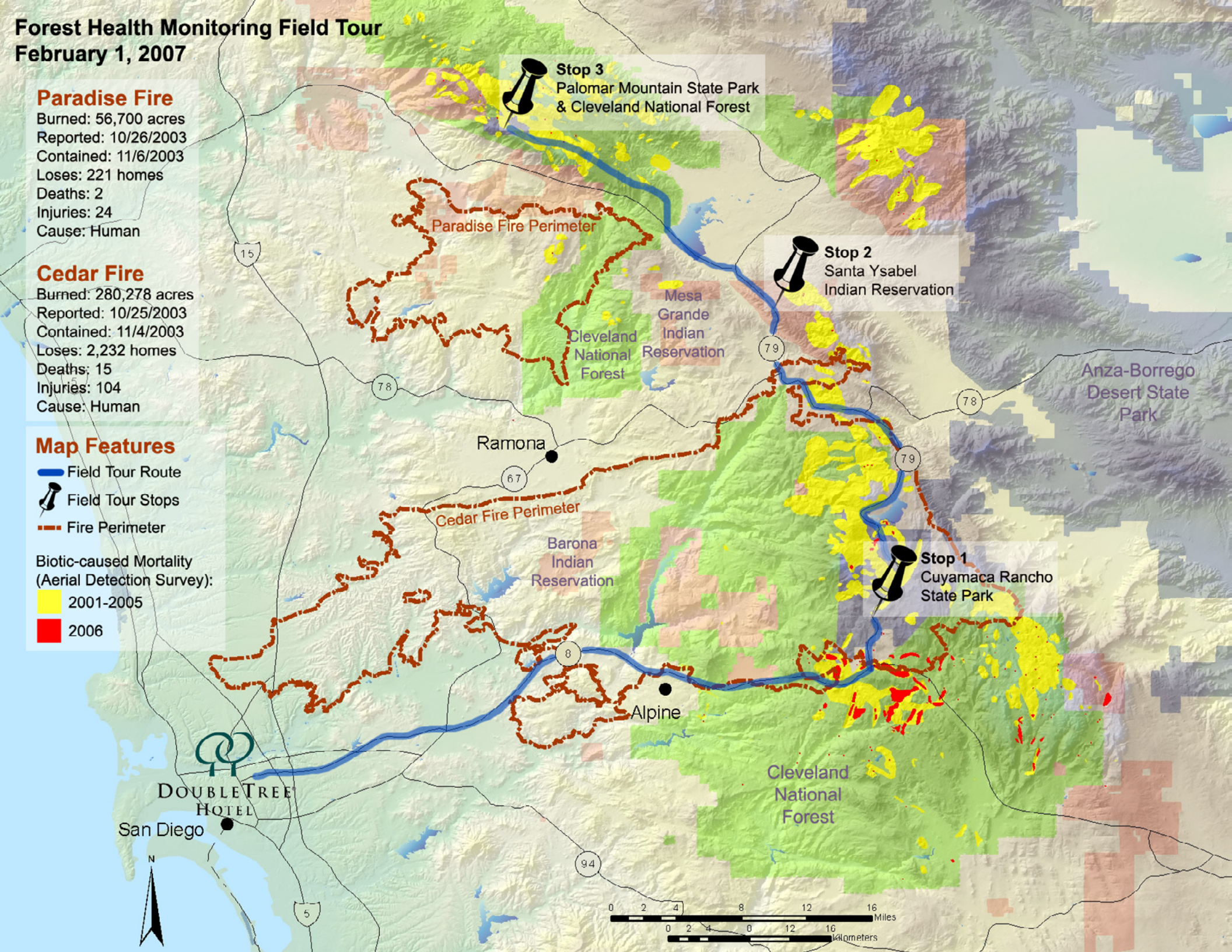

Forest Health Monitoring Field Tour
February 1, 2007
Paradise Fire
Burned: 56,700 acres
Reported: 10/26/2003
Contained: 11/6/2003
Loses: 221 homes
Deaths: 2
Injuries: 24
Cause: Human
Cedar Fire
Burned: 280,278 acres
Reported: 10/25/2003
Contained: 11/4/2003
Loses: 2,232 homes
Deaths: 15
Injuries: 104
Cause: Human
Map Features
Field Tour Route
Field Tour Stops
Fire Perimeter
Biotic-caused Mortality
(Aerial Detection Survey):
2001-2005
2006
Stop 3
Palomar Mountain State Park
& Cleveland National Forest
Stop 2
Santa Ysabel
Indian Reservation
Stop 1
Cuyamaca Rancho
State Park
Paradise Fire Perimeter
Cedar Fire Perimeter
Cleveland
National
Forest
Mesa
Grande
Indian
Reservation
Barona
Indian
Reservation
Anza-Borrego
Desert State
Park
Ramona
Alpine
San Diego
DoubleTree
Hotel
15
78
79
67
8
94
5
N
0 2 4 8 12 16 Miles
0 2 4 0 12 16 Kilometers

Forest Health Monitoring Field Tour, February 1, 2007

Tour Leaders:
Rich Hawkins, Cleveland National Forest
Bryan Petit, National Resources Conservation Service

Stop 1: Cuyamaca Rancho State Park
Speakers: Jim Dice and Gary Reece, California State Parks, Colorado Desert District
Location: Sweetwater River pullout off State Highway 79

Stop 2: Santa Ysabel Indian Reservation
Speaker: Rodney Kephart, EPA Officer for Santa Ysabel Tribe and Santa Ysabel Tribal Council Member
Title: Tribal and Agency Collaboration to Reduce Fuels and Increase Forest Health
Location: Schoolhouse Canyon Road and Highway 79.

Stop 3: Palomar Mountain
Speakers: Kelly Strecker, California Department of Forestry and Fire Protection
Megan Jennings and Jeff Wells, Palomar Ranger District, Cleveland National Forest
