

Large-scale Riparian Restoration in the Santa Clara River

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Abstract

UCSB's Riparian Invasion Research (RIVR) Lab studies the ecology and integrated management of invasive plants in western riparian systems. We are conducting a large-scale *Arundo* (*Arundo donax*; giant reed) control and habitat restoration program on over 250 acres in the Santa Clara River (SCR) floodplain (Ventura and LA Counties). The SCR watershed is an extensive and biologically rich region at the junction of five of California's 10 identified Bioregions. The SCR is one of the few remaining major river systems in the State that retains much of its natural hydrology, providing habitat for 18 endangered species. The goals of the program are to: 1) implement riparian restoration at a sufficient scale to re-establish the ecosystem structure, function, and processes necessary to recover sensitive and listed species, 2) establish a long-term and scientifically-based monitoring program to measure wildlife responses to restoration, and 3) evaluate biological data to document successful strategies, identify unsuccessful restoration practices, and inform future projects in the region. Riparian restoration projects (and restoration in general) routinely evaluate only the first trophic level and are conducted at temporal scales (five years or less) that are insufficient to evaluate population-level responses in the organisms that these projects are intended to benefit. Our goal is to promote riparian restoration as a science-based and data driven endeavor that uses long-term data sets to evaluate trends and trajectories in target species. We are measuring biotic and abiotic ecosystem components (vegetation diversity and phenology, plant water use, insects, birds, mammals, and sub-surface water dynamics) to construct a holistic framework to evaluating the restoration process.

Restoration Site (Santa Clara River)

