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COLORADO
Department of Agriculture
Division of Plant Industry



Phylloxera Bulletin for the Colorado Grape and Wine Industry

BACKGROUND INFORMATION

Colorado scientists have identified and confirmed the presence of grape phylloxera (*Daktulosphaira vitifoliae*) in multiple commercial vineyards in Colorado:

- August 2015, during a routine Grape Commodity Survey looking for other grape vine pests, the [Cooperative Agricultural Pest Survey \(CAPS\)](#) identified phylloxera in a Larimer County vineyard on hybrid vines.
- November 2016, in a Mesa County *Vitis vinifera* vineyard that requested a consultation about a block of vines showing symptoms that mimic nutritional deficiencies.
- December 2016 through spring 2017, additional surveys positively identified additional vineyard infestations on both *vinifera* and hybrid vines in other vineyards in Mesa and Delta counties.

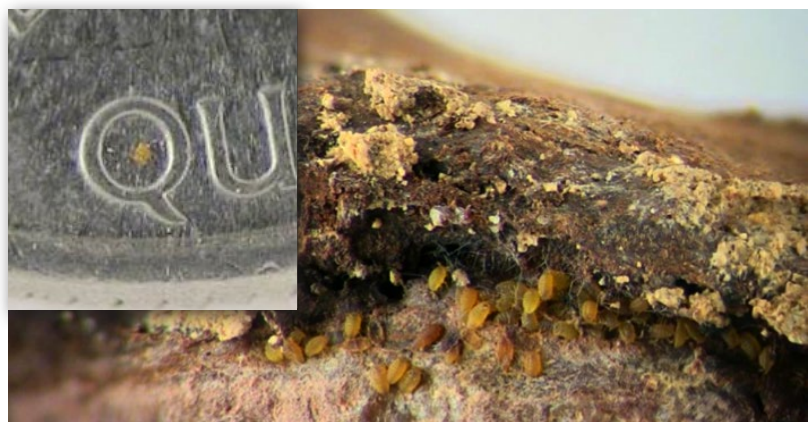
Photos, this page: Shutterstock



Phylloxera is a nearly microscopic insect related to aphids that can cause mild to moderate damage to grape leaves and severe damage to grape roots.

The insect migrates between leaves and roots; with winged and wingless forms developing at each stage of migration.

A full life cycle of the insect with both leaf and root feeding forms may or may not develop, depending on the strain of phylloxera present and the variety of grape infested.



