State of California
Natural Resources Agency
Department of Fish and Wildlife

REPORT TO THE FISH AND GAME COMMISSION

STATUS REVIEW OF COAST YELLOW LEPTOSIPHON (*Leptosiphon croceus*)

December 2017

Coast yellow leptosiphon (*Leptosiphon croceus*), CDFW photo by Cherilyn Burton

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LIST OF ABBREVIATIONS, ACRONYMS AND TERMS

CEQA – California Environmental Quality Act

CESA – California Endangered Species Act

CNDDB – California Natural Diversity Database

CNPS – California Native Plant Society

Commission – California Fish and Game Commission

CRPR – California Rare Plant Rank

Department – California Department of Fish and Wildlife

Occurrence – CNDDB Element Occurrence

Evaluation – Initial Evaluation of the Petition to List Coast Yellow Leptosiphon (*Leptosiphon croceus*) as an Endangered Species under the California Endangered Species Act

Id. – "the same"

NEPA – National Environmental Policy Act

Petition - Petition to the State of California Fish and Game Commission from Ms. Toni Corelli Cosponsored by the California Native Plant Society to List Coast Yellow Leptosiphon (*Leptosiphon croceus*) as an Endangered Species Pursuant to the California Endangered Species Act

ssp. – Subspecies

var. – Variety

EXECUTIVE SUMMARY

This Status Review of Coast Yellow Leptosiphon (*Leptosiphon croceus* (Eastw.) Strother & Kersh) (Status Review) has been prepared by the California Department of Fish and Wildlife (Department) for the California Fish and Game Commission (Commission) pursuant to the requirements of the California Endangered Species Act (CESA). This Status Review has been independently reviewed by scientific peers, and is based upon the best scientific information available to the Department.

Coast yellow leptosiphon is a low-growing annual plant in the Phlox family (Polemoniaceae) that was first described in 1904. It is known from only one small population that occupies approximately 167 square meters (1,800 square feet), located on Vallemar Bluff in Moss Beach, San Mateo County. This population is located in coastal prairie habitat atop a sea bluff at the edge of the coastline.

The population of coast yellow leptosiphon occurs in close proximity to urban land use, and has been either directly or indirectly impacted by modification or destruction of habitat. Coast yellow leptosiphon is threatened, both directly and indirectly, by development and other land-use changes; impacts from invasive plant species; and impacts from human activities such as trampling. Bluff-top erosion is also a serious threat to this species, and climate change may accelerate this process. In addition, coast yellow leptosiphon is highly vulnerable to extinction due to its extremely limited distribution and restriction to only one small population. Because of the rarity of coast yellow leptosiphon, the loss of any occupied habitat or any portion of the population would represent the loss of a significant portion of its total range, and could result in extinction of the species.

Scientific information available to the Department indicates that coast yellow leptosiphon is in serious danger of becoming extinct in all or a significant portion of its range due to one or more causes, including loss of habitat, change in habitat, competition and other effects from invasive plant species, and other natural occurrences and human-related activities. The Department recommends that the Commission find that the petitioned action to list coast yellow leptosiphon as an endangered species is warranted, and further recommends implementation of the management recommendations and recovery measures described in this Status Review.

INTRODUCTION

This Status Review addresses coast yellow leptosiphon (*Leptosiphon croceus* (Eastw.) Strother & Kersh).

Petition History

On May 25, 2016, the Commission received a petition (Petition) from Ms. Toni Corelli, cosponsored by the California Native Plant Society (CNPS), to list coast yellow leptosiphon as an endangered species pursuant to CESA (Fish & G. Code, § 2050 *et seq*.).

On May 27, 2016, the Commission referred the Petition to the Department for evaluation.

On June 10, 2016, as required by Fish and Game Code section 2073.3, the Commission published notice of receipt of the Petition in the California Regulatory Notice Register. (Cal. Reg. Notice Register 2016, No. 24-Z, p.1002, https://www.oal.ca.gov/wp-content/uploads/sites/28/2017/05/24z-2016.pdf). The Department on July 25, 2016, pursuant to Fish and Game Code Section 2073.5 requested a 30-day extension of time to complete its evaluation report.

On September 26, 2016, the Department provided the Commission with a report, "Evaluation of the Petition from Ms. Toni Corelli and the California Native Plant Society to List Coast Yellow Leptosiphon (*Leptosiphon croceus*) as an Endangered Species under the California Endangered Species Act" (Evaluation). Based upon the information contained in the Petition, the Department concluded, pursuant to Fish and Game Code, section 2073.5, subdivision (a), that sufficient information exists to indicate that the petitioned action may be warranted, and recommended to the Commission that the Petition should be accepted and considered.

On December 8, 2016, at its scheduled public meeting in San Diego, California, the Commission considered the Petition, the Department's Evaluation and recommendation, and comments received. The Commission found that sufficient information existed to indicate the petitioned action may be warranted and accepted the Petition for consideration.

Subsequently, on December 23, 2016, the Commission published its Notice of Findings for coast yellow leptosiphon in the California Regulatory Notice Register, designating coast yellow leptosiphon as a candidate species. (Cal. Reg. Notice Register 2016, No. 52-Z, p. 2197, https://www.oal.ca.gov/wp-content/uploads/sites/28/2017/05/52z-2016.pdf).

Department Review

Following the Commission's action to designate coast yellow leptosiphon as a candidate species, the Department notified affected and interested parties and solicited data and comments on the petitioned action pursuant to Fish and Game Code section 2074.4 (see also Cal. Code Regs., tit. 14, § 670.1, subd. (f)(2)). All comments received are included in Appendix A to this report. The Department promptly commenced its review of the status of the species as required by Fish and Game Code section 2074.6, which has now concluded with this Status Review document.

The Department sought independent and competent peer review on its draft Status Review report by persons of the scientific and academic community commonly acknowledged to be

experts on coast yellow leptosiphon and possessing the knowledge and expertise to critique the scientific validity of the draft Status Review. Appendix B contains a listing of the individuals and agencies given an opportunity to review the draft Status Report, the specific input provided to the Department by the individual peer reviewers, the Department's written response to the input, and any amendments made to the draft Status Review report (Fish & G. Code, § 2074.6; Cal. Code Regs., tit. 14, § 670.1, subd. (f)(2)).

BIOLOGY

Species Description

The information below is paraphrased from the original species description of coast yellow leptosiphon (Eastwood 1904) and from the Jepson eFlora (Patterson and Battaglia 2017).

Coast yellow leptosiphon is an herbaceous plant that grows to a height of 2 to 7 centimeters (0.8 to 2.8 inches). Its slender stem is much-branched from the base and is covered with white appressed hairs, meaning the hairs are pressed closely against the stem. It has opposite leaves that are palmately-divided, which means that all the lobes of the leaf are fused together at a common point, resembling a fan. The leaves are generally divided into six lobes that are approximately 4 to 7 millimeters (0.16 to 0.28 inches) long on the lower stem and almost twice as long near the flowers, appearing as whorls at the nodes. The lobes are narrowly ovate with the narrower end at the base, sometimes appearing linear. The flowers are arranged in heads that are subtended by palmately-divided leaf-like structures called bracts, with five linear divisions that are approximately 7 millimeters (0.28 inch) long and up to 1 millimeter (0.04 inch) wide. The flowers have bright yellow petals that are fused together at the base and are collectively referred to as a corolla. The corolla lobes are approximately 6 to 8 millimeters (0.24 to 0.31 inch) wide and generally have two bright red dots at the base. The fused corolla forms a long tube that is 26 to 39 millimeters (1.0 to 1.5 inches) long and is covered with fine, scattered, spreading hairs. The calyx lobes, otherwise known as sepals, are generally deltate or triangular-shaped, less than 1 millimeter (0.04 inch) wide at the middle, densely glandular-hairy, and are connected by an obscure thin membrane, forming a tube. Flowers are bisexual, which means they contain both male and female organs in the same flower. The fruit is called a capsule, which is a dry fruit from a compound pistil (female organ) that opens at maturity to release its seeds. Few seeds are produced by each flower. Coast yellow leptosiphon has a chromosome number of 2n=18.

Taxonomy

Coast yellow leptosiphon is in the Phlox family (Polemoniaceae), which has a long history of taxonomic confusion (Bell and Patterson 2000; Hankamp et al. 2016). *Leptosiphon* was originally recognized as a genus in 1833 (Bell and Patterson 2000; Porter and Johnson 2000). Greene (1889-1892) combined several genera, including *Leptosiphon*, into a single genus, *Linanthus,* based predominantly on the presence of opposite, palmately-lobed leaves (Battaglia and Patterson 2001). Porter and Johnson (2000) reclassified the taxa within Polemoniaceae and divided *Linanthus* into two distinct genera, *Leptosiphon* and *Linanthus*.

Alice Eastwood, botanist and curator of the California Academy of Sciences Herbarium from 1894 until 1949, formally described coast yellow leptosiphon as a species in 1904 (Eastwood 1904; Porter and Johnson 2000). A single specimen collected by Eastwood on May 9, 1901, has been designated as the type specimen for coast yellow leptosiphon (Strother and Kersh

2016), and is maintained at the California Academy of Sciences Herbarium. Eastwood originally labeled the specimen as *Gilia androsacea* var. *crocea* (Corelli 2016; Strother and Kersh 2016), but assigned it the species name *Linanthus croceus* Eastw. when she first formally described the species in 1904. Coast yellow leptosiphon has been reclassified several times. Other names assigned to the species include *Linanthus parviflorus* var. *croceus* (Milliken 1904), *Linanthus androsaceus* var. *croceus* (Jepson 1925), and *Linanthus androsaceus* ssp. *croceus* (Munz 1959). In the 1993 Jepson manual, coast yellow leptosiphon and several other closely-related species were grouped together into a single species called variable linanthus (*Linanthus parviflorus*) (Patterson 1993), until Porter and Johnson revised the entire family based on morphological and molecular data. In Porter and Johnson's publication, *Linanthus parviflorus* was reclassified as *Leptosiphon parviflorus*, and coast yellow leptosiphon was recognized as a distinct species, *Leptosiphon croceus* (Eastw.) (Porter and Johnson 2000). Due to an incorrect citation in Porter and Johnson's publication (2000), *Leptosiphon croceus* was not considered to be a validly published species name until Strother and Kersh (2016) corrected the citation error and validly published the current taxonomic name, *Leptosiphon croceus* (Eastw.) Strother & Kersh (Strother and Kersh 2016; Patterson and Battaglia 2017).

There are 31 species and 9 subspecies of *Leptosiphon*. Geographically, five of these species occur in the same geographic area of central California as coast yellow leptosiphon: bristly leptosiphon (*L. aureus*), false babystars (*L. androsaceus*), true babystars (*L. bicolor*), variable linanthus (*L. parviflorus*), and rose leptosiphon (*L. rosaceus*). Taxonomically, coast yellow leptosiphon is most closely related to variable linanthus and broad-lobed leptosiphon (*L. latisectus*) (Hankamp et al. 2016).

Range and Distribution

Range is the general geographical area where an organism occurs. For purposes of CESA and this Status Review, the range is the species' California range (*Cal. Forestry Assn. v. Cal. Fish and Game Com*. (2007) 156 Cal.App.4th 1535, 1551). Distribution refers to actual sites where individuals and populations of the species occur within the species' range.

The genus *Leptosiphon* occurs primarily in western North America, with one species occurring only in Chile. California is the center of diversity for *Leptosiphon* (Hankamp et al. 2016), where 90 percent of the species occur across diverse habitats in the California Floristic Province and adjacent areas (Bell and Patterson 2000).

Coast yellow leptosiphon occurs only in California. Coast yellow leptosiphon was first collected at "Blenheim" by Alice Eastwood, which was a short-lived place name mapped about 3–5 kilometers (2–3 miles) north of Pillar Point and apparently referred to a place at or near present-day Moss Beach (Strother and Kersh 2016; CNDDB 2017). There is limited history of collection of plants in the vicinity of Moss Beach, with most collections dating from the early 1900s to the 1940s. A search conducted by the petitioner for coast yellow leptosiphon in the Consortium of California Herbaria database and California herbaria throughout California found 40 collection sheets that were labeled *Leptosiphon croceus* or a synonym of *Leptosiphon croceus*. These specimens were reviewed in 2016 to verify their identification (Corelli 2016). Many plant specimens that were originally identified as coast yellow leptosiphon had been misidentified and actually represent other *Leptosiphon* species. Review of these specimens indicates that only the historic specimens that were collected from Moss Beach represent coast yellow leptosiphon, and that coast yellow leptosiphon is restricted to one colony in Moss Beach, San Mateo County.

The coast of San Mateo County has been frequently visited by botanists and scientific plant collectors, including botanists that specialize in *Leptosiphon* species. Despite their attempts, no additional populations of coast yellow leptosiphon have been discovered (Corelli 2016). Available data indicate that coast yellow leptosiphon has always been limited in its range and restricted to the Moss Beach area.

The distribution of coast yellow leptosiphon is documented in the California Natural Diversity Database (CNDDB). The CNDDB documents plant taxa, animal taxa, and natural communities that are of conservation concern within California and refers to these taxa as "elements." An "element occurrence" (occurrence) is a location record for a site which contains an individual, population, nest site, den, or stand of a special status element. Populations, individuals, or colonies that are located within 1/4 mile of each other generally constitute a single occurrence, sometimes with multiple "parts" (Bittman 2001). The CNDDB previously contained four occurrences for coast yellow leptosiphon. In March 2016, the CNDDB updated its database to remove three of these occurrences because they had been incorrectly identified as coast yellow leptosiphon, but actually represented other closely related species (Corelli 2016; Lazar pers. comm. 2016). This update resulted in there being only one valid occurrence for this species in the CNDDB (see Figure 1).

The CNDDB documented occurrence and coast yellow leptosiphon population is located within the Fitzgerald Marine Reserve, which is owned by the County of San Mateo and is a San Mateo County Park. The area immediately adjacent to the coast yellow leptosiphon population and the Fitzgerald Marine Reserve consists of several privately owned parcels that are proposed for development as shown in Figure 1 and as described below in the Factors Affecting the Ability to Survive and Reproduce section of this report. The County of San Mateo property and the adjacent private parcels are zoned Resource Management-Coastal Zone (RM-CZ). Development is allowed in an RM-CZ zone, but all development requires approval from the San Mateo County Coastside Design Review Committee (CDRC 2017).

The population of coast yellow leptosiphon is estimated to occupy an area approximately 18 meters by 9 meters (60 feet by 30 feet) or 167 square meters (1,800 square feet) in size (CNDDB 2017; Department staff observation), which represents the entire distribution and range of the species. In addition to the mapped population of coast yellow leptosiphon shown in the CNDDB, one individual plant was also identified outside of the mapped population on the adjacent private property on May 16, 2016 (T. Corelli pers. comm. 2016) (see Figure 2). Since annual plants reproduce by seed, a seed bank is potentially present in the area where this plant was identified.

Life History

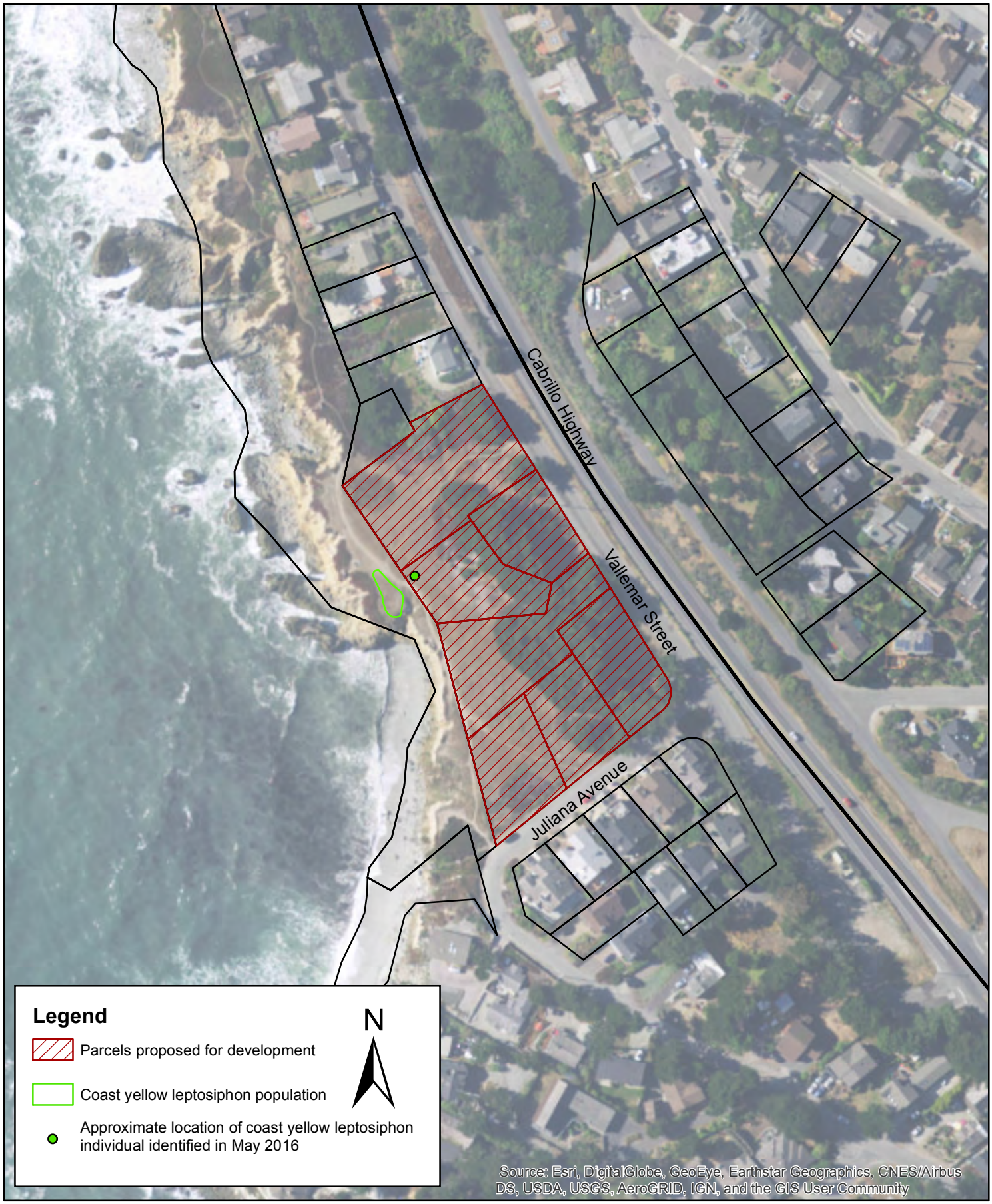
Coast yellow leptosiphon is an annual plant, which means that it completes its life cycle within one year or growing season. It generally flowers from April to June (CNPS 2017; Patterson and Battaglia 2017). Little is known about the mating system of coast yellow leptosiphon. It is closely related to variable linanthus, which is a fully self-incompatible species, meaning it does not self-fertilize (Goodwillie 1999; Weber and Goodwillie 2013). Self-incompatible plants rely on pollinators or are wind-pollinated (Goodwillie 1999). Pollination studies conducted on other species of *Leptosiphon* indicate they are predominantly bee fly- (Bombyliidae) and wind-pollinated (Goodwillie 2001). Other potential pollinators such as a beetle (*Listrus* sp.) in the Melyridae family (soft-wing flower beetles) have been recently observed on coast yellow leptosiphon (Corelli 2016). The Department does not have information on seed dispersal for

Species Occurrence Data Source: California Natural Diversity Database (July 2017)

0 1.75 3.5 7
Kilometers

Figure 1. Vicinity of Coast Yellow Leptosiphon (*Leptosiphon croceus*)

California Department of Fish and Wildlife
Status Review of Coast Yellow Leptosiphon (*Leptosiphon croceus*)



Parcel Data Source: Digital Map Products 2017

Figure 2. Parcels Proposed for Development

coast yellow leptosiphon, but like many other plant species, seeds may be dispersed by birds or other animals, gravity, water flow, or other mechanisms.

Similar-looking Plants

Coast yellow leptosiphon shares morphological characteristics with other leptosiphon species, including false baby-stars, broad-lobed leptosiphon, rose leptosiphon, and variable linanthus. One population of variable linanthus located in the Santa Cruz Mountains near Boulder Creek looks particularly similar to coast yellow leptosiphon (A. Schusteff pers. comm. 2017), but the herbarium specimen records which presumably refer to this population have been confirmed as variable linanthus (Corelli 2016). Coast yellow leptosiphon is the shortest of all *Leptosiphon* species, and the width of the corolla lobes is the largest in the complex. Coast yellow leptosiphon can be distinguished from false baby-stars and rose leptosiphon by its densely glandular-hairy calyx lobes throughout the whole surface as opposed to the non-glandular ciliate hairs only on the margins of the calyx lobes of false baby-stars and rose leptosiphon (Patterson and Battaglia 2017). Coast yellow leptosiphon is distinguished from variable linanthus and broad-lobed leptosiphon by its rounded corolla lobes and short habit of less than 7 centimeters (2.8 inches) tall (Battaglia and Patterson 2001). In addition, broad-lobed leptosiphon is not known to occur in the same geographical range as coast yellow leptosiphon (Patterson and Battaglia 2017).

Habitat that may be Essential to the Continued Existence of the Species

Coast yellow leptosiphon grows at the edge of the coastline on a marine terrace supported by sedimentary sandstone-derived soil. It occurs on a bluff at an elevation of 14 meters (46 feet), in habitat that is highly influenced by wind, cool salt-laden air, and fog (CNDDB 2017).

Vegetation Communities

Coast yellow leptosiphon is associated with a diverse array of native perennial grasses such as maritime brome (*Bromus maritimus*), California oat grass (*Danthonia californica*), tufted hairgrass (*Deschampsia cespitosa* ssp*. holciformis*), and northern barley (*Hordeum brachyantherum* ssp. *brachyantherum*). Other species associated with coast yellow leptosiphon include native species such as sea-pink (*Armeria maritima* ssp. *californica*), seaside wild buckwheat (*Eriogonum latifolium*), coastal button-celery (*Eryngium armatum*), beach strawberry (*Fragaria chiloensis*), purple cudweed (*Gamochaeta ustulata*), coastal gumplant (*Grindelia stricta* var. *platyphylla*), and Davy's centaury (*Zeltnera davyi*). Three other rare species grow in association with coast yellow leptosiphon: Blasdale's bent grass (*Agrostis blasdalei*), harlequin lotus (*Hosackia gracilis*), and Johnny-nip (*Castilleja ambigua* ssp. *ambigua*) (Department observation; Corelli 2016; Jodi McGraw Consulting 2017). Blasdale's bent grass has a California Rare Plant Rank (CRPR) of 1B.2 (rare, threatened or endangered in California and elsewhere; moderately threatened in California), and harlequin lotus and Johnny-nip have a CRPR of 4.2 (plants of limited distribution – a watch list; moderately threatened in California). Several non-native species are associated with coast yellow leptosiphon and are colonizing the bluff top, including freeway iceplant (*Carpobrotus edulis*), rattail sixweeks grass (*Festuca myuros*), rye grass (*Festuca perennis*), hare barley (*Hordeum murinum* ssp*. leporinum*), rough cat's-ear (*Hypochaeris radicata*), cut-leaved plantain (*Plantago coronopus*), and English plantain (*Plantago lanceolata*).

The Department uses A Manual of California Vegetation, Second Edition (Sawyer et al. 2009) to classify natural communities within California. However, the area where coast yellow

leptosiphon occurs has not yet been classified using A Manual of California Vegetation, Second Edition. The habitat where coast yellow leptosiphon occurs would likely be classified as Coastal Terrace Prairie (Element Code 41100) under Robert Holland's Preliminary Descriptions of the Terrestrial Natural Communities of California (1986). Holland's classification system was used by the Department in the past to classify natural communities within California, but has since been superseded by A Manual of California Vegetation, Second Edition (Sawyer et al. 2009). The CNDDB continues to maintain historic records of the natural community occurrences, although new community occurrences have not been added to the CNDDB since the 1990s (California Department of Fish and Wildlife 2017). While the Holland system for classifying natural communities is no longer supported by the Department, this information may be useful for describing vegetation in areas of California that have not yet been classified using A Manual of California Vegetation, Second Edition. Information on Holland's Coastal Terrace Prairie community in the CNDDB is described below but this information should be used with caution as the rankings are no longer updated or reviewed by the CNDDB.

Coastal Terrace Prairie is a rare natural community described as having a dense, tall grassland dominated by both sod and tussock-forming perennial grasses growing to 1 meter (3.3 feet) tall, with patchy and variable stands that reflect local differences in available soil moisture capacity (Holland 1986). Coastal Terrace Prairie has a natural heritage global rarity rank of G2 (Imperiled) and a state rarity rank of S2.1 (Imperiled and very threatened) in the CNDDB. A rank of G2 means that an element is at high risk of global extinction or elimination due to a very restricted range, very few populations (often 20 or fewer), very steep declines, or other factors. A state rank of S2 means that an element is imperiled in the state because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the state, and the ".1" signifies that the element is "very threatened" (CNDDB 2017).

While the habitat where coast yellow leptosiphon occurs is not yet classified in A Manual of California Vegetation, Second Edition (Sawyer et al. 2009), the species composition overlaps with that listed in the *Deschampsia cespitosa* Herbaceous Alliance (tufted hair grass meadow). The *D. cespitosa – Danthonia californica* and *D. cespitosa – Eryngium armatum* Associations, which have been described on coastal bluffs and terraces and in other areas in California (Sawyer et al. 2009; Klein et al. 2015), fall within the *Deschampsia cespitosa* Herbaceous Alliance. This alliance includes both the Coastal Terrace Prairie and the Wet Subalpine or Alpine Meadow (Element Code 45210) communities described in the Holland classification system (1986). It is mapped on bluffs and terraces along the central and northern California coast and in montane areas in northern and central California, and is widespread outside of California. The *D. cespitosa* Herbaceous Alliance has a natural heritage global rarity rank of G5 (Secure) and a state rarity rank of S4? (Uncertain but Apparently Secure) (Sawyer et al. 2009; CNDDB 2017). The specific association type of this vegetation has yet to be defined. However, in the recent study of the vegetation of Sonoma County (Klein et al. 2015) both of the related associations are considered imperiled and/or imperiled and very threatened. The *D. cespitosa – Danthonia californica* Association has a Global Rank of G3 (Vulnerable) and a State Rank of S2 (Imperiled), while the other closely related association, the *D. cespitosa – Eryngium armatum* Provisional Association is ranked G3G2?/S3S2? (Uncertain but Vulnerable or Imperiled). It is likely that all of the coastal associations of the *D. cespitosa* Herbaceous Alliance are similarly rare and threatened.

East of the coast yellow leptosiphon population, a large stand of Monterey cypress (*Hesperocyparis macrocarpa*) trees is growing on Vallemar Bluff along Vallemar Street. Monterey cypress is known from only two native occurrences, which are in the Monterey area. It

is considered invasive in other parts of California, and it has been widely planted and naturalized in other areas along the coast (Cal-IPC 2017; CNPS 2017). The Monterey cypress trees near the coast yellow leptosiphon population likely represent planted specimens. The understory of this stand is disturbed and consists mostly of non-native plant species including ripgut brome (*Bromus diandrus*), freeway iceplant, panic veldt grass (*Ehrharta erecta*), false brome (*Brachypodium distachyon*), pride of Madeira (*Echium candicans*), Japanese cheesewood (*Pittosporum tobira*), and pincushion flower (*Scabiosa atropurpurea*). Freeway iceplant is present in large patches scattered throughout the Coastal Terrace Prairie, and a large patch is growing on the bluff immediately adjacent to the coast yellow leptosiphon population. North of the coast yellow leptosiphon population, the coastal bluff between the existing homes and the edge of the bluff is completely dominated by large mats of freeway iceplant with very little room for other herbaceous plants to grow. Monterey cypress trees are also scattered along the bluff north of the coast yellow leptosiphon population.

South of the Coastal Terrace Prairie, on the other side of Juliana Drive, the area consists of residential development (Figure 2).

Geology and Soils

Coast yellow leptosiphon grows on the edge of Vallemar Bluff in Moss Beach overlooking the Pacific Ocean. The Natural Resources Conservation Services' soil map unit for this area is rock outcrop-Orthents complex (Soil Survey Staff 2017). Orthents occur on escarpments, which are steep slopes or long cliffs that form as an effect of faulting or erosion and separate two relatively level areas of differing elevations. Orthents parent material consists of mixed sedimentary, serpentine, or basaltic volcanic rock (Soil Survey Staff 2017). The coast yellow leptosiphon population grows on a marine terrace supported by sedimentary sandstone-derived soil underlain by a relatively thin veneer of terrace deposits, consisting primarily of poorly to moderately consolidated gravel, sand, silt, and clay of marine origin (Pampeyan 1994).

The site is in a geologically active region of California, and is located approximately 427 meters (1,400 feet) northeast of the Seal Cove Fault and about 10.9 kilometers (6.8 miles) southwest of the seismically active San Andreas Fault Zone. The active San Andreas, Hayward, and Calaveras Faults are all located within the nearby San Francisco Bay Area and could have active secondary faults with the potential to cause severe shaking at the coast yellow leptosiphon population. A major earthquake could significantly affect the unstable bluffs and soils, causing loose soil on the steep slopes near the coast yellow leptosiphon population to form sloughs or slides (JCP 1990).

Hydrology

The coast yellow leptosiphon population occurs in the Dean Creek catchment, which is approximately 146 hectares (360 acres) in size. Dean Creek is located northeast of the Fitzgerald Marine Reserve and flows into Kelp Cove, approximately 0.6 kilometers (0.3 miles) south of Vallemar Bluff.

The coast yellow leptosiphon population is located near a coastal bluff comprised partially of coastal terrace deposits that are susceptible to erosion, particularly by concentrated uncontrolled runoff of surface drainage. In two areas of the bluff edge, shallow gullies approximately 0.3 to 0.6 meter (1 to 2 feet) deep extend inland from the bluff edge. These gullies were likely formed as a result of overland storm runoff (Haro, Kasunich & Associates, Inc. 2015).

A geotechnical investigation was completed at Vallemar Bluff by Haro, Kasunich & Associates, Inc. in 2016. Test bore holes encountered groundwater at 4 to 5 meters (13 to 17 feet) below the ground surface. The groundwater appears to be perched upon the bedrock and seeping through the terrace (Haro, Kasunich & Associates, Inc. 2015).

Climate

Coast yellow leptosiphon occurs in an area with a maritime Mediterranean climate with distinct wet and dry seasons. Most of the area's precipitation occurs from November through April. Virtually all precipitation occurs as rain, although fog accounts for a small percentage (Brady/LSA 2002). Using PRISM weather data from 1895 to 2015, the average minimum temperature in the vicinity of Vallemar Bluff is 9°C (48°F), the average maximum temperature is 17°C (63°F), the average temperature is 13°C (55°F), and the average precipitation is 69 centimeters (27 inches) per year (PRISM Climate Group 2017).

POPULATION TRENDS

Scientific information on coast yellow leptosiphon's population trends is limited. The species has not been monitored regularly, and the earliest reported survey was conducted by R. Battaglia in 1998, with about 1,000 plants estimated (Battaglia 1998; Corelli 2016; CNDDB 2017). T. Corelli estimated population numbers in 1999 and 2015. An estimated 400–500 plants were recorded in 1999, and fewer than 400 plants were estimated in 2015 (Corelli 1999, 2015).

Although little is known about population trends of coast yellow leptosiphon, the population that was once described as covering the ground for several acres (Eastwood 1904) is now limited to an area covering approximately 167 square meters (1,800 square feet or 0.04 acre), clearly indicating a significant declining population trend.

FACTORS AFFECTING THE ABILITY TO SURVIVE AND REPRODUCE

Habitat Modification and Destruction

Past Modification and Destruction of Habitat

Habitat loss is considered the primary cause for species extinctions at local, regional, and global scales (Dirzo and Raven 2003). Most of the coastal prairie habitat, which provides potential habitat for coast yellow leptosiphon, has been destroyed or modified due to urban development, agriculture, and invasion of non-native plant species (Ford and Hayes 2007). Coast yellow leptosiphon was likely present over a larger geographic area prior to the development of the San Mateo coast and conversion of coastal prairie habitat. Most of the habitat surrounding the coast yellow leptosiphon population has been eliminated or altered due to road construction, residential development, and invasion by non-native plant species, particularly the invasive freeway iceplant which covers the coastal bluff adjacent to the coast yellow leptosiphon population (Departmental observation). Installation of hardscape and storm drainage systems related to urban development have altered runoff patterns and hydrology in and around occupied coast yellow leptosiphon habitat.

Although it is likely that coast yellow leptosiphon has always been rare and restricted in range, past modification and destruction of habitat has contributed to the limited availability of suitable habitat for this species. These past changes affect the ability of coast yellow leptosiphon to survive and reproduce.

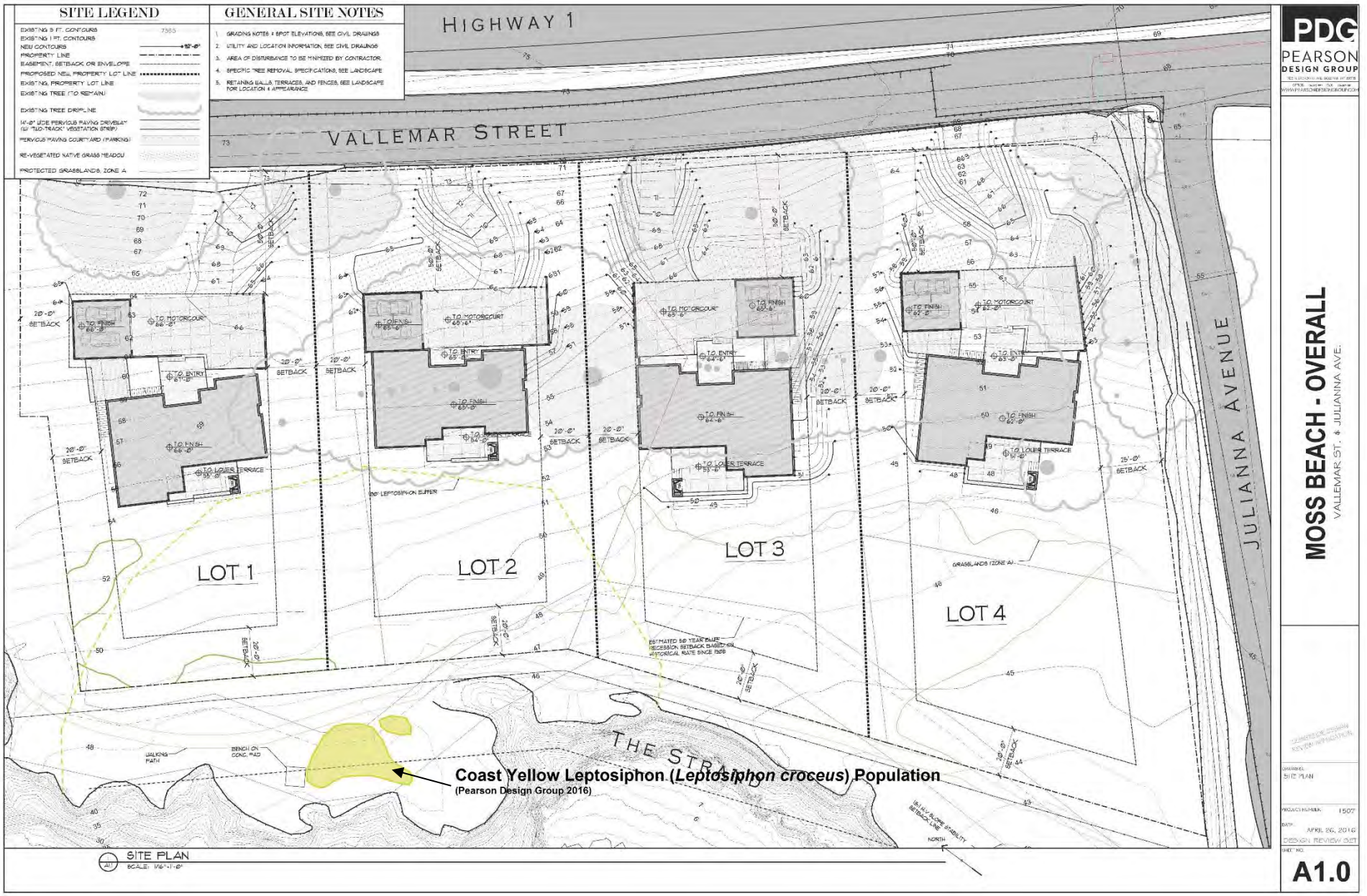
Present and Future Modification and Destruction of Habitat

Development or changes in land use could directly destroy plants and living seeds in the seed bank and destroy both occupied and potential habitat. Threats to coast yellow leptosiphon may occur from development and changes in land use near the existing population. A residential development project is proposed on the parcels immediately adjacent to the coast yellow leptosiphon population (County of San Mateo 2017; Midcoast Community Council 2017). The area proposed for development consists of seven lots, which will be consolidated into four lots for the project. The proposed project will build four, three-story single-family residences, between 4,740 and 4,859 square feet in size, and is pending design review approval by the San Mateo County Coastside Design Review Committee (CDRC 2017). Figure 2 shows the property proposed for development in relationship to the coast yellow leptosiphon population, and Figure 3 shows the site plan. The developer has erected story poles on the parcels that represent locations and footprints of the proposed houses (Figure 4).

Coast yellow leptosiphon has been buffered from impacts from the adjacent highway by the 1.0-hectare (2.5-acre) undeveloped coastal prairie that provides a natural buffer between Highway 1 and the coast yellow leptosiphon population. Habitat buffers provide protection from edge effects (Saunders et al. 1991; Given 1994), which are changes in community structure that occur at the boundary of two habitats. Habitat buffers also provide extra protection from human activities, allow for a more natural habitat boundary, slow the speed of water runoff, and filter sediments, fertilizers, pesticides, heavy metals, and pathogens from runoff (Given 1994; Godfrey 2015; USDA 2017).

