

1

---

---

---

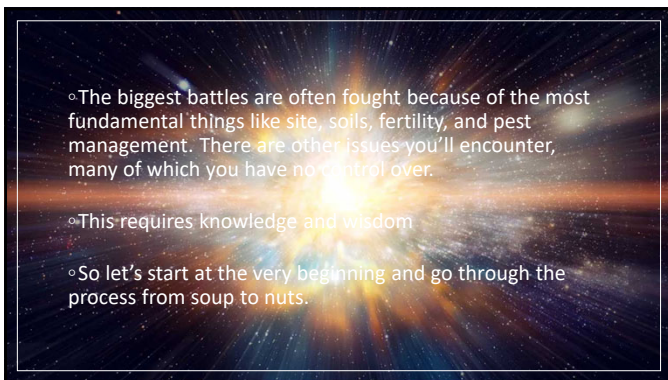
---

---

---

---

---



2

---

---

---

---

---

---

---

---



3

---

---

---

---

---

---

---

---



4

---

---

---

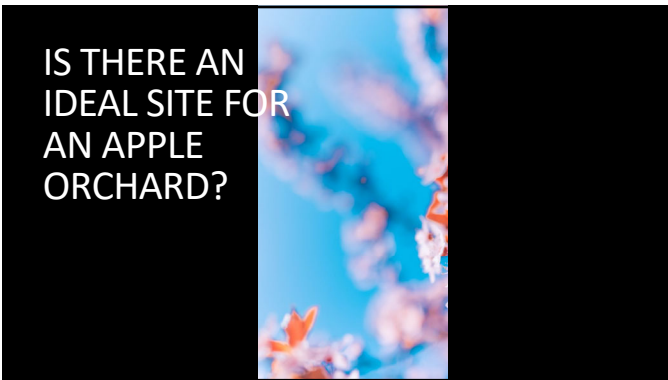
---

---

---

---

---



5

---

---

---

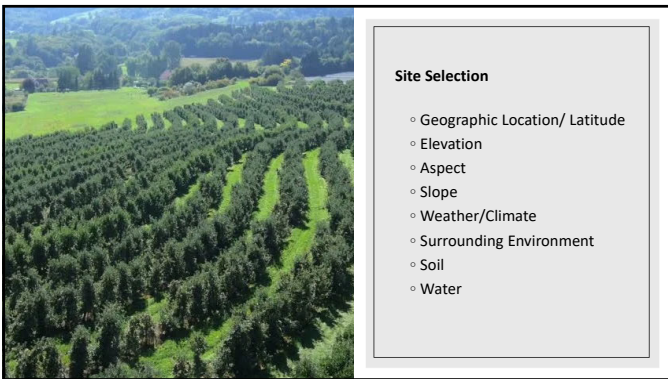
---

---

---

---

---



6

---

---

---

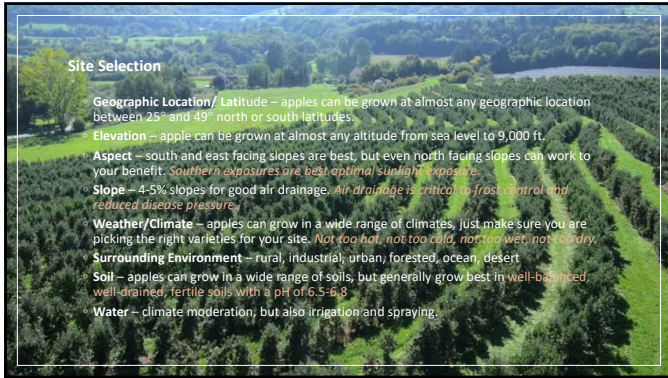
---

---

---

---

---



7

---

---

---

---

---

---

---

---



8

---

---

---

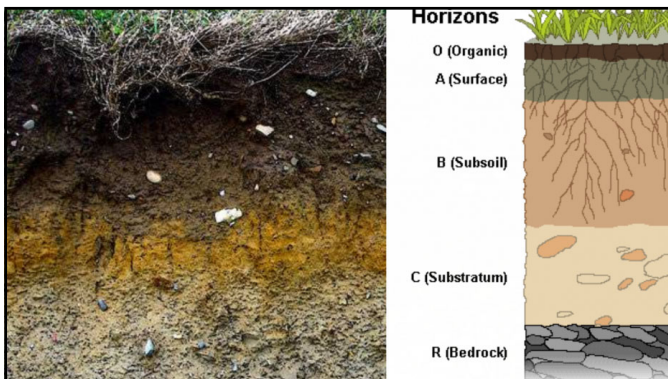
---

---

---

---

---



9

---

---

---

---

---

---

---

---

• **Physical**

- Texture
- Color
- Structure
- Bulk density
- Porosity

---

---

---

---

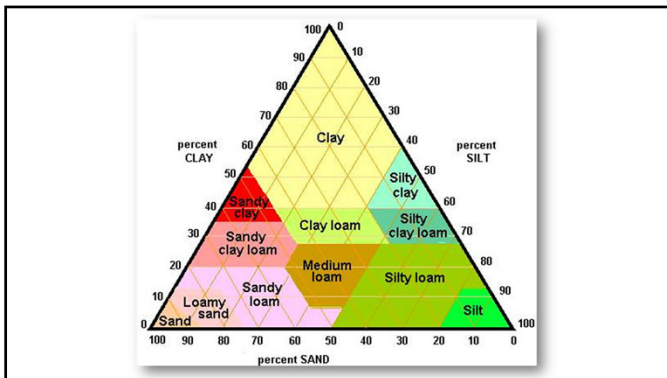
---

---

---

---

10



---

---

---

---

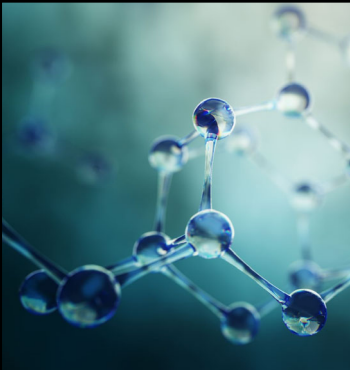
---

---

---

---

11



**Chemical/Mineral**

- pH
- CEC
- OM
- Organic Acids

---

---

---

---

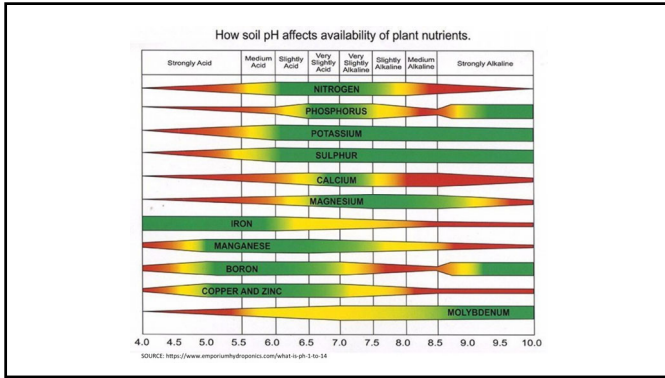
---

---

---

---

12



13

---

---

---

---

---

---

---

---

---

---

### MACRONUTRIENTS

- Nitrogen** - an essential macronutrient for plant function and is a key component of amino acids, which form the building blocks of plant proteins and enzymes.
- Phosphorus** - involved in several key plant functions, including energy transfer, photosynthesis, transformation of sugars and starches, nutrient movement within the plant and transfer of genetic characteristics from one generation to the next.
- Potassium** - movement of water, nutrients and carbohydrates in plant tissue. Involved with enzyme activation within the plant, which affects protein, starch and adenosine triphosphate (ATP) production. The production of ATP can regulate the rate of photosynthesis.
- Calcium** - needed in large amounts by all plants for the formation of cell walls and cell membranes, and it plays a vital role in soil structure.
- Magnesium** - Magnesium is the central core of the chlorophyll molecule in plant tissue. If Mg is deficient, the shortage of chlorophyll results in poor and stunted plant growth. Helps activate specific enzyme systems.
- Sulfur** - It is used in the formation of amino acids, proteins, and oils. It is necessary for chlorophyll formation, promotes nodulation in legumes, helps develop and activate certain enzymes and vitamins, and is a structural component of two of the 21 amino acids that form protein.

