

Small Acre Tree Fruit Pome Fruit

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Orchards are difficult to manage in the best of circumstances.

- Orchard management is a year-round commitment.
- Even if you only have a few trees, they need to be:
 - Planted into conditions that will encourage them to thrive.
 - Monitored for disease and insect pressure.
 - Winter pruned.
 - Properly managed during times of stress (heavy snowfall, cold snaps, droughts, etc.)



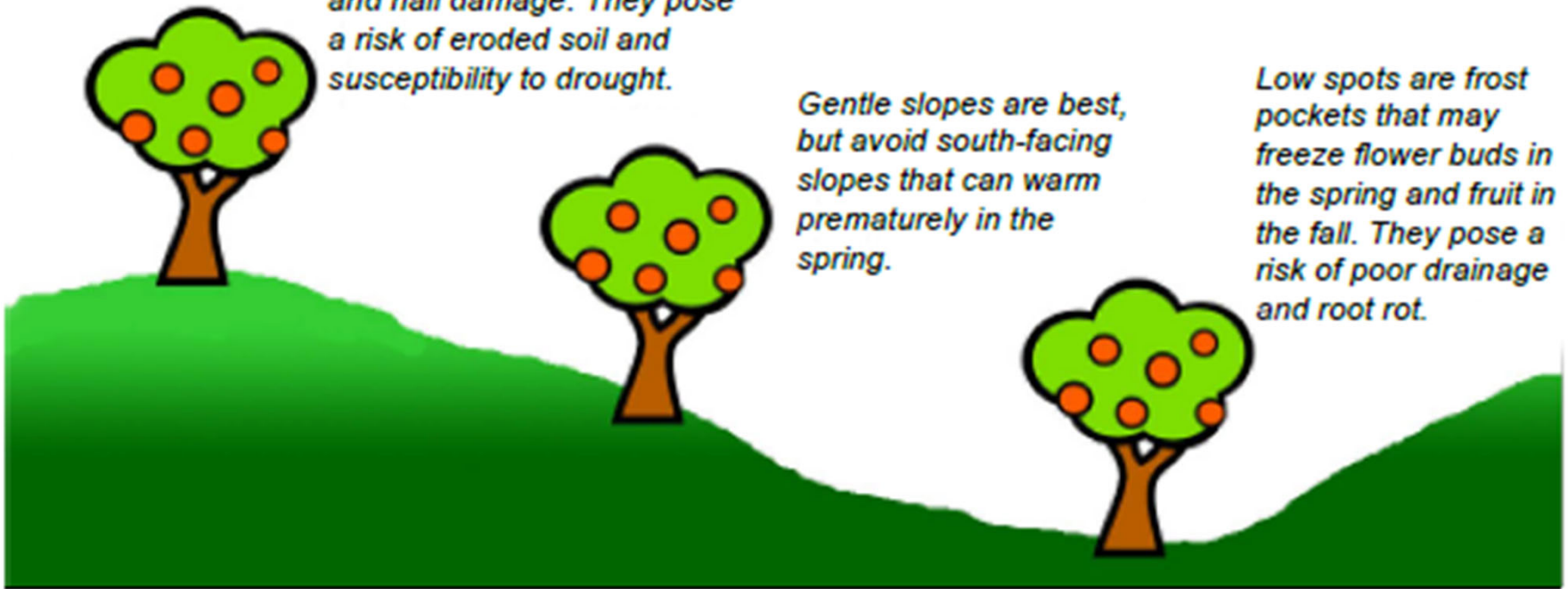
Site Selection and Preparation

Site Selection

Hilltops are exposed to strong winds, winter injury and hail damage. They pose a risk of eroded soil and susceptibility to drought.

Gentle slopes are best, but avoid south-facing slopes that can warm prematurely in the spring.

Low spots are frost pockets that may freeze flower buds in the spring and fruit in the fall. They pose a risk of poor drainage and root rot.



