Major tree fruit crops that can be grown in New Jersey

<table>
<thead>
<tr>
<th>Level of Difficulty</th>
<th>Crops</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low (after establishment)</td>
<td>Pawpaw (a NJ native plant)</td>
</tr>
<tr>
<td>Moderate</td>
<td>Pear, Sour Cherry</td>
</tr>
<tr>
<td>High</td>
<td>Peach, Plum, Apple</td>
</tr>
<tr>
<td>Very high</td>
<td>Apricot, Nectarine, Sweet Cherry</td>
</tr>
</tbody>
</table>
Factors to consider when growing tree fruit

- Site Selection
- Variety Selection
- Pollination
- Rootstock
- Spacing
- Transplanting
- Fertilization
- Pruning/Training
- Thinning
- Pest Control
- Harvesting
- Fruit Storage
Site selection

1. Plant in an area protected from strong winds.
2. Avoid low lying frost pockets.
3. Tree fruit on sites with good air drainage will be less subject to cold damage.
4. Plant on sites with deep, well-drained soils, for a healthy root system.
It is important to identify the best sites on a property.
Variety selection

- Consider planting disease resistant varieties.
- Early maturing varieties will have fewer disease and insect problems.
- Plant 3 or more varieties so that you can have ripe fruit throughout the season.
- Be sure you like the taste of the varieties that you grow!
# Apple scab resistant cultivars recommended for NJ

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Ripening Season</th>
<th>Bloom Season</th>
<th>Mildew</th>
<th>Rust</th>
<th>Fire Blight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pristine</td>
<td>Early</td>
<td>Early</td>
<td>HR</td>
<td>R</td>
<td>R</td>
</tr>
<tr>
<td>Redfree</td>
<td>Early</td>
<td>Mid</td>
<td>MR</td>
<td>R</td>
<td>R</td>
</tr>
<tr>
<td>Jonafree</td>
<td>Mid</td>
<td>Mid</td>
<td>SR</td>
<td>SR</td>
<td>SR</td>
</tr>
<tr>
<td>Liberty</td>
<td>Mid</td>
<td>Mid</td>
<td>MR</td>
<td>HR</td>
<td>HR</td>
</tr>
<tr>
<td>Enterprise</td>
<td>Late</td>
<td>Mid-Late</td>
<td>MR</td>
<td>HR</td>
<td>HR</td>
</tr>
<tr>
<td>Sundance</td>
<td>Late</td>
<td>Mid-Late</td>
<td>SR</td>
<td>HR</td>
<td>HR</td>
</tr>
<tr>
<td>Goldrush</td>
<td>Late</td>
<td>Late</td>
<td>MR</td>
<td>S</td>
<td>HR</td>
</tr>
</tbody>
</table>

Key: HR *highly resistant*, R *resistant*, SR *slightly resistant*, S *susceptible*
Pollination

- Apples, pears, sweet cherries, pawpaw and many plums require cross pollination with a different variety for good fruit set.
- Plant two or more different varieties that tend to bloom at the same time.
- Triploid varieties do not make good pollen.
- Planting very early and late blooming varieties may not provide good pollination.
Rootstocks and spacing

- Some fruit trees can be grafted onto a variety of rootstocks to control tree size.
- Trees on dwarfing rootstocks can be planted closer, but require staking.
- Dwarfing rootstocks will come into bearing much sooner, usually after 2-3 years.
- Many dwarfing apple rootstocks are susceptible to fire blight.
Several apple rootstocks that are available
# Apple rootstock characteristics

