

**San Diego Association of Governments
Rare Dune Species Restoration Project
Nature Collective**

Quarterly Progress Report

Reporting Period: October, 2023 – December 31, 2023

Submission Date: January 15, 2024

SANDAG Contract Number: S1125507

Quarterly Status Report Overview

During this reporting period Nature Collective staff continued with seed collection, propagation and project planning. We hosted one volunteer event to spread seed and hand-pull emerging weeds. During this quarter we continued with an in-house germination study for Nuttall's Acmispon (*Acmispon prostratus*). We collected vegetation transect data and photo points at the end of the reporting period.

Work Performed this Period:**1. Task 1- Seed Collection & Propagation**

During this quarter we continued collecting seeds for propagation and spreading- we collected on four different dates throughout the quarter. During this quarter we collected seed from six species totaling 1.75 lbs. Details on species and weight per species are included in Table 1. We are 100% complete with seed collection and propagation efforts for Year 1.

<i>Species</i>	<i>Common name</i>	10/12/23	11/27/23	12/01/23	12/12/23	Total (g)	Total (lbs)
<i>Abronia maritima</i>	sticky sand verbena	-	136	-	-	136	0.300
<i>Acmispon prostratus</i>	Nuttall's Acmispon	-	-	305.4	-	305.4	0.673
<i>Ambrosia chamissonis</i>	beach bur	-	94	-	-	94	0.207
<i>Atriplex leucophylla</i>	beach saltbush	-	-	-	2.7	2.7	0.006
<i>Croton californicus</i>	California croton	6.5	-	-	-	6.5	0.014
<i>Nemacaulis denudata</i> var. <i>denudata</i>	coast woolly heads	-	-	251	-	251	0.553
Total						795.6	1.754

Table 1. Seed Collected for Propagation and Spreading (g)

Last quarter we set up an in-house germination study at our nursery to determine germination and seed viability rates of Nuttall's Acmispon (*Acmispon prostratus*). Due to little germination, likely due to birds eating the seeds or the seeds falling too deep in the growing medium we decided to restart the study. For the new study we placed the propagation trays in pest-proof cages made of chicken wire and pvc and used a growing medium mix of: 1.5 part perlite, 1 part vermiculite and 0.5 part sand. The germination study consists of 6 trays of rose pots with different treatments and collection locations. Each tray had 49 rose pots with 10 seeds or 5 fruits in them. We sowed approximately 2,940 seeds between 294 rose pots. Seeds were either collected from West Basin Dunes (east of Highway 101) or Seaside Terrace Dune/Cardiff Living Shorelines (west of Highway 101). We hand watered the trays between every 2 to 4 days and then rotated the trays counterclockwise once a week. The seed collection location and tray treatments are shown below in Figure 1.

Tray 1	Tray 4
- <u>Seed collected</u> : West Basin Dunes	- <u>Seed Collected</u> : Seaside Terrace
- <u>Seed treatment</u> : None- sown in fruit	Dune/Cardiff Living Shorelines
- <u>Amount sown</u> : 5 fruits (approx. 10 seeds)	- <u>Seed treatment</u> : None- sown in fruit
- <u>Number of rose pots</u> : 49	- <u>Amount sown</u> : 5 fruits (approx. 10 seeds)
	- <u>Number of rose pots</u> : 49

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<p>Tray 2</p> <p>-<u>Seed Collected</u>: West Basin Dunes</p> <p>-<u>Seed treatment</u>: seed removed from fruit</p> <p>-<u>Amount sown</u>: 10 seeds</p> <p>-<u>Number of rose pots</u>: 49</p>	<p>Tray 5</p> <p>-<u>Seed Collected</u>: Seaside Terrace Dune/Cardiff Living Shorelines</p> <p>-<u>Seed treatment</u>: seed removed from fruit</p> <p>-<u>Amount sown</u>: 10 seeds</p> <p>-<u>Number of rose pots</u>: 49</p>
<p>Tray 3</p> <p>-<u>Seed Collected</u>: West Basin Dunes</p> <p>-<u>Seed treatment</u>: seed removed from fruit, boiling water was poured over seeds and left to soak overnight- approximately 15 hrs</p> <p>-<u>Amount sown</u>: 10 seeds</p> <p>-<u>Number of rose pots</u>: 49</p>	<p>Tray 6</p> <p>-<u>Seed Collected</u>: Seaside Terrace Dune/Cardiff Living Shorelines</p> <p>-<u>Seed treatment</u>: seed removed from fruit, boiling water was poured over seeds and left to soak overnight- approximately 15 hrs</p> <p>-<u>Amount sown</u>: 10 seeds</p> <p>-<u>Number of rose pots</u>: 49</p>

Figure 1. Germination Study Treatments and Seed Collection Locations

Each Monday for 5 weeks we counted the number of rose pots that had seedlings and the number of seedlings per tray. The highest number of seedlings for each tray was recorded 2 weeks after the seeds were sown. We found that Tray 6 had the highest germination rates and Tray 4 had the lowest. The two trays that were processed and boiled had the highest germination and the two trays that had no pretreatments had the lowest germination. The figures below show the number of rose pots with germination and the number of seedlings recorded each week.

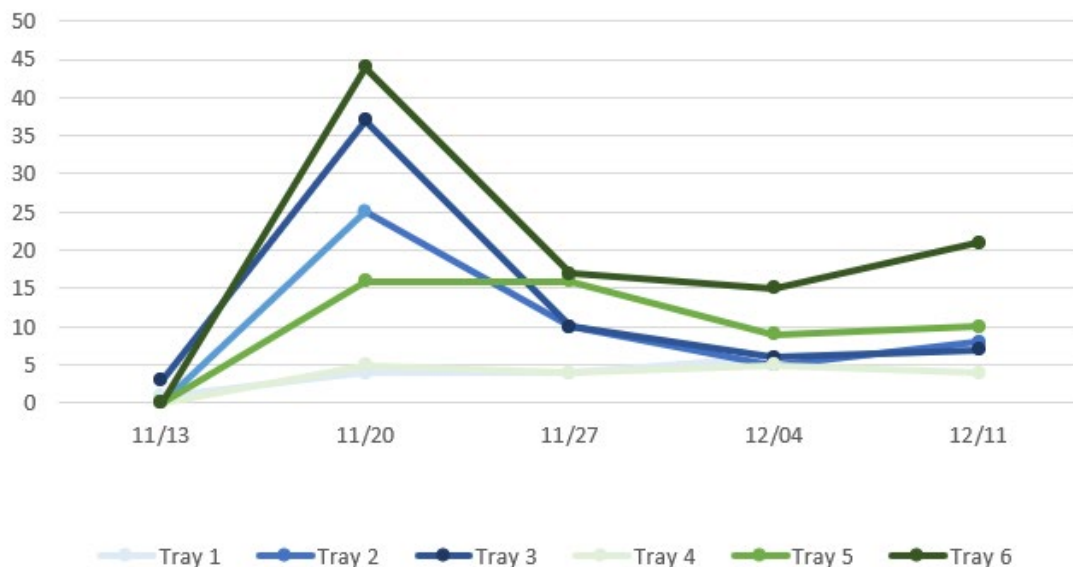


Figure 2. Number of Nuttall's lotus (*Acmispon prostratus*) Rose Pots Germinated

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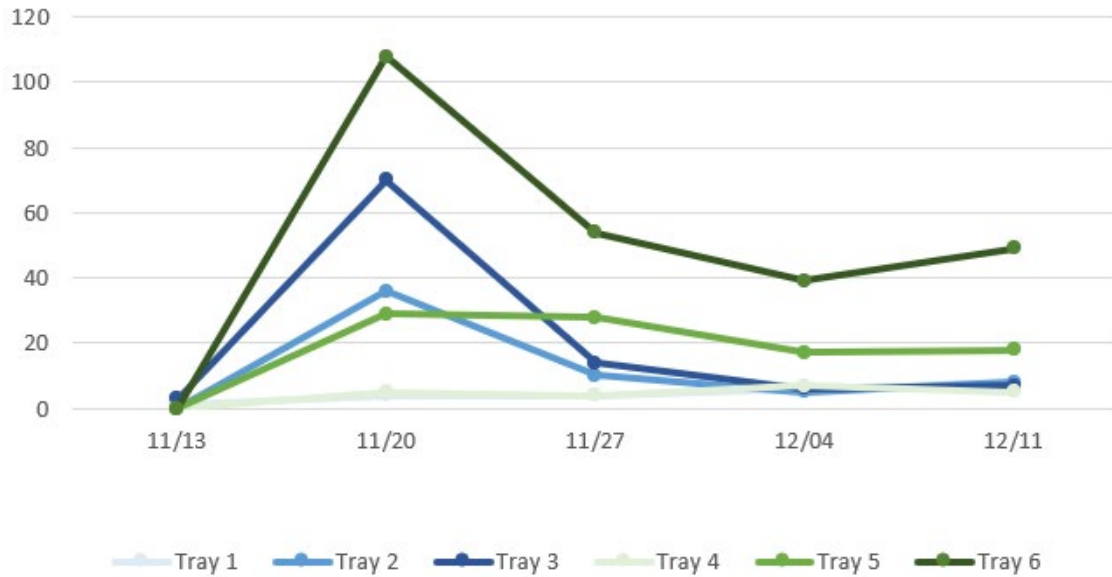


Figure 3. Number of Nuttall's lotus (*Acmispon prostratus*) Seedlings Per Tray

2. Task 2- Work & Monitoring Plan

This task has been completed.

3. Task 3- Seeding & Planting

During this quarter NC staff spread perennial and annual species along the west side of Highway 101. Table 2 shows the quantities of each species within each seed mix. On 12/06/23 volunteers spread seed at all sites within the project boundary. One of the focus areas of this effort was at West Basin Dunes where we removed large patches of biomass with volunteers over the past few quarters. Before spreading and raking in seed we raked up additional litter into piles so the seed would have direct contact with the sand. We hope that removing the biomass will increase the likelihood of germination. Table 3 shows the quantities in grams of each species within each seed mix that was spread during the volunteer event.



Photo 1. West Basin Dunes after biomass removal



Photo 2. Volunteers spreading and raking seed

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11/13/2023 - West of Hwy 101 – NC Staff				
Spread at CLS on 11/13/23				
Species	Grams	Date Collected	Source	Location Spread
<i>Ambrosia chamissonis</i>	292	7/12/2023	STD/CLS	Toe/Crest
<i>Abronia maritima</i>	203.16	7/12/2023	STD/CLS	Toe/Crest
<i>Eriogonum parvifolium</i>	41	7/20/2023	SCSB	Toe/Crest
<i>Ambrosia chamissonis</i>	78	8/24/2023	CLS	Toe/Crest
<i>Ambrosia chamissonis</i>	60	8/24/2023	CLS	Toe/Crest
<i>Camissoniopsis cheiranthifolia</i> <i>ssp. suffruticosa</i>	4.67	7/12/2023	WBD	Toe/Crest
<i>Eriogonum parvifolium</i>	75	1/23/2023	S&S	Toe/Crest
<i>Abronia maritima</i>	120	8/24/2023	CLS	Toe/Crest
Site Total	873.83			
Spread at STD on 11/13/23				
Species	Grams	Date Collected	Source	Location Spread
<i>Acmispon prostratus</i>	158	7/12/2023	STD/CLS	Crest
<i>Nemacaulis denudata</i> var. <i>denudata</i>	170	2019	Native West	Crest
<i>Chaenactis glabriuscula</i> var. <i>orcuttiana</i>	141.02	2019	Native West	Crest
Site Total	469.02			
Spread at CLS South on 11/13/23				
Species	Grams	Date Collected	Source	Location Spread
<i>Nemacaulis denudata</i> var. <i>denudata</i>	91.27	7/21/2023	CLS/WBD	Crest/Heel
<i>Nemacaulis denudata</i> var. <i>denudata</i>	28	8/24/2023	CLS	Crest/Heel
<i>Acmispon prostratus</i>	53	7/12/2023	WBD	Crest/Heel
<i>Acmispon prostratus</i>	20	6/7/2023	STD/CLS	Crest/Heel
<i>Abronia umbellata</i>	5.63	7/12/2023	STD	Crest/Heel
<i>Eriogonum parvifolium</i>	123	45163	Ponto	Crest/Heel
Site Total	320.9			
Spread at CLS North on 11/13/23				
Species	Grams	Date Collected	Source	Location Spread
<i>Acmispon prostratus</i>	110.31	9/13/2023	WBD	Crest/Heel
<i>Acmispon prostratus</i>	30.09	7/21/2023	CLS	Crest/Heel
<i>Acmispon prostratus</i>	44.32	7/21/2023	WBD	Crest/Heel
Site Total	184.72			
Total Spread	1848.5			

