Woolsey Fire

National Park Service
U.S. Department of the Interior

Santa Monica Mountains
National Recreation Area

When did the fire happen?

- November 8 – 21, 2018
- The fire was 100% contained on November 21, 2018

Where did the fire happen?

- Los Angeles and Ventura Counties
- The fire started November 8, 2018 near the Santa Susana Field Laboratory above Simi Valley

How big was the fire?

- 96,949 acres

What was the impact?

- 1500 structures destroyed with 341 damaged
- 3 civilian fatalities
- 3 firefighter injuries

What caused the fire?

- The cause is still under investigation

What was the impact on the Santa Monica Mountains National Recreation Area?

- This fire burned more acres within the recreation area than any other fire in recorded history.
- 21,000 of the 23,595 National Park Service acres (88%) have burned.
- Park partners have also sustained significant damage.
- Peter Strauss Ranch was lost in the fire. This historic site was once a weekend retreat for Harry Miller who patented a carburetor featured at the Indianapolis 500 car races. The ranch was later transformed into a weekend resort called Lake Enchanto and later became the beloved home for actor Peter Strauss before being sold to the National Park Service in 1987.
- Most of Paramount Ranch, which is a National Historic Register site and the only site in the National Park Service that interprets American film history was lost in the fire. This well-known site is still a working movie ranch that allows the public to see filmmaking in action. A campaign has begun to rebuild this site.

What about the wildlife?

- Wildlife have instincts to avoid danger. In general, large animals like deer, coyotes, bobcats, and mountain lions can run and may be able to escape the flames. Smaller animals have a more difficult time escaping. Those that can, will burrow underground. Birds and bugs that can fly will flee the flames.
- Of the 13 lions with working radio-collars, 11 were in or near the fire perimeter. 9 have survived the fire and appear to be moving normally.
- All four collared bobcats appear to be moving; however, the entire home ranges of these cats has burned.
- Some animals, like woodpeckers, reptiles, and some insects are attracted to burn areas. Others will return home as the habitat recovers. The vegetation will attract different animals over time as it goes through the process of recovery.

When will the plants come back?

- There is no quantifiable answer, but in general plants need two things: time and the right amount of rain. Too much rain in too short a period of time may cause mud and debris flows, and thus wash out seeds and new sprouts. That being said, if there is not enough rain, germinating seeds might not survive. With the right amount of rain, we should get a post-fire bloom of wildflowers. These fire-following flowers can act as nature's own "band-aid" to help control erosion. The recovery of the plant communities also depends on the condition of the land prior to the fire. With recent years of drought, conditions are not encouraging but there is no simple way to predict how the mountains will recover.

What can I do to help?

- Thank you for your enthusiasm! You can sign up to volunteer by calling the visitor center at 805-370-2301 or by filling out the form at https://form.jotform.com/83166857030155

Fire Ecology & Wildfire FAQs

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What is the fire triangle, and what are the three elements fire needs?

The fire triangle is a model used by scientists to represent the various components that are necessary to have fire. The three components are fuel (e.g. wood, chaparral, flashy fuels), heat, and oxygen (this is why the strong, warm Santa Ana winds spread fire so rapidly).

What does it mean when a fire "jumps" the freeway?

Wildland firefighters often use natural and human-constructed barriers to try to contain a wildland fire. In the event of Santa Ana Winds, or other natural forces, embers from the fire can "jump" across a barrier that seems impassable to flames.

What's the Wildland Urban Interface?

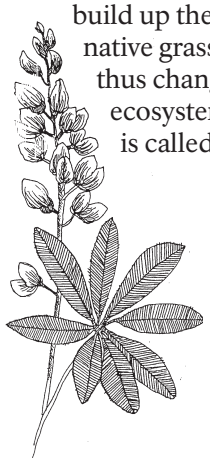
The Wildland Urban Interface is the area where homes and wildlands meet. It is a significant area for wildfire impact and management.

how does wildfire impact bugs and insects?

