

MONARCH GENOMICS BRIEF PROJECT DESCRIPTION

TITLE:

Harnessing the Power of Genomics to Inform Recovery Strategies for the Monarch Butterfly (*Danaus plexippus*)

GOAL OF PROJECT AND BACKGROUND:

Our overarching goal is to apply new cutting-edge **genomic** (*definitions of bolded words are provided in a Glossary towards the end of the proposal*) methods to inform recovery strategies for North American monarch butterflies (*Danaus plexippus*). Recent monitoring efforts of monarch butterflies have revealed a striking decline in abundance, particularly western monarchs which have declined from millions of individuals in the 1980s to only 2,000 overwintering butterflies in coastal California in the winter of 2020-21 (Schultz et al. 2017; Crone et al. 2019; Pelton et al. 2019; Crone & Schultz 2021). The causes are multifaceted, and include loss of overwintering and breeding habitat, pesticides, climate change, and infection with a specialist protozoan parasite, *Ophryocystis elektroscirrha* (OE) (Crone et al. 2019; Pelton et al. 2019; Crone & Schultz 2021).

Based on the monarch scientific literature and conversations with experts in the ecology, demography, and conservation of monarch butterflies, three genomic research questions have emerged as the most important to address immediately to inform recovery strategies for monarch butterflies in North America. The first critical research question is the degree to which migratory western monarchs that overwinter in Monterey cypress and eucalyptus groves on the California coast are **connected** to non-migratory western monarchs that breed year-long on tropical milkweed, which is a popular non-native ornamental plant that has been planted extensively in gardens in southern and central California. At the same time that the migratory western monarch population has crashed over the last several years, the non-migratory year-long breeding population seems to have increased in abundance, suggesting that tropical milkweed patches may act as a sink for the migratory population (Satterfield et al. 2016; Crone & Schultz 2021). Genomic data will help inform the degree to which these populations are connected.

A second critical information need that can be addressed with genomics is the population structure and distribution of **conservation units** across the North American range of monarch butterflies. It is essential to know how many units exist and their distribution in order to manage them appropriately (Funk et al. 2012). This information will also lay the groundwork for genetic monitoring of changes in the genetic composition of monarch butterflies at overwintering sites (e.g., by providing a breakdown of the proportion of butterflies from different breeding populations; Schwartz et al. 2007). If the proportion from breeding population X declines, for example, this would suggest that some stressor is negatively impacting butterflies in that particular breeding population. Previous genetic and isotope analyses hint that there may be hidden population structure in western monarch butterflies (Yang et al. 2016; Talla et al. 2020).

In addition, by extensively sampling eastern and western monarchs on the breeding grounds, we will have adequate power to detect any subtle differences in genes under selection in these very different climates, which would indicate **adaptive differences** between western and eastern monarchs. Talla et al. (2020) actually point this possibility in their Discussion.

A third critical information need that can be answered with genomics is the degree to which butterflies from each breeding population migrate to a specific overwintering site/grove each winter (e.g., De Saix et al. 2019). High **migratory connectivity** occurs when individuals from each breeding population migrate to the same specific overwintering site each year. Low migratory connectivity occurs when individuals from each breeding population migrate to various overwintering sites each year, thereby mixing with individuals from other breeding populations. Understanding migratory connectivity is key for unraveling which threats are most important for each breeding population.

OBJECTIVES:

- a) *Test for genetic differences between migratory and non-migratory western monarch butterflies*
- b) *Characterize population structure and test for distinct management units throughout the North American breeding range of monarch butterflies*
- c) *Characterize migratory connectivity of North American monarch butterflies*

EXPECTED RESULTS, OUTCOMES, and POTENTIAL BENEFITS

- a) *Test for genetic differences between migratory and non-migratory western monarch butterflies*
 - Will allow testing whether overwintering migratory vs. non-migratory (butterflies that breed year-round on tropical milkweed) western monarchs are genetically differentiated or genetically similar, which will inform the degree to which non-migratory populations are connected to migratory populations.
 - This information is important to know whether non-migratory populations act as sinks for migratory populations. If so, then suggests that non-migratory populations need to be managed appropriately to reduce this threat to overwintering migratory monarchs.
- b) *Characterize population structure and test for distinct management units throughout the North American breeding range of monarch butterflies*
 - Will allow updated delineation of **evolutionarily significant units (ESUs, similar to distinct population segments [DPSs])** and management units (MUs, small demographically independent units within ESUs).
 - Will provide estimates of the degree of connectivity and isolation of populations, and the factors that facilitate connectivity.

