Using PRISM Data: How to Get and Use PRISM Estimates of Precipitation for Your Location

(AACD Technical Reference #C-3B)

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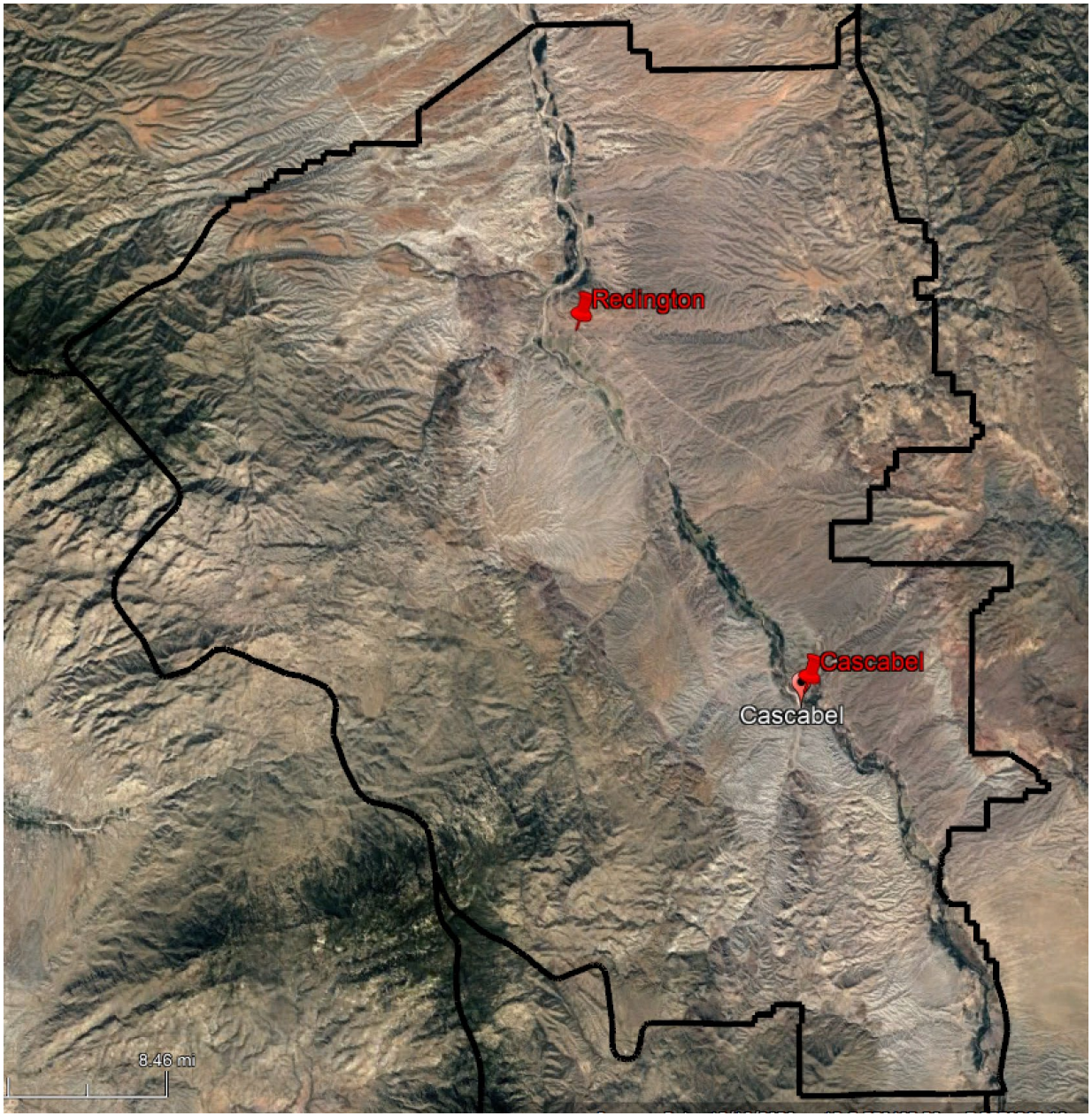
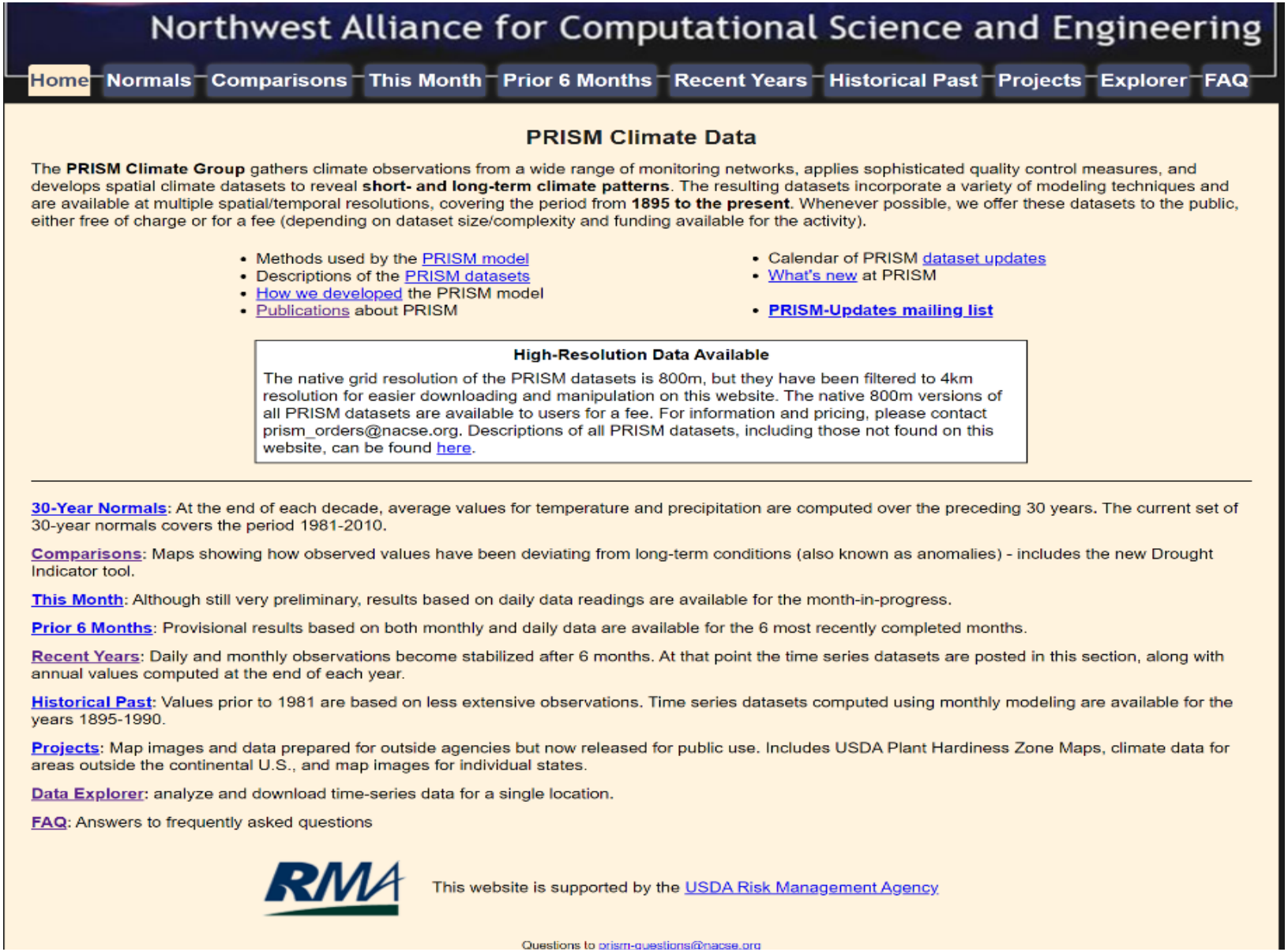
This example is how to obtain precipitation data using PRISM. PRISM data can be obtained for any given point. It is based on extrapolation and interpolation among nearby weather stations with adjustments for topography, elevation, etc.

