



FOREST HEALTH PROTECTION Pacific Southwest Region

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Pitch Canker on Monterey Pines at Benicia State Recreation Area Solano County, California

Introduction

Pitch Canker (*Fusarium circinatum* (= *F. sublutinans* f.sp.*pini*)(PC) is an exotic pathogen of native pines, first discovered along the central California coast in 1986. Since then, it has spread up and down the coastline primarily infecting native or planted Monterey pines (*Pinus radiata*) stands. Insects are suggested to be vectoring the pathogen to new locations throughout the state. New infection centers are continually being detected, with heavy mortality and damage usually occurring within the first few years following introduction.

Benicia State Recreation Area (UTM 10 S 07831249 4207141) was probably infected with Pitch Canker around 2004. This 720 acre park is a pristine marshland along the narrowest point off the Carquinez Strait (Appendix A). The park is a prime wildlife refuge as a critical migratory bird stop and home many species of birds and mammals. Monterey Pines and Eucalyptus (*Eucalyptus globulus*) are the predominant shade trees in the park, with a very minor component of oaks and cottonwoods. All pines in the park were planted around 1930 and unfortunately, many of them appear have pitch canker infection.

Forest Health Protection, Beverly Bulaon and Martin MacKenzie, met with park personnel Gerald Aus (Park Ranger), Betsy Lund (Park Maintenance Assistant), and Sandy Stillwell (Park Maintenance worker 1) on two separate occasions during November 2007. The park had been experiencing massive limb dieback and scattered mortality in Monterey Pines for the past few years. During both visits we discussed pitch canker identification, severity within the park, and possible management options to mitigate disease proliferation.



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Observations

At the park main entrance off Freeway 780, a large grouping of Monterey pines were observed with light to severe infections of Pitch Canker (Figures 1 and 2). Several trees were displaying severe symptoms of branch and top dieback from older cankers, while some were found with active infections where pitch streaming was fairly fresh. Of 38 remaining green trees, 29 were observed with some degree of flagging. Trees displayed various levels of infection, with no specific size or age class predominantly showing symptoms.



Figures 1 and 2. 1(*left*). Monterey pines displaying symptoms of Pitch Canker, park entrance. 2(*right*). Close-up of pine crown showing needle discoloration.

Despite dispersed planting of the pines in the park, most of them appeared to have some degree of PC infection (Figure 3). Pines at the main picnic area about a mile south of the entrance also show varying degrees of damage (Figure 4). Two trees were top-killed but live branches were still in the lower crown; three were confirmed dead. One large pine alongside the road was completely devoid of needles except for one live green branch and has persisted in this condition for the past few years.



Figure 3. Line of Monterey pines with varying degrees of PC infection.



Figure 4. Monterey pines at the picnic area show severe infection in the upper crowns.

Pitch tubes and boring dust indicative of bark beetles were observed on symptomatic trees. Prolific boring dust without much pitch tube formation, were visible along bark cracks on two of the three dead trees at the picnic site. Larger tubes indicative of Red turpentine beetle were found on other symptomatic pines, but less than ten were counted per tree. Due to the high

visibility of pines in the park, bark was not removed to confirm beetle identification, nor determine whether trees were subsequently killed by beetle attacks. Signs of insects on other dead trees were minimal, and appear to have occurred after trees were already dead or felled.

Sixteen large trees had already been felled and removed at the park entrance for safety reasons (Figure 5). Park personnel were pruning dead branches in an effort to alleviate hazards, and removing trees only when death was certain. Examination of cut stumps revealed good annual growth prior to death and no evidence that the recent years of drought conditions had slowed individual tree growth. We saw no evidence of other damage agents or predisposing factors that could have contributed to mortality of pines.



Figure 5. Loss of pine shade trees at park entrance and picnic area.

