

Washoe County Rain Gauge Network: Historical Analysis and Comparison to PRISM

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ABSTRACT

In an effort to improve precipitation estimates in Washoe County, a data sparse region of northwest Nevada, over 80 storage type rain gauges were installed beginning in the late 1990s. Recently, the Washoe County Rain Gauge Network (WCRGN) data records were digitized to allow for a thorough inspection of data quality and evaluation of potential use of the data for improved regional water budget information. In this study the WCRGN data were compared to other local weather stations and also to the Parameter Regression on Independent Slopes Model (PRISM). Data from the WCRGN were found to be of good quality and seasonal precipitation totals were comparable to other data sources. In comparing seasonal precipitation totals from PRISM to the WCRGN correlations were often strong ($R^2 > 0.75$) but large biases were found ($> +/- 50\%$ difference). A comparison of precipitation to grid point and station elevations revealed a key finding that showed the change in precipitation with elevation was often small (non-linear) in the WCRGN and PRISM tends overestimate this change with elevation leading to large wet biases. We recommend continued monitoring using the WCRGN and developing bias-corrected PRISM estimates using the WCRGN data. This could potentially improve Nevada hydrographic basin-wide precipitation estimates and groundwater recharge estimates that are presently calculated using crude, dated methods. Accurate estimates of water availability will become crucial as Washoe County continues to develop with more focus being placed on groundwater as a primary resource for new developments.

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LIST OF ACRONYMS

AV	Antelope Valley
BF	Bedell Flat
COOP	Cooperative Observer Station
CS	Cold Spring Valley
DL	Duck Lake Valley
DV	Dry Valley
LV	Lemmon Valley
OP	Observation Peak
PM	Poodle Mountain
PRISM	Parameter Regression on Independent Slopes Model
RAWS	Remote Automated Weather Station
R ²	Coefficient of determination
SC	Smoke Creek Desert
USGS	United States Geological Survey
VP	Virginia Peak
WCRGN	Washoe County Rain Gauge Network

INTRODUCTION

Washoe County is located in the northwest corner of Nevada with the southern portion of the county consisting of the rapidly growing Reno-Sparks metropolitan region (population of 425,417 according to the 2010 census) with a significant decline in population as you move further north in the county. With increasing population has come a higher demand for new water supplies and a number of basins in central and northern Washoe County have been identified as potential new water sources (e.g., Handman et al., 1990, Maurer 1993). In order to quantify the available water in a basin it is essential to first understand the local climate and hydrology. Specifically, understanding the spatial distribution of precipitation is crucial as many of the Washoe County hydrographic basins are closed with all of the water in the system originating from local precipitation.

Development of spatial precipitation estimates for Washoe County remains a challenge as weather stations measuring precipitation are sparse, particularly north of the Reno-Sparks region (Figure 1). Several commonly used spatial precipitation data sets have been developed including isohyetal maps from Hardman and Mason (1949) and Hardman (1965), and more recent computer generated spatially gridded maps from the Parameter Regression on Independent Slopes Model (PRISM; Daly et al. 1994). Comparisons of PRISM to Hardman maps in Washoe County show that PRISM estimates are much greater than Hardman estimates with a 50% to greater than 100% difference in annual averages (Jeton et al. 2006, Epstein et al. 2010). Despite these large differences, Hardman estimates are still used by the Nevada Division of Water Resources to quantify the Nevada Hydrographic Basin perennial yield estimates developed in a series of United States Geological Survey (USGS) reconnaissance reports (e.g., Sinclair 1963, Glancy and Rush 1968, VanDenburgh et al. 1973). Many years after the USGS reconnaissance reports came out new reports were developed to update the hydrology and hydrogeology of individual basins and Hardman estimates continued to be the primary means of estimating spatial precipitation (e.g., Handman et al. 1990, Maurer 1993). While PRISM is a much more sophisticated and physically based precipitation estimate compared to Hardman, there has still been minimal validation of the accuracy of PRISM in Washoe County simply due to the lack of observations.

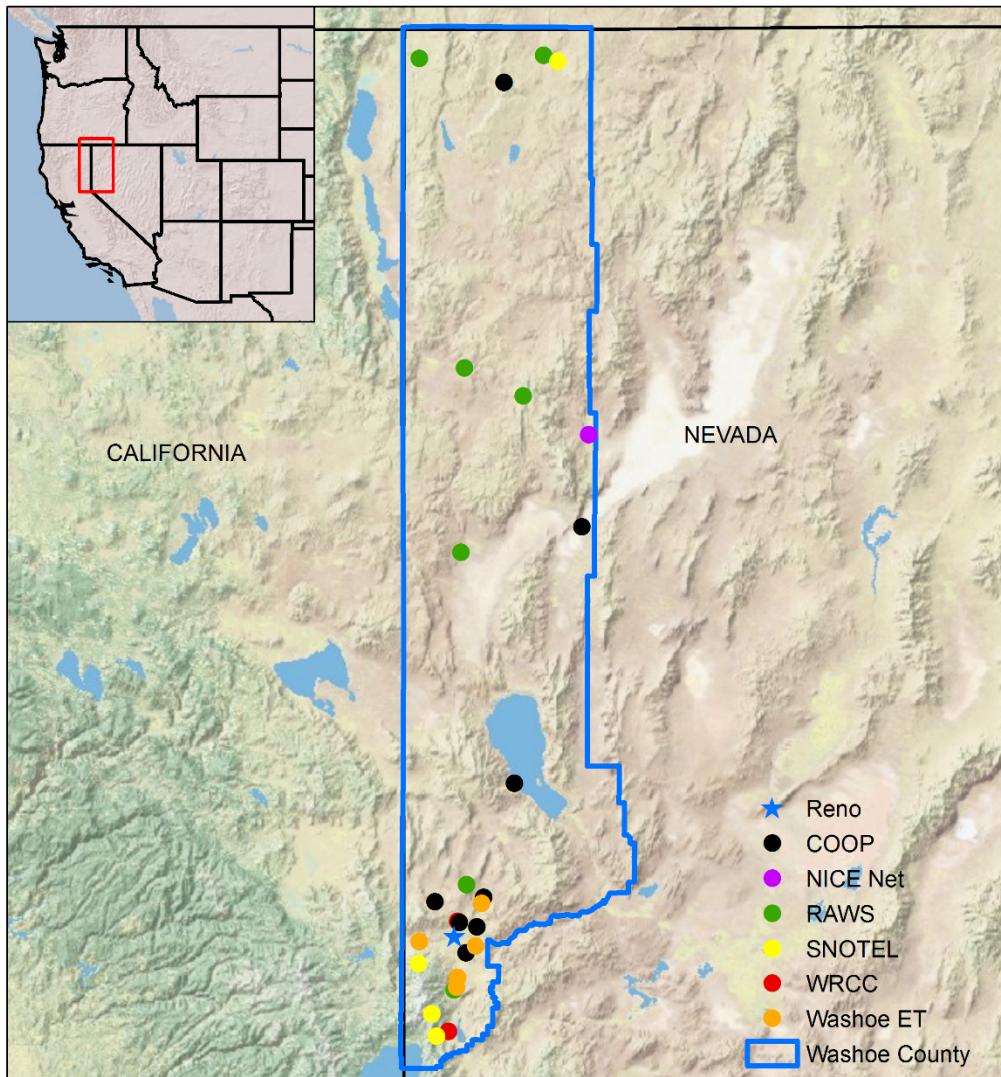


Figure 1. Study area showing Washoe County and reporting weather stations as of August, 2017.

In the late 1990s a storage rain gauge network was deployed covering severely under-gauged regions of central and northern Washoe County. The intended use of the precipitation data was to validate and potentially improve existing groundwater recharge estimates that are commonly calculated using Hardman and PRISM data. Additionally, the Washoe County Rain Gauge Network (WCRGN) could be used to provide improved general monitoring of regional water sources and supplies. The WCRGN data has recently been compiled electronically and provides a unique opportunity to analyze the quality of WCRGN precipitation records, use the WCRGN data to validate spatial estimates of precipitation, and potentially improve existing groundwater recharge estimates. When assessing modeled spatial precipitation estimates like PRISM it is best to use independent data (i.e., not used in

the model to develop spatial estimates) like the WCRGN to avoid biased evaluations (Daly 2006). For example, McEvoy et al. (2014) used independent observations in eastern and southern Nevada to evaluate PRISM and other gridded data, and Strachan and Daly (2017) evaluated daily PRISM air temperature in the eastern Sierra Nevada using in-situ temperature sensors. This report examines the WCRGN data and provides a comparison to PRISM.

WASHOE COUNTY RAIN GAUGE NETWORK

The Washoe County Rain Gauge Network (WCRGN) consists of 78 rain gauges that were installed between 1998 and 2008 (Table 1). Each station consists of a basic storage type rain gauge (Figure 2) that is manually emptied approximately twice a year, once in the fall near the beginning of the water year (water year defined as October 1 through September 30) and once in the late spring or early summer. It should be noted that spring/summer maintenance dates vary greatly from year to year with limited access to many locations after wet winters due to snow at higher elevations, impassable mud on unmanaged roads, and standing water at lower elevations. Gauges are 24-36 inches deep made from 6-inch diameter Polyvinyl Chloride pipe. Each station is equipped with a screen during the summer months covering the orifice to prevent debris and wildlife from entering the gauge. The gauges are charged with 500 ml of ethylene glycol with approximately 30 ml of oil to prevent evaporation of accumulated precipitation. Three locations, Virginia Peak (Figure 2d), Poodle Mountain and Observation Peak, are equipped with larger steel gauges that range from 5.5-7 feet deep and are 12 inches on diameter. In addition, the large gauges also have alter shields to prevent precipitation undercatch from wind.



Figure 2. Pictures of stations from the WCRGN. Stations include (a) Lemmon Valley #19, (b) Lemmon Valley #2, (c) Cold Springs Valley #10, and Virginia Peak large collector.

Stations are located throughout southern and central Washoe County within the following Nevada Hydrographic basins (Figure 3): Cold Spring Valley (CS), Lemmon Valley (LV), Antelope Valley (AV), Bedell Flat (BF), Dry Valley (DV), Smoke Creek Desert (SC), and Duck Lake Valley (DL). Outside of the aforementioned Nevada Hydrographic basins there are two stations located on Observation Peak (OP) in eastern California (just west of SC) and two stations located on Virginia Peak (VP) near a National Weather Service NEXRAD Doppler weather radar.

Historical records have been kept for each station and were recently digitized. A spreadsheet is available for each station and provides the measurement start and end dates,

total number of days in the measurement period, number of measurements made for the period, initial measurement value (ft.), final measurement value (ft.), and total precipitation (ft.). This detailed record keeping allows for comparison of the Network data to other daily data (i.e., PRISM). For this analysis the last records were collected in fall of 2015.

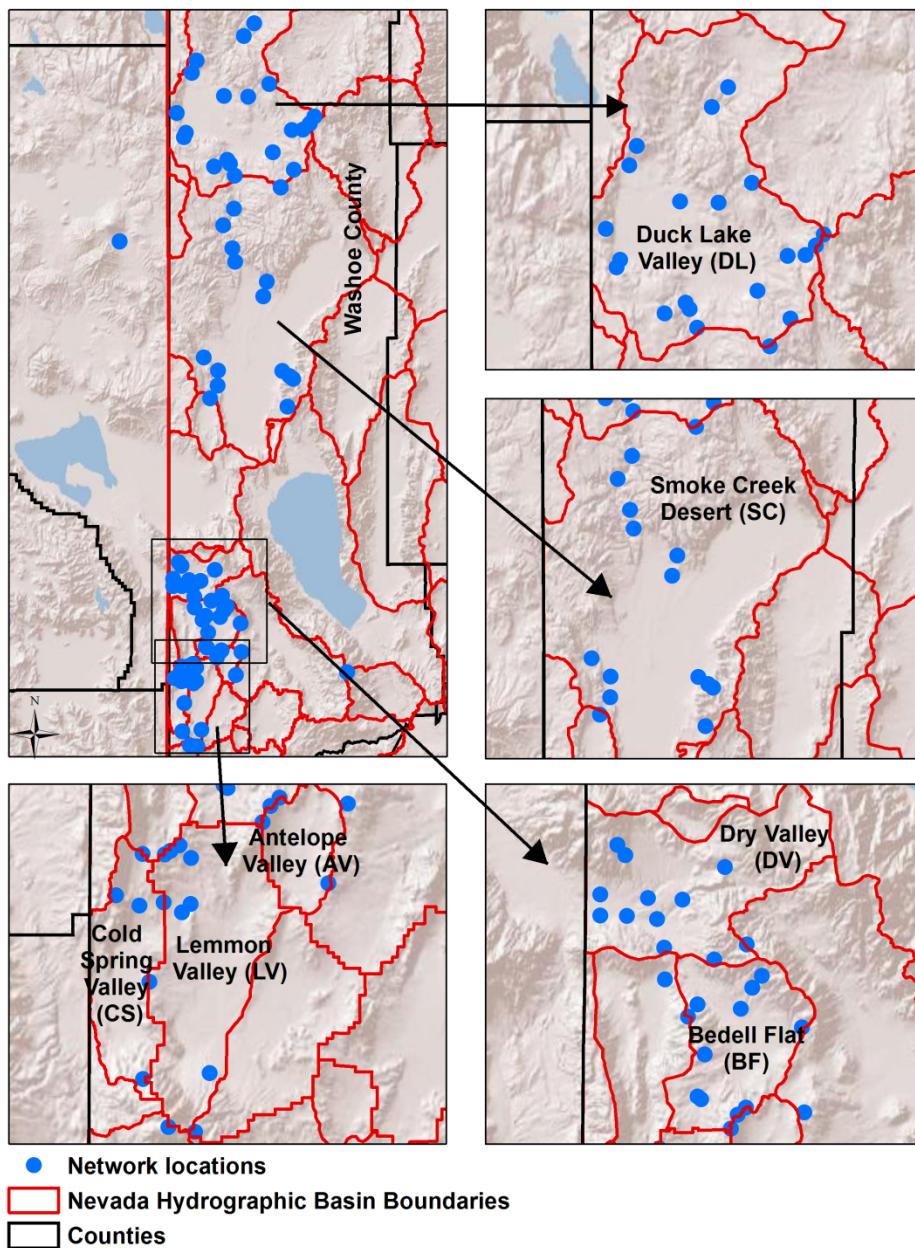


Figure 3. Washoe County Rain Gauge Network locations (blue dots) and Nevada Hydrographic Basin borders.

Table 1. WCRGN metadata including station name, latitude, longitude, elevation, and period of record start.

Station	Latitude	Longitude	Elevation (ft)	Period of Record Start
Antelope Valley (AV)				
AV1	39.78358501	-119.851247	6792	6/11/1999
AV2	39.79439196	-119.844329	6384	6/11/1999
AV3	39.80005997	-119.836237	5816	6/11/1999
AV4	39.796139	-119.777168	5797	10/19/1999
Bedell Flat (BF)				
BF1	39.90159097	-119.820115	5925	10/15/1999
BF2	39.89246199	-119.829517	5383	10/15/1999
BF3	39.87627603	-119.841188	5054	10/15/1999
BF4	39.87014098	-119.894438	5755	10/18/1999
BF5	39.87959501	-119.884837	5185	10/18/1999
BF6	39.86198497	-119.779837	5768	10/19/1999
BF7	39.84095796	-119.877486	5825	10/20/1999
BF8	39.80647598	-119.881392	5467	10/21/1999
Cold Springs (CS)				
CS2	39.72813101	-119.957667	5601	9/8/1998
CS3	39.73032204	-119.936855	5616	9/8/1998
CS6	39.67724003	-119.949149	5554	9/8/1998
CS10-PEAVINE NORTH	39.61230802	-119.954748	6749	1/11/1999
CS11 PETERSON	39.73508899	-119.978087	6799	1/8/1999
Duck Lake Valley (DL)				
DL1	40.90176601	-119.619731	5904	11/11/2006
DL2	40.94129196	-119.682872	5150	11/11/2006
DL3 (Fox Mt)	41.02242501	-119.556836	7939	11/19/2006
DL4	41.00664097	-119.571518	6922	11/11/2006
DL5	40.992668	-119.59132	6051	11/11/2006
DL6	40.99195403	-119.625312	5418	11/11/2006
DL7	40.90915298	-119.859475	6044	11/12/2006
DL8	40.92447803	-119.819772	5413	11/12/2006
DL9	40.91511897	-119.812137	4980	11/12/2006
DL10	41.096528	-119.69301	6186	11/19/2006
DL11	41.06796398	-119.756801	5280	11/19/2006
DL12	41.06967196	-119.829712	4929	11/19/2006
DL13	41.23372299	-119.738705	5875	11/18/2006
DL14	41.20497096	-119.769762	5478	11/18/2006
DL15	41.14929803	-119.912317	5852	11/10/2006
DL16	41.12157798	-119.92668	4702	11/10/2006

DL17	41.03018104	-119.971635	5266	11/25/2006
DL18	40.98572896	-119.944062	4746	11/25/2006
DL19	40.97530003	-119.950676	5044	11/25/2006
Dry Valley (DV)				
DV1	39.92344896	-119.918526	4910	12/22/2000
DV2	40.002652	-119.965469	5937	12/23/2000
DV3	39.99489999	-119.957443	5512	12/23/2000
DV4	39.91426701	-119.868208	5514	12/28/2000
DV5	39.92579598	-119.835452	6308	12/29/2000
DV6	39.98572097	-119.857126	5388	12/30/2000
DV7	39.94562002	-119.925461	4597	1/17/2002
DV8	39.94810198	-119.95571	4490	1/17/2002
DV9	39.961723	-119.934812	4671	1/17/2002
DV10	39.94832704	-119.982819	4447	1/17/2002
DV11	39.964513	-119.982691	4433	1/20/2002
DV12	39.96050402	-119.899974	4739	1/20/2002
Lemmon Valley (LV)				
LV11	39.75983698	-119.913123	5876	9/11/1998
LV12	39.76232196	-119.935795	6062	9/11/1998
LV13	39.76457703	-119.931104	6302	9/11/1998
LV14	39.76830203	-119.923241	6378	9/11/1998
LV15	39.76238902	-119.955201	6187	9/11/1998
LV16	39.723557	-119.921065	5392	9/8/1998
LV17	39.61639512	119.8970596	5400	9/9/1998
LV19	39.577142	-119.909667	6921	9/9/1998
LV20	39.58031497	-119.932677	7652	9/9/1998
Observation Peak (OP)				
OP (Large Collector)	40.73831898	-120.143736	5571	9/28/2004
OP2 (Can)	40.73868996	-120.143658	5575	6/14/2008
Virginia Peak (VP)				
VP (Large Collector)	39.74905198	-119.459887	8027	5/16/2001
VP2 (Can)	39.74905903	-119.459539	8336	6/17/2008
Smoke Creek (SC)				
SC1	40.409051	-119.848879	4018	9/27/2003
SC2	40.37947403	-119.87153	4258	9/27/2003
SC3	40.44355804	-119.847462	3857	9/27/2003
SC4	40.47381998	-119.89034	3875	9/27/2003
SC5	40.42454042	119.6218088	4705	9/28/2003
SC6	40.43068696	-119.632699	4399	9/28/2003
SC7	40.44243302	-119.654505	3946	9/28/2003

	SC8	40.36026103	-119.638788	4922	9/28/2003
	SC9	40.861742	-119.659004	6016	5/22/2004
PM (Large Collector)	SC10	40.861482	-119.659018	6005	10/5/2004
	SC10	40.61288204	-119.711833	3935	5/23/2004
	SC11	40.64669204	-119.700733	4422	5/23/2004
	SC12	40.69173999	-119.796636	4710	5/24/2004
	SC13	40.72288899	-119.804731	4849	5/24/2004
	SC14	40.774893	-119.832387	5005	5/24/2004
	SC15	40.81344397	-119.800127	5179	5/24/2004
	SC16	40.88819001	-119.797525	5351	5/24/2004

PRISM DATA

Gridded spatial estimates of precipitation from PRISM were used to 1) evaluate the WCRGN data and 2) develop bias estimates that can be potentially used in the future to improve spatial estimates of precipitation throughout Washoe County. PRISM uses precipitation observations from weather stations, a digital elevation model, and several physiographic factors, such as topographic orientation, coastal proximity, inversion height, and topographic position (Daly et al. 2008). Weather stations are weighted by vertical and horizontal distance, and in data sparse regions such as central and northern Washoe County much of the information for large areas may come from a singular weather station. Daily PRISM data at 4-km spatial resolution were obtained (PRISM Climate Group, Oregon State University, <http://prism.oregonstate.edu>, last accessed July 31, 2017) and matched to the WCRGN collection dates (see Methods section).

Figure 4 shows the weather stations used to generate PRISM relative to the Network locations on January 8, 2017, which was a heavy precipitation day for Washoe County. Very few PRISM control points exist in the Nevada Hydrographic Basins covered by WCRGN gauges, and a clear gap can be seen in station density over all of Washoe County and northwest Nevada in general. Note that most RAWS stations shown in Figure 1 are not included as PRISM control points. RAWS stations are equipped with non-heated tipping bucket precipitation gauges and cannot accurately measure frozen precipitation (i.e., snowfall), and are generally not useful during the cold season in high elevation locations (e.g., Humphrey et al. 1997, Rasmussen et al. 2012, McEvoy et al. 2014).

