Small-Scale Cherry Production, Big Time Market Opportunities

Gregory Lang
Michigan State University

Funding includes support from the USDA's National Institute of Food and Agriculture Hatch projects #MICL01305 and #MICL02002

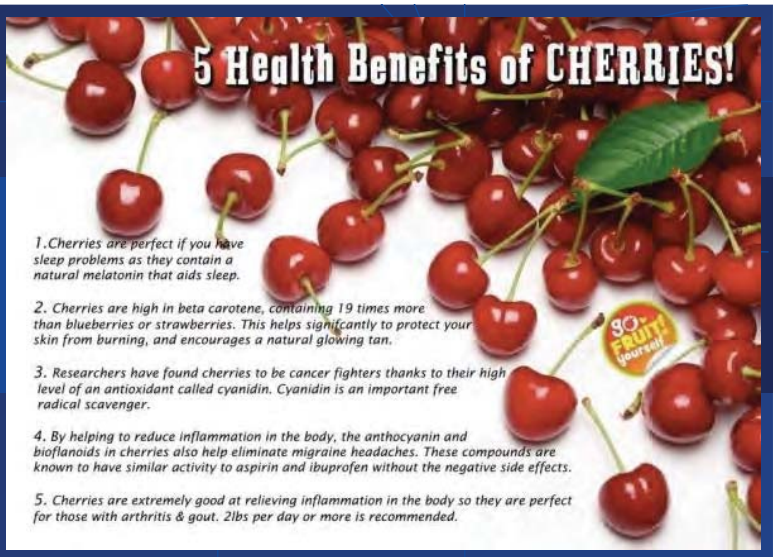
www.thewaywardecologist.com

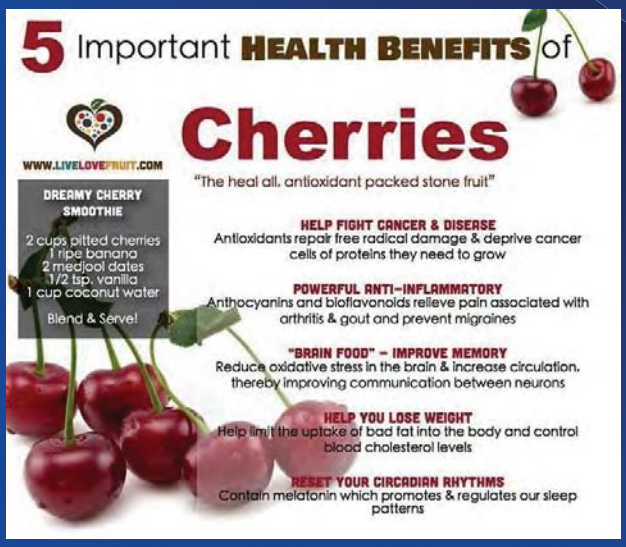
NC-140

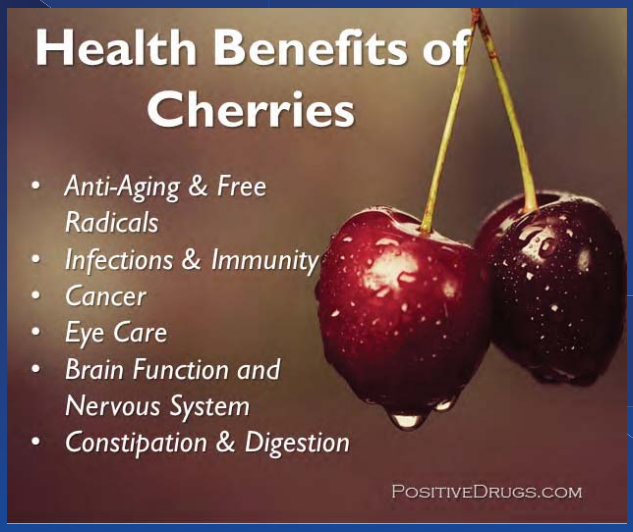
IFTA
INTERNATIONAL FRUIT TREE ASSOCIATION

MICHIGAN STATE UNIVERSITY AgBioResearch


Health Benefits of Cherries
the Little Red Fruit With a Powerful Health Punch
rich source of antioxidants
relieves & prevents arthritis & gout
anti-inflammatory properties
helps to relieve migraines
rich in melatonin
improves circadian rhythm
improves sleep
improves memory
high in beta carotene
reduces chance of colon cancer
helps to lower cholesterol
slows aging process
extremely effective diuretic
boosts libido in men & women
Very Berry Cherry Smoothie
1.5 cups fresh strawberries
1 cup pitted dark sweet cherries or
1 cup frozen unsweetened pitted
dark sweet cherries
1 cup fresh raspberries
1 cup pomegranate juice, chilled
1/2 cup fresh blueberries
In a blender combine strawberries, cherries, raspberries, pomegranate juice & blueberries. Blend until smooth.
facebook.com/OasisAdvancedWellness


5 Health Benefits of CHERRIES!
1. Cherries are perfect if you have sleep problems as they contain a natural melatonin that aids sleep.
2. Cherries are high in beta carotene, containing 19 times more than blueberries or strawberries. This helps significantly to protect your skin from burning, and encourages a natural glowing tan.
3. Researchers have found cherries to be cancer fighters thanks to their high level of an antioxidant called cyanidin. Cyanidin is an important free radical scavenger.
4. By helping to reduce inflammation in the body, the anthocyanin and bioflanoids in cherries also help eliminate migraine headaches. These compounds are known to have similar activity to aspirin and ibuprofen without the negative side effects.
5. Cherries are extremely good at relieving inflammation in the body so they are perfect for those with arthritis & gout. 2lbs per day or more is recommended.
go fruit yourself


5 Important HEALTH BENEFITS of
Cherries
WWW.LIVELOVEFRUIT.COM
"The heal all, antioxidant packed stone fruit"
DREAMY CHERRY SMOOTHIE
2 cups pitted cherries
1 ripe banana
2 medjool dates
1/2 tsp. vanilla
1 cup coconut water
Blend & Serve!
HELP FIGHT CANCER & DISEASE
Antioxidants repair free radical damage & deprive cancer cells of proteins they need to grow
POWERFUL ANTI-INFLAMMATORY
Anthocyanins and bioflavonoids relieve pain associated with arthritis & gout and prevent migraines
"BRAIN FOOD" - IMPROVE MEMORY
Reduce oxidative stress in the brain & increase circulation, thereby improving communication between neurons
HELP YOU LOSE WEIGHT
Help limit the uptake of bad fat into the body and control blood cholesterol levels
RESET YOUR CIRCADIAN RHYTHMS
Contain melatonin which promotes & regulates our sleep patterns


Health Benefits of Cherries
Anti-Aging & Free Radicals
Infections & Immunity
Cancer
Eye Care
Brain Function and Nervous System
Constipation & Digestion
PositiveDrugs.com

HEALTH BENEFITS OF SWEET CHERRIES

Sweet NW cherries may be considered a summer treat, but they're easy to enjoy all year long and boast plenty of health benefits you may not know about. Aside from being high in fiber and low in calories, they can protect against serious diseases. See how this superfruit benefits both your body and your taste buds!

7 SWEET REWARDS OF THIS SWEET SUPERFRUIT

PROTECT AGAINST ALZHEIMER'S:

Flavonoids and procyanidin can help guard neuronal cells, reducing oxidant stress and fighting dementia

WARD OFF CANCER:

Fiber + vitamin C + carotenoids + anthocyanins = anti-cancer team

- Cyanidin and quercetin help by reducing free radicals

COMBAT HYPERTENSION AND STROKE:

Potassium may reduce these risks, and cherries have more potassium (270 mg) than strawberries (254 mg) or apples (148 mg)

FIGHT CARDIOVASCULAR DISEASE:

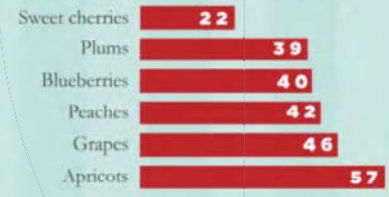
Anthocyanin also reduces inflammation, plaque and nitric oxide, keeping your heart strong and healthy.

- Quercetin's fight against free radicals helps ward off heart disease.

DISCOURAGE DIABETES:

Anthocyanin may reduce insulin resistance and increase glucose tolerance

Fruit Glycemic Index (Lower Is Better)

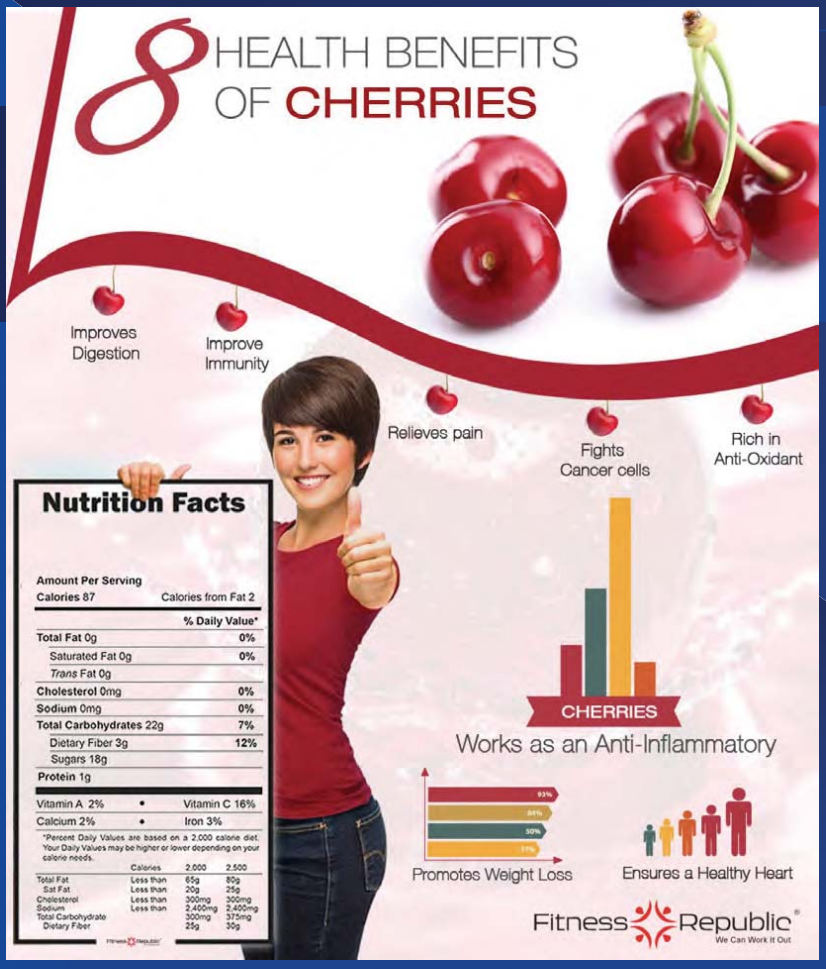


REDUCE INFLAMMATION:

Phytochemicals inhibit inflammation-causing enzymes, reducing pain from arthritis, injury and other ailments.

SLEEP BETTER AND BATTLE JET LAG:

Melatonin regulates circadian rhythm, helping you get truly restful sleep while reducing the tiring effects of jet lag.


8 HEALTH BENEFITS OF CHERRIES
Improves Digestion
Improve Immunity
Relieves pain
Fights Cancer cells
Rich in Anti-Oxidant
Nutrition Facts
Amount Per Serving
Calories 87
Calories from Fat 2
% Daily Value*
Total Fat 0g 0%
Saturated Fat 0g 0%
Trans Fat 0g
Cholesterol 0mg 0%
Sodium 0mg 0%
Total Carbohydrates 22g 7%
Dietary Fiber 3g 12%
Sugars 18g
Protein 1g
Vitamin A 2% • Vitamin C 16%
Calcium 2% • Iron 3%
*Percent Daily Values are based on a 2,000 calorie diet. Your Daily Values may be higher or lower depending on your calorie needs.
Calories 2,000 2,500
Total Fat Less than 65g 80g
Sat Fat Less than 20g 25g
Cholesterol Less than 300mg 300mg
Sodium Less than 2,400mg 2,400mg
Total Carbohydrate 300mg 375mg
Dietary Fiber 25g 30g
CHERRIES
Works as an Anti-Inflammatory
Promotes Weight Loss
Ensures a Healthy Heart
Fitness Republic
We Can Work It Out


8 Outstanding Health Benefits of Cherries
© Malilvan / iStock / Thinkstock


Cherries An Authentically Nourishing Food
❖Help promote relaxation and sleep
❖Useful in preventing gout
❖Rich in antioxidants to help fight inflammation
❖Contain anthocyanins to help regulate blood sugar levels
❖Dark cherries contain perillyl alcohol that can prevent certain cancers
❖Helpful for those with arthritis
❖Can boost brain function and improve memory
Please Tag on Facebook: Authentic Self Wellness

10 Health Benefits of...

Cherries

1. Improves Kidneys & Liver Health
2. Improves Heart Health
3. Full of Antioxidants
4. Anti-Inflammatory
5. Reduces Cholesterol
6. Improves Immunity
7. Great for Arthritis
8. Anti-Aging
9. Full of Vitamin A
10. Eases Digestion

eathealthylivefit.com

Amazing Health Benefits Of CHERRIES!

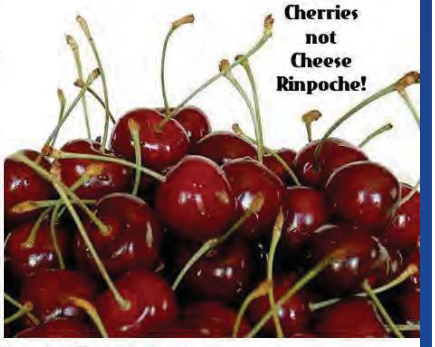
1. Promote Liver Health
2. Keep Your Heart Healthy
3. Help Fight Cancer
4. Arthritis Relief
5. Bone Density
6. Gout Relief
7. Anti-Inflammatory
8. Reduction In Diabetes Symptoms
9. Promote Kidney Health
10. Improved Sleep

herbs-info.com
pinterest.com/herbsandhealth1

Don't forget to share!

