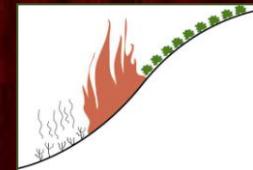


The Fire Environment



California
Chaparral
Institute
...the voice of the chaparral

Fire Basics



Fire Basics

- Fire needs three things to burn, and more importantly propagate
 1. Fuel: Vegetation, wood decks, houses, gazebos, etc.

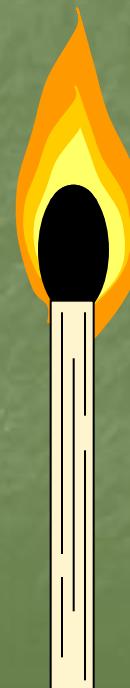


Fire Basics

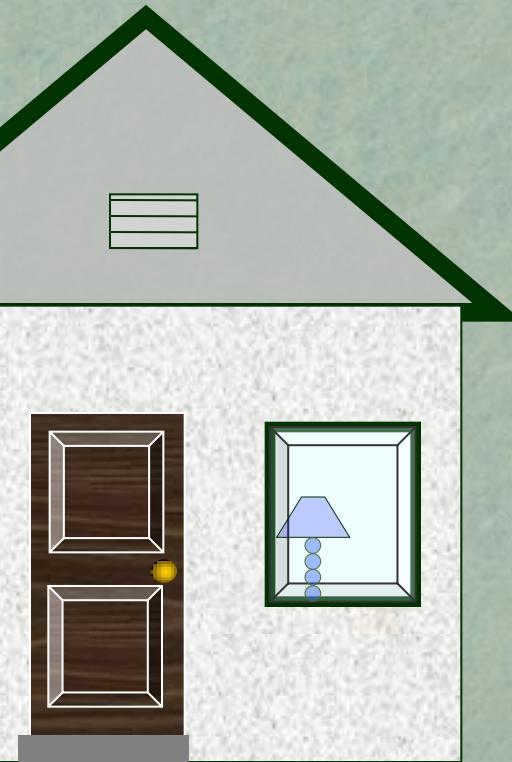
- Fire needs three things to burn, and more importantly propagate
 1. Fuel: Vegetation, wood decks, houses, gazebos, etc.
 2. Oxygen: Fire will burn better in fuels where air can circulate; i.e. dead leaves still on the tree will burn better than leaves on the ground
 3. Heat: fuels can ignite through one, or through a combination, of three ways:

Heat Transfer

- Conduction: The transfer of heat through objects in direct physical contact
- Example: embers falling on wood roof or into unprotected attic spaces



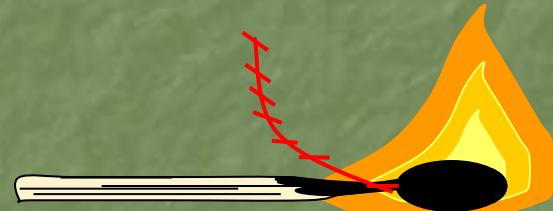
Conduction
Slowest



Heat Transfer

Radiation: Transfer of heat through rays

- Example: a hot fire in the yard igniting curtains inside the house through a window.



Conduction and Radiation

Radiant Heat



Heat Transfer

- Convection: The transfer of heat through gasses or liquid
- Example: Structures on hill sides being pre-heated from fire down slope



Fire Demonstration

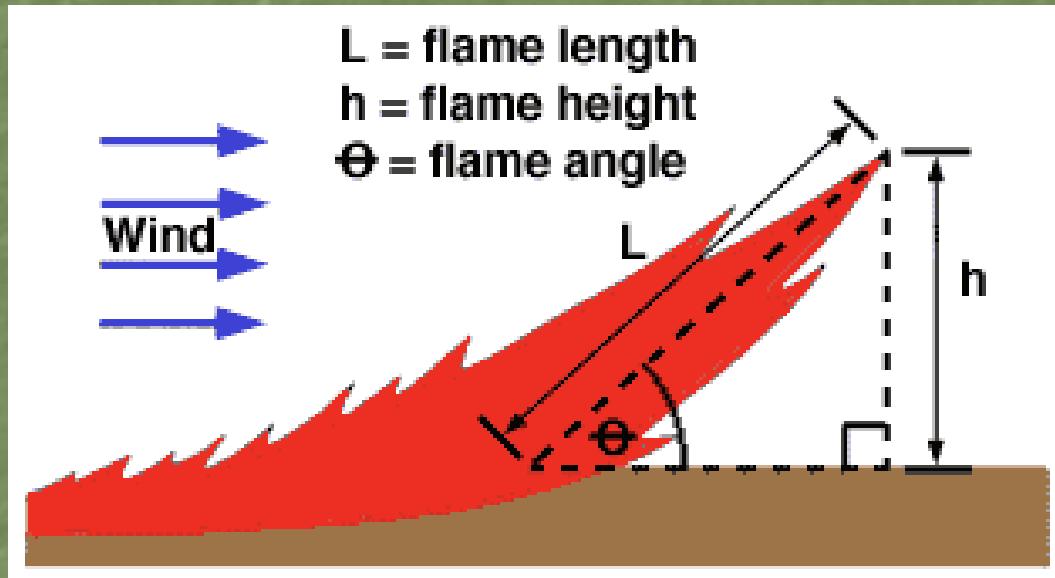


JUN 28 2000
3:10:40 PM

1 minute 33 seconds = approximately 1,400 degrees Fahrenheit !

Characteristics of Fire

- Flame Length:

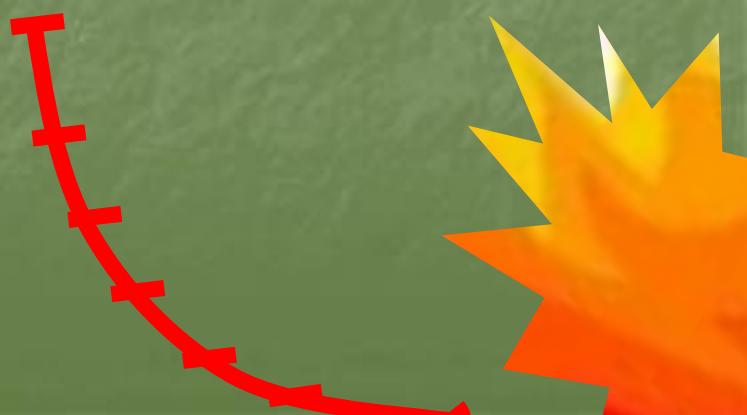


Graphic by CSIRO Bushfire Behaviour and Management Team

- Six foot flame lengths probably won't ignite a house if the fire is 30 feet away (not accounting for embers).

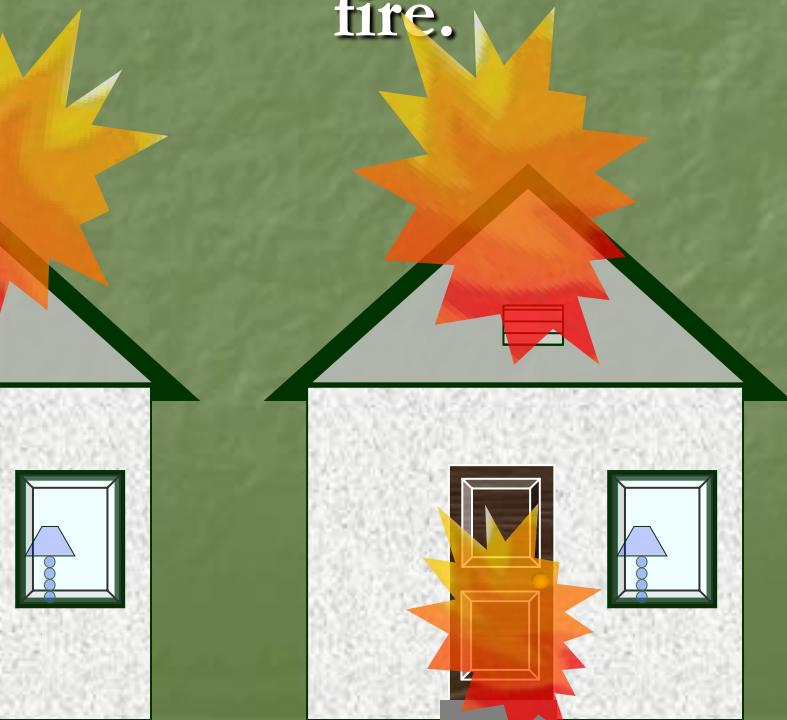
Characteristics of Fire

- Fire line Intensity:
 - Amount of heat produced in flaming front of fire.
 - Implications: Reduce the impact of radiant heat, preferably by increasing the structural materials resistance to heat and by reducing the radiant heat of the fire itself immediately next to the structure.



