

# Grape Workshop Handout:

**Arm:** Major short branches of the trunk from which canes develop.

**Bud:** A compound bud or eye containing the primary, secondary and tertiary buds located in the axil of each leaf.

**Cane:** A mature shoot after harvest and leaf fall; a shoot becomes a cane after the growing season.

**Cordon:** An extension of the trunk, usually trained along a wire, from which spurs grow.

**Fruiting zone:** The section of a shoot where fruit clusters appear.

**Head:** The top of the trunk where it transitions to cordon, spurs, or canes.

**Internode:** Portion of the shoot or cane between two nodes.

**Lateral:** A branch of a shoot or cane.

**Node:** (1) Thickened portion of the shoot where the leaf and lateral bud appear; (2) the place on a cane or spur where a bud appears.

**Shoot:** New green growth with leaves, tendrils, and often flower clusters, developing from a bud on a cane or spur.

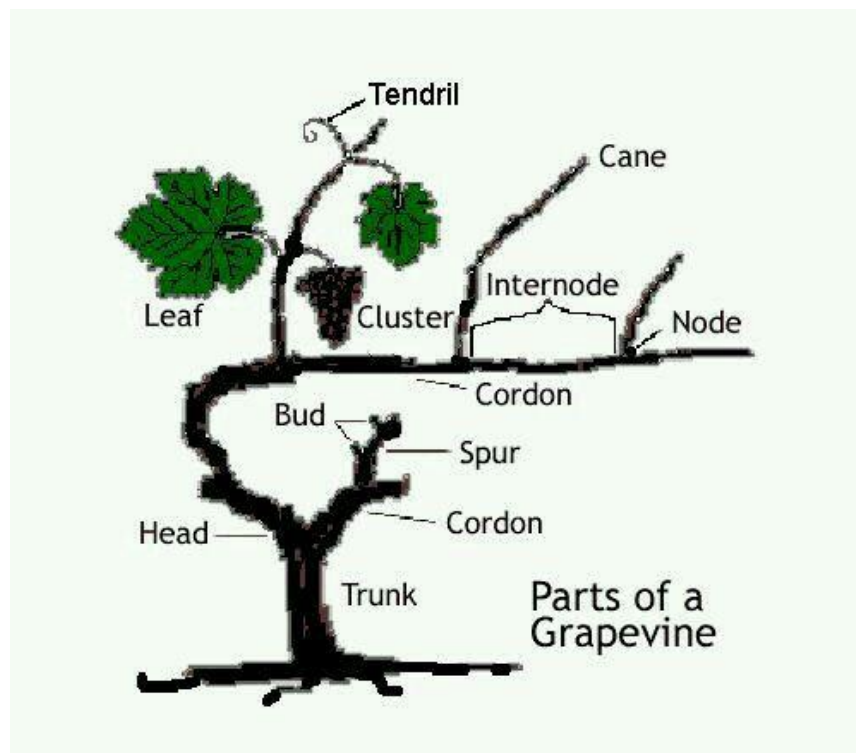
**Spur:** A cane pruned back to one to five buds. A spur is on a cordon or at the head of the vine.

**Sucker:** Also called a “water sprout”; a shoot growing from old wood, often at the trunk base or at the head of the vine.

**Tendrils:** A long, slender, curled structure borne at some of the nodes of a shoot that can firmly attach the shoot to other shoots and the trellis system.

**Trunk:** Permanent above ground stem of the vine.

**Veraison:** The start of grape ripening, when color change begins. Green berries start changing to red or blue in a colored grape cultivar, or a green grape becomes more translucent. In the Willamette Valley, this change occurs in about mid-August.



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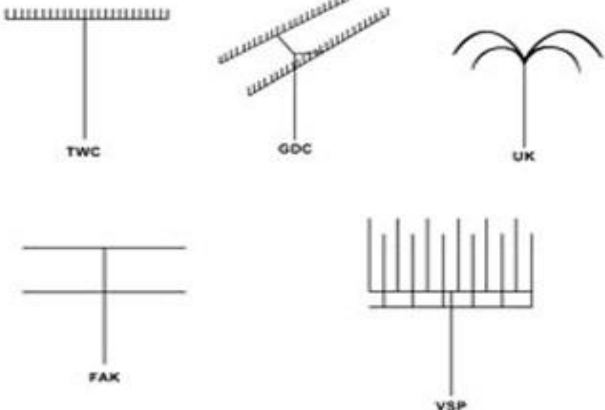
## Planting:

- Plant rows north and south.
- Plant in early spring as soon as soil can be worked.
- Remove all competing vegetation (1<sup>st</sup> year).
- If planting bare root ensure roots don't dry out and spread roots without bending (if too long or broken, trim roots).
- If planting propagated plants be careful not to break roots while digging.
- If potted, plant at same height.
- If grafted be careful not to bury the graft.
- Most roots 18" deep.
- Space plants 6 - 8' apart in row.
- Separate rows 8 - 10' apart to prevent shading and depending on training methods.

## Fertilization:

- Fertilize grapes sparingly.
- More problems occur from overfeeding than from underfeeding.
- Fertilize each plant with a total of 0.5 to 1 ounce of nitrogen (N).
- Use a well-balanced fertilizer such as 16-16-16. To calculate how much product to apply, divide the desired amount of N (in this case, 1 ounce) by the percentage of N in the fertilizer:  $16\% = 0.16$ .  $1 \text{ oz} \div 0.16 = 6.3 \text{ oz product per plant}$ .
- Manure or compost can be used.
- Plants may be fertilized with 1 to 1.5 ounces of N per plant if needed
- Approximately 9.6 ounces per plant.
- Broadcast the fertilizer in a circle about 6 to 18 inches from the trunk.
- Be careful not to get fertilizer right up against the trunk or to place it all in one spot near the vine.
- The best time to fertilize is around bud break.

