



# Point Blue Report

Annual Report

Pacheco Creek Reserve Riparian

Restoration Project

Report to the Santa Clara Valley Habitat Agency

February, 2021

Conservation science for a healthy planet

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## **Pacheco Creek Reserve Riparian Restoration Project**

**February, 2021**

**Point Blue Conservation Science**

**STRAW Project**

**Prepared by Jennifer Benson**

**Point Blue Conservation Science** – Point Blue’s 140 staff and seasonal scientists conserve birds, other wildlife and their ecosystems through scientific research and outreach. At the core of our work is ecosystem science, studying birds and other indicators of nature’s health. Visit Point Blue on the web [www.pointblue.org](http://www.pointblue.org).

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## PROJECT SUMMARY

The Pacheco Creek Preserve is a 55-acre property located in the southeastern portion of the Santa Clara County on the southeast side of Highway 152 (SR 152), approximately 13.6 miles east of Gilroy. There is a federally owned property to the east-southeast of the site which provides a buffer between the site and private land.

The acquisition of the Pacheco Creek property by the Santa Clara Valley Habitat Agency (Agency) provides key contributions to the Santa Clara Valley Habitat Plan (Summary, Pacheco Creek Mitigation Area, January 2016) in terms of management considerations. The Pacheco Creek property is located in conservation analysis zone Pacheco-6 (moderate conservation effort) and could contribute to conservation analysis zone requirements identified for Pacheco 1-6 and Plan-wide requirements. At the species-level, the site protects potential habitat for 9 of the 18 covered species. At the natural-community level, the site protects a healthy riparian woodland natural community (willow riparian forest and scrub and mixed riparian forest and woodland and Central California sycamore alluvial riparian) and provides opportunities for enhancement and restoration of these same land cover types. At the landscape level, the site protects land on either side of SR 152 at one of two key crossing points targeted under the Habitat Plan to protect and provide opportunities to enhance wildlife movement across the road. It protects 0.65 miles of Pacheco Creek and contributes to the protection of 2 linkages (#15 Henry W. Coe State Park southeast to San Benito County line and #17 Main stem of Pacheco Creek).

In October 2017, the Agency requested the assistance of Point Blue Conservation Science's (Point Blue) Students and Teachers Restoring A Watershed Program (STRAW) for contract in revegetation and habitat enhancement, local classroom involvement in restoration implementation, as well as maintenance and monitoring of plantings. STRAW sub-contracted Prunuske Chatham, Inc. (PCI) to assist with the revegetation planning and implementation.

The goal of the project is to enhance wildlife habitat with the establishment of a diverse palette of native tree and shrub species utilizing a climate-smart restoration approach to prepare the system for the consequences of climate change. Key considerations in the design plan include: 1) enhancement of Sycamore Alluvial Woodland Habitat (SAW); 2) inclusion of native heat/drought-tolerant woody species; 3) incorporating plant species that benefit special-status wildlife species such as the Least Bell's Vireo; California Red-legged Frog, California Tiger Salamander, and the San Joaquin Kit Fox; and 4) involving local schools and community members in hands-on restoration and stewardship.

Figure 1 illustrates the Pacheco Reserve Enhancement/Restoration planting area which is a total of 2 acres. The planting zone and design plan was developed by PCI and adapted by STRAW and was chosen given the mix of Cortina very gravelly loam and Garretson gravelly loam soil types which support both upland oak woodland and riparian forest natural communities.



**Figure 1.** Pacheco Reserve Enhancement/Restoration planting area. Additional replanting occurred in March to June 2020 within the boundaries of this planting area.

## PLANTING IMPLEMENTATION

K-12 students, community volunteers, and STRAW staff were involved in plant installation for the Pacheco Reserve Enhancement/Restoration planting area. Table 1 describes the planting dates as well as schools and community volunteers involved.