14

---

---

---

---

---

---

---

---

---

---

### MICRONUTRIENTS

- Boron** - regulates plant hormone levels and promotes proper growth. Increases flower production and retention, pollen tube elongation and germination, and seed and fruit development.
- Cobalt** - component of a number of enzymes and increases the drought resistance of seeds. In legumes, cobalt is important for nitrogen fixation by the bacteria that associate with legumes.
- Copper** - required for many enzymatic activities in plants and for chlorophyll and seed production. Deficiency can lead to increased susceptibility to diseases.
- Iron** - constituent of several enzymes and some pigments and assists in nitrate and sulfate reduction and energy production within the plant. Not used in the synthesis of chlorophyll; it is essential for its formation.
- Manganese** - important micronutrient for plant growth and development and sustains metabolic roles within different plant cell compartments. The metal is an essential cofactor for the oxygen-evolving complex (OEC) of the photosynthetic machinery, catalyzing the water-splitting reaction in photosystem II (PSII).
- Molybdenum** - essential component in two enzymes that convert nitrate into nitrite and then into ammonia before it is used to synthesize amino acids within the plant. Converts inorganic phosphorus into organic forms.
- Silica** - Silica reduces the threat of pests and disease, creates plants with stronger cell structures, improves nutrient absorption, protects against metal toxicities, and ultimately improves overall crop performance.
- Selenium** - mitigate stress in plants because of its capacity to induce the synthesis of S- and nitrogen (N) compounds, in addition to stimulating the activity of antioxidant enzymes and metabolites.
- Zinc** - formation of chlorophyll and some carbohydrates, conversion of starches to sugars and its presence in plant tissue helps the plant to withstand cold temperatures. Essential in the formation of auxins, which help with growth regulation and stem elongation.

15

---

---

---

---

---

---

---

---

---

---



16

---

---

---

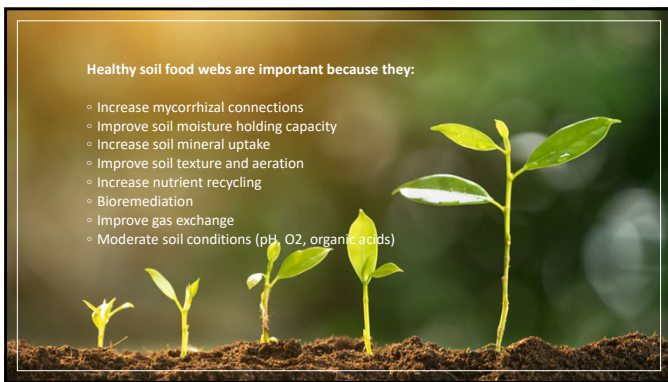
---

---

---

---

---



Healthy soil food webs are important because they:

- Increase mycorrhizal connections
- Improve soil moisture holding capacity
- Increase soil mineral uptake
- Improve soil texture and aeration
- Increase nutrient recycling
- Bioremediation
- Improve gas exchange
- Moderate soil conditions (pH, O<sub>2</sub>, organic acids)

17

---

---

---

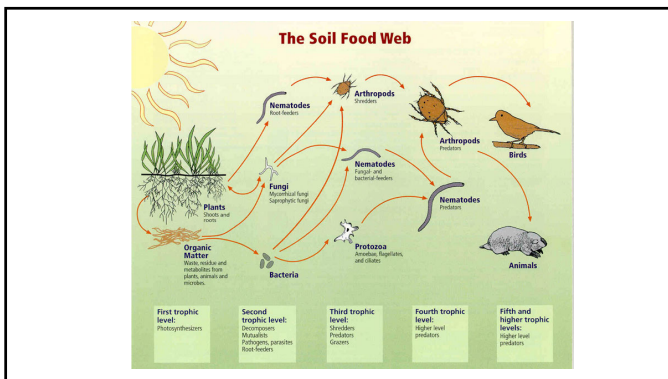
---

---

---

---

---



18

---

---

---

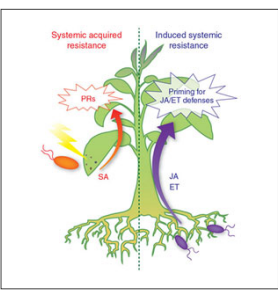
---

---

---

---

---



The diagram shows a plant with two pathways of systemic resistance. On the left, 'Systemic acquired resistance' is shown with a red arrow pointing from a leaf to the root, labeled 'SA'. On the right, 'Induced systemic resistance' is shown with a purple arrow pointing from a leaf to the root, labeled 'JA ET'. A dashed line indicates 'Priming for JA ET releases' between the two pathways.

**Induced Systemic Resistance (ISR)**  
**Systemic Acquired Resistance (SAR)**

- **Systemic acquired resistance (SAR) and induced systemic resistance (ISR)** are the two primary plant resistance pathways
- Defense mechanisms that are triggered by a stimulus prior to infection or pest attack and that may reduce the damage and enhance self-healing.

19

---

---

---


---

---

---

---

---



ORCHARD PLANNING & DESIGN

20

---

---

---

---

---

---

---

---



21

---

---

---

---

---

---

---

---



22

---

---

---

---

---

---

---

---



23

---

---

---

---

---

---

---

---



24

---

---

---

---


---

---

---

---

- Orchard design over the years has hinged primarily on the development of dwarfing rootstocks. Without smaller trees, growers could only plant so many trees per acre.
- Once trees could be grown smaller and planted at higher densities, planting systems, equipment, varieties, pest management, and quality expectations came more into line with a factory mentality as opposed to an ecosystem vision.
- Market demands have driven the need for higher production, perfect fruit, and profitability. Horticultural technology allowed this to happen.
- Today's most modern orchards can cost close to \$60,000 per acre and produce upwards of 3,000 bushels per acre at a total value of nearly \$150,000 (gross) per acre.
- But at what cost?



