

CONE CAMP & THE IMPORTANCE OF COOPERATIVE CONE SURVEYING IN CALIFORNIA'S REFORESTATION MISSION



Our state faces a serious uphill challenge when it comes to reforestation. In the last 10 years alone approximately 25 percent of all of California's forest land has been impacted by wildfire. There has also been significant impact from drought, disease, and pests. These circumstances form the backdrop for [California's reforestation mission](#).

It is important to note that while CAL FIRE is the state's forestry and fire protection agency, it only directly manages 85,000 acres of land – the Demonstration State Forests- approximately 0.08 percent of the total of California. With that being said, CAL FIRE needs significant assistance and cooperation when it comes to obtaining the seeds it needs to meet the target of storing enough seed to [reforest 25 percent](#) of productive conifer forests on non-Federal lands at any given time throughout the state of California.

Throughout the Spring and early Summer, CAL FIRE, The U. S. Department of Agriculture (USDA) Forest Service , and American Forests through the [California Reforestation Pipeline Cooperative](#) launched the Cone Camp initiative. This program consists of three camps in southern, central, and northern California directed at public and private landowners, forest managers, academics, non-profit organizations, and government employees. The aim of these events was to provide these groups with the scientific tools and applied basics of conifer cone surveying and monitoring in California.



Figure 1 - Cone Camp attendees learning the indicators of healthy tree stands from USDA Forest Service and American Forests staff.

This aids in the diversification and democratization of cone surveying and seed collection as a wider and deeper pool of cone surveyors are now available across California. Attendees also had access to subject matter experts to answer questions about 2023 seed need priorities, surveys, and collection plans.



Figure 2 - A cone sample. This cone is not ripe yet and shows signs of insect incursion on the right side.

The first day of camp consisted of classroom training with several speakers from CAL FIRE, USDA Forest Service, American Forests, and Sierra Pacific Industries and covered topics such as tree genetics, cone monitoring and sampling techniques.

Another valuable takeaway from the camps was the new [Cone Observation Survey \(COS\) application](#). Available on smart devices via the ArcGIS Survey123 platform, the COS allows anyone to document a cone crop with GPS positioning information, photographs, and important information for cone collection climbers such as terrain, and road access. Using the information collected from the COS app, American Forests will be able to direct cone collectors to the appropriate locations whilst also getting a broader, statewide picture of the quality and density of the cone crop available.

The second and final day of Cone Camp was spent in the field. At the central California Cone Camp, which took place at the Blodgett Research Forest in El Dorado County, this consisted of rotating stations where participants put the previous day's knowledge into practice.

The first session of the day focused on how drones can be used for cone crop surveying, or re-CONE-naissance (fig 3). Using a drone to fly to the top of the canopy, where the best cone crop can normally be found saves the use of other survey tools such as climbers or slingshots, which are less cost and time effective.

Next was learning how to sample cones and what the CAL FIRE's State Seed Bank does when the cone crop is delivered. Cone surveying involves cutting the face of a collected cone in half (fig 2) and looking at various indicators such as ripeness, number of filled seed, seed embryo development, and any signs of pest or disease encroachment. After looking at the surveyed cone, a trained individual will be able to surmise the quality of the cone crop from a given tree or tree stand and when it may be able to be harvested.

Figure 3 - A demonstration of drone use in cone surveying. This drone was able to fly up and circle this tree's cone crop, capturing photos and video.



Sampling methods were next on the agenda. This consisted of a demonstration of the tools that can be used for cone surveying and the collection of samples including a slingshot. This method involves using a large slingshot (fig 4) to fire a small rope over a branch holding a cone. Then using the rope to shake to cone free. It is important to note that these methods are only used for sampling. Cone collecting is always carried out by trained tree climbers.



Figure 4 - American Forests staff demonstrating the slingshot method of collecting cones for sampling.

Finally, attendees put the previous day's knowledge into practice when it came to developing an eye for good cone crops. Looking at tree reproduction indicators while practicing reporting a crop with the COS app demonstrated to attendees what they should be looking for when out in the field.

Ultimately, the tools and knowledge gained from Cone Camp will help to build an interdisciplinary workforce of cone surveyors across the state who are able to centrally report quality crops with the COS app. In both the short and long term, this will help to achieve California's reforestation goals and reseed healthier forests.

