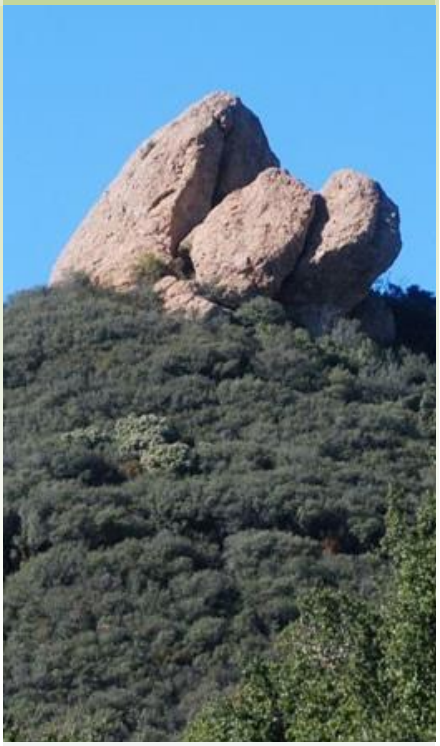
2020 Annual Report

UCLA La Kretz Center for California Conservation Science



The year in review

2020. A year like no other. Here at the La Kretz Center, covid-induced changes in how we work put some things on hold, while others kept moving forward. For the first time in a decade we cancelled both the La Kretz Public Lecture and our Conservation Genomics Workshop, opting for a breather rather than virtual meetings. Seminars, lab, and field work slowed as we recalibrated our strategies for continuing to work.

Other aspects of our work progressed and even flourished. Our last in-person meetings were the La Kretz Postdoc candidate interviews, and Dr. Dave Daversa was offered, and accepted, our 2020 postdoc fellowship. Postdocs Joscha Beninde and Erin Toffelmier continued to lead our LA Genomics project, and moved from the fieldwork to genomics lab work to determine the movement patterns of 20 species of plants and animals across LA's sprawling urban matrix. We officially launched the California Conservation Genomics Project (CCGP), our $12,000,000 analysis of plant and animal biodiversity and how to protect it in the face of climate change and other stressors. With this infusion of state funding, we now support over 100 investigators from across the University of California's 10 campus system, analyzing 230 species of plants and animals spanning the state. We renovated UCLA lab space, hired a new technician (Dan Oliveira), associate director (Erin Toffelmier), project manager (Courtney Miller), and genome informatician (Merly Escalona). CCGP is very much launched.

It remains to be seen how 2021 will play out, for all of us. If you'd like to talk about conservation in our state, including how you can help, please give me a call or shoot me an email. I love to talk!

Stay safe and be well.

Brad Shaffer, Director

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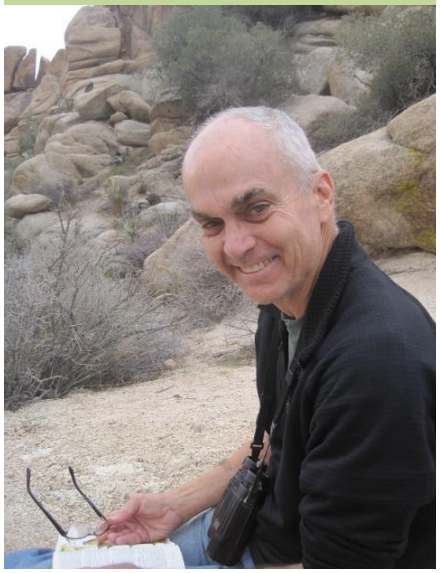
The La Kretz Center is made possible by a generous endowment by UCLA alumnus and philanthropist Morton La Kretz

Director's Initiative



California Conservation Genomics Project

Progress to date: In January 2020, we issued a call for proposals from University of California researchers wishing to contribute to the California Conservation Genomics Project (CCGP), officially launching this major La Kretz Center initiative. After extensive internal and external review, initial funding decisions were announced in early May. Details of projects funded to-date can be found on the newly revised CCGP website.

Our first CCGP workshop took place over two days in July 2020, when over 100 principal investigators and their collaborators convened online. During and after the workshop, several key staff positions were identified and filled.

