



FRAP Assessment: Inventory and Monitoring for Climate Change Analysis

California Department of Forestry

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Acknowledgements

Ralph Warbington, Retired USFS

Carlos Ramirez, RSL

Lisa Fischer, FHP

**Visit our web site at: <http://frap.cdf.ca.gov> or
<http://www.fs.fed.us/r5/rsl/projects/mapping/zone-map.shtml>**

FRAP MANDATE

PRC 4789

- Mandates an Assessment of Forest Resources to guide forest policies for the State.
 - An assessment and analysis of the supply and availability of forest and rangeland resources of the state
 - A discussion of important policy considerations, laws, regulations, management responsibilities, and other factors expected to influence and significantly affect the use, ownership, and management of forest and rangeland resources.
- Systematic overview of the status and trends on CA forests
- Forest condition and extent
- Trend analysis and reporting

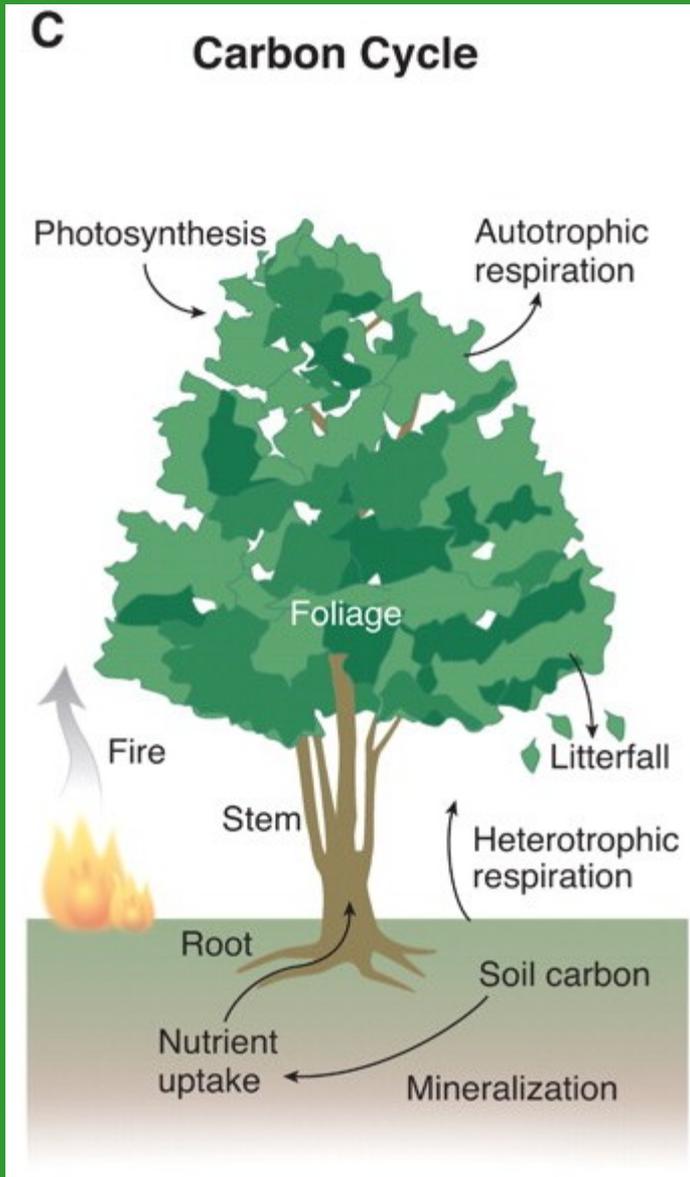
FRAP Assessment Climate Change Chapter

June, 2010

Provides a review of potential climate change impacts on forest and range lands in California.

Assessment Activities

- Model Changes in carbon stock for 2010, 2020, 2050 and 2100 (fire and insect/disease threats) (MC1 model)
- Model potential changes in vegetation distribution (BIOMOVE – UCSB collaboration)
- Establish Indicators for Climate Change based on temperature, precipitation, snow water equivalents.

