

Midwest Vineyard Labor Calendar

Various tasks must be completed in a vineyard for it to become and remain productive, yield quality fruit, and deliver a financial return. As most vineyards in the Midwest are hand-farmed, an adequate supply of available labor is necessary to complete operations at appropriate times and with maximal efficiency. For example, if shoot thinning is performed too early (before the 4- to 6-inch growth stage), a second thinning pass may be needed to remove late-emerging shoots, but if performed too late (10-inch growth or more), shoots may have to be cut with shears, which greatly reduces efficiency. Therefore, to achieve the greatest possible efficiency, adequate labor is needed to thin all vineyard acres when shoots are between 4 and 10 inches long. Numerous other cultural operations in vineyards have similar narrow windows of opportunity.

This publication aims to help grape producers develop appropriate management plans and reasonable financial expectations by providing information on (1) operations that are generally advised for commercial vineyards and when they should be done, and (2) the estimated number of labor hours required to complete them. Labor requirements are provided on a per-acre basis, unless otherwise specified, and assume manual execution of most tasks by laborers skilled in vineyard work. Producers using unskilled labor will need to budget for higher labor-training expenses and labor requirements due to lower productivity. Seasonal and climatic variability across the Midwest will require producers to adjust the timing and perhaps sequence of operations according to a vineyard's location and observed weather conditions. Tasks included in this timeline assume conventional or sustainable management practices because of their prevalence in the Midwest region.

This publication is not intended to replace labor records for individual enterprises but to serve as a reference for those that do not yet possess them. Vineyard enterprises should monitor their labor use and costs for various tasks on an individual block basis to accurately determine their establishment and production costs.

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Vineyard development timeline

The vineyard development timeline referenced in this publication assumes an extensive site preparation period, starting in late summer and about 18 months before spring planting. This schedule is appropriate for sites that require significant modification before planting due to limitations such as highly irregular topography, surface obstructions, unfavorable soil chemistry or structure, or poor internal drainage. Sites with difficult perennial weed populations would also likely benefit from this approach.

Site preparation needs can vary widely, and sites that require little modification may be well prepared for planting in as little as 6 to 8 months. Prospective growers are encouraged to seek expert guidance in preparing a site-development strategy.

This publication refers to preplant vineyards as *establishment phase* from the start of site development until the fall before planting and *planting phase* for the 6 to 8 months before spring planting. *Nonbearing* vineyards are those planted but not yet bearing. Vineyards attain *bearing* status in late winter of the first cropping year, typically as they enter their third or fourth leaf.

Cost estimate basis

The three studies referenced in this publication developed cost estimates based upon different assumptions.

1. Capps et al. (1998) specified a VSP trellis (for low cordon training with vertical shoot positioning) with 7 feet between vines and 10 feet between rows.
2. Domoto (2001) specified a two-wire trellis for high bilateral cordon training and spacing of 7 feet x 9 feet (vine x row).
3. Noguera et al. (2005) specified a two-wire trellis for high bilateral cordon training of hybrid vines and 8 feet between both vines and rows.

Where appropriate, the figures reported herein are averages of those reported in these studies, with references provided in parentheses. This was done to approximate, as accurately as possible, the labor required by Midwestern vineyards that are grown with differing training methods and vine densities. This method did result in a loss of specificity, however, so readers are encouraged to examine the referenced studies for information most pertinent to their operations.

Labor demands for tasks not included in these studies are estimates provided by the current authors. Demand for tasks that vary by block size was estimated based

upon 8-acre enterprises trained to single cultivars. Labor demands for some tasks, including irrigation system installation, nutrient application other than granular nitrogen to planted vineyards, and harvest, were not estimated due to expected high variability between enterprises and locations (harvest costs are estimated on a piece-rate basis).

January

(Dormancy)

All vineyards

- Attend educational meetings (seasonal estimate per acre per enterprise employee).
➤ **9 hours**

Bearing vineyards

- Begin pruning the hardiest cultivars if time demands require it; however, prune as late as possible (large operations or those with limited labor resources will generally need to begin pruning earlier to complete the task in an acceptable timeframe). Prune, train and tie canes and cordons, and remove/chop debris (seasonal estimate).
➤ Third leaf (first bearing year): **42.8 hours** (1, 2, 3)
➤ Fourth leaf and beyond: **42.0 hours** (1, 2, 3)
-

February

(Dormancy)

All vineyards

- Attend educational meetings.

