Point Blue Report

Annual Report

Pacheco Creek Reserve Contingency Planting Project

Report to the Santa Clara Valley Habitat Agency

January 2022

Conservation science for a healthy planet

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Point Blue Conservation Science

STRAW Project

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Point Blue Conservation Science – Point Blue's 160 scientists work to reduce the impacts of climate change, habitat loss, and other environmental threats while developing nature-based solutions to benefit both wildlife and people. We partner with land and water managers, fishermen, ranchers, farmers, cities, counties, and others to improve the health of our planet. Visit Point Blue on the web 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 Oak Contingency Planting area which is a total of 7.25 acres. The planting zone and design plan were developed by PCI and adapted by STRAW and were 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.

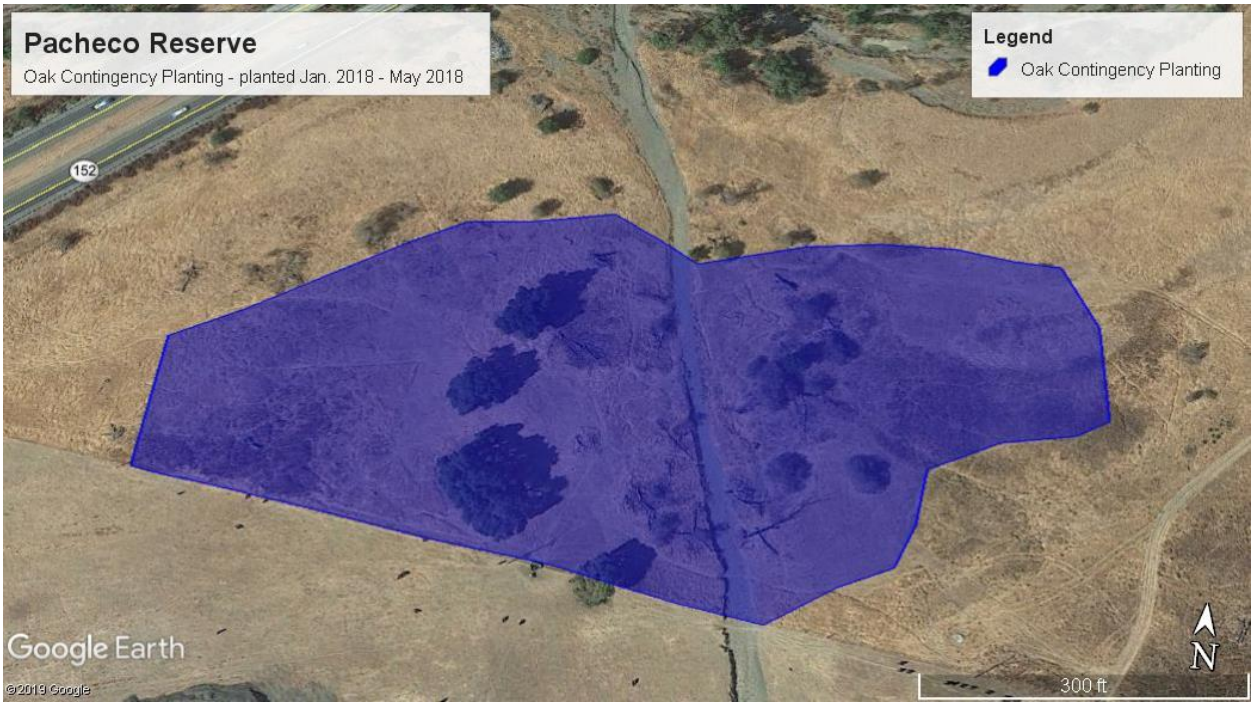

Figure 1. Oak Contingency Planting area. Additional replanting occurred in March to June 2020 and Winter 2021 within the boundaries of this planting area.

PLANTING IMPLEMENTATION

K-12 students, community volunteers, and STRAW staff were involved in plant installation for the Oak Contingency 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 Contingency Planting Project at Pacheco Reserve in 2017-2020.

