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Science by the Sea

Natural Resources and Science in the Mediterranean Coast Network

November, 2016

Mountain Lions Face Loss of Genetic Diversity

A young female mountain lion (P-42). NPS photo.

On the surface, mountain lions in the Santa Monica Mountains are doing well, surviving, and reproducing at healthy rates. However, recently published research predicts that there could be serious challenges to this population's long-term survival. Using a unique combination of geographic, genetic, and demographic data, researchers at Santa Monica Mountains National Recreation Area, UCLA, UC Davis, and Utah State University modeled how the mountain lions might fare under different future scenarios.

One scenario studied is what will happen if the mountain lions continue as they are. Besides appearing relatively health, this status quo scenario includes a high degree of isolation. Major freeways and developed areas represent major barriers to the movement of mountain lions and other wildlife to and from the Santa Monica Mountains. Since 2002, National Park Service biologists have tracked over 50 mountain lions in the region and documented only one instance where a subadult male from the Simi Hills (identified as P-12) crossed highway 101 to enter the Santa Monica Mountains. Only one male and one female (P-32 and P-33) have been confirmed leaving, also by crossing highway 101.

With isolation comes inbreeding and a subsequent loss of genetic diversity. At a certain point, low genetic diversity leads to inbreeding depression, whereby populations can no longer survive and reproduce at normal rates. The Park Service has already documented many cases of close inbreeding. For example, the male that managed migrate into the population from the Simi Hills later mated with two of his daughters and a granddaughter, quickly undoing his initial positive genetic contributions. As it stands, the genetic diversity of the Santa Monica Mountains population is among the lowest ever documented for the species. Only the Florida panther (panthers and mountain lions are the same species) population experienced lower genetic diversity, and nearly went extinct as a result.

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Drought Impacts on Santa Rosa Island Surface Water

Volunteer surveying surface water on Santa Rosa Island. Water features were photographed and geotagged as part of the surveys. NPS photo.

Streams and other surface water features are found mostly on Santa Cruz and Santa Rosa Islands within Channel Islands National Park. Although they are not widespread, they nonetheless support a high diversity of plants and animals. For insights into the hydrology of Santa Rosa Island and the impacts of the prolonged drought, park staff and volunteers set out to map visible surface water in September 2014, and again in August 2016.

In 2014, during the driest time of year, mappers hiked more than 325 kilometers in 19 major and seven lesser watersheds, and recorded 1,117 water features. The four watersheds with the greatest length of visible water for their size were then chosen for re-survey in 2016. Three out of the four showed a decrease in surface water between 2014 and 2016. The fourth showed an increase, likely because of an additional section being surveyed and due to the now-measurable effects of the re-routing of a spring into the watershed in 2014. Two watersheds had slight increases in small water features three meters or less in length, possibly related to the shrinking lengths of surface water with less continuity overall. In other words, as the drought wears on, it is measurably reshaping the amount and distribution of valuable surface water on Santa Rosa Island.

Interested in learning more? A poster on the Santa Rosa Island stream surveys is available from rocky_rudolph@nps.gov upon request.

Chaparral Species Responding Differently to Intense Drought

Santa Monica Mountains National Recreation Area landscape, blanketed in chaparral. Chaparral is the most common plant community in southern California. NPS photo.

Understanding how chaparral plants respond to drought is a timely challenge in southern California where chaparral habitat dominates. The implications of different plant responses could be especially far-reaching for land managers given climate change models suggesting that severe droughts will become more frequent in the region as temperatures rise.

The severe drought of 2014 allowed a team of scientists led by Dr. Martin Venturas to study how chaparral species responded, for a glimpse into what the future might hold. Their recently published findings show that species respond differently based factors such as how they reproduce (seeds, resprouting buds, or both), their size and root structure, and what strategies they employ for dealing with dry conditions. For instance, chamise and bigberry manzanita shrubs with larger crowns had higher survival than smaller-crowned plants of the same

species. These species also had relatively high survival overall. They can resprout after fires, maintaining their root systems which can grow larger and deeper than species that must start over from seeds after each fire. Deeper root systems help them stay hydrated, which the study finds is more effective than having dehydration-tolerant tissues but shallower root systems in severe short-term drought scenarios. Species with the highest survival included sugar sumac and mountain mahogany, while greenbark ceanothus had the lowest.

