


<div style="text-align: center;">  <b>SCIENTIFIC RESEARCH AND COLLECTING PERMIT</b>          Grants permission in accordance with the attached          general and special conditions  <b>United States Department of the Interior National Park Service</b>  <b>Death Valley</b> </div>	<b>Study#:</b> DEVA-00437 <b>Permit#:</b> DEVA-2015-SCI-0040 <b>Start Date:</b> Nov 02, 2015 <b>Expiration Date:</b> Dec 31, 2018 <b>Coop Agreement#:</b> <b>Optional Park Code:</b>
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<b>Name of institution represented:</b> University of California, Berkeley																																																		
<b>Co-Investigators:</b> <table border="0" style="width: 100%;"> <tr> <td><b>Name:</b> Barry R. Sinervo</td> <td><b>Phone:</b> 831-459-3425</td> <td><b>Email:</b> lizardrps@gmail.com</td> </tr> <tr> <td><b>Name:</b> Blair O. Wolf</td> <td><b>Phone:</b> 505-277-4122</td> <td><b>Email:</b> wolf@unm.edu</td> </tr> <tr> <td><b>Name:</b> Carla Cicero</td> <td><b>Phone:</b> 510-642-7868</td> <td><b>Email:</b> ccicero@berkeley.edu</td> </tr> <tr> <td><b>Name:</b> Carol L. Spencer</td> <td><b>Phone:</b> 510-643-5778</td> <td><b>Email:</b> atrox@berkeley.edu</td> </tr> <tr> <td><b>Name:</b> Christopher J. Conroy</td> <td><b>Phone:</b> 510-643-7709</td> <td><b>Email:</b> ondatra@berkeley.edu</td> </tr> <tr> <td><b>Name:</b> James L. Patton</td> <td><b>Phone:</b> 510-643-7712</td> <td><b>Email:</b> patton@berkeley.edu</td> </tr> <tr> <td><b>Name:</b> Jimmy A. McGuire</td> <td><b>Phone:</b> 510-316-6201</td> <td><b>Email:</b> mcguirej@berkeley.edu</td> </tr> <tr> <td><b>Name:</b> Lori Hargrove</td> <td><b>Phone:</b> 619-255-0248</td> <td><b>Email:</b> lhargrove@sdnhm.org</td> </tr> <tr> <td><b>Name:</b> Michael W. Nachman</td> <td><b>Phone:</b> 510-642-1792</td> <td><b>Email:</b> mnachman@berkeley.edu</td> </tr> <tr> <td><b>Name:</b> Michelle Koo</td> <td><b>Phone:</b> 510-642-8547</td> <td><b>Email:</b> mkoo@berkeley.edu</td> </tr> <tr> <td><b>Name:</b> Philip Unitt</td> <td><b>Phone:</b> 619-255-0235</td> <td><b>Email:</b> punitt@sdnhm.org</td> </tr> <tr> <td><b>Name:</b> Rauri C. K. Bowie</td> <td><b>Phone:</b> 510-643-1617</td> <td><b>Email:</b> bowie@berkeley.edu</td> </tr> <tr> <td><b>Name:</b> Raymond M. Sauvajot</td> <td><b>Phone:</b> 202-208-3884</td> <td><b>Email:</b> ray_sauvajot@nps.gov</td> </tr> <tr> <td><b>Name:</b> Scott Tremor</td> <td><b>Phone:</b> 619-255-0209</td> <td><b>Email:</b> stremor@sdnhm.org</td> </tr> <tr> <td><b>Name:</b> Theodore Papenfuss</td> <td><b>Phone:</b> 510-643-7706</td> <td><b>Email:</b> asiaherp@berkeley.edu</td> </tr> <tr> <td><b>Name:</b> Tierne M. Nickel</td> <td><b>Phone:</b> 617-905-5943</td> <td><b>Email:</b> tmnickel@berkeley.edu</td> </tr> </table>			<b>Name:</b> Barry R. Sinervo	<b>Phone:</b> 831-459-3425	<b>Email:</b> lizardrps@gmail.com	<b>Name:</b> Blair O. Wolf	<b>Phone:</b> 505-277-4122	<b>Email:</b> wolf@unm.edu	<b>Name:</b> Carla Cicero	<b>Phone:</b> 510-642-7868	<b>Email:</b> ccicero@berkeley.edu	<b>Name:</b> Carol L. Spencer	<b>Phone:</b> 510-643-5778	<b>Email:</b> atrox@berkeley.edu	<b>Name:</b> Christopher J. Conroy	<b>Phone:</b> 510-643-7709	<b>Email:</b> ondatra@berkeley.edu	<b>Name:</b> James L. Patton	<b>Phone:</b> 510-643-7712	<b>Email:</b> patton@berkeley.edu	<b>Name:</b> Jimmy A. McGuire	<b>Phone:</b> 510-316-6201	<b>Email:</b> mcguirej@berkeley.edu	<b>Name:</b> Lori Hargrove	<b>Phone:</b> 619-255-0248	