

Adopted 2/28/2017

Cosco Busan Trustee Council  
Resolution Regarding Disbursement of Funds  
for Restoration Projects  
for Fiscal Year 2017

1. The State of California, acting through the Department of Fish and Wildlife (CDFW) and the California State Lands Commission (CSLC); the National Oceanic and Atmospheric Administration (NOAA); and the Department of the Interior (DOI), acting through the U.S. Fish and Wildlife Service (USFWS) and the National Park Service (NPS), are the trustees responsible for restoring those natural resources injured by the discharge of oil from the *M/V Cosco Busan* on November 7, 2007.
2. Sums recovered in the civil action *United States v. M/V Cosco Busan et al.*, and related actions, are being held in the DOI Natural Resource Damage Assessment and Restoration Fund (NRDAR Fund) and the San Francisco Bay Shoreline Parks and Recreational Use account established by the National Fish and Wildlife Foundation (NFWF Rec Account).
3. The Trustees have entered into a Memorandum of Understanding (MOU) among themselves for the purpose of coordinating their trust responsibilities.
4. The MOU specifies several procedural prerequisites to the implementation of projects selected in the Restoration Plan. Among other things, a selected project may not proceed unless a lead Trustee has been designated for that project and the Trustee Council has given its written authorization to commence the project.
5. The MOU further requires the Trustee Council to memorialize all expenditures of funds from the above-referenced accounts in a Trustee Council Resolution signed by the participating voting members. The settlement funds may only be used for the design, implementation, permitting (as necessary), monitoring and oversight of restoration projects and for the costs of complying with the requirements of law to conduct a restoration planning and implementation process. The use of such funds must be documented and an accounting provided to the Cosco Busan Trustee Council.
6. The Trustee Council hereby authorizes the disbursement of the following funds (totaling \$718,253.20) from the Cosco Busan NRDAR Account for continued restoration implementation of the projects, described in the Cosco Busan Damage Assessment and Restoration Plan (DARP)/Environmental Assessment, identified below:
  - **\$256,452** to NOAA Restoration Center for the Rockweed Restoration project (Attachment 1: *Fucus* Restoration in San Francisco Bay Phase II) to be executed by University of California at Santa Cruz. Funds will be administered by the NOAA/NFWF multi-year agreement and the total includes the 4.8% overhead to NFWF.
  - **\$419,200** to NOAA Restoration Center for Native Oyster Restoration (Attachment 2: Olympia Oyster Enhancement at Giant Marsh, Richmond, CA) to be executed by the

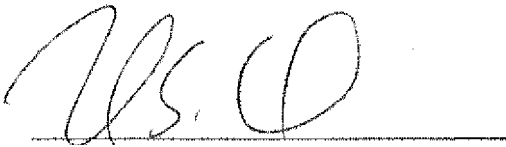
State California Coastal Conservancy and University of California at Davis. Funds will be administered by the NOAA/NFWF multi-year agreement and the total includes the 4.8% overhead to NFWF.

542,601.20 to USFWS (San Francisco Bay National Wildlife Refuge Complex) for the Farallon Island Nest Site Improvements project.

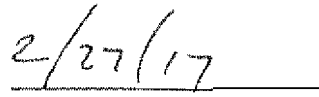
7. This Resolution may be executed in counterparts, A copy with all original executed signature pages affixed shall constitute the original Resolution and be retained by the Lead Administrative Trustee that maintains records.

8 The effective date of this resolution shall be the date on which the last Trustee signs this resolution,

Concurred in by the following who are the duly authorized Cosco Busan Trustee Council representatives:



Michael Anderson  
California Department of Fish and Wildlife



Date

\_\_\_\_\_  
Sarah Mongano  
California State Lands Commission

\_\_\_\_\_  
Date

\_\_\_\_\_  
Carolyn Marn  
US Department of the Interior

\_\_\_\_\_  
Date

\_\_\_\_\_  
Natalie Cosentino-Manning  
National Oceanic and Atmospheric Administration

\_\_\_\_\_  
Date

State California Coastal Conservancy and University of California at Davis. Funds will be administered by the NOAA/NFWF multi-year agreement and the total includes the 4.8% overhead to NFWF.

- **\$42,601.20** to USFWS (San Francisco Bay National Wildlife Refuge Complex) for the Farallon Island Nest Site Improvements project.

