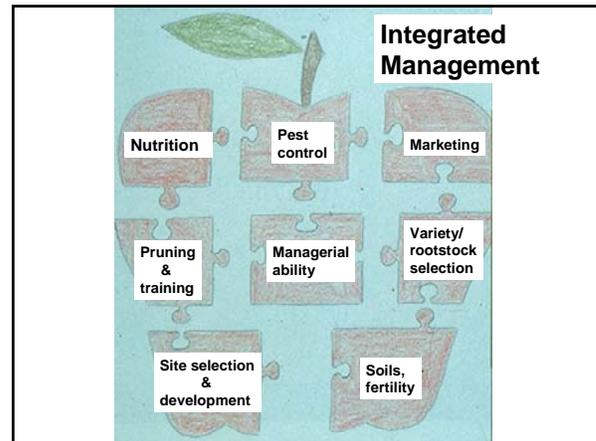


**Organic Fruit Production - -  
What to Grow  
&  
Where to Grow It**

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ORGANIC & SUSTAINABLE CROP PRODUCTION



**Plan BEFORE Planting**

- The fate of the planting is determined before the crop is set out

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**What to Grow?**

- Market demand
- Site limitations
  - Winter damage
  - Spring frosts
  - Pest pressures
- Species
  - Cold hardiness
  - Chilling requirement
- Varieties
  - Bloom time
  - Pest resistance
- Rootstocks
  - Pest resistance
  - Size control
  - Precocity

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**What To Grow?**

- What is not being grown in your area?
  - Is this an opportunity?
    - No competition
    - High returns
  - Or a **Red Flag?**
    - No market demand
    - Serious production limitations
    - Limited availability of equipment & supplies

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**Variety Selection**

- Pest resistance
  - Does NOT mean immunity
    - 2005 – bacterial spot was a problem on “resistant” varieties of peach
  - May not possess resistance to multiple pests
    - Prima apple is highly resistant to scab, but highly susceptible to cedar apple rust
- Market demand
  - Prima apple is harvested at the same time as Gala, which is in much higher demand

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## Disease Resistant Apple Varieties\*

\* 1 = susceptible, 9 = immune, U = unknown

Variety	Apple Scab	Cedar Apple Rust	Fireblight	Powdery Mildew
CrimsonCrisp	9	6	4	4
Enterprise	9	8	8	6
Goldrush	9	3	6	7
Crimson Topaz	9	U	5	6
Crimson Gold	9	U	U	U

## Dwarf Apple Rootstock Pest Resistance

- M9 337 – fireblight susceptible
- M9 Nic 29 – fireblight susceptible
- Bud 9 – very winter hardy, resistant to collar rot, less fireblight susceptible than M9
- G 16 – resistant to collar rot, strong resistance to fireblight
- EMLA 26 – does not tolerate wet feet, highly susceptible to fireblight & wooly apple aphids
- G 11 – fireblight resistant

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## Blackberry Disease Susceptibility

Variety	Rosette	Orange Rust	Anthraco
Chickasaw	S	?	S
Choctaw	S	R	R(?)
Kiowa	S	R(?)	S
Shawnee	VS	R	R
Arapaho	R	?	R(?)
Apache	R(?)	R(?)	R(?)
Navaho	R	VS	R(?)
Ouachita	R	R(?)	S
Prime Jim	S*	R	S
Prime Jan	S*	R	S

R = resistant    R(?) = none observed    S = susceptible    VS = very susceptible

\* = Not an issue with primocane bearers grown for fall crop only

## Deal With a Reputable Nursery

- Purchase good quality trees
  - Plant costs are negligible when compared to total establishment costs
- Organic planting stock is required
- If not available, documentation of attempts to find it and lack of availability must be done

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## Certified Organic Tree Fruit & Small Fruit Plants

- Trees of Antiquity (CA)
  - <http://www.treesofantiquity.com/>
- Rolling River Nursery (CA)
  - [www.rollingrivernursery.com](http://www.rollingrivernursery.com)
- Hidden Springs Nursery (TN)
  - [www.hiddenspringsnursery.com](http://www.hiddenspringsnursery.com)
- Cottle Strawberry Nursery (NC)
  - [www.cottlefarms.com](http://www.cottlefarms.com)

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## If Organic Planting Stock is Unavailable ---

- Document search for organic stock & its lack of commercial availability
- Most certifiers interpret the organic standards as requiring organic management of non-organic planting stock for at least 12 months before harvesting a crop that is to be sold as certified organic

