



Forensic Analytical Consulting Services

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Engage Afterburners: Assessing Wildfire Impacts...It's More than the Heat

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February 11, 2019

Right People. **Right** Perspective. **Right** Now.

Agenda – Health & Safety

During Fire

After Fire

Worker Safety

2017 Season

- Previously the most destructive in history
- >10,000 structure destroyed
- 43 deaths (41 civilians & 2 firefighters)
 - Higher than 10 years combined





Carr Fire

- Northern California
 - Shasta County
- July 2018
- Caused evacuations of >36,000
- 8 deaths



Tubbs Fire

- Previously the most ***destructive*** in California history
- October 2017
- Northern CA
 - Napa, Sonoma, Lake counties
- Burned >35,000 acres
- 22 people killed



- ***Largest*** wildfire in California history
- December 2017
- Southern CA
 - Santa Barbara & Ventura counties
- Burned >280,000 acres
- >2 billion in damage
- >1,000 structure burned

Thomas Fire

2018 Season

- Deadliest and most destructive wildfire season on record in CA
- Total of 8,527 fires
- Burned 1,893,913 acres





Mendocino Complex Fire

- July 2018
- 157 residential buildings destroyed
- 123 others destroyed
- 1 firefighter killed, 4 firefighters injured



- November 2018
- Largest and most ***destructive*** in California history
- 88 dead
- >18,500 structures destroyed
- >150,00 acres burned

Camp Fire



Woolsey Fire

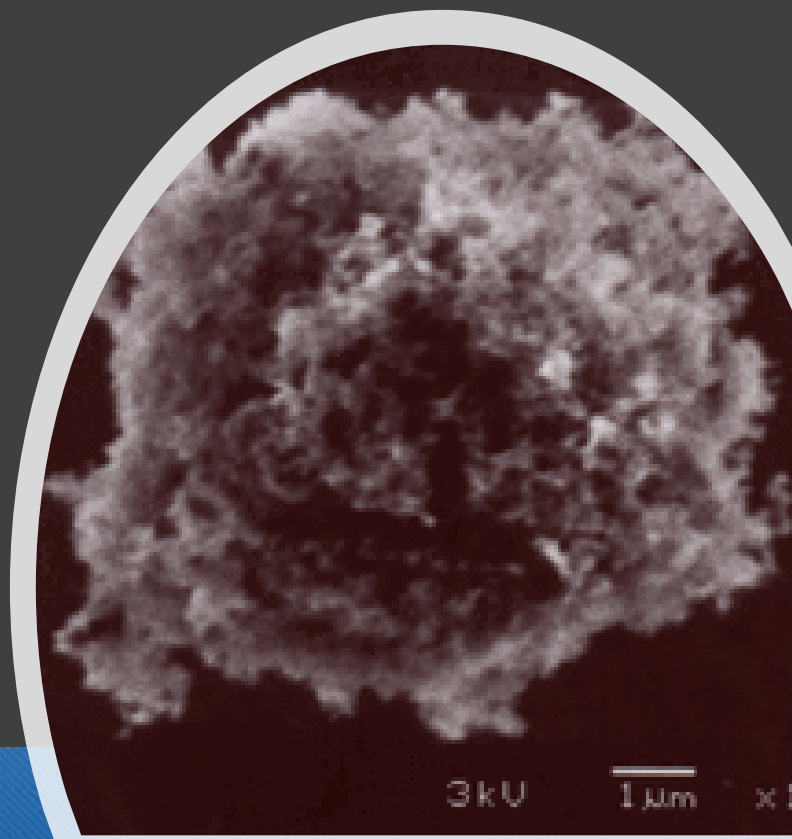
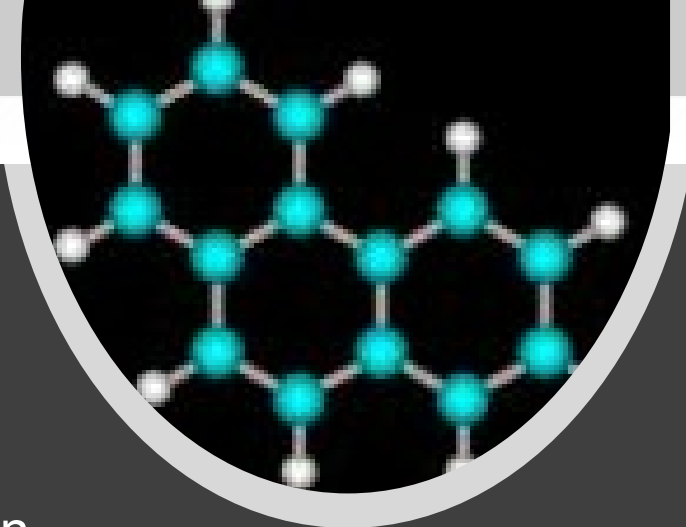
- November 2018
- 1,643 structures destroyed
- >95,000 acres burned
- Killed 3 civilians



