



Midpeninsula Regional  
Open Space District

R-26-61  
Meeting 26-14  
May 13, 2026

## SPECIAL MEETING AGENDA ITEM 1

### AGENDA ITEM

20-Year Sudden Oak Death Update and Strategic Goals

### GENERAL MANAGER'S RECOMMENDATION

Receive the 20-year Sudden Oak Death status report and presentation and provide feedback on the 10-year Sudden Oak Death Strategic Goals.

### SUMMARY

The General Manager recommends that the Board of Directors receive the 20-year Sudden Oak Death status report and provide feedback on the proposed 10-year Strategic Goals attached to this report. The attached report summarizes past Midpeninsula Regional Open Space District (District) work and identifies recommended future actions related to pathogen tracking, protection of high-value resources, outbreak response, and partnership support. Implementation of the proposed 10-year Strategic Goals is estimated at approximately \$3 million over 10 years, but may range between \$1.75 million to \$5 million. No contract is proposed under this item, and no Board appropriation is requested at this time. Instead, the activities recommended in the report would be brought forward through the District's annual budget process.

### DISCUSSION

Sudden Oak Death (SOD), caused by the species of water mold, *Phytophthora ramorum*, has affected District lands for more than two decades and remains a long-term forest health issue because susceptible host tree species are widespread and the pathogen cannot realistically be eliminated at a landscape scale. In addition to causing mortality in tanoak and several oak species, SOD can alter habitat conditions, increase fuel loading, create openings for invasive plants, and raise public safety concerns where dead and declining trees occur near roads, trails, and facilities. The attached report summarizes the District's past work, current conditions, and a proposed 10-year management approach.

### FISCAL IMPACT

There is no fiscal impact associated with the recommended action. Activities recommended in the attached report would be brought forward to the Board of Directors (Board) through the District's annual budget process.

## **PRIOR BOARD AND COMMITTEE REVIEW**

On February 10, 2016, the Board reviewed the Sudden Oak Death Ten-Year Update and authorized the General Manager to pursue additional Sudden Oak Death and related research and management responses ([R-16-06](#), [Minutes](#)).

## **PUBLIC NOTICE**

Public notice was provided to the Resource Management Interested Parties list and others as required by the Brown Act.

## **CEQA COMPLIANCE**

This item is not a project subject to the California Environmental Quality Act.

## **NEXT STEPS**

After incorporating Board feedback, the General Manager will direct staff to continue existing SOD research and management measures and will develop additional SOD research and management projects and nursery disease prevention activities consistent with the recommendations outlined herein. Funding for future fiscal years expenditures will be considered by the Board during the annual budget approval process.

### Attachment

1. Sudden Oak Death: Background, Management History, and Future Direction

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# Sudden Oak Death: Background, Management History, and Future Direction

## Background Information

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### Overview

Sudden Oak Death (SOD) is a plant disease caused by the exotic oomycete (water mold) pathogen *Phytophthora ramorum*. The disease has been detected in forest ecosystems and wildland-urban interface areas throughout coastal California, spanning fourteen counties from the Oregon border to Big Sur. It was introduced to the San Francisco Bay Area in the 1980s through infected ornamental plants and has killed more than 60 million trees to date, constituting one of the worst tree epidemics in the world. SOD has affected Midpeninsula Regional Open Space District (District) lands for more than two decades and remains a long-term forest health issue because susceptible host tree species are widespread and the pathogen cannot realistically be eliminated at a landscape scale. In addition to causing mortality in tanoak and several oak species, SOD can alter habitat conditions, reduce native biodiversity and habitat, increase fuel loading and reduce wildfire resiliency, create openings for invasive plants, and raise public safety concerns where dead and declining trees occur near roads, trails, and facilities. The attached report summarizes the District's past work, current conditions, and a proposed 10-year management approach.