Next Steps: Our first goal is to produce gold-standard reference genomes that serve as the genetic foundations for CCGP research, and will be made publicly available immediately upon completion. Then comes the fun part—150 genomes for each of 130 sets of species to identify populations with the greatest climate resilience in the future. Stay tuned!

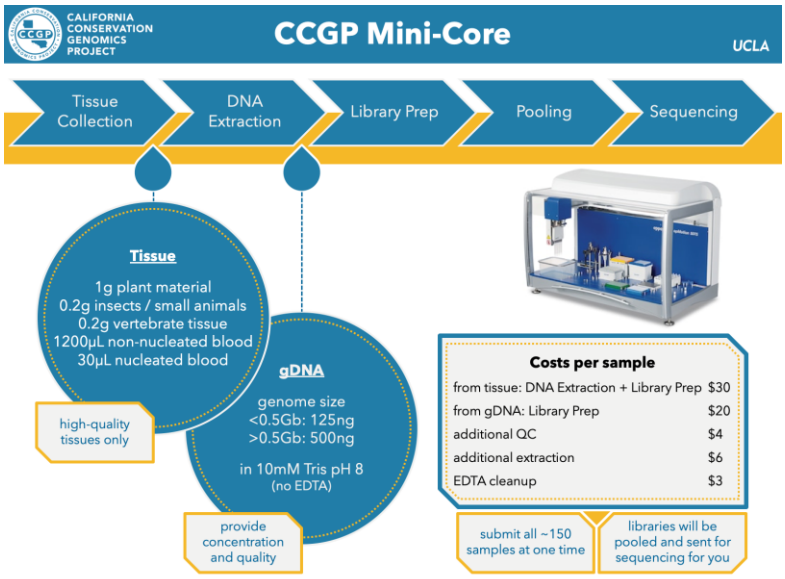
CCGP will provide genomic resources for conservation and resource managers, as well as the broader scientific community.

New conservation strategy for our state's endangered desert tortoise

A new study, published in *Science* by La Kretz Center director Brad Shaffer and UCLA postdoc Peter Scott, shows that animals with more genetic variation are more likely to survive translocation to a new home.

"It flies in the face of what we know from other translocation studies, but lots of genetic variation was hands-down the best predictor of whether a tortoise lived or died," said Shaffer, a professor in Ecology and Evolutionary Biology and director of the UCLA La Kretz Center for California Conservation Science. "Relocating endangered plants and animals is increasingly necessary to counteract the effects of climate change, and this gives us a new tool to increase survival rates."

Mini-core facility established on UCLA campus to support the CCGP



Based on extensive input from the CCGP community of over 100 scientists, we established a new core facility to provide molecular benchwork services to all funded projects. A state of the art liquid handling robot and dedicated technician (welcome Dan Oliveira) are housed at UCLA to ensure that high quality data are delivered efficiently to all researchers regardless of their molecular expertise. Our goal is to expedite the molecular biology, so that our investigators can spend time on critical ecological and conservation research.

Rachel Blakey studies effects of wildfire on mountain lion movement and behavior

Rachel Blakey's La Kretz postdoctoral research addresses a key conservation concern: how do top carnivores respond to the wildfires that are increasing in severity and extent in the world's fire-prone regions? As a La Kretz postdoc, she is working collaboratively with Seth Riley and Jeff Sikich, both wildlife biologists with National Park Service, and Dan Blumstein, professor in Ecology and Evolutionary Biology and the IoES at UCLA. Rachel's project leverages 20 years of movement ecology data collected by Seth and Jeff, and Dan's expertise at the interface of animal behavior and conservation, to ask how mountain lions at local (Santa Monica Mountains) and statewide (California) scales deal with fire. The project also includes statewide Californian mountain lion biologists and NASA remote sensing scientists as collaborators.

Rachel's initial results show that urban mountain lions respond to large wildfire by taking more risks and that risk-taking is greater for subadults, with important conservation implications for populations already challenged by the barriers and threats of urbanization. Part of this work has already resulted in a paper examining the importance of the size of urban centers on conserving urban biodiversity (see Uchida et al., *Trends in Ecology and Evolution*).

