

San Diego Association of Governments
Navajo and Chollas Radio Canyon Coastal Cactus Wren Habitat Restoration Project
Final Report
Project Period: November 2018 to November 2020
SANDAG Contract Number: 5005501

Executive Summary

Coastal Cactus Wrens in San Diego County are threatened by habitat loss and fragmentation that has resulted from rapid urbanization, frequent wildfires, and invasive plant species that reduce habitat quality. The Management Strategic Plan for Conserved Lands in Western San Diego County (SDMMP) lists Coastal Cactus Wren (*Campylorhynchus brunneicapillus*) as a priority SO species. Navajo Canyon Open Space and Chollas Radio Canyon Open Space both have recent recorded occurrences of Coastal Cactus Wren.

The primary goal is to create, enhance and expand existing Coastal Cactus Wren (CACW) habitat and reduce the threat of wildfire and invasive plant conversion by replacing areas of invasive flashy fuels with native cactus in City of SD Chollas Radio Canyon and Navajo Canyon Open Spaces. The main objectives to reach these goals are 1) to perform brush removal and invasive weed control within newly proposed and existing CACW sites, and 2) harvest and plant cactus cuttings from existing mature native prickly pear and coast cholla to create more CACW habitat. Urban Corps crews will be hired to perform initial and ongoing brush and weed clearing so that City staff can perform herbicide applications to control the weeds in the CACW habitat. Urban Corps labor will also be used to harvest cactus cuttings from existing specimens onsite at both locations and install them in the CACW habitat enhancement sites. Urban Corps crews will also be used to install erosion control materials. City staff will oversee and manage the project. This project will build on past projects performed by AECOM and Urban Corps that worked to create and enhance Coastal Cactus Wren habitat in Chollas Radio Canyon Open Space.

Installation of cactus and implementation of weed management activities at these locations and at other City of San Diego conserved lands has proven to be successful in reducing flashy fuels and improving overall habitat quality. Furthermore, research by Conlisk et al. (2014) suggests that the best strategy for conservation of Coastal Cactus Wren is to enhance and expand habitat in areas that are already occupied by wrens. Cactus wren were observed nesting in both Navajo and Chollas Radio Open Spaces in December 2017; therefore, habitat enhancement and expansion in these areas is likely to contribute to successful conservation of this species.

The project was implemented with intensive dethatching and then follow up spraying was conducted that reduced thatch cover by 95% and annual weed cover was reduced by at least 75% if not more in some locations. A total of 500 cactus between the two sites were proposed to be installed, but in the end a total of 1,825 Coastal Cholla (*Cylindropuntia prolifera*) and Coastal Prickly Pear (*Opuntia littoralis*) cactus cuttings were harvested and planted at Navajo Canyon and 2,153 cactus cuttings were harvested and planted at Chollas Radio Canyon during this project. These counts do not include hundreds of smaller cactus pieces that fell off in the restoration sites during planting and transport. Large multi-branched cactus cuttings up to one meter in height were harvested either from onsite in the same canyon location or a nearby city managed location. To give the appearance of a more established habitat and so that the restoration sites would fill in sooner large cactus cuttings were used. 403 coastal sage scrub habitat plants were also planted along with cactus cuttings brought in from a nearby location in a restoration site on a steep slope at Navajo Canyon that had limited cactus onsite available for

cuttings. Two hundred pounds of native plant seed were also broadcast. A total of 1.96 acre of cactus restoration and .10 acre of coastal sage scrub restoration occurred during this project.

For future management the sites should be continued to be monitored for new and reoccurring threats. Follow up trash pickup, maintenance and weed control will need to be done a few times per year until the cactus patches are mature enough to produce viable Cactus Wren habitat. The installed container plants will need to be maintained through the Spring and Summer of 2021 to fill in the slope area.

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Project Background

Coastal Cactus Wrens in San Diego County are threatened by habitat loss and fragmentation that has resulted from rapid urbanization, frequent wildfires, and invasive plant species that reduce habitat quality. The Management Strategic Plan for Conserved Lands in Western San Diego County (SDMMP) lists Coastal Cactus Wren (*Campylorhynchus brunneicapillus*) as a priority SO species. Navajo Canyon Open Space and Chollas Radio Canyon Open Space both have recent recorded occurrences of Coastal Cactus Wren.

The proposed habitat enhancement areas are located on City of San Diego Open Space land in the Allied Gardens/Del Cerro and Emerald Hills/Encanto areas. It is within the City of San Diego's Multi-Habitat Planning Area of the City's MSCP. The enhancement areas are within the MSP Management Unit 2. See attached maps.

The proposed project will enhance and expand existing Coastal Cactus Wren habitat and reduce the threat of wildfire and invasive plant conversion by replacing areas of invasive flashy fuels with native cactus in City of San Diego owned and dedicated Chollas Radio Canyon and Navajo Canyon Open Spaces. Contracted crews will be hired to perform brush and invasive weed clearing to remove the dead thatch so that City staff can perform multiple as needed herbicide applications to control the weeds in existing and newly planted cactus patches. Contracted crews will also harvest cactus pads from existing mature cactus at both locations and install them in the proposed habitat enhancement sites. Additionally, erosion control materials will be installed on a steep canyon edge in one of the proposed habitat enhancement areas that is currently heavily invaded by annual forbs and grasses. This project will build on past projects performed by AECOM and Urban Corps that worked to create and enhance Coastal Cactus Wren habitat in Chollas Radio Canyon Open Space.