For this example, I used Cascabel, Arizona as the point to be described. Cascabel is located in the Redington NRCD but there is no official weather station currently there. There may be some private records. There is an official station at Redington which is also in the Redington District, but at an elevation lower than most of the District. Cascabel may be more representative of the District. Or you could use both locations or choose one at a higher altitude.

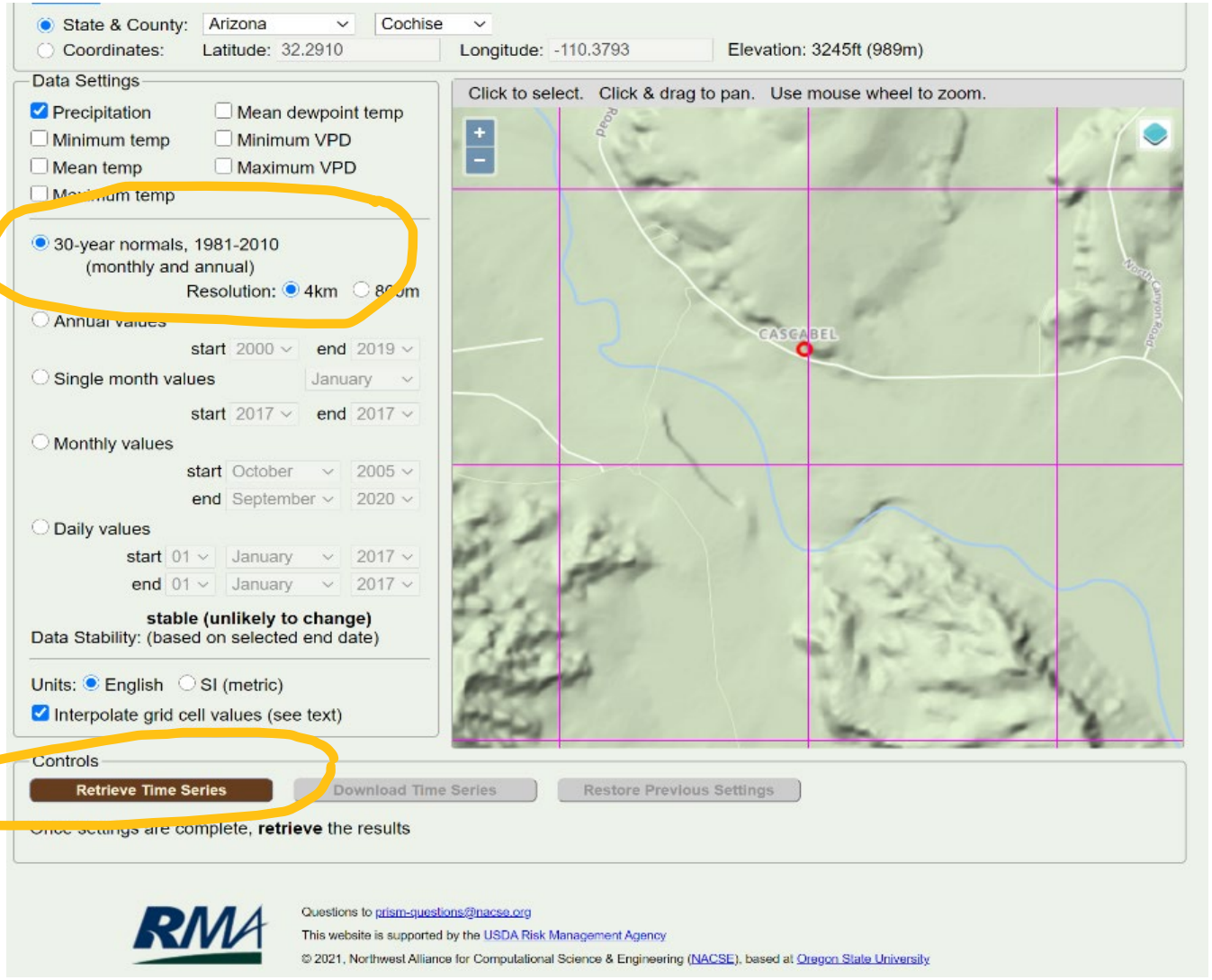


The first step is to log into PRISM (https://prism.oregonstate.edu/).