Table 2. Seed Spread by Nature Collective Staff on 11/13/2023

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12/06/2023 - West of Hwy 101 - Volunteers				
Spread at CLS on 12/06/23 - Seed Mix #5				
Species	Grams	Date Collected	Source	Location Spread
<i>Ambrosia chamissonis</i>	94	11/27/2023	CLS	Toe/Crest
<i>Abronia maritima</i>	136	11/27/2023	CLS	Toe/Crest
<i>Eriogonum parvifolium</i>	175.8	1/23/2023	S&S	Toe/Crest
<i>Camissoniopsis cheiranthifolia</i> <i>ssp. suffruticosa</i>	4.6	7/12/2023	WBD	Toe/Crest
Site Total	410.4			
12/06/2023 - East of Hwy 101 - Volunteers				
Spread at WBD on 12/06/23 - Seed Mix #1				
Species	Grams	Date Collected	Source	Location Spread
<i>Chaenactis glabriuscula</i> var. <i>orcuttiana</i>	101.5	2019	Native West	South small pocket
<i>Chaenactis glabriuscula</i> var. <i>orcuttiana</i>	6.02	6/28/2023	HST	South small pocket
<i>Chaenactis glabriuscula</i> var. <i>orcuttiana</i>	1.98	2015	CBG	South small pocket
<i>Nemacaulis denudata</i> var. <i>denudata</i>	55	7/12/2023	WBD	South small pocket
<i>Abronia umbellata</i>	7.04	10/17/2023	WBD	South small pocket
<i>Croton californicus</i>	1.13	9/6/2023	WBD	South small pocket
<i>Acmispon prostratus</i>	59.37	12/1/2023	WBD	South small pocket
Site Total	232.04			
Spread at WBD on 12/06/23 - Seed Mix #2				
Species	Grams	Date Collected	Source	Location Spread
<i>Chaenactis glabriuscula</i> var. <i>orcuttiana</i>	155.05	2019	Native West	Entrance area
<i>Nemacaulis denudata</i> var. <i>denudata</i>	98.8	7/21/2023	WBD	Entrance area
<i>Acmispon prostratus</i>	6.1	5/18/2023	WBD	Entrance area
<i>Acmispon prostratus</i>	65.57	12/1/2023	WBD	Entrance area
Site Total	325.52			
Spread at WBD on 12/06/23 - Seed Mix #3				
Species	Grams	Date Collected	Source	Location Spread
<i>Croton californicus</i>	6.5	10/12/2023	Santa Helena	Debris area
<i>Lupinus concinnus</i>	3	5/18/2023	WBD	Debris area
<i>Chaenactis glabriuscula</i> var. <i>orcuttiana</i>	16	7/12/2023	WBD	Debris area
<i>Nemacaulis denudata</i> var. <i>denudata</i>	116	12/1/2023	WBD	Debris area
<i>Nemacaulis denudata</i> var. <i>denudata</i>	109	2015	Native West	Debris area
<i>Acmispon prostratus</i>	201	6/7/2023	WBD	Debris area
Site Total	451.5			

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Spread at WBD on 12/06/23 - Seed Mix #4				
Species	Grams	Date Collected	Source	Location Spread
<i>Acmispon prostratus</i>	110	12/1/2023	CLS	Northern most area
<i>Acmispon prostratus</i>	70.5	12/1/2023	WBD	Northern most area
<i>Chaenactis glabriuscula</i> var. <i>orcuttiana</i>	5.36	6/7/2023	WBD	Northern most area
<i>Croton californicus</i>	2.69	7/21/2023	WBD	Northern most area
<i>Nicotiana clevelandii</i>	3.7	5/18/2023	WBD	Northern most area
<i>Nemacaulis denudata</i> var. <i>denudata</i>	66	7/12/2023	CLS	Northern most area
<i>Nemacaulis denudata</i> var. <i>denudata</i>	114	12/1/2023	WBD	Northern most area
<i>Nemacaulis denudata</i> var. <i>denudata</i>	2.27	2015	CBG	Northern most area
Site Total	374.52			

Table 3. Seed Spread by Volunteers on 12/06/2023

We will begin planting in Winter 2024 in areas where weeds are present and high foot traffic is observed in order to increase biodiversity, suppress weeds and discourage trampling of the dunes. We are 20% complete with this task.

4. Task 4- Maintenance

During this quarter we continued with maintenance- we completed multiple site visits to hand-pull weeds, assess site conditions and determine other management needs. During the volunteer event on 12/06/23 volunteers' hand-pulled non-native and invasive species including European sea rocket (*Cakile maritima*), tecolote (*Centaurea melitensis*) and crystal iceplant (*Mesembryanthemum crystallinum*). Maintenance for Year 1 is 100% complete.

5. Task 5- Monitoring

We collected photo points for this quarter in December. Photo point locations are shown in Appendix A: Map B. Photo monitoring from this quarter is included in Appendix B.

During this quarter we collected data for the 16 vegetation transects (Appendix A: Map C). Photos were taken at the start and end of each transect and are included in Appendix C. Figures 4-6 show the average native vs. non-native cover of the three sites and Figures 7-12 show the change in species diversity and ground cover between each of the sites at baseline data collection in April 2023 and December 2023. Figures for the native vs. non-native cover of each transect are shown in Appendix D.

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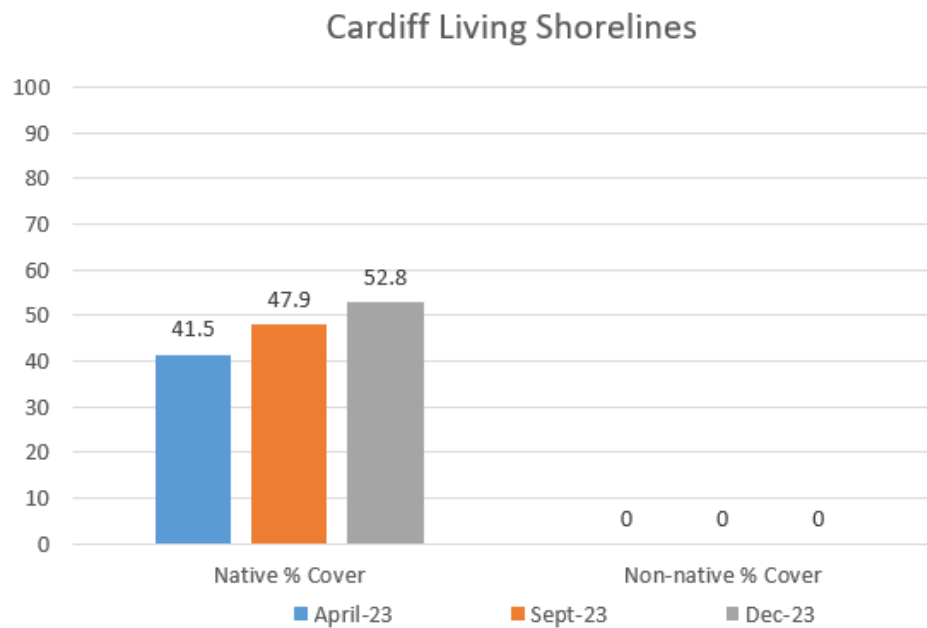


Figure 4. Native vs. Non-native Cover at Cardiff Living Shorelines

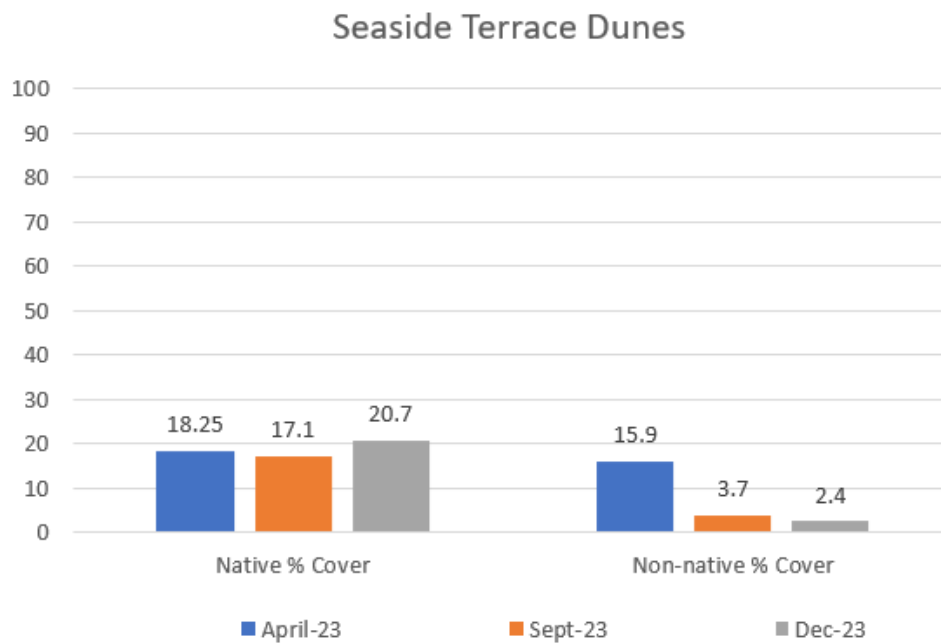


Figure 5. Native vs. Non-native Cover at Seaside Terrace Dunes

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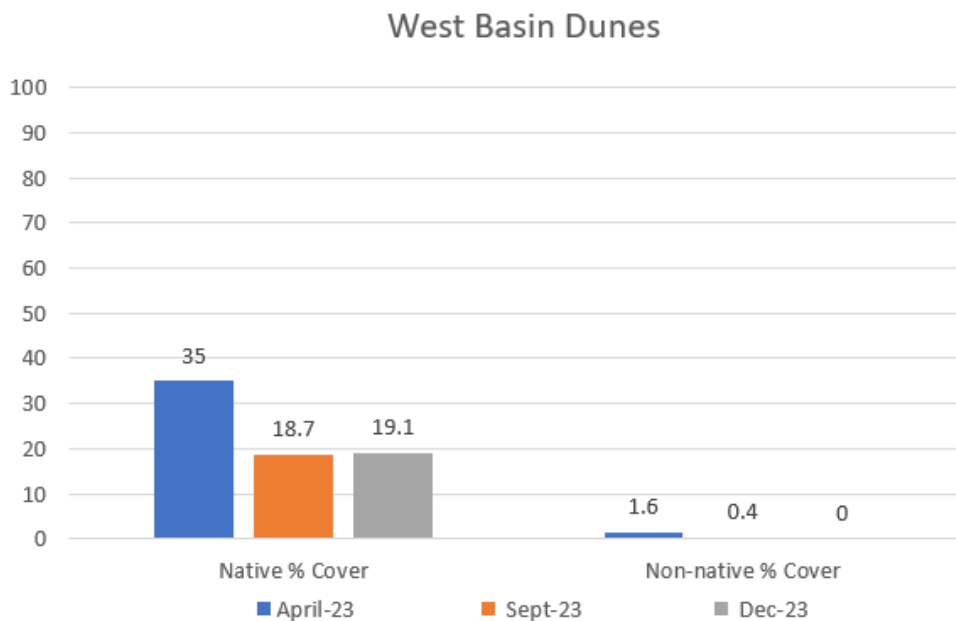


Figure 6. Native vs. Non-native Cover at West Basin Dunes

Cardiff Living Shorelines (CLS) shows a 5% increase in native cover this quarter. Photos 3 & 4 below show that native vegetation has increased cover on its own following winter storms. Seaside Terrace Dunes (STD) has the highest non-native cover and the lowest native cover. This can likely be attributed to winter storms impacting much of the dunes and heavy foot traffic bringing in an influx of non-native species. Filaree (*Erodium cicutarium*) was the prominent non-native species at STD, primarily in areas with high foot traffic. Weed control events next quarter will be focused in this area. Native cover at West Basin Dunes (WBD) is primarily comprised of native annuals (Nuttall's acmispon and coast woolly heads) or drought deciduous perennials, therefore lower native cover during dry months is expected.