Any change in land use on this adjacent property is expected to result in indirect impacts to the coast yellow leptosiphon population. The proposed development will alter the hydrologic regime of the site. This will involve increased, altered, and unseasonal runoff patterns resulting from addition of hard, impervious surfaces, installation of drainage features such as storm drains and drainage pipes (Mesiti-Miller Engineering, Inc. 2017), and installation and use of landscape irrigation systems. Development often leads to unseasonal summer moisture resulting from watering landscape plants, washing cars, and other human activities. In addition, residential development will lead to an increase in use of fertilizers and nutrients, herbicides, pesticides, and other household chemicals and products which will run off and disperse into habitat occupied by coast yellow leptosiphon and could impact the plants as well as alter the soil chemistry. Increased nutrient load and unseasonal moisture resulting from human activities creates conditions that promote the spread of non-native plant species, which can outcompete the native plants for light, space, nutrients, water, and other factors (Smil 1997; Vitousek et al. 1997; Line and White 2007). Furthermore, development will increase the number of human visitors using the area, result in soil disturbance and compaction, increase garbage and pollution, and create conditions that are favorable for the spread of non-native plant species.

Construction of houses on the parcels adjacent to the coast yellow leptosiphon population will lead to an increase in human use of the area. Walking paths exist on the bluff, and one heavily-used path exists immediately adjacent to the coast yellow leptosiphon population. Increased human use of the area will increase the impacts to the habitat from foot traffic, will increase the spread of weed seeds and introduce nutrients from dog walking, and will increase the risk of



Source: Pearson Design Group (2016) No Scale

Figure 3. Proposed Development Project on Vallemar Bluff – Site Plan

California Department of Fish and Wildlife
Status Review of Coast Yellow Leptosiphon (*Leptosiphon croceus*)

Figure 4. Story Poles Depicting Planned Locations for Four Homes on Vallemar Bluff

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trampling and killing of coast yellow leptosiphon plants. In addition, development of the area will modify the aesthetics and accessibility of the bluff, potentially resulting in alterations of walking patterns in the area. People may create new paths through the remaining portions of the habitat accessible on Vallemar Bluff, potentially through the coast yellow leptosiphon population.

Development of this area may also result in the loss of pollinator habitat and further fragment the habitat adjacent to the coast yellow leptosiphon population. Habitat fragmentation often leads to a disruption in plant and pollinator population dynamics by altering pollinator densities and behavior (Xiao et al. 2016). Information on pollinators and pollinator requirements for coast yellow leptosiphon is currently lacking, but loss of pollinators essential to the reproduction of coast yellow leptosiphon would negatively impact coast yellow leptosiphon, especially if the species is self-incompatible (Goodwillie 1999).

Although the population of coast yellow leptosiphon is not reported in the CNDDB on the adjacent parcels that are proposed for development, one individual plant was identified on one of the parcels on May 16, 2016 (T. Corelli pers. comm. 2016) (see Figure 2). Since annual plants reproduce by seed, identification of coast yellow leptosiphon on one of the adjacent properties indicates that the plants have distributed seed beyond the currently-mapped occurrence, and that a seed bank is potentially present in the area where this plant was identified. A seed bank constitutes a living plant population, even when above-ground plants are not visible. Presence of a potential seed bank may be an essential element for long-term survival of coast yellow leptosiphon. Development of any of the adjacent properties could result in impacts to coast yellow leptosiphon through the elimination of a soil seed bank for this species or direct impacts to individual plants that may emerge from the seed bank.

In addition to impacts from human activities, habitat modification can result from other activities. Burrowing mammals such as pocket gophers (*Thomomys* spp.) have profound impacts on ecosystems, from consuming vegetation to physically altering the soil (Reichman and Seabloom 2002). Burrowing mammals influence the physical environment, altering patterns and rates of soil development and nutrient availability, microtopography, and the abiotic environment. Burrowing activity can affect the demography and abundance of plant species, altering vegetation patterns and diversity, and thus altering ecosystem structure (Inouye et al. 1987; Huntly and Inouye 1988; Villarreal et al. 2008). Burrowing mammals such as gophers excavate vast burrow systems and deposit tailings in abandoned tunnels and on the ground surface (Reichman and Seabloom 2002), reducing the area of available habitat for plants. Evidence of burrowing mammals is present in the coast yellow leptosiphon population (Department staff observation), but the Department does not have any specific information on the effects of burrowing mammals on the survival of coast yellow leptosiphon.

The Department considers present and future modification and destruction of habitat a serious threat to coast yellow leptosiphon. Habitat modification and destruction will affect the ability of coast yellow leptosiphon to survive and reproduce.

Impacts from Invasive Species (Competition and other Factors)

Invading alien species cause major environmental damages and losses and are a significant risk factor leading to extinction of threatened and endangered species (Pimentel et al. 2004; Conser and Conner 2009), second only to habitat loss and fragmentation (Wilcove et al. 1998; Randall and Hoshovsky 2000). Compared to other threats to biodiversity, invasive non-native plants present a complex problem that is difficult to manage and has long-lasting effects. North America has accumulated the largest number of naturalized plants in the world (van Kleunen et

al. 2015), and many non-native plant species have established within California, dramatically changing the state's ecological landscape (Conser and Connor 2009). Many studies hypothesize or suggest that competition is the process responsible for observed invasive species impacts to biodiversity; however, invasive species may also impact native ecosystems by altering environmental conditions and resource availability (D'Antonio and Vitousek 1992; Levine et al. 2003). Invasive species may threaten native populations through competition for light, water, or nutrients; allelopathic mechanisms; alteration of soil chemistry; thatch accumulation that inhibits seed germination and seedling recruitment; changes in natural fire frequency; disruptions to pollination or seed-dispersal mutualisms; changes in soil microorganisms; or other mechanisms. The magnitude of invasive species impacts in Mediterranean habitats, such as those in California, largely depends on characteristics of the invading species and the habitat being invaded (Fried et al. 2014). The invader's life form and ability to form very dense stands have an effect on the magnitude of impacts, with creeping plant species such as freeway iceplant having greater effect (Gaertner et al. 2009; Fried et al. 2014). Invasive species may also influence native species colonization rates, and may thus lead to declines in local diversity over longer timescales (Yurkonis and Meiners 2004). Studies have not been conducted on the impact of invasive species on coast yellow leptosiphon specifically; however, negative impacts of plant invasions on Mediterranean ecosystems have been well demonstrated (Gaertner et al. 2009; Fried et al. 2014).

The coast yellow leptosiphon population is threatened by encroachment of non-native invasive plants, especially invasive freeway iceplant that is a highly-rated noxious weed by the California Invasive Plant Council (Cal-IPC 2017). Freeway iceplant is a low-growing, creeping succulent perennial plant that roots at the nodes and often forms deep mats covering large areas. It originates from South Africa, but is one of the most widespread non-native plants in the Mediterranean coastal ecosystems throughout the world, and is considered a severe threat to the native plant communities it invades (Albert 1995; Santoro et al. 2011). In California, it occurs along the coast and on the Channel Islands, especially in areas with a warm winter climate (Cal-IPC 2017). It was originally introduced into California in the early 1900s to stabilize soil along railroad tracks, and the California Department of Transportation soon began using it widely to line highways. It has also been widely promoted as an ornamental plant for home gardens (Albert 1995, 2000). Because this plant spreads easily by seed and vegetative means, it has spread beyond landscape plantings and has invaded coastal habitats, including the coastal prairie where coast yellow leptosiphon grows. Freeway iceplant forms nearly impenetrable mats that dominate the landscape, and it competes directly with native plant species for light, nutrients, water, and space (D'Antonio and Haubensak 1998). The fleshy fruits often bear more than one thousand small seeds (Bartomeus and Vilà 2009) that are eaten and widely dispersed by several mammals such as rabbits (D'Antonio 1990) and rats (Bourgeois et al. 2005). It competes aggressively with native plant species, achieving high rates of space colonization, which suppresses growth and establishment of other plants (D'Antonio and Mahall 1991; Albert 1995; Suehs et al. 2004; Vilà et al. 2006). Furthermore, it also interacts indirectly with native vegetation by altering soil chemistry by lowering pH (Conser and Connor 2009). Although freeway iceplant was originally used to stabilize soil and control erosion, it can actually contribute to erosion and landslides. It has shallow roots that do not hold soil well, and it absorbs ample water during rain events, becoming so heavy that it can slump off of steep hillsides and cliffs, pulling soil down with it (Spitzer 2002). Freeway iceplant covers the bluffs in much of the habitat near the coast yellow leptosiphon population, and it is growing on the bluff immediately adjacent to the coast yellow leptosiphon population and is encroaching into the population (see Figure 5).

Photo 1: Freeway iceplant (*Carpobrotus edulis*) dominating Vallemar Bluff north of the coast yellow leptosiphon (*Leptosiphon croceus*) population

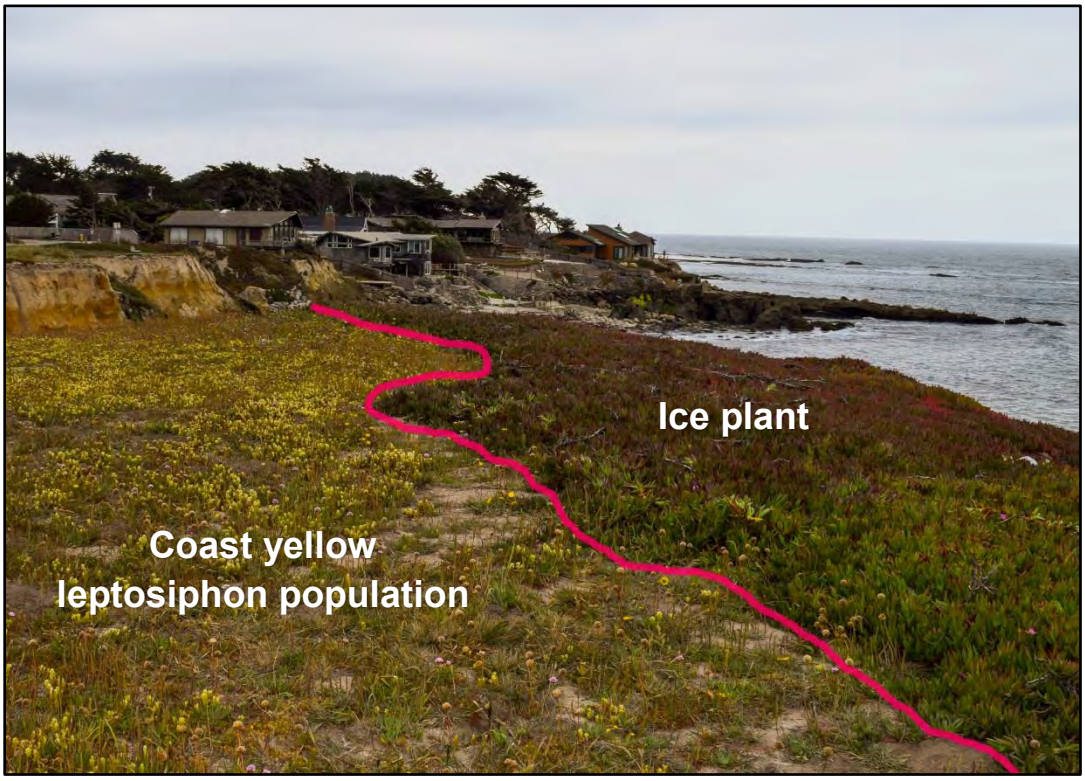


Photo 2: Freeway iceplant (*Carpobrotus edulis*) encroachment into coast yellow leptosiphon (*Leptosiphon croceus*) population

Figure 5. Freeway Iceplant Invasion

Other non-native plant species, such as rough cat's ear, rye grass, hare barley, and cut-leaved plantain, are also present growing in and around the coast yellow leptosiphon population. These invasive species may threaten the coast yellow leptosiphon population through a variety of mechanisms, including competition for light, water, or nutrients; thatch accumulation that inhibits seed germination and seedling recruitment; disruptions to pollination or seed-dispersal mutualisms; or other mechanisms (D'Antonio and Haubensak 1998).

The coast yellow leptosiphon population will likely continue to experience ongoing and increasing inputs of invasive plant propagules from nearby populations and other sources. The area is frequently used by pedestrians, who can serve as vectors for invasive species into the area. Habitat disturbances resulting from the close proximity of the population to urban development also provides opportunities for invasive species populations to establish and expand. In addition, the proposed development on the adjacent property would likely increase the input of invasive plant species from the spread of landscape plants into the area, and will increase disturbance and habitat modification, providing favorable habitat for invasive species.

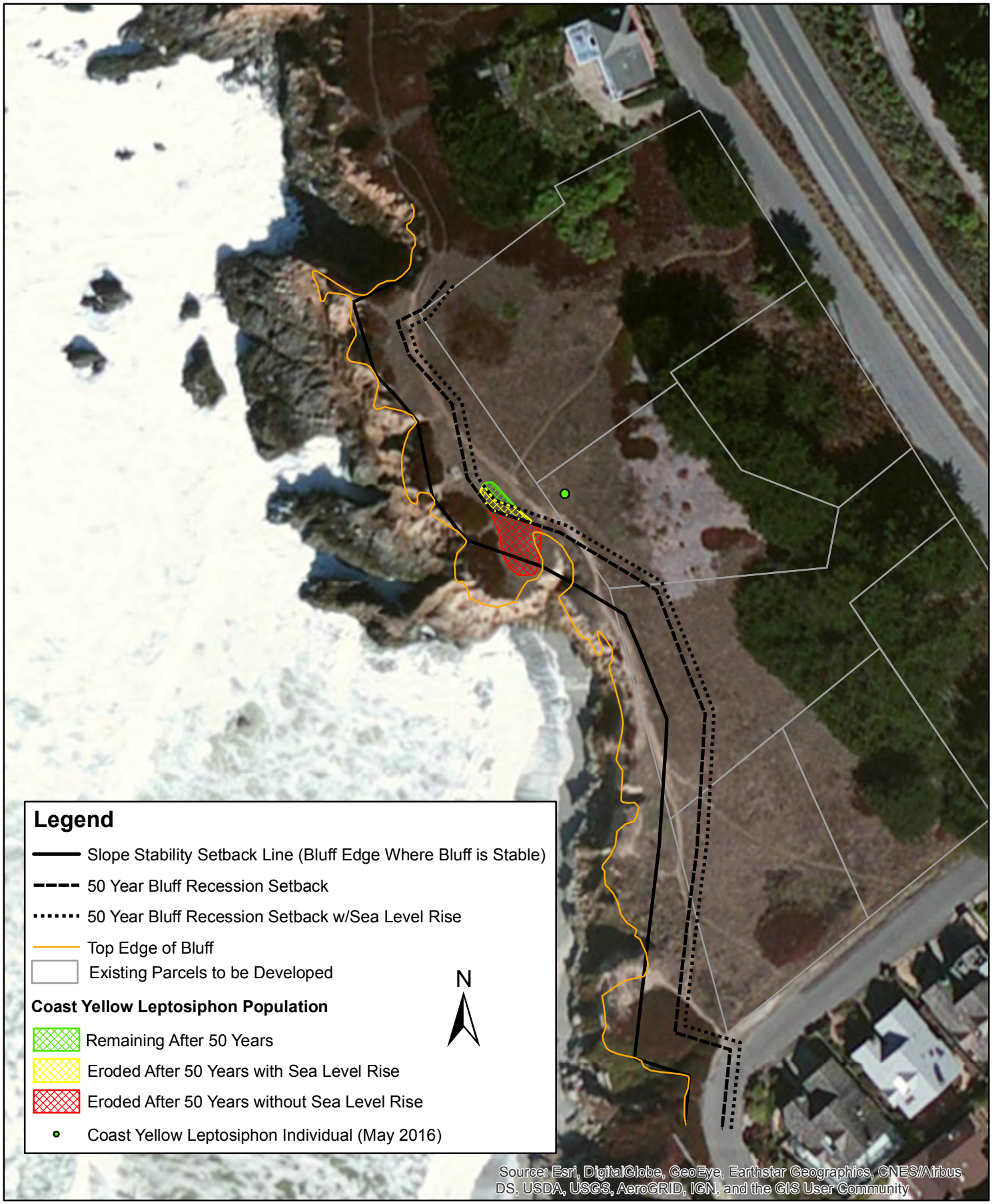
Bluff-Top Erosion and Rising Ocean Levels

The coast yellow leptosiphon population is located on Vallemar Bluff, approximately 8 meters (27 feet) from the edge of the bluff, and bluff-top erosion and rising ocean levels pose a serious threat to this species. Rainfall and wave splash or spray cause erosion of the bluff face. Additionally, slope instability results in landslides along the coastal bluff face, resulting in landward recession of the top edge of the coastal bluff. Coastal bluff landslides are caused by undermining the base of the bluff or from saturation of the bluff edge or bluff face (Haro, Kasunich & Associates, Inc. 2015).

A coastal bluff recession study was prepared by Haro, Kasunich & Associates, Inc., Consulting Geotechnical and Coastal Engineers (2015). Historical satellite photos and maps were reviewed and compared with the bluff edge position as surveyed in 2014. The results indicated that the coastal bluff had receded inland up to 14.6 meters (48 feet) between 1908 and 2014, which is a long term historical bluff recession rate of about 0.14 meter (0.45 foot) per year. Results of the study also indicated that about 3 to 5 meters (10 to 18 feet) of bluff recession occurred between 1986 and 2014, which is a long term historical bluff recession rate of about 0.11 to 0.20 meters (0.36 to 0.64 feet) per year.

Future bluff and coastal recession risk was estimated using the long-term historical average annual erosion rates as a minimum. Results suggested that a minimum of 6.9 meters (22.5 feet) of bluff recession will occur at Vallemar Bluff in the next 50 years (by the year 2065). Mean sea level along the California coast is expected to rise between 1.0 to 1.4 meters (3.3 to 4.6 feet) by the year 2100 due to climate change (Heberger et al. 2009), and the accelerating rate of sea level rise will likely result in increased future recession rates compared to average historical rates (Haro, Kasunich & Associates, Inc. 2015). Accelerated future sea level rise is expected to result in an estimated additional 1.7 meters (5.5 feet) of recession over the next 50 years, for a total of 8.6 meters (28 feet) of recession (Haro, Kasunich & Associates, Inc. 2015).

Projected future bluff edge recession was measured from where the bluff is considered stable as determined by Haro, Kasunich & Associates, Inc. (2015) (see Figure 6). They used the projected stable edge to project future recession and arrived at an estimated 50-year coastal recession setback line for development on Vallemar Bluff using the projected rates of recession described above. The 50-year setback is considered the minimum distance necessary to provide a stable building site of a 50-year lifetime of a proposed structure. The portion of the



Source: Haro, Kasunich, & Associates, Inc. (2015)

Figure 6. Coastal Bluff Recession at Vallemar Bluff

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bluff seaward of the 50-year setback line, which supports a large portion of the coast yellow leptosiphon population, is considered to be vulnerable to erosion over the next 50 years. It is likely that the coast yellow leptosiphon population, which is perched near the bluff edge, has been steadily reduced by cliff erosion. Based on the study conducted by Haro, Kasunich & Associates, Inc., the coast yellow leptosiphon population is located on a portion of the bluff that is highly susceptible to erosion over the next 50 years. If the bluff erodes to the 50-year setback line that accounts for rising sea level, approximately 80 percent of the coast yellow leptosiphon population will be destroyed (see Figure 6). Erosion of the bluff presents a significant threat to coast yellow leptosiphon and could lead to the extinction of the species.

Other Human-related Activities

The coast yellow leptosiphon population is threatened by other human-related activities, specifically trampling from foot traffic. People commonly walk on the bluff where the coast yellow leptosiphon population occurs, which may damage or kill coast yellow leptosiphon individuals through direct trampling of plants. In addition, there is nothing to prevent people from riding their bicycles on the bluff, which would further impact the coast yellow leptosiphon population. The property is easily accessible to the public, and a foot trail has been worn along the bluff that passes along the edge of the coast yellow leptosiphon population. A bench is present near the population overlooking the ocean, attracting visitors to cut through the coast yellow leptosiphon population to view the ocean. In addition to direct trampling of plants, human use of the site also increases disturbance and compaction of soil and facilitates the spread of invasive plant species. No barriers exist around the coast yellow leptosiphon population to protect plants from foot traffic and trampling. The proposed development will result in increased human activity in the area, thus increasing the threat to coast yellow leptosiphon from foot traffic and other human impacts.

Climate Change

Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia (IPCC 2014). Climate change presents a major challenge to the conservation of California's natural resources, and it will intensify existing threats and create new threats to natural systems.

Department staff conducted an assessment of the vulnerability of coast yellow leptosiphon to climate change using the NatureServe Climate Change Vulnerability Index Version 3.02 (NatureServe 2016). Based upon the Department's assessment, coast yellow leptosiphon likely has a climate change vulnerability index value of Highly Vulnerable (HV), indicating that available evidence suggests that abundance and/or range extent within the geographical area of the species is likely to decrease significantly by the year 2050. However, some ecological and life history information used for the climate change vulnerability assessment is not yet known for coast yellow leptosiphon. In particular, the Department does not know the mechanisms or species required for effective pollination of coast yellow leptosiphon, the mechanisms used by coast yellow leptosiphon for seed dispersal, or coast yellow leptosiphon's seed dispersal distance. Furthermore, the Department does not know whether or to what extent competing plant species such as freeway iceplant will be favored by projected future climates. Despite the lack of information about some of the ecological and life history information for coast yellow leptosiphon, the confidence in the vulnerability index score is very high based on the results of the Monte Carlo simulation used in the index (Young et al. 2015).

Vulnerability of Small Populations

Coast yellow leptosiphon has an exceptionally limited distribution, with only one population that occupies a very small area. The Department recognizes that species with small numbers of populations and small population sizes are highly vulnerable to extinction due to stochastic (chance) demographic, environmental, and genetic events (Shaffer 1981, 1987; Dirzo and Raven 2003; Groom et al. 2006; Primack 2006). Chance events such as a landslide at the bluff edge could result in the loss of all or a significant part of the coast yellow leptosiphon population.

Species with small numbers of populations or small populations may also be subject to increased genetic drift and inbreeding, which can affect population viability (Menges 1991; Ellstrand and Elam 1993).

Due to the vulnerability and rarity of coast yellow leptosiphon, the loss of any portion of the population would represent the loss of a significant portion of this species' genetic diversity and total range, and could result in its extinction.

Predation

The introduction of non-native slugs into the area from neighboring residential landscapes could pose a threat to the coast yellow leptosiphon population (A. Schusteff pers. comm. 2017). Non-native slugs are generalist herbivores that have been shown to negatively affect seedling survival of a wide range of plant species (Rathcke 1985; Buschmann et al. 2005; Strauss et al. 2009), and could potentially be grazing on coast yellow leptosiphon. Generalist herbivores such as slugs can reduce plant density and biomass, as well as alter species diversity within vegetation communities (Buschmann et al. 2005). The Department does not have any specific information on the impacts of non-native slugs to coast yellow leptosiphon, but it is possible that herbivory from slugs could negatively impact this species' survival.

Disease and Parasites

The Department does not have any information on diseases or parasites affecting coast yellow leptosiphon.

Overexploitation

The Department does not have any information on overexploitation affecting coast yellow leptosiphon.

REGULATORY AND LISTING STATUS

Federal

Coast yellow leptosiphon is not protected pursuant to the federal Endangered Species Act.

State

On December 23, 2016, the Commission published its Notice of Findings for coast yellow leptosiphon in the California Regulatory Notice Register, designating this species as a candidate

pursuant to CESA. The provisions of CESA apply to coast yellow leptosiphon while it is a candidate species (Fish & G. Code, § 2085). CESA prohibits the import, export, take, possession, purchase or sale of coast yellow leptosiphon, or any part or product of thereof, except in limited circumstances, such as through a permit or agreement issued by the Department under the authority of the Fish and Game Code. For example, the Department may issue permits that allow the incidental take of listed and candidate species if the take is minimized and fully mitigated, the activity will not jeopardize the continued existence of the species, and other conditions are met (Fish & G. Code, § 2081 subd. (b)). The Department may also authorize the take and possession of coast yellow leptosiphon for scientific, educational, or management purposes (Fish & G. Code, § 2081 subd. (a)).

Natural Heritage Program Ranking

All natural heritage programs, such as the CNDDB, use the same ranking methodology originally developed by The Nature Conservancy and now maintained by NatureServe (NatureServe 2012). This ranking methodology consists of a global rank describing the rank for a given taxon over its entire distribution, and a state rank describing the rank for the taxon over its state distribution. Both global and state ranks reflect a combination of rarity, threat, and trend factors. Coast yellow leptosiphon has been assigned a global rank of G1 and a state rank of S1 (CNDDB 2017), indicating that the species is critically imperiled both within California and throughout its entire range, with a very high risk of extinction due to extreme rarity (often five or fewer populations), very steep declines, or other factors.

California Rare Plant Rank

Some plants in California are assigned a California Rare Plant Rank (CRPR) to identify them as species of conservation concern. The Department works in collaboration with CNPS and botanical experts throughout the state to assign rare and endangered plants a CRPR reflective of their status. Coast yellow leptosiphon has been assigned a CRPR of 1B.1 (CNDDB 2017).

Plants with a CRPR of 1B are rare throughout their range with the majority of them endemic to California. Most of the plants that are ranked 1B have declined significantly over the last century. The threat code extension of ".1" indicates that the species is seriously threatened in California, with over 80 percent of occurrences threatened or a high degree and immediacy of threat (CNDDB 2017).

EXISTING MANAGEMENT EFFORTS

Resource Management Plans

The Department is not aware of any resource management plans prepared for coast yellow leptosiphon.

The coast yellow leptosiphon population is located within the Fitzgerald Marine Reserve, which is a San Mateo County Park, and is also adjacent to the Montara State Marine Reserve, which is a California Marine Protected Area that is located in California state waters below the mean high tide line. San Mateo County released a Master Plan for the Fitzgerald Marine Reserve in 2002, but the area where the coast yellow leptosiphon occurs on Vallemar Bluff was not surveyed, and coast yellow leptosiphon is not accounted for in the Master Plan (Brady/LSA 2002). San Mateo County Parks Department has been contacted about the omission and the

presence of coast yellow leptosiphon and the other rare plants located on the property. The County of San Mateo intends to revise the Master Plan to include management and protection of coast yellow leptosiphon and other rare plants located within the Fitzgerald Marine Reserve (Corelli 2016; R. Arechiga pers. comm. 2016, 2017).

Monitoring and Research

Petitioner and botanist, Toni Corelli, continues to visit and observe the coast yellow leptosiphon population at least once per year and observational information is being collected. The Department is not aware of any other ongoing coast yellow leptosiphon research or monitoring of the coast yellow leptosiphon population.

Habitat Restoration Projects

The Department has discussed the potential for seed collection, reintroduction, and habitat restoration for coast yellow leptosiphon with the County of San Mateo (R. Arechiga pers. comm. 2016, 2017). The County of San Mateo is interested in identifying nearby suitable habitat owned by the County of San Mateo to introduce coast yellow leptosiphon seed (Arechiga 2017). University of California Botanical Garden at Berkeley has approximately 870 seeds from 53 individual coast yellow leptosiphon plants in conservation storage (H. Forbes pers. comm. 2016, 2017). No efforts have been initiated for habitat restoration.

Impacts of Existing Management Efforts

Since its inception, the Fitzgerald Marine Reserve has been managed for multiple purposes, including education, research and scientific study, recreation, collection of seashore animals and plants, and fishing. However, the area where coast yellow leptosiphon occurs was not surveyed during preparation of the Master Plan, and currently no management is taking place on this portion of the Fitzgerald Marine Reserve (Brady/LSA 2002; Arechiga pers. comm. 2016, 2017).

SCIENTIFIC DETERMINATIONS REGARDING THE STATUS OF COAST YELLOW LEPTOSIPHON IN CALIFORNIA

CESA directs the Department to prepare this report regarding the status of coast yellow leptosiphon based upon the best scientific information available to the Department (Fish & G. Code, § 2074.6). CESA's implementing regulations identify key factors that are relevant to the Department's analyses. Specifically, a "species shall be listed as endangered or threatened ... if the Commission determines that its continued existence is in serious danger or is threatened by any one or any combination of the following factors: 1. present or threatened modification or destruction of its habitat; 2. overexploitation; 3. predation; 4. competition; 5. disease; or 6. other natural occurrences or human-related activities" (Cal. Code Regs., tit. 14, § 670.1, subd. (i)(1)(A)).

The definitions of endangered and threatened species in the Fish and Game Code provide key guidance to the Department's scientific analysis. An endangered species under CESA is one "which is in serious danger of becoming extinct throughout all, or a significant portion, of its range due to one or more causes, including loss of habitat, change in habitat, over exploitation, predation, competition, or disease" (Fish & G. Code, § 2062). A threatened species under CESA is one "that, although not presently threatened with extinction, is likely to become an

endangered species in the foreseeable future in the absence of special protection and management efforts required by [CESA]" (*Id.*, § 2067).

The preceding sections of this Status Review report describe the best scientific information available to the Department, with respect to the key factors identified in the regulations.

Present or Threatened Modification or Destruction of Habitat

Habitats along the San Mateo Coast have been impacted by a history of modification and destruction from development, agriculture, grazing, and other land use. Most of the coastal prairie habitat, which provides potential habitat for coast yellow leptosiphon, has been destroyed or modified due to urban development, agriculture, and invasion by non-native plant species. The proposed development on the property adjacent to the coast yellow leptosiphon population will result in habitat degradation and modification that will negatively impact the species and could result in a severe decline or extirpation of the population, thus leading to the extinction of the species. In addition, human use within and in the vicinity of the coast yellow leptosiphon population has resulted in habitat degradation that is evident on the ground and is visible from aerial imagery (see Figure 7). The proposed development will lead to an increase in human use of the area, resulting in additional impacts from trampling and habitat disturbance. In addition, burrowing mammals such as gophers are present at the coast yellow leptosiphon population and may be impacting coast yellow leptosiphon. The Department considers modification and destruction of habitat to be a significant threat to the continued existence of coast yellow leptosiphon.

Overexploitation

The Department does not consider overexploitation to be a significant threat to the continued existence of coast yellow leptosiphon.

Predation

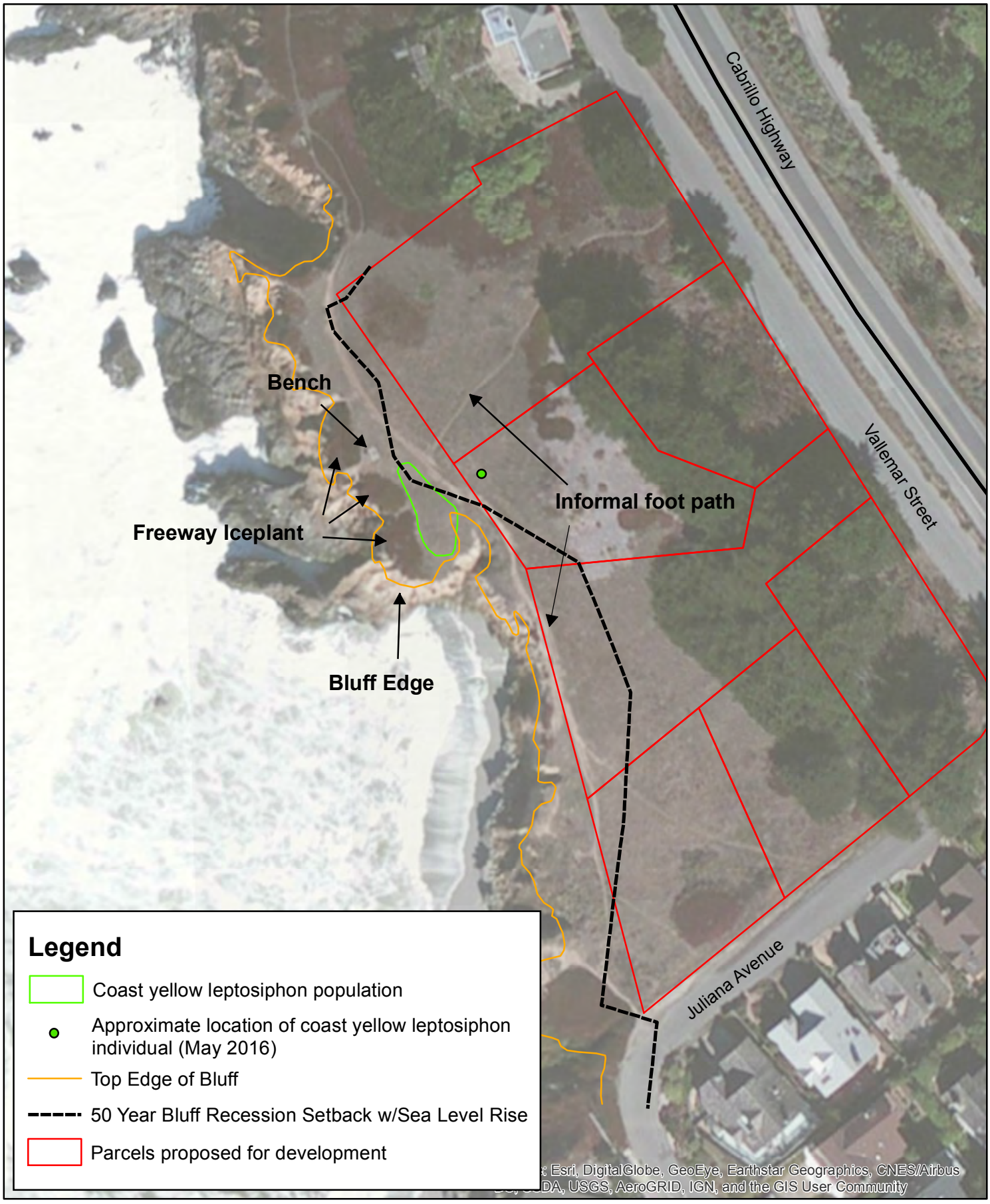
Herbivory from introduced non-native slugs could impact the survival of coast yellow leptosiphon, although limited information is available. The Department considers that predation could threaten the continued existence of coast yellow leptosiphon, but the degree of the threat is unknown.

Competition

Invasive plant species have been documented to pose serious threats to biodiversity around the world, and are a particularly pervasive problem in Mediterranean-type habitats like those in California. Invasive mat-forming freeway iceplant and other invasive plants, such as rough cat's ear and English plantain, occur within and in close proximity to the coast yellow leptosiphon population. The Department considers invasive plant species, particularly freeway iceplant, to be a significant threat to the continued existence of coast yellow leptosiphon.

Disease

There are no diseases known to be threats to the continued existence of coast yellow leptosiphon. The Department does not consider disease to be a significant threat to the continued existence of coast yellow leptosiphon.



Parcel Data Source: Digital Map Products 2017

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Figure 7. Proximity of Threats to Coast Yellow Leptosiphon (*Leptosiphon croceus*)
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Other Natural Occurrences or Human-related Activities

The coast yellow leptosiphon population is located near the edge of Vallemar Bluff, and bluff-top erosion and rising ocean levels pose a serious threat to this species. The climate of California is certain to change due to warming of the global climate system, which could lead to an accelerated rate of bluff erosion. Coast yellow leptosiphon has an extremely narrow distribution consisting of one population that occupies an extremely small area. Coast yellow leptosiphon's rarity and extremely limited distribution, and its occurrence in only one area that is partially surrounded by development, makes the species very vulnerable to stochastic events such as erosion, landslides, and drought, and to all other threats. Therefore, the loss of all or a significant portion of the coast yellow leptosiphon population would represent the loss of all or a significant portion of coast yellow leptosiphon's total range, and could result in the extinction of the species. Impacts from pedestrian traffic and trampling also pose a threat to coast yellow leptosiphon, and the proposed development would likely increase human use of the area. The Department considers erosion, other natural occurrences, and human-related activities to be a significant threat to the continued existence of coast yellow leptosiphon.

SUMMARY OF KEY FINDINGS

Coast yellow leptosiphon is an extremely rare species known from only one small population. The population occurs in close proximity to urban land use, and has been either directly or indirectly impacted by modification or destruction of habitat. Based upon current land use practices that include the potential development of the adjacent property, the modification, destruction, and impacts to coast yellow leptosiphon habitat are likely to continue into the future. The coast yellow leptosiphon population is being impacted by invasive plant species and human activities, such as pedestrian use of the area. Bluff-top erosion is also a serious and imminent threat to this species, and climate change may accelerate that process. Bluff-top erosion alone could lead to near extinction of the species in 50 years based on current bluff-top recession predictions. Compounding the threats to the species is the inherent vulnerability of small populations to extirpation due to stochastic events. The entire distribution of coast yellow leptosiphon is limited to one site that occupies an area approximately 167 square meters (1,800 square feet) in size (CNDDB 2017; Department staff observation), with population estimates over the years ranging between 400 and 1,000 individual plants; it is found nowhere else in the world. Due to the extremely limited distribution of coast yellow leptosiphon and its small population size, the loss of any portion of its population would be considered the loss of a significant portion of the species total range and would likely result in the extinction of this species.

The information available to the Department regarding the status of coast yellow leptosiphon indicates that there are significant threats to the continued existence of the species. Proximity of threats to the coast yellow leptosiphon population are illustrated in Figure 7.

RECOMMENDATION FOR PETITIONED ACTION

CESA directs the Department to prepare this report regarding the status of coast yellow leptosiphon in California based upon the best scientific information available to the Department (Fish & G. Code, § 2074.6). CESA also directs the Department to indicate in this Status Review whether the petitioned action is warranted (Fish & G. Code, § 2074.6; Cal. Code Regs., tit. 14, § 670.1, subd. (f)). The Department includes and makes its recommendation in this Status Review

as submitted to the Commission in an advisory capacity based on the best available science. Based on the criteria described above, the best scientific information available to the Department indicates that coast yellow leptosiphon is in serious danger of becoming extinct in all or a significant portion of its range due to one or more causes including loss of habitat, change in habitat, competition and other effects from invasive plant species, and other natural occurrences and human-related activities.

The Department recommends that the Commission find the petitioned action to list coast yellow leptosiphon as an endangered species to be warranted.

PROTECTION AFFORDED BY LISTING

It is the policy of the state to conserve, protect, restore and enhance any endangered or any threatened species and its habitat (Fish & G. Code, § 2052). If listed as an endangered or threatened species, unauthorized "take" of coast yellow leptosiphon will be prohibited, making the conservation, protection, and enhancement of the species and its habitat an issue of statewide concern. As noted earlier "take" is defined under CESA as hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill (*Id.*, § 86). Any person violating the take prohibition would be punishable under state law. The Fish and Game Code provides the Department with related authority to authorize "take" under certain circumstances (*Id.*, §§ 2081, 2081.1, 2086, 2087, 2089.6, 2089.10 and 2835). As authorized through an incidental take permit, however, impacts of the taking on coast yellow leptosiphon caused by the activity must be minimized and fully mitigated according to state standards.

