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:

(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 overseern 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, nutritiional 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, perdiem, 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

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 maintenace 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 movemenet.

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;

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.

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:

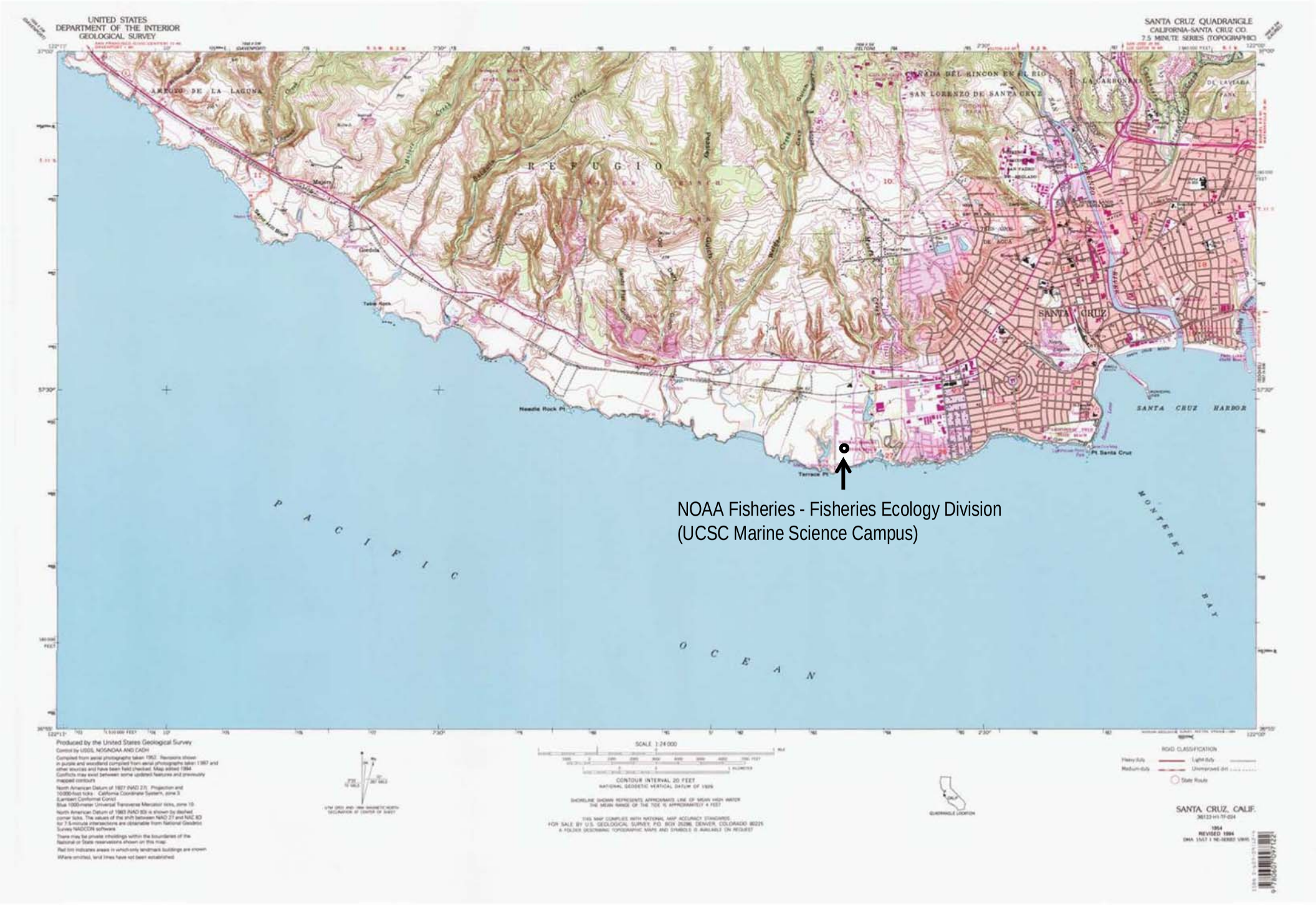
The Grantee will not proceed with on the ground implementation until all necessary permits and consultations are secured. Work in flowing streams is restricted per the Army Corp of Engineers Regional General Permit. Actual project start and end dates, within this timeframe, are at the discretion of the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

Southern Coho Salmon Captive Broodstock Program . Fisheries Ecology Division Rearing Facility
UCSC Marine Science Campus USGS 7.5 Minute Series (Topographic) Santa Cruz Quad.



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

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

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

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

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Lasiurus cinereus hoary bat	AMACC05030	None	None	G5	S4	
Laterallus jamaicensis coturniculus California black rail	ABNME03041	None	Threatened	G3G4T1	S1	FP
Limnanthes douglasii ssp. sulphurea Point Reyes meadowfoam	PDLIM02038	None	Endangered	G4T1	S1	1B.2
Lytta moesta moestan blister beetle	IICOL4C020	None	None	G2	S2	
Malacothamnus arcuatus arcuate bush-mallow	PDMAL0Q0E0	None	None	G2Q	S2	1B.2
Margaritifera falcata 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	
Meta dolloff Dolloff Cave spider	ILARA17010	None	None	G1	S1	
Microseris paludosa marsh microseris	PDAST6E0D0	None	None	G2	S2	1B.2
Mielichhoferia elongata elongate copper moss	NBMUS4Q022	None	None	G5	S4	4.3
Monardella sinuata ssp. nigrescens northern curly-leaved monardella	PDLAM18162	None	None	G3T2	S2	1B.2
Monolopia gracilens 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	
Neochthonius imperialis Empire Cave pseudoscorpion	ILARAD1010	None	None	G1	S1	
Neotoma fuscipes annectens 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	

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 boylii 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

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

Record Count: 115

MBSTP Coho Captive Broodstock and Recovery Program 2019

Introduction:

The Monterey Bay Salmon and Trout Project (MBSTP) will implement the MBSTP Coho Captive Broodstock and Recovery Program. Since 1982, the MBSTP has engaged in captive spawning and rearing of native coho salmon (*Oncorhynchus kisutch*) at the hatchery, and, more recently, has focused on conserving the genetic diversity and supplementing the native coho salmon populations. The Coho Captive Broodstock Program began as a joint venture between NOAA fisheries and MBSTP in 2002. In this project, MBSTP will produce up to 120,000 coho salmon swim-up fry and up to 50,000 parr/smolts at Kingfisher Flat Conservation hatchery (KFH) annually, primarily for release as smolts in local watersheds, and as a source of captive broodstock for the continuation of the program at partner agency rearing facilities. Up to 100 female and 200 male adult coho salmon will be retained annually as captive broodstock at KFH. Sexually mature coho salmon will be spawned according to a genetically informed spawning matrix to minimize inbreeding depression and the likelihood of reduced fitness among progeny. All production fish will be marked by a coded wire tag (CWT) and released to regional watersheds in order to aid ongoing recovery efforts.

