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EFFECTIVE WEED MANAGEMENT CONSIDERATIONS

Gabriele Ludwig, *Almond Board of California*

Drew Wolter, *Almond Board of California*

Brad Hanson, *UC Davis*

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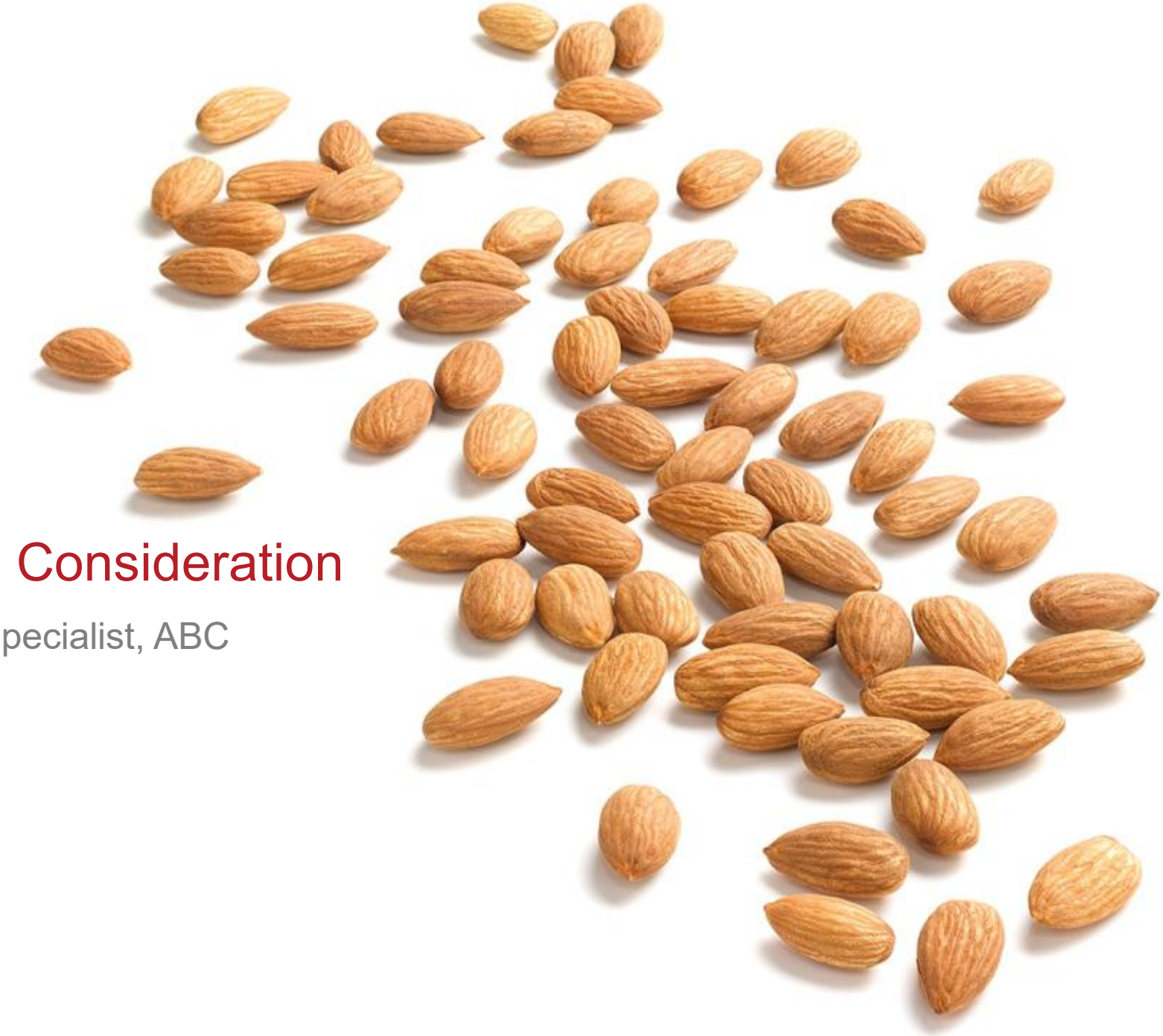

