

## **SCOPE OF WORK:**

### **San Clemente Island, Historical Vegetation Communities & Marine Corps Base, Camp Pendleton, Fire Danger Fuel Moisture Analysis**

**1. Purpose and Requirement:** The purpose of this Cooperative Agreement is to understand historical vegetation community mapping in support San Clemente Island Invasive Species Management and Endangered Species Programs. This work is in direct support of the installations Integrated Natural Resources Management Plan (INRMP) and the military mission of the facility. The benefits to the military mission as a result of the implementation this project will be enhanced ecosystem health to support military testing and training. The authority for this Cooperative Agreement is 16 USC §670c-1 (Sikes Act; on-post project for the maintenance and improvement of natural resources or for the benefit of natural and historic research).

### **2. Background:**

The Navy has a need to understand the historical vegetation of San Clemente Island prior to the introduction of non-native ungulates. Grazing by these ungulates had a significant effect on the plant communities of the Island and was removed after being present there for more than 100 years. Understanding the historical plant communities is needed to help predict vegetation changes as the island recovers from grazing and to inform conservation planning. Previous work located a small amount of information in the National Archives on plant communities of San Clemente Island as part of a 1860's coastal geographic survey and as part of a project to locate cultural resources documents. Because the purpose was to locate cultural resource information, rather than biological information, there is a chance that documents pertaining to biological resources were overlooked. In addition to historic information, the Navy is evaluating feasibility of using phytoliths to determine the composition of the historic vegetation communities.

For the second part of this project, the Navy is working to understand the relationship between fire size, fuel moisture and weather on Camp Pendleton. The Marine Corps has established fuel moisture monitoring stations and additional data collection and analyses are needed for this effort.

### **3. Statement of Work:**

The proposed work will be archive research and on-the-ground actions on San Clemente Island (SCI). The overall project objective at SCI is to develop an understanding of the historical plant communities to help predict vegetation changes. The proposed work will be on-the-ground actions at Camp Pendleton. The overall project objective at SCI is to conduct fuel moisture sampling to develop a fuel moisture report that will help predict future wildfire risks. Achieving these objectives involves six main Tasks.

## **Services Required:**

### **Task 1. Search the National Archives for Historic Biological information:**

Under its cultural resources program, the Navy sponsored a records search which resulted in an honors thesis at California State University Long Beach entitled “A historical geography of San Clemente Island 1542-1935” (Bruce 1994). While this study was focused on historic sites, it did turn up some information on plant communities (Greenwell’s 1860-1862 surveys of the SCI) present before the introduction of non-native ungulates. However, since vegetation was not the primary focus of the funded study, leads related to vegetation were not followed up. The Cooperative Ecosystem Studies Unit Member will search the National Archives including the Cartographic Division, for biological information that may have been missed during the original investigations. Additional searches will be made at other locations such as the Library of Congress Map Room.

### **Task 2. Digitize geographic data**

High-resolution scans of all materials (including Greenwell’s surveys) will be made and these original field maps will be geo-referenced and digitized onto a GIS database along with accurate polygon digitizing of all areas of vegetation shown on these earlier field maps. All field notes will be typed into a searchable Access database and will be accessible through the GIS database.

### **Task 3. Prepare Report on Tasks 1 and 2**

The Cooperative Ecosystem Studies Unit (CESU) member will prepare a report on tasks 1 and 2 that includes a detailed description of the methodology of the search, a discussion of the likely accuracy of the resultant maps given the mapping standards of the time period and the particular source (eg Greenwells 1860-1862 survey) and the resultant GIS data.

### **Task 4. Conduct literature review preliminary lab work to identify phytoliths of plant of management interest on SCI and literature review to on rooting structure of those species.**

The CESU member will conduct a literature review to determine whether descriptions of phytoliths for species of management interest have already been developed. If this is the case it will likely be for species with mainland distributions. Once it has been determined whether these exist, the Navy and the CESU member will identify 7 species of management interest for laboratory work to identify their phytoliths. In addition the CESU member will conduct a literature review to determine rooting structure for both sets of species. Root architecture is important due to excessive erosion that has occurred on the island, it is possible that many or all of the phytoliths produced shallower rooting species may be gone. The CESU member will prepare a report of summarizing their findings.