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

Objective(s):

The primary project objective is to maintain the viability of coho salmon populations south of San Francisco Bay, and to advance regional recovery efforts. Specific goals in support of this project include:

(1) Spawning of all SCSCBP captive broodstock at Kingfisher Flat Hatchery; (KFH);
(2) Incubation of all collected eggs/fry at KFH;
(3) Husbandry of SCSCBP production fish and age 1+ and age 2+ captive broodstock at KFH; and
(4) Coded-wire tagging (CWT) and release of all production fish.

Project Description:

Location:

Kingfisher Flat Genetic Conservation Hatchery:

The Monterey Bay Salmon and Trout Project (MBSTP) Kingfisher Flat Genetic Conservation Hatchery (hereinafter Kingfisher Flat Hatchery; KFH) is located on Big Creek, a tributary to Scott Creek in Santa Cruz, County, Calif. The hatchery facility sits approximately 0.9 river miles upstream of the confluence of Big Creek

and the mainstem of Scott Creek, and 3.0 river miles from the Pacific Ocean. Physical address: 825 Big Creek Road, Davenport, California 95017. Latitude: 37.089722°, Longitude: -122.230556°.

NOAA Fisheries, Southwest Fisheries Science Center, Fisheries Ecology Division:

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. Physical address: 110 McAllister Way, Santa Cruz, California 95060. Latitude: 36.951667°, Longitude: -122.065000°.

Don Clausen Fish Hatchery:

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 river miles upstream of the confluence of Dry Creek and the mainstem Russian River and 33 river miles from the Pacific Ocean. Physical address: 3246 Skaggs Springs Road, Geyserville, California 95441. Latitude: 38.718333°, Longitude: -123.001111°.

Project Set Up:

MBSTP's Hatchery Manager, Mark Galloway, will be responsible for implementing and overseeing all aspects of fish culture at KFH. He will be applying his professional knowledge and experience to perform and directly oversee the tasks required to manage the hatchery, spawn the brood-fish, incubate the eggs, hatch the eggs, pond the fry, rear the fry to smolt stage, rear the captive brood-fish to maturity, and release fish of all life stages as required by the approved program and permits. Mr. Galloway will also be responsible for making fish husbandry decisions (in cooperation with the FED and CDFW) regarding handling, feed, medications, therapeutic treatments, and other spawning/rearing details. The Hatchery Manager will be assisted in all phases of the work by MBSTP Fish Culturist (FC) Seth Bowman. Mr. Bowman has the knowledge and experience to care for the fish and accomplish program tasks and facility operation during any unavoidable absence of HM Galloway. Mr. Bowman is also responsible for volunteer coordination, training and development. MBSTP's Executive Director (ED) Ben Harris will be responsible for overseeing all MBSTP operations related to this project, as well as grant administration. The ED will be responsible for permit coordination, application, amendments and updating, as well as document generation for planning and compliance. The ED will also manage employee relations and contracts and oversee bookkeeping, payroll and taxes, oversee facilities maintenance and management. The ED will research the adaptation of program elements to changing conditions, confirm that

reporting requirements are being met, and coordinate and facilitate necessary meetings. The Facilities Managers (FM) Bob Anderson and Chuck Backman will manage and oversee the maintenance, repair, and proper function of the hatchery facility. The FM will make regular periodic inspections of the facilities to identify maintenance needs, and ensure consistent functioning of all equipment and systems. The FM will act as purchasing agent for materials related to the maintenance, repair, upgrade of KFH. During spawning season, a minimum of two Spawning Assistants (SA) will work under contract for each of the three spawning seasons covered by the grant term. Chuck Backman has served in this SA capacity for five seasons, and Jessie Bush for three years. Krysten Bush has also served as an additional SA for two seasons. HM Galloway has been satisfied with the efficiency, precision, and reliability of these assistants. Fish Culture Volunteers (FCV) will support hatchery function, security, feeding, and water and weather data collection and recording during weekends and holidays. Additionally, the FCV will assist with special projects, maintenance, and operations as identified by the Hatchery Manager. Payroll and bookeeping/accounting technical services will be provided by Shannon Stevens (Integrated Accounting), and will be overseen by Sam Bishop (MBSTP Treasurer). Regular bookeeeping, accounting and tax return prepartion will be done by Larry Wolf.

Materials:

The following amterials will be used in this project.

- Iodine ($3,840), Sodium Bicarbonate ($17), Ethanol ($300) and Argentyne ($362) will all be used for the disinfection of nets, gloves, needles, trays etc. used in the rearing of fish at KFH. Iodine solution (Iodophor) is the primary disinfecting agent used at KFH. Each of these materials is necessary to ensure optimal rearing conditions, safe handling and general health of fish in captivity at KFH. All disinfection/sanitation materials will be purchased by the applicant (MBSTP).
- Vibrio ($375) and Draxxin ($500) vaccines are required for inoculation against waterborne pathogens for fish in captivity at KFH. These vaccines are required to ensure the health of all fish being held as captive broodstock and release cohorts. All vaccines will be purchased by the applicant (MBSTP).
- Fish food: Various pellet and crumble feed for juvenile coho salmon ($17,025) will be sourced from Bio Oregon, inc., including some which is vitamin enhanced to strengthen the immune systems of individual fish.
- Fish tags: All fish released from KFH will be marked to facilitate program monitoring by partner agencies. Coded wire tags (CWT, $24,000) will be applied to juvenile fish, and disc tags ($870) will be applied to adult fish in captivity at KFH. Rental of a CWT injector and tagging materials ($30,000) are required to facilitate program monitoring. All CWTs and the associated marking equipment will be purchased or rented by the applicant (MBSTP).

