

2014 Southwest Michigan Fruit Schools  
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## Support Systems for Modern Apple Plantings

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### Why a Support System?

#### To Provide Support for Early Heavy Crops



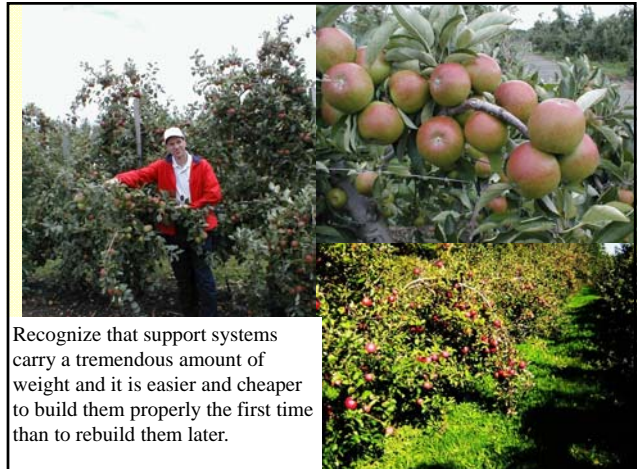
- 1) To promote early cropping without “growing” the needed structural support (a trunk!)
- 2) To be able to use the most precocious rootstocks available.
- 3) To support a heavy mature crop load

### Why a Support System?

#### To Prevent Tree Failure



- 1) To withstand increasingly adverse weather - Rain, Wind, Ice and Snow



Recognize that support systems carry a tremendous amount of weight and it is easier and cheaper to build them properly the first time than to rebuild them later.

## How much weight must a support system hold?

- From 20 - 35 tons of fruit at maturity (1000+ bushels)
- Wind force 2<sup>#s</sup>/sq. ft = 10-12 tons (70 mph)
- Snow load 20<sup>#s</sup>/cu. ft = 200 - 350 tons
  
- Worst case scenario = 407 tons/acre
- Easily 10 times the weight of the crop alone

Hurricane Irene  
August 28, 2011  
Long Is, NY

Photo by Jen Halsey  
From her front window







- Heavy crop
- M.7 rootstock
- Light weight individual stake

Tropical Storm Lee  
September 8, 2011



- Free standing tree
- Full crop
- 12 inches of rain over 3 days
- M.7 rootstock
- 1 week after Hurricane Irene and 8 inches of rain



Too much distance between posts

Champlain Valley, McIntosh, Peru, NY. Photo by K. Iungerman



Trellis Post Failure

Photos by Jon Clements







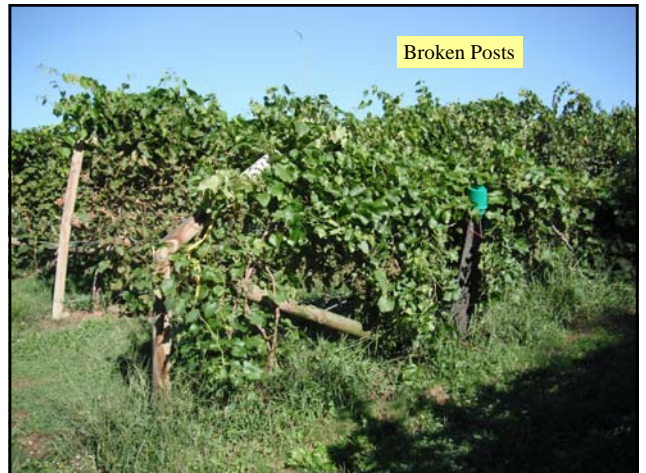
Tree Tie Failure



Erosion



End post assembly



Broken Posts

Flooding



Dam Failure



“The economic success of a modern orchard depends on the trees surviving for 15-20 years. A good support system that will last for 20 years and require little maintenance will help ensure fruit growers success.”