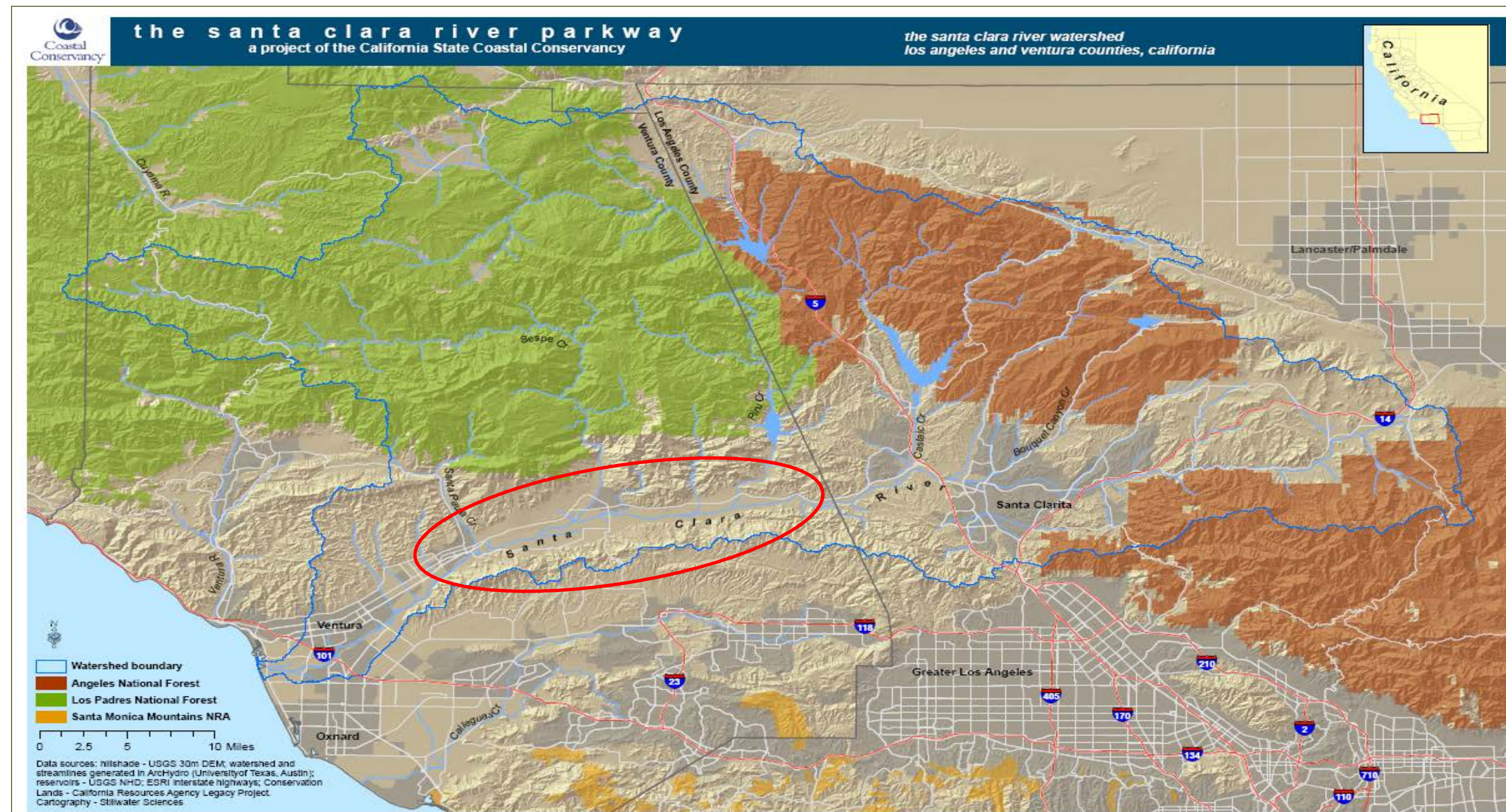


Figure 1. Santa Clara River Watershed spanning Los Angeles and Ventura Counties.

Partnerships

Santa Clara River Watershed Conservancy	CA Department of Fish and Wildlife
Friends of the Santa Clara River	Ventura County Weed Management Area
Santa Clara River Trustees Council	California Trout
The Nature Conservancy	Ventura County Weed Management Area
California State Coastal Conservancy	US Department of Agriculture
US Fish and Wildlife	Stillwater Sciences

