

# 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 bookkeeping/accounting technical services will be provided by Shannon Stevens (Integrated Accounting), and will be overseen by Sam Bishop (MBSTP Treasurer). Regular bookkeeping, accounting and tax return preparation will be done by Larry Wolf.

## **Materials:**

The following materials 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 effectively 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 SCSCBP 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

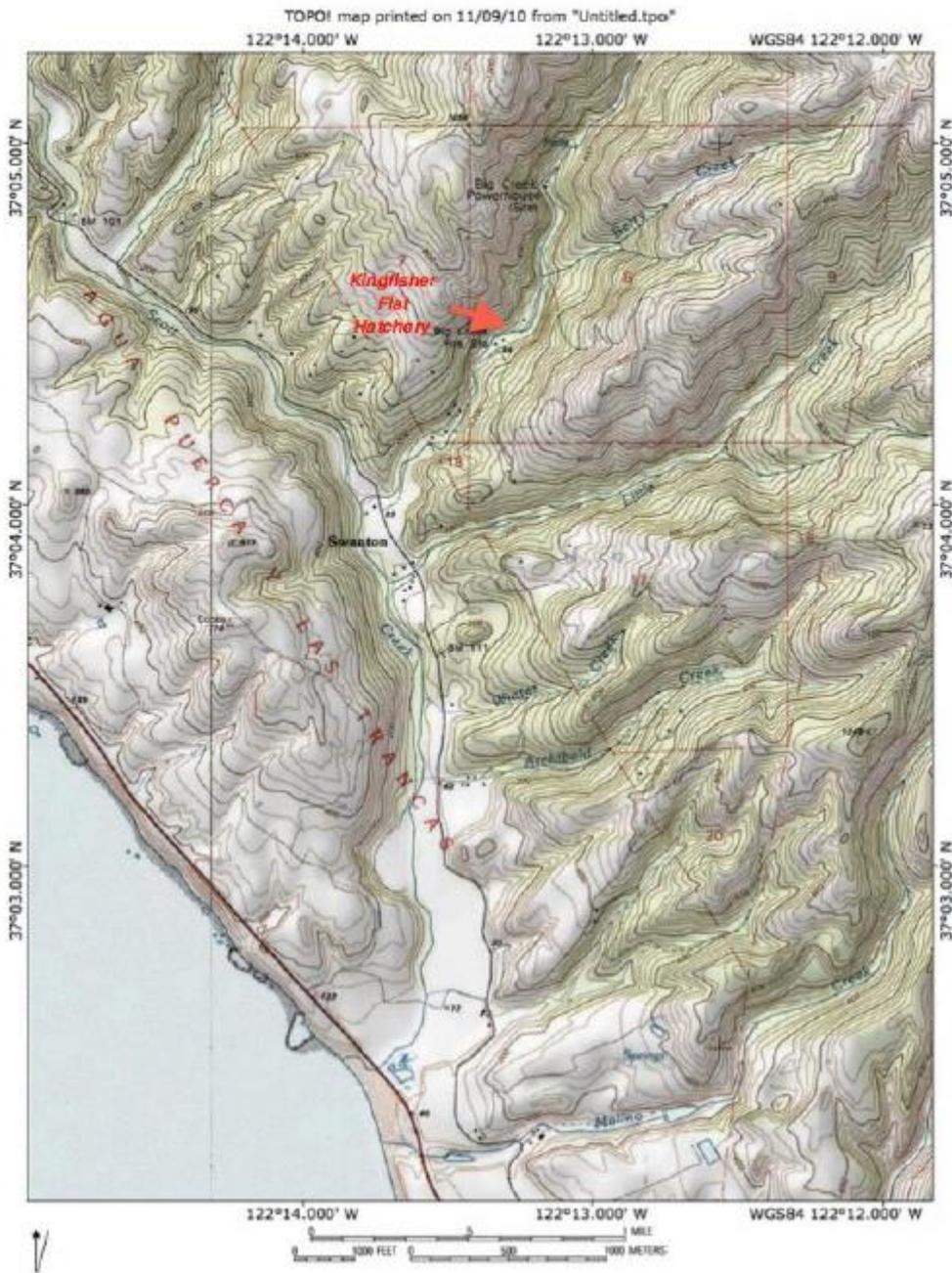
## **Additional Requirements:**

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.