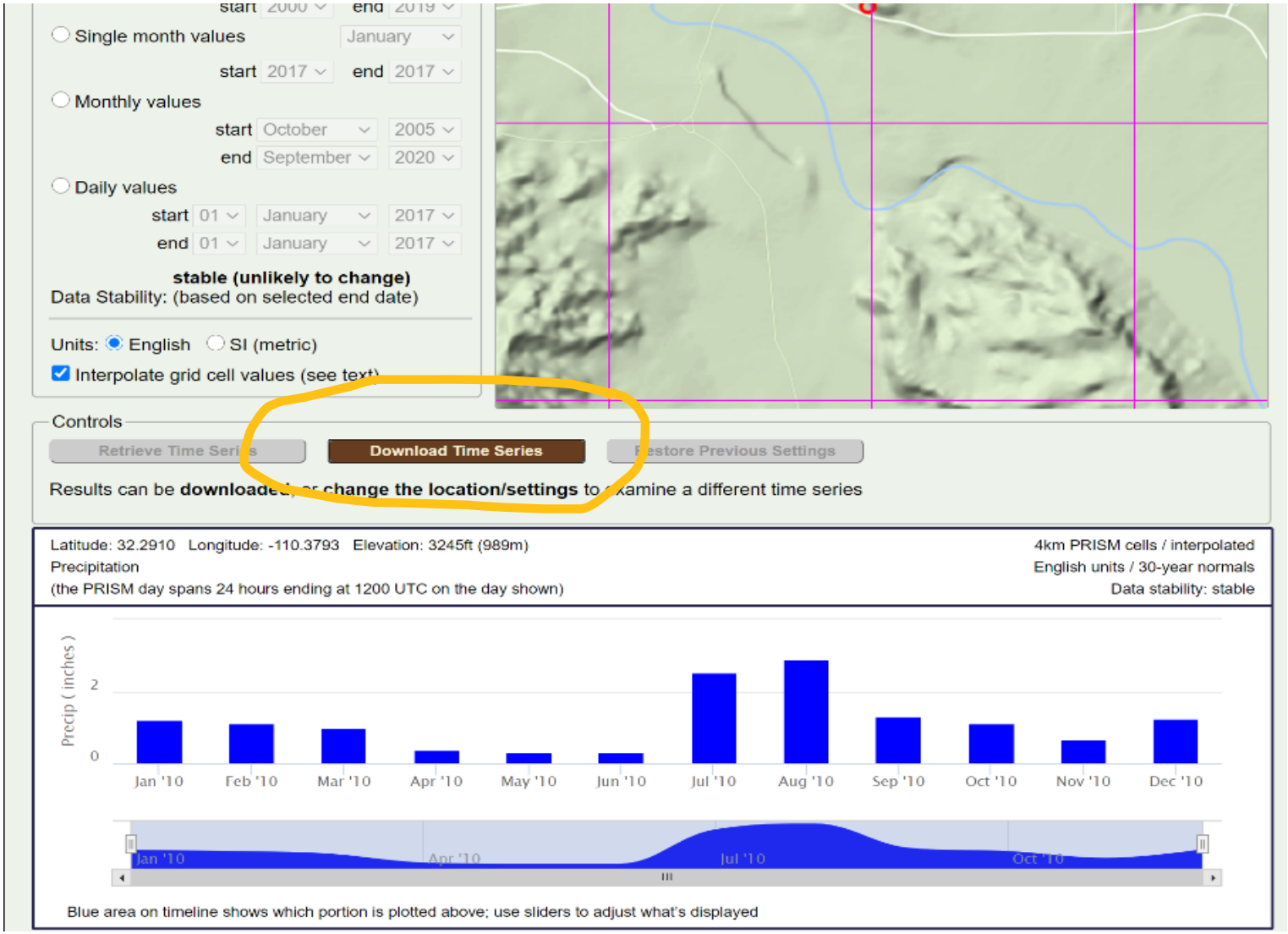
The first screen will look like the one below:



You can locate a point using the State and County or by using coordinates. For this example, I used Arizona and Cochise County. That produced a map of Cochise County which you use to set a pin (the red dot) where you want it. You can also get temperature and dewpoint data if you want. I chose the 4 km resolution. I selected the 10 years from October 1, 2010, through September 30, 2020, i.e., the last 10 forage years. You can select any interval you want.

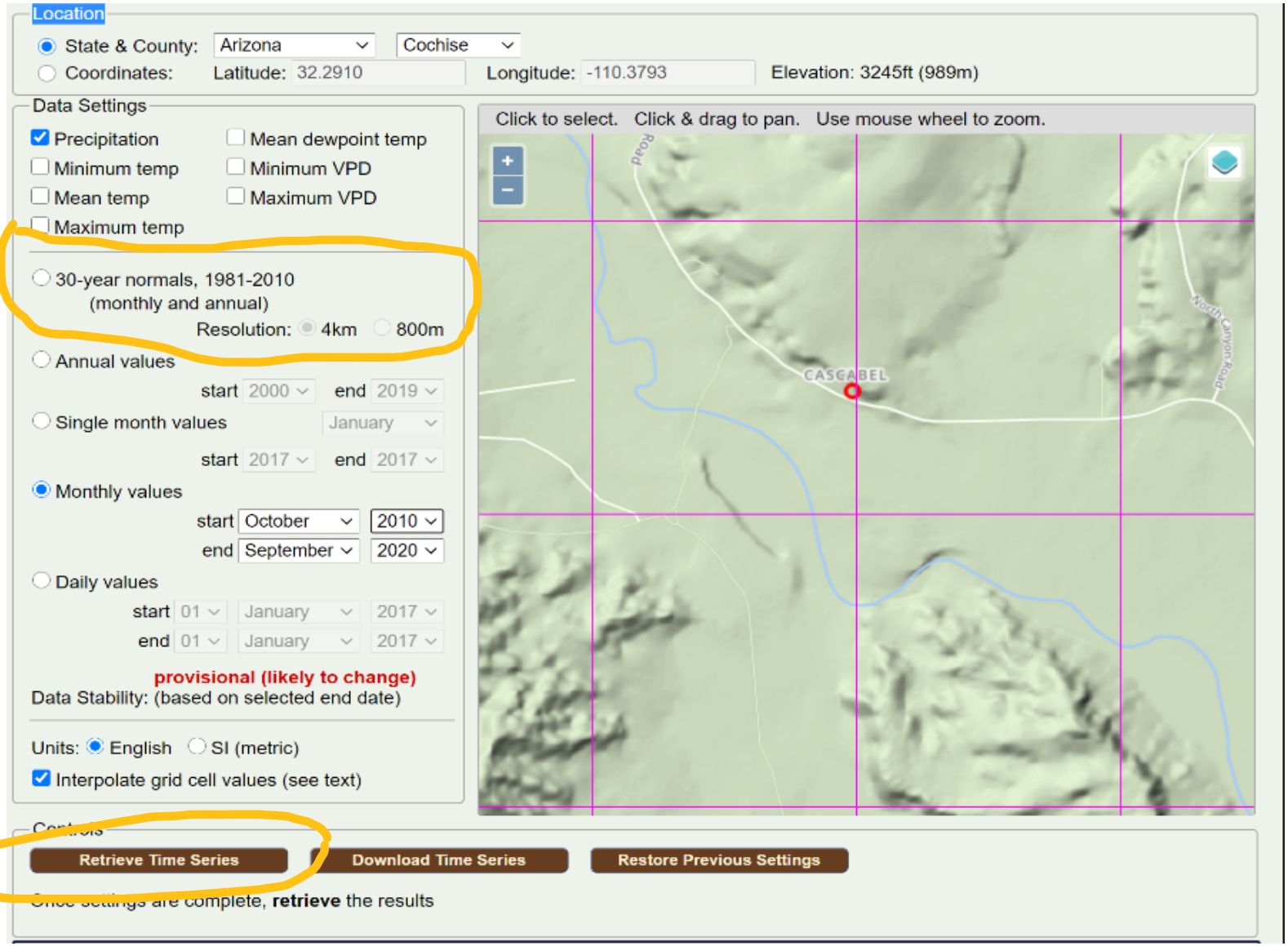


The forage year long term average by month is shown at the bottom of the screen. Select “Download Time Series” and an excel file containing these data will download to your computer (see next slide).

