

Upright Fruiting Offshoot Cherry at Urban Roots

Abstract—Can dwarf cherry trees be a viable fruit tree in Northern Nevada?

Can a dwarf fruit tree orchard be a teaching tool for Urban Root's Farm on E. 2nd St. Reno, Nevada?

I. INTRODUCTION

The Site:

In 2017, Urban Roots broke ground on the Urban Teaching Farm at 1700 E. 2nd St Reno, NV transforming an urban location into a place for garden based education where the garden is the classroom. The growing conditions of the site is urban- the soil was initially a mix of contractors fill dirt and gravel, there's no natural habitat for atleast 400 yards.



Fig. 1. 1700 E. 2nd St Reno, NV 2017



Fig. 2. 1700 E. 2nd St Reno, NV 2018

In 2017, the site for 12 trees was mapped out 70ft long garden bed going NS on the West side of Hoop House 1. We began ground prep by using a variation of the double dig garden method. By digging out the garden bed 70ft long and 3ft wide, adding compost and replacing the soil. A total of 4 yds of compost was applied.



Fig. 3. Original soil conditions October 2017 before adding soil amendments



Fig. 4. 70ft long garden bed going NS on the West side of Hoop House 1

Cherries: taken from *Loping Coyote Farms plant nursery catalog*

'Compact Stella', Mazzard Rootstock -Size: 10-15' Zone: 5 5/8" Price: \$28

Semi-dwarf cherry tree produces large, dark-red fruit that is firm and sweet. The Compact Stella Cherry produces delicious fruit that is more resistant to cracking. The tree is small and compact, bears at a young age, and is self-fertile.

Cherry 'Lapins,' Mazzard Rootstock Size: 15-25' Zone: 5 3/4" Price: \$30

Most cherry lovers would agree it's hard to improve on a good Bing, but that's precisely what the breeders have done at the Pacific Agri-Food Research Centre in Summerland, British Columbia. Breeders crossed Van and Stella cherries and came up with Lapins, a self-pollinating variety that produces large crops of delicious dark fruit that often measure almost 1 inch in width. The fruit resists splitting, and its texture is somewhat firmer than Bing. Lapin cherries are distinguished by their

deep ruby red colored skin and their lush, plump size. The fruit's surface is smooth and rounded with a slight heart-shape and lustered finish. They produce flavors that are rich and sweet, without a trace of tartness. The texture is meaty and succulent with a juicy mouthfeel.

Cherry 'Montmorency', Mazzard Rootstock Size: 15-25'
Zone: 3 5/8" Price: \$28 The classic pie cherry, Montmorency produces abundant crops of firm, bright red, richly tart fruit with clear juice. Montmorency makes the best cherry pies! A self-fertile and naturally dwarf tree, Montmorency will grow 10-12 ft. in height and is hardy to minus 40°F

Upright Fruiting Off Shoots (UFO): info taken from [https://www.canr.msu.edu/uploads/resources/pdfs/Cherry_Training_Systems_\(E3247\).pdf](https://www.canr.msu.edu/uploads/resources/pdfs/Cherry_Training_Systems_(E3247).pdf) pages 50-56

Cloud Mountain Farm - <https://www.youtube.com/watch?v=ZS1OIqGlpLY>



UPRIGHT FRUITING OFFSHOOTS (UFO)

Recommended spacing

Between rows	
vertical UFO	9-10'
dual-angled UFO-Y	12-14'
Between trees (UFO)	
vigorous rootstock	6-7'
semi-vigorous rootstock	5-6'
semi-dwarfing rootstock	4-5'
Between trees (UFO-Y)	
vigorous rootstock	5-6'
semi-vigorous rootstock	4-5'
semi-dwarfing rootstock	3-4'

The Upright Fruiting Offshoots (UFO) system was developed to:

1. Simplify training, pruning, and crop load management
2. Utilize the sweet cherry's natural upright growth habit and manage vigor by establishing multiple vertical structural fruiting units (number of vertical units should be proportional to tree vigor)
3. Optimize input efficiencies (e.g., light, labor, agrochemicals) and achieve high, uniform light distribution to fruiting sites
4. Facilitate the adoption of orchard mechanization and automation technologies