- Fish Culture Supplies: various materials are necessary for the maintenance of fish husbandry and retention of captive broodstock and release cohorts at the KFH facility. These materials include, but are not limited to oxygen for fish transport trucks ($800), sample tubes for gamete collection/analysis ($2,505), filters (poly and carbon, $195 and $450, respectively) for various water conveyance systems, tank netting to prevent predator interference or fish escaping the rearing vessel ($400) and vinyl dip nets ($340). Each of these materials is required for the rearing of coho salmon in captivity, and the maintenance of a functioning aquaculture facility at the scale necessary to achieve program goals. All of the above Fish Culture Supplies will be purchased by the applicant (MBSTP). The Moist Air Incubator (MAI) system requires UV Lamps ($1,143) and crystal tube assemblies ($756) to effecitvely sterilize water conveyed to the incubation trays.
- Operating expenses: These costs are necessary for MBSTP's achievement of specified tasks under the project. These expenses include, but are not limited to fish transport costs ($5,500), backup generator fuel ($3,377) and maintenance ($4,200), electricity costs for the KFH facility ($33,000), light bulbs (LED $180, CFL $163), equipment maintenance ($24,000) (including ATV and small machinery), recirculation system upkeep ($2,160), fish rearing systems maintenance ($4,500), facilities access upkeep ($885), and ultrasound calibration ($900). Each of these items is necessary for the continuation of a functioning fish husbandry facility.
- Rental of an office space ($30,000) for MBSTP's administration of the Coho Captive Broodstock Program at KFH.
- Lodging ($3,150) and per-diem ($1,400) for MBSTP staff to travel in fulfillment of project objectives, including broodstock transfers. All of the above-stated items will be purchased by the applicant (MBSTP).

Tasks:

TASK 1: ADULT BROODSTOCK SPAWN AND RIPENESS CHECKS.
Spawn checks are performed at least twice weekly during spawning season using electric fish-handling gloves to anesthetize the fish, and an ultrasound machine to confirm ripeness for spawning.

TASK 2: REARING, HUSBANDRY AND INVENTORY OF CAPTIVE ADULT BROODSTOCK.
MBSTP will rear up to 300 adult coho salmon for retention as captive broodstock annually. Adult fish will be held on hand at KFH, and a proportion will be transferred to CDFW Warm Springs hatchery or the NOAA FED lab. All adult fish in the SCSCBP will be spawned at KFH facility.

TASK 3: MAINTENANCE, REPAIR AND UPKEEP OF THE KINGFISHER FLAT HATCHERY FACILITY.

Building maintenance, equipment and systems maintenance, grounds maintenance, vegetation management, assessing functioning and efficiency of systems and identifying, planning for, and implementing improvements when funding is available.

Many of the significant volunteers, contractors, and staff involved with this process are reimbursed for mileage on their personal vehicles. Systems requiring periodic maintenance include the following: Berry Creek water diversion system, including all piping, screens, primary coarse sediment trap, filtration and water storage systems, valves, back-flushing systems, pumps, and storage tanks. Big Creek water diversion system including all piping, screens, intake box, primary coarse sediment trap, filtration, pumps, valves, and flow gage is maintained. Both water conveyance systems use appropriately sized sand filtration units plumbed in parallel that employ automatic back-flushing systems. All influent water is treated by ultraviolet arrays to sterilize pathogens in the water. The ultraviolet units have light bulbs and sleeves and O-rings that need periodic replacement. Temperature-sensing drop-out units protect the arrays from overheating in the event of low flow volume. The moist air incubator (MAI) water supply has additional pre-filters (both spun poly, and carbon). The MAI has a high-pressure pump, a low-pressure pump, u/v sterilizer, mist emitters, tubing, gaskets, O-rings, seals, pressure gage, thermometer, and sensor system that monitors correct functioning. Wet-lab supplies, weighing scales, a microscope, refrigerator and freezer, chemical storage, and hand tools are maintained. Facilities maintenance includes tools and tool/storage room including carpentry, plumbing, and electrical hand and power tools, chainsaw, pressure washer, portable electric generator, portable gasoline powered high volume pump and hoses, weed-whacker, waders for staff and volunteers, John Deere Gator XUV utility vehicle, and hazmat lockers. Hatchery office with phone system, DSL modem and wireless router, all-in-one printer, copier, scanner, laptop computer, file cabinets, desks, and electric baseboard heat is maintained. Feed room with rodent-resistant feed containers, scoops and measurers, scale, and buckets are maintained. Automatic back-up 20KW electric generator and control panel and assorted fish handling nets are maintained. Water recirculation system including two 3-hp high volume pumps, conveyance plumbing, and de-gassing tower. There are nine primary rearing pools 15-foot diameter or greater, all with predator exclusion and shade systems. Two of the pools dedicated to captive brood-stock have water current generation pumps, two on one pool, one on the other, and an independent water recirculation system including filter tower with fluidized bed, nitrogen reactor, and recirculation pump. Six smaller (12-foot diameter and less) fish rearing/holding vessels all with plumbed water supply and drain systems installed and anti-predator/shade structures. All pools and vessels have plumbed compressed air generated by one primary and one plumbed back-up pump, and a spare pump, manifolds, distribution tubing, and air-stone type diffusers for every vessel, and some pools have additional ‘air-lift’-type aerators plumbed to the compressed air.

Two fish transport trucks are maintained and kept registered, insured, and serviced.

TASK 4: REARING OF UP TO 40,000 CCC COHO SALMON SMOLTS FOR RELEASE ANNUALLY.
MBSTP will rear coho salmon from egg through the smolt stage. This involves the retention and spawning of adult captive broodstock, fertilization of gametes, incubation of eggs and rearing through larval/juvenile development at Kingfisher Flat hatchery. Substantial amounts of pelletized fish food (Bio Oregon) are required for this task.