Ten Great Health Benefits of Eating Cherries

1. Cherries, known as a "super-fruit", are packed with antioxidants called anthocyanins which aid in the reduction of heart disease and cancer.
2. Cherries are one of the few food sources that c...ontain melatonin, an antioxidant that helps regulate heart rhythms and the body's sleep cycles.
3. Cherries are an excellent source of beta carotene (vitamin A). In fact they contain 19 times more beta carotene than blueberries and strawberries.
4. Cherries are rich in vitamins C, E, potassium, magnesium, iron, folate and fiber.
5. Cherries are referred to as "brain food", aiding in brain health and in the prevention of memory loss.
6. Because cherries contain anthocyanins, they can reduce inflammation and symptoms of arthritis and gout.
7. Eating cherries reduces the risk of diabetes.
8. Cherries are a good source of fiber which is important for digestive health.
9. Cherries are a great snack or dessert choice important for weight-maintenance.
10. Because of their powerful anti-inflammatory benefits, cherries are said to reduce pain and joint soreness for runners and athletes after workouts.



Vegans Do It For Love

Love of themselves, love for the planet, and love for all sentient beings

PEACE LOVE RESPECT VEGAN

Buddhist Students for a Vegan Rinpoche

The Health Benefits of CHERRIES (12!)

* Great source of Dietary Fiber
* Aids in Exercise Recovery
* Excellent source of Antioxidants
* Anti-Inflammatory Benfits
* Low Calorie
* Natural source of Melatonin
* Contain Boron for Bone Health
* Low Fat Snack
* Cancer Prevention
* Quercetin prevents Oxidative Damage
* Helps fight LDL 'Bad' Cholesterol
* Tart Cherries contain Anthocyanins for Pancreatic Health

fitnessfueltraining.com

2014 Cherry Ads

June 22

July 17

July 28

July 30

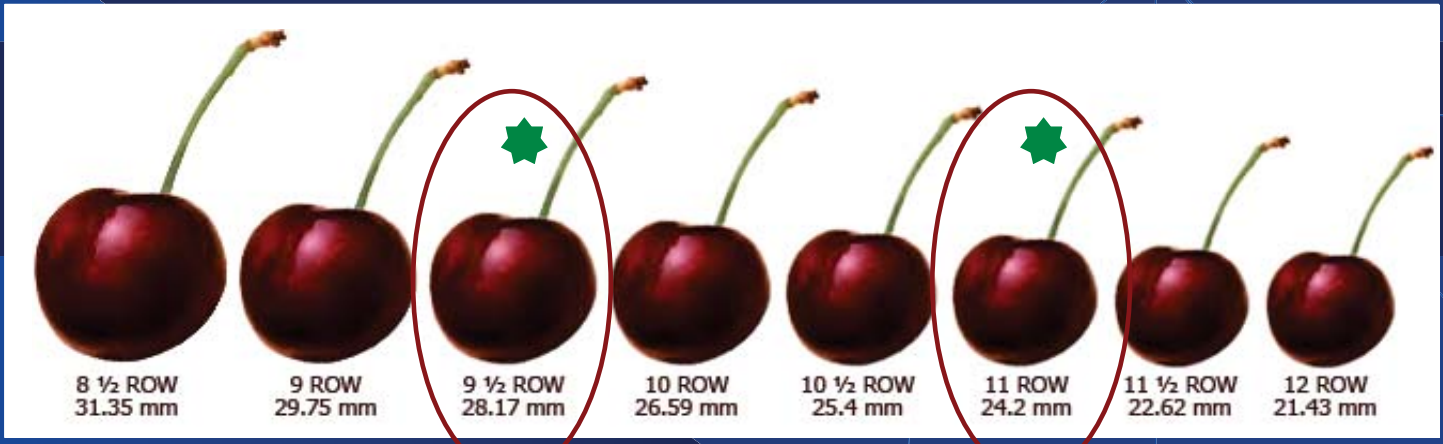
June 25

July 4

July 15

July 25

Fruit Quality: Cherry Size Affects Wholesale Value



2007	$2.78	$2.36	$2.17	$2.01	Average price differential between 24 mm and 28 mm fruit size = $0.67 / lb
2010	$2.56	$2.31	$2.08	$2.00	
2011	$2.85	$2.61	$2.34	$2.18	
Average	$2.73	$2.43	$2.20	$2.06	

USDA, Detroit Terminal Market data

At 7.5 tons/acre, that is $10,050 more per acre

Cherry Hills
FARMERS MARKET
Menifee

TASTE OKLAHOMA GROWN FRUITS & VEGETABLES

CHERRY STREET FARMERS MARKET

CHERRY ST FARMER'S Mkt

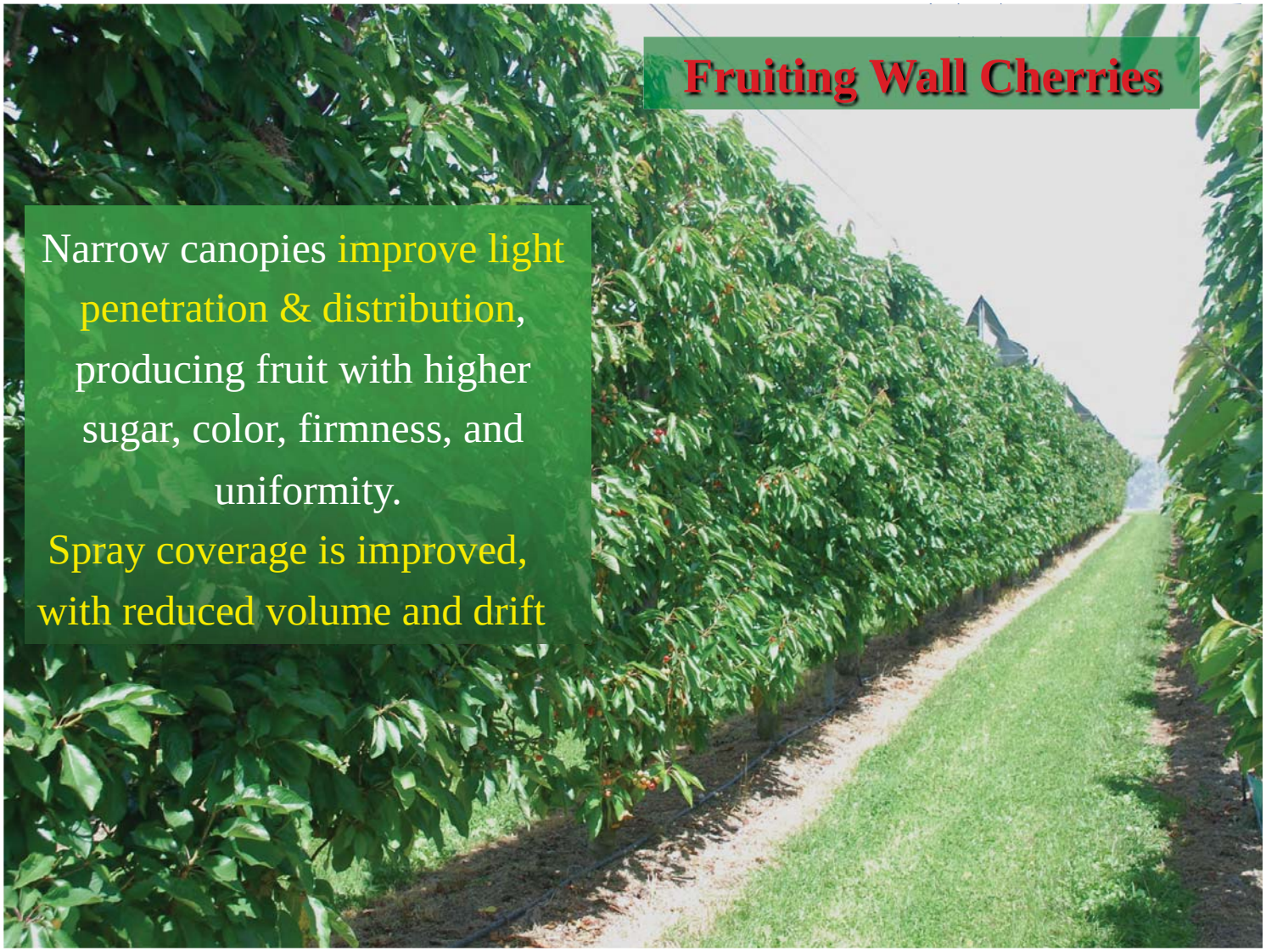
BE A FRIEND OF THE FARMERS' MARKET

VISIT US AT: WWW.CHERRYSTREETFARMERSMARKET.COM

Traditional Cherry Trees

Large, deep root systems

Extensive area for extraction of soil nutrients and water


Fruiting Wall Cherries
Narrow canopies improve light penetration & distribution, producing fruit with higher sugar, color, firmness, and uniformity.
Spray coverage is improved, with reduced volume and drift


Protective Covers
for Rain and Birds

Improvised Worker Platforms

Cornell Stone Fruit

An IPM Variety

BlackPearl® NY 8139

BlackPearl is the best cherry it's season, ripening 10 days before Bing, with Chelan. (-10) It has exceptional flavor and is extremely firm and crunchy. The fruit is medium size with 20% sugar. BlackPearl has amazing storage qualities and keeps better than almost any other cherry. It is hardy and canker resistant with low cracking. Early season bloom,
S4 unknown.

- Early ripening season (week 3)
- Very good flavor and firmness
- Less susceptibility to rain cracking

Santina

- Self-fertile
- Firm, large size
- Early ripening season (week 3)
- Moderately tolerant to rain cracking

Cornell Stone Fruit

An IPM Variety

BurgundyPearl™ NY 38L

- Early-mid ripening season (week 4)

A large, high quality, very firm, crack resistant cherry with a tough, grower friendly tree. BurgundyPearl ripens 3 to 5 days before Bing. (-3) It has large, firm, crunchy, 12g fruit with 20.5% sugar. The tree is vigorous, productive, and canker resistant . BurgundyPearl has superior quality, storability and excellent crack resistance, averaging 4% cracking with 1" of rain in 2008. Early midseason bloom,S3S4

- Early-mid ripening season (week 4)

Cornell Stone Fruit

An IPM Variety

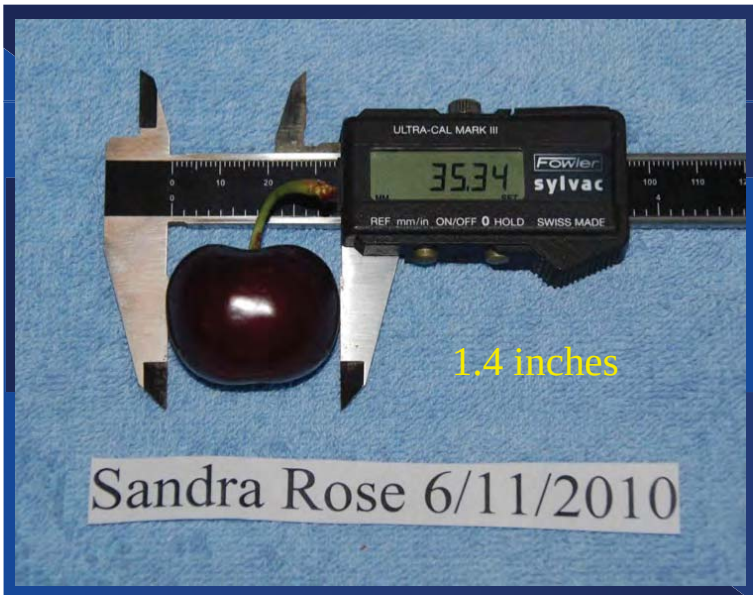
EbonyPearl™ NY 32

EbonyPearl is a large, very high quality cherry that ripens 3 days ahead of Bing. (-3) It has excellent crack resistance, averaging 4% cracking with 1" of rain in 2008. The tree is hardy, vigorous and canker resistant . Very large fruit averages 9.5 row, 11.6g with exceptional flavor and quality and has long, firmly attached stems. EbonyPearl has a early mid -season bloom. S1S4.

Benton

- Self-fertile
- Firm, large fruit size
- High sugar, excellent flavor

- Blooms late, mid-ripening season (week 5)
- Less susceptible to rain cracking



Sandra Rose

- Medium firm, large fruit size
- Self-fertile
- Blooms mid-season, mid-ripening season (week 5)
- Susceptible to rain cracking

Attika (Kordia)

- Very firm, large, heart-shaped fruit, excellent flavor

- Blooms late, mid-late ripening season (week 6), not self-fertile

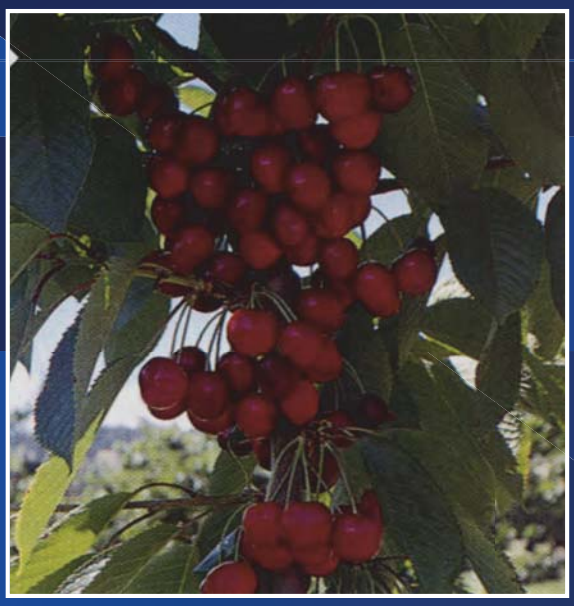
- Less susceptible to rain cracking; more susceptible to frost

Skeena

- Very firm, large fruit size
- Self-fertile
- Blooms mid-season, mid-late ripening season (week 6)
- Very susceptible to rain cracking

Regina

- Very firm, large fruit
- Blooms late, late ripening season (week 7)
- Low susceptibility to rain cracking
- Productivity can be a problem; pollen-compatible with Sam, Blackgold, Attika, Sylvia



Sweetheart

- Self-fertile
- Blooms early, very late ripening season (week 8)
- Precocious, highly productive, very horizontal growth habit
- Medium to large fruit, moderately susceptible to rain cracking

Rainier

- Highest value cherry in the market
- Blooms early, mid-ripening season (week 5-6)
- Precocious, highly productive, large fruit
- Excellent bud and wood cold hardiness

Radiance Pearl

RadiancePearl™ is a Rainier type cherry that ripens 7 to 10 days ahead of Bing (-7-10) and has exceptional flavor and quality. The fruit averages 11g with 20% sugar and has exceptional flavor and low rain cracking. It has a vigorous, hardy and productive tree. RadiancePearl™ has an early mid-season bloom, S1 Unknown. It is perfect for fresh market and u-pick operations.

