

Growing Fruit Trees On A Diversified Farm

Orchard Planning & Management



Cornell University

Hudson Valley Research Laboratory

THE JENTSCH LAB

INSECT BIOLOGY, ECOLOGY, AND MANAGEMENT IN HUDSON VALLEY AGRICULTURAL COMMODITIES



WELCOME ENTOMOLOGY BROWN MARMORATED STINK BUG INVASIVES ORGANIC AG. RESEARCH TREE FRUIT THE HEIRLOOM ORCHARD
VEGETABLE SWEET CORN SMALL FRUIT GRAPE IN THE NEWS

Welcome to the Jentsch Lab



HVRL ENTOMOLOGY STAFF

Research Our research and extension outreach program is directed by [Cornell University's Department of Entomology](#) and located at the [Hudson Valley Research Laboratory \(now FARM\)](#), in Highland, NY. We are a part of the [New York State Agricultural Experiment Station in Geneva, NY](#), with the laboratory building owned by a non-profit cooperative tree fruit grower organization (HVRL Inc.).

Partnership This cooperative partnership with the [College of Agriculture and Life Science \(CALS\)](#), [Cornell Cooperative Extension \(CCE\)](#) and the [Eastern New York Commercial Horticultural Program \(ENYCHP\)](#) providing continuous agricultural

Research and Extension to the agricultural community on Tree Fruits and Vegetables in the Hudson Valley since 1923.



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2017 BLOG PAGES

- Last Chance To Sign Up: The Heirloom Orchard: A Three-Day Series on Estate Orchard Management. Saturday Dec 8th, 15th, 22nd 2018. 5:00-8:00 pm HVRL 3357 Rt. 9W, Highland NY 12528 December 6, 2018
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Plant Protection Presentations

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Plant Protection Presentations

Fruit Production IPM Presentations:

2019

Growing Fruit Trees On A Diversified Farm-Orchard Planning & Management. 2019 Young Farmers Conference, Stone Barns Ctr. for Food & Ag, Tarrytown, NY

[Presence and Redistribution of Samurai Wasp, *T. japonicus* \(Ashmead, 1904\), in NYS. 90th Annual Meeting of the Eastern Branch of the Entomological Society of America March 9-12, 2019, Virginia Tech, Blacksburg, Va.](#)

[Jentsch: Pre-Bloom Decision Making for Your Orchard, March 8, 2019, 2-5PM Hudson Valley Research Lab Conf. Rm., Highland, NY](#)

[Acimovic Presentation: Guiding Management of Apple Scab, Fire Blight, SB&FS and Marssonina Leaf and Fruit Blotch with RIMpro and NEWA Models. Pre-Bloom Decision Making for Your Orchard, March 8, 2019, 2-5PM Hudson Valley Research Lab Conf. Rm., Highland, NY](#)



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Orchard Planning & Management

Why Grow Apple: Discussion

- Understanding the why behind growing apple. Simply not just fruit.
- **Orchardists** should prioritize the why and use of fruit grown.
 - *Esthetics* – View & Vista, Garden & Grounds, Wildlife
 - Tree architecture from **standard** to highly dwarfing
 - Art forms in farm landscape
 - Kid Climbing Heaven
 - Fruit for family & friends, parties, weddings
 - Center point for social gatherings, bonfires
 - Scion Rooted (Standard): 140 trees / A = 400 bu./A



Orchard Planning & Management – Standards



Cornell University

Hudson Valley Research Laboratory

Orchard Planning & Management – Standards



'Seedling' Tree Architecture

- Scion Rooted
- Open Canopy
- 'Kid Friendly'
- Orchard Floor visibility
- Grazing potential (sheep)



Apple trees can highlight specific activities other than farming, provide site specific purpose on the farm





Three-dimensionality to open space



- striking forms and color
- Provides fruit to Wildlife in small and large mammals.



Orchard Planning & Management – Standards



Apple Restoration

- Re-establishing orchard provides 'A Story' of unique strains, lost varieties, historical perspectives of your region.
- Represent resilient and sustainable varieties of apple that have endured low levels of inputs and management





Inducing excessive vigor in scion rooted trees by reducing the size and removing the central leader

Orchard Planning & Management

Why Grow Apple: Discussion

- Understanding the why behind growing apple. Simply not just fruit.
- **Orchardists** should prioritize the why and use of fruit grown.
 - *Growing Fruit for Income* – Count the costs!
 - Investment resources, availability of acreage, time, labor
 - Orchard development: planting – harvest Fruit Quality & Yield
 - 1 bu = 42 lbs;
 - One standard mature apple produces 8-18 bu./Yr. (2200 apples)
 - 1A High density orchard produces 1200 bu./Yr. (25 tons of fruit)



Orchard Planning & Management

Growing Apple: Discussion

- **Plan your markets** - Fresh for CSA, PYO, Retail, Wholesale, Mixed
- **Harvest Labor:** family, hires (H2A)
- **Storage:** Long term cold storage
- **Processing:** Juice, Hard Cider, Vinegar, Sauce, Baking



Orchard Planning & Management

Site Selection

Location

- Accessibility (distance to markets, labor, support, road conditions)

Elevation & Topography

- Slope, Water and Air Drainage

Cold air, frosts, and fogs settle in low areas, increasing the potential for frost and disease problems.

For each 100-foot rise in elevation from a valley, expect a 5-10°F increase in spring night temperatures during a radiation frost/freeze events.



Orchard Planning & Management

Site Selection

Location

- Accessibility (distance to markets, labor, support, road conditions)

Elevation & Topography

- Slope, Water and Air Drainage
- Plant on slopes that are not too steep to be safely traversed with equipment.
- The tops of hills are not necessarily good sites as orchards are more vulnerable to advective freezes than the sides of hills
- Soils on the tops of hills are frequently shallow due to erosion.



Orchard Planning & Management

Site Selection

Orchard Orientation

Sunlight: deciduous & conifer forest edge tree shading

North / South rows on east slopes ideal

- **South facing** – Increased chances of southwest trunk injury during winter, earlier blooming.
- **North facing** – Delayed bloom.
- **East facing** – Reduced disease potential as the morning sun dries off the foliage early.
- **West facing** – Intermediate between north and south.



Orchard Planning & Management

Site Selection

Soils

- Minimum rooting depth of 4-5 feet is desirable. (Trees on shallow soils will be more affected by drought and by root injury during extended severe cold spells.)
- Good internal and surface water drainage characteristics. Apple trees will not tolerate waterlogged soils for extended periods during the growing season.
- Soil pH and fertility can be adjusted and are not major considerations; however, highly fertile soils can cause excessive tree vigor and are, therefore, not desirable.



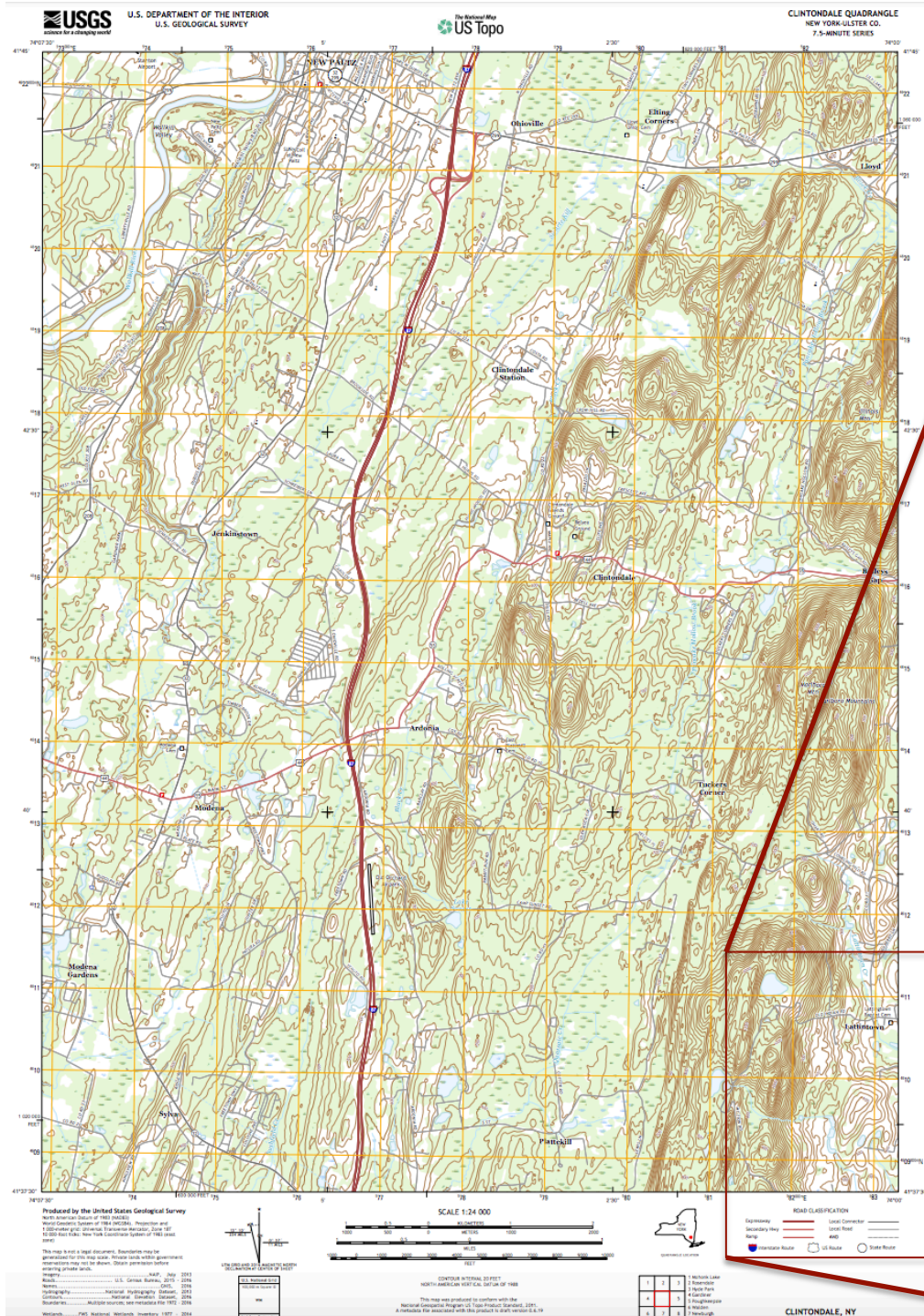
Orchard Planning & Management

Site Selection

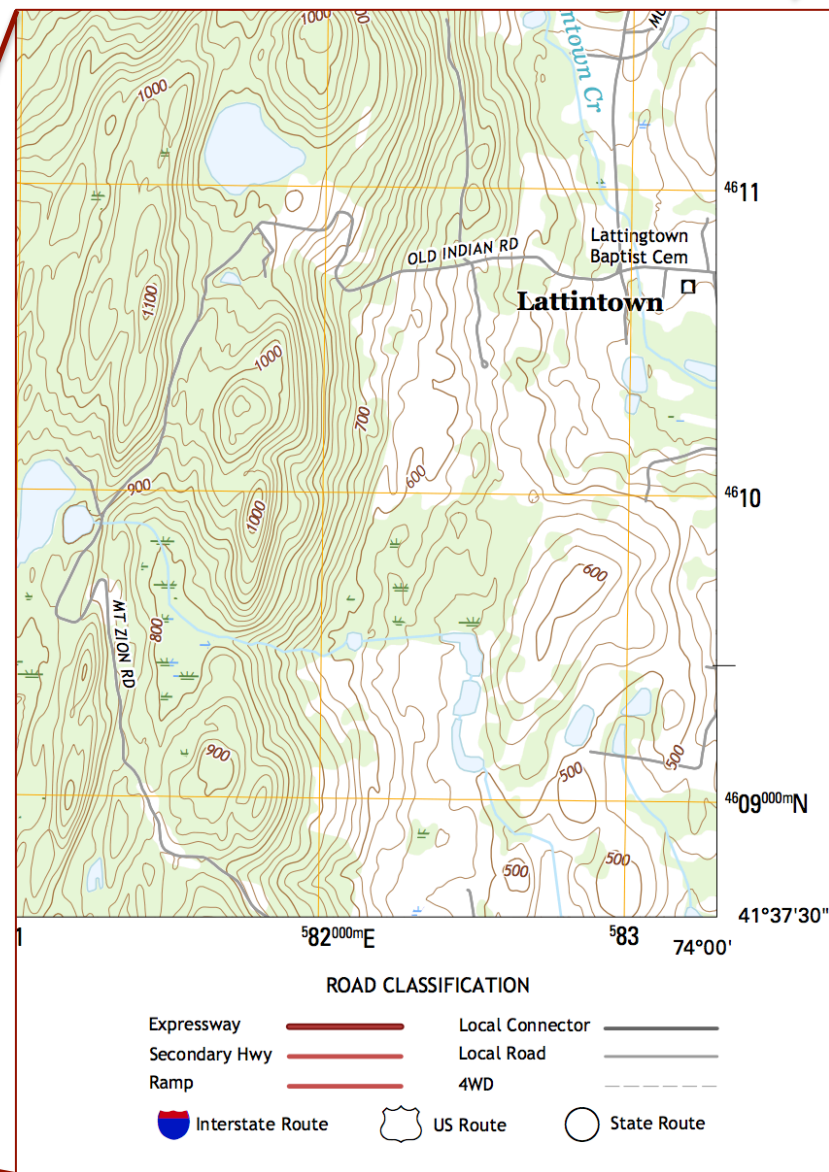
Water availability

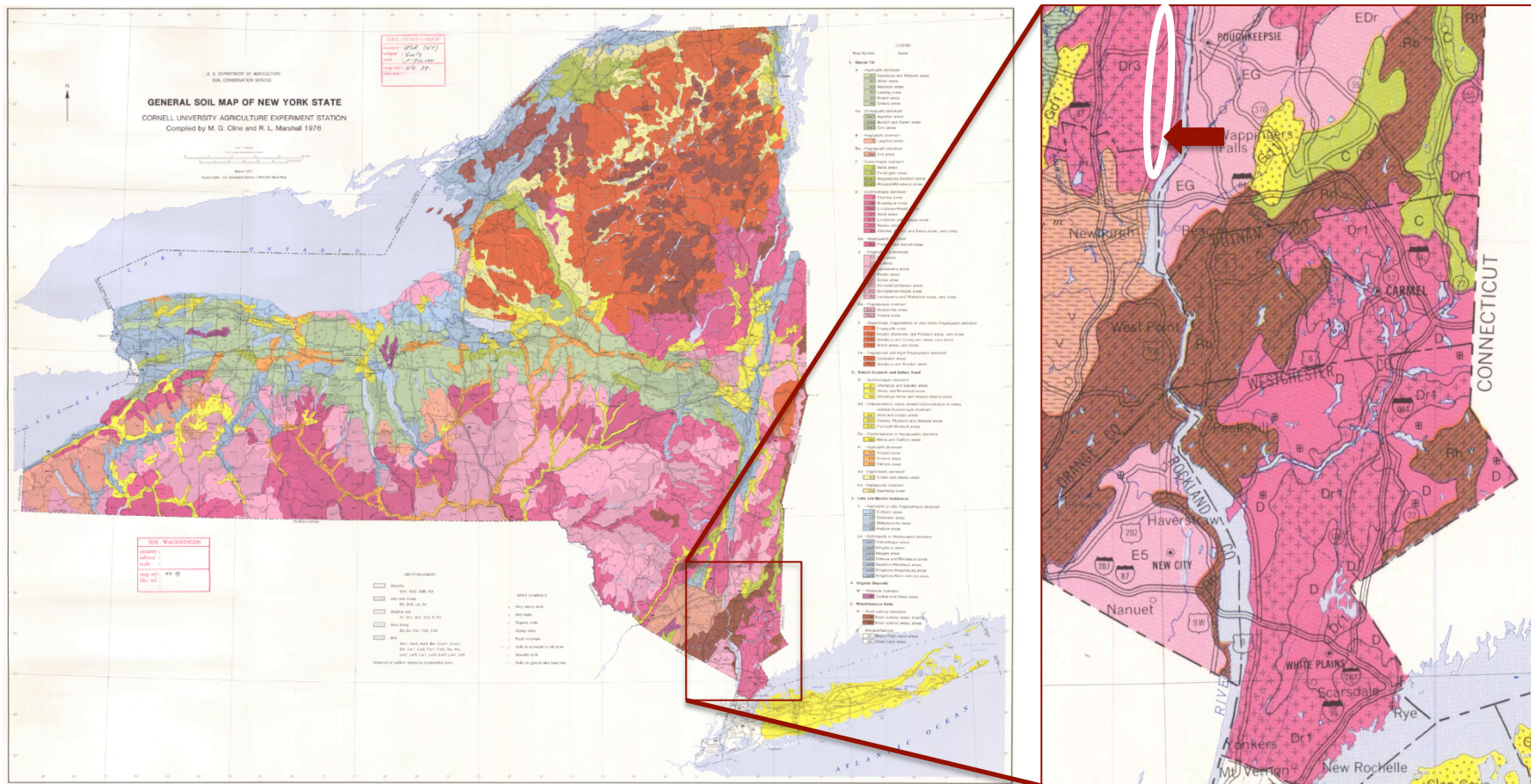
- A reliable, close, clean water supply is required for irrigation, spraying, and possibly overhead frost protection and evaporative cooling.
- High density planting systems are quite susceptible to water stress and require irrigation systems in place at planting to avoid stunting growth and stress that may increase insect infestations (DWB, BSB)





Water & Cold Air Drainage





D - *Dystrochrepts* dominant

- D Charlton areas
- Dh Muskingum areas
- DhE Lordstown-Mardin areas
- Dr1 Hollis areas
- Dr2 Lordstown and Oquaga areas
- Dr3 Nassau areas
- Ds Charlton, Paxton, and Essex areas, very stony

SOIL SURVEY OF Ulster County, New York



United States Department of Agriculture
Soil Conservation Service
in cooperation with
Cornell University Agricultural Experiment Station

Nassau series

The Nassau series consists of loamy-skeletal, mixed, mesic Lithic Dystrachrepts. These soils are shallow (fig. 11) and somewhat excessively drained. They formed in glacial till derived mainly from shale and slate. These soils are on bedrock controlled, glacially modified landforms. The bedrock is folded and tilted at various angles, and bedrock outcrops are common. These soils have a medium textured subsoil. Slope ranges from 3 to 65 percent, but is dominantly 8 to 60 percent.

Nassau soils are closely associated with the moderately deep, well drained to excessively drained Manlius soils and the deep, well drained Bath soils and moderately well drained Mardin soils. Nassau soils do not have the angular fragments and flagstones derived mainly from siltstone and sandstone that Arnot soils have. They have a lower base status and more coarse fragments in the solum than Farmington soils that are shallow to limestone bedrock.

Typical pedon of Nassau shaly silt loam, in an area of Bath-Nassau complex, 8 to 25 percent slopes, in the town of New Paltz, 2,300 feet northwest on Jansen Road from its intersection with N.Y. Route 32 and 20 feet north, in an apple orchard:

Ap—0 to 6 inches; brown (10YR 4/3) shaly silt loam; moderate fine granular structure; very friable; many fine roots; 25 percent shale fragments; strongly acid; abrupt smooth boundary.

B21—6 to 10 inches; yellowish brown (10YR 5/4) very shaly silt loam; weak very fine subangular blocky structure; very friable; many fine roots; many fine pores; 35 percent shale fragments; strongly acid; abrupt smooth boundary.

