AOC | Association of Oregon Counties

Sudden Oak Death Task Force

Strategic Action Plan

Approved May 31, 2017

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Executive Summary

This Strategic Action Plan is the culmination of three months' work completed by the Sudden Oak Death (SOD) Task Force and its six subcommittees. The Task Force was co-convened by U.S. Senator Jeff Merkley and State Representative David Brock Smith. Its mission is to develop a collaboration-based action plan, including the securement of adequate resources, to contain the NA1 lineage of *Phytophthora ramorum* (*P. ramorum*) and eradicate the EU1 lineage using the best available science. This plan details how the mission will be accomplished through recommendations from the six issue-specific subcommittees, including but not limited to the following:

- **Funding**
    - Form a working group to identify and secure funding to implement landscape scale, place-based projects.
- **Communication and Civic Engagement**
    - Hire a marketing firm to develop a communications and civic engagement plan to begin implementing by January 2018.
- **Core Science Team**
    - Prioritize and fund new research to improve monitoring and determine pathogen host range, including examining integrated pest management and EU1 epidemiology.
- **Economic Impact and Workforce Development**
    - Hire a consultant to conduct an economic impact study to answer several questions, including evaluating:
        - The current economic impacts of SOD
        - The future economic impacts if SOD treatment is stopped and no further treatment is completed
        - The future economic impacts if we do not treat the NA1 strain but eradicate EU1
    - Implement workforce strategies to increase capacity for detection, treatment and monitoring of SOD.
- **All Lands**
    - Develop an interagency Memorandum of Understanding to implement collaborative SOD related projects across all ownerships and hire an outreach coordinator to work with landowners.

- **Adaptation**
    - Develop and implement fire risk and prevention, transportation and recreation and restoration and conservation strategies, as well as best management practices in areas affected or likely to be affected by SOD.

This plan also outlines funding requests that have been submitted at the state ($1.7 million for the 2017-2019 Biennium) and federal levels ($6.28 million for Fiscal Year 2018) to implement the recommendations of the Subcommittees. Priorities include adding capacity for detection, treatment and monitoring; funding and executing new scientific research about SOD; conducting an economic impact study; developing and executing a communications plan; and further developing and funding adaptation efforts.

With authorization from the Task Force and securement of funds, the Association of Oregon Counties' (AOC) County Solutions program staff will support the implementation of this plan by facilitating the implementation work groups and staffing their efforts.

The members of the SOD Task Force Subcommittees wish to express their most sincere appreciation to Senator Jeff Merkley and Representative David Brock Smith for convening this Task Force and their commitment and leadership in seeking the funds necessary to implement this plan.

Background Information

Who Convened this Task Force?

U.S. Senator Jeff Merkley and Oregon State Representative David Brock Smith co-convened the Sudden Oak Death Task Force at the beginning of March 2017 to develop a collaborative action plan to address the spread of the NA1 and EU1 lineages of *Phytophthora ramorum* (*P. ramorum*), often called Sudden Oak Death (SOD) in Southwest Oregon.

Senator Merkley:
"Oregon has a long history of pioneering innovative ways to resolve urgent natural resource issues. I'm proud that in a time of political divisiveness, we in Oregon are coming together to tackle a pressing issue for our southern counties. The Sudden Oak Death pathogens NA1 and EU1 are too great a problem for one agency or one level of government to solve. With the potential for devastating impacts on our local economy and environment, this task force will work collaboratively to look for more and better solutions to fight these pathogens."

Representative David Brock Smith:
"I am grateful to Senator Merkley for co-convening the Sudden Oak Death Task Force and am very appreciative of his deep understanding of this issue and its potential impact on our region."

Who serves on the SOD Task Force and its subcommittees?

Senator Merkley and Representative Brock Smith convened a large group of stakeholders, including the counties and cities in the region, state and federal agencies, local tribes, industry associations, philanthropic entities, and environmental and community groups, including (but not limited to):

- U.S. Bureau of Land Management (BLM)
- U.S. Forest Service (USFS)
- U.S. Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS)
- U.S. Department of Agriculture Animal and Plant Health Inspection Service Plant Health (USDA APHIS)
- U.S. Fish & Wildlife
- Confederated Tribes of the Grand Ronde
- Confederated Tribes of Siletz Indians of Oregon
- Coquille Indian Tribe
- Cow Creek Band of Umpqua Indians
- Elk Valley Rancheria
- Tolowa Dee-Ni Nation
- Governor of Oregon's Office/Regional Solutions
- Business Oregon
- Oregon Department of Forestry (ODF)

- Oregon Department of Agriculture (ODA)
- Oregon Department of Transportation (ODOT)
- Oregon Forest Industry Council (OFIC)
- Curry, Coos, Josephine and Douglas Counties
- Cities of Brookings, Port Orford and Gold Beach
- Oregon State University, Department of Forestry
- Oregon State University, Extension Service
- Oregon Association of Nurseries
- Oregon Small Woodlands Association
- Easter Lily Research Foundation
- Port of Coos Bay
- South Coast Lumber
- Weyerhaeuser
- Roseburg Resources
- Rayonier
- Coos Forest Protective Association
- South Coast Development Council
- SW Oregon Workforce Investment Board
- Wild Rivers Forest Collaborative
- Wild Rivers Coast Alliance
- Wild Rivers Land Trust

What is the Task Force's Charge?

The Task Force received two charges – one from the Oregon State Legislative Emergency Board and one through the development of the Task Force's mission statement:

- Direction from the Oregon State Legislative Emergency Board in the Fall of 2016:
  The Association of Oregon Counties has been asked by the Oregon Legislature to convene and facilitate a task force on Sudden Oak Death comprised of critical partners. The task force will assess the work that has been accomplished so far, the results of these efforts, and develop a strategic action plan moving forward, which will include how this plan will be funded. The task force may identify additional work tasks.

- Mission Statement approved by the Sudden Oak Death Task Force on March 3, 2017:
  Our mission is to develop a collaboration-based action plan, including the securement of adequate resources, to contain the NA1 pathogen and eradicate the EU1 pathogen using the best available science.

What is the Problem?

Sudden Oak Death (SOD), caused by a non-native pathogen *Phytophthora ramorum* (*P. ramorum*), is a devastating disease that has killed hundreds of thousands of tanoaks trees in Curry County. SOD was first detected in Oregon in 2001 and has spread to approximately one-third of the county since the initial detection. These are the only forests in Oregon that are currently affected and a containment program is in place to slow the spread. If further measures aren't taken, however, the pathogen is expected to spread north into Coos County and west into Josephine County in the coming years.

Additionally, a European strain of *P. ramorum*, EU1, which affects evergreen trees was recently detected in Oregon. This is the only forest infestation of EU1 ever found in the United States. Given the potential for extremely negative economic and environmental impacts, treatment to eradicate EU1 from Oregon's forest has been a priority for the Oregon Department of Forestry and the interagency Science Team.

Why the Need to Call the Task Force Now?

Sudden Oak Death continues to spread mostly to the north in Curry County. If more aggressive action is not taken to slow and contain the disease, it will continue to expand its range, which could result in further restrictions and quarantines that would negatively affect the natural environment of species susceptible to SOD and continue to hurt the economy of the South Coast.

The relatively recent detection of the EU1 strain of *P. ramorum* has the potential for extremely negative consequences for conifer species, the environment and the economy. Thus, the Task Force established a clear priority to eradicate the EU1 strain before it expands any further.