Photo courtesy of Stuff.co.nz (probably Lapins fruit)

Rain and Cherry Cracking

2005 MSU Clarksville
Crop Value (6-yr-old trees):
$31,590 / acre

46 to 54% Culls
due to Rain

Crop Loss Due to Rain =
$15,795 per acre

Are Rain Covers Affordable?

Rain Covers in Norway

High Tunnels (Haygrove) in the United Kingdom

- Protection from rain, hail, and wind; greater heat retention in spring

Two Types of Cherry Fruit Cracking

Type 1: Rain on Fruit Skin

Cracking at the tip (stylar end) or bowl (stem end) due to long fruit contact with rainwater.

Eliminated with protective covers (reduced with some water-resistant fruit coatings)

Two Types of Cherry Fruit Cracking

Type 1: Rain on Fruit Skin

Cracking at the tip (stylar end) or bowl (stem end) due to long fruit contact with rainwater.

Eliminated with protective covers (reduced with some water-resistant fruit coatings)

Type 2: Excessive Water in the Soil

Fruit side cracking (due to rain or irrigation water taken up by the roots and pumped into the fruit (*especially when leaves have low evapotranspiration*).

Can occur even with protective covers; must manage soil moisture and drainage

Management of Rain Run-off from Tunnels to Reduce Type 2 Cracking

MICHIGAN STATE UNIVERSITY

Leg-row drainage tile and gravel channels

Also beneficial: Planting on berms or raised beds

Slide from Ben Gluck (2012)


MICHIGAN STATE
UNIVERSITY
Automated Retractable Roof Panels with Gutters Close in Response
to Rain, Wind, and High and Low Temperature Set-Points

What is the Basic Cherry Fruiting Unit?

Year 1 - New shoot growth with single leaves

Year 2 – First season growth forms non-fruiting spurs, with *greater spur density* in the terminal portion and a few basal non-spur fruit buds

Year 3 – First season growth forms fruiting spurs, with *more flower buds per spur (and greater spur density)* in the terminal portion

Ayala and Lang, 2004

Fruit Quality: Managing Leaf-to-Fruit Ratios

Year 3:

Fruit populations: 1 spur (e.g., 75 total), 1 non-spur (e.g., 10 total)

Leaf populations: 2 spur (e.g., 120 total), 1 shoot (e.g., 10 x 2X)

Leaf-to-Fruit Ratio: 1.65

Year 4:

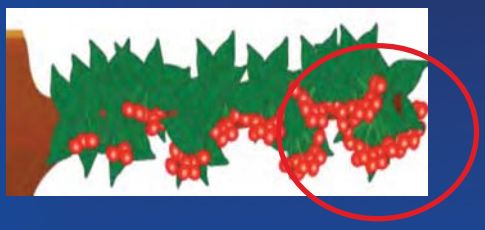
Fruit populations: 2 spur (e.g., 150 total), 1 non-spur (e.g., 10)

Leaf populations: 3 spur (e.g., 180 total), 1 shoot (e.g., 10 x 2X)

Leaf-to-Fruit Ratio: 1.25

A 25% reduction yields smaller fruit

Precision Management of Leaf-to-Fruit Ratios



Anticipation of the future unbalanced cropping sites can be pre-emptively managed to better balance leaf-to-fruit ratios

A dormant heading cut to remove:
15 to 30% of last year's shoot
will therefore remove:
25 to 40% of the future flower density

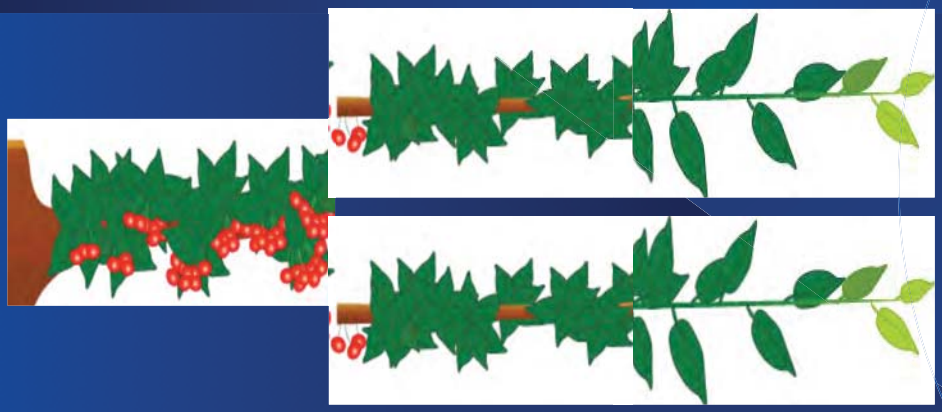
Precision Management of Leaf-to-Fruit Ratios

This heading cut reduces future spur fruit populations…..

Precision Management of Leaf-to-Fruit Ratios

This heading cut reduces future spur fruit populations…..

Precision Management of Leaf-to-Fruit Ratios



This heading cut not only reduces future spur fruit populations,

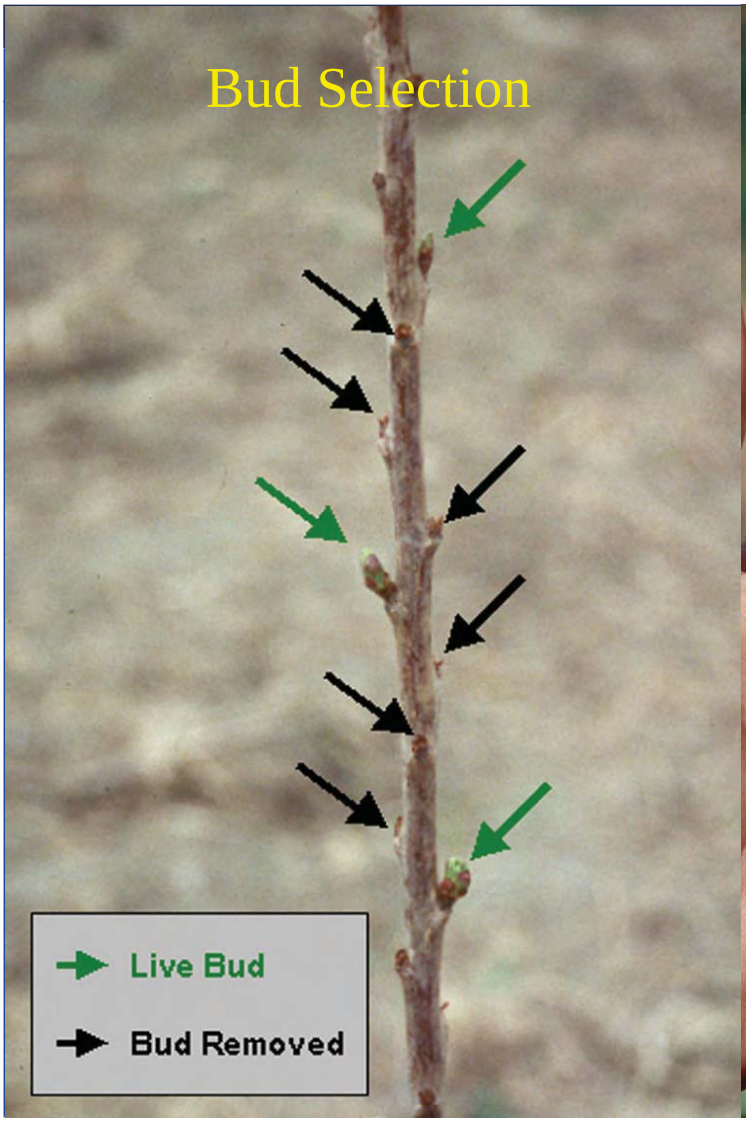
but also promotes new shoot leaf populations

Year 3:

Fruit populations: 1 spur (e.g., 40 total), 2 non-spur (e.g., 20 total)

Leaf populations: 3 spur (e.g., 166 total), 2 shoot (e.g., 20 x 2X)

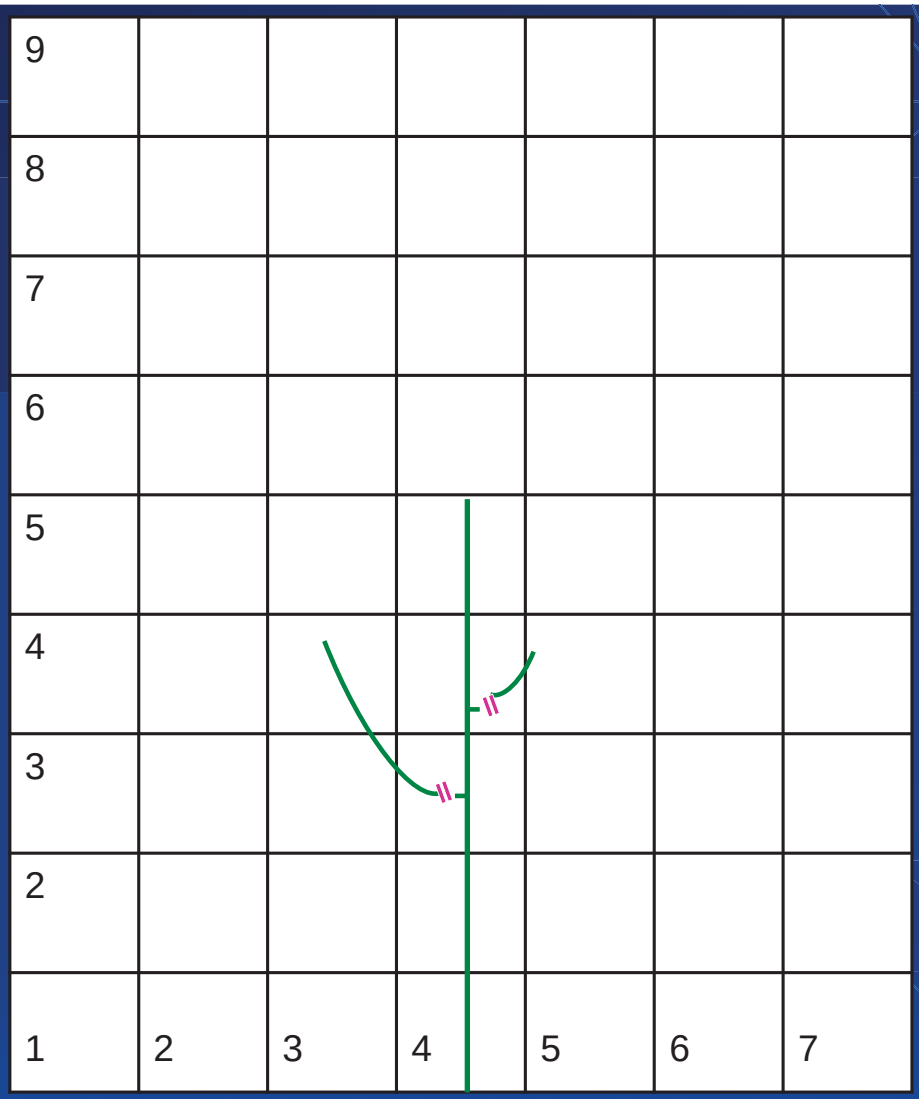
Leaf-to-Fruit Ratio: 2.75


Bud Selection
Live Bud
Bud Removed


Promalin
(BA+GA4+7)