B22—10 to 16 inches; brown (7.5YR 4/4) very shaly silt loam; weak fine and medium subangular blocky structure; friable; many fine roots; many fine pores; 50 percent shale fragments; strongly acid; abrupt irregular boundary.

lIR—16 inches; dark gray (N 4/0) shale with cleavage planes tipped almost vertically.

The thickness of the solum ranges to a depth of 10 to 20 inches and coincides to the depth to bedrock. Rock fragments are derived mainly from shale and slate. They range from 15 to 50 percent, by volume, in the Ap horizon and from 35 to 70 percent in the B horizon. Reaction, in unlimed areas, is very strongly acid or strongly acid throughout.

The Ap horizon has hue of 7.5YR to 2.5Y, value of 3 to 5, and chroma of 2 or 3. Structure is weak or moderate, medium or fine granular.

The B horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. The fine earth is silt loam or loam. The B horizon has weak subangular blocky structure, or it is massive. Consistence is friable or very friable. In some profiles, a thin horizon above the bedrock has more than 90 percent loose shale fragments.

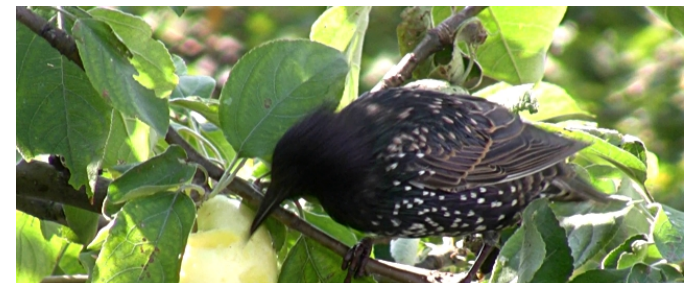
Orchard Planning & Management – Standards

Site Selection

- Forest and shrub edge influence orchard pest presence

Wildlife management

- **Perimeter deer fencing:** required in the Northeast for tree establishment
 - **Grey Squirrel** – perimeter fruit removal
 - **Woodchuck** – gnaw constantly on the stems and trunks of trees, claw and dig at the base of newly planted fruit trees.
 - **Birds** – peck on fruit at tops of trees. Starlings will flock to orchards
-
- Maintain in row tree height to limit shading of adjacent orchard rows



Orchard Planning & Management - Varieties

Heirloom Apple

- Baldwin (1700's – New England - culinary)
- Bramley's Seedling (1803 England - culinary)
- Calville Blanc d'Hiver (1598 France – culinary flavor & texture)
- Esopous Spitzenburg (1700's NY - tart/flavour/fresh)
- Northern Spy (mid-1800's Lake Ontario NY – Spys for pies)

Disease (Apple Scab) Resistant Varieties (PRI Breeding Program)

- *Goldrush (tart/sugar/good keeper) susc. FB & Cedar Apple Rust
- *Liberty, *Pixie Crunch, *Crimson Crisp

Cider Varieties – Finding Balance

Sweet (< tannin / > acidity) / **Sharp** (< tannin / > acidity)

Bittersweets (> tannin / < acidity) / **Bittersharps** (> tannin / > acidity)

- Dabinett, Somerset Redstreak / Kingston Black, Porters Perfection



Orchard Planning & Management - Varieties

Markets: The driver in orchard decision making?

Selecting varieties:

- **Markets:**
 - **Consumer** – Retail, ‘Pick-Your-Own’ drivers
 - **Wholesale: shelf space constraints**
 - ‘19 Rejections: Empire, Goldens, Macoun, Jonagold, McIntosh...

‘19 Commercial HV growers able to sell (required to grow)

- Gala, Fuji, Honeycrisp, Club Varieties (Snap Dragon, Ruby Frost, Sweetango, Evercrisp) – Consumer ‘demand’ for crunch



Orchard Planning & Management - Varieties

Heirloom Apple

Montgomery Place, Tivoli & Locust Grove Fruit Farm, Milton

>50 heirloom varieties

- Baldwin (1700's – New England - culinary)
- Bramley's Seedling (1803 England - culinary)
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Orchard Planning & Management - Varieties

Disease (Apple Scab) Resistant Varieties (PRI Breeding Program)

- *Goldrush (tart/sugar/good keeper)
Susceptible to fireblight & cedar apple rust
- *Liberty:
- *Pixie Crunch: great 'kid' apple
- *Crimson Crisp

Cider Varieties

Sweet / Sharp

Bittersweets (> tannin / < acidity) / **Bittersharps** (> tannin / > acidity)

- Kingston Black, Tremletts Bitter, Hereford Redstreak



Orchard Planning & Management

Why Grow Apple: Discussion

- **Understand and prioritize production practices** for fruit trees to provide 'sound' fruit (managing the biotic - nature)

Production Practices – Pest Management

Organic

IPM based

Conventional



The Heirloom Orchard Estate Orchard Management

Apple Tree Architecture

- Rootstock:
- Tree size management
 - Scion rooted standard (100%)

The Heirloom Orchard

Estate Orchard Management

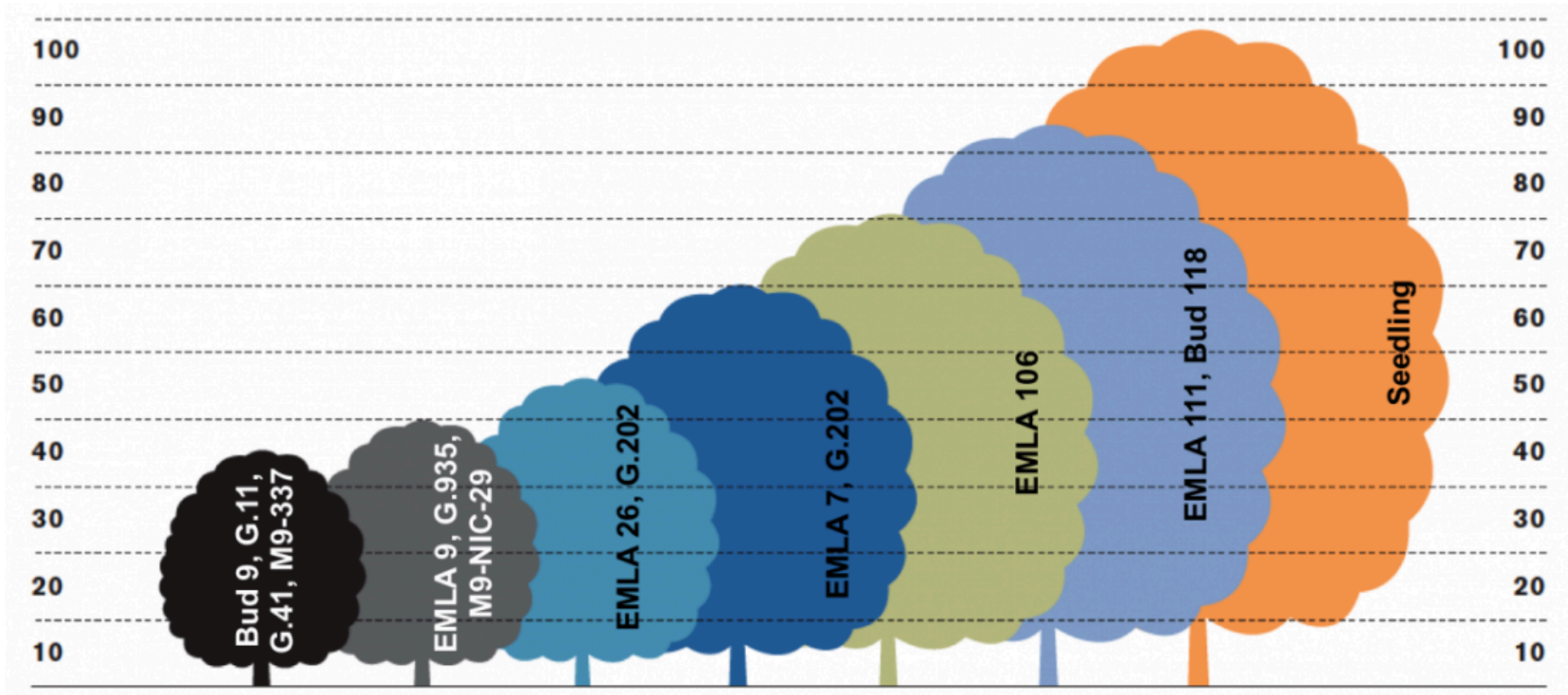
Apple Tree Architecture

- Rootstock:
- Tree size management
 - Scion rooted standard (100%)
 - Semi-dwarf
- Root distribution and depth
- Susceptibility to insect and disease
- Sucker growth, management inputs
- Apple require 1" of water / week

Scion: Tree Characteristics

- Tree height (management requirements)
- Branching (upright, horizontal, drooping)
- Bark characteristics (smooth, flake, burr knots)

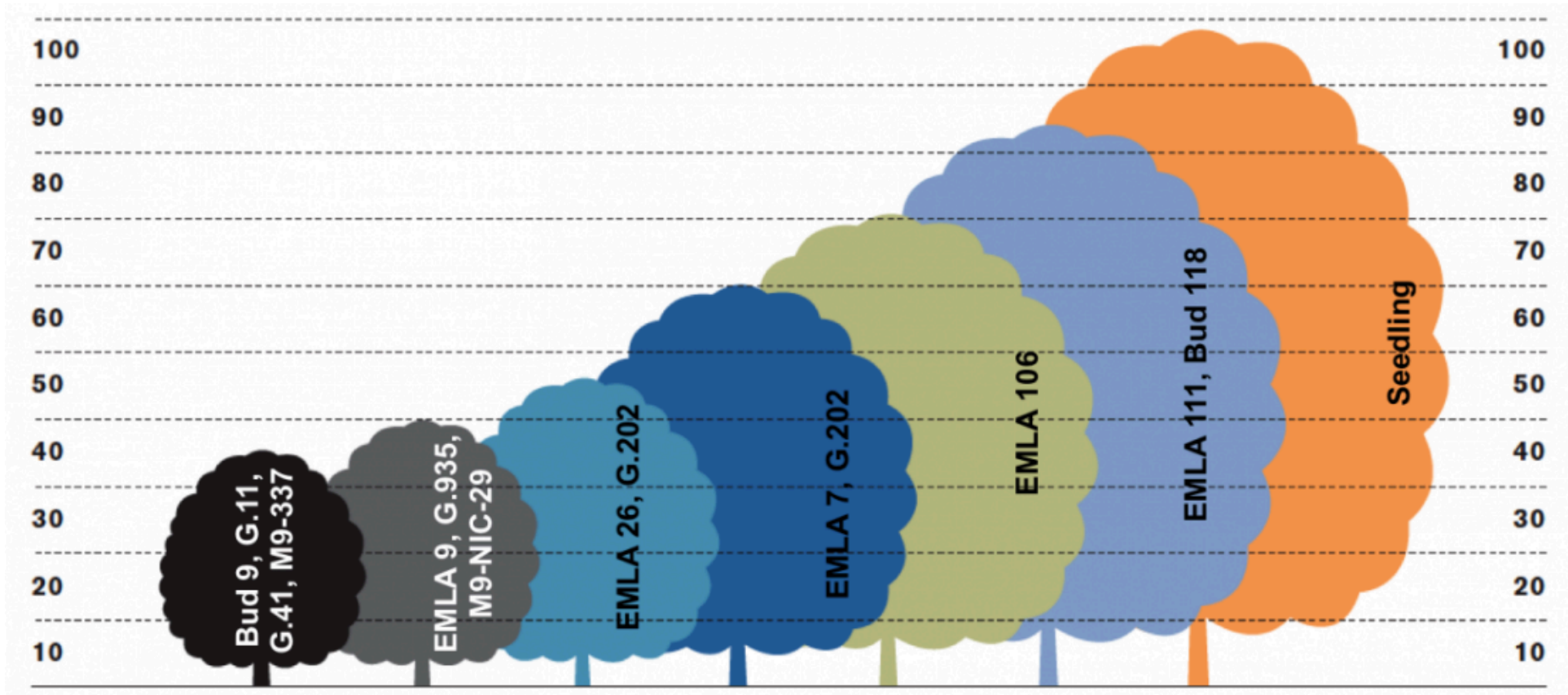
Tree size comparisons using different rootstocks based on percent size of standard apple seedling.



Apple rootstocks can have a variety of desirable characteristics including **tree size, crop load**

- Dwarfing and tree branching modifications
- Increased precocity (early fruitfulness)
- Increased productivity, tree spacing for light interception
- Tolerance to apple replant disease (ARD)

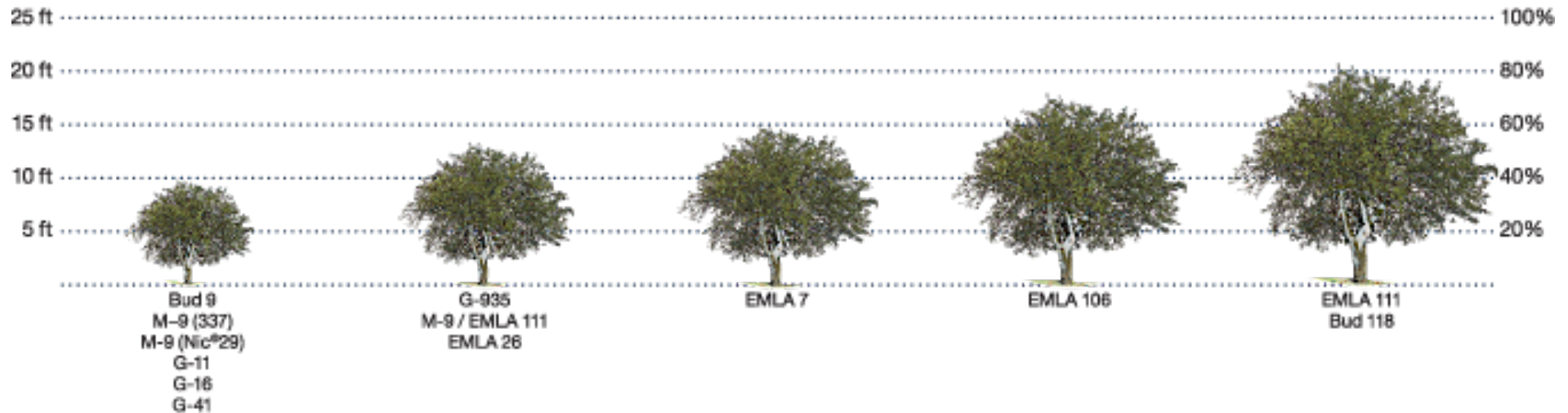
Tree size comparisons using different rootstocks based on percent size of standard apple seedling.



Apple rootstocks can have a variety of desirable characteristics including **resistance to**

- Crown rot oomycetes (*Phytophthora* spp.)
- Fire blight bacteria (*Erwinia amylovora*)
- Woolly apple aphids

Growth Characteristics of Apple Rootstocks



General Characteristics of GENEVA® Apple Rootstocks

• Disease resistance

- o Fire blight
- o Crown and root rots (Phytophthora)
- o Apple Replant Disease Complex *

• Pest resistance

- o Woolly apple aphid*

• Other characteristics

- o All are dwarf types that differ within dwarf sizes
- o Cold hardiness*

*Applies to some GENEVA® Apple Rootstocks.

Selected Current Licensees for Geneva Series Grafted Trees

- Cameron Nursery, LLC
- Consorcio Viveros Sacramento
- Copenhagen Farms
- **Cummins Nursery, 1408 Trumansburg Rd, Ithaca, NY 14850** ←
- Domaine de Castan, SAS
- Fruit growing Equipment and Service SRI
- Helios Nursery
- Janssen Brothers Nurseries Ltd.
- Kit Johnston Farms
- SAPO Trust
- SNC ELARIS
- Treco, Inc.
- Uni-Viveros
- **Wafler Nursery** 10748 Slaght Road, Wolcott, NY 14590 877-397-0874
- Willamette Nurseries, Inc.
- Willow Drive Nursery, Inc.



Shop now

Spring 2019 All Fruits Inventory

ALL APPLES

- Antiques & Exotics
- Cider
- Crabapples
- Disease- Resistant
- For the North
- For the South
- Wildlife Planting

ALL PEARS

- Asian pears
- European pears
- Perry pears
- Self-Fertile Pears

APRICOTS

PEACHES

- Cold Hardy Peaches
- Disease Resistant Peaches
- Flat Peaches (Peentos)
- White

NECTARINES

CHERRIES

- Cold Hardy Cherries
- Self Fertile Cherries
- Sweet Cherry
- Tart/Pie

ALL PLUMS

- European plums
- Hybrid Plums
- Japanese Plums
- Self-Fertile Plums

ROOTSTOCKS

More info

[Home](#) > [Shop](#) > [ALL APPLES](#) > [Antiques & Exotics](#)

Antiques & Exotics

Scion	Category	Rootstock	Size class	Stock
Alkmene	Apple	G.222	Semi-dwarf	1
Arkansas Black	Apple	G.41	Dwarf	4
Arkansas Black	Apple	G.935	Dwarf	1
Ashmead's Kernel	Apple	G.11	Dwarf	91
Ashmead's Kernel	Apple	G.935	Dwarf	29
Ashmead's Kernel	Apple	G.210	Semi-dwarf	14
Ashmead's Kernel	Apple	G.890	Semi-dwarf	1
Ashmead's Kernel	Apple	M.7	Semi-dwarf	71
Baldwin	Apple	G.935	Dwarf	3
Black Oxford	Apple	G.935	Dwarf	97
Blenheim Orange	Apple	M.7	Semi-dwarf	5
Calville Blanc	Apple	G.11	Dwarf	21
Campfield	Apple	G.11	Dwarf	47
Elstar	Apple	G.935	Dwarf	3
Frostbite (MN 447)	Apple	G.210	Semi-dwarf	1
Frostbite (MN 447)	Apple	P.18	Full-size	12
Golden Nugget	Apple	G.41	Dwarf	1
Golden Russet	Apple	B.9	Dwarf	159
Golden Russet	Apple	G.11	Dwarf	109
Golden Russet	Apple	G.222	Semi-dwarf	54
Golden Russet	Apple	G.202	Semi-dwarf	26
Golden Russet	Apple	MM.111	Semi-standard	1
Grimes Golden	Apple	G.11	Dwarf	1
Grimes Golden	Apple	G.41	Dwarf	9
King David	Apple	G.11	Dwarf	7
King David	Apple	G.41	Dwarf	33



Shop now

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APRICOTS

PEACHES

- Cold Hardy Peaches
- Disease Resistant Peaches
- Flat Peaches (Peentos)
- White

NECTARINES

CHERRIES

- Cold Hardy Cherries
- Self Fertile Cherries
- Sweet Cherry
- Tart/Pie

ALL PLUMS

- European plums
- Hybrid Plums
- Japanese Plums
- Self-Fertile Plums

ROOTSTOCKS

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[Wildlife Planting](#)

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Baldwin



Baldwin is also known as Woodpecker, Pecker and Butters. It was first discovered as a chance seedling in Wilmington, Massachusetts, USA, 1740. It was the most popular all-purpose dessert apple in the United States until it was killed during harsh winters between 1934-1935 and was replaced by McIntosh. The original tree died in the mid 1800's, but is marked by a monument to the Baldwin apple.

The apple is smaller than McIntosh, medium sized but dense and heavy, with yellow to flushed/striped brick red and bronze. This heirloom is crisp, juicy, with sweet to subacid flavor, aromatic, and firm. It is very hard and thick skinned, good for shipping. Good cider base, and great for pies. The fruit contains 13.64% sugar which ferments to 6% alcohol.