Credit: NDSU Extension

pH Ranges for Tree Fruit

Fruit	pH Range
Apples	5.0 – 6.5
Peaches/Nectarines	6.0 – 7.0
Pears	5.0 – 7.5
Sweet Cherries	6.0 – 6.5
Tart Cherries	6.0 – 7.0

Mineral Nutrients and Their Functions

Nutrient	What do fruit trees use it for?
Nitrogen	Leaf and shoot growth
Potassium	Fruit flavor and color
Phosphorus	Flower bud development
Calcium	Improving storage life of fruit
Magnesium	Good bud development and normal ripening
Boron	Root growth, fruit set, normal fruit shape and size
Manganese	Bud development and leaf growth
Zinc	Bud development and leaf growth
Copper	Lignin synthesis, photosynthesis
Iron	Chlorophyll production



Flower Production

- Flowers form most commonly on fruiting spurs.
- Trees that are exceptionally vigorous, whether because of improper pruning or because of overfertilization, produce fewer flowers.

Credit: Penn State Extension

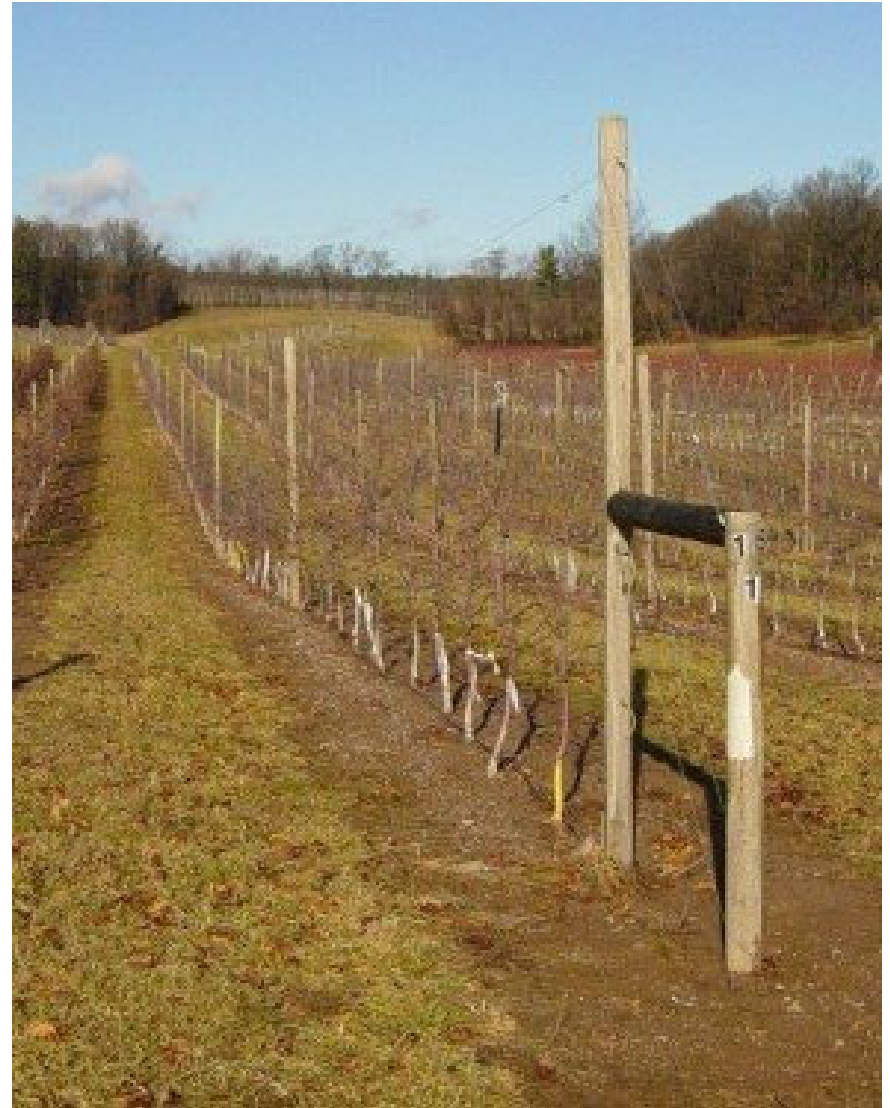
Fruit Production

- Flower production (number of flowers) and pollinator availability are the two most important considerations for fruit production
- Apples, pears, and sweet cherries are self-unfruitful
 - Another tree of a different cultivar is necessary for a successful crop.
- Planting habitats for native bee species and/or maintenance of honeybees are good things to consider to help improve pollination



