

Sibara filifolia
(Santa Cruz Island rock-cress)

**5-Year Review:
Summary and Evaluation**



Sibara filifolia.
Photo credit Kim Klementowski,
U.S. Navy, 2008.

Sibara filifolia.
Photo credit Sarah Ratay, Catalina Island
Conservancy, 2011.

**U.S. Fish and Wildlife Service
Carlsbad Fish and Wildlife Office
Carlsbad, CA**

April 25, 2012

5-YEAR REVIEW
***Sibara filifolia* (Santa Cruz Island rock-cress)**

I. GENERAL INFORMATION

Purpose of 5-Year Reviews:

The U.S. Fish and Wildlife Service (Service) is required by section 4(c)(2) of the Endangered Species Act (Act) to conduct a status review of each listed species at least once every 5 years. The purpose of a 5-year review is to evaluate whether or not the species' status has changed since it was listed (or since the most recent 5-year review). Based on the 5-year review, we recommend whether the species should be removed from the list of endangered and threatened species, be changed in status from endangered to threatened, or be changed in status from threatened to endangered. Our original listing of a species as endangered or threatened is based on the existence of threats attributable to one or more of the five threat factors described in section 4(a)(1) of the Act, and we must consider these same five factors in any subsequent consideration of reclassification or delisting of a species. In the 5-year review, we consider the best available scientific and commercial data on the species, and focus on new information available since the species was listed or last reviewed. If we recommend a change in listing status based on the results of the 5-year review, we must propose to do so through a separate rule-making process defined in the Act that includes public review and comment.

Species Overview:

Sibara filifolia (Santa Cruz Island rock-cress) is a diminutive and slender annual herb in the Brassicaceae (mustard family). This is the only species in its genus that occurs on the Channel Islands of southern California. Historically, plants have been found on dry, rocky, sparsely vegetated ridges at various elevations on San Clemente, Santa Catalina, and Santa Cruz Islands. At the time of listing, only two of the five known historical occurrences were considered extant, one on Santa Catalina Island and one on San Clemente Island. In 2001, an additional occurrence was discovered in Wild Boar Gully on Santa Catalina Island. At the time of the last 5-year review, two occurrences on Santa Catalina Island and one on San Clemente Island were considered extant. In this review we still consider these three occurrences to be extant. *Sibara filifolia* was listed as endangered under the Act in 1997 and has not been listed by the State of California as endangered or threatened. Restricted access to occurrences on San Clemente Island precludes monitoring the status of the species in most of its known extant range. The primary threats to the species at listing were degradation of habitat, fire, predation by introduced herbivores, nonnative plants, erosion, and hybridization. Currently, this species is threatened by impacts from nonnative plants, fire, erosion, herbivory, trampling, small population size, and climate change. These are the same threats to the species identified in the 2006 5-year review and will be discussed in this review. Based on the current threats impacting *S. filifolia*, we recommend no change in endangered status at this time.

Methodology Used to Complete This Review:

This review was prepared by Dan Huser and staff at the Carlsbad Fish and Wildlife Office, following the Region 8 guidance issued in March 2008. We used survey information from experts who have been monitoring known occurrences of *Sibara filifolia*, the U.S. Department of the Navy (Navy), the Catalina Island Conservancy, and the California Natural Diversity Database (CNDDDB) maintained by the California Department of Fish and Game (CDFG). We received no information in response to our **Federal Register** notice initiating this 5-year review and requesting information regarding *S. filifolia*. This 5-year review contains updated information on the species' biology and threats, and an assessment of information compared to that known at the time of listing and since the last 5-year review. We focus on current threats to the species pursuant to the Act's five listing factors. This review synthesizes this information to evaluate the listing status of the species and provide an indication of its progress towards recovery. Finally, based on this synthesis and the threats identified in performing the five-factor analysis, we recommend a prioritized list of conservation actions to be completed or initiated within the next 5 years.

Contact Information:

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Lead Field Office: Betty Grizzle and Gary Wallace, Carlsbad Fish and Wildlife Office; 760-431-9440.

Federal Register (FR) Notice Citation Announcing Initiation of This Review:

A notice announcing initiation of the 5-year review of this taxon and the opening of a 60-day period to receive information from the public was published in the **Federal Register** on May 21, 2010 (USFWS 2010, p. 28637). No information, relevant to the taxon reviewed here, was received during the open period.

Listing History:

Federal Listing

FR Notice: 62 FR 42692 (USFWS 1997a)

Date of Final Listing Rule: August 8, 1997

Entity Listed: *Sibara filifolia* (Santa Cruz Island rock-cress), a plant species

Classification: Endangered

Critical Habitat: Critical habitat has not been designated for this species.

State Listing

Sibara filifolia (Santa Cruz Island rock-cress) is not listed by the State of California.

Associated Rulemakings: None

Review History:

The last status review for *Sibara filifolia* was completed in 2006 (USFWS 2006) and recommended no change in status.

Species' Recovery Priority Number at Start of 5-year Review:

The recovery priority number for *Sibara filifolia* is 2 according to the Service's 2011 Recovery Data Call for the CFWO, based on a 1–18 ranking system where 1 is the highest-ranked recovery priority and 18 is the lowest (USFWS 1983a, pp. 43098–43105; USFWS 1983b, p. 51985). This number indicates the species faces a high degree of threat and has a high potential for recovery.

Recovery Plan or Outline:

No recovery plan or outline has been prepared for *Sibara filifolia*.

II. REVIEW ANALYSIS

Application of the 1996 Distinct Population Segment (DPS) Policy:

The Act defines “species” as including any subspecies of fish, or wildlife, or plants, and any distinct population segment (DPS) of any species of vertebrate. This definition of species under the Act limits listing as DPSs to species of vertebrate fish or wildlife. Because the species under review is a plant, the DPS policy is not applicable, and the application of the DPS policy to the species' listing is not addressed further in this review.

Information on the Species and its Status:

Species Description

Sibara filifolia was first described as *Cardamine filifolia* by Greene from specimens grown from seed he collected in 1886 on Santa Cruz Island, California (Greene 1887a, p. 31). *Sibara filifolia* (Santa Cruz Island rock-cress) is a diminutive and slender annual herb in the Brassicaceae (mustard family) that flowers in April (Munz 1974, pp. 300–301). It is 13 to 38 centimeters (cm) (5 to 15 inches (in)) tall. The flowers are bisexual and are borne in small terminal unbranched flower stalks called racemes. The flowers are pink to purplish with spoon-shaped petals 3 to 6 millimeters (mm) (0.12 to 0.25 in) in length. The leaves are 2.5 to 5 cm (1 to 2 in) long with a prominent midvein and narrow linear lobes arising along their length. The fruit is a slender two-chambered pod (silique), 1.5 to 3 cm (0.6 to 1 in) long that contains many (e.g., 20 to 30) wingless seeds (Junak and Wilken 1998, p. 341; M. Wall, Rancho Santa Ana Botanic Garden, Claremont, California, pers. comm., 2006).

Species Biology and Life History

Based on greenhouse observations, it appears that *Sibara filifolia* is self-compatible and capable of self-pollination or is possibly apomictic (capable of producing seeds without pollination) (Wall, pers. comm., 2006; K. Helenurm, University of South Dakota, pers. comm., 2006). Under natural conditions, plants typically produce 2 to 10 fruits (Helenurm, pers. comm., 2006). Seed dispersal appears to be by gravity, with many seeds likely tumbling or washing downhill (Helenurm 2003, p. 184). Past germination trials at Rancho Santa Ana Botanic Garden have proven successful by simply placing *S. filifolia* seeds in the soil (Wall, pers. comm., 2006). As discussed in the 2006 5-year review, previous studies investigating the tolerance of *S. filifolia* seed to smoke and fire suggested that the plant is not well-adapted to fire (C. Ames, Rancho Santa Ana Botanic Garden, pers. comm., 2006; Wall, pers. comm., 2006).

Spatial Distribution

Sibara filifolia was historically known from only three of the eight Channel Islands off the coast of southern California. Greene thought *S. filifolia* might be common on Santa Cruz Island when he first discovered the species (Greene 1887a, p. 31). It was later documented on Santa Catalina Island by Trask where she described the plant as “common in two localities” (Trask 1901). Although historically known from Santa Cruz and Santa Catalina Islands, *S. filifolia* was thought to be extinct in the 1980s, until located again in 1986 on San Clemente Island near Pyramid Point (EO 2) by Beauchamp (Beauchamp 1987, p. 4). This was the first report of the species from San Clemente Island. An additional location for *S. filifolia* on Santa Catalina Island in Cape Canyon was vouchered in 1973 (EO 6) but the specimen was not noticed until 1996 (S. Junak, Santa Barbara Botanic Garden, pers. comm., 2006) (Appendix 1). *Sibara filifolia* is the only species of *Sibara* that occurs on the Channel Islands. *Sibara filifolia* is often difficult to detect because of its diminutive stature, short life span and tendency to blend in with the surrounding substrate as it ages and dries (J. Dunn, San Diego Zoological Society, pers. comm., 2006; Junak, pers. comm., 2006).

At listing, *Sibara filifolia* was confirmed extant at two occurrences (Appendix 1) on San Clemente and Santa Catalina Islands. The occurrence on San Clemente Island (EO 2) was confirmed in 1996, where fewer than 30 plants were observed (Junak and Wilken 1998, p. 341). The other occurrence known to be extant at listing was from Cape Canyon on Santa Catalina Island (EO 6). Since listing, *S. filifolia* was discovered in 2001 on Santa Catalina Island at a new location Wild Boar Gully (EO 7) (D. Knapp, Catalina Island Conservancy, pers. comm., 2001; USFWS 2006, p. 4). Since the 2006 5-year review, additional point localities have been identified at the two extant occurrences on San Clemente Island at Pyramid Point (EO 2) and Santa Catalina Island at Wild Boar Gully (EO 7).

It is standard practice for plants, to maintain herbarium specimens at various institutions, to document occurrence and distribution information. Specimens are permanent and verifiable and may be the only record that the plant ever existed at a place where it has subsequently been

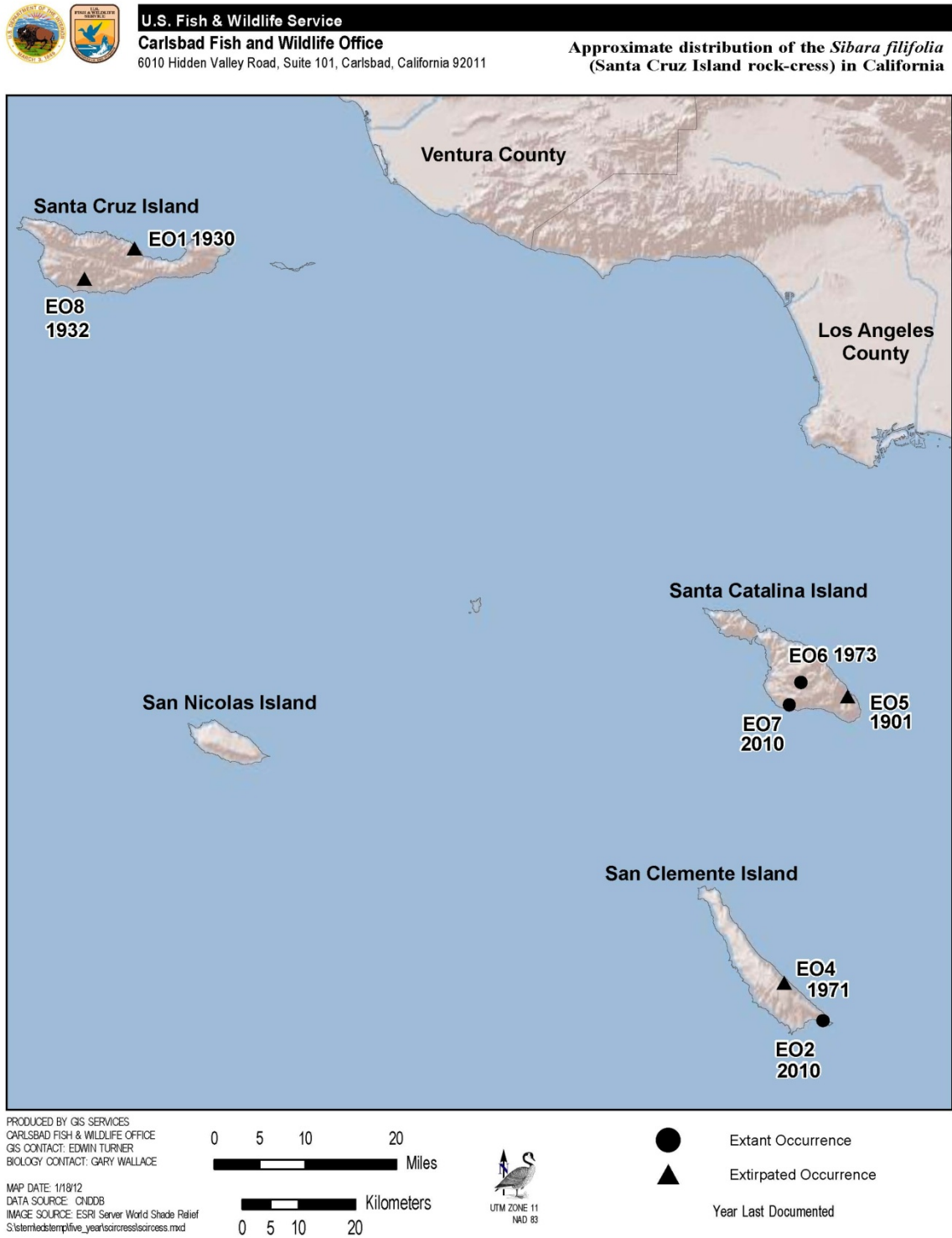


Figure 1: Distribution of *Sibara filifolia* (Santa Cruz Island rock-cress) occurrences including the year that the species was most recently documented at each location; developed for 2012 5-year review.

extirpated since the specimens were collected. Herbarium vouchers for occurrences of *Sibara filifolia* are available in the Consortium of California Herbaria. These are referenced in Appendix 1 by the name of the collector, their collection number, and the year of collection followed by the acronym of the herbaria holding the collections.

