Restoration, Invasive Species, and Conservation Challenges in a Region with Extraordinarily Rapid Changes

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Managing native biodiversity emphasizes:

• Protecting native biodiversity at all levels of organization
• Controlling invasive species that homogenize biotic communities
• Finding solutions to multiple threats
• Building capacity through collaboration
• Hard work, passion
California’s biotic communities occupy a diverse landscape across California, including within southern California.

Faults & land movement → complex parent geology

Continental influence

Ocean influence

Topography

Precipitation and temperature

Cross section from desert, west to near coast
Interaction of topography, geology, and climate results in many different plant and animal communities.
Transition from desert vegetation to conifer forests → west

cactus scrub

desert chaparral

amazing meadows!

yellow pine forest

pinyon-juniper
San Jacinto Mountains west to valley and hills below

- Californian mountain coniferous forest
- California black oak forest
- Chamise chaparral and red-shank chaparral
- Coastal sage scrub
- Vernal alkali plains
- Alluvial scrub
diversity between San Jacinto and Temescal Valleys

Lake Skinner, California sagebrush, California buckwheat scrub and more

Motte Rimrock Reserve, mix of sage scrub types

Walker Canyon, mosaic of forblands and sage scrub

Gavilan Hills, Juniper woodland and fields of slender goldfields and small fescue

Harford Springs, alkali meadow

Box Springs, brittlebush scrub
A sample of amazing local diversity:

Some local wildflowers in coastal sage scrub communities
Special status wildlife in sage scrub

Stephen’s kangaroo rat, Endangered
California gnatcatcher, Threatened
Burrowing owls, SC
Quino checkerspot butterfly, Endangered
Red-diamond rattlesnake, Special Concern
Western spadefoot toad, SC
Granite spiny lizard, SC
San Diego coast horned lizard, SC
Orange-throated whiptail, SC
Riparian plant communities & wetlands crisscross region

Prenda Arroyo, Riverside

Santa Ana River bank

Tequesquite alkali meadow

Sycamore Creek, Riverside

Santa Ana River and Arundo

Photo: Shani Pynn, RCRCD
Westward across the Temescal Valley to Santa Ana Mtns

Temescal Valley with Santa Ana Mtns in back ground

Coast live oak woodland, and many types of chaparral

Chaparral nolina, *Nolina cismontana*

San Miguel savory, *Clinopodium chandleri*

Southern oak woodland: Engelmann oak & coast live oak, Santa Rosa Plateau

Matilija poppy, *Romneya coulteri*

*Diplacus clevelandii* 2019 ©Ron Vanderhoff, CC NC-4
Non-native weed diversity is growing.
Native plant diversity is shrinking!
Threats to southern California’s biodiversity

- Conversion of wildland to agriculture
- Development of all kinds
- Invasive plant species
- Increased ignitions, fire frequency
- Air pollution, especially nitrogen deposition
- Invasive insects and diseases
- Rapid climate change

• Apr. 2019 Riverside Co: 747 volunteers counted 2,811 homeless, a 21% rise in a year.

• Elaborate encampments occur along the Santa Ana River and its tributaries.

• Clean Camp Coalition aims to alleviate issues through education and trash pickup.

• On field trip, hear about how local groups are participating in this program.
Air pollution and nitrogen deposition

- Oxidized nitrogen is in vehicle emissions.
- Oxidized nitrogen is also a plant fertilizer (nitrate).
- When deposited on the soil, invasive grasses take up the nitrogen more rapidly than native plants and become dominant.
Nitrogen Deposition
$\text{kg N ha}^{-1} \text{yr}^{-1}$

- Blue: $< 3$
- Light blue: $3 - 5$
- Green: $5 - 7$
- Yellow: $7 - 9$
- Orange: $9 - 11$
- Red: $11 - 15$
- Bright red: $15 - 19$
- Pink: $19 - 25$
- Magenta: $> 25$

Sources: Nitrogen Deposition: BCOE-CERT (UCR), Terrain: SCAS (OSU)
Center for Conservation Biology, UC Riverside Sept. 2009
In areas where air pollution is low, we see the most extensive displays of wildflowers. Long drought and *infrequent* fire knock back invasive grasses.
Some weeds ignite quickly and carry fire: annual Mediterranean grasses (e.g., red brome, split grass), shortpod mustard, tocalote, rockets (Sisymbrium).
Threats to alkali habitats along the San Jacinto River

Water diversions and channelization → changes in hydrology.

Sahara mustard (hills), non-native grass, and stinknet invasions

Compost and manure spreading favors weeds over rare plants

Warehouse and urban development love flat land

Coulter’s goldfields, Lasthenia glabrata subsp. coulteri, 1B.1

Stinknet
We need to factor in rapid climate change using CA-BCM downscaled climate data (270 m resolution).

Future climate in the Santa Ana Basin

Minimum Monthly Temperature
BCM climate data 10-yr averages

4.8 °C (8.6 °F)
3.2 °C (5.8 °F)

—HISTORICAL—
—CCSM4 rcp8.5—
—CNRM rcp8.5—
—MIROC ESM rcp8.5—
—GFDL A2—

http://climate.calcommons.org/aux/BCM_WS_graph/index.php
Climate change interacts with other threats in complex feedbacks.
Examples of collaborative problem solving: e.g., Delhi Sands flower-loving fly and associated dune habitat

Delhi Sands habitat threatened by invasive plant species and development.

Restoring this habitat requires testing to be sure chemicals and shallow soil disturbance do not threaten pupae.
Delhi Sands Dune Restoration, collaboration:
Rivers & Lands Conservancy, UC Cooperative Extension, entomologists, agencies

Sand Pro at work

Friday field trip: Michael Viramontes, Nicole Padron (Rivers & Lands Conservancy), and Chris Mcdonald (UC Cooperative Extension)

Photos curtesy of Rivers & Lands Conservancy
Western Riverside County Multiple Species Habitat Conservation Plan (HCP)- 2004

New Upper Santa Ana River HCP under development

- New HCPs trying to avoid funding and implementation pitfalls.
- Requires collaboration among many agencies, NGOs, stakeholders, and researchers.
Acquiring suitable habitat to mitigate loss: Los Angeles Pocket Mouse Model

✓ Plan includes extensive restoration of degraded areas

• Overlay permanent and temporary impact footprints
• Calculate acres of impact to estimate “take” of species
Thank you for all that you do to help!