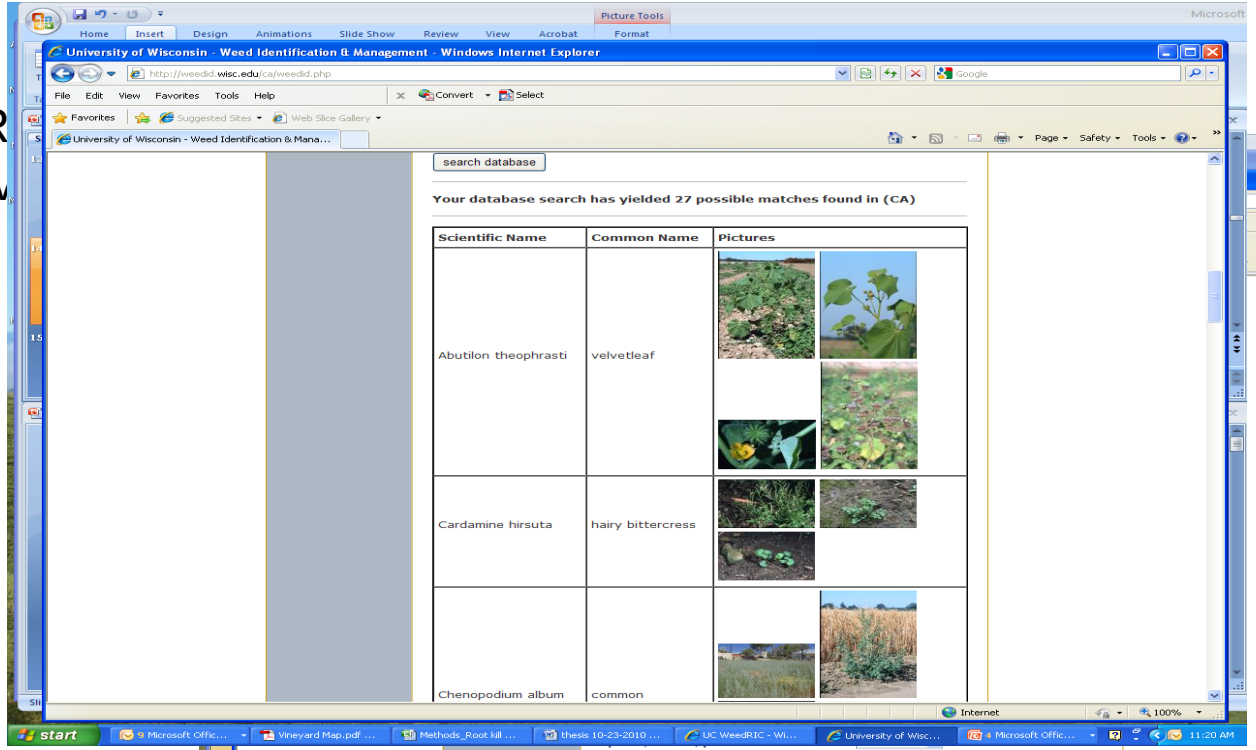
- Several available
- I currently use a software from XID Services
  - Available from UC Davis, WSSA, WSWS, and others



Online Weed ID Resources

A few online (FR
resources are av

UC Davis Weed Research
and Information Center
www.wric.ucdavis.edu



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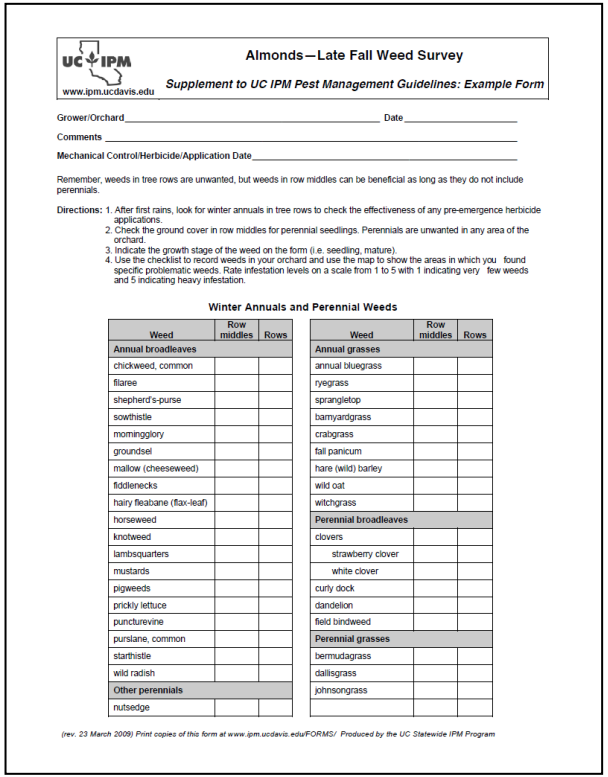
Keeping records