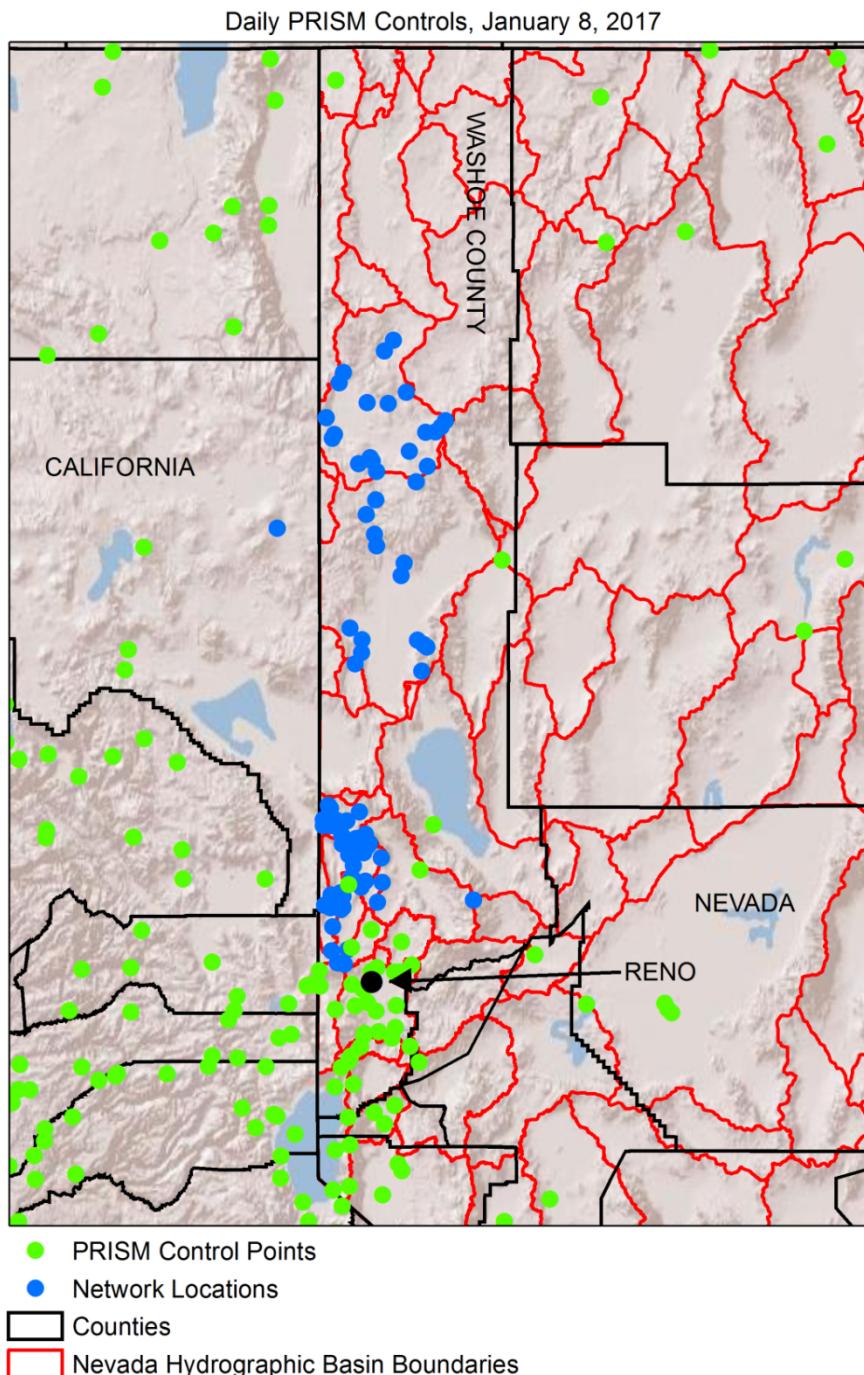


Figure 4. PRISM control points (green dots) relative to WCRGN locations (blue dots) on January 8, 2017.

Each PRISM control point represents a weather station used to generate the PRISM precipitation grid for that day. Many of the control points around Reno are part of the volunteer Community Collaborative Rain Hail and Snow network (CoCoRaHS) and are not shown in Figure 1.

METHODS

PRISM comparison to COOP stations

The National Weather Service Cooperative Observer Program (COOP) weather stations are a primary source of precipitation data used to drive PRISM estimates. Comparisons of COOP stations to nearby PRISM grid cells can therefore provide a good sense of general PRISM biases in the region, which is important to understand prior to comparing PRISM to the WCRGN. Four COOP stations with long-term reliable records (Table 2) from Washoe County were compared to PRISM precipitation estimates. For each COOP station and nearest PRISM grid cell accumulated water year precipitation was computed for all available years in the COOP record during the period 1982-2016. Water years with more than five days of missing COOP data were excluded. Error statistics of bias (absolute and relative [%] difference) and coefficient of determination (R^2) were computed for each station.

Table 2. COOP stations used in comparison to PRISM.

Station Name	COOP ID	Latitude	Longitude	Elevation (feet)	# Valid Water Years (1982-2016)
Reno Tahoe International Airport	266779	39.48	-119.77	4410	35
Reno WFO	266791	39.57	-119.80	4987	19
Stead	267820	39.63	-119.88	5101	19
Gerlach	263090	40.65	-119.36	3954	20

WCRGN comparison to collocated RAWS station

To illustrate the deficiency in RAWS stations for measuring frozen precipitation (as described in the PRISM Data section) we have compared the Fox Mountain RAWS to a co-located WCRGN station. The DV4 station is located approximately 0.2 miles from the Fox Mountain RAWS and the two stations have a difference in elevation of 32 ft. (Fox Mountain RAWS: 6890 ft, DV4: 6922 ft). RAWS dates were matched to the observation periods from DV4 and RAWS precipitation data were summed over each DV4 observation period.

WCRGN large wind shielded gauges compared to collocated non-shielded gauges

Three locations in the WCRGN (Observation Peak, Virginia Peak, and Poodle Mountain) have large gauges with wind shields located closely to the standard smaller gauges with no wind shields. This provides a unique opportunity to examine gauge undercatch, when precipitation is under measured due to high winds, in the standard non-shielded smaller gauges. At each of the three locations we provide a comparison of the reporting period precipitation totals for the shielded and non-shielded gauges. This analysis can provide insight about the level of gauge undercatch happening. However, given the coarse temporal resolution of the data (not capturing individual wind events) and no wind speed data to pair with the precipitation observations, actual gauge undercatch can't be computed since it is typically estimated at the daily temporal resolution using wind speed at the station (e.g., Fassnacht 2004).

PRISM comparison to WCRGN

At each WCRGN station error statistics of bias (absolute and relative [%] difference) and coefficient of determination (R^2) were computed. Biases were computed as [PRISM – WCGRN]. The PRISM grid cell nearest to each station was used and daily data matching the WCRGN collection dates were extracted. For example, at WCRGN station AV5 a measurement period started on 10/10/2010 and ended on 5/14/2011 with a total of 216 days in the period and a single total precipitation measurement was recorded for this period. Daily PRISM data for the same 216-day period was extracted and summed, and used as a single data point for the AV5 error statistics. Error statistics were computed using three seasonal periods: wet season (October through March), dry season (April through September), and a combined wet and dry season using all months. Wet and dry seasons are not exact since measurement dates varied largely throughout each station and period of record. If a measurement period overlapped wet and dry seasons, the measurement was classified based on the season with more days in the period. For example, using the same AV5 measurement period above (10/10/2010 through 5/14/2011) would result in this classification of wet season for that data point. Occasionally stations are only measured once a year and these measurements get lumped into the wet season since climatologically most precipitation in the regions falls October through March.

Case Study: Precipitation-elevation relationships in the WCRGN

A case study was developed using the three wettest and three driest years in the WCRGN record to examine the relationships between precipitation and elevation in the study area. Wettest and driest years were determined based on the Reno-Tahoe International Airport COOP station. Orographic precipitation patterns have been studied extensively in the larger mountain ranges of the western U.S. such as the Sierra Nevada (e.g., Dettinger et al. 2004, Lundquist et al. 2010) and Cascade Range (e.g., Schermerhorn 1967, Smith et al. 2005). However, little research has been done looking at orographic precipitation in smaller ranges like those found in Washoe County. Over two dozen small ranges and individual

peaks exist in Washoe County. WCRGN station elevations range from 3857 feet to 8336 feet providing a unique opportunity to study orographic effects of precipitation directly in the lee of the Sierra Nevada. Spatially interpolated gridded data like PRISM are developed using elevation as one of the main predictors of precipitation (e.g., Daly et al. 1994), and understanding these relationships in Washoe County could potentially improve future versions of PRISM or other statistical models. Differences between wet years (2004/2005, 2005/2006, and 2016/2017) and dry years (2000/2001, 2006/2007, and 2013/2014) were examined. For each year, accumulated precipitation was regressed against station elevation (grid point digital elevation model elevation for PRISM) to see if PRISM has the ability to capture elevation gradients in Washoe County. Coefficient of determination and slope were computed from each regression.

RESULTS AND DISCUSSION

Scatterplots of COOP and PRISM precipitation show generally good agreement (R^2 between 0.75 and 0.95) between the two datasets (Figure 5), which is not surprising given that the COOP data are ingested into the PRISM model. Biases ranged from -13.85% (Figure 5d) to 1.45% (Figure 5a). A south-to-north bias gradient is observed with a small wet bias observed at the southernmost station (Reno Tahoe Intl. AP, Figure 5a) and then a dry bias that increased in magnitude moving north. Density of stations used in the PRISM model decreases rapidly moving north from Reno which could explain the south-to-north bias gradient. Reno Tahoe Intl. AP COOP station is located in the valley bottom and lies within a 4-km PRISM grid cell that covers a region with little variation in terrain elevation which should improve the comparison to PRISM and lead to smaller bias.

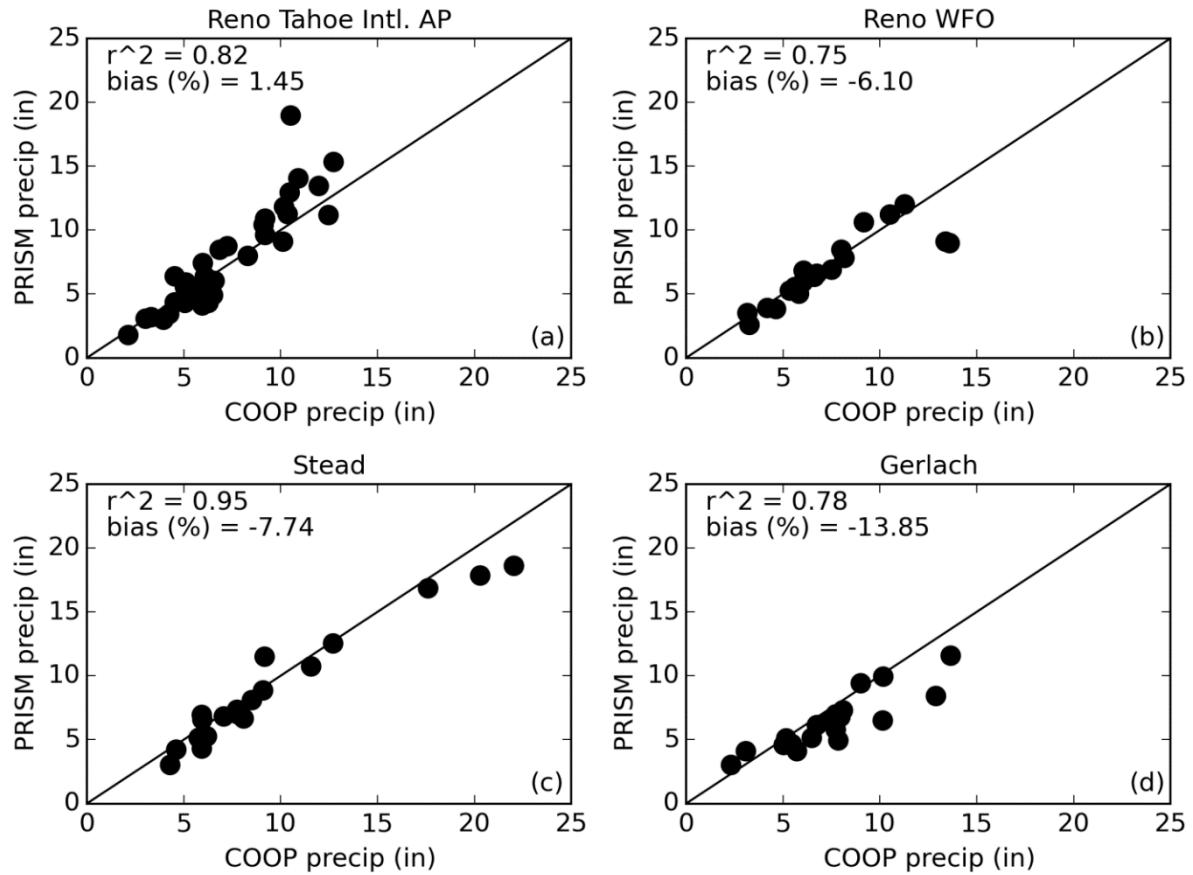


Figure 5. Scatter plots of water year precipitation totals using COOP stations (horizontal axes) and collocated PRISM grid cells (vertical axes).

A scatterplot showing Fox Mountain RAWS compared to DV4 is shown in Figure 6. These results illustrate that the RAWS station severely under measures precipitation due mostly to non-heated tipping bucket rain gauges that accurately measure frozen precipitation. This indicates that the RAWS stations located in Washoe County should not be used to obtain cold season precipitation measurements and highlights another benefit of the WCRGN in the data sparse region of central and northern Washoe County.

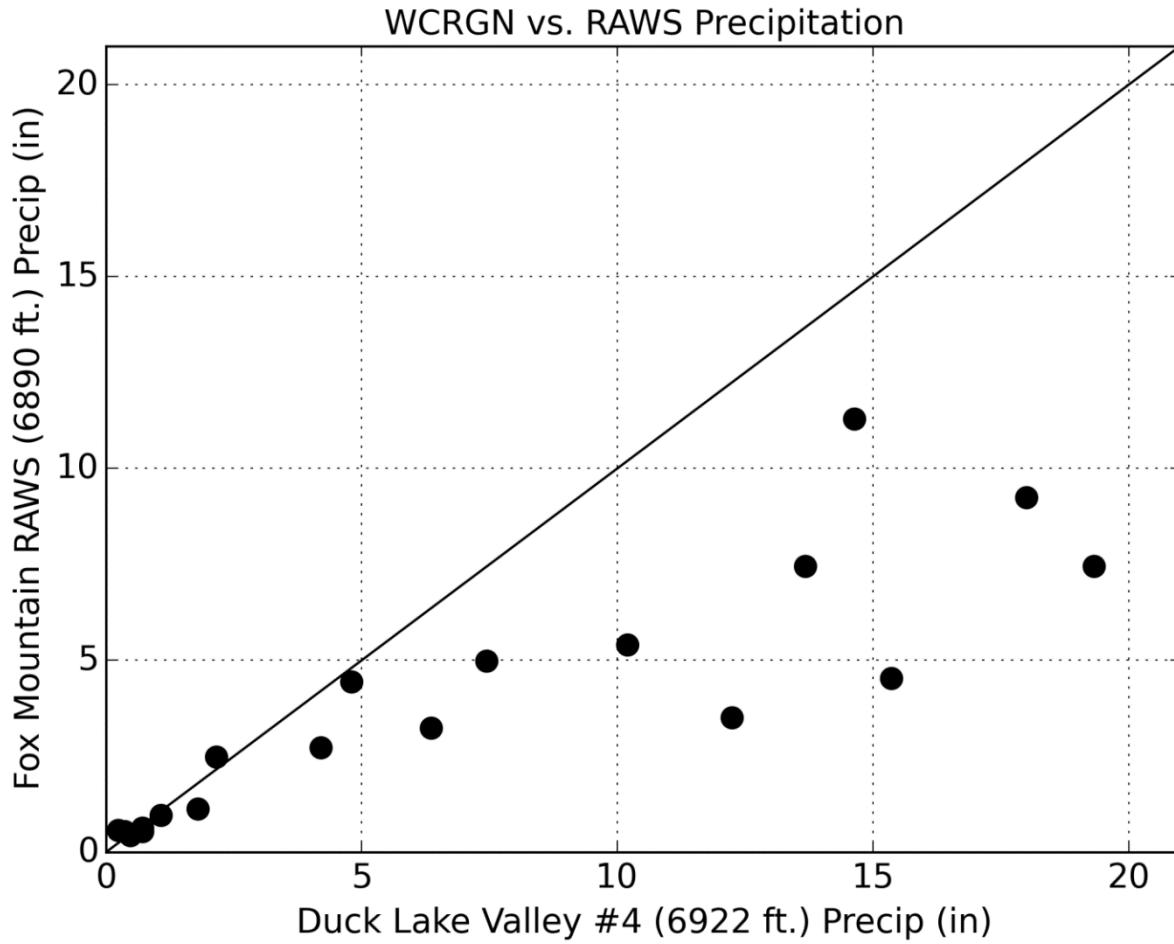


Figure 6. Scatterplot of DV4 (x-axis) and Fox Mountain RAWS (y-axis) total precipitation during the DV4 measurement periods.

Figure 7 and Table 3 shows comparisons between the three wind shielded gauges and collocated WCRG standard non-shielded gauges. Observation Peak gauges (Figures 7a) show what would typically be expected: a systematic dry bias (-13%) at OP2 indicating less precipitation being caught due to no wind shield. However, both Poodle Mountain (Figure 7b) and Virginia Peak (Figure 7c) show a wet bias (+13% and +28%, respectively) at the non-shielded gauges. Poodle Mountain is more mixed, with some recording periods showing more precipitation at the non-shielded gauge (SC9) while other periods measured less precipitation. At Virginia Peak, the non-shielded gauge (VP2) consistently measured more precipitation than the shielded gauge (VP). The VP2 gauge is surrounded tightly by vegetation that is similar in height to the gauge itself, and closer to the zero plane displacement than VP, which clearly is acting as a natural wind shield. Overall, these results show that gauge undercatch will likely vary greatly depending on gauge placement and surrounding vegetation. The non-shielded gauges, which make up most of the WCRGN,

generally show similar observations to the shielded gauges which provides additional confidence in the overall quality of WCRGN observations.

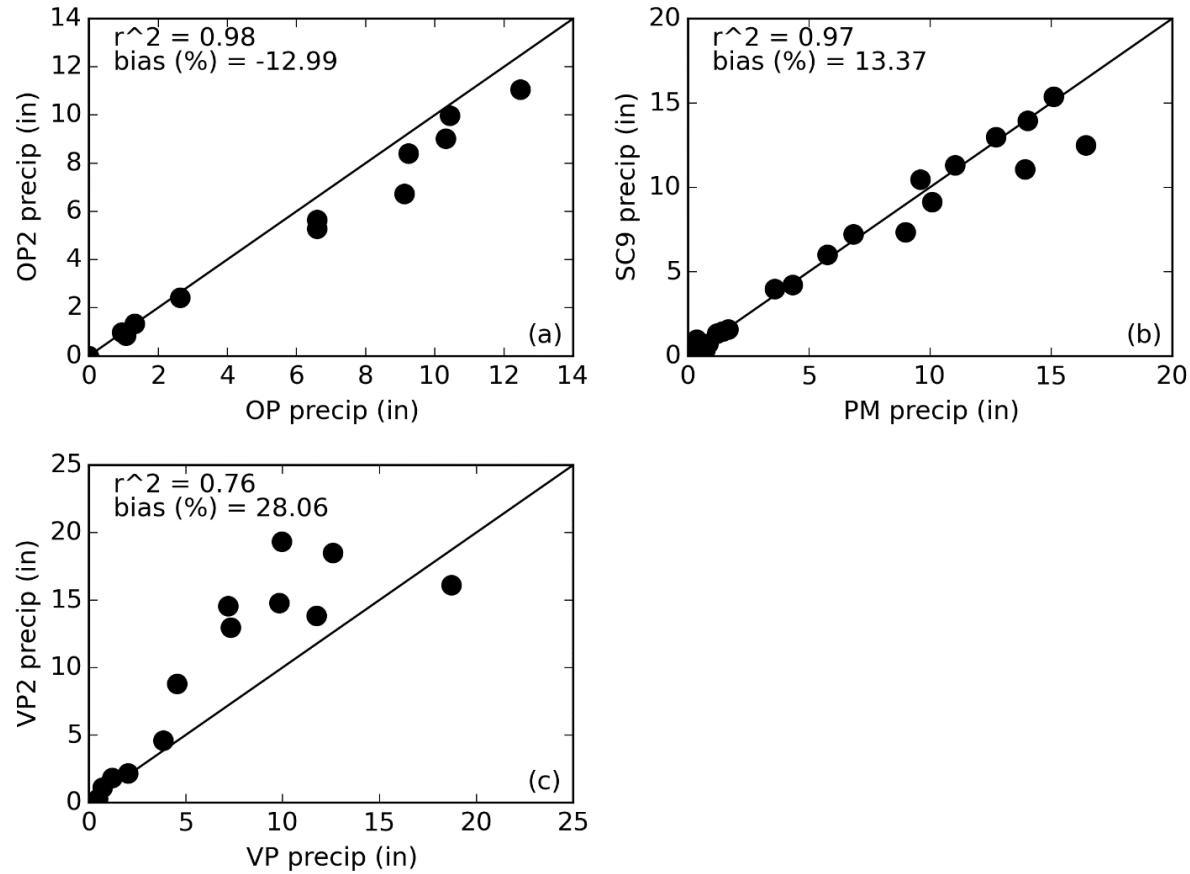


Figure 7. Comparison of wind shielded (x-axis) vs. non-shielded (y-axis) gauges at Observation Peak (a), Poodle Mountain (b), and Virginia Peak (c). Each dot represents a reporting period precipitation total.

Table 3. Total observing period precipitation comparisons between non-shielded and shielded gauges. Light blue shading indicates that station recorded greater precipitation during each observing period.

