DETERMINING SUITABLE LOCATIONS FOR URBAN SEED BANKS IN LOS ANGELES

Seed LA Practicum Team
UCLA IOES 2019-2020

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UCLA IOES Practicum 2020

Photo: Salewskia (2017)

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Photo: Rorabaugh, J. (2017)

WHO IS SEED LA?

Seed LA is a collaborative effort between seven non-profits and government agencies. They are dedicated to protecting and enhancing native plant populations in the greater Los Angeles region through increasing the availability of locally-adapted seed. Their vision is to "provide [their] public, non-profit, and private partners with the highest quality native seed..." (SeedLA.org).

Seed LA
Los Angeles Regional Native Seed Network

Seed LA is creating a regional seed bank for locally adapted native plants. By collecting, distributing, propagating, and planting these seeds, Seed LA aims to provide both in-situ and ex-situ conservation. They aim to accomplish this with physical seed banking and by planting living seed banks throughout greater Los Angeles area.

Photo: Independentman (2005)

Audubon
Audubon Center at Debs Park

California Botanic Garden

Grown in LA

North East Trees
Bringing Nature Back

National Park Service

Palos Verdes Peninsula Land Conservancy

Theodore Payne Foundation for Wild Flowers & Native Plants, Inc.

Photo: SeedLA.org (2019)

LIVING SEED BANKS

What is a "living" urban seed bank and why is it beneficial?

While traditional seed banking serves as a storage facility for harvested seeds, Seed LA's vision takes a different approach. Instead of conservation through the storage of plant genetics, living seed banks are active, regenerative plant populations. They not only serve as a seed source for future restoration, but also function as important habitats for wildlife and incorporate greenery into the city.

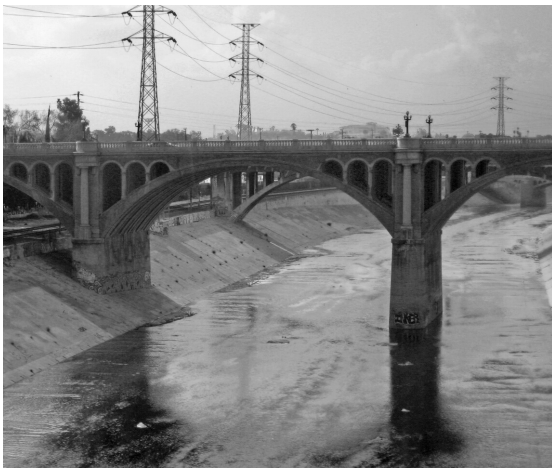


Photo: Downtowngal (2008)

One of Seed LA's goals is to plant living seed banks in urban areas throughout LA, such as vacant lots, freeway medians, and city-owned parcels. Twelve target species have been selected for this project based on their regional suitabiity and natural occurrence in the Los Angeles area. This effort will reintroduce locally-adapted native plants to urban areas, providing important habitat connectivity and seed sources for years to come.

Photo: Salewskia (2017)

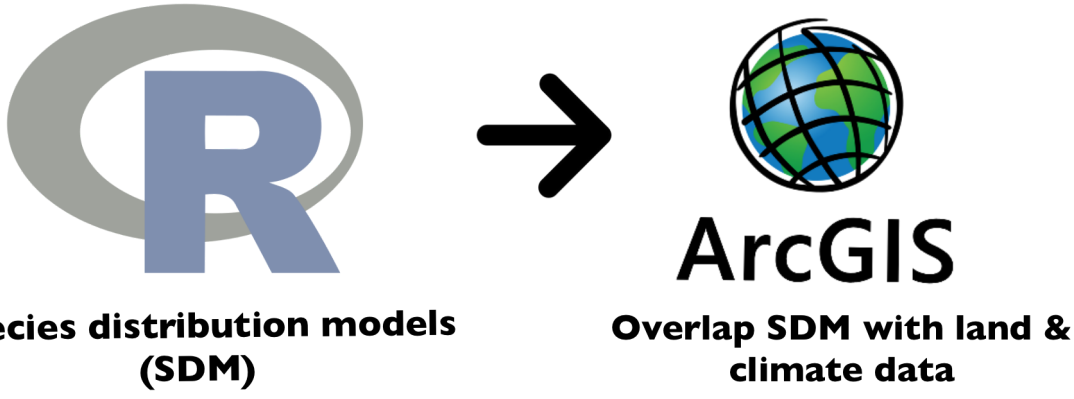
THE PRACTICUM PROJECT

Our team's approach to determining suitable locations for living seed banks in the urban landscape of L.A.

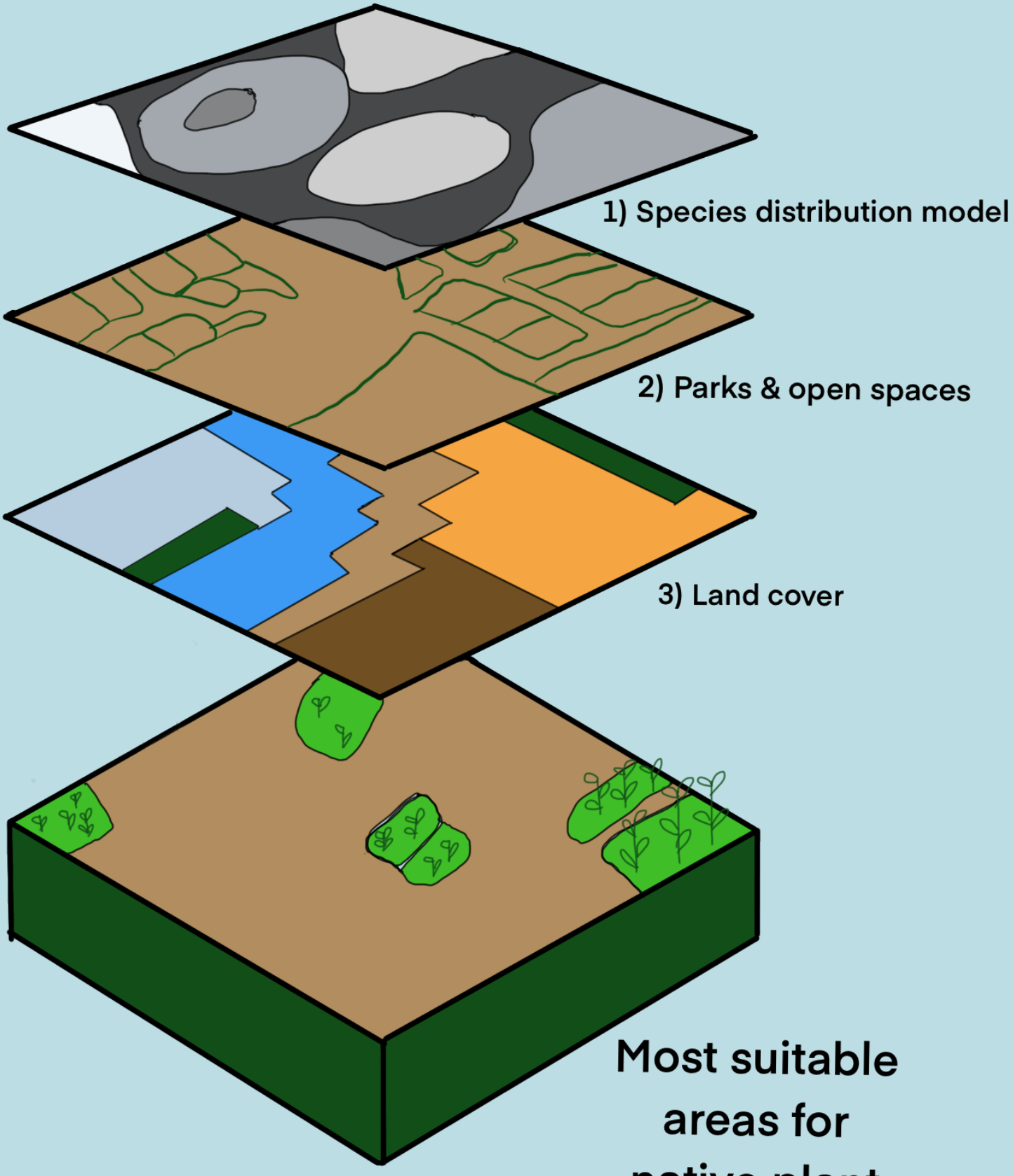
Our team was tasked with identifying suitable locations in Los Angeles for living seed banks. We researched each of the twelve target species and created habitat suitability models to determine the best sites for them in the greater LA area. We also pulled land ownership data to find vacant plots of land, including freeway medians, empty lots, parks, alleyways, and unused city parcels. By overlaying this data in ArcGIS, we were able to determine where ideal habitats intersected with available land. We used future climate projections to identify how these habitats might change in the future.

METHODS

In order to find suitable locations for urban seed banks in Los Angeles, we used a two-step process. The first step was creating a species distribution model (SDM) in R for each of the 12 target species. The second step was using ArcMap (within ArcGIS) to identify open urban areas and then overlapping the SDMs, which reveal the optimum places for seed banks of each of the 12 target species.