The tree is slow to bear, long-lived, and usually a productive and vigorous tree. Can tend towards

biennial or even triennial production. Triploid. Susceptible to apple scap and Baldwin spot, but resistant to Cedar Apple Rust. Ripens in October in upstate New York and will keep till February. Hardy to zone 4.

G.935 Dwarf rootstock (40% of standard)

#1 grade	11/16 grade	9/16 grade	7/16 grade	5/16 grade	
Sold out	<input type="text"/> \$27.75 each 4 in stock	Sold out	Sold out	Sold out	<input type="button" value="Add to cart"/>

In partnership with
AllAboutApples

Orange Pippin

All about apples, pears, plums, and cherries - and orchards where they are grown



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Esopus Spitzenburg apple

[Features](#) [Tasting](#) [Photos](#) [Reviews](#) [Tree register](#) [Buy](#)

One of the great American apple varieties, thought to be Thomas Jefferson's favourite. Noted for its spicy flavour, and for its susceptibility to any and every disease afflicting apples.

Origins

- Species: **Malus domestica**
- Parentage: **Unknown**
- Originates from: **Esopus, New York, United States**
- Introduced: **Early 1800s**
- Orange Pippin Cultivar ID: **1193**
- UK National Fruit Collection accession: **1950-033**
- Some historical details taken with kind permission from 'The New Book of Apples' by Joan Morgan and Alison Richards, illustrated by Elisabeth Dowle, published by Ebury Press, 2002.

Identification

- Fruit colour: **Red / Orange flush**
- Flesh colour: **White to Cream, pale yellow**
- Flesh colour: **White to Greenish to Greenish Yellow**
- Flesh colour: **Yellow to Very Yellow**
- Fruit size: **Variable**
- Fruit size: **Small**
- Fruit size: **Medium**
- Fruit size: **Large**
- Fruit shape: **Round-conical**
- Fruit shape: **Conical**
- Fruit shape: **Long-conical**
- Fruit shape: **Oblong-conical**
- Bultitude apple group: **7. Flushed / striped, some russetting, sweet**



VARIETIES YOU VIEWED

[Apple - Esopus Spitzenburg](#)

[Apple - Northern Spy](#)

[Click here to compare varieties](#)

TOP 10 VARIETIES

TOP 10 HIGHEST RANKED VARIETIES

[Tentation®](#) (4.70) - votes: 20

[Baldwin](#) (4.67) - votes: 9

[Katy](#) (4.67) - votes: 9

[Karmijn de Sonnaville](#) (4.64) - votes: 22

[Mairac®](#) (4.63) - votes: 8

[Wolf River](#) (4.62) - votes: 21

[Pixie Crunch™](#) (4.62) - votes: 13

[Cox's Orange Pippin](#) (4.60) - votes: 55

[Regent](#) (4.60) - votes: 5

[Viking](#) (4.60) - votes: 5

TOP 10 MOST VOTED ON VARIETIES

[Pink Lady®](#) (votes: 221) - rating: 4.47

GENEVA® Apple Rootstocks

Traits	D1148	D1147	D3610	D3539	D4950	D6263	D3609	D4190	D2737	D4951	D3785	D3540	D5107
	G.11	G.16	G.41 ^(a)	New! G.213	G.214	New! G.814	G.935	G.222	G.202	G.969	G.30	G.210	G.890
Arranged in order by size (smallest to largest)	M.9 T337	M.9 T337	M.9 T337	M.9 T337	M.9/M.26	M.9/M.26	M.26	M.26	M.26	M.7	M.7	M.7	M.7/ MM.106
Woolly Apple Aphid Resistance	No	No	High	High	High	No	No	High	High	High	No	High	High
Fire Blight Resistance	Resistant	Resistant	Very Resistant	Very Resistant	Very Resistant	Very Resistant	Very Resistant	Very Resistant	Very Resistant	Very Resistant	Very Resistant	Very Resistant	Very Resistant
Replant Disease Complex Resistance	Partial	Partial	Tolerant	Tolerant	Tolerant	Tolerant	Tolerant	No	Tolerant	Tolerant	Tolerant	Tolerant	Tolerant
Crown and Root Rots (Phytophthora)	Tolerant	Tolerant	Tolerant	Tolerant	Tolerant	Tolerant	Tolerant	Tolerant	Tolerant	Tolerant	Tolerant	Tolerant	Tolerant
Cold Hardiness	Yes	Partial: Good Mid-winter, Bad early-cold	Yes	TBD	Yes	Yes	Yes	Yes	Yes-Good, Mid-winter	Yes	Yes	Yes	Yes
Productivity/Yield Efficiency- as good or better than M.9	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Low suckering and burr knots	Yes	Yes	Yes	Yes	Yes	Medium	Yes	Medium	Yes	Yes	Yes	Yes	Yes
Susceptibility to latent viruses	No	Yes	No	No	No	Yes	Yes	No	No	No	No	No	No

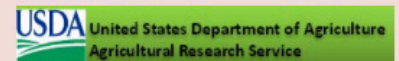
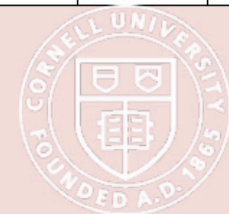
TBD: To Be Determined.

(a) Remarks: G.41 has presented weak graft unions with the following scions: Cripps Pink, Scilate, and Honeycrisp. The well feathered trees are prone to breakage in strong winds in the first 2-3 years and additional care needs to be taken to prevent breakage. Breakage risk decreases with time.

Recommendation: Use plant materials that have been tested and are "clean" of viruses.

Licensing for all varieties is available as exclusive or non-exclusive in selected Domestic and International Territories.

Chart data valid as of September 20, 2018, and supplied by Cornell University apple rootstock breeding team members, Gennaro Fazio, PhD., USDA Breeder, Terence Robinson, PhD, Cornell Breeder, and Herb Aldwinckle, PhD., Professor Emeritus.



Using

- Uses: **Eat fresh**
- Uses: **Cooking**
- Uses: **Juice**
- Uses: **Drying**
- Flavour quality: **Exceptional**
- Flavour quality: **Very good**
- Flavour style: **Honeyed / Scented**
- Flavour style: **Sweeter**
- Flavour style: **Aromatic**
- Harvest period: **Mid-Late season**
- Harvest period: **Late season**
- Use / keeping: **3 months or more** Should be stored for at least a month before eating.

Growing

- Cropping: **Heavy**
- Flowering period: **Mid-Late season**
- Flowering group: **4**
- Fertility: **Self-sterile**
- Ploidy: **Diploid**
- Vigour: **Slightly large**
- Bearing regularity: **Biennial tendency**
- Gardening skill: **Some skill needed**
- Fruit bearing: **Spur-bearer**
- General disease resistance: **Poor**
- Period of origin: **1800 - 1849**

Climate

- Climate suitability: **Warm climates**
- Climate suitability: **Temperate climates**
- Climate suitability: **Tolerates cold winters**

Diseases

- Canker - Very susceptible
- Scab - Very susceptible
- Fireblight - Very susceptible
- Cedar apple rust - Some susceptibility

Relationships to other varieties

Offspring of this variety:

- [Jonathan](#)

Also known as

- Spitzenburg

References and further reading about this variety

- **Apples for the 21st Century**
Author: Manhart
Listed as Spitzenberg
- **Some Antique Apples for Modern Orchards**, (2008)
Author: Merwin I.A.

[Honeycrisp](#) (votes: 181) - rating: 4.56

[Fuji](#) (votes: 160) - rating: 4.42

[Granny Smith](#) (votes: 152) - rating: 4.37

[Red Delicious](#) (votes: 151) - rating: 2.79

[Jazz™](#) (votes: 149) - rating: 4.43

[Gala](#) (votes: 89) - rating: 4.02

[Golden Delicious](#) (votes: 85) - rating: 4.05

[McIntosh](#) (votes: 78) - rating: 4.56

[Jonagold](#) (votes: 77) - rating: 4.12

OUR TOP 10 MOST POPULAR VARIETY DESCRIPTIONS

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Fruit Quarterly

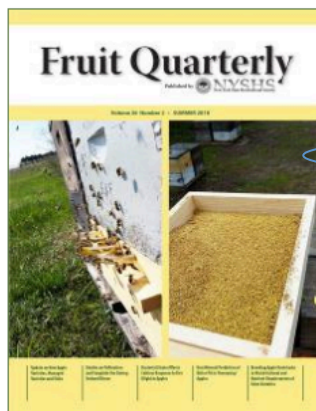
Fruit Quarterly

Published by NYSHS
New York State Horticultural Society

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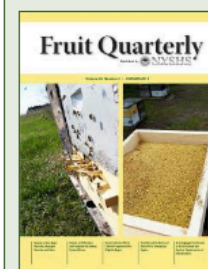
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4. Non-Mineral Prediction of Bitter Pit in 'Honeycrisp' Apples
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Update on New Apple Varieties, Managed Varieties and Clubs

Susan Brown and Kevin Maloney

Horticulture Section, School of Integrative Plant Science, Cornell University, Geneva, NY

Keywords: branding, apple marketing, apple cultivars, exclusive licensing, patents

This is the third in a series of updates on club varieties. Readers are encouraged to review the earlier series for additional information (Brown and Maloney 2009, 2013). In this article, we are stressing some of the managed or new varieties being tested in New York (such as 'Koru' or 'Smitten'), or

"In this article, we are stressing some of the managed or new varieties being tested in New York, or those gaining attention on an international scale."

those gaining attention on an international scale (such as the scab-resistant apples 'Natyra' and 'Bonita'). The trademarked or marketing names of the apples are used, and the varietal names follow, as the trademarked names are best known by consumers and growers. If you are interested in testing some of these selections, we encourage you to read the plant patent, which is available and may be downloaded from the US plant patent database at www.uspto.gov. Plant patents provide details that are not always featured in variety release notices. Where possible, the US plant patent number is included in the write-up. Anyone with comments on varieties they are testing, that differ from these reports, are encouraged to contact Susan at skb3@cornell.edu.

There are two commercialization entities detailed below, which provide information on new offerings on their website. **Midwestern Apple Improvement Association (MAIA):** This group is best known for their 'EverCrisp' apple, but recently released more varieties. Contracts require a one-time payment, a \$1 per tree royalty and trademark fees of 20 cents per tree in years four through 10; and 30 cents per tree in years 11 through 20. The website offers candid discussions on the strengths and weakness of the selections and varieties, and testers are encouraged to stay informed.

It is important to stress that brief descriptions of each variety may be based on MAIA test plot experiences over the last five years, so any discussions about field resistances should be interpreted with caution. Their Ortel newsletters are an excellent source of information. <http://www.midwestapple.com/midwest-apple-improvement-association-about.htm>

Arctic Apples: The first transgenic apples offered in the US, these apples have silencing of polyphenol oxidase (PPO), to reduce flesh browning after cutting. Three apples are available: 'Arctic Granny', 'Arctic Golden', 'Arctic Fuji', and an 'Arctic Gala' is in development. Further information is available at www.arcticapples.com/arctic-apples-r/arctic-apples-varieties/. A New York Fruit Quarterly article reviewed this technology (Xu 2013).

Apples in the News

'Antietam Blush': US plant patent 28,595 was granted in 2017. University of Maryland Professor Chris Walsh and then graduate student Julia Harshman were the creators. This apple is a hybrid of 'Cripps Pink' x an unknown advanced selection of 'McIntosh Wjicki' (columnar habit) x 'Gala'. It ripens about the first week of October and seems to tolerate the heat. The narrow canopy may reduce pruning needs.

'Autumn Glory' ('Huaguan'): A cross of 'Fuji' x 'Golden Delicious' made in 1976. 'Autumn Glory' is bi-color, with a striped red blush over yellow. The fruits are large and slightly ribbed. The flavor is sweet, with some reports of caramel and cinnamon notes, while others do not perceive those flavors. 'Autumn Glory' is exclusive to Domex Superfresh Growers in Washington State. <https://www.superfreshgrowers.com/our-fruit/apples/autumn-glory>. Unfortunately, two samples purchased in Geneva NY on April 17 had internal disorders, yet this was traced back by the company to very young trees and a late harvest. Their customer service was excellent.

'Baker's Delight' (MAIA8): A 'Goldrush' x 'Sweet 16' cross, with a different flavor profile, with some suggesting a flavor similar to cherry or strawberry milkshakes. This apple tends to set a heavy crop, which may negatively impact its unique flavor profile. Fruits are medium in size and reported to have a tender texture. Fruits are said to hang well on the tree and be good for baking, due to sufficient acidity (Herrick 2017). MAIA8 ripens in early to mid-September — about a week after 'Honeycrisp'. Trees are available from Gurney's Seed and Nursery for the home market and commercially from Waffer Nursery (NY) and Early Morning Star Nursery (WA).

'Bonita': This scab-resistant variety from the Czech Republic is a hybrid of 'Topaz' x 'Cripps Pink' ('Pink Lady'); it is being planted in Italy and represents 10% of new plantings. Bonita has 13°Brix and 0.7% titratable acidity and it ripens close to 'Golden Delicious'.

'Bravo' (ANABP-1): The marketing tag-line is "like no other." 'Bravo' is a cross of 'Royal Gala' x 'Cripps Red' (aka 'Sundowner') developed in Manjimup, Australia. There are 60 producers in Australia and testing is beginning in Singapore. 'Bravo' is an unusual, deep burgundy to black in color and has reduced flesh browning after cutting. It is sweet but with an acid balance. 'Bravo' is also late ripening, maturing about 2 weeks before 'Cripps Pink'. 'Bravo' has a narrow harvest window. The thicker skin is suggested to reduce bruising. <https://www.fruitwest.com.au/bravo.htm>

'Cosmic Crisp' (WA 38): USPP# 24,210 in 2014. This hybrid of 'Honeycrisp' x 'Enterprise' from Washington State University is set to make history in terms of rapid commercialization of an

apple variety. 2019 will be the first commercial debut in supermarkets. The production goal of 10 million boxes within the first 5 years requires a massive push of new plantings. WA 38 has excellent storage and quality attributes. A team of researchers are aiding growers with recommendations on best practices for 'Cosmic Crisp'. All of this is detailed on the website. <https://www.cosmiccrisp.com/the-facts/>. Stay tuned!

'Crimson Snow': (AU): (MC28) "Great Feeling" is the marketing tag-line. This chance seedling found in Australia will be managed by Kiku. Reported to have great coloration, white flesh and slow flesh browning after cutting. 'Crimson Snow' needs special production techniques to ensure annual bearing. <http://www.kiku-partner.com/en/crimson-snow-mc38s/>

'Crunch-a-Bunch' (MAIA7): USPP 29,126, granted in 2018. This yellow apple is an open-pollinated 'Honeycrisp' seedling, with 'Goldrush' suggested as a potential parent. Trees are prone to oversetting and can become biennial, but the quality is said to be retained with a heavy crop. That statement needs to be confirmed. This apple's flavor is said to have hints of pineapple and tropical fruits, and the fruits have a light texture. The patent for MAIA7 indicated that it is susceptible to powdery mildew and to soft rot (*Penicillium*) in storage.

'Dazzle' (Pema129): The US plant patent application was filed in 2016. The pedigree of Pema129 is 'NZ Queen'/'Scired' (which is a cross of 'Gala' x 'Splendour') x 'Sweetie' (a hybrid of 'Royal Gala' x 'Braeburn'). The cross was made in 1997. FruitCraft in New Zealand, formed by three of NZ's largest growers (Mr. Apple, Bostock and Freshmax) obtained the worldwide rights to Pema129 from Prevar, Ltd. Fruitcraft is forecasting that 1 million cartons will be exported from NZ by 2028. 'Dazzle' is a large red and very sweet apple (Figure 1), with about 14.5°Brix and low acidity (0.26–0.32). More information may be found at www.dazzleapple.com.



Figure 1. 'Dazzle' apple (Pema129) [photo: FruitCraft, NZ]

'Envy' ('Scilate'): USPP in 2008. Tag line: "Bite and believe" and also "When you are this good they call you Envy." Envy has won the US Apple playoffs each year, yet many ask where can they find 'Envy' in the US. In searching the literature, 'Scilate' is not the easiest apple to grow, with reports of susceptibility to *Neonectria*, with infected trees sometimes symptomless (Amponsah

et al. 2015). Reports submitted to Enza by researchers also mention russet and shrivel (Breen et al. 2008), bitter pit, and internal browning. Bulls eye rot infections are not frequent, but given it is a quarantine pathogen, it was studied proactively (Everett et al. 2017). Van Hooijdonk et al. (2014) suggested specific pruning techniques to maximize fruit quality. <https://envyapples.com/en/about-envy>

'EverCrisp' (MAIA1): USPP 24,579, granted in July 2014. This hybrid of 'Honeycrisp' x 'Fuji', resembles 'Fuji' and the quality is a mix of the parents, with excellent storage life. Comments from the patent and website include: russet extending out over stem cavity, with tendency to crack, modest susceptibility to watercore, susceptible to scab, powdery mildew, soft rot (*Penicillium*). Fire blight was reported in Massachusetts with MAIA1 on B9. Fruit are late ripening and tree vigor is low to medium. Calyx cracking (about 30%) was reported on 3rd-leaf trees in Maryland. There is excellent information on issues to watch for, as well as suggestions for mitigation, on the website. MAIA is partnering with the International Pome Fruit Alliance for global marketing rights.

'Gala' sports

'Foxtrot': USPP 24,664, July 2014. A whole-tree mutation of 'Tenroy Gala' with early ripening and intense coloration.

'Wildfire Gala' (PPAF): This sport is said to ripen 3 weeks earlier than standard 'Gala'. It is available from Helios Nursery.

'First Kiss' (MN 55): The name for MN 55 when grown in Minnesota. More details on this apple are covered in the 'Rave' section, the name used outside of Minnesota.

'Franklin' ('Mayo'): USPP 28,791. This partially russeted apple was named for its discovery in Franklin, VT. It is suggested for use by the sweet and hard cider industry, yet it is unclear how extensively it has been tested for horticultural attributes and cider production, so those interested in 'Franklin' might want to start with a small test planting.

'Honeycrisp' sports

'Cameron Select Honeycrisp': From Cameron Nursery in Washington State, this sport has redder color.

'Firestorm Honeycrisp': This sport is reported to color well, even in heat. Tree loss has been reported on Geneva 935 rootstock (Courtney 2017).

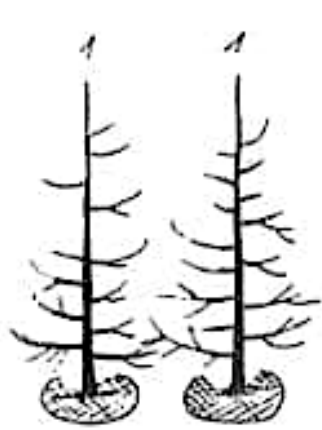
Honeycrisp (MINB42): USPP#26,644. This sport originated as a limb mutation in the University of Minnesota's research block. It is said to allow excellent red coloration in regions not prone to good coloring of 'Honeycrisp', with the patent indicating southern NY and Southern Pennsylvania as two such regions.

'New Zealand Honeycrisp': For retailers wanting 'Honeycrisp' at the end of the domestic crop, it is said to be superior to other sources (Wheat 2016).

