

# U.S. Forest Service Aerial Survey Program in California

CONDUCTED BY REGION 5 STATE AND PRIVATE  
FORESTRY AERIAL SURVEY PROGRAM

JEFFREY MOORE  
INTERIM PROGRAM MANAGER  
AND PRIMARY SURVEYOR





# Who We Are

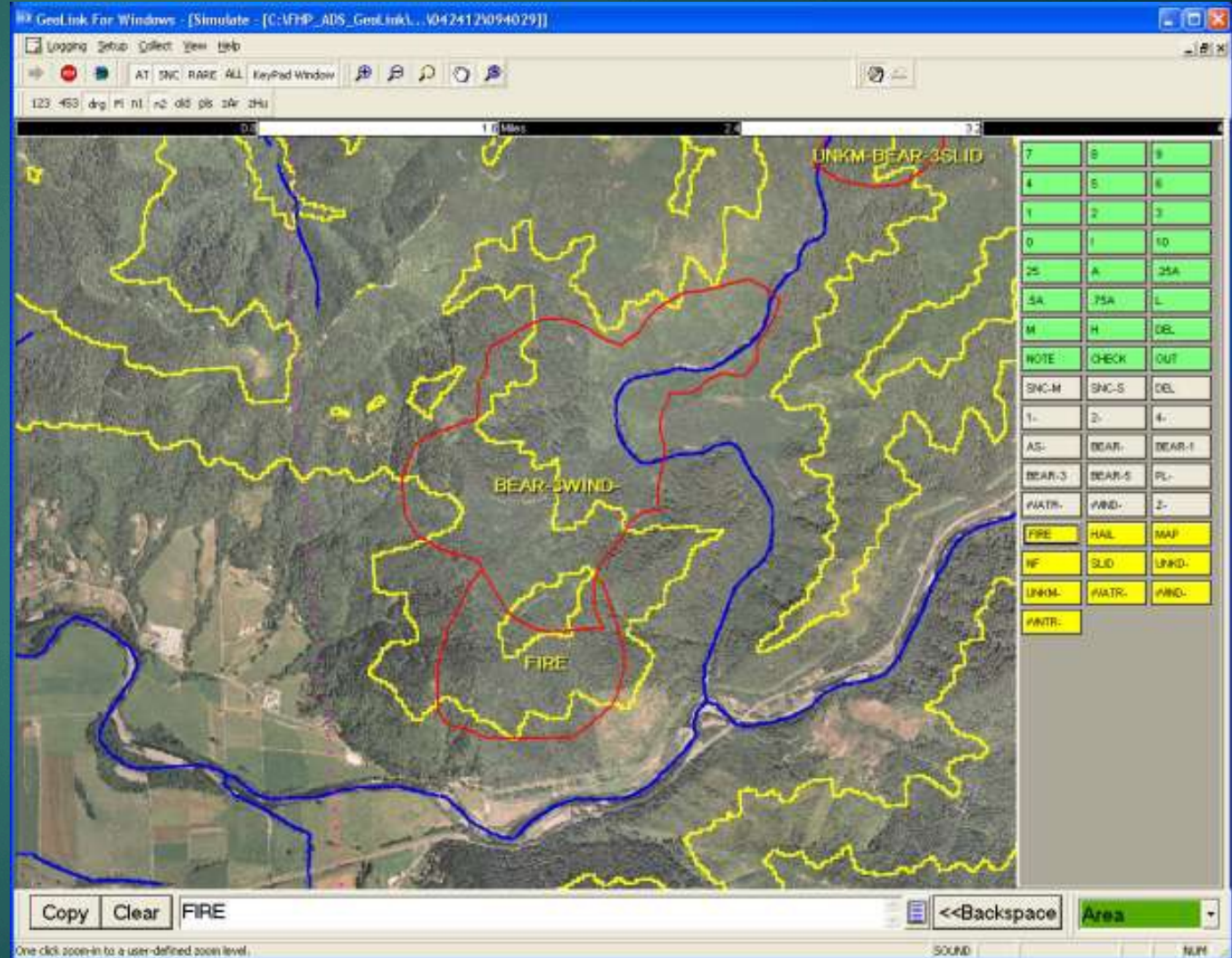
- Small Program
- Primarily use a contracted plane and pilot
  - Cessna 205
  - Agency Cessna186 used on occasion
- Recently and presently utilize contract surveyors
- Operating budget around \$100,000 annually for aircraft services





# How we Operate

- Typical configuration
  - Two surveyors looking out opposite sides of aircraft
  - Visual estimation of **red dead** trees
  - Swath width 1.5 to 2 miles
  - Flight altitude approximately '1000
- Cover approximately 50-55 million acres over 200-250 flight hours
- Survey is conducted in summer once dead trees dry out and turn color
- Survey is meant to be coarse overview and detailed precision at stand level is limited





# What We Produce

Annual update to a Regional database reflecting the location and extent of recently killed trees and other tree damage

- Approximately 95% of this damage is mortality mostly attributable to bark beetle or wood borer insect activity. Examples include:
  - Mountain pine beetle
  - Fir engraver
  - Golden spotted oak borer
- Other mortality agents include:
  - Root diseases such Sudden Oak Death or Port Orford-Cedar root disease
  - Bear feeding damage to young plantation Douglas-fir and redwood
  - Recently directly attributed to drought especially oaks
  - Abiotic factors such as windthrow, water damage, avalanches etc.