Date Installed	Community Volunteers	# of Volunteers
1/18/18	Tres Pinos Elementary	31
1/19/18	Rucker Elementary, Pinnacles NP Intern Volunteer	66

1/26/18	Cerra Vista Elementary, San Benito Arts Council Coordinator	139
4/17/18	R.O. Hardin Elementary, Pinnacles NP, Santa Clara County Parks, BioSITE, Bar SZ Ranch	109
5/15/18	Cerra Vista Elementary	67
5/16/18	Cerra Vista Elementary	65
3/10/20	Tres Pinos Elementary	27
	Total Volunteers	**504**

Figures 2 and 3. Students (March 2020) installing seed baskets and using direct-seed method to plant acorns. Acorns were collected on site by Point Blue staff. Benefits to direct-seed planting include preservation of site-specific genetics, increased overall survivorship, and establishment of seedlings that grow at a relatively faster rate compared to container plants.

Figures 4 and 5. Valley oak acorns planted in March 2020 display germination and growth in May 2020 (left) and late August 2020 (right).

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) 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), 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/fruiting 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 6 and 7 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 and winter 2021 to account for previous year's mortality.

For another climate-smart analysis perspective, we ran the plant species list in the Climate Smart Habitat Riparian Model Planner (cSHRMP), which is a (beta-phase) tool created for restoration designers in the Bay Area of California. This tool evaluates species planting lists for potential vulnerabilities by projecting habitat suitability models through two climate scenarios, CNRM (representing a Warm + Wet

future scenario) and MIROC (representing a Hot + Dry future scenario). The intended use of cSHRMP is to identify species within a planting list which have low suitability based on the specific project location, which factors in precipitation, temperature, and climatic water deficit at the Watershed Planning Level. Therefore, restoration designers should first create a planting list, and then use cSHRMP for refinement. Figure 8 details the results based on our plant species list for this project. In evaluating our plant species list, all species show high suitability based on the historic model which makes sense because these are the species we already see occurring and thriving on site. Alternatively, species such as *Aesculus californica*, *Frangula californica*, *Mimulus aurantiacus*, and *Quercus agrifolia* show low suitability under the MIROC model which indicates that these species may do poorly in a hotter and drier future.

Table 2. Planting palette for the Pacheco Creek Reserve Contingency Planting Project. 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 & 2021	Plant Material
Aesculus californica	CA Buckeye	15	28	29	Container pots, direct seed
Artemisia californica	Coastal Sagebrush	40	8	0	Container pot
Baccharis pilularis	Coyote Brush	40	0	0	Container pot
Frangula californica	CA Coffeeberry	30	50	3	Container pot
Heteromeles arbutifolia	Toyon	30	14	0	Container pot
Mimulus aurantiacus	Sticky Monkeyflower	40	38	0	Container pot
Prunus ilicifolia	Holly Leaf Cherry	30	36	0	Container pot
Quercus agrifolia	Coast Live Oak	50	61	28	Direct seed, container pot
Quercus douglasii	Blue Oak	5	0	0	Direct seed
Quercus lobata	Valley Oak	25	8	57	Direct seed, container pot
Platanus racemosa	CA Sycamore	60	0	0	Container cuttings
Rosa californica	CA Rose	0	6	0	Container pot
Sambucus nigra ssp. caerulea	Blue Elderberry	20	32	1	Container pot
	Totals	**385**	**281**	**118**	

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 98th 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.*

