

# Substrate Enhancements and Botanical Diversity for Successful Oak Habitat Creation

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**P S O M A S**

This is a PDF-version of the slide show that accompanied Psomas' oral presentation at the University of California Agriculture & Natural Resources' 8<sup>th</sup> California Oak Symposium in San Luis Obispo, California, on November 1, 2022. The narration from that presentation has been added via text boxes to this PDF version.

A large concrete arch dam is situated in a valley, with a reservoir behind it. The dam is surrounded by steep, rocky hillsides covered in sparse vegetation. In the background, the San Gabriel Mountains rise under a clear blue sky. A wooden sign in the foreground provides information about the dam.

LOS ANGELES COUNTY  
FLOOD CONTROL DISTRICT  
SANTA ANITA  
DAM

PURPOSE: FLOOD CONTROL AND WATER CONSERVATION  
TYPE: CONCRETE ARCH  
DRAINAGE AREA: 10.8 SQUARE MILES  
STORAGE CAPACITY: 1380 ACRE- FEET  
CREST HEIGHT: 225 FEET                      COMPLETED 1927

Los Angeles County Public Works  
operates Santa Anita Dam and Reservoir  
in the San Gabriel Mountains.



## Sediment Removal:

- Stormwater capacity
- Public safety / Water supply

Sediment is periodically removed for stormwater capacity, public safety, and to benefit water supply.

# Angeles National Forest

Other Natural Areas

Other Natural Areas

**Middle SPS**

**Lower SPS**

The sediment was moved to two sediment placement sites (or SPS) located downstream of the dam.

Santa Anita Park

San Gabriel Valley



# Angeles National Forest

Other Natural Areas

Other Natural Areas

Middle SPS

Lower SPS

The Lower SPS is the habitat creation site. It is located at the tip of a wedge of open space that extends into the urban grid. It can be visualized as the 'middle fingernail' on a hand extending southwest from Angeles National Forest—mostly surrounded by residential development. This is relevant for the later discussion herein on plant pathogens.

Santa Anita Park

San Gabriel Valley

P S O M A S





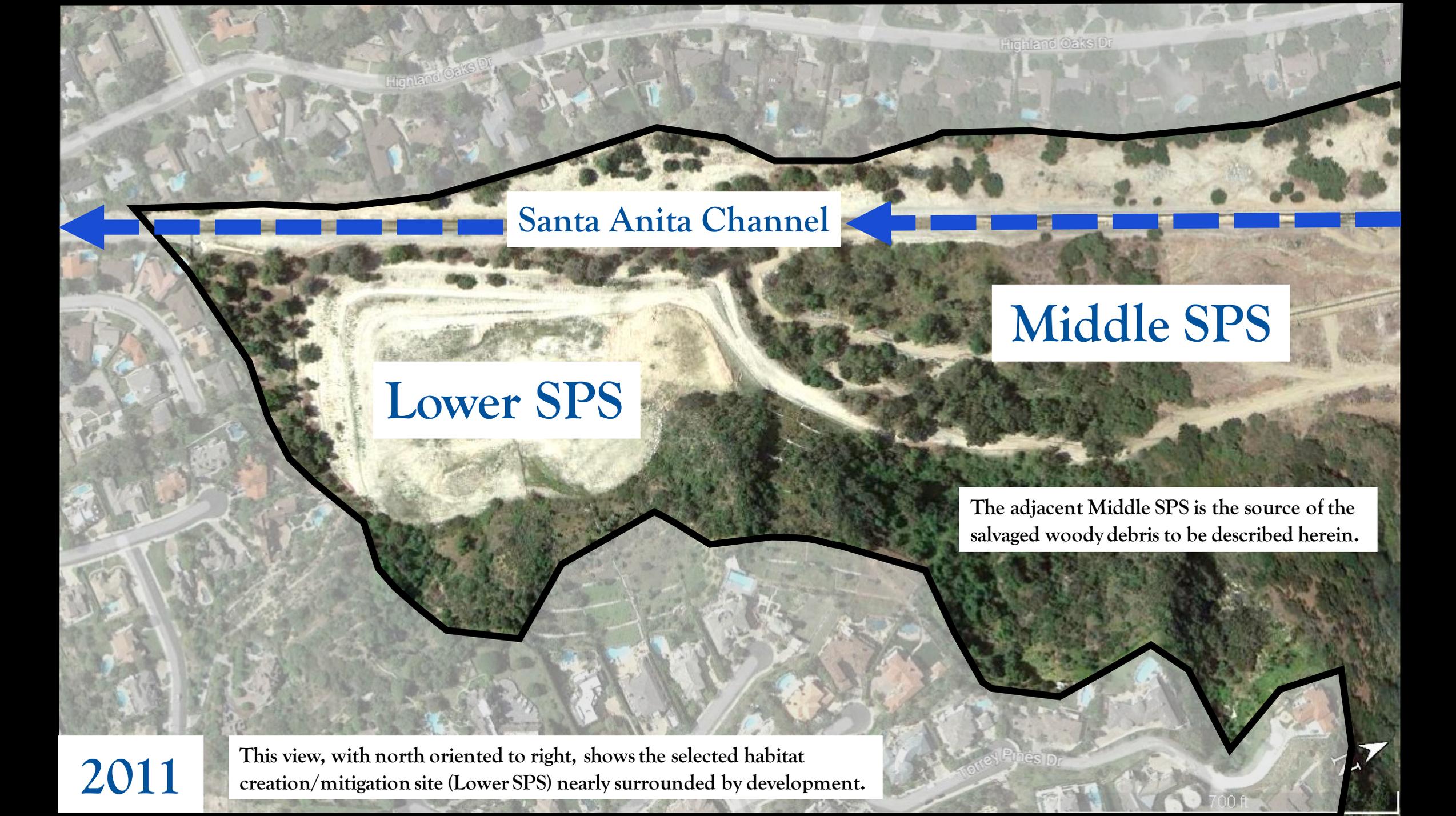
## Middle SPS



The Middle SPS was the vegetation impact site. Note that the understory vegetation is badly degraded by invasive herbs, similar to other regional woodlands. Public Works retained Psomas in 2009 to prepare the habitat mitigation plan.

2009

PSOMAS



Santa Anita Channel

Middle SPS

Lower SPS

The adjacent Middle SPS is the source of the salvaged woody debris to be described herein.

2011

This view, with north oriented to right, shows the selected habitat creation/mitigation site (Lower SPS) nearly surrounded by development.

Torrey Pines Dr  
700 ft



2009

Here's the Lower SPS prior to the placement of the final 30 feet of sediment. Public Works engaged in community outreach leading up to the project. The California Department of Fish and Wildlife (CDFW) had three primary concerns about suitability and function: Soil compaction, hydrology, and bio-diversity.

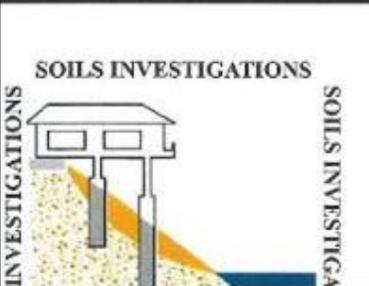
- Lower SPS prior to final 30' sediment placement
- Public Works' performs community outreach to constituents
- **CDFW: Soil compaction / hydrology / bio-diversity**

Geo-technical analysis indicated that the existing sediment was somewhat compacted. However, the final sediment would have less than 80% compaction.



**NORTH**

 Boring location  
 Nuclear gage test location



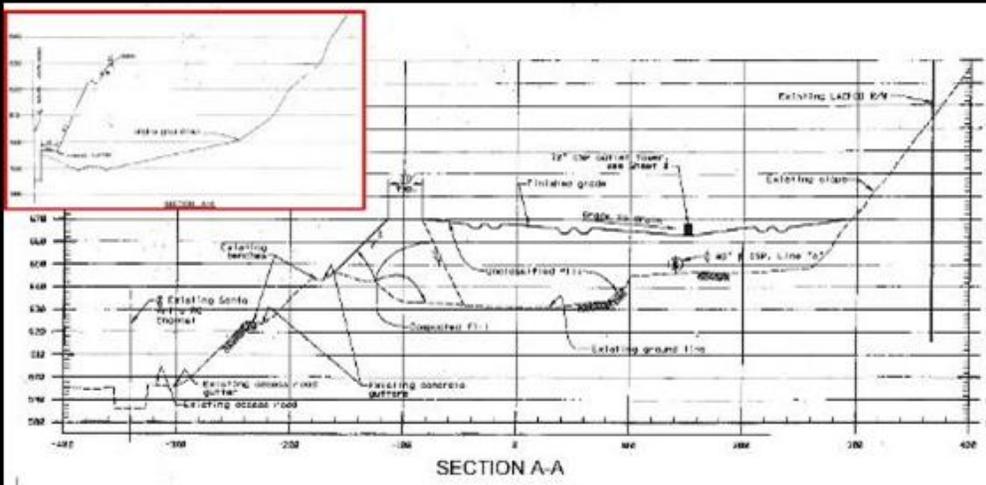
COUNTY OF LOS ANGELES  
DEPARTMENT OF PUBLIC WORKS  
Geotechnical and Materials Engineering Division