At maturity, the UFO system yields a planar fruiting wall architecture that is precocious, productive, and simple to maintain. Each tree is comprised of a permanent single horizontal trunk (or cordon) from which renewable fruiting leaders are grown vertically. Fruit are borne predominantly on spurs but also at the base of 1-year-old shoots, all on vertical wood. The UFO system may be configured to a single vertical or dual-angled (Y, each plane 30 degrees off vertical) system, both requiring trellising (about five wires per plane). UFO training may be used to establish a pedestrian orchard, though higher yields in the single vertical wall UFO can be achieved by maintaining a tree height about 20 percent taller than the inter-row spacing.

Establishing the UFO system is straightforward with little to no pruning required at planting.

STAGE: At planting

GOALS

- Fill the in-row tree space with the horizontal nursery tree leader.
- Promote formation of multiple upright fruiting offshoots (vertical leaders) on trunk
- Maintain upright growth of the tree terminal growing point



Example of a UFO-Y trellis

SYSTEM DEVELOPMENT

- Unheaded and unbranched (whip) nursery trees are recommended. This requires close communication with the contracted nursery, since standard commercial practice is to head trees back to about 4 feet for shipping.
- Plant trees at a 45-degree angle pointing the terminal to the south (northern hemisphere) or to the north (southern hemisphere) (Figure 64). This reduces the potential for sunburn on the trunk during establishment. Important: do not plant the trees vertically and bend them to a 45-degree angle.
- Clip/tie the trunk where it intersects the lowest wire (20 inches above ground) to maintain the planting angle. There is a single lowest wire in both the UFO and the UFO-Y trellises.
- Remove any nursery tree feathery with thinning cuts.
- Manually rub off all buds below the first trellis wire.
- Impose bud-activation techniques to upper buds about every 8 inches (UFO) or about every 4 inches (UFO-Y) to stimulate vertical shoot formation.



Figure 64

STAGE: First growing season (con't)

SYSTEM DEVELOPMENT

- Important: Do not train the trunk below a horizontal plane.
- If tree length exceeds tree spacing, train the terminal end as a vertical shoot (Figure 66).
- In mid summer, if any shoots still exhibit excessively vigorous growth ("bull" shoots), remove them entirely with a thinning cut.

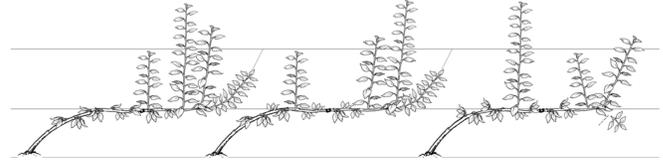


Figure 66

STAGE: First growing season

GOALS

- Develop about 10 well-distributed vertical leaders, which will provide basal fruiting capacity in Year 2 and spur fruiting capacity in Year 3
- Promote relatively uniform, moderate vigor among the vertical leaders
- Eliminate vigorous shoots that form below the first trellis wire

SYSTEM DEVELOPMENT

- Remove any shoots that form below the first trellis wire.
- In late spring, evaluate growth uniformity of vertical shoots; head any excessively strong shoots to a stub of no more than 2 inches with several leaves to promote regrowth of each as new dual shoots to be more in balance with the existing moderate shoots.
- Once new shoots at the terminal end are 12 inches or longer, train trees to the lowest wire by removing the initial clip and placing it further along the trunk so that the orientation is slightly above horizontal (Figures 65 and 66).

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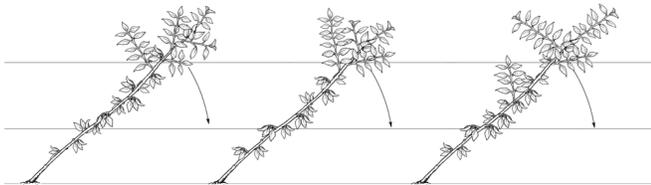


Figure 65

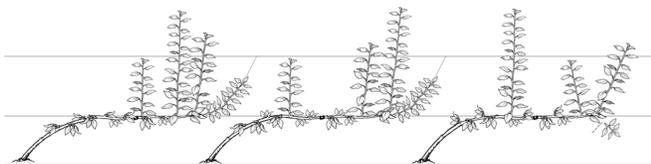


Figure 66

STAGE: First dormant season

GOALS

- Promote uniformity in upright shoot growth
- Space and orient upright shoots uniformly to upper wires