- Measures of adaptive divergence among populations will inform source populations for potential supplementation, as well as adaptive potential of populations.

c) *Characterize migratory connectivity of North American monarch butterflies*

- Will allow determination of whether monarchs from each breeding population/area migrate to the same specific overwintering site each year (which would indicate high migratory connectivity).
- Understanding migratory connectivity key for unraveling which threats affect different populations.
- We could find some unexpected results, e.g., evidence that some western monarchs migrate to MX or that some eastern monarchs migrate to CA.

Glossary

adaptive differences: Genetic differences among populations that increase fitness in the local environment.

connectivity: The degree to which individuals or gametes move through a landscape, which is affected by landscape features and environmental heterogeneity.

conservation unit: A population of organisms that is considered distinct for purposes of conservation, such as a management unit (MU), distinct population segment (DPS), or evolutionarily significant unit (ESU).

distinct population segment (DPS): A level of classification under the US ESA that allows for legal protection of populations that are distinct, relatively reproductively isolated, and represent a significant evolutionary lineage to the species.

evolutionarily significant unit (ESU): A classification of populations that have substantial reproductive isolation which has led to adaptive differences so that the population represents a significant evolutionary component of the species. Both evolutionarily and evolutionary are used in the literature, but the original term was “evolutionarily”.

genome-wide association studies (GWAS): The genotyping of many loci in different individuals to see whether any alleles or loci are associated with a particular trait.

genomics: The study of the structure, function, variation within, evolution, mapping, and editing of genomes.

management unit (MU): A local population that is managed as a distinct unit because of its demographic independence.

migratory connectivity: The degree to which individuals from each breeding population migrate to a specific overwintering site each winter

single nucleotide polymorphism (SNP): A nucleotide site (base pair) in a DNA sequence that is polymorphic in a population and can be used as a marker to assess genetic variation within and among populations.

whole-genome resequencing: Sequencing genomic DNA from multiple individuals at lower read depth than would be used for assembling a reference genome for population genomic analyses.

References

- Crone EE, Schultz CB (2021) Resilience or catastrophe? Startling changes in the distribution of monarch butterflies in the West. Report for USFWS, 23 January 2021.
- Crone EE, Pelton EM, Brown LM, Thomas CC, Schultz CB (2019) Why are monarch butterflies declining in the West? Understanding the importance of multiple correlated drivers. *Ecological applications*, 29, e01975-n/a.
- DeSaix MG, Bulluck LP, Eckert AJ, Viverette CB, Boves TJ, Reese JA, Tonra CM, Dyer RJ (2019) Population assignment reveals low migratory connectivity in a weakly structured songbird. *Molecular Ecology*, 28, 2122-2135.
- Freedman MG, de Roode JC, Forister ML, Kronforst MR, Pierce AA, Schultz CB, Taylor OR, Crone EE (2020) Are eastern and western monarch butterflies distinct populations? A review of evidence for ecological, phenotypic, and genetic differentiation and implications for conservation. Preprint.
- Fuentes-Pardo AP, Ruzzante DE (2017) Whole-genome sequencing approaches for conservation biology: Advantages, limitations and practical recommendations. *Molecular Ecology*, 26, 5369-5406.
- Funk WC, McKay JK, Hohenlohe PA, Allendorf FW (2012) Harnessing genomics for delineating conservation units. *Trends Ecol Evol*, 27, 489-496.
- Pelton EM, Schultz CB, Jepsen SJ, Hoffman Black S, Crone EE (2019) Western Monarch Population Plummet: Status, Probable Causes, and Recommended Conservation Actions. *Frontiers in ecology and evolution*, 7, 258.
- Satterfield DA, Villablanca FX, Maerz JC, Altizer S (2016) Migratory monarchs wintering in California experience low infection risk compared to monarchs breeding year-round on non-native milkweed. *Integrative and comparative biology*, 56, 343-352.
- Schultz CB, Brown LM, Pelton E, Crone EE (2017) Citizen science monitoring demonstrates dramatic declines of monarch butterflies in western North America. *Biological conservation*, 214, 343-346.
- Schwartz MK, Luikart G, Waples RS (2007) Genetic monitoring as a promising tool for conservation and management. *Trends in Ecology and Evolution*, 22, 25-33.
- Talla V, Pierce AA, Adams KL, de Man TJB, Nallu S, Villablanca FX, Kronforst MR, de Roode JC (2020) Genomic evidence for gene flow between monarchs with divergent migratory phenotypes and flight performance. *Molecular ecology*, 29, 2567-2582.
- Yang LH, Ostrovsky D, Rogers MC, Welker JM (2016) Intra-population variation in the natal origins and wing morphology of overwintering western monarch butterflies *Danaus plexippus*. *Ecography (Copenhagen)*, 39, 998-1007.