Effective Weed Management Consideration

Drew Wolter- Pest Management Senior Specialist, ABC

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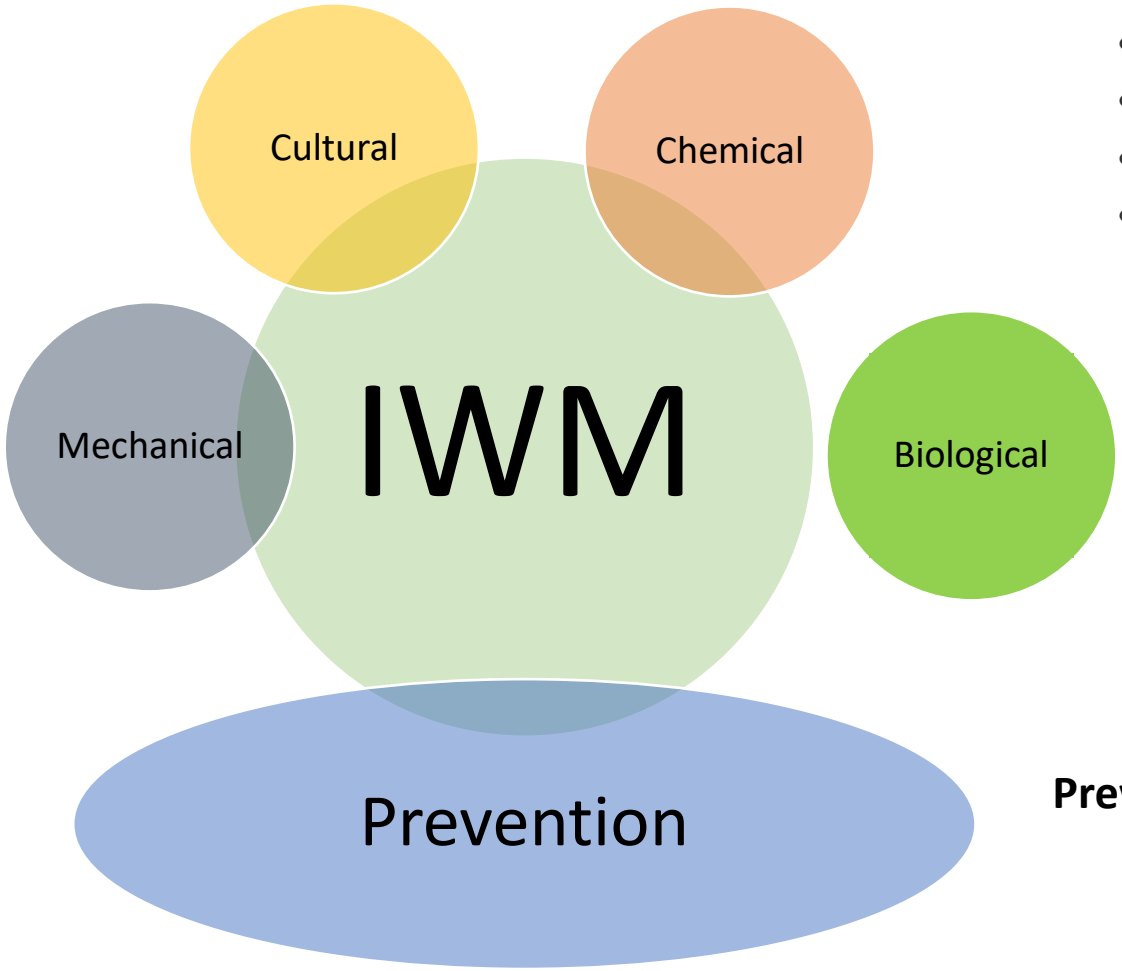
Outline

- Integrated Weed Management
- Weed management considerations:
  - Pre-plant orchard preparation
  - Young orchards
    - Precautions
  - Established orchards
- What's your goal?

Integrated Weed Management (IWM)



Mechanical-

- Hand-pulling
- Tillage
- Burning aka “flaming”
- Mowing
- Emerging technology

Cultural-

- Cover crops
- Berms
- Keep weeds in ditches and canals under control

Chemical Applications Stewardship :

- **Proper weed identification**
  - Herbicide-resistant weeds
- Use tank mixes with different MOA’s
- Plan ahead across **seasons** to avoid using herbicides with the same MOA repeatedly
- The **4 R’s**

Prevention-

- Avoid contamination
- Avoid spreading
- Control weeds before they go to seed
- **Weed scouting**