Photos: Melissa Franklin

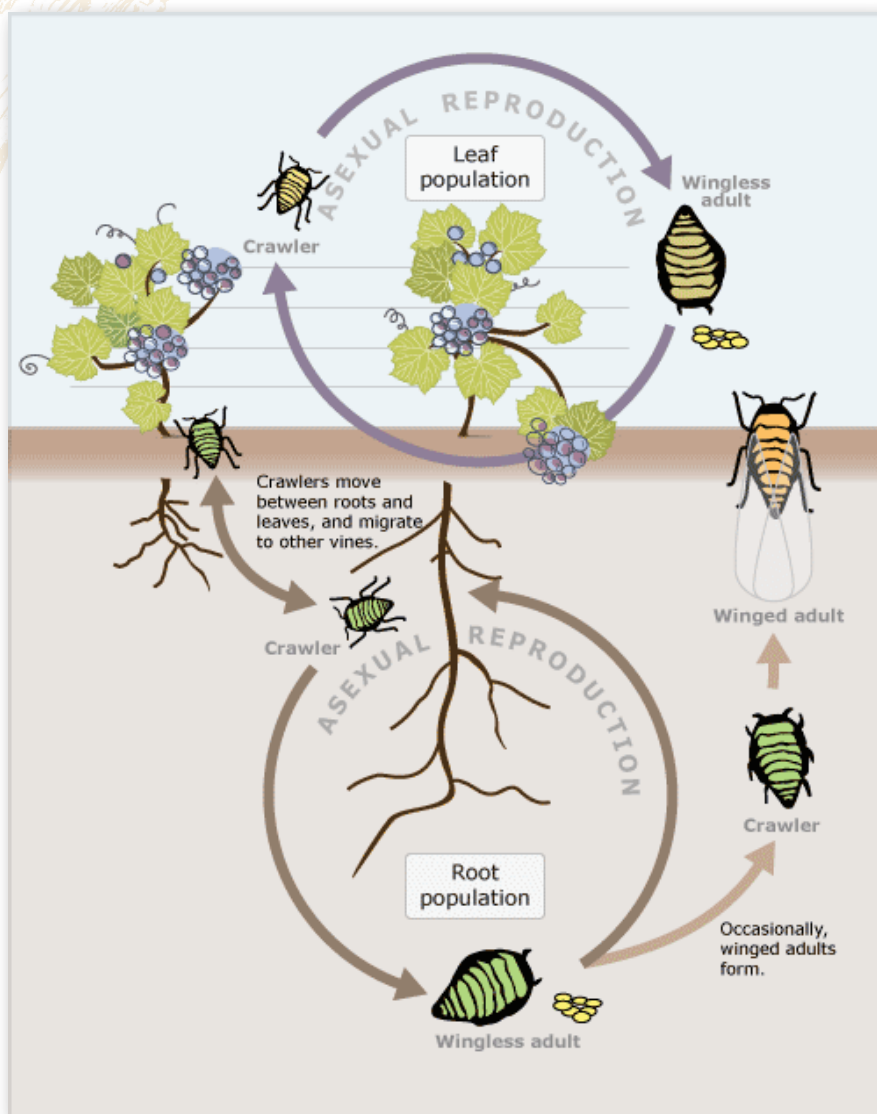


Diagram: Maggy Wassilieff, Te Ara—the Encyclopedia of New Zealand

Background images: Shutterstock

Root form (radicicoles) is the damaging form of phylloxera

- Present on self-rooted *vinifera* and some other rootstock genetics
- heavy clay soils in cooler climates are preferred
- crawlers move from plant to plant through cracks in the soil
- also transported by boots, cuttings, and equipment
- feed on roots when soil is 60° or above
 - Spread of phylloxera in the cooler climate of Washington State has been significantly slower than in California, which may prove true in Colorado as well
- feeding causes swelling (nodosities and tuberosities)



- leads to plant poisoning and fungal development
- 3-5 generations per year
- **Resistant rootstock is the most effective preventative treatment**



- Aerial form (gallicoles) usually seen on *V. labrusca* & *V. aestivalis*

Although phylloxera, which is native to northeastern North America, is commonly found on *Vitis riparia* and other grape native American species, prior surveys found no evidence of phylloxera in Colorado's commercial vineyards until 2015.

- American native grape species *Vitis rupestris*, *V. berlandieri*, & *V. riparia* are resistant (tolerant)
 - rootstocks based on these species are primary management method
- American species *V. labrusca*, *V. aestivalis*, & *V. vulpina* are susceptible in some degree
 - Often host aerial forms
- European wine grapes, *V. vinifera* are the most susceptible
 - Often host root, but not aerial forms
- **Remember: Many resistant varieties support symptomless, reproducing phylloxera populations**
- Only feeds on *Vitis* and no other known species.

IMPORTANT: Live phylloxera nymphs and adults can survive for up to eight days in vineyard soil without feeding on grapevines.

Phylloxera co-exists with grapes in virtually every wine-growing region across the globe, with a few exceptions such as Chile and the Mosel Valley. Phylloxera spread to Europe more than 150 years ago, and the wine industry continues there.



Root galls (nodosities) form at the end of young roots due to phylloxera feeding.

Phylloxera infestation spreading through an Oregon vinyard. Notice the oval pattern of affected vines.



Kills vines by damaging the roots and inhibiting the flow of nutrients and water from roots to leaves (see photos).

Symptoms to look for:

- Unexplained weak growth
- Appearance of poor vine nutrition
- Premature leaf drop
- Symptoms spreading from a small area that expands over time

Multiple sources of introduction are probable:

- Infested commercial nursery stock is likely in many of the positive vineyards to date.
 - Keep in mind that even if you order “certified” vines that does not certify pest-free
 - The term “certified” means that vines have been tested for viruses, and that such tests were negative for known grape vine viruses

- The term “certified” does not mean that vines have been tested and found to be free of pests and diseases.
- Even “certified” nursery stock from any nursery can be infested by pests such as phylloxera and can carry diseases not covered by the certification.
- Also easily transported on dirty equipment, tractors, vineyard workers’ clothing and footwear, harvesting bins, and vehicles used to transport grapes.
- Can be spread through irrigation drainage.



Photos: Melissa Franklin (left) and Janet Hardin (right), Colorado State University

RESPONSE: WHAT DO WE DO NOW?

Procedures for simple, inexpensive, front line response to avoid the spread of phylloxera should become routine, standard operating practices: **The point is to implement simple preventive practices statewide at this time so we will not have to move to more severe and expensive responses**

I. Assess your risk:

- Is phylloxera already present in your vineyard?
- Do you have self-rooted *vinifera*?
- Do you have a mix of symptomless and susceptible varieties?
- How much inter-vineyard traffic is there, including people, equipment, and supplies?
- Do consumers or tourists frequently walk through your vineyard?

II. Implement “Bio-security Protocols”

Adopting these and other practices will help control the spread of infestation in Colorado vineyards.