CDFW Interim Authorization for Monarch Sacrifice (S-211960002-21196-001)

Hirano, Chad@Wildlife <Chad.Hirano@Wildlife.ca.gov>

11/30/2023, 2:15 PM

To: Funk, Chris <Chris.Funk@colostate.edu>

Cc: Sardinias, Hillary@Wildlife <Hillary.Sardinias@Wildlife.ca.gov>; Louie H. Yang <lhyang@ucdavis.edu>;

Woods, Mackenzie <Mackenzie.Woods@colostate.edu>; micah.freedman@botany.ubc.ca

<micah.freedman@botany.ubc.ca>

**** Caution: EXTERNAL Sender ****

Dear Chris –

Thank you for contacting us about your upcoming work with Monarch butterflies involving the sacrifice of overwintering, resident, and breeding/migratory adults. Because it is likely that final approval of your SCP Amendment (S-211960002-21196-001-01) will not occur until after your field work is scheduled, we are providing this authorization.

By this email, the Department of Fish and Wildlife (CDFW) hereby authorizes you to collect up to **90** overwintering monarchs, **90** resident monarchs, and **140** breeding/migratory individuals. You may sacrifice up to **(five) 5** monarchs per sampling site, or you may sacrifice up to **1%** of the local population, only if a population estimate of the site can be ascertained.

All other conditions of your SCP (S-211960002-21196-001) shall be followed during the course of your upcoming work.

In the meantime, please carry a copy of this email along with your SCP and associated authorizations while conducting field work.

Please refer persons with questions about your interim authorization to me.

Good luck with your upcoming field season and thanks for your continued work to help us better understand the ecology of California's wildlife!

Thank you,
Chad

Chad Hirano
Environmental Scientist
Scientific Collecting Permit Coordinator
CDFW Wildlife Branch, Wildlife Diversity Program
West Sacramento, CA
Chad.Hirano@wildlife.ca.gov

California Department of Fish and Wildlife - Wildlife Branch
Authorizations and Conditions for Scientific Collecting Permit (SCP)
Principal Investigator: William C. Funk
Colorado State University; Funk Lab

Individual

Authorizations and conditions based on your SCP application entitled "Monarch butterfly conservation genomics" and SCP Executive Summary entitled "Monarch butterfly conservation genomics in California" received by the Department on August 18, 2021 on file with the Wildlife Branch.

You are authorized to **take** (survey by pursuit, capture and sacrifice caterpillars; and salvage) the Monarch butterfly (*Danaus plexippus*) in conjunction with scientific research activities for the purpose of enhancing their survival, in accordance with the conditions below.

Permitted activities are restricted to the following geographic areas in California:

- a. Location where monarch butterfly may be salvaged:

Statewide

- b. Location where monarch butterfly caterpillars may be captured and sacrificed:

Mendocino, Sonoma, Marin, San Francisco, San Mateo, Santa Cruz, Monterey, San Luis Obispo, Santa Barbara, Ventura, Los Angeles, Orange and San Diego counties, in accordance with your "**Limited Exemption from 2021 Changes to SCP Authorizations and Sacrifice of Monarch Butterflies**" letter.

See "**Notice of Changes to Scientific Collecting Permit (SCP) Authorizations and Sacrifice for Monarch Butterflies**" (2 pages dated February 4, 2021 or later amendments) for more information.