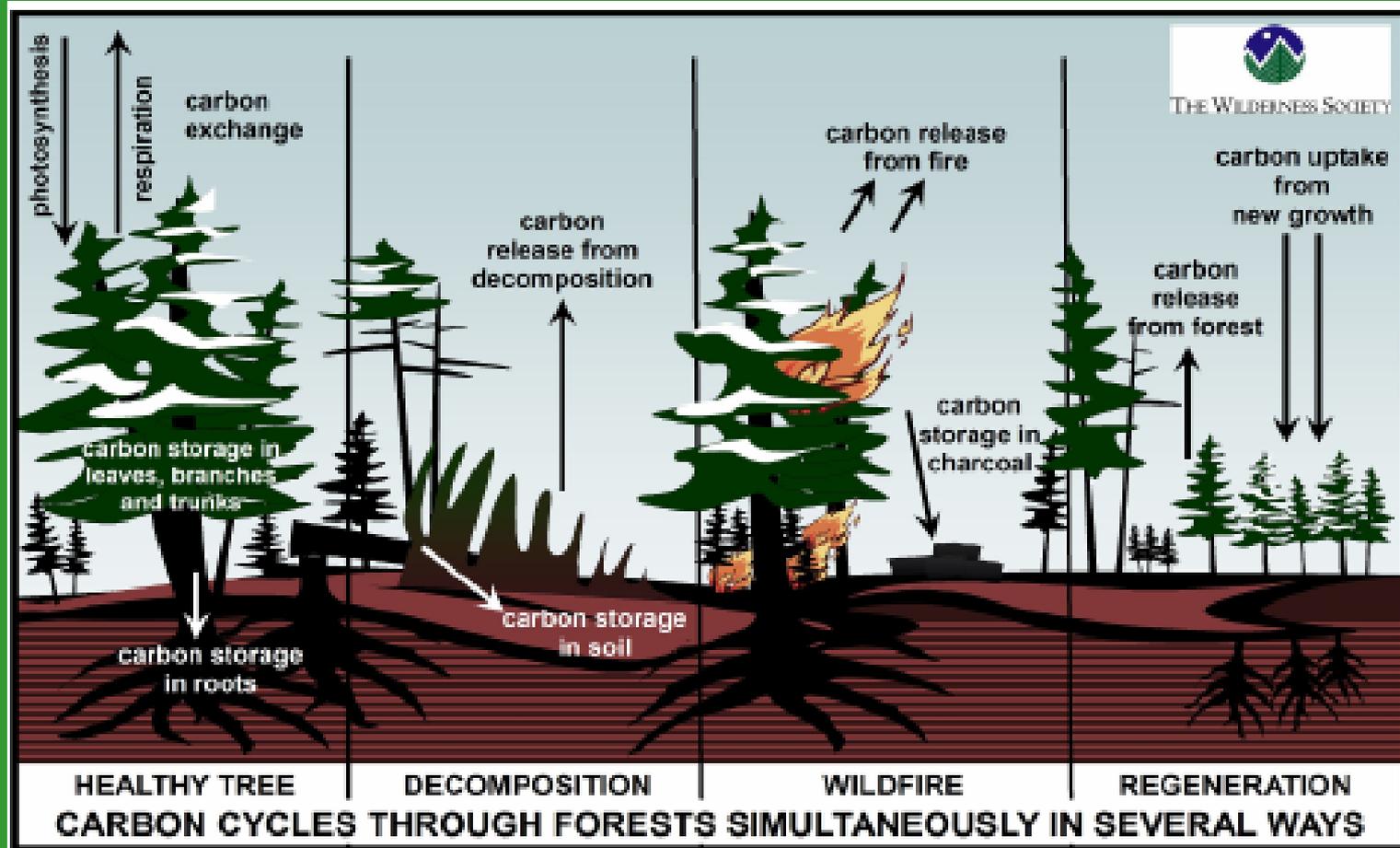


Forest Carbon Pools

- Bole
- Branch and Leaf Foliage
- Roots
- Down Woody Debris
- Soil Organics*

G. B. Bonan *Science* 320, 1444 -1449 (2008)

Carbon Pools in Forests



Source: The Wilderness Society



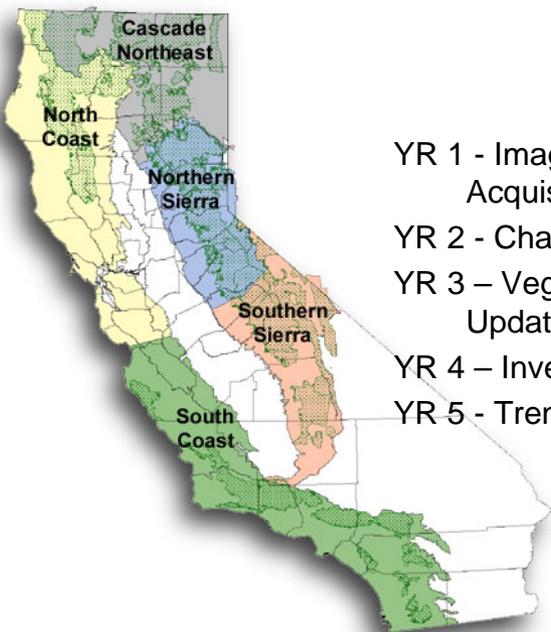
Land Cover Mapping and Monitoring Strategy

CA Land Cover Mapping and Monitoring Program (LCMMP) provides data and analysis via WWW

- **Cooperative Among CAL FIRE and USFS**
- **Data for Forest and Rangelands**
- **Vegetation Mapping Component**
- **Vegetation Monitoring Component**
- **Coordinated Schedule**

Cooperative Strategy

5 Panel Project Areas



- YR 1 - Imagery Acquisition
- YR 2 - Change Detection
- YR 3 - Vegetation Updates
- YR 4 - Inventory
- YR 5 - Trend Analysis

Vegetation and Fuels Mapping

Statewide 5- 10 year Cycle

- Baseline Vegetation Map
- Inventory Link
- Change Monitoring
- Vegetation Map updates
- Trend analysis

