Master Gardener
Fruit Trees in the Home Garden
M. Elena Garcia Ph.D.

Fruit Trees
- Growing fruit trees in the home garden
- Pruning and training

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Fruit Trees

Why?

Important factors for successful fruit production

- Site selection
- Variety and rootstock
- Proper planting
- Adequate fertility
- Pruning and training
- Pest management

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Site Selection

- Survey
- Soil conditions
- Sun exposure
- Available space
- Frost pockets

Make a Map!!

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Site selection

- Soil conditions
  - Ideal soil for most tree fruits
    - slightly acidic
    - well drained
    - medium loam

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Site selection

- Soil Conditions
  - pH
    - Range 6.0-6.5
    - Availability of elements
  - Test your soil pH before planting

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Soil Conditions

Problems:

- < 5.3
  - Bark measles due to excess Mn
  - Ca and Mg deficiencies become more acute
  - N and K become less available
  - Al can build up to become toxic

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Soil Conditions

Problems:

- > 6.5
  - B, Cu, Mn, Zn, and Fe uptake seriously reduced

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Site selection

- Soil fertility
  - Soil amendments
    - peat moss, lime, organic matter, or mineral elements

Site selection

- Soil conditions
  - Drainage
  - Soil type
    - clay
    - sandy
    - hardpan
  - Best soil: Sandy loam
Planting Site

- Sun exposure
- Row orientation
- North-south best

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### Space Requirements, Yield, Bearing Age, and Life Expectancy of Tree Fruits

<table>
<thead>
<tr>
<th>FRUIT</th>
<th>Minimum Distance Between Plants</th>
<th>Approximately Yield per Plant (Bushels)</th>
<th>Bearing Age</th>
<th>Life Expectancy (Years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apples (standard)</td>
<td>30</td>
<td>8</td>
<td>6 to 10</td>
<td>35 +</td>
</tr>
<tr>
<td>Apple (semidwarf)</td>
<td>15</td>
<td>4</td>
<td>4 to 6</td>
<td>20 to 25</td>
</tr>
<tr>
<td>Apple (dwarf)</td>
<td>10</td>
<td>1</td>
<td>2 to 3</td>
<td>15 to 20</td>
</tr>
<tr>
<td>Pear (standard)</td>
<td>25</td>
<td>3</td>
<td>5 to 8</td>
<td>35 to 45</td>
</tr>
<tr>
<td>Pear (Semidwarf)</td>
<td>15</td>
<td>1-2</td>
<td>4 to 6</td>
<td>20 to 25</td>
</tr>
<tr>
<td>Peach</td>
<td>15</td>
<td>4</td>
<td>3 to 4</td>
<td>15 to 20</td>
</tr>
<tr>
<td>Plum</td>
<td>18</td>
<td>2</td>
<td>4 to 5</td>
<td>15 to 20</td>
</tr>
<tr>
<td>Cherry</td>
<td>20</td>
<td>60 qt.</td>
<td>4 to 5</td>
<td>15 to 20</td>
</tr>
</tbody>
</table>
**Planting Site**

- **Slope**
  - A 4 to 8% slope is ideal.
  - A steeper than 10% slope may make it difficult to operate machinery.
  - Avoid areas at the bottom of the hill where cold air settles and frost pockets form.

**Variety and Rootstock**

- **Large selection**
  - Apples ~10,000 cultivars
- **Questions to consider**
  - Uses
  - Maturity
  - Storage
Cultivars and Rootstocks

- Most commercially sold fruit trees consist of two parts:
  - Scion
  - Rootstock

Why are most fruit trees grafted?
- Most are open pollinated
- genetic variability
- To get certain characteristics
Cultivar and Rootstock

- What to look for in a cultivar
  - Type and use for fruit
  - Disease resistance
  - Type of tree
  - Cold hardiness
  - Pollination

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Commonly used apple cultivars

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Color</th>
<th>Harvest</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>McIntosh</td>
<td>Red</td>
<td>Mid-Sept</td>
<td>Fresh, dessert</td>
</tr>
<tr>
<td>Delicious</td>
<td>Red</td>
<td>2 weeks after Mc’s</td>
<td>Fresh</td>
</tr>
<tr>
<td>Northern Spy</td>
<td>Red</td>
<td>20 days after Mc’s</td>
<td>Cooking Mc’s</td>
</tr>
</tbody>
</table>

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Disease Resistant Cultivars

- Resistance cultivars
- Apple scab resistance
  - have varying degrees of resistance to other diseases
- [http://orchard.uvm.edu/uvmapple/hort/cultivars/](http://orchard.uvm.edu/uvmapple/hort/cultivars/)
  - Liberty, Redfree, Novamac, Jonafree
  - Williams Pride
- Fireblight resistance in pears
- Bacterial spot resistance in peaches