With overall chaparral stand density declining by around 63% during the course of the study, and some species surviving more than others by large margins, the composition and structure of the chaparral communities changed quickly. Other impacts could follow as a result, such as changed soil hydrology and nutrient levels, greater susceptibility to invasive species, and more frequent fires.

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Cabrillo Helps the San Diego Community 'See Life'

Last month Cabrillo National Monument, in association with Artist-in-Residence Michael Ready and a community donation from visitor Miranda Hope, was proud to present a classroom set of images from the ***See Life Collection*** to Monarch School.

A mounted classroom set of 10 *See Life Collection* prints. NPS photo.

The ***See Life Collection*** is a unique project highlighting the stunning and diverse ecosystems and animals that call Cabrillo home. With the collection, Ready masterfully captures the morphology of his subjects while building awareness for the biodiversity of the Southwest. These images include some commonly occurring and easily discovered species, and others that are rarely seen due to their small size, ephemeral existence, or natural behavior. Merging the worlds of science and art, ***See Life*** challenges the community to take a closer look and garner a deeper appreciation for our diverse world.

From these pictures, classroom sets of 10 prints were created and mounted with full descriptions of each organism. The purpose of these sets is to bring the wonders of the natural world to San Diego classrooms and beyond. The first of these sets was donated to 8th grade marine science teacher, Ms. Hartwood of Monarch School. As one of the premier educational institutions supporting homeless youth in San Diego, Cabrillo was honored to partner with Monarch School in this unique endeavor. Additionally, the park looks forward to hosting Ms. Hartwood's class for a tidepool exploration this fall.

The ***See Life Collection*** is a product of the Cabrillo Artist-in-Residence Program. This program provides a platform for participating artisans to inspire and improve their local community and their National Park. The Monument offers beautiful views, powerful messages, and rich history that our artists capture through a variety of media. Stewarding the mission of the National Park Service through their unique voice, artists take visitors down a journey which expands their perspectives, unveils new meaning, and heightens their understanding of our cultural and historical resources.

Check out the ***See Life Collection*** Artist-in-Residence Spotlight video to learn more.

Native STEAM: Exploring the Fusion of Science and Native Culture at Cabrillo

Through activities such as storytelling, nature journaling, tidepool monitoring, and ethnobotany, youth ages 6-15 explored their cultural heritage within and beyond Cabrillo National Monument. NPS photo.

"One morning, as the tide went out, the old people came down to sit and watch by the shore. That was the way it was done in the old days."[1] Strumming his banjo in accompaniment, Park Ranger Tavio del Rio shares the Nootka story of the "Octopus and Raven."

For the students of Native STEAM (Science, Technology, Engineering, Art, and Math), this is how every morning begins. In partnership with Southern Indian Health Council (SIHC), a social service agency that serves youth from seven Kumeyaay reservations in San Diego County, Cabrillo National Monument proudly hosted twelve students throughout the summer. Native STEAM is the first Cabrillo program of its kind and comprises a unique blend of western science and indigenous practices. Through activities such as storytelling, nature journaling, tidepool monitoring, and ethnobotany, youth ages 6-15 explored their cultural heritage within and beyond the park.

VISTA/Americorps member Amy Rouillard spearheaded the idea last spring working with Willow Rouillard of SIHC, and Park Rangers Tavio del Rio and Alex Warneke, to design the full program. Cultural educators Cindy Alvitre and Craig Torres (Gabrielino/Tongva) of the Ti'at Society from Orange County led a hands-on workshop about maritime culture of Southern California Indigenous communities. This included songs, storytelling, learning to use a hand-pump drill, cordage making from agave fiber, and sea grass weaving. Geologist Norrie "Doc" Robbins led a workshop in pigment making and highlighted the geology of the park. Additionally, the youth enjoyed a field trip to the Natural History Museum and Ocean Beach Native Plant Gardens, and a nature scramble in the park canyons led by Cabrillo educator and VISTA/Americorps member Andrew Rosales.

Rouillard added at the conclusion of the summer, " I am really grateful to see Cabrillo staff embrace the program. These kids deserve culturally relevant programming, so to see it happen at a National Park, once a Kumeyaay territory, is really powerful."