<table>
<thead>
<tr>
<th>Rootstock</th>
<th>% Size</th>
<th>Spacing (ft)</th>
<th>Anchorage</th>
<th>1st fruit (yrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seeding</td>
<td>100</td>
<td>16-22</td>
<td>Excellent</td>
<td>6-10</td>
</tr>
<tr>
<td>MM.111</td>
<td>85</td>
<td>14-18</td>
<td>Excellent</td>
<td>4-6</td>
</tr>
<tr>
<td>MM.106</td>
<td>80</td>
<td>12-16</td>
<td>Excellent</td>
<td>3-4</td>
</tr>
<tr>
<td>M.7a</td>
<td>70</td>
<td>10-14</td>
<td>Fair</td>
<td>3-4</td>
</tr>
<tr>
<td>M.26</td>
<td>50</td>
<td>8-12</td>
<td>Poor</td>
<td>2-4</td>
</tr>
<tr>
<td>Mark</td>
<td>35-40</td>
<td>6-10</td>
<td>Fair</td>
<td>2-3</td>
</tr>
<tr>
<td>M.9</td>
<td>35</td>
<td>6-10</td>
<td>Poor</td>
<td>2-3</td>
</tr>
</tbody>
</table>
When to plant

3 Bare root trees should be planted in the spring (April) while the trees are still dormant.

3 Ball and burlap trees should be planted in the spring (April) while the trees are still dormant or in the fall.

3 Container stock can be planted at any time, but will do best if planted in the fall or early spring when the tree is still dormant.
Soil preparation and transplanting

3 Mix organic matter and other amendments with the soil so that the pH is 6.0-6.5.
3 Dig an irregular hole wider than the root ball, but no deeper than the root ball.
3 If the tree was container grown, carefully spread out the roots.
3 Fill the area around the roots with soil so that the bud union is 2” above the level of the soil.
Details count... Pay attention when you plant. Left, the correct procedure; right, how not to go about it.

- Pruned
- Covered support wire
- Wire slightly slack
- Protective trunk wrap
- Mulch layered 2 to 4 inches deep over root area
- Sloping sides, wider at top than bottom
- Burlap pulled back from top of root ball
- Ropes or wire cut and burlap slashed
- Stake avoids root ball

Right Way

Wrong Way

- Unpruned
- Wire label
- Wire too tight
- Uncovered wire
- Unprotected gaps
- No mulch
- Wire or rope not cut
- Sides too narrow and straight
- Stake driven through root ball
- Burlap left intact

Root ball sits on small mound of firm soil

Hole deeper than root ball; tree can sink even lower
Planting Bare-root Trees

Clip off broken roots. The hole must be wide enough for the roots to spread. Soak the soil after the hole is refilled, make a volcano-shaped mound, then soak again from the top, running water slowly so it sinks in. Mound higher in dense soil, lower in good soil.
Ball and Burlap Planting

Do not jar the rootball or you may damage the tree. After the first layer of fill is pressed down, lay back the burlap and fill again. Soak, make mound, soak again. Protect all newly planted trees from winds or strong sun.

Container Planting

Cans

Remove can before planting

Fiber pots

Leave plant in fiber pot but be sure to cover lip of pot entirely
When planting container stock it is important to loosen outer outer roots.

- **Remove containers before planting.** Even peat pots can interfere with root growth. If the root ball doesn’t slide out, cut the pot and peel it back.

- **Root balls may be so dense that you have to use a knife to begin loosening the mass.** Do this gently, cutting only as absolutely necessary.

- **Circling roots must be loosened before planting.** Try to tease them apart with your fingers, but if the mass is tightly packed, use a knife to begin the untangling.
Planted too deep!
Planted too high!
Planted just right!
Fertilization

3 In the early spring, fertilize the trees with one pound of 5-10-5 the first year under the tree.
3 The second year, apply 2 lbs.
3 The third year, apply 3 lbs.
3 Each year increase the amount of fertilizer applied to a maximum of 15 lbs.
3 For trees on dwarfing rootstocks, adjust the amount of fertilizer accordingly.
## Pounds of fertilizer to apply annually to trees grown in sod

