



Channel Islands National Park

Terrestrial Vegetation Monitoring Annual Report - 2016

Natural Resource Report NPS/MEDN/NRR—2022/2436





ON THIS PAGE

Dudleya greenei on Santa Rosa Island

Photograph by: Dirk Rodriguez

ON THE COVER

Santa Cruz Island coast line

Photograph by: Dirk Rodriguez

Channel Islands National Park

Terrestrial Vegetation Monitoring Annual Report - 2016

Natural Resource Report NPS/MEDN/NRR—2022/2436

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Executive Summary

This report presents the data collected in 2016 as part of the long-term terrestrial vegetation monitoring program at Channel Islands National Park.

The purposes of the monitoring program are to document the long-term trends in the major vegetation communities within the park. The data collected are from 30 m point-line intercept transects. In the past, each transect was sampled annually. However, beginning in 2012 the program began adding randomly located transects to improve the representativeness of the sampling, and transitioned to a rotating panel design. Now only a core subset of the transects are read annually. Non-core transects are assigned to one of four panels, and those transects are read only once every four years.

A summary analysis of the 2016 data shows that:

165 transects were read.

The 165 transects were distributed across all five islands: Santa Rosa Island ($n = 87$), Santa Cruz Island ($n = 33$), Santa Barbara Island ($n = 18$), Anacapa Island ($n = 9$) and San Miguel Island ($n = 11$).

Relative native plant cover averaged 63% across all islands and sampled communities while absolute native plant cover averaged 32%. Among plant communities, relative percent native cover ranged from a low of 1% in seablite scrub to a high of 98% in oak woodland.

In general, the number of vegetation data points recorded per transect positively correlates with average rainfall, which is reflected in the number of “hits” or transect points intersecting vegetation. When precipitation declined there is a corresponding drop in the number of hits. In 2016, however this was not the case. Even though rainfall increased as compared to the previous 4 years (18.99 inches in 2016 vs an average of 6.32 for the previous 4 years), the average number of hits was only 64. To put this into perspective, the highest average number of hits was 240 in 1993, an El Niño year of high precipitation.

The number of vegetation communities sampled varied by island with the larger islands having more communities. In 2016, there were 15 communities sampled on Santa Rosa Island, 12 communities on Santa Cruz Island, 7 communities on San Miguel Island, 7 communities on Santa Barbara Island, and 7 communities on Anacapa Island.

Twenty-six vegetation types were sampled in 2016. Of these, 13 occurred on more than one island. The most commonly shared community was Valley/Foothill grassland which was found in one form or another on all five islands within the park. The next most commonly shared communities were coastal sage scrub and coastal scrub, which were found on four islands. Coastal bluff scrub and coreopsis scrub were monitored on three islands. Four communities—ironwood, mixed woodland, oak woodland, riparian, and seacliff scrub—were monitored on two islands, and 12 communities—Torrey pine woodland, shrub savannah, seablite scrub, Santa Cruz Island pine, perennial iceplant, lupine scrub, fennel, coastal strand, coastal marsh,

cactus scrub, boxthorn scrub, barren, and *Baccharis* scrub—were each monitored on one island.



Island oak on Santa Rosa Island with San Miguel Island in the background (photo by D. Rodriguez).

Acknowledgments

No one accomplishes their work without assistance from others. This report is a result of the hard work done by the employees at Channel Islands National Park and is just one of the fruits of their labors. We thank Julia Aaronson, Clark Cowan, and Ken Niessen for their assistance with fieldwork.

Introduction

Channel Islands National Park (CHIS) is comprised of five islands off the coast of southern California – Anacapa Island (ANI), Santa Cruz Island (SCI), Santa Rosa Island (SRI), San Miguel Island (SMI), and Santa Barbara Island (SBI) (Figure 1).



Figure 1. Channel Islands National Park (islands outlined in green).

The park, under the auspice and financial support from the national Inventorying and Monitoring Program (I&M), began a formal long-term terrestrial vegetation monitoring program in 1984 when the park was comprised of just three islands – SBI, ANI, and SMI. At that time, 54 transects were installed or incorporated from prior monitoring efforts as the basis of the long-term terrestrial vegetation monitoring program (Halvorson et al. 1988). The goal, as established in 1984, was to annually survey 30-meter-long point-line intercept transects to monitor the dominant island vegetation communities (McEachern 2001). In subsequent years, shrub and tree-based monitoring

SOPs were added to the point-line intercept transects adhering to protocols outlined McEachern (2000).

In 1990, the park acquired SRI (54,000 acres) where an additional 86 transects were installed as part of the long-term monitoring program. Santa Cruz Island, the largest of the Channel Islands is owned and administered by The Nature Conservancy (TNC). In 1999, the park acquired approximately 6,000 acres at the east end of the island which was not owned by TNC. This was followed by the acquisition of the adjacent 8,702 acres in 2001 which was owned by TNC at that time. Following these additions to the park, 43 additional transects were installed on those acquired lands and incorporated into the vegetation monitoring program. The majority of SCI is owned and administered by the TNC and is not monitored as part of the park's long-term monitoring program.

In 2000, the Mediterranean Coast Network (MEDN) of I&M was created, and the long-term vegetation monitoring became one of the network's 15 'Vital Signs' monitoring programs (Cameron et al. 2015). Beginning in 2012, improvements were made to the original monitoring protocol to correct deficiencies identified in the program and improve the underlying statistical framework. These improvements included installing additional transects and transitioning from monitoring all transects annually to a rotating panel design in which a core set of transects are visited annually while the remaining transects are visited once every four years. While this will result in a loss of some statistical power to detect year-to-year variability, it will provide a common statistical framework in which to analyze data from all islands (except SCI) as well as expand spatial coverage. The modified program was then expanded to the two other parks within the MEDN—Santa Monica National Recreation Area and Cabrillo National Monument. See Tiszler et al. (2016) for a detailed review of changes to the monitoring program.

This report summarizes data collected in 2016. Summary statistics that include previous years are provided for context.

Methods

Monitoring Dates

The seasonality of monitoring can be an important variable that affects the data collected. Characterized by cool wet winters and warm dry summers, California's Mediterranean-type climate drives much of the phenological variation in the State's vegetation. The optimal period for terrestrial vegetation monitoring at CHIS is between late February and mid-May.

Transects were monitored during separate tours to each island. Each tour was eight days in length, including two travel days and six full days on the island. For the smaller islands (SBI, ANI, and SMI) one tour per island was sufficient to monitor all transects for a particular year. For SCI, two tours were usually required whereas up to four tours were needed for SRI. Table 1 shows the dates that each island was visited in 2016.

Table 1. 2016 field schedule for vegetation monitoring at Channel Islands National Park.

Island	# of Transects Sampled	Dates visited
Santa Barbara Island	18	02/11 – 02/15
Santa Cruz Island	19	02/23 – 02/29
Santa Cruz Island	19	03/08 – 03/12
Santa Rosa Island	29	03/22 – 03/28
Santa Rosa Island	22	05/04 – 05/07
Santa Rosa Island	35	05/17 – 05/28
Santa Rosa Island	2	06/05
San Miguel Island	11	06/15 – 06/18
Anacapa Island (East)	4	07/27
Anacapa Island (West)	4	09/21
Anacapa Island (Middle)	2	09/22

Transect Locations

The transects monitored in 2016 were a combination of legacy sites used for monitoring and other research purposes, plus a set of transects assigned to a four-year rotating panel (Figures 2-5). Out of necessity, some legacy transects were placed subjectively. For instance, on SRI, very little intact native vegetation remained on the island due to grazing by nonnative animals at the time monitoring began. Consequently, the legacy transects were deliberately placed in areas with intact native vegetation. The locations of new transects were chosen using a Generalized Random Tessellation Stratified (GRTS) survey design (Olsen et al. 2012) to achieve a spatially balanced random sample that allows inference to the entire island, in all cases except SCI. Due to the issues associated with

the placement of transects on the islands, any thorough analysis of the data would need to take these factors into account. However, for the purposes of this annual report, the data are treated as a simple random sample.

