



Wine Grape Training Systems

**Dr. Duke Elsner
Small Fruit Educator
Michigan State University Extension
Traverse City, Michigan**

MICHIGAN STATE UNIVERSITY

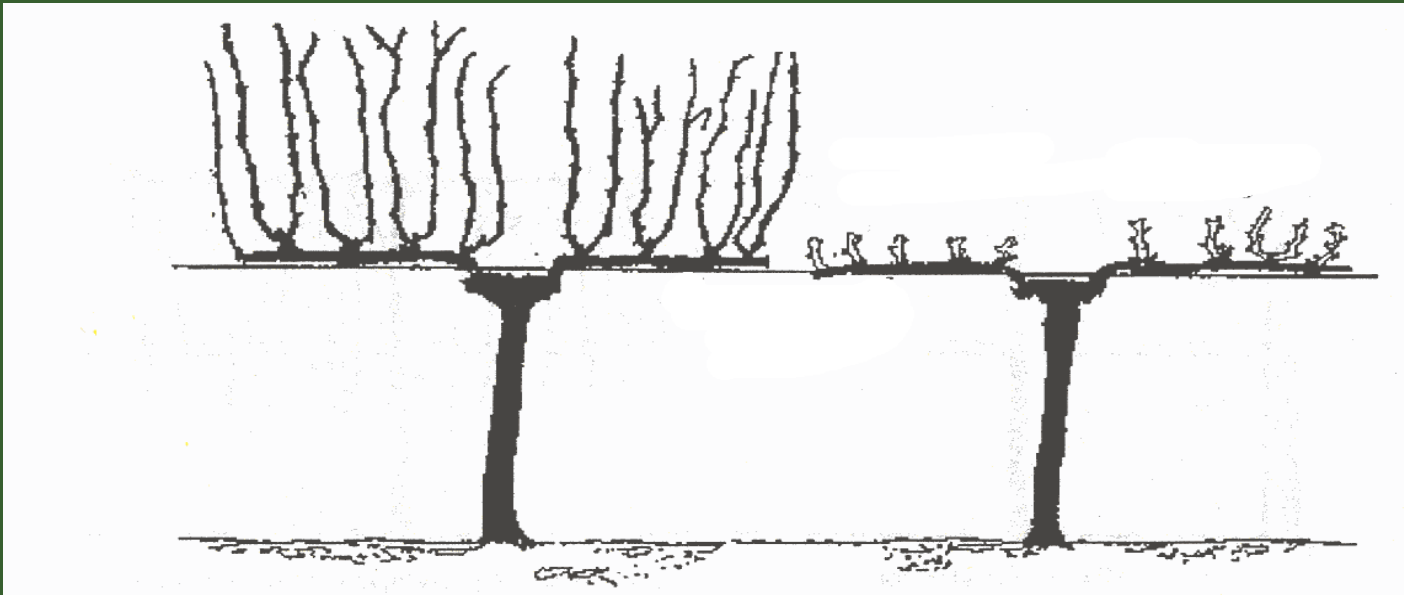


2014 Wine Grape Vineyard Establishment Conference

Training System

Definition

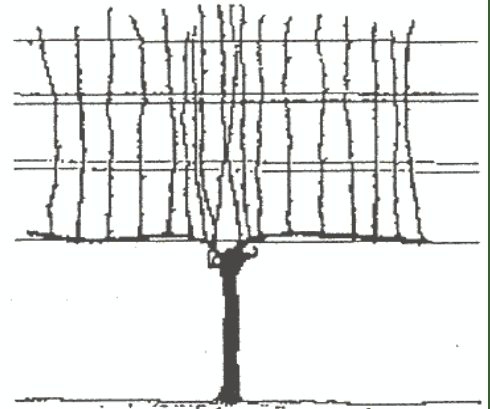
- An orderly, sustainable growth form for a vine.
- A specific training system has a conceptualized ideal form for a vine.



Selecting a Training System

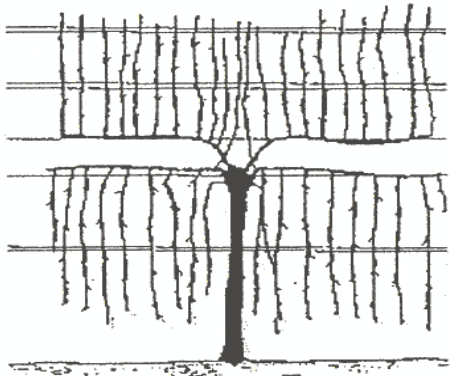


Hudson River Umbrella

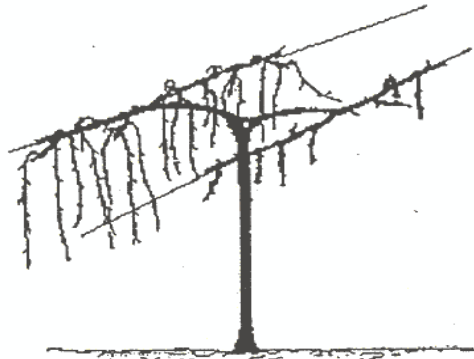


Guyot

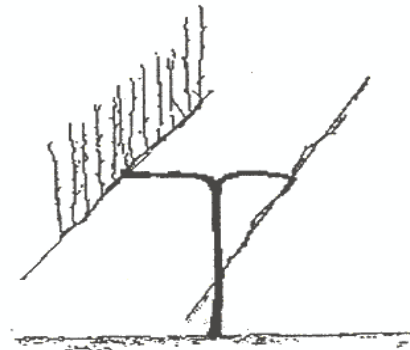
?



Scott-Henry



GDC



Lyre

Training System Choice Is Influenced By:

- Cultivar growth habit
- Cultivar cold hardiness
- Potential for winter injury
- Fruitfulness of base buds
- Grafted vs. own-rooted vines
- Desirability for mechanization
- Facilitation of equipment
- Labor and cost-effectiveness

An acceptable training system will:

- **Promote maximum exposure of leaf area to sunlight.**
 - **Leaves must be well-exposed for photosynthesis to occur optimally.**

An acceptable training system will:

- **Warm clusters for adequate sugar accumulation, acid degradation, and biosynthesis of flavor of flavor compounds in cool grape regions.**

An acceptable training system will:

- **Create a desirable environment within the canopy (microclimate), particularly in the renewal region.**
 - **Proper training can provide for a renewal zone to be formed, which ensures that the vine form is perpetuated and yield is maintained.**

An acceptable training system will:

- **Arrange perennial wood and bearing units in such a way that shoot crowding and leaf and fruit shading are avoided, thus optimizing wine quality, disease control and yield.**

An acceptable training system will:

- **Promote uniform bud break, especially with those cultivars that exhibit pronounced apical dominance.**

An acceptable training system will:

- **Distribute vines and bearing units to avoid undue competition between vines.**

An acceptable training system will:

- **Minimize the volume of perennial wood, such as old trunks, in situations where the hazards of winter injury outweigh the merits of perennial wood retention.**

American Cultivars

- Typical of *Vitis labrusca* (Concord)
- Procumbent (drooping) shoot growth habit
- High yield per vine
- Very cold-hardy



European Cultivars

- *Vitis vinifera* as dominant parentage
- Upright shoot growth habit
- Low yield per vine (about 15 lb)
- Cold-tender compared to American cultivars



Hybrid Cultivars

- American and European genetics
- Most have a procumbent shoot growth habit
- High yield per vine
- Relatively cold hardy, some very cold hardy



Training Systems for Procumbent Vines

- High Cordon /
Top Wire Cordon
 - Hudson River Umbrella
- Geneva Double Curtain
- Umbrella Kniffin

