



# Blueberry Production Basics

David W. Lockwood  
Plant Sciences  
Univ. of Tennessee

# 3 Major Types of Commercial Blueberries

- Lowbush – eastern provinces of Canada & northeastern U. S.
- Rabbiteye – southeastern U. S.
- Highbush – major cultivated species in North America
  - Northern highbush
  - Southern highbush

# Characteristics of Highbush Plants

- Mature plants 6 to 8 ft. tall
- Several canes produced from the crown annually
- Canes live for many years
- Flower buds form in fall
- Plants produce fruit about 2 months after flowering in spring
- Duration of Harvest: ~ 4 weeks
- Typical yields 4,000 – 6,000 lbs./acre

# Root System of Blueberry

- Fine, fibrous roots, no root hairs, mostly in upper 9 – 12” of soil
- Form symbiotic relationships with mycorrhizal fungi which aid root functions
- Spread
  - About the width of the canopy



## Depth

- most roots at 9 to 12” depth
- Almost no roots below 16”

# Rabbiteye Blueberries

- Easier to grow than highbush
  - Not as pH sensitive
  - Tolerate soils having a lower organic matter content better
  - Not as dependent on supplemental watering
- Select varieties having a chilling requirement of at least 500 to 600 hours
- Some varieties need to be cross pollinated by a 2nd variety
- Fruit ripening begins in early July and lasts 6 to 8 weeks or longer
  - ~ 90 days from bloom to 1<sup>st</sup> harvest

# Highbush Blueberries

- ~ 60 days from bloom to harvest

## Northern Highbush

- More cold tolerant in winter
- Blooms later
  - (less frost sensitive)
- More difficult to grow – soil pH, organic matter content, water
- Long chilling requirements
  - (800+ hours)
- All varieties are self-fertile

## Southern Highbush

- Select varieties having about an 800 hour chilling requirement
- Ripens over the same period as northern highbush
- Needs cross pollination

# Cross Pollination Requirements

- Rabbiteye: most varieties need cross pollination
- Highbush:
  - Northern highbush: all varieties are self-fertile
  - Southern highbush: cross-pollination needed
- Rabbiteye & highbush varieties do not cross pollinate
- **ALL blueberries fruit better with cross-pollination**



# Blueberry Varieties

## Rabbiteye:

- Briteblue – med./large berries
- Bluebelle – large berries
- Climax – high yields, blooms early
- Garden Blue – small/med. Berries
- Tifblue – high yields, dependable cropper