*Geotechnical Engineering Section*

**SANTA ANITA DAM RISER MODIFICATION  
AND SEDIMENT REMOVAL PROJECT**

# Sediment Placement/Analysis

- Pre-Existing 78% to 90% Compaction Gradient (0 to 53')
- 30' of New Sediment to Complete Lower SPS
- **New Sediment Compaction < 80% (Deck)**
- Slope Compaction at Least 80% for Stability





Irvine CA 92602

Project : Arcadia

Report No : **13-275-0012**  
Purchase Order : L307010  
Date Recd : 10/02/2013  
Date Printed : 10/07/2013  
Page : 1 of 1

### COMPREHENSIVE SOIL ANALYSIS

Sample Description - Sample ID	Half Sat %	pH	ECe dS/m	NO <sub>3</sub> -N ppm	NH <sub>4</sub> -N ppm	PO <sub>4</sub> -P ppm	K ppm	Ca ppm	Mg ppm	Cu ppm	Zn ppm	Mn ppm	Fe ppm	Organic % dry wt.	Lab No.
	TEC	Qual Lime		Sufficiency Factors											
West Slope CSS	13	5.8	1.7	2	9	8	104	914	198	3.5	1.2	6	104	1.0	11989
	61	None		0.4	0.5	1.6	1.1	1.7	5.4	0.5	1.1	4.2			
10:1 CSS Slope	15	5.1	2.1	9	11	0	100	966	181	4.9	3.4	6	194	1.6	11990
	59	None		0.7	0	1.5	1.1	1.5	7.4	1.3	1.1	7.8			
South Channel	15	5.8	1.5	5	12	1	111	1077	169	4.9	1.2	7	243	1.8	11991
	66	None		0.6	0.1	1.4	1.1	1.3	6.6	0.4	1.2	8.7			

Saturation Extract Values							Gravel %		Percent of Sample Passing 2 mm Screen					USDA Soil Classification	Lab No.
Ca meq/L	Mg meq/L	Na meq/L	K meq/L	B ppm	SO <sub>4</sub> meq/L	SAR	Coarse 5 - 12	Fine 2 - 5	Sand			Silt .002-.05	Clay 0-.002		
									Very Coarse 1 - 2	Coarse 0.5 - 1	Med. to Very Fine 0.05 - 0.5				
12.1	5.4	2.9	0.5	0.26	20.4	1.0	12.2	20.1	16.5	19.0	48.4	10.6	5.3	Gravelly Loamy Sand	11989
16.9	6.7	1.5	0.5	0.44	27.0	0.4	7.4	20.3	13.9	16.8	49.2	15.6	4.3	Gravelly Loamy Sand	11990
12.0	4.3	1.4	0.4	0.47	18.2	0.5	5.6	13.7	14.6	13.9	51.4	15.6	4.3	Gravelly Loamy Sand	11991

Soil testing was conducted on the final sediment material, and no serious fertility issues were identified.



- Upper SPS: Coast live oaks and coastal sage scrub
- Non-irrigated / south- and west-facing slopes

Several large coast live oaks (*Quercus agrifolia* var. *agrifolia*) in good condition, and sage scrub vegetation, occur on the nearby Upper SPS, growing in placed sediment from the same source (Santa Anita Reservoir).





1,800 LF versus 200 LF

2013

The drainage configuration resulted in 1,800 linear feet of drainage (blue line) versus 200 linear feet (red line) if flows had been conveyed directly to the outlet tower.



2013



The observed early flows in the drainages indicated that we've optimized the hydrology on the mitigation site.

## EIR MM's / CDFW Permit / Habitat Mitigation Plan:

- 7 to 10-year maint./monit.
- Non-irrigated for 2 years
- Oaks
  - 363 Plantings
  - 80% Survival ( $\geq 290$  oaks)
  - $\geq 2\%$  Canopy cover
  - Certified Arborist evaluations ( $\geq 1x/yr$ )
- Botanical Diversity
  - Oak woodland:  $\geq 24$  spp.
  - Coastal sage scrub:  $\geq 18$  spp.
- Vegetation cover: **by type**

Brief summary of performance standards from the permits and HMP: Note the 80% survival requirement for planted oak tree spp., and 2% minimum canopy cover. The vegetation cover has targets by type, as shown on the next slide.

# Oak Woodland Native Veg Cover Standards:

- Native (All):  $\geq 75\%$
- Large shrubs:  $\geq 5\%$
- Medium shrubs:  $\geq 18\%$
- Spiniferous shrubs:  $\geq 2\%$
- Sub-shrubs:  $\geq 5\%$
- Herbaceous:  $\geq 30\%$
- Non-Native:  $\leq 5\%$



Here are the various vegetation cover targets, including minimum 30% cover of native herbs.

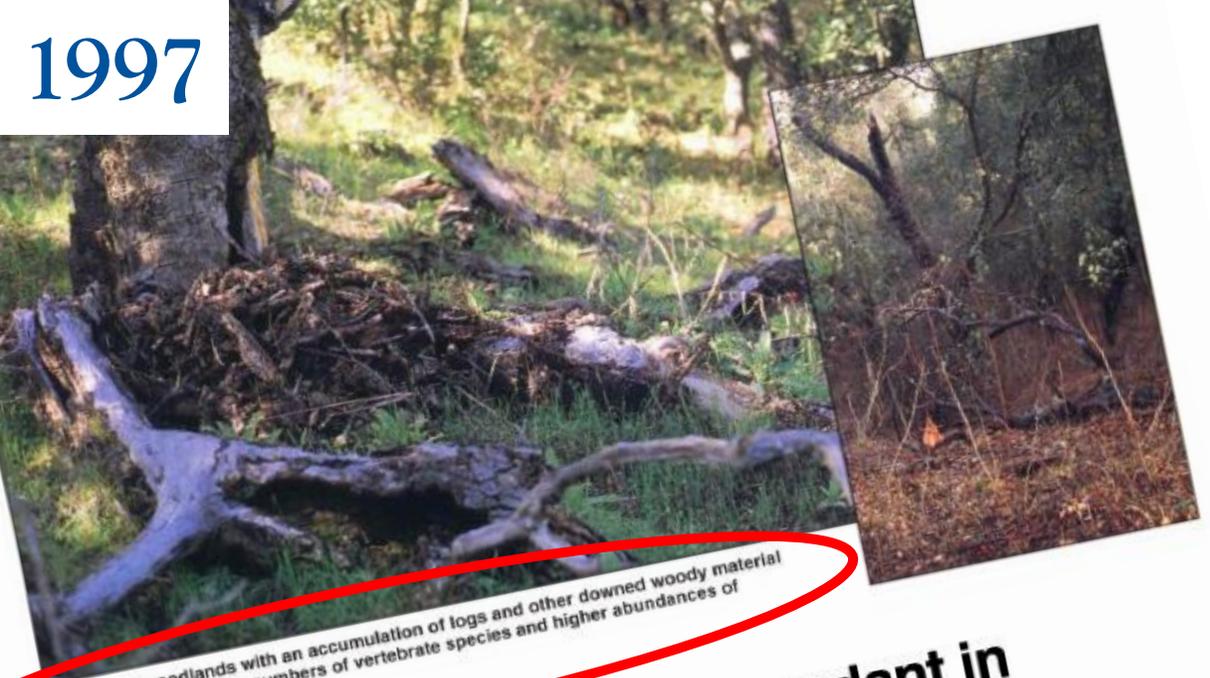


2012

Again, here is the Lower SPS—basically a moonscape. A creative and assertive, science-based approach was needed to achieve best results.

400 ft





Dense oak woodlands with an accumulation of logs and other downed woody material supported the greatest numbers of vertebrate species and higher abundances of individuals.

## Vertebrates diverse and abundant in well-structured oak woodland

William D. Tietje □ Justin K. Vreeland

*Knowledge of the diversity and abundance of vertebrates in relatively undisturbed oak woodlands could be used as a baseline for evaluating natural and human-caused perturbations. High numbers of terrestrial vertebrates were found in well-structured oak woodland at a study site in the Central Coast region. Within classes of terrestrial vertebrates, slender salamanders exhibited the strongest habitat associations.*

In much of California's 7 million acres of oak woodlands, grazing, wood cutting, row cropping, road building and development have altered the habitat to the extent that much understory vegetation and downed woody material have been removed. These alterations have had mostly unknown consequences on oak woodland fauna. Knowledge of the diversity and abundance of vertebrates in relatively unaltered woodlands could be used as a baseline for evaluating natural and anthropogenic disturbances in California oak woodland.

ties, 11 miles north of Paso Robles. The facility covers 43,800 acres, of which approximately 17,800 acres (41%) are classified as oak woodland. Most of the woodland in the areas referred to as "the hill country," the steep, rugged southwestern part of the installation, receives minimal use by military personnel and is not managed for livestock, woodcutting or other land-use activities.