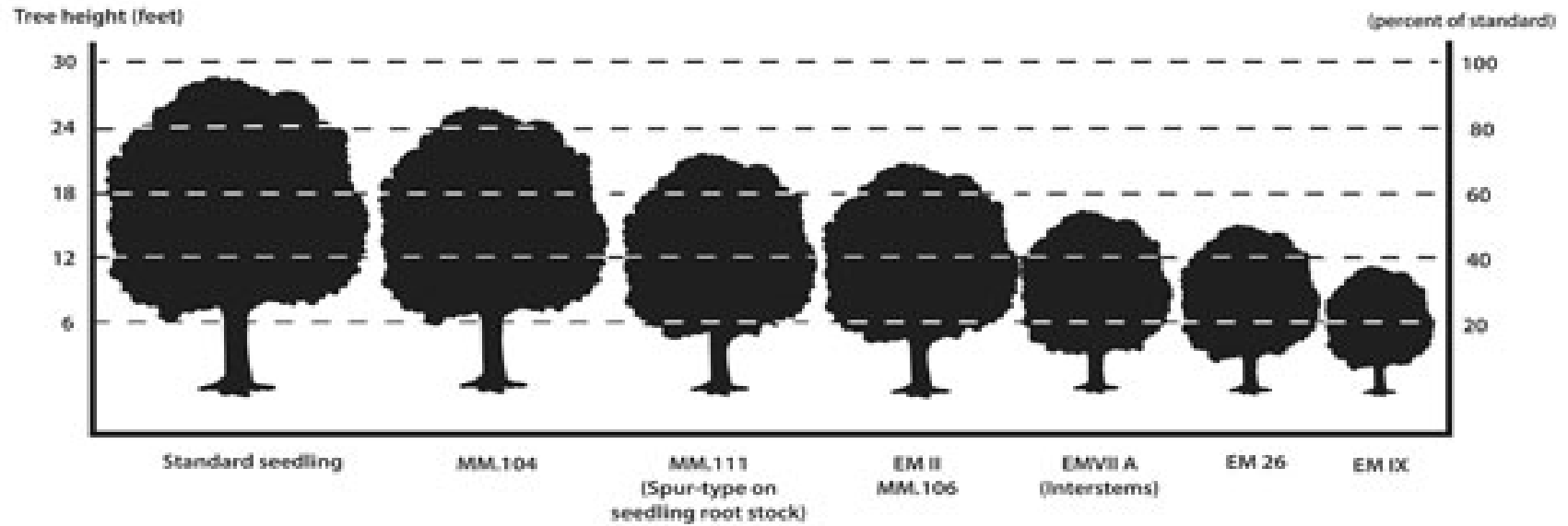
Trellis or Free-Standing Orchards

- Think about how you want to use your orchard (farm market supplement, pick your own operation, etc.)
- High density trellis production has a significant start up cost
- Potential for very high yields and profits
- Free standing orchards have lower costs for installation



Cultivar Selection

Rootstock Selection



Standard

Full size trees (22-30 ft tall)
 No size control through genetics.
 Grown on seedling rootstocks.
 Only controlled through pruning.

