

PROTECT AND MANAGE ENDEMIC GABBRO-SOIL AT-RISK PLANT SPECIES

Project Information

1. **Proposal Title:**

PROTECT AND MANAGE ENDEMIC GABBRO-SOIL AT-RISK PLANT SPECIES

2. **Proposal applicants:**

NIALL McCARTEN, Environmental Science Associates
AL FRANKLIN, U.S. BUREAU OF LAND MANAGEMENT
DANIEL BERMESTER, CALIFORNIA DEPARTMENT OF FISH AND GAME

3. **Corresponding Contact Person:**

NIALL McCARTEN
ENVIRONMENTAL SCIENCE ASSOCIATES
700 UNIVERSITY AVENUE, SUITE 130 SACRAMENTO, CA 95825
916 564-4500
nmccarten@esassoc.com

4. **Project Keywords:**

At-risk species, plants
Native Plants
Natural Resource Management

5. **Type of project:**

Monitoring

6. **Does the project involve land acquisition, either in fee or through a conservation easement?**

No

7. **Topic Area:**

At-Risk Species Assessments

8. **Type of applicant:**

Private for profit

9. **Location - GIS coordinates:**

Latitude: 38.8183174

Longitude: -121.0300980

Datum:

Describe project location using information such as water bodies, river miles, road intersections, landmarks, and size in acres.

THE PROJECT IS LOCATED IN WESTERN EL DORADO COUNTY. THE PRIMARY STUDY AREA IS THE PINE HILL PRESERVE, LOCATED APPROXIMETALY 6 MILES DUE NORTH OF HIGHWAY 50, EAST OF THE CITY OF SACRAMENTO. THE SITE IS ACCESSED ON PINE HILL LOOKOUT ROAD WHICH GOES NORTH OF GREEN VALLEY ROAD, APPROXIMATELY 4 MILES EAST OF THE INTERSECTION WITH CAMERON PARK DRIVE AND STARBUCK ROAD.

10. Location - Ecozone:

9.1 American Basin, Code 16: Inside ERP Geographic Scope, but outside ERP Ecozones

11. Location - County:

El Dorado

12. Location - City:

Does your project fall within a city jurisdiction?

No

13. Location - Tribal Lands:

Does your project fall on or adjacent to tribal lands?

No

14. Location - Congressional District:

4th

15. Location:

California State Senate District Number: 1

California Assembly District Number: 4

16. How many years of funding are you requesting?

3 years

17. Requested Funds:

a) Are your overhead rates different depending on whether funds are state or federal?

No

If no, list single overhead rate and total requested funds:

Single Overhead Rate: 0%

Total Requested Funds: \$454,400

b) Do you have cost share partners already identified?

No

c) Do you have potential cost share partners?

No

d) Are you specifically seeking non-federal cost share funds through this solicitation?

No

If the total non-federal cost share funds requested above does not match the total state funds requested in 17a, please explain the difference:

18. **Is this proposal for next-phase funding of an ongoing project funded by CALFED?**

No

Have you previously received funding from CALFED for other projects not listed above?

Yes

If yes, identify project number(s), title(s) and CALFED program.

F23	SOUTH NAPA RIVER TIDAL SLOUGH RESTORATION	HABITAT RESTORATION
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19. **Is this proposal for next-phase funding of an ongoing project funded by CVPIA?**

No

Have you previously received funding from CVPIA for other projects not listed above?

No

20. **Is this proposal for next-phase funding of an ongoing project funded by an entity other than CALFED or CVPIA?**

No

Please list suggested reviewers for your proposal. (optional)

KIRSTEN TARP U.S. FISH AND WILDLIFE SERVICE 916/414-6600

KEN FULLER U.S. FISH AND WILDLIFE SERVICE 916/414-6600

DIANE ELAM U.S. FISH AND WILDLIFE SERVICE 916/414-6600

**ROXANNE
BITTMAN CALIFORNIA
DEPARTMENT OF FISH AND GAME 916/323-8970 rbittman@dfg.ca.gov**

21. Comments:

Environmental Compliance Checklist

PROTECT AND MANAGE ENDEMIC GABBRO-SOIL AT-RISK PLANT SPECIES

1. CEQA or NEPA Compliance

a) Will this project require compliance with CEQA?

No

b) Will this project require compliance with NEPA?

No

c) If neither CEQA or NEPA compliance is required, please explain why compliance is not required for the actions in this proposal.

THIS IS A RESEARCH AND MONITORING PROJECT ONLY.

2. **If the project will require CEQA and/or NEPA compliance, identify the lead agency(ies). If not applicable, put "None".**

CEQA Lead Agency:

NEPA Lead Agency (or co-lead:)

NEPA Co-Lead Agency (if applicable):

3. **Please check which type of CEQA/NEPA documentation is anticipated.**

CEQA

-Categorical Exemption

-Negative Declaration or Mitigated Negative Declaration

-EIR

Xnone

NEPA

-Categorical Exclusion

-Environmental Assessment/FONSI

-EIS

Xnone

If you anticipate relying on either the Categorical Exemption or Categorical Exclusion for this project, please specifically identify the exemption and/or exclusion that you believe covers this project.

4. **CEQA/NEPA Process**

a) Is the CEQA/NEPA process complete?