SYSTEM DEVELOPMENT

- Thin out weakest or most vigorous shoots if density exceeds one per approximately 8 inches (UFO) or approximately 4 inches (UFO-Y).
- Where possible, clip or tie shoots to the second wire (UFO) or to the dual second wires (UFO-Y, in an alternating pattern) as appropriate.
- Using thinning cuts, remove any shoots growing below horizontal from the main leader.

STAGE: Second growing season

GOALS

- Fill in horizontal gaps with upright shoots every 8 inches (UFO) or 4 inches (UFO-Y)
- Begin filling vertical space in fruiting wall by promoting balanced upright growth of 24-30 inches per shoot
- Harvest initial fruit along the horizontal scaffold or base or both of previous season vertical shoots

SYSTEM DEVELOPMENT

- Where gaps on the horizontal trunk exist, impose bud activation techniques to upper facing buds to promote completion of vertical shoot formation.
- Tie or clip upright shoots to successive vertical (UFO) or angled (UFO-Y) trellis wires as growth allows (Figure 67).
- Using thinning cuts, remove any new shoots from below the first trellis wire.
- In late spring, evaluate growth uniformity of new vertical shoots; head any excessively strong shoots to a stub of no more than 2 inches with several leaves to promote regrowth of each as new dual shoots to be more in balance with the existing moderate shoots.
- In mid summer, remove excessively vigorous uprights with a

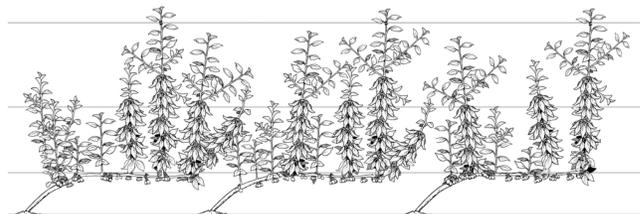


Figure 67

STAGE: *Second dormant season***GOALS**

- Promote uniform light distribution along the vertical length of each upright leader

SYSTEM DEVELOPMENT

- Thin out weakest or most vigorous leaders if density exceeds one per approximately 8 inches (UFO) or one per approximately 4 inches (UFO-Y).
- For highly productive varieties, remove all lateral shoots on upright leaders with thinning cuts (Figure 68); on moderately productive varieties, remove all lateral shoots on upright leaders with stub cuts (i.e., leaving three to seven buds at the base of the lateral shoots for additional fruiting). NOTE: this removal of lateral shoots also can be done by summer hedging about 4 to 6 weeks after harvest.
- Tie or clip upright shoots to wires.

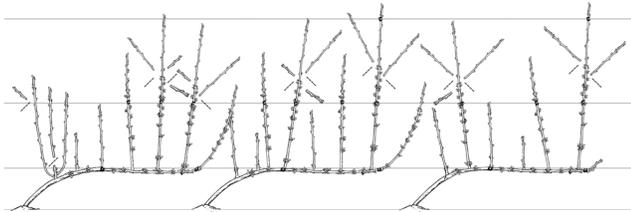


Figure 68

55

STAGE: *Third and subsequent growing seasons***GOALS**

- Finish filling vertical space in fruiting wall by promoting balanced upright growth of 24–30 inches per leader
- Maintain maximum fruiting wall height
- Maintain adequate leader spacing and vigor balance

SYSTEM DEVELOPMENT

- Tie or clip upright shoots to successive vertical (UFO) or angled (UFO-Y) trellis wires as growth allows.
- Remove any excessively dense (closer than one per approximately 8 inches for UFO or one per approximately 4 inches for UFO-Y) or vigorous leaders out of balance with the others by using a thinning cut after harvest.
- Trees may be topped, either manually or mechanically, at a height ratio of about 1.1–1.2 times the row spacing for the vertical UFO (i.e., 11–12 feet for 10-foot rows) or to about 10 feet for the angled UFO-Y. Topping 4 to 6 weeks after harvest will devitalize the tree top. Regrowth will be minimal, and no dormant pruning will be necessary to maintain fruiting wall height.