Bearing vineyards

- Continue pruning as required.
-

March

(Dormancy)

All vineyards

- Attend educational meetings.
- Repair trellis and irrigation system as necessary if not completed in fall of the previous year (see November–December).

Nonbearing vineyards

- Begin pruning the hardiest cultivars if time demands require it; however, prune as late as possible. Prune, train and tie canes and cordons, and remove debris (seasonal estimate).
➤ First leaf: **9.4 hours** (1, 2)
➤ Second leaf: **45.7 hours** (1, 2, 3)

Bearing vineyards

- Continue pruning cold-hardy cultivars as required. Delay pruning of cold-tender cultivars until the latest possible date.
 - Submit soil samples from established vineyards for analysis every second or third year.
➤ **1.0 hour** (1, 2)^a
-

April

(Bud swell and burst; shoot growth begins)

All vineyards

- Prune cold-tender cultivars.
- Tighten trellis wires as necessary.
➤ **0.5 hour**
- Mow interrow cover crop.
➤ **0.4 hour**
- Apply herbicide to vine rows in established vineyards.
➤ **0.7 hour** (1, 2, 3)^b
- Charge irrigation system; inspect and repair leaks.
➤ **0.5 hour**

Preplant vineyards

Site preparation phase:

- Disk and harrow vineyard expansion areas to incorporate winter cover crop, level the soil surface and create a firm seedbed.
➤ **2.0 hours** (1, 2)
- Lay out vineyard expansion areas; mark row lines and end-post locations.
➤ **3.4 hours** (1, 2)
- Seed vineyard expansion interrow areas with desired cover crop.
➤ **0.7 hour** (1, 2)
- Order vines for planting in the following season.
➤ **0.5 hour**

Planting phase:

- Apply herbicide to, or cultivate, vine rows being prepared for planting.
➤ **0.7 hour** (1, 2, 3)^b
- Plant new vines. Dormant vines can be planted 2 to 3 weeks before the frost-free date; however, green-growing vines should be planted after the danger of frost has passed.
➤ Machine-transplanted: **8.5 hours** (2)
➤ Hand-transplanted: **60.7 hours** (1, 3)^c

Bearing and nonbearing vineyards

- Apply liquid lime sulfur or other recommended fungicide to dormant vines before bud swell if the vineyard has a history of anthracnose infection.
➤ **0.6 hour** (3)^d
- Begin fungicide and/or insecticide treatments at 1- to 3-inch shoot length or as recommended in pest management guide. Anticipate making 1 to 2

foliar applications in April, dependent upon location, cultivar and vine age.

- ▶ Per application: **0.4 hour** (1, 2, 3)^e
- Deploy weather station and Grape Berry Moth pheromone traps; scout for insect pests and diseases; generate disease model infection charts (seasonal estimate per acre).
 - ▶ **9.0 hours**

May

(Early shoot growth; start of bloom)

Preplant vineyards

- Control vine row weeds with tillage or postemergent herbicide application.
 - ▶ **0.7 hour** (1, 2, 3)^b

Nonbearing vineyards

- Erect trellises in new vineyards (seasonal estimate).
 - ▶ **46.2 hours** (1, 2, 3)
- Shoot thin/sucker, train and tie (seasonal estimate).
 - ▶ First leaf, with grow tubes: **22.0 hours** (3)
 - ▶ Grow tube installation: **10.7 hours** (2, 3)^f
 - ▶ First leaf, without grow tubes: **21.3 hours** (1)
 - ▶ Second leaf: **25.0 hours** (1, 2, 3)
- Remove flower clusters.
 - ▶ First leaf: **3.0 hours** (1, 2)
 - ▶ Second leaf: **8.6 hours** (1, 2)
- Apply nitrogen, with rate dependent upon soil test results. Delay application to newly planted vines until soil has settled around them. In clay and loam soils, a single seasonal application may be sufficient. In sand or gravel soils, split applications are advised and the May application should contain half of the full intended rate.
 - ▶ Hand-applied band application (granular): **3.0 hours** (1, 2)
 - ▶ Tractor-mounted broadcast or band application (granular): **0.5 hour** (1, 2)
- Important time for disease control. Anticipate making 1 to 2 foliar fungicide applications in May, dependent upon cultivar and weather conditions. Insecticide applications may also be necessary.
 - ▶ Per application: **0.4 hour** (1, 2, 3)^e
- Monitor vine and soil moisture status, and irrigate as necessary.
- Scout and treat weed escapes.
 - ▶ **0.9 hour** (2, 3)^g
- Mow interrow cover crop.
 - ▶ **0.4 hour**