Pitch Canker Biology

Pitch Canker is an exotic pathogen of several native pine species in California. Monterey Pine (*Pinus radiata*) appears to be the most susceptible host with low occurrences in Bishop, Coulter, Italian stone, Aleppo, Ponderosa, and Canary Island pines (Storer *et al.* 2007). Evident symptoms of the pathogen are heavy resinous sunken cankers found on the bole or branches of host trees. Removal of bark over cankers will reveal honey-colored, resin saturated areas of necrotic tissue. Copious amounts of pitch streaming down the bole from cankers are another indicator of infection. Prolonged infection will result in a gradual needle fade on affected branches with eventual crown dieback due to heavy infection.

Mortality of Monterey pine is not always certain despite severe levels of infection. Observations of infected pines in Santa Cruz County have shown trees to persevere despite high infection ratings and symptoms (Owen and Adams 2001). Infected stands monitored over a 12-year period were found to have a survival range of 19 to 68%, with most of the mortality occurring during the first few years after introduction. As the disease progressed in the study plots, pitch canker activity declined. Trees were found with fewer new infections and active infections became dormant. Trees even recovered and new, uninfected growth was observed.

The impact of Pitch Canker on Recreational Quality

Monterey pine is the dominant shade tree in the Benicia State Recreation Area and the death of shade trees is bound to reduce the recreational experience of visitors. Even though infected trees may not die, dead limbs pose a hazard. While stopped in the parking area at the main entrance to the Benicia State Recreational Area Park the stumps of 16 recently felled, 75 year old, Monterey pines can be seen (Figure 6). Next summer, picnickers at several picnic tables will find themselves sharing a single tree. The loss of shade trees is bound to reduce the picnic capacity of the area, and place increased pressure on the sites that still have shade trees.



Figure 6. The impact of pitch canker upon the recreational quality. (Note that the tree in the background has flags (arrows) and that the remaining tree is in decline.)

Discussion and Management Alternatives

While no field samples were confirmed with laboratory analysis, symptoms on infected pines were visibly indicative of pitch canker. The prolific pitching and terminal branch dieback was the most supporting evidence of PC infection. Insect infestation appeared minimal and not suspected of causing the rapid decline of pines in the park.

General recommendations for reducing damage and spread:

- Isolate and relocate downed trees possibly killed by PC. If possible, confine infected material to an area away from non-infected hosts and in an open clearing to accelerate wood drying.
- Do not transport infected material to uninfested areas. If necessary, wrap infected material prior to transport to prevent spore dissemination.
- Do not retain material for use as public firewood or other public use.
- Clean and disinfect all equipment used in pruning or treatment of infected material. This will prevent spore transfer on proceeding treated trees.

Owen and Adams (2001) noted bark beetles were often present in pines with moderate to severe PC ratings, subsequently killing them. Red turpentine or engraver beetles (*Ips* species) favored trees with bole cankers or previous top-kill. Pesticide sprays can prolong survivability of pines by reducing bark beetle attacks. Sprays may be considered for high-value trees that currently have, low infection ratings, are showing some resistance to the pathogen, or where beetle risk is elevated. No fungicide treatments have been found effective against PC.

As the infection of PC at the Benicia Rec Area is a new occurrence, the projected initial loss of Monterey pines may be significant. However, changes in vegetation management plans can accommodate prevention and conservation efforts of remaining pines. Regardless that these pines were historically planted rather than natural pioneers, ecosystems within the park have adapted to their presence and would suffer from the loss these trees. Monterey pines play an important role as the main overstory tree in the park and efforts should be made to conserve all residual trees that appear healthy and infection-free. All non-Monterey conifers and any other shade producing trees should be reserved where possible.

In 1994, California Native Plant Society considered the native Monterey pine to be rare and endangered due to increased threats of land development, feral animals, and disease. The CNPS (1995): “recommends that no further removal of healthy, non-hazardous native Monterey pine trees. . . to provide wildlife corridors, habitat connectivity, or occupy rare terrace soils.” Larger mammals such as deer and coyotes have been spotted more frequently in the park as well as a wider array of bird species probably due to housing development in the surrounding Benicia hills. Retention of remaining pines in the park would be crucial to providing necessary habitat and forage.

It is not recommended to replant nursery stock Monterey pines at this time. Research to identify genetically resistant native strains is currently being conducted; however they are not yet available for widespread distribution. Pitch canker is infectious on other species of native pines, so revegetation planning should be undertaken with caution.