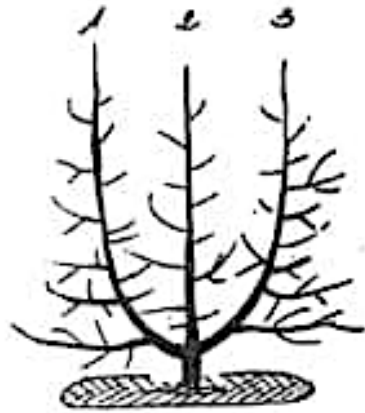
'Premier Honeycrisp' (DAS 10): This sport received its US plant patent #24,833 in 2011. This sport ripens three weeks before 'Honeycrisp'. Available from Adams County Nursery.

'Royal Red Honeycrisp' (LJ-1000): This sport was discovered in Washington State and was granted USPP# 22,244 in November 2011. LJ-1000 is said to color earlier and have higher sugar than standard 'Honeycrisp'. 'Royal Red Honeycrisp' is offered exclusively by Willow Drive Nursery, and sales started in

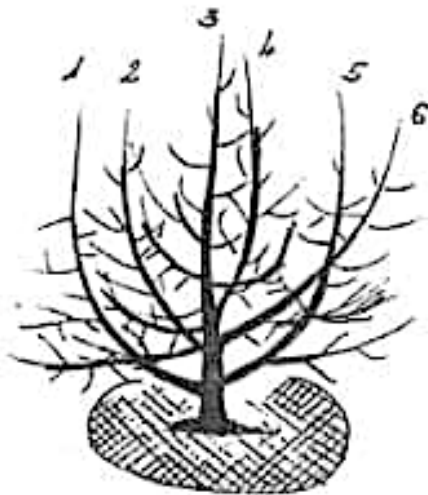
Orchard Planning & Management – Training



AXES VERTICAUX



PALMETTE - 3 AXES -



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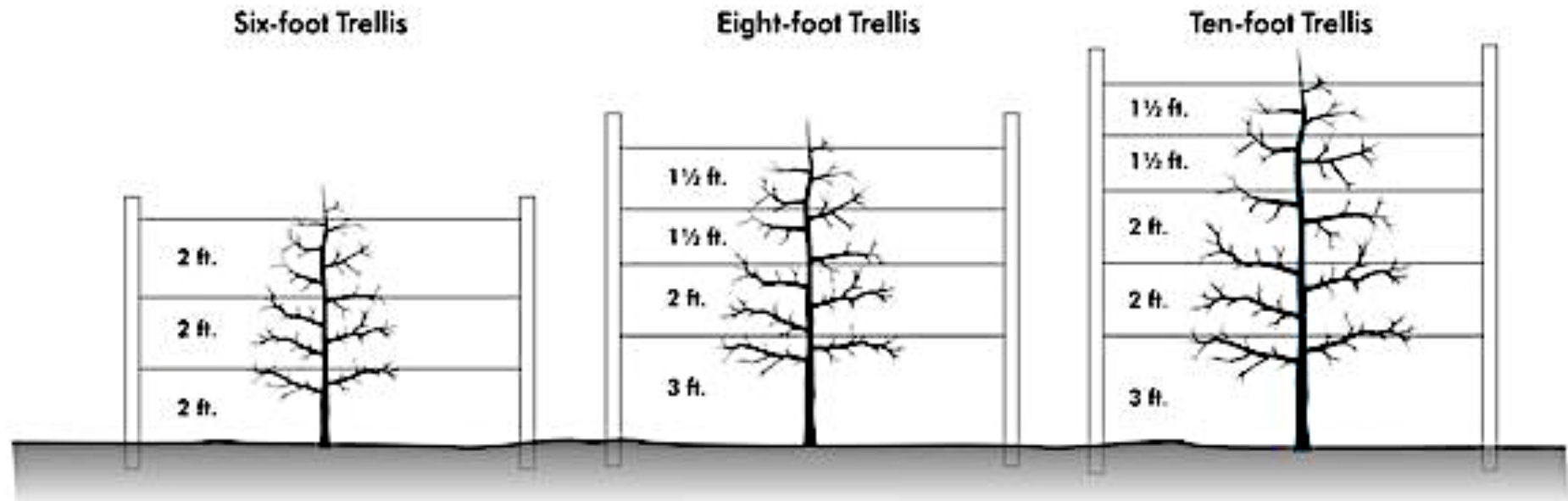
DRAPEAU RÉÉQUILBRÉ

Pruning & Training

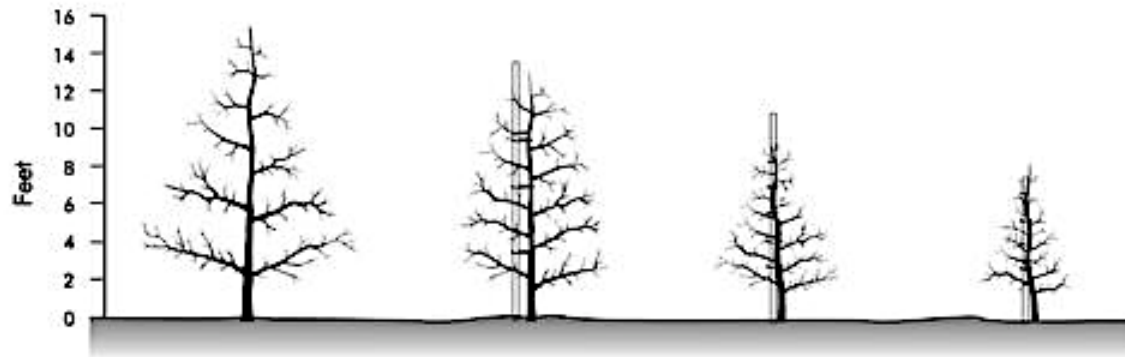
- Fill in-row space
- Fewer trees per acre
- Higher yields



Orchard Planning & Management – High Density



Orchard Planning & Management – High Density



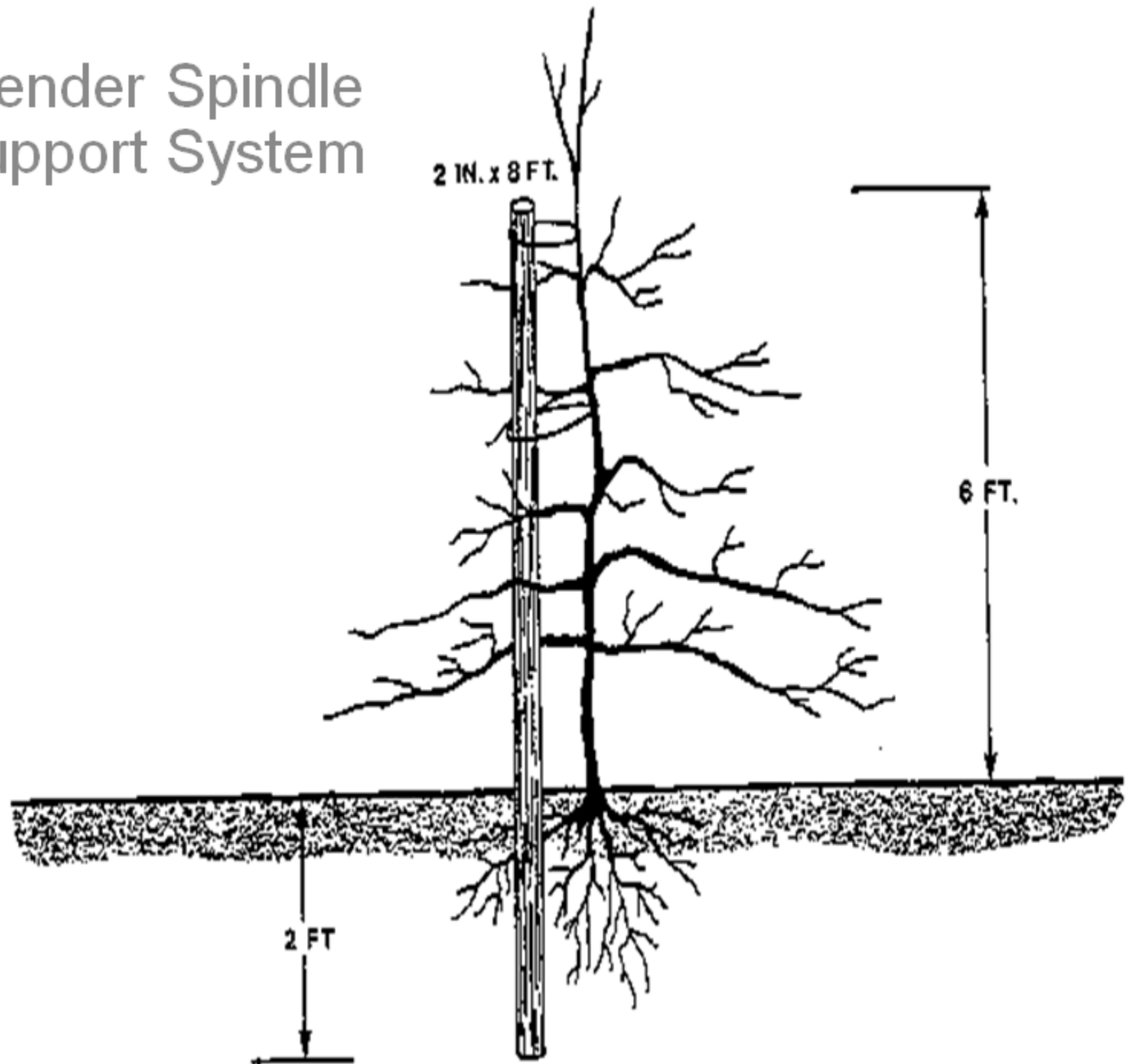
Size Limiting Rootstock

- Pedestrian harvest
- No ladders
- Use of platforms for pruning and harvesting
- Higher density
- Higher cost per acre for establishment
- Greater returns for early yield and high quality packout

Characteristic	Freestanding Central Leader	Vertical Axis	HYTEC (Hybrid Tree Cone)	Slender Spindle
Tree height (feet)	12-14	10-14	9-11	7-8
Tree spread at the base (feet)	9-11	5-7	5-7	3-5
In-row spacing (feet)	10-15	5-6	5-6	4-5
Between-row spacing (feet)	15-22	13-15	11-14	10-12
Density (trees/acre)	132-290	500-700	500-900	700-1,000
Rootstocks	M.7, MM.106, MM.111	M.9, M.26, M.7	M.9, M.26	M.9
Support system required	no	yes	yes	yes
Yield expectations, years 2-4	low	medium to high	high	high
Yield expectations, years 5-10	medium	high	high	high
Central leader pruning	headed annually	no pruning	remove to a weaker lateral; may head or snake depending on tree vigor	remove to a weaker lateral



Slender Spindle Support System

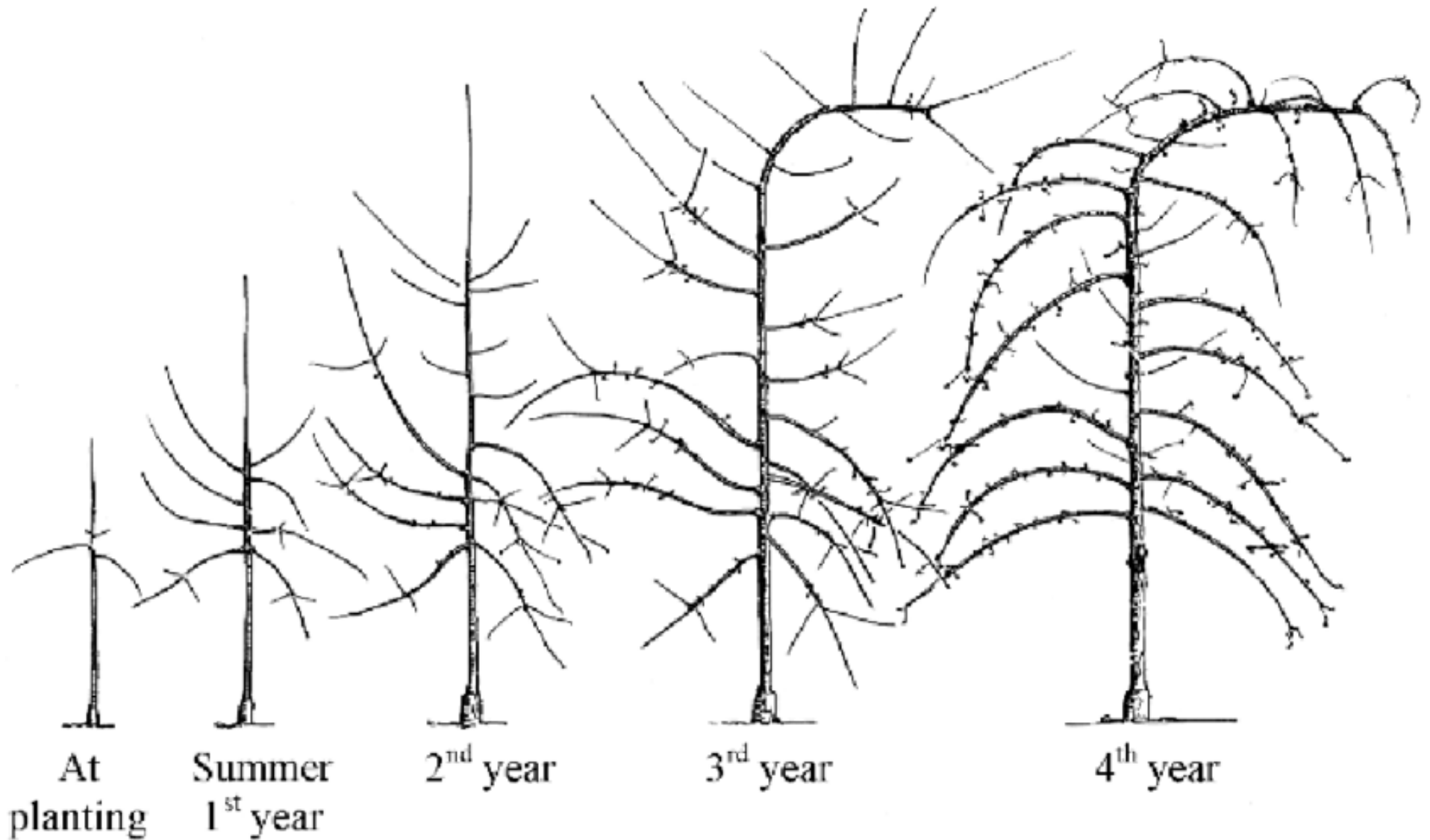


Vertical axis system

- The trees are trained in a narrow pyramidal shape with a dominant central leader to maximise light penetration
- The leader is trained to grow to 10ft height
- Few pruning cuts are made in the initial three years
- Thereafter laterals are periodically renewed by cutting into 2 year old or older growth
- Trees are supported by a trellis

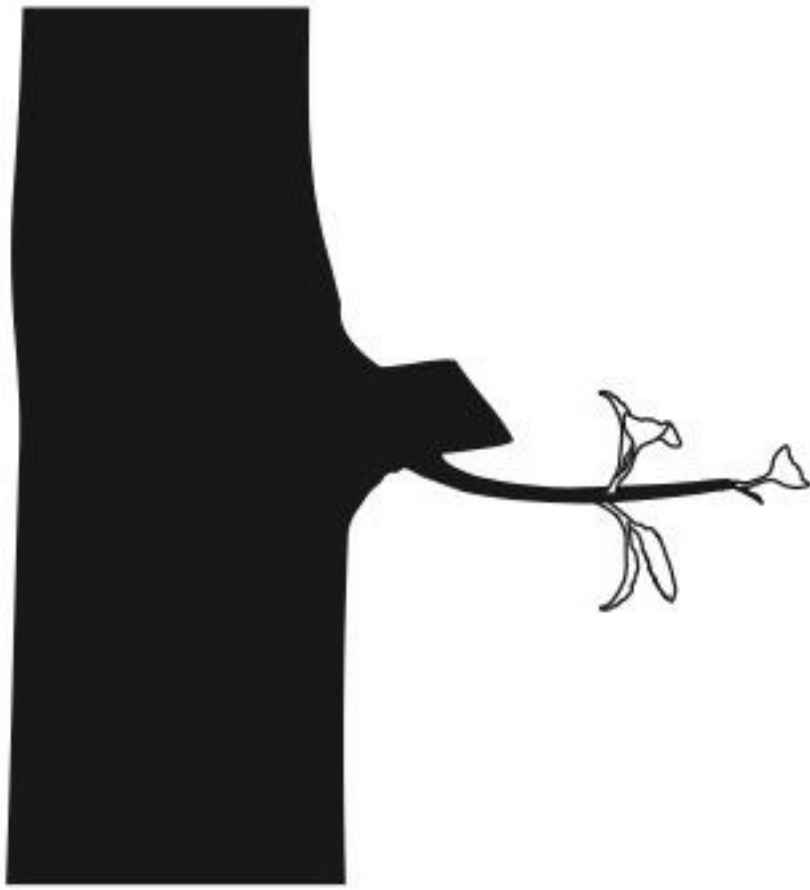


Central Leader Management of Vertical Axis



Dutch or Bench cut of limbs >1"

- Push latent buds to produce horizontal shoots from ventral bark



**Annual yields per acre for
central leader and slender spindle-type training systems.**

	Central Leader 181 trees per acre 12 x 20-foot spacing	Slender Spindle 605 trees per acre 6 x 12-foot spacing	Slender Spindle 605 trees per acre 6 x 12-foot spacing
Year	Central Leader	Slender Spindle (Avg. Yields)	Slender Spindle (High Yields)
1	0	0	0
2	0	0	0
3	0	180	525
4	51	350	688
5	168	600	688
6	302	800	1,000*

<https://content.ces.ncsu.edu/high-density-apple-orchard-management>

Net present value analysis for the **Central Leader** training system assuming average yields and low returns.

Year	Yield/Tree (Bushel)	Yield/Acre (Bushel)	Gross Income (\$12/Bushel)	Annual Growing Costs			Total Growing Costs	Total Fixed Costs	Harvest and Packing Costs	Net Cash Flow	Accumulated Cash Flow	Discount Factor (6%)	Present Value of Net Cash Flow
				Labor	Machine	Materials							
Land	0	0	0	0	0	0	2,000	0	0	-2,000	-2,000	1.0000	-2,000
0	0	0	0	144	47	3,568	3,759	238	0	-3,997	-5,997	1.0000	-3,997
1	0	0	0	183	81	130	394	196	0	-590	-6,587	0.9434	-557
2	0	0	0	197	81	156	434	196	0	-630	-7,217	0.8900	-594
3	0	0	0	221	81	163	465	196	0	-661	-7,878	0.8396	-588
4	0.28	51	505	240	159	237	636	391	228	-751	-8,629	0.7921	-630
5	0.93	168	1,663	260	159	251	670	391	753	-150	-8,779	0.7473	-119
6	1.67	302	2,990	430	236	482	1,148	414	1,353	75	-8,704	0.7050	56
7	2.76	500	4,950	471	236	482	1,189	442	2,240	1,079	-7,625	0.6651	761
8	4.42	800	7,920	536	236	482	1,254	442	3,584	2,640	-4,985	0.6274	1,756
9	4.70	850	8,415	536	236	482	1,254	442	3,808	2,911	-2,074	0.5919	1,826
10	4.70	850	8,415	536	236	482	1,254	442	3,808	2,911	837	0.5584	1,723
11	4.70	850	8,415	624	236	482	1,342	442	3,808	2,823	3,660	0.5268	1,576
12	5.07	918	9,088	624	236	482	1,342	442	4,113	3,192	6,851	0.4970	1,681
13	5.52	1,000	9,900	624	236	482	1,342	442	4,480	3,636	10,487	0.4688	1,807
14	5.52	1,000	9,900	624	236	482	1,342	442	4,480	3,636	14,123	0.4423	1,705
15	5.52	1,000	9,900	624	236	482	1,342	442	4,480	3,636	17,759	0.4173	1,608

Net present value analysis for the **Slender-Spindle** training system assuming high yields and high returns.