Rachel has also entered into collaborations with disease ecologists on a project highlighting cross-scale insights from ecology and evolution into the COVID-19 pandemic (there's a paper under review in *Trends in Microbiology*), and with fellow La Kretz postdocs Joscha Beninde (as co-editors of a special issue of *Frontiers in Conservation Science*) and Dave Daversa in weekly reading group meetings. Add to that her ongoing work with our Ph.D., Masters, undergraduates, and local high school students investigating the global effects of human weekend recreation on mammal movement behavior, and it's been a full, productive year. Finally, Rachel has put her hands on two adult mountain lions (safely, with her NPS collaborators) and participated in the "summer of kittens", a record breaking period when 13 lion kittens were found in 5 dens from tracked females in the Santa Monica Mountains and Simi Hills.

Research Projects

Joscha Beninde

La Kretz postdoctoral researcher Joscha Beninde is leading two projects, one exploring the role of connectivity for the Los Angeles Genomics project (LAG), and the other a collaborative meta-analysis of California population genetics (CaliPopGen) to quantify all pre-existing research on California landscape genetics and what it tells us about conservation.

For LAG, his main project, almost 10,000 samples of 20 species of plants, butterflies and vertebrates have been assembled from the LA basin and its surrounding wildlands. More than 5,000 of these are now having their DNA sequenced at UCLA. The goal is to map patterns of genetic diversity and perform connectivity analyses across LA to identify spatially explicit strategies to maintain and increase native species across our city and manage their long-term persistence. LAG is a collaborative project with the UCLA Sustainable LA Grand Challenge initiative.

CaliPopGen expands the scale of Joscha's work to the State of California. Along with a team of nine UCLA undergraduate researchers, postdoctoral research fellow Erin Toffelmier and faculty lead Brad Shaffer, Joscha is compiling a database of genetic data for roughly 500 species of plants, animals, and marine organisms published over the last 40 years. Synthesizing and reanalyzing these data will allow the team to evaluate and compare the roles of California topography, land cover and land use in shaping connectivity, isolation, and regional genetic diversity across species and ecosystems.

2020 fellowship awarded to Dave Daversa

La Kretz postdoc Dave Daversa is interested in optimizing landscape connectivity for endangered species threatened by disease. In collaboration with the National Park Service, he will work on the interacting effects of movement ecology and infection risk in endangered Yosemite toads, with the goal of developing data-driven re-introduction strategies to strengthen vulnerable populations in the park.

Dave received his PhD in 2016 from the University of Cambridge (UK) followed by a postdoc at the University of Liverpool Institute for Integrative Biology, where he worked on quantifying host species contributions to pathogen transmission in multihost communities. His La Kretz postdoc is co-funded by the National Park Service.

Visit Dave's website at https://www.davedaversa.com/

Our postdocs collaborate with government and non-government partners to produce cutting edge research that facilitates conservation policy outcomes

Where are they now?

Eric Abelson (2013-2015) is a research scientist at University of Texas, Austin

Elizabeth Long (2014-2015) is director of conservation science at Mohonk Preserve, New York

John Benson (2014-2016) is an assistant professor at the University of Nebraska School of Natural Resources

Alexandria Pivovaroff (2015-2017) is a postdoc at Pacific Northwest National Lab

Gary Bucciarelli (2015-2017) is an adjunct assistant professor at UCLA

Jesse Grismer (2016-2018) is an assistant professor at La Sierra University

Justin Valliere (2016-2018) is an assistant professor at CSU Dominguez Hills

Luke Browne (2017-2019) is a postdoctoral associate at Yale University

Postdoc update: John Benson, Assistant Professor, University of Nebraska

John was a La Kretz postdoc from 2014-2016, when he worked with Seth Riley to statistically model mountain lion populations and their current and future trajectory in the Santa Monica Mountains. We checked in with John recently to see what he's up to. Here's what he reported:

My research projects tend to study interactions between behavior, genetics, and population dynamics of threatened wildlife populations. I've continued to work on mountain lions in the Los Angeles area in collaboration with the National Park Service on projects that grew out of my time as postdoctoral fellow with the La Kretz Center. We are particularly interested in the small, inbred lion population in the Santa Monica Mountains, and how to best manage its long-term survival.

