

## Introduction:

The Salmon Protection and Watershed Network (SPAWN) (Permittee) will conduct a feasibility assessment, design, and planning for large wood loading recruitment through toppling existing hardwood trees throughout a 5 mile stretch of Lagunitas Creek on National Park Service (NPS) land in partnership with NPS. The approach being considered is a low-cost, low-impact, highly economical strategy to drastically increase wood loading within Lagunitas Creek. It is unique to the location which has high tree density and has limited liability to downstream structures such as bridges or residential development due to its location inside NPS lands.

This project is needed to address limiting factors for the survival of wild Coho Salmon in the Lagunitas Creek Watershed. Lagunitas Creek supports (20%) of the remaining wild Central CA Coast Coho Salmon and is arguably the most important watershed for wild Coho Salmon south of Mendocino County. The Lagunitas population is an anchor for the recovery of the species through the central coast range. The limiting factor for Coho Salmon in Lagunitas Creek is the availability of winter habitat. Winter habitat is the high frequency and complexity/cover of pools, accessible floodplains, side channels, and off-channel habitats, and bar/pool units that support spawning and insect food prey for salmonids. This project is also needed to support large wood loading targets set forth in the Lagunitas Sediment Total Maximum Daily Load (TMDL) that calls for the hardwood forests in the Tocaloma Reach of Lagunitas Creek to contribute 100 cu meters of wood per hectare.

The middle (Tocaloma Reach) of the watershed included in this study area consists of 5 miles of Lagunitas Creek. Although the middle reach has seen recent large floodplain restoration projects, the reach still has many locations of plain bed glides, moderate channel incision, and an overall lack of Large Wood adequate to meet the goals of the Lagunitas Sediment TMDL.

This project has been informed by a previous study of floodplain activation and restoration potential (2019 Lagunitas Creek Floodplain Activation Flow Assessment, Salmonid Protection and Watershed Network: SPAWN, Environmental Science Associates: ESA). This study determined that high density, toppled trees can help dramatically in addressing limiting factors and helping achieve the Lagunitas Sediment TMDL. The approach of toppling existing hardwoods into the channel to mimic living large wood structures presents major opportunities for addressing the limiting factors for salmonids while meeting objectives of the Lagunitas Sediment TMDL in a low-cost, highly economical manner.

Living toppled trees help reverse the chronic structural and biological problems that have plagued the watershed. Toppled trees are seen in Lagunitas Creek and when alive and semi-rooted, help contribute sources of Large Wood, occupy a large surface area that engage with the water column, persist within the channel, offer in-stream cover and complexity that dead trees don't provide, provide inset prey, retain shade over the water, and can be built for less money, across a larger distance, and for far less impact than traditional anchored structures.

The goals of this project are to address the limiting factors for Coho Salmon survival in the watershed and help meet wood loading targets set forth in the Lagunitas Sediment TMDL. These goals will result in a dramatic increase in Large Wood (100 cubic meters per hectare), assist with the formation of bar/pool habitats where plain beds and glides are dominant, increase instream cover, complexity, and pool formation, enhance sediment storage and spawning gravel retention, and raise water surfaces to help connect backwater, side-channel and off-channel habitats.

The Permittee will develop conceptual, intermediate, and final design plans, specifications, cost estimates, and Basis of Design (BOD) documents necessary for construction. Lastly, the project will conduct biological, cultural, botanical and wetland impact assessments, National Oceanic and Atmospheric Administration (NOAA) biological opinion application, California Department of Fish and Wildlife (CDFW) Lake and Streambed Alteration Agreement (LSAA) or 1600 permit application, NPS Special Use Permit application, and will complete National Environmental Policy Act (NEPA) EA/FONSI compliance. This will result in a shovel-ready project that aims to help achieve a 2-3x increase in wood in the project reach. Increasing large wood by such significant densities will help to improve natural processes for salmonids such as instream wood recruitment, sediment storage, and bar/pool habitat formation. This will improve limiting factors for Coho Salmon through increased pool habitat complexity, cover, and floodplain connectivity; and improve habitat for adults through riffle formation and improved sediment sorting and gravel storage.

The Permittee shall not proceed with on the ground implementation until all necessary permits, consultations, and/or Notice to Proceed are secured. All habitat improvement(s) will follow techniques in the *California Salmonid Stream Habitat Restoration Manual* (Volume I, Section VI & VII).

## **Objective(s):**

This project will conduct a feasibility assessment, design, and planning for large wood loading recruitment through toppling existing hardwood trees throughout a 5 mile stretch of Lagunitas Creek on National Park Service (NPS) land in partnership with NPS. The approach being considered is a low-cost, low-impact,

highly economical strategy to drastically increase wood loading within Lagunitas Creek. It is unique to the location which has high tree density and has limited liability to downstream structures such as bridges or residential development due to its location inside NPS lands.

The project will develop conceptual, intermediate, and final design plans, specifications, cost estimates, and Basis of Design documents necessary for construction. Lastly, the project will conduct biological, cultural, botanical and wetland impact assessments, NOAA biological opinion application, CDFW 1600 LSAA permit application, NPS Special Use Permit application, and will complete NEPA EA/FONSI compliance.

## Feasibility Assessment:

SPAWN will hire respected Design Engineering firm Prunuske Chatham, Inc., (PCI) to lead the project design and compliance needed for this project. initiate a Technical Working Group (TWG) for the project that will consist of SPAWN, PCI, NPS, CDFW, and Regional Water Quality Control Board (RWQCB). Permittee will coordinate a virtual kick-off meeting to provide an overview of project goals, objectives, tasks, deliverables, and timeline. PCI will review and synthesize relevant references on large wood in hardwood forests (i.e. Opperman, 2005; Opperman and Merenlender, 2007; Opperman et al., 2008), low-tech restoration methods (i.e. Wheaton et al., 2019), accelerated wood recruitment restoration use/methods (Carah et al., 2014), and recent studies of Lagunitas Creek (i.e. Napolitano, 2014). PCI will conduct a desktop review of topographic data collected through a recent (2018) Light Detection and Ranging (LiDAR) survey of Marin County. PCI will work with SPAWN and NPS to identify the project reaches within the project area, which consists of 5 miles of Lagunitas Creek within the Golden Gate National Recreation Area (GGNRA). PCI with SPAWN will conduct a field reconnaissance of all of the possible toppled tree recruitment sites (approximately 5 miles) in the project area for which toppling trees is a feasible approach to wood recruitment. The field reconnaissance will collect relevant information such as existing channel wood, areas lacking wood, channel bed conditions, details regarding streamside trees such as species, frequency, size, and location relevant to the channel, points of access, and infrastructure such as adjacent roads or bridges. PCI will work with SPAWN and NPS to identify site opportunities, constraints, and project reaches to be included in the Conceptual (30%) Design. PCI will work with SPAWN, and NPS to explore and select feasible implementation methods for toppling live hardwood trees to increase wood recruitment, that consider aspects such as tree sizes and species, field conditions, constructability, cost, access, and risk to any infrastructure. PCI will produce a working draft Basis of Design (BOD) report (that will be updated throughout the project) to document all work done as part of the feasibility study, including a synthesis of supporting science, description of selected wood recruitment reaches, rationale and description of the selected

topple tree implementation methods, and risk analysis that includes qualitative description of structure stability and risk to local infrastructure.

## Conceptual Design (30%):

PCI will develop Conceptual (30%) Design plans for all wood recruitment reaches identified in feasibility assessment, which will include overview of the project area, and a plan view map of each reach with delineated wood recruitment areas and proposed access routes and staging areas, and topple tree detail based on the methods selected as part of the feasibility study. SPAWN will convene a meeting with the landowner and TWG prior to finalizing the feasibility study and Conceptual (30%) Design plans to present landowner and TWG a draft of the feasibility assessment, the conceptual design, and discuss implementation methods, selection of a Demonstration Reach, and planning/permitting needs.