Characteristics of Fire

- Embers:
 - Smoldering pieces of fuel carried by winds that can travel well ahead of fire front and ignite homes and vegetation far from the main fire.



Several Factors Affect Fire Behavior

- Fuel
- Topography
- Weather



Photo by JOHN GASTALDO / Union-Tribune

Fuels Affect Fire Behavior

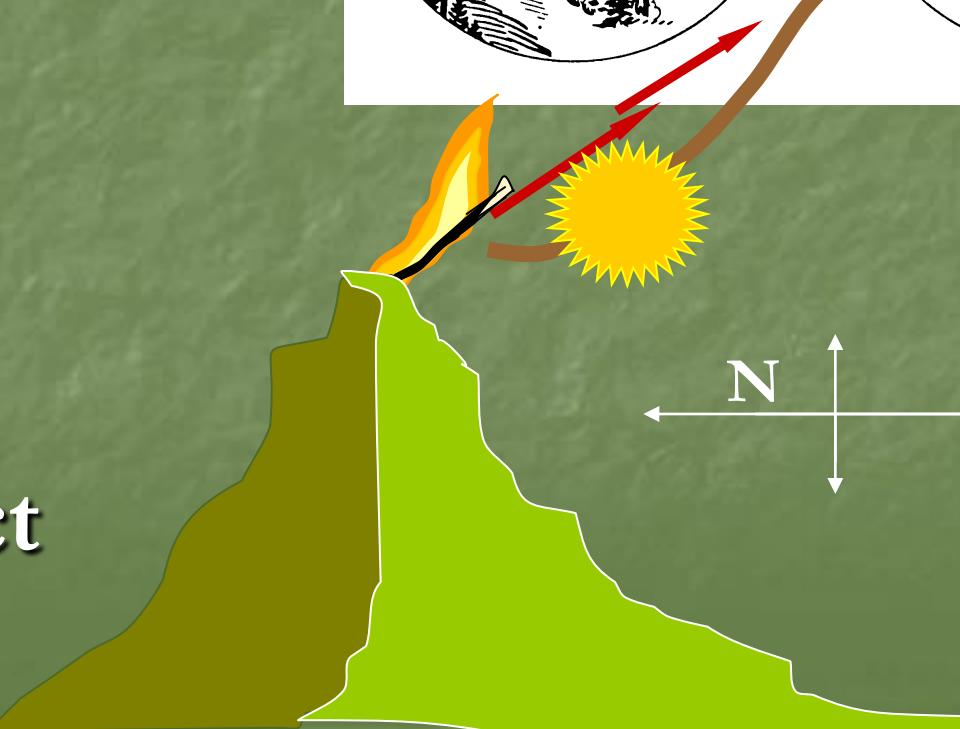
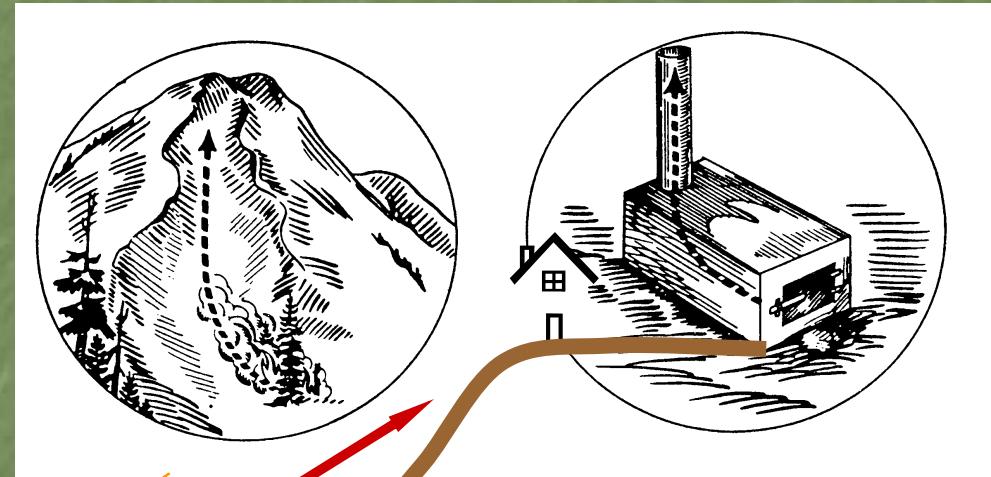


- Live fuel moisture
- Fuel Type
 - Light, flashy fuels
 - Shrubs/Brush
 - Heavy fuels, timber
- Ladder fuels



Topography

- Corridors / Chimney's
- Slope
- Aspect



Weather

- Relative Humidity (RH):
- Temperature
- Wind
 - Dries fuels
 - Adds fresh oxygen to fire
 - Leans flames toward unburned fuels, pre-heating, drying and igniting them
 - Carries embers

Santa Ana Winds

- Dry, hot winds
- Start when inland desert gets *cold*
 - Therefore, can happen anytime but most often in late-Summer / early-Autumn, September or October
- As the cool air descends it is compressed, releasing moisture and heating the air.

San Diego Weather

Mediterranean climate



- Characterized by mild winters and dry hot summers
- Only plant communities able to thrive in drought conditions and periodic wildfire have been able to survive.

San Diego Native Habitats



San Diego Native Habitats

- Primary Habitats
 - Coastal Sage Scrub
 - Chaparral
 - Woodland/Forest
 - Riparian