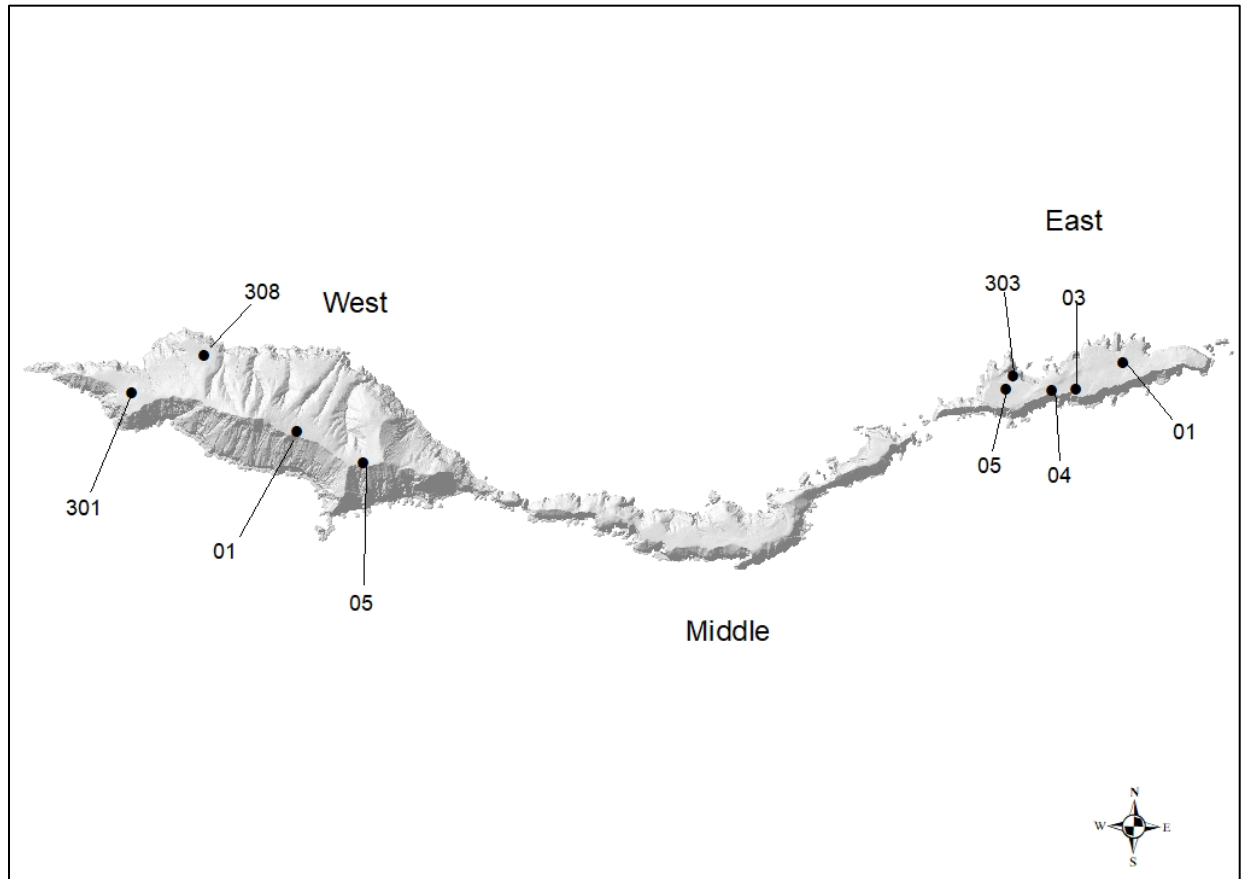


Figure 2. Vegetation monitoring transects on Anacapa Island that were sampled in 2016.

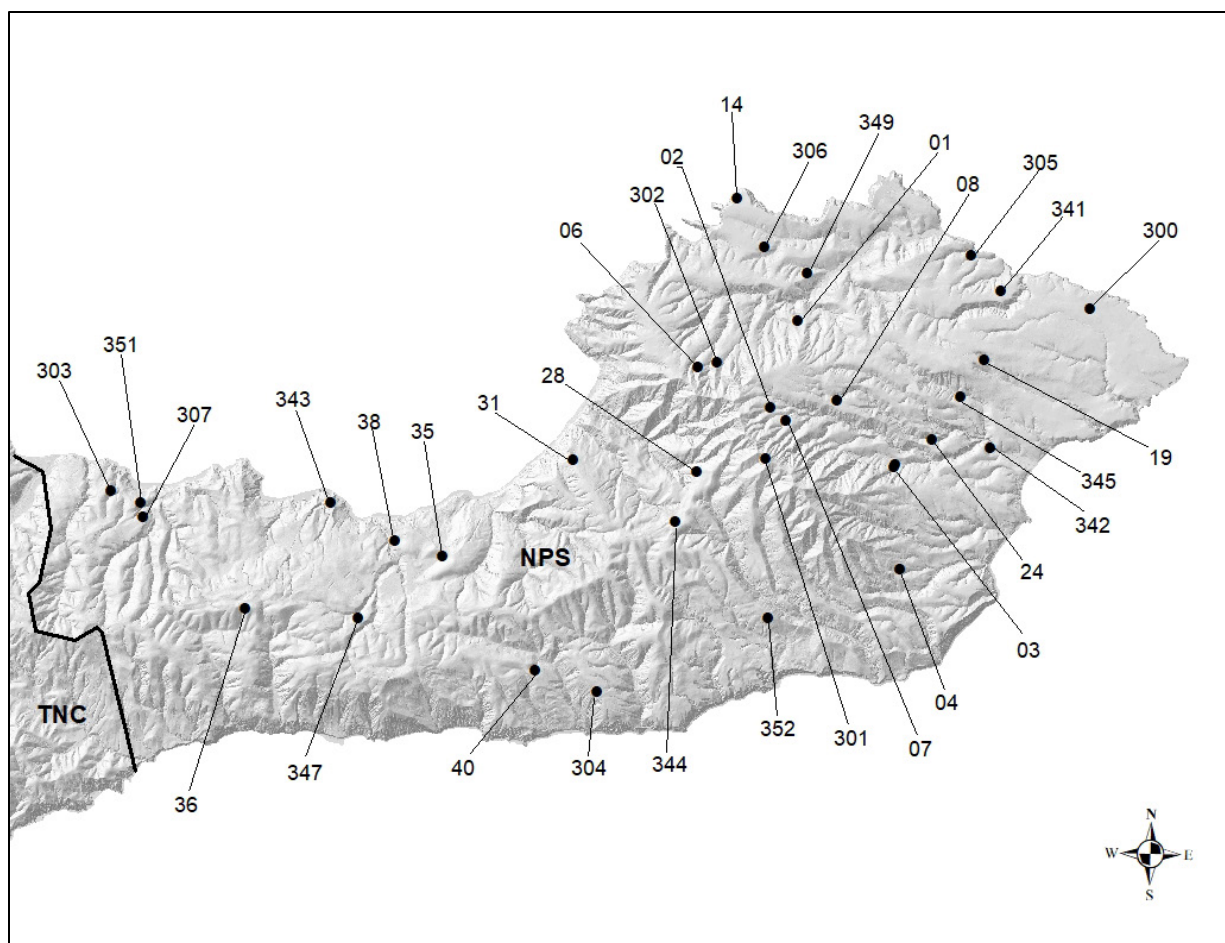


Figure 3. Vegetation monitoring transects on Santa Cruz Island that were sampled in 2016.

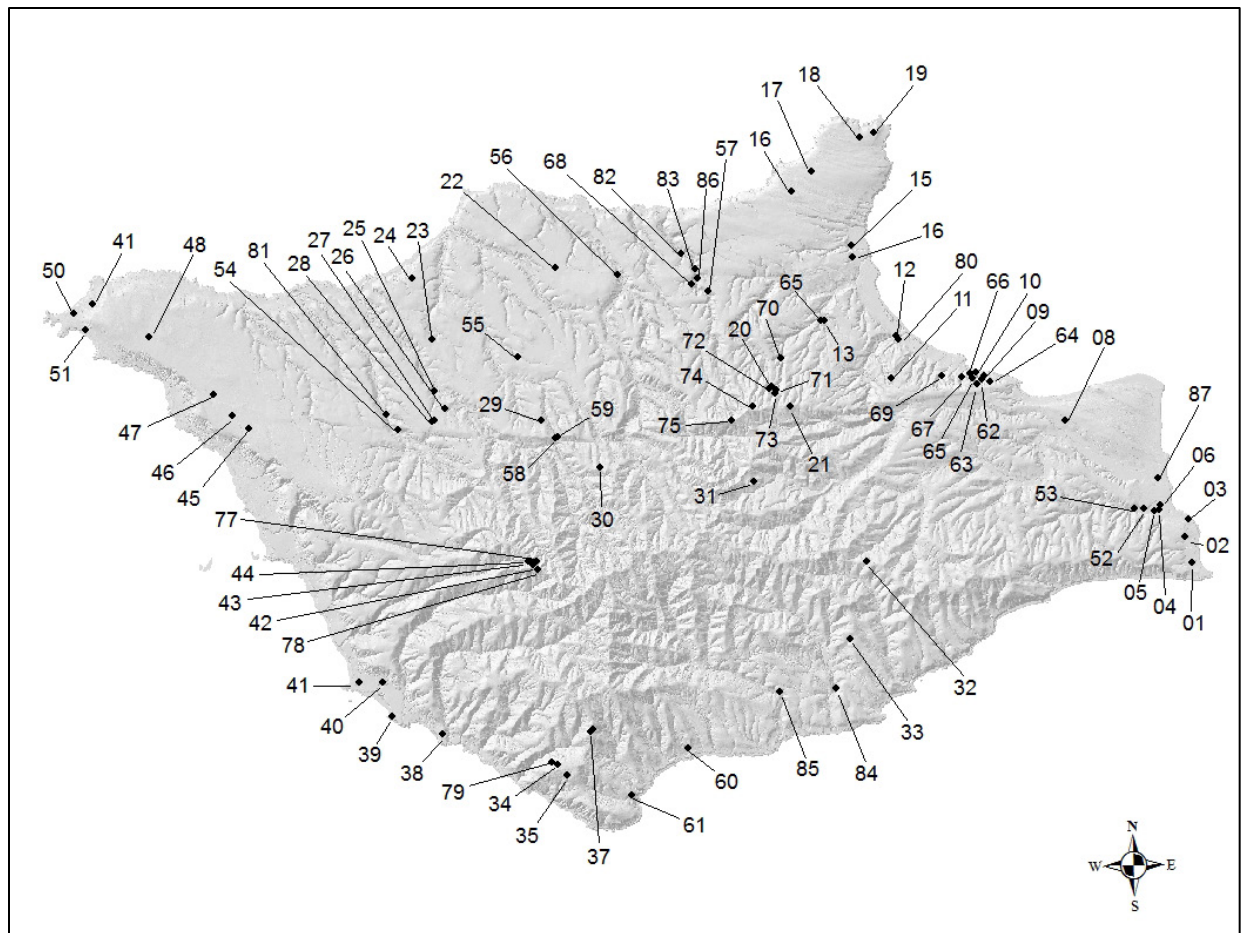


Figure 4. Vegetation monitoring transects on Santa Rosa Island that were sampled in 2016.