Installation of cactus and implementation of weed management activities at these locations and at other City of San Diego conserved lands has proven to be successful in reducing flashy fuels and improving overall habitat quality. Furthermore, research by Conlisk et al. (2014) suggests that the best strategy for conservation of Coastal Cactus Wren is to enhance and expand habitat in areas that are already occupied by wrens. Cactus wren were observed nesting in both Navajo and Chollas Radio Open Spaces in December 2017; therefore, habitat enhancement and expansion in these areas is likely to contribute to successful conservation of this species.

Project Goals

The primary goal is to create, enhance and expand existing Coastal Cactus Wren (CACW) habitat and reduce the threat of wildfire and invasive plant conversion by replacing areas of invasive flashy fuels with native cactus in City of San Diego managed Chollas Radio Canyon and Navajo Canyon Open Spaces. The main objectives to reach these goals are 1) to perform brush removal and invasive weed control within newly proposed and existing CACW sites, and 2) harvest and plant cactus cuttings from existing mature native prickly pear and coast cholla to create more CACW habitat. Contracted crews will be hired to perform initial and ongoing brush and weed clearing so that City staff can perform herbicide applications to control the weeds in the CACW habitat. Contracted crew labor will also be used to harvest cactus cuttings from existing specimens onsite at both locations and install them in the CACW habitat enhancement sites. Contracted crews will also be used to install erosion control materials. City staff will oversee and manage the project. This project will build on past projects performed by AECOM and Urban Corps that worked to create and enhance Coastal Cactus Wren habitat in Chollas Radio Canyon Open Space.

The expected results are as follows:

- Existing patches of Coastal Cactus Wren habitat will be enhanced and expanded allowing existing populations to thrive and disperse into new areas.
- Degraded habitat that is currently dominated by nonnative forbs and grasses will be converted to high quality cactus scrub.
- Wildfire impacts will be reduced by replacing flashy annual fuels with over 500 perennial cactus propagules.
- Intensive dethatching treatments will reduce thatch and thick nonnative brush cover by 95%.
- As needed herbicide treatments will reduce annual weed cover by 75%.

Work Performed by Task

Task 1- Implementation

Budget: \$75,000 (from grant agreement)

Spent: \$74,716.59

The detailed work completed for Task 1 is listed below by date with corresponding pictures displayed above the date and details for some of the dates worked. Yes, there were some issues encountered during Task 1 Implementation. Project Task 1 Implementation was delayed by internal City purchasing and contracting issues that delayed getting contractors setup to do the work, contracted crew delays because of availability and wildfires, significant precipitation causing access issues, and Covid-19 delays.

Purchasing and contracting issues were resolved by using multiple contractors and having patience navigating through the City of San Diego contracting process. Contracted crew availability was limited at times because of other obligations that included CCC crews being needed to fight wildfires during

Summer and Fall of 2020. This was resolved by using other crews or waiting for the crews to be available. Significant precipitation caused exhausting amounts of non-native weeds and safety access issues to some sloped areas not allowing implementation or maintenance to be done that had to wait to be completed later when safe to do so. At the beginning of the Covid-19 pandemic in Spring 2020 City staff and contractors were limited in working and performing site maintenance, but health and safety protocols were put into place and allowed work to continue. Overall timelines of the whole project were thrown off because of the delays and a 6-month extension was needed to be able to complete the scope of work. Once the issues were resolved the tasks and scope of work were completed under budget and funding remained to purchase and install container plants, perform more weed control and install additional cactus.

Intensive dethatching and then follow up spraying reduced thatch by 95% and annual weed cover was reduced by at least 75% if not more in some locations. A total of 500 cactus between the two sites were proposed to be installed, but in the end a total of 1,825 Coastal Cholla (*Cylindropuntia prolifera*) and Coastal Prickly Pear (*Opuntia littoralis*) cactus cuttings were harvested and planted at Navajo Canyon and 2,153 cactus cuttings were harvested and planted at Chollas Radio Canyon during this project. These counts do not include hundreds of smaller cactus pieces that fell off in the restoration sites during planting and transport. Large multi-branched cactus cuttings up to one meter in height were harvested either from onsite in the same canyon location or a nearby city managed location. To give the appearance of a more established habitat and so that the restoration sites would fill in sooner large cactus cuttings were used. 403 coastal sage scrub habitat plants were also planted along with cactus cuttings brought in from a nearby location in a restoration site on a steep slope at Navajo Canyon that had limited cactus onsite available for cuttings. A total of 1.96 acre of cactus restoration and .10 acre of coastal sage scrub restoration occurred during this project.

Follow up trash pickup, maintenance and weed control will need to be done annually before the cactus patches are mature enough to produce viable Coastal Cactus Wren habitat. The installed container plants will need to be maintained through the Spring and Summer of 2021 to fill in the slope area.



On 5/20/19 a City of San Diego provided contracted crew weed whacked invasive plants on the flat mesa top at the Navajo Canyon Carthage/Eldridge location.

On 6/5/19 City of San Diego staff sprayed and weed whacked invasive plants and picked up trash on the slope and flat mesa top at the Navajo Canyon Carthage/Eldridge location.

On 9/3/19 trash was picked up at Chollas Radio Canyon and restoration sites were photo documented.