Strategic Action Plan

To address specific issue areas, Co-conveners Senator Jeff Merkley and State Representative David Brock Smith also convened six issue-specific Subcommittees that met once in April and once in May. Their objectives were:

- **Communication & Civic Engagement Strategy Subcommittee**
  This committee will develop a communication and civic engagement strategy for the public, property owners and agencies interested in this subject.

- **Core Science Team**
  This subcommittee is responsible for providing information on the latest science, research still needed and recommendations.

- **Adaptation Team within the Quarantine Area**
  This committee will develop a strategy to deal with the effects of SOD on fire danger, transportation, and public safety. They will explore how to live with and be proactive with SOD.

- **Public, Private, Civic Funding Subcommittee**
  This committee will help develop funding strategies and proposals as well as advocate for funding as identified by the other groups.

- **All Lands Coordination Subcommittee**
  This committee will include public, tribal and private property owners working and coordinating together to ensure all entities who have an interest integrate their efforts in a seamless fashion.

- **Economic Impacts and Workforce Training Subcommittee**
  This committee will work with a contractor to develop an economic impact study of Sudden Oak Death now and into the future. This committee will also develop workforce strategies that will help implement the recommendations from the other Subcommittees and the SOD Task Force and create jobs to treat the disease infested areas.

Recommendations:

The Public, Private, Civic Funding Subcommittee recommends a working group be formed, including major land owners (USFS, BLM, State) and other interest groups such as NRCS, Oregon Watershed Enhancement Board (OWEB), Federal Energy Regulatory Commission (FERC), Oregon Nurseries Association, Oregon Forest Industry Council, tribes, key philanthropic entities, the local forest collaborative, and others that works to:

1) Identify landscape scale, place-based projects that cross ownership boundaries, and
2) secure the appropriate resources to implement those projects.

Example: Klamath model

The Communications & Civic Engagement Subcommittee recommends issuing a Request for Proposals to hire a marketing/outreach firm to work with key partners to develop a clear message and a coordinated communications plan to begin implementation no later than January 2018. The message must be one that can be tailored for each target audience to answer the questions, "how does this affect me?" and “what can I do?” The plan should include (but is not limited to):

- Talking Points
- Website
- Earned Media Strategy
- Social Media
- Public Service Announcements
- Mail
- Speaker's Bureau
- Door-to-door outreach
- Citizen Science program

Talking points and strategies should also communicate protocols for the public in and around the quarantine area, as well as treatments and SOD-related work that has already been done or are underway.

Example: The Samara Group (samarapdx.com) in Portland has conducted marketing/outreach campaigns with the Oregon Department of Agriculture and the Oregon Invasive Species Council to address gypsy moth and other infestations of invasive species in Oregon.

To ensure accountability, it is recommended that this Subcommittee continue to meet to review the RFP, assess the applicants, and provide support as the plan is developed and executed. AOC’s County Solutions staff will support implementation of these recommendations by facilitating the implementation work group and staffing their efforts.

The Core Science Team recommends prioritizing the following research to improve monitoring and determine pathogen host range. Priorities for funding should include:

- Integrated Pest Management
  - Silvicultural treatments
  - Chemical treatment
  - Disease resistance – investigate the use of resistant plants to sustain ecological function.

- EU1 Epidemiology
    - Compare EU1 and NA1 strains for virulence, pathogenicity, sporulation and epidemiology
    - Research how EU1 propagates itself
    - Identify the impact of EU1 on conifer species and sporulation

- Evaluate and improve control efforts and early detection monitoring techniques.

- Quantify the ecological and social impact of living with SOD.

These research priorities assume additional landowner participation through in-kind contributions.

The Economic Impact & Workforce Development Subcommittee recommends issuing a Request for Proposals and hiring a consultant to complete an economic impact study of Sudden Oak Death.

Key questions to examine/include in the RFP:

1. What is the economic impact of SOD today in the quarantine area, on state, federal, tribal and private lands?
2. What's the economic impact if we do nothing?
3. What's the impact if we do not treat NA1 and aggressively focus on EU1?

The study should also assess:

- The direct/indirect/induced impacts, including:
    - The indirect economic costs of the loss of public revenue and increased cost to local government and tribes
    - Socioeconomic impacts on tribal cultural and traditional uses
    - Habitat and ecological value
    - Extraction (hunting, fishing) and other recreational uses (hiking, camping, bird watching, biking)
    - Whether the quarantine zone impacts land/property values?
- The geography of the quarantine area – what is the economic impact of the current quarantine area? What if the quarantine expands to all of Curry County? All of Curry and Coos Counties? If it reaches the Port of Coos Bay? And what if it expands everywhere tanoak is present (Coos, Curry, Josephine, Jackson, and Douglas Counties)?
- The value of the trees for private property owners – what is the true value of the trees?
- What's the economic cost of hazard trees falling on roads, houses, etc.?
- The added cost to private land owners to meet regulatory requirements to export products from Curry County.

- What is the economic impact of conifers being infected by NA1 over and over, which causes tip die back, suppresses the new growth, and reduces the size/overall health of the tree?
- What is the economic impact on the nursery industry in Oregon?

It is recommended that members of this Subcommittee continue to meet to review the RFP before it goes to bid, assess the applicants, provide support as the study is developed and review the final product. AOC's County Solutions staff will support implementation of these recommendations by facilitating the implementation work group and staffing their efforts.

Workforce Development

The Economic Impact & Workforce Development Subcommittee also recommends several strategies to increase capacity for SOD detection, treatment, monitoring and restoration activities and create jobs, including (but not limited to):

- Hiring additional staff at the agency level to administer expanded treatment opportunities.
- Hiring additional workers in and around Curry County for treatment and other SOD related activities.
    - Contracting local fire crews, agency crews, and tribal crews that are out of work at the end of the summer fire season.
    - Working with the county to keep their seasonal employees employed year-round to do SOD treatments.
    - Coordinating with the Oregon Workforce Investment Board to examine the applicability of hiring low-income workers in SW Oregon.
- Helping to streamline processes so fire crews that are laid off after the summer fire season can be picked up by another agency. (It can be challenging to extend contracts for these crews because they are hired as "1039" temporary employees and are limited in the number of hours they can work for one agency.) Strive to establish processes that give priority to local contractors and workers.
- Explore opportunities for:
    - Jobs related to restoration (planting pathogen-resistant species and protecting water quality)
    - Value-added forest product industry and related workforce (i.e. chipping tanoak, using it for pallets or flooring, log debarking, cleaning, etc.)
    - People with strong technical skills to help with surveying, etc.

AOC's County Solutions staff will support the implementation of these recommendations by facilitating the implementation work group and staffing their efforts.

The All Lands Subcommittee recommends:

- The agencies develop policies at the programmatic level to encourage and support projects across all land ownership (i.e. The Wyden Bill, IGAs that allow for work across boundaries, Good Neighbor Authority, Tribal Forest Protection Act).
- An interagency MOU between ODF, BLM, USFS and Tribes to implement SOD related all lands projects.
- Funding a SOD outreach coordinator as soon as possible.
- Providing prior notification and opportunity for input between agencies, Tribes, private landowners, and counties in and close to the quarantine area in establishing or expanding the quarantine area.
- The Science Team continue to take an all lands approach.

AOC's County Solutions staff will support implementation of these recommendations by facilitating the implementation work group and staffing their efforts.

The Adaptation within the Quarantine Area Subcommittee divided their recommendations into several categories including:

Fire Risk and Prevention:

- Secure funding to remove tanoak trees once they are dead and help private land owners dispose of the trees.
- Create Fire Wise Communities to get the work done for people in the area and reduce fire risk. The first priority would be the Cape Ferrelo Rural Fire District for now.
- Explore the possibility of an incentive program for landowners to remove dead oaks and restore habitat.
- Investigate potential disposal sites inside the Generally Infested Area (GIA) for SOD treatment material.