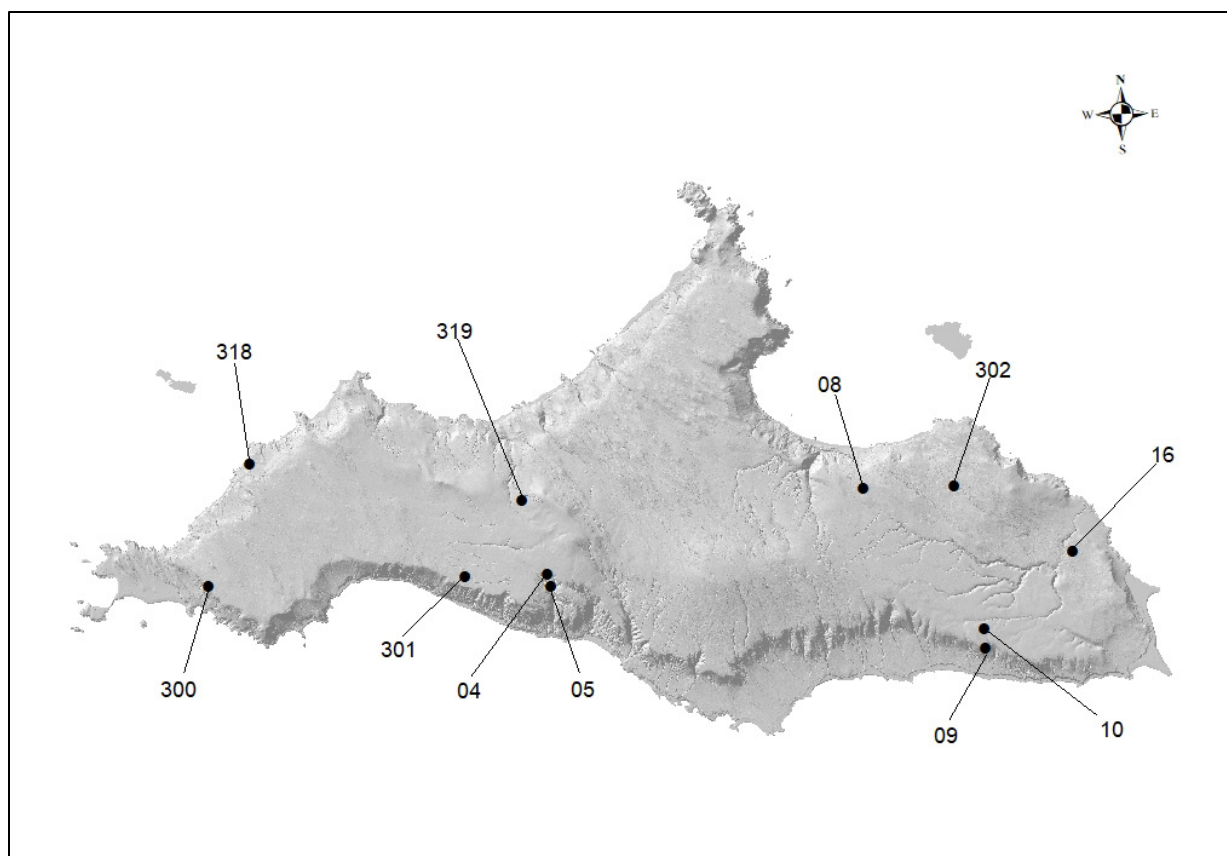


Figure 5. Vegetation monitoring transects on San Miguel Island that were sampled in 2016.

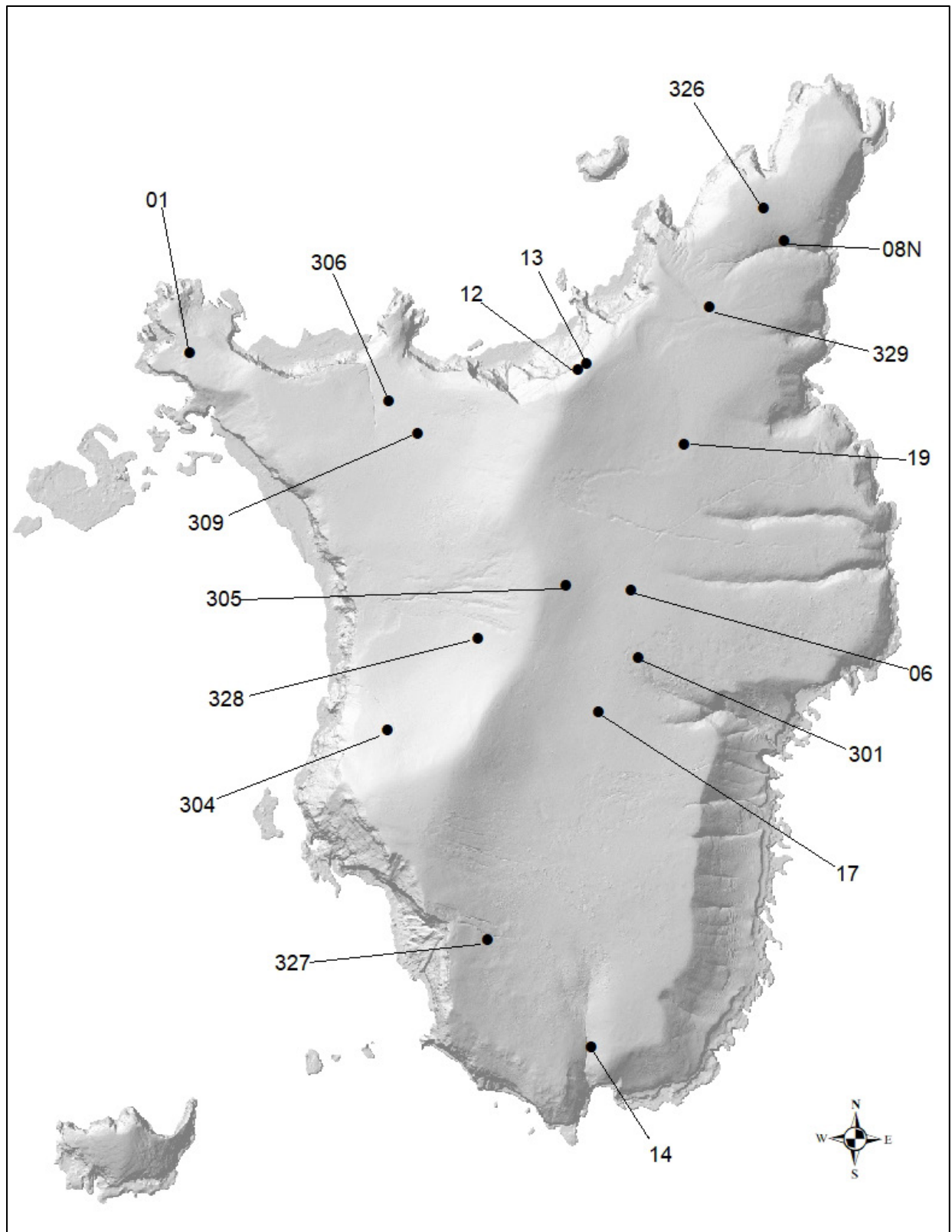


Figure 6. Vegetation monitoring transects on Santa Barbara Island that were sampled in 2016.

Field Data Collection

Three SOPs describe the methods that are used in terrestrial vegetation monitoring—a base SOP, a shrub SOP, and a tree SOP. These SOPs were referred to as ‘protocols’ in the CHIS legacy vegetation monitoring handbook (Halverson et al. 1988) and in a USGS report on tree and shrub monitoring (McEachern 2000). According to the base SOP, a meter tape is stretched out between two aluminum stakes that mark the ends of a transect, and data are recorded every 30 cm along the meter tape using a point-line-intercept method. The data recorded are the plant species that are present at those points (both live and dead tissue for perennial species). The height of the tallest vegetation is also recorded at each point. Each transect provides 100 points of data which is then converted to percent absolute cover.

Although the majority of the transects are 30 m in length, five transects on SBI and one on ANI were originally 39 meters in length. These longer transects were installed for other monitoring purposes and were later incorporated into the park’s long-term monitoring program. For three of these longer transects, the data collected can simply be truncated to 30 meters. The remaining three transects were deliberately installed across ecotones, so they were split into six short transects, each approximately 2/3 the length of the normal length transect. These short transects are all located on SBI and can be identified by their alpha-numeric naming convention (e.g., 08N or 09S).

For transects located in shrub-dominated plant communities, the shrub SOP is implemented. A 1-m belt is placed adjacent to the base transect, divided into six 1-m x 5-m sub-belts, and the number of individuals present within each sub-belt is counted (Figure 7). Four developmental classes—seedling, juvenile, live adult, and dead adult—are recorded. For each live adult, the count of live and dead stems is also recorded.

The tree SOP is implemented in tree-dominated communities. This SOP consists of a 10 x 30-m belt plot that is centered atop the 30-m point-line intercept transect with half of the plot on the uphill side of the base transect line and the other half on the downhill side (Figure 7). Within the plot, tree species are recorded in five categories: seedlings, juveniles, live adults, dead adults, and basal resprouts. Shrub species are also recorded in four stage classes: seedlings, juveniles, live adults, and dead adults within the tree plot.

Data were recorded on paper datasheets and error-checked at the end of each day. Data sheets were reviewed once more prior to entering the data into a Microsoft Access (version 16.0; Microsoft Corporation 2016a) database maintained by the MEDN I&M data manager. The entered data were then verified against the paper datasheets by the park’s I&M botanist.