Not Applicable

b) If the CEQA/NEPA document has been completed, please list document name(s):

5. **Environmental Permitting and Approvals** (*If a permit is not required, leave both Required? and Obtained? check boxes blank.*)

LOCAL PERMITS AND APPROVALS

Conditional use permit

Variance

Subdivision Map Act

Grading Permit

General Plan Amendment

Specific Plan Approval

Rezone

Williamson Act Contract Cancellation

Other

STATE PERMITS AND APPROVALS

Scientific Collecting Permit Required

CESA Compliance: 2081

CESA Compliance: NCCP

1601/03

CWA 401 certification

Coastal Development Permit

Reclamation Board Approval

Notification of DPC or BCDC

Other

FEDERAL PERMITS AND APPROVALS

ESA Compliance Section 7 Consultation

ESA Compliance Section 10 Permit

Rivers and Harbors Act

CWA 404

Other

PERMISSION TO ACCESS PROPERTY

Permission to access city, county or other local agency land.

Agency Name:

Permission to access state land.

Agency Name: CA DEPARTMENT OF FISH AND GAME

Obtained

Permission to access federal land.

Agency Name: US BUREAU OF LAND MANAGEMENT

Obtained

Permission to access private land.

Landowner Name:

6. **Comments.**

Land Use Checklist

PROTECT AND MANAGE ENDEMIC GABBRO-SOIL AT-RISK PLANT SPECIES

1. **Does the project involve land acquisition, either in fee or through a conservation easement?**

No

2. **Will the applicant require access across public or private property that the applicant does not own to accomplish the activities in the proposal?**

No

3. **Do the actions in the proposal involve physical changes in the land use?**

No

If you answered no to #3, explain what type of actions are involved in the proposal (i.e., research only, planning only).

THIS IS A RESEARCH AND MONITORING PROJECT ONLY.

4. **Comments.**

Conflict of Interest Checklist

PROTECT AND MANAGE ENDEMIC GABBRO-SOIL AT-RISK PLANT SPECIES

Please list below the full names and organizations of all individuals in the following categories:

- Applicants listed in the proposal who wrote the proposal, will be performing the tasks listed in the proposal or who will benefit financially if the proposal is funded.
- Subcontractors listed in the proposal who will perform some tasks listed in the proposal and will benefit financially if the proposal is funded.
- Individuals not listed in the proposal who helped with proposal development, for example by reviewing drafts, or by providing critical suggestions or ideas contained within the proposal.

The information provided on this form will be used to select appropriate and unbiased reviewers for your proposal.

Applicant(s):

NIALL McCARTEN, Environmental Science Associates
AL FRANKLIN, U.S. BUREAU OF LAND MANAGEMENT
DANIEL BERMESTER, CALIFORNIA DEPARTMENT OF FISH AND GAME

Subcontractor(s):

Are specific subcontractors identified in this proposal? Yes

If yes, please list the name(s) and organization(s):

R. DOUGHERTY FIRESTOP

Helped with proposal development:

Are there persons who helped with proposal development?

Yes

If yes, please list the name(s) and organization(s):

AL FRANKLIN U.S. BUREAU OF LAND MANAGEMENT

DAVID BERMESTER CALIFORNIA DEPARTMENT OF FISH AND GAME

Comments:

Budget Summary

PROTECT AND MANAGE ENDEMIC GABBRO-SOIL AT-RISK PLANT SPECIES

Please provide a detailed budget for each year of requested funds, indicating on the form whether the indirect costs are based on the Federal overhead rate, State overhead rate, or are independent of fund source.

Independent of Fund Source

Year 1												
Task No.	Task Description	Direct Labor Hours	Salary (per year)	Benefits (per year)	Travel	Supplies & Expendables	Services or Consultants	Equipment	Other Direct Costs	Total Direct Costs	Indirect Costs	Total Cost
1	DETERMINE FIRE HISTORY IN WESTERN EL DORADO COUNTY AND MAP RARE PLANTS	668	61,300		950	1,500	3,600		4,675	72025.0		72025.00
2	ASSESS PRESCRIBED BURN POTENTIAL FOR TOPOGRAPHIC/VEGETATION UNITS OF PRESERVE	440	47,880		500	500	10,650		3,100	62630.0		62630.00
3	HABITAT AND POPULATION MODEL FOR EL DORADO BEDSTRAW	1,072	89,400		2,000	650			14,635	106685.0		106685.00
		2180	198580.00	0.00	3450.00	2650.00	14250.00	0.00	22410.00	241340.00	0.00	241340.00

Year 2												
Task No.	Task Description	Direct Labor Hours	Salary (per year)	Benefits (per year)	Travel	Supplies & Expendables	Services or Consultants	Equipment	Other Direct Costs	Total Direct Costs	Indirect Costs	Total Cost
1	DETERMINE FIRE HISTORY IN WESTERN EL DORADO COUNTY AND MAP RARE PLANTS									0.0		0.00
2	ASSESS PRESCRIBED BURN POTENTIAL FOR TOPOGRAPHIC/VEGETATION UNITS OF PRESERVE	276	25,260		375	400			1,925	27960.0		27960.00
3	HABITAT AND POPULATION MODEL FOR EL DORADO BEDSTRAW	976	86,600		1,800	1,250			6,200	95850.0		95850.00
		1252	111860.00	0.00	2175.00	1650.00	0.00	0.00	8125.00	123810.00	0.00	123810.00

Year 3												
Task No.	Task Description	Direct Labor Hours	Salary (per year)	Benefits (per year)	Travel	Supplies & Expendables	Services or Consultants	Equipment	Other Direct Costs	Total Direct Costs	Indirect Costs	Total Cost
1	DETERMINE FIRE HISTORY IN WESTERN EL DORADO COUNTY AND MAP RARE PLANTS									0.0		0.00
2	ASSESS PRESCRIBED BURN POTENTIAL FOR TOPOGRAPHIC/VEGETATION UNITS OF PRESERVE									0.0		0.00
3	HABITAT AND POPULATION MODEL FOR EL DORADO BEDSTRAW	876	81,800		1,850	950			4,650	89250.0		89250.00
		876	81800.00	0.00	1850.00	950.00	0.00	0.00	4650.00	89250.00	0.00	89250.00

Grand Total=454400.00

Comments.