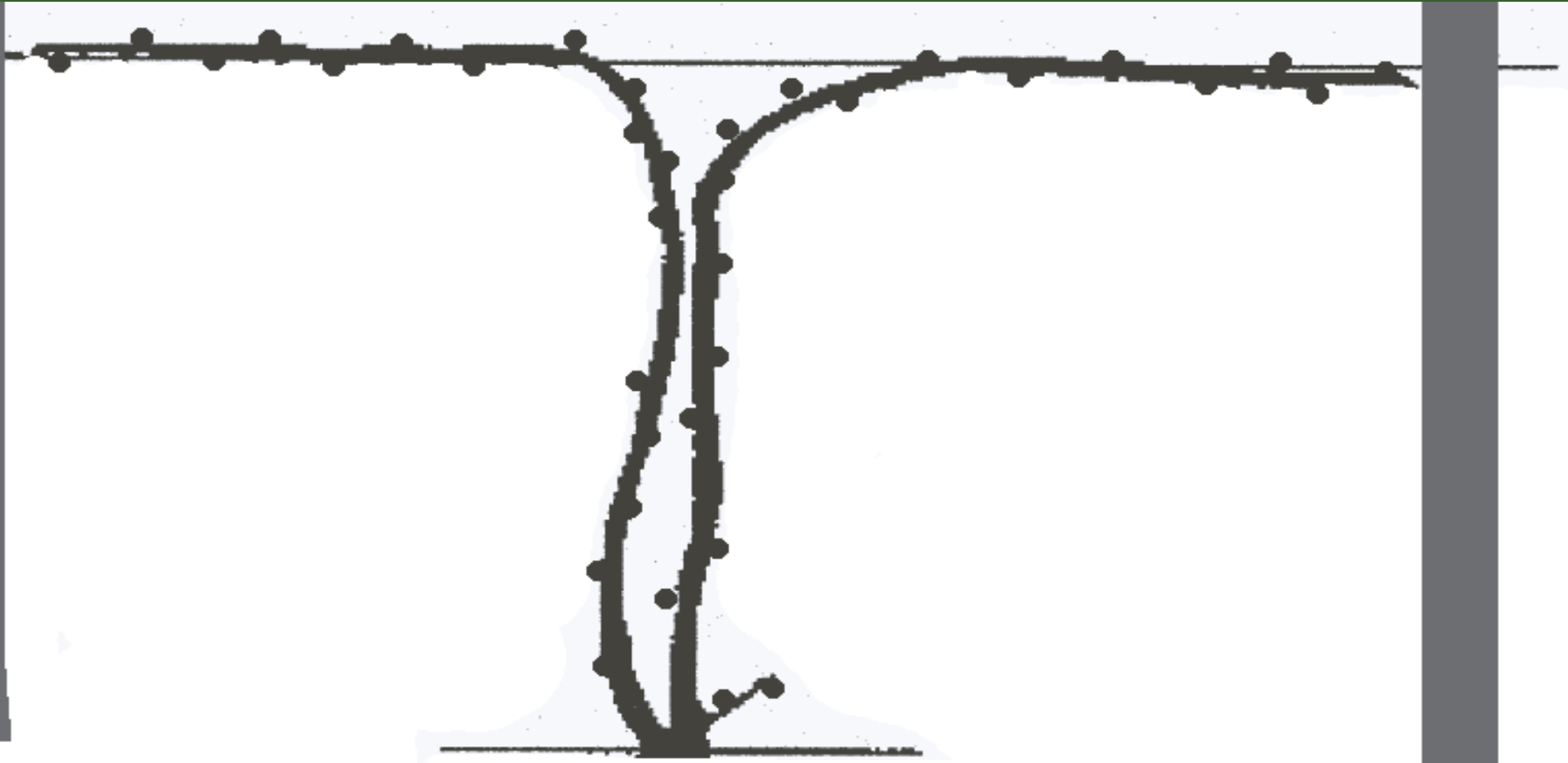


High Cordon / Top-Wire Cordon



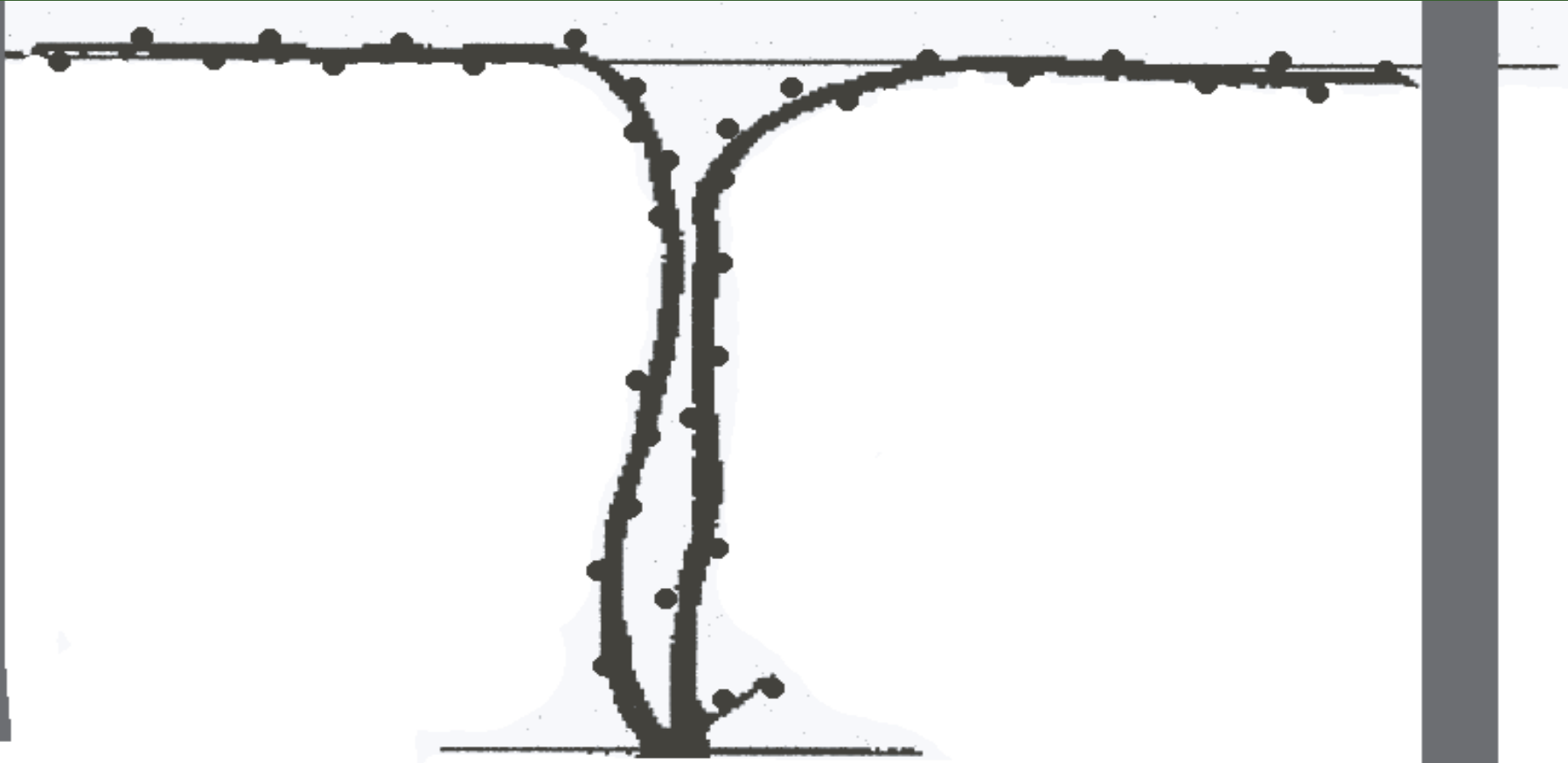
High Cordon Growth, Training & Pruning

- Requires a single “bearing” wire
- Typically 6 foot above ground



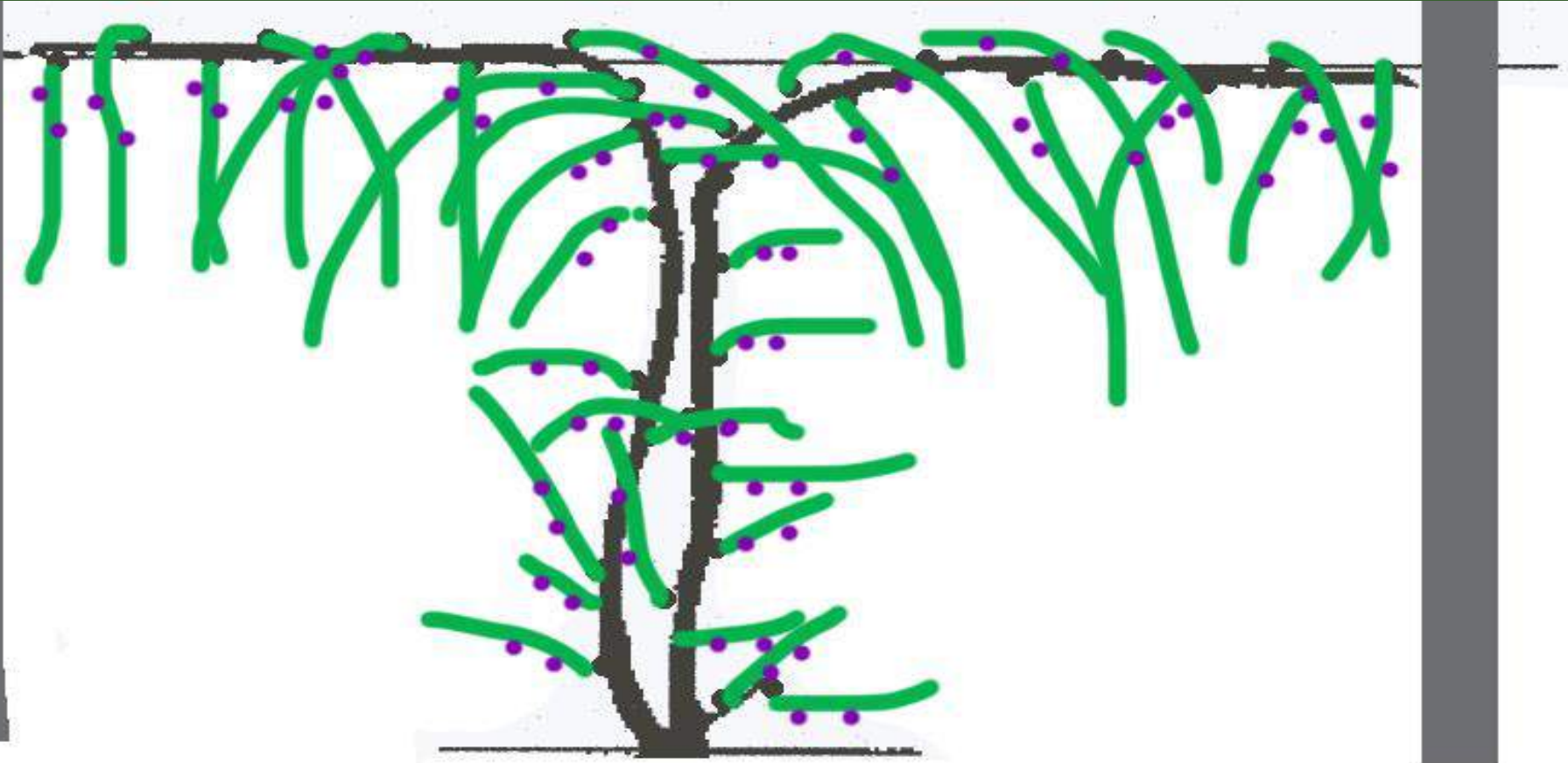
High Cordon Growth, Training & Pruning

- 1st bearing year (3-4 year old vines)
- All 1 year old canes



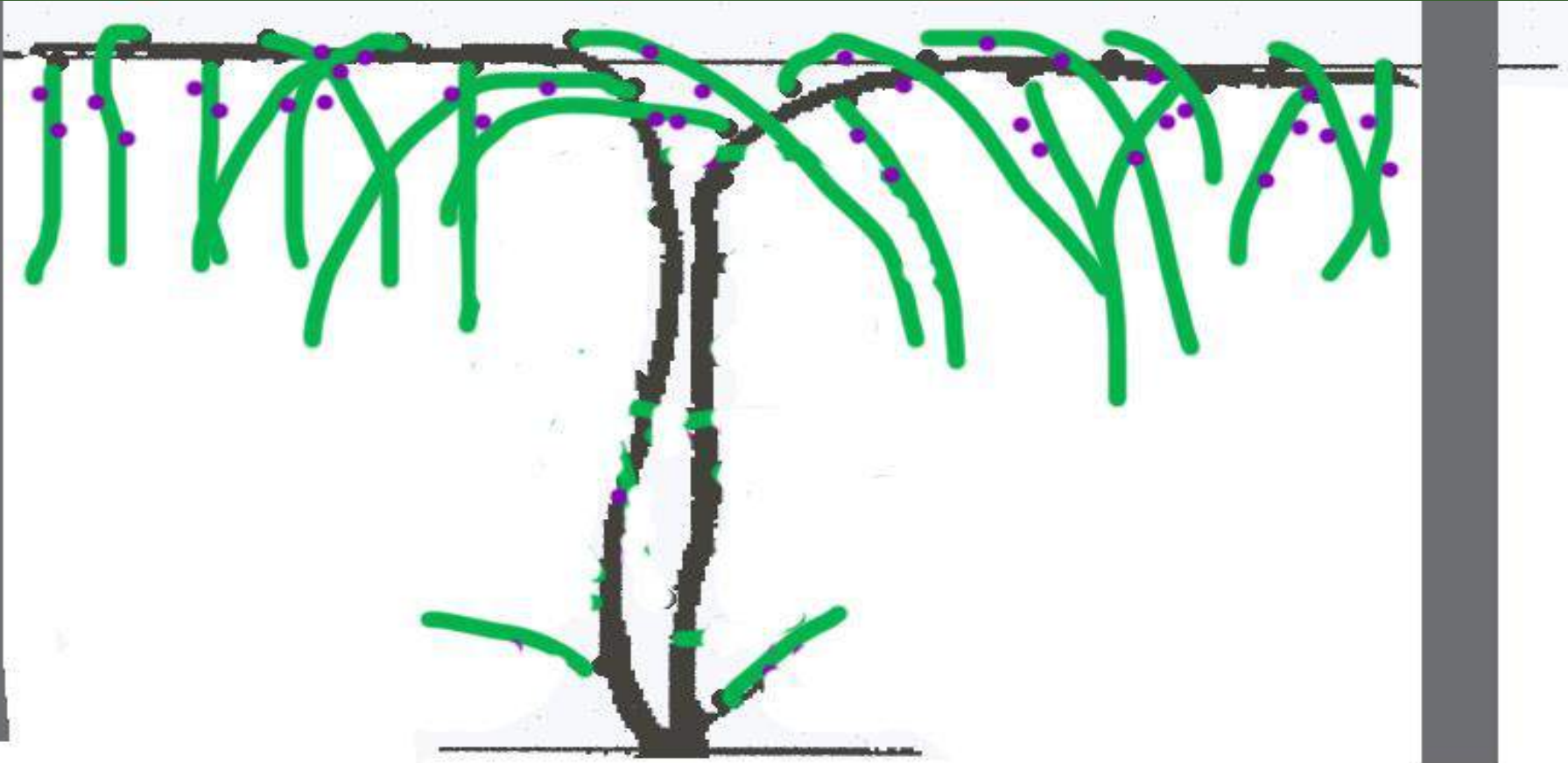
High Cordon Growth, Training & Pruning

- Early season shoot growth



High Cordon Growth, Training & Pruning

- After removing suckers and unwanted fruit

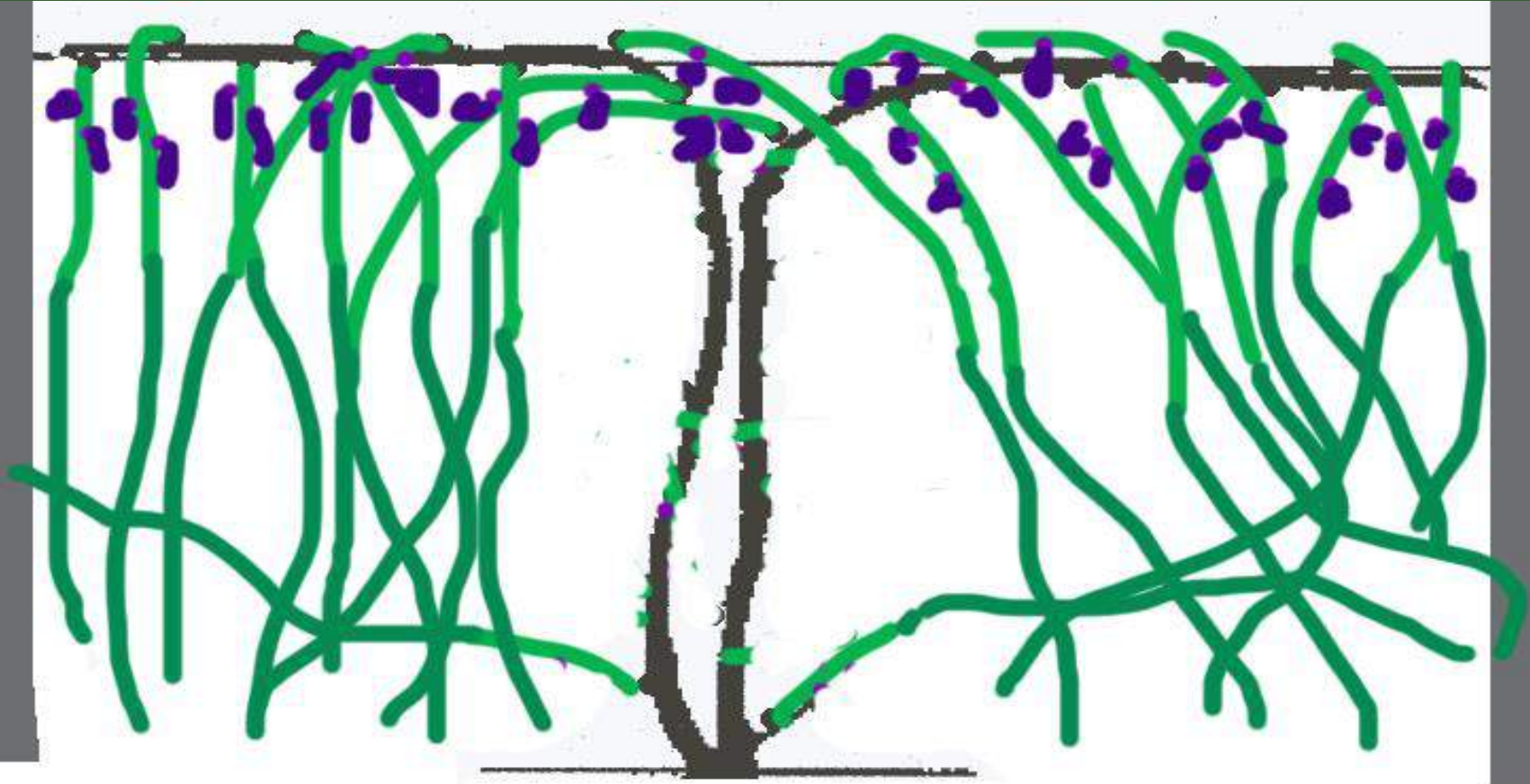


High Cordon



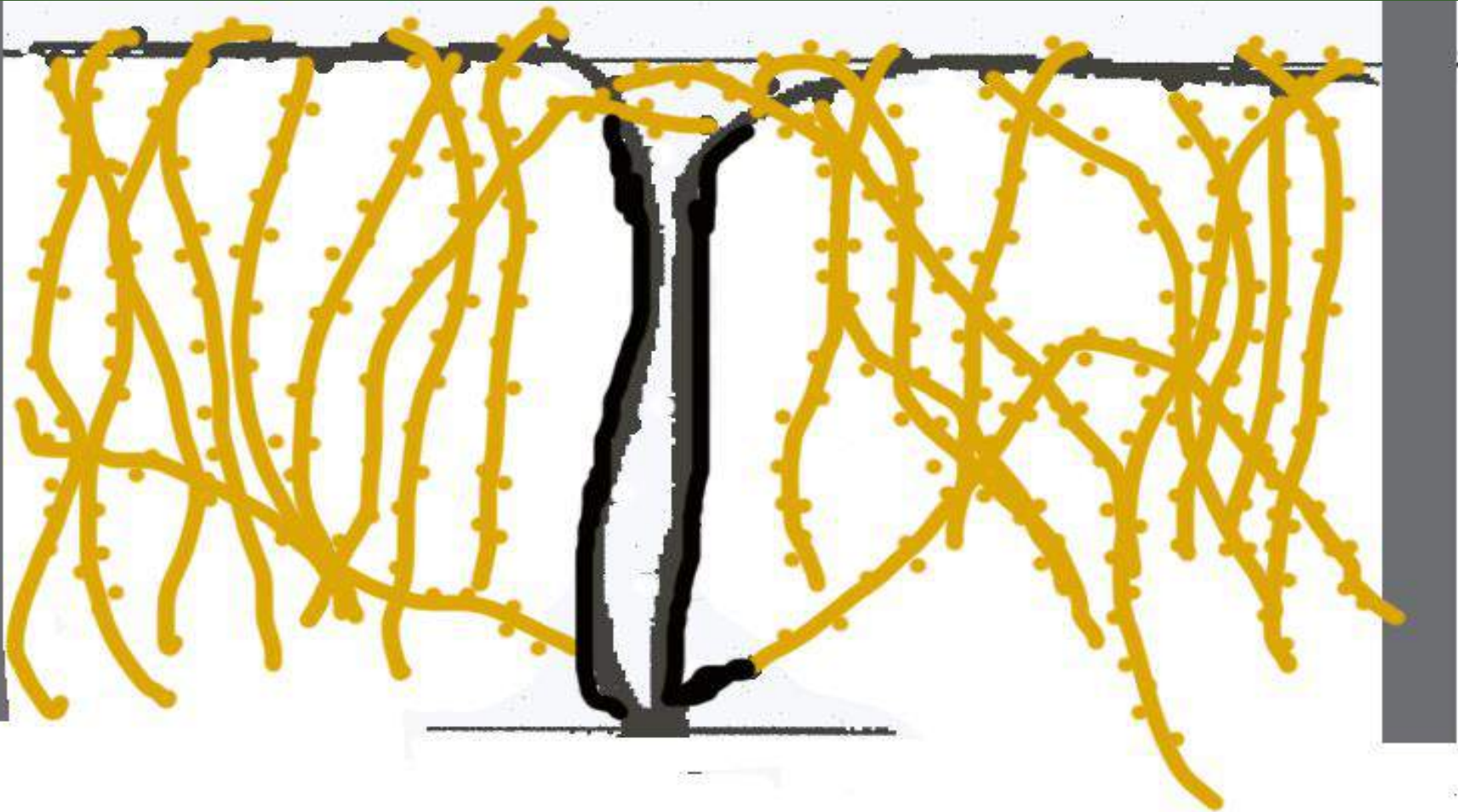
High Cordon Growth, Training & Pruning

- Shoot growth by end of season - harvest



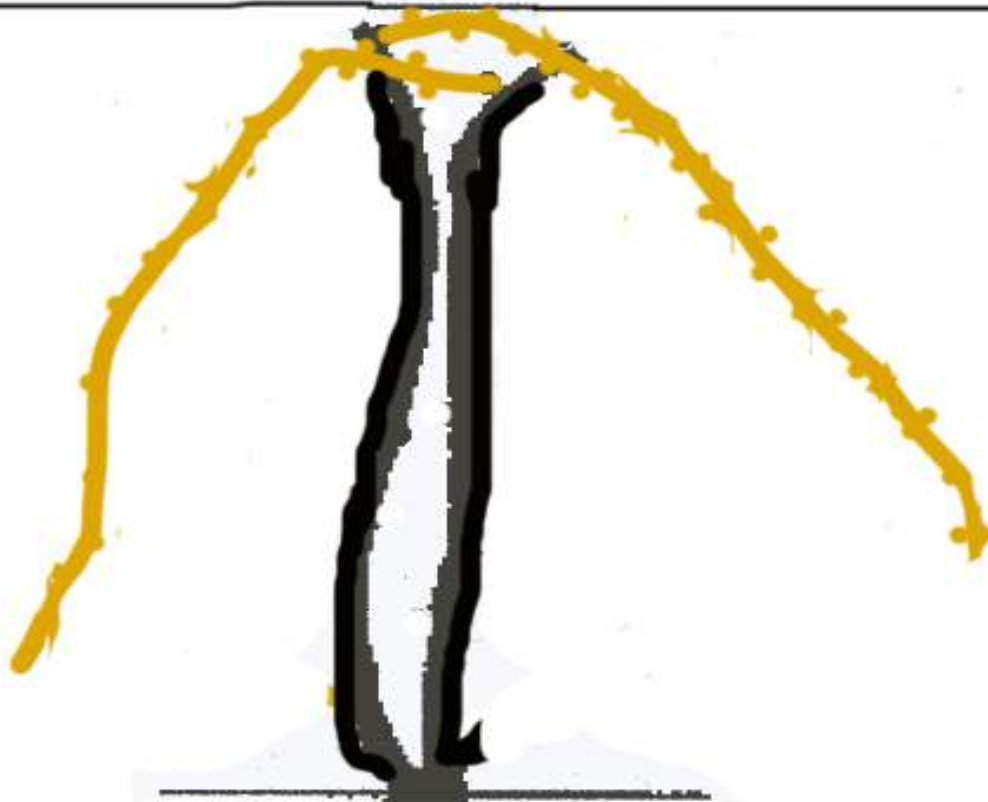
High Cordon Growth, Training & Pruning

- Mature canes after harvest & fall leaf drop



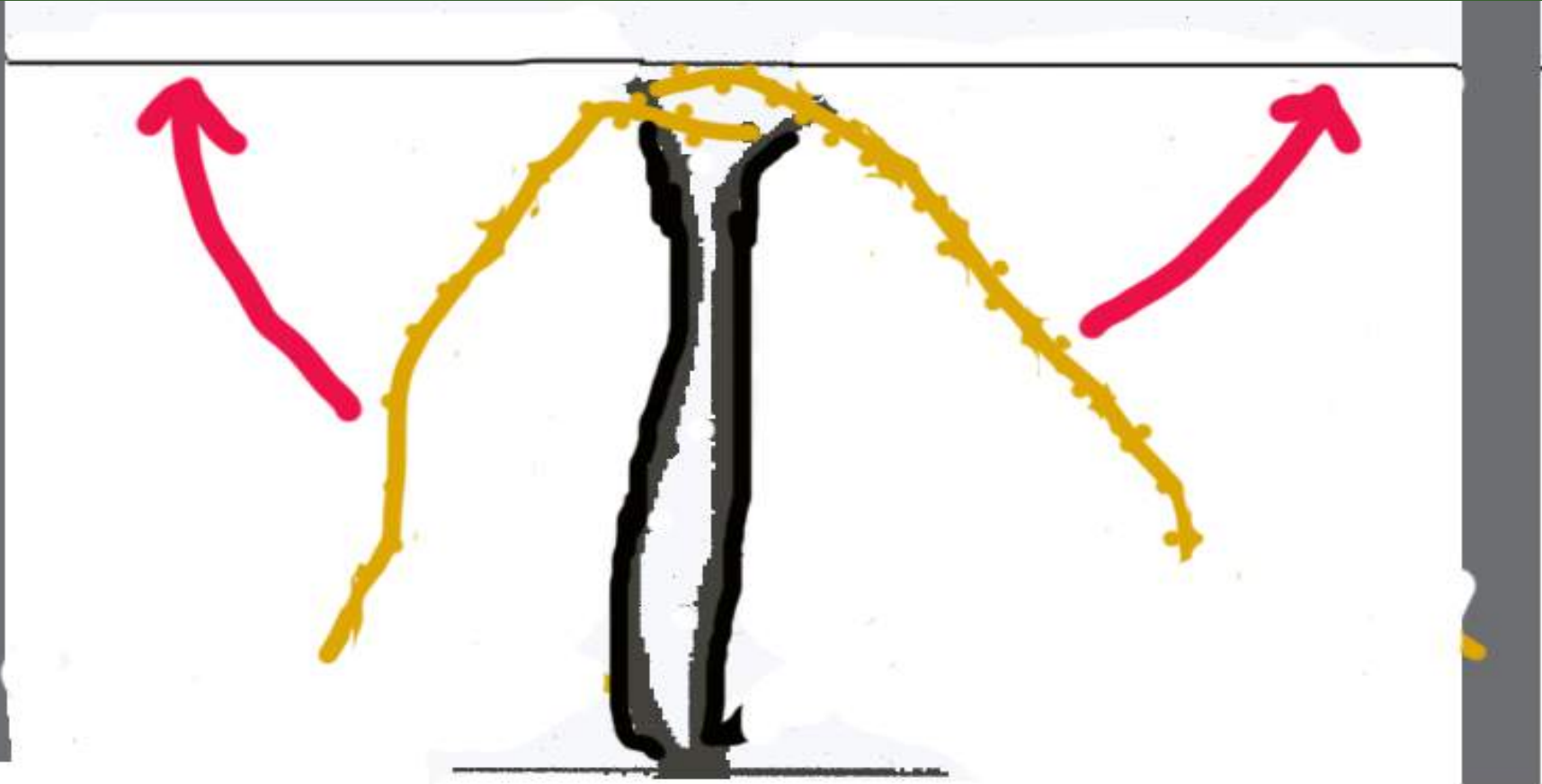