The District has been engaged in SOD monitoring, sampling, research partnerships, preventative treatments, and field hygiene measures since 2000, consistent with prior Board direction and the District's Resource Management Policies. This approach reflects that SOD management must be targeted and adaptive rather than uniform across the landscape. Preventative actions are generally most effective before infection is well established, while heavily affected areas may require a greater focus on resiliency, fuel reduction, invasive plant prevention, and protection of key resources. The General Manager recommends continuing this work through four primary actions: (1) tracking pathogen spread; (2) protecting high-value resources through targeted treatment, thinning, pruning, and phytosanitation; (3) curtailing spread of the NA2 lineage where warranted; and (4) supporting coordination with external partners on nursery, seed amplification, and related restoration-support opportunities. Some actions identified in support of the Protect High-Value Resources Goal are already being implemented through existing grant-funded forest health and ecosystem resiliency projects supported by the State Coastal Conservancy, CAL FIRE, and the Wildlife Conservation Board.

### Infection Pathways

As *P. ramorum* is a type of water mold, its spores typically spread through rainfall, soil moisture, stream water, or through the air when temperatures are in the 60-80°F range. Because of this, most infections occur in the rainy season, particularly when spring temperatures rise from mid-April

through June. New infections occur when water splashes spores onto leaves and bark, and when mud moves on boots, vehicles, and tools. Infected plants and infested soil can carry the pathogen to new sites, where it can survive within infected plant tissues and lay dormant, resurfacing when conditions are appropriate. As such, even extended periods of drought are inadequate to mitigate the spread. Since weather and site conditions change each year, SOD behaves like a chronic stressor with occasional surges, rather than a one-time event. On average, the pathogen spreads at a rate of 200 meters per year.

### Species Affected by SOD

*P. ramorum* causes mortality in tanoaks

(*Notholithocarpus densiflorus*) and four species of oak trees found in the San Francisco Bay region:

coast live oak (*Quercus agrifolia*), canyon live oak (*Q. chrysolepis*), black oak (*Q. kelloggii*), and Shreve's oak (*Q. parvula* var. *shrevei*).

Infected tanoaks exhibit symptomatic leaves, characterized by blackened midveins surrounded by yellow or brown leaf tissue. In contrast, when *P. ramorum* infects oaks, the disease manifests as a stem infection, destroying the cambium under the bark and effectively girdling, or strangling, the tree. Girdled trees can survive for several years on stored resources but eventually die, seemingly suddenly, giving rise to the name "Sudden Oak Death." Occasionally, oak bark will show signs of infection, exhibiting "bleeding cankers," but this is uncommon.



Figure 1: Infected Tanoak leaf

*P. ramorum* can also infect more than 100 other plants, including rhododendrons, camellias, madrones, toyons, and most notably in wildland environments, California bay laurel (*Umbellularia californica*), which exhibit a foliar disease called "ramorum blight." While ramorum blight is rarely lethal, infected plants can vector the pathogen spores to nearby oaks and tanoaks. As such, oaks and tanoaks are most often infected when in proximity (within 200 yards) of bay laurels. Notably, oaks are a terminal host for the disease, meaning they do not spread the pathogen despite being affected by it. In contrast, tanoaks and bay laurel both contract and spread the pathogen. While bay trees infect other bays and oaks alike, tanoaks primarily infect other tanoaks.

To date, none of the affected species have exhibited true genetic resistance to the pathogen, but some degree of genetic tolerance has been demonstrated in tanoaks, bay laurels, and coast live oak. More research is needed to determine the exact mechanisms for this resistance.

### Pathogen Lineages

Three genetically distinct lineages of *P. ramorum* have been detected in North America to date: NA1, EU1, and NA2. Although these lineages have evolved separately for at least a quarter of a million years and exhibit varied characteristics, they are not genetically distinct enough to be deemed different species, and are all considered to be causal agents of SOD.

## NA1

NA1 was first detected in the San Francisco Bay Area in the 1990s and is the most prevalent pathogen lineage in North America. It is responsible for the vast majority of the tree mortality documented to date.