## Detailed Design Plans for Demonstration Reach:

PCI geomorphologist and engineer team will retain a Forester to identify, tag, survey, and map all trees in the field to be toppled to increase wood recruitment in the Demonstration Reach. SPAWN will map and measure all instream wood to estimate current wood load densities and the amount of wood recruitment needed to achieve wood density targets. PCI Survey Crew will perform ground surveys to capture key existing features within site access and staging limits, such as utilities, buildings, fences, irrigation, and paths to support planning of site access and staging. Surveys will be conducted under prevailing wage and comply with associated state regulations. SPAWN will support ground surveys through access coordination and vegetation clearing. PCI will perform a hydraulic analysis, geomorphic assessment, and assessment of wood stability, mobility, and risk to determine engineering needs (if any). The modeling will utilize publicly available LiDAR recently collected (2018) for Marin County and hydrologic data from the nearby Lagunitas Creek USGS stream gage in Samuel P. Taylor Park (USGS 11460400). The 2-dimensional modeling will be used to assess how increasing channel roughness through high density wood recruitment will force more flow onto the adjacent inset floodplain and increase salmonid rearing habitat conditions. The model will be used to also perform a geomorphic assessment on potential to increase instream deposition and habitat complexity. PCI will complete the 30% designs for the 5 mile reach, but advance a Demonstration Reach selected from the Conceptual (30%) Design plans to Intermediate (65%) and eventually Final (100%) Design plans. Intermediate Plans will provide an overview of access and staging, capture all trees to be toppled in recruitment locations, and provide a design details and specification for the topple tree. PCI will update the draft BOD report to be included with the Intermediate (65%) Design plan submittal that will document all data collection, analysis, and engineering needed for design review approval by agency permitting and engineering staff. SPAWN will convene a field meeting with NPS and the TWG at the completion of the Intermediate (65%) Design plans of the

Demonstration Reach to solicit input from technical and regulatory agency staff to guide preparation of final construction documents and permits. PCI will produce and submit Draft (90%) Design plans that will incorporate revisions and refinements from the Intermediate (65%) Design plans, focusing on addressing input from SPAWN, NPS, and the TWG. PCI will provide a draft engineering cost estimate and a list of bid Items with Draft (90%) Design plan submittal. PCI will produce and submit Final (100%) Design Plans that will incorporate the final comments and revisions to the Draft (90%) Design Plans sufficient to support bidding and construction consist of final signed and stamped drawings that include technical specifications in specific sheets, list of bid items, engineer's opinion of probable construction costs, and proposed construction schedule. The final BOD memo will be submitted with the Final (100%) Design Plans and will document site-specific data collection including ground surveys of trees, access and staging, topple tree design, analysis and engineering calculations as needed, and other critical design decisions. This approach will provide Basis of Design and conceptual plans for future phases of implementation beyond the demonstration reach. Future phases will be able complete Intermediate and Final designs with Implementation.

## Special Studies, Permitting, and Environmental Compliance:

PCI and SPAWN will complete special studies, permitting, and environmental compliance documentation for the Demonstration Reach that will meet the standards for evaluation included in the Fisheries Restoration Grants Program (FRGP) Guidelines and provide sufficient information for consultation with permitting and responsible agencies during FRGP programmatic permitting and SPAWN's acquisition of the CDFW Lake and Streambed Alteration Agreement (LSAA). The project is located on National Park Service (NPS) lands; therefore, a National Environmental Policy Act (NEPA) evaluation is required for issuance of a federal special use permit. PCI will produce a biological resources and wetland report, cultural resources report, paleontological evaluation memo, and a calculation of greenhouse gas emissions. Of special note is that Pacific Lamprey larvae, or ammocoetes, may reside in Lagunitas Creek where the channel is relatively deep, low gradient, low velocity, and the riparian canopy is open. Rearing ammocoetes burrow into fine sediments mixed with organic matter and detritus during rearing periods. The Project design of toppling wood will incorporate location placement and orientation that promotes sediment deposition and sorting that may be effective at developing habitat attractive to rearing Pacific Lamprey ammocoetes. PCI and SPAWN will develop application materials for the CDFW LSAA, the NOAA Restoration Center Biological Opinion Application, including a site visit and coordination with the agencies during the permit evaluation process.

# Large Woody Debris Wood Loading & Recruitment Project for Lagunitas Creek

## 2021

---

### Monitoring and Evaluation:

PCI and SPAWN will develop a geomorphic/hydrologic monitoring plan to assess and document the geomorphic and hydrologic response to the approach of wood recruitment through toppling trees in the Demonstration Reach. The geomorphic/hydrologic monitoring plan will include pre- and post-project mapping of bar and pool features, tracking of wood load density, repeat cross section surveys, and level loggers recording water levels. SPAWN will manage the deployment and retrieval of field data loggers.

### Project Description:

#### Location:

This project occurs across 5 miles of the mainstem of Lagunitas Creek, referred to as the `Tocaloma` Reach. The Tocaloma Reach extends from the western boundary of Samuel P Taylor Park, downstream to the confluence of Nicasio Creek. This reach is approximately 4 miles upstream of the mouth of Lagunitas Creek where it meets Tomales Bay. The reach is dominated by hardwood forests of willow, alder, Oregon Ash, and boxelder. The riparian corridor is very thick with an abundance of vegetation, due to the regulated hydrograph. The center point of the project is 38.055948 north latitude, -122.760026 west longitude and is located in Inverness 7.5 Minute U.S Geological Survey (USGS) Quadrangle map.

#### Project Set Up:

##### Task 1. Project Management

SPAWN Project Supervisor, Project Manager, Project Associate, and Project Associate II will provide administrative services associated with performing and completing the work, including managing the grant Agreement, administering subcontracts, invoicing and payments, submitting progress and final reports, schedule and deliverables, coordinating meetings, and following data management protocols. SPAWN Communications Manager will provide content of the project for SPAWN media advisories, membership support updates, match funding reporting, community newsletters, and public notices. SPAWN will establish a contract with Prunuske Chatham Inc., to lead the Design and compliance process. PCI will support SPAWN with administrative services, coordination, invoicing, progress reports, and data management protocols. SPAWN Personnel will convene a Technical Working Group (TWG) composed of CDFW grant managers and engineering staff, as well as regional staff from regulatory and resource agencies to provide technical review and guidance throughout the project. PCI Staff, including the Principal Landscape Architect, Principal Geomorphologist, Civil Engineer, Project Manager/ Senior Geomorphologist, and Principal Environmental Planner, will support SPAWN with TWG meetings, including preparing and presenting technical presentations from

project work products at specified meetings, and recording meeting notes that document key decisions and guidance.

SPAWN Project Supervisor, Project Manager, and Project Associate will provide project progress updates, with technical support from PCI, to the Lagunitas Creek Technical Advisory Committee (TAC) at their quarterly meetings. SPAWN will retain a Bookkeeper to assist with invoicing, payments, budget tracking, and budget management.

### Task 2. Feasibility Assessment

SPAWN will initiate a Technical Working Group (TWG) for the project that will consist of at least SPAWN, PCI, NPS, CDFW, and RWQCB. SPAWN will coordinate a virtual kick-off meeting to provide an overview of project goals, objectives, tasks, deliverables, and timeline. PCI will review and synthesize relevant references on large wood in hardwood forests (i.e. Opperman, 2005; Opperman and Merenlender, 2007; Opperman et al., 2008), low-tech restoration methods (i.e. Wheaton et al., 2019), accelerated wood recruitment restoration use/methods (Carah et al., 2014), and recent studies of Lagunitas Creek (i.e. Napolitano, 2014). PCI Civil Engineer, Civil Engineer II, Assistant Engineer I, will conduct a desktop review of topographic data collected through a recent (2018) Light Detection and Ranging (LiDAR) survey of Marin County. PCI will work with SPAWN and NPS to identify the project reaches within the project area, which consists of 5 miles of Lagunitas Creek within the Golden Gate National Recreation Area (GGNRA). PCI with SPAWN will conduct a field reconnaissance of all of the possible toppled tree recruitment site (approximately 5 miles) in the project area for which toppling trees is a feasible approach to wood recruitment. PCI will work with SPAWN and NPS to identify site opportunities, constraints, and project reaches to be included in the Conceptual (30%) Design. PCI Project Manager/Senior Geomorphologist, Principal Geomorphologist, Principal Landscape Architect, and Principal Environmental Planner will work with SPAWN, and NPS to explore and select feasible implementation methods for toppling live hardwood trees to increase wood recruitment, and that consider aspects such as tree sizes and species, field conditions, constructability, cost, access, and risk to any infrastructure. PCI will produce a working draft Basis of Design (BOD) report of the selected topple tree implementation methods, and risk analysis that includes qualitative description of structure stability and risk to local infrastructure. SPAWN staff involved in this task include a Project Supervisor, Project Manager, Project Associate, Intern I and Intern II.

### Task 3. Conceptual Design (30%)

PCI will develop Conceptual (30%) Design plans for all wood recruitment reaches identified in the feasibility assessment, which will include an overview of the project area, and a plan view map of each reach with delineated wood recruitment areas and proposed access routes and staging areas, and topple

tree detail based on the methods selected as part of the feasibility study. SPAWN Project Supervisor, Project Manager, Project Associate, Project Associate II, and Intern I and Intern II will convene a meeting with the landowner and TWG prior to finalizing the feasibility study and Conceptual (30%) Design plans. A draft of the feasibility assessment, and the conceptual design will be presented to landowner and TWG. The presentation will include discussion on implementation methods, selection of a Demonstration Reach, and planning/permitting needs. PCI staff involved with Task 3 include the Principal Landscape Architect, Principal Geomorphologist, Project Manager/ Senior Geomorphologist, Principal Environmental Planner, and Principal Civil Engineer.