Bearing vineyards

- Remove unnecessary water sprouts and suckers. Thin excess or “noncount” shoots (seasonal estimate).
 - ▶ **8.3 hours** (1, 2)^h

- Begin shoot separation and positioning in bearing cultivars with adequate shoot growth.
 - ▶ **8.0 hours**
- Thin flower clusters as desired on vines that will be allowed to bear their first crop.
 - ▶ **10.0 hours**
- Apply nitrogen 2 to 3 weeks before bloom as necessary based upon vine size, soil test and previous year petiole test results. In clay and loam soils, a single seasonal application may be adequate. In sand or gravel soils, split applications are advised and the May application should contain half of the full intended rate. Foliar applications of micronutrients may also be appropriate at this time; refer to previous year test results for guidance.
 - ▶ Hand-applied band application (granular): **3.0 hours** (1, 2)
 - ▶ Tractor-mounted broadcast or band application (granular): **0.5 hour** (1, 2)
- Critical time for disease control, particularly with regard to the prebloom application near the end of the month. Insecticide applications may also be necessary, particularly for control of foliar phylloxera and Grape Berry Moth in moderate- or high-risk vineyards. Anticipate making 2 to 3 foliar applications in May, dependent upon cultivar and weather conditions.
 - ▶ Per application: **0.4 hour** (1, 2, 3)^e
- Monitor vine and soil moisture status, and irrigate as necessary.
- Scout and treat weed escapes.
 - ▶ **0.9 hour** (2, 3)^g
- Mow interrow cover crop.
 - ▶ **0.4 hour**
- Service weather station and insect monitoring traps; scout for insect pests and diseases; generate disease model infection charts.

June

(Fruit set; continued canopy development)

Preplant vineyards

- Mow interrow cover crop.
 - ▶ **0.4 hour**
- Control vine row weeds with tillage or postemergent herbicide application.
 - ▶ **0.7 hour** (1, 2, 3)^b

Nonbearing vineyards

- Continue monitoring vine and soil moisture status, and irrigate as necessary.
- Continue training young vines; lateral shoot removal may be necessary.
- Continue trellis installation.
- Mow interrow cover crop.
 - ▶ **0.4 hour**

- Continue disease and insect pest management programs. In regions where Japanese Beetles are active, control may be warranted in the latter half of the month. Anticipate making 2 foliar applications in June.
 - Per application: **0.4 hour** (1, 2, 3)^e
- Deliver second application of nitrogen fertilizer about 30 days after the May application to sand or gravel soils. This application typically should contain half the annual N budget but may be reduced if unwanted crop reduction has occurred or vine growth is stronger than expected.
 - Hand-applied band application (granular): **3.0 hours** (1, 2)
 - Tractor-mounted broadcast or band application (granular): **0.5 hour** (1, 2)
- Apply herbicide to vine rows.
 - **0.7 hour** (1, 2, 3)^b

