CALIFORNIA
NATIVE PLANT SOCIETY

May 25, 2016

California Fish and Game Commission
P.O. Box 944209
Sacramento, CA
94244-2090

Memorandum: Evaluation of a Petition to List *Leptosiphon croceus* (coast yellow leptosiphon) under the California Endangered Species Act

Dear California Fish and Game Commission:

The California Native Plant Society (CNPS) has reviewed a petition to list *Leptosiphon croceus* (coast yellow leptosiphon) as Endangered under the California Endangered Species Act (CESA). We provide our recommendation below.

CNPS is a non-profit organization that works to protect California's native plant heritage and preserve it for future generations. CNPS' mission is to increase the understanding and appreciation of California's native plants and to preserve them in their natural habitat. Our nearly 10,000 members promote native plant appreciation, research, education, and conservation through our 5 statewide programs and 35 Chapters across the state of California, and Baja California, MX.

CNPS has completed a review of this petition for its scientific validity and conservation merits. The CNPS Rare Plant Program Committee has assessed the petition's scientific validity by evaluating the accuracy of information regarding taxonomy, ecology, life history, and demographic data presented herein. The CNPS Conservation Program Committee has assessed the petition's conservation merits by evaluating threats, stressors, and management information applicable to this species.

Based upon our review of these factors, CNPS finds the current status of *Leptosiphon croceus* to merit consideration for listing as Endangered under the California Endangered Species Act. Therefore, the California Native Plant Society endorses this petition and should be considered a co-sponsor of this effort.

Our organization looks forward to working with you to ensure *Leptosiphon croceus* is provided the protections and management requirements afforded to it through the CESA. Please do not hesitate to contact us with any questions regarding our review and endorsement.

Sincerely,

James M. André

Jim André
Rare Plant Program Senior Advisor
Rare Plant Program Committee Chair

Greg Suba

Greg Suba
Conservation Program Director

FGC - 670.1 (3/94)

A PETITION TO THE STATE OF CALIFORNIA
FISH AND GAME COMMISSION

For action pursuant to Section 670.1, Title 14, California Code of Regulations (CCR) and Sections 2072 and 2073 of the Fish and Game Code relating to listing and delisting endangered and threatened species of plants and animals.

I. SPECIES BEING PETITIONED:

Common Name: coast yellow leptosiphon

Scientific Name: *Leptosiphon croceus*

II. RECOMMENDED ACTION:

(Check appropriate categories)

a. List XX

As Endangered XX

As Threatened ___

b. Change Status

from _____

to _____

Or Delist ___

III. AUTHOR OF PETITION:

Name: Toni Corelli, Botanist (corelli@coastside.net)
former Rare Plant Chairperson, Santa Clara Valley Chapter of California Native Plant Society

Address: 250 Granelli Avenue

Half Moon Bay, California 94019

Phone Number: (650) 726-0689

I hereby certify that, to the best of my knowledge, all statements made in this petition are true and complete.

Signature: Toni Corelli

Date: May 23, 2016

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A PETITION TO THE STATE OF CALIFORNIA FISH AND GAME COMMISSION
SUPPORTING INFORMATION FOR

coast yellow leptosiphon	*Leptosiphon croceus*
Common Name	Scientific Name

EXECUTIVE SUMMARY

Coast yellow leptosiphon (*Leptosiphon croceus*) is a bright yellow flowered, low growing annual in the phlox family (Polemoniaceae) first described by Alice Eastwood in 1904 as a "strictly local species" (Strother & Kersh 2016). Although four Element Occurrences (EOs) are included in the California Natural Diversity Database (CDFW 2016) *Leptosiphon croceus* (LECR) is currently known from a single extant occurrence, element occurrence 2 (EO2), and is a San Mateo County endemic species (Baldwin, 2012). The colony is limited to a 60x30' area at Fitzgerald Marine Reserve, County of San Mateo Parks and Recreation Division. Located on Vallemar Bluff in Moss Beach, San Mateo County, California.

Leptosiphon croceus is listed in the California Native Plant Society's *Inventory of Rare and Endangered Plants* as a California Rare Plant Rank 1B.1 species Rare, threatened, or endangered in California and elsewhere; .1 Seriously threatened in California. (California Native Plant Society, Rare Plant Program 2016). Three historical occurrences of LECR - EO1, EO3, EO4 are now documented as extirpated making the Moss Beach, Fitzgerald Marine Reserve LECR EO2 the last remaining population. LECR occurs on the immediate coastal terrace bluff top in coastal prairie habitat. This colony has steadily been reduced by cliff erosion, encroachment of non-native plants, fragmentation and compaction of soil within and around the population. The adjacent coastal prairie habitat has been impacted in the past by heavy equipment used to drill test wells and now there is a proposed development to build houses on the lots located there (see Figure 6).