The Element Occurrence (EO) tracking system, used to identify and track the conditions of the occurrences of *Sibara filifolia* and other rare taxa, was initiated in 1979 by The Nature Conservancy to identify specific locations and track site changes for rare taxa. This system is now embodied in the CNDDDB maintained by CDFG. The range of *S. filifolia* given in the final listing rule was derived from accumulated herbarium records, published literature, available reports, and personal accounts. The CNDDDB assigns different EO numbers to occurrences that are more than 400 meters (m) (0.25 mile (mi)) apart. EOs are generally assigned consecutive numbers as occurrences of the species are originally recorded and newly detected occurrences are subsequently recorded. EO numbers are permanent and not reused, nor is an occurrence given a new number for any reason; however, some EOs for *S. filifolia* have been merged subsequent to analysis, such as EO 2 and EO 3 on San Clemente Island. Point locations for *S. filifolia* that are associated with an area represented by an EO are grouped with that EO as indicated on Appendix 1.

The CNDDDB (2011) includes seven historical *Sibara filifolia* occurrences spanning all three islands (EOs 1, 2 (includes EO 3), 4, 5, 6, 7, and 8). Details and current status of each occurrence is described below in association with the specific islands and their ownership and management regimes. The distribution of these occurrences is depicted in Figure 1.

Santa Cruz Island

On Santa Cruz Island, in addition to the specimen Greene collected in 1886 from an unspecified location, collections of *Sibara filifolia* were made by Brandegee in 1888 from a non-specific location, by Hoffman in 1930, on the northern side of the island near the mouth of the drainage into Pelican Bay (EO 1), and in 1932 on the southern part of the island above Laguna Canyon (EO 8) (Hoffman 1930; Hoffman 1932). *Sibara filifolia* was last seen on Santa Cruz Island in 1936 (USFWS 1997a, p. 42694). It has yet to be detected during a number of mostly untargeted plant surveys over the last 20 to 30 years (Helenurm 2003, p. 181; Junak, pers. comm., 2006; K. Chess, U.S. Geological Survey, pers. comm., 2006; K. McEachern, U.S. Geological Survey, pers. comm., 2010). We consider this species to be extirpated from Santa Cruz Island.

The Nature Conservancy owns about 76 percent of Santa Cruz Island, while the National Park Service owns the remaining 24 percent (McEachern *et al.* 2010, p. 1). The location of the historical occurrences (EO 1 and 8) appear to be on what is now land owned by The Nature Conservancy; however, both The Nature Conservancy and the National Park Service are implementing conservation and habitat restoration actions on the island and have placed limits on visitation to control recreational use (CNDDDB 2011) (McEachern *et al.* 2010, p. 2). Invasive nonnative plant management programs and ongoing native plant restoration activities are also being implemented by both entities and are discussed in more detail in **Factor D** below (McEachern *et al.* 2010, p. 2). It is anticipated that these actions will increase the possibility that

Sibara filifolia may yet be relocated on the island or that suitable habitat for reintroduction may be identified.

Santa Catalina Island

Three occurrences of *Sibara filifolia* (CNDDDB 2011, EOs 5, 6, and 7) have been reported on Santa Catalina Island. Prior to listing in 1997, the only known reliably recorded occurrence of *S. filifolia* on Santa Catalina Island was based on a 1973 herbarium collection (EO 6). The herbarium record indicates it was collected on a dry, rocky slope with an eastern exposure at an elevation of 1,000 feet in Cape Canyon (Probst and Hoefs 1973). *Sibara filifolia* was not found in the area in a search in the late 1990s prior to listing; however, the Cape Canyon area is quite large and thus the plant could have been overlooked. Despite not finding the plant, the habitat and associated species in the general area appeared to be in good condition (USFWS 1997a, p. 42694).

The occurrence near Avalon (EO 5) is based on a specimen collected by Trask (Trask 1901); she wrote on the specimen label that *Sibara filifolia* was common at two locations on dry ridges on the island at the time (Trask 1901; USFWS 1997a, p. 42694). Accession records for the specimen suggest that it was collected along sea cliffs on the eastern part of the island near Avalon (Trask 1901). CNDDDB (2011, EO 5) used Avalon as the location, although there is some uncertainty as to the exact location (Junak, pers. comm., 2006). Based on the labeling system on Trask's specimens for the period it is unlikely that *S. filifolia* ever actually occurred at Avalon (G. Wallace, USFWS, pers. obs., 2011). Rather, Trask's printed labels included the name of the location of her residence at the time. None of her labels of this type have so far, been found to include a named location for the collections made. We do not consider this occurrence extant and it may not represent a valid historical occurrence.

The occurrence of *Sibara filifolia* at Wild Boar Gully (EO 7) was unknown at the time of listing. This occurrence is located at some distance from the historical locations. An area at Wild Boar Gully (45.3 hectare (ha) (112 acres (ac)) was fenced in 1999 to protect the few remaining individuals of federally endangered shrub, *Cercocarpus traskiae* (Catalina Island mountain-mahogany) from nonnative mammalian herbivores (i.e., bison, deer, goats, pigs). Either due to the enclosure of herbivores or because of more intensive rare plant surveys in this area, *S. filifolia* was found in 2001 at two closely spaced locations separated by a drainage (Knapp, pers. comm., 2001; USFWS 2006, p. 4). In recent years, *S. filifolia* plants have been recognized approximately 30 m (100 feet (ft)) east and west of the larger populations found in 2001 (S. Ratay, Catalina Island Conservancy, pers. comm., 2010). In 2010, an additional locality was found approximately 250 m (820 ft) west across a drainage from the closer of the two previously discovered localities (Ratay, pers. comm., 2010).

Most of Santa Catalina Island (88 percent) is owned and managed by the Catalina Island Conservancy. The mission of Catalina Island Conservancy is to be a responsible steward of its land through the balance of conservation, education, and recreation. Its lands include the Cape Canyon area (EO 6) where *Sibara filifolia* was collected in 1973 and Wild Boar Gully (EO 7) where it is currently known to exist. The Conservancy erected the enclosure fences for Wild Boar Gully in 1999 and continues to manage a number of other enclosures for native plants

(Ratay, pers. comm., 2010). A long-term invasive plant management program has been implemented on the island and treatment areas include parts of Wild Boar Gully (Ratay, pers. comm., 2010).

San Clemente Island

Two occurrences (EO 2 and EO 4) of *Sibara filifolia* have been documented on San Clemente Island. Pyramid Point (EO 2) was the only known extant occurrence at the time of listing (USFWS 1997a, p. 42694). The occurrence at that time supported approximately 30 plants in one locality. Surveys of several adjoining open ridge tops and nearby flats towards the southern tip of the Island above Pyramid Point (Junak and Wilken 1998, pp. 341, 345, 347–348; Junak 2006) have revealed eight point localities for *S. filifolia* during targeted rare plant surveys conducted from 1996 to 2006 (USFWS 2006, p. 5). Four localities were revisited and one new locality of 10 plants was discovered in 2008 (Howe and Zink 2010, p. 3). In 2010, several new localities were found between and extending further downhill from the previously monitored point localities (B. Hoyer, Navy, pers. comm., 2011; Howe and Zink 2010, p. 4). Since the 2006 5-year review, it appears the number of point localities currently considered occupied by *S. filifolia* on San Clemente Island detected within EO 2 has increased from 8 to 14 (Howe and Zink 2010, p. 6). All of these are found within an area estimated at 195 hectares (ha) (480 ac) (Junak, pers. comm., 2006). A *S. filifolia* herbarium specimen from San Clemente Island was discovered during the 2006 5-year review. The specimen was collected on Peak 1942, directly south of White Rock (Benedict 1971). The location of this collection was identified by the CNDDDB as EO 4 and mapped near triangulation point “Alta.” Although this collection resembles *S. filifolia*, its identity is difficult to verify because the herbarium specimen is dry and fragmented (Junak, pers. comm., 2006). This taxon was not observed in 2006 at the Peak 1942 area and surveyors noted that the habitat in this area did not resemble other extant locations for the species (Junak, pers. comm., 2006). We do not consider this occurrence extant.

San Clemente Island is owned by the Navy and with its associated offshore range complex, is the primary maritime training area for the U.S. Navy Sea, Air, and Land teams. The island also supports training by the U.S. Marine Corps, the U.S. Air Force, and other military service branches. San Clemente Island is considered the last range in the eastern Pacific Basin where many training operations are performed prior to troop deployments and portions of the island receive intensive use. Under the Sikes Act (16 U.S.C. 670a-670o), as amended, the Navy adopted an Integrated Natural Resource Management Plan (INRMP) to help integrate its mission with resource protection on the island (USFWS 2006, p. 11).

The Navy has delineated areas of military use on San Clemente Island to define where specific activities will take place. These delineated areas include the Shore Bombardment Area (SHOBA), constituting the southern one third of the island. SHOBA, which covers approximately 4,072 ha (10,061 ac) (Navy 2009, p. 2-4), serves as a buffer around Impact Areas I and II and supports a variety of training operations (Navy 2002, p. 2-4) where fire suppression can be used to protect sensitive resources, such as *Sibara filifolia* (Navy 2002, p. 2-4). The occurrence at Pyramid Point (EO 2) is within this buffer area of SHOBA. Parts of SHOBA are not subject to training activities and serve only as a buffer, while other areas support military activities, including movement of troops and vehicles or bombing exercises. The Impact Areas

sustain heavy live fire, which is a recurrent source of wildfires (Navy 2002, p. 2-3). Fuel breaks are applied each year prior to fire season to help prevent spread of fire to areas outside of the Impact Areas. Because parts of SHOBA are used for ship-to-shore bombardment, access to this area is often restricted for nonmilitary personnel on days when bombing is occurring. Individuals conducting surveys or working on invasive plant control projects are granted access to areas outside of the Impact Areas within SHOBA when military activities requiring exclusive use are not occurring (K. O'Connor, Navy, pers. comm., 2006; B. Munson, Navy, pers. comm., 2011c). Because of the frequency of training, access to SHOBA can be restricted for long periods. Range operators are aware of the natural resource obligations within SHOBA, and at least 1 day a week is usually allowed for natural resource programs to conduct their activities. Weeks with reduced natural resource access, including infrequent events that exclude natural resource personnel from SHOBA for 10 to 20 days, are announced in advance and provide natural resource managers the opportunity to plan accordingly. Safety concerns relative to the presence of unexploded ordnance (UXO) within SHOBA have recently prompted the Navy to review access policies (O'Connor, pers. comm., 2006; USFWS 2008, p. 50; Munson, pers. comm., 2011d). In the Navy's FMP (Navy 2008a; pp. 2-38 to 2-44), Impact Areas I and II were indefinitely closed "for any purpose, including monitoring and management of endangered and sensitive species and their habitat" for safety reasons (Navy 2008a, p. 2-45). Thus, the *S. filifolia* occurrence near Pyramid Point (EO 2), known to support high numbers of the plant, has not been monitored since 2008 due to the potential of UXO within the vicinity (Howe and Zink 2010, p. 7). This limits opportunities to acquire information of the status of *S. filifolia* and implement conservation measures to manage threats in those areas. The Navy is revising their INRMP to develop solutions to monitor species and their threats in these areas potentially through unmanned vehicles, aircraft, or with the assistance of range maintenance personnel that regularly access the areas. The Navy is developing a strategy to clear UXO from this area to avoid affecting *S. filifolia* localities and allow for new surveys (Munson, pers. comm., 2011c). In the meantime, there are no monitoring or management actions occurring in these areas. The Navy is developing plans to trim the vegetation in these areas so that sweeps by specially trained technicians can clear the areas of unexploded ordnance to allow access by nonmilitary personnel (Munson, pers. comm., 2011d).