- Note recent weed control tactics
  - What, when?
- Note weed species present
- Density
  - Scattered, patchy, dense, OMG!
- Where they are located
  - in-row, middles, field edges, openings?
- Comment on potential changes for weed management in that block



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Almonds—Late Fall Weed Survey

Supplement to UC IPM Pest Management Guidelines: Example Form

Grower/Orchard_____ Date_____

Comments _____

Mechanical Control/Herbicide/Application Date_____

Remember, weeds in tree rows are unwanted, but weeds in row middles can be beneficial as long as they do not include perennials.

Directions: 1. After first rains, look for winter annuals in tree rows to check the effectiveness of any pre-emergence herbicide applications.
2. Check the ground cover in row middles for perennial seedlings. Perennials are unwanted in any area of the orchard.
3. Indicate the growth stage of the weed on the form (i.e. seedling, mature).
4. Use the checklist to record weeds in your orchard and use the map to show the areas in which you found specific problematic weeds. Rate infestation levels on a scale from 1 to 5 with 1 indicating very few weeds and 5 indicating heavy infestation.

Winter Annuals and Perennial Weeds

Weed	Row middles	Rows
Annual broadleaves		
chickweed, common		
filaree		
shepherd's-purse		
sowthistle		
morningglory		
groundsel		
mallow (cheeseweed)		
fiddlenecks		
hairy fleabane (flax-leaf)		
horseweed		
knotweed		
lambsquarters		
mustards		
pigweeds		
prickly lettuce		
puncturevine		
purslane, common		
starthistle		
wild radish		
Other perennials		
nutsedge		

Weed	Row middles	Rows
Annual grasses		
annual bluegrass		
ryegrass		
sprangletop		
barnyardgrass		
crabgrass		
fall panicum		
hare (wild) barley		
wild oat		
witchgrass		
Perennial broadleaves		
clovers		
strawberry clover		
white clover		
curly dock		
dandelion		
field bindweed		
Perennial grasses		
bermudagrass		
dallisgrass		
johnsongrass		

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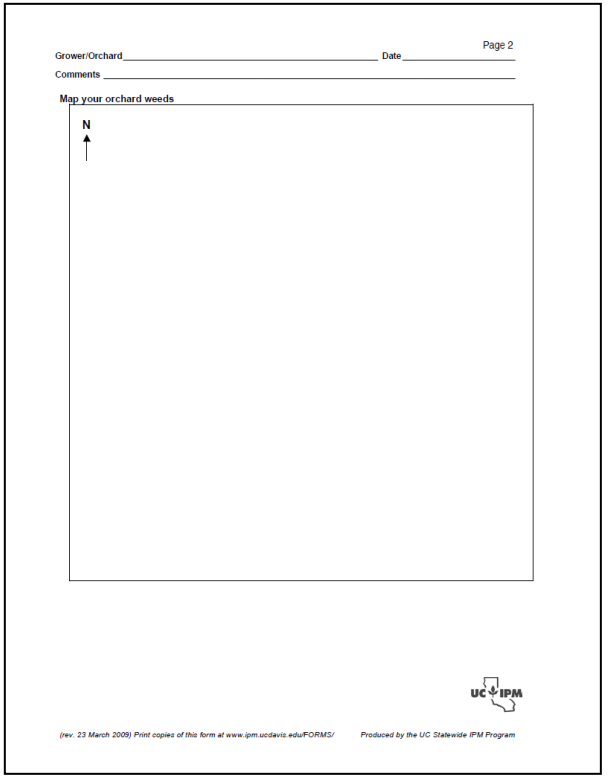