LECR should be proposed for listing under the Federal Endangered Species Act as well since the last population is on public land and the colony is endangered. Listing the coast yellow leptosiphon under the California Endangered Species Act is necessary to provide critical legal protections and habitat designations to ensure survival of this highly endangered species.

TAXONOMY AND DESCRIPTION

TAXONOMIC HISTORY

Coast yellow leptosiphon (*Leptosiphon croceus*) is now known from only one colony. That population is on Vallemar Bluff in Moss Beach, San Mateo County, California (LECR EO2). The plants were first found and named at the species rank as *Linanthus croceus* Eastwood (Botanical Gazette, vol. 37, p. 442, April 1904). Alice Eastwood collected the type specimen and in the protologue for the name wrote, "This beautiful species was collected by the author May 9, 1901, near Point San Pedro, San Mateo County, California." The Eastwood name is basionym for the currently accepted name for the species: *Leptosiphon croceus* (Eastwood) Strother & Kersh. Other synonyms of *Leptosiphon croceus* include: *Linanthus parviflorus* var. *croceus* Milliken, Univ. Calif. Publ. Bot. 2:59. 1904. *Linanthus androsaceus* var. *croceus* (Eastwood) Jepson, Man. Fl. Pl. Calif. 805. 1925. *Linanthus androsaceus* ssp. *croceus* (Milliken) Mason in Abrams, Ill. Fl. Pacific States 3:430. 1951. *Leptosiphon croceus* (Eastw.) J.M. Porter & L.A. Johnson (Baldwin 2012). Also *Linanthus croceus* has been treated as a synonym of *Linanthus parviflorus* (Bentham) Greene, e.g., in J. C. Hickman ed., The Jepson Manual. 1993.

DESCRIPTION

Coast yellow leptosiphon (*Leptosiphon croceus*, henceforth abbreviated LECR) is a low growing, hairy, annual. It is often much-branched from base and when mature grows to a height of 4-7 cm. The inflorescence is in a

dense, bracted head with a long corolla tube and bright yellow flowers. The calyx is sessile, clustered within a head of leaf-like bracts. Each of the 5 calyx lobes is densely glandular-hairy. The flowers are bright yellow with 5 corolla lobes 6-8 mm long, > 5 mm wide and generally with 2 red spots at base. Each flower has a corolla tube measuring 26-39 mm long. The stamens are exserted and the stigmas are 2-5 mm long. The leaves are thick and somewhat succulent fleshy, opposite, palmately 3-9 lobed, each lobe 4-7 mm long. (Baldwin 2012, Battaglia 2001). The fruit is a capsule. The number of seeds in each capsule for similar species when pollinated is 20-60 (Goodwillie).

Figure 1. Coast yellow leptosiphon (*Leptosiphon croceus*). Photograph by Avis Boutell

PHENOLOGY

LECR generally flowers from April-May (Baldwin 2012)

SIMILAR TAXA (similar taxa of *Leptosiphon* labeled *L.)*

LECR is extremely low growing, being the shortest of all the species (4-7 cm) and the width of corolla lobes, both at middle and tip, are the largest in the complex. LECR shares morphological characteristics with *L. androsaceus, L. parviflorus, L. latisectus, L. rosaceus* and some of the characteristics are intermediate between them. LECR can be distinguished from *L. androsaceus* and *L. rosaceus* by its calyx lobes that are densely glandular-hairy throughout the whole surface as opposed to the calyx hairs ciliate only on the margins and nonglandular in *L. androsaceus* and *L. rosaceus.* LECR is distinguished from *L. parviflorus* and *L. latisectus* by its rounded corolla lobes and short habit of <7 cm tall (Battaglia 2001). *L. latisectus* is also not known to occur in the same geographical range as LECR.

ECOLOGY

HABITAT

LECR occurs at an elevation of 14 meters atop a sea bluff at the edge of the coastline on a marine terrace supported by sedimentary sandstone derived soil. This habitat is highly influenced by wind, cool salt-laden air and fog.

Of the natural communities list the most similar association for LECR is Coastal Terrace Prairie Code CTT41100CA (California Department of Fish and Wildlife, Natural Communities - List a Hierarchical List of Natural Communities with Holland Types, Sept. 2010).