In summary, currently there are two extant occurrences of *Sibara filifolia* located on Santa Catalina Island (EOs 6, and 7), and one on San Clemente Island (EO 2) and the species is considered extirpated from Santa Cruz Island. The historical and current range of the species, based on herbarium specimens and CNDDDB EO reports is depicted in Figure 1 and described in Appendix 1.

Abundance

At the time of listing in 1997, 29 individuals of *Sibara filifolia* were recorded in 1996 from only one known extant occurrence on San Clemente Island at Pyramid Point (EO 2).

Subsequent to preparation of the listing document, this site was found to support 208 plants in 1997 and four additional point locations with 500, 25, 12, and 11 plants respectively were documented in the area of the Pyramid Point occurrence (EO 2) for a total of 756 plants found in 1997 (Junak and Wilken 1998, pp. 347–348). An occurrence was discovered on Santa Catalina

Island in 2001 in Wild Boar Gully (EO 7) with 63 plants (CNDDDB 2011, EO7). Three additional point localities supporting 4, 11, and 52 plants respectively were detected on San Clemente Island in 2003 (Junak 2006, p. 3). At the time of the 2006 5-year review, the eight point localities associated with Pyramid Point (EO 2) and the occurrence at Wild Boar Gully (EO 7) were the only recently documented occurrences of *S. filifolia*. An increase in the number of point localities of the species within these occurrences has been observed, especially during wet years.

Surveys have recorded localities on San Clemente Island numbering from a few to perhaps more than a thousand individual plants (Beauchamp 1987, p. 4, 6; Junak and Wilken 1998, pp. 341, 347-348; Junak 2006, p. 3; Knapp, pers. comm., 2006; Ratay, pers. comm., 2010). As is typical of annual plants, monitoring indicates that populations fluctuate in response to seasonal rainfall and, during some years, plants may not be evident (Helenurm, pers. comm., 2006; Junak, pers. comm., 2006; Knapp, pers. comm., 2006). On San Clemente Island, eight point localities near Pyramid Point (EO 2) were documented in 2006 and three to five of these were described to be observable on a regular basis (Helenurm, pers. comm., 2006). In 2008, one new point locality containing *Sibara filifolia* was discovered and 619 plants were observed on the western edge of the Pyramid Point occurrence (EO 2) (Howe and Zink 2010, p. 3). In 2010, *S. filifolia* was found at 10 point localities including several new localities found between previously known reference points and extending further downhill from where the plants were previously documented along the eastern ridge of Pyramid Point (Howe and Zink 2010, p. 4; Hoyer, pers. comm., 2011). The largest point locality found in 2010 supported 139 plants, and among all point locations surveyed, 360 plants were counted (Howe and Zink 2010, p. 4).

The three western-most point localities supporting *Sibara filifolia* on San Clemente Island have not been visited since 2008 due to concerns of UXO (Howe and Zink 2010, pp. 3, 7). The Pyramid Point occurrence (EO 2) is at the southern end of the Island within the boundaries of the SHOBA, where the Navy conducts ship to shore bombing exercises (Navy 2002, pp. 2-2-2-4).

On Santa Catalina Island, the initial discovery of *Sibara filifolia* in Wild Boar Gully (EO 7) in 2001 reported 63 plants, between the two closely spaced sites (Knapp, pers. comm. 2001; USFWS 2006, p. 4). Monitoring of the occurrence documented annual population fluctuations for the two point localities from as many as 253 plants in 2003 to a low of 0 plants in 2004 (Knapp, pers. comm., 2005). Eighty-nine plants were counted in 2008 from the two more consistently occupied point localities (Ratay, pers. comm., 2010). In 2010, three localities were estimated to support only 49 plants combined and 75 were later observed at those locations in 2011 (Ratay, pers. comm., 2011). An additional point locality of *S. filifolia* was discovered in 2010 that was estimated to support over 1,000 plants (Ratay, pers. comm., 2010); 300 plants were detected at this site in 2011 (Ratay, pers. comm., 2011). In 2011, approximately 400 plants were observed among six point localities in Wild Boar Gully (EO 7) (Ratay, pers. comm., 2011). No abundance estimates are currently available for the occurrence at Cape Canyon (EO 6).

Habitat or Ecosystem

Sibara filifolia was characterized as occurring in shady places on the northward slope on Santa Cruz Island (Greene 1887a, p. 31); subsequent collectors found the species in open areas along

dry rocky ridgelines on the island. Historical and extant records suggest that *S. filifolia* can tolerate soils derived from a variety of parent materials including rocks of volcanic and metamorphic origin (Junak, pers. comm., 2006).

It is difficult to draw conclusions about the habitats in which *Sibara filifolia* was historically found on Santa Cruz Island, due to the lack of adequate collections and descriptions of the occurrences. The substrate type in the area in which *S. filifolia* likely was found in the Pelican Bay (EO 1) area is believed to be Conejo volcanics (Junak, pers. comm., 2006). The other documented population above Laguna Canyon (EO 8) likely grew in metamorphic or granitic rocks (described to be potentially Santa Cruz schist) (Junak, pers. comm., 2006).

Sibara filifolia localities on Santa Catalina Island have recently been described as associated within habitats with an abundance of a distinct light gray soil type, possibly the non-volcanic serpentinite, and in very sparse, coastal sage scrub (Junak, pers. comm., 2006; Ratay, pers. comm., 2010). These vegetative communities are dominated by *Salvia mellifera* (black sage) and associated with *Nassella lepida* (foothill needlegrass), *Opuntia littoralis* (prickly-pear cactus), *Calystegia macrostegia* (morning glory), and *Hesperolinon micranthum* (dwarf flax) as shown in Figure 1 (Knapp 2001; Ratay, pers. comm., 2010).

On San Clemente Island, *Sibara filifolia* occurs near Pyramid Point (EO 2) on volcanic rock scree in association with *Opuntia littoralis* (coastal prickly pear cactus), *Cylindropuntia* (as *Opuntia*) *prolifera* (cholla), *Bergerocactus emoryi* (Golden cereus), *Selaginella bigelovii* (spike-moss), *Acmispon* (as *Lotus*) *argophyllus* var. *adsurgens* (San Clemente Island birds-foot trefoil), *Perityle emoryi* (Emory's rock daisy), *Muhlenbergia appressa* (appressed muhly), and *Cistanthe* (as *Calandrinia*) *maritima* (seaside cistanthe) (Beauchamp 1987, p. 4; Elvin 1996; Howe and Zink 2010, p. 6). This vegetation community is classified as Maritime Desert Scrub-Prickly Pear Cholla-Phase (Navy 2002, p. 3-64; Howe and Zink 2010, p. 6), and is located inside the SHOBA training area on the island (Howe and Zink 2010, p. 6). The Pyramid Point area is also more sparsely vegetated than much of the remaining part of the island (Figure 2) (Howe and Zink 2010, p. 6). The soils on San Clemente Island are finely textured and include vertisols (heavy, light-colored, high clay content), alfisols (fine, light-colored, subsurface clay horizons), and eolian dune deposits (Navy 2008b, p. 3.1-2). At Pyramid Point, the predominant soil complex is Shoba, a vertisol soil that dominates the southern portion of San Clemente Island (Navy 2008b, p. 3.1-2). These soils have a tendency to swell during rainfall events and develop deep cracks in dry periods (Navy 2008b, p. 3.1-2). The ridges at Pyramid Point on which *S. filifolia* occurs are steep and rocky and primarily face the southeast and southwest (Howe and Zink 2010, p. 6).

Locations on the island with the same unique habitat characteristics are rare, although several areas contain a few of these same habitat features (Howe and Zink 2010, p. 6).

Based on the description of the species associated with collections of *Sibara filifolia* from Santa Catalina Island and San Clemente Island, the habitats occupied by this species would currently be described as Coastal prickly pear scrub (Sawyer *et al.* 2009, pp. 599–601 or California desert thorn shrubland (Sawyer *et al.* 2009, p. 588).



Figure 1: Landscape within Wild Boar Gully on Santa Catalina Island. Photo credit: Sarah Ratay (Catalina Island Conservancy).



Figure 2: Rocky escarpment looking southeast towards Pyramid Point on San Clemente Island. Photo credit: Susie Tharratt (USFWS).

Given the survival of *Sibara filifolia* in localities characterized by different vegetative communities and in different soil types on Santa Catalina and San Clemente, and under different moisture regimes, the plant may be able to survive in a wider variety of habitat conditions than it currently occurs (Howe and Zink 2010, p. 7). The cryptic characteristic of the species and the variety of localities where *S. filifolia* was observed suggest that other populations may have gone undetected on all three Channel Islands. It appears to be currently located in marginal habitats within areas with less impact from nonnative plants. This may be demonstrated by the disparity in its type locality, which was originally described as occurring in shady places on the "northward slope" (Greene 1887a, p. 31), when compared to all other verified records and extant occurrences in dry, open, rocky areas with thin soils and sparse vegetation.

Historical defoliation from overgrazing by nonnative mammalian herbivores resulted in severe habitat destruction and alteration that likely curtailed the range of this species (USFWS 2006, p. 6). Although most of the mammalian herbivores have been removed from the islands on which *Sibara filifolia* occurs, the ecological damage remains in the form of legacy threats such as eroded landscapes and the dominance of nonnative plants (USFWS 2006, p. 6). In the flat rocky areas and saddles where *S. filifolia* is currently monitored on San Clemente and Santa Catalina Islands, erosion does not presently appear to be a problem (Junak, pers. comm., 2006; Hoyer, pers. comm., 2011); however, it may be a factor within suitable habitat elsewhere on the islands.

Contemporaneous with and likely aided by feral grazing animals, a large number of invasive nonnative plants have naturalized on the islands and have become a dominant component of many habitats. As mentioned above, the widespread historical distribution of *Sibara filifolia* on several islands under variable conditions may indicate the habitat specificity of the plant was once not so unique, which suggests invasive plants may have been a dominant factor in curtailing its range and continuing to limit its distribution (Howe and Zink 2010, p. 7). The invasion of the islands by nonnative annual grasses likely represents the greatest structural change to *S. filifolia* habitat and new invasions by previously undocumented grasses continue to be discovered (e.g., *Schismus arabicus* (Mediterranean grass) and *Brachypodium distachyon* (purple false brome) on San Clemente Island) (Dunn, pers. comm., 2006; Junak, pers. comm., 2006).

Changes in Taxonomic Classification or Nomenclature

Sibara filifolia (E. Greene) was first collected by Greene in 1886 and described as *Cardamine filifolia* (Greene 1887a, p. 30). Greene later transferred it to *Arabis filifolia* (1887b, p. 390). In 1896, Greene proposed the new genus *Sibara* to accommodate the species (Greene 1896, pp. 10–12). *Sibara filifolia* has been maintained by all subsequent floristic and systematic treatments (Munz 1974, pp. 300–301; Rollins 1993, pp. 435–436; Al-Shehbaz 2012, p. 562). There have been no changes in the nomenclature or taxonomic classification of *Sibara filifolia* since it was listed.

Genetics

No genetic evaluations were conducted prior to the listing of *Sibara filifolia*. Helenurm began investigating the amount and distribution of genetic variation in *S. filifolia* and other sensitive plants from San Clemente Island in the late 1990s as part of a larger project to ensure for

effective conservation of the endangered and sensitive plants on the island (Helenurm 1997, p. 1; USFWS 1997b, p. 13). Plants from three localities on three adjoining ridges on San Clemente Island near Pyramid Point (EO 2) were first sampled in 1996 and analyzed using allozyme analysis (Helenurm 2003, p. 181). The study revealed that there is low genetic variation at both the species and population levels among plants from those localities (Helenurm 2003, pp. 181, 183). Random Amplified Polymorphic DNA analysis was also used to assess genetic variation for the same localities and results indicated much more genetic variation than was detectable using allozymes as well as genetic variation within all of the populations studied.

Since the 2006 5-year review, McGlaughlin *et al.* (2008) conducted a microsatellite analysis of specimens from the three localities on adjacent ridges at Pyramid Point (EO 2) on San Clemente Island. They found all nine isolated loci to be polymorphic, although levels of genetic diversity and allelic variation were very low in the sampled individuals and heterozygotes were observed in only two of nine loci (McGlaughlin *et al.* 2008, p. 368). Observed variability was found primarily among populations or in rare homozygous individuals (McGlaughlin *et al.* 2008, p. 367).