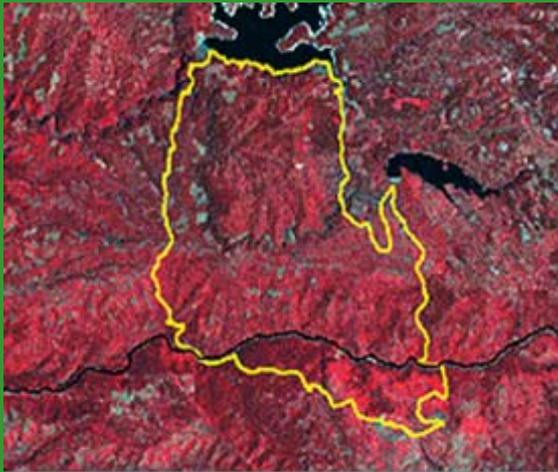
Cooperative Mapping Approach

- Make use of existing vegetation data
 - Cost effective
 - Avoids redundancy
 - Promotes ownership and acceptance of data and analysis
 - Encourages collaboration
- Define a consistent spatial base (polygons)
 - Independent of map attributes
 - Stand based
 - Objective delineation of landscape features
- Hierarchically add thematic detail necessary to meet map standards
 - Specific focus on detailed type and structure attributes
- Accuracy assessment
 - Forest inventories used for independent accuracy assessment and as a statistical sample for forest attributes

Land Cover Monitoring

Methods

Time 1 Image



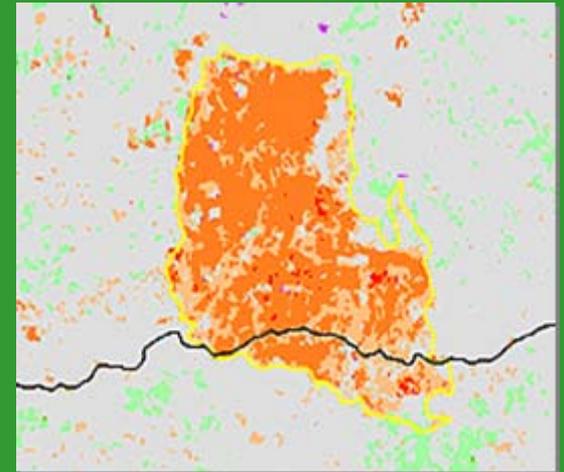
 Red is a presence of vegetation

Time 2 Image



 Gray is an absence of vegetation

Change Detection Map



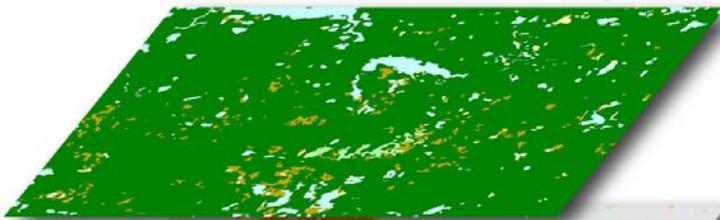
 Decrease in vegetation cover
 Increase in vegetation cover
 No change in vegetation cover

- **LANDSAT, Aerial photos, field data, other imagery sources used to classify change**

LCMMP Coming Together

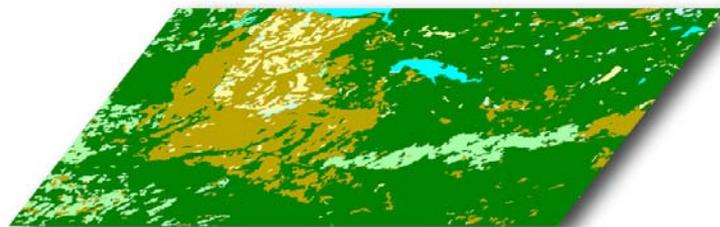
Land Cover Map Update Process

1991 Land cover map



Land cover changes between 1991 and 1996

↓ Remap



1996 Land cover map (updated)

- Establish Baseline Vegetation Information
- Re-map only where changes are identified
- Vegetation data updated

Land Cover Monitoring

Identifying Causes of Change is facilitated by tracking activities such as wildfire, harvesting, and insect and disease outbreaks using GIS

- Wildfire
- Rx burn
- Mortality
- Harvesting
- Thinning
- Regeneration
- Development
- Conversion
- etc.