On 9/3/19 trash was picked up at Navajo Canyon and restoration sites were photo documented.

On 10/24/19 City staff performed weed control and hand pulled Stinkwort (*Dittrichia graveolens*) at Navajo Canyon restoration sites.

On 10/29/19 City staff performed weed control and hand pulled Stinkwort (*Dittrichia graveolens*) at Navajo Canyon and trash was picked up at Navajo Canyon.

On 11/7/19 City staff applied herbicide to non-native Acacia tree at Chollas Radio Canyon restoration site.



On 12/5/19 Habitat West crew harvested and planted large multi-branch Coastal Cholla (*Cylindropuntia prolifera*) and Coastal Prickly Pear (*Opuntia littoralis*) cuttings at Chollas Radio Canyon restoration site locations. City staff picked up trash and raked site for cactus planting. Above pictures.





On 12/6/19 Habitat West crew harvested and planted large multi-branch Coastal Cholla (*Cylindropuntia prolifera*) and Coastal Prickly Pear (*Opuntia littoralis*) cuttings at Chollas Radio Canyon restoration site locations. City staff applied herbicide to two non-native Pepper trees, spread native plant seed, installed 10 sand bags and two straw wattles. Above picture before and after.

On 12/9/19 – 12/10/19 Habitat West crew harvested and planted large multi-branch Coastal Cholla (*Cylindropuntia prolifera*) and Coastal Prickly Pear (*Opuntia littoralis*) cuttings at Chollas Radio Canyon restoration site locations.

On 12/11/19 Habitat West crew harvested and planted large multi-branch Coastal Cholla (*Cylindropuntia prolifera*) and Coastal Prickly Pear (*Opuntia littoralis*) cuttings at Navajo Canyon restoration site locations. Alpha Project crew weed whacked and cut down non-native Olive tree in restoration sites at Navajo Canyon.



On 12/12/19 Alpha Project crew weed whacked dry weeds, cut down non-native Acacia and Pepper trees, picked up trash and installed 10 straw wattles in eroding areas at Chollas Radio Canyon restoration site locations. City staff spread native plant seed in restoration sites. Above picture.

On 12/13/19 Alpha Project crew weed whacked dry weeds, cut down non-native trees and installed straw wattles in eroding areas at Chollas Radio Canyon restoration site locations. City staff applied herbicide to non-native weeds in restoration sites.

On 12/19/19 Habitat West crew harvested and planted large multi-branch Coastal Cholla (*Cylindropuntia prolifera*) and Coastal Prickly Pear (*Opuntia littoralis*) cuttings at Navajo Canyon restoration site locations.



On 12/27/19 Habitat West crew harvested and planted large multi-branch Coastal Cholla (*Cylindropuntia prolifera*) and Coastal Prickly Pear (*Opuntia littoralis*) cuttings at Navajo Canyon restoration site locations. Above pictures.

On 2/13/20 City staff applied herbicide to non-native weeds at Navajo Canyon restoration site.



On 2/18/20 City staff applied herbicide to non-native weeds at Navajo Canyon restoration site. Above picture.

On 2/25/20 City staff applied herbicide to non-native weeds at Navajo Canyon restoration site.

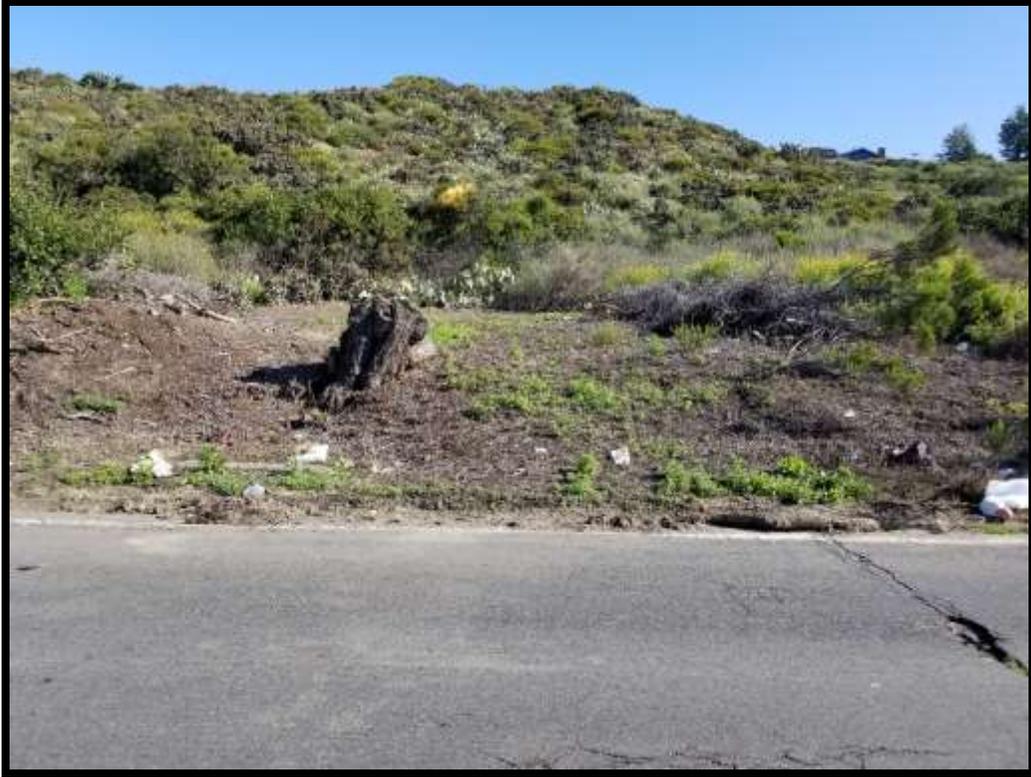


On 2/27/20 City staff applied herbicide to non-native weeds at Navajo Canyon and Chollas Radio Canyon restoration sites and weed whacked at Chollas Radio Canyon. Above picture.