Budget Justification

PROTECT AND MANAGE ENDEMIC GABBRO-SOIL AT-RISK PLANT SPECIES

Direct Labor Hours. Provide estimated hours proposed for each individual.

ENVIRONMENTAL SCIENCE ASSOCIATES: MATTHEW ZIDAR - OFFICE DIRECTOR: 80 HOURS NIALL McCARTEN - PROJECT MANAGER/SR. BOTANIST: 1184 HOURS CHRIS ROGERS ECOLOGIST: 440 HOURS YOLANDA MOLETTE BOTANIST: 760 HOURS ERICH FISHER - BOTANIST: 248 HOURS STAFF BOTANIST: 1500 HOURS ADMINISTRATION: 256 HOURS FIRESTOP: R. DOUGHERTY CONSULTANT: 192 HOURS

Salary. Provide estimated rate of compensation proposed for each individual.

ENVIRONMENTAL SCIENCE ASSOCIATES: MATTHEW ZIDAR - OFFICE DIRECTOR: \$12,000 NIALL McCARTEN - PROJECT MANAGER/SR. BOTANIST: \$126,640 CHRIS ROGERS ECOLOGIST: \$45,000 YOLANDA MOLETTE BOTANIST: \$55,000 ERICH FISHER GEOGRAPHIC INFORMATION SYSTEMS: \$23,760 STAFF BOTANIST: \$112,500 ADMINISTRATION: \$17,340 FIRESTOP: R. DOUGHERTY CONSULTANT: \$13,600

Benefits. Provide the overall benefit rate applicable to each category of employee proposed in the project.

BENEFITS ARE INCLUDED IN THE HOURLY RATE.

Travel. Provide purpose and estimate costs for all non-local travel.

TRAVEL WILL INVOLVE TRAVEL FROM ENVIRONMENTAL SCIENCE ASSOCIATES (ESAs) SACRAMENTO, OAKLAND, AND SAN FRANCISCO OFFICES BY FIELD STAFF TO CONDUCT STUDIES IDENTIFIED IN THE PROPOSAL. DUE TO REPEATED VISITS FOR MONITORING, WE ANTICIPATE THAT 75 PERCENT OF OUR TRAVEL EXPENSE OF \$5,606 WILL BE FOR TRAVEL TO FIELD SITES. THE REMAINING TRAVEL COSTS WILL BE FOR MEETINGS WITH ESA STAFF, CONSULTANTS, AND U.S. BUREAU OF LAND MANAGEMENT (BLM) AND CALIFORNIA DEPARTMENT OF FISH AND GAME (DFG) AGENCY STAFF.

Supplies & Expendables. Indicate separately the amounts proposed for office, laboratory, computing, and field supplies.

INCLUDES PURCHASING AERIAL PHOTOGRAPHS AND OTHER MAPPING SUPPLIES, AND 35MM FILM AND PROCESSING FOR PHOTODOCUMENTATION DURING FIELD WORK AND MONITORING. FIELD: \$4,800 COMPUTING: \$450

Services or Consultants. Identify the specific tasks for which these services would be used. Estimate amount of time required and the hourly or daily rate.

WE WILL SUBCONTRACT WITH R. DOUGHERTY OF FIRESTOP IN GRANITE BAY, CALIFORNIA, FOR FIRE MANAGEMENT EXPERTISE. MR. DOUGHERTY WILL CONTRIBUTE 192 HOURS, PRIMARILY IN TASKS 1 AND 2 DURING YEAR 1. HIS HOURLY RATE IS \$85.

Equipment. Identify non-expendable personal property having a useful life of more than one (1) year and an acquisition cost of more than \$5,000 per unit. If fabrication of equipment is proposed, list parts and materials required for each, and show costs separately from the other items.

NOT APPLICABLE.

Project Management. Describe the specific costs associated with insuring accomplishment of a specific project, such as inspection of work in progress, validation of costs, report preparation, giving presentations, response to project specific questions and necessary costs directly associated with specific project oversight.

MATTHEW ZIDAR (ESA) WILL SPEND APPROXIMATELY 90 PERCENT OF HIS \$12,000 BUDGET TO ENSURE THAT SCHEDULES ARE MET, AND QUARTERLY AND TECHNICAL REPORTS ARE PRODUCED, REVIEWED, AND SUBMITTED. NIAL McCARTEN (ESA) WILL BE THE TECHNICAL PROJECT MANAGER. HE WILL SPEND APPROXIMATELY 10 PERCENT OF HIS TIME AND BUDGET TO ENSURE FIELD AND OTHER STAFF ARE CONDUCTING THE APPROPRIATE STUDIES AND DEVELOPING THE REQUIRED TECHNICAL REPORTS. HE ALSO WILL PREPARE THE QUARTERLY REPORTS FOR CALFED, AND WILL BE RESPONSIBLE FOR COORDINATING WITH BLM AND DFG STAFF TO ENSURE THAT ALL NECESSARY PERMITS ARE OBTAINED.

Other Direct Costs. Provide any other direct costs not already covered.