In the summer of 1993, we established nine square 14-acre sampling plots. On each plot we laid out a grid comprised of 289 intersections. Be-

The project team benefited from multiple papers by Dr. William D. Tietje and others on the importance, and widespread deficiency, of coarse woody debris in California's oak woodlands.



1997

2002

# Coarse Woody Debris in Oak Woodlands of California

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**William D. Tietje**, *Department of Environmental Science, Policy, and Management, University of California, Berkeley, CA 94720*; **Karen L. Waddell**, *USDA Forest Service, Pacific Northwest Research Station, Forest Sciences Laboratory, 620 SW Main, Suite 400, Portland, OR 97205*; **Justin K. Vreeland**, *U.C. Cooperative Extension, 2156 Sierra Way, Suite C, San Luis Obispo, CA 93401*; and **Charles L. Bolsinger (retired)**, *USDA Forest Service, Pacific Northwest Research Station, Forest Sciences Laboratory, 620 SW Main, Suite 400, Portland, OR 97205*.

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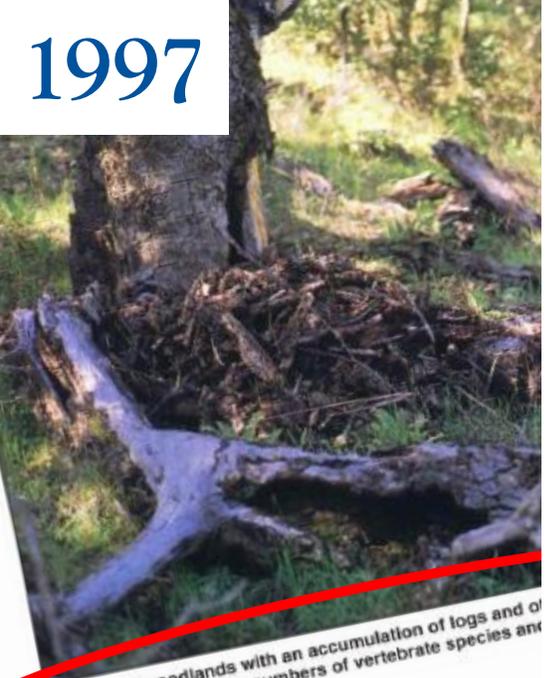
## Vertebrates divers well-structured oak

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Knowledge of the diversity and abundance of vertebrates in relatively undisturbed oak woodlands could be used as a baseline for evaluating natural and human-caused perturbations. High numbers of terrestrial vertebrates were found in well-structured oak woodland at a study site in the Central Coast region. Within classes of terrestrial vertebrates, woodrats, dark-eyed juncos and slender salamanders exhibited the strongest habitat associations.

**ABSTRACT:** *An extensive forest inventory was conducted to estimate the amount and distribution of coarse woody debris (CWD) on 5.6 million ac of woodlands in California that are outside of national forests and reserved areas. Woodlands consist primarily of oak (Quercus spp.) types and are defined as forestland incapable of producing commercial quantities of traditional forest products because of adverse site and tree morphophysiology. Approximately 671 million ft<sup>3</sup> of CWD were estimated to occur over the study area. Almost 3 million ac of woodland (52% of the sampled area) were estimated to have no CWD. The large-end diameter of CWD was <12 in. on 67% of all logs sampled. Blue oak (Q. douglasii) CWD occurred over the largest area and gray pine (Pinus sabiniana) produced the most volume (164.1 million ft<sup>3</sup>) of CWD. An average of 115 ft<sup>3</sup>/ac, 1.2 tons/ac, 21 logs/ac, and 56.8 linear ft/ac were estimated for CWD across all woodland types. The coast live oak (Q. agrifolia) type produced the largest per-acre measure of CWD volume (164.1 ft<sup>3</sup>/ac). The California laurel (Umbellularia californica) type produced the highest log density (48 logs/ac) and the most linear feet per acre of CWD (131.8 ft/ac). CWD was most abundant in the central coast and least abundant in the northeastern portion of the state. Results of this study suggest that CWD is not common across much of California's woodlands. More detailed research is needed to evaluate the amount and distribution of CWD, affects of land-use, and the implications for wildlife. West. J. Appl. For. 17(3):139-146.*

**Key Words:** Coarse wood, down wood, dead wood, debris, oak woodlands, forest inventory.



1997

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Chapter 3

2005

## Oak Woodlands as Wildlife Habitat

William Tietje, Kathryn Purcell, and Sabrina Drill

This chapter provides local planners and policymakers with information on the diversity and abundance of oak woodland wildlife, wildlife habitat needs, and how local planning activities can influence wildlife abundance and diversity. Federal and state laws, particularly the federal and California Endangered Species Act and the California Environmental Quality Act (CEQA), require local governments to include wildlife needs in land-use planning. Increasingly, local governments must account for the impacts of their activities on wildlife. The future of oak woodland wildlife depends on how we plan and manage oak woodlands in the face of increasing pressure from recreation and development. Habitat offers resident wildlife food, cover, water, and living space. California's oak woodlands are some of the richest in the state. Of the 632 terrestrial vertebrates (mammals) native to California,

**ABSTRACT:** Coarse woody debris (CWD) in oak woodlands of California's reserved areas. CWD is often incapable of producing a diverse morphophysiology. In a study of 3 million ac of woodlands, the mean CWD was <12 in. in diameter. Gray pine (Pinus sabiniana) type produced the most CWD (131.8 ft/ac), a portion of the state. More detail on use, and the implications for wildlife.

**Key Words:** Coarse woody debris, oak woodlands, wildlife habitat

The project team benefited from multiple papers by Dr. William D. Tietje and others on the importance, and widespread deficiency, of coarse woody debris in California's oak woodlands.



Man is that uniquely conscious creature who can perceive and express. He must become the steward of the biosphere. To do this, he must design with nature. —Ian McHarg





To achieve the program's aggressive performance standards, we needed some 'building blocks'.



2011

During the habitat impact phase, Psomas worked with Public Works and their General Contractor to salvage and stockpile a huge volume of removed debris—trunks, stumps, brush piles, including some trunks with root masses attached for installation as natural snags.



Many tons of boulders were salvaged from the reservoir during sediment removal activities.

2012



2013



Here are some of the stockpiled natural materials. Whatever trunks/stems were not retained whole, were mulched for use in conditioning the placed sediment. We essentially used 'the whole animal' in terms of woody vegetation from the Middle SPS.

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## Preliminary / Ongoing Weed Control:

- Avoid Seed Dispersal
- Avoid Adverse Impacts
- Voluntary Buffer Areas (8 Acres)



2013



Assertive weed control was performed at all phases of this project.

# Nakae & Associates, Inc., Restoration Contractor (Psomas' Subcontractor)



Psomas' subcontractor Nakae & Associates is starting to place the huge volume of natural mulch on the deck area.

2013



2013



- Large volume of salvaged mulch ripped to minimum 2-foot depth
- Urea added for nitrogen balance

The mulch was ripped to a minimum depth of 2 feet using a bulldozer, and urea was added for nitrogen balance.

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# Compaction ✓



Here, we think we've addressed CDFW's concerns about soil compaction.

2013



2013

In terms of diversifying the substrate, here are massive boulders being imported and placed.

Psomas' Restoration Ecologists worked with Nakae to create naturalistic assemblages of material.



2013

Psomas' Restoration Ecologists worked with Nakae to create naturalistic assemblages of material.



2013

Psomas' Restoration Ecologists worked with Nakae to create naturalistic assemblages of material.



2013



2013

We also pushed dirt around to create microtopography—pits and hummocks all over the place.



2013

A total of 14 natural snags were erected, and you can see the scale of these. Within minutes these features were being used by raptors and songbirds.



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2013

Many kinds of equipment were used for the CWD placement including these grapple attachments.



2013

Many kinds of equipment were used for the CWD placement including these grapple attachments.



2013

None of these assemblages appear on a map or plan. It was all placed intuitively, drawing on our team's collective hundreds of years in local wildlands, toward re-creating a natural landscape.



2013



Here are some of the boulders and scatters of woody debris.



2013

I encouraged our team, especially our more junior Ecologists, to 'get creative', and here are some of their works of natural art in the medium of wood and stone.



This is the resulting landscape with the substrate assertively enhanced. Imagine the attraction for wildlife already, prior to any planting or seeding.



*“Are you open yet?”*

2013

Wildlife did want an invitation,  
but we weren't quite ready.

An eight-foot perimeter fence (shown here mid-construction) was installed to temporary exclude large mammals—especially mule deer (*Odocoileus hemionus*)—to avoid excessive herbivory or trampling of the establishing vegetation, oak seedlings, etc.