Year	Yield/Tree (Bushel)	Yield/Acre (Bushel)	Gross Income (\$12/Bushel)	Annual Growing Costs			Total Growing Costs	Total Fixed Costs	Harvest and Packing Costs	Net Cash Flow	Accumulated Cash Flow	Discount Factor (6%)	Present Value of Net Cash Flow
				Labor	Machine	Materials							
Land	0	0	0	0	0	0	2,000	0	0	-2,000	-2,000	1.0000	-2,000
0	0	0	0	650	47	7,668	8,365	178	0	-8,543	-10,543	1.0000	-8,543
1	0	0	0	432	146	198	776	258	0	-1,034	-11,577	0.9434	-975
2	0	0	0	527	97	502	1,126	254	0	-1,380	-12,957	0.8900	-1,228
3	0.875	525	5,198	680	131	352	1,163	319	2,352	1,364	-11,594	0.8396	1,145
4	1.147	688	6,811	674	168	494	1,336	334	3,082	2,059	-9,535	0.7921	1,631
5	1.147	688	6,811	752	181	278	1,211	343	3,082	2,175	-7,360	0.7473	1,625
6	1.667	1,000	9,900	358	192	278	828	343	4,480	4,249	-3,111	0.7050	2,996
7	1.667	1,000	9,900	358	192	278	828	343	4,480	4,249	1,138	0.6651	2,826
8	1.667	1,000	9,900	358	192	278	828	343	4,480	4,249	5,387	0.6274	2,666
9	1.667	1,000	9,900	358	192	278	828	343	4,480	4,249	9,636	0.5919	2,515
10	1.667	1,000	9,900	358	196	278	832	343	4,480	4,245	13,881	0.5584	2,370
11	1.667	1,000	9,900	358	196	278	832	343	4,480	4,245	18,126	0.5268	2,236
12	1.667	1,000	9,900	358	196	278	832	343	4,480	4,245	22,371	0.4970	2,110
13	1.667	1,000	9,900	358	196	278	832	343	4,480	4,245	26,616	0.4688	1,990
14	1.667	1,000	9,900	358	196	278	832	343	4,480	4,245	30,861	0.4423	1,878
15	1.667	1,000	9,900	361	207	278	846	350	4,480	4,224	35,085	0.4173	1,763

Managing the Hudson Valley Insect Pest Complex Using Homeowner Toolbox

Insect Pest Biology & Management



Cornell University

Hudson Valley Research Laboratory

The Hudson Valley Insect Pest Complex

Plum Curculio

Apple Maggot

European Apple Sawfly

Comstock Mealybug

Plant Bug Complex

*Tarnished Plant Bug

*Mullein Plant Bug

Leafhopper complex

*White Apple Leafhopper

*Rose Leafhopper

*Potato Leafhopper

Lepidopteran Complex

*American Plum Borer

*Apple Blotch Leafminer

*Codling Moth

*Cutworms

*Dogwood Borer

*European Corn Borer

*Green Fruitworm

*Lesser Appleworm

*Obliquebanded Leafroller

*Oriental Fruit Moth

*Redbanded Leafroller

*Sparganothis Fruitworm

*Spotted Tentiform Leafminer

*Tufted Apple Budmoth

*Variegated Leafroller

Scale Complex

*San Jose Scale

*Oystershell Scale

*Pernicola White Scale

Phytophagous Mite Complex

*European Red Mite

*Two Spotted Spider Mite

*Apple Rust Mite

Aphid Complex

*Woolly Apple Aphid

*Apple & Spirea Aphid

*Rosy Apple Aphid

Stink Bug Complex



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The Hudson Valley Insect Pest Complex

Plum Curculio

Apple Maggot

European Apple Sawfly

Comstock Mealybug

Plant Bug Complex

*Tarnished Plant Bug

*Mullein Plant Bug

Leafhopper complex

*White Apple Leafhopper

*Rose Leafhopper

*Potato Leafhopper

Lepidopteran Complex

*American Plum Borer

*Apple Blotch Leafminer

*Codling Moth

*Cutworms

*Dogwood Borer

*European Corn Borer

*Green Fruitworm

*Lesser Appleworm

*Obliquebanded Leafroller

*Oriental Fruit Moth

*Redbanded Leafroller

*Sparganothis Fruitworm

*Spotted Tentiform Leafminer

*Tufted Apple Budmoth

*Variegated Leafroller

Scale Complex

*San Jose Scale

*Oystershell Scale

*Pernicola White Scale

Phytophagous Mite Complex

*European Red Mite

*Two Spotted Spider Mite

*Apple Rust Mite

Aphid Complex

*Woolly Apple Aphid

*Apple & Spirea Aphid

*Rosy Apple Aphid

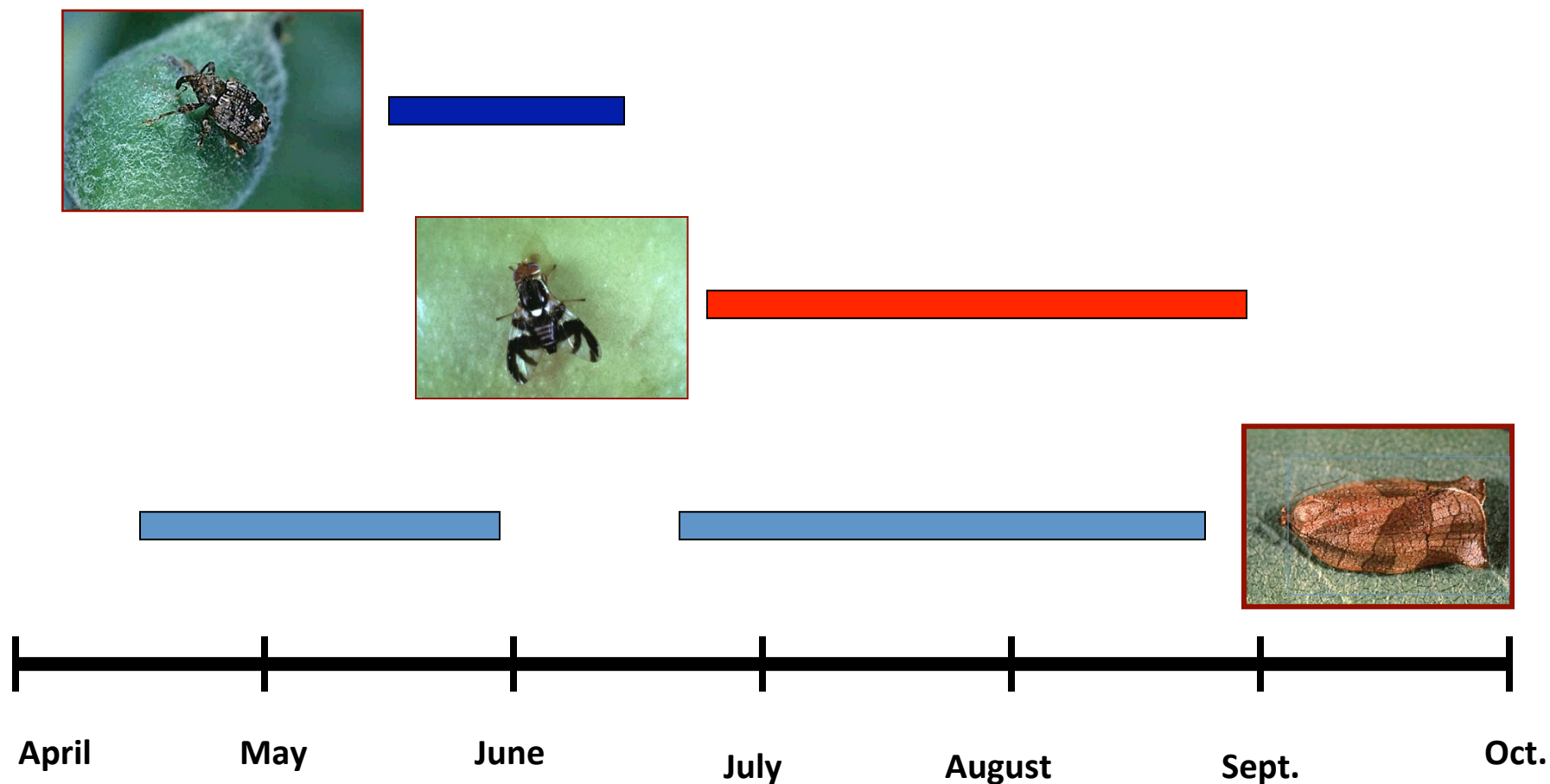
Stink Bug Complex



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SEASONAL ACTIVITY OF 3 MAJOR PESTS OF APPLES IN THE HUDSON VALLEY OF NEW YORK STATE



H. Reissig



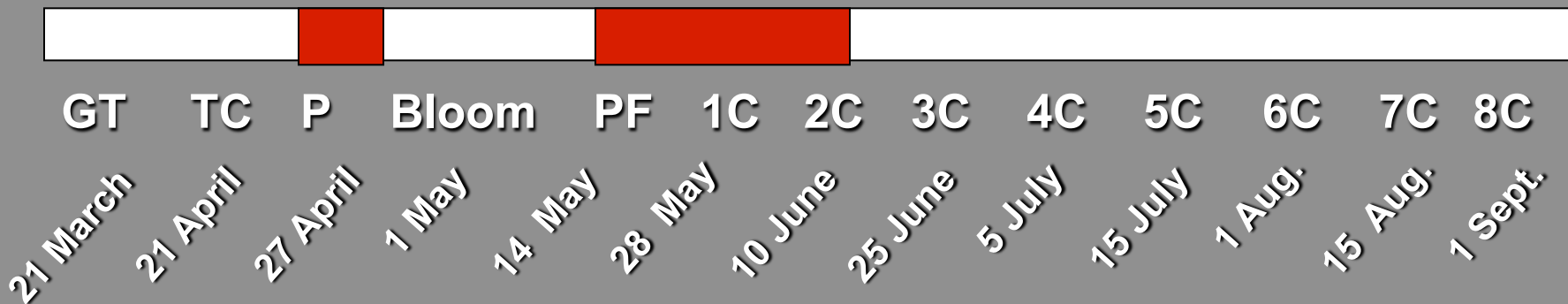
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Plum Curculio

- Adult overwinter in woodland, stone walls
- Adults emerge after 2-3d @ 70°F
- Migrate into orchard from bloom to 2C
- Adults cut and lay eggs in fruitlet
- Can cause up to 100% fruit injury & drop
- Management: pre-bloom – 2C
 - 2-3 appl. of pyrethroid, carbaryl
 - End applications at 308 DD 50°F



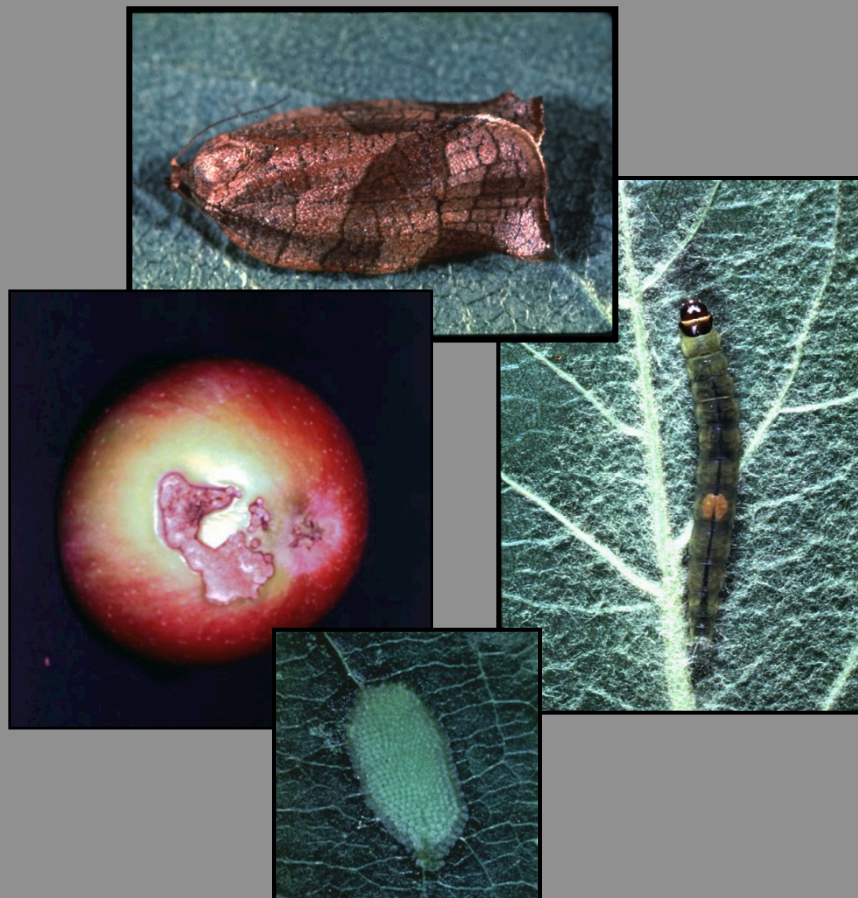
Apple Maggot



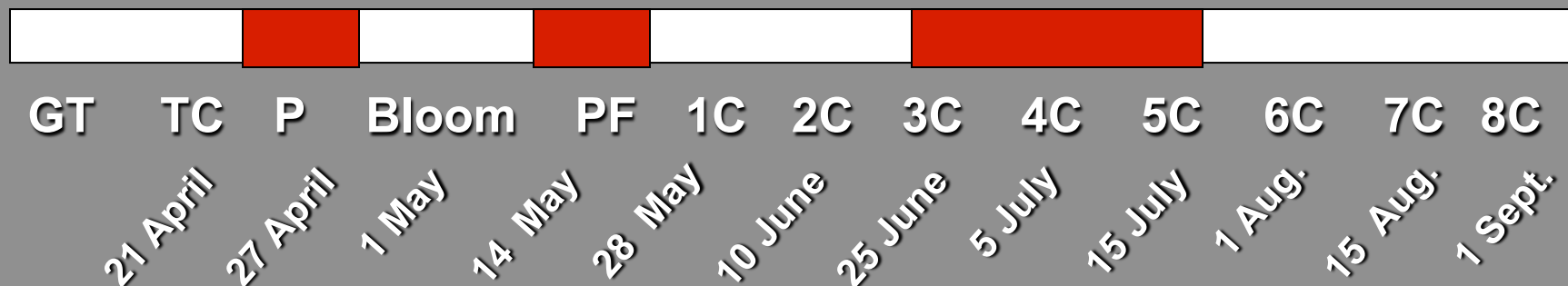
- Overwinters as pupa in the soil
- Adults emerge in June in moist soil
- Adults feed for 7-10 d prior to mating and egg laying into fruit
- Individual eggs are laid within fruit
- Developing larva feed on the interior flesh of the apple causing oxidized trails (‘Trail Worm’)
- Management: Carbaryl & Pyrethroid



Obliquebanded Leafroller



- Overwinter as a late instar larva that causes injury to fruit through bloom to 1C
- Adults emerge in June, mate and begin egg laying
- Larva emerge 350 DD base 43°F after first adult sustained flight (biofix)
- Management: Bt at bloom, low rate multiple applications



Codling Moth, *Cydia pomonella*

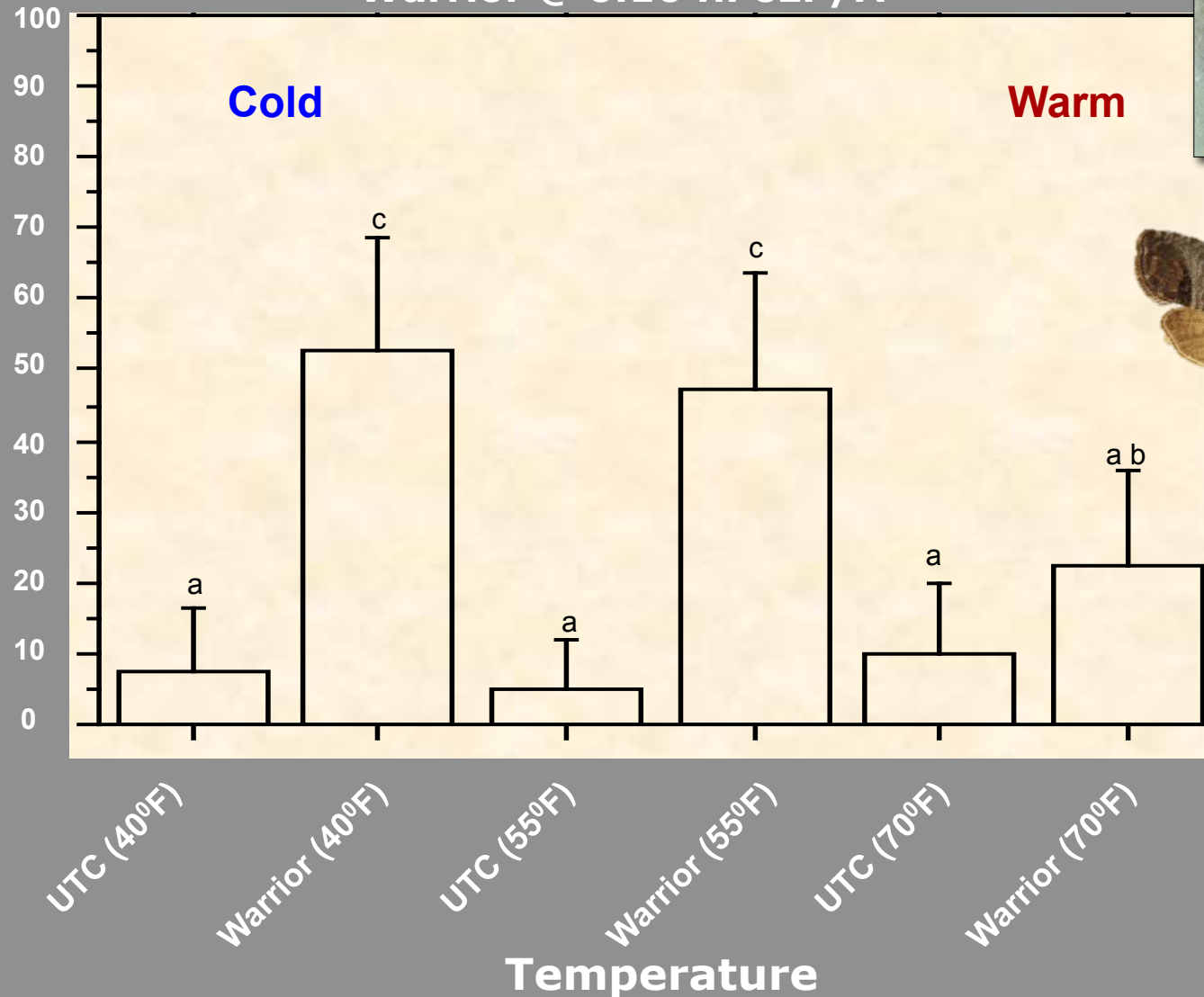
- Overwinters as pupa under tree bark
- Adults emerge during late bloom
- Eggs are laid on foliage and fruit
- Larva evacuate fruit skin as they burrow
- Then feed directly on seeds in carpels
- Management: Granulosis virus plus mating disruption at first hatch
- Use NEWA modeling to obtain timing of CM hatch



Codling Moth Larvae Bioassay (UTC susceptible 'Benzon' Colony) NYSAES, Highland NY 2009¹

Warrior @ 0.16 fl. oz. /A

Percent Mortality (After 24hrs.)