# Examples of Non-mortality Tree Damage

- Defoliation
  - Defoliating insect activity such as tussock moth and oak leafroller
  - Foliar diseases such as *marsonina* and *anthracnose*
  - *Recently early leaf drop of deciduous oaks as a drought response*
- *Flagging or Branch Dieback*
  - *Cytospora in true fir*
  - *Engraver beetles in conifers*
- *Dieback*
- *Topkill*
- *Discoloration*



# Photos

- ▶ Photos are taken and freely shared via our Flickr site at: <https://www.flickr.com/photos/usfsr5/albums>
- ▶ Photos are samples of events seen and are only occasionally taken for representation of larger scale events
- ▶ We do not take aerial imagery per se
- ▶ Photos as well as visual cues in general are on a **unique top down, oblique angle** that allows for enhanced views for better tree species and damage identification as well as generous swath coverage
- ▶ Human eye is still superior to photos due to acuity, fine color gradations, versatility, poor lighting conditions, etc. but is limited to visible spectrum



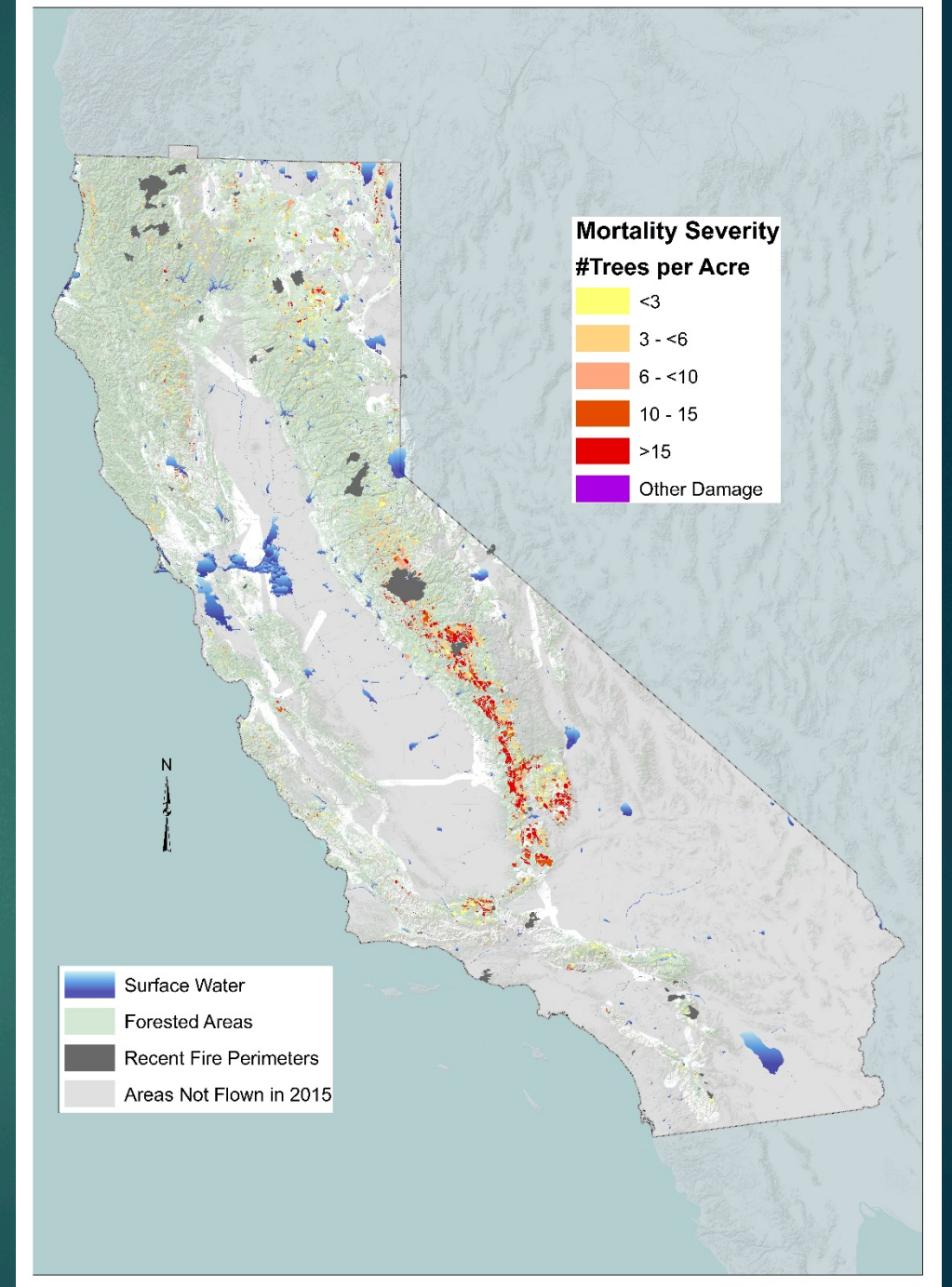


# 2015 Aerial Survey Map of California

Go to

<http://egis.fire.ca.gov/TreeMortalityViewer/>

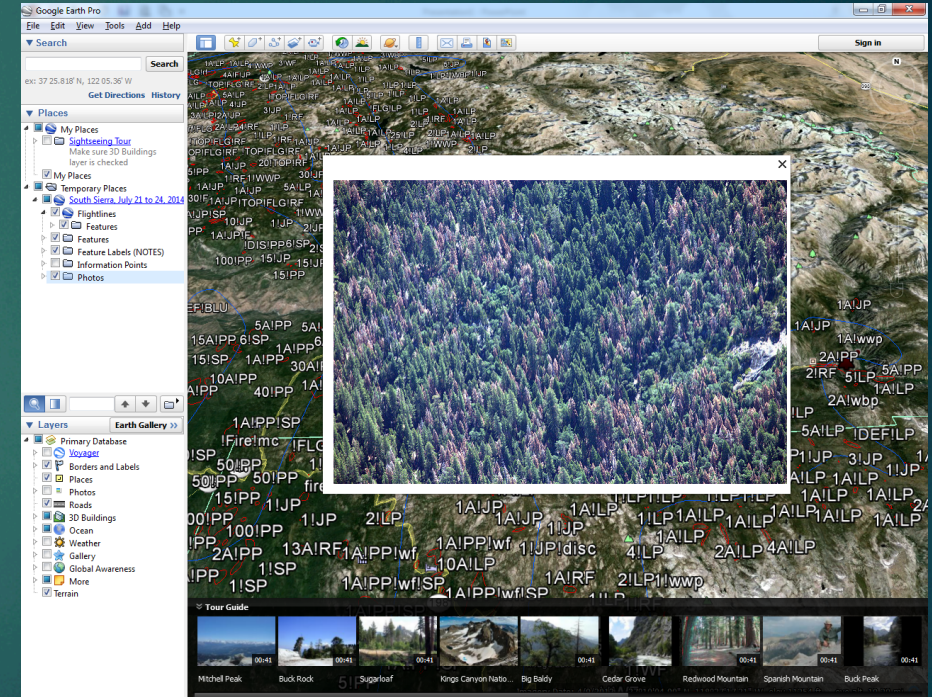
To access an interactive viewer that displays our results.





# Deliverables

- Reports
  - Interim Reports are quick turnaround summaries of a particular location or flight iteration. They are typically succinct and include a map of the survey area and selected photos. They can be downloaded from here: [http://www.fs.usda.gov/detail/r5/forest-grasslandhealth/?cid=fsbdev3\\_046696](http://www.fs.usda.gov/detail/r5/forest-grasslandhealth/?cid=fsbdev3_046696)
  - KMZs for viewing data and collocated photos in Google Earth – not yet finished for 2015
  - Final report summary – not yet finished for 2015
- GIS Data
  - Once finalized, a statewide Geodatabase for use in ARC and other GIS applications