8-foot high exclosure fence



2013

Because we temporarily fenced-off some water resources, we installed some temporary 'drinker tanks' for wildlife, and these have been heavily used.



## Oak Collection:

- 50+ source trees
- Coast live oak
- **Engelmann oak**
- Canyon live oak
- **San Gabriel oak**

*Quercus engelmannii*

*Q. agrifolia* var. *agrifolia*

Acorns were collected from at least 50 source trees to capture adequate genetic diversity of local stands.

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## Native Seed/Cuttings Collection:

- Started 2011 – S&S Seeds, Inc. / Psomas
- Subwatershed only
- Cities of Arcadia, Monrovia, Sierra Madre
- 2,000+ Ac. of open space
- Seeding performed every year
- **132 native spp. collected**



Overall seed collection started in 2011, two years before habitat installation. Public Works arranged access with local cities for collection in adjacent habitats. 124 seed species were collected to-date.



*Penstemon spectabilis*



*Clematis lasiantha*

# Oaks:

- Established primarily via acorns
- 400 *contingency* oaks propagated
- Rare oaks



Oaks were established primarily via acorns, but we had our subcontractor El Nativo Growers produce several hundred seedlings as a contingency just in case.



## Container Plants:

- January 2014 and December 2014 (Initial)
- Supplemental through Fall 2021
- El Nativo Growers (6,775 total plants)
- California Botanic Garden
  - Rare oaks, ferns, rushes, etc.
- **50 container species propagated**



50 species of container plants were installed to-date. Our subcontractor California Botanic Garden focused their efforts primarily on rare oaks, ferns, rushes, and other specialty lots.

## Ferns:

- Innovative methodology
- California Botanic Garden
- 6 species propagated
- **600 planted since 2014**



The fern collection/propagation methodology we developed with California Botanic Garden was very successful, with over 600 ferns of 6 species planted on the Lower SPS.



*Polypodium californicum*

*Pellaea mucronata*

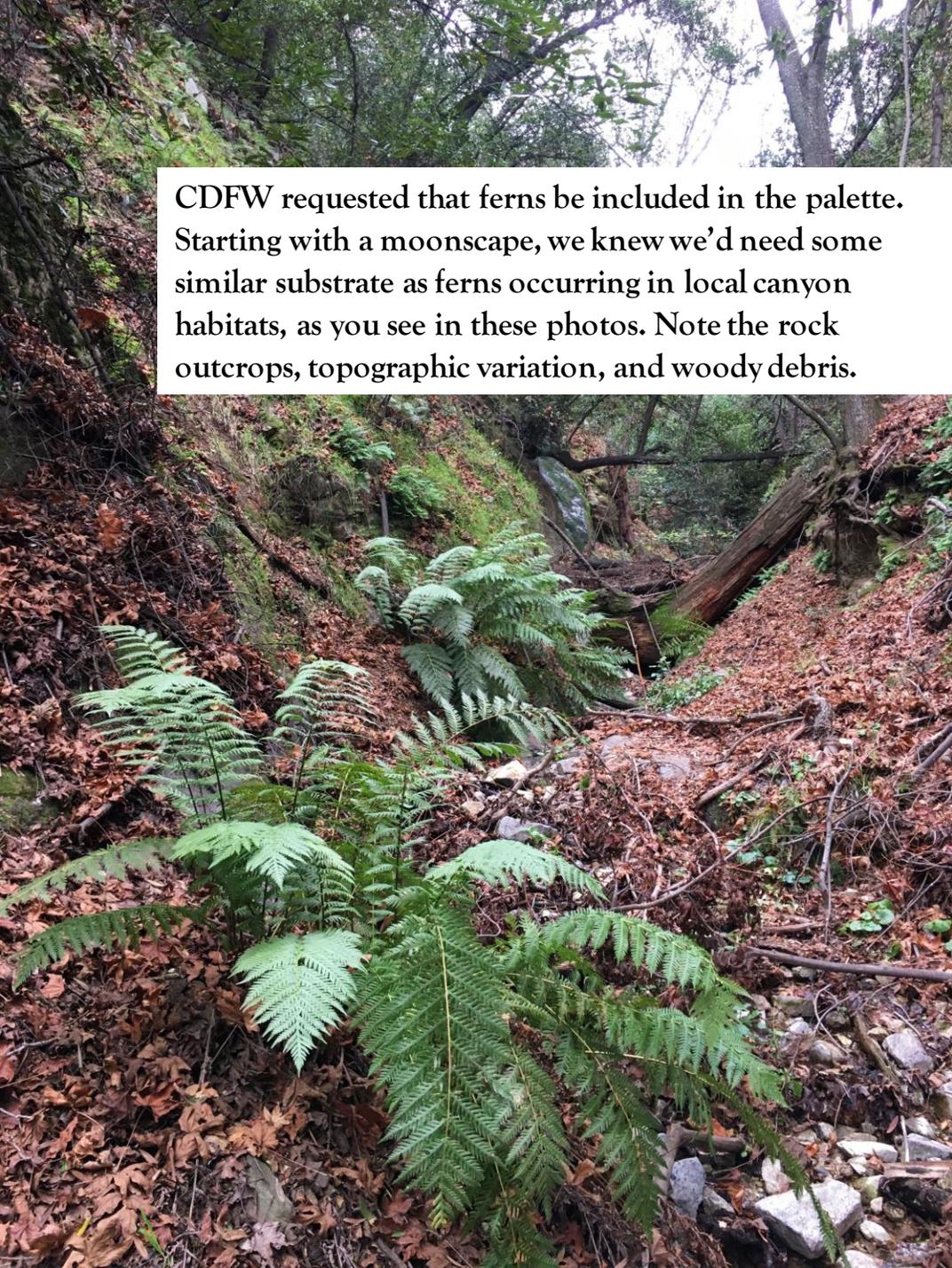
*Dryopteris arguta*

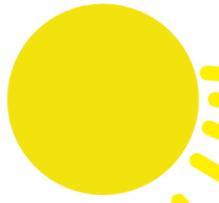


CDFW requested that ferns be included in the palette. Starting with a moonscape, we knew we'd need some similar substrate as ferns occurring in local canyon habitats, as you see in these photos. Note the rock outcrops, topographic variation, and woody debris.