## EU1

In 2020, researchers identified another lineage, EU1, which likely came to California from Oregon. EU1 tends to proliferate in slightly cooler climatic conditions. In the Midpeninsula region, disease transmission associated with the EU1 lineage appears limited, as occurrences are localized and do not seem to be spreading as rapidly or extensively as the other lineages.

## NA2

In 2024, the NA2 lineage was found in the region through the SOD Blitz surveying effort, concentrated in five outbreaks spanning the Midpeninsula and the East Bay areas. This lineage is more virulent and aggressive than both the NA1 and EU1 lineages and is infectious at a slightly higher temperature threshold (70 - 80°F range). Accordingly, it has the capacity to occupy ecological niches previously assumed to be unattainable for the pathogen to invade, particularly in the Midpeninsula region. Upon further study, researchers determined that this lineage was present in the region as early as 2018 but just had not been detected.

## Ecological Dynamics and Broader Impacts

The effects of SOD extend far beyond individual trees. When infected trees die in a forest ecosystem, the light, moisture, and structural conditions change in response to the opening of canopy gaps, resulting in ecological shifts that may alter wildlife habitat and native plant communities. In areas with high levels of disturbance, for example, invasive plants may have the capacity to overtake native plant communities. The greatest on-the-ground impact occurs where tanoak is common, as tanoak tends to die in large numbers once an infection has become established, resulting in the most significant changes to forest structure.



**Figure 2: Landscape level impacts from SOD**

Moreover, dead and dying trees can intensify hazards and pose safety risks, particularly near roads, trails, and facilities and on steep slopes, where erosion risks may increase as roots decay. Prevalent dead and down wood exacerbate fuel loads, inhibiting wildland fire resiliency. These broader dynamics may result in increased maintenance needs and fuel reduction work, short-term trail or

preserve closures, as well as aesthetic changes, impacting both District operations and visitor experience.

## 20-year Accomplishments

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Over the last two decades, the District has maintained a sustained SOD management program consistent with the District's Resource Management Policies to protect and restore native ecosystems, use the best available science and adaptive management, prevent avoidable spread of pests and pathogens, and maintain safe public access while limiting damage to natural resources. The District's approach pairs early detection with targeted protection of high-value trees and stands and long-term research partnerships.

### Tracking SOD

The District first began surveying for SOD in 2000. Staff were trained to recognize symptoms, collect samples suspected of *P. ramorum*, submit samples for lab confirmation, and ensure confirmed detections were entered into statewide tracking and mapping systems. In 2010, the District began participating in the SOD Blitz Project, an annual community science initiative led by the University of California, Berkeley to delineate the zone of infection and track the spread of SOD. The District then built this work around Board direction to identify and map trees that appear resistant, collect tissue samples where feasible, and carry out targeted work where risks are highest to protect heritage trees. See Figure 3: Monitoring Results from SOD Blitz.

### Limiting the Spread

In 2018, the District developed field hygiene and other biosecurity practices to curtail the spread of pathogens across District preserves. The District has also worked with regional agencies, researchers, and neighboring land managers to better understand the pathogen and mitigate its spread throughout the region.

### Supporting Research Efforts

Over the past two decades, the District has been investing in research and field trials that have improved how land managers respond to SOD. The District co-funded tanoak resistance research with the USDA Forest Service and UC Berkeley, supported by acorn and leaf collections in the Santa Cruz Mountains and in-kind field support. The District also implemented and monitored preventative treatment methods for specimen oaks and oak/tanoak stands in multiple preserves, centered on bay removal near susceptible trees and phosphite applications, with monitoring designed and tracked with Phytosphere Research. This work helped refine treatment practices, improved understanding of which hosts are vulnerable, and strengthened the District's ability to target actions where they are most likely to work.

