I Don’t Know Why She swallowed a fly

Orchard system integration from the front line: True life experiences

Mike Robinson, Double Diamond Fruit

Notes on slides can be viewed by holding the cursor over the icon in the upper left corner.
She swallowed the spider to catch the fly, I don’t know why she swallowed the fly, perhaps she’ll die.
Linear Decision Making

Need Big Gala ➔ Apply more Nitrogen ➔ More vegetative growth ➔ More green aphids ➔ Shading

- Spray aphid ➔ Kill predators ➔ Rosy aphids expand ➔ Spray rosy aphid
- Summer prune ➔ Fruit burns ➔ Do more cooling ➔ More mildew
The old lady eventually swallows a dog to catch the cat ..........

![Image of an old lady and a dog with a smile]
Systems integration = Not swallowing flies
Systems integration

- Melding science with on farm experience
- Leaving checks
- Following up on observations
- Looking for unintended consequences, good and bad
Maintaining Balance

- Trees fill the space
- Moderate vigor
- Annual cropping
- Limited pest and disease control
- Minimize production costs
Canopy Management

- Long pruning
- Avoiding heading cuts in vegetative wood
- Only heading flat wood in a bearing habit
- Need for summer pruning indicates an out of balance condition
Insect Management

- We have the tools from research to manage apple pests organically
- Most of the most useful organic tools are prophylactic
Codling Moth Pheromones

- Repeated scientific trials show good response
- Adoption by most of the industry, both conventional and organic
- Personal experience has been excellent

Mature codling moth larva

Codling moth adult (J. Brunner)
Oils

- Delayed dormant, 2.5% superior oil NW 200 gpa
- 20% bloom, 2% Crockers fish oil, 200 gpa
- 80% bloom, 2% Crockers fish oil, 200 gpa
- 200 degree days, 1% superior oil NW 200 gpa
- 400 degree days, 1% superior oil NW 200 gpa
- 600 degree days, 1% superior oil NW 200 gpa.

Brunner and Willet showed good results for pest control, 10 years of use show no horticultural problems. We mix with Calcium chloride
Predator release

- No scientific work supports efficacy
- I use lacewing cards every year, it's cheap and I have seen some positive results in a couple of farms.
- No good checks in my trials
- This practice is hard to justify based on my usual standards
DAS The Decision Aid System

- Developed By Vince Jones
- Models for most major pests, diseases, sunburn
- Scientific timing recommendations for pest control
- Can be set to give organic recommendations
- Specific for AWN sites or my farm
- Can be accessed via iPhone
- I use it most days in season,
AG Weather Net

- The source of raw data for DAS
- Historical Data can be searched in many ways
- Real time temp and weather info available
- Very useful during frost and cooling
- Good for comparing years
- I use it with chemical thinning and spray records to get a complete picture
LS & FO

- Lime Sulfur + Fish oil has been shown to provide some control of leafrollers at the Wenatchee TFRC.
- Neither component alone was effective
- My leafroller pressure is very light where I have used it
- Harold Ostenson may soon find someone to prove it is a cure for AIDS
Entrust
Wooly aphid sprays
Natural enemy studies

- As a part of the Area wide 2 projects, Entomologists are looking at both acute and sub lethal effects of pest control materials on beneficial's.
- There is a chart in the Spray guide. Take a look at Success another spinosad like Entrust.
Disease Management

- LS + FO appears to provide some control of fire blight, Work of Ken Johnson, OSU
- Lime Sulphur controls Mildew
- Managing humidity and overwintering infections is important with most diseases
Not enough to go around at bloom
Science based options

Gala 2010

- Lime sulfur & Fish oil 2X
- LS+FO 2X then Bloomtime 1X Serenade 1X
- LS+FO 2X then Blossom Protect 2X
- Bloomtime 1x then Oxytet 1X
- Streptomycin 2X
- Water

Fire Blight Strikes per Tree

Dr. ken Johnson  OSU
Rodent Management

- Mulch and not till create great mouse habitat
Rodent Damage
Organic no till mouse control

- 50 traps per acre
- $0.30 each
- Traps last 3 years
- Check 5 times at 1 hour per acre
- Round labor cost to $50 per year
- Traps are $5 per acre per year
- Organic peanut butter for bait $$$$$
Weed Management

Minimize tillage

- Bark damage to trunk
- Damage to the roots in the most productive soil horizon on a regular basis
- Soil compaction from frequent travel
- Reduces soil OM
Mulch

Haul it in

Mow and blow

David Granatstien
Extensive research

- Seven year mulch trial at Summerland PARC
  Denise and Gerry Neilsen, Gene Hogue, Tom Forge
- Mulch Subplots in the PRD trial block at Quincy
- David Granatstein trials near Orondo, and Wenatchee
- Grow your own N trials, David Granatstein and Joan Davenport
- Multi year on farm trials in Canada and WA
  Denise and Gerry Neilsen, Gene Hogue, et al.
Mulch provides several positive effects

- Improved water use efficiency
- Better vegetative growth
- Larger Fruit
- Weed suppression
Quincy PRD trial Mulch

- In early spring of 2002, five tree subplots were established in the Deficit and control plots with three inches of composted yard waste. The results were dramatic. The unanswered question: Did the mulch provide better soil moisture relations or nutrition?