Coastal Sage Scrub



California buckwheat



Eriogonum fasciculatum

Coastal Sage Scrub

California Sagebrush



*Artemisia
californica*

Key Species

Black Sage



Salvia melifera

Chaparral

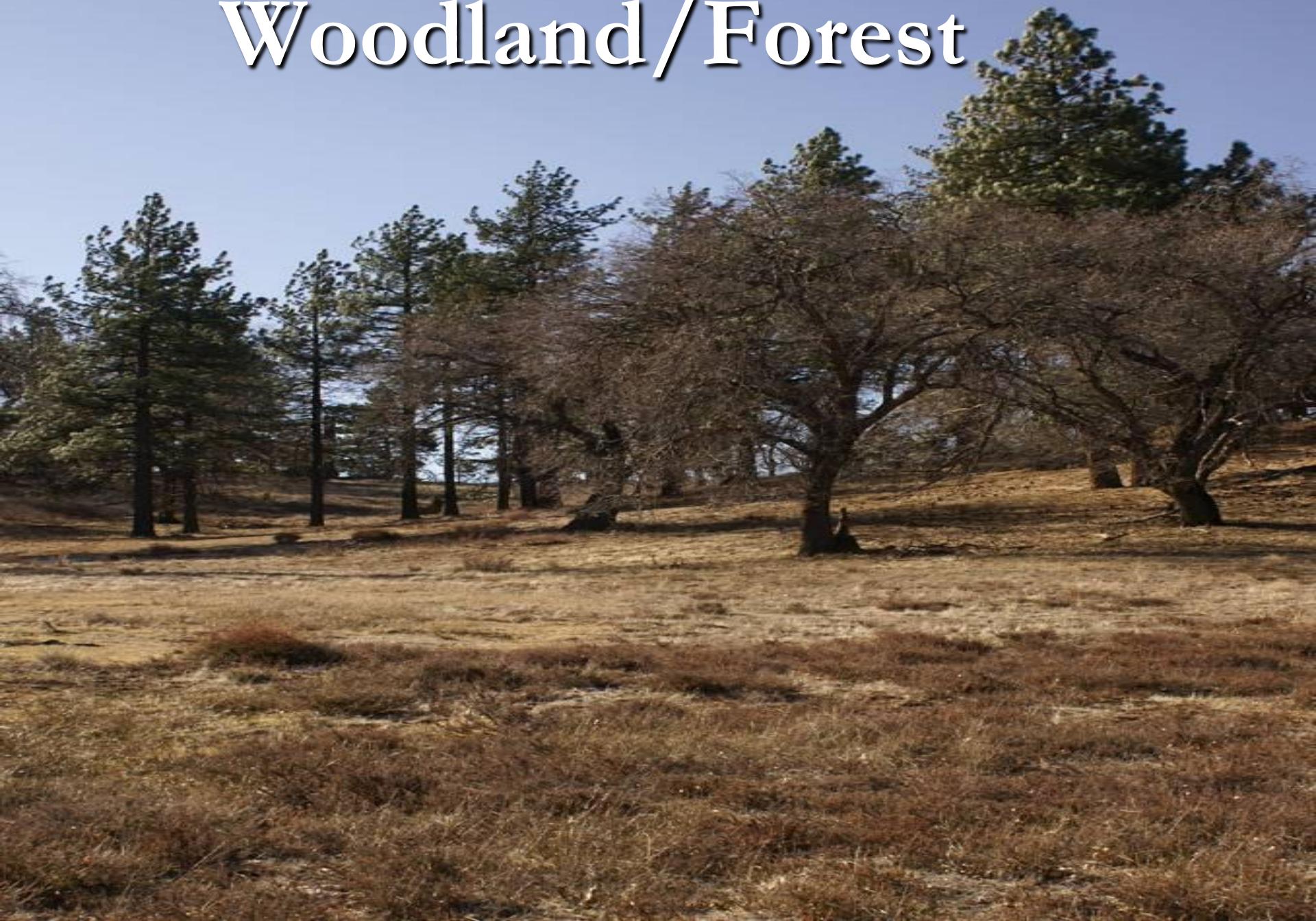


Chaparral



Key Species

Woodland/Forest



Pine Oak Forest/Woodland



Coast live oak



Key Species

Quercus agrifolia



Riparian



Mule fat



Baccharis salicifolia

Riparian



Arroyo
willow



Cottonwood

Key Species

Populus fremontii

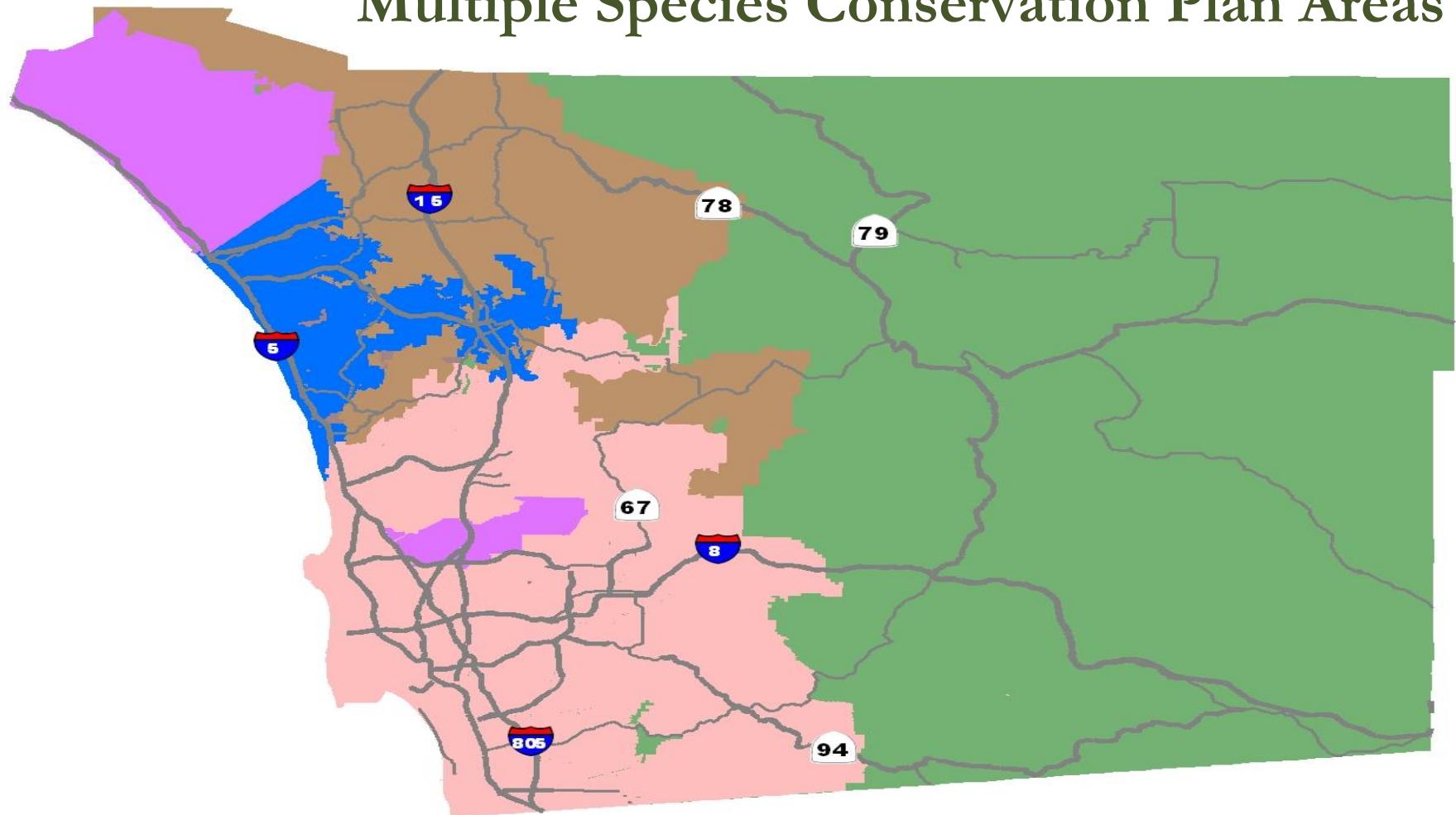
Conservation

- Habitat Conservation Program/Multiple Species Conservation Plan (MSCP)
- Rare Species Protection

Threats

- Invasive Species Threats
- Type Conversion by Repeat Fires

Multiple Species Conservation Plan Areas



- North County MSCP
- Military Lands
- Multiple Habitat Conservation Program (MHCP)
- Multiple Species Conservation Plan (MSCP)
- Multiple Habitat Conservation and Open Space Program

San Diego thorn mint



Plants

Otay tarplant



Dudleya variegata



Quino Checkerspot Butterfly



Least Bell's Vireo



Animals



Coast Horned Lizard

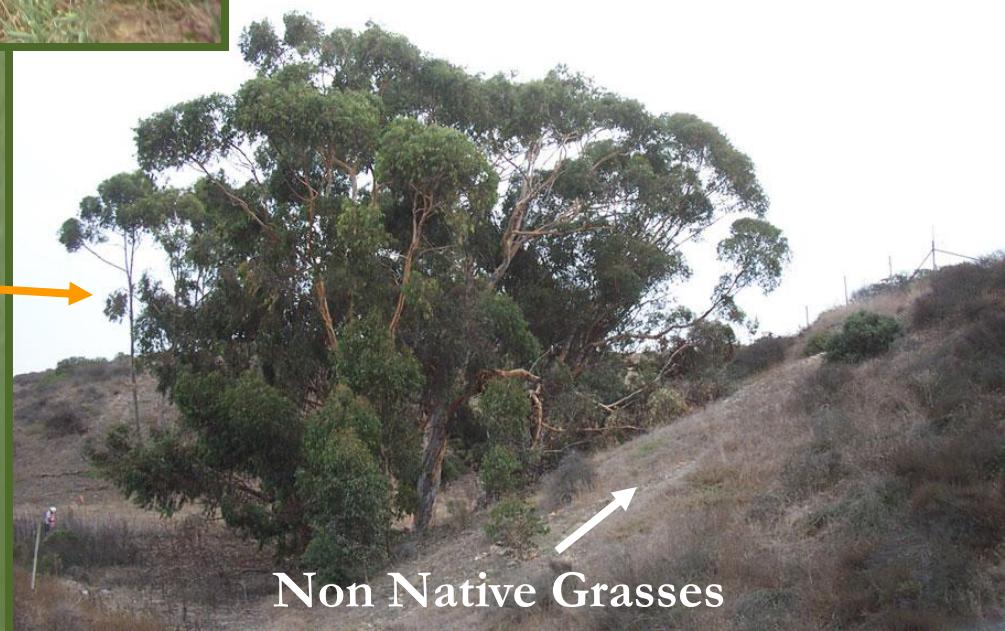
Stephen's Kangaroo Rat



Invasive Species



Eucalyptus



Non Native Grasses

Brush Management and Local Jurisdictions

- City Regulations
- County Regulations
- Fire / Weed Abatement Code
- USFWS Regulations
- CDFG Regulations



Fuel Modification Effects



Brush Management



Vegetation Management Methods



Timing affects habitat

For example, in nesting areas of Coastal California Gnatcatcher, brush management cannot occur during nesting season February 15 – August 15



Fire Resistant Plantings/Erosion Control



Costs of improper or excessive

- Erosion
- Clearance
- Invasive weeds
- Increase in flashy fuels
- Habitat destruction