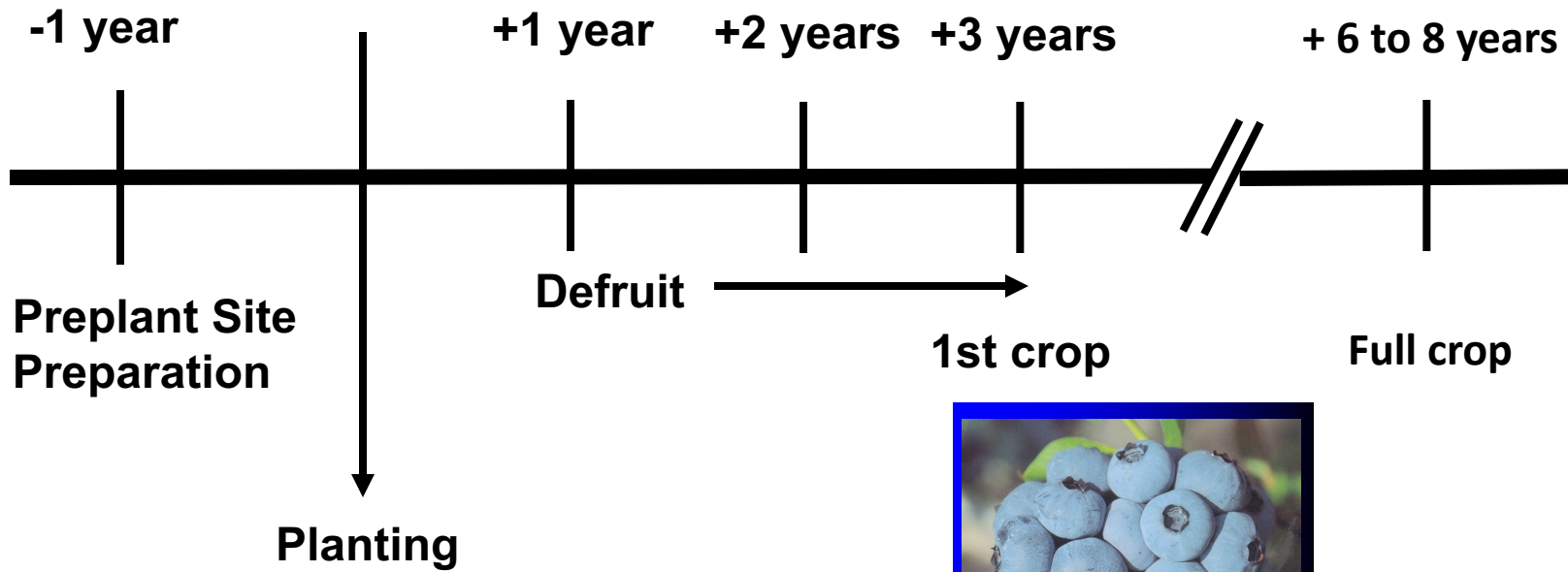
*\*need cross pollination*

## Highbush:

- Duke – early ripening, large berries
- Bluecrop – large fruit, may overcrop
- Berkley – large fruit, keeps well
- Blueray, large fruit, excellent flavor
- Patriot – large fruit, attractive plant



# Blueberry Production Timeline



## Blueberries: estimated yields

Plant age	Per plant (lbs.)		Per acre (lbs.)
	Plant spacing: 5' X 12'		
1 year	No yield		
2	No yield		
3	2	(highbush)	1,500
(first harvest)	3	(rabbiteye)	2,500
6 to 8	8 to 10		6,000 to 8,000
(full harvest)			

# Blueberries – before planting

## Site Selection

- Accessibility
- Elevation – passive frost & disease protection
- Soils:
  - Loams, silt loams, clay loams
  - 30 to 36 inches to impermeable layer
- Water
- Avoid soils having:
  - A heavy clay content
  - High pH
  - High calcium levels

## Site Development

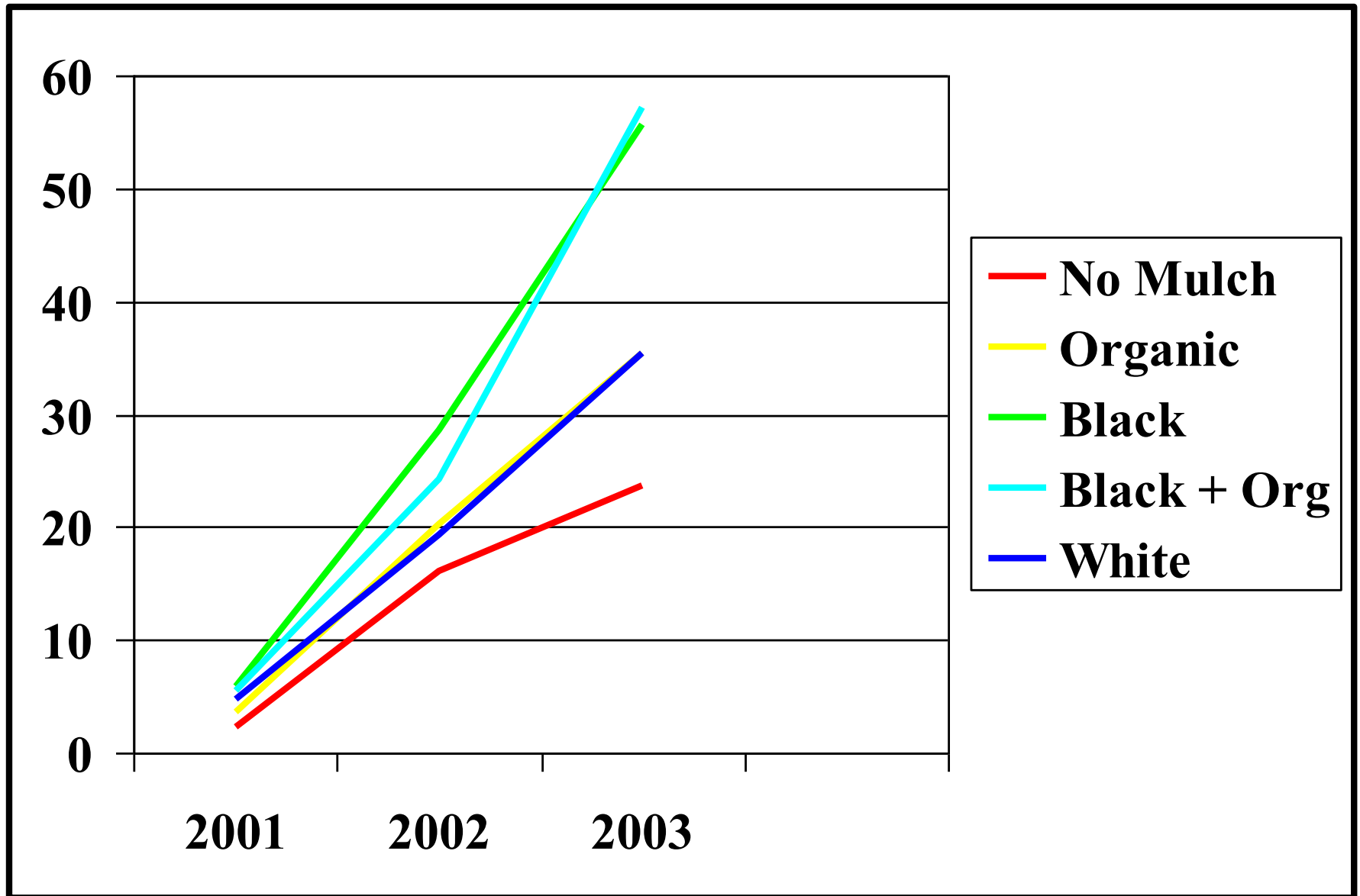
- Adjust soils to:
  - pH of 4.8 to 5.3
  - Organic matter levels above 3%
  - Consider building a raised bed for marginal sites
- Eliminate noxious weeds
- Install irrigation and have it ready to operate once bushes are planted