25

---

---

---

---

---

---

---


---

---

---

### Geneva® Rootstocks by Tree Size


Mark B.9



15-25%

**G.11**  
**G.41**  
**G.214**


SMALL M.9: T337



30-35%

**G.935**  
**G.210**  
**G.969**  
**G.222**  
**G.16**


Large M.9: Pajam 2, EMLA Nic29



35-40%

**G.935**  
**G.210**  
**G.969**  
**G.222**  
**G.16**


'M.26 Class'



40-50%


**G.30**  
**G.890**  
**G.202**

M.7 MM106



50-75%

Bud 118 Seedling



75+%

Modified for Washington State conditions from Terence Robinson, Cornell University; Genaro Fazio, USDA

26

---

---

---

---

---

---

---

---

---

---

GENEVA® Apple Rootstocks												
	G.11	G.16	G.41	G.935	G.210	G.214	G.222	G.30	G.890	G.935	G.969	G.985
Arranged in order by size (smallest to largest)	M.27	M.9-T337	M.9-T337	M.9-T337	M.26	M.26	M.26	M.7	M.7	M.7	M.7 and M.106	G.985
Woolly Apple Aphid Resistance	No	High	No	High	High	No	High	High	No	High	High	High
Fire Blight Resistance	Very Resistant	Resistant	Resistant	Very Resistant	Very Resistant	Very Resistant	Very Resistant	Very Resistant	Very Resistant	Very Resistant	Very Resistant	Very Resistant
Rootstock Disease Complex Resistance	TBD	No	Partial	Tolerant	Tolerant	Tolerant	Tolerant	No	Tolerant	Tolerant	Tolerant	Tolerant
Crown and Root Buds (Phytophthora)	Tolerant	Tolerant	Tolerant	Tolerant	Tolerant	Tolerant	Tolerant	Tolerant	Tolerant	Tolerant	Tolerant	Tolerant
Cold Hardiness	Yes	Yes	Partial Good	Yes	TBD	Yes	Yes	Yes	Yes	Yes	TBD	TBD
Productivity/ Yield Efficiency as good or better than M.9	TBD	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	TBD	TBD
Low suckering and burr levels	TBD	TBD	Yes	Yes	Yes	Yes	Yes	TBD	Yes	Yes	Yes	Yes

TBD: To Be Determined  
 Licensing for all varieties is available as exclusive or non-exclusive in selected Domestic and International Territories.  
 Chart data valid as of December 8, 2011 and accepted by Cornell University apple rootstock breeding team members:  
 Genaro Fazio, PhD, Herb Adenot, PhD, and Terence Robinson, PhD.

27

---

---

---

---

---

---

---

---

---

---

SPECIFIC RESISTANCES OF SOME APPLE VARIETIES				
VARIETY	SCAB	CEDAR APPLE RUST	POWDERY MILDEW	FIRE BLIGHT
Akane	Tolerant	Mod. Res.	Mod. Res.	Mod. Res.
Davon	Immune	Mod. Susc.	Mod. Res.	Mod. Res.
Empire	Susceptible	Mod. Res.	Mod. Susc.	Intermediate
Enterprise	Immune	Resistant	Intermediate	Resistant
Freedom	Immune	Intermediate	Intermediate	Intermediate
Gala	V. Susc.	Mod. Res.	Intermediate	V. Susc.
Golden Russet	Intermediate	Susceptible	Susceptible	Susceptible
GoldRush	Immune	Susceptible	Resistant	Intermediate
Jonafree	Immune	Mod. Susc.	Mod. Susc.	Mod. Susc.
Liberty	Immune	Resistant	Mod. Res.	Resistant
NovoEasyGo	Immune	Mod. Res.	Mod. Res.	Mod. Res.
NY 75840-1	Immune	Resistant	Resistant	Intermediate
Prima	Immune	Susceptible	Mod. Res.	Mod. Res.
Priscilla	Immune	Resistant	Mod. Res.	Mod. Res.
Pristine	Immune	Resistant	Mod. Res.	Resistant
Redfree	Immune	Resistant	Mod. Res.	Mod. Res.
Roxbury Russett	Intermediate	Intermediate	Intermediate	Intermediate
Sir Prize	Immune	Mod. Susc.	Mod. Res.	Susceptible
Williams' Prop.	Immune	Resistant	Mod. Res.	Resistant

28

---

---

---

---

---

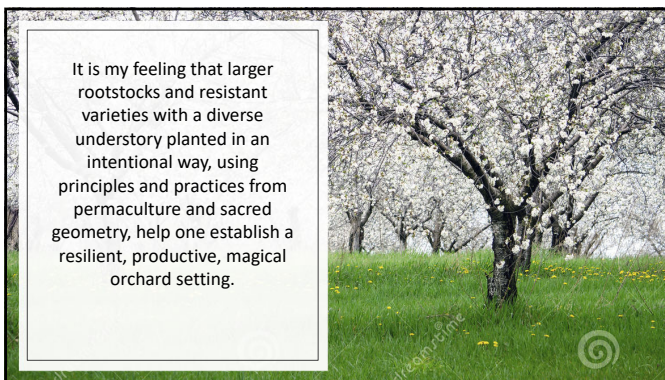
---

---

---

---

---



29

---

---

---

---

---

---

---

---

---

---



30

---

---

---

---

---

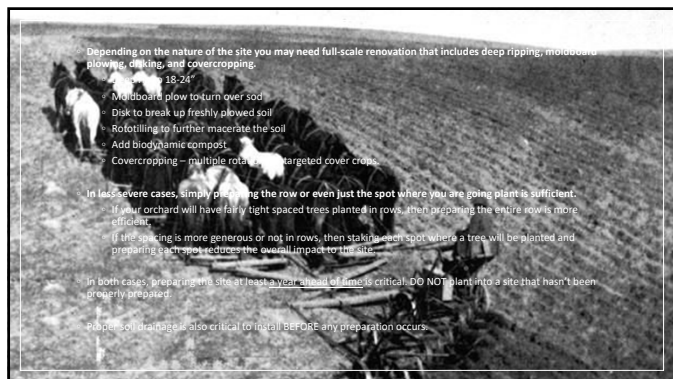
---

---

---

---

---



31

---

---

---

---

---

---

---

---

---

---



32

---

---

---

---

---

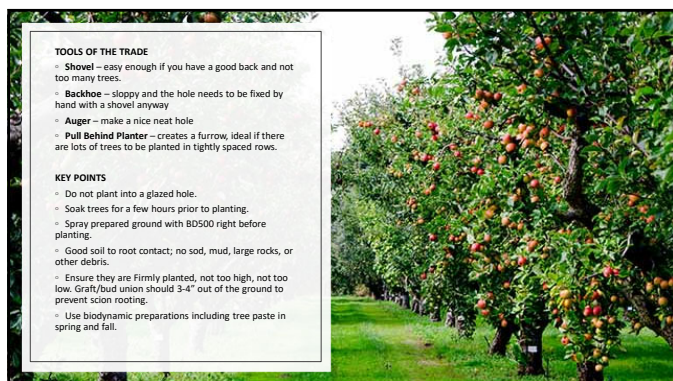
---

---

---

---

---



33

---

---

---

---

---

---

---

---

---

---



**Orchard Understory Management**

- **Bare soil**
  - Managed with herbicides or tillage
- **Grassiness**
  - Seeding with low growing grasses that grow right up to the trunk of the tree
- **Weediness**
  - Whatever comes, comes
- **Selective understory management**
  - Selectively weeding out undesirables
- **Intentional understory management**
  - Planting preferred species for beneficial insects, pollinators, soil biotic diversity, nutrient accumulation, continuous cover crop, weed competition, soil moisture retention, soil moisture percolation.....

◦ The downsides of excessive plant growth in the understory is competition for water, nutrients, and sunlight. Also provides habitat for pests like voles, borers, and other pests.

◦ But in a properly planned and planted orchard understory, the benefits are "infinite."