Coastal prairie along the San Mateo Coast is characterized by low growing perennial grasses and annual and perennial forbs. LECR EO2 occurs with a diverse array of perennial grasses (*Bromus maritimus, Danthonia californica, Deschampsia cespitosa* ssp*. holciformis, Hordeum brachyantherum, Agrostis blasdalei*) and other native herbaceous flowering plants (see associated species section below), but has become diminished as non-native plants have colonized the bluff top. The last population of LECR occurs with two other California Rare Plant Rank species *Agrostis blasdalei*, and *Castilleja ambigua* var*. ambigua*. LECR has been sheltered by the 2.5 acre undeveloped coastal prairie adjacent that provides a natural buffer between Highway 1 and the bluff top edge. LECR yellow mats shown below in Figure 2.

Figure 2. LECR occurrence EO2 Vallemar Bluff, Moss Beach, San Mateo County. Photograph by Avis Boutell

POLLINATION

Pollination studies have been conducted on similar species of *Leptosiphon* and have shown that they are predominantly bee fly (Bombyliidae) pollinated and wind pollinated (Goodwillie 2001). Other potential pollinators have been recently observed on LECR, such as the beetle (*Listrus* sp.) in the Melyridae (soft-wing flower beetles) see Figure 3 (Bug Guide 2013-2016).

Figure 3. Family Melyridae (soft-wing flower beetles), Genus *Listrus* on LECR, photographed on LECR by Aaron Schusteff in Moss Beach, San Mateo County, California, USA

ASSOCIATED SPECIES

LECR is associated with a number of native species including *Agrostis blasdalei, Armeria maritima, Bromus maritimus, Danthonia californica, Deschampsia cespitosa* ssp. *holciformis, Castilleja ambigua* ssp. *ambigua, Eriogonum latifolium, Eryngium armatum, Fragaria chiloensis*, *Gamochaeta ustulata, Grindelia stricta* var. *platyphylla, Hordeum brachyantherum, Zeltnera davyi.* Non-native species including *Carpobrotus edulis (*CAL-IPC category High*), Festuca myuros, Festuca perennis, Hordeum murinum* ssp. *leporinum* (CAL-IPC category Moderate), *Hypochaeris radicata* (CAL-IPC category Moderate)*, Plantago coronopus, Plantago lanceolata* (CAL-IPC category Limited).

DISTRIBUTION AND ABUNDANCE

The only known extant population of LECR is located at the Fitzgerald Marine Reserve in Moss Beach, San Mateo County element occurrence (EO2). Attempts to locate other populations and account for historical occurrences EO1, 3 and 4 are noted in the following tables.

OCCURRENCES

Table 1. LECR Element Occurrences

Element Occurrence (EO)	Quad, County, Location	Presence
EO1	Pigeon Point, San Mateo, PEBBLE BEACH	LECR is not present now or in the past at Pebble Beach, San Mateo County, see Table 2
EO2	Montara Mountain, San Mateo, VALLEMAR BLUFF MOSS BEACH	Extant, see Table 3
EO3	Montara Mountain, San Mateo, NEAR POINT SAN PEDRO	No longer a valid EO since no vouchers were collected from Point San Pedro
EO4	Bolinas, Marin, BOLINAS, NEAR RADIO STATION	LECR is not present now or in the past in Marin County, see Table 4

LECR EO1 - Pebble Beach population. Presence of this population is based on 1929 and1935 collections. After reviewing the specimens it is determined that sheets labeled LECR as occurring at Pebble Beach are *Leptosiphon parviflorus*.

Table 2. LECR EO1

Collector, Number, Date Collected	Annotation 2016	Taxon Name on Collection Sheet	County, Locality
Specimen number: POM279138			
H. E. Wieser, May 1929	*Leptosiphon parviflorus*	*Leptosiphon croceus*	San Mateo, Pebble Beach
Specimen number: RSA18361, SD244610, UC729640			
C. B. Wolf, 3727, May 25 1929	*Leptosiphon parviflorus*	*Leptosiphon croceus*	San Mateo, Pebble Beach
Specimen number: POM310909, UC964718, UC908670			
H. L. Mason, 8315, May 21 1935	*Leptosiphon parviflorus*	*Leptosiphon croceus*	San Mateo, Pebble Beach

LECR EO2 - Moss Beach (Blenheim is an older place name for Moss Beach (Morrall 2009). LECR has been collected 7 times from 1899-2015 in Moss Beach, San Mateo County. After a survey of historical documents and herbarium collections LECR EO2 was and is the only occurrence (see Table 5).

