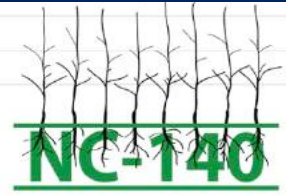


# Innovative High Density Sweet Cherry Training Systems: Five Years of Comparative Trials Across North America



Gregory Lang, *Coordinator*  
Suzanne Blatt, Joe Grant, Steve Hoying, Chuck Ingels,  
Denise Neilsen, Gerry Neilsen, Terence Robinson





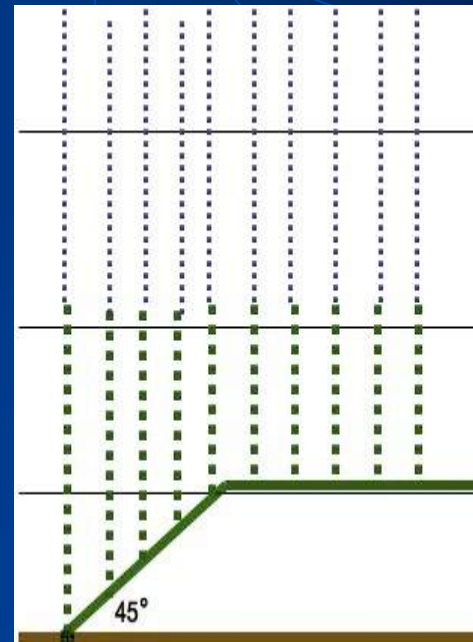
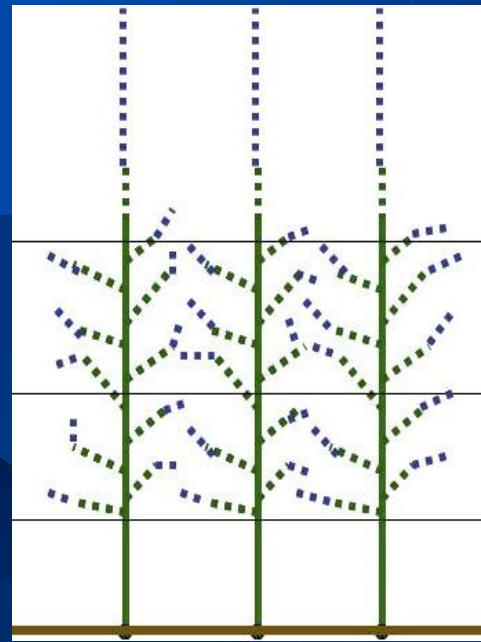
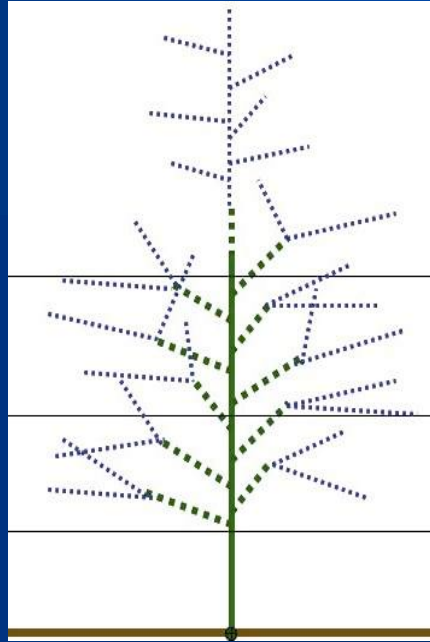
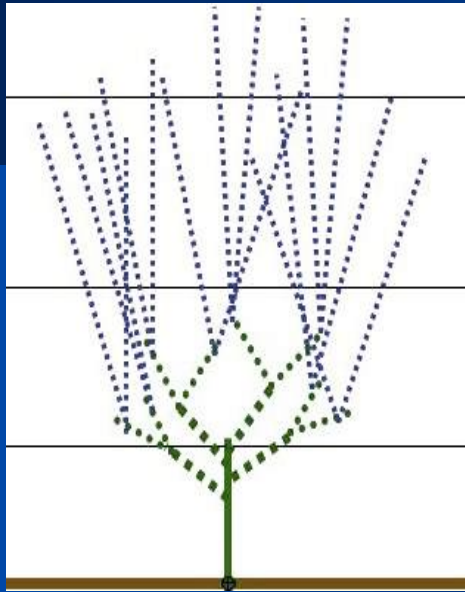
# NC140 Sweet Cherry Canopy Systems Trial