### Forest Health Implementation

The District has also initiated forest health work across multiple preserves to mitigate impacts from Sudden Oak Death and to address related safety and resiliency concerns. This work has included treatments designed to reduce hazard exposure, manage fuels where mortality has increased dead and downed material, and support more resilient stand conditions where appropriate. Bear Creek Redwoods is one example. The District managed more than 200 acres at Bear Creek Redwoods, a site selected for the Los Gatos Collaborative Forest Health Grant in part due to the presence of SOD and its documented impacts. This example illustrates how SOD considerations are being

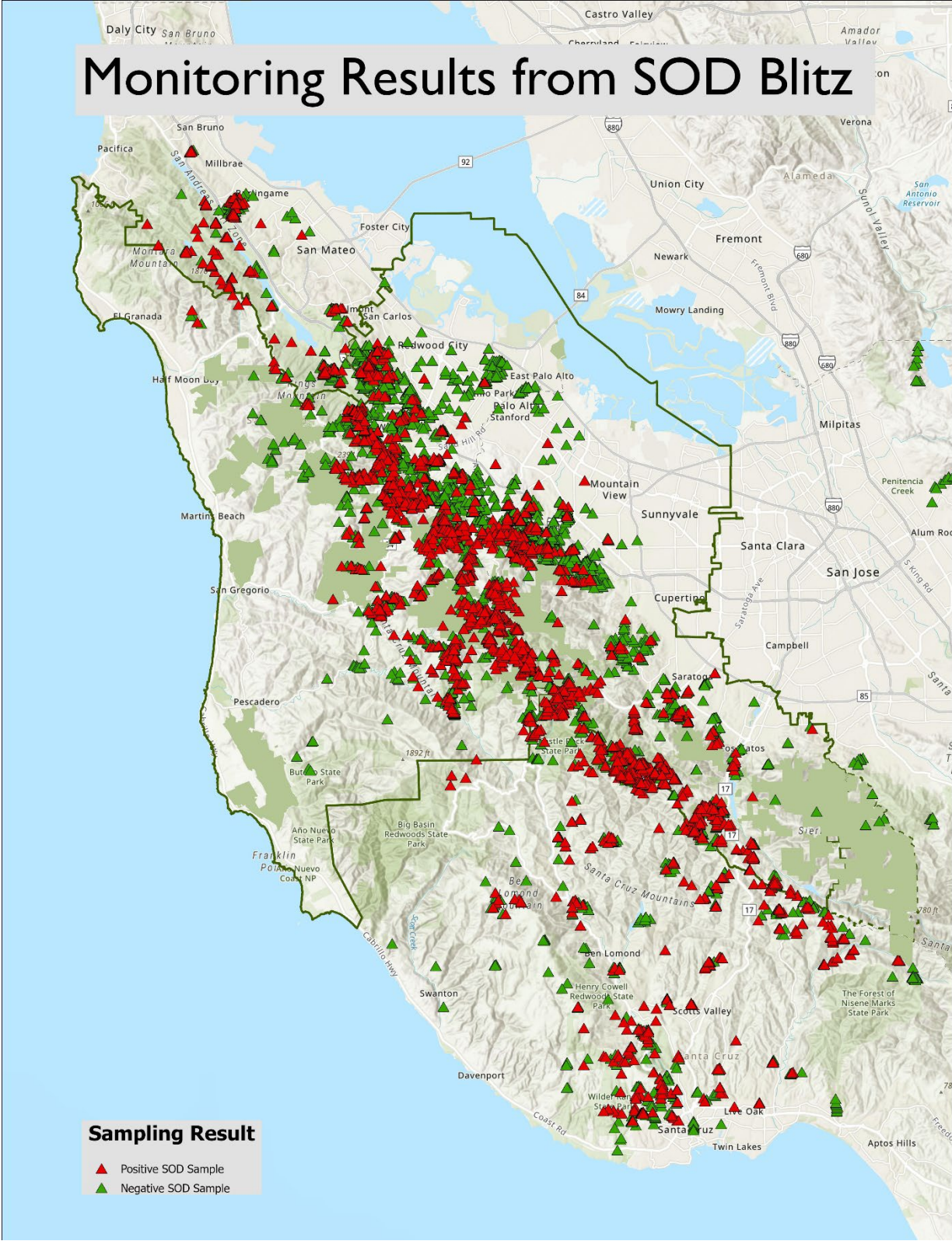


Figure 3: Monitoring Results from SOD Blitz

integrated into broader forest health and wildfire resiliency efforts Districtwide when conditions and funding allow.

