

Developing a Climate Resilient Habitat Conservation Project. Applicant Guidance for CDFW Proposition 1 Grant Programs

Introduction

California Department of Fish and Wildlife (CDFW) encourages Proposition 1 Grant Program applicants to consider long-term ecosystem resilience when developing projects and, whenever feasible, to include project components likely to increase the resiliency and adaptive capacity of the site, watershed, or region to future climate conditions. Priorities for ecosystem protection, enhancement, and/or restoration include critical habitat corridors (for wildlife and ecosystem movement), predicted climate refugia, sensitive species habitat, and other components that enhance climate adaptation. This document provides key resources, recommended approaches, and examples of habitat conservation projects that incorporate climate adaptation and resilience features to assist applicants in developing projects and responding to Climate Change application questions. These resources will be particularly valuable for projects that include acquisition, site selection, and development of plans for restoration, planting, monitoring and adaptive management, and long-term management.

General Recommendations

1. Prioritize acquisition/protection, enhancement, and restoration projects at sites that could provide significant refugia and/or ecosystem connectivity (i.e., corridors for terrestrial and aquatic species movement) over the near-term, and pathways for ecosystem/biome migration over the long-term.
2. Consider anticipated climate conditions over the next 50 to 100 years. Do models predict significant changes to temperature, precipitation, and hydrology in this watershed? Will the threat of fire, drought, flood, tidal inundation, or related changes increase? How vulnerable is the target ecosystem to the anticipated changes? Is it vulnerable to habitat type conversion? Are there state or federally listed species in the area that may be vulnerable to these changes, including potential future phenological mismatches with their food supplies or other conditions that could exceed their physiological tolerances? Identify strategies to facilitate adaptation to anticipated future conditions.
3. Prioritize projects that enhance both short-term and long-term climate adaptation and ecosystem resiliency.
4. Incorporate multifaceted climate mitigation strategies to reduce greenhouse gas emissions during project construction and increase carbon sequestration over the long term.

General climate adaptation strategies for all project types

- Conserve potential future habitat and climate refugia

- Restore degraded habitat in areas likely to be climate refugia or migration steppingstones
- Improve terrestrial and aquatic connectivity
- Restore ecosystem functions and services
- Create diverse microhabitats
- Control invasive species and establish actions to prevent new invasions
- When replanting, use a diverse palette with wildlife-supporting species that are likely to be resilient to projected future conditions
- Enhance groundwater recharge
- Develop monitoring plans, long-term management plans, and adaptive management plans to identify and respond to changing conditions

California-specific, state-wide resources

- [Cal Adapt](#): Visualize projected climate changes near your project area
- CDFW's Areas of Conservation Emphasis ([ACE](#)) [version 3.0](#): Access spatial data regarding climate change resilience, climate vulnerability, and connectivity
- [State of California Sea-Level Rise \(SLR\) Guidance](#): Guidance for selecting a SLR scenario that is appropriate for a particular application
- [California Climate Change Vulnerability Assessments](#) for fish, wildlife, and plant species
- [CalWeedMapper](#): Visualize the potential spread of invasive plants under climate change
- [Point Blue Climate-Smart Restoration Toolkits](#): Assists with the identification of climate-smart restoration activities for a variety of regions and habitat types
- [Safeguarding California and Climate Change Adaptation Policy](#)
- [California Adaptation Planning Guide](#): A planning tool for helping local government, regional entities, and climate organizations incorporate best practices and current science into their adaptation plans.
- [Readying California Fisheries for Climate Change](#)

