**California Department of Fish and Game - CDFG - 2**

**Descriptive Title of Project/Task**: Climate change vulnerability index for rare plants in California.

**Primary Individual, Agency responsible for completing Project/Task**: California Department of Fish and Game

**Brief Description of Project/Task**: Rare plant species are potentially at great risk of local and global extinction as lowlands are flooded, fire frequencies increase, alpine habitats move up in elevation, air temperatures warm and precipitation patterns change. Species with very restricted distributions or dependent on specific geo-climatic regimes are believed to be at greatest risk.

The project will use species distribution modeling to assess the risk to habitat change under various climate change scenarios for rare plants. To predict the response of rare plant species to climate change, the project will model the current distribution of the species using climate and environmental data (e.g., soils, disturbance, land-use), use these models to predict the species distribution given climate change, calculate current and future range size, calculate the amount of overlap of predicted future distribution with current distribution, and assess where barriers and protected areas are located with reference to the change in species distribution. Given the results of the distribution modeling, each species will be scored with regard to predicted vulnerability to climate change. In addition, the modeling results will be used to identify areas of high rare plant diversity and to predict areas that will serve as climatic refugia in the future for rare plant diversity.

To accomplish this, the project will first (1) review climate change vulnerability indices created for other taxa (e.g., birds, mammals) and review spatial modeling techniques for climate change vulnerability assessment, especially for rare plant species. The review process will include literature review and consultation with conservationists and modelers at UC Davis, UC Berkeley, TNC, NatureServe, the Chicago Botanical Garden, and other institutions. A second step (2) will be to acquire or create appropriate downscaled climate data, other environmental data, and point coordinates for species, extracted from the CA Natural Diversity Database (CNDDB). Fourth (4), species distribution models will be created for each species of concern and used to predict future changes in plant distributions.

This phase of the project will prioritize plants species to be addressed in the subsequent phases and provide data to the national scoring effort being formulated by NatureServe. NatureServe, working with the state National Heritage Programs, uses a standardized set of criteria to assign species with a score of its vulnerability to climate change. The species distribution modeling proposed here will inform scoring of NatureServe factors, especially the factors in the section called "Documented or Modeled Response to Climate Change," which include 1) Documented response to recent climate change. 2) Modeled future change in range or population size. 3) Overlap of modeled future range with current range. 4) Occurrence of protected areas in modeled future distribution. Additional factors included in the vulnerability index for California rare plants will likely include barriers, land use changes, dispersal ability, physiological sensitivity to temperature and moisture, affinity for special soils, reliance on interspecific interactions, genetic factors, phenological response to changing seasonal temperature and precipitation dynamics, and population size.

**Performance Metric(s) Addressed by Project/Task**: Creation of a CA Rare Plant Climate Change Vulnerability Assessment Methodology and its application to the rarest plant species in the state. All information will be available on the web for use by managers and planners. Continued efforts will be made to communicate availability of this information to all parties that may be interested.

**Completion Date or Timetable for Project/Task**:

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| Task | Start | Finish |
| Select a HR Firm for Employee Management | 15-Nov | 8-Dec |
| Advertise, Interview and Hire Project Scientist | 8-Dec | 10-Jan |
| Conduct literature, methodology & climatic data review | 10-Jan | 1-Mar |
| Extract rare plant data set from CNDDB | 12-Jan | 15-Feb |
| Obtain down-scaled climate data | 1-Feb | 1-Mar |
| Obtain slope and aspect data sets | 1-Feb | 1-Mar |
| Finalize vulnerability assessment methodology | 1-Feb | 1-March |
| Analyze the data / assign vulnerability scores  | 1-March | 1-July |
| Write up the results into a report | 1-July | 1-Aug |
| Present the results to partners and stakeholders | 1-Aug | 1-Oct |
| Publish the results in a scientific journal | 1-Oct | 31-Dec |