#### Task 4. Detailed Design Plans for Demonstration Reach

PCI will retain the services of a Forester to identify, tag, survey, and map all trees in the field to be toppled to increase wood recruitment in the Demonstration Reach. SPAWN Project Manager, Intern I and Intern II will map and measure all instream wood to estimate current wood load densities to estimate the amount of wood recruitment needed to achieve wood density targets. PCI will perform ground surveys with PCI Survey Crew to capture key existing features within site access and staging limits, such as utilities, buildings, fences, irrigation, and paths to support planning of site access and staging. SPAWN Intern I and Intern II will support surveys through access coordination and vegetation clearing. PCI will perform a hydraulic analysis, geomorphic assessment, and assessment of wood stability, mobility, and risk to determine engineering needs (if any). The 2-Dimensional modeling will utilize publically available LiDAR and hydrologic data from the Lagunitas Creek USGS stream gage in Samuel P. Taylor Park (USGS 11460400). The modeling will be used to assess how increasing channel roughness through high density wood recruitment will force more flow onto the adjacent inset floodplain and increase salmonid rearing habitat conditions. PCI will complete the 30% designs for the 5 mile reach, but advance a selected Demonstration Reach from the Conceptual (30%) Design plans to Intermediate (65%) and eventually Final (100%) Design plans. PCI will update the draft BOD report to be included with the Intermediate (65%) Design plan submittal, which will document all data collection, analysis, and engineering needed for design review approval by agency permitting and engineering staff. SPAWN will convene a field meeting with NPS and the TWG at the completion of the Intermediate (65%) Design plans of the Demonstration Reach to solicit input from technical and regulatory agency staff to guide preparation of final construction documents and permits. PCI will produce and submit Draft (90%) Design plans that will incorporate revisions and refinements from the Intermediate plans. PCI will provide engineering cost estimate and a list of bid Items with Draft (90%) Design plan and submit Final (100%) Design Plans sufficient to support bidding and construction, list of bid items, engineer's opinion of probable construction costs, proposed construction schedule. The final BOD memo will be submitted with the Final (100%) Design Plans and will document site-specific data



collection including ground surveys of trees, access and staging, topple tree design, analysis and engineering calculations as needed, and other critical design decisions. PCI staff that will be involved in this task include Principal Landscape Architect, Principal Geomorphologist, Project Manager/ Senior Geomorphologist, Principal Civil Engineer, Civil Engineer, Principal Vegetation Ecologist, Senior Biologist, Civil Engineer II, Assistant Engineer I, and Assistant Engineer III.

### Task 5. Special Studies, Permitting, and Environmental Compliance

PCI and SPAWN will complete special studies, permitting, and environmental compliance documentation for the Demonstration Reach that will meet the standards for evaluation included in the FRGP Guidelines and will provide sufficient information for consultation with permitting and responsible agencies during FRGP programmatic permitting and SPAWN's acquisition of the CDFW Lake and Streambed Alteration Agreement. The project is located on National Park Service (NPS) lands; therefore, a National Environmental Policy Act (NEPA) evaluation is required for issuance of a federal special use permit. PCI will produce a biological resources and wetland report, cultural resources report, paleontological evaluation memo, and a calculation of greenhouse gas emissions. PCI and SPAWN will develop application materials for the CDFW LSAA, the NOAA Restoration Center Biological Opinion Application, including a site visit and coordination with the agencies during the permit evaluation process. The SPAWN personnel that will assist with this include SPAWN Project Manager, Project Associate, Project Associate II, Intern I and Intern II. The PCI staff that will be involved in this Task include Project Manager/ Senior Geomorphologist, Principal Environmental Planner, Principal Vegetation Ecologist, Senior Biologist, Environmental Planner III, Civil Engineer II, Vegetation Ecologist II, Assistant Engineer I, and Assistant Engineer III.

### Task 6. Monitoring and Evaluation

PCI and SPAWN will develop a geomorphic/hydrologic monitoring plan to assess and document the geomorphic and hydrologic response to the approach of wood recruitment through toppling trees in the Demonstration Reach. The geomorphic/hydrologic monitoring plan will include pre and post-project mapping of bar and pool features, tracking of wood load density, repeat cross section surveys, and level loggers recording water levels. SPAWN will manage the deployment and retrieval of field data loggers. This task will be done by SPAWN Project Manager, Intern I and Intern II. PCI staff involved include Principal Geomorphologist, and Project Manager/ Senior Geomorphologist.

---

**Materials:**

SPAWN supplies include, but are not limited to cost associated with:

**Biological and Geomorphic Field Supplies:**

These supplies include survey stadia rods, meter tapes. These supplies are being used to map, measure, track, and evaluate the conditions for design. The purpose of the supplies are to accurately collect locations of existing conditions and data on site conditions required for permitting and design. These materials are required in order to accurately carry out field investigations and analysis. These materials will be provided and purchased by the applicant.

**Water Level Loggers:**

These supplies include water level loggers. These are being used to measure, track, and evaluate pre-project water conditions. The purpose of the supplies are to accurately collect water surfaces at specific locations, to understand what post-project responses are. These materials are required in order to accurately carry out project monitoring and analysis. These materials will be purchased by the applicant.

**Waders:**

These supplies include waders. These supplies are being used to access field sites in the water. The purpose of the supplies are to accurately collect field data and report existing conditions in a safe and comfortable way. These materials are required in order to accurately carry out project monitoring and analysis. These materials will be provided by the applicant.

**Survey Equipment:**

These include total station and RTK. These equipment are required to collect accurate topographic ground data of the design conditions. The purpose of these equipment is to make certain the location of features on maps and in plans that reflect the conditions of the sites in true form. These are required to prepare detailed designs that are accurate to scale. These materials will be provided by the subcontractor.

**Field Vehicle Rental:**

This includes a biological vehicle rental. This is required to haul equipment to field sites. The purpose of this vehicle rental is to provide means of transport of needed supplies, equipment, and personnel in order to conduct the field investigations in a thorough and efficient manner. This is required to haul equipment efficiently, and provide access to the 5 mile reach of the study area. This will be provided/ procured by the applicant.

### Field Cameras:

These include time-lapse cameras and fixed station cameras. These equipment are required to collect accurate conditions of storm events, floodplain inundation patterns, and site conditions. The purpose of these equipment is to evaluate real time field conditions and document site conditions to assist in hydraulic modeling and design. These are required to prepare project Basis of Design documents and test hypothesis. These materials will be provided by the applicant.

### Intern Housing Facility:

This includes part-time housing of Intern I and II while they are participating in project activities. This housing facility is being used to provide short-term housing for volunteer interns while they are assisting with the project. The purpose of this housing facility is to provide support for volunteer interns. This intern housing facility is required for the project to allow young Interns to participate in the project activities and gain access to the field of stream restoration and salmonid recovery, in a setting that they would not otherwise be able to so. Housing is too expensive for young professionals, and this will allow them professional development. This will be provided/procured by the applicant.

### Mileage:

Mileage includes miles for the applicant and subcontractor to travel to the sites. Mileage is used cover the cost of transportation using personal vehicles to and from the restoration design sites. The purpose of mileage is to reimburse travel in personal vehicles through the area, to and from the sites, for work covered under this grant. This will be required in order to allow the applicant and subcontractor personnel the ability to carry out the field investigations and assessments efficiently with use of their personal vehicles. This will be purchased by the subcontractor and the applicant.

### Printing and Duplicating:

This is used to provide information and details, including, project plans, reports, and findings to stakeholders. This is needed for grant reports and submitting materials for review and comments. The purpose is to provide these reports, permits, and plans to stakeholders. These materials are required to provide information about the project so people can make accurate decisions about, impacts, results, and suggest input and give feedback. The applicant will purchase these materials.

### Direct Mailings:

These are newsletters mailed to SPAWN partners and members. These will be used to advertise the project and provide updates to SPAWN partners and members. The purpose is to gain support for SPAWN programs and the public funding sources in order to gain additional membership, match funding, and continued support from the community and greater salmonid recovery community

in California. These are required because this work needs to be supported by broader members of the environmental community. SPAWN has thousands of members and to gain support, direct mailings are needed to showcase the work and highlight the positive aspects of the project. The applicant will purchase these.

### **Tasks, Deliverables, and Timelines:**

#### **Task 1: Project Management**

SPAWN will provide administrative services associated with performing and completing the work for this project, including managing the Agreement with CDFW, administering subcontracts, invoicing, and payments, submitting progress and final reports, reviewing and tracking schedule and deliverables, and ensuring data management protocols are followed. SPAWN Communications Manager will provide content of the project for SPAWN media advisories, membership support updates, match funding reporting, community newsletters, and public notices. SPAWN Communications Manager will also produce content for Direct Mailings that will be mailed to SPAWN partners and members to detail the project developments, showcase the positive benefits of the project, acknowledge the funding and project partners, and provide updates on the novel approach this project is spearheading.

SPAWN will convene a Technical Working Group (TWG) composed of CDFW grant managers and engineering staff, as well as regional staff from regulatory and resource management agencies, to provide technical review and guidance to support project development. SPAWN will retain the services of a Bookkeeper to assist with invoice preparation, budget management, and budget tracking.