Invasive Species in the Watershed



Giant Reed- (*Arundo*) Castor Bean African Clawed Frog

Sensitive Species in the Watershed

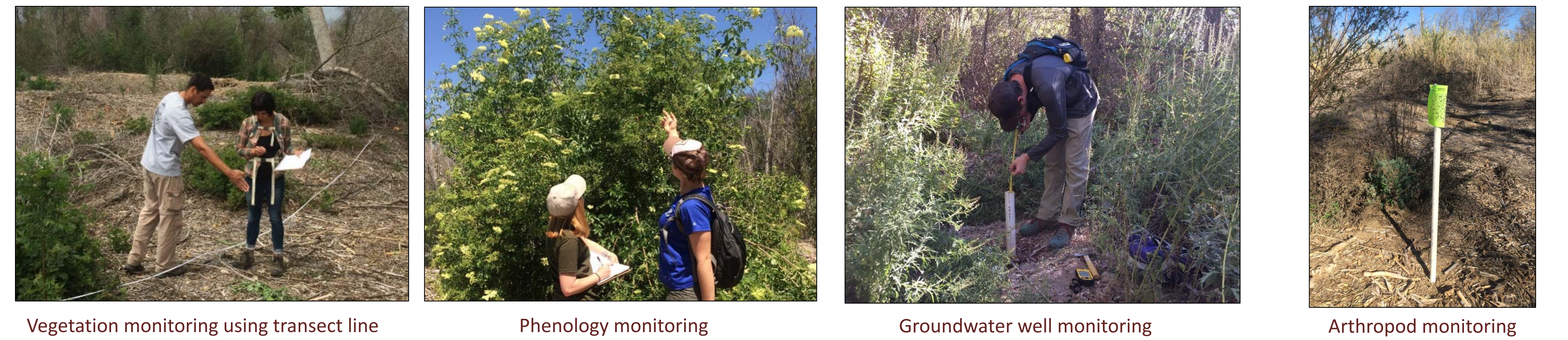


Least Bell's Vireo Southwestern Willow Flycatcher Red-legged Frog

Improving the Restoration Process

- ✓ Planning and implementation grounded in science-based methods with clear objectives and hypotheses.
- ✓ Monitoring framework that objectively evaluates whether desired outcomes have been achieved.
- ✓ Evaluating floodplain-wide recovery of vegetation, wildlife, and ecosystem functions by integrating efforts with watershed partners.