Observing Period Start Date	Observing Period End Date	Total Precipitation (inches)	
		OP2 (non-shielded)	OP (shielded)
6/14/08	10/5/09	9	10.32
10/5/09	6/7/10	8.40	9.24
6/7/10	11/17/10	2.40	2.64
11/17/10	7/8/11	11.04	12.48
7/8/11	10/22/11	0.84	1.08
10/22/11	6/20/12	5.28	6.6

10/21/12	7/20/13	6.72	9.12
7/20/13	10/18/13	0.96	0.96
10/18/13	5/26/14	5.64	6.6
5/26/14	10/13/14	1.32	1.32
10/1/15	6/2/16	9.96	10.44
Poodle Mountain		SC9 (non-shielded)	PM (shielded)
10/5/04	6/5/05	11.04	13.92
6/5/05	7/17/05	0.72	0.84
7/17/05	9/18/05	0.48	0.24
9/18/05	5/28/06	13.92	14.04
5/28/06	8/5/06	0.36	0.72
8/5/06	10/3/06	0.24	0
10/3/06	3/25/07	4.2	4.32
3/25/07	5/20/07	1.44	1.44
5/20/07	9/1/07	0.48	0.48
9/1/07	10/6/07	0.6	0.6
7/3/08	10/10/08	0.48	0.36
10/10/08	5/31/09	9.12	10.08
5/31/09	10/4/09	1.56	1.68
10/4/09	5/16/10	7.32	9
5/16/10	10/16/10	3.96	3.6
10/16/10	6/22/11	12.96	12.72
9/10/11	5/13/12	6	5.76
5/13/12	10/7/12	0.84	0.36
10/7/12	8/5/13	11.28	11.04
8/5/13	10/15/13	0.96	0.36
10/15/13	6/15/14	7.2	6.84
6/15/14	10/12/14	1.32	1.2
10/12/14	10/10/15	15.36	15.12
10/10/15	6/24/16	10.44	9.6
6/24/16	6/13/17	12.48	16.44
Virginia Peak		VP2 (non-shielded)	VP (shielded)
6/17/08	10/5/09	19.32	9.96
10/5/09	6/8/10	13.8	11.76
6/8/10	10/15/10	2.16	2.04
10/15/10	7/13/11	18.48	12.6
7/13/11	9/11/11	0.24	0.48
9/11/11	6/18/12	8.76	4.56
6/18/12	10/21/12	1.8	1.2
10/21/12	7/21/13	14.52	7.2
7/21/13	10/11/13	1.08	0.72
10/11/13	5/26/14	12.96	7.32

5/26/14	10/13/14	4.56	3.84
10/14/15	6/3/16	14.76	9.84
6/3/16	6/27/17	16.08	18.72

Statistics computed between WCRGN and PRISM precipitation were found to have a wide range of error for both R2 and bias (Table 4). Coefficient of determination (R2) ranged from 0.21 to 0.98 and biases ranged from -71.69% to 49.7%, which is far outside of the range of error found in the comparison to COOP stations (Figure 5). Figure 8 shows the relationships between error statistics and latitude, and also highlights patterns found for each Hydrographic Basin. When considering all data (both wet and dry seasons) a distinct relationship between bias and latitude can be seen with nearly all locations south of 40° N latitude showing negative (dry) bias in PRISM and a positive (wet) PRISM bias is found for nearly all locations north of 41° N latitude (Figure 8a). Wet season biases showed little relationship to latitude and the southern locations (south of 40° N latitude) biases are shifted toward much wetter overall (Figure 8b) when compared to biases computed using all data (Figure 8a). Dry season biases (Figure 8c) look similar to Figure 8a with the exception of the southern locations showing a more negative (dry) bias often in the range of -60% to -100%. Little relationship was found between R2 and latitude. Overall, R2 was quite strong (>0.8) at most locations when considering all data (Figure 8d) and much weaker relationships were found when considering wet season only (Figure 8e) and dry season only (Figure 8f). Error statistics were also plotted against elevation (not shown) with very weak relationships found for both bias and R2.

Table 4. Error statistics for comparison of WCRGN to PRISM precipitation. Biases were computed as [PRISM – WCRGN].

Station	R ²	Bias (%)	n (# of measurements used in analysis)
Antelope Valley (AV)			
AV1	0.88	-71.69	43
AV2	0.90	-41.84	48
AV3	0.92	-26.99	44
AV4	0.97	-12.35	43
Bedell Flat (BF)			
BF1	0.93	-32.76	53
BF2	0.93	-55.56	52
BF3	0.42	-44.19	49
BF4	0.90	-58.17	55
BF5	0.96	-59.70	49

BF6	0.92	-14.59	48
BF7	0.94	-53.16	53
BF8	0.93	-19.22	47
Cold Springs (CS)			
CS2	0.91	-27.71	56
CS3	0.92	-16.46	55
CS6	0.95	-30.10	55
CS10-PEAVINE NORTH	0.78	-29.35	43
CS11 PETERSON	0.77	-34.44	46
Duck Lake Valley (DL)			
DL1	0.94	10.96	20
DL2	0.90	14.94	18
DL3 (Fox Mt)	0.94	-15.93	15
DL4	0.86	6.13	16
DL5	0.91	39.39	19
DL6	0.95	15.97	21
DL7	0.90	17.64	23
DL8	0.92	-0.26	24
DL9	0.97	24.14	20
DL10	0.61	6.71	23
DL11	0.95	11.90	21
DL12	0.96	49.70	23
DL13	0.87	19.45	20
DL14	0.96	27.58	21
DL15	0.80	12.93	22
DL16	0.95	20.70	21
DL17	0.87	27.11	18
DL18	0.97	30.07	23
DL19	0.98	36.34	23
Dry Valley (DV)			
DV1	0.97	-47.76	40
DV2	0.87	-24.36	43
DV3	0.95	-6.74	37
DV4	0.96	-32.40	47
DV5	0.95	-42.09	42
DV6	0.95	-31.65	47
DV7	0.28	-27.33	35
DV8	0.96	-43.84	36
DV9	0.82	-32.52	34
DV10	0.95	-58.97	37
DV11	0.96	-7.20	33

DV12	0.94	-43.05	34
Lemmon Valley (LV)			
LV11	0.91	-35.52	64
LV12	0.93	-25.22	66
LV13	0.91	-25.74	59
LV14	0.89	-51.67	67
LV15	0.74	-27.23	59
LV16	0.95	-37.32	59
LV17	0.96	-40.42	44
LV19	0.88	-27.97	54
LV20	0.88	-31.35	54
Observation Peak (OP)			
OP (Large Collector)	0.53	-30.10	22
OP2 (Can)	0.51	35.15	13
Virginia Peak (VP)			
VP (Large Collector)	0.21	0.10	32
VP2 (Can)	0.76	-10.63	14
Smoke Creek (SC)			
SC1	0.91	-43.46	29
SC2	0.95	-41.13	31
SC3	0.95	-34.89	22
SC4	0.68	29.88	33
SC5	0.93	-37.42	20
SC6	0.94	-19.18	28
SC7	0.94	-30.23	19
SC8	0.91	-27.97	30
SC9	0.98	-12.27	25
SC10	0.44	28.94	26
SC11	0.24	-532.87	26
SC12	0.85	21.05	29
SC13	0.92	-6.26	27
SC14	0.89	9.65	26
SC15	0.92	-4.97	23
SC16	0.94	-12.84	25
PM (Large Collector)	0.96	0.24	28

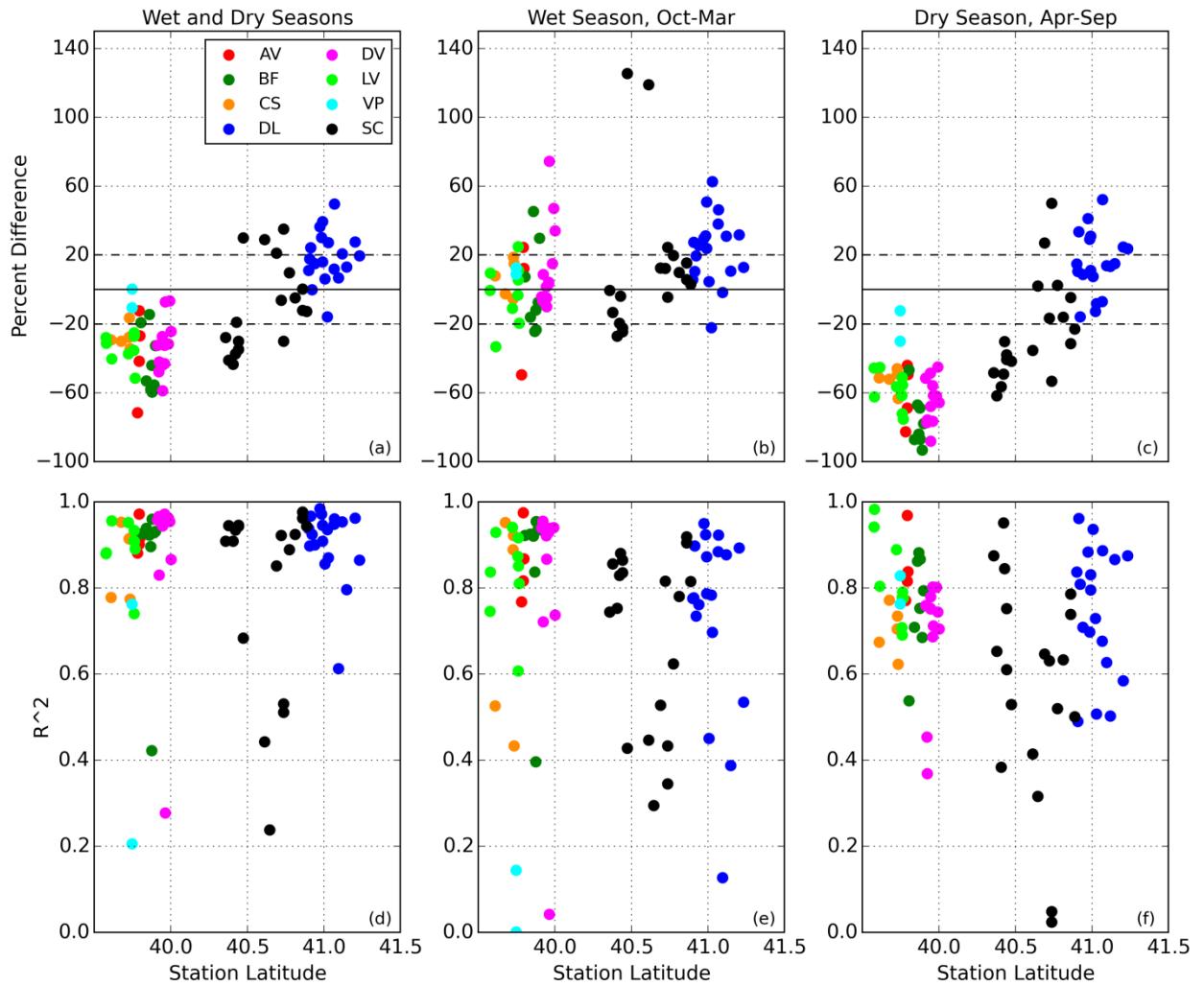


Figure 8. Bias (expressed as the percent difference of [PRISM – WCRGN] and R^2 computed between PRISM and WCRGN. All data were used for (a) and (d), wet season only for (b) and (e), and dry season only for (c) and (f). Colors indicate different Hydrographic Basins described in Figure 3 and Table 1. Dashed lines indicate the +/- 20% range of biases.

Results from several case studies examining the orographic influence on precipitation are presented in Figure 9 and Figure 10. During the three wettest years a fairly consistent minor change in precipitation with elevation was observed at the WCRGN (Figure 9a, 9c, and 9e) with slopes ranging from 1.38-2.19 in./1000 ft. and R^2 ranging from 0.19-0.37. During all three wet winters at the WCRGN total precipitation rarely exceeded 20 inches. In contrast PRISM estimates indicate a strong precipitation-elevation relationship with slopes ranging from 3.37-5.78 in./1000 ft and R^2 ranging from 0.43-0.81 (Figure 9b, 9d, and 9f). PRISM precipitation totals at higher elevation locations were often much larger than observed at the WCRGN, particularly during 2016/2017 where several locations exceeded 40 in (Figure 8f).

During the dry years the precipitation-elevation relationships are similar when comparing WCRGN to PRISM. At the WCRGN the slopes (0.85-1.65 in./1000 ft.) and R² (0.27-0.48) during the dry years (Figure 10a, 10c, and 10e) are comparable to what was observed during the wet years. However, the PRISM slopes (1.08-1.44 in./1000 ft.) and R² (0.31-0.52) during the dry years (Figures 10b, 10d, and 10f) have major differences when compared to the wet years indicating a systematic change of PRISM precipitation in Washoe County during wet years that is likely due to overestimation of precipitation during heavy or extreme events.

A challenging disadvantage of the WCRGN is the coarse temporal resolution of the data with on average only two measurements per year. This makes it impossible to examine individual storm events or even monthly precipitation totals. However, PRISM is available at daily temporal resolution and future research should examine the ability of PRISM to accurately capture heavy and extreme daily precipitation using high elevation observations (i.e., the SnoTel [Snow Telemetry]) east of the Sierra Nevada. Lundquist et al. (2015) assessed daily gridded precipitation from several datasets in the Sierra Nevada and found underprediction of individual storm events can lead to large biases in water year precipitation totals, and the actual precipitation gradients during strong storms on the windward side of the Sierra was not well represented in gridded data.

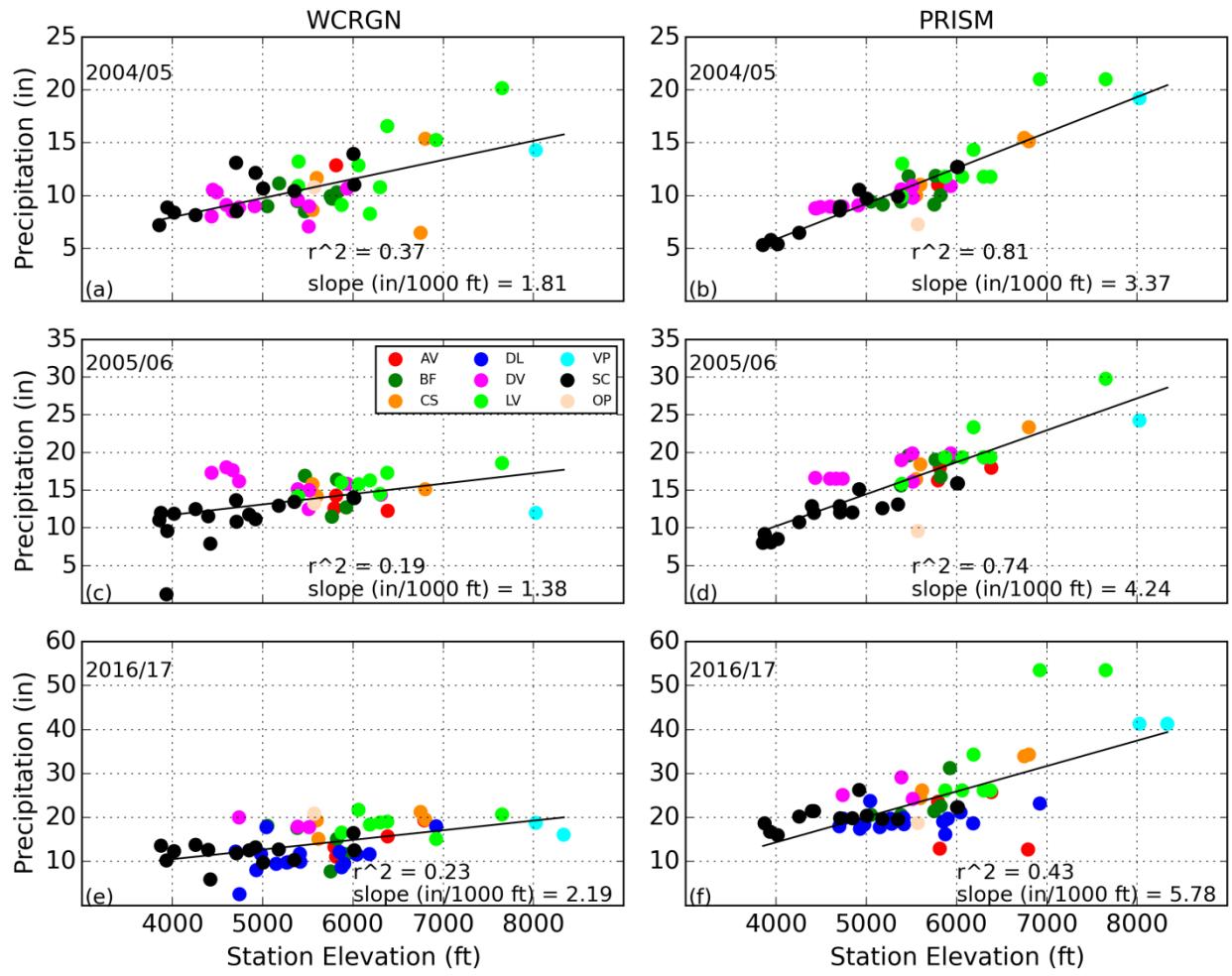


Figure 9. Station/grid point elevation plotted against wet season (~October-March) precipitation for the three wettest years in the WCRGN record using WCRGN observations (left column) and PRISM (right column): (a, b) 2004/2005, (c, d) 2005/2006, and (e, f) 2016/2017. Colors indicate Nevada Hydrographic Basins.

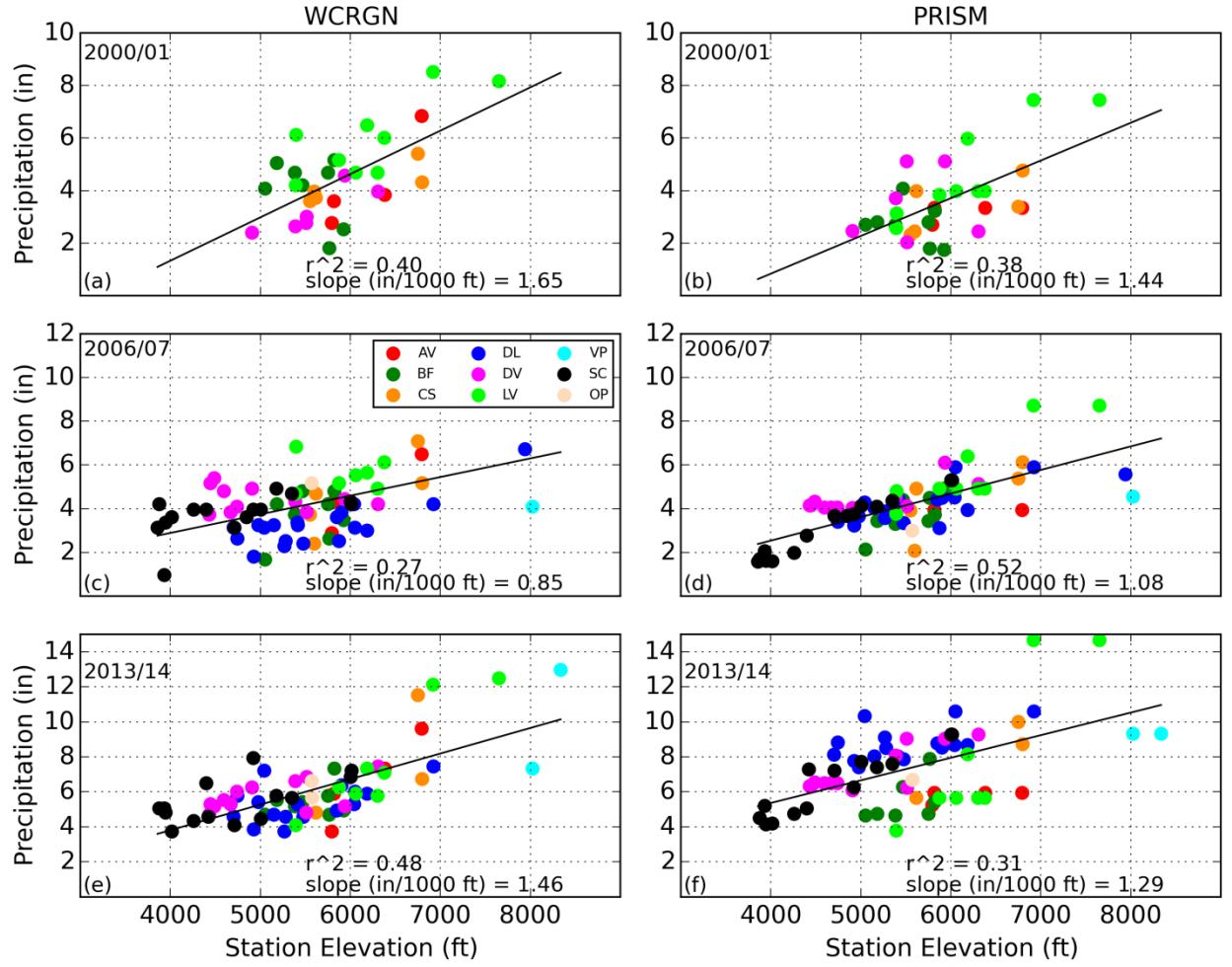


Figure 10. Station/grid point elevation plotted against wet season (~October-March) precipitation for the three driest years in the WCRGN record using WCRGN observations (left column) and PRISM (right column): (a, b) 2000/2001, (c, d) 2006/2007, and (e, f) 2013/2014. Colors indicate Nevada Hydrographic Basins.

CONCLUSIONS AND RECOMMENDATIONS

Gridded spatial precipitation estimates rely heavily on available gauge-based measurements as a primary data source, and in data sparse regions with few observations large uncertainty exists. In Washoe County, where spatial precipitation estimates are heavily used to estimate basin-wide water availability and perennial yield, long-term observations used to drive gridded data models such as PRISM are largely non-existent with the exception of the Reno-Sparks metropolitan region at the southern reaches of the county. In this study we examined a precipitation monitoring network spread out over southern and central Washoe County with records dating back as far as 1998. Data from the Washoe County Rain Gauge Network (WCRGN) were only recently digitized (2016) and provide a unique

opportunity to examine precipitation observations in otherwise ungauged regions of the county, and to conduct an independent comparison to the commonly used PRISM dataset.

In general, PRISM did reasonably well tracking the variability of WCRGN observations with R² often >0.75. This indicates that PRISM is capable of capturing the large scale synoptic features associated with storms that produce most of the winter precipitation for the region like cold frontal passages and anomalous sub-tropical moisture transport (i.e., atmospheric rivers). However, large biases were found that commonly exceeded +/- 50% difference. During the wet season larger biases tended to be wet (positive; PRISM wetter than observed) with little relationship to elevation or latitude. During the dry season the largest biases were dry (negative; PRISM drier than observed) and a distinct latitudinal gradient was found where southern locations were biased dry and northern locations biased wet. Dry season precipitation, particularly June-August, tends to be associated with the North American Monsoon and convective thunderstorms which can be isolated and difficult to spatially interpolate. This could be one reason for the overall larger biases found during the dry season. Using the biases developed in this study to bias-correct PRISM estimates could greatly improve general spatial precipitation estimates for Washoe County.