Additional protection of coast yellow leptosiphon following listing would also occur during required public agency environmental review under the California Environmental Quality Act (CEQA), and its federal counter-part, the National Environmental Policy Act (NEPA). CEQA and NEPA both require affected public agencies to analyze and disclose project-related environmental effects, including potentially significant impacts on endangered, rare, and threatened special status species. Under CEQA's "substantive mandate," for example, state and local agencies in California must avoid or substantially lessen significant environmental effects to the extent feasible. With that mandate, and the Department's regulatory jurisdiction generally, the Department expects related CEQA and NEPA review will likely result in increased information regarding the status of coast yellow leptosiphon in California as a result of, among other things, updated occurrence and abundance information for individual projects. Where significant impacts are identified under CEQA, the Department expects project-specific required avoidance, minimization and mitigation measures will also benefit the species. While both CEQA and NEPA would require analysis of potential impacts to coast yellow leptosiphon regardless of their listing status under CESA, the acts contain specific requirements for analyzing and mitigating impacts to listed species. In common practice, potential impacts to listed species are examined more closely in CEQA and NEPA documents than potential impacts to unlisted species. State listing, in this respect, and required consultation with the Department during state and local agency environmental review under CEQA, is also expected to benefit the species in terms of related impacts for individual projects that might otherwise occur absent listing.

If coast yellow leptosiphon is listed under CESA, it may increase the likelihood that state and federal land and resource management agencies will allocate funds towards protection and recovery actions. However, funding for species recovery and management is limited, and there is a growing list of threatened and endangered species.

MANAGEMENT RECOMMENDATIONS AND RECOVERY MEASURES

CESA directs the Department in its Status Review to recommend management activities and other recommendations for recovery of coast yellow leptosiphon (Fish & G. Code, § 2074.6; Cal. Code Regs., tit. 14, § 670.1, subd. (f)). The utility of current data on coast yellow leptosiphon is limited by being largely anecdotal and qualitative. Studies designed to provide quantitative data on the coast yellow leptosiphon population, and the factors that affect the potential for coast yellow leptosiphon to survive and reproduce, are necessary for species management. Department staff with suggestions from local agencies, non-profits, and interested parties generated the following list of recommended management actions:

- Collect and bulk seeds of coast yellow leptosiphon for long term conservation storage and potential introduction into suitable habitat;
- Identify and restore degraded potential coast yellow leptosiphon habitat near the existing population. Collect and distribute seed into nearby suitable habitat;
- Permanently protect the coast yellow leptosiphon population on County of San Mateo property and on the private parcel where one individual coast yellow leptosiphon individual was observed from modification and destruction via fee title acquisition, conservation easements or similar protective measures;
- Permanently protect the private parcels adjacent to the coast yellow leptosiphon population from modification and destruction via fee title acquisition, conservation easements or similar protective measures to provide a buffer adjacent to the coast yellow leptosiphon population;
- Remove and control the freeway iceplant invasion adjacent to the coast yellow leptosiphon population;
- Restrict public access in the vicinity of the coast yellow leptosiphon population through installation of protective fencing and/or signs, or other suitable means;
- Remove or relocate the bench adjacent to the coast yellow leptosiphon population, or provide other creative foot-traffic influencing features in the area to encourage people to avoid walking through the coast yellow leptosiphon population;
- Research the life history characteristics of coast yellow leptosiphon, including factors related to pollination, seed dispersal, seed longevity and soil seed bank, seed productivity, growth, propagation, and microhabitat requirements for germination and recruitment;
- Implement monitoring and adaptive management programs for the coast yellow leptosiphon population. Ensure that monitoring results trigger appropriate management responses such as implementing other measures to control invasive species or controlling recreational activities. Make the data and reports from monitoring and adaptive management programs available to resource agencies and to those who are directly involved in coast yellow leptosiphon management;
- Implement a program to detect coast yellow leptosiphon population trends using statistically-valid population estimates; and
- Survey for additional populations of coast yellow leptosiphon.

PUBLIC RESPONSE

Comments were invited in response to the Petition in letters mailed on June 6, 2017, to property owners where the coast yellow leptosiphon population occurs and adjacent property owners,

and in a Department Press Release dated August 9, 2017. The Department received three comments in response to the press release and letters, which are included in Appendix A.

PEER REVIEW

Independent botany experts were invited to review the Status Review report before submission to the Fish and Game Commission. A list of names and affiliations of invited peer reviewers, the letters of invitation, all comments received by the Department's deadline, and the Department's responses to comments are included in Appendix B.

ACKNOWLEDGEMENTS

The Department would like to thank Mr. Neal Kramer, Dr. Robert Patterson, and Dr. Aaron Schusteff for providing scientific peer review for this Status Review.

LITERATURE CITED

The following sources were used during the preparation of this Status Review report:

Albert, M. 2000. *Carpobrotus edulis* (L.) N.E. Br. Pages 90-94 in C.C. Bossard, J.M. Randall, and M.C. Hoshovsky. Invasive Plants of California's Wildlands. University of California Press, Berkeley, CA.

Albert, M.E. 1995. Portrait of an invader II: the ecology and management of *Carpobrotus edulis*. CalEPPC News 3(2):4-6.

Bartomeus, I., and M. Vilà. 2009. Breeding system and pollen limitation in two supergeneralist alien plants invading Mediterranean shrublands. Australian Journal of Botany 67:109-115.

Battaglia, R. 1998. Field survey form for *Linanthus croceus* dated May 23, 1998.

Battaglia, R., and R. Patterson. 2001. A morphometric analysis of the *Leptosiphon androsaceus* complex (Polemoniaceae) in the Central and South Coast ranges. Madroño 48:62-78.

Bell, C.D., and R.W. Patterson. 2000. Molecular phylogeny and biogeography of *Linanthus* (Polemoniaceae). American Journal of Botany 87:1857-1870.

Bittman, R. 2001. The California Natural Diversity Database: A Natural Heritage Program for Rare Species and Vegetation. Fremontia 29:3-4.

Bourgeois, K., C.M. Suehs, E. Vidal, and F. Médail. 2005. Invasional meltdown potential: Facilitation between introduced plants and mammals on French Mediterranean islands. Ecoscience 12:248-256.

Brady/LSA. 2002. Fitzgerald Marine Reserve Master Plan. Prepared for the County of San Mateo. Available from http://parks.smcgov.org/documents/fitzgerald-marine-reserve-master-plan 157 pp.

Buschmann, H., M. Keller, N. Porret, H. Dietz, and P.J. Edwards. 2005. The effect of slug grazing on vegetation development and plant species diversity in an experimental grassland. Functional Ecology 19:291-298.

California Department of Fish and Wildlife, Biogeographic Data Branch. 2017. Natural Communities – Background Information. Website https://www.wildlife.ca.gov/data/VegCAMP/Natural-Communities/Background [accessed 26 June 2017].

California Department of Fish and Wildlife. 2016. Report to the Fish and Game Commission Evaluation of the Petition from Ms. Toni Corelli and the California Native Plant Society to List Coast Yellow Leptosiphon (*Leptosiphon croceus*) as an Endangered Species under the California Endangered Species Act. 17 pp.

CNDDB (California Natural Diversity Database). 2017. Rarefind 5 [Internet]. California Department of Fish and Wildlife. [Version: July 1, 2017].

Cal-IPC (California Invasive Plant Council). 2017. California Invasive Plant Inventory Database. Available online at: http://www.cal-ipc.org/paf/. [accessed 2017 August 2].

CDRC (Coastside Design Review Committee). 2017. Letter to Moss Beach Associates, LLC dated July 25, 2017. Available from: http://www.midcoastcommunitycouncil.org/vallemar-bluff/ [accessed 8 August 2017].

CNPS (California Native Plant Society) Rare Plant Program. 2017. Inventory of Rare and Endangered Plants (Online Edition, v8-03 0.39). Available online at: http://www.rareplants.cnps.org [accessed 10 August 2017].

Conser, C., and E.F. Connor. 2009. Assessing the residual effects of *Carpobrotus edulis* invasion, implications for restoration. Biological Invasions 11:349-358.

Corelli, T. 1999. Field survey form for *Linanthus croceus* dated May 31, 1999.

Corelli, T. 2015. 2015. Field survey form for *Leptosiphon croceus* dated May 3, 2015.

Corelli, T. 2016. Coast Yellow Leptosiphon Petition to the State of California Fish and Game Commission. May 23, 2016. 18 pp.

County of San Mateo, Planning and Building. 2017. Four Residences at Juliana & Vallemar, Moss Beach. Website: http://planning.smcgov.org/four-residences-juliana-vallemar-moss-beach [accessed 3 August 2017].

D'Antonio, C.M. 1990. Seed production and dispersal in the non-native, invasive succulent *Carpobrotus edulis* (Aizoaceae) in coastal strand communities of central California. Journal of Applied Ecology 27:693-702.

D'Antonio, C.M., and K. Haubensak. 1998. Community and ecosystem impacts of introduced species. Fremontia 26(4):13-18.

D'Antonio, C.M., and B.E. Mahall. 1991. Root profiles and competition between the invasive, exotic perennial, *Carpobrotus edulis*, and two native shrub species in California coastal scrub. American Journal of Botany 78: 885-894.

D'Antonio, C.M., and P.M. Vitousek. 1992. Biological invasions by exotic grasses, the grass/fire cycle, and global change. Annual Review of Ecology and Systematics 23(1992):63-87.

Digital Map Products. 2017. LandVision, subscription map service. Website: https://www.digmap.com [Accessed 25 May 2017].

Dirzo, R., and P. Raven. 2003. Global state of biodiversity and loss. Annual Review of Environment and Resources 28:137-167.

Eastwood, A. 1904. Some new species of western Polemoniaceae. Botanical Gazette 37:437-447.

Ellstrand, N.C., and D.R. Elam. 1993. Population Genetic Consequences of Small Population Size: Implications for Plant Conservation. Annual Review of Ecology and Systematics 24: pp. 217-242.

Ford, L. D., and G. F. Hayes. 2007. Northern Coastal Scrub and Coastal Prairie. Pages 180-207 in M.G. Barbour, T. Keeler-Wolf, and A. Schoenherr, eds. Terrestrial Vegetation of California. 3rd edition. University of California Press, Berkeley.

Fried, G, B. Laitung, C. Pierre, N. Chagué, and F.D. Panetta. 2014. Impact of Invasive Plants in Mediterranean Habitats: Disentangling the Effects of Characteristics of Invaders and Recipient Communities. Biological Invasions 16:1639-1658.

Gaertner, M., A.D. Breeyen, C. Hui, and D.M. Richardson. 2009. Impacts of Alien Plant Invasions on Species Richness in Mediterranean-type Ecosystems: A Meta-analysis. Progress in Physical Geography 33:319–338.

Given, D.R. 1994. Principles and Practice of Plant Conservation. Timber Press, Portland, Oregon.

Godfrey, M. 2015. Ecological Buffers. Reducing Ecological Impacts of Shale Development: Recommended practices for the Appalachians. Available from: https://www.nature.org/media/centralapps/recommended-shale-practices-ecological-buffers.pdf?redirect=https-301 [accessed 14 August 2017].

Goodwillie, C. 1999. Wind pollination and reproductive assurance in *Linanthus parviflorus* (Polemoniaceae), a self-incompatible annual. American Journal of Botany 86:948-954.

Goodwillie, C. 2001. Pollen limitation and the evolution of self-compatibility in *Linanthus* (Polemoniaceae). International Journal of Plant Science 162:1283-1292.

Greene, E.L. 1889-1892. Some American Polemoniaceae. Pittonia 2:251-260.

Groom, M.J., Meffe, G.K., and C.R. Carroll. 2006. Principles of Conservation Biology, Third Edition. Sinauer Associates, Inc., Sunderland, MA.

Hankamp, P., C.D. Bell, and R. Patterson. 2016. Towards a complete species level phylogeny of *Leptosiphon* (Polemoniaceae). Madroño 63:208-219.

Haro, Kasunich & Associates, Inc. 2015. Coastal Bluff Recession Study, Juliana Avenue and Vallemar Street. Report prepared for Moss Beach Associates LLC. Available from: http://www.midcoastcommunitycouncil.org/vallemar-bluff/ [accessed 8 August 2017].

Heberger, M., H. Cooley, P. Herrera, P.H. Gleick, and E. Moore. 2009. The impacts of sea-level rise on the California coast. Prepared by the Pacific Institute for the California Climate Change Center. 115 pp.

Holland, R. 1986. Preliminary Descriptions of the Terrestrial Natural Communities of California. California Department of Fish and Game, The Resources Agency. Sacramento, CA. 165 pp.

Huntly, N., and R. Inouye. 1988. Pocket gophers in ecosystems: patterns and mechanisms. BioScience 38:786-793.

Inouye, R.S., N.J. Huntly, D. Tilman, and J.R. Tester. 1987. Pocket gophers (*Geomys bursarius*), vegetation, and soil nitrogen along a successional sere in east central Minnesota. Oecologia 72:178-184.

IPCC. 2014. Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland. 151 pp.

JCP-Engineers and Geologists, Inc. 1990. Engineering Geologic Reconnaissance Study for Proposed Development of Seven Homes on Vallemar Street, Juliana Avenue, Moss Beach, California. Prepared for Richard Charnock, November 15, 1990.

Jepson, W.L. 1925. A manual of the flowering plants of California. University of California Press, Berkeley, CA.

Jodi McGraw Consulting. 2017. Vallemar Bluffs Conservation Strategy. Report Prepared for Moss Beach Associates. Available online at http://www.midcoastcommunitycouncil.org/vallemar-bluff/ [accessed 8 August 2017].

Klein, A., T. Keeler-Wolf, and J. Evens. 2015. Classification of the Vegetation Alliances and Assocations of Sonoma County, California. Volume 1 of 2 – Introduction, Methods, and Results. Report prepared for The Sonoma County Agricultural Preservation and Open Space District, The Sonoma County Water Agency.

Levine J.M., M. Vilà, C.M. D'Antonio, J.S. Dukes, K. Grigulis, and S. Lavorel. 2003. Mechanisms Underlying the Impacts of Exotic Plant Invasions. Proceedings of the Royal Society of London B 270:775-781.

Line, D.E., and N.M. White. 2007. Effects of development on runoff and pollutant export. Water Environment Research 79:185-190.

Menges, E.S. 1991. The Application of Minimum Viable Population Theory to Plants. pp. 45-61 in D.A Falk and K.E. Holsinger (eds.). Genetics and Conservation of Rare Plants. Oxford University Press, New York, NY.

Mesiti-Miller Engineering, Inc. 2017. Utility and Drainage Plan, Vallemar Street & Juliana Avenue, Moss Beach California. Available from: http://www.midcoastcommunitycouncil.org/vallemar-bluff/ [accessed 3 August 2017].

Midcoast Community Council. 2017. Vallemar Bluff. Website: http://www.midcoastcommunitycouncil.org/vallemar-bluff/ [accessed 3 August 2017].

Milliken, J. 1904. A review of California Polemoniaceae. University of California Publications in Botany 2:1-71.

Munz, P.A. 1959. A California Flora. University of California Press, Berkeley, CA.

NatureServe. 2012. NatureServe Conservation Status Assessments: Methodology for Assigning Ranks. NatureServe Report Revised Edition June 2012. Available online at http://www.natureserve.org/sites/default/files/publications/files/natureserveconservationstatusmethodology_jun12_0.pdf [accessed 10 August 2017].

NatureServe. 2016. The NatureServe Climate Change Vulnerability Index release 3.02. Available from: http://www.natureserve.org/climatechange [accessed 28 July 2017].

Pampeyan, E. 1994. Geologic Map of the Montara Mountain and San Mateo 7-1/2' Quadrangles, San Mateo County, California. U.S. Department of the Interior, U.S. Geological Survey.

Patterson, R. 1993. *Linanthus parviflorus*, pp. 843-844 in J.C. Hickman (ed.). The Jepson Manual: Higher Plants of California. University of California Press. Berkeley, CA.

Patterson, R., and R. Battaglia. 2017. *Leptosiphon croceus*, in Jepson Flora Project (eds.) *Jepson eFlora.* http://ucjeps.berkeley.edu/eflora/eflora_display.php?tid=80954 [accessed 2017 August 7].

Pearson Design Group. 2016. Moss Beach – Overall Site Plan. Design Review Set, April 26, 2016. Available from http://www.midcoastcommunitycouncil.org/vallemar-bluff/ [accessed 10 August 2017].

Pimentel, D., R. Zuniga, and D. Morrison. 2004. Update on the Environmental and Economic Costs Associated with Alien-invasive Species in the United States. Ecological Economics 52:273-288.

Porter, J.M., and L.A. Johnson. 2000. A phylogenetic classification of Polemoniaceae. Aliso: A Journal of Systematic and Evolutionary Biology 19:55-91.

Primack, R.B. 2006. Essentials of Conservation Biology, Fourth Edition. Sinauer Associates, Sunderland, MA.

PRISM Climate Group. 2017. Oregon State University. Available online at: http://prism.oregonstate.edu. Created June 27, 2017.

Randall, J.M., and M.C. Hoshovsky. 2000. California's Wildland Invasive Plants. pp. 11-27 in Bossard, C.C., J.M. Randall, and M.C. Hoshovsky. Invasive Plants of California's Wildlands. University of California Press. Berkeley, CA.

Rathcke, B. 1985. Slugs as generalist herbivores: Tests of three hypotheses on plant choices. Ecology 66:828-836.

Reichman, O.J., and E.W. Seabloom. 2002. The role of pocket gophers as subterranean ecosystem engineers. Trends in Ecology and Evolution 17:44-49.

Santoro, R., T. Jucker, M.L. Carranza, and A.T.R. Acosta. 2011. Assessing the effects of *Carpobrotus* invasion on coastal dune soils. Does the nature of the invaded habitat matter? Community Ecology 12:234-240.

Saunders, D.A., R.J. Hobbs, and C.R. Margules. 1991. Consequences of ecosystem fragmentation: a review. Conservation Biology 5(1):18-32.

Sawyer, J.O., T. Keeler-Wolf, and J.M. Evans. 2009. A Manual of California Vegetation, Second Edition. California Native Plant Society Press. Sacramento, CA.

Shaffer, M.L. 1981. Minimum population Sizes for Species Conservation. Bioscience 31:131-134.

Shaffer, M.L. 1987. Minimum Viable Populations: Coping with Uncertainty. pp. 69-86 in Soule, M.E. (ed.), Viable Populations for Conservation. Cambridge University Press, Cambridge, England.

Smil, V. 1997. Global population and the nitrogen cycle. Scientific American 277(1):76-81.

Soil Survey Staff. 2017. Web Soil Survey. Natural Resources Conservation Service, United States Department of Agriculture. Available online at https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx [accessed June 26, 2017].

Spitzer, G. 2002. Ice plant getting cold reception from naturalists. Los Angeles Times, May 04, 2002. Available online at http://articles.latimes.com/2002/may/04/local/me-outthere4 [accessed 4 August 2017].

Strauss, S.Y., M.L. Stanton, N.C. Emery, C.A. Bradley, A. Carleton, D.R. Dittrich-Reed, O.A. Ervin, L.N. Gray, A.M. Hamilton, J.H. Rogge, S.D. Harper, K.C. Law, V.Q. Pham, M.E. Putnam, T.M. Roth, J.H. Theil, L.M. Wells, and E.M. Yoshizuka. 2009. Cryptic seedling herbivory by nocturnal introduced generalists impacts survival, performance of native and exotic plants. Ecology 90:419-429.

Strother, J.L., and K.R. Kersh. 2016. Typifications of *Linanthus parviflorus* var. *croceus* Milliken and *Linanthus croceus* Eastw. (Polemoniaceae). Phytoneuron 2016-21:1-2.

Suehs, C.M., E. Medail, and L. Affre. 2004. Invasion dynamics of two alien *Carpobrotus* (Aizoaceae) taxa on a Mediterranean island: I. Genetic diversity and introgression. Heredity (2004) 92:31-40.

USDA (United States Department of Agriculture), Natural Resources Conservation Service. 2017. Buffer Strips: Common Sense Conservation. Webpage: https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/home/?cid=nrcs143_023568 [accessed 14 August 2017].

van Kleunen, M., W. Dawson, F. Essl, J. Pergl, M. Winter, E. Weber, H. Kreft, P. Weigelt, J. Kartesz, M. Nishino, L.A. Antonova, J. F. Barcelona, F. J. Cabezas, D. Cárdenas, J. Cárdenas-Toro, N. Casaño, E. Chacón, C. Chatelain, A.L. Ebel, E.Figueiredo, N. Fuentes, Q.J. Groom, L. Henderson, Inderjit, A. Kupriyanov, S. Masciadri, J. Meerman, O. Morozova, D. Moser, D.L. Nickrent, A. Patzelt, P.B. Pelser, M.P. Baptiste, M. Poopath, M. Schulze, H. Seebens, S. Shu, J. Thomas, M. Velayos, J.J. Wieringa, and P. Pyšek. 2015. Global Exchange and Accumulation of Non-native Plants. Nature 525:100-103.

Vilà, M., M. Tessier, G.M. Suehs, G. Brundu, L. Carta, A. Galanidis, P. Lambdon, M. Manca, F. Médail, E. Moragues, A. Traveset, A.Y. Troumbis, and P.E. Hulme. 2006. Local and regional assessment of the impacts of plant invaders on vegetation structure and soil properties of Mediterranean islands. Journal of Biogeography 33:853-861.

Villarreal, D., K.L. Clark, L.C. Branch, J.L. Hierro, and M. Machicote. 2008. Alteration of ecosystem structure by a burrowing herbivore, the plains vizcacha (*Lagostomus maximus*). Journal of Mammalogy 89:700-711.

Vitousek, P.M., J.D. Aber, R.W. Howarth, G.E. Likens, P.A. Matson, D.W. Schindler, W.H. Schlesinger, and D.G. Tilman. 1997. Human alteration of the global Nitrogen cycle: sources and consequences. Ecological Applications 7:737–750.

Weber, J.J., and C. Goodwillie. 2013. Variation in floral longevity in the genus *Leptosiphon*: mating system consequences. Plant Biology 15(2013):220-225.

Wilcove, D.S., D. Rothstein, J. Dubow, A. Phillips, and E. Losos. 1998. Quantifying Threats to Imperiled Species in the United States. Bioscience 48:607-615.

Xiao, Y., X. Li, Y. Cao, and M. Dong. 2016. The diverse effects of habitat fragmentation on plant-pollinator interactions. Plant Ecology 217:857-868.

Young B.E., E. Byers, G. Hammerson, A. Frances, L. Oliver, and A. Treher. 2015. Guidelines for using the NatureServe Climate Change Vulnerability Index Release 3.0. Arlington, VA: NatureServe.

Yurkonis, K.A., and S.J. Meiners. 2004. Invasion Impacts Local Species Turnover in a Successional System. Ecology Letters 7:764-769.

Zander, Michael J. 2015. Vegetation Characterization and Mapping, Moss Beach Lots. Letter to Owen Lawlor, Moss Beach Associates, LLC. May 21, 2015.

Personal Communication

Arechiga, Ramona. Phone conversation. August 12, 2016.

Arechiga, Ramona. Phone conversation. June 27, 2017.

Corelli, Toni. Personal e-mail communication. June 8, 2016.

Forbes, Holly. Personal e-mail communication. August 11, 2016.

Forbes, Holly. Personal e-mail communication. August 03, 2017.

Lazar, Kristi. Personal e-mail communication. March 4, 2016.

Schusteff, Aaron. Peer review comments. November 1, 2017.

APPENDIX A: Comments from Affected and Interested Parties on the Petitioned Action

VRAM 6/28/17

Moss Beach Associates, LLC

June 19, 2017

Richard Macedo
Branch Chief
Habitat Conservation Planning Branch
California Department of Fish and Wildlife
1416 Ninth Street, 12th Floor
Sacramento, CA 95814

RE: Coast Yellow Leptosiphon

Dear Mr. Macedo:

Thank you for your letter dated June 6, 2017 regarding the status review of coast yellow leptosiphon (*Leptosiphon croceus*). Moss Beach Associates, LLC received the listing notice dated December 8, 2016 and are aware of current candidate status and imminent listing of this rare species.

We have observed that coast yellow leptosiphon occurs on the Fitzgerald Marine Reserve located west (seaward) of our parcel (APN 037-086-250), as described in greater detail in the listing petition. Since *2013*, prior to the listing, my associates and I have worked with a multidisciplinary team of experts including biologists, and have coordinated with representatives of local conservation agencies and organizations including the San Mateo County Parks Department, the local California Native Plant Society, and the Committee for Green Foothills, to craft a conservation strategy for the site. The strategy is designed to completely avoid impacts to coast yellow leptosiphon and protect coastal prairie habitat through a series of conservation measures.

First, the project will permanently protect (through a conservation easement) 0.91 acres on the western portion of the parcel, adjacent to the coast yellow leptosiphon occurrence and the Fitzgerald Marine Reserve. This new Preserve, which will feature high-quality coastal prairie habitat will be restored and then managed in perpetuity to promote biodiversity conservation goals for coastal prairie habitat. The specific management goals and strategies will be identified in an Adaptive Management and Monitoring Plan (AMMP), which our team has offered to develop in coordination with San Mateo County Parks Department, which manages the adjacent Fitzgerald Marine Reserve which supports the coast yellow leptosiphon, to address management of the larger coastal prairie community on the bluff., The AMMP is anticipated to include measures to protect coastal prairie habitat, including controlling exotic plants and managing public access to limit impacts on rare plants and coastal bluff erosion.

We intend to construct four homes on the property in the landward (eastern) portion of the parcel, which is largely dominated by exotic and ornamental plants. The development proposal includes the following additional measures to avoid impacts to coast yellow leptosiphon: development will be sited in largely unsuitable habitat; storm water and drainage will be managed to limit impacts to the coastal prairie, erosive bluff edge, and the near-shore marine environment; landscaping will be conducted with

plants native to coastal San Mateo County; and use restrictions will be recorded on the deeds to protect the preserve and adjacent reserve, including preventing invasive species installation and restricting the use of pesticides and fertilizers.

The potential effects of this development project on rare species, including coast yellow leptosiphon, will be thoroughly evaluated in the California Environmental Quality Act (CEQA) document for the project, which will document complete avoidance of impacts to coast yellow leptosiphon, and thereby also be consistent with the Sensitive Habitat Section of San Mateo County's LCP. As a result of the conservation strategy that has been developed for the site, we are confident that all potential effects to coast yellow leptosiphon will be avoided and that the portion of the site dedicated for the protection and long-term management of coastal prairie will increase the probability of the persistence of the rare plant species occurring in the Fitzgerald Marine Reserve, including coast yellow leptosiphon. As such, we expect that the CEQA evaluation will conclude that all effects will be avoided and that the effects of the project are less than significant.

Sincerely,

Owen Lawlor

Managing Member

Moss Beach Associates, LLC

Cc:

Ramona Arechiga, Natural Resources Manager San Mateo County Parks 455 County Center, Redwood City, CA 94063

Jodi M. McGraw, Ph.D., Ecologist and Principal, Jodi McGraw Consulting, PO Box 221, Freedom, CA 95019

Mike Zander, Zander Associates, 1569 Solano Avenue, #255 Berkeley, CA 94707

Burton, Cherilyn@Wildlife

From: [redacted]
Sent: Thursday, August 10, 2017 9:54 AM
To: Wildlife Native Plants
Subject: Coast Yellow Leptosiphon
Attachments: FINAL-Winter2016.pdf; 2015-12-04-VB-Rare-Plant-Corelli.pdf; 20170810_081043.jpg; 20170810_081604.jpg; 20170810_081950.jpg; 20170810_082019.jpg

To whom it may concern:

My name is Marcia Yeates and I am a resident of Moss Beach CA. I live about 5 minutes walking distance from the site which I think is the California Coast Prairie
which is the habitat of the Coast Yellow Leptosiphon .
Developers are in the permitting process of building 4 large scale houses on the backside of this area.
I have attached articles and photos.
Please protect this rare beautiful area and it's rare, delicate flora.

Thank you, Marcia yeates

greenfootnotes
COMMITTEE FOR GREEN FOOTHILLS

Vallemar Bluffs: A Coastal Jewel

BY LENNIE ROBERTS LEGISLATIVE ADVOCATE

Vallemar Bluffs, a small but significant piece of the coast in Moss Beach that we are working to protect.

Perched above the rocky coastal bluffs in northern Moss Beach is the 2.4-acre Vallemar Bluffs. Neighbors and visitors alike enjoy the spectacular views of the cliffs, pocket beach, and intertidal reefs. An informal public trail begins at Juliana Avenue and follows the edge of the bluffs along a historic street called "The Strand," a street that existed only on developers' plans. Neighbors have built three benches overlooking the coast, adding to the trail's charm.

Several attempts to develop this property over the past 25 years have been unsuccessful, primarily due to the lack of community water. Now, however, the Montara Water and Sanitary District has found a new, reliable water source, and the landowners are moving ahead with development plans for five homes.

While we and many others would love to see this coastal gem added to the adjacent Fitzgerald Marine Reserve in its entirety, we recognize that due to lack of sufficient funding available for acquisition, some development is likely to be permitted here.

FULLY PROTECTING COASTAL PRAIRIE HABITAT AND AVOIDING BLUFF EROSION IS KEY

Committee for Green Foothills has been pushing for maximum protection of the site's rare coastal prairie grassland and wildflower habitat and establishment of adequate setbacks from future cliff and bluff erosion. Ensuring these two protections would preserve most of the scenic views along the shore and the existing public access. The new plans already include a proposal to conserve permanently some of the western area of the property. However, development of "Lot D" remains a significant problem.

Continued on Page 4

IN THIS ISSUE

THE COAST YELLOW LEPTOSIPHON

The coast yellow leptosiphon is a rare plant which is found nowhere else in the world.

This beautiful species was collected May 9, 1901 by Alice Eastwood. From her notes: ***"it covered the ground for several acres, but was seen in no other place...It is perhaps the most strikingly beautiful species of the group...The great masses almost monopolized the ground."***

Half Moon Bay Botanist Toni Corelli has petitioned the State for listing of this rare species.

Continued from Page 1

The western area of the property is comprised of increasingly rare coastal prairie habitat, which supports four rare and endangered plants, one of which is found nowhere else in the world. The coast yellow leptosiphon, a plant first described by Alice Eastwood in the early 1900s, is now only found clinging to the edge of the Vallemar Bluffs. We are asking that the entire coastal prairie be protected, with adequate buffers to allow the habitat to migrate inland as the bluffs erode.

Committee for Green Foothills' Legislative Advocate Lennie Roberts and Surfrider's Rob Caughlan on a section of Moss Beach coast we're trying to protect.

A dynamic interface between ocean and land operates in this area. The cliffs and bluffs are eroding, and the future erosion of the coastal terrace marine deposits is a major constraint to building in the western portion of this property. The County's Local Coastal Program and the Coastal Act require that new development must be set back far enough to avoid projected bluff erosion. We believe that building a house on "Lot D" fails this requirement.

We have engaged two experts in coastal erosion processes to provide an independent evaluation of the projected bluff erosion, taking into consideration sea level rise and other factors that the developer's consultants appear to have underestimated.

SOME MORE LEGAL AND PRACTICAL CONCERNS

An "antiquated subdivision map" filed with the county in the early 1900s created 42 tiny lots on Vallemar Bluffs, without regard to topography, habitats, public services, access, or any other modern planning constraints. In 1990 the county consolidated these 42 lots into seven through a "Lot Merger and Lot Line Adjustment," without any public notice and review. Whether this process was legal is debatable. Coastal Commission staff has written to the county planning office questioning why a Coastal Development Permit was not required. We have raised similar questions.

Another concern is whether the proposed long term management and monitoring of the coastal prairie habitat will be successful over time. Even the best-written plans depend upon adequate funding, and enforcement inevitably requires vigilance and oversight of overworked environmentalists.

While we are pleased that the revisions to the project are a step in the right direction, we continue to oppose development on "Lot D", as it is perilously close to the bluffs and is covered with significant area of coastal prairie habitat. Further, any development on this lot would completely block coastal views from much of Juliana Avenue.

NEXT STEPS

We are urging the county to require a focused Environmental Impact Report that includes a revised plan that fully addresses our concerns, as well as those of many members of the public. Winning protection of this coastal jewel's sensitive habitats and scenic beauty will be a high priority for us in the upcoming year.

For nearly 40 years, Lennie Roberts has been our voice in San Mateo County. One of the Bay Area's most respected environmental leaders, Lennie has led countless critical open space battles on the San Mateo county coast and along Skyline Boulevard.

December 4, 2015

To: Dave Holbrook, Senior Planner, County of San Mateo
San Mateo County Planning and Building
455 County Center, 2nd Floor
Redwood City, CA 94063

Proposed development of Juliana & Vallemar, Moss Beach also known as Vallemar Bluff (PLN2015-00380).

Dear Dave,

As the Rare Plant Chairperson in San Mateo County, for the Santa Clara Valley Chapter of the California Native Plant Society (CNPS) we are concerned about the proposed development of Juliana & Vallemar, Moss Beach, also referred to as Vallemar Bluff (Planning Case File No. PLN2015-00380, http://planning.smcgov.org/six-residences-juliana-vallemar-moss-beach). This proposal would greatly disturb and eliminate much of the coastal prairie grassland and rare plant habitat on the bluff top. A map showing rare plants and habitat is attached. A small section of the bluff, the western edge is San Mateo County Property, a part of Fitzgerald Marine Reserve. (APN-037-087-050)

This year the California Native Plant Society documented the rare plants that occur on the Vallemar bluff top and we discovered a new population of Agrostis blasdalei (BLASDALE'S BENT GRASS). This species is very rare in San Mateo County with only one other population documented near Franklin Point. We also documented Castilleja ambigua ssp. ambigua (JOHNNY-NIP), Hosackia gracilis (HARLEQUIN LOTUS), and Leptosiphon croceus (COAST YELLOW LEPTOSIPHON) occurrence #2.

Leptosiphon croceus (COAST YELLOW LEPTOSIPHON) is a very rare plant. There are two other historical occurrences #1 and #3 documented along the San Mateo Coast. Other botanists and I have looked for these occurrences for a number of years and have not found them. These two occurrences are now presumed extinct and a report was sent to CNDDB documenting this. The Vallemar Bluff, occurrence #2 occupies a very small area between the cliff edge and a local trail on San Mateo County property, this is the last known remaining extant population in the world.

The proposed development of Vallemar Bluff in Moss Beach would destroy much of the rare coastal prairie grassland and rare plant habitat on the bluff top (see the attached VallemarBluff-parcels map and proposed development plan map). There would be very little habitat left for the Leptosiphon croceus (COAST YELLOW LEPTOSIPHON) and Agrostis blasdalei (BLASDALE'S BENT GRASS) to spread as the bluff tops erode. If this plan is approved most of the coastal prairie and rare plant habitat will be lost. It is important that the County of San Mateo have a management plan for the preservation of the rare plants and habitat that occur on the County property.

It is hoped that these biological factors be considered before development of the Vallemar Bluff. Attached are the field survey forms submitted for the 4 rare plants occurring on the Vallemar Bluff.

Sincerely,

Toni Corelli, Botanist
San Mateo County Rare Plant Chairperson
Santa Clara Valley Chapter CNPS
250 Granelli Avenue
Half Moon Bay, California 94019
corelli@coastside.net


COUNTY OF SAN MATEO
PLANNING AND BUILDING
NOTICE OF COASTSIDE
DESIGN REVIEW
Address: Valkenar @ Tolowa
Owner's Name: Mass Beach Assoc, LLC
Project Description: 4 SFD
Exterior Surface Color: Cedar/Redwood Colored panels; concrete; metal seam roof
Proposed trees to be removed:
Total
30 Monterey Cypress
yellow tape
Planning Permit Number: P.L.N. 2015-00330
Date: Thursday, July 13, 2017

Burton, Cherilyn@Wildlife

From: [redacted]
Sent: Sunday, August 27, 2017 7:00 PM
To: Wildlife Native Plants
Subject: d: Moss Beach

-----Original Message-----
[redacted]
To: nativeplants <nativeplants@wilslife.ca.gov>
Sent: Sun, Aug 27, 2017 6:58 pm
Subject: Moss Beach

The coast yellow leptosiphon is as worthy of most to be placed under protection. There is too much development now and anything to help stop the depradations to wild nature of all sorts is to be desired.

Beauty for some reason is always a threat to some who look at land as something to scrape down and lay bare.

My vote is yes and thank you for caring.

Katie murdock
[redacted]

APPENDIX B: External Peer Review Invitation Letters and Comments from Peer Reviewers on the Coast Yellow Leptosiphon Status Review Report

Names and Affiliations of Invited Peer Reviewers

Name	Affiliation
Robyn Battaglia*	Current affiliation unknown
Neal Kramer	Kramer Botanical
Robert Patterson, Ph.D.	Department of Biology, San Francisco State University
Aaron Schusteff, Ph.D.	Mathematics Department, City College of San Francisco

*****No comments received by Department deadline.

State of California – Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
Habitat Conservation Planning Branch
1416 Ninth Street, 12th Floor
Sacramento, CA 95814
www.wildlife.ca.gov

EDMUND G. BROWN JR., Governor
CHARLTON H. BONHAM, Director

October 2, 2017

Ms. Robyn Battaglia
[redacted]

Dear Ms. Battaglia:

Coast Yellow Leptosiphon (*Leptosiphon croceus*); California Department of Fish and Wildlife, Peer Review Status Report

Thank you for agreeing to serve as a scientific peer reviewer for the California Department of Fish and Wildlife (Department) Status Review of coast yellow leptosiphon (*Leptosiphn croceus*). Please review the copy of the Department's peer review draft report dated October 2, 2017, that is included with this letter. The Department seeks your expert analysis and input regarding the scientific validity of the report and its assessment of the status of coast yellow leptosiphon in California based on the best scientific information currently available. The Department respectfully requests that you focus your peer review effort on the body of relevant scientific information and the Department's related assessment of the population and life history elements prescribed in the California Endangered Species Act (CESA). **The Department would appreciate receiving your peer review input on or before October 31, 2017**.

The Department seeks your scientific peer review as part of formal proceedings pending before the California Fish and Game Commission (Commission) under CESA. As you may know, the Commission is a constitutionally established entity distinct from the Department, exercising exclusive statutory authority under CESA to list species as endangered or threatened (Fish & G. Code, § 2070). The Department serves in an advisory capacity during CESA listing proceedings, charged by the Fish and Game Code to focus on the best scientific information available to make related recommendations to the Commission (Fish & G. Code, § 2074.6).