Transportation/Roads/Recreation

- Pretreat areas along roads and high-use recreation areas that could potentially become a hazard with buffer strips (i.e. Increase public safety and decrease risk by establishing clear protocols and removing tanoak adjacent to roads and high-use recreation areas within the quarantine area).
- Prioritize Carpenterville Rd. (Old Highway 101) for clean-up and then focus on local County, National Forest and BLM roads affected by tanoak mortality.

Restoration and Conservation:

- Identify important cultural and ecological sites to preserve and protect.
- Engage public and private landowners to help identify infestations.
- Incentivize citizens to help identify living tanoaks inside of the GIA for potential resistance breeding or genetic conservation.
- Expand SOD related education programming provided by OSU Extension and others.

Prevention

- Provide best management practices to communities in advance of SOD infestation via education outreach.
- We encourage the creation of a citizen science program.
- Explore funding opportunities/options to provide phosphite kits to areas with surviving tanoaks within the GIA. (Phosphite can be effective as a preventative treatment in tanoak if applied before the tree is exposed to *P. ramorum.)*

Seek an early win with communities living with the disease by targeting high priority areas such Cape Ferrelo for dead tree removal.

AOC's County Solutions staff will support implementation of these recommendations by facilitating the implementation work group and staffing their efforts.

Funding Recommendations

Through interagency cooperation, the U.S. Forest Service and Oregon Department of Forestry developed a white paper detailing four possible funding alternatives (*See Appendix A*). After careful review of the four alternatives and consideration of the Task Force's mission to contain the NA1 pathogen and eradicate the EU1 pathogen using the best science available, it is recommended that Alternative 4 be used for planning, implementation, and funding.

Alternative 4: Contain to Curry County for As Long as Possible

Focus on preventing sudden oak death from entering the adjacent counties, Coos, Douglas, and Josephine, for as long as possible. This alternative increases the chance to protect important tanoak ecosystems, and provide long term conservation and adaptation of tanoak genes. Alternative 4 builds on Alternatives 2 and 3 because continuing to slow the spread in the southern portion of Curry County is essential for containment farther north.

There is strong interest in avoiding a county wide SOD Quarantine in Curry County as well as avoiding the spread of SOD into neighboring counties. In addition to treatments, a way to stop human-assisted spread and other unanticipated infestations would be to establish an Emergency Fund held in reserve and available to rapidly respond to new infestations in an action zone adjacent to neighboring counties or for sites detected in the neighboring counties themselves.

This opportunity also requires an expansion of survey, detection and monitoring capacity due to the need to survey the action zone and the area between the action zone and quarantine area at intensities currently reserved for within the quarantine area and for areas proximately surrounding its boundary. From the Emergency Board allocation in 2016, $100,000 has been placed into an emergency treatment fund to be used on any new infestation outside of the current quarantine area or a new infestation of the EU1 strain. Given the cost of an ideal eradication treatment (600-foot radius, 26 acres), this emergency treatment money is sufficient to cover one infestation. An emergency eradication treatment fund totaling $500,000 would potentially treat five new sites (or 100 acres) at the ideal treatment level. Establishing this fund would relieve the continual burden of finding additional funding for rapid response to new infestations in an action zone.

Alternative 4 requires increased survey effort in the 6-mile-wide action zone between Curry, Coos and Douglas Counties. The additional survey effort would include 20-30 stream baits and two aerial surveys of 250,000 acres each near the county line. It would also include intensive delimitation surveys whenever a new infestation is found. This alternative will likely require an increase in field staff. The cost of this increase in aerial surveys, field technician time, and lab diagnostics is estimated at $100,000 per year.

Additionally, the program must be able to mobilize eradication crews quickly and sometimes simultaneously within days or weeks of detection to prevent additional spread, especially in the action zone. Contractor response time has been problematic due to fire danger and contractor availability. We will need to review and secure contracts to ensure acceptable response or train a local workforce to conduct eradication work.

Alternative 4 is designed primarily to ensure SOD does not move into Coos, Douglas, or Josephine Counties for as long as possible. This funding level would accomplish this goal for at least 10 years but potentially longer.

Cost: $6,020,000 per year

- **ODF -** $225,000 for program administration and treatment on state and private lands
- **USFS** - $380,000 for program administration and treatment on USFS land
  $3,650,000 for support to others (e.g. ODF, OSU, BLM) and additional treatment on USFS land
  $1,200,000 for research
- **USDA APHIS** - $15,000 to OSU
- **BLM -** $550,000 for program administration and treatment on BLM land

Funding Requests in Progress

As of May 2017, two funding requests have been submitted to State and Federal legislators and the Task Force recommends ongoing efforts to secure these funding requests at the highest level possible in order to efficiently and effectively implement the recommendations developed and accepted by the Subcommittees.

State Funding Request

House Bill 3151 was introduced by Representative David Brock Smith with an amendment to fund the SOD program at **$1.7 million for the biennium**, including a small amount of funding for AOC to assist in facilitating the implementation of the Task Force's recommendations. HB 3151 has the support of the Oregon Coastal Caucus as their number one legislative priority. Meetings and lobbying efforts have occurred with the Senate President, the Speaker's Office, both Co-Chairs of Ways and Means and key staff in the Governor's office. HB 3151 was passed by the House of Representatives in April and has been assigned to the Natural Resources Subcommittee of Ways and Means where it awaits a hearing, which should be scheduled in the next few weeks.

Federal Funding Request

The following Federal Fiscal Year 2018 Appropriations requests have been submitted to Senator Merkley on behalf of the Task Force:

- BLM – $550,000 increase for SOD treatment and language to allow BLM to more transparently transfer grant funds to the state or counties for the treatment of invasive species and research.

- USFS – Increase the Forest Health line item in two categories:
    - $380,000 increase for treatment on USFS lands
    - $3,650,000 for support to others (e.g. ODF, OSU, BLM) and additional treatment on USFS land

Research funding – $1,200,000 for year one, to be increased to $1,700,000 per year for the following three years.

Implementation Strategy

With authorization from the Task Force and securement of funds, the Association of Oregon Counties' County Solutions program staff will support the implementation of the Strategic Action Plan by facilitating the implementation strategy work groups and staffing their efforts.

Specific implementation strategies include, but are not limited to:

- Issuing a Request for Proposals and hiring a consultant to complete an economic impact study of SOD and ensuring the results of this study are shared broadly and are used to help develop communication strategies.

- Issuing a Request for Proposals and hiring a marketing firm to develop a clear message and communication plan by January 2018 that engages and coordinates public, private, civic, and local partners and working with partners to execute it.

- Forming a working group across all land ownerships to identify landscape scale, place-based projects and secure the resources needed to implement those projects.

- Facilitating funding for new research into integrated pest management strategies and improved control techniques, EU1 epidemiology, early detection methods and the ecological and social impacts of living with SOD.

- Coordinating the exploration of workforce opportunities for SOD related activities including detection, treatment and restoration.

- Supporting the development of a Memorandum of Understanding (MOU) between ODF, BLM, USFS, and Tribes to encourage and support efficient detection, treatment and monitoring of SOD across all ownerships.

- Coordinating with local agencies to facilitate fire risk and prevention strategies, transportation and recreation safety projects, restoration of the landscape following SOD treatments and outreach and education of private property owners and the public.

The Association of Oregon Counties County Solutions staff may assume other commitments to aid in the implementation of this Strategic Plan as identified by the Task Force and its implementation work groups.

