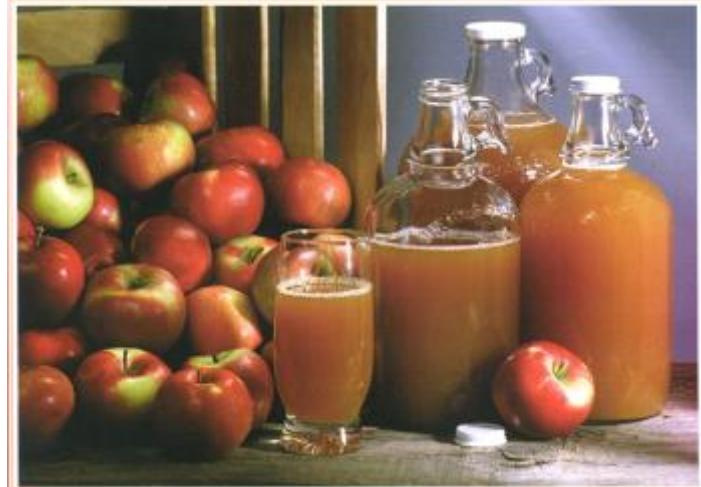


Growing Cider Apples



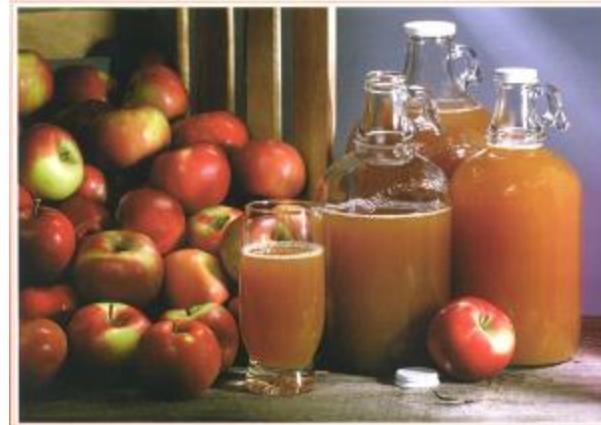
Beginning Farmer Webinar Series

Bob Tritten
District Fruit Educator
Michigan State University Extension



Growing Cider Apples

- This session will focus on growing apples for cider making. Cultural practices, variety selection, storage, and other considerations unique to cider apples will be discussed.



Growing Cider Apples - roadmap for webinar

- General considerations
- Site selection
- Variety selection
- Bloom time considerations
- Pollination
- Rootstock & tree characteristics
- Planting tips
- ~~Pruning systems~~
- Pest considerations
- Sweet cider production
- Hard cider varieties
- Hard cider production
- Questions - all along the way



Growing Cider Apples

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Why raise apples as part of a farming operation?

Because-

- greater offerings to consumers
- you can grow unusual varieties
- can add value with cider
- good demand for 'locally' grown



However-

- the knowledge level may need to be ramped up
- investment in specialized equipment
- greater risks and rewards
- apples take time to ramp up production



Tree fruit versus Small fruit

- Tree fruit – once established may be less work and longer lived than small fruit
- Small fruit – more compact and comes into production more quickly than tree fruit



Michigan is a great place to grow fruit

Michigan's national ranking in fruit crops



- #1 Blueberries, tart cherries,
Niagara grapes
- #3 Apples, Sweet Cherries, Plums
- #6 Peaches
- Other important fruit crops include concord
grapes, wine grapes, brambles, pears,
strawberries



Our Michigan climate is friendly to fruit growing

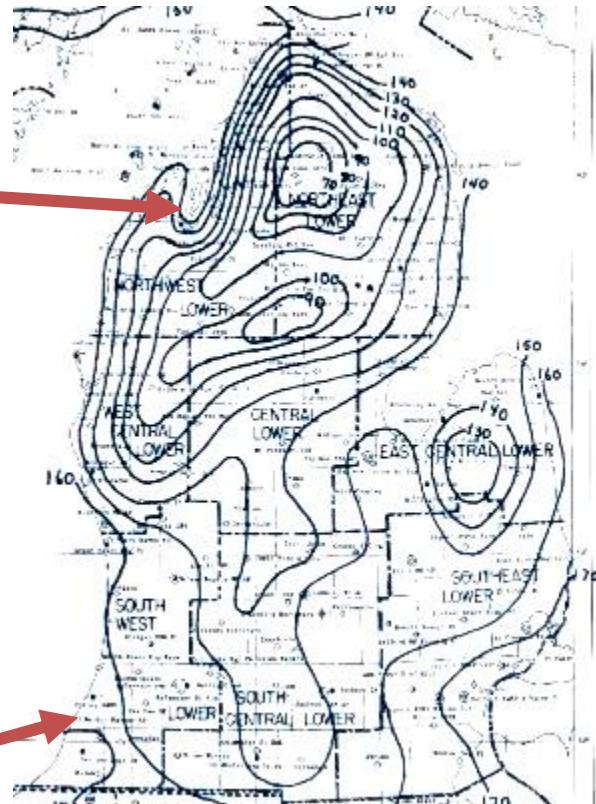
Lake water helps to:

- prevent air temperatures from getting too cold in the midwinter
- prevent warm air temperatures in early spring, thereby delaying bloom



Average number of frost-free days depends on where you are in Michigan

Traverse City area averages 150 frost-free days



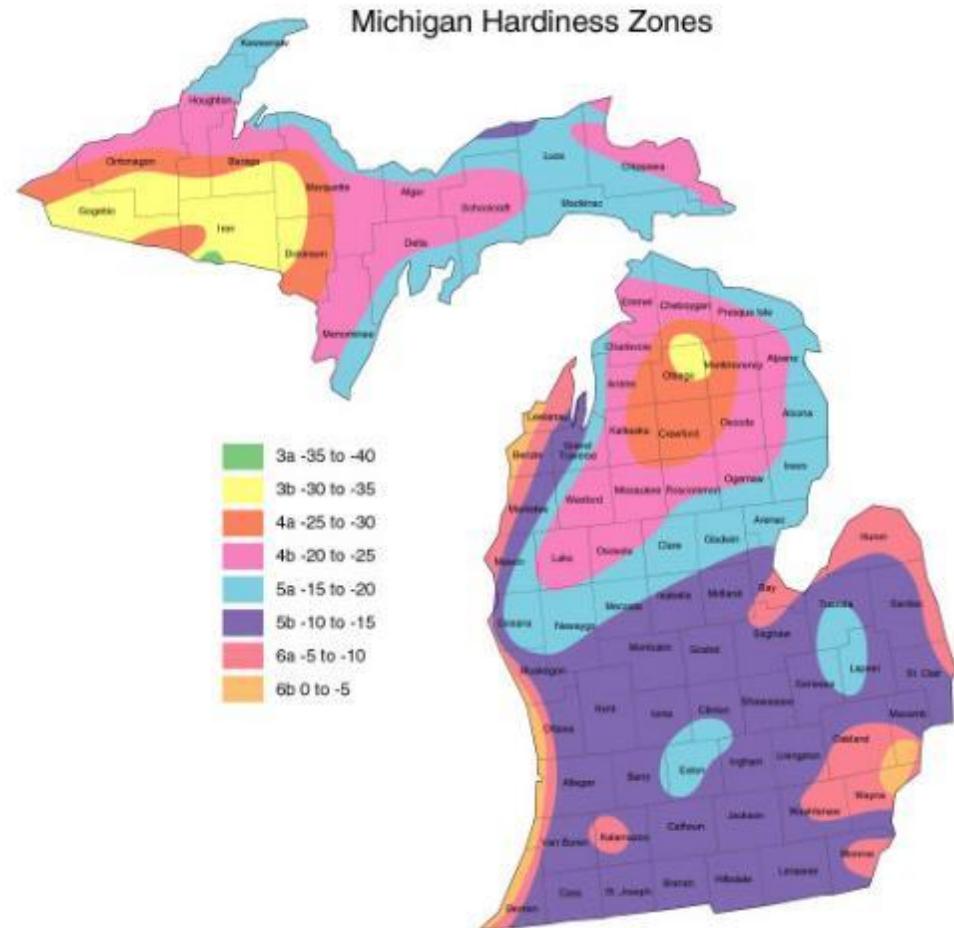
Benton Harbor area averages 170 frost-free days

Variety	Typical SW MI Harvest	Days from bud opening to harvest
Macs	Sept. 8	146
Gala	Sept. 10	148
Red Delicious	Oct. 1	169
Golden Delicious	Oct. 3	171
Fuji	Oct. 15	183

So—the day length in northern regions of Michigan is insufficient for late-ripening varieties in many years

Michigan hardness zones

- Typical winter low temperatures are used to determine hardness zones
- These zones are used in choosing plants that can survive Michigan's winters



source: CropMap – Purdue University

HOWEVER - We also need to be concerned about flower bud hardiness for all of our tree fruit crops and most of our small fruit crops

- The flowering and fruiting is a two year process
- Extreme cold events in fall, winter and spring can injure buds, twigs and tree trunks
- Strawberries and fall red raspberries are the exceptions to this



Cold hardiness, what is it?