34

---

---

---

---

---

---

---

---

---

---

**MANAGEMENT CONSIDERATIONS**

35

---

---

---

---

---

---

---

---

---

---

**CONSIDERATIONS**

- **Labor**
  - Management
  - Seasonal
  - Administrative
- **Equipment**
  - Tractor
  - Sprayer
  - Mower
  - Harvest
  - Miscellaneous
- **Administrative**
  - Insurance
  - Legal
- **Tasks and Activities**
  - Pruning and Training
  - Spraying
  - Fertility
  - Thinning
  - Harvest
  - Equipment Repair
  - Handling and Storage

36

---

---

---

---

---

---

---

---

---

---



37

---

---

---

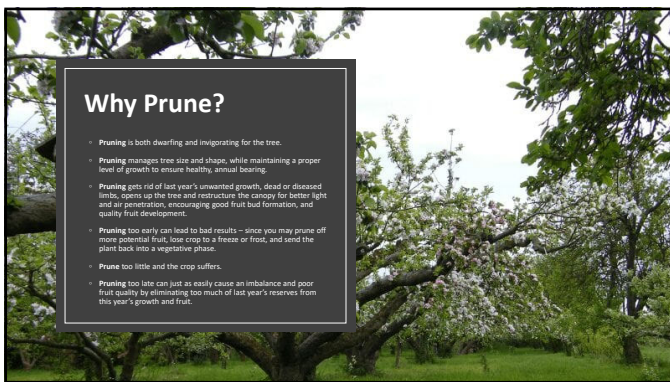
---

---

---

---

---



38

---

---

---

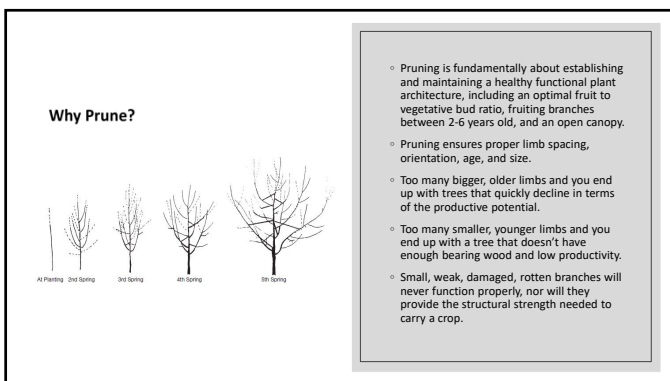
---

---

---

---

---



39

---

---

---

---

---

---

---

---

### Sunlight

- More than anything else we do, we principally are in the business of harvesting sunlight.
- Without light there is no photosynthesis to support a crop, develop high quality fruit, or develop fruit buds for next year.
- Opening up the tree or vine so the sunlight can reach all areas is critical.
- It was shown years ago that even in well-pruned (larger) trees, only about 30% of the canopy (the exterior 30%) gets enough sunlight.
- So simply consider this: sunlight = sugar. If the tree is not photosynthesizing, its not growing.
- The sugars produced during photosynthesis help the developing fruit buds overwinter properly and grow strong next spring.



40

---

---

---

---

---

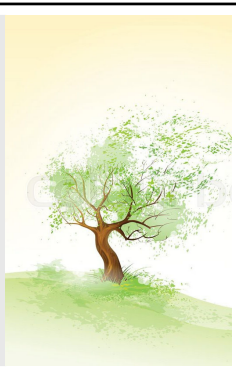
---

---

---

### Air Movement

- Second only to sunlight, you need to consider how air moves through your tree's canopy and the crop, and how pruning can help that process.
- Good air movement in concert with good sunlight penetration can help dry out plants after a rain or heavy dew, while helping moderate the temperature throughout the tree.
- It allows the trees to breathe



41

---

---

---

---

---

---

---

---

### Water and Nutrients

- Pruning helps manage the number of growing points in the plant. Each growing point requires optimal resources to grow properly.
- Too many growing points and they dilute the available resources.
- Too few and the plant could grow excessively vigorous, even rank, growth with very few fruit.
- So before you start pruning always keep in mind the ratio of fruit to vegetative buds on the plant before making the first cut.
- The rule of thumb for apples is that you need 20 leaves per fruit to grow healthy fruit.
- *If you need to remove a large number of growing points, do so with a few cuts. This is ALWAYS better than making a lot of little cuts. The more individual cuts, the stronger the tree reacts, and the more adverse the reaction.*



42

---

---

---

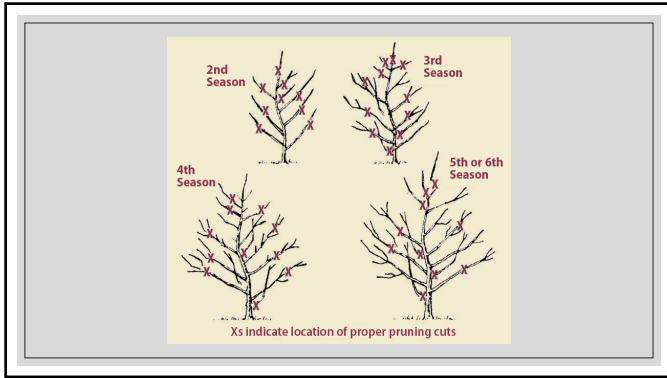
---

---

---

---

---



43

---

---

---

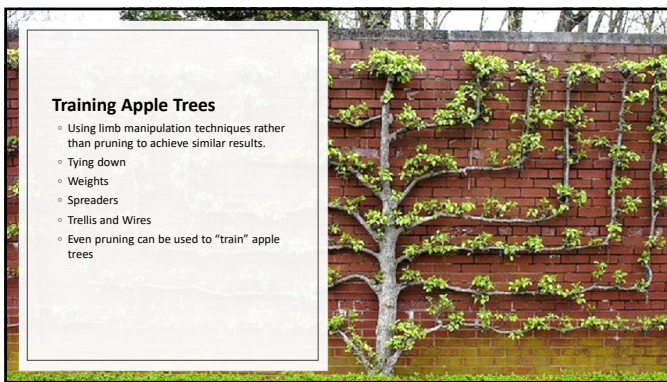
---

---

---

---

---



44

---

---

---

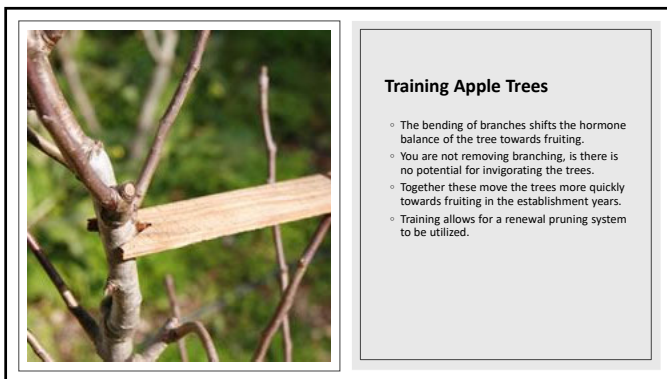
---

---

---

---

---



45

---

---

---

---

---

---

---

---



- **Pruning lopper.** You will use your loppers more than any other tool – at least I do. Use bypass loppers, not the anvil types that crush the branches. I prefer Corona CORP AL-8462.
- **Hand Shears.** There are many styles and sizes for everyone. I prefer Felco 6. Make sure you buy some replacement springs and blades, too.
- **Pruning saw.** I prefer a solid straight curved 13" saw blade with holder.
- **Pole Pruners.** Allen Brothers 8' pole pruners. Simple in design and function.
- **Ladder.** An 8' aluminum ladder is needed for anything you can't reach from the ground or with your pole pruners. A tripod ladder is easy to set wherever you need it.
- **Chainsaw.** A small chainsaw to cut larger limbs that are too big for your handsaw. You don't need a massive chainsaw – 16" chain maximum – that's light enough to carry up a ladder or into trees if all you need. I prefer Stihl. And a small electric one for easier carrying.
- **Other Tools and Supplies.** Replacement blades for pruning shears, small sharpening file, WD-40, hand tools,