¹ Bioassay conducted on 1st instar codling moth larva topically treated with 1 μ L droplet of lambda-cyhalothrin at 0.0005 μ g A.I./ 1000 mL or 0.0005 ppm [3% of the labeled field rate] placed in temperature controlled chambers over 24 hours.
(df = 3, F-value = 8.648, P-value = 0.0001).



San Jose Scale

- Overwinter as adult on bark
- Adults produce live young
- Crawlers emerge at 2C
- Damage fruit & bark cambium
- Management: pre-bloom
 - 1% Horticultural oil

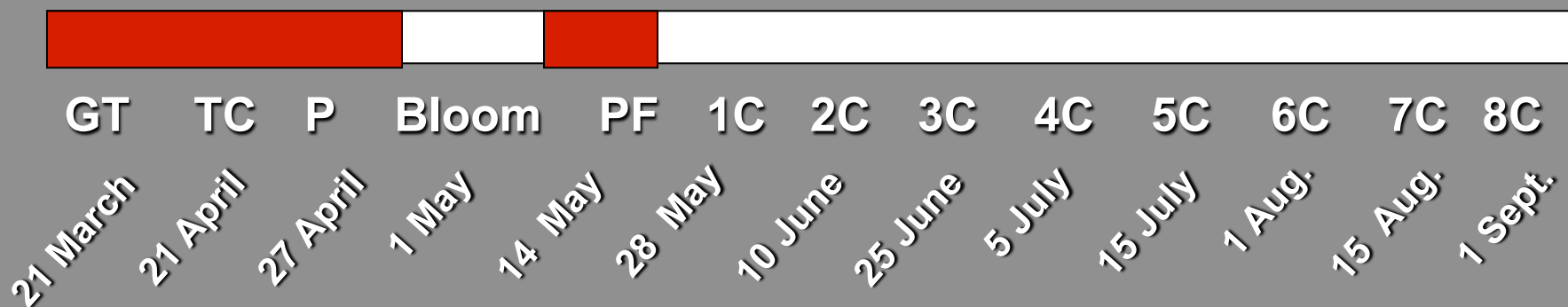


GT	TC	P	Bloom	PF	1C	2C	3C	4C	5C	6C	7C	8C
21 March	21 April	27 April	1 May	14 May	28 May	10 June	25 June	5 July	15 July	1 Aug.	15 Aug.	1 Sept.



Rosy Apple Aphid

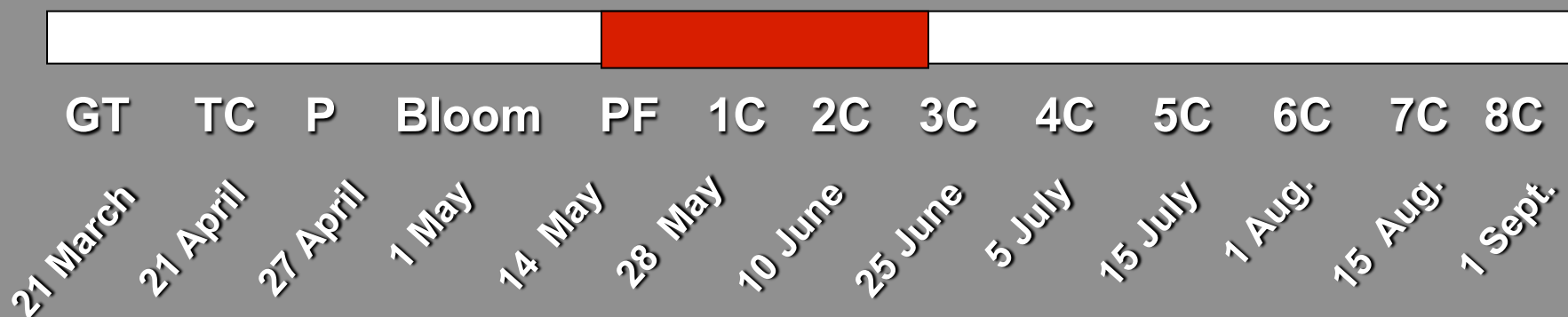
- Overwinter as eggs
- Adults produce live young
- Begin feeding on foliage and developing fruit clusters
- Damage fruit post bloom
- Management @ Pink
 - Pyrethroids





Green Aphid Complex

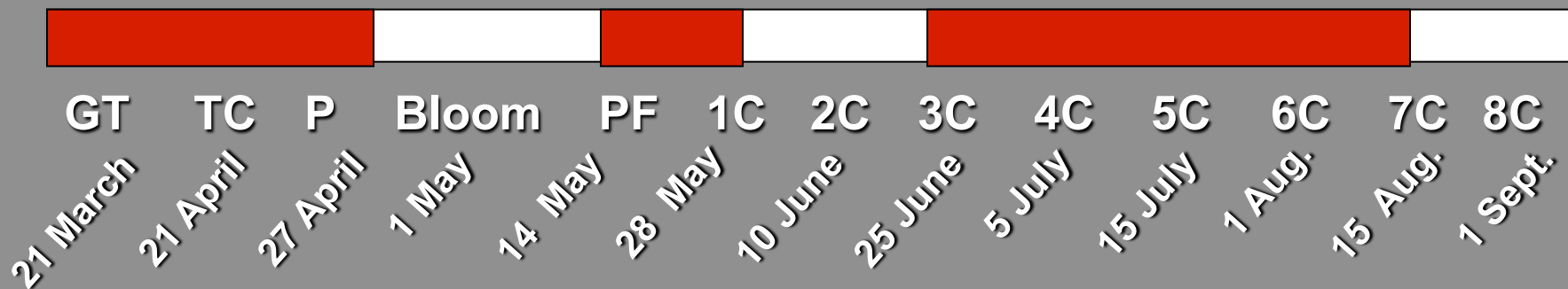
- Overwinter as eggs
- Adults produce live young
- Begin feeding on foliage and developing fruit clusters during spring & summer
- Produce blackened leaves
- Management @ Pink
 - Pyrethroids
- Management @ PF and summer
 - Azadirect





European Red Mite

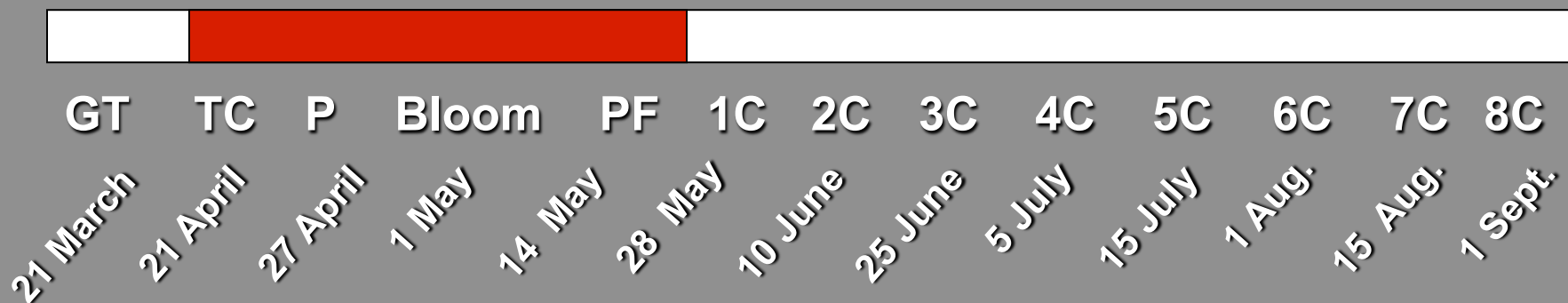
- Overwinter as egg
- Motiles emerge pre-bloom
- Adults after bloom cause foliar injury
- High populations with increasing temperatures >80°F & drought
- Reduced fruit size, color, Lf. bronzing
- Management Pink, Petal Fall, 1-2C:
 - Horticultural Oil @ 1%
 - Avermectin plus 0.25% oil





Tarnished Plant Bug

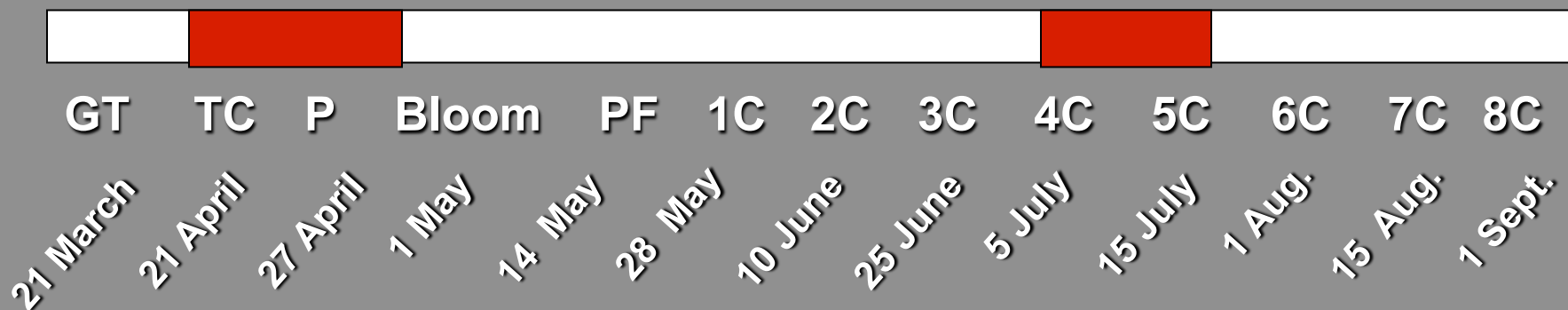
- Nymphs / adults cause fruit injury beginning at tight cluster with 2d above 75°F
- Pre-bloom – 15mm fruit size
- Scout: yellow sticky cards, flowers
- Feeding and oviposition in fruit
- Management: Pre-bloom, @ Petal Fall, 1C:
 - Pyrethroids





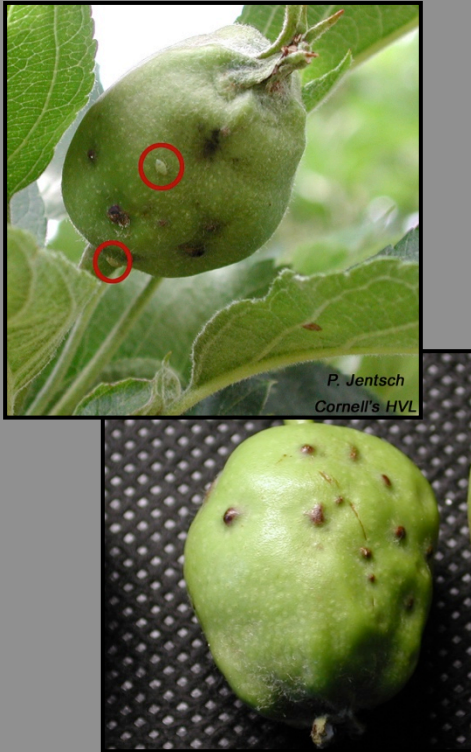
Dogwood Borer

- Overwinter as larva beneath bark
- Adults emerge at 2C
- Girdles bark cambium
- Adults lay eggs in bark scales
- Management: pre-bloom
 - Multiple appl. of neonicotinoid or Spinosad (Spintor)

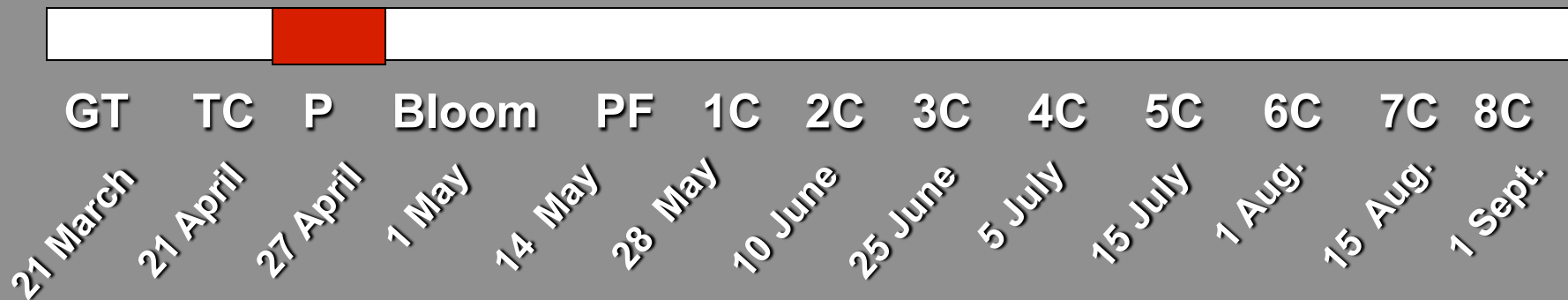


Mullein Plant Bug *Campylomma verbasci* (Meyer)

Apple Brown Bug *Atractotomus mali* (Meyer)



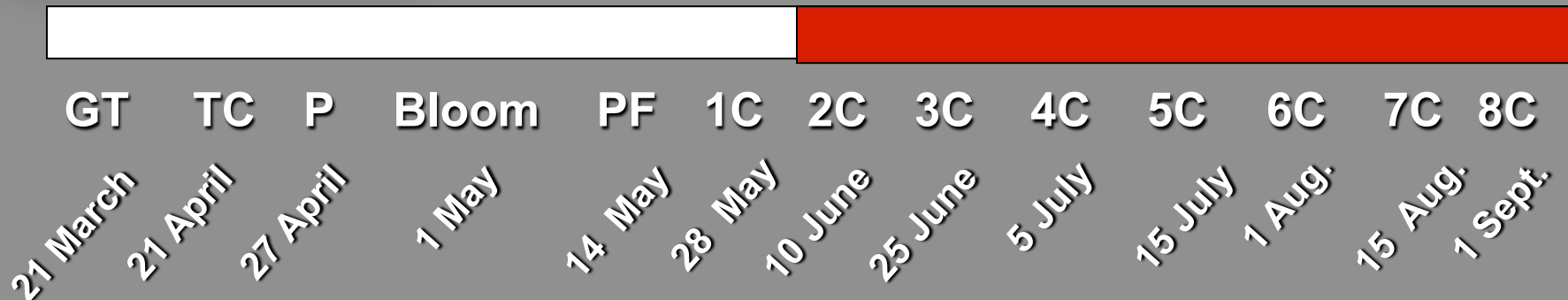
- Sporadic orchard pests on both pear and apple. Both species occur simultaneously; collectively called “mirid bugs”.
- Pre-bloom, they are considered beneficial, feeding on mite and aphid species.
- Management: Pyrethroid at Pink



Green Stink Bug *Acrosternum hilare* (Say).
Brown Stink Bug *Euschistus servus* (Say)



- Sporadic orchard pests on both pear and apple. Most often occurs on Hudson Valley fruit late in the season during dry periods or drought.
- Management: Pyrethroid upon scouting for adults.





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Stink Bug Injury To Pear



Stink Bug Injury To Apple
Typically To Shoulder Of Fruit



Stink Bug Injury

Bitter Pit Injury



Depressions With Corking Up
To The Skin Surface



Cornell University

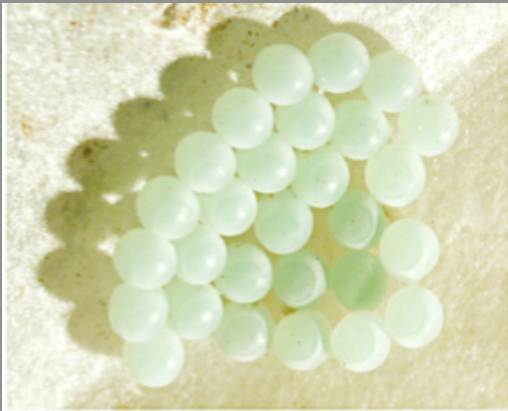
Hudson Valley Research Laboratory

Brown Marmorated Stink Bug, *Halyomorpha halys* Stål



- Overwinter as adults
- 1-2 generations / year
- Eggs lain late May
- Nymphs and adults feeds on leaves, branches and through skin of fruit
- Causes dimpling, corking
- Management: pyrethroids

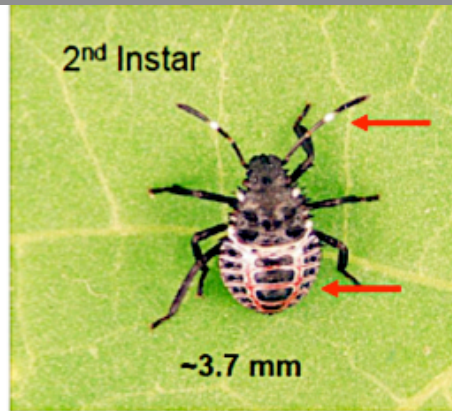




Eggs: Average 28/cluster; light green to white



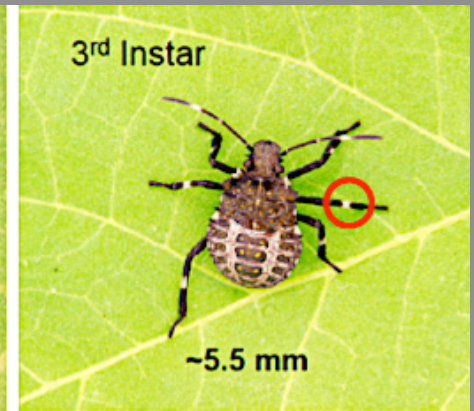
1st instar: black & red; cluster near eggs



2nd Instar

~3.7 mm

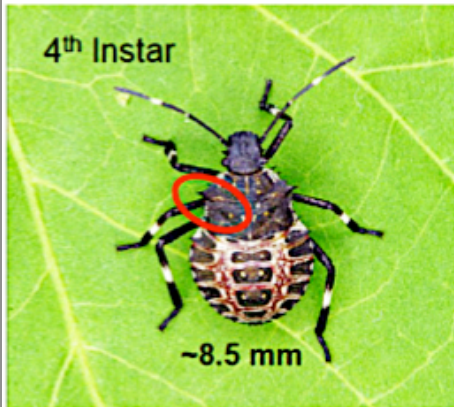
2nd instar: striped antennae



3rd Instar

~5.5 mm

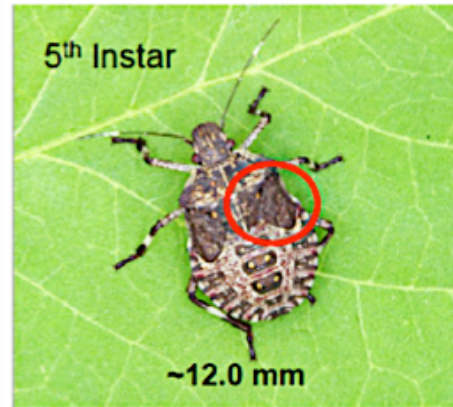
3rd instar: striped antennae and legs



4th Instar

~8.5 mm

4th instar: thoracic spur striped antennae & legs



5th Instar

~12.0 mm

5th instar: wing pads striped antennae & legs



BMSB Adults: red eyes, 4 cream colored dots on shoulders; banding on legs and antenna, smooth blunt shoulders. Banded abdomen; 14 -17 mm in length.

Homeowner Insecticides Available Locally In Stores or Internet Based Suppliers (Amazon and Direct Distributors.

