



Climate Monitoring in the Mediterranean Coast Network 2010

Channel Islands National Park

Natural Resource Report NPS/MEDN/NRR—2015/1059



ON THE COVER

Inspiration Point, Anacapa Island
Photograph by the National Park Service

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Executive Summary

This report details the climate (temperature, precipitation, drought, and wind conditions) of Channel Islands National Park (Channel Islands NP) during 2010. Gridded GIS maps are used to present broad-brush conditions across the region for each month. This regional presentation is compared to detailed data from Remote Automated Weather Stations (RAWS) and a manually operated weather station on Santa Cruz Island. Prior to analysis, a set of data quality control checks were performed by the author in accordance with established National Park Service protocols (Rocky Mountain Climate Working Group 2010). Calendar-year 2010 began with drought conditions, but drought was alleviated by March. Total annual precipitation was above the 1971-2000 averages across the park. Average daily maximum temperatures (Tmax) for 2010 overall were either near average or as much as 1-3 degrees Fahrenheit (F) below the 1971-2000 averages. Average daily minimum temperatures (Tmin) for the year were either near or slightly above average. Within these yearly averages, there was significant variability. April and July had notably below average temperatures, when Parameter-elevation Regression on Independent Slopes Model (PRISM) estimates indicate that some parts of Channel Islands NP had Tmax 6 or more degrees (F) below average and Tmin 2-4 degrees (F) below average in some high elevation areas. In October and December, Tmin was generally above average but Tmax was generally below average. There was significant spatial and month to month variability in the data that provided exceptions to these generalizations, so an examination of the regional maps (Figures 3-5) are key to understanding the climatic patterns for 2010. Section 2 contains a set of narratives that provide details for each season of the year. Bullet points within section 2 highlight key data for each month of the year.

Introduction

Background

This report details the climate (temperature, precipitation, drought and wind conditions) of Channel Islands National Park (Channel Islands NP) during 2010. Climatic events are presented both from a local perspective, with data from individual weather stations, and from a regional perspective, with maps that depict broad-scale conditions across southern California during each month of the year. The climatic conditions of 2010 are also compared to a historical context, based primarily on a standard 30-year average or “normal” period (currently 1971-2000).

The content is divided into sections that discuss precipitation, temperature and drought; and wind conditions. The section on temperature, precipitation and drought is further sub-divided into seasonal narratives that highlight key data and events. The locations of weather stations cited in this report are shown in Figure 1. Metadata for these stations can be accessed from the internet links provided in Appendix 1. Those interested in additional climate-related information for Channel Islands NP and the surrounding areas should seek:

- Western Regional Climate Center (<http://www.wrcc.dri.edu/>)
- Drought Monitor (<http://drought.unl.edu/dm/monitor.html>)
- NOAA (National Oceanic Atmospheric Administration) National Weather Service (<http://www.cpc.ncep.noaa.gov/>)

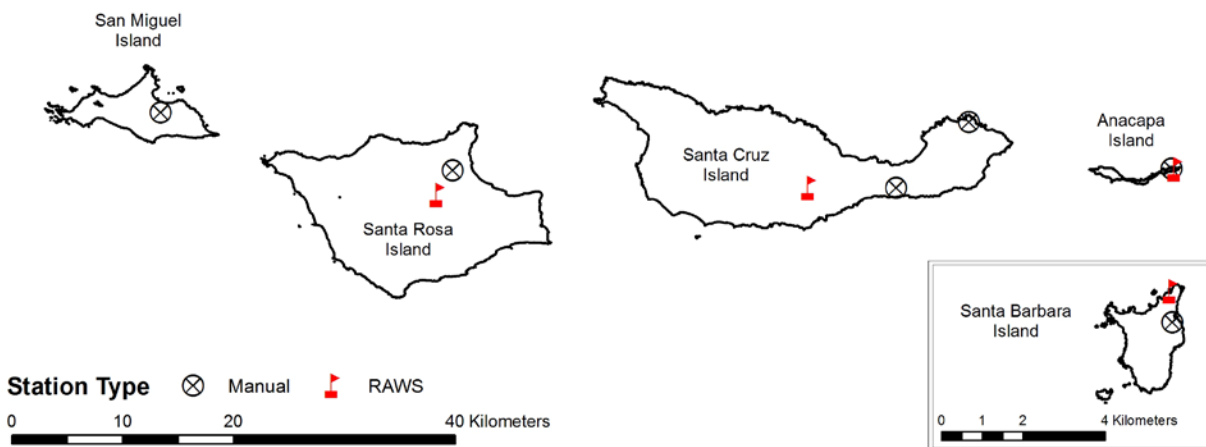


Figure 1. Map showing key climate stations in Channel Islands National Park.

Approach and methods

Selection of Datasets

In order to place Channel Islands NP within a regional context, grid-based estimates of precipitation and temperature were used to provide a broad overview of climatic conditions in the area. These estimates were generated via a statistical modeling technique that interpolates precipitation and temperature values between actual climate stations while also accounting for the effects of aspect and elevation. Known as the Parameter-elevation Regression on Independent Slopes Model (PRISM; <http://www.prism.oregonstate.edu/>), this approach has a long history of use in the western United States, and it has been shown to provide highly robust products in a wide variety of studies (Daly et al. 2008). Records from individual precipitation and temperature observing stations were included as a way to highlight intra-regional variability. The process of selecting specific stations included in this report is described in the Rocky Mountain Climate Protocol (Rocky Mountain Climate Working Group 2010). Generally, the selection criteria were:

1. Stations provide good spatial coverage within and near the parks of interest.
2. Stations provide a sufficient length of record to provide historical context for current observations. For this report, RAWS stations provide the majority of the available data, even though they were not in operation during the standard reference period of 1971-2000. The manual station on Santa Cruz Island central valley was used because it was in operation during the period 1971-2000.
3. Instrumentation at individual stations is relatively consistent over the life of the record.
4. Instrumentation and siting standards used in selected networks are suitable for providing consistent, continuous, and long-duration records of climate.

As a way of presenting the integrated effects of temperature and precipitation, maps from the US Drought Monitor (<http://drought.unl.edu/dm/monitor.html>) were used to depict broad-brush conditions across the region.

Quality Control of Weather Station Data

Following guidelines from Kittel (2008) and Kittel et al. (2009), a series of quality checks were performed by the author of this report, involving graphing and visual inspection of the time series, comparison with historical observations and observations from surrounding sites, and logical consistency tests (e.g., confirming that minimum daily temperatures were lower than the daily maximum temperatures). Point observations provided by the weather stations were also compared to corresponding estimates from the PRISM datasets. Because Remote Automated Weather Station (RAWS) data are collected hourly, daily Tmax, Tmin, and precipitation values must be derived from the automated data stream. If any particular day was missing more than two hours of measurements, the entire day was considered missing. In addition, if the temperature during any day varied by less than 2 degrees Fahrenheit, data for the entire day was considered invalid and replaced with missing values. Once daily statistics had been calculated, diagnostic plots were used to screen for physically

impossible measurements, which were ascribed to instrumental error and considered missing. If more than 3 days of precipitation data were missing for a particular month, a monthly total was not calculated, and the entire month was instead considered missing. Similarly, if more than 5 days of mean daily maximum temperature (Tmax) or mean daily minimum temperature (Tmin) were missing, monthly average temperatures were not calculated. Even though this report focuses on calendar-year 2010, quality control was performed and monthly statistics were calculated for the entire period of record at each RAWS station, so that summary data would be available to NPS staff for ancillary climate analyses. These monthly summaries appear in Appendix 2.

All the data used in the preparation of this report (including original and quality checked files) are available electronically from the Mediterranean Coast Network I&M program. These data files may be read and re-analyzed by the same software that was used to produce this report, available for download at www.YellowstoneEcology.com.

Analysis of Wind Data

Wind roses were used to present average conditions during 2010 and to contrast them with the period 2005-2009. In addition, wind roses were used to summarize wind conditions at each station for every month during 2010 (Appendix 3).

Results

Temperature, Precipitation, and Drought Status during Calendar Year 2010

The patterns described in this section are often stated as broad generalizations. In most cases there was significant variability across the region and exceptions to the patterns described here were common. In order to appreciate this variability, it is important to examine the PRISM maps and compare them to the weather station data presented in the figures.

January – April: General Patterns

Channel Islands NP began the year in a state of drought classified as “Abnormally Dry” (D0 in Figure 2), but precipitation was near or above the 1971-2000 averages in January and February (Figure 3), and drought-free status had been achieved throughout the region by the beginning of March (Figure 2). During January and February, average daily maximum temperatures (Tmax) were generally near or below average, and average daily minimum temperatures (Tmin) were generally above average, with the exception of a few higher elevation areas, which experienced below average Tmin. (Figures 4, 5). In March, precipitation was generally less than 25% the 1971-2000 averages and temperatures were generally near or above average, with the exception of higher elevation areas, which were again often cooler than average (Figures 3-5). April was quite wet with precipitation generally 300% or more above average and below average temperatures (Figures 3-5).

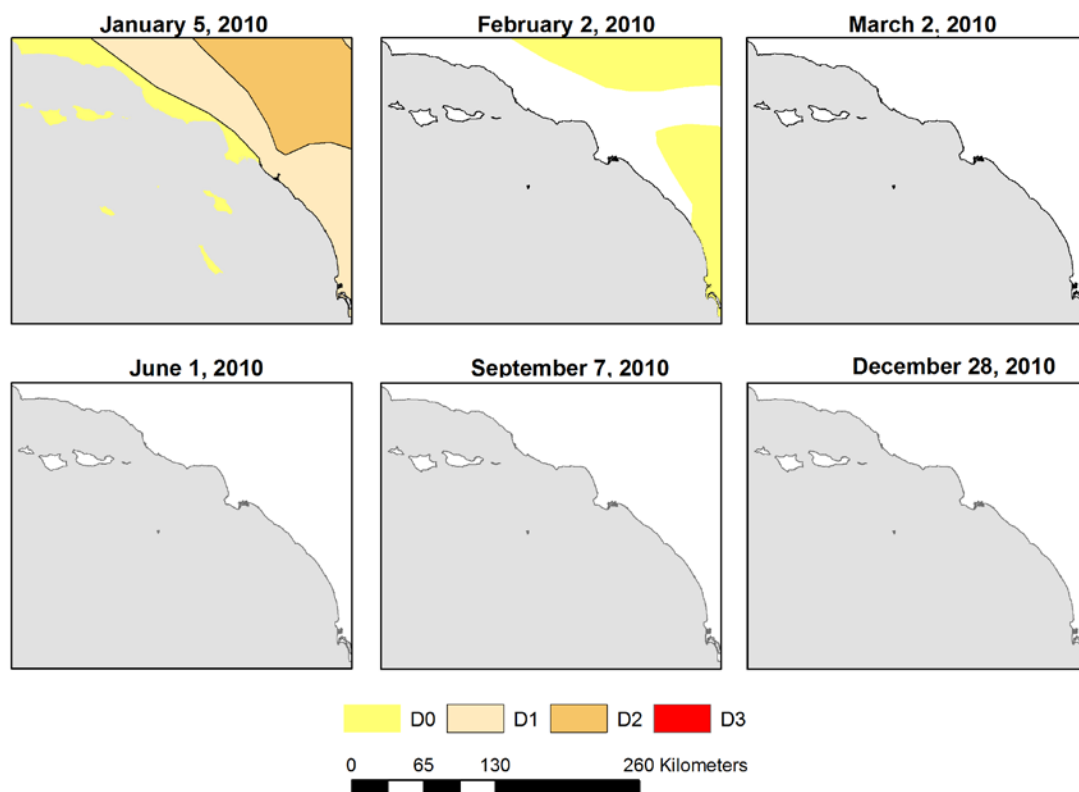


Figure 2. U.S. Drought Monitor maps for Channel Islands National Park during calendar year 2010. Drought classifications range from abnormally dry (D0) to exceptional drought (D4). White areas on the map indicate lack of drought status. Gray area = Pacific Ocean. For more information visit: www.drought.unl.edu/dm/monitor.html.

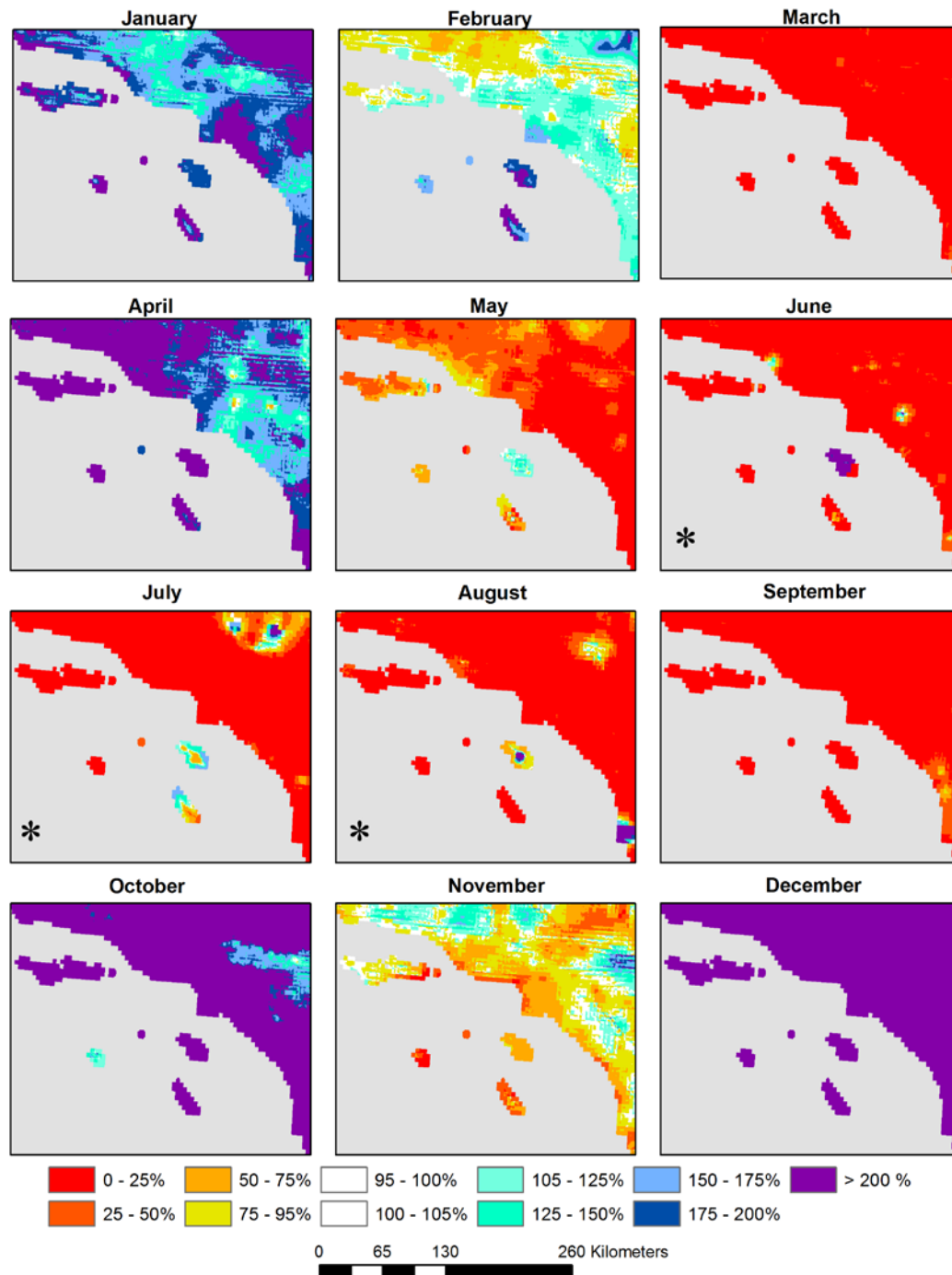


Figure 3. Maps showing percent of average precipitation versus 1971-2000 for each month in calendar year 2010. Colors show estimates from the Parameter-elevation Regressions on Independent Slopes Model (PRISM). Gray area = Pacific Ocean. PRISM interpolates precipitation values between actual observation stations, and corrects these interpolated estimates for changes in topography across the region. For more information, see <http://www.prism.oregonstate.edu/>. Asterisks indicate months that had very low average precipitation during 1971-2000. For example, the Santa Cruz Island Main Ranch station had average July precipitation = 0.02 inches average during 1971-2000. For this reason, map colors indicating 0-25% average precipitation may represent very small departure from average in absolute terms (0.1 inches less than normal).