46

---

---

---

---

---


---

---

---

### Developing a Pruning Strategy

- How old are my trees?
- What is general fruiting to vegetative wood ratio?
- Is your orchard on a strong site – in other words, do the trees naturally grow more vigorously there than on another site?
- Do you have early or late blooming varieties?
- Consider the cold hardness of your particular varieties, rootstocks and locations; factor in the potential for spring frost using your site history
- Did I have a crop last year?
- How big was my crop last year?
- What do the buds "look like" on the tree?
- What if any cold damage past, present or future have the trees experienced?
- Do I have a "Frosty" site
- Finally, while the basic principles of pruning are the same no matter what size trees you have, you will want to adjust your pruning style based on tree size and crop objectives. Some additional questions to ask – What size fruit do I want? Does this variety return bloom well? Is my fruit intended for fresh market or cider?



47

---

---

---

---

---

---

---

---



## FERTILITY

48

---

---

---

---

---

---

---

---



49

---

---

---

---

---

---

---

---



50

---

---

---

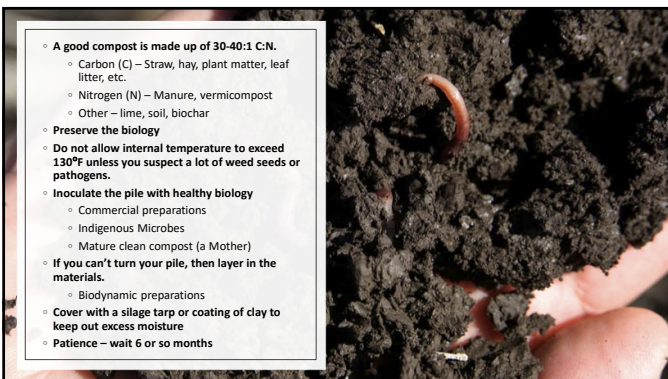
---

---

---

---

---



- **A good compost is made up of 30-40:1 C:N.**
  - Carbon (C) – Straw, hay, plant matter, leaf litter, etc.
  - Nitrogen (N) – Manure, vermicompost
  - Other – lime, soil, biochar
- **Preserve the biology**
- **Do not allow internal temperature to exceed 130°F unless you suspect a lot of weed seeds or pathogens.**
- **Inoculate the pile with healthy biology**
  - Commercial preparations
  - Indigenous Microbes
  - Mature clean compost (a Mother)
- **If you can't turn your pile, then layer in the materials.**
  - Biodynamic preparations
- **Cover with a silage tarp or coating of clay to keep out excess moisture**
- **Patience – wait 6 or so months**

51

---

---

---

---

---

---

---

---



**Stinging Nettles (*Urtica dioica*)  
BD 504 [Mars]**

Stinging nettles have a strong astral energy (which is why they don't need an animal membrane), along with a strong affinity for iron and protein [nitrogen]. Because of the strong affinity for nitrogen – also a good food source for critters – earthworms can and will devour your composting preparation. As well, it prevents the contamination of the composted preparation from the surrounding soil. Nettles can help with both iron deficiency and toxicity, energizing enzymes and minerals alike.

52

---

---

---

---

---

---

---

---



- Compost, wood chips and plants can go a long way to providing good organic fertility, but they many not provide everything your plant or soil needs.
- A testing program is needed – at least on some level – to determine baseline levels of nutrients and chemistry and as a basis for making adjustments.
  - Basic Soil tests
  - Basic Tissue tests
  - Soil Food Web/Biological tests
  - Sap Testing
  - Chromatograms

53

---

---

---

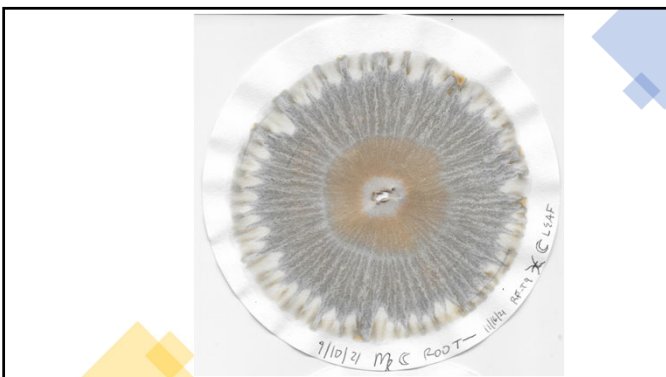
---

---

---

---

---



54

---

---

---

---

---

---

---

---



# CROP LOAD MANAGEMENT

55

---

---

---

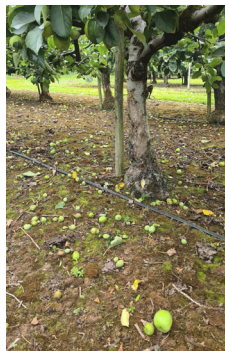
---

---

---

---

---



Every fruit tree has the potential to carry way more fruit than it can physiologically bear. In other words, there are more potential mouths to feed than food at the table. So, through a natural process of attrition the number of potential fruits is reduced:

- Poor pollination
- Poor fertilization
- Insect damage
- Disease
- Physiological stress

**But there are still many more developing fruits than the tree can carry efficiently. So, growers must reduce further through some common horticultural practices.**

56

---

---

---

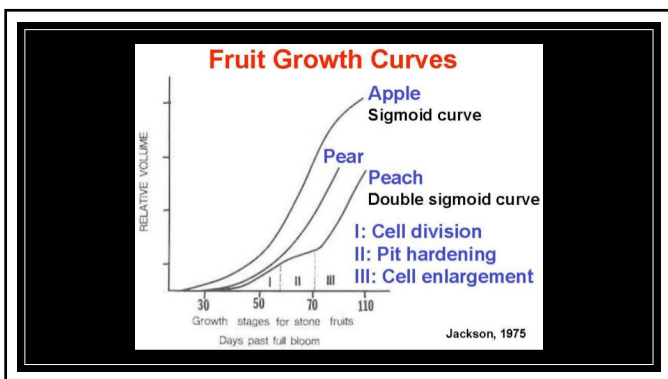
---

---

---

---

---



57

---

---

---

---

---

---

---

---





REDUCE STRESS    RETURN BLOOM    FRUIT QUALITY

58

---

---

---


---

---

---

---

---



**Return Bloom**    You only need 12-15% of the total number of blossoms to have a "full" crop in apples. You need and want less than that for peaches. Other stone fruit vary.

Grapes also very much improve quality when you "drop" clusters.

---

**Gibberellic Acid**    Developing seeds of apple fruit produce a compound called gibberellic acid (GA). GA is transported from the seed to the differentiating tissue during floral induction. High concentrations can reduce the propensity of tissue to be "induced" the transform into floral tissue.