SPAWN will provide project progress updates, with technical support from Prunuske Chatham, Inc. (PCI), to the Lagunitas Creek Technical Advisory Committee (TAC) at their quarterly meetings. PCI will support SPAWN with administrative and coordination tasks for the project. PCI will provide SPAWN with support in specified meetings by preparing and giving technical presentations derived from project work products and recording meeting notes that document key decisions and guidance. PCI will provide brief summaries for grant quarterly progress and final reports prepared and submitted by SPAWN to CDFW. PCI will ensure that materials produced for the project follow the data management standards outlined in CDFW's Scientific Integrity Policy for data collection, data acquisition, and/or data development activities (<https://www.wildlife.ca.gov/Science-Institute/Policies-and-Guidelines>).

**Deliverables:** Quarterly Progress Reports; Invoice and Summary Reports; Draft Final Project Report; Final Project Reports; and Attendance of the quarterly Lagunitas TAC Meeting

**Timeline:**

Start Date: 5/1/2022

End Date: 3/31/2025

**Task 2: Feasibility Assessment**

PCI will work with SPAWN, National Parks Service (NPS), and the TWG to identify feasible methods and locations for wood recruitment by toppling hardwood trees throughout the Middle Reach (Tocaloma Reach) of Lagunitas Creek as a process-based approach to enhancing instream habitat conditions and floodplain connectivity for Coho Salmon rearing. The project will take a low-tech, low-impact, process-based restoration approach by developing methods that are simple, low unit-cost, mimic natural functions, and initiate specific processes (Wheaton, 2019). The project area over which this approach will be explored encompasses up to 5 miles of the Middle Lagunitas Creek within the Golden Gate National Recreation Area (GGNRA). The feasibility study will be initiated by SPAWN and PCI through a virtual kick-off meeting with National Parks Service (NPS) to provide an overview of project goals, objectives, tasks, deliverables, and timeline. This meeting will be hosted by PCI via video conference call. Next, PCI will work with SPAWN and NPS to identify the Project reaches within the project area for which toppling trees is a feasible approach to wood recruitment. This will begin with conducting a desktop review of topographic data collected through a recent (2018) Light Detection and Ranging (LiDAR) survey of Marin County. PCI will review and synthesize relevant references on large wood in hardwood forests, (i.e. Opperman, 2005; Opperman and Merenlender, 2007; Opperman et al., 2008), low-tech restoration methods (i.e. Wheaton et al., 2019), accelerated wood recruitment restoration use/methods (Carah et al., 2014), and recent studies of Lagunitas Creek (i.e. Napolitano, 2014). After a review of relevant information, PCI and SPAWN will conduct a field reconnaissance of all the possible reaches (approximately 5 miles) in the project area. The field reconnaissance will note relevant information such as existing channel wood, areas lacking wood, details regarding streamside trees such as species, frequency, size, and location relevant to the channel. The field reconnaissance will be guided by a GPS device with georeferenced maps. The field reconnaissance will be documented through detailed notes and photos using Biological and Geomorphic Field Supplies, Waders, Field Cameras, and use of a Biological Field Vehicle.

Use of the Intern Housing Facility will support Interns while conducting this task. General site opportunities and constraints will be identified and roughly map based on past SPAWN studies, available spatial data, and observations from the field reconnaissance. Following field reconnaissance, PCI will work with SPAWN and NPS to select the exact project sites to be included in the Conceptual (30%) Design. The implementation methods will consider aspects such as tree sizes and species, field conditions, constructability, cost, access, and risk to property

and infrastructure. PCI will convene a design team meeting to evaluate potential implementation methods. Once implementation methods have been selected, PCI will determine what will be included in the planning to support permitting, environmental compliance, and implementation. This includes developing design criteria, including calculation of canopy changes, that is consistent with National Oceanic and Atmospheric Administration (NOAA) Fisheries Restoration Center programmatic approach.

PCI and SPAWN will evaluate potential planning needs. The expectation is to develop an approach to implementation methods that are simple, low- impact, low-cost, low-risk, and require less traditional engineering, thus also reducing planning effort as well. However, with a cutting-edge approach such as toppling trees at high densities, it's uncertain at this time the extent of the analysis or engineering that will be needed. Thus, the approach of this project is to be broad enough, following an industry standard approach, steps, and deliverables, to ensure all work determined to be needed by the client, NPS, and regulatory/resource agencies will be completed. Throughout the project, SPAWN and PCI will explore efficiencies and cost savings for future work of this type. One such significant savings will be that implementation phases of this project will be able to start from Intermediate (65%) Design (see Task 3 for discussion of phasing). PCI will develop a working draft Basis of Design (BOD) report that documents all work done as part of the feasibility assessment. The BOD report will include a synthesis of supporting science, description of selected wood recruitment reaches, rationale and description of the selected topple tree implementation methods, and risk analysis that includes qualitative description of structure stability and risk to infrastructure. The BOD report will be updated throughout the project and finalized with the completion of the Final (100%) Designs. PCI will also attend the quarterly Lagunitas TAC to inform the advisory committee of the project's progress.

**Deliverables:** Virtual Meeting: Project Kick-off with SPAWN, PCI, NPS, and TWG; Documentation of Feasibility Assessment in a Draft Basis of Design (BOD) Report

**Timeline:**

Start Date: 5/1/2022

End Date: 11/1/2022

### **Task 3: 30% Conceptual Design**

PCI will develop Conceptual (30%) Design plans for all wood recruitment sites identified in the feasibility assessment (Task 2). Development of the Conceptual (30%) Design plans will be supported by work performed in (Task 2). The conceptual plans will include overview of the project area, and a plan view map of each reach with delineated wood recruitment areas and proposed access

routes and staging areas. A conceptual design of the topple tree detail will be developed based on the methods selected as part of the feasibility assessment (Task 2). As part of Task 3, one of the identified project reaches will be selected from Conceptual (30%) to be advanced to a first phase of detailed design. The selection of this Demonstration Reach will be based on the most ideal fit for testing the design approach, and input from the NPS and the TWG. SPAWN and PCI will then convene a virtual meeting with the landowner and TWG prior to finalizing the feasibility assessment and Conceptual (30%) Design plans.

The purpose of this meeting is to present landowner and TWG a draft of the feasibility assessment, the conceptual design, and to discuss implementation methods, selection of the Demonstration Reach, and planning/permitting needs. Selection of the Demonstration Reach will include the TWG to determine what selected reach from the feasibility assessment, will help determine unknown variables that will make future implementation phases easier and more efficient. Work done as part of the Conceptual (30%) Design, including design considerations; and descriptions for each reach will be documented in an updated draft of the BOD report. The landowner and TWG input will be incorporated into finalizing the feasibility study and Conceptual (30%) Design plans.

**Deliverables:** Virtual Meeting: Presentation of feasibility study and conceptual design to NPS and TWG; Conceptual (30%) Design Plans; Updated (30%) Draft Basis of Design (BOD) Report

**Timeline:**

Start Date: 12/1/2022

End Date: 2/28/2023

### **Task 4: Detailed Design Plans for Demonstration Reach**

The Demonstration Reach selected from the Conceptual (30%) Design plans will be advanced through Intermediate (65%), Draft (90%) Design, and Final (100%) Design plans ready for permitting, environmental compliance, and implementation.

The majority of design-related work will be completed as part of the Intermediate (65%) Design phase. The Draft (90%) and Final (100%) Design phase will address all SPAWN, NPS, and TWG input from the (65%) Design. PCI will hire a Forester to map all trees in the project reach to be toppled to increase wood recruitment in the Demonstration Reach. PCI and SPAWN will confirm with NPS all specific trees to be toppled in the field. The identified trees will be tagged with a specific number and surveyed with map-grade GPS. SPAWN also map and measure all instream wood to estimate current wood load densities. This will be used to estimate the amount of wood recruitment needed to achieve wood

density targets set by the Water Board.

SPAWN will host a meeting with the TWG to see the locations of the Demonstration Reach and each tree selected for toppling. PCI will perform ground surveys using Survey Equipment (total station and RTK) to capture key existing features within site access and staging limits, such as utilities, buildings, fences, irrigation, and paths. SPAWN will support surveys through access coordination and vegetation clearing. The survey data will be used to support planning of site access and staging. The base map will incorporate property lines and easements. PCI will perform a hydraulic analysis, geomorphic assessment, and assessment of wood stability, mobility, and risk to determine engineering needs (if any). PCI will perform a 2-D hydraulic model analysis for the entire Demonstration Reach to compare existing and design conditions. PCI will utilize the (HEC-RAS) model for this effort.