Volunteers installed acorns and container plants with browse protection from deer and hare by using deer cages above ground. Seed baskets were used for oak plantings as direct acorn seed was utilized in planting. Seed baskets extended below-ground by 10 inches to protect roots from ground squirrel and gopher activity. Coir weed mats were also installed by volunteers to deter invasive plant growth directly around plants. Tree wrap was later used on trees and woodier shrubs to deter rodent girdling. STRAW staff installed dripline irrigation for each plant after installation.

**Table 1.** Volunteer participation in Pacheco Creek Reserve Riparian Restoration Project in 2017-2020.

Date Installed	Community Volunteers	# of Volunteers
12/14/17	Rucker Elementary	76
1/10/18	R.O. Hardin Elementary	80
1/12/18	R.O. Hardin Elementary, Pinnacles NP Intern Volunteer	85

<b>2/15/18</b>	Bradley Elementary	62
<b>2/16/18</b>	Bradley Elementary, Pinnacles NP Intern Volunteers	56
<b>3/11/20</b>	R.O. Hardin Elementary	94
	<b>Total Volunteers</b>	<b>453</b>



**Figure 2.** Replanting efforts in March 2020.

PCI developed an initial plant list (Table 2) for STRAW restoration activities, and from that list Point Blue conducted a climate-smart restoration assessment. In general, climate models predict more extreme weather events along with warmer temperatures. Climate projections (Table 3) were collected from Cal-Adapt ([cal-adapt.org](http://cal-adapt.org)) to give a sense for future climate conditions at Pacheco Reserve. Other climate models, such as Climate-Smart Watershed Analyst ([climate.calcommons.org/tbc3/sf-bay-watershed-analyst](http://climate.calcommons.org/tbc3/sf-bay-watershed-analyst)), can provide even more insight for projecting seasonal water balances and seasonal precipitation patterns. The planting palette included drought tolerant species (e.g. live oak, buckeye,

sagebrush) and species diversity to provide insurance against unknowns. Diverse food sources as well as structure and flowering/fruitleting timing help support wildlife facing climate stresses. To meet these needs, 18 species of trees, shrubs, and forbs were selected for the planting palette. Figures 3 and 4 below describe the planting palette’s climate-smart performance. As we began to source plants, we made adaptations to the original planting list and design plan based on limited plant stock availability onsite and at nurseries. These adaptations are described below. In some cases we bumped up numbers planted to fill in for species we were unable to locate. Further, Point Blue began replanting in winter/spring 2020 to account for previous year’s mortality.

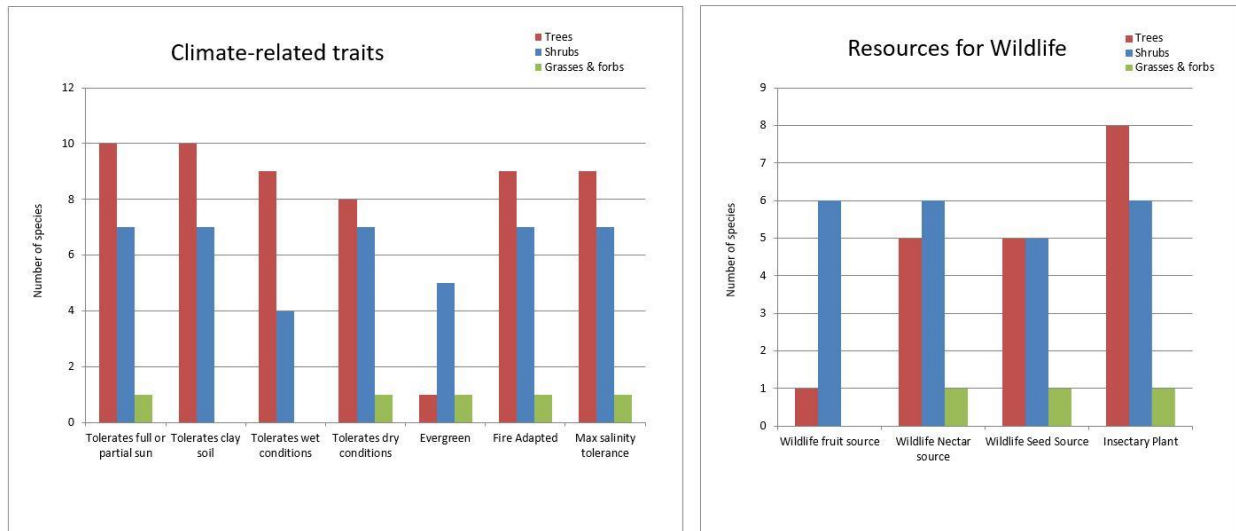
**Table 2.** Planting palette for the Pacheco Creek Reserve Riparian Restoration. The actual number planted reflects adjusted planting number totals due to available plant stock.