Photo 3. ESC_L1_03_T5 – April 2023



Photo 4. ESC_L1_03_T5 – December 2023

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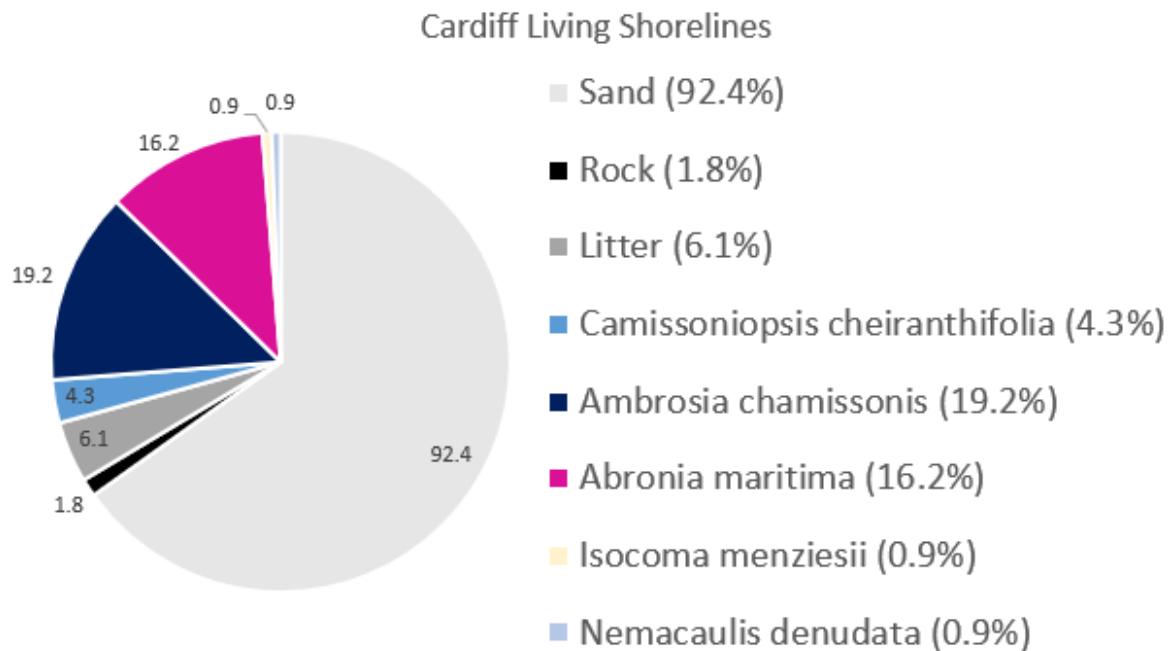


Figure 7. April 2023 Species Diversity and Ground Cover at Cardiff Living Shorelines

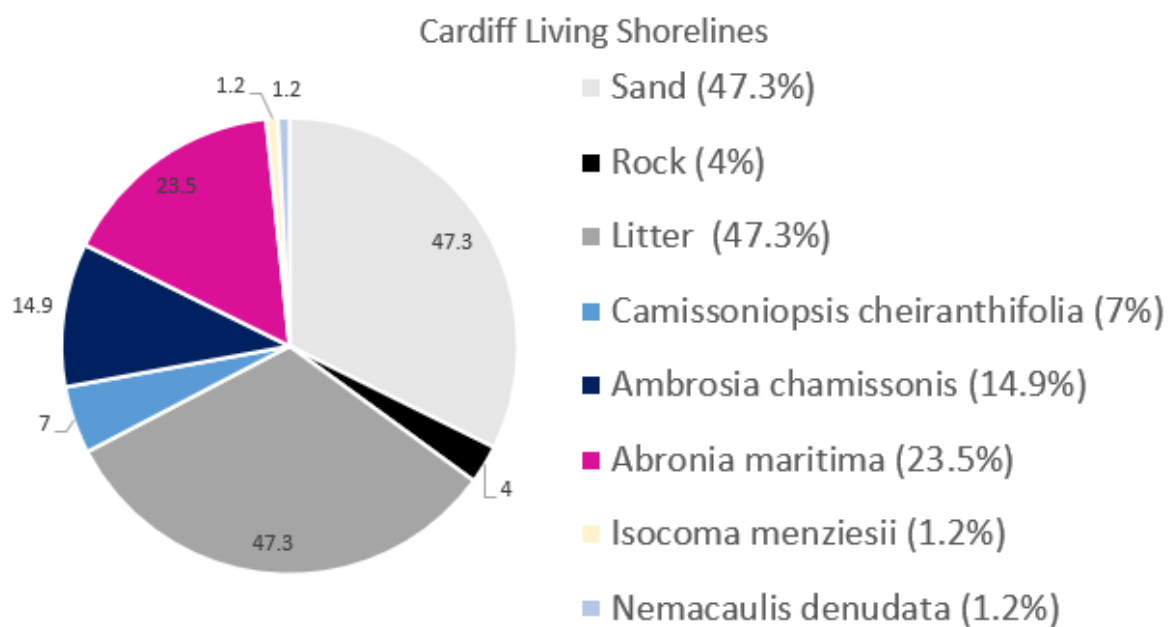


Figure 8. December 2023 Species Diversity and Ground Cover at Cardiff Living Shorelines

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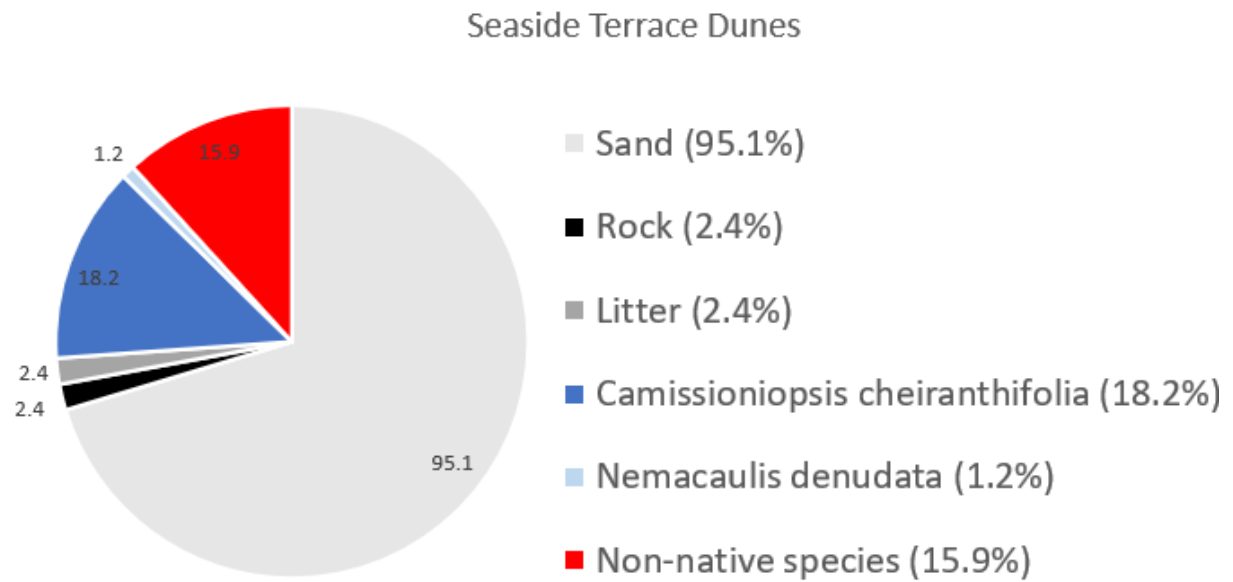


Figure 9. April 2023 Species Diversity and Ground Cover at Seaside Terrace Dunes

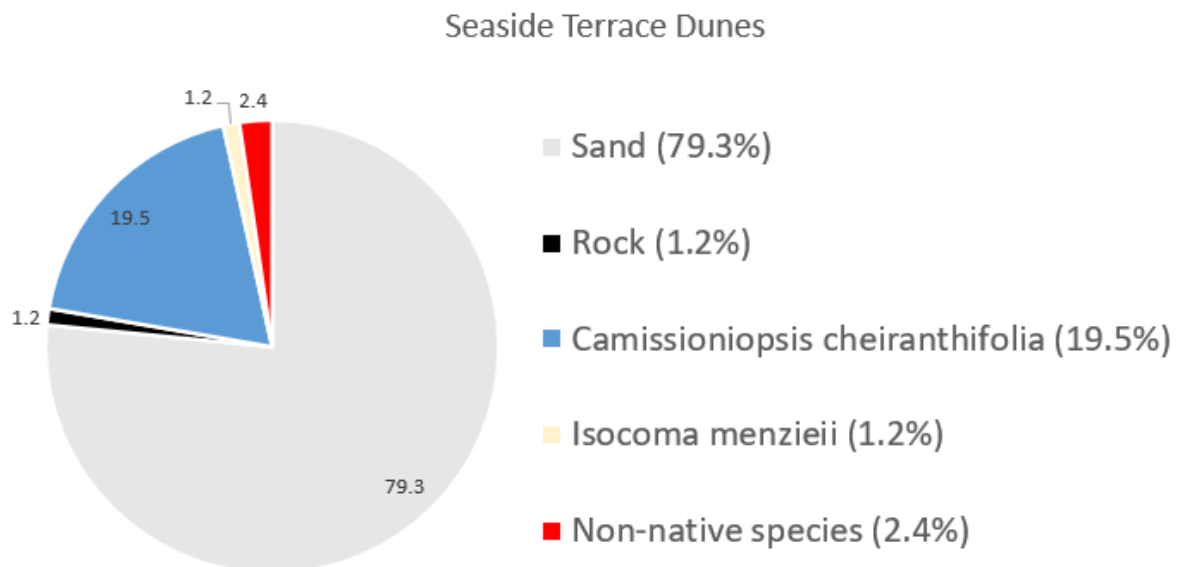


Figure 10. December 2023 Species Diversity and Ground Cover at Seaside Terrace Dunes

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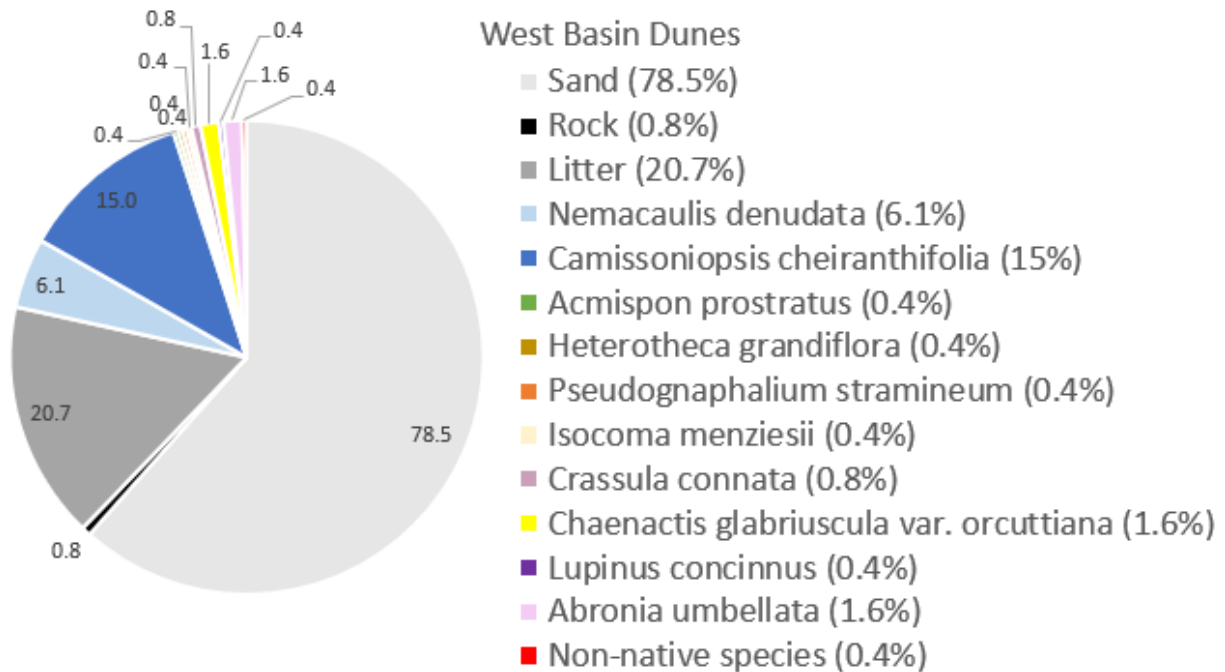