Semi-dwarf

60-90% standard size
 14-22 ft tall
 Examples: Malling 7 (M.7) or Malling 2 (M.2)

Dwarf

30-60% standard size
 6-12 ft tall
 Examples: Malling 9 (M.9) or Budagovsky 9 (B.9 or Bud.9)

A Note About Rootstocks

- The most common apple rootstocks are
 - Budagovsky (abbreviated as B or Bud) (Bud.9 most common)
 - Cornell/Geneva (CG or G)
 - Malling (M) (M.9 increasing in popularity)
 - Malling Merton (MM)
 - Michigan Apple Rootstock Clones (MARK)
 - Ottawa (O)
 - Poland (P)
- These are all dwarf or semi-dwarf rootstocks with various disease and yield effects

Scab-Resistant Apple Cultivars (In Order of Ripening in PA)

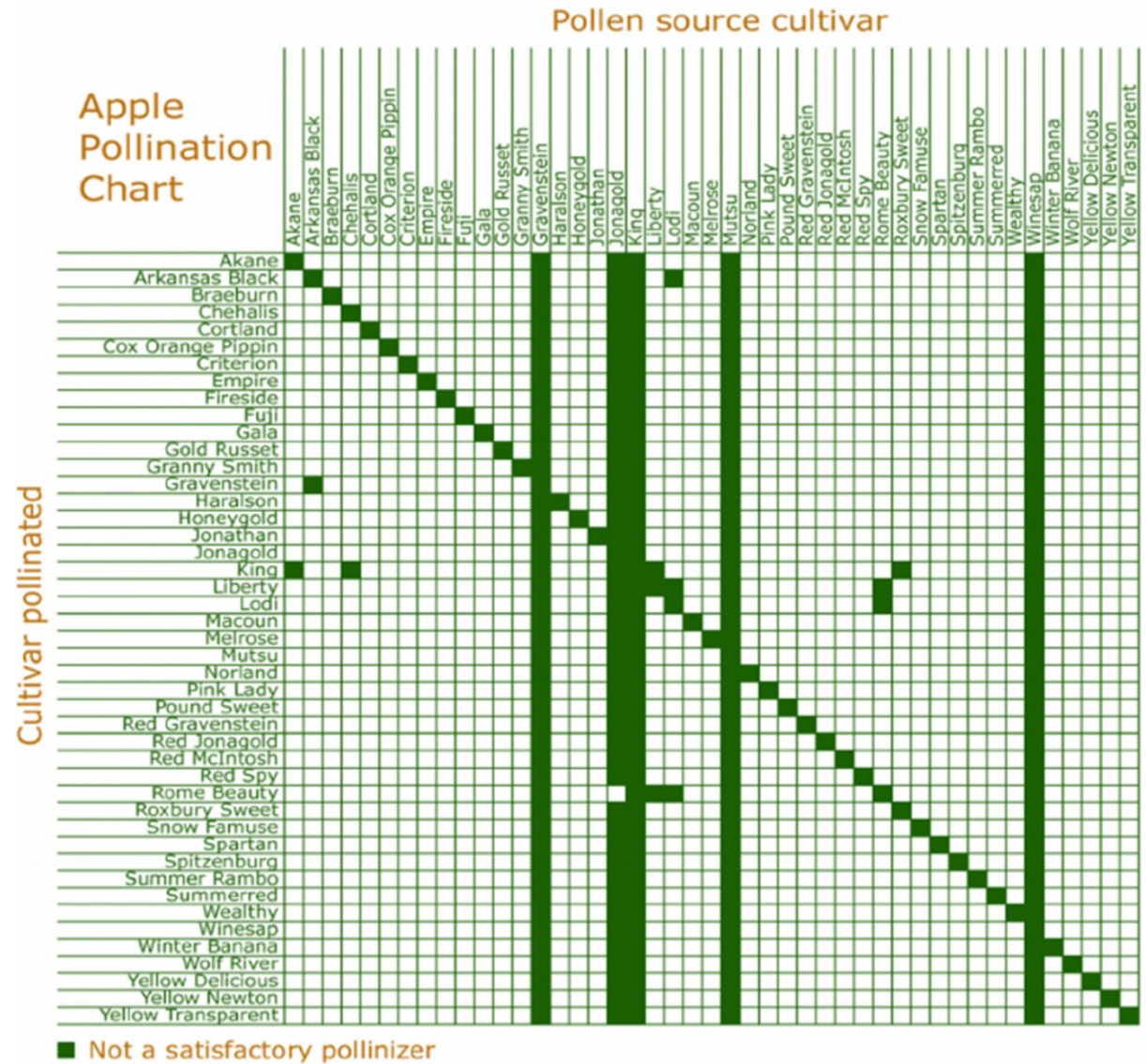
Cultivar	Ripening Period	Other Disease Resistance		
		CAR	PM	FB
Pristine	Late July to early August	M	R	M
Williams Pride	Mid-August	R	M	R – M
Redfree	Late August to mid-September	R	R – M	R- M
Crimson Crisp	Early September	M	M	S
Liberty	Mid to late September	R	R	R
Freedom	Mid to late September	R	R	R – M
Jonafree	Mid to late September	S	R	M
Scarlet O’Hara	Early to mid-October	R	M	S
Sundance	Mid-October	R	M	R
Enterprise	Mid-October	R	M	R
Goldrush	Late October	S	R	M

