Coast Live Oak Resistance to

*Phytophthora ramorum*

Brice A. McPherson¹, Sylvia R. Mori², David L. Wood¹, Pierluigi Bonello³

¹University of California, Berkeley; ²USDA-Forest Service, Albany, CA; ³Ohio State University, Columbus
East Bay hills, November 2008
China Camp State Park 2010
Phytophthora ramorum infections follow a predictable sequence in coast live oaks and black oaks (less often in tanoaks):

1. Bleeding
2. Bleeding + Beetle Attacks
3. Bleeding + Beetle Attacks + Hypoxylon
4. Death
1) Bleeding: exudation through intact bark, above soil line to about 2 meters

2) Beetle attacks on infected part of bark; ambrosia and bark beetles

3) Fungal fruiting bodies (Hypoxylon) develop on bark after beetle attacks
Median survival by disease stage, coast live oaks
Modeled median survival, based on 9 years of data

<table>
<thead>
<tr>
<th>Tree Status</th>
<th>Coast Live Oak*</th>
<th>Black Oak</th>
<th>Tanoak</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asymptomatic</td>
<td>15.8 (1.5)/11.7 (0.8)</td>
<td>13.8 (3.0)</td>
<td>8.8 (0.7)</td>
</tr>
<tr>
<td>Bleeding</td>
<td>11.7 (2.7)/7.5 (1.6)</td>
<td>6.2 (1.3)</td>
<td>5.8 (0.7)</td>
</tr>
<tr>
<td>Bleeding + Beetles</td>
<td>3.3 (0.4)/2.0 (0.2)</td>
<td>1.9 (0.9)</td>
<td>1.7 (0.4)</td>
</tr>
</tbody>
</table>

*China Camp/Marin Municipal Water District

What are roles for beetles in Sudden Oak Death?

✦ Inoculated 80 coast live oaks, 40 mock-inoculated, in July 2002 in 2 Marin County sites

✦ Treated half of each group with permethrin, a relatively nonpersistent insecticide twice per year

✦ Trapped beetles on permethrin-treated trees

✦ Collected beetles at 1-2 month intervals in 2003, then twice thereafter through 2007
Inoculated July 2002, image July 2009
External canker lengths, April 2002 (9 months after inoculation)
An inoculated tree with a canker 20 cm or less in length has an 80% probability of surviving at least another 6 years.
“It became necessary to destroy the town to save it.”, attributed to an American military official by Peter Arnett, Associated Press reporter in Vietnam, 1968

A current approach to limiting damage to threatened host oaks employs removing bay laurel trees* (the presumed Typhoid Mary of sudden oak death) to minimize ambient spore load and, it is anticipated, save oaks. The wisdom and efficacy of removing one native tree to increase the survival of another needs to be examined.

Can we justify choosing which native species will be saved, when we really do not understand the ecology of these forests?

*Oregon myrtle, to some
Acknowledgments

Marin County Open Space District
USDA Forest Service, Pacific Southwest Research Station (Albany)
Gabriela Ritokova, Nadir Erbilgin, Andrew Nelson