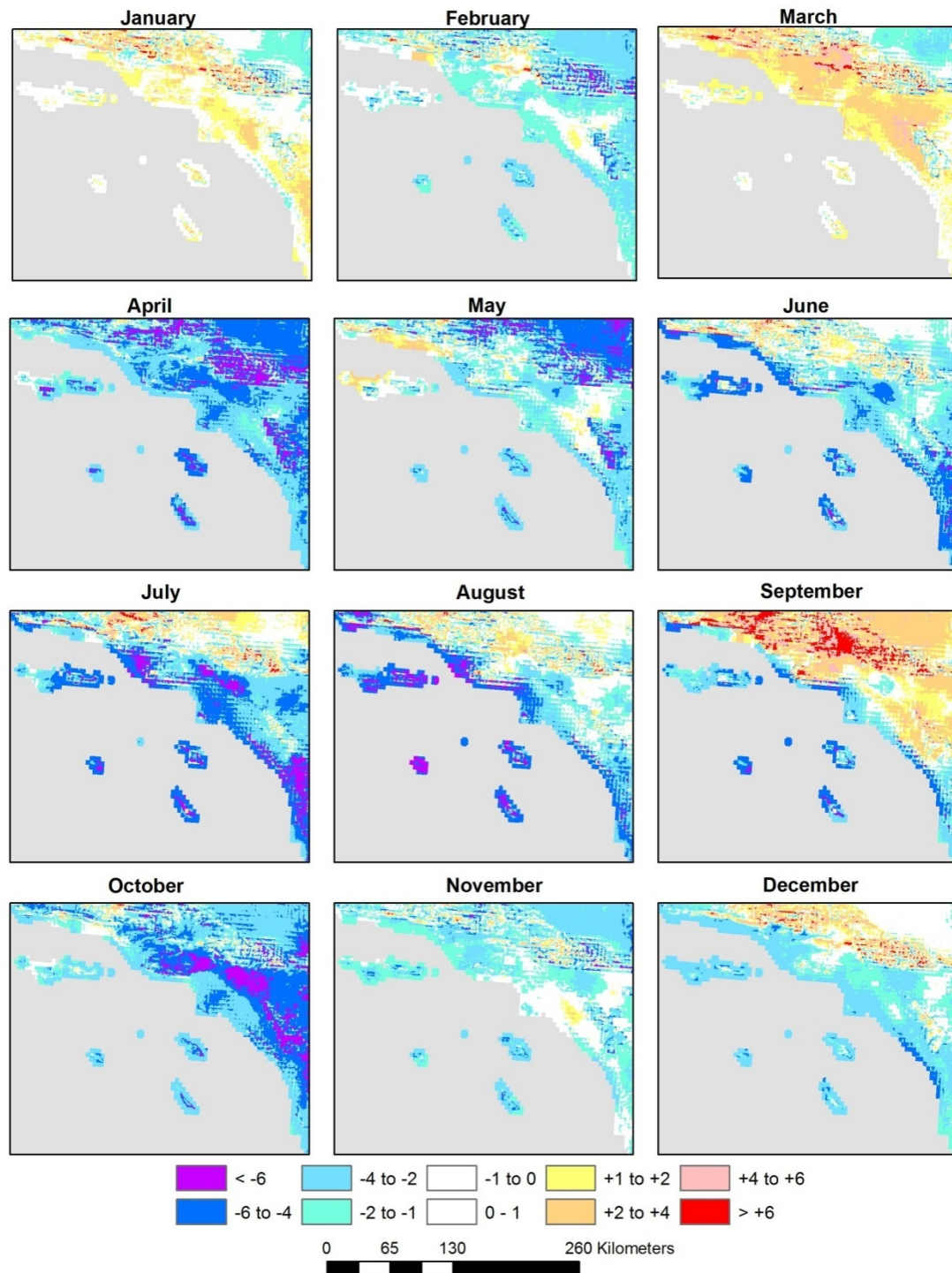


Figure 4. Maps showing departures from average maximum daily temperatures (Tmax) for each month in calendar year 2010 versus 1971-2000. Departure values are reported in degrees Fahrenheit. Gray area = Pacific Ocean. Maps were created using estimates from the Parameter-elevation Regressions on Independent Slopes Model (PRISM). PRISM interpolates precipitation values between actual observation stations, and corrects these interpolated estimates for changes in topography across the region. For more information, see <http://www.prism.oregonstate.edu/>.

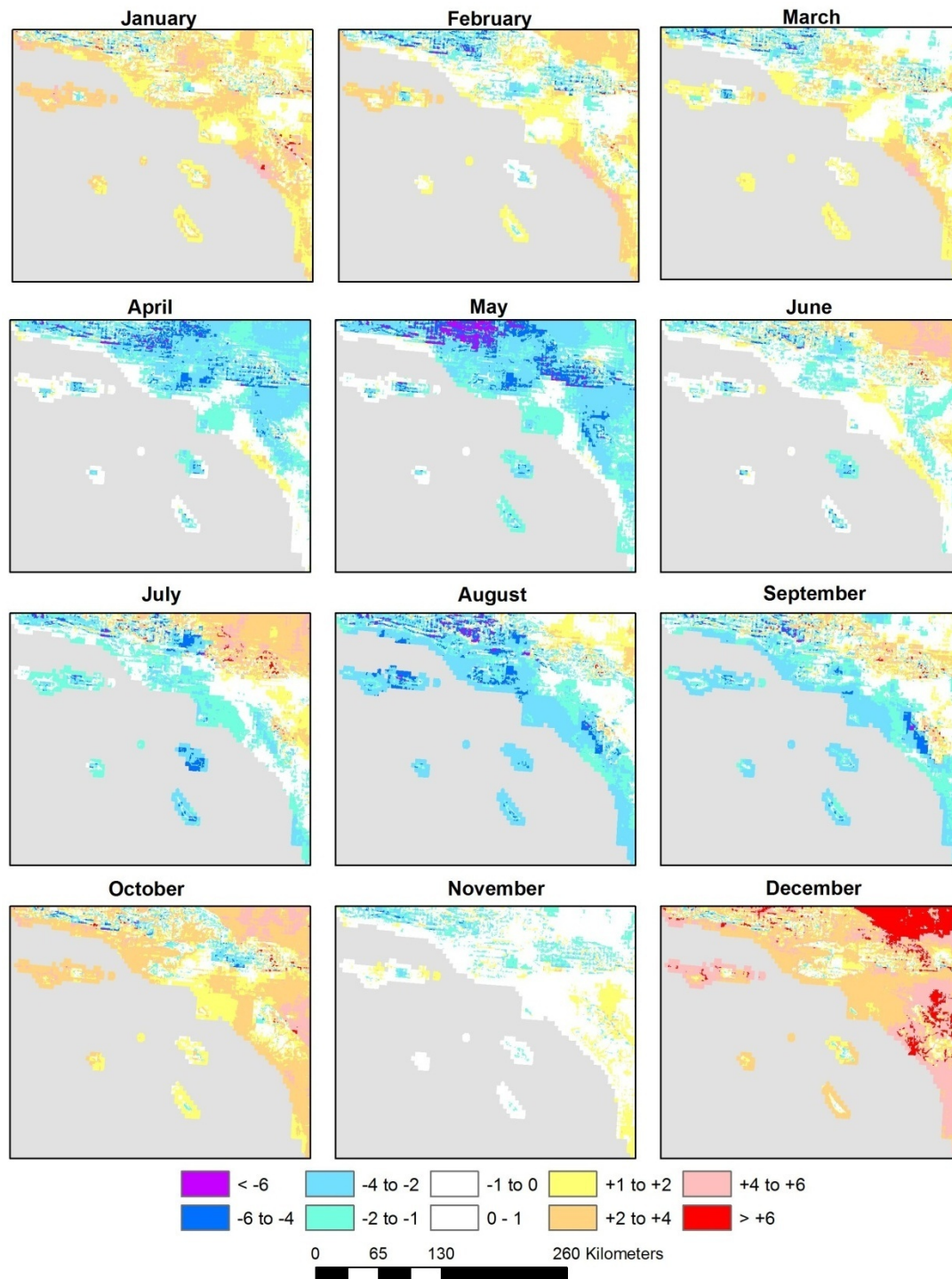


Figure 5. Maps showing departures from average minimum daily temperatures (Tmin) for each month in calendar year 2010 versus 1971-2000. Departure values are reported in degrees Fahrenheit. Gray area = Pacific Ocean. Maps were created using estimates from the Parameter-elevation Regressions on Independent Slopes Model (PRISM). PRISM interpolates precipitation values between actual observation stations, and corrects these interpolated estimates for changes in topography across the region. For more information, see <http://www.prism.oregonstate.edu/>.

January – April: Details from Weather Station Data (Tables 1, 2 Figures 6-8):

- ⤴ Precipitation at the Santa Cruz Island Main Ranch was 131% and 148% of 1971-2000 averages during January and February, respectively. RAWS stations corroborated this by recording precipitation that plotted within the upper range of previous years (gray lines, Figure 7). Both Tmax and Tmin were warmer than many previous years at the RAWS stations during January and February (gray lines, Figure 7), in agreement with the PRISM Tmin estimates, which were 2-4 degrees (F) above average in some areas. In contrast, PRISM Tmax estimates were generally near to slightly below average during January and February (Figures 4-5).
- ⤴ During March, precipitation was 16% the 1971-2000 average at Santa Cruz Island Main Ranch. At the RAWS stations, Tmax and Tmin during March plotted within the mid-upper range of previous years (gray lines, Figure 6), which corroborates the PRISM maps (Figures 4-5), which showed temperatures as much as 2 degrees Fahrenheit (F) above average.
- ⤴ April precipitation at the Santa Cruz Island Main Ranch was 149% the 1971-2000 average. Tmax and Tmin at the RAWS stations were generally in the mid-low range of previous years, with the exception of Tmin at the Santa Cruz Island RAWS station, which plotted within the upper third of previous years (Figure 7). During April, PRISM Tmax estimates were generally 2-4 degrees (F) below average, and Tmin estimates were either near-average or as much as 2-4 degrees (F) below average.

Table 1. Monthly precipitation in inches during 2010 in Channel Islands National Park. For Santa Cruz Island Main Ranch, departures from 1971-2000 averages (%) are shown in parenthesis.

Station Name	Station Type	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
Santa Cruz Island	RAWS	6.12	6.17	0.53	1.17	0.22	0.01	0	0	0	1.11	0.65	12.22	28.2
Santa Cruz Island Central Valley (Main Ranch)	Manual	6.27 (131%)	6.58 (148%)	0.56 (16%)	1.3 (149%)	0.26 (84%)	0.02 (29%)	0 (*)	0 (*)	0 (0%)	1.29 (274%)	0.89 (54%)	11.07 (362%)	28.24 (143%)
Anacapa Island	RAWS	3.01	4.56	0.31	1.22	0.05	0	0.04	0.01	0	0.66	0.13	9.59	19.58
Santa Rosa Island	RAWS	5.38	3.53	0.28	1.25	0.05	0.02	0.01	0	0.03	0.74	0.49	6.89	18.67
Santa Barbara Island	RAWS	3.17	2.72	0.21	0.44	0.18	0	0	0	0	0	0.09	3.99	10.8

Note: For RAWS stations, daily values are not calculated if more than two hours of measurement are missing. Subsequently, monthly statistics are not reported if more than 3 days of data are missing.

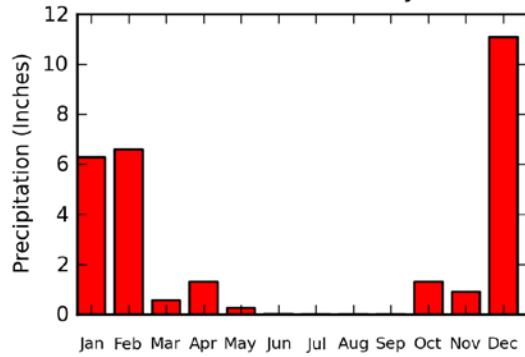
* 1971-2000 average precipitation at the Santa Cruz Island Main Ranch was 0.02 and 0.1 inches during July and August, respectively.

Table 2. Average daily maximum temperatures (Tmax) and average daily minimum temperatures (Tmin) during 2010.

Station Name	Station Type	Parameter	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Santa Cruz Island	RAWS	Tmax	66.84	64.39	66.23	63.47	69.55	69.50	73.16	75.61	77.37	69.94	67.03	61.90
		Tmin	42.19	42.71	45.52	45.47	49.13	50.63	54.32	51.55	52.53	53.84	46.73	46.26
Anacapa Island	RAWS	Tmax	65.10	64.46	(-)	61.10	62.55	64.53	64.65	63.97	67.07	67.23	64.47	67.58
		Tmin	54.32	53.04	(-)	51.60	52.16	55.43	56.84	55.39	57.17	58.55	55.03	57.90
Santa Rosa Island	RAWS	Tmax	62.65	59.11	61.16	57.83	58.87	61.30	62.48	65.58	72.43	67.58	64.57	58.19
		Tmin	49.03	46.93	47.32	45.60	45.90	48.07	49.90	50.97	55.87	52.97	50.67	47.42
Santa Barbara Island	RAWS	Tmax	61.65	60.14	61.00	58.33	59.52	62.37	62.03	63.03	64.37	63.84	62.77	57.55
		Tmin	52.68	52.14	51.52	50.53	51.68	53.97	55.74	55.16	55.87	56.68	54.23	51.19

Note: For RAWS stations, daily values are not calculated if more than two hours of measurement are missing. Subsequently, monthly statistics are not reported if more than 5 days of data are missing.

Santa Cruz Island Central Valley - Main Ranch



Santa Cruz Island Main Ranch

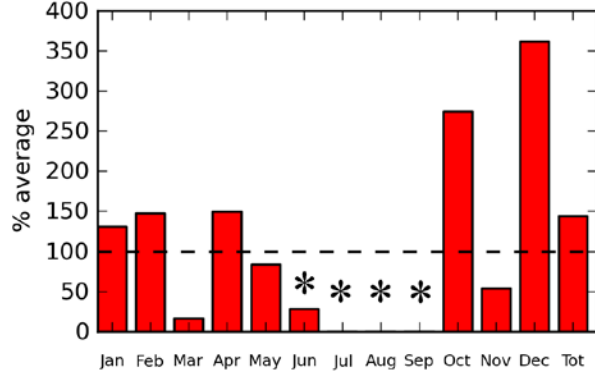


Figure 6. Total monthly precipitation and percent of 1971-2000 average precipitation for each month at Santa Cruz Island Main Ranch. Asterisks indicate months that had less 0.1 inches or less average precipitation during 1971-2000. When interpreting months that have been marked with asterisks, it is important to bear in mind that 0% average precipitation may represent a small difference in absolute precipitation departure. For example, 1971-2000 average precipitation for the month of July is only 0.02 inches, so the fact that no precipitation fell during July, 2010 results in 0% average precipitation, but in absolute terms it is only 0.02 inches less than normal.

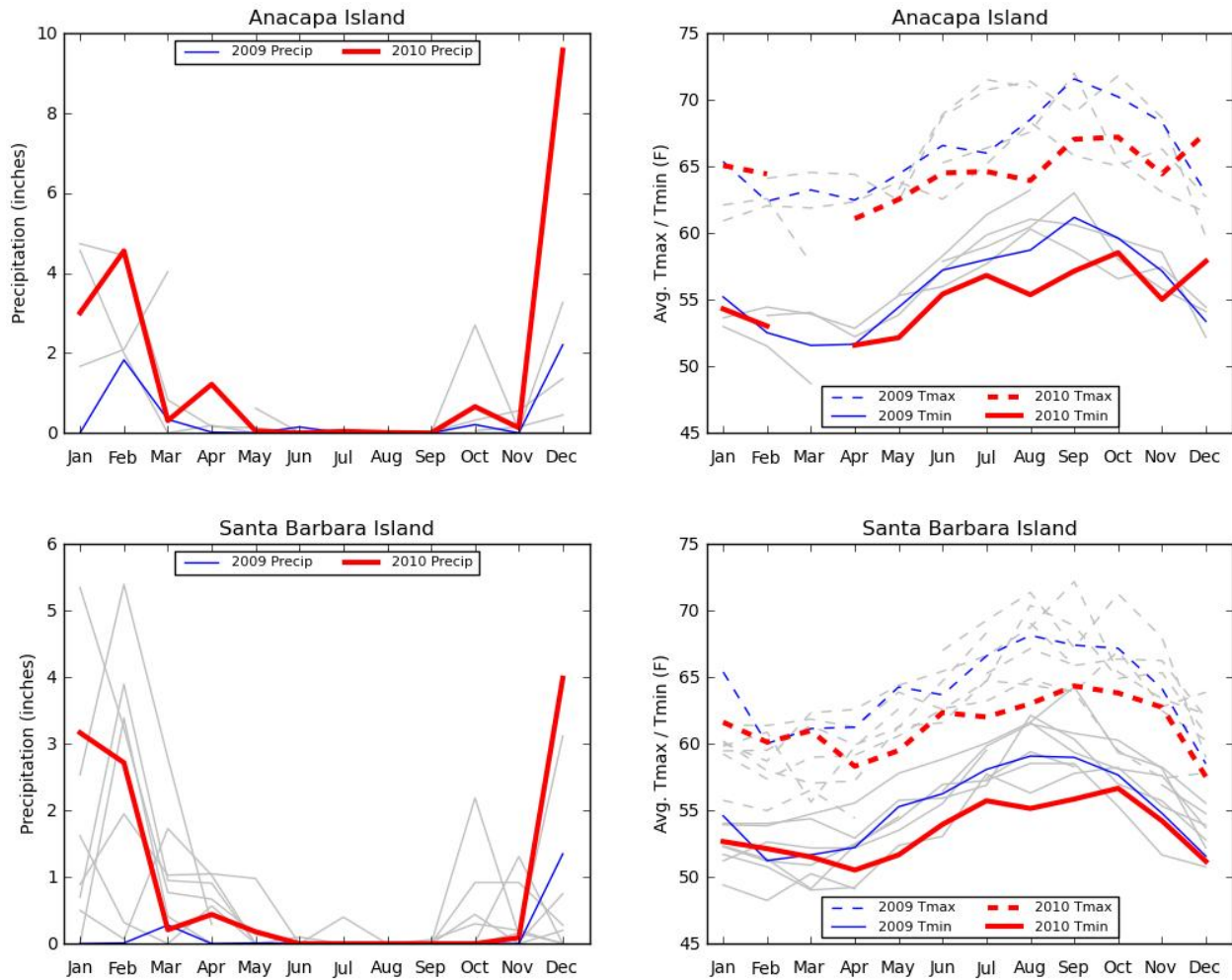


Figure 7. Total monthly precipitation, average daily maximum temperature (Tmax), and average daily minimum temperature (Tmin) for the period of record at RAWS stations in Channel Islands National Park. Calendar year 2010 is shown in red. 2009 is shown in blue. All earlier years are shown as gray lines. RAWS stations do not have officially calculated monthly normals (averages for the period 1971-2000), so it is not possible to exactly quantify the difference between the year 2010 and “normal” conditions. However, the difference between 2010 and previous years can be judged in a rough way from the position of the red lines relative the gray lines. Record length for each station appears in Appendix 1.