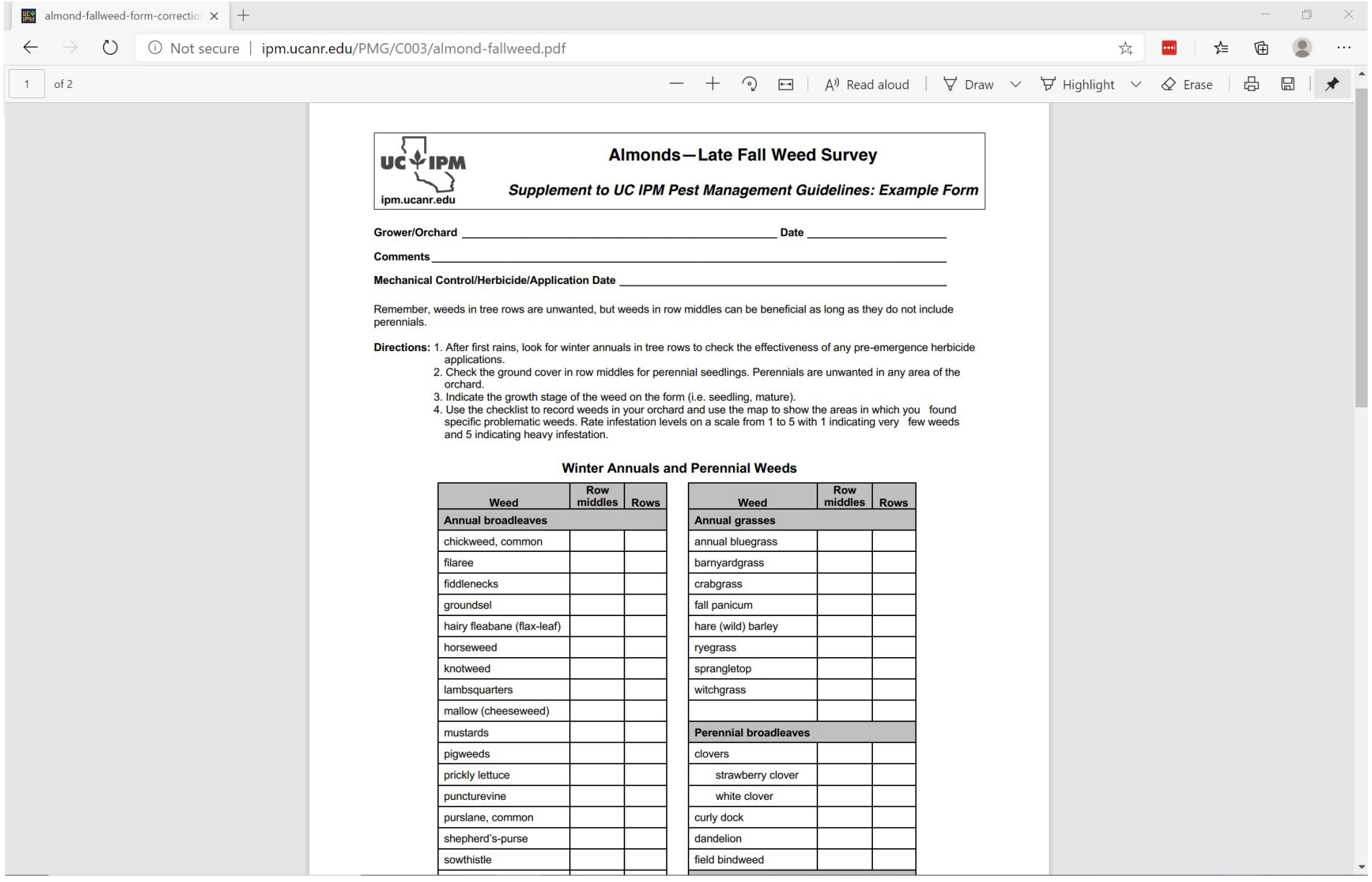
Weed Scouting

Scouting for weeds is the basis for a good Integrated Weed Management (IWM) plan

- While weeds are present in every orchard, there is variation in:
  - Weed species and phenology
  - Composition and density
- Most weed species are much more challenging to manage as they mature
- Scouting should be done at the start of the season and post harvest in order to catch weeds when they are young
- Allows for monitoring of herbicide resistance
  - **Google**:

    The Current Status of Herbicide Resistance in California

Helpful Tool for Scouting: IPM.ucanr.edu/agriculture/almond/



almond-fallweed-form-correctio

Not secure | ipm.ucanr.edu/PMG/C003/almond-fallweed.pdf

1 of 2 — Read aloud | Draw | Highlight | Erase

UC IPM
ipm.ucanr.edu

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		
fiddlenecks		
groundsel		
hairy fleabane (flax-leaf)		
horseweed		
knotweed		
lambsquarters		
mallow (cheeseweed)		
mustards		
pigweeds		
prickly lettuce		
puncturevine		
purslane, common		
shepherd's-purse		
sowthistle		

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

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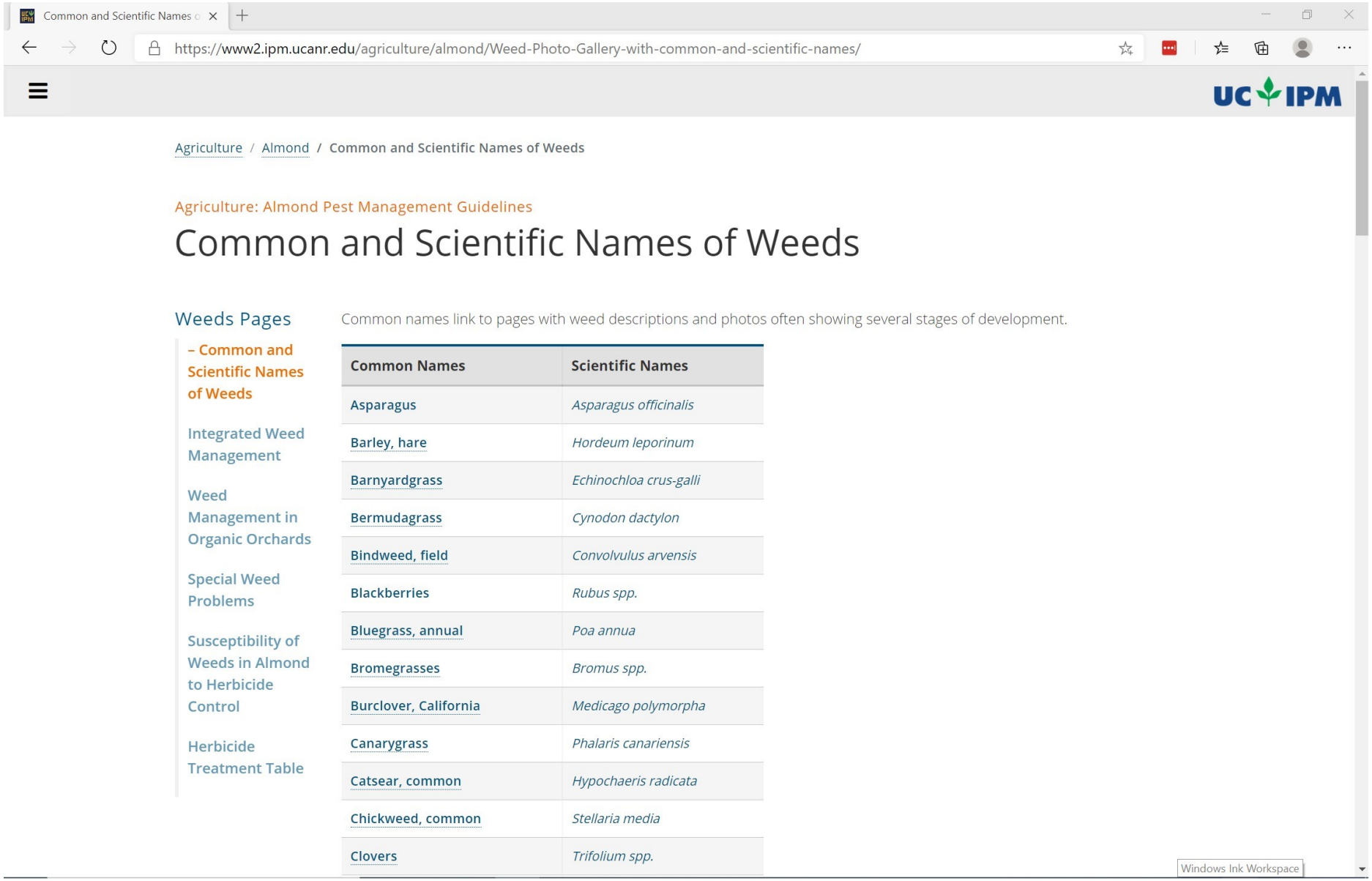
Proper Weed ID