- The vigor of the mulched trees seem to be increasing. How long will the organic amendment affect the trees in the mulch plots?

- Fruit color and leaf nitrogen are known to be inversely related; more nitrogen=less fruit color. The fruit and nitrogen levels of the mulched plots clearly support this relationship.

- Leaf calcium and magnesium also trend higher in the mulch plots but the calcium / magnesium ratio move in a favorable direction.

Jim McFerson, Horst Caspari, Tom Auvil
Alfalfa

Year 3 after planting, Alfalfa supplies 47# N

David Granatstein
Mulch

Moo and blow
Deficit irrigation

- Sets terminals
- Improves fruit color
- Helps control effect of excessive vigor
- Improves spur density
- Improves sugar levels
- Reduces harvest bruising
- May reduce fruit size if done incorrectly
Quincy PRD Deficit Irrigation

- Three year significant findings:
- Very uniform applications of water allows water stress to be manipulated to improve fruit color while maintaining yield and minimizing fruit size reduction.
- The irrigation practices in this trial did not induce typical water stress symptoms such as off fruit color, sunburn, leaf wilt or drought mark on the fruit.
- Mulches can have big impacts on the soil moisture and nutritional relationship.
- Two lines of buried drip per row may allow the successful completion of a quality crop with less than 20 inches of water.
- Thorough, regular monitoring of deficit irrigated blocks can minimize the risk of crop and/or tree damage due to excessive water stress.
- The 2003 crop did not have the fruit appearance of the prior two seasons. The soil moisture levels at the end of July are very different for the two seasons. Is this a critical time to stress trees for improved color in Fuji?

Jim McFerson, Horst Caspari, Tom Auvil,
The yellow leaves indicate the result of less water. The trees have the same appearance as low nitrogen trees. This is an example of the intricate relationship of soil moisture, root health, nutritional status and tree vigor.

McFerson, Caspari, Auvil
Standard Fuji

- Fruit color is enhanced with less tree vigor. Below are Fuji where less water is applied and the appearance is excellent. Significantly more water was applied in 2003 due to the heat, and fruit appearance was not as good. 2003 crop load was heavy, further challenging the ability of fruit to color.

Jim McFerson, Horst Caspari, Tom Auvil,
- Over irrigating early in the year leads to excess vegetative growth and nutrient leaching
- Over irrigation late in the year delays development of background color
- Under irrigating in periods of temp stress can lead to drought injury
- Watch the second and third feet of the profile
### Fuji

<table>
<thead>
<tr>
<th>Farm: BAIRD EAST</th>
<th>Block: BLOCK 5</th>
<th>Tube: ROW 20</th>
<th>#1</th>
<th>Sample Date: 09/28/2010</th>
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<tbody>
<tr>
<td>Root Depth: 2</td>
<td>Avg Dec %: 73</td>
<td>Proj ET: 0.12</td>
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<td>Int Interval: 11.00</td>
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#### Current Moisture Status

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<thead>
<tr>
<th>F.I.R</th>
<th>F.C.</th>
<th>T.L.</th>
<th>M.</th>
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<tbody>
<tr>
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<td>5</td>
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</tr>
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</table>

![Graph showing seasonal moisture status](image)

### Gala 5

<table>
<thead>
<tr>
<th>Farm: BAIRD EAST</th>
<th>Block: BLOCK 4</th>
<th>Tube: ROW 24</th>
<th>#2</th>
<th>Sample Date: 09/28/2010</th>
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<td>Root Depth: 1</td>
<td>Avg Dec %: 70</td>
<td>Proj ET: 0.11</td>
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<td>Int Interval: 9.00</td>
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#### Current Moisture Status

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<td>1.50</td>
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![Graph showing seasonal moisture status](image)

### Goldens

<table>
<thead>
<tr>
<th>Farm: BAIRD EAST</th>
<th>Block: GOLDENS</th>
<th>Tube:</th>
<th>#3</th>
<th>Sample Date: 09/28/2010</th>
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#### Current Moisture Status

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![Graph showing seasonal moisture status](image)

### Gala 3

<table>
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<th>Farm: BAIRD EAST</th>
<th>Block: BLOCK 3</th>
<th>Tube: ROW 71</th>
<th>#4</th>
<th>Sample Date: 09/28/2010</th>
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<td>Root Depth: 1</td>
<td>Avg Dec %: 70</td>
<td>Proj ET: 0.10</td>
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<td>Int Interval: 10.00</td>
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</tbody>
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#### Current Moisture Status

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<thead>
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<th>F.I.R</th>
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<tbody>
<tr>
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<td>2.35</td>
<td>2.20</td>
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<tr>
<td>2</td>
<td>2.50</td>
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<tr>
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<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