# Floor Management

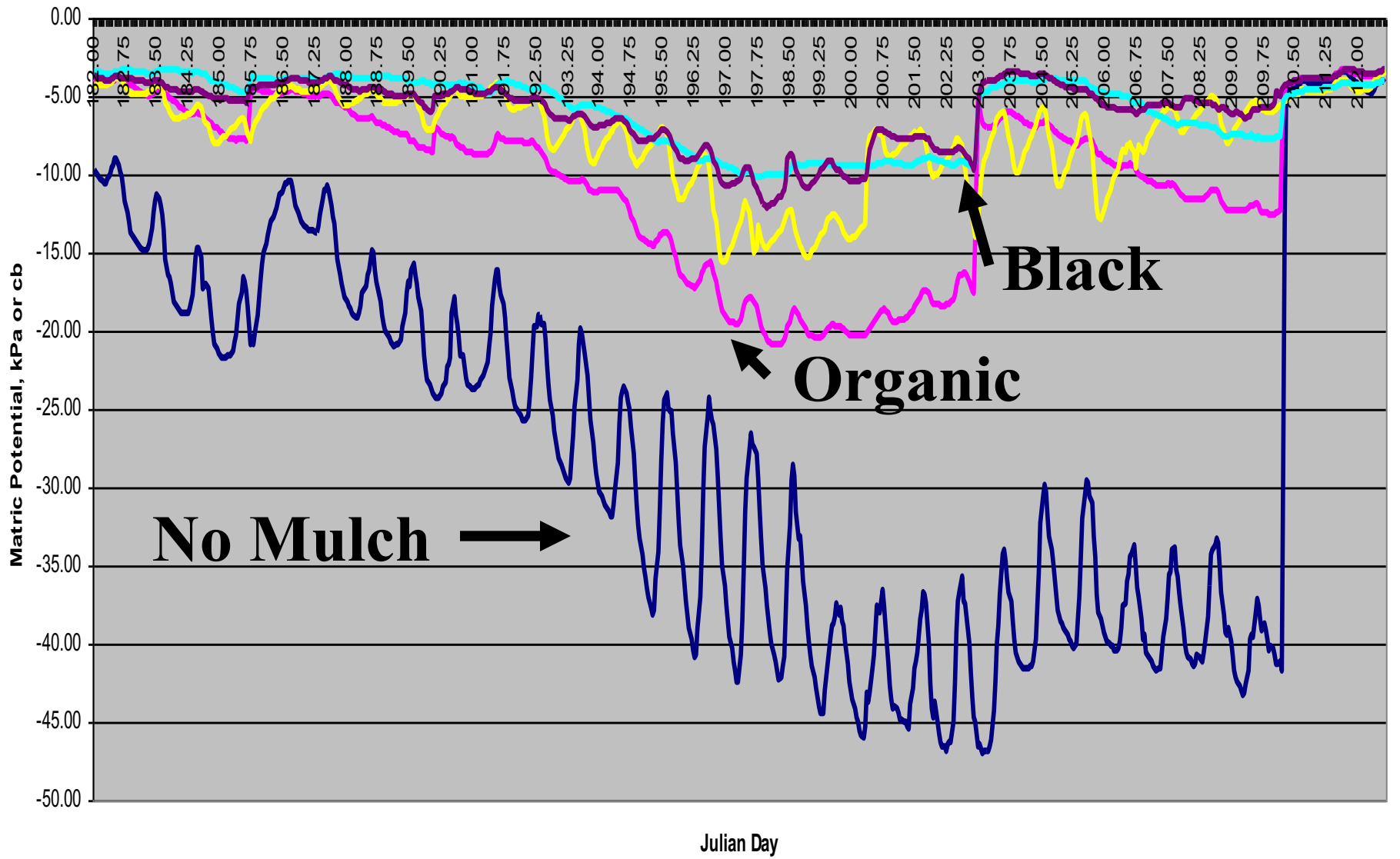
- Permanent sod between rows
  - Serves as a deceleration and diffusion strip for runoff water
  - Support for equipment
- Mulching down the row
  - Suppresses weeds
  - Moderates moisture & temperature