- Enables plants to withstand winter cold
- Related to dormancy or winter rest
- Plants gain hardiness in subfreezing conditions
- Plants lose hardiness in warm weather
- Lose cold hardiness much faster than they can regain it



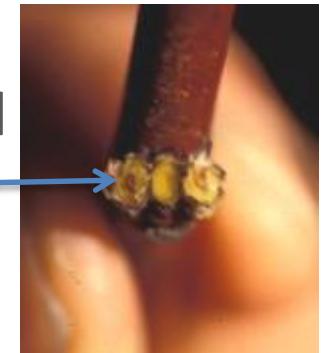
Winter injury - what is it all about? - several types

- Extreme winter cold
- Cold snap following warm weather
 - **Fall** - early hard cold
 - Before plants are acclimated
 - **Winter** - warm up during winter
 - Loss of cold hardiness
 - **Spring** - cold snap after spring warm up
 - Loss of dormancy and cold hardiness

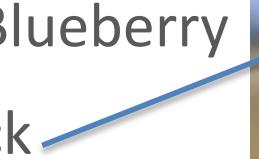


Three levels of cold damage to fruit crops

1st Flower buds - Bud cross section shows brown tissue of dead fruit buds with healthy leaf bud in middle positions



2nd Twig damage - Blueberry shoot tip dieback



3rd Trunk damage - Brown cambial layer under bark



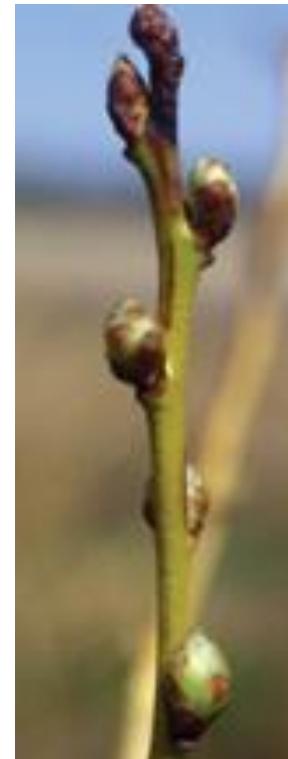
Flower bud damage

- Apparent after thaws
- Slice bud crosswise, cutting deeper with each slice to assess damage to all flowers
- May kill all or some flower buds
- Some buds do not grow in spring, others only partly damaged



Mid-winter hardness levels of flower buds

Fruit type	Critical temp. (F) for flower injury
Apple	-30
Apricot, Pear, Concards	-25
Tart Cherry, E. Plum	-20
Raspberry (summer)	-17
Blueberries	-15
Blackberry	-15
Sweet Cherry, J. Plum	-15
Peach and Nectarine	-13
European Grapes	-8 to -15



Peach trunk splitting due to -19° F temperatures in 1994

We did not have much research or data on the impact of extreme cold to tree trunk and scaffold branches; however....



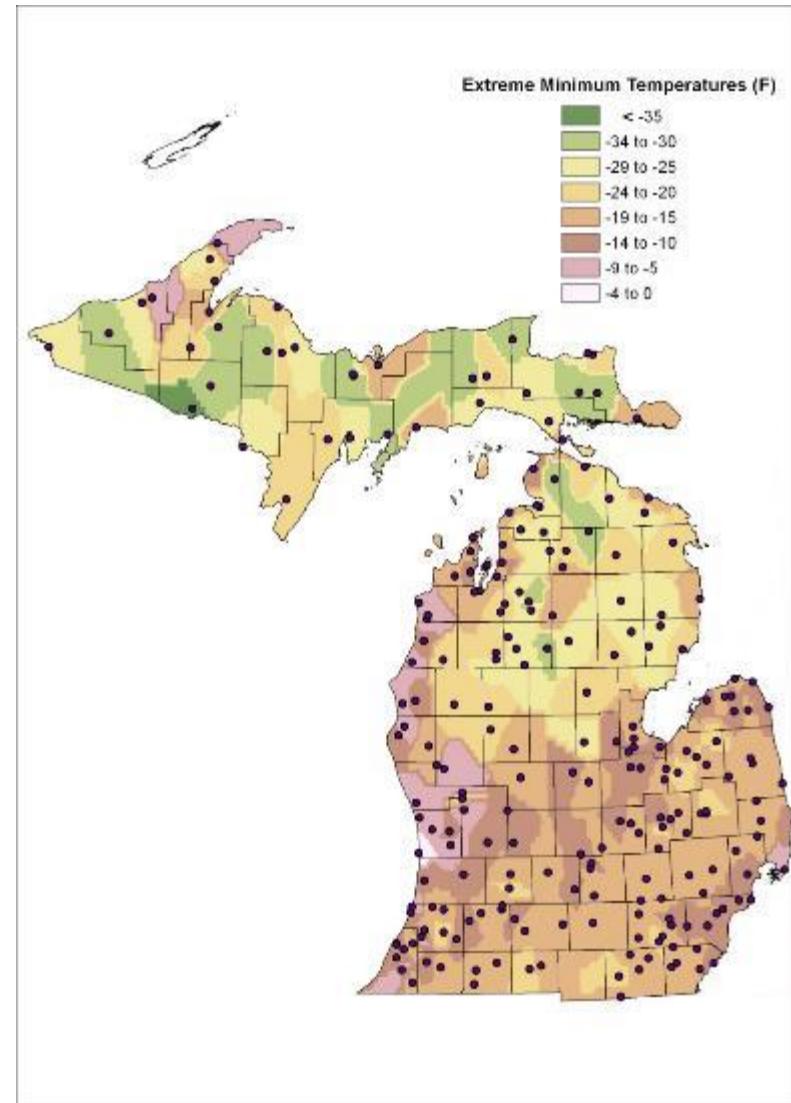
The Winters of
2014 and 2015
-two tough winters
back to back!



A screenshot of a web browser showing the Enviro-weather homepage. The URL in the address bar is "http://www.enviroweather.msu.edu/homeMap.php". The page features a map of Michigan with numerous yellow dots representing weather stations, overlaid on a background of roads and state boundaries. A legend in the top left corner of the map area says "Show magnifier". To the right of the map, there's a sidebar with the heading "Welcome to Enviro-weather!" followed by instructions for using the site and a call to contribute. Below this are logos for Michigan State University Extension and AgBioResearch, and the Project GREEN logo. At the bottom of the page, there's contact information for Enviro-weather, including an email address and a phone number. The overall layout includes a green header bar with the Michigan State University logo and a navigation menu.

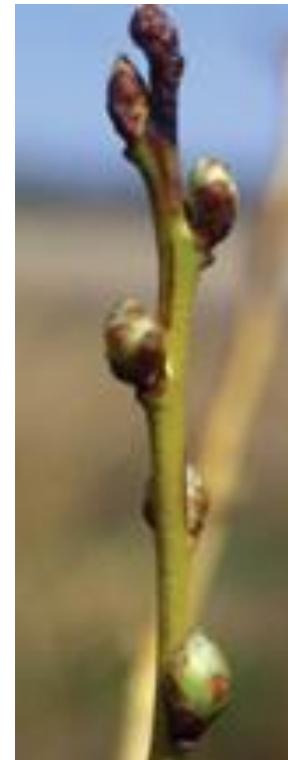
Extreme minimum temperatures for the winter of 2014

Dr. Jeff Andresen
MSU



Mid-winter hardness levels of flower buds

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Tree anatomy and growth characteristics

Some fruit varieties such as Northern Spy and Rome have vigorous growth each year. Spur type varieties such as Red Delicious tend to be smaller trees.