High Cordon Growth, Training & Pruning

- 2nd bearing season – long cane pruning



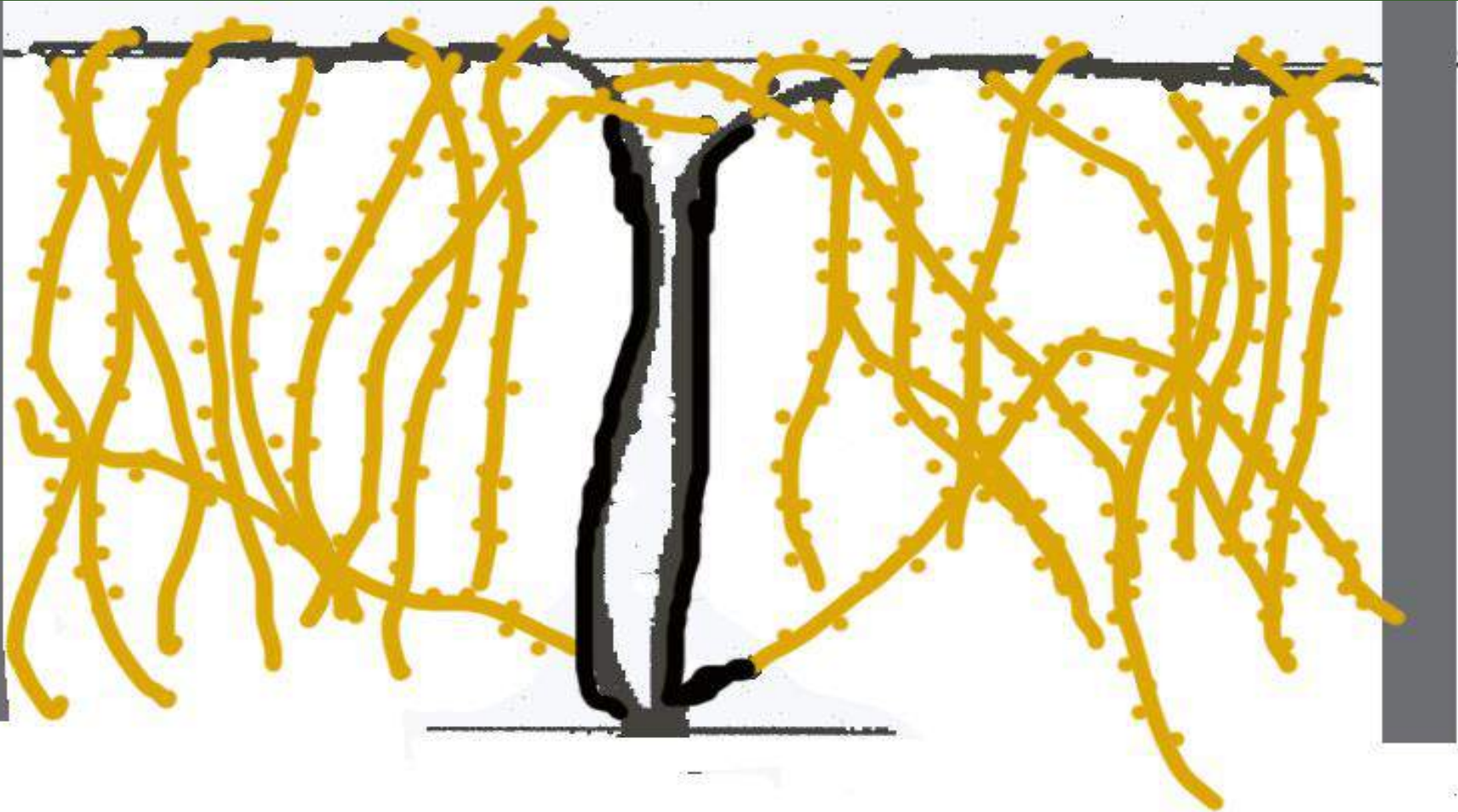
High Cordon Growth, Training & Pruning

- renewing the system with long canes



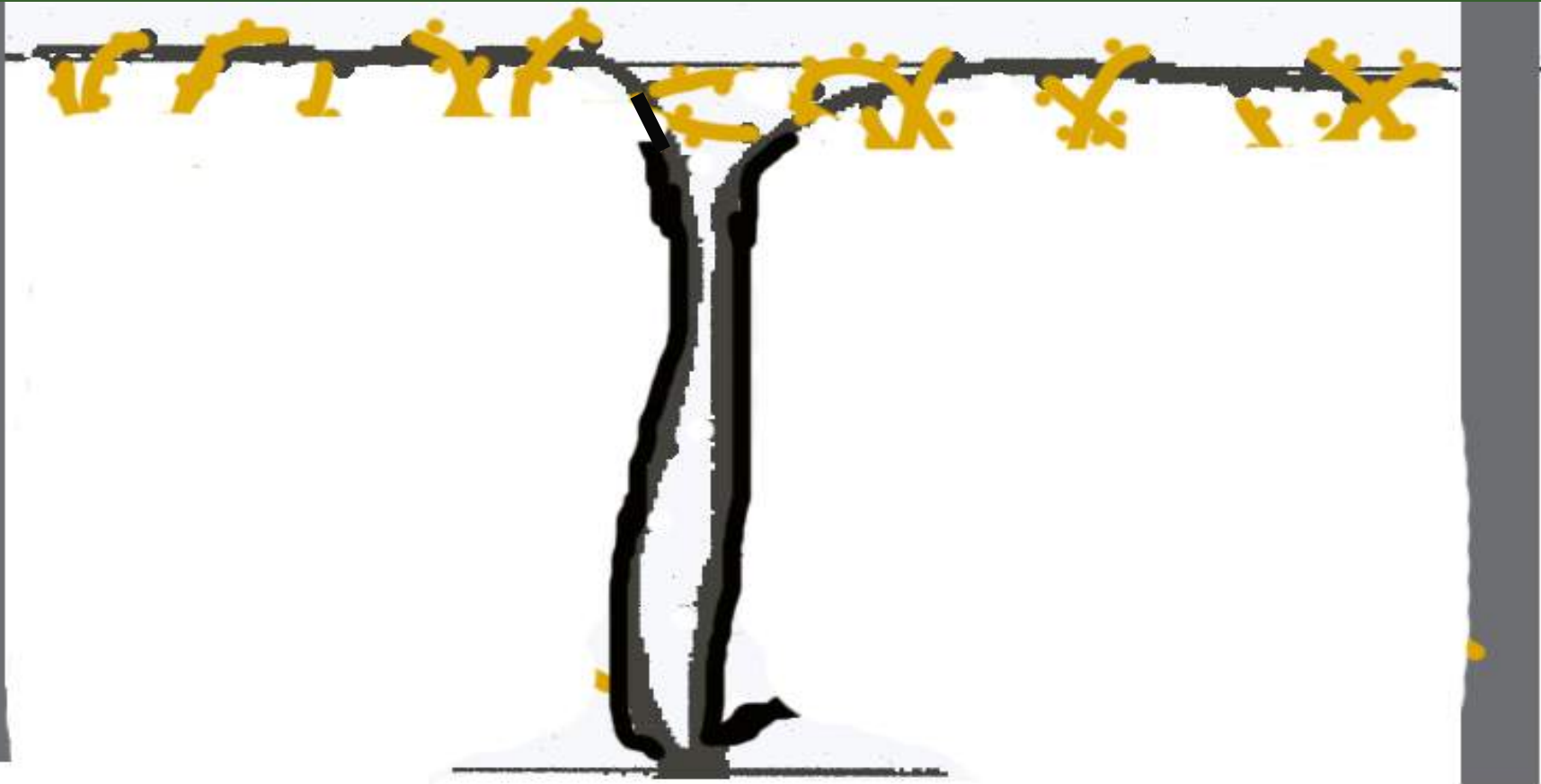
High Cordon Growth, Training & Pruning

- Mature canes after fall leaf drop



High Cordon Growth, Training & Pruning

- 2nd bearing year – spur pruning
- Adjust crop by number & length of spurs



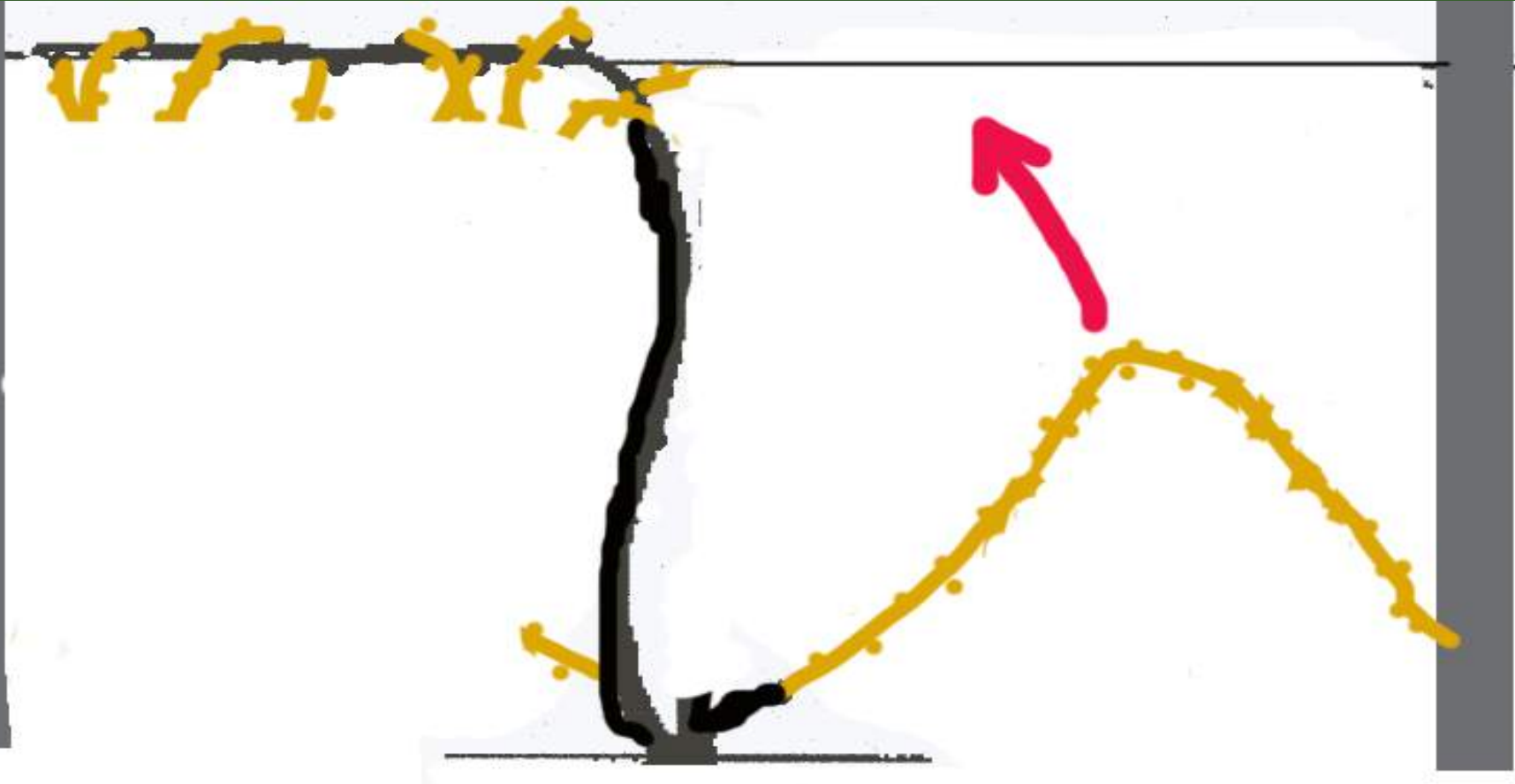
High Cordon Growth, Training & Pruning

- 2nd bearing year – spur pruned
- Adjust crop by number & length of spurs



High Cordon Growth, Training & Pruning

- replacing injured trunks as needed



High Cordon Training

■ Advantages

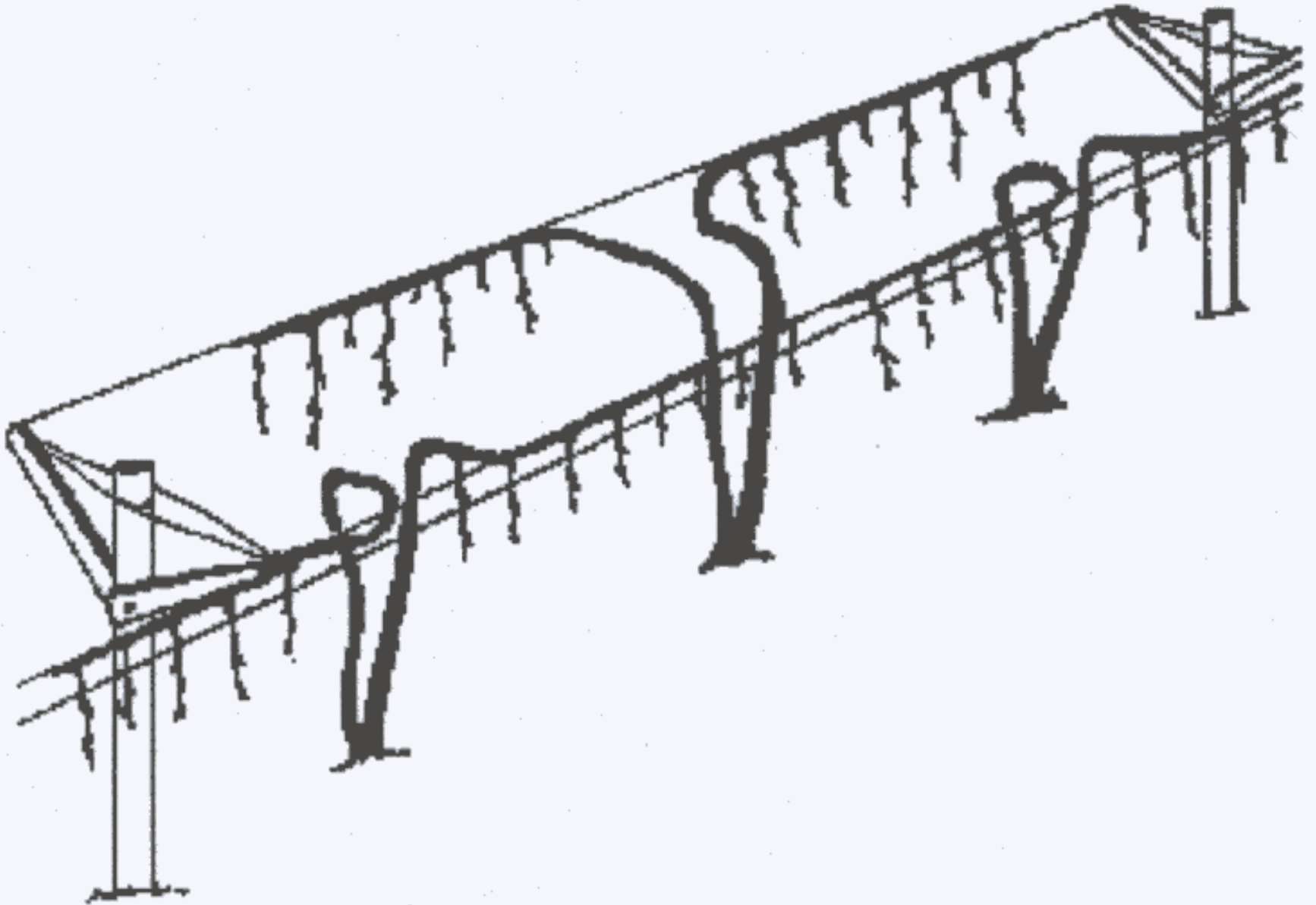
- Adaptable to mechanical pruning, unskilled manual pruning, and mechanical harvest
- Fruit high for good sun exposure
- Simple trellis construction