Depending on how hot the fire burns, insects may be able to survive, but, they are likely to experience losses. Some insects, however, like charcoal beetles (*Melanophila consputa*), are attracted to an area almost immediately after a burn. Charcoal beetles colonize and lay their eggs in trees almost immediately after a fire because the trees will not produce the chemical attacks that usually keep the beetles away. Additionally, since many plants and animals take a while to return to burned areas, the beetles are able to have the land to themselves and take their time placing their larvae.

Could native plants be taken over by non-native invaders?

Unfortunately, yes. Many native plants in the Santa Monica Mountains require at least twenty years to reach maturity and to start flowering (reproducing). If the area has burned multiple times without enough time for the native plants to build up their seed banks and/or root system, non-native grasses can sprout quicker and invade an area thus changing the plant community from a native ecosystem to a non-native ecosystem. This process is called type-conversion.



Plants provide shelter and food for many animals and insects. What's happened to the animal populations and will those populations return?

Some animals, like reptiles, woodpeckers, and aerial predators are attracted to recently burned areas. Others will return as the plant communities return.

With the loss of so many shrubs, is there a higher chance of a mudslide?

Absolutely--which is why it is very important to remain vigilant before, during, and after a major rainstorm. After a fire, soil begins to move and load channels with sediment. Plants have microroots which can attach to nearly every particle of soil. When a lot of plants die after a major burn, the roots can die too, resulting in less hold on the mountainside.

Should I spread native California plant seeds while I'm hiking in the burn area?

Thank you for your desire to help the plant recovery. Please *do not spread seeds* in the burn areas, even if they are California native seeds. We want to keep the plant communities in the Santa Monica Mountains *native to these mountains* and many native California plants are not native to these mountains. We will be hosting volunteer days to help replant in the burned areas soon. Call the visitor center at 805-370-2301 to inquire about upcoming opportunities.

Should I leave food and water out for animals?

While it is hard to accept, please keep wildlife wild. The best thing you can do is to leave them alone. Do not approach wildlife. They're already undergoing stress from what has taken place. We do not recommend leaving out water or food, as it may habituate the animals to humans. They are highly resourceful. It is against the law leave out food and water on National Park Service land (36 Code of Federal Regulations/CFR 2.2, with a fine up to $5,000 and up to six months imprisonment). If you see an injured animal, you can call the California Wildlife Center at (310) 458-WILD.

Wildfire Resources

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Mediterranean Climate and Biome

- https://courses.lumenlearning.com/biology2xmaster/chapter/terrestrial-biomes/
- https://www.nationalgeographic.org/encyclopedia/ecosystem/
- https://www.nps.gov/samo/learn/nature/mediterraneanecosystem.htm
- https://www.youtube.com/watch?v=FhaldPmkoNE

Chaparral and Other Plant Communities

- http://calfire.ca.gov/foresttsteward/pdf/news-summer2013.pdf
- http://www.californiachaparral.org/chaparralfacts/clantsanimals.html
- http://www.californiachaparral.org/shrublandecosystems.html
- https://www.nps.gov/samo/learn/nature/
- Halsey, R. W. (2008). Fire, chaparral, and survival in southern California. San Diego, CA: Sunbelt Publications.

Natural History of Fire

- http://www.californiachaparral.com/enativeamericans.html
- http://www.californiachaparral.com/images/Santa_Ana_Fires_500_years.pdf
- http://www.californiachaparral.org/threatstochaparral.html
- https://www.nps.gov/samo/learn/historyculture/ranchos.htm
- https://www.nps.gov/samo/learn/management/firehistory.htm
- Keeley, J. E. (2002). Native American impacts on fire regimes of the California coastal ranges. Journal of Biogeography,29(3), 303-320. doi:10.1046/j.1365-2699.2002.00676.x
- Timbrook, J., Johnson, J. R, & Earle, D. D. (1982). Vegetation Burning by the Chumash. Journal of California and Great Basin Anthropology, 4(2). Retrieved from https://escholarship.org/uc/item/1rv936jq
- Van Wagtendonk, J., Sugihara, N., Stephens, S., Thode, A., Shaffer, K., & Fites-Kaufman, J. (2018). Fire in California's ecosystems (Second ed.).

