

LAKE CACHUMA OAK TREE RESTORATION PROGRAM

2019 ANNUAL REPORT

with

Fiscal Year 2019-2020 Financials and Water Usage



Prepared for: Cachuma Operation and Maintenance Board

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September 3, 2020

Executive Summary

The following is the annual report for the Lake Cachuma Oak Tree Restoration Program that contains the results of the 2019 annual inventory of all planted mitigation oak trees and the Fiscal Year 2019-2020 financial and water usage details. The results of the 2015 Lakeshore Survey set the mitigation number for the Lake Cachuma Oak Tree Restoration Program at 4,721 (COMB, 2016). This number included the established mitigation ratio of two to one (2:1) and an 18% mortality rate that was determined from the 2015 and 2016 annual survey reports (COMB, 2017a; COMB, 2017b). As of the end of this year's inventory, 5,025 oak trees have been planted (and 55 adopted trees for a total of 5,080 trees) and 4,092 are alive which is a survival rate of 80.55% (Figures 1, 3 and 4). The number of mitigation trees still to be planted is **629** trees (mitigation number minus total alive trees). The cost of the program during Fiscal Year 2019-2020 was \$140,775 with a total cost of the program since it started in 2005 of \$1,768,337. Water usage for irrigation over the year was 1.33 acre-feet.

Introduction/Background

This Annual Report presents the results of the 2019 oak tree inventory and Fiscal Year 2019/2020 (FY19/20) maintenance with water use and financials for the Lake Cachuma Oak Tree Restoration Program (Program). For Program details and objectives, see the 2-Year Plan for Fiscal Years 2013/14 and 2014/15 (COMB, 2014). This annual report contains oak tree survival rates, maintenance with water usage, financials, and suggested program improvements. Annual Reports have been written for each year of the Program. References for the recent reports are as follows: 2015 (COMB, 2017a), 2016 (COMB, 2017b), 2017 (COMB, 2018), and 2018 (COMB, 2019).

There were 311 oak trees planted during FY19/20 at Lake Cachuma County Park that are referenced as Year (YR) 11 trees, the eleventh year of planting trees since the Program started in 2005 (Figure 2). The survey results for this reporting period are presented by the year of the program that they were planted, and include the financials and maintenance effort.

Results

The 2019 inventory (or survey) of the oak trees planted through the Lake Cachuma Oak Tree Restoration Program was completed in February 2020 with the data entry and quality-assurance/quality-control occurring during the following month. The objective of the annual survey is to determine the status and success rate of the trees planted since the beginning of the program with eleven years of plantings; Year 1 (2005-2006), Year 2 (2006-2007), Year 3 (2007-2008), Year 4 (2008-2009), Year 5 (2009-2010), Year 6 (2010-2011), Year 7 (2014-2015), Year 8 (2015-2016), Year 9 (2016-2017), the Dam Tender (DT) trees (approximately 2005 through 2018), Year 10 (2018-2019), Year 11 (2019-2020). Annual surveys traditionally are conducted in the late fall and early winter to best document the survival after the dry season and growth since the last survey. With the increased number of planted trees in recent years, the annual inventory takes longer with the objective now of completion by early spring of the following year. Methods for reducing the survey time continue to be investigated.

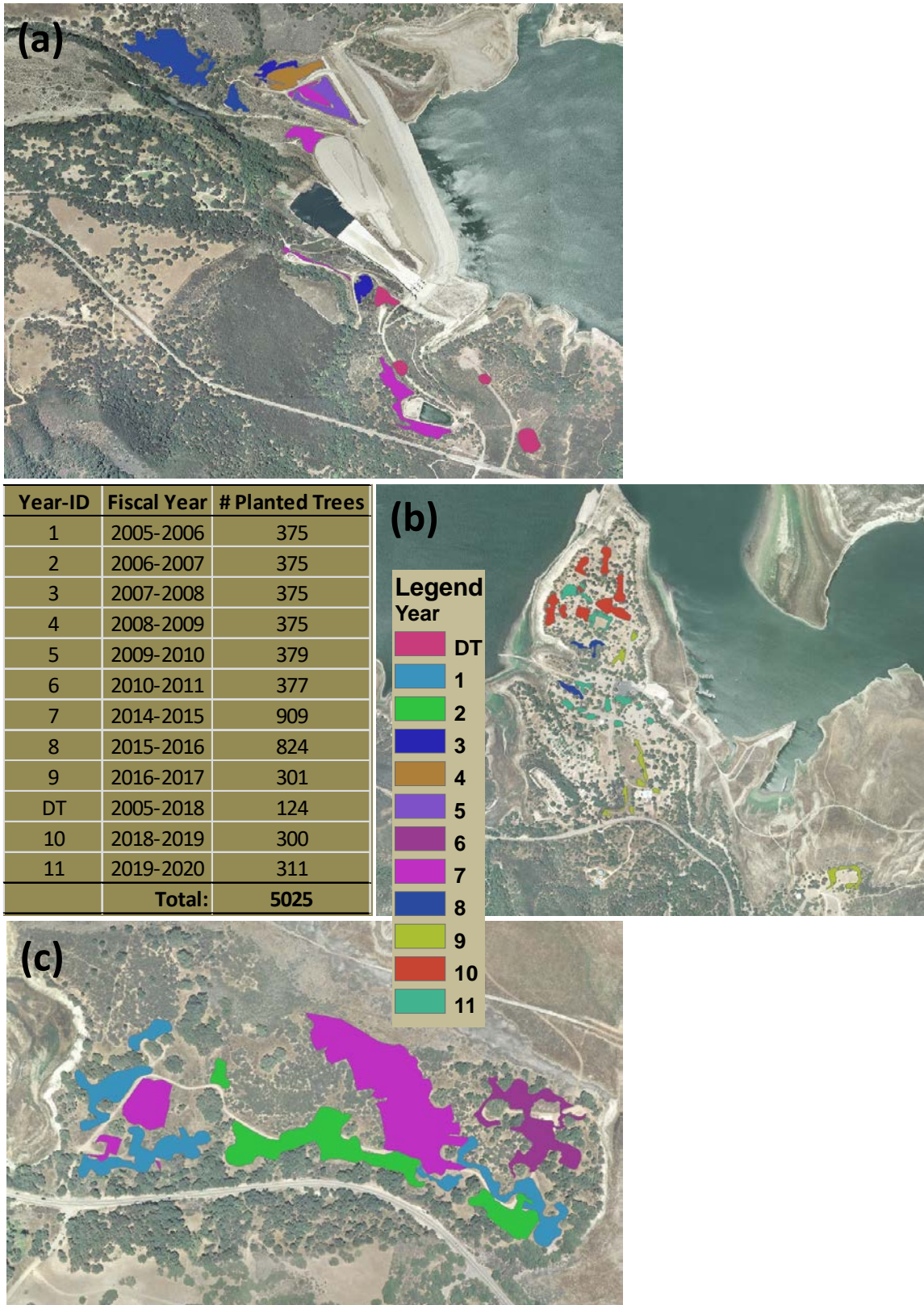


Figure 1: Oak tree planting locations by year planted (Year-ID) at; (a) Bradbury Dam area, (b) Cachuma Lake Recreation Area (County Park), and (c) Storke Flats.