- Little or no annual tying

High Cordon Training

■ Disadvantages

- Difficult to establish cordons where winter injury is frequent
- Old cordons hard to remove from the wire
- Old cordons may become a reservoir of diseases

Geneva Double Curtain



Geneva Double-Curtain Training

■ Advantages

- Handles large canopies of vigorous vines

■ Disadvantages

- Similar to Top-Wire Cordon, but more difficult to maintain

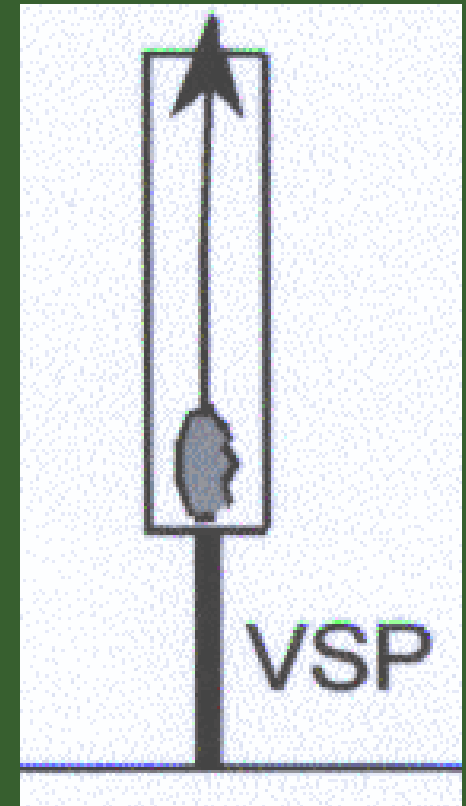
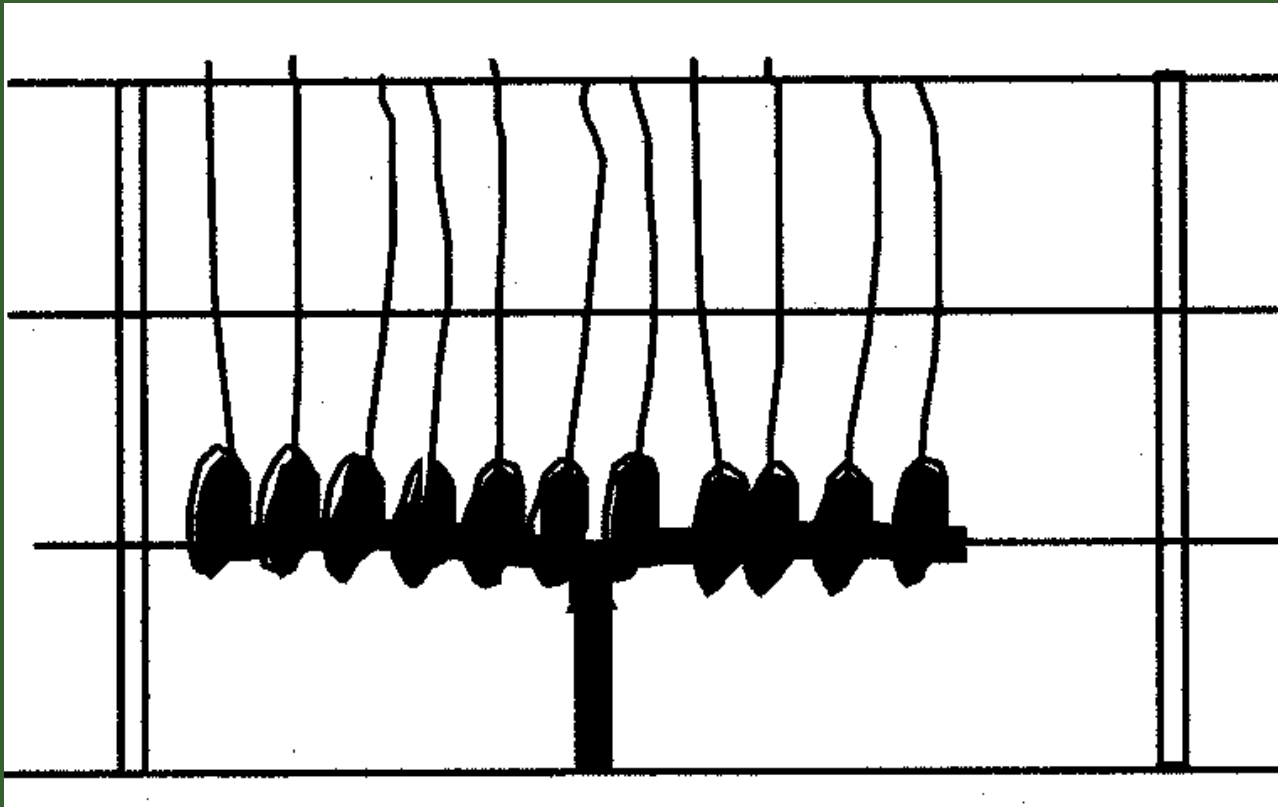
Training Systems for Upright Vines

- Guyot
- Mid-wire cordon
- Pendlebogen
- Fan
- Divided canopy systems



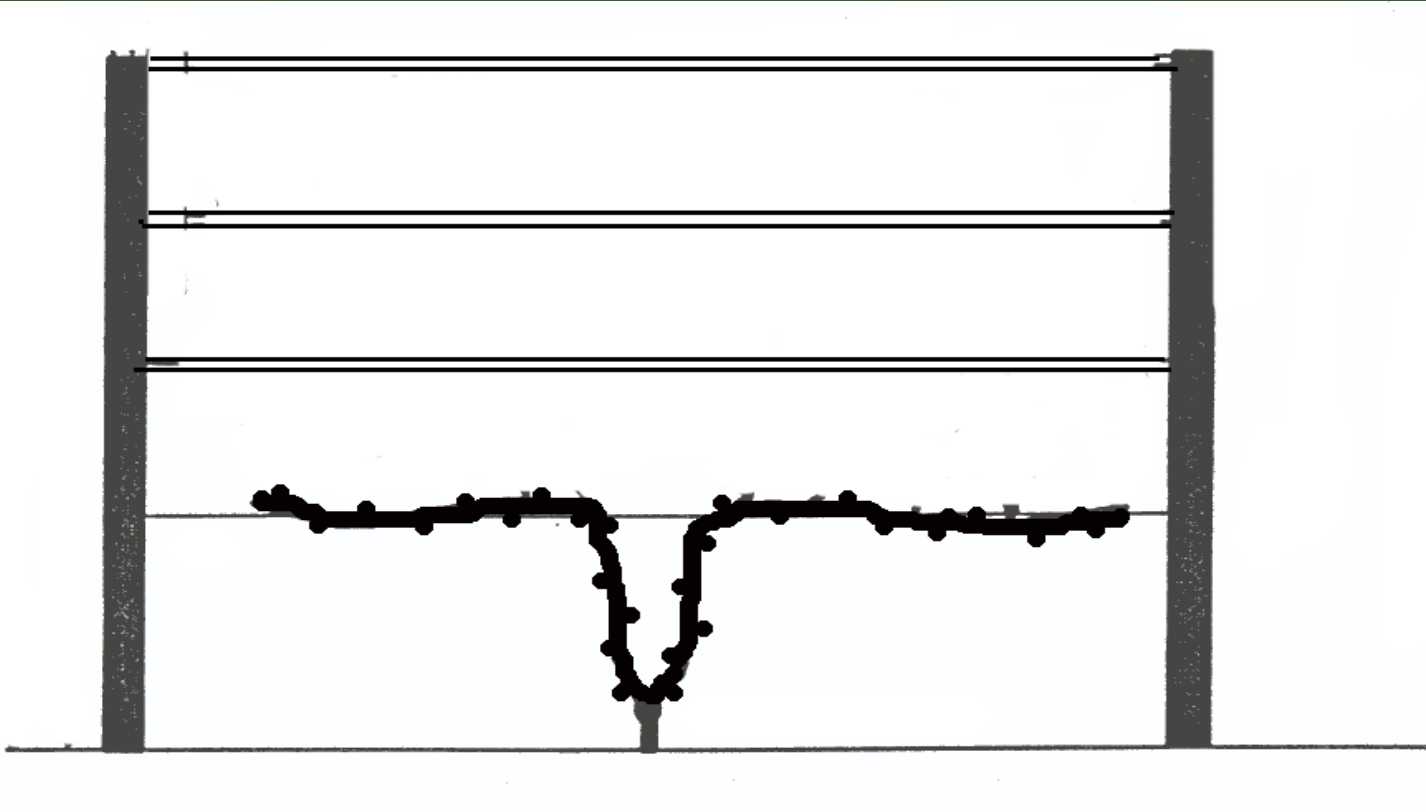
What about “VSP”?

Vertical Shoot Positioning is a canopy management action, not a training system per se



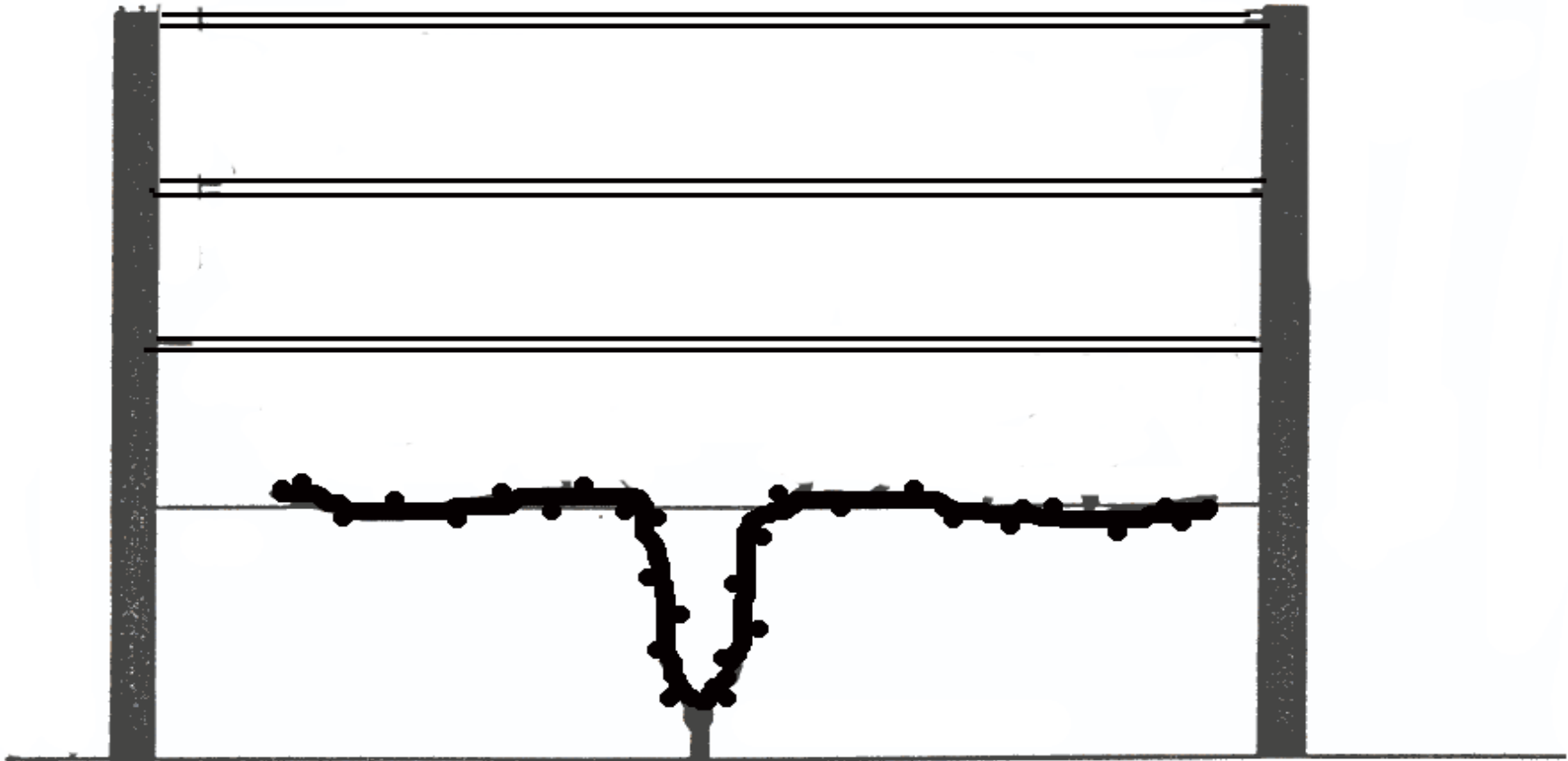
Guyot training

- Requires a single “bearing” wire
- Requires 2-3 pairs of “catch” wires
- Typically 6 foot posts