Table 1. Examples of CDFW Proposition 1 Priority-Specific Climate Strategies

| CDFW Proposition 1 PSN Priority | Potential climate-related stressors and impacts | Examples of priority-specific strategies to enhance resilience or facilitate adaptation or mitigation ¹ | Tools & resources |
|---|---|--|--|
| <p>Large-Scale Wildfire Recovery, Response, and Prevention</p> <p><i>Project examples:</i></p> <ul style="list-style-type: none"> • Forest management for fire threat reduction • Post-fire restoration | <p>Stressors: Increased fire risk; increased temperature; extremes in precipitation (drought and flood)</p> <p>Impacts: Increased forest pest infestation; increased soil erosion; vegetation type conversion; fish and wildlife habitat loss</p> | <ul style="list-style-type: none"> • Maintain multi-aged forests with diverse species to reduce the frequency of severe fires and disease susceptibility • Restore ecological diversity to forests, in part through selective timber harvesting and polyculture replanting palettes • Reduce fuels through prescribed burns, prescribed grazing, and/or control of invasive plants • Use bioengineering solutions to control erosion and prevent sediment loading in streams | <p>Climate projections and impacts</p> <ul style="list-style-type: none"> • CalAdapt Wildfire Projection Maps • CalWeedMapper for invasive plant maps and projections <p>Adaptation strategies and guidance</p> <ul style="list-style-type: none"> • CalFire Vegetation Management Program • Climate Adaptation Clearinghouse: Forests • CALIPC Climate Adaptation Resources • California Climate Refugia in the Sierra Nevada: Fire Refugia |

¹. See General Adaptation Strategies, above, for all project types.

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| <p>Manage Headwaters for Multiple Benefits</p> <p><i>Project example:</i></p> <ul style="list-style-type: none"> • Improve and protect the quantity and quality of water available year-round | <p>Stressors: Rising air/water temperatures; decreased rainfall; decreased snowpack</p> <p>Impacts: Reduced groundwater retention; increased wildfire risk</p> | <ul style="list-style-type: none"> • Develop buffers (e.g., around riparian areas, seeps, and springs) • Use bioengineering methods rather than hardscape wherever possible • Manage forests to reduce wildfire risks and enhance groundwater storage • Enhance stream flow during critical periods for fish and wildlife • Restore mountain meadows to improve groundwater storage | <p>Climate projections and impacts</p> <ul style="list-style-type: none"> • CalAdapt streamflow projections • Projected Effects of Future Climates on Freshwater Fished of California <p>Adaptation strategies and guidance</p> <ul style="list-style-type: none"> • Guide to climate-smart meadow restoration in the Sierra Nevada and southern Cascades; pages 40-42 • California Climate Refugia in the Sierra Nevada: Hydrologic refugia |
| <p>Protect and Restore Mountain Meadow Ecosystems</p> <p><i>Project examples:</i></p> <ul style="list-style-type: none"> • Restore mountain meadow functions • Sequester greenhouse gases | <p>Stressors: Increased temperature; decreased snowpack; increased wildfire risk</p> <p>Impacts: Reduced groundwater retention</p> | <ul style="list-style-type: none"> • Use process-based design approaches and implementation methods, e.g. <ul style="list-style-type: none"> ○ Encourage beavers and/or build beaver analog structures ○ Encourage multi-thread (anastomosing) channel systems that can adjust naturally to future flows • Stabilize and shade streams, and reduce erosion with native riparian shrubs and graminoids • Reduce cattle grazing pressure • Manage for carbon sequestration | <p>Adaptation strategies and guidance</p> <ul style="list-style-type: none"> • California Climate Refugia in the Sierra Nevada: Meadow Refugia • Guide to climate-smart meadow restoration in the Sierra Nevada and southern Cascades pages 40-42 • Sierra Nevada Meadows Data Clearinghouse |