Notching /
Scoring
Photo by Stefano Musacchi

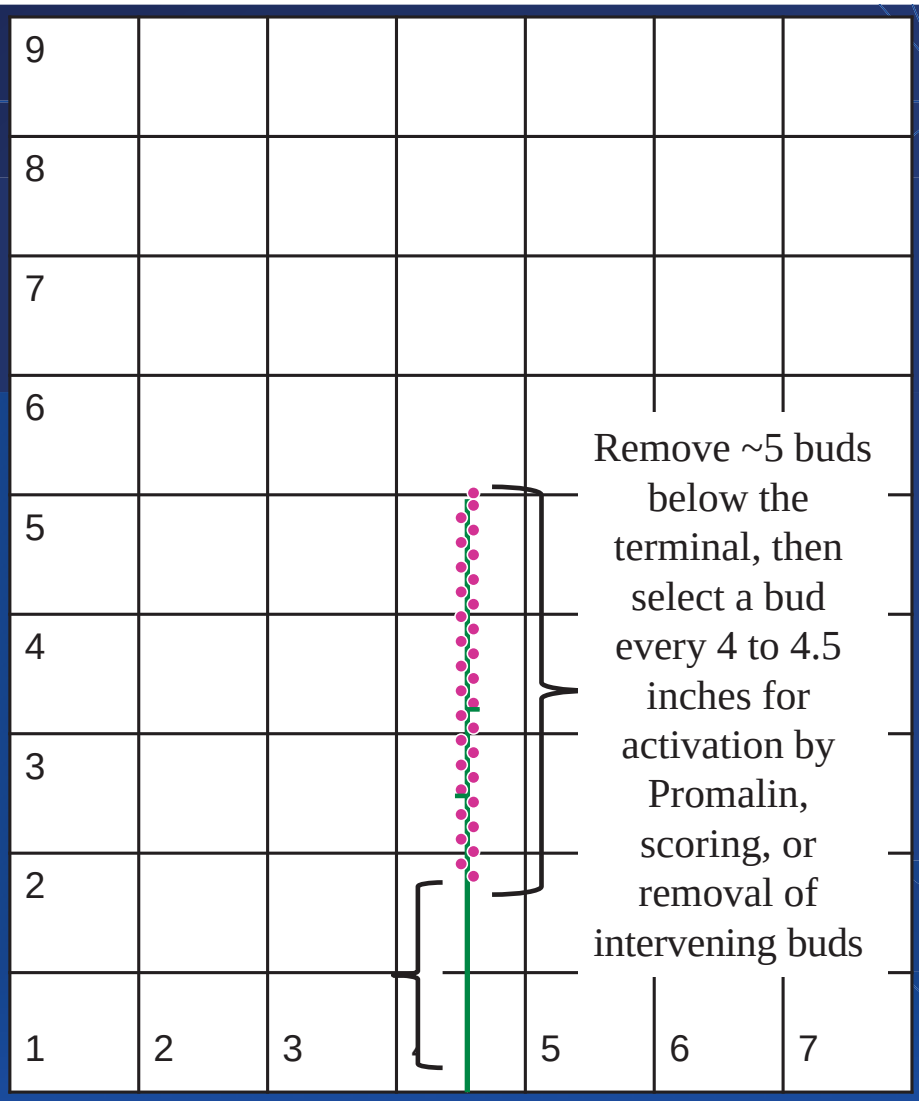

24.05.2007 11:39
Pegs for Crotch Angles



MSU CHERRY RESEARCH

TSA Year 1

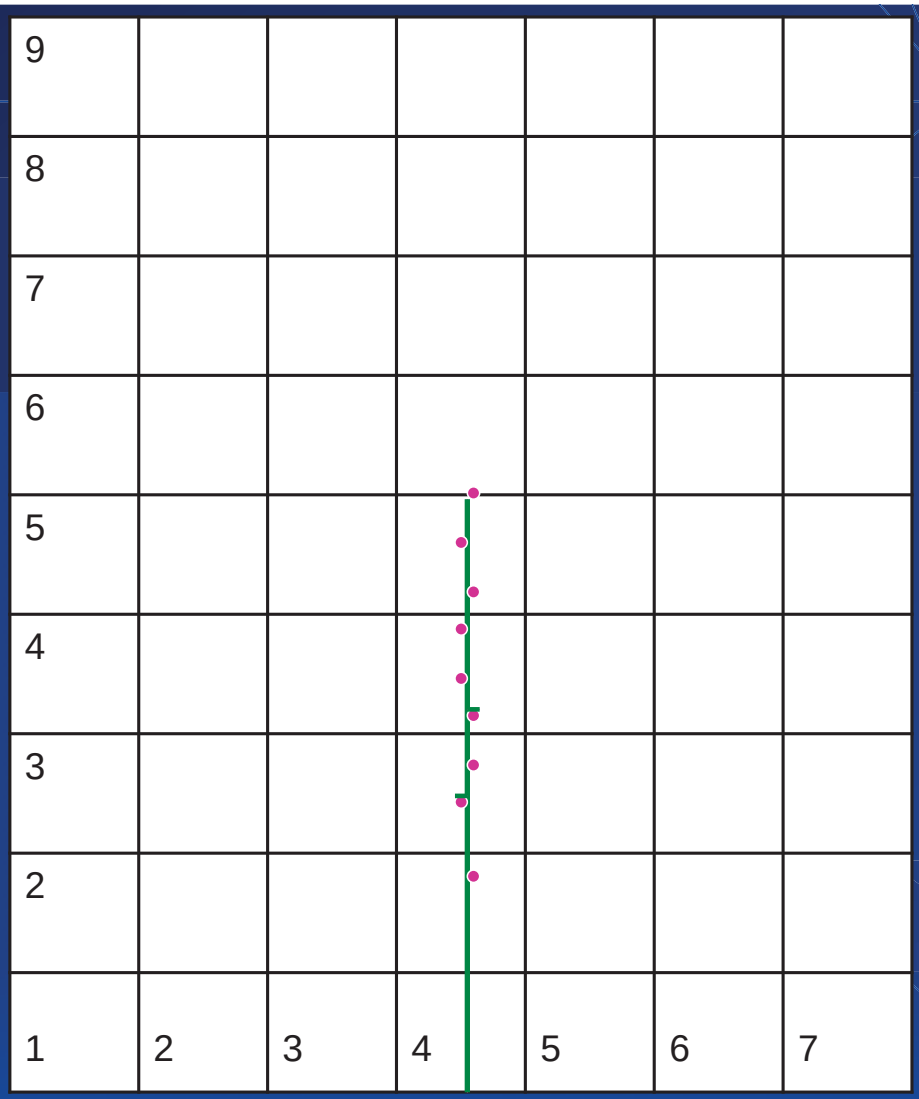
Planting of nursery tree, removal of any lateral branches (“feathers”)



MSU Cherry Research

TSA Year 1

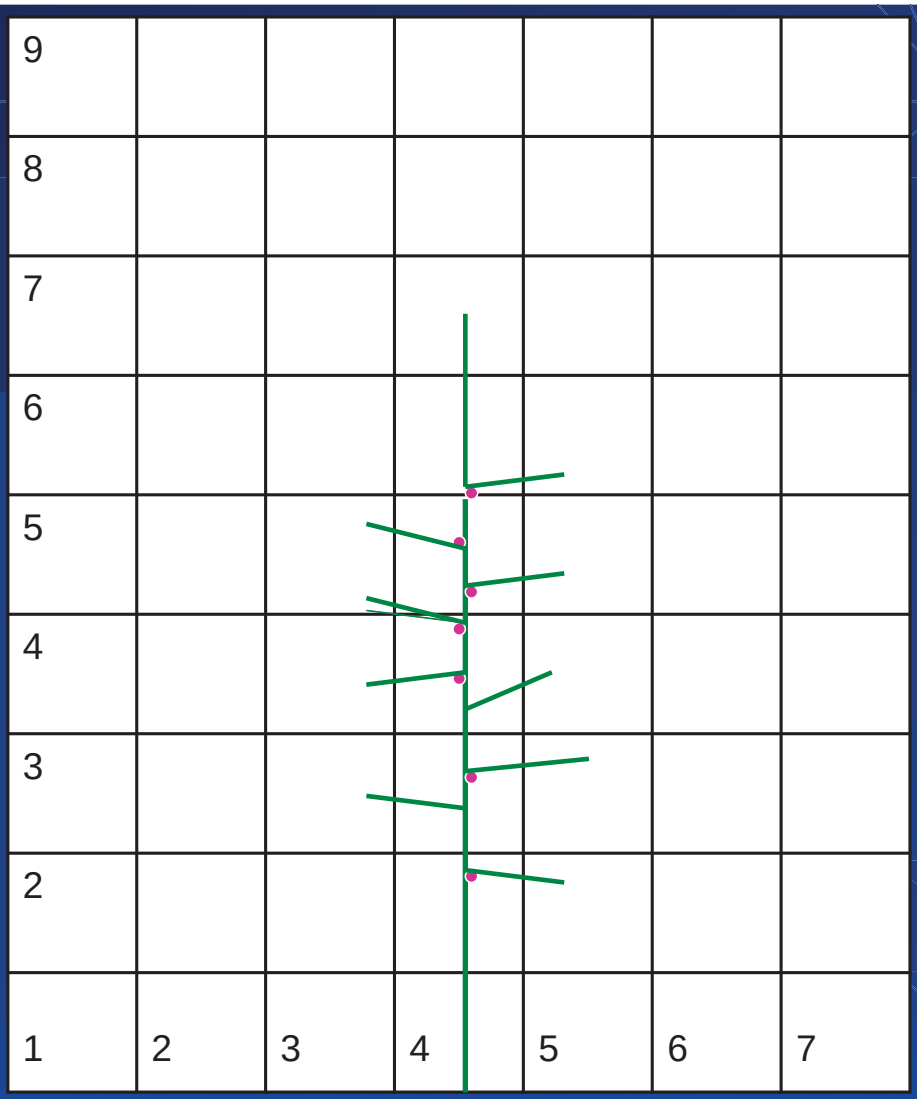
After planting, removal of lowest buds for weed spray clearance



MSU Cherry Research

TSA Year 1

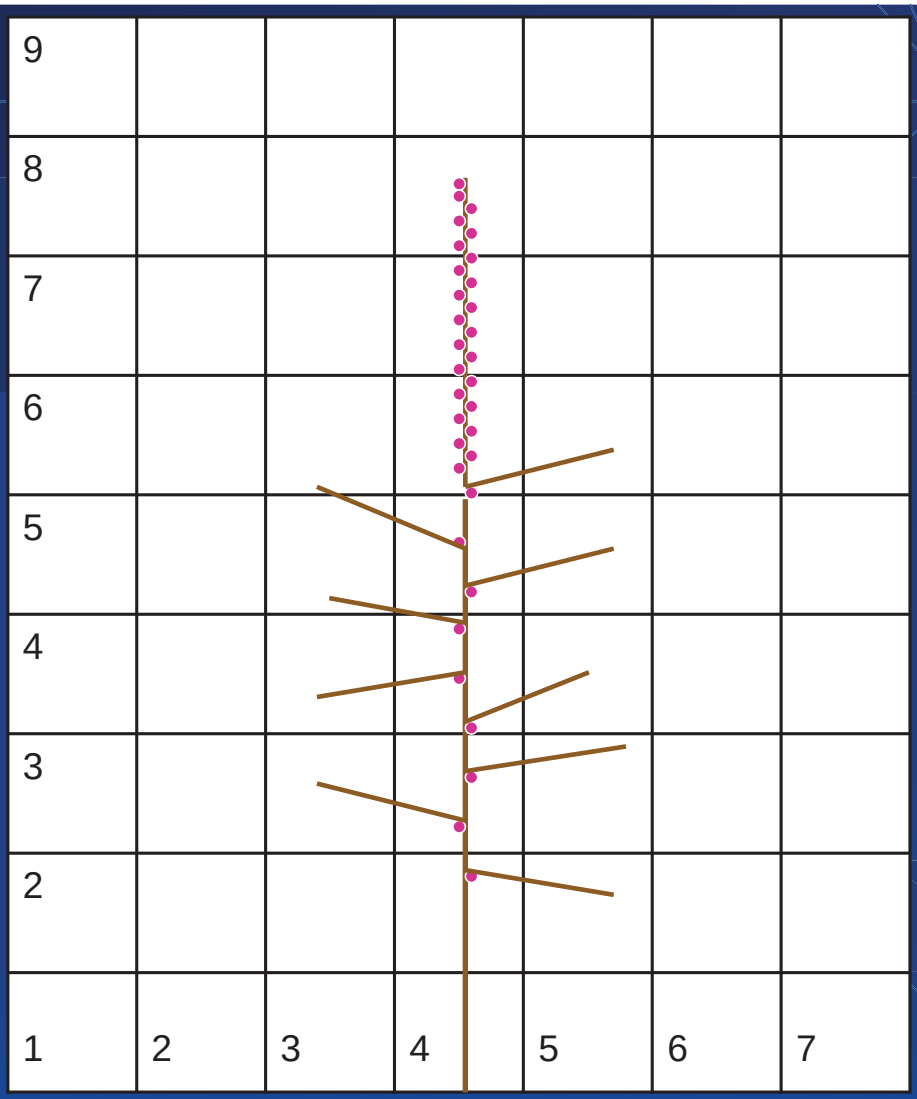
After bud selection for activation by Promalin, scoring, or bud removal