- Accurately identifying weed species is crucial for effective management because herbicide recommendations, mechanical, and cultural control strategies vary depending on the species
- While some species can look similar, they may have drastically different management requirements

Helpful Tool for Weed ID: IPM.ucanr.edu/agriculture/almond/



Pre-plant Orchard Prep

Weed management before planting is a critical period

- Proper management before planting helps reduce weed seed bank, weed numbers, and makes weed control less expensive later
- Site prep via cultivation followed by pre-emergent application in tree rows
  - Incorporate a preemergent herbicide into the soil after planting
  - Maintain a weed-free strip that is at least 30 inches from trunk on each side of the tree to prevent weeds from competing with the developing tree

Weed Management In Young Orchards

Weed management in young orchards can be challenging:

- Young trees often are more susceptible to herbicide damage
- Several different annual grasses and broadleaves need to be controlled
- There are fewer herbicides available for use in a young orchard, compared with mature trees
- Cover crops are often overlooked when establishing orchards

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Young Orchard Precautions

- Remember that tree crops are not resistant to herbicides, crop safety is usually achieved by proper application
- After planting, tree roots are shallow and soil is still settling, which means soil-applied herbicide can settle or run into loosely packed pockets or cracks
  - Make sure soil is settled before applying herbicides and manage water carefully to avoid moving herbicides too deeply into the soil
- Branches on young trees are lower and more likely to get hit by drift. Be extra cautious with windy conditions, spray rig height, nozzle angles, and nozzle selection
- Green trunk wood is often still susceptible to contact & systemic herbicides. Leave cartons on tree trunks for the first two years after planting or until the trunk diameter gets too large.
  - Harden-off

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Weed Management in Established Orchards

Orchard Middles- Vegetation can be managed via chemical applications or mechanically via shallow discing or mowing. Cover crops may be seasonally appropriate.

Tree Rows- Preemergence and postemergence herbicides are common management tools used within the tree row along with flaming.

- Pre's bind to organic matter and soil to limit leaching and mobility once applied (Pro and Con)
- Clearing the berm of leaf litter and skeletal remains of any resident vegetation from last season will help evenly distribute and incorporate the pre-emergent for optimal control

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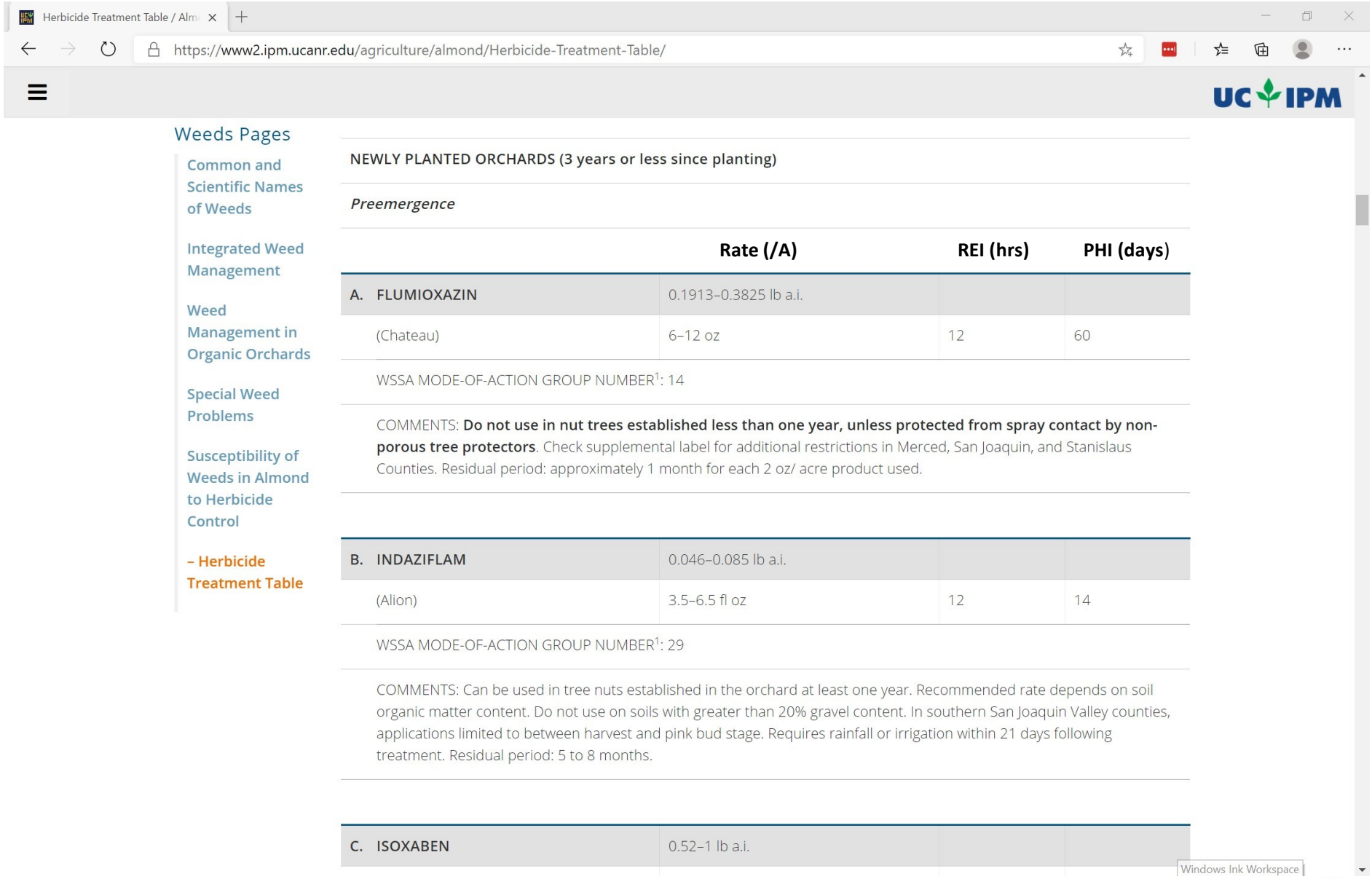
Helpful Tool for Herbicide Information: IPM.ucanr.edu/agriculture/almond/



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At the end of the day…

Ask yourself…

What are my goals when thinking of orchard floor management?