Figure 11. April 2023 Species Diversity and Ground Cover at West Basin Dunes

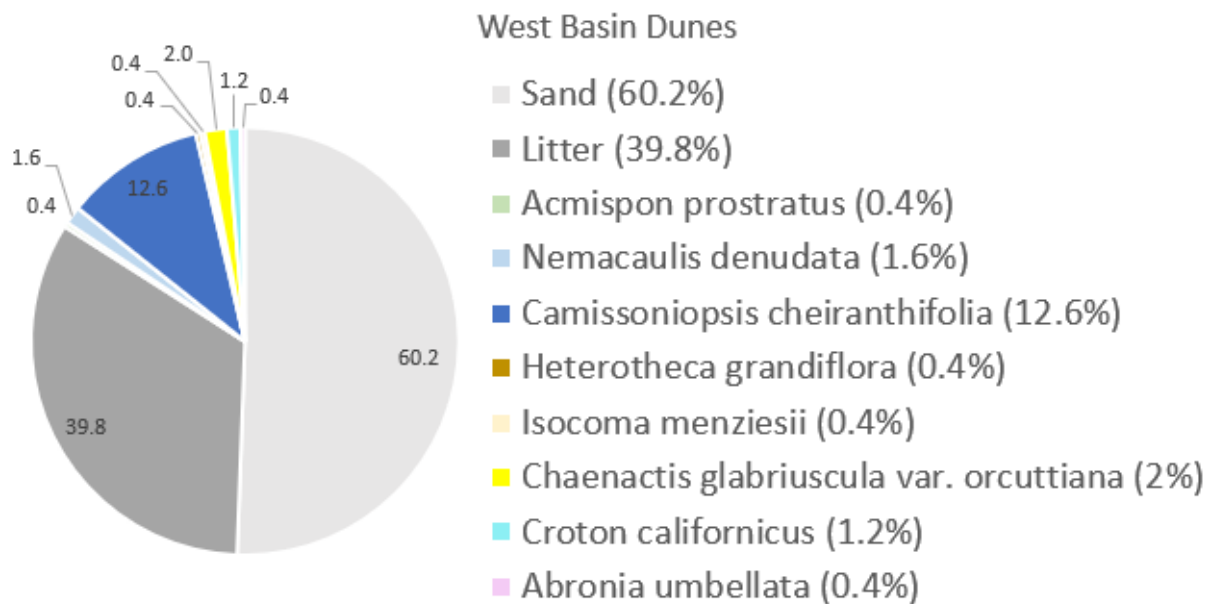


Figure 12. December 2023 Species Diversity and Ground Cover at West Basin Dunes

Low species richness at CLS and STD is the result of limited species being planted during the implementation of these restoration sites. We expect species richness and diversity to increase following winter planting and seeding efforts. West Basin Dunes has the highest species richness, however large patches of biomass or “litter”

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– as recorded on the transect – were accumulated throughout the site. After seeding and biomass removal we expect the percent cover of rare annuals to increase at West Basin Dunes. The photos below depict West Basin Dunes prior to and following biomass removal.



Photo 5. ESC_L1_03_T15 - April 2023



Photo 6. ESC_L1_03_T15 – December 2023

After reviewing the data and determining that there is little change in vegetation cover between quarters and additional unnecessary monitoring is contributing to trampling and disturbance of the project site, we have decided to limit transect monitoring to bi-annually. The timing will be determined once peak blooming and weed cover is observed but will likely take place in March and June, moving forward. We are 100% complete with monitoring for Year 1.

6. Task 6- Reporting & Media

During this period, we completed quarterly reporting. We are 100% complete with reporting for Year 1.

7. Task 7- GOIN Program

We have begun planning our GOIN events for 2023. We are approximately 10% complete with this task.

8. Task 8- Administrative

Stevie Steele, Ecologist/Project Manager, oversaw and participated in daily planning, project management, invoicing, germination study and restoration tasks during this period. We are approximately 25% complete with this task.

Work Anticipated Next Period

We will continue with weed control using hand removal methods. We anticipate planting at Seaside Terrace Dunes next quarter. We have scheduled the GOIN events for February 10th & 24th.

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Issues to Note

As stated in the last quarterly report- after project planning began, we determined that we will more than likely not be able to meet two of our performance measures including “*Atriplex coulteri* – 200 individuals restored” and “*Phacelia stellaris*” – 200 individuals restored”. However, we anticipate restoring 400+ individuals of *Chaenactis orcuttiana* ssp. *glabriuscula* (Orcutt’s yellow pincushion) to replace those performance measures. Orcutt’s yellow pincushion is listed at California Rare Plant Rank 1B.1 – “Plants rare, threatened, or endangered in California and elsewhere; seriously threatened in California” and has only 20 presumed extant occurrences in California. (CNPS, RPP 2023) We do not expect to meet the original performance measures due to the lack of seed available to ethically collect as well as the difficult germination requirements.

Photographs & Figures

All project photo monitoring, transect photo monitoring, project photos, and vegetation transect figures are included in the appendices following this report.

- Appendix B: 2023 Q4 Photo Monitoring
- Appendix C: 2023 Q4 Transect Photo Monitoring
- Appendix D: 2023 Q4 Vegetation Transects Native vs. Non-native Cover

Performance Measures



2023 Q4
Performance Measures

References

California Native Plant Society (CNPS), Rare Plant Program (RPP). 2023. Rare Plant Inventory (online edition, v9.5). Website <https://www.rareplants.cnps.org> [accessed 20 July 2023].