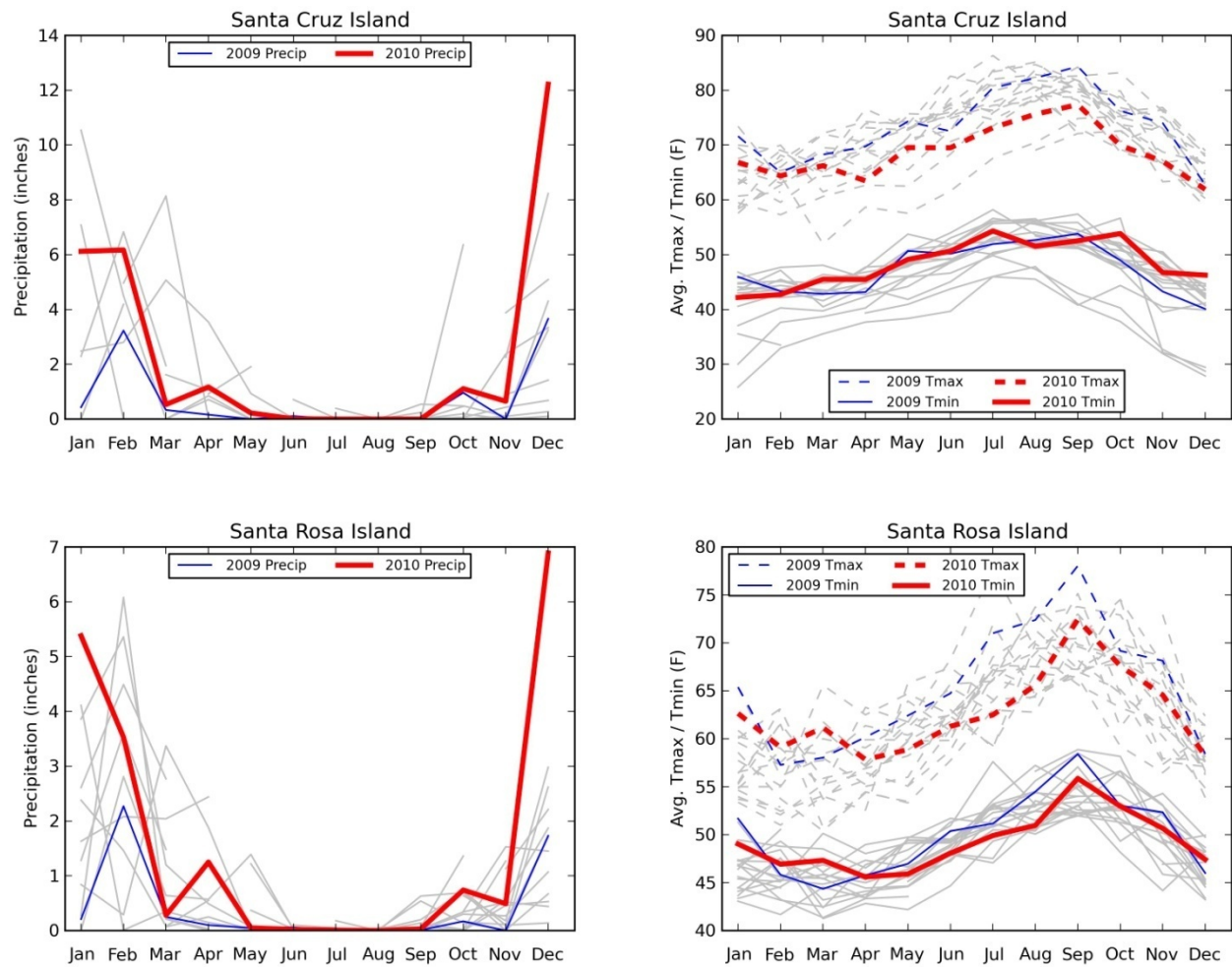


Figure 7. Total monthly precipitation, average daily maximum temperature (Tmax), and average daily minimum temperature (Tmin) for the period of record at RAWS stations in Channel Islands National Park (continued). Calendar year 2010 is shown in red. 2009 is shown in blue. All earlier years are shown as gray lines. RAWS stations do not have officially calculated monthly normals (averages for the period 1971-2000), so it is not possible to exactly quantify the difference between the year 2010 and “normal” conditions. However, the difference between 2010 and previous years can be judged in a rough way from the position of the red lines relative the gray lines. Record length for each station appears in Appendix 1.

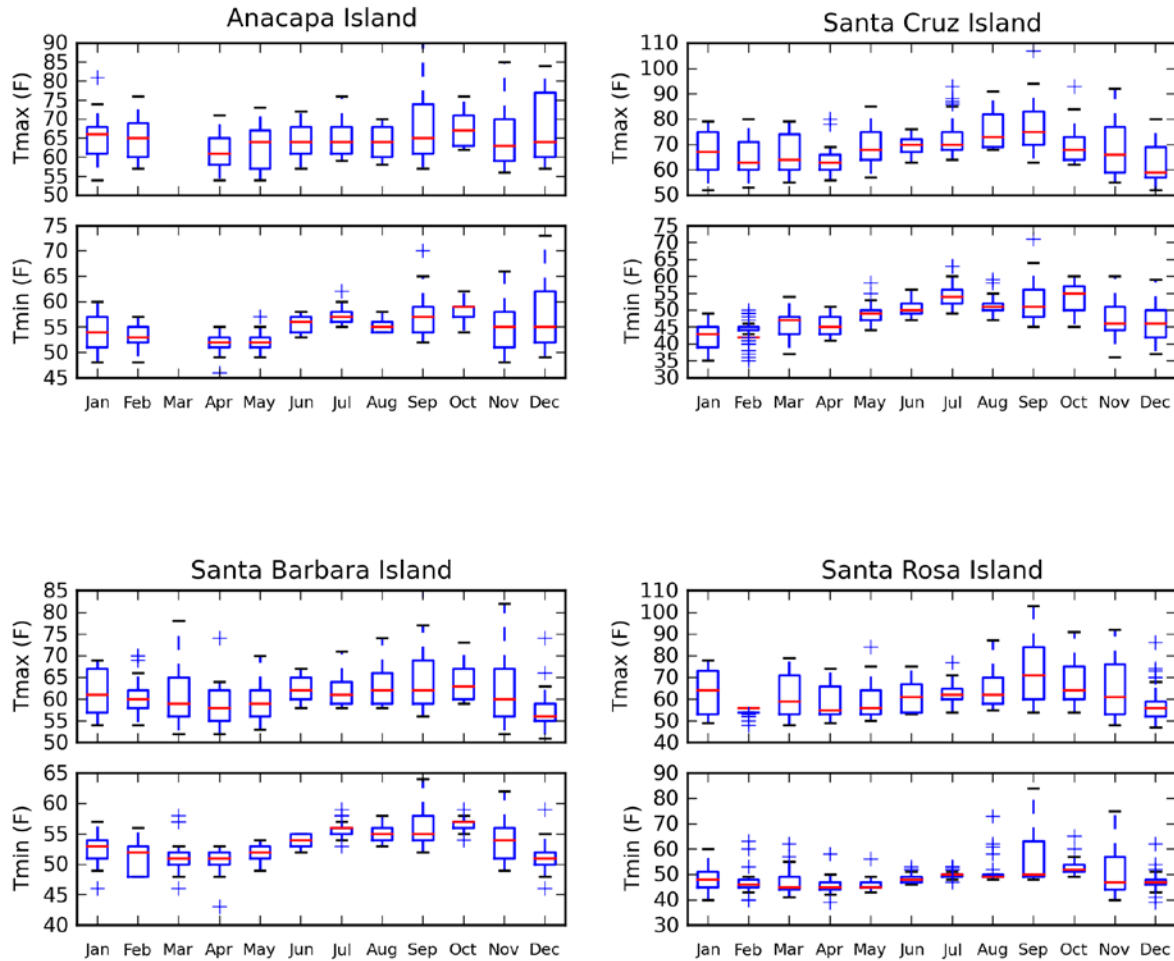


Figure 8. Boxplots of average maximum (Tmax) and average minimum (Tmin) daily temperatures at key climate stations in Channel Islands National Park. Horizontal lines indicate the median value. Boxes indicate the 25th and 75th percentiles. Whiskers extend 1.5 times the interquartile Range (IQR). Crosses indicate values exceeding 1.5 times the IQR.

May – August: General Patterns

As characteristically low summer precipitation combined with generally below average temperatures (Figures 4, 5), May-August in and near Channel Islands NP continued the drought-free conditions that had begun in March (Figure 2).

Channel Islands NP typically experiences slight precipitation during the summer. For example, monthly averages at the Santa Cruz Island Main Ranch during 1971-2000 were 0.31, 0.07, 0.02, and 0.1 inches for May-August, respectively. Because average (“normal”) precipitation is low during these months, care should be taken when interpreting statistics that quantify the amount (%) of normal precipitation that fell during the summer months. In the case of calendar-year 2010, PRISM maps (Figure 3) show that May-June were apparently quite dry, with precipitation often less than 25% average across the region. However, in terms of absolute difference (rather than % difference), this amounted to a small change from normal. For example, during June 2010, Santa Cruz Island

Main Ranch recorded 0.02 inches total precipitation. This was 29% of the 1971-2000 average, but since the monthly average for June was only 0.07 inches, it was only 0.05 inches less than average.

May – August: Details from Weather Station Data (Tables 1, 2; Figures 6-8):

- ⤴ May precipitation was 84% the 1971-2000 average at Santa Cruz Island Main Ranch. Tmax and Tmin at the RAWS stations were generally within the mid-range of previous years (gray lines, Figure 7) during May. The PRISM maps showed Tmin as much as 2 -4 degrees (F) below 1971-2000 averages and Tmax ranging both above and below average.
- ⤴ During June and July, temperatures at the Santa Cruz and Santa Rosa Island RAWS stations were generally in the mid-range of previous years (gray lines, Figure 7). In contrast RAWS stations on Anacapa and Santa Barbara Island recorded Tmax and Tmin that were generally cooler than previous years. PRISM estimates show that Tmax and Tmin were in many areas 1-4 degrees (F) below average, in some cases 4-6 degrees (F) below average.
- ⤴ Temperatures during August were generally below most other recorded years at the RAWS stations, with the exception of the Santa Cruz Island station, which recorded temperatures in the middle-high range. This corroborates the below average temperatures depicted for August in the PRISM maps (Figures 4, 5), which often showed Tmin 4- 6 degrees (F) below average and Tmax greater than 6 degrees (F) below average in some areas.

September – December: General Patterns

Drought free conditions were maintained until the end of the year (Figure 2). Below average precipitation in September (Figure 3) was compensated by generally cooler than average September temperatures (Figures 4, 5). Even though November was generally drier than the 1971-2000 averages, it had generally average to below average temperatures. October and December both had precipitation at roughly 300% or more average (Figures 3-5). Average daily maximum temperatures (Tmax) were often below average during October and December (Figure 4), but average daily minimum temperatures (Tmin) were above average, sometimes markedly so, during these months (Figure 5). PRISM estimates for Tmin were greater than 6 degrees (F) above average in some areas during December.

September - December: Details from Weather Station Data (Tables 1, 2; Figures 6-8):

- ⤴ September precipitation was 0% the 1971-2000 average (no precipitation recorded) at Santa Cruz Island Main Ranch. The 1971-2000 average for September was 0.42 inches at this station.
- ⤴ September temperatures at the RAWS stations on Anacapa and Santa Barbara Islands were lower than many previous years (gray lines, Figure 7), which corroborates the PRISM maps (Figures 4, 5), which were generally 1-6 degrees (F) below average. The Santa Cruz and Santa Rosa Island RAWS stations had temperatures that plotted within the mid-range of previous years (Figure 7)
- ⤴ October precipitation at the Santa Cruz Island Main Ranch was 274% average. RAWS stations corroborated the PRISM maps in showing October Tmax generally in the lower

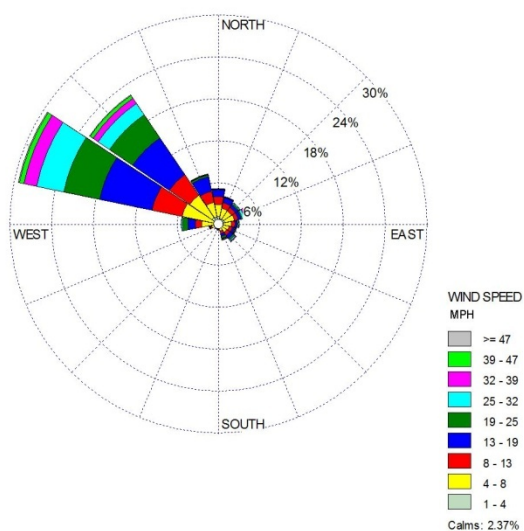
range of previous years, with the exception of Santa Rosa Island, which had mid-range Tmax measurements (Figure 7). October Tmin measurements at the RAWS stations were often in the mid-low range relative to previous years (Figure 7), which contrasts with Tmin PRISM estimates that were 2-4 degrees (F) above average for this month (Figure 5).

- ✧ November precipitation was 54% average at the Santa Cruz Island Main Ranch. November Tmax and Tmin at the RAWS stations were near to below the mid-range relative to previous years, in agreement with the PRISM estimates for November (Figure 4), which showed often Tmin near average and Tmax often 1-2 degrees (F) below average.
- ✧ December precipitation at the Santa Cruz Island Main Ranch was 362% the 1971-2000 average. December PRISM Tmax estimates (Figure 4) were generally 2-4 degrees (F) below average while PRISM Tmin were greater than 6 degrees (F) above average in some areas.

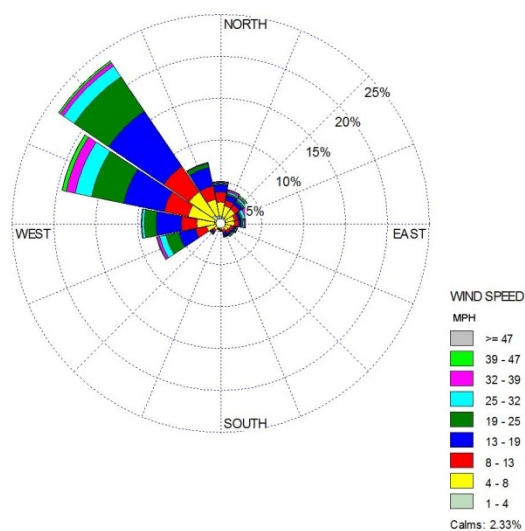
Wind

Summary wind data suggest that calendar-year 2010 was similar to average conditions during 2005-2009, with a few exceptions (Figure 9). The Santa Rosa Island RAWS station received a greater proportion of its winds from the southeast during 2010 than in past years. The Santa Barbara Island station measured a greater proportion of high velocity winds (gray areas = winds greater than 47 MPH in Figure 9), and the Santa Cruz Island Station received more frequent easterly winds during 2010. Wind summaries for each month of 2010 appear in Appendix 3.

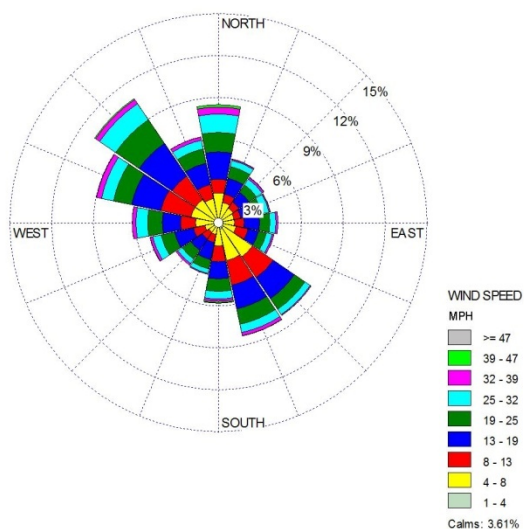
Anacapa Island 2010



Anacapa Island 2005 - 2009



Santa Rosa Island 2010



Santa Rosa Island 2005 - 2009

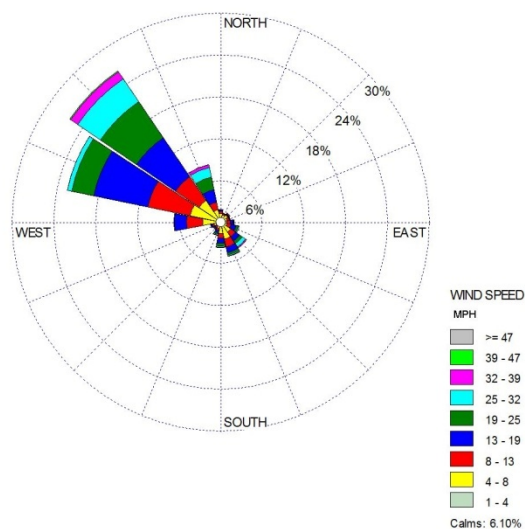
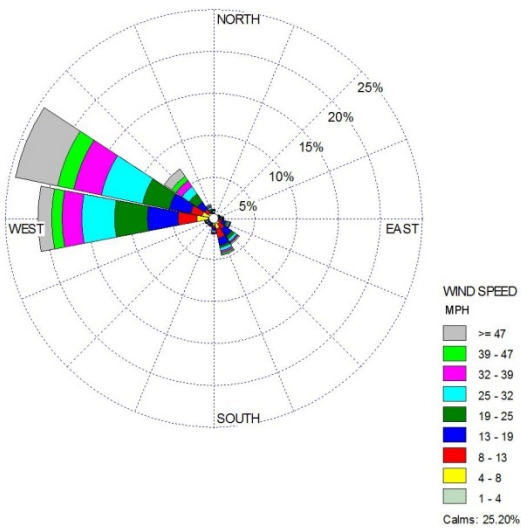
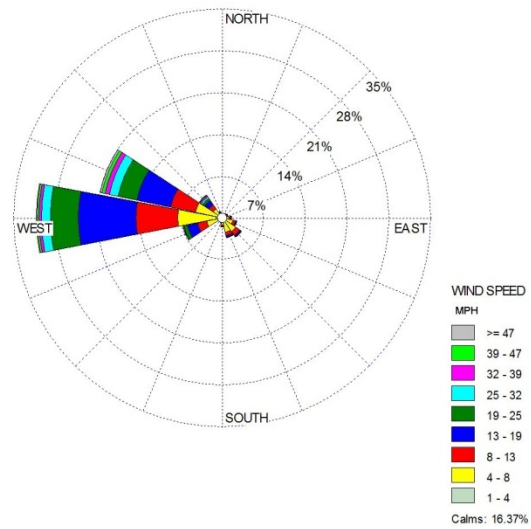


Figure 9. Wind roses for RAWS stations in Channel Islands National Park, contrasting calendar year 2010 to the averages for 2005-2009. The orientation of a spoke indicates wind direction (compass heading, degrees from which the wind originated), and the length of a spoke indicates the amount of time (%) that wind from a given direction occurred. Colors within the spokes express the amount of time (%) that wind from each direction had the indicated velocity.