OVERVIEW OF METHODOLOGY



1) SPECIES DISTRIBUTION MODEL

The species distribution models (SDM) for each of the 12 target species were created in R, using Maxent modeling. SDMs are used to identify where the species are currently growing and where they can grow in the future through the inclusion of current and future climate data. **Bioclimatic variables** considered within the climate data include:

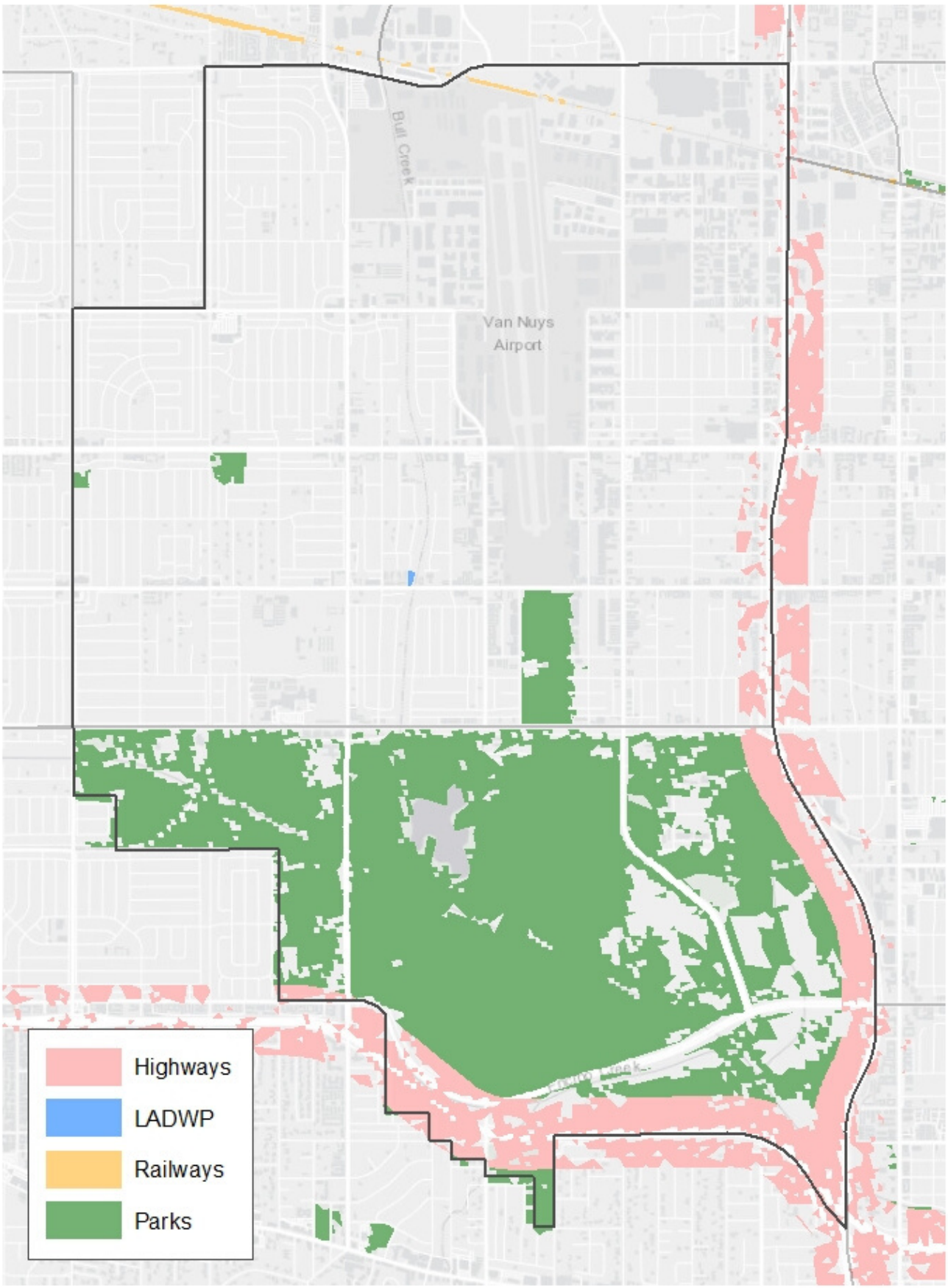
- Mean annual temperature
- Mean diurnal range
- Isothermality
- Temperature seasonality
- Temperature annual range
- Precipitation of the wettest month
- Precipitation of the driest month
- Precipitation seasonality
- Available water capacity
- Percent of clay
- Percent of sand

2) PARKS & OPEN SPACES

For parks & open spaces, we incorporated major freeway medians, railways, and Department of Water and Power (DWP) facilities into our geographic analysis using data from the California Department of Transportation (Caltrans) and the Los Angeles City Controller website. The categories include:

- Highways
- LADWP properties
- Railways
- Parks

This is an example of what the parks & open spaces layer looks like in the Lake Balboa region of Los Angeles.



Produced for SEED LA Senior Practicum Team, UCLA

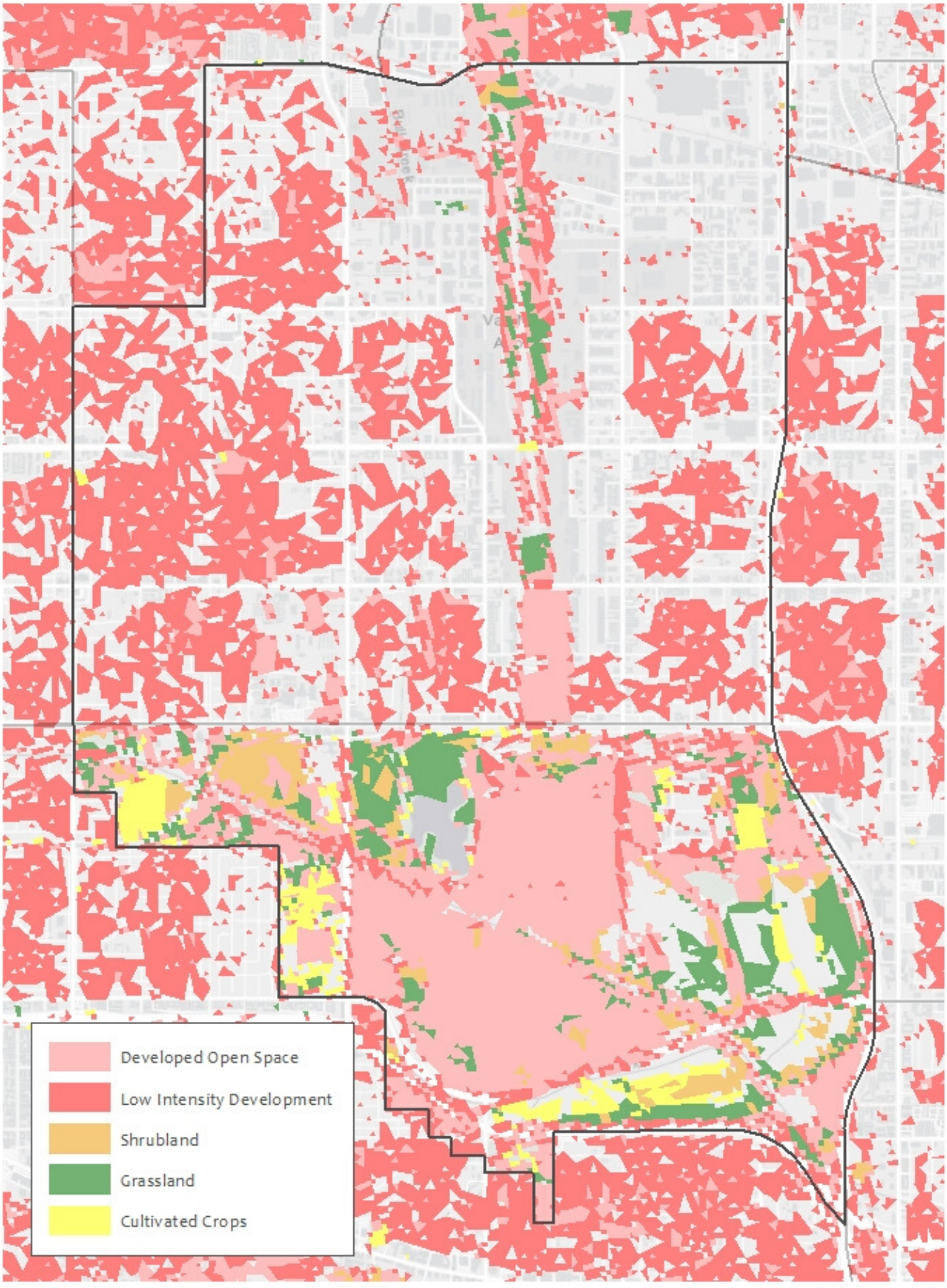
Source: CalTrans, LA County GIS Data Portal

3) LAND COVER

Land cover layer refers to the physical state of land. Using data from the National Land Cover Database (NLCD), we used **5 classifications** that encompass non-developed land to low intensity developed land:

- Shrubland
- Grassland
- Cultivated crops
- Developed open spaces (<20% impervious surface)
- Low intensity development (20-49% impervious surface)

This is an example of what the land cover data looks like in the Lake Balboa region of Los Angeles.



Produced for SEED LA Senior Practicum Team, UCLA

Source: LA County GIS Data Portal, NLCD


Photo: Herbert, N. (2011)

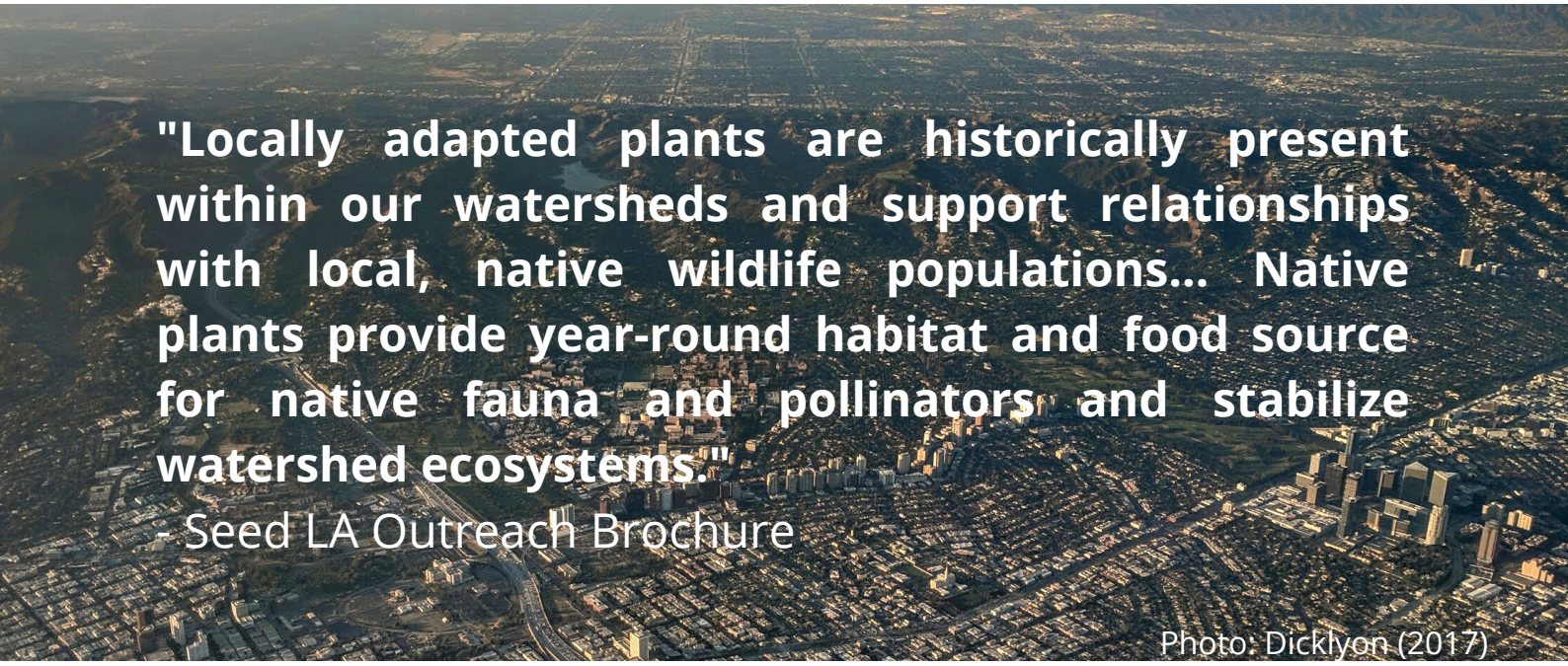
SELECTING THE TWELVE TARGET SPECIES

Seed LA has carefully selected twelve target species for this project. These species were chosen based on their natural occurrence in the region, ability to be collected and propagated, and their suitability for future restoration projects.