![Graph showing seasonal moisture status](image)
Overhead Cooling

- Burn is affected by temperature, UV radiation, wind, size of fruit, and humidity. Larry Schrader et al.
- Model on DAS
- I don’t cool below 90 degrees, before 12pm, or after 5pm
- Lots of days 85 to 90, few days above 90.
- Negative effects of cooling include splits in Gala and poor fruit finish in Goldens and Fuji
- Fruit at a 90° angle to the sun and directly exposed may burn regardless of what you do. More downgrades
Fertility = Blind Men Describing an Elephant
Samples don’t correlate

- Soil samples don’t correlate to the quality of the block
- The best producing / highest quality blocks should have numbers closest to optimum levels
- The results are often the opposite
Eliminate the block numbers, can you tell which block is which?

70 BPA Moderate Fuji

40 BPA Weak Granny
Why might this be?

- We are only looking at one piece of a complex problem.
- Treating living soil like a chemistry experiment
- Soil Biology plays a large role in nutrient availability and plant response
- Water can move the nutrients in the soil and plant
Fertility

- How much P and K are too much?
- How do we get enough N without P and K?
- What correlation is there between soil OM levels and fruit quality or production?
- How many smart guys like Mark Mazzola will it take to figure this out before I die?
We need a test, or tests, that can predict a response in the tree

- Government agencies require use of sampling even though there is no correlation with any test. NRCS equip
- NOP requires proof of deficiency through testing to use nutrients
Crop load Management

- Annual cropping is the biggest challenge I face organically.
- The earlier we thin, the bigger the crop we can carry and have return bloom. Batjer.
- I suspect that leaf N levels directly affect response to sulfur thinners.
- We don’t know the mode of action for LS&FO.
Table 6. Incidence and percentage of results significantly superior (p=.05) to untreated control.

Table: Apple chemical bloom thinning trials WTFRC 1999-2004.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Fruitlets/100 blossom clusters</th>
<th>Harvested fruit diam</th>
<th>Return bloom&lt;sup&gt;1,2&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonium thiosulfate</td>
<td>13 / 41 (32%)</td>
<td>9 / 44 (20%)</td>
<td>2 / 33 (6%)</td>
</tr>
<tr>
<td>NC99 (Mg**+/Ca**+/Cl-) brine</td>
<td>14 / 26 (54%)</td>
<td>7 / 28 (25%)</td>
<td>2 / 22 (9%)</td>
</tr>
<tr>
<td>Lime sulfur</td>
<td>25 / 48 (52%)</td>
<td>12 / 42 (29%)</td>
<td>9 / 36 (25%)</td>
</tr>
<tr>
<td>Crocker's Fish Oil + lime sulfur</td>
<td>50 / 68 (74%)</td>
<td>24 / 63 (38%)</td>
<td>12 / 45 (27%)</td>
</tr>
<tr>
<td>JMS Stylet Oil + lime sulfur</td>
<td>14 / 23 (61%)</td>
<td>8 / 22 (36%)</td>
<td>4 / 20 (20%)</td>
</tr>
<tr>
<td>Wilbur-Ellis Supreme Oil + lime sulfur</td>
<td>14 / 22 (64%)</td>
<td>4 / 21 (19%)</td>
<td>3 / 16 (19%)</td>
</tr>
<tr>
<td>Vegetable Oil Emulsion</td>
<td>13 / 18 (72%)</td>
<td>4 / 17 (24%)</td>
<td>2 / 15 (13%)</td>
</tr>
</tbody>
</table>

<sup>1</sup>Does not include data from 2004 trials.

<sup>2</sup>(no. blossom clusters year 2/sample area) / (no. blossom clusters year 1/sample area)

McFerson et al.
“This big picture view of more than 100 trials shows clearly that oil and lime sulfur mixes have yielded positive results more consistently than have desiccating salts such as ATS or NC99, especially with respect to return bloom”

Fruit finish
While some have adopted a number of the thinning programs we have evaluated, many growers express concern over fruit finish issues. We continue to carefully evaluate fruit sampled from every trial for russet on fruit flanks, shoulders, and in stem bowls. Despite rigorous application of conservative grading standards (e.g. all fruit with any visible russet is graded as “russeted,” regardless of degree) we have been unable to discern that any of our treatments have had a consistent effect, positive or negative, on fruit finish. We have observed isolated cases of fruit marking in sprayer blast zones, which may offer some new research directions. At any rate, attention to fruit finish will continue to be a high priority in our programs.

Chemical alternatives for cost effective apple crop load management. (2005) Dr Jim McFerson
Integration

- Moderate vigor
- Deficit early and late
- Avoid cooling below 90 and after 5 pm
- Mulch
- Limited tillage
- Trap for mice
- Minimize heading cuts on vegetative wood
- Avoid summer pruning
- Use predators
- Minimize spray, tolerate some pests, think about the effect on predators
- Maintain annual cropping, take risks with thinning
- Plan for the long term
Don’t swallow flies