Compile data from multiple agencies



Land Cover Monitoring

Identifying Causes of Change Using GIS: North Sierra 2000-2005

2005 Air Photo



Fire Perimeters



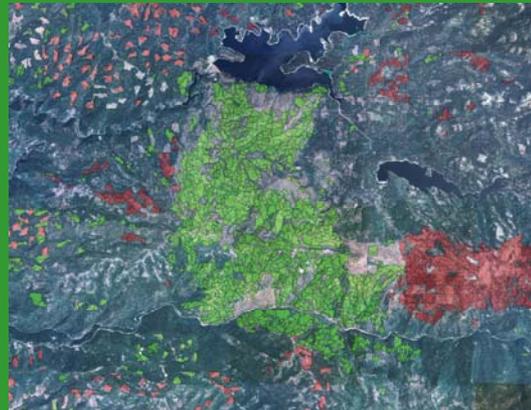
THP 1996-1999



THP 2000 - 2005



Change Data 2000-2005

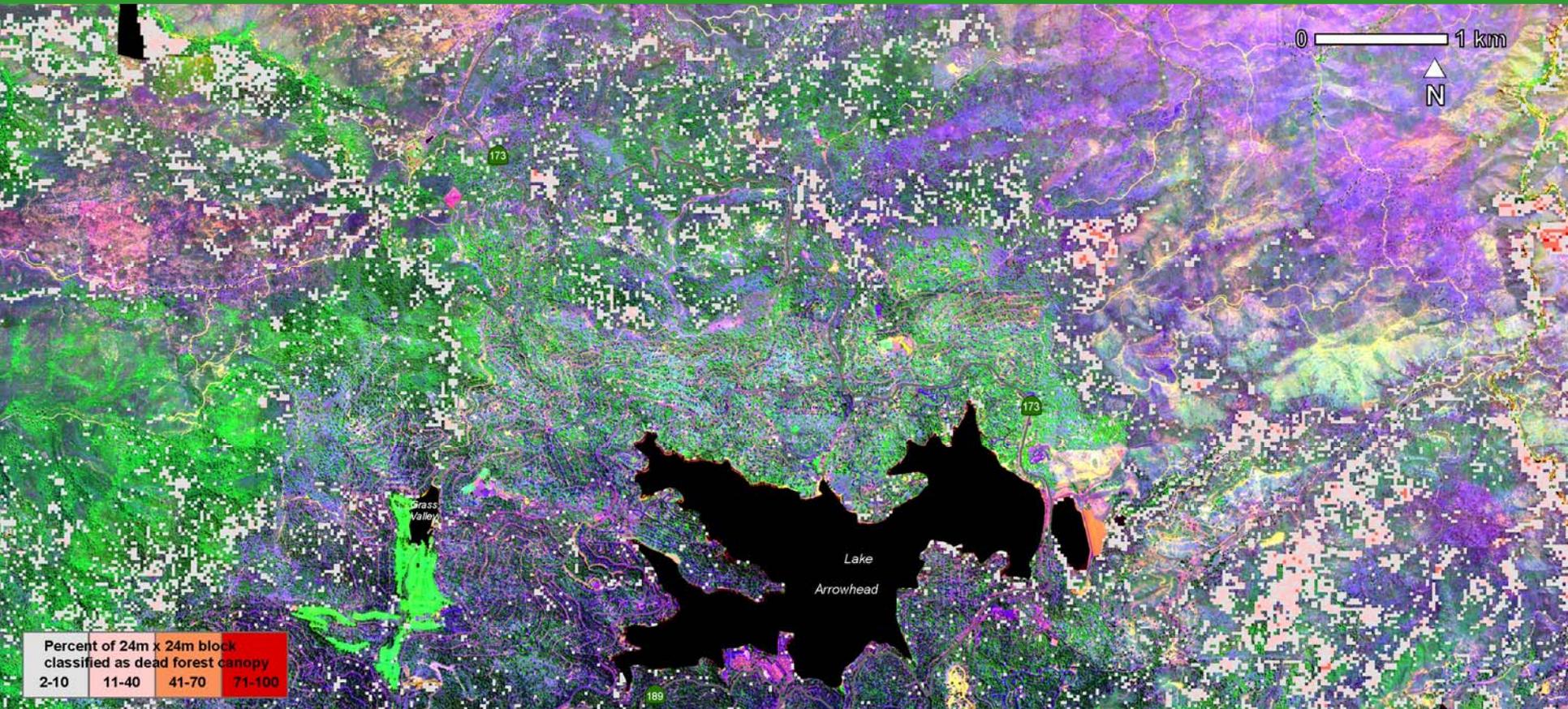


Cause of Change



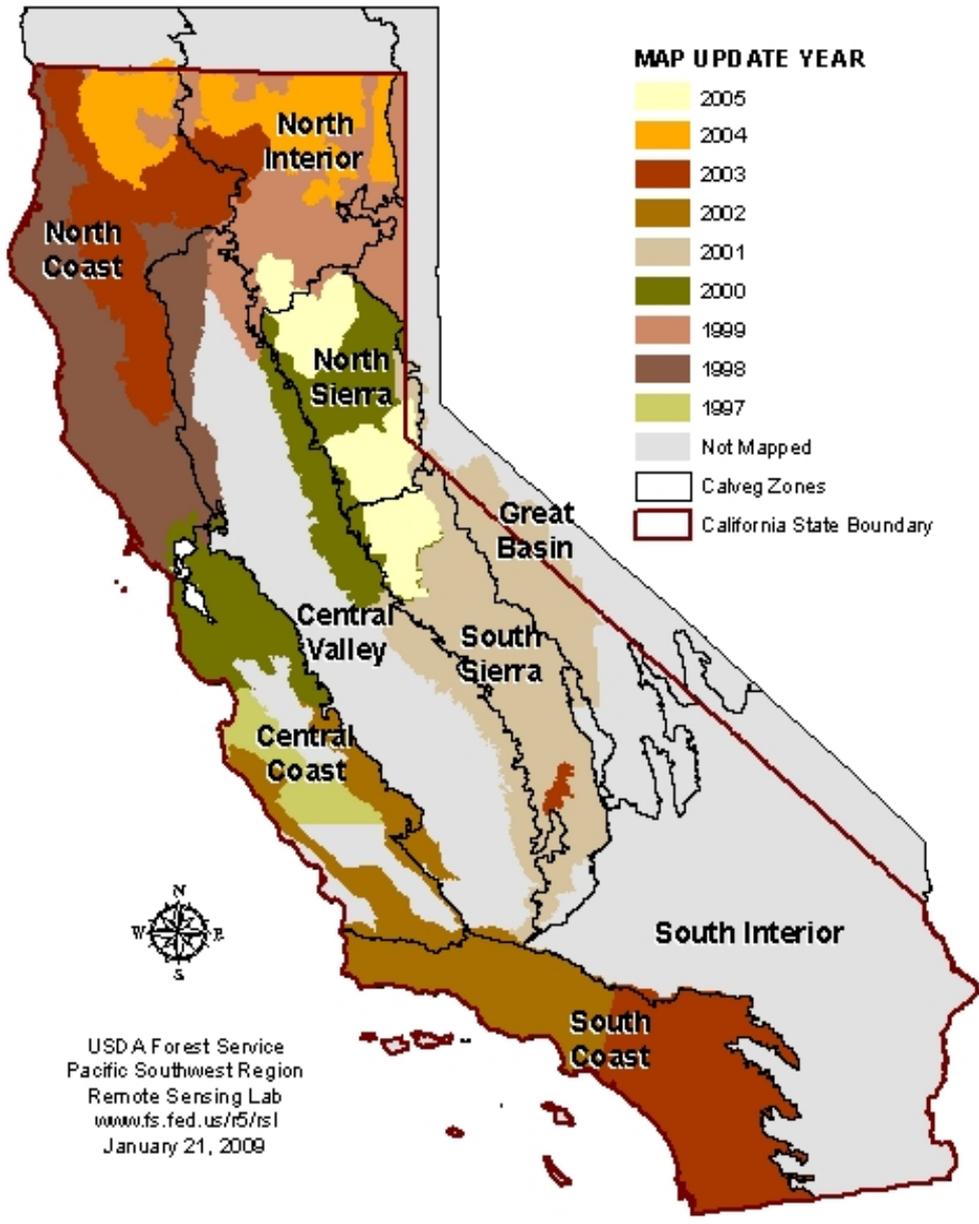
Trends in Forest Mortality:

2007 Southern California Tree Mortality



Map Status by CALVEG Ecological Zones

Extent of Mapped Existing Vegetation



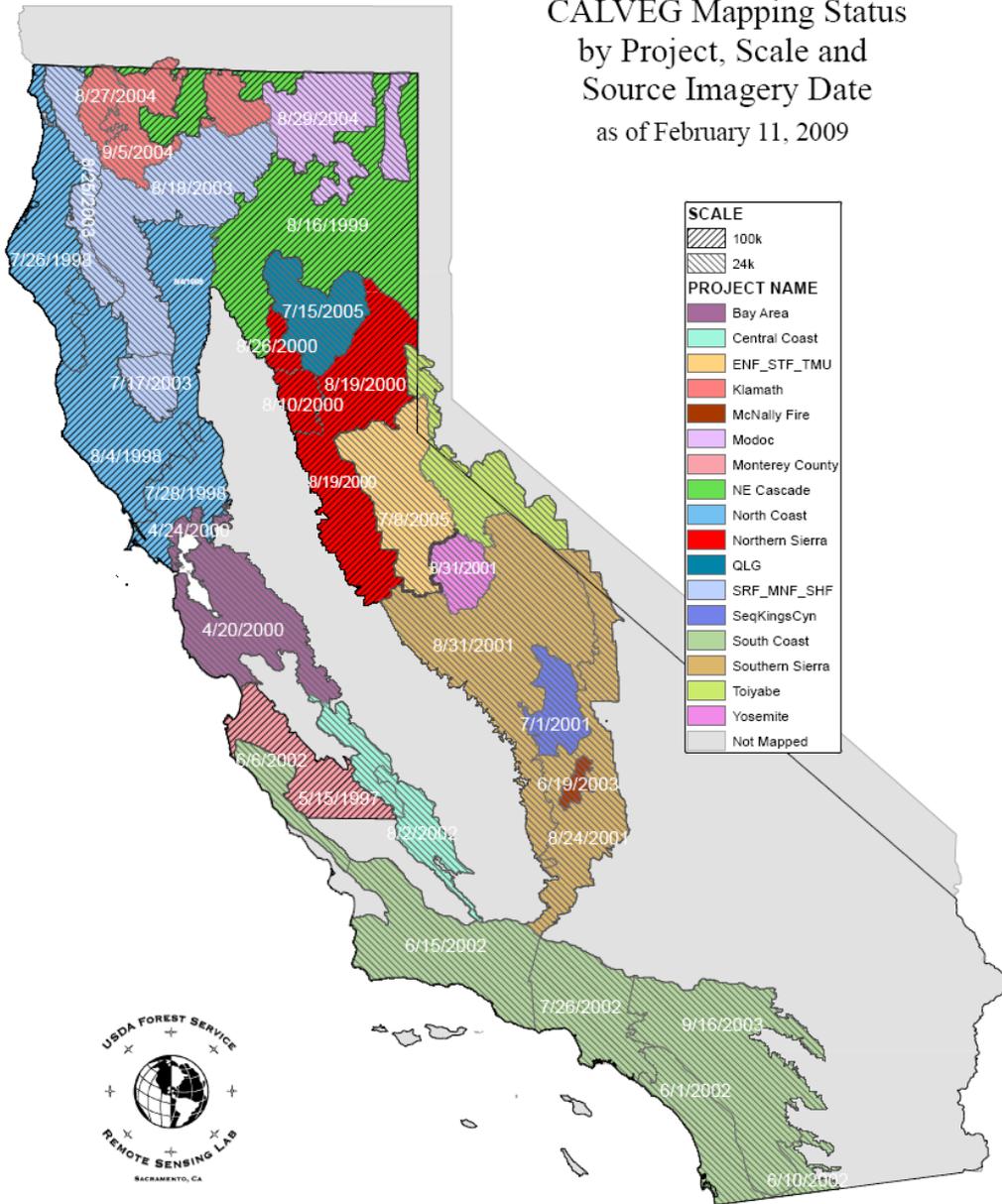
Current Status

- Private land data from 1997-2002
- NFS land data from 1999-2005
- Some areas not mapped
 - Central Valley
 - Desert
 - Counties of San Luis Obispo and San Benito



USDA Forest Service

CALVEG Mapping Status
by Project, Scale and
Source Imagery Date
as of February 11, 2009



Current Efforts

- Integrate Existing Vegetation Map Products from Other Sources
