

Southern Coho Salmon Captive Broodstock Program (UCSC/NOAA)

2019

Introduction:

The Regents of the University of California, UC Santa Cruz will implement the Southern Coho Salmon Captive Broodstock Program (SCSCBP). The principal objective of this project is to enhance the viability of Central California Coast coho salmon (*Oncorhynchus kistuch*) populations in the Santa Cruz Mountains Diversity Stratum. This will be accomplished through continued operation of the SCSCBP by University of California at Santa Cruz (UCSC) and NOAA Fisheries Southwest Fisheries Science Center (SWFSC) in coordination with program partners at Monterey Bay Salmon and Trout Project (MBSTP). The project includes husbandry of coho salmon captive broodstock at the SWFSC rearing facility, nutrition of all coho salmon in the program, genetic screening of all program fish and the development of annual genetic spawning matrices, PIT tagging of production fish prior to release, and program coordination, planning, and reporting. The project will select 380 young-of-the-year coho salmon from each annual spawning event (brood year) and rear them for three years to maturity. Sexually mature coho salmon will be spawned according to a genetic spawning matrix to minimize inbreeding depression and the likelihood of reduced fitness among progeny. Production fish will be marked and released to regional watersheds to aid recovery efforts. This project is needed because The Central California Coast coho salmon ESU is listed as endangered under both the federal Endangered Species Act (ESA) and the California Endangered Species Act (CESA). Populations are especially depressed at the southern end of their range (i.e., Santa Cruz Mountains Diversity Stratum; SCMDS), where coho salmon have been functionally extirpated from most watersheds and all brood year lineages have too few individuals to be self-sustaining (CDFG 2004). The Scott Creek run of coho salmon is the last extant population in the SCMDS and universally recognized as critical to regional conservation and recovery efforts (CDFG 2004, NMFS 2012). Nevertheless, the Scott Creek population is presently at high risk of extirpation through both demographic and genetic processes. The small effective population size (number of breeders) combined with low encounter rates between potential mates in the natural environment have resulted in a substantial loss of genetic diversity from the population. Moreover, the reduction of the natural population to an unsustainably small number of family groups necessitates the continued production of coho salmon through captive breeding and rearing as a means of preserving the remaining genetic lineage and reducing the likelihood of complete extirpation due to stochastic processes.

The Grantee shall not proceed with on the ground implementation until all necessary permits, consultations, and/or a Notice to Proceed are secured.

Objective(s):

During each year of the grant the project will:

Southern Coho Salmon Captive Broodstock Program (UCSC/NOAA)

2019

- (1) Select 380 young-of-the-year coho salmon from the Monterey Bay Salmon and Trout Project (MBSTP);
- (2) Rear 380 coho salmon from each brood year to maturity;
- (3) Return mature coho salmon broodstock to MBSTP each winter for spawning;
- (4) Develop a genetic-based spawning matrix for utilization by MBSTP; and
- (5) PIT tag production fish prior to release to recovery watersheds.

Project Description:

Location:

Parts of the project will be implemented at three different locations.

The NOAA Fisheries Southwest Fisheries Science Center (SWFSC), Fisheries Ecology Division (FED) laboratory is located on the Coastal Science Campus at the University of California at Santa Cruz (Latitude: 36.951667°, Longitude: -122.065000°, Elevation: 23.5 m). Physical address: 110 McAllister Way, Santa Cruz, California 95060

The Monterey Bay Salmon and Trout Project (MBSTP) Kingfisher Flat Genetic Conservation Hatchery (KFH) is located on Big Creek, a tributary to Scott Creek in Santa Cruz, County, California. The hatchery facility is located approximately 0.9 river miles (rm) upstream of the confluence of Big Creek and the mainstem of Scott Creek, and 3.0 rm from the Pacific Ocean (Latitude: 37.089722°, Longitude: -122.230556°, Elevation: 102 m). Physical address: 825 Big Creek Road, Davenport, California 95017

Don Clausen Fish Hatchery (DCFH) is located on Dry Creek at the base of Warm Springs Dam (Lake Sonoma), within the Russian River watershed in Northern California. The hatchery is located approximately 14.4 rm upstream of the confluence of Dry Creek and the mainstem Russian River and 33 rm from the Pacific Ocean (Latitude: 38.718333°, Longitude: -123.001111°, Elevation: 62.8 m). Physical address: 3246 Skaggs Springs Road, Geyserville, California 95441.

