Travelogue
International Fruit Tree Association
2015 Summer Study Tour
Washington State

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Washington Agriculture
- $49 Billion Industry
- Over 300 Commodities

Washington Apple Industry
- $2 Billion industry
- 116.2 million boxes
- 155,000 bearing acres
- 1500 growers
- Avg orchard 100 acres, some 5000 acres

*only 16 growers/families control 80%
<6” precipitation annually (half is snow)
Direct sunlight (as opposed to diffuse)
300 days of sunlight each year

Irrigation: Columbia Basin Project
• 1952 first water received
• Over 670,000 Acres
• Farmers pay by acre based on land classification
Abandoned Orchards: County Horticultural Pest and Disease Boards have the authority to remove trees.
Organic Production
- 10% of the industry
- Less moisture $\rightarrow$ significantly less pest pressure
- Cultivation for mechanical weed control

Most orchards are started conventionally, then transitioned to organic
Overhead irrigation
- Drought
- Sunburn
(dependent on fruit surface temperature)
Angled or V-trellis systems
- Increased sunlight interception
- Shades fruit
- More productive?

Engineering problem

Pedestrian orchard, 7’ Gala on Mark

13’ Buckeye gala on M.9T337
~ $35,000/Acre
Multi-leader systems

14x1.5’
Alternate trees trained to 13° angle
4 leaders per tree

10x1.5’
Alternate trees
2 leaders per tree
Washing State Apple Production Regions
Western Cascade Plateau & Columbia River Basin

- Okanogan Region
- Lake Chelan Region
- Wenatchee Region
- Columbia River Region
- Yakima Valley Region
Wenatchee Research Farm, WSU
East of the Cascade Mountains

**Arid climate:** Low disease & insect pest pressure

**Limited deciduous forest:** Reduced diversity of pest ecology

**Relatively Flat Terrain:** High density, mechanization and automation

**Irrigation:** Columbia River & tributaries - cheap clean plentiful water

  Annual precipitation about 6 inches/yr; 1000 dams for storage
Typical Hudson Valley Orchard
Typical Hudson Valley Orchard

**Humid Continental Climate:** High disease & insect pest pressure

**Deciduous forest borders:** High diversity of pest ecology

**Sloping Terrain:** Difficulty to install high density, mechanization and automation

**Irrigation:** Pond and well water

Average Rainfall 46.2”/yr.
Key Pests of Washington State Apple

**Lepidoptera:**
*Codling Moth*
*Leafroller*
Lesser Appleworm
Lacambia sp.
Eye spotted bud moth

**Diptera:**
*Apple maggot*

**Hemiptera:**
Lygus bug
*Stink Bug species*
Campylomma
Box elder bug

**Homoptera:**
*Rosy Apple aphid*
*San Jose Scale*

**Thysanoptera:**
Western flower thrips
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**Thysanoptera:**
- Western flower thrips
- Green Fruitworm
- Plum Curculio
- European Apple Sawfly

**Sunburn - cooling fruit (Surround)**
**Fruit Size (To Large)**
Conducive for Organic Production
Organic apple sales and prices

8 million boxes shipped

$41.25 per box

6 million

$32.36 per box

4 million

$16.99 per box

2 million

CROP YEAR

Key Pests of Washington State Apple

Washington’s organic apple acreage

Some historical events that have influenced organic apple production include the Alar incident, price volatility (Drop), the introduction of mating disruption (MD) for codling moth control, and market entry by national chain supermarkets (Retail chains).

- CERTIFIED ORGANIC
- IN TRANSITION

Alar


Retail chains

$ Drop

Hudson Valley Research Laboratory

Cornell University
Apple maggot *Rhagoletis pomonella* (Walsh) (Diptera: Tephritidae)

- The first confirmed apple maggot infestations in the Northwest were in Oregon in 1979.
- Trapping programs have located maggots in western Washington, both sides of the Columbia River Gorge and in Spokane (eastern part of Washington State).
Apple maggot *Rhagoletis pomonella* (Walsh) (Diptera: Tephritidae)

- In the early 1980s, states in the Pacific Northwest launched programs to control and contain apple maggot.
- The **control / containment** program ended in 1985 when *financial resources* became limited and the apple maggot was found in **native hawthorn** along streams, preventing control by insecticides.
Apple maggot *Rhagoletis pomonella* (Walsh) (Diptera: Tephritidae)

• Apple maggot trapping program conducted annually using 5,000 - 8,500 apple maggot traps.

• Trapping results forwarded to county pest boards for control, *suppression*, or *eradication*.

• Counties may be quarantined in whole or in part based on trap catches and other evidence of apple maggot activity detected.
Apple maggot *Rhagoletis pomonella* (Walsh) (Diptera: Tephritidae)

- **Purpose of apple maggot quarantine:**

  Facilitate the movement of commercial fruit to domestic and international markets by providing shippers with one of two types of WSDA documents certifying their fruit is apple-maggot free.

- One certificate states no apple maggot flies were caught within a half-mile of the orchard shipping the fruit.

- The other certificate states flies were caught within a half-mile of the orchard, but WSDA inspection revealed no apple maggot larvae in the fruit.
**Apple maggot** *Rhagoletis pomonella* (Walsh)  
(Diptera: Tephritidae)

- Central Washington AM populations have increased in 1981–2010 in Kittitas and Yakima Counties.
- However, only 0 to 4.7% of traps on apple, crabapple, and hawthorn trees were positive for flies (commercial apple production region)
**Apple maggot** *Rhagoletis pomonella* (Walsh)  
(Diptera: Tephritidae)

- While further north in Klickitat County, located farther from commercial apple orchards, 0 to 41.9% of traps were positive.

- Higher populations of Black-fruited hawthorn trees, black hawthorn and Douglas' thornapple (*C. douglasii*) contribute to AM presence.
Apple Maggot trap #’s on the increase in northern counties (Data Skagit Co.)

WSFC “Apple maggots have never been found in commercially packed fruit in the state.”
Apple maggot *Rhagoletis pomonella* (Walsh)  
(Diptera: Tephritidae)

**AM Management** (Assail, Carbaryl, Pyrethroids)

- Apply control treatments within 7 days of trapping AM fly in the orchard.
- Upon captures repeat treatments in 14 to 21 days.
- Do not treat again until another fly is detected. Fruit inspected by the Washington State Department of Agriculture for certification prior to shipments.
Key Pests of Washington State Apple

Lepidoptera:
Codling Moth

CM Management

• Prior to the synthetic insecticides 25-60% losses from CM.

• Use of chlorinated hydrocarbon resulted in spider mite (McDM, TSSM and ERM spider mite control failure due to resistance.

• Loss of AZN (azinphosmethyl – Guthion) transition to soft insecticide programs: Assail, Delegate, Altacor, Intrepid 2F, Rimon 0.83EC, CM Virus and mating disruption.
Key Pests of Washington State Apple

Lepidoptera:
Codling Moth

Codling moth Area-wide Management Project (CAMP)

- **Mating disruption** (Isomate C+, Isomate CTT, NoMate, CheckMate) at 200 to 400 dispensers/acre.

- **Management-biological (microbial) control**: COMMERCIAL USE codling moth granulosis virus (Carpovirusine, Cyd-X, Virosoft CP4)