I am also continuing my work on the conservation of federally and provincially threatened eastern wolves in collaboration with the Ontario (Canada) Ministry of Natural Resources. Closer to home, I am working locally with the Nebraska Game and Parks Commission studying a small, at-risk population of bighorn sheep in Western Nebraska and several populations of Nebraska mule deer to understand why some populations appear to be struggling. A very new direction in my research will involve conservation of a full-carnivore guild reintroduction project in Mozambique. My goal is always to conduct rigorous, impactful science that provides managers with information and solutions that will aid them in conserving wildlife populations, while also contributing to basic ecology. These goals align really well with those of the La Kretz Center, which helped me complete both short and longer-term research projects that are at the center of my work.

La Kretz Center and Stunt Ranch award conservation grants to UCLA grad students

Awards totaling $28,000 will help students conduct research in the Santa Monica Mountains and throughout Southern California marine and terrestrial ecosystems

Congratulations to:

Wilmer Amaya-Mejia, Ecology and Evolutionary Biology: *Urbanization effects on the disease dynamics of haemosprodian infections in dark-eyed juncos (Junco hyemalis)*

Ioana Anghel, Ecology and Evolutionary Biology: *Evolution of floral scent variation in Linanthus*

Elijah Catalan, Institute of Environment and Sustainability: *Monitoring of artificial reef restoration in Palos Verdes using eDNA*

Joey Curti, Ecology and Evolutionary Biology: *Assessing Barriers to California Quail (Callipepla californica) Gene Flow in the Santa Monica Mountains*

Chloe Nouzille, Ecology and Evolutionary Biology: *Wildlife Post-Woolsey Fire: Recovery and Recolonization*

Tanner Waters, Institute of the Environment and Sustainability*: Using Environmental DNA to Assess the Community Composition of Eelgrass Meadows in Santa Monica Bay and Catalina Island*

Maddie Zuercher, Ecology and Evolutionary Biology: *Investigating ringtail ecology and behavior in the Santa Monica Mountains*

Our student research projects draw on local resources to answer basic and applied conservation questions

Each academic year, the La Kretz Center partners with the UCLA Stunt Ranch Reserve to fund outstanding graduate student projects, and to help UCLA PhD students complete their conservation science research. The research projects that we support address important issues in basic environmental science and simultaneously fulfill our mission of working to preserve California's biological and ecological diversity.

Given the limitations imposed by Covid-19, this year in our call for proposals we emphasized local projects that could be conducted safely and still produce meaningful results. We encouraged students to consider designing and implementing field-based projects that could be completed at Stunt Ranch Reserve and/or within the surrounding Santa Monica Mountains National Park.

We were thrilled with the results, and funded seven diverse students to help them accomplish their Ph.D. research objectives. These projects, which range from measuring the chemical composition of floral scents of desert annual plants, to the efficacy of artificial reefs installed off the Palos Verde peninsula, to collecting ecological data on the incredibly cryptic ringtail "cat" (it's really related to raccoons), capture the spirit of the La Kretz program—curiosity-driven science with strong conservation outcomes.

In collaboration with Stunt Ranch, the La Kretz Center develops rebuilding plans

After the loss of our main Field Station building in the Woolsey Fire, the La Kretz Center is studying the feasibility of moving its field operations to another location in the Santa Monica Mountains.

In collaboration with our partners at Stunt Ranch Reserve, we are in the advanced planning stages to repurpose our existing facilities at Stunt to fully accommodate La Kretz workshops, classes and researchers.

Our vision is to carve dorm, kitchen, meeting and teaching space out of our existing buildings, upgrade restrooms, and install stand-alone modular units for faculty lodging.

The La Kretz rebuild at Stunt will result in greater synergy between the two programs, and the joint endeavor will provide more opportunities for conservation research and education in the Santa Monicas. We are still in the permitting stage, but moving forward.