Page 2

Grower/Orchard_____ Date_____

Comments _____

Map your orchard weeds

N

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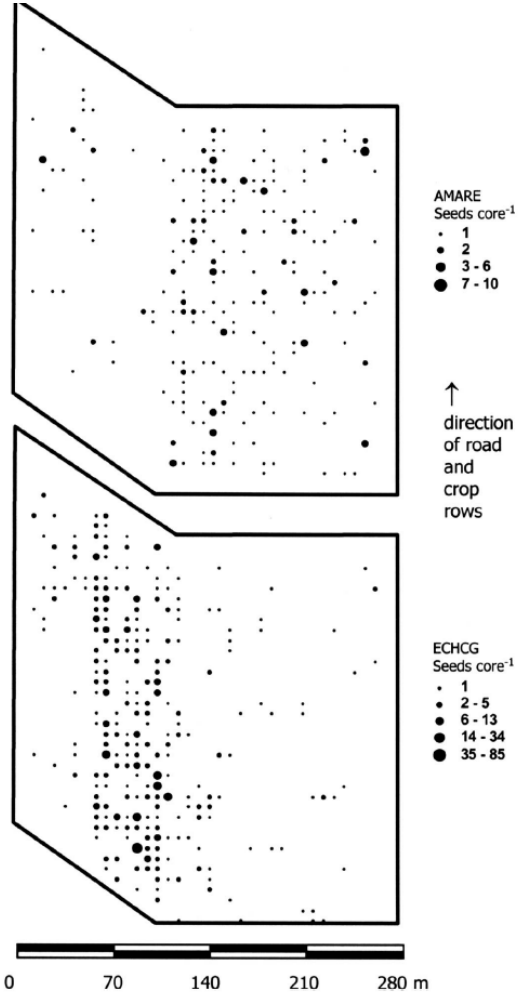
Weed survey form example from UC IPM Online

Mapping

- Can be sophisticated (or not)

- Key points:
  - Mapping helps define the size and scope of a weed problem
  - May be able to focus efforts on portions of the orchard
  - Allows comparison over years – look for trends



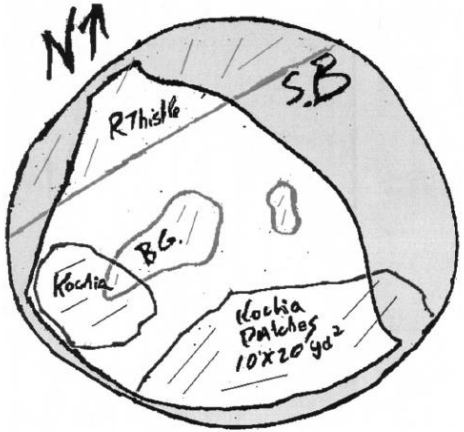
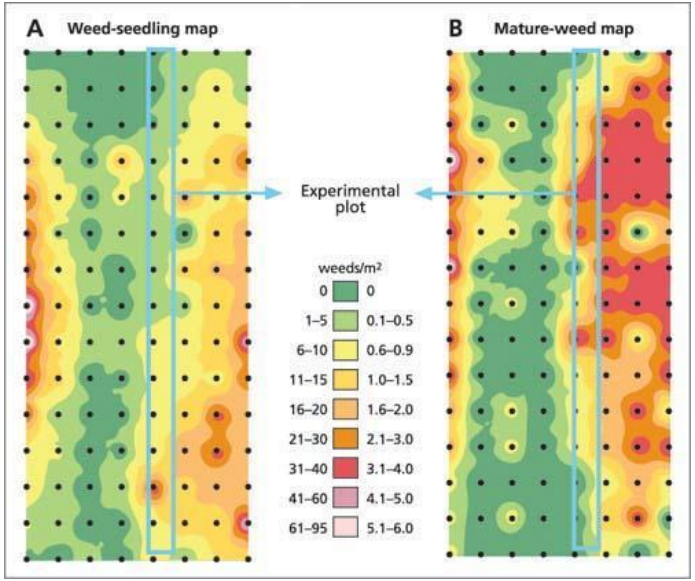


FIGURE 5. Map drawn by an agricultural consultant of the spatial distribution of weeds in an irrigated corn field. Weed patches drawn are barnyardgrass (BG in the map), sandbur (S.B.), kochia [*Kochia scoparia* (L.) Schrad.], and Russian thistle (*Salsola iberica* Sennen & Pau) (R. Thistle).