On 3/3/20 City staff applied herbicide to non-native weeds at Navajo Canyon restoration site.



On 4/28/20 City staff hand weeded around installed cactus and native plants that were seeded at Chollas Radio Canyon restoration site. Above picture.



On 5/4/20 CCC crew weed whacked, chipped branches from trees that had been previously cut down, picked up trash and installed 180 new cactus cuttings at Chollas Radio Canyon restoration site. Above pictures before and after.





On 5/11/20 CCC crew weed whacked at Navajo Canyon restoration site. Above pictures.



On 5/12/20 - 5/13/20 CCC crew scaled a slope of pampas grass to get to bottom of Navajo Canyon. Crew raked and piled old pampas grass masses into burlap sheets to create pampas grass straw wattles

that will be used for erosion control when slope is planted at Navajo Canyon restoration site. Above pictures.



On 5/14/20 – 5/15/20 CCC crew weed whacked at Navajo Canyon restoration site. Above picture.



On 5/20/20 City staff weed whacked and hand weeded around installed cactus patches at Navajo Canyon restoration site. Above pictures before and after.



On 7/23/20, 7/27/20 – 7/30/20 Alpha Project crew performed weed control and raked pampas grass biomass into walls and installed hand-made straw wattles (made of burlap, twine and pampas grass biomass) at Navajo Canyon restoration sites. Above picture.



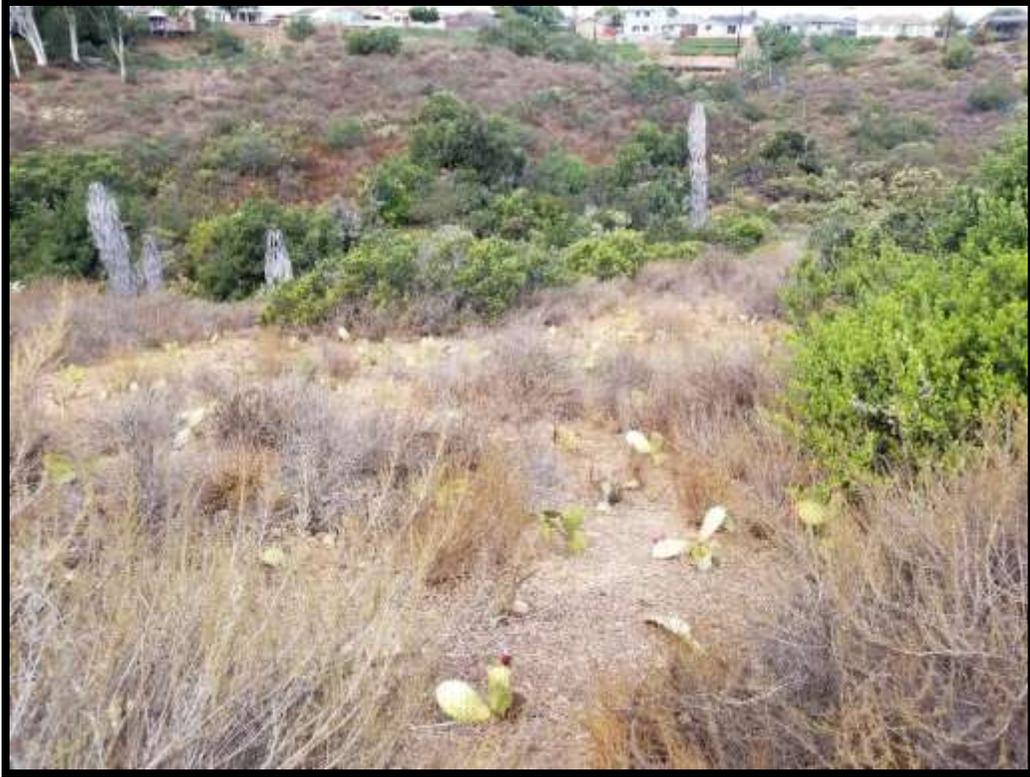
On 8/6/20 – 8/7/20 Alpha Project crew installed 100 additional cactus cuttings, performed biomass removal and trash pickup in a new location at Chollas Radio Canyon restoration sites. Above picture.