- c. Location where sacrificed and salvaged monarchs will be deposited:

Bohart Entomology Museum, University of California, Davis

Other Permits:

You shall obtain and maintain during the term of this SCP any federal, state and/or other permit(s) required to conduct the activities authorized herein. Although the provisions of the federal permit(s), other permit(s) and this SCP may vary, the more restrictive conditions prevail. Copies of your federal permit(s) or other research-related permits (e.g., State Parks, landowner access agreements), and any amendments, shall be provided to the Department contacts (see below), and the names of all authorized sub-permittees shall be provided for the permit(s). See also SCP Standard Condition L.

You shall carry all required documents, permits and MOUs, along with your SCP, with you while conducting all authorized activities.

Department Contacts:

The primary Department contact for this permit is the Wildlife Branch SCP Coordinator (Justin Garcia, Environmental Scientist, Justin.Garcia@wildlife.ca.gov).

The Department contact for Monarch is Hillary Sardiñas (Senior Environmental Scientist (Specialist), Hillary.Sardinas@wildlife.ca.gov). See Condition #10 for the Department Regional contact(s).

**Conditions to Scientific Collecting Permit
S-211960002-21196-001**

1. When a Memorandum of Understanding is needed

Intentional take or possession of species listed as Threatened, Endangered, or Candidate under the California Endangered Species Act (CESA), or intentional take or possession of Fully Protected species, is not authorized without a Memorandum of Understanding (MOU) from the Department on which you are specifically named.

To apply for a State MOU, contact the Department Research MOU Coordinator, Esther Burkett (Esther.Burkett@wildlife.ca.gov), for study proposal requirements.

2. When additional authorization on your SCP is needed

Incidentally-captured individuals of non-target wildlife taxa shall be released at the capture site immediately, once identified, without further handling. For purposes of this permit, non-target wildlife are any animals other than Monarch butterfly (monarch).

Except as authorized above, intentional take (e.g., capture, salvage) of non-target Terrestrial and Vernal Pool Invertebrates of Conservation Priority (list dated June 12, 2017) or other non-target wildlife requires an amendment to your SCP. See also Condition #1, above.

Intentional take of Federally-listed species is not authorized without a valid federal permit **and** additional written authorization from the Department, on which you are specifically named or otherwise authorized.

3. Location of Field Activities

Your field activities may be located in a special status natural community or in an area that provides habitat for a non-target special status plant or animal. It is your responsibility to determine whether or not implementation of your field activities could have potential adverse impacts to a listed or special status plant or animal or special status natural community. To minimize potential impacts, compile relevant biological information in the general study area prior to conducting field activities or research. Generally, identify vegetation and habitat types occurring in your study area based on biological and physical properties of the site and surrounding ecological subregion¹, unless a larger assessment area is appropriate. Conduct a Rarefind or CNDDB Quick Viewer search and check with other reliable resources for known occurrences of special status plants, animals, or natural communities at the site before conducting your research. Contact the Wildlife Branch SCP Coordinator (Justin.Garcia@wildlife.ca.gov) if non-target special status plant or animal species are likely to be encountered or are being handled or disturbed.

You shall check with the landowner to determine if any other researchers are permitted to conduct activity(ies) in the same site or area. Prior to entering CDFW lands to conduct the activity(ies) described herein, you shall first receive additional written authorization from the Reserve Manager. See also SCP Standard Condition E & D.

Prior to conducting activities within or nearby State Parks, you shall coordinate with the California Department of Parks and Recreation staff (Nita Barve, Nita.Barve@wildlife.ca.gov) to ensure you have the appropriate permits and authorizations for your activities.

¹ U.S. Forest Service Ecological Subregions of California

4. Notification of Field Activities

Prior to conducting field activities pursuant to this permit, notification shall be submitted to the Department Wildlife Branch SCP Coordinator (Justin.Garcia@wildlife.ca.gov) and Department Regional contacts (see Condition #10, below), in an electronic format, at least 36 hours but preferably 14 days, prior to conducting activities. See also Standard Condition F.

In addition to sending the Notification of Field Work or Activity (DFW 1379b) form, notifications for such activities shall include: (a) an explanation of the purpose of the study; (b) the names of personnel conducting the work; (c) a clear description of the methods to be used, including trapping and marking techniques; (d) the extent of the area to be surveyed; (e) the number and dates of surveys; and (f) a map depicting the location of the survey site(s).

Any separate written authorizations that you receive from the Department for activities shall become conditions of your SCP and shall remain attached to the SCP at all times while conducting the research (including hard copies of authorizations received via email).

