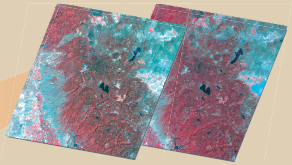
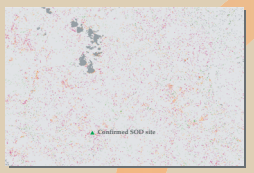
The Use of Remotely Sensed Data for the Detection, Mapping, and Monitoring of Sudden Oak Death

The US Forest Service (FS) and California Department of Forestry and Fire Protection (CDF) are monitoring Sudden Oak Death (SOD) under the umbrella of the larger California Land Cover Mapping and Monitoring Program (LCMMP). The LCMMP is a statewide cooperative effort among the FS and CDF focused on mapping and monitoring California's vegetation and land cover.

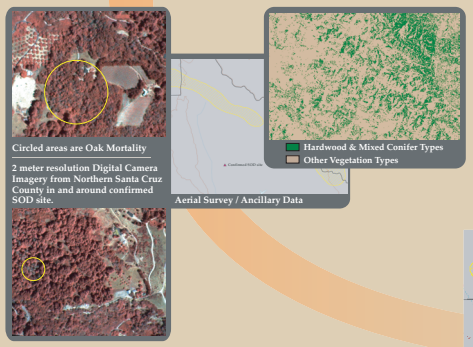
This program utilizes satellite imagery and change detection techniques to map and monitor changes in vegetation due to drought-induced insect mortality, fire mortality, and subtle changes due to selective harvest methods. The current project has been easily adapted under the larger program to identify oak mortality, potential SOD areas, and develop a basis for establishing a monitoring program for SOD in collaboration with the California Oak Mortality Task Force. Multi-scale remote sensing, aerial survey expertise and on-the-ground sampling form baseline information to identify areas affected by SOD and to facilitate identification of changes due to SOD over time.

Change Detection



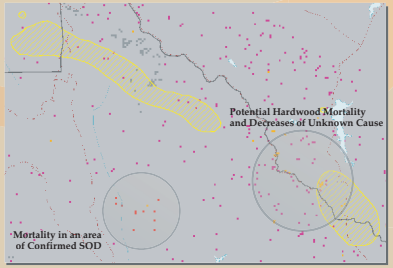


Initial Change Image

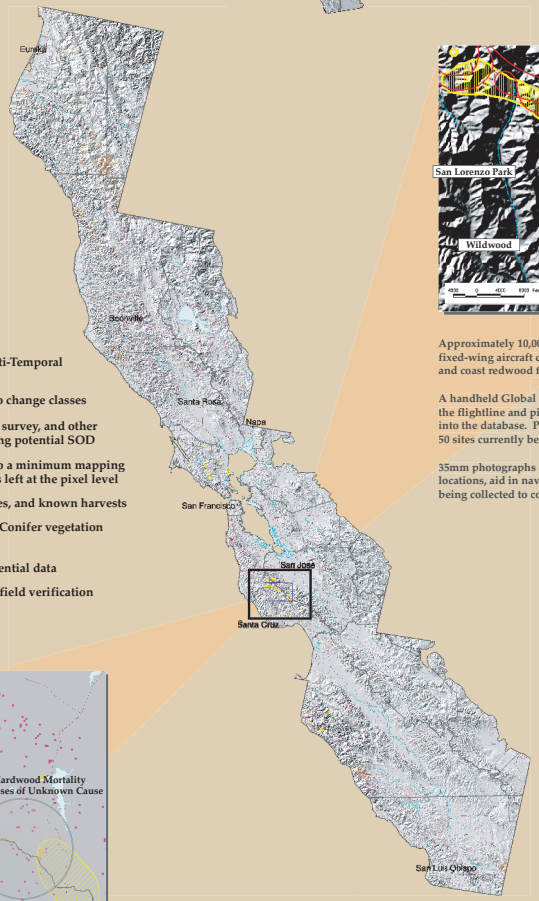


Multi-Scale Approach

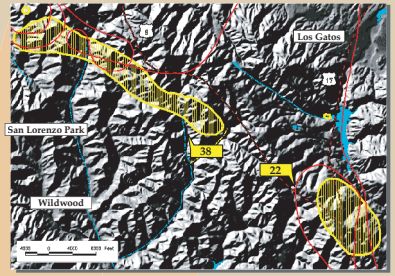
- Derive change image using a Multi-Temporal Kauth-Thomas Transformation
- Classify by lifeform and label into change classes
- Use digital camera imagery, aerial survey, and other data sources to assist in interpreting potential SOD
- Aggregate increases/decreases into a minimum mapping unit of 2.5 acres - Potential SOD is left at the pixel level
- Mask urban areas, agriculture, fires, and known harvests
- Stratify by Hardwood and Mixed Conifer vegetation types only
- Mask increases and other non-essential data
- Perform accuracy assessment and field verification



Final Change Image



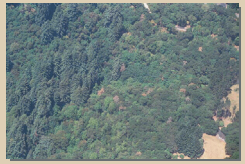
Aerial Survey



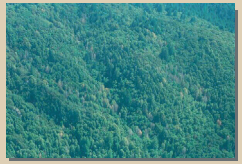
Approximately 10,000,000 acres within the Project Area (left) were surveyed using fixed-wing aircraft during July 2001. Survey efforts concentrated on oak woodland and coast redwood forest types.