- Leverage existing data and programs (FIA, RSL, FHP, FRAP, NLCD)
- Link Vegetation maps to Inventory and derive canopy fuel attributes (Forest Vegetation only)

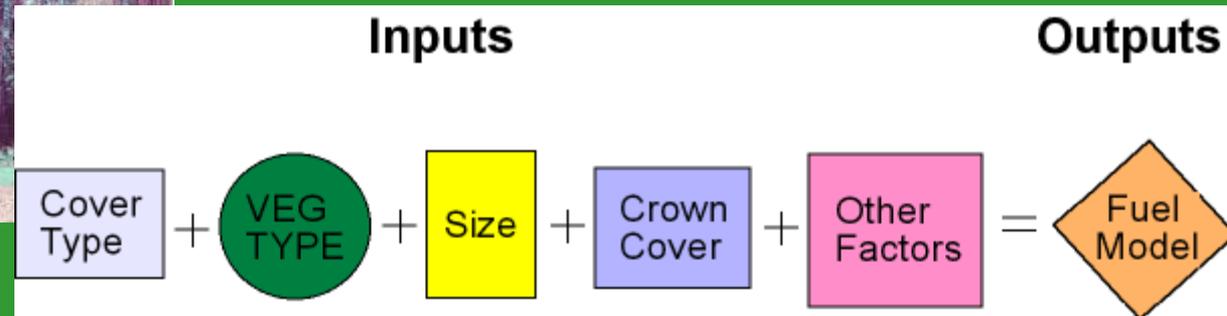


Forest Health Protection
California Department of Forestry and Fire Protection
USDA Forest Service

Fuels Product Description



- Surface Fuels (40 categories)
- Ladder Fuels
- Crown Fuels (CBD From FIA)

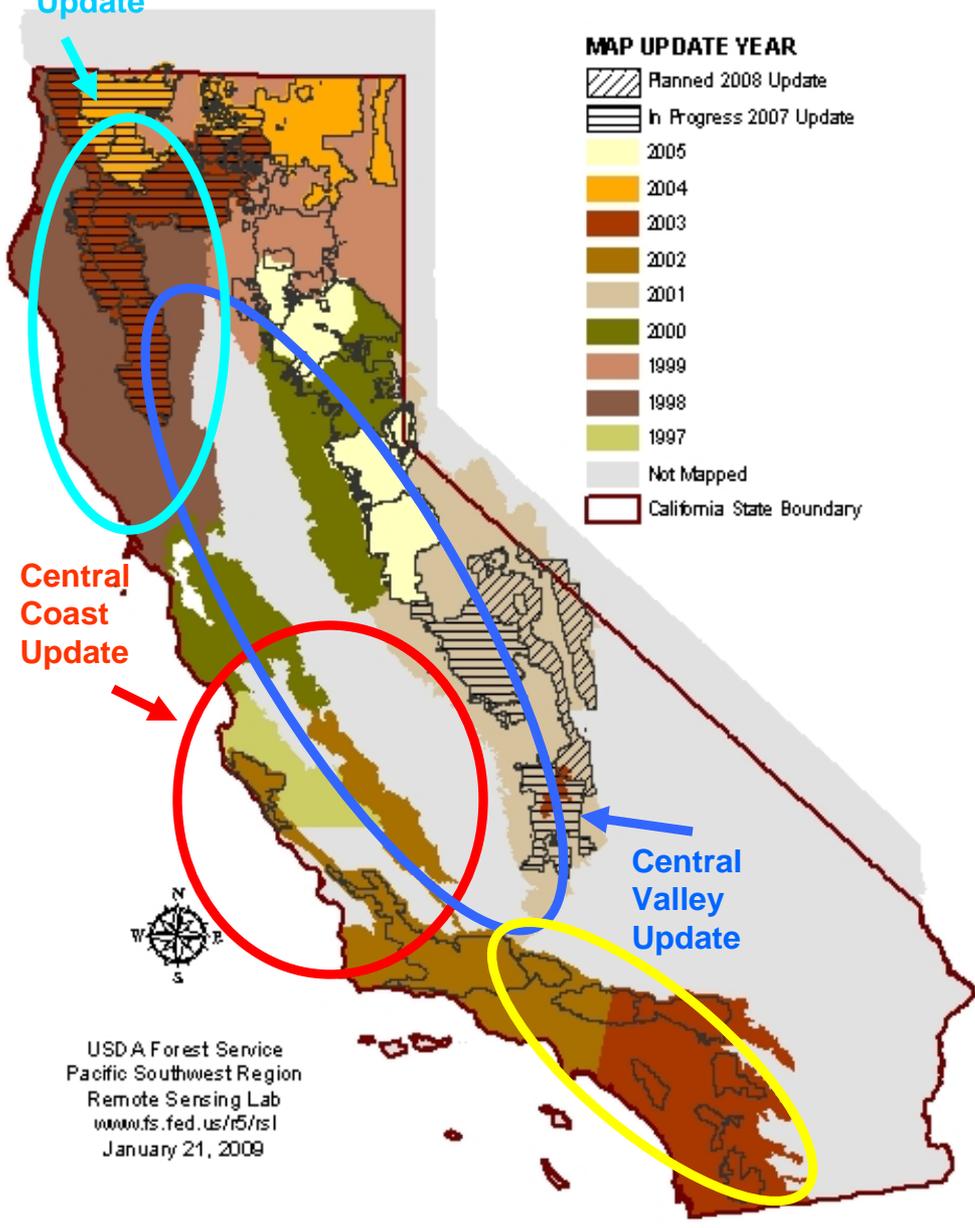
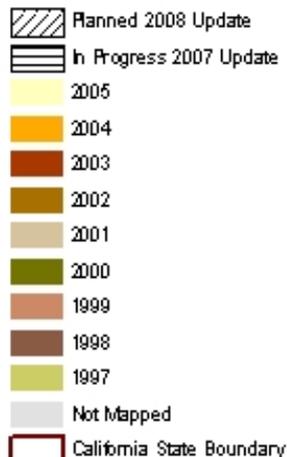