Table 3. LECR EO2

Collector, Number, Date Collected	Annotation 2016	Taxon Name on Collection Sheet	County, Locality
Specimen number: CAS394			
Alice Eastwood, May 2 1899	*Leptosiphon croceus*	*Linanthus croceus*	San Mateo, Near Pt. San Pedro (Blenheim)
Specimen number: CAS393			
Alice Eastwood, May 9 1901	*Leptosiphon croceus*	*Linanthus croceus*	San Mateo, Blenheim
Specimen number: DS133196, POM3565, GH78828, NY336940, UC106861			
Alice Eastwood, May 19 1901	*Leptosiphon croceus*	*Linanthus croceus*	San Mateo, Blenheim
Specimen number: UC106675			
Katharine Brandegee, Jun 19 1905	*Leptosiphon croceus*	*Linanthus androsaceus*	Moss Beach
Specimen number: UC176059			
Miss Kate Cole, May 1914	*Leptosiphon croceus*	*Linanthus androsaceus*	San Mateo, Moss Beach
Specimen number: SEINET3861922			
Genevieve K. Walden, 203, 2009-06-22	*Leptosiphon croceus*	*Leptosiphon croceus*	San Mateo, Moss Beach
Specimen number: SJSU15003			
Toni Corelli, 1193, 5/3/2015	*Leptosiphon croceus*	*Leptosiphon croceus*	San Mateo, Moss Beach

The Moss Beach (Blenheim) population of LECR was collected 5 times between 1899-1914, then not again until 2009 (*Walden 203*), and was last collected in 2015 (*Corelli 1193*). In May 2015, a census conducted of EO2 (Corelli 2015) estimated less than 500 individuals. Figure 4 shows the mapped location as Moss Beach, California.

Figure 4. LECR occurrence EO2 map.

LECR EO3 – Point San Pedro - Lacking any other evidence, this occurrence was likely generated because of Alice Eastwood's CAS394, May 2, 1899 collection (see Table 3). On the herbarium label it reads "Near Pt. San Pedro (Blenheim)". Pt. San Pedro is most likely the geographical area and the collection was made in Blenheim where the extant EO2 occurrence is located. EO3 should be removed as an occurrence for LECR.

LECR EO4 - Bolinas, Marin County. No herbarium sheets were found labeled LECR for Bolinas, Marin County; however two collections were found from Point Reyes, Marin County (see Table 4). These have been annotated as *Leptosiphon parviflorus*. In a personal communication with Doreen Smith, Rare Plant Chair, California Native Plant Society (CNPS) Marin Chapter on 11/11/2015 she said "I was never able to find (the) Bolinas population." LECR is not confirmed as present now or in the past in Marin County.

Table 4. LECR EO4

Collector, Number, Date Collected	Annotation 2016	Taxon Name on Collection Sheet	County, Locality
Specimen number: RSA12224			
C. B. Wolf, 5768, Jun 28 1934	*Leptosiphon parviflorus*	*Leptosiphon croceus*	Marin, Pt. Reyes
Specimen number: RSA148677			
Verne Grant, Jun 23 1961	*Leptosiphon parviflorus*	*Leptosiphon croceus*	Marin, Point Reyes

ATTEMPTS TO LOCATE ADDITIONAL POPULATIONS

There is very limited collection history of plants in general in the vicinity of Moss Beach, San Mateo County or Blenheim and most collections date from the early 1800's to the 1940's with very few recent collections.

- Katharine Brandegee in the 1880s and early 1900s - San Mateo Coast - *Leptosiphon* collections shown in Table 5
- Alice Eastwood in the 1890s and early 1900s - San Mateo Coast - *Leptosiphon* collections shown in Table 5
- Maibelle Williams in 1920s - San Mateo Coast - no *Leptosiphon* collections
- Ira L. Wiggins in the 1920s 1930s and 1940s - San Mateo Coast - *Leptosiphon* collections shown in Table 5
- Lyman Benson in the 1930s - San Mateo Coast - *Leptosiphon* collections shown in Table 5
- Lewis S. Rose in the 1930s and 1940s - San Mateo Coast - no *Leptosiphon* collections

However, botanists Robert Patterson (patters@sfsu.edu), convening editor and treatment author of the Polemoniaceae family and genus *Leptosiphon* in The Jepson Manual, Second Edition; Mike Vasey (mcvasey@gmail.com), Director of the San Francisco Bay National Estuarine Research Reserve; Robyn Battaglia (battagliabunch@sbcglobal.net), author of "A Morphometric Analysis of the *Leptosiphon androsaceus* complex (Polemoniaceae) in the Central and South Coast Ranges" (2001); Neal Kramer (kramerbotanical@yahoo.com), local environmental consult and myself, Curator Emeritus at Carl W. Sharsmith Herbarium, San Jose State University and Research Associate at the Oakmead Herbarium and Collections, Jasper Ridge Biological Preserve, Stanford University, have searched throughout the San Mateo Coast for over 15 years for LECR and have only found one colony element occurrence 2 (EO2). There are no other validated collections of coast yellow leptosiphon (*Leptosiphon croceus*) elsewhere in California.