The Commission received the petition to list coast yellow leptosiphon under CESA on May 25, 2016. On December 23, 2016, the Commission published findings formally designating coast yellow leptosiphon as a candidate for listing as threatened or endangered under CESA. Coast yellow leptosiphon is currently protected under CESA in California in that capacity.

The peer review draft report forwarded to you today reflects the Department's effort to identify and analyze the best scientific information available regarding the status of coast yellow leptosiphon in California. At this time, the Department believes that the

best available science indicates that listing the species as endangered under CESA is warranted. We underscore, however, that scientific peer review plays a critical role in the Department's effort to develop and finalize its recommendation to the Commission as required by the Fish and Game Code. Our expected recommendation to the Commission at this point may change following your input.

We ask you to focus your peer review on the best scientific information available regarding the status of coast yellow leptosiphon in California. As with our own effort to date, your peer review of the science and analysis regarding each of the population and life history categories prescribed in CESA are particularly important (Cal. Code Regs., tit. 14, § 670.1(i)(1)(A)) (i.e., present or threatened habitat modification, overexploitation, predation, competition, disease, and other natural occurrences or human-related activities that could affect the species) as well as whether it indicates, in your opinion, that coast yellow leptosiphon is at serious risk of becoming extinct throughout all or a significant portion of its range in California, or whether the species is likely to become so in California in the foreseeable future. Please note that the Department releases this peer review report to you solely as part of the peer review process, and it is not yet public.

A Microsoft Word version and a PDF version of the report are included with this letter; however, only the PDF version includes figures and appendices. For ease of review, you may submit your comments in "track changes" format, or in list form by page and line number. Please submit your comments electronically to Ms. Cherilyn Burton, Senior Environmental Scientist (Specialist) at cherilyn.burton@wildlife.ca.gov. Ms. Burton may also be reached at (916) 651-6508. If there is anything the Department can do to facilitate your review, please let us know.

Following receipt and consideration of peer review comments, the Department will prepare and submit its final report and related recommendation to the Commission. After at least a 30 day public review period, the Commission will consider the petition to list coast yellow leptosiphon, the Department's report and related recommendations including peer review, and public testimony during a regularly scheduled Commission meeting prior to making their decision.

Thank you again for your contribution to the status review effort and the important input it provides during the Commission's related proceedings.

Sincerely,

Richard Macedo, Branch Chief
Habitat Conservation Planning Branch

Enclosures

ec: California Department of Fish and Wildlife

Isabel Baer, Acting Program Manager
Timberland Conservation and Native Plant Programs
Habitat Conservation Planning Branch
isabel.baer@wildlife.ca.gov

Cherilyn Burton, Senior Environmental Scientist (Specialist)
Native Plant Program
Habitat Conservation Planning Branch
cherilyn.burton@wildlife.ca.gov

Jeb Bjerke, Senior Environmental Scientist (Specialist)
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Habitat Conservation Planning Branch
jeb.bjerke@wildlife.ca.gov

State of California – Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
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1416 Ninth Street, 12th Floor
Sacramento, CA 95814
www.wildlife.ca.gov

EDMUND G. BROWN JR., Governor
CHARLTON H. BONHAM, Director

October 2, 2017

Mr. Neal Kramer
Botanist/Ecologist
Kramer Botanical
PO Box 1582
El Granada, California 94018
kramerbotanical@yahoo.com

Dear Mr. Kramer:

Coast Yellow Leptosiphon (*Leptosiphon croceus*); California Department of Fish and Wildlife, Peer Review Status Report

Thank you for agreeing to serve as a scientific peer reviewer for the California Department of Fish and Wildlife (Department) Status Review of coast yellow leptosiphon (*Leptosiphn croceus*). Please review the copy of the Department's peer review draft report dated October 2, 2017, that is included with this letter. The Department seeks your expert analysis and input regarding the scientific validity of the report and its assessment of the status of coast yellow leptosiphon in California based on the best scientific information currently available. The Department respectfully requests that you focus your peer review effort on the body of relevant scientific information and the Department's related assessment of the population and life history elements prescribed in the California Endangered Species Act (CESA). **The Department would appreciate receiving your peer review input on or before October 31, 2017**.

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Thank you again for your contribution to the status review effort and the important input it provides during the Commission's related proceedings.

Sincerely,

Richard Macedo, Branch Chief
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State of California
Natural Resources Agency
Department of Fish and Wildlife

REPORT TO THE FISH AND GAME COMMISSION

STATUS REVIEW OF COAST YELLOW LEPTOSIPHON (*Leptosiphon croceus*)

December 2017

Coast yellow leptosiphon (*Leptosiphon croceus*), CDFW photo by Cherilyn Burton

Charlton H. Bonham, Director
Department of Fish and Wildlife

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LIST OF ABBREVIATIONS, ACRONYMS AND TERMS

CEQA – California Environmental Quality Act

CESA – California Endangered Species Act

CNDDB – California Natural Diversity Database

CNPS – California Native Plant Society

Commission – California Fish and Game Commission

CRPR – California Rare Plant Rank

Department – California Department of Fish and Wildlife

Occurrence – CNDDB Element Occurrence

Evaluation – Initial Evaluation of the Petition to List Coast Yellow Leptosiphon (*Leptosiphon croceus*) as an Endangered Species under the California Endangered Species Act

Id. – "the same"

NEPA – National Environmental Policy Act

Petition - Petition to the State of California Fish and Game Commission from Ms. Toni Corelli Cosponsored by the California Native Plant Society to List Coast Yellow Leptosiphon (*Leptosiphon croceus*) as an Endangered Species Pursuant to the California Endangered Species Act

ssp. – Subspecies

var. – Variety

EXECUTIVE SUMMARY

This Status Review of Coast Yellow Leptosiphon (*Leptosiphon croceus* (Eastw.) Strother & Kersh) (Status Review) has been prepared by the California Department of Fish and Wildlife (Department) for the California Fish and Game Commission (Commission) pursuant to the requirements of the California Endangered Species Act (CESA). This Status Review has been independently reviewed by scientific peers, and is based upon the best scientific information available to the Department.

Coast yellow leptosiphon is a low-growing annual plant in the Phlox family (Polemoniaceae) that was first described in 1904. It is known from only one small population that occupies approximately 167 square meters (1,800 square feet), located on Vallemar Bluff in Moss Beach, San Mateo County. This population is located in coastal prairie habitat atop a sea bluff at the edge of the coastline.

The population of coast yellow leptosiphon occurs in close proximity to urban land use, and has been either directly or indirectly impacted by modification or destruction of habitat. Coast yellow leptosiphon is threatened, both directly and indirectly, by development and other land-use changes; impacts from invasive plant species; and impacts from human activities such as trampling. Bluff-top erosion is also a serious threat to this species, and climate change may accelerate this process. In addition, coast yellow leptosiphon is highly vulnerable to extinction due to its extremely limited distribution and restriction to only one small population. Because of the rarity of coast yellow leptosiphon, the loss of any occupied habitat or any portion of the population would represent the loss of a significant portion of its total range, and could result in extinction of the species.

Scientific information available to the Department indicates that coast yellow leptosiphon is in serious danger of becoming extinct in all or a significant portion of its range due to one or more causes, including loss of habitat, change in habitat, competition and other effects from invasive plant species, and other natural occurrences and human-related activities. The Department recommends that the Commission find that the petitioned action to list coast yellow leptosiphon as an endangered species is warranted, and further recommends implementation of the management recommendations and recovery measures described in this Status Review.

INTRODUCTION

This Status Review addresses coast yellow leptosiphon (*Leptosiphon croceus* (Eastw.) Strother & Kersh).

Petition History

On May 25, 2016, the Commission received a petition (Petition) from Ms. Toni Corelli, cosponsored by the California Native Plant Society (CNPS), to list coast yellow leptosiphon as an endangered species pursuant to CESA (Fish & G. Code, § 2050 *et seq*.).

On May 27, 2016, the Commission referred the Petition to the Department for evaluation.

On June 10, 2016, as required by Fish and Game Code section 2073.3, the Commission published notice of receipt of the Petition in the California Regulatory Notice Register. (Cal. Reg. Notice Register 2016, No. 24-Z, p.1002, https://www.oal.ca.gov/wp-content/uploads/sites/28/2017/05/24z-2016.pdf). The Department on July 25, 2106, pursuant to Fish and Game Code Section 2073.5 requested a 30-day extension of time to complete its evaluation report.

On September 26, 2016, the Department provided the Commission with a report, "Evaluation of the Petition from Ms. Toni Corelli and the California Native Plant Society to List Coast Yellow Leptosiphon (*Leptosiphon croceus*) as an Endangered Species under the California Endangered Species Act" (Evaluation). Based upon the information contained in the Petition, the Department concluded, pursuant to Fish and Game Code, section 2073.5, subdivision (a), that sufficient information exists to indicate that the petitioned action may be warranted, and recommended to the Commission that the Petition should be accepted and considered.

On December 8, 2016, at its scheduled public meeting in San Diego, California, the Commission considered the Petition, the Department's Evaluation and recommendation, and comments received. The Commission found that sufficient information existed to indicate the petitioned action may be warranted and accepted the Petition for consideration.

Subsequently, on December 23, 2016, the Commission published its Notice of Findings for coast yellow leptosiphon in the California Regulatory Notice Register, designating coast yellow leptosiphon as a candidate species. (Cal. Reg. Notice Register 2016, No. 52-Z, p. 2197, https://www.oal.ca.gov/wp-content/uploads/sites/28/2017/05/52z-2016.pdf).

Department Review

Following the Commission's action to designate coast yellow leptosiphon as a candidate species, the Department notified affected and interested parties and solicited data and comments on the petitioned action pursuant to Fish and Game Code section 2074.4 (see also Cal. Code Regs., tit. 14, § 670.1, subd. (f)(2)). All comments received are included in Appendix A to this report. The Department promptly commenced its review of the status of the species as required by Fish and Game Code section 2074.6, which has now concluded with this Status Review document.

The Department sought independent and competent peer review on its draft Status Review report by persons of the scientific and academic community commonly acknowledged to be

experts on coast yellow leptosiphon and possessing the knowledge and expertise to critique the scientific validity of the draft Status Review. Appendix B contains a listing of the individuals and agencies given an opportunity to review the draft Status Report, the specific input provided to the Department by the individual peer reviewers, the Department's written response to the input, and any amendments made to the draft Status Review report (Fish & G. Code, § 2074.6; Cal. Code Regs., tit. 14, § 670.1, subd. (f)(2)). [This will be included in the final report]

BIOLOGY

Species Description

The information below is paraphrased from the original species description of coast yellow leptosiphon (Eastwood 1904) and from the Jepson eFlora (Patterson and Battaglia 2017).

Coast yellow leptosiphon is an herbaceous plant that grows to a height of 2 to 7 centimeters (0.8 to 2.8 inches). Its slender stem is much-branched from the base and is covered with white appressed hairs, meaning the hairs are pressed closely against the stem. It has opposite leaves that are generally divided into six lobes and are palmately compound, which means that all the sections or lobes of the leaf, called leaflets, are connected at a common point, resembling a fan. The leaflets are approximately 4 to 7 millimeters (0.16 to 0.28 inches) long on the lower stem and almost twice as long near the flowers, appearing as whorls at the nodes. The leaflets are narrowly oval with the narrower end at the base. The flowers are arranged in heads that are subtended by palmately-divided leaf-like structures called bracts, with five linear divisions that are approximately 7 millimeters (0.28 inch) long and up to 1 millimeter (0.04 inch) wide. The flowers have bright yellow petals that are approximately 6 to 8 millimeters (0.24 to 0.31 inch) wide and generally have two faint red dots at the base. The petals, which collectively are referred to as the corolla, are fused at the base, forming a long funnel-shaped tube that is 26 to 39 millimeters (1.0 to 1.5 inches) long and covered with fine, scattered, spreading hairs. The calyx lobes, otherwise known as sepals, are generally deltate or triangular-shaped, less than 1 millimeter (0.04 inch) wide at the middle, densely glandular-hairy, and have an obscure thin membrane between the lobes. Flowers are bisexual, which means they contain both male and female flower parts in the same flower. The fruit is called a capsule, which is a dry fruit from a compound pistil (female flower part) that opens at maturity to release its seeds. Few seeds are produced by each flower. Coast yellow leptosiphon has a chromosome number of 2n=18.

Taxonomy

Coast yellow leptosiphon is in the Phlox family (Polemoniaceae), which has a long history of taxonomic confusion (Bell and Patterson 2000; Hankamp et al. 2016). *Leptosiphon* was originally recognized as a genus in 1833 (Bell and Patterson 2000; Porter and Johnson 2000). Greene (1889-1892) combined several genera, including *Leptosiphon*, into a single genus, *Linanthus,* based predominantly on the presence of opposite, palmately-lobed leaves (Battaglia and Patterson 2001). Porter and Johnson (2000) reclassified the taxa within Polemoniaceae and divided *Linanthus* into two distinct genera, *Leptosiphon* and *Linanthus*.

Alice Eastwood, botanist and curator of the California Academy of Sciences Herbarium from 1894 until 1949, formally described coast yellow leptosiphon as a species in 1904 (Eastwood 1904; Porter and Johnson 2000). A single specimen collected by Eastwood on May 9, 1901, has been designated as the type specimen for coast yellow leptosiphon (Strother and Kersh 2016), and is maintained at the California Academy of Sciences Herbarium. Eastwood originally

labeled the specimen as *Gilia androsacea* var. *crocea* (Corelli 2016; Strother and Kersh 2016), but assigned it the species name *Linanthus croceus* Eastw. when she first formally described the species in 1904. Coast yellow leptosiphon has been reclassified several times. Other names assigned to the species include *Linanthus parviflorus* var. *croceus* (Milliken 1904), *Linanthus androsaceus* var. *croceus* (Jepson 1925), and *Linanthus androsaceus* ssp. *croceus* (Munz 1959). In the 1993 Jepson manual, coast yellow leptosiphon and several other closely-related species were grouped together into a single species called variable linanthus (*Linanthus parviflorus*) (Hickman 1993), until Porter and Johnson revised the entire family based on morphological and molecular data. In Porter and Johnson's publication, *Linanthus parviflorus* was reclassified as *Leptosiphon parviflorus*, and coast yellow leptosiphon was recognized as a distinct species, *Leptosiphon croceus* (Eastw.) (Porter and Johnson 2000). Due to an incorrect citation in Porter and Johnson's publication (2000), *Leptosiphon croceus* was not considered to be a validly published species name until Strother and Kersh (2016) corrected the citation error and validly published the current taxonomic name, *Leptosiphon croceus* (Eastw.) Strother & Kersh (Strother and Kersh 2016; Patterson and Battaglia 2017).

There are 31 species and 9 subspecies of *Leptosiphon*. Geographically, five of these species occur in the same geographic area of central California as coast yellow leptosiphon: bristly leptosiphon (*L. acicularis*), false babystars (*L. androsaceus*), true babystars (*L. bicolor*), variable linanthus, and rose leptosiphon (*L. rosaceus*). Taxonomically, coast yellow leptosiphon is most closely related to variable linanthus and broad-lobed leptosiphon (*L. latisectus*) (Hankamp et al. 2016).

Range and Distribution

Range is the general geographical area where an organism occurs. For purposes of CESA and this Status Review, the range is the species' California range (*Cal. Forestry Assn. v. Cal. Fish and Game Com*. (2007) 156 Cal.App.4th 1535, 1551). Distribution refers to actual sites where individuals and populations of the species occur within the species' range.

The genus *Leptosiphon* occurs primarily in western North America, with one species occurring only in Chile. California is the center of diversity for *Leptosiphon* (Hankamp et al. 2016), where 90 percent of the species occur across diverse habitats in the California Floristic Province and adjacent areas (Bell and Patterson 2000).

Coast yellow leptosiphon occurs only in California. Coast yellow leptosiphon was first collected at "Blenheim" by Alice Eastwood, which was a short-lived place name mapped about 3-5 kilometers (2-3 miles) north of Pillar Point and apparently referred to a place at or near present-day Moss Beach (Strother and Kersh 2016; CNDDB 2017). There is limited history of collection of plants in the vicinity of Moss Beach, with most collections dating from the early 1900's to the 1940's. A search conducted by the petitioner for coast yellow leptosiphon in the Consortium of California Herbaria database and California herbaria throughout California found 40 collection sheets that were labeled *Leptosiphon croceus* or a synonym of *Leptosiphon croceus*. These specimens were reviewed in 2016 to verify their identification (Corelli 2016). Many plant specimens that were originally identified as coast yellow leptosiphon had been misidentified and actually represent other *Leptosiphon* species. Review of these specimens indicates that only the historic specimens that were collected from Moss Beach represent coast yellow leptosiphon, and that coast yellow leptosiphon is restricted to one colony in Moss Beach, San Mateo County.

The coast of San Mateo County has been frequently visited by botanists and scientific plant collectors, including botanists that specialize in *Leptosiphon* species. Despite their attempts, no

additional populations of coast yellow leptosiphon have been discovered (Corelli 2016). Available data indicate that coast yellow leptosiphon has always been limited in its range and restricted to the Moss Beach area.

The distribution of coast yellow leptosiphon is documented in the California Natural Diversity Database (CNDDB). The CNDDB documents plant taxa, animal taxa, and natural communities that are of conservation concern within California and refers to these taxa as "elements." An "element occurrence" (occurrence) is a location record for a site which contains an individual, population, nest site, den, or stand of a special status element. Populations, individuals, or colonies that are located within 1/4 mile of each other generally constitute a single occurrence, sometimes with multiple "parts" (Bittman 2001). The CNDDB previously contained four occurrences for coast yellow leptosiphon. In March 2016, the CNDDB updated its database to remove three of these occurrences because they had been incorrectly identified as coast yellow leptosiphon, but actually represented other closely related species (Corelli 2016; Lazar pers. comm. 2016). This update resulted in there being only one valid occurrence for this species in the CNDDB (see Figure 1).

The CNDDB documented occurrence and coast yellow leptosiphon population is located within the Fitzgerald Marine Reserve, which is owned by the County of San Mateo and is a San Mateo County Park. The area immediately adjacent to the coast yellow leptosiphon population and the Fitzgerald Marine Reserve consists of several privately owned parcels that are proposed for development as shown in Figure 1 and as described below in the Factors Affecting the Ability to Survive and Reproduce section of this report. The County of San Mateo property and the adjacent private parcels are zoned Resource Management-Coastal Zone (RM-CZ). Development is allowed in an RM-CZ zone, but all development requires approval from the San Mateo County Coastside Design Review Committee (CDRC 2017).

The population of coast yellow leptosiphon is estimated to occupy an area approximately 18 meters by 9 meters (60 feet by 30 feet) or 167 square meters (1,800 square feet) in size (CNDDB 2017; Department staff observation), which represents the entire distribution and range of the species. In addition to the mapped population of coast yellow leptosiphon shown in the CNDDB, one individual plant was also identified outside of the mapped population on the adjacent private property on May 16, 2016 (T. Corelli pers. comm. 2016) (see Figure 2). Since annual plants reproduce by seed, a seed bank is potentially present in the area where this plant was identified.

Life History

Coast yellow leptosiphon is an annual plant, which means that it completes its life cycle within one year or growing season. It generally flowers from April to June (CNPS 2017; Patterson and Battaglia 2017). Little is known about the mating system of coast yellow leptosiphon. It is closely related to variable linanthus, which is a fully self-incompatible species, meaning it does not self-fertilize (Goodwillie 1999; Weber and Goodwillie 2013). Self-incompatible plants rely on pollinators or are wind-pollinated (Goodwillie 1999). Pollination studies conducted on other species of *Leptosiphon* indicate they are predominantly bee fly- (Bombyliidae) and wind-pollinated (Goodwillie 2001). Other potential pollinators such as a beetle (*Listrus* sp.) in the Melyridae family (soft-wing flower beetles) have been recently observed on coast yellow leptosiphon (Corelli 2016). The Department does not have information on seed dispersal for coast yellow leptosiphon, but like many other plant species, seeds may be dispersed by birds or other animals, gravity, water flow, or other mechanisms.

Figure 1 - Vicinity of Coast Yellow Leptosiphon

Figure 2 - Parcels Proposed for Development

Similar-looking Plants

Coast yellow leptosiphon shares morphological characteristics with other leptosiphon species, including false baby-stars, broad-lobed leptosiphon, rose leptosiphon, and variable linanthus. Coast yellow leptosiphon is the shortest of all *Leptosiphon* species, and the width of the corolla lobes is the largest in the complex. Coast yellow leptosiphon can be distinguished from false baby-stars and rose leptosiphon by its densely glandular-hairy calyx lobes throughout the whole surface as opposed to the non-glandular ciliate hairs only on the margins of the calyx lobes of false baby-stars and rose leptosiphon (Patterson and Battaglia 2017). Coast yellow leptosiphon is distinguished from variable linanthus and broad-lobed leptosiphon by its rounded corolla lobes and short habit of less than 7 centimeters (2.8 inches) tall (Battaglia and Patterson 2001). In addition, broad-lobed leptosiphon is not known to occur in the same geographical range as coast yellow leptosiphon (Patterson and Battaglia 2017).

Habitat that may be Essential to the Continued Existence of the Species

Coast yellow leptosiphon grows at the edge of the coastline on a marine terrace supported by sedimentary sandstone-derived soil. It occurs on a bluff at an elevation of 14 meters (46 feet), in habitat that is highly influenced by wind, cool salt-laden air, and fog (CNDDB 2017).

Vegetation Communities

Commented [A1]: The description below is thorough and consistent with my experience

Coast yellow leptosiphon is associated with a diverse array of native perennial grasses such as maritime brome (*Bromus maritimus*), California oat grass (*Danthonia californica*), tufted hairgrass (*Deschampsia cespitosa* ssp. *holciformis*), and northern barley (*Hordeum brachyantherum* ssp. *brachyantherum*). Other species associated with coast yellow leptosiphon include native species such as sea-pink (*Armeria maritima* ssp. *californica*), seaside wild buckwheat (*Eriogonum latifolium*), coastal button-celery (*Eryngium armatum*), beach strawberry (*Fragaria chiloensis*), purple cudweed (*Gamochaeta ustulata*), coastal gumplant (*Grindelia stricta* var. *platyphylla*), and Davy's centaury (*Zeltnera davyi*). Three other rare species grow in association with coast yellow leptosiphon, Blasdale's bent grass (*Agrostis blasdalei*), harlequin lotus (*Hosackia gracilis*), and Johnny-nip (*Castilleja ambigua* ssp. *ambigua*) (Department observation; Corelli 2016; Jodi McGraw Consulting 2017). Blasdale's bent grass has a California Rare Plant Rank (CRPR) of 1B.2 (rare, threatened or endangered in California and elsewhere; moderately threatened in California), and harlequin lotus and Johnny-nip have a CRPR of 4.2 (plants of limited distribution – a watch list; moderately threatened in California). Several non-native species are associated with coast yellow leptosiphon and are colonizing the bluff top, including freeway iceplant (*Carpobrotus edulis*), rattail sixweeks grass (*Festuca myuros*), rye grass (*Festuca perennis*), hare barley (*Hordeum murinum* ssp. *leporinum*), rough cat's-ear (*Hypochaeris radicata*), cut-leaved plantain (*Plantago coronopus*), and English plantain (*Plantago lanceolata*).

The Department uses A Manual of California Vegetation, Second Edition (Sawyer et al. 2009) to classify natural communities within California. However, the area where coast yellow leptosiphon occurs has not yet been classified using A Manual of California Vegetation, Second Edition. The habitat where coast yellow leptosiphon occurs would likely be classified as Coastal Terrace Prairie (Element Code 41100) under Robert Holland's Preliminary Descriptions of the Terrestrial Natural Communities of California (1986). Holland's classification system was used by the Department in the past to classify natural communities within California, but has since been superseded by A Manual of California Vegetation, Second Edition (Sawyer et al. 2009). The CNDDB continues to maintain historic records of the natural community occurrences,

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although new community occurrences have not been added to the CNDDB since the 1990's (California Department of Fish and Wildlife 2017). While the Holland system for classifying natural communities is no longer supported by the Department, this information may be useful for describing vegetation in areas of California that have not yet been classified using A Manual of California Vegetation, Second Edition. Information on Holland's Coastal Terrace Prairie community in the CNDDB is described below but this information should be used with caution as the rankings are no longer updated or reviewed by the CNDDB.

Coastal Terrace Prairie is a rare natural community described as having a dense, tall grassland dominated by both sod and tussock-forming perennial grasses growing to 1 meter (3.3 feet) tall, with patchy and variable stands that reflect local differences in available soil moisture capacity (Holland 1986). Coastal Terrace Prairie has a natural heritage global rarity rank of G2 (Imperiled) and a state rarity rank of S2.1 (Imperiled and very threatened) in the CNDDB. A rank of G2 means that an element is at high risk of global extinction or elimination due to a very restricted range, very few populations (often 20 or fewer), very steep declines, or other factors. A state rank of S2 means that an element is imperiled in the state because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the state, and the ".1" signifies that the element is "very threatened" (CNDDB 2017).

While the habitat where coast yellow leptosiphon occurs is not yet classified in A Manual of California Vegetation, Second Edition (Sawyer et al. 2009), the species composition overlaps with that listed in the *Deschampsia cespitosa* Herbaceous Alliance (tufted hair grass meadow). The *D. cespitosa – Danthonia californica* and *D. cespitosa – Eryngium armatum* Associations, which have been described on coastal bluffs and terraces and in other areas in California (Sawyer et al. 2009; Klein et al. 2015), fall within the *Deschampsia cespitosa* Herbaceous Alliance. This alliance includes both the Coastal Terrace Prairie and the Wet Subalpine or Alpine Meadow (Element Code 45210) communities described in the Holland classification system (1986). It is mapped on bluffs and terraces along the central and northern California coast and in montane areas in northern and central California, and is widespread outside of California. The *D. cespitosa* Herbaceous Alliance has a natural heritage global rarity rank of G5 (Secure) and a state rarity rank of S4? (Uncertain but Apparently Secure) (Sawyer et al. 2009, CNDDB 2017). The specific association type of this vegetation has yet to be defined. However, in the recent study of the vegetation of Sonoma County (Klein et al. 2015) both of the related associations are considered imperiled and/or imperiled and very threatened. The *D. cespitosa – Danthonia californica* Association has a Global Rank of G3 (Vulnerable) and a State Rank of S2 (Imperiled), while the other closely related association, the *D. cespitosa – Eryngium armatum* Provisional Association is ranked G3G2?/S3S2? (Uncertain but Vulnerable or Imperiled). It is likely that all of the coastal associations of the *D. cespitosa* Herbaceous Alliance are similarly rare and threatened.

East of the coast yellow leptosiphon population, a large stand of Monterey cypress (*Hesperocyparis macrocarpa*) trees is growing on Vallemar Bluff along Vallemar Street. Monterey cypress is known from only two native occurrences, which are in the Monterey area. It is considered invasive in other parts of California, and it has been widely planted and naturalized in other areas along the coast (Cal-IPC 2017; CNPS 2017). The Monterey cypress trees near the coast yellow leptosiphon population likely represent planted specimens. The understory of this stand is disturbed and consists mostly of non-native plant species including ripgut brome (*Bromus diandrus*), freeway iceplant, panic veldt grass (*Ehrharta erecta*), false brome (*Brachypodium distachyon*), pride of Madeira (*Echium candicans*), Japanese cheesewood (*Pittosporum tobira*), and pincushion flower (*Scabiosa atropurpurea*).

Freeway iceplant is present in large patches scattered throughout the Coastal Terrace Prairie, and a large patch is growing on the bluff immediately adjacent to the coast yellow leptosiphon population. North of the coast yellow leptosiphon population, the coastal bluff between the existing homes and the edge of the bluff is completely dominated by large mats of freeway iceplant with very little room for other herbaceous plants to grow. Monterey cypress trees are also scattered along the bluff north of the coast yellow leptosiphon population.

South of the Coastal Terrace Prairie, on the other side of Juliana Drive, the area consists of residential development (Figure 2).

Geology and Soils

Coast yellow leptosiphon grows on the edge of Vallemar Bluff in Moss Beach overlooking the Pacific Ocean. The Natural Resources Conservation Services' soil map unit for this area is rock outcrop-Orthents complex (Soil Survey Staff 2017). Orthents occur on escarpments, which are steep slopes or long cliffs that form as an effect of faulting or erosion and separate two relatively level areas of differing elevations. Orthents parent material consists of mixed sedimentary, serpentine, or basaltic volcanic rock (Soil Survey Staff 2017). The coast yellow leptosiphon population grows on a marine terrace supported by sedimentary sandstone-derived soil underlain by a relatively thin veneer of terrace deposits, consisting primarily of poorly to moderately consolidated gravel, sand, silt, and clay of marine origin (Pampeyan 1994).

The site is in a geologically active region of California, and is located approximately 427 meters (1,400 feet) northeast of the Seal Cove Fault and about 10.9 kilometers (6.8 miles) southwest of the seismically active San Andreas Fault Zone. The active San Andreas, Hayward, and Calaveras Faults are all located within the nearby San Francisco Bay Area and could have active secondary faults with the potential to cause severe shaking at the coast yellow leptosiphon population. A major earthquake could significantly affect the unstable bluffs and soils, causing loose soil on the steep slopes near the coast yellow leptosiphon population to form sloughs or slides (JCP 1990).

Hydrology

The coast yellow leptosiphon population occurs in the Dean Creek catchment, which is approximately 146 hectares (360 acres) in size. Dean Creek is located northeast of the Fitzgerald Marine Reserve and flows into Kelp Cove, approximately 0.6 kilometers (0.3 miles) south of Vallemar Bluff.

The coast yellow leptosiphon population is located near a coastal bluff comprised partially of coastal terrace deposits that are susceptible to erosion, particularly by concentrated uncontrolled runoff of surface drainage. In two areas of the bluff edge, shallow gullies approximately 0.3 to 0.6 meter (1 to 2 feet) deep extend inland from the bluff edge. These gullies were likely formed as a result of overland storm runoff (Haro, Kasunich & Associates, Inc. 2015).

A geotechnical investigation was completed at Vallemar Bluff by Haro, Kasunich & Associates, Inc. in 2016. Test bore holes encountered groundwater at 4 to 5 meters (13 to 17 feet) below the ground surface. The groundwater appears to be perched upon the bedrock and seeping through the terrace (Haro, Kasunich & Associates, Inc. 2015).

Climate

Coast yellow leptosiphon occurs in an area with a maritime Mediterranean climate with distinct wet and dry seasons. Most of the area's precipitation occurs from November through April. Virtually all precipitation occurs as rain, although fog accounts for a small percentage (Brady/LSA 2002). Using PRISM weather data from 1895 to 2015, the average minimum temperature in the vicinity of Vallemar Bluff is 9°C (48°F), the average maximum temperature is 17°C (63°F), the average temperature is 13°C (55°F), and the average precipitation is 69 centimeters (27 inches) per year (PRISM Climate Group 2017).

POPULATION TRENDS

Scientific information on coast yellow leptosiphon's population trends is limited. The species has not been monitored regularly, and the earliest reported survey was conducted by R. Battaglia in 1998, with about 1,000 plants estimated (Battaglia 1998; Corelli 2016; CNDDB 2017). T. Corelli estimated population numbers in 1999 and 2015. An estimated 400-500 plants were recorded in 1999, and fewer than 400 plants were estimated in 2015 (Corelli 1999, 2015).

Although little is known about population trends of coast yellow leptosiphon, the population that was once described as covering the ground for several acres (Eastwood 1904) is now limited to an area covering approximately 167 square meters (1,800 square feet or 0.04 acre), clearly indicating a significant declining population trend.

FACTORS AFFECTING THE ABILITY TO SURVIVE AND REPRODUCE

Habitat Modification and Destruction

Past Modification and Destruction of Habitat

Habitat loss is considered the primary cause for species extinctions at local, regional, and global scales (Dirzo and Raven 2003). Most of the coastal prairie habitat, which provides potential habitat for coast yellow leptosiphon, has been destroyed or modified due to urban development, agriculture, and invasion of non-native plant species (Ford and Hayes 2007). Coast yellow leptosiphon was likely present over a larger geographic area prior to the development of the San Mateo coast and conversion of coastal prairie habitat. Most of the habitat surrounding the coast yellow leptosiphon population has been eliminated or altered due to road construction, residential development, and invasion by non-native plant species, particularly the invasive freeway iceplant which covers the coastal bluff adjacent to the coast yellow leptosiphon population (Departmental observation). Installation of hardscape and storm drainage systems related to urban development have altered runoff patterns and hydrology in and around occupied coast yellow leptosiphon habitat.

Although it is likely that coast yellow leptosiphon has always been rare and restricted in range, past modification and destruction of habitat has contributed to the limited availability of suitable habitat for this species. These past changes affect the ability of coast yellow leptosiphon to survive and reproduce.

Present and Future Modification and Destruction of Habitat

Development or changes in land use could directly destroy plants and living seeds in the seed bank and destroy both occupied and potential habitat. Threats to coast yellow leptosiphon may occur from development and changes in land use near the existing population. A residential development project is proposed on the parcels immediately adjacent to the coast yellow leptosiphon population (County of San Mateo 2017; Midcoast Community Council 2017). The area proposed for development consists of seven lots, which will be consolidated into four lots for the project. The proposed project will build four, three-story single-family residences, between 4,740 and 4,859 square feet in size, and is pending design review approval by the San Mateo County Coastside Design Review Committee (CDRC 2017). Figure 2 shows the property proposed for development in relationship to the coast yellow leptosiphon population, and Figure 3 shows the site plan. The developer has erected story poles on the parcels that represent locations and footprints of the proposed houses (Figure 4).

Coast yellow leptosiphon has been buffered from impacts from the adjacent highway by the 1.0-hectare (2.5-acre) undeveloped coastal prairie that provides a natural buffer between Highway 1 and the coast yellow leptosiphon population. Habitat buffers provide protection from edge effects (Saunders et al. 1991; Given 1994), which are changes in community structure that occur at the boundary of two habitats. Habitat buffers also provide extra protection from human activities, allow for a more natural habitat boundary, slow the speed of water runoff, and filter sediments, fertilizers, pesticides, heavy metals, and pathogens from runoff (Given 1994; Godfrey 2015; USDA 2017).

Any change in land use on this adjacent property is expected to result in indirect impacts to the coast yellow leptosiphon population. The proposed development will alter the hydrologic regime of the site. This will involve increased, altered, and unseasonal runoff patterns resulting from addition of hard, impervious surfaces, installation of drainage features such as storm drains and drainage pipes (Mesiti-Miller Engineering, Inc. 2017), and installation and use of landscape irrigation systems. Development often leads to unseasonal summer moisture resulting from watering landscape plants, washing cars, and other human activities. In addition, residential development will lead to an increase in use of fertilizers and nutrients, herbicides, pesticides, and other household chemicals and products which will run off and disperse into habitat occupied by coast yellow leptosiphon and could impact the plants as well as alter the soil chemistry. Increased nutrient load and unseasonal moisture resulting from human activities creates conditions that promote the spread of non-native plant species, which can outcompete the native plants for light, space, nutrients, water and other factors (Smil 1997; Vitousek et al. 1997; Line and White 2007). Furthermore, development will increase the number of human visitors using the area, result in soil disturbance and compaction, increase garbage and pollution, and create conditions that are favorable for the spread of non-native plant species.

Construction of houses on the parcels adjacent to the coast yellow leptosiphon population will lead to an increase in human use of the area. Walking paths exist on the bluff, and one heavily-used path exists immediately adjacent to the coast yellow leptosiphon population. Increased human use of the area will increase the impacts to the habitat from foot traffic, will increase the spread of weed seeds and introduce nutrients from dog walking, and will increase the risk of trampling and killing of coast yellow leptosiphon plants. In addition, development of the area will modify the aesthetics and accessibility of the bluff, potentially resulting in alterations of walking patterns in the area. People may create new paths through the remaining portions of the habitat accessible on Vallemar Bluff, potentially through the coast yellow leptosiphon population.

Figure 3 - Proposed Development Project on Vallemar Bluff - Site Plan

Figure 4 - Story Poles for Proposed Development Project on Vallemar Bluff

Development of this area may also result in the loss of pollinator habitat and further fragment the habitat adjacent to the coast yellow leptosiphon population. Habitat fragmentation often leads to a disruption in plant and pollinator population dynamics by altering pollinator densities and behavior (Xiao et al. 2016). Information on pollinators and pollinator requirements for coast yellow leptosiphon is currently lacking, but loss of pollinators essential to the reproduction of coast yellow leptosiphon would negatively impact coast yellow leptosiphon, especially if the species is self-incompatible (Goodwillie 1999).

Although the population of coast yellow leptosiphon is not reported in the CNDDB on the adjacent parcels that are proposed for development, one individual plant was identified on one of the parcels on May 16, 2016 (T. Corelli pers. comm. 2016) (see Figure 2). Since annual plants reproduce by seed, identification of coast yellow leptosiphon on one of the adjacent properties indicates that the plants have distributed seed beyond the currently-mapped occurrence, and that a seed bank is potentially present in the area where this plant was identified. A seed bank constitutes a living plant population, even when above-ground plants are not visible. Development of this property could result in impacts to coast yellow leptosiphon through the elimination of a soil seed bank for this species or direct impacts to individual plants that may emerge from the seed bank.

Commented [A2]: Ultimately, this potential seed bank may be an essential element for long term survival of the species.

In addition to impacts from human activities, habitat modification can result from other activities. Burrowing mammals such as pocket gophers (*Thomomys* spp,) have profound impacts on ecosystems, from consuming vegetation to physically altering the soil (Reichman and Seabloom 2002). Burrowing mammals influence the physical environment, altering patterns and rates of soil development and nutrient availability, microtopography, and the abiotic environment. Burrowing activity can affect the demography and abundance of plant species, altering vegetation patterns and diversity, and thus altering ecosystem structure (Inouye et al. 1987; Huntly and Inouye 1988; Villarreal et al. 2008). Burrowing mammals such as gophers excavate vast burrow systems and deposit tailings in abandoned tunnels and on the ground surface (Reichman and Seabloom 2002), reducing the area of available habitat for plants. Evidence of burrowing mammals is present in the coast yellow leptosiphon population (Department staff observation), and burrowing mammals could impact coast yellow leptosiphon.

Commented [A3]: Any evidence that this would be a net positive or negative impact? The leptosiphon might benefit from soil tilling or seed dispersal by burrowing mammals.

The Department considers present and future modification and destruction of habitat a serious threat to coast yellow leptosiphon. Habitat modification and destruction will affect the ability of coast yellow leptosiphon to survive and reproduce.