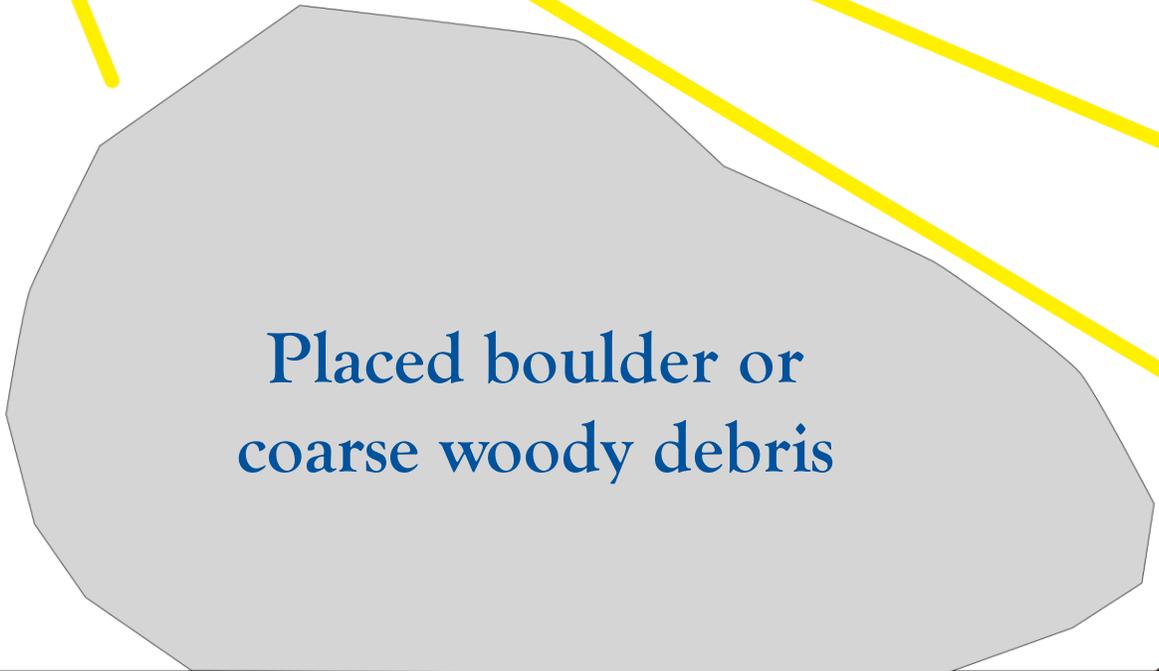


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East/North Aspect



Placed boulder or coarse woody debris



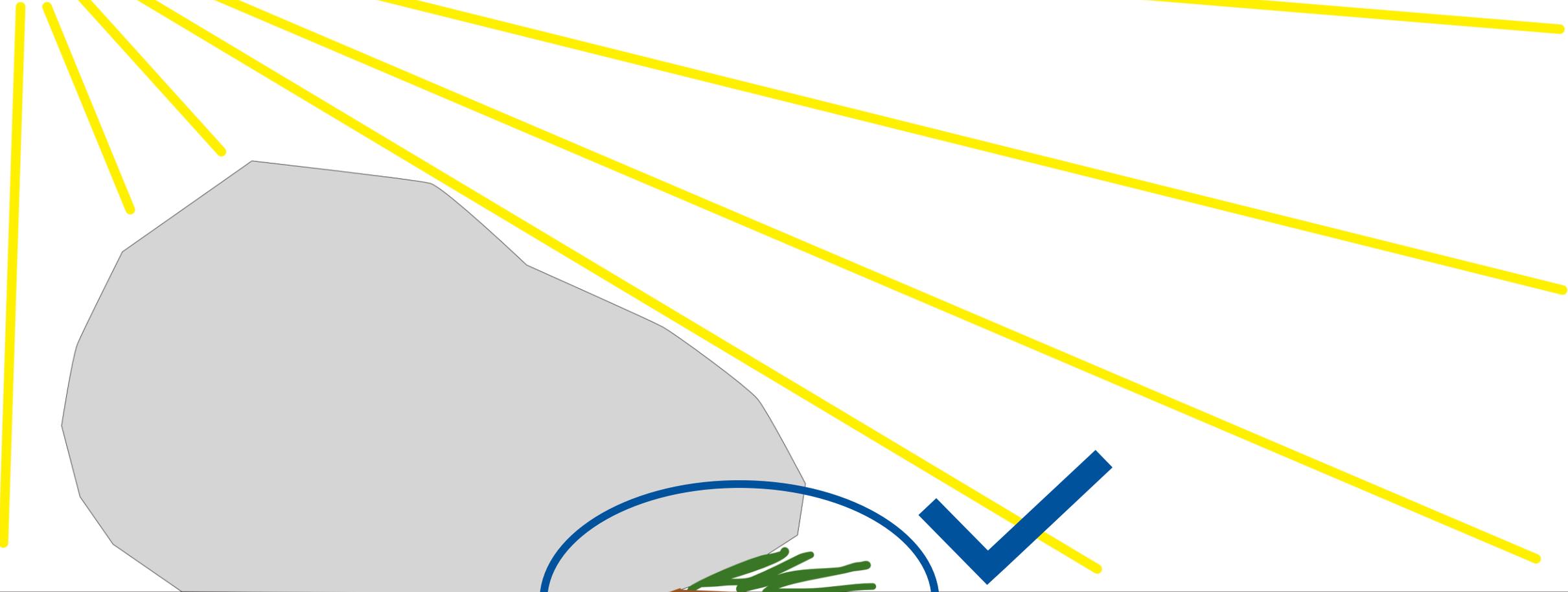
We did not plant our ferns with a fully concentric basin—too much exposure to sun and wind.

Fern Planting

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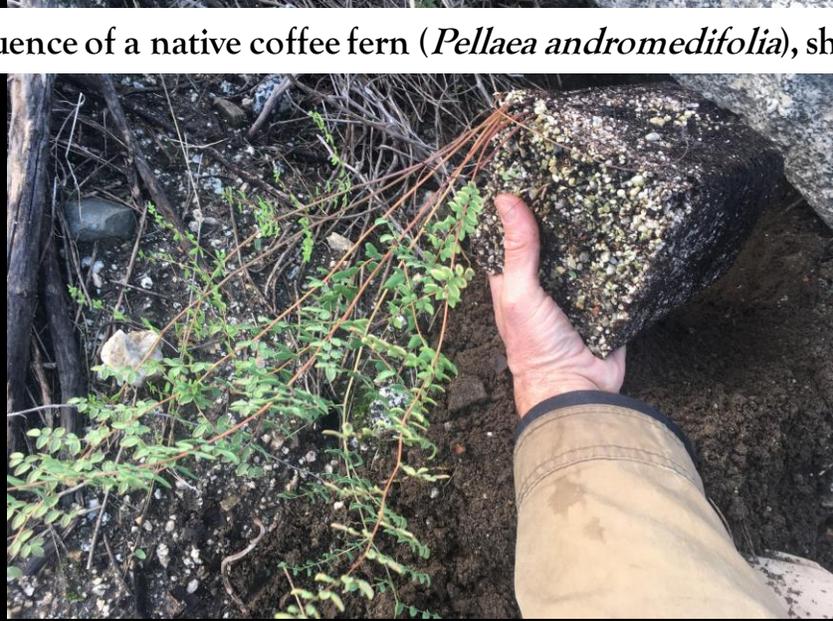


East/North Aspect



Instead, we dug beneath placed boulders and CWD, beneath overhang as possible, and this has worked well.

Here's a planting sequence of a native coffee fern (*Pellaea andromedifolia*), showing this method.



A Dingo™ was used to auger the oak planting holes. The seedlings were caged and mostly positioned adjacent to rock and CWD. This was to provide protection from sun and wind, and so the oaks roots could benefit from cooler and moist soils under these features.



Initial Planting / Seeding

PSOMAS



Here are more of the oak cages, including a more robust type that was used on the surrounding slopes, outside the 8-foot fence. We experimented with planting a single California sagebrush (*Artemisia californica*) plant on the southwest exposure of some oak plantings to serve as a kind of nurse plant. A combination of interpretive signs, and warning signs (shown here), were installed to deter trespassing.

# Oak Protection

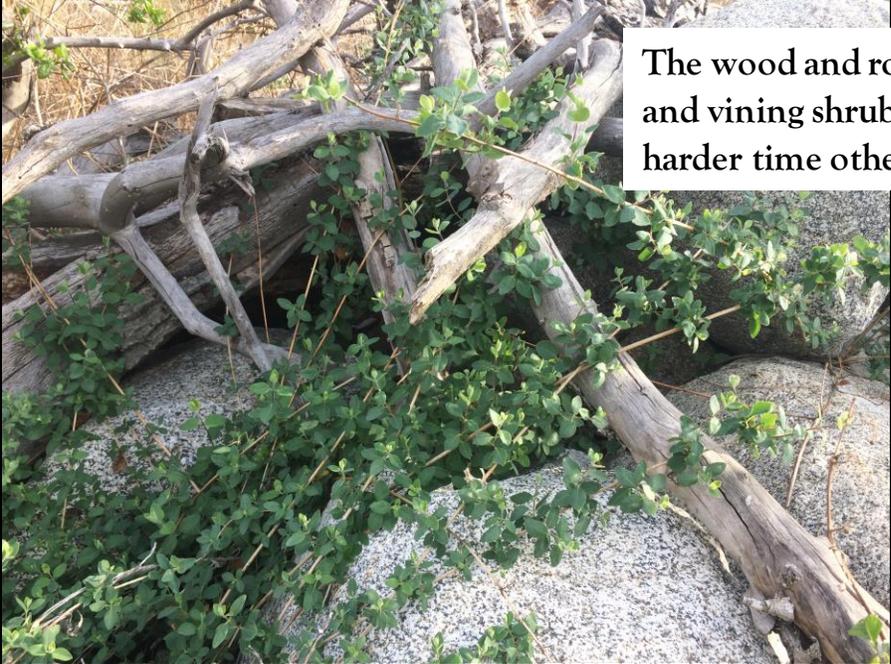


Some interim conditions, showing the rapid growth of native vegetation amongst the stone and downed wood. As I mentioned, wildlife immediately colonized the site, such as this California ground squirrel (*Otospermophilus beecheyi*) and cedar waxwing (*Bombycilla cedrorum*).



More of the interim conditions. Some oak saplings to the lower right, and some temporary ponding in the drainages (top right).

The wood and rocks also support vines and vining shrubs that would have had a harder time otherwise.



*Lonicera subspicata*



*Rubus ursinus*



*Calystegia macrostegia*



*Phacelia ramosissima*



*Keckiella cordifolia*

A photograph of a native meadow habitat. The foreground is filled with a dense, colorful mosaic of wildflowers, including purple, yellow, and white blooms. Several large pieces of weathered driftwood are scattered throughout the field. In the background, a wire fence runs across the middle ground, and beyond that, a range of rugged, brownish mountains stretches across the horizon under a clear sky.

A native meadow habitat where woody shrubs were deliberately excluded to yield more of a mosaic cover. A broad swath of native four-spot (*Clarkia purpurea* ssp. *quadrivulnera*) and other wildflowers. As you likely know, this is very difficult to achieve due to intense competition with invasive herbs.