Locations: Palomar Mountain State Park; and Fry Creek, Cleveland National Forest (if time)

Bark Beetle activity near Mt. Laguna prior to the Cedar Fire. The adjoining forest within the Cuyamaca Rancho State Park also had substantial beetle kill that contributed to the near total loss of the mixed conifer forest in the state park. Only a few thousand acres of forest (including what is pictured in this photo) were lost at Mt. Laguna as control lines held and firefighters successfully kept it off most of the mountain.

Night time photo of the Cedar Fire.

Typical forest conditions prior to the Cedar Fire near the Julian Area. Dead or dying Coulter Pine due to bark beetles mixed with decadent manzanita and Black Oak.

Aerial image of Cuyamaca Rancho State Park after the 2003 Cedar Fire.

Fry Creek Healthy Forest Project

The Forest Service implemented the Fry Creek Healthy Forest Project on Palomar Mountain to reduce fire risk and improve the health of a dense area of forest where drought and beetle activity have resulted in large-scale tree mortality. The Fry Creek area is a mixed conifer and hardwood forest composed mostly of white fir, incense cedar, big-cone Douglas fir, black oak, and coast live oak.

Since 2005, over 200 acres have been treated in and around the Fry Creek Campground. The treatment includes removal of dead trees and brush and more recently, thinning of the understory. Much of the larger material removed from the project area has been transported to mills to use as wood products, such as fence posts and wooden pallets. Other material has been chipped and removed for use in gardens and as landscaping mulch. Some material has even been made available for firewood.