Topographic data will use publicly available LiDAR. Model hydrology will be based on the nearby Lagunitas Creek USGS stream gage in Samuel P. Taylor (USGS 11460400). The high density of wood will be represented by an extreme high roughness value following a study by Shields and Gippel (1995). The modeling will be used to assess how increasing channel roughness through high density wood recruitment will force more flow onto the adjacent inset floodplain, force bar/pool features, and increase salmonid rearing habitat conditions. The model will also be used to perform a geomorphic assessment on potential to increase instream deposition and habitat complexity. Finally, it will be used to assess stability, mobility, and risk of the toppled tree. From this assessment the need of any engineering will be determined and applied.

PCI will produce and submit Intermediate (65%) Design drawings that will include detailed design plan views that articulate the project location, each topple tree species, toppling methods, location and identification number, construction limits, and specific enhancement features, including preliminary access and staging areas to evaluate impacts. All technical specifications will be included in the plan set. General requirement technical specifications and technical specifications related to mobilization and clearing will be included in the notes sheet. Technical specifications related the topple tree will be included in the construction detail sheet. An updated draft BOD report will be included with the Intermediate (65%) Design plan submittal. PCI will produce and submit Draft (90%) Design plans that will incorporate revisions and refinements from the Intermediate (65%) Design plans, focusing on addressing input from SPAWN, NPS, and the TWG. A draft engineering cost estimate and a list of bid items will be provided with Draft (90%) Design plan submittal. A review meeting between SPAWN, PCI, and CDFW engineering staff will occur before completion of 100% plans. PCI will produce and submit Final (100%) Design Plans that will incorporate the final comments and revisions to the Draft (90%) Design Plans. This will serve as the final set of



design documents sufficient to support bidding and construction. The Final (100%) Design submittal will consist of final signed and stamped drawings that include technical specifications in specific sheets, list of bid items, engineer's opinion of probable construction costs, and proposed construction schedule. PCI will retain a Forester to assist with detailed design of the toppling method and approach. The final BOD memo will be submitted with the Final (100%) Design Plans and will include site-specific data collection, engineering calculations as needed, and design decisions including ground surveys, geomorphic assessment, access, staging, and topple tree design and engineering.

**Deliverables:** Intermediate (65%) Design Plans; Updated (65%) Draft Basis of Design (BOD) Report; Draft (90%) Design Plans and Engineering Cost Estimate; Final (100%) Design Plans and Engineering Cost Estimate; and Final (100%) Basis of Design (BOD) Report

**Timeline:**

Start Date: 3/1/2023

End Date: 1/31/2024

**Task 5: Special Studies, Permitting, and Environmental Compliance**

PCI and SPAWN will complete special studies, permitting, and environmental compliance for the Demonstration Reach. Lagunitas Creek and the surrounding watershed provide habitat for several special-status species including salmonids, California freshwater shrimp, and northern spotted owls. Special studies for biological and botanical resources will focus on Lagunitas Creek and the riparian corridor where access and staging would occur, to identify habitats and species present in the area. The need for channel dewatering and fish and aquatic resource relocation is not anticipated. The special studies would also be used to guide project design to avoid impacts on biological and wetland resources where feasible and to identify avoidance, minimization, and mitigation measures needed to protect resources where impacts cannot be avoided. These studies will meet the standards for evaluation included in the NEPA Guidelines programmatic evaluation procedures and provide sufficient information for consultation with responsible agencies during FRGP programmatic permitting and SPAWN's acquisition of the CDFW Lake and Streambed Authorization. The biological resources report will inform the NOAA Biological Opinion. The project is completely located in National Park Service (NPS) lands; therefore, a National Environmental Policy Act (NEPA) evaluation is required for issuance of a federal special use permit. SPAWN and PCI will draft the document and coordinate with NPS to review and comment. NPS will be responsible for development of the decision document. A NEPA Environmental Assessment and Finding of No Significant Impact is the anticipated document. A cultural resources and paleontological resource evaluation will be completed to inform the CEQA document and to provide information FRGPs programmatic consultation with

Native American tribes and the State Historic Preservation Officer. A calculation of greenhouse gas emissions will be developed and provided for use in future CEQA document. This effort will also include a site visit and coordination with the agencies during the permit evaluation process. The permit application fees for CDFW 1600 LSAA and the NPS Special Use Permit will be paid through the application process. Printing and Duplicating will be required to submit permit application materials, review project plans, reports, and details. Mileage will be billed to reimburse travel of personal vehicles to and from the site.

**Deliverables:** Biological and Wetland Resource Assessment Report; Botanical Survey Report; Cultural Resources Site Assessment Report; Paleontological Assessment Memo; Permit applications: CDFW 1600 LSAA, NOAA RC Biological Opinion Application, NPS Use Permit, NEPA Environmental Assessment and FONSI

**Timeline:**

Start Date: 9/1/2023

End Date: 6/1/2024

## **Task 6: Monitoring and Evaluation**

A geomorphic/hydrologic monitoring plan will be developed to assess and document the geomorphic and hydrologic response to the approach of wood recruitment through toppling trees in the Demonstration Reach. The geomorphic monitoring plan will include pre and post-project mapping of bar and pool features, tracking of wood load density, repeat cross section surveys and Water Level Loggers used for recording water levels. Pre-project and annual repeat cross section surveys will be used to examine the geomorphic response of toppling trees at a high density across the Demonstration Reach, by comparing changes in cross section deposition and erosion patterns.

Water level data loggers and time-lapse cameras will be installed to examine the hydrologic response of toppling trees at a high density across the Demonstration Reach, by comparing changes in floodplain activation for given flows. Fixed cameras will be used to capture conditions at the time of field visits. As part of this and prior tasks, mileage will be billed to reimburse travel of personal vehicles to and from the site. Printing and Duplicating will be required to submit permit application materials, review project plans, reports, and details. As part of this project, PCI will install level loggers and establish monitoring sections at up to three locations, including setting monument pins following stakeholder review of the Intermediate (65%) Design plans. SPAWN will map the existing bar and pool features prior to implementation. Use of Intern Housing Facility will be utilized to provide short-term housing for volunteer SPAWN interns. Collection of post-project conditions information (i.e. post-project mappings of bar and pool

features, estimating the wood density, repeat section surveys, collecting water level data, and estimating changes to floodplain inundation areas) is not included in this project, and is expected to be funded as part of implementation.

**Deliverables:** Geomorphic Monitoring Plan; Geomorphic monitoring cross-sections

**Timeline:**

Start Date: 6/1/2024

End Date: 2/28/2025

**Additional Requirements:**

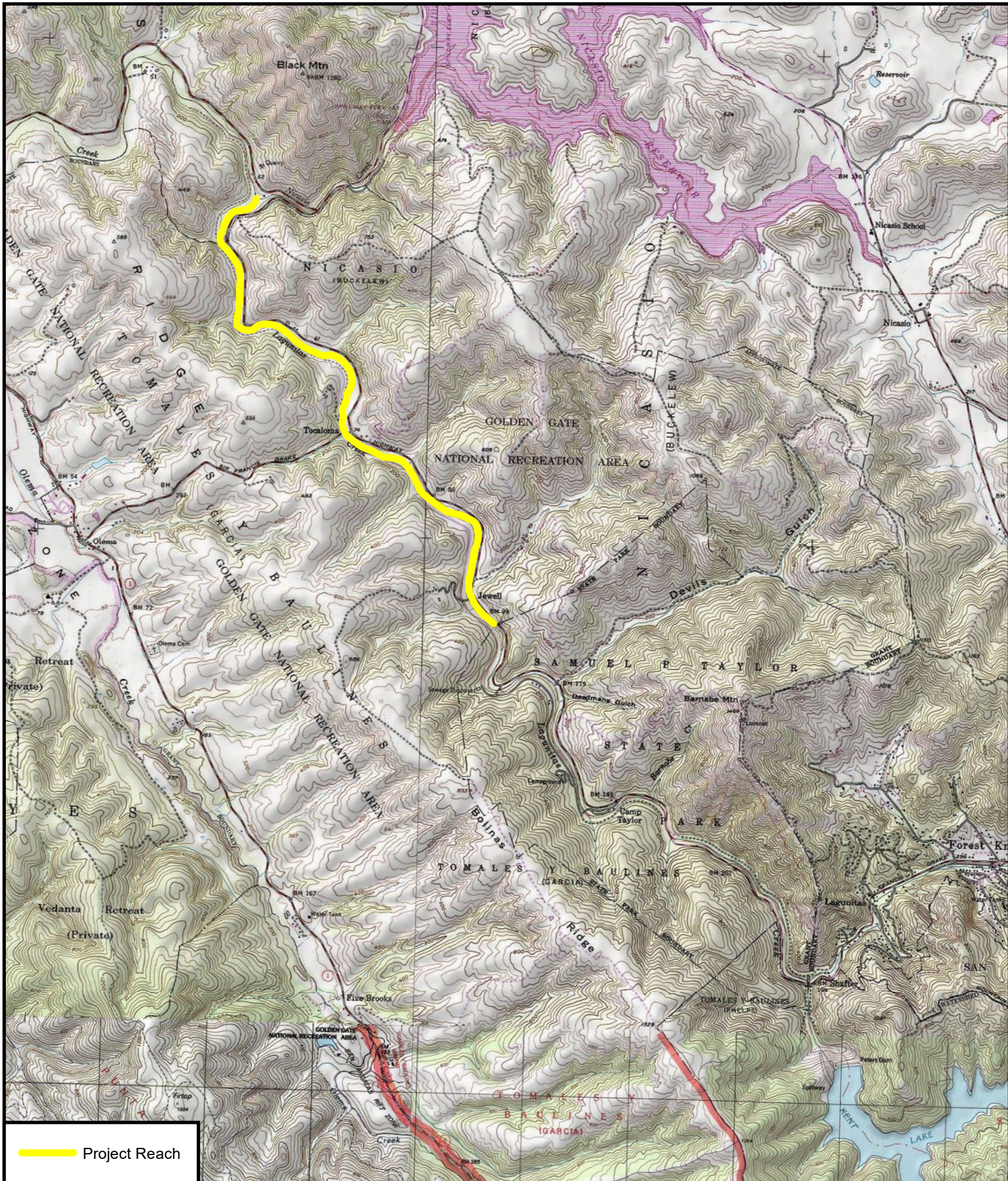
The Permittee will not proceed with on the ground implementation until all necessary permits and consultations are secured. Work in flowing streams is restricted per the United States Army Corp of Engineers (USACE) Regional General Permit. Actual project start and end dates, within this timeframe, are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