From Wiles, 2005 (Weed Sci 53:228)

Spatial sampling

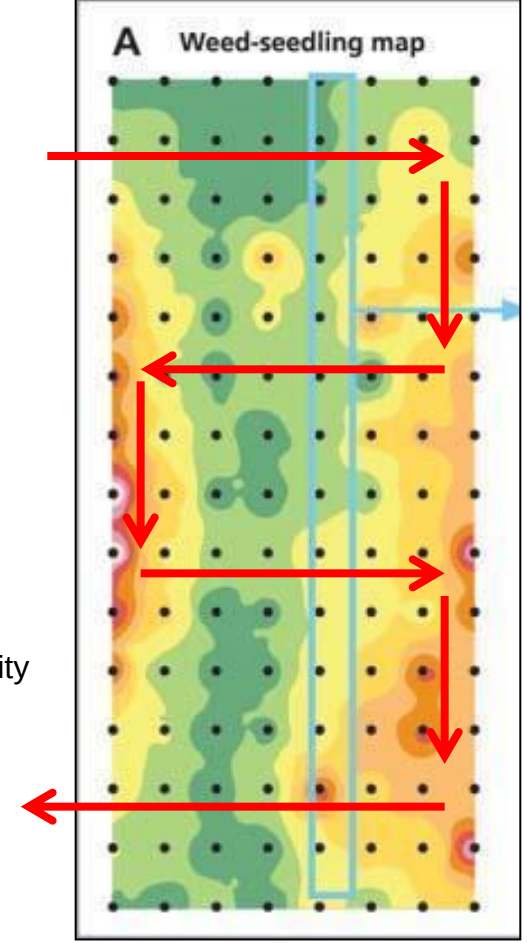
- Weeds are usually not uniformly distributed in a field
  - Sampling strategies need to take this into account
    - A single observation made in a “clean” part of the field could lead to undertreating the site, while an observation made in a patch could lead to overtreating the majority of the field



From Koller and Lanini 2005 (Calif Agric 59:182)

Spatial sampling

- Wide range of sampling intensities
  - Map illustrates a fairly intense grid sampling strategy
    - Probably a bit excessive in terms of precision needed
  - Could be a “drive by” observation from the truck or “ask the irrigator”
    - Probably a bit lax
- Take a walk or ride through each zone a few times each season
  - “zone” size may vary among operations due to scale
- Key points
  - Cross the top, middle, and bottom of the field to account for that variability
  - Don’t follow traffic patterns
  - Hit known “different” areas (soils, swales, historical use)
  - Note weed differences in middles vs rows



Modified from Koller and Lanini 2005 (Calif Agric 59:182)

Sampling over the course of the season

- Weed scouting should not be a “once and done” operation
- Different weed species emerge over the course of the year
  - winter annuals, spring annuals, perennial weeds, summer-hardy species
- At a minimum, assess each field prior to a weed management operation
  - Better yet, monitor both before and a few weeks after to determine how you did

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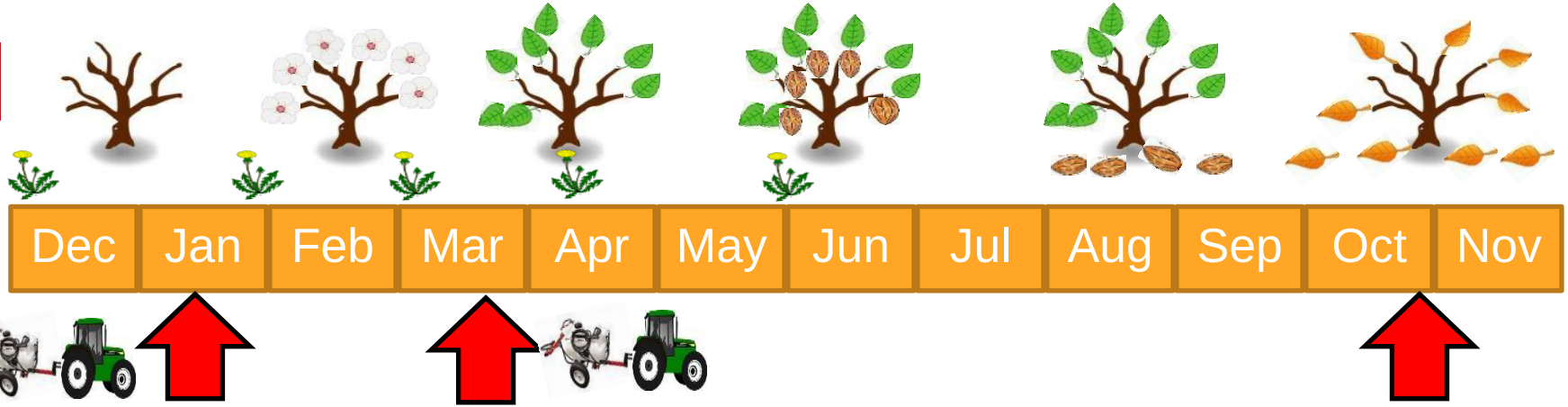
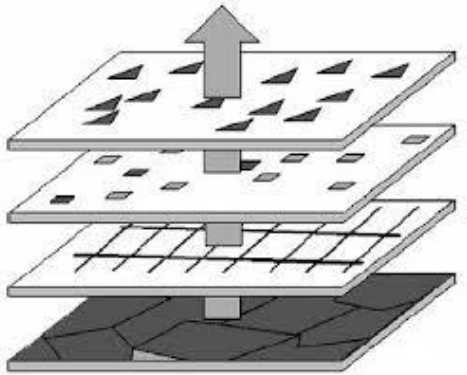