CAR – Cedar Apple Rust; PM – Powdery Mildew; FB – Fire Blight; R – Resistant; M – moderate; S – susceptible

Non-Scab Resistant Apple Cultivars (In Order of Ripening in PA)

Cultivar	Ripening Period	Cultivar	Ripening Period
Jerseymac	Late July to early August	Golden Delicious**	Late September to early October
Zestar!	Early to mid-August	Idared	Early to mid-October
Ginger Gold	Mid-August	Jonagold	Early to mid-October
Gala	Late August to September	Mutsu	Mid-October
McIntosh	Early September	SunCrisp	Mid to late October
Honeycrisp**	Mid-September	Fuji	Late October
Delicious	Early to mid-October	Braeburn	Late October
Empire	Mid to late September	Pink Lady**	Late October to early November

Apple Pollination Chart



Source: Melke, Abayneh and Masresha Fetene. "Apples (*Malus domestica*, Borkh.) Phenology in the Ethiopian Highlands: Plant Growth, Blooming, Fruit Development, and Fruit Quality Perspectives."

How to use the pollination chart:

1. Choose the cultivar to be pollinated from the left of the chart (Cultivar pollinated).
2. Possible pollinators can be chosen from the top of the chart (Pollen source cultivar).
3. Only cultivars whose intersecting square is white are acceptable pollinators.
4. If the intersecting square is green, the cultivars are incompatible and the cultivar will not be pollinated.

European Pear Cultivar Selection

Cultivar	Ripening Period
Anjou (D'Anjou)	3 to 3.5 weeks after Bartlett
Bartlett**	Late August
Bosc	3 to 4 weeks after Bartlett
Gorham	12 to 14 days after Bartlett
Keiffer	5 to 6 weeks after Bartlett
Magness	2 to 3 weeks after Bartlett
Moonglow	1 to 2 weeks before Bartlett
Seckel**	3 weeks after Bartlett

Tree Fruit Pests, Diseases and Disorders

Prevention of Southwest Injury – Tree Fruit Disorder



Photo Credit: R. Crassweller, FSU

- Southwest injury is bark cracking caused by bark warmed by the sun being rapidly cooled at nighttime
- This can be prevented by the application of white latex paint

Tree Fruit Disease: Fire Blight

- Fire blight (*Erwinia amylovora*) overwinters in the margins of cankers on branches and trunks
- Prune 8 – 12 inches below cankers
- Tools do not need to be disinfected