FIELD AND LAB-RELATED EXPENSES: SOIL SAMPLING AND ANALYSIS: \$12,000
FIELD MONITORING EQUIPMENT RENTAL: 3 YEARS OF MONITORING- DATA LOGGERS: \$5,200
ENVIRONMENTAL SENSORS (TEMP, HUMIDITY, PRECIP): \$3,500
ECOPHYSIOLOGICAL EQUIPMENT AND LEAF AREA METER: \$6,500
EQUIPMENT CALIBRATION COST (CALIBRATION EACH YEAR): \$1,200
GLOBAL POSITIONING SYSTEMS AND ANTENNA: \$5,000
VEHICLE RENTAL: \$1,850
EQUIPMENT PURCHASE: 4 LICOR QUANTUM LIGHT SENSORS (@ \$525 EA.): \$2100

Indirect Costs. Explain what is encompassed in the overhead rate (indirect costs). Overhead should include costs associated with general office requirements such as rent, phones, furniture, general office staff, etc., generally distributed by a predetermined percentage (or surcharge) of specific costs.

NONE.

Executive Summary

PROTECT AND MANAGE ENDEMIC GABBRO-SOIL AT-RISK PLANT SPECIES

THIS PROJECT WILL PROVIDE CRITICAL INFORMATION FOR THE DEVELOPMENT OF PROTECTION AND MANAGEMENT PLANS FOR GABBRO-SOIL AT-RISK PLANT SPECIES. THIS PROJECT IS A PRIORITY FOR CVPIA HABITAT RESTORATION. THE PROJECT WILL CONDUCT STUDIES ON THE FIRE HISTORY ON PRESERVES THAT HAVE CHAPARRAL, WOODLANDS, AND AT-RISK SPECIES ASSOCIATED WITH THE NUTRIENT-POOR GABBRO-SOILS IN WESTERN EL DORADO COUNTY. LOSS OF HABITAT FROM URBAN DEVELOPMENT HAS CAUSED A LOSS OF THE RARE GABBRO-SOILS. OUR HYPOTHESIS IS A RETURN TO NATURE FIRE REGIMES, AND A BETTER UNDERSTANDING OF AT-RISK SPECIES BIOLOGY WILL ALLOW US TO DEVELOP MANAGEMENT ACTIVITIES THAT WILL PROVIDE HIGH-QUALITY HABITAT. FIRE HISTORY INFORMATION WILL BE ENTERED INTO A GEOGRAPHIC INFORMATION SYSTEM (GIS), AND AT-RISK PLANT LOCATION DATA COLLECTED IN THE FIELD WILL BE OVERLAIN ALONG WITH EXISTING GIS VEGETATION DATA. ANALYSIS TO DETERMINE AT-RISK PLANT POPULATION CONDITION WITH FIRE WILL BE CONDUCTED. A SECOND TASK WILL EVALUATE THE PRESERVE FOR POTENTIAL FUTURE PRESCRIBED BURNING. FIRE HISTORY DATA AND SURVEYS OF THE VEGETATION, TOPOGRAPHY, AND HAZARDS ASSOCIATED WITH U.S. BUREAU OF LAND MANAGEMENT AND CALIFORNIA DEPARTMENT OF FISH AND GAME PRESERVES WILL BE USED TO IDENTIFY AND DELINEATE MANAGEMENT UNITS. RECOMMENDATIONS BY FIRE MANAGEMENT EXPERTS WILL ASSIST IN DEVELOPING IMPLEMENTATION OF A PRESCRIBED BURNING PROGRAM. A THIRD TASK WILL CONDUCT HABITAT AND POPULATION STUDIES ON EL DORADO BEDSTRAW, AN AT-RISK GABBRO-SOIL ENDEMIC PLANT. THE STUDIES WILL INCLUDE DETAILED POPULATION SIZE AND STRUCTURE MAPPING AND 3 YEARS OF MONITORING. WE WILL CONDUCT DETAILED HABITAT EVALUATION TO DETERMINE WHAT KEY CHARACTERISTICS ARE ASSOCIATED WITH THE RARE PLANT. WE WILL DEVELOP A DETAILED POPULATION AND HABITAT MODEL THAT WILL BE INTEGRATED INTO THE FIRE ECOLOGY AND MANAGEMENT PLANNING PROCESS.

Proposal

Environmental Science Associates

PROTECT AND MANAGE ENDEMIC GABBRO-SOIL AT-RISK PLANT SPECIES

NIALL McCARTEN, Environmental Science Associates
AL FRANKLIN, U.S. BUREAU OF LAND MANAGEMENT
DANIEL BERMESTER, CALIFORNIA DEPARTMENT OF FISH AND GAME

Calfed Ecosystem Restoration Plan Proposal

PROTECT AND MANAGE ENDEMIC GABBRO-SOIL AT-RISK PLANT SPECIES IN EL DORADO COUNTY

A. Project Description

Five federally listed plant species and one species identified as a federal species of concern (Table 1) grow on low-nutrient gabbro soils in El Dorado County, California (U.S. Fish and Wildlife Service [USFWS] 1999). The listed species grow in association with fire-adapted chaparral and woodland plant communities that are distinct and have been classified as gabbroic northern mixed chaparral (Holland 1986, Hunter and Horenstein 1991). The gabbro soils in which these CALFED At-risk plant species grow are limited in their extent. There are approximately 10,400 hectares (27,700 acres) of land that is part of the Pine Hill geologic formation in which the gabbro soils occur. These gabbro soils have been classified as part of the Rescue soil series. They have mineral, nutrient, and soil-water characteristics that make them unique. Gabbro soils and the ecology of the plants that occur on them has been compared with serpentine soils which have a relatively high diversity of endemic plants (Kruckeberg 1984, McCarten 1986, Harrison et al. 2000). It has been hypothesized that plant adaptation to the low nutrient and other ecologically challenging conditions of serpentine soils, and by correlation gabbro soils, has resulted in reduced competition (Kruckeberg 1984, McCarten 1986, 1997).