"An almond! I thought we'd agreed— nothing extravagant."

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UCDAVIS
PLANT SCIENCES

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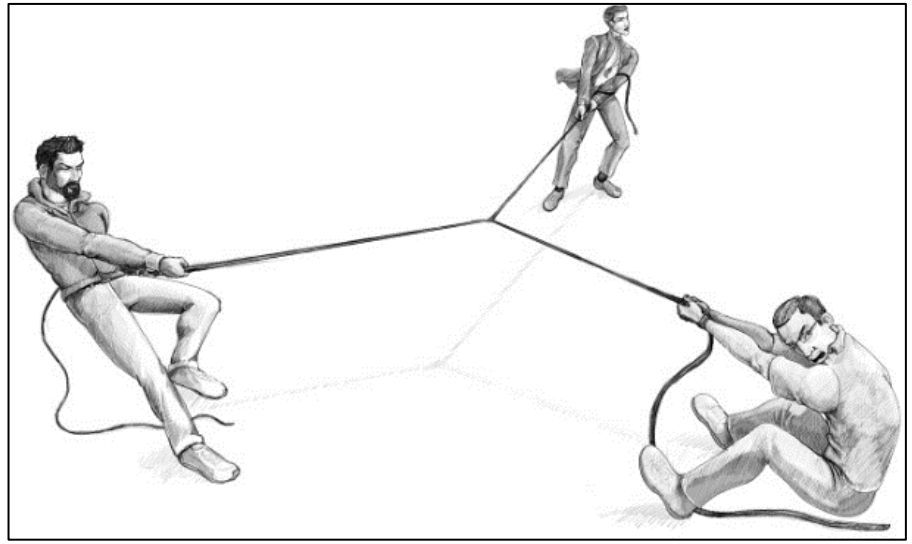
Thinking about goals

Weed Management: Short- and Long-term

- Crop productivity and quality
- Production system efficiency
- Economic considerations
- Site and system sustainability



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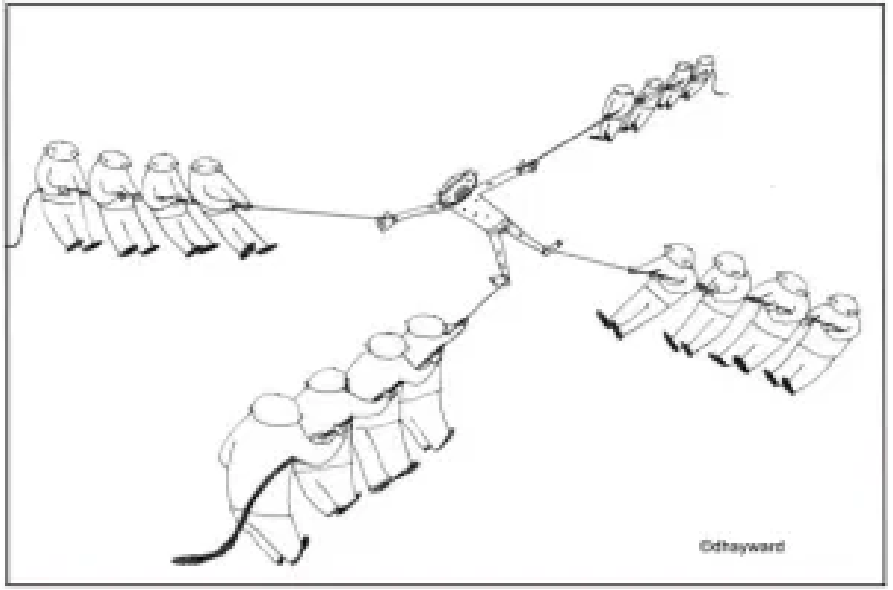

https://staywellfireyourdoctor.files.wordpress.com/2011/06/tug-of-war.jpg

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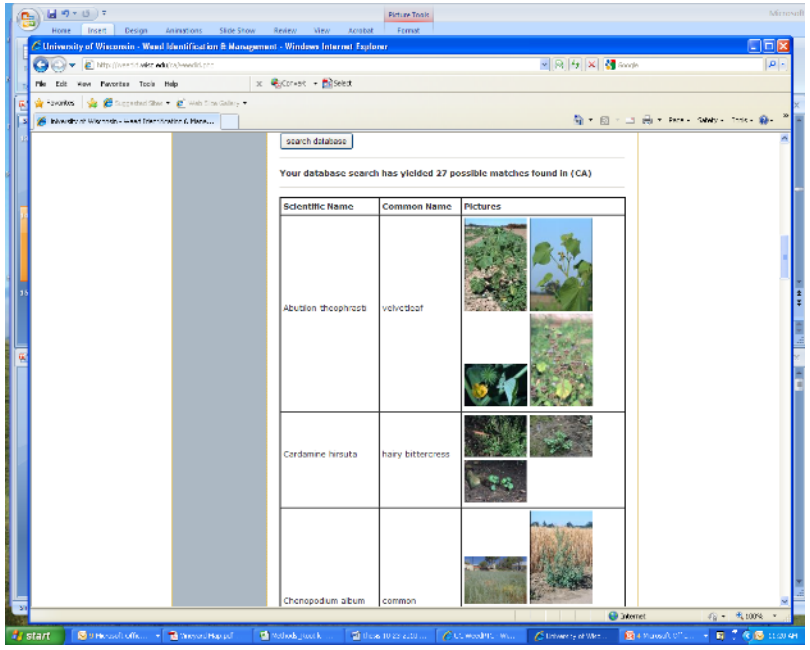
Weed management intensity (herbicides)