Photo Credit: K. Peter, PSU

Fire Blight Management Suggestions

Timing	Materials
Pink	Actigard
Bloom	10 – 20 % Bloom: Serenade ASO, Double Nickel 50 – 100% Bloom: Streptomycin + Actigard 1- 2 oz/A; Streptomycin + Prohexadione calcium (Apogee or Kudos; 2 - 12 oz/A depending on the tree size)
Petal Fall	Streptomycin + Prohexadione calcium (Apogee or Kudos; 2 - 12 oz/A depending on the tree size) Streptomycin + Regalia (2 qt/A) Streptomycin + Prohexadione calcium (2-4 oz/A) + Regalia (2 qt/A) Other options (still under study at Penn State): LifeGard and Vacciplant

Tree Fruit Disease – Sooty Mold

- Sooty mold is caused by fungus of the genus *Capnodium*
- Can appear in spots or large streaks
- Treated by treating the insect pest



Photo credit: K. Peter

Tree Fruit Disease – Powdery Mildew

- Caused by the fungus *Podosphaera leucotricha*
- Attacks buds, blossoms, leaves, new shoots and fruit
- White to light gray powder or felt-like patches on infected tissue
- Unlike most fungi, requires NO moisture for spore germination



Photo Credit: K. Peter, PSU

Tree Fruit Disease – Sooty Blotch and Flyspeck

- Sooty blotch is a fungal complex caused by several fungi
- Flyspeck is caused by fungus *Zygothiala jamaicensis*
- Extended periods of above-normal temperatures and frequent rainfall/high humidity encourage growth