Photo: Los Angeles District USACE (2012)

Target species meet the following criteria: native and appropriate to the greater LA area, propagules are available to collect from within the LA area, propagules are tolerant of traditional storage methods, plants can be propagated by seed and maintained in a nursery, and plants are not listed, candidates, or proposed as threatened or endangered under the Endangered Species Act

SUITABILITY MODELS FOR THE TWELVE TARGET SPECIES



"Locally adapted plants are historically present within our watersheds and support relationships with local, native wildlife populations... Native plants provide year-round habitat and food source for native fauna and pollinators and stabilize watershed ecosystems."

- Seed LA Outreach Brochure

Photo: Dicklyon (2017)

In the following section, we introduce each of the twelve target species, provide information about their basic ecological needs, and show their present suitability in the LA Basin using the models we made in ArcMap. These models include all of the previously-discussed land cover, open space, and habitat suitability data, as well as observations of current populations.

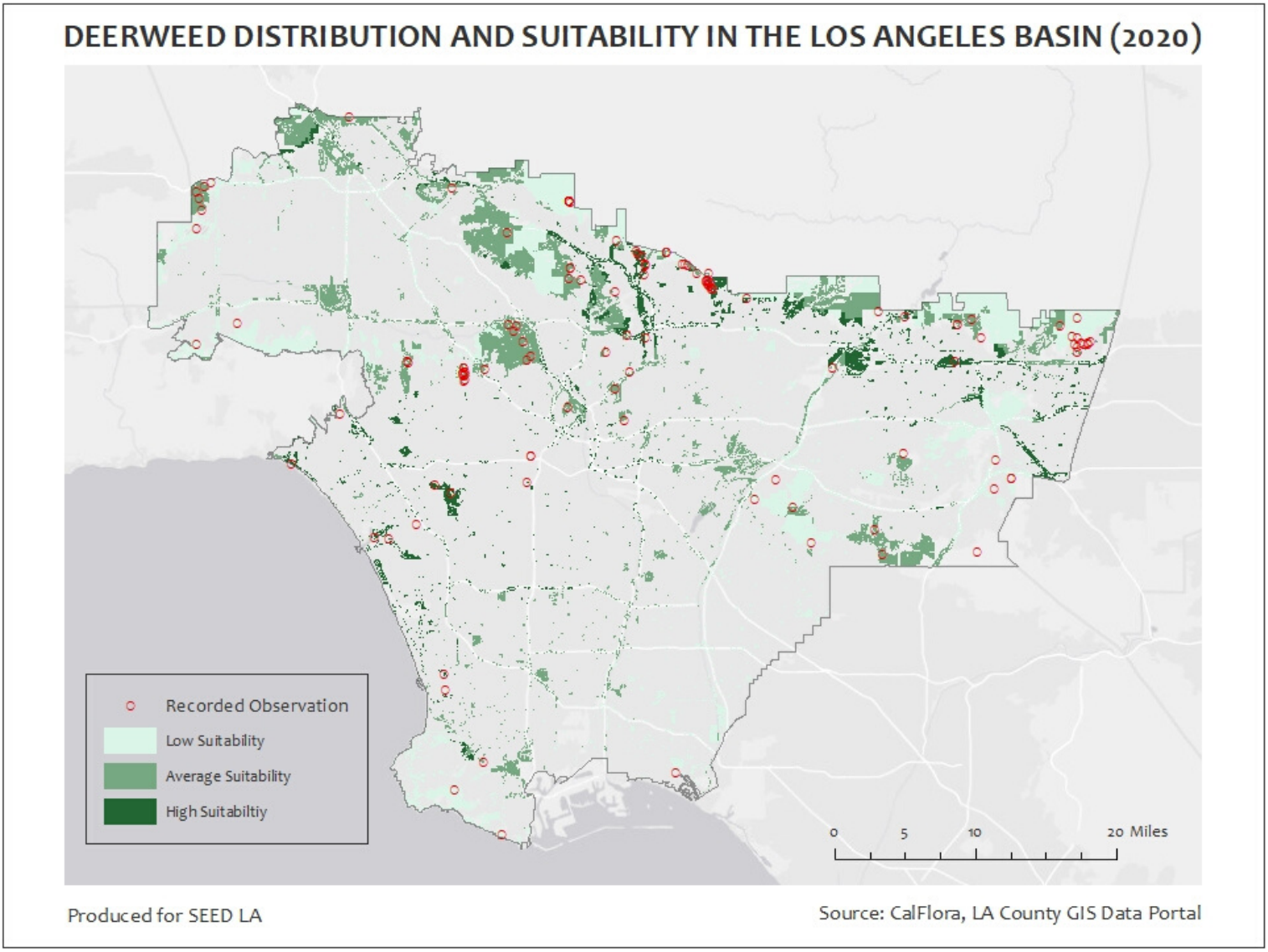
Photo: Rusk, J. (2017)

DEERWEED

(Acmispon glaber)


Photo: Cox, L. (2011)

Habitat: Open coastal regions, gentle slopes, full sun
Pollinator: Native bees
Reproduction: Requires fire to seed, self-compatible
Precipitation: 10-40 in.
Temperature: 18-63 F

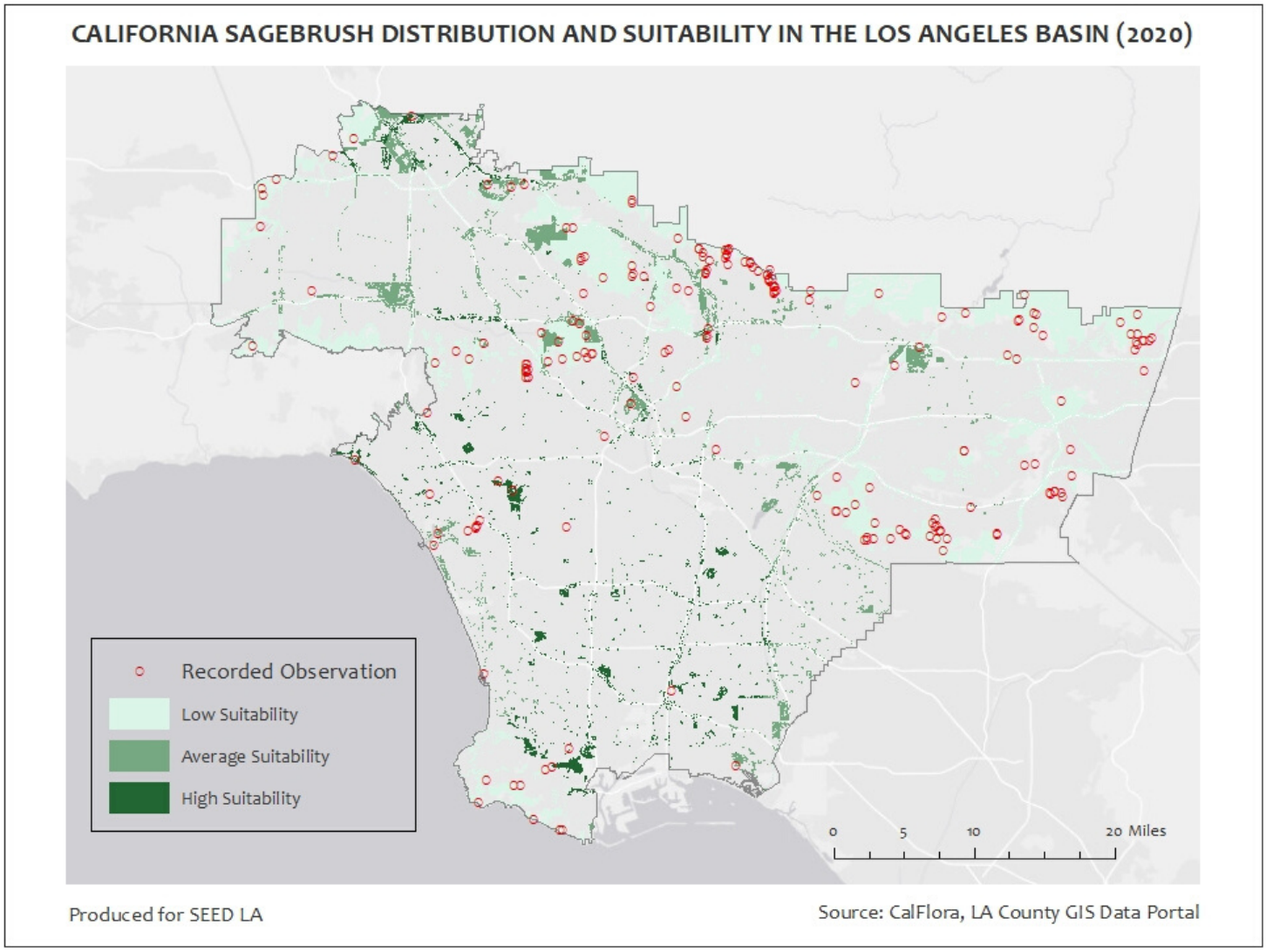


CALIFORNIA SAGEBRUSH

(Artemisia californica)