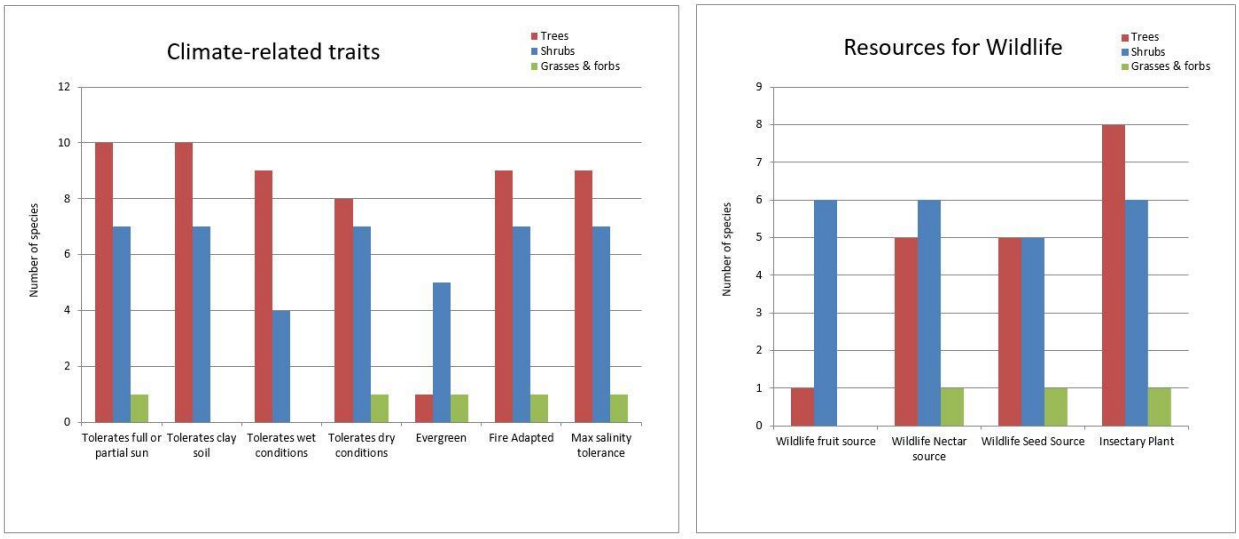

Figure 6. Evaluating the plant list with Point Blue's Climate-Smart Restoration Toolkit, each chart shows the number of species that meet specific climate-related traits and number of species provide wildlife resources. Some species exhibit several traits.

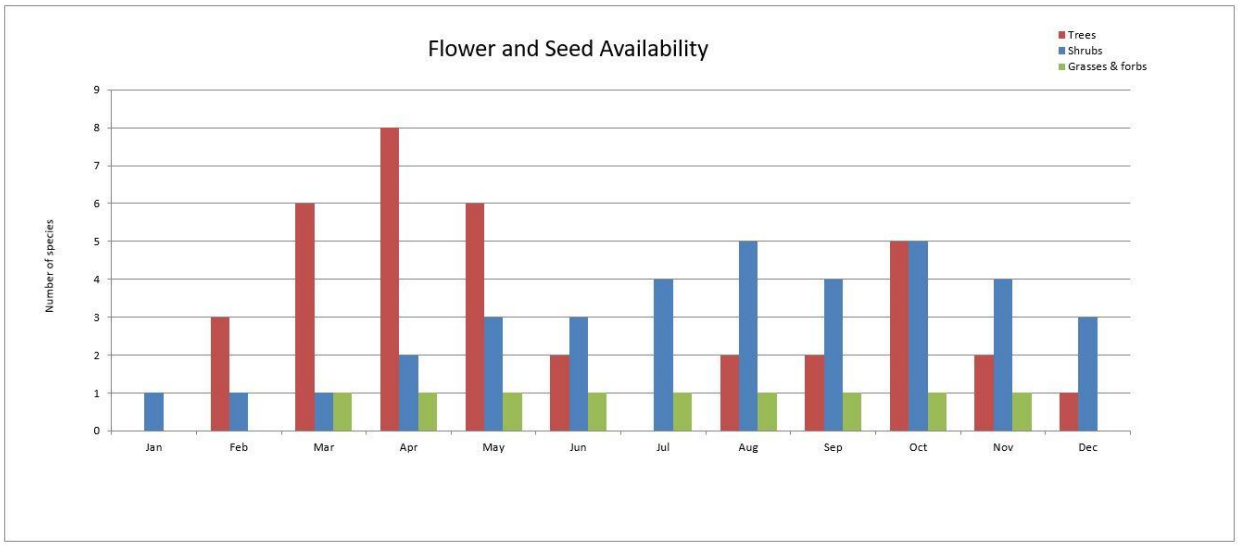

Figure 7. Evaluating the plant list with Point Blue's Climate-Smart Restoration Toolkit, this chart depicts how many plant species in our palette provide wildlife resources throughout each month of the year. An optimal spread would be to have several species of varying vegetative structure (trees, shrubs, grasses & forbs) providing wildlife resources for each month of the year. A year-round supply of wildlife resources buffers wildlife against changing climate conditions.