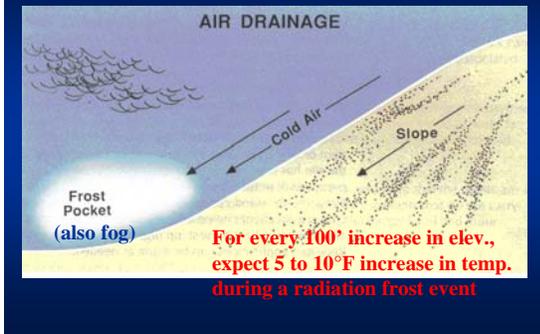
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**“Live where you farm,”  
not  
“Farm where you live.”**

## Site Selection

- Soils – type, depth, drainage, fertility, pH
- Water – availability, quality
- Frost/freeze
- Previous cropping history
- Topography
- Wildlife

## Elevation



## North

Less potential for winter injury  
Plants stay dormant later - less chance for frost

Intermediate  
West between  
north & south

Morning sun  
reduces disease East  
pressure

Increased potential for winter injury  
Plants start growth earlier - increased potential for frost  
Soils tend to be drier, warmer and thinner

## South

## Previous Cropping History

- Persistent herbicides
- Verticillium susceptible crops & weeds
  - tomato, pepper, potato, eggplant, strawberry, raspberry, nightshade, ground cherry, horehound, lambsquarter, pigweed, cocklebur
- Cotton root rot
- Nematodes

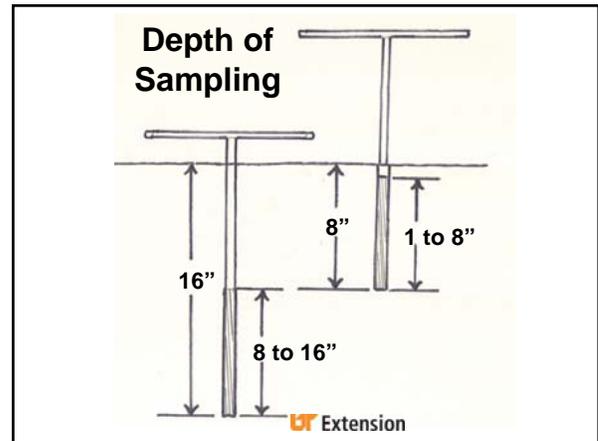
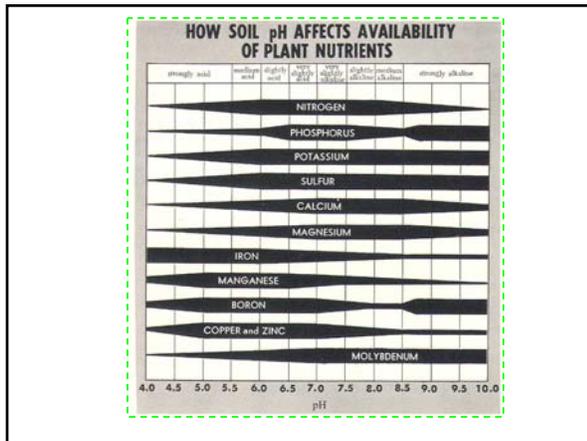
## Water Quality?



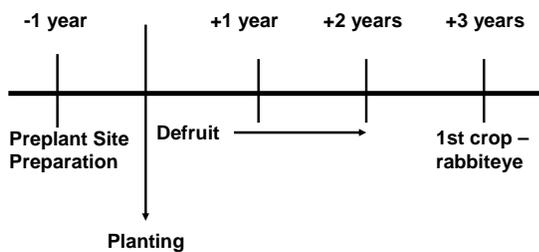
A critical year in fruit production is the one before planting – the success or failure of a fruit crop is often determined before the plants are set

## Site Preparation

- Soil testing
- Elimination of noxious weeds
- Facilitation of good air and water drainage
- Floor management
- Elimination of host plants in the vicinity of the planting



## Blueberry Production Timeline



## Determining Nutritional Needs: Postplant

- Soil testing
- Tissue analysis
- Growth & fruiting
- Past experience

## Objectives of a Nutrient Management Program

- **Healthy plants**
- **High yields**
- **Quality fruit**
- **Consistent production**

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## Nitrogen Availability

- Manures and compost
  - 50% available during year of application
  - 90% available in application year with fresh poultry manure
  - Balance available during subsequent years (be sure to figure it in annual applications)

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## Manure as Fertilizer

- Fertilizer value usually highly variable
- Unbalanced in regards to N, P, K
- Specific application rates will be impossible to recommend
- Typical application rates:
  - Most manures – 1 to 4 tons/acre
  - Poultry manures – 1 to 2 tons/acre

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## Timing of Manure Applications

- 120 days pre-harvest in crops where fruit may be in contact with the soil or soil can be splashed onto the fruit from rainfall or irrigation
- 90 days preharvest where fruit is elevated or shielded from soil contact
- Properly composted manures can be applied at higher rates & at times closer to harvest

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## Organic Fruit Production – Pest Control

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## Why Control Wildlife in Fruit Crops?