**KGB**

**TSA**

**SSA**

**UFO**



**Kym Green Bush**

**Tall Spindle Axe**

**Super Slender Axe**

**Upright Fruiting Offshoots**

**Rootstock Vigor:**

Spacing: 1.5 x 3.5 m  
(SSA) 0.75 x 3.5 m

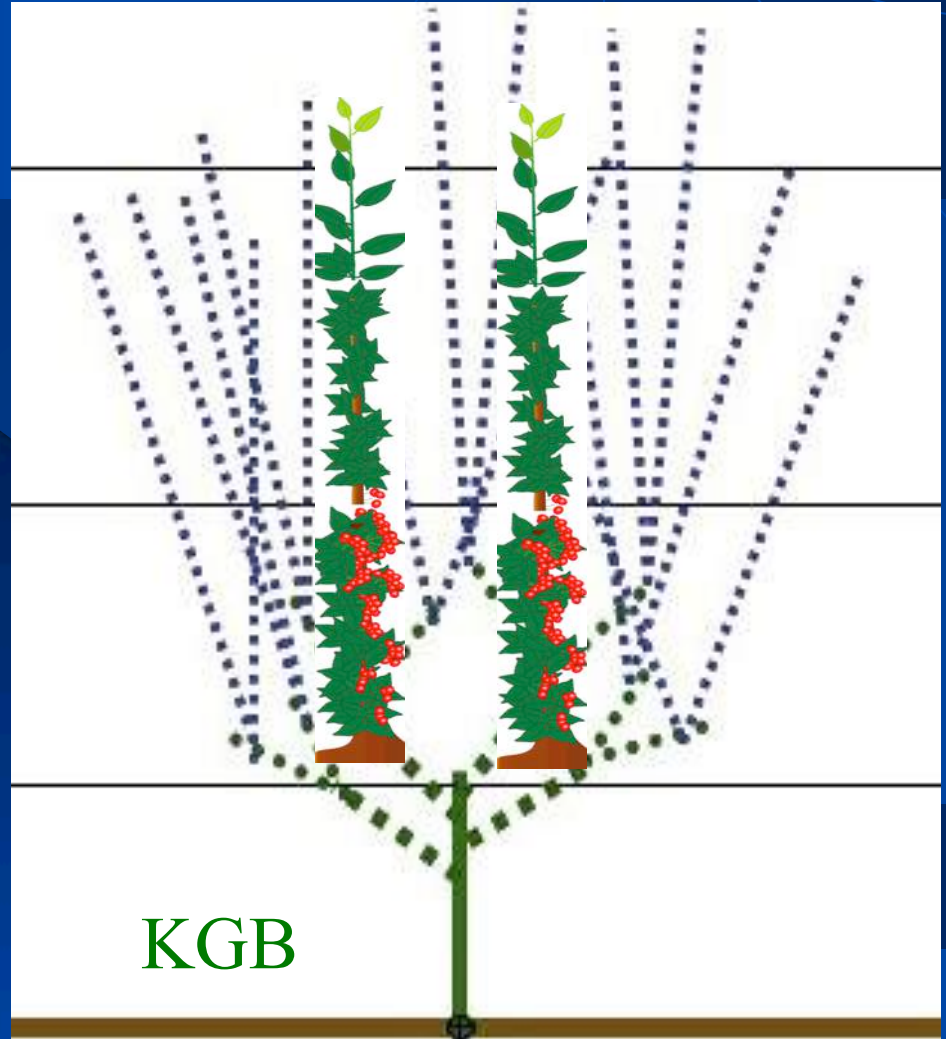
Gisela 3 – very dwarfing

Gisela 5 – dwarfing

Gisela 6 - vigorous

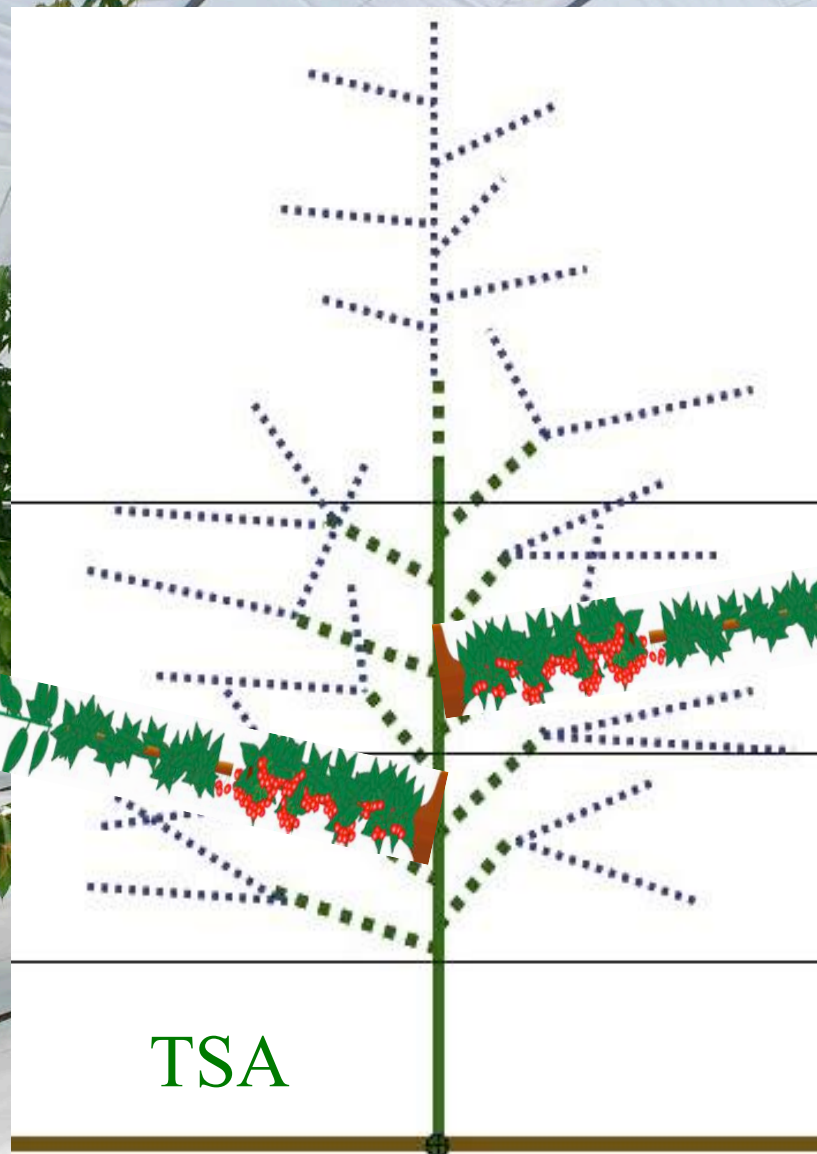