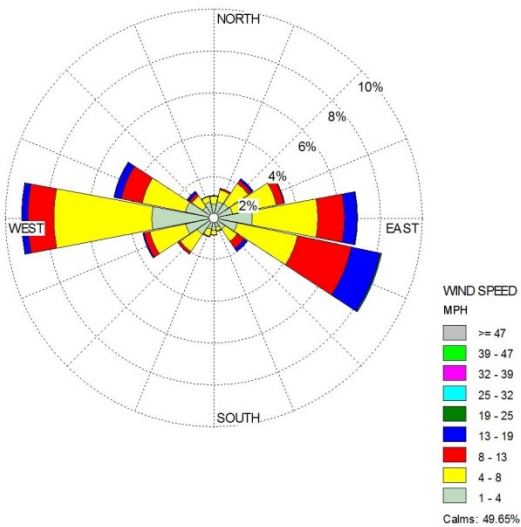
Santa Barbara Island 2010



Santa Barbara Island 2005 - 2009



Santa Cruz Island 2010



Santa Cruz Island 2005 - 2009

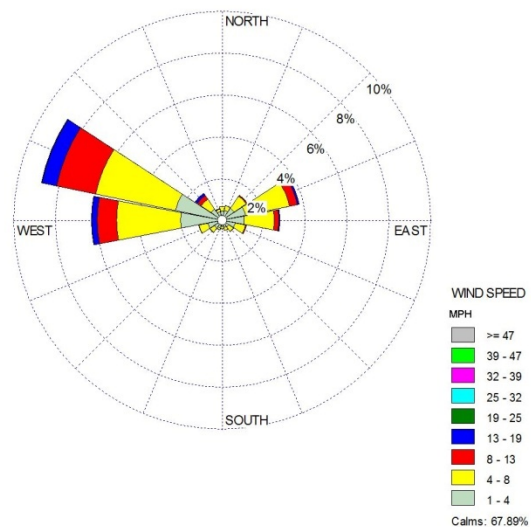


Figure 9. Wind roses for RAWS stations in Channel Islands National Park, contrasting calendar year 2010 to the averages for 2005-2009 (continued). The orientation of a spoke indicates wind direction (compass heading, degrees from which the wind originated), and the length of a spoke indicates the amount of time (%) that wind from a given direction occurred. Colors within the spokes express the amount of time (%) that wind from each direction had the indicated velocity.

Conclusions

- ⤴ Channel Islands NP began the year in a state of drought classified as “Abnormally Dry” (D0 in Figure 2), but precipitation was near or above the 1971-2000 averages in January and February (Figure 3), and drought-free status had been achieved throughout the region by the beginning of March (Figure 2).
- ⤴ Total precipitation for 2010 was 143% the 1971-2000 average at Santa Cruz Island Main Ranch (Table 1).
- ⤴ Average daily maximum temperatures (Tmax) for 2010 overall were either near average or as much as 1-3 degrees (F) below the 1971-2000 averages. Average daily minimum temperatures (Tmin) for the year were either near or slightly above average. Within these yearly averages, there was significant variability. April and July had notably below average temperatures, when PRISM estimates indicate that some parts of Channel Islands NP had Tmax 6 or more degrees (F) below average and Tmin 2-4 degrees (F) below average in some high elevation areas. In October and December, Tmin was generally above average but Tmax was generally below average (Figures 4, 5).
- ⤴ The differences noted between data from RAWS stations and the maps showing PRISM estimates of temperature and precipitation are likely due to the relatively sparse coverage of weather stations within Channel Islands NP. Since the PRISM maps take into account elevation and aspect, they are depicting conditions that differ from those measured in the areas surrounding the RAWS stations. Moreover, it is not possible to quantify the departure of current year RAWS measurements from “normal” or “average” conditions because the RAWS stations in Channel Islands NP were not in operation during the 1971-2000 reference period.

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Appendix 1. Weather stations for Channel Islands National Park, 2010.

Table A1-1. Weather stations selected for Channel Islands National Park.

Name	Stn type	Period of Record	Metadata
Santa Rosa Island "Black Mountain" (NPS) ¹	RAWS	1990 - present	http://www.wrcc.dri.edu/cgi-bin/rawMAIN.pl?caCSRI
Santa Cruz Island "Main Ranch" (NPS) ²	RAWS	1990 - present	http://www.wrcc.dri.edu/cgi-bin/rawMAIN.pl?caCSCI
Anacapa Island (NPS) ³	RAWS	2004 - present	http://www.wrcc.dri.edu/cgi-bin/rawMAIN.pl?caCANA
Santa Barbara Island ((NPS) ⁴	RAWS	1996 - present	http://www.wrcc.dri.edu/cgi-bin/rawMAIN.pl?caCSBB
Santa Cruz Island "Main Ranch" (manual) ⁵	Manual	1904 - present	Contact Mediterranean Coast Network

Table A1-2. Other weather stations considered for Channel Islands National Park.

Name	Stn type	Stn ID	Reason for rejection	Documentation / notes
Anacapa Island	COOP	40188	ended in 2000	http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca0188
Santa Cruz Island Scorpion	COOP	967802	ended in 2004	http://www.wrcc.dri.edu/channel_isl/
Santa Rosa Island	COOP	867804	ended in 2003	http://www.wrcc.dri.edu/channel_isl/
Santa Barbara Island	COOP	967801	ended in 2004	http://www.wrcc.dri.edu/channel_isl/
San Miguel Island	COOP	967803	ended in 2004	http://www.wrcc.dri.edu/channel_isl/
K6TZ – Diablo Peak	RAWS		inactive	http://www.findu.com/cgi-bin/wxpage.cgi?call=K6TZ&last=24
Del Norte	RAWS		Data downloaded but failed QA/QC – apparently bad thermometer	Author's analysis
Prisoner's Harbor	RAWS		Data unavailable, possibly inactive	http://www.csun.edu/~hfgeg010/santacruz.html
Christy Ranch	RAWS		Data unavailable, possibly inactive	http://www.csun.edu/~hfgeg010/santacruz.html
Santa Cruz Willows	RAWS		Data unavailable, possibly inactive	http://www.csun.edu/~hfgeg010/santacruz.html
Santa Cruz Pine Forest	RAWS		Data unavailable, possibly inactive	http://www.csun.edu/~hfgeg010/santacruz.html
San Miguel Navy	RAWS		Intermittent Data	McEachern et al. 2008

Notes: COOP = National Weather Service Cooperative Observer Network, RAWS = Remote Automated Weather Station. RAWS stations do not have ID numbers.

Appendix 2. Monthly data summaries for Channel Islands National Park, 2010.

Table A2-1. Monthly summary data for Anacapa Island RAWS Station 2004-2010.

Year	Month	Precip (Inches)	Tmax (F)	Tmin (F)
2004	6	0.00	65.30	57.90
2004	7	0.00	66.40	59.00
2004	8	0.00	67.61	60.48
2004	9	0.00	72.03	63.03
2004	10	2.70	65.52	58.06
2004	11	0.08	63.10	55.83
2004	12	3.27	61.58	54.13
2005	1	4.74	60.94	53.65
2005	2	4.45	62.07	54.46
2005	3	0.83	61.90	53.94
2005	4	0.16	62.37	52.87
2005	5	0.13	63.87	55.32
2005	6	0.00	62.57	56.00
2005	7	0.00	65.19	57.71
2005	8	0.00	68.35	60.32
2005	9	0.02	65.83	58.63
2005	10	0.32	65.06	56.58
2005	11	0.56	66.33	57.47
2005	12	1.36	62.74	54.45
2006	1	1.67	62.13	53.00
2006	2	2.09	62.61	51.54
2006	3	4.04	57.74	48.71
2006	4	N/A	N/A	N/A
2006	5	0.62	63.29	55.45
2006	6	0.01	68.93	58.30
2006	7	0.00	71.55	61.39
2006	8	0.01	70.97	63.26
2006	9	N/A	N/A	N/A
2006	10	N/A	N/A	N/A
2006	11	0.3	N/A	N/A
2006	12	N/A	N/A	N/A
2007	1	N/A	N/A	N/A
2007	2	N/A	N/A	N/A
2007	3	N/A	N/A	N/A
2007	4	N/A	N/A	N/A
2007	5	N/A	N/A	N/A
2007	6	N/A	N/A	N/A
2007	7	N/A	N/A	N/A
2007	8	N/A	N/A	N/A
2007	9	N/A	N/A	N/A

Table A2-1. Monthly summary data for Anacapa Island RAWS Station 2004-2010 (continued).

Year	Month	Precip (Inches)	Tmax (F)	Tmin (F)
2007	10	0.06	73.23	63.13
2007	11	0.15	N/A	N/A
2007	12	0.45	N/A	N/A
2008	1	4.57	N/A	N/A
2008	2	2	64.14	53.83
2008	3	0	64.58	54.06
2008	4	0.19	64.43	52.23
2008	5	0	62.45	53.87
2008	6	0	68.77	57.23
2008	7	0	70.77	59.87
2008	8	0	71.42	61.06
2008	9	0	69.07	60.63
2008	10	0	71.84	59.61
2008	11	0	68.70	58.57
2008	12	0	59.71	52.19
2009	1	0	65.39	55.23
2009	2	1.83	62.41	52.54
2009	3	0.34	63.26	51.58
2009	4	0.02	62.50	51.67
2009	5	0	64.45	54.45
2009	6	0.15	66.60	57.23
2009	7	0	66.03	58.03
2009	8	0	68.55	58.74
2009	9	0	71.60	61.20
2009	10	0.21	70.26	59.65
2009	11	0	68.37	57.17
2009	12	2.21	63.03	53.39
2010	1	3.01	65.10	54.32
2010	2	4.56	64.46	53.04
2010	3	0.31	N/A	N/A
2010	4	1.22	61.10	51.60
2010	5	0.05	62.55	52.16
2010	6	0	64.53	55.43
2010	7	0.04	64.65	56.84
2010	8	0.01	63.97	55.39
2010	9	0	67.07	57.17
2010	10	0.66	67.23	58.55
2010	11	0.13	64.47	55.03
2010	12	9.59	67.58	57.90

Notes: N/A indicates either missing data or data that did not pass quality checks. Tmax = Average daily maximum temperature. Tmin = Average daily minimum temperature.

Table A2-2. Monthly summary data for Santa Rosa Island RAWS Station 1990-2010.

Year	Month	Precip (Inches)	Tmax (F)	Tmin (F)
1990	5	0.37	58.84	45.55
1990	6	0.03	61.8	47.23
1990	7	0.01	66.19	51.68
1990	8	N/A	65.06	52.45
1990	9	0.08	66.47	52.23
1990	10	0	70.35	53.13
1990	11	N/A	64.03	50.57
1990	12	N/A	56.97	44.55
1991	1	N/A	56.39	44.45
1991	2	N/A	61.5	47.57
1991	3	N/A	50.77	41.26
1991	4	0.09	54.47	42.83
1991	5	N/A	53.32	42.19
1991	6	0.1	57.73	44.67
1991	7	0.05	63	49.32
1991	8	N/A	62.77	50.61
1991	9	0.01	70.8	53.03
1991	10	N/A	N/A	N/A
1991	11	N/A	N/A	N/A
1991	12	N/A	59.26	46.65
1992	1	N/A	60.26	46.81
1992	2	5.88	59	49.31
1992	3	N/A	55.03	46.1
1992	4	N/A	63.27	48.97
1992	5	N/A	61.74	49.74
1992	6	N/A	62.43	49.53
1992	7	0.18	66.1	52.84
1992	8	0	73.74	54.35
1992	9	N/A	69.83	54
1992	10	0.16	68.61	54.1
1992	11	0.11	63.5	51.27
1992	12	1.71	53.87	44.84
1993	1	N/A	53.71	45.61
1993	2	2.83	52.89	44.46
1993	3	N/A	N/A	N/A
1993	4	N/A	57.04	45.32
1993	5	N/A	61.19	47.55
1993	6	N/A	65.37	51.32
1993	7	N/A	62.74	52.66
1993	8	0.03	64.48	53.06
1993	9	N/A	73.23	54.02
1993	10	N/A	N/A	N/A
1993	11	N/A	72.94	51.98
1993	12	N/A	58.86	48.68
1994	1	N/A	N/A	N/A
1994	2	N/A	N/A	N/A
1994	3	N/A	N/A	45.94

Table A2-2. Monthly summary data for Santa Rosa Island RAWS Station 1990-2010 (continued).

Year	Month	Precip (Inches)	Tmax (F)	Tmin (F)
1994	4	N/A	55.03	44.43
1994	5	N/A	56	44.65
1994	6	N/A	63.03	48.03
1994	7	N/A	59.06	47.52
1994	8	N/A	69.9	53.55
1994	9	N/A	66.9	52.27
1994	10	0	68.52	52.77
1994	11	0.46	57.93	45.87
1994	12	0.53	57.84	45.32
1995	1	N/A	55.38	46.41
1995	2	0.06	63.14	50.54
1995	3	N/A	N/A	N/A
1995	4	N/A	N/A	N/A
1995	5	N/A	55.1	45.13
1995	6	0	60.93	48
1995	7	N/A	67.68	53.03
1995	8	0	67.52	50.77
1995	9	N/A	67.23	51.97
1995	10	N/A	69.87	53.06
1995	11	N/A	68.57	52.17
1995	12	N/A	58.06	47.13
1996	1	N/A	59.61	47.26
1996	2	N/A	57.25	47.18
1996	3	0.07	57.74	45.39
1996	4	0.25	61.37	47.33
1996	5	0.01	60.39	46.65
1996	6	N/A	62.53	48.93
1996	7	N/A	67.1	50.87
1996	8	0.02	69	52.45
1996	9	N/A	65.67	51.97
1996	10	0.64	63.26	51.29
1996	11	0.18	61.57	50.17
1996	12	2.98	56.84	48.19
1997	1	N/A	55	46.74
1997	2	N/A	55	45.61
1997	3	0	60.97	46.87
1997	4	N/A	57.13	45.57
1997	5	N/A	63.94	49.45
1997	6	N/A	60.83	49.4
1997	7	N/A	63.9	50.97
1997	8	0.04	68.94	55.61
1997	9	N/A	73	58.5
1997	10	N/A	68.13	56.13
1997	11	N/A	62.9	53.03
1997	12	N/A	56.43	48.3
1998	1	N/A	53.97	47.39
1998	2	N/A	52.07	45.21

Table A2-2. Monthly summary data for Santa Rosa Island RAWS Station 1990-2010 (continued).

Year	Month	Precip (Inches)	Tmax (F)	Tmin (F)
1998	3	0.9	55.26	45.84
1998	4	N/A	56.47	45
1998	5	1.22	55.06	46.42
1998	6	0.04	58.77	48.73
1998	7	0.03	66.65	53.58
1998	8	0	73.29	57.23
1998	9	0.14	68.2	54.73
1998	10	0.02	64.74	51.13
1998	11	1.27	57.63	47.17
1998	12	N/A	57.1	43.23
1999	1	0.84	58.58	46.9
1999	2	0.29	53.75	43.25
1999	3	3.37	50.39	41.35
1999	4	1.88	54.37	43.33
1999	5	0.01	53.45	43.55
1999	6	N/A	N/A	N/A
1999	7	N/A	N/A	N/A
1999	8	N/A	61.62	49.15
1999	9	N/A	N/A	N/A
1999	10	N/A	N/A	N/A
1999	11	N/A	57.33	46.93
1999	12	0.01	60.39	47.13
2000	1	1.28	54.65	44.48
2000	2	3.61	52.45	43.17
2000	3	1.48	54.06	42.48
2000	4	N/A	55.7	43.77
2000	5	N/A	59.77	45.68
2000	6	0.03	62.33	47.93
2000	7	0.01	59.29	47.06
2000	8	0.02	66.84	51
2000	9	0.2	66.43	53.07
2000	10	0.72	59.23	48.16
2000	11	0.1	56.47	44.17
2000	12	0.14	60.13	48.32
2001	1	2.61	53.39	43.06
2001	2	4.49	51	41.68
2001	3	2.77	54	44.52
2001	4	N/A	52.57	43.4
2001	5	0.01	65.81	49.65
2001	6	0.01	67.43	51.7
2001	7	0.02	64.1	51.16
2001	8	0.04	64.35	50.06
2001	9	N/A	67	52.23
2001	10	0.35	65.13	51.65
2001	11	1.53	60.23	49.17
2001	12	1.45	54.87	44.9
2002	1	N/A	55.26	43.65

Table A2-2. Monthly summary data for Santa Rosa Island RAWs Station 1990-2010 (continued).