### Key Accomplishments

On February 10, 2016, the Board of Directors reviewed the Sudden Oak Death Ten-Year Update and authorized the General Manager to pursue additional Sudden Oak Death and related research and management responses. The following are the District's key accomplishments.

1. Monitoring, detection, and reporting
  - Established recurring surveys and sampling protocols (surveying since 2000; trained staff and volunteers; sampling and lab confirmation; incorporation into statewide mapping databases).
  - Maintained partnerships that expand detection capacity and improve local resolution of disease distribution, including community science mapping through SOD Blitz-style efforts.
  - Established recurring surveys and sampling protocols (surveying since 2000; trained staff and volunteers; sampling and lab confirmation; incorporation into statewide mapping databases).
  - Maintained partnerships that expand detection capacity and improve local resolution of disease distribution, including community science mapping through SOD Blitz-style efforts.
  
2. Research leadership and collaboration
  - Co-funded major resistance and epidemiology research with agencies and universities, including tanoak resistance work with USDA-FS and UC Berkeley, supported by District funding and in-kind field support.
  - Supported a broad research footprint on District lands, resulting in numerous scientific publications/presentations and management guidance used by other land managers.
  
3. Targeted treatments and on-the-ground management
  - Implemented preventative treatments in multiple preserves using bay removal near susceptible trees and recurring phosphite applications, with built-in research monitoring (treated vs. untreated comparisons; different application methods and equipment tested).
  - Expanded protection to additional host types and locations as new information emerged, including adding canyon live oak protection where appropriate.
  - Implemented forest health treatments to mitigate SOD-related impacts, including management of 235 acres at Bear Creek Redwoods under the Los Gatos Collaborative Forest Health Grant, with SOD as a contributing site-selection factor. See Figure 4 for a map of SOD presence and forest health work completed in response.
  