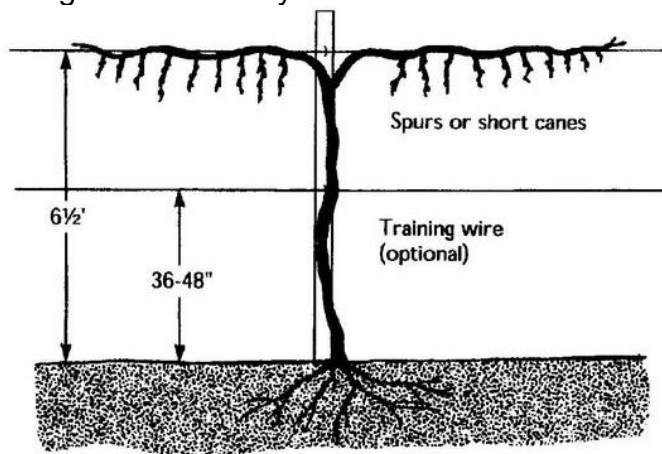
## Training Methods:

<ul style="list-style-type: none"><li>• <b>Top Wire Cordon (TWC).</b></li><li>• <b>Geneva Double Curtain (GDC).</b></li><li>• <b>Umbrella Kniffen (UK).</b></li><li>• <b>Four Arm Kniffen (FAK).</b></li><li>• <b>Vertical Shoot Positioning (VSP).</b></li></ul>	 <p>The diagrams illustrate five grape training methods:</p> <ul style="list-style-type: none"><li><b>TWC (Top Wire Cordon):</b> A single vertical trunk with a horizontal wire at the top, and several short, horizontal shoots extending from the top.</li><li><b>GDC (Geneva Double Curtain):</b> A vertical trunk with two diagonal wires extending from the top, each supporting a curtain of vertical shoots.</li><li><b>UK (Umbrella Kniffen):</b> A vertical trunk with two curved wires extending from the top, each supporting a fan-shaped canopy of vertical shoots.</li><li><b>FAK (Four Arm Kniffen):</b> A vertical trunk with two horizontal wires extending from the top, each supporting a horizontal canopy of vertical shoots.</li><li><b>VSP (Vertical Shoot Positioning):</b> A vertical trunk with a horizontal wire near the top, and several vertical shoots extending upwards from the wire.</li></ul>
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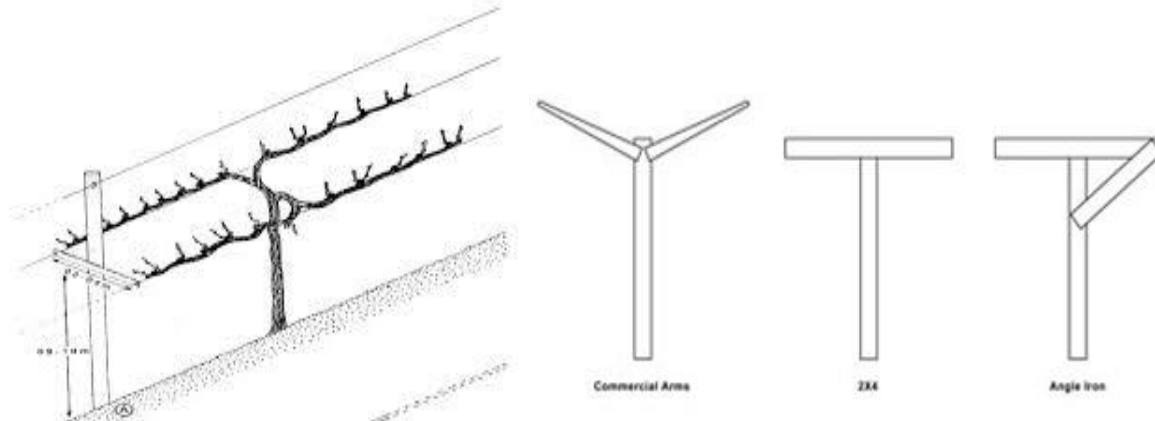
## Top Wire Cordon:

Two cordons are located along the top wire. One cordon goes to the right of the trunk and the other cordon goes to the left of the trunk. This system is often used for vines that have a downward growth tendency. Leaf pulling is necessary to expose the fruit, but that exposure near the top wire makes it easy for the birds to help themselves and also increases the risk of sunburned fruit. Shoot combing is performed by untangling and encouraging the canes to grow downward in a vertical fashion. Combing helps to keep the shoots from growing horizontally along the trellis in a tangled mess that shades the fruit and makes harvest more difficult. TWC is a very commonly implemented trellis and training system for Hybrids and American cultivars that have shoots with a downward growth tendency.



## Geneva Double Curtain:

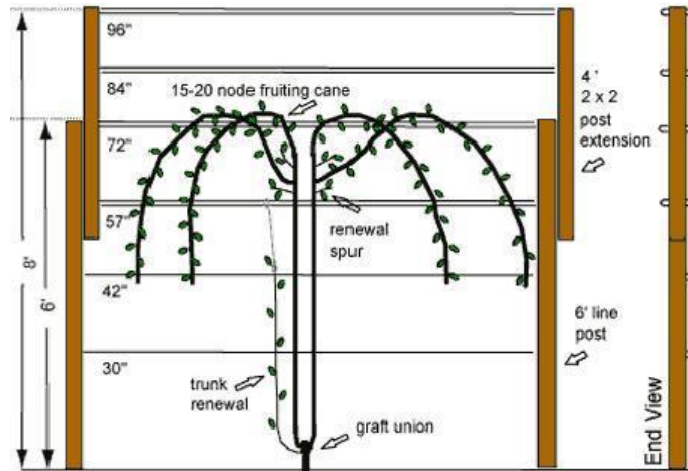
The GDC system uses some variation of a T-bracket at the top of the post. The T-bracket will have a wire at each end of the T, a wire about a foot from the top of the posts, and another trunk wire approximately 30 inches (76 cm) from the ground. The advantage of using the GDC Trellis and training system is that it provides more canopy area for highly vigorous, downward growing cultivars. The GDC system is basically two TWC systems from one vine. Leaf pulling can be more difficult because access to both sides of the canopies is somewhat restricted as compared to the TWC. Installing and removing bird netting can also be more complicated with GDC than it is for TWC. Double curtain systems usually increase your yield per square foot of vineyard.