Appendix A: Maps

Map A: Rare Coastal Dune Species Habitat Restoration Project Overview



Rare Dune Community - Project Overview

Map B: Photo Monitoring Points



Photo Monitoring Points - September 2023

Map C: Transect Monitoring Locations



Transect Monitoring Locations - September 2023

Appendix C: 2023 Q4 Photo Monitoring
11/28/2023



EMP11_PP01



EMP11_PP02



EMP11_PP03



EMP11_PP04



EMP11_PP05



EMP11_PP06



EMP11_PP07



EMP11_PP08



EMP11_PP09



EMP11_PP10



EMP11_PP11



EMP11_PP12



EMP11_PP13



EMP11_PP14



EMP11_PP15



EMP11_PP16



EMP11_PP17



EMP11_PP18



EMP11_PP19



EMP11_PP20



EMP11_PP21



EMP11_PP22



EMP11_PP23



EMP11_PP024



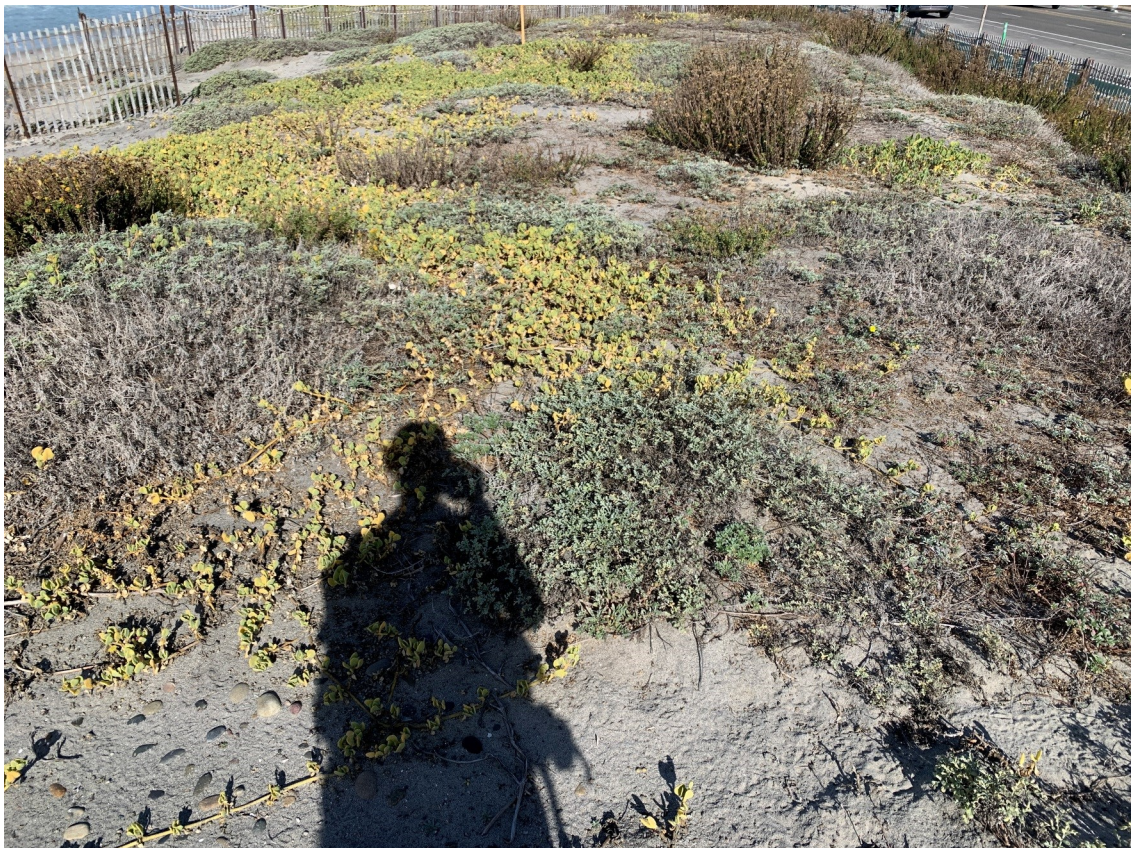
EMP11_PP25



EMP11_PP26



EMP11_PP27



EMP11_PP28



EMP11_PP29



EMP11_PP30



EMP11_PP31



EMP11_PP32

Appendix C: 2023 Q4 Transect Photo Monitoring

12/12/2023



ESC_L1_T1 South facing north



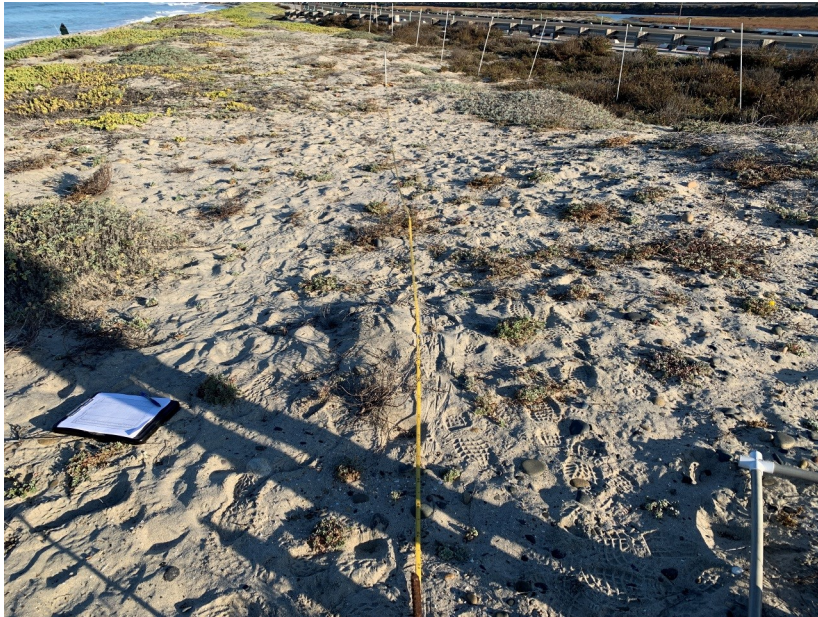
ESC_L1_T1 North facing south



ESC_L1_T2 South facing north



ESC_L1_T2 North facing south



ESC_L1_T3 South facing north



ESC_L1_T3 North facing south



ESC_L1_T4 South facing north



ESC_L1_T4 North facing south



ESC_L1_T5 South facing north



ESC_L1_T5 North facing south



ESC_L1_T6 South facing north



ESC_L1_T6 North facing south



ESC_L1_T7 South facing north



ESC_L1_T7 North facing south



ESC_L1_T8 South facing north



ESC_L1_T8 North facing south



ESC_L1_T9 South facing north



ESC_L1_T9 North facing south



ESC_L1_T10 South facing north



ESC_L1_T10 North facing south



ESC_L1_T11 South facing north



ESC_L1_T11 North facing south



ESC_L1_T12 South facing north



ESC_L1_T12 North facing south



ESC_L1_T13 South facing north



ESC_L1_T13 North facing south



ESC_L1_T14 South facing north



ESC_L1_T14 North facing south



ESC_L1_T30 South facing north



ESC_L1_T30 North facing south



ESC_L1_T31 South facing north

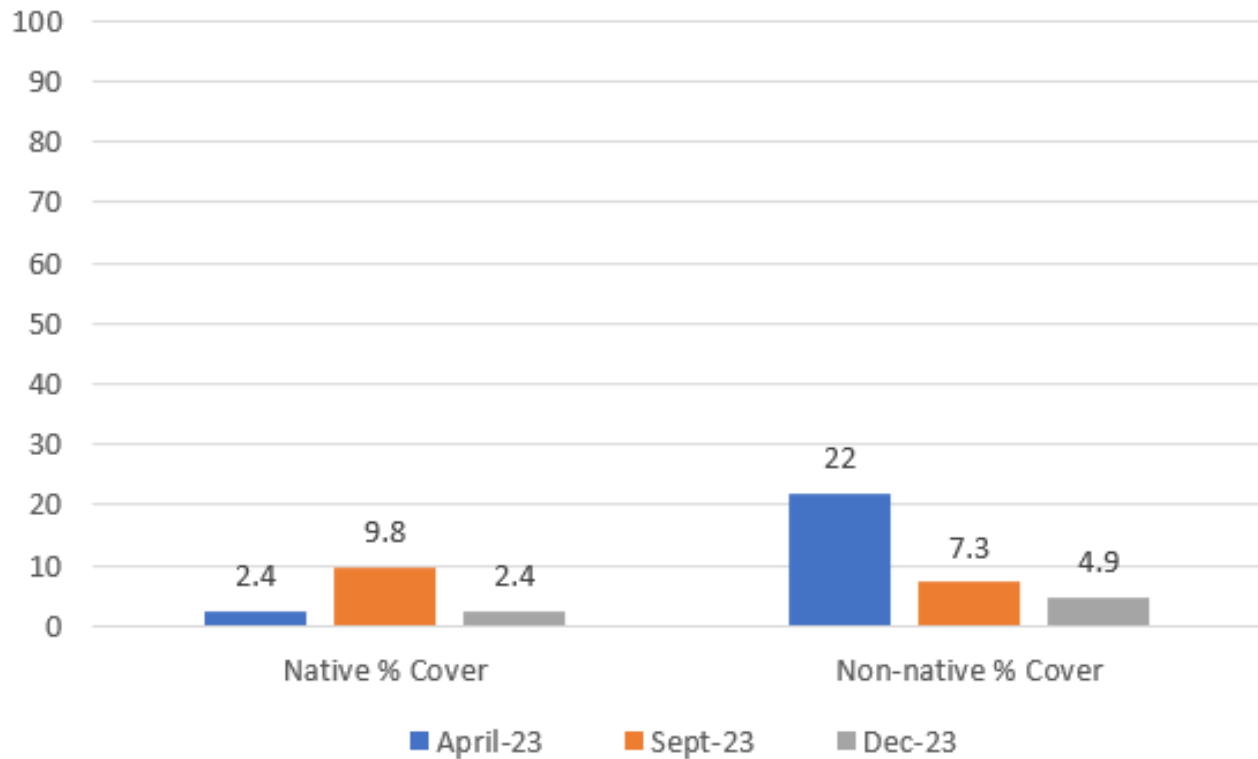


ESC_L1_T31 North facing south

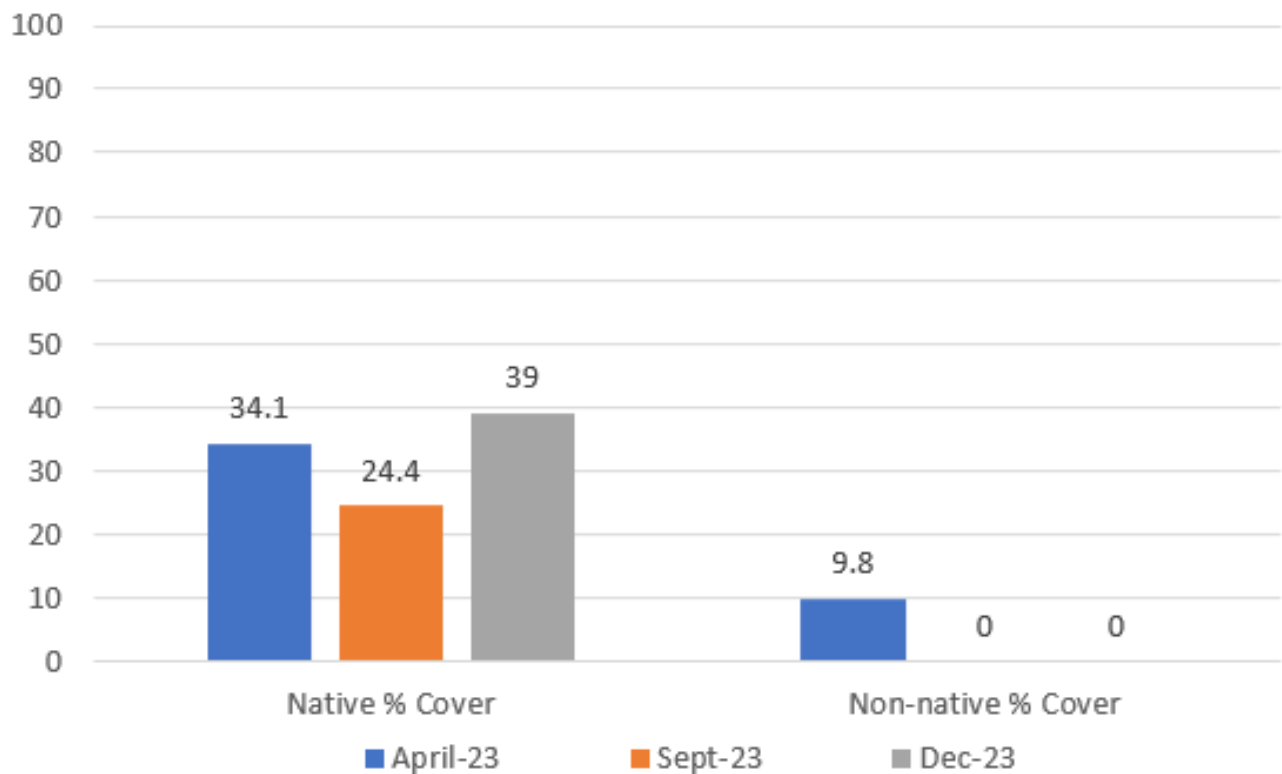
Appendix D: 2023 Q4 Vegetation Transects
Native vs. Non-native Cover