Wildland Fire- A Physical Process

- https://www.nps.gov/articles/wildlandfire-facts-fuel-heat-oxygen.htm
- https://www.nps.gov/olym/learn/management/upload/fire-wildfire-definitions-2.pdf
- https://www.nps.gov/samo/learn/management/firebehavior.htm
- https://www.nps.gov/samo/learn/management/firefrequency.htm
- http://www.openculture.com/2012/06/iwhat_is_a_flamei_the_first_prize winner_at_alan_aldas_science_video_competition.html
- https://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1018&context=jfspsynthesis

Fires in the Santa Monica Mountains

- https://www.nps.gov/samo/learn/management/2013-springs-fire.htm
- https://www.nps.gov/samo/learn/management/upload/_SpringsFireBAERPlan_FINAL_4-1-web-reduced.pdf
- https://www.nps.gov/samo/learn/management/modernfirehistory.htm
- https://www.nps.gov/samo/learn/management/upload/SAMO_FMP_Review_Final_2012.pdf
- https://www.researchgate.net/publication/43285811_Management_of_fire_regime_fuels_and_fire_effects_in_southern_California_chaparral_lessons_from_the_past_and_thoughts_for_the_future

Wildfire Resources

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Fire Ecology- How fire impacts plants and animals

- https://ca.water.usgs.gov/flooding/wildfires-debris-flow.html
- http://www.californiachaparral.com/chaparralmyths.html
- http://www.californiachaparral.org/fire/firenature.html
- https://www.esa.org/esa/education-and-diversity/what-does-ecology-have-to-do-with-me/
- https://www.fs.fed.us/psw/publications/barro/psw_1991_barro001.pdf
- https://www.fs.fed.us/rm/pubs/rmrs_gtr042_1.pdf
- https://www.nps.gov/articles/learning-about-fire-ecology-basics.htm
- https://www.nps.gov/samo/learn/management/fireecology.htm
- https://www.nps.gov/samo/learn/management/upload/Vegetation-Response-to-Wildfire-and-Fire-History-in-the-Santa-Monica-Mountains-California.pdf
- http://talltimbers.org/wp-content/uploads/2014/03/Komarek1969_op.pdf
- https://www.youtube.com/watch?v=aJ9mE0TzrX0

Wildland Urban Interface (WUI)

- https://www.fs.fed.us/nwacfire/home/terminology.html#F
- https://www.nps.gov/samo/learn/management/create-defensible-space.htm
- https://www.nps.gov/samo/learn/management/fire-and-fuel-zones.htm
- https://www.nps.gov/samo/learn/management/harden-your-home.htm
- https://www.nps.gov/samo/learn/management/upload/SMM_CWPP_02MAY2012_FINAL_v3.pdf
- http://www.readyforwildfire.org/Emergency-Supply-Kit/
- http://www.readyforwildfire.org/Hardening-Your-Home/
- http://www.readyforwildfire.org/Prepare-For-Wildfire/
- http://www.readyforwildfire.org/Prepare-Your-Family/

Wildland Fire Careers

- http://calfire.ca.gov/about/about_careers_fireprotection_seasonal
- https://www.fws.gov/fire/downloads/DOIRecruitmentBrochure.pdf
- https://www.fs.fed.us/working-with-us/jobs/fire
- https://www.jobcorps.gov/train/390/renewable-resources-and-energy/191/advanced-wildland-fire-management
- https://www.nps.gov/orgs/1965/fire-ecology-research.htm
- https://smokeybear.com/en/about-wildland-fire/fighting-wildfires/the-front-line
- https://www.youtube.com/watch?v=QxJFIfkOQLY
- https://www.youtube.com/watch?v=VnzMdzmlYuo
- https://www.youtube.com/watch?v=ZxkeYnEBZzg