Figure 2: Year 11 trees within Lake Cachuma County Park as mapped in FY19/20.

The following figures and tables are the results of the survey in 2019 with 2018 results included for comparison; overall success rates in 2018 and 2019 (Figures 3 and 4) and success by planting year in 2018 and 2019 (Figures 5-15). The overall success rate went from 78.48% in 2018 to 80.55% in 2019; due to more trees being planted and some dead trees being replaced. Year 11 trees have a 100% success rate and had no comparison to the previous year (Figure 16).

Prior to WY2017, six consecutive years of below average rainfall were observed that made it difficult for planted trees to survive particularly in the Year 1 through Year 6 trees that were thought to be self-sustaining by now at a minimum of eight years since planted. The number of required mitigated trees from the Lake Cachuma Surcharge Project was set in 2015 and reported in the 2015 Lakeshore Survey Report (COMB, 2016). The required mitigation ratio is two to one (2:1) survival rate (self-sustaining) in 2025. The results of the 2015 Lakeshore Survey found there were 879 dead and 1,122 at-risk oak trees. With a 2:1 mitigation ratio and an estimated 18% mortality rate, it was estimated that 4,721 trees would need to be planted to meet our mitigation requirements in 2025. To date, there are 4,092 planted alive trees suggesting that **629** trees (mitigation number minus total alive trees) still need to be planted and soon to get established and be self-sustaining within five years (2025).

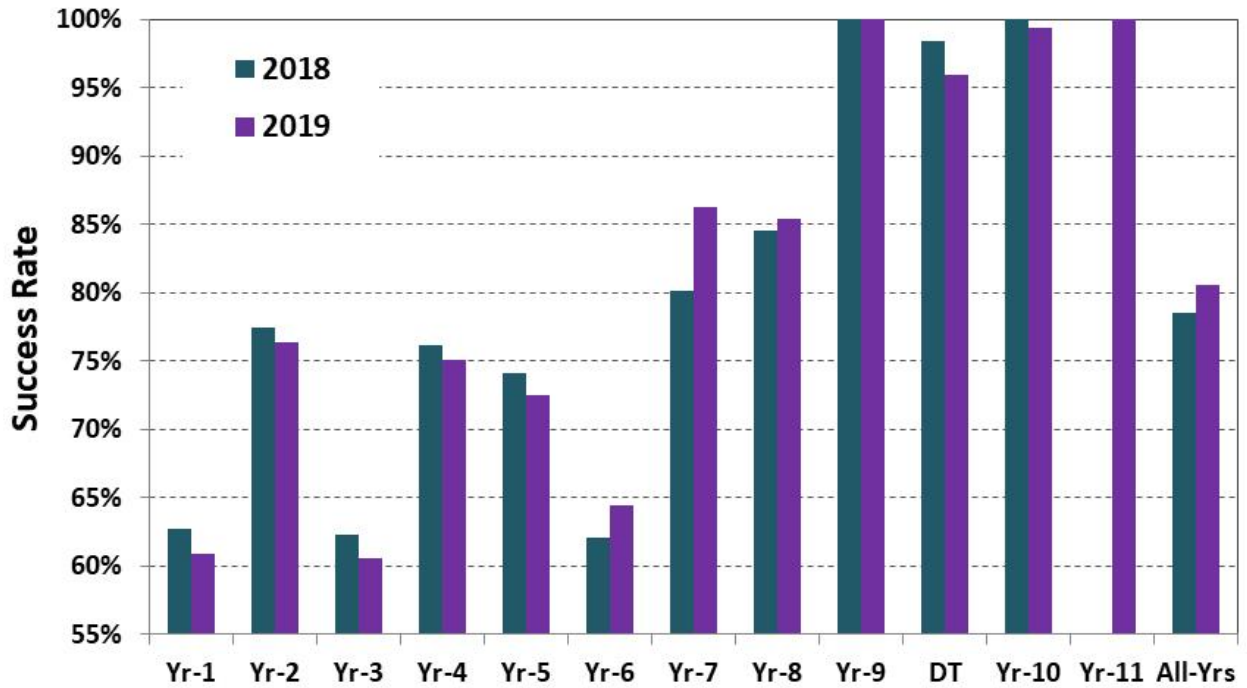


Figure 3: Success rate comparison from 2018 to 2019 for each and all tree years (Yr).

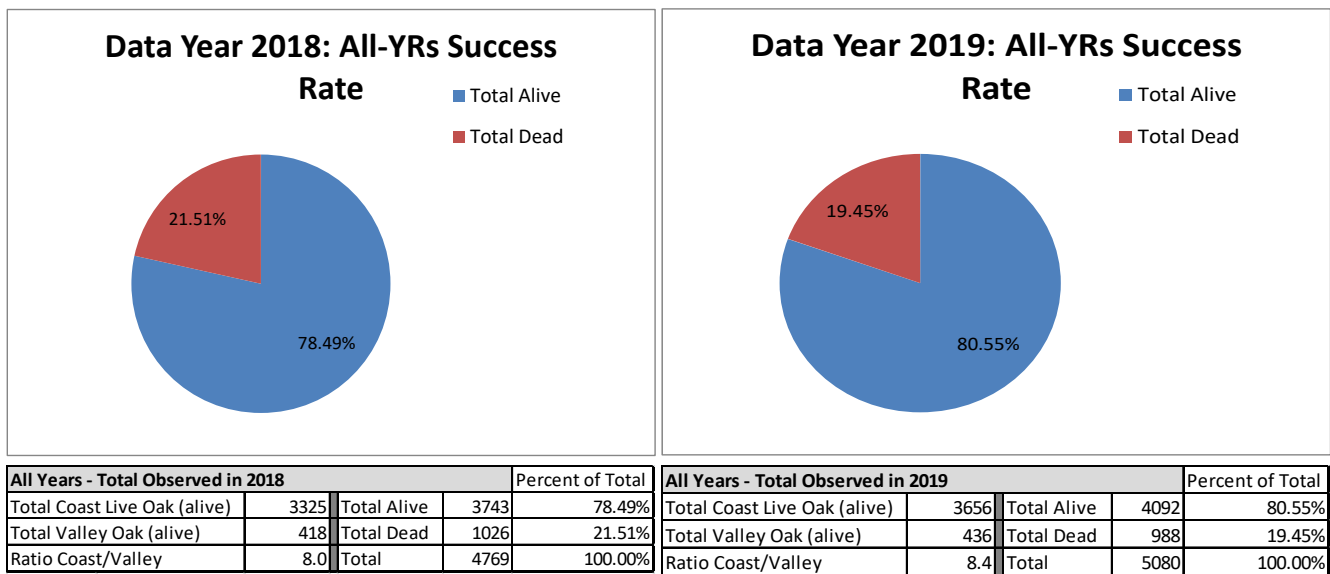
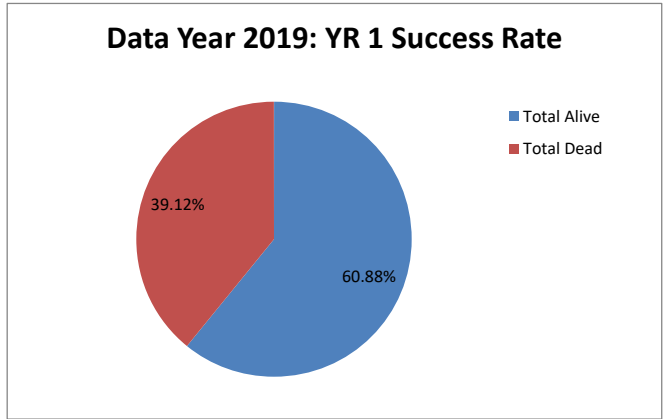
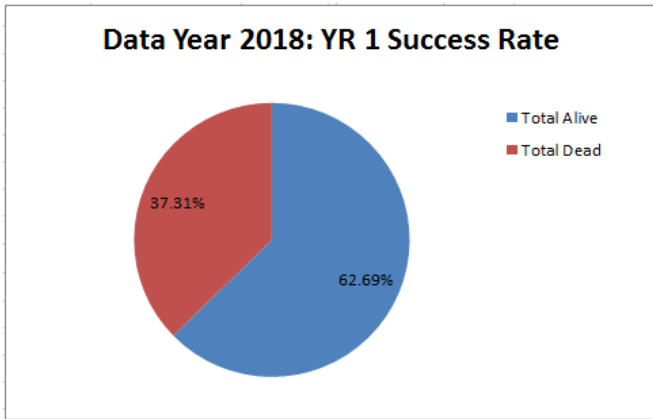