Recently, McGlaughlin investigated the variation in microsatellite markers for Santa Catalina Island plants at Wild Boar Gully (EO 7) and at two additional populations at Pyramid Point on San Clemente Island (EO 2). Results were then compared to the previously sampled populations on San Clemente Island. The resampled populations (on adjacent San Clemente Island ridges) showed a similar pattern of low diversity and low differentiation (M. McGlaughlin, University of Northern Colorado, pers. comm., 2011). The two populations from San Clemente Island that were not previously sampled revealed one population that was very similar to the others and one that was very distinct when compared to the other four (McGlaughlin, pers. comm., 2011). Although little genetic diversity was found in the populations, the distinctness between the one newly sampled population and the other four suggests there are two genetic populations on the island (McGlaughlin, pers. comm., 2011). However, the low genetic diversity within populations may indicate a bottleneck or potentially nearly complete selfing lineages, or both (McGlaughlin, pers. comm., 2011).

Evaluation of the Wild Boar Gully population on Santa Catalina Island by McGlaughlin produced unexpected results (McGlaughlin, pers. comm., 2011). The Wild Boar Gully population is comparatively very diverse, which may refute the idea of high selfing rates, although additional genetics tests are needed to determine whether outcrossing or selfing is occurring (McGlaughlin, pers. comm., 2011). The observed diversity likely indicates the contributions of a well-maintained diverse seed bank even during the time period when its occurrence was not documented at the location (McGlaughlin, pers. comm., 2011). This population therefore represents an important source for seed bank samples and conservation actions, although all three genetic populations are important for protection and seed collection (McGlaughlin, pers. comm., 2011).

Because *Sibara filifolia* exists as a few, small, isolated, locally-distributed populations, exhibiting habitat specificity, individual plants were expected to be somewhat low in genetic diversity (Helenurm 2003, pp. 181, 184). Many alleles may have also been lost over time as grazing pressures by introduced livestock have likely reduced the range of *S. filifolia* and kept

populations low in number for the past century (Kellogg and Kellogg 1994, pp. 4–5; Helenurm 1997, p. 77). The discovery of the genetic diversity of the population on Santa Catalina Island suggests that, rather than high selfing rates, the San Clemente Island populations may be in two bottlenecks with individuals outcrossing with almost identical and highly related individuals (McGlaughlin, pers. comm., 2011). Limited gene flow suggests that genetic variation, necessary for species survival, can only be protected through the protection of all known extant populations (Helenurm 1999, p. 50). Loss of genetic variation could impair the ability of this species to respond to a changing environment (Helenurm 1999, p. 50) and potential reintroductions or ex situ collections may safeguard against potential extirpation (Helenurm 2003, p. 185).

The *Sibara filifolia* populations on San Clemente and Santa Catalina Islands are also phenotypically distinct. The plants on San Clemente Island as described are significantly shorter and with flowers much more pink in color when compared to those found on Santa Catalina Islands (Tierra Data Systems 2006, p. 2; Ratay, pers. comm., 2010). Although differences in rainfall amounts and soils supporting *S. filifolia* on the two islands may explain the differences in plant height, further genetic and character/morphological analysis may be necessary to determine the differences in the two populations. Results from these studies may provide critical information regarding these expressed differences and should be completed prior to considering reintroduction of the species to historical or unoccupied but suitable habitat of Santa Catalina, San Clemente, or Santa Cruz Island.

Species-specific Research and/or Grant-supported Activities

Species-specific research has been conducted on *Sibara filifolia* to determine how best to conserve the species genetic diversity (as discussed above), its tolerance to fire, and conditions influencing germination. Current research is being conducted to propagate the plant offsite and investigate potential outplanting sites on San Clemente Island. Other activities contributing to the conservation of the species include ongoing seed banking efforts from San Clemente and Santa Catalina Islands, where *S. filifolia* has been recently observed, and nonnative invasive plant control projects (discussed in the **Factor A** section) that are implemented annually on all the islands where the plant historically occurred.

Greenhouse propagation of *Sibara filifolia* has been conducted in the past at Rancho Santa Ana Botanical Garden (RSABG) (Wall, pers. comm., 2006). The plants appeared more robust and different in appearance compared to plants found in the wild (Wall, pers. comm. 2006). Plant propagation activities have also been undertaken in order to facilitate the genetics research discussed in the Genetics section above (Helenurm, pers. comm., 2006; McGlaughlin, pers. comm., 2011).

The Navy entered into a cooperative agreement with the Soil Ecology and Restoration Group (SERG) of San Diego State University in preparation for potential reintroduction of *Sibara filifolia* and *Lithophragma maximum* (San Clemente Island woodland star), another federally listed plant, to other locations on San Clemente Island. The focus of this cooperative effort is to provide up-to-date mapping of current populations, identify and map potential outplanting sites, and develop outplanting and seed banking strategies (Howe and Zink 2010, p. 1). Soils, vegetation, and topographical characteristics have been compiled for currently known occupied

habitat at the Pyramid Point occurrence (EO 2) in an effort to identify potential sites with similar characteristics (Howe and Zink 2010, p. 6). Although the habitat at this occurrence has a fairly unique combination of physical and biological characteristics, several similar sites on the island have been identified. Sites supporting *S. filifolia* occur in somewhat variable microclimates, vegetation communities, soil types, and on ridges of variable aspects (Howe and Zink 2010, pp. 6–7); although all occurrences appear to have in common, dry ridges, and sparse vegetation.

Seed banking efforts have been implemented for *Sibara filifolia* as a preventative measure for potential catastrophic events, genetics research, and potential reintroductions in the future. Seed collections were completed by McGlaughlin in 2008 on Santa Catalina Island for genetic research (McGlaughlin, pers. comm., 2011) and Helenurm (2003, p. 182) on San Clemente Island. Seed is currently located at the Santa Barbara Botanical Garden, SERG Seed Bank on San Clemente Island, and RSABG (Howe and Zink 2010, p. 8; Wall, pers. comm., 2012).

Five-factor Analysis

Threats to *Sibara filifolia* identified at the time of listing included: grazing, fire, competition from nonnative plant species, and erosion (USFWS 1997a, pp. 42692–42702). The 2006 5-year review identified threats to *S. filifolia* as: erosion and habitat impacts associated with historical grazing, competition from nonnative plants, fire, conflicting land use, restricted access to populations, herbivory, and stochastic risks due to small population sizes (USFWS 2006, pp. 7–19). These threats continue to impact *S. filifolia* throughout its known range. The following five-factor analysis describes and evaluates the current threats to *S. filifolia* attributable to one or more of the five listing factors outlined in section 4(a)(1) of the Act.

FACTOR A: Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range

At the time of listing, Factor A threats to *Sibara filifolia* included loss of habitat associated with introduced herbivores and fire. In the last status review, grazing and associated erosion and habitat destruction, competition from nonnative plants, fire, land use conflict, and restricted access to populations were considered threats to *S. filifolia* attributable to Factor A. Threats to the habitat of *S. filifolia* associated with nonnative plants are also included here and impacts from grazing will be discussed under **Factor C**. Current threats impacting *S. filifolia* habitat are discussed under Nonnative Plants, Fire, and Erosion. The types of threats, extent of their impacts, and management responses to threats differ between Santa Catalina and San Clemente Islands. Consequently, the following discussions treat each island separately reflects the differences in island environments, ownership, and degree of management.

Nonnative Plants

One of the primary threats to *Sibara filifolia* identified in the listing rule is the expansion of invasive nonnative plants into its habitat. Invasive nonnative plants can alter ecological processes such as nutrient cycling (Zink *et al.* 1995, p. 304) or the prevalence of fire (Brooks 1999, p. 13) that may otherwise affect the persistence of this species. In California, it has been suggested that spread of nonnative plants and the associated change of shrub-dominated

landscapes to more herbaceous landscapes has resulted in an increase in fire frequency (Haidinger and Keeley 1993, p. 141). Invasion of the Channel Islands by several species of annual nonnative grasses is of particular concern due to the ability of these species to persist on thin rocky soils and the difficulty in their eradication. Nonnative species are not as abundant on the thin rocky soils in which *S. filifolia* now occurs, but they are dominant in areas that were likely part of this taxon's historical range and habitat (e.g., Triangulation Point Alta (EO 4) on San Clemente Island).

Santa Catalina Island

On Santa Catalina Island, *Brachypodium distachyon* (purple false brome) has been identified as a habitat threat by its ability to displace *Sibara filifolia* (Junak, pers. comm., 2006). Other species identified as a threat to *S. filifolia*, include *Nicotiana glauca* (tree tobacco), *Phalaris aquatica* (Harding grass), and *Ehrharta calycina* (perennial veldt grass) in Wild Boar Gully (EO 7), and in the wetter, larger, less remote Cape Canyon (EO 6), *Nicotiana glauca* (tree tobacco), *Phalaris aquatica* (Harding grass), *Silybum marinum* (milk thistle), *Cortaderia selloana* (Pampas grass), *Ficus carica* (fig), and *Foeniculum vulgare* (fennel).

Large herbivores may also act as vectors for the spread of nonnative grasses and other plants on Santa Catalina Island by contributing to the dispersal of nonnative seeds and other propagules (Sweitzer *et al.* 2003, pp. 52–56). In particular, mule deer (*Odocoileus hemionus*), blackbuck antelope (*Antelope cervicapra*), and bison (*Bison bison*) continue to be potential factors in expanding the ranges of nonnative plant species within the vicinity of Cape Canyon (EO 6). Although this occurrence is located in steep, sparse terrain, which is not ideal for grazing or browsing, adjacent habitat or the movement of animals through this areas, may promote the dispersal of nonnative plant seed that encroach on *Sibara filifolia* habitat.

The Catalina Habitat Improvement and Restoration Program, on Santa Catalina Island is being implemented in Cape Canyon (EO 6) and Wild Boar Gully (EO 7) to restore native plant communities, including *Sibara filifolia*, and treat invasive plants. With four staff assigned to the program, 76 plant species have been identified for potential need of control or eradication (Ratay, pers. comm., 2010). The entire island has been mapped for invasive species and approximately 35 species are currently being treated on the island.

San Clemente Island

Invasive nonnative plant species of particular concern on San Clemente Island include annual grasses such as including *Schismus arabicus* (Mediterranean grass), *Bromus madritensis* subsp. *rubens* (foxtail chess), *Avena* spp. (wild oats), *Ehrharta calycina* (perennial veldt grass), *Brachypodium distachyon* (purple false brome), and *Brassica tournefortii* (Sahara mustard). Vegetation trend monitoring along a transect in sparsely vegetated, rocky, *Nassella* grassland habitat on the island documented an increase in cover of *Avena barbata* (slender wild oats) from 5 percent in 1992 to 29 percent in 1994, which may have fueled a 1995 fire (Navy 2002, p. D-4). *Schismus arabicus* and *Brassica tournefortii* discovered on the southern end of San Clemente Island along with *Avena* spp. and *Bromus madritensis* subsp. *rubens* represent particularly important threats, because they could completely displace *Sibara filifolia* or allow fire into areas

with little vegetation (Junak, pers. comm. 2006; E. Kellogg, Tierra Data Systems, pers. comm., 2006; O'Connor, pers. comm., 2006). Other invasive plants found in occupied *S. filifolia* habitat on San Clemente Island include *Erodium* spp. (Heron's bill) and *Mesembryanthemum crystallinum* (crystalline iceplant); considerable effort is expended to treat *Brassica tournefortii* (E. Howe, Soil Ecology and Restoration Group, pers. comm., 2011).

Specific INRMP objectives targeted at habitat protection in the Maritime Desert Scrub habitat of Pyramid Cove include: control of invasive nonnative grasses using appropriate wildland fire management protocols; improve the soil and community description of this area and its range and variability; reduce nonnatives, mostly red brome, from the 1992 to 1993 baseline condition of 40 percent by maintaining the pace of shrub recovery; controlling escape of fire from Impact Area 1; and protecting rare species while allowing light fire (Navy 2002, p. 4-15).

On San Clemente Island, the Navy has dedicated significant funding to invasive plant control programs and annual reports documenting the program activities have been produced since 1994 (Munson, pers. comm., 2011b). Priority target species for control include *Foeniculum vulgare* (fennel), *Ehrharta calycina* (veldt grass), *Tragopogon porrifolius* (salsify), *Asphodelus fistulosus* (asphodel), and *Centaurea solstitialis* (yellow star thistle) to protect habitat on the island, including the occurrence at Pyramid Point (EO 2) (Munson, pers. comm., 2011a). To prioritize invasive eradication, staff conduct vehicle surveys on the island at the beginning of the growing season to identify treatment areas, which are managed at different intervals throughout the year (Munson, pers. comm. 2011a). Additional nonnative plant control activities are conducted throughout the year in conjunction with other island activities (Munson, pers. comm., 2011b). For example, staff on San Clemente Island have sprayed for and hand removed nonnatives at Pyramid Point (EO 2) (Hoyer, pers. comm., 2011).