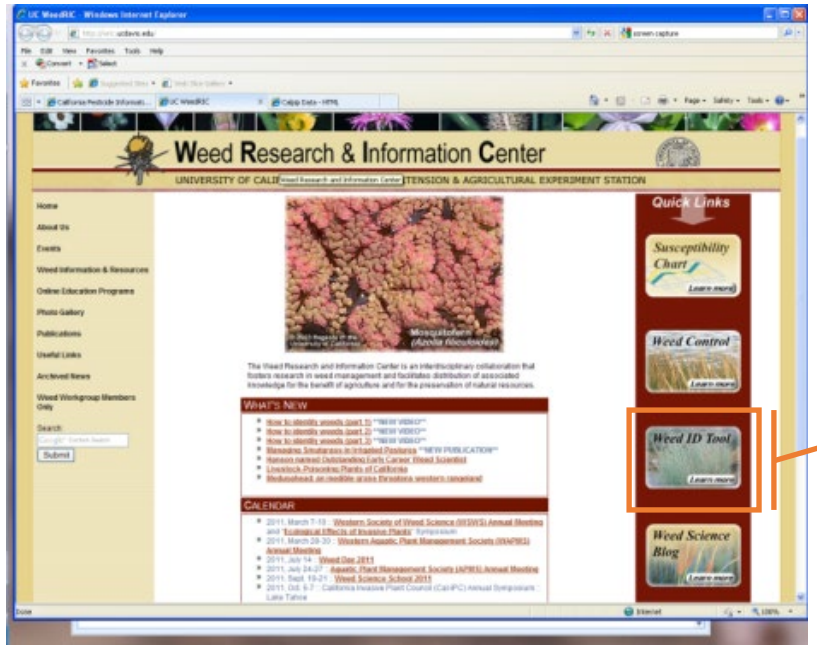
Questions

- What weeds do I have in the orchard?
- Which of these are actual production problems?
  - Young orchard vs older orchards
- What is my tolerance for weeds in the strips? In the middles?
- What are my control options (strips and middles)?
- Can I reduce my weed control intensity (spatially or chronologically) with minimal effects on production and system economics?
  - Can we move towards sustainability goals with minimal effects on weed management?

Weed ID and scouting are the foundation for management decisions

- 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 (i.e. herbicide resistant biotypes)





Weed Research and Info Center
http://wric.ucdavis.edu

Online Weed ID Tool

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How problematic is a specific weed?

Do we need to expend the same level of effort (and cost and consequences) on all?

Consider some examples:

1. Annual bluegrass
   - Annual
   - Germinates in late fall
   - Completes lifecycle by mid-spring
   - Relatively short stature
   - Residue not very persistent

   - Probably a minor weed issue in most orchards

2. Johnsongrass
   - Perennial
   - Germinates or regrows in spring/summer
   - Large stature, clumping growth habit
   - Spreads by short rhizomes and seed

   - Relatively competitive weed problem, especially in young orchards.
     - But tends to get shaded out in older orchards

Where are the weeds? And when are they present?

Is this a production problem or later management concern?

- Location, location, location
  - Weeds near young trees can be a real competition problem but weeds in middles of an established orchard probably have minimal direct impact on tree productivity
    - In many cases, weeds in the middles can be relatively easily controlled later
  - Weeds that physically interfere with irrigation systems likely require intervention

- Timing
  - Understanding specific weed's growth patterns, especially germination and emergence timing, can really inform management practices and success
  - Most herbicides work best before weeds emergence (PRE herbicides) or seedlings or small plants (POST herbicides)
    - Using the right herbicide but at the wrong time will likely perform poorly and require additional management actions
    - Example: Italian ryegrass vs junglerice
  - Knowledge of seed production can be helpful in timing spring mowing or tillage operations to reduce seed set (also useful for cover crops if seed set is desired)

How can **herbicidal** weed management intensity be reduced?

- What “levers” do we have?

- What product(s) are being used?
  - Are they the best for the weed problem and your goals?
- What rate(s) are they being applied at?
  - Could a lower rate (at a better timing?) achieve the goal?
  - Could a lower rate product replace a higher use rate product?
- How frequently are herbicides applied in the orchard?
  - Could a better-designed program or slightly-relaxed threshold reduce this by one or more per year?
- How many sprayed acres vs orchard acres for each application?
  - Could more narrow strips be used to reduce overall herbicide treated area?
    - (8ft strip vs 10ft strip = 9% reduction in treated area in 22ft row spacing)
  - What about the middles?
    - Is your current middles herbicide program necessary?
    - Could other approaches be used instead (or to supplement) middles vegetation management?
  - Spot or limited area treatments?

Typical herbicide application timing

~ Oct/Nov. **Post harvest burndown (strips)**

- Glufosinate, Glyphosate, Paraquat

~ Dec-Jan. **Winter PRE/POST tank mix (strips, occasionally also middles)**

- PRE = Flazasulfuron, Flumioxazin, Indaziflam, Oryzalin, Oxyfluorfen, Pendimethalin, Penoxsulam, Rimsulfuron
- POST = Clethodim, Glufosinate, Glyphosate, Paraquat, Sethoxydim

~ Mar/Apr. **Spring burndown (mostly strips, increasingly also middles)**

- POST = Carfentrazone, Clethodim, Glufosinate, Glyphosate, Paraquat, Pyraflufen, Saflufenacil

~ Jun/Jul. **Pre-harvest burndown and/or mowing (typically full orchard floor)**

- POST = Glufosinate, Glyphosate, Oxyfluorfen, Paraquat

How can (**chemical**) weed management intensity be reduced?