59

---

---

---


---

---

---

---

---



**What to do?**

- **Remove blossoms**
  - Non-selective removal of flowers using mechanical and/or mechanical means
- **Remove fruit**
  - Selective removal of fruit using chemical, mechanical, and manual means
  - CHEMICAL – application of specific PGRs
  - MECHANICAL – pruning, physically knocking the fruit off
  - MANUAL – hand-thinning
  - BIODYNAMIC – use of 501 at various intervals
- **Plant growth regulators**
  - Regalia
  - Lime sulfur and fish oil
  - Naphthaleneacetic acid
  - 6-Benzyladenine
  - Ethylene

60

---

---

---

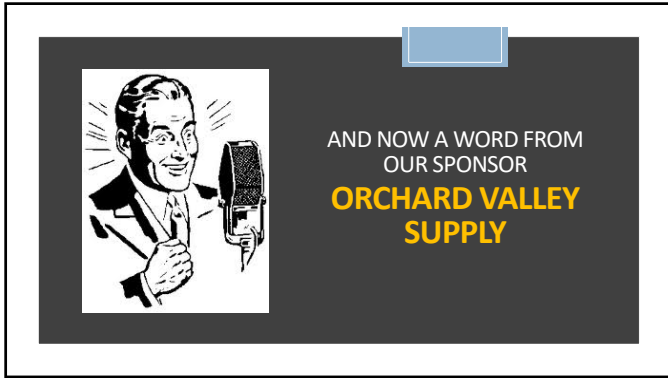
---

---

---

---

---



61

---

---

---

---

---

---

---

---



62

---

---

---

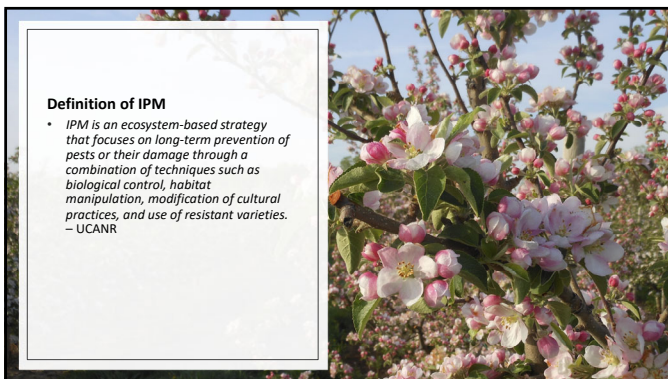
---

---

---

---

---



63

---

---

---

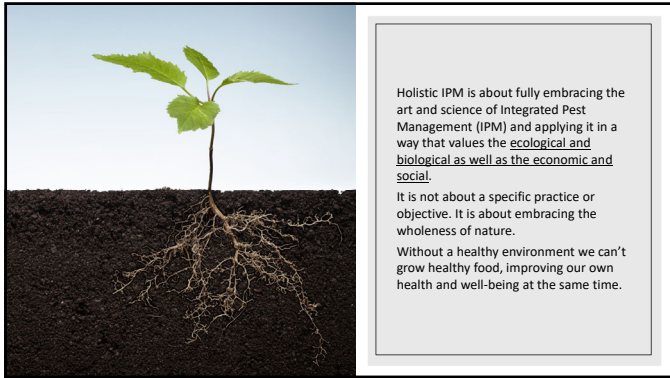
---

---

---

---

---



64

---

---

---

---

---

---

---

---



65

---

---

---

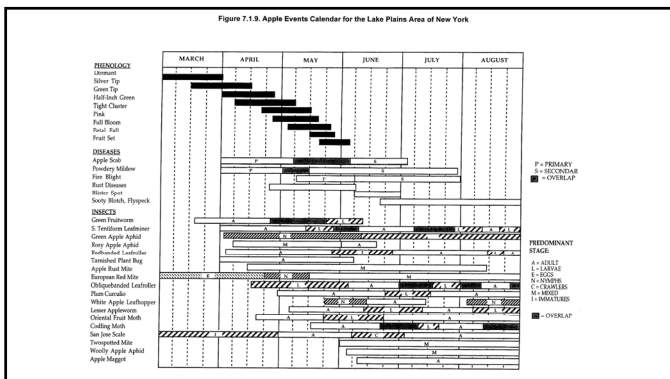
---

---

---

---

---



66

---

---

---

---

---

---

---

---



67

---

---

---

---

---

---

---

---



68

---

---

---

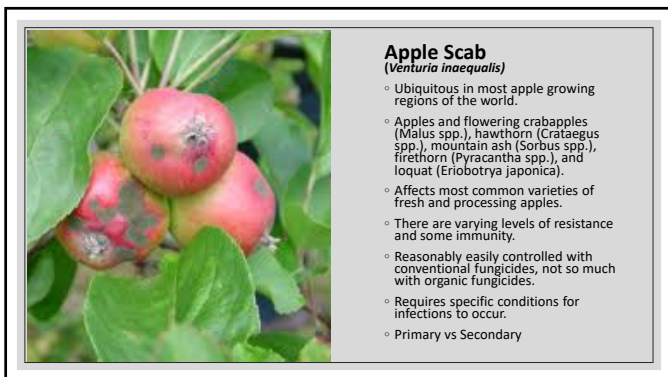
---

---

---

---

---



69

---

---

---

---

---

---

---

---

**CEDAR APPLE RUST**  
*(Gymnosporangium juniperi-virginianae)*



Property of Estate Landscaping LLC

70

---

---

---

---

---

---

---

---

**POWDERY MILDEW**  
*(Podosphaera leucotricha)*



71

---

---

---

---

---

---

---

---



**INSECTS**

72

---

---

---


---

---

---

---

---



**Common Apple Pests**

- European Red Mite
- Aphids – RAA, GAA, WAA
- Oriental Fruit Moth
- European Apple SAWfly
- Plum Curculio
- Codling Moth
- Obliquebanded Leafroller
- Apple Maggot
- Japanese Beetle
- Blackstem Borer
- Dogwood Borer