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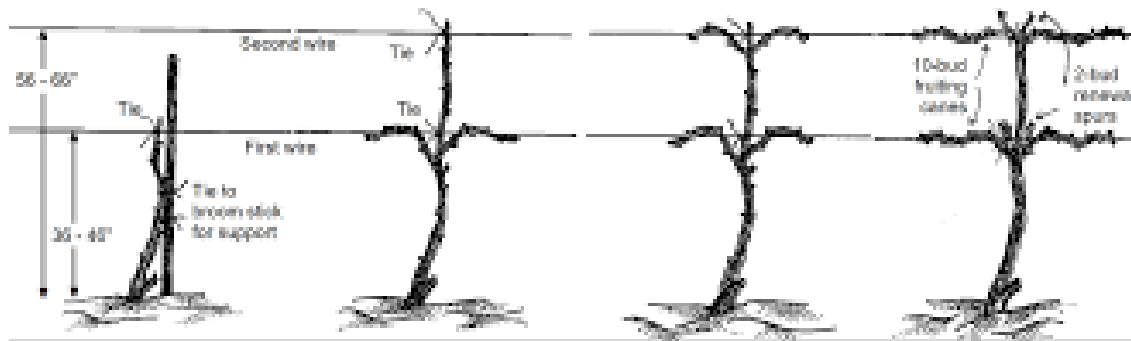
## Umbrella Kniffen:

The UK is implemented by tying the trunk to the bottom wire and developing the renewal spur zone at the second wire or just below the top wire. Either a bilateral cane system or a quadrilateral cane system is implemented. The canes start in the spur renewal zone by the second wire, and then are draped over the top wire and tied down at the second wire, forming arches on both sides of the trunk. The UK allows more buds to be retained because an arched cane is longer than a cane that is laid flat on a single wire. A variation of the UK system is to have the spur renewal zone low in the trellis and then have catch wire pairs to allow vertical shoot positioning.



## Four Arm Kniffen:

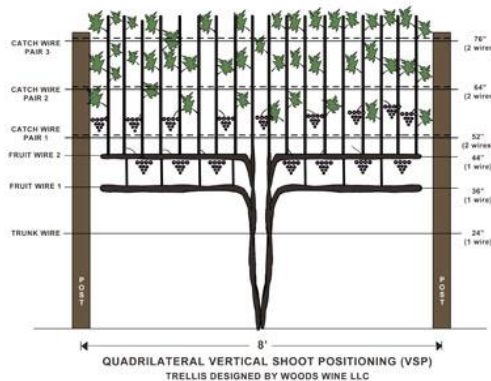
The FAK is a quadrilateral cane system with two canes on the top wire and two canes on a mid-wire. This system allows for sufficient bud retention and uses the inexpensive three-wire trellis. The upper two canes usually produce larger shoots than the bottom two canes, and shading can become a problem. Leaf pulling must be performed to expose the fruit and the canes should be "combed" down so they don't grow to long in horizontal length. Skirting the shoots when they touch the ground is also required. If you already have a three-wire trellis in place, the FAK is a good way to get adequate bud count per linear foot, but the canopy can become thick and entangled, and considerable leaf pulling and shoot hedging is required. If you already have a three wire trellis installed, the FAK is a viable system.



## Vertical Shoot Positioning:

# Grape Workshop Handout:

The 9-wire VSP trellis and training system has a trunk wire, two fruiting wires, and three catch wire pairs. With this VSP system, the fruit is easy to pick without having to bend over or reach up high for long hours during harvest. This VSP nicely exposes the fruit to the sun, wind, and pesticides. After appropriate leaf pulling in the fruiting zone, you will experience dappled sunlight exposure on the grapes. The canopy also looks like a prudently manicured hedge when the canes are tucked up into the catch wire pairs. To keep out the birds, side netting is also easily used with this VSP system because the fruiting zone is easily accessible and the nets can be rolled down and tied to the trunk wire when not in use. All of the new shoot growth will come out of the top of the canopy and eventually begin to drape down and possibly shade the fruit. The excessive shoot growth can be easily hedged off the top, while still retaining sufficient length shoots that can become next year's fruiting canes.



## Arbors:

Grapes are well suited to training on an arbor. The plants make attractive ornamentals and provide shade. Depending on how the arbor is constructed, fruit hangs down through the arbor to see and harvest underneath. You can choose a red-, blue, and green fruited grape to grow on each side of a large, three-sided arbor. If you grow one vine per side, plant each in the center of its arbor "wall" and train each trunk to grow up the side and along the top to the middle of the arbor. It may take more than 2 years to grow a trunk to that length. After the first growing season (when the goal is to grow the trunk as tall as possible), select shoots along each trunk to distribute fruiting canes along the trunk's length. If a trunk is not tall enough yet, use the topmost shoot to extend the trunk in the current season. Repeat this process until the framework of the vine has been established (each vine's trunk goes up the side and along the top to the middle of the arbor). Have short fruiting canes alternate on the left and right sides of each trunk, so that shoots (leaves and shade) and fruit are well distributed along the trunk and arbor.

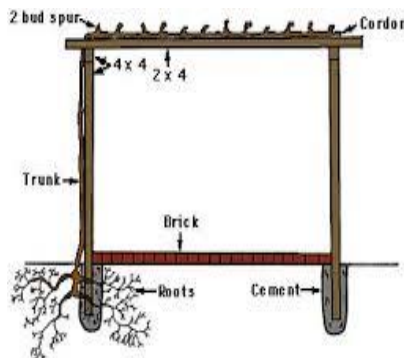


Figure 4. An end view of a grape arbor with a dormant mature vine pruned to an arbor cordon.

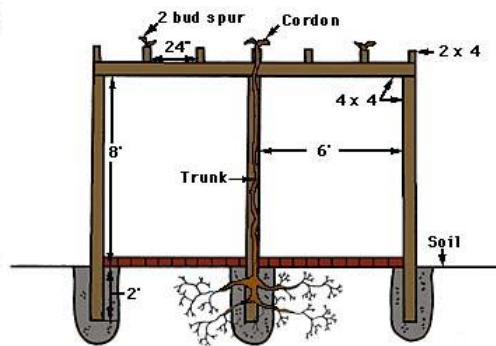


Figure 3. A side view of a grape arbor with a dormant mature vine pruned to an arbor cordon.