Non-spur type



Spur type



Spur types require less pruning but may “runt out”



Closer view of spur type growth habit

Red Delicious apple



Bartlett pear



Spurs may grow less than an inch per year



Growing Cider Apples

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Site selection for apples

Sunlight requirements

- fruit needs approximately 90% full sun-
 - all day is best

Soil requirements

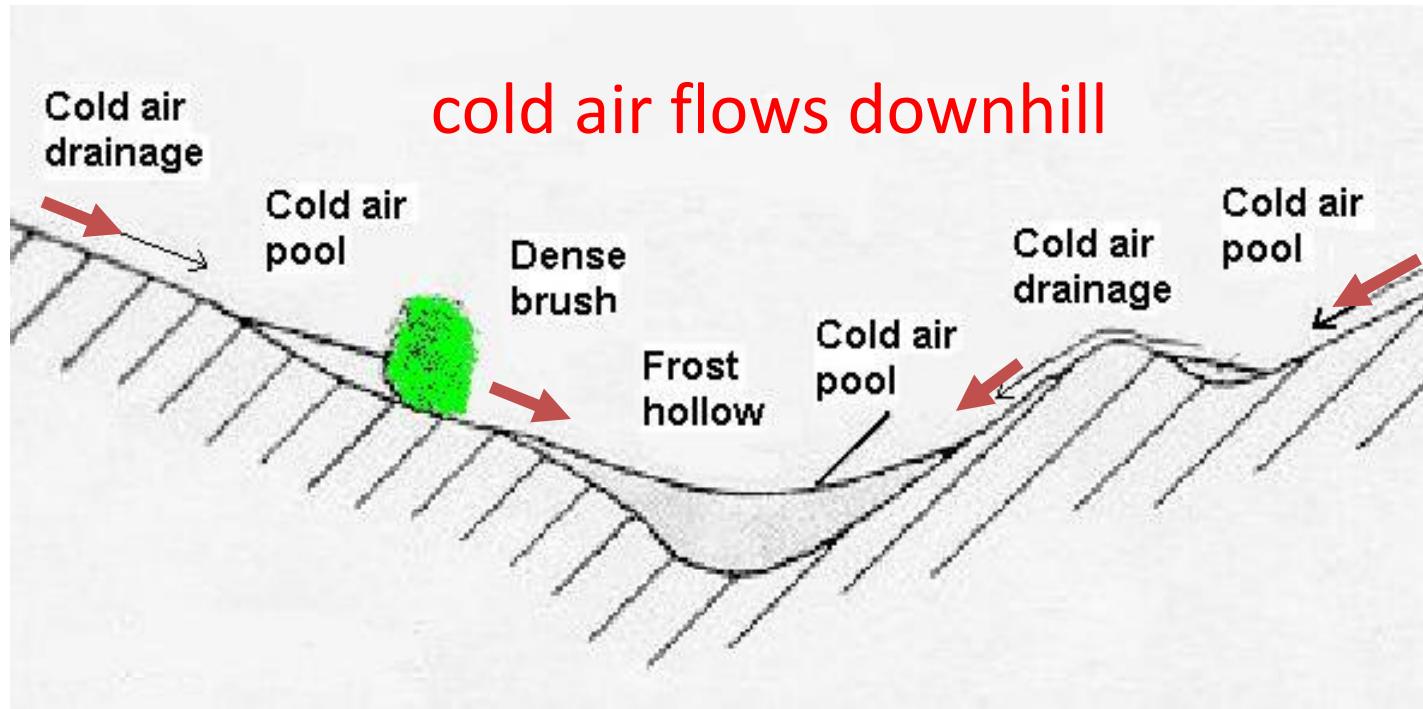
- sandy loam to clay loam
- good water drainage
- soil pH



- for most fruit: soil pH best is 6.2 to 6.8, okay is 5.5 to 7.5.
- blueberries and cranberries require pH below 5.5 and perform best at pH between 4.5 and 5.

Frost pockets

-avoid planting fruit in “frost pockets” that collect cold air under still conditions



Adapted from graphic by Andrew Bootsma, Specialist, Land Resource Research Institute, Agriculture Canada

Tolerance to poorly drained soil

Worst

Peach/Nectarine/Apricot

Strawberry

Cherry, Brambles

Concord grape

Apple/Pear

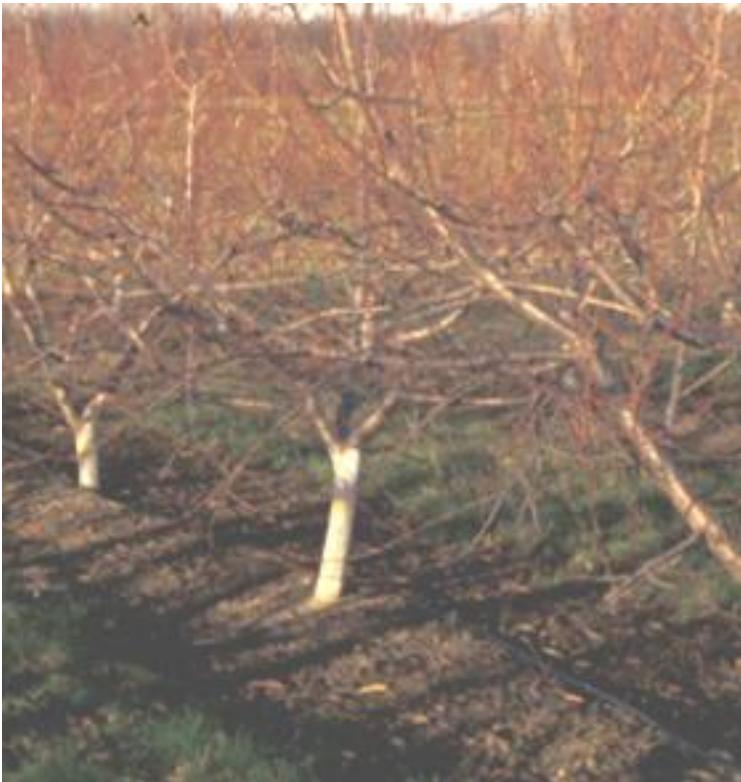
Blueberry

Best



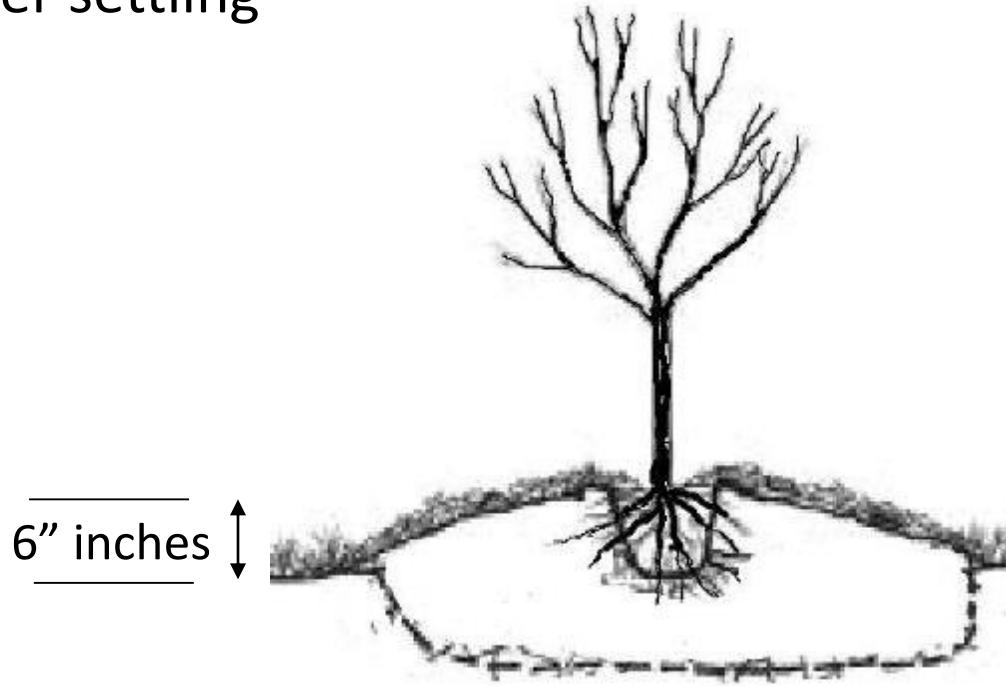
Overcoming wet soils

- build a mound or berm where wet soil is a problem
- also consider tiling to improve water drainage



Mounding fruit trees

-mound or berm should be about 6" above normal ground level after settling



Adding organic matter

-will help if soil is sandy or heavy clay



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Choosing apple varieties

- Choose fruit types, varieties & rootstocks that are adapted to the region.
- Choose varieties to spread the harvest season.
- End the season with varieties known to have longer storage life.
- Disease resistance will reduce pest control.
- Don't just choose from a catalog



Sweet cider varieties – Bob's list

- Gala
- McIntosh
- Jonathan
- Jonagold
- Golden Russet
- Empire
- Golden Delicious
- Northern Spy
- Goldrush

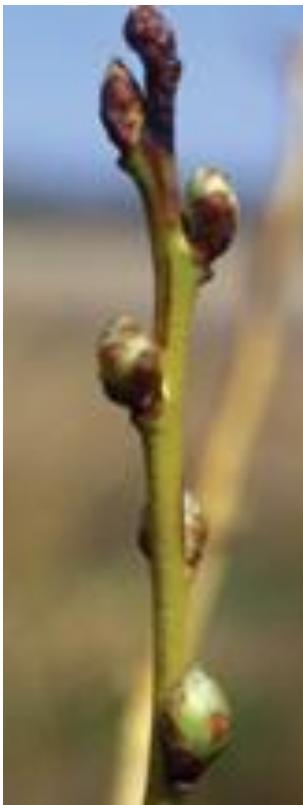


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Mid-winter hardness levels of flower bud is much different than cold temperatures in bloom