Appendix A

USDA Forest Service

Oregon Department of Forestry

Sudden Oak Death Management in Oregon Forests

Issue Paper

Options for Current Management Program
21 April 2017

SUMMARY

The purpose of this document is to summarize alternatives for the sudden oak death program for all forest lands in Oregon for the next five years. The Sudden Oak Death (SOD) Technical Task Force developed initial options for the function, funding and organizational structure of the sudden oak death program. The technical specialists (pathologists) convened the meetings to engage agency leaders with program leadership and planning. State and federal management teams responsible for the SOD program reviewed these options. Key components of those strategies were discussed and are presented here as a set of alternatives. The discussions did not lead to a recommendation for a fundamental change in the current SOD program, although the discussion recognized that continuing the current program is not sustainable as currently structured and funded.

ISSUE

The current slow-the-spread program uses early detection, monitoring and eradication treatment to reduce the rate of disease spread and slow disease intensification. The SOD technical team designed the program to treat infested sites outside of the generally-infested area (GIA), where the disease is commonly found. Eradication treatment priorities are set based on multiple factors including number of infested trees, location relative to quarantine boundaries, and available funds. Eradication treatments on non-federal lands range from cutting and burning an infected tree and its nearest neighbors (1/10 acre) to cutting and burning all host plants within a 300-foot treatment buffer (up to a maximum of 600-foot buffer). Expanding the GIA alleviates the obligation of non-federal landowners to treat infested sites in recognition of the high cost of doing so and the lack of available funds to cover these costs.

At the current pattern and rate of spread, the program does not have sufficient funds to treat sites that are of high priority for disease spread as proposed in the design of the slow-the-spread program. Currently, the minimum treatment option is being implemented due to insufficient funds to support the maximum treatment option. As the disease progresses, the slow-the-spread program will become more costly. Further, the inability to apply eradication treatments to infested sites on all land ownerships will increase disease intensification and spread and ultimately require expansion of the GIA. This trend also will increase the probability of spread of SOD into surrounding counties (Coos, Douglas and Josephine).

BACKGROUND

In 2001, Oregon discovered *Phytophthora ramorum,* the invasive non-native pathogen that causes the sudden oak death (SOD) disease in tanoak. *P. ramorum* spreads mostly by air when rain splashes the spores into the wind, which carries them to another host species; most likely the upper canopy of a tanoak. However, people can also spread the disease by transporting infected plant material to uninfected areas. Besides tanoak, *P. ramorum* can infect many other species of trees and shrubs. In Oregon, the diseases on these other hosts do not lead to plant mortality.

When first discovered, the objective of Oregon's SOD program in forestland was elimination of the pathogen through eradication. Eradication treatment of an infested site consists of cutting, piling and burning all infected plant material and exposed host plant material within a specified radius (aka treatment buffer) surrounding infected plants. The species of exposed host plants that are treated varies from site to site based on infestation levels and could include Oregon myrtlewood, evergreen huckleberry, and rhododendron. The size of the treatment buffer varies depending on the level of infestation and the availability of funds to conduct the treatment; but efforts have shown that treatment within a 300-foot buffer conducted promptly following detection can successfully eliminate the pathogen from the site and slow spread. Eradication treatment can also include the application of herbicides to prevent sprouting of tanoak from stump material. Treatment is followed by reforestation by conifer or other non-host species that reduce the risk of disease recurrence or spread. Sites are monitored for persistence or recurrence of the pathogen with follow-up treatment to destroy residual or recurring infections.

Spread of *P. ramorum* is managed through the designation of a SOD quarantine area under the authorities of the Oregon Department of Agriculture (ORS 603-052-1230) and the U.S. Department of Agriculture Animal Plant Health Inspection Service (7 CFR 301-92). The state and federal quarantines regulate the intrastate and interstate movement of host plant material outside of the quarantine area. Oregon regulations require infested sites on state and private lands to undergo eradication treatment and sets forth requirements for disease free certification when moving uninfected host material to areas outside the quarantine. While federal land management agencies (U.S. Department of Interior Bureau of Land Management (BLM) and U.S. Department of Agriculture Forest Service (USFS)) are not required by federal regulations to eradicate *P. ramorum* from infested sites, federal land managers have conducted eradication treatments on all known infested sites on federal lands up to 2016.

By 2010, the quarantine area had expanded from its original 2001 size of nine square miles to 154 square miles and Oregon's SOD program on forestland transitioned from eradication to slowing the spread of *P. ramorum*. The 2010 SOD Quarantine also designated a Generally Infested Area (GIA) within the quarantine area where eradication treatment of infested sites is no longer required. Currently, federal land managers (BLM) are still conducting eradication treatments on infested sites within the GIA. The USFS has no lands within the current GIA. In contrast, treatment of non-federal sites within the GIA has mostly abated. The quarantine area expanded to 202 square miles in 2012; to 264 miles in 2013 and to 515 square miles in 2015. If SOD expands beyond the new 2015 quarantine boundary, the next quarantine area likely will be all of Curry County. The GIA now covers 58 square miles of disease establishment and intensification within the quarantine area; approximately 10 miles north-south and six miles east-west

DISEASE SPREAD

From the original infestations of 2001, SOD has spread 18 miles to the north and 8 miles to the east (Figure 1). The farthest of the infestations have received eradication treatments consisting of cutting, piling and burning of all host material within a 300-foot treatment buffer surrounding the infected trees. Many factors can affect rate of disease spread. These include climate, forest structure, host distribution, and disease abundance. Human assisted spread by moving infected plant material can transmit the disease over long distances and is a wildcard factor in terms of predicting disease spread.

Current rates of spread are estimates made from the following:

Humboldt County, **California Infestation**: From 2003 to 2014 SOD had spread northward 39 miles (3.5 miles/year) from the initial infestation. There is no comprehensive control program in Humboldt County. Further, compared to Curry County, Oregon, the Humboldt County climate is less conducive to disease spread.

Curry County: Maximum distance of natural spread (no evidence of human assistance) in any given year appears to be 3 to 4 miles. From 2001 to 2016 the disease has spread northward 18 miles (average 1.4 miles/year) from the original 2001 infestations. Over the same period spread to the northeast up the Chetco River was 8 miles (average 0.6 miles/year) from the original infestations. Human assisted spread by moving infected plant material, usually nursery stock, can transmit the disease over long distances and is a wildcard factor in terms of predicting disease spread. An example of this in Oregon is the 2010 infestation at Cape Sebastian State Park, which probably originated from nursery plants from as far away as California. Eradication treatments under the current slow-the-spread program now focus on new infested sites located outside of the GIA. The goal is to prevent these sites from becoming new sources of inoculum (or at least diminish their power); thus, slowing disease spread.

Expected Spread Scenarios

While it is difficult to forecast an expected rate of spread, the following comparisons are informative.

Spread scenario assuming little or no eradication treatment to slow spread. This scenario assumes no human assisted spread, and natural spread northward at a rate of 3.5 mi/year, from the farthest north infestation (Hunter Creek). This spread rate is based on data for Humboldt County and for recent years in Oregon. Under this scenario, SOD reaches an adjacent county (most likely Coos) in ±12 years.

*Spread scenario under the current slow-the-spread program***.** This scenario also assumes no human assisted spread. It assumes the GIA expands northward at a rate of 2 mi/year (the rate of recent GIA expansion), with new infestations occurring no more than 12 miles north of it. All new infestations outside the GIA get some level of eradication treatment. Because of limited funding many sites will not be treated to the desired 300-foot treatment buffer. Under this scenario, SOD reaches an adjacent county (most likely Coos) in ±20 years.