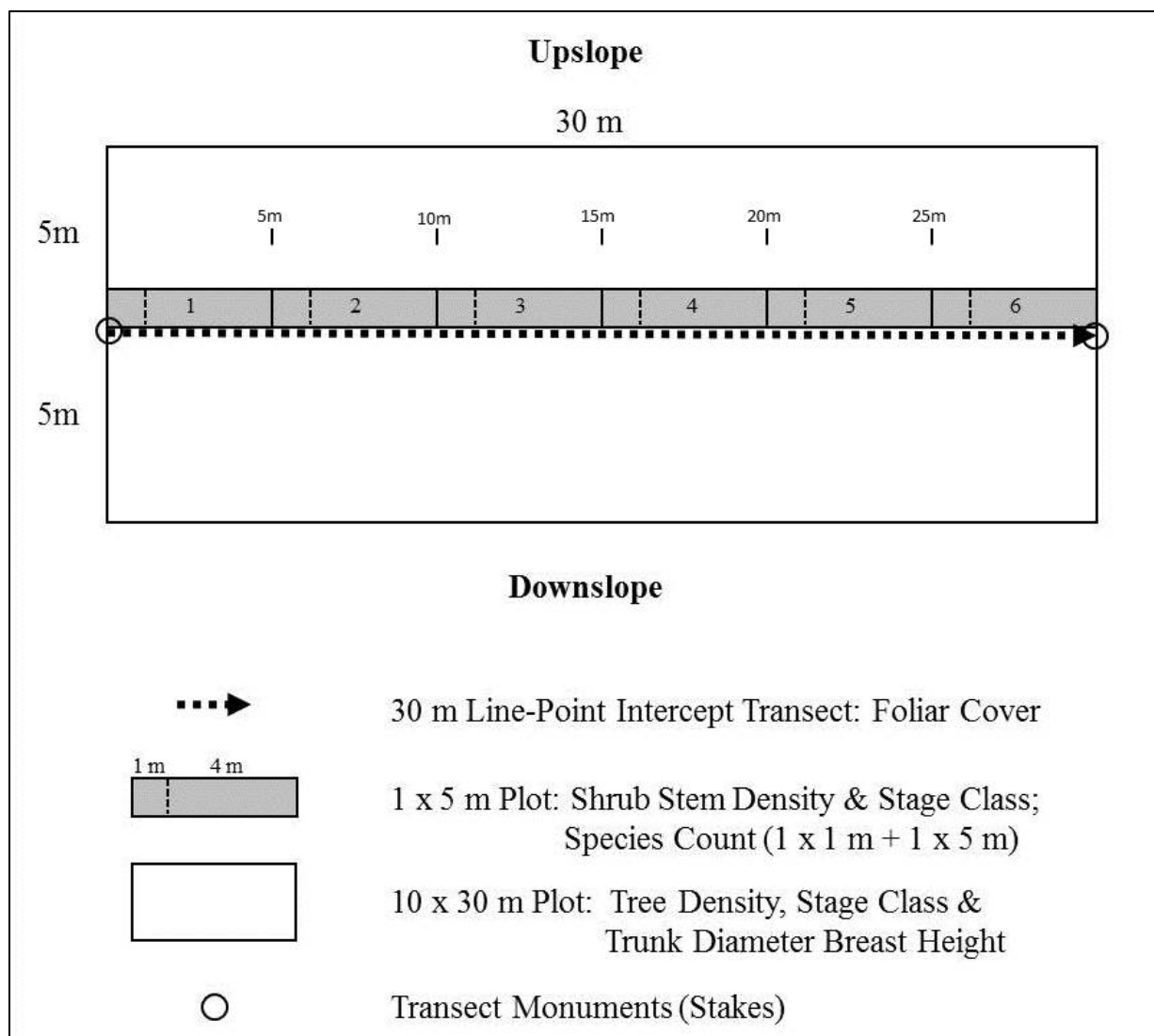


Figure 7. Diagram showing 30-m transect with overlying shrub and tree plots (from Tiszler et al. 2016).

Data Analysis

The QA/QC'd data were summarized in Access using queries. The summarized data were exported to Microsoft Excel (version 16.0; Microsoft Corporation 2016b) in which quantitative community indicators such as species richness and species diversity were calculated, and summary charts and tables were generated.

Results and Discussion

Minimal data analyses are presented in this report as it presents only a single year of data. However, simple comparisons can be made between native plant communities within and between islands. Comparisons are primarily presented in charts and tables.

Precipitation

The 2012-2016 drought that gripped California may have been the driest 4 years of the previous 1,200 years (Dong et al. 2019). Below average rainfall tends to result in lower mean hits across all islands and all years, although this did not seem to be case in 2016 as shown in Figure 8.

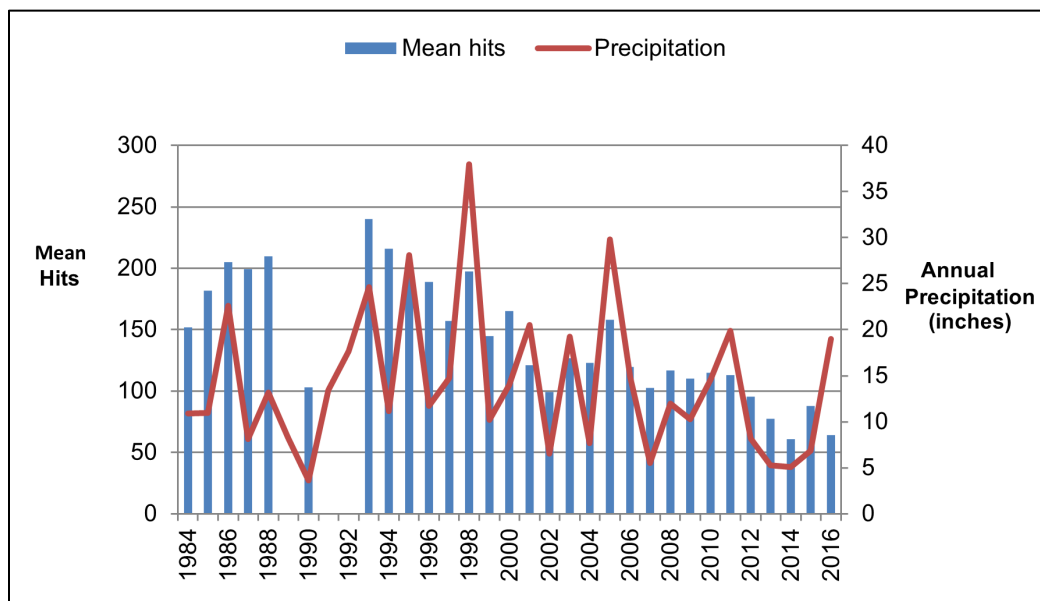


Figure 8. Mean number of plant hits across all transects and islands per year compared to annual precipitation. Precipitation data are from Station 168 (Ventura County Watershed Protection District), near the Oxnard airport where the 1984-2016 mean was 14.1 in. While not the same as the actual precipitation that fell on the islands, the data reflect the high variability of rainfall from year to year in southern California. Transect data gaps for 1989, 1991, and 1992 reflect a lack of monitoring in those years.

Native Plant Cover

In evaluating the condition of the park's vegetation communities after years of extensive grazing, one metric of interest is the ratio of native to non-native plants. Some plant communities increased native plant cover following the removal of introduced herbivores (Willis et al. 2018). However, the on-going drought in California has likely had the most influence on the data this year, in particular the cover of annual species.

All five islands

Figures 9 and 10 show the average absolute and relative cover of native plant cover and non-native plants by plant community for all five islands.

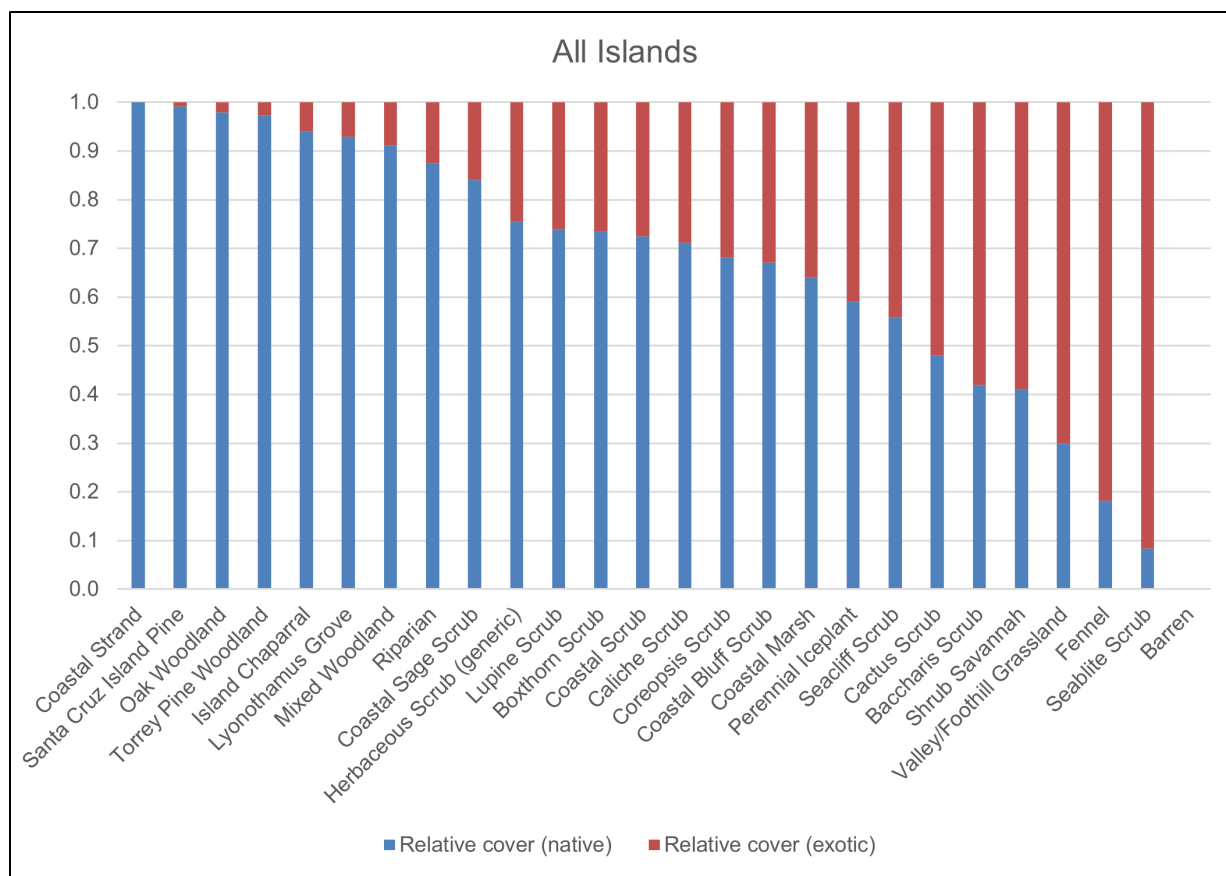


Figure 9. Average relative cover of native vs non-native plants by community on all five islands in 2016. Communities are ranked highest to lowest proportion of native cover.