Habitat: Dry coastal slopes, full sun
Pollinator: Wind
Reproduction: Re-sprouts from plant base, self-incompatible
Precipitation: 10-25 in.
Temperature: 18-61 F

Photo: Consultaplantas(2011)

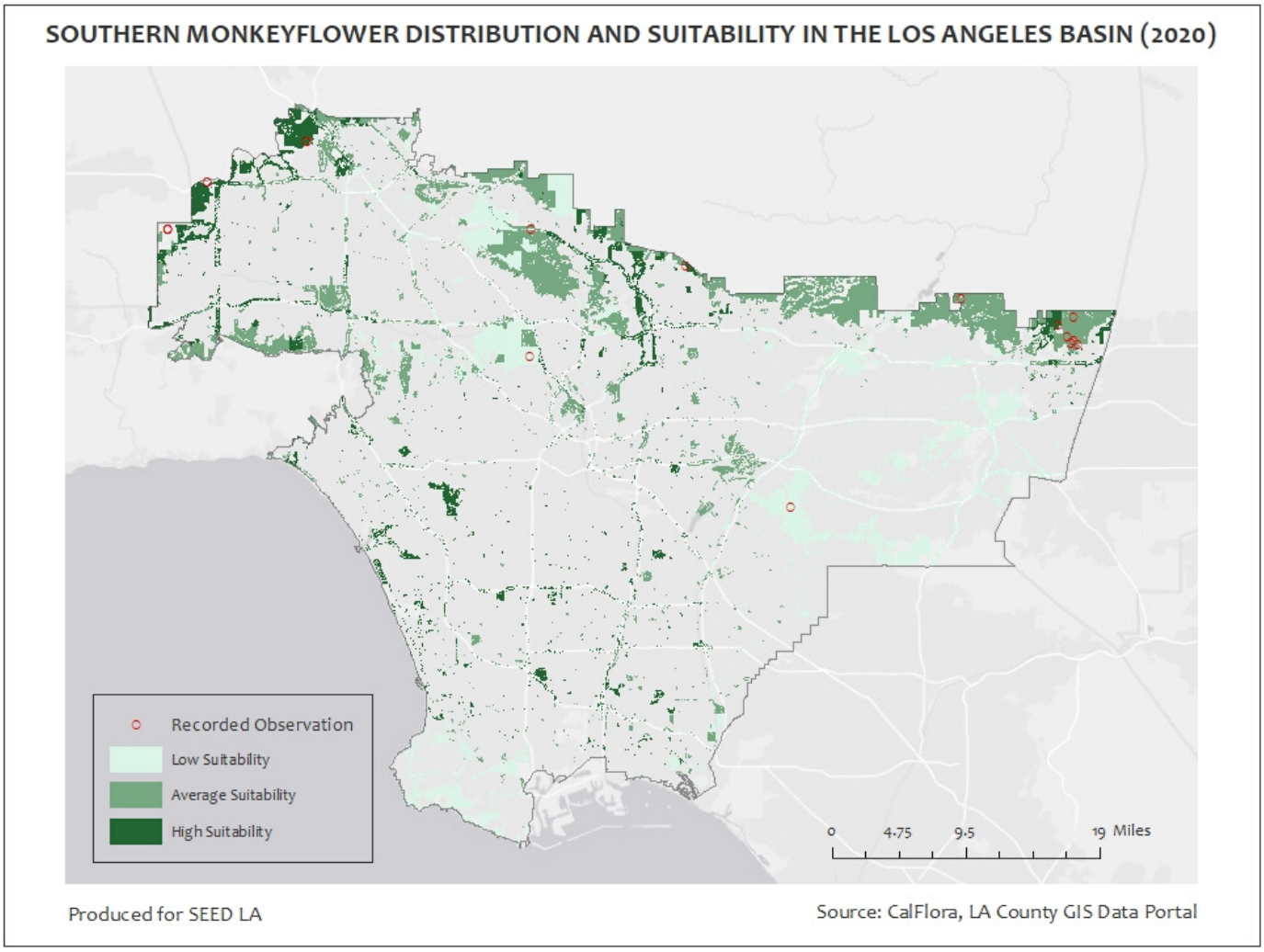


SOUTHERN BUSH MONKEYFLOWER

(Diplacus longiflorus)

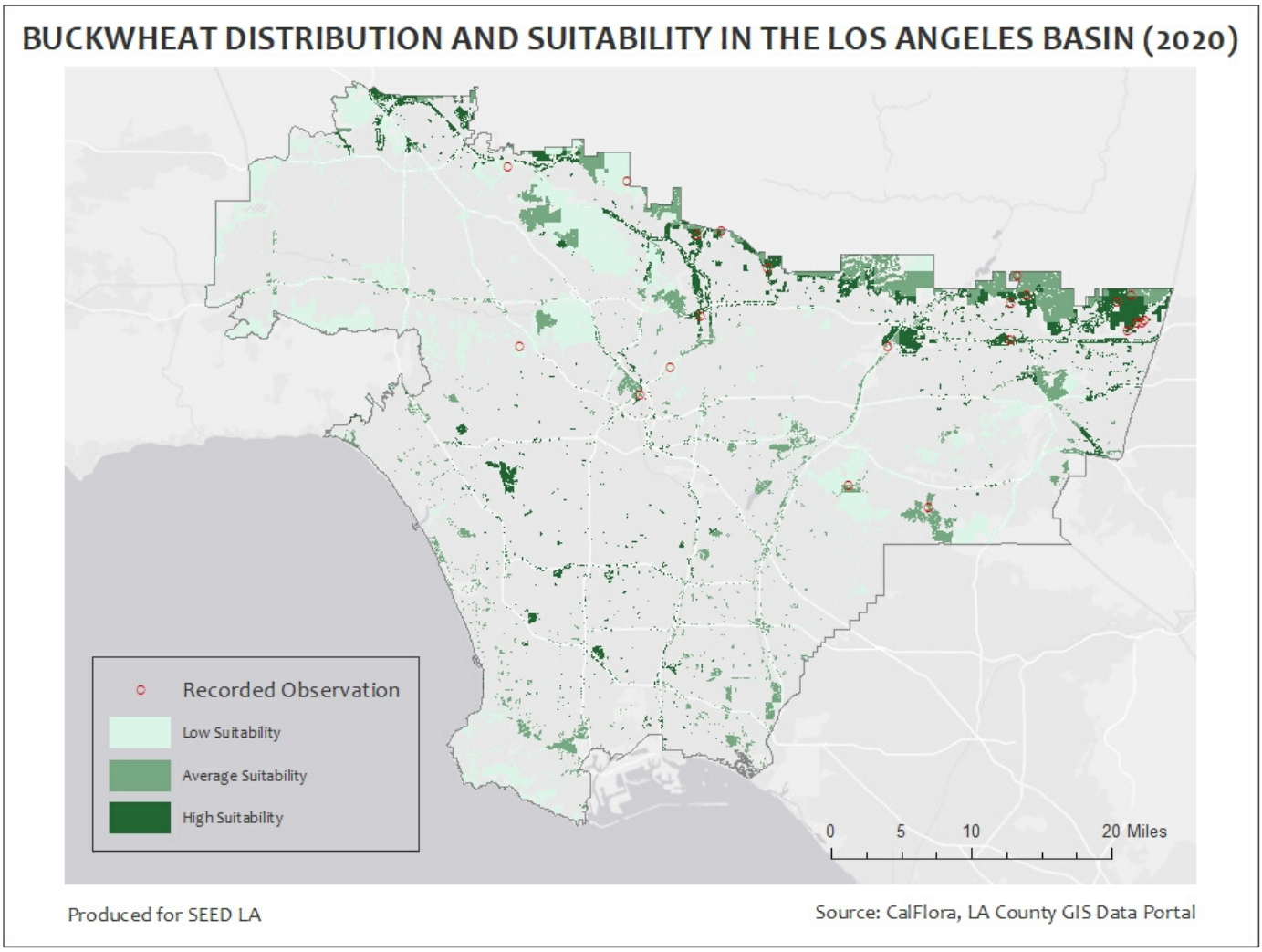
Habitat: Rocky hillsides and cliffs, disturbed areas, full sun
Pollinator: Insects and birds
Reproduction: Propagates from stem, thrives when outbred
Precipitation: 4-36 in.

Photo: Georgewilliams1 (2020)



LEAFY CALIFORNIA BUCKWHEAT

(Erigonum fasciculatum var. foliolosum)



Habitat: Sandy coastal areas and alluvial deposits, full sun
Pollinator: Generalist pollinators
Reproduction: Self-incompatible, resprouts best after fire
Precipitation: 4-51in.
Temperature: 5-67 F

