



# It All Flows Down Hill:

## Sediment Management In Los Angeles County



Jody Noiron, Forest Supervisor, Angeles National Forest

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# Angeles National Forest Statistics:

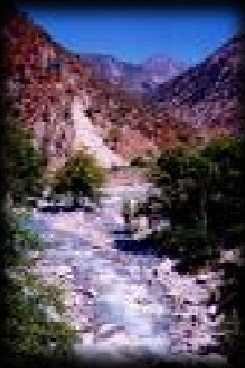
- The most urban National Forest in the Nation.
- Established in 1892 by President Harrison to reduce wildfire threat and protect watershed and timber resources decimated during establishment of the City/Pueblo of Los Angeles.
- 650,000 acres of land in 4 major watersheds: Los Angeles River, San Gabriel River, Mojave River, and Santa Clara River.
- Provides 72% of all open space in Los Angeles County.
- Source for 33% of all downstream water in the Los Angeles basin.



# What's Happening at the Top of the Watershed:

## An Island of Green in a Sea of Humanity

- 17 million people living and working within 1 hour drive.
- 3.5 million visitors per year; 50% of visitors come from within 50 mile radius of Forest.
- 9 federally listed Threatened/Endangered plant and animal species and 50+ Forest Service sensitive species.
- Recreation: hiking, biking, winter sports, fishing, boating, water-play, off-highway vehicle use, picnicking, camping, horseback riding, etc.
- Major infrastructure for LA basin: powerlines, water conveyances, roads, highways, freeways, natural gas and oil pipelines, flood control facilities, and telecommunications sites.





# Facts About the Southern California Transverse Ranges

- Better known as the Los Angeles Ranges and include the San Gabriel and San Bernardino mountains.
- Trend east-west, which makes them transverse to the general north-south orientation of most of California's coastal mountains.
- The San Andreas Fault bounds the San Gabriels on the north, causing them to slowly slip northward at a rate of about 2-6 inches per year.
- Tectonically “young” range – elevations up to 10,000 ft.
- Characterized by steep slopes and narrow chute canyons.
- Predominantly a fire-created chaparral ecosystem, with mixed conifer forests at higher elevations.
- Generally soils have low productivity and are coarse-textured, shallow, and erosive.
- Alluvial fans at the mouths of canyons are evidence of natural sediment transport down channels.



# Fire, Flood, Mud

- The link between wildfires and major sedimentation events has been recognized since the 1930s, particularly in southern California where the concept of "fire-flood sequences" was first defined (e.g., Kotak and Kraebel, 1935).
- In 1936, Eaton first used the term "debris flow" to describe the conditions he saw from 1914-1935 after fires and rain events caused flows of a mixture of rock particles and water the consistency of freshly mixed concrete ready to be poured.
- History of slumps and slides is evident on the Forest landscape.
- Fire accelerates erosion because without vegetation there is nothing to slow the velocity of rain drops and soil movement.
- Watersheds or portions of watersheds can remain unstable for a number of years after a fire – typically 3-5 years.