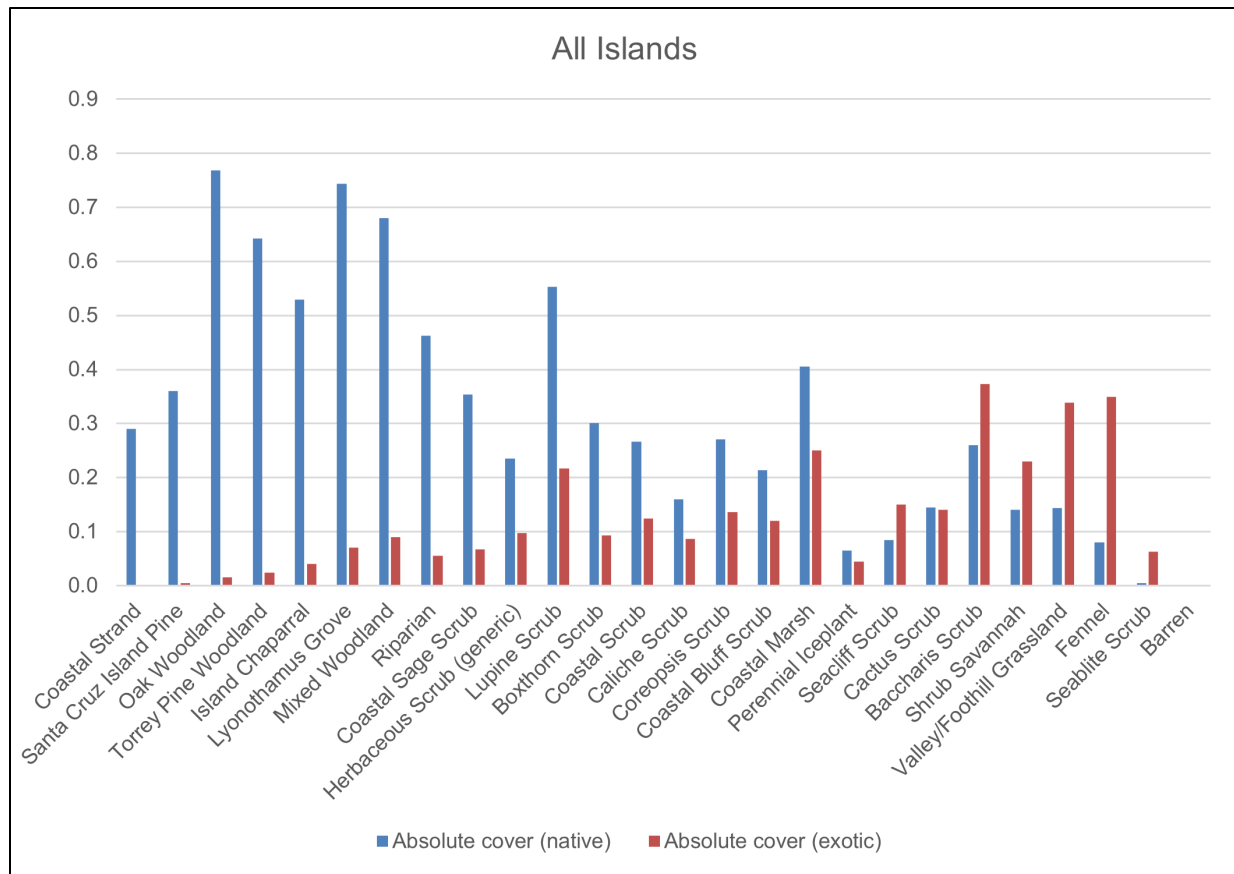


Figure 10. Average absolute cover of native vs non-native plants by community on all five islands in 2016. Communities are ranked highest to lowest proportion of native cover, as in Figure 9.

Anacapa Island

Figures 11 and 12 show the average absolute and relative cover of native plant cover and non-native plants by plant community for Anacapa Island.

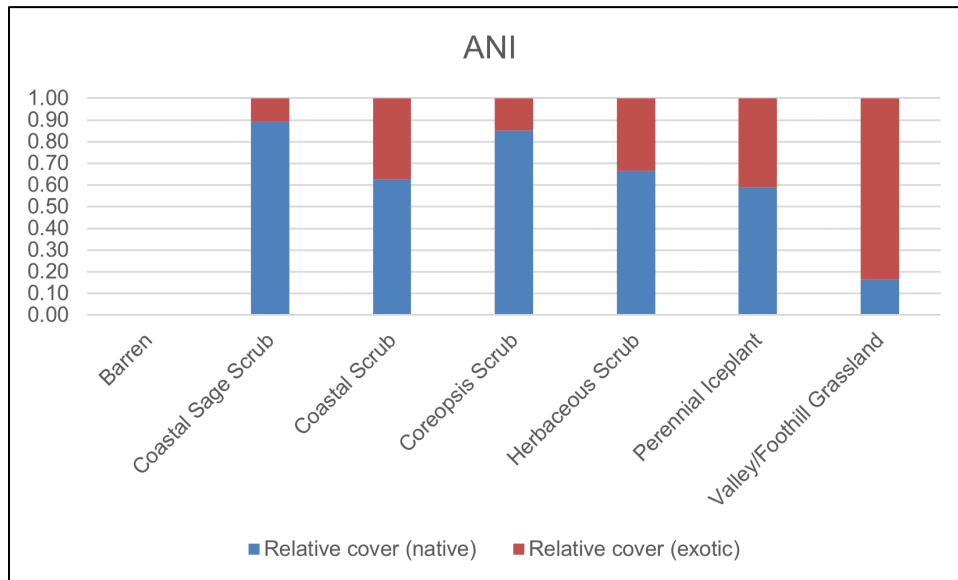


Figure 11. Average relative cover of native vs non-native plants by community on ANI in 2016.

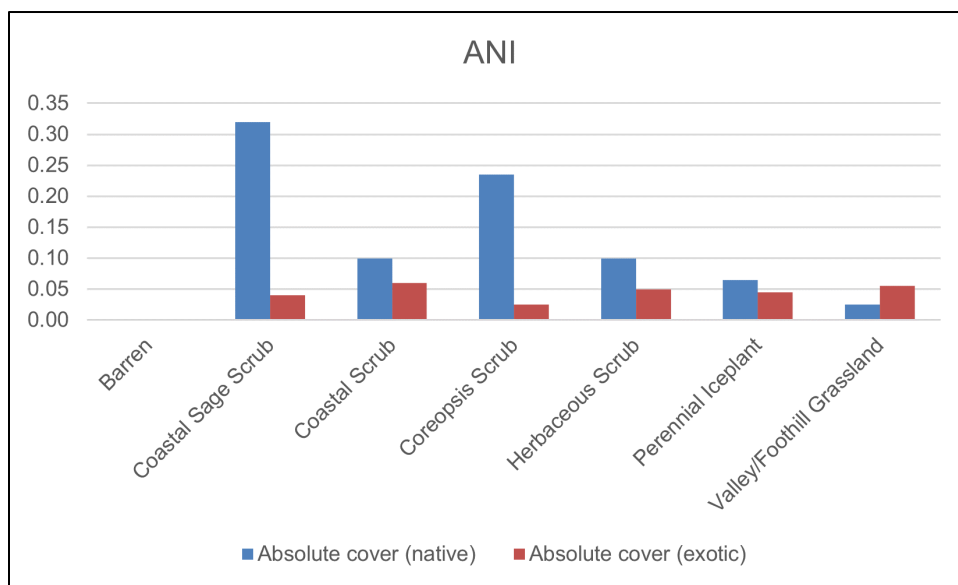


Figure 12. Average absolute cover of native vs non-native plants by community on ANI in 2016.

Santa Barbara Island

Figures 13 and 14 show the average absolute and relative cover of native plant cover and non-native plants by plant community for Santa Barbara Island.