Project Set Up:

All project tasks will be overseen by the project's principal investigator, Dr Joseph Kiernan of UCSC Institute of Marine Sciences and NOAA Fisheries SWFSC. Project oversight is provided at no cost to the project. NOAA SWFSC is not a subcontractor to UCSC in this project. The work to be performed will be implemented by three UCSC employees identified in the Personnel Services section of the budget. Daily husbandry of coho salmon and the tagging (external and PIT) of fish prior to release (Tasks 1 and 2) will be implemented by one full-

time staff (Laboratory Assistant) and two part-time staff (Assistant Specialist [50%] and Undergraduate Student Assistant [65%]). Genetic sample preparation, processing, and analysis (Task 3) and project coordination, planning, and reporting (Task 4) will be supported by the part-time Assistant Specialist.

Materials:

Materials required for the continuous implementation of this project include fish feed, nutritional supplements, and feeding supplies (pellet food, fresh/frozen krill, vitamins, cod liver oil, belt feeders); tagging, marking, and data capture items (PIT tags, external disc/floy tags, RFID injector syringes and needles, handheld and multiplexing PIT tag interrogation devices); fish husbandry supplies (tank netting, fish landing nets, tank vacuum hoses, tank brushes, UV sterilization replacement bulbs, Iodine, juvenile and adult balances, and filter media); genetic analysis (reagents and consumable supplies); and project related travel (lodging, per diem, and GSA vehicle lease). All materials requested will be purchased by the University. Each non-labor item is briefly summarized below.

Frozen krill (\$103,413). Krill are small shrimp that provide essential supplemental nutrition to growing fish at the hatchery.

Pellet food (\$2,957). Pellet food provided the bulk of the basic nutrition to hatchery fish.

Materials and Supplies

- Vitamin powder (\$728). Nutritional supplement.
- Cod liver oil (\$3,400). Nutritional supplement.
- PIT tags (\$69,000 request, \$11,500 partner cost share). Internal tags inserted into hatchery fish that allow identification of individual fish in the hatchery setting and likewise after release into the environment.
- External Floy/Disc tags and accessories (\$2,100). Allows identification of mature fish during spawning activities.
- Genetic analyses (\$36,000 request, \$60,000 partner cost share). Essential for the genotyping of all program fish prior to spawning to avoid inbreeding depression.
- RFID injector syringes with needles (\$5,000). Necessary to deliver internal PIT tags into the peritoneal cavity or dorsal musculature of fish.
- Handheld PIT tag reader (\$1,850). Necessary to identify PIT tags of fish in the hatchery environment and to identify hatchery-origin fish in the wild.
- Tank netting (\$2,000). Protective covers for each rearing tank that guarantee the security and safety of fish in the hatchery.
- Metal frame dip/landing nets (\$1,040). Required to capture and remove fish from tanks. As a biosecurity measure, net sets (small and large mesh) are dedicated to specific tanks at the hatchery.
- Vacuum hoses, brush heads and handles (\$1,200). Necessary to remove excess food and fish metabolic waste products from rearing tanks. As a

Southern Coho Salmon Captive Broodstock Program (UCSC/NOAA)

2019

biosecurity measure, hoses and brushes are dedicated to specific tanks at the hatchery.

- UV sterilization bulbs (\$2,700 request, \$2,700 partner cost share). Annual bulb replacement(s) are necessary to maintain water quality.
- Iodine (\$1,125). Required for cleaning of tanks and fish handling equipment.
- Belt feeders (\$1,200). Required for automated slow-release feeding of fish in the hatchery.
- Portable electronic fish balance - juvenile (\$310). Required to collect growth and condition information for juvenile and sub-adult fish.
- Portable electronic fish balance - adult (\$520). Required to collect growth and condition information for adult fish.
- Filter media replacement/maintenance (\$10,500 partner cost share). Required maintenance of sand filtration systems to ensure clean water is delivered to the four rearing tanks (two brood years) at SWFSC.
- Multiplexing HDX PIT tag detection system (\$6,500 partner cost share). GIS enabled data capture devices used to detect and record PIT tag numbers and location upon release to the stream and to track instream movement.