Year	Month	Precip (Inches)	Tmax (F)	Tmin (F)
2002	2	N/A	61.61	47.54
2002	3	0.22	55.87	43.19
2002	4	0.03	56.9	44.1
2002	5	N/A	58.23	44.58
2002	6	0.01	60.9	47.43
2002	7	N/A	67.23	50.48
2002	8	0.02	65.26	50.39
2002	9	0.03	73.07	55.27
2002	10	N/A	61.19	49.32
2002	11	1.13	67	52.23
2002	12	2.21	56.61	45.35
2003	1	0	65.39	51.29
2003	2	2.81	56.11	45.57
2003	3	0.64	58	45.45
2003	4	0.57	55.23	43.43
2003	5	1.39	59.74	46.03
2003	6	0.02	59.83	48.37
2003	7	N/A	71.94	53.16
2003	8	0.06	64.58	51.48
2003	9	0.06	67.27	52.97
2003	10	1.36	74.48	56.61
2003	11	N/A	61.36	49.54
2003	12	1.85	57.58	47.19
2004	1	0.28	57.74	45.39
2004	2	6.08	55.1	45.1
2004	3	0.21	65.58	50.13
2004	4	0	62.5	48.03
2004	5	0	64.71	49.13
2004	6	0	62.5	49.13
2004	7	N/A	67.03	52.3
2004	8	0	67.35	52.94
2004	9	0.63	75.13	57.07
2004	10	0.69	64.68	51.61
2004	11	0	61.13	49.1
2004	12	2.62	61.48	49.94
2005	1	3.86	60.87	49.45
2005	2	5.36	57.36	48.79
2005	3	1.2	60	48.52
2005	4	0.49	59.07	46.53
2005	5	0.07	61.81	49.39
2005	6	0.06	59.9	49.23
2005	7	0.02	68.52	53.19
2005	8	0.01	71.35	54.52
2005	9	0.03	67.3	52.57
2005	10	0.34	67.84	52.52
2005	11	0.52	67.9	54.3
2005	12	0.44	62.39	49.74

Table A2-2. Monthly summary data for Santa Rosa Island RAWS Station 1990-2010 (continued).

Year	Month	Precip (Inches)	Tmax (F)	Tmin (F)
2006	1	1.63	60.03	47.29
2006	2	2.08	63.14	48.43
2006	3	2.04	53.71	42.39
2006	4	2.44	57.37	46.87
2006	5	N/A	61.71	48.42
2006	6	N/A	68.27	50.93
2006	7	0	77.68	57.61
2006	8	0.01	69.39	53.13
2006	9	0.01	69.6	53.4
2006	10	0.3	68.16	53.29
2006	11	0.27	65.53	50.7
2006	12	1.07	61.35	47.87
2007	1	2.38	56.52	43.35
2007	2	1.46	57.54	44.57
2007	3	0.08	61.77	47.23
2007	4	0.55	57.86	45.31
2007	5	N/A	N/A	N/A
2007	6	N/A	N/A	N/A
2007	7	N/A	N/A	N/A
2007	8	0.02	72.81	56.61
2007	9	0.54	73.77	58.87
2007	10	0.14	72.9	58.16
2007	11	0.01	66.07	49.43
2007	12	0.67	56.23	43.39
2008	1	4.11	54.81	44.1
2008	2	0.01	58.76	45.31
2008	3	0.35	58.42	44.84
2008	4	0.15	59.9	45.87
2008	5	0.01	59.87	46.03
2008	6	0	65.7	50.43
2008	7	0	66	50.81
2008	8	0	70.16	52.48
2008	9	0	70.47	54.97
2008	10	0.02	74.52	56.65
2008	11	0.56	67.77	53.1
2008	12	1.87	57.61	45.1
2009	1	0.21	65.39	51.68
2009	2	2.27	57.29	45.82
2009	3	0.25	58.03	44.35
2009	4	0.1	60.17	45.77
2009	5	0.05	62.42	46.97
2009	6	0.06	64.73	50.37
2009	7	0	71	51.16
2009	8	0	72.39	54.48
2009	9	0.01	78.03	58.4
2009	10	0.17	69.16	53.03
2009	11	0	68.13	52.33

Table A2-2. Monthly summary data for Santa Rosa Island RAWS Station 1990-2010 (continued).

Year	Month	Precip (Inches)	Tmax (F)	Tmin (F)
2009	12	1.73	58.42	46
2010	1	5.38	62.65	49.03
2010	2	3.53	59.11	46.93
2010	3	0.28	61.16	47.32
2010	4	1.25	57.83	45.6
2010	5	0.05	58.87	45.9
2010	6	0.02	61.3	48.07
2010	7	0.01	62.48	49.9
2010	8	0	65.58	50.97
2010	9	0.03	72.43	55.87
2010	10	0.74	67.58	52.97
2010	11	0.49	64.57	50.67
2010	12	6.89	58.19	47.42

Table A2-3. Monthly summary data for Santa Barbara Island RAWS Station 1990-2010.

Year	Month	Precip (Inches)	Tmax (F)	Tmin (F)
1996	7	N/A	65.29	57.42
1996	8	N/A	67.16	59.42
1996	9	N/A	65.93	58.30
1996	10	N/A	N/A	N/A
1996	11	N/A	N/A	N/A
1996	12	N/A	N/A	N/A
1997	1	N/A	N/A	N/A
1997	2	N/A	N/A	N/A
1997	3	N/A	N/A	N/A
1997	4	N/A	N/A	N/A
1997	5	N/A	N/A	N/A
1997	6	N/A	N/A	N/A
1997	7	N/A	N/A	N/A
1997	8	N/A	N/A	N/A
1997	9	N/A	N/A	N/A
1997	10	N/A	N/A	N/A
1997	11	N/A	N/A	N/A
1997	12	N/A	N/A	N/A
1998	1	N/A	N/A	N/A
1998	2	N/A	N/A	N/A
1998	3	N/A	N/A	N/A
1998	4	N/A	N/A	N/A
1998	5	N/A	N/A	N/A
1998	6	N/A	N/A	N/A
1998	7	N/A	N/A	N/A
1998	8	N/A	N/A	N/A
1998	9	N/A	N/A	N/A
1998	10	N/A	N/A	N/A
1998	11	N/A	N/A	N/A
1998	12	N/A	60.37	51.57
1999	1	0.50	60.23	51.71
1999	2	0.07	58.00	50.78
1999	3	1.73	57.06	49.03
1999	4	1.03	57.23	49.23
1999	5	0.00	61.32	52.39
1999	6	0.10	61.60	53.07
1999	7	0.00	64.77	57.74
1999	8	0.00	64.45	56.32
1999	9	0.00	63.90	57.80
1999	10	0.00	67.00	58.26
1999	11	0.16	62.80	55.33
1999	12	0.01	63.90	53.90
2000	1	0.70	59.26	52.29
2000	2	3.90	57.38	51.21
2000	3	0.95	59.00	50.90
2000	4	0.91	59.17	52.50
2000	5	0.00	60.61	54.32

Table A2-3. Monthly summary data for Santa Barbara Island RAWS Station 1990-2010 (continued).

Year	Month	Precip (Inches)	Tmax (F)	Tmin (F)
2000	6	0.00	62.67	56.97
2000	7	0.00	63.23	57.26
2000	8	0.00	64.90	58.55
2000	9	0.06	63.90	58.53
2000	10	0.30	59.52	55.32
2000	11	0.20	57.43	51.67
2000	12	0.00	57.84	50.77
2001	1	2.54	55.77	49.42
2001	2	5.40	55.00	48.25
2001	3	2.79	56.55	50.26
2001	4	0.29	54.43	49.13
2001	5	N/A	N/A	N/A
2001	6	N/A	N/A	N/A
2001	7	N/A	N/A	N/A
2001	8	N/A	N/A	N/A
2001	9	N/A	N/A	N/A
2001	10	N/A	N/A	N/A
2001	11	N/A	N/A	N/A
2001	12	N/A	N/A	N/A
2002	1	N/A	N/A	N/A
2002	2	N/A	N/A	N/A
2002	3	N/A	N/A	N/A
2002	4	N/A	N/A	N/A
2002	5	N/A	N/A	N/A
2002	6	N/A	N/A	N/A
2002	7	N/A	N/A	N/A
2002	8	N/A	N/A	N/A
2002	9	N/A	N/A	N/A
2002	10	N/A	N/A	N/A
2002	11	N/A	N/A	N/A
2002	12	1.75	N/A	N/A
2003	1	N/A	N/A	N/A
2003	2	3.68	N/A	N/A
2003	3	N/A	N/A	N/A
2003	4	0.89	N/A	N/A
2003	5	N/A	N/A	N/A
2003	6	N/A	N/A	N/A
2003	7	N/A	N/A	N/A
2003	8	N/A	N/A	N/A
2003	9	0	64.40	59.10
2003	10	N/A	N/A	N/A
2003	11	0.03	62.50	56.93
2003	12	0.75	60.29	54.77
2004	1	0.01	60.06	53.94
2004	2	3.39	58.72	53.86
2004	3	0.41	62.35	54.74
2004	4	0	62.60	55.57

Table A2-3. Monthly summary data for Santa Barbara Island RAWS Station 1990-2010 (continued).

Year	Month	Precip (Inches)	Tmax (F)	Tmin (F)
2004	5	0	64.42	57.81
2004	6	0	65.47	58.87
2004	7	N/A	66.63	60.07
2004	8	0	68.77	61.65
2004	9	0	72.20	64.30
2004	10	2.19	65.42	59.35
2004	11	0.14	63.40	58.27
2004	12	3.12	62.26	55.55
2005	1	5.35	61.42	54.03
2005	2	3.24	61.39	54.04
2005	3	0.77	61.87	54.39
2005	4	0.67	61.27	52.93
2005	5	0.15	63.90	55.77
2005	6	0	62.60	55.93
2005	7	0	64.71	56.90
2005	8	0	70.42	62.16
2005	9	0	68.90	60.37
2005	10	0.92	64.94	57.00
2005	11	0.92	65.37	55.73
2005	12	0.28	60.74	52.81
2006	1	0.89	59.84	52.35
2006	2	1.95	60.89	51.36
2006	3	1.03	55.65	49.13
2006	4	1.05	59.80	52.40
2006	5	0.98	62.65	54.55
2006	6	0.00	N/A	N/A
2006	7	0.40	N/A	N/A
2006	8	0.00	69.10	61.61
2006	9	0.00	65.90	59.37
2006	10	0.44	66.39	58.13
2006	11	0.00	66.27	57.63
2006	12	0.20	61.97	53.71
2007	1	1.62	59.48	51.23
2007	2	0.32	59.54	52.64
2007	3	0.00	61.39	52.19
2007	4	0.57	59.93	52.20
2007	5	0.00	61.26	53.52
2007	6	0.00	64.73	55.53
2007	7	0.00	68.35	59.55
2007	8	N/A	N/A	N/A
2007	9	N/A	N/A	N/A
2007	10	N/A	N/A	N/A
2007	11	N/A	N/A	N/A
2007	12	N/A	N/A	N/A
2008	1	N/A	N/A	N/A
2008	2	N/A	N/A	N/A
2008	3	N/A	N/A	N/A

Table A2-3. Monthly summary data for Santa Barbara Island RAWs Station 1990-2010 (continued).

Year	Month	Precip (Inches)	Tmax (F)	Tmin (F)
2008	4	N/A	N/A	N/A
2008	5	N/A	N/A	N/A
2008	6	0.00	67.03	56.47
2008	7	0.00	69.29	59.84
2008	8	0.00	71.39	61.52
2008	9	0.00	67.23	60.80
2008	10	0.02	71.29	60.29
2008	11	1.31	68.00	58.17
2008	12	0.00	59.00	52.19
2009	1	0.00	65.42	54.61
2009	2	0.01	60.04	51.25
2009	3	0.28	61.16	51.68
2009	4	0.00	61.27	52.23
2009	5	0.01	64.29	55.29
2009	6	0.00	63.70	56.27
2009	7	0.00	66.61	58.10
2009	8	0.00	68.16	59.10
2009	9	0.00	67.43	59.00
2009	10	0.00	67.19	57.68
2009	11	0.00	64.17	54.80
2009	12	1.35	58.52	51.58
2010	1	3.17	61.65	52.68
2010	2	2.72	60.14	52.14
2010	3	0.21	61.00	51.52
2010	4	0.44	58.33	50.53
2010	5	0.18	59.52	51.68
2010	6	0.00	62.37	53.97
2010	7	0.00	62.03	55.74
2010	8	0.00	63.03	55.16
2010	9	0.00	64.37	55.87
2010	10	0.00	63.84	56.68
2010	11	0.09	62.77	54.23
2010	12	3.99	57.55	51.19

Notes: N/A indicates either missing data or data that did not pass quality checks. Tmax = Average daily maximum temperature. Tmin = Average daily minimum temperature.

Table A2-4. Monthly summary data for Santa Cruz Island RAWS Station 1990-2010.

Year	Month	Precip (Inches)	Tmax (F)	Tmin (F)
1990	8	N/A	69.06	52.00
1990	9	N/A	72.10	52.70
1990	10	0.00	72.58	54.13
1990	11	0.10	66.70	50.10
1990	12	0.27	58.71	43.71
1991	1	N/A	57.55	43.52
1991	2	4.96	64.39	47.14
1991	3	8.14	51.97	40.48
1991	4	0.02	58.67	43.90
1991	5	N/A	57.55	41.84
1991	6	0.71	61.60	45.03
1991	7	0.03	67.58	50.39
1991	8	N/A	70.45	51.74
1991	9	0.01	74.83	54.10
1991	10	N/A	75.24	56.66
1991	11	N/A	76.43	32.17
1991	12	N/A	67.94	29.45
1992	1	N/A	70.00	30.03
1992	2	7.28	69.03	37.66
1992	3	N/A	66.26	38.68
1992	4	0.00	76.60	40.27
1992	5	N/A	73.10	45.90
1992	6	N/A	75.33	46.63
1992	7	0.39	82.00	49.84
1992	8	0.00	82.87	47.35
1992	9	N/A	81.80	42.93
1992	10	N/A	75.10	40.29
1992	11	0.00	73.00	32.70
1992	12	4.30	60.81	28.74
1993	1	N/A	60.68	35.55
1993	2	5.42	61.43	33.50
1993	3	N/A	N/A	N/A
1993	4	N/A	73.18	39.36
1993	5	N/A	72.74	40.94
1993	6	N/A	76.73	43.73
1993	7	N/A	74.61	46.00
1993	8	N/A	78.55	47.81
1993	9	N/A	80.20	40.97
1993	10	N/A	78.81	37.81
1993	11	N/A	72.70	31.93
1993	12	N/A	68.37	27.87
1994	1	N/A	69.53	25.83
1994	2	N/A	64.57	32.93
1994	3	N/A	69.52	35.55
1994	4	N/A	69.00	37.70
1994	5	N/A	68.65	38.35
1994	6	N/A	78.50	39.67

Table A2-4. Monthly summary data for Santa Cruz Island RAWS Station 1990-2010 (continued).

Year	Month	Precip (Inches)	Tmax (F)	Tmin (F)
1994	7	N/A	75.94	45.97
1994	8	N/A	83.71	45.52
1994	9	N/A	80.17	40.80
1994	10	N/A	75.57	44.37
1994	11	0.89	63.30	40.50
1994	12	1.42	63.84	39.90
1995	1	N/A	58.66	44.86
1995	2	0.50	68.14	45.11
1995	3	N/A	65.13	44.77
1995	4	0.11	68.97	45.77
1995	5	N/A	65.47	46.07
1995	6	0.28	72.77	48.50
1995	7	N/A	79.84	53.06
1995	8	0.00	81.81	51.03
1995	9	N/A	81.27	51.97
1995	10	N/A	73.74	49.39
1995	11	N/A	72.53	45.40
1995	12	N/A	66.26	44.71
1996	1	4.17	65.45	42.29
1996	2	N/A	63.07	45.46
1996	3	1.62	65.94	42.90
1996	4	1.06	73.90	47.73
1996	5	0.23	74.29	48.19
1996	6	N/A	76.00	49.33
1996	7	N/A	N/A	N/A
1996	8	N/A	79.04	53.42
1996	9	N/A	73.17	51.40
1996	10	N/A	69.19	48.06
1996	11	2.25	66.67	46.17
1996	12	8.23	60.58	42.94
1997	1	7.08	58.35	43.03
1997	2	0.00	62.68	42.18
1997	3	0.00	67.45	42.71
1997	4	N/A	68.97	47.59
1997	5	N/A	75.29	53.74
1997	6	N/A	70.63	51.90
1997	7	N/A	73.45	52.39
1997	8	N/A	78.61	56.16
1997	9	N/A	81.14	57.39
1997	10	N/A	72.74	51.06
1997	11	N/A	66.47	47.73
1997	12	N/A	60.27	42.73
1998	1	N/A	59.48	43.52
1998	2	N/A	57.29	44.36
1998	3	N/A	60.61	43.55
1998	4	N/A	62.67	42.73
1998	5	N/A	62.52	46.00

Table A2-4. Monthly summary data for Santa Cruz Island RAWS Station 1990-2010 (continued).