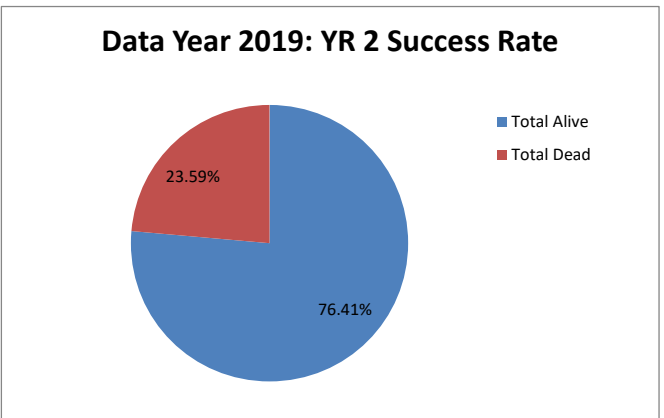
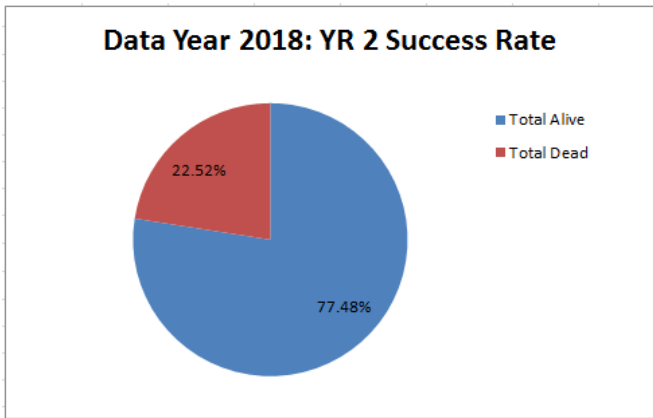
Figure 4: 2018 and 2019 status of oak trees from all years (Years 1 through 11) planted; including DT trees.



Year 1 - Total Observed in 2018				Percent of Total
Total Coast Live Oak (alive)	228	Total Alive	242	62.69%
Total Valley Oak (alive)	14	Total Dead	144	37.31%
Ratio Coast/Valley	16.3	Total	386	100.00%

Year 1 - Total Observed in 2019				Percent of Total
Total Coast Live Oak (alive)	219	Total Alive	235	60.88%
Total Valley Oak (alive)	16	Total Dead	151	39.12%
Ratio Coast/Valley	13.7	Total	386	100.00%

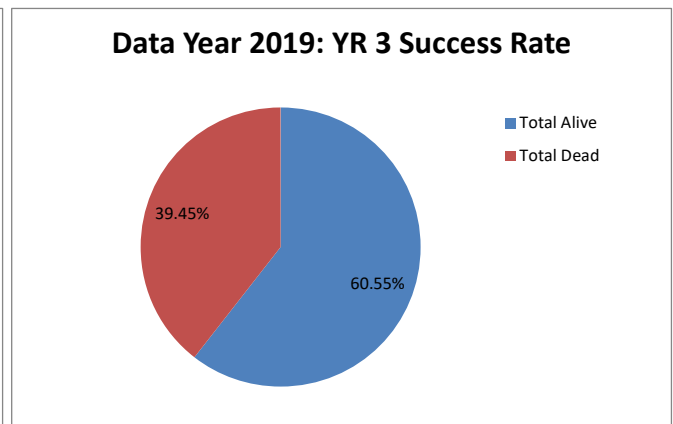
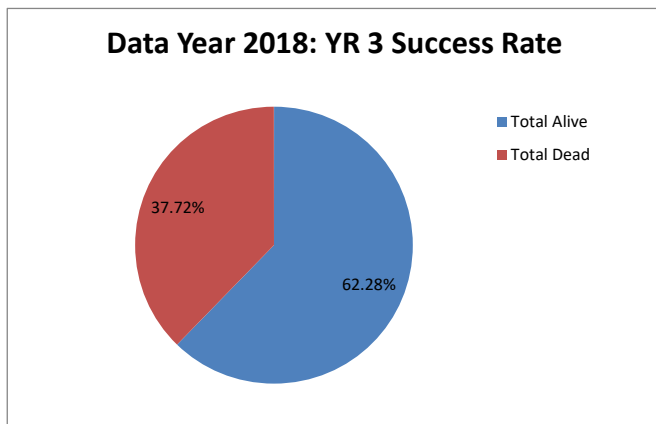
Figure 5: Status comparison of Year 1 trees from 2018 to 2019.