# KGB Fundamental Fruiting Unit



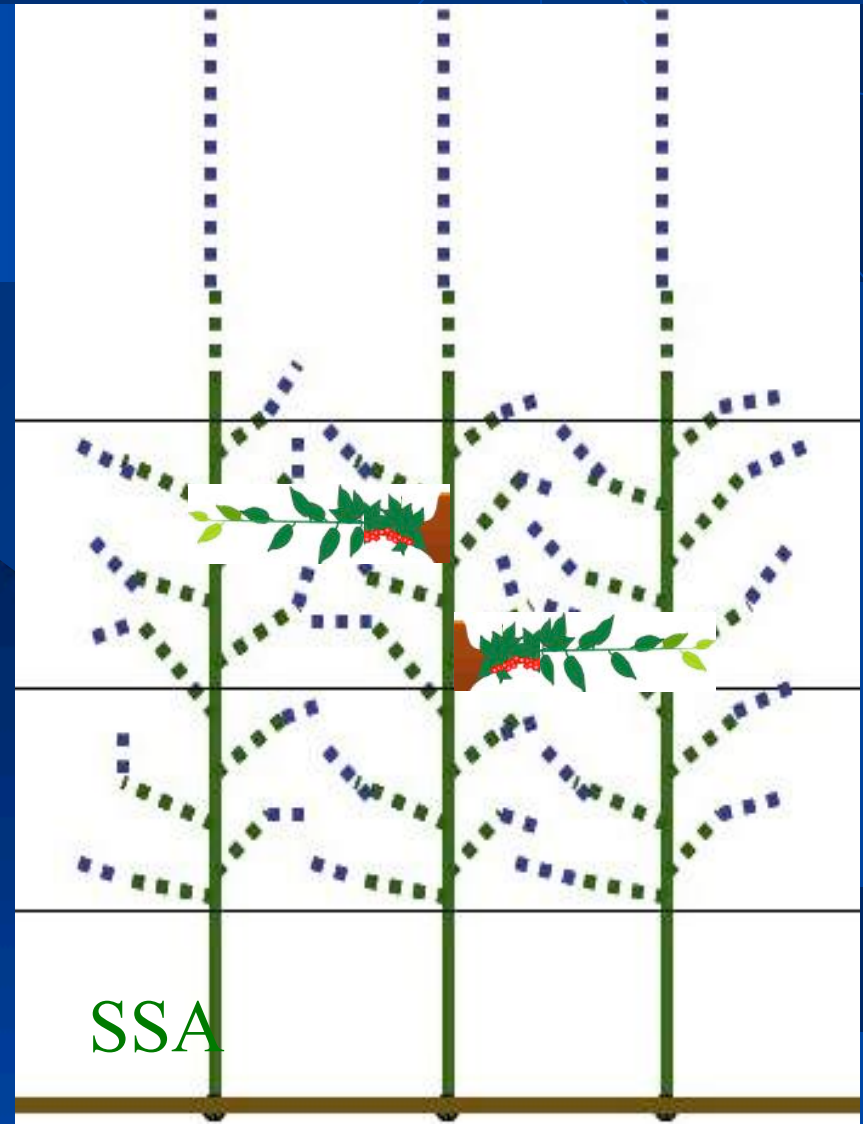


# TSA Fundamental Fruiting Unit



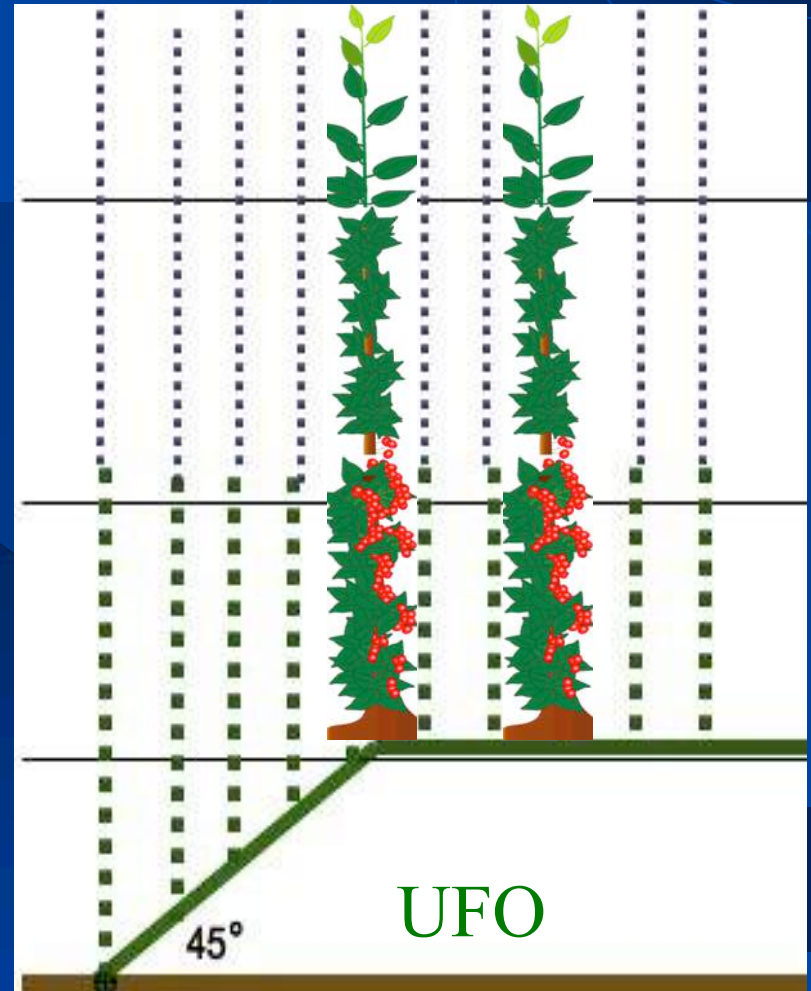


# SSA Fundamental Fruiting Unit

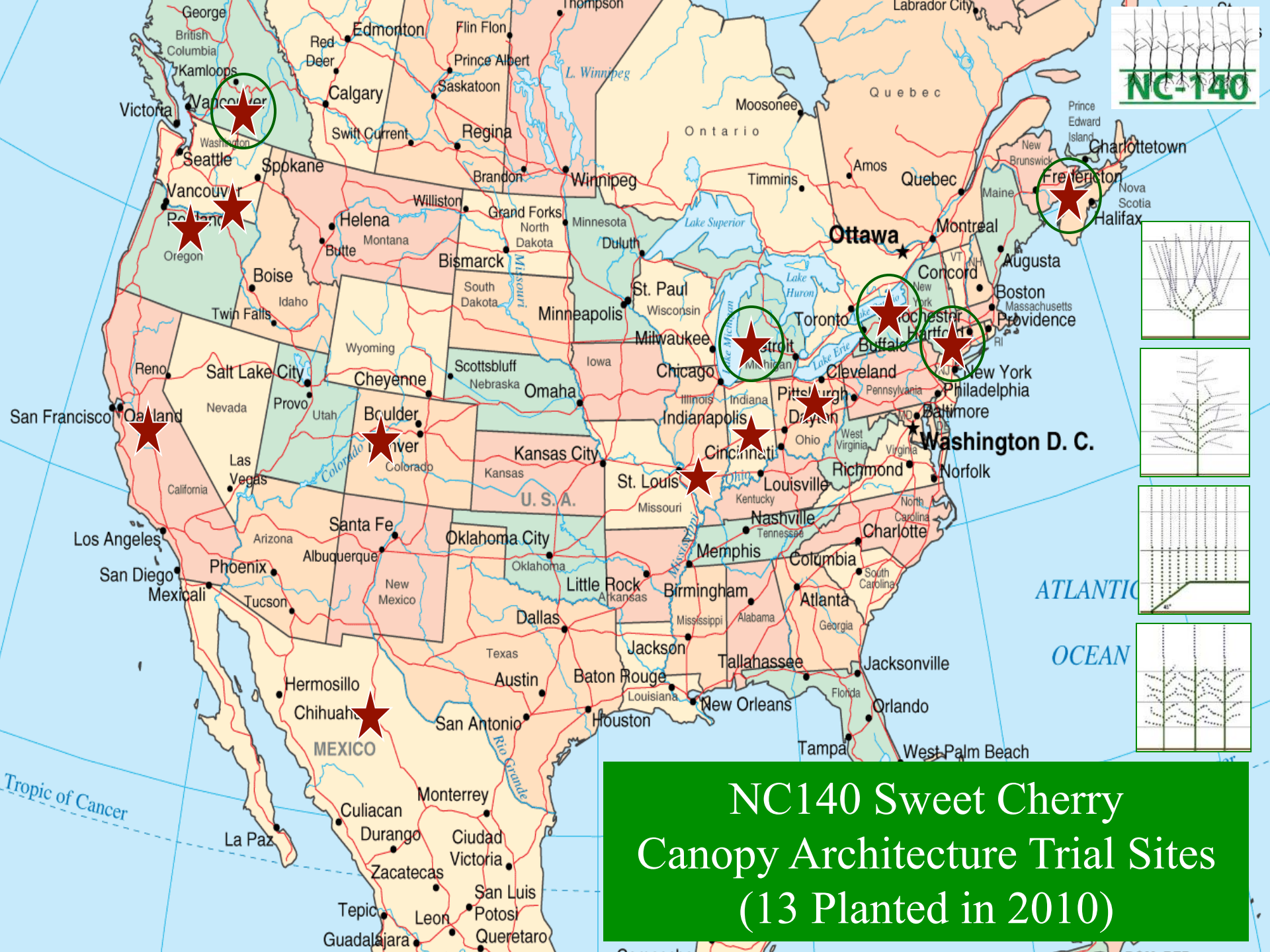




# UFO Fundamental Fruiting Unit

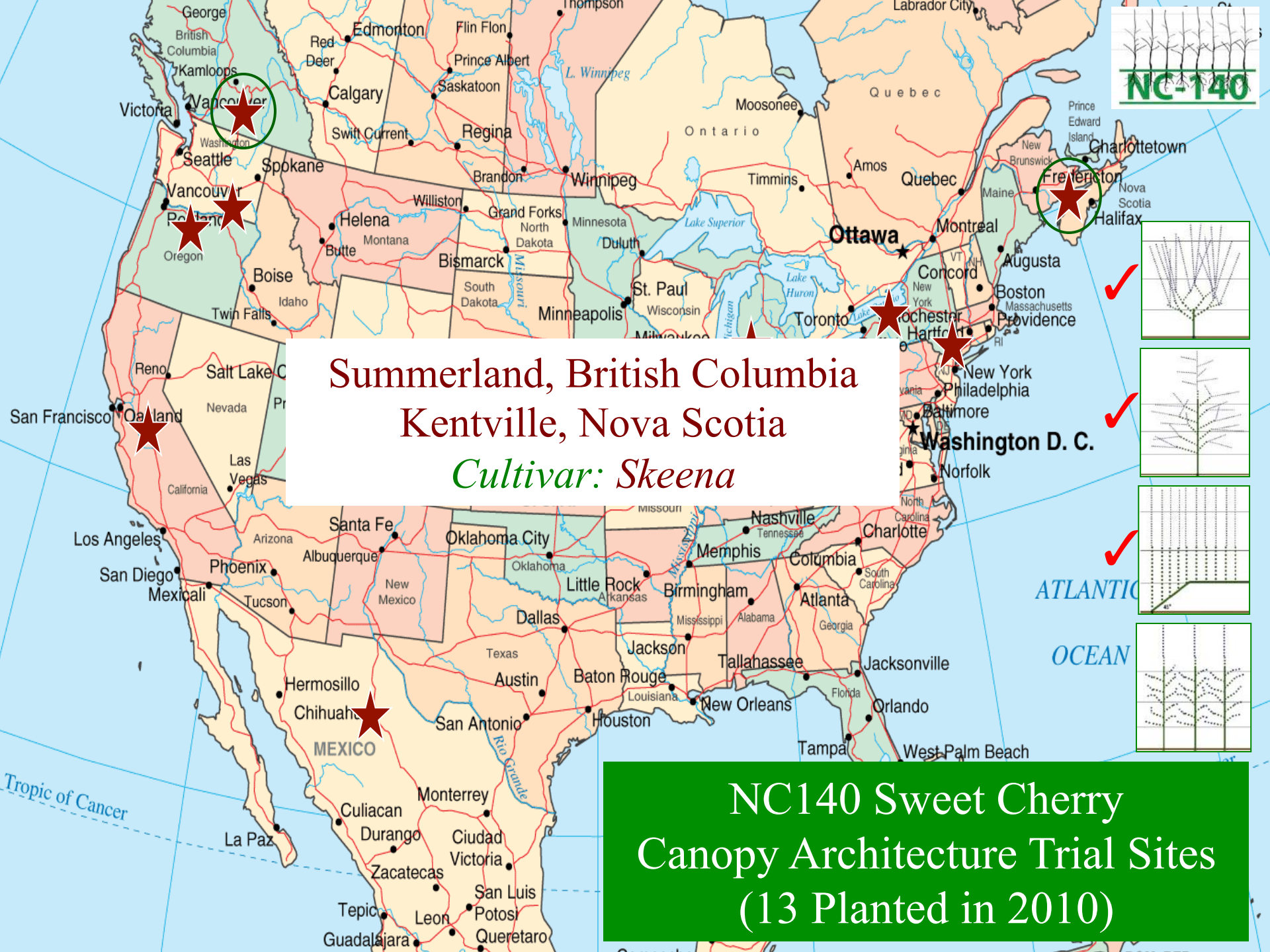






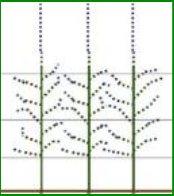
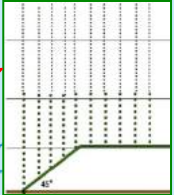
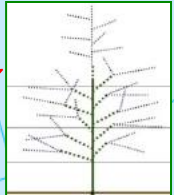
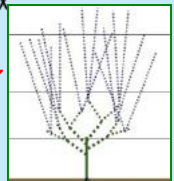
NC-140

**NC140 Sweet Cherry  
Canopy Architecture Trial Sites  
(13 Planted in 2010)**



Summerland, British Columbia  
Kentville, Nova Scotia  
*Cultivar: Skeena*

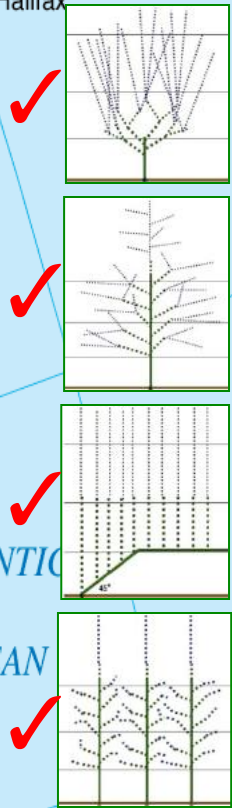
NC140 Sweet Cherry  
Canopy Architecture Trial Sites  
(13 Planted in 2010)