Project Travel

- Project travel - Lodging (\$1,890 request, \$2,160 partner cost share). Travel is necessary to care for program fish housed at satellite rearing facilities.
- Project travel - Per diem (\$966 request, \$1,104 partner cost share). Travel is necessary to care for program fish housed at satellite rearing facilities.
- GSA vehicle and fuel (\$7,200 partner cost share). Used for transportation between rearing facilities.

Tasks:

TASK 1. DAILY HUSBANDRY OF COHO SALMON CAPTIVE BROODSTOCK.

Husbandry and feeding of coho salmon rearing at the NOAA SWFSC FED laboratory will occur every day of the funding period. Daily husbandry and feeding of coho salmon will be supervised (at no cost to the project) by NOAA SWFSC staff, and carried out by all project personnel. This task will include feeding, maintenance of water and air systems, cleaning of tanks, and health maintenance procedures. This task will also require periodic travel to satellite rearing facilities (Don Clausen Fish Hatchery and Kingfisher Flat Hatchery) to perform routine husbandry activities such as weighing and measuring program fish, delivering broodstock smolts to their long-term rearing facility, and returning mature fish back to Kingfisher Flat Hatchery prior to spawning.

Items included in the budget that support this task are: Project personnel (Laboratory Assistant, Student Assistant, and Assistant Specialist); project travel (lodging and per diem); GSA vehicle; Frozen Krill; Pellet food; Vitamin powder; Cod liver oil; Handheld PIT tag reader; Tank netting; Metal frame landing nets;

Southern Coho Salmon Captive Broodstock Program (UCSC/NOAA)

2019

Vacuum hoses, brush heads and handles; UV sterilization bulbs; Iodine; Belt feeders; and Portable electronic fish balances (juvenile + adult).

TASK 2. PIT TAGGING OF CAPTIVE BROODSTOCK PROGRAM FISH.

During each year of the grant NOAA staff and project personnel will implant PIT tags into all retained broodstock individuals and a sub-sample of program fish (up to 20,000 annually, depending on production levels). The tagging of program production fish will predominantly occur during the winter (Dec-Feb) of each year, when fish are at the late parr/pre-smolt stage. However, tagging may occur at other times of the year if earlier life stages are chosen by the Technical Oversight Committee (TOC) for release. Fish marking/tagging is a coordinated effort between MBSTP and UCSC/NOAA, and coded wire tagging and PIT tagging typically occur simultaneously. NOAA/UCSC staff will collect and maintain tag codes in established databases.

Specific expenses associated with Task 2 and included in the budget include: personnel (Assistant Spec., Laboratory Asst., and Student Asst. help conduct tagging; Asst. Spec. coordinates tagging effort and data management); GSA vehicle and fuel; PIT Tags, RFID injector syringes with needles; and Multiplexing PIT tag detection system.

TASK 3. DEVELOPMENT OF GENETIC SPAWNING MATRICES.

To create a spawning matrix, program staff collect a small tissue sample (typically caudal fin clip at time of PIT tagging) from each captive broodstock coho salmon and any natural-origin fish captured in regional streams and transported to Kingfisher Flat Hatchery. The tissue samples are subsequently processed in the laboratory by NOAA SWFSC staff for DNA extraction and analysis. Results of the analysis are used to create a matrix that prioritizes potential mating partners according to their level of relatedness. Items in the budget necessary for the creation and execution of the spawning matrix are: project personnel; PIT and external Floy/Disc tags (serve as unique identifier in matrix) and genetic laboratory analyses.

TASK 4. PROGRAM COORDINATION, PLANNING, AND REPORTING.

Program staff will coordinate and plan key SCSCBP events and activities. Program personnel (Assistant Specialist) and permanent NOAA SWFSC staff will maintain program databases, track established program performance metrics, and generate reports.

Deliverables:

TASK 1. DAILY HUSBANDRY OF COHO SALMON CAPTIVE BROODSTOCK.

Southern Coho Salmon Captive Broodstock Program (UCSC/NOAA)

2019

Delivery of a cohort of mature coho salmon of the highest possible physical and genetic quality to Kingfisher Flat Hatchery for spawning.