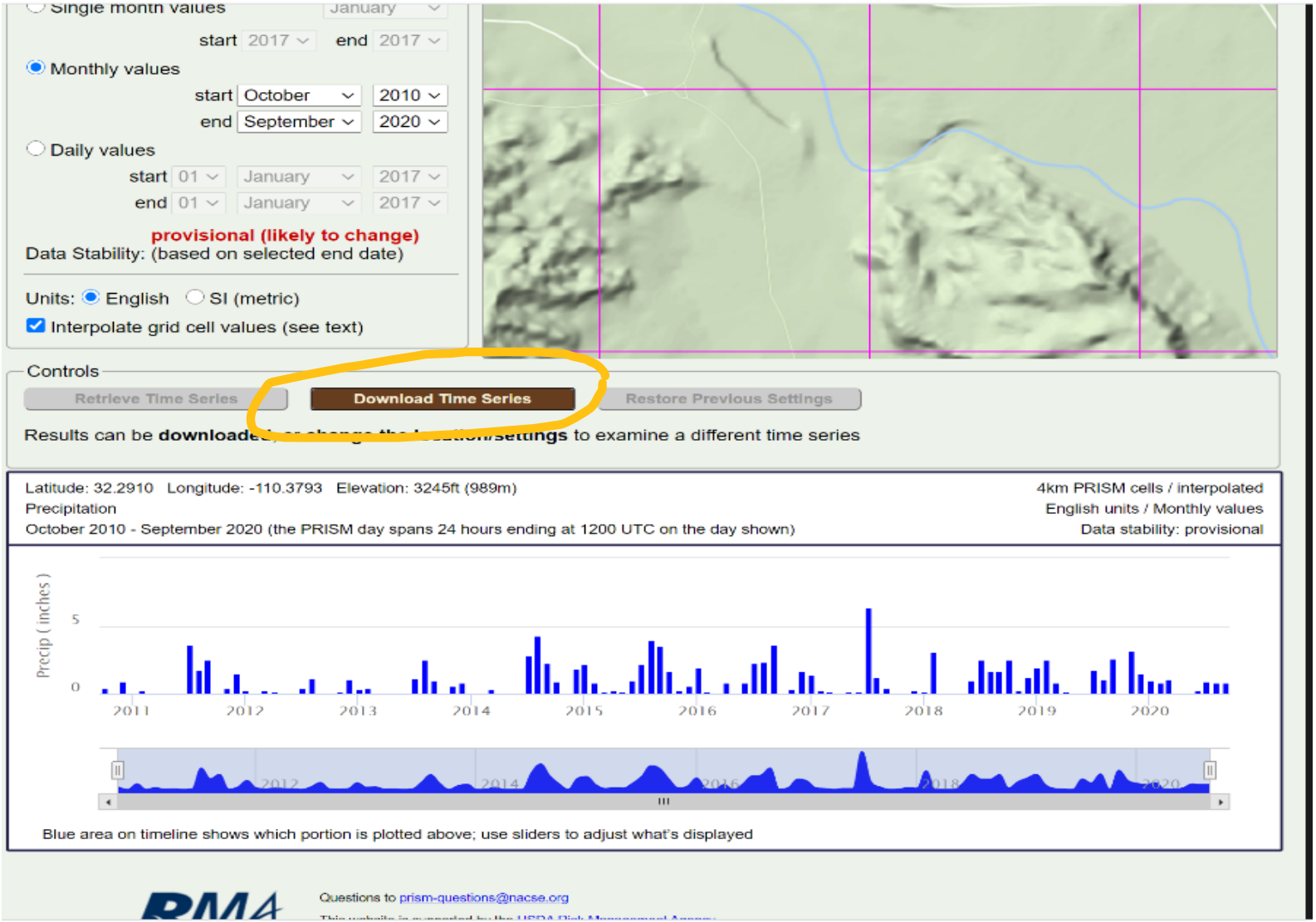


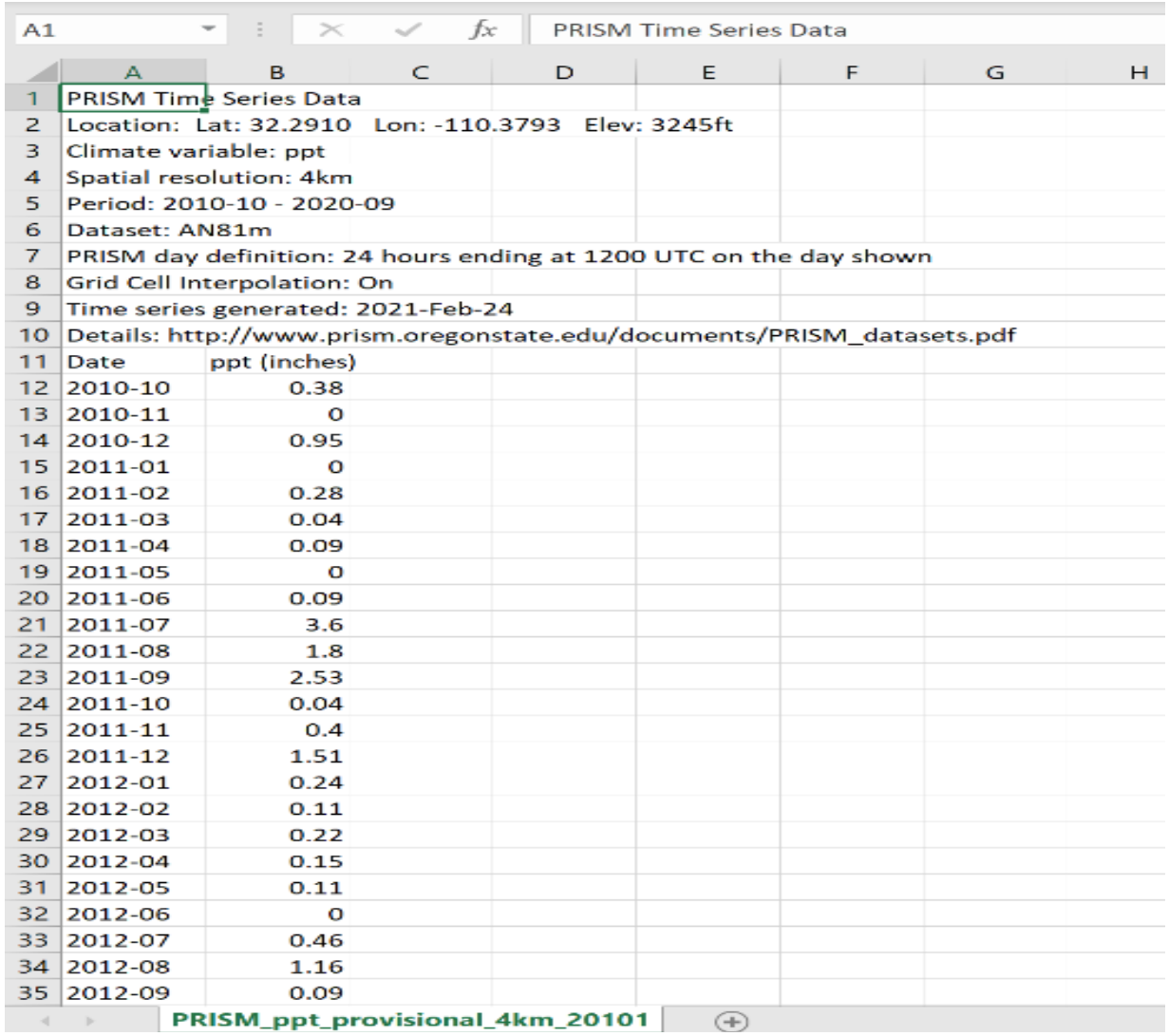
	A	B	C	D	E	F	G	H	I
1	PRISM Time Series Data								
2	Location: Lat: 32.2910 Lon: -110.3793 Elev: 3245ft								
3	Climate variable: ppt								
4	Spatial resolution: 4km								
5	Monthly 1981-2010 Normals								
6	Dataset: Norm81m								
7	PRISM day definition: 24 hours ending at 1200 UTC on the day shown								
8	Grid Cell Interpolation: On								
9	Time series generated: 2021-Feb-24								
10	Details: http://www.prism.oregonstate.edu/documents/PRISM_datasets.pdf								
11	Date	ppt (inches)							
12	January	1.2							
13	February	1.12							
14	March	0.96							
15	April	0.38							
16	May	0.3							
17	June	0.3							
18	July	2.52							
19	August	2.89							
20	September	1.31							
21	October	1.11							
22	November	0.68							
23	December	1.24							
24	Annual	14.01							
25									
26									