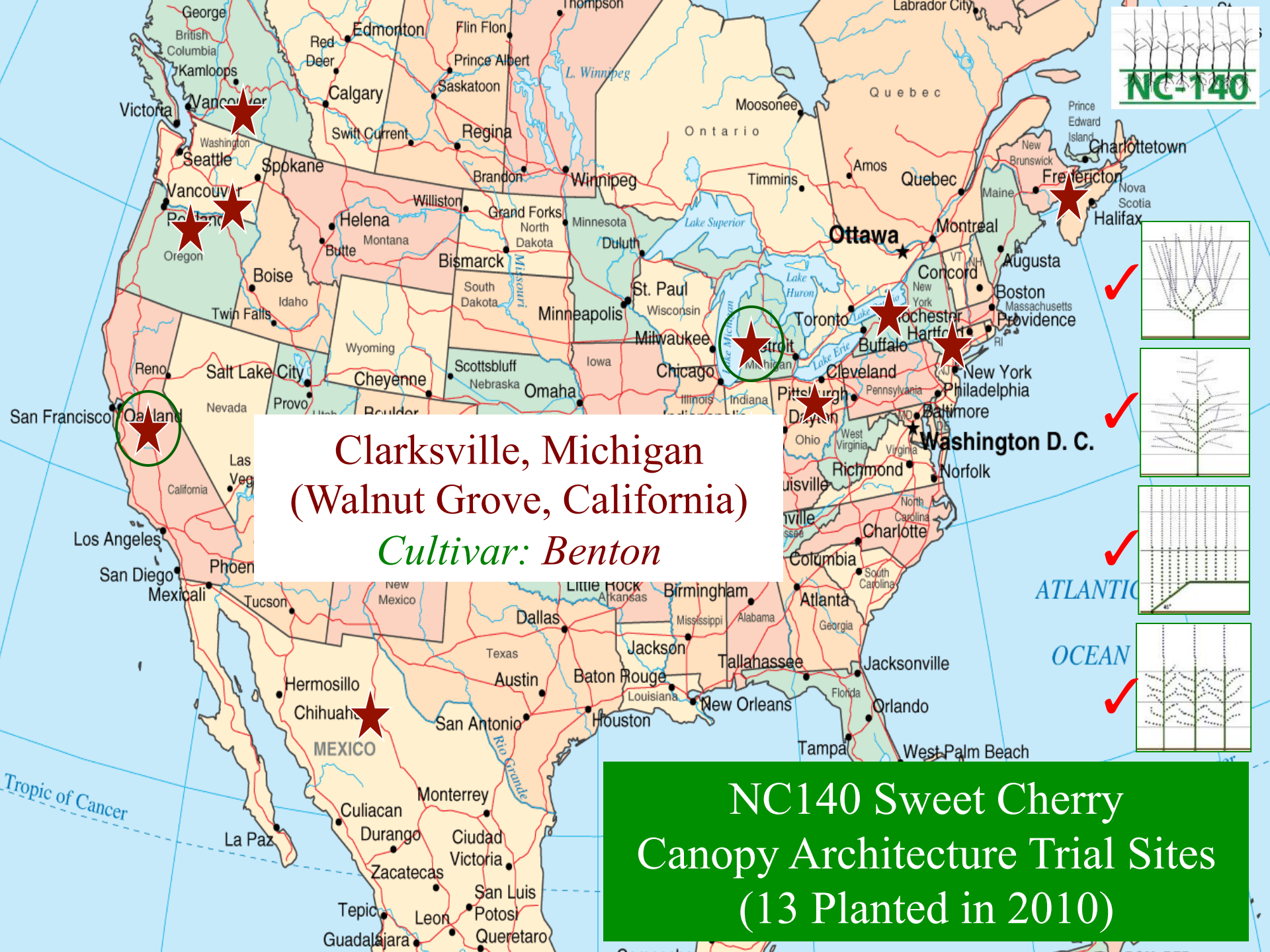


Geneva, New York  
Hudson Valley, New York  
*Cultivar: Regina*



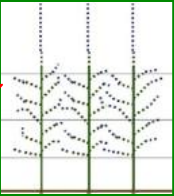
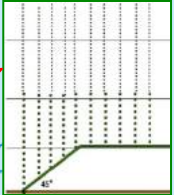
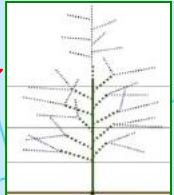
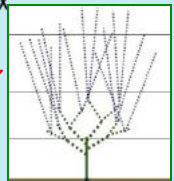
**NC140 Sweet Cherry  
Canopy Architecture Trial Sites  
(13 Planted in 2010)**





Clarksville, Michigan  
(Walnut Grove, California)

*Cultivar: Benton*

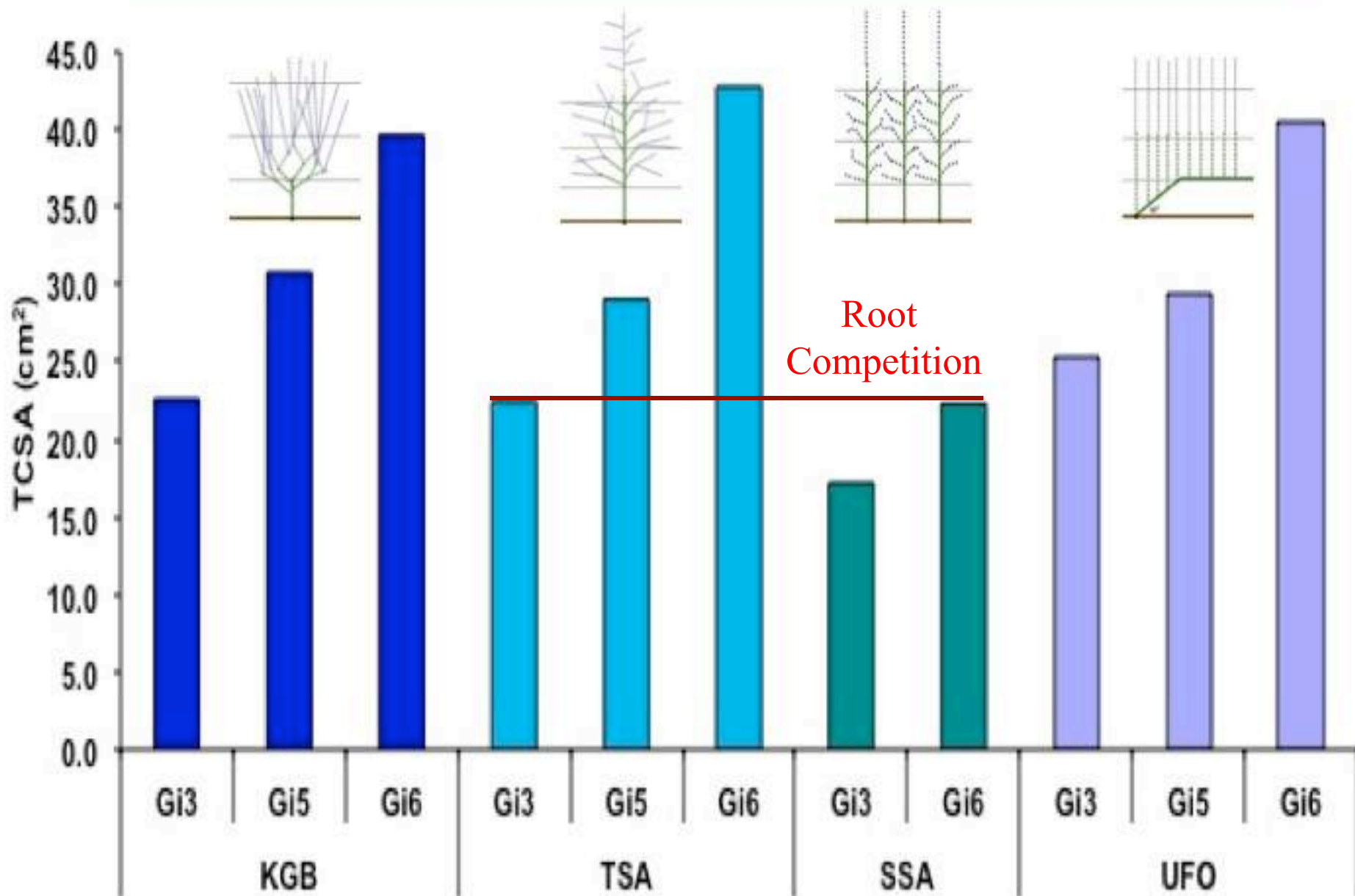


NC140 Sweet Cherry  
Canopy Architecture Trial Sites  
(13 Planted in 2010)