Year 2 - Total Observed in 2018				Percent of Total
Total Coast Live Oak (alive)	267	Total Alive	289	77.48%
Total Valley Oak (alive)	22	Total Dead	84	22.52%
Ratio Coast/Valley	12.1	Total	373	100.00%

Year 2 - Total Observed in 2019				Percent of Total
Total Coast Live Oak (alive)	263	Total Alive	285	76.41%
Total Valley Oak (alive)	22	Total Dead	88	23.59%
Ratio Coast/Valley	12.0	Total	373	100.00%

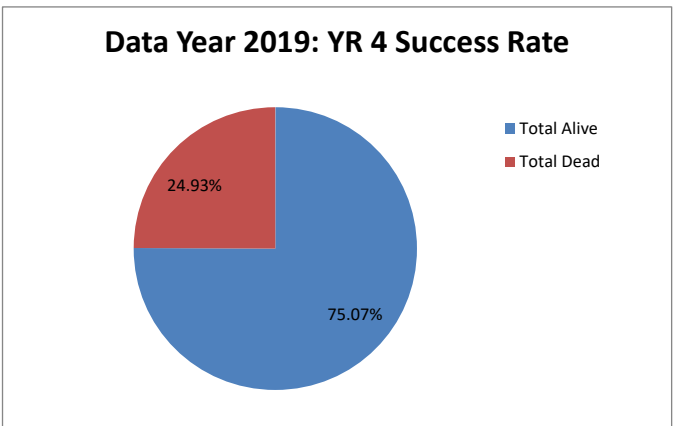
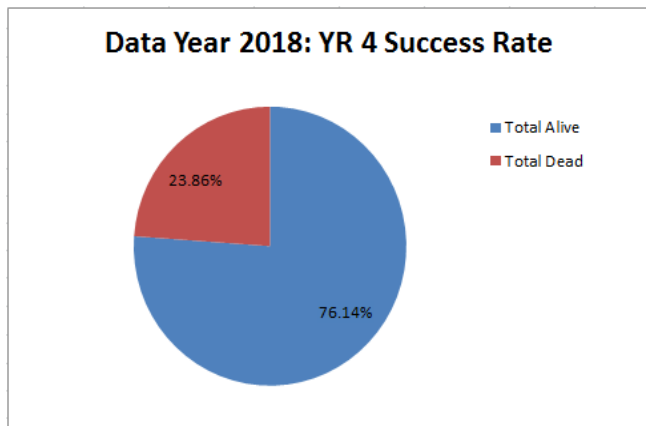
Figure 6: Status comparison of Year 2 trees from 2018 to 2019.



Year 3 - Total Observed in 2018		Percent of Total	
Total Coast Live Oak (alive)	229	Total Alive	251 62.28%
Total Valley Oak (alive)	22	Total Dead	152 37.72%
Ratio Coast/Valley	10.4	Total	403 100.00%

Year 3 - Total Observed in 2019		Percent of Total	
Total Coast Live Oak (alive)	224	Total Alive	244 60.55%
Total Valley Oak (alive)	20	Total Dead	159 39.45%
Ratio Coast/Valley	11.2	Total	403 100.00%

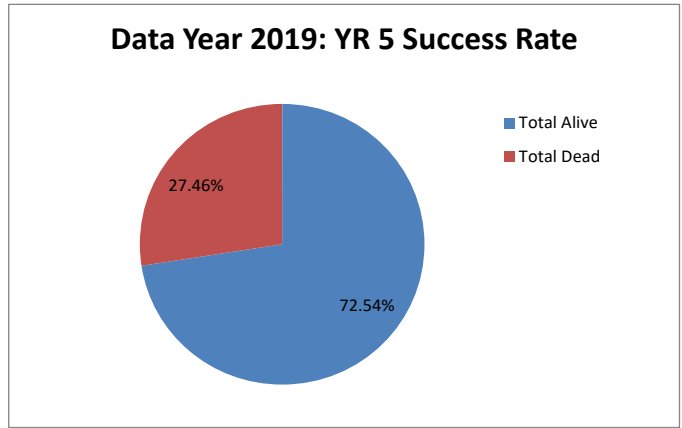
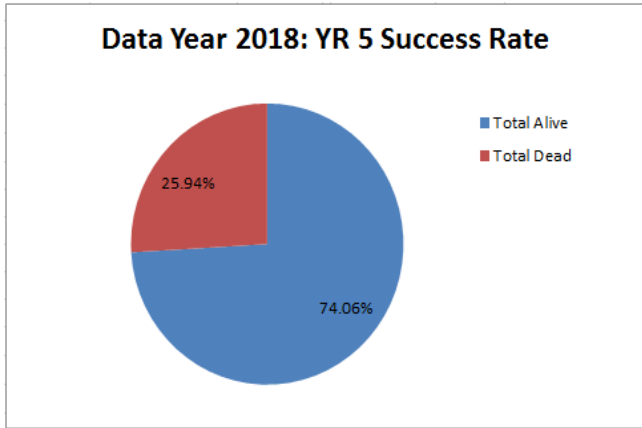
Figure 7: Status comparison of Year 3 trees from 2018 to 2019.



Year 4 - Total Observed in 2018		Percent of Total	
Total Coast Live Oak (alive)	256	Total Alive	284 76.14%
Total Valley Oak (alive)	28	Total Dead	89 23.86%
Ratio Coast/Valley	9.1	Total	373 100.00%

Year 4 - Total Observed in 2019		Percent of Total	
Total Coast Live Oak (alive)	253	Total Alive	280 75.07%
Total Valley Oak (alive)	27	Total Dead	93 24.93%
Ratio Coast/Valley	9.4	Total	373 100.00%

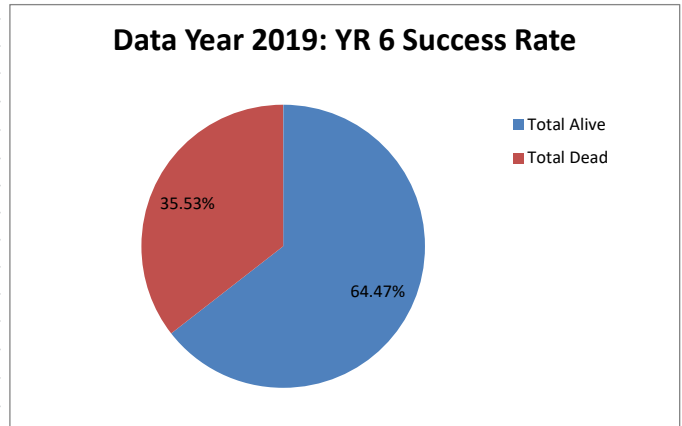
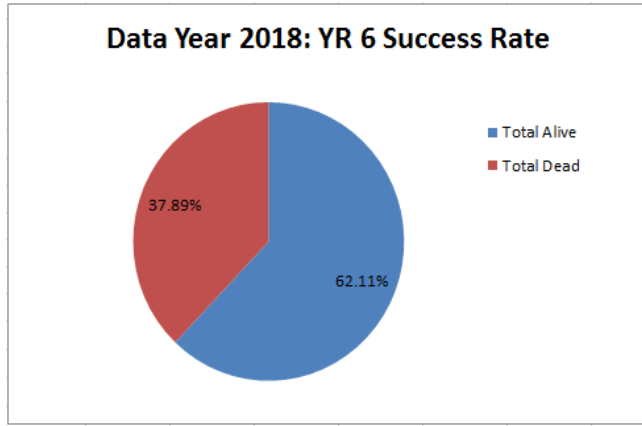
Figure 8: Status comparison of Year 4 trees from 2018 to 2019.