Reference: <https://winemakermag.com/article/1388-backyard-vineyard-trellis-and-training>

# Grape Workshop Handout:

## Winter Pruning:

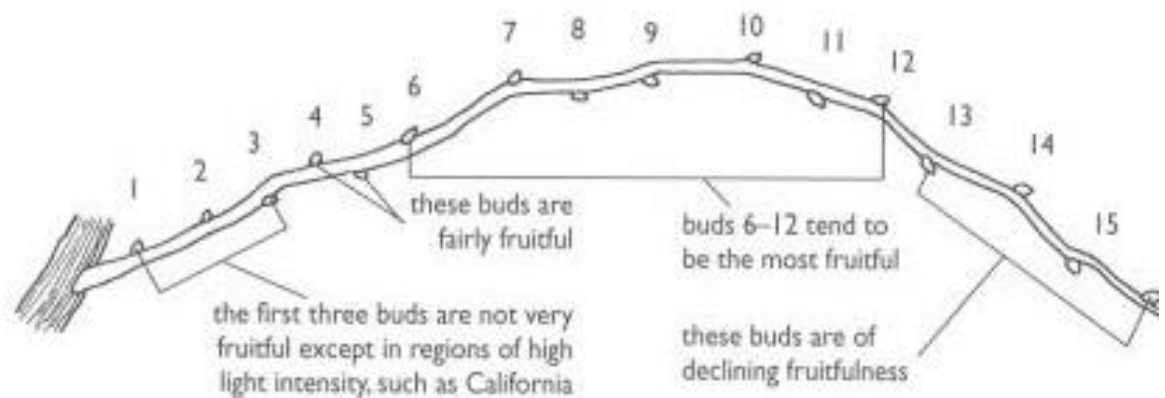
Grapes are produced from buds that will grow into shoots on 1-year old canes (the long stems or “shoots” after they’ve borne fruit for at least one year). The most fruitful canes will be those that were exposed to light during the growing season. These are thicker than a pencil in width and as close to the trunk as possible.

Mature plants should be pruned yearly to remove all growth except new 1-year-old fruiting canes and renewal spurs (a cane pruned back to one to five buds).

Pruning vines should be done between January and the 1<sup>st</sup> of March.

## Spur pruning vs Cane replacement:

- Fruitfulness of buds determines pruning technique
- Fruiting canes with fruitful buds at basal end should be spur pruned
- Fruiting cane with fruitful buds beyond buds 1-3 should be cane pruned
- Example pictured below would be cane pruned leaving 12 buds on replacement cane
- If example pictured showed only first 3 buds to be fruitful, spur pruning would be required.
- With a cane pruned cultivar, number of fruitful bud dictates length of replacement cane which dictates planting distance between plants.
- If required pruning technique unknown, start with cane replacement while observing fruiting along cane. Can change to spur if fewer than first 6 buds fruitful.



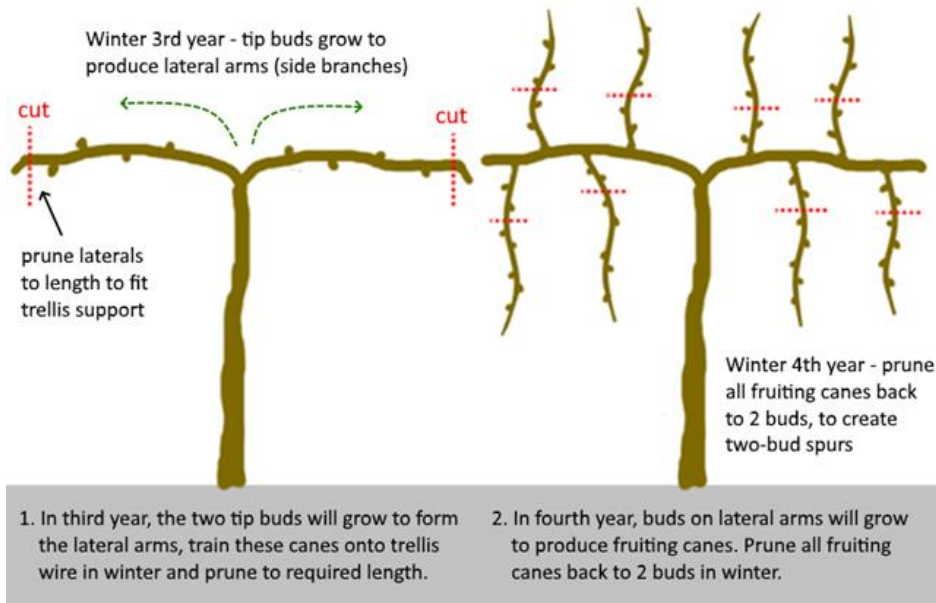
Fruitful Buds in a Typical French Hybrid Cane

**Spur pruning** is done on vines that retain one or two pairs of long canes (a permanent cordon) trained along a trellis system. Each winter, new canes that have grown along the permanent cordon are cut back to a small shoot containing two buds, known as a **spur**. In spring new growth develops from the buds on the **spur**.

To spur prune, prune along main canes to leave two- to three- bud spurs, each four to six inches apart. Leave no more than 20 to 80 buds per plant, depending on the type of grape. Remove all other 1-year-old wood.

# Grape Workshop Handout:

## Spur Pruning - 3rd and 4th Year



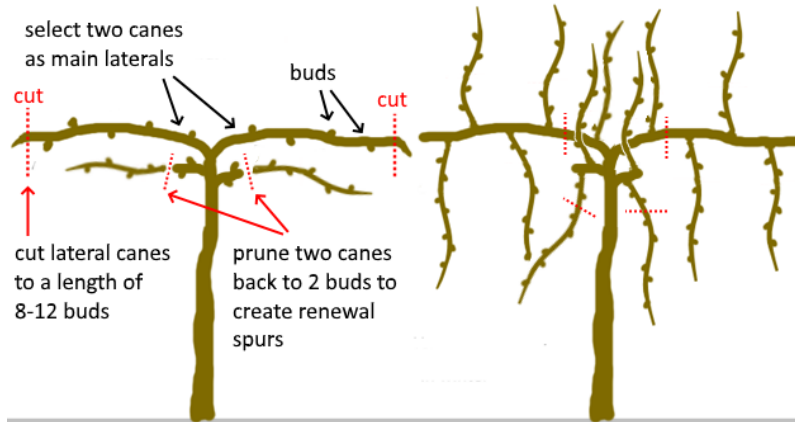
- When in doubt about cultivar 'basal buds', cane prune.
- Spur pruned vines.
- Rough pruning.
- Remove old fruiting canes, leaving 4 - 5 buds on spurs.
- On a clear, clean cordon, prune to 2 buds per spur.
- Remove older, overgrown spurs in favor of new spurs.
- Spurs should be 4 - 6" apart.
- Remove suckers.
- Bud wipe trunk.