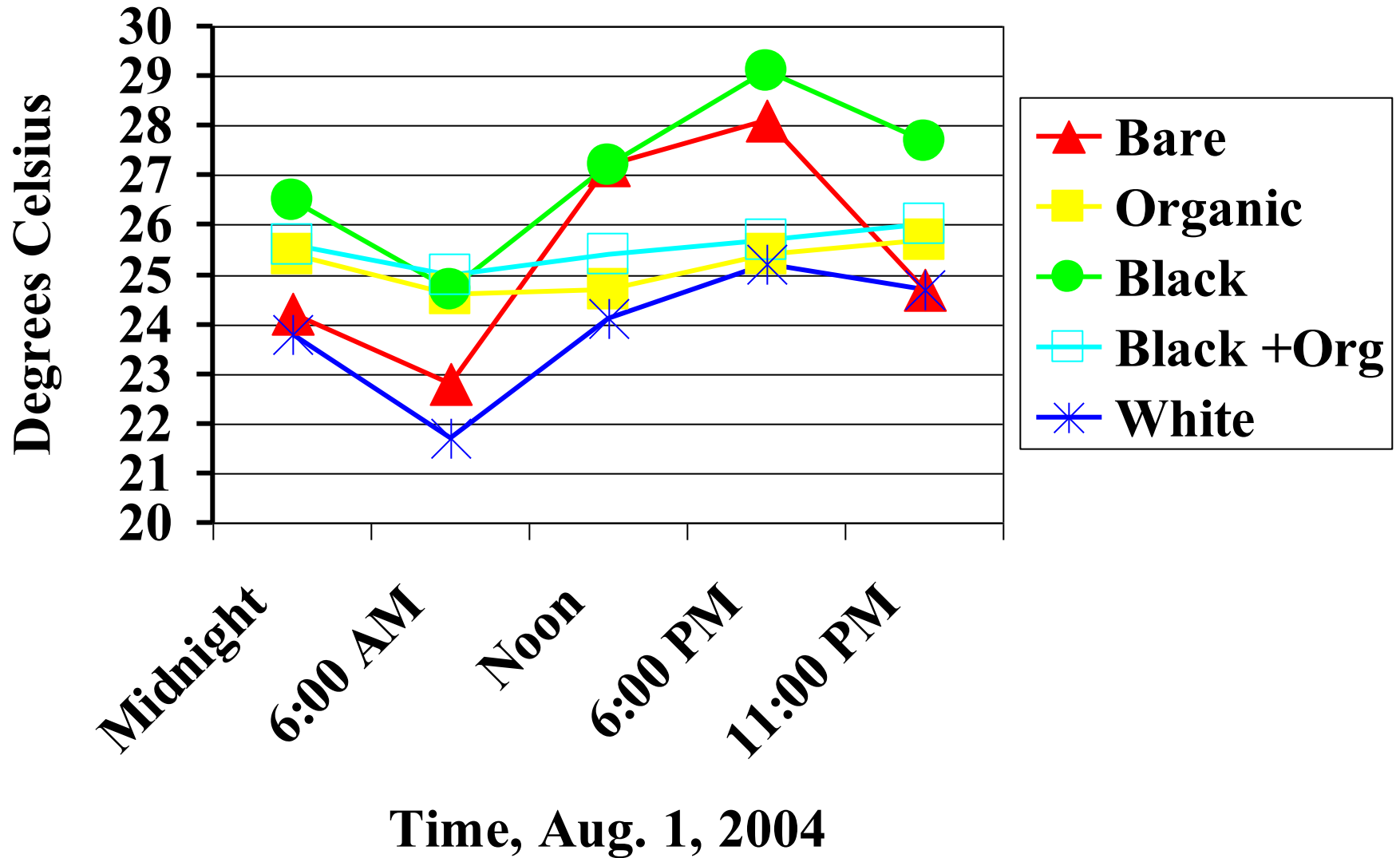
# Canopy Vol. (ft<sup>3</sup>) by Tmt & Year