Year 5 - Total Observed in 2018		Percent of Total	
Total Coast Live Oak (alive)	249	Total Alive	294
Total Valley Oak (alive)	45	Total Dead	103
Ratio Coast/Valley	5.5	Total	397
			100.00%

Year 5 - Total Observed in 2019		Percent of Total	
Total Coast Live Oak (alive)	246	Total Alive	288
Total Valley Oak (alive)	42	Total Dead	109
Ratio Coast/Valley	5.9	Total	397
			100.00%

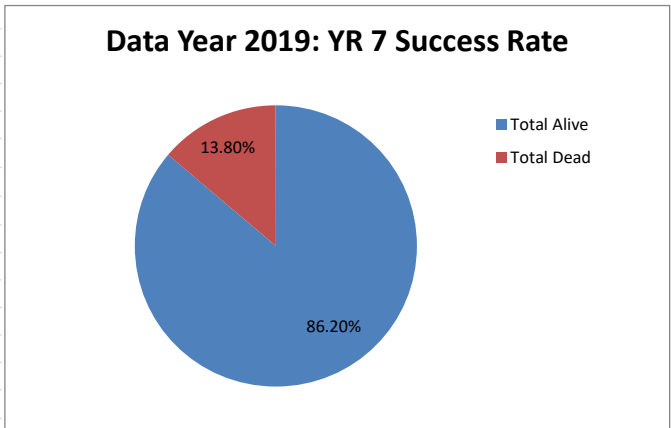
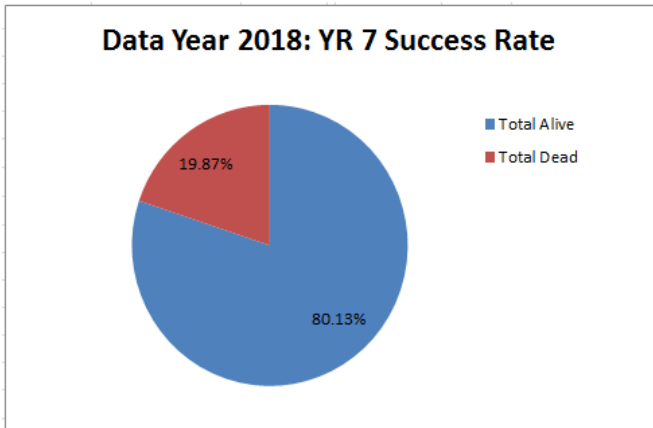
Figure 9: Status comparison of Year 5 trees from 2018 to 2019.



Year 6 - Total Observed in 2018		Percent of Total	
Total Coast Live Oak (alive)	208	Total Alive	236
Total Valley Oak (alive)	28	Total Dead	144
Ratio Coast/Valley	7.4	Total	380
			100.00%

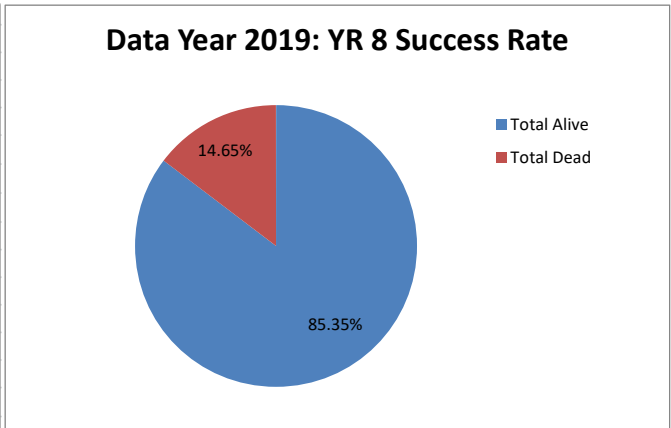
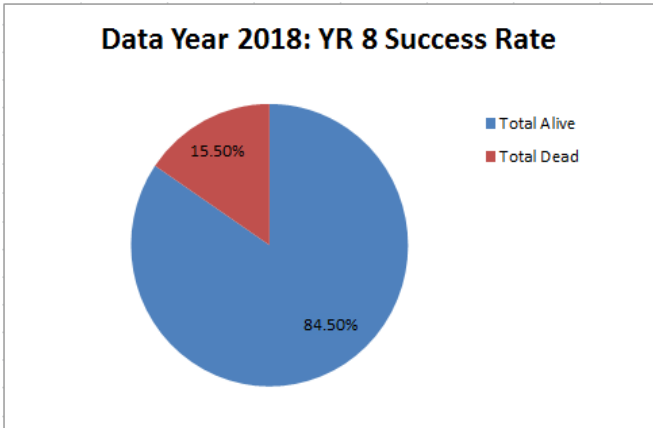
Year 6 - Total Observed in 2019		Percent of Total	
Total Coast Live Oak (alive)	219	Total Alive	245
Total Valley Oak (alive)	26	Total Dead	135
Ratio Coast/Valley	8.4	Total	380
			100.00%

Figure 10: Status comparison of Year 6 trees from 2018 to 2019.



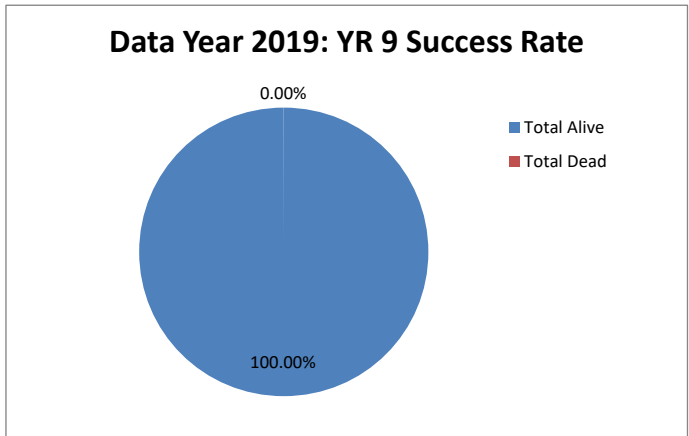
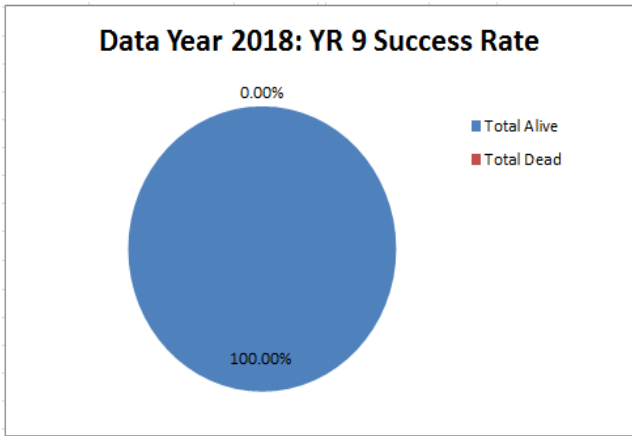
Year 7 - Total Observed in 2018				Percent of Total		Year 7 - Total Observed in 2019				Percent of Total	
Total Coast Live Oak (alive)	593	Total Alive	726	80.13%	Total Coast Live Oak (alive)	648	Total Alive	781	86.20%		
Total Valley Oak (alive)	133	Total Dead	180	19.87%	Total Valley Oak (alive)	133	Total Dead	125	13.80%		
Ratio Coast/Valley	4.5	Total	906	100.00%	Ratio Coast/Valley	4.9	Total	906	100.00%		

Figure 11: Status comparison of Year 7 trees from 2018 to 2019.