The La Kretz rebuild at Stunt Ranch will result in greater synergy between the two programs, and provide more opportunities for conservation research in the Santa Monicas

La Kretz Center hosts California quail researcher at Rocky Oaks

The La Kretz Center hosted Dr. Pedro Chavarria of Arizona State University for two weeks during the summer of 2020 at our annex building in Rocky Oaks park. Dr. Chavarria is collaborating with UCLA grad student Joey Curti (pictured at right) on a project to assess the impacts of roadways and urbanization on the genetic health of California quail *(Callipepla californica*) populations in Southern California (see Joey's funded grant, on page 5).

The La Kretz Center building at Rocky Oaks was also utilized during the pandemic by the National Park Service as housing for essential workers, from law enforcement rangers to wildlife interns.

Featured project: Assessing barriers to California quail gene flow in the Santa Monica Mountains

Imbedded within the urban matrix of LA, the Santa Monica Mountains provide a natural laboratory to understand the impacts of human development and disturbance on the ecology of wild populations. While a great deal of empirical research has been done to understand the impact of roadways on animal movement and gene flow of large mammals such as mountain lions, no research exists to evaluate the impact of roadways on smaller, often-overlooked species.

Joey Curti, a second-year PhD student in the Wayne Lab at UCLA, is using high throughput sequencing to understand how California quail populations are affected by the presence of roadways to inform conservation actions such as the Liberty Canyon Wildlife Crossing Project. Although one might think that birds like quail are unaffected by roads (they can fly, right?), subtle barriers to movement often show up, even in birds and flying insects. Joey's work will be an important contribution to our understanding of how roads and urbanization affect the movement ecology of these less studied species.

Joey's project is supported in part by the La Kretz Center through its graduate grants program, and we were pleased to host one of his collaborators at our annex building at Rocky Oaks during the summer of 2020.

Stunt Ranch year in review

With access to Stunt limited from April through the rest of the year, the Reserve was definitely quieter than usual. No children hiked in awe with our local Cold Creek Docents and a relatively small percentage of researchers were eventually able to make it to the Reserve. However, during a time when the outdoors became so valuable and critical for our well-being, dozens of students and researchers were able to explore the Santa Monica Mountains by accessing the Reserve. For some, it was their first time hiking along the Cold Creek watershed or visiting this part of the Santa Monica Mountains. Reserves can offer a lot, from a site to collect meaningful weather data that helps us understand how climate is changing to a place to carry out experiments on the biological effects of drought. But this year, it was primarily a place for visitors to be reminded of how crucial protected green spaces are in everyday life.

Research program

The role of Stunt in research, education, and outreach for UC students and the broader community remained relatively strong throughout 2020. Graduate students were able to film MFA projects at Stunt and capture some incredible footage that showcases the talent of our community and the stunning landscapes at Stunt. Long-term climate and fire ecology projects - including research that was started by former La Kretz postdoc Alexandria Pivovaroff - pushed forward and students, engineers, and IT were busy throughout the year ensuring data collection was never compromised. Local ecologists were able to perform numerous remote projects, including monitoring for small native mammals using camera and footprint traps. Behavioral ecologists visited to study native pollinators and learn about the ways bumble bees search for nests. And botanists sought out sensitive ferns in the Cold Creek Watershed to understand the way plants are dealing with climate change. Thanks to the California Conservation Genomics Project, we also saw an influx of molecular ecologists looking to use Stunt as a southern California sampling site for their projects. Graduate students and researchers from several UC campuses made multiple trips to Stunt this past year to find key species to help determine the genetic health of California species.

Gary Bucciarelli

Gary Bucciarelli is the director of research at the Stunt Ranch Reserve, and an assistant adjunct professor at UCLA.

Gary's research program is based in the Santa Monica Mountains and the Cold Creek watershed that runs through the Reserve. He is also collaborating with the National Park Service to optimize a long-term management plan for amphibians in the Santa Monicas.

Established as a reserve site of the UC Natural Reserve System in 1995, Stunt Ranch Reserve has been partnering with the La Kretz Center since 2015. The Reserve is a 310-acre biological field station located in the Santa Monica Mountains and is composed of chaparral, coast live oak woodland, riparian, and annual grassland habitats. Less than an hour drive from UCLA, the Reserve offers a unique research opportunity for university-level teaching, research, and public service. For more information about Stunt, please contact Gary Bucciarelli (research director) or Brad Shaffer (director).