# Ave. Soil Moisture - July '01

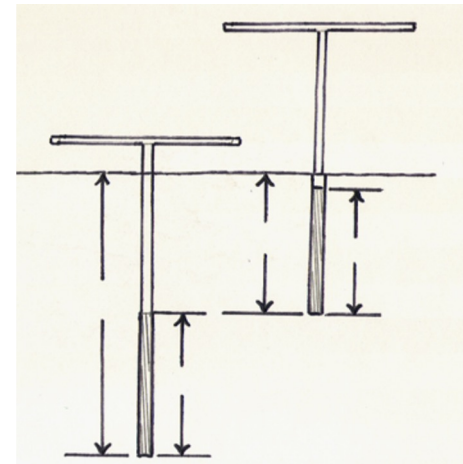


# Effect of Mulches on Soil Temperature



# Pre-plant Blueberry Fertilization

- Soil test upper 8 in., 8 – 16 in.
  - Soils with a natural pH over 6.0 or very high calcium may not be suitable
  - Very high phosphorus levels ( $>300\#/A$ ) may reduce iron availability





# Raised Beds

- The use of raised beds will provide better drainage in the root zone, especially where plantings are in low areas or in soils having poor internal drainage characteristics.
- Construct beds 8 to 10 inches high and 4 to 5 feet wide.
- Incorporation of organic matter in raised beds will create a more favorable soil environment for the plants.

# Applying Sulfur

- Elemental sulfur –
  - Apply at least 6 months prior to planting
  - Thoroughly incorporate in soil
    - Direct contact with roots can injure or kill them
  - May need to make split applications
- Injecting sulfuric acid or phosphoric acid through the drip irrigation system
  - Thoroughly mix acid with water in irrigation line
  - Monitor water pH (4.5 – 5.5)

# Cultural Practices

- **Year of planting**
  - **Plant in late winter to early spring**
  - **Prune**
  - **Mulch**
  - **Irrigate**
  - **Fertilize**
  - **Control pests (weeds, insects, diseases)**

# Blueberries – Planting Tips

- What to plant
  - Age of plants – 2 year old
  - Bare root vs. container
  - When to plant: late winter to early spring for bare root plants
- Spacing (orient rows north/south if possible):
  - Rabbiteye: 5 ft. inrow X 12 ft. between rows
    - 5' X 12' = 726 plants/acre
  - Highbush: 4 ft. inrow X 10 to 12 ft. between rows
    - 4' X 10' = 1089 plants/acre, 4' X 12' = 907 plants/acre
- Pruning at planting
  - Remove fruit buds, low, weak branches

# **Cultural Practices**

## **Nonbearing & Bearing**

- **Soil test (maintain soil pH 4.8 to 5.2)**
- **Maintain mulch cover**
- **Prune**
- **Remove fruit for at least 2 years**
- **Fertilize**
- **Irrigate**
- **Control pests**
- **Harvest**

# Determining Nutritional Needs: Postplant

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

# Effects of Soil Amendments on pH

Amendment	Effect on pH
<b>Biological Reactions</b>	
Organic matter	Reduction in pH is due to microbial degradation & production of organic acids. Large amounts are needed
Ammonium fertilizers	Minor effect on pH when used in amounts recommended as a fertilizer. Ammonium sulfate will have a much greater impact on lowering soil pH than ammonium nitrate or urea. Calcium nitrate & potassium nitrate will cause a rise in soil pH.
Elemental sulfur (S)	Creates acidity as bacteria form sulfuric acid
<b>Nonbiological Reactions</b>	
Aluminum sulfate Iron Sulfate	Chemical reactions create acidity. Less temperature dependent than for biological reactions

# Organic Matter

- Incorporating any organic matter will make soil more acidic
  - Sphagnum peat and pine bark are particularly effective
    - large amounts must be incorporated in the soil to have much effect on pH



