

Local mountain lion inbreeding grows dire, but relief in sight

New study details biological evidence of inbreeding, which could lead to their local extinction.



This female mountain lion appears to be posing for a trail camera in the western Santa Ana Mountain foothills, in this photo taken Sept. 17, 2021, as part of research by the UC Davis Wildlife Health Center. (Courtesy of UC Davis Wildlife Health Center)

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Plans for wildlife crossings that would expand two key Southern California mountain lion ranges could be coming to fruition in the nick of time to save the animals, also known as cougars, pumas and ghost cats.

A new study details biological evidence that the lions of the Santa Monica and Santa Ana mountain ranges are experiencing inbreeding reactions that could lead to their local extinction. Hemmed in by freeways and urbanization, they're restricted to areas too small to support the genetic diversity needed for survival.

[Scientists in 2019 calculated](#) that those two populations will go extinct within 50 years unless the gene pools broaden, but the new study is the first to show that the consequences of inbreeding have already begun.

[The study](#), published last month in the journal *Theriogenology*, documents abnormal sperm, problems with testicle development, and kinked tails among Southern California cougars. All are symptoms of a level of inbreeding that can affect biological health — including the ability to reproduce.

“It wasn’t surprising exactly — it was what we thought would happen,” said Winston Vickers, a UC Davis researcher who has studied the region’s cougars since 2001 and who contributed to the new study. Leading the research was Audra Huffmeyer, who conducted the work while completing her biology Ph.D studies at UCLA.

But Vickers added that one finding was particularly alarming.

A new study details biological signs of among Southern California mountain lions, which could lead to their local extinction.



Above, a mother mountain lion with three kittens at Irvine Ranch Natural Landmarks in the Santa Ana Mountains. (Courtesy of Irvine Ranch Conservancy)

Last year, National Park Service biologist [Jeff Sikich reported](#) two lions in the Santa Monica Mountains with kinked tails, one of which had only one descended testicle. That was an initial warning that inbreeding may be growing severe. However, physical accidents can also lead to kinked tails and the sample size of a single incidence of testicle abnormality was exceedingly small.

Huffmeyer's study increased the kinked tail count in the greater Los Angeles area to four and added a second incidence of testicle abnormality. More dramatically, all five of the dead lions examined had abnormal sperm.

"The percentage of sperm that was abnormal surprised me," Vickers said. "It's still a low sample size but the fact that all five had it raises the level of alarm. There was an expectation that we would see this, but it was a bit surprising to see it at this stage."

Perilous roads

Every year or so, a Southern California mountain lion tries to escape its confines for broader ranges nearby but gets killed crossing the freeway. In the Santa Monica Mountains, that usually happens on the 101 Freeway between Woodland Hills and Thousand Oaks. In the Santa Ana Mountains, it occurs on the 15 Freeway near Temecula.

Even rarer is a successful crossing, as those who try usually get hit by a vehicle and die.

But in mid October, a year-old female crossed the 15 Freeway from the Santa Ana Mountains at or near Warm Springs Creek in Murrieta. It was the first documented successful crossing to or from those mountains since at least 2016, when genetic testing determined a male in the Santa Anas had crossed from the much larger Eastern Peninsular Range east of the freeway.

The young female had been captured in February by the state Department of Fish and Wildlife after her mother was killed by a car on Antonio Parkway in South Orange County. Dubbed F291 by Vickers' research group, the animal was released with an electronic tracking collar in June, when it was determined to be old enough to survive on its own.

Vickers said it's not clear if F291 crossed over the freeway or under it, but noted that there's an underpass at Warm Springs Creek. Once east of the freeway, she followed the creek bed until reaching a high water area that would have forced her to the edge of the surrounding subdivision if she wanted to continue.



This young female mountain lion was released in the Santa Ana Mountains in June 2021 after a four-month stay with a wildlife center. She'd been found with a sibling alone when their mother was hit by a car and killed near the Tijeras Creek Golf Course in Rancho Santa Margarita. In October 2021, she was tracked as crossing the 15 Freeway in Murrieta and then returning to the Santa Ana Mountains. (Courtesy of San Diego Humane Society)

Instead, she went back to the other side of the freeway and returned to the Santa Ana Mountains. It's the first documented case of a lion successfully crossing the 15 Freeway in both directions — but that's not the only unusual aspect of her trip.

Of the seven previous animals documented to have successfully crossed that freeway, all were males, who are typically more motivated to seek out broader ranges. There are an estimated 16 adult lions in the roughly 600 square acres of Santa Ana Mountains, 11 females and five males. Males are far more territorial than females, typically guarding a home range of more than 100 square miles. They're also more likely to kill each other fighting, and to be hit trying to cross the freeway in search of undisputed territory.

Finally, F291's crossing location was not the path usually pursued by the region's cougars, who are deterred by the amount of urbanization east of the freeway. More common is a stretch beginning six miles to the south, at Temecula Creek — an area currently being studied for multiple possible crossings.

Relief in sight

While few mountain lions try crossing the freeways at the Santa Ana and Santa Monica mountains, plenty appear to consider the possibility.

Vickers has documented mountain lions sitting for hours on the Santa Ana Mountain foothills near the 15 Freeway, as though gazing longingly at the promised land. The Eastern Peninsular Range on the other side is a wildlife area that extends into Mexico.