Impacts from Invasive Species (Competition and other Factors)

Invading alien species cause major environmental damages and losses and are a significant risk factor leading to extinction of threatened and endangered species (Pimentel et al. 2004; Conser and Conner 2009), second only to habitat loss and fragmentation (Wilcove et al. 1998; Randall and Hoshovsky 2000). Compared to other threats to biodiversity, invasive non-native plants present a complex problem that is difficult to manage and has long-lasting effects. North America has accumulated the largest number of naturalized plants in the world (van Kleunen et al. 2015), and many non-native plant species have established within California, dramatically changing the state's ecological landscape (Conser and Connor 2009). Many studies hypothesize or suggest that competition is the process responsible for observed invasive species impacts to biodiversity; however, invasive species may also impact native ecosystems by altering environmental conditions and resource availability (D'Antonio and Vitousek 1992; Levine et al. 2003). Invasive species may threaten native populations through competition for light, water, or nutrients; allelopathic mechanisms; alteration of soil chemistry; thatch

accumulation that inhibits seed germination and seedling recruitment; changes in natural fire frequency; disruptions to pollination or seed-dispersal mutualisms; changes in soil microorganisms; or other mechanisms. The magnitude of invasive species impacts in Mediterranean habitats, such as those in California, largely depends on characteristics of the invading species and the habitat being invaded (Fried et al. 2014). The invader's life form and ability to form very dense stands have an effect on the magnitude of impacts, with creeping plant species such as freeway iceplant having greater effect (Gaertner et al. 2009; Fried et al. 2014). Invasive species may also influence native species colonization rates, and may thus lead to declines in local diversity over longer timescales (Yurkonis and Meiners 2004). Studies have not been conducted on the impact of invasive species on coast yellow leptosiphon specifically; however, negative impacts of plant invasions on Mediterranean ecosystems have been well demonstrated (Gaertner et al. 2009; Fried et al. 2014).

The coast yellow leptosiphon population is threatened by encroachment of non-native invasive plants, especially invasive freeway iceplant that is a highly-rated noxious weed by the California Invasive Plant Council (Cal-IPC 2017). Freeway iceplant is a low-growing, creeping succulent perennial plant that roots at the nodes and often forms deep mats covering large areas. It originates from South Africa, but is one of the most widespread non-native plants in the Mediterranean coastal ecosystems throughout the world, and is considered a severe threat to the native plant communities it invades (Albert 1995; Santoro et al. 2011). In California, it occurs along the coast and on the Channel Islands, especially in areas with a warm winter climate (Cal-IPC 2017). It was originally introduced into California in the early 1900's to stabilize soil along railroad tracks, and the California Department of Transportation soon began using it widely to line highways. It has also been widely promoted as an ornamental plant for home gardens (Albert 1995, 2000). Because this plant spreads easily by seed and vegetative means, it has spread beyond landscape plantings and has invaded coastal habitats, including the coastal prairie where coast yellow leptosiphon grows. Freeway iceplant forms nearly impenetrable mats that dominate the landscape, and it competes directly with native plant species for light, nutrients, water and space (D'Antonio and Haubensak 1998). The fleshy fruits often bear more than one thousand small seeds (Bartomeus and Vilà 2009) that are eaten and widely dispersed by several mammals such as rabbits (D'Antonio 1990) and rats (Bourgeois et al. 2005). It competes aggressively with native plant species, achieving high rates of space colonization, which suppresses growth and establishment of other plants (D'Antonio and Mahall 1991; Albert 1995; Suehs et al. 2004; Vilà et al. 2006). Furthermore, it also interacts indirectly with native vegetation by altering soil chemistry by lowering pH (Conser and Connor 2009). Although freeway iceplant was originally used to stabilize soil and control erosion, it can actually contribute to erosion and landslides. It has shallow roots that do not hold soil well, and it absorbs ample water during rain events, becoming so heavy that it can slump off of steep hillsides and cliffs, pulling soil down with it (Spitzer 2002). Freeway iceplant covers the bluffs in much of the habitat near the coast yellow leptosiphon population, and it is growing on the bluff immediately adjacent to the coast yellow leptosiphon population and is encroaching into the population (see Figure 5).

Other non-native plant species, such as rough cat's ear, rye grass, hare barley, and cut-leaved plantain, are also present growing in and around the coast yellow leptosiphon population. These invasive species may threaten the coast yellow leptosiphon population through a variety of mechanisms, including competition for light, water, or nutrients; thatch accumulation that inhibits seed germination and seedling recruitment; disruptions to pollination or seed-dispersal mutualisms; or other mechanisms (D'Antonio and Haubensak 1998).

Figure 5 – Freeway Iceplant Invasion

The coast yellow leptosiphon population will likely continue to experience ongoing and increasing inputs of invasive plant propagules from nearby populations and other sources. The area is frequently used by pedestrians, who can serve as vectors for invasive species into the area. Habitat disturbances resulting from the close proximity of the population to urban development also provides opportunities for invasive species populations to establish and expand. In addition, the proposed development on the adjacent property would likely increase the input of invasive plant species from the spread of landscape plants into the area, and will increase disturbance and habitat modification, providing favorable habitat for invasive species.

Bluff-Top Erosion and Rising Ocean Levels

The coast yellow leptosiphon population is located on Vallemar Bluff, approximately 8 meters (27 feet) from the edge of the bluff, and bluff-top erosion and rising ocean levels pose a serious threat to this species. Rainfall and wave splash or spray cause erosion of the bluff face. Additionally, slope instability results in landslides along the coastal bluff face, resulting in landward recession of the top edge of the coastal bluff. Coastal bluff landslides are caused by undermining the base of the bluff or from saturation of the bluff edge or bluff face (Haro, Kasunich & Associates, Inc. 2015).

A coastal bluff recession study was prepared by Haro, Kasunich & Associates, Inc., Consulting Geotechnical and Coastal Engineers (2015). Historical satellite photos and maps were reviewed and compared with the bluff edge position as surveyed in 2014. The results indicated that the coastal bluff had receded inland up to 14.6 meters (48 feet) between 1908 and 2014, which is a long term historical bluff recession rate of about 0.14 meter (0.45 foot) per year. Results of the study also indicated that about 3 to 5 meters (10 to 18 feet) of bluff recession occurred between 1986 and 2014, which is a long term historical bluff recession rate of about 0.11 to 0.20 meters (0.36 to 0.64 feet) per year.

Future bluff and coastal recession risk was estimated using the long-term historical average annual erosion rates as a minimum. Results suggested that a minimum of 6.9 meters (22.5 feet) of bluff recession will occur at Vallemar Bluff in the next 50 years (by the year 2065). Mean sea level along the California coast is expected to rise between 1.0 to 1.4 meters (3.3 to 4.6 feet) by the year 2100 due to climate change (Heberger et al. 2009), and the accelerating rate of sea level rise will likely result in increased future recession rates compared to average historical rates (Haro, Kasunich & Associates, Inc. 2015). Accelerated future sea level rise is expected to result in an estimated additional 1.7 meters (5.5 feet) of recession over the next 50 years, for a total of 8.6 meters (28 feet) of recession (Haro, Kasunich & Associates, Inc. 2015).

Projected future bluff edge recession was measured from where the bluff is considered stable as determined by Haro, Kasunich & Associates, Inc. (2015) (see Figure 6). They used the projected stable edge to project future recession and arrived at an estimated 50-year coastal recession setback line for development on Vallemar Bluff using the projected rates of recession described above. The 50-year setback is considered the minimum distance necessary to provide a stable building site of a 50-year lifetime of a proposed structure. The portion of the bluff seaward of the 50-year setback line, which supports a large portion of the coast yellow leptosiphon population, is considered to be vulnerable to erosion over the next 50 years.

Figure 6 - Coastal Bluff Recession at Vallemar Bluff

It is likely that the coast yellow leptosiphon population, which is perched near the bluff edge, has been steadily reduced by cliff erosion. Based on the study conducted by Haro, Kasunich & Associates, Inc., the coast yellow leptosiphon population is located on a portion of the bluff that is highly susceptible to erosion over the next 50 years. If the bluff erodes to the 50-year setback line that accounts for rising sea level, approximately 80 percent of the coast yellow leptosiphon population will be destroyed (see Figure 6). Erosion of the bluff presents a significant threat to coast yellow leptosiphon and could lead to the extinction of the species.

Other Human-related Activities

The coast yellow leptosiphon population is threatened by other human-related activities, specifically trampling from foot traffic. People commonly walk on the bluff where the coast yellow leptosiphon population occurs, which may damage or kill coast yellow leptosiphon individuals through direct trampling of plants. In addition, there is nothing to prevent people from riding their bicycles on the bluff, which would further impact the coast yellow leptosiphon population. The property is easily accessible to the public, and a foot trail has been worn along the bluff that passes along the edge of the coast yellow leptosiphon population. A bench is present near the population overlooking the ocean, attracting visitors to cut through the coast yellow leptosiphon population to view the ocean. In addition to direct trampling of plants, human use of the site also increases disturbance and compaction of soil and facilitates the spread of invasive plant species. No barriers exist around the coast yellow leptosiphon population to protect plants from foot traffic and trampling. The proposed development will result in increased human activity in the area, thus increasing the threat to coast yellow leptosiphon from foot traffic and other human impacts.

Climate Change

Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia (IPCC 2014). Climate change presents a major challenge to the conservation of California's natural resources, and it will intensify existing threats and create new threats to natural systems.

Department staff conducted an assessment of the vulnerability of coast yellow leptosiphon to climate change using the NatureServe Climate Change Vulnerability Index Version 3.02 (NatureServe 2016). Based upon the Department's assessment, coast yellow leptosiphon likely has a climate change vulnerability index value of Highly Vulnerable (HV), indicating that available evidence suggests that abundance and/or range extent within the geographical area of the species is likely to decrease significantly by the year 2050. However, some ecological and life history information used for the climate change vulnerability assessment is not yet known for coast yellow leptosiphon. In particular, the Department does not know the mechanisms or species required for effective pollination of coast yellow leptosiphon, the mechanisms used by coast yellow leptosiphon for seed dispersal, or coast yellow leptosiphon's seed dispersal distance. Furthermore, the Department does not know whether or to what extent competing plant species such as freeway iceplant will be favored by projected future climates. Despite the lack of information about some of the ecological and life history information for coast yellow leptosiphon, the confidence in the vulnerability index score is very high based on the results of the Monte Carlo simulation used in the index (Young et al. 2015).

Vulnerability of Small Populations

Coast yellow leptosiphon has an exceptionally limited distribution, with only one population that occupies a very small area. The Department recognizes that species with small numbers of populations and small population sizes are highly vulnerable to extinction due to stochastic (chance) demographic, environmental, and genetic events (Shaffer 1981, 1987; Dirzo and Raven 2003; Groom et al. 2006; Primack 2006). Chance events such as a landslide at the bluff edge could result in the loss of all or a significant part of the coast yellow leptosiphon population.

Species with small numbers of populations or small populations may also be subject to increased genetic drift and inbreeding, which can affect population viability (Menges 1991; Ellstrand and Elam 1993).

Due to the vulnerability and rarity of coast yellow leptosiphon, the loss of any portion of the population would represent the loss of a significant portion of this species' genetic diversity and total range, and could result in its extinction.

Predation

The Department does not have any information on predation affecting coast yellow leptosiphon.

Disease and Parasites

The Department does not have any information on diseases or parasites affecting coast yellow leptosiphon.

Overexploitation

The Department does not have any information on overexploitation affecting coast yellow leptosiphon.

REGULATORY AND LISTING STATUS

Federal

Coast yellow leptosiphon is not protected pursuant to the federal Endangered Species Act.

State

On December 23, 2016, the Commission published its Notice of Findings for coast yellow leptosiphon in the California Regulatory Notice Register, designating this species as a candidate pursuant to CESA. The provisions of CESA apply to coast yellow leptosiphon while it is a candidate species (Fish & G. Code, § 2085). CESA prohibits the import, export, take, possession, purchase or sale of coast yellow leptosiphon, or any part or product of thereof, except in limited circumstances, such as through a permit or agreement issued by the Department under the authority of the Fish and Game Code. For example, the Department may issue permits that allow the incidental take of listed and candidate species if the take is minimized and fully mitigated, the activity will not jeopardize the continued existence of the species, and other conditions are met (Fish & G. Code, § 2081 subd. (b)). The Department may

also authorize the take and possession of coast yellow leptosiphon for scientific, educational, or management purposes (Fish & G. Code, § 2081 subd. (a)).

Natural Heritage Program Ranking

All natural heritage programs, such as the CNDDB, use the same ranking methodology originally developed by The Nature Conservancy and now maintained by NatureServe (NatureServe 2012). This ranking methodology consists of a global rank describing the rank for a given taxon over its entire distribution, and a state rank describing the rank for the taxon over its state distribution. Both global and state ranks reflect a combination of rarity, threat, and trend factors. Coast yellow leptosiphon has been assigned a global rank of G1 and a state rank of S1 (CNDDB 2017), indicating that the species is critically imperiled both within California and throughout its entire range, with a very high risk of extinction due to extreme rarity (often five or fewer populations), very steep declines, or other factors.

California Rare Plant Rank

Some plants in California are assigned a California Rare Plant Rank (CRPR) to identify them as species of conservation concern. The Department works in collaboration with CNPS and botanical experts throughout the state to assign rare and endangered plants a CRPR reflective of their status. Coast yellow leptosiphon has been assigned a CRPR of 1B.1 (CNDDB 2017).

Plants with a CRPR of 1B are rare throughout their range with the majority of them endemic to California. Most of the plants that are ranked 1B have declined significantly over the last century. The threat code extension of ".1" indicates that the species is seriously threatened in California, with over 80 percent of occurrences threatened or a high degree and immediacy of threat (CNDDB 2017).

EXISTING MANAGEMENT EFFORTS

Resource Management Plans

The Department is not aware of any resource management plans prepared for coast yellow leptosiphon.

The coast yellow leptosiphon population is located within the Fitzgerald Marine Reserve, which is a San Mateo County Park, and is also adjacent to the Montara State Marine Reserve, which is a California Marine Protected Area that is located in California state waters below the mean high tide line. San Mateo County released a Master Plan for the Fitzgerald Marine Reserve in 2002, but the area where the coast yellow leptosiphon occurs on Vallemar Bluff was not surveyed, and coast yellow leptosiphon is not accounted for in the Master Plan (Brady/LSA 2002). San Mateo County Parks Department has been contacted about the omission and the presence of coast yellow leptosiphon and the other rare plants located on the property. The County of San Mateo intends to revise the Master Plan to include management and protection of coast yellow leptosiphon and other rare plants located within the Fitzgerald Marine Reserve (Corelli 2016; R. Arechiga pers. comm. 2016, 2017).

Monitoring and Research

Petitioner and botanist, Toni Corelli, continues to visit and observe the coast yellow leptosiphon population at least once per year and observational information is being collected. The Department is not aware of any other ongoing coast yellow leptosiphon research or monitoring of the coast yellow leptosiphon population.

Commented [A4]: I would be happy to contribute to any formal monitoring activities proposed.

Habitat Restoration Projects

The Department has discussed the potential for seed collection, reintroduction, and habitat restoration for coast yellow leptosiphon with the County of San Mateo (R. Arechiga pers. comm. 2016, 2017). The County of San Mateo is interested in identifying nearby suitable habitat owned by the County of San Mateo to introduce coast yellow leptosiphon seed (Arechiga 2017). University of California Botanical Garden at Berkeley has approximately 870 seeds from 53 individual coast yellow leptosiphon plants in conservation storage (H. Forbes pers. comm. 2016, 2017). No efforts have been initiated for habitat restoration.

Impacts of Existing Management Efforts

Since its inception, the Fitzgerald Marine Reserve has been managed for multiple purposes, including education, research and scientific study, recreation, collection of seashore animals and plants, and fishing. However, the area where coast yellow leptosiphon occurs was not surveyed during preparation of the Master Plan, and currently no management is taking place on this portion of the Fitzgerald Marine Reserve (Brady/LSA 2002; Arechiga pers. comm. 2016, 2017).

SCIENTIFIC DETERMINATIONS REGARDING THE STATUS OF COAST YELLOW LEPTOSIPHON IN CALIFORNIA

CESA directs the Department to prepare this report regarding the status of coast yellow leptosiphon based upon the best scientific information available to the Department (Fish & G. Code, § 2074.6). CESA's implementing regulations identify key factors that are relevant to the Department's analyses. Specifically, a "species shall be listed as endangered or threatened ... if the Commission determines that its continued existence is in serious danger or is threatened by any one or any combination of the following factors: 1. present or threatened modification or destruction of its habitat; 2. overexploitation; 3. predation; 4. competition; 5. disease; or 6. other natural occurrences or human-related activities" (Cal. Code Regs., tit. 14, § 670.1, subd. (i)(1)(A)).

Commented [A5]: The case is clearly made that factors 1., 4., and 6. apply.

The definitions of endangered and threatened species in the Fish and Game Code provide key guidance to the Department's scientific analysis. An endangered species under CESA is one "which is in serious danger of becoming extinct throughout all, or a significant portion, of its range due to one or more causes, including loss of habitat, change in habitat, over exploitation, predation, competition, or disease" (Fish & G. Code, § 2062). A threatened species under CESA is one "that, although not presently threatened with extinction, is likely to become an endangered species in the foreseeable future in the absence of special protection and management efforts required by [CESA]" (*Id.*, § 2067).

The preceding sections of this Status Review report describe the best scientific information available to the Department, with respect to the key factors identified in the regulations.

Present or Threatened Modification or Destruction of Habitat

Habitats along the San Mateo Coast have been impacted by a history of modification and destruction from development, agriculture, grazing, and other land use. Most of the coastal prairie habitat, which provides potential habitat for coast yellow leptosiphon, has been destroyed or modified due to urban development, agriculture, and invasion by non-native plant species. The proposed development on the property adjacent to the coast yellow leptosiphon population will result in habitat degradation and modification that will negatively impact the species and could result in a severe decline or extirpation of the population, thus leading to the extinction of the species. In addition, human use within and in the vicinity of the coast yellow leptosiphon population has resulted in habitat degradation that is evident on the ground and is visible from aerial imagery (see Figure 7). The proposed development will lead to an increase in human use of the area, resulting in additional impacts from trampling and habitat disturbance. In addition, burrowing mammals such as gophers are present at the coast yellow leptosiphon population and may be impacting coast yellow leptosiphon. The Department considers modification and destruction of habitat to be a significant threat to the continued existence of coast yellow leptosiphon.

Overexploitation

The Department does not consider overexploitation to be a significant threat to the continued existence of coast yellow leptosiphon.

Predation

The Department does not consider predation to be a significant threat to the continued existence of coast yellow leptosiphon.

Competition

Invasive plant species have been documented to pose serious threats to biodiversity around the world, and are a particularly pervasive problem in Mediterranean-type habitats like those in California. Invasive mat-forming freeway iceplant and other invasive plants, such as rough cat's ear and English plantain, occur within and in close proximity to the coast yellow leptosiphon population. The Department considers invasive plant species, particularly freeway iceplant, to be a significant threat to the continued existence of coast yellow leptosiphon.

Disease

There are no diseases known to be threats to the continued existence of coast yellow leptosiphon. The Department does not consider disease to be a significant threat to the continued existence of coast yellow leptosiphon.

Other Natural Occurrences or Human-related Activities

The coast yellow leptosiphon population is located near the edge of Vallemar Bluff, and bluff-top erosion and rising ocean levels pose a serious threat to this species. The climate of California is

Figure 7 - Proximity of Threats to Coast Yellow Leptosiphon

certain to change due to warming of the global climate system, which could lead to an accelerated rate of bluff erosion. Coast yellow leptosiphon has an extremely narrow distribution consisting of one population that occupies an extremely small area. Coast yellow leptosiphon's rarity and extremely limited distribution, and its occurrence in only one area that is partially surrounded by development, makes the species very vulnerable to stochastic events such as erosion, landslides, and drought, and to all other threats. Therefore, the loss of all or a significant portion of the coast yellow leptosiphon population would represent the loss of all or a significant portion of coast yellow leptosiphon's total range, and could result in the extinction of the species. Impacts from pedestrian traffic and trampling also pose a threat to coast yellow leptosiphon, and the proposed development would likely increase human use of the area. The Department considers erosion, other natural occurrences, and human-related activities to be a significant threat to the continued existence of coast yellow leptosiphon.

SUMMARY OF KEY FINDINGS

Coast yellow leptosiphon is an extremely rare species known from only one small population. The population occurs in close proximity to urban land use, and has been either directly or indirectly impacted by modification or destruction of habitat. Based upon current land use practices that include the potential development of the adjacent property, the modification, destruction and impacts to coast yellow leptosiphon habitat are likely to continue into the future. The coast yellow leptosiphon population is being impacted by invasive plant species and human activities, such as pedestrian use of the area. Bluff-top erosion is also a serious and imminent threat to this species, and climate change may accelerate that process. Bluff-top erosion alone could lead to near extinction of the species in 50 years based on current bluff-top recession predictions. Compounding the threats to the species is the inherent vulnerability of small populations to extirpation due to stochastic events. The entire distribution of coast yellow leptosiphon is limited to one site that occupies an area approximately 167 square meters (1,800 square feet) in size (CNDDB 2017; Department staff observation), with population estimates over the years ranging between 400 and 1,000 individual plants; it is found nowhere else in the world. Due to the extremely limited distribution of coast yellow leptosiphon and its small population size, the loss of any portion of its population would be considered the loss of a significant portion of the species total range and would likely result in the extinction of this species.

The information available to the Department regarding the status of coast yellow leptosiphon indicates that there are significant threats to the continued existence of the species. Proximity of threats to the coast yellow leptosiphon population are illustrated in Figure 7.

RECOMMENDATION FOR PETITIONED ACTION

CESA directs the Department to prepare this report regarding the status of coast yellow leptosiphon in California based upon the best scientific information available to the Department (Fish & G. Code, § 2074.6). CESA also directs the Department to indicate in this Status Review whether the petitioned action is warranted (Fish & G. Code, § 2074.6; Cal. Code Regs., tit. 14, § 670.1, subd. (f)). The Department includes and makes its recommendation in this Status Review as submitted to the Commission in an advisory capacity based on the best available science. Based on the criteria described above, the best scientific information available to the Department indicates that coast yellow leptosiphon is in serious danger of becoming extinct in all or a significant portion of its range due to one or more causes including loss of habitat,

change in habitat, competition and other effects from invasive plant species, and other natural occurrences and human-related activities.

The Department recommends that the Commission find the petitioned action to list coast yellow leptosiphon as an endangered species to be warranted.

PROTECTION AFFORDED BY LISTING

It is the policy of the state to conserve, protect, restore and enhance any endangered or any threatened species and its habitat (Fish & G. Code, § 2052). If listed as an endangered or threatened species, unauthorized "take" of coast yellow leptosiphon will be prohibited, making the conservation, protection, and enhancement of the species and its habitat an issue of statewide concern. As noted earlier "take" is defined under CESA as hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill (*Id.*, § 86). Any person violating the take prohibition would be punishable under state law. The Fish and Game Code provides the Department with related authority to authorize "take" under certain circumstances (*Id.*, §§ 2081, 2081.1, 2086, 2087, 2089.6, 2089.10 and 2835). As authorized through an incidental take permit, however, impacts of the taking on coast yellow leptosiphon caused by the activity must be minimized and fully mitigated according to state standards.

Additional protection of coast yellow leptosiphon following listing would also occur during required public agency environmental review under the California Environmental Quality Act (CEQA), and its federal counter-part, the National Environmental Policy Act (NEPA). CEQA and NEPA both require affected public agencies to analyze and disclose project-related environmental effects, including potentially significant impacts on endangered, rare, and threatened special status species. Under CEQA's "substantive mandate," for example, state and local agencies in California must avoid or substantially lessen significant environmental effects to the extent feasible. With that mandate, and the Department's regulatory jurisdiction generally, the Department expects related CEQA and NEPA review will likely result in increased information regarding the status of coast yellow leptosiphon in California as a result of, among other things, updated occurrence and abundance information for individual projects. Where significant impacts are identified under CEQA, the Department expects project-specific required avoidance, minimization and mitigation measures will also benefit the species. While both CEQA and NEPA would require analysis of potential impacts to coast yellow leptosiphon regardless of their listing status under CESA, the acts contain specific requirements for analyzing and mitigating impacts to listed species. In common practice, potential impacts to listed species are examined more closely in CEQA and NEPA documents than potential impacts to unlisted species. State listing, in this respect, and required consultation with the Department during state and local agency environmental review under CEQA, is also expected to benefit the species in terms of related impacts for individual projects that might otherwise occur absent listing.

If coast yellow leptosiphon is listed under CESA, it may increase the likelihood that state and federal land and resource management agencies will allocate funds towards protection and recovery actions. However, funding for species recovery and management is limited, and there is a growing list of threatened and endangered species.

MANAGEMENT RECOMMENDATIONS AND RECOVERY MEASURES

CESA directs the Department in its Status Review to recommend management activities and other recommendations for recovery of coast yellow leptosiphon (Fish & G. Code, § 2074.6; Cal. Code Regs., tit. 14, § 670.1, subd. (f)). The utility of current data on coast yellow leptosiphon is limited by being largely anecdotal and qualitative. Studies designed to provide quantitative data on the coast yellow leptosiphon population, and the factors that affect the potential for coast yellow leptosiphon to survive and reproduce, are necessary for species management. Department staff with suggestions from local agencies, non-profits, and interested parties generated the following list of recommended management actions:

- Collect and bulk seeds of coast yellow leptosiphon for long term conservation storage and potential introduction into suitable habitat;
- Identify and restore degraded potential coast yellow leptosiphon habitat near the existing population. Collect and distribute seed into nearby suitable habitat;
- Permanently protect the coast yellow leptosiphon population on County of San Mateo property and on the private parcel where one individual coast yellow leptosiphon individual was observed from modification and destruction via fee title acquisition, conservation easements or similar protective measures;
- Permanently protect the private parcels adjacent to the coast yellow leptosiphon population from modification and destruction via fee title acquisition, conservation easements or similar protective measures to provide a buffer adjacent to the coast yellow leptosiphon population;
- Remove and control the freeway iceplant invasion adjacent to the coast yellow leptosiphon population;
- Restrict public access in the vicinity of the coast yellow leptosiphon population through installation of protective fencing and/or signs, or other suitable means;
- Remove or relocate the bench adjacent to the coast yellow leptosiphon population, or provide other creative foot-traffic influencing features in the area to encourage people to avoid walking through the coast yellow leptosiphon population;
- Research the life history characteristics of coast yellow leptosiphon, including factors related to pollination, seed dispersal, seed longevity and soil seed bank, seed productivity, growth, propagation, and microhabitat requirements for germination and recruitment;
- Implement monitoring and adaptive management programs for the coast yellow leptosiphon population. Ensure that monitoring results trigger appropriate management responses such as implementing other measures to control invasive species or controlling recreational activities. Make the data and reports from monitoring and adaptive management programs available to resource agencies and to those who are directly involved in coast yellow leptosiphon management;
- Implement a program to detect coast yellow leptosiphon population trends using statistically-valid population estimates; and
- Survey for additional populations of coast yellow leptosiphon.

Commented [A6]: Protection for at least some portion of the adjacent parcels, nearest to and/or with habitat best suited for the leptosiphon, is urgent!

PUBLIC RESPONSE

Comments were invited in response to the Petition in letters mailed on June 6, 2017, to property owners where the coast yellow leptosiphon population occurs and adjacent property owners,

and in a Department Press Release dated August 9, 2017. The Department received three comments in response to the press release and letters, which are included in Appendix A.

PEER REVIEW

Independent botany experts were invited to review the Status Review report before submission to the Fish and Game Commission. The letters of invitation and all comments received are included in Appendix B [Will be included in the final draft].

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LITERATURE CITED

The following sources were used during the preparation of this Status Review report:

Albert, M. 2000. *Carpobrotus edulis* (L.) N.E. Br. Pages 90-94 in C.C. Bossard, J.M. Randall, and M.C. Hoshovsky. Invasive Plants of California's Wildlands. University of California Press, Berkeley, CA.

Albert, M.E. 1995. Portrait of an invader II: the ecology and management of *Carbobrotus edulis*. CalEPPC News 3(2): 4-6.

Bartomeus, I., and M. Vilà. 2009. Breeding system and pollen limitation in two supergeneralist alien plants invading Mediterranean shrublands. Australian Journal of Botany 67:109-115.

Battaglia, R. 1998. Field survey form for *Linanthus croceus* dated May 23, 1998.

Battaglia, R., and R. Patterson. 2001. A morphometric analysis of the *Leptosiphon androsaceus* complex (Polemoniaceae) in the Central and South Coast ranges. Madroño 48:62-78.

Bell, C.D., and R.W. Patterson. 2000. Molecular phylogeny and biogeography of *Linanthus* (Polemoniaceae). American Journal of Botany 87:1857-1870.

Bittman, R. 2001. The California Natural Diversity Database: A Natural Heritage Program for Rare Species and Vegetation. Fremontia 29:3-4.

Bourgeois, K., C.M. Suehs, E. Vidal, and F. Médail. 2005. Invasional meltdown potential: Facilitation between introduced plants and mammals on French Mediterranean islands. Ecoscience 12:248-256.

Brady/LSA. 2002. Fitzgerald Marine Reserve Master Plan. Prepared for the County of San Mateo. Available from http://parks.smcgov.org/documents/fitzgerald-marine-reserve-master-plan 157 pp.

California Department of Fish and Wildlife, Biogeographic Data Branch. 2017. Natural Communities – Background Information. Website https://www.wildlife.ca.gov/data/VegCAMP/Natural-Communities/Background [accessed 26 June 2017].
California Department of Fish and Wildlife. 2016. Report to the Fish and Game Commission Evaluation of the Petition from Ms. Toni Corelli and the California Native Plant Society to List Coast Yellow Leptosiphon (*Leptosiphon croceus*) as an Endangered Species under the California Endangered Species Act. 17 pp.

CNDDB (California Natural Diversity Database). 2017. Rarefind 5 [Internet]. California Department of Fish and Wildlife. [Version: July 1, 2017].

Cal-IPC (California Invasive Plant Council). 2017. California Invasive Plant Inventory Database. Available online at: http://www.cal-ipc.org/paf/. [accessed 2017 August 2].

CDRC (Coastside Design Review Committee). 2017. Letter to Moss Beach Associates, LLC dated July 25, 2017. Available from: http://www.midcoastcommunitycouncil.org/vallemar-bluff/ [accessed 8 August 2017].

CNPS (California Native Plant Society) Rare Plant Program. 2017. Inventory of Rare and Endangered Plants (Online Edition, v8-03 0.39). Available online at: http://www.rareplants.cnps.org [accessed 10 August 2017].

Conser, C., and E.F. Connor. 2009. Assessing the residual effects of *Carpobrotus edulis* invasion, implications for restoration. Biological Invasions 11:349-358.

Corelli, T. 1999. Field survey form for *Linanthus croceus* dated May 31, 1999.

Corelli, T. 2015. 2015. Field survey form for *Leptosiphon croceus* dated May 3, 2015.

Corelli, T. 2016. Coast Yellow Leptosiphon Petition to the State of California Fish and Game Commission. May 23, 2016. 18 pp.

County of San Mateo, Planning and Building. 2017. Four Residences at Juliana & Vallemar, Moss Beach. Website: http://planning.smcgov.org/four-residences-juliana-vallemar-moss-beach [accessed 3 August 2017].

D'Antonio, C.M. 1990. Seed production and dispersal in the non-native, invasive succulent *Carpobrotus edulis* (Aizoaceae) in coastal strand communities of central California. Journal of Applied Ecology 27:693-702.

D'Antonio, C.M., and K. Haubensak. 1998. Community and ecosystem impacts of introduced species. Fremontia 26(4):13-18.

D'Antonio, C.M., and B.E. Mahall. 1991. Root profiles and competition between the invasive, exotic perennial, *Carpobrotus edulis*, and two native shrub species in California coastal scrub. American Journal of Botany 78: 885-894.

D'Antonio, C.M., and P.M. Vitousek. 1992. Biological invasions by exotic grasses, the grass/fire cycle, and global change. Annual Review of Ecology and Systematics 23(1992):63-87.

Digital Map Products. 2017. LandVision, subscription map service. Website: https://www.digmap.com [Accessed 25 May 2017].

Dirzo, R., and P. Raven. 2003. Global state of biodiversity and loss. Annual Review of Environment and Resources 28:137-167.

Eastwood, A. 1904. Some new species of western Polemoniaceae. Botanical Gazette 37:437-447.

Ellstrand, N.C., and D.R. Elam. 1993. Population Genetic Consequences of Small Population Size: Implications for Plant Conservation. Annual Review of Ecology and Systematics 24: pp. 217-242.

Ford, L. D., and G. F. Hayes. 2007. Northern Coastal Scrub and Coastal Prairie. Pages 180-207 *in* M.G. Barbour, T. Keeler-Wolf, and A. Schoenherr, eds. Terrestrial Vegetation of California. 3rd edition. University of California Press, Berkeley.

Fried, G, B. Laitung, C. Pierre, N. Chagué, and F.D. Panetta. 2014. Impact of Invasive Plants in Mediterranean Habitats: Disentangling the Effects of Characteristics of Invaders and Recipient Communities. Biological Invasions 16:1639-1658.

Gaertner, M., A.D. Breeyen, C. Hui, and D.M. Richardson. 2009. Impacts of Alien Plant Invasions on Species Richness in Mediterranean-type Ecosystems: A Meta-analysis. Progress in Physical Geography 33:319–338.

Given, D.R. 1994. Principles and Practice of Plant Conservation. Timber Press, Portland, Oregon.

Godfrey, M. 2015. Ecological Buffers. Reducing Ecological Impacts of Shale Development: Recommended practices for the Appalachians. Available from: https://www.nature.org/media/centralapps/recommended-shale-practices-ecological-buffers.pdf?redirect=https-301 [accessed 14 August 2017].

Goodwillie, C. 1999. Wind pollination and reproductive assurance in *Linanthus parviflorus* (Polemoniaceae), a self-incompatible annual. American Journal of Botany 86: 948-954.

Goodwillie, C. 2001. Pollen limitation and the evolution of self-compatibility in *Linanthus* (Polemoniaceae). International Journal of Plant Science 162: 1283-1292.

Greene, E.L. 1889-1892. Some American Polemoniaceae. Pittonia 2:251-260.

Groom, M.J., Meffe, G.K., and C.R. Carroll. 2006. Principles of Conservation Biology, Third Edition. Sinauer Associates, Inc., Sunderland, MA.

Hankamp, P., C.D. Bell, and R. Patterson. 2016. Towards a complete species level phylogeny of *Leptosiphon* (Polemoniaceae). Madroño 63:208-219.

Haro, Kasunich & Associates, Inc. 2015. Coastal Bluff Recession Study, Juliana Avenue and Vallemar Street. Report prepared for Moss Beach Associates LLC. Available from: http://www.midcoastcommunitycouncil.org/vallemar-bluff/ [accessed 8 August 2017].

Heberger, M., H. Cooley, P. Herrera, P.H. Gleick, and E. Moore. 2009. The impacts of sea-level rise on the California coast. Prepared by the Pacific Institute for the California Climate Change Center. 115 pp.

Hickman, J.C. (ed.) 1993. The Jepson Manual: Higher Plants of California. University of California Press. Berkeley, CA.

Holland, R. 1986. Preliminary Descriptions of the Terrestrial Natural Communities of California. California Department of Fish and Game, The Resources Agency. Sacramento, CA. 165 pp.

Huntly, N., and R. Inouye. 1988. Pocket gophers in ecosystems: patterns and mechanisms. BioScience 38:786-793.

Inouye, R.S., N.J. Huntly, D. Tilman, and J.R. Tester. 1987. Pocket gophers (*Geomys bursarius*), vegetation, and soil nitrogen along a successional sere in east central Minnesota. Oecologia 72:178-184.

IPCC. 2014. Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp.

JCP-Engineers and Geologists, Inc. 1990. Engineering Geologic Reconnaissance Study for Proposed Development of Seven Homes on Vallemar Street, Juliana Avenue, Moss Beach, California. Prepared for Richard Charnock, November 15, 1990.

Jepson, W.L. 1925. A manual of the flowering plants of California. University of California Press, Berkeley, CA.

Jodi McGraw Consulting. 2017. Vallemar Bluffs Conservation Strategy. Report Prepared for Moss Beach Associates. Available online at http://www.midcoastcommunitycouncil.org/vallemar-bluff/ [accessed 8 August 2017].

Klein, A., T. Keeler-Wolf, and J. Evens. 2015. Classification of the Vegetation Alliances and Assocations of Sonoma County, California. Volume 1 of 2 – Introduction, Methods, and Results. Report prepared for The Sonoma County Agricultural Preservation and Open Space District, The Sonoma County Water Agency.

Levine J.M., M. Vilà, C.M. D'Antonio, J.S. Dukes, K. Grigulis, and S. Lavorel. 2003. Mechanisms Underlying the Impacts of Exotic Plant Invasions. Proceedings of the Royal Society of London B 270:775-781.

Line, D.E., and N.M. White. 2007. Effects of development on runoff and pollutant export. Water Environment Research 79:185-190.

Menges, E.S. 1991. The Application of Minimum Viable Population Theory to Plants. pp. 45-61 in D.A Falk and K.E. Holsinger (eds.). Genetics and Conservation of Rare Plants. Oxford University Press, New York, NY.

Mesiti-Miller Engineering, Inc. 2017. Utility and Drainage Plan, Vallemar Street & Juliana Avenue, Moss Beach California. Available from: http://www.midcoastcommunitycouncil.org/vallemar-bluff/ [accessed 3 August 2017].

Midcoast Community Council. 2017. Vallemar Bluff. Website: http://www.midcoastcommunitycouncil.org/vallemar-bluff/ [accessed 3 August 2017].

Milliken, J. 1904. A review of California Polemoniaceae. University of California Publications in Botany 2:1-71.

Munz, P.A. 1959. A California Flora. University of California Press, Berkeley, CA.

NatureServe. 2012. NatureServe Conservation Status Assessments: Methodology for Assigning Ranks. NatureServe Report Revised Edition June 2012. Available online at http://www.natureserve.org/sites/default/files/publications/files/natureserveconservationstatusmethodology_jun12_0.pdf [accessed 10 August 2017].

NatureServe. 2016. The NatureServe Climate Change Vulnerability Index release 3.02. Available from: http://www.natureserve.org/climatechange [accessed 28 July 2017].

Pampeyan, E. 1994. Geologic Map of the Montara Mountain and San Mateo 7-1/2' Quadrangles, San Mateo County, California. U.S. Department of the Interior, U.S. Geological Survey.