# Acidifying Soils

- ~ 1 yr. is required for supplemental S to oxidize & reduce soil pH
- Oxidized sulfur is available as aluminum sulfate and ferrous sulfate
  - They are required in larger amounts (6 & 8-fold, respectively) than elemental sulfur & they can be toxic to blueberries (Al & Mn become very available when pH is < 5.0)
- Soils high in organic matter rarely need supplemental N

# Maintaining Soil pH - postplant

- Soil test frequently
- Use ammonium sulfate as a nitrogen source
- Use ferrous sulfate instead of aluminum sulfate for further pH adjustment
  - Injecting sulfuric acid into trickle system

# Uses of Tissue Analysis

- Troubleshooting problem areas
- \* Monitoring nutritional status of planting to detect impending deficiencies or toxicities before visible symptoms show up

# Leaf Analysis - blueberries

- Do annually
- Detect trends in nutrient levels
- Sampling procedures:
  - One variety/sample
  - Max. area of 10 acres/sample having
    - Same soil type, fertilization & irrigation
  - Collect mature leaves from mid-potion of current season's growth about 2 weeks after harvest
- Take soil samples form same areas

# Blueberry Fertilization

- Maintain soil pH around 5.0
  - Above 5.3 to 5.5, iron deficiency is apt to develop
  - Below pH of 5.0, aluminum toxicity can be a concern
- Inorganic fertilizers (nitrogen):
  - Use multiple applications at low rates
  - Consider using ammonium sulfate to help in maintaining soil pH in desired range
    - Fertilize at bloom, 6 weeks postbloom & 12 weeks postbloom
    - Use ~ 2 ounces ammonium sulfate/plant/application
- Organic fertilizers: 1 application/season @ budbreak

# Nitrogen - blueberries

- Effect of organic matter:
  - For each 1% of soil organic matter, about 15# of N is released/acre/year
  - Ammonium form is preferred over the nitrate form
  - Excess N results in
    - Reduced fruit size
    - Delayed ripening
    - Fruit softening
    - Reduced cold hardiness

# Irrigation (trickle or drip)

- Increased:
  - Plant survival
  - Growth
  - Fruit size & quality
  - Fruit bud initiation for next year
- Suggested water requirement:
  - 1 inch per week for mature plants during the growing season
    - Supplement natural rainfall



# Fertigating Blueberries

- N rates:
  - 1<sup>st</sup> yr. plants      1 to 1 ½ pounds/week
  - 2<sup>nd</sup> yr                2 – 2 ½ #
  - 3<sup>rd</sup> yr                3 – 3¼ #
  - 4<sup>th</sup>+ yr              4 – 5 #/week
  - Reduce rates during fruit ripening
- Phosphorus & potassium
  - ½ the rate of nitrogen
    - During ripening, use equal amounts of N & K
    - Do not use P if water iron levels are high

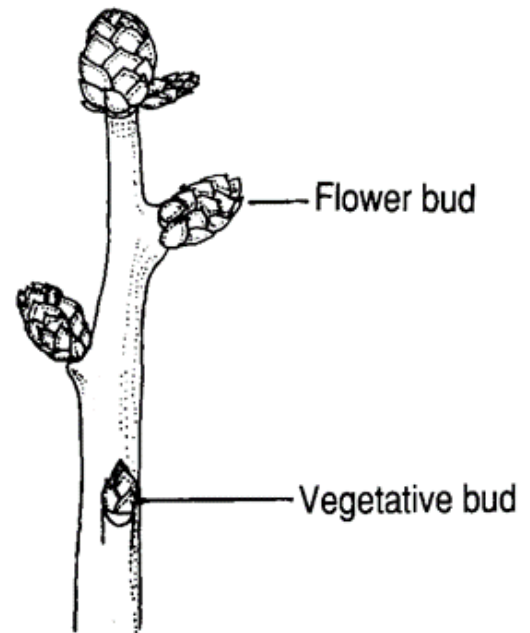


# Pruning Nonbearing Blueberry Plants

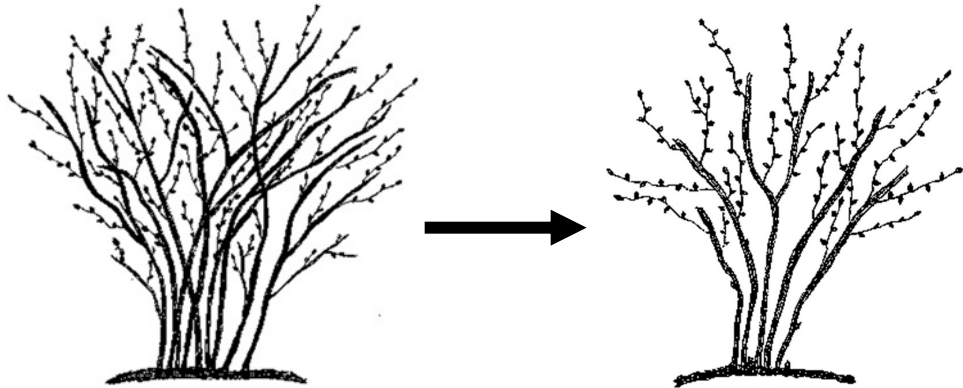
- At planting:
  - Remove weak shoots
  - Remove fruit buds
- 1<sup>st</sup> Dormant Pruning:
  - Remove fruit buds
  - Remove weaker, shorter shoots at the base of plants