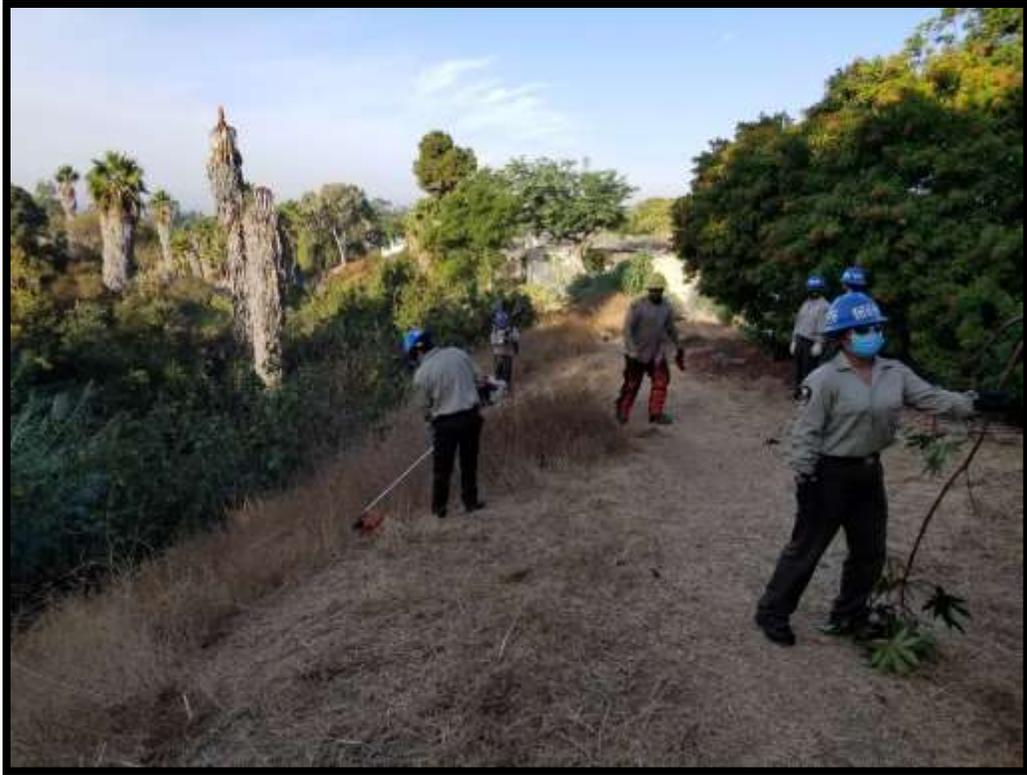
On 10/12/21 CCC crew planted cactus cuttings at Navajo Canyon restoration site. Above picture.



On 10/13/21 CCC crew harvested cactus cuttings and installed them, installed burlap sheets for erosion control and spread seed at Navajo Canyon restoration site. Above picture.



On 10/27/21-10/29/21 CCC crew installed cactus cuttings, removed weeds and trash at Navajo Canyon restoration site. Above pictures.



On 11/3/21 CCC crew removed weeds from Navajo Canyon restoration site. Above picture.





On 11/4/21-11/5/21 CCC crew cut into burlap sheets originally placed for erosion control and installed 304 CSS container plants at Navajo Canyon restoration site. Above pictures.

Task 2-Monitoring

Budget: \$0 (from grant agreement)

Spent: \$0

Four photo points were setup at Navajo Canyon and three photo points were setup at Chollas Radio Canyon to track the change and progress of the project over time. Significant positive change occurred over the 24 months for all photo point locations. Monitoring visits occurred on 5/20/19, 6/5/19, 10/24/19, 12/10/19, 12/27/19, 2/11/20, 2/27/20, 4/21/20, 5/13/20, 5/15/20, 6/17/20, 7/16/20, 7/21/20, 7/23/20, 7/29/20 and 8/6/20 at Navajo Canyon and 11/7/19, 12/5/19-12/13/19, 2/11/20, 2/27/20, 4/21/20, 4/28/20, 5/4/20, 6/17/20, 7/13/20, 7/16/20, 7/21/20 and 8/6/20 at Chollas Radio Canyon. Photo labels under each photo.