Bearing vineyards

- Collect petiole samples annually at full bloom from *Vitis vinifera* cultivars, and from native and hybrid cultivars if the nitrogen status of vines is in question and appropriate sufficiency ranges are accessible.
 - **0.4 hour** (1, 2)
- Perform early yield estimate after fruit set based upon cluster counts and known berry/cluster weights. Contact buyers and inform them of potential yield; discuss harvest arrangements, quality targets and pricing.
 - **1.5 hours**
- Complete shoot thinning soon after fruit set as necessary.
- Perform yield adjustment as necessary after fruit set by cluster thinning mature, bearing vines.
 - **13.3 hours** (2, 3)ⁱ
- Continue monitoring vine and soil moisture status, and irrigate as necessary.
- Continue removing unnecessary water sprouts and suckers.
- Perform fruit zone leaf removal after fruit set as desired (seasonal estimate).
 - **10.0 hours** (1)
- Perform shoot positioning after fruit set as appropriate (seasonal estimate).
 - **16.5 hours** (1, 2)^{h,j}
- Continue disease and insect pest management programs. The two fungicide applications postbloom are essential. Grape Berry Moth control may be needed in moderate- or high-risk vineyards. In regions where Japanese Beetles are active, control may be warranted in the latter half of the month. Anticipate making 3 foliar applications in June.
 - Per application: **0.4 hour** (1, 2, 3)^e
- Deliver second application of nitrogen fertilizer about 30 days after the May application to sand or gravel soils. This application typically should contain half the annual N budget but may be reduced if unwanted

crop reduction has occurred or vine growth is greater than expected.

- Hand-applied band application (granular): **3.0 hours** (1, 2)
- Tractor-mounted broadcast or band application (granular): **0.5 hour** (1, 2)
- Hedge or skirt vigorous bearing vines late in the month if necessary (seasonal estimate).
 - **10.0 hours** (1)^{h,i}
- Apply herbicide to established vine rows.
 - **0.7 hour** (1, 2, 3)^b
- Mow interrow cover crop.
 - **0.4 hour**
- Service and/or deploy weather station and insect monitoring traps (Grape Root Borer where prevalent); scout for insect pests and diseases; generate disease model infection charts.

July

(Canopy development nears completion; veraison in early cultivars)

Preplant vineyards

- Control vine row weeds with tillage or postemergent herbicide application.
 - **0.7 hour** (1, 2, 3)^b
- Mow interrow cover crop.
 - **0.4 hour**

Nonbearing vineyards

- Continue monitoring vine and soil moisture status and irrigate as necessary.
- Finish trellis installation if not complete.
- Continue disease and insect pest management programs. Need for fungicide applications in the latter half of the month may vary according to weather conditions, levels of disease inoculum, and cultivar resistance. Anticipate making 1 to 2 foliar applications in July, although more may be required, particularly if Japanese Beetles are abundant.
 - Per application: **0.4 hour** (1, 2, 3)^e
- Continue training young vines.
- Scout and treat weed escapes.
 - **0.9 hour** (2, 3)^g
- Mow interrow cover crop.
 - **0.4 hour**

Bearing vineyards

- Continue monitoring vine and soil moisture status, and irrigate as necessary.
- Continue disease and insect pest management programs. Need for fungicide applications in the latter half of the month may vary according to weather conditions, levels of disease inoculum, and cultivar resistance. Anticipate making 2 to 3 foliar applications in July, although more may be required if Japanese Beetles are abundant. Chemical control

of third-generation Grape Berry Moth may also be warranted.

- ▶ Per application: **0.4 hour** (1, 2, 3)^e
- Chemical control of Grape Root Borer with soil-applied insecticide may be warranted in regions where this pest is prevalent.
- Continue shoot positioning as necessary. Hedge, skirt or top as necessary but delay until shoot growth slows if possible.
- Scout and treat weed escapes.
 - ▶ **0.9 hour** (2, 3)^g
- Start bird-deterrent activities at veraison and continue through harvest. Install netting after vine growth has slowed, if it is to be used.
 - ▶ Net application: **2.0 hours**
- Perform a final yield estimate. Advise buyer of anticipated yield; discuss terms of purchase agreement and determine approximate harvest parameters if not already done.
 - ▶ **1.5 hours**
- Begin monitoring grape ripening at veraison and continue through harvest (seasonal estimate for sampling; laboratory analysis will require additional labor).
 - ▶ Per cultivar: **3.0 hours**
- Mow interrow cover crop.
 - ▶ **0.4 hour**
- Service weather station and insect monitoring traps; scout for insect pests and diseases; generate disease model infection charts.