<b>Email:</b> lhargrove@sdnhm.org	<b>Name:</b> Michael W. Nachman	<b>Phone:</b> 510-642-1792	<b>Email:</b> mnachman@berkeley.edu	<b>Name:</b> Michelle Koo	<b>Phone:</b> 510-642-8547	<b>Email:</b> mkoo@berkeley.edu	<b>Name:</b> Philip Unitt	<b>Phone:</b> 619-255-0235	<b>Email:</b> punitt@sdnhm.org	<b>Name:</b> Rauri C. K. Bowie	<b>Phone:</b> 510-643-1617	<b>Email:</b> bowie@berkeley.edu	<b>Name:</b> Raymond M. Sauvajot	<b>Phone:</b> 202-208-3884	<b>Email:</b> ray_sauvajot@nps.gov	<b>Name:</b> Scott Tremor	<b>Phone:</b> 619-255-0209	<b>Email:</b> stremor@sdnhm.org	<b>Name:</b> Theodore Papenfuss	<b>Phone:</b> 510-643-7706	<b>Email:</b> asiaherp@berkeley.edu	<b>Name:</b> Tierne M. Nickel	<b>Phone:</b> 617-905-5943	<b>Email:</b> tmnickel@berkeley.edu
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<b>Study Title:</b> Responses of Terrestrial Vertebrates to Rapid Recent Climate Change																																																		
<b>Purpose of study:</b> <p>The purpose of this study is to advance understanding of faunal responses in a climate-change hotspot (California deserts: Sonoran, Mojave, and Great Basin) by using a unique historical resource (Grinnell-era surveys from the early 1900s) to examine both local colonization and extinction (turnover) for ~150 species of terrestrial vertebrates over the past century. We address three interrelated questions in a harsh environment that has already experienced strong warming and drying, and is forecast to become hotter and drier: (1) To what degree are differences in site-level turnover among species driven by physiological limitations, climatic variation, habitat change, species interactions, and species traits?; (2) Has recent warming resulted in individualistic or community shifts in species composition?; and (3) Have phenotypes and niches responded to climate change, and do responses differ between species with shifted or static ranges? Answering these three key questions in an integrated study for multiple taxa with robust samples will transform our understanding of ecological responses to climate change.</p> <p>We propose to resurvey birds, mammals, reptiles, and amphibians at sites in California deserts and adjacent sky islands that were originally surveyed prior to 20th century climate change by Joseph Grinnell and colleagues at the University of California, Berkeley's Museum of Vertebrate Zoology from 1904 to 1945. These include ~70–80 sites in Death Valley (DEVA) and Joshua Tree (JOTR) National Parks and Mojave National Preserve (MOJA). These resurveys will complement ~50 sites along elevational transects in the San Jacinto and White/Inyo mountains and on the eastern side of the Sierras that we have already surveyed. Grinnell et al.'s field notes include bird counts, small mammal trapping, habitat observations, specimens, maps, and images. A century later, we are retracing Grinnell's path to assess how terrestrial vertebrates have responded to environmental change and to establish another benchmark for future comparison as part of the Grinnell Resurvey Project. The Grinnell Resurvey Project aims to leave two legacies to serve as future benchmarks of biodiversity change in California: (1) Resurveys of the occurrence and abundance of terrestrial vertebrates to compare with distributional data collected in the future; and (2) Specimens collected at the time of surveys that serve as environmental monitors</p>																																																		