**Cane pruning** involves cutting back about 90 percent of the last year's growth. To **cane prune** you first remove the dead two-year-old **canes**. You then select two well-formed **canes** growing out of the head of the vine. The **canes** you select should be one-year-old wood, containing tightly spaced, healthy buds.

To cane prune, select two to four new fruiting canes per vine. Cut back each of these to leave about 15 buds per cane. For wine grapes, leave about 20 to 30 buds per plant. In table grapes, leave 50 to 80 buds per plant. Leave a one - or two-bud spur cane near the fruiting cane with one or two buds each. These "renewal spurs" will produce the fruiting canes for the following year and thus maintain fruiting close to the trunk. All other cane growth should be pruned off.

# Grape Workshop Handout:

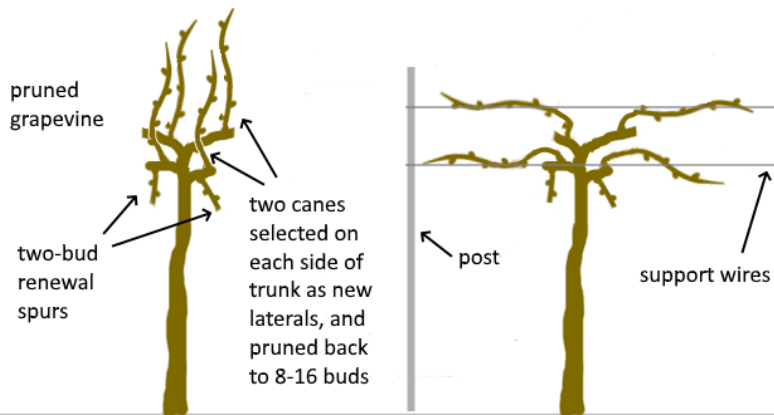
## Cane Pruning - 3rd Year



1. In third year, select two buds to grow as lateral canes and two for renewal spurs, prune to length

2. After third year, all buds on laterals and renewal spurs will have grown into fruiting canes

## Cane Pruning - 4th Year



3. Select two canes on each side as replacement laterals and one cane on each side as renewal spurs

4. Train canes horizontally along trellis wires

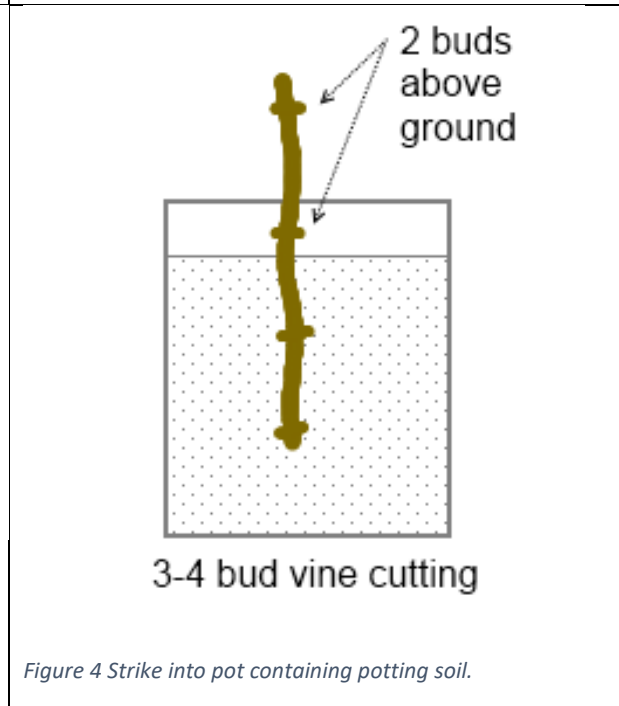
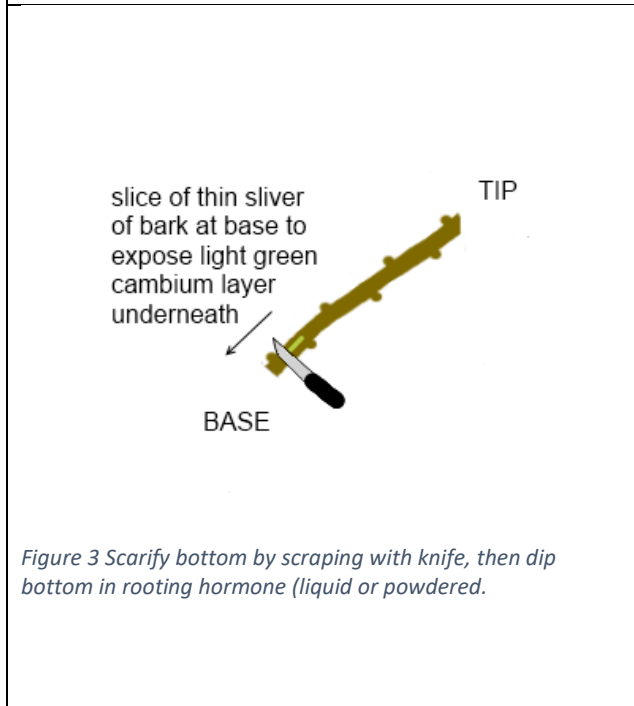
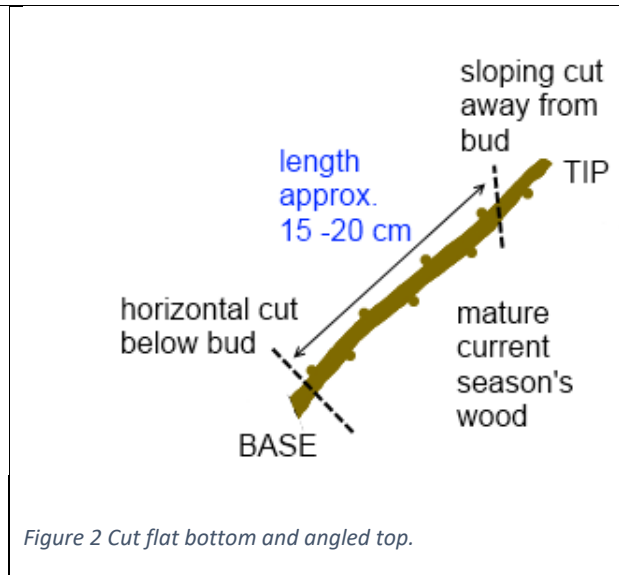
- Rough pruning: Removal of all fruiting shoots from cordon.
- Remove fruit canes (cordon) from trunk.
- Choose two new fruiting canes.
- Carefully wrap fruiting cane on fruiting wire either side of trunk.
- Depending on cultivar, leave 9 - 14 (long cane) or 5 - 8 (short cane) buds on cane.
- Cut through next node and secure cane to wire.
- Remove suckers.
- Bud wipe trunk.