Any requests to conduct activities that are not authorized herein will require an amendment to this SCP.

5. Monarch Butterfly Research

You shall make a reasonable effort to coordinate with any other researchers who may be collecting the monarchs in the same locations to avoid impacts to local populations, and to share information on individually-marked individuals and their movements (e.g., Cheryl Schultz, Washington State University; Elizabeth Pringle, University of Nevada, Reno).

a. Capture and Release

You may survey for monarchs using appropriate methods to avoid incidental injury or mortality to monarchs or any non-target species. Surveys for the monarch shall be conducted in accordance with the most recent survey guidelines approved by the Department, or, otherwise, in common or accepted use.

Passive visual surveys are the preferred method for gathering invertebrate data when feasible. Any habitat elements (e.g., vegetation) moved to survey for the monarch shall be placed back exactly where they were found to avoid negative impacts on habitat conditions.

Monarch caterpillars may be handled when necessary to facilitate collection for authorized research activities involving sacrifice (see Condition #5b, below). The authorized methods of capture for monarch caterpillars are: hand. Other monarch life stages may not be captured.

To reduce the likelihood of disease transmission, you shall employ the decontamination protocols using methods that are effective against diseases. When moving between sampling locations (both within and between counties), wash hands and decontaminate collection equipment (i.e., gloves) using bleach or ethanol. UV light (sunlight) may also be used. Spray equipment with ethanol or 10% dilute bleach. To enhance effectiveness of sanitation treatments, ensure bleach is new and has not been degraded by sunlight.

b. Sacrifice of Caterpillars

Monarch caterpillars may be captured and removed from the wild (i.e., sacrificed) when necessary for scientific research purposes, as described in your SCP justification.

See "**Notice of Changes to Scientific Collecting Permit (SCP) Authorizations and Sacrifice for Monarch Butterflies**" (2 pages dated February 4, 2021 or later amendments) for information about the current moratorium on removing monarchs from the wild- exceptions are noted below.

i. Collection Limits

You may sacrifice up to 30 monarch caterpillars from each focal area (i.e., Los Angeles basin, Monterey Bay, and San Francisco Bay Area) per calendar year, not to exceed 90 monarch caterpillars per calendar year or 270 total caterpillars throughout the term of this 3-year permit.

To request additional collections, submit a SCP amendment detailing the requested species, numbers, methods, and collection locations.

ii. Removal from the Wild

The totals are cumulative and shall not be exceeded by the combined efforts of other researchers associated with this research study(ies).

Total take shall be spread geographically over three (3) study years (2021-2024), to the greatest extent possible, to avoid impacts to local populations, and in consideration of environmental factors such as extended drought conditions, take by other researchers, threats to the population(s), and cumulative impacts facing monarchs at the collection site(s).

You shall take reasonable measures to avoid collection of migratory monarchs. You may only collect caterpillars during the breeding season (April-August) in the authorized coastal locations to target non-migratory monarch populations.

All reasonable efforts shall be made to obtain specimens from locations imposing imminent death or deleterious alteration of habitat.

You or someone present should have the expertise to distinguish monarch caterpillars from non-target species using field techniques.

The authorized monarchs shall be sacrificed using humane euthanasia guidelines, as described in "*Sampling protocol for collection of monarch butterfly tissue samples for genomic analysis*" dated August 12, 2021 or later versions approved by the Department contact.

Undocumented localities for monarch butterflies shall be established through the California natural Diversity Database (CNDDDB).

c. Incidental Injury or Mortality

You shall report any incidental serious injury or mortality of a monarch butterfly to the Department (Justin.Garcia@wildlife.ca.gov and Hillary.Sardinas@wildlife.ca.gov) within three (3) days, and you shall provide a written report of the incident within ten (10) days via email.

6. Terrestrial Plants

Terrestrial plants are exempt from the SCP requirements, but this SCP does not authorize collection of or incidental harm to a State-listed plant. To obtain a voucher permit for the collection of a listed plant species for identification purposes, or to apply for a plant research permit, please visit the CDFW Native Plant Program webpage and/or contact Cherilyn Burton (Cherilyn.Burton@wildlife.ca.gov). You shall obtain the property owner's permission to collect plant species. You may need a plant permit to work in the vicinity of listed plants even if you are not collecting them.