The Navy has implemented a Fire Management Plan (FMP) for San Clemente Island that prioritizes areas surrounding *Sibara filifolia* localities as primary targets for eradication of nonnative plants to the extent practicable and as appropriate based on potential impacts. To reduce the potential for transport of invasive plants to the island, the Navy has developed control measures within the FMP including checking and removal of any visible plant material, dirt, or mud on equipment and shoes for both military and non-military personnel prior to coming to San Clemente Island (USFWS 2008, p. 139). Vehicles are also washed prior to delivery to the island or movement to other parts on the island (Munson, pers. comm., 2011a). Other efforts being developed to control spread of nonnatives include briefing of military units on maneuver area boundaries prior to conducting operations and to conduct assault vehicle travel or maneuvering activities only within these specified boundaries (USFWS 2008, p. 140).

Invasive species control efforts may be limited within the Impact Areas on San Clemente Island due to limitations in accessing these areas for treatment and surveys, particularly if these restrictions occur during optimal treatment points in the life cycle of invasive plants (e.g., prior to setting seed). The three *Sibara filifolia* point localities (EO 2) along the west ridge, which have been known to support high numbers of the plants, have not been monitored for invasive plant threats since 2008 due to UXO within their vicinity (Howe and Zink 2010, p. 7).

The removal of large mammalian herbivores from San Clemente Island has resulted in a rebound of native vegetation, and populations of many rare plants have improved (e.g., *Castilleja grisea* (San Clemente Island paintbrush) and *Acmispon dendroideus* var. *traskiae* (San Clemente Island lotus)) (Junak, pers. comm., 2006; USFWS 2007, p. 4). However, the range of *Sibara filifolia* has not significantly increased, possibly due to the small number of plants remaining at the time of animal removals and the limited dispersal of the seed.

Summary

Invasive nonnative plants represent a significant, ongoing, rangewide threat to *Sibara filifolia*. Vectors for their dispersal into habitat occupied by *S. filifolia* can include vehicles, humans, and other animals. Increased fire frequency, associated with nonnative plants, can also produce type conversion from shrub-dominated landscapes to those occupied by mainly invasive, nonnative, annual grasses. Nonnative invasive plant removal activities are being implemented on both islands where *S. filifolia* is known to be extant. The implementation and effectiveness of such programs may be limited to currently monitored occurrences (Wild Boar Gully (EO 7) on Santa Catalina Island), where site-specific monitoring and treatment actions are identified and implemented. The implementation is absent and effectiveness unknown for nonnative plant control at point localities associated with the occurrence at Pyramid Point (EO 2) on San Clemente Island; this area is closed due to the presence of UXO. The long-term threat to habitat occupied by *S. filifolia* may be significantly reduced if sources of invasive plant propagules and vectors that facilitate their spread are reduced or eliminated. Impacts of invasive nonnative plants on *S. filifolia* habitat will continue at significant levels in areas where these elements are not controlled.

Fire

At the time of listing, fire was reported to have contributed to the decline of *Sibara filifolia* due to the small populations and unknown tolerance to fire (USFWS 1997a, p. 42699). Fire, discussed under Factor E at the time of listing, is included here under **Factor A** because of the threat to the habitat of *S. filifolia*. Fire can destroy or significantly decrease plants and plant cover, result in increased erosion, and alter climax vegetation components and associated habitat. Although the habitat of *S. filifolia* on open ridge tops and rocky areas contains little vegetation to carry fire, the invasion of nonnative annual grasses and other nonnative species during wet years into *S. filifolia* habitat likely results in an increase in the fuel load for fire (Navy 2002, p. 2-17). Fire may not have previously been an important evolutionary force for *S. filifolia*, so any change in the fire regime may have adverse effects on the species. Individual plants seems less likely to burn because they flower and set seed very early in the year; thus, fire may have a greater effect on the seed bank (Tierra Data Systems 2006, p. 2; Navy 2008a, p. 5-86). While some proportion of *S. filifolia* populations would likely persist as a dormant seed bank in the soil following a fire in its usually sparsely vegetated habitat, the small, thin-coated seeds do not appear to be well adapted to withstand fire. Results of smoke treatments on *S. filifolia* seed conducted at RSABG imply a lack of resistance of *S. filifolia* seed to wildfire and associated smoke. Additionally, after a fire in 1995, surveys in 1996 of known localities of *S. filifolia* on San Clemente Island were unable to detect plants except at one locality (M. Elvin, RSABG, pers. comm., 1996). The soils in this area were described as very shallow, approximately 2 to 5 mm (0.08 to 0.20 in), and

unlikely to accommodate the survival of any of the seed bank (Elvin, pers. comm., 1996). Thus, any loss of plants from fire prior to setting seed or loss of seed banks represents a threat to the small populations of this species. A change to an increased fire regime associated with the invasion of nonnative grasses would likely exacerbate this threat.

Santa Catalina Island

In the last 100 years, 299 fires have been recorded (70 structural fires and 229 fires in natural areas), though only 6 were caused by natural events, such as lightning (http://www.catalinaconservancy.org/index.php?s=wildlife&p=fire_faqs). Fortunately, few of these human-caused fires resulted in major damage. Since 1999, approximately 13 percent of Santa Catalina Island has burned, primarily from four large fires (greater than 40.5 ha (100 ac) in size), three of which were human caused (Ratay, pers. comm. 2010). In May 2007, the largest fire ever recorded for the island burned 1,926 ha (4,762 ac) (http://www.catalinaconservancy.org/userfiles/files/maps/island_fires_2010.pdf). This large fire took place near Avalon (EO 5), although the area within approximately 0.8 kilometer (0.5 mi) of the coast where the species was previously thought to have been collected remained largely unburned. Although Santa Catalina Island has greater annual precipitation than the more southern San Clemente Island (Dunkle 1950, p. 258), the larger areas of intact natural vegetation, as compared to the historically denuded San Clemente Island, likely support the more rapid spread of fire across larger areas containing higher density fuels. The large burn areas of recent fires on Santa Catalina Island may be evidence of this pattern (http://www.catalinaconservancy.org/userfiles/files/maps/island_fires_2010.pdf). The presence of invasive nonnative plants on the island may also support patterns of higher fire frequency and more intense fires (Brooks 1999, p. 13). In addition, visitors and residents on the island represent potential sources of ignition for fire, particularly around communities and in well-traveled areas, and likely contribute to the incidence of significant fire events as discussed above.

The Cape Canyon occurrence (EO 6) is within a few miles of the 2007 fire footprint and Airport Road, one of the main roads on the island. The Wild Boar Gully occurrence (EO 7) is on the South end of the island and represents some of the least densely vegetated areas on the island that is unlikely to carry fire through its habitat. However, any invasion of nonnative annual grasses into this habitat would increase the vulnerability of the *Sibara filifolia* to fire. Only 6 of the nearly 300 fires in the last 100 years were human caused; the fires, even the large one in 2007, did not impact a known extant occurrence of *S. filifolia*. However, given the importance of the island's seed bank and high numbers of individual plants, loss of *S. filifolia* at Wild Boar Gully due to fire would significantly impact the survival and potential recovery of the species.

San Clemente Island

Fire frequency is higher on San Clemente Island, compared to Santa Catalina Island. Prevalence and fire frequency data on San Clemente Island indicate that 130 wildland fires were documented during 1990 to 2004, with wildland fires defined as those spreading through vegetative fuels in a wildland environment (Navy 2008a, pp. 5-17–5-18). Of the uncontained wildfires, 108 were confirmed or suspected to be the result of normal Navy operational events

(Navy 2008a, p. 5-18). Many of these remained small and extinguished themselves without intervention (Navy 2008a, p. 5-18).

Fires in SHOBA may be larger than those on the rest of the island for several reasons, including distance (and delayed response) from fire protection on the island, reduced capacity for fire detection, and increased danger due to presence of UXO (Navy 2008a, p. 5-20). The primary training activities that occur within SHOBA are Naval gun shell impact, artillery, air-to-ground bombing, Naval Special Warfare Training, and amphibious training (Navy 2008a, p. 1-6). Certain munitions exercises involve the use of incendiary devices, such as illumination rounds and tracer rounds, which pose a high risk of fire ignition (Navy 2008a, p. 2-6; USFWS 2002, p. 10). Because of the elevated risk of fire associated with these training activities, live and non-live munitions fire is targeted towards two delineated Impact Areas, where training disturbances and repeated fires are concentrated. Strip burning and fire retardant are used to maintain fuel breaks around these areas (Navy 2008a, p. 2-42). Much of the remainder of SHOBA serves as a buffer around the impact areas, where there is less intensive use, and fire suppression can be used to protect sensitive resources (e.g., *Sibara filifolia* occurrence at Pyramid Point (EO 2)).

In 2008, the Navy proposed to increase the frequency of training operations and conduct new training operations on San Clemente Island (USFWS 2008, p. 4). A FMP was developed to provide greater flexibility regarding the use of various munitions during the fire season and to offset the anticipated increase in ignition events as a result of increased training (USFWS 2008). Measures identified in the FMP to minimize the risk of fires spreading from the impact areas to adjoining habitat include: maintenance of fire breaks around impact areas; restrictions on the times and conditions when certain munitions can be used during the fire season; and, the presence of a fire-fighting helicopter on-island during periods of military training within SHOBA (USFWS 2008, p. 50).

Direct impacts to *Sibara filifolia* were not expected as a result of the new FMP, because this taxon occurs largely outside operational boundaries (USFWS 2008, p. 137). The presence of UXO has resulted in restricted access for the past several years to the area that includes the westernmost *S. filifolia* point localities (Munson, pers. comm., 2011b). Potential impacts to *S. filifolia* may occur as a result of increased frequency of operations at the Infantry Operations Area, Artillery Firing Point 1, and San Clemente Island Ridge Road, which may increase the exposure of *S. filifolia* to fire, fire management and suppression activities, erosion from vehicle traffic, foot traffic, and invasive species (USFWS 2008, p. 137). However, the Navy implemented significant conservation measures to minimize these potential effects (USFWS 2008, p. 137). The Navy also committed to annually evaluate potential impacts of fire on *S. filifolia* to adapt management strategies to minimize the frequency and spread of fires that could result in type conversion of *S. filifolia* native habitat (USFWS 2008, p. 138).

The INRMP also includes a set of Fire Management Guiding Principles that reference a FMP that was initiated in 2008 as discussed above (Kellogg, pers. comm., 2006; Hoyer, pers. comm., 2011). The guiding principles emphasize the allocation of fire protection resources for human life and firefighter safety first, with high value, vulnerable facilities, structures, habitats, and natural and cultural resources ranked second. The guiding principles also call for the use of pre-suppression management to reduce the risk of ignitions and adverse ecological effects of

wildland fire. When pre-suppression management strategies are needed to protect natural resource assets, highest priority is given to those assets that fall under regulatory compliance (e.g., listed species).

Future fire management practices, including development of fuelbreaks as well as fire suppression, may adversely affect *Sibara filifolia* due to the proximity of occurrences to impact areas. The Navy proposed to minimize impacts to listed species associated with future fuelbreak installation by considering the locations of documented occurrences, by studying the effects of Phos-Chek on San Clemente Island vegetation, and avoiding application of Phos-Chek within 91 m (300 ft) of listed species to the extent consistent with fuelbreak installation. Phos-Chek would likely facilitate growth of nonnative annual grasses. Controlled burns have been used in the past, within SHOBA on the edges of San Clemente Island Ridge and within the Impact Areas, and fuel break lines have been moved in the past to avoid *S. filifolia* localities (USFWS 2008, p. 138; Munson, pers. comm., 2011b). There are currently no controlled burns planned near *S. filifolia* (Munson, pers. comm., 2011b).

Despite the level of protections and planning surrounding fire protection on San Clemente Island, fire continues to represent a real threat for the *Sibara filifolia* occurrence on the island near Pyramid Point (EO 2). Conditions of the FMP help to minimize, but do not eliminate this threat or those of fire suppression activities to *S. filifolia*, which is primarily distributed uphill and downwind from the target areas. Access to the area is limited because of the presence of UXO. This will likely slow or preclude response to a fire or pre-suppression management. Based on fire mapping from recollection of events, only one fire since 1979 has burned close to known localities of *S. filifolia* (USFWS 1997b, p. 15; USFWS 2008, p. 136). However, fires are frequent in SHOBA and the potential exist for fire impacts to occur to *S. filifolia* on the island.