- Economic losses
  - Fruit destroyed or consumed by wildlife
  - Increased disease & insect pressure with damaged fruit
  - Damage to plants and cropping system
    - Feeding on succulent shoots
    - Girdling or rubbing on plants
    - Puncturing plastic
- Food Safety

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## Wildlife Damage Prevention Categories

- Habitat modification
- Exclusion
  - Fencing
  - Netting
- Scare devices (visual & auditory)
- Repellents (taste & smell)
- Removal
  - trapping
  - shooting

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## Maintaining plants in good health is important in insect and disease management

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## Pest Management Strategies

- Cultural Controls
- Mechanical Controls
- Biological Controls
- Chemical Controls

## Cultural Controls (New Plantings)

- Site Selection
- Crop Rotation
- Soil Preparation
- Cultivar Selection
- “Clean” Planting Stock
- Row Spacing & Plant Density

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## Cultural Controls (established plantings)

Mulching (first year)  
Weed & Grass Control  
Pruning  
Fertilization  
Irrigation  
Sanitation  
Habitat Modifications

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## Mechanical Controls

- Keeping pests away from crops
  - Traps, row covers, netting
- Removing pests
  - Hand removal, vacuuming
- Removing diseased plants
- Cultivation & hand weeding

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## Biological Controls

- Mating disruption pheromones
- Microbial pesticides
  - (beneficial pathogens that kill pests)
- Natural enemies
  - Encourage predators

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## Biological Control of Insects:

- Can be enhanced by cover crops & habitat management
- Timed release of beneficial insects
  - Where a known pest appears predictably & can be controlled by specific biological agent
    - Predatory mites
    - Lady beetles
    - Green lacewings
    - Trichogramma wasps

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## Chemical Control

<u>Fungicides</u>	<u>Insecticides</u>	<u>Herbicides</u>
Sulfur	Rotenone	Corn gluten meal (Preen)
Copper	<i>Bacillus thuringensis</i>	Vinegar
Serenade ( <i>Bacillus subtilis</i> )	Azadirachtin	Lime/lemon juice
		Clove/cinnamon oil

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## Disease Control

- Know:
  - susceptibilities of species, varieties and/or rootstocks
  - the symptoms of the disease
  - when infection occurs
  - what weather conditions favor infection
  - control measures

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## Apple Scab

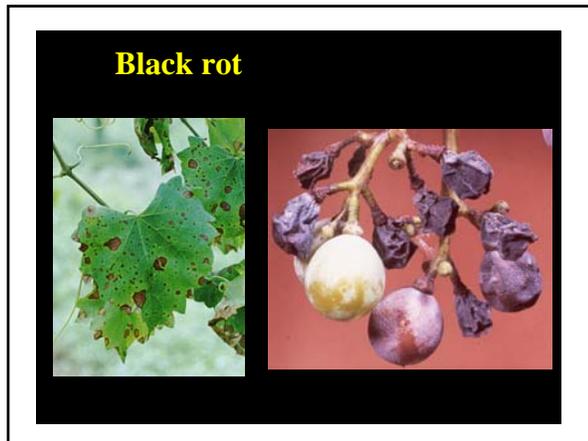
- Primary Infection
- Secondary Infection



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## Mill's Chart for Apple Scab Infection

Ave. Temp. °F	Hours Required for Infection			Secondary
	Primary	Light	Moderate	
45	17	26	40	12.6
50	14	19	29	9.3
55	11	16	24	7.3
60	9.5	13	20	6.3
63 – 75	9	12	18	5.9
76	9.5	12	19	6.3
77	11	14	21	7.3
78	13	17	26	8.7



**# of Wetting Hours Required for Black Rot Infection at Various Temperatures**

Ave. Temperature (°F)	Hours of Leaf Wetness
50	24
55	12
60	9
65	8
70	7
75	7
80	6
85	9
90	12