TASK 2. PIT TAGGING OF CAPTIVE BROODSTOCK PROGRAM FISH.

All broodstock individuals and a subset of production coho salmon will be tagged with passive integrated transponder (PIT) tags prior to release. The task includes the reporting of instream detection and survey data generated by various agencies/groups throughout the diversity stratum.

TASK 3. DEVELOPMENT OF GENETIC SPAWNING MATRICES.

All program fish will be sampled and genotyped. SWFSC will produce an annual genetic spawning matrix prior to the onset of the winter spawning season and provide in-season updates to the matrix as needed.

TASK 4. PROGRAM COORDINATION, PLANNING, AND REPORTING.

Annual and final progress reports. Annual reports will examine performance metrics at each facility (SWFSC, KFH, and DCFH) and contrast results with historical SCSCBP data. The final report will include the following: (1) Demonstrated fish survival at each rearing facility; (2) estimates of marine survival for released program fish; (3) brood year-specific data for all fish in the program; (4) metrics of performance for key life-stages at each facility; (5) number of fish tagged annually, including all associated tag codes and estimates of tag retention; (6) data on the date, number, life stage, and release location of program fish outplanted in regional coho salmon recovery watersheds; and (7) all pertinent Geographical Information System (GIS) data.

Timelines:

TASK 1. DAILY HUSBANDRY OF COHO SALMON CAPTIVE BROODSTOCK.

06/01/2020 – 05/31/2023

TASK 2. PIT TAGGING OF CAPTIVE BROODSTOCK PROGRAM FISH.

06/01/2020 – 05/31/2023

TASK 3. DEVELOPMENT OF GENETIC SPAWNING MATRICES.

06/01/2020 – 05/31/2023

TASK 4. PROGRAM COORDINATION, PLANNING, AND REPORTING.

06/01/2020 – 05/31/2023

Additional Requirements:

Southern Coho Salmon Captive Broodstock Program (UCSC/NOAA)

2019

The Grantee will not proceed with on the ground implementation until all necessary permits and consultations are secured. Work in flowing streams is restricted per the Army Corp of Engineers Regional General Permit. Actual project start and end dates, within this timeframe, are at the discretion of the California Department of Fish and Wildlife.

No equipment maintenance will be performed within or near the stream channel where pollutants (such as petroleum products) from the equipment may enter the channel via rainfall or runoff. Appropriate spill containment devices (e.g., oil absorbent pads, tarpaulins) will be used when refueling equipment. Any and all equipment will be removed from the streambed and flood plain areas at the end of each workday.

All equipment and gear will be brushed with a stiff brush prior to leaving each stretch of stream to avoid the transport of aquatic invasive species (AIS). When transporting traps out of the area, each numbered trap will be bagged in its own bag to avoid cross contamination during transport in and out of the work area. All crew members will decontaminate equipment and shoes for AIS according to the standards detailed in the California Department of Fish & Wildlife Aquatic Invasive Species Decontamination Protocol.

During project activities, all trash that may attract predators will be properly contained, removed from the work site, and disposed of regularly. Following construction, all trash and construction debris will be removed from work areas.

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Southern Coho Salmon Captive Broodstock Program – Kingfisher Flat Rearing Facility (MBSTP) Scott Creek Watershed. USGS 7.5 Minute Series (Topographic) Davenport Quad.



U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

DAVENPORT QUADRANGLE
CALIFORNIA-SANTA CRUZ CO.
7.5-MINUTE SERIES (TOPOGRAPHIC)



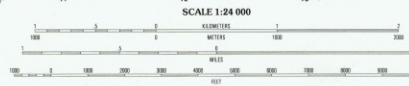
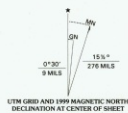
●MBSTP Kingfisher Flat Hatchery

Produced by the United States Geological Survey

Topography compiled 1953. Planimetry derived from imagery taken 1951 and other sources. Photomosaic using imagery dated 1997; no major culture or drainage changes observed. PLS and survey control current as of 1955. Boundaries revised 1999.

North American Datum of 1927 (NAD 27). Projection and 1000-meter grid. Universal Transverse Mercator, zone 10. 10 000-foot ticks. California Coordinate System of 1977 (zone 5).