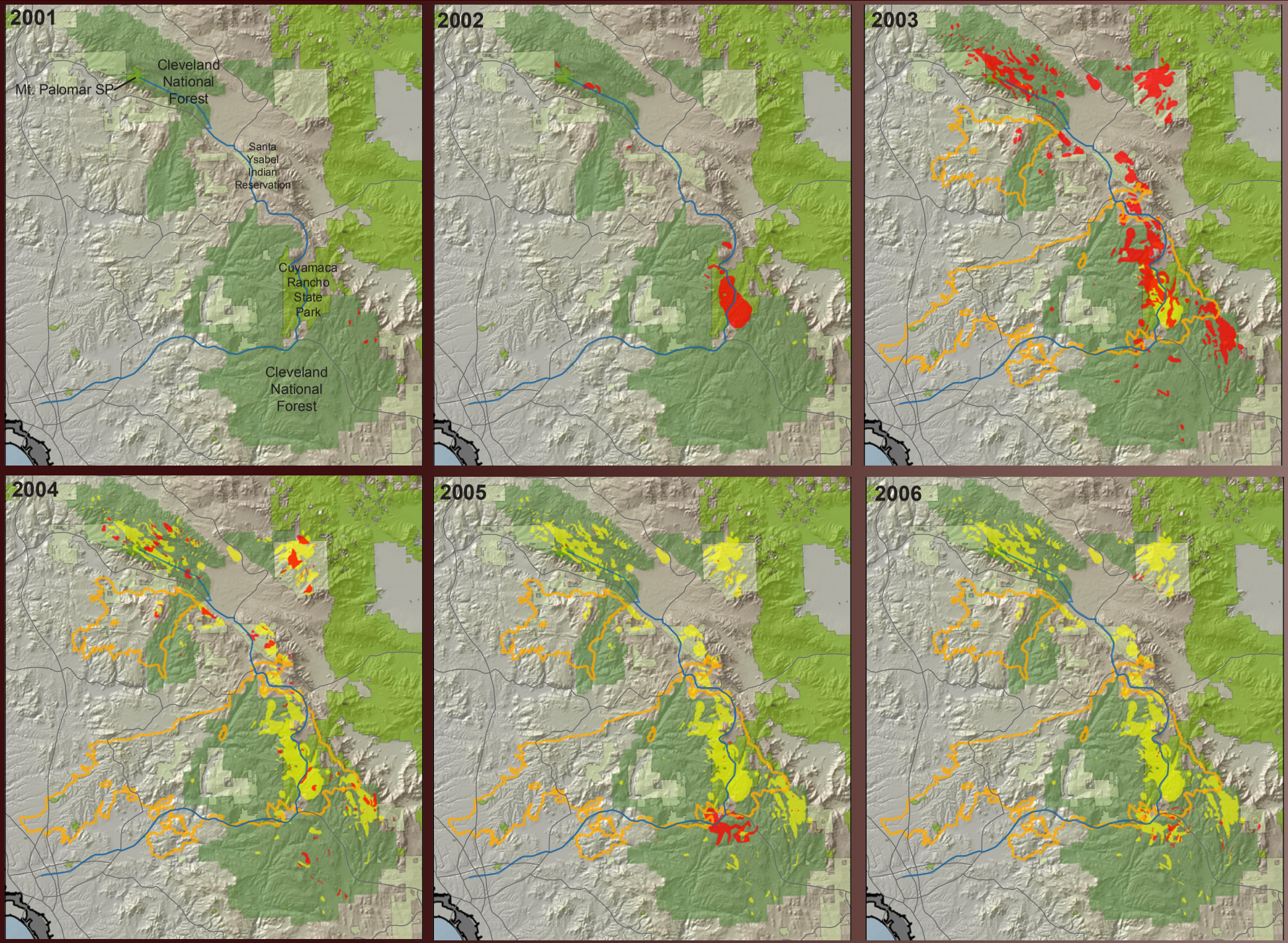
By reducing the amount of dead, dry wood and brush, this project is helping to restore the forest to a healthy condition, while at the same time reducing fuel buildup. This Forest Service project joins the other efforts on public and private lands to provide community wildfire protection on Palomar Mountain.

Fry Creek area prior to Healthy Forest Project.

A winter time photo depicting a few remaining white fir and dormant black oak at Fry Creek. Cedar was the other major component prior to the drought that caused widespread loss of fir and cedar.

Log deck photo at the Fry Creek project on Palomar Mountain. Pictured are drought killed cedar trees. Most of the bark beetle problems are elsewhere in the County of San Diego as bark beetles killed most of the pine on Palomar Mtn in the late 1980s.