Repeat the process to get forage year monthly totals for the period of interest



This shows the monthly total rainfall for every month in the time period selected, i.e., Oct 2010 through Sept 2020. Selecting “Download Time Series” will produce an excel table with the rainfall amounts for each month.



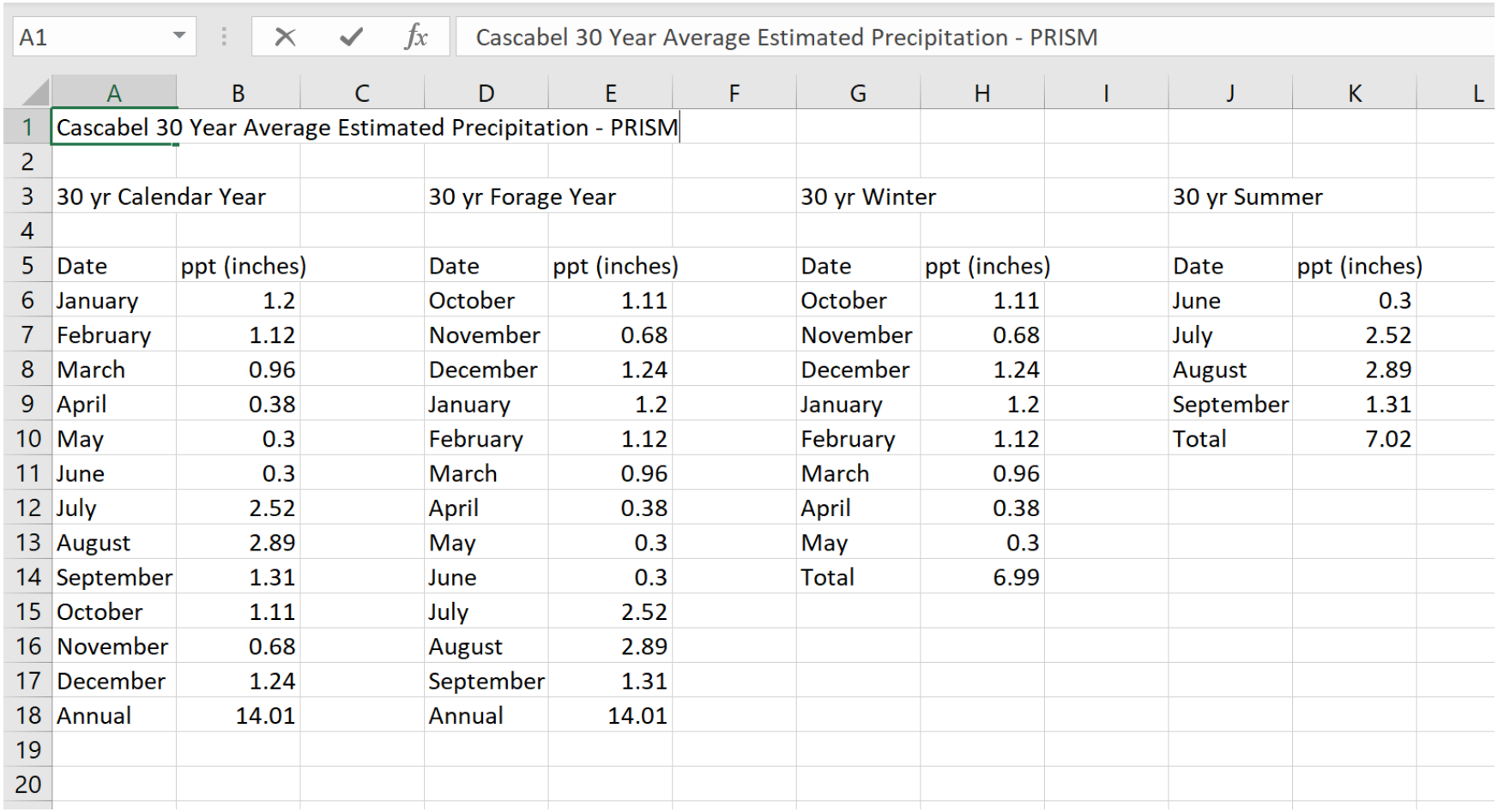


	A	B	C	D	E	F	G	H
1	PRISM Time Series Data							
2	Location: Lat: 32.2910 Lon: -110.3793 Elev: 3245ft							
3	Climate variable: ppt							
4	Spatial resolution: 4km							
5	Period: 2010-10 - 2020-09							
6	Dataset: AN81m							
7	PRISM day definition: 24 hours ending at 1200 UTC on the day shown							
8	Grid Cell Interpolation: On							
9	Time series generated: 2021-Feb-24							
10	Details: http://www.prism.oregonstate.edu/documents/PRISM_datasets.pdf							
11	Date	ppt (inches)						
12	2010-10	0.38						
13	2010-11	0						
14	2010-12	0.95						
15	2011-01	0						
16	2011-02	0.28						
17	2011-03	0.04						
18	2011-04	0.09						
19	2011-05	0						
20	2011-06	0.09						
21	2011-07	3.6						
22	2011-08	1.8						
23	2011-09	2.53						
24	2011-10	0.04						
25	2011-11	0.4						
26	2011-12	1.51						
27	2012-01	0.24						
28	2012-02	0.11						
29	2012-03	0.22						
30	2012-04	0.15						
31	2012-05	0.11						
32	2012-06	0						
33	2012-07	0.46						
34	2012-08	1.16						
35	2012-09	0.09						

The excel worksheet above lists the monthly totals for every month from October 2010 through September 2020. (Only a portion of the sheet is shown here.)

Then, using the two excel sheets generated, cut and paste the data to provide estimates of forage year and seasonal precipitation.