A search for LECR in the Consortium of California Herbaria database and California herbaria throughout the State found 40 collection sheets labeled LECR or synonyms of LECR. Table 5 is a review of these collections arranged by county and date collected.

Table 5 - LECR Collection History

Collector, Number, Date Collected	Annotation 2016	Taxon Name on Collection Sheet	County, Locality
Specimen number: POM279091A			
Lyman Benson, 861, Apr 1927	*Leptosiphon parviflorus*	*Leptosiphon croceus*	Lake, Kelseyville
Specimen number: RSA93024			
Milo S. Baker, 12931, May 6 1954	*Leptosiphon parviflorus*	*Leptosiphon croceus*	Lake, Middleton
Specimen number: RSA12224			
C. B. Wolf, 5768, Jun 28 1934	*Leptosiphon parviflorus*	*Leptosiphon croceus*	Marin, Pt. Reyes
Specimen number: RSA148677			
Verne Grant, Jun 23 1961	*Leptosiphon parviflorus*	*Leptosiphon croceus*	Marin, Point Reyes
Specimen number: POM202880			
Alice Eastwood, 1311, Apr 10 1934	*Leptosiphon parviflorus*	*Leptosiphon croceus*	Mendocino, Longvale
Specimen number: POM65133, POM65135			
A. A. Heller, 6673, May 4 1903	*Leptosiphon parviflorus*	*Leptosiphon croceus*	Monterey, Pacific Grove
A. A. Heller, 6699, May 8 1903	*Leptosiphon parviflorus*	*Leptosiphon croceus*	Monterey, Del Monte
Specimen number: RSA259010			
Florence J. Youngberg, Jul 1938	*Leptosiphon androsaceus*	*Leptosiphon croceus*	Monterey, Near Monterey

Specimen number: CAS37502, POM65848, UC75210			
C. F. Baker, 706, May 2 1902	*Leptosiphon androsaceus*	*Leptosiphon croceus*	San Francisco, Presidio
Specimen number: RSA164304			
Clare B. Hardham, 6833, Apr 17 1961	*Leptosiphon parviflorus*	*Leptosiphon croceus*	San Luis Obispo, Pine Mt
Specimen number: CAS394			
Alice Eastwood, May 2 1899	*Leptosiphon croceus*	*Linanthus croceus*	San Mateo, Near Pt. San Pedro (Blenheim)
Specimen number: CAS393			
Alice Eastwood, May 9 1901	*Leptosiphon croceus*	Polemoniaceae	San Mateo, Blenheim
Specimen number: DS133196, POM3565, *GH78828, *NY336940, UC106861			
Alice Eastwood, May 19 1901	*Leptosiphon croceus*	*Linanthus croceus*	San Mateo, Blenheim
Specimen number: *GH91312, POM65887, UC133649			
E. B. Copeland, 3260, May 24 1903	*Leptosiphon rosaceus*	*Leptosiphon croceus*	San Mateo, Montara Point
Specimen number: POM65886, UC133724			
E. B. Copeland, 3300, Jun 6 1903	*Leptosiphon rosaceus*	*Leptosiphon croceus*	San Mateo, Montara Point
Specimen number: UC106675			
Katharine Brandegee, Jun 19 1905	*Leptosiphon croceus*	*Linanthus androsaceus*	San Mateo, Moss Beach
Specimen number: UC176059			
Miss Kate Cole, May 1914	*Leptosiphon croceus*	*Linanthus androsaceus*	San Mateo, Moss Beach
Specimen number: POM279138			
H. E. Wieser, May 1929	*Leptosiphon parviflorus*	*Leptosiphon croceus*	San Mateo, Pebble Beach
Specimen number: RSA18361, SD244610, UC729640			
C. B. Wolf, 3727, May 25, 1929	*Leptosiphon parviflorus*	*Leptosiphon croceus*	San Mateo, Pebble Beach
Specimen number: POM279148			
Arthur L. Cohen, 629, Apr 21 1935	*Leptosiphon parviflorus*	*Leptosiphon croceus*	San Mateo, Jasper Ridge
Specimen number: POM310909, UC964718, UC908670			
H. L. Mason, 8315, May 21 1935	*Leptosiphon parviflorus*	*Leptosiphon croceus*	San Mateo, Pebble Beach
Specimen number: RSA51347, RSA128553			
P. H. Raven, 1954, Apr 30 1950	*Leptosiphon rosaceus*	*Leptosiphon croceus*	San Mateo, Montara
Specimen number: SEINET3861922			
Genevieve K. Walden, 203, 2009-06-22	*Leptosiphon croceus*	*Leptosiphon croceus*	San Mateo, Moss Beach
Specimen number: SJSU15003			
Toni Corelli, 1193, 5/3/2015	*Leptosiphon croceus*	*Leptosiphon croceus*	San Mateo, Moss Beach
Specimen number: UCR197844, UCD38190			
Beecher Crampton, 392, Aug 3 1941	*Leptosiphon parviflorus*	*Linanthus androsaceus* subsp. *croceus*	Santa Cruz, Boulder Creek