II. A. Pre-planting Inspection and Treatments:

- All growers should carefully inspect all stock purchased from commercial nurseries. Don’t forget that phylloxera are not visible to the naked eye, even when using a 20x hand lens.
- Ask nurseries what pest prevention protocols they follow prior to shipping your grape vines, and request hot water dips or pesticide treatments if these are not already standard procedure prior to shipment.
Find out what procedures they take to limit the spread of phylloxera internally and to their customers’ vineyards
- Grape vines are classified as nursery stock, and as such are inspected if the product is purchased from a nursery within Colorado but not if purchased from an out-of-state nursery.

II. B. A grower can also request that the CDA inspect new plant material received through a wholesale shipment from outside Colorado. Early Colorado grape growers did this in the 1980s.

- Cost is \$45/hour plus drive time and mileage for the inspector.
- Inspectors are based in Grand Junction so drive time should not be too great for most Western Slope vineyards.
- CDA needs at least one week's lead time to schedule an inspection. \$100 additional charge for last minute inspection requests.

Cost savings idea: collect new vine purchases at one central holding location for one inspector to look at before delivering to individual growers, provided the central collection and inspection location is kept phylloxera-free.

For more information on CDA inspections, contact:

Laura Pottorff: laura.pottorff@state.co.us
or 303.869.9070

Cheryl Smith: cheryl.smith@state.co.us
or 303.869.9073

II. C. Hot water treatments are easily done in-house and have proven effective in controlling phylloxera on nursery stock

- Need to be standard operating procedure for all *Vitis* planting material brought in to the area
- 5 minutes at 43° C (110° F), followed by 5 minutes at 52° C (125° F)
- Overheating (too hot, too long) can damage plants
- Phylloxera can survive shorter time periods and/or cooler water

II. D. Actions for Existing Vineyards

D. 1. If you would like to have your existing vines inspected and the roots examined for phylloxera:

- The Cooperative Ag Pest Survey continues to include phylloxera on its list of grape pests through the 2020 growing season. Contact Laura Pottorff, CDA State Survey Supervisor for Cooperative Agriculture Pest Survey Program, to inquire about a survey at your location, 303.869.9070 or laura.pottorff@state.co.us.
- The Upper Grand Valley Pest Control District (Palisada area) lists phylloxera as a species

regulated for control. To report infestations or request assistance, contact Mesa County Noxious Weed and Pest Management Coordinator, weed.pest@mesacounty.us, 970.255.7121

- State viticulturist Dr. Horst Caspari and Mesa County Extension Agent and entomologist Meredith Shrader have also been doing sampling. Find their contact information on page 8.

Treatments

D. 2. Chemical control: There have been some advances in systemic pesticides, but they mostly buy time to save up for replanting self-rooted or damaged vinifera. See [Cornell University Management Options for Phylloxera on Frontenac](#). The leaf form of phylloxera causes little damage to the vine. For this reason, foliar sprays to control phylloxera during their wandering stage are of limited value.

- Movento Spirotetramat
- Neonicotinoids (Nicotinic Acetylcholine Receptor Agonist) such as:

- Imidacloprid (Admire Pro, others)
- Clothianidin (Belay, others)
- Dinotefuran (Venom, Scorpion, others)
- Thiamethoxam (Platinum, others)

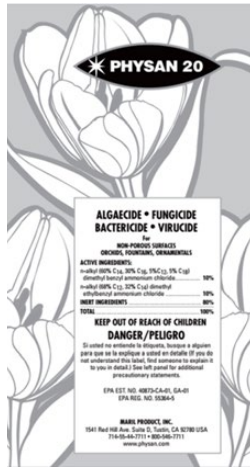
D. 3. Limit and closely monitor foot and equipment traffic in your vineyard.

- Especially if your vineyard is on or near a winery with lots of consumer traffic, post signs requesting people get permission to enter your vineyard.
 - The Colorado Association for Viticulture and Enology (CAVE) and the Colorado Wine Industry Development Board (CWIDB) have developed such signs for you to post at all vineyard perimeters. Call 303.869.9177 or 970.464.0111 to request a sign. Also you can ask CSU staff.
- Provide protective or sanitation equipment (foot booties, protective clothing, etc.) for workers and authorized visitors when necessary.

D. 4. Equipment and worker sanitation protocols: Read pg. 7-8 of [“Grape Phylloxera, Biology and Management in the Pacific Northwest”](#) from Oregon State University Extension Service.

- Restrict the movement of soil in the vineyard: start work in blocks known to be free of phylloxera and move to those thought to be infested.