TASK 5: SPAWNING OF SCSCBP BROODSTOCK AT KFH.
All spawning of broodstock will occur at the Kingfisher Flat hatchery facility. MBSTP will provide facilities, materials and personnel to engage in spawning each season.

TASK 6: TRANSFER OF ADULT BROODSTOCK TO KFH.
MBSTP uses a large fish transport truck to move broodstock from WSH and the NOAA FED lab back to KFH for spawning. Only ripe and near-ripe females are transferred to KFH, along with enough males to execute the spawning matrix. Trips to the NOAA FED and WSH are made weekly during spawning season. About seven trips are made over the course of a season.

TASK 7: SEASONAL SPAWNING PREPARATIONS.
Each season, MBSTP undertakes extensive preparation for spawning events. The Moist Air Incubator (MAI) is sterilized and tested, scheduled maintenance is provided to the MAI, replacement of UV light bulbs, tubes, arrays, sensors, door seals, mist emitters, etc. The vertical tray incubators are cleaned and sterilized. Adequate supplies of an assortment of disinfectants, drugs, tags and other fish culture supplies are confirmed. Supplies for hatchery operation such as nets, containers, brushes, paper goods, lab supplies, waders, buckets and operational supplies are checked to confirm adequacy for another season of use.

TASK 8: TAGGING OF ALL RELEASED FISH AND CAPTIVE BROODSTOCK (CWT / DISC).
MBSTP will tag (mark) all fish designated for release with sequential Coded-Wire Tags (CWT). Fish may be tagged in early development (to facilitate unfed fry/ autumn parr releases) or as they approach smolt stage. MBSTP will purchase the CWTs and rent necessary tagging equipment (CWT injector) to facilitate program monitoring.

Additionally, MBSTP will externally disc-tag all adult broodstock at KFH for identification and spawning matrix validation purposes. All adult fish will be tagged both with CWT and external disc tag prior to any release to the wild.

MBSTP will help facilitate PIT tagging operations carried out by project partner NOAA FED.

TASK 9: PROGRAM ADMINISTRATION.
The MBSTP Executive Director administers grant funds, manages contracts and employees, oversee all phases of the operation to ensure and verify effective operation, writes, reviews, and submits reports and ensures compliance. The MBSTP ED coordinates and manages permitting of all aspects of this project, interfaces with public agencies for planning and coordination purposes, oversees bookkeeping, payroll, and tax return preparation, manages landowner relations, and ensures compliance with workplace documentation requirements. The ED also engages in education and outreach to assist the Board of Directors in the cultivation of new members and donors, volunteers and Board members. The ED also manages project promotional efforts and public image.

TASK 10: BOOKKEEPING.
Accurate bookkeeping of the Program is necessary to facilitate grant administration, professional payroll and tax return preparation.

Deliverables:

TASK 1: ADULT BROODSTOCK SPAWN AND RIPENESS CHECKS.
Provision of up to 300 sexually mature (ripe) adult CCC coho salmon broodstock annually.

TASK 2: REARING, HUSBANDRY AND INVENTORY OF CAPTIVE ADULT BROODSTOCK.
Up to 300 adult coho salmon captive broodstock provided annually in order to support SCSCBP goals. MBSTP will assist with preparations and inventories of captive broodstock to be spawned during each upcoming season. These are performed at KFH, the NOAA FED lab and WSH by MBSTP and FED staff. Travel to the rearing site and overnight stays are required to accomplish this task. The size, development and sex of the fish are determined, genetic tissue samples are taken for genotyping, and the ultrasound is used to make initial survey of gonadal development. Spawning of Adult transfer/release levels are dependent upon planning from the MBSTP Technical Oversight Committee (TOC).

TASK 3: MAINTENANCE, REPAIR AND UPKEEP OF THE KINGFISHER FLAT HATCHERY FACILITY.
A fully operational, staffed and administered conservation hatchery achieving the highest possible egg viability, and capable of releasing genetically diverse and

locally-adapted native coho salmon. Opportunities to increase the production and out-planting numbers will be explored, evaluated, and when feasible, implemented each season.

TASK 4: REARING OF UP TO 40,000 CCC COHO SALMON SMOLTS FOR RELEASE ANNUALLY.
Up to 40,000 Central California Coast coho salmon smolts annually. Actual production numbers will be dependent upon broodstock availability, environmental and rearing conditions, and facilities limitations at Kingfisher Flat hatchery.

TASK 5: SPAWNING OF SCSCBP BROODSTOCK AT KFH.
Materials, facilities and personnel necessary for spawning of all adult broodstock within the SCSCBP. This includes help with spawning-take, fertilization and incubation. Spawning events require a team of at least six individuals to accomplish efficiently and securely. MBSTP will provide volunteer effort in support of each spawning event at KFH.

TASK 6: TRANSFER OF ADULT BROODSTOCK TO KFH.
Adult broodstock selected by the parental spawning matrix are all transferred by MBSTP to the KFH facility throughout the spawning season.

TASK 7: SEASONAL SPAWNING PREPARATIONS.
Provision of materials necessary for spawn-take from adult broodstock each season. MBSTP will ensure adequate supplies, materials, spawning and incubation infrastructure are in place prior to each spawning season.

TASK 8: TAGGING OF ALL RELEASED FISH AND CAPTIVE BROODSTOCK (CWT / DISC).
Tags and tagging equipment for up to 70,000 coho salmon annually. The actual number of fish tagged will be dependent upon annual production levels, but 100% of fish released from KFH will be tagged via CWT.

TASK 9: PROGRAM ADMINISTRATION.
MBSTP will acquire the necessary permits, volunteer resources, organizational infrastructure, and facilitate program planning/coordination in pursuit of SCSBP goals on behalf of MBSTP. Monthly hatchery reports and year-end summary reports will be submitted. The monthly reports will include: Number and species of fish on hand at month's end and inventory adjustments; Number of mortalities and causes; Average fish size; Amount of feed consumed and feed rate; Water flow through rearing facilities in gallons per minute; Water quality and precipitation; Summary of activities, accomplishments, significant events and volunteer hours contributed during each month. The year-end summary reports will include: Fish culture protocols, Adult coho brood-fish collection plan; coho

salmon brood-fish spawning, incubating and rearing summaries, Juvenile fish marking, planting numbers and planting location summaries.