Patterson, R., and R. Battaglia. 2017. *Leptosiphon croceus*, in Jepson Flora Project (eds.) *Jepson eFlora.* http://ucjeps.berkeley.edu/eflora/eflora_display.php?tid=80954 [accessed 2017 August 7].

Pearson Design Group. 2016. Moss Beach – Overall Site Plan. Design Review Set, April 26, 2016. Available from http://www.midcoastcommunitycouncil.org/vallemar-bluff/ [accessed 10 August 2017].

Pimentel, D., R. Zuniga, and D. Morrison. 2004. Update on the Environmental and Economic Costs Associated with Alien-invasive Species in the United States. Ecological Economics 52:273-288.

Porter, J.M., and L.A. Johnson. 2000. A phylogenetic classification of Polemoniaceae. Aliso: A Journal of Systematic and Evolutionary Biology 19:55-91.

Primack, R.B. 2006. Essentials of Conservation Biology, Fourth Edition. Sinauer Associates, Sunderland, MA.

PRISM Climate Group. 2017. Oregon State University. Available online at: http://prism.oregonstate.edu. Created June 27, 2017.

Randall, J.M., and M.C. Hoshovsky. 2000. California's Wildland Invasive Plants. pp. 11-27 in Bossard, C.C., J.M. Randall, and M.C. Hoshovsky. Invasive Plants of California's Wildlands. University of California Press. Berkeley, CA.

Reichman, O.J., and E.W. Seabloom. 2002. The role of pocket gophers as subterranean ecosystem engineers. Trends in Ecology and Evolution 17:44-49.

Santoro, R., T. Jucker, M.L. Carranza, and A.T.R. Acosta. 2011. Assessing the effects of *Carpobrotus* invasion on coastal dune soils. Does the nature of the invaded habitat matter? Community Ecology 12:234-240.

Saunders, D.A., R.J. Hobbs, and C.R. Margules. 1991. Consequences of ecosystem fragmentation: a review. Conservation Biology 5(1):18-32.
Sawyer, J.O., T. Keeler-Wolf, and J.M. Evans. 2009. A Manual of California Vegetation, Second Edition. California Native Plant Society Press. Sacramento, CA.

Shaffer, M.L. 1981. Minimum population Sizes for Species Conservation. Bioscience 31:131-134.

Shaffer, M.L. 1987. Minimum Viable Populations: Coping with Uncertainty. pp. 69-86 in M.E. Soule (editor), Viable Populations for Conservation. Cambridge University Press, Cambridge, England.

Smil, V. 1997. Global population and the nitrogen cycle. Scientific American 277(1):76-81.

Soil Survey Staff. 2017. Web Soil Survey. Natural Resources Conservation Service, United States Department of Agriculture. Available online at https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx [accessed June 26, 2017].

Spitzer, G. 2002. Ice plant getting cold reception from naturalists. Los Angeles Times, May 04, 2002. Available online at http://articles.latimes.com/2002/may/04/local/me-outthere4 [accessed 4 August 2017].

Strother, J.L., and K.R. Kersh. 2016. Typifications of *Linanthus parviflorus* var. *croceus* Milliken and *Linanthus croceus* Eastw. (Polemoniaceae). Phytoneuron 2016-21:1-2.

Suehs, C.M., E. Medail, and L. Affre. 2004. Invasion dynamics of two alien *Carpobrotus* (Aizoaceae) taxa on a Mediterranean island: I. Genetic diversity and introgression. Heredity (2004) 92:31-40.

USDA (United States Department of Agriculture), Natural Resources Conservation Service. 2017. Buffer Strips: Common Sense Conservation. Webpage: https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/home/?cid=nrcs143_023568 [accessed 14 August 2017].

van Kleunen, M., W. Dawson, F. Essl, J. Pergl, M. Winter, E. Weber, H. Kreft, P. Weigelt, J. Kartesz, M. Nishino, L.A. Antonova, J. F. Barcelona, F. J. Cabezas, D. Cárdenas, J. Cárdenas-Toro, N. Casaño, E. Chacón, C. Chatelain, A.L. Ebel, E.Figueiredo, N. Fuentes, Q.J. Groom, L. Henderson, Inderjit, A. Kupriyanov, S. Masciadri, J. Meerman, O. Morozova, D. Moser, D.L. Nickrent, A. Patzelt, P.B. Pelser, M.P. Baptiste, M. Poopath, M. Schulze, H. Seebens, S. Shu, J. Thomas, M. Velayos, J.J. Wieringa, and P. Pyšek. 2015. Global Exchange and Accumulation of Non-native Plants. Nature 525:100-103.

Vilà, M., M. Tessier, G.M. Suehs, G. Brundu, L. Carta, A. Galanidis, P. Lambdon, M. Manca, F. Médail, E. Moragues, A. Traveset, A.Y. Troumbis, and P.E. Hulme. 2006. Local and regional assessment of the impacts of plant invaders on vegetation structure and soil properties of Mediterranean islands. Journal of Biogeography 33:853-861.

Villarreal, D., K.L. Clark, L.C. Branch, J.L. Hierro, and M. Machicote. 2008. Alteration of ecosystem structure by a burrowing herbivore, the plains vizcacha (*Lagostomus maximus*). Journal of Mammology 89:700-711.

Vitousek, P.M., J.D. Aber, R.W. Howarth, G.E. Likens, P.A. Matson, D.W. Schindler, W.H. Schlesinger, and D.G. Tilman. 1997. Human alteration of the global Nitrogen cycle: sources and consequences. Ecological Applications 7:737–750.
Weber, J.J., and C. Goodwillie. 2013. Variation in floral longevity in the genus *Leptosipon*: mating system consequences. Plant Biology 15(2013):220-225.

Wilcove, D.S., D. Rothstein, J. Dubow, A. Phillips, and E. Losos. 1998. Quantifying Threats to Imperiled Species in the United States. Bioscience 48:607–615.

Xiao, Y., X. Li, Y. Cao, and M. Dong. 2016. The diverse effects of habitat fragmentation on plant-pollinator interactions. Plant Ecology 217:857-868.

Young B.E., E. Byers, G. Hammerson, A. Frances, L. Oliver, and A. Treher. 2015. Guidelines for using the NatureServe Climate Change Vulnerability Index Release 3.0. Arlington, VA: NatureServe.

Yurkonis, K.A., and S.J. Meiners. 2004. Invasion Impacts Local Species Turnover in a Successional System. Ecology Letters 7:764-769.

Zander, Michael J. 2015. Vegetation Characterization and Mapping, Moss Beach Lots. Letter to Owen Lawlor, Moss Beach Associates, LLC. May 21, 2015.

Personal Communication

Arechiga, Ramona. Phone conversation. August 12, 2016.

Arechiga, Ramona. Phone conversation. June 27, 2017.

Corelli, Toni. Personal e-mail communication. June 8, 2016.

Forbes, Holly. Personal e-mail communication. August 11, 2016.

Forbes, Holly. Personal e-mail communication. August 03, 2017.

Lazar, Kristi. Personal e-mail communication. March 4, 2016.

APPENDIX A: Comments from Affected and Interested Parties on the Petitioned Action

APPENDIX B: External Peer Review Invitation Letters and Comments from Peer Reviewers on the Coast Yellow Leptosiphon Status Review Report

Peer Review Comments from Neal Kramer and Department Responses

Page	Line	Reviewer Comment	Department Response
7	17	The description below is thorough and consistent with my experience.	Comment noted. No response needed.
7	45	Typo corrected.	Text updated.
14	15	Ultimately, this potential seed bank may be an essential element for long term survival of the species.	Text added to this section: “Presence of a potential seed bank may be an essential element for long-term survival of coast yellow leptosiphon.”
14	31	Any evidence that this would be a net positive or negative impact? The leptosiphon might benefit from soil tilling or seed dispersal by burrowing mammals.	The Department does not have information on how burrowing mammals would specifically affect coast yellow leptosiphon, only general references on the negative impacts of burrowing mammals to plant populations and species diversity. Text modified to indicate the Department does not have any specific information on the effects of burrowing mammals on the survival of coast yellow leptosiphon.
22	4	I would be happy to contribute to any formal monitoring activities proposed.	Comment noted. No response needed.
22	28	The case is clearly made that factors 1., 4., and 6. apply.	Comment noted. No response needed.
27	19	Protection for at least some portion of the adjacent parcels, nearest to and/or with habitat best suited for the leptosiphon, is urgent!	Comment noted. No response needed.
27	31	“and soil seed bank” added to text.	Text updated.

State of California – Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
Habitat Conservation Planning Branch
1416 Ninth Street, 12th Floor
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EDMUND G. BROWN JR., Governor
CHARLTON H. BONHAM, Director

October 2, 2017

Robert Patterson, Ph.D.
Department of Biology
San Francisco State University
1600 Holloway Avenue
San Francisco, California 94132
patters@sfsu.edu

Dear Dr. Patterson:

Coast Yellow Leptosiphon (*Leptosiphon croceus*); California Department of Fish and Wildlife, Peer Review Status Report

Thank you for agreeing to serve as a scientific peer reviewer for the California Department of Fish and Wildlife (Department) Status Review of coast yellow leptosiphon (*Leptosiphn croceus*). Please review the copy of the Department's peer review draft report dated October 2, 2017, that is included with this letter. The Department seeks your expert analysis and input regarding the scientific validity of the report and its assessment of the status of coast yellow leptosiphon in California based on the best scientific information currently available. The Department respectfully requests that you focus your peer review effort on the body of relevant scientific information and the Department's related assessment of the population and life history elements prescribed in the California Endangered Species Act (CESA). **The Department would appreciate receiving your peer review input on or before October 31, 2017**.

The Department seeks your scientific peer review as part of formal proceedings pending before the California Fish and Game Commission (Commission) under CESA. As you may know, the Commission is a constitutionally established entity distinct from the Department, exercising exclusive statutory authority under CESA to list species as endangered or threatened (Fish & G. Code, § 2070). The Department serves in an advisory capacity during CESA listing proceedings, charged by the Fish and Game Code to focus on the best scientific information available to make related recommendations to the Commission (Fish & G. Code, § 2074.6).

The Commission received the petition to list coast yellow leptosiphon under CESA on May 25, 2016. On December 23, 2016, the Commission published findings formally designating coast yellow leptosiphon as a candidate for listing as threatened or endangered under CESA. Coast yellow leptosiphon is currently protected under CESA in California in that capacity.

The peer review draft report forwarded to you today reflects the Department's effort to identify and analyze the best scientific information available regarding the status of

coast yellow leptosiphon in California. At this time, the Department believes that the best available science indicates that listing the species as endangered under CESA is warranted. We underscore, however, that scientific peer review plays a critical role in the Department's effort to develop and finalize its recommendation to the Commission as required by the Fish and Game Code. Our expected recommendation to the Commission at this point may change following your input.

We ask you to focus your peer review on the best scientific information available regarding the status of coast yellow leptosiphon in California. As with our own effort to date, your peer review of the science and analysis regarding each of the population and life history categories prescribed in CESA are particularly important (Cal. Code Regs., tit. 14, § 670.1(i)(1)(A)) (i.e., present or threatened habitat modification, overexploitation, predation, competition, disease, and other natural occurrences or human-related activities that could affect the species) as well as whether it indicates, in your opinion, that coast yellow leptosiphon is at serious risk of becoming extinct throughout all or a significant portion of its range in California, or whether the species is likely to become so in California in the foreseeable future. Please note that the Department releases this peer review report to you solely as part of the peer review process, and it is not yet public.

A Microsoft Word version and a PDF version of the report are included with this letter; however, only the PDF version includes figures and appendices. For ease of review, you may submit your comments in "track changes" format, or in list form by page and line number. Please submit your comments electronically to Ms. Cherilyn Burton, Senior Environmental Scientist (Specialist) at cherilyn.burton@wildlife.ca.gov. Ms. Burton may also be reached at (916) 651-6508. If there is anything the Department can do to facilitate your review, please let us know.

Following receipt and consideration of peer review comments, the Department will prepare and submit its final report and related recommendation to the Commission. After at least a 30 day public review period, the Commission will consider the petition to list coast yellow leptosiphon, the Department's report and related recommendations including peer review, and public testimony during a regularly scheduled Commission meeting prior to making their decision.

Thank you again for your contribution to the status review effort and the important input it provides during the Commission's related proceedings.

Sincerely,

Richard Macedo, Branch Chief
Habitat Conservation Planning Branch

Enclosures

ec: California Department of Fish and Wildlife

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State of California
Natural Resources Agency
Department of Fish and Wildlife

REPORT TO THE FISH AND GAME COMMISSION

STATUS REVIEW OF COAST YELLOW LEPTOSIPHON (*Leptosiphon croceus*)

December 2017

Coast yellow leptosiphon (*Leptosiphon croceus*), CDFW photo by Cherilyn Burton

Charlton H. Bonham, Director
Department of Fish and Wildlife

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LIST OF ABBREVIATIONS, ACRONYMS AND TERMS

CEQA – California Environmental Quality Act

CESA – California Endangered Species Act

CNDDB – California Natural Diversity Database

CNPS – California Native Plant Society

Commission – California Fish and Game Commission

CRPR – California Rare Plant Rank

Department – California Department of Fish and Wildlife

Occurrence – CNDDB Element Occurrence

Evaluation – Initial Evaluation of the Petition to List Coast Yellow Leptosiphon (*Leptosiphon croceus*) as an Endangered Species under the California Endangered Species Act

Id. – "the same"

NEPA – National Environmental Policy Act

Petition - Petition to the State of California Fish and Game Commission from Ms. Toni Corelli Cosponsored by the California Native Plant Society to List Coast Yellow Leptosiphon (*Leptosiphon croceus*) as an Endangered Species Pursuant to the California Endangered Species Act

ssp. – Subspecies

var. – Variety

EXECUTIVE SUMMARY

This Status Review of Coast Yellow Leptosiphon (*Leptosiphon croceus* (Eastw.) Strother & Kersh) (Status Review) has been prepared by the California Department of Fish and Wildlife (Department) for the California Fish and Game Commission (Commission) pursuant to the requirements of the California Endangered Species Act (CESA). This Status Review has been independently reviewed by scientific peers, and is based upon the best scientific information available to the Department.

Coast yellow leptosiphon is a low-growing annual plant in the Phlox family (Polemoniaceae) that was first described in 1904. It is known from only one small population that occupies approximately 167 square meters (1,800 square feet), located on Vallemar Bluff in Moss Beach, San Mateo County. This population is located in coastal prairie habitat atop a sea bluff at the edge of the coastline.

The population of coast yellow leptosiphon occurs in close proximity to urban land use, and has been either directly or indirectly impacted by modification or destruction of habitat. Coast yellow leptosiphon is threatened, both directly and indirectly, by development and other land-use changes; impacts from invasive plant species; and impacts from human activities such as trampling. Bluff-top erosion is also a serious threat to this species, and climate change may accelerate this process. In addition, coast yellow leptosiphon is highly vulnerable to extinction due to its extremely limited distribution and restriction to only one small population. Because of the rarity of coast yellow leptosiphon, the loss of any occupied habitat or any portion of the population would represent the loss of a significant portion of its total range, and could result in extinction of the species.

Scientific information available to the Department indicates that coast yellow leptosiphon is in serious danger of becoming extinct in all or a significant portion of its range due to one or more causes, including loss of habitat, change in habitat, competition and other effects from invasive plant species, and other natural occurrences and human-related activities. The Department recommends that the Commission find that the petitioned action to list coast yellow leptosiphon as an endangered species is warranted, and further recommends implementation of the management recommendations and recovery measures described in this Status Review.

INTRODUCTION

This Status Review addresses coast yellow leptosiphon (*Leptosiphon croceus* (Eastw.) Strother & Kersh).

Petition History

On May 25, 2016, the Commission received a petition (Petition) from Ms. Toni Corelli, cosponsored by the California Native Plant Society (CNPS), to list coast yellow leptosiphon as an endangered species pursuant to CESA (Fish & G. Code, § 2050 *et seq*.).

On May 27, 2016, the Commission referred the Petition to the Department for evaluation.

On June 10, 2016, as required by Fish and Game Code section 2073.3, the Commission published notice of receipt of the Petition in the California Regulatory Notice Register. (Cal. Reg. Notice Register 2016, No. 24-Z, p.1002, https://www.oal.ca.gov/wp-content/uploads/sites/28/2017/05/24z-2016.pdf). The Department on July 25, 2106, pursuant to Fish and Game Code Section 2073.5 requested a 30-day extension of time to complete its evaluation report.

On September 26, 2016, the Department provided the Commission with a report, "Evaluation of the Petition from Ms. Toni Corelli and the California Native Plant Society to List Coast Yellow Leptosiphon (*Leptosiphon croceus*) as an Endangered Species under the California Endangered Species Act" (Evaluation). Based upon the information contained in the Petition, the Department concluded, pursuant to Fish and Game Code, section 2073.5, subdivision (a), that sufficient information exists to indicate that the petitioned action may be warranted, and recommended to the Commission that the Petition should be accepted and considered.

On December 8, 2016, at its scheduled public meeting in San Diego, California, the Commission considered the Petition, the Department's Evaluation and recommendation, and comments received. The Commission found that sufficient information existed to indicate the petitioned action may be warranted and accepted the Petition for consideration.

Subsequently, on December 23, 2016, the Commission published its Notice of Findings for coast yellow leptosiphon in the California Regulatory Notice Register, designating coast yellow leptosiphon as a candidate species. (Cal. Reg. Notice Register 2016, No. 52-Z, p. 2197, https://www.oal.ca.gov/wp-content/uploads/sites/28/2017/05/52z-2016.pdf).

Department Review

Following the Commission's action to designate coast yellow leptosiphon as a candidate species, the Department notified affected and interested parties and solicited data and comments on the petitioned action pursuant to Fish and Game Code section 2074.4 (see also Cal. Code Regs., tit. 14, § 670.1, subd. (f)(2)). All comments received are included in Appendix A to this report. The Department promptly commenced its review of the status of the species as required by Fish and Game Code section 2074.6, which has now concluded with this Status Review document.

The Department sought independent and competent peer review on its draft Status Review report by persons of the scientific and academic community commonly acknowledged to be

experts on coast yellow leptosiphon and possessing the knowledge and expertise to critique the scientific validity of the draft Status Review. Appendix B contains a listing of the individuals and agencies given an opportunity to review the draft Status Report, the specific input provided to the Department by the individual peer reviewers, the Department's written response to the input, and any amendments made to the draft Status Review report (Fish & G. Code, § 2074.6; Cal. Code Regs., tit. 14, § 670.1, subd. (f)(2)). [This will be included in the final report]

BIOLOGY

Species Description

The information below is paraphrased from the original species description of coast yellow leptosiphon (Eastwood 1904) and from the Jepson eFlora (Patterson and Battaglia 2017).

Coast yellow leptosiphon is an herbaceous plant that grows to a height of 2 to 7 centimeters (0.8 to 2.8 inches). Its slender stem is much-branched from the base and is covered with white appressed hairs, meaning the hairs are pressed closely against the stem. It has opposite leaves that are generally divided into six lobes and are palmately compound, which means that all the sections or lobes of the leaf, called leaflets, are connected at a common point, resembling a fan. The leaflets are approximately 4 to 7 millimeters (0.16 to 0.28 inches) long on the lower stem and almost twice as long near the flowers, appearing as whorls at the nodes. The leaflets are narrowly oval with the narrower end at the base. The flowers are arranged in heads that are subtended by palmately-divided leaf-like structures called bracts, with five linear divisions that are approximately 7 millimeters (0.28 inch) long and up to 1 millimeter (0.04 inch) wide. The flowers have bright yellow petals that are approximately 6 to 8 millimeters (0.24 to 0.31 inch) wide and generally have two faint red dots at the base. The petals, which collectively are referred to as the corolla, are fused at the base, forming a long funnel-shaped tube that is 26 to 39 millimeters (1.0 to 1.5 inches) long and covered with fine, scattered, spreading hairs. The calyx lobes, otherwise known as sepals, are generally deltate or triangular-shaped, less than 1 millimeter (0.04 inch) wide at the middle, densely glandular-hairy, and have an obscure thin membrane between the lobes. Flowers are bisexual, which means they contain both male and female flower parts in the same flower. The fruit is called a capsule, which is a dry fruit from a compound pistil (female flower part) that opens at maturity to release its seeds. Few seeds are produced by each flower. Coast yellow leptosiphon has a chromosome number of 2n=18.

Commented [A1]: No, the leaves are not compound.

Commented [A2]: This is an incorrect use of the term. Leaflets are divisions of a compound leaf. Leptosiphon has deeply lobed simple leaves. Lobes are simply called lobes.

Commented [A3]: lobes

Commented [A4]: lobes

Commented [A5]: Here you're referring to corolla lobes. The term "petal" should be reserved for corolla parts that are not fused to each other.

Commented [A6]: I would call these dots pretty bright, not faint at all (cf your photo).

Commented [A7]: The tube isn't really funnel-shaped. It's tubular. The corolla is actually salverform.

Commented [A8]: The calyx lobes are actually connected by the membrane so that the entire calyx is a tube.

Commented [A9]: organs

Commented [A10]: organ

Taxonomy

Coast yellow leptosiphon is in the Phlox family (Polemoniaceae), which has a long history of taxonomic confusion (Bell and Patterson 2000; Hankamp et al. 2016). *Leptosiphon* was originally recognized as a genus in 1833 (Bell and Patterson 2000; Porter and Johnson 2000). Greene (1889-1892) combined several genera, including *Leptosiphon*, into a single genus, *Linanthus,* based predominantly on the presence of opposite, palmately-lobed leaves (Battaglia and Patterson 2001). Porter and Johnson (2000) reclassified the taxa within Polemoniaceae and divided *Linanthus* into two distinct genera, *Leptosiphon* and *Linanthus*.

Alice Eastwood, botanist and curator of the California Academy of Sciences Herbarium from 1894 until 1949, formally described coast yellow leptosiphon as a species in 1904 (Eastwood 1904; Porter and Johnson 2000). A single specimen collected by Eastwood on May 9, 1901, has been designated as the type specimen for coast yellow leptosiphon (Strother and Kersh 2016), and is maintained at the California Academy of Sciences Herbarium. Eastwood originally

labeled the specimen as *Gilia androsacea* var. *crocea* (Corelli 2016; Strother and Kersh 2016), but assigned it the species name *Linanthus croceus* Eastw. when she first formally described the species in 1904. Coast yellow leptosiphon has been reclassified several times. Other names assigned to the species include *Linanthus parviflorus* var. *croceus* (Milliken 1904), *Linanthus androsaceus* var. *croceus* (Jepson 1925), and *Linanthus androsaceus* ssp. *croceus* (Munz 1959). In the 1993 Jepson manual, coast yellow leptosiphon and several other closely-related species were grouped together into a single species called variable linanthus (*Linanthus parviflorus*) (Hickman 1993), until Porter and Johnson revised the entire family based on morphological and molecular data. In Porter and Johnson's publication, *Linanthus parviflorus* was reclassified as *Leptosiphon parviflorus*, and coast yellow leptosiphon was recognized as a distinct species, *Leptosiphon croceus* (Eastw.) (Porter and Johnson 2000). Due to an incorrect citation in Porter and Johnson's publication (2000), *Leptosiphon croceus* was not considered to be a validly published species name until Strother and Kersh (2016) corrected the citation error and validly published the current taxonomic name, *Leptosiphon croceus* (Eastw.) Strother & Kersh (Strother and Kersh 2016; Patterson and Battaglia 2017).

There are 31 species and 9 subspecies of *Leptosiphon*. Geographically, five of these species occur in the same geographic area of central California as coast yellow leptosiphon: bristly leptosiphon (*L. acicularis*), false babystars (*L. androsaceus*), true babystars (*L. bicolor*), variable linanthus, and rose leptosiphon (*L. rosaceus*). Taxonomically, coast yellow leptosiphon is most closely related to variable linanthus and broad-lobed leptosiphon (*L. latisectus*) (Hankamp et al. 2016).

Range and Distribution

Range is the general geographical area where an organism occurs. For purposes of CESA and this Status Review, the range is the species' California range (*Cal. Forestry Assn. v. Cal. Fish and Game Com*. (2007) 156 Cal.App.4th 1535, 1551). Distribution refers to actual sites where individuals and populations of the species occur within the species' range.

The genus *Leptosiphon* occurs primarily in western North America, with one species occurring only in Chile. California is the center of diversity for *Leptosiphon* (Hankamp et al. 2016), where 90 percent of the species occur across diverse habitats in the California Floristic Province and adjacent areas (Bell and Patterson 2000).

Coast yellow leptosiphon occurs only in California. Coast yellow leptosiphon was first collected at "Blenheim" by Alice Eastwood, which was a short-lived place name mapped about 3-5 kilometers (2-3 miles) north of Pillar Point and apparently referred to a place at or near present-day Moss Beach (Strother and Kersh 2016; CNDDB 2017). There is limited history of collection of plants in the vicinity of Moss Beach, with most collections dating from the early 1900's to the 1940's. A search conducted by the petitioner for coast yellow leptosiphon in the Consortium of California Herbaria database and California herbaria throughout California found 40 collection sheets that were labeled *Leptosiphon croceus* or a synonym of *Leptosiphon croceus*. These specimens were reviewed in 2016 to verify their identification (Corelli 2016). Many plant specimens that were originally identified as coast yellow leptosiphon had been misidentified and actually represent other *Leptosiphon* species. Review of these specimens indicates that only the historic specimens that were collected from Moss Beach represent coast yellow leptosiphon, and that coast yellow leptosiphon is restricted to one colony in Moss Beach, San Mateo County.

The coast of San Mateo County has been frequently visited by botanists and scientific plant collectors, including botanists that specialize in *Leptosiphon* species. Despite their attempts, no

Commented [A11]: The correct citation is Patterson 1993. Hickman was the editor of TJM1, Patterson authored the treatment.

Commented [A12]: This species is now known as L. aureus (see Porter and Patterson, 2014, Aliso 32(2), 55–88.

Commented [A13]: Insert (L. parviflorus)

Commented [A14]: A minor issue, but here and throughout ranges should be expressed by an en-dash, not a hyphen.

additional populations of coast yellow leptosiphon have been discovered (Corelli 2016). Available data indicate that coast yellow leptosiphon has always been limited in its range and restricted to the Moss Beach area.

The distribution of coast yellow leptosiphon is documented in the California Natural Diversity Database (CNDDB). The CNDDB documents plant taxa, animal taxa, and natural communities that are of conservation concern within California and refers to these taxa as "elements." An "element occurrence" (occurrence) is a location record for a site which contains an individual, population, nest site, den, or stand of a special status element. Populations, individuals, or colonies that are located within 1/4 mile of each other generally constitute a single occurrence, sometimes with multiple "parts" (Bittman 2001). The CNDDB previously contained four occurrences for coast yellow leptosiphon. In March 2016, the CNDDB updated its database to remove three of these occurrences because they had been incorrectly identified as coast yellow leptosiphon, but actually represented other closely related species (Corelli 2016; Lazar pers. comm. 2016). This update resulted in there being only one valid occurrence for this species in the CNDDB (see Figure 1).

The CNDDB documented occurrence and coast yellow leptosiphon population is located within the Fitzgerald Marine Reserve, which is owned by the County of San Mateo and is a San Mateo County Park. The area immediately adjacent to the coast yellow leptosiphon population and the Fitzgerald Marine Reserve consists of several privately owned parcels that are proposed for development as shown in Figure 1 and as described below in the Factors Affecting the Ability to Survive and Reproduce section of this report. The County of San Mateo property and the adjacent private parcels are zoned Resource Management-Coastal Zone (RM-CZ). Development is allowed in an RM-CZ zone, but all development requires approval from the San Mateo County Coastside Design Review Committee (CDRC 2017).

The population of coast yellow leptosiphon is estimated to occupy an area approximately 18 meters by 9 meters (60 feet by 30 feet) or 167 square meters (1,800 square feet) in size (CNDDB 2017; Department staff observation), which represents the entire distribution and range of the species. In addition to the mapped population of coast yellow leptosiphon shown in the CNDDB, one individual plant was also identified outside of the mapped population on the adjacent private property on May 16, 2016 (T. Corelli pers. comm. 2016) (see Figure 2). Since annual plants reproduce by seed, a seed bank is potentially present in the area where this plant was identified.

Life History

Coast yellow leptosiphon is an annual plant, which means that it completes its life cycle within one year or growing season. It generally flowers from April to June (CNPS 2017; Patterson and Battaglia 2017). Little is known about the mating system of coast yellow leptosiphon. It is closely related to variable linanthus, which is a fully self-incompatible species, meaning it does not self-fertilize (Goodwillie 1999; Weber and Goodwillie 2013). Self-incompatible plants rely on pollinators or are wind-pollinated (Goodwillie 1999). Pollination studies conducted on other species of *Leptosiphon* indicate they are predominantly bee fly- (Bombyliidae) and wind-pollinated (Goodwillie 2001). Other potential pollinators such as a beetle (*Listrus* sp.) in the Melyridae family (soft-wing flower beetles) have been recently observed on coast yellow leptosiphon (Corelli 2016). The Department does not have information on seed dispersal for coast yellow leptosiphon, but like many other plant species, seeds may be dispersed by birds or other animals, gravity, water flow, or other mechanisms.

Figure 1 - Vicinity of Coast Yellow Leptosiphon

Figure 2 - Parcels Proposed for Development

Similar-looking Plants

Coast yellow leptosiphon shares morphological characteristics with other leptosiphon species, including false baby-stars, broad-lobed leptosiphon, rose leptosiphon, and variable linanthus. Coast yellow leptosiphon is the shortest of all *Leptosiphon* species, and the width of the corolla lobes is the largest in the complex. Coast yellow leptosiphon can be distinguished from false baby-stars and rose leptosiphon by its densely glandular-hairy calyx lobes throughout the whole surface as opposed to the non-glandular ciliate hairs only on the margins of the calyx lobes of false baby-stars and rose leptosiphon (Patterson and Battaglia 2017). Coast yellow leptosiphon is distinguished from variable linanthus and broad-lobed leptosiphon by its rounded corolla lobes and short habit of less than 7 centimeters (2.8 inches) tall (Battaglia and Patterson 2001). In addition, broad-lobed leptosiphon is not known to occur in the same geographical range as coast yellow leptosiphon (Patterson and Battaglia 2017).

Habitat that may be Essential to the Continued Existence of the Species

Coast yellow leptosiphon grows at the edge of the coastline on a marine terrace supported by sedimentary sandstone-derived soil. It occurs on a bluff at an elevation of 14 meters (46 feet), in habitat that is highly influenced by wind, cool salt-laden air, and fog (CNDDB 2017).

Vegetation Communities

Coast yellow leptosiphon is associated with a diverse array of native perennial grasses such as maritime brome (*Bromus maritimus*), California oat grass (*Danthonia californica*), tufted hairgrass (*Deschampsia cespitosa* ssp. *holciformis*), and northern barley (*Hordeum brachyantherum* ssp. *brachyantherum*). Other species associated with coast yellow leptosiphon include native species such as sea-pink (*Armeria maritima* ssp. *californica*), seaside wild buckwheat (*Eriogonum latifolium*), coastal button-celery (*Eryngium armatum*), beach strawberry (*Fragaria chiloensis*), purple cudweed (*Gamochaeta ustulata*), coastal gumplant (*Grindelia stricta* var. *platyphylla*), and Davy's centaury (*Zeltnera davyi*). Three other rare species grow in association with coast yellow leptosiphon, Blasdale's bent grass (*Agrostis blasdalei*), harlequin lotus (*Hosackia gracilis*), and Johnny-nip (*Castilleja ambigua* ssp. *ambigua*) (Department observation; Corelli 2016; Jodi McGraw Consulting 2017). Blasdale's bent grass has a California Rare Plant Rank (CRPR) of 1B.2 (rare, threatened or endangered in California and elsewhere; moderately threatened in California), and harlequin lotus and Johnny-nip have a CRPR of 4.2 (plants of limited distribution – a watch list; moderately threatened in California). Several non-native species are associated with coast yellow leptosiphon and are colonizing the bluff top, including freeway iceplant (*Carpobrotus edulis*), rattail sixweeks grass (*Festuca myuros*), rye grass (*Festuca perennis*), hare barley (*Hordeum murinum* ssp. *leporinum*), rough cat's-ear (*Hypochaeris radicata*), cut-leaved plantain (*Plantago coronopus*), and English plantain (*Plantago lanceolata*).

The Department uses A Manual of California Vegetation, Second Edition (Sawyer et al. 2009) to classify natural communities within California. However, the area where coast yellow leptosiphon occurs has not yet been classified using A Manual of California Vegetation, Second Edition. The habitat where coast yellow leptosiphon occurs would likely be classified as Coastal Terrace Prairie (Element Code 41100) under Robert Holland's Preliminary Descriptions of the Terrestrial Natural Communities of California (1986). Holland's classification system was used by the Department in the past to classify natural communities within California, but has since been superseded by A Manual of California of Vegetation, Second Edition (Sawyer et al. 2009). The CNDDB continues to maintain historic records of the natural community occurrences, although new community occurrences have not been added to the CNDDB since the 1990's

Commented [A15]: Here and elsewhere, no apostrophe. Should read 1990s.

(California Department of Fish and Wildlife 2017). While the Holland system for classifying natural communities is no longer supported by the Department, this information may be useful for describing vegetation in areas of California that have not yet been classified using A Manual of California Vegetation, Second Edition. Information on Holland's Coastal Terrace Prairie community in the CNDDB is described below but this information should be used with caution as the rankings are no longer updated or reviewed by the CNDDB.

Coastal Terrace Prairie is a rare natural community described as having a dense, tall grassland dominated by both sod and tussock-forming perennial grasses growing to 1 meter (3.3 feet) tall, with patchy and variable stands that reflect local differences in available soil moisture capacity (Holland 1986). Coastal Terrace Prairie has a natural heritage global rarity rank of G2 (Imperiled) and a state rarity rank of S2.1 (Imperiled and very threatened) in the CNDDB. A rank of G2 means that an element is at high risk of global extinction or elimination due to a very restricted range, very few populations (often 20 or fewer), very steep declines, or other factors. A state rank of S2 means that an element is imperiled in the state because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the state, and the ".1" signifies that the element is "very threatened" (CNDDB 2017).

While the habitat where coast yellow leptosiphon occurs is not yet classified in A Manual of California Vegetation, Second Edition (Sawyer et al. 2009), the species composition overlaps with that listed in the *Deschampsia cespitosa* Herbaceous Alliance (tufted hair grass meadow). The *D. cespitosa – Danthonia californica* and *D. cespitosa – Eryngium armatum* Associations, which have been described on coastal bluffs and terraces and in other areas in California (Sawyer et al. 2009; Klein et al. 2015), fall within the *Deschampsia cespitosa* Herbaceous Alliance. This alliance includes both the Coastal Terrace Prairie and the Wet Subalpine or Alpine Meadow (Element Code 45210) communities described in the Holland classification system (1986). It is mapped on bluffs and terraces along the central and northern California coast and in montane areas in northern and central California, and is widespread outside of California. The *D. cespitosa* Herbaceous Alliance has a natural heritage global rarity rank of G5 (Secure) and a state rarity rank of S4? (Uncertain but Apparently Secure) (Sawyer et al. 2009, CNDDB 2017). The specific association type of this vegetation has yet to be defined. However, in the recent study of the vegetation of Sonoma County (Klein et al. 2015) both of the related associations are considered imperiled and/or imperiled and very threatened. The *D. cespitosa – Danthonia californica* Association has a Global Rank of G3 (Vulnerable) and a State Rank of S2 (Imperiled), while the other closely related association, the *D. cespitosa – Eryngium armatum* Provisional Association is ranked G3G2?/S3S2? (Uncertain but Vulnerable or Imperiled). It is likely that all of the coastal associations of the *D. cespitosa* Herbaceous Alliance are similarly rare and threatened.

East of the coast yellow leptosiphon population, a large stand of Monterey cypress (*Hesperocyparis macrocarpa*) trees is growing on Vallemar Bluff along Vallemar Street. Monterey cypress is known from only two native occurrences, which are in the Monterey area. It is considered invasive in other parts of California, and it has been widely planted and naturalized in other areas along the coast (Cal-IPC 2017; CNPS 2017). The Monterey cypress trees near the coast yellow leptosiphon population likely represent planted specimens. The understory of this stand is disturbed and consists mostly of non-native plant species including ripgut brome (*Bromus diandrus*), freeway iceplant, panic veldt grass (*Ehrharta erecta*), false brome (*Brachypodium distachyon*), pride of Madeira (*Echium candicans*), Japanese cheesewood (*Pittosporum tobira*), and pincushion flower (*Scabiosa atropurpurea*).

Freeway iceplant is present in large patches scattered throughout the Coastal Terrace Prairie, and a large patch is growing on the bluff immediately adjacent to the coast yellow leptosiphon population. North of the coast yellow leptosiphon population, the coastal bluff between the existing homes and the edge of the bluff is completely dominated by large mats of freeway iceplant with very little room for other herbaceous plants to grow. Monterey cypress trees are also scattered along the bluff north of the coast yellow leptosiphon population.

South of the Coastal Terrace Prairie, on the other side of Juliana Drive, the area consists of residential development (Figure 2).

Geology and Soils

Coast yellow leptosiphon grows on the edge of Vallemar Bluff in Moss Beach overlooking the Pacific Ocean. The Natural Resources Conservation Services' soil map unit for this area is rock outcrop-Orthents complex (Soil Survey Staff 2017). Orthents occur on escarpments, which are steep slopes or long cliffs that form as an effect of faulting or erosion and separate two relatively level areas of differing elevations. Orthents parent material consists of mixed sedimentary, serpentine, or basaltic volcanic rock (Soil Survey Staff 2017). The coast yellow leptosiphon population grows on a marine terrace supported by sedimentary sandstone-derived soil underlain by a relatively thin veneer of terrace deposits, consisting primarily of poorly to moderately consolidated gravel, sand, silt, and clay of marine origin (Pampeyan 1994).

The site is in a geologically active region of California, and is located approximately 427 meters (1,400 feet) northeast of the Seal Cove Fault and about 10.9 kilometers (6.8 miles) southwest of the seismically active San Andreas Fault Zone. The active San Andreas, Hayward, and Calaveras Faults are all located within the nearby San Francisco Bay Area and could have active secondary faults with the potential to cause severe shaking at the coast yellow leptosiphon population. A major earthquake could significantly affect the unstable bluffs and soils, causing loose soil on the steep slopes near the coast yellow leptosiphon population to form sloughs or slides (JCP 1990).