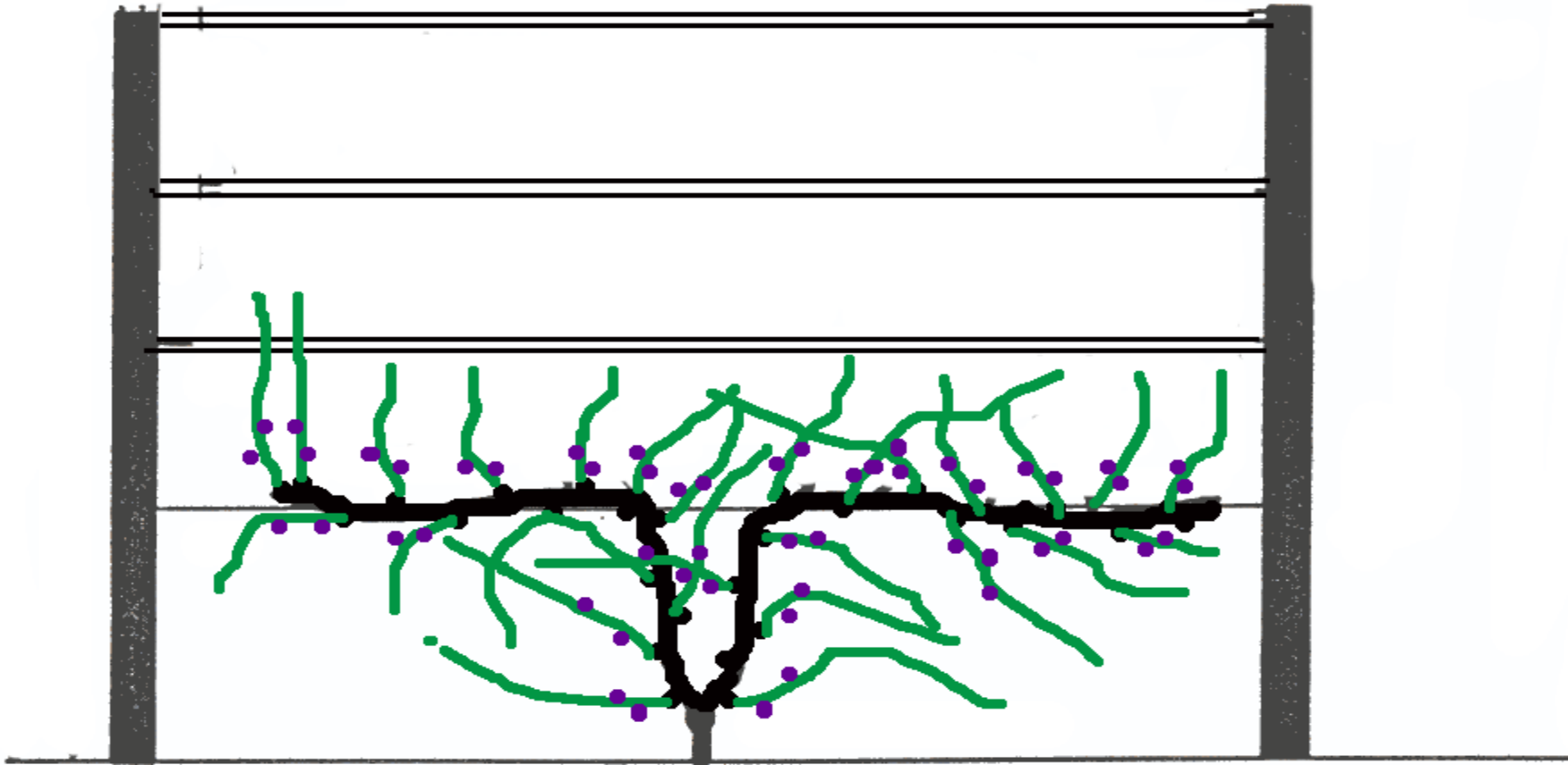
Guyot Growth, Training & Pruning

- 1st bearing year, after pruning (3-4 years old)