North American Datum of 1983 (NAD 83) is shown by dashed corner ticks. The values of the shift between NAD 27 and NAD 83 for 7.5 minute intersections are obtainable from National Geographic Society NADCON software. There may be private inholdings within the boundaries of the National or State reservations shown on this map. Where omitted, land lines have not been established.



CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
TO CONVERT FROM FEET TO METERS, MULTIPLY BY 0.3048
SHORELINE SHOWN REPRESENTS THE APPROXIMATE LINE OF MEAN HIGH WATER
THE MEAN RANGE OF TIDE IS APPROXIMATELY 4 FEET

THIS MAP COMPLETES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U.S. GEOLOGICAL SURVEY, P.O. BOX 25286, DENVER, COLORADO 80225
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST



QUADRANGLE LOCATION

1	2	3
4	5	6
7	8	9

Primary highway
hard surface
Secondary highway
hard surface
Unimproved road
Interstate Route
U.S. Route
State Route

Light-duty road, hard or improved surface
Unimproved road

DAVENPORT, CA
1997

NOMA 1558 II SW-SERIES VB95





Selected Elements by Scientific Name

California Department of Fish and Wildlife

California Natural Diversity Database



Query Criteria: Quad IS (Davenport (3712212) OR Castle Rock Ridge (3712221) OR Felton (3712211) OR Santa Cruz (3612281) OR Franklin Point (3712223) OR Big Basin (3712222))

Possible species within the Davenport and surrounding quads for 2968 Southern Coho Salmon Captive Broodstock Program (UCSC-NOAA), Santa Cruz County

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
<i>Accipiter cooperii</i> Cooper's hawk	ABNKC12040	None	None	G5	S4	WL
<i>Agelaius tricolor</i> tricolored blackbird	ABPBXB0020	None	Threatened	G2G3	S1S2	SSC
<i>Agrostis blasdalei</i> Blasdale's bent grass	PMPOA04060	None	None	G2	S2	1B.2
<i>Amsinckia lunaris</i> bent-flowered fiddleneck	PDBOR01070	None	None	G3	S3	1B.2
<i>Aneides flavipunctatus niger</i> Santa Cruz black salamander	AAAAD01070	None	None	G3	S3	SSC
<i>Anomobryum julaceum</i> slender silver moss	NBMUS80010	None	None	G5?	S2	4.2
<i>Antrozous pallidus</i> pallid bat	AMACC10010	None	None	G5	S3	SSC
<i>Arctostaphylos andersonii</i> Anderson's manzanita	PDERI04030	None	None	G2	S2	1B.2
<i>Arctostaphylos glutinosa</i> Schreiber's manzanita	PDERI040G0	None	None	G1	S1	1B.2
<i>Arctostaphylos ohloneana</i> Ohlone manzanita	PDERI042Y0	None	None	G1	S1	1B.1
<i>Arctostaphylos regismontana</i> Kings Mountain manzanita	PDERI041C0	None	None	G2	S2	1B.2
<i>Arctostaphylos silvicola</i> Bonny Doon manzanita	PDERI041F0	None	None	G1	S1	1B.2
<i>Ardea herodias</i> great blue heron	ABNGA04010	None	None	G5	S4	
<i>Arenaria paludicola</i> marsh sandwort	PDCAR040L0	Endangered	Endangered	G1	S1	1B.1
<i>Athene cunicularia</i> burrowing owl	ABNSB10010	None	None	G4	S3	SSC
<i>Bombus caliginosus</i> obscure bumble bee	IIHYM24380	None	None	G4?	S1S2	
<i>Bombus occidentalis</i> western bumble bee	IIHYM24250	None	None	G2G3	S1	
<i>Brachyramphus marmoratus</i> marbled murrelet	ABNNN06010	Threatened	Endangered	G3G4	S1	
<i>Calasellus californicus</i> An isopod	ICMAL34010	None	None	G2	S2	