<table>
<thead>
<tr>
<th>Tree Age</th>
<th>5-10-10</th>
<th>10-6-4</th>
<th>20-5-10</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>1-2</td>
<td>0.5-1.0</td>
<td>0.25-0.5</td>
</tr>
<tr>
<td>3-4</td>
<td>3-4</td>
<td>1.5-2.0</td>
<td>0.75-1</td>
</tr>
<tr>
<td>5-6</td>
<td>5-6</td>
<td>2.5-3.0</td>
<td>1.25-1.5</td>
</tr>
<tr>
<td>7-8</td>
<td>7-8</td>
<td>3.5-4.0</td>
<td>1.75-2</td>
</tr>
<tr>
<td>9-10</td>
<td>9-10</td>
<td>4.5-5.0</td>
<td>2.25-2.5</td>
</tr>
<tr>
<td>11-12</td>
<td>11-12</td>
<td>5.5-6.0</td>
<td>2.75-3</td>
</tr>
<tr>
<td>13-14</td>
<td>13-14</td>
<td>6.5-7.0</td>
<td>3.25-3.5</td>
</tr>
</tbody>
</table>
Why is pruning important?

- Control the shape and size of the tree.
- Develop a balanced framework of scaffold limbs.
- Select for strong non-crossing branches with wide crotch angles.
- Maintain tree vigor and reduce crop load.
- Removes dead & diseased branches.
Removing the apical bud promotes branching

PRUNING AND PLANT HORMONES

To prune for maximum production of quality fruit, you need to know how plant hormones, or auxins, regulate plant growth patterns. Auxins made at branch and root tips confer “apical dominance,” inhibiting the growth of other tissue such as buds lower on the limb. If you prune off the tip of the plant, dormant side buds will be free to grow. Each pruning cut you make will affect your plant’s future growth on this invisible but potent hormonal level.

Apical bud produces auxins which inhibit development of lateral buds

Auxins flow downward to lateral buds

Lateral buds dormant thanks to auxins

Apical bud removed

Lateral buds directly below site of removed apical bud lose dormancy

New dominant buds produce auxins that inhibit lower bud growth
Proper pruning cuts promote strong shoots & reduce disease.

Proper cuts protect against diseases: (1) too close to the bud; (2) correct cut; (3) too far above the bud; (4) too long.
Anatomy of a Fruit Tree

Crotch: The angle where branches fork, or where a main limb joins the trunk. Strong crotches are wide angled—45 degrees or more; weak crotches are narrow.

Scaffold: The main limbs branching from the trunk.

Watersprout: A very vigorous shoot from a dormant bud on an old branch. Remove by cutting at the base.

Sucker: A vigorous shoot from the roots or from below the bud union. Cut off at the base.

Choosing the Right Bud
Prune to the lateral bud that will produce the branch you want. An outside bud will usually produce an outside branch. The placement of that bud on the stem points the direction of the new branch.
Heading cuts foliage denser

**Heading Cuts**

Make a slanting cut just beyond a bud.
Thinning cuts promote light penetration and strong growth.

Branches are removed entirely, leaving no buds to grow. Their energy is diverted into remaining branches, which grow more vigorously.
As the tree ages, some larger branches need to be removed.

Large branches must be cut in stages to protect both the tree and the pruner: (1) Make your first cut about 6 inches from the trunk, cutting from the underside to about midway through the limb. (2) Now make a cut from the upper side, 2 to 3 inches from the first to midway through the limb. (3) Make the final cut just beyond the collar of the branch.
Apple and Pear Pruning:
Training to a central leader
(also used with cherries and European plums)
Some terms used in tree fruit training
**Parts of the Branch**

**Terminal Bud:** The fat bud at a branch tip will always grow first and fastest if you leave it. Cut it, and several buds will grow behind it.

**Leaf Bud:** Flattish triangle on the side of a branch. To make one grow, cut just above it. Choose buds pointing outward from the trunk so the growing branch will have space and light.

**Flower Bud:** Plump compared to leaf buds and first to swell in spring. On stone fruits they grow alone or beside leaf buds. On apples and pears they grow with a few leaves.

**Spurs:** Twiglets on apples, pears, plums, and apricots. They grow on older branches, produce fat flower buds, then fruit. Don’t remove them.