- Sanitize trucks, bins and shoes before entering and when leaving the vineyard with one of the following:
 - 60 second treatment with a 2% solution of sodium hypochlorite (NaOCl or NaClO), which is the active ingredient in most bleach formulas. Check the bleach content label to determine proper ratio to reach 2% sodium hypochlorite. Note that some bleach formulas do not contain NaOCl.
 - Soap or fatty acid-based disinfectants
 - Commercial products such as Physan 20
 - A quaternary ammonia solution
- At the winery, restrict all vehicles to a paved sanitation pad, which should be washed down



- daily with one of the mixtures above or at the very least pressure wash with hot water.
- **KNOW WHERE EACH LUG, BIN AND WORKER HAS BEEN BEFORE ENTERING YOUR VINEYARD.**
- Keep picking totes and macro-bins separate for each vineyard and do not share totes or bins with other vineyards or wineries.
- Know what the sanitation procedures are for all of the vineyards and wineries before exchanging containers or equipment or workers.
- It is probably easier to just sanitize and power wash the inside and outside of all bins, totes, etc.
- Use buffer zones and transmission barriers between *vinifera* and hybrid planting blocks and between known infestation sites and phylloxera-free sites.

Most grape movement in Colorado is from the Western Slope to the Front Range, but be extra cautious about grape bins and any other equipment that travel across the state.

III. Replanting

III. A. Use grafted, resistant rootstock for *V. vinifera* plantings:

- “Self-rooted European winegrapes are not resistant to grape phylloxera and will die after they become infested. **Vines grafted onto a resistant rootstock are the best insurance and the only control measure against phylloxera.**” (from berrygrape.org/buying-winegrape-plants/)
- Compare the added cost of purchasing new *vinifera* vines grafted onto resistant rootstock to the future expense of replacing self-rooted vines when they become infested.
- Consider the added cost benefits of resistant, native *Vitis* species vs. *Vitis vinifera* when selecting cultivars for a new planting.
- When ordering new vines, consider grafted rootstock:
 - Own rooted vines may be cheaper and less susceptible to cold damage at the graft.
 - Resistant rootstocks can support long term reproducing phylloxera populations. This is the most successful defense mechanism that has allowed California, Europe and the rest of the world to continue to grow grapes in the presence of phylloxera.

- Be sure to select rootstock that not only shows appropriate phylloxera resistance and tolerance for Colorado’s climate but also is appropriate for your soil types and location.
 - CSU State Viticulturist, Dr. Horst Caspari, has some very preliminary results from rootstock trials that are not always consistent with trials done in other states.
 - Consult with CSU or another viticulture expert to select the best rootstock for your particular location and conditions.

III. B. Implement cold protection protocols to prevent graft damage in winter if needed.

- Traditionally, this means physically mounding up soil around the graft union before the first fall freeze and uncovering it after the last spring frost. This method can be very labor intensive and consequently expensive.
- Research using straw to mulch the graft unions. Up front costs may be greater than mounding soil, but may provide multi-year graft protection as well as weed control and organic matter for the soil.

MORE INFORMATION SOURCES

Questions and contacts:

Dr. Horst Caspari, CSU State Viticulturist:
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970.434.3264 x204

Colorado Association for Viticulture and Enology
(CAVE): 970.464.0111

Colorado Wine Industry Development Board (CWIDB):
303.869.9177 or 303.869.9178

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CDA State Survey Coordinator for Cooperative
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Meredith Shrader, CSU Tri River Area Extension
Entomologist:
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970.244.1838

Miranda Ulmer, CSU Extension Viticulture Specialist:
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970.241.3346 x105

Upper Grand Valley Pest Control District/Mesa
County Noxious Weed and Pest Management
(Montana Cohn)
weed.pest@mesacounty.us,
970.255.7121

Information resources for Colorado grape growers:

[Colorado Wine Board Trade Resources Page](#): for
research documents, information links and industry
information.

[Colorado Grape Growers Guide](#), CSU Extension
Bulletin 550A, 1998, pg. 10-13

[Western Colorado Research Center recent
rootstock trials](#) (Look for variety and rootstock trial
results.)

[“Grape Phylloxera, Biology and Management in
the Pacific Northwest,”](#) Oregon State University
Extension Service, #EC 1463-E, Revised June 2009

[Ontario Ministry of Agriculture Factsheet 88-125](#)
[University of Arkansas Division of Agriculture
FSA7074](#)

[University of Kentucky College of Agriculture
EntFACT-222](#)

[McLaren Vale Phylloxera Code of Conduct](#)
[University of California Integrated Pest
Management Program](#)

[Northwest Berry & Grape Information Network](#)
[Phylloxera in the Yarra Valley: A Case Study](#)
<https://en.wikipedia.org/wiki/Phylloxera>

[Annals of Applied Biology: “Grape Phylloxera—a
review of potential detection and alternative
management options.”](#)

[Rootstocks for Planting or Replanting New York
Vineyards](#), (Cornell Fruit, 2016)

[Phylloxera on Frontenac—Management Options](#),
Northern NY Grape Management Update, Cornell
University, 2013)