Selected Elements by Scientific Name
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<i>Calyptridium parryi</i> var. <i>hesseae</i> Santa Cruz Mountains pussypaws	PDPOR09052	None	None	G3G4T2	S2	1B.1
<i>Campanula californica</i> swamp harebell	PDCAM02060	None	None	G3	S3	1B.2
<i>Carex saliniformis</i> deceiving sedge	PMCYP03BY0	None	None	G2	S2	1B.2
<i>Charadrius alexandrinus nivosus</i> western snowy plover	ABNNB03031	Threatened	None	G3T3	S2S3	SSC
<i>Chorizanthe pungens</i> var. <i>hartwegiana</i> Ben Lomond spineflower	PDPGN040M1	Endangered	None	G2T1	S1	1B.1
<i>Chorizanthe robusta</i> var. <i>hartwegii</i> Scotts Valley spineflower	PDPGN040Q1	Endangered	None	G2T1	S1	1B.1
<i>Chorizanthe robusta</i> var. <i>robusta</i> robust spineflower	PDPGN040Q2	Endangered	None	G2T1	S1	1B.1
<i>Cicindela hirticollis gravida</i> sandy beach tiger beetle	IICOL02101	None	None	G5T2	S2	
<i>Cicindela ohlone</i> Ohlone tiger beetle	IICOL026L0	Endangered	None	G1	S1	
<i>Cirsium andrewsii</i> Franciscan thistle	PDAST2E050	None	None	G3	S3	1B.2
<i>Clarkia concinna</i> ssp. <i>automixa</i> Santa Clara red ribbons	PDONA050A1	None	None	G5?T3	S3	4.3
<i>Coelus globosus</i> globose dune beetle	IICOL4A010	None	None	G1G2	S1S2	
<i>Collinsia multicolor</i> San Francisco collinsia	PDSCR0H0B0	None	None	G2	S2	1B.2
<i>Corynorhinus townsendii</i> Townsend's big-eared bat	AMACC08010	None	None	G3G4	S2	SSC
<i>Coturnicops noveboracensis</i> yellow rail	ABNME01010	None	None	G4	S1S2	SSC
<i>Cypseloides niger</i> black swift	ABNUA01010	None	None	G4	S2	SSC
<i>Dacryophyllum falcifolium</i> tear drop moss	NBMUS8Z010	None	None	G2	S2	1B.3
<i>Danaus plexippus</i> pop. 1 monarch - California overwintering population	IILEPP2012	None	None	G4T2T3	S2S3	
<i>Dicamptodon ensatus</i> California giant salamander	AAAAH01020	None	None	G3	S2S3	SSC
<i>Dipodomys venustus venustus</i> Santa Cruz kangaroo rat	AMAFD03042	None	None	G4T1	S1	
<i>Elanus leucurus</i> white-tailed kite	ABNKC06010	None	None	G5	S3S4	FP



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Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
<i>Emys marmorata</i> western pond turtle	ARAAD02030	None	None	G3G4	S3	SSC
<i>Erethizon dorsatum</i> North American porcupine	AMAFJ01010	None	None	G5	S3	
<i>Eriogonum nudum</i> var. <i>decurrens</i> Ben Lomond buckwheat	PDPGN08492	None	None	G5T1	S1	1B.1
<i>Erysimum ammophilum</i> sand-loving wallflower	PDBRA16010	None	None	G2	S2	1B.2
<i>Erysimum teretifolium</i> Santa Cruz wallflower	PDBRA160N0	Endangered	Endangered	G1	S1	1B.1
<i>Eucyclogobius newberryi</i> tidewater goby	AFCQN04010	Endangered	None	G3	S3	SSC
<i>Euphilotes enoptes smithi</i> Smith's blue butterfly	IILEPG2026	Endangered	None	G5T1T2	S1S2	
<i>Falco peregrinus anatum</i> American peregrine falcon	ABNKD06071	Delisted	Delisted	G4T4	S3S4	FP
<i>Fissidens pauperculus</i> minute pocket moss	NBMUS2W0U0	None	None	G3?	S2	1B.2
<i>Fissilicreagris imperialis</i> Empire Cave pseudoscorpion	ILARAE5010	None	None	G1	S1	
<i>Fritillaria liliacea</i> fragrant fritillary	PMLIL0V0C0	None	None	G2	S2	1B.2
<i>Geothlypis trichas sinuosa</i> saltmarsh common yellowthroat	ABPBX1201A	None	None	G5T3	S3	SSC
<i>Grimmia torenii</i> Toren's grimmia	NBMUS32330	None	None	G2	S2	1B.3
<i>Grimmia vaginulata</i> vaginulate grimmia	NBMUS32340	None	None	G2G3	S1	1B.1
<i>Hesperovax sparsiflora</i> var. <i>brevifolia</i> short-leaved evax	PDASTE5011	None	None	G4T3	S2	1B.2
<i>Hesperocyparis abramsiana</i> var. <i>abramsiana</i> Santa Cruz cypress	PGCUP04081	Threatened	Endangered	G1T1	S1	1B.2
<i>Hesperocyparis abramsiana</i> var. <i>butanoensis</i> Butano Ridge cypress	PGCUP04082	Threatened	Endangered	G1T1	S1	1B.2
<i>Hoita strobilina</i> Loma Prieta hoita	PDFAB5Z030	None	None	G2?	S2?	1B.1
<i>Holocarpha macradenia</i> Santa Cruz tarplant	PDAST4X020	Threatened	Endangered	G1	S1	1B.1
<i>Horkelia cuneata</i> var. <i>sericea</i> Kellogg's horkelia	PDROS0W043	None	None	G4T1?	S1?	1B.1
<i>Horkelia marinensis</i> Point Reyes horkelia	PDROS0W0B0	None	None	G2	S2	1B.2