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. 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 CDFW 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. All habitat improvements will follow techniques described in the *California Salmonids Stream Habitat Restoration Manual*, Volume I and Volume II.





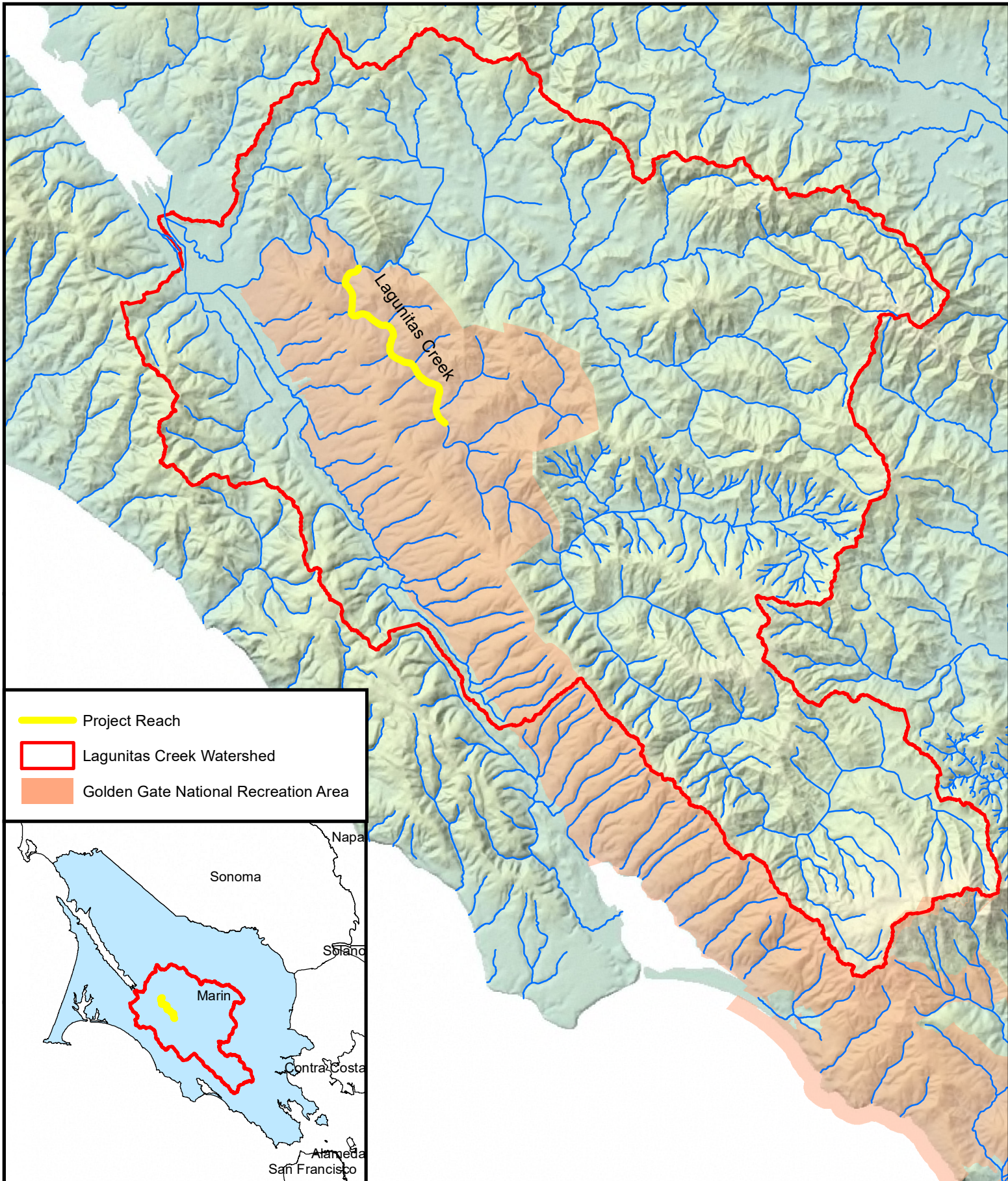
Supplemental Document 4: Project Location Map  
Lagunitas Creek Wood Recruitment Planning Project  
SPAWN




0 0.5 1 Miles

4/9/2021  
USGS 7.5 Minute Quadrangles:  
San Geronimo  
Inverness







-  Project Reach
-  Lagunitas Creek Watershed
-  Golden Gate National Recreation Area





## Selected Elements by Scientific Name

### California Department of Fish and Wildlife

### California Natural Diversity Database



**Query Criteria:** Quad<span style='color:Red'> IS </span>(Inverness (3812217)<span style='color:Red'> OR </span>San Geronimo (3812216)<span style='color:Red'> OR </span>Bolin (3812286)<span style='color:Red'> OR </span>Double Point (3812287)<span style='color:Red'> OR </span>Drakes Bay (3812218)<span style='color:Red'> OR </span>Tomaes (3812228)<span style='color:Red'> OR </span>Point Reyes NE (3812227)<span style='color:Red'> OR </span>Petaluma (3812226))

Possible species within the Inverness and surrounding quads for 1725990 - Large Woody Debris Wood Loading & Recruitment Project for Lagunitas Creek, Marin County