*TLR and SAH '98*



**Pomologists are constantly looking for rootstocks that are dwarf, precocious and self supporting. To date none have been found that have been proven not to require support.**

Semi-dwarf stocks do not need support since they do not crop before establishing beefy trunks and limbs!<sup>1</sup>



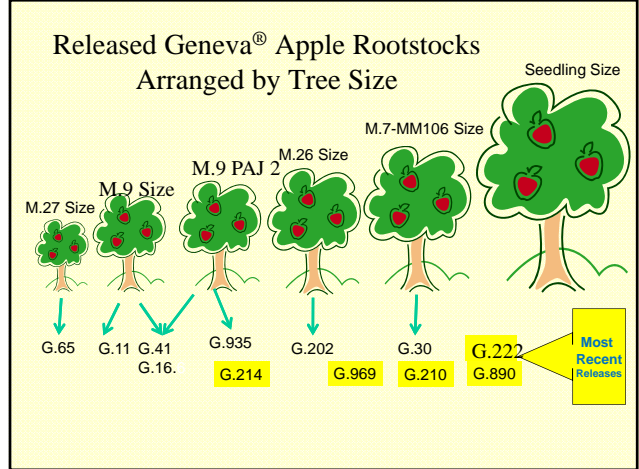
1. Newer training systems and precocious full size rootstocks will require some support!





**Dwarfing Rootstocks are the Basis of Modern Apple Orchards**

- They affects the earliness of cropping (precocity)
  - Time to payback initial investment
- They affect the amount of yield/tree (productivity)
  - Annual profitability
- They affect fruit size and quality
- They affect the size of the tree (dwarfing level)
  - Ease and cost of spraying
  - Ease and cost of picking
  - Ease and cost of pruning



We can't change the weather so what can we do to make sure our trellises don't fail in the future?

A Review of Support Systems for Apples

## Types of Support Systems

1. Individual post or stake for each tree
2. Wire Trellis with post and wire.
3. Combination of Trellis and individual tree stakes



**Vertical Trellis**

Vertical are more easily installed and more stable. Dwarfing rootstocks are a must!

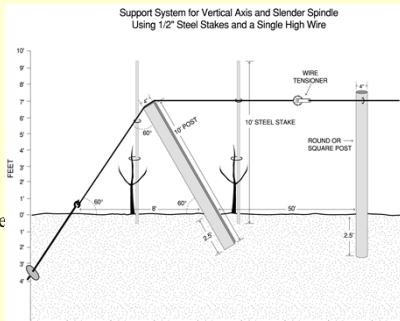
**Angled**

Angled are better for high vigor situations and where light interception must be maximized. Suitable for stonefruit. Beware of canker!

## SUPPORT SYSTEMS

### Basic Components

- POSTS AND STAKES
  - Wood Species
  - Size
- ANCHORS
  - Screw Types
  - Driven Posts
  - Brace or Back-brace
- WIRE
- TENSIONER
- SUPPLIES





Be sure and match the type of Support System to the Planting and Training System



## Where did Trellises Fail in 2011&2012

- Posts
- Anchors
- Fasteners
  - Crimps, Staples and Gripples

Why?

## How and why did posts fail?

- Trellis posts were too far apart.
- Trellis posts too short, trees were too tall
  - too much torque
- Augered posts tipped
- Pounded Trellis posts were not deep enough and tipped
- Posts that were damaged by rot and equipment broke off at ground level





## POSTS AND STAKES

**Wood Species**

- Pressure Treated
  - Pine, Red vs. Yellow, Lodgepole
- Untreated - Debarked
  - Black Locust, Cedar
- Bamboo stakes







**POSTS AND STAKES**

**SIZE –** 10' minimum with Stakes  
12' minimum without Stakes

Ends and Anchors	4-5"
Inline	3-4"