- ✓ Measuring abiotic and biotic ecosystem components including groundwater/soil dynamics, plant transpiration, vegetation composition, and wildlife diversity (birds, insects, mammals).
- ✓ Consistent and scalable data collection methods among projects to facilitate landscape level assessment of biological resources and trends related to climate change and human activities.
- ✓ Combining research on integrated control, invasive species biology, and restoration efficacy to improve the process of habitat restoration.

Monitoring Progress



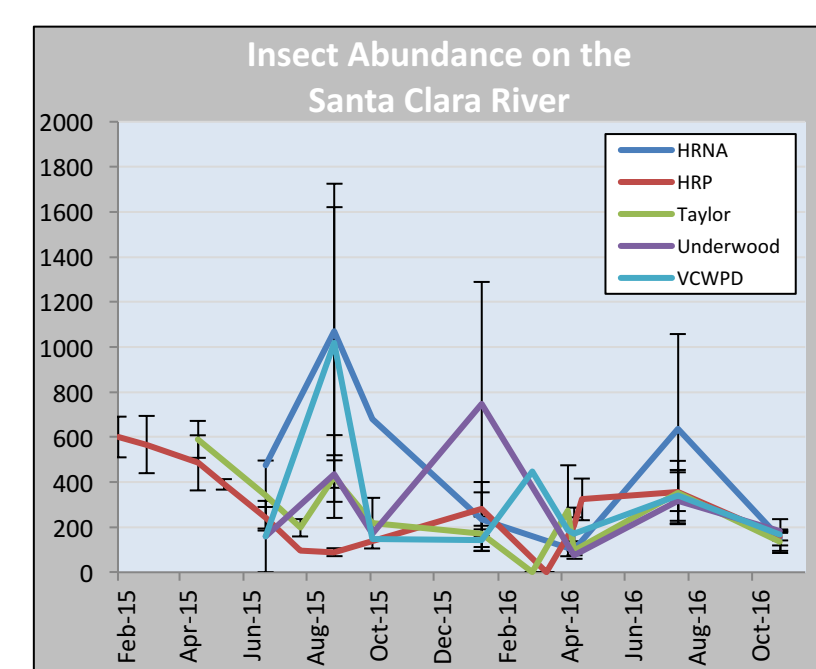
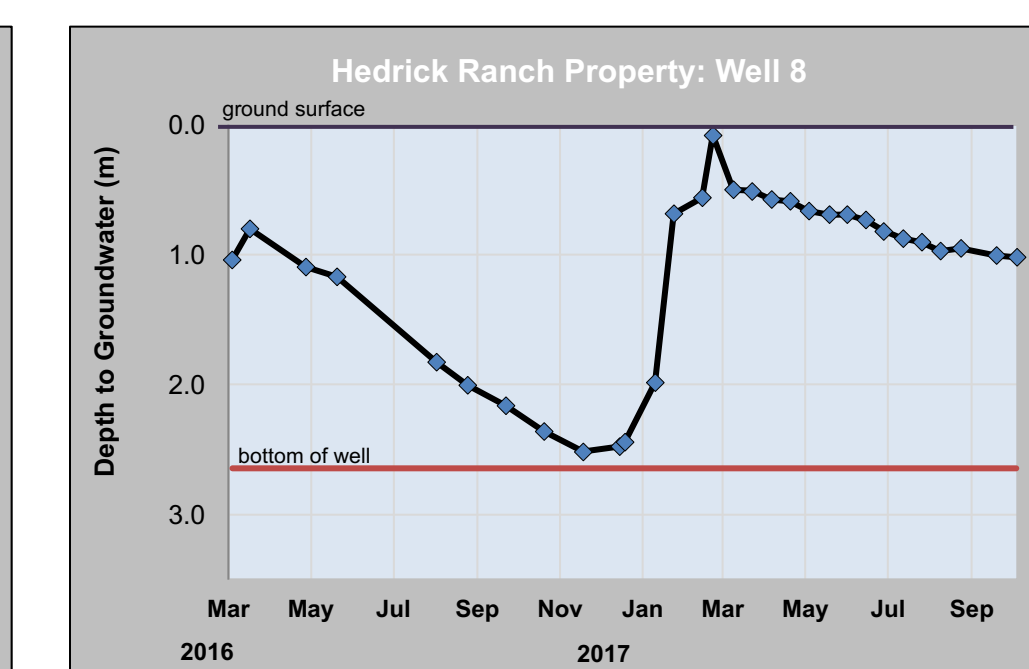
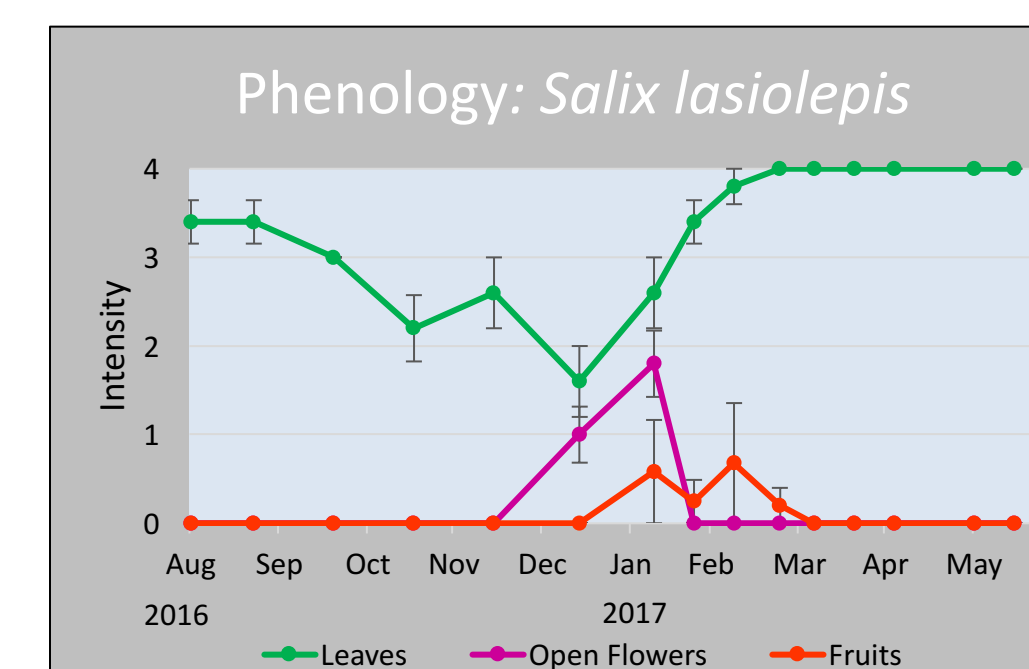
Vegetation monitoring using transect line