Through innovative programs such as Native STEAM, Cabrillo National Monument is committed to connecting with new audiences and providing opportunities to foster the next generation of park stewards. Cabrillo looks to build stronger ties with Native communities and continue the Native STEAM program in the future.

[1] "Octopus and Raven" (Nootka- Pacific Northwest) – *Keepers of the Animals*

Global Kelp Forest Trends? It's Complicated

Kelp forests at Channel Islands National Park are home to over 1,000 species of marine plants and animals. NPS photo.

Kelp forests are incredibly diverse, productive ocean ecosystems. Just within Channel Islands National Park they are home to over 1,000 species of marine plants and animals. A new study by an international team of 37 scientists, including National Park Service marine ecologist David Kushner, is the first to analyze decades of kelp forest data from around the world to paint a comprehensive picture of how they are responding to environmental change.

To the researchers' surprise, they found kelp forests to be faring well globally when compared to other key species like corals and seagrasses. Overall kelp decline was estimated at a rate of 1.8% per year. Regional trends, however, were found to be far more complex. Of the 34 kelp forest ecoregions analyzed, 38% showed clear declines, 35% showed no change, and 27% showed increases in kelp abundance. Such wide regional variation suggests that local factors play an outsized role in kelp forest success, and that global climate change is impacting different regions in different ways. For instance, kelp declines were often associated with warming in combination with other environmental stressors such as fishing of sea urchin predators (leading to overpopulation of sea urchins, which consume kelp), pollution, and invasive species.

The Southern California Bight ecoregion, including the eight Channel Islands, the Santa Barbara Channel, and extending south along the California and Baja California coasts, was among the regions to show small but clear kelp forest growth. Improved sewage treatment leading to better ocean water quality and the subsequent recovery of kelp beds off of the mainland coast may have been among the local drivers of that increase.

A UC Santa Barbara Current article has more study highlights, or dig in to the details of the full publication in the Proceedings of the National Academy of Sciences.

Study Looks at Light Pollution Within Coastal Southern California National Parks

The Milky Way viewed from within Santa Monica Mountains National Park. NPS photo.

Few things compare to the wonder of looking up at a night sky brimming with billions of stars. Starry skies also hold considerable historical and cultural importance for human beings. Moreover, research has shown that dark night skies free of artificial light pollution are crucial for many species and ecosystems. Migrating songbirds, for example, rely on stars for nighttime navigation and may become disoriented by city lights. As a first step towards helping parks manage dark night skies within their boundaries, UCLA researchers and National Park Service scientists examined satellite data between 1992 and 2012 to see how light levels have changed in each of the Mediterranean Coast Network national parks.

In Cabrillo National Monument, the study found a decrease in light pollution within the park, but very high levels of light pollution overall from the surrounding city and naval base. For the darkest night skies, try the park's southern tip. Light pollution remained steady, albeit also very high, in Santa Monica Mountains National Recreation Area. There were increases and decreases at a more local scale, possibly related to different local outdoor lighting policies. The park's western mountains offer the best dark night sky viewing.

Channel Islands National Park had the darkest night skies, and levels of light pollution remained relatively steady during the study period. Even so, the park is not free of "skyglow" from the mainland. Channel Islands supports several globally or nationally important breeding seabird populations, so one potential concern is that other studies have found that even low levels of nighttime lighting may negatively affect seabird reproductive success.

Check out the press release or explore the full report to learn more.

Events & Announcements

Upcoming Cabrillo National Monument Events

- Where have all the Sea Stars Gone? - December 17, 11:30 am – 1 pm
- Whales! Whales! Whales! - January 14, Noon – 1:30 pm

Additional events and event details are available from the Cabrillo National Monument schedule of events.

Upcoming "From Shore to Sea" Lectures

- Finding the Lone Woman's People: The Nicolenos in Los Angeles, Susan Morris - December 8, 7 pm

For further details about these free talks at the the Channel Islands National Park Robert J. Lagomarsino Visitor Center, visit https://www.nps.gov/chis/planyourvisit/from-shore-to-sea.htm.

Upcoming Santa Monica Mountains Events

- Tips for Living in Mountains Lion Country - November 30, 7 – 8:30 pm

Additional events and event details are available from the Santa Monica Mountains National Recreation Area schedule of events.

To submit updates or to subscribe/unsubscribe to future issues, please contact jessica_weinberg@nps.gov.