4. Public safety and operational response

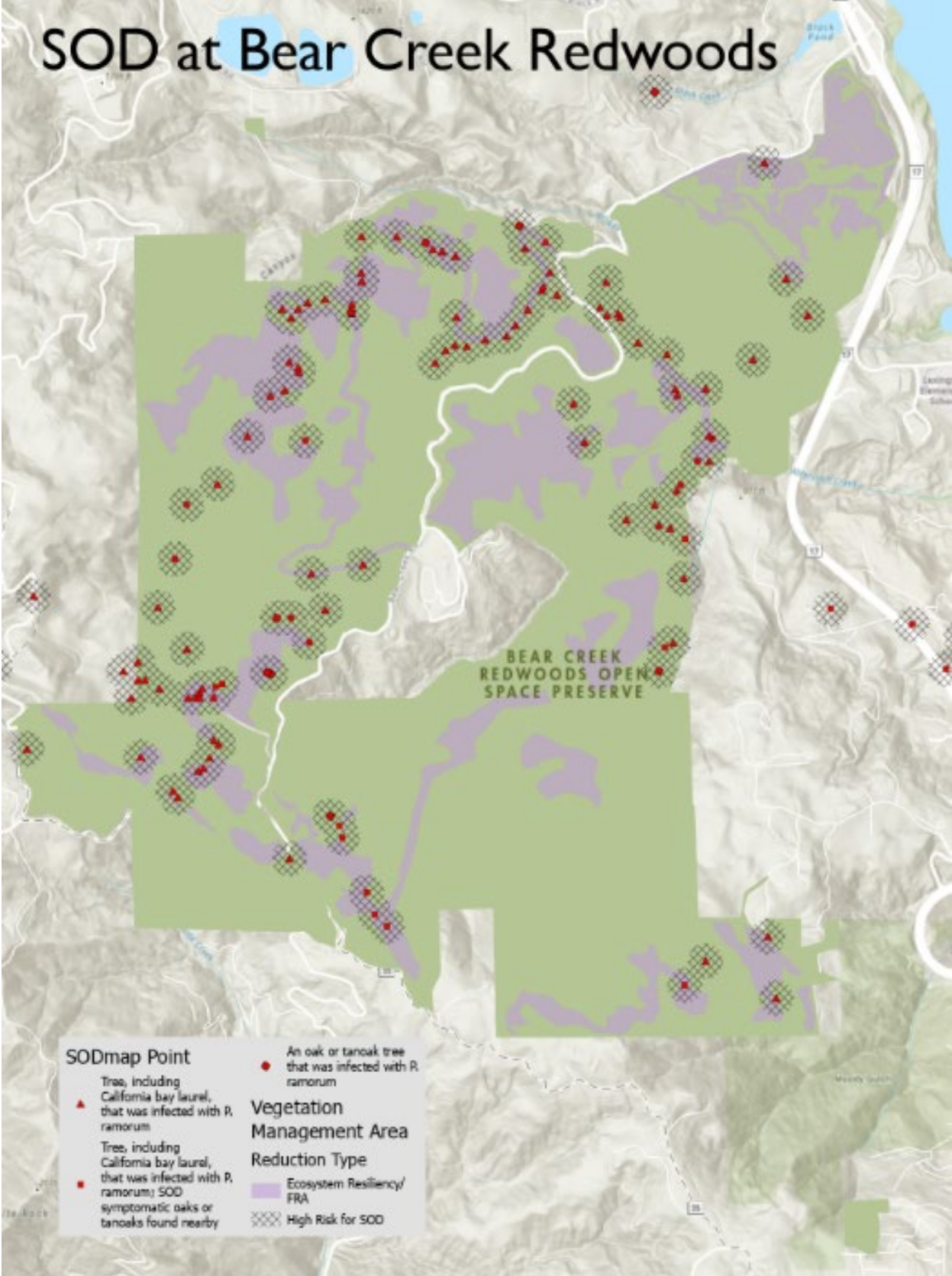


Figure 4: SOD presence and management at BCR

- Addressed hazard-tree risks in high-use areas when SOD-related mortality created public safety concerns, with a stated emphasis on removing only hazard trees<sup>1</sup> rather than widespread dead-tree removal.
5. Education, hygiene, and spread prevention
- Implemented best management practices to reduce human-assisted spread, including informational signage and installation of boot and bike tire brushes at some trailheads; conducted staff trainings; and supported public education through events and symposium engagement

## Current Status of the Pathogen

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Sudden Oak Death remains a long-term problem where susceptible hosts occur. Statewide infection rates doubled from 2024 to 2025, meeting the “high severity” threshold necessary to be categorized as an epidemic. Disease incidences are particularly high throughout Sonoma, Marin, San Mateo, Santa Clara, and Santa Cruz Counties, with significant NA1 and NA2 outbreaks in the Midpeninsula region. At the same time, drought, wildfire, post-fire recovery needs, and heavy recreation use have changed where SOD risk shows up and how land managers can respond with limited staff and funding. Because the pathogen is unlikely to be eliminated at a landscape scale, the practical goal is to document and limit the spread to the greatest extent feasible, protect high-value areas, and reduce safety hazards where mortality is high.

## Future Direction

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### Program Needs and Strategic Goals for the Next 10 Years

SOD will stay on the landscape and will keep reshaping parts of District forests. The District therefore needs an ongoing program that is built around prevention, early detection, and targeted response. The District Resource Management Policy already identifies the core needs:

manage forest disease to protect natural biological diversity and critical ecosystem functions; detect, report, and monitor infested areas; use sanitation and best management practices to limit spread; train staff and educate the public; and support research that guides land management decisions. These are also consistent with prior Board direction that framed the District’s SOD work around three pillars: mapping potentially resistant trees, protecting selected heritage trees, and building collaborative support for research.

Operationally, the next decade needs a clearer “delivery model” than the early years: standard biosecurity requirements across all District operations and contractors; a repeatable monitoring and

### Vegetation Management Policy - 4

Manage forest disease, when necessary, to protect native biological diversity and critical ecosystem function.