of many dimensions of ecological and environmental change.

**Subject/Discipline:**

Animal Communities / Wildlife

**Locations authorized:**

Localities of the 37 proposed resurvey sites within DEVA:

Furnace Creek (36.458, -116.866, -52m)

Emigrant Canyon, Panamint Mountains (36.376, -117.141, 1495m)

2.5 mi E + 1 mi S Grapevine Peak (36.956, -117.092, 2210m)

8 mi E Grapevine Peak (36.973, -117.003, 1493m)

Mesquite Spring (36.965, -117.367, 562m)

Saline Valley, Lower Grapevine Canyon (1) (36.473, -117.719, 1905m)

Saline Valley, Lower Grapevine Canyon (2) (36.592, -117.629, 929m)

Saline Valley, Lower Grapevine Canyon (3) (36.572, -117.612, 1131m)

Saline Valley, Lower Grapevine Canyon (4) (36.565, -117.582, 1397m)

Nelson Mountains, Grapevine Canyon (36.544, -117.570, 1591m)

2 mi SW Jackass Spring (36.532, -117.547, 1855m)

Jackass Spring (36.543, -117.519, 2111m)

3 mi NE Jackass Spring (36.581, -117.472, 1969m)

Wildrose Canyon (36.259, -117.194, 1528m)

Nemo Canyon (36.244, -117.227, 1084m)

Jail Canyon (36.184, -117.219, 677m)

Mahogany Flat (36.239, -117.069, 2349m)

Hanaupah Canyon (West) (36.209, -117.087, 2825m)

Hanaupah Canyon (West) (36.206, -116.982, 760m)

Hanaupah Canyon (East) (36.209, -116.919, 203m)

Bennett's Well (36.158, -116.862, -69m)

2 mi NW Ryan (36.348, -116.692, 693m)

Saratoga Springs (35.683, -116.423, 60m)

Johnson Canyon (East) (36.080, -116.982, 938m)

Johnson Canyon (West) (36.106, -117.041, 1895m)

Panamint City (36.120, -117.094, 2009m)

Triangle Spring/Midway Well (36.738, -117.138, 16m)

Emigrant Spring (36.430, -117.189, 1270m)

Lee Flat, 15 mi N Darwin (36.506, -117.647, 1698m)

South of Lee Flat, near Wilson Ranch (36.489, -117.612, 1639m)

Saline Valley (36.705, -117.825, 330m)

Saline Valley, North Sand Dunes (36.762, -117.864, 363m)

Eureka Valley (South) (37.109, -117.676, 914m)

Daylight Spring, Boundary Canyon, Grapevine Mountains (36.789, -116.936, 1311m)

Vicinity of Greenwater (36.166, -116.621, 1433m)

Butte Valley (35.991, -117.031, 1341m)

Salsberry Pass (35.922, -116.433, 945m)

**Transportation method to research site(s):**

Vehicles will be used to transport surveyors along maintained roadways and sampling sites will be accessed on foot from the roadways.

**Collection of the following specimens or materials, quantities, and any limitations on collecting:**

**Name of repository for specimens or sample materials if applicable:**

Repository type: Permanently retained in National Park Service collection, maintained in one or more non-NPS repositories identified in attached Appendix A (complete and submit an Appendix A for each proposed repository) (University of California, Berkeley)

Objects collected:

For the resurveys of national parks in the Sierra Nevada, we received permission to collect and preserve up to 10 specimens per species per sampling site. This level of sampling was deemed to be the minimum number necessary to estimate various genetic parameters of potential concern, such as allele frequency, inter-population divergence measures, etc. Preserved remains include, minimally, a museum study skin (mammals and birds) or fluid preserved specimen (reptiles and amphibians), cleaned skull and post-cranial skeleton (mammals), a variety of organ tissues preserved in recently developed RNA preserving buffers (e.g., brain, heart, liver, muscle, kidney, eye, lung, and gonads) that provide an ability to optimize applicability for genomic methods (ranging from gene sequencing to tissue-specific expression patterns of key genes), and both internal and external parasites. Our repeated sampling at the same site over multiple years demonstrated that the removal of a few specimens of a given species had no effect on the abundance of that species in

following years.