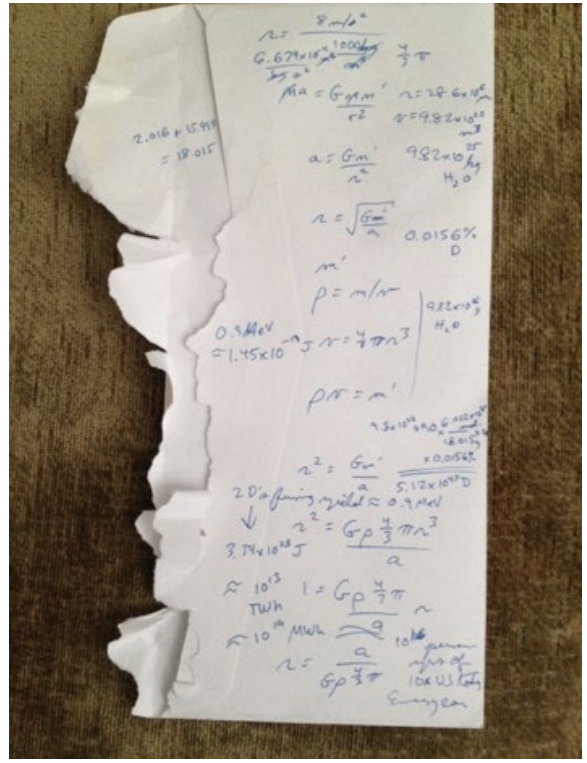
- What “levers” do we have?

- What product(s) are being used?
  - Are they the best for the weed problem and your goals?
  - Have you really considered what weeds are in this orchard?
    - Does this herbicide program work on these weeds?
  - What level of weed control is really needed?
    - Are we adding another component to the herbicide mix in an attempt to get the last 0.1% control?
- At what rate(s) are they being applied?
  - Could a lower rate (at a better timing?) achieve the goal?
    - Am I using the top label rate because I need to or for “insurance”? Am I using the product at the right time?
    - Am I simply trying to “heat up” the activity without careful consideration of the need?
  - Could a lower rate product replace a higher use rate product?
    - Are there other products that could do the same job at oz/A instead of lbs./A?
- What about resistance management goals?
  - Recognize that some mixtures and programs are driven by HRW

How can (**chemical**) weed management intensity be reduced?

- What “levers” do we have?

- How frequently are herbicides applied in the orchard?
  - Could a better-designed program or slightly-relaxed threshold reduce this by one or more per year?
    - Could my POST programs be reduced with better PRE-programs?
    - Do I really need to get that last 0.1% control?
- How many sprayed acres **vs** orchard acres for each application?
  - Could more narrow strips be used to reduce overall herbicide treated area?
    - (8ft strip vs 10ft strip = 9% reduction in treated area in 22ft row spacing)
    - “back of envelope” calculation. If 1.4 million acres of almonds narrowed sprayed strip by 1 ft, that would ~ 63k sprayed acres for each application or ~150-200k sprayed acres/yr!
  - What about the middles?
    - Is your current middles herbicide program necessary?
    - Could other approaches be used instead (or to supplement) middles vegetation management?
    - Relaxed weed tolerance, mowing/tillage, cover crops, lower-rate herbicides, etc.
  - Spot or limited area treatments?
    - Spot treatments. Opportunity to revisit “smart sprayers”?



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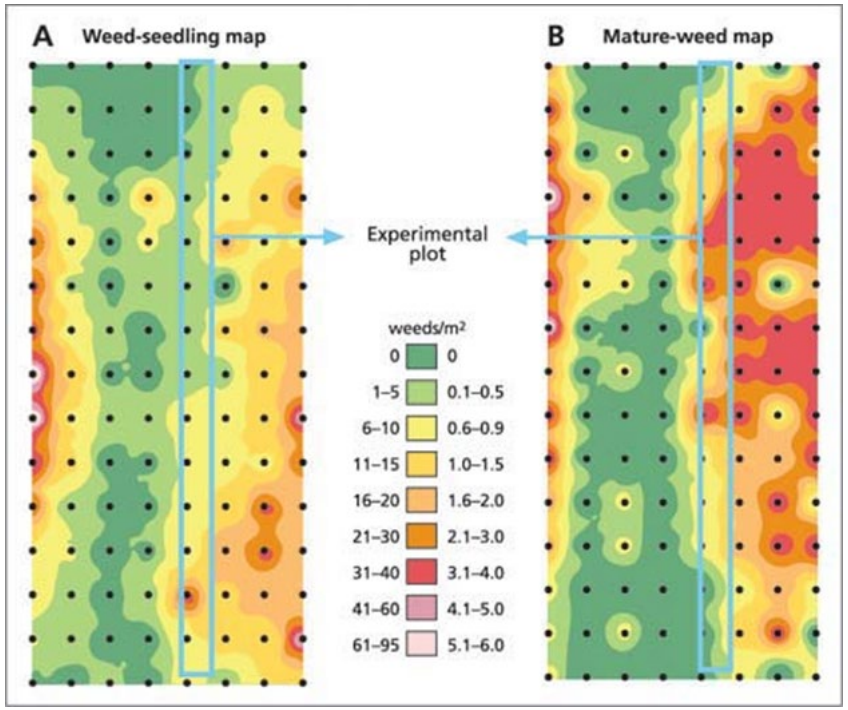
Is a weed control treatment needed on the whole orchard?

- Spot treatments?
- Smart sprayers?

- Chemigation?
- Treatment of only problem areas/fields?