Source: R. A. Spotts, Ohio State Univ.  
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**Powdery Mildew**

- **Conditions favoring infection:**
  - Rel. humidity > 60%
  - Temp. 50 - 77°F
    - 66 - 72°F optimum
- **Critical growth period:**
  - Tight cluster to pink through 1<sup>st</sup> or 2<sup>nd</sup> cover.
- **Pressure greater following mild winter**

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**Cultural & Mechanical Practices for Pest Control - Preplant**

- **Site selection:**
  - Elevated, well-drained, full sun, consider previous cropping history
- **Site preparation:**
  - Adjust soil pH, P, K, Ca & Mg
  - Eliminate noxious weeds
  - Eliminate barriers to air drainage
  - Eliminate alternate hosts for pests
- **Plant selection:**
  - Select types of fruits & varieties suited to your area
  - Purchase plants from reputable nurseries, inspect plants upon receipt
  - Consider pest resistant varieties/rootstocks

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**Cultural Practices for Pest Control - Postplant**

- Pruning to remove diseased & insect-infested wood, promote good sunlight, air & spray penetration throughout the canopy
- Conservative, timely nitrogen application
- Trickle irrigation instead of overhead
- Crop thinning
- Timely harvest
- Sanitation

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**Organic Fruit Production – Floor Management**

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## Orchard Floor



## Management

## Floor Management

- Permanent sod between rows
  - Serves as a deceleration & diffusion strip for runoff water
  - Support for equipment
- Mulching or shallow cultivation around trees or down tree row with high density plantings

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## Mulching



- Weed control
- Uniformity in:
  - Soil moisture
  - Soil Temperature
- Fertility
- Maintain or enhance soil organic matter levels
- Voles
  - Keep mulches 8 to 10 inches away from trunk
  - Use trunk guards on young trees
- Must re-apply organic mulches to maintain benefits

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## Irrigation – Overhead or Trickle

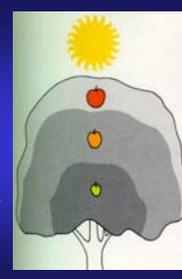


## Why Prune?

- Promote growth in desired areas
- Stiffen limbs
- Remove dead, broken, diseased & insect infested limbs
- Remove unfruitful branches or canes
- Promote development of new shoots for future crops
- Adjust crop size, increase fruit size

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Sunlight  
is the  
key to  
fruit production



- Reduces pest problems
- Increases fruit quality (color, soluble solids)
- Maintains fruitfulness of the interior portions of the plant

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## Organic Fruit Production – Cropping Systems

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## Cropping Systems - Strawberries

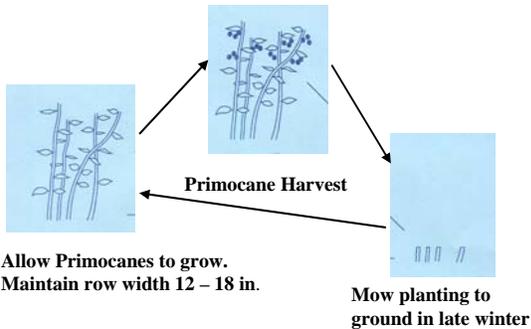
- Matted Row
- Annual Production



- Less disease pressure

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## Primocane Crop Only



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## Advantages of a Single-Cropping System:

- Cane thinning, detailed pruning & tying are eliminated
- Cold injury to buds is eliminated
- Winter damage from voles & rabbits is eliminated
- Spur blight, anthracnose, cane blight & several other diseases are reduced
- Sap beetle problems are reduced, many other insect problems are eliminated
- Application of fertilizers & pesticides is easier

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## Alternate Year Cropping

Rotation -

- 1<sup>st</sup> year:
  - Crop ½ of the field, mow off canes in winter
- 2<sup>nd</sup> year
  - Crop the 2<sup>nd</sup> half of the field, grow primocanes on the 1<sup>st</sup> half
- Repeat sequence in following years

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## Alternate Year Cropping

- Increased primocane growth
- Heavier yields in floricanes rows
- Easier management
- Reduced pruning costs
- Alternate row cropping increases air movement through planting
- Lessens pest carryover

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## Use of Protective Structures



- Season extension
- Increased yields
- Less disease pressure
- Physical exclusion of some insects & wildlife

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## Questions?



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Fruit Notes

[www.utextension.utk.edu/publications/](http://www.utextension.utk.edu/publications/)

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