Scientific Name	Common Name	Original number to plant per design	Actual number planted	Replanting numbers 2020	Plant Material
<i>Aesculus californica</i>	CA Buckeye	0	0	7	Container pot and direct seed
<i>Artemisia californica</i>	Coastal Sagebrush	20	21	0	Container pot
<i>Baccharis pilularis</i>	Coyote Brush	40	38	0	Container pot
<i>Frangula californica</i>	CA Coffeeberry	40	19	22	Container pot
<i>Heteromeles arbutifolia</i>	Toyon	40	30	18	Container pot
<i>Juglans hindsii</i>	CA Black Walnut	15	10	0	Container pot
<i>Mimulus aurantiacus</i>	Sticky Monkeyflower	20	7	0	Container pot
<i>Prunus ilicifolia</i>	Holly Leaf Cherry	10	0	0	Container pot
<i>Quercus agrifolia</i>	Coast Live Oak	15	13	0	Direct seed
<i>Quercus douglasii</i>	Blue Oak	5	0	0	Direct seed
<i>Quercus lobata</i>	Valley Oak	20	19	21	Direct seed and container pot
<i>Platanus racemosa</i>	CA Sycamore	20	0	0	Container cuttings
<i>Populus fremontii</i>	Fremont Cottonwood	15	11	0	Container pot
<i>Rosa californica</i>	CA Rose	40	26	0	Container pot
<i>Sambucus nigra ssp. caerulea</i>	Blue Elderberry	40	44	24	Container pot
	<b>Totals</b>	<b>340</b>	<b>238</b>	<b>97</b>	

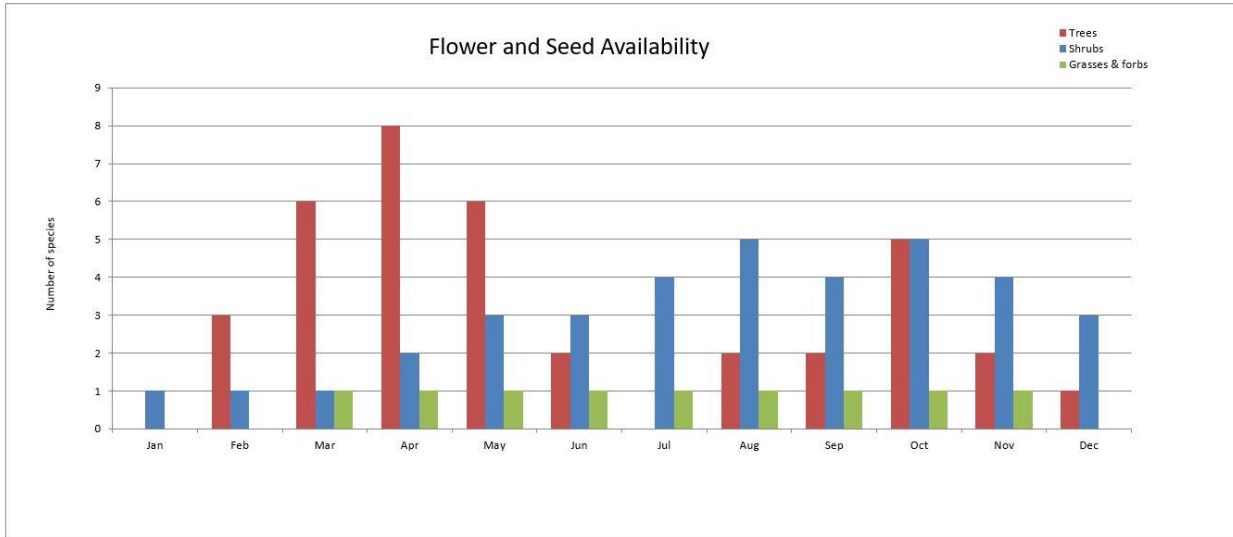
**Table 3.** Modeled climate projections for annual averages from Cal-Adapt, grid cell 37.03125, - 121.34375. Historic values observed from 1950-1990, modeled projected values are for 2070-2099. Modeled projections feature two scenarios: RCP 4.5 – Emissions peak around 2040, then decline. RCP 8.5 – Emissions continue to rise strongly through 2050 and plateau around 2100.