# Grape Workshop Handout:

## Propagation:

- During pruning take cuttings to use for propagation.
- Note buds slant upward to tip of cane.
- Made a flat cut between nodes at base.
- Count 5 nodes up and make a diagonal cut half way between nodes.
- Soak base end in rooting solution.
- Place cuttings in potting soil with two nodes below and three nodes above soil level.
- Root system will develop, best to leave for 2 years.



# Grape Workshop Handout:

## **Shoot Thinning:**

Shoot thinning, a grapevine can produce up to three shoots per bud at a node. When you prune to a certain number of buds per vine, you are estimating yield by assuming there will be only one fruitful shoot per node. Shoot thinning is removing extra shoots to leave just one shoot per node. Thin shoots once in spring when the main shoot is about 6 inches long. You can usually determine the shoot to keep because it's longer than the secondary or tertiary shoots (shorter shoots at the same node). Remove the extra shoot(s) by carefully snapping them. Avoid shoot thinning when shoots are too long, so you won't accidentally remove the main (primary) shoot.

## **Fruit Thinning:**

It's best to limit young vines to one cluster per shoot. Thin fruit right before bloom to improve fruit set on the remaining clusters. Fruit thinning can also be done later in the season, if you feel you haven't pruned the vine severely enough and there's too much fruit for the crop to ripen well. If you remove fruit clusters before veraison, berry size increases, yield is less affected, and the grape clusters ripen sooner. If you thin fruit soon after veraison, there is little effect on berry size, but yield is reduced, and the remaining fruit ripens sooner. In general, shoots need to be at least 3 feet long to support a fruit crop. Remove clusters from shorter shoots.

## **Leaf Pulling:**

Good exposure to sun improves fruit quality. In cooler climates, you can remove two to four leaves per shoot in the fruiting zone so that clusters are less shaded. Remove leaves only on the side of the row that gets morning sun. Do not remove leaves on the side that gets afternoon sun, or clusters may get sunburned. If you pull leaves off when fruit are pea-size (about late June) or earlier, the clusters won't get sunburned.

## **Hedging:**

Usually, 3 to 4 feet of growth per shoot is enough to ripen a crop. If plants become too vigorous, you can top or trim shoots. Be sure not to shorten too much the shoots that are to become next year's new fruiting canes. Hedged or tipped shoots produce lateral branches. Trim these also to prevent too much shading of the fruiting zone.

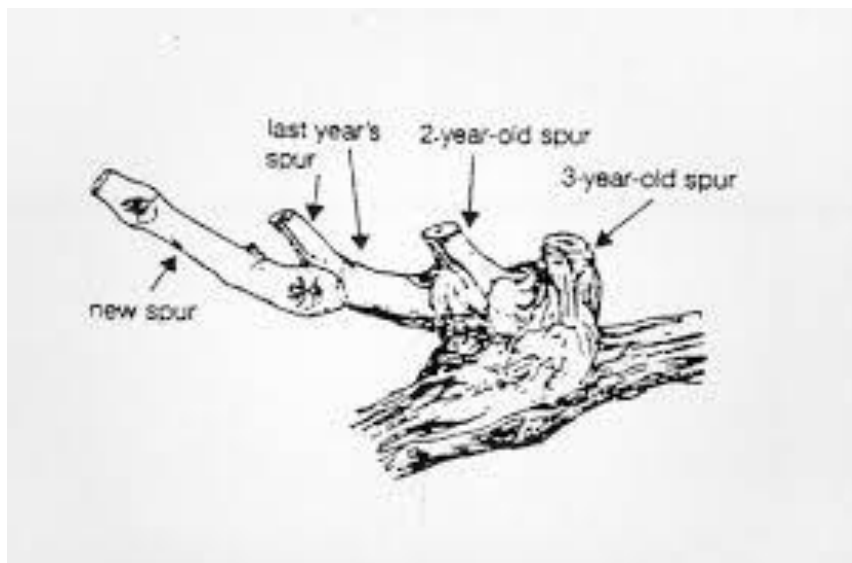
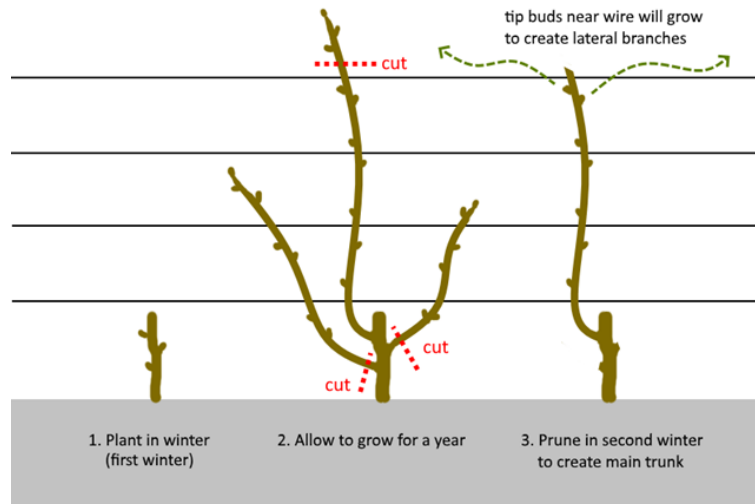
## **Bud Wiping:**

Remove all dormant buds on trunk below those you may want as new.

