

# Oregon Wine Advisory Board Research Progress Report

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## Identifying Phylloxera in a Vineyard

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### INTRODUCTION

The grape phylloxera, *Daktulosphaira vitifoliae* (Fitch), is a small root feeding insect that lives on the roots of grapevines. It is rare in Oregon but its presence in a commercial vineyard can be disastrous. Phylloxera imported into a susceptible vineyard can multiply and destroy the vineyard in only a few years.

This publication is intended to help growers identify a phylloxera infestation in the vineyard. it includes descriptions of phylloxera and phylloxera damage and suggests some sampling procedures.

Oregon vineyards are mostly self-rooted vines of *Vitis vinifera*. These vines are very susceptible to damage by phylloxera. Phylloxera can be easily moved from one vineyard to another. Therefore, the infestation of a single commercial vineyard could have important consequences for all vineyards in Oregon. Oregon currently has a quarantine designed to prevent the introduction of phylloxera into the state. However, large infestation of phylloxera are still possible in Oregon as there are already a few infestations in older, backyard vines and phylloxera could be accidentally introduced from outside the state by the illegal importation of rooted vines. If growers and their employees are familiar with phylloxera and the signs of phylloxera damage, there would be a greater chance of early detection of an infestation.

Thus, control programs and replanting plans could be started earlier, and the inadvertant spread of phylloxera to other vineyards by the careless movement of plants and soil might be prevented. Learn what to look for, to protect your vineyard, and your neighbor's.

### BIOLOGY

Phylloxera are aphid-like insects and can reproduce both sexually and asexually. The presence of the sexual stage depends on food sources, temperature and humidity. The sexual stage is not common in California and we do expect it under Oregon conditions. The asexual life cycle consists entirely of females with the complete life cycle underground.

Phylloxera overwinter as small nymphs (hibernants). In the spring they feed and mature in response to warmer temperatures and vine sap flow. The mature adults lay eggs which in turn become egg-laying adults. There can be several generations a summer. Newly hatched nymphs can leave the roots where they were hatched and travel on the soil surface, in cracks in the soil, or can climb the vine and be wind blown for considerable distances. These nymphs mature and begin laying eggs, thus establishing new

infestations. This natural spread is aided by the movement of soil and plants by man. In September or October nymphs become hibernants and the cycle is repeated.



Phylloxera hibernants on an older root. (19X) (photo by I. A. Rammer)

The food source for phylloxera is restricted to the genus *Vitis*. Most species of *Vitis*, including phylloxera-resistant rootstocks, will support a phylloxera population, although they differ greatly in the degree of damage that may result. Therefore, any rooted grape, whether grafted on a resistant rootstock or not, can potentially carry phylloxera and infect new areas.

## ROOT SYMPTOMS

When phylloxera feed on roots they cause nearby cells to divide and form swollen areas. When feeding occurs on root tips, the tips swell and become distorted. The tip then becomes club- or crook-shaped. These white or yellow growths are called nodosities and are easy to see due to their bright color relative to the rest of the root surface. They are found during times of active root growth. When the feeding is on older, larger roots, swollen areas called tuberosities are formed. As these age and decay, they may split longitudinally and infected roots will appear darker, with more cracks and sloughing bark than healthy roots. A severely infected vine will have little or no new root growth.

## VINE SYMPTOMS

In *Vitis vinifera*, phylloxera injury to the top of the plant is an indirect result of root damage. Therefore, there are no signs of damage on the above ground portion of the plant that are unique to phylloxera injury. The symptoms are similar to many other root disorders; fungal root rots, gopher damage, or mechanical damage to the roots all result in a weakened vine.

The first sign of infection is a decrease in vigor. Shoots will grow slowly, be thinner and have no tendrils. Shoot growth will stop earlier in the season than on healthy vines. Leaf analysis will indicate decreased concentrations of N, S, and K. Infected vines are more prone to water stress. As the infection proceeds, growth becomes very reduced, leaves may become scorched, and vines can collapse in mid-summer.

One of the most distinctive symptoms of phylloxera is the pattern of dead and weak vines that results from spreading infestation. Initially, only a few vines will be visibly weakened (the point source).

Within a few years a large group of weak and dead vines will surround the point source and new areas of infestation will appear nearby (satellite outbreaks). The spread may be circular or it may be influenced by wind patterns or directions of movement of machinery. Diseases that also cause areas of dead vines, such as oak root fungus (*Armillaria mellea*), do not spread as rapidly as phylloxera spots and do not develop satellite outbreaks.



Phylloxera hibernants and adults on a root nodosity. (30X) (photo by H. Kido)



Root nodosities. Scale in centimeters. (photo by D. Jordan)

Aerial photography with color or infrared film is a useful management tool in vineyards and is one of the best ways to spot early phylloxera infestations. Patterns of weak vines are clearly visible and weak vines can be checked on the ground for indications of phylloxera infestation on the roots.

## DESCRIPTION

Phylloxera are very small. Adult females are only 0.7 to 1 mm long and eggs and hibernants are only about a third that size. Adult females are pear-shaped and about twice as long as they are wide. Their color varies from greenish-yellow to light brown. Eggs are oval-shaped and bright lemon yellow when first laid. Newly hatched nymphs are also yellow and colonies of eggs and nymphs can appear as yellow patches on the roots. Hibernants are generally brown and flattened. Hibernants, nymphs and adults all

have small ridges that run across their backs. There are no other aphid-like insects that live on grape roots in Oregon.

## **FIELD SAMPLING**

An area of vines that is suspected of being infested with phylloxera should be examined carefully. As many roots as possible should be dug and examined with a 10X hand lens or a dissecting scope. Unfortunately, phylloxera are not always easy to find and they are very hard to see.

Phylloxera reproduce most successfully on healthy root systems, so vines with the most obvious symptoms of damage to the top will often have low phylloxera populations on the roots. When sampling a suspected phylloxera spot in the field, it is best to look at the border of the damaged area, at vines just showing the first signs of damage.

Phylloxera are present on vines year round but the ease of sampling and the appearance of the phylloxera will change with the season. Sampling is simplest when the ground is wet and soft and large numbers of roots can be easily dug up with a shovel. In the winter and early spring the phylloxera will all be hibernants which are very small and are the same color as the roots. They are small enough that a single hibernant on a finger tip is just barely visible to the naked eye. Hibernants congregate in cracks and under the bark of older roots. In late spring, after the adults are active, populations are higher. Adults are larger than hibernants and the bright color of eggs and young larvae are easier to see. In addition, phylloxera are more widely dispersed on the root system in late spring.

The presence of even one phylloxera in a positive proof of However, it is more prove that a phylloxera-free. phylloxera are found in a suspected spot it should still be watched carefully. If the spot enlarges rapidly it should be sampled again. County extension agents and extension specialists in the departments of entomology and horticulture at Oregon State University are available to help growers with field sampling and in examining roots suspected of harboring infestations.