Similarly, to the north, the Santa Monica Mountains are separated by the 101 Freeway from the Santa Susanna Mountains, which lead to the vast Western Sierra Nevada range. There are an estimated seven adult lions in the 230 square miles of the Santa Monica Mountains, five females and two males.

Plans for a wildlife bridge over the 101 Freeway at Liberty Canyon in Agoura Hills have been underway for more than a decade, with construction expected to begin by February and be completed in late 2024, according to Beth Pratt, regional executive director of the National Wildlife Federation.

The group has raised nearly \$73 million toward its \$85 million goal for the project. So far, there have been 4,500 donors. They include the California Wildlife Conservation Board and the Annenberg Foundation, which each gave \$25 million. The bridge is awaiting final approval from Caltrans and then will be put out to bid.

"I can't wait to cut the ribbon and see the first wild creature to use it," Pratt said.



An artist rendering of the Liberty Canyon wildlife crossing, which will help restore connectivity in the Santa Monica Mountains, enriching the gene pool of the threatened cougars in those mountains. Backers hope to begin construction by February. (Courtesy of National Wildlife Federation/Living Habitats)

Things aren't quite as far along at the prime crossing area for the Santa Ana Mountains on the 15 Freeway, but they're moving in that direction.

At Temecula Creek, there is a broad, undeveloped freeway underpass connecting wildlife areas on either side that mountain lions have approached but rarely, if ever, used. The Nature Conservancy added \$117,000 to a \$400,000 grant from the Wildlife Conservation Board for detailed plans to make the underpass more attractive to the animals. Those plans are expected to be completed by fall 2023, with construction beginning the following year at a cost of \$500,000 to \$1 million, according to The Nature Conservancy's Trish Smith.

Meanwhile, Caltrans is completing a fencing project south of that underpass to prevent the lions from the usually fatal attempts at crossing the freeway — and which is also hoped to guide them toward the underpass.

Additionally, Caltrans has received a \$1.3 million Wildlife Conservation Board grant to study a possible wildlife bridge two miles south of Temecula Creek as well as a second underpass, with that study to be completed by March 31, 2025, according to Caltrans' Scott Quinnell.

Cal Poly Pomona engineering faculty and students were recruited by Vickers to develop the [conceptual plans](#) now being fleshed out by Caltrans and The Nature Conservancy.

In addition to Caltrans and the conservation board, the lions have found a Sacramento friend in the Fish and Game Commission, which last year granted the animals temporary protective status in six geographic areas, including the Santa Ana, Santa Monica, San Gabriel and San Bernardino mountains.

The state is in the home stretch of a study to determine if that temporary status should be made permanent, with that work to be completed in the spring.

"There's been this steady dawning of awareness of the possibility of local extinction," Vickers said. "They can travel such long distances, and they would strike one as the least likely to be trapped. But by golly, that's what we've done with our freeways and development."

But the growing momentum for wildlife crossings is "definitely cause for optimism," he added.

Still not enough?

Nonetheless, a 2020 study raises the question of whether wildlife crossings on the 15 Freeway will ultimately provide enough real estate for mountain lions — even by connecting the Santa Ana Mountains to the Eastern Peninsular Range.

Of the five male lions with abnormal sperm, one was from the Eastern Peninsular Range. That could be coincidence, as North American cougars are already more likely to have abnormal sperm than their South American counterparts. Or it could be because that male came from the Santa Ana Mountains, carrying the inbred genetics across the freeway. Genetic testing will help determine if that's the case.

Finally, there already could be enough inbreeding east of the 15 Freeway to cause sperm abnormalities.

The 2020 study, led by state Fish and Wildlife biologist Justin Dellinger, suggests that the mountain lions ultimately need at least 10,000 square kilometers of range — 3,900 square miles — to survive in the long run. The greater Santa Ana Mountains are nearly 800 square miles, according to Dellinger. The Eastern Peninsular Range, which includes the San Jacinto and Palomar mountains, are nearly 3,000 square miles.

That would leave the two combined areas, known simply as the Peninsular Range, short of Dellinger's estimated need — particularly when considering that not all that habitat is protected or necessarily accessed by the lions currently.

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Also falling short of the mark would be the combined San Gabriel and San Bernardino mountains, a 1,450-square-mile area known as the Transverse Range.

If the Transverse Range and the Peninsular Range are combined, there would be 5,250 square miles of total habitat, which would meet Dellinger's minimum. But simply connecting those ranges might not be enough: If you count only the currently protected habitat, it comes to 3,500 square miles — leaving the need for an additional 400 square miles of protected areas.

If the ranges are granted long-term protective status, it could help put more land off limits to development. Additionally, work is underway for additional wildlife corridors.

The Nature Conservancy is working with others, including Caltrans, to connect those two ranges. In April, the groups held a workshop on linking the two areas and a report on that idea is due to come out soon, according to The Nature Conservancy's Trish Smith.

"Linkages and wildlife crossings in the greater I-10 area are important to connecting the Transverse Range to the Peninsular Range, especially for mountain lions," Smith said.

"Lots of challenges there to securing connectivity, but we are starting to work on resolving those issues."

This story was updated Nov. 11 to use Dellinger's overall habitat estimates for the mountain ranges mentioned, along with the caveat that not all of that area is protected or necessarily used by mountain lions.