Alienation from
the natural
environment

Unauthorized
Homeowner
Clearing Can
Lead to Erosion



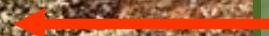


Minimize Soil Disturbance

Tire Track



Lichen



Horse Track



Don't scrape soil

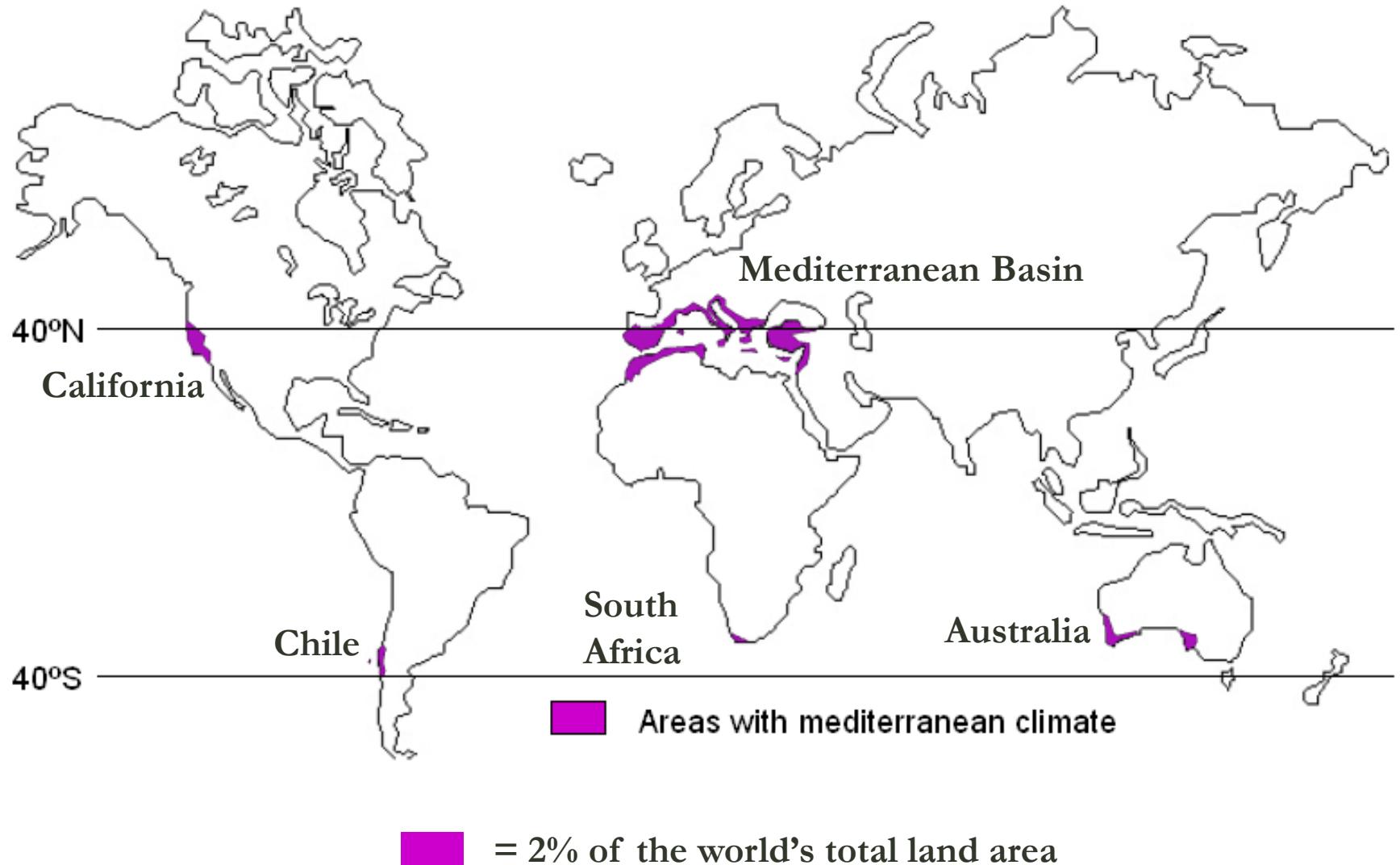
Native Habitat and Effects of Wildfires



Why Sunshine, Shrubs, and Wildfires?

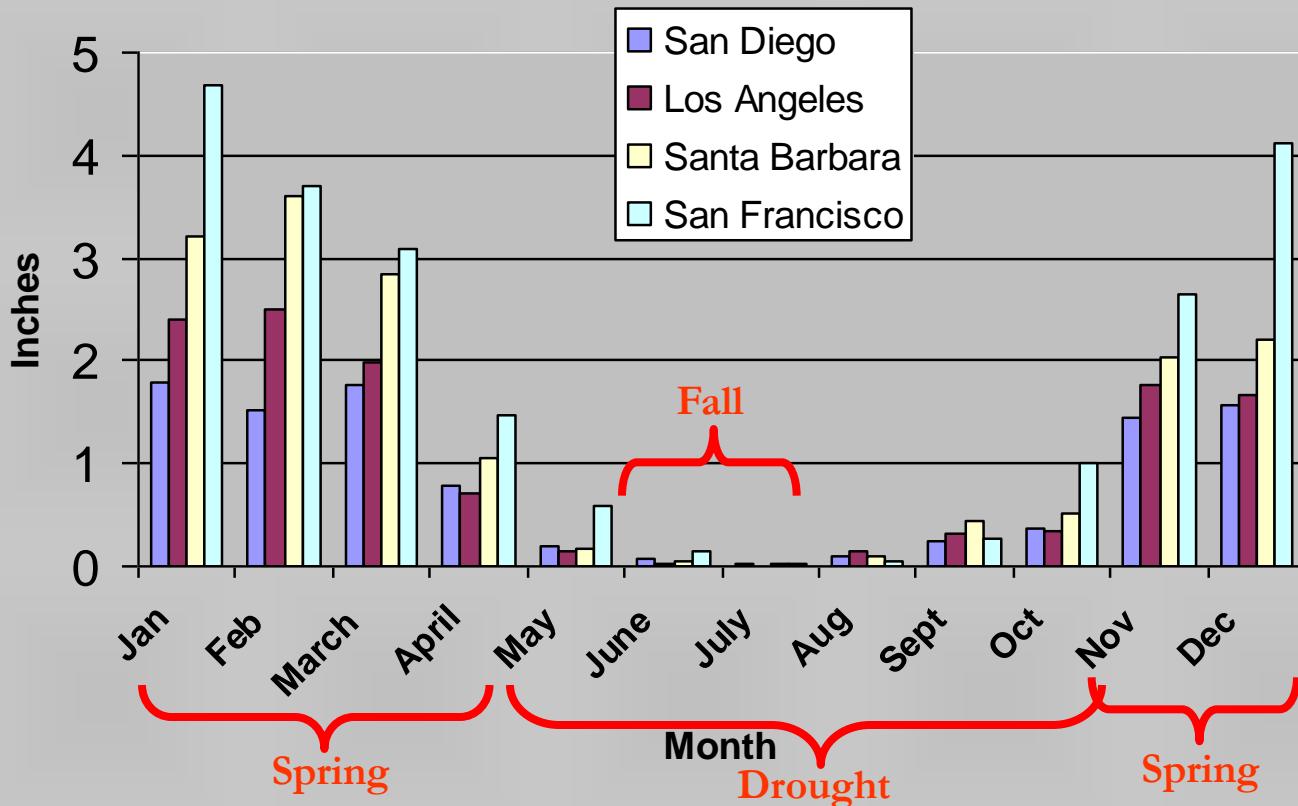


San Diego County is in one of only five Mediterranean climate zones in the world.



Why Sunshine, Shrubs, and Wildfires?

Average Monthly Rainfall



Spring (after first rains)



A photograph of a hillside covered in dense shrubs. The foliage is predominantly green, but there are significant patches of bright orange and yellow autumn colors, particularly on the upper and middle slopes. The sky is clear and blue.

Fall (August at higher elevations)

Fall (June at lower elevations)



Drought (May to ?)

Photo taken 2003. Area burned in 1994.



N

S

We live among a group of unique, natural communities dominated by hardy shrubs (plus a few tough trees) and shaped by summer drought, winter rain, and wildfire.