Land use changes primarily due to urban development has resulted in the loss of habitat and caused habitat fragmentation. El Dorado County is one of California's faster growing counties. Further development of land in the County, including the gabbro soil areas, will have a significant impact on the gabbro soil rare plants. Water contract renewal for the El Dorado Irrigation District requires the protection and management of these rare plant species and their habitats.

A recovery plan has been developed by the USFWS (1999) for gabbro soil plants of the Sierra Nevada foothills. This recovery plan has identified specific activities that can lead to recovery of the At-risk plant species. Protection of land is a primary part of the recovery process and some lands have been acquired by the U.S. Bureau of Land Management (BLM), California Department of Fish and Game (DFG) and El Dorado County. Management activities, including controlled burning and other fuel load reduction methods, have begun on some preserves and proposed in other preserves. The recovery plan has identified a series of steps needed for individual species to become unlisted. Habitat management that will replicate the natural fire regime is one of those steps. Limited experiments on some species, Pine Hill ceanothus (*Ceanothus rodericki*), El Dorado mule-ears (*Wyethia reticulata*), and Pine Hill flannelbush (*Fremontodendron Californicum* ssp. *Decumbens*), has determined that replicating the natural fire regime will

result in increased reproduction and plant growth (Boyd 1987). It will be important to monitor the response of the At-risk species to determine whether controlled burning, and other management activities that are more broadly applied, benefit the plant species. Although studies have identified restoration of the natural fire regime as important to the recovery of these species, we currently do not know the fire history of western El Dorado County. Investigations on the fire history and the occurrence of At-risk plants are needed. Studies on the reproduction and population biology have been conducted for some of the gabbro At-risk plant species (USFWS 1999). One species, El Dorado bedstraw (*Galium californicum* ssp. *sierrae*), has not been studied to the same extent as other gabbro plants. The recovery plan has identified a need for demographic and ecological studies for El Dorado bedstraw.

Our project proposes to implement monitoring and research activities that will meet three primary goals and their associated objectives. The proposed project will occur during a three-year period in order to encompass multiple years of monitoring.

Goals and Objectives

Goal 1: Determine the fire history in western El Dorado County in relation to the occurrences of At-risk gabbro soil plant species.

Objective 1: Correlate historical fire events with gabbro soil areas and develop a fire chronology,

Objective 2: Correlate plant species and population data with the fire history of specific sites.

Goal 2: Use Geographical Information System (GIS) to assemble pertinent data to assess the risks and benefits to At-risk species of prescribed burning in each of the various topographic/vegetation units of the preserve.

Goal 3: Identify demographic and other ecological factors for El Dorado bedstraw that need to be understood to aid species recovery.

Objective 1: Characterize habitat and plant associations for El Dorado bedstraw.

Objective 2: Conduct a demographic study to determine population size and variation with respect to biotic and abiotic variables.

Objective 3: Determine life-history characteristics for this species that make it susceptible to extirpation and characteristics that are needed to aid recovery.

2. Justification

The acquisition of lands by the BLM and DFG is just the first step in the protection of gabbro-soil vegetation and At-risk plant species. Developing an implementing sound management plans is crucial to the success of the habitat and species protection. Extensive information on chaparral habitats indicates that restoring the natural fire regime through prescribed burning will benefit the habitat, plant species, and overall fire hazards. We have developed a conceptual model (Figure 1) that shows the relationship of our project to CALFED ERP and Science Programs and the CVPIA priorities. To better understand the fire ecology of the area we are proposing to study the fire history and assess fire management issues on the preserves. The concept model shows the process of evaluating fire history for gabbro-soil chaparral and determining the condition of associated At-risk plants. Independently the model demonstrates that we will assess prescribed burning on the BLM and DFG preserves. The fire management assessment directly relates to CVPIA priorities for protecting and managing gabbro-soil chaparral and At-risk plants. Under the CALFED Science program and the CVPIA priorities we will build population models for El Dorado bedstraw, an At-risk plant that have not been adequately studied to identify risk issues. We will conduct studies leading to the development of population and habitat models needed for the development of management plans.

3. Approach

Our approach will include the following three tasks that will be implemented to meet our proposed goals and objectives.

Task 1 - Determine the Fire History in Western El Dorado County

We will correlate historical fire events with gabbro soil areas and develop a fire chronology. Using historical aerial photographs and information gathered on fire history, we will digitize boundaries of previous fires into an ArcInfo GIS using existing digital vegetation baseline maps. We will develop a fire history database that will include key information on each fire when available, such as seasonal timing, fire direction, intensity, and weather conditions (wind, air temperature, humidity).

As part of this task, we will locate known populations of the at-risk species and locate the site using a global positioning system (GPS) with an accuracy of 1-3 meters. Using the fire history map, we will correlate At-risk plant species and population data with the fire history at specific sites. Additionally, we will correlate the fire histories with the overall vegetation types using the existing plant community GIS database.

Task 2 - Assessing Prescribed Burn Potential for Topographic and Vegetation Units of the Preserve.