73

---

---

---

---


---

---

---

---

**European Red Mite** (*Panonychus ulmi*)



74

---

---

---

---


---

---

---

---

**Aphids**



Green ↑

Rosy ↓

Woolly ↑

75

---

---

---

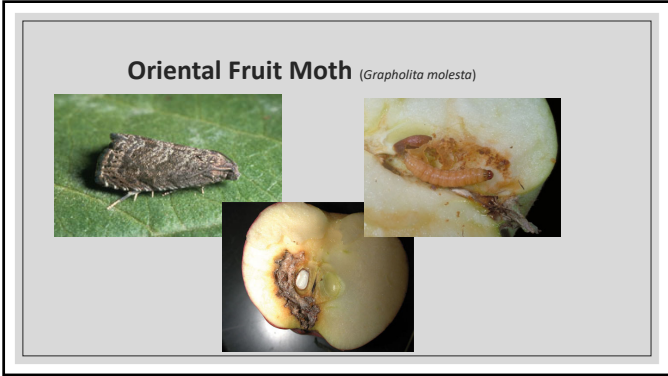
---

---

---

---

---



76

---

---

---

---

---

---

---

---



77

---

---

---

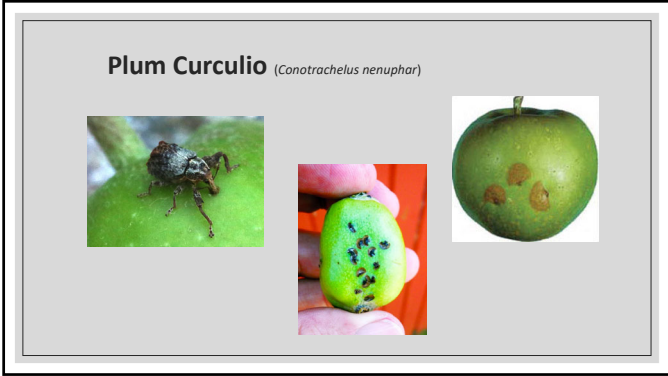
---

---

---

---

---



78

---

---

---

---

---

---

---

---





82

---

---

---

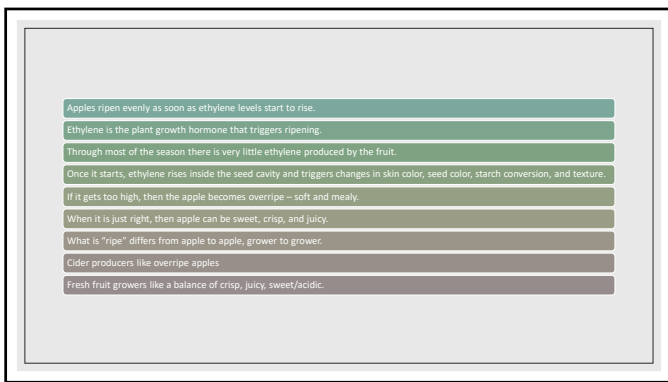
---

---

---

---

---



83

---

---

---

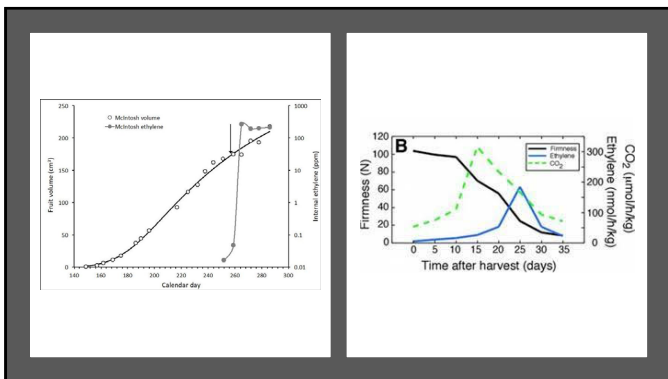
---

---

---

---

---



84

---

---

---

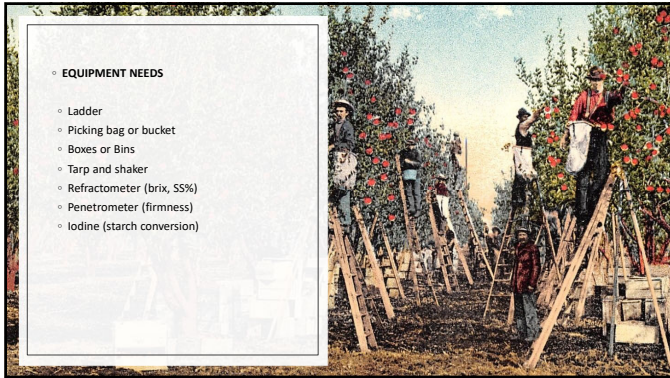
---

---

---

---

---



85

---

---

---

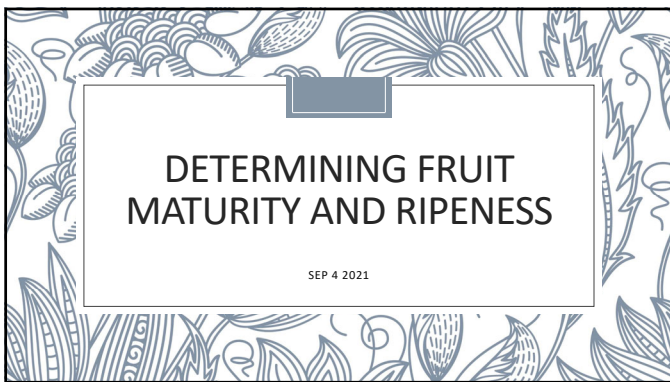
---

---

---

---

---



86

---

---

---

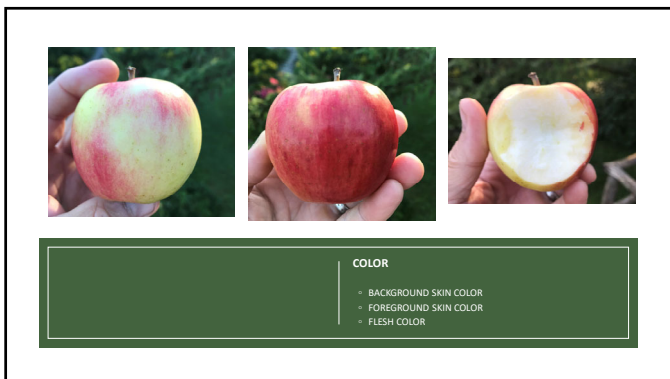
---

---

---

---

---



87

---

---

---

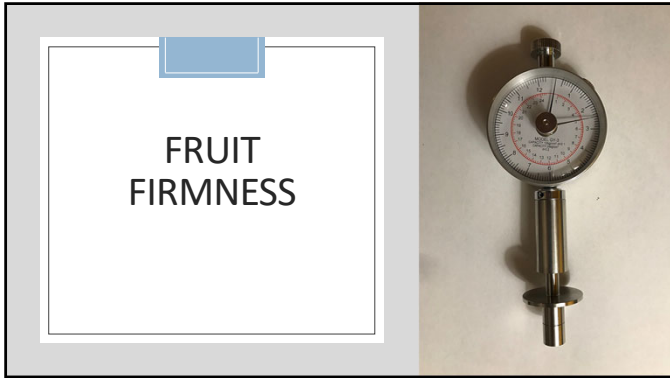
---

---

---

---

---



88

---

---

---

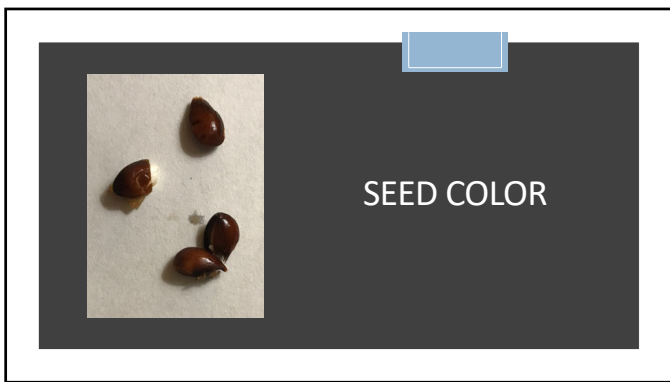
---

---

---

---

---



89

---

---

---

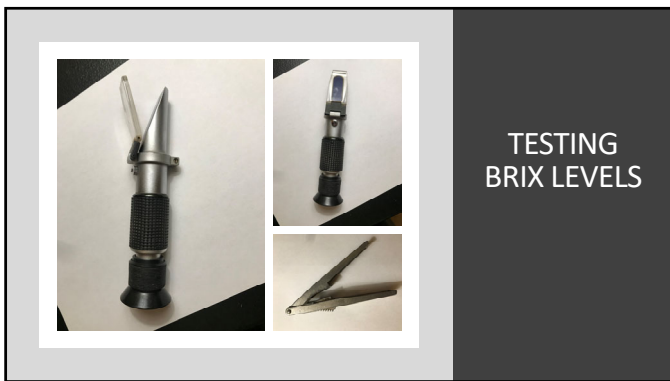
---

---

---

---

---



90

---

---

---

---

---

---

---

---



STARCH IODINE

91

---

---

---

---

---

---

---

---

---

---

Cornell University  
Cooperative Extension

### Generic Starch-Iodine Index Chart for Apples

**A** simple procedure is available to determine the starch content of apples. This procedure is based on the reaction of iodine with starch. The iodine solution is applied to the cut surface of the apple core. The color of the iodine-starch complex is compared to the color of the iodine solution. The starch content is determined by comparing the color of the iodine-starch complex to the color of the iodine solution.