Elevation is one of the main predictors of precipitation in the PRISM model, and there is currently minimal information available regarding elevation-precipitation relationships in the small mountain ranges directly in the lee of the Sierra Nevada in Washoe County. The WCRGN spans an elevation range of ~4000-8000 ft and we have provided a first look and how precipitation varies with elevation in the mountains of Washoe County. Examining three wet years and three dry years showed that in general only minor changes were found in precipitation with increased elevation based on WCRGN observations. On the other hand, PRISM showed a strong linear relationship between precipitation and elevation during the three wet years and severely overestimated precipitation totals at higher elevations.

One of the uncertainties with the WCRGN is gauge undercatch, when precipitation is under measured due to high winds, since none of the gauges are equipped with Alter shields (with the exception of the large collectors). Snowfall undercatch is greater than rainfall undercatch (e.g., Larson and Peck 1974, Fassnacht 2004, Rasmussen et al. 2012) and it is common for all WCRGN locations to receive snowfall every year. PRISM does not include an adjustment for gauge undercatch (Maurer et al. 2002, Lundquist et al. 2015) which rules out accounting for undercatch as a source of the large positive biases during the three wet winter case studies. We have shown that gauge undercatch will likely vary greatly at each station and stations sited in dense vegetation (near or below the rim of the gauge) will benefit from a natural wind shield effect.

To fully understand the sources of PRISM biases found in this study further research is needed to evaluate PRISM at daily temporal scale. This would allow for attribution of

biases to individual storm events and specific types of storms. The main challenge in conducting this type of study would be finding observations of daily precipitation in Washoe County at a range of different elevations. Outside of the Carson Range, a spur of the Sierra Nevada on the northeast side of Lake Tahoe, there is only one mid-elevation mountain station available (the Sheldon SnoTel at 5865 ft) in Washoe County that collects daily precipitation measurements. Future effort should be invested in developing a small network of automated weather stations that collect daily precipitation along an elevational gradient in Washoe County. This would be particularly useful in places such as Peavine Peak (location of CS10, CS11, LV19, and LV20 gauges) where PRISM severely overestimated seasonal totals during wet winters.

We have shown that the WCRGN provides valuable data and insight to seasonal precipitation totals, and spatial distribution of precipitation in otherwise ungauged mountain locations in Washoe County. Efforts should continue to keep this network operational in the future. Further evaluation of the network is necessary to determine if any stations are redundant or inefficient from a cost (travel) perspective, and could be removed from the network in the future. It was determined to be cost effective to place a gauge in close proximity to a few existing telemetered gauges that don't have wind shields or are configured for frozen precipitation (RAWS; see results from Figure 6). Three new WCRGN gauges were installed during the Fall of 2017 next to the Juniper Springs (Duck Lake Valley Hydrographic Basin), Desert Springs (Bedell Flat Hydrographic Basin) and Buffalo Creek (Smoke Creek Desert Hydrographic Basin) RAWS, which were already along the travel route for the existing WCRGN. Deployment purposes are for comparison and for analysis of precipitation distribution between regular can measurement intervals. This will increase value of not only the WCRGN data (information between measurement periods), but also the RAWS data (information about precipitation during frozen precipitation events).

We recommend additional work be conducted to bias correct PRSIM estimates using the biases established in this study. For each of the Hydrographic Basins in this study the biases should be spatially interpolated over the PRISM grid, and then each PRISM grid cell should be bias corrected with the end result of forming Hydrographic Basin spatial averages of annual or seasonal precipitation totals. The intended use of these new estimates would be to compare to, and potentially replace, the existing basin-wide estimates that were crudely generated predominantly in the 1960s. New spatial estimates would provide crucial information on perennial yield and general water availability for Hydrographic Basins subject to future water transfers largely due to continued development in central and southern Washoe County.

REFERENCES

- Daly, C., M. Halbleib, J. I. Smith, W. P. Gibson, M. K. Doggett, G. H. Taylor, J. Curtis, and P. P. Pasteris, 2008: Physiographically sensitive mapping of climatological temperature and precipitation across the conterminous United States. *Int. J. Climatol.*, **28**, 2031–2064, doi:10.1002/joc.1688.
- Daly, C., 2006: Guidelines for assessing the suitability of spatial climate data sets. *Int. J. Climatol.*, **26**, 707–721, doi:10.1002/joc.1322.
- Daly, C., R. P. Neilson, and D. L. Phillips, 1994: A statistical-topographic model for mapping climatological precipitation over mountainous terrain. *J. Appl. Meteor.*, **33**, 140–158, doi:10.1175/1520-0450(1994)033,0140:ASTMFM.2.0.CO;2.
- Dettinger, M., K. Redmond, and D. Cayan, 2004: Winter orographic precipitation ratios in the Sierra Nevada—Large-scale atmospheric circulations and hydrologic consequences. *J. Hydrometeor.*, **5**, 1102–1116.
- Epstein, B. J., G. M. Pohll, J. L. Huntington, R. H. Carroll, 2010: Development and Uncertainty Analysis of an Empirical Recharge Prediction Model for Nevada's Desert Basins. *Journal of the Nevada Water Resources Association*. 5:1, 1-22.
- Fassnacht, S. R., 2004: Estimating Alter-shielded gauge snowfall undercatch, snowpack sublimation, and blowing snow transport at six sites in the coterminous USA. *Hydrology Process.*, **18**, 3481-3492.
- Glancy, P. A., F. E. Rush, 1968: Water-resources appraisal of Smoke Creek-San Emidio Desert area, Nevada and California. Nevada Department of Conservation and Natural Resources, Water Resources-Reconnaissance Report 44, 57 p.
- Handman, E. H., C. J. Londquist, and D. K. Maurer, 1990: Ground-water resources of Honey Lake Valley, Lassen County, California, and Washoe County. Nevada. U.S. Geological Survey Water Resources Investigation Report 90-4050.
- Hardman, G., 1965: Nevada precipitation map, adapted from map prepared by George Hardman, Victor Krai, and others, 1936: University of Nevada, Reno, Agricultural Experiment Station Bulletin 185, 27 p.
- Hardman, George, and Mason, H.G., 1949, Irrigated lands in Nevada: University of Nevada, Reno, Agricultural Experiment Station Bulletin 183, 57 p.
- Humphrey, M. D., J. D. Istok, J. Y. Lee, A. Hevesi, and A. L. Flint, 1997: A new method for automated dynamic calibration of tipping-bucket rain gauges. *J. Atmos. Oceanic Technol.*, **14**, 1513–1519, doi:10.1175/1520-0426(1997)014,1513: ANMFAD.2.0.CO;2
- Jeton, A. E., S. A. Watkins, T. J. Lopes, and J. L. Huntington, 2006: Evaluation of precipitation estimates from PRISM for the 1961–90 and 1971–2000 data sets, Nevada.

USGS Scientific Investigations Rep. 2005-5291, 25 pp. [Available online http://pubs.usgs.gov/sir/2005/5291/PDF/SIR2005_5291.pdf.]

Larson L. W. and E. L. Pec, 1974: Accuracy of precipitation measurements for hydrologic modelling. *Water Resour Res*, **10(4)**, 857–863.

Lundquist, J. D., J. R. Minder, P. J. Neiman, and E. Sukovich, 2010: Relationships between barrier jet heights, orographic precipitation gradients, and streamflow in the northern Sierra Nevada. *J. Hydrometeor*, **11(5)**, 1141-1156.

Lundquist, J. D., M. Hughes, B. Henn, E. D. Gutmann, B. Livneh, J. Dozier, and P. Neiman, 2015: High-elevation precipitation patterns: Using snow measurements to assess daily gridded datasets across the Sierra Nevada, California. *J. Hydrometeor*, **16(4)**, 1773-1792.

Maurer, D. K., 1993: Hydrogeologic Setting and Hydrologic Data of the Smoke Creek Desert Basin, Washoe County, Nevada, and Lassen County, California, Water Years 1988-90. U.S. Geological Survey Water Resources Investigation Report 93-4043.

Maurer, E. P., A. W. Wood, J. C. Adam, D. P. Lettenmaier, and B. Nijssen, 2002: A long-term hydrologically based data set of land surface fluxes and states for the conterminous United States. *J. Climate*, **15**, 3237–3251, doi:10.1175/152-0442(2002)015,3237:ALTHBD.2.0.CO;2

McEvoy, D.J., J. Mejia, and J.L., Huntington, 2014: Use of an Observation Network in the Great Basin to Evaluate Gridded Climate Data. *J. Hydrometeor*, **15**, 1913-1931, doi:10.1175/JHM-D-14-0015.1

Rasmussen, R., and Coauthors, 2012: How well are we measuring snow: The NOAA/FAA/NCAR winter precipitation test bed. *Bull. Amer. Meteor. Soc.*, **93**, 811–829, doi:10.1175/BAMS-D-11-00052.1.

Schermerhorn, V. P., 1967: Relations between topography and annual precipitation in western Oregon and Washington. *Water Resour Res*, **3(3)**, 707-711.

Sinclair, W. C., 1963: Ground-water appraisal of Duck Lake Valley, Washoe County, Nevada. Nevada Department of Conservation and Natural Resources, Water Resources-Reconnaissance Report 17, 30 p.

Smith, R. B., I. Barstad, and L. Bonneau, 2005: Orographic precipitation and Oregon's climate transition. *J. Atmos. Sci.*, **62(1)**, 177-191.

Strachan, S., and C. Daly (2017), Testing the daily PRISM air temperature model on semiarid mountain slopes, *J. Geophys. Res. Atmos.*, **122**, 5697–5715, doi:10.1002/2016JD025920.

Van Denburgh, A. S., R. D. Lamke, and J. L. Hughes, 1973: A brief water-resources appraisal of the Truckee River Basin, Western Nevada. Nevada Department of Conservation and Natural Resources, Water Resources-Reconnaissance Report 57, 119 p.

APPENDIX A – WCRGN historical tabular data archive

Table A1. Antelope Valley

Measurement period start	Measurement period end	Total precipitation (ft)	Number of days in period
AV1			
6/11/99	8/17/99	0.08	67
8/17/99	10/14/99	ND	58
10/14/99	12/24/99	0.12	71
12/24/99	4/13/00	0.75	111
4/13/00	5/30/00	0.20	47
5/30/00	8/11/00	0.01	73
8/11/00	8/29/00	0.00	18
8/29/00	10/9/00	0.02	41
10/9/00	11/5/00	0.03	27
11/5/00	12/18/00	0.20	43
12/18/00	3/19/01	0.20	91
3/19/01	4/30/01	0.14	42
4/30/01	7/9/01	0.01	70
7/9/01	10/1/01	0.02	84
10/1/01	5/12/02	ND	223
5/12/02	10/19/02	0.16	160
10/19/02	6/1/03	1.55	225
6/1/03	7/20/03	0.01	49
7/20/03	9/20/03	0.12	62
9/20/03	10/11/03	0.01	21
10/11/03	4/24/04	ND	196
4/24/04	7/18/04	0.13	85
7/18/04	10/1/04	0.05	75
10/1/04	4/30/05	ND	211
4/30/05	7/10/05	0.19	71
7/10/05	10/9/05	0.11	91
10/9/05	5/13/06	ND	216
5/13/06	6/17/06	0.06	35
6/17/06	8/13/06	0.05	57
8/13/06	10/14/06	0.03	62
10/14/06	3/17/07	0.54	154
3/17/07	5/24/07	0.25	68
5/24/07	7/28/07	0.02	65
7/28/07	10/18/07	0.10	82

10/18/07	6/12/08	1.44	238
6/12/08	9/6/08	0.00	86
9/6/08	10/5/08	0.01	29
10/5/08	6/23/09	1.48	261
6/23/09	10/9/09	0.05	108
10/9/09	6/4/10	1.69	238
6/4/10	10/10/10	0.21	128
10/10/10	5/14/11	ND	216
5/14/11	10/8/11	0.35	147
10/8/11	5/20/12	0.62	225
5/20/12	10/20/12	0.13	153
10/20/12	6/2/13	0.97	225
6/2/13	10/17/13	0.30	137
10/17/13	5/25/14	0.80	220
5/25/14	10/15/14	0.29	143
10/15/14	10/7/15	1.23	357
10/7/15	6/3/16	1.61	240
6/3/16	5/31/17	ND	362
5/31/17	10/27/17	0.21	149
AV2			
6/11/99	8/17/99	0.05	67
8/17/99	10/14/99	0.03	58
10/14/99	12/24/99	0.06	71
12/24/99	4/13/00	0.38	111
4/13/00	5/30/00	0.12	47
5/30/00	8/11/00	0.03	73
8/11/00	8/29/00	0.00	18
8/29/00	10/9/00	0.01	41
10/9/00	11/5/00	0.02	27
11/5/00	12/18/00	0.08	43
12/18/00	3/19/01	0.11	91
3/19/01	4/30/01	0.11	42
4/30/01	7/9/01	0.03	70
7/9/01	10/1/01	0.01	84
10/1/01	5/12/02	0.64	223
5/12/02	10/19/02	0.14	160
10/19/02	3/11/03	0.32	143
3/11/03	6/1/03	0.23	82
6/1/03	7/20/03	0.01	49
7/20/03	9/20/03	0.11	62
9/20/03	10/11/03	0.01	21
10/11/03	4/24/04	ND	196

4/24/04	7/18/04	0.12	85
7/18/04	10/1/04	0.04	75
10/1/04	4/30/05	ND	211
4/30/05	7/10/05	0.18	71
7/10/05	10/9/05	0.10	91
10/9/05	5/13/06	1.02	216
5/13/06	6/17/06	0.06	35
6/17/06	8/13/06	0.04	57
8/13/06	10/14/06	0.03	62
10/14/06	3/17/07	ND	154
3/17/07	5/24/07	0.15	68
5/24/07	7/28/07	0.02	65
7/28/07	10/18/07	0.08	82
10/18/07	4/20/08	0.66	185
4/20/08	6/12/08	0.13	53
6/12/08	9/6/08	0.00	86
9/6/08	10/5/08	0.00	29
10/5/08	6/23/09	0.82	261
6/23/09	10/9/09	0.02	108
10/9/09	4/25/10	0.82	198
4/25/10	10/10/10	0.31	168
10/10/10	5/14/11	0.78	216
5/14/11	10/8/11	0.28	147
10/8/11	5/20/12	0.39	225
5/20/12	10/20/12	0.09	153
10/20/12	6/2/13	0.65	225
6/2/13	10/17/13	0.26	137
10/17/13	5/25/14	0.61	220
5/25/14	10/15/14	0.27	143
10/15/14	10/7/15	1.06	357
10/7/15	6/3/16	1.20	240
6/3/16	5/31/17	1.31	362
5/31/17	10/27/17	0.21	149

AV3

6/11/99	8/17/99	0.06	67
8/17/99	10/14/99	ND	58
10/14/99	12/24/99	0.07	71
12/24/99	4/13/00	0.46	111
4/13/00	5/30/00	0.10	47
5/30/00	8/11/00	0.02	73
8/11/00	8/29/00	0.00	18
8/29/00	10/9/00	0.02	41

10/9/00	11/5/00	0.02	27
11/5/00	12/18/00	0.06	43
12/18/00	3/19/01	0.15	91
3/19/01	4/30/01	0.07	42
4/30/01	7/9/01	ND	70
7/9/01	7/10/01	ND	1
7/10/01	10/1/01	0.02	83
10/1/01	5/12/02	0.96	223
5/12/02	10/19/02	0.07	160
10/19/02	3/11/03	0.45	143
3/11/03	6/1/03	0.23	82
6/1/03	7/20/03	0.01	49
7/20/03	9/20/03	0.10	62
9/20/03	10/11/03	0.00	21
10/11/03	2/15/04	ND	127
2/15/04	4/24/04	0.10	69
4/24/04	7/18/04	0.10	85
7/18/04	10/1/04	0.01	75
10/1/04	4/30/05	1.07	211
4/30/05	7/10/05	0.15	71
7/10/05	10/9/05	0.09	91
10/9/05	5/13/06	1.19	216
5/13/06	6/17/06	0.04	35
6/17/06	8/13/06	0.04	57
8/13/06	10/14/06	0.02	62
10/14/06	3/17/07	0.36	154
3/17/07	5/24/07	0.12	68
5/24/07	7/28/07	0.02	65
7/28/07	10/18/07	0.07	82
10/18/07	4/20/08	ND	185
4/20/08	6/12/08	0.10	53
6/12/08	9/6/08	0.00	86
9/6/08	10/5/08	0.01	29
10/5/08	6/23/09	0.64	261
6/23/09	10/9/09	0.02	108
10/9/09	6/4/10	ND	238
6/4/10	10/10/10	0.13	128
10/10/10	5/14/11	0.79	216
5/14/11	10/8/11	0.53	147
10/8/11	5/20/12	ND	225
5/20/12	10/20/12	0.08	153
10/20/12	6/2/13	0.61	225
6/2/13	10/17/13	0.16	137

10/17/13	5/25/14	0.49	220
5/25/14	10/15/14	0.25	143
10/15/14	10/7/15	0.92	357
10/7/15	6/3/16	ND	240
6/3/16	10/27/17	ND	511
AV4			
10/19/99	12/23/99	0.04	65
12/23/99	3/22/00	0.46	90
3/22/00	5/30/00	0.11	69
5/30/00	6/23/00	0.00	24
6/23/00	8/11/00	ND	49
8/11/00	8/29/00	0.00	18
8/29/00	10/9/00	0.00	41
10/9/00	11/5/00	0.02	27
11/5/00	12/18/00	0.05	43
12/18/00	3/18/01	0.10	90
3/18/01	5/3/01	0.06	46
5/3/01	7/10/01	ND	68
7/10/01	10/1/01	0.03	83
10/1/01	3/3/02	0.35	153
3/3/02	4/28/02	0.06	56
4/28/02	10/6/02	0.11	161
10/6/02	10/26/02	0.00	20
10/26/02	3/8/03	0.39	133
3/8/03	5/18/03	0.15	71
5/18/03	7/13/03	0.00	56
7/13/03	9/14/03	0.18	63
9/14/03	10/18/03	0.00	34
10/18/03	2/15/04	0.22	120
2/15/04	4/25/04	0.12	70
4/25/04	7/11/04	0.10	77
7/11/04	5/27/05	0.81	320
5/27/05	7/10/05	0.07	44
7/10/05	10/9/05	0.07	91
10/9/05	5/13/06	1.05	216
5/13/06	6/17/06	0.03	35
6/17/06	8/13/06	0.02	57
8/13/06	10/14/06	0.04	62
10/14/06	3/17/07	0.24	154
3/17/07	5/24/07	0.09	68
5/24/07	7/28/07	0.01	65
7/28/07	10/18/07	ND	82

10/18/07	4/20/08	ND	185
4/20/08	7/1/08	0.09	72
7/1/08	9/6/08	0.00	67
9/6/08	10/5/08	0.01	29
10/5/08	6/23/09	0.55	261
6/23/09	10/9/09	0.04	108
10/9/09	4/25/10	0.65	198
4/25/10	10/10/10	0.18	168
10/10/10	5/14/11	0.61	216
5/14/11	10/8/11	0.27	147
10/8/11	5/20/12	0.24	225
5/20/12	10/20/12	ND	153
10/20/12	6/2/13	0.37	225
6/2/13	10/17/13	0.16	137
10/17/13	5/25/14	0.31	220
5/25/14	10/15/14	0.26	143
10/15/14	10/6/15	0.90	356
10/6/15	6/3/16	0.69	241
6/3/16	5/31/17	1.11	362
5/31/17	10/27/17	0.06	149
AV5			
10/21/99	12/23/99	0.00	63
12/23/99	3/22/00	0.40	90
3/22/00	8/11/00	0.10	142
8/11/00	8/30/00	0.00	19
8/30/00	10/9/00	0.00	40
10/9/00	11/5/00	0.01	27
11/5/00	12/18/00	0.08	43
12/18/00	3/19/01	0.10	91
3/19/01	4/30/01	0.06	42
4/30/01	7/9/01	0.01	70
7/9/01	9/29/01	0.03	82
9/29/01	3/3/02	0.38	155
3/3/02	4/28/02	0.05	56
4/28/02	3/10/03	0.42	316
3/10/03	3/17/03	0.02	7
3/17/03	6/1/03	0.10	76
6/1/03	7/20/03	0.01	49
7/20/03	9/20/03	0.09	62
9/20/03	10/11/03	0.00	21
10/11/03	2/15/04	0.19	127
2/15/04	4/24/04	0.13	69

4/24/04	7/18/04	0.09	85
7/18/04	10/1/04	0.05	75
10/1/04	4/30/05	0.97	211
4/30/05	7/10/05	0.17	71
7/10/05	10/9/05	0.07	91
10/9/05	5/13/06	1.07	216
5/13/06	6/17/06	0.04	35
6/17/06	8/13/06	0.09	57
8/13/06	10/14/06	ND	62
10/14/06	3/17/07	0.23	154
3/17/07	5/24/07	0.07	68
5/24/07	7/28/07	0.00	65
7/28/07	10/18/07	0.04	82
10/18/07	4/20/08	0.34	185
4/20/08	6/12/08	0.11	53
6/12/08	9/6/08	0.00	86
9/6/08	10/5/08	0.01	29
10/5/08	6/23/09	0.58	261
6/23/09	10/9/09	0.01	108
10/9/09	4/25/10	0.67	198
4/25/10	10/10/10	0.19	168
10/10/10	5/14/11	0.58	216
5/14/11	10/8/11	0.21	147
10/8/11	5/20/12	0.20	225
5/20/12	10/20/12	0.04	153
10/20/12	6/2/13	0.44	225
6/2/13	10/17/13	0.14	137
10/17/13	5/25/14	0.35	220
5/25/14	10/15/14	0.21	143
10/15/14	10/14/15	0.82	364
10/14/15	6/3/16	0.24	233
6/3/16	6/6/17	ND	368
6/6/17	10/3/17	0.28	119