The information collected also will provide a basis for wildfire suppression planning for the preserve. It also will aid in planning mechanical fuels reduction projects. We propose to conduct the following studies for this task:

1. Using topographic mapping divide the preserve into aspect/slope units.
2. Using vegetation mapping, divide the preserve into vegetation units.
3. Using aerial photography and ground truthing, divide the preserve into fuel load units. Fuel units should be characterized by height of fuels, mass of fuels, and percentage of dead fuels.
4. Map existing fuelbreaks including both cleared areas (e.g., roads, rights-of-way), recent burns and areas that naturally support only sparse, discontinuous vegetation. Fuelbreaks will be mapped for both the interior of the preserve and for the boundaries of the preserve (including cleared private land immediately adjacent to the preserve). The width of fuel breaks will be recorded. If fuelbreak areas are vegetated, characterize the fuels (see no.3 above). If natural revegetation is occurring following a previous disturbance, we will estimate the length of time fuelbreaks will remaining effect.
5. Using parcel maps, aerial photos and ground truthing, divide preserve boundary segments into units of risk to private property at the boundary of the preserve:
 - (A) From prescribed burns (if an escape occurs),
 - (B) From wildfire, if no burning or other fuels reduction occurs beforehand. (High risk to structures from a potential wildfire can be an additional incentive for prescribed fire that has the potential to reduce fuels and reduce the potential for a devastating wildfire.)
6. For each of the larger units of the preserve, assess smoke hazard of burning based on proximity of residences, businesses, critical infrastructure (highways, roads, airport), topography, and prevailing winds. The expertise of local air quality regulators and local fire specialists will be incorporated in these assessments.
7. Using existing information from California Natural Diversity Database (CNDDDB) and other sources, map rare plant occurrences on preserve. The proximity of rare plant occurrences to potential burn units will affect the potential of burns to stimulate regeneration of rare species.

8. Combining the above information, with the expertise of professionals firefighter, rank geographic areas within the preserve for prescribed burning based on risk of escape and potential property damage.
9. Combining the above information, rank geographic areas within the preserve for prescribed burning based on their potential to produce the greatest information about the responses of the At-risk species. Initial research burns may be on the order of 10 acres or less. Factors should include:
 - A) Rare species is extensive enough that it is feasible to create a burn unit that includes only a portion of the rare plant occurrence.
 - B) No unacceptable risk to entire occurrence or population from burning.
 - C) Multiple species can be researched with a single burn.
 - D) Not located in the highest risk areas as determined from item No.8 above.

Task 3 - Develop a Habitat and Population Biology Model for El Dorado Bedstraw

We will characterize habitat and plant associations for El Dorado bedstraw and conduct measurements within existing preserves and on private properties where permission is granted. We will identify the specific locations of each population using GPS that is accurate to 1-3 meters and develop a GIS map. We will measure abiotic factors including slope, aspect, soils, leaf litter and other organic debris, and incident light levels. Soil samples will measure primary nutrients (nitrogen, phosphorus), minerals (calcium, magnesium, potassium, manganese), pH, soil texture (percent sand, silt, clay), percent organic matter, permanent wilting point, and field capacity. Light levels will be monitored through the growing season using a LiCor quantum light sensor to measure diurnal photosynthetically active radiation (PAR). The light sensors will be connected to a data logger and multiple light sensors will measure the PAR variation in at least two populations. Climatic variables will be measured including temperature, humidity, and precipitation.

Plant community and plant associate information will be collected to determine the community composition and structure. A sampling grid will be established at particular populations as part of the demographic study (see below). The sampling grid will be used to identify plant associates and quantify their relative cover for species occurring within El Dorado bedstraw populations and outside the population boundaries.

We will conduct a demographic study to determine population size and variation with respect to biotic and abiotic variables. Sex ratios for this dioecious species will be established by complete counts where feasible, by sampling otherwise. A limited number of plants will be excavated to shed light on the degree of vegetative spread of individual genets, as well as providing information about underground architecture. Excavations

will be performed under the terms of permits from USFWS and California Department of Fish and Game (DFG).

This study will measure the population size, density and area by establishing a sampling grid that will include the population and that extend beyond the population boundaries. The grid will be created for use in obtaining baseline information on this species, and to establish a long-term population-monitoring program for the Pine Hill Preserve. One known population occurs on BLM preserve property and one occurs on the DFG Pine Hill Preserve. All other known populations occur on private land (USFWS 1999). An ongoing acquisition program may bring one or more additional populations into public ownership within the time frame of this proposal. We will coordinate with landowners to obtain permission to conduct at least a one-time population monitoring effort.

We will establish permanent sample plots that can be used for long-term monitoring including monitoring at the individual plant level. Establishment, growth, reproductive output (for females), and mortality will be recorded for individuals. We will conduct a study on the seed production by female plants, test seed viability and percent germination, and we will establish a seed viability decay study during the three-year program that will continue beyond the term of this proposal. Micromapping will be used to identify individuals, male and female plants, of this perennial species from year to year.

Population study plots will establish grids with cells that incorporate a population of El Dorado bedstraw and that extend outside the population boundaries. The size of the grid cells and the grids will depend on the population size and densities. Our objective will be to establish a baseline on specific populations and track individual plants in the future. We will count all the plants within four populations. We will measure plant densities and distance to the nearest El Dorado bedstraw and plant associates. We will measure specific life-history characteristics, including plant height and diameter, number of branches, number of flowers, and seed set.

We will develop a habitat and population model for El Dorado bedstraw based on a correlation of abiotic and biotic characteristics of the habitat with demographic measurements and characteristics. The correlation analysis will use multivariate statistical methods including canonical correlation analysis using the software package CANOCO (ter Braak 1987-1992). These methods will be used to determine the significance of correlation between El Dorado bedstraw population numbers and reproductive characteristics, with specific abiotic variables and plant associations.