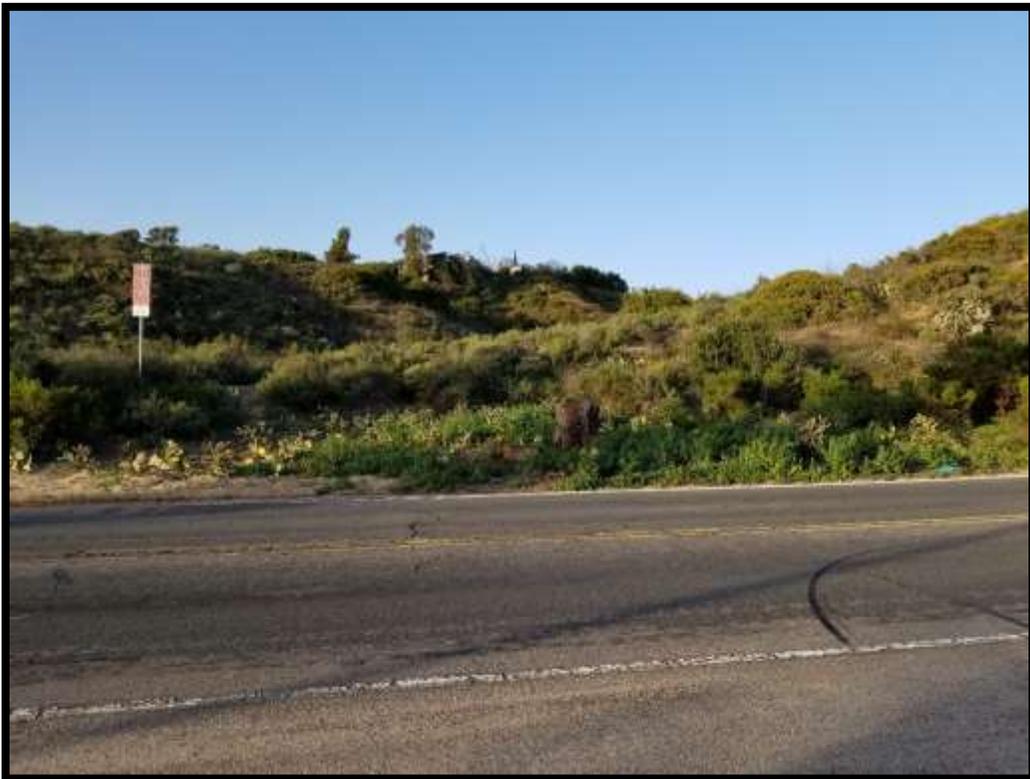
Photo Point 1 – Chollas Radio Canyon



Chollas Radio Canyon Photo Point 1: 12/6/19 – Facing North. Before cactus cuttings installed.



Chollas Radio Canyon Photo Point 1: 12/7/19 – Facing North. After cactus cuttings installed.



Chollas Radio Canyon Photo Point 1: 2/11/20 – Facing North. Native seedlings and weeds growing.



Chollas Radio Canyon Photo Point 1: 2/27/20 – Facing North. Seedlings and weeds growing.



Chollas Radio Canyon Photo Point 1: 4/21/20 – Facing North. Cactus covered by weeds.



Chollas Radio Canyon Photo Point 1: 4/28/20 – Facing North. Weeds pulled in piles.



Chollas Radio Canyon Photo Point 1: 6/17/20 – Facing North. Weeds growing.



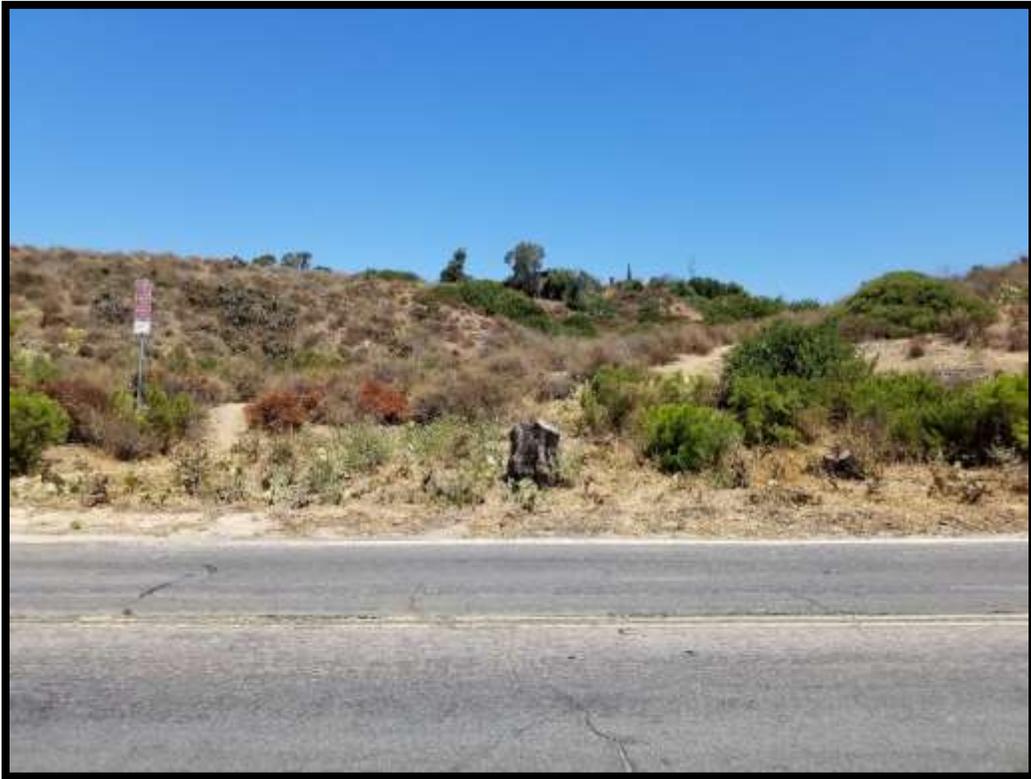
Chollas Radio Canyon Photo Point 1: 7/13/20 – Facing North. Native plants around cactus.



Chollas Radio Canyon Photo Point 1: 7/21/20 – Facing North. Before weed maintenance.



Chollas Radio Canyon Photo Point 1: 7/21/20 – Facing North. After weed maintenance.



Chollas Radio Canyon Photo Point 1: 8/6/20 – Facing North. Native plants and cactus.



Chollas Radio Canyon Photo Point 1: 12/31/20 – Facing North. Native plants and cactus.

Photo Point 2 – Chollas Radio Canyon



Chollas Radio Canyon Photo Point 2: 3/26/19 – Slope facing South. Before cactus cuttings installed.



Chollas Radio Canyon Photo Point 2: 12/12/19 – Slope facing South. After cactus cuttings installed.



Chollas Radio Canyon Photo Point 2: 2/27/20 – Slope facing South.



Chollas Radio Canyon Photo Point 2: 4/21/20 – Slope facing South.



Chollas Radio Canyon Photo Point 2: 7/21/20 – Slope facing South.