Table A2. Bedell Flat

Measurement period start	Measurement period end	Total precipitation (ft)	Number of days in period
BF1			
10/15/99	12/23/99	0.04	69
12/23/99	3/21/00	0.43	89
3/21/00	5/30/00	0.16	70
5/30/00	6/22/00	0.01	23
6/22/00	8/10/00	0.11	49
8/10/00	8/29/00	0.00	19
8/29/00	10/9/00	0.00	41
10/9/00	11/5/00	0.07	27
11/5/00	12/14/00	0.07	39
12/14/00	3/18/01	ND	94
3/18/01	5/4/01	0.07	47
5/4/01	7/9/01	0.04	66
7/9/01	9/30/01	0.01	83
9/30/01	3/3/02	0.44	154
3/3/02	4/28/02	0.12	56
4/28/02	10/6/02	0.15	161
10/6/02	10/26/02	0.00	20
10/26/02	3/8/03	0.38	133
3/8/03	5/18/03	0.27	71
5/18/03	7/13/03	0.01	56
7/13/03	9/14/03	0.12	63
9/14/03	10/18/03	0.02	34
10/18/03	2/15/04	0.28	120
2/15/04	4/25/04	0.14	70
4/25/04	7/11/04	0.10	77
7/11/04	10/16/04	0.04	97
10/16/04	4/30/05	ND	196
4/30/05	7/10/05	0.15	71
7/10/05	9/11/05	0.11	63
9/11/05	10/8/05	0.01	27
10/8/05	2/11/06	0.58	126
2/11/06	4/30/06	0.48	78
4/30/06	6/11/06	0.10	42
6/11/06	8/27/06	0.03	77
8/27/06	10/8/06	0.03	42
10/8/06	2/3/07	0.14	118
2/3/07	3/17/07	0.15	42
3/17/07	5/17/07	0.15	61

5/17/07	8/5/07	0.11	80
8/5/07	10/17/07	0.09	73
10/17/07	3/30/08	0.49	165
3/30/08	7/1/08	0.14	93
7/1/08	9/6/08	0.00	67
9/6/08	10/5/08	0.00	29
10/5/08	5/23/09	0.47	230
5/23/09	10/7/09	0.22	137
10/7/09	4/17/10	0.61	192
4/17/10	9/25/10	0.20	161
9/25/10	5/14/11	1.02	231
5/14/11	10/8/11	0.34	147
10/8/11	6/2/12	0.38	238
6/2/12	10/14/12	0.05	134
10/14/12	6/1/13	0.47	230
6/1/13	10/17/13	0.15	138
10/17/13	5/11/14	0.41	206
5/11/14	10/15/14	0.33	157
10/15/14	10/6/15	1.12	356
10/6/15	6/10/16	0.86	248
6/10/16	10/24/16	0.17	136
10/24/16	5/31/17	0.97	219
5/31/17	10/27/17	0.25	149
BF2			
10/15/99	12/23/99	0.05	69
12/23/99	3/21/00	0.42	89
3/21/00	5/30/00	0.22	70
5/30/00	6/22/00	0.00	23
6/22/00	8/10/00	0.15	49
8/10/00	8/29/00	0.00	19
8/29/00	10/9/00	0.00	41
10/9/00	11/5/00	0.07	27
11/5/00	12/14/00	0.08	39
12/14/00	3/18/01	0.16	94
3/18/01	5/4/01	0.08	47
5/4/01	7/9/01	0.05	66
7/9/01	9/30/01	0.02	83
9/30/01	3/3/02	0.45	154
3/3/02	4/28/02	0.13	56
4/28/02	10/6/02	0.15	161
10/6/02	10/26/02	0.00	20
10/26/02	3/8/03	0.44	133

3/8/03	5/18/03	0.27	71
5/18/03	7/13/03	0.03	56
7/13/03	9/14/03	0.10	63
9/14/03	10/18/03	0.01	34
10/18/03	2/15/04	0.28	120
2/15/04	4/25/04	0.14	70
4/25/04	7/11/04	0.15	77
7/11/04	10/16/04	0.04	97
10/16/04	4/17/05	0.79	183
4/17/05	7/10/05	0.20	84
7/10/05	9/11/05	0.15	63
9/11/05	10/8/05	0.01	27
10/8/05	2/11/06	0.66	126
2/11/06	4/30/06	0.51	78
4/30/06	6/11/06	0.09	42
6/11/06	8/27/06	0.04	77
8/27/06	10/8/06	0.02	42
10/8/06	2/3/07	0.17	118
2/3/07	3/17/07	0.14	42
3/17/07	5/17/07	0.18	61
5/17/07	8/5/07	0.10	80
8/5/07	10/17/07	0.10	73
10/17/07	3/30/08	0.53	165
3/30/08	7/1/08	0.15	93
7/1/08	9/6/08	0.00	67
9/6/08	10/5/08	0.01	29
10/5/08	5/23/09	0.48	230
5/23/09	10/7/09	0.23	137
10/7/09	4/17/10	0.63	192
4/17/10	9/25/10	0.23	161
9/25/10	5/14/11	0.85	231
5/14/11	10/8/11	ND	147
10/8/11	6/2/12	0.42	238
6/2/12	10/14/12	0.05	134
10/14/12	6/1/13	0.52	230
6/1/13	10/17/13	0.15	138
10/17/13	5/11/14	0.43	206
5/11/14	10/15/14	0.36	157
10/15/14	10/6/15	ND	356
10/6/15	6/10/16	0.61	248
6/10/16	10/24/16	ND	136
10/24/16	5/31/17	1.47	219
5/31/17	10/27/17	0.34	149

BF3			
10/15/99	12/23/99	0.04	69
12/23/99	3/21/00	0.42	89
3/21/00	5/30/00	0.17	70
5/30/00	8/10/00	0.13	72
8/10/00	8/29/00	0.00	19
8/29/00	10/9/00	0.01	41
10/9/00	11/5/00	0.04	27
11/5/00	12/14/00	0.07	39
12/14/00	3/18/01	0.17	94
3/18/01	5/4/01	0.06	47
5/4/01	7/9/01	0.03	66
7/9/01	9/30/01	0.01	83
9/30/01	3/3/02	0.41	154
3/3/02	4/28/02	0.09	56
4/28/02	10/6/02	0.18	161
10/6/02	10/26/02	0.00	20
10/26/02	3/8/03	0.43	133
3/8/03	5/18/03	0.20	71
5/18/03	7/13/03	ND	56
7/13/03	9/14/03	0.11	63
9/14/03	10/18/03	0.00	34
10/18/03	2/15/04	0.24	120
2/15/04	4/25/04	0.14	70
4/25/04	7/11/04	0.15	77
7/11/04	10/16/04	0.03	97
10/16/04	4/17/05	0.75	183
4/17/05	7/10/05	0.18	84
7/10/05	9/11/05	ND	63
9/11/05	10/8/05	0.01	27
10/8/05	2/11/06	ND	126
2/11/06	4/30/06	0.47	78
4/30/06	6/11/06	0.07	42
6/11/06	8/27/06	0.03	77
8/27/06	10/8/06	0.03	42
10/8/06	2/7/07	ND	122
2/7/07	3/17/07	0.14	38
3/17/07	5/17/07	0.15	61
5/17/07	8/5/07	0.05	80
8/5/07	10/17/07	0.08	73
10/17/07	3/30/08	0.50	165
3/30/08	7/1/08	0.10	93
7/1/08	9/6/08	0.01	67

9/6/08	10/5/08	0.00	29
10/5/08	5/23/09	0.46	230
5/23/09	10/7/09	0.18	137
10/7/09	4/17/10	0.64	192
4/17/10	9/25/10	0.20	161
9/25/10	5/14/11	0.90	231
5/14/11	10/8/11	ND	147
10/8/11	6/2/12	ND	238
6/2/12	10/14/12	0.04	134
10/14/12	6/1/13	ND	230
6/1/13	10/17/13	0.17	138
10/17/13	5/11/14	0.39	206
5/11/14	10/15/14	0.33	157
10/15/14	10/6/15	0.98	365
10/6/15	6/10/16	1.03	248
6/10/16	10/24/16	0.04	136
10/24/16	5/31/17	1.51	219
5/31/17	10/27/17	0.22	149
BF4			
10/18/99	12/23/99	0.08	66
12/23/99	3/21/00	0.52	89
3/21/00	5/30/00	0.13	70
5/30/00	6/22/00	0.00	23
6/22/00	8/11/00	0.07	50
8/11/00	8/28/00	0.00	17
8/28/00	10/9/00	0.02	42
10/9/00	11/5/00	0.02	27
11/5/00	12/14/00	0.07	39
12/14/00	3/18/01	0.18	94
3/18/01	5/4/01	0.12	47
5/4/01	7/9/01	0.02	66
7/9/01	9/30/01	0.02	83
9/30/01	3/3/02	0.56	154
3/3/02	4/28/02	0.10	56
4/28/02	10/6/02	0.13	161
10/6/02	10/26/02	0.01	20
10/26/02	3/8/03	0.53	133
3/8/03	5/18/03	0.20	71
5/18/03	7/13/03	0.01	56
7/13/03	9/14/03	0.13	63
9/14/03	10/18/03	0.01	34
10/18/03	2/15/04	0.30	120

2/15/04	4/25/04	0.20	70
4/25/04	7/11/04	0.12	77
7/11/04	10/16/04	0.01	97
10/16/04	4/17/05	0.83	183
4/17/05	7/10/05	0.19	84
7/10/05	9/11/05	0.06	63
9/11/05	10/8/05	0.03	27
10/8/05	2/11/06	0.94	126
2/11/06	4/30/06	ND	78
4/30/06	6/11/06	0.07	42
6/11/06	8/27/06	0.05	77
8/27/06	10/8/06	0.00	42
10/8/06	2/3/07	0.17	118
2/3/07	3/17/07	0.18	42
3/17/07	5/17/07	0.12	61
5/17/07	8/5/07	0.03	80
8/5/07	10/17/07	0.11	73
10/17/07	3/30/08	1.17	165
3/30/08	7/1/08	0.09	93
7/1/08	9/6/08	0.01	67
9/6/08	10/5/08	0.01	29
10/5/08	5/23/09	0.54	230
5/23/09	10/7/09	0.19	137
10/7/09	4/17/10	0.79	192
4/17/10	9/25/10	0.22	161
9/25/10	5/14/11	1.12	231
5/14/11	10/8/11	0.46	147
10/8/11	6/2/12	0.42	238
6/2/12	10/14/12	0.06	134
10/14/12	6/1/13	0.61	230
6/1/13	10/17/13	0.12	138
10/17/13	5/11/14	0.48	206
5/11/14	10/15/14	0.33	157
10/15/14	10/6/15	1.02	365
10/6/15	6/10/16	1.16	248
6/10/16	10/24/16	ND	136
10/24/16	5/31/17	0.64	219
5/31/17	10/27/17	0.34	149
BF5			
10/18/99	12/23/99	0.09	66
12/23/99	3/21/00	0.54	89
3/21/00	5/30/00	0.19	70

5/30/00	6/22/00	0.00	23
6/22/00	8/11/00	0.06	50
8/11/00	8/28/00	0.00	17
8/28/00	10/9/00	0.01	42
10/9/00	11/5/00	0.04	27
11/5/00	12/14/00	0.08	39
12/14/00	3/18/01	0.19	94
3/18/01	5/4/01	0.11	47
5/4/01	7/9/01	0.02	66
7/9/01	9/30/01	0.03	83
9/30/01	3/3/02	0.65	154
3/3/02	4/28/02	0.12	56
4/28/02	10/6/02	ND	161
10/6/02	3/8/03	0.54	153
3/8/03	5/18/03	0.25	71
5/18/03	7/13/03	0.03	56
7/13/03	9/14/03	0.14	63
9/14/03	10/18/03	0.00	34
10/18/03	2/15/04	0.41	120
2/15/04	4/25/04	0.19	70
4/25/04	7/11/04	0.13	77
7/11/04	10/16/04	0.06	97
10/16/04	4/17/05	0.93	183
4/17/05	5/30/05	ND	43
5/30/05	7/10/05	0.11	41
7/10/05	9/11/05	0.06	63
9/11/05	10/8/05	0.02	27
10/8/05	2/11/06	0.96	126
2/11/06	4/30/06	ND	78
4/30/06	6/11/06	0.05	42
6/11/06	8/27/06	0.03	77
8/27/06	10/8/06	0.03	42
10/8/06	2/3/07	0.17	118
2/3/07	3/17/07	0.18	42
3/17/07	5/17/07	0.16	61
5/17/07	8/5/07	0.06	80
8/5/07	10/17/07	0.09	73
10/17/07	3/30/08	0.64	165
3/30/08	7/1/08	0.11	93
7/1/08	9/6/08	0.00	67
9/6/08	10/5/08	0.01	29
10/5/08	5/23/09	0.57	230
5/23/09	10/7/09	0.27	137

10/7/09	4/17/10	0.69	192
4/17/10	9/25/10	0.24	161
9/25/10	5/14/11	1.18	231
5/14/11	10/8/11	0.51	147
10/8/11	6/2/12	0.49	238
6/2/12	10/14/12	0.05	134
10/14/12	6/1/13	0.61	230
6/1/13	10/17/13	0.11	138
10/17/13	5/11/14	0.46	206
5/11/14	10/15/14	0.38	157
10/15/14	10/6/15	ND	365
10/6/15	6/10/16	ND	248
6/10/16	10/24/16	ND	136
10/24/16	5/31/17	ND	219
5/31/17	10/27/17	0.30	149

BF6			
10/19/99	12/23/99	0.03	65
12/23/99	3/22/00	0.41	90
3/22/00	5/30/00	0.11	69
5/30/00	6/22/00	0.01	23
6/22/00	8/10/00	0.03	49
8/10/00	8/29/00	0.00	19
8/29/00	10/9/00	0.01	41
10/9/00	11/5/00	0.03	27
11/5/00	12/14/00	0.04	39
12/14/00	3/18/01	ND	94
3/18/01	5/4/01	0.08	47
5/4/01	7/9/01	ND	66
7/9/01	9/30/01	0.13	83
9/30/01	3/3/02	0.35	154
3/3/02	4/28/02	0.06	56
4/28/02	10/6/02	0.11	161
10/6/02	10/26/02	0.00	20
10/26/02	3/8/03	0.32	133
3/8/03	5/18/03	0.14	71
5/18/03	7/13/03	0.01	56
7/13/03	9/14/03	0.17	63
9/14/03	10/18/03	0.00	34
10/18/03	2/15/04	0.20	120
2/15/04	4/25/04	0.15	70
4/25/04	7/11/04	0.14	77
7/11/04	10/16/04	0.00	97

10/16/04	4/17/05	0.81	183
4/17/05	7/10/05	0.16	84
7/10/05	9/11/05	0.08	63
9/11/05	10/9/05	0.01	28
10/9/05	2/11/06	0.51	125
2/11/06	4/30/06	0.45	78
4/30/06	6/11/06	0.05	42
6/11/06	8/27/06	0.02	77
8/27/06	10/8/06	0.03	42
10/8/06	2/3/07	0.10	118
2/3/07	3/17/07	0.12	42
3/17/07	5/17/07	ND	61
5/17/07	8/5/07	0.05	80
8/5/07	10/17/07	0.05	73
10/17/07	3/30/08	0.42	165
3/30/08	7/1/08	0.09	93
7/1/08	9/6/08	0.01	67
9/6/08	10/5/08	0.00	29
10/5/08	5/23/09	0.39	230
5/23/09	10/7/09	ND	137
10/7/09	4/17/10	0.60	192
4/17/10	9/25/10	0.13	161
9/25/10	5/14/11	0.80	231
5/14/11	10/8/11	0.32	147
10/8/11	6/2/12	0.34	238
6/2/12	10/14/12	ND	134
10/14/12	6/1/13	0.38	230
6/1/13	10/17/13	0.20	138
10/17/13	5/11/14	0.39	206
5/11/14	10/15/14	0.31	157
10/15/14	10/6/15	0.96	356
10/6/15	6/10/16	0.91	248
6/10/16	5/31/17	ND	355
5/31/17	10/27/17	0.33	149

BF7

10/20/99	12/23/99	0.12	64
12/23/99	3/21/00	0.43	89
3/21/00	5/30/00	0.14	70
5/30/00	6/22/00	0.00	23
6/22/00	8/10/00	0.12	49
8/10/00	8/28/00	0.00	18
8/28/00	10/9/00	0.02	42

10/9/00	11/5/00	0.02	27
11/5/00	12/14/00	0.08	39
12/14/00	3/19/01	0.18	95
3/19/01	5/4/01	0.15	46
5/4/01	7/9/01	0.02	66
7/9/01	9/30/01	0.03	83
9/30/01	3/2/02	0.43	153
3/2/02	4/28/02	0.18	57
4/28/02	10/6/02	0.24	161
10/6/02	10/26/02	0.01	20
10/26/02	3/8/03	0.44	133
3/8/03	5/18/03	0.26	71
5/18/03	7/13/03	0.00	56
7/13/03	9/14/03	0.11	63
9/14/03	10/18/03	0.01	34
10/18/03	2/15/04	0.33	120
2/15/04	4/25/04	0.13	70
4/25/04	7/11/04	0.21	77
7/11/04	10/16/04	0.02	97
10/16/04	4/17/05	0.86	183
4/17/05	5/30/05	ND	43
5/30/05	7/10/05	0.08	41
7/10/05	9/11/05	0.07	63
9/11/05	10/8/05	0.02	27
10/8/05	2/11/06	0.82	126
2/11/06	4/30/06	0.55	78
4/30/06	6/11/06	0.05	42
6/11/06	8/27/06	0.04	77
8/27/06	10/8/06	0.02	42
10/8/06	2/3/07	0.23	118
2/3/07	3/17/07	0.17	42
3/17/07	5/17/07	ND	61
5/17/07	8/5/07	0.05	80
8/5/07	10/17/07	0.10	73
10/17/07	3/30/08	0.56	165
3/30/08	7/1/08	0.12	93
7/1/08	9/6/08	0.01	67
9/6/08	10/5/08	0.00	29
10/5/08	5/23/09	0.65	230
5/23/09	10/7/09	0.15	137
10/7/09	4/17/10	0.71	192
4/17/10	9/25/10	ND	161
9/25/10	5/14/11	1.03	231

5/14/11	10/8/11	ND	147
10/8/11	6/2/12	0.51	238
6/2/12	10/14/12	0.04	134
10/14/12	6/1/13	0.69	230
6/1/13	10/17/13	0.27	138
10/17/13	5/11/14	0.61	206
5/11/14	10/15/14	0.37	157
10/15/14	10/6/15	1.18	356
10/6/15	6/10/16	1.26	248
6/10/16	10/24/16	0.22	136
10/24/16	5/31/17	1.26	219
5/31/17	10/27/17	0.37	149
BF8			
10/21/99	12/23/99	0.03	63
12/23/99	3/21/00	0.52	89
3/21/00	5/30/00	0.12	70
5/30/00	6/22/00	0.00	23
6/22/00	8/10/00	0.06	49
8/10/00	8/28/00	0.00	18
8/28/00	10/9/00	0.00	42
10/9/00	11/5/00	0.02	27
11/5/00	12/14/00	0.13	39
12/14/00	3/19/01	0.12	95
3/19/01	5/4/01	0.08	46
5/4/01	7/9/01	0.01	66
7/9/01	9/30/01	0.01	83
9/30/01	3/2/02	0.47	153
3/2/02	4/28/02	0.09	57
4/28/02	10/6/02	0.21	161
10/6/02	10/26/02	0.01	20
10/26/02	3/8/03	0.48	133
3/8/03	5/18/03	0.22	71
5/18/03	7/13/03	ND	56
7/13/03	9/14/03	0.09	63
9/14/03	10/18/03	0.00	34
10/18/03	2/15/04	0.29	120
2/15/04	4/25/04	0.17	70
4/25/04	7/11/04	0.13	77
7/11/04	10/16/04	0.02	97
10/16/04	4/17/05	0.71	183
4/17/05	7/10/05	0.16	84
7/10/05	9/11/05	ND	63

9/11/05	10/8/05	0.08	27
10/8/05	2/11/06	0.87	126
2/11/06	4/30/06	0.54	78
4/30/06	6/11/06	0.04	42
6/11/06	8/27/06	ND	77
8/27/06	10/8/06	0.02	42
10/8/06	2/3/07	0.19	118
2/3/07	3/17/07	0.21	42
3/17/07	5/17/07	ND	61
5/17/07	8/5/07	0.03	80
8/5/07	10/17/07	0.07	73
10/17/07	3/30/08	0.54	165
3/30/08	7/1/08	0.09	93
7/1/08	9/6/08	0.01	67
9/6/08	10/4/08	0.00	28
10/4/08	5/23/09	0.56	231
5/23/09	10/7/09	0.13	137
10/7/09	4/17/10	0.82	192
4/17/10	9/25/10	0.19	161
9/25/10	5/13/11	ND	230
5/13/11	10/8/11	0.19	148
10/8/11	2/25/12	0.25	140
2/25/12	6/2/12	0.17	98
6/2/12	10/14/12	ND	134
10/14/12	6/1/13	0.65	230
6/1/13	10/17/13	0.24	138
10/17/13	5/11/14	0.45	206
5/11/14	10/15/14	ND	157
10/15/14	10/6/15	1.00	356
10/6/15	6/10/16	0.96	248
6/10/16	10/24/16	0.21	136
10/24/16	5/31/17	ND	219
5/31/17	10/27/17	ND	149

Table A3. Cold Spring Valley

Measurement period start	Measurement period end	Total precipitation (ft)	Number of days in period
CS2			
9/8/98	10/13/98	0.20	35
10/13/98	12/29/98	0.29	77
12/29/98	1/29/99	0.28	31