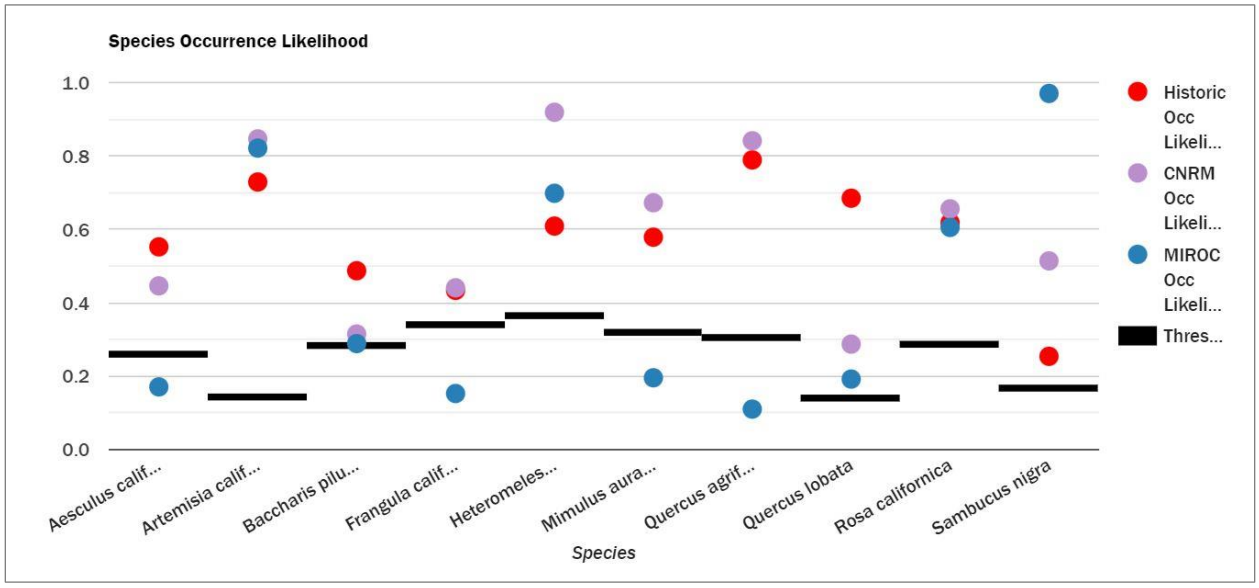

Figure 8. Each dot represents the site suitability for each species for three different climate scenarios: Historic (red), CNRM (purple) and MIROC (blue). CNRM and MIROC are modeled future scenarios for 2050-2079, where CNRM represents a Warm+Wet scenario and MIROC represents a Hot+Dry scenario. The black bars represent 95% site suitability thresholds for each species. Therefore, if a dot is above a bar for a particular species, it can be inferred that the plant and their associated traits fall within the site characteristics at 95% of observed locations for that species.

An additional change to our planting design was the omission of planting 80 sycamores (*Platanus racemosa*) in the 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. California Buckeye (*Aesculus californica*) seed was in low supply when this project was initiated, however we have been able to harvest high-quality seed over the last couple years and prefer to use a direct seed planting approach over purchased container plants. 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 phytopthora 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 our own Casa Grande Nursery in Petaluma, California. In late summer 2020, we conducted 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 OAK CONTINGENCY 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 October 7th, 2021. The survival percentages in the Oak Contingency Planting area monitored for four summers after installation shows an overall survival percentage of 28%, almost half of the percentage from last

year's report. Of the surviving plants, nearly all are of high vigor, exhibiting new height and foliage growth.

Of note, the consistency in survival percentage reflects a combination of factors: 1) replanting of a total of 83 Coast Live Oak, Valley Oak, and California Buckeye trees, and 2) die-off of previously planted (2018) species.