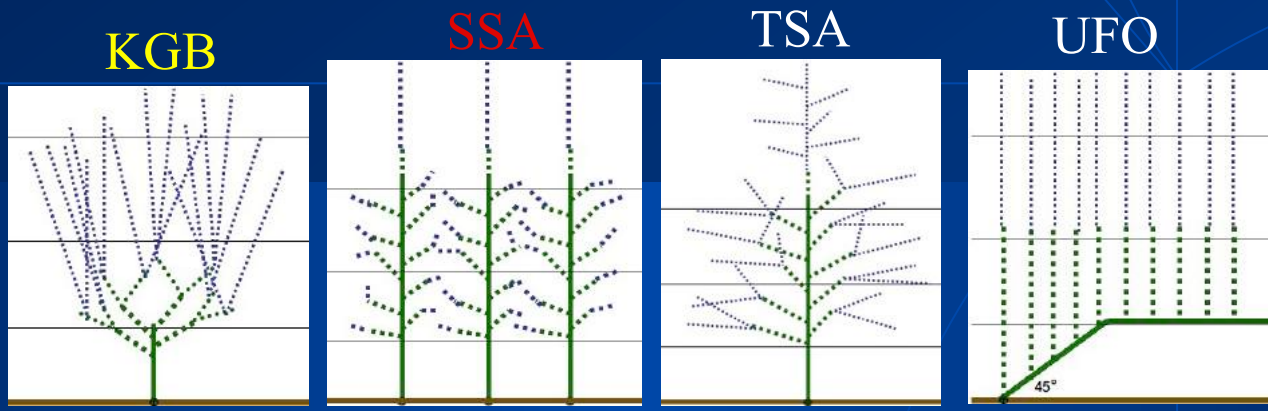
ATLANTIC  
OCEAN



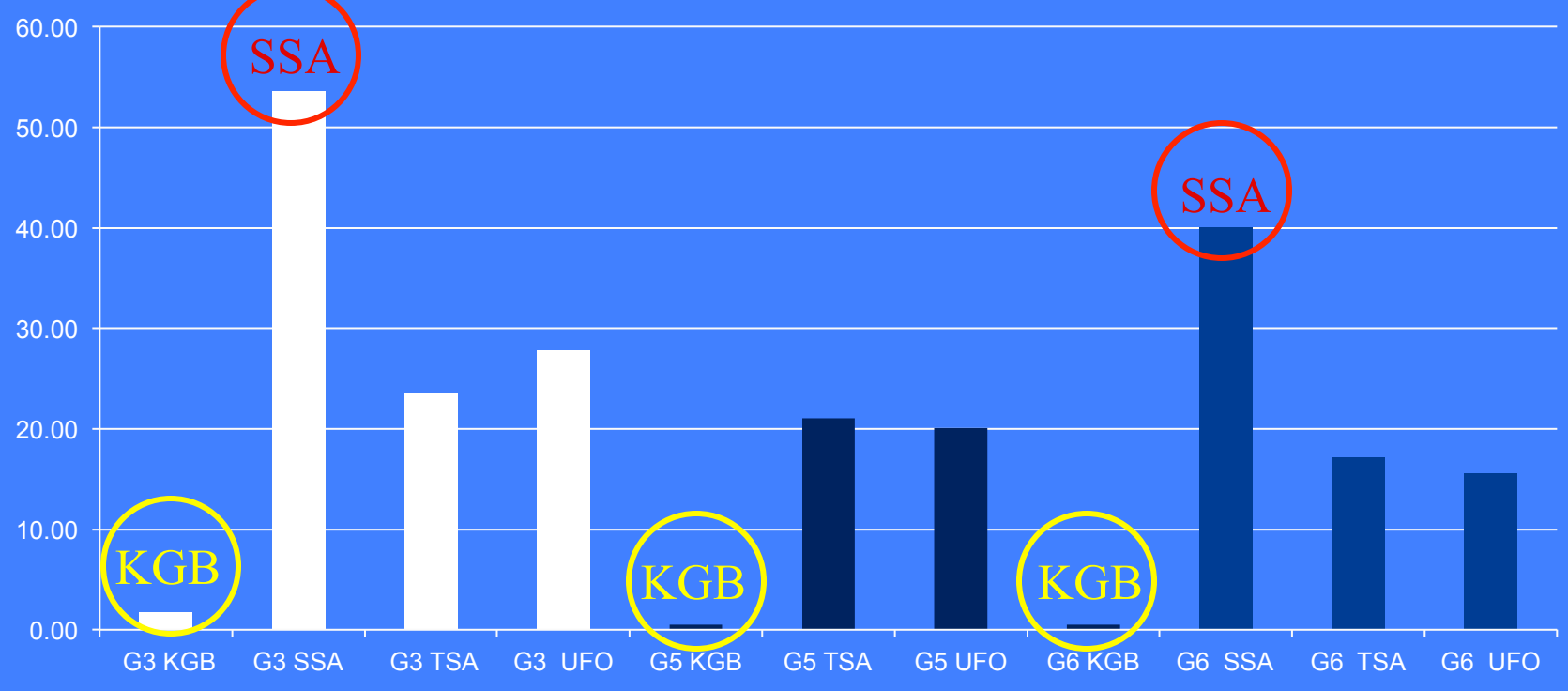
# System x Rootstock Effect on Tree Vigor (TCSA), Fall 2012







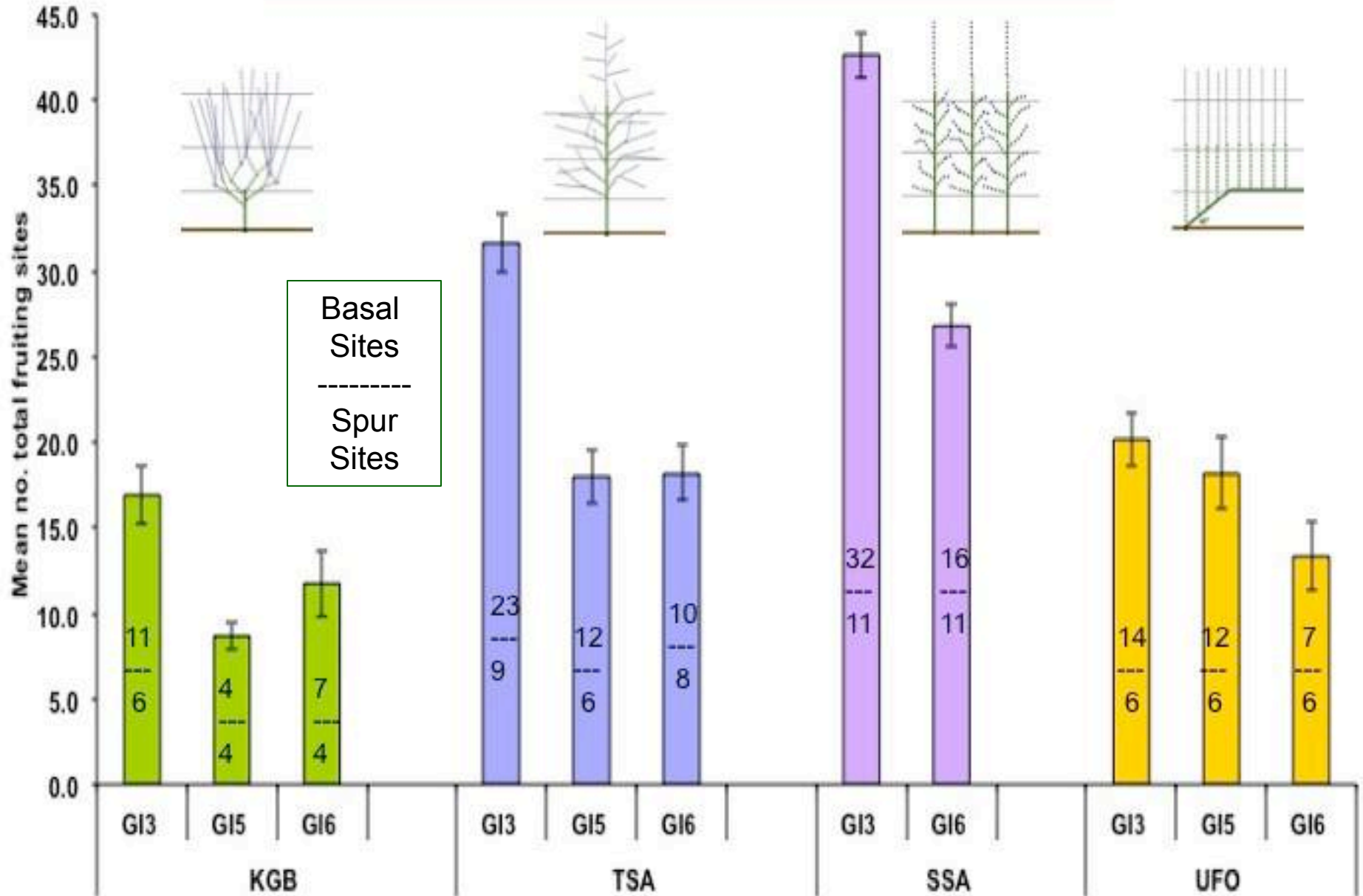
Number Flower Buds 2011 (Year 2)