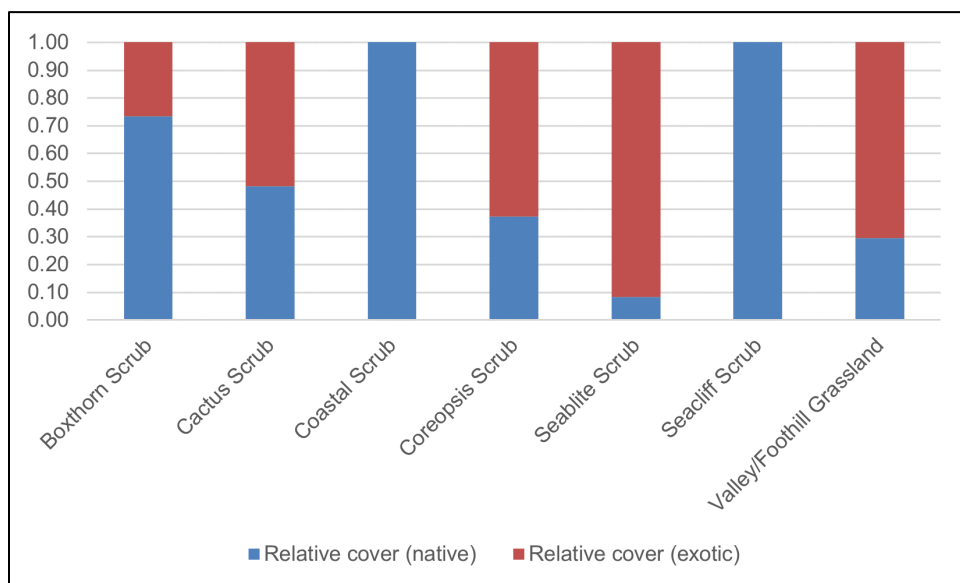


Figure 13. Average relative cover of native vs non-native plants by community on SBI in 2016.

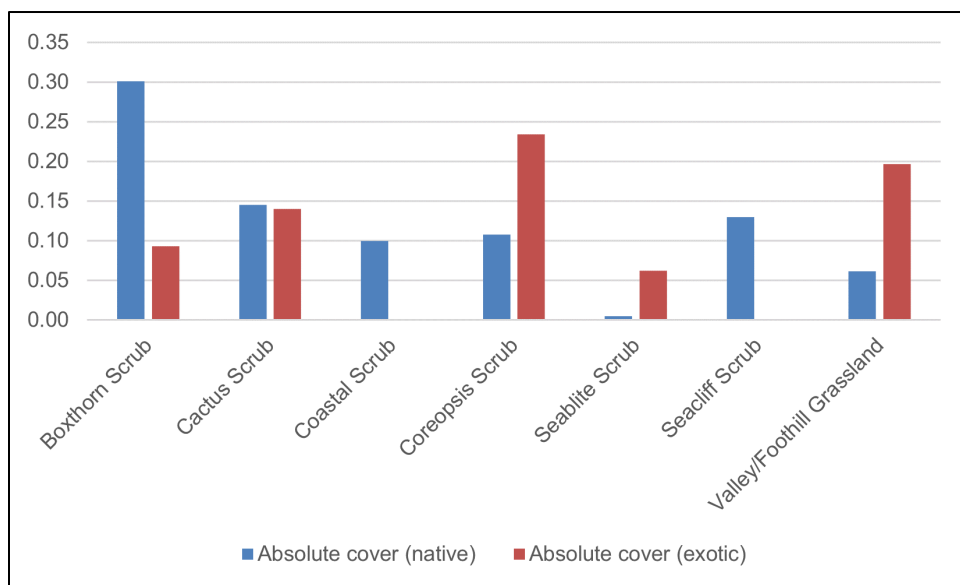


Figure 14. Average absolute cover of native vs non-native plants by community on SBI in 2016.

Santa Cruz Island

Figures 15 and 16 show the average absolute and relative cover of native plant cover and non-native plants by plant community for Santa Cruz Island.

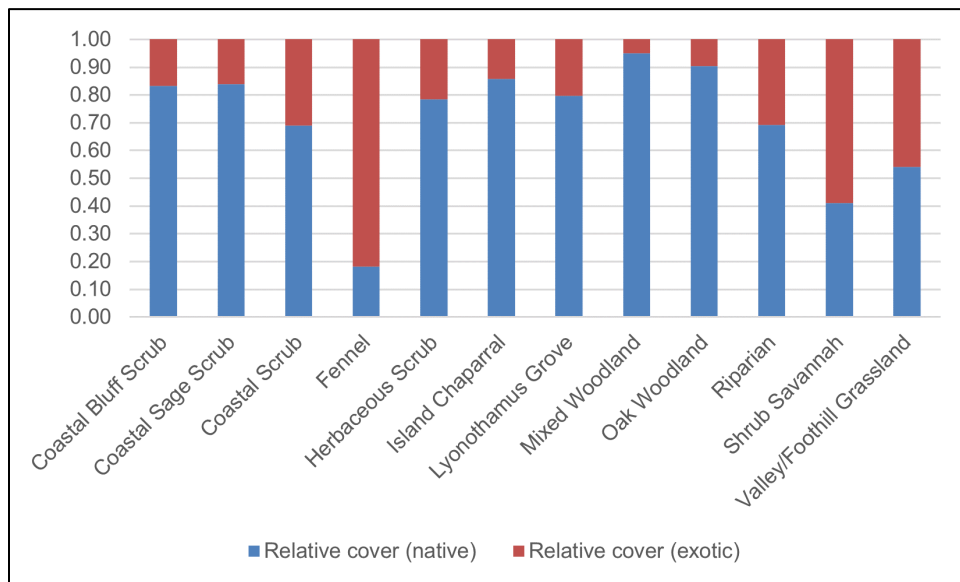


Figure 15. Average relative cover of native vs non-native plants by community on SCI in 2016.

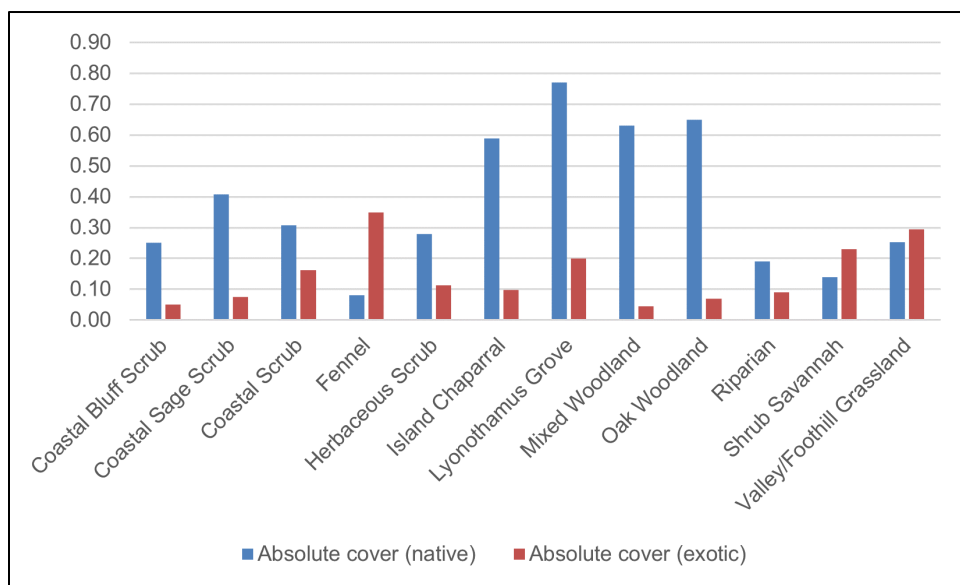


Figure 16. Average absolute cover of native vs non-native plants by community on SCI in 2016.

San Miguel Island

Figures 17 and 18 show the average absolute and relative cover of native plant cover and non-native plants by plant community for San Miguel Island.

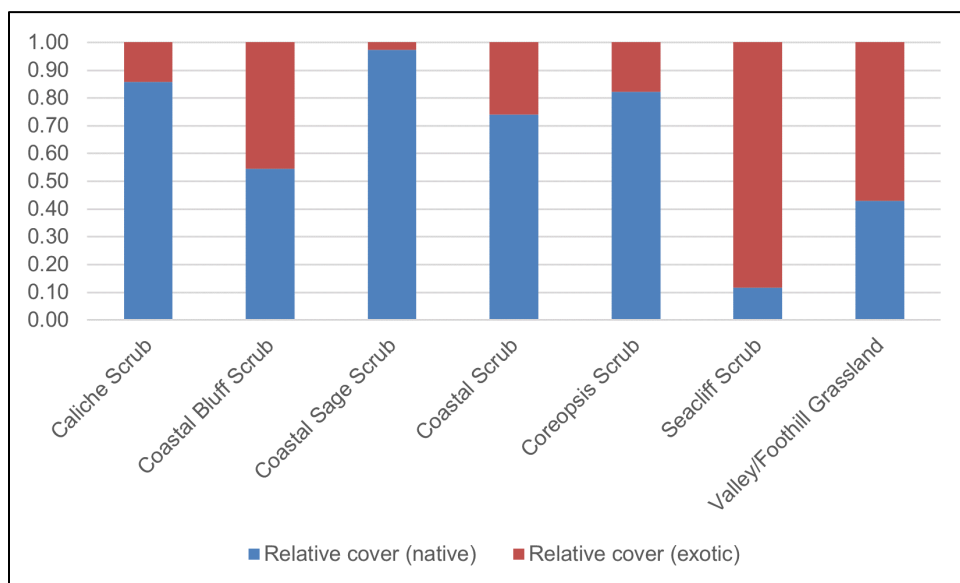


Figure 17. Average relative cover of native vs non-native plants by community on SMI in 2016.