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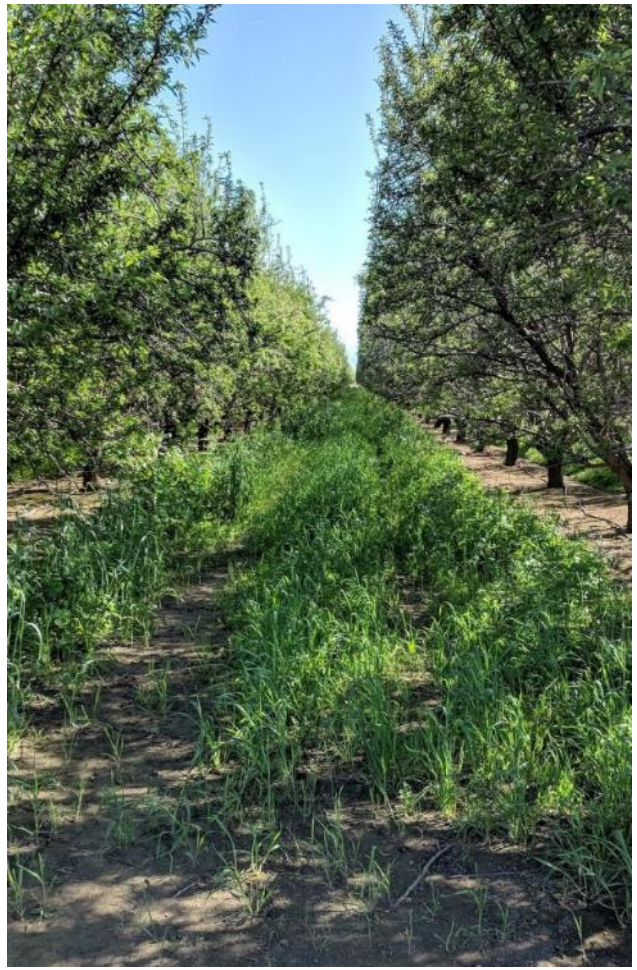
Middles management comments

No one-size-fits-all solutions

- But….
  - Year-round “scorched earth” programs challenge industry sustainability goals and increase regulatory scrutiny
  - A lot of herbicide applications are probably made to enforce an unnecessarily high level of vegetation management in tree nut orchards
  - Physical weed control practices can contribute to dust issue, but that is influenced by timing and soil moisture. Still a good tool in the IPM toolbox
  - Remember that “vegetation management” does not necessarily have to be “complete control”.
    - Many of our chemical, physical, and cultural weed control practices can be used to manipulate plant populations to reduce negative effects and, perhaps, increase benefits
  - If chemical middles management is needed, be clear about “why” and how best to achieve the goal
    - Especially considering challenges with some important late-season POST herbicides

Predictable and manageable vegetation?



Kern County - March 2018

Merced County - March 2018

Tehama County - March 2018

Haring, Creze, Gaudin et al.

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Consider your weed management goals and how “best” to achieve them

Sometimes a bigger hammer isn’t the best solution for our orchard weed management challenges.

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

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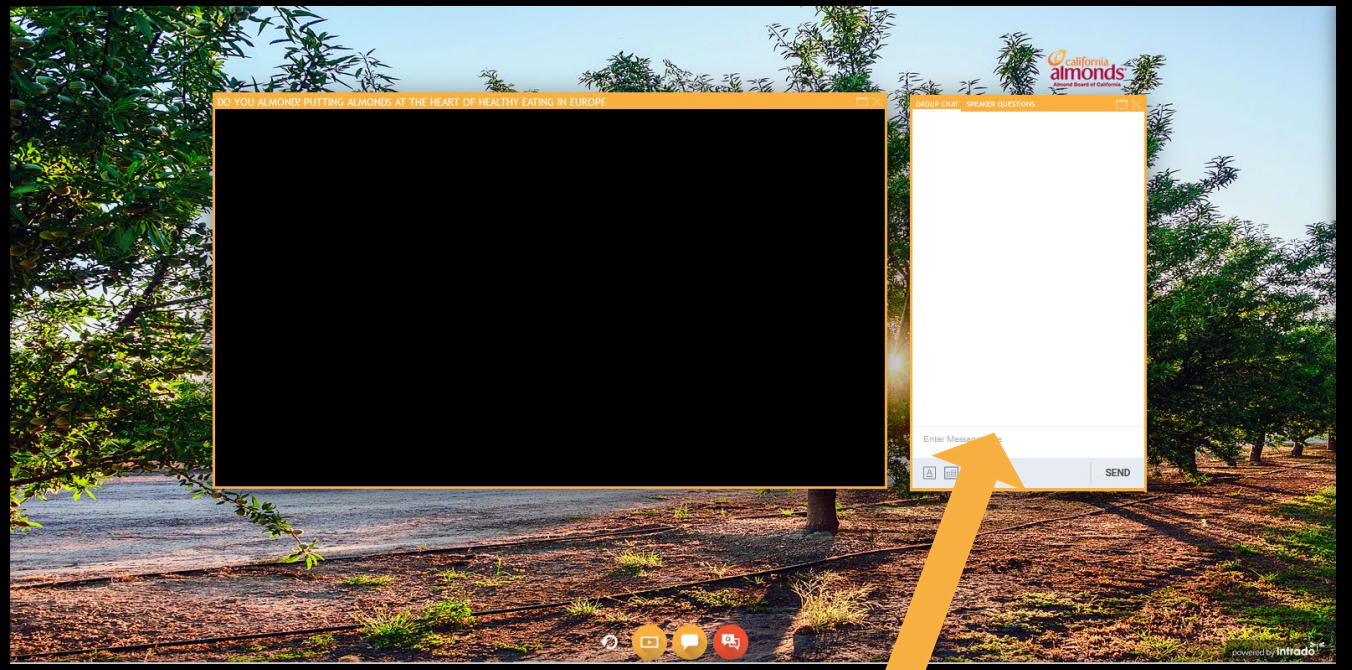
Group Chat is live now!



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