1/29/99	2/16/99	0.20	18
2/16/99	4/22/99	0.21	65
4/22/99	5/5/99	0.03	13
5/5/99	6/17/99	0.04	43
6/17/99	8/16/99	0.04	60
8/16/99	10/12/99	0.03	57
10/12/99	12/22/99	0.09	71
12/22/99	3/17/00	0.58	86
3/17/00	5/30/00	0.22	74
5/30/00	8/9/00	0.03	71
8/9/00	8/28/00	0.00	19
8/28/00	10/10/00	0.01	43
10/10/00	11/4/00	0.04	25
11/4/00	12/14/00	0.09	40
12/14/00	3/19/01	0.20	95
3/19/01	4/26/01	ND	38
4/26/01	7/7/01	0.00	72
7/7/01	9/29/01	0.02	84
9/29/01	3/2/02	0.52	154
3/2/02	4/27/02	0.13	56
4/27/02	10/5/02	0.20	161
10/5/02	10/25/02	0.00	20
10/25/02	3/7/03	0.49	133
3/7/03	5/17/03	0.32	71
5/17/03	7/12/03	0.02	56
7/12/03	9/20/03	ND	70
9/20/03	10/12/03	0.00	22
10/12/03	2/14/04	0.39	125
2/14/04	4/24/04	0.14	70
4/24/04	7/10/04	0.02	77
7/10/04	10/10/04	0.01	92
10/10/04	4/23/05	0.97	195
4/23/05	7/16/05	0.16	84
7/16/05	10/15/05	0.05	91
10/15/05	2/12/06	0.70	120
2/12/06	4/29/06	0.48	76
4/29/06	6/10/06	0.03	42
6/10/06	8/12/06	0.05	63
8/12/06	9/30/06	0.00	49
9/30/06	2/4/07	0.20	127
2/4/07	3/11/07	ND	35
3/11/07	5/15/07	0.15	65
5/15/07	8/4/07	0.10	81

8/4/07	10/20/07	0.09	77
10/20/07	3/29/08	0.56	161
3/29/08	6/30/08	0.07	93
6/30/08	10/4/08	0.02	96
10/4/08	5/24/09	0.57	232
5/24/09	10/8/09	0.24	137
10/8/09	4/24/10	0.91	198
4/24/10	10/10/10	0.24	169
10/10/10	5/11/11	ND	213
5/11/11	10/9/11	0.32	151
10/9/11	6/3/12	0.41	238
6/3/12	10/22/12	0.06	141
10/22/12	5/18/13	0.47	208
5/18/13	10/18/13	0.18	153
10/18/13	5/10/14	ND	204
5/10/14	10/16/14	0.25	159
10/16/14	10/5/15	1.14	354
10/5/15	5/12/16	0.98	220
5/12/16	10/22/16	0.20	163
10/22/16	5/4/17	1.61	194
5/4/17	10/31/17	0.37	180
CS3			
9/8/98	10/13/98	0.21	35
10/13/98	12/29/98	0.24	77
12/29/98	1/29/99	0.24	31
1/29/99	2/16/99	0.17	18
2/16/99	4/22/99	0.15	65
4/22/99	5/5/99	0.03	13
5/5/99	6/17/99	0.05	43
6/17/99	8/16/99	0.04	60
8/16/99	10/12/99	ND	57
10/12/99	12/22/99	0.07	71
12/22/99	3/17/00	0.52	86
3/17/00	5/30/00	0.18	74
5/30/00	8/9/00	0.04	71
8/9/00	8/28/00	0.00	19
8/28/00	10/10/00	0.01	43
10/10/00	11/4/00	0.02	25
11/4/00	12/14/00	0.07	40
12/14/00	3/19/01	0.15	95
3/19/01	4/26/01	0.07	38
4/26/01	7/7/01	0.01	72

7/7/01	9/29/01	0.01	84
9/29/01	3/2/02	0.45	154
3/2/02	4/27/02	0.09	56
4/27/02	10/5/02	0.20	161
10/5/02	10/25/02	ND	20
10/25/02	3/7/03	0.51	133
3/7/03	5/17/03	0.25	71
5/17/03	7/12/03	0.01	56
7/12/03	9/20/03	ND	70
9/20/03	10/12/03	0.00	22
10/12/03	2/14/04	0.23	125
2/14/04	4/24/04	0.14	70
4/24/04	7/10/04	0.11	77
7/10/04	10/10/04	0.06	92
10/10/04	4/23/05	ND	195
4/23/05	7/16/05	0.18	84
7/16/05	10/15/05	0.07	91
10/15/05	2/12/06	ND	120
2/12/06	4/29/06	0.56	76
4/29/06	6/10/06	0.04	42
6/10/06	8/12/06	ND	63
8/12/06	9/30/06	0.00	49
9/30/06	2/4/07	0.20	127
2/4/07	3/11/07	0.19	35
3/11/07	5/15/07	0.13	65
5/15/07	8/4/07	0.13	81
8/4/07	10/20/07	0.09	77
10/20/07	3/29/08	0.50	161
3/29/08	6/30/08	0.06	93
6/30/08	10/4/08	0.01	96
10/4/08	5/24/09	0.47	232
5/24/09	10/8/09	ND	137
10/8/09	4/24/10	0.90	198
4/24/10	10/10/10	0.20	169
10/10/10	5/11/11	1.14	213
5/11/11	10/9/11	0.33	151
10/9/11	6/3/12	0.41	238
6/3/12	10/22/12	0.07	141
10/22/12	5/18/13	0.55	208
5/18/13	10/18/13	ND	153
10/18/13	5/10/14	0.40	204
5/10/14	10/16/14	0.25	159
10/16/14	10/5/15	1.13	354

10/5/15	5/12/16	1.18	220
5/12/16	10/22/16	0.24	163
10/22/16	5/4/17	1.26	194
5/4/17	10/31/17	0.37	180
CS5			
9/9/98	10/13/98	0.25	34
10/13/98	1/4/99	0.19	83
1/4/99	1/29/99	0.14	25
1/29/99	2/16/99	0.17	18
2/16/99	5/3/99	0.17	76
5/3/99	5/5/99	0.00	2
5/5/99	6/21/99	0.02	47
6/21/99	8/16/99	0.06	56
8/16/99	10/12/99	0.00	57
10/12/99	12/22/99	0.04	71
12/22/99	3/20/00	0.55	89
3/20/00	5/30/00	0.10	71
5/30/00	8/9/00	0.03	71
8/9/00	8/28/00	0.00	19
8/28/00	10/10/00	0.00	43
10/10/00	11/4/00	0.02	25
11/4/00	12/15/00	0.12	41
12/15/00	3/19/01	0.17	94
3/19/01	4/26/01	0.06	38
4/26/01	7/7/01	0.01	72
7/7/01	9/29/01	0.04	84
9/29/01	3/2/02	ND	154
3/2/02	4/27/02	0.09	56
4/27/02	10/5/02	0.11	161
10/5/02	10/25/02	0.00	20
10/25/02	3/7/03	0.47	133
3/7/03	5/17/03	0.23	71
5/17/03	7/12/03	0.01	56
7/12/03	9/21/03	0.08	71
9/21/03	10/12/03	0.00	21
10/12/03	2/14/04	0.32	125
2/14/04	4/25/04	0.15	71
4/25/04	7/10/04	0.07	76
7/10/04	10/10/04	0.12	92
CS6			
9/9/98	10/13/98	0.21	34
10/13/98	1/4/99	0.17	83

1/4/99	1/29/99	0.16	25
1/29/99	2/16/99	0.16	18
2/16/99	5/3/99	0.18	76
5/3/99	5/5/99	0.00	2
5/5/99	6/21/99	0.05	47
6/21/99	8/16/99	0.06	56
8/16/99	10/12/99	0.02	57
10/12/99	12/22/99	0.07	71
12/22/99	3/20/00	0.50	89
3/20/00	5/30/00	0.09	71
5/30/00	8/9/00	0.02	71
8/9/00	8/28/00	0.00	19
8/28/00	10/10/00	0.01	43
10/10/00	11/4/00	0.02	25
11/4/00	12/15/00	0.10	41
12/15/00	3/19/01	0.11	94
3/19/01	4/26/01	0.07	38
4/26/01	7/7/01	0.02	72
7/7/01	9/29/01	0.03	84
9/29/01	3/2/02	0.39	154
3/2/02	4/27/02	0.10	56
4/27/02	10/5/02	0.10	161
10/5/02	10/25/02	0.00	20
10/25/02	3/7/03	ND	133
3/7/03	5/17/03	0.20	71
5/17/03	7/12/03	0.01	56
7/12/03	9/21/03	ND	71
9/21/03	10/12/03	0.00	21
10/12/03	2/14/04	0.31	125
2/14/04	4/25/04	0.13	71
4/25/04	7/10/04	0.08	76
7/10/04	10/10/04	0.16	92
10/10/04	4/23/05	0.72	195
4/23/05	7/16/05	0.13	84
7/16/05	10/15/05	0.06	91
10/15/05	2/12/06	0.74	120
2/12/06	4/29/06	0.58	76
4/29/06	6/10/06	0.03	42
6/10/06	8/12/06	0.01	63
8/12/06	9/30/06	0.08	49
9/30/06	2/4/07	0.08	127
2/4/07	3/11/07	0.23	35
3/11/07	5/15/07	0.14	65

5/15/07	7/29/07	0.01	75
7/29/07	10/20/07	0.07	83
10/20/07	3/29/08	0.51	161
3/29/08	6/30/08	ND	93
6/30/08	10/4/08	0.03	96
10/4/08	5/24/09	0.50	232
5/24/09	10/8/09	0.22	137
10/8/09	4/24/10	0.77	198
4/24/10	10/10/10	0.26	169
10/10/10	5/13/11	0.90	215
5/13/11	10/9/11	0.26	149
10/9/11	6/3/12	0.35	238
6/3/12	10/22/12	0.07	141
10/22/12	5/18/13	0.49	208
5/18/13	10/18/13	0.21	153
10/18/13	5/10/14	ND	204
5/10/14	10/16/14	0.23	159
10/16/14	10/5/15	ND	354
10/5/15	5/12/16	0.60	220
5/12/16	5/4/17	ND	357
5/4/17	10/3/17	0.15	152
CS9			
9/10/98	10/14/98	ND	34
10/14/98	1/4/99	0.39	82
1/4/99	2/1/99	0.35	28
2/1/99	2/11/99	0.28	10
2/11/99	5/5/99	0.22	83
5/5/99	5/6/99	0.00	1
5/6/99	6/21/99	0.01	46
6/21/99	8/17/99	0.06	57
8/17/99	10/11/99	0.00	55
10/11/99	12/22/99	0.15	72
12/22/99	3/20/00	0.84	89
3/20/00	5/31/00	0.15	72
5/31/00	8/11/00	0.03	72
8/11/00	8/30/00	0.00	19
8/30/00	10/9/00	0.01	40
10/9/00	12/18/00	0.18	70
12/18/00	3/21/01	0.28	93
3/21/01	4/30/01	0.13	40
4/30/01	7/7/01	0.02	68
7/7/01	10/1/01	0.05	86

10/1/01	5/10/02	ND	221
5/10/02	10/13/02	0.10	156
10/13/02	3/11/03	ND	149
3/11/03	5/18/03	0.33	68
5/18/03	7/12/03	0.05	55
7/12/03	9/14/03	0.13	64
9/14/03	10/12/03	0.00	28
CS10			
1/11/99	2/1/99	0.22	21
2/1/99	3/22/99	0.24	49
3/22/99	5/6/99	0.19	45
5/6/99	6/21/99	0.03	46
6/21/99	8/17/99	0.04	57
8/17/99	10/11/99	0.01	55
10/11/99	12/22/99	0.13	72
12/22/99	3/20/00	0.66	89
3/20/00	4/24/00	0.03	35
4/24/00	5/31/00	0.09	37
5/31/00	8/11/00	0.02	72
8/11/00	8/30/00	0.00	19
8/30/00	10/9/00	0.03	40
10/9/00	3/21/01	0.45	163
3/21/01	4/30/01	0.14	40
4/30/01	7/7/01	0.02	68
7/7/01	10/1/01	0.05	86
10/1/01	5/10/02	ND	221
5/10/02	10/13/02	ND	156
10/13/02	3/11/03	0.54	149
3/11/03	5/18/03	0.33	68
5/18/03	7/12/03	0.04	55
7/12/03	9/14/03	0.13	64
9/14/03	10/12/03	0.00	28
10/12/03	4/28/04	0.65	199
4/28/04	7/10/04	0.09	73
7/10/04	5/28/05	0.54	322
5/28/05	6/16/05	0.07	19
6/16/05	10/9/05	0.06	115
10/9/05	5/14/06	ND	217
5/14/06	8/16/06	0.04	94
8/16/06	10/15/06	0.04	60
10/15/06	4/7/07	0.59	174
4/7/07	5/22/07	0.08	45

5/22/07	7/28/07	0.02	67
7/28/07	10/18/07	ND	82
10/18/07	6/12/08	1.25	238
6/12/08	10/18/08	0.03	128
10/18/08	6/29/09	0.98	254
6/29/09	10/8/09	0.06	101
10/8/09	6/2/10	1.23	237
6/2/10	10/14/10	0.40	134
10/14/10	7/12/11	0.70	271
7/12/11	10/23/11	0.10	103
10/23/11	7/1/12	0.52	252
7/1/12	10/22/12	ND	113
10/22/12	7/21/13	0.99	272
7/21/13	10/10/13	0.10	81
10/10/13	10/16/14	0.96	371
10/16/14	10/4/15	1.02	353
10/4/15	5/12/16	2.05	221
5/12/16	10/21/16	0.27	162
10/21/16	6/7/17	1.77	229
6/7/17	10/3/17	0.10	118
CS11			
1/8/99	3/24/99	0.45	75
3/24/99	5/7/99	0.13	44
5/7/99	6/21/99	0.06	45
6/21/99	8/17/99	0.03	57
8/17/99	10/11/99	0.03	55
10/11/99	12/24/99	0.09	74
12/24/99	4/17/00	0.57	115
4/17/00	4/24/00	0.03	7
4/24/00	6/8/00	0.18	45
6/8/00	8/11/00	0.05	64
8/11/00	8/30/00	0.00	19
8/30/00	10/9/00	0.02	40
10/9/00	3/21/01	0.36	163
3/21/01	5/2/01	0.13	42
5/2/01	7/9/01	0.00	68
7/9/01	10/1/01	0.02	84
10/1/01	5/13/02	1.58	224
5/13/02	10/20/02	0.18	160
10/20/02	6/1/03	0.73	224
6/1/03	7/20/03	0.01	49
7/20/03	9/21/03	0.11	63

9/21/03	10/11/03	0.01	20
10/11/03	5/3/04	0.86	205
5/3/04	7/18/04	0.12	76
7/18/04	9/30/04	0.02	74
9/30/04	5/29/05	1.28	241
5/29/05	7/16/05	0.09	48
7/16/05	10/15/05	0.09	91
10/15/05	5/14/06	1.26	211
5/14/06	8/12/06	0.08	90
8/12/06	10/15/06	0.07	64
10/15/06	4/7/07	0.43	174
4/7/07	5/22/07	0.15	45
5/22/07	7/28/07	0.06	67
7/28/07	10/18/07	0.05	82
10/18/07	6/12/08	ND	238
6/12/08	10/18/08	0.02	128
10/18/08	6/29/09	1.13	254
6/29/09	10/9/09	ND	102
10/9/09	6/3/10	1.79	237
6/3/10	10/14/10	0.23	133
10/14/10	5/12/11	1.34	210
5/12/11	10/23/11	0.33	164
10/23/11	6/15/12	0.39	236
6/15/12	10/23/12	0.28	130
10/23/12	7/21/13	0.52	271
7/21/13	10/8/13	0.09	79
10/8/13	5/25/14	0.56	229
5/25/14	10/16/14	0.31	144
10/16/14	10/4/15	1.18	353
10/4/15	6/3/16	1.40	243
6/3/16	10/22/16	0.20	141
10/22/16	5/4/17	1.63	194
5/4/17	10/31/17	0.32	180

Table A4. Duck Lake Valley

Measurement period start	Measurement period end	Total precipitation (ft)	Number of days in period
DL1			
11/11/06	3/31/07	0.32	140
3/31/07	5/26/07	0.09	56
5/26/07	9/3/07	0.03	100
9/3/07	9/29/07	0.03	26

9/29/07	4/19/08	0.65	203
4/19/08	5/24/08	0.03	35
5/24/08	8/30/08	0.11	98
8/30/08	10/10/08	0.05	41
10/10/08	5/14/09	0.85	216
5/14/09	8/22/09	ND	100
8/22/09	10/11/09	0.00	50
10/11/09	5/23/10	ND	224
5/23/10	10/9/10	0.26	139
10/9/10	6/20/11	1.23	254
6/20/11	10/1/11	0.04	103
10/1/11	5/6/12	0.45	218
5/6/12	9/29/12	0.04	146
9/29/12	8/12/13	0.85	317
8/12/13	10/12/13	0.06	61
10/12/13	6/13/14	0.53	244
6/13/14	10/12/14	0.09	121
10/12/14	10/11/15	1.20	364
10/11/15	10/11/15	ND	364
6/24/16	6/13/17	0.79	354
6/13/17	10/14/17	0.28	123
DL2			
11/11/06	3/31/07	0.27	140
3/31/07	5/26/07	0.07	56
5/26/07	9/3/07	ND	100
9/3/07	9/29/07	0.02	26
9/29/07	4/19/08	ND	203
4/19/08	5/25/08	ND	36
5/25/08	8/30/08	0.14	97
8/30/08	10/10/08	0.04	41
10/10/08	5/14/09	0.53	216
5/14/09	8/22/09	0.13	100
8/22/09	10/11/09	0.00	50
10/11/09	5/23/10	0.59	224
5/23/10	10/9/10	0.39	139
10/9/10	6/20/11	0.74	254
6/20/11	10/1/11	0.03	103
10/1/11	5/6/12	ND	218
5/6/12	9/30/12	0.03	147
9/30/12	8/12/13	0.65	316
8/12/13	10/13/13	0.07	62
10/13/13	6/13/14	0.39	243

6/13/14	10/12/14	0.07	121
10/12/14	10/11/15	ND	364
10/11/15	6/24/16	0.65	257
6/24/16	6/13/17	0.79	354
6/13/17	10/14/17	0.13	123
DL3			
11/19/06	3/31/07	0.56	132
3/31/07	5/26/07	0.22	56
5/26/07	9/3/07	0.08	100
9/3/07	9/29/07	0.02	26
9/29/07	5/24/08	1.59	238
5/24/08	8/30/08	0.17	98
8/30/08	10/9/08	0.04	40
10/9/08	5/9/09	1.13	212
5/9/09	8/23/09	0.24	106
8/23/09	10/10/09	0.02	48
10/10/09	5/25/10	ND	227
5/25/10	10/9/10	ND	137
10/9/10	6/19/11	2.01	253
6/19/11	10/2/11	0.05	105
10/2/11	5/6/12	0.65	217
5/6/12	9/30/12	0.14	147
9/30/12	8/11/13	ND	315
8/11/13	10/13/13	0.10	63
10/13/13	6/13/14	ND	243
6/13/14	10/10/14	ND	119
10/10/14	10/11/15	ND	366
10/11/15	6/25/16	0.87	258
6/25/16	6/24/17	ND	364
6/24/17	10/14/17	0.14	112
DL4			
11/11/06	3/31/07	0.35	140
3/31/07	5/26/07	0.15	56
5/26/07	6/3/07	0.00	8
6/3/07	9/3/07	ND	92
9/3/07	9/29/07	0.02	26
9/29/07	4/19/08	1.02	203
4/19/08	5/24/08	0.06	35
5/24/08	8/30/08	ND	98
8/30/08	10/9/08	0.03	40
10/9/08	5/9/09	0.85	212
5/9/09	8/23/09	ND	106

8/23/09	10/10/09	ND	48
10/10/09	5/25/10	1.28	227
5/25/10	10/9/10	0.40	137
10/9/10	6/19/11	ND	253
6/19/11	10/2/11	0.04	105
10/2/11	5/6/12	0.53	217
5/6/12	9/30/12	0.06	147
9/30/12	8/11/13	1.14	315
8/11/13	10/13/13	0.09	63
10/13/13	6/13/14	0.62	243
6/13/14	10/10/14	0.18	119
10/10/14	10/11/15	1.22	366
10/11/15	6/25/16	1.61	258
6/25/16	6/24/17	1.50	364
6/24/17	10/14/17	0.11	112
DL5			
11/11/06	3/31/07	0.26	140
3/31/07	5/26/07	0.10	56
5/26/07	9/3/07	ND	100
9/3/07	9/29/07	0.01	26
9/29/07	4/19/08	0.38	203
4/19/08	5/24/08	0.05	35
5/24/08	8/30/08	0.13	98
8/30/08	10/9/08	0.03	40
10/9/08	5/9/09	0.50	212
5/9/09	8/23/09	0.24	106
8/23/09	10/10/09	0.01	48
10/10/09	5/25/10	0.70	227
5/25/10	10/9/10	0.36	137
10/9/10	6/19/11	0.80	253
6/19/11	10/2/11	0.03	105
10/2/11	5/6/12	0.32	217
5/6/12	9/30/12	0.04	147
9/30/12	8/11/13	0.70	315
8/11/13	10/13/13	0.07	63
10/13/13	6/13/14	0.50	243
6/13/14	10/10/14	0.12	119
10/10/14	10/11/15	1.05	366
10/11/15	6/25/16	ND	258
6/25/16	6/24/17	ND	364
6/24/17	10/14/17	0.12	112
DL6			

11/11/06	3/31/07	0.27	140
3/31/07	5/26/07	0.10	56
5/26/07	9/3/07	0.05	100
9/3/07	9/29/07	0.02	26
9/29/07	4/19/08	0.40	203
4/19/08	5/24/08	0.04	35
5/24/08	8/30/08	0.13	98
8/30/08	10/9/08	0.02	40
10/9/08	5/9/09	0.57	212
5/9/09	8/23/09	0.16	106
8/23/09	10/10/09	0.01	48
10/10/09	5/25/10	0.66	227
5/25/10	10/9/10	0.39	137
10/9/10	6/19/11	0.83	253
6/19/11	10/2/11	0.03	105
10/2/11	5/6/12	0.34	217
5/6/12	9/30/12	0.04	147
9/30/12	8/11/13	0.72	315
8/11/13	10/13/13	0.09	63
10/13/13	6/13/14	ND	243
6/13/14	10/10/14	0.09	119
10/10/14	10/11/15	0.99	366
10/11/15	6/25/16	0.72	258
6/25/16	6/24/17	0.83	364
6/24/17	10/14/17	0.12	112