Time of flowering

-fruit types with early bloom are at greatest risk for spring frost damage

Bloom
early



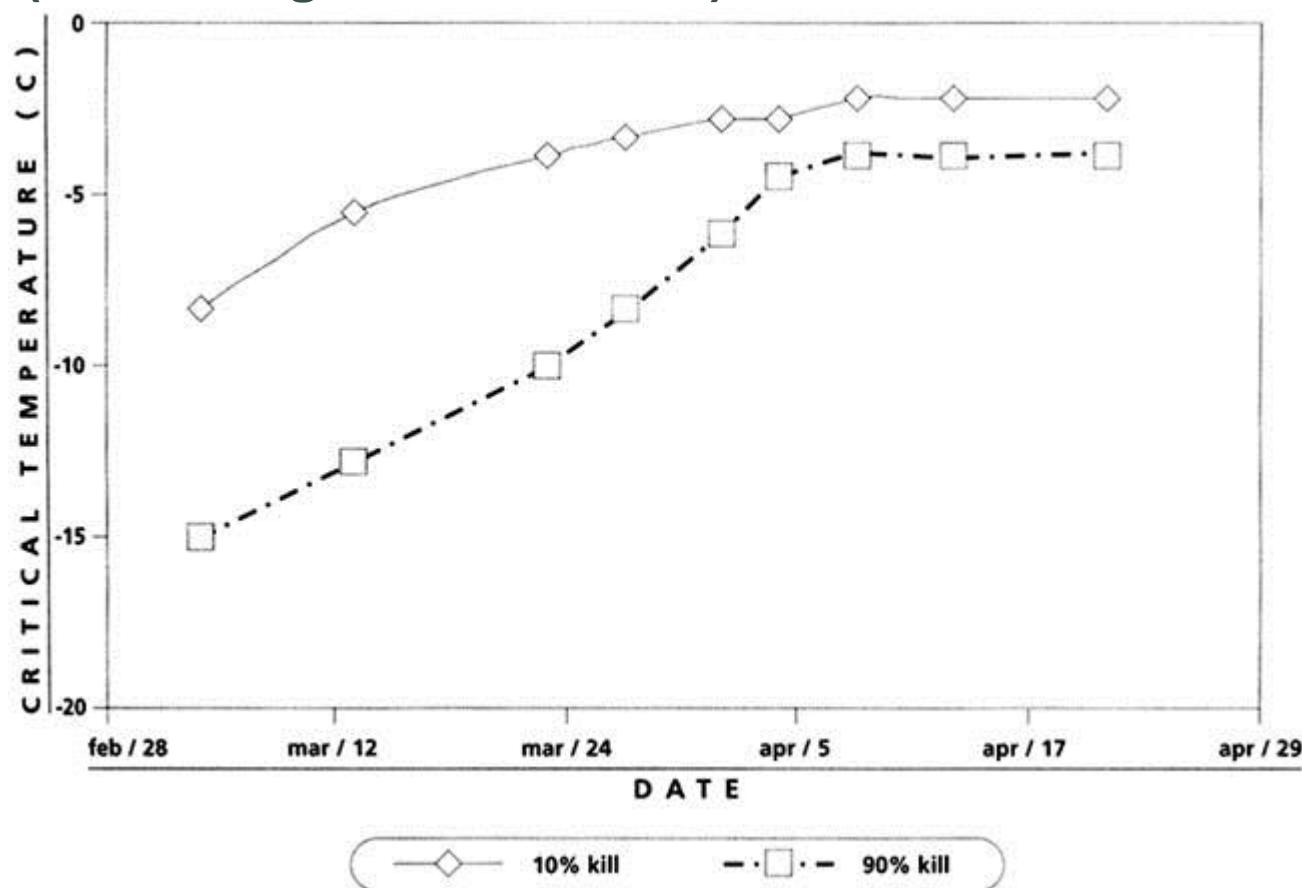
Apricot
Japanese Plum
European Plum
Peach/Nectarine
Sweet Cherry
Tart Cherry
Pear
Apple
Blueberry, Strawberry
Summer Raspberry
Concord Grape

Bloom late

Critical spring temperatures for tree fruit bud development stages

Pome Fruit (Apples and Pears)										
Apples										
Apples	Silver tip	Green Tip	Half inch green	Tight Cluster	First Pink	Full Pink	First Bloom	Full Bloom	Post Bloom	
Old temp	16	16	22	27	27	28	28	29	29	
10% kill	15	18	23	27	28	28	28	28	28	
90% kill	2	10	15	21	24	25	25	25	25	
Pears										
Pears	Bud scales separating	Blossom buds exposed	No name	Tight cluster	First White	Full White	First Bloom	Full Bloom	Post Bloom	
Old temp	18	23		24	28	29	29	29	30	
10% kill	15	20	No data	24	25	26	27	28	28	
90% kill	0	6		15	19	22	23	24	24	

Typical 10 percent and 90 percent bud kill temperatures for cherry trees corresponding to average dates observed at the Washington State University, Prosser Research and Extension Centre (Proebsting and Mills, 1978)



Growing Cider Apples

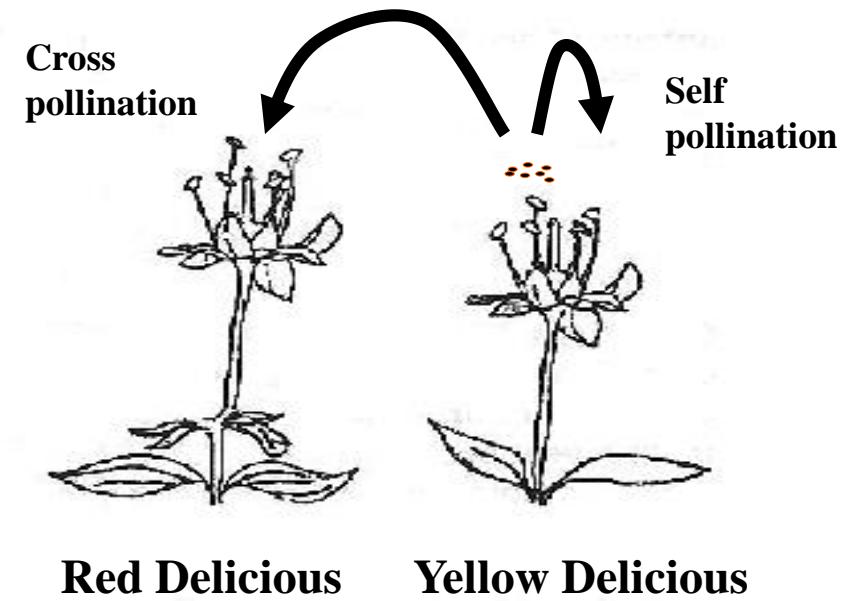
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Some apples may require a pollinizer partner

Self-fruitful varieties:
pollen from another variety is not needed

Self-unfruitful varieties:
pollen from another variety is needed for fruit production



Yellow Delicious is self-fruitful. Red Delicious is self-unfruitful and requires pollen from a compatible partner such as Yellow Delicious

Pollination requirements

- Self fruitful or pollinating (with some exceptions)
 - Examples: peach, nectarine, apricot, tart cherry, grape, raspberry, strawberry, blueberry
- Self unfruitful or not self pollinating (generally)
 - Examples: **apples**, pear, sweet cherry, Japanese plum, nut crops

Both types generally need pollinators (bees or insects) or wind (nuts) to move pollen.



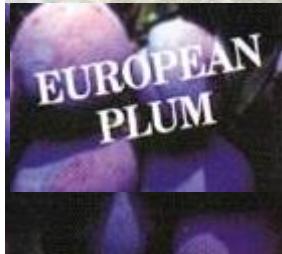
Choosing compatible pollination combinations

Choose pollinating partners that are:

1. Genetically compatible
2. Produces enough pollen
3. Bloom at the same time



Finding compatible varieties – example for plums



Legend:

- Can be relied upon to pollinate this variety.
- Suggested good pollinizer for this variety.
- Partially self-fruitful, but we not be recommend solid planting.
- Should not be to pollinate this variety.