Year 8 - Total Observed in 2018				Percent of Total		Year 8 - Total Observed in 2019				Percent of Total	
Total Coast Live Oak (alive)	648	Total Alive	698	84.50%	Total Coast Live Oak (alive)	654	Total Alive	705	85.35%		
Total Valley Oak (alive)	50	Total Dead	128	15.50%	Total Valley Oak (alive)	51	Total Dead	121	14.65%		
Ratio Coast/Valley	13.0	Total	826	100.00%	Ratio Coast/Valley	12.8	Total	826	100.00%		

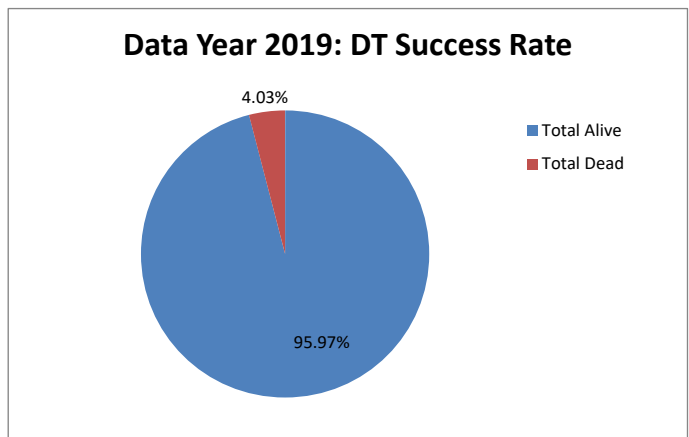
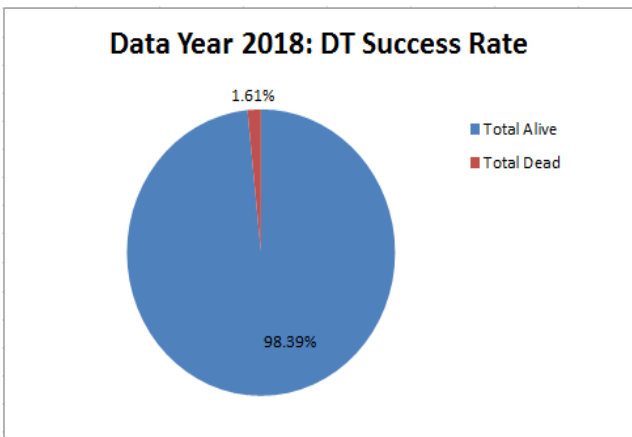
Figure 12: Status comparison of Year 8 trees from 2018 to 2019.



Year 9 - Total Observed in 2018		Percent of Total	
Total Coast Live Oak (alive)	282	Total Alive	301
Total Valley Oak (alive)	19	Total Dead	0
Ratio Coast/Valley	14.8	Total	301
			100.00%

Year 9 - Total Observed in 2019		Percent of Total	
Total Coast Live Oak (alive)	282	Total Alive	301
Total Valley Oak (alive)	19	Total Dead	0
Ratio Coast/Valley	14.8	Total	301
			100.00%

Figure 13: Status comparison of Year 9 trees from 2018 to 2019.



DT - Total Observed in 2018		Percent of Total	
Total Coast Live Oak (alive)	94	Total Alive	122
Total Valley Oak (alive)	28	Total Dead	2
Ratio Coast/Valley	3.4	Total	124
			100.00%

Year 10 - Total Observed in 2019		Percent of Total	
Total Coast Live Oak (alive)	269	Total Alive	298
Total Valley Oak (alive)	29	Total Dead	2
Ratio Coast/Valley	9.3	Total	300
			100.00%

Figure 14: Status comparison of DT trees from 2018 to 2019.

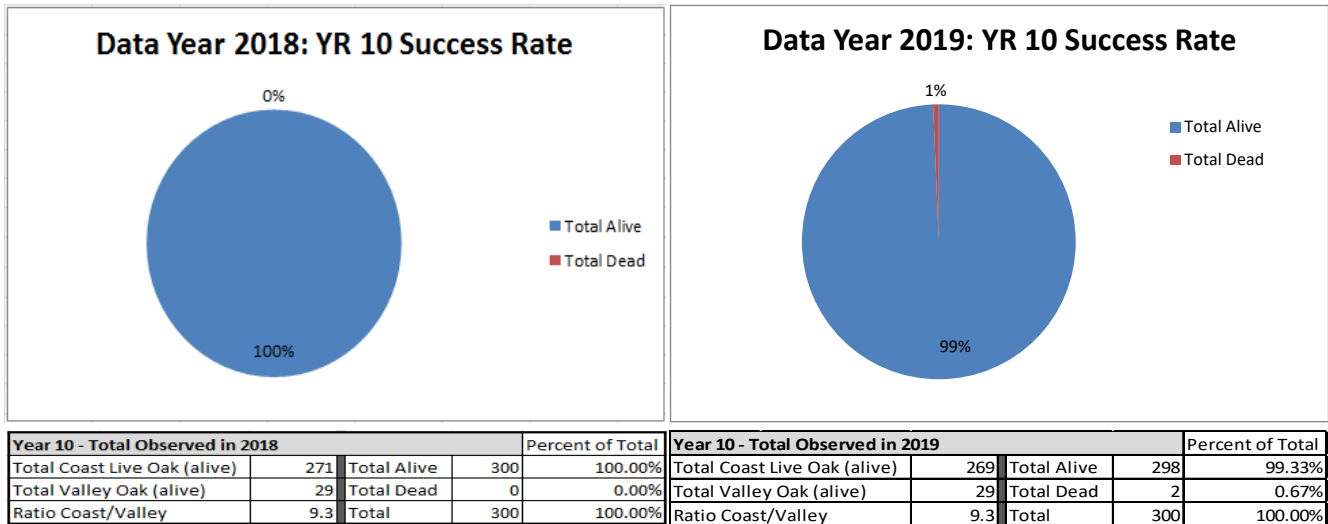


Figure 15: Status comparison of Year 10 trees from 2018 to 2019.