# Selected Elements by Scientific Name

California Department of Fish and Wildlife

California Natural Diversity Database



**Query Criteria:** Quad (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
<i>Accipiter cooperii</i> Cooper's hawk	ABNKC12040	None	None	G5	S4	WL
<i>Adela oplerella</i> Opler's longhorn moth	IILEE0G040	None	None	G2	S2	
<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>Allium peninsulare var. franciscanum</i> Franciscan onion	PMLIL021R1	None	None	G5T2	S2	1B.2
<i>Ambystoma californiense</i> California tiger salamander	AAAAA01180	Threatened	Threatened	G2G3	S2S3	WL
<i>Ambystoma macrodactylum croceum</i> Santa Cruz long-toed salamander	AAAAA01082	Endangered	Endangered	G5T1T2	S1S2	FP
<i>Amorpha californica var. napensis</i> Napa false indigo	PDFAB08012	None	None	G4T2	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>Aquila chrysaetos</i> golden eagle	ABNKC22010	None	None	G5	S3	FP
<i>Arborimus pomo</i> Sonoma tree vole	AMAFF23030	None	None	G3	S3	SSC
<i>Arctostaphylos andersonii</i> Anderson's manzanita	PDERI04030	None	None	G2	S2	1B.2
<i>Arctostaphylos bakeri ssp. sublaevis</i> The Cedars manzanita	PDERI04222	None	Rare	G2T2	S2	1B.2
<i>Arctostaphylos glutinosa</i> Schreiber's manzanita	PDERI040G0	None	None	G1	S1	1B.2



Selected Elements by Scientific Name  
California Department of Fish and Wildlife  
California Natural Diversity Database



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



Selected Elements by Scientific Name  
California Department of Fish and Wildlife  
California Natural Diversity Database



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



Selected Elements by Scientific Name  
California Department of Fish and Wildlife  
California Natural Diversity Database



Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
<i>Dacryophyllum falcifolium</i> tear drop moss	NBMUS8Z010	None	None	G2	S2	1B.3
<i>Danaus plexippus pop. 1</i> 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>Dubiraphia giuliani</i> Giuliani's dubiraphian riffle beetle	IICOL5A020	None	None	G1G3	S1S3	
<i>Dudleya abramsii ssp. setchellii</i> Santa Clara Valley dudleya	PDCRA040Z0	Endangered	None	G4T2	S2	1B.1
<i>Elanus leucurus</i> white-tailed kite	ABNKC06010	None	None	G5	S3S4	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>Erigeron greenei</i> Greene's narrow-leaved daisy	PDAST3M5G0	None	None	G3	S3	1B.2
<i>Erigeron serpentinus</i> serpentine daisy	PDAST3M5M0	None	None	G2	S2	1B.3
<i>Eriogonum cedrorum</i> The Cedars buckwheat	PDPGN087A0	None	None	G1	S1	1B.3
<i>Eriogonum nudum var. 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



Selected Elements by Scientific Name  
California Department of Fish and Wildlife  
California Natural Diversity Database



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



Selected Elements by Scientific Name  
California Department of Fish and Wildlife  
California Natural Diversity Database



Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
<b><i>Leptosiphon jepsonii</i></b> Jepson's leptosiphon	PDPLM09140	None	None	G2G3	S2S3	1B.2
<b><i>Lessingia micradenia</i> var. <i>glabrata</i></b> smooth lessingia	PDAST5S062	None	None	G2T2	S2	1B.2
<b><i>Limnanthes douglasii</i> ssp. <i>sulphurea</i></b> Point Reyes meadowfoam	PDLIM02038	None	Endangered	G4T1	S1	1B.2
<b><i>Linderiella occidentalis</i></b> California linderiella	ICBRA06010	None	None	G2G3	S2S3	
<b><i>Lupinus sericatus</i></b> Cobb Mountain lupine	PDFAB2B3J0	None	None	G2?	S2?	1B.2
<b><i>Lytta moesta</i></b> moestan blister beetle	IICOL4C020	None	None	G2	S2	
<b><i>Malacothamnus arcuatus</i></b> arcuate bush-mallow	PDMAL0Q0E0	None	None	G2Q	S2	1B.2
<b><i>Margaritifera falcata</i></b> western pearlshell	IMBIV27020	None	None	G4G5	S1S2	
<b>Maritime Coast Range Ponderosa Pine Forest</b> Maritime Coast Range Ponderosa Pine Forest	CTT84132CA	None	None	G1	S1.1	
<b><i>Meta dolloff</i></b> Dolloff Cave spider	ILARA17010	None	None	G1	S1	
<b><i>Microseris paludosa</i></b> marsh microseris	PDAST6E0D0	None	None	G2	S2	1B.2
<b><i>Mielichhoferia elongata</i></b> elongate copper moss	NBMUS4Q022	None	None	G5	S4	4.3
<b><i>Monardella sinuata</i> ssp. <i>nigrescens</i></b> northern curly-leaved monardella	PDLAM18162	None	None	G3T2	S2	1B.2
<b><i>Monolopia gracilens</i></b> woodland woollythreads	PDAST6G010	None	None	G3	S3	1B.2
<b>Monterey Pine Forest</b> Monterey Pine Forest	CTT83130CA	None	None	G1	S1.1	
<b><i>Myotis yumanensis</i></b> Yuma myotis	AMACC01020	None	None	G5	S4	
<b>N. Central Coast Calif. Roach/Stickleback/Steelhead Stream</b> N. Central Coast Calif. Roach/Stickleback/Steelhead Stream	CARA2633CA	None	None	GNR	SNR	
<b><i>Neochthonius imperialis</i></b> Empire Cave pseudoscorpion	ILARAD1010	None	None	G1	S1	
<b><i>Neotoma fuscipes annectens</i></b> San Francisco dusky-footed woodrat	AMAFF08082	None	None	G5T2T3	S2S3	SSC
<b>North Central Coast Drainage Sacramento Sucker/Roach River</b> North Central Coast Drainage Sacramento Sucker/Roach River	CARA2623CA	None	None	GNR	SNR	



Selected Elements by Scientific Name  
California Department of Fish and Wildlife  
California Natural Diversity Database



Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
<b>North Central Coast Short-Run Coho Stream</b> North Central Coast Short-Run Coho Stream	CARA2632CA	None	None	GNR	SNR	
<b>Northern Coastal Salt Marsh</b> Northern Coastal Salt Marsh	CTT52110CA	None	None	G3	S3.2	
<b>Northern Interior Cypress Forest</b> Northern Interior Cypress Forest	CTT83220CA	None	None	G2	S2.2	
<b>Northern Maritime Chaparral</b> Northern Maritime Chaparral	CTT37C10CA	None	None	G1	S1.2	
<b>Oncorhynchus kisutch pop. 4</b> coho salmon - central California coast ESU	AFCHA02034	Endangered	Endangered	G4	S2?	
<b>Oncorhynchus mykiss irideus pop. 8</b> steelhead - central California coast DPS	AFCHA0209G	Threatened	None	G5T2T3Q	S2S3	
<b>Orthotrichum kellmanii</b> Kellman's bristle moss	NBMUS56190	None	None	G2	S2	1B.2
<b>Pandion haliaetus</b> osprey	ABNKC01010	None	None	G5	S4	WL
<b>Pedicularis dudleyi</b> Dudley's lousewort	PDSCR1K0D0	None	Rare	G2	S2	1B.2
<b>Penstemon rattanii var. kleei</b> Santa Cruz Mountains beardtongue	PDSCR1L5B1	None	None	G4T2	S2	1B.2
<b>Pentachaeta bellidiflora</b> white-rayed pentachaeta	PDAST6X030	Endangered	Endangered	G1	S1	1B.1
<b>Philanthus nasalis</b> Antioch specid wasp	IIHYM20010	None	None	G1	S1	
<b>Pinus radiata</b> Monterey pine	PGPIN040V0	None	None	G1	S1	1B.1
<b>Piperia candida</b> white-flowered rein orchid	PMORC1X050	None	None	G3	S3	1B.2
<b>Plagiobothrys chorisianus var. chorisianus</b> Choris' popcornflower	PDBOR0V061	None	None	G3T1Q	S1	1B.2
<b>Plagiobothrys diffusus</b> San Francisco popcornflower	PDBOR0V080	None	Endangered	G1Q	S1	1B.1
<b>Plagiobothrys glaber</b> hairless popcornflower	PDBOR0V0B0	None	None	GH	SH	1A
<b>Polygonum hickmanii</b> Scotts Valley polygonum	PDPGN0L310	Endangered	Endangered	G1	S1	1B.1
<b>Polyphylla barbata</b> Mount Hermon (=barbata) June beetle	IICOL68030	Endangered	None	G1	S1	
<b>Progne subis</b> purple martin	ABPAU01010	None	None	G5	S3	SSC
<b>Ramalina thrausta</b> angel's hair lichen	NLLEC3S340	None	None	G5	S2?	2B.1