Cultivars

- [http://orchard.uvm.edu/uvmapple/hort/cultivars/index.htm](http://orchard.uvm.edu/uvmapple/hort/cultivars/index.htm)
- Cultivars for Vermont
Cultivars and rootstocks

- What to look for in a rootstock
  - Hardiness
  - Soil type adaptability
  - Pest resistance
  - Overall tree size
    - standard
    - semidwarf
    - dwarf

Rootstocks

Mark
M. 9
M. 7
M. 26
MM. 106
M. 111
Seedling

8-9 ft
>15 ft

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Rootstocks for Cherries

GI-5        GI-7            GI-6      Mazzard
GI-148-2  GI-148-8

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Rootstocks

http://orchard.uvm.edu/uvmapple/hort/rootstocks/index1.htm

Rootstocks for Vermont

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Proper planting

- **When to plant?**
  - **Spring**
    - If trees are bare-root
    - Late April or May
  - **Fall**
    - If trees are in containers

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Proper planting

- Never let the roots dry out
  - Soak roots of bare-root trees 1-3 hrs before planting
- Hole should twice as large as the root system
- If putting any soil amendment, mix with soil that will be used to refill the hole

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Proper planting

- Prune roots
- Graft union should be 2”-3” above the soil line
- Pack the soil gently, but firmly
- Stake dwarf trees
- Place mouse guard at base of tree
- “Head back” to about 36” tall

Mineral nutrition

- Nitrogen
- Potassium
- Calcium
- Magnesium
- Boron
- Phosphorous
- Manganese
- Copper
- Iron
- Zinc
Adequate Fertility

- Major nutrients for growth are nitrogen, phosphorous, and potassium (N-P-K)
- As a rule, no fertilizer at planting time
- Soil preparation should be done in Fall before planting

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Adequate Fertility

- After growth begins
  - 1/2lb of a 16% or 20% nitrate fertilizer
  - 8-10 inches from tree trunk
- AVOID OVER FERTILIZATION!!

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Adequate Fertility

- For one year old and older trees
  - When growth begins, 1/2lb of 10-10-10/ age of tree
  - In a band or a circle at least 18 inches from the trunk
  - No fertilizers after June

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Fertility

- Calcium deficiency

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Fertility

- Zn deficiency

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Fertility

- Mg deficiencies

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Fertility

- Boron deficiency
- Boron toxicity

Fruiting Trees

- Pollination
- Most fruit trees are not self-fertile
  - cross-pollination
- Cultivars' bloom period should coincide
- Tetraploid apple cultivars such as Mutsu produce sterile pollen
- Honey bees are the primary pollinators
Pollination charts are available in most nursery catalogs

Fruit Thinning

- Removing some of the developing fruit
  - To provide top quality, full-sized fruit
  - To ensure good return bloom the following year
- Time of thinning depends on the time of flower initiation according to the species

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# Time of flower initiation of some deciduous fruits

<table>
<thead>
<tr>
<th>Fruit</th>
<th>Initiation</th>
<th>Flowers borne on</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peach</td>
<td>Late June-</td>
<td>Lateral buds, 1 yr.</td>
</tr>
<tr>
<td>Apricot</td>
<td>Early Aug</td>
<td>Lateral buds, 1 yr.</td>
</tr>
<tr>
<td>Cherry (swt)</td>
<td>Early July</td>
<td>Lateral buds, 2 yr. spurs</td>
</tr>
<tr>
<td>Cherry sour</td>
<td>Mid-July</td>
<td>Lateral buds, 2 yr. spurs</td>
</tr>
<tr>
<td>Apple</td>
<td>Mid-June-mid-July</td>
<td>Terminal buds.</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>FRUIT</th>
<th>TYPE OF BUD</th>
<th>FLOWER BUD LOC AND TYPE</th>
<th>INFLORESCENCE</th>
<th>FLOWER NUMBE R</th>
<th>TIME OF FLOWER INITIATION</th>
<th>CHARC. 1ST YEAR WOOD</th>
<th>CHARC. 2SN YEAR WOOD</th>
<th>CHARC. 3RD YEAR WOOD</th>
<th>WOOD PRODUCTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple</td>
<td>Vegetative and mixed</td>
<td>Terminal epigynous</td>
<td>Determinate</td>
<td>5</td>
<td>Early summer</td>
<td>Where buds are attached</td>
<td>Will initiate flower buds for next season</td>
<td>Where fruit is found</td>
<td>Youngest wood most productive</td>
</tr>
<tr>
<td>Pear</td>
<td>Vegetative and mixed</td>
<td>Terminal epigynous</td>
<td>Indeterminate</td>
<td>7-8</td>
<td>60 days past full bloom</td>
<td>Similar to apple</td>
<td>Similar to apple</td>
<td>Similar to apple</td>
<td>Similar to apple</td>
</tr>
<tr>
<td>Peach</td>
<td>Unmixed</td>
<td>Lateral epigynous</td>
<td>Solitary</td>
<td>1</td>
<td>Midsummer</td>
<td>Where fruit is located</td>
<td>Interior flower buds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cherry</td>
<td>Unmixed clusters</td>
<td>Lateral epigynous</td>
<td>Cluster</td>
<td>2-4</td>
<td>July, after crop is harvested</td>
<td>Sweet Cherry-spurs. Sour cherry-long shoots</td>
<td>Sweet Cherry- best spars. Sour cherry</td>
<td>Long productivity 10-15 years in sweet cherry</td>
<td></td>
</tr>
<tr>
<td>Plum</td>
<td>Unmixed</td>
<td>Lateral perigynous</td>
<td>1-3 flowers/ bud</td>
<td>1-3</td>
<td>Mid to late summer</td>
<td>Most vigorous spurs. Fruit production</td>
<td></td>
<td>Similar to apple, spurs older than 4 years may die</td>
<td></td>
</tr>
</tbody>
</table>