August

(Canopy development complete; veraison for late cultivars; harvest for early cultivars)

Preplant vineyards *(about 18 months before planting)*

- Dig soil pits and perform percolation tests in vineyard expansion areas to survey soil depth, drainage and structure.
 - ▶ **2.0 hours**
- Collect soil samples from vineyard expansion areas and submit for analysis.
 - ▶ **1.0 hour** (1, 2)^a
- Deliver broadcast application of nonselective herbicide to vineyard expansion areas.
 - ▶ **0.7 hour** (1, 2, 3)^b

Nonbearing vineyards

- Continue monitoring vine and soil moisture status, and irrigate as necessary. In most seasons, water requirements of nonbearing vines are met by rainfall after the middle of the month. Reduce irrigation rates midmonth and stop irrigating near the end of the month unless drought prevails.
- Continue fungicide applications as necessary for late foliage infections, and insecticide applications as needed for Japanese Beetles and other herbivorous

insects. Anticipate making 1 to 2 foliar applications in August.

- ▶ Per application: **0.4 hour** (1, 2, 3)^e
- Remove grow tubes by the end of the month.
 - ▶ **8.6 hours** (2, 3)^k

Bearing vineyards

- Continue monitoring vine and soil moisture status, and irrigate as necessary. Irrigation demand will vary seasonally due to variable rainfall amounts. Supply water as necessary to maintain canopy health and function, but avoid overirrigating to control vine growth and facilitate acclimation.
- Collect petiole samples for routine annual nutrient analysis of native and hybrid cultivars 60 to 70 days postbloom.
 - ▶ **0.4 hour** (1, 2)
- Continue bird-deterrent activities.
- Continue fungicide applications as necessary for bunch rots and late foliage infections. Insecticide application for chemical control of third generation Grape Berry Moth, and near-harvest pests such as Multicolored Asian Lady Beetle and Brown Marmorated Stink Bug, may also be warranted. Anticipate making 2 to 3 foliar applications in August.
 - ▶ Per application: **0.4 hour** (1, 2, 3)^e
- Remove bird netting just before harvest.
 - ▶ **2.0 hours**
- Harvest early ripening cultivars at optimal maturity. Collect average berry and cluster weight data at harvest.
 - ▶ Harvest labor expense estimate (piece rate): **\$1.25 per 25 to 30 lb. lug** (1, 2, 3)
 - ▶ Data collection labor estimate: **1.0 hour**
- Service weather station and insect monitoring traps; scout for insect pests and diseases; generate disease model infection charts.

September

(Harvest for midseason cultivars)

Preplant vineyards

Site preparation phase:

- Subsoil vineyard expansion areas when soil conditions are correct if compaction or impenetrable soil layers are present.
 - ▶ **1.8 hours** (2)
- Apply needed nutrients and soil amendments to vineyard expansion areas (about 18 months before planting).
 - ▶ **1.1 hours** (1, 2)
- Disk vineyard expansion areas to incorporate nutrients and amendments and level the surface.
 - ▶ **2.0 hours** (1, 2)
- Sow winter annual cover crop in vineyard expansion areas.
 - ▶ **0.7 hour** (1, 2)

Planting phase

- Mow interrow cover crop.
 - **0.4 hour**
- Control vine row weeds with tillage or postemergent herbicide application.
 - **0.7 hour** (1, 2, 3)^b

Nonbearing vineyards

- Apply postemergent herbicide to perennial weeds in vine rows as necessary.
 - **0.7 hour** (1, 2, 3)^b
- Scout for late-season powdery and/or downy mildew foliar infections and insect pest problems and treat with fungicides or insecticides as necessary. Anticipate making 1 foliar application in September.
 - Per application: **0.4 hour** (1, 2, 3)^c
- Mow interrow cover crop.
 - **0.4 hour**

Bearing vineyards

- Harvest midseason cultivars at optimal maturity.
- Continue fungicide applications as necessary for bunch rots or late foliage infections. Scout for late-season insect pests (Multicolored Asian Lady Beetle, Brown Marmorated Stink Bug, etc.) and treat as necessary. Anticipate making 1 to 2 foliar applications in September.
 - Per application: **0.4 hour** (1, 2, 3)^c
- Continue monitoring vine and soil moisture status, and irrigate as necessary, but restrict irrigation rates to control vine growth and facilitate acclimation. Irrigate thoroughly after harvest if possible.
- Service weather station and insect monitoring traps; scout for insect pests and diseases; generate disease model infection charts.
- Apply postemergent herbicide to perennial weeds in vine rows postharvest as necessary.
 - **0.7 hour** (1, 2, 3)^b