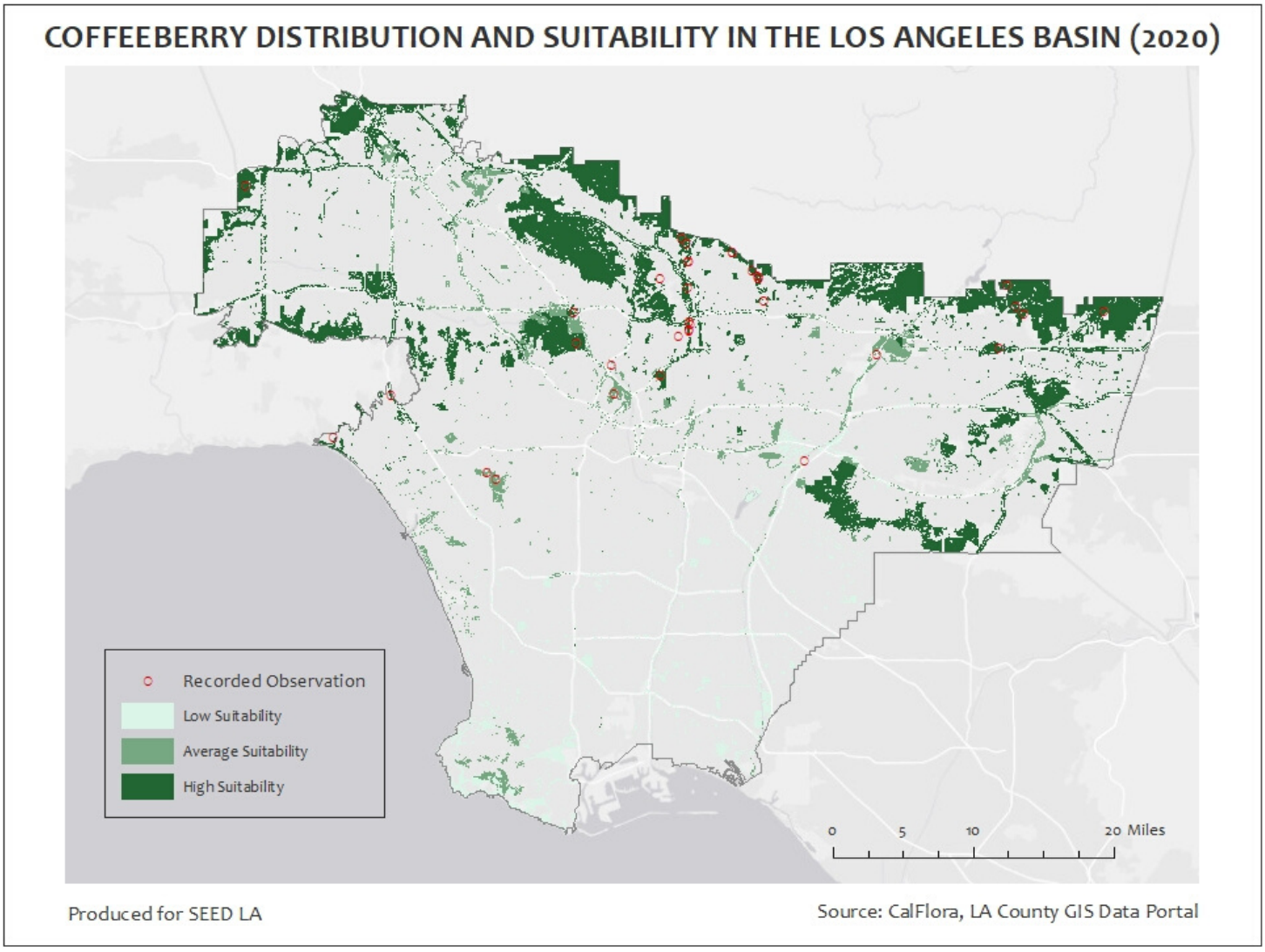
Photo: Blackledge, A. (2009)

COFFEE BERRY

(Frangula californica)

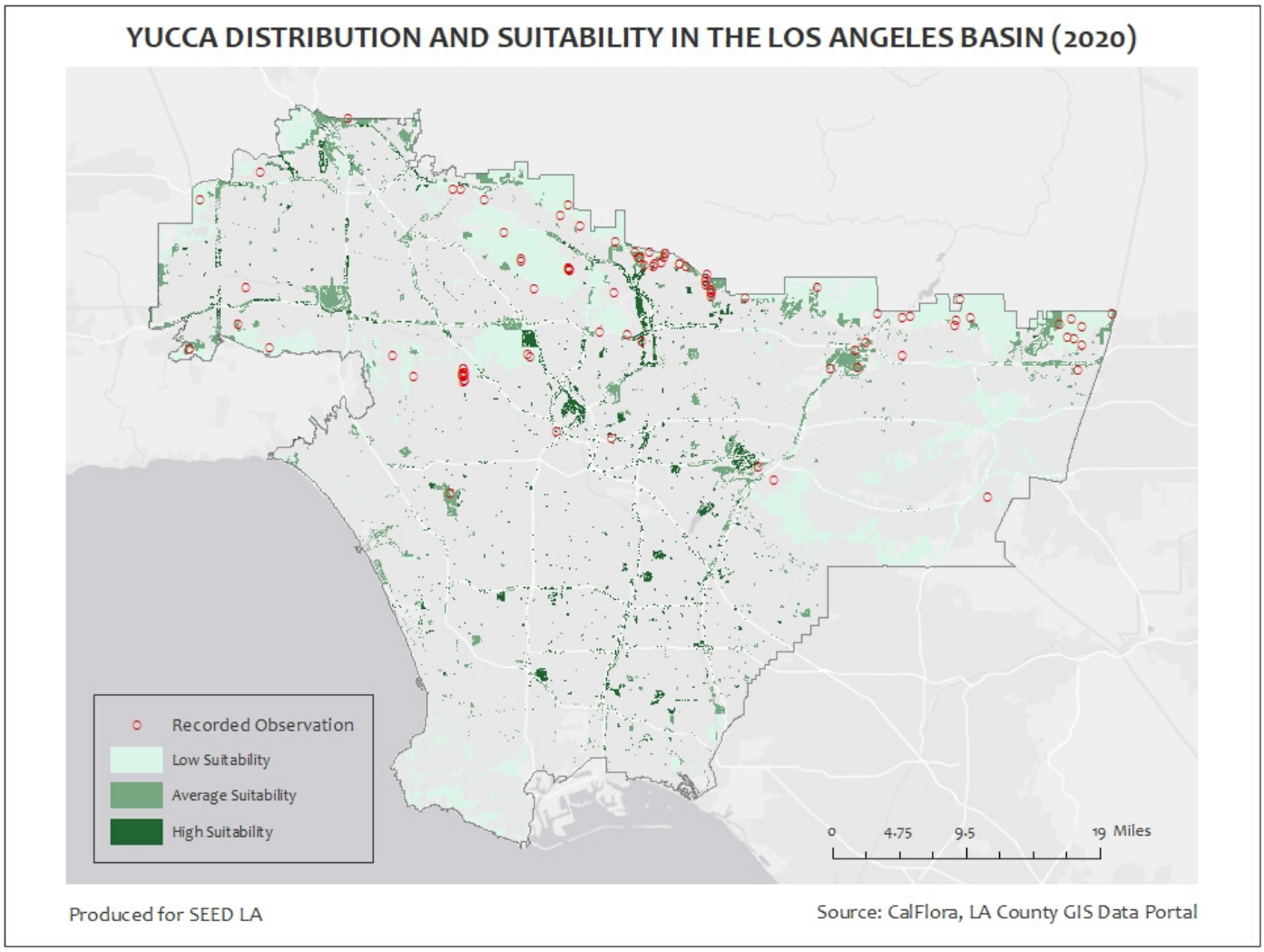
Habitat: Full to partial sun, variety of soils and habitats
Pollinator: Bees
Reproduction: Sexual and asexual
Precipitation: 5-159 in.
Temperature: 10-61 F

Photo: Rusk, J. (2017)



CHAPARRAL YUCCA

(Hesperoyucca whipplei)



Habitat: Dry slopes and chaparral, full sun
Pollinator: Obligate relationship with the California Yucca Moth
Reproduction: Reproduces from rhizome
Precipitation: 11-55 in.
Temperature: 24-63 F

Photo: Weldon, B. (2010)

TOYON

(Heteromeles arbutifolia)

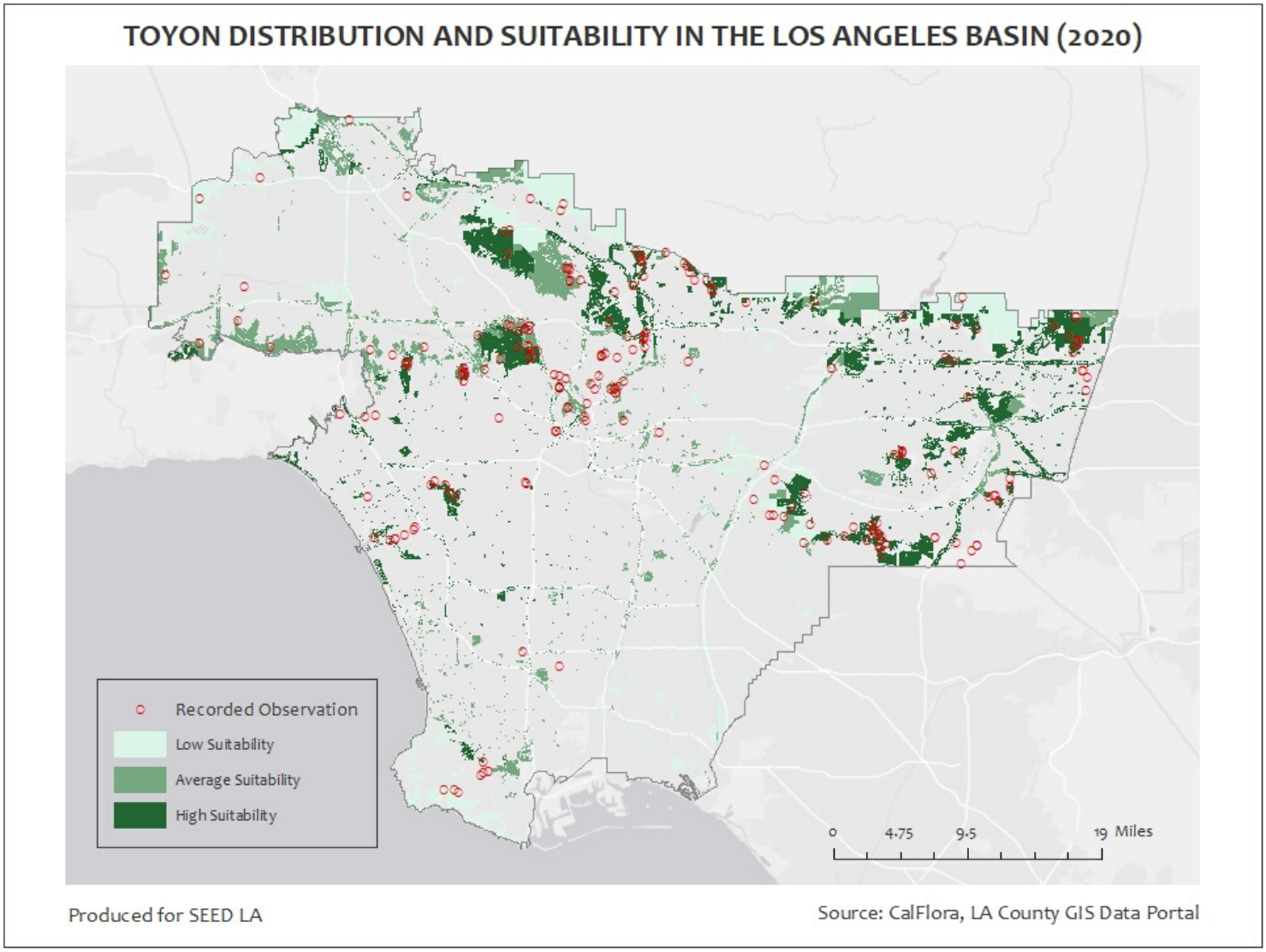


Photo: Ballentine, D. (2014)