*Collections from GH (Harvard University Herbaria) and NY (New York Botanical Garden) were not looked at but the duplicate collections were annotated.

These records indicate that LECR is restricted to one colony in Moss Beach, San Mateo County, first collected at Blenheim (Moss Beach) by Alice Eastwood and it was and is the only occurrence. There are no current or historical LECR populations in Lake, Marin, Mendocino, Monterey, San Francisco, San Luis Obispo or Santa Cruz counties. Current publications of floras and checklists show that LECR does not occur in Monterey County (Mathews 2015), Santa Cruz County (Neubauer 2013), or in San Francisco's Natural Areas (Wood 2013). One location is mentioned in San Mateo County (Corelli 2011), the Moss Beach occurrence. The collections along the San Mateo Coast at Pebble Beach (Bean Hollow State Beach) were redetermined as *L. parviflorus* and the Montara collections redetermined as *L. rosaceous* (CNPS 1B).

Table 6 - Other Collections of *Leptosiphon* from the San Mateo Coast

Collector, Number, Date Collected	Annotation 2016	Taxon Name on Collection Sheet	County, Locality
Specimen number: UC106675, UC106678			
Katharine Brandegee, Jun 19 1905	*Leptosiphon rosaceus*	*Linanthus androsaceus*	San Mateo, Moss Beach
Specimen number: DS81352, JEPS58097			
Adele Lewis Grant, 936, 5/6/1917	*Leptosiphon androsaceus*	*Linanthus parviflorus*	San Mateo, Pebble Beach
Specimen number: RSA18460			
C. B. Wolf, 547, June 29 1927	*Leptosiphon androsaceus*	*Leptosiphon androsaceus*	San Mateo, Pebble Beach
Specimen number: RSA18357, SD27819, UC729676			
C. B. Wolf, 3731, May 26 1929	*Leptosiphon androsaceus*	*Leptosiphon androsaceus*	San Mateo, N of Pigeon Pt
Specimen number: CHSC1270			
H. Pearl, 05 01 1930	*Leptosiphon rosaceus*	*Linanthus androsaceus*	San Mateo, Moss Beach
Specimen number: UC908670, UC964718			
Herbert L. Mason, 8314, 8315, May 21 1935, May 21 1936	*Leptosiphon androsaceus*	*Linanthus parviflorus*	San Mateo, near Moss Beach
Specimen number: UC727278			
Ira L. Wiggins, 10164, 4/21/1943	*Leptosiphon androsaceus*	*Linanthus parviflorus*	San Mateo, near Pescadero

At one time there were populations of *L. androsaceus* and *L. parviflorus* along the San Mateo Coast at Pebble Beach (now a part of Bean Hollow State Beach), and *L. androsaceus* and *L. rosaceus* were collected at or near Moss Beach. Currently only *L. croceus* and *L. rosaceus* occur on the San Mateo Coast (Boutell, Corelli, Frost 2013).

POPULATION TRENDS AND THREATS

The threat to the last remaining occurrence LECR EO2 is significant and immediate. The primary threats are habitat destruction through potential development that includes a plan to build 6 houses adjacent to LECR population on coastal prairie habitat (see Figure 6) (County of San Mateo, Planning and Building, Case Number PLN2015-00380). Competition from non-native plants especially the invasive Carpobrotus that is a highly ranked noxious weed, and other human-related activities (including an informal trail and park bench). Another threat is bluff top erosion, and rising ocean levels. Mean sea level along the California coast will rise from 1.0 to 1.4 meters by the year 2100. In areas where the coast erodes easily, sea-level rise will likely accelerate shoreline recession due to erosion (Heberger, et al. 2009).