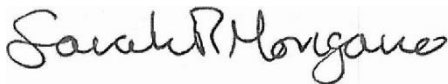
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Sarah Mongano  
California State Lands Commission

02/27/2017

\_\_\_\_\_  
Date

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National Oceanic and Atmospheric Administration

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Sarah Mongano  
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\_\_\_\_\_  
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*Carolyn Marn*

\_\_\_\_\_  
Carolyn Marn  
US Department of the Interior

02/28/2017

\_\_\_\_\_  
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Natalie Cosentino-Manning  
National Oceanic and Atmospheric Administration

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California Department of Fish and Wildlife

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\_\_\_\_\_  
Sarah Mongano

\_\_\_\_\_  
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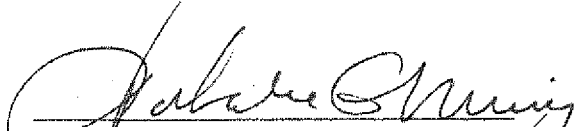
California State Lands Commission

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Carolyn Main  
US Department of the Interior

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Date



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Cosentino-Manning  
National Oceanic and Atmospheric Administration

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2/28/2017

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Date

## ***Fucus* Restoration in San Francisco Bay: Phase II**

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### **Project Summary**

We propose phase II of the overall project to restore *Fucus* populations damaged as a result of the Cosco Busan oil spill in San Francisco Bay. Our earlier work assessed genetic structure (Whitaker et al, in press), outplant design, transplant approach, and sampling frequency for a restoration project. As part of those efforts, we also did a series of transplants to Point Isabel in Richmond, CA. Over the two years since the restoration project initiated, approximately 400 linear meters of coastline have recovered to the point where no further transplants are currently being considered. In Phase II, we propose to implement this restoration approach in areas near San Leandro Marina, an area affected by Cosco Busan oiling and cleanup activities.

### **Background**

One of the most perplexing issues concerning restoration of marine biological habitats is how to provide donor species to impacted areas without compromising the ecological or structural integrity of donor patches. As an example, consider restoration of mussels to an area from which mussels have been removed by some sort of disturbance. Mussels (e.g. *Mytilus californianus*) are easily transplanted, and the success of the transplants is typically high (Raimondi, unpublished data). However, for each square meter that is transplanted to a recipient patch, a square meter is lost in the donor patch. This sort of tradeoff is inevitable in restorations that rely entirely on transplantation.

An alternative approach that has been proposed takes advantage of the common bi-partite life history of most near-shore marine organisms. This life history has two very different stages. The adult form of a species is typically large, sedentary, and long lived. The propagule form (larvae, zygotes, or spores) is typically very small, very mobile, and temporally short. In addition, for every adult individual, there are typically thousands to millions of propagules. One way to avoid relying entirely on transplantation of adults is to conduct transplantation that best leads to reproduction and local recruitment of new individuals. We call this strategic transplantation. This approach has great potential for species that reliably produce large cohorts of propagules and which also have low dispersal away from the location of parental reproduction. Following a disturbance, such species are not likely to recover quickly because of limited propagule dispersal. This means that these species will not quickly recover in impacted areas without some sort of intervention. By contrast, these same life history traits (high number of propagules, low dispersal) make such species likely candidates for successful restoration, especially with respect to strategic restoration. The critical elements of strategic restoration for such species are (1)

development of a transplant design that minimizes adult transplants, while (2) maximizing the likelihood that transplantation spacing maximizes successful reproduction (that is, leading to



gamete fertilization and production of viable zygotes). Because dispersal in these species is limited, restoration is accomplished primarily through local recruitment resulting from the transplanted individuals rather than the transplanted individuals themselves. This works particularly well for species that mature quickly as the effect compounds geometrically as a function of generations.

Along many coasts of the world, and along both the east and west coasts of North America, one of the most conspicuous groups of intertidal organisms are furoid algae. This group (and the genus *Fucus* in particular) has been shown to be severely impacted by a variety of natural and anthropogenic disturbances such as oil spills. For example, one of the major impacts from the Exxon Valdez oil spill was to *Fucus*. *Fucus* is a species that recovers slowly, sometimes very slowly (MMS-Kinetics, Conway-Cranos) without intervention. Because natural recovery is slow and very unpredictable, in part because of very limited propagule dispersal, restoration has been advocated as a strategy for compensation of anthropogenic impacts. As adults, furoids can be transplanted successfully (Whitaker 2009, Whitaker et al. 2010), but often with the problems to donor populations as noted above. The goal of this proposal is to utilize our recently developed approach for strategic restoration that will lead to recovery of *Fucus* in areas that were damaged as a result of the Cosco Busan oil spill.