Aerial Survey Results: Cleveland National Forest and Surrounding State and Tribal Lands: 2001-2006



Cleveland National Forest

State Land

Tribal Land

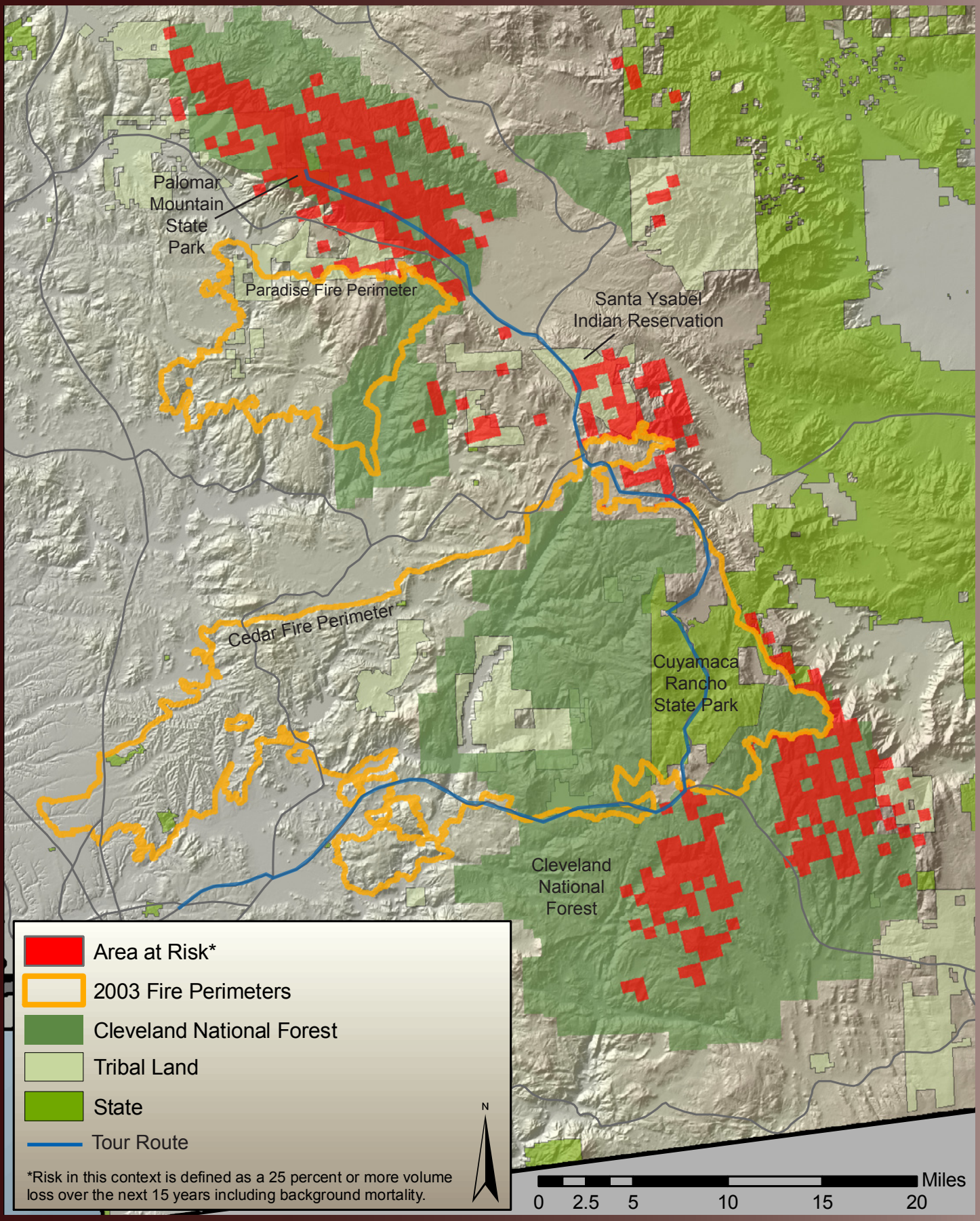
2003 Cedar and Paradise Fire Boundaries

Biotic-caused Mortality: Previous Years

Biotic-caused Mortality: Current Year

Tour Route

Areas at Risk after the Cedar and Paradise Fires



USDA Forest Service
Pacific Southwest Region
Forest Health Protection

Forest Health Monitoring Programs
3237 Peacekeeper Way, Suite 207, McClellan, CA 95652
www.fs.fed.us/r5/spf/fhp/fhm