TASK 10: BOOKKEEPING.
MBSTP will coordinate funding, prepare tax documentation and oversee personnel/staffing considerations for all Program personnel.

Timelines:

TASK 1: ADULT BROODSTOCK SPAWN AND RIPENESS CHECKS.
06/01/2020 – 05/31/2023

TASK 2: REARING, HUSBANDRY AND INVENTORY OF CAPTIVE ADULT BROODSTOCK.
06/01/2020 – 05/31/2023

TASK 3: MAINTENANCE, REPAIR AND UPKEEP OF THE KINGFISHER FLAT HATCHERY FACILITY.
06/01/2020 – 05/31/2023

TASK 4: REARING OF UP TO 40,000 CCC COHO SALMON SMOLTS FOR RELEASE ANNUALLY.
06/01/2020 – 05/31/2023

TASK 5: SPAWNING OF SCSCBP BROODSTOCK AT KFH.
06/01/2020 – 05/31/2023

TASK 6: TRANSFER OF ADULT BROODSTOCK TO KFH.
06/01/2020 – 05/31/2023

TASK 7: SEASONAL SPAWNING PREPARATIONS.
06/01/2020 – 05/31/2023

TASK 8: TAGGING OF ALL RELEASED FISH AND CAPTIVE BROODSTOCK (CWT / DISC).
06/01/2020 – 05/31/2023

TASK 9: PROGRAM ADMINISTRATION.
06/01/2020 – 05/31/2023

TASK 10: BOOKKEEPING.
06/01/2020 – 05/31/2023

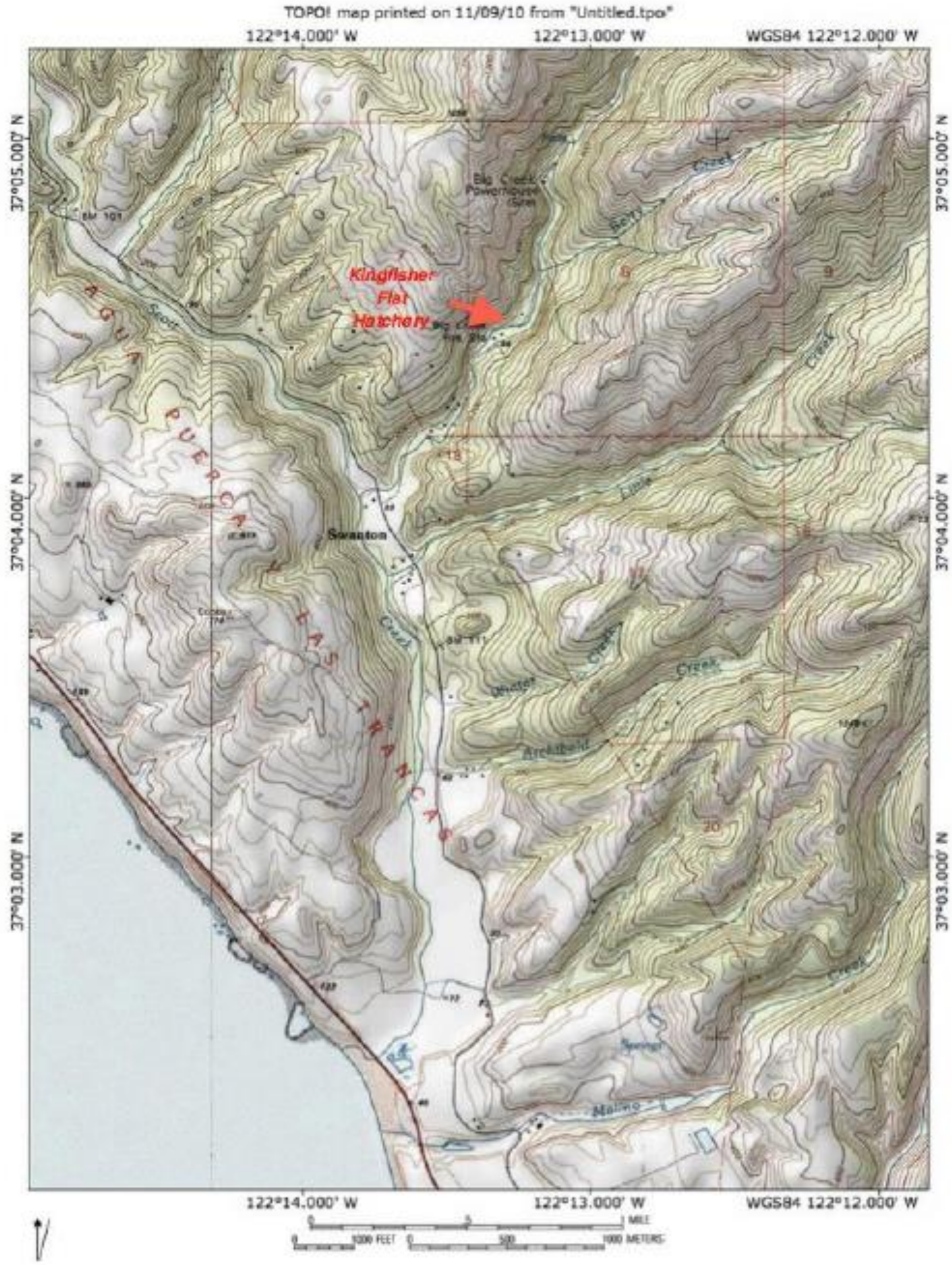
Additional Requirements:

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 12. 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 area.