7. Salvage

You may salvage monarchs incidentally killed during permitted activities or encountered dead in the field, as specified below. You may salvage up to 500 total monarchs throughout the term of this permit.

8. Disposition and Labeling of Specimens

Preserve all collected monarch specimens in a freezer, as described in "Sampling protocol for collection of monarch butterfly tissue samples for genomic analysis" dated August 12, 2021 or later versions approved by the Department contact.

You may transport monarch specimens across state lines to the Funk Lab at Colorado State University for the purpose of conducting genomics research, only when adhering to other state, federal, or local laws or ordinances.

After the planned genomic research is completed, all suitable monarch specimens sacrificed or salvaged shall be deposited at UC Davis Bohart Museum of Entomology, or donated to another public scientific institution in California (e.g., The Yang Lab at UC Davis) approved by the Department (contact Dr. Hillary Sardiñas Hillary.Sardinas@wildlife.ca.gov).

You shall securely label each specimen with the following information: (a) date of collection; (b) location of the specimen (GPS coordinates and datum); (c) species name; (d) unique identification number; (e) name and affiliation of the person who collected the specimen; and (f) the permit number(s) and expiration date(s) under which the specimen was collected.

To validate the specimens were collected pursuant to this permit, a copy of the Transfer of Possession – Chain of Custody form (DFW 1379c) shall accompany any specimens when transferred to another person or entity.

9. Reporting Requirements

Abstracts, reports, and other publications shall be submitted to the Wildlife Branch SCP Coordinator (Justin.Garcia@wildlife.ca.gov), in an electronic format (such as a pdf file), which is the preferred format. **All required reporting information shall also be uploaded into the SCP Portal (see Section 1b of the online permit).**

If no activities were conducted with any or all species authorized under the SCP during the previous year of your permit, you shall state this in writing in your annual report and/or MWR form.

a. **Annual Report for Monarch Butterfly:**

You are required to submit an annual report to Hillary Sardiñas (Hillary.Sardinas@wildlife.ca.gov) and Justin Garcia (Justin.Garcia@wildlife.ca.gov), in an electronic format, describing the results and significant findings of your research on monarchs.

The annual reports shall be submitted on or before **January 31st** of the year following each year of research. The reports shall follow standard scientific format (Title, Date, Author(s) and Affiliation(s), Introduction, Study Area (with map), Methods, Results, Discussion, and Literature Cited). Photographs may be included as needed, or as an Appendix.

i. The reports for monarch surveys and research shall include, but not be limited to, the following information:

- A. The dates of field work, site name, and names of all workers;
- B. Date observed, captured or collected;
- C. Number and location of monarchs observed or handled by GPS coordinates and datum;

- D. Information on individual health, condition, sex, life stage, and morphometric measurements (e.g., wing length);
- E. A map depicting the locations of the survey/research site(s);
- F. A map indicating the locations of monarch detections and/or locations where monarchs were sacrificed;
- G. Any information regarding movements and habitat use;
- H. Estimates of population size, distribution, and relative density of monarchs, if feasible;
- I. A description of the number, causes, and location of any incidental injuries or mortalities;
- J. The date and location of reposition of each salvageable specimen; and
- K. Other pertinent observations made regarding the status or ecology of the monarch, along with a description of known threats to the species and any management recommendations.

b. Mandatory Wildlife Report:

You shall report all take (e.g., sacrifice, salvage) of monarchs, including incidental take of non-target species, on the Mandatory Wildlife Report (MWR) form. The MWR shall be submitted on or before **January 31st** of the year following each year of research.

When you submit the MWR form, you may simply reference your annual scientific reports for the monarch butterfly research described above and any CNDDDB data that have been submitted to the Department. There is no need to repeat the more detailed information contained in your CNDDDB forms on the MWR form.

c. Other Reports:

For activities associated with this SCP, you shall also provide copies of abstracts you may prepare for any papers you present, or copies of any papers you prepare for popular articles or scientific journals, or copies of any periodic, annual, or final report that you prepare or assist in preparing for a client or other third party.

d. California Natural Diversity Database (CNDDDB):