Forest Pests of Southern California

Western Pine Beetle, *Dendroctonus brevicomis*

The Western Pine Beetle occurs in forests throughout the western half of North America and northern portions of Mexico from below 1,000 feet (300 m) to above 8,000 feet (2,400 m) in elevation. This beetle attacks Coulter and Ponderosa pines, but primarily targets Coulter pines in southern California. Western pine beetles can produce up to 4 generations per year in the warm climate of southern California. Western pine beetles invade new host trees greater than 6 inches (15 cm) in diameter. The attacks typically take place mid way up the trunk. The entire life cycle, from egg to adult, can take as little as 2 months. The adults emerge to attack a new host throughout the warmer months. These attack periods can last up to three weeks. The host tree is typically dead within a year of the initial infestation.

Western pine beetle killed trees.

Mountain Pine Beetle, *Dendroctonus ponderosae*

The Mountain Pine Beetle is found in forests throughout the western half of North America from sea level to 11,000 feet (3,353 m) in elevation. This beetle targets 4 major tree species, White, Sugar, Lodgepole, and Ponderosa pines, but inflicts the most damage on Ponderosa and Sugar pines in southern California. Mountain pine beetles typically produce a single generation per year, but in the warmer climate of California this species may produce 2 generations in a single year. The host trees are generally killed by a single generation of Mountain pine beetles.

Jeffrey pine beetle with characteristic J-shaped gallery

Jeffrey Pine Beetle, *Dendroctonus jeffreyi*

The Jeffrey Pine Beetle occurs in the west coast from the border of southwestern Oregon to northern Mexico and is host specific to Jeffrey pine. Jeffrey Pine Beetles complete a single generation in 1 year in cooler climates, and up to 2 generations in Southern California. Jeffrey Pine Beetles invade new host trees typically 10 inches or greater in diameter but will occasionally attack trees as small as 4 inches in diameter. Mated females lay eggs singly in characteristic J shaped galleries packed with boring dust. The adults tunnel out through the bark and invade new Jeffrey pines from June to as late as early October. Jeffrey pines are slow to die. The beetles usually abandoned the tree by the time it begins to fade. The Jeffrey pine beetle is a major pest of Jeffrey pine in the mountains of San Diego County.

Red turpentine beetle attack.

Red Turpentine Beetle, *Dendroctonus valens*

The Red Turpentine beetle is found throughout the forested areas of North America and Mexico, with the exception of the Atlantic and Gulf coast states. This beetle is known to attack a variety of conifer species but is most problematic to Sugar and Ponderosa pines in the West. Red turpentine beetles complete 1 generation per two years in cold climates and as many as 3 generations per year in warmer climates. Females invade a new host tree and emit aggregating pheromones to attract males and females to the tree. Attacks by the red turpentine beetle are often seen at the base of stressed pine trees.

California flatheaded borer gallery.

California Flatheaded Borer, *Melanophila californica*

The California flatheaded borer can kill seriously weakened pines, often in conjunction with other mortality causing agents. *M. californica* eggs are laid in clusters in bark crevices of host trees. Upon hatching the larvae tunnel into the phloem where they may feed for a few months to 4 years without causing much injury to the tree. If the tree is sufficiently weakened, the larvae pass into a rapid-growth stage and kill the cambium. The California flatheaded borer remained active in southern California in 2006 but at a much reduced levels compared to previous years. This insect is active in Jeffrey pine in the mountains of San Diego County.