Climate Variable	Historic Annual Mean	Modeled Projection RCP 4.5	Modeled Projection RCP 8.5
Maximum temperature	70.9 degrees F	76.0 degrees F	78.7 degrees F
Minimum temperature	44.1 degrees F	49.4 degrees F	52.5 degrees F
Precipitation	20.2 inches	22.1 inches	25.1 inches
Extreme heat days*	4 days	19 days	31 days

\*Extreme heat days are defined as a day in a year when the daily maximum temperature exceeds the 98<sup>th</sup> historical percentile of daily maximum temperatures based on observed historical data from 1961-1990 between April and October. The threshold temperature for this grid cell is 96.7 degrees F.



**Figure 3.** Evaluating the plant list with Point Blue’s Climate-Smart Restoration Toolkit, each chart shows the number of species that meet specific climate-related traits and number of species provide wildlife resources. Some species exhibit several traits.



**Figure 4.** Evaluating the plant list with Point Blue’s Climate-Smart Restoration Toolkit, this chart depicts how many plant species in our palette provide wildlife resources throughout each month of the year. An optimal spread would be to have several species of varying vegetative structure (trees, shrubs, grasses & forbs) providing wildlife resources for each month of the year. A year-round supply of wildlife resources buffers wildlife against changing climate conditions.

As for adaptations to our planting design, we collectively decided to omit from our design plan willow and cottonwood planting along the banks. The planting along the northern bank was intended for 3-foot sprigs of 20 cottonwood (*Populus fremontii*) and 3-foot sprigs of 77 willow (*Salix lasiandra* and *Salix lasiolepis*); however, the plant stock on site was not adequate. Further discussion with the Agency later in planning determined anticipated stream restructuring and the need to obtain a Lake & Streambed Alteration 1600 permit from CDFW, therefore sprigging was omitted from the plan at this time.

An additional change to our planting design was the omission of planting 80 sycamores (*Platanus racemosa*) in the Pacheco Reserve Enhancement/Restoration planting area, for two reasons. First, STRAW staff was unable to locate confirmed non-hybridized sycamore plant stock at local native plant nurseries. Second, given a previous study conducted by San Francisco Estuary Institute (SFEI) and H.T. Harvey & Associates (HTH), in partnership with the Agency, we collectively determined that we didn’t have enough information yet to appropriately assess non-hybridized sycamore stands to select planting material from nor an informed methodology for successful propagation techniques. According to the 2017 Sycamore Alluvial Woodlands study, groundwater levels are a crucial factor in sycamore survivability as well as periodic flooding to create conditions that support regeneration. Consultation with the Agency, California Department of Fish and Wildlife, and H.T. Harvey are needed prior to any restoration implementation involving sycamores. However, one approach to encourage sycamore regeneration could involve planting woody plant nurseries with species that are closely associated with sycamores as well as monitoring primary channels for invasive species that may outcompete sycamores.