MSU CHERRY RESEARCH

TSA Year 1

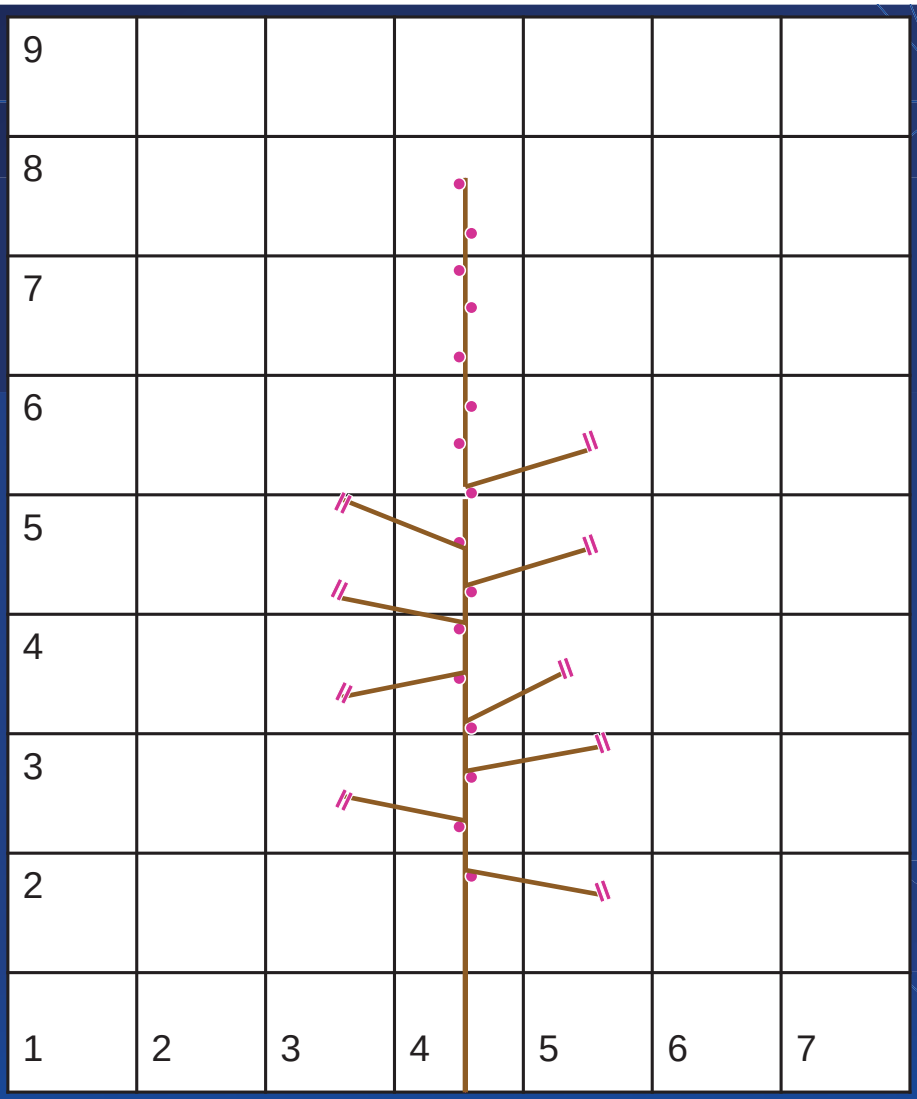
Spring shoot growth from activated buds



MSU CHERRY RESEARCH

TSA Year 2

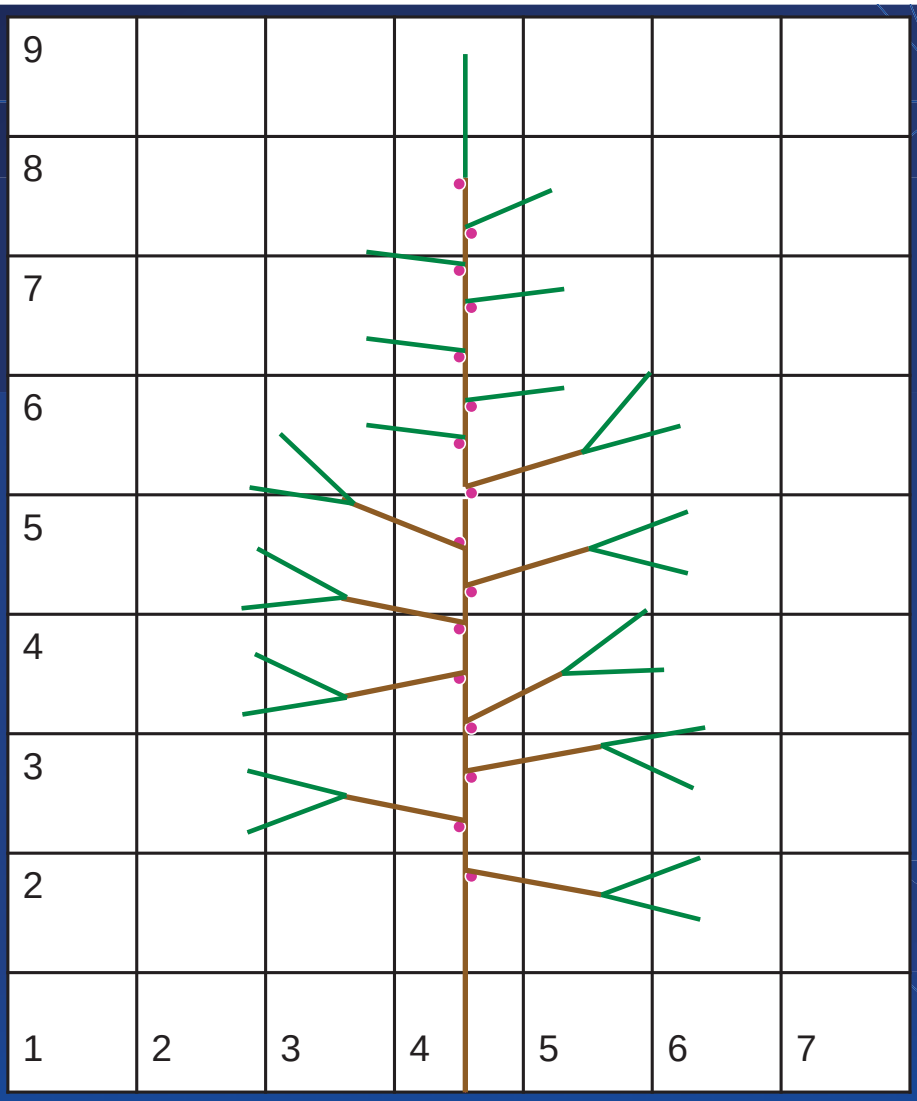
Tree canopy prior to dormant pruning before 2nd growing season in orchard



MSU CHERRY RESEARCH

TSA Year 2

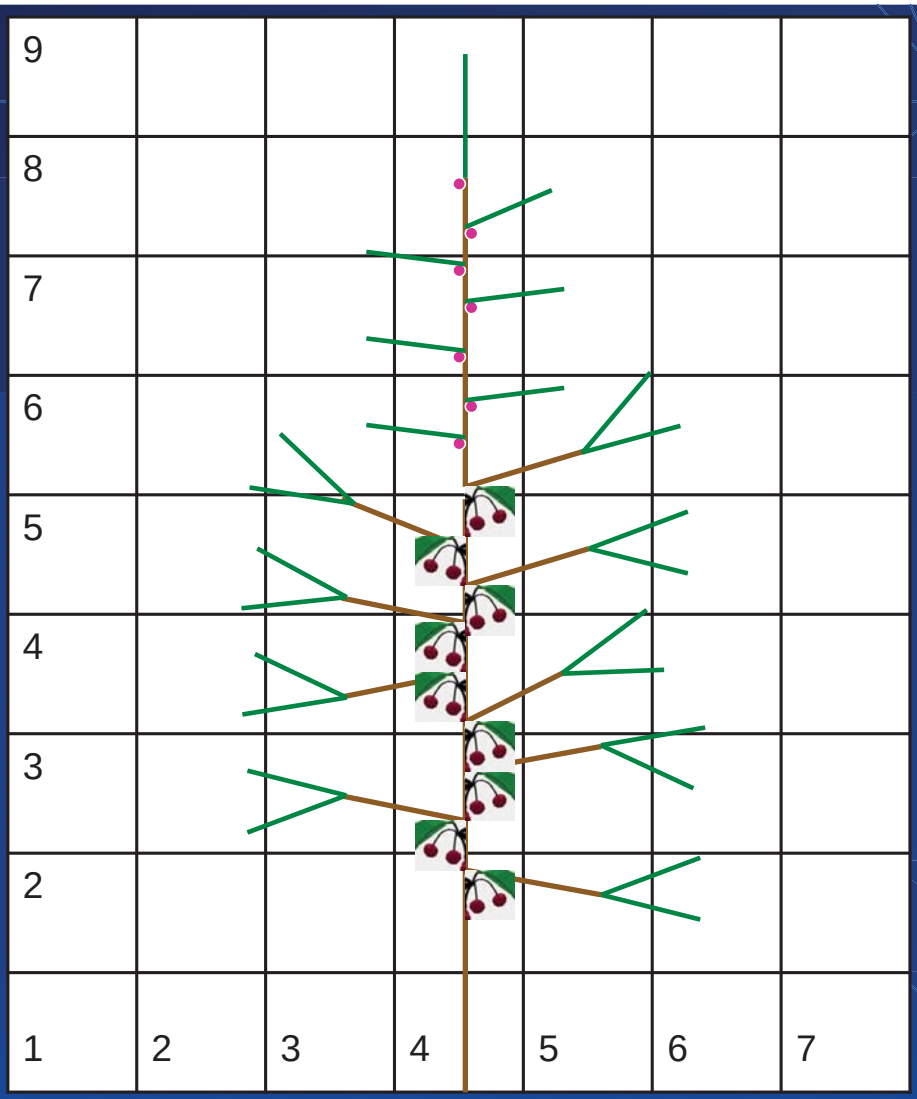
Bud selection of the previous season's terminal growth and dormant pruning of the previous season's lateral shoots



MSU CHERRY RESEARCH

TSA Year 2

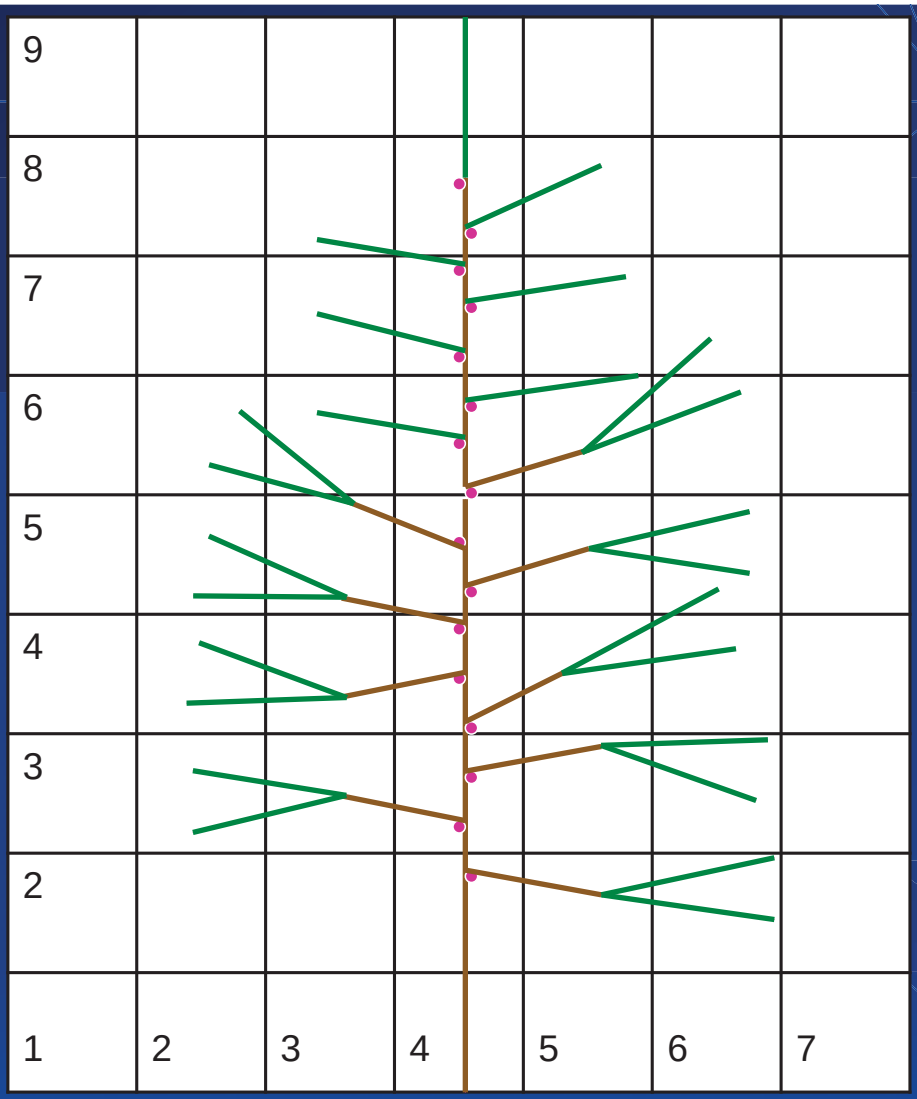
Spring shoot growth



MSU CHERRY RESEARCH

TSA Year 2

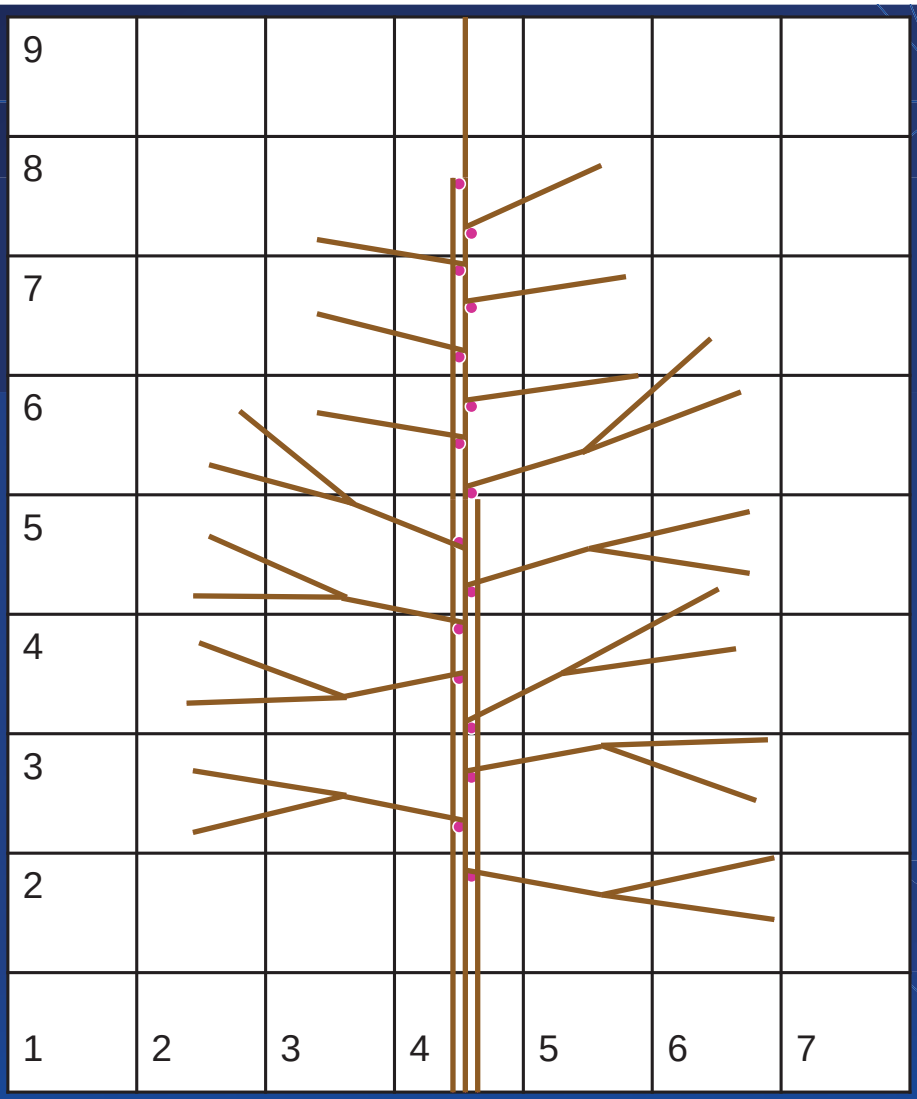
Spring shoot growth; fruiting at base of last season's shoot growth and on spurs on portion of the leader that grew in the nursery