For monarchs (e.g., overwintering populations) and any Threatened, Endangered, Candidate, Fully Protected, Species of Special Concern or other CDFW Special Animals encountered and correctly identified, you shall send occurrence data to the CNDDDB. You shall submit point data to the CNDDDB at least annually. You shall submit data using CNDDDB's Online Field Survey Form. If you cannot access the Online Field Survey Form or receive permission from the primary CDFW contact, data may also be submitted on the standard CNDDDB Field Survey Forms, or in an electronic spreadsheet with an attached map depicting locations of observations. Include known threats to the species in your submittal. A cross reference to your annual report(s) shall also be included.

e. Reporting Compliance and Data Exchange

It is mutually understood that there will be a free exchange of data and information during the course of study covered by this SCP. Draft documents, raw/field data, photographs, notes, and other information resulting from work conducted under the authority of this SCP shall be submitted to the CDFW contacts upon request. Failure to comply with reporting requirements may result in non-renewal or suspension/revocation of this SCP.

10. Regional Office Notification and Report Circulation

In addition to the regional office notification requirement in Standard Condition F, you shall send notification to the regional biologists listed below for field activity(ies) in the county(ies) below. Submit electronic copies of any reports produced or required by this permit, within two weeks of completion, to the contact listed below, as appropriate for the counties of your activities.

Northern Region (1):

Mendocino: Tom Batter, Thomas.Batter@wildlife.ca.gov, (707) 456-0335

Bay Delta Region (3):

Sonoma

Stacy Martinelli, Stacy.Martinelli@wildlife.ca.gov, 707-576-2868

Marin

John Krause, John.Krause@wildlife.ca.gov, (415) 454-8050

Santa Cruz, San Mateo, San Francisco

Terris Kasteen, Terris.Kasteen@wildlife.ca.gov, 408-365-1066

Central Region (4):

Monterey, San Luis Obispo

David Hacker, David.Hacker@wildlife.ca.gov, (559) 417-2976

South Coast Region (5):

Santa Barbara, Ventura, Los Angeles, Orange, San Diego

Hans Sin, Hans.Sin@wildlife.ca.gov, (858) 467-4217

Kyle Rice, Kyle.Rice@wildlife.ca.gov

For Department Law Enforcement contacts, send notifications to the appropriate Regional office email address:

Northern Region (1): AskRegion1@wildlife.ca.gov

North Central Region (2): R2info@wildlife.ca.gov

Bay Delta Region (3): AskBDR@wildlife.ca.gov

Central Region (4): Reg4sec@wildlife.ca.gov

South Coast Region (5): AskR5@wildlife.ca.gov

Inland Deserts Region (6): AskRegion6@wildlife.ca.gov

11. Standard Provisions

The attached provisions shall also be followed: Standard Conditions for All Scientific Collecting Permits (2 pages dated July 1, 2017).

12. List of Authorized Individuals

All researchers working independently on your research project(s) shall carry a copy of this SCP and be named on your SCP List of Authorized Individuals (LAI; Section 3c of SCP Portal permit).

The Principal Investigator may request to change or add Authorized Individuals (Lead Scientists) to be named on the LAI by submitting a SCP amendment application with the following information: a) name of the individual; b) species the individual will be working with; c) research activities the individual will conduct; d) whether or not these research activities will be conducted independently or under direct supervision (within three meters); and e) resumes/CVs and statements of qualifications that describe the individual's experience with the species, and experience with the research methods to be employed in the study. Letters of recommendation may also be required as supplemental information.

13. Term

This Individual SCP shall be in your possession while conducting the activities described above, and is valid for three years from the date of issuance (see SCP Cover Letter).

You may use the Specific Use SCP amendment form for any modifications to your research in the future.

Minor deviation from the stipulated terms and conditions may be authorized on a case-by-case basis when approved by the Department contact unless an amendment to this permit would be required.

Should you have any questions, please contact the Wildlife Branch SCP Coordinator (Justin Garcia, Justin.Garcia@wildlife.ca.gov) and/or Dr. Hillary Sardiñas (Hillary.Sardinas@wildlife.ca.gov).

Garcia,
Justin@W
ldlife

Digitally signed by Garcia,
Justin@Wildlife
DN: CN=Garcia, Justin@Wildlife*
Reason: I am the author of this
document
Location: your signing location
here
Date: 2021.11.19 13:50:29
Foxit PhantomPDF Version: 9.7.3

SCP Reviewer
CDFW Wildlife Branch