Recent Trends in Disease Intensification and Spread (2014-2016)

Due to funding limits on the current slow-the-spread effort on non-federal lands and the establishment and expansion of the GIA (where there is no eradication effort on non-federal land), the amount of disease is increasing. This, along with favorable wet weather conditions for disease spread, has increased the number of new infestations at dispersal distances greater than 2.5 miles. It is reasonable to assume that rate of spread calculations that include the first 10 years of the eradication program will underestimate current and future spread.

In early 2015, another clonal lineage of *P. ramorum* (EU1) was detected on a single tanoak tree near the Pistol River on non-federal land. This is the first report of the European (EU1) lineage in US forests. Genetic analysis suggests a nearby private nursery (now closed) as the probable source. This finding is of particular concern because in Europe, the EU1 lineage kills or damages several conifer tree species and is considered more aggressive than the North American lineage (NA1). Furthermore, establishment of the EU1 lineage would create the potential for sexual reproduction and increased variability in the North American *P. ramorum* population. The EU1 infestation was cut and burned (13 acres) and has not been detected in post-treatment vegetation sampling in the vicinity. In 2016, the EU1 lineage was detected for a second time, ½ mile south of the one EU1-infested tanoak found in 2015. Of the 25 positive trees identified, two grand fir seedlings and 23 tanoaks are confirmed positive for EU1.The 2016 EU1 infestation is the top treatment priority and will include a 300-600 ft. treatment buffer, resulting in a 50-acre treatment. Continued monitoring and ground surveys in the area have resulted in the detection of two additional infestations, one directly to the north of the 2016 eradication treatment and one a half mile north of the treatment. At this point, eradication of the EU1 linage is still possible, but funding and landowner cooperation have been challenges.

CURRENT SOD SLOW-THE-SPREAD PROGRAM

The current slow-the-spread program uses early detection, monitoring and eradication treatment on sites outside the GIA to reduce the rate of disease spread and slow disease intensification. Survey, detection, and monitoring efforts compose of ground, aerial and stream bait surveys. Ground-based detection and delimitation surveys around infested sites are conducted year-round. Aerial surveys, both fixed winged and helicopter, are conducted four times per year; the main surveys occur in July and October when current-year mortality is most visible. Aerial surveys cover a cumulative area of at least 700,000 acres of forest; ground surveys cover 600 acres. The current program is incorporating the use of high resolution digital aerial imagery to augment aerial surveys. High-risk streams within and outside of the SOD quarantine area are targeted for stream baiting; the practice of periodically submerging host plant materials in streams and then testing the material for the presence of *P. ramorum*. Additional streams near infested nurseries or other infested non-forest sites may also be baited. Stream baits are deployed and collected at two-week to one-month intervals for a minimum of 8-10 months, beginning in late April.

Once an infestation is detected from the survey efforts, eradication treatments are conducted on all infested sites outside the GIA to the desired 300-foot treatment buffer. Eradication treatment on non-federal land still complies with quarantine regulations for conducting treatment, but the level of treatment varies from site to site due to limitations on available funds. Federal land managers conduct eradication treatments to the desired 300-foot treatment buffer outside of the GIA, and in the case of BLM, also within the GIA.

Eradication treatments are most effective when conducted promptly and at the largest treatment buffer possible. However, if funds are not sufficient, the minimal treatment is better than no treatment but increases the likelihood of the disease showing up nearby in subsequent years.

- Minimal Treatment -- Cut and burn all host material within **20 to 50'** radius of infected tree (0.03 to 0.18 acres) and fell and lop remaining tanoak within 300' radius of the infected tree. Cost $1,500 per site.
- Desired Treatment – Hack and squirt all tanoak, then cut and burn all tanoak within **300'** radius of infected tree (6.5 acres). Cost would be $32,500 per site ($5,000 per acre). Sites that have a cluster of infected trees would be disproportionately higher in cost as the 300' radius for the buffer treatment is from the farthest tree out from center.
- Ideal Treatment – Hack and squirt all tanoak, then cut and burn all tanoak within **600'** radius of infected tree (26 acres). Cost would be $130,000 per site ($5,000 per acre). Sites that have a cluster of infected trees would be disproportionately higher in cost as the 600' radius for the buffer treatment is from the farthest tree out from center.

Program Structure

Essential program functions are shared among the following:

Oregon Department of Forestry (ODF) – Survey, detection and monitoring; planning and administration of eradication treatments on non-federal land; landowner education and assistance. Operations are managed by the statewide forest pathologist in Salem Private Forests Division plus two Coos Bay District SOD foresters located in Brookings.

Oregon Department of Agriculture (ODA) – Authority and administration of the SOD Quarantine. Authority and administration of the nursery SOD program. Coordinates with USDA Animal and Plant Health Inspection Service (APHIS). Operations managed out of Salem.

USDA Forest Service (USFS) – Planning and administration of eradication treatments on Rogue River-Siskiyou National Forest lands; assists ODF with aerial survey, conducts ground survey, detection and monitoring and technical assistance to federal land managers. Ground survey and treatment operations are managed by Southwest Oregon Forest Health Protection Service Center's zone forest pathologist in Central Point and SOD Forester in Gold Beach in conjunction with the Rogue River-Siskiyou National Forest. Aerial survey assistance provided by Pacific Northwest Region Forest Health Protection aerial survey program. Through grants provided to ODF & BLM and contracts with OSU the USFS provides program funding, technical support and assistance to entities engaged in SOD work.

USDI Bureau of Land Management (BLM) – Planning and administration of eradication treatments on Coos Bay District lands; conducts ground surveys and monitoring. Operations managed by BLM foresters in the Coos Bay District Office with program coordination by Oregon State Office in Portland.

Oregon State University (OSU) College of Forestry – Testing of sampled plant material for *P. ramorum* and related diagnostics. Everett Hansen Lab in Corvallis. Research into pathogenicity of NA1 and EU1 lineages of *P. ramorum*. Jared Leboldus Lab in Corvallis.

Oregon State University College of Agricultural Sciences/USDA Agricultural Research Service (ARS) Horticultural Crops Research Unit -- Genotyping of *P. ramorum* species and clonal lineages from sampled plant material. Nik Grünwald Lab in Corvallis.

Oregon State University Forestry and Natural Resource Extension Service – Outreach, education and assistance. Operations conducted by Forest Health Extension Specialist in Corvallis and the Coos and Curry Extension Forester in Myrtle Point.

Coordination of operations is conducted by the SOD Science Team: Ellen Goheen (Forest Pathologist, USDA Forest Service), Everett Hansen and Jared Leboldus (Forest Pathologists, OSU), Sarah Navarro (Forest Pathologist, ODF), and Helmuth Rogg (Plant Program Director, ODA). Communication among landowners, nurseries, other organizations, and other interested parties is conducted through monthly SOD Core Group conference calls hosted by Gary McAninch, Nursery and Christmas Tree Manager, ODA.

Current funding sources

All funding for the SOD program in forests is provided by agencies. The program also benefits from cooperation by private landowners.

USFS funds a pathologist that provides program oversight and expertise and a Gold Beach RD SOD forester positions which is focused on detection and treatment on National Forest lands. It also provides $150,000 per year for SOD diagnostics via a cost-reimbursable agreement with the Everett Hansen laboratory at OSU. USFS eradication treatments are funded internally through USFS budget processes on an annual basis. In FY2016, $265,000 was provided for treatments and their administration. USFS also funds grants to ODF annually which supports SOD surveys, monitoring, and eradication treatments. ODF receives $375,000 per year from USFS for SOD (which includes $35,000 from the forest health monitoring grant for stream baiting).