Furoids are long lived species, and are among the most important of algal species in intertidal areas. They form a distinctive mid-intertidal zone and are a canopy forming species that provide structure and refuge for many other species. Native furoid species along the east and west coast of the United States exhibit an “animal-like” life history. Sperm and eggs are produced within blades of each individual (some species have separate sexes, others are hermaphroditic) and are typically mixed as the gametes are exuded. Eggs are fertilized, and the zygotes are thought to disperse very close to the parental plants (Hays 2006, 2007). There is no further dispersal, and resulting individuals grow from settled zygotes. Furoids, while long-lived, typically become reproductive in less than a year. Adults are attached directly to rock substrata. Recovery of many furoid species (including native east and west coast species) following a disturbance can be slow because of the very limited dispersal of propagules (Conway-Cranos and Raimondi 2009, unpublished data). While there are four relatively common native intertidal furoid species in central California, only *Fucus distichus* occurs in San Francisco Bay.

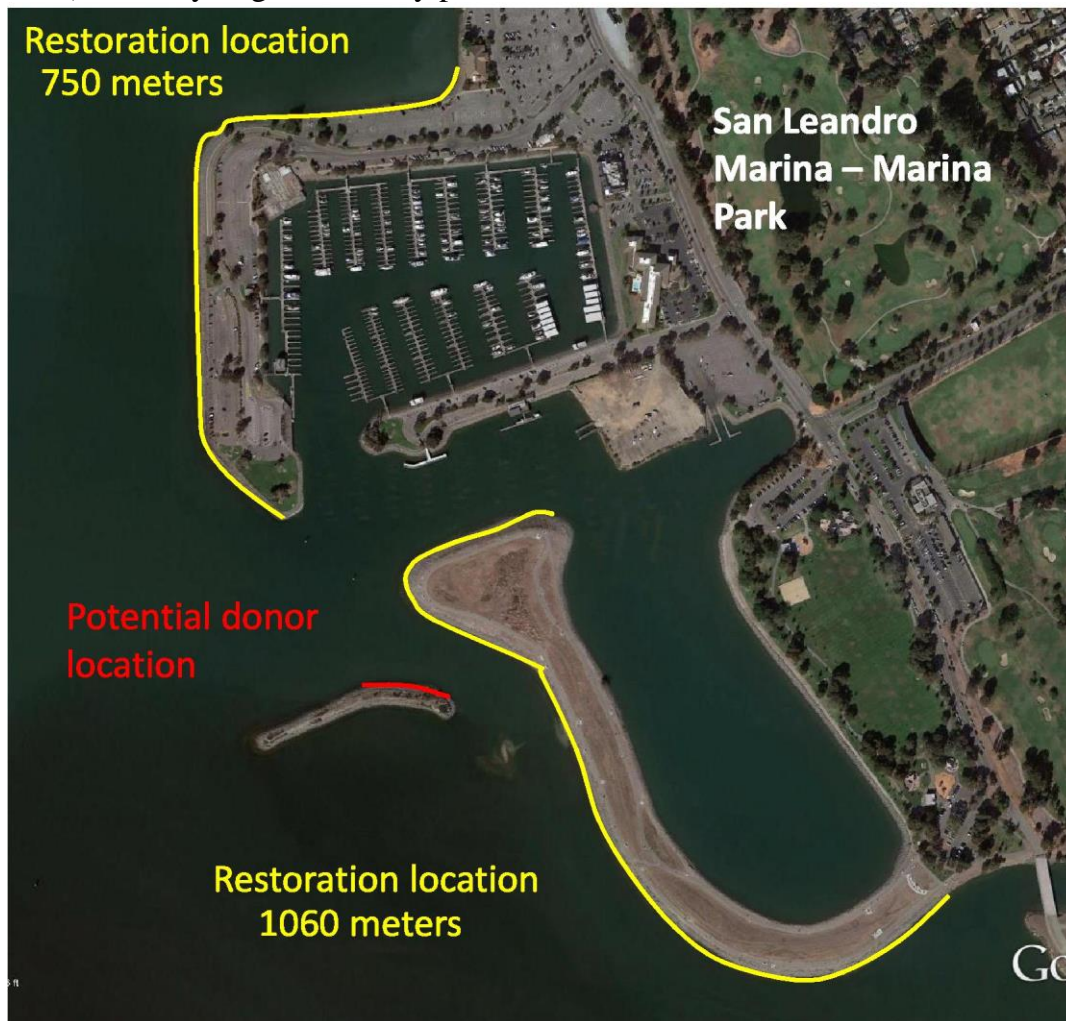
Over the period of 2014-2016, we carried out a series of transplant experiments at a site near Point Isabel. This set of experiments was impacted by unusually warm water in 2015, but after conditions returned to typical in 2016, *Fucus* in the area of our restoration recovered to a level where no further transplantation is anticipated. This does not mean that the population is fully recovered. Instead, it means that it has recovered to the point where no further intervention is necessary because further increases will occur through local reproduction of new individuals. This is the goal of strategic restoration.