Year	Month	Precip (Inches)	Tmax (F)	Tmin (F)
1998	6	0.02	68.33	48.77
1998	7	0.00	75.87	53.13
1998	8	0.00	80.77	54.10
1998	9	0.24	72.03	52.53
1998	10	N/A	N/A	N/A
1998	11	N/A	N/A	N/A
1998	12	N/A	N/A	N/A
1999	1	N/A	N/A	N/A
1999	2	N/A	N/A	N/A
1999	3	N/A	N/A	N/A
1999	4	N/A	N/A	N/A
1999	5	N/A	N/A	N/A
1999	6	N/A	N/A	N/A
1999	7	N/A	N/A	N/A
1999	8	N/A	N/A	N/A
1999	9	N/A	N/A	N/A
1999	10	N/A	N/A	N/A
1999	11	N/A	N/A	N/A
1999	12	0.01	68.29	43.42
2000	1	2.29	63.81	44.65
2000	2	6.83	59.55	45.21
2000	3	1.95	65.03	43.16
2000	4	N/A	70.00	44.77
2000	5	0.00	73.55	48.03
2000	6	0.00	75.30	51.20
2000	7	N/A	77.84	50.06
2000	8	0.02	80.58	52.10
2000	9	0.01	78.17	51.33
2000	10	0.19	68.68	47.45
2000	11	0.00	66.70	39.53
2000	12	0.10	67.94	41.16
2001	1	N/A	N/A	N/A
2001	2	N/A	N/A	N/A
2001	3	N/A	N/A	N/A
2001	4	N/A	N/A	N/A
2001	5	0.00	72.81	49.39
2001	6	N/A	77.27	49.10
2001	7	0.01	76.32	52.74
2001	8	0.00	79.03	51.48
2001	9	0.00	78.67	51.13
2001	10	0.46	73.68	48.39
2001	11	N/A	67.50	46.73
2001	12	N/A	60.74	40.81
2002	1	N/A	63.03	37.06
2002	2	0.39	68.96	40.29
2002	3	N/A	64.26	39.74
2002	4	0.01	65.07	42.33

Table A2-4. Monthly summary data for Santa Cruz Island RAWS Station 1990-2010 (continued).

Year	Month	Precip (Inches)	Tmax (F)	Tmin (F)
2002	5	N/A	70.16	44.19
2002	6	N/A	74.87	48.53
2002	7	N/A	77.23	51.90
2002	8	0.00	77.97	52.42
2002	9	0.02	82.27	52.60
2002	10	N/A	70.61	47.48
2002	11	3.88	73.63	48.77
2002	12	5.09	63.16	42.03
2003	1	0.01	73.42	46.81
2003	2	4.19	63.71	43.36
2003	3	N/A	69.10	45.45
2003	4	0.92	65.53	46.10
2003	5	1.91	71.10	47.81
2003	6	N/A	72.70	51.73
2003	7	0.00	83.61	56.61
2003	8	0.00	85.13	55.55
2003	9	0.00	79.67	53.77
2003	10	0.06	79.87	51.45
2003	11	N/A	67.17	43.97
2003	12	N/A	62.96	43.52
2004	1	N/A	64.53	44.23
2004	2	N/A	N/A	N/A
2004	3	N/A	N/A	N/A
2004	4	N/A	N/A	N/A
2004	5	N/A	N/A	N/A
2004	6	N/A	N/A	N/A
2004	7	N/A	N/A	N/A
2004	8	0.00	79.84	55.71
2004	9	0.03	84.23	55.87
2004	10	6.36	73.65	49.35
2004	11	N/A	68.73	44.87
2004	12	N/A	66.71	44.26
2005	1	N/A	66.23	45.74
2005	2	N/A	65.36	47.68
2005	3	N/A	67.16	48.06
2005	4	N/A	71.20	45.70
2005	5	N/A	75.71	50.87
2005	6	N/A	75.47	51.73
2005	7	N/A	81.23	56.03
2005	8	N/A	81.26	56.55
2005	9	N/A	79.23	51.73
2005	10	N/A	76.81	50.77
2005	11	N/A	75.07	48.30
2005	12	1.25	68.48	44.55
2006	1	2.48	67.52	44.10
2006	2	2.80	69.96	43.50
2006	3	5.07	61.45	41.58

Table A2-4. Monthly summary data for Santa Cruz Island RAWS Station 1990-2010 (continued).

Year	Month	Precip (Inches)	Tmax (F)	Tmin (F)
2006	4	3.54	64.47	45.03
2006	5	0.93	71.35	50.45
2006	6	0.02	81.37	53.97
2006	7	0.00	86.32	58.19
2006	8	0.00	80.68	53.65
2006	9	0.00	80.60	52.23
2006	10	0.06	76.13	49.06
2006	11	0.43	76.83	48.30
2006	12	0.68	68.97	42.35
2007	1	2.21	65.26	40.58
2007	2	N/A	65.96	42.85
2007	3	0.00	72.00	46.39
2007	4	0.85	70.47	45.57
2007	5	0.00	72.90	48.45
2007	6	0.00	77.53	50.47
2007	7	0.00	83.35	55.68
2007	8	0.00	84.68	55.87
2007	9	0.54	81.77	53.40
2007	10	0.48	78.45	52.13
2007	11	0.10	73.00	46.57
2007	12	3.25	65.23	40.71
2008	1	10.54	62.84	43.00
2008	2	4.50	67.14	43.55
2008	3	0.00	72.16	45.42
2008	4	0.71	74.27	46.80
2008	5	0.00	73.81	48.03
2008	6	0.00	82.57	53.03
2008	7	0.00	80.81	56.13
2008	8	0.00	82.39	56.19
2008	9	0.00	82.60	54.47
2008	10	0.03	83.19	51.71
2008	11	2.37	76.13	50.50
2008	12	3.34	64.61	42.61
2009	1	0.43	71.61	45.94
2009	2	3.23	65.00	43.32
2009	3	0.33	68.26	42.84
2009	4	0.16	69.73	43.17
2009	5	0.00	74.29	50.68
2009	6	0.11	72.53	50.17
2009	7	0.00	80.42	51.94
2009	8	0.00	82.23	52.68
2009	9	0.00	84.33	53.80
2009	10	0.96	76.23	48.97
2009	11	0.00	74.00	43.27
2009	12	3.66	62.74	40.10
2010	1	6.12	66.84	42.19
2010	2	6.17	64.39	42.71

Table A2-4. Monthly summary data for Santa Cruz Island RAWS Station 1990-2010 (continued).

Year	Month	Precip (Inches)	Tmax (F)	Tmin (F)
2010	3	0.53	66.23	45.52
2010	4	1.17	63.47	45.47
2010	5	0.22	69.55	49.13
2010	6	0.01	69.50	50.63
2010	7	0.00	73.16	54.32
2010	8	0.00	75.61	51.55
2010	9	0.00	77.37	52.53
2010	10	1.11	69.94	53.84
2010	11	0.65	67.03	46.73
2010	12	12.22	61.90	46.26

Notes: N/A indicates either missing data or data that did not pass quality checks. Tmax = Average daily maximum temperature. Tmin = Average daily minimum temperature.

Appendix 3. Wind summaries for Channel Islands National Park, 2010.

Anacapa Island

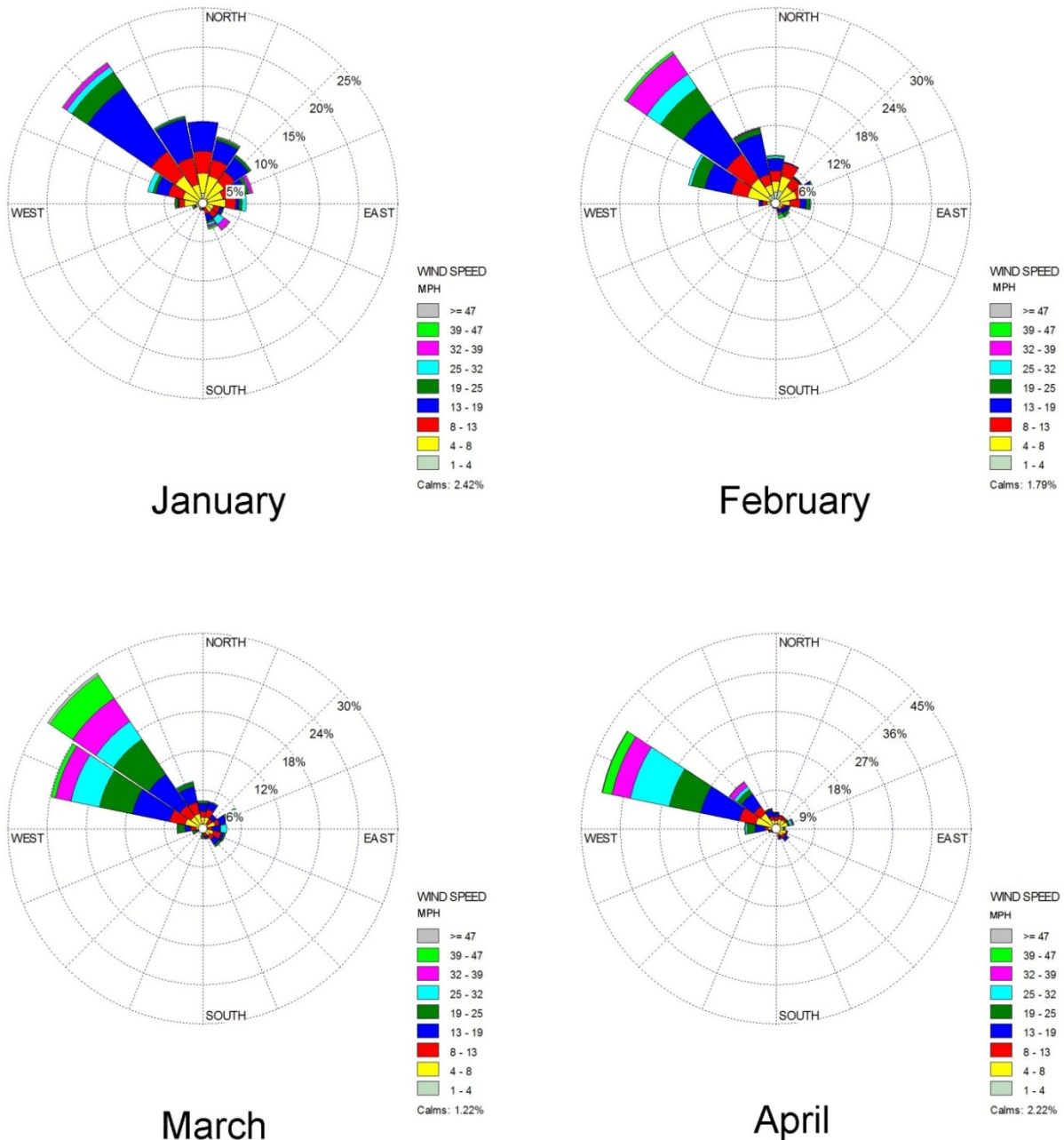
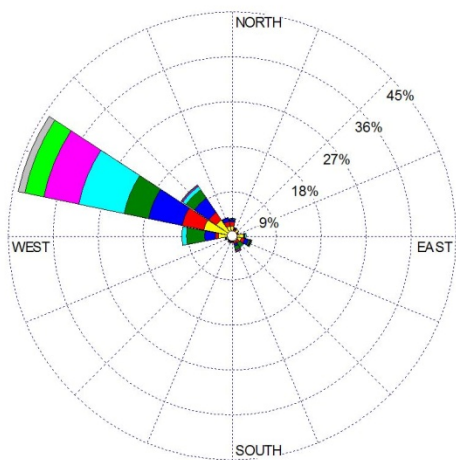
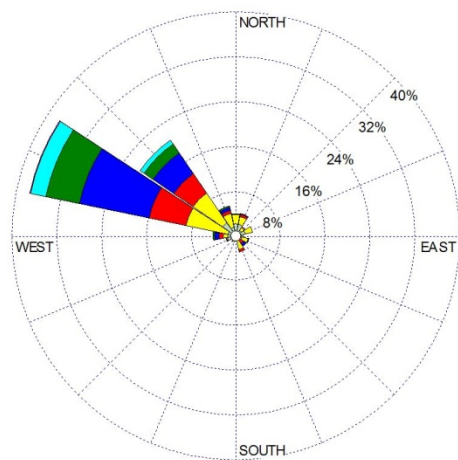


Figure A3-1. Wind Roses for Anacapa Island RAWS station in Channel Islands National Park for each month of 2010. The orientation of a spoke indicates wind direction (compass heading, degrees from which the wind originated), and the length of a spoke indicates the amount of time (%) that wind from a given direction occurred. Colors within the spokes express the amount of time (%) that wind from each direction had the indicated velocity.

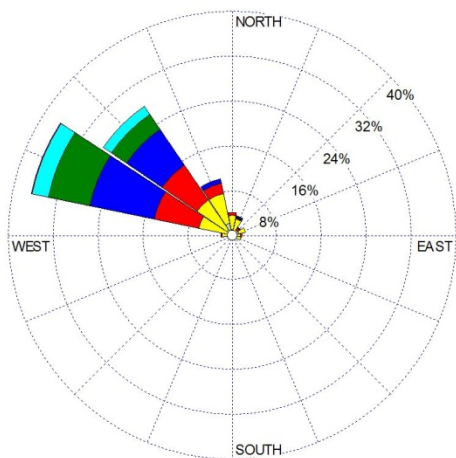
Anacapa Island



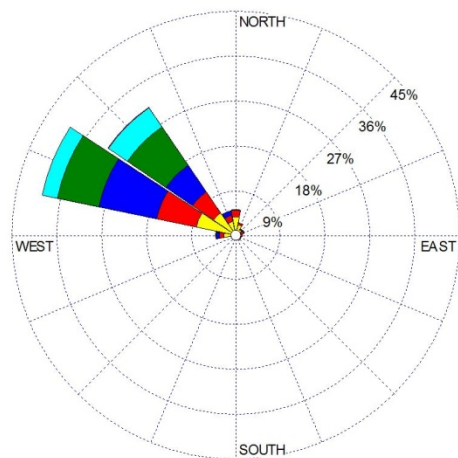
May



June



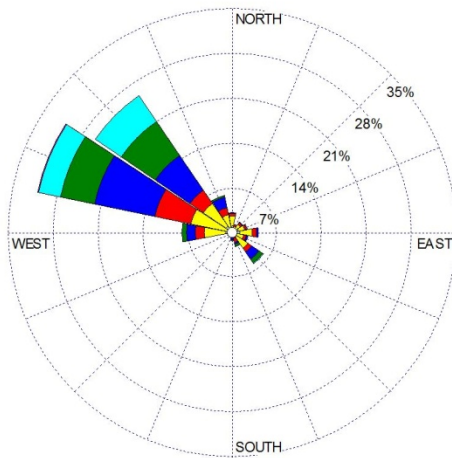
July



August

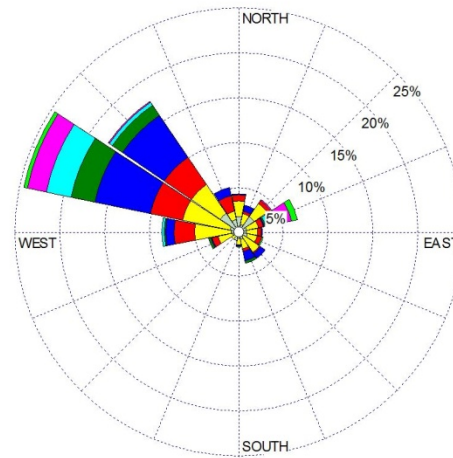
Figure A3-1. Wind Roses for Anacapa Island RAWS station in Channel Islands National Park for each month of 2010 (continued). The orientation of a spoke indicates wind direction (compass heading, degrees from which the wind originated), and the length of a spoke indicates the amount of time (%) that wind from a given direction occurred. Colors within the spokes express the amount of time (%) that wind from each direction had the indicated velocity.

Anacapa Island



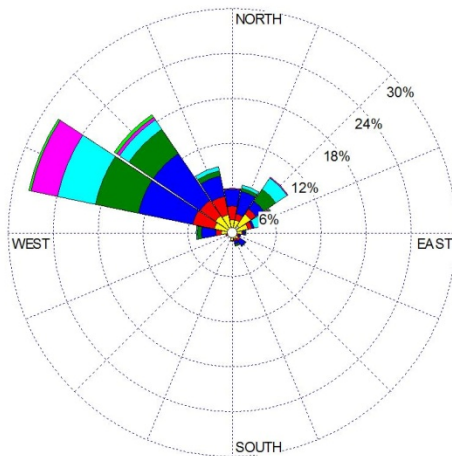
September

WIND SPEED
MPH
 >= 47
 39 - 47
 32 - 39
 25 - 32
 19 - 25
 13 - 19
 8 - 13
 4 - 8
 1 - 4
 Calms: 1.81%



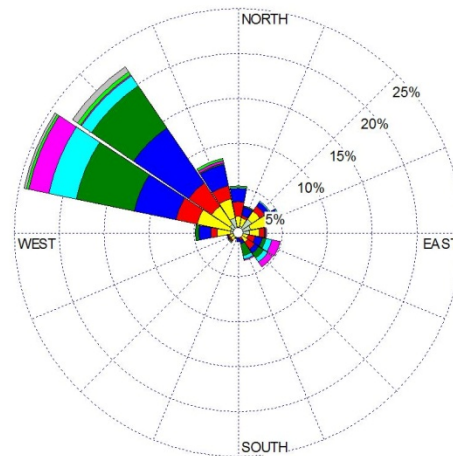
October

WIND SPEED
MPH
 >= 47
 39 - 47
 32 - 39
 25 - 32
 19 - 25
 13 - 19
 8 - 13
 4 - 8
 1 - 4
 Calms: 5.51%



November

WIND SPEED
MPH
 >= 47
 39 - 47
 32 - 39
 25 - 32
 19 - 25
 13 - 19
 8 - 13
 4 - 8
 1 - 4
 Calms: 0.70%

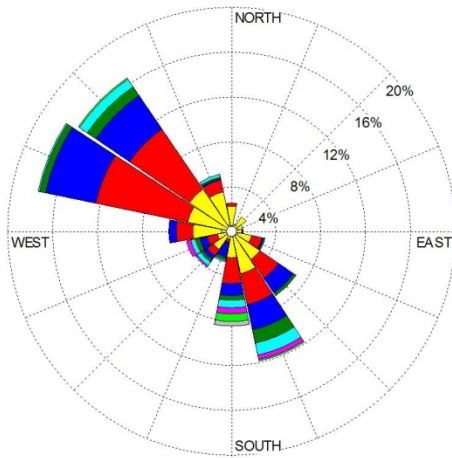


December

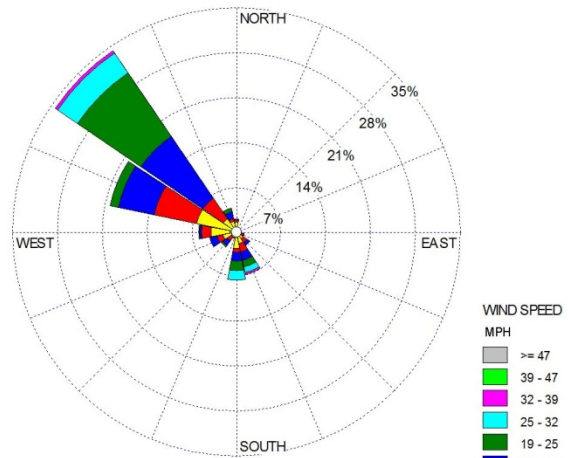
WIND SPEED
MPH
 >= 47
 39 - 47
 32 - 39
 25 - 32
 19 - 25
 13 - 19
 8 - 13
 4 - 8
 1 - 4
 Calms: 1.62%

Figure A3-1. Wind Roses for Anacapa Island RAWS station in Channel Islands National Park for each month of 2010 (continued). The orientation of a spoke indicates wind direction (compass heading, degrees from which the wind originated), and the length of a spoke indicates the amount of time (%) that wind from a given direction occurred. Colors within the spokes express the amount of time (%) that wind from each direction had the indicated velocity.