**Bud Scar:** A ring on a branch that marks the point where the terminal bud began growing after the dormant season. The line marks the origin of this year’s growth.
Basic anatomy of a central leader tree

- 1st whorl
- 18-24 inch light slot
- 2nd whorl
Pruning and Training (Yr 1)

1. First remove dead and diseased branches.
2. Next remove any crossing branches.
3. Select 3-4 branches around the lower part of the tree to form the lower scaffold limbs.
4. Make a heading cut on the central leader 18-24” from your scaffold limbs to stimulate branching.
Training to a central leader after its 1st season of growth

Make a heading cut on the central leader to stimulate a second whorl of branches

Make thinning cuts to remove weak, competing branches with narrow crotch angles

Select 3 or 4 strong branches with wide crotch angles as your scaffold limbs

Branches should be evenly distributed about the trunk and not opposite each other.
Pruning and training (Yr 2)

1. Again, first remove dead, diseased and crossing branches.
2. Select 3-4 branches about 18-24” from the lower scaffold limbs to form your second whorl of limbs.
3. Prune the tree in the shape of a pine tree to reduce shading on the lower branches.
Training Apple Trees to Develop Strong Branches

When first transplanted, bare-root trees should be headed back to about 2 feet.

During the first growing season, the branches should be carefully spread when they are about 6 inches long.

First growing season  A two-year old apple tree with spreaders
Prune off hangers and crossing branches

**Pruning Apples**

Trim lightly to remove tangled branches or damaged wood. Cut dangling limbs or vertical watersprouts at the base. Head back branch tips to maintain size of older trees. Leave twiggy spurs for fruit production.
As tree ages, excess fruit buds on spurs can be thinned.

**Spur Pruning and Thinning**

You will develop an understanding of spur pruning and thinning as you watch your tree grow: When spurs are too crowded, too many fruits will form; when spurs are too old, buds decline in vitality. Try to thin spurs, either by removing them entirely or by cutting off buds, before they become too crowded. You can thin spurs in late winter or early spring each year.
Peach and Nectarine Pruning:

Training to an open center
(also used with apricots and Japanese plums)
Prune to 30” high at planting

Select 3-4 strong branches between 15-30” high & tip. Remove other branches.
During early summer, remove excess scaffold branches
During early spring the next year prune tree into a vase shape.

Remove diseased branches and cut out any inner vigorous upright shoots.
Video of pruning fruit trees

- Matt Palmer - Utah State University

Link to pruning demonstration (28 min):

Why thin off some of the fruit?

- Excessive crop loads can break limbs.
- Heavy crops will inhibit flower buds from setting for next year’s crop.
- Trees will not have sufficient leaf area to produce large, high-quality fruits.
- Fruit too close together will make pest control difficult.
How to thin the fruit

- Trees should be at least partially thinned just after bloom.
- With apricots, pears, plums and apples, thin to the best single fruit per spur.
- Ideally there should be only one fruit every 6-8 inches, more for small fruited species.
- Earlier thinning will result in the greatest return bloom, highest fruit size and the best fruit quality.
Harvesting

- Peaches, plums, apricots, Asian pears, apples and cherries should be harvested when they reach optimal quality.

- European pears and apples (to be stored) should be picked when mature, but not fully ripe to avoid gritty or mealy texture.
  - fruit should be stored in a refrigerator
  - the fruit will soften after their removal
Fruit storage

1. Fruit should be promptly stored in a refrigerator until ready to be used.
2. With apples, storage-life is a function of the maturity, temperature, and variety.
   - Generally, later ripening varieties store longer than early ripening varieties.
   - Fruit stored at 32°F will store better than at 50°F.
3. Some varieties will shrivel if not stored in perforated plastic bags.
Pest control

- Plant disease resistant cultivars.
- Plant on well-drained sites.
- Fertilize properly to prevent weak or excessive growth.
- Prune properly for air movement and good light penetration.
Pest control (continued)

3 Use proper sanitation.
   - Remove diseased branches and dropped fruit.
   - Rake and bag old leaves where insects and diseases overwinter.
   - Control broadleaf weeds.

3 Use timely chemical sprays according to label instructions.

3 Consider bagging some fruit.
GOOD SANITATION

Keeping your fruit plants clean becomes close to second nature once you discover how good sanitation practices lessen the incidence of pests and diseases.