Seaside Terrace Dunes

ESC_L1_03_T1

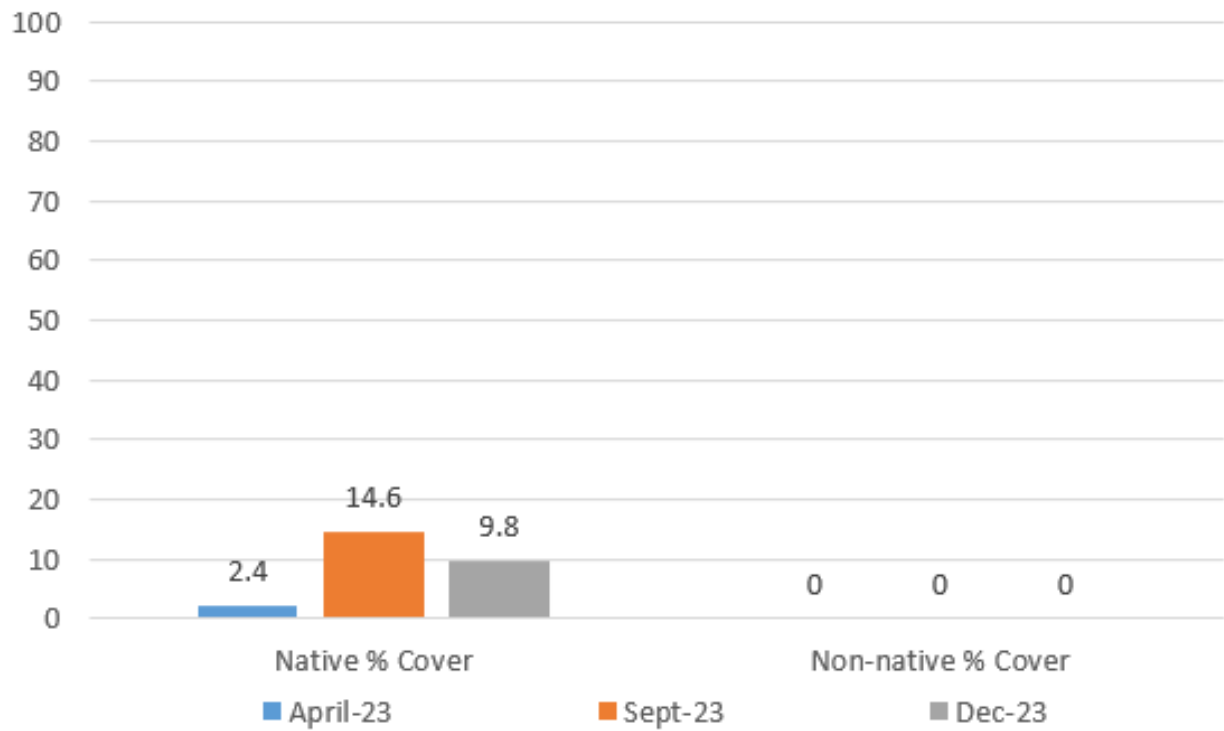


ESC_L1_03_T2

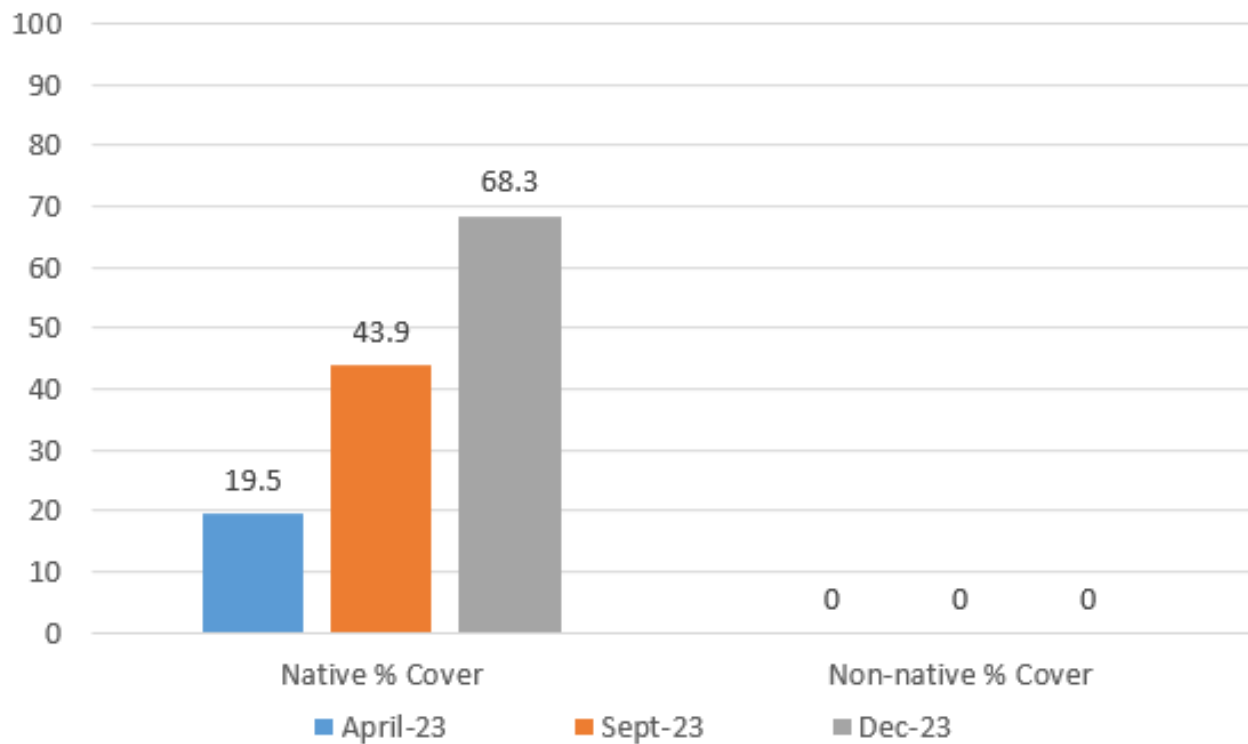


Cardiff Living Shorelines

ESC_L1_03_T3

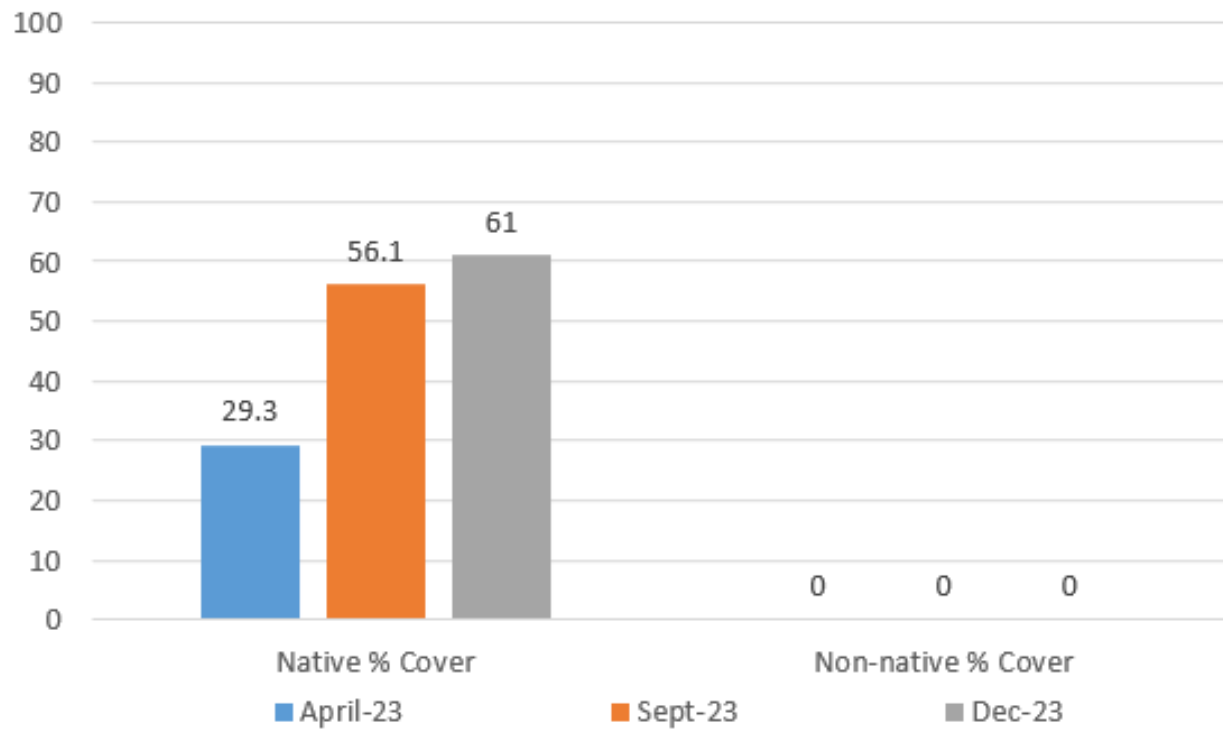


ESC_L1_03_T4

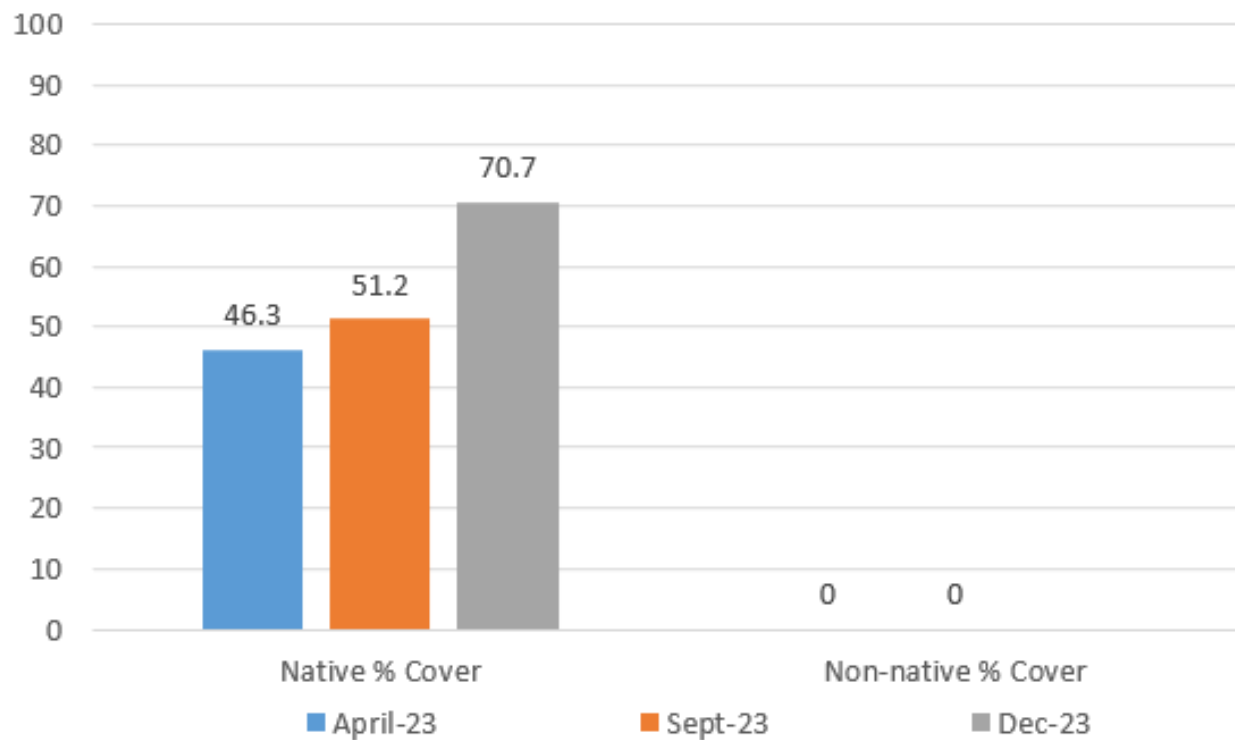


Cardiff Living Shorelines

ESC_L1_03_T5