When Alice Eastwood first mentioned this colony in 1904 (Eastwood 1904), she stated "It covered the ground for several acres, but was seen in no other place, and is probably a strictly local species. It is perhaps the most strikingly beautiful species of the group where it belongs, with the long threadlike tubes of the corolla supporting the wonderfully beautiful yellow disks. The great masses almost monopolized the ground." Since then, most coastal prairie habitat has been extirpated as a result of agriculture, urban development, habitat fragmentation and non-native plant encroachment (Ford and Hayes 2007).

LECR EO2 occurs in an area approximately 60'x30' at the edge of the cliff. A census was conducted in 1999 and 2015 (Corelli) utilizing the same survey technique. The area was divided into 10 sections, and individual plants were counted in each section while standing outside the edge of the colony to avoid trampling of plants. The estimated number of plants in 1999 was 400-500 plants, and in 2015 <500 plants were estimated (Corelli 1999, 2015). The earliest survey reported by R. Battaglia was done in 1998 and ~1000 plants were estimated

(Battaglia 1998).

Compared to 1998 there was a decrease in the number of plants in 1999. The decline could be explained by inherent natural demographic variation in this annual plant, and/or it could be the result of sampling error because of the two different sampling schemes. It could also be timing of surveys and variation in the environment conditions such as the amount of annual rainfall. Total amount of rainfall for nearby Half Moon Bay in 1998 was 50.2 inches and 29.59 inches in 1999 (Woyshner 2010). The survey method and number of plants for the 1999 and 2015 surveys are roughly similar.

There have been yearly field observation visits between 2000-2014 without documentation. The colony as observed is resilient, but fragile as its location makes it vulnerable and exposed to the multiple threats mentioned including development of adjacent habitat, and the number of plants and colony size compared to what was found in the early 1900's when it "covered the ground for several acres".

CURRENT MANAGEMENT ACTIVITIES

Fitzgerald Marine Reserve, a San Mateo County Park is also a part of the California Marine Protected Area (MPAs) that lies in California state waters within the Montara State Marine Reserve.

The Fitzgerald Marine Reserve encompasses approximately 35 acres of terrestrial area along the coastline. The Vallemar Bluff top where LECR occurs is the last intact coastal prairie on the reserve. At one time there was a continuous stretch of coastal prairie that extended along the bluff top throughout the preserve but much of it was planted with Monterey cypress (*Hesperocyparis macrocarpa*) more than a century ago. Monterey cypress is not native to San Mateo County and where it occurs on the reserve the understory is sparse and associated with non-native vegetation.

The County of San Mateo released a Master Plan for the Fitzgerald Marine Reserve in May 2002. The area where LECR occurs was not surveyed and none of the 3 rare plants occurring there are accounted for in the master plan. Since discovering this omission the San Mateo County Parks Department has been contacted with the information about these rare plant locations and habitat. The county will be surveying this property in 2016 (written and personal communication in 2016 with San Mateo County staff: Ramona Arechiga (trarechiga@smcgov.org), Natural Resource Manager; Senior Planners Samuel F. Herzenberg (SHerzberg@co.sanmateo.ca.us) and Dave Holbrook (dholbrook@smcgov.org) and revising the Master Plan to include management and protection of LECR and other rare plants at Fitzgerald Marine Reserve.

POTENTIAL MANAGEMENT ACTIVITIES

To assure adequate management and recovery of LECR, the species must be listed pursuant to the California Endangered Species Act (CESA) by the State of California and the last remaining population must be protected and assured of sufficient ecosystem function, adequate buffering from disturbance, appropriate ecological management, and inclusion of areas of potential, unoccupied habitat.

LISTING THE SPECIES UNDER CESA

Given the extreme rarity of the species and its current threats, listing under the CESA is an appropriate action to be undertaken by the State of California. This plant is not currently proposed for listing under the Federal Endangered Species Act (FESA), but a proposal for FESA listing should be considered given that the species is endangered to the point of potential extinction. State and Federal listing will make it possible to procure private and public funding to initiate some of the protective and research needs of the species.

ADEQUATE BUFFERING

For development projects that have the potential to occur at or near LECR EO2 adequate buffering should be delineated. Buffering for sensitive species is typically set at a minimum buffer of 100 feet (California Coastal Commission 2013) Buffering of sensitive species is theorized to provide protection from edge effects, which include invasion of non-native species, microclimate changes, and changes in hydrology.

LECR EO2 cannot be buffered where it occurs on the immediate cliff edge so can only be buffered to the north and east of the extant colony (Figure 6). A concern is that LECR is currently insufficiently buffered from direct impacts on the bluff top because of an informal trail, a park bench and proposed development on adjacent property as shown in Figure 6. There should be yearly monitoring because of the continued impacts from these activities, from non-native plants within and outside the colony, and direct and indirect impacts brought on by development.