**Preparation of Iodine Solution**

1. Dissolve 10 grams of potassium iodide in 100 ml of distilled water in a glass container.
2. Add 2 grams of potassium dichromate to the solution.
3. Dilute the solution to 1 liter with distilled water.

**Starch-Iodine Index Chart**

The following index can be used to determine the starch content of apples. The index is based on the color of the iodine-starch complex. The index ranges from 100% (dark blue) to 0% (yellow).

**Procedure**

1. Cut the apple into four equal parts.
2. Remove the core and cut the core into four equal parts.
3. Apply the iodine solution to the cut surface of the core.
4. Compare the color of the iodine-starch complex to the color of the iodine solution.
5. Determine the starch content of the apple based on the index chart.

**Starch-Iodine Index Chart**

100%	50%	0%	100%	80%	60%	40%	20%	0%	
1	2	3	4	5	6	7	8		
core stain			starch-iodine index						
			fresh stain						

92

---

---

---

---

---

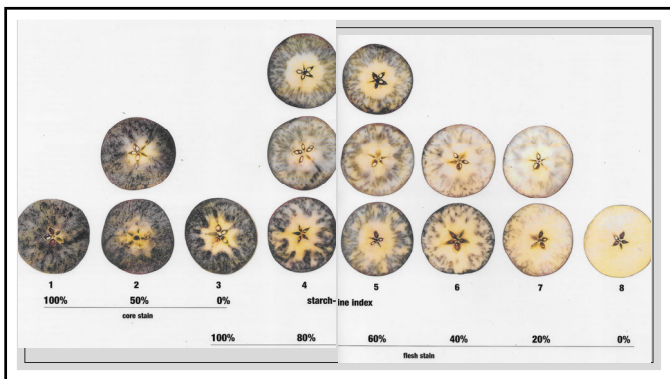
---

---

---

---

---



93

---

---

---

---

---

---

---

---

---

---

**FRUIT STORAGE**

- The best way to store fruit is in a cool, dark room with adequate humidity to keep the apples from dehydrating over the winter.
- The ideal temperature range is 34-36F
- When picked and stored properly they can last for 3-6 months quite nicely.
- But....not all apples store the same.
- If you are a cider enthusiast, you probably prefer riper apples and will press them within a few weeks of harvest.
- Sweating apples is a good way to reduce water and concentrate flavors and sugars.
- Sweating involves setting apples out in an ambient environment for a few days or weeks.

94

---

---

---

---

---

---

---

---

**EDUCATE YOURSELF**

95

---

---

---

---

---

---

---

---

- Conferences
- Online Learning
- Goodfruit Grower
- Fruit Grower News
- Malus
- Holistic Orchard Network
- Books
- Employment & Internship Opportunities

**Know Your Roots LLC – 2022 Webinar Series!**

96

---

---

---

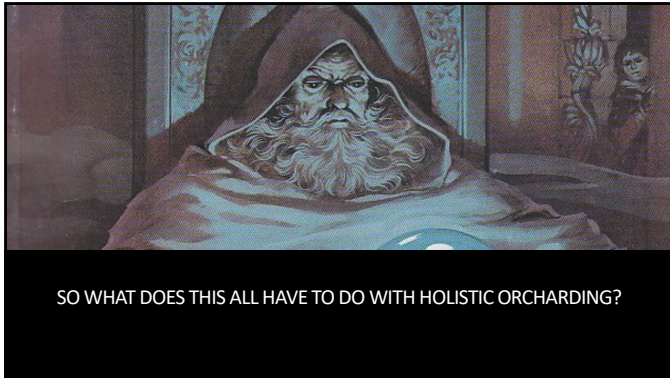
---

---

---

---

---



97

---

---

---


---

---

---

---

---



**BIODYNAMIC ORCHARDLING WORKSHOP**  
SATURDAY MARCH 12TH 2022 8AM - 5PM  
LOCATION: JPI FARM IN FLOYD, VA

WITH JPI BOARD PRESIDENT MIKE BELTOSH OF KNOW YOUR ROOTS

**JOIN JPI FOR A DAY OF BIODYNAMIC ORCHARDLING INSTRUCTION!**

- ORCHARD NUTRITION
- PRUNING
- CROP LEAD MANAGEMENT
- INSECT AND DISEASE MANAGEMENT
- PRACTICAL GRAFTING EXPERIENCE

**KNOW YOUR ROOTS UPDATES**

- We are currently in the process of cataloging commercial biological sprays and updating our **Biointensive Spray Guidelines**.
- **Holistic Orchard Webinar Series** - 16 seminars, starting Feb 19. [www.knowyourroots.com](http://www.knowyourroots.com)
- **Biodynamic Orchardling** – Josephine Porter Institute, Floyd, VA – March 12
- eNewsletter – available by subscription
- Volunteer, Inter, Employment, and Learning Opportunities. **Sign up today!**

98

---

---

---

---

---

---

---

---

**Holistic and Biodynamic Pomology**  
**An Orchard is More Than Just the Sum of Its Parts**

This 16-course series covers almost all aspects of holistic orchard stewardship for any apple grower, but with an organic and cosmic flavor.

The focus is "what's happening" in your orchard throughout the year.

There is a FREE introductory session on Feb 19 where you can learn more about this course before committing. Email [mike@knowyourroots.com](mailto:mike@knowyourroots.com) to register.

Each webinar is 2 hours long including Q&A and highlights intensive biodynamic and holistic insights. Registrants from the 2021 series receive 20% off registration for the 2022 webinar series.

For more information and to register, go to <http://knowyourroots.com/orchard-classes2.html>. Email [mike@knowyourroots.com](mailto:mike@knowyourroots.com) with questions.

**KNOW YOUR ROOTS UPDATES**

- We are currently in the process of cataloging commercial biological sprays and updating our **Biointensive Spray Guidelines**.
- **Holistic Orchard Webinar Series** - 16 seminars, starting Feb 19. [www.knowyourroots.com](http://www.knowyourroots.com)
- **Biodynamic Orchardling** – Josephine Porter Institute, Floyd, VA – March 12
- eNewsletter – available by subscription
- Volunteer, Inter, Employment, and Learning Opportunities. **Sign up today!**

99

---

---

---

---

---

---

---

---



Mike Biltonen  
Know Your Roots, LLC  
[www.knowyourroots.com](http://www.knowyourroots.com)  
845-674-5124  
[mike@knowyourroots.com](mailto:mike@knowyourroots.com)

---

---

---

---

---

---

---