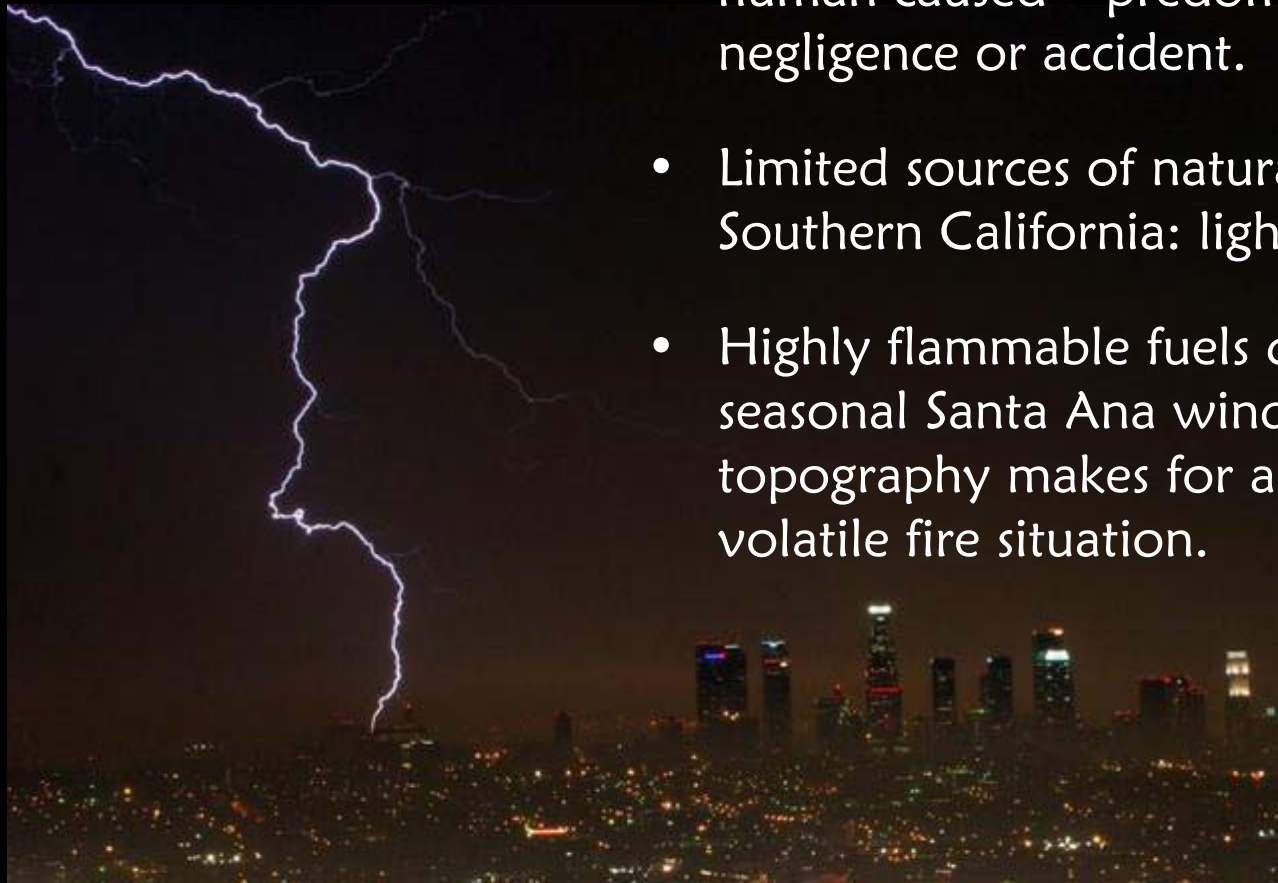


*Debris flow scars formed in 1968-1969 in greater Los Angeles area*

# The Burning

part of the Fire, Flood, Mud Sequence

- >95% of fires in Southern California are human caused – predominantly through negligence or accident.
- Limited sources of natural ignition in Southern California: lightning, rock fall.
- Highly flammable fuels combined with seasonal Santa Ana winds and very steep topography makes for an explosive and volatile fire situation.



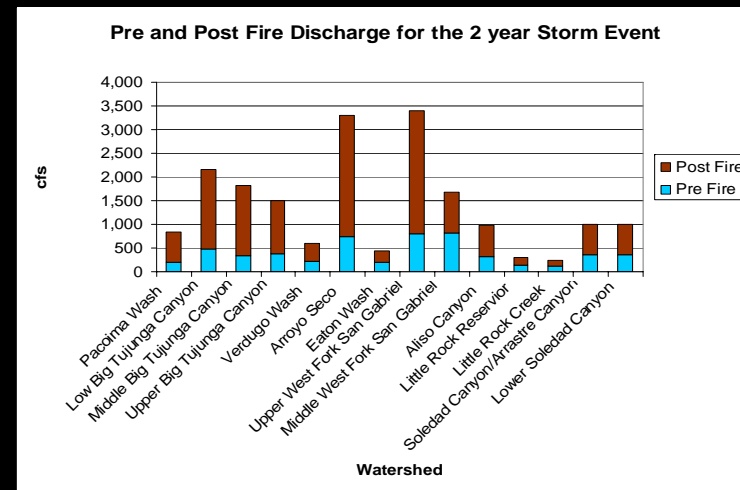
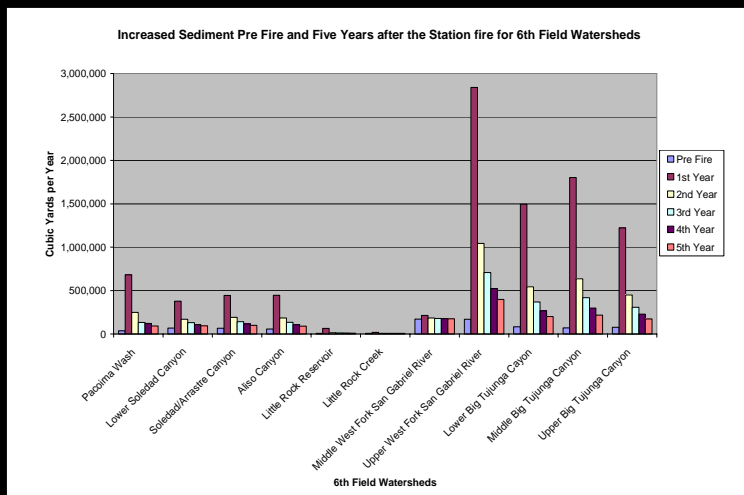
SMOKEY SAYS—

Care will  
prevent  
9 out of 10  
wildfires!



