[The following paper was distributed in October 2003 at an SOD seminar organized by the California Department of Pesticide Regulation. We understand it was prepared by University of California SOD researchers. Bracketed [ ] language changed from original.]

GUIDELINES FOR THE SELECTION OF GOOD CANDIDATE TREES FOR THE TREATMENT AGAINST *PHYTOPHTHORA RAMORUM* (SUDDEN OAK DEATH, "SOD") USING INJECTABLE AGRIFOS AND AGRIFOS + PENTRABARK

- The treatments now available for SOD are not a universal "cure". Within any number of oak trees in an area, some trees will be extremely susceptible to SOD, some will be moderately susceptible to it, and a few will be only minimally susceptible to the disease. Trees that are highly susceptible are the least likely to be treated effectively, while moderately and little susceptible trees will be positively affected by the treatment.

- At this point, there is no easy way of determining how susceptible to SOD any specific tree may be. Trees thus should be selected for preventive treatment based on the risk-rating shown below (Table 1). We recommend treatment only for those trees that fall within the first and second risk classes.

- Not all trees with a risk-rating of 1 or 2 are necessarily good candidates. Individuals with poor form, poor growth, and spiral pattern of growth often will not be able to intake the administered compounds. If injection is the application method of choice, the abundance of decay pockets, punks, and other malformation on the lower stem will negatively affect the efficacy of the treatment, and should not be treated. Trees whose vigor has been compromised by other significant diseases should not be treated either.

- Although treatments are best used as a preventative approach, it may be possible to significantly prolong life of trees already infected by the SOD pathogen by using the newly available treatments. Research results indicate that treatments are effective only if trees are treated rapidly after being infected. The first sign of infection is the presence of viscous brown droplets on the intact bark of the tree, this symptom is often referred to as "bleeding". Treatment within 1-2 months from the first appearance of such viscous droplets is recommended. Treatment of trees having displayed symptoms for six months or longer is not recommended.

- SOD kills trees mostly by girdling the stem. The stem is girdled by cankers identifiable as sunken areas of the bark. If a large canker is already noticeable, treatment may only be partially effective. Only trees displaying lesions up to $1/10^{th}$ of the trunk circumference should be treated.

- Treatments require 3-6 weeks to be assimilated by the plant and start being effective.

- Tanoaks can only be treated via injection. All tanoaks fall into risk rating of 1 if within 4 miles of an area with confirmed SOD infestation.

- Tanoaks and live oaks can be treated all year around. Black oaks (deciduous) should be treated only when leaves are present. Optimal treatment routine for live oaks call for first treatment in November-December (if temperature still mild), with a booster treatment 6 months later. Avoid treatments when it is too cold.

Table 1. RISK TABLE FOR OAKS*

Location	Trees with diameters up to 10 cm	Trees with diameters between 10 & 50 cm	Trees with diameters >50 cm
A	3	1	1
B	4	2	1
C	4	3	3
D	4	4	4

1=most severe risk rating
4=least severe risk rating

A: candidate is at 30 m or less from a bay laurel tree known to be affected by SOD, or 50 m or less if candidate is downwind or downhill from infected bay, or 10 m or less from another oak tree or any other tree known to be infected with SOD.

B: candidate is at 30 m or less from any bay laurel trees (50 m if downhill or downwind from tree), and there are known infections in any of the known SOD host at distances between 30 and 300 m from the candidate.

C: candidate is at 30 m or less from any bay laurel trees (50 m if downhill or downwind from tree) and there are known SOD infections within a 4 mile radius.

D: all other situations (e.g., no known infection within 4 mile radius, no bay laurel trees in vicinity of candidate).

* Coast live oak, Shreve's oak, black oak, [Tanoak,] and canyon live oak are the only known [oak] hosts for SOD, other species do not need treatment as they are not affected by the disease.

Table 1. Known hosts, plant part infected, and potential impact of *Phytophthora ramorum*.

Host species[1]	**Family**	**Common Name**	**Location**[2]	**Plant part infected and impact**
Quercus agrifolia	Fagaceae	Coast live oak	CA	stem cankers; death of large trees
Q. kellogii	Fagaceae	California Black oak	CA	stem cankers; death of large trees
Q. parvula var. *shrevei*	Fagaceae	Shreve's oak	CA	stem cankers; death of large trees
Q. chrysolepsis	Fagaceae	Canyon live oak	CA	Stem cankers, death of saplings, possible death of large trees
Lithocarpus densiflora	Fagaceae	Tanoak	CA, OR	stem and branch cankers, foliar lesions; death of large trees, saplings and regeneration
Arbutus menziesii	Ericaceae	Madrone	CA	branch cankers, foliar lesions; death of regeneration and possibly large trees
Vaccinium ovatum	Ericaceae	Evergreen huckleberry	CA, OR	stem and branch cankers, foliar lesions; dieback of canes and possible death of plants
Arctostaphylos manzanita	Ericaceae	Manzanita	CA	stem and branch cankers; foliar lesions; dieback of branches
Rhododendron spp.[3]	Ericaceae	Ornamental rhododendron	CA, OR, E	stem and branch cankers, foliar lesions; dieback and death of plants
Umbellularia californica	Lauraceae	Bay laurel, Oregon myrtle	CA	foliar lesions; long term impact unknown
Acer macrophyllum	Aceraceae	Big leaf maple	CA	foliar lesions; long term impact unknown
Heteromeles arbutifolia	Rosaceae	Toyon	CA	branch cankers, foliar lesions; branch dieback, long term impact unknown
Aesculus californica	Hippocastan-aceae	California Buckeye	CA	foliar lesions; long term impact unknown
Rhamnus californica	Rhamnaceae	Coffeeberry	CA	foliar lesions; long term impact unknown
Rhamnus purshiana	Rhamnaceae	cascara	OR	foliar lesions; long term impact unknown
Viburnum spp.[4]	Caprifoliaceae	Viburnum	CA, OR, E	Stem lesions
Lonicera	Caprifoliaceae	Honeysuckle	CA	foliar lesions; long term impact

hispidula				unknown
Toxicodendron diversilobum	Anacardiaceae	Poison oak	CA, OR	Limited stem canker; long term impact unknown
Trientalis latifolia	Primulaceae	Western starflower	CA	Foliar lesions; long term impact unknown
Sequoia sempervirens	Taxodiaceae	Coast redwood	CA	branch cankers, foliar lesions; death of sprouts, decline of saplings
Pseudotsuga menziesii	Pinaceae	Douglas-fir	CA	branch cankers, foliar lesions; death of new shoots and small branches

[1] Cultures of *P. ramorum* have been obtained from all hosts with the exception of *A. manzanita*.

[2] Location from which *P. ramorum* has been observed on named host to date. CA, California; OR, Oregon; E, Europe.

[3] Rhododendron species and cultivars from which *P. ramorum* has been isolated include: *Rhododendron catawbiense*, *R. macrophyllum*, 'Catawbiense Grandiflorum', 'Catawbiense Boursalt', 'Schneewolk', 'Colonel Coen', 'Gomer Waterer', and 'Cunningham's White'.

[4] Viburnum species include *V. bodnantense*, *V. fragans*, *V. plicatum*, and *V. tinus* (Werres, 2002).

Modified from: J. M. Davidson, S. Werres, M. Garbelotto, E. M. Hansen, and D. M. Risso. Sudden oak death and associated diseases caused by *Phytophthora ramorum*. Online Plant Health Progress doi:10.1094/PHP-2003-0707-01-DG.