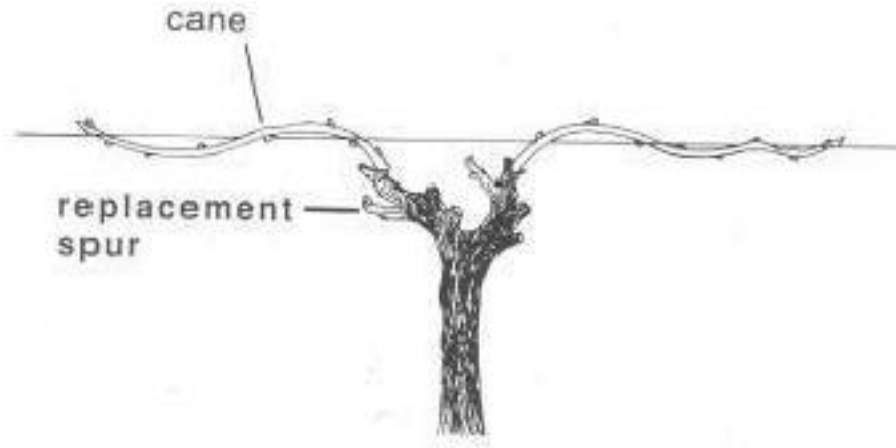
# Grape Workshop Handout:



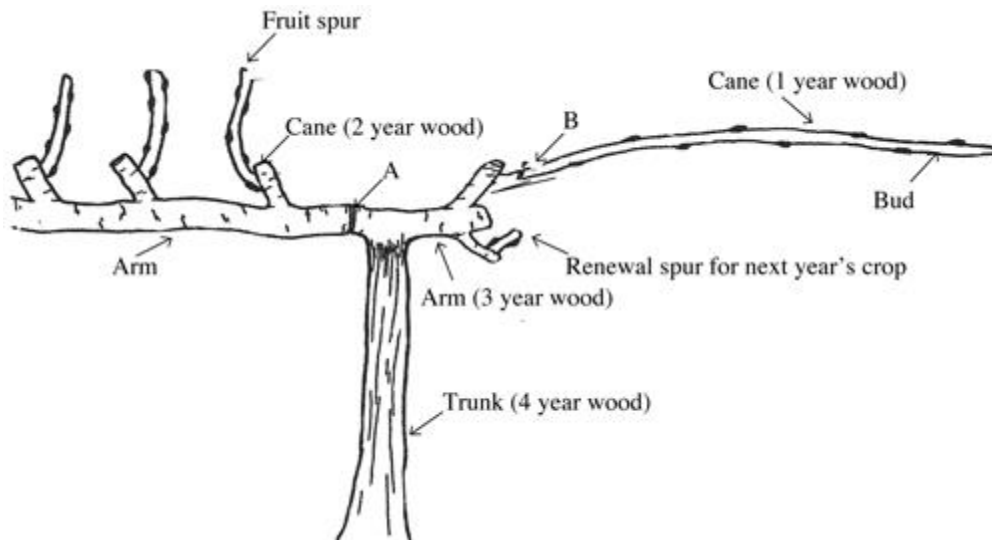
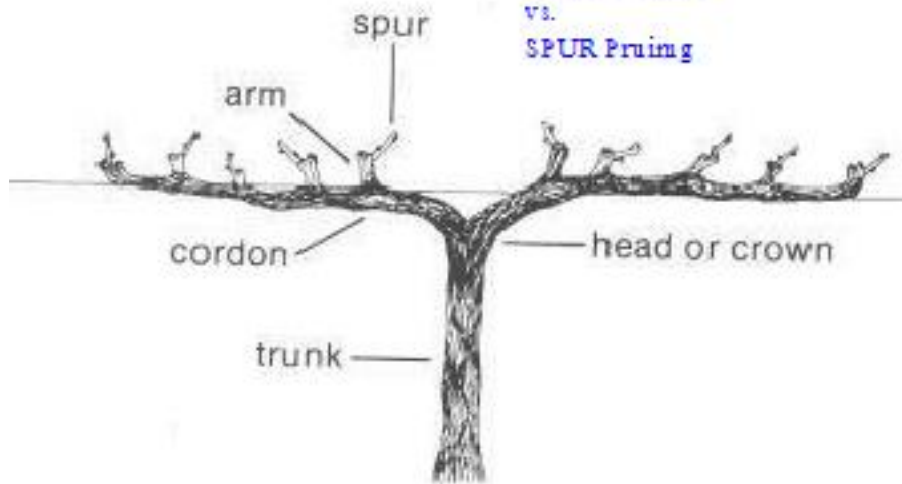
Pruning to Establish Grapevine Framework - 1st and 2nd Year



# Grape Workshop Handout:



CANE Pruning  
vs.  
SPUR Pruning



# Grape Workshop Handout:

## TASKS:

**Cleanup debris from previous year's growth.**

**Rough pruning vine (spur/cordon):**

Remove all shoot growth, leaving 4 buds on spur.

**Finish pruning vine (spur/cordon):**

Cut last year's fruiting shoot to desired number of buds (2 - 4), removing all other shoots on that spur. For new spurs, locate 3-5" apart.

**Rough pruning vine (cane replacement):**

Remove previous year's new, fruit bearing shoots leaving four new replacement shoots/canes nearest the trunk. Try to locate two replacements on either side of the trunk.

**Finish pruning vine (cane replacement):**

Remove last year's fruiting canes, being careful not to remove new replacement canes. Carefully lay down two new fruiting canes, one to either side of trunk. After completing, remove 2 extra replacement canes. If first attempt results in broken replacement cane, use 2<sup>nd</sup> cane. Prune this new cane to desired length. Adjacent vines can overlap fruiting canes but the aggregate bud number per foot should not exceed 3-5 buds.

**Bud wiping:**

Remove all dormant buds on trunk below those you may want as new, replacement canes.

**After bud break:**

When new shoots appear on fruiting cane or spur, remove all except two strongest at each bud. Keep buds along fruiting cane 3-5 inches apart.