Fire Ecology & Wildfire Education Standards

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California Next Generation Science Standards (NGSS) Relevant to Wildland Fire Ecology

Kindergarten

K-LS1-1. Use observations to describe patterns of what plants and animals (including humans) need to survive.
K-ESS2-1. Use and share observations of local weather conditions to describe patterns over time.
K-ESS2-2. Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.
K-ESS3-1. Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.
K-ESS3-2. Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.
K-ESS3-3. Communicate solutions that will reduce the impact of humans on the land, water, air and/or other living things in the local environment.

First Grade

1-LS1-1. Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow and meet their needs.
1-LS1-2. Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.
1-LS3-1. Make observations to construct an evidence-based account that young plants and animals are alike, but not exactly like, their parents.

Second Grade

2-PS1-4. Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.
2-LS2-1. Plan and conduct an investigation to determine if plants need sunlight and water to grow.
2-LS3-2. Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.
2-LS4-1. Make observations of plants and animals to compare the diversity of life in different habitats.
2-ESS1-1. Use information from several sources to provide evidence that Earth events can occur quickly or slowly.
2-ESS2-2. Develop a model to represent the shapes and kinds of land and bodies of water in an area.
K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
K-2-ETS1-3. Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

Third Grade

3-LS1-1. Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.
3-LS3-2. Use evidence to support the explanation that traits can be influenced by the environment.
3-LS4-3. Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.
3-LS4-4. Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.
3-ESS2-1. Represent data in table and graphical displays to describe the typical weather conditions expected during a particular season.
3-ESS2-2. Obtain and combine information to describe climates in different regions of the world.
3-ESSE3-1. Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.

Fourth Grade

4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
4-LS1-2. Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.
4-ESS2-1. Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.
4-ESS2-2. Analyze and interpret data from maps to describe patterns of Earth's features.
4-ESS3-2. Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.

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Fifth Grade

5-ESS2-1. Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.
5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.
3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints to the problem.
3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

Sixth Grade

MS-LS1-4. Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behavior and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.
MS-LS1-5. Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
MS-ESS2-5. Collect data to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions.
MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.
MS-ESS3-5. Ask questions to clarify evidence of the factors that have caused the rise in global temperatures of the past century.
MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
MS-ETS1-4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

Seventh Grade

MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
MS-ETS1-4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.
MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations in an ecosystem.
MS-LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
MS-LS2-3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.
MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations
MS-LS2-5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services.
MS-ESS3-2. Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.

Eighth Grade

MS-ESS3-4. Construct and argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.
MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

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MS-ETS1-4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

High School Physical Sciences

HS-PS1-1. Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.
HS-PS1-2. Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.
HS-PS1-5. Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.

High School Life Sciences

HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
HS-LS2-2. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
HS-LS2-6. Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
HS-LS4-5. Evaluate the evidence supporting claims that changes in environmental conditions may result in (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.

High School Earth and Space Sciences

HS-ESS3-1. Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
HS-ESS3-3. Create a computational simulation to illustrate the relationships among the management of natural resources, the sustainability of human populations, and biodiversity.
HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
HS-ESS3-5. Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth's systems.
HS-ESS3-6. Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.

High School Engineering Design

HS-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
HS-ETS1-4. Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

Sources:

(2017, September). DCI Arrangements of the Next Generations Science Standards. Retrieved from https://www.nextgenscience.org/sites/default/files/AllDCI.pdf

(2015, Revised March). California NGSS for Public Schools, K-12. Retrieved from https://www.cde.ca.gov/pd/ca/sc/ngssstandards.asp