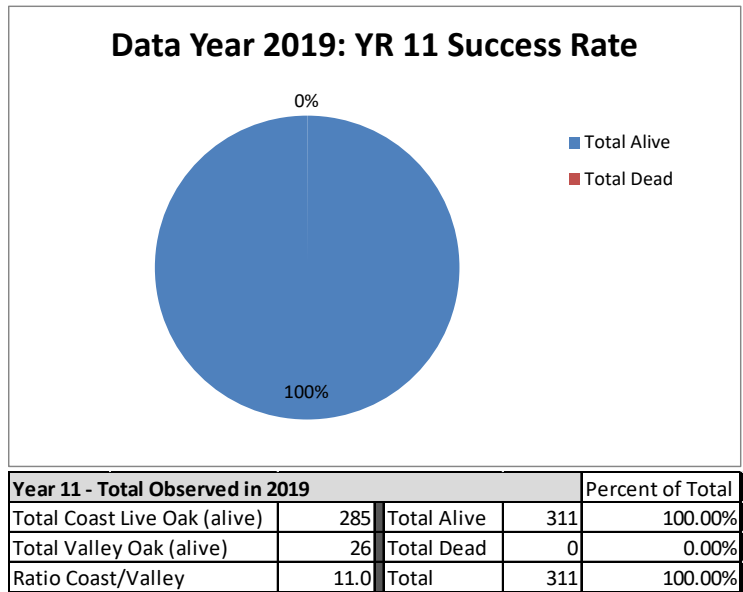


Figure 16: Year 11 trees planted in 2019.

Maintenance

Maintenance of all planted oak trees in FY19/20 included irrigating, weeding, mulching, and deer cage maintenance is presented in Table 1. The total amount of water used from Lake Cachuma to irrigate oak trees from all year classes in FY19/20 was 1.33 acre-feet which was slightly lower than last year at 1.41 acre-feet due to late spring rainfall in 2020 and a delayed start to the current irrigation season (Table 2).

Table 1: Cachuma Oak Tree Restoration Program completed maintenance in FY19/20.

	July 2019	Aug 2019	Sept 2019	Oct 2019	Nov 2019	Dec 2019	Jan 2020 ²	Feb 2020 ²	March 2020 ²	April 2020 ²	May 2020	June 2020
Year 11 Oaks (2019-2020)							New Trees Gopher Baskets Fert/Comp Deer Cages Mulch/Irrigated	New Trees Gopher Baskets Fert/Comp Deer Cages Mulch/Irrigated	Weeded	Weeded	Weeded	Irrigated Weeded
Year 10 Oaks (2018-2019)	Irrigated Weeded	Irrigated Weeded		Irrigated Weeded		Planted ¹		Irrigated	Irrigated Weeded	Weeded	Weeded	
Year 9 Oaks (2016-2017)	Irrigated Weeded		Irrigated Weeded Mulched	Irrigated Weeded	Deer Cages	Planted ¹					Weeded	
Year 8 Oaks (2015-2016)	Irrigated Weeded	Irrigated Weeded	Irrigated Weeded Mulched		Irrigated Mulched Deer Cages	Planted ¹			Mulched		Weeded Mowed	
Year 7 Oaks (2014-2015)	Irrigated Weeded	Irrigated Weeded Deer Cages	Irrigated Weeded	Mulched Weeded	Mulched Weeded Deer Cages	Mulched Weeded		Irrigated Irrigated	Irrigated Irrigated		Mowed	
Year 6 Oaks (2010-2011)											Mowed	
Year 5 Oaks (2009-2010)												
Year 4 Oaks (2008-2009)												
Year 3 Oaks (2007-2008)												
Year 2 Oaks (2006-2007)												
Year 1 Oaks (2005-2006)												
¹ Dead trees replaced												
² Oak tree inventory												

Table 2: Cachuma Oak Tree Restoration Program water usage from Lake Cachuma for irrigation during FY19/20.

	Gallons	Acre-feet
July	135,725	0.417
August	96,250	0.324
September	79,950	0.245
October	38,475	0.118
November	46,300	0.142
December	1,000	0.003
January	8,000	0.025
February	3,000	0.009
March	3,800	0.012
May	3,600	0.011
June	7,250	0.022
Total:	423,350	1.33

Financials

Annual expenses by Fiscal Year since the beginning of the Lake Cachuma Oak Tree Restoration Program in FY05/06 are presented in Table 3. The totals include COMB staff (plus burden) and consulting arborist hours, material, supplies, fuel expenses, GPS mapping, conducting the annual inventory, replanting trees over the period, and reporting. The breakout for those costs is presented by

labor (Table 4) and the total cost (labor, materials, and supplies) (Table 5). The financials do include the Year 11 planting and mapping efforts.

Table 3: Total program costs by Fiscal Year including planting, maintenance, mapping, conducting the annual inventory, and reporting by year (Year-ID) and number of trees planted during those years.

# of Years	Fiscal Year	Operator	Year-ID	# Planted Trees	Cost
1	2005-2006	Fournier	1	375	\$116,731
2	2006-2007	Fournier	2	375	\$117,620
3	2007-2008	Fournier	3	375	\$138,786
4	2008-2009	Fournier	4	375	\$137,872
5	2009-2010	Fournier	5	379	\$136,900
6	2010-2011	Fournier	6	377	\$137,878
7	2011-2012	Fournier	-	-	\$79,439
8	2012-2013	COMB	-	-	\$101,431
9	2013-2014	COMB	-	-	\$48,097
10	2014-2015	COMB	7	909	\$134,054
11	2015-2016	COMB	8	824	\$128,241
12	2016-2017	COMB	9	301	\$101,227
13	2005-2018	COMB	DT	124	\$128,752
14	2018-2019	COMB	10	300	\$120,573
15	2019-2020	COMB	11	311	\$140,775
			Total:	5025	\$1,768,377

Table 4: Labor costs for the Lake Cachuma Oak Tree Program during FY19/20.

	Total
COMB Staff (hours):	
Seasonal Biologist Aide A	522.5
Seasonal Biologist Aide B	629.75
Seasonal Biologist Aide C	85
Seasonal Biologist Aide D	1013
Water Service Worker I	164.5
Water Service Worker III	51
Water Service Worker I	138
Water Service Worker III	93
Biologist Assistant	1061
Project Biologist A	30
Project Biologist B	118.5
Senior Resource Scientist	84.81
Total Staff Hours:	3991
Cost - Labor plus burden	117,616.93
Consultant Service Hours (Ken Knight):	12.5
Consultant Cost	\$1,250.00
Total Personnel /Consultant Cost	\$118,866.93

Table 5: Total expenses (labor, materials and supplies) for the Lake Cachuma Oak Tree Program during FY19/20.