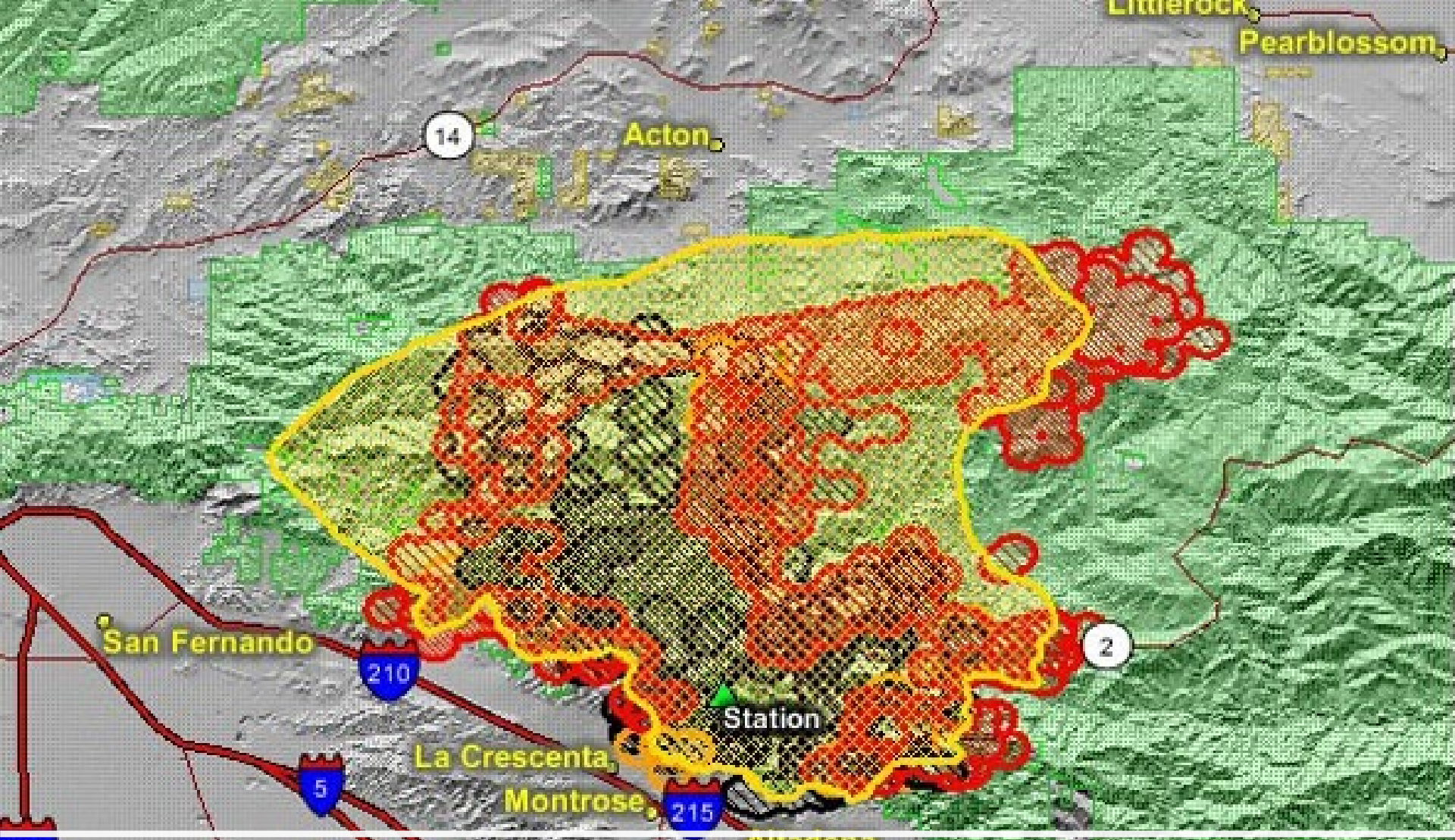
**DURING THE
WILDFIRE**

During the Fire

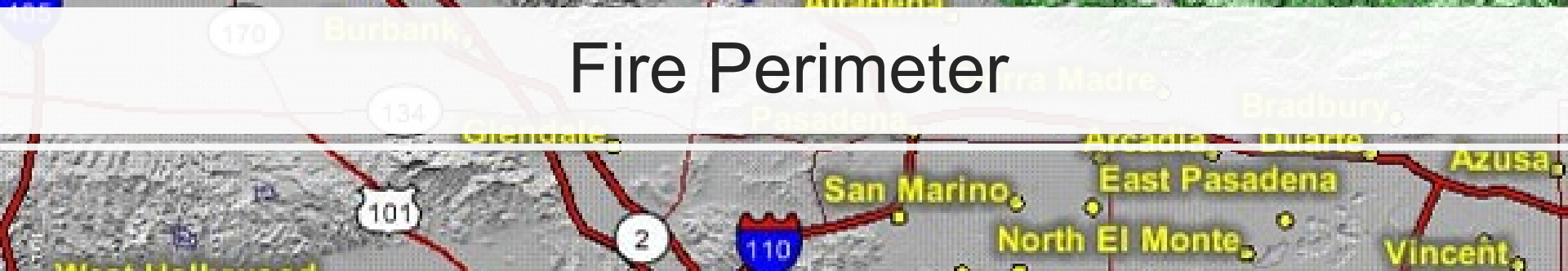
- Contaminants of wildfire smoke can include:
 - VOC
 - aldehydes (e.g. formaldehyde)
 - carbon monoxide
 - hydrocarbons, PAH
 - nitrogen oxides
 - acids
 - PAHs
 - alcohols
 - and more...







Fire Perimeter



During the Fire

- PM2.5 and PM10
 - What public health officials generally look at and cause the most issues
- Gases (CO, NOx)
- Potential carcinogens
 - PAHs, formaldehyde, VOCs

Air Quality Index -

<https://airnow.gov>

PM10
 PM2.5
 Nitrogen Dioxide
 Ozone
 Carbon Monoxide
 Carbon Dioxide

Current AQI
Forecast
AQI Loop
More Maps

Current AQI (Combined PM and O₃)

Tuesday, March 13, 2018 7:00 AM PDT

Current Conditions

Air Quality Index (AQI)
 observed at 7:00 PDT

72 Moderate

Health Message: Unusually sensitive people should consider reducing prolonged or heavy exertion.
 Max. Index above 300 are considered beyond the AQI. Follow recommendations for the Maximum category. Additional information on reducing exposure to ambient air's levels of particulate pollution is available [here](#).