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Fruit Thinning

- How to thin apples
  - As early as possible after bloom
  - Use small hand pruners
  - Cut off the young fruit by their stems
  - Leave the largest fruit
  - Fruit should be 4-6 inches apart
- Goal: Keep the “king” fruit
- June drop

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Fruit Thinning

As a general rule for apples, 18 leaves are necessary for one apple to develop satisfactorily

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Harvesting

- Apples are matured
  - Stems separate easily from spur
  - Seeds are brown

Storage tips for apple

- Generally early cultivars do not store well
- Storage tips
  - Pick apples when slightly green
  - Only blemish-free fruit
  - Cool as soon as possible
  - High humidity
  - 32°F-35°F
Apple bud stages

Dormant (D)

Silver Tip (TP)

Green Tip (GT)

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Apple bud Stages (Cont.)

Half inch Green (HIG)  Tight Cluster (TC)  Pink (P)

Apple bud stages

Full Bloom (FB)  Petal Fall (PF)  Fruit Set (FS)

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Goals for training and pruning include:

- Producing a supporting framework for the tree
- Allowing annual flower formation
- Developing a tree which allows maximum fruit growth and quality development
- Ease of management

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Pruning Equipment

Keep Sharp!

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Parts of a Fruit Tree

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Light Penetration

Light penetration into the canopy of a large tree

Effective light penetration into an unrestricted canopy is ~ 1 m

% of full radiation needed for various quality factors in apples

<table>
<thead>
<tr>
<th>Character</th>
<th>Satisfactory development</th>
<th>Unsatisfactory development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruit size</td>
<td>&gt;50%</td>
<td>&lt;50%</td>
</tr>
<tr>
<td>Red color</td>
<td>&gt;70%</td>
<td>&lt;40%</td>
</tr>
<tr>
<td>Spur development</td>
<td>&gt;30%</td>
<td>&lt;25%</td>
</tr>
</tbody>
</table>

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Pruning and training

Balancing Act

Vegetative  Fruiting

Vertical View
Showing Desired Distribution of Scaffolds

…needs to be developed during years 1-3 of training

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Light Penetration

Types of Pruning Cuts

- heading back
- thinning out
Pruning

Heading back cuts

- Removal of a part of a shoot or branch
  - It removes terminal buds
  - Apical dominance is weakened or lost
  - Physiological effects
- Net result: increase in total shoot growth

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Pruning
Thinning cuts

- Removal of an entire shoot or branch at its junction with the trunk
- Ratio of terminal to lateral buds is not disturbed
  - Less physiological changes
- Net result: It does not increase shoot growth as much as heading cuts

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MODIFIED CENTRAL LEADER System

...at planting

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MODIFIED CENTRAL LEADER (cont.)

...2nd and 3rd year dormant pruning

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Before and After

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Branch Spreading

- promotes strong crotch angles
- promotes early bearing
- reduces scaffold vigor

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Pruning Bearing Fruit Trees

- annual necessary
- dead, damaged branches
- water sprouts
- weak, drooping wood
- crossing-over
- thin out to increase light

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Lowering the Height of a Neglected Tree

Removing Undesired Interior Branches from a Neglected Tree
Reducing the Breadth of a Neglected Tree

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Excessive branching as a result of the removal of the central leader

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Large tree with good light penetration

Pest Management

Best Defense

- Horticultural Management
  - Proper nutrition
  - Water
  - Pruning

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Tools of pest management

- Cultural methods
- Mechanical
- Biological
- Chemical

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Tools of Pest Management

- Cultural Methods
  - Crop refuse destruction
  - Pruning
  - Water management
  - Nutrition

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Pest Management

- Sanitation
- Pruning
- Rake leaves
- Remove fallen fruit

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Thank You

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