Forest Pests of Southern California

California Five Spine *Ips*
Ips paraconfusus

Ips paraconfusus Adult

In most years, *Ips* beetles do not cause mortality even though large populations commonly infest slash, cull logs, windthrown trees, and other forest debris. Infestations in standing trees during years of low mortality consist of scattered individuals and small groups of trees which have been previously damaged by wind, snow, fire or lightning. Outbreaks in healthy trees are usually associated with drought or buildups of slash piles. Larger trees are top-killed by *Ips* with the lower bole either uninfested or colonized by other species of bark beetles or wood borers. In San Diego County *Ips paraconfusus* can often be found infesting weakened conifers in concert with the California flatheaded borer.

Jeffrey pine infested with *Ips paraconfusus* and the California flatheaded borer

Oak Mortality
Cause unknown

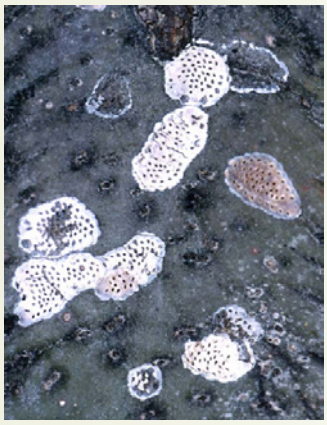
Unidentified bleeding canker (with zone lines)

An unknown condition is causing extensive mortality in live oak in southern San Diego County. Mortality has been mapped on roughly 7,500 acres of coast live and Engelmann oaks. The mortality is centered near Descanso, CA. Mortality is occurring in both young and mature trees, in dry and mesic sites, and in clumped and scattered trees. There has been a single isolation of *Phytophthora cinnamomi*, downslope from an avocado orchard. However, the injury agent responsible for the widespread mortality is as yet undetermined. Typically affected trees develop thin crowns which then die in part or total.

Dead Coast Live Oak near Descanso, CA

Fruittree Leafroller
Archips argyrospila

The fruittree leafroller is the most significant defoliator of California black oak, but also affects many other broadleaf trees. An outbreak of the fruittree leafroller has occurred in recent years on Palomar Mountain in San Diego County. Heavy defoliation is usually observed in early summer, however egg masses may be visible on the bark of hardwood trees this time of year.



Fruittree leafroller egg masses

United States Department of Agriculture

Forest Service

Pacific Southwest Region

State & Private Forestry

R5-PR-006

July 2004

Annosus Root Disease

Effects, Biology and Prevention in Southern California Recreation Areas

Annosus root disease is caused by the fungus *Heterobasidion annosum*.

Widespread and damaging in southern California recreation sites, the disease results in mortality of conifers, which creates hazard trees, depletes vegetative cover and adversely effects wildlife habitat. The disease can be prevented by use of Sporax® on freshly cut stump surfaces.

Adverse Effects

- Depletion of vegetative cover
- Creation of hazard trees
- Loss of wildlife habitat
- Tree mortality

Signs/Symptoms

- Chronic mortality
- Thin, chlorotic crowns
- Resin soaking of infected tissues
- White, stringy rot
- Conks

Effects in Recreation Areas

Annosus root disease is widespread and damaging in southern California recreation sites, especially on the Cleveland and San Bernardino National Forests. Because the disease results in mortality of conifers, it has numerous adverse effects.

Trees dying over a period of years in a stand indicate root disease. Root infection results in reduced height growth , thin and chlorotic crowns, and increased susceptibility to bark beetles.