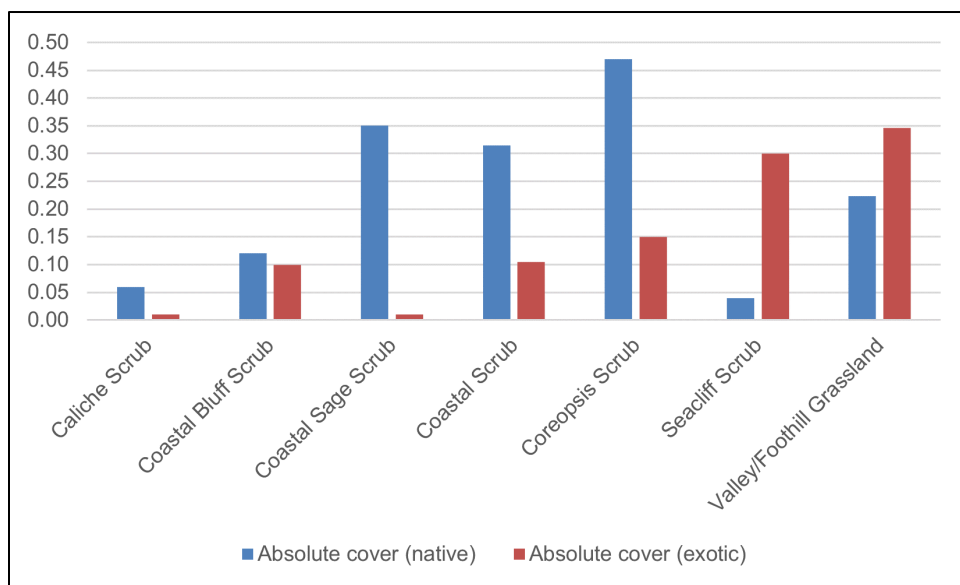


Figure 18. Average absolute cover of native vs non-native plants by community on SMI in 2016.

Santa Rosa Island

Figures 19 and 20 show the average absolute and relative cover of native plant cover and non-native plants by plant community for Santa Rosa Island.

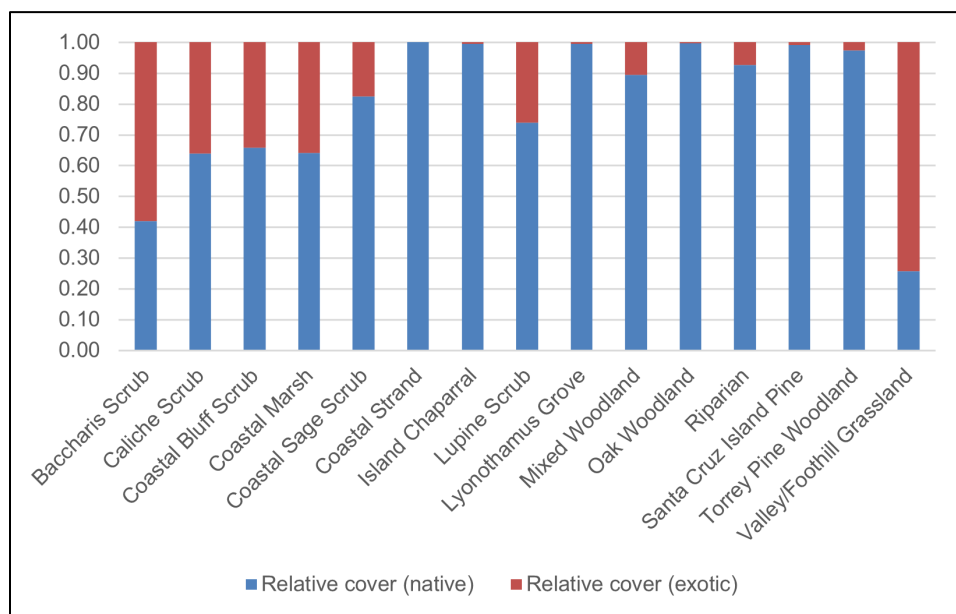


Figure 19. Average relative cover of native vs non-native plants by community on SRI in 2016.

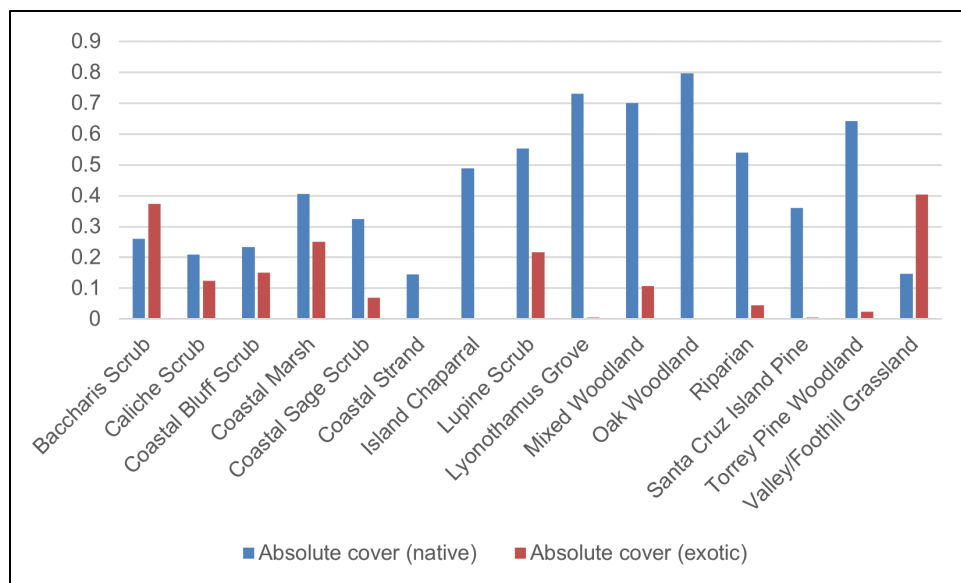


Figure 20. Average absolute cover of native vs non-native plants by community on SRI in 2016.

Community Diversity

Other measures of plant community condition include indices such as species richness or species diversity. Often it is assumed that higher species richness or diversity indicates “healthier” plant communities. This may or may not be true, depending on what is desired from a land management

perspective or whether the species is native. For instance, in some riparian areas, bank stability or resistance to erosion may be more indicative of plant community health or may be more desirable. A riparian area dominated by one native species with a deep or strong root structure would be preferred compared to a diverse riparian community in which some are non-native or have weak root structures that would allow for increased erosion during strong precipitation events. Regardless, these diversity indices have become a common way of evaluating and comparing plant communities. Three of the most commonly used indices are species richness, species evenness, and species diversity.

Species Richness

This parameter is simply a sum of the number of species found on a single transect or on all transects within a specific community, depending on the spatial scale considered. Data presented here reflect the number of species found along all point-line intercept transects monitored within each particular community in 2016. Table 2 shows the relative species richness among the islands' dominant plant communities. The use of point-line intercept transects typically underestimates the actual number of species present in an area or plant community because this method often misses the infrequent or rare plants – a significant flaw (Dethier et al. 1993). In addition, species richness can be misleading when applied to a rich but low diversity community dominated by only a few species. Another critique of species richness is its dependency on sampling intensity because up to a certain point the number of species recorded in an area increases with the number of samples taken.

Table 2. Vegetation Species Richness for all five islands at Channel Islands National Park in 2016.

Vegetation Community	ANI	SBI	SMI	SCI	SRI
<i>Baccharis</i> scrub	–	–	3	–	37
Barren	–	–	–	–	–
Boxthorn scrub	–	10	–	–	–
Cactus scrub	–	14	–	–	–
Caliche scrub	–	–	4	–	16
Coastal bluff scrub	–	–	8	5	10
Coastal marsh	–	–	–	–	10
Coastal sage scrub	5	–	8	25	45
Coastal scrub	10	2	13	32	–
Coastal strand	–	–	–	–	8
Coreopsis scrub	13	10	15	–	–
Fennel	–	–	–	4	–
Herbaceous scrub	3	–	–	14	–
Island chaparral	–	–	–	17	21

Table 2 (continued). Vegetation Species Richness for all five islands at Channel Islands National Park in 2016.

Vegetation Community	ANI	SBI	SMI	SCI	SRI
Lupine scrub	–	–	–	–	17
<i>Lyonothamnus</i> woodland	–	–	–	4	10
Mixed woodland	–	–	–	16	31
Oak woodland	–	–	–	7	5
Perennial iceplant	6	–	–	–	–
Riparian	–	–	–	17	22
Santa Cruz Island Pine	–	–	–	–	9
Seablite scrub	–	7	–	–	–
Seacliff scrub	–	4	3	–	–
Shrub Savannah	–	–	–	8	–
Torrey Pine woodland	–	–	–	–	20
Valley/Foothill grassland	8	15	19	20	63

Species Evenness

Species evenness is a measure of variation in community species abundance among samples (Smith and Wilson 1996). It is a way to evaluate the relative dominance between the species present with the idea that evenness is highest when a community is not dominated by a few species of very high abundance, or equivalently that all species have an equal abundance (Magurran and McGill 2011). For instance, if there were three species within a plant community but there were 100 plants of species X and only 15 and 10 plants of species Y and J respectively, then the community would not be very even. However, if the plant community had 50 plants of species X, and 45 of species Y and 52 of species J, it would be considered fairly even. While species evenness is highly important in helping to evaluate diversity, it does not reflect how many species may be present within the area or community that is being measured. The evenness of a community or area can be represented by the Shannon Evenness Index equation:

$$E_H = H / H_{max}$$

Where H is the number derived from the Shannon diversity index and H_{max} is the maximum possible value of H (i.e. if every species were equally likely). E_H falls between 0 and 1 with lower values representing samples or populations with lower evenness. Species evenness values by vegetation community and island are provided in Table 3.

Table 3. Shannon evenness index values in 2016 by vegetation community and by island at Channel Islands National Park.