**DIMENSIONS**

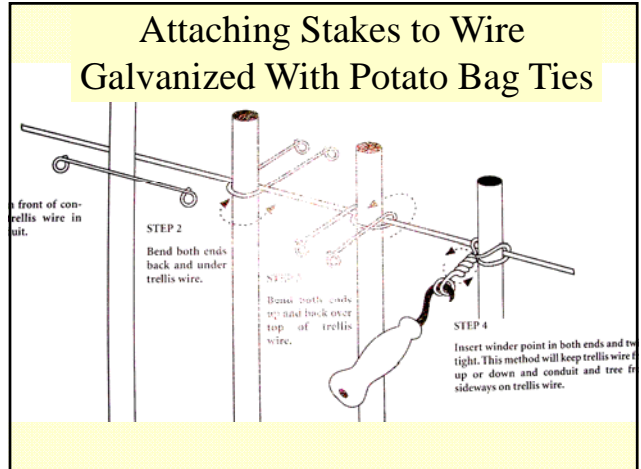
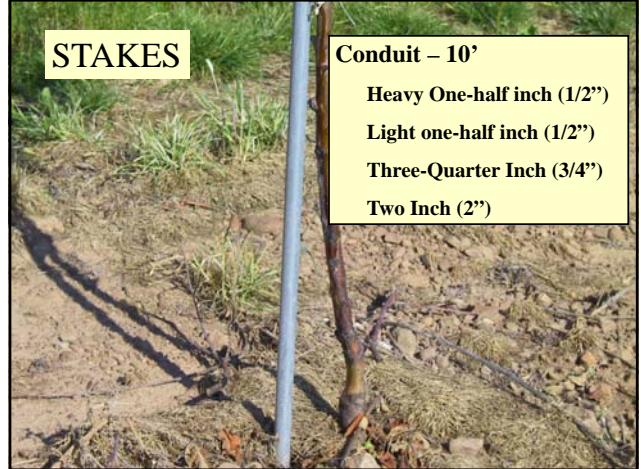
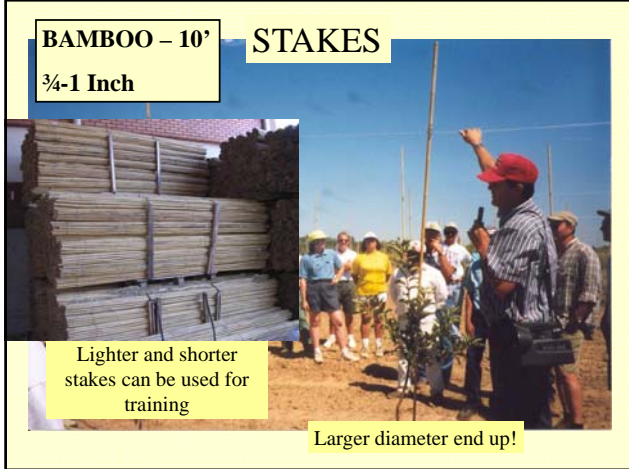
Round vs. Square