Hydrology

The coast yellow leptosiphon population occurs in the Dean Creek catchment, which is approximately 146 hectares (360 acres) in size. Dean Creek is located northeast of the Fitzgerald Marine Reserve and flows into Kelp Cove, approximately 0.6 kilometers (0.3 miles) south of Vallemar Bluff.

The coast yellow leptosiphon population is located near a coastal bluff comprised partially of coastal terrace deposits that are susceptible to erosion, particularly by concentrated uncontrolled runoff of surface drainage. In two areas of the bluff edge, shallow gullies approximately 0.3 to 0.6 meter (1 to 2 feet) deep extend inland from the bluff edge. These gullies were likely formed as a result of overland storm runoff (Haro, Kasunich & Associates, Inc. 2015).

A geotechnical investigation was completed at Vallemar Bluff by Haro, Kasunich & Associates, Inc. in 2016. Test bore holes encountered groundwater at 4 to 5 meters (13 to 17 feet) below the ground surface. The groundwater appears to be perched upon the bedrock and seeping through the terrace (Haro, Kasunich & Associates, Inc. 2015).

Climate

Coast yellow leptosiphon occurs in an area with a maritime Mediterranean climate with distinct wet and dry seasons. Most of the area's precipitation occurs from November through April. Virtually all precipitation occurs as rain, although fog accounts for a small percentage (Brady/LSA 2002). Using PRISM weather data from 1895 to 2015, the average minimum temperature in the vicinity of Vallemar Bluff is 9°C (48°F), the average maximum temperature is 17°C (63°F), the average temperature is 13°C (55°F), and the average precipitation is 69 centimeters (27 inches) per year (PRISM Climate Group 2017).

POPULATION TRENDS

Scientific information on coast yellow leptosiphon's population trends is limited. The species has not been monitored regularly, and the earliest reported survey was conducted by R. Battaglia in 1998, with about 1,000 plants estimated (Battaglia 1998; Corelli 2016; CNDDB 2017). T. Corelli estimated population numbers in 1999 and 2015. An estimated 400-500 plants were recorded in 1999, and fewer than 400 plants were estimated in 2015 (Corelli 1999, 2015).

Although little is known about population trends of coast yellow leptosiphon, the population that was once described as covering the ground for several acres (Eastwood 1904) is now limited to an area covering approximately 167 square meters (1,800 square feet or 0.04 acre), clearly indicating a significant declining population trend.

FACTORS AFFECTING THE ABILITY TO SURVIVE AND REPRODUCE

Habitat Modification and Destruction

Past Modification and Destruction of Habitat

Habitat loss is considered the primary cause for species extinctions at local, regional, and global scales (Dirzo and Raven 2003). Most of the coastal prairie habitat, which provides potential habitat for coast yellow leptosiphon, has been destroyed or modified due to urban development, agriculture, and invasion of non-native plant species (Ford and Hayes 2007). Coast yellow leptosiphon was likely present over a larger geographic area prior to the development of the San Mateo coast and conversion of coastal prairie habitat. Most of the habitat surrounding the coast yellow leptosiphon population has been eliminated or altered due to road construction, residential development, and invasion by non-native plant species, particularly the invasive freeway iceplant which covers the coastal bluff adjacent to the coast yellow leptosiphon population (Departmental observation). Installation of hardscape and storm drainage systems related to urban development have altered runoff patterns and hydrology in and around occupied coast yellow leptosiphon habitat.

Although it is likely that coast yellow leptosiphon has always been rare and restricted in range, past modification and destruction of habitat has contributed to the limited availability of suitable habitat for this species. These past changes affect the ability of coast yellow leptosiphon to survive and reproduce.

Present and Future Modification and Destruction of Habitat

Development or changes in land use could directly destroy plants and living seeds in the seed bank and destroy both occupied and potential habitat. Threats to coast yellow leptosiphon may occur from development and changes in land use near the existing population. A residential development project is proposed on the parcels immediately adjacent to the coast yellow leptosiphon population (County of San Mateo 2017; Midcoast Community Council 2017). The area proposed for development consists of seven lots, which will be consolidated into four lots for the project. The proposed project will build four, three-story single-family residences, between 4,740 and 4,859 square feet in size, and is pending design review approval by the San Mateo County Coastside Design Review Committee (CDRC 2017). Figure 2 shows the property proposed for development in relationship to the coast yellow leptosiphon population, and Figure 3 shows the site plan. The developer has erected story poles on the parcels that represent locations and footprints of the proposed houses (Figure 4).

Coast yellow leptosiphon has been buffered from impacts from the adjacent highway by the 1.0-hectare (2.5-acre) undeveloped coastal prairie that provides a natural buffer between Highway 1 and the coast yellow leptosiphon population. Habitat buffers provide protection from edge effects (Saunders et al. 1991; Given 1994), which are changes in community structure that occur at the boundary of two habitats. Habitat buffers also provide extra protection from human activities, allow for a more natural habitat boundary, slow the speed of water runoff, and filter sediments, fertilizers, pesticides, heavy metals, and pathogens from runoff (Given 1994; Godfrey 2015; USDA 2017).

Any change in land use on this adjacent property is expected to result in indirect impacts to the coast yellow leptosiphon population. The proposed development will alter the hydrologic regime of the site. This will involve increased, altered, and unseasonal runoff patterns resulting from addition of hard, impervious surfaces, installation of drainage features such as storm drains and drainage pipes (Mesiti-Miller Engineering, Inc. 2017), and installation and use of landscape irrigation systems. Development often leads to unseasonal summer moisture resulting from watering landscape plants, washing cars, and other human activities. In addition, residential development will lead to an increase in use of fertilizers and nutrients, herbicides, pesticides, and other household chemicals and products which will run off and disperse into habitat occupied by coast yellow leptosiphon and could impact the plants as well as alter the soil chemistry. Increased nutrient load and unseasonal moisture resulting from human activities creates conditions that promote the spread of non-native plant species, which can outcompete the native plants for light, space, nutrients, water and other factors (Smil 1997; Vitousek et al. 1997; Line and White 2007). Furthermore, development will increase the number of human visitors using the area, result in soil disturbance and compaction, increase garbage and pollution, and create conditions that are favorable for the spread of non-native plant species.

Construction of houses on the parcels adjacent to the coast yellow leptosiphon population will lead to an increase in human use of the area. Walking paths exist on the bluff, and one heavily-used path exists immediately adjacent to the coast yellow leptosiphon population. Increased human use of the area will increase the impacts to the habitat from foot traffic, will increase the spread of weed seeds and introduce nutrients from dog walking, and will increase the risk of trampling and killing of coast yellow leptosiphon plants. In addition, development of the area will modify the aesthetics and accessibility of the bluff, potentially resulting in alterations of walking patterns in the area. People may create new paths through the remaining portions of the habitat accessible on Vallemar Bluff, potentially through the coast yellow leptosiphon population.

Figure 3 - Proposed Development Project on Vallemar Bluff - Site Plan

Figure 4 - Story Poles for Proposed Development Project on Vallemar Bluff

Development of this area may also result in the loss of pollinator habitat and further fragment the habitat adjacent to the coast yellow leptosiphon population. Habitat fragmentation often leads to a disruption in plant and pollinator population dynamics by altering pollinator densities and behavior (Xiao et al. 2016). Information on pollinators and pollinator requirements for coast yellow leptosiphon is currently lacking, but loss of pollinators essential to the reproduction of coast yellow leptosiphon would negatively impact coast yellow leptosiphon, especially if the species is self-incompatible (Goodwillie 1999).

Although the population of coast yellow leptosiphon is not reported in the CNDDB on the adjacent parcels that are proposed for development, one individual plant was identified on one of the parcels on May 16, 2016 (T. Corelli pers. comm. 2016) (see Figure 2). Since annual plants reproduce by seed, identification of coast yellow leptosiphon on one of the adjacent properties indicates that the plants have distributed seed beyond the currently-mapped occurrence, and that a seed bank is potentially present in the area where this plant was identified. A seed bank constitutes a living plant population, even when above-ground plants are not visible. Development of this property could result in impacts to coast yellow leptosiphon through the elimination of a soil seed bank for this species or direct impacts to individual plants that may emerge from the seed bank.

In addition to impacts from human activities, habitat modification can result from other activities. Burrowing mammals such as pocket gophers (*Thomomys* spp,) have profound impacts on ecosystems, from consuming vegetation to physically altering the soil (Reichman and Seabloom 2002). Burrowing mammals influence the physical environment, altering patterns and rates of soil development and nutrient availability, microtopography, and the abiotic environment. Burrowing activity can affect the demography and abundance of plant species, altering vegetation patterns and diversity, and thus altering ecosystem structure (Inouye et al. 1987; Huntly and Inouye 1988; Villarreal et al. 2008). Burrowing mammals such as gophers excavate vast burrow systems and deposit tailings in abandoned tunnels and on the ground surface (Reichman and Seabloom 2002), reducing the area of available habitat for plants. Evidence of burrowing mammals is present in the coast yellow leptosiphon population (Department staff observation), and burrowing mammals could impact coast yellow leptosiphon.

The Department considers present and future modification and destruction of habitat a serious threat to coast yellow leptosiphon. Habitat modification and destruction will affect the ability of coast yellow leptosiphon to survive and reproduce.

Impacts from Invasive Species (Competition and other Factors)

Invading alien species cause major environmental damages and losses and are a significant risk factor leading to extinction of threatened and endangered species (Pimentel et al. 2004; Conser and Conner 2009), second only to habitat loss and fragmentation (Wilcove et al. 1998; Randall and Hoshovsky 2000). Compared to other threats to biodiversity, invasive non-native plants present a complex problem that is difficult to manage and has long-lasting effects. North America has accumulated the largest number of naturalized plants in the world (van Kleunen et al. 2015), and many non-native plant species have established within California, dramatically changing the state's ecological landscape (Conser and Connor 2009). Many studies hypothesize or suggest that competition is the process responsible for observed invasive species impacts to biodiversity; however, invasive species may also impact native ecosystems by altering environmental conditions and resource availability (D'Antonio and Vitousek 1992; Levine et al. 2003). Invasive species may threaten native populations through competition for light, water, or nutrients; allelopathic mechanisms; alteration of soil chemistry; thatch

accumulation that inhibits seed germination and seedling recruitment; changes in natural fire frequency; disruptions to pollination or seed-dispersal mutualisms; changes in soil microorganisms; or other mechanisms. The magnitude of invasive species impacts in Mediterranean habitats, such as those in California, largely depends on characteristics of the invading species and the habitat being invaded (Fried et al. 2014). The invader's life form and ability to form very dense stands have an effect on the magnitude of impacts, with creeping plant species such as freeway iceplant having greater effect (Gaertner et al. 2009; Fried et al. 2014). Invasive species may also influence native species colonization rates, and may thus lead to declines in local diversity over longer timescales (Yurkonis and Meiners 2004). Studies have not been conducted on the impact of invasive species on coast yellow leptosiphon specifically; however, negative impacts of plant invasions on Mediterranean ecosystems have been well demonstrated (Gaertner et al. 2009; Fried et al. 2014).

The coast yellow leptosiphon population is threatened by encroachment of non-native invasive plants, especially invasive freeway iceplant that is a highly-rated noxious weed by the California Invasive Plant Council (Cal-IPC 2017). Freeway iceplant is a low-growing, creeping succulent perennial plant that roots at the nodes and often forms deep mats covering large areas. It originates from South Africa, but is one of the most widespread non-native plants in the Mediterranean coastal ecosystems throughout the world, and is considered a severe threat to the native plant communities it invades (Albert 1995; Santoro et al. 2011). In California, it occurs along the coast and on the Channel Islands, especially in areas with a warm winter climate (Cal-IPC 2017). It was originally introduced into California in the early 1900's to stabilize soil along railroad tracks, and the California Department of Transportation soon began using it widely to line highways. It has also been widely promoted as an ornamental plant for home gardens (Albert 1995, 2000). Because this plant spreads easily by seed and vegetative means, it has spread beyond landscape plantings and has invaded coastal habitats, including the coastal prairie where coast yellow leptosiphon grows. Freeway iceplant forms nearly impenetrable mats that dominate the landscape, and it competes directly with native plant species for light, nutrients, water and space (D'Antonio and Haubensak 1998). The fleshy fruits often bear more than one thousand small seeds (Bartomeus and Vilà 2009) that are eaten and widely dispersed by several mammals such as rabbits (D'Antonio 1990) and rats (Bourgeois et al. 2005). It competes aggressively with native plant species, achieving high rates of space colonization, which suppresses growth and establishment of other plants (D'Antonio and Mahall 1991; Albert 1995; Suehs et al. 2004; Vilà et al. 2006). Furthermore, it also interacts indirectly with native vegetation by altering soil chemistry by lowering pH (Conser and Connor 2009). Although freeway iceplant was originally used to stabilize soil and control erosion, it can actually contribute to erosion and landslides. It has shallow roots that do not hold soil well, and it absorbs ample water during rain events, becoming so heavy that it can slump off of steep hillsides and cliffs, pulling soil down with it (Spitzer 2002). Freeway iceplant covers the bluffs in much of the habitat near the coast yellow leptosiphon population, and it is growing on the bluff immediately adjacent to the coast yellow leptosiphon population and is encroaching into the population (see Figure 5).

Other non-native plant species, such as rough cat's ear, rye grass, hare barley, and cut-leaved plantain, are also present growing in and around the coast yellow leptosiphon population. These invasive species may threaten the coast yellow leptosiphon population through a variety of mechanisms, including competition for light, water, or nutrients; thatch accumulation that inhibits seed germination and seedling recruitment; disruptions to pollination or seed-dispersal mutualisms; or other mechanisms (D'Antonio and Haubensak 1998).

Figure 5 – Freeway Iceplant Invasion

The coast yellow leptosiphon population will likely continue to experience ongoing and increasing inputs of invasive plant propagules from nearby populations and other sources. The area is frequently used by pedestrians, who can serve as vectors for invasive species into the area. Habitat disturbances resulting from the close proximity of the population to urban development also provides opportunities for invasive species populations to establish and expand. In addition, the proposed development on the adjacent property would likely increase the input of invasive plant species from the spread of landscape plants into the area, and will increase disturbance and habitat modification, providing favorable habitat for invasive species.

Bluff-Top Erosion and Rising Ocean Levels

The coast yellow leptosiphon population is located on Vallemar Bluff, approximately 8 meters (27 feet) from the edge of the bluff, and bluff-top erosion and rising ocean levels pose a serious threat to this species. Rainfall and wave splash or spray cause erosion of the bluff face. Additionally, slope instability results in landslides along the coastal bluff face, resulting in landward recession of the top edge of the coastal bluff. Coastal bluff landslides are caused by undermining the base of the bluff or from saturation of the bluff edge or bluff face (Haro, Kasunich & Associates, Inc. 2015).

A coastal bluff recession study was prepared by Haro, Kasunich & Associates, Inc., Consulting Geotechnical and Coastal Engineers (2015). Historical satellite photos and maps were reviewed and compared with the bluff edge position as surveyed in 2014. The results indicated that the coastal bluff had receded inland up to 14.6 meters (48 feet) between 1908 and 2014, which is a long term historical bluff recession rate of about 0.14 meter (0.45 foot) per year. Results of the study also indicated that about 3 to 5 meters (10 to 18 feet) of bluff recession occurred between 1986 and 2014, which is a long term historical bluff recession rate of about 0.11 to 0.20 meters (0.36 to 0.64 feet) per year.

Future bluff and coastal recession risk was estimated using the long-term historical average annual erosion rates as a minimum. Results suggested that a minimum of 6.9 meters (22.5 feet) of bluff recession will occur at Vallemar Bluff in the next 50 years (by the year 2065). Mean sea level along the California coast is expected to rise between 1.0 to 1.4 meters (3.3 to 4.6 feet) by the year 2100 due to climate change (Heberger et al. 2009), and the accelerating rate of sea level rise will likely result in increased future recession rates compared to average historical rates (Haro, Kasunich & Associates, Inc. 2015). Accelerated future sea level rise is expected to result in an estimated additional 1.7 meters (5.5 feet) of recession over the next 50 years, for a total of 8.6 meters (28 feet) of recession (Haro, Kasunich & Associates, Inc. 2015).

Projected future bluff edge recession was measured from where the bluff is considered stable as determined by Haro, Kasunich & Associates, Inc. (2015) (see Figure 6). They used the projected stable edge to project future recession and arrived at an estimated 50-year coastal recession setback line for development on Vallemar Bluff using the projected rates of recession described above. The 50-year setback is considered the minimum distance necessary to provide a stable building site of a 50-year lifetime of a proposed structure. The portion of the bluff seaward of the 50-year setback line, which supports a large portion of the coast yellow leptosiphon population, is considered to be vulnerable to erosion over the next 50 years.

Figure 6 - Coastal Bluff Recession at Vallemar Bluff

It is likely that the coast yellow leptosiphon population, which is perched near the bluff edge, has been steadily reduced by cliff erosion. Based on the study conducted by Haro, Kasunich & Associates, Inc., the coast yellow leptosiphon population is located on a portion of the bluff that is highly susceptible to erosion over the next 50 years. If the bluff erodes to the 50-year setback line that accounts for rising sea level, approximately 80 percent of the coast yellow leptosiphon population will be destroyed (see Figure 6). Erosion of the bluff presents a significant threat to coast yellow leptosiphon and could lead to the extinction of the species.

Other Human-related Activities

The coast yellow leptosiphon population is threatened by other human-related activities, specifically trampling from foot traffic. People commonly walk on the bluff where the coast yellow leptosiphon population occurs, which may damage or kill coast yellow leptosiphon individuals through direct trampling of plants. In addition, there is nothing to prevent people from riding their bicycles on the bluff, which would further impact the coast yellow leptosiphon population. The property is easily accessible to the public, and a foot trail has been worn along the bluff that passes along the edge of the coast yellow leptosiphon population. A bench is present near the population overlooking the ocean, attracting visitors to cut through the coast yellow leptosiphon population to view the ocean. In addition to direct trampling of plants, human use of the site also increases disturbance and compaction of soil and facilitates the spread of invasive plant species. No barriers exist around the coast yellow leptosiphon population to protect plants from foot traffic and trampling. The proposed development will result in increased human activity in the area, thus increasing the threat to coast yellow leptosiphon from foot traffic and other human impacts.

Climate Change

Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia (IPCC 2014). Climate change presents a major challenge to the conservation of California's natural resources, and it will intensify existing threats and create new threats to natural systems.

Department staff conducted an assessment of the vulnerability of coast yellow leptosiphon to climate change using the NatureServe Climate Change Vulnerability Index Version 3.02 (NatureServe 2016). Based upon the Department's assessment, coast yellow leptosiphon likely has a climate change vulnerability index value of Highly Vulnerable (HV), indicating that available evidence suggests that abundance and/or range extent within the geographical area of the species is likely to decrease significantly by the year 2050. However, some ecological and life history information used for the climate change vulnerability assessment is not yet known for coast yellow leptosiphon. In particular, the Department does not know the mechanisms or species required for effective pollination of coast yellow leptosiphon, the mechanisms used by coast yellow leptosiphon for seed dispersal, or coast yellow leptosiphon's seed dispersal distance. Furthermore, the Department does not know whether or to what extent competing plant species such as freeway iceplant will be favored by projected future climates. Despite the lack of information about some of the ecological and life history information for coast yellow leptosiphon, the confidence in the vulnerability index score is very high based on the results of the Monte Carlo simulation used in the index (Young et al. 2015).

Vulnerability of Small Populations

Coast yellow leptosiphon has an exceptionally limited distribution, with only one population that occupies a very small area. The Department recognizes that species with small numbers of populations and small population sizes are highly vulnerable to extinction due to stochastic (chance) demographic, environmental, and genetic events (Shaffer 1981, 1987; Dirzo and Raven 2003; Groom et al. 2006; Primack 2006). Chance events such as a landslide at the bluff edge could result in the loss of all or a significant part of the coast yellow leptosiphon population.

Species with small numbers of populations or small populations may also be subject to increased genetic drift and inbreeding, which can affect population viability (Menges 1991; Ellstrand and Elam 1993).

Due to the vulnerability and rarity of coast yellow leptosiphon, the loss of any portion of the population would represent the loss of a significant portion of this species' genetic diversity and total range, and could result in its extinction.

Predation

The Department does not have any information on predation affecting coast yellow leptosiphon.

Disease and Parasites

The Department does not have any information on diseases or parasites affecting coast yellow leptosiphon.

Overexploitation

The Department does not have any information on overexploitation affecting coast yellow leptosiphon.

REGULATORY AND LISTING STATUS

Federal

Coast yellow leptosiphon is not protected pursuant to the federal Endangered Species Act.

State

On December 23, 2016, the Commission published its Notice of Findings for coast yellow leptosiphon in the California Regulatory Notice Register, designating this species as a candidate pursuant to CESA. The provisions of CESA apply to coast yellow leptosiphon while it is a candidate species (Fish & G. Code, § 2085). CESA prohibits the import, export, take, possession, purchase or sale of coast yellow leptosiphon, or any part or product of thereof, except in limited circumstances, such as through a permit or agreement issued by the Department under the authority of the Fish and Game Code. For example, the Department may issue permits that allow the incidental take of listed and candidate species if the take is minimized and fully mitigated, the activity will not jeopardize the continued existence of the species, and other conditions are met (Fish & G. Code, § 2081 subd. (b)). The Department may

also authorize the take and possession of coast yellow leptosiphon for scientific, educational, or management purposes (Fish & G. Code, § 2081 subd. (a)).

Natural Heritage Program Ranking

All natural heritage programs, such as the CNDDB, use the same ranking methodology originally developed by The Nature Conservancy and now maintained by NatureServe (NatureServe 2012). This ranking methodology consists of a global rank describing the rank for a given taxon over its entire distribution, and a state rank describing the rank for the taxon over its state distribution. Both global and state ranks reflect a combination of rarity, threat, and trend factors. Coast yellow leptosiphon has been assigned a global rank of G1 and a state rank of S1 (CNDDB 2017), indicating that the species is critically imperiled both within California and throughout its entire range, with a very high risk of extinction due to extreme rarity (often five or fewer populations), very steep declines, or other factors.

California Rare Plant Rank

Some plants in California are assigned a California Rare Plant Rank (CRPR) to identify them as species of conservation concern. The Department works in collaboration with CNPS and botanical experts throughout the state to assign rare and endangered plants a CRPR reflective of their status. Coast yellow leptosiphon has been assigned a CRPR of 1B.1 (CNDDB 2017).

Plants with a CRPR of 1B are rare throughout their range with the majority of them endemic to California. Most of the plants that are ranked 1B have declined significantly over the last century. The threat code extension of ".1" indicates that the species is seriously threatened in California, with over 80 percent of occurrences threatened or a high degree and immediacy of threat (CNDDB 2017).

EXISTING MANAGEMENT EFFORTS

Resource Management Plans

The Department is not aware of any resource management plans prepared for coast yellow leptosiphon.

The coast yellow leptosiphon population is located within the Fitzgerald Marine Reserve, which is a San Mateo County Park, and is also adjacent to the Montara State Marine Reserve, which is a California Marine Protected Area that is located in California state waters below the mean high tide line. San Mateo County released a Master Plan for the Fitzgerald Marine Reserve in 2002, but the area where the coast yellow leptosiphon occurs on Vallemar Bluff was not surveyed, and coast yellow leptosiphon is not accounted for in the Master Plan (Brady/LSA 2002). San Mateo County Parks Department has been contacted about the omission and the presence of coast yellow leptosiphon and the other rare plants located on the property. The County of San Mateo intends to revise the Master Plan to include management and protection of coast yellow leptosiphon and other rare plants located within the Fitzgerald Marine Reserve (Corelli 2016; R. Arechiga pers. comm. 2016, 2017).

Monitoring and Research

Petitioner and botanist, Toni Corelli, continues to visit and observe the coast yellow leptosiphon population at least once per year and observational information is being collected. The Department is not aware of any other ongoing coast yellow leptosiphon research or monitoring of the coast yellow leptosiphon population.

Habitat Restoration Projects

The Department has discussed the potential for seed collection, reintroduction, and habitat restoration for coast yellow leptosiphon with the County of San Mateo (R. Arechiga pers. comm. 2016, 2017). The County of San Mateo is interested in identifying nearby suitable habitat owned by the County of San Mateo to introduce coast yellow leptosiphon seed (Arechiga 2017). University of California Botanical Garden at Berkeley has approximately 870 seeds from 53 individual coast yellow leptosiphon plants in conservation storage (H. Forbes pers. comm. 2016, 2017). No efforts have been initiated for habitat restoration.

Impacts of Existing Management Efforts

Since its inception, the Fitzgerald Marine Reserve has been managed for multiple purposes, including education, research and scientific study, recreation, collection of seashore animals and plants, and fishing. However, the area where coast yellow leptosiphon occurs was not surveyed during preparation of the Master Plan, and currently no management is taking place on this portion of the Fitzgerald Marine Reserve (Brady/LSA 2002; Arechiga pers. comm. 2016, 2017).

SCIENTIFIC DETERMINATIONS REGARDING THE STATUS OF COAST YELLOW LEPTOSIPHON IN CALIFORNIA

CESA directs the Department to prepare this report regarding the status of coast yellow leptosiphon based upon the best scientific information available to the Department (Fish & G. Code, § 2074.6). CESA's implementing regulations identify key factors that are relevant to the Department's analyses. Specifically, a "species shall be listed as endangered or threatened ... if the Commission determines that its continued existence is in serious danger or is threatened by any one or any combination of the following factors: 1. present or threatened modification or destruction of its habitat; 2. overexploitation; 3. predation; 4. competition; 5. disease; or 6. other natural occurrences or human-related activities" (Cal. Code Regs., tit. 14, § 670.1, subd. (i)(1)(A)).

The definitions of endangered and threatened species in the Fish and Game Code provide key guidance to the Department's scientific analysis. An endangered species under CESA is one "which is in serious danger of becoming extinct throughout all, or a significant portion, of its range due to one or more causes, including loss of habitat, change in habitat, over exploitation, predation, competition, or disease" (Fish & G. Code, § 2062). A threatened species under CESA is one "that, although not presently threatened with extinction, is likely to become an endangered species in the foreseeable future in the absence of special protection and management efforts required by [CESA]" (*Id.*, § 2067).

The preceding sections of this Status Review report describe the best scientific information available to the Department, with respect to the key factors identified in the regulations.

Present or Threatened Modification or Destruction of Habitat

Habitats along the San Mateo Coast have been impacted by a history of modification and destruction from development, agriculture, grazing, and other land use. Most of the coastal prairie habitat, which provides potential habitat for coast yellow leptosiphon, has been destroyed or modified due to urban development, agriculture, and invasion by non-native plant species. The proposed development on the property adjacent to the coast yellow leptosiphon population will result in habitat degradation and modification that will negatively impact the species and could result in a severe decline or extirpation of the population, thus leading to the extinction of the species. In addition, human use within and in the vicinity of the coast yellow leptosiphon population has resulted in habitat degradation that is evident on the ground and is visible from aerial imagery (see Figure 7). The proposed development will lead to an increase in human use of the area, resulting in additional impacts from trampling and habitat disturbance. In addition, burrowing mammals such as gophers are present at the coast yellow leptosiphon population and may be impacting coast yellow leptosiphon. The Department considers modification and destruction of habitat to be a significant threat to the continued existence of coast yellow leptosiphon.

Overexploitation

The Department does not consider overexploitation to be a significant threat to the continued existence of coast yellow leptosiphon.

Predation

The Department does not consider predation to be a significant threat to the continued existence of coast yellow leptosiphon.

Competition

Invasive plant species have been documented to pose serious threats to biodiversity around the world, and are a particularly pervasive problem in Mediterranean-type habitats like those in California. Invasive mat-forming freeway iceplant and other invasive plants, such as rough cat's ear and English plantain, occur within and in close proximity to the coast yellow leptosiphon population. The Department considers invasive plant species, particularly freeway iceplant, to be a significant threat to the continued existence of coast yellow leptosiphon.

Disease

There are no diseases known to be threats to the continued existence of coast yellow leptosiphon. The Department does not consider disease to be a significant threat to the continued existence of coast yellow leptosiphon.

Other Natural Occurrences or Human-related Activities

The coast yellow leptosiphon population is located near the edge of Vallemar Bluff, and bluff-top erosion and rising ocean levels pose a serious threat to this species. The climate of California is

Figure 7 - Proximity of Threats to Coast Yellow Leptosiphon

certain to change due to warming of the global climate system, which could lead to an accelerated rate of bluff erosion. Coast yellow leptosiphon has an extremely narrow distribution consisting of one population that occupies an extremely small area. Coast yellow leptosiphon's rarity and extremely limited distribution, and its occurrence in only one area that is partially surrounded by development, makes the species very vulnerable to stochastic events such as erosion, landslides, and drought, and to all other threats. Therefore, the loss of all or a significant portion of the coast yellow leptosiphon population would represent the loss of all or a significant portion of coast yellow leptosiphon's total range, and could result in the extinction of the species. Impacts from pedestrian traffic and trampling also pose a threat to coast yellow leptosiphon, and the proposed development would likely increase human use of the area. The Department considers erosion, other natural occurrences, and human-related activities to be a significant threat to the continued existence of coast yellow leptosiphon.

SUMMARY OF KEY FINDINGS

Coast yellow leptosiphon is an extremely rare species known from only one small population. The population occurs in close proximity to urban land use, and has been either directly or indirectly impacted by modification or destruction of habitat. Based upon current land use practices that include the potential development of the adjacent property, the modification, destruction and impacts to coast yellow leptosiphon habitat are likely to continue into the future. The coast yellow leptosiphon population is being impacted by invasive plant species and human activities, such as pedestrian use of the area. Bluff-top erosion is also a serious and imminent threat to this species, and climate change may accelerate that process. Bluff-top erosion alone could lead to near extinction of the species in 50 years based on current bluff-top recession predictions. Compounding the threats to the species is the inherent vulnerability of small populations to extirpation due to stochastic events. The entire distribution of coast yellow leptosiphon is limited to one site that occupies an area approximately 167 square meters (1,800 square feet) in size (CNDDB 2017; Department staff observation), with population estimates over the years ranging between 400 and 1,000 individual plants; it is found nowhere else in the world. Due to the extremely limited distribution of coast yellow leptosiphon and its small population size, the loss of any portion of its population would be considered the loss of a significant portion of the species total range and would likely result in the extinction of this species.

The information available to the Department regarding the status of coast yellow leptosiphon indicates that there are significant threats to the continued existence of the species. Proximity of threats to the coast yellow leptosiphon population are illustrated in Figure 7.

RECOMMENDATION FOR PETITIONED ACTION

CESA directs the Department to prepare this report regarding the status of coast yellow leptosiphon in California based upon the best scientific information available to the Department (Fish & G. Code, § 2074.6). CESA also directs the Department to indicate in this Status Review whether the petitioned action is warranted (Fish & G. Code, § 2074.6; Cal. Code Regs., tit. 14, § 670.1, subd. (f)). The Department includes and makes its recommendation in this Status Review as submitted to the Commission in an advisory capacity based on the best available science. Based on the criteria described above, the best scientific information available to the Department indicates that coast yellow leptosiphon is in serious danger of becoming extinct in all or a significant portion of its range due to one or more causes including loss of habitat,

change in habitat, competition and other effects from invasive plant species, and other natural occurrences and human-related activities.

The Department recommends that the Commission find the petitioned action to list coast yellow leptosiphon as an endangered species to be warranted.

PROTECTION AFFORDED BY LISTING

It is the policy of the state to conserve, protect, restore and enhance any endangered or any threatened species and its habitat (Fish & G. Code, § 2052). If listed as an endangered or threatened species, unauthorized "take" of coast yellow leptosiphon will be prohibited, making the conservation, protection, and enhancement of the species and its habitat an issue of statewide concern. As noted earlier "take" is defined under CESA as hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill (*Id.*, § 86). Any person violating the take prohibition would be punishable under state law. The Fish and Game Code provides the Department with related authority to authorize "take" under certain circumstances (*Id.*, §§ 2081, 2081.1, 2086, 2087, 2089.6, 2089.10 and 2835). As authorized through an incidental take permit, however, impacts of the taking on coast yellow leptosiphon caused by the activity must be minimized and fully mitigated according to state standards.

Additional protection of coast yellow leptosiphon following listing would also occur during required public agency environmental review under the California Environmental Quality Act (CEQA), and its federal counter-part, the National Environmental Policy Act (NEPA). CEQA and NEPA both require affected public agencies to analyze and disclose project-related environmental effects, including potentially significant impacts on endangered, rare, and threatened special status species. Under CEQA's "substantive mandate," for example, state and local agencies in California must avoid or substantially lessen significant environmental effects to the extent feasible. With that mandate, and the Department's regulatory jurisdiction generally, the Department expects related CEQA and NEPA review will likely result in increased information regarding the status of coast yellow leptosiphon in California as a result of, among other things, updated occurrence and abundance information for individual projects. Where significant impacts are identified under CEQA, the Department expects project-specific required avoidance, minimization and mitigation measures will also benefit the species. While both CEQA and NEPA would require analysis of potential impacts to coast yellow leptosiphon regardless of their listing status under CESA, the acts contain specific requirements for analyzing and mitigating impacts to listed species. In common practice, potential impacts to listed species are examined more closely in CEQA and NEPA documents than potential impacts to unlisted species. State listing, in this respect, and required consultation with the Department during state and local agency environmental review under CEQA, is also expected to benefit the species in terms of related impacts for individual projects that might otherwise occur absent listing.

If coast yellow leptosiphon is listed under CESA, it may increase the likelihood that state and federal land and resource management agencies will allocate funds towards protection and recovery actions. However, funding for species recovery and management is limited, and there is a growing list of threatened and endangered species.

MANAGEMENT RECOMMENDATIONS AND RECOVERY MEASURES

CESA directs the Department in its Status Review to recommend management activities and other recommendations for recovery of coast yellow leptosiphon (Fish & G. Code, § 2074.6; Cal. Code Regs., tit. 14, § 670.1, subd. (f)). The utility of current data on coast yellow leptosiphon is limited by being largely anecdotal and qualitative. Studies designed to provide quantitative data on the coast yellow leptosiphon population, and the factors that affect the potential for coast yellow leptosiphon to survive and reproduce, are necessary for species management. Department staff with suggestions from local agencies, non-profits, and interested parties generated the following list of recommended management actions:

- Collect and bulk seeds of coast yellow leptosiphon for long term conservation storage and potential introduction into suitable habitat;
- Identify and restore degraded potential coast yellow leptosiphon habitat near the existing population. Collect and distribute seed into nearby suitable habitat;
- Permanently protect the coast yellow leptosiphon population on County of San Mateo property and on the private parcel where one individual coast yellow leptosiphon individual was observed from modification and destruction via fee title acquisition, conservation easements or similar protective measures;
- Permanently protect the private parcels adjacent to the coast yellow leptosiphon population from modification and destruction via fee title acquisition, conservation easements or similar protective measures to provide a buffer adjacent to the coast yellow leptosiphon population;
- Remove and control the freeway iceplant invasion adjacent to the coast yellow leptosiphon population;
- Restrict public access in the vicinity of the coast yellow leptosiphon population through installation of protective fencing and/or signs, or other suitable means;
- Remove or relocate the bench adjacent to the coast yellow leptosiphon population, or provide other creative foot-traffic influencing features in the area to encourage people to avoid walking through the coast yellow leptosiphon population;
- Research the life history characteristics of coast yellow leptosiphon, including factors related to pollination, seed dispersal, seed longevity, seed productivity, growth, propagation, and microhabitat requirements for germination and recruitment;
- Implement monitoring and adaptive management programs for the coast yellow leptosiphon population. Ensure that monitoring results trigger appropriate management responses such as implementing other measures to control invasive species or controlling recreational activities. Make the data and reports from monitoring and adaptive management programs available to resource agencies and to those who are directly involved in coast yellow leptosiphon management;
- Implement a program to detect coast yellow leptosiphon population trends using statistically-valid population estimates; and
- Survey for additional populations of coast yellow leptosiphon.

PUBLIC RESPONSE

Comments were invited in response to the Petition in letters mailed on June 6, 2017, to property owners where the coast yellow leptosiphon population occurs and adjacent property owners, and in a Department Press Release dated August 9, 2017. The Department received three comments in response to the press release and letters, which are included in Appendix A.

PEER REVIEW

Independent botany experts were invited to review the Status Review report before submission to the Fish and Game Commission. The letters of invitation and all comments received are included in Appendix B [Will be included in the final draft].

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LITERATURE CITED

The following sources were used during the preparation of this Status Review report:

Albert, M. 2000. *Carpobrotus edulis* (L.) N.E. Br. Pages 90-94 in C.C. Bossard, J.M. Randall, and M.C. Hoshovsky. Invasive Plants of California's Wildlands. University of California Press, Berkeley, CA.

Albert, M.E. 1995. Portrait of an invader II: the ecology and management of *Carbobrotus edulis*. CalEPPC News 3(2): 4-6.

Bartomeus, I., and M. Vilà. 2009. Breeding system and pollen limitation in two supergeneralist alien plants invading Mediterranean shrublands. Australian Journal of Botany 67:109-115.

Battaglia, R. 1998. Field survey form for *Linanthus croceus* dated May 23, 1998.

Battaglia, R., and R. Patterson. 2001. A morphometric analysis of the *Leptosiphon androsaceus* complex (Polemoniaceae) in the Central and South Coast ranges. Madroño 48:62-78.

Bell, C.D., and R.W. Patterson. 2000. Molecular phylogeny and biogeography of *Linanthus* (Polemoniaceae). American Journal of Botany 87:1857-1870.

Bittman, R. 2001. The California Natural Diversity Database: A Natural Heritage Program for Rare Species and Vegetation. Fremontia 29:3-4.

Bourgeois, K., C.M. Suehs, E. Vidal, and F. Médail. 2005. Invasional meltdown potential: Facilitation between introduced plants and mammals on French Mediterranean islands. Ecoscience 12:248-256.

Brady/LSA. 2002. Fitzgerald Marine Reserve Master Plan. Prepared for the County of San Mateo. Available from http://parks.smcgov.org/documents/fitzgerald-marine-reserve-master-plan 157 pp.

California Department of Fish and Wildlife, Biogeographic Data Branch. 2017. Natural Communities – Background Information. Website https://www.wildlife.ca.gov/data/VegCAMP/Natural-Communities/Background [accessed 26 June 2017].