### **Task 5. Conduct fuel moisture sampling at Camp Pendleton**

The CESU member will participate in weekly fuel moisture sampling with the Navy. The CESU member will conduct 24 sampling days over the period of performance of the cooperative agreement, conducting the sampling 2 to 3 times a month. The specific schedule will be worked

out between the Navy and the CESU member based on field personnel availability. Travel time on the Base between sites and sample processing time typically takes 7 to 8 hours. Because there is often high variation among samples collected by different people, the sampling done by the CESU member must be done by no more than two people each of whom must go out at least once a month and field personnel should stay on the project for a minimum of 6 months. In addition, the field crew should be able to readily identify the dominant shrubs in the sampling area and readily able to identify the different tissue types (produced in the current or past years) on the plant, which can be confusing late in the year.

The following methods will be used: Weather data will be collected using a hand-held Kestrel weather meter at every site fuel samples area collected. In addition, once the final site selection is made and a sampling route is established, additional locations along the route may be identified for collection of weather data.

#### Live Fuel Moisture:

- a.** Samples will be collected weekly, and all samples should be collected between 11:00 a.m. and 2:00 p.m. Field personnel should select shrubs in a pseudo-random fashion from within each sampling area. Field personnel will wear surgical gloves to prevent contaminants from altering the fuel moisture measurement.
- b.** The sample should include branchwood, with foliage from both new growth and old growth on the shrub species being sampled. The proportion of new and old growth within a sample should reflect the proportion on a shrub.
- c.** Since the fuel moisture is expected to vary on a given shrub, samples should be taken from different heights and sides of the shrub. Sample size will be approximately 3 grams. Field personnel should be trained to distinguish the difference between old growth and new growth during a “sampling orientation.” However, it will not always be possible to distinguish between new and old growth throughout the year.
- d.** Two samples of each species will be collected.
- e.** The samples will be processed using COMPUTRAC fuel moisture analyzers located at Fire Station 6 on Camp Pendleton.

#### Dead Fuel Moisture:

Samples will be collected between 11:00 am and 2:00 pm.

*1 hour fuels* – One hour fuels are cured grass or dead twigs less than or equal to ¼ inch in diameter. This will be calculated using the BehavePlus software rather than determined by sampling.

#### *10-hour fuels*

Data from the closest RAWS (Remote Automatic Weather Station) to the sampling location will be used for 10 hour fuel moisture when available. Dead fuel moisture for 10-hour fuels will be approximated using fuel moisture sticks. Stations with fuel moisture sticks will be installed at Fire Stations 6, 7, and 8 Fuel moisture sticks are an array of dowels with a known oven-dried weight of 100 grams. They equilibrate with the environment so that their weight reflects the

moisture of dry fuels. They will be set out in each plot and weighed each time that live fuel samples are collected.

*100 and 1,000 - hour fuels*

Dead fuel moisture for 100 and 1,000-hour fuels will be measured quarterly by collecting samples from dead and downed vegetation. Samples will consist of branch cross-sections (or wafers) approximately 1 inch thick. 100 hour fuels will be sampled from branches 1 to 3-inches in diameter and 1,000 hour fuels if present will be from branches 3 to 4 inches in diameter.

Weekly reports will be submitted to the Navy contact and Base Fire Ecologist immediately upon processing the samples or at least within 24 hours. They will include the data in flat file format and weekly report spreadsheet (these will be provided by the Navy).

**Task 6. Prepare Fuel Moisture Report.**

The CESU member will analyze the fuel moisture data to determine the relationship between fuel moisture, weather and fire size on Camp Pendleton submit a report with their findings.

**Option Task 1. Conduct Additional Fuel Moisture Sampling:**

If preliminary data analyses reveal variation in the data that is too high to draw conclusions about the relationship between fuel moisture and fire size, the Navy may execute this option for additional samples. This will consist of an additional 24 sampling days.

**B. Completion Schedule & Deliverables:**

The period of performance for this contract task order is upon award through December 31, 2014. The Contractor shall adhere to the following schedule, unless otherwise approved by the NTR.

<b><u>Event</u></b>	<b><u>Due Date</u></b>
Task 1 Archive Search	September 2013
Task 2 Digitize Geographic Data	January 2013
Task 3 Report on task 1 and 2	October 2013
Task 4 Phytolith literature review and identification	October 2014
Task 5 Fuel Moisture Sampling	July 2014
Task 6 Fuel Moisture Report	August 2014

**C. GIS & Electronic Data Requirements:**

It is the responsibility of the Contractor to ensure that all electronic deliverables are fully compatible and functional based on the current applications used by the Navy Marine Corps Intranet (NMCI).