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| <p>Protect and Restore Anadromous and Other Non-Game Native Fish Habitat</p> <p><i>Project example:</i></p> <ul style="list-style-type: none"> Restore instream spawning and rearing habitat for Chinook salmon, Coho salmon, and steelhead | <p>Stressors: increased water temperatures, increased flooding</p> <p>Impacts: Changes in streamflow/ hydrologic regimes; invasive species expansion</p> | <ul style="list-style-type: none"> Expand riparian corridors Enhance stream flow during critical periods for fish and wildlife Restore fish access to historic habitats that support climate change resilience Remove fish passage impediments (e.g., dams, eroded culverts) Improve stream shading Replenish spawning gravel Improve rearing habitat (e.g., floodplains) | <p>Climate projections and impacts</p> <ul style="list-style-type: none"> Projected Effects of Future Climates on Freshwater Fishes of California CalAdapt streamflow projections <p>Adaptation strategies and guidance</p> <ul style="list-style-type: none"> Sacramento Valley Salmon Resiliency Strategy |
| <p>Protect and Restore Coastal Wetland Ecosystems</p> <p><i>Project example:</i></p> <ul style="list-style-type: none"> Protect and restore estuarine habitat | <p>Stressors: Sea-level rise; temperature increases</p> <p>Impacts: Site inundation; saltwater intrusion; coastal flooding; habitat type conversion; invasive species expansion</p> | <ul style="list-style-type: none"> Utilize sea-level rise projections to inform project planning, ensuring that project benefits will be sustained Protect adjacent floodplains and uplands from development Manually place sediments, e.g., beach sand replenishment from natural process improvement or use of dredge fill, thin-layer sediment augmentation Remove dams to improve flushing upstream and downstream sediment dynamics in wetlands | <p>Climate projections and impacts</p> <ul style="list-style-type: none"> CalFloD-3D (via CalAdapt): Sea-level rise projections CoSMoS: The Coastal Storm Modeling System Bay Shoreline Flood Explorer <p>Adaptation strategies and guidance</p> <ul style="list-style-type: none"> Sea Level Rise Guidance Conserving California's Coastal Habitat Baylands Ecosystem Habitat Goals Science Update 2015 |

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| <p>Protect and Restore Cross-Border Urban Creeks and Watersheds</p> <ul style="list-style-type: none"> • Preserve and restore riparian ecosystems and floodplains • Reduce impacts from upstream inputs of trash and chemicals that affect water quality | <p>Stressors: Temperature increases; precipitation changes (flood and drought)</p> <p>Impacts: Water quality reduction; invasive species expansion</p> | <ul style="list-style-type: none"> • Create continuous, wide riparian zones with vegetation appropriate for current and future conditions • Restore river processes, including floodplains • Create biofilters to improve water quality | <p>See statewide resources above.</p> |
| <p>Improve Habitats in the Delta</p> <p><i>Project examples:</i></p> <ul style="list-style-type: none"> • Restore tidal wetland and transitional habitat | <p>Stressors: Sea-level rise; drought; increased air/water temperatures</p> <p>Impacts: Increased subsidence; levee instability; site inundation; saltwater intrusion; invasive species expansion</p> | <ul style="list-style-type: none"> • Protect and/or restore upland and transition zone habitat adjacent to tidal areas to allow for inland migration over time • Increase elevation to reduce site inundation (e.g., use dredge material) | <p>Climate projections and impacts</p> <ul style="list-style-type: none"> • CalFloD-3D (via CalAdapt): Sea-level rise projections • CoSMoS: Coastal Storm Modeling System <p>Adaptation strategies and guidance</p> <ul style="list-style-type: none"> • Sea Level Rise Guidance • A Delta Renewed: A Guide to Science Based Ecological Restoration in the Sacramento San Joaquin Delta |

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| <p>Improve Habitats in the Delta</p> <p><i>Project examples:</i></p> <ul style="list-style-type: none"> Develop managed wetlands for subsidence reversal and carbon sequestration | <p>Stressors: Sea-level rise; increased air/water temperatures</p> <p>Impacts: Increased subsidence; site inundation; saltwater intrusion; drought; levee instability; invasive species expansion</p> | <ul style="list-style-type: none"> Change land use activities to reverse subsidence Manage water regime and vegetation to minimize methane production, reduce carbon losses, and enhance carbon sequestration | <p>Quantifying carbon sequestration</p> <ul style="list-style-type: none"> Methodology for the Quantification, Monitoring, Reporting and Verification of Greenhouse Gas Emissions Reductions and Removals from the Restoration of California Deltaic and Coastal Wetlands Revised Quantification Methodology for Land Restoration <p>Mitigation strategies and guidance</p> <ul style="list-style-type: none"> Draft California 2030 Natural and Working Lands Climate Change Implementation Plan |