State of Fire

In the aftermath of the 2018 Woolsey Fire, La Kretz Center director Brad Shaffer saw a remarkable opportunity for undergraduates to conduct hands-on research. In collaboration with researchers from the NPS and USGS, our team trained student scientists, including 64 from UCLA, to take monthly observations of 340 one-meter-square study plots to determine how differing levels of fire severity affected plant recovery. The study examined how small oases of less-severely burned areas influence the return of plant and animal life. Almost two years later, the team is busily compiling the student's Woolsey fire 's impact on plants. And like always, the picture is mixed. On one hand, there are signs of recovery, as "dead" ashen terrain has recovered with weedy plant regrowth. At the same time, wildfires have also returned with punishing force, sometimes outpacing recovery.

Read the full story on UCLA News

We aim to raise the visibility and impact of California conservation science through our public outreach programs

Artificial pond construction for spadefoot breeding habitat in Orange County

These tiny three-inch "toads" (they aren't really toads) were once found throughout California in seasonal ponds. Today these native amphibians are limited to only a few sites due to habitat loss and urban development. The La Kretz Center partnered with the Natural Communities Coalition to create a series of artificial ponds to increase spadefoot breeding in Orange County. And it worked, with successful breeding our first year!

La Kretz Center joins effort to rescue endangered pond turtle

A team of biologists — including members from the U.S. Geological Survey, California Department of Fish and Wildlife, U.S. Forest Service, University of California, Los Angeles, Endemic Environmental Services Inc., Citrus College and San Diego Zoo Global — worked together recently to find and rescue the last remaining viable population of southwestern pond turtles in the San Gabriel Mountains, and one of the last in LA County.

"This is not the first such effort, and almost certainly will not be the last," said Brad Shaffer, UCLA distinguished professor and director of the La Kretz Center for California Conservation Science. "These turtles will also be part of a range-wide genomic analysis of variation across the species that we are conducting with our state and federal partners to better understand and conserve this critical population, which is the last known for the species in the San Gabriel River watershed."

Read the story in the Times of San Diego

Selected Publications

1. Blakey, R. V., Siegel, R. B., Webb, E. B., Dillingham, C. P., Johnson, M., & Kesler, D. C. 2020. Northern Goshawk (*Accipiter gentilis*) Home Ranges, Movements, and Forays Revealed by GPS-Tracking. *Journal of Raptor Research*, 54(4):388-401
2. Blakey, Rachel V., Rodney B. Siegel, Elisabeth B. Webb, Colin P. Dillingham, Matthew Johnson, and Dylan C. Kesler. 2020. Multi-scale habitat selection by Northern Goshawks (*Accipiter gentilis*) in a fire-prone forest. *Biological Conservation* 241:108348
3. Hwang, Wen-Han, Rachel V. Blakey, and Jakub Stoklosa. 2020. Right-Censored Mixed Poisson Count Models with Detection Times. *Journal of Agricultural, Biological and Environmental Statistics* 25(1):112-132
4. Kimmig, Sophia E., Joscha Beninde, Miriam Brandt, Anna Schleimer, Stephanie Kramer-Schadt, Heribert Hofer, Konstantin Börner et al. 2020. Beyond the landscape: Resistance modelling infers physical and behavioural gene flow barriers to a mobile carnivore across a metropolitan area. *Molecular ecology* 29(3):466-484
5. McLaughlin, Blair C., Rachel Blakey, Andrew P. Weitz, Xue Feng, Brittni J. Brown, David D. Ackerly, Todd E. Dawson, and Sally E. Thompson. 2020. Weather underground: Subsurface hydrologic processes mediate tree vulnerability to extreme climatic drought. *Global change biology* 26(5):3091-3107
6. Nicholson, E. G., S. Manzo, Z. Devereux, T. P. Morgan, R. N. Fisher, C. Brown, R. Dagit, P. A. Scott, and H. B. Shaffer. 2020. Historical museum collections and contemporary population studies implicate roads and introduced predatory bullfrogs in the decline of western pond turtles. *PeerJ* 8:e9248 DOI 10.7717/peerj.9248 (pages 1-23)
7. Scott, P. A., L. J. Allison, K. J. Field, R. C. Averill-Murray, and H. B. Shaffer. 2020. Individual heterozygosity predicts translocation success in threatened desert tortoises. *Science* 370:1086-1089
8. Stanford, C. B. (with 51 total coauthors). 2020. Turtles and tortoises are in trouble. *Current Biology* 30:R721-735
9. Thomson, R. C., P. Q. Phillip Spinks, and H. B. Shaffer. A global phylogeny of turtles reveals a burst of climate-associated diversification on continental margins. *Proceedings of the National Academy of Sciences*, in press
10. Uchida, K., Blakey, R. V., Burger, J. R., Cooper, D. S., Niesner, C. A., & Blumstein, D. T. 2020. Opinion: Urban Biodiversity and the Importance of Scale. *Trends in Ecology & Evolution* Volume 36(2):123-131