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<i>Lasiurus cinereus</i> hoary bat	AMACC05030	None	None	G5	S4	
<i>Laterallus jamaicensis coturniculus</i> California black rail	ABNME03041	None	Threatened	G3G4T1	S1	FP
<i>Limnanthes douglasii ssp. sulphurea</i> Point Reyes meadowfoam	PDLIM02038	None	Endangered	G4T1	S1	1B.2
<i>Lytta moesta</i> moestan blister beetle	IICOL4C020	None	None	G2	S2	
<i>Malacothamnus arcuatus</i> arcuate bush-mallow	PDMAL0Q0E0	None	None	G2Q	S2	1B.2
<i>Margaritifera falcata</i> western pearlshell	IMBIV27020	None	None	G4G5	S1S2	
Maritime Coast Range Ponderosa Pine Forest Maritime Coast Range Ponderosa Pine Forest	CTT84132CA	None	None	G1	S1.1	
<i>Meta dolloff</i> Doloff Cave spider	ILARA17010	None	None	G1	S1	
<i>Microseris paludosa</i> marsh microseris	PDAST6E0D0	None	None	G2	S2	1B.2
<i>Mielichhoferia elongata</i> elongate copper moss	NBMUS4Q022	None	None	G5	S4	4.3
<i>Monardella sinuata ssp. nigrescens</i> northern curly-leaved monardella	PDLAM18162	None	None	G3T2	S2	1B.2
<i>Monolopia gracilens</i> woodland woollythreads	PDAST6G010	None	None	G3	S3	1B.2
Monterey Pine Forest Monterey Pine Forest	CTT83130CA	None	None	G1	S1.1	
N. Central Coast Calif. Roach/Stickleback/Steelhead Stream N. Central Coast Calif. Roach/Stickleback/Steelhead Stream	CARA2633CA	None	None	GNR	SNR	
<i>Neochthonius imperialis</i> Empire Cave pseudoscorpion	ILARAD1010	None	None	G1	S1	
<i>Neotoma fuscipes annectens</i> San Francisco dusky-footed woodrat	AMAFF08082	None	None	G5T2T3	S2S3	SSC
North Central Coast Drainage Sacramento Sucker/Roach River North Central Coast Drainage Sacramento Sucker/Roach River	CARA2623CA	None	None	GNR	SNR	
North Central Coast Short-Run Coho Stream North Central Coast Short-Run Coho Stream	CARA2632CA	None	None	GNR	SNR	
Northern Coastal Salt Marsh Northern Coastal Salt Marsh	CTT52110CA	None	None	G3	S3.2	
Northern Interior Cypress Forest Northern Interior Cypress Forest	CTT83220CA	None	None	G2	S2.2	



