Organic Stone Fruit Orchard Floor Management:
Integration of management of arthropods, weeds, water use, and crop quality and nutrition

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Critical Stakeholder Needs
- Utah is a prime stone-fruit production area (peach & cherry)
- Lack of successful organic role models

Potential Economic, Social and Environmental Benefits
- Highly urbanized state: Most of 2.8 mill residents live in ~150 mile-length Wasatch Front
- Expanding local market opportunities
- Water! Water! Water! (Quantity & Quality – alkalinity, salinity)
Utah OAREI: 2009-13

- **Stakeholder Engagement**
  - Well organized tree fruit grower organization
    - Research committee
    - Organic advisory committee
  - Long-standing relationship with USU

- **Outreach Plan**
  - Existing resources + Train-the-Trainer, Fruit Schools (North & South – inter-state: ID, W CO), Field Days, Organic Web content, Organic Chapter in UT/CO Commercial TF Guide
Utah’s Tree Fruit Industry*

- 6,644 acres
- 306 operations

*Utah Tree Fruit and Berry Survey, 2006

## Percentage of Tree Fruit Acreage

- **Tart Cherry**: 48%
- **Apple**: 21%
- **Peach**: 19%
- **Sweet Cherry**: 9%
- **Apricot**: 2%
- **Other^**: 1%

^Pear, Plum/Prune, Nectarine
Decline in Utah’s Tree Fruit Industry: 1987-2006

- Sweet Cherry
- Apple
- Peach
- Tart Cherry


Values: 0, 2000, 4000, 6000, 8000, 10000, 12000, 14000, 16000
Utah’s Tree Fruit Production and Human Population Increase

Utah's Population

Fruit Producing Regions
Utah Co. 78% of acreage
N. Wasatch 14%
Southwest 5%
Southeast 3%

2.3% growth
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• Objectives
  1. Tradeoffs in water use efficiency and tree growth with living and non-living mulches, internal and external fertility inputs, and soil quality
  2. Weed and arthropod response to organic management practices
     • Orchard floor cover / organic management
  3. Evaluate orchard floor cover crops to optimize weed suppression, arthropod dynamics, water use, and early season N release
     • Utah orchards have cold winters, arid summers and shallow, alkaline soils
  4. Evaluate orchard floor management for optimum fruit quality, environmental benefit, and economic return
  5. Increase adoption of stone fruit organic production through education and outreach
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Component Integration

- Tree growth & fertility
- Water efficiency
- Soil health
- Ground cover mgmt.
- Weeds and arthropods
- Economic return
- Fruit quality & flavor
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Relevant Background

• Orchard floor mgmt., weeds & fertility are major concerns in organic tree fruit production (Hoaglund et al. 2008, Skroch & Shribbs 1986)
  • Competition – weeds, ground cover veg. (Parker & Meyer 1996), water (Neilsen & Hogue 2000)
  • Harbor pests – lygus, stink bug, spider mites (Epstein et al. 2007, Alston 1994)
  • Compost is $$
  • Legumes can supply N, but competition & timing of release is critical (Meyer et al. 2006, Antonelli et al. 1997)

• Fruit quality and flavor
  • Aesthetics, texture, Brix, antioxidants (Reganold et al. 2001, Carbonero & Mattera 2001)
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Entomological Objectives

1. Management of key fruit-feeding pests (peach & cherry)
   - Lygus bug, European earwig, cherry fruit fly
     - Intra- and extra-orchard ground covers, trap crops, mulches, mechanical traps, attract-and-kill stations
     - Spatial and temporal attraction

[J. Brunner]
2. Extra-floral nectaries of peach and cherry
   • Attraction & retention of arthropod pests and natural enemies
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Entomological Objectives

3. Evaluate effects of organic insecticide programs on natural enemy populations and biological control efficiency
   • Products
   • Timing / Frequency

4. Survey predators and parasitoids in organic stone fruit orchards
Orchard ground cover treatments

- Research peach orchards established in 2008
  1. Organic block
     - Compost + tillage
     - Compost + fabric mulch
     - Compost + straw mulch
     - Compost + alyssum living mulch
     - Compost + straw mulch + legume alleys
     - Compost + alyssum living mulch + legume alleys
Orchard ground cover treatments

2. Integrated block
   - Conventional NPK + herbicides
   - Compost + herbicides
   - NPK + paper mulch + reduced herbicides
   - Compost + paper mulch + organic herbicides
   - NPK + herbicides – convert to organic once established
Preliminary results – 2\textsuperscript{nd} year

- Tree growth in compost vs. conventional NPK (herbicides) was similar
  - Compost isn’t a limiting factor
    - Quality & quantity critical
- Weed suppression with straw was poor, good with paper mulch & intermediate with alyssum
- Tree growth was reduced in organic and reduced herbicide vs. conventional herbicide treatments
  - Competition from weeds was greatest limiting factor so far
Extension resources
www.utahpests.usu.edu

-One-stop shopping for insect and plant disease info
-Over 150 fact sheets & bulletins
-Diagnostic image gallery
-Resources: slideshows, reports, etc.
-Utah Pests News: quarterly newsletter
-Portal to: IPM, Plant Diseases, Arthropods & CAPS
Pest Advisory Program
(Free subscription service)
  Tree fruits
  Small fruits & veggies
  Landscape ornamentals
  Turf

Utah TRAPs
(Timing Resource and Alert for Pests)
  Utah Climate Center
  12 orchard sites (N UT)
  Real-time weather data (10 min.)
  ET
  Pest models (insect & disease)
Insects:
% moth flight
% egg hatch
daily DD

Fireblight:
risk index
5-day history
4-day forecast
mgmt. actions