Table 4. Oak Contingency Planting area survival data after summer 2021 (Year 4 of 5 for maintenance and monitoring):

Latin Name	Common Name	Total Planted	Alive 2018	Alive 2019	Alive 2020	Alive 2021	Survive 2021	<3ft-LV	<3ft-HV	>3ft-LV	>3ft-HV
Quercus agrifolia	Coast Live Oak	61	42	50	36	14	23%		3		11
Prunus ilicifolia	Holly leaf cherry	36	20	16	11	9	25%		8		1
Quercus lobata	Valley Oak	8	2	2	32	9	113%	3	5		1
Frangula californica	CA Coffeeberry	50	41	32	30	26	52%	1	19		6
Heteromeles arbutifolia	Toyon	14	4	5	2	1	7%	1			
Mimulus aurantiacus	Sticky Monkeyflower	38	15	12	9	8	21%		8		
Artemisia californica	Coastal Sagebrush	8	6	3	3	3	38%		1		2
Aesculus californica	CA Buckeye	28	21	6	8	4	14%	2	2		
Sambucus nigra	Blue Elderberry	32	15	14	9	5	16%	1			4
Rosa californica	California rose	6	3	0	0	0	0%				
	Total	**281**	**169**	**140**	**140**	**79**	**28%**	**8**	**46**	**0**	**25**
							Percent	*10%*	*58%*	*0%*	*32%*

In this planting area, the irrigation line hooked up to the existing trough piping which exhibited excellent pressure throughout the summer. Irrigation was run only during maintenance visits which was typically every other week, and that amount proved to be sufficient. We continued irrigation maintenance visits until October and temporarily stopped watering given early season rains. We irrigated again in early December as significant rains didn't show up again until mid-December.

The next section provides details on each maintenance visit over the summer (Table 5). Overall, individual plants were weeded by hand-pulling inside browse protection caging. Large-scale invasive species removal of hemlock and thistle was not conducted this year, but could be considered for this coming season utilizing field support from the San Jose Conservation Corps.

This past maintenance season focused on keeping surviving plants weeded and watered. After an initial weeding in late spring, plants required little weeding maintenance over the summer. We removed cages from dead plants and reconfigured drip lines to reduce the length of tubing onsite. Rodents chewing through drip line proved to be a weekly occurrence and each maintenance visit involved repairing leaks. Of note, we observed two rodent "hotspots" all summer located in the western end of the planting area; however we did not uncover why these "hotspots" were located in these specific areas. Gallons of water used per watering session varied weekly based on how many leaks we had in driplines. We eventually targeted "hotspots" as priority for irrigation checks to be sure we were fixing leaks before losing too much water. After late October rains, we observed wild pig activity as evidenced by rooting (Figures 9 and 10), although no major damage to our plantings occurred because of their activity. Lastly, we

wrapped up maintenance season in early December after planting 35 plants to replace some that have died off. We ran irrigation for a short time to water these new plants in.

Figures 9 and 10. Wild pig rooting activity noted in November after late-October rains.

MAINTENANCE WORK PERFORMED FOR OAK CONTINGENCY PLANTING

Table 5. Maintenance work performed during summer of 2021 in the Oak Contingency Planting area. Maintenance visits typically entailed running irrigation, walking drip line and repairing leaks, and weeding.

Date	Water Duration Hours	Total Work Hours	Activities	Site Health	Observations	Notes for next visit
5/13/21	~1 hr	13	Ran irrigation – didn't observe leaks, but the water pressure was low. Removed ½" dripline from dead plants and reconfigured layout.		Used 230 gallons.	Get more plugs! Bring pressure reducer and wrenches.
5/18/21	0	4	Continued weeding inside and around cages, repositioned emitters, and fixed browse protection cages. Fixed leaks in ½" line.			Continue weeding inside cages. Need more plugs.

