Eradicating invasive sea lavenders from San Francisco Bay wetlands

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European sea lavender flowers by Brad Kelley.

Abstract

Beginning in 2006, several densely growing populations of Algerian sea lavender (*Limonium ramosissimum*), were discovered in San Francisco Bay salt marshes. A perennial, salt-tolerant forb of Mediterranean origin, Algerian sea lavender has spread to marshes and tidal lagoons in southern California, from San Diego to Morro Bay. There, the plant displays invasive characteristics including broad salinity tolerance, prolific seed production and the ability to compete with native plants[1].

In San Francisco Bay, Algerian as well as what is thought to be European sea lavender (*Limonium duriusculum*) have been found in the high marsh and upland transition zone where they form near-monotypic stands and competes directly with native salt marsh species. At the upper end of this elevation range, Algerian sea lavender grows taller, more robustly and produces more seed, competing directly with perennial pickleweed, and altering high tide wildlife refugia habitat[2].

San Francisco Bay invasive sea lavender infestations have been detected on scattered marshes, and cover approximately 4 net acres within a combined 50 acre gross area. Such limited establishment offers a rare opportunity for eradication without great economic expenditure and without the harm caused by allowing this invasive to spread. Eradication also pre-empts the long term impacts of controlling these species if they are not stopped in the early stage.

Many partners around San Francisco Bay have already initiated detection and eradication efforts against invasive sea lavenders and are actively coordinating with the Bay Area Early Detection Network (BAEDN) on this and other priority eradication species. BAEDN is working to bring additional stakeholders and support on-board. **Working together we can eradicate invasive lavenders from San Francisco Bay. Please report new sightings to the appropriate land managers as well as the occurrence database at www.Calflora.org.**

Identification

Four known sea lavenders are known in Francisco Bay marshes

Non-native invasive: Algerian sea lavender (*Limonium ramosissimum*)

Photo by Gavin Archbald.

Non-native invasive: possibly European sea lavender (*Limonium duriusculum*)

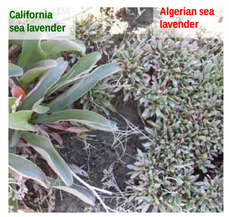
Photo by Gavin Archbald.

European sea lavender is smaller with shorter, more rounded leaves than Algerian sea lavender. European sea lavender flowers are evenly distributed and not as crowded on the ends of the branches compared to Algerian sea lavender.

Non-native ornamental Canary or Perez's sea lavender (*Limonium perezii*)

Photo by Gavin Archbald.

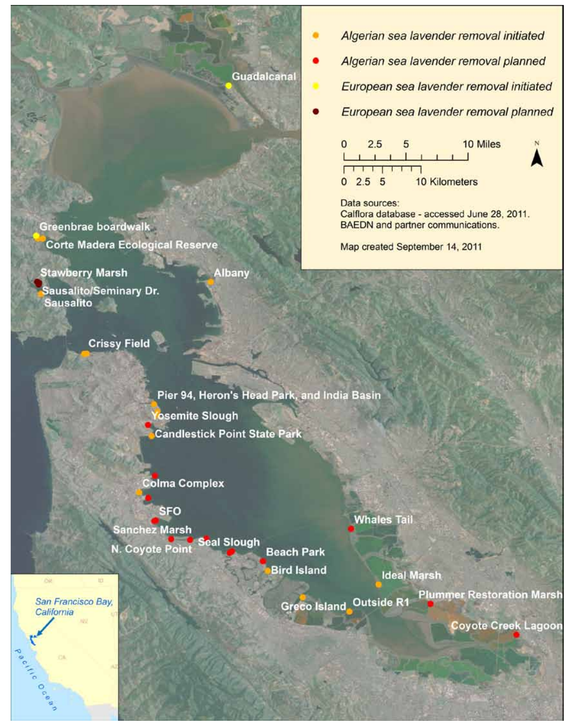
Native California sea lavender or marsh Rosemary (*Limonium californicum*)



Native California sea lavender has larger, rounder, and more spatulate-shaped leaves than Algerian and European sea lavenders. California sea lavender has a more open inflorescence and smaller flowers than Canary sea lavender. Photo by Mike Perlmutter.

San Francisco Bay Distribution

A concerted effort has been made to map San Francisco Bay invasive sea lavenders. As part of his Master's work at San Francisco State University, Gavin Archbald conducted extensive and repeated searches along shorelines a few kilometers north and south of known and suspected populations from 2007-2010. Gavin also identified suitable habitat for Algerian sea lavender and used this model guide additional surveys. Partner observations of invasive sea lavenders augment Gavin's targeted searches and have all been collected in the Calflora occurrence database.