# For example, the 2009 **Station Fire**

- Burned ¼ of the Angeles National Forest – over 160,000 acres.
- 74 % of the soils burned to moderate or high level seriously altering stability within the watersheds.
- Forest Service analysis predicts the following watershed responses for the subbasins burned in the fire:





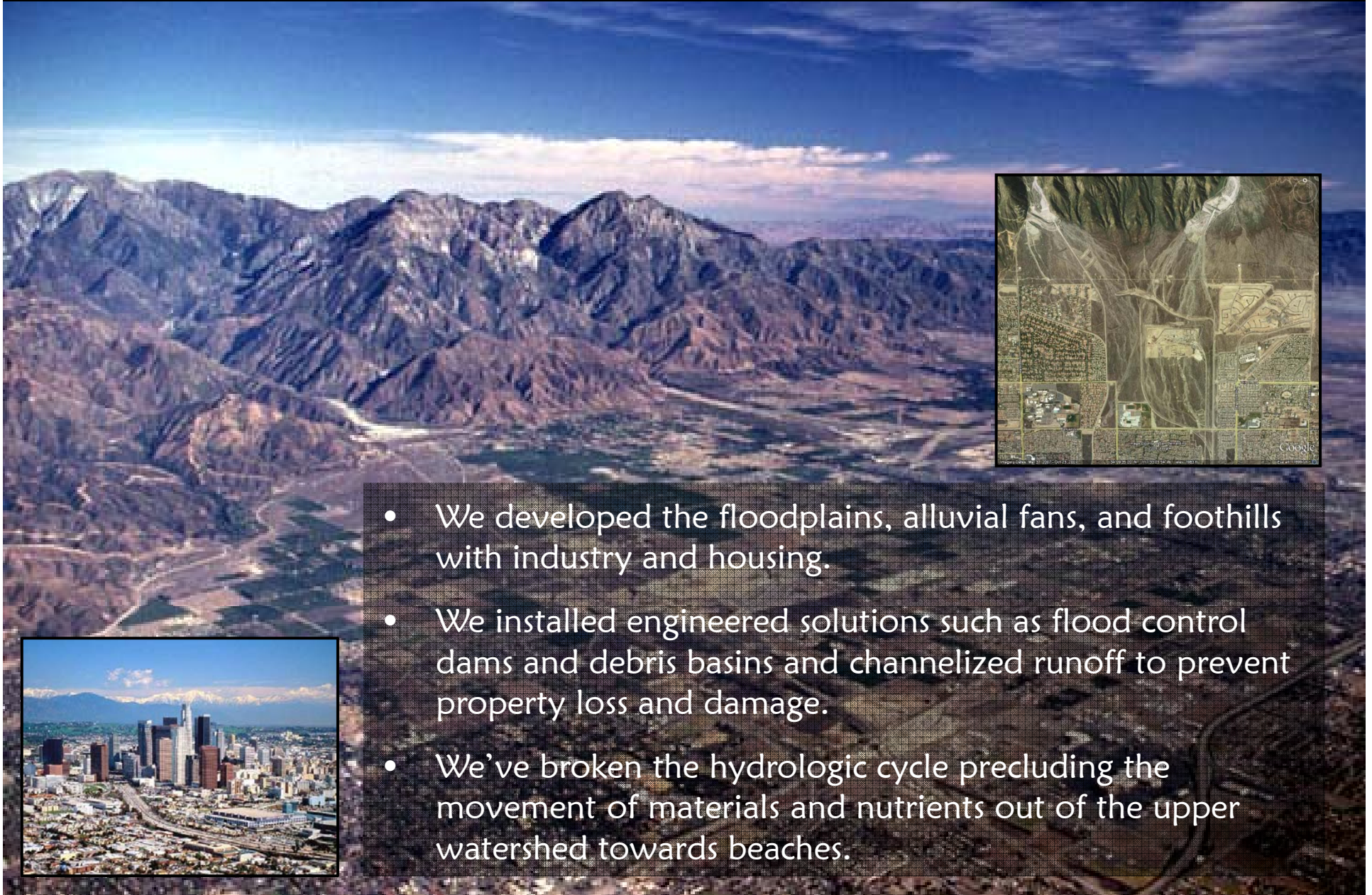
# What's supposed to happen next...