STRAW staff procured all planting materials for restoration implementation. Acorns for Coast Live Oak (*Quercus agrifolia*) and Valley Oak (*Quercus lobata*) were sourced from several trees on site. Blue Oak (*Quercus douglasii*) was removed from the design plan as we determined that our planting zones were just below the elevation for optimal Blue Oak success. The remainder of plants were sourced from local nurseries who are utilizing phytosanitary best management practices for reduced risk of introducing plant pathogens to restoration sites via plant stock. Those nurseries are Central Coast Wilds, The Watershed Nursery, Capitol Wholesale Nursery, and California Flora Nursery. Further, Point Blue has consulted with Phytosphere Research principal, Ted Swiecki Ph.D., and now perform almost all phytophthora testing in-house using pear-bait and leachate testing methods.

For future plantings, we highly recommend sourcing local seed sources and conducting a contract grow. Currently, Point Blue is doing extensive research into site-specific seed collection, propagation, and planting and monitoring for any trends in survival and climate change resilience. Seed collection methods and timing protocols have been developed so seeds can be stored and grown at the Casa Grande Nursery in Petaluma, California. We did conduct small-scale seed collection efforts of Narrowleaf Milkweed (*Asclepias fascicularis*) and sent seeds into Hedgerow Farms for storage and future propagation. For future projects, we encourage discussions for future plantings so that we may be able to collect and store seeds now.

## **CURRENT SURVIVAL AND SITE CONDITIONS FOR PACHECO RESERVE ENHANCEMENT/RESTORATION PLANTING**

The table below (Table 4) shows the species and number of plants installed as well as plant survival numbers, height class, and health rating, either as high vigor (HV) showing healthy new growth or buds or as low vigor (LV) showing systemic stress. Plant establishment monitoring was performed on September 30<sup>th</sup>, 2020. The survival percentage in the Pacheco Reserve Enhancement/Restoration planting area monitored for three summers after installation has an overall survival percentage of 53%, up from 31% last year. Of the surviving plants, most plants are of high vigor, exhibiting new height and foliage growth as well as flowering and fruiting. Of note, the increase in survival percentage reflects a combination of factors: 1) replanting of a total of 97 Valley Oak, California Buckeye, Blue Elderberry, Toyon, and California coffeeberry trees and shrubs, and 2) die-off of previously planted (2018) species.

**Table 4.** Pacheco Reserve Enhancement/Restoration planting area survival data after summer 2020 (Year 3 of 5 for maintenance and monitoring).

Latin Name	Common Name	Total Planted	Alive 2018	Alive 2019	Alive 2020	Survive 2020	<3ft-LV	<3ft-HV	>3ft-LV	>3ft-HV
<i>Quercus lobata</i>	Valley Oak	19	17	17	43	226%	1	31		11
<i>Quercus agrifolia</i>	Coast Live Oak	13	12	17	13	100%		8		5
<i>Aesculus californica</i>	California Buckeye	0	0	0	7	700%	2	5		
<i>Rosa californica</i>	California rose	26	4	3	3	12%	1	2		
<i>Artemisia californica</i>	Coastal Sagebrush	21	2			0%				
<i>Heteromeles arbutifolia</i>	Toyon	30	5	5	21	70%	1	18		2
<i>Sambucus nigra</i>	Blue Elderberry	44	8	4	10	23%	4	4		2
<i>Juglans hindsii</i>	CA Black Walnut	10	1	2	2	20%	1	1		
<i>Baccharis pilularis</i>	Coyote Brush	38	13	9	5	13%		1		4
<i>Mimulus aurantiacus</i>	Sticky Monkeyflower	7	1			0%				
<i>Frangula californica</i>	CA Coffeeberry	19	19	15	23	121%		20		3
<i>Populus fremontii</i>	Fremont Cottonwood	11	2	1		0%				
	<b>Total</b>	<b>238</b>	<b>84</b>	<b>73</b>	<b>127</b>	<b>53%</b>	<b>10</b>	<b>90</b>		<b>27</b>
						<i>Percent</i>	<i>8%</i>	<i>71%</i>	<i>0%</i>	<i>21%</i>

Again, we would highly recommend doing a contract grow and researching options for collecting our own seeds sources for future plantings. Currently, Point Blue is doing extensive research into site-specific seed collection, propagation, and planting and monitoring for any trends in survival and climate change resilience. Seed collection methods and timing protocols have been developed so seeds can be stored and grown at the Casa Grande Nursery in Petaluma, California. For future projects, we encourage discussions for future plantings so that we may be able to collect and store seeds now.