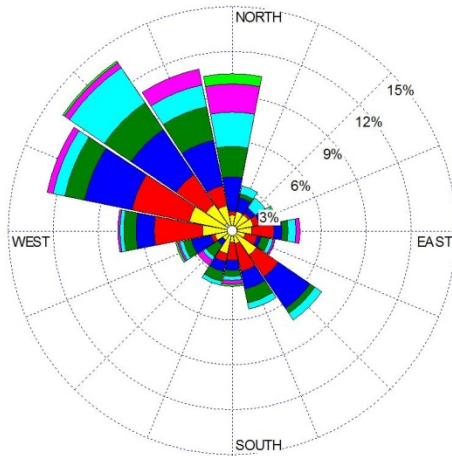
Santa Rosa Island



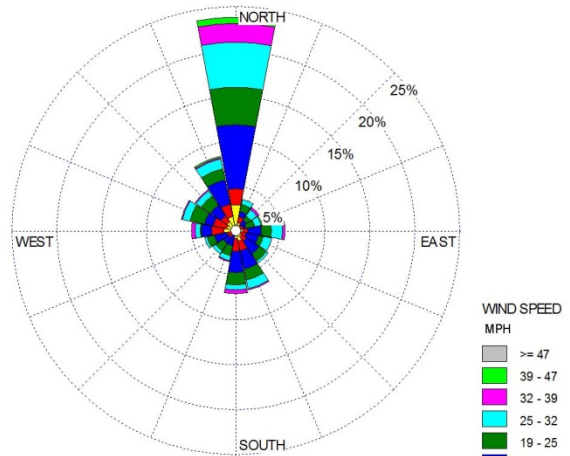
January



February



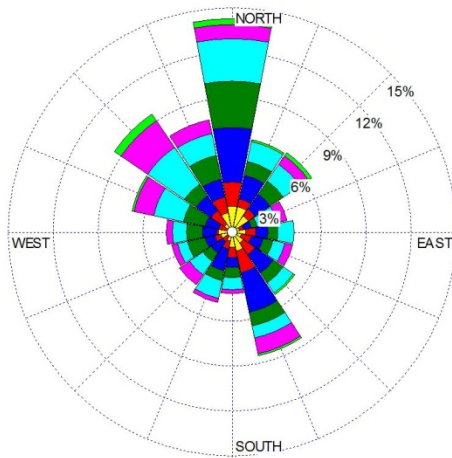
March



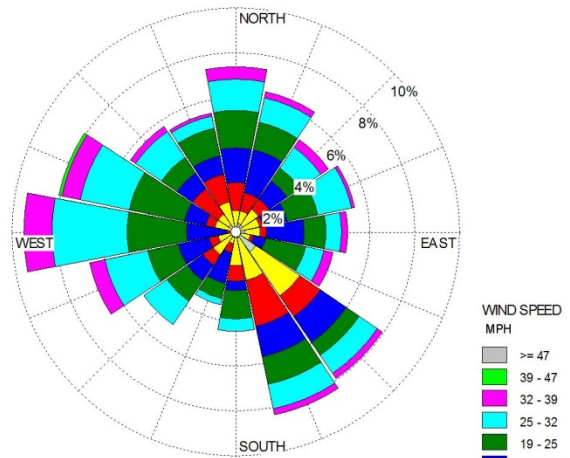
April

Figure A3-2. Wind Roses for Santa Rosa Island RAWS station in Channel Islands National Park for each month of 2010. The orientation of a spoke indicates wind direction (compass heading, degrees from which the wind originated), and the length of a spoke indicates the amount of time (%) that wind from a given direction occurred. Colors within the spokes express the amount of time (%) that wind from each direction had the indicated velocity.

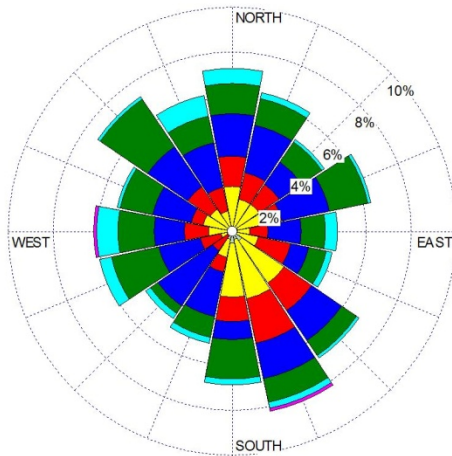
Santa Rosa Island



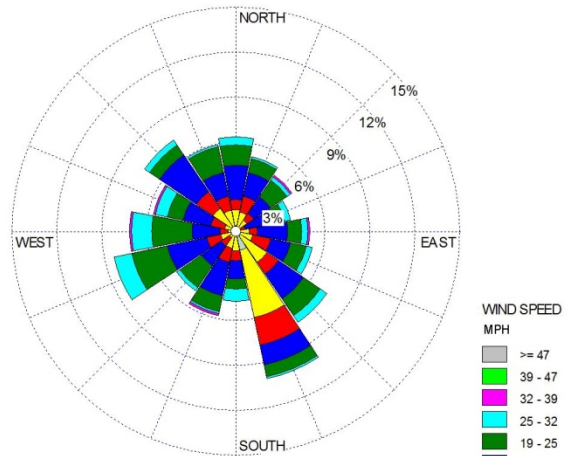
May



June



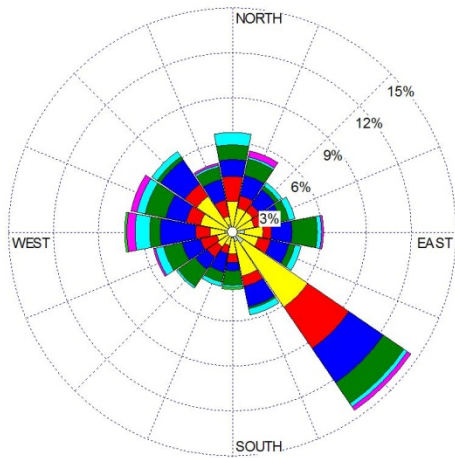
July



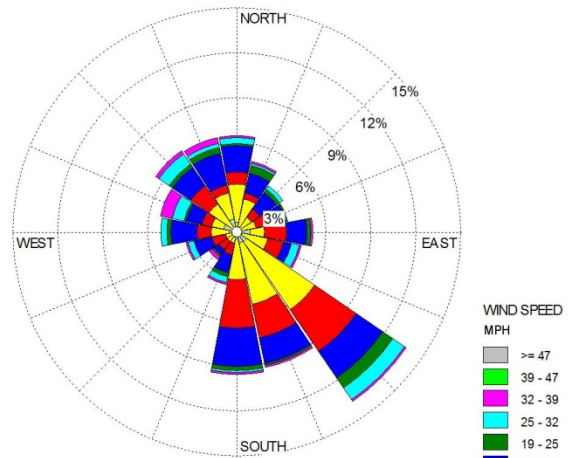
August

Figure A3-2. Wind Roses for Santa Rosa Island RAWS station in Channel Islands National Park for each month of 2010 (continued). The orientation of a spoke indicates wind direction (compass heading, degrees from which the wind originated), and the length of a spoke indicates the amount of time (%) that wind from a given direction occurred. Colors within the spokes express the amount of time (%) that wind from each direction had the indicated velocity.

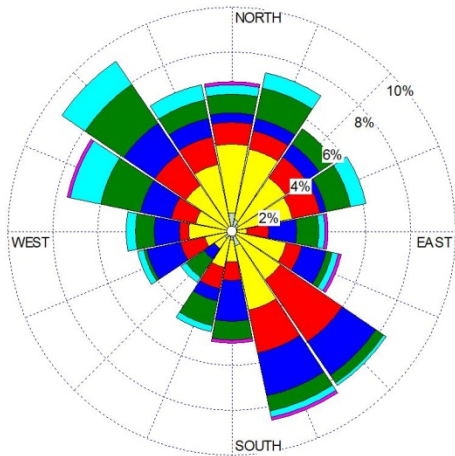
Santa Rosa Island



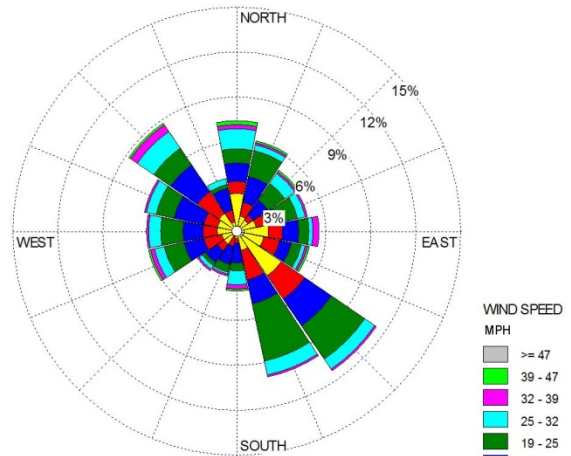
September



October



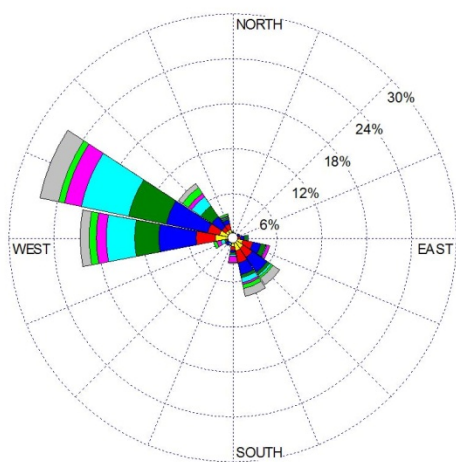
November



December

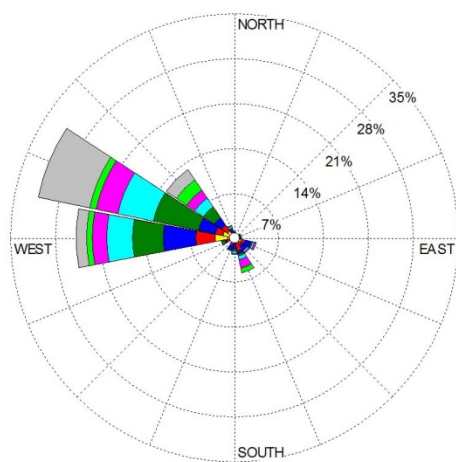
Figure A3-2. Wind Roses for Santa Rosa Island RAWS station in Channel Islands National Park for each month of 2010 (continued). The orientation of a spoke indicates wind direction (compass heading, degrees from which the wind originated), and the length of a spoke indicates the amount of time (%) that wind from a given direction occurred. Colors within the spokes express the amount of time (%) that wind from each direction had the indicated velocity.

Santa Barbara Island



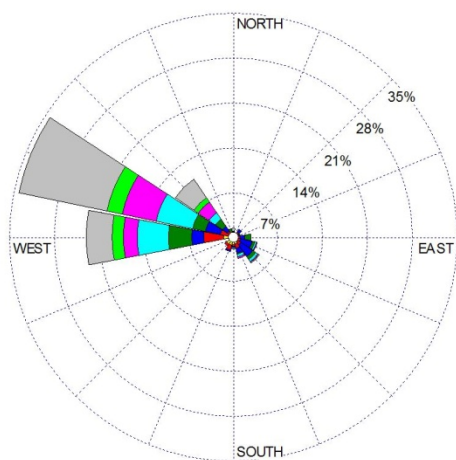
January

WIND SPEED
MPH
 >= 47
 39 - 47
 32 - 39
 25 - 32
 19 - 25
 13 - 19
 8 - 13
 4 - 8
 1 - 4
 Calms: 5.78%



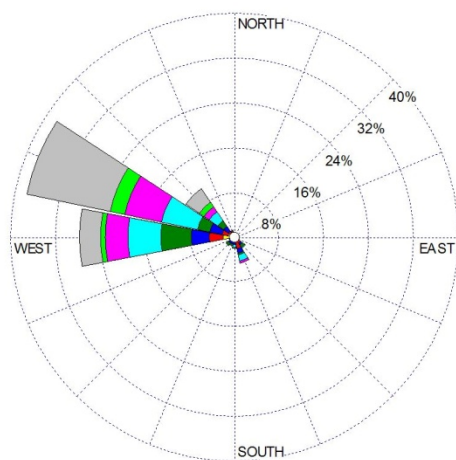
February

WIND SPEED
MPH
 >= 47
 39 - 47
 32 - 39
 25 - 32
 19 - 25
 13 - 19
 8 - 13
 4 - 8
 1 - 4
 Calms: 4.02%



March

WIND SPEED
MPH
 >= 47
 39 - 47
 32 - 39
 25 - 32
 19 - 25
 13 - 19
 8 - 13
 4 - 8
 1 - 4
 Calms: 3.38%

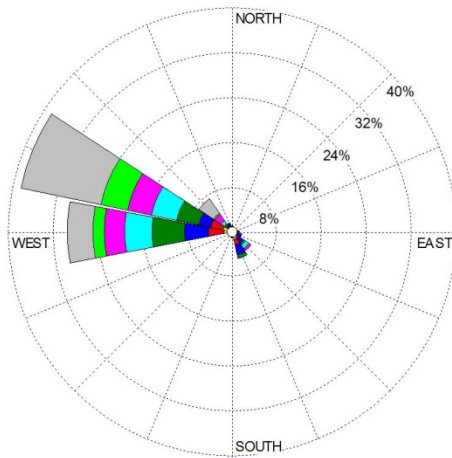


April

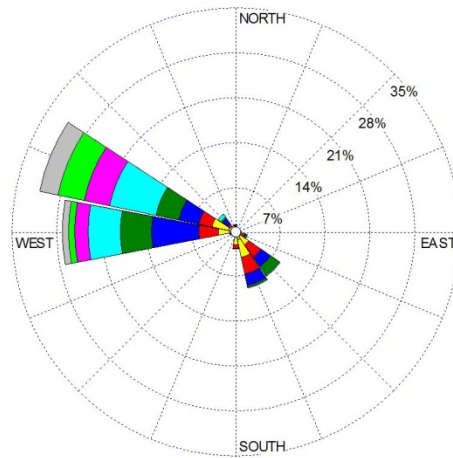
WIND SPEED
MPH
 >= 47
 39 - 47
 32 - 39
 25 - 32
 19 - 25
 13 - 19
 8 - 13
 4 - 8
 1 - 4
 Calms: 4.17%

Figure A3-3. Wind Roses for Santa Barbara Island RAWS station in Channel Islands National Park for each month of 2010. The orientation of a spoke indicates wind direction (compass heading, degrees from which the wind originated), and the length of a spoke indicates the amount of time (%) that wind from a given direction occurred. Colors within the spokes express the amount of time (%) that wind from each direction had the indicated velocity.