Summary

In summary, fire remains an ongoing threat to *Sibara filifolia* habitat on Santa Catalina and San Clemente Islands. The vulnerability results from small populations and potential type conversion of habitat resulting from fire, particularly the invasion of nonnative invasive annual grasses. Fires on San Clemente and Santa Catalina Islands occur frequently and fire prevention measures and invasive plant control are necessary for the protection of *S. filifolia* habitat. Control of invasive nonnative grasses is necessary on Santa Catalina Island to prevent adverse fuel conditions that might impact *S. filifolia* habitat and seed bank. The FMP developed for San Clemente Island has identified measures to minimize the risk of fires spreading from the impact areas to adjoining habitat where *S. filifolia* may occur; however, lack of access will likely limit or preclude site specific management actions, fire response measures, and post-fire assessments.

Erosion

Erosion as an artifact of historical widespread grazing on the Channel Islands was discussed in association with fire in the listing rule (USFWS 1997a, pp. 42697–42698) and is still a potential habitat threat impacting *Sibara filifolia*. The high rates of runoff and erosion are well documented on the Channel Islands (Renwick *et al.* 1982, p. 149; Kellogg and Kellogg 1994, p. ix; Mertes *et al.* 2000, p. 467). However, recently monitored occurrences on San Clemente

Island at Pyramid Point (EO 2) and Santa Catalina Island at Wild Boar Gully (EO 7) appear to occur on rocky ridges where erosion is not likely to be a concern (Hoyer, pers. comm., 2011; Ratay, pers. comm., 2010).

Erosion from training exercises on the island has resulted in the past. The likely extent of erosion has recently been evaluated for off-road Assault Vehicle Maneuver Areas, Artillery Firing Points, Artillery Maneuvering Points, and Infantry Operations Area (Navy 2008a, pp. G-1, G-2). The Navy has proposed an erosion control plan that would consider a variety of erosion control methods to promote sustainable land use in support of military operations in these areas) (Navy 2008a, p. G-22); however, there is no approved off-highway vehicle use until this plan comes into effect (Munson, pers. comm., 2011a). The erosion control projects developed in this plan will be implemented in ways that best avoid threatened and endangered species (Munson, pers. comm., 2011a). Erosion impacts to *Sibara filifolia* habitat do not appear to be significant at this time.

Summary of Factor A

There are currently three occurrences of *Sibara filifolia* considered to be extant. Two are on Santa Catalina Island and one is on San Clemente Island. Current threats to the habitat of *S. filifolia* include invasive nonnative plants and fire, and to a lesser extent habitat alteration from erosion. The threat from nonnative plants and fire are rangewide, though land managers on Santa Catalina Island have established programs to remove invasive nonnative plants. The INRMP for San Clemente Island also contains an invasive plant removal program and an FMP to help ameliorate impacts of nonnatives and fire on the island. The threat of fire is a concern for Santa Catalina Island and San Clemente Island due to the presence of invasive nonnative grasses and, on San Clemente Island within the Impact Areas within SHOBA. Threats from alteration of habitat from grazing now only occur on Santa Catalina Island, and have been greatly reduced since the time of listing due to the removal of pigs and goats from Santa Catalina Island. A potential threat also exists from erosion on San Clemente Island, but erosion control methods are being developed and the threat is minimal at the present time. Continued land management practices are needed on both islands where *S. filifolia* occurs to continue to minimize impacts from threats and promote conservation of the species.

FACTOR B: Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

The listing rule for *Sibara filifolia* indicated that, due to the extreme rarity of the species and the focus of many evolutionary biologists on the biology of islands, any unauthorized collection or even unintentional use could result in the extirpation of the species from Santa Catalina Island (USFWS 1997a, p. 42698). Because public access is restricted by the Navy on San Clemente Island, overutilization was not considered an appreciable threat at this location.

Since it was listed, voucher herbarium specimens and seed of *Sibara filifolia* have been collected from populations on each of the islands for genetic research and seed banking purposes (Helenurm 2003, p. 182; Knapp, pers. comm., 2005; Wall, pers. comm., 2006; Howe and Zink

2009, p. 1; Ratay, pers. comm., 2010). These collections were authorized and made for scientific purposes. Therefore, overutilization is not considered a threat at the present time.

FACTOR C: Disease or Predation

The listing rule did not include disease as a Factor C threat to *Sibara filifolia* (USFWS 1997a, p. 42698). We are not aware of any plant diseases currently known to affect *S. filifolia* and believe that disease does not pose a threat at this time.

Grazing and associated habitat destruction was discussed in the listing rule for *Sibara filifolia* as the causal factor for the loss of habitat for endemic species on all Channel Islands (USFWS 1997a, pp. 42697–42698). The final rule stated that herbivores on Santa Cruz and Santa Catalina Islands were considered threats to the possible natural reestablishment of *S. filifolia* on those islands (USFWS 1997a, pp. 42697–42698). At the time of the 2006 5-year review, herbivory by feral pigs was considered a threat on Santa Catalina Island for *S. filifolia* occurrences outside of Wild Boar Gully (EO 7). An analysis of current impacts from herbivory on Santa Catalina Island is presented below. Though direct impacts from grazing on San Clemente had been eliminated by the time of listing, legacy effects to the habitat from grazing are still affecting the species (USFWS 2006, p. 7). These impacts are discussed above under **Factor A** (see discussion of habitat threats for Erosion and Nonnatives).

Herbivory

Herbivory was discussed in the listing rule as a probable threat to *Sibara filifolia* on Santa Catalina Island (USFWS 1997a, p. 42698). Although its diminutive stature suggests that *S. filifolia* may not be a primary target of mammalian herbivores, grazing can lead to the direct loss of plants through herbivory (and to a small degree, trampling at Cape Canyon as discussed under **Factor E**) (USFWS 2006, p. 7). Over the years, considerable work was done to ameliorate the impacts of grazing of large herbivorous mammals on Santa Catalina and San Clemente Islands where *S. filifolia* occurs. Pig and goat removal efforts were completed on Santa Catalina Island in 2004 (Ratay, pers. comm., 2010) and 2001 (Knapp, pers. comm., 2006), respectively.

The only large mammalian herbivores remaining on the islands where *Sibara filifolia* occurs are blackbuck antelope (*Antelope cervicapra*), mule deer (*Odocoileus hemionus*), and American bison (*Bison bison*) on Santa Catalina Island. The presence of blackbuck antelope is not perceived as a threat since the population is currently limited to a single area on Santa Catalina Island and its numbers have declined to potentially only two animals (Knapp, pers. comm., 2006; Ratay, pers. comm., 2010). Mule deer are managed as a game species by the CDFG and are unlikely to be removed from Santa Catalina Island (Knapp, pers. comm., 2006). Though no reliable estimate is available of the size of the deer herd, their numbers may be increasing in response to management of bison and the removal of goats and pigs (Knapp, pers. comm., 2006; Ratay, pers. comm., 2010). With the exception of Wild Boar Gully (EO 7) and a few experimental exclusion plots in burned areas, the exclusion fencing used for feral animal removals on Santa Catalina Island is ineffective at restricting deer movements, and deer are found throughout the island (Knapp, pers. comm., 2006; Ratay, pers. comm., 2010). Fencing surrounding Wild Boar Gully (EO 7) is 2.7 m (9 ft) tall and is generally effective at excluding

deer from the *S. filifolia* localities, though deer have gained access to this area on occasion (Knapp, pers. comm., 2006; Ratay, pers. comm., 2010). Effects from mule deer activity near Cape Canyon (EO 6) are unknown at this time.

Mule deer can also act as vectors for the dispersal of seeds and other propagules of invasive nonnative plants (Sweitzer *et al.* 2003, pp. 52–56). Deer have established game trails on the island, but are not known to produce the severe habitat alterations that goats, sheep, and pigs have caused on the Channel Islands in the past. American bison are also present at low numbers (approximately 150 animals) and are found in the center portion of the island around Cape Canyon (EO 6) (excluding Wild Boar Gully, which is fenced) (Knapp, pers. comm., 2006). American bison activities can also aid in the dispersal of seeds of nonnative plants and their presence is likely to continue to affect the local ecology and structure of plant communities in this area (Sweitzer *et al.* 2003, p. v). The habitat in the vicinity of Cape Canyon (EO 6) is considered to be less favorable for grazing due to its steep grade and poor forage resources (Ratay, pers. comm., 2010), but still appears to provide good conditions for *Sibara filifolia*. The Catalina Island Conservancy is actively managing the size of the American bison herd and their rangeland boundaries (Sweitzer *et al.* 2003, p. iv).

The potential threat to *Sibara filifolia* from ground foraging birds noted in the 2006 review (USFWS 2006, p. 15) is not considered to be demonstrated, measurable, or of significance and will not be discussed further.

Summary of Factor C

Despite the occurrence of large grazing mammals on Santa Catalina Island, the threat of herbivory to *Sibara filifolia* has been substantially reduced on this island, compared to the threat at the time of listing. This is largely due to the fencing at Wild Boar Gully (EO 7) and the removal of goats and pigs from the island. Due to the sparsely vegetated habitat in which *S. filifolia* generally occurs, plants are unlikely to be found within optimal grazing/browsing habitat. We have no evidence that herbivory poses a threat to the species on San Clemente Island. We believe that herbivory no longer represents a significant threat to the species at this time.

FACTOR D: Inadequacy of Existing Regulatory Mechanisms

At the time of listing, regulatory mechanisms that were thought to have some protection for *Sibara filifolia* included: (1) California Environmental Quality Act (CEQA); (2) the National Environmental Policy Act (NEPA); and (3) the Act in those cases where *S. filifolia* occurs in habitat occupied by other listed species. The listing rule analyzed the potential level of protection provided by these regulatory mechanisms (USFWS 1997a, p. 42698).

Since listing, *Sibara filifolia* was discovered on Santa Catalina Island in close proximity to the only known occurrence of *Cercocarpus traskiae* (Catalina Island mountain mahogany) a State and federally listed plant species. Additionally, in 2002, the Navy adopted an INRMP for San Clemente Island. These factors and several State and Federal regulatory mechanisms that provide a conservation benefit to *S. filifolia* are described below.

State Protections in California

California Environmental Quality Act (CEQA)

As a federally listed species, *Sibara filifolia* must be considered as a rare species under CEQA (Section 15380, Public Resources Code), which is the principal statute mandating environmental assessment of projects in California. The purpose of CEQA is to evaluate whether a proposed project may have an adverse effect on the environment, and, if so, to determine whether that effect can be reduced or eliminated by pursuing an alternative course of action or through mitigation. CEQA applies to projects proposed to be undertaken or requiring approval by State and local public agencies (http://www.ceres.ca.gov/topic/env_law/ceqa/summary.html). CEQA requires disclosure of potential environmental impacts and a determination of “significant” if a project has the potential to reduce the number or restrict the range of a rare or endangered plant or animal; however, projects may move forward if there is a statement of overriding consideration. CEQA protections apply to the occurrences of *S. filifolia* on Santa Catalina Island, which is mostly owned and managed by the Catalina Island Conservancy. If significant effects are identified, the lead agency has the option of requiring mitigation through changes in the project or to decide that overriding considerations make mitigation infeasible (CEQA section 21002). Protection of listed species through CEQA is therefore dependent upon the discretion of the lead agency involved. Note, San Clemente Island is owned and operated by the Navy. While they do not have to comply with CEQA, Federal agencies are required through NEPA to assess potential environmental damage from proposed projects (see National Environmental Policy Act (NEPA) below).

Federal Protections

Endangered Species Act of 1973, as amended (Act)

Since listing, the Act is the primary Federal law providing protection for *Sibara filifolia*. The Service’s responsibilities include administering the Act, including sections 7, 9, and 10. Section 7(a)(1) of the Act requires all Federal agencies to utilize their authorities in furtherance of the purposes of the Act by carrying out programs for the conservation of endangered and threatened species. There does not appear to be a high potential for Federal protections to be invoked on Santa Catalina Island where the species occurs on private lands, except for Federal grant opportunities (e.g., Partners for Fish and Wildlife Conservation grants). However, the occurrence on San Clemente Island is managed by the Navy and receives the full protections afforded by the Act. Section 7(a)(2) of the Act requires Federal agencies, including the Service, to ensure that actions they fund, authorize, or carry out do not jeopardize a listed species or result in the destruction or adverse modification of habitat in areas designated by the Service to be critical. Critical habitat has not been proposed for this taxon.

Since listing in 1997, the Navy has consulted and coordinated with the Service regarding the effects of various activities on San Clemente Island for *Sibara filifolia*. In November 2008, the Navy completed a programmatic biological consultation with the Service on the impact of the Navy’s military training program and fire management plan on 11 federally listed species occurring on San Clemente Island (USFWS 2008, pp. 1–237). This consultation addressed the

proposed expansion to the frequency and amount of military training on the island, along with enhanced training complex capabilities, construction of new gates and buildings, use of an Infantry Operations Areas, and use of an Assault Maneuver Vehicle Corridors. However, all current occurrences of *S. filifolia* are located outside of the operational boundaries of the proposed activities; therefore, after considering the status and distribution of each of the plant taxa, and the various management and avoidance and minimization measures in place, and those to be implemented by the Navy, we concluded that the proposed increases in military training activities and implementation of the fire management plan would not jeopardize the continued existence of *S. filifolia* (USFWS 2008, p. 141).

Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the “take” of federally listed wildlife, however, plants are not protected against take. Instead, plants are protected from harm in two particular circumstances. Section 9 prohibits (1) the removal and reduction to possession (i.e., collection) of endangered plants from lands under Federal jurisdiction, and (2) the removal, cutting, digging, damage, or destruction of endangered plants on any other area in knowing violation of any State law or regulation or in the course of violation of a State criminal trespass law.

Under the terms of section 7(b)(4) and section 7(o)(2) of the Act, taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of an incidental take statement. Sections 7(b)(4) and 7(o)(2) of the Act generally do not apply to listed plant species because take of plants is not prohibited. However, limited protection of listed plants from take is provided to the extent that the Act and the implementing regulations prohibit the removal and reduction to possession of federally listed threatened or endangered plants or the malicious damage of endangered plants on areas under Federal jurisdiction, or the destruction of endangered plants on non-Federal areas when in violation of state law or regulation or in the course of any violation of a State criminal trespass law.

Section 10(a)(1)(A) of the Act includes provisions for collection of plants or plant parts for scientific purposes or to enhance the propagation and survival of the species. The occurrences of *Sibara filifolia* on San Clemente Island would be covered under this provision and activities would require consultation and coordination with the Service.

National Environmental Policy Act (NEPA)

NEPA (42 U.S.C. 4371 *et seq.*) can offer some protection for sensitive species that may be affected by activities undertaken, authorized, or funded by Federal agencies. Prior to implementation of projects with a Federal nexus, NEPA requires the agency to analyze the project for potential impacts to the human environment, including natural resources. NEPA does not impose substantive environmental obligations on Federal agencies—it merely prohibits a uniformed, rather than unwise, agency action, and its public notice provisions provide an opportunity for the Service and others to review proposed actions and provide recommendations to the implementing agency. However, if an Environmental Impact Statement is developed for an agency action, the agency must take a “hard look” at the consequences of this action and must

consider all potentially significant environmental impacts. In cases where that analysis reveals significant environmental effects, the Federal agency must propose mitigations that could offset those effects (40 C.F.R. 1502.16). These mitigations usually provide some protection for listed species. However, NEPA does not require that adverse impacts be fully mitigated, only that impacts be assessed and the analysis disclosed to the public. Therefore, NEPA does not mandate that proposed actions avoid impacts to *Sibara filifolia*, but requires that Federal agencies take such impacts into consideration before proceeding. For example, the Navy must meet the procedural requirements of NEPA in developing its INRMPs and Federal funding of restoration projects may trigger NEPA compliance depending on the significance of the project.

Sikes Act

Section 101 of the Sikes Act (16 U.S.C. 670a-670o), as amended, requires the Department of Defense to develop and implement INRMPs for military installations across the United States. INRMPs are reviewed every year by military installations and modified as needed, and are generally updated every 5 years with coordination from the Service and States. INRMPs provide for the conservation and rehabilitation of natural resources on military lands consistent with the use of military installations to ensure the readiness of the Armed Forces. An INRMP is a plan intended "...to guide installation commanders in managing their natural resources in a manner that is consistent with the sustainability of those resources while ensuring continued support of the military mission" (Navy 2002, p. 1-1). While INRMPs are technically not regulatory mechanisms because their implementation is subject to funding availability, they can be an added conservation tool in promoting the recovery of endangered and threatened species on military lands.

San Clemente Island Integrated Natural Resource Management Plan (INRMP):

Pursuant to the Sikes Act, the Navy adopted an INRMP for San Clemente Island that targets multiple objectives towards protection of *Sibara filifolia* and its habitat, and helps to reduce threats to this taxon (Navy 2002). The INRMP includes provisions to comply with the Endangered Species Act (16 U.S.C. 1531–1544), the Comprehensive Environmental Response, Compensation, and Liability Act (42 U.S.C. 9601), the Resources Conservation and Recovery Act (42 U.S.C. 6901), Federal Noxious Weed Act of 1974 (7 U.S.C. 2801), and Soil Conservation Act (16 U.S.C. 3B). Management strategies in the INRMP that specifically focus on *S. filifolia* include the following: consideration of *S. filifolia* as a 'management focus plant' such that it is considered independently from its associated plant community for management; conducting status surveys for this species; ensuring that management-focus plants have a network of suitable sites; performing pollination studies on *S. filifolia*; performing fire tolerance research on *S. filifolia* seed; continuing to conduct genetics research; and comparing *S. filifolia* habitat on San Clemente Island with that on Santa Catalina Island to gain insight into habitat preferences for the species to help define a desired future condition for its habitat (Navy 2002, pp. 4-15, 4-40; USFWS 2008, p. 136). Desired future conditions for the plant according to the INRMP are the eventual removal of the species from the list of endangered and threatened plants, removal of nonnative grasses, especially *Avena barbata* (slender wild oat), and continued monitoring of the species to determine the pollinators and response to fire of *S. filifolia* (Navy 2002, p. D-4).

The San Clemente Island INRMP describes the area around Pyramid Point (EO 2), where *Sibara filifolia* is known to occur, as having "...high military value for ship to shore bombardment and other activities" (Navy 2002, p. 4-14). Therefore, the Navy's objective is to protect military access to the Pyramid Cove firing ranges in a manner consistent with protecting habitat conditions that support *S. filifolia*.

To date, multiple INRMP management strategies, or aspects of them, have been implemented. The Navy has conducted rare plant surveys that have resulted in the documentation of several new point localities of *Sibara filifolia* within Pyramid Point (EO 2). Genetics and natural history research have also been performed. The Navy has recognized and addressed the potential for invasive species establishment and spread into this area, by monitoring for invasive plant species and treating them when possible. Concerted efforts have been made to control the escape of fire from the SHOBA impact areas. Other objectives have yet to be met, such as ensuring a network of suitable sites for the species, reducing the percent cover invasive plants from 1992 to 1993 baseline conditions, or studying the tolerance of *S. filifolia* to fire (O'Connor, pers. comm., 2006; USFWS 2008, p. 137).

In summary, the INRMP is an important guiding document that helps to integrate the military's mission with natural resource protection on San Clemente Island. The INRMP includes objectives targeted toward habitat protection of optimal *Sibara filifolia* habitat; however, Navy operational needs may diverge from INRMP natural resource goals. For example, control measures for nonnatives, fire, and erosion described in the INRMP may not be implemented effectively or consistently or be monitored in those areas that have been operationally closed due to the presence of unexploded ordnance since the previous 5-year review of *S. filifolia*. The FMP, nonnative plant species control efforts and erosion control plan help to minimize threats associated with *S. filifolia* on San Clemente Island and are discussed above under **Factor A**. Absent listing under the Act, the Navy would still be required to develop and implement an INRMP under the Sikes Act. However, as noted under the other factors, while the INRMP helps to ameliorate threats and provides some protection for *S. filifolia* occurrences, those occurrences within operationally closed areas may not benefit from these conservation measures. While land use consistent with military readiness and training is ongoing, implemented provisions of the INRMP have reduced the severity of threats and contributed to conservation of the species.

Private Nongovernment Organizations

Catalina Island Conservancy

Catalina Island Conservancy owns the majority (88 percent) of Santa Catalina Island and manages it with the goal of balancing conservation, education, and recreation. Relevant management to *Sibara filifolia* includes the Catalina Island Habitat Improvement and Restoration Program as discussed in **Factor A** and the construction and maintenance of various fences around the island to protect native plants and their habitats from large herbivorous mammals, such as the one protecting Wild Boar Gully (EO 7). The Wild Boar Gully enclosure protects the habitat of the only known native occurrence of *Cercocarpus traskiae* (Catalina Island mountain-mahogany) and the only recently documented occurrence of *S. filifolia* on the island. The Catalina Island Conservancy was instrumental in eradicating feral pigs from the island and they

are actively managing the bison herd as discussed in **Factor C**. They also discovered and are monitoring the distribution of *S. filifolia* on the island (EO 7) within Wild Boar Gully, are actively surveying for *S. filifolia*, and have collected seed for seed conservation banks.

Summary of Factor D

All regulatory mechanisms in place at listing are still operating today and as outlined above provide adequate conservation of *Sibara filifolia*. The Act is still the primary law that provides protection for this species on Federal lands or in instances where there is a Federal nexus. Other Federal and State regulatory mechanisms provide discretionary protections for the species based on current management direction, but do not guarantee protection for the species absent its status under the Act. Significant protections from the Catalina Island Conservancy also provide long-term protections, invasive nonnative plant management programs, and monitoring of *S. filifolia* occurrences on Santa Catalina Island. Continuing a long history of cooperative conservation efforts, the Navy implements several conservation actions that provide protection, avoidance measures, and some management for the plant that benefits the occurrence at Pyramid Point on San Clemente Island (EO 2). The Navy is implementing a FMP to reduce the risk of fire on the island, and is in the process of developing an erosion control plan and a nonnative plant species control program. Provisions included in the San Clemente Island INRMP provide protection of *S. filifolia* and adaptive management of the habitat in order to help address threats to the plant from military activities and nonnative plants.

Existing regulatory mechanisms that protect *Sibara filifolia* are not considered inadequate and afford protection through State, Federal, and nongovernmental means. These mechanisms do not provide preservation for the species in perpetuity. Protections are reliant on both funding and prioritization, both of which have potentially increased due to the protection of *S. filifolia* by the Act. While conservation provisions the INRMP are adequate on San Clemente Island, some conservation measures may not be implemented due to closure at the extant occurrence. However, the Navy is working to remedy this situation. Therefore, we believe that the Act still provides the most extensive protection for *S. filifolia*.

FACTOR E: Other Natural or Manmade Factors Affecting Its Continued Existence

The 1997 listing rule identified the following threats to *Sibara filifolia* under **Factor E**: increased competition from nonnative plant species, fire (some of which may be related to military activities), and erosion (USFWS 1997a, p. 42699). Impacts from these threats were discussed here under **Factor A** (threats of modification of habitat or curtailment of range). Various stochastic factors were considered threats to *S. filifolia* in the previous 5-year review (USFWS 2006, p. 18). These are considered to be associated with small population size in this review. Current threats attributable to this factor include trampling, small population size, and climate change, the latter of which was not discussed at the time of listing or in the previous 5-year review.

Trampling

Although trampling of native vegetation was not discussed directly as a threat in the listing rule, it was described relative to grazing of large mammalian herbivores, which together have facilitated the spread of nonnative plants on the Channel Islands (USFWS 1997a, p. 42693). The threat of trampling from large mammalian herbivores has been reduced since listing due to the removal of goats and pigs from Santa Catalina Island and San Clemente Island. The fencing surrounding Wild Boar Gully (EO 7) on Santa Catalina Island has also substantially reduced this threat. At present, the potential threat of trampling from large grazing animals (blackbuck antelope (*Antelope cervicapra*), mule deer (*Odocoileus hemionus*), and American bison (*Bison bison*)) only exists near Cape Canyon (EO 6) (Appendix 1).

Sibara filifolia is at risk from human trampling due to the small size of the populations, although human access is regulated on each of the Channel Islands. Due to its cryptic appearance, this may result from biologists surveying or otherwise conducting management activities on the islands (Kellogg, pers. comm., 2006). On Santa Catalina Island, work crews removing invasive plant species likely represent the primary threat, as the area where the plant occurs is fenced with restricted public access. On San Clemente Island, the potential threat of trampling can result from biologists' activities as well as any military training activities that could involve troop movements through the area where the plant is distributed. The Navy proposed to brief military units on maneuver area boundaries prior to conducting operations to minimize the potential of incidental foot traffic in *S. filifolia* habitat; the use of markers to aid in identification of range boundaries or sensitive areas is considered incompatible with training (USFWS 2008, p. 140). The potential for human traffic is high, because the plant is distributed on ridgetops and flat areas rather than within inaccessible steep terrain, (Kellogg, pers. comm., 2006). However, the incidence of impacts to *S. filifolia* is expected to be very low.

Small Population Size

The listing rule discussed the vulnerabilities associated with few occurrences of small population sizes for *Sibara filifolia* (USFWS 1997a, p. 42699). *Sibara filifolia* is vulnerable to extirpation from a number of factors such as environmental stochasticity, genetic stochasticity, demographic stochasticity, and natural catastrophes, because it is an insular endemic species presumed to currently exist as three small, narrowly distributed occurrences (Shaffer 1981, p. 131).