AQI - Pollutant Details

Ozone	3	Good
Particles (PM2.5)	72	Moderate

AQI - Pollutant Details

Data Not Available		
Carbon Monoxide	15	Good
Nitrogen Dioxide	20	Good
Ozone	37	Good
Particles (PM10)	29	Good
Particles (PM2.5)	53	Moderate

Air Quality Forecast

Today	Tomorrow
Air Quality Index (AQI) 53 Moderate	Data Not Available
<small>Health Message: Unusually sensitive people should consider reducing prolonged or heavy exertion.</small>	

Local Air Quality Resources

South Coast Air Quality Management District

State Air Quality Resources

- Amador County Air Pollution Control District
- American Lung Association (ALA) of California
- Antelope Valley Air Quality Management District
- BAAQMD Spare the Air 2002
- Bay Area Air Quality Management District (BAAQMD)
- Butte County Air Pollution Control District
- California Air Resources Board (CARB)
- California Environmental Protection Agency
- California Environmental Protection Agency - Contact Us
- Colusa County Air Pollution Control District
- El Dorado County Air Quality Management District
- Feather River Air Quality Management District
- Glenn County Air Pollution Control District
- Hem County Air Pollution Control District
- Hendocino County Air Quality Management District

Past Air Quality Maps and Data

[Yesterday's Maps and Data](#)
[Air Quality Maps Archive \(by region\)](#)

E-Mail Notification

EnviroFlash provides air quality information such as forecasts and action day notifications via email for your area of interest. [Sign Up](#)

During the Fire

- Smoke can irritate your eyes and your respiratory system.
- Acute & Chronic health effects
 - Respiratory system irritation
 - Inflammatory response
 - Asthma triggers
 - COPD
- Who is at greatest risk?
 - Sensitive populations

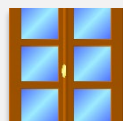
During the Fire

- Other safety hazards:
 - Fire risk
 - Falling trees
 - Electrical hazards
 - Gas leaks

During the Fire



Stay indoors



Keep windows and doors closed



Avoid vigorous outdoor activities



Reduce the amount of time spent in
the smoky area



Drink plenty of water

During the Fire



HVAC & outdoor
air dampers

Home vs.
commercial



Use a high- efficiency
particulate air (HEPA) filter to
reduce indoor air pollution



Avoid using additional
combustion sources



Respiratory protection???