TOPO! map printed on 11/09/10 from "Untitled.tpo"
122°14.000' W
122°13.000' W
WGS84 122°12.000' W
37°05.000' N
37°04.000' N
37°03.000' N
Kingfisher Flat Hatchery
Big Creek Powerhouse
AGUA PUERCA Y LAS TRANCAS
Swanton
Scott
Little
Creek
Archibald
Mill
MILE
1000 FEET
1000 METERS

Selected Elements by Scientific Name

California Department of Fish and Wildlife

California Natural Diversity Database

Query Criteria: Quad IS (Davenport (3712212) OR Santa Cruz (3612281) OR Warm Springs Dam (3812361) OR Asti (3812278) OR Geyserville (3812268) OR Guerneville (3812258) OR Cazadero (3812351) OR Fort Ross (3812352) OR Tombs Creek (3812362) OR Big Foot Mtn. (3812372) OR Cloverdale (3812371) OR Franklin Point (3712223) OR Big Basin (3712222) OR Castle Rock Ridge (3712221) OR Los Gatos (3712128) OR Laurel (3712118) OR Felton (3712211) OR Soquel (3612188))

Possible species within the Davenport, Santa Cruz and Warm Springs Dam and their surrounding quads for 3063 MBSTP Coho Captive Broodstock and Recovery Program, Sonoma and Santa Cruz Counties

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Accipiter cooperii Cooper's hawk	ABNKC12040	None	None	G5	S4	WL
Adela oplerella Opler's longhorn moth	IILEE0G040	None	None	G2	S2	
Agelaius tricolor tricolored blackbird	ABPBXB0020	None	Threatened	G2G3	S1S2	SSC
Agrostis blasdalei Blasdale's bent grass	PMPOA04060	None	None	G2	S2	1B.2
Allium peninsulare var. franciscanum Franciscan onion	PMLIL021R1	None	None	G5T2	S2	1B.2
Ambystoma californiense California tiger salamander	AAAAA01180	Threatened	Threatened	G2G3	S2S3	WL
Ambystoma macrodactylum croceum Santa Cruz long-toed salamander	AAAAA01082	Endangered	Endangered	G5T1T2	S1S2	FP
Amorpha californica var. napensis Napa false indigo	PDFAB08012	None	None	G4T2	S2	1B.2
Amsinckia lunaris bent-flowered fiddleneck	PDBOR01070	None	None	G3	S3	1B.2
Aneides flavipunctatus niger Santa Cruz black salamander	AAAAD01070	None	None	G3	S3	SSC
Anomobryum julaceum slender silver moss	NBMUS80010	None	None	G5?	S2	4.2
Antrozous pallidus pallid bat	AMACC10010	None	None	G5	S3	SSC
Aquila chrysaetos golden eagle	ABNKC22010	None	None	G5	S3	FP
Arborimus pomo Sonoma tree vole	AMAFF23030	None	None	G3	S3	SSC
Arctostaphylos andersonii Anderson's manzanita	PDERI04030	None	None	G2	S2	1B.2
Arctostaphylos bakeri ssp. sublaevis The Cedars manzanita	PDERI04222	None	Rare	G2T2	S2	1B.2
Arctostaphylos glutinosa Schreiber's manzanita	PDERI040G0	None	None	G1	S1	1B.2

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Arctostaphylos manzanita ssp. elegans Konocti manzanita	PDERI04271	None	None	G5T3	S3	1B.3
Arctostaphylos ohloneana Ohlone manzanita	PDERI042Y0	None	None	G1	S1	1B.1
Arctostaphylos regismontana Kings Mountain manzanita	PDERI041C0	None	None	G2	S2	1B.2
Arctostaphylos silvicola Bonny Doon manzanita	PDERI041F0	None	None	G1	S1	1B.2
Arctostaphylos stanfordiana ssp. decumbens Rincon Ridge manzanita	PDERI041G4	None	None	G3T1	S1	1B.1
Arctostaphylos stanfordiana ssp. raichei Raiche's manzanita	PDERI041G2	None	None	G3T2	S2	1B.1
Ardea herodias great blue heron	ABNGA04010	None	None	G5	S4	
Arenaria paludicola marsh sandwort	PDCAR040L0	Endangered	Endangered	G1	S1	1B.1
Athene cunicularia burrowing owl	ABNSB10010	None	None	G4	S3	SSC
Bombus caliginosus obscure bumble bee	IIHYM24380	None	None	G4?	S1S2	
Bombus occidentalis western bumble bee	IIHYM24250	None	None	G2G3	S1	
Brachyramphus marmoratus marbled murrelet	ABNNN06010	Threatened	Endangered	G3G4	S1	
Brodiaea leptandra narrow-anthered brodiaea	PMLIL0C022	None	None	G3?	S3?	1B.2
Calasellus californicus An isopod	ICMAL34010	None	None	G2	S2	
Calochortus raichei The Cedars fairy-lantern	PMLIL0D1L0	None	None	G2	S2	1B.2
Calyptridium parryi var. hesseae Santa Cruz Mountains pussypaws	PDPOR09052	None	None	G3G4T2	S2	1B.1
Campanula californica swamp harebell	PDCAM02060	None	None	G3	S3	1B.2
Carex comosa bristly sedge	PMCYP032Y0	None	None	G5	S2	2B.1
Carex saliniformis deceiving sedge	PMCYP03BY0	None	None	G2	S2	1B.2
Ceanothus confusus Rincon Ridge ceanothus	PDRHA04220	None	None	G1	S1	1B.1
Ceanothus purpureus holly-leaved ceanothus	PDRHA04160	None	None	G2	S2	1B.2