30-year average precipitation by calendar year, forage year, winter, and summer seasonal precipitation.



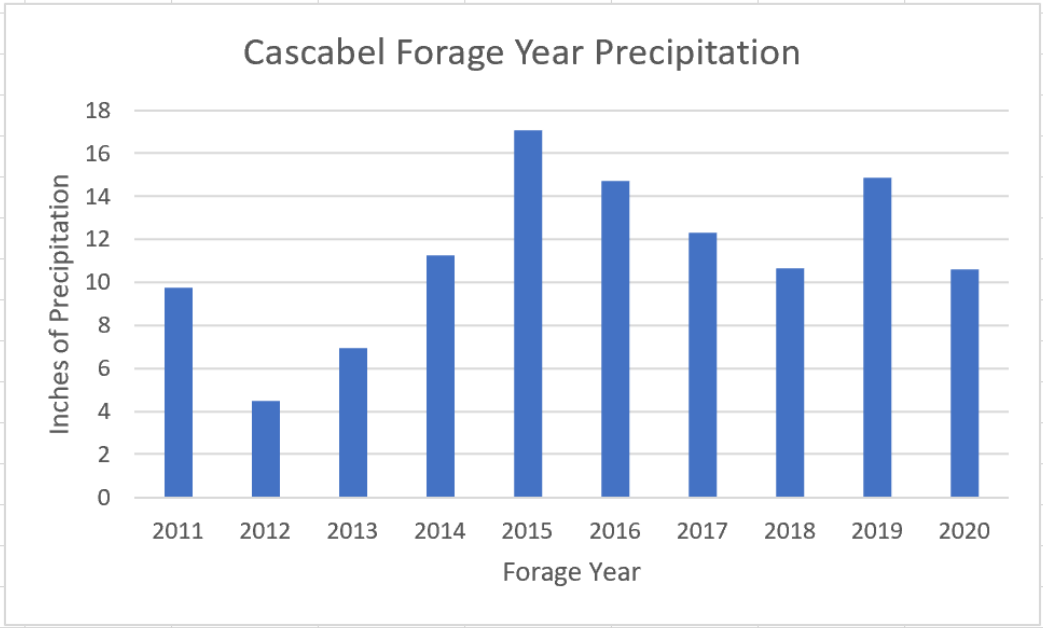
A1 | Cascabel 30 Year Average Estimated Precipitation - PRISM

	A	B	C	D	E	F	G	H	I	J	K	L
1	Cascabel 30 Year Average Estimated Precipitation - PRISM											
2												
3	30 yr Calendar Year			30 yr Forage Year			30 yr Winter			30 yr Summer		
4												
5	Date	ppt (inches)		Date	ppt (inches)		Date	ppt (inches)		Date	ppt (inches)	
6	January	1.2		October	1.11		October	1.11		June	0.3	
7	February	1.12		November	0.68		November	0.68		July	2.52	
8	March	0.96		December	1.24		December	1.24		August	2.89	
9	April	0.38		January	1.2		January	1.2		September	1.31	
10	May	0.3		February	1.12		February	1.12		Total	7.02	
11	June	0.3		March	0.96		March	0.96				
12	July	2.52		April	0.38		April	0.38				
13	August	2.89		May	0.3		May	0.3				
14	September	1.31		June	0.3		Total	6.99				
15	October	1.11		July	2.52							
16	November	0.68		August	2.89							
17	December	1.24		September	1.31							
18	Annual	14.01		Annual	14.01							
19												
20												

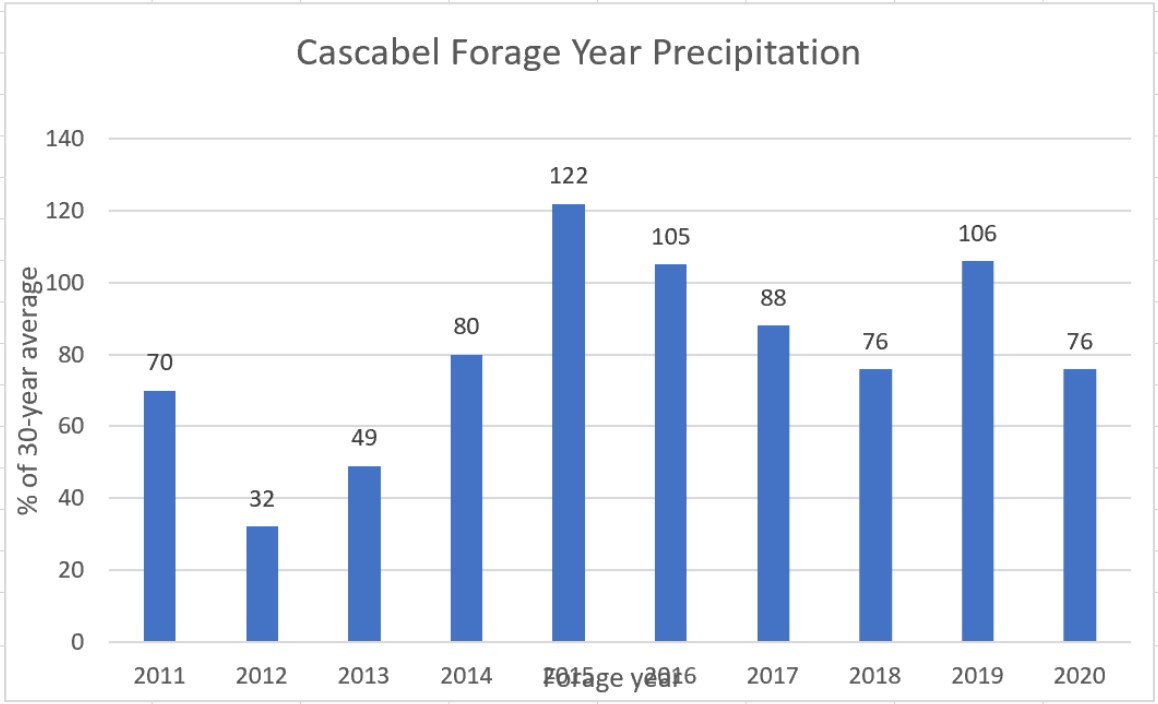
Monthly Precipitation Analysis by Forage Year for Cascabel 2011-2020 - PRISM