We propose to implement this restoration approach in areas near San Leandro Marina, an area affected by Cosco Busan oiling and cleanup activities.

**Task 1: Choose focal sites**

In consultation with NOAA and regional jurisdictions, and based on our own reconnaissance, we will select our focal sites, most likely in the vicinity of San Leandro Marina. There is approximately 1800 linear meters at Marina Park near San Leandro Marina that may be suitable for restoration (Figure 1). The key characteristics for site selection all are met at San Leandro Marina:

- 1) *Fucus* population shown to be affected by the Cosco Busan spill
- 2) Sufficient area for restoration (600+ linear meters), see figure 1. As of 1-25-2017 survey there was almost no *Fucus* in the restoration locations.
- 3) Location near to potential donor population (based on genetic, substrate, and reconnaissance information), see figures 1 and 2. As of 1-25-2017 survey there was abundant *Fucus* in the donor location.
- 4) Ability to get necessary permits for restoration



**Figure 1:** San Leandro Marina - Marina Park. Suitable locations for restoration and donor populations .





Figure 2: *Fucus* at potential donor location (photographed 1-25-2017)

### Task 2: Field transplantation

*Fucus* is reproductive throughout much of the year (Wright et al 2004, Raimondi unpublished data for the central and southern CA coasts), but our trials have indicated that recruitment seems to be highest in spring and summer (assuming normal water temperatures). As noted above, gametes are produced in the fronds of individuals and typical fertilization of eggs occurs when gametes are exuded and mixed together. Fertilized eggs develop into embryos, and dispersal of these propagules is very limited (Hays 2006, Stekoll and Deysner 2000).

The strategic restoration approach we will be using will be to use limited donor adults (adults from a donor population) to “seed” the restoration site. This is a four step process: (1) prepare transplantation site(s), (2) transplantation of adults, (3) reproduction by transplanted adults leading to recruitment at restoration site(s), (4) small scale relocation of recruits to nearby areas within the restoration site(s). Each of these steps is discussed in more detail below.

- 1) Prepare transplantation site(s): We will be transplanting adult stock to core areas in restoration sites. This means that these areas need to:
  - a. Be delineated and ephemeral algae removed from hard substrate in the vicinity of the core area,
  - b. If insufficient cobble is near a core area, cobble will be moved near to the core areas. This is to facilitate recruitment to substrate that can be later redistributed at the site.
- 2) Transplantation of donor adults: Adults from nearby donor populations will be collected on cobbles (common in the Bay) and transported to core areas in the restoration site.
  - a. Core areas will be initially stocked with approximately twenty cobbles with *Fucus* growing on them. This number will be maintained over time and may be augmented depending on local recruitment.
  - b. Collection from donor populations will be done in a way to minimize impact to those populations. In particular, collection design will ensure that reproduction at the donor sites are not compromised.
- 3) Reproduction by transplanted adults: the key attribute of strategic restoration is to facilitate reproduction and local recruitment with the lowest number of transplanted adults. This controls cost and effort and also impact to the donor site. Recruitment will be assessed monthly. Estimates of recruitment will guide two things: augmentation of adults and timing of relocation of new recruits.
- 4) Relocation of new recruits: once recruits develop blades that are 2.5 cm tall, they will be transplanted on cobbles to facilitate further restoration.

### Task 3: Reporting and reviews

We will produce a final report that documents the basis, methods, results, and recommendations. This will be a three step process: (1) draft report, (2) agency review, (3) final report.