We enjoyed working with park personnel and hope this information has been helpful. If you have need more information about discussion recommendations or have further questions, please contact Beverly M. Bulaon or Martin MacKenzie at 209-532-3671.

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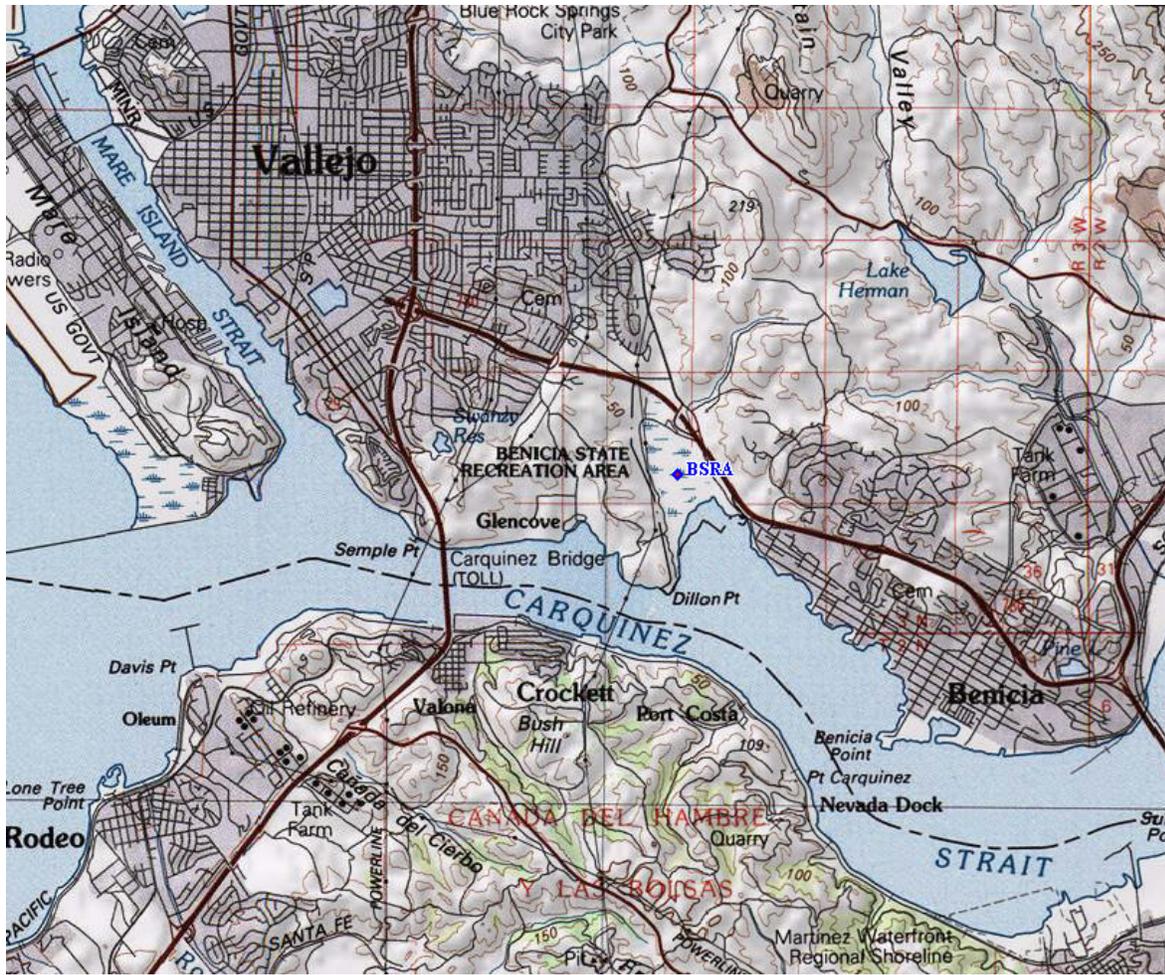
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Appendix A. Benicia State Recreation Area located north of Dillon Point along the Carquinez Strait, Solano County, California.