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<sup>1</sup> A hazard tree in a natural environment is a tree with structural defects, decline, damage, or other conditions indicating it is likely to fail in the near term, and whose failure would be expected to strike or obstruct an area where people regularly gather or remain for some period of time, such as a parking lot, trailhead, building, picnic area, staging area, or similar congregation point. Areas used primarily for travel through the landscape, such as trails, are not by themselves considered congregation areas unless they include features where people commonly stop, gather, or queue.

reporting approach that produces decision-grade information; and a simple prioritization method that focuses effort where the consequences are highest (high-use trails, roads, facilities, and priority habitat stands). Past Board updates show why: management options are most effective before oaks and tanoaks are infected, and early detection remains critical to slowing spread. The District also needs to maintain partner capacity (e.g., SOD Blitz-style early detection and education) because it produces fine-scale maps the District uses to target proactive management and to help prioritize fuel reduction work.

### **Sudden Oak Death 10 Year Strategic Goals 2026-2036**

1. Prevent avoidable spread through sanitation and biosecurity  
The District will strengthen and enforce consistent sanitation and best management practices across staff, contractors, and volunteers, with added emphasis during wet-weather periods when spread risk is highest. This continues the Resource Management Policy’s direction to use sanitation/BMPs, train staff, and educate the public.
2. Improve early detection, monitoring, and reporting  
The District will maintain a monitoring and reporting program that tracks pathogen presence and forest change in priority areas and directly informs annual work planning and budgeting, consistent with Resource Management Policy’s “detect, report and monitor” direction. This includes maintaining early detection tools and partnerships because management is most effective before infection becomes established.
3. Protect high-value trees and priority stands where prevention is still feasible  
The District will focus prevention where it can still matter most, on selected specimen and heritage trees, and on priority stands. This builds on the Board’s long-standing approach and updates priorities based on monitoring and research.
4. Support forest recovery and resilience in heavily impacted areas  
The District will implement restoration actions in areas where SOD has already changed forest structure. This includes preventing invasive plant establishment in new openings and supporting desired future stand conditions. This matches the District’s earlier framing that SOD response is long-term and should include restoration strategies for heavily infested forests.
5. Focus research and partnership on management-ready answers  
The District will continue to support research and collaboration that improves field decisions (what works, where, and when), consistent with Policy VM and long-standing Board direction. The District will use research results to test management responses, project likely changes, and adjust actions as conditions shift.

### **Recommendations for Future Action**

Over the next decade, staff propose continuing monitoring efforts to ensure the zone of infection is clearly delineated across the landscape, especially in areas where the NA2 lineage may be more likely to proliferate. In areas exhibiting high mortality from Sudden Oak Death, staff propose implementing ecosystem resiliency work through the Wildland Fire Resiliency Program to address

elevated fuel loads, reduce conditions that may facilitate pathogen spread, and protect key natural resources. Lastly, staff propose continued investment in research to stay current with evolving science and best management practices for pathogen management.

### 1. Track Pathogen Spread

- Collaborate with researchers and land managers to better understand the source of the NA2 lineage, the zone of infection, and the rate of spread through plant sampling and testing, including participation in annual SOD Blitzes.
- Use the SODmap tool to identify known outbreaks, determine priority areas for additional survey effort, and inform management actions accordingly.