The next section provides details on each maintenance visit over the summer. The challenge again this summer was to ensure adequate watering capacity, and Point Blue continued to work closely with the Habitat Agency to notify when we needed a battery swap to power the pump and operate the irrigation. This system of notifying Habitat Agency worked well overall; however, it also resulted in additional time/travel spent on going to the site only to find that we couldn't run the irrigation. Last year we explored alternatives to water in the case that the pump couldn't be operated. One alternative would be for Point Blue to bring a filled water buffalo trailer that we could use for irrigating plants in the event that the pump is not working.

Overall rodent pressure was relatively minimal this past summer and fall. Of note was rodent burrowing at the base of an established walnut plant (Figures 7 and 8) and some of the other newer plantings. Another plant, a Fremont Cottonwood, was basically "clipped" by a rodent nibbling at the base of the plant. Despite aforementioned rodent activity, girdling was rarely observed during maintenance checks.



Figures 5 and 6. Buckeye seed germinating, utilizing direct-seed planting method.

## MAINTENANCE WORK PERFORMED FOR PACHECO RESERVE ENHANCEMENT/RESTORATION PLANTING

**Table 5.** Maintenance work performed during summer of 2020 at the Pacheco Reserve Enhancement/Restoration planting area. Maintenance visits typically entailed running irrigation, walking drip line and repairing leaks, and weeding. Irrigation was not run on an automated system and only ran during maintenance visits.

Date	Water Duration Hours	Work Hours	Activities	Site Health	Observations	Notes for next visit
5/6/20	N/A	2	Had planned to plant plants, but not getting good enough pressure in irrigation.	New plants looking thirsty.	Water making it to eastern section, but the pressure was not enough to activate drip emitters. Battery charge great at 23.1 V.	Bring water pressure gauge. Hold off on any planting until we get irrigation fixed and running.

<b>5/15/20</b>	Bucket-watered	2	Bucket-watered some of the new thirsty-looking plants.	Irrigation system not running well.	Need to walk lines and troubleshoot for plugged areas.	
<b>5/21/20</b>	1	12	Trouble-shooted low pressure/volume and watered subzone west of the tributary. Main problem in west subzone was a missing figure-8 on one of the ½" lines. When replaced, the pressure dramatically increased.			Bring more stands, and 2 gph and figures 8's.
<b>5/22/20</b>	4	24	Ran irrigation and concentrated weeding efforts inside cages.			Set up ½" drip line for incoming plantings.
<b>5/29/20</b>	4	8	Ran irrigation in all subzones, planted 10 valley oaks and 2 buckeyes. Watered in new plants and set up irrigation.			
<b>6/2/20</b>	3	14	Watered all subzones except for the last two since it got too hot out there and heated up the water in the drip line. Planted 6 valley oaks, 2 buckeyes, 2 toyon, and 2 coffeeberry.	Overall looking good.		Run last two subzones later this week.
<b>6/10/20</b>	0	2	The batteries at the pump were only charged to around 14.0 V, then down to 0 V with switch flipped on. Returned mid-day and batteries were holding 13.7 V charge.			Need to figure out how to water in this planting area.
<b>6/18/20</b>	0	2	Morning battery voltage is 18 V (pump off), then 14.3 V (pump on). Left pump on for the morning to see if there was enough water for the first subzone.			Notify Gerry about battery charging.