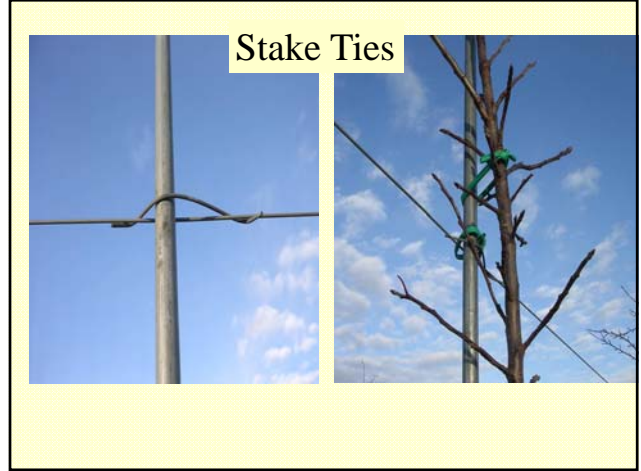


**INSTALLING TRELLIS**









### Important Considerations - Posts

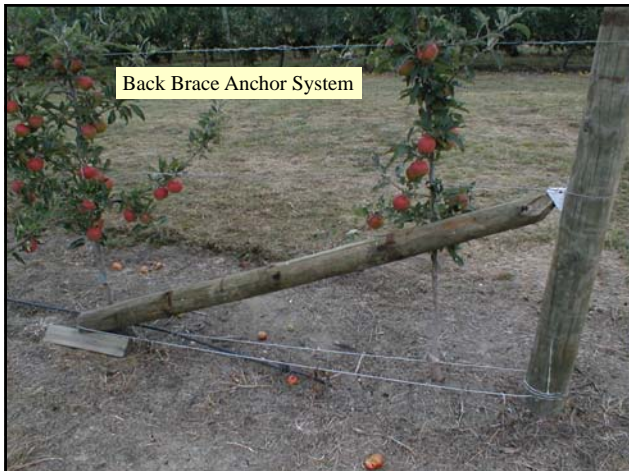
- Distance between support posts – Strength
  - No more than 30 ft.
- Height of trellis or stakes – Yield, Support
  - 7 ft for VA (10 ft with stake), 9-10 ft for TS
- Trellis too short
  - Torque causes trees (and trellis) to lean

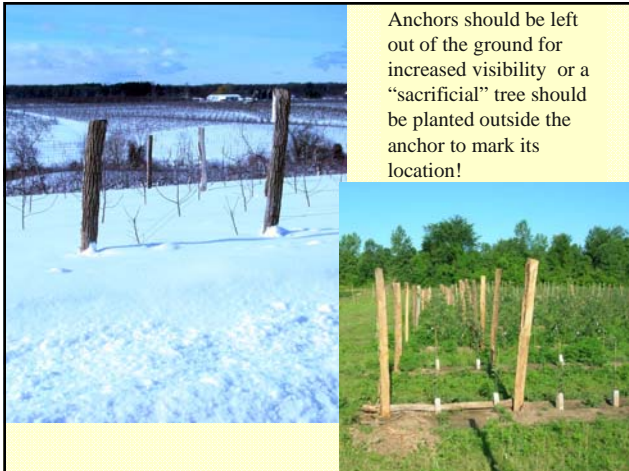
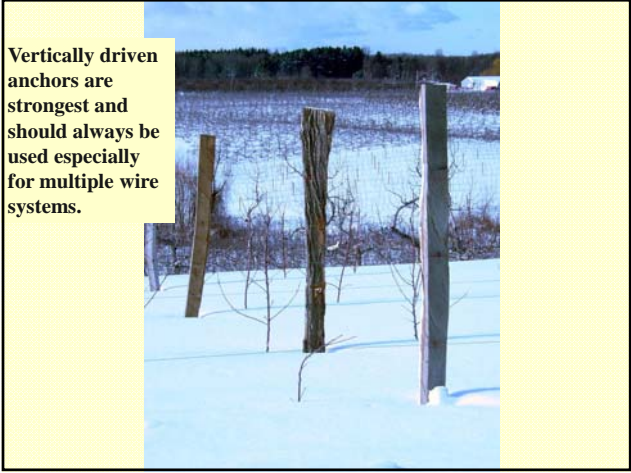


## How and Why did Anchors Fail?

- Not driven deep enough
- Bracing systems weakened post
- Too much stress on the rings of deadmen.
  - Welds broke and wire pulled out.