4. Feasibility

This project has a high level of feasibility due to participation of the BLM and DFG staff that are currently managing the gabbro soil preserves. The staff from these agencies, in coordination with the USFWS, have identified the needs and priorities for aiding the recovery of the At-risk plant species. In addition, the plant ecologists identified on the

proposal team have direct experience with the gabbro soil habitats and the At-risk species, and are recognized as experts on serpentine and gabbro soil rare plants. Further, the plant ecologists have direct experience working with other federal, state, and local agencies (i.e. U.S. Forest Service, California Department of Forestry, and the Marin Water District) on controlled burns for the purpose of managing vegetation.

5. Performance Measures

Our proposed project intends to conduct needed research that will increase our understanding on the fire ecology of the gabbro-soil chaparral and the associated rare plants. This information is critical prior to attempting to implement a prescribed burning program. In addition, our study will include a detailed population and habitat study on El Dorado bedstraw which is the one remaining species that is poorly understood in terms of its requirements. The data we collect will be peer-reviewed by experts. This independent review will ensure that our methods and interpretation of the results are sound.

Because many of the At-risk species we will be studying and managing have such a large threat of population extirpation, or in some cases species extinction, we will use due caution in the application of our methods. We will be using strict controls of our methods and not be placing any species at additional risk. Oversight of the project by the USFWS and DFG will provide additional safeguards.

6. Data Handling and Storage

All original data and copies will be maintained by BLM. Copies of all data will be stored at DFG, and copies will be sent to the USFWS and El Dorado County Planning Department. Field survey forms and other data, including GIS databases, related to plant population locations and habitat information will be sent to the CNDDDB. Environmental Science Associates will maintain a copy of all data collected by its staff; otherwise all original data will be copied and sent to BLM.

7. Expected Products/Outcomes

8. Work Schedule

All products/outcomes anticipated and the work schedule are given in Table 1 at the end of the text section of this proposal.

B. Applicability to CALFED ERP and Science Program Goals and Implementation Plan and CVPIA Priorities

1. ERP, Science Program and CVPIA Priorities

Our project will specifically meet a CVPIA Habitat Restoration Program Priority:

- Protect and manage gabbro-soil chaparral habitat: Protect and manage gabbro-soil chaparral habitat in El Dorado County to benefit federally-listed plant species and other at-risk plant species. (Implementation Plan, page 58).

CALFED Science Program Goals

The proposed project incorporates two main priorities identified in the CALFED Science Program including:

- Conduct adaptive management experiments: Our project provide the basis for experimental controlled burning and manual clearing as methods to improve at-risk species habitats and their populations (Implementation Plan, page 58) and,
- Build population models for at-risk species: Our project will develop a quantitative and qualitative population and habitat model for El Dorado bedstraw. (Implementation Plan, page 58).

2.1 Relationship to Other Ecosystem Restoration Projects

This project is the first of its kind to address issues of this type including fire management for terrestrial vegetation and At-risk species.

3. Requests for Next Phase Funding

N/A

4. Previous Recipients of CALFED Program on CVPIA Funding

N/A

5. System-Wide Ecosystem Benefits

Prescribed burning is a very important tool for the management of vegetation and watersheds. Restoring natural fire regimes will improve vegetation growth and plant community structure that ultimately will protect the watershed from erosion caused by catastrophic fires and improve water quality. The use of fire management will be important throughout the ecosystem in protecting the vegetation, and benefit At-risk species that are adapted to habitats that have fire as an ecological factor.

6. Additional Information for Proposals Containing Lead Acquisition

C. Qualifications

Niall McCarten, Ph.D. is senior plant ecologist with Environmental Science Associates and Research Associate with the Section of Plant Biology at UC Davis, and the UC Jepson Herbarium at UC Berkeley. He received his B.A. in botany at UC Santa Barbara, M.A. in Ecology and Systematics at San Francisco State University, and Ph.D. in botany at UC Berkeley. He is a nationally recognized plant ecologist with peer-reviewed papers and conference presentations on rare and endangered plants, research with serpentine and gabbro soil habitats, and plant population monitoring. He has conducted rare plant studies for federal agencies including the U.S. Forest Service, USFWS, DFG, Department of Parks and Recreation, and numerous local agencies. He was one of the few non-public agency scientists asked to participate in the development of the original CALFED Ecosystem Restoration Program plan, participated in the development of the CALFED Natural Community Conservation Plan. He was chairman of conservation and vice-president of the California Botanical Society. Dr. McCarten will be the project manager for this project and will be responsible for coordinating with federal and state agency staff and ensuring the project meets its goals and objectives.

Al Franklin is a botanist for BLM, Folsom Field Office. He received a B.A. in Biology from Humboldt State University, and an M.S. in Range and Wildlands Science from the University of California, Davis. He has worked for the U.S. Forest Service, four forests and the Pacific Southwest Forest and Range Experiment Station; and the National Park Service as well as BLM. He has done prescribed burning and wildfire suppression. He has 11 years of experience in monitoring and management of rare species of serpentine and gabbro substrates. He has been the BLM lead for the management of the Red Hills Area of Critical Environmental Concern in Tuolumne County (serpentine). He has had responsibility for management of the extensive public lands supporting gabbro soils species in El Dorado County. He will become interim manager of the newly created Pine Hill Preserve in 2002.

Daniel Burmester is an Associate Biologist/Botanist with DFG. He received his B.S. in Biological Sciences and an M.S. in Biological Sciences (concentration in Biological Conservation) at CSU Sacramento. He is DFG's botanist for the Sacramento Valley-Central Sierra Region. He is the lead DFG representative on rare plant species and native plant communities in the region. He is currently working with BLM to develop a management plan for the Pine Hill Preserve. He also is managing a contract with the American River Conservancy for Education and Outreach in regards to Pine Hill Gabbro Plants. He has over 11 years' experience conducting research, restoration, and monitoring throughout California. His area of research is on community ecology, invasive weeds, and restoration. For over a decade, he has been active in the Sacramento Chapter of the California Native Plant Society and has been a member of the California Botanical Society.