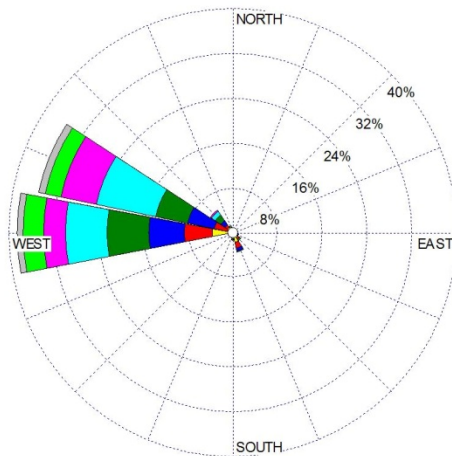
Santa Barbara Island



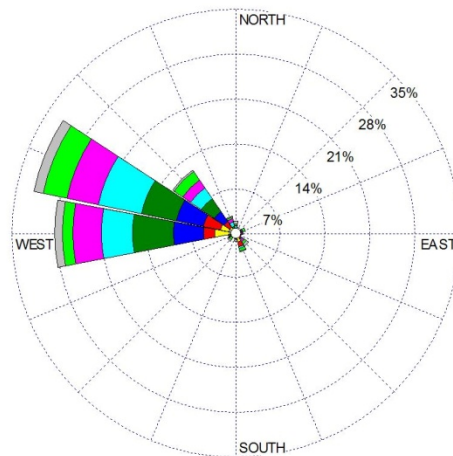
May



June



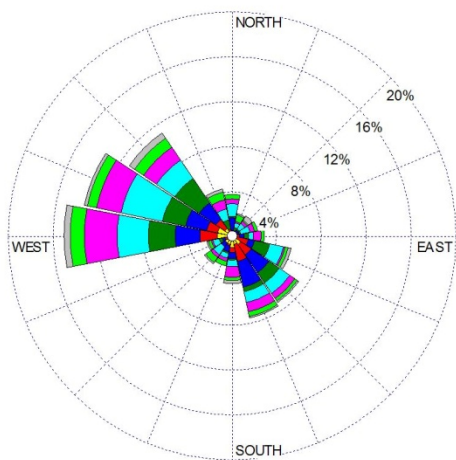
July



August

Figure A3-3. Wind Roses for Santa Barbara Island RAWS station in Channel Islands National Park for each month of 2010 (continued). The orientation of a spoke indicates wind direction (compass heading, degrees from which the wind originated), and the length of a spoke indicates the amount of time (%) that wind from a given direction occurred. Colors within the spokes express the amount of time (%) that wind from each direction had the indicated velocity.

Santa Barbara Island

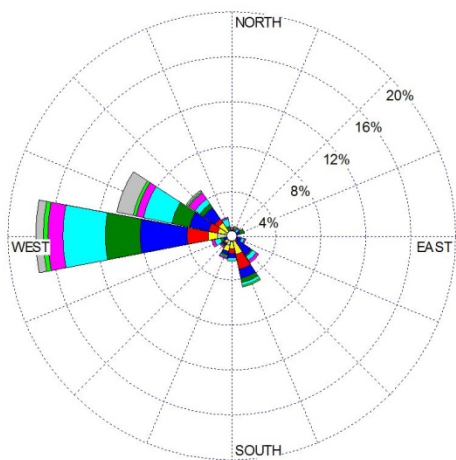


September

WIND SPEED
MPH

- >= 47
- 39 - 47
- 32 - 39
- 25 - 32
- 19 - 25
- 13 - 19
- 8 - 13
- 4 - 8
- 1 - 4

Calms: 10.14%

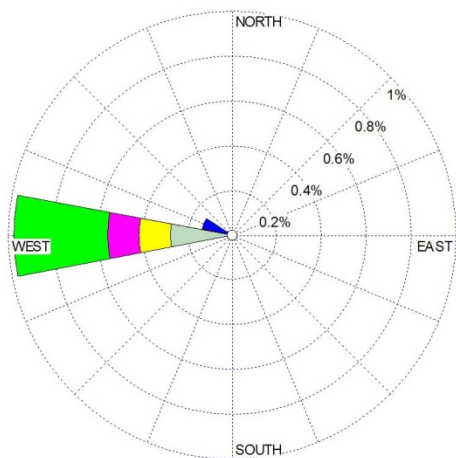


October

WIND SPEED
MPH

- >= 47
- 39 - 47
- 32 - 39
- 25 - 32
- 19 - 25
- 13 - 19
- 8 - 13
- 4 - 8
- 1 - 4

Calms: 44.22%

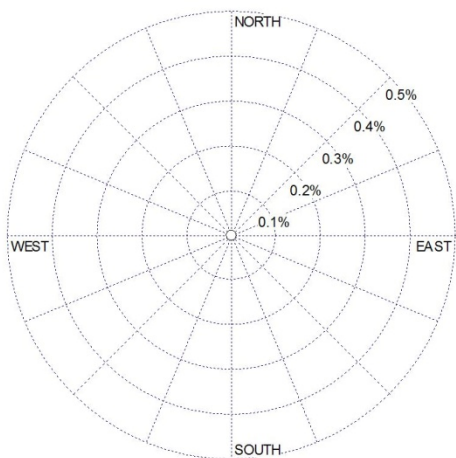


November

WIND SPEED
MPH

- >= 47
- 39 - 47
- 32 - 39
- 25 - 32
- 19 - 25
- 13 - 19
- 8 - 13
- 4 - 8
- 1 - 4

Calms: 98.89%



December

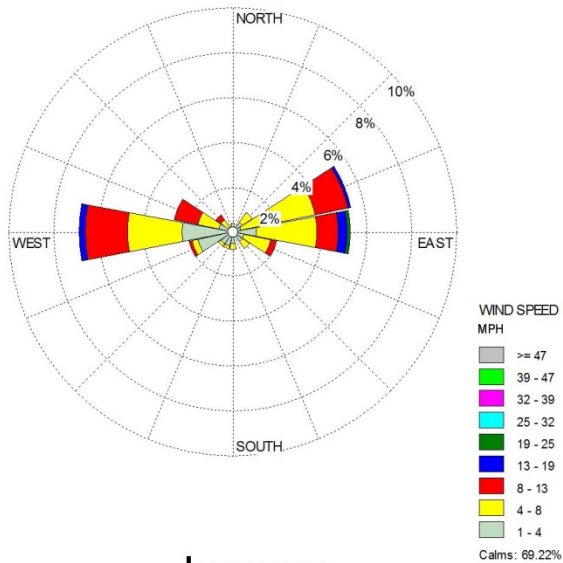
WIND SPEED
(Knots)

- >= 47
- 39 - 47
- 32 - 39
- 25 - 32
- 19 - 25
- 13 - 19
- 8 - 13
- 4 - 8
- 1 - 4

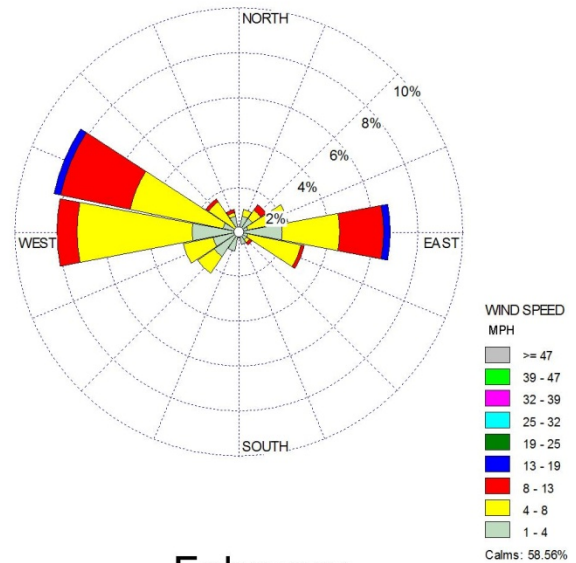
Calms: 100.00%

Figure A3-3. Wind Roses for Santa Barbara Island RAWS station in Channel Islands National Park for each month of 2010 (continued). The orientation of a spoke indicates wind direction (compass heading, degrees from which the wind originated), and the length of a spoke indicates the amount of time (%) that wind from a given direction occurred. Colors within the spokes express the amount of time (%) that wind from each direction had the indicated velocity.

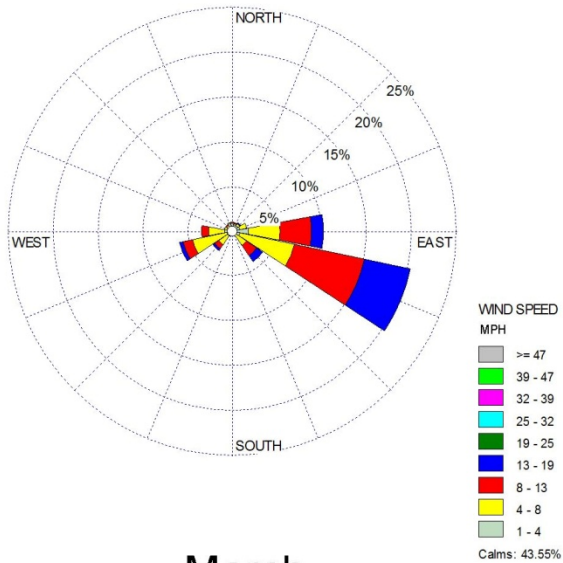
Santa Cruz Island



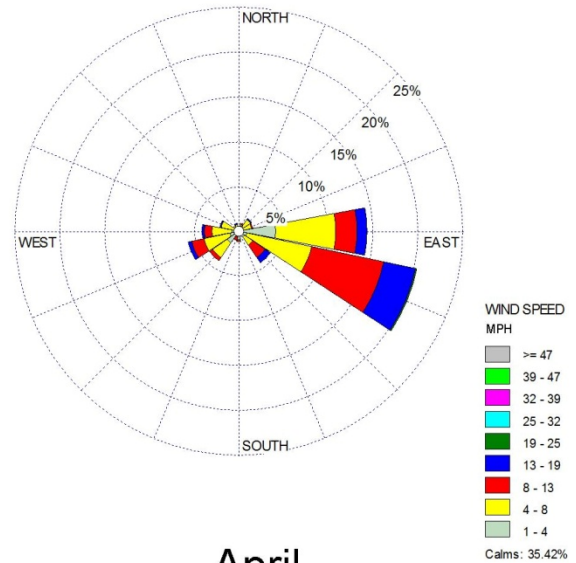
January



February



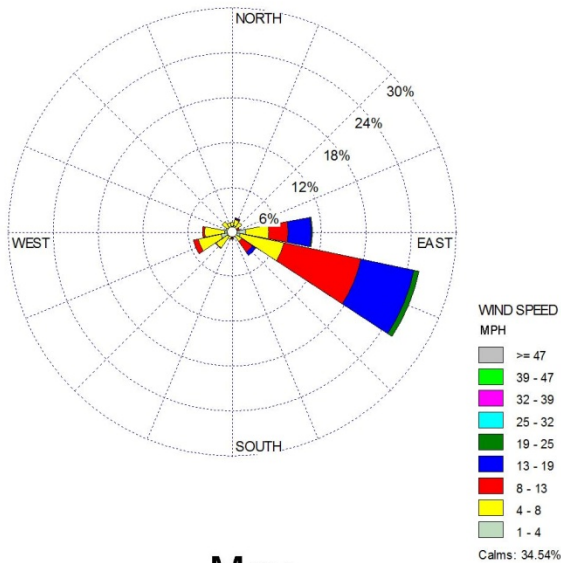
March



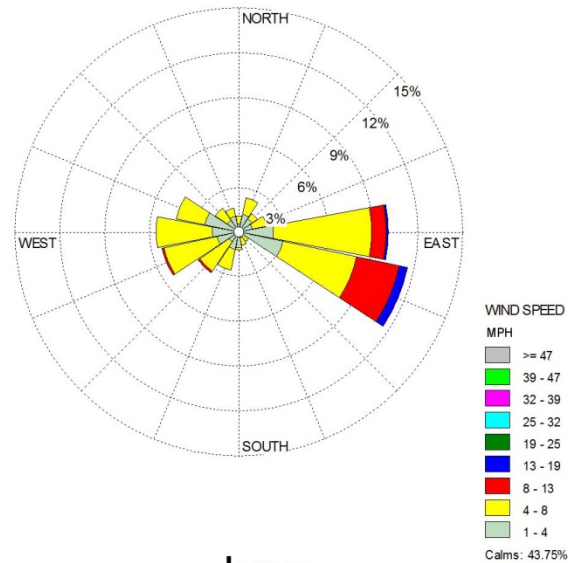
April

Figure A3-4. Wind Roses for Santa Cruz Island RAWS station in Channel Islands National Park for each month of 2010. The orientation of a spoke indicates wind direction (compass heading, degrees from which the wind originated), and the length of a spoke indicates the amount of time (%) that wind from a given direction occurred. Colors within the spokes express the amount of time (%) that wind from each direction had the indicated velocity.

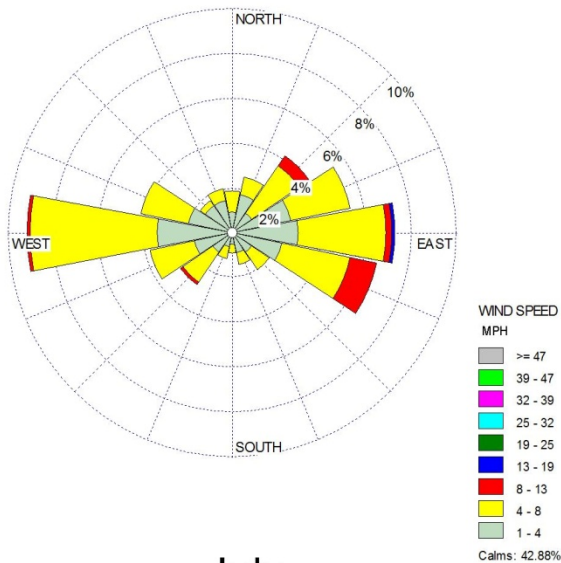
Santa Cruz Island



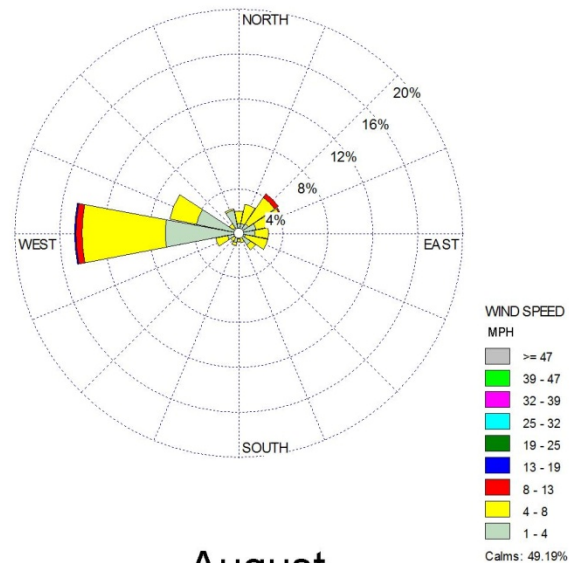
May



June



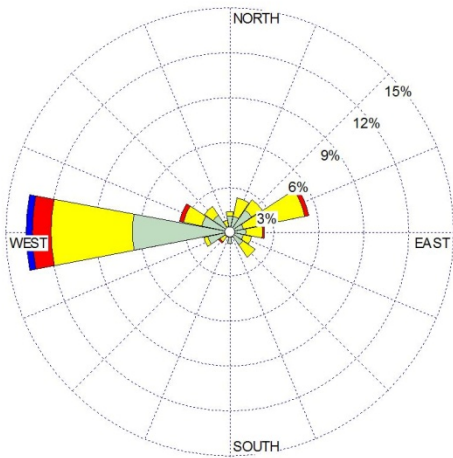
July



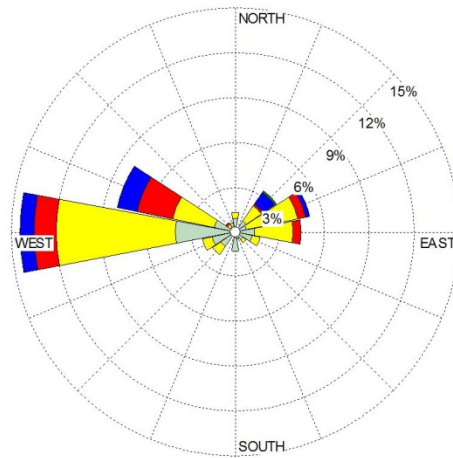
August

Figure A3-4. Wind Roses for Santa Cruz Island RAWS station in Channel Islands National Park for each month of 2010 (continued). The orientation of a spoke indicates wind direction (compass heading, degrees from which the wind originated), and the length of a spoke indicates the amount of time (%) that wind from a given direction occurred. Colors within the spokes express the amount of time (%) that wind from each direction had the indicated velocity.

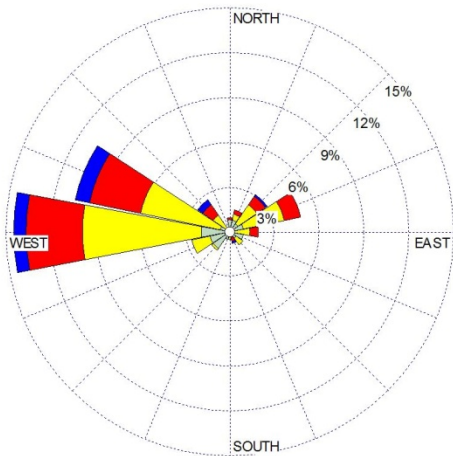
Santa Cruz Island



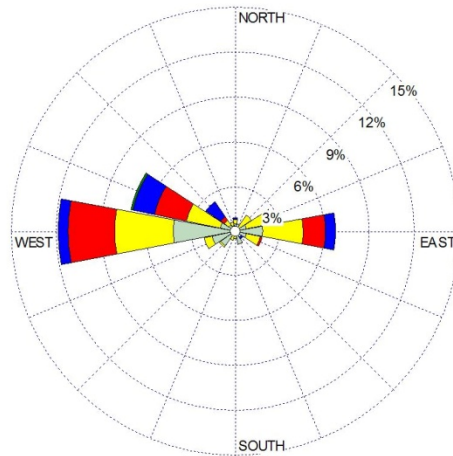
September



October



November



December

Figure A3-4. Wind Roses for Santa Cruz Island RAWS station in Channel Islands National Park for each month of 2010 (continued). The orientation of a spoke indicates wind direction (compass heading, degrees from which the wind originated), and the length of a spoke indicates the amount of time (%) that wind from a given direction occurred. Colors within the spokes express the amount of time (%) that wind from each direction had the indicated velocity.

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.

NPS 159/130093, October 2015

National Park Service
U.S. Department of the Interior



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