Sediment, water, and debris move down gradient through the watershed towards the ocean, creating dynamic riverine and riparian habitat and replenishing beaches along the way.



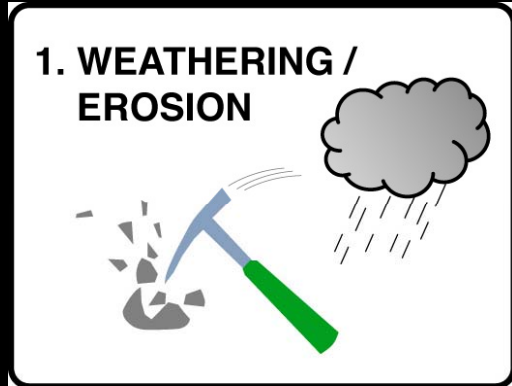
# What Actually Happens in Southern California....



- We developed the floodplains, alluvial fans, and foothills with industry and housing.
- We installed engineered solutions such as flood control dams and debris basins and channelized runoff to prevent property loss and damage.
- We've broken the hydrologic cycle precluding the movement of materials and nutrients out of the upper watershed towards beaches.



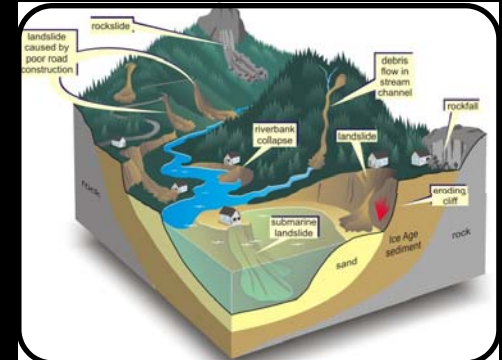
So now, we still have all the natural processes going on  
(rain, erosion, fires, landslides, etc.)



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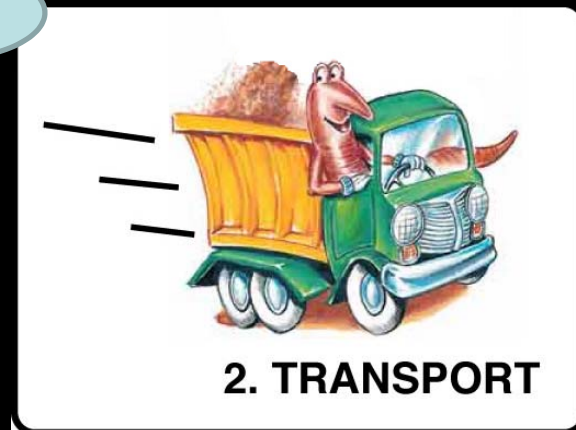


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**BUT**

we've taken Nature out of its cycle and replaced it with unnatural  
and costly engineered solutions.



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# What this means to the Angeles NF:

- 6 permitted Dam Sediment Disposal sites (e.g. Maple Canyon, Burro Canyon).
- 50+ permitted Debris Disposal sites.
- Abnormally high amounts of trapped materials in stream channels.
- A bunch of sediment and nutrients that never make it to their destination.



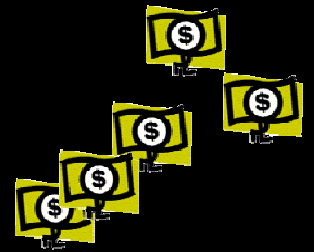
Burro Canyon Sediment Disposal Site,  
San Gabriel Canyon



# The Bigger Picture (What's the “So What?”)

Our current system of debris/sediment management in Southern California is economically and environmentally unsustainable – it:

- costs a lot of money (e.g. San Gabriel Reservoir cleanout cost taxpayers ~\$37 M, removed ~6.1 M cubic yards of material, and lasted 3 years – the material was deposited back up on the Forest),
- has human health risks (heavy equipment emissions, noise, traffic, dust, precludes natural flushing events)
- results in repetitive need to move larger and larger amounts of material back up slope, and
- robs downstream landscapes and ecosystems of their essential building blocks (fine sediments, sands, gravel, nutrients, etc.)



# What can we do?

The **Station Fire** has accelerated sediment and debris production, which is exacerbating and highlighting management challenges.

## TIME FOR A CHANGE IN PARADIGM!

- Educational outreach to the public to improve understanding about natural processes.
- Pursue sediment management options that safely mimic natural processes from the top of the watershed to the bottom (sluicing, others?).
- Promote **SMART** development and re-development
  - Landuse regulations (green buffers, density, proximity to wildlands, defensible space, distance from geologic hazards)
  - Building design (house placement, ember-resistant building materials).



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