Twigs and prunings should be disposed of or burned far away from all your fruit plants. They may be carrying pests and diseases that can spread from one species to another.

June drops and many of the small fruits that drop early in the season are infected with pest larvae. Pick them up every other day to interrupt the pests’ life cycles.

Fall leaves and old mulch are probably hosting disease spores that will reinfect the tree next season. Don’t let these layers build up under your trees. Instead, rake them up and spread new mulch.
Dormant oil concentrate

- Applied in spring while trees are dormant to kill over-wintering insects and their eggs.
- Controls scales, spider mites and mealybugs on many fruit and shade trees.
- Always carefully follow label instructions.
All purpose fruit tree spray

- Kills aphids, mealybugs, spider mites, scale, whiteflies and many other insects.
- Controls fungus such as rust, powdery mildew, anthracnose and blight.
- Always carefully follow label instructions.
Neem oil concentrate

- Organic 3 in 1 product for insects, mites and fungus control.
- Shields to prevent germination and penetration of fungal spores on leaf surfaces.
- Always carefully follow label instructions.
All natural disease control

- Made from 100% naturally occurring oils.
- This product controls disease on ornamentals, vegetables, turf, roses, grapes, etc.
- Meets National Organic Program (NOP) standards.
- Always carefully follow label instructions.
Fruit bagging

- Center very young fruit in the top of a zipper sealing sandwich bag.
- Seal & staple top of bag
- Cut small slits at bottom corners to allow water to escape.

Video clip:
http://agbiotvradio.sdstate.edu/vstory.cfm?id=1842
Use white latex paint to protect the trunks of young trees from sunscald.
Protect the trunks of young trees from deer and rodents.
In deer country, you may need to consider more extreme measures.
Diseases and Disorders

Pome Fruits
Apple Scab

- **FUNGUS**
- Most common fungal disease on apple.
- Spray with organic and non organic fungicides.
- Plant resistant varieties.
- Remove dead leaves and fruit in winter.
Fire Blight

- **BACTERIA**
- Most common bacterial disease on apple and pears.
- Spray with copper.
- Plant resistant varieties.
- Reduce tree vigor.
- Remove cankered branches.
Cedar Apple Rust

- **FUNGUS**
- Spray with organic and non organic fungicides
- Plant resistant varieties
- Remove cedars and junipers from area
Japanese Apple Rust

- **FUNGUS**
- Recently reported in the mid-Atlantic states.
- Spray with organic and nonorganic fungicides.
- Plant resistant varieties
- Remove cedars and junipers from area.
Quince Rust

- **FUNGUS**
- Infects fruit of apples and pears.
- Spray with organic and non organic fungicides.
- Plant resistant varieties
- Remove cedars and junipers from area.
Powdery Mildew

- **FUNGUS**
- Infects leaves and fruit of apples and pears.
- Spray with organic and non-organic fungicides.
- Also managed by pruning infected shoots during dormancy.
Sooty Blotch and Flyspeck

1. **FUNGUS**
2. Superficial diseases on the fruit that often occur together.
3. Wiping the apples with a soft cloth will remove most traces of the disease.
Black Rot

FUNGUS

- Infects fruit and leaves of apples and pears.
- Spray with organic and non organic fungicides.
- Remove mummified fruit and prune out cankers.
Bitter or White Rot

- FUNGUS
- Infects fruit of apples and pears.
- Spray with organic and non-organic fungicides.
- Remove mummified fruit and prune out cankers.
Cork Spot and Bitter Pit

- ENVIRONMENTAL DISORDER
- Bitter pit is related to low calcium levels in fruit
- Affects both apples and pears.
- Reduce tree vigor.
Sunburn

- **ENVIRONMENTAL DISORDER**
- Affects both apples and pears.
- Prevent damage by keeping a healthy leaf canopy.
- Paint trunks with whitewash.
Early Season Frost Injury

- ENVIRONMENTAL DISORDER
- Damage to the seed within the fruit may cause the fruit to drop.
- Remaining fruit may be severely deformed.
Diseases and Disorders

Stone Fruits
Bacterial Spot

- **BACTERIA**
- Common bacterial disease on peach nectarines, cherries, apricot and plums.
- Causes leaf loss and fruit damage.
- Best approach is to plant resistant varieties.
Brown Rot

- **FUNGUS**

- Infests flowers, leaves and fruit of most stone fruit crops.