	Total
Materials and Supplies:	
Oak trees	\$7,102.90
Tree stakes	\$495.58
Tree tags	\$151.09
Mulch	\$642.48
Compost	\$803.49
Fertilizer	\$155.92
Gopher baskets	\$1,672.82
Protective deer caging/netting	\$1,890.94
Hand tools	\$478.69
Hoses	\$322.37
PPE	\$98.61
Cable ties	\$144.43
Roadbase	\$992.12
Equipment mobilization	\$1,088.41
Honda water pump	\$1,068.47
Vehicle Fuel Cost	\$1,339.59
Equipment Fuel Cost (incl. diesel H2O truck)	\$3,460.08
Total Materials and Supplies	\$21,907.98
TOTAL EXPENSES (labor, materials + supplies)	\$140,774.91

The total cost of the Lake Cachuma Oak Tree Restoration Program in FY19/20 was \$140,775 which includes any replanting and mapping costs of the Year 11 trees. Again, the total reflects personnel cost (labor plus burden), materials, supplies, expenses (vehicle and equipment fuel), and consultant fees. For comparison, during the first six years of the project annual consultant costs were approximately \$136,000 to plant approximately 375 and maintain the previously planted trees. In FY16/17, COMB staff planted 301 trees and maintained all previously planted trees (4,290 trees) at a cost of \$101,227. The ability to keep costs down is attributed to multiple factors, which include but are not limited to:

- Relying on the COMB Fisheries Division seasonal staff to conduct the bulk of field activities.
- Minimizing the amount of full-time staff being used.
- Reduced equipment needs as the bulk of purchases occurred during the fiscal year when COMB took over the project.
- Reduced consultant hours due to staff gaining more tree care experience.
- Reduced vehicle gas consumption as some of the seasonal staff live in the Santa Ynez Valley and use their own vehicles to travel to oak tree locations.
- A wet year that reduced the number of days staff had to water the trees.
- Reduced equipment (generator/pumps) gas consumption from more efficient irrigation hosing and better delivery technique for extracting water from Lake Cachuma.
- Repurposed salvaged deer cages and stakes from Program trees over 6 feet in height.

Summary and Recommendations for Program Improvements

There are 4,092 (including Year 11 trees) alive oak trees attributed to the mitigation effort of the Program. The survival rate to date is 80.55% (Years 1-11 and DT trees) which would be considered very respectful in any open range oak tree planting effort in a similar climate. The number of mitigation trees still to be planted is **629** trees. It is recommended to continue planting next year 300-500 more mitigation trees depending on the projection for a normal to wet year.

Challenges for the Program, specifically tree survival, are six of the last nine years of the Program experienced extraordinary drought conditions (WY2012-WY2020, except WY2017, WY2019, and WY2020), inadequate initial planting methodology during the first six years (compromised gopher wire baskets, trees planted too low, deer cages removed too soon, auger hole planting, etc.), and a limited staff to take care of an extensive number of trees. Some planting areas have better soils and topography than others, for example the Year 3 planting area has shallow soils with southern exposure whereas the Year 7 planting area is just the opposite.

Lessons learned by the COMB staff from eight years of conducting this Program have been put into practice and are recommended for future work, specifically:

- Systematically mulching all trees once a year, particularly newly planted trees (Figure 17).
- Maintain deer cages for all trees below deer browsing level (approximately 6 feet).
- Clear the dirt away from the tree trunk base.
- Expose gopher wire baskets at the surface wherever possible to prohibit gopher travel over the top of the wire basket.
- Plant new trees in professional gopher wire baskets using backhoe dug holes (no auger holes that limit the spread of tree roots) (Figure 18a); plant the trees slightly above grade to accommodate subsidence; and use sturdy wire deer cages instead of netting or chicken wire.
- Plant well established trees from the nursery (at least a foot tall) instead of acorns as they have a better success rate.
- Structurally pruned planted trees grow larger, taller and faster than unpruned trees thus becoming more likely to survive and be self-sustaining.
- Carefully mow and/or weed-whack around trees for weed control and grade access roads to facilitate access for all maintenance tasks (Figure 19).
- Continue to use Grow-Tubes as they appear to be quite successful particularly in areas with poor soils and where surface rodent impacts are noticed, such as near brushy natural vegetation found along the margins of planting areas. Remove the Grow-Tubes once the trees are taller than the tube (Figure 18b training on Grow-Tube removal and tree tying).
- Wrap the bottom of deer cages with fine mesh shade cloth to prohibit surface rodents from accessing planted trees in areas near the margins of planting areas.
- Gather acorns from the local area in August for Valley Oaks and September for Coast Live Oaks to be germinated and grown at a nursery for future plantings.
- Continue to carefully conduct the tree inventory to maximize accuracy and Program results (Figure 20).
- Reconfigure the Water Truck to use an external pump motor and newly configured delivery system to enable pumping of the water without running the diesel truck motor to improve engine longevity (Figure 21).
- Clear brush near any planted trees to discourage herbivory of Program trees.



Figure 17: Tree mulching and watering of Year 7 trees at Storke Flats.



Figure 18: Oak Tree Program showing (a) digging with a backhoe and planting Year 11 trees at Santa Barbara County Park, and (b) hired arborist training staff on Grow-Tube removal and tree tying.

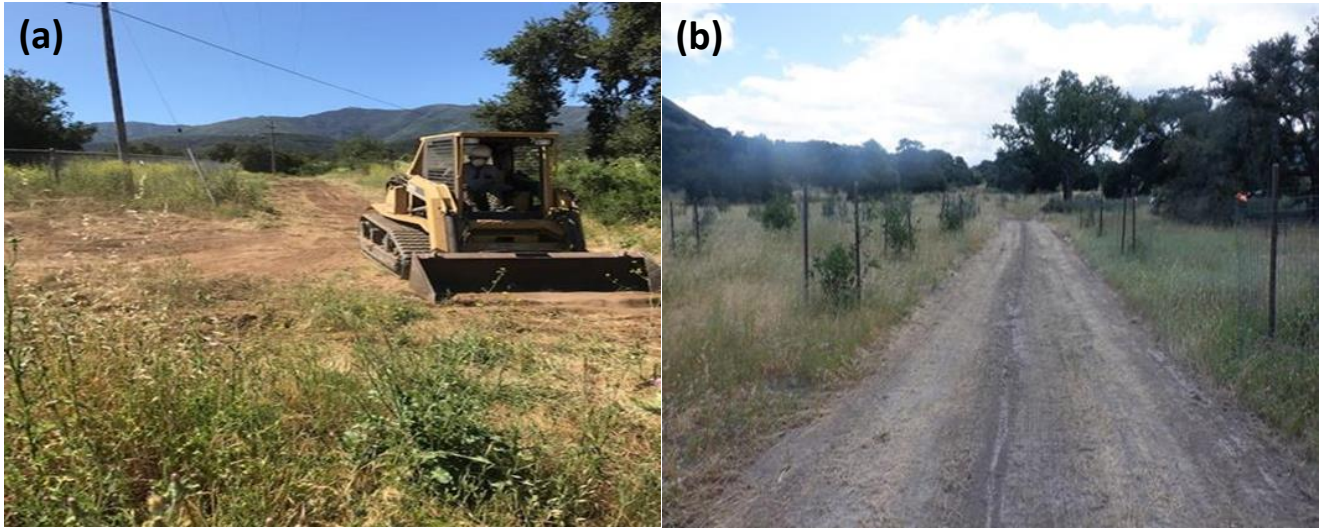


Figure 19: Area maintenance showing (a) grading and clearing access road near the Wastewater Treatment Plant, and (b) grading completed at Long Pool Flat.



Figure 20: Annual oak tree inventory showing (a) GPS point gathering and measuring a newly planted Year 11 tree, and (b) measuring the height of a mature Year 5 tree.



Figure 21: Water tanker truck with newly installed Honda pump motor on rear.

References

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