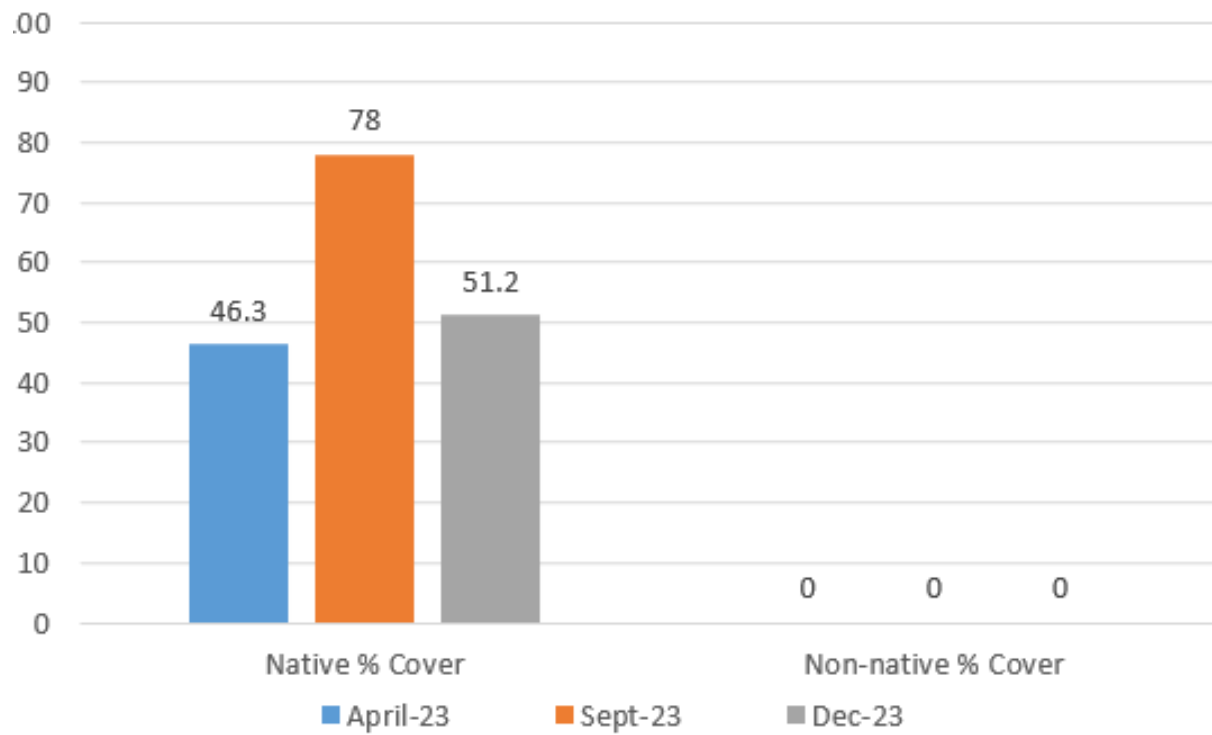


ESC_L1_03_T6

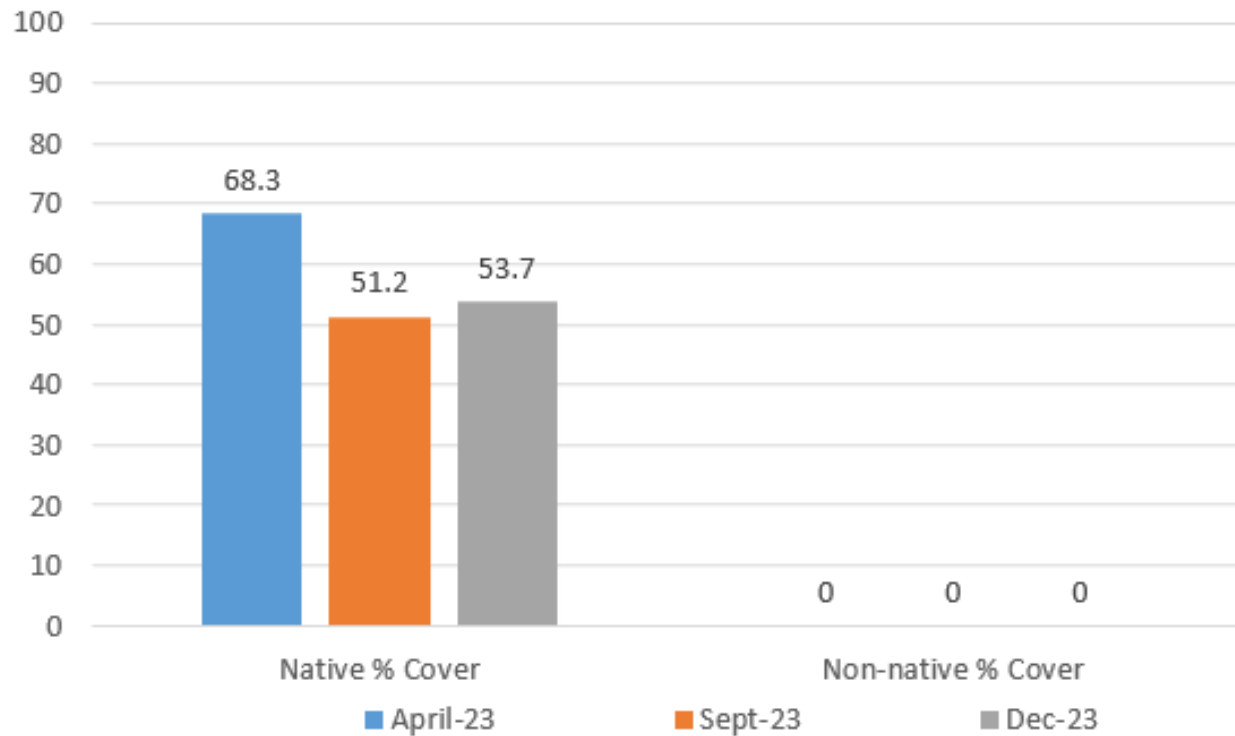


Cardiff Living Shorelines

ESC_L1_03_T7

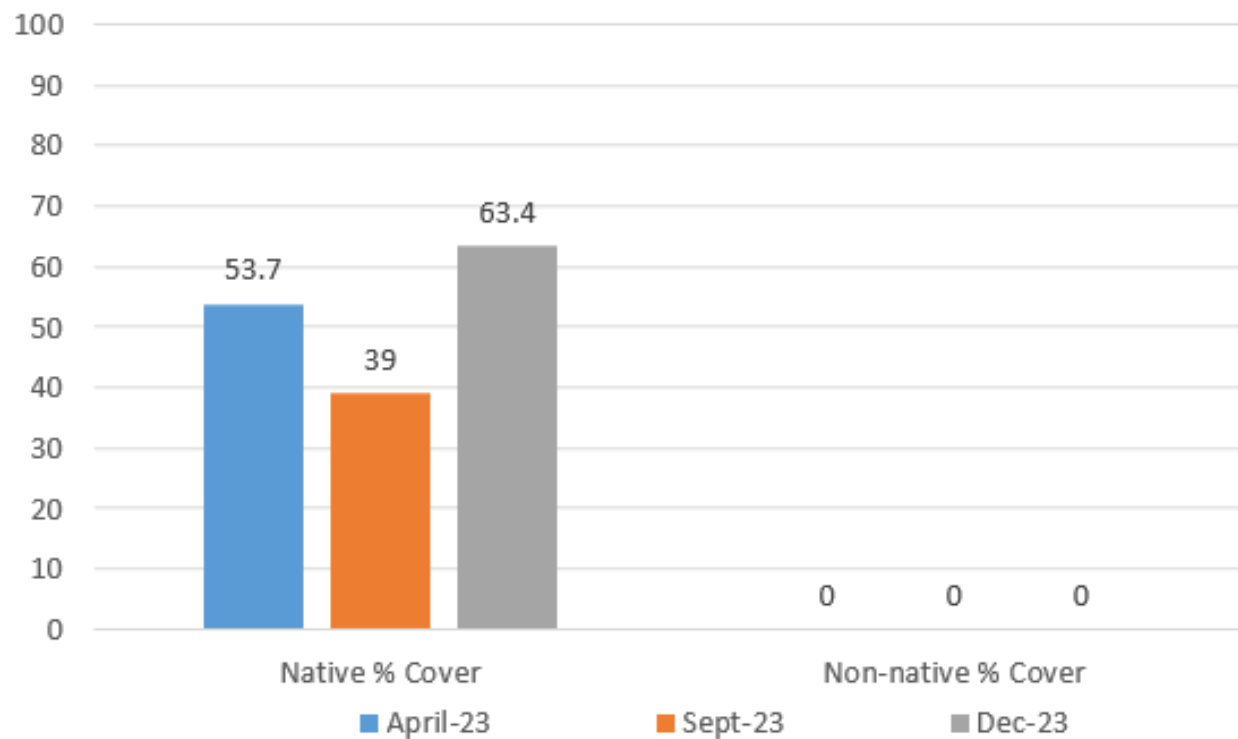


ESC_L1_03_T8

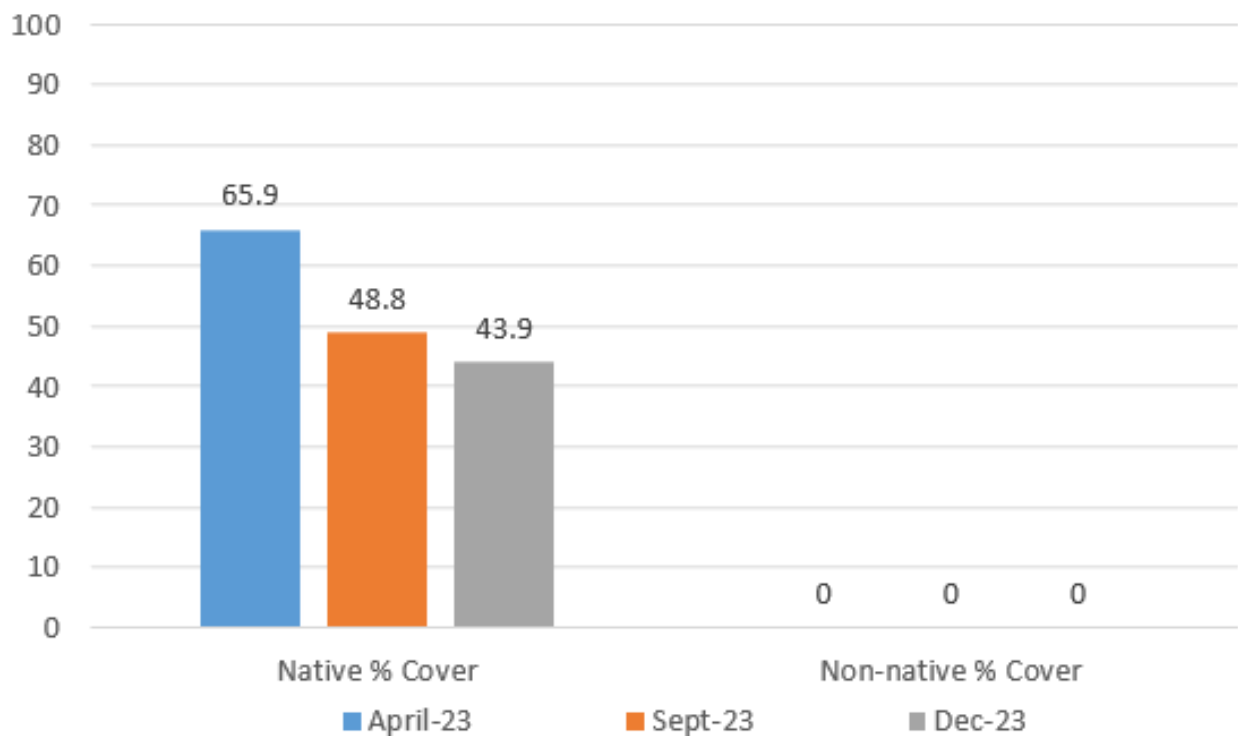


Cardiff Living Shorelines

ESC_L1_03_T9

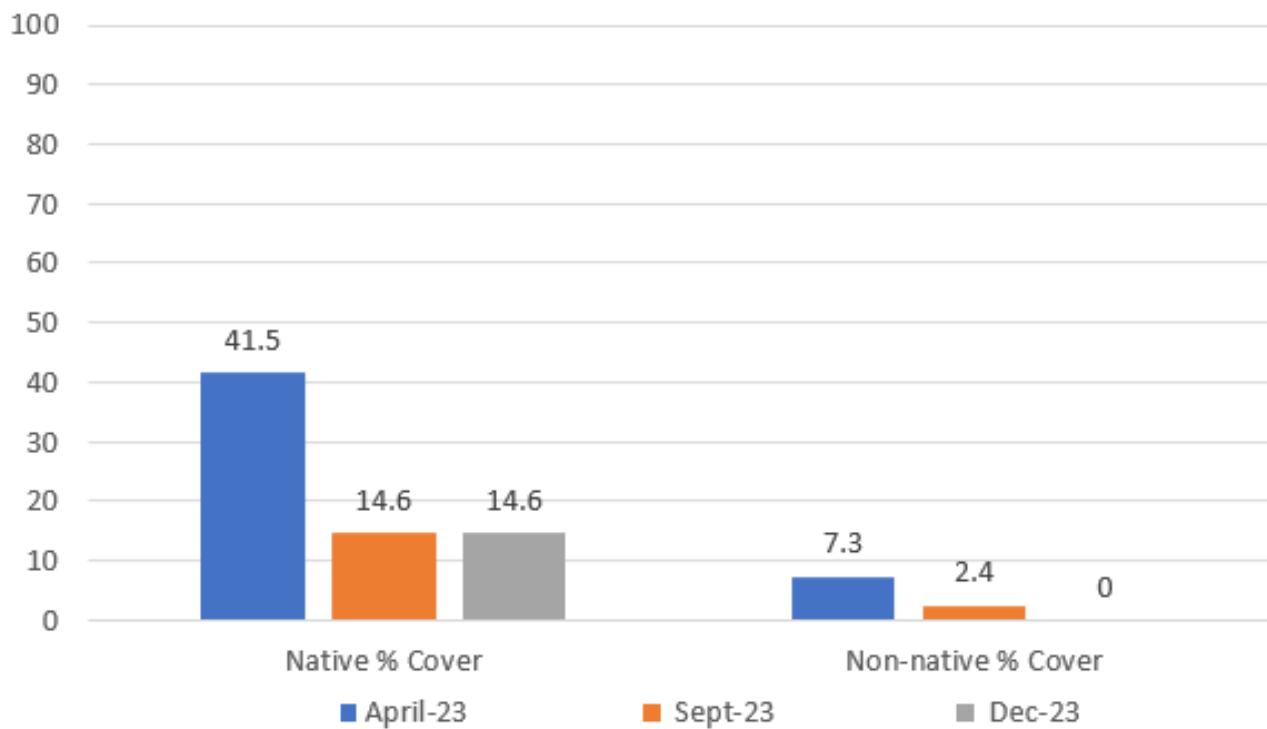


ESC_L1_03_T10