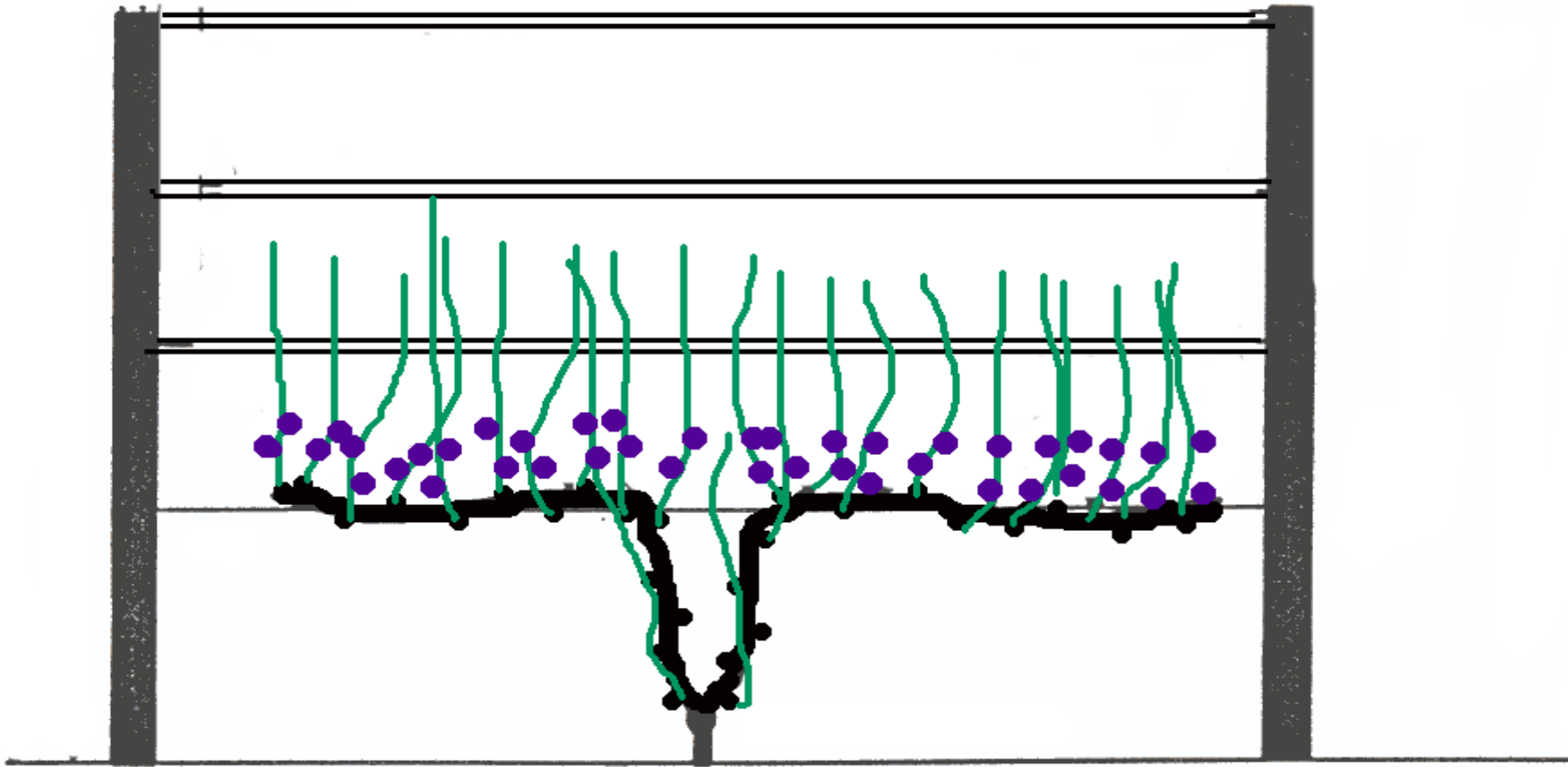
Guyot Growth, Training & Pruning

- 1st bearing year – early shoot growth



Guyot Growth, Training & Pruning

- 1st bearing year – after suckering & defruiting



Guyot Growth, Training & Pruning

- Vertical Shoot Positioning – tucking shoots

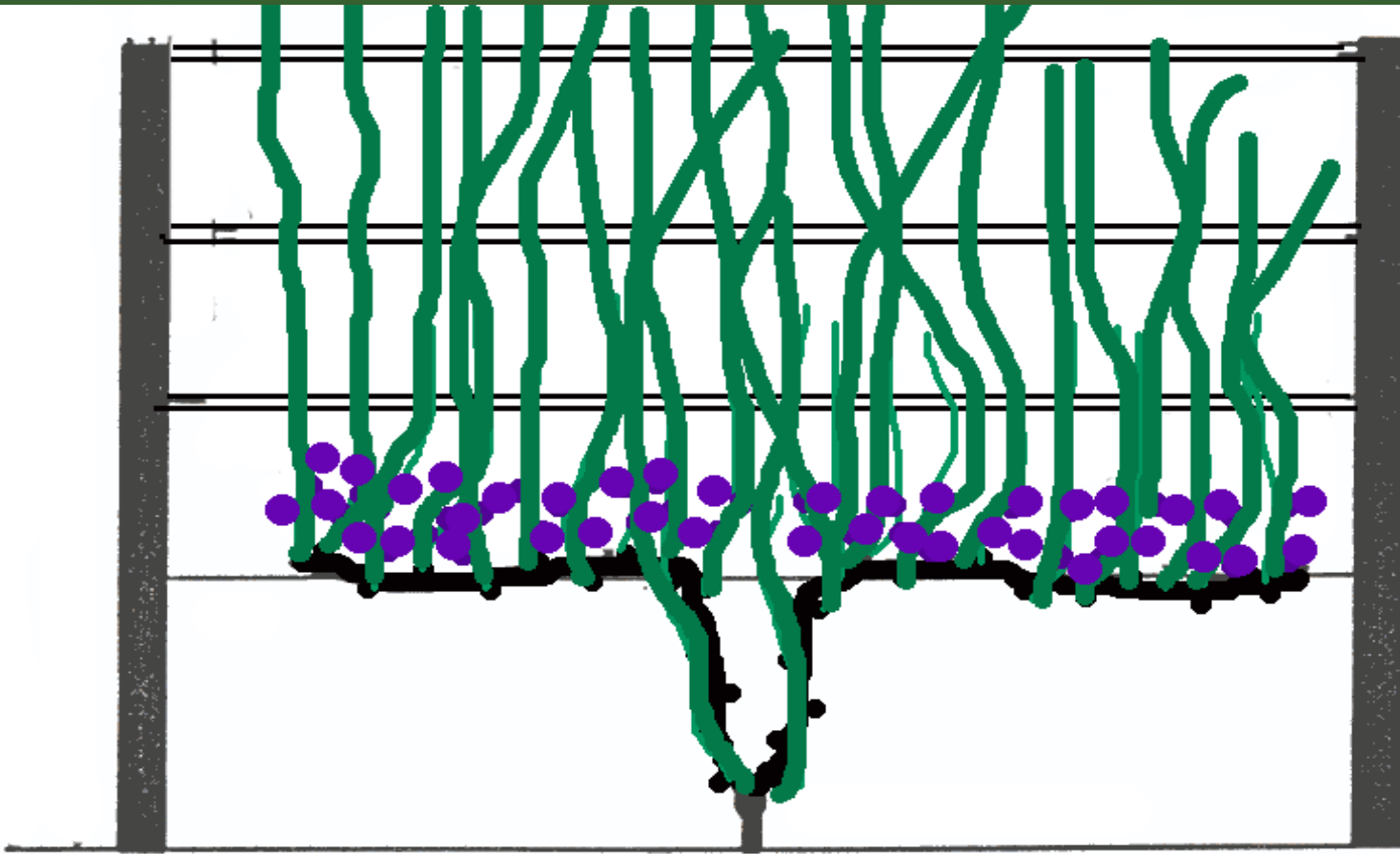


Well positioned shoots



Guyot Growth, Training & Pruning

- 1st bearing year, at harvest



Guyot Growth, Training & Pruning

- Leaves removed to show uniform fruiting zone



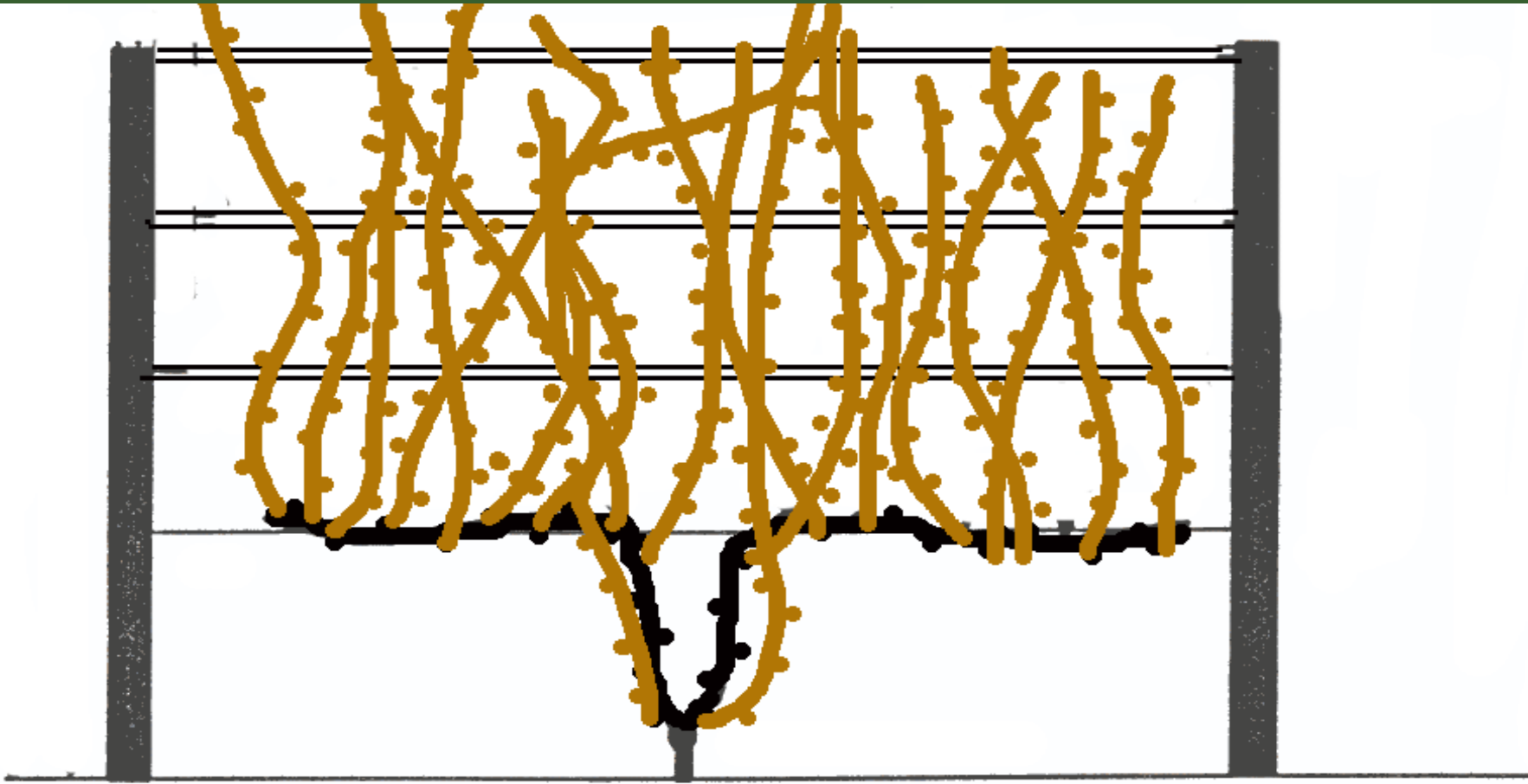
Guyot Growth, Training & Pruning

- mature canes after leaf drop



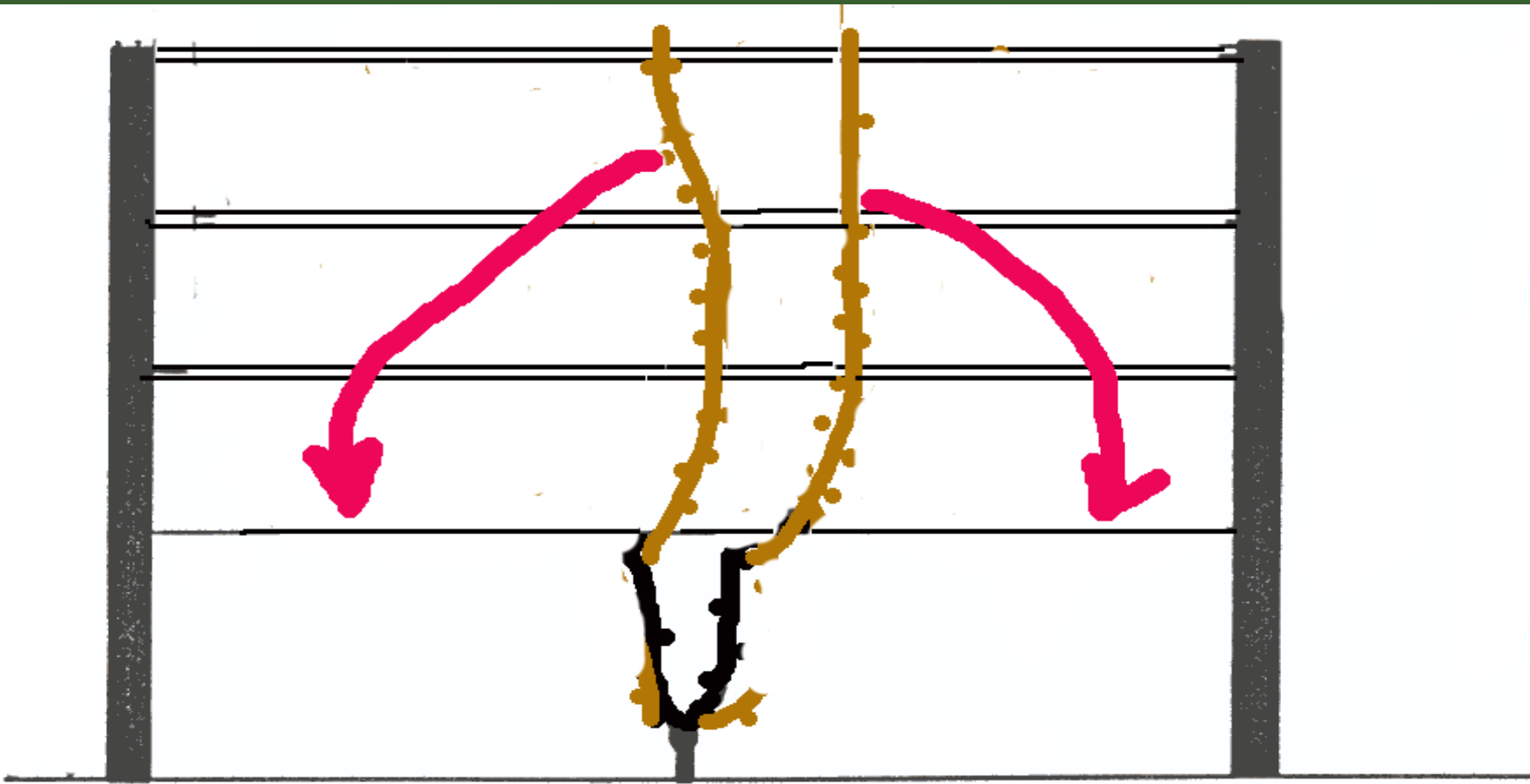
Guyot Growth, Training & Pruning

- 1st bearing year – mature canes after leaf drop



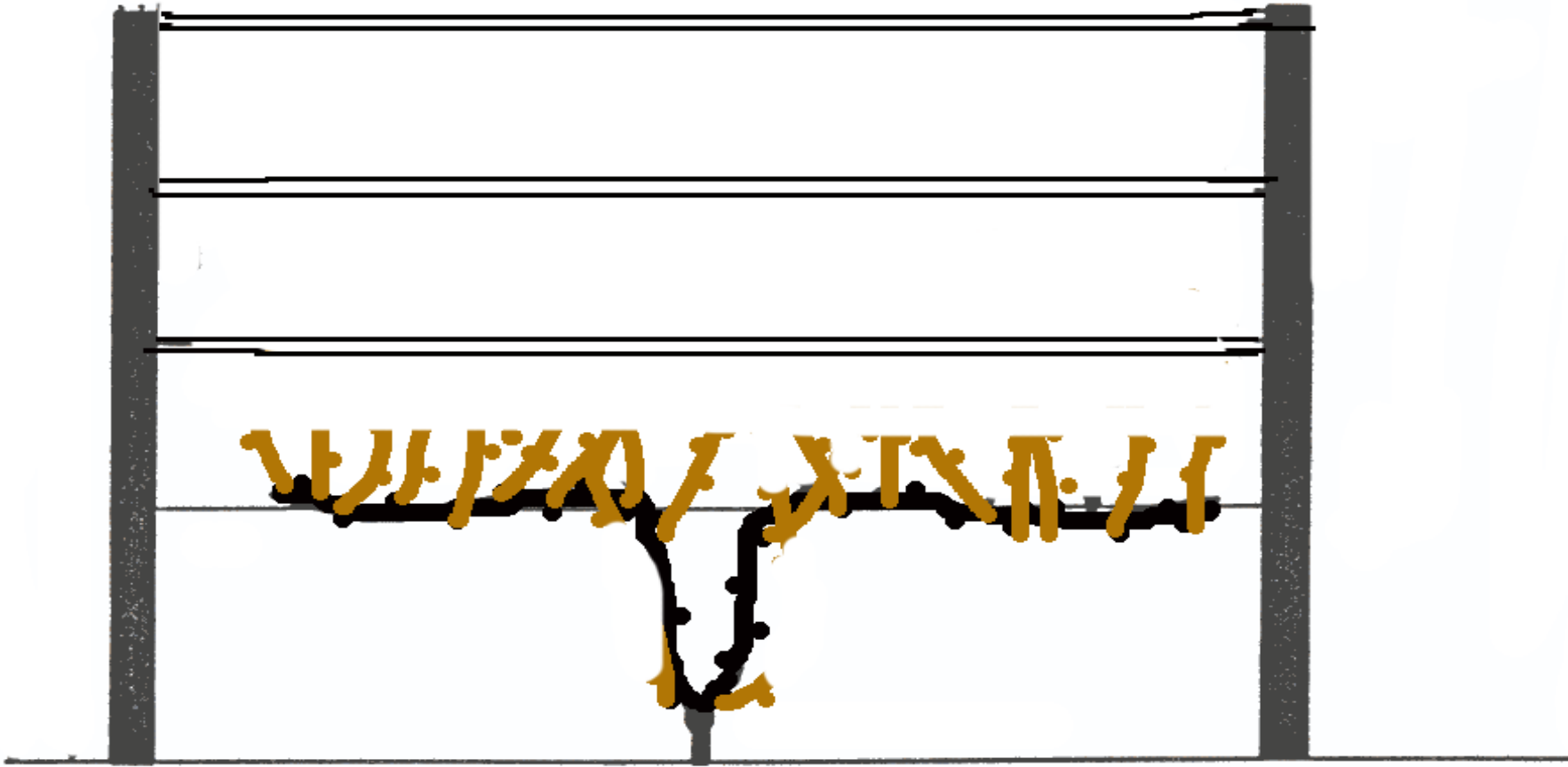
Guyot Growth, Training & Pruning

- 2nd bearing year, long cane pruning to renew



Guyot becomes... Mid-wire cordon

- 2nd bearing year – spur pruning on cordons



Guyot / Mid-Wire Cordon Training

■ Advantages

- Ease of establishment
- Adaptable to mechanical pruning
- Little tying required

■ Disadvantages

- Fruiting zone may become crowded and shaded on large vines
- Nodes on fruiting spurs may be of lower quality

Low Cordon Training

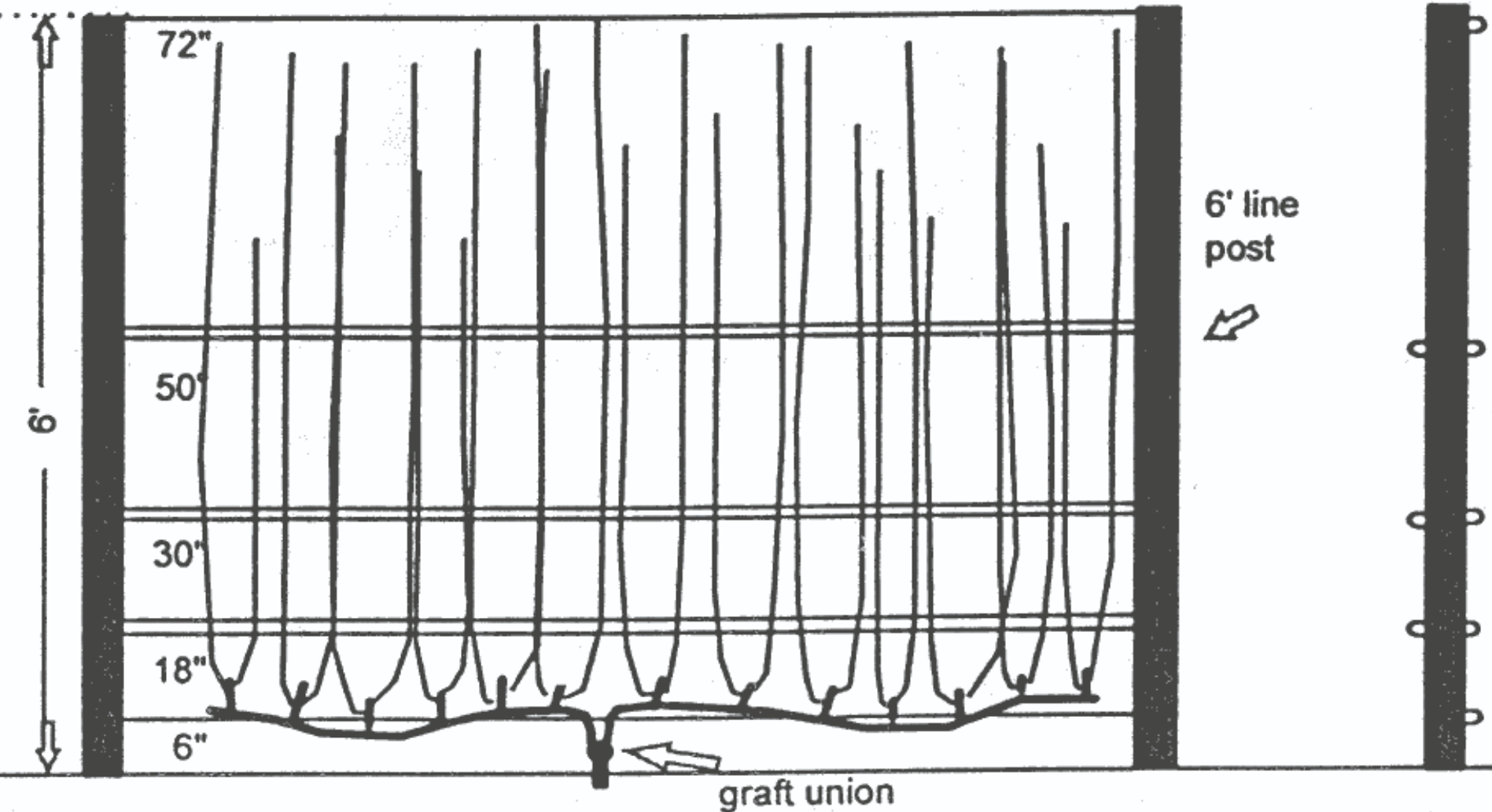


Fig. 13. A Low-Cordon training system.

Low Cordon Training

■ Advantages

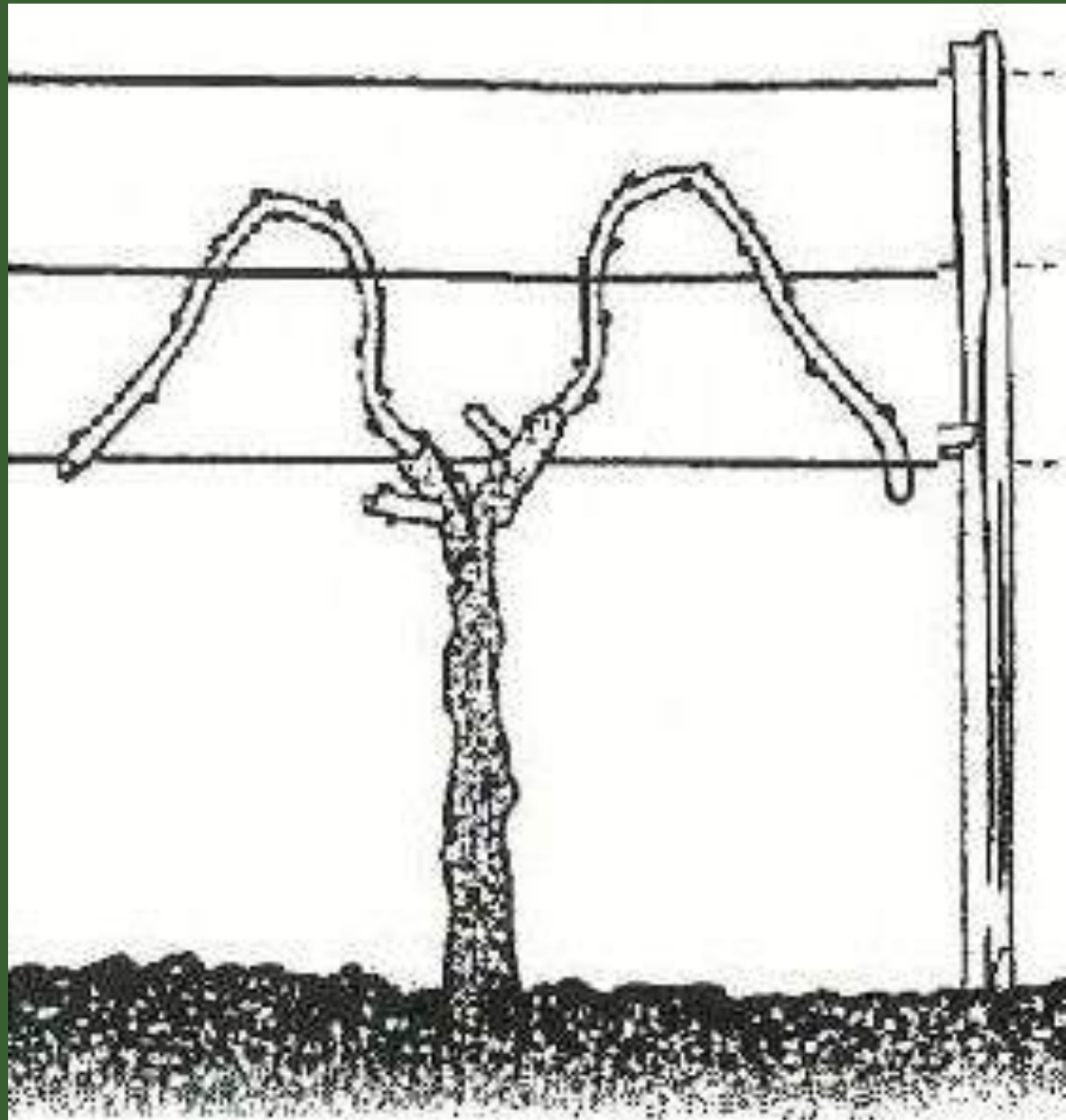
- Fruiting zone close to the ground utilizes radiant heat to promote ripening
- Adaptable to mechanical pruning
- Low fruiting and renewal zones may benefit from snow cover or mulch to avoid winter injury