BLM funds eradication on their lands and related work through their internal budgeting process, and thru interagency grant programs which are approximately $250,000 per year from USFS.

ODF funds the pathologist and two foresters in Brookings, plus $75,000 per year for eradication. In 2016, in order to alleviate the eradication treatment funding shortage, ODF submitted a request to the Emergency Board for $250,000 of General Fund to the SOD program in May of 2016. The request was granted to ODF and the money was allocated in three parts: $100,000 to increase treatment of the leading edge of infested sites in or near the quarantine boundary; $100,000 will be used to create an emergency treatment fund that will be held by ODF for rapid treatment of any site outside of the quarantine area or an infestation of the EU1 lineage; and $50,000 was given as a block grant to the Association of Oregon Counties to convene and facilitate the SOD Task Force. Although the Emergency Board money helps to address the current backlog of funding, there is no guarantee the SOD slow the spread program will receive funding such as this in the future.

OSU receives funding for diagnostics and other lab support primarily from USFS, plus other agencies ($185,000 per year). The Grunwald Lab receives $15,000 per year from USDA APHIS for genetic lineage analysis.

Estimated Annual Program Expenditures- (funding source)

ODF-Brookings Field Office ($100,000 US Forest Service, $60,000 State General Fund)	$160,000
ODF-Salem Staff (State General Fund)	$90,000
ODF-Aerial Surveys (includes digital imaging) (US Forest Service)	$45,000
OSU-Hansen Lab (US Forest Service)	$185,000
OSU/USDA ARS-Grunwald lab (USDA APHIS)	$15,000
USDA Forest Service	$130,000
BLM-Coos Bay staff	$145,000
Subtotal	**$770,000**

*Excludes treatment costs for ODF Survey, detection, monitoring, and program administration costs are $325,000 per year.

Estimated Annual Eradication Treatment Expenditures

ODF ($75,000 State General Fund; $75,000 US Forest Service)	$150,000
USDA Forest Service	$250,000
BLM ($305,000 BLM and $250,000 US Forest Service)	$555,000
Subtotal	**$955,000**
TOTAL	**$1,725,000**

Cumulative Program Expenditures – 2001 through 2015

Cumulative Operating and Eradication Treatment Expenditures by Funding Source (excluding research)

USDA Forest Service	$10,195,700[1]
BLM	$3,901,000
ODF – State General Fund	$3,442,000
Oregon Department of Agriculture / USDA APHIS	$490,000
Private	$322,000
Other State Agency (Eradication Treatments)	$96,500
TOTAL	**$18,447,200**

[1] In 2010, the Oregon SOD Program received $2,692,000 from the American Recovery and Reinvestment Act through the US Forest Service.

ALTERNATIVES AND THEIR CONSEQUENCES

Alternative 1: Transition to Living With The Disease

Sudden oak death is here to stay and will be a forest health issue into the future. Under this alternative, the slow-the spread program (survey, detection, and eradication) would be halted. Federal funding for SOD would likely decrease and agencies would conduct SOD detection and monitoring surveys during their normal course of business. Through annual aerial surveys and imaging, small scale ground surveys, and possible citizen science programs, the disease spread could be monitored and provide data to researchers and graduate students. ODF could continue to provide technical assistance to landowners who want to know why their tanoaks are dying and what they can do about it, give advice on how to reduce hazards from fire and tree fall, assist in enforcing quarantine regulations, and promote best management practices for this forest health issue. In short, we would rely on educating people to mitigate the effects of the disease and prevent spread to other susceptible forests in adjacent counties. This scenario would be similar to what is happening in much of California.

Without treatment the disease intensifies and rate of spread increases. Tanoak is rapidly being eliminated from infested areas in California and in the Oregon GIA. Oregon will lose tanoak in at least the western portion of its range. Birds, mammals, insects and fungi dependent on tanoak will migrate or die. Loss of tanoak will impact Native American culture; they have traditionally relied on tanoak acorns as a food source. Assuming no human spread, starting at the farthest north infestation (Hunter Creek), disease spreads northward 3.5 mi/yr. Disease reaches the Coos County line in 10-12 years.

The quarantine regulations would change soon to encompass all of Curry County, and eventually Coos and Douglas counties, potentially raising export and trade issues with species on the *P. ramorum* host list, including Douglas-fir, western hemlock, grand fir, and others. Forest, nursery, Christmas tree and other forest product operations that intend to ship material will need inspections and disease-free certifications, probably on a fee-for-service basis.

Alternative 2: Continue the Current Slow-The-Spread Program (with prioritized treatment sites – essentially status quo)

This alternative continues the current slow-the-spread program as funded today. In 2016, 65 new sites outside the GIA were confirmed; if these were treated with a 300 foot buffer the total treatment area would be 638 acres: 481 acres on privately owned land, 57 acres on BLM, and 100 acres on USFS (Figure 1). BLM is treating all infestations on their ownerships. USFS expects to treat all known sites to some extent; minimal treatment standards may need to be used based on available funds. The number of outlying sites in 2016 exceeded the program's capacity to treat all sites with 300 foot buffers. Thus, the program created treatment priority areas to identify where sites will receive 300 foot buffers, whiles other sites will receive treatment based on available funding. The establishment of the GIA has allowed the program to focus treatment efforts on high priority sites, however, the current budget does not allow for full treatments of all new infestations outside of the GIA.

The consequences of continuing the slow-the-spread program at current funding levels are becoming clear. In areas where treatments have stopped, disease intensifies dramatically and kills most of the tanoaks in just a few years. As more inoculum is produced in the areas of uncontrolled disease, the leading edge of the main infestation expands northward and eastward, and the probability of human-assisted spread increases. Each year, outlier infestations become more numerous and occur farther from the leading edge. Funding for eradication treatments is not sufficient to treat all outliers effectively and will continue to be increasingly insufficient as the disease continues to intensify. Scaling treatment area size to importance of site allows the most important infestations to be cut and burned, which slows disease relative to no treatment.

Under this scenario, disease reaches the Coos County line in 20 years. The GIA would continue to expand northward 2 mi/year (rate of recent GIA expansion), with outliers occurring no more than 12 miles north of it and assuming no human assisted spread. At current funding levels, there is a risk that the rate of spread will increase over time and that risk of human spread also increases.

Additionally, Oregon State University would continue to conduct small scale research studies based on SOD program needs using existing funding from ODF and USFS.

Cost: $1,825,000/year

ODF-$225,000 for program admin/treatment on state & private
USFS-$380,000 for program admin/treatment on USFS land
USFS-$655,000 for support to others (ODF, OSU, BLM etc.)
USDA-APHIS-$15,000 to OSU
BLM-$550,000 for program admin/treatment on BLM land

Alternative 3: Continue the Current Slow-The-Spread Program, with Enhanced Funding to fully treat all sites

Assuming at least 638 acres requiring treatment per year on forestlands, implementing the desired treatment level (300-foot buffer) at an average $5,000 per acre would cost $3,190,000 per year. Expanding this number to $3,350,000 per year provides an eradication treatment budget that hedges that some sites may be larger because they encompass groups of infected trees and/or more costly due to difficult terrain or working in and around homes, power lines and other structures.