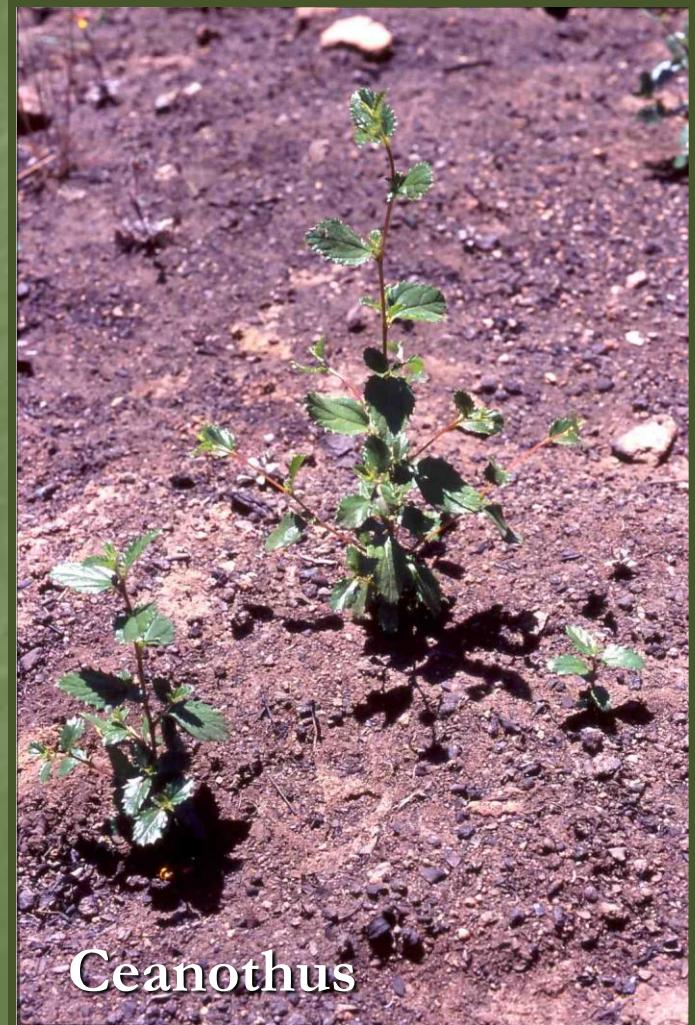
Chaparral

Coastal Sage Scrub

Adapting to the Mediterranean lifestyle



Toyon

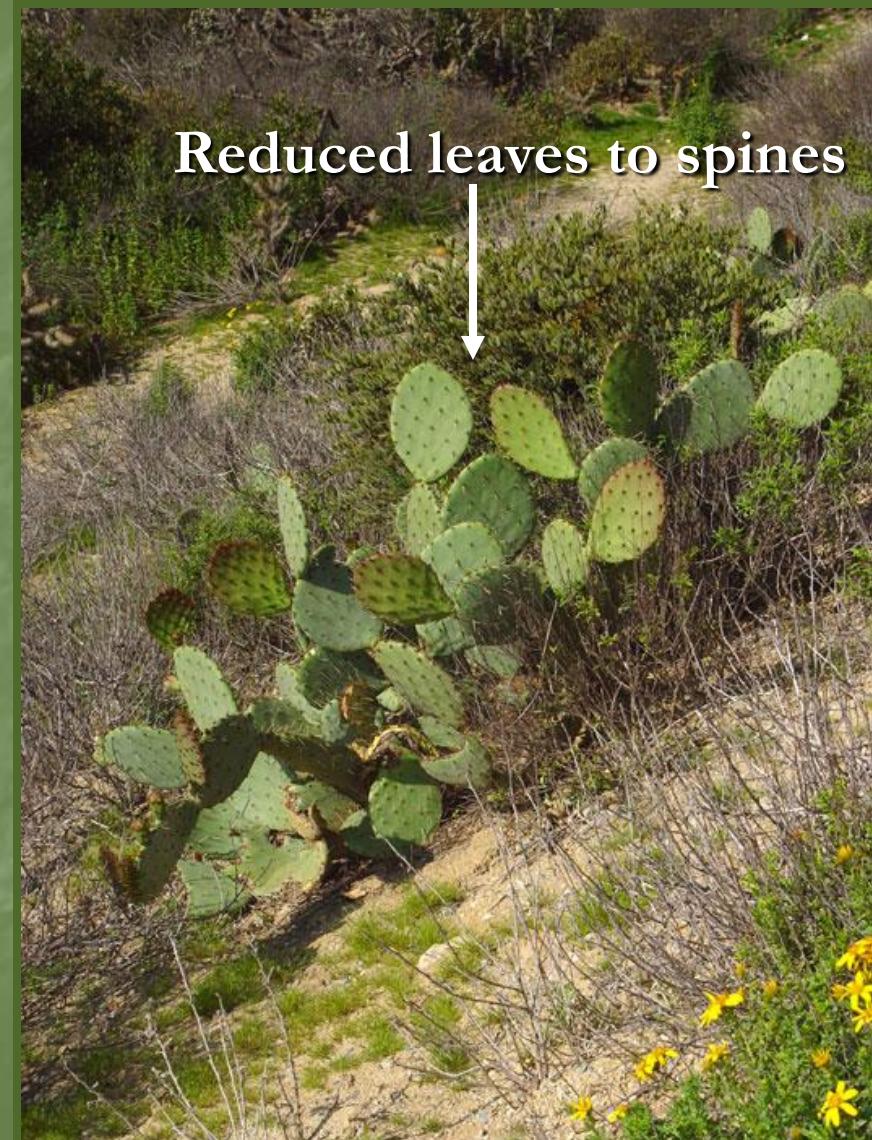


Ceanothus

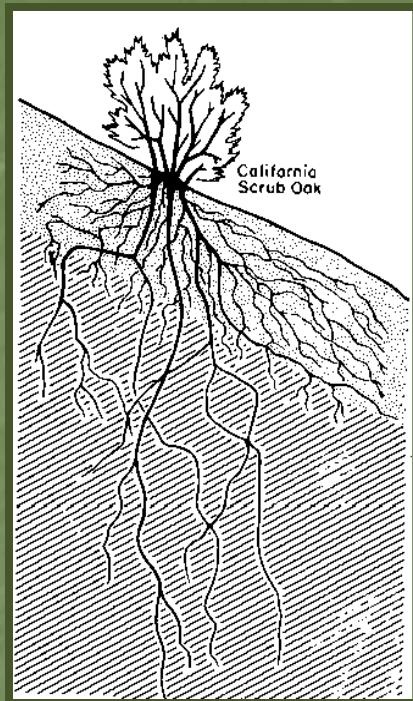
What is an “adaptation?”

The foibles of prior learning...

Drought Adaptations



Drought Strategies



From Hellmers et al., 1955

Retreaters



Avoiders



Persisters



Chameleons

Fire Survival

Adaptations
Myth #1! Chaparral is adapted to fire.*



*it's designed
to burn!

Fire vs. Fire

Regimes

- Frequency
- Intensity
- Seasonality



Crown-fire regime

Chaparral



Surface-fire regime

Ponderosa pine

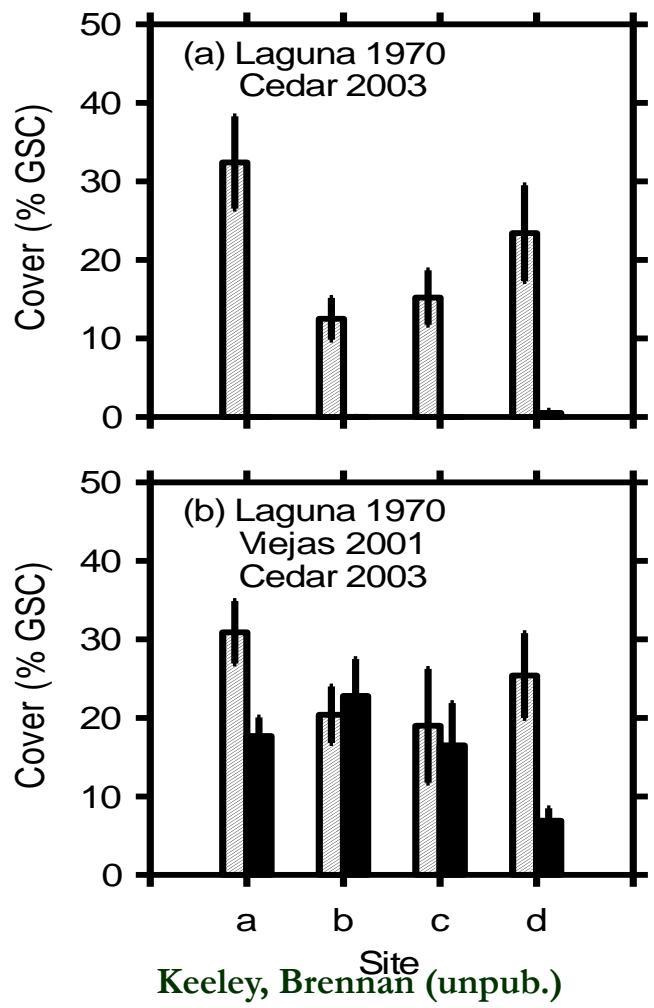
Photo: Grand Canyon Trust 2002

Impact of too many fires

1970

1970 &
2001

1970, 2001, & 2003



A landscape photograph showing a hillside covered in dense green chaparral shrubs. The hillside slopes down from the left foreground towards the right background. In the far distance, another smaller hill is visible under a sky filled with white and grey clouds.