Selected Elements by Scientific Name
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Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Northern Maritime Chaparral Northern Maritime Chaparral	CTT37C10CA	None	None	G1	S1.2	
Oncorhynchus kisutch pop. 4 coho salmon - central California coast ESU	AFCHA02034	Endangered	Endangered	G4	S2?	
Oncorhynchus mykiss irideus pop. 8 steelhead - central California coast DPS	AFCHA0209G	Threatened	None	G5T2T3Q	S2S3	
Orthotrichum kellmanii Kellman's bristle moss	NBMUS56190	None	None	G2	S2	1B.2
Pandion haliaetus osprey	ABNKC01010	None	None	G5	S4	WL
Pedicularis dudleyi Dudley's lousewort	PDSCR1K0D0	None	Rare	G2	S2	1B.2
Penstemon rattanii var. kleei Santa Cruz Mountains beardtongue	PDSCR1L5B1	None	None	G4T2	S2	1B.2
Pentachaeta bellidiflora white-rayed pentachaeta	PDAST6X030	Endangered	Endangered	G1	S1	1B.1
Philanthus nasalis Antioch specid wasp	IIHYM20010	None	None	G1	S1	
Pinus radiata Monterey pine	PGPIN040V0	None	None	G1	S1	1B.1
Piperia candida white-flowered rein orchid	PMORC1X050	None	None	G3	S3	1B.2
Plagiobothrys chorisianus var. chorisianus Choris' popcornflower	PDBOR0V061	None	None	G3T1Q	S1	1B.2
Plagiobothrys diffusus San Francisco popcornflower	PDBOR0V080	None	Endangered	G1Q	S1	1B.1
Polygonum hickmanii Scotts Valley polygonum	PDPGN0L310	Endangered	Endangered	G1	S1	1B.1
Polyphylla barbata Mount Hermon (=barbate) June beetle	IICOL68030	Endangered	None	G1	S1	
Rana boylei foothill yellow-legged frog	AAABH01050	None	Candidate Threatened	G3	S3	SSC
Rana draytonii California red-legged frog	AAABH01022	Threatened	None	G2G3	S2S3	SSC
Riparia riparia bank swallow	ABPAU08010	None	Threatened	G5	S2	
Senecio aphanactis chaparral ragwort	PDAST8H060	None	None	G3	S2	2B.2
Sidalcea malachroides maple-leaved checkerbloom	PDMAL110E0	None	None	G3	S3	4.2
Silene scouleri ssp. scouleri Scouler's catchfly	PDCAR0U1MC	None	None	G5T4T5	S2S3	2B.2



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Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
<i>Speyeria adiastrae adiastrae</i> unsilvered fritillary	IILEPJ6143	None	None	G1G2T1	S1	
<i>Speyeria zerene myrtilleae</i> Myrtle's silverspot butterfly	IILEPJ608C	Endangered	None	G5T1	S1	
<i>Spirinchus thaleichthys</i> longfin smelt	AFCHB03010	Candidate	Threatened	G5	S1	
<i>Stebbinsoseris decipiens</i> Santa Cruz microseris	PDAST6E050	None	None	G2	S2	1B.2
<i>Stuckenia filiformis ssp. alpina</i> slender-leaved pondweed	PMPOT03091	None	None	G5T5	S2S3	2B.2
<i>Stygobromus mackenziei</i> Mackenzie's Cave amphipod	ICMAL05530	None	None	G1	S1	
<i>Taxidea taxus</i> American badger	AMAJF04010	None	None	G5	S3	SSC
<i>Thamnophis sirtalis tetrataenia</i> San Francisco gartersnake	ARADB3613B	Endangered	Endangered	G5T2Q	S2	FP
<i>Trifolium buckwestiorum</i> Santa Cruz clover	PDFAB402W0	None	None	G2	S2	1B.1
<i>Trifolium polyodon</i> Pacific Grove clover	PDFAB402H0	None	Rare	G1	S1	1B.1
<i>Trimerotropis infantilis</i> Zayante band-winged grasshopper	IIORT36030	Endangered	None	G1	S1	
<i>Tryonia imitator</i> mimic tryonia (=California brackishwater snail)	IMGASJ7040	None	None	G2	S2	
<i>Usnea longissima</i> Methuselah's beard lichen	NLLEC5P420	None	None	G4	S4	4.2

Record Count: 115