Selected Elements by Scientific Name  
California Department of Fish and Wildlife  
California Natural Diversity Database



Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
<b><i>Rana boylei</i></b> foothill yellow-legged frog	AAABH01050	None	Candidate Threatened	G3	S3	SSC
<b><i>Rana draytonii</i></b> California red-legged frog	AAABH01022	Threatened	None	G2G3	S2S3	SSC
<b><i>Riparia riparia</i></b> bank swallow	ABPAU08010	None	Threatened	G5	S2	
<b><i>Sanicula saxatilis</i></b> rock sanicle	PDAP11Z0H0	None	Rare	G2	S2	1B.2
<b><i>Senecio aphanactis</i></b> chaparral ragwort	PDAST8H060	None	None	G3	S2	2B.2
<b><i>Sidalcea malachroides</i></b> maple-leaved checkerbloom	PDMAL110E0	None	None	G3	S3	4.2
<b><i>Sidalcea malviflora ssp. purpurea</i></b> purple-stemmed checkerbloom	PDMAL110FL	None	None	G5T1	S1	1B.2
<b><i>Silene scouleri ssp. scouleri</i></b> Scouler's catchfly	PDCAR0U1MC	None	None	G5T4T5	S2S3	2B.2
<b><i>Speyeria adiastrae adiastrae</i></b> unsilvered fritillary	IILEPJ6143	None	None	G1G2T1	S1	
<b><i>Speyeria zerene myrtleae</i></b> Myrtle's silverspot butterfly	IILEPJ608C	Endangered	None	G5T1	S1	
<b><i>Spirinchus thaleichthys</i></b> longfin smelt	AFCHB03010	Candidate	Threatened	G5	S1	
<b><i>Stebbinsoseris decipiens</i></b> Santa Cruz microseris	PDAST6E050	None	None	G2	S2	1B.2
<b><i>Streptanthus albidus ssp. peramoenus</i></b> most beautiful jewelflower	PDBRA2G012	None	None	G2T2	S2	1B.2
<b><i>Streptanthus glandulosus ssp. hoffmanii</i></b> Hoffman's bristly jewelflower	PDBRA2G0J4	None	None	G4T2	S2	1B.3
<b><i>Streptanthus morrisonii ssp. hirtiflorus</i></b> Dorr's Cabin jewelflower	PDBRA2G0S2	None	None	G2T1	S1	1B.2
<b><i>Streptanthus morrisonii ssp. morrisonii</i></b> Morrison's jewelflower	PDBRA2G0S3	None	None	G2T1?	S1?	1B.2
<b><i>Stuckenia filiformis ssp. alpina</i></b> slender-leaved pondweed	PMPOT03091	None	None	G5T5	S2S3	2B.2
<b><i>Stygobromus mackenziei</i></b> Mackenzie's Cave amphipod	ICMAL05530	None	None	G1	S1	
<b><i>Syncaris pacifica</i></b> California freshwater shrimp	ICMAL27010	Endangered	Endangered	G2	S2	
<b><i>Taricha rivularis</i></b> red-bellied newt	AAAAF02020	None	None	G4	S2	SSC
<b><i>Taxidea taxus</i></b> American badger	AMAJF04010	None	None	G5	S3	SSC



Selected Elements by Scientific Name  
California Department of Fish and Wildlife  
California Natural Diversity Database



Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
<i>Thaleichthys pacificus</i> eulachon	AFCHB04010	Threatened	None	G5	S3	
<i>Thamnophis sirtalis tetrataenia</i> San Francisco gartersnake	ARADB3613B	Endangered	Endangered	G5T2Q	S2	FP
<i>Tracyina rostrata</i> beaked tracyina	PDAST9D010	None	None	G2	S2	1B.2
<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: 171