### **Text, Spreadsheet, and Database Files:**

The Navy and Marine Corps standard desktop computing software is Microsoft Office 2010. Final Reports and other text documents shall be provided in Microsoft Word 2010 and/or Adobe Portable Document Format (PDF) readable with Adobe Acrobat X unless other mutually agreeable formats are determined. Adobe PDF files and Microsoft Word documents should include a complete linked table of contents and all mention of tables or figures within the text of the report should be linked directly to the referenced table or figure. Spreadsheet files shall be provided in Microsoft Excel 2010 format. Database files shall be provided in Microsoft Access format, unless specified otherwise, as approved by the NTR. Prior to database development, the CESU member shall provide the Government with a Technical Approach Document for approval, which describes the CESU member's technical approach to designing and developing the database. All text, spreadsheet, and database files shall be delivered on CD-ROM, DVD or other electronic media as approved by the Naval Technical Representative (NTR). All graphics used for reports and CD covers shall be delivered in Adobe Photoshop (PSD) format. All hard-copy reports must be submitted bound in a "D" type three ring binder. The binder shall have clear exterior pockets suitable for document labels and interior pockets suitable for storing additional paper sheets. Both spine and front cover will be labeled.

### **Geospatial Data, Maps, Drawings, and Sketches:**

#### Data Standards:

Data standards facilitate the development, sharing, and use of geospatial data. The CESU member shall ensure that all geospatial data delivered is consistent with the Spatial Data Standards for Facilities, Infrastructure and Environment (SDSFIE), reference (b), unless otherwise directed by the NTR. The Contractor shall use SDSFIE v3.0. Geospatial data shall be delivered in a single file geodatabase format, unless otherwise directed by the NTR, that is compatible with Oracle using ArcGIS 10.0, or higher, and must be importable to an Oracle 10g multi-user geodatabase using ArcSDE 10.0, or higher. Digital map files (.mxd files) shall be delivered in ArcGIS 10.0 format and the associated data layers shall be sourced by a relative file pathway to the file geodatabase. In addition, all geospatial data delivered by the Cooperator shall adhere to the following criteria:

- (1) precise geographic coordinates in decimal degree format with four decimal precision;
- (2) units of nautical miles (nm) for expansive marine areas and statute miles (mi) for expansive land areas;
- (3) reference the GRS 1980 spheroid and the North American Datum 1983 (WGS-84);
- (4) contain a projection file, if appropriate, based on format;

#### Metadata Standards:

The term "metadata" is defined as data about data. The term is often used to refer to information that allows either:

- (1) discovery of data,
- (2) understanding the provenance and quality of the data, or/and

(3) analysis of the data via a set of machine readable instructions that describe the data and its relationships.

The CESU member shall provide metadata in accordance with Content Standard for Digital Geospatial Metadata (CSDGM), reference (c), the current US Federal metadata standard. The Cooperator shall ensure that metadata is provided for all geospatial data delivered, including data furnished by the Government, a third party, or generated as a result of this project, and is compliant with current Federal Geographic Data Committee (FGDC) endorsed metadata standards (see table at

<http://www.fgdc.gov/standards/projects/FGDC-standards-projects/fgdc-endorsedstandards>).

All metadata shall be in XML format. The Cooperator shall reference the FGDC ESRI metadata style sheet when populating Service-level and Feature Class-level metadata. The CESU member is required to supply metadata for all fields within this style sheet.

#### Mapping Guidelines:

The CESU member shall comply with FGDC *Geospatial Positioning Accuracy Standards, Part 4: Architecture, Engineering, Construction, and Facilities Management*, reference (d), which provides accuracy standards for engineering drawings, maps, and surveys. Map or drawing scales will be determined by the NTR, given specific project requirements.

#### Data Integrity:

The CESU member shall employ appropriate QA/QC standards to ensure that data is topologically correct, accurate and complete, including:

- (1) no erroneous overshoots, undershoots, dangles or intersections in the line work;
- (2) point and line features shall be snapped together where appropriate to support networks, e.g. do not break linear features for labeling or other aesthetic purposes;
- (3) lines should be continuous and point features should be digitized as points;
- (4) no sliver polygons; and
- (5) digital representation of the common boundaries for all graphic features must be coincident, regardless of feature layer.

### III. GENERAL INFORMATION

#### A. Meetings:

A kick-off meeting may be held in person at the selected Cooperator or otherwise agreed upon location. Update meetings may be held to review progress and discuss interim products and draft deliverables. In addition, there will be a need to organize an expert panel review meeting (Task 5). The meeting location should be suitable for approximately 20 people and will include a projector and note taker. The location will be approved by both the Cooperative Ecosystem Studies Unit Member and the NTR. The CESU member will be responsible for sending meeting minutes to the NTR's after all scheduled meetings summarizing discussions, decisions, and tasking.