MSU CHERRY RESEARCH

TSA Year 2

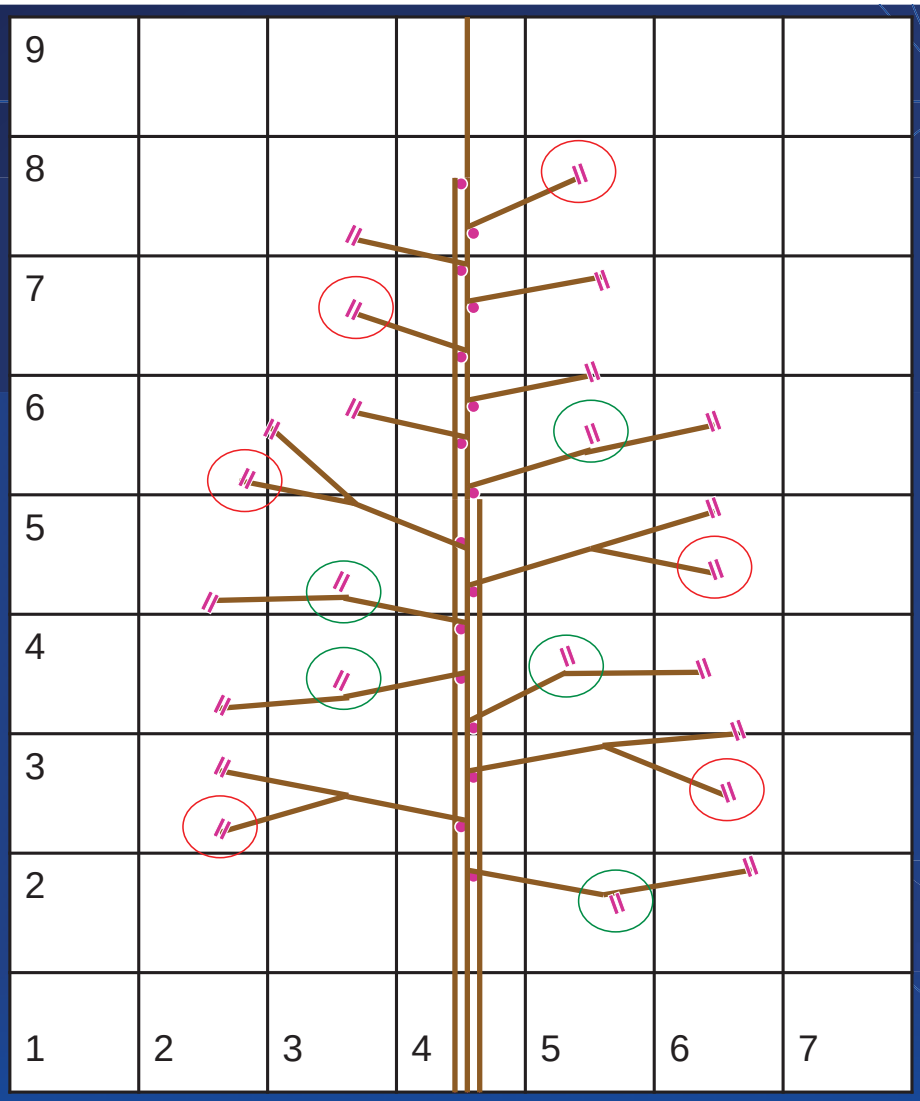
Summer shoot extension growth



MSU Cherry Research

TSA Year 3

Tree canopy prior to dormant pruning before 3rd growing season in orchard

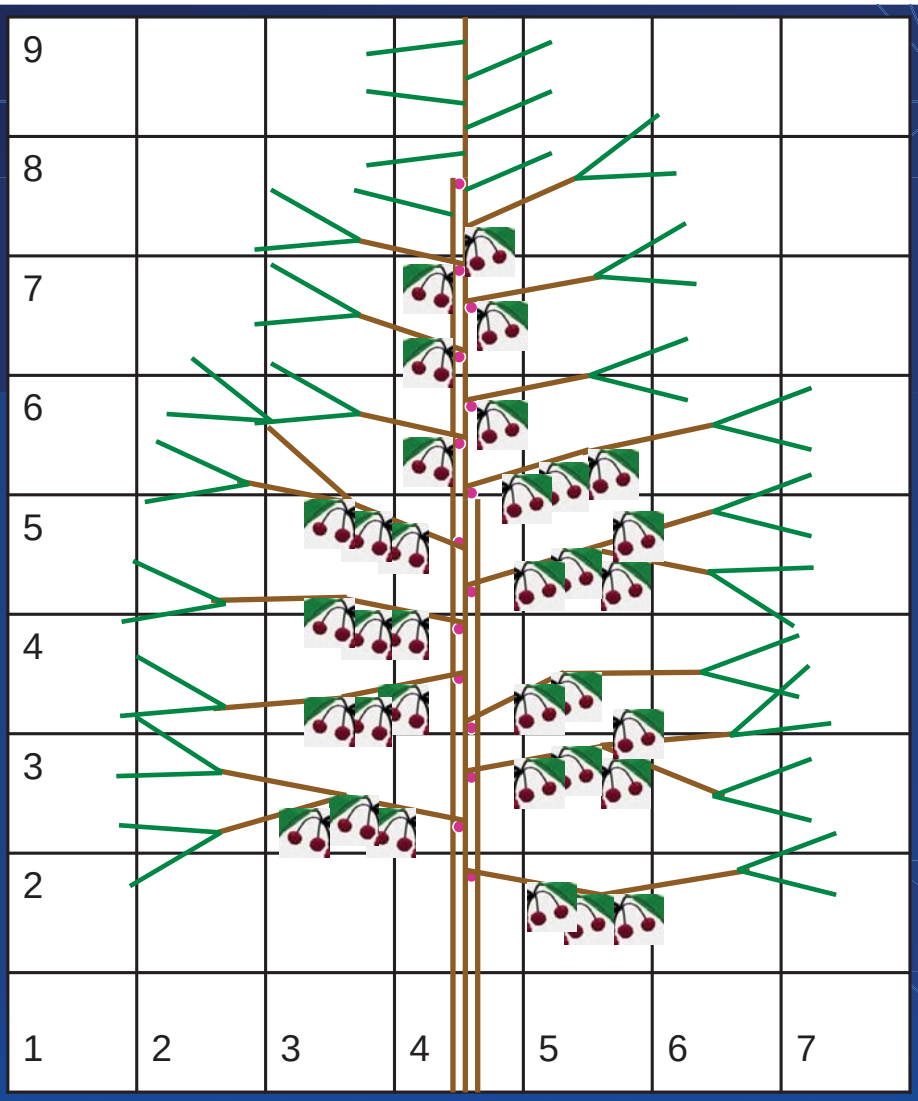


MSU CHERRY RESEARCH

TSA Year 3

Dormant-prune for: 1) future crop load management, and

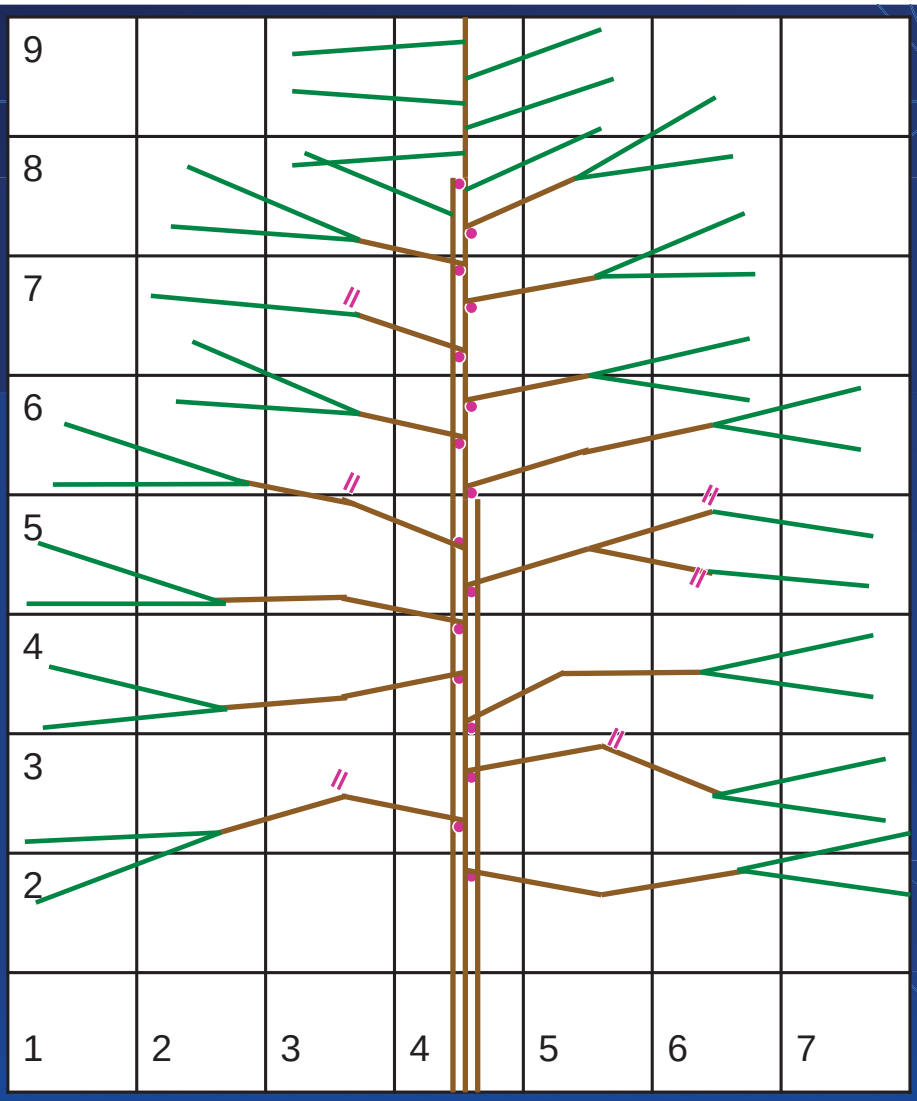
2) to thin out any overlapping shoots (promote good light distribution)



MSU CHERRY RESEARCH

TSA Year 3

Fruiting at base of last season's shoot growth and on spurs from Year 1 shoot growth

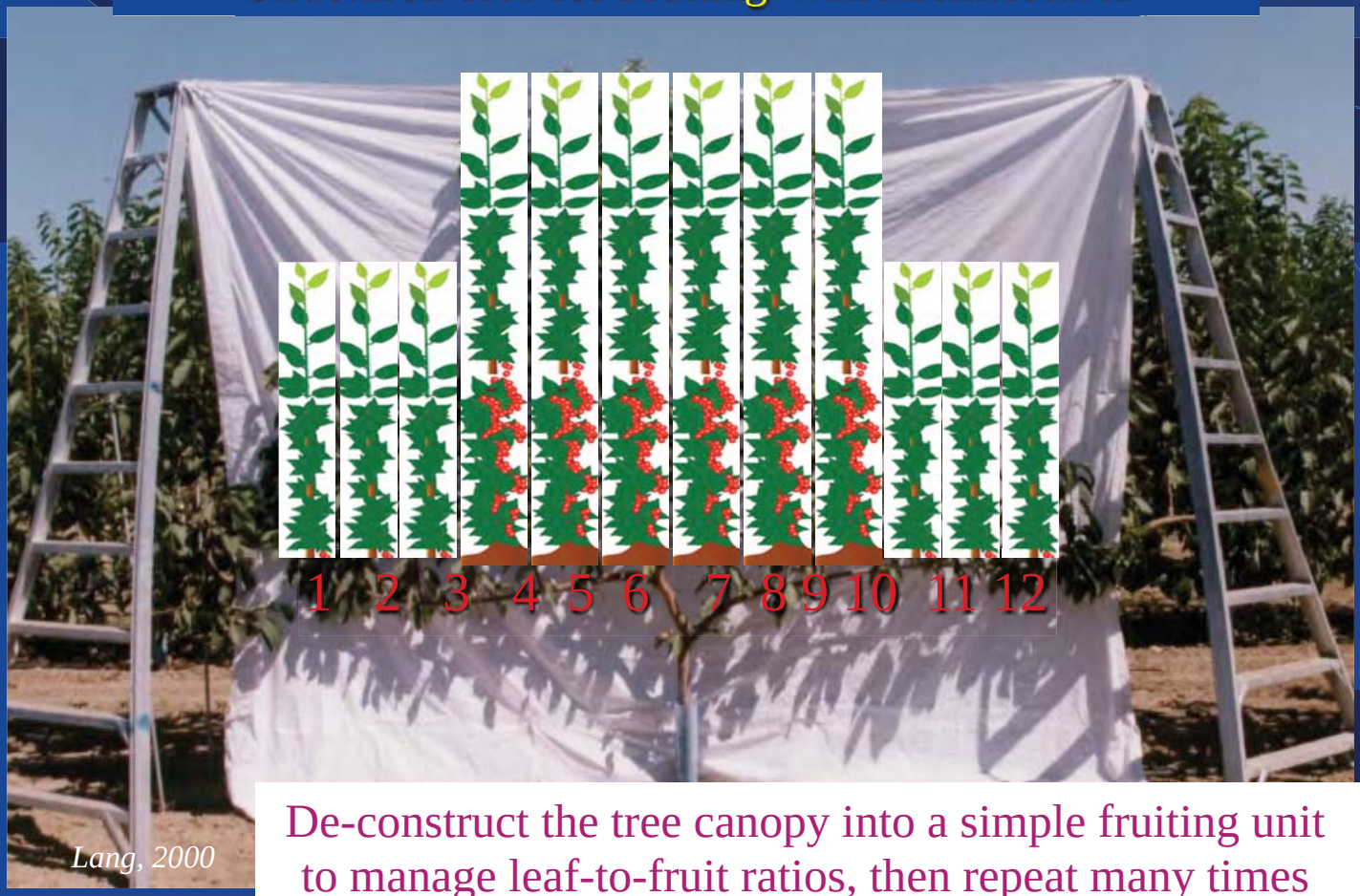


MSU Cherry Research

TSA Year 3

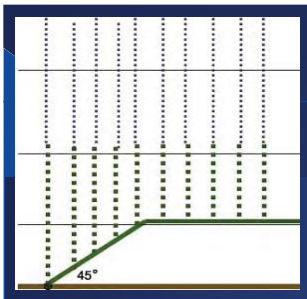
Summer-prune any overlapping shoots to minimize shading of developing flower buds