North
Coast
Update

Planned Mapping Updates

January 2009

MAP UPDATE YEAR



Map Updates In Progress

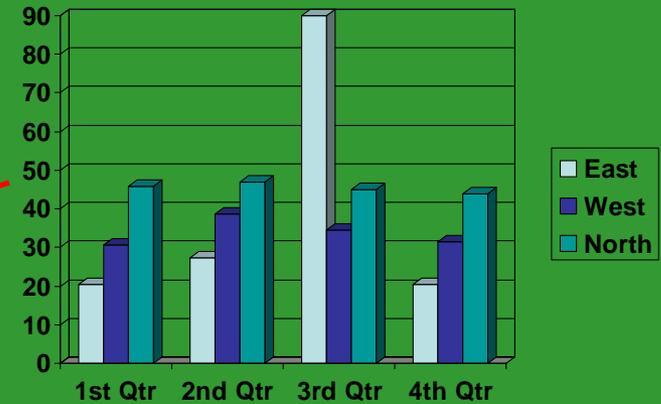
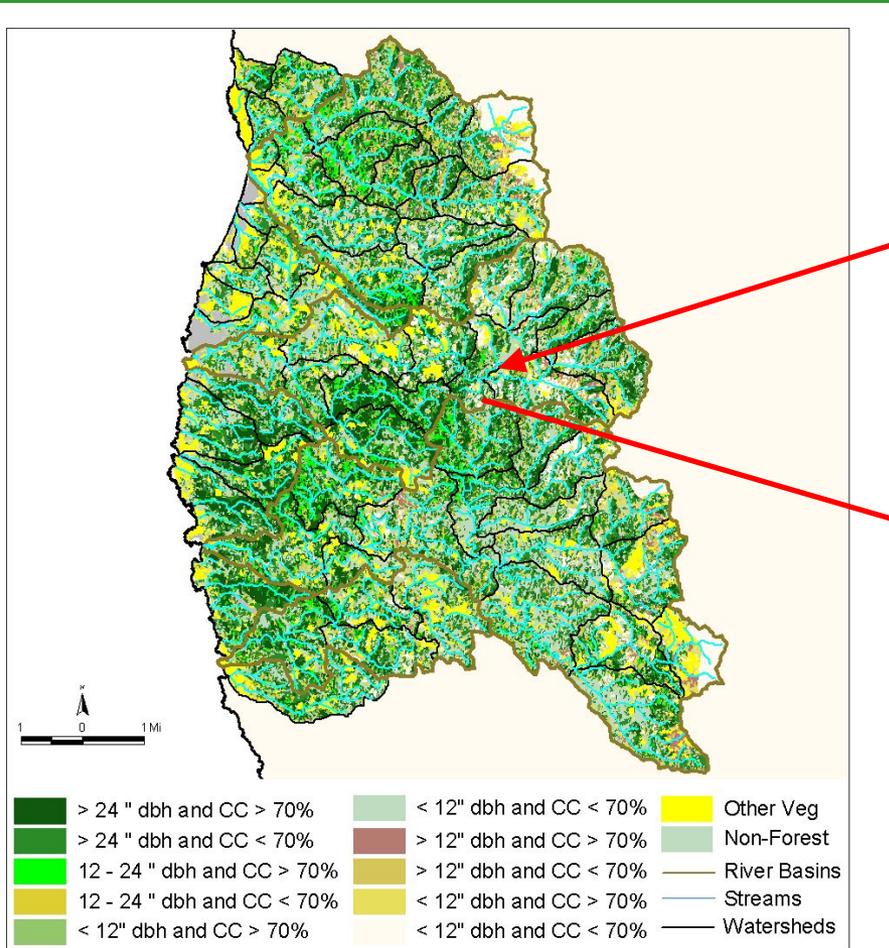
Integrates Existing data from
Multiple sources