The buffer zone should be large enough to support, in perpetuity, a biologically secure, reproducing population, of the annual LECR in the preferred coastal prairie habitat where it occurs. Little information exists regarding an accurate minimum buffering requirement for LECR. With little known about the reproductive biology of LECR, buffers need to be set at conservative distances until we understand what is the allowable minimum. Vegetation monitoring of this colony will help analyze the yearly changes that occur within and nearby on the coastal prairie that supports LECR.

PRESERVATION OF POTENTIAL HABITAT

Principles of conservation biology include an emphasis on the need for the preservation of both occupied and unoccupied, potential habitat of a given species. Currently within San Mateo County only very small remnant pockets of coastal prairie habitat occur on the San Mateo Coast. Most occur on public land owned by State Beaches and Parks, Golden Gate National Recreation Area, Land Trusts, Peninsula Open Space Preserve and other open space agencies. Other rare plants occur in the coastal prairie habitat within these public lands including *Agrostis blasdalei, Castilleja ambigua* ssp*. ambigua, Centromadia parryi* ssp*. parryi, Chorizanthe robusta* var*. robusta*, *Fritillaria liliacea*, *Hosackia gracilis, Lasthenia californica* ssp*. macrantha, Leptosiphon rosaceus, Plagiobothrys chorisianus* var*. chorisianus, Plagiobothrys diffusus*, and *Potentilla hickmanii*.

It should be noted that although protecting adjacent similar habitat for long-term viability is a viable concept, all areas mapped as similar habitat may not be suitable since much of it is occupied by other rare plants and coastal prairie associates, and it would be inadvisable to disturb those sites. There is no current evidence that LECR can survive outside its current distribution since it occurs at no other place. However there is one stretch of disturbed coastal terrace bluff top at Montara State Beach (Figure 5), about 1.3 miles north of LECR EO2. This bluff top was planted in the past with ornamental *Agapanthus africanus*, but it should be looked at to see if it can be restored to provide potential coastal prairie habitat for LECR.

Figure 5. Potential Coastal Prairie habitat at Montara State Beach.

ECOLOGICAL MANAGEMENT

A program of ecological management, including the principles of adaptive management, is required to ensure the long-term viability of LECR. LECR EO2 was not accounted for or protected by the Fitzgerald Marine Reserve Master Plan. It is now limited to a small 60'x30' area fragmented by an informal trail, park bench, non-native plant encroachment and the proposed development of the adjacent 2.5 acres of coastal prairie habitat as shown in Figure 6.

Figure 6. Proposed development on potential coastal prairie habitat on Moss Beach's Vallemar Bluffs

LECR should be protected and accounted for by the County of San Mateo, and a management plan should be written providing protection for this species and other rare plant species found at Fitzgerald Marine Reserve.

RESEARCH NEEDS

Priorities for biological and ecological research include studies that address population genetics, demographics, pollination biology, seed dispersal, seed viability, herbivory, germination and soil and other habitat requirements.

One of the greatest threats within the population and coastal prairie habitat are the invasive non-native plants. Management research should explore the best ways to control the non-native plants as well as the timing, frequency and intensity of these activities.

Seed should be collected and stored at a reputable seed bank. Research should be undertaken to see what is the best use and time to use these seeds at this location or another designated appropriate coastal prairie habitat.

MONITORING

Demographic and site monitoring of LECR EO2 should be undertaken yearly using standardized protocols that ensure the least disturbance of this population and habitat. Data obtained should be submitted to the California

Department of Fish and Wildlife Natural Diversity Database. Surveys of any additional suitable habitat should also be performed.

AGENCIES AND ORGANIZATIONS TO BE INVOLVED

Department of Interior, U.S. Fish and Wildlife Service
California Department of Fish and Wildlife
California Coastal Commission
California State Parks, San Mateo Coast Sector
Midcoast Community Council
San Mateo County Board of Supervisors
San Mateo County Parks Department
San Mateo County Planning Department

SOURCE INFORMATION

HERBARIA	CONTACT
CAS/DS California Academy of Sciences	Debra Trock, Rebecca Peters
CHCS California State University, Chico	Lawrence Janeway
GH Harvard University	
NY New York Botanical Garden	
RSA/POM Rancho Santa Ana Botanic Garden & Pomona College	Mare Nazaire
SEINET Southwest Environmental Information Network	
SD San Diego Natural History Museum	Jon Rebman
SJSU San Jose State University	Lars Rosengreen
UC/JEP UC Berkeley	John Strother, Kim Kersh
UCR UC Riverside	Andrew Sanders

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