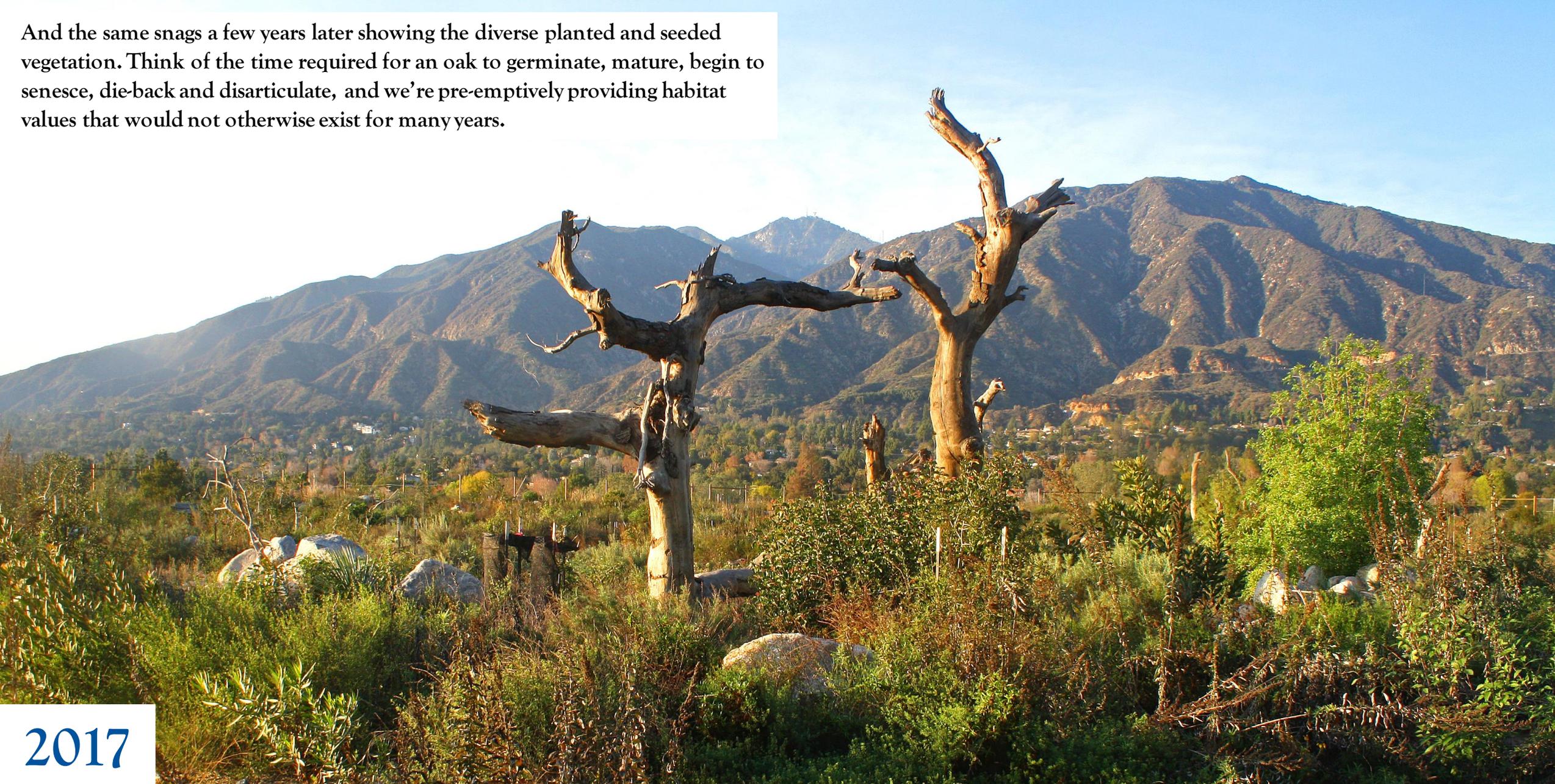
2016



2014

Two placed snags shortly after the initial planting.

And the same snags a few years later showing the diverse planted and seeded vegetation. Think of the time required for an oak to germinate, mature, begin to senesce, die-back and disarticulate, and we're pre-emptively providing habitat values that would not otherwise exist for many years.



2017



These results are not possible without diligent maintenance. We're not only weeding regularly, but supplemental plantings, seeding—continually loading more propagules into the site to facilitate natural recruitment.



Maintenance / Enhancement

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2013

These panoramas show the progress at a landscape level.



2020



2013

These panoramas show the progress at a landscape level.



2021



Despite ongoing, acute drought, the planted oaks exhibit remarkably good survival, health, and growth, with 221 oaks (61%) exceeding 10 feet in height, and 139 oaks (38%) exceeding 12 feet in height in 2022. The overall oak tree canopy cover on the site was 8.04 percent in 2022, which substantially exceeded the performance standard of 2 percent oak tree canopy cover.

A contingency of 36 oaks were installed in 2013 above the required 363 oak plantings per the HMP. Including these contingency plants, and seedlings arising from supplemental acorn sowing (12 plants), the oak survival (364 oaks) currently exceeds 100% of the 363 specified plantings, and far exceeds the performance standard of 290 surviving oaks.

2022



Healthy, drought-resilient oaks in a mosaic of understory vegetation and natural debris.



2022

It's very important that some outcrops are emergent and not covered with vegetation, to support particular wildlife functions.





In addition to the large snags, we often place smaller branches among the assemblages, and these are heavily used by critters.



And some areas are just a lovely mess, with tangles of placed stone and brush and clambering vegetation.

2022

PSOMAS



The placed CWD continues to weather and decay.



Just more scenes from the site. There are all kinds of niches, resources, every time you turn around there's something different and interesting to see.



The oaks are resilient despite ongoing drought. The oak habitat has not been irrigated since 2018, and the CSS areas not since 2015. We only received 3/4 of average rainfall in the prior year, and 1/3 of average in the year before that—really some acute drought.

2022

PSOMAS



2022

The spiraling drainages are well vegetated with native sedges, rushes...

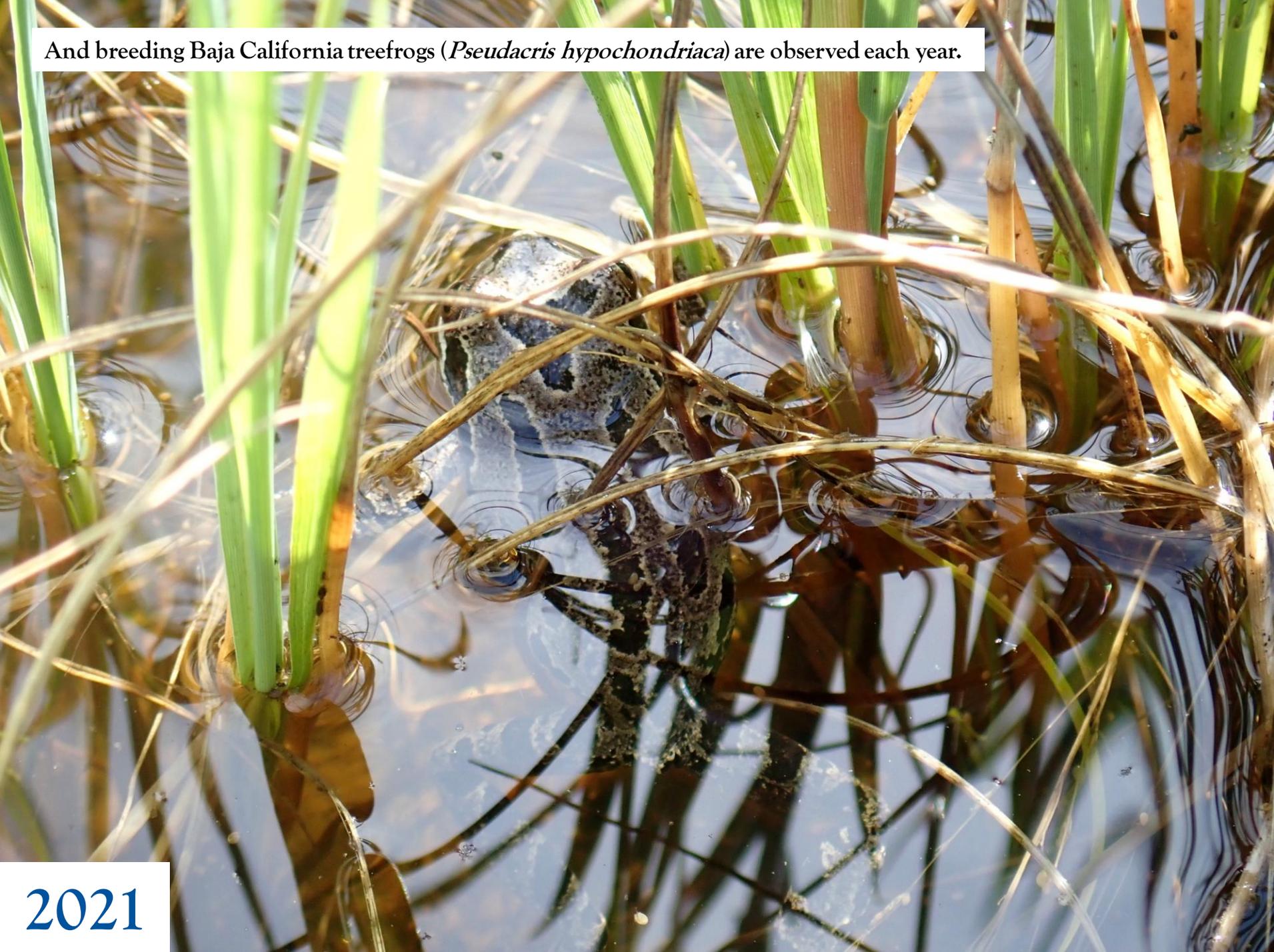


2022

...native riparian shrubs and grasses.