October

(Harvest for late cultivars; growing season nearing its end)

Nonbearing vineyards

- Flush, chlorinate and drain irrigation system.
 - **1.5 hours**
- Reduce tension on trellis wires after leaf fall (in regions where severely low winter temperatures are common).
 - **0.5 hour**
- For regions with long growing seasons and cultivars that acclimate slowly for winter, a postharvest application of fungicide may be warranted to retain a healthy leaf canopy until frost. Anticipate making 1 foliar application in October.
 - Per application: **0.4 hour** (1, 2, 3)^c

Bearing vineyards

- Harvest late cultivars at optimal maturity, and irrigate postharvest if possible.
- Flush, chlorinate and drain irrigation system.
 - **1.5 hours**
- Reduce tension on trellis wires after leaf fall (in regions where severely low winter temperatures are common).
 - **0.5 hour**
- Winterize weather station; remove insect monitoring traps.
- For regions with long growing seasons and cultivars that acclimate slowly for winter, a postharvest application of fungicide may be warranted to retain a healthy leaf canopy until frost. Anticipate making 1 foliar application in October.
 - Per application: **0.4 hour** (1, 2, 3)^c

November–December

(Dormancy)

All vineyards

- Attend educational meetings.

Nonbearing vineyards

- Repair, modify and adjust equipment as necessary.
- Repair trellising and irrigation system as necessary.
 - **1.0 hour**

Bearing vineyards

- Repair, modify and adjust equipment as necessary.
- Repair trellising and irrigation system as necessary.
 - **1.0 hour**
- Meet with buyer to review fruit quality and harvest operations. Review vineyard management plan for the following season and revise as necessary.
 - **1.0 hour**

Notes

- Capps et al. report soil sampling labor demand at 1.6 hours per acre; Domoto reports a demand of 0.4 hour per 2.5 acres.
- Assumes use of a tractor-mounted or -towed herbicide sprayer.
- Capps et al. specify machine-augured holes; Noguera et al. do not specify hand-planting method.
- Assumes use of a handgun sprayer.
- Assumes use of tractor-powered air-assisted sprayer.
- Domoto grow tube placement labor estimate includes installation of bamboo training stakes.
- Assumes use of a powered spot sprayer.
- Noguera et al. specify a seasonal allowance of 11 hours per acre for suckering and canopy management operations.
- Noguera et al. labor estimate is for *Vitis vinifera*.
- Capps et al. labor estimate is for VSP-trained vines.
- Domoto estimate includes tying shoots to stake.

Estimated seasonal total labor demand per acre

Assumptions

- Immature vineyards are hand-planted to own-rooted hybrid vines and trained using grow tubes.
- Irrigation is installed at planting, though labor for installation is not included in this estimate.
- Trellising is installed after vines are planted.
- Nitrogen fertilizer is applied in split applications using a tractor-mounted or -towed spreader.
- Modest numbers of fungicide and insecticide applications are made in the first and second leaf, with more frequent applications in third and fourth leaf.
- Bird netting is used to prevent depredation in the third and fourth leaf.
- Labor for harvest in the third and fourth leaf is not included.

Labor hours

Preplant vineyards	28.5
Nonbearing vineyards	
First leaf	179.5
Second leaf	110.6
Bearing vineyards	
Third leaf	153.7
Fourth leaf and beyond	155.4

For a more comprehensive tool for calculating vineyard labor demand and establishment expenses, download the interactive spreadsheet available from the Agricultural Marketing Resource Center at http://www.agmrc.org/commodities_products/fruits/wine/winery_and_vineyard_feasibility_workbooks.cfm.

References

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Acknowledgements: The authors sincerely appreciate the kind and valued assistance of Tim Burson, Mary Burson, Jackie Harris, Fred Dressel, Brandon Fahrmeier and Lynn Gay in reviewing this publication.

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■ Issued in furtherance of the Cooperative Extension Work Acts of May 8 and June 30, 1914, in cooperation with the United States Department of Agriculture. Director, Cooperative Extension, University of Missouri, Columbia, MO 65211
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