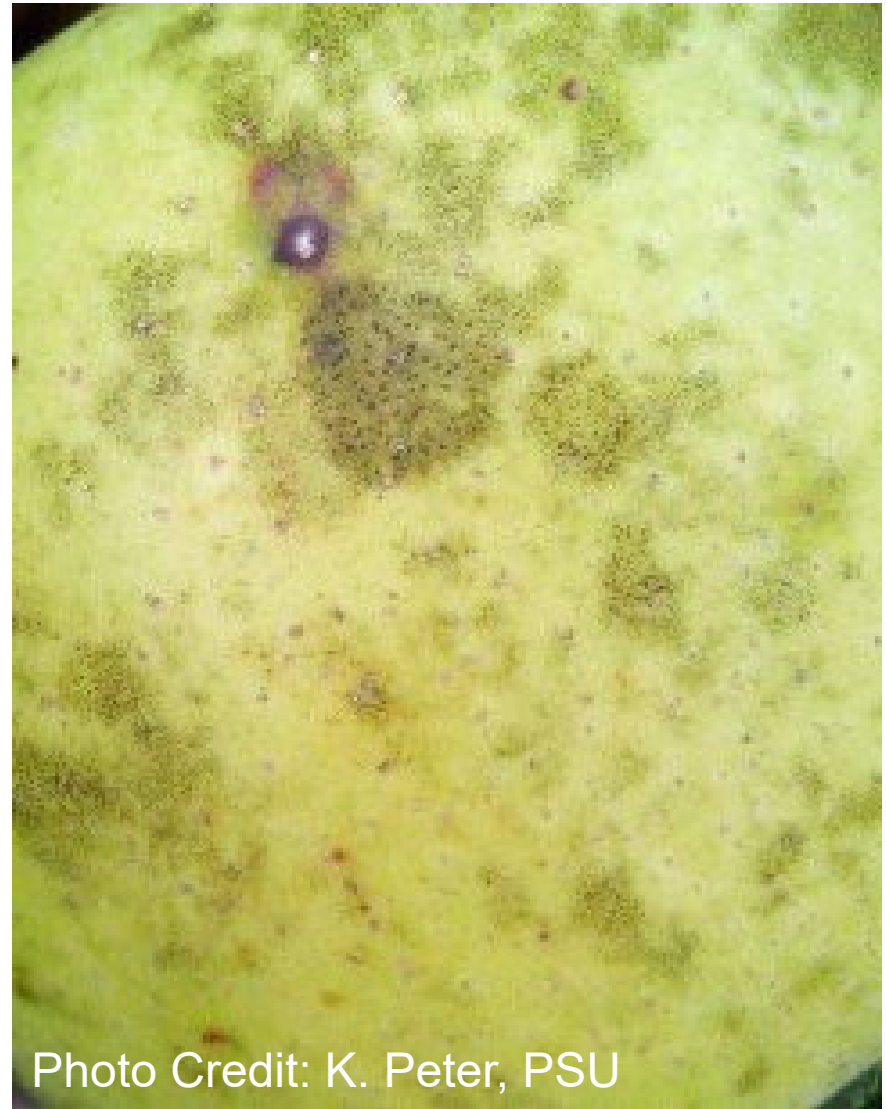


Photo Credit: K. Peter, PSU

Tree Fruit Disease – Apple Scab

- Apple scab overwinters on infected leaves on the orchard floor
- Orchard sanitation is key to preventing future infection
- Urea can be used to help breakdown leaves



Photo Credit: K. Peter, PSU

Apple Scab Spray Timings and Materials

Timing	Materials
Dormant	Copper
Green tip	Rainfast mancozeb + Syllit OR Captan OR potassium bicarbonate
Tight cluster	Rainfast Mancozeb + Syllit FRAC Groups 3 and/or 9 (Ceyva, Rally, Indar, Procure, Rhyme, Vanguard, Inspire Super) Sulfur Potassium bicarbonate
Pink, bloom, petal fall	Rainfast mancozeb + FRAC Group 7 (Aprovia, Fontelis, Excalia, Luna Tranquility, Luna Sensation, Merivon, Miravis, Pristine, Sercadis)
Cover sprays	Captan (alone) OR + TopsinM + Ziram
Preharvest	Merivon, Pristine, Luna Sensation

Tree Fruit Pest – European Apple Sawfly



Photo Credit: G. Krawczyk, PSU

- *Hoplocampa testudinea*
- First instars (life stage) burrow tunnels just under the skin of the fruit
- Older life stage bore more deeply and release brownish frass

Tree Fruit Pest – Plum Curculio



- *Conotrachelus nenuphar*
- Create crescent shaped oviposition scars on fruit
- Eggs are pearly white
- Hatch into yellow-white larvae about $\frac{1}{4}$ long with a brown head
- Adults are $\frac{1}{4}$ inch long

Tree Fruit Pest – Brown Marmorated Stink Bug

- Overwinters as adults in northeast
- Moves out to feed on available hosts in early Spring – mid-June
- Can be monitored using pheromone traps



Photo Credit: G. Krawczyk, PSU

Tree Fruit Pest – Brown Marmorated Stink Bug



Photo Credit: G. Krawczyk, PSU

Tree Fruit Pest – Pear Psylla

- The Pear Psylla produces abundant honeydew, leading to sooty mold, a fungal growth
- Adults are 1/10” long
- Can produce 4 generations a year



Photo credit: G. Krawczyk

Tree Fruit Pest – Spotted Lanternfly

- Will be found as egg masses in winter.
- Scraping or destruction are current control methods.
- Research being done on effective ovicides.
- Research being done on entomophagic fungi to observe control



Photo Credit: E. Swackhamer, PSU

Fruit Moths (Oriental Fruit Moth, Codling Moth, Tufted Apple Bud Moth)



Apple Insect Pest Pheromone Trap Timing

Insect	Trap Timing
Oriental fruit moth	First week of April
Codling moth	At pink
Tufted apple bud moth	At pink
Obliquebanded leafroller	After bloom
Apple maggot	Early June

Orchard Insect Pests and Insecticidal Control Measures

Insect	Control Measure
Brown marmorated stink bug (BMSB)	Assail, Actara, imidacloprid
Spotted tentiform leafminer (STLM)	Actara, imidacloprid, Agri-Mek
Tarnished plant bug (TPB)	Assail, Avaunt, Imidan
Rosy apple aphid (RAA)	Assail, Actara, imidacloprid
Eastern apple sawfly (EAS)	Assail, Avaunt, Imidan
European red mite (ERM)	Agri-Mek
Plum curculio (PC)	Assail, Avaunt, Actara, imidacloprid, Imidan
Oriental fruit moth	Assail, Avaunt, Imidan