Removal & Restoration

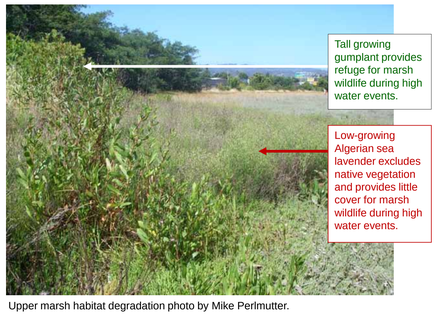
Small populations are **easily handpulled**. Herbicide application in southern California has shown varying success. Native plant revegetation is recommended as follow-up to large-scale removal.

Algerian sea lavender removal photo by Margo Bors.

BAEDN is coordinating with partners to eradicate invasive sea lavenders from San Francisco Bay wetlands. Many partners are surveying for and removing these species where they find them. **BAEDN is seeking funding to assist additional partners complete eradication work around the Bay.**

Threats

California Clapper Rail by Joyce Gross.

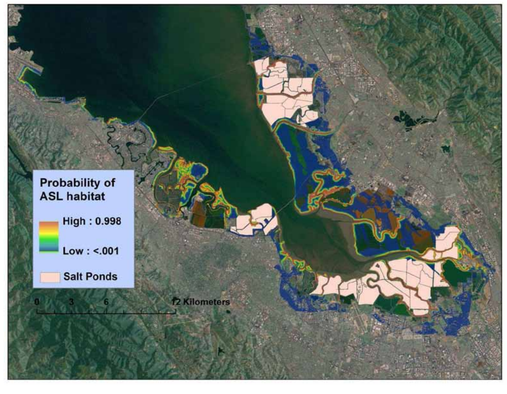


Upper marsh habitat degradation photo by Mike Perlmutter.

•**Displacement of native upper marsh vegetation** by Algerian sea lavender could threaten endangered **Clapper Rail** (*Rallus longirostris obsoletus*), **Black Rail (***Laterallus jamaicensis coturniculus*), **salt marsh harvest mouse** (*Reithrodontomys raviventris*), and endemic **San Francisco Bay Song Sparrow subspecies** (*Melospiza melodia* subspecies *pusillula, samuelis*, and *maxillaris*) which use tall native vegetation for nesting as well as for refuge during high water events.

•**Invasion to additional marshes**, and especially newly breached marsh restoration projects, which are more vulnerable to invasions as a result disturbance and less competition with established natives.

Top left photo: Invasive Algerian sea lavender spreading in the high marsh zone by Gavin Archbald. Bottom left photo: Algerian sea lavender growing in near mono-typic stand. Photo by Mike Perlmutter.



(left) Algerian sea lavender invasion potential model for South San Francisco Bay. Warm colors indicate high Algerian sea lavender habitat suitability. From Gavin Archbald, 2011.

Salt marsh bird's beak by Mike Perlmutter.

•**Displacement of rare plants.** Invasive sea lavenders are invading habitat for the rare Point Reyes bird's beak (*Chloropyron maritimus ssp. palustris*) in San Francisco Bay and endangered salt marsh bird's beak (*Chloropyron maritimus ssp. maritimus*) in Southern California. Other San Francisco Bay rare plants such as Johnny nip (*Castilleja ambigua ssp. ambigua*), and the endangered soft bird's beak (*Chloropyron mollis ssp. mollis*) may also be at risk to Algerian sea lavender invasion.

•**Localized extinction of native California sea lavender (*Limonium californicum*) via hybridization with non-native sea lavender species.** The sea lavender genus exhibits high hybridization potential[3] and at least three non-native sea lavender species co-occur with native sea lavender populations in San Francisco Bay.

California sea lavender
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Acknowledgements

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Citations

[1] Page,H.R., Schroeter, S., Wolf, J. and David Hubbard. 2007. PowerPoint Presentation. "Ecology of the exotic sea lavender, *Limonium ramosissimum* in the salt marshes of southern California." Society of Wetland Scientists, Sacramento, CA.

[2] Archbald and Boyer, unpublished.

[3] Palacios C, Rosello JA, Gonzales-Candelas F. 2000. Study of the Evolutionary Relationships among *Limonium* Species (Plumbaginaceae) Using Nuclear and Cytoplasmic Molecular Markers. Molecular Phylogenetics and Evolution 14 (2) 232-249.