Biology

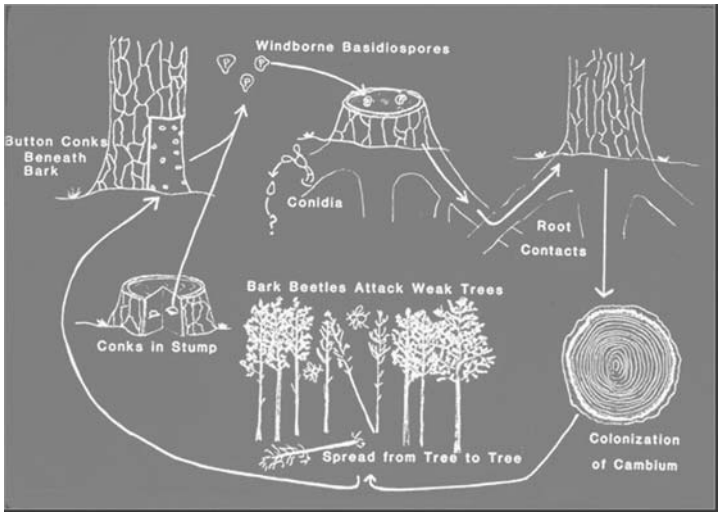
Windborne spores enter through stump surfaces. The fungus grows into the roots, causes decay of the roots, and eventually kills the tree. The disease can spread from tree to tree through root contacts, resulting in gradually enlarging centers of infection.

Once the disease is present in an area, trees will continue to die for many years. Direct control is not feasible. The best means of control is prevention.

Annosus root disease center, Barton Flats Campground.

Conks are produced in stumps.

Local spread is through roots.



Disease cycle of *Heterobasidion annosum*.

Management Strategies

- Prevent stump infection
- Species conversion
- Interplanting with resistant hosts
- Remove infected stumps and roots

Pine stumps treated with Sporax®.

Precautions

- Follow label instructions when using the product.
- Applicators should wear googles or a face shield and waterproof gloves.

Annosus disease center, Laguna Mountain.

Prevention

Annosus root disease can easily be prevented.

Treatment of all freshly cut conifer stumps with a registered borate compound prevents infection. The borate prevents the spores of the pathogen from germinating.

Sporax® (sodium tetraborate decahydrate) is the currently registered treatment.

Sporax® treatment is effective. The pesticide is easy to apply and relatively inexpensive.

Consequences of not using Sporax® now are future chronic tree mortality, loss of vegetative cover, stressed trees susceptible to bark beetle attack, and creation of hazardous trees.

In California national forests, use of the borate powder is required in all recreation areas and developed sites because of the high value of the trees.

The Forest Service Manual (FSM 2303.14 R5 supplement 2300-92-1) and Forest Service Handbooks (FSH 2109.14 and FSH 3409.11-94-1) provide direction and guidance for use. Follow label directions.

Sporax® Hazards

Sporax® is a white, odorless, crystalline product. The active ingredient in Sporax® is borax, a naturally occurring mineral made of sodium, boron, oxygen, and water. Borax is used in fertilizer formulations to supply the essential nutrient boron, as a laundry booster and water softener, as a general purpose cleaner, and in fire retardants.

Boron compounds occur widely in nature; boron is found in most natural soils. Borax is practically nontoxic to humans, to birds, to fish, and to aquatic invertebrate animals.

The proper use of the product to control annosus root disease poses a low risk of adverse human or environmental risks.

Because of its low oral and dermal toxicity, the chemical is a Class III (CAUTION) pesticide. However, because the active ingredient is an eye irritant, the label carries the DANGER signal word. As with any chemical, improper use may pose health hazards, and Sporax® should be used with care.

Resources Available

►Additional information on annosus root disease can be found in: Schmitt, C.L.; Parmeter, J.R.; Kliejunas, J.T. 2000. Annosus Root Disease of Western Conifers. USDA Forest Service, Forest Insect & Disease Leaflet 172. 10 p. www.fs.fed.us/r6/nr/fid/fidls/annosus.pdf

►Additional information on Sporax® is available at the following web sites:

The Label: www.cdms.net/ldat/ld1NU004.pdf

The Material Safety Data Sheet: www.cdms.net/ldat/mp1NU002.pdf

A Borax Pesticide Fact Sheet: infoventures.com/e-hlth/pestcide/borax.html

In Southern California, contact Forest Health Protection 909-382-2727 for additional information.

www.fs.fed.us/r5/spf/ Forest Health Protection