Strategies to Optimize Precision Cropping: The Highly-Structured Tree for Fruiting Wall Architectures



Lang, 2000

De-construct the tree canopy into a simple fruiting unit to manage leaf-to-fruit ratios, then repeat many times



UFO Fruiting Units and Yield

Ultimately, easier to manage 1000 simplified small trees/acre than 150 large trees with high variability in branching and orientation

Tree Spacing: 5 ft x 8 ft 1,079 trees/acre

Fruiting unit (upright shoot) spacing: 8 inches

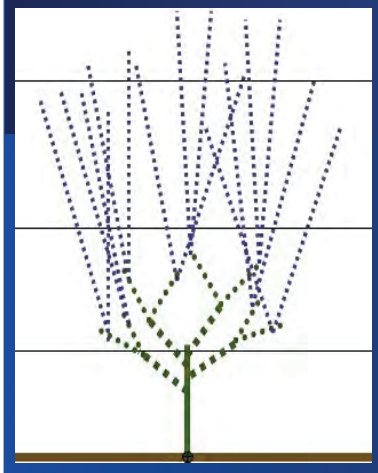
Fruiting Units (shoots / acre)	Target Yield (ton / acre)	Fruit Size (g/fruit)	Crop Load (fruit/upright)
7,555	8.0	10.0	107
7,555	7.0	11.0	85
7,555	6.0	12.0	67

Photo by Earnscy Weaver


UFO in California

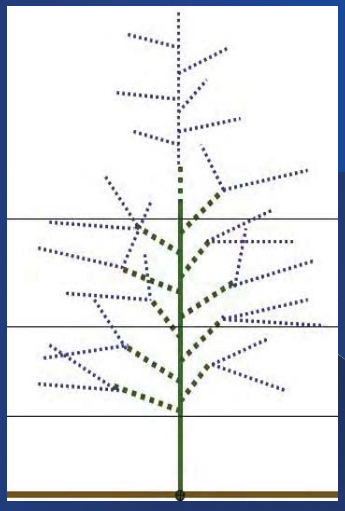
NC140 Sweet Cherry Canopy Systems Trial

KGB



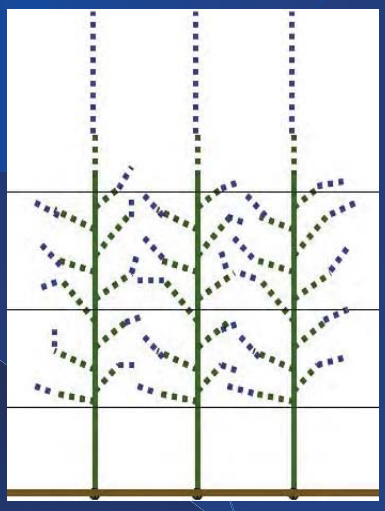
Kym Green Bush

TSA



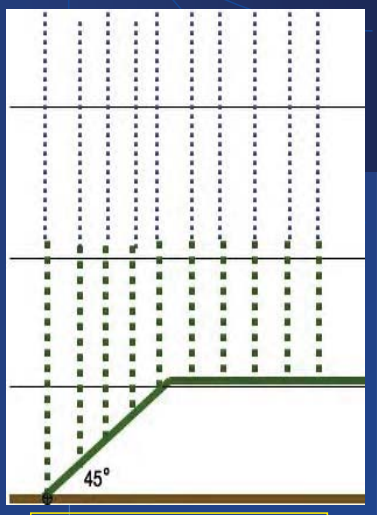
Tall Spindle Axe

SSA



Super Slender Axe

UFO



Upright Fruiting Offshoots

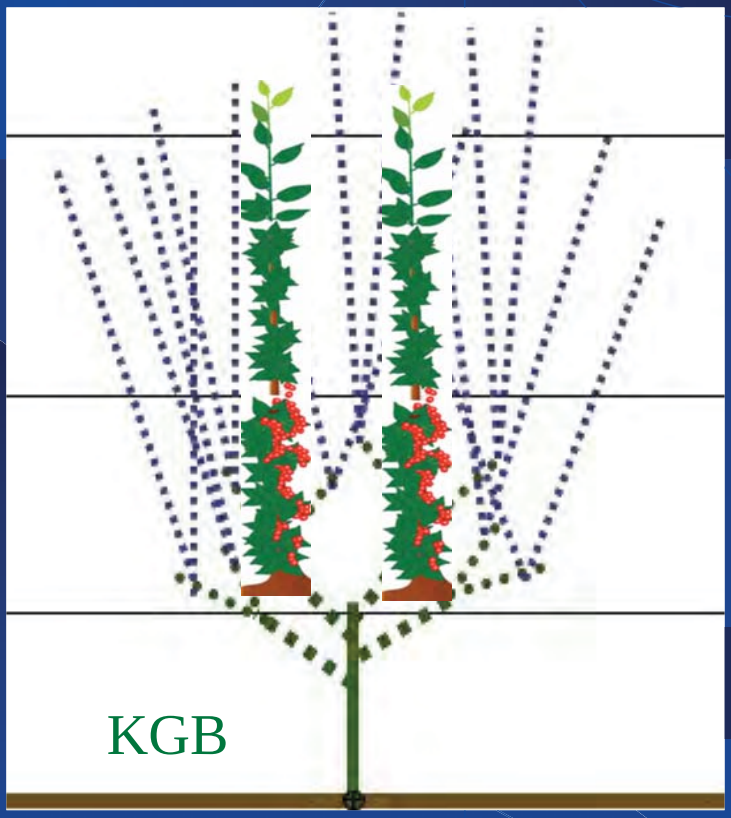
Rootstock Vigor:

Gisela 3 – very dwarfing
Gisela 5 – dwarfing
Gisela 6 – vigorous

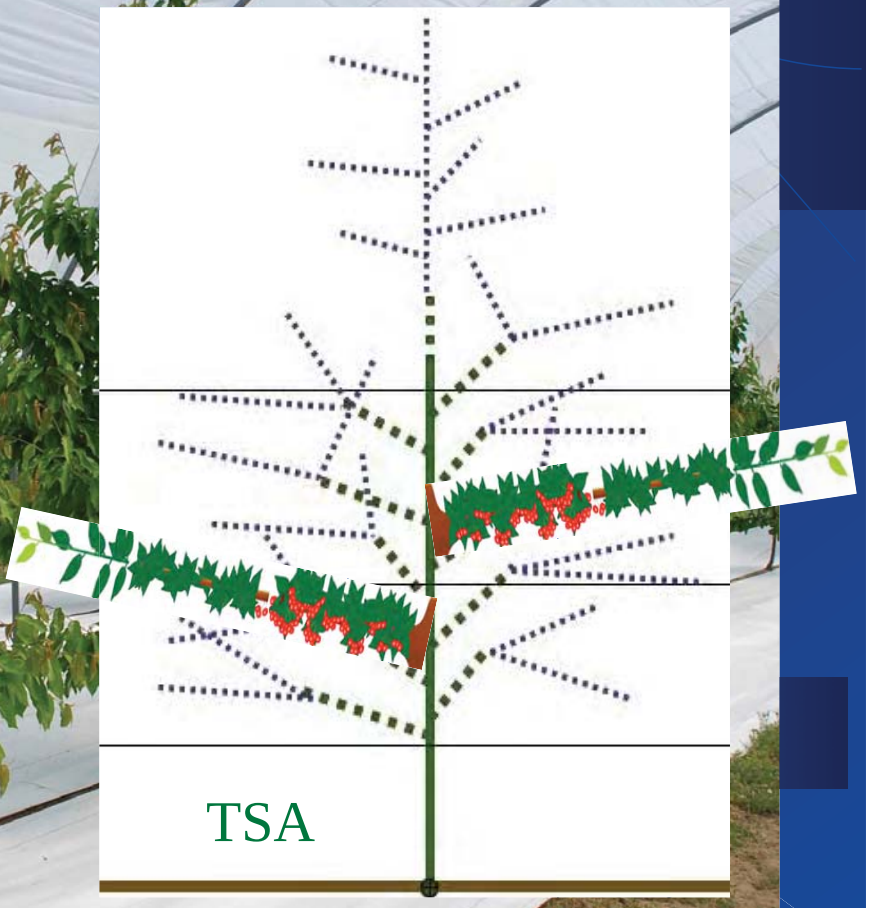
2010 Spacing: 5 x 11 ft
(SSA) 2.5 x 11 ft


NC-140
Cultivar: Skeena
- Summerland, British Columbia
- Kentville, Nova Scotia
Cultivar: Regina
- Geneva, New York
- Hudson Valley, New York
Cultivar: Benton
- Clarksville, Michigan
- (Walnut Grove, California)
Other Collaborative Trials
- Italy, Turkey, Chile, New Zealand
NC140 Sweet Cherry
Canopy Architecture Trial Sites
(13 Planted in 2010)