Mixed chaparral near
Temecula, California

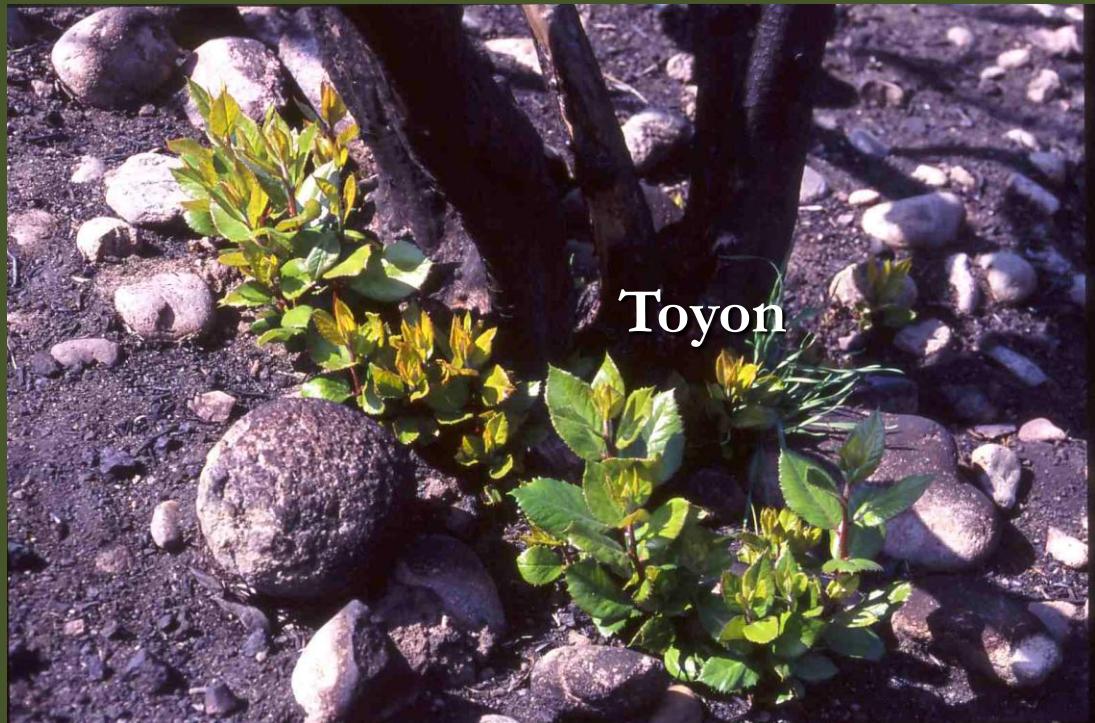
A photograph of a steep, rocky hillside. The slope is covered in dry, brown grass and numerous small, light-colored rocks. The hillside rises towards a rocky peak in the background. The sky above is a clear, pale blue.

Alien grassland near
Ramona, California

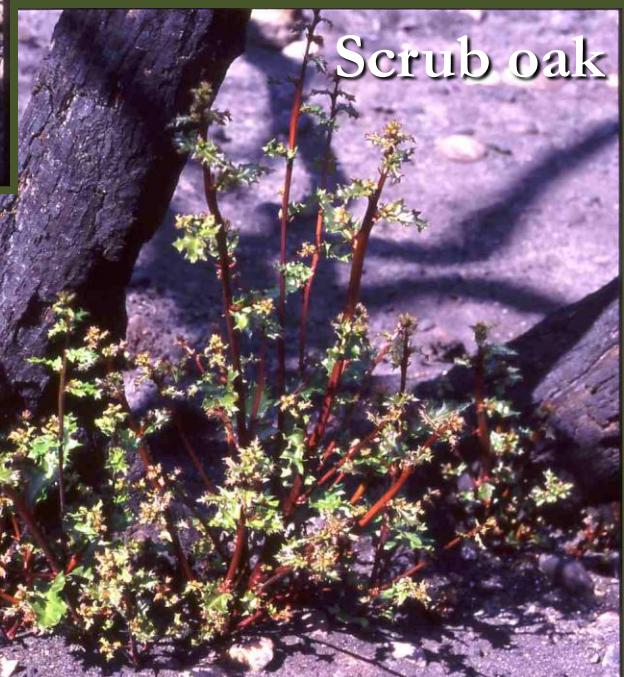
Fire Survival Adaptations

- Fires occurring less than 15-20 years apart can convert chaparral to weedy grasslands
- Best to think of chaparral and other natural communities as adapted to particular fire regimes
- Three basic responses to fire...