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Centromadia parryi ssp. congdonii Congdon's tarplant	PDAST4R0P1	None	None	G3T1T2	S1S2	1B.1
Charadrius alexandrinus nivosus western snowy plover	ABNNB03031	Threatened	None	G3T3	S2S3	SSC
Chlorogalum pomeridianum var. minus dwarf soaproot	PMLIL0G042	None	None	G5T3	S3	1B.2
Chorizanthe pungens var. hartwegiana Ben Lomond spineflower	PDPGN040M1	Endangered	None	G2T1	S1	1B.1
Chorizanthe pungens var. pungens Monterey spineflower	PDPGN040M2	Threatened	None	G2T2	S2	1B.2
Chorizanthe robusta var. hartwegii Scotts Valley spineflower	PDPGN040Q1	Endangered	None	G2T1	S1	1B.1
Chorizanthe robusta var. robusta robust spineflower	PDPGN040Q2	Endangered	None	G2T1	S1	1B.1
Chorizanthe valida Sonoma spineflower	PDPGN040V0	Endangered	Endangered	G1	S1	1B.1
Cicindela hirticollis gravida sandy beach tiger beetle	IICOL02101	None	None	G5T2	S2	
Cicindela ohlone Ohlone tiger beetle	IICOL026L0	Endangered	None	G1	S1	
Cirsium andrewsii Franciscan thistle	PDAST2E050	None	None	G3	S3	1B.2
Cirsium fontinale var. campylon Mt. Hamilton fountain thistle	PDAST2E163	None	None	G2T2	S2	1B.2
Clarkia concinna ssp. automixa Santa Clara red ribbons	PDONA050A1	None	None	G5?T3	S3	4.3
Coastal Terrace Prairie Coastal Terrace Prairie	CTT41100CA	None	None	G2	S2.1	
Coelus globosus globose dune beetle	IICOL4A010	None	None	G1G2	S1S2	
Collinsia multicolor San Francisco collinsia	PDSCR0H0B0	None	None	G2	S2	1B.2
Cordylanthus tenuis ssp. capillaris Pennell's bird's-beak	PDSCR0J0S2	Endangered	Rare	G4G5T1	S1	1B.2
Corynorhinus townsendii Townsend's big-eared bat	AMACC08010	None	None	G3G4	S2	SSC
Coturnicops noveboracensis yellow rail	ABNME01010	None	None	G4	S1S2	SSC
Cryptantha dissita serpentine cryptantha	PDBOR0A0H2	None	None	G2	S2	1B.2
Cypseloides niger black swift	ABNUA01010	None	None	G4	S2	SSC

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Dacryophyllum falcifolium tear drop moss	NBMUS8Z010	None	None	G2	S2	1B.3
Danaus plexippus pop. 1 monarch - California overwintering population	IILEPP2012	None	None	G4T2T3	S2S3	
Dicamptodon ensatus California giant salamander	AAAAH01020	None	None	G3	S2S3	SSC
Dipodomys venustus venustus Santa Cruz kangaroo rat	AMAFD03042	None	None	G4T1	S1	
Dubiraphia giulianii Giuliani's dubiraphian riffle beetle	IICOL5A020	None	None	G1G3	S1S3	
Dudleya abramsii ssp. setchellii Santa Clara Valley dudleya	PDCRA040Z0	Endangered	None	G4T2	S2	1B.1
Elanus leucurus white-tailed kite	ABNKC06010	None	None	G5	S3S4	FP
Emys marmorata western pond turtle	ARAAD02030	None	None	G3G4	S3	SSC
Erethizon dorsatum North American porcupine	AMAFJ01010	None	None	G5	S3	
Erigeron greenei Greene's narrow-leaved daisy	PDAST3M5G0	None	None	G3	S3	1B.2
Erigeron serpentinus serpentine daisy	PDAST3M5M0	None	None	G2	S2	1B.3
Eriogonum cedrorum The Cedars buckwheat	PDPGN087A0	None	None	G1	S1	1B.3
Eriogonum nudum var. decurrens Ben Lomond buckwheat	PDPGN08492	None	None	G5T1	S1	1B.1
Erysimum ammophilum sand-loving wallflower	PDBRA16010	None	None	G2	S2	1B.2
Erysimum teretifolium Santa Cruz wallflower	PDBRA160N0	Endangered	Endangered	G1	S1	1B.1
Eucyclogobius newberryi tidewater goby	AFCQN04010	Endangered	None	G3	S3	SSC
Euphilotes enoptes smithi Smith's blue butterfly	IILEPG2026	Endangered	None	G5T1T2	S1S2	
Falco peregrinus anatum American peregrine falcon	ABNKD06071	Delisted	Delisted	G4T4	S3S4	FP
Fissidens pauperculus minute pocket moss	NBMUS2W0U0	None	None	G3?	S2	1B.2
Fissilicreagris imperialis Empire Cave pseudoscorpion	ILARAE5010	None	None	G1	S1	
Fritillaria liliacea fragrant fritillary	PMLIL0V0C0	None	None	G2	S2	1B.2

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Geothlypis trichas sinuosa saltmarsh common yellowthroat	ABPBX1201A	None	None	G5T3	S3	SSC
Grimmia torenii Toren's grimmia	NBMUS32330	None	None	G2	S2	1B.3
Grimmia vaginulata vaginulate grimmia	NBMUS32340	None	None	G2G3	S1	1B.1
Hemizonia congesta ssp. congesta congested-headed hayfield tarplant	PDAST4R065	None	None	G5T2	S2	1B.2
Hesperevax sparsiflora var. brevifolia short-leaved evax	PDASTE5011	None	None	G4T3	S2	1B.2
Hesperocyparis abramsiana var. abramsiana Santa Cruz cypress	PGCUP04081	Threatened	Endangered	G1T1	S1	1B.2
Hesperocyparis abramsiana var. butanoensis Butano Ridge cypress	PGCUP04082	Threatened	Endangered	G1T1	S1	1B.2
Hoita strobilina Loma Prieta hoita	PDFAB5Z030	None	None	G2?	S2?	1B.1
Holocarpha macradenia Santa Cruz tarplant	PDAST4X020	Threatened	Endangered	G1	S1	1B.1
Horkelia cuneata var. sericea Kellogg's horkelia	PDROS0W043	None	None	G4T1?	S1?	1B.1
Horkelia marinensis Point Reyes horkelia	PDROS0W0B0	None	None	G2	S2	1B.2
Horkelia tenuiloba thin-lobed horkelia	PDROS0W0E0	None	None	G2	S2	1B.2
Hysterocarpus traskii pomo Russian River tule perch	AFCQK02011	None	None	G5T4	S4	SSC
Kopsiopsis hookeri small groundcone	PDORO01010	None	None	G4?	S1S2	2B.3
Lasiurus blossevillii western red bat	AMACC05060	None	None	G5	S3	SSC
Lasiurus cinereus hoary bat	AMACC05030	None	None	G5	S4	
Lasthenia californica ssp. macrantha perennial goldfields	PDAST5L0C5	None	None	G3T2	S2	1B.2
Laterallus jamaicensis coturniculus California black rail	ABNME03041	None	Threatened	G3G4T1	S1	FP
Lathyrus palustris marsh pea	PDFAB250P0	None	None	G5	S2	2B.2
Lavinia symmetricus parvipinnis Gualala roach	AFCJB19025	None	None	G4T1T2	S2S3	SSC
Layia septentrionalis Colusa layia	PDAST5N0F0	None	None	G2	S2	1B.2