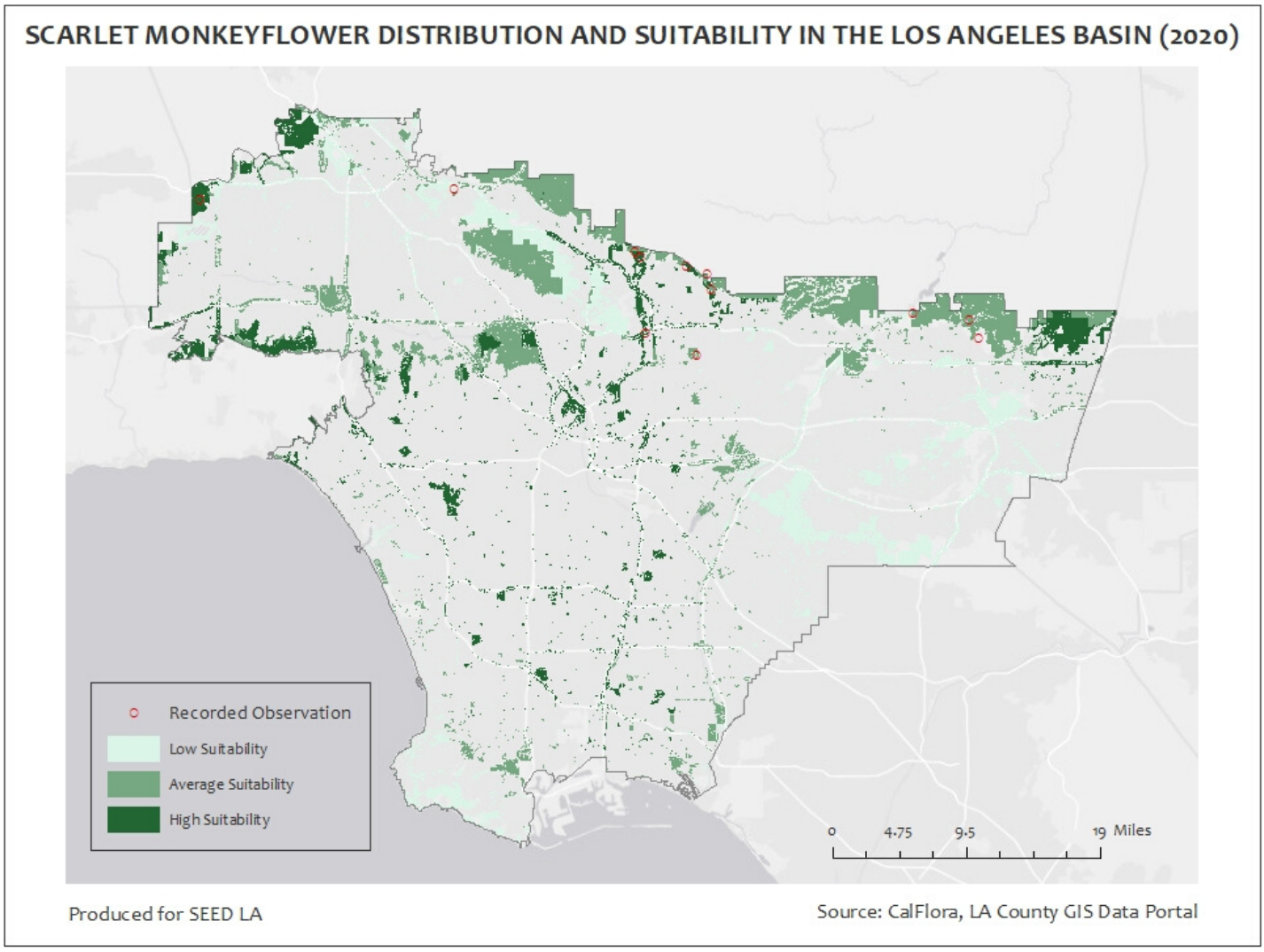
Habitat: Rocky slopes and alluvial terraces
Pollinator: Native bees
Reproduction: Sprouts after fire or cutting, self-compatible
Precipitation: 17-77 in.
Temperature: 15-59 F

SCARLET MONKEYFLOWER

(Mimulus cardinalis, Erythranthe cardinalis)

Habitat: Riparian habitats, bogs, wetlands, in full to partial sun
Pollinator: Hummingbirds
Precipitation: 11-105 in.
Temperature: Cold hardy to 15 F


Photo: Dcrjsr (2015)

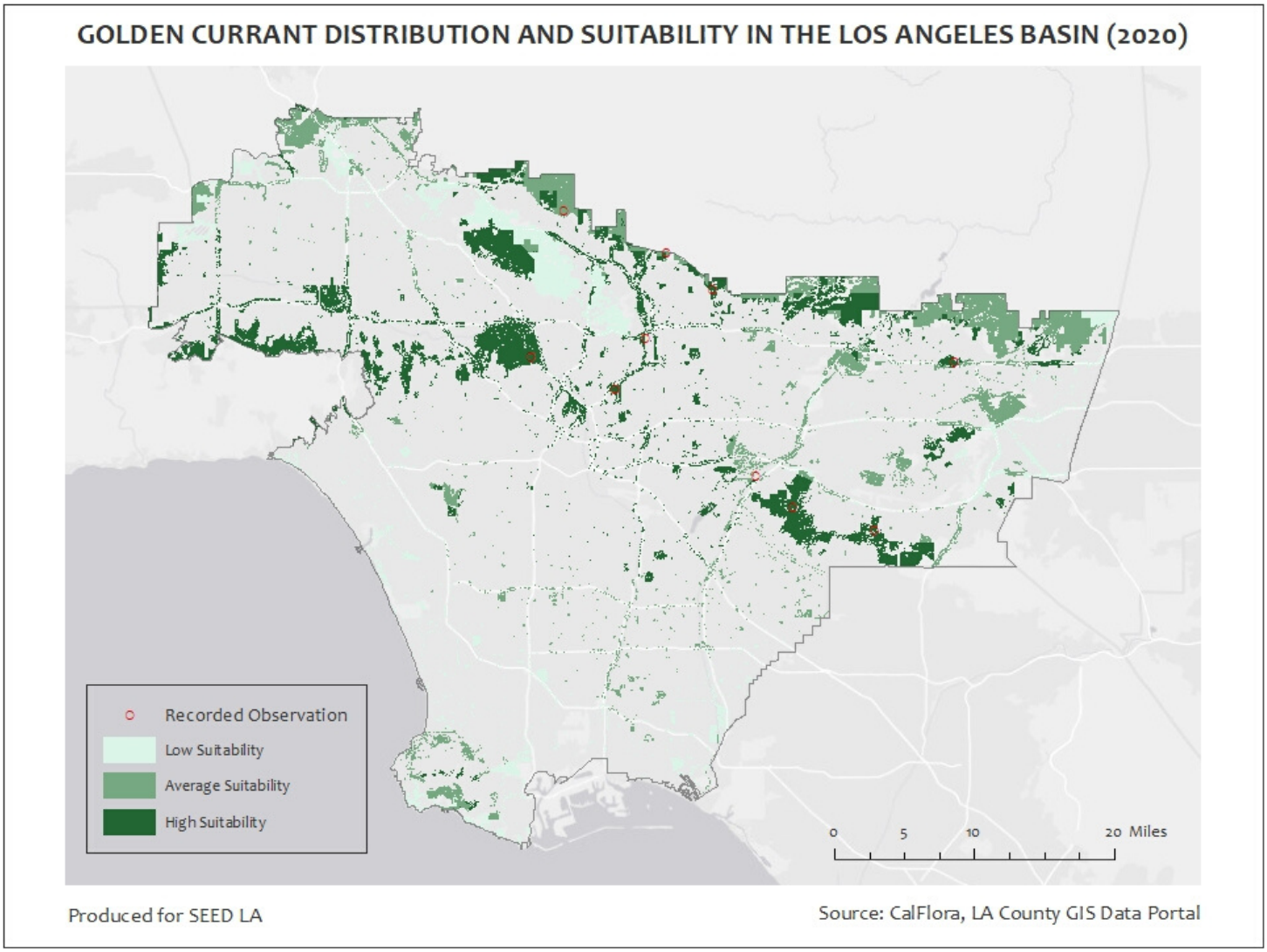


GOLDEN CURRANT

(*Ribes aurem var. gracillimum*)