5/27/21	1.5 (west of trib.), 0.5 (east of trib.)	11	Ran irrigation. Fixed mainline leak west of tributary. Continued to remove/consolidate ½" line east of tributary.		Measured PSI, which is at 100+ after removing disk filter.	Weed and reset emitters in area east of tributary.
6/3/21	1.5	25	Watered each subzone for 1.5 hrs. Continued weeding plants, resetting emitters, and fixed leaks in ½" lines.		Used 540 gallons. Tri-colored Blackbird flock (~25 birds) in Zone A!	
6/10/21	~1.5	19	Ran irrigation – 1.25 hrs west of tributary, 1.5 hrs east of tributary. Lots of leaks to repair due to rodents.		Used 1,800 gallons, due to numerous leaks.	Bring more ½" couplers, and one metal 1-inch coupler plus hose clamps.
6/24/21	1.5	10	Ran irrigation in both subzones for 1.5 hours each. Fixed several leaks in the ½" lines, chewed by ground squirrels.		Used 1,320 gallons as the watering duration was longer than an hour and there were numerous leaks.	Bring more hose clamps and 1" metal couplers. Look up for when to collect CA sagebrush.
7/2/21	1	10	Ran irrigation in both subzones for 1 hours each. Repaired minimal leaks in ½" lines.		Used 480 gallons.	
7/15/21	1.5	10	Ran irrigation in both subzones for 1.5 hours each. Lots of ground squirrel-nibbled leaks in ½" line.		Used 930 gallons.	
7/23/21	1.5	9	Ran irrigation in each subzone for 1.5 hours. Repaired a lot of leaks, the squirrels are thirsty.		Used 1830 gallons.	
8/5/21	1.5	10	Ran irrigation in each subzone for 1.5 hours. Note: in west trib subzone, start irrigation check on western end since that typically has most leaks to fix.	Deer drinking out of the trough.	Used 1,380 gallons.	Bring tools/supplies to elevate ½" line west of large live oaks in the west tributary zone (most rodent activity).

						Bring more '500' size couplers.
8/17/21	1.5	8	Ran each subzone for 1.5 hours each. Fixed numerous leaks due to rodents chewing through ½ inch line.		Used 1,380 gallons.	Bring more plugs and spaghetti barbs.
8/31/21	1.5	8	Ran each subzone for 1.5 hours each. Observed more leaks on east side of tributary this time out.	Saw wild boar trotting through pasture near trough. Loggerhead Shrike patrolled fenceline.	Used 1,160 gallons of water.	
9/23/21	1.5	8	Ran each subzone for 1.5 hours. Repaired leaks as needed.		Used 1890 gallons of water.	Bring more connectors and plugs.
10/7/21	1.5	24	Ran each subzone for 1.5 hours. Lots of leaks in both ¼" and ½" lines. Still have leaks to fix in south section east of tributary. Way less leaks on west side of tributary. Collected monitoring data.		Used 1350 gallons of water. Bull found in enclosure, notified Lacy to remove.	Check acorns and buckeye seeds, not ready to collect this time.
11/11/21	1	12	Ran irrigation in both zones for 1 hour each. Fixed leaks. Collected acorns (~40) and buckeye seeds (10). Inventoried planting supplies.		Used 1030 gallons of water. Lots of pig activity evidenced by rooting.	Purchase and bring 1" connector.
11/23/21	0.5 hr	18	Planted 16 infilling plants (15 buckeyes, 1 elderberry). Ran irrigation to water in newly installed plants, other plants also received water.		Used 120 gallons of water.	
12/2/21	15 mins	18	Planted 19 infilling plants (7 buckeyes (5 by DS), 9 live oaks (8 by DS), and 3 coffeeberry.		Used 25 gallons.	

SITE MONITORING PHOTOS

Figure 11. Each year, Point Blue conducts photo-monitoring surveys (year 4 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 Oak Contingency Planting_1 – Nov. 2018 (left) and Oct. 2021 (right)

Photomonitoring point Oak Contingency Planting_2 – Nov. 2018 (left) and Oct. 2021 (right)

Photomonitoring point Oak Contingency Planting_3 – Nov. 2018 (left) and Oct. 2021 (right)

Photomonitoring point Oak Contigency Planting_4 – Nov. 2018 (left) and Oct. 2021 (right)

Photomonitoring point Oak Contingency Planting_5 – Nov. 2018 (left) and Oct. 2021 (right)

Photomonitoring point Oak Contingency Planting_6 – Sept. 2018 (left) and Oct. 2021 (right)

Photomonitoring point Oak Contingency Planting_7 – Sept. 2018 (left) and Oct. 2021 (right)