Highlighted paper


Historical museum collections and contemporary population studies implicate roads and introduced predatory bullfrogs in the decline of western pond turtles

ABSTRACT

The western pond turtle (WPT), recently separated into two paripatrically distributed species (*Emys pallida* and *Emys marmorata*), is experiencing significant reductions in its range and population size. In addition to habitat loss, two potential causes of decline are female-biased road mortality and high juvenile mortality from non-native predatory bullfrogs (*Rana catesbeiana*). However, quantitative analyses of these threats have never been conducted for either species of WPT. We used a combination of historical museum samples and published and unpublished field studies shared with us through personal communications with WPT field researchers (B. Shaffer, P. Scott, R. Fisher, C. Brown, R. Dagit, L. Patterson, T. Engstrom, 2019, personal communications) to quantify the effect of roads and bullfrogs on WPT populations along the west coast of the United States. Both species of WPT shift toward increasingly male-biased museum collections over the last century, a trend consistent with increasing, female-biased road mortality. Recent WPT population studies revealed that road density and proximity were significantly associated with increasingly male-biased sex ratios, further suggesting female biased road mortality. The mean body size of museum collections of *E. marmorata*, but not *E. pallida*, has increased over the last 100 years, consistent with reduced recruitment and aging populations that could be driven by invasive predators. Contemporary WPT population sites that co-occur with bullfrogs had significantly greater average body sizes than population sites without bullfrogs, suggesting strong bullfrog predation on small WPT hatchlings and juveniles. Overall, our findings indicate that both species of WPT face demographic challenges which would have been difficult to document without the use of both historical data from natural history collections and contemporary demographic field data. Although correlational, our analyses suggest that

OPEN ACCESS

In a new paper published in the open access journal *PeerJ*, IoES senior practicum students highlight deadly trends which threaten population stability of California's only native turtles, the two species of Western Pond Turtle. Both species are under consideration for federal protection .

The students used a combination of historical museum samples (they measured every turtle in the major museum collections across northern and southern California), and published and unpublished field studies to quantify the effect of roads and non-native predatory bullfrogs on turtle populations across their range.

The project was supported by grants from the U.S. Fish and Wildlife Service (USFWS), the UCLA Institute of Environment and Sustainability, UCLA La Kretz Center for California Conservation Science, the Madelyn and Bruce Glickfeld Award, and the UCLA Center for the Advancement of Teaching. It was led by Brad Shaffer and UCLA postdoc Peter Scott, with input from Cat Darst, USFWS Ventura Field Office.

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Our partners

We are affiliated with a diverse network of UCLA faculty, postdocs and students, and we work closely with our partners, including the U.S. National Park Service, the Museum of Natural History of Los Angeles County, The Nature Conservancy, the U.S. Geological Survey, the U.S. Fish and Wildlife Service, the California Department of Fish and Wildlife, the U.S. Bureau of Land Management, California State Parks, and the Natural Communities Coalition. Our collective goal is to protect and restore California's biodiversity, in ecosystems ranging from urban LA landscapes to pristine national parks.