A. Obligate resprouters

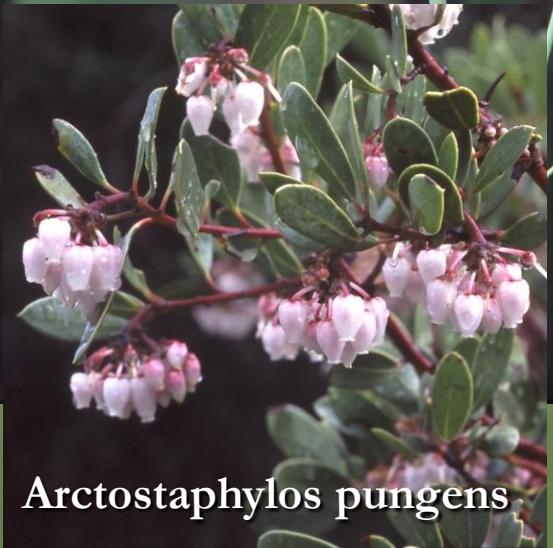


Redberry

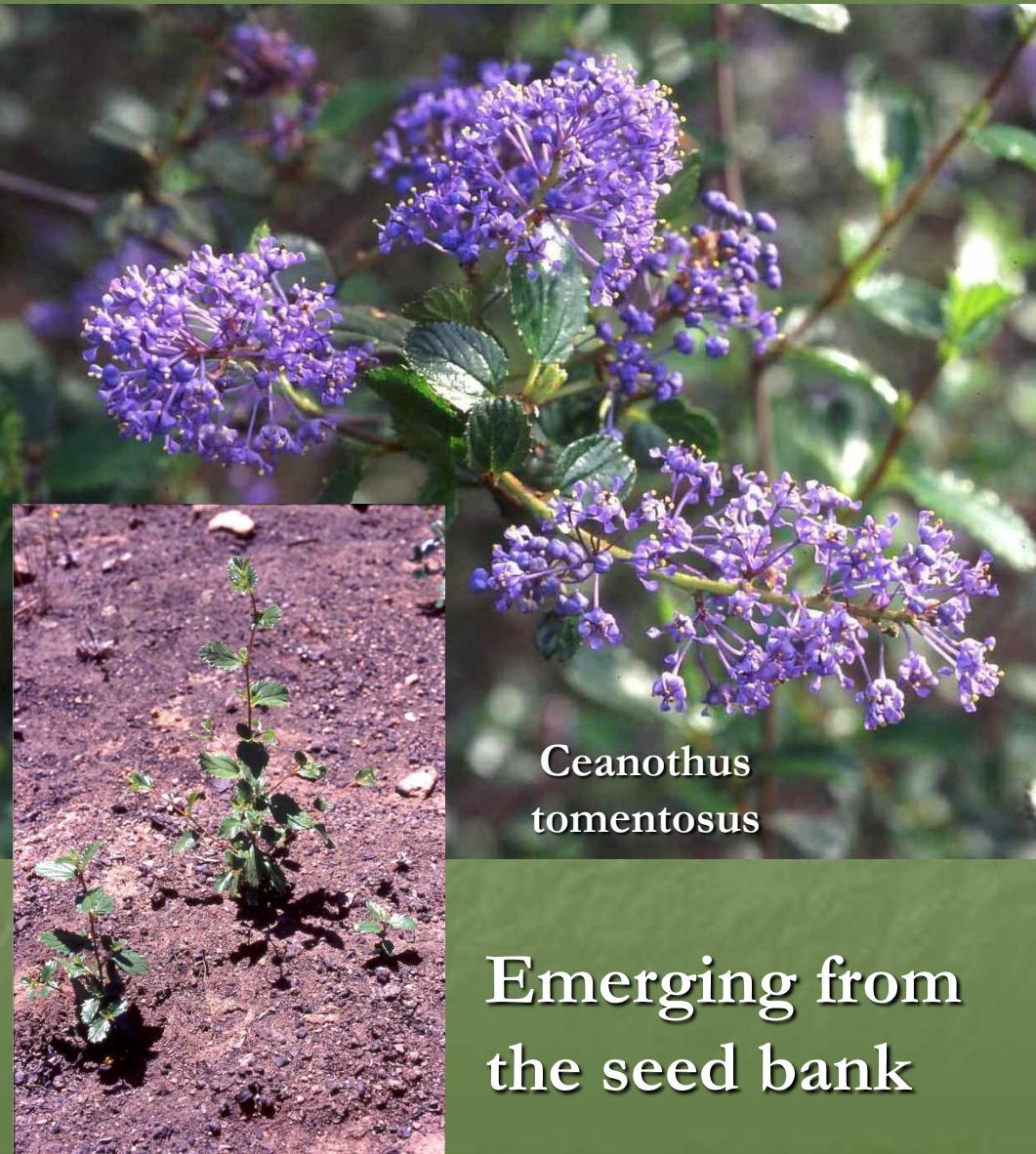


Heteromeles arbutifolia
Rhamnus crocea
Quercus berberidifolia

Golden Eardrops
Dicentra chrysanthia



B. Obligate seeders



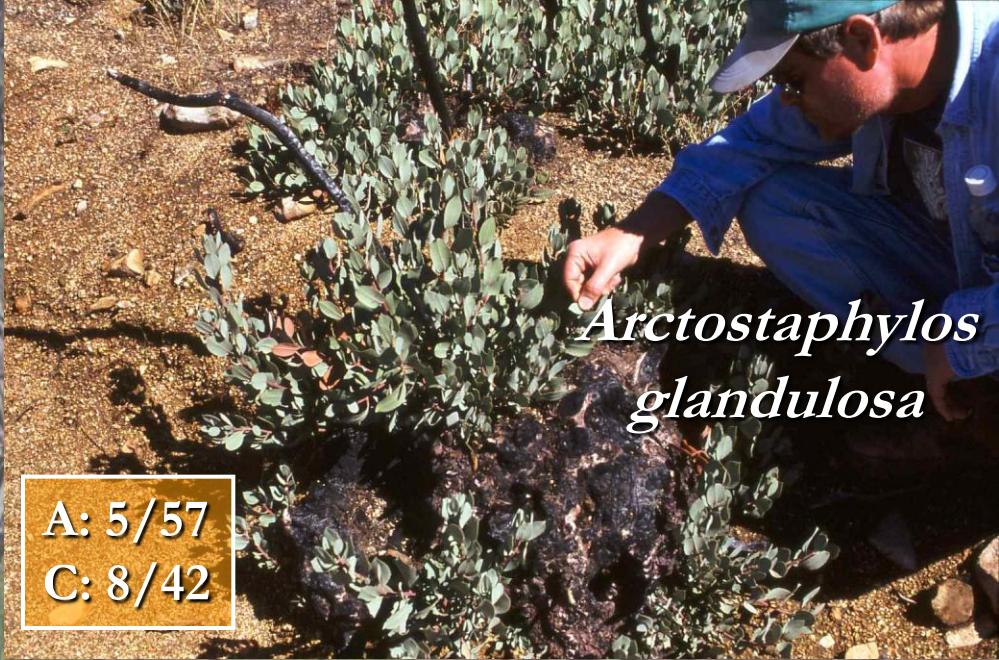
Ceanothus tomentosus

Emerging from
the seed bank

C. Facultative seeders



Chamise
seedlings



Chamise
Resprouting



So why would plants have
fire-cue dependent seeds?



Myth #2: Old-growth chaparral is unhealthy, choking hillsides with “decadent” brush.*



*it “needs”
to burn



Cedar fire
scar

Chamise/manzanita chaparral
75+ years old in August



Old-growth
chaparral
remains a
healthy,
dynamic plant
community
and is one of
California's
natural
treasures.

Photo by Pete Veilleux
12/3/04



*Chrysotrix
granulosa*
on
manzanita

Flavoparmelia subcapitata
on chamise

Man in manzanita

Guatay Mountain

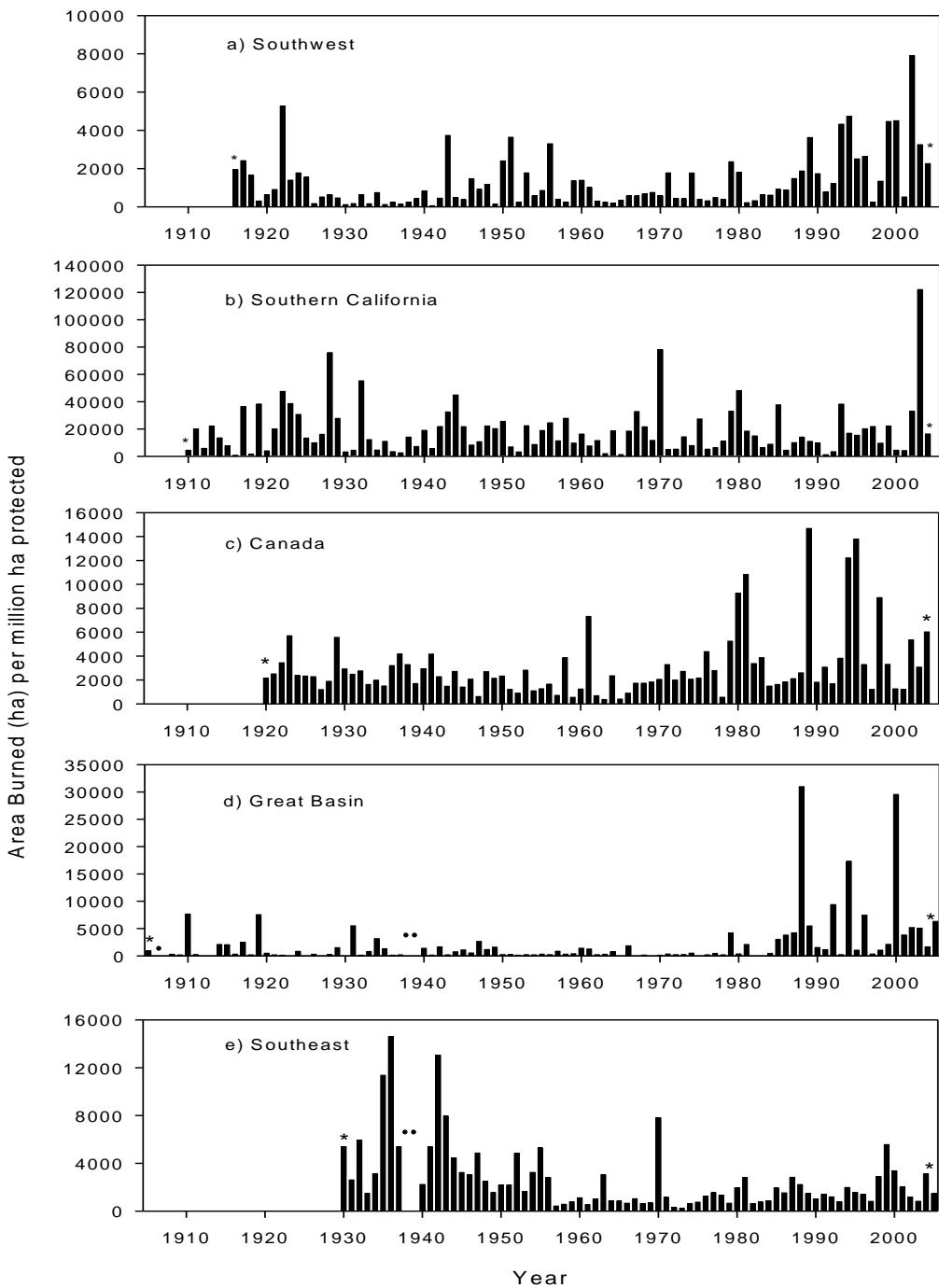
*Flavopunctelia
faventior*

Usnea subfloridana

Myth #3: Fire suppression has led to an “unnatural” accumulation of chaparral, leading to huge, catastrophic wildfires.*

*it's the chaparral's fault





Are wildfires really getting more frequent and larger?

Different
answers for
different
places



From: Keeley, Conard,
Christensen, Aplet, Swetnam,
Johnson, Omi, Peterson, in
review.

Sources of Ignition



Natural: In 25 years, only 2 lightning fires have been recorded in the Santa Monica Mountains.

Native Americans?
Significant impact
probably for less
than 5,000 years.
What happened
before that?