	Forage Year									
	2011	2012	0	2014	2015	2016	2017	2018	2019	2020
October	0.38	0.04	0.03	0	0.95	1.71	0.04	0	2.49	0.02
November	0	0.4	0.13	0.63	0	0.26	0.33	0.04	0.22	3.22
December	0.95	1.51	1.12	0.86	1.86	0.57	1.72	0.28	1.29	1.49
January	0	0.24	0.36	0	2.17	1.94	1.44	0.19	1.9	1.01
February	0.28	0.11	0.41	0.03	0.81	0.19	0.25	3.15	2.53	0.82
March	0.04	0.22	0.04	0.36	0.15	0.06	0.14	0	0.8	1.13
April	0.09	0.15	0.06	0	0.26	0.83	0	0	0.15	0.04
May	0	0.11	0	0	0.21	0	0.16	0	0.04	0.04
June	0.09	0	0.08	0	1.02	0.88	0.14	1.02	0	0.25
July	3.6	0.46	1.19	2.84	2.19	2.26	6.42	2.55	1.76	0.93
August	1.8	1.16	2.49	4.28	3.99	2.39	1.27	1.72	1.08	0.8
September	2.53	0.09	1.02	2.27	3.49	3.61	0.4	1.72	2.61	0.83
Total	9.76	4.49	6.93	11.27	17.1	14.7	12.31	10.67	14.87	10.58
			30-year average = 14.01							
% Avg	70	32	49	80	122	105	88	76	106	76

The data for each month of the 10-year period downloaded from PRISM are then rearranged to provide a compact table of monthly values by year as shown above. The 30-year monthly averages can then be used to calculate the percentage of the average for each month, and this can also be converted to the deviation from the average in percent. For example, if the average winter rainfall for 2015 is 2 inches and the actual rainfall is 2.5 inches, then the percentage of average is 125% and the deviation is +25%. Likewise, if the actual rainfall is 1.5 inches, then the percentage of average is 75% and the deviation is -25%.

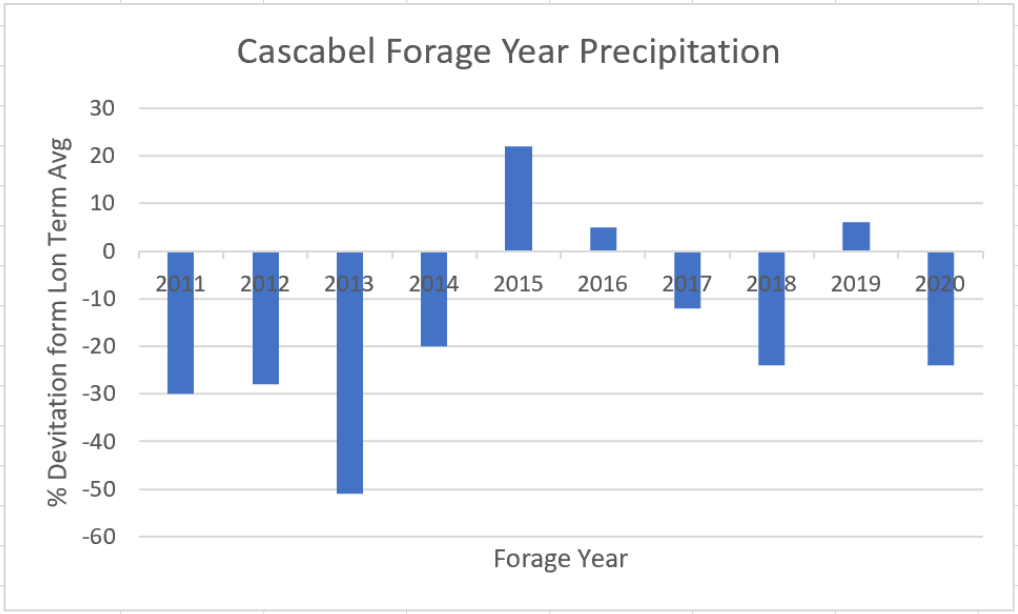


Forage Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Inches	9.76	4.49	6.93	11.27	17.1	14.7	12.31	10.67	14.87	10.58



Forage Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
% Avg	70	32	49	80	122	105	88	76	106	76

This chart shows that 2011, 2012, and 2013 would have been considered “drought years” using the 75% of average criterion. All other years are more or less average with one, 2014 approaching a “wet year” using the 125% criterion.



Forage Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Deviation	-30	-28	-51	-20	22	5	-12	-24	6	-24

Graphing precipitation as a deviation from average gives a better picture of actual conditions for the forage year. This shows that almost every year over the 10-year period was below average, some considerably below.

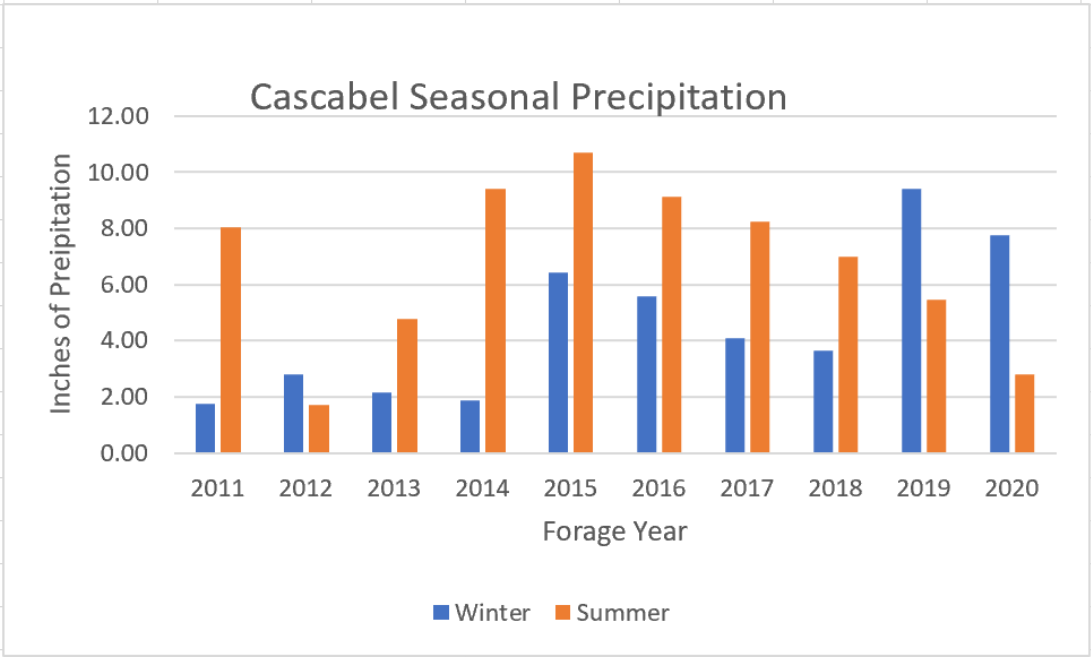
Analysis of Seasonal Precipitation for Cascabel 2011-2020 Forage Years

	Forage Year									
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
October	0.38	0.04	0.03	0	0.95	1.71	0.04	0	2.49	0.02
November	0	0.4	0.13	0.63	0	0.26	0.33	0.04	0.22	3.22
December	0.95	1.51	1.12	0.86	1.86	0.57	1.72	0.28	1.29	1.49
January	0	0.24	0.36	0	2.17	1.94	1.44	0.19	1.9	1.01
February	0.28	0.11	0.41	0.03	0.81	0.19	0.25	3.15	2.53	0.82
March	0.04	0.22	0.04	0.36	0.15	0.06	0.14	0	0.8	1.13
April	0.09	0.15	0.06	0	0.26	0.83	0	0	0.15	0.04
May	0	0.11	0	0	0.21	0	0.16	0	0.04	0.04
Winter	1.74	2.78	2.15	1.88	6.41	5.56	4.08	3.66	9.42	7.77
% Avg	25	40	31	27	92	80	58	52	135	111
Deviation	-75	-60	-69	-73	-8	-20	-42	-48	35	11