		Variety Pollinated															
		Earliblue	Mount Royal	Castleton	NY66.609.6	Stanley	Polly	NY 58.900.9	Twilight	Italian	Demaris	Shropshire Damson	Victory	Green Gage	Vision	Empress	President
Pollen Source Variety	Earliblue	●															
	Mount Royal		●														
	Castleton		●	●	●	●	●			●	●						
	NY66.609.6		●	●	●	●	●	●		●	●						
	Stanley		●	●	●	●	●	●		●	●				●	●	●
	Polly	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	NY 58.900.9			●				●									
	Twilight								●								
	Italian			●	●	●				●	●				●	●	●
	Demaris			●	●					●	●						
	Shropshire Damson											●					
	Victory											●					
	Green Gage											●					
	Vision				●				●			●			●	●	●
	Empress					●			●				●	●	●	●	●
	President									●			●	●	●	●	●

Source: Hilltop Trees Nursery Catalog

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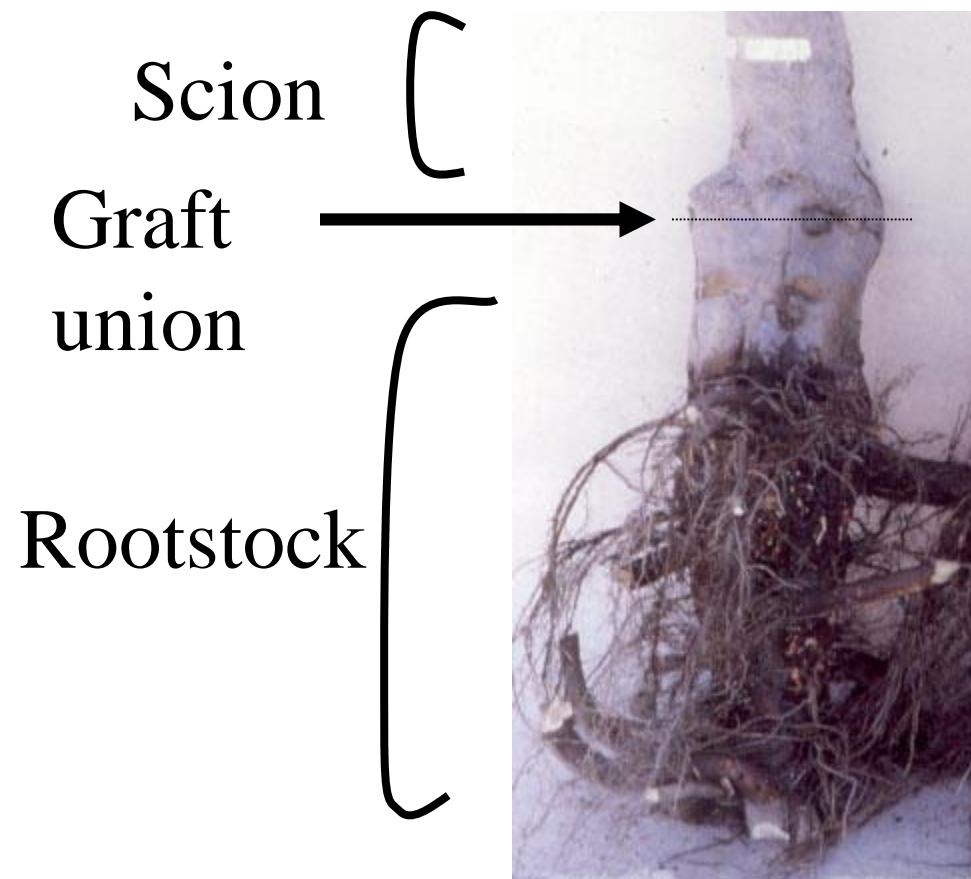


All apple trees are grafted

- Grafting is an ancient art
- The shoot or top of the tree is referred to as the scion (sign)
- The root system is referred to as the rootstock
- The graft union is the junction of the rootstock and the scion



Characteristics of scion and rootstock



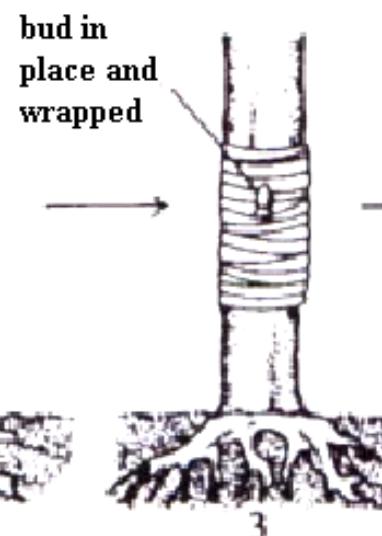
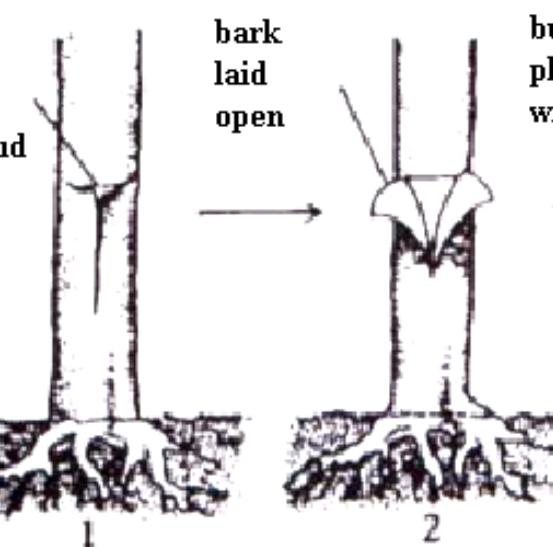
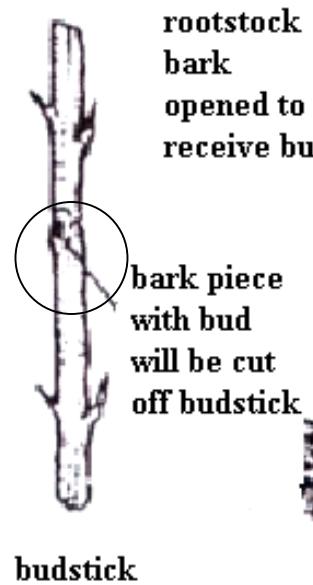
Scion: chosen for yielding,
fruit characteristics

Rootstock: chosen for tree
size control, support,
disease resistance,
adaptation to soil conditions

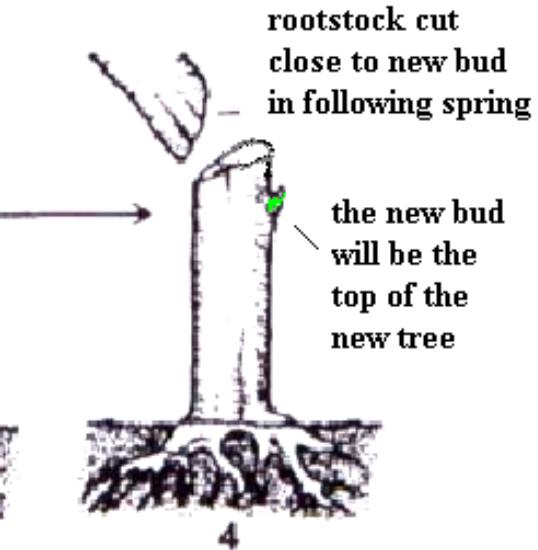
Most fruit trees are formed by grafting
scion onto rootstock

Tree propagation by T-budding

Year 1



Year 2



Inserted bud
before growth
in spring



Inserted bud
starts to grow
in spring



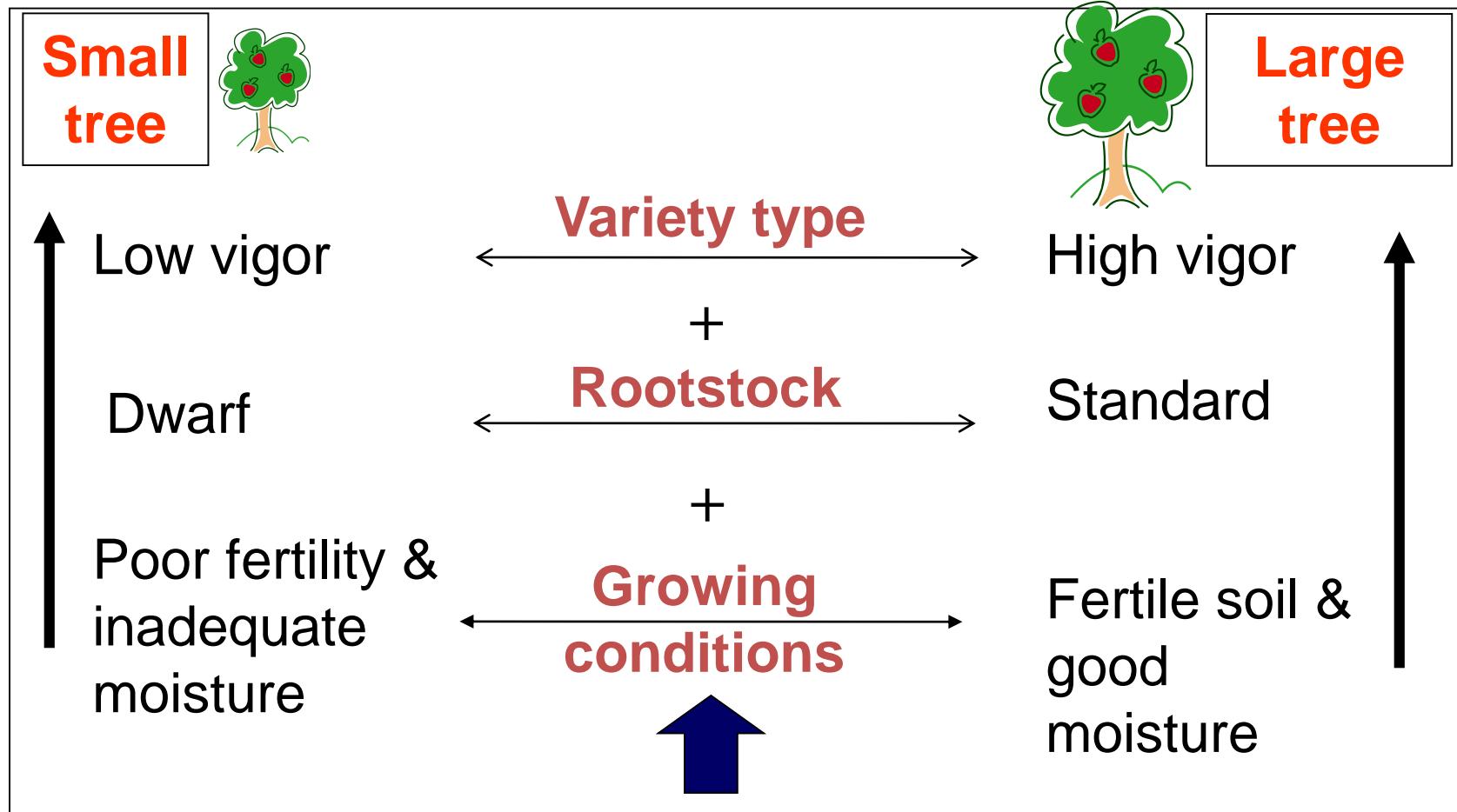
Examples of apple rootstocks and their effect on tree height