  - It can also be downloaded from same location for custom use
- Special Surveys, data and reports. For example in 2015 performed blowdown survey on the Lassen NF, early survey of SoCal and South Sierras, Aspen occurrence on the Lassen NF and a special survey of the American fire area.





# 2015 aerial Survey Results

- ▶ Estimated 27.6 million trees killed statewide across 2.8 million acres
- ▶ Mortality became increasingly intense into southern Sierra Nevada Range continuing into southern California
- ▶ Mortality generally was most intense in areas where the recent/current drought has been most exceptional for the longest period of time.
- ▶ Conifers especially in the low elevation pine type were most severely impacted.
- ▶ In many of these areas all species including oak, incense-cedar and even chaparral were severely impacted
- ▶ Areas with less intense drought conditions and at higher elevations also had increased levels of mortality especially in fir but was generally less intense and more scattered.
- ▶ Drought is not conducive to the spread of tree diseases such as sudden oak death and disease expression was not elevated from previous years.
- ▶ Tree mortality rates have been increasing over the last three years and increased dramatically in 2015. **This is known as a lag.**



# Expectations for 2016

- ▶ Bark beetle populations have had superior reproductive success for several years and are now at very high levels throughout the landscape.
- ▶ Trees which will be mapped this year mostly died in 2015 when the drought was at its zenith. Trees at this time were highly drought stressed and under considerable bark beetle pressure.
- ▶ Recent precipitation came too late in the season to improve tree defenses.
- ▶ Tree diseases will likely spread and intensify in many areas due to the increased moisture especially if precipitation events last later in the spring.