Winter Long Term Avg = 6.99

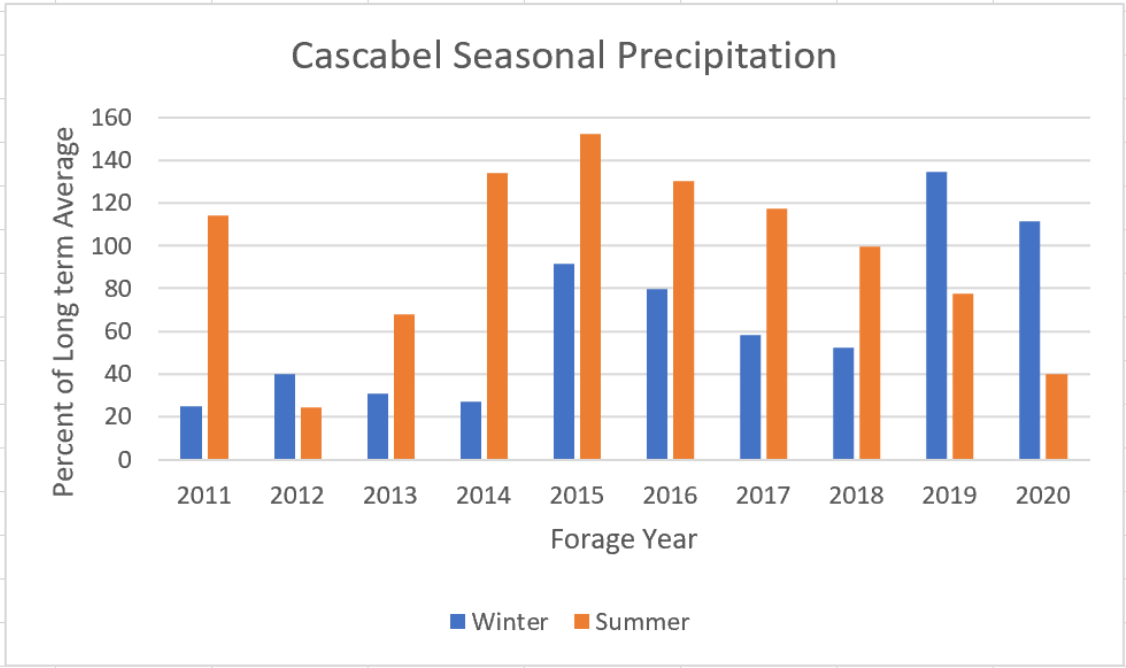
June	0.09	0	0.08	0	1.02	0.88	0.14	1.02	0	0.25
July	3.6	0.46	1.19	2.84	2.19	2.26	6.42	2.55	1.76	0.93
August	1.8	1.16	2.49	4.28	3.99	2.39	1.27	1.72	1.08	0.8
September	2.53	0.09	1.02	2.27	3.49	3.61	0.4	1.72	2.61	0.83
Summer	8.02	1.71	4.78	9.39	10.69	9.14	8.23	7.01	5.45	2.81
% Avg	114	24	68	134	152	130	117	100	78	40
Deviation	14	-76	-32	34	52	30	17	0	-22	-60

Summer Long Term Avg = 7.02

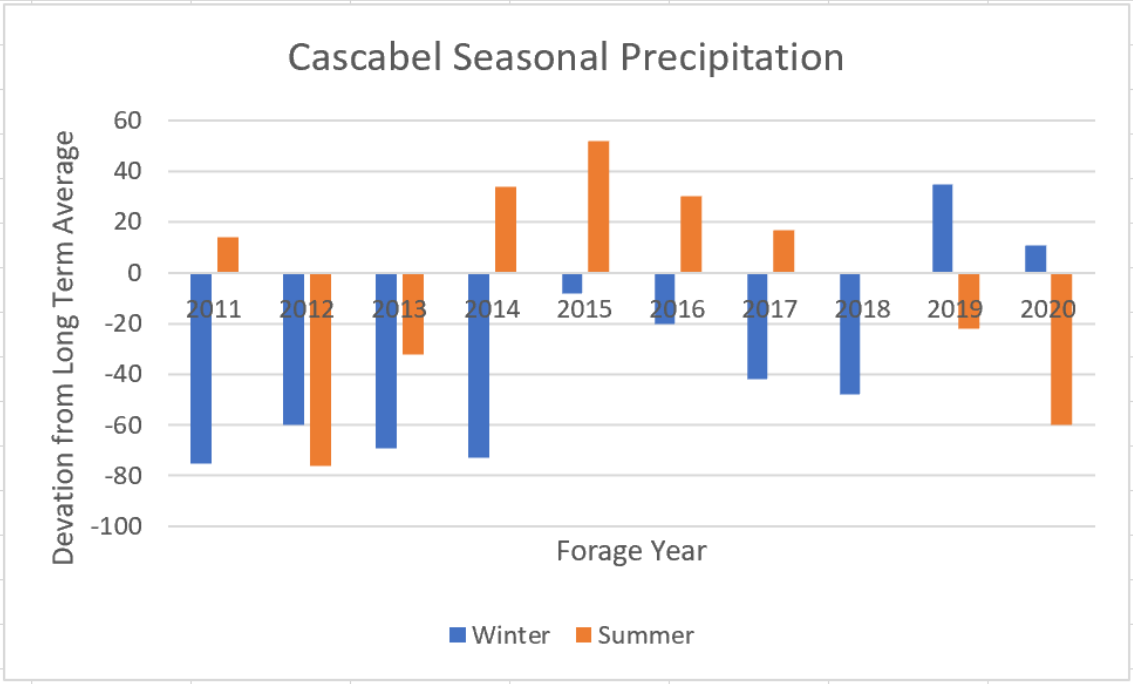


Forage Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Winter	1.74	2.78	2.15	1.88	6.41	5.56	4.08	3.66	9.42	7.77
Summer	8.02	1.71	4.78	9.39	10.69	9.14	8.23	7.01	5.45	2.81

This chart shows that summer rain has generally been better than winter rain over this 10-year period.



Forage Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Winter	25	40	31	27	92	80	58	52	135	111
Summer	114	24	68	134	152	130	117	100	78	40



Forage Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Winter	-75	-60	-69	-73	-8	-20	-42	-48	35	11
Summer	14	-76	-32	34	52	30	17	0	-22	-60

This type of chart shows very clearly that the period from winter of 2010-2011 to the winter of 2014 was well below average in both winter and summer rainfall, except for one summer which was only a little above average. This type of successive dry season is what can cause significant mortality of range plants and plant production and reproduction. Four summers of above-average precipitation following may have allowed some recovery of warm season grasses, although winters were still dry.