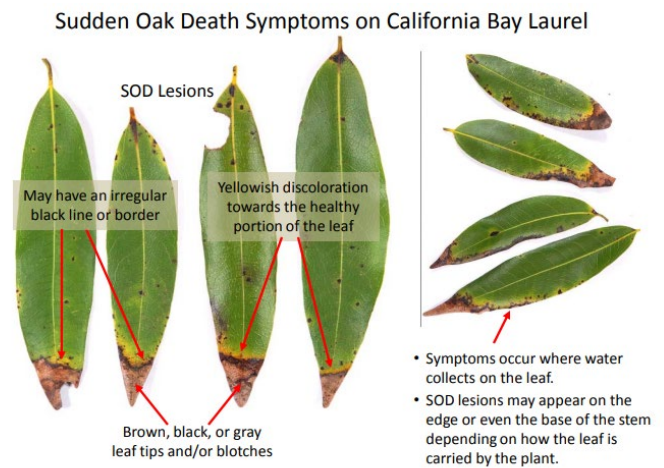


Figure 5: Symptoms of SOD on California Bay Laurel

### 2. Protect High-Value Resources<sup>2</sup>

- To protect high-value oaks that do not exhibit SOD symptoms and to increase resistance to the pathogen, consider removing bay laurels within 15 to 30 feet and/or applying phosphonates. Emphasis should be placed on removing smaller bay laurel trees, as these are often the most infectious, while avoiding tree removal on steep slopes or in riparian areas.
- Selectively thin overly dense forest stands, particularly in areas with high proportions of oaks, tanoak, and bay laurel, to improve forest health and resilience to pathogens, including *Phytophthora ramorum*.
- Conduct major pruning work in late summer or early to mid-fall to minimize the risk of pathogen spread.
- Continue to enforce phytosanitation protocols and standards for staff, contractors, consultants, and nurseries to help prevent pathogen spread.

### 3. Curtail the NA2 Outbreak

- Target SOD sampling in areas where the NA2 lineage is most likely to proliferate to track disease spread.
- Limit movement of green waste and plant materials between areas known to be infested with the NA2 lineage and areas where it has not yet been detected. Dispose of infected bay foliage appropriately, such as through composting, burning, solarization, incorporation into the upper soil layer, or other approved treatment methods.
- Where appropriate, and where needed to protect high-value resources, preemptively reduce the spread of NA2 through strategic removal of infected tanoak trees and pruning of bay

<sup>2</sup> The majority actions identified under Protect High-Value Resources are already being implemented through existing grant-funded forest health and ecosystem resiliency projects, with funding support from the State Coastal Conservancy, CAL FIRE, and the Wildlife Conservation Board.

laurels, with emphasis on the lower 15 feet of branches where inoculum production and spread risk may be greatest.

- If NA2 is detected on Midpen lands, consider establishing a quarantine zone and developing specific procedures for vegetation management within that designated area.

#### 4. Partnerships and Plant Material Biosecurity

- Respond to partner and potential partner inquiries related to nursery development, seed amplification, and other restoration-support opportunities.
- Review potential nursery or seed amplification sites, when requested, to evaluate feasibility, biosecurity considerations, source appropriateness, and alignment with District resource management objectives.
- Support coordination and information sharing with external partners to help advance collaborative approaches to plant material development, restoration, and long-term ecosystem resilience.



**Figure 6: Accreditation to Improve Restoration (AIR) is a program to implement the systematic use of clean production practices designed to exclude *Phytophthora* plant pathogens from nurseries.**

### General Costs Considerations

Implementation of the proposed 10-year work plan would require a rough order-of-magnitude investment of approximately \$3 million over 10 years, with actual costs varying based on monitoring intensity, treatment needs, outbreak response requirements, staffing, contractor support, and future grant funding.

The proposed strategic plan does not expand the scope of the District's existing Sudden Oak Death monitoring and research efforts. The District intends to maintain the current level of effort in monitoring, early detection, and research partnerships, and to continue using these efforts to inform annual prioritization and management decisions. Any cost variability within these elements would primarily reflect year-to-year conditions, partner capacity, and the timing of planned monitoring activities rather than an increase in program scope.

The primary area where costs may increase over the next decade is fuel management work implemented through the District's Wildfire Resiliency Program in forest stands affected by Sudden Oak Death. This increased pace of work would be balanced with other District priorities and shaped by the District's ability to secure grant funding to offset costs, including any matching requirements. A substantial portion of work that supports protection of high-value resources is already being advanced through existing grant-funded forest health and ecosystem resiliency projects supported by the State Coastal Conservancy, CAL FIRE, and the Wildlife Conservation Board. Future grant availability and project eligibility will influence the level and timing of expanded fuel management work.