DL7			
11/12/06	3/31/07	0.35	139
3/31/07	5/26/07	0.10	56
5/26/07	6/3/07	0.00	8
6/3/07	9/3/07	0.06	92
9/3/07	9/29/07	0.04	26
9/29/07	5/25/08	0.53	239
5/25/08	8/30/08	0.08	97
8/30/08	9/28/08	0.00	29
9/28/08	5/14/09	0.62	228
5/14/09	8/23/09	0.08	101
8/23/09	10/11/09	0.01	49
10/11/09	5/23/10	0.53	224
5/23/10	10/9/10	0.24	139
10/9/10	6/20/11	0.75	254
6/20/11	10/2/11	0.06	104
10/2/11	5/6/12	0.41	217

5/6/12	9/30/12	0.05	147
9/30/12	8/11/13	0.66	315
8/11/13	10/13/13	0.11	63
10/13/13	6/13/14	0.44	243
6/13/14	10/10/14	0.45	119
10/10/14	10/9/15	1.06	364
10/9/15	6/26/16	0.77	261
6/26/16	6/14/17	0.96	353
6/14/17	10/14/17	0.09	122
DL8			
11/12/06	3/31/07	0.28	139
3/31/07	5/26/07	0.08	56
5/26/07	9/3/07	0.05	100
9/3/07	9/29/07	0.03	26
9/29/07	5/25/08	0.68	239
5/25/08	8/30/08	0.12	97
8/30/08	9/28/08	0.01	29
9/28/08	5/14/09	0.53	228
5/14/09	8/23/09	0.09	101
8/23/09	10/11/09	0.00	49
10/11/09	5/23/10	ND	224
5/23/10	10/9/10	ND	139
10/9/10	6/20/11	0.77	254
6/20/11	10/2/11	0.06	104
10/2/11	5/6/12	0.41	217
5/6/12	9/30/12	0.06	147
9/30/12	8/11/13	0.63	315
8/11/13	10/13/13	0.12	63
10/13/13	6/13/14	0.44	243
6/13/14	10/10/14	0.13	119
10/10/14	10/9/15	1.14	364
10/9/15	6/26/16	0.79	261
6/26/16	6/14/17	0.98	353
6/14/17	10/14/17	0.08	122
DL9			
11/12/06	3/31/07	0.27	139
3/31/07	5/26/07	0.09	56
5/26/07	9/3/07	0.02	100
9/3/07	9/29/07	0.02	26
9/29/07	5/25/08	0.47	239
5/25/08	8/30/08	0.14	97
8/30/08	9/28/08	0.00	29

9/28/08	5/14/09	0.55	228
5/14/09	8/23/09	0.09	101
8/23/09	10/11/09	0.00	49
10/11/09	5/24/10	0.59	225
5/24/10	10/9/10	0.21	138
10/9/10	6/22/11	0.81	256
6/22/11	10/2/11	0.05	102
10/2/11	5/6/12	0.38	217
5/6/12	9/30/12	0.04	147
9/30/12	8/11/13	0.73	315
8/11/13	10/13/13	0.12	63
10/13/13	6/13/14	0.45	243
6/13/14	10/10/14	0.10	119
10/10/14	10/9/15	1.14	364
10/9/15	6/26/16	0.75	261
6/26/16	6/14/17	0.97	353
6/14/17	10/14/17	0.10	122
DL10			
11/19/06	3/31/07	0.25	132
3/31/07	5/27/07	0.12	57
5/27/07	9/8/07	0.05	104
9/8/07	9/29/07	0.01	21
9/29/07	5/25/08	0.77	239
5/25/08	8/31/08	0.12	98
8/31/08	10/9/08	0.06	39
10/9/08	5/9/09	0.60	212
5/9/09	8/22/09	0.17	105
8/22/09	10/10/09	0.00	49
10/10/09	5/25/10	0.61	227
5/25/10	10/2/10	0.24	130
10/2/10	6/19/11	1.03	260
6/19/11	10/1/11	0.07	104
10/1/11	5/5/12	0.40	217
5/5/12	9/29/12	0.07	147
9/29/12	8/10/13	0.73	315
8/10/13	10/12/13	0.16	63
10/12/13	6/13/14	0.49	244
6/13/14	10/9/14	0.17	118
10/9/14	10/9/15	1.02	365
10/9/15	6/25/16	1.02	260
6/25/16	6/13/17	0.97	353
6/13/17	10/14/17	0.14	123

DL11			
11/19/06	3/31/07	0.21	132
3/31/07	5/27/07	0.11	57
5/27/07	9/8/07	0.05	104
9/8/07	9/29/07	0.00	21
9/29/07	5/25/08	0.52	239
5/25/08	8/31/08	0.17	98
8/31/08	10/9/08	0.04	39
10/9/08	5/9/09	0.51	212
5/9/09	8/22/09	0.23	105
8/22/09	10/10/09	0.01	49
10/10/09	5/25/10	0.54	227
5/25/10	10/2/10	0.21	130
10/2/10	6/19/11	0.85	260
6/19/11	10/1/11	0.11	104
10/1/11	5/5/12	0.33	217
5/5/12	9/29/12	0.07	147
9/29/12	8/10/13	ND	315
8/10/13	10/12/13	0.11	63
10/12/13	6/13/14	0.38	244
6/13/14	10/9/14	0.16	118
10/9/14	10/9/15	0.81	365
10/9/15	6/25/16	0.64	260
6/25/16	6/13/17	0.82	353
6/13/17	10/14/17	0.13	123
DL12			
11/19/2006	3/31/07	0.15	132
3/31/2007	5/27/07	0.07	57
5/27/2007	9/8/07	0.02	104
9/8/2007	9/29/07	0.00	21
9/29/2007	5/25/08	0.39	239
5/25/2008	8/31/08	0.13	98
8/31/2008	10/9/08	0.03	39
10/9/2008	5/9/09	0.42	212
5/9/2009	8/22/09	0.18	105
8/22/2009	10/10/09	0.00	49
10/10/2009	5/25/10	0.38	227
5/25/2010	10/2/10	0.13	130
10/2/2010	6/19/11	0.74	260
6/19/2011	10/1/11	0.03	104
10/1/2011	5/5/12	0.25	217
5/5/2012	9/29/12	0.03	147

9/29/2012	8/10/13	0.52	315
8/10/2013	10/12/13	0.09	63
10/12/2013	6/13/14	0.32	244
6/13/2014	10/9/14	0.11	118
10/9/14	10/9/15	0.78	365
10/9/15	6/25/16	0.78	260
6/25/16	6/14/17	0.67	354
6/14/17	10/14/17	0.07	122
DL13			
11/18/06	4/1/07	0.21	134
4/1/07	5/27/07	0.11	56
5/27/07	9/8/07	0.04	104
9/8/07	9/30/07	0.01	22
9/30/07	6/6/08	0.97	250
6/6/08	8/31/08	0.01	86
8/31/08	10/9/08	0.03	39
10/9/08	5/10/09	0.56	213
5/10/09	8/22/09	0.13	104
8/22/09	10/10/09	0.00	49
10/10/09	5/24/10	0.47	226
5/24/10	10/2/10	0.09	131
10/2/10	6/18/11	0.82	259
6/18/11	10/1/11	0.05	105
10/1/11	5/5/12	0.39	217
5/5/12	9/29/12	0.06	147
9/29/12	8/10/13	0.67	315
8/10/13	10/12/13	0.13	63
10/12/13	6/12/14	ND	243
6/12/14	10/9/14	0.17	119
10/9/14	10/8/15	ND	364
10/8/15	6/25/16	0.75	261
6/25/16	6/13/17	0.72	353
DL14			
11/18/06	4/1/07	0.20	134
4/1/07	5/27/07	0.09	56
5/27/07	9/8/07	0.04	104
9/8/07	9/30/07	0.01	22
9/30/07	6/6/08	0.55	250
6/6/08	8/31/08	0.03	86
8/31/08	10/9/08	0.02	39
10/9/08	5/10/09	0.54	213
5/10/09	8/22/09	0.10	104

8/22/09	10/10/09	0.00	49
10/10/09	5/24/10	0.50	226
5/24/10	10/2/10	0.11	131
10/2/10	6/18/11	0.77	259
6/18/11	10/1/11	0.13	105
10/1/11	5/5/12	0.39	217
5/5/12	9/29/12	0.10	147
9/29/12	8/10/13	0.63	315
8/10/13	10/12/13	0.14	63
10/12/13	6/12/14	0.38	243
6/12/14	10/9/14	0.19	119
10/9/14	10/8/15	0.77	364
10/8/15	6/25/16	0.75	261
6/25/16	6/13/17	ND	353
DL15			
11/10/06	4/1/07	0.30	142
4/1/07	5/27/07	0.11	56
5/27/07	9/8/07	0.04	104
9/8/07	9/30/07	0.04	22
9/30/07	5/26/08	1.17	239
5/26/08	8/31/08	ND	97
8/31/08	10/9/08	0.03	39
10/9/08	5/10/09	0.91	213
5/10/09	8/22/09	0.17	104
8/22/09	10/10/09	0.01	49
10/10/09	5/24/10	0.77	226
5/24/10	10/2/10	0.14	131
10/2/10	6/18/11	1.34	259
6/18/11	10/1/11	0.06	105
10/1/11	5/5/12	0.41	217
5/5/12	9/29/12	0.02	147
9/29/12	8/10/13	0.60	315
8/10/13	10/12/13	0.13	63
10/12/13	6/12/14	0.41	243
6/12/14	10/9/14	0.14	119
10/9/14	10/8/15	0.92	364
10/8/15	6/25/16	0.73	261
6/25/16	6/13/17	1.01	353
6/13/17	10/14/17	0.11	123
DL16			
11/10/06	4/1/07	0.26	142
4/1/07	5/27/07	0.09	56

5/27/07	9/8/07	0.02	104
9/8/07	9/30/07	0.03	22
9/30/07	5/26/08	0.54	239
5/26/08	8/31/08	0.06	97
8/31/08	10/9/08	0.04	39
10/9/08	5/10/09	0.44	213
5/10/09	8/22/09	0.15	104
8/22/09	10/10/09	0.00	49
10/10/09	5/24/10	0.39	226
5/24/10	10/2/10	0.15	131
10/2/10	6/18/11	0.90	259
6/18/11	10/1/11	0.05	105
10/1/11	5/5/12	ND	217
5/5/12	9/29/12	0.02	147
9/29/12	8/10/13	0.56	315
8/10/13	10/12/13	0.15	63
10/12/13	6/12/14	0.38	243
6/12/14	10/9/14	0.11	119
10/9/14	10/8/15	0.98	364
10/8/15	6/25/16	0.77	261
6/25/16	6/13/17	1.02	353
6/13/17	10/14/17	0.09	123
DL17			
11/25/06	4/1/07	0.19	127
4/1/07	5/26/07	0.06	55
5/26/07	9/8/07	0.05	105
9/8/07	9/29/07	0.00	21
9/29/07	5/26/08	0.58	240
5/26/08	9/1/08	ND	98
9/1/08	10/10/08	0.06	39
10/10/08	5/14/09	ND	216
5/14/09	8/23/09	ND	101
8/23/09	10/11/09	0.00	49
10/11/09	5/23/10	0.33	224
5/23/10	10/2/10	0.12	132
10/2/10	6/20/11	0.76	261
6/20/11	10/2/11	0.07	104
10/2/11	5/6/12	0.25	217
5/6/12	9/30/12	0.04	147
9/30/12	8/12/13	0.38	316
8/12/13	10/13/13	0.12	62
10/13/13	6/13/14	0.31	243

6/13/14	10/10/14	0.15	119
10/10/14	10/9/15	0.76	364
10/9/15	6/25/16	0.63	260
6/25/16	6/13/17	0.81	353
6/13/17	10/14/17	0.16	123
DL18			
11/25/06	4/1/07	0.22	127
4/1/07	5/26/07	0.06	55
5/26/07	9/8/07	0.03	105
9/8/07	10/6/07	0.03	28
10/6/07	5/26/08	0.51	233
5/26/08	9/1/08	0.04	98
9/1/08	10/10/08	0.05	39
10/10/08	5/14/09	0.53	216
5/14/09	8/23/09	0.15	101
8/23/09	10/11/09	0.00	49
10/11/09	5/23/10	0.51	224
5/23/10	10/9/10	0.20	139
10/9/10	6/20/11	0.95	254
6/20/11	10/2/11	0.06	104
10/2/11	5/6/12	0.42	217
5/6/12	9/30/12	0.03	147
9/30/12	8/12/13	0.69	316
8/12/13	10/13/13	0.14	62
10/13/13	6/13/14	0.48	243
6/13/14	10/10/14	0.17	119
10/10/14	10/9/15	0.78	364
10/9/15	6/25/16	0.91	260
6/25/16	6/13/17	0.21	353
6/13/17	10/14/17	0.08	123
DL19			
11/25/06	4/1/07	0.26	127
4/1/07	5/26/07	0.08	55
5/26/07	9/8/07	0.06	105
9/8/07	10/6/07	0.03	28
10/6/07	6/6/08	0.67	244
6/6/08	9/1/08	0.00	87
9/1/08	10/10/08	0.05	39
10/10/08	5/14/09	0.65	216
5/14/09	8/23/09	0.16	101
8/23/09	10/11/09	0.00	49
10/11/09	5/23/10	0.63	224

5/23/10	10/9/10	0.23	139
10/9/10	6/20/11	1.08	254
6/20/11	10/2/11	0.06	104
10/2/11	5/6/12	0.56	217
5/6/12	9/30/12	0.03	147
9/30/12	8/12/13	0.80	316
8/12/13	10/13/13	0.15	62
10/13/13	6/13/14	0.60	243
6/13/14	10/10/14	0.17	119
10/10/14	10/9/15	0.92	364
10/9/15	6/25/16	1.10	260
6/25/16	6/13/17	1.48	353
6/13/17	10/14/17	0.11	123

Table A5. Dry Valley

Measurement period start	Measurement period end	Total precipitation (ft)	Number of days in period
DV1			
12/22/00	3/20/01	0.13	88
3/20/01	5/3/01	0.07	44
5/3/01	7/8/01	0.03	66
7/8/01	9/30/01	0.12	84
9/30/01	1/17/02	0.40	109
1/17/02	5/11/02	0.31	114
5/11/02	10/12/02	0.23	154
10/12/02	3/9/03	0.55	148
3/9/03	5/31/03	0.22	83
5/31/03	7/19/03	0.01	49
7/19/03	9/13/03	0.09	56
9/13/03	10/19/03	0.00	36
10/19/03	4/4/04	0.53	168
4/4/04	5/1/04	0.00	27
5/1/04	7/17/04	0.11	77
7/17/04	10/9/04	0.05	84
10/9/04	4/24/05	0.75	197
4/24/05	7/9/05	0.18	76
7/9/05	9/10/05	0.07	63
9/10/05	10/8/05	0.01	28
10/8/05	5/6/06	ND	210
5/6/06	6/18/06	0.07	43
6/18/06	8/26/06	0.02	69

8/26/06	10/7/06	0.02	42
10/7/06	3/18/07	0.41	162
3/18/07	5/18/07	0.12	61
5/18/07	7/29/07	0.08	72
7/29/07	10/14/07	0.12	77
10/14/07	4/5/08	0.55	174
4/5/08	7/2/08	0.11	88
7/2/08	9/21/08	0.00	81
9/21/08	12/7/08	0.11	77
12/7/08	6/7/09	0.68	182
6/7/09	10/2/09	0.02	117
10/2/09	4/18/10	0.70	198
4/18/10	9/26/10	0.21	161
9/26/10	5/15/11	1.10	231
5/15/11	9/17/11	ND	125
9/17/11	5/19/12	0.53	245
5/19/12	10/13/12	0.05	147
10/13/12	5/19/13	0.63	218
5/19/13	10/16/13	ND	150
10/16/13	5/24/14	0.52	220
5/24/14	10/14/14	ND	143
10/14/14	9/28/15	1.06	349
9/28/15	6/10/16	1.21	256
6/10/16	10/24/16	0.26	136
10/24/16	6/6/17	ND	225
6/6/17	10/28/17	0.23	144

DV2			
12/23/00	3/20/01	0.28	87
3/20/01	5/3/01	0.10	44
5/3/01	7/8/01	0.01	66
7/8/01	9/30/01	ND	84
9/30/01	1/25/02	0.35	117
1/25/02	5/11/02	0.30	106
5/11/02	10/12/02	0.08	154
10/12/02	3/9/03	0.86	148
3/9/03	5/31/03	0.24	83
5/31/03	7/19/03	0.02	49
7/19/03	9/13/03	0.10	56
9/13/03	10/19/03	0.00	36
10/19/03	4/4/04	0.50	168
4/4/04	5/1/04	0.01	27
5/1/04	7/17/04	0.14	77

7/17/04	10/9/04	0.18	84
10/9/04	4/24/05	0.89	197
4/24/05	7/9/05	0.18	76
7/9/05	9/10/05	0.05	63
9/10/05	5/6/06	1.32	238
5/6/06	6/18/06	0.07	43
6/18/06	8/26/06	0.00	69
8/26/06	10/7/06	0.03	42
10/7/06	3/18/07	0.37	162
3/18/07	5/18/07	0.12	61
5/18/07	7/29/07	0.05	72
7/29/07	10/14/07	0.11	77
10/14/07	4/5/08	0.60	174
4/5/08	7/2/08	0.17	88
7/2/08	9/21/08	0.02	81
9/21/08	12/7/08	0.12	77
12/7/08	6/7/09	0.67	182
6/7/09	10/2/09	0.02	117
10/2/09	4/18/10	0.64	198
4/18/10	9/26/10	0.20	161
9/26/10	5/15/11	1.01	231
5/15/11	9/17/11	0.31	125
9/17/11	5/19/12	-0.07	245
5/19/12	10/13/12	0.05	147
10/13/12	5/19/13	0.60	218
5/19/13	10/16/13	0.07	150
10/16/13	5/24/14	0.43	220
5/24/14	10/14/14	0.23	143
10/14/14	9/28/15	1.12	349
9/28/15	6/13/16	1.11	259
6/13/16	10/24/16	0.10	133
10/24/16	6/6/17	ND	225
6/6/17	10/28/17	0.33	144

DV3			
12/23/00	3/20/01	0.17	87
3/20/01	5/3/01	0.06	44
5/3/01	7/8/01	0.00	66
7/8/01	9/30/01	ND	84
9/30/01	1/25/02	0.25	117
1/25/02	5/11/02	0.27	106
5/11/02	10/12/02	0.06	154
10/12/02	3/9/03	0.32	148

3/9/03	5/31/03	0.18	83
5/31/03	7/19/03	0.01	49
7/19/03	9/13/03	ND	56
9/13/03	10/19/03	0.00	36
10/19/03	4/4/04	0.36	168
4/4/04	5/1/04	0.01	27
5/1/04	7/17/04	0.14	77
7/17/04	10/9/04	ND	84
10/9/04	4/24/05	0.59	197
4/24/05	7/9/05	0.15	76
7/9/05	9/10/05	0.04	63
9/10/05	5/6/06	1.04	238
5/6/06	6/18/06	0.05	43
6/18/06	8/26/06	0.01	69
8/26/06	10/7/06	0.02	42
10/7/06	3/18/07	ND	162
3/18/07	5/18/07	0.09	61
5/18/07	7/29/07	0.06	72
7/29/07	10/14/07	0.07	77
10/14/07	4/5/08	0.41	174
4/5/08	7/2/08	0.14	88
7/2/08	9/21/08	0.02	81
9/21/08	12/7/08	0.10	77
12/7/08	6/7/09	0.49	182
6/7/09	10/2/09	0.03	117
10/2/09	4/18/10	0.47	198
4/18/10	9/26/10	0.21	161
9/26/10	5/15/11	1.01	231
5/15/11	9/17/11	0.31	125
9/17/11	5/19/12	0.39	245
5/19/12	10/13/12	ND	147
10/13/12	5/19/13	ND	218
5/19/13	10/16/13	0.06	150
10/16/13	5/24/14	0.40	220
5/24/14	10/14/14	0.16	143
10/14/14	9/28/15	1.02	349
9/28/15	6/13/16	ND	259
6/13/16	10/24/16	0.11	133
10/24/16	6/6/17	ND	225
6/6/17	10/28/17	0.28	144

DV4

12/28/00	3/20/01	0.17	82
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3/20/01	5/1/01	0.08	42
5/1/01	7/9/01	0.01	69
7/9/01	9/30/01	0.02	83
9/30/01	1/25/02	0.39	117
1/25/02	5/12/02	0.29	107
5/12/02	10/12/02	0.11	153
10/12/02	3/10/03	0.40	149
3/10/03	5/31/03	0.24	82
5/31/03	7/19/03	0.02	49
7/19/03	9/13/03	0.11	56
9/13/03	10/20/03	0.00	37
10/20/03	4/4/04	0.46	167
4/4/04	5/1/04	0.00	27
5/1/04	7/17/04	0.18	77
7/17/04	10/9/04	0.03	84
10/9/04	4/30/05	0.75	203
4/30/05	7/9/05	0.15	70
7/9/05	9/10/05	0.06	63
9/10/05	5/7/06	1.25	239
5/7/06	6/18/06	0.05	42
6/18/06	8/26/06	0.00	69
8/26/06	10/7/06	0.03	42
10/7/06	3/18/07	0.32	162
3/18/07	5/18/07	0.14	61
5/18/07	7/29/07	0.06	72
7/29/07	10/14/07	0.10	77
10/14/07	4/7/08	0.53	176
4/7/08	7/2/08	0.14	86
7/2/08	9/21/08	0.00	81
9/21/08	12/8/08	0.11	78
12/8/08	6/7/09	0.77	181
6/7/09	10/2/09	0.17	117
10/2/09	4/18/10	0.65	198
4/18/10	9/26/10	0.26	161
9/26/10	5/15/11	0.98	231
5/15/11	9/17/11	0.36	125
9/17/11	5/19/12	0.47	245
5/19/12	10/13/12	0.07	147
10/13/12	5/19/13	0.56	218
5/19/13	10/16/13	0.10	150
10/16/13	5/24/14	0.57	220
5/24/14	10/15/14	0.34	144
10/15/14	9/29/15	1.03	349