Chris Rogers is a plant ecologist with Environmental Science Associates. He received his B.A. in ecology from San Francisco State University. He is considered a regional expert on serpentine plant ecology and chaparral fire ecology. He has conducted ecological studies on serpentine chaparral and participated in prescribed burning studies in the Marin Water District's serpentine preserve at Carson Ridge. He also has conducted studies on serpentine rare plants and plant communities for the Mendocino National Forest.

Erich Fischer is a biologist with Environmental Science Associates who serves as a technical analyst for a variety of projects. He specializes in environmental assessments, environmental impact statements, and biological assessments. He received his B.A. in Biological Sciences from UC California, Sacramento. Mr. Fischer is also skilled in field surveys for many California listed species, habitat modeling on GIS systems, ecological monitoring and restoration, and habitat delineation. Mr. Fischer is expert in the requirements of the CEQA and the NEPA, and in the preparation of environmental documents. Mr. Fischer will conduct field studies on wildlife and will prepare environmental regulatory documents.

Yolanda Molette is a botanist and plant ecologist with Environmental Science Associates and has extensive experience with identification and ecology of California flora. She received her B.A. in Biology (emphasis botany) and M.A. in Conservation Biology from San Francisco State University. Her experience ranges from conducting rare plant surveys, vegetation mapping, and ecological monitoring and interpretation to preparing habitat restoration plans, erosion control plans, and experience with non-native invasive plant species. Ms. Molette also analyzes impacts to biological resources, and performs habitat assessments for various types of projects and environmental compliance monitoring for construction projects.

Mark Fogiel, plant ecologist, specializes in vegetation analysis, rare plant surveys, and restoration planning and monitoring. He is particularly knowledgeable in rare plant management in a variety of California ecosystems including vernal pools, grasslands, oak woodlands, riparian, and Sierran forest. Mr. Fogiel has conducted rare plant surveys, wetland evaluations and restoration plans for numerous projects throughout California. His experience in the Delta Region includes rare plant surveys and wetland evaluations for the San Joaquin Irrigation District/South County Surface Water Project, the Napa Sanitation District Recycled Water Pipeline project, the South Bay Aqueduct Improvement Project, the Frank's Tract State Recreation Area Project. He also conducted extensive rare plant surveys and tidal wetland habitat quality assessment covering approximately 48,000 acres for Contra Costa County Tidal Wetlands Inventory Project. The inventory resulted in an atlas mapping and rating habitat quality and restoration potential for the tidal and formerly tidal wetlands of the county. He has an M.A., Biology, concentration in Ecology and Systematics, San Francisco State University and a B.S., Biology, emphasis in Botany, San Francisco State University.

Ronald Dougherty is Vice President of Operations for Fire Stop. He is a Type I Incident Commander and a Type O Prescribe Burn Boss. He has been with Fire Stop since 1994. He retired as the Forest Fire Management Officer of the Eldorado National Forest in 1993 and has had 35 years' experience in prescribed fire including positions with the Riverside Forest Fire Lab and the Rocky Mountain Experiment Station conducting fire research projects. He has been an instructor for Harold Biswell, Professor at the University of California at Berkeley, and has presented papers at an International Symposium on Prescribed Fire. He started the first large-scale prescribed burns on national forests in southern California and conducted prescribed fire training in the Pacific Isles, including Guam and Hawaii.

D. Cost

1. Budget

The total cost of this proposed project will be **\$454,400**.

2. Cost-Sharing

N/A

E. Local Involvement

This project will include involvement with federal and state agencies that own and manage a series of biological preserves. Two team members and co-applicants on this proposal, Mr. Al Franklin (BLM) and Mr. Daniel Burmester (DFG), are responsible for management of the botanical resources on the preserve. In addition, we will be coordinating with the County of El Dorado, El Dorado Irrigation District, El Dorado Fire Department, local interest groups, and property owners.

F. Compliance with Standard Terms and Conditions

If this project is funded we will comply with all contracting standard terms and conditions as identified in the Proposal Solicitation Package Attachments D and E.

G. Literature Cited

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Table 1 List of Tasks, Products , Outcomes and Schedule

Tasks	Products/Outcomes and Work Schedule
Task 1 - Determine the Fire History in Western El Dorado County and map Rare Plants	Map of polygons showing historical fire locations on the GIS vegetation map March 2003
	Map of polygons showing historical fire locations with at-risk plant locations overlain May 2003
	Report and database (in Access) on the fire history, specific fire conditions for each site, and a correlation of at-risk plant populations July 2003
	CNDDDB data forms for locations of at-risk plant populations September 2003
	Submit manuscript for publication of the fire history and at-risk plant information in the Natural Areas Journal November 2004
Task 2 - Assessing Prescribed Burn Potential for Topographic and Vegetation Units of the Preserve	Conduct preserve evaluation for management units August 2002 through December 2002
	Develop map with GIS layers for slope/aspect units of the Preserve, vegetation, fuels, fuelbreaks, rare plant occurrences, life/property risk along boundaries. April 2003
Task 3 - Habitat and Population Biology Model for El Dorado Bedstraw	Conduct population structure and habitat study August 2002 through July 2003
	Conduct population monitoring August 2002 through October 2004
	Technical report on the findings and completed model for habitat and populations January 2005
	Develop manuscript for publication of population and habitat information in the journal Conservation Biology May 2005