Vegetation Community	ANI	SBI	SMI	SCI	SRI
<i>Baccharis</i> scrub	–	–	–	–	0.58
Barren	–	–	–	–	–
Boxthorn scrub	–	0.76	–	–	–
Cactus scrub	–	0.85	–	–	–
Caliche scrub	–	–	0.90	–	0.79
Coastal bluff scrub	–	–	0.57	0.51	0.60
Coastal marsh	–	–	–	–	0.79
Coastal sage scrub	0.69	–	0.67	0.55	0.50
Coastal scrub	0.91	0.47	0.69	0.65	–
Coastal strand	–	–	–	–	0.73
Coreopsis scrub	0.79	0.70	0.71	–	–
Fennel	–	–	–	0.65	–
Herbaceous scrub	0.75	–	–	0.67	–
Island chaparral	–	–	–	0.55	0.63
Lupine scrub	–	–	–	–	0.81
<i>Lyonothamnus</i> woodland	–	–	–	0.46	0.52
Mixed woodland	–	–	–	0.75	0.75
Oak woodland	–	–	–	0.68	0.36
Riparian	–	–	–	0.82	0.63
Bishop pine woodland	–	–	–	–	0.56
Perennial iceplant	0.52	–	–	–	–
Seablite scrub	–	0.77	–	–	–
Seacliff scrub	–	0.78	0.51	–	–
Shrub savannah	–	–	–	0.88	–
Torrey pine woodland	–	–	–	–	0.46
Valley/foothill grassland	0.79	0.74	0.70	0.68	0.62

Species Diversity

Species diversity is the function of the number of species (richness) in an area or community and their relative abundance (evenness) to one another within that area or community (Hulbert 1971).

Often diversity is represented by the Shannon Diversity Index or Shannon-Wiener Index (Spellerberg 2003). The Shannon index (SDI) is represented by the equation:

$$H = - \sum_{i=1}^r P_i \ln P_i$$

(where P_i represents the portion of species i to all species within the population or sample). As the evenness of the sample declines (one species is largely dominant) the index approaches zero and a sample consisting of only one species would be zero. SDI numbers between 2 and 3 reflect communities or populations that are considered moderately diverse Table 4 shows the Shannon index values calculated for the 2016 Channel Islands sampling effort.

Table 4. Shannon Diversity Index values for 2016 by vegetation community and island at Channel Islands National Park.

Vegetation Community	ANI	SBI	SMI	SCI	SRI
<i>Baccharis</i> scrub	–	–	–	–	2.10
Barren	–	–	–	–	–
Boxthorn scrub	–	1.75	–	–	–
Cactus scrub	–	2.24	–	–	–
Caliche scrub	–	–	1.25	–	2.19
Coastal bluff scrub	–	–	1.19	0.82	1.39
Coastal marsh	–	–	–	–	1.82
Coastal sage scrub	1.12	–	1.40	1.76	1.89
Coastal scrub	2.10	0.33	1.78	2.26	–
Coastal strand	–	–	–	–	1.52
Coreopsis scrub	2.03	1.60	1.92	–	–
Fennel	–	–	–	0.90	–
Herbaceous scrub	0.82	–	–	1.76	–
Island chaparral	–	–	–	1.56	1.92
Lupine scrub	–	–	–	–	2.28
<i>Lyonothamnus</i> woodland	–	–	–	0.63	1.21
Mixed woodland	–	–	–	2.08	2.56
Oak woodland	–	–	–	1.32	0.58
Perennial iceplant	0.93	–	–	–	–

Table 4 (continued). Shannon Diversity Index values for 2016 by vegetation community and island at Channel Islands National Park.

Vegetation Community	ANI	SBI	SMI	SCI	SRI
Riparian	–	–	–	2.33	1.94
Bishop pine woodland	–	–	–	–	1.23
Seablite scrub	–	1.51	–	–	–
Seacliff scrub	–	1.09	0.56	–	–
Shrub savannah	–	–	–	1.82	–
Torrey pine woodland	–	–	–	–	1.37
Valley/foothill grassland	1.63	1.99	2.06	2.04	2.56

Percent Species Capture

The point-line intercept method minimizes bias among observers; data reflect species presence-absence at each point along a transect and are not dependent on an estimation of percent cover for a particular species. This method, however, tends to capture only the more common species present in a particular community or sample. One technique employed in the protocol to minimize this deficiency is to record those species that were not “hit” along the transect line, but did occur within a 1-m plot along the length of the 30-m transect line. Those data have not been tabulated and are not presented here but are another measure to ascertain the percentage of species that are captured or missed by the point-line intercept method. The proportion of species recorded on transects against all species known to occur on that island is presented in Table 5. These numbers are influenced by climatic conditions and vary from year to year. Drought increases the likelihood that the point-intercept method will “miss” some species, especially those that are uncommon. However, over the long term this method has been able to capture a significant number of the known species for each island (Table 5).

Table 5. Number of species and percent species captured on sampling transects in 2016 by island at Channel Islands National Park.

Metric	ANI	SBI	SMI	SCI*	SRI
Number of species hit (2016)	24	24	36	70	146
Number of species known to occur	266	130	285	661	528
Percent species hit (2016)	9	18	13	11	28
Percent species hit (1984-2016)	48	58	42	27	58

*Majority of SCI is owned by TNC and is not monitored by the park

Indicator Plant Species

Under the network protocol (Tiszler et al. 2016), individual plant species were identified as important status indicators for certain plant communities. They were chosen based on their importance in defining community structure or for what was believed to be their ability to provide inference to community function. These species were also seen to “represent varying ranges of environmental adaptation and their co-occurrence is a response to the unique conditions in each park”. The tracking of these species should elucidate the overall health of the native plant communities over time.

Some species were common to all three parks within the MEDN (CHIS, Cabrillo National Monument, and Santa Monica Mountains National Recreation Area) while others were shared by only two parks, or were unique to individual parks. The selection of these species may change as our understanding of them increases and individual park interests change over time. For CHIS, 12 plant species were selected as indicator species as shown in Table 6.

Table 6. Indicator species at Channel Islands National Park.

Species	Community
<i>Adenostomma fasciculatum</i> (var. <i>fasciculatum/prostratum</i>)	chaparral
<i>Arctostaphylos confertiflora</i>	chaparral
<i>Artemisia californica</i>	coastal sage scrub
<i>Baccharis pilularis</i>	coastal sage scrub
<i>Isocoma menziesii</i>	coastal sage scrub
<i>Leptosyne gigantea</i>	coastal sage scrub
<i>Lycium californicum</i>	coastal sage scrub
<i>Quercus pacifica</i>	chaparral
<i>Rhus integrifolia</i>	transitional/ubiquitous
<i>Stipa lepida</i>	coastal sage scrub
<i>Stipa pulchra</i>	coastal sage scrub
<i>Suaeda taxifolia</i>	coastal sage scrub

All CHIS indicator species occurred on one or more of the transects read in 2016. Except for *A. confertiflora*, which only occurs on SRI, all occur on at least two islands within the park. *Artemisia californica*, *L. gigantea*, and *B. pilularis* are represented on all five park islands. Table 7 presents the mean number of hits per transect, and the number of transects that the indicator species occurred on within the park. The table also shows the maximum and minimum mean hits for the indicator species that have occurred over the program’s time span. Although there will be inter-annual fluctuation in the amount of cover for these indicator species, ideally, we want them to remain stable or increase over time. Because these numbers can be sample dependent, the number of transects on which these species were monitored in 2016 are indicated, as well as the maximum and minimum number of

transects on which data for these species have been obtained over the term of the monitoring program. In addition, the identification of the native grasses *Stipa lepida* and *Stipa pulchra* have been taxonomically problematic over the course of the monitoring program, and the data shown for these species should therefore be evaluated accordingly.

Table 7. Indicator species, mean number of hits, and historical number of transects containing the species at Channel Islands National Park in 2016. Maximum and minimum counts obtained from 1984 through 2016.

Indicator species	Mean hits (# transects)		
	2016	Min	Max
<i>Adenostomma fasciculatum</i> (var. <i>fasciculatum/prostratum</i>)	16.8 (5)	16.8 (5)	46.5 (46)
<i>Arctostaphylos confertiflora</i>	16.2 (5)	2.0 (4)	15.2 (5)
<i>Artemisia californica</i>	14.1 (39)	14.1 (39)	40.0 (4)
<i>Baccharis pilularis</i>	5.7 (24)	5.7 (24)	19.8 (22)
<i>Isocoma menziesii</i>	7.5 (15)	5.3 (3)	25.9 (12)
<i>Leptosyne gigantea</i>	7.8 (5)	7.6 (10)	33.5 (13)
<i>Lycium californicum</i>	9.7 (3)	4.0 (2)	24.0 (1)
<i>Quercus pacifica</i>	19.5 (20)	16.7 (21)	36.2 (16)
<i>Rhus integrifolia</i>	14.5 (4)	2.0 (1)	28.0 (2)
<i>Stipa lepida</i>	1.0 (1)	1.0 (1)	40.0 (2)
<i>Stipa pulchra</i>	7.9 (26)	7.9 (26)	44.4 (14)
<i>Suaeda taxifolia</i>	4.3 (3)	2.7 (3)	44.9 (7)

Conclusions

No long-term trends can be discerned when presenting only a single year of raw data; however, some general comparisons can be made between the islands and vegetation communities. For instance, when looking at percent cover of native versus non-native species, the smaller islands (ANI and SBI), generally had greater cover of non-native plant species within their plant communities. For the larger islands, native exceeded non-native cover except for the Valley/Foothill Grassland community on SRI and SMI.

For the indicator species, all show declines in cover from recorded highs, but this is not unexpected given the current dry spell. However, it is of some concern that in 2016 five of the 12 species (*Adenostoma fasciculatum* var. *prostratum*, *Artemisia californica*, *Baccharis pilularis*, *Stipa lepida*, and *S. pulchra*) had record lows, and one species (*Leptosyne gigantea*) had a near record low.

Over the past 20 years the park has worked to eliminate the non-native animals that were introduced to SCI and SRI during the ranching period (Davidson et al. 2019). Many of these animals such as cattle, sheep, deer, and elk altered the composition of many island plant communities and caused impacts such as accelerated erosion, trail formation, and nutrient loading in riparian areas. However even without the introduction and removal of non-native animals the islands have always experienced change. Native Americans manipulated the vegetation to suit their needs. All of these changes have impacted the islands' plant communities and are reflected in their present condition.

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The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

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