IPM Commercial

- Organophosphates
- Carbamates
- Pyrethroids
- Spinosad
- Neonicotinoids

Biologicals

- Bt's (Bacterial)
- Fungi (Beauvaria)
- Virus (CM Granulosis)
- IGR (Insect Growth Regulators)

Barrier Films

- Horticultural Oil
- Kaolin Clay

Malathion: Bonide

Broad Spectrum

Organophosphate insecticide



ACTIVE INGREDIENT:

Malathion (CAS No. 121-75-5) . 50.00%

OTHER INGREDIENTS: 50.00%

TOTAL: 100.00%

This product contains petroleum distillate.

1 gallon contains 4.37 lbs. of malathion

EPA Est. No. 4-NY-1 EPA Reg. No. 4-99

Crop	Insects	When to Apply	Amount/Gal. Water	Comments
Apples	Woolly apple aphid, bud moth, Forbes scale, green apple aphid, rosy apple aphid, mealybug, codling moth, plum curculio, red banded leaf roller, tent caterpillar	Start to spray early in season. Make up to 2 applications per year - at least 7 days apart. Do not spray during blossom period. Do not apply within 1 day of harvest.	½ to 1½ fl. oz. to cover 1,000 to 3,500 sq. ft.	Do not exceed 1½ fl. oz./1000 sq. ft. per single application. May cause injury to Cortland and McIntosh varieties.
Apricots	codling moth, orange tortrix, terrapin scale, soft brown scale, aphids	Start to spray early in season. Make up to 2 applications per year - at least 7 days apart. Do not spray during blossom period. Do not apply within 6 days of harvest.	½ to 1½ fl. oz. to cover 1,000 to 3,500 sq. ft.	Do not exceed 1½ fl. oz./1000 sq. ft. per single application.
Cherries	black cherry aphid, fruit tree roller, cherry fruit fly, bud moth, mealy plum aphid	Start to spray early in season. Make up to 4 applications per year - at least 3 days apart. Do not spray during blossom period. Do not apply within 3 days of harvest.	½ to 2 fl. oz. to cover 1,000 to 3,500 sq. ft.	Do not exceed 2 fl. oz./1000 sq. ft. per single application.
Peaches	oriental fruit moth, plum curculio; green peach, black cherry, black peach, rusty plum aphids, Japanese beetle; terrapin, cottony peach scales	Start to spray early in season. Make up to 3 applications per year - at least 11 days apart. Do not spray during blossom period. Do not apply within 7 days of harvest.	1 to 3 fl. oz. to cover 1,000 to 3,500 sq. ft.	Do not exceed 3 fl. oz./1000 sq. ft. per single application.

Carbaryl: 22.5% (Lowes/ Home Depo)

- Insecticide & Apple Crop Load Reduction*
- Pink (P) Plum Curculio, Leafroller
- Petal Fall (PF) Plum Curculio, Leafroller
 - 2 appl. At 10d intervals (1st & 2nd Cover)



* May overthin some varieties including Cortland

Imidacloprid: Translaminar / Systemic Soil Drench



SOIL DRENCH TO APPLE, PEAR, PEACH, PLUM, CHERRY AND PECAN TREES Cont.

For best results, use this product as part of a preventative treatment program before insect damage occurs. Use one soil drench treatment per year during early spring to early fall. This product can be applied anytime except when the ground is saturated or frozen. These conditions will make movement of the product down into the root zone difficult. When applying this product during dry periods, generously water the tree or shrub the night before treatment.

RESTRICTIONS:

- Do not apply pre-bloom or during bloom or when bees are foraging.
- Do not apply to soil that is frozen or waterlogged.
- **For apple, pear, peach, plum and cherry - A.** Allow twenty-one (21) days between the final application and harvest. **B.** Do not apply more than 3 gallons of this product per acre per year.
- **For pecans - A.** Allow seven (7) days between the final application and harvest. **B.** Do not apply more than 3.2 gallons of this product per acre per year.

Trees that are already heavily infested may not survive due to the existing pest damage and the resulting stress.

Determining Amount of This Product to Use

Measure the circumference (distance around the tree trunk) in inches at chest height or at 4.5 feet from the soil using a flexible tape. Or, measure the diameter of the tree trunk in inches at chest height or at 4.5 feet from the soil.

Mix 1 oz. of this product per inch of circumference of the tree trunk to one (1) gallon of water. Refer to the mixing chart for the amounts of this product needed.

How to Apply

Apply the solution to the root zone as a band around the base of the tree. Apply one (1) gallon of solution in a circular band from the base of the tree outward for two (2) feet. For trees with trunk diameters more than 16 inches at chest height, apply two (2) gallons of solution in a circular band from the base of the tree outward for three to four (3-4) feet.

Imidacloprid: Translaminar / Systemic Soil Drench



ACTIVE INGREDIENT:

Imidacloprid 1.47%
OTHER INGREDIENTS ... 98.53%
TOTAL 100.00%

EPA Est. No. 4-NY-1 EPA Reg. No. 53883-205-4

Pests Controlled		
Adelgids	Bronze Birch, Alder Borers, and Emerald Ash Borers)	Pine Tip Moth Larvae
Aphids	Japanese Beetles (adult)	Psyllids
Armored scales (suppression)	Lacebugs	Royal Palm Bugs
Black Vine Weevil Larvae	Elm Leaf Beetles	Sawfly Larvae
Borers: Roundheaded Borers (incl. Eucalyptus Longhorned Borers and Asian Longhorned Beetles)	Viburnum Leaf Beetles	Soft Scale (suppression)
Flatheaded Borers (incl.	Leafhoppers	Thrips (suppression)
	Leafminers	White grub larvae
	Mealybugs	Whiteflies

Permethrin: Pyrethroid Broad Spectrum

ACTIVE INGREDIENT:

Permethrin . . . (Cas No. 52645-53-1) . . . 2.50%

OTHER INGREDIENTS: 97.50%

TOTAL 100.00%

EPA Est. No. 4-NY-1 EPA Reg. No. 4-408



FRUIT & NUT TREES

USE DIRECTIONS

Use 2 fl. oz. in 1 gal. of water. Apply when insects appear. Wet the plants to the dripping point. Try to hit underside of leaves and penetrate dense foliage.

	Pests:	How to use:
Almonds, Pecans	Navel orangeworms, Peach twig borers	Do not make more than 2 applications during hull split and 5 applications per season. Can be applied up to 7 days prior to harvest.
Apples	Green fruitworms, Aphids, Leafrollers (Oblique-banded, Redbanded), Plum curculio, Rosy apple aphids, Spotted tentiform leafminers, Tarnished plant bugs, White apple leafhoppers, Japanese Beetles	Repeat as required to maintain control. Do not make more than 3 applications. Do not apply after petal fall.
Peaches	Borers (Lesser peachtree, Peach twig), Green fruitworms, Plum curculio, Oriental fruit moths, Tarnished plant bugs	Do not apply within 7 days of harvest. Do not make more than 8 applications per season.
Pears (dormant through delayed dormant)	Pear psylla	Apply during the dormant through delayed dormant growth period only. Do not make more than 2 applications per season.
Pears (summer)	Codling Moths, Green fruitworms, Pear psylla, Aphids	Do not make more than 3 applications per season. Can be applied up to 14 days prior to harvest.

Lowes/ Home Depo
Zeta-cypermethrin: 0.35%
14 DTH

Pest Complex:

Apple Maggot, Codling Moth, European Apple Sawfly, Green Fruitworm, Japanese Beetle, Lesser Appleworm, Oblique Banded Leafroller, Oriental Fruit Moth, Pandemis Leafroller, Pear Psylla, Plum Curculio, Potato Leafhopper, Redbanded Leafroller, Rosy Apple Aphid, Spirea Aphid, Spotted Tentiform Leafminer, Stink Bugs, Tarnished Plant Bug, Tufted Apple Bud Moth, Variegated Leafroller, White Apple Leafhopper



\$49.97 / gallon

Spectracide Malathion Insect Spray Concentrate

Lowes/ Home Depo

Malathion: 50 %

Peaches only:

Make up to 3 applications per year

➤ 11 days apart.

➤ Do not apply within 7 days of harvest.

Pest Complex:

Aphids

Red Spider Mites

Mealybugs

Thrips

Scale

ACTIVE INGREDIENTS

Malathion 50%

Other Ingredients* 50%

Total: 100.00%

*Contains Xylene range aromatic solvent.



Spinosad: Lepidopteran Insecticide



Kills bagworms, borers, beetles, caterpillars, codling moth, gypsy moth, loopers, leaf miners, spider mites, tent caterpillars, thrips

ACTIVE INGREDIENT:

spinosad (a mixture of spinosyn A and spinosad D) . . . 0.5%

OTHER INGREDIENTS: . . . 99.5%

TOTAL: . . . 100.0%

Contains 0.04 lb of active ingredient per gallon.

EPA Reg. No. 4-471 EPA Est. No. 4-NY-1

Crops	Pests Controlled	Maximum Number of Applications per Calendar Year	Minimum Days to Wait Before Reapplying	Minimum Days to Wait from Last Application to Harvest
apple and other pome fruits including: crabapples, mayhaw, pears, and quince	codling moth, European grapevine, moth, leafminers, leafrollers, light brown apple moth, oriental fruit moth, thrips, tufted apple budmoth	6	10	7
asparagus (post-harvest to protect ferns)	asparagus beetles	3	7	60
bulb vegetables including: dry bulb onion, garlic,	armyworms, dipteran leafminers, European corn borer, flea beetle,	5	4	1

Bacillus thuringiensis: kurstaki Lepidopteran Larvae



ACTIVE INGREDIENT:

**Bacillus thuringiensis* subspecies *kurstaki* strain SA-12solids, spores and Lepidopteran active toxins (At least 6 million viable spores per mg.)* 15.0%

OTHER INGREDIENTS 85.0%

TOTAL 100.0%

EPA Est. No. 4-NY-1

EPA Reg. No. 4-226

VEGETABLES, FRUITS & NUTS		
Crop	Pest	Rate (tsp./gal. water)
Almonds	redhumped caterpillar, tent caterpillar	2 - 4
Apples, Pears Apply when eggs or newly hatched larvae first appear	redbanded leafroller, tufted apple budmoth, variegated leafroller, tent caterpillar, fruit tree leafroller, gypsy moth	2 - 4
Broccoli, Brussels Sprouts, Cabbage, Cauliflower, Collards, Kale, Mustard Greens, Turnip Greens	cabbage looper	2 - 4
	imported cabbage worm, green cloverworm	1 - 3
	diamondback moth	1 - 2
Beans, Beets, Carrots, Celery, Chard, Chinese Cabbage, Endive, Escarole, Garlic, Kohlrabi, Lentils, Lettuce, Onions, Parsley, Radishes, Spinach, Squash	cabbage looper	2 - 4

Commercial & Private License Availability of Insecticides Through Direct Distributors Crop Protective Services (CPS), Helena,

IPM Commercial / Class

- Organophosphates (1B)
- Carbamates (1A)
- Pyrethroids (3A)
- Neonicotinoids (4A)
- Spinosad (5)
- Other groups (6-28)

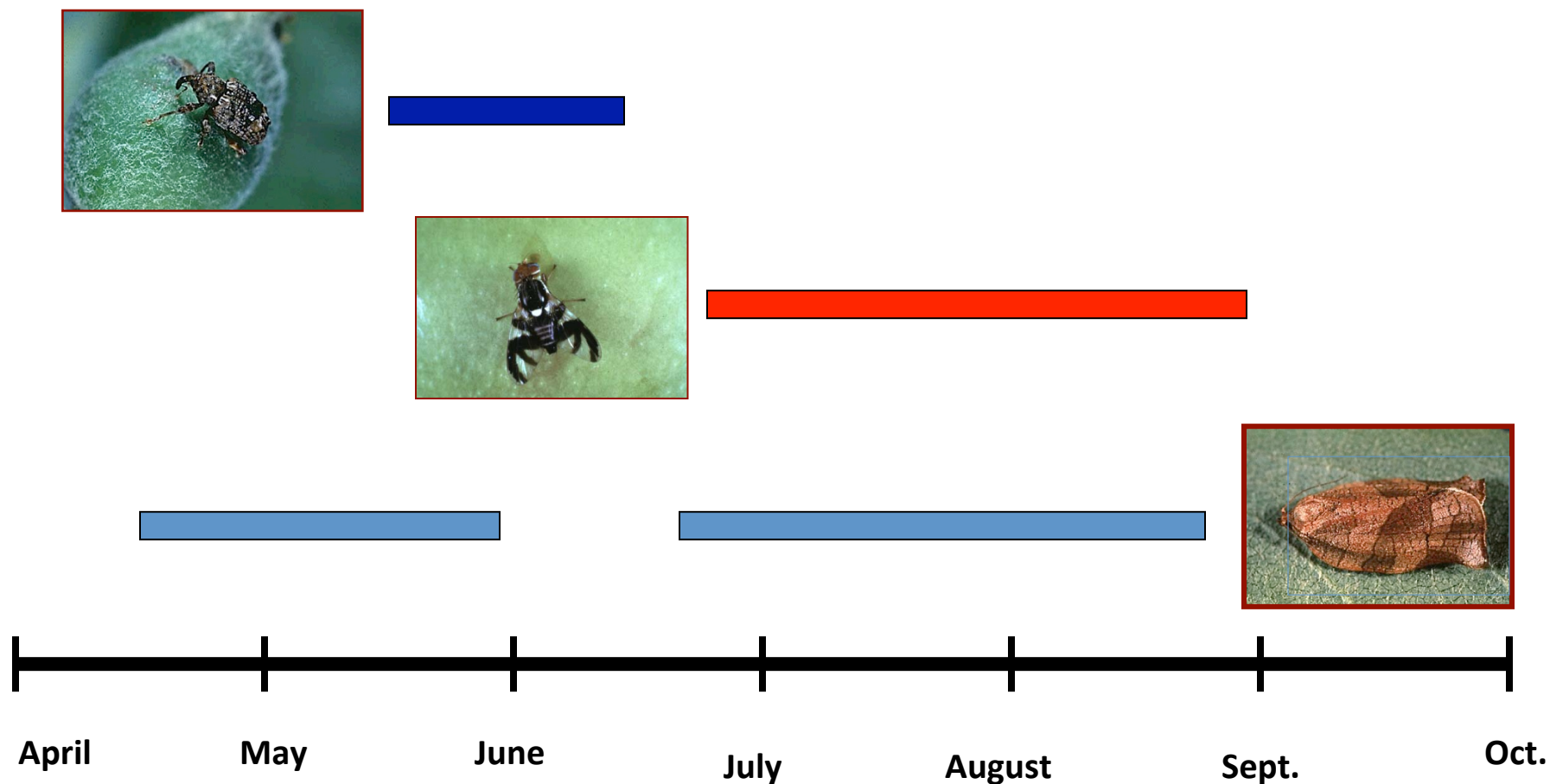
Biologicals

- Bt's (Bacterial - 11)
- Fungi (Beauvaria)
- Virus
(CM Granulosis)
- IGR (Insect Growth
Regulators - 7)

Barrier Films

- Horticultural Oil
- Kaolin Clay

SEASONAL ACTIVITY OF 3 MAJOR PESTS OF APPLES IN THE HUDSON VALLEY OF NEW YORK STATE



H. Reissig



Cornell University

Hudson Valley Research Laboratory

[Weather Data](#) [Pest Forecasts](#) [Station Pages](#) [Crop Management](#) [Crop Pages](#) [Weather Stations](#) [Help](#)

Apple Insects

NEWA Apple Insect Models

Select a pest:

Codling Moth

State:

New York

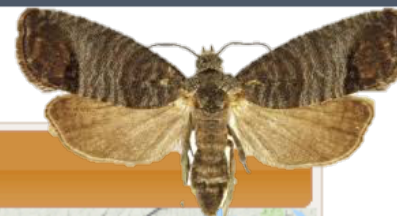
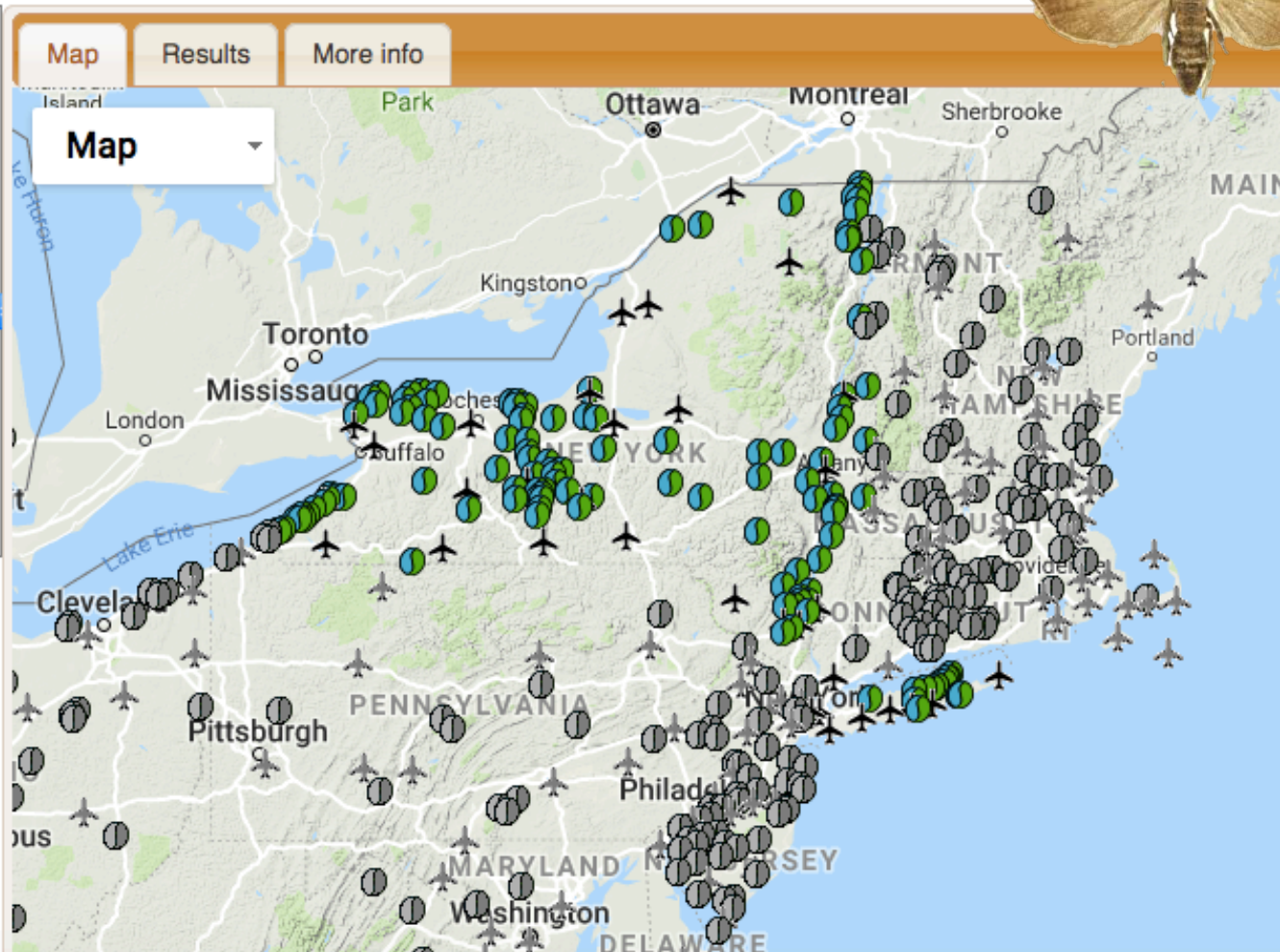
Weather station:

Highland HVL 2

Accumulation End Date:

12/15/2018

Calculate





NEWA Apple Insect Models

Select a pest:

Codling Moth

State:

New York

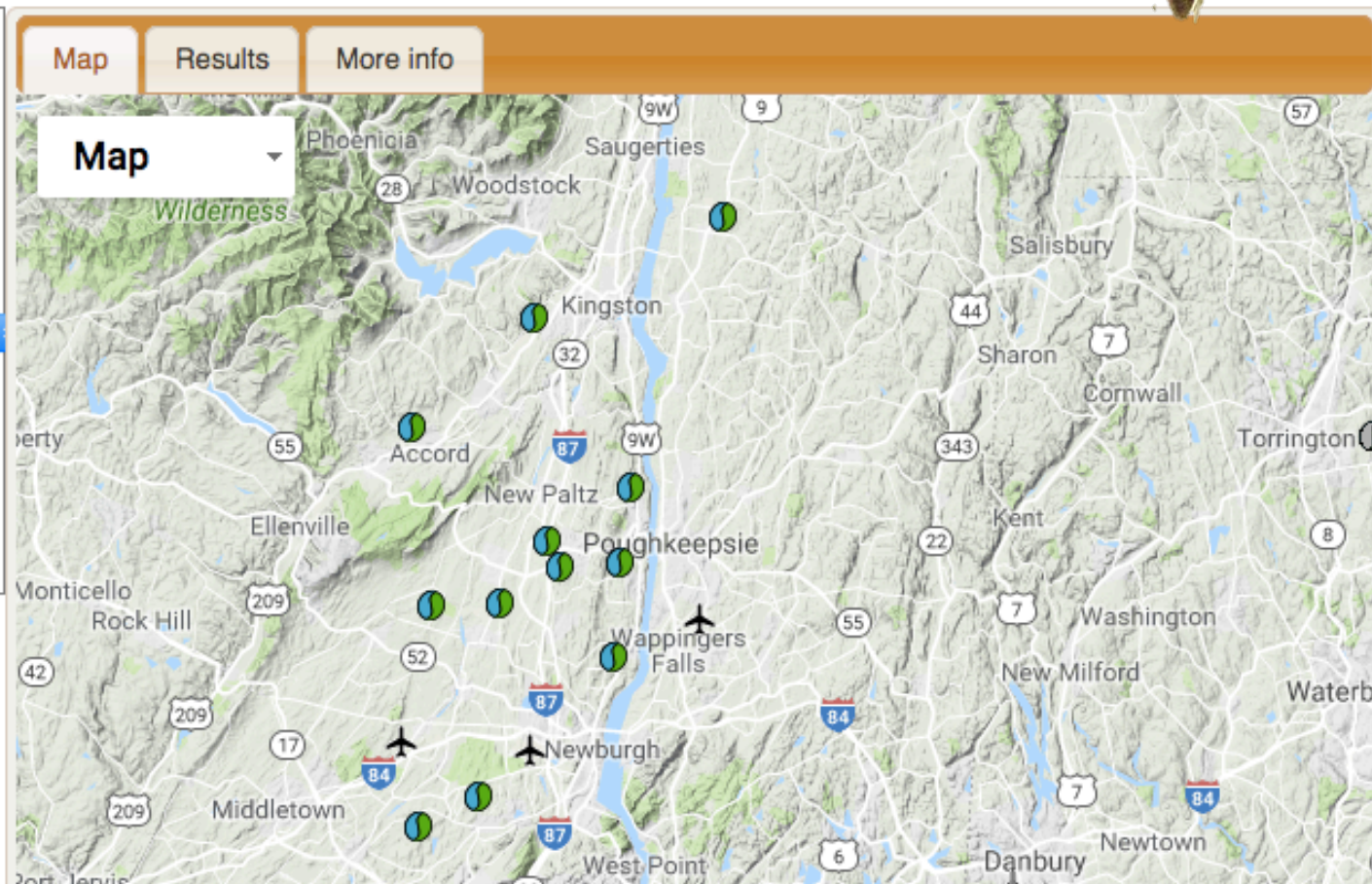
Weather station:

Highland HVL 2

Accumulation End Date:

12/15/2018

Calculate



NEWA Apple Insect Models



Select a pest:

Codling Moth

State:

New York

Weather station:

Highland HVL 2

Accumulation End Date:

06/01/2018

Calculate

Map

Results

More info

Codling Moth Results for Highland HVL 2

First Trap Catch: 5/24/2018

First Trap Catch date above is estimated based on degree day accumulations or user input. Enter the actual date for blocks of interest and the model will calculate the protection period after first trap catch more accurately.

Accumulated degree days (base 50°F) first trap catch through 6/1/2018: 185 (0 days missing)

	Past	Past	Current	5-Day Forecast			Forecast Details	
Date	May 30	May 31	Jun 1	Jun 2	Jun 3	Jun 4	Jun 5	Jun 6
Daily Degree Days (Base 50BE)	23	16	26	24	13	11	10	8
Accumulation since January 1	542	558	584	607	620	630	640	648

[Show Degree Day Graph](#)

Pest stage: Moths flying & first eggs laid

The pest stage above is estimated. Select the actual stage and the model will recalculate recommendations.

Pest Status	Pest Management
First eggs are laid at about 50 DD and the first eggs usually hatch after about 220 DD.	Apply insecticides that need to be present before egg laying at about 50-75 DD. Apply insecticides that target early egg laying period at 100-200 DD. Pesticide information

Disclaimer: These are theoretical predictions and forecasts. The theoretical models predicting pest development or disease risk use the weather data collected (or forecasted) from the weather station location. These results should not be substituted for actual observations of plant growth stage, pest



Your Purchased Guidelines

2018 Berry Crops

2018 Cornell Guide for the Integrated Management of Berry Crops



Cornell Cooperative Extension

[View Online](#)

[Buy Print](#)

2018 Grapes

2018 New York and Pennsylvania Pest Management Guidelines for Grapes



Cornell Cooperative Extension Penn State Extension

[View Online](#)

[Buy Print](#)

2018 Tree Fruit

2018 Cornell Pest Management Guidelines for Commercial Tree Fruit Production



Cornell Cooperative Extension

[View Online](#)

[Buy Print](#)

Carbamate Insecticides (IRAC 1A)
Organophosphate Insecticides (IRAC 1B)
Neonicotinoid Insecticides (IRAC 4)
Pyrethroid Insecticides (IRAC 3)
Spinosad Insecticides (IRAC



Carbamate Insecticides (IRAC 1A)

Trade Name (Active Ingredient)	Ratings for the Control of															
	IRAC‡	AM	Aph	EAS	Int	GFW	LH	OBLR	PC	PPs	RAA	RBLR	SJS	STLM	TPB	WAA
*Lannate (methomyl)	1A	2	2	1	3	3	3	2-3	2	0	1	3	2	3	1	-
Sevin (carbaryl)	1A	2	1	-	2	1	3	2	2	0	1	1	2	1	1	-
*†Vydate (oxamyl)	1A	0	2	-	0	-	2	0	0	0	2	-	-	3	1	-

Key to control ratings:

- = Unknown, unlabeled, or does not apply

0 = not effective

1 = poor

2 = fair

3 = good

* Restricted-use pesticide.

† Not for use in Nassau and Suffolk Counties.

§ = Potentially acceptable in certified organic programs

‡ = IRAC (Insecticide Resistance Action Committee) Mode of Action Classification Group: Arthropod pest populations are more likely to exhibit cross-resistance to materials within the same group.



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Organophosphate Insecticides (IRAC 1B)

<i>Ratings for the Control of</i>																
Trade Name (Active Ingredient)	IRAC†	AM	Aph	EAS	Int	GFW	LH	OBLR	PC	PPs	RAA	RBLR	SJS	STLM	TPB	WAA
*diazinon	1B	3	1	-	2	2	1	0	2	0	3	0	2	1	1	3
*dimethoate	1B	3	2	-	3	2	3	0	2	0	2	0	2	1	2	-
*Imidan (phosmet)	1B	3	1	3	3	1	1	1	3	0	1	3	2	1	1	-
Lorsban (chlorpyrifos)	1B	-	-	-	-	-	-	-	-	-	2	2	3	1	1	-
Malathion	1B	2	2	2	2	1	1	1	2	0	1	2	-	1	1	-

Key to control ratings:

- = Unknown, unlabeled, or does not apply

0 = not effective

1 = poor

2 = fair

3 = good

* Restricted-use pesticide.

† Not for use in Nassau and Suffolk Counties.

§ = Potentially acceptable in certified organic programs

‡ = IRAC (Insecticide Resistance Action Committee) Mode of Action Classification Group: Arthropod pest populations are more likely to exhibit cross-resistance to materials within the same group.



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Neonicotinoid Insecticides (IRAC 4)

Ratings for the Control of																
Trade Name (Active Ingredient)	IRAC‡	AM	Aph	EAS	Int	GFW	LH	OBLR	PC	PPs	RAA	RBLR	SJS	STLM	TPB	WAA
*†Actara (thiamethoxam)	4A	1	3	3	1	-	3	0	3	3	3	0	0	2	2	-
*Admire Pro (imidacloprid)	4A	-	3	-	-	-	3	-	-	2	3	-	2	3	-	2
Assail (acetamiprid)	4A	3	3	2	3	-	3	0	2	2	3	0	2	3	2	2
*†Voliam Flexi (thiamethoxam/ chlorantraniliprole)	4A/28	-	3	3	3	3	3	3	3	3	3	-	-	2	-	-
*†Agri-Flex (abamectin/ thiamethoxam)	6/4A	1	3	3	1	-	3	0	3	3	3	0	0	3	1	-

Key to control ratings:

- = Unknown, unlabeled, or does not apply

0 = not effective

1 = poor

2 = fair

3 = good

* Restricted-use pesticide.

† Not for use in Nassau and Suffolk Counties.

§ = Potentially acceptable in certified organic programs

‡ = IRAC (Insecticide Resistance Action Committee) Mode of Action Classification Group: Arthropod pest populations are more likely to exhibit cross-resistance to materials within the same group.



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Pyrethroid Insecticides (IRAC 3)

<i>Ratings for the Control of</i>																
Trade Name (Active Ingredient)	IRAC‡	AM	Aph	EAS	Int	GFW	LH	OBLR	PC	PPs	RAA	RBLR	SJS	STLM	TPB	WAA
*Pounce (permethrin)	3A	3	2	2	-	3	3	2-3	2	2	2	3	1	3	3	-
*Asana XL (esfenvalerate)	3A	3	2	2	2-3	3	3	2-3	2	2	2	3	1	3	3	-
*Danitol (fenpropathrin)	3A	3	2	2	2-3	3	3	2-3	2	2	2	3	1	3	3	-
*†Endigo (thiamethoxam/ lambda-cyhalothrin)	3A/4A	3	2	2	2-3	3	3	2-3	2	2	2	3	2	3	3	-

Key to control ratings:

- = Unknown, unlabeled, or does not apply

0 = not effective

1 = poor

2 = fair

3 = good

* Restricted-use pesticide.

† Not for use in Nassau and Suffolk Counties.

§ = Potentially acceptable in certified organic programs

‡ = IRAC (Insecticide Resistance Action Committee) Mode of Action Classification Group: Arthropod pest populations are more likely to exhibit cross-resistance to materials within the same group.



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Spinosad Insecticides

<i>Ratings for the Control of</i>																
Trade Name (Active Ingredient)	IRAC‡	AM	Aph	EAS	Int	GFW	LH	OBLR	PC	PPs	RAA	RBLR	SJS	STLM	TPB	WAA
Delegate (spinetoram)	5	2	0	-	3	3	-	3	2	3	-	3	-	3	-	-
§Entrust (spinosad)	5	2	0	-	2	3	0	3	0	-	0	3	-	2	0	-

Key to control ratings:

- = Unknown, unlabeled, or does not apply

0 = not effective

1 = poor

2 = fair

3 = good

Other Insecticide Grouping

Ratings for the Control of																
Trade Name (Active Ingredient)	IRAC‡	AM	Aph	EAS	Int	GFW	LH	OBLR	PC	PPs	RAA	RBLR	SJS	STLM	TPB	WAA
*†Altacor (chlorantraniliprole)	28	2	1	3	3	3	-	3	2	-	-	3	2	-	1	-
Avaunt (indoxacarb)	22	2	1	2	2	-	3	0	3	-	0	-	0	2	2	-
§Aza-Direct, §Neemix	18B	-	2	1	2	-	2	-	0	-	2	-	-	3	-	-
§B.t, (§Agree, §Biobit, §Deliver, §Dipel, §Javelin)	11A	0	0	-	2	3	0	3	0	0	0	3	-	0	0	-
Beleaf (flonicamid)	9C	-	3	-	-	-	-	-	-	-	-	-	-	-	3	2
*†Centaur (buprofezin)	16	-	-	-	-	-	2	-	-	3	-	-	3	-	-	-
Esteem (pyriproxyfen)	7C	0	0	-	2	0	0	0	0	3	3	0	3	2	0	-
*†Exirel (cyantraniliprole)	28	2	1	3	3	3	3	3	3	3	3	3	0	3	0	0

Key to control ratings:

- = Unknown, unlabeled, or does not apply

0 = not effective

1 = poor

2 = fair

3 = good

Other Insecticide Grouping

Ratings for the Control of																
Trade Name (Active Ingredient)	IRAC‡	AM	Aph	EAS	Int	GFW	LH	OBLR	PC	PPs	RAA	RBLR	SJS	STLM	TPB	WAA
*†Minecto Pro (cyantraniliprole/abamectin)	28/6	2	0	0	3	3	3	3	3	3	3	3	0	3	0	0
Movento (spirotetramat)	23	-	3	-	-	-	-	-	-	3	-	-	3	-	-	3
†Nexter (pyridaben)	21	-	0	-	-	-	2	-	-	3	-	-	-	-	-	-
*Proclaim (emamectin benzoate)	6	0	0	-	2	3	0	3	1	2	0	3	0	3	0	-
*Rimon (novaluron)	15	-	-	-	3	-	2	3	-	-	-	3	-	3	2	-
§Surround (kaolin)	-	2	1	-	2	2	-	-	2	2	0	-	-	2	0	-
*†Voliam Flexi (thiamethoxam/ chlorantraniliprole)	4A/28	-	3	3	3	3	3	3	3	3	3	-	-	2	-	-
†Voliam Xpress/†Besiege (chlorantraniliprole/ lambda-cyhalothrin)	3A/28	3	2	3	3	3	3	3	3	2	2	3	2	3	3	-
Key to control ratings:																
- = Unknown, unlabeled, or does not apply					0 = not effective			1 = poor			2 = fair			3 = good		

Commercial & Private License Availability of Insecticides Through Direct Distributors Crop Protective Services (CPS), Helena,

Organic/ Class

- **Pyganic (3)**
- Spinosad (5)
- Other groups (6-28)

Biologicals

- Bt's (Bacterial - 11)
- Fungi (Beauvaria)
- Virus
(CM Granulosis)
- IGR (Insect Growth
Regulators - 7)

Barrier Films

- Horticultural Oil
- Kaolin Clay

Organic Fungicide Program

- **Cedar-Apple Rust**
[Bloom to 2nd cover] Regalia + JMS Stylet-Oil
- **Apple scab**
[silver tip through midsummer] - copper
[silver tip & green tip]; sulfur
[tight cluster to midsummer] *Bacillus sp*, potassium bicarbonate,
and peroxides
- **Powdery mildew**
[tight cluster to midsummer]
sulfur, potassium bicarbonate, peroxides, and white mineral oil

Organic Fungicide Program

Table 1. Control of quince rust on Golden Delicious.

	Treatment and rate/ 100 gal dilute	Timing	% fruit infected	% control
0	Non-treated control	---	36 d	---
1	Manzate Pro-Stick 75DF 12 oz	2 May	20 c	44
2	Rally 40WSP 0.6 oz	2 May	3 a	92
3	Topguard 1.04SC 1 fl oz	2 May	6 b	83
4	Inspire Super 2.82EW 1.5 fl oz	2 May	7 b	81
5	Regalia Biofungicide 5% 4 qt + JMS Stylet-Oil 1 gal	2 May	4 ab	89
6	Rally 40WSP 1.25 oz	5 May	5 ab	86
7	Rally 40WSP 0.6 oz	5 May	5 ab	86
8	Topguard 1.04SC 1 fl oz	5 May	7 b	81
9	Regalia Biofungicide 5% 4 qt + JMS Stylet-Oil 1 gal	5 May	2 ab	94

Mean separation by Waller-Duncan K-ratio t-test ($p=0.05$). Counts of 100 fruit per rep 3 Jun.

Table 2. Control of quince rust on Red Delicious.

	Treatment and rate/ 100 gal dilute	Timing	% fruit infected	% control
0	Non-treated control	---	35 b	---
1	Regalia Biofungicide 5% 4 qt + JMS Stylet-Oil 1 gal	16 May	16 a	54
2	Inspire Super 2.82EW 1.5 fl oz	16 May	14 a	60
3	Topguard 1.04SC 1 fl oz	16 May	10 a	71
4	Rally 40WSP 0.6 oz	16 May	13 a	63
5	Rally 40WSP 1.25 oz	16 May	15 a	57

Mean separation by Waller-Duncan K-ratio t-test ($p=0.05$). Counts of 50 fruit per rep 3 Jul.

Organic Fungicide Program

- **Fire blight**
[pink to terminal budset] copper
[pink to petal fall] *B. subtilis*, *B. amyloliquefaciens*
[pink to terminal budset] *B. mycooides*, *Reynoutria sachalinensis*
- **Flyspeck and Sooty Blotch -**
[petal fall to harvest] *B. subtilis*, *B. amyloliquefaciens*
[petal fall to harvest] coppers

Organic Insecticide Program

Barrier Films

- Horticultural Oil
- Kaolin Clay

Biologicals

- Bt's (Bacterial)
- Fungi (Beauvaria)
- Virus
(CM Granulosis)
- IGR (Insect
Growth
Regulators)

Organic Insecticide Program

- **Obliquebanded leafroller**
[bloom, summer cover sprays] - *Bacillus thuringiensis*/B.t.
- **Internal-feeding Lepidoptera** (codling moth, oriental fruit moth, lesser appleworm)
[petal fall + summer cover sprays] - mating disruption; spinosad, B.t.; granulosis virus
Chromobacterium subtsugae
- **Plum curculio**
[petal fall, 1st cover] - kaolin clay; pyrethrin; entomopathogenic nematodes
- **Aphids, leafhoppers**
[midsummer] - azadirachtin; insecticidal soap
- **San Jose scale**
[midsummer] - pyrethrin; *Burkholderia*
- **Apple maggot**
[mid-July through August] - spinosad; pyrethrin
- **Mites**
[tight cluster] - highly refined mineral oil



Thanks to the staff at the HVRL for all their support:

Research Support Specialist I	Dana Acimovic
Laboratory Technician	Lydia Brown
Research Assistant	Christopher Leffelman
Research Assistant	Lucas Canino
Farm Manager	Albert Woelfersheim
Administrative Assistant	Erica Kane
Administrative Assistant	Christine Kane
HRVL & NEWA Weather Data.....	Christopher Leffelman, Albert Woelfersheim

Special thanks to Elijah Talamas (Trissolcus spp. / parasitoid identification)

ARDP - NYS Ag. & Mkts, NY Farm Viability Institute, NYS SCRI, NYS Orchards & Farmers

National Institute of Food and Agriculture (NIFA), U.S. Department of Agriculture, Specialty Crop Research Initiative under award numbers 2016-51181-25409 and 2011-51181-30937.