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
<b><i>Abronia umbellata</i> var. <i>breviflora</i></b> pink sand-verbena	PDNYC010N4	None	None	G4G5T2	S2	1B.1
<b><i>Adela oplerella</i></b> Opler's longhorn moth	IILEE0G040	None	None	G2	S2	
<b><i>Agelaius tricolor</i></b> tricolored blackbird	ABPBXB0020	None	Threatened	G1G2	S1S2	SSC
<b><i>Agrostis blasdalei</i></b> Blasdale's bent grass	PMPOA04060	None	None	G2	S2	1B.2
<b><i>Allium peninsulare</i> var. <i>franciscanum</i></b> Franciscan onion	PMLIL021R1	None	None	G5T2	S2	1B.2
<b><i>Alopecurus aequalis</i> var. <i>sonomensis</i></b> Sonoma alopecurus	PMPOA07012	Endangered	None	G5T1	S1	1B.1
<b><i>Ambystoma californiense</i> pop. 3</b> California tiger salamander - Sonoma County DPS	AAAAA01183	Endangered	Threatened	G2G3	S2	WL
<b><i>Amorpha californica</i> var. <i>napensis</i></b> Napa false indigo	PDFAB08012	None	None	G4T2	S2	1B.2
<b><i>Amsinckia lunaris</i></b> bent-flowered fiddleneck	PDBOR01070	None	None	G3	S3	1B.2
<b><i>Antrozous pallidus</i></b> pallid bat	AMACC10010	None	None	G4	S3	SSC
<b><i>Apodontia rufa phaea</i></b> Point Reyes mountain beaver	AMAF01012	None	None	G5T2	S2	SSC
<b><i>Arctostaphylos montana</i> ssp. <i>montana</i></b> Mt. Tamalpais manzanita	PDERI040J5	None	None	G3T3	S3	1B.3
<b><i>Arctostaphylos virgata</i></b> Marin manzanita	PDERI041K0	None	None	G2	S2	1B.2
<b><i>Ardea alba</i></b> great egret	ABNGA04040	None	None	G5	S4	
<b><i>Ardea herodias</i></b> great blue heron	ABNGA04010	None	None	G5	S4	
<b><i>Astragalus pycnostachyus</i> var. <i>pycnostachyus</i></b> coastal marsh milk-vetch	PDFAB07B2	None	None	G2T2	S2	1B.2
<b><i>Astragalus tener</i> var. <i>tener</i></b> alkali milk-vetch	PDFAB0F8R1	None	None	G2T1	S1	1B.2
<b><i>Athene cunicularia</i></b> burrowing owl	ABNSB10010	None	None	G4	S3	SSC
<b><i>Blennosperma nanum</i> var. <i>robustum</i></b> Point Reyes blennosperma	PDAST1A022	None	Rare	G4T2	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>Bombus caliginosus</i></b> obscure bumble bee	IIHYM24380	None	None	G4?	S1S2	
<b><i>Bombus occidentalis</i></b> western bumble bee	IIHYM24250	None	Candidate Endangered	G2G3	S1	
<b><i>Buteo swainsoni</i></b> Swainson's hawk	ABNKC19070	None	Threatened	G5	S3	
<b><i>Caecidotea tomalensis</i></b> Tomaes isopod	ICMAL01220	None	None	G2	S2S3	
<b><i>Calamagrostis crassiglumis</i></b> Thurber's reed grass	PMPOA17070	None	None	G3Q	S2	2B.1
<b><i>Callophrys mossii marinensis</i></b> Marin elfin butterfly	IILEPE2207	None	None	G4T1	S1	
<b><i>Calystegia purpurata ssp. saxicola</i></b> coastal bluff morning-glory	PDCON040D2	None	None	G4T2T3	S2S3	1B.2
<b><i>Campanula californica</i></b> swamp harebell	PDCAM02060	None	None	G3	S3	1B.2
<b><i>Cardamine angulata</i></b> seaside bittercress	PDBRA0K010	None	None	G4G5	S3	2B.1
<b><i>Carex leptalea</i></b> bristle-stalked sedge	PMCYP037E0	None	None	G5	S1	2B.2
<b><i>Carex lyngbyei</i></b> Lyngbye's sedge	PMCYP037Y0	None	None	G5	S3	2B.2
<b><i>Castilleja affinis var. neglecta</i></b> Tiburon paintbrush	PDSCR0D013	Endangered	Threatened	G4G5T1T2	S1S2	1B.2
<b><i>Castilleja ambigua var. humboldtensis</i></b> Humboldt Bay owl's-clover	PDSCR0D402	None	None	G4T2	S2	1B.2
<b><i>Castilleja leschkeana</i></b> Point Reyes paintbrush	PDSCR0D1R0	None	None	GX	SX	1A
<b><i>Ceanothus decornutus</i></b> Nicasio ceanothus	PDRHA04440	None	None	G1	S1	1B.2
<b><i>Ceanothus gloriosus var. porrectus</i></b> Mt. Vision ceanothus	PDRHA040F7	None	None	G4T2	S2	1B.3
<b><i>Ceanothus masonii</i></b> Mason's ceanothus	PDRHA04200	None	Rare	G1	S1	1B.2
<b><i>Central Dune Scrub</i></b> Central Dune Scrub	CTT21320CA	None	None	G2	S2.2	
<b><i>Charadrius nivosus nivosus</i></b> western snowy plover	ABNNB03031	Threatened	None	G3T3	S2	SSC
<b><i>Chloropyron maritimum ssp. palustre</i></b> Point Reyes salty bird's-beak	PDSCR0J0C3	None	None	G4?T2	S2	1B.2
<b><i>Chorizanthe cuspidata var. cuspidata</i></b> San Francisco Bay spineflower	PDPGN04081	None	None	G2T1	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>Chorizanthe cuspidata</i> var. <i>villosa</i></b> woolly-headed spineflower	PDPGN04082	None	None	G2T2	S2	1B.2
<b><i>Chorizanthe valida</i></b> Sonoma spineflower	PDPGN040V0	Endangered	Endangered	G1	S1	1B.1
<b><i>Cicindela hirticollis grvida</i></b> sandy beach tiger beetle	IICOL02101	None	None	G5T2	S2	
<b><i>Cicuta maculata</i> var. <i>bolanderi</i></b> Bolander's water-hemlock	PDAP10M051	None	None	G5T4T5	S2?	2B.1
<b><i>Circus hudsonius</i></b> northern harrier	ABNKC11011	None	None	G5	S3	SSC
<b><i>Cirsium andrewsii</i></b> Franciscan thistle	PDAST2E050	None	None	G3	S3	1B.2
<b><i>Cirsium hydrophilum</i> var. <i>vaseyi</i></b> Mt. Tamalpais thistle	PDAST2E1G2	None	None	G2T1	S1	1B.2
<b><i>Clarkia concinna</i> ssp. <i>raichei</i></b> Raiche's red ribbons	PDONA050A2	None	None	G5?T1	S1	1B.1
<b><i>Coastal and Valley Freshwater Marsh</i></b> Coastal and Valley Freshwater Marsh	CTT52410CA	None	None	G3	S2.1	
<b><i>Coastal Terrace Prairie</i></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 corymbosa</i></b> round-headed Chinese-houses	PDSCR0H060	None	None	G1	S1	1B.2
<b><i>Corynorhinus townsendii</i></b> Townsend's big-eared bat	AMACC08010	None	None	G4	S2	SSC
<b><i>Coturnicops noveboracensis</i></b> yellow rail	ABNME01010	None	None	G4	S1S2	SSC
<b><i>Cypseloides niger</i></b> black swift	ABNUA01010	None	None	G4	S2	SSC
<b><i>Danaus plexippus</i> pop. 1</b> monarch - California overwintering population	IILEPP2012	Candidate	None	G4T2T3	S2S3	
<b><i>Delphinium bakeri</i></b> Baker's larkspur	PDRAN0B050	Endangered	Endangered	G1	S1	1B.1
<b><i>Delphinium luteum</i></b> golden larkspur	PDRAN0B0Z0	Endangered	Rare	G1	S1	1B.1
<b><i>Dicamptodon ensatus</i></b> California giant salamander	AAAAH01020	None	None	G3	S2S3	SSC
<b><i>Dirca occidentalis</i></b> western leatherwood	PDTHY03010	None	None	G2	S2	1B.2
<b><i>Emys marmorata</i></b> western pond turtle	ARAAD02030	None	None	G3G4	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
<b><i>Entosthodon kochii</i></b> Koch's cord moss	NBMUS2P050	None	None	G1	S1	1B.3
<b><i>Erethizon dorsatum</i></b> North American porcupine	AMAFJ01010	None	None	G5	S3	
<b><i>Erigeron supplex</i></b> supple daisy	PDAST3M3Z0	None	None	G2	S2	1B.2
<b><i>Eriogonum luteolum var. caninum</i></b> Tiburon buckwheat	PDPGN083S1	None	None	G5T2	S2	1B.2
<b><i>Erysimum concinnum</i></b> bluff wallflower	PDBRA160E3	None	None	G3	S2	1B.2
<b><i>Eucyclogobius newberryi</i></b> tidewater goby	AFCQN04010	Endangered	None	G3	S3	
<b><i>Eumetopias jubatus</i></b> Steller (=northern) sea-lion	AMAJC03010	Delisted	None	G3	S2	
<b><i>Falco peregrinus anatum</i></b> American peregrine falcon	ABNKD06071	Delisted	Delisted	G4T4	S3S4	FP
<b><i>Fratercula cirrhata</i></b> tufted puffin	ABNNN12010	None	None	G5	S1S2	SSC
<b><i>Fritillaria lanceolata var. tristulis</i></b> Marin checker lily	PMLIL0V0P1	None	None	G5T2	S2	1B.1
<b><i>Fritillaria liliacea</i></b> fragrant fritillary	PMLIL0V0C0	None	None	G2	S2	1B.2
<b><i>Geothlypis trichas sinuosa</i></b> saltmarsh common yellowthroat	ABPBX1201A	None	None	G5T3	S3	SSC
<b><i>Gilia capitata ssp. chamissonis</i></b> blue coast gilia	PDPLM040B3	None	None	G5T2	S2	1B.1
<b><i>Gilia capitata ssp. tomentosa</i></b> woolly-headed gilia	PDPLM040B9	None	None	G5T2	S2	1B.1
<b><i>Gilia millefoliata</i></b> dark-eyed gilia	PDPLM04130	None	None	G2	S2	1B.2
<b><i>Helminthoglypta nickliniana awania</i></b> Peninsula coast range shoulderband	IMGASC2361	None	None	G3T1	S1	
<b><i>Helminthoglypta stiversiana williamsi</i></b> Williams' bronze shoulderband	IMGASC2034	None	None	G2G3T1	S1	
<b><i>Hemizonia congesta ssp. congesta</i></b> congested-headed hayfield tarplant	PDAST4R065	None	None	G5T2	S2	1B.2
<b><i>Hesperovax sparsiflora var. brevifolia</i></b> short-leaved evax	PDASTE5011	None	None	G4T3	S3	1B.2
<b><i>Hesperolinon congestum</i></b> Marin western flax	PDLIN01060	Threatened	Threatened	G1	S1	1B.1
<b><i>Heteranthera dubia</i></b> water star-grass	PMPON03010	None	None	G5	S2	2B.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>Horkelia cuneata</i> var. <i>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>Hydrobates homochroa</i></b> ashy storm-petrel	ABNDC04030	None	None	G2	S2	SSC
<b><i>Hydrochara rickseckeri</i></b> Ricksecker's water scavenger beetle	IICOL5V010	None	None	G2?	S2?	
<b><i>Hypogymnia schizidiata</i></b> island tube lichen	NLT0032640	None	None	G2G3	S2	1B.3
<b><i>Ischnura gemina</i></b> San Francisco forktail damselfly	IIDOD72010	None	None	G2	S2	
<b><i>Lasionycteris noctivagans</i></b> silver-haired bat	AMACC02010	None	None	G3G4	S3S4	
<b><i>Lasiurus blossevillei</i></b> western red bat	AMACC05060	None	None	G4	S3	SSC
<b><i>Lasiurus cinereus</i></b> hoary bat	AMACC05030	None	None	G3G4	S4	
<b><i>Lasthenia californica</i> ssp. <i>bakeri</i></b> Baker's goldfields	PDAST5L0C4	None	None	G3T1	S1	1B.2
<b><i>Lasthenia californica</i> ssp. <i>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>Lavinia symmetricus</i> ssp. <i>2</i></b> Tomaes roach	AFCJB19022	None	None	G4T2T3	S2	SSC
<b><i>Layia carnosa</i></b> beach layia	PDAST5N010	Endangered	Endangered	G2	S2	1B.1
<b><i>Leptosiphon rosaceus</i></b> rose leptosiphon	PDPLM09180	None	None	G1	S1	1B.1
<b><i>Lessingia micradenia</i> var. <i>micradenia</i></b> Tamalpais lessingia	PDAST5S063	None	None	G2T2	S2	1B.2
<b><i>Lichnanthe ursina</i></b> bumblebee scarab beetle	IICOL67020	None	None	G2	S2	
<b><i>Lilaeopsis masonii</i></b> Mason's lilaeopsis	PDAP19030	None	Rare	G2	S2	1B.1
<b><i>Lilium maritimum</i></b> coast lily	PMLIL1A0C0	None	None	G2	S2	1B.1
<b><i>Lilium pardalinum</i> ssp. <i>pitkinense</i></b> Pitkin Marsh lily	PMLIL1A0H3	Endangered	Endangered	G5T1	S1	1B.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>Limnanthes douglasii ssp. 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 tidestromii</i></b> Tidestrom's lupine	PDFAB2B3Y0	Endangered	Endangered	G1	S1	1B.1
<b><i>Melospiza melodia samuelis</i></b> San Pablo song sparrow	ABPBXA301W	None	None	G5T2	S2	SSC
<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	S3S4	4.3
<b><i>Monardella sinuata ssp. nigrescens</i></b> northern curly-leaved monardella	PDLAM18162	None	None	G3T2	S2	1B.2
<b><i>Navarretia rosulata</i></b> Marin County navarretia	PDPLM0C0Z0	None	None	G2	S2	1B.2
<b><i>Northern Coastal Salt Marsh</i></b> Northern Coastal Salt Marsh	CTT52110CA	None	None	G3	S3.2	
<b><i>Northern Maritime Chaparral</i></b> Northern Maritime Chaparral	CTT37C10CA	None	None	G1	S1.2	
<b><i>Northern Vernal Pool</i></b> Northern Vernal Pool	CTT44100CA	None	None	G2	S2.1	
<b><i>Oncorhynchus kisutch pop. 4</i></b> coho salmon - central California coast ESU	AFCHA02034	Endangered	Endangered	G5T2T3Q	S2	
<b><i>Oncorhynchus mykiss irideus pop. 8</i></b> steelhead - central California coast DPS	AFCHA0209G	Threatened	None	G5T2T3Q	S2S3	
<b><i>Pandion haliaetus</i></b> osprey	ABNKC01010	None	None	G5	S4	WL
<b><i>Phacelia insularis var. continentis</i></b> North Coast phacelia	PDHYD0C2B1	None	None	G2T2	S2	1B.2
<b><i>Piperia elegans ssp. decurtata</i></b> Point Reyes rein orchid	PMORC1X011	None	None	G4T1	S1	1B.1
<b><i>Plagiobothrys mollis var. vestitus</i></b> Petaluma popcornflower	PDBOR0V0Q2	None	None	G4?TX	SX	1A
<b><i>Plebejus icarioides parapheres</i></b> Point Reyes blue butterfly	IILEPG801D	None	None	G5T1T2	S1S2	
<b><i>Pleuropogon hooverianus</i></b> North Coast semaphore grass	PMPOA4Y070	None	Threatened	G2	S2	1B.1
<b><i>Pogonichthys macrolepidotus</i></b> Sacramento splittail	AFCJB34020	None	None	GNR	S3	SSC
<b><i>Polygonum marinense</i></b> Marin knotweed	PDPGN0L1C0	None	None	G2Q	S2	3.1