Currently, the annual operating budget for conducting eradication treatments on new sites on non-federal lands is $150,000 per year; $75,000 from the USDA Forest Service Forest Health Protection Program and $75,000 from the state general fund. The annual operating budget for conducting eradication treatments on USFS land is $250,000 and on BLM lands is $555,000. The current deficit for needed funds is an estimated $2,235,000 to treat new sites detected in 2016. Therefore, current funding only provides enough to treat approximately 107 acres on federal lands and 30 acres on non-federal lands to the desired level; or less than 22 percent of the anticipated need.

Under this alternative, the slow-the-spread program would need to secure increased funding for conducting eradication treatments on all lands by $2,395,000 per year for a total treatment of $3,350,000 per year. Unused funds should be allowed to be banked from year to year to take

advantage of savings incurred in lower than average spread years to be available to address treatment needs in above average spread years. Mechanisms should be developed so funds can also be used on all lands should their managers face the same financial limitation currently being incurred on non-federal lands to treat sites at the desired levels.

Research is needed to improve our ability to combat sudden oak death, especially given the introduction of the EU1 lineage in Oregon's forests. A cooperative, competitive research program is proposed to improve early detection and silvicultural control methods, as well as compare aggressiveness and host range for the NA1 lineage versus EU1 lineage. Studies are also needed to describe the ecological and economic impacts of sudden oak death in Oregon. The program would be administered through the US Forest Service, Pacific Southwest Research Station, and would require an annual budget of $1.2 million for 2018 and $1.7 million for the following 3 years.

Cost: $5,420,000/year

ODF-$225,000 for program admin/treatment on state & private
USFS-$380,000 for program admin/treatment on USFS land
USFS-$3,050,000 for support to others/additional treatment on USFS (ODF, OSU, BLM)
USDA-APHIS-$15,000 to OSU
USFS $1,200,000 for research thru Pacific Southwest Research Station
BLM-$550,000 for program admin/treatment on BLM land

Alternative 4: Contain to Curry County For As Long As Possible

Alternative 4 focuses on preventing sudden oak death from entering the adjacent counties, Coos, Douglas, and Josephine, for as long as possible. This alternative increases the chance to protect important tanoak ecosystems, and provide long term conservation and adaptation of tanoak genes. Alternative 4 builds on alternatives 2 and 3 because continuing to slow the spread in the southern portion of Curry County is essential for containment farther north.

There is strong interest in avoiding a county wide SOD Quarantine for Curry County as well as avoiding the spread of SOD into neighboring counties. A means of ensuring aggressive eradication of human assisted or other unanticipated infestations would be to establish an Emergency Fund held in reserve and available to rapidly respond to new infestations in an action zone adjacent to neighboring counties (Figure 2); or for sites detected in the neighboring counties themselves.

This opportunity also requires an expansion of survey, detection and monitoring capacity due to the need to survey the action zone and the area between the action zone and quarantine area at intensities currently reserved for within the quarantine area and areas proximately surrounding its boundary. From the Emergency Board allocation in 2016, $100,000 has been placed into an emergency treatment fund to be used on any new infestation outside of the current quarantine or a new infestation of the EU1 lineage. Given the cost of an ideal eradication treatment (600-foot radius, 26 acres), this emergency treatment money would be spent down in order to cover one infestation. An emergency eradication treatment fund totaling $500,000 would potentially treat five new sites (or 100 acres) at the ideal treatment level; this would relieve the burden of finding continued funding on potentially an annual basis.

Alternative 4 requires increased survey effort in the 6-mile-wide action zone between Curry, Coos and Douglas Counties (Figure 2). The additional survey effort would include 20-30 stream baits and two aerial surveys of 250,000 acres each near the county line. Intensive delimitation surveys are conducted whenever a new infestation is found. This alternative will likely require an increase in field staff. The cost of this increase in aerial surveys, field technician time, and lab diagnostics is estimated at $100,000 /year.

Additionally, the program must be able to mobilize eradication crews quickly and sometimes simultaneously within days or weeks of detection to prevent additional spread, especially in the action zone. Contractor response time has been problematic due to fire danger and contractor availability. We will need to review and secure contracts to ensure acceptable response or train a local workforce to conduct eradication work.

Alternative 4 is designed primarily to ensure that SOD does not move into Coos, Douglas, or Josephine Counties, and it should succeed at doing that for at least 10 years, probably longer. Cutting and burning isolated individual infestations can stop intensification and spread, provided delimitation and treatments are done properly. Based on current observations, it is unlikely that the disease will naturally spread across the 6-mile-wide action zone without detection and an opportunity for eradication, provided continued diligence with detection surveys. Host removal in disease pathways leading to the action zone should improve the chance of containment in Curry County. The GIA likely will expand slowly, the rate of which will depend in part on our capacity to treat infestations beyond its leading edge to the north, but short of the action zone.

Cost: $6,020,000/year

ODF-$225,000 for program admin/treatment on state & private
USFS-$380,000 for program admin/treatment on USFS land
USFS-$3,650,000 for support to others/additional treatment on USFS (ODF, OSU, BLM)
USDA-APHIS-$15,000 to OSU
USFS $1,200,000 for research thru Pacific Southwest Research Station
BLM-$550,000 for program admin/treatment on BLM land

Other Options that can be done simultaneously with alternatives.

Finding and developing disease-resistant tanoaks is a long-term proposition with an unknown probability of success. Preservation of important tanoak ecosystems (refuges) seems possible if located away from the highest disease risk areas.

- **Tanoak Refugia**: Protection of important tanoak ecosystems (refugia) is possible if located away from the current distribution of SOD as well as away from the highest disease risk areas as shown in Figure 2. Areas of tanoak with high ecological and/or cultural value would be identified. Protection would involve intensive early detection, strict limits on human access and ideally eradication within 2-3 miles of each identified refuge. These areas likely will be located on federal land and will be selected by land managers and interested parties. These areas also could be part of a larger tanoak gene conservation effort. **Cost: $130,000/year-** $30,000 for additional aerial and ground surveys at 3 areas ($10,000 per area) and $100,000 to expand scope of Emergency SOD Treatment Fund to include treatment needs around designated refuges.

- **Resistance Breeding for Tanoak**[2]: Begin long-term program of locating and developing tanoaks that can grow and reproduce in the presence of *P. ramorum*. Partner with Dorena Genetic Resource Center and OSU. **Cost: $30,000/year.**

- **Tanoak Removal in Strategic Areas:** Identify areas on the landscape that are likely pathways for aerial dispersal of *P. ramorum* into adjacent counties and remove or destroy tanoak in advance of the disease. The location of these areas will be determined by recent dispersal patterns, land forms, the amount and distribution of tanoak, and risk modeling. Private landowners will need incentives to do this. Incentive programs may be available to encourage landowners to remove tanoak and establish conifers or other non-host species. Increase market opportunities to utilize tanoak so as to cover the cost of removal within the quarantine area to encourage projects. **Cost: $650,000/year** to treat 1,000 acres/year; 50% hack and squirt treatment at $300/acre; 50% slash and burn treatment at $1,000/acre. This opportunity is scalable depending on the amount of funding secured.
- **Stakeholder Cooperative:** Coordinate detection and control among all landowners in SW Oregon. If stakeholders, especially private industry, do not want SOD to enter Coos and Douglas Counties, they should begin action and investment now.

[2] Finding and developing disease-resistant tanoaks is a long-term proposition with an unknown probability of success.