A handheld Global Positioning System (GPS) was used during the flight to capture the flightline and pinpoint mortality areas, which were subsequently incorporated into the database. Polygons 38 and 22 shown above are two of the approximately 50 sites currently being investigated on the ground as possible SOD.

35mm photographs display mortality observed from the air and, together with GPS locations, aid in navigation to mortality areas on the ground. Samples are currently being collected to confirm or refute presence of *Phytopthora ramorum*.



Aerial Survey Polygon #22 - Yellow to Orange-colored crowns indicate recent mortality.



Aerial Survey Polygon #38 - "Greyish" colored trees that have been dead more than a year mixed with recent mortality.

Legend

- Potential Hardwood Decline
- Hardwood Mortality in Areas of Confirmed SOD
- Decrease in Hardwood Vegetation
- Cloud, Snow, or Fog Obscured
- Water
- Aerial Survey Mortality Polygon
- Roads
- Flight Line

POLY #	ACRES	CHECK_SOD?	MAJOR_VEG	MORT_% ALL	MORT_% SPP	COMMENTS
17	62.7	y	mc/oak	20	mostly l-oak/bve	last 60 ac; l-oak in areas/off-color other HW - chk!
18	37.2	y	oak	20	l-oak/b-oak mix?	last 30 ac; faded HW; uncertain if mort-ground chk!
19	22237.4		oak	100	mix HW	last 30,000 ac; wildfire each side Putah Crk
20	9.9		oak	0	0	last 5 ac; buckeye patch - not mortality
21	13.2	y	rw	15	l-oak	last 10 ac; 70% new mort in draw w of lex res
22	2117.3	y	rw	5	l-oak 90 l-oak10	last 1800 ac; 90% new mort; mort % est averaged
23	9.3	y	oak	10	l-oak	last 5 ac; b-eye present but possible l-oak mort
24	8.3	y	oak	10	l-oak	last 5 ac; 2 clumps recent l-oak-but buckeye--chk!
25	13.8	y	oak	5	l-oak	last 10 ac; b-eye present but scat older dead l-oak
26	13.8		oak	0	l-oak	single & isolated, dead l-oak - similarly SOD
27	30.0	y	oak	5	l-oak	last 20 ac; buckeye but l-oak also - more mort?
28	1514.2	y	oak	20	l-oak 80/bay/mad	last 1000+ ac; 80% is older dead/10% new
29	11.8	y	oak	10	l-oak	last 5 ac; 95% old mort & 5% new
30	104.5	y	oak	10	l-oak	last 100 ac; 95% old mort & 5% new
31	869.2	y	rw	5	l-oak	last 500 ac; 20% in patch/lighter overall; 50%new
32	1550.9	y	rw	5	l-oak	last 1000 ac; 20% in patch/lighter overall; 90%new
33	252.1	y	rw	5	l-oak	last 200 ac; location approx - scat ww of tom. bay
34	106.1	y	oak	2	l-oak	last 100 ac; buckeye present but possible l-oak
35	3.7	y	oak	2	l-oak	last 3 ac; buckeye present but possible l-oak
36	49.6	y	oak	5	l-oak	3 patches @ 3ac ea; buckeye/sent/transmitter hill
37	24.3	y	rw	5	l-oak	last 15 ac; 50% new mortality
38	3635.6	y	rw	15	l-oak	last 3200+ ac; 50% new; likely larger than mapped
39	2.8	y	oak	1	l-oak	last 2 ac; buckeye present but possible l-oak
40	7157.4		oak mc	85	pine mix-pp/bp?	last 6000+ac; wildfires-several historic throughout
41	28.1	y	oak mc	5	pp/bp 90 h/bev 10	last 20 ac; Other mort pine but mad. fade/chk oaks
42	56.3		mc	15	pp	last 50 ac; patch and scat pine kill
43	16.9	y	rw	5	l-oak	last 10 ac; trib to main mort area 44-pics overlap?

Data table displaying attributes captured during flight for each polygon. GPSed point features identify polygon number along the GPSed flightline and link the table to the map.

Contacts:

Lisa Levien
Chris Fischer
Lianne Mahon
Jeff Mai

prepared by Ryan Calle

FHM Posters home page | FHM 2002 Posters