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



# Number of Basal and Spur Fruiting Sites, Spring 2012 (Year 3)



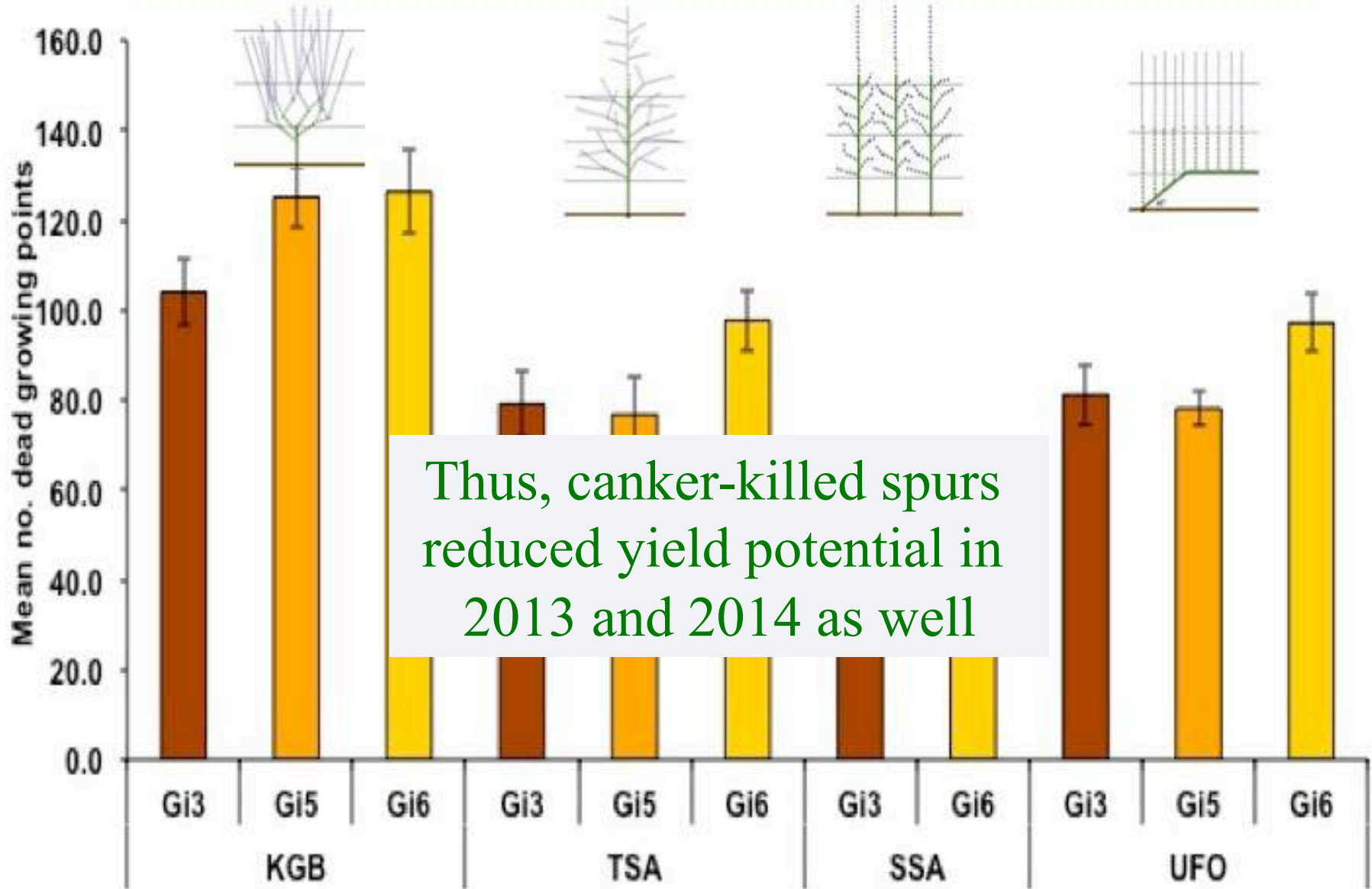


# 2012 Spring Frost-induced Canker Spur Death





# Meristem Mortality, Spring 2012 (Freezes + Bacterial Canker)



Thus, canker-killed spurs reduced yield potential in 2013 and 2014 as well

# Summer 2012: Established Protective Covering Systems Over NC140 Trial



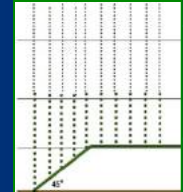
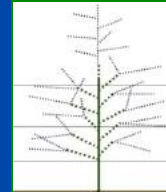
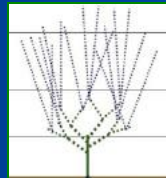
Voën (passive venting)

Cravo Retractable Roof  
(automated venting)





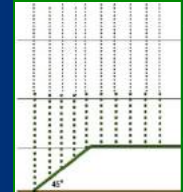
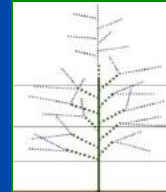
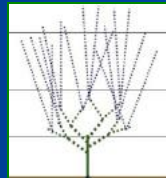
# 2013 Yields per Orchard Basis, Michigan



	KGB	TSA	SSA	UFO
Proposed modified orchard spacing (m)	1.75 x 4.0	1.5 x 3.5	0.75 x 2.75	1.5 x 2.5
Trees/ha	1777	1904	4848	2666
Rootstock	<b>Orchard yield (t/ha)</b>			
Gi3	1.3	7.1	9.2	3.7
Gi5	0.6	2.2	-	0.9
Gi6	0.1	1.4	3.4	1.1



# 2014 Yields per Orchard Basis, Michigan



	KGB	TSA	SSA	UFO
Proposed modified orchard spacing (m)	1.75 x 4.0	1.5 x 3.5	0.75 x 2.75	1.5 x 2.5
Trees/ha	1777	1904	4848	2666
Rootstock	<b>Orchard yield (t/ha)</b>			
Gi3	5.9	9.1	6.3	8.0
Gi5	4.1	9.1	-	9.6
Gi6	3.0	6.7	1.9	5.6