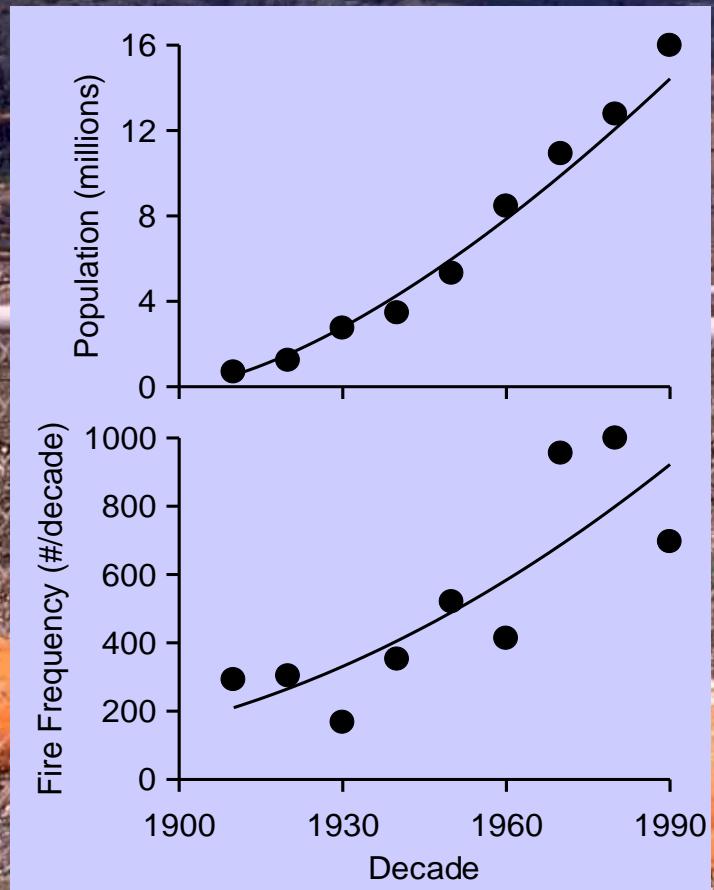


Ishi

Natural State

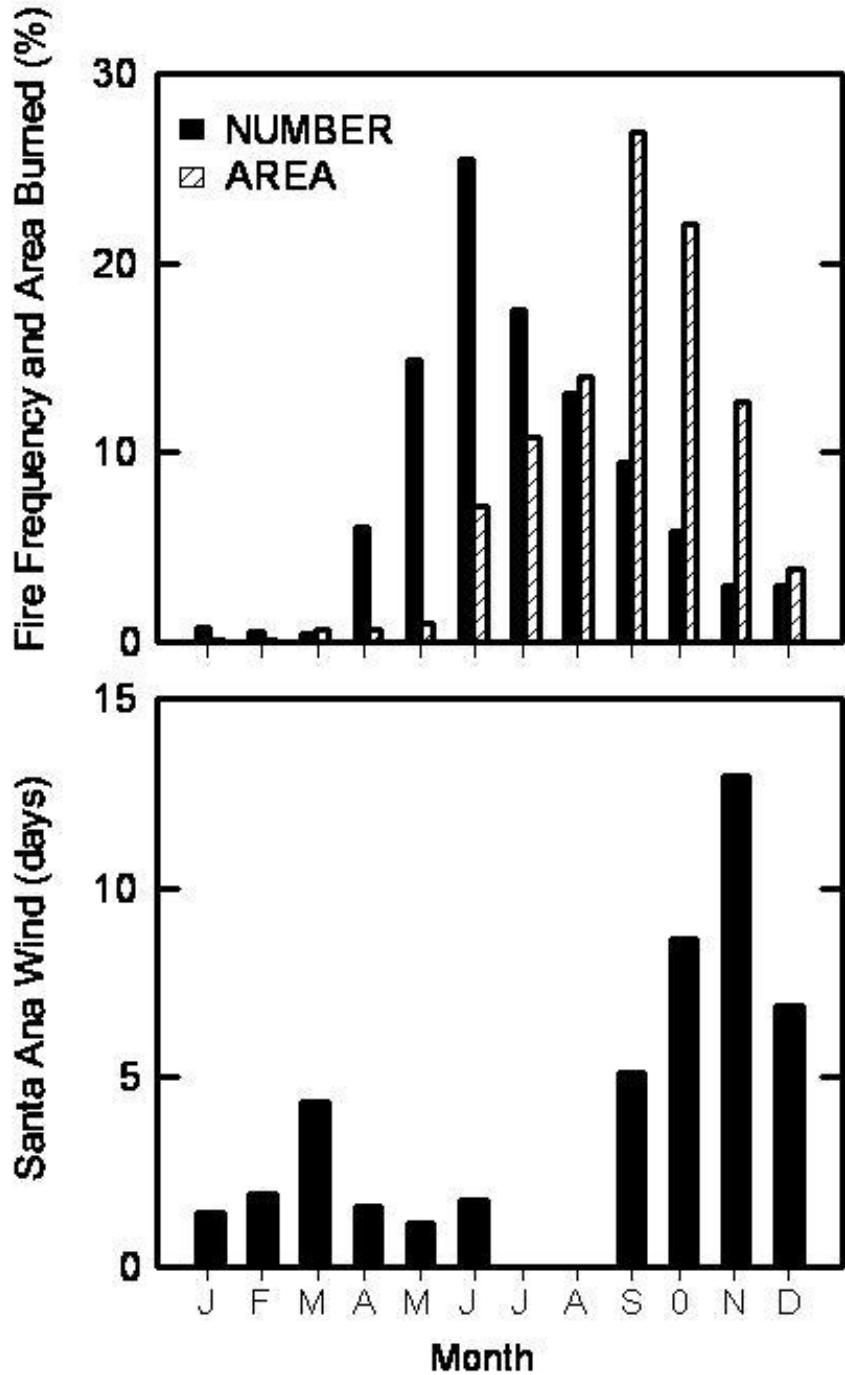
Step 1

Population and Fire Frequency



(Data: Keeley and Fotheringham)

Step 2

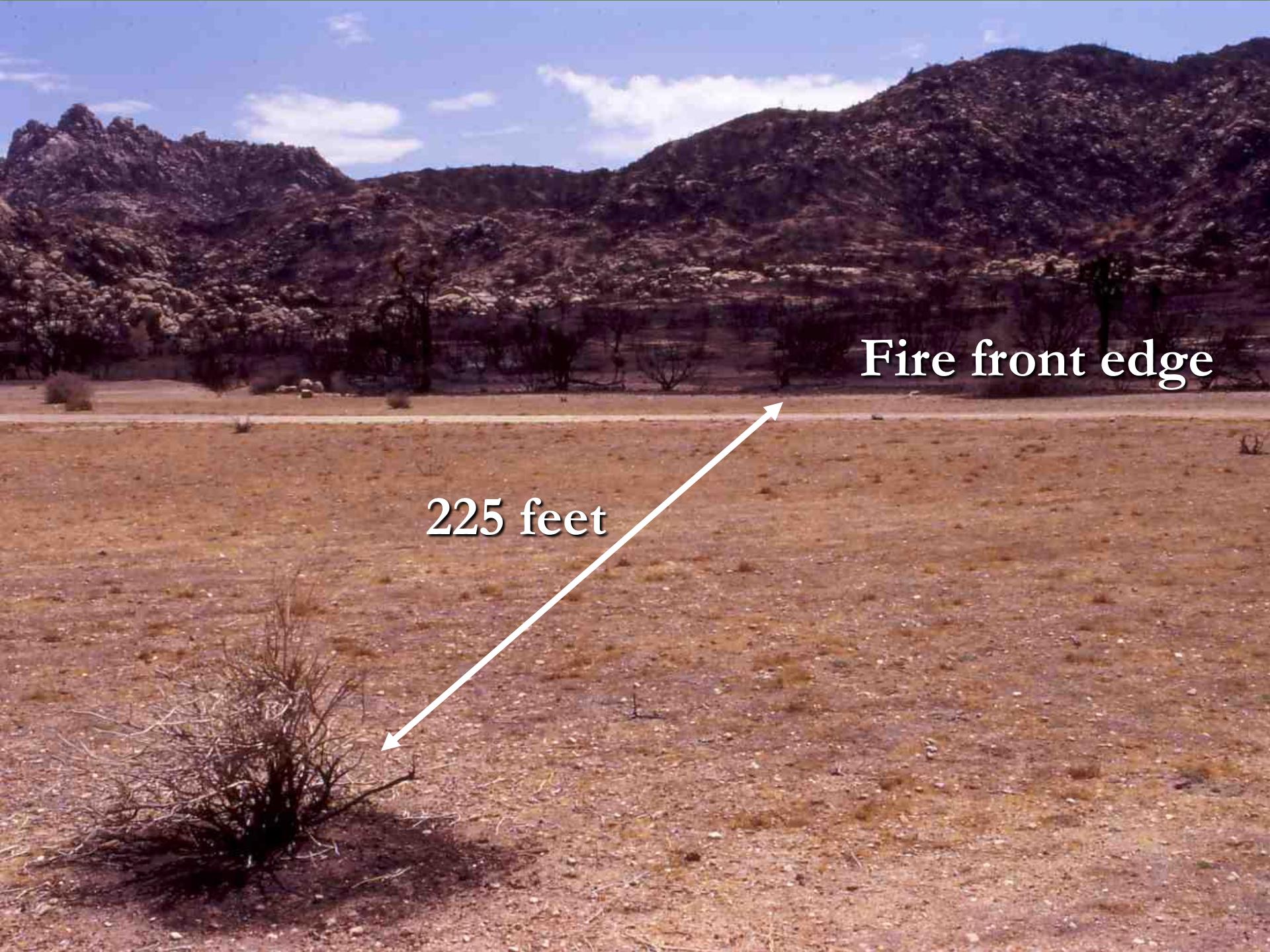


Main driver
of big
fires...

Severe fire
weather

20th century in Los
Angeles County

From Keeley and
Fotheringham 2003



Fire front edge

225 feet

Create sustainable, fire-safe environments
for our homes by starting from the house
out rather than from the wildland in.



- Community design
- Building design
- Landscape design
- Personal responsibility