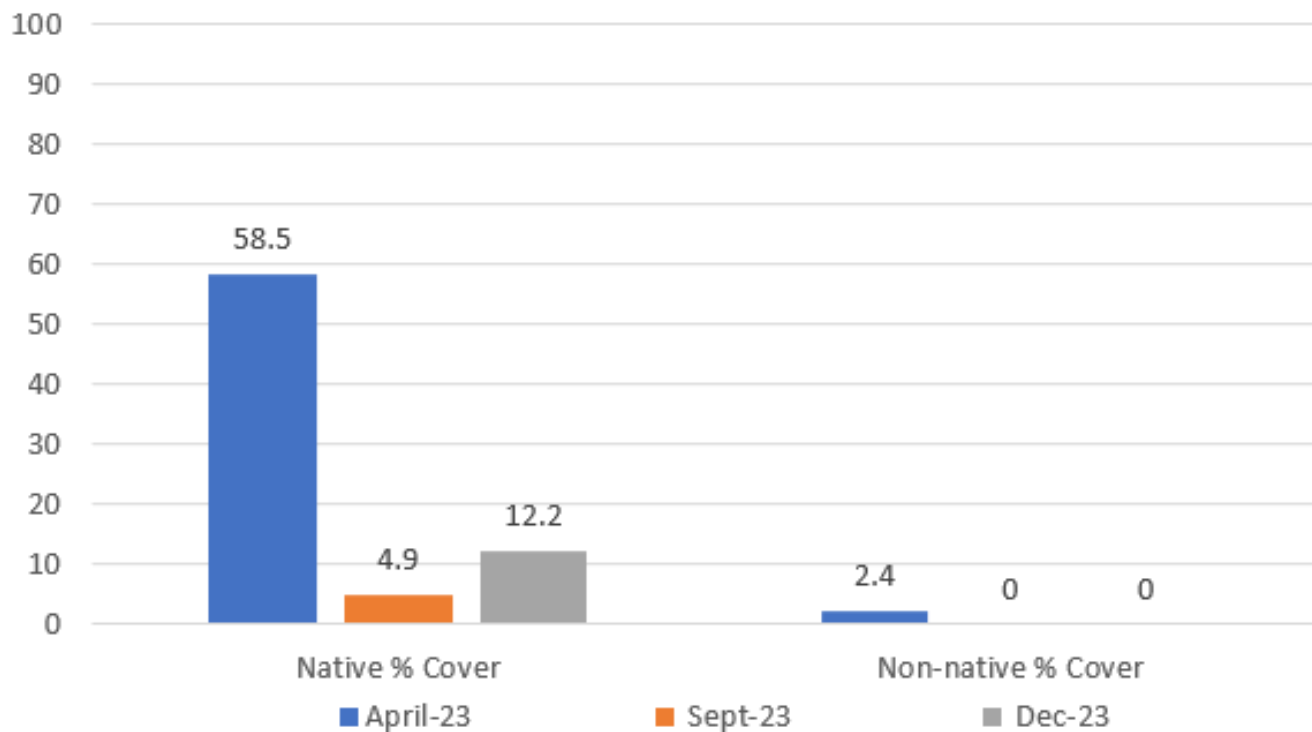


West Basin Dunes

ESC_L1_03_T11

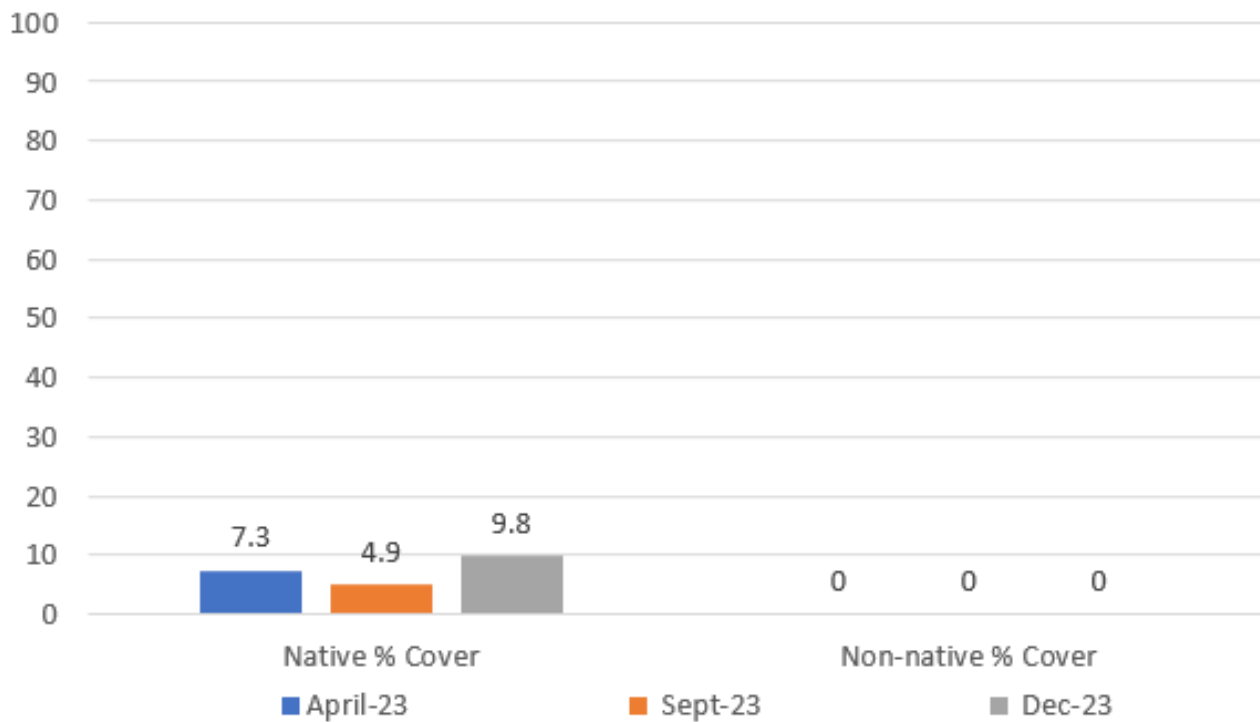


ESC_L1_03_T12

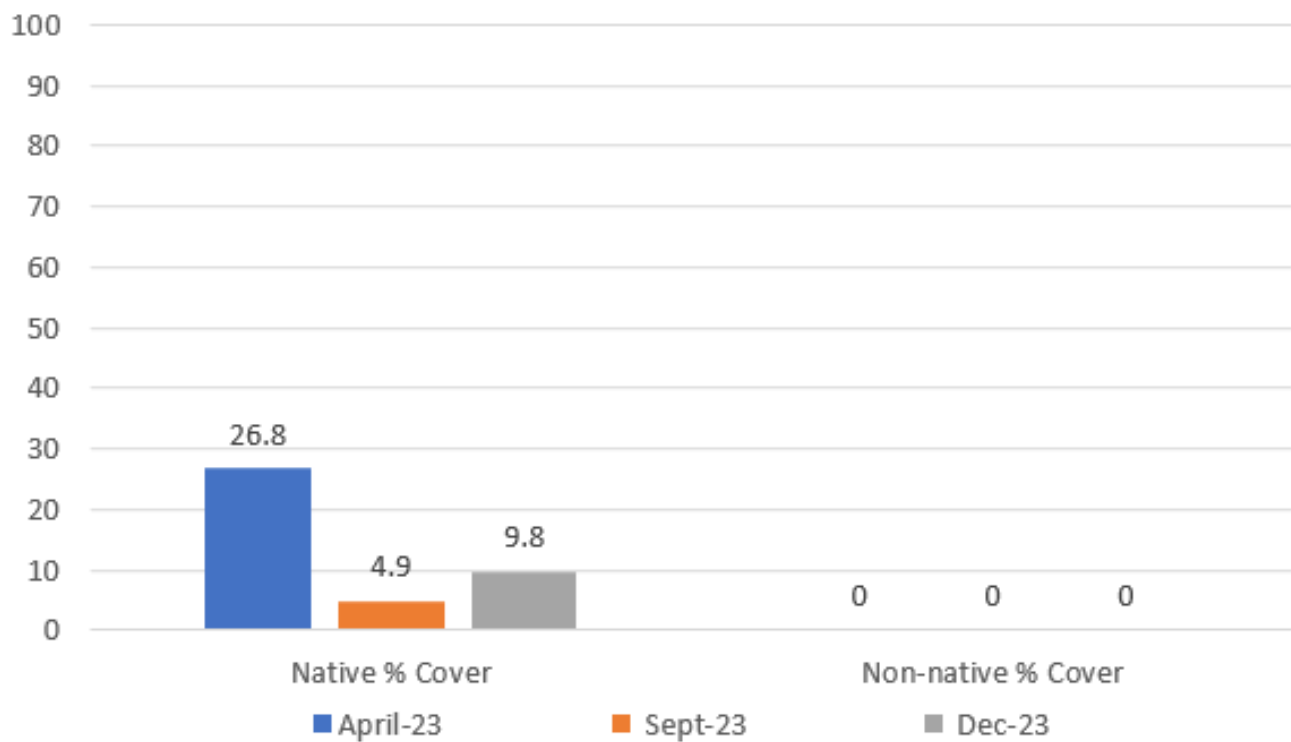


West Basin Dunes

ESC_L1_03_T13

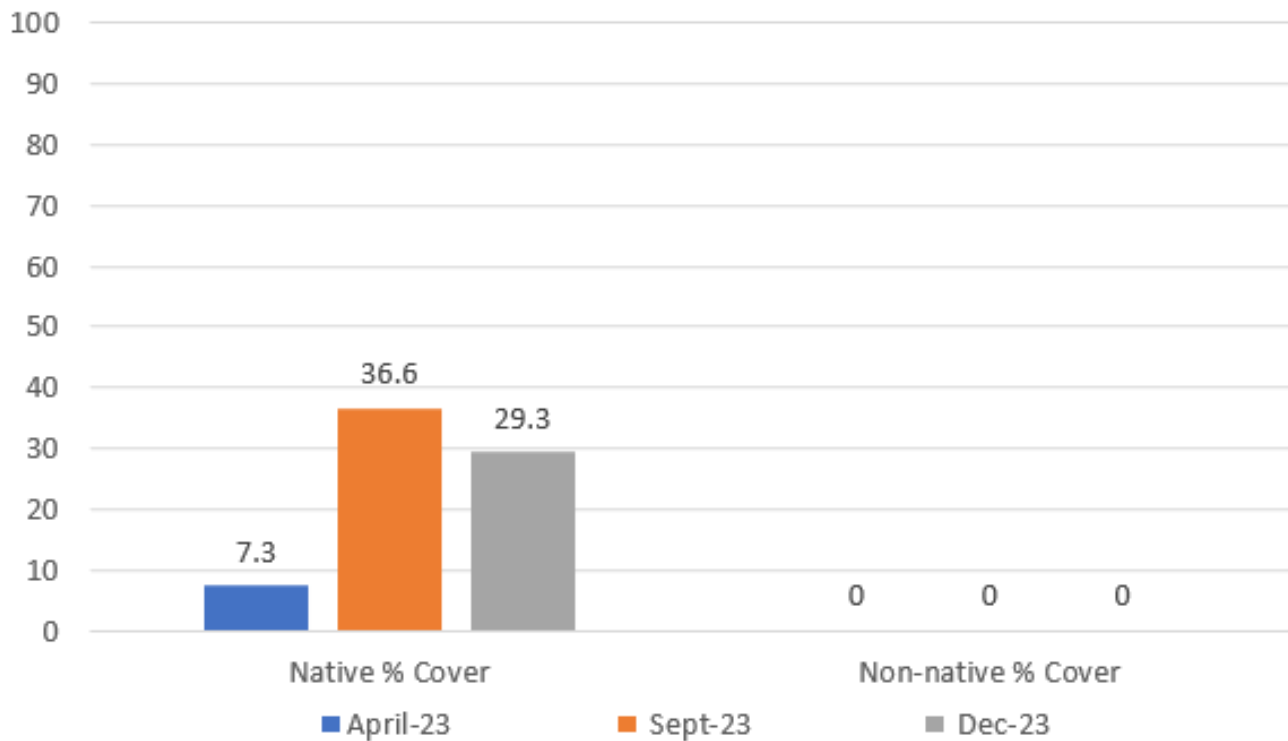


ESC_L1_03_T14



West Basin Dunes

ESC_L1_03_T15



ESC_L1_03_T16