# Pruning

- First 2 to 3 years:
  - Remove fruit buds to encourage more vegetative growth
- Every year:
  - Remove lower, shorter, weaker branches
  - Thin the canopy of bushes to assure good light penetration for fruit bud development, good disease control, ease of management

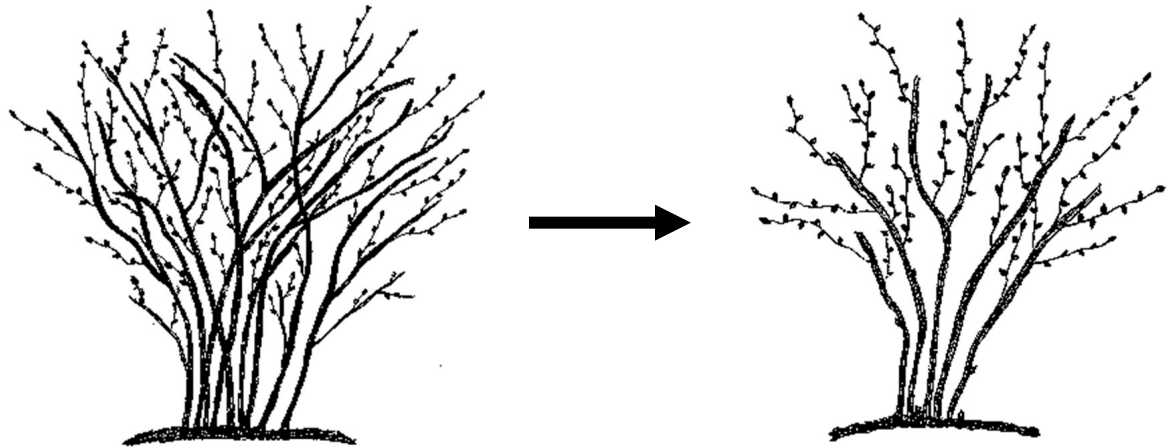


# Annual Pruning



- Every year:
  - Remove lower, shorter, weaker branches
    - Low yields, shading
  - Thin the canopy of bushes to assure good light penetration for fruit bud development, good disease control, ease of management
    - Necessary for fruit bud initiation throughout the canopy
- Maintain plants 5 to 6 ft. in height
- Canopy diameter: 4 ft.

## Mature Bushes



- begin a systematic removal of old canes throughout the canopy to encourage development of new canes more capable of producing heavy, high quality crop
  - Highbush - beginning the 6<sup>th</sup> year, remove about 20% of canes each year
    - Results in total renewal of the crown of the plant every 5 years
  - Rabbiteye – beginning about the 7<sup>th</sup> year, remove about 15% of the canes every year
    - Results in renewal of the entire crown every 7<sup>th</sup> year