Chollas Radio Canyon Photo Point 2: 8/6/2020 – Slope facing South.



Chollas Radio Canyon Photo Point 2: 12/31/2020 – Slope facing South.

Photo Point 3 – Chollas Radio Canyon



Chollas Radio Canyon Photo Point 3: 12/7/19 – Facing Northwest. After cactus cuttings installed.



Chollas Radio Canyon Photo Point 3: 2/27/20 – Facing Northwest. Weeds growing.



Chollas Radio Canyon Photo Point 3: 4/21/20 – Facing Northwest. Weeds growing and trash.



Chollas Radio Canyon Photo Point 3: 7/21/20 – Facing Northwest.



Chollas Radio Canyon Photo Point 3: 8/6/20 – Facing Northwest.

Photo Point 1 – Navajo Canyon



Navajo Canyon Photo Point 1: 6/5/19 – Slope facing South. Slope dominated by invasive weed biomass.



Navajo Canyon 9/3/19 – Slope facing South towards canyon where thatch and weeds will be removed. Cactus cuttings will be installed on slope to create cactus wren habitat.



Navajo Canyon Photo Point 1: 12/27/19 – Slope facing South. After slope had cactus cuttings installed.



Navajo Canyon Photo Point 1: 1/27/20 – Slope facing South. Non-native weeds growing in.



Navajo Canyon Photo Point 1: 2/18/20 – Slope facing South. Non-native weeds growing in.



Navajo Canyon Photo Point 1: 4/21/20 – Slope facing South. Weeds sprayed.



Navajo Canyon Photo Point 1: 5/15/20 – Slope facing South. Second wave of weeds emerged.



Navajo Canyon Photo Point 1: 7/16/20 – Slope facing South. Before weed removal.



Navajo Canyon Photo Point 1: 7/22/20 – Slope facing South. After weed removal.



Navajo Canyon Photo Point 1: 10/26/20 – Slope facing South.



Navajo Canyon Photo Point 1: 12/22/20 – Slope facing South.

Photo Point 2 – Navajo Canyon



Navajo Canyon Photo Point 2: 12/10/19 – Slope facing South. Before slope had cactus cuttings installed.



Navajo Canyon Photo Point 2: 12/27/19 – Slope facing South. After slope had cactus cuttings installed.



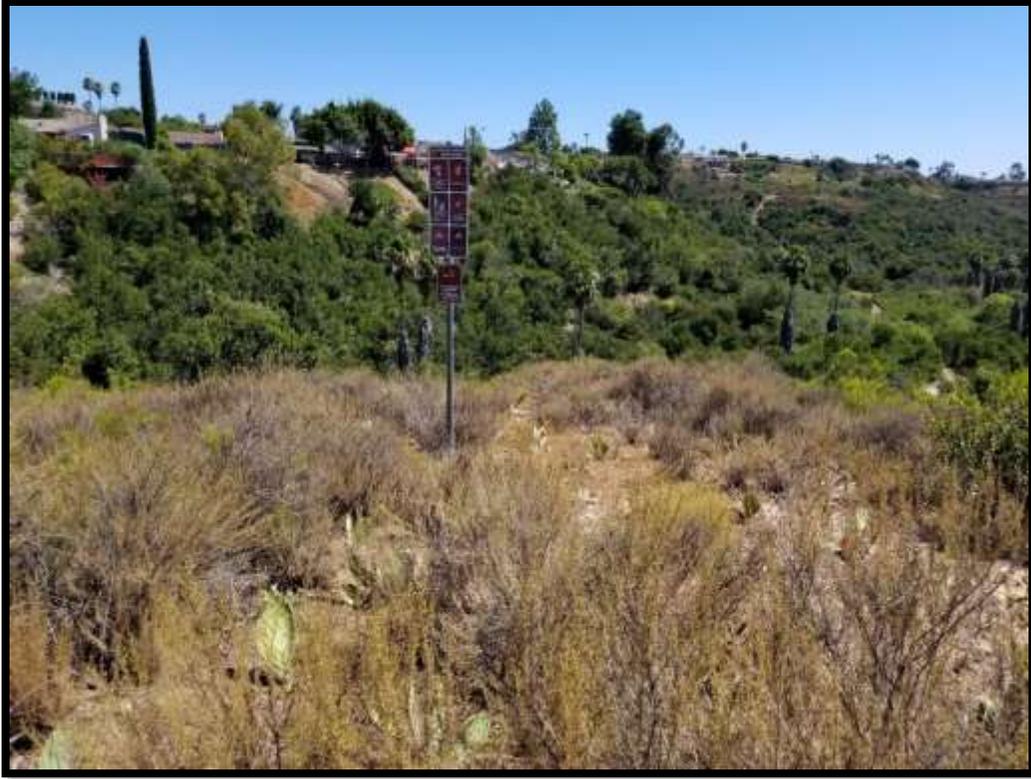
Navajo Canyon Photo Point 2: 2/11/20 – Slope facing South.



Navajo Canyon Photo Point 2: 4/21/20 – Slope facing South.



Navajo Canyon Photo Point 2: 5/13/20 – Slope facing South.



Navajo Canyon Photo Point 2: 7/16/20 – Slope facing South.

Photo Point 3a – Navajo Canyon



Navajo Canyon Photo Point 3a: 12/10/19 – Mesa facing East. Before mesa had cactus cuttings installed.