PSOMAS

And breeding Baja California treefrogs (*Pseudacris hypochondriaca*) are observed each year.



2021

PSOMAS



A few volunteer willows and sycamores were retained for diversity.

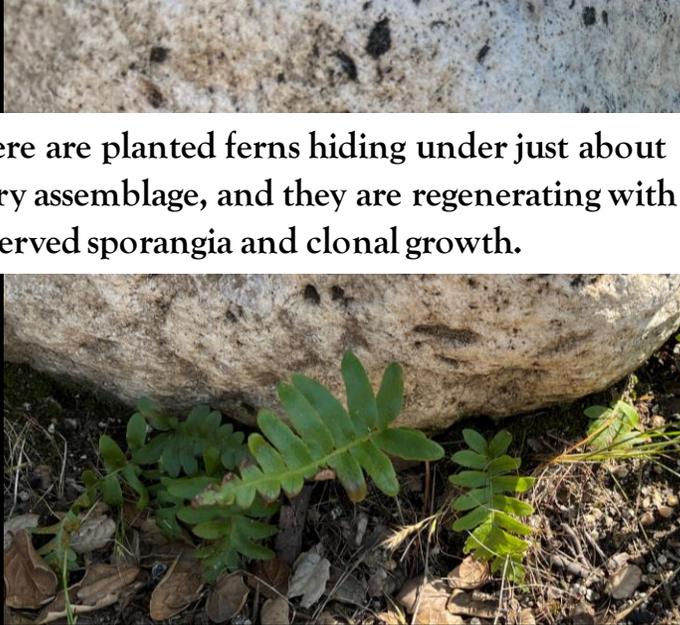
2021

The coastal sage scrub mitigation areas are a mosaic that includes large patches of spiniferous shrubs—cactus and yucca.



2022

PSOMAS



There are planted ferns hiding under just about every assemblage, and they are regenerating with observed sporangia and clonal growth.



Fern growth and *regeneration*



The placed CWD enables a beneficial decomposition food web that would have otherwise taken many years to establish.



Beneficial decay processes

PSOMAS



We see all kinds of detritivores and their associated predators.

# Decomposition food web

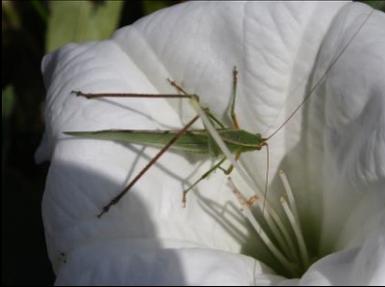


The botanical diversity is very high, with over 150 native vascular plant species. Our work emphasizes bio-diversity, but this is really an unprecedented level of bio-diversity in our practice.



151 native vascular plant taxa

PSOMAS



Arthropod abundance / diversity

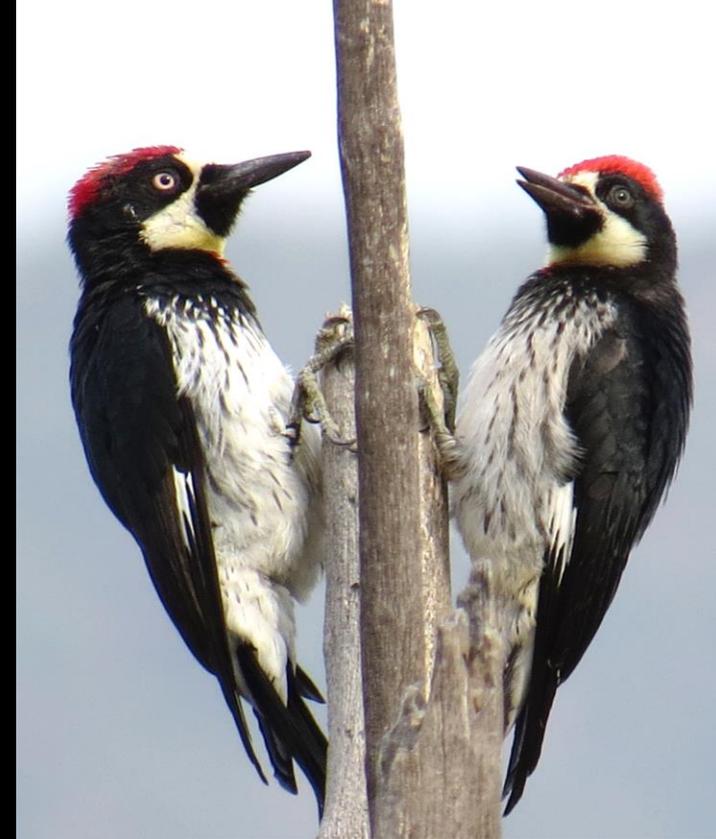
Arthropods are abundant and diverse, and every species has its own value.

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We observed an abundance of volunteer, short-fruited willowherb (*Epilobium brachycarpum*) on the site and protected it. Later, we saw hundreds of sphinx moth (*Hyles lineata*) larvae using this as their host plant, and later the adults nectaring on the site. We placed some carpenter bee houses to see what would happen, but the acorn woodpeckers (*Melanerpes formicivorus*) had other plans...





The woodpeckers colonized our snags pretty much overnight, excavating nest cavities and caching acorns to create valuable granaries.





**Canyon Wren**  
*(Catherpes mexicana)*



**Rock wren**  
*(Salpinctes obsoletus)*

One of Psomas' Wildlife Biologists called me from the site in the first couple years, to say he had four wrens on the site. I said, "Great—Bewick's wren? House wren?" and he said "No, four SPECIES of wren", including Bewick's and house, plus rock wren and canyon wren.