- North Coast – 2007
 - NWFP products
- Central Coast – 2001
 - NLCD products
 - Tree Size mapping (2001 Imagery)
- South Coast
 - Change Detection 2009
- Central Valley – 2001
 - NLCD products
 - Tree size mapping

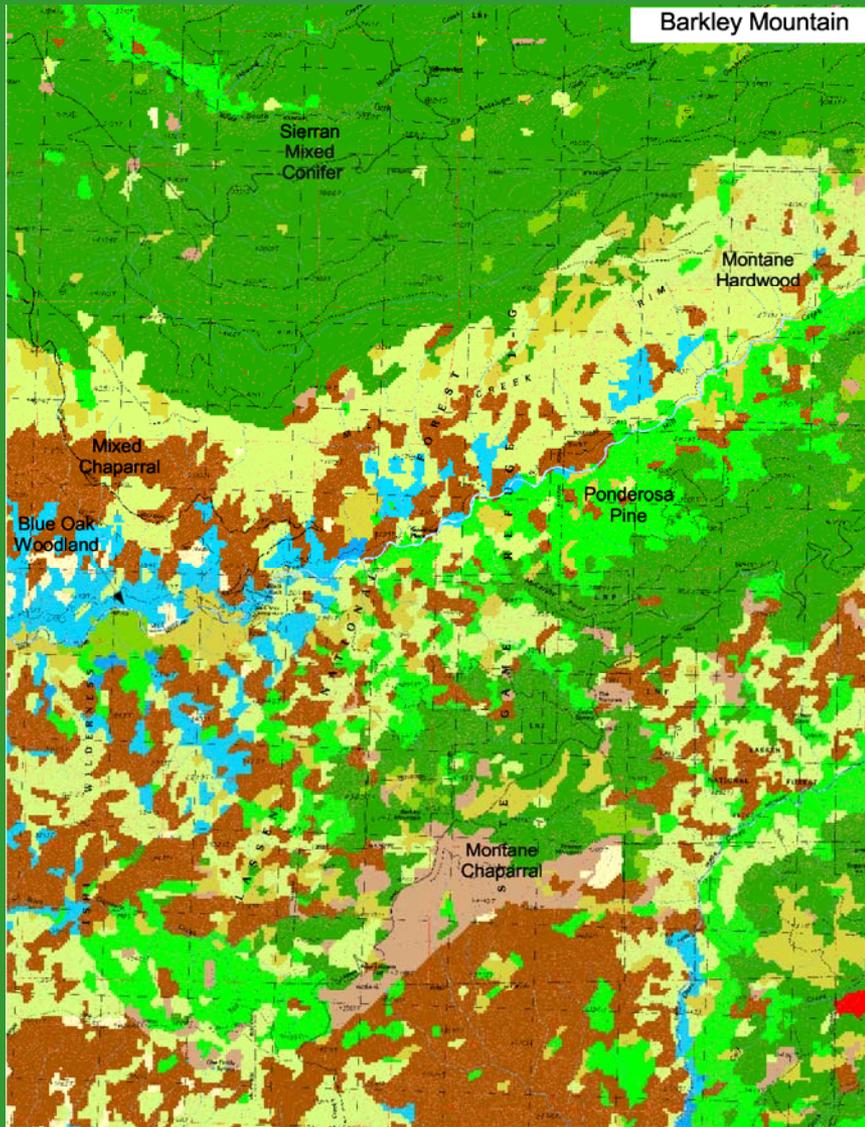


USDA Forest Service

Quantify the Distribution of Conifer and Hardwood by size and cover



Vegetation Mapping and Monitoring



Carbon & Biomass Inventory

- Develop Forest Biomass and Carbon Stock Estimates Using Vegetation maps and Inventories from FIA
- Track Changes with Inventory, Remote Sensing and/or GIS based Activity information (fire perimeters, Harvest, Development, Growth)
- Overlay Activity data on Carbon Surface to Estimate Carbon Stock Changes Annually by sub-category
- Observe changes in Land Cover composition and distribution and adjust strategies as needed

Applications Using Mapping and Monitoring Data



Assessing Wildlife Habitat
Monitoring Forest Management
Hazardous Fire Fuels Mapping
Post-Fire Vegetation Characteristics
Trends in Forest Mortality
Quantifying Watershed Characteristics
Climate Change Monitoring???



For More Information

FRAP Website:

- http://www.frap.cdf.ca.gov/projects/land_cover/index.html
- <http://www.frap.cdf.ca.gov/assessment2010.html>

USFS RSL Website

- http://www.fs.fed.us/r5/rsl/projects/frdb/layers/ev_mid.html
- <http://www.fs.fed.us/r5/rsl/clearinghouse/gettiles.shtml>
- <http://www.fs.fed.us/r5/rsl/projects/classification/>

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