Navajo Canyon Photo Point 3a: 2/18/20 – Mesa facing East.



Navajo Canyon Photo Point 3a: 4/21/20 – Mesa facing East. Some weeds moving in.



Navajo Canyon Photo Point 3a: 10/26/20 – Mesa facing East.

Photo Point 3b – Navajo Canyon



Navajo Canyon Photo Point 3b: 12/27/19 – Mesa facing East. After mesa had cactus cuttings installed.



Navajo Canyon Photo Point 3b: 7/16/20 – Mesa facing East.



Navajo Canyon Photo Point 3b: 10/26/20 – Mesa facing East.

Photo Point 4 – Navajo Canyon



Navajo Canyon Photo Point 4: 5/12/20 – Slope facing West.



Navajo Canyon Photo Point 4: 7/23/20 – Slope facing West.



Navajo Canyon Photo Point 4: 7/29/20 – Slope facing West.



Navajo Canyon Photo Point 4: 10/15/20 – Slope facing West.



Navajo Canyon Photo Point 4: 11/4/20 – Slope facing West. Before planting.



Navajo Canyon Photo Point 4: 11/5/20 – Slope facing West. During planting.



Navajo Canyon Photo Point 4: 11/17/20 – Slope facing West. Plants growing. Need more rain.



Navajo Canyon Photo Point 4: 12/31/20 – Slope facing West. Plants growing. Need more rain.

Task 3-Maintenance

Budget: \$5,000 (from grant)

Spent: \$5,000

The detailed work completed for Task 3 is listed below by date with corresponding pictures displayed above the date and details for some of the dates worked. Task 3 Maintenance was a small portion of the overall project. No issues were encountered, task was completed according to the original scope, task came in at budget and overall weed cover was reduced by at least 75% or greater.



On 7/21/20 Alpha Project crew performed follow up weed control and trash pickup at Chollas Radio Canyon restoration sites. Above picture.

On 7/22/20 Alpha Project crew performed follow up weed control at Navajo Canyon restoration sites.



On 7/22/20 City staff performed follow up weed control and applied herbicide to weeds in restoration sites at Navajo Canyon. Above picture.

On 7/23/20 City staff applied herbicide to summer annual weeds and perennial weeds in restoration sites at Navajo Canyon.



On 8/6/20 and 8/7/20 Alpha Project crew trash pickup and weed whack at Chollas Radio Canyon.



8/6/20 Above picture after trash pickup.

Conclusions

Was it successful and did it accomplish the specified goals?

Yes, the project was successful. The primary goal was to create, enhance and expand existing Coastal Cactus Wren (CACW) habitat and reduce the threat of wildfire and invasive plant conversion by replacing areas of invasive flashy fuels with native cactus in City of San Diego managed Chollas Radio Canyon and Navajo Canyon Open Spaces. The main objectives to reach these goals were 1) to perform brush removal and invasive weed control within newly proposed and existing CACW sites, and 2) harvest and plant cactus cuttings from existing mature native prickly pear and coast cholla to create more CACW habitat.

City staff and contracted crews were used to perform initial and ongoing brush and weed clearing so that City staff could perform herbicide applications to control the weeds in created the CACW habitat. Contracted crews were also used to harvest cactus cuttings from existing specimens onsite at both locations and install them in the CACW habitat enhancement sites. A total of over 4,000 cactus propagules were planted. 200 pound of native plant seed was also spread. Contracted crews were also used to install erosion control materials.

What could have been done differently to improve the project outcome?

The project outcome turned out great, but a lot of factors caused delays and were out of our control and these delays threw off the timeline and did not allow as much maintenance and weed control to happen as originally desired. If we had more time to perform maintenance at the restoration sites the project outcome would have been even better.

How have the results contributed to the conservation of MSP species and has it enhanced recovery/prevented further decline?

Coastal Cactus Wrens in San Diego County are threatened by habitat loss and fragmentation that has resulted from rapid urbanization, frequent wildfires, and invasive plant species that reduce habitat quality. The proposed project will enhance and expand existing Coastal Cactus Wren habitat and reduce the threat of wildfire and invasive plant conversion by replacing areas of invasive flashy fuels with native cactus in City of San Diego owned and dedicated Chollas Radio Canyon and Navajo Canyon Open Spaces.

The results have contributed to the conservation of Coast Cactus Wren (*Campylorhynchus brunneicapillus*) MSP species by enhancing and expanding patches of existing patches of Coastal Cactus Wren habitat allowing existing populations to thrive and disperse into new areas. Intensive dethatching treatments reduced thatch and thick nonnative brush cover by 95%. As needed herbicide treatments reduced annual weed cover by 75%. Degraded habitat that was once dominated by nonnative forbs and grasses is being converted to high quality cactus scrub. Wildfire impacts have been reduced by replacing the flashy annual fuels with over 4,000 perennial cactus propagules. In time these new and expanded cactus patches will create sustainable Coastal Cactus Wren habitat.

What work still needs to be done, what are the future management recommendations?

For future management the sites should be continued to be monitored for new and reoccurring threats. Follow up trash pickup, maintenance and weed control will need to be done a few times per year until

the cactus patches are mature enough to produce viable Cactus Wren habitat. The installed container plants will need to be maintained through the Spring and Summer of 2021 to fill in the slope area.