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>Pomatiopsis binneyi</i></b> robust walker	IMGASJ9010	None	None	G1	S1	
<b><i>Quercus parvula</i> var. <i>tamalpaisensis</i></b> Tamalpais oak	PDFAG051Q3	None	None	G4T2	S2	1B.3
<b><i>Rallus obsoletus obsoletus</i></b> California Ridgway's rail	ABNME05011	Endangered	Endangered	G3T1	S1	FP
<b><i>Rana boylei</i></b> foothill yellow-legged frog	AAABH01050	None	Endangered	G3	S3	SSC
<b><i>Rana draytonii</i></b> California red-legged frog	AAABH01022	Threatened	None	G2G3	S2S3	SSC
<b><i>Rhynchospora californica</i></b> California beaked-rush	PMCYP0N060	None	None	G1	S1	1B.1
<b><i>Sagittaria sanfordii</i></b> Sanford's arrowhead	PMALI040Q0	None	None	G3	S3	1B.2
<b><i>Serpentine Bunchgrass</i></b> Serpentine Bunchgrass	CTT42130CA	None	None	G2	S2.2	
<b><i>Setophaga petechia</i></b> yellow warbler	ABPBX03010	None	None	G5	S3S4	SSC
<b><i>Sidalcea calycosa</i> ssp. <i>rhizomata</i></b> Point Reyes checkerbloom	PDMAL11012	None	None	G5T2	S2	1B.2
<b><i>Sidalcea hickmanii</i> ssp. <i>viridis</i></b> Marin checkerbloom	PDMAL110A4	None	None	G3TH	SH	1B.1
<b><i>Sidalcea malviflora</i> ssp. <i>purpurea</i></b> purple-stemmed checkerbloom	PDMAL110FL	None	None	G5T1	S1	1B.2
<b><i>Silene scouleri</i> ssp. <i>scouleri</i></b> Scouler's catchfly	PDCAR0U1MC	None	None	G5T4T5	S2S3	2B.2
<b><i>Speyeria zerene myrtilae</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 anomalus</i></b> Mount Burdell jewelflower	PDBRA2G520	None	None	G1	S1	1B.1
<b><i>Streptanthus batrachopus</i></b> Tamalpais jewelflower	PDBRA2G050	None	None	G2	S2	1B.3
<b><i>Streptanthus glandulosus</i> ssp. <i>pulchellus</i></b> Mt. Tamalpais bristly jewelflower	PDBRA2G0J2	None	None	G4T2	S2	1B.2
<b><i>Stygobromus hyporheicus</i></b> Hypoheic amphipod	ICMAL05D80	None	None	G1	S1	
<b><i>Syncaris pacifica</i></b> California freshwater shrimp	ICMAL27010	Endangered	Endangered	G2	S2	



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>Taricha rivularis</i></b> red-bellied newt	AAAAF02020	None	None	G2	S2	SSC
<b><i>Taxidea taxus</i></b> American badger	AMAJF04010	None	None	G5	S3	SSC
<b><i>Thamnomia vermicularis</i></b> whiteworm lichen	NLTES43860	None	None	G5	S1	2B.1
<b><i>Trachusa gummiifera</i></b> San Francisco Bay Area leaf-cutter bee	IIHYM80010	None	None	G1	S1	
<b><i>Trifolium amoenum</i></b> two-fork clover	PDFAB40040	Endangered	None	G1	S1	1B.1
<b><i>Trifolium polyodon</i></b> Pacific Grove clover	PDFAB402H0	None	Rare	G1	S1	1B.1
<b><i>Triphysaria floribunda</i></b> San Francisco owl's-clover	PDSCR2T010	None	None	G2?	S2?	1B.2
<b><i>Triquetrella californica</i></b> coastal triquetrella	NBMUS7S010	None	None	G2	S2	1B.2
<b><i>Vespericola marinensis</i></b> Marin hesperian	IMGASA4140	None	None	G2	S2	
<b><i>Zapus trinotatus orarius</i></b> Point Reyes jumping mouse	AMAFH01031	None	None	G5T1T3Q	S1S3	SSC

Record Count: 155