■ Disadvantages

- Difficult labor close to ground
- Requires excellent weed management
- Soil residues on fruit
- Spring frost susceptible
- Animal depredation problems

Pendlebogen Training

“arched cane”



Pendlebogen Training

■ Advantages

- All of the advantages of Guyot, plus....
- Arching of canes gives better vertical distribution of the fruit
- Combats apical dominance
- Relatively fewer ties per vine
- Can be spur pruned for next 1-2 years

Pendlebogen Training

■ Disadvantages

- More challenging if fruiting wires are low to the ground
- A bit less adaptable to mechanical pruning

Fan Training

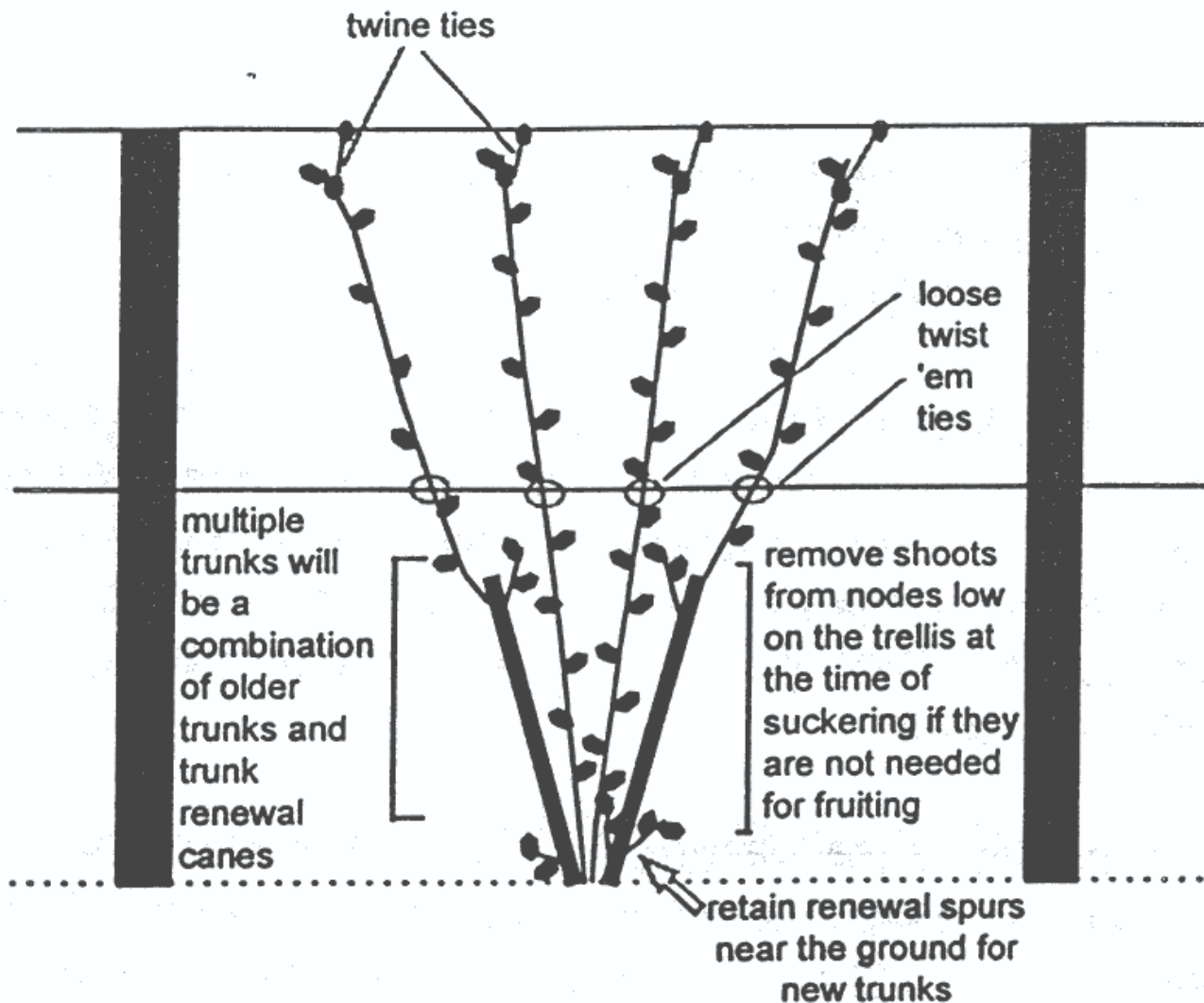


Fig. 6. The Fan training system which provides maximum flexibility in response to frequent winter injury.

Fan Training

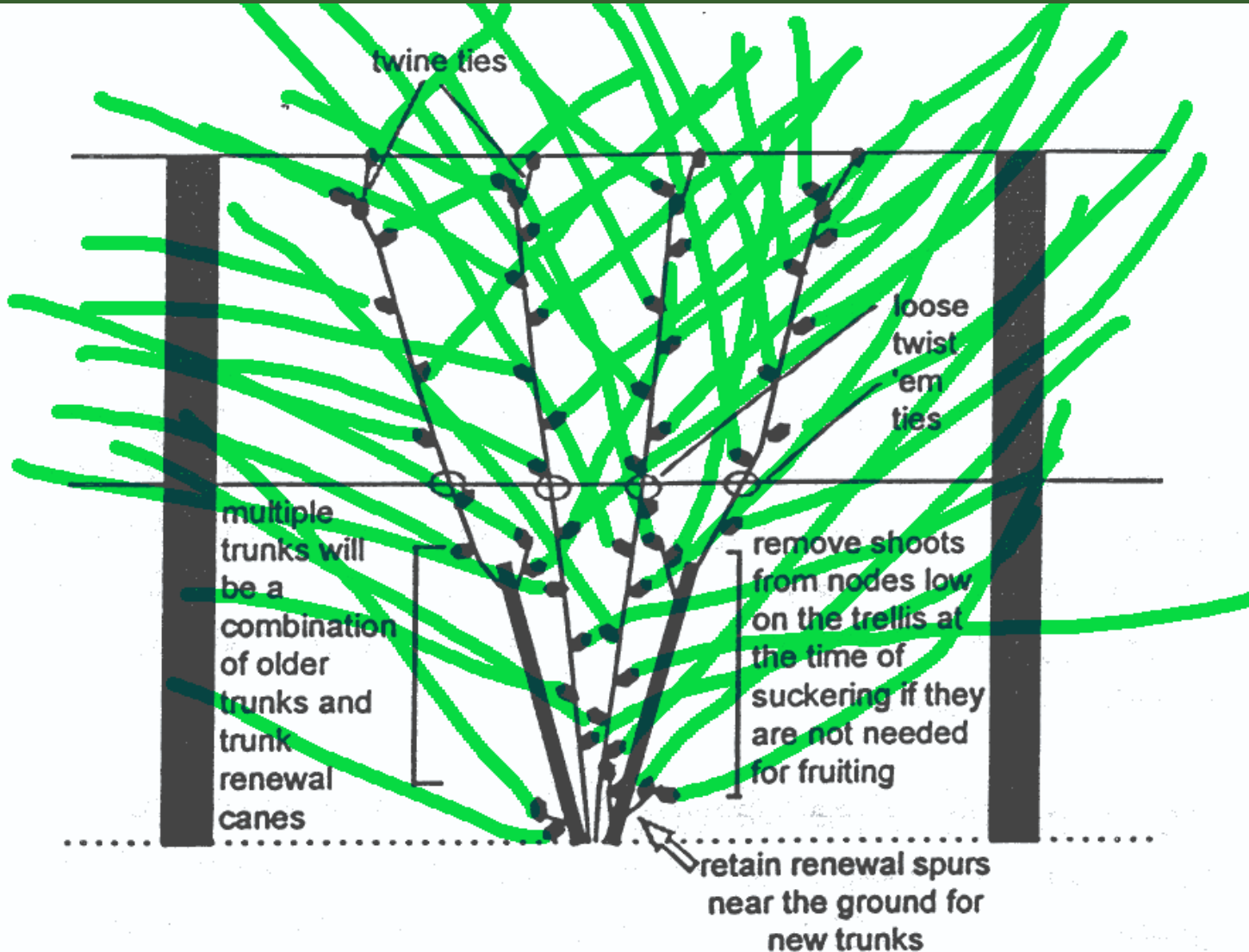


Fig. 6. The Fan training system which provides maximum flexibility in response to frequent winter injury.

Fan Training

■ Advantages

- Maximum flexibility to adjust for frequent winter injury to vines
- Easily learned by hand labor pruners

■ Disadvantages

- Lots of tying
- Not adaptable to mechanical pruning
- Not adaptable to systematic shoot positioning or leaf removal
- Fruit is hard to find at harvest

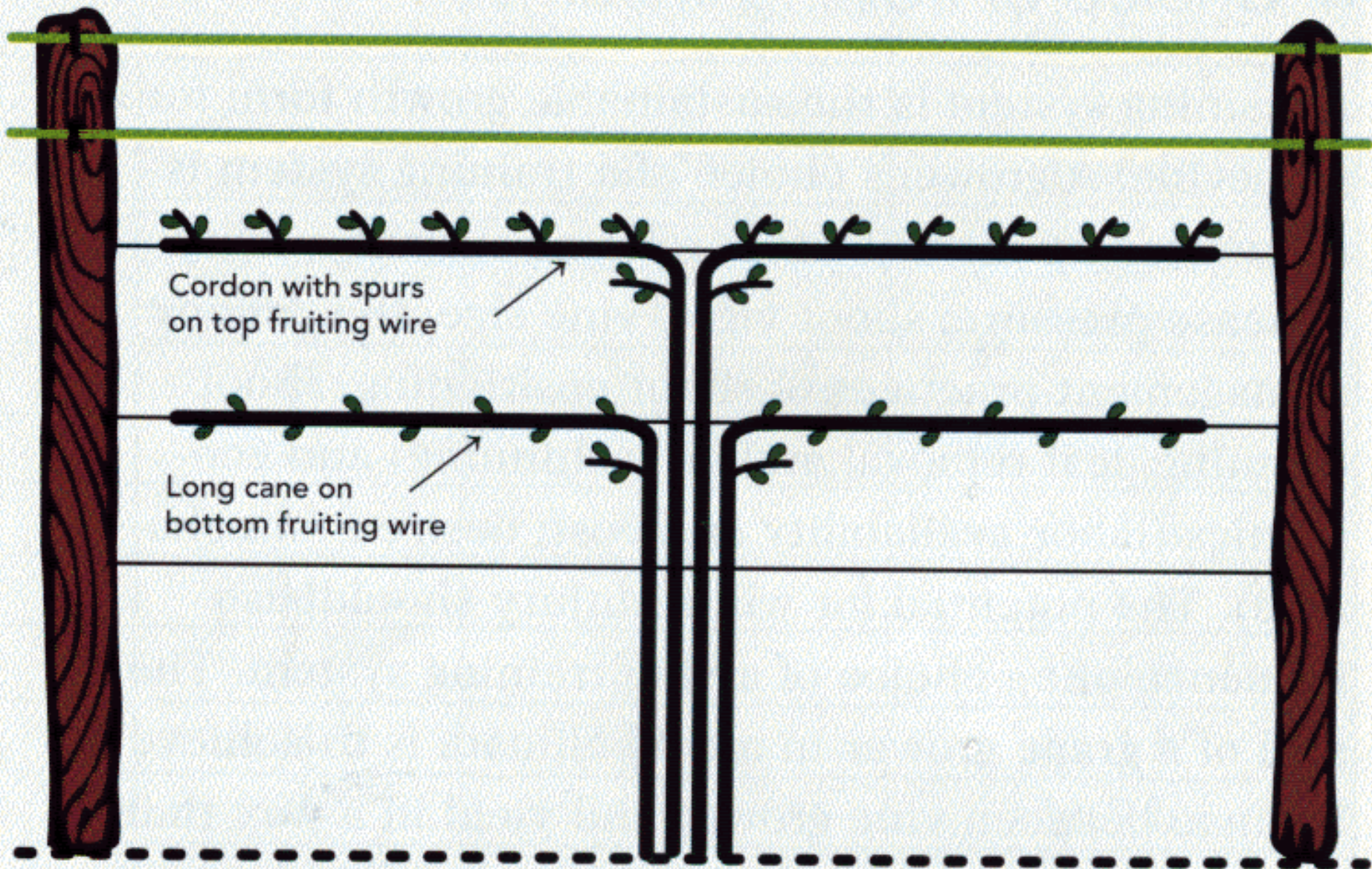
Systems for upright growth habit cultivars (*Vitis vinifera*) – dealing with vigor & large vines

■ Divided canopy systems

- Scott Henry
- Smart Dyson
- Lyre

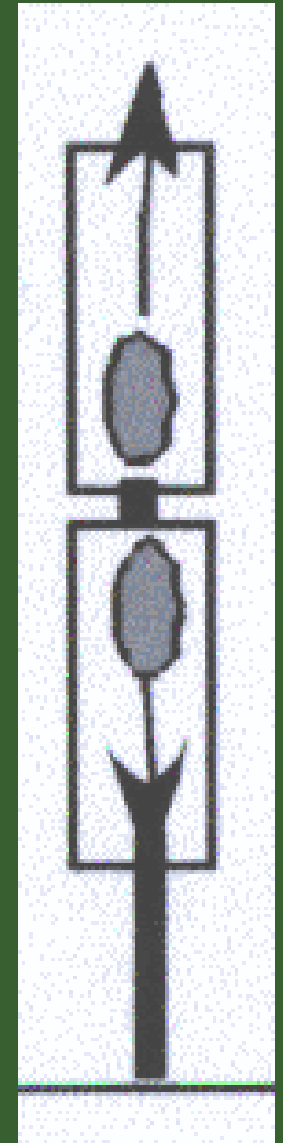
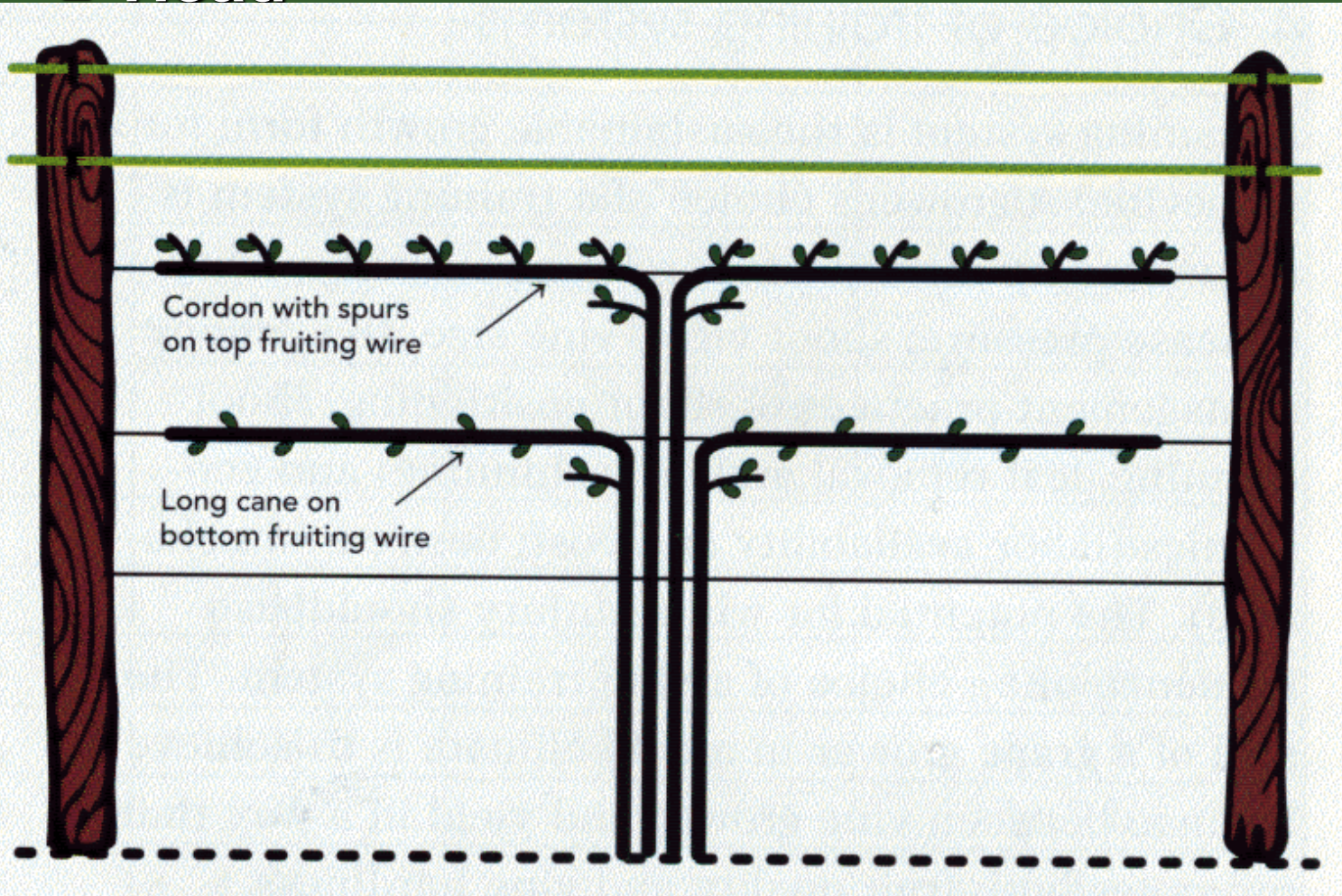