Tree Fruit Pest – Deer

- Deer are one of the most prolific pests of tree fruit in Pennsylvania
- Deer are most active during early morning and the evening
- Damage can occur year-round but is especially prevalent during the winter



Photo Credit: Orchard Wildlife – Integrated Management of White-Tailed Deer

Tree Fruit Pest – Voles

- Keep ground clear of debris to limit hiding spots.
- Natural predators will help keep populations in check if they can spot these rodents
- Mole repellent will also work against voles

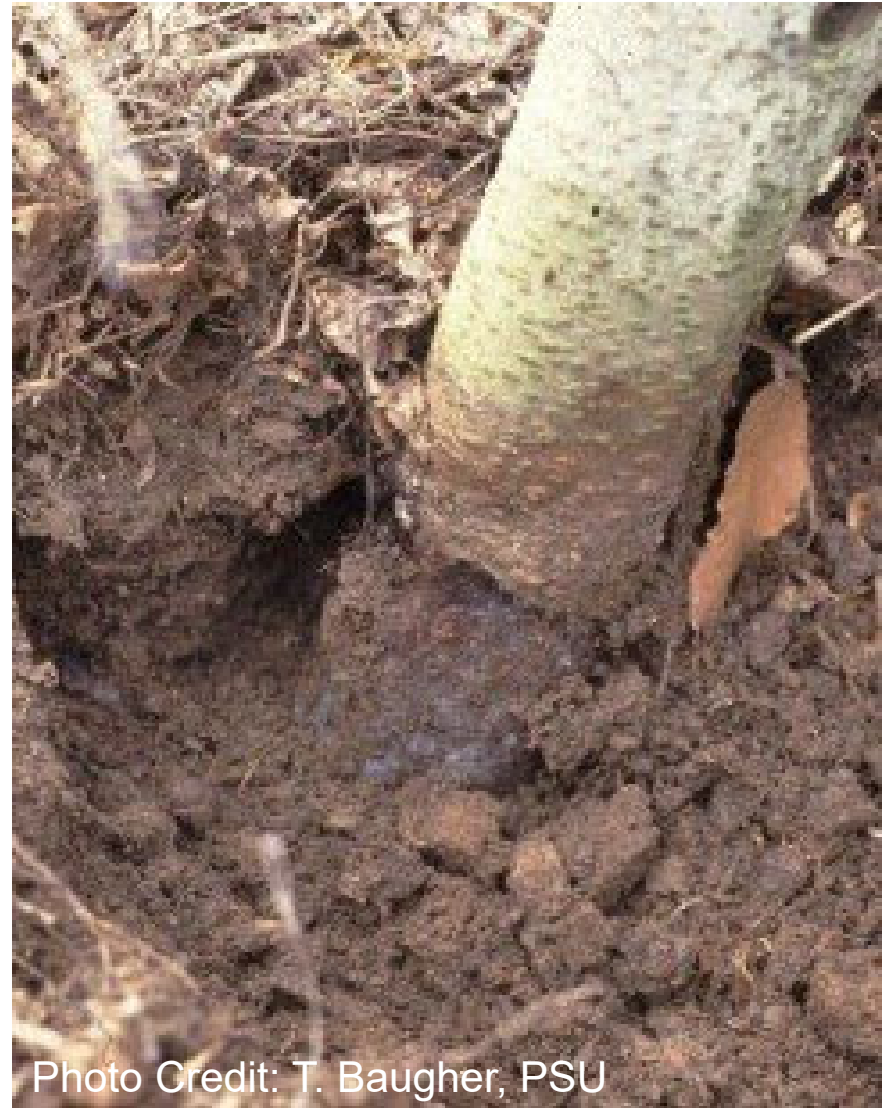


Photo Credit: T. Baugher, PSU

Any other questions?

Thank you!



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