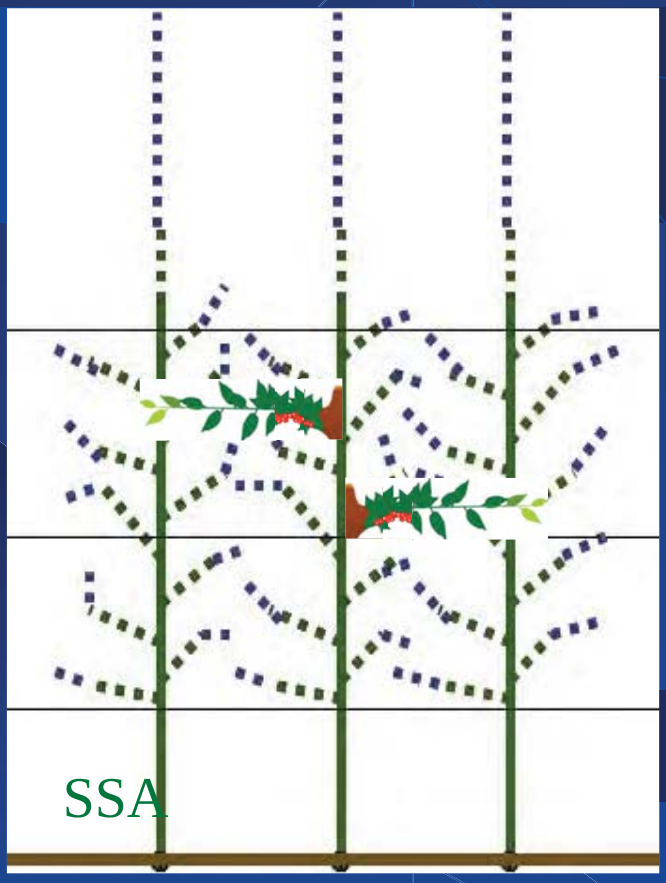
KGB Fundamental Fruiting Unit



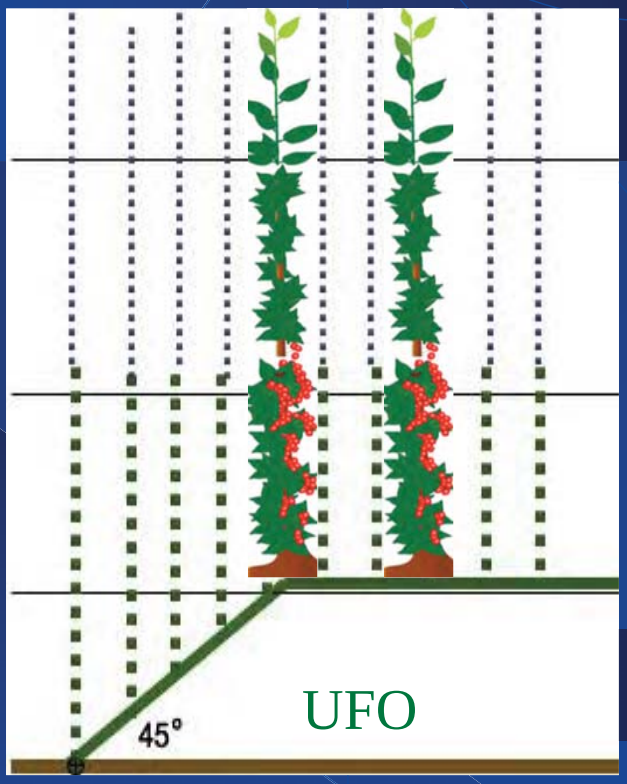
TSA Fundamental Fruiting Unit

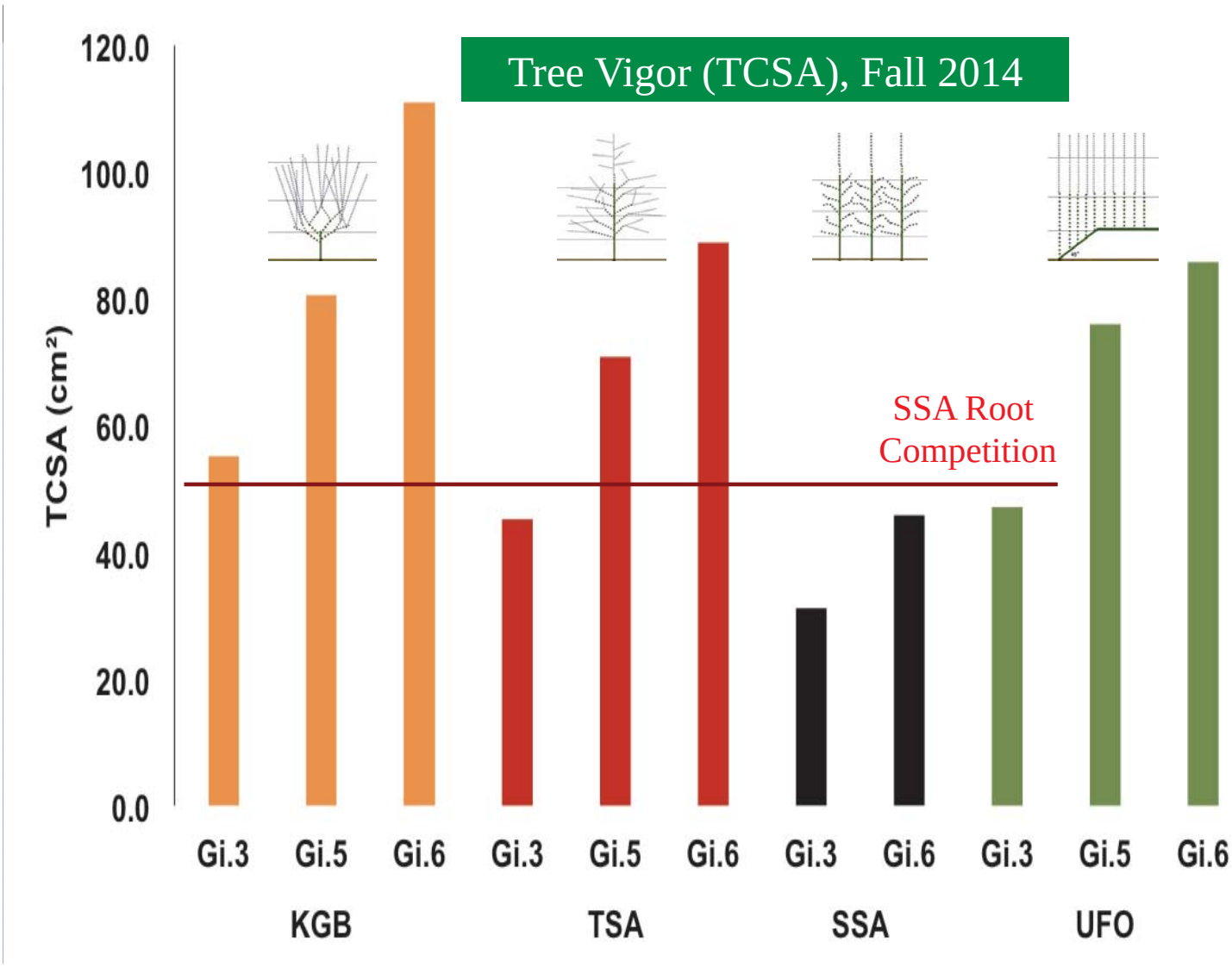


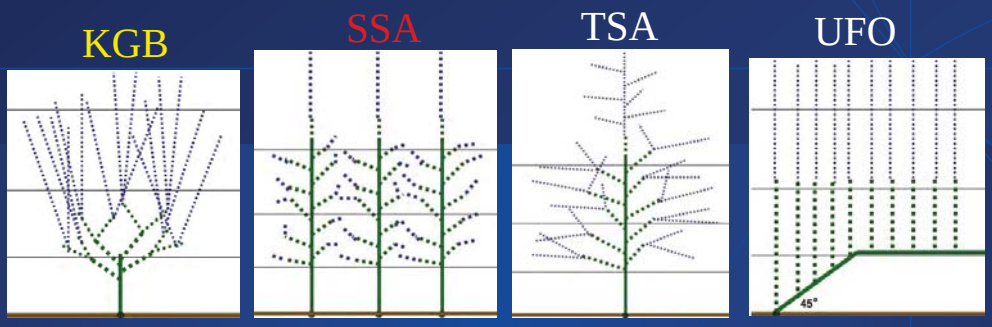
SSA Fundamental Fruiting Unit

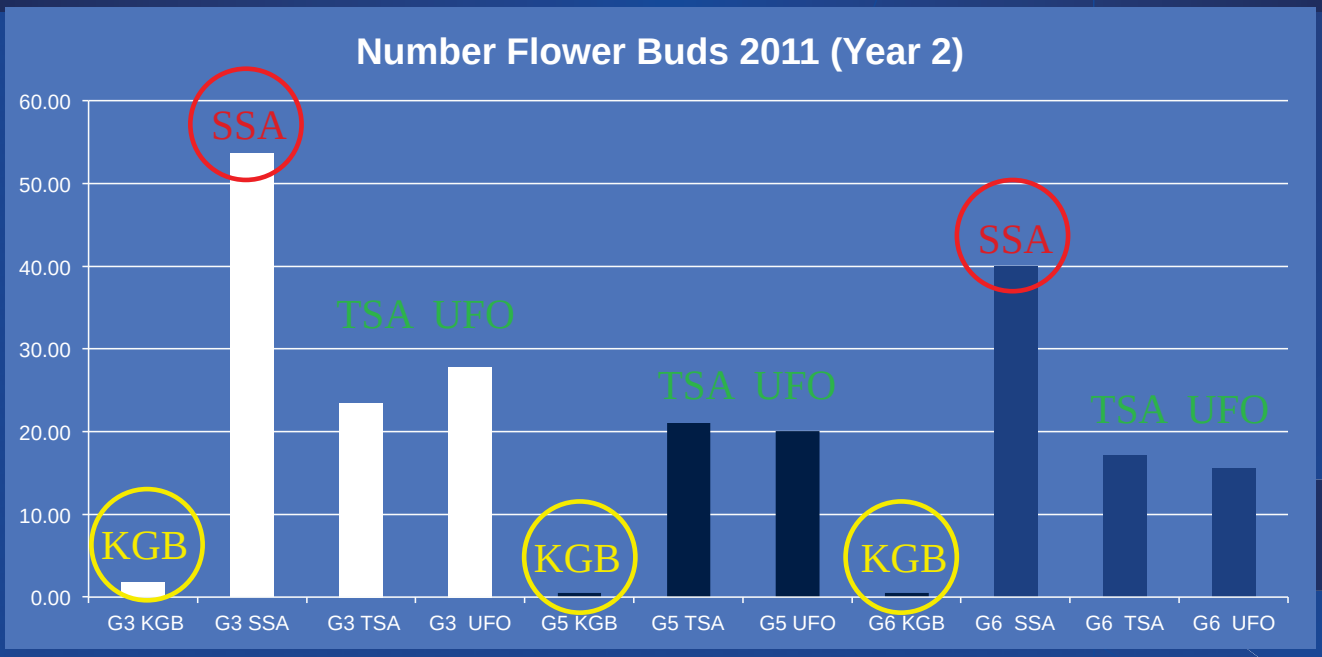


UFO Fundamental Fruiting Unit



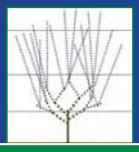
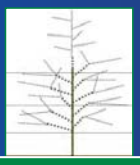
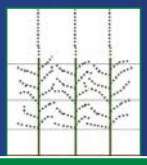
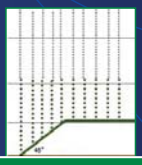

Tree Vigor (TCSA), Fall 2014
TCSA (cm²)
120.0
100.0
80.0
60.0
40.0
20.0
0.0
SSA Root Competition
Gi.3
Gi.5
Gi.6
Gi.3
Gi.5
Gi.6
Gi.3
Gi.6
Gi.3
Gi.5
Gi.6
KGB
TSA
SSA
UFO





Lillrose and Lang, 2011 (preliminary data, not analyzed for publication)

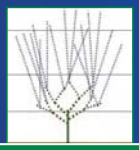
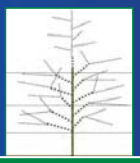
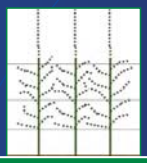
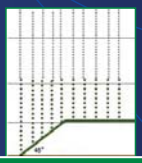
2013 (Year 4) Yields, Michigan

	KGB	TSA	SSA	UFO
Proposed modified orchard spacing (ft)	5.7 x 13	5 x 11.3	2.5 x 9	5 x 8.1
Trees/acre	719	770	1962	1079
Rootstock	**Orchard yield (ton/acre)**			
Gi3	0.6	3.2	4.2	1.7
Gi5	0.3	1.0	-	0.4
Gi6	0.05	0.6	1.6	0.5

MSU Cherry Research

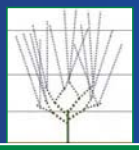
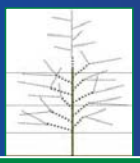
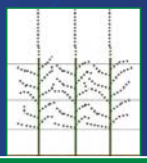
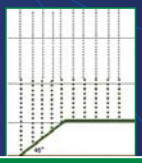
Estimated Year 4 Yield *Potential**

	KGB	TSA	SSA	UFO
Proposed modified orchard spacing (ft)	5.7 x 13	5 x 11.3	2.5 x 9	5 x 8.1
Trees/acre	719	770	1962	1079
Rootstock	**Orchard yield (ton/acre)**			
Gi3	2.5 – 3.4	4.6 – 5.3	5.7 – 6.5	3.7 - 4.7
Gi5	2.2 – 3.1	2.4 – 3.1	-	2.4 – 3.4
Gi6	1.9 – 2.8	2.0 – 2.7	3.1 – 3.9	2.5 – 3.5

*Potential yield accounting for 2012 spur loss

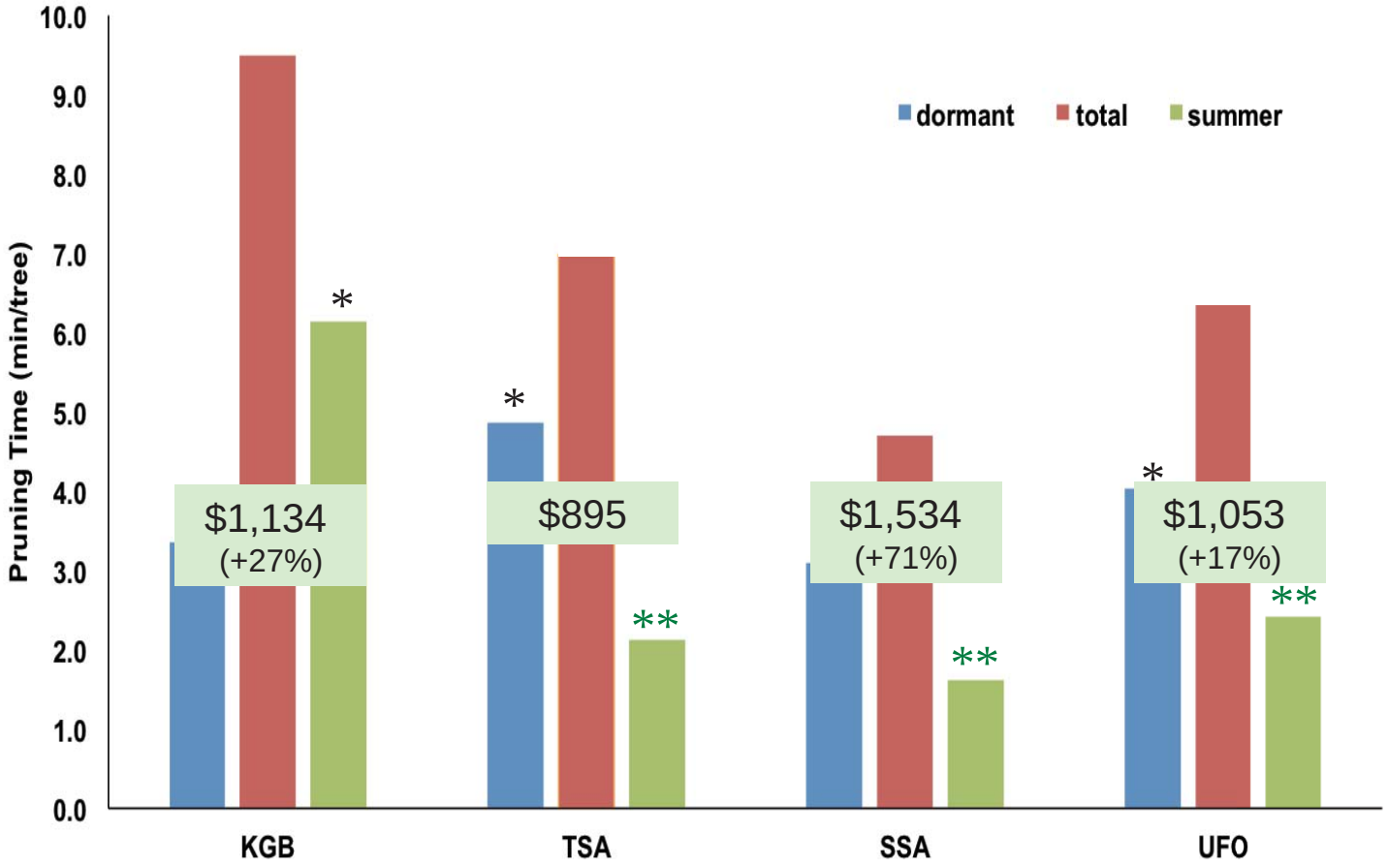
Estimated Year 5 Yield *Potential**

	KGB	TSA	SSA	UFO
Proposed modified orchard spacing (ft)	5.7 x 13	5 x 11.3	2.5 x 9	5 x 8.1
Trees/acre	719	770	1962	1079
Rootstock	**Orchard yield (ton/acre)**			
Gi3	4.6 – 5.5	5.6 – 6.3	4.4 – 5.2	5.7 – 6.7
Gi5	3.8 – 4.7	5.6 – 6.3	-	6.4 – 7.4
Gi6	3.3 – 4.2	4.5 – 5.2	2.4 – 3.2	4.6 – 5.6

*Potential yield accounting for 2012 spur loss

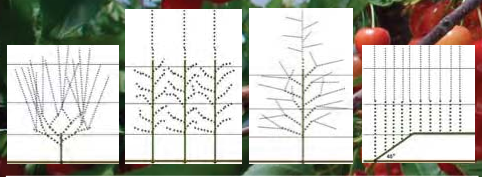
2014 Dormant + Summer Pruning Time (per tree & cost per acre)



*hand-pruned ** hedged

MSU Tree Fruit Research

Other support from:
USDA-NIFA Hatch project MICL01305, USDA-Small Farms, Haygrove Tunnels, Cravo Greenhouses, VOEN



Training video clips at:
www.giselacherry.com

www.cherries.msu.edu