

## Survey of Pitch Canker in Post-fire Bishop pine

### **Background**

Pitch canker, caused by the introduced pathogen *Fusarium circinatum*, has recently been identified in the young, post-fire Bishop pine forest where it is causing large visible centers of infected trees. The goal of the sampling is to precisely locate these centers, ascertain their size, survey the disease severity within the centers, and collect isolates of the pathogen to determine genotypes. These data will provide a base-line assessment that when compared to sampling in subsequent years will provide a basis for predicting the progress of the disease within the park.

### **Main Goals of Study:**

- 1) determine location and size of infection centers
- 2) estimate disease severity
- 3) send in specimens to get genotypes
- 4) date the first mortality in the infection centers

### **Sampling scheme**

#### **1) Establish a permant photo point on the opposing hill (Two people - a photographer/spotter and walkie talkie/recorder)**

1. On an oppossing hillside set up a photo station, mark it with rebar, a rebar cap, and record the GPS.
2. set the tripod directly over the photopoint, point the camera at the center of the disease center, record the azimuth that the camera is pointed toward, and the angle that the camera is tilted from horizontal (if it is). Shoot the first photo. Leave the camera in this position, shoot a second photo with the with the 20 cm target placed 1m from the camera. Leave the camera in place until all photos of the site are taken.
3. When plots are located by the sampling coordinate with the team via walkie talkie and to shoot additional photos with the reflective target in the view. Record the plot number associated with each and the GPS.

#### **2) Sampling for Disease Severity (two teams of 2-3 people each)**

1. Locate the site and walk into it trying to avoid poison oak. **Flag your path** so that you can find your way out and so others can find the way in.
2. Once you are in an area with several diseased trees establish the first plot. Go to the nearest infected or pitch canker-killed tree, rate its disease severity, flag it, and **tag it**. Raise the reflective pole and coordinate with the opposing hill photographer so that the location of the plot is imaged. Record the GPS.
3. Within 2.5 meters (20 sq m circular plot), or 1.8 m if the trees are too dense (10 sq m) of this first tree count all trees, and talley the number of living, infected, and dead by pitch canker.
4. Tag and flag and rate disease in four living trees that are either in this plot or in immediate area. Ideally spread these out in the four directions from the plot center. If they are no living trees, move to the closest outside the

plot and GPS them. If the center tree is living, make that a fifth tree for rating. If not, chose one more in a random direction.

5. For one of the five remove a living but infected branch, and bag the part of the branch that includes the transition zone from living to dead. Label the bag with the tree number.
6. Establish four more similar plots within the disease center. Each should ideally be at least 15 m from all others. Work with the spotter/photographer via walkie talkie to find areas that vary in visible disease severity. Ideally you want to spread the plots across several levels of infection.

### **3) Aging the infection centers.**

If the centers have sites of heavy mortality cut down what appear to be the five oldest dead trees, cut a cross-section out of the base and bag them together in one labeled bag.

**Impact of the sampling** will be minimal. All of the sites are remote from roads and trails and generally separated from the latter by thick forest or scrub; tags, flagging, and PVC used in the plots will not be visible to park visitors. The only materials removed are diseased branches (6/plot). Tools used to remove them will be wiped with ethanol soaked towels between samples to eliminate cross contamination.

**Personnel:** Six undergraduate students (listed below) from UC Berkeley and Prof. Tom Bruns of UC Berkeley will be responsible for the field sampling. Tom Gordon of UC Davis will be responsible for final isolation and characterization of the *Fusarium circinatum* isolates.

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