## **B. Progress Reports:**

Monthly progress reports shall be submitted to the NTR via email on a monthly basis. Each report should include a detailed summary of work accomplished under each task and estimated percentage of each task completed to date. Activities planned for the following month should be incorporated as well as any issues encountered while performing the tasks. Progress report structure and information required may be amended as requested by the NTR.

## **C. Deliverables:**

Deliverables will be made by USPS/UPS/FedEx and/or by electronic delivery as specified by the NTR

1. Detailed Data stake holder review meeting minutes including the proposed direction the CESU member will take to rectify any issues discussed, shall be submitted to the NTR within 30 days after the meeting is held
2. The CESU member will prepare a summary near the end of the period of performance to document what has been investigated, problems discovered, and any proposed solutions.
3. Monthly progress reports

## **D. Navy Technical Representative:**

The Navy Technical Representative (NTR) will be the Cooperator's point-of-contact on all associated technical matters. Mr. David James, Code EV52, NAVFAC Atlantic, TEL (757) 322-4883, FAX (757) 322-4894, is the designated NTR for this Cooperative Agreement. The NTR and the Contract Administrator are the only persons authorized to direct work under this scope or to affect decisions or evaluations. The CESU member shall notify the NTRs of the individual designated as the Principle Investigator. Routine correspondence to the NTRs may be addressed to:

Naval Facilities Engineering Command Atlantic  
Attn: Mr. David James (Code EV52)  
6506 Hampton Blvd. Bldg. A  
Norfolk, VA 23508  
Email: [david.m.james@navy.mil](mailto:david.m.james@navy.mil)

## **E. Contract Administration:**

The Contractor shall receive direction on all elements of this contract from Ms. Tina Gillespie-Lucas. Correspondence should be addressed as follows:

Naval Facilities Engineering Command Atlantic  
Attn: Ms. Tina Gillespie-Lucas (Code AQ11)  
6506 Hampton Blvd.  
Norfolk, VA 23508

Phone: 758-322-4162

## **F. Evaluation:**

Eligible Applicants:

This financial assistance opportunity is being issued under a Cooperative Ecosystems Studies Unit (CESU) Program. CESUs are partnerships that provide research, technical assistance, and education. Eligible recipients must be a participating partner of the California Cooperative Ecosystem Studies Unit (CESU) Program.

Upon completion of this contract, the NTR will prepare an evaluation of the The Cooperative Ecosystem Studies Unit Member's performance under this contract. The completed evaluation will be retained in the The Cooperative Ecosystem Studies Unit Member 's file at NAVFAC Atlantic for review and consideration by future selection boards.

## **G. Points of Contact:**

Points of contact for SPAWAR PAC are as follows:

Dawn M. Lawson Ph.D.  
Ecologist  
Environmental Sciences and Applied Systems Branch  
SPAWARSYSCEN Pacific (SSC PAC), Code 71750  
53560 Hull Street  
San Diego, CA 92152-6310  
Voice: 619-553-7585  
Fax: 619-553-6305  
Cell: 760 415-1981  
Email: [dawn.lawson@navy.mil](mailto:dawn.lawson@navy.mil)

## **H. Payment:**

Upon approval by the NTR, payment will be authorized on a monthly basis (as requested) to the Cooperator. Payment authorization by the NTR shall be based solely on the percentage of the entire project completed within the period for which the Government is billed. An up-to-date status report that clearly indicates the actual work performed during the specific billing period **must** accompany each billing statement before payment is authorized by the NTR.

Requests for payment shall be made in accordance with NAVFAC Atlantic instructions and addressed to:

Naval Facilities Engineering Command Atlantic  
Attn: Code AQ12  
6506 Hampton Blvd.  
Norfolk, VA 23508

**I. Release of Information:**

The US Navy shall retain rights to access all digital files, hard-copy products, and related materials and information (including all data collected and associated analysis products) for the purposes of environmental planning and regulatory compliance requirements. The primary researchers shall retain rights to unrestricted analysis and publication of data and results without requirement of authorization from the NTR.

**J. Equipment:**

No equipment is being purchased under this Cooperative Agreement.

**K. Quality of Work:**

The CESU member will be responsible for the professional and technical accuracy in addition to the coordination of all work or services rendered. The products submitted by the CESU member will represent the best solutions possible and will be reviewed by the Navy for compliance with Government requirements and criteria. The CESU member, at no additional cost to the Government, will correct errors and/or deficiencies in the final product resulting from the CESU member's performance that are designated within three months of final product delivery and that can be corrected by the CESU member within 24 man-hours.