Root-stock	Mature tree height (ft)	Requires staking
MM 111	30	No
MM 106*	25	No
M7	20	No
G30		
M26*^	16	Yes
G11		
M9^	12	Yes
Bud 9		

* = susceptible to Phytophthora collar rot

^ = very susceptible to fire blight

Factors influencing fruit tree size



Tree size is influenced by these three factors

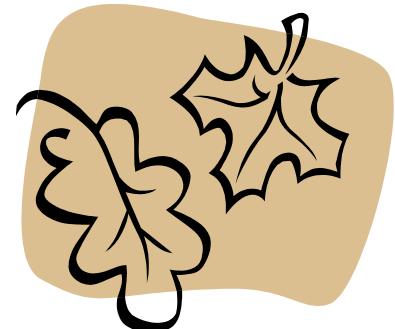
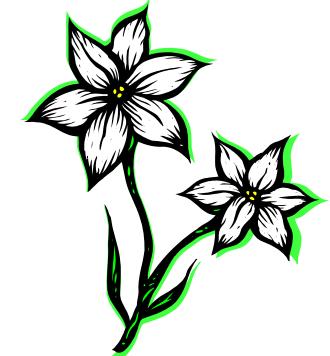
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When to plant apple trees

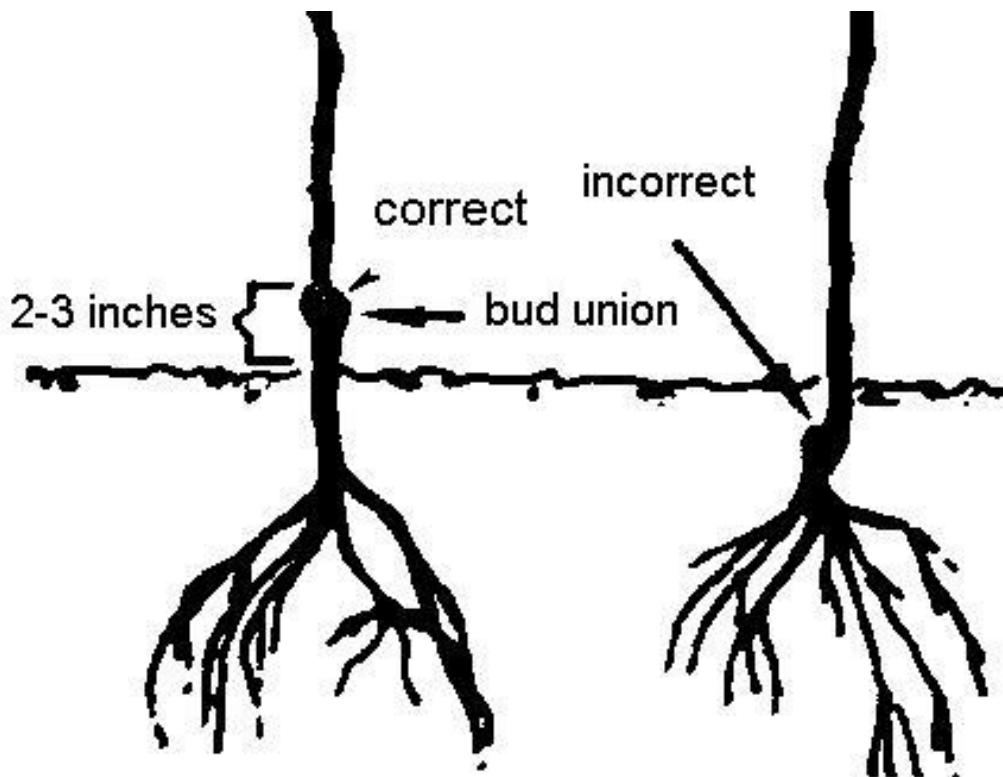
- Bare root trees - spring planting is best, fall is 2nd best choice
- Container grown trees - spring or fall is best, but can be planted anytime during the growing season



Tips on planting apple trees

- Don't let roots dry out.
 - Cut off damaged root tips.
 - Don't wrap roots around in planting hole, shorten if necessary.
 - Tamp the soil down gently around the roots gently while filling the hole. Water to settle the soil.
 - Check over the next few days, especially following rain, to make sure that the graft union is above the soil line for apples and pears.
- 

Planting depth for apples and pears



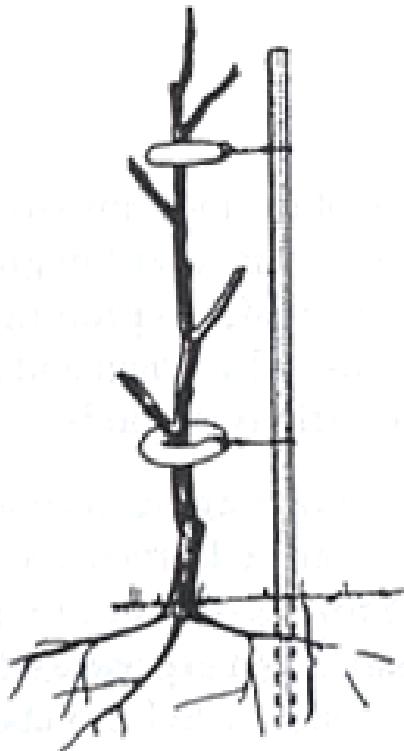
- Note: with cherry, peach, and plum, plant so that the bud union is close to the soil line.

Scion rooting if planted too deep



The tree on the left was planted too deep and the scion sent down roots, resulting in vigorous tree growth

Stake apple trees growing on dwarfing rootstocks



Fruit load tipped tree

Tree wraps, tree cages, & tree paint



tree wraps



cage + white latex paint

- both plastic tree wraps and cages help prevent rodent feeding.
- white latex paint and wraps reflect light and thus reduce trunk damage due to rapid temperature fluctuations due to sunlight in mid winter.
- remove tree wraps in summer to avoid disease & insect problems, cages can stay on year-round.

Latex paint does not protect against extreme low temperatures



Peach trunk splitting due to -19 F temperatures in 1994

Protect from deer browsing



Where to buy fruit trees

Locally

- better nurseries
- big box stores
- mostly container grown



Mail order

- mostly bare root
- better variety selection
- old varieties



Mail order catalogs

- Fedco Trees www.fedcoseeds.com/trees.htm
- Cummins Nursery www.cummins nursery.com
- Raintree Nursery www.raintreenursery.com



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Pruning – a science and art in itself