- Key points:
  - Monitoring should begin after harvest.
    - Recall the techniques used last year and consider how they worked. Adjust as needed.
    - Scout orchards to assess weed presence and size for fall treatments with PRE/POST tankmixes
  - In late winter, assess the efficacy of the dormant season weed control program. Decide on spring program needs.
  - In late spring, evaluate previous control efficacy and determine pre-harvest weed control program.
  - At harvest, note how well the yearly program worked.

Record keeping: comparing weed scouting reports over several years

- Like any other orchard performance evaluations, look for weed trends over time
- Compare several year's records to evaluate changes
  - Look for new species
  - Are patches expanding or moving?
  - Failures on the same weed in the same area – could be early stages of resistance
- Compare weed management programs
  - Are there multiple strategies (integrated weed management) being used?
  - Are multiple herbicide modes of action being used within and among years?
  - Document and consider weed control successes and failures
  - Could varying levels of intensity be used in different parts of the orchard?
    - May save money while controlling weed patches
- Refine and fine-tune weed management program as needed



www.pbinsight.com

Orchard weed scouting

- Get a good representation of the weeds throughout the orchard management zone
- Scout several times per year to catch multiple weed flushes at sizes that can be controlled
- Choose the right tool for the job
  - Avoid economic and environmental problems with over- or under-treating
  - May need to consider rows and middles separately
- Keep records and compare year-over-year
  - Identify new weed problems and weed control failures and address at early stages
- Use scouting results to reevaluate and refine your weed management program
  - Should be an iterative process and something to consider throughout the year

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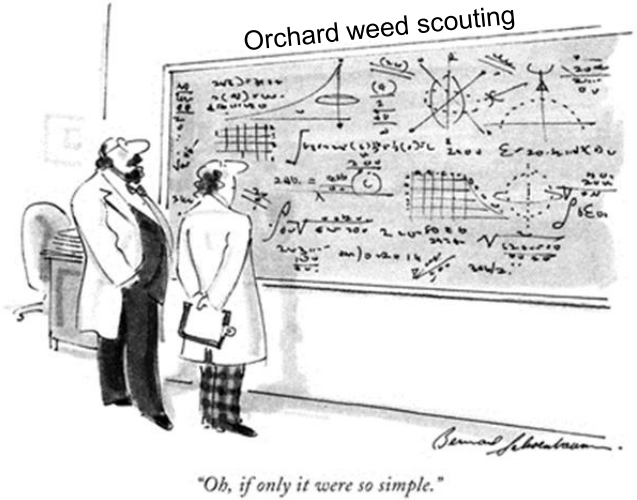
University of California
Agriculture and Natural Resources

Brad Hanson
bhanson@ucdavis.edu
530 752 8115
http://ucanr.org/brad.hanson



"Oh, if only it were so simple."

UC Davis Weed Research and Information Center
http://wric.ucdavis.edu/
http://ucanr.org/blogs/UCDWeedScience/
@UCWeedScience on Twitter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