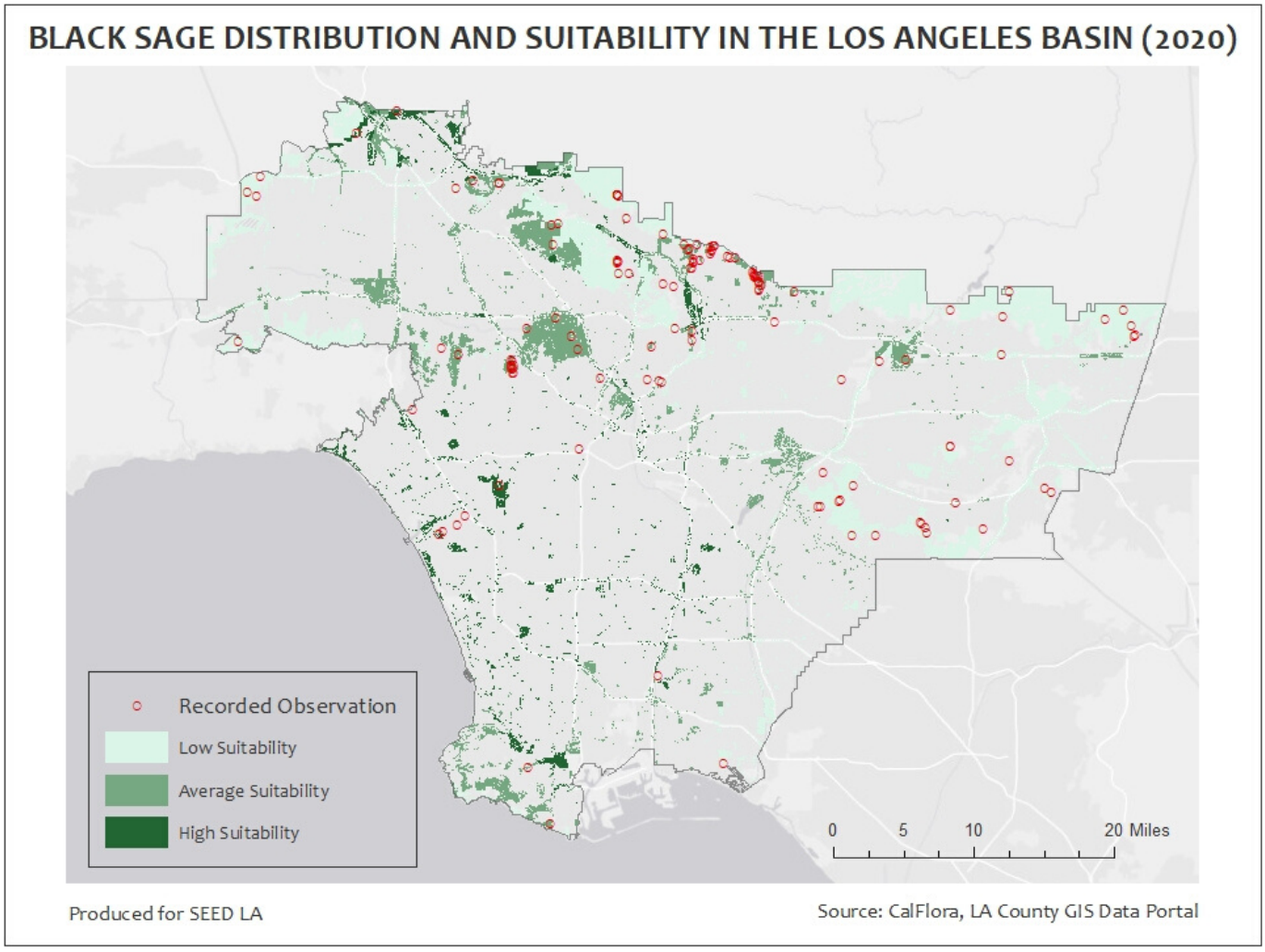

Photo: Public Domain

Habitat: Slope bottoms adjacent to riparian habitats, full to partial sun
Pollinator: Hummingbirds, bees, monarch butterflies
Precipitation: 15-37 in.
Temperature: 10-50 F



BLACK SAGE

(Salvia mellifera)



Habitat: Dry slopes, alluvial fans, full sun
Pollinator: Native and introduced bees
Reproduction: Self-compatible, often resprouts after after fires
Precipitation: 10-47 in.
Temperature: 25-60 F

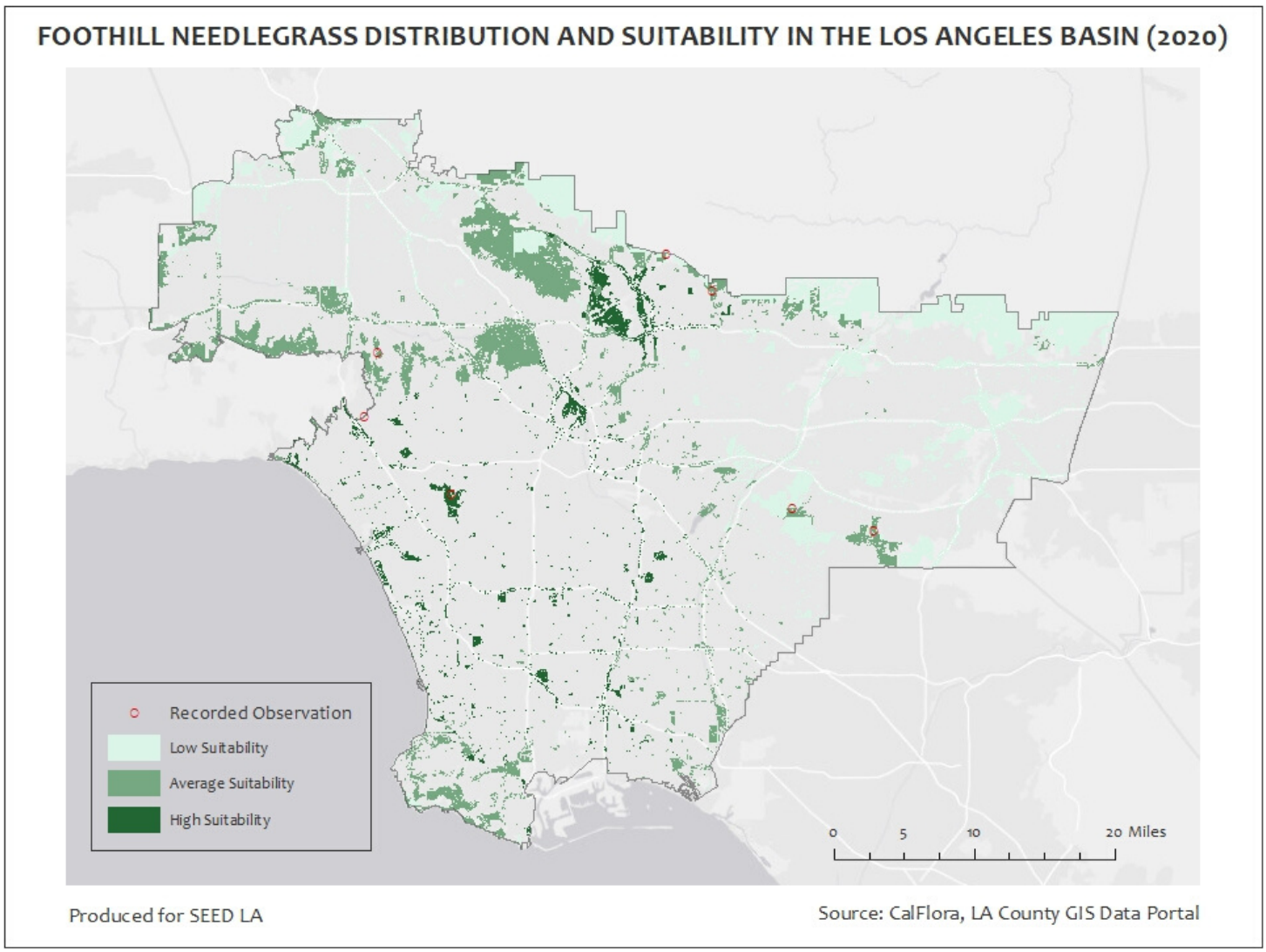
Photo: Kirkhart, J. (2008)

FOOTHILL NEEDLEGRASS

(Stipa lepida)

Habitat: Dry slopes, chapparal, full sun to full shade
Pollinator: Wind
Reproduction: Self-pollinated
Precipitation: 13-67 in.
Temperature: 15-59 F

Photo: Rusk, J. 2011)



PURPLE NEEDLEGRASS

(Stipa pulchra)