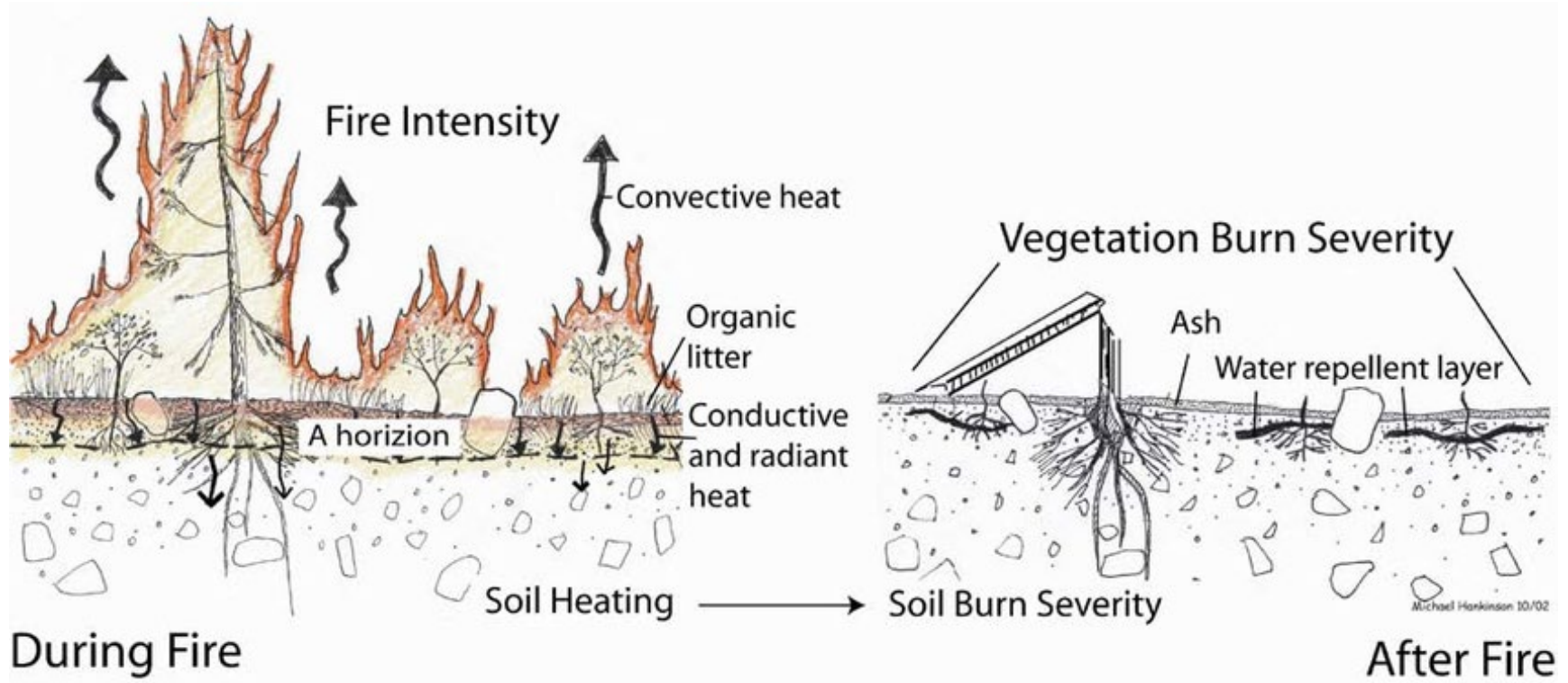
**AFTER THE
FIRE**

Following the Fire - Safety

- Electrical Safety
- Structural Issues
- Roadways



Soil Impact:



Ventura and Santa Barbara Mudslides



After the Fire

- Indoor Air Quality
- What Remains?
- Clean up

Following the Fire

- *While the health effects of wood smoke inhalation have been well-documented, there is very little research directly addressing the short or long-term health effects of exposure to settled wildfire particles and organic and inorganic residues that may have infiltrated into a structure following a wildfire.*
- Evidence Review: Wildfire smoke and public health risk
March 31, 2014. BC Centre for Disease Control

Cleanup Efforts

- Dependent on level of impact
- Hazardous materials present?
- Respiratory protection?
- Qualified professional



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WORKER SAFETY

Worker Safety and Health in Wildfire Regions

- *Smoke from wildfires contains chemicals, gases and fine particles that can harm health. Hazards continue even after fires have been extinguished and cleanup work begins. Proper protective equipment and training is required for worker safety in wildfire regions.*
 - *Cal/OSHA*
 - *Control of Harmful Exposure to Employees (Title 8 section 5141)*
 - *Respiratory(Title 8 section 5144) Protection*

Cal/OSHA Worker Safety

Protecting Outdoor Workers
Exposed to Smoke from
Wildfires

Protecting Indoor Workplaces
from Wildfire Smoke with
Building Ventilation Systems

Worker Safety and Health
During Fire Cleanup

Safety and Health of Workers
Rebuilding after Wildfires

Outdoor Workers

- For those who work in locations where wildfire smoke can travel (does not include fire fighters). Factors to consider:
 - Local air quality districts data
 - How long workers are outside
 - Level of physical exertion
 - Symptoms consistent with exposure to wildfire smoke, such as those listed above
 - Pre-existing medical conditions

Outdoor Workers



- Implement controls
- Engineering
- Administrative
- Respiratory

Indoor Workers

- Ventilation
- Restrict exits/entries
- Air Scrubbers



Worker Safety and Health - Cleanup

- Safety Issues
 - Electrical Safety
 - Structural Issues
 - Excavation
- Health Issues
 - Carbon Monoxide
 - Smoke related particulates
 - Asbestos
 - Heat Illness
 - Others...

Worker Safety and Health - Rebuilding

- Rebuilding residences and structures after wildfires can begin when all hazardous materials have been removed and debris cleanup hazards have been corrected. The following information covers some of requirements for rebuilding safely.



Thank You

Forensic Analytical Consulting Services, Inc.

Right People
Right Perspective
Right Now