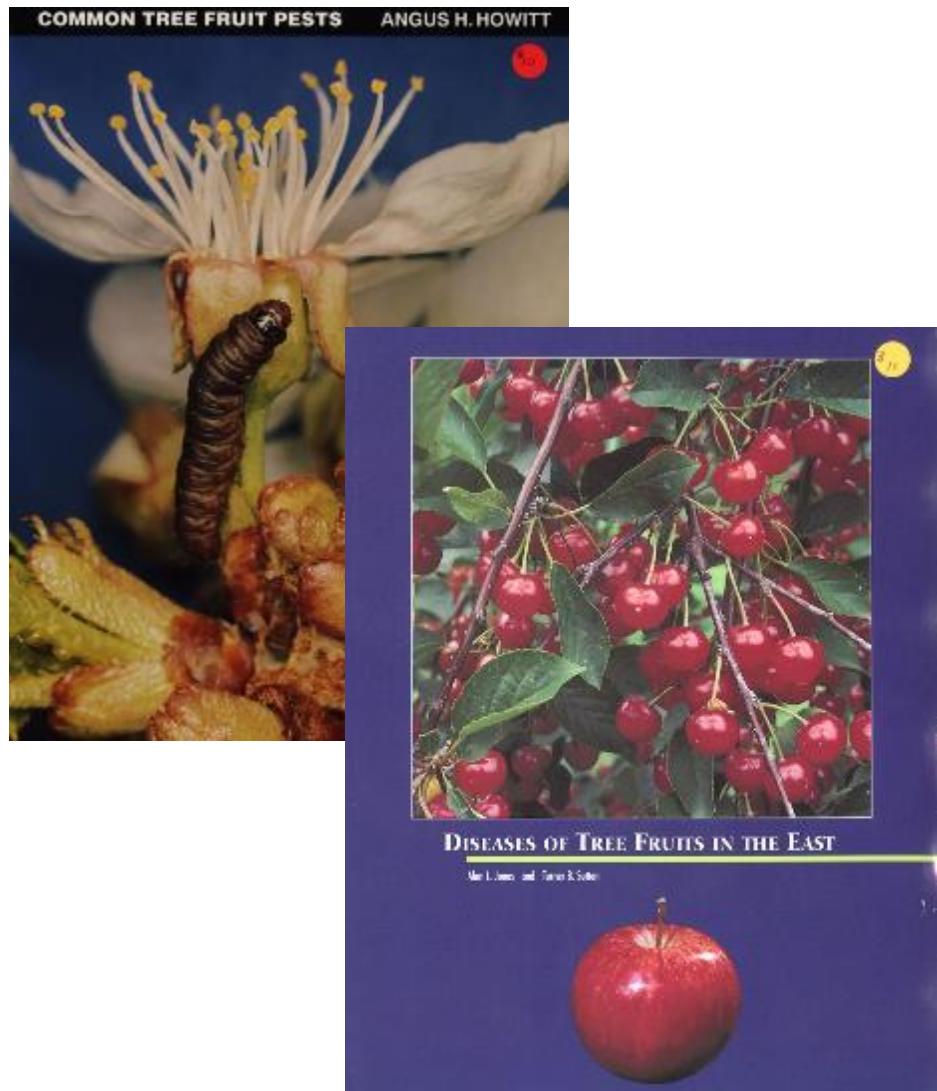
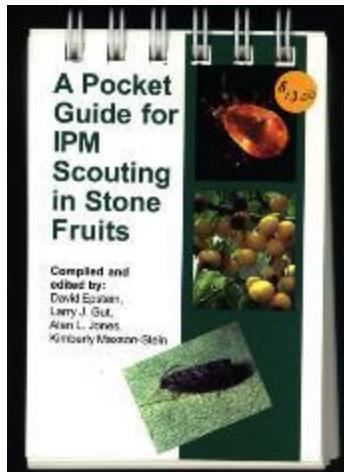
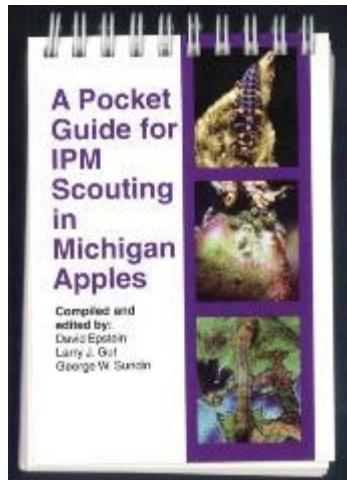
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Identifying pests

There are several good references to quickly identify insect pests and other problems in fruit trees



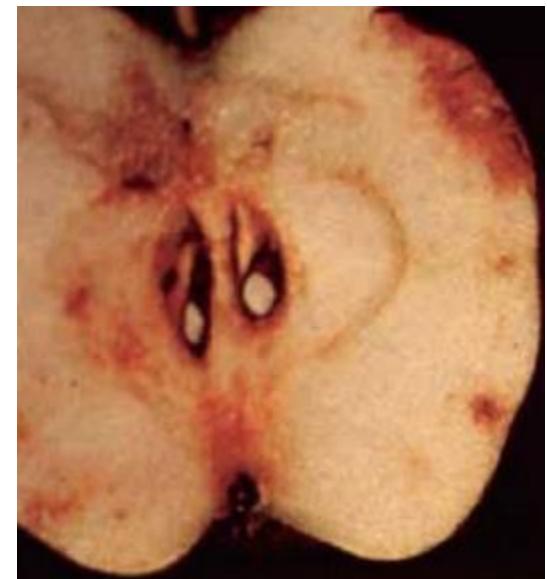
Direct fruit pests

- Fruit feeding insect pests direct damage to fruit
- May not be a problem until fruit have developed
- Hard to ignore damage
- Need ID to control

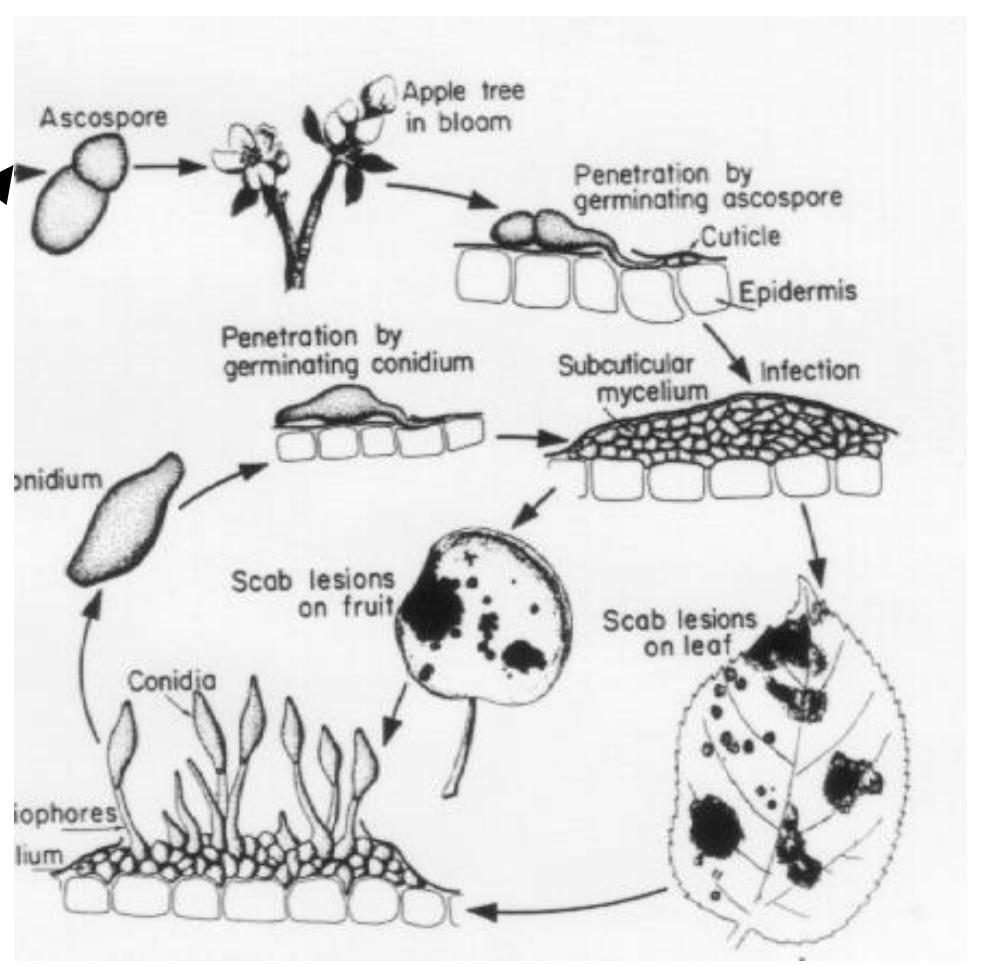
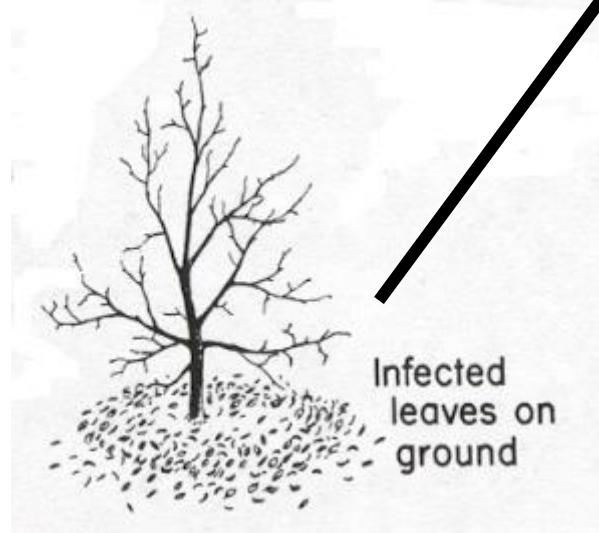


Apple maggot

- Affected apples look lumpy
- Apple maggot damage appears as winding brown trails under the apple skin
- Adults emerge after a rain in July and August
- Fly about for 7-10 days
- Lay eggs under skin of apple
- Control the adult!