Small population size may be the result of several conditions, including local extirpations or ongoing natural or artificial factors limiting establishment and survival of the taxon. Stochastic events represent a significant threat to small occurrences. Given the extremely restricted distribution of this species, any natural catastrophe such as a fire, landslide, or prolonged drought on an island could lead to the extirpation of the species from one of the two islands currently known to support the species. On San Clemente Island, the known extant occurrence (EO 2) of *Sibara filifolia* could be affected by a single fire. The Santa Catalina Island occurrences (EOs 6, and 7) are also closely spaced and likely to be similarly affected by a single catastrophic event. However, the presence of *S. filifolia* on separate islands improves the prospects for continued survival of the species in the event of a natural catastrophe.

The likelihood of maintaining genetic diversity decreases in smaller populations (Barrett and Kohn 1991, pp. 9, 10, and 13) and elevates concern for small, isolated populations of *Sibara filifolia*. The low genetic diversity and low differentiation observed from San Clemente Island may indicate a bottleneck or potentially nearly complete selfing lineages, or both for this population (McGlaughlin, pers. comm., 2011). Loss of genetic variation could limit the likelihood of this species maintaining tolerances suited to a changing environment (Helenurm 2003, p. 185). In contrast, the observed genetic diversity found within the Santa Catalina Island indicates the importance of those populations for seed banking and other conservation activities.

The risk of extinction of *Sibara filifolia* from elements inherent in its small insular population size is lessened by the conservation seed bank established at RSABG since the listing (Wall, pers. comm., 2006). While seed banking, by itself, does not remove the systematic or stochastic threats facing natural populations of *S. filifolia*, these seeds can provide source material to re-establish populations in the wild should they become extirpated.

Climate Change

Our analyses under the Act include consideration of ongoing and projected changes in climate. The terms “climate” and “climate change” are defined by the Intergovernmental Panel on Climate Change (IPCC). “Climate” refers to the mean and variability of different types of weather conditions over time, with 30 years being a typical period for such measurements, although shorter or longer periods also may be used (IPCC 2007, p. 78). The term “climate change” thus refers to a change in the mean or variability of one or more measures of climate (e.g., temperature or precipitation) that persists for an extended period, typically decades or longer, whether the change is due to natural variability, human activity, or both (IPCC 2007, p. 78). Various types of changes in climate can have direct or indirect effects on species. These effects may be positive, neutral, or negative and they may change over time, depending on the species and other relevant considerations, such as the effects of interactions of climate with other variables (e.g., habitat fragmentation) (IPCC 2007, pp. 8–14, 18–19). In our analyses, we use our expert judgment to weigh relevant information, including uncertainty, in our consideration of various aspects of climate change.

Sibara filifolia is located on San Clemente and Santa Catalina Islands, which are located within a Mediterranean climatic regime with a significant maritime influence. Climate change models indicate a 1 to 3 degrees Celsius (1.8 to 5.4 degrees Fahrenheit) increase in average temperature for southern California by the year 2070 (Cayan *et al.* 2008, p. S26; Field *et al.* 1999, p. 5; PRBO 2011, p. 40). Over the same time span, a 10 to 37 percent decrease in annual precipitation is indicated (PRBO 2011, p. 40), while other modeling predictions indicate little to no change in annual precipitation (Cayan *et al.* 2008, p. S26; Field *et al.* 1999, pp. 8–9). Although the islands experience a short rain season (generally November through April), the presence of fog during the summer months may help to reduce moisture stress for many plant species on the islands (Halvorson *et al.* 1988, p. 111); though climate modeling as it relates to fog projections remains a subject of uncertainty (Field *et al.* 1999, pp. 21–22).

In the event of a prolonged period of warmer air temperatures and lower rainfall amounts, the abundance of *Sibara filifolia* per year may decrease, which would reduce the seed bank over

time. Such climate conditions also imply an increased frequency of drought conditions that may increase fire frequency. Significant increases in temperature can create a stressor for endemic species. This stressor enhances pressures from competitors, nonnative species, habitat change, low water supply, and disease. Species must tolerate these pressures *in situ* (in place) (i.e. shift their ecological range), shift their geographic range (Cayan *et al.* 2009, p. 45), or die out. Such a shift in range for narrow endemic species such as *S. filifolia* seems unlikely due to apparently limited dispersal mechanisms, narrow habitat preferences, and low (at least on San Clemente Island) genetic diversity; however, little is known about the tolerances of this taxon.

Impacts to *Sibara filifolia* under predicted future climate change remain unclear. While it appears reasonable to assume that this taxon may be affected, we lack sufficient certainty on knowing how and when climate change will affect the species, the extent of average temperature increases in California, or potential changes to the level of threat posed by fire on the Channel Islands. While we recognize that climate change is an important issue with potential effects to listed species and their habitats, we lack adequate information to make accurate predictions regarding its effects to *S. filifolia* at this time.

Summary of Factor E

Factor E threats to *Sibara filifolia* have changed little since listing and do not appear to be high magnitude threats at this time. Impacts from trampling have largely been reduced by the removal of most large herbivores on the islands. Threats associated with small population size affect this species rangewide, although geographic separation between islands and the presence of several point localities on San Clemente Island improves the prospects for continued persistence of the species in the event of a stochastic event. Finally, climate change will likely influence this taxon, although the magnitude of this rangewide threat is unknown at this time.

III. RECOVERY CRITERIA

No recovery plan or outline has been prepared for *Sibara filifolia*.

IV. SYNTHESIS

At the time of listing, there was only one known occurrence of *Sibara filifolia* near Pyramid Point on San Clemente Island and the species was considered to be possibly extant at Cape Canyon on Santa Catalina Island. Since that time, multiple point localities have been detected at the Pyramid Point occurrence on San Clemente Island and an additional occurrence was detected in Wild Boar Gully on Santa Catalina Island. We currently consider these three occurrences of *S. filifolia* to be extant. Removal of pigs and goats, and erection of fencing to exclude bison and mule deer from Wild Boar Gully have helped to conserve the species on Santa Catalina Island. On San Clemente Island, the Navy is implementing conservation and monitoring to minimize impacts from current threats, but all protections may not be realized due to operational closure of the area supporting the only extant occurrence of *S. filifolia* on the island. *Sibara filifolia* continues to be subject to impacts from nonnative plants, fire, erosion, herbivory, trampling, small population size, and climate change; however, many of these threats have been ameliorated or are being managed to reduce impacts to *S. filifolia*. Though it is difficult to eliminate these

threats, programs to control nonnatives, fire, and erosion exist on islands where *S. filifolia* occurs. The threat from small population size is also difficult to alleviate because of the naturally scattered distribution of small populations. Fire is perhaps a more severe threat due to the catastrophic nature and the potential to destroy entire occurrences in a single event. The range of the species is the same as it was at listing although there has been an increase in the number of occurrences and additional point localities have been detected since listing. The species remains in danger of extinction throughout all of its range. Therefore, we recommend that the classification of *S. filifolia* remain unchanged, as endangered.

V. RESULTS

Recommended Listing Action:

- Downlist to Threatened
 Uplist to Endangered
 Delist (indicate reason for delisting according to 50 CFR 424.11):
 Extinction
 Recovery
 Original data for classification in error
 No Change

New Recovery Priority Number and Brief Rationale:

Grazing impacts to *Sibara filifolia* and the habitat have been substantially reduced through removal of animals and the use of fencing, and no longer represent a significant threat to the species at this time. Trampling is also no longer considered a significant threat to *S. filifolia*. Stochastic events represent a concern for this species given the small population size where it presently occurs. Climate change is a potential rangewide threat, though we have limited information on predicted effects to the Channel Island habitats. The spread and establishment of invasive, nonnative plant species is considered the primary threat to *S. filifolia*, and is likely to continue, rangewide, though management actions implemented through the INRMP are helping to reduce impacts from this threat. Fire is also an ongoing threat to the occurrence on San Clemente Island, though a fire management plan is in place to minimize impacts to *S. filifolia*. Some conservation measures on San Clemente Island may not be implemented due to closure of habitat in some occurrences where *S. filifolia* occurs. From a conservation standpoint this is balanced by the fact that most of the San Clemente Island point localities support plants with very little genetic diversity and, evolutionary potential, while the genetically much more diverse occurrence on Santa Catalina Island are regularly monitored and actively managed. At this time, we recommend a change in the recovery priority number from 2 to 11, because *S. filifolia* is a species that faces a moderate degree of threat with a low recovery potential (RPN 11) (USFWS 1983a, p. 43104).

VI. RECOMMENDATIONS FOR ACTIONS OVER THE NEXT 5 YEARS

The recommended actions listed below are to be completed over the next 5 years. These will reduce threats to *Sibara filifolia* and provide information to better understand the biological and physical factors limiting the population growth and distribution. We recognize that conservation of *S. filifolia* will require cooperation and coordination with partners (Federal, State, and local agencies) to minimize impacts from current threats, aid future restoration, and maximize effectiveness of limited funding.

1. Based on recommendations and genetic diversity of occurrences, establish an adequate seed bank for *Sibara filifolia* with sampling emphasis on genetically highly diverse sites on Santa Catalina and a lesser emphasis on the less diverse sites on San Clemente Island.
2. Maintain and improve invasive nonnative plant control programs with a focus on sites where *Sibara filifolia* occurs or where habitat conditions may support reemergence of the species from a dormant seed bank.
3. Continue to collaborate with the Navy on ongoing projects to assist with conservation of listed species on the island to help facilitate effective management and monitoring of *Sibara filifolia*.
4. Determine soil and habitat preferences for *Sibara filifolia* and conduct additional surveys on all three islands where *S. filifolia* has been collected historically using this data to look for previously undetected occurrences as well as identify and characterize potential reintroduction sites.

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Appendix 1: Occurrences of *Sibara filifolia* (Santa Cruz Island rock-cress); prepared for 5-year review, 2012.

Geographic Location	CNDDDB Element Occurrence	Herbarium Records	Status and Threats at Listing	Status and Threats 2006 5-yr Review	Current Status and Threats	Land Ownership and Conservation Mechanism
Santa Cruz Island						
Central Santa Cruz Island (above Laguna Canyon)	EO8	Hoffman s.n., in 1932 SBBG 80084	Presumed Extirpated	Presumed Extirpated	Presumed Extirpated	The Nature Conservancy
Central Santa Cruz Island (near the mouth of drainage into Pelican Bay)	EO1	Hoffman s.n., in 1930 SBBG 80087	Presumed Extirpated	Presumed Extirpated; not found in 1985, 2010	Presumed Extirpated	The Nature Conservancy
Santa Catalina Island						
North Santa Catalina Island (Cape Canyon)	EO6	Probst and Hoefs 350, in 1973 RSA 590820	Presumed Extant Factor A: Grazing, trampling	Presumed Extant	Presumed Extant Factor A: Nonnative Plants, Fire, Factor C: Herbivory Factor E: Trampling, small population size, climate change	Catalina Land Conservancy
South Santa Catalina Island (Wild Boar Gully)	EO7	Collections unknown	Not known	Extant (known from 3 point localities) Factor A: Grazing, Nonnative Plants, Fire	Extant (known from 5 point localities) Factor A: Nonnative Plants, Fire Factor E: Small population size, climate change	Catalina Land Conservancy
East Catalina Island (near Avalon)	EO5	Trask s.n., in 1901 RSA 668617	Presumed Extirpated	Presumed Extirpated; not found in 1997	Presumed Extirpated	Unknown

San Clemente Island						
South San Clemente Island (Pyramid Point)	EO2 (includes former EO3)	Beauchamp s.n., s.d.(1986), RSA 356586 Mistretta 142 in 1992 RSA 660879 Elvin <i>et al.</i> 154 in 1996 RSA 678887 Junak 1997 SBBG 108979 Junak SCI-742 in 1997 SBBG 108979 Junak SCI-758 in 1997 SBBG 108894	Extant (known from only one point locality) Factor A: Fire, Erosion Factor E: Small population size	Extant (known from 7 point localities) Factor A: Nonnative plants , Fire	Extant Factor A; Nonnative Plants, Fire Factor E: Small population size, climate change	Department of Defense (Navy), Integrated Natural Resource Management Plan (INRMP)
South San Clemente Island (near Triangulation Point Alta)	E04	Benedict s.n. in 1971 SBBG 94045	Not known	Presumed Extirpated; Not found in 2006	Presumed Extirpated	Department of Defense (Navy), INRMP

U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW

Sibara filifolia
(Santa Cruz Island rock-cress)

Current Classification: Endangered

Recommendation Resulting from the 5-Year Review:

- Downlist to Threatened
- Uplist to Endangered
- Delist
- No change needed

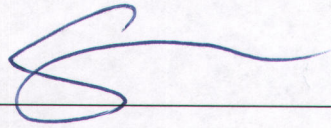
Review Conducted By: Carlsbad Fish and Wildlife Office

FIELD OFFICE APPROVAL:

Lead Field Supervisor, U.S. Fish and Wildlife Service

ACTING

Approve _____ Date _____



APR 25 2012

Scott A. Sobiech