# SSA Yield Potential with Canopy Maturation



Year 2      **SSA/Gi3** > SSA/Gi6 > UFO/Gi3  
> TSA/Gi3 > TSA/Gi5 = UFO/Gi5

Year 3      **SSA/Gi3** > SSA/Gi6 > TSA/Gi3  
> UFO/Gi3 > TSA/Gi5 = UFO/Gi5

Year 4      **SSA/Gi3** > TSA/Gi3 > UFO/Gi3  
> SSA/Gi6 > TSA/Gi5

Year 5      UFO/Gi5 > TSA/Gi3 = TSA/Gi5  
> UFO/Gi3 > **SSA/Gi3**\* = KGB/Gi3

\* Actually declined 32% from Year 4 to Year 5

# SSA Yield Potential with Canopy Maturation



Year 2      SSA/Gi3 > **SSA/Gi6** > UFO/Gi3  
> TSA/Gi3 > TSA/Gi5 = UFO/Gi5

Year 3      SSA/Gi3 > **SSA/Gi6** > TSA/Gi3  
> UFO/Gi3 > TSA/Gi5 = UFO/Gi5

Year 4      SSA/Gi3 > TSA/Gi3 > UFO/Gi3  
> **SSA/Gi6\*** > TSA/Gi5

Year 5      UFO/Gi5 > TSA/Gi3 = TSA/Gi5  
> UFO/Gi3 > SSA/Gi3 = KGB/Gi3

\*Actually declined 45% from Year 4 to Year 5



# UFO Yield Potential with Canopy Maturation



Year 2      SSA/Gi3 > SSA/Gi6 > UFO/Gi3  
                 > TSA/Gi3 > TSA/Gi5 = UFO/Gi5

Year 3      SSA/Gi3 > SSA/Gi6 > TSA/Gi3  
                 > UFO/Gi3 > TSA/Gi5 = UFO/Gi5

Year 4      SSA/Gi3 > TSA/Gi3 > UFO/Gi3  
                 > SSA/Gi6 > TSA/Gi5

Year 5      UFO/Gi5\* > TSA/Gi3 = TSA/Gi5  
                 > UFO/Gi3\* > SSA/Gi3 = KGB/Gi3

\*increased from 10X to 2X from Year 4 to Year 5

# TSA Yield Potential with Canopy Maturation



Year 2      SSA/Gi3 > SSA/Gi6 > UFO/Gi3  
                 > TSA/Gi3 > TSA/Gi5 = UFO/Gi5

Year 3      SSA/Gi3 > SSA/Gi6 > TSA/Gi3  
                 > UFO/Gi3 > TSA/Gi5 = UFO/Gi5

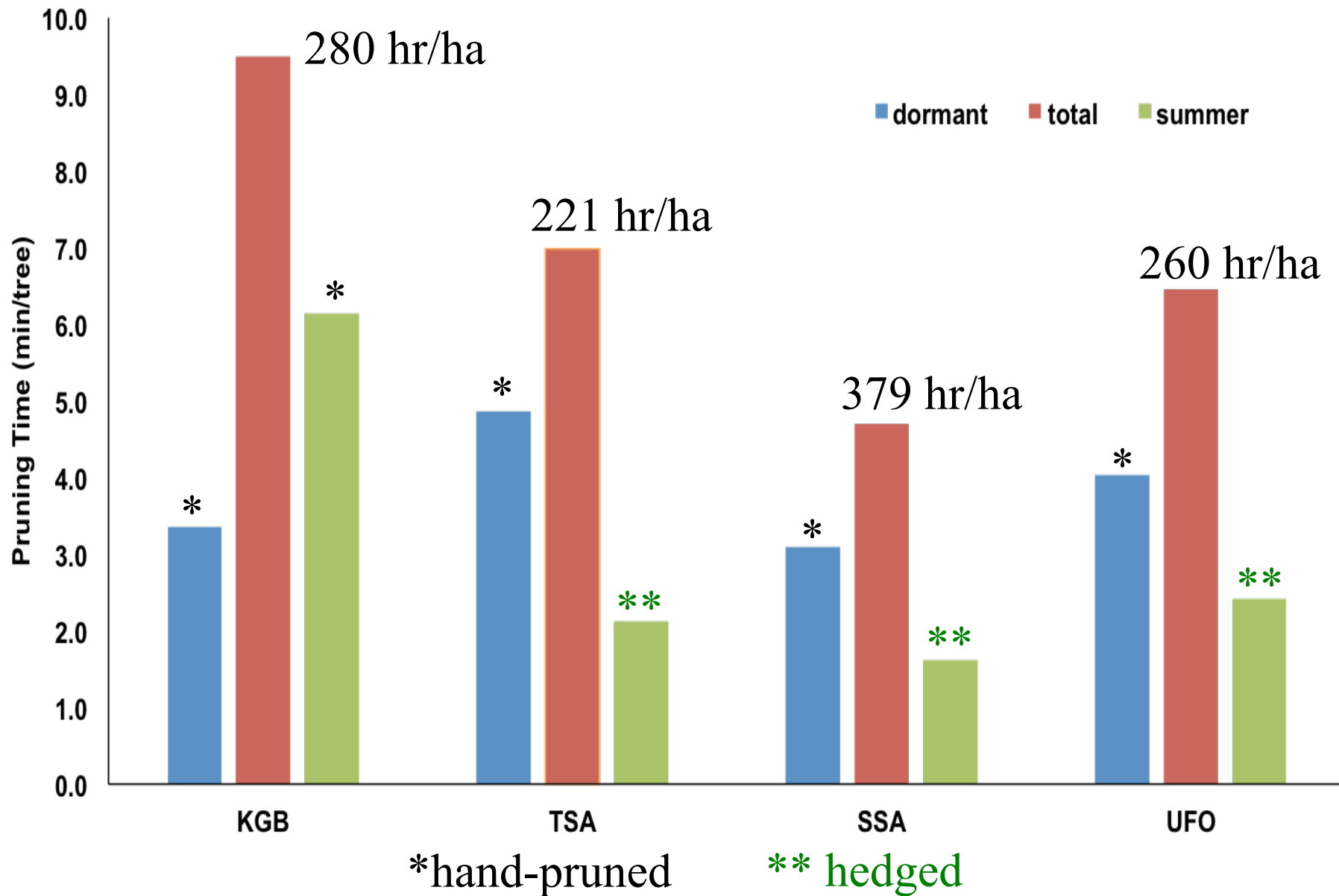
Year 4      SSA/Gi3 > TSA/Gi3 > UFO/Gi3  
                 > SSA/Gi6 > TSA/Gi5

Year 5      UFO/Gi5 > TSA/Gi3\* = TSA/Gi5\*  
                 > UFO/Gi3 > SSA/Gi3 = KGB/Gi3

\*increased from 28% to ~4X from Year 4 to Year 5



# Total Pruning Times 2014





## Canopy Systems



The *Orchard Establishment Phase* of the trial is complete, the *Mature Production Phase* has begun

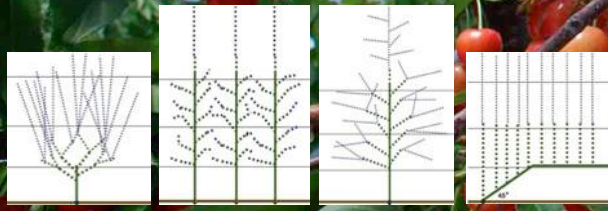
SSA is most precocious, but has high labor needs for pruning, and productivity may be declining

TSA and UFO have had a good balance of precocity, productivity, and labor efficiencies

KGB is least precocious, with modest productivity thus far, and is less amenable to summer hedging



# MSU Tree Fruit Research



Training video clips at:  
[www.giselacherry.com](http://www.giselacherry.com)



[www.cherries.msu.edu](http://www.cherries.msu.edu)