Apple scab - life cycle





Apple scab resistant varieties

Pristine	Yellow type, early, better quality than Lodi or Transparent, somewhat fire blight susceptible
Redfree	Somewhat Jonathan-like, susceptible to fireblight
Williams Pride	Somewhat like Red Delicious, decent quality, early, mid-August, productive.
Liberty	Somewhat mac-like with better shelf life, moderately resistant to fire blight, productive.
Jonafree	Late September, somewhat Jonathan like, productive, susceptible to fire blight
Enterprise	Large, dark red, productive, looks like Rome,
Goldrush	Late (early Nov), excellent storage, rough finish,

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Cider making is a blend of science, history, and art



Blending of varieties is the key to good tasting cider

- Sweets
- Tarts
- Flavor



Quality control in sweet cider

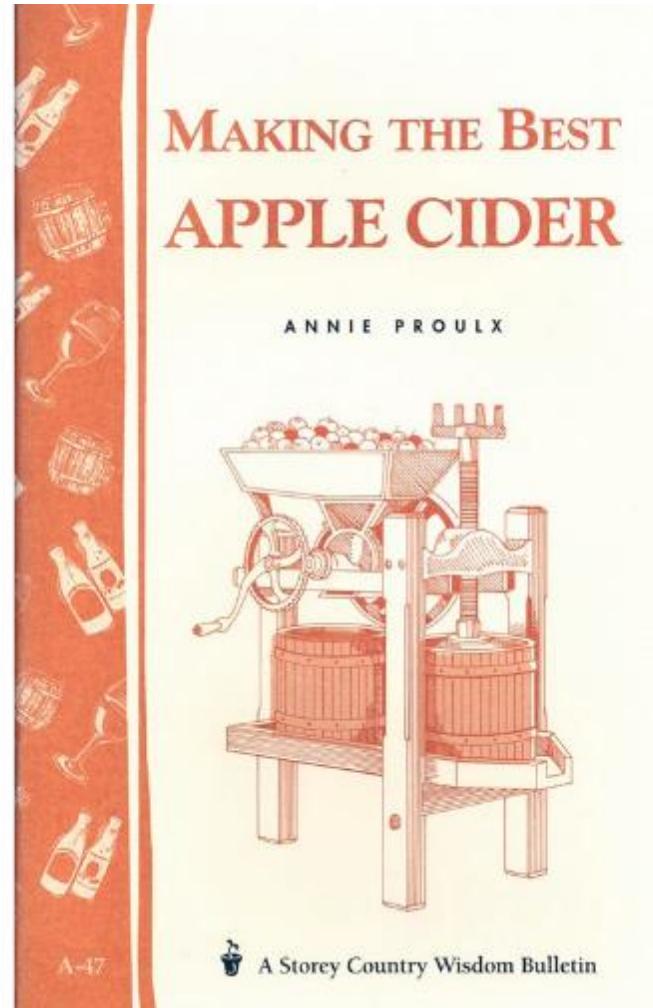
- Only mature, tree-ripe, picked, sound apples should be used in cider
- Windfall apples often contain soil and unwanted bacteria that could cause danger in the finished cider



Cleanliness through the entire process is the key



A nice reference
guide on cider making



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Hard cider apples are generally not considered fit for eating fresh; they may be small, bittersweet, or downright ugly. Often a mixture of apples is used to provide the right balance of tannins and acids, sweetness and aromatics.



Cider varieties are grouped into

1. bittersweets (with tannins greater than 0.2% and malic acid less than 0.45%),
 2. bittersharps (with tannins greater than 0.2% and malic acid greater than 0.45%),
 3. sharps (with tannins less than 0.2% and malic acid greater than 0.45%), and
 4. sweet or dessert apples (with tannins less than 0.2% and malic acid less than 0.45%).
- 

Sweet apples make up 30-60% of the blend. These apples are high in sugar, low in acid and will blend well with the juice of other more zesty and aromatic varieties. Examples of apples in this category are Baldwin, Red Delicious, Cortland, and Rome.



Tart or sharp varieties will make up 10-40% of the juice: Jonathan, McIntosh, Granny Smith, Rhode Island Greenings, and Winesaps are good examples.



Bitter apples comprise 5-20% of the juice and varieties in this category include Golden Russets, Red Gravenstein, and Northern Spy.



Aromatic apples round out the cider by furnishing the cider with its bouquet and “nose”; these apples make up 10 - 20% of the juice.



Hard cider varieties

17 hard cider apple varieties to consider

From Ian Merwin
Horticulture Professor Emeritus
Cornell University



- **Gold Rush**- “of the modern scab-resistant varieties that are inexpensive to produce and the ones I encourage growers to consider for hard cider, this would be at the top of my list” Merwin says.
 - **Stayman’s Winesap**
 - **Winesap**
 - **Crimson Crisp**
 - **Liberty** –a scab free variety
- 

- **Black Twig**
 - **Arkansas Black**
 - **Roxbury Russet**
 - **Golden Russet** - “It’s a heavily-russetted variety, quite brown and like sandpaper on the outside and has a very high sugar content and lots of acidity. It’s a very potent apple in a cider blend. It tends to give you aromas of citrus, grapefruit, and wine. As part of a cider blend, you get some really nice aromatic traits”
- 

- **Harrison**
 - **Newtown Pippin** - also known as Albemarle Pippin, “A really popular variety for blending in hard cider”
 - **Cox Orange Pippin** “One that does well in New England and upstate New York. It is an excellent apple for blending in a hard cider”
 - **Ashmeads Kernel** –the most commonly known hard cider variety
- 

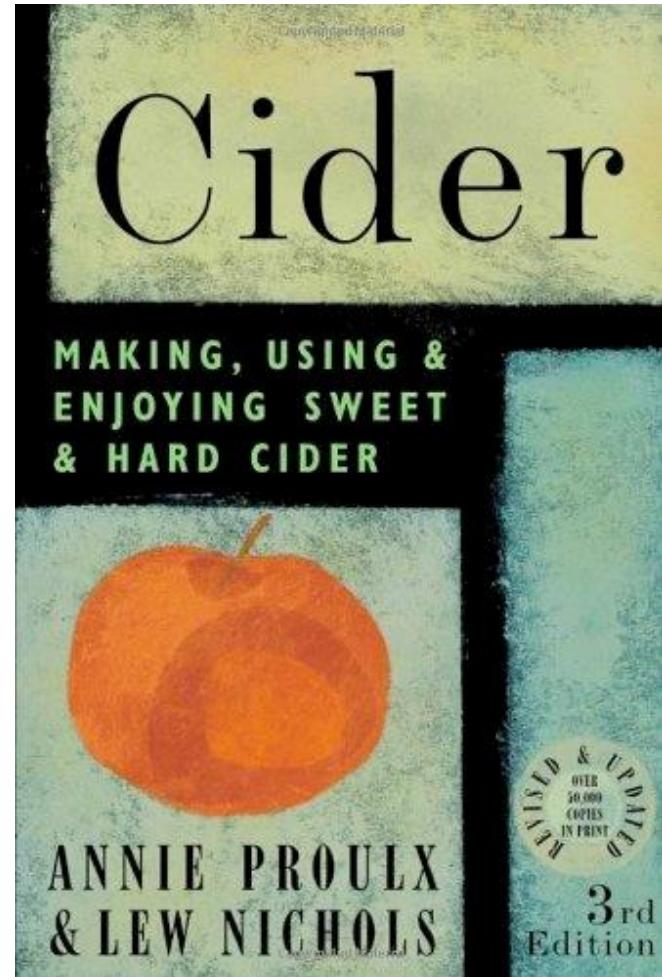
- **Wickson**
 - **Ribston Pippin**
 - **Northern Spy** - “Makes a really excellent cider”
 - **Baldwin** - “Has high sugar and it is high acid. So it really makes a good base cider”
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Growing Cider Apples

- General considerations
- Site selection
- Variety selection
- Bloom time considerations
- Pollination
- Rootstock & tree characteristics
- Planting tips
- Pruning systems
- Pest considerations
- Sweet cider production
- Hard cider varieties
- **Hard cider production**
- Questions



Good hard cider reference



Organize Your Blocks —blocks of European hard cider varieties should be organized according to bloom time, because about half of the European varieties are late blooming.



Be Choosy When Picking Rootstock —
select rootstocks that are a little more
tolerant to viruses because a lot of the
European and antique apple budwood has
viruses in it. Good rootstocks are B.9, G.41,
and G.935.



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Questions?



Thank You!
Bob Tritten