Scott Henry Training



Scott Henry Training

■ Head



Scott Henry Training

■ Advantages

- Promotes a systemic display of a large canopy and good exposure of fruit to sunlight
- If cordons are used in upper zone partial mechanized pruning is possible
- Well organized fruiting zones are easy to hand harvest

Scott Henry Training

■ Disadvantages

- Fruit maturation in lower fruiting zone is often behind the upper fruit
- Canes and buds developing in the lower portion of the trellis are of inferior quality
- Complicated shoot positioning is required
- Tall trellis, lots of wire required
- No advantage to weak vines

Smart-Dyson Training

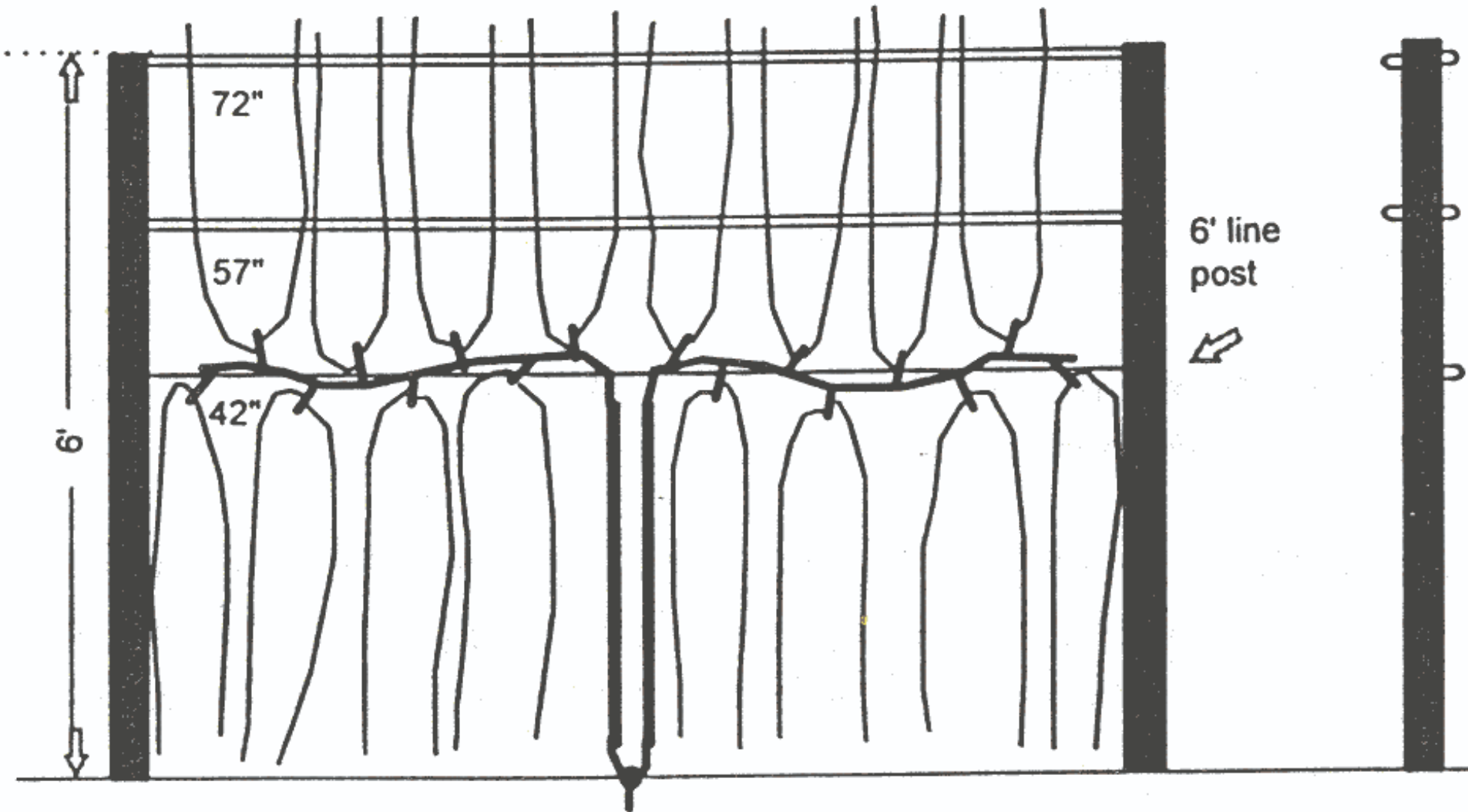


Fig. 11. The Smart-Dyson training system which has a vertically divided canopy and is shoot positioned.

Smart-Dyson Training

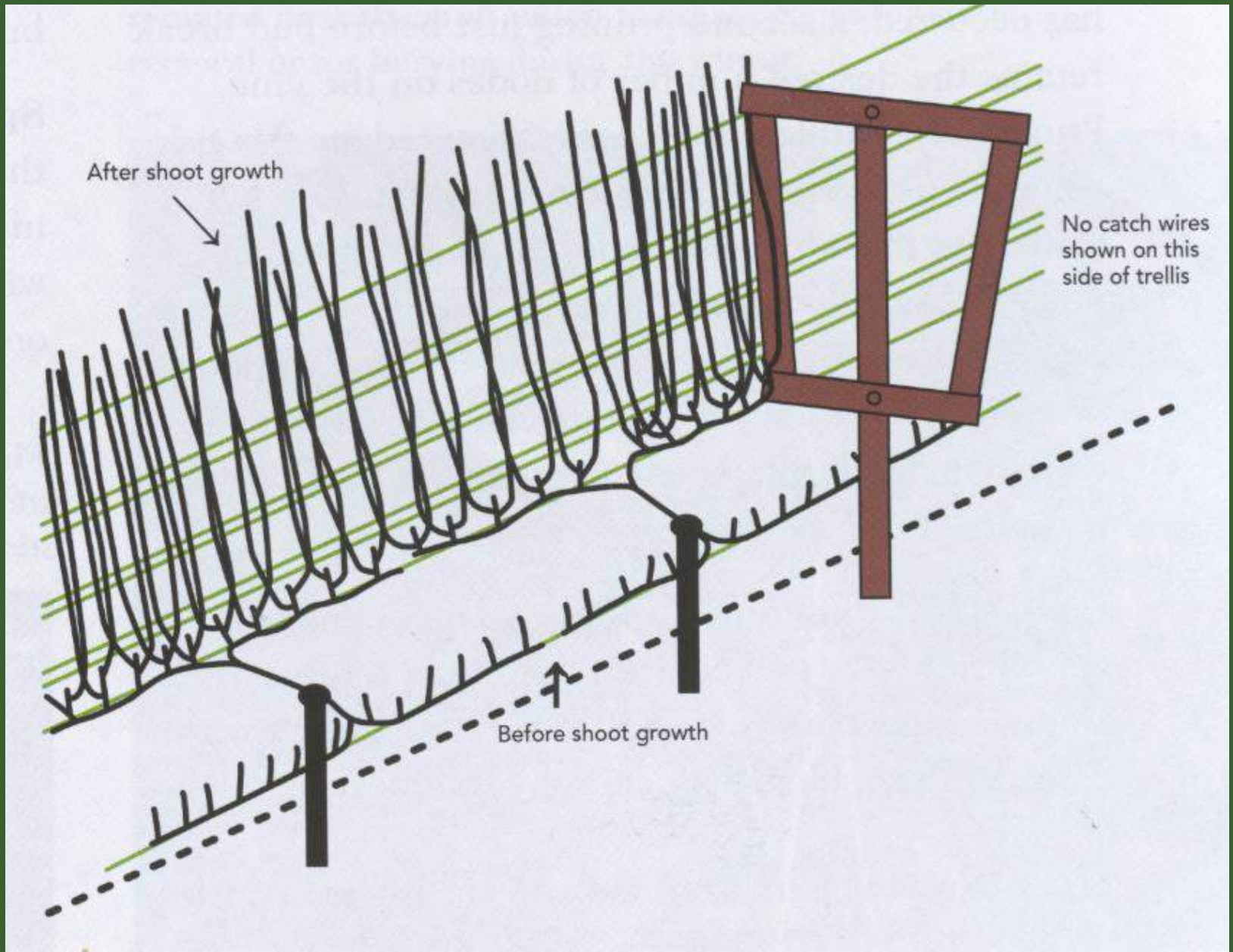
■ Advantages

- Adaptable to mechanical pruning
- Good fruit exposure for ripening
- Less likely to develop differences in fruit maturity and bud quality than with Scott Henry

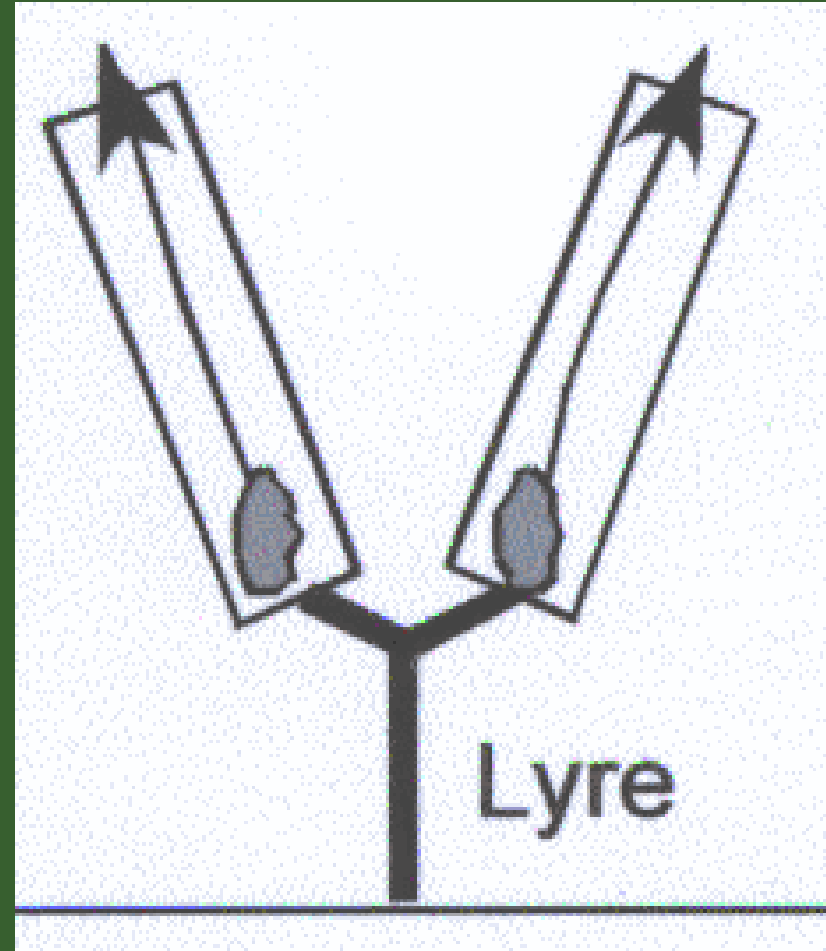
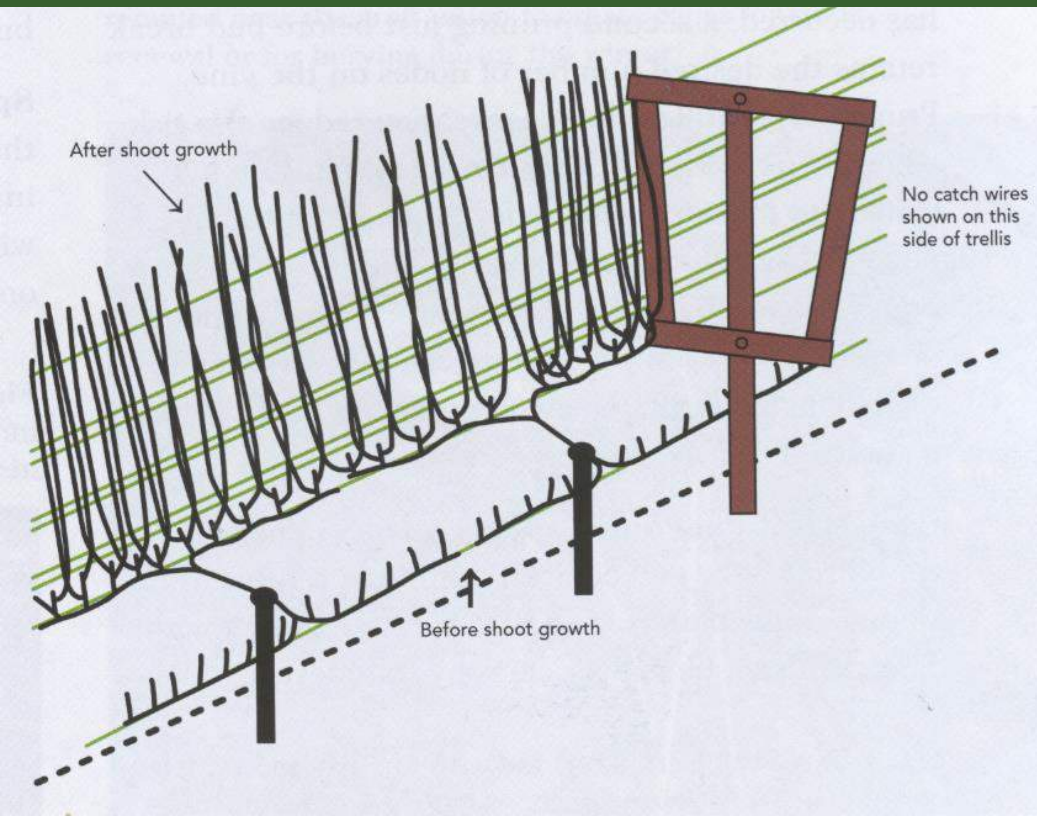
■ Disadvantages

- Lack of experience with this system
- Many uncertainties

Lyre Training



Lyre Training



Lyre Training

■ Advantages

- Excellent distribution of the vine canopy
- Good exposure of fruit for ripening
- Adaptable to mechanical pruning

■ Disadvantages

- Complex and expensive
- Extensive shoot positioning required
- Difficult to mechanically harvest

Alright, Which One?

- You and your winemaker must judge
- Don't discount employee opinion
- Avoid decisions based on neatness
- Learn how to recognize deficiencies

Recognizing deficiencies in training systems

- Difficulty in maintaining vine form
- Unfavorable trend in vine size
- Poor fruit quality from shading
- Pest & disease problems
- Poor fruiting capacity over time

Recognizing deficiencies in training systems

- Dense canopies with deteriorating interior leaves
- Confusion at pruning & training time
- Inability to efficiently employ canopy management practices
- Must & wine quality problems