Phenology monitoring

Groundwater well monitoring

Arthropod monitoring

Transect	Planting Area	Absolute Non-native Cover			Absolute Native Cover		
		2015	2016	2017	2015	2016	2017
1	4	1.1	0.0	1.6	55.7	76.2	75.7
2	4	3.1	0.0	0.8	67.4	75.1	33.8
3	3	13.2	2.1	4.7	24.1	56.2	54.2
4	3	12.0	0.0	0.0	46.8	34.2	51.4
5	2	10.2	0.0	0.0	88.7	62.5	86.5
6	2	1.9	0.7	0.2	64.4	57.6	65.2
7	1	17.6	1.7	0.0	8.4	11.4	34.8
8	1	18.9	1.0	1.8	0.0	1.8	19.2
9	1	41.1	0.2	0.0	38.4	31.6	16.7
Averages		13.2	0.6	1.0	43.8	45.2	48.6



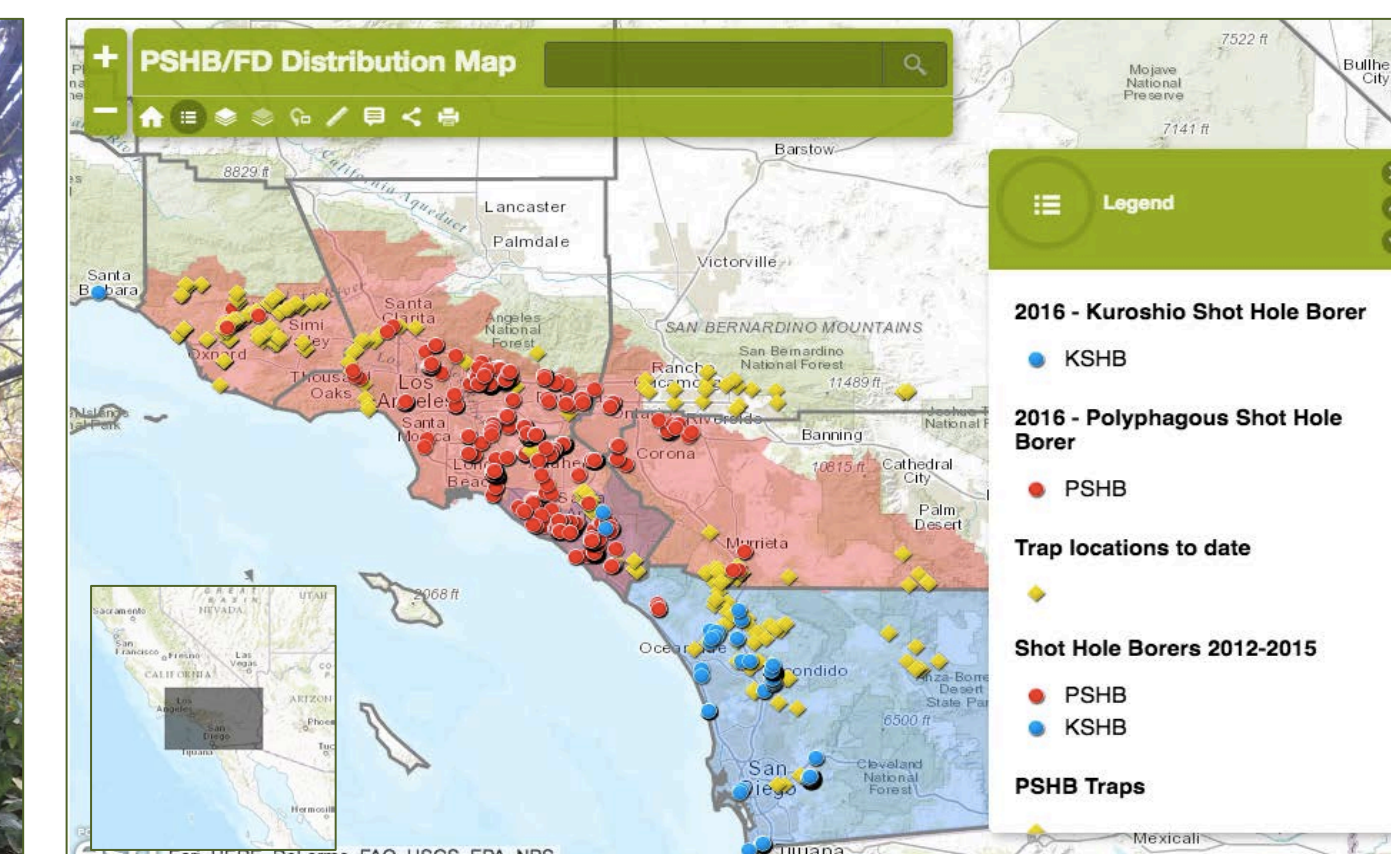
Research Projects



Plot design for understory biodiversity study.

Psychrometers installed on arundo to measure water use.

Trap for invasive Polyphagous Shot Hole Borer.



Sites where invasive Shot Hole Borers have been found in Santa Barbara and Ventura counties.