**House Wren** *(Troglodytes aedon)*



**Bewick's Wren**  
*(Thyromanes bewickii)*



**Rock wrens**

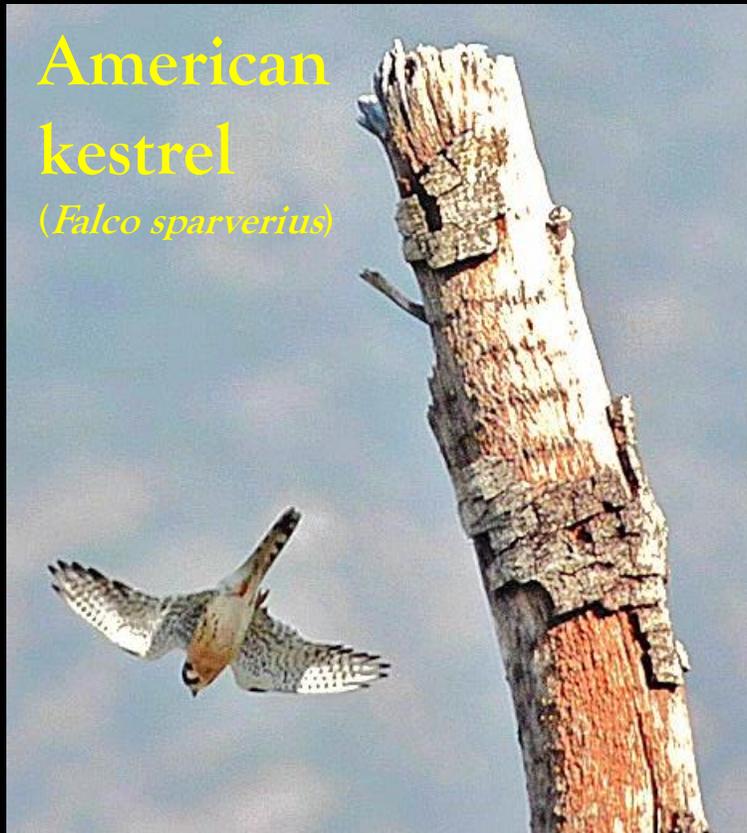
# Red-tailed hawk

*(Buteo jamaicensis)*



# Turkey vulture

*(Cathartes aura)*

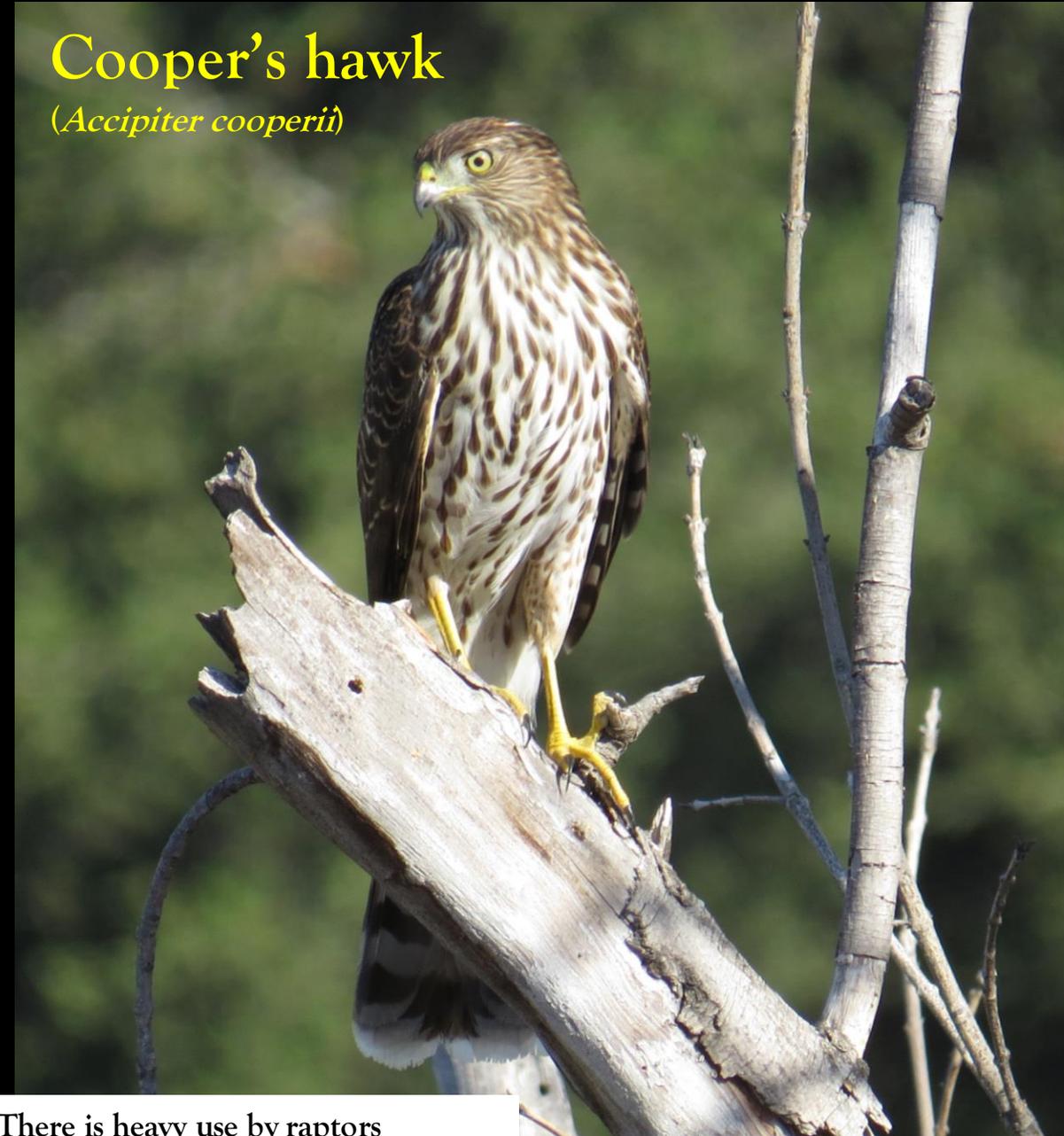


# American kestrel

*(Falco sparverius)*

# Cooper's hawk

*(Accipiter cooperii)*



There is heavy use by raptors including hawks, kestrels; and vultures and owls also use the snags.



Wildlife camera placed at suspected woodrat nest

**Bryant's woodrat: California Species of Special Concern**

I saw some telltale signs of woodrats, so we placed wildlife cameras at several assemblages and confirmed Bryant's woodrat (*Neotoma bryanti intermedia*), a California Species of Special Concern.



Here's another California Species of Special Concern, the San Diegan tiger whiptail (*Aspidoscelis tigris stejnegeri*)—upper left.



114 observed native vertebrate spp. (15 spp. nesting birds)

PSOMAS



We're observing new species all the time, from minute insects up to large predators. So we think we've pretty well exceeded the bio-diversity goals of the program.



Bio-Diversity ✓

114 observed native vertebrate spp. (15 spp. nesting birds)

PSOMAS



These kind of results were mainly possible due to the active collaboration of all team members, with Public Works (top center) taking an active role throughout the planning and implementation phases.



# What About Pathogens?

- Must be mindful of potential disease vectors
- These substrate enhancement methods are likely unsuitable for many habitat creation/restoration sites in California
- Select sites offer good opportunities for experimentation without risking contamination of sensitive habitat areas
- **Practitioners must carefully evaluate materials to be salvaged/moved, site locality and configuration, and the overall bio-resource context**

Serious plant pathogens such as *Phytophthora* spp. have not been identified on this habitat creation site to-date. In general, practitioners must be very careful in evaluating biotic materials for relocation.

# Angeles National Forest

Other Natural Areas

Other Natural Areas

**Middle SPS**

**Lower SPS**

San Gabriel Valley

Santa Anita Park

The specific location and configuration of this site, at the tip of a wedge of habitat surrounded by development, make it a good candidate for experimentation without risking the contamination of sensitive natural areas.

In fact, this site is far more likely to receive plant pathogens from adjacent urbanized areas, such as the manufactured ornamental landscape slope (red polygon) that is off-site to the east (north is oriented to the right in this image).

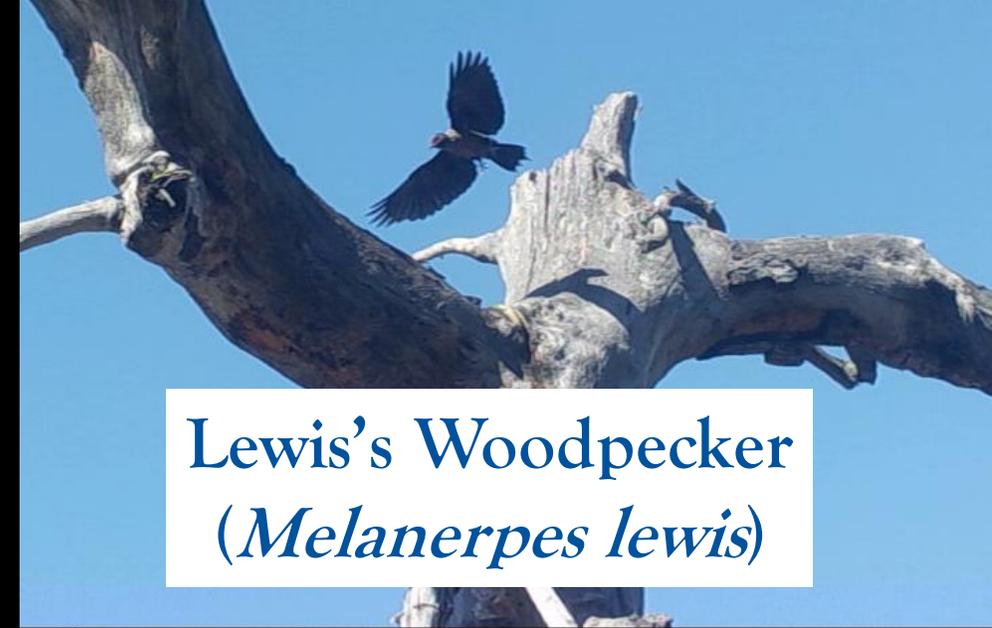


Santa Anita Channel

# Performance Summary – 2022:

- Excellent oak survival/growth/health
- Very high bio-diversity of flora/fauna
- Drought-adapted habitat mosaic
- Site has met most 10-year standards

We've demonstrated that by radically enhancing our substrate and optimizing botanical bio-diversity, excellent results of oak survival, growth, health, and drought adaptation can be achieved, along with intensive wildlife colonization on a recently graded landform.



Lewis's Woodpecker  
(*Melanerpes lewis*)

11/23/2021 12:25PM C7KB30



Here's our full project team, not previously mentioned are Cornerstone Studios who prepared irrigation plans and photo-simulations, and Leatherman BioConsulting who have provided supplemental botanical expertise throughout the project.



PSOMAS



On behalf of Los Angeles County Public Works, thank you for your time, and the website is here for more information.

*Thank You*

<https://dpw.lacounty.gov/wrd/Projects/SAHMP/index.cfm>



*Public Works*  
LOS ANGELES COUNTY

**P S O M A S**