Commented [A16]: Carpobrotus

California Department of Fish and Wildlife. 2016. Report to the Fish and Game Commission Evaluation of the Petition from Ms. Toni Corelli and the California Native Plant Society to List Coast Yellow Leptosiphon (*Leptosiphon croceus*) as an Endangered Species under the California Endangered Species Act. 17 pp.

CNDDB (California Natural Diversity Database). 2017. Rarefind 5 [Internet]. California Department of Fish and Wildlife. [Version: July 1, 2017].

Cal-IPC (California Invasive Plant Council). 2017. California Invasive Plant Inventory Database. Available online at: http://www.cal-ipc.org/paf/. [accessed 2017 August 2].

CDRC (Coastside Design Review Committee). 2017. Letter to Moss Beach Associates, LLC dated July 25, 2017. Available from: http://www.midcoastcommunitycouncil.org/vallemar-bluff/ [accessed 8 August 2017].

CNPS (California Native Plant Society) Rare Plant Program. 2017. Inventory of Rare and Endangered Plants (Online Edition, v8-03 0.39). Available online at: http://www.rareplants.cnps.org [accessed 10 August 2017].

Conser, C., and E.F. Connor. 2009. Assessing the residual effects of *Carpobrotus edulis* invasion, implications for restoration. Biological Invasions 11:349-358.

Corelli, T. 1999. Field survey form for *Linanthus croceus* dated May 31, 1999.

Corelli, T. 2015. 2015. Field survey form for *Leptosiphon croceus* dated May 3, 2015.

Corelli, T. 2016. Coast Yellow Leptosiphon Petition to the State of California Fish and Game Commission. May 23, 2016. 18 pp.

County of San Mateo, Planning and Building. 2017. Four Residences at Juliana & Vallemar, Moss Beach. Website: http://planning.smcgov.org/four-residences-juliana-vallemar-moss-beach [accessed 3 August 2017].

D'Antonio, C.M. 1990. Seed production and dispersal in the non-native, invasive succulent *Carpobrotus edulis* (Aizoaceae) in coastal strand communities of central California. Journal of Applied Ecology 27:693-702.

D'Antonio, C.M., and K. Haubensak. 1998. Community and ecosystem impacts of introduced species. Fremontia 26(4):13-18.

D'Antonio, C.M., and B.E. Mahall. 1991. Root profiles and competition between the invasive, exotic perennial, *Carpobrotus edulis*, and two native shrub species in California coastal scrub. American Journal of Botany 78: 885-894.

D'Antonio, C.M., and P.M. Vitousek. 1992. Biological invasions by exotic grasses, the grass/fire cycle, and global change. Annual Review of Ecology and Systematics 23(1992):63-87.

Digital Map Products. 2017. LandVision, subscription map service. Website: https://www.digmap.com [Accessed 25 May 2017].

Dirzo, R., and P. Raven. 2003. Global state of biodiversity and loss. Annual Review of Environment and Resources 28:137-167.

Eastwood, A. 1904. Some new species of western Polemoniaceae. Botanical Gazette 37:437-447.

Ellstrand, N.C., and D.R. Elam. 1993. Population Genetic Consequences of Small Population Size: Implications for Plant Conservation. Annual Review of Ecology and Systematics 24: pp. 217-242.

Ford, L. D., and G. F. Hayes. 2007. Northern Coastal Scrub and Coastal Prairie. Pages 180-207 *in* M.G. Barbour, T. Keeler-Wolf, and A. Schoenherr, eds. Terrestrial Vegetation of California. 3rd edition. University of California Press, Berkeley.

Fried, G, B. Laitung, C. Pierre, N. Chagué, and F.D. Panetta. 2014. Impact of Invasive Plants in Mediterranean Habitats: Disentangling the Effects of Characteristics of Invaders and Recipient Communities. Biological Invasions 16:1639-1658.

Gaertner, M., A.D. Breeyen, C. Hui, and D.M. Richardson. 2009. Impacts of Alien Plant Invasions on Species Richness in Mediterranean-type Ecosystems: A Meta-analysis. Progress in Physical Geography 33:319–338.

Given, D.R. 1994. Principles and Practice of Plant Conservation. Timber Press, Portland, Oregon.

Godfrey, M. 2015. Ecological Buffers. Reducing Ecological Impacts of Shale Development: Recommended practices for the Appalachians. Available from: https://www.nature.org/media/centralapps/recommended-shale-practices-ecological-buffers.pdf?redirect=https-301 [accessed 14 August 2017].

Goodwillie, C. 1999. Wind pollination and reproductive assurance in *Linanthus parviflorus* (Polemoniaceae), a self-incompatible annual. American Journal of Botany 86: 948-954.

Goodwillie, C. 2001. Pollen limitation and the evolution of self-compatibility in *Linanthus* (Polemoniaceae). International Journal of Plant Science 162: 1283-1292.

Greene, E.L. 1889-1892. Some American Polemoniaceae. Pittonia 2:251-260.

Groom, M.J., Meffe, G.K., and C.R. Carroll. 2006. Principles of Conservation Biology, Third Edition. Sinauer Associates, Inc., Sunderland, MA.

Hankamp, P., C.D. Bell, and R. Patterson. 2016. Towards a complete species level phylogeny of *Leptosiphon* (Polemoniaceae). Madroño 63:208-219.

Haro, Kasunich & Associates, Inc. 2015. Coastal Bluff Recession Study, Juliana Avenue and Vallemar Street. Report prepared for Moss Beach Associates LLC. Available from: http://www.midcoastcommunitycouncil.org/vallemar-bluff/ [accessed 8 August 2017].

Heberger, M., H. Cooley, P. Herrera, P.H. Gleick, and E. Moore. 2009. The impacts of sea-level rise on the California coast. Prepared by the Pacific Institute for the California Climate Change Center. 115 pp.

Hickman, J.C. (ed.) 1993. The Jepson Manual: Higher Plants of California. University of California Press. Berkeley, CA.

Holland, R. 1986. Preliminary Descriptions of the Terrestrial Natural Communities of California. California Department of Fish and Game, The Resources Agency. Sacramento, CA. 165 pp.

Huntly, N., and R. Inouye. 1988. Pocket gophers in ecosystems: patterns and mechanisms. BioScience 38:786-793.

Inouye, R.S., N.J. Huntly, D. Tilman, and J.R. Tester. 1987. Pocket gophers (*Geomys bursarius*), vegetation, and soil nitrogen along a successional sere in east central Minnesota. Oecologia 72:178-184.

IPCC. 2014. Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp.

JCP-Engineers and Geologists, Inc. 1990. Engineering Geologic Reconnaissance Study for Proposed Development of Seven Homes on Vallemar Street, Juliana Avenue, Moss Beach, California. Prepared for Richard Charnock, November 15, 1990.

Jepson, W.L. 1925. A manual of the flowering plants of California. University of California Press, Berkeley, CA.

Jodi McGraw Consulting. 2017. Vallemar Bluffs Conservation Strategy. Report Prepared for Moss Beach Associates. Available online at http://www.midcoastcommunitycouncil.org/vallemar-bluff/ [accessed 8 August 2017].

Klein, A., T. Keeler-Wolf, and J. Evens. 2015. Classification of the Vegetation Alliances and Assocations of Sonoma County, California. Volume 1 of 2 – Introduction, Methods, and Results. Report prepared for The Sonoma County Agricultural Preservation and Open Space District, The Sonoma County Water Agency.

Levine J.M., M. Vilà, C.M. D'Antonio, J.S. Dukes, K. Grigulis, and S. Lavorel. 2003. Mechanisms Underlying the Impacts of Exotic Plant Invasions. Proceedings of the Royal Society of London B 270:775-781.

Line, D.E., and N.M. White. 2007. Effects of development on runoff and pollutant export. Water Environment Research 79:185-190.

Menges, E.S. 1991. The Application of Minimum Viable Population Theory to Plants. pp. 45-61 in D.A Falk and K.E. Holsinger (eds.). Genetics and Conservation of Rare Plants. Oxford University Press, New York, NY.

Mesiti-Miller Engineering, Inc. 2017. Utility and Drainage Plan, Vallemar Street & Juliana Avenue, Moss Beach California. Available from: http://www.midcoastcommunitycouncil.org/vallemar-bluff/ [accessed 3 August 2017].

Midcoast Community Council. 2017. Vallemar Bluff. Website: http://www.midcoastcommunitycouncil.org/vallemar-bluff/ [accessed 3 August 2017].

Milliken, J. 1904. A review of California Polemoniaceae. University of California Publications in Botany 2:1-71.

Munz, P.A. 1959. A California Flora. University of California Press, Berkeley, CA.

NatureServe. 2012. NatureServe Conservation Status Assessments: Methodology for Assigning Ranks. NatureServe Report Revised Edition June 2012. Available online at http://www.natureserve.org/sites/default/files/publications/files/natureserveconservationstatusmethodology_jun12_0.pdf [accessed 10 August 2017].

NatureServe. 2016. The NatureServe Climate Change Vulnerability Index release 3.02. Available from: http://www.natureserve.org/climatechange [accessed 28 July 2017].

Pampeyan, E. 1994. Geologic Map of the Montara Mountain and San Mateo 7-1/2' Quadrangles, San Mateo County, California. U.S. Department of the Interior, U.S. Geological Survey.

Patterson, R., and R. Battaglia. 2017. *Leptosiphon croceus*, in Jepson Flora Project (eds.) *Jepson eFlora.* http://ucjeps.berkeley.edu/eflora/eflora_display.php?tid=80954 [accessed 2017 August 7].

Pearson Design Group. 2016. Moss Beach – Overall Site Plan. Design Review Set, April 26, 2016. Available from http://www.midcoastcommunitycouncil.org/vallemar-bluff/ [accessed 10 August 2017].

Pimentel, D., R. Zuniga, and D. Morrison. 2004. Update on the Environmental and Economic Costs Associated with Alien-invasive Species in the United States. Ecological Economics 52:273-288.

Porter, J.M., and L.A. Johnson. 2000. A phylogenetic classification of Polemoniaceae. Aliso: A Journal of Systematic and Evolutionary Biology 19:55-91.

Primack, R.B. 2006. Essentials of Conservation Biology, Fourth Edition. Sinauer Associates, Sunderland, MA.

PRISM Climate Group. 2017. Oregon State University. Available online at: http://prism.oregonstate.edu. Created June 27, 2017.

Randall, J.M., and M.C. Hoshovsky. 2000. California's Wildland Invasive Plants. pp. 11-27 in Bossard, C.C., J.M. Randall, and M.C. Hoshovsky. Invasive Plants of California's Wildlands. University of California Press. Berkeley, CA.

Reichman, O.J., and E.W. Seabloom. 2002. The role of pocket gophers as subterranean ecosystem engineers. Trends in Ecology and Evolution 17:44-49.

Santoro, R., T. Jucker, M.L. Carranza, and A.T.R. Acosta. 2011. Assessing the effects of *Carpobrotus* invasion on coastal dune soils. Does the nature of the invaded habitat matter? Community Ecology 12:234-240.

Saunders, D.A., R.J. Hobbs, and C.R. Margules. 1991. Consequences of ecosystem fragmentation: a review. Conservation Biology 5(1):18-32.

Sawyer, J.O., T. Keeler-Wolf, and J.M. Evans. 2009. A Manual of California Vegetation, Second Edition. California Native Plant Society Press. Sacramento, CA.

Shaffer, M.L. 1981. Minimum population Sizes for Species Conservation. Bioscience 31:131-134.

Shaffer, M.L. 1987. Minimum Viable Populations: Coping with Uncertainty. pp. 69-86 in M.E. Soule (editor), Viable Populations for Conservation. Cambridge University Press, Cambridge, England.

Smil, V. 1997. Global population and the nitrogen cycle. Scientific American 277(1):76-81.

Soil Survey Staff. 2017. Web Soil Survey. Natural Resources Conservation Service, United States Department of Agriculture. Available online at https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx [accessed June 26, 2017].

Spitzer, G. 2002. Ice plant getting cold reception from naturalists. Los Angeles Times, May 04, 2002. Available online at http://articles.latimes.com/2002/may/04/local/me-outthere4 [accessed 4 August 2017].

Strother, J.L., and K.R. Kersh. 2016. Typifications of *Linanthus parviflorus* var. *croceus* Milliken and *Linanthus croceus* Eastw. (Polemoniaceae). Phytoneuron 2016-21:1-2.

Suehs, C.M., E. Medail, and L. Affre. 2004. Invasion dynamics of two alien *Carpobrotus* (Aizoaceae) taxa on a Mediterranean island: I. Genetic diversity and introgression. Heredity (2004) 92:31-40.

USDA (United States Department of Agriculture), Natural Resources Conservation Service. 2017. Buffer Strips: Common Sense Conservation. Webpage: https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/home/?cid=nrcs143_023568 [accessed 14 August 2017].

van Kleunen, M., W. Dawson, F. Essl, J. Pergl, M. Winter, E. Weber, H. Kreft, P. Weigelt, J. Kartesz, M. Nishino, L.A. Antonova, J. F. Barcelona, F. J. Cabezas, D. Cárdenas, J. Cárdenas-Toro, N. Casaño, E. Chacón, C. Chatelain, A.L. Ebel, E.Figueiredo, N. Fuentes, Q.J. Groom, L. Henderson, Inderjit, A. Kupriyanov, S. Masciadri, J. Meerman, O. Morozova, D. Moser, D.L. Nickrent, A. Patzelt, P.B. Pelser, M.P. Baptiste, M. Poopath, M. Schulze, H. Seebens, S. Shu, J. Thomas, M. Velayos, J.J. Wieringa, and P. Pyšek. 2015. Global Exchange and Accumulation of Non-native Plants. Nature 525:100-103.

Vilà, M., M. Tessier, G.M. Suehs, G. Brundu, L. Carta, A. Galanidis, P. Lambdon, M. Manca, F. Médail, E. Moragues, A. Traveset, A.Y. Troumbis, and P.E. Hulme. 2006. Local and regional assessment of the impacts of plant invaders on vegetation structure and soil properties of Mediterranean islands. Journal of Biogeography 33:853-861.

Villarreal, D., K.L. Clark, L.C. Branch, J.L. Hierro, and M. Machicote. 2008. Alteration of ecosystem structure by a burrowing herbivore, the plains vizcacha (*Lagostomus maximus*). Journal of Mammology 89:700-711.

Vitousek, P.M., J.D. Aber, R.W. Howarth, G.E. Likens, P.A. Matson, D.W. Schindler, W.H. Schlesinger, and D.G. Tilman. 1997. Human alteration of the global Nitrogen cycle: sources and consequences. Ecological Applications 7:737–750.

Commented [A17]: Mammalogy

Weber, J.J., and C. Goodwillie. 2013. Variation in floral longevity in the genus *Leptosipon*: mating system consequences. Plant Biology 15(2013):220-225.

Wilcove, D.S., D. Rothstein, J. Dubow, A. Phillips, and E. Losos. 1998. Quantifying Threats to Imperiled Species in the United States. Bioscience 48:607–615.

Xiao, Y., X. Li, Y. Cao, and M. Dong. 2016. The diverse effects of habitat fragmentation on plant-pollinator interactions. Plant Ecology 217:857-868.

Young B.E., E. Byers, G. Hammerson, A. Frances, L. Oliver, and A. Treher. 2015. Guidelines for using the NatureServe Climate Change Vulnerability Index Release 3.0. Arlington, VA: NatureServe.

Yurkonis, K.A., and S.J. Meiners. 2004. Invasion Impacts Local Species Turnover in a Successional System. Ecology Letters 7:764-769.

Zander, Michael J. 2015. Vegetation Characterization and Mapping, Moss Beach Lots. Letter to Owen Lawlor, Moss Beach Associates, LLC. May 21, 2015.

Personal Communication

Arechiga, Ramona. Phone conversation. August 12, 2016.

Arechiga, Ramona. Phone conversation. June 27, 2017.

Corelli, Toni. Personal e-mail communication. June 8, 2016.

Forbes, Holly. Personal e-mail communication. August 11, 2016.

Forbes, Holly. Personal e-mail communication. August 03, 2017.

Lazar, Kristi. Personal e-mail communication. March 4, 2016.

Commented [A18]: Leptosiphon

APPENDIX A: Comments from Affected and Interested Parties on the Petitioned Action

APPENDIX B: External Peer Review Invitation Letters and Comments from Peer Reviewers on the Coast Yellow Leptosiphon Status Review Report

Peer Review Comments from Dr. Robert Patterson and Department Responses

Page	Line	Reviewer Comment	Department Response
2	15	The leaves are not compound	Text revised: “It has opposite leaves that are palmately-divided…”
2	16	This is an incorrect use of the term. Leaflets are divisions of a compound leaf. Leptosiphon has deeply lobed simple leaves. Lobes are simply called lobes.	Text revised to reflect proper terminology: “It has opposite leaves that are palmately-divided, which means that all the lobes of the leaf are fused together at a common point, resembling a fan. The leaves are generally divided into six lobes that are approximately 4 to 7 millimeters (0.16 to 0.28 inches) long on the lower stem and almost twice as long near the flowers, appearing as whorls at the nodes.”
2	17	“Leaflets” corrected to “lobes.”	Text revised to replace “leaflets” with “lobes”.
2	18	“Leaflets” corrected to “lobes.”	Text revised to replace “leaflets” with “lobes”.
2	22	Here you’re referring to corolla lobes. The term “petal” should be reserved for corolla parts that are not fused to each other.	Text revised to reflect proper terminology: “The flowers have bright yellow petals that are fused together at the base and are collectively referred to as a corolla. The corolla lobes are approximately 6 to 8 millimeters (0.24 to 0.31 inch) wide and generally have two bright red dots at the base. The fused corolla forms a long tube that is 26 to 39 millimeters (1.0 to 1.5 inches) long and is covered with fine, scattered, spreading hairs.”
2	23	I would call these dots pretty bright, not faint at all (cf your photo).	Text revised to replace the word “faint” with “bright”.
2	24	The tube isn’t really funnel-shaped. It’s tubular. The corolla is actually salverform.	Text revised: “funnel-shaped” removed.
2	27-28	The calyx lobes are actually connected by the membrane so that the entire calyx is a tube.	Text revised: “The calyx lobes, otherwise known as sepals, are generally deltate or triangular-shaped, less than 1 millimeter (0.04 inch) wide at the middle, densely glandular-hairy, and are connected by an obscure thin membrane, forming a tube.”
2	29	Female “flower parts” corrected to female “organs”	Text revised to reflect the correction.
2	30	Female “flower part” corrected to female “organ”	Text revised to reflect the correction.
3	8	The correct citation is Patterson 1993. Hickman was the editor of TJM1, Patterson authored the treatment.	Citation corrected in text and in Literature Cited section.

3	19	Referring to bristly leptosiphon (*Leptosiphon acicularis*) - This species is now known as *L. aureus* (see Porter and Patterson, 2014, Aliso 32(2), 55–88.)	Text updated to reflect the current name of this species.
3	20	Insert (*L. parviflorus*)	Text revised to add (*L. parviflorus*).
3	36	A minor issue, but here and throughout ranges should be expressed by an en-dash, not a hyphen.	Text revised throughout the document to replace hyphens with en-dash when referring to ranges.
8	1	Here and elsewhere, no apostrophe. Should read 1990s.	Apostrophe removed in this instance and throughout the document as appropriate.
28	15	"*Carbobrotus*" corrected to *"Carpobrotus*"	Text corrected
33	48	"Mammology" corrected to "Mammalogy"	Text corrected
34	1	"*Leptosipon*" corrected to *"Leptosiphon*"	Text corrected

State of California – Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
Habitat Conservation Planning Branch
1416 Ninth Street, 12th Floor
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EDMUND G. BROWN JR., Governor
CHARLTON H. BONHAM, Director

October 2, 2017

Aaron Schusteff, Ph.D.
[redacted]

Dear Dr. Schusteff:

Coast Yellow Leptosiphon (*Leptosiphon croceus*); California Department of Fish and Wildlife, Peer Review Status Report

Thank you for agreeing to serve as a scientific peer reviewer for the California Department of Fish and Wildlife (Department) Status Review of coast yellow leptosiphon (*Leptosiphn croceus*). Please review the copy of the Department's peer review draft report dated October 2, 2017, that is included with this letter. The Department seeks your expert analysis and input regarding the scientific validity of the report and its assessment of the status of coast yellow leptosiphon in California based on the best scientific information currently available. The Department respectfully requests that you focus your peer review effort on the body of relevant scientific information and the Department's related assessment of the population and life history elements prescribed in the California Endangered Species Act (CESA). **The Department would appreciate receiving your peer review input on or before October 31, 2017**.

The Department seeks your scientific peer review as part of formal proceedings pending before the California Fish and Game Commission (Commission) under CESA. As you may know, the Commission is a constitutionally established entity distinct from the Department, exercising exclusive statutory authority under CESA to list species as endangered or threatened (Fish & G. Code, § 2070). The Department serves in an advisory capacity during CESA listing proceedings, charged by the Fish and Game Code to focus on the best scientific information available to make related recommendations to the Commission (Fish & G. Code, § 2074.6).

The Commission received the petition to list coast yellow leptosiphon under CESA on May 25, 2016. On December 23, 2016, the Commission published findings formally designating coast yellow leptosiphon as a candidate for listing as threatened or endangered under CESA. Coast yellow leptosiphon is currently protected under CESA in California in that capacity.

The peer review draft report forwarded to you today reflects the Department's effort to identify and analyze the best scientific information available regarding the status of

coast yellow leptosiphon in California. At this time, the Department believes that the best available science indicates that listing the species as endangered under CESA is warranted. We underscore, however, that scientific peer review plays a critical role in the Department's effort to develop and finalize its recommendation to the Commission as required by the Fish and Game Code. Our expected recommendation to the Commission at this point may change following your input.

We ask you to focus your peer review on the best scientific information available regarding the status of coast yellow leptosiphon in California. As with our own effort to date, your peer review of the science and analysis regarding each of the population and life history categories prescribed in CESA are particularly important (Cal. Code Regs., tit. 14, § 670.1(i)(1)(A)) (i.e., present or threatened habitat modification, overexploitation, predation, competition, disease, and other natural occurrences or human-related activities that could affect the species) as well as whether it indicates, in your opinion, that coast yellow leptosiphon is at serious risk of becoming extinct throughout all or a significant portion of its range in California, or whether the species is likely to become so in California in the foreseeable future. Please note that the Department releases this peer review report to you solely as part of the peer review process, and it is not yet public.

A Microsoft Word version and a PDF version of the report are included with this letter; however, only the PDF version includes figures and appendices. For ease of review, you may submit your comments in "track changes" format, or in list form by page and line number. Please submit your comments electronically to Ms. Cherilyn Burton, Senior Environmental Scientist (Specialist) at cherilyn.burton@wildlife.ca.gov. Ms. Burton may also be reached at (916) 651-6508. If there is anything the Department can do to facilitate your review, please let us know.

Following receipt and consideration of peer review comments, the Department will prepare and submit its final report and related recommendation to the Commission. After at least a 30 day public review period, the Commission will consider the petition to list coast yellow leptosiphon, the Department's report and related recommendations including peer review, and public testimony during a regularly scheduled Commission meeting prior to making their decision.

Thank you again for your contribution to the status review effort and the important input it provides during the Commission's related proceedings.

Sincerely,

Richard Macedo, Branch Chief
Habitat Conservation Planning Branch

Enclosures

ec: California Department of Fish and Wildlife

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Wednesday, November 1, 2017

Leptosiphon Croceus Report: Line Item Comments

Submitted by Aaron Schusteff

Page 2, Line 19: "The leaflets are **narrowly oval**…"

Suggestion: Seems to me the leaflet shape in *Leptosiphon croceus* is better described as *linear* rather than *oval…*the latter meaning somewhat *widely* rounded (e.g. with width at least half the length), which does not conform with my experience (or photos) of *L. croceus*.

Page 4: Pertaining to "Life History"

I just want to share a number of remarks here (some of which I mentioned in a previous email) which perhaps fit best under "Life History".

First, from the salverform corolla morphology alone, one might reasonably speculate that *L. croceus* is likely pollinated by a bee or fly with a long proboscis. In this context, it's perhaps worth noting that Grant & Grant(1965) state (on pg. 110) that the small-headed fly *Eulonchus smaragdinus* was observed visiting flowers of "*Linanthus adrosaceus croceus*" at Pt. Reyes. And I have observed a congener, *Eulonchus tristis*, not far from Moss Beach on San Pedro Mountain (though in very different habitat…namely, dense, undisturbed coastal scrub).

But the Pt. Reyes plants that the Grants referred to as "*Linanthus androsaceus croceus*" would not be placed as *Leptosiphon croceus* under current circumscriptions. J. T. Howell referred to those Pt. Reyes plants as *Linanthus parviflorus ssp. rosaceus.* And for a while (a few years back) some botanists were tentatively referring to those same Pt. Reyes plants as *Leptosiphon rosaseus* (Hooker f.) Battaglia, though I believe the latter name is now only applied to a few populations at Mori Point and Pillar Point, both not far from the Moss Beach station for *Leptosiphon croceus* (see Jepson eFlora web page here). In the fairly recent 2007 revised version of Howell's original "Marin Flora" by Almeda, Follette, & Best, the Pt. Reyes plants are simply referred to as *Leptosiphon parviflorus*, and the discussion there includes the following intriguing remark:

> "*Leptosiphon croceus* (Eastw.) J.M. Porter & L.A. Johnson, a yellow-flowered coastal plant may also occur in Marin County near Bolinas."

I don't know whether a thorough search has been made for *Leptosiphon croceus* in the Bolinas area, though I have seen habitat quite similar to the Moss Beach station in that area. (By the way, some images of these Pt. Reyes plant appear on this CalPhotos web page, under the name "*Leptosiphon longitubus*"...for an explanation of that name, which is not formally published or recognized, see the "manifesto" at this link, written by the late naturalist and CNPS fellow Randy Morgan.)

But returning to the question of the pollination syndrome for *Leptosiphon croceus*...perhaps surprisingly, it seems more likely to me that this species is wind-pollinated rather than insect-pollinated. This is because during many hours of observation of the Moss Beach population...during favorable conditions (i.e. calm and warm) at peak bloom...I never saw a single bee (or bee-fly, or acrocerid, etc.) visit any of the flowers, even though I found large colonies of both *Anthorphora bomboides* and a *Lasioglossum* species in very close proximity to the *L. croceus*. All I was able to observe were beetles visiting the flowers, and they are more likely net pollen predators rather than effective pollinators for the *Leptosiphon* (they tend to feed on single flowers for hours and do not efficiently transfer pollen among many flowers.) Images can be seen at the following links:

<http://bugguide.net/node/view/246717>
<http://bugguide.net/node/view/148098>
<http://bugguide.net/node/view/136293>

Wind-pollination in the very closely related species *L. parviflorus* and *L. jepsonii* is discussed in various papers by Carol Goodwillie and others:

<http://www.amjbot.org/content/86/7/948.full>
<http://www.journals.uchicago.edu/doi/10.1086/322946>
<http://www.ecu.edu/cs-cas/biology/upload/Aaron-Wallace-Final-Poster.pdf>

I think it may be fruitful to engage Carol Goodwillie in a discussion of the possibilities of wind-pollination in *L. croceus*, and what ramifications that may have for conservation issues relating to the *Leptosiphon*.

Page 7, Line 12: Pertaining to “Similar Looking Plants”

I believe the entity that is most similar-looking to *Leptosiphon croceus* is the population, formally placed as *Leptosiphon parviflorus*, that occurs in a wet meadow within surrounding forest north of Boulder Creek, in the Santa Cruz Mountains. Like the Moss Beach population of *L. croceus*, this entity is known from only a single population (of about the same size)…but in a very different inland habitat. See photos and remarks at the link below:

<https://calphotos.berkeley.edu/cgi/img_query?where-kwid=0000+0000+0512+1723&one=T>

Page 7, Line 23: “Eriogonum latifolium, coastal celery-button (*Eryngium armatum*),…”

Also growing intermingled with *L. croceus* (near the southwest corner of the population) at least in 2006 and for a few years afterwards, was the native forb *Clarkia rubicunda ssp. blasdalei* (a coastal form of *Clarkia rubicunda* that has been synonimized with the nominate form). Also, in my experience, the *Eryngium* used to mainly grow on the east side of the beaten foot path…near to, but disjoint from, the *L. croceus* population, which was restricted to the west side of the walking path. However, the *Eryngium* may now have spread to the west side of the foot path as well.

Page 9: Pertaining to “Geology and Soils”

During a visit to the site, Randy Morgan once remarked that the presence of the *Leptosiphon* and many other native plants to the west of the beaten foot path may owe to the soil there having never been plowed. Agricultural use of the coastal prairies adjacent to bluffs had been common earlier in the last century all along the coast from south of San Francisco to Santa Cruz, and farmers often plowed right up to the use paths that followed the top of the bluffs. “Never

plowed soil” may be a habitat characteristic to keep in mind when considering optimal sites for possible seeding of new populations.

Page 20, Line 17: Predation (or perhaps “Herbivory”?)

I think it’s VERY IMPORTANT to include somewhere in the report mention of the possible threat of the introduction of non-native slugs into the population (e.g. from neighboring residential landscaping, or other venues), which could quickly devastate the population (and may provide an explanation for the very rapid decrease in number of plants in the population over the previous few years).

Slugs can eat the small seedlings early in the season when they’re barely noticeable to humans. And the slugs nocturnal and winter “wet-cycle” phenology might make them a relatively cryptic threat to most observers. Simple experimental sampling (e.g. setting down flat pieces of plywood or other such attractive slug shelters, and checking underneath them in the morning) should be done, especially during early rains.

If slugs are present, a judicious program of elimination and control (e.g. use of a targeted and relatively non-toxic slug bait like “sluggo") could be effective (and essential) for protecting the *Leptosiphon* population!

Peer Review Comments from Dr. Aaron Schusteff and Department Responses

Page	Line	Reviewer Comment	Department Response
2	19	"The leaflets are **narrowly oval**…" *Suggestion*: Seems to me the leaflet shape in *Leptosiphon croceus* is better described as *linear* rather than *oval*…the latter meaning somewhat *widely* rounded (e.g. with width at least half the length), which does not conform with my experience (or photos) of *L. croceus.*	In the species description in the Jepson eflora (Patterson and Battaglia 2017), the leaves are described as narrowly obovate, which means narrowly "egg shaped" with the widest part above the middle (i.e., away from the base). "Linear" is defined in the Jepson Manual 2nd edition as "elongate, with nearly parallel sides; narrower than elliptic or oblong". The description in the Jepson Manual 2nd edition is accurate, since the sides of the leaves are not parallel, but widen toward the tip of the leaves. The text has been revised as follows: "The lobes are narrowly ovate with the narrower end at the base," since "ovate" is a more descriptive term for this shape.
4	Pertaining to "Life History"	I just want to share a number of remarks here (some of which I mentioned in a previous email) which perhaps fit best under "Life History". First, from the salverform corolla morphology alone, one might reasonably speculate that *L. croceus* is likely pollinated by a bee or fly with a long proboscis. In this context, it's perhaps worth noting that Grant & Grant(1965) state (on pg. 110) that the small-headed fly *Eulonchus smaragdinus* was observed visiting flowers of "*Linanthus adrosaceus croceus*" at Pt. Reyes. And I have observed a congener, *Eulonchus tristis*, not far from Moss Beach on San Pedro Mountain (though in very different habitat…namely, dense, undisturbed coastal scrub).	Comment noted. No response needed.

4	Pertaining to "Life History" (continued)	But the Pt. Reyes plants that the Grants referred to as "*Linanthus androsaceus croceus*" would not be placed as *Leptosiphon croceus* under current circumscriptions. J. T. Howell referred to those Pt. Reyes plants as *Linanthus parviflorus* ssp. *rosaceus*. And for a while (a few years back) some botanists were tentatively referring to those same Pt. Reyes plants as *Leptosiphon rosaseus* (Hooker f.) Battaglia, though I believe the latter name is now only applied to a few populations at Mori Point and Pillar Point, both not far from the Moss Beach station for *Leptosiphon croceus* (see Jepson eFlora web page here). In the fairly recent 2007 revised version of Howell's original "Marin Flora" by Almeda, Follette, & Best, the Pt. Reyes plants are simply referred to as *Leptosiphon parviflorus*, and the discussion there includes the following intriguing remark: "*Leptosiphon croceus* (Eastw.) J.M. Porter & L.A. Johnson, a yellow-flowered coastal plant may also occur in Marin County near Bolinas." I don't know whether a thorough search has been made for *Leptosiphon croceus* in the Bolinas area, though I have seen habitat quite similar to the Moss Beach station in that area. (By the way, some images of these Pt. Reyes plant appear on this CalPhotos web page, under the name "Leptosiphon longitubus"…for an explanation of that name, which is not formally published or recognized, see the "manifesto" at this link, written by the late naturalist and CNPS fellow Randy Morgan.)	*Leptosiphon croceus* had previously been reported in Bolinas, Marin County, and this location was previously tracked in the California Natural Diversity Database (CNDDB) as Element Occurrence #4. In a review of herbarium specimens conducted by botanist and petitioner Toni Corelli (2016), no herbarium sheets were found that were labeled *L. croceus* from Bolinas, and this population was not confirmed; therefore, the Element Occurrence was considered erroneous and was removed from the CNDDB. Two voucher specimens were located from Point Reyes, Marin County (Specimen numbers RSA12224 and RSA148677), which were reviewed and the identifications were corrected to *Leptosiphon parviflorus*. No other collections have been found from Marin County, and *L. croceus* is not confirmed as historically or currently present there. No changes made to the document.

4	Pertaining to "Life History" (continued)	But returning to the question of the pollination syndrome for *Leptosiphon croceus*…perhaps surprisingly, it seems more likely to me that this species is wind-pollinated rather than insect-pollinated. This is because during many hours of observation of the Moss Beach population…during favorable conditions (i.e. calm and warm) at peak bloom…I never saw a single bee (or bee-fly, or acrocerid, etc.) visit any of the flowers, even though I found large colonies of both *Anthorphora bomboides* and a *Lasioglossum* species in very close proximity to the *L. croceus*. All I was able to observe were beetles visiting the flowers, and they are more likely net pollen predators rather than effective pollinators for the Leptosiphon (they tend to feed on single flowers for hours and do not efficiently transfer pollen among many flowers.) Images can be seen at the following links: <http://bugguide.net/node/view/246717> <http://bugguide.net/node/view/148098> <http://bugguide.net/node/view/136293> Wind-pollination in the very closely related species *L. parviflorus* and *L. jepsonii* is discussed in various papers by Carol Goodwillie and others: <http://www.amjbot.org/content/86/7/948.full> <http://www.journals.uchicago.edu/doi/10.1086/322946> <http://www.ecu.edu/cs-cas/biology/upload/Aaron-Wallace-Final-Poster.pdf> I think it may be fruitful to engage Carol Goodwillie in a discussion of the possibilities of wind-pollination in *L. croceus*, and what ramifications that may have for conservation issues relating to the *Leptosiphon*.	Comments on pollination noted. The Status Review indicates that *L. croceus* may be wind pollinated, but that little is known about the mating system of this species. More research on pollination is needed. No changes made to the document. The Department will attempt to contact Carol Goodwillie to discuss wind-pollination and the conservation implications it may have for *L. croceus.*

7	12	Pertaining to "Similar Looking Plants" I believe the entity that is most similar-looking to *Leptosiphon croceus* is the population, formally placed as *Leptosiphon parviflorus*, that occurs in a wet meadow within surrounding forest north of Boulder Creek, in the Santa Cruz Mountains. Like the Moss Beach population of *L. croceus*, this entity is known from only a single population (of about the same size)…but in a very different inland habitat. See photos and remarks at the link below: <https://calphotos.berkeley.edu/cgi/img_query?where-kwid=0000+0000+0512+1723&one=T>	The voucher specimens that presumably refer to this population (UCR197844, UCD38190) were reviewed by Toni Corelli in 2016, and the identifications of these collections were determined as *Leptosiphon parviflorus*. Text added to this section: "One population of variable linanthus located in the Santa Cruz Mountains near Boulder Creek looks particularly similar to coast yellow leptosiphon (A. Schusteff pers. comm. 2017), but the herbarium specimen records which presumably refer to this population have been confirmed as variable linanthus (Corelli 2016)."
7	23	"Eriogonum latifolium, coastal celery-button (*Eryngium armatum*),…": Also growing intermingled with *L. croceus* (near the southwest corner of the population) at least in 2006 and for a few years afterwards, was the native forb *Clarkia rubicunda* ssp. *blasdalei* (a coastal form of *Clarkia rubicunda* that has been synonimized with the nominate form). Also, in my experience, the *Eryngium* used to mainly grow on the east side of the beaten foot path…near to, but disjoint from, the *L. croceus* population, which was restricted to the west side of the walking path. However, the *Eryngium* may now have spread to the west side of the foot path as well.	Department staff did not observe *Clarkia rubicunda* at the population during site visits, and the species was not listed on the plant list of Vallemar Bluff provided by Toni Corelli. The species may still occur there but was not included in the report since it was not recorded during site visits. Department staff observed *Eryngium armatum* growing within the *L. croceus* population west of the foot path. No changes made to the document.
9	"Geology and Soils"	During a visit to the site, Randy Morgan once remarked that the presence of the Leptosiphon and many other native plants to the west of the beaten foot path may owe to the soil there having never been plowed. Agricultural use of the coastal prairies adjacent to bluffs had been common earlier in the last century all along the coast from south of San Francisco to Santa Cruz, and farmers often plowed right up to the use paths that followed the top of the bluffs. "Never plowed soil" may be a habitat characteristic to keep in mind when considering optimal sites for possible seeding of new populations.	Comment noted. No response needed.

20	17	Predation (or perhaps “Herbivory”?) I think it’s VERY IMPORTANT to include somewhere in the report mention of the possible threat of the introduction of non-native slugs into the population (e.g. from neighboring residential landscaping, or other venues), which could quickly devastate the population (and may provide an explanation for the very rapid decrease in number of plants in the population over the previous few years). Slugs can eat the small seedlings early in the season when they’re barely noticeable to humans. And the slugs nocturnal and winter “wet-cycle” phenology might make them a relatively cryptic threat to most observers. Simple experimental sampling (e.g. setting down flat pieces of plywood or other such attractive slug shelters, and checking underneath them in the morning) should be done, especially during early rains. If slugs are present, a judicious program of elimination and control (e.g. use of a targeted and relatively non-toxic slug bait like “sluggo") could be effective (and essential) for protecting the Leptosiphon population!	Added text to the “Predation” sections of the document to describe the potential threat from introduced non-native slugs to coast yellow leptosiphon. Citations and references added to the text and literature cited.