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Leptosiphon jepsonii Jepson's leptosiphon	PDPLM09140	None	None	G2G3	S2S3	1B.2
Lessingia micradenia var. glabrata smooth lessingia	PDAST5S062	None	None	G2T2	S2	1B.2
Limnanthes douglasii ssp. sulphurea Point Reyes meadowfoam	PDLIM02038	None	Endangered	G4T1	S1	1B.2
Linderiella occidentalis California linderiella	ICBRA06010	None	None	G2G3	S2S3	
Lupinus sericatus Cobb Mountain lupine	PDFAB2B3J0	None	None	G2?	S2?	1B.2
Lytta moesta moestan blister beetle	IICOL4C020	None	None	G2	S2	
Malacothamnus arcuatus arcuate bush-mallow	PDMAL0Q0E0	None	None	G2Q	S2	1B.2
Margaritifera falcata 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	
Meta dolloff Dolloff Cave spider	ILARA17010	None	None	G1	S1	
Microseris paludosa marsh microseris	PDAST6E0D0	None	None	G2	S2	1B.2
Mielichhoferia elongata elongate copper moss	NBMUS4Q022	None	None	G5	S4	4.3
Monardella sinuata ssp. nigrescens northern curly-leaved monardella	PDLAM18162	None	None	G3T2	S2	1B.2
Monolopia gracilens woodland woollythreads	PDAST6G010	None	None	G3	S3	1B.2
Monterey Pine Forest Monterey Pine Forest	CTT83130CA	None	None	G1	S1.1	
Myotis yumanensis Yuma myotis	AMACC01020	None	None	G5	S4	
N. Central Coast Calif. Roach/Stickleback/Steelhead Stream N. Central Coast Calif. Roach/Stickleback/Steelhead Stream	CARA2633CA	None	None	GNR	SNR	
Neochthonius imperialis Empire Cave pseudoscorpion	ILARAD1010	None	None	G1	S1	
Neotoma fuscipes annectens 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	

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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	
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
Plagiobothrys glaber hairless popcornflower	PDBOR0V0B0	None	None	GH	SH	1A
Polygonum hickmanii Scotts Valley polygonum	PDPGN0L310	Endangered	Endangered	G1	S1	1B.1
Polyphylla barbata Mount Hermon (=barbate) June beetle	IICOL68030	Endangered	None	G1	S1	
Progne subis purple martin	ABPAU01010	None	None	G5	S3	SSC
Ramalina thrausta angel's hair lichen	NLLEC3S340	None	None	G5	S2?	2B.1

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Rana boylii 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	
Sanicula saxatilis rock sanicle	PDAPI1Z0H0	None	Rare	G2	S2	1B.2
Senecio aphanactis chaparral ragwort	PDAST8H060	None	None	G3	S2	2B.2
Sidalcea malachroides maple-leaved checkerbloom	PDMAL110E0	None	None	G3	S3	4.2
Sidalcea malviflora ssp. purpurea purple-stemmed checkerbloom	PDMAL110FL	None	None	G5T1	S1	1B.2
Silene scouleri ssp. scouleri Scouler's catchfly	PDCAR0U1MC	None	None	G5T4T5	S2S3	2B.2
Speyeria adiaste adiaste unsilvered fritillary	IILEPJ6143	None	None	G1G2T1	S1	
Speyeria zerene myrtleae Myrtle's silverspot butterfly	IILEPJ608C	Endangered	None	G5T1	S1	
Spirinchus thaleichthys longfin smelt	AFCHB03010	Candidate	Threatened	G5	S1	
Stebbinsoseris decipiens Santa Cruz microseris	PDAST6E050	None	None	G2	S2	1B.2
Streptanthus albidus ssp. peramoenus most beautiful jewelflower	PDBRA2G012	None	None	G2T2	S2	1B.2
Streptanthus glandulosus ssp. hoffmanii Hoffman's bristly jewelflower	PDBRA2G0J4	None	None	G4T2	S2	1B.3
Streptanthus morrisonii ssp. hirtiflorus Dorr's Cabin jewelflower	PDBRA2G0S2	None	None	G2T1	S1	1B.2
Streptanthus morrisonii ssp. morrisonii Morrison's jewelflower	PDBRA2G0S3	None	None	G2T1?	S1?	1B.2
Stuckenia filiformis ssp. alpina slender-leaved pondweed	PMPOT03091	None	None	G5T5	S2S3	2B.2
Stygobromus mackenziei Mackenzie's Cave amphipod	ICMAL05530	None	None	G1	S1	
Syncaris pacifica California freshwater shrimp	ICMAL27010	Endangered	Endangered	G2	S2	
Taricha rivularis red-bellied newt	AAAAF02020	None	None	G4	S2	SSC
Taxidea taxus American badger	AMAJF04010	None	None	G5	S3	SSC

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Thaleichthys pacificus eulachon	AFCHB04010	Threatened	None	G5	S3	
Thamnophis sirtalis tetrataenia San Francisco gartersnake	ARADB3613B	Endangered	Endangered	G5T2Q	S2	FP
Tracyina rostrata beaked tracyina	PDAST9D010	None	None	G2	S2	1B.2
Trifolium buckwestiorum Santa Cruz clover	PDFAB402W0	None	None	G2	S2	1B.1
Trifolium polyodon Pacific Grove clover	PDFAB402H0	None	Rare	G1	S1	1B.1
Trimerotropis infantilis Zayante band-winged grasshopper	IIORT36030	Endangered	None	G1	S1	
Tryonia imitator mimic tryonia (=California brackishwater snail)	IMGASJ7040	None	None	G2	S2	
Usnea longissima Methuselah's beard lichen	NLLEC5P420	None	None	G4	S4	4.2

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