Repository type: Permanently retained in National Park Service collection, maintained in one or more non-NPS repositories identified in attached Appendix A (complete and submit an Appendix A for each proposed repository) (San Diego Natural History Museum)  
Objects collected:

For the resurveys of national parks in the Sierra Nevada, we received permission to collect and preserve up to 10 specimens per species per sampling site. This level of sampling was deemed to be the minimum number necessary to estimate various genetic parameters of potential concern, such as allele frequency, inter-population divergence measures, etc. Preserved remains include, minimally, a museum study skin (mammals and birds) or fluid preserved specimen (reptiles and amphibians), cleaned skull and post-cranial skeleton (mammals), a variety of organ tissues preserved in recently developed RNA preserving buffers (e.g., brain, heart, liver, muscle, kidney, eye, lung, and gonads) that provide an ability to optimize applicability for genomic methods (ranging from gene sequencing to tissue-specific expression patterns of key genes), and both internal and external parasites. Our repeated sampling at the same site over multiple years demonstrated that the removal of a few specimens of a given species had no effect on the abundance of that species in following years.

**Specific conditions or restrictions (also see attached conditions):**

General conditions for research in National Parks and conditions specific to Death Valley National Park are attached.

A valid Scientific Collecting Permit from California Department of Fish and Wildlife is required and a copy must accompany this NPS permit. The Scientific Collecting Permit must specifically authorize all species that are to be collected. This Scientific Research and Collecting Permit issued by Death Valley National Park is not valid unless accompanied by a current Scientific Permit from California Department of Fish and Wildlife with all necessary authorizations.

Collecting birds requires a Federal Migratory Bird Scientific Collecting Permit issued by the U.S. Fish and Wildlife Service. Collecting birds is not authorized unless specifically permitted by the U.S. Fish and Wildlife Service.

It is the investigator's responsibility to obtain necessary approval from the University's Institutional Animal Care and Use Committee. The University IACUC approval must be reviewed by the NPS IACUC. Contact [npaiacuc@nps.gov](mailto:npaiacuc@nps.gov) for review.

An Investigator's Annual Report will be required for each year this permit is active. This report must include numbers of individuals of each species collected and locations and dates of each capture (GPS coordinates). In addition, the park requires copies of all reports, data, and publications derived from this work.

Vehicle use is limited to existing roads. Access to designated wilderness is by foot. Mechanized equipment is prohibited in wilderness. Use of bird song recorders in wilderness is permitted as per a Minimum Requirements Analysis.

Extra caution is required during the desert tortoise active season. Drive slowly, watch for tortoises on the road, and check under vehicle before moving it.

Collections will remain the property of the federal government and must be curate according to NPS standards under a loan agreement. Contact Melanie Spoo: [melanie\\_spoo@nps.gov](mailto:melanie_spoo@nps.gov).

Use of firearms is prohibited in Death Valley National Park. No threatened or endangered species may be collected in Death Valley National Park. Specific conditions for rare species are outlined in the authorized species list that states limits of collection for each species.

If a bird species not on the authorized collection list is accidentally collected, field work must stop and Death Valley National Park's Wildlife Biologist, Linda Manning contacted ([linda\\_manning@nps.gov](mailto:linda_manning@nps.gov)). Fieldwork may resume upon approval of the Superintendent.

If any objects of cultural value (e.g. historic or prehistoric ruins, graves, fossils, or artifacts) are found during the implementation of the project, all necessary steps will be taken to protect them, and the Park Archeologist notified immediately ([wanda\\_raschkow@nps.gov](mailto:wanda_raschkow@nps.gov)). Operations at the site will be suspended until the appropriate mitigation action has been determined. Objects of cultural value will not be moved or collected.

**Recommended by park staff(name and title):**

**Reviewed by Collections Manager:**

Yes \_\_\_\_\_ No \_\_\_\_\_

Approved by park official:

Mike Reynolds

Date Approved:

12-9-15

Title:

Resource Specialists

**I Agree To All Conditions And Restrictions Of this Permit As Specified**  
(Not valid unless signed and dated by the principal investigator)

\_\_\_\_\_  
(Principal investigator's signature)

\_\_\_\_\_  
(Date)

**THIS PERMIT AND ATTACHED CONDITIONS AND RESTRICTIONS MUST BE CARRIED AT ALL TIMES WHILE  
CONDUCTING RESEARCH ACTIVITIES IN THE DESIGNATED PARK(S)**