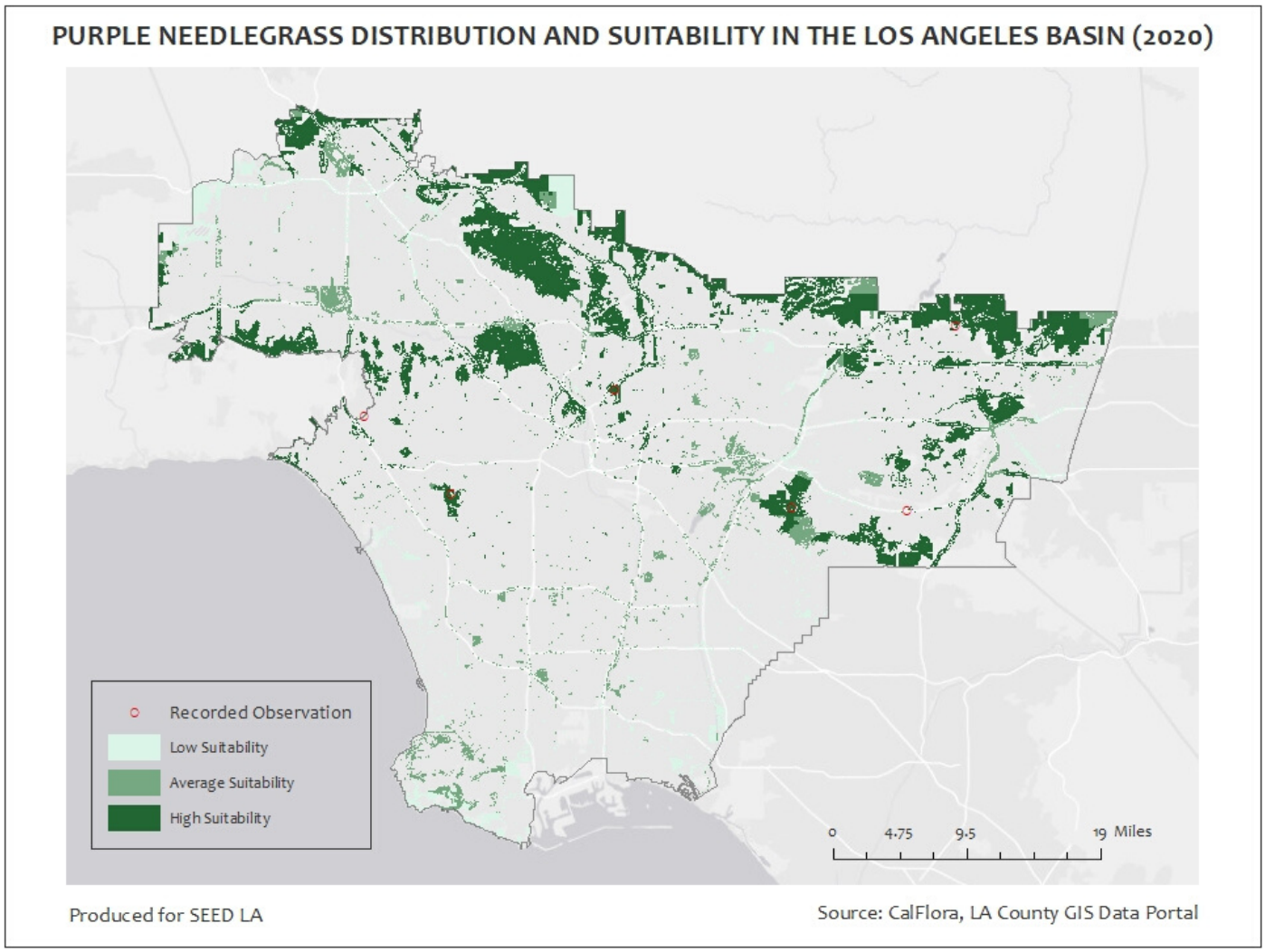
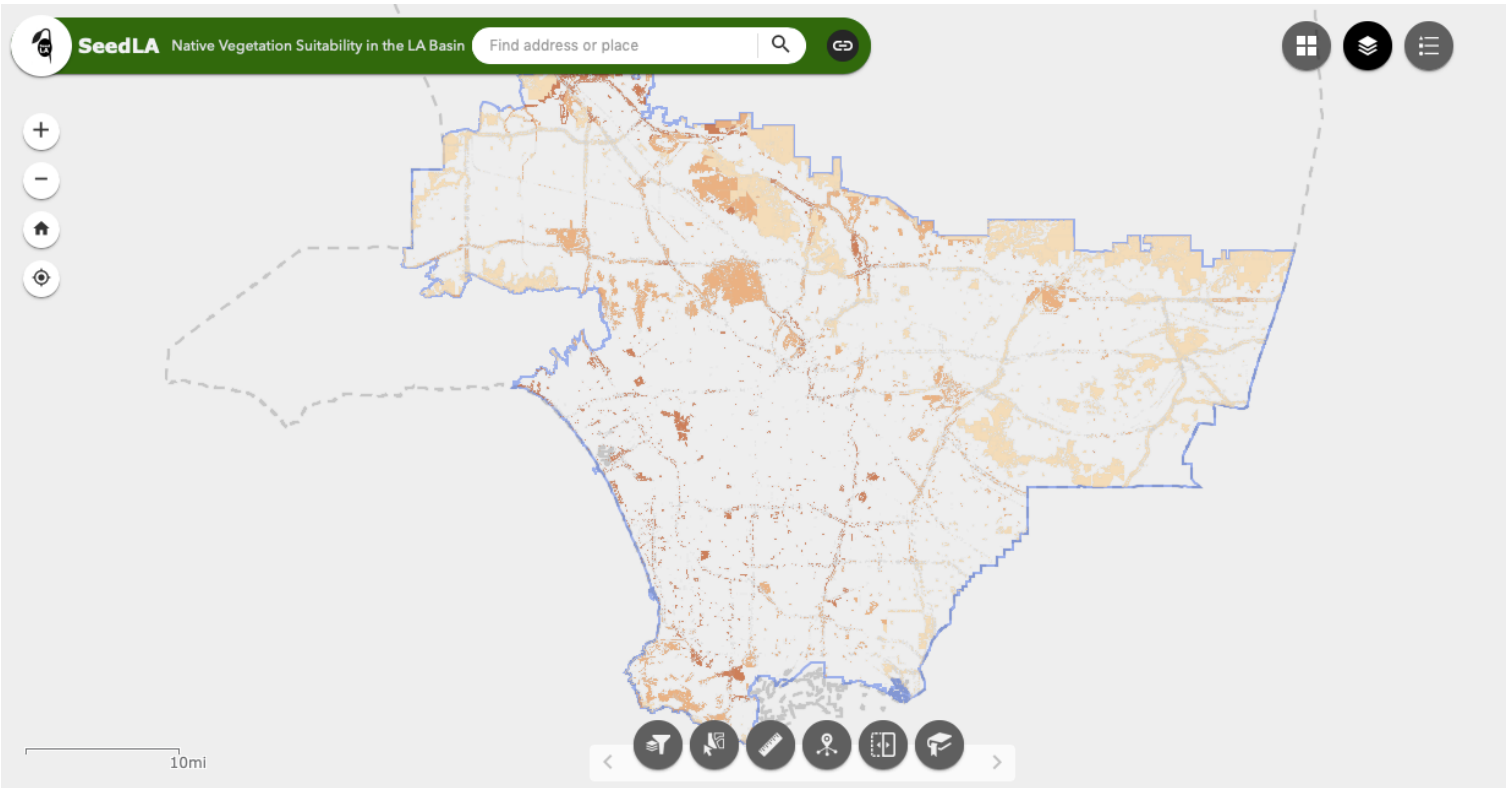


Photo: National Park Service (2013)

Habitat: Warm slopes, well-drained flat areas
Pollinator: Wind
Reproduction: Self-pollinated, does not produce rhizome
Precipitation: 8-30 in.
Temperature: 15-59 F

INTERACTIVE MAPPING TOOL

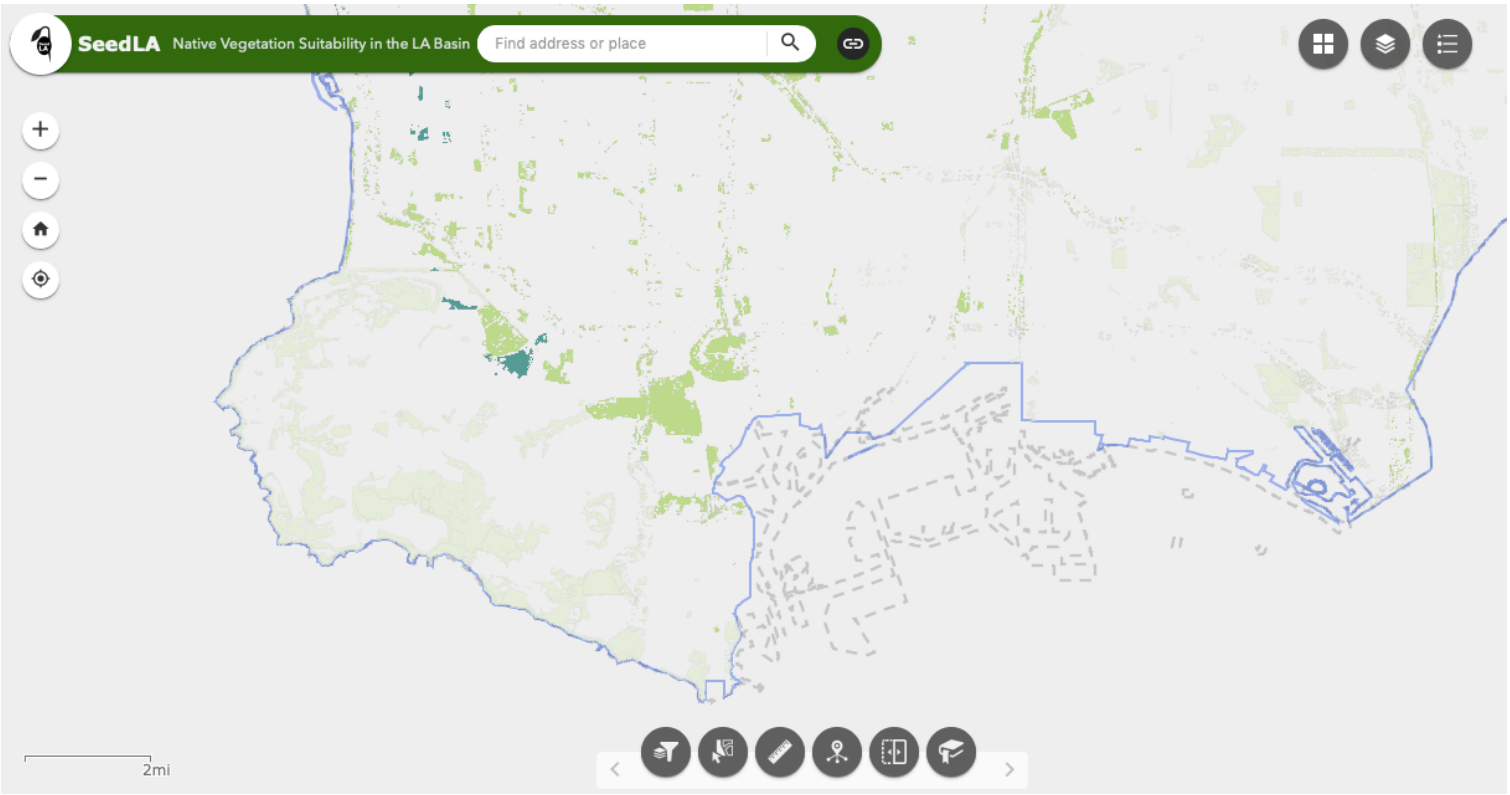
We have compiled all of this data into an interactive map that shows the overlap of species distribution, open space, and habitat suitability. This map allows the user to layer habitat suitability and current population distribution of all twelve target species. The map also shows land ownership data and future projections, and allows the user to zoom in to small land parcels.



Screenshot of Black Sage suitability for 2020 in the greater LA Basin from our ESRI online mapping tool.

Link to the ESRI Online Interactive Map for Seed LA:
https://gisucla.maps.arcgis.com/apps/webappviewer/index.html?id=ce57c918ddbc48c4a8ca441a5f9b48fa

Screenshot of Deerweed suitability for 2020 layered with Deerweed occurrence. This map is zoomed in to the Port of LA/Port of Long Beach to show how individual parcels can be identified for habitat suitability.



We anticipate that Seed LA will be able to use this data to inform where they plant the target species and utilize it as a tool to communicate about future restoration with clients and partners.


Photo: Avocado, L. (2013)

TECHNICAL REPORT

In addition to this summary report, we have also generated an in-depth technical report that details each step of the project methodology. This includes the species distribution modeling, geographic analysis, suitability mapping in R, ArcGIS mapping procedures, and explanations of data sources.


Photo: Blackledge, A. (2009)

For access to the technical report, including our R scripts, please follow this link to our project website: https://www.ioes.ucla.edu/project/creating-a-living-seed-bank-for-urban-restoration-in-los-angeles/

ACKNOWLEDGEMENTS

The Seed LA Practicum team would like to thank Seed LA for facilitating the project and UCLA IOES for providing this opportunity. We hope that our efforts provide insight and information for future restoration in the Los Angeles region.

From left: Amir Patel, Madeleine McKee, Emma Lauterbach, Hannah Crispi, Michelle Pham, Keely Watland, Jaclyn Ha

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