<b>6/19/20</b>	0	1	Did not run irrigation. Voltage at 18 V (pump off) and 14.3 V (pump on), which is not enough charge to operate the pump for the system.			Will need to get batteries charged up.
<b>6/25/20</b>	6.5	7	Watered all subzones! Fixed minor leaks in ½" lines. In zone east side of tributary, fixed split mainline.	Some water stress exhibited, but also new growth on other plants.	Mature elderberries (not planted by us) are producing a lot of fruit. Saw 3 Great-tailed Grackles and a Green Heron sipping water from the remaining pool in the creek.	Consider starting watering in subzones S4 and S5.
<b>7/1/20</b>	5	8	Ran irrigation in all subzones. Beginning charge 23.3 V, and went down to 22.9V after turning on pump. Battery light on monitor flashing quickly. Turned pump off 4 hours later, and final charge is 13.7 V.		Saw large rattlesnake!	
<b>7/9/20</b>	4.5	4	Ran irrigation. Morning voltage 21.3 V, then down to 14.3 V.		Saw a flock of Band-tailed Pigeons munching on elderberries.	Consider crimping 1" mainline after solenoid 2 to increase pressure. Seems solenoid 4 is not shutting completely.
<b>7/15/20</b>	0	2	Morning voltage 14.5 V (pump off), 0.8 V (pump on). Afternoon voltage 16.5 V (pump off), 0.4 V (pump on).			Notify Gerry that we need a battery swap.
<b>7/17/20</b>	6	14	Irrigation running like a dream! Able to water all subzones. Voltage remained above 23 V all day.			Bring more tree wrap to preemptively protect new plantings.

<b>7/22/20</b>	6	21	Ran all subzones. Voltage at 22.5 V all day.	Plants are looking happy!		
<b>7/28/20</b>	6	14	Ran all subzones. Starting voltage 22.2 V, then down to 14.3 V mid-morning. Began charging when sun broke through morning fog and voltage climbed to 18.5 V.			Plan to water this planting area earlier in the week in case batteries don't charge.
<b>8/13/20</b>	6	16	Ran irrigation and took photo points for Narrowleaf Milkweed locations. Final voltage was 13.7 V.			Gerry on site with surveyor and will swap the battery.
<b>8/27/20</b>	6	12	Smooth-sailing, watered all zones w/no problem.			Bring more tree wrap.
<b>9/1/20</b>	5	8	22 V to start in the morning, then settled at 14.3 V. Aftn voltage back up to 19.5 V.	Switched 1 gph to 2 gph emitters on elderberry, coffeeberry, direct seeds, and toyon.		Fix main line leak near toyon on east side of tributary. Same spot that was nibbled before.
<b>9/16/20</b>	0	2	Voltage at 14.3 V in morning w/ pump off, not enough juice to run irrigation. Checked back in afternoon, voltage at 13.7 V.			
<b>9/22/20</b>	0	2	Morning voltage 5.9 V, and charged up to 14.3 V by mid-day. Not enough juice to run the irrigation.			Will need to head back soon to water.
<b>9/28/20</b>	6	16	Ran all subzones. End-of-day voltage was around 19 V, will see how this holds up.			
<b>11/2/20</b>	6.5	8	Ran each subzone. Some emitters clogged.			Check S3 line as it may be plugged



**Figures 7 and 8.** Third-year walnut with rodent burrowing pressure. We filled the hole and continued to water for the rest of the summer and the walnut tree was able to pull through.



**Figures 9 and 10.** Healthy-looking first-year valley oak and buckeye trees – made it through the summer!



**Figures 11 and 12.** Wildlife – baby rattlesnake (left) and wild pig (right).

## SITE MONITORING PHOTOS



**Figure 13.** Each year, Point Blue conducts photo-monitoring surveys (year 2 of 5). Photo point locations below. Zone A = Oak Contingency Planting area photo points, and Zone B = Pacheco Reserve Enhancement/ Restoration planting area photo points.



**Photomonitoring point Pacheco Reserve Enhncmnt/Rest\_1 – Nov. 2018 (left) and Sept. 2020 (right)**



**Photomonitoring point Pacheco Reserve Enhncmnt/Rest\_2 – Nov. 2018 (left) and Sept. 2020 (right)**



**Photomonitoring point Pacheco Reserve Enhncmnt/Rest\_3 – Nov. 2018 (left) and Sept. 2020 (right)**