**After fruit set:**

For cultivars susceptible to mildew, pull leaves around fruit cluster to improve air circulation. Use gentle blower to remove debris from fruit clusters. Thin fruit clusters to 1-2 clusters per fruiting shoot. Generally speaking, fruiting shoots would be 5ft in length, 2 fruit clusters per shoot, 12-14 leaves per cluster. The fruiting cane itself, from which the new fruiting shoots arise, would have a length based on internode distance. Rule of thumb would be 3ft in length with 5-8 buds per foot remaining on cane.

**Hedging:**

At some point in in mid-growing season, new shoots are 'hedged' (cut) back to 5ft in length.

**Leaf pulling:**

Later in summer, as "veraison" (color changing) occurs, remove leaves that prevent sunlight from reaching fruit clusters. The leaves remaining above the cluster on the shoot will provide photosynthesis.

# Grape Workshop Handout:



## Grape propagation from hardwood cuttings



Why: Grow new plants from an existing preferred variety.

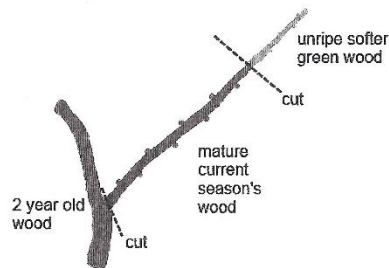
What: A grape hardwood cutting is taken from a cane that grew and fruited last year.

Taken while the plant is dormant.

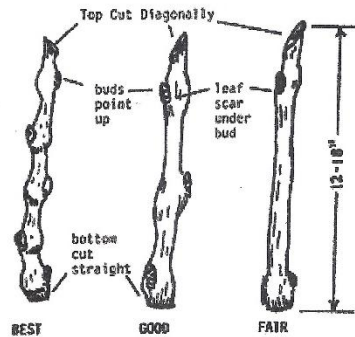
From first hard frost in the fall (November) to first bud swell or vegetative growth in the spring.

Typically taken during late winter dormant pruning.

Last year's growth = color: red to brown, not dark or grey, fruit cluster stems.



Scion wood = 3 bud section of pruned hardwood cutting cane.



Pencil size or larger.

Basal end cut (root end) made 1/4"-1/2" below Basal end bud at 90 deg. angle

Growing tip cut made 1"-2" inches above 3<sup>rd</sup> bud at a 45 deg. Angle

This helps differentiate root end from tip end and provides a handle for inserting into growing medium without injuring top bud.

# Grape Workshop Handout:

Hardwood cuttings are cut much longer than herbaceous cuttings (soft wood) because they take more time to develop roots. A longer cutting stores more food in it allowing time for root development.

If not striking (planting) right away, wrap basal end in damp paper towel, put in zip lock bag and store in refrigerator hydrator until ready to strike.

Soak in water for 24 hours

Just cover bud you want roots from (Basal end)

Encourages bud to develop roots instead of vegetative growth

Callusing tissue is where the roots will grow from.

Scarify basal stem

Don't injure buds

Scrape with knife to expose cambium layer (green)

Increases callus tissue to increase rooting area.

Dip in rooting hormone. (Not required but may improve success rate)

Liquid or powdered

Follow directions on label.

Growing medium.

Any potting mix will work.

Strike into pot containing growing medium.

Create a hole big enough to receive scion wood.

Put basal end in 4"- 6" deep or up to 2<sup>nd</sup> bud (assuming a 3 bud scion)

No more than 2" from bottom of pot.

Press in lightly to eliminate air pockets.

Label and date

Water in.

Until water flows out bottom of pot

Eliminates air pockets.

Bottom heat. (Not required but may improve success rate)

Callusing is stimulated (rooting tissue) with bottom heat 70 – 80 degs.

Keep protected from freezing

May be put outside after risk of frost is over.

Morning sun then shade.

Transplant to permanent location.

September if good root system. Will produce fruit 1 year sooner

Following Spring after last frost date.

References:

WSU Viticulture and Enology

Oregonstate.edu

"Making more plants" the science art & fun of propagation. By Ken Druse.

"Complete book of plant propagation"

bunchgrapes.com

deepgreenpermaculture.com

# Grape Workshop Handout:

## Grape Varieties:

Variety	Color	Ripening	American or European	Cane or Spur	Notes	Seeds
Baco	Black	Late	European (F h)*	Either	Wine / Juice	Seeded
Buffalo	Blue	Early to mid	American	Either	Table / Juice	Seeded
Campbell**	Black	Early	American	Spur (2-3 buds)	Table / Juice	Seeded
Canadice	Red	Early	American	Spur (2-3 buds)	Table / Juice	Seedless
Flame	Red	Late	American	Either	Table	Seedless
Foch	Blue	Early	European (F h)*	Either	Wine   Juice	Seeded
Glenora	Blue	Mid	American	Cane	Table	Seedless
Golden Muscat	Gold	Very late	American	Spur	Wine / Juice	Seeded
Himrod	White	Early	American	Cane	Table / Juice	Seedless
Interlaken	Green/Gold	Very early	American	Cane	Table / Juice / Rasins	Seedless
Lakemont	White	Mid	American	Cane	Table   Juice	Seedless
Lynden Blue	Blue	Mid	American	Cane	Table   Juice	Seeded
Marquis	White	Early/Mid	American	Cane	Table	Seedless
Okanogan Riesling	White	Early to mid	American	Cane	Wine / Table	Seedless
Price	Blue	Early	American	Cane	Table	Seeded
Reliance	Red	Mid	American	Cane	Table / Juice	Seedless
Siegenerbe	White/Gold	Early	European	Cane	Wine / Table	Seeded
Suffolk Red	Red	Mid	American	Either	Table	Seedless
Swensen Red	Red	Mid	American	Cane	Table	Seeded
Vanessa	Red	Early	American	Cane	Table	Seedless
Venus	Black	Early/Mid	American	Cane	Table	Seedless

\* French hybrid

\*\* Campbell and Island Belle are often called the same plant.

\*\*\* Concord grape ripening in mid-September is point of reference for determining grape ripening category.

Revised May, 2018



# Grape Workshop Handout:

## References:

- Growing Table Grapes. OSU EC1639
- Growing Wine Grapes in Maritime Western Wash. EM068E
- Jeff Cox, *From Vines to Wines*
- Pest Management Guide for Grapes in Washington. EB0762
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