## ANCHORS

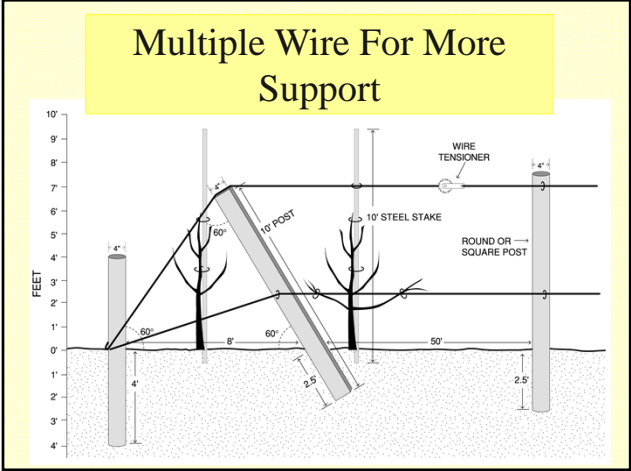








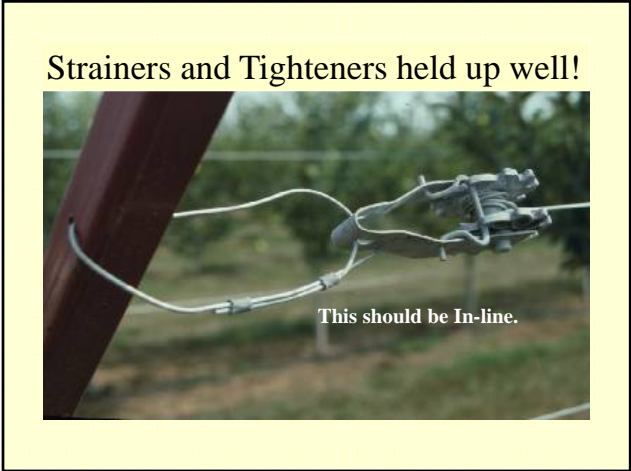
**Tree Ties**



**Multiple Wire For More Support**

**No Wire failures!**

- High Tensile Steel Only!
- 12.5 gauge
- Galvanizing (Type III – 50 yr life)



**Strainers and Tighteners held up well!**

This should be In-line.







### PREVENTING STAPLE PULL-OUT

A major cause of failure in wire trellises is the pulling out of staples. The most common cause of staple pull-out is improperly driving them.

Staples at least 1 3/4" long are recommended. Tests show that 1 3/4" x 9 gage staples driven into wood posts have 50 percent more resistance to pull-out than 1 1/2" staples.



### Designing Tree Support Systems

- Cost of the system
- Strength of the system
- Availability of materials
- Ease of Installation

## 4 Wire Trellis or Super Spindle Without Training Stakes

<u>Materials List 4Wire or XSS System</u>	<u># Pieces</u>	<u>Cost/Piece</u>	<u>Total</u>
12 ft Angle Driven End Posts	18.2		
12 ft In-Line Posts	103		
6 ft Driven Anchor Posts	18.2		
<b>Total 12 ft Posts</b>	<b>139.4</b>	<b>\$8.50</b>	<b>\$1184.90</b>
8 ft bamboo stakes	0	\$0.45	\$0.00
3/4 inch Galvanized Staples	200	\$0.08	\$16.00
12 Ga High Tensile Steel Wire	19,340	\$0.02	\$386.80
12 Ga Lead Wire Crimps	54.6	\$0.11	\$6.01
13 Ga 9 inch Galvanized Wire Ties	0	\$0.01	\$0.00
Strainers	9.1	\$2.00	\$18.20

**Cost Using 5 Wire System**

**\$1611.91**



Recognize that support systems carry a tremendous amount of weight and it is easier and cheaper to build them properly the first time than to rebuild them later.

## Preventing Support System Failures

- Use Driven instead of augered anchors and posts
- Use 1 3/4 Staples and double them where stresses occur
- Use adequate post size
- Plant “sacrificial” tree
- Perform regular maintenance and repair problems as soon as they are spotted.

## Preventing Support System Failures

- Use Driven Anchors
- Drill top wires on posts and thread wire through posts.
- Use 45mm staples for lower wires. Double them where stresses occur
- Use adequate post size
- Plant “sacrificial” tree
- Perform regular maintenance and repair problems as soon as they are spotted.



## Annual Support System Maintenance

- Re-pound pulled **anchors**.
- **Replace** broken or weakened support **posts** and **stakes**.
- Check for weak or **pulled staples** especially on the end posts or where undue stress is exerted because of abrupt changes in wire direction (like the transition point from anchor to end post to inline post).
- **Straighten leaning tree stakes** by retying with potato bag tie or reclipping.
- **Readjust wire tension** after harvest and the crop load has been removed.