STAGE: *Mature pruning for cropping***GOALS**

- Renew 15–20 percent of the fruiting vertical (UFO) or angled (UFO-Y) leaders per year
- Promote uniform light distribution along the vertical length of each upright leader

SYSTEM DEVELOPMENT

There are two pruning rules for maintaining yields of mature UFO trees:

- 1. Renew vigorous upright leaders**
 - Select the largest one or two leaders for renewal every year; ideally, no leader should be more than 6 or 7 years old. Remove these with a stub cut during or just prior to bloom, leaving one or two live nodes for regrowth.
 - As new uprights are generated from renewal cuts, manage these following the same rules for uprights when establishing the system.
 - Any weak uprights should be removed with thinning cuts.
- 2. Remove lateral branches**
 - For highly productive varieties, remove all lateral shoots on upright leaders with thinning cuts; on moderately productive varieties, remove all lateral shoots on upright leaders with stub cuts (i.e., leaving three to seven buds at the base of the lateral shoots). These short stubs are retained to bear fruit and subsequently can be eliminated after harvest or, if a vegetative bud is present, can be managed as fruiting laterals similar to those in the SSA system.
 - NOTE: the removal of lateral shoots growing into the alley also can be done by summer hedging about 4 to 6 weeks after harvest; follow-up removal of lateral shoots growing between trees in the row can be done during dormancy.

SUMMARY

The UFO training system produces a uniform fruiting wall orchard somewhat comparable to the SSA system, but with about half the density of trees required. The fruiting units are renewable and vertical, similar to the KGB system but with greater precocity and greater potential for partial mechanization. To achieve these advantages, it requires a more extensive trellis system than the SSA and more attention to establishment tasks than the KGB.

56

II. THE PROCESS



Fig. 5. Trees getting established 1 month after planting

Year 1 : 2018

Originally 12 unheaded and unbranched (whip) trees were planted May 2018 in 2 rows. 6 Compact Stellas, 3 Lapins, and 3 Montmorencys. Trees were planted 6 ft apart at 45 deg angle, shoots facing down were pruned, trees tied to trellis wire 20in off ground for support. Tree's were watered deeply about once a week and fed compost tea. General idea was to promote good tree root establishment and upright growth of the tree terminal growing point.



Fig. 6. Trees planted at 45deg angle 6ft apart

Year 2 : 2019

6 Trees went on to survive to year 2, 4 Compact Stellas, 1 Lapins, 1 Montmorency. Decease in survival most likely do to



Fig. 7. Yr 2 Compact Stella, upright shoots tied to second trellis wire

tree establishment to site with plant stresses such as heat and irrigation problems. Remaining trees were pruned in the spring 2019 to space upright shoots atleast 6in. Trees blossomed in April 2019. June 2019, tall shoots tied to second trellis wire 40in above ground for support before lignification. No cherry fruit observed.



Fig. 8. 2 yr Compact Stella, upright shoots spaced 6in apart

III. DATA ANALYSIS

See Table 1 for 2nd yr tree measurements

TABLE I
TREE MEASUREMENTS FROM JULY 2019

Tree # (S to N)	Variety	Tree Length	Trunk Width	Tallest Upright Shoot	# of Upright shoots
1	Compact Stella	6ft	5in	3ft 9in	9
2	Compact Stella	6ft 5in	4.5in	4ft 2in	5
3	Compact Stella	6ft	6in	3ft 6in	10
4	Compact Stella	5ft	4.5in	2ft 8in	5
5	Lapins	4ft 8in	3in	1ft 2in	1
6	Montmorency	4ft 8in	2.75in	1ft 3in	4



Fig. 9. Yr 2 Upright Shoot growth

CONCLUSIONS

Our second year data suggests the Compact Stella is growing well and starting to take shape as a Upright Fruiting Offshoot dwarf cherry tree variety. Our third year should start fruit. Lapins and Montmorecy had trouble establishing at first but could reach potential upright growth of the tree terminal growing point by end of 2019. As a teaching tool the trees have served as observational orchard that will continue to grow with Urban Roots Farm