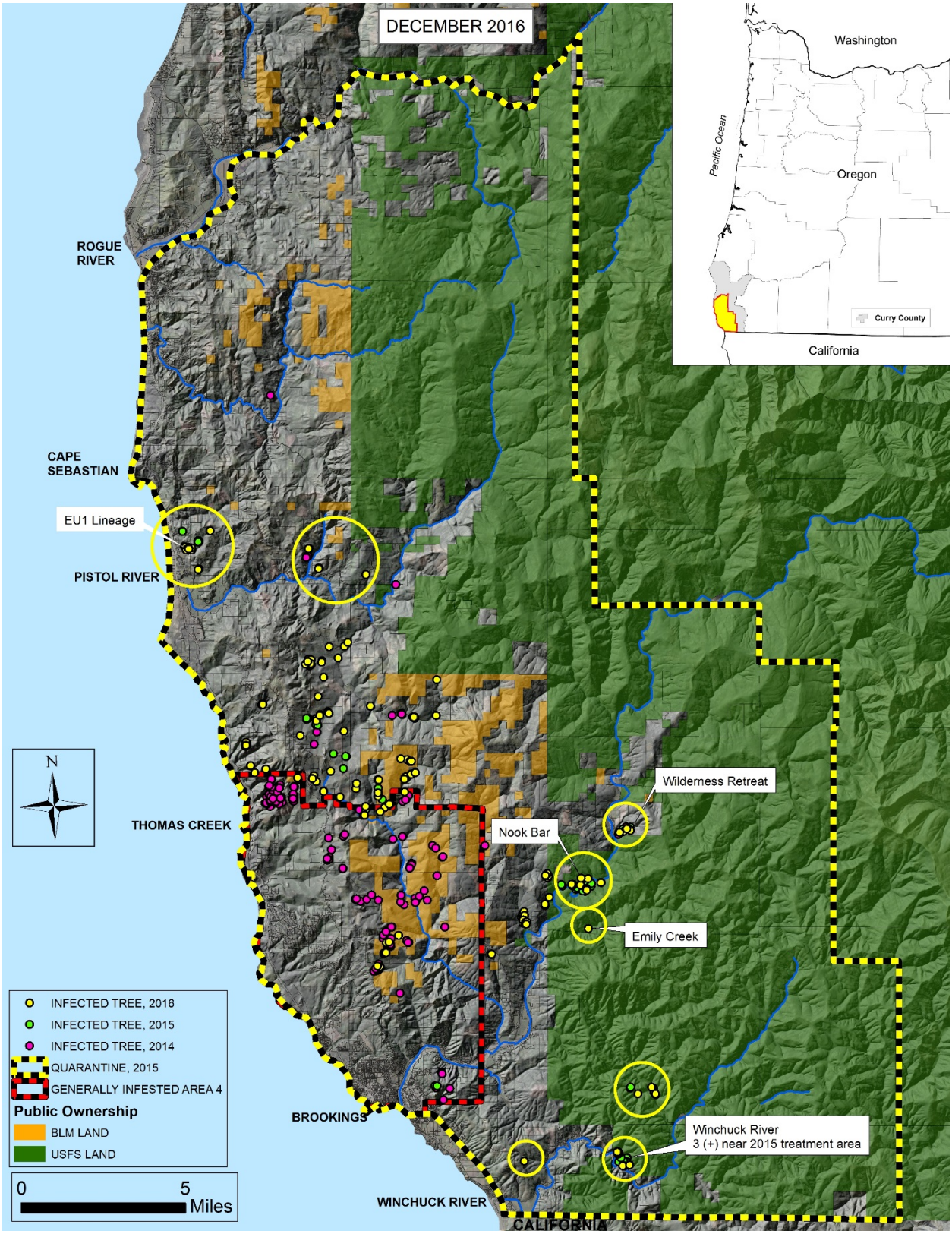

Figure 1. Location of sites infested with *Phytophthora ramorum* in southwest Oregon that were discovered in 2014-2016. All 2015 infestations have received some level of eradication treatment. Yellow circles designate 2016 infestations have been prioritized for treatment.

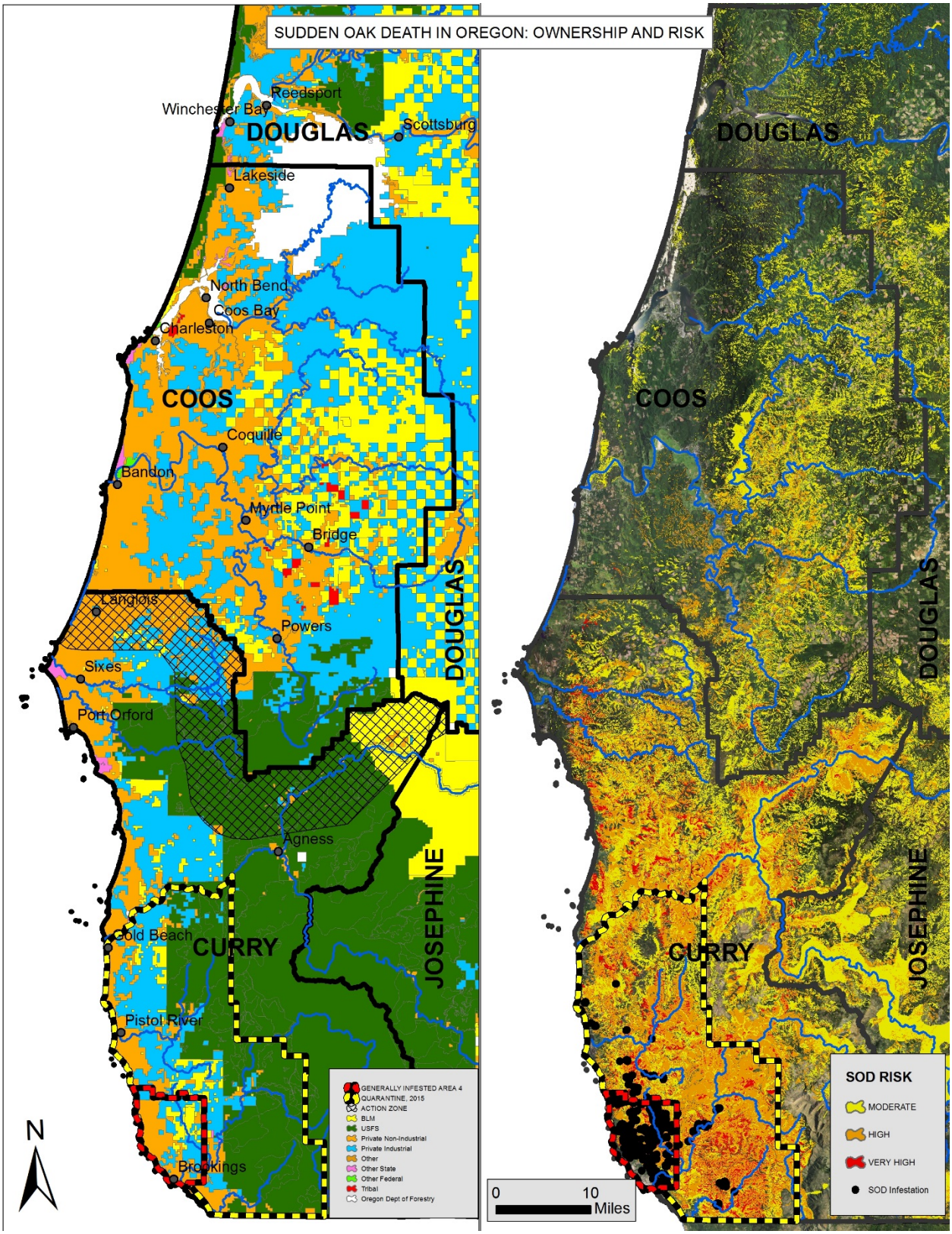

Figure 2. Sudden oak death action zone, major land ownership, and potential distribution in southwestern Oregon.