Highbush Blueberry Production Guide

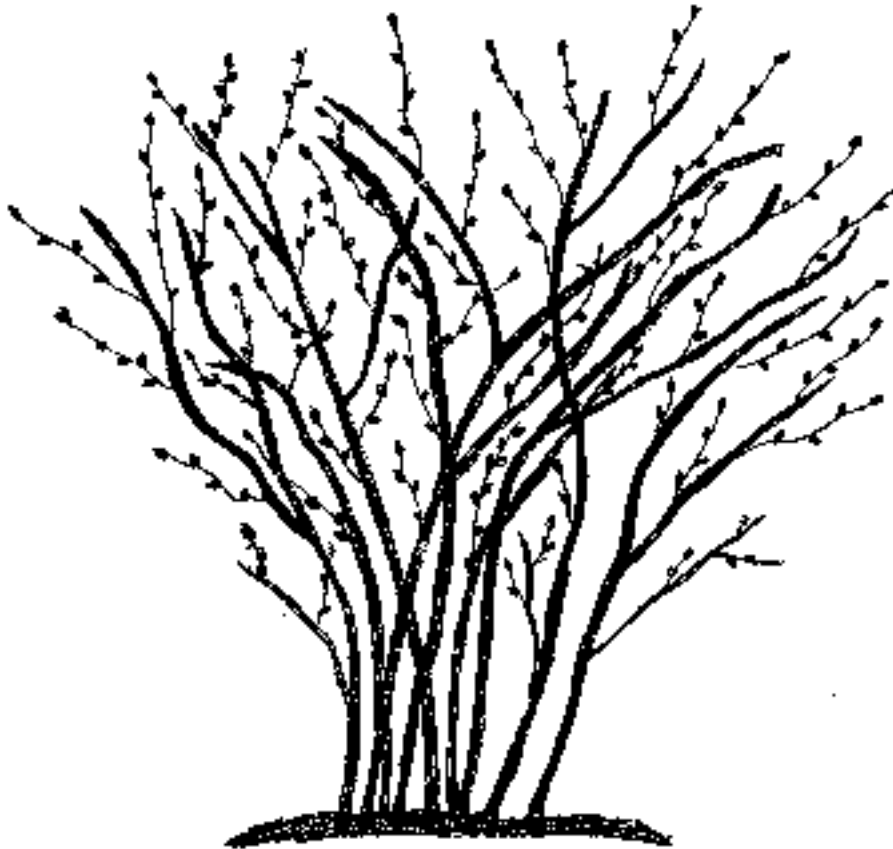
Plant Growth Habit

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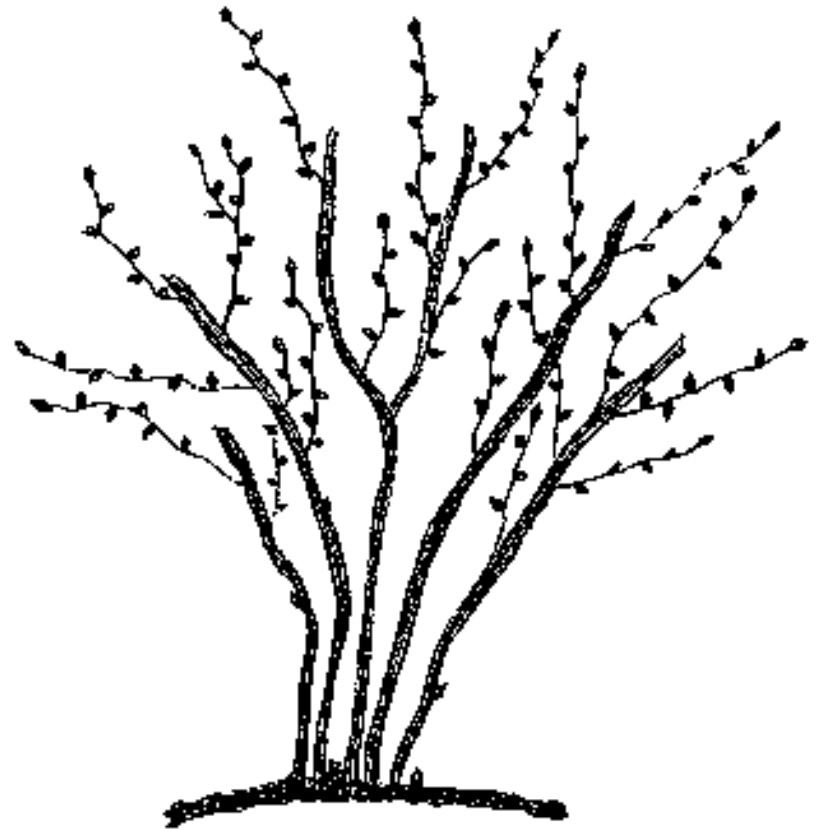
# Mature, Dormant Blueberry Bush

# Pruning Mature Blueberries

Before



After



# Fertilizing Blueberries

- Soil test annually to monitor pH
  - Most frequent cause of problems in blueberry production
- Tissue analysis to determine nutrient needs
- Nitrogen
  - Use an ammonium form of nitrogen
  - Use multiple applications at low rates
    - Timing: Bloom
    - Bloom + 6 weeks
    - Bloom + 12 weeks

# Damage to Blueberry Fruit



- Pin prick oviposition scars
- Larva emerged from fruit
- Soft, mushy spots on fruit

Pam Fisher, Berry  
Specialist/OMAFRA



# Spotted Wing Drosophila (*Drosophila suzukii*)

2 mm

Spots →

← Ovipositor

Female

Male