- Spray with organic and non organic fungicides.

- Remove mummified fruit and prune out cankers.
Bacterial Blast and Canker

BACTERIA

- Infects flowers, leaves and vascular system of many stone fruit crops.
- Plant resistant varieties.
- Difficult to control with chemical methods.
Constriction Canker

- **FUNGUS**
- Infects leaf scars in the fall that expand the following season and girdle previous year’s growth.
- Plant resistant varieties and prune out cankers in the summer.
Perennial Canker

- **FUNGUS**
- Infects crotches, pruning wounds and trunk of tree.
- Plant resistant varieties.
- Prune out cankers when possible or remove diseased tissue with knife.
Plum Pox Virus

- Virus
- Infects leaves and fruit of most stone fruit crops often have ring spots.
- Devastating virus of stone fruits.
- Infected and surrounding trees are eradicated.
Tree Fruit Insects and Mites
Major pests of fruit crops

- Oriental fruit moth
- Tufted apple bud moth
- Plum curculio
- Apple maggot
- European apple sawfly
- Codling moth
- Aphids
- San Jose scale
- Thrips
- Spider mites
Oriental Fruit Moth

- Larvae bore into twigs and young shoots and into the center of green and ripening fruit.
- Very difficult to control.
- Spray repeatedly with insecticides or consider fruit bagging.
Tufted Apple Budmoth

- Serious pest of fruit crops in our region.
- Larvae feed on leaves and fruit.
- Good sanitation can reduce pressure.
- Spray with organic and non organic insecticides or consider fruit bagging.
Plum Curculio

- Adults lay eggs in fruit just after bloom leaving crescent-shaped wound.
- Larvae bore into fruit and cause it to rot.
- Adults feed on fruit.
- Spray with insecticides after bloom or consider fruit bagging.
Apple Maggot

1. Female apple maggot fly deposit eggs below the skin of an apple.
2. Larva damaged fruit are not usable.
3. Spray with organic and non-organic insecticides or consider fruit bagging.
European Apple Sawfly

- Adults deposit eggs in apples just after the flower petals fall.
- Larva mines just under skin and creates cavity in the fruit.
- Spray with organic and non organic insecticides or consider fruit bagging.
Codling Moth

- On apples and pears, larvae penetrate the fruit and tunnel to the core.
- Good sanitation can reduce pressure.
- Spray with organic and non-organic insecticides or consider fruit bagging.
Aphids infest fruit crops and may be green, yellow, brown, red, or black.

Low to moderate numbers of leaf-feeding aphids are usually not damaging to fruit trees.

Dormant oil kills overwintering eggs.
San Jose Scale

- Overwinter on trunk and branches of fruit trees.
- Cause blemishes on fruit and high infestations eventually kill fruit trees.
- Dormant oil kills overwintering scale and beneficial insects help to suppress scale.
Thrips

- Tiny insects that feed on tiny fruit.
- Feeding scars enlarge as the fruit grows.
- Thrips can also cause silvering just before nectarines mature.
- Tough to control.
Spider Mites

- Spider mites look like tiny moving dots, sometime associated webs.
- Cause yellow speckling on leaves.
- Best controlled with dormant oil to kill overwintering eggs.
Beneficial insects

Lady beetle larva

Lacewing adult & larva

Syrphid fly larva
Pawpaw - Our native tree fruit

- A slow growing tree that grows to 20 feet.
- Fruit weigh up to 1lb and have a tropical flavor and a custard-like texture.
- Has few if any pests that require control.
- Plant 2 or more varieties for cross pollination.
Contributors and Sources

- Jerome Frecon, Agricultural Agent
- Dean Polk, IPM Fruit Agent
- UC IPM Online
  (Website:http://www.ipm.ucdavis.edu/PMG/menu.homegarden.html)