9/29/15	6/13/16	1.09	258
6/13/16	10/24/16	0.19	133
10/24/16	6/6/17	1.48	225
6/6/17	10/28/17	0.25	144
DV5			
12/29/00	3/20/01	0.23	81
3/20/01	5/1/01	0.10	42
5/1/01	7/9/01	0.04	69
7/9/01	9/30/01	0.03	83
9/30/01	1/25/02	0.48	117
1/25/02	5/12/02	0.34	107
5/12/02	10/12/02	0.15	153
10/12/02	3/10/03	0.61	149
3/10/03	5/31/03	0.39	82
5/31/03	7/19/03	0.00	49
7/19/03	9/13/03	0.13	56
9/13/03	10/20/03	0.00	37
10/20/03	4/4/04	0.25	167
4/4/04	5/1/04	0.36	27
5/1/04	7/17/04	0.13	77
7/17/04	10/9/04	0.03	84
10/9/04	4/30/05	ND	203
4/30/05	7/9/05	0.19	70
7/9/05	9/10/05	0.09	63
9/10/05	5/7/06	1.20	239
5/7/06	6/18/06	0.13	42
6/18/06	8/26/06	0.01	69
8/26/06	10/7/06	0.04	42
10/7/06	3/18/07	0.35	162
3/18/07	5/18/07	0.16	61
5/18/07	7/29/07	0.07	72
7/29/07	10/14/07	0.08	77
10/14/07	4/7/08	0.98	176
4/7/08	7/2/08	0.16	86
7/2/08	9/21/08	0.00	81
9/21/08	12/8/08	0.10	78
12/8/08	6/7/09	0.85	181
6/7/09	10/9/09	0.25	124
10/9/09	4/18/10	0.50	191
4/18/10	9/26/10	0.30	161
9/26/10	5/15/11	0.95	231
5/15/11	9/17/11	0.33	125

9/17/11	5/19/12	0.50	245
5/19/12	10/13/12	0.07	147
10/13/12	5/19/13	0.58	218
5/19/13	10/16/13	0.12	150
10/16/13	5/24/14	0.62	220
5/24/14	10/15/14	0.34	144
10/15/14	9/29/15	1.10	349
9/29/15	6/13/16	1.18	258
6/13/16	10/24/16	0.16	133
10/24/16	6/6/17	ND	225
6/6/17	10/28/17	0.30	144
DV6			
12/30/00	3/20/01	0.16	80
3/20/01	5/3/01	0.06	44
5/3/01	7/9/01	0.02	67
7/9/01	9/30/01	0.02	83
9/30/01	1/20/02	0.38	112
1/20/02	5/11/02	0.31	111
5/11/02	10/12/02	0.11	154
10/12/02	3/9/03	0.49	148
3/9/03	5/31/03	0.24	83
5/31/03	7/19/03	0.03	49
7/19/03	9/13/03	0.10	56
9/13/03	10/19/03	0.00	36
10/19/03	4/4/04	0.48	168
4/4/04	5/1/04	0.02	27
5/1/04	7/17/04	0.09	77
7/17/04	10/9/04	0.11	84
10/9/04	4/24/05	0.80	197
4/24/05	7/9/05	0.18	76
7/9/05	9/10/05	0.05	63
9/10/05	5/6/06	1.26	238
5/6/06	6/18/06	0.10	43
6/18/06	8/26/06	0.02	69
8/26/06	10/7/06	0.02	42
10/7/06	3/18/07	0.36	162
3/18/07	5/18/07	0.09	61
5/18/07	7/29/07	0.07	72
7/29/07	10/14/07	0.10	77
10/14/07	4/5/08	0.65	174
4/5/08	7/2/08	0.14	88
7/2/08	9/21/08	0.01	81

9/21/08	12/7/08	0.10	77
12/7/08	6/7/09	0.63	182
6/7/09	10/2/09	0.07	117
10/2/09	4/18/10	0.63	198
4/18/10	9/26/10	0.26	161
9/26/10	5/15/11	1.00	231
5/15/11	9/17/11	0.39	125
9/17/11	5/19/12	0.49	245
5/19/12	10/13/12	0.05	147
10/13/12	5/19/13	0.60	218
5/19/13	10/16/13	0.08	150
10/16/13	5/24/14	0.55	220
5/24/14	10/14/14	0.24	143
10/14/14	9/28/15	1.00	349
9/28/15	6/13/16	1.15	259
6/13/16	10/24/16	0.18	133
10/24/16	6/6/17	1.49	225
6/6/17	10/28/17	0.23	144

DV7			
1/17/02	5/11/02	0.27	114
5/11/02	10/13/02	0.08	155
10/13/02	3/9/03	0.58	147
3/9/03	5/31/03	0.20	83
5/31/03	7/19/03	0.00	49
7/19/03	9/13/03	0.09	56
9/13/03	10/19/03	0.00	36
10/19/03	4/4/04	0.51	168
4/4/04	5/1/04	0.00	27
5/1/04	7/17/04	0.10	77
7/17/04	10/9/04	0.10	84
10/9/04	4/30/05	0.76	203
4/30/05	7/9/05	0.12	70
7/9/05	9/10/05	0.07	63
9/10/05	10/8/05	0.01	28
10/8/05	5/6/06	1.50	210
5/6/06	6/18/06	0.05	43
6/18/06	8/26/06	0.03	69
8/26/06	10/7/06	0.01	42
10/7/06	3/18/07	0.40	162
3/18/07	5/18/07	0.09	61
5/18/07	7/29/07	0.07	72
7/29/07	10/14/07	0.11	77

10/14/07	4/7/08	ND	176
4/7/08	7/2/08	0.10	86
7/2/08	9/21/08	0.00	81
9/21/08	12/8/08	0.10	78
12/8/08	6/7/09	0.52	181
6/7/09	10/2/09	0.02	117
10/2/09	4/18/10	0.67	198
4/18/10	9/26/10	0.16	161
9/26/10	5/15/11	1.02	231
5/15/11	9/17/11	ND	125
9/17/11	5/19/12	0.50	245
5/19/12	10/13/12	0.04	147
10/13/12	5/19/13	0.67	218
5/19/13	10/16/13	ND	150
10/16/13	5/24/14	0.46	220
5/24/14	10/14/14	0.24	143
10/14/14	9/29/15	0.88	350
9/29/15	6/13/16	1.16	258
6/13/16	10/24/16	0.20	133
10/24/16	6/6/17	ND	225
6/6/17	10/28/17	0.20	144
	DV8		
1/17/02	5/11/02	0.30	114
5/11/02	10/13/02	0.08	155
10/13/02	3/9/03	0.69	147
3/9/03	5/31/03	0.22	83
5/31/03	7/19/03	0.01	49
7/19/03	9/13/03	0.14	56
9/13/03	10/19/03	0.00	36
10/19/03	4/4/04	0.55	168
4/4/04	5/1/04	0.00	27
5/1/04	7/17/04	0.10	77
7/17/04	10/9/04	0.15	84
10/9/04	4/24/05	0.86	197
4/24/05	7/9/05	0.15	76
7/9/05	9/10/05	0.06	63
9/10/05	10/8/05	0.02	28
10/8/05	5/6/06	ND	210
5/6/06	6/18/06	0.07	43
6/18/06	8/26/06	0.01	69
8/26/06	10/7/06	0.02	42
10/7/06	3/18/07	0.45	162

3/18/07	5/18/07	0.11	61
5/18/07	7/29/07	0.06	72
7/29/07	10/14/07	0.13	77
10/14/07	4/5/08	0.55	174
4/5/08	7/2/08	0.09	88
7/2/08	9/21/08	0.01	81
9/21/08	12/7/08	0.12	77
12/7/08	6/7/09	0.58	182
6/7/09	10/2/09	0.02	117
10/2/09	4/18/10	ND	198
4/18/10	9/26/10	0.17	161
9/26/10	5/15/11	1.18	231
5/15/11	9/17/11	0.33	125
9/17/11	5/19/12	0.60	245
5/19/12	10/13/12	0.03	147
10/13/12	5/19/13	0.76	218
5/19/13	10/16/13	ND	150
10/16/13	5/24/14	0.43	220
5/24/14	10/14/14	ND	143
10/14/14	9/28/15	0.85	349
9/28/15	6/13/16	1.24	259
6/13/16	10/24/16	0.19	133
10/24/16	6/6/17	ND	225
6/6/17	10/28/17	0.20	144

DV9			
1/17/02	5/11/02	0.25	114
5/11/02	10/12/02	0.05	154
10/12/02	3/9/03	0.60	148
3/9/03	5/31/03	0.15	83
5/31/03	7/19/03	0.01	49
7/19/03	9/13/03	0.15	56
9/13/03	10/19/03	0.00	36
10/19/03	4/4/04	0.48	168
4/4/04	5/1/04	0.01	27
5/1/04	7/17/04	ND	77
7/17/04	10/9/04	0.14	84
10/9/04	4/24/05	0.71	197
4/24/05	7/9/05	0.12	76
7/9/05	9/10/05	0.07	63
9/10/05	10/8/05	0.01	28
10/8/05	5/6/06	1.47	210
5/6/06	6/18/06	0.05	43

6/18/06	8/26/06	0.02	69
8/26/06	10/7/06	0.02	42
10/7/06	3/18/07	0.32	162
3/18/07	5/18/07	0.08	61
5/18/07	7/29/07	0.07	72
7/29/07	10/14/07	0.13	77
10/14/07	4/5/08	0.48	174
4/5/08	7/2/08	0.11	88
7/2/08	9/21/08	0.00	81
9/21/08	12/7/08	0.10	77
12/7/08	6/7/09	0.52	182
6/7/09	10/2/09	0.03	117
10/2/09	4/18/10	0.64	198
4/18/10	9/26/10	0.17	161
9/26/10	5/15/11	1.00	231
5/15/11	9/17/11	0.28	125
9/17/11	5/19/12	0.49	245
5/19/12	10/13/12	0.04	147
10/13/12	5/19/13	0.63	218
5/19/13	10/16/13	0.06	150
10/16/13	5/24/14	0.44	220
5/24/14	10/14/14	0.20	143
10/14/14	9/28/15	0.88	349
9/28/15	6/13/16	1.10	259
6/13/16	10/24/16	0.16	133
10/24/16	6/6/17	ND	225
6/6/17	10/28/17	0.21	144

DV10			
1/17/02	5/11/02	0.31	114
5/11/02	10/13/02	0.10	155
10/13/02	3/9/03	0.71	147
3/9/03	5/31/03	0.24	83
5/31/03	7/19/03	0.01	49
7/19/03	9/13/03	0.16	56
9/13/03	10/19/03	0.00	36
10/19/03	4/4/04	0.55	168
4/4/04	5/1/04	0.00	27
5/1/04	7/17/04	0.12	77
7/17/04	10/9/04	0.16	84
10/9/04	4/24/05	0.88	197
4/24/05	7/9/05	0.13	76
7/9/05	9/10/05	0.06	63

9/10/05	10/8/05	0.02	28
10/8/05	5/6/06	ND	210
5/6/06	6/18/06	0.05	43
6/18/06	8/26/06	0.01	69
8/26/06	10/7/06	0.03	42
10/7/06	3/18/07	0.43	162
3/18/07	5/18/07	ND	61
5/18/07	7/29/07	0.06	72
7/29/07	10/14/07	0.14	77
10/14/07	4/5/08	0.51	174
4/5/08	7/2/08	0.09	88
7/2/08	9/21/08	0.01	81
9/21/08	12/7/08	0.12	77
12/7/08	6/7/09	0.63	182
6/7/09	10/2/09	0.04	117
10/2/09	4/18/10	0.73	198
4/18/10	9/26/10	0.21	161
9/26/10	5/15/11	1.21	231
5/15/11	9/17/11	0.30	125
9/17/11	5/19/12	ND	245
5/19/12	10/13/12	0.06	147
10/13/12	5/19/13	0.77	218
5/19/13	10/16/13	ND	150
10/16/13	5/24/14	0.44	220
5/24/14	10/14/14	ND	143
10/14/14	9/29/15	ND	350
9/29/15	6/13/16	1.19	258
6/13/16	10/24/16	0.22	133
10/24/16	6/6/17	ND	225
6/6/17	10/28/17	0.25	144

DV11

1/20/02	5/11/02	0.27	111
5/11/02	10/13/02	0.04	155
10/13/02	3/9/03	0.62	147
3/9/03	5/31/03	0.15	83
5/31/03	7/19/03	0.00	49
7/19/03	9/13/03	0.10	56
9/13/03	10/19/03	0.01	36
10/19/03	4/4/04	0.48	168
4/4/04	5/1/04	0.00	27
5/1/04	7/17/04	0.11	77
7/17/04	10/9/04	0.14	84

10/9/04	4/24/05	0.67	197
4/24/05	7/9/05	0.13	76
7/9/05	9/10/05	ND	63
9/10/05	10/8/05	0.02	28
10/8/05	5/6/06	1.44	210
5/6/06	6/18/06	0.05	43
6/18/06	8/26/06	0.01	69
8/26/06	10/7/06	0.02	42
10/7/06	3/18/07	0.31	162
3/18/07	5/18/07	0.09	61
5/18/07	7/29/07	0.06	72
7/29/07	10/14/07	0.10	77
10/14/07	4/5/08	0.46	174
4/5/08	7/2/08	0.07	88
7/2/08	9/21/08	0.01	81
9/21/08	12/7/08	0.11	77
12/7/08	6/7/09	0.52	182
6/7/09	10/2/09	0.05	117
10/2/09	4/18/10	0.64	198
4/18/10	9/26/10	ND	161
9/26/10	5/15/11	ND	231
5/15/11	9/17/11	0.30	125
9/17/11	5/19/12	0.47	245
5/19/12	10/13/12	0.05	147
10/13/12	5/19/13	ND	218
5/19/13	10/16/13	0.05	150
10/16/13	5/24/14	0.39	220
5/24/14	10/14/14	0.18	143
10/14/14	9/29/15	0.85	350
9/29/15	6/13/16	0.99	258
6/13/16	10/24/16	0.16	133
10/24/16	6/6/17	ND	225
6/6/17	10/28/17	0.21	144

DV12			
1/20/02	5/11/02	0.25	111
5/11/02	10/13/02	0.08	155
10/13/02	3/9/03	0.51	147
3/9/03	5/31/03	ND	83
5/31/03	7/19/03	0.01	49
7/19/03	9/13/03	0.14	56
9/13/03	10/19/03	0.00	36
10/19/03	4/4/04	0.47	168

4/4/04	5/1/04	0.00	27
5/1/04	7/17/04	0.09	77
7/17/04	10/9/04	0.04	84
10/9/04	4/30/05	0.74	203
4/30/05	7/9/05	0.14	70
7/9/05	9/10/05	0.06	63
9/10/05	10/8/05	0.02	28
10/8/05	5/6/06	1.35	210
5/6/06	6/18/06	0.05	43
6/18/06	8/26/06	0.03	69
8/26/06	10/7/06	0.02	42
10/7/06	3/18/07	0.34	162
3/18/07	5/18/07	0.08	61
5/18/07	7/29/07	0.06	72
7/29/07	10/14/07	0.14	77
10/14/07	4/7/08	0.53	176
4/7/08	8/5/08	ND	120
8/5/08	9/21/08	0.00	47
9/21/08	12/8/08	0.09	78
12/8/08	6/7/09	0.68	181
6/7/09	10/2/09	0.07	117
10/2/09	4/18/10	0.61	198
4/18/10	9/26/10	0.20	161
9/26/10	5/15/11	ND	231
5/15/11	9/17/11	ND	125
9/17/11	5/19/12	ND	245
5/19/12	10/13/12	0.06	147
10/13/12	5/19/13	0.57	218
5/19/13	10/16/13	ND	150
10/16/13	5/24/14	0.50	220
5/24/14	10/14/14	0.26	143
10/14/14	9/29/15	0.96	350
9/29/15	6/13/16	1.20	258
6/13/16	10/24/16	ND	133
10/24/16	6/6/17	1.67	225
6/6/17	10/28/17	0.25	144

Table A6. Lemmon Valley

Measurement period start	Measurement period end	Total precipitation (ft)	Number of days in period
LV10			
9/9/98	10/13/98	0.22	34

10/13/98	1/4/99	0.24	83
1/4/99	2/23/99	0.40	50
2/23/99	5/5/99	0.15	71
5/5/99	6/21/99	0.00	47
6/21/99	8/16/99	0.08	56
8/16/99	10/12/99	ND	57
10/12/99	12/22/99	0.08	71
12/22/99	3/20/00	0.54	89
3/20/00	5/30/00	0.13	71
5/30/00	8/10/00	0.02	72
8/10/00	8/28/00	0.00	18
8/28/00	10/10/00	0.01	43
10/10/00	11/4/00	0.03	25
11/4/00	12/15/00	0.10	41
12/15/00	3/19/01	0.20	94
3/19/01	4/26/01	0.08	38
4/26/01	7/7/01	ND	72
LV11			
9/11/98	10/13/98	0.20	32
10/13/98	1/4/99	0.25	83
1/4/99	1/29/99	0.24	25
1/29/99	3/1/99	0.32	31
3/1/99	5/5/99	0.17	65
5/5/99	8/16/99	0.06	103
8/16/99	10/12/99	0.04	57
10/12/99	12/22/99	0.08	71
12/22/99	3/20/00	0.57	89
3/20/00	5/30/00	0.09	71
5/30/00	8/10/00	0.02	72
8/10/00	8/28/00	0.00	18
8/28/00	10/10/00	0.01	43
10/10/00	11/4/00	0.03	25
11/4/00	12/15/00	0.12	41
12/15/00	3/19/01	0.19	94
3/19/01	4/26/01	0.09	38
4/26/01	7/7/01	0.01	72
7/7/01	9/29/01	0.02	84
9/29/01	3/2/02	0.69	154
3/2/02	4/28/02	0.11	57
4/28/02	10/5/02	0.19	160
10/5/02	10/25/02	0.00	20
10/25/02	3/7/03	0.73	133

3/7/03	5/17/03	0.27	71
5/17/03	7/12/03	0.02	56
7/12/03	9/20/03	0.08	70
9/20/03	10/12/03	0.00	22
10/12/03	2/14/04	0.34	125
2/14/04	4/25/04	0.17	71
4/25/04	7/10/04	0.16	76
7/10/04	10/10/04	0.06	92
10/10/04	4/23/05	0.76	195
4/23/05	7/16/05	0.23	84
7/16/05	10/15/05	0.09	91
10/15/05	2/12/06	0.75	120
2/12/06	4/29/06	0.58	76
4/29/06	6/10/06	0.06	42
6/10/06	8/12/06	0.09	63
8/12/06	9/30/06	0.01	49
9/30/06	2/4/07	0.23	127
2/4/07	3/11/07	0.20	35
3/11/07	5/15/07	0.16	65
5/15/07	7/29/07	0.04	75
7/29/07	10/20/07	0.09	83
10/20/07	3/29/08	0.73	161
3/29/08	6/30/08	0.11	93
6/30/08	10/4/08	0.01	96
10/4/08	5/24/09	0.71	232
5/24/09	10/8/09	0.24	137
10/8/09	4/24/10	0.94	198
4/24/10	10/10/10	0.19	169
10/10/10	5/13/11	1.19	215
5/13/11	10/9/11	0.34	149
10/9/11	6/2/12	0.49	237
6/2/12	10/22/12	0.07	142
10/22/12	5/18/13	0.65	208
5/18/13	10/18/13	0.35	153
10/18/13	5/10/14	0.52	204
5/10/14	10/16/14	0.27	159
10/16/14	10/5/15	1.17	354
10/5/15	5/12/16	1.13	220
5/12/16	10/22/16	0.25	163
10/22/16	5/4/17	1.38	194
5/4/17	10/31/17	ND	180

LV12

9/11/98	10/13/98	0.20	32
10/13/98	12/29/98	0.27	77
12/29/98	1/29/99	0.26	31
1/29/99	2/16/99	0.13	18
2/16/99	5/3/99	0.13	76
5/3/99	5/5/99	0.00	2
5/5/99	6/17/99	0.02	43
6/17/99	8/16/99	0.07	60
8/16/99	10/12/99	0.01	57
10/12/99	12/22/99	0.10	71
12/22/99	3/17/00	0.61	86
3/17/00	5/30/00	0.12	74
5/30/00	8/9/00	0.03	71
8/9/00	8/28/00	0.00	19
8/28/00	10/10/00	0.01	43
10/10/00	11/4/00	0.03	25
11/4/00	12/14/00	0.07	40
12/14/00	3/19/01	0.21	95
3/19/01	4/26/01	0.08	38
4/26/01	7/7/01	0.02	72
7/7/01	9/29/01	0.01	84
9/29/01	3/2/02	0.66	154
3/2/02	4/27/02	0.10	56
4/27/02	10/5/02	0.25	161
10/5/02	10/25/02	0.00	20
10/25/02	3/7/03	0.59	133
3/7/03	5/17/03	0.27	71
5/17/03	7/12/03	0.00	56
7/12/03	9/20/03	0.10	70
9/20/03	10/12/03	0.00	22
10/12/03	2/14/04	0.37	125
2/14/04	4/24/04	0.15	70
4/24/04	7/10/04	0.15	77
7/10/04	10/10/04	0.04	92
10/10/04	4/23/05	1.07	195
4/23/05	7/16/05	0.17	84
7/16/05	10/15/05	0.05	91
10/15/05	2/12/06	0.74	120
2/12/06	4/29/06	0.58	76
4/29/06	6/10/06	0.05	42
6/10/06	8/12/06	0.10	63
8/12/06	9/30/06	0.01	49
9/30/06	2/4/07	0.20	127

2/4/07	3/11/07	0.26	35
3/11/07	5/15/07	0.12	65
5/15/07	8/4/07	0.03	81
8/4/07	10/20/07	0.08	77
10/20/07	3/29/08	0.73	161
3/29/08	6/30/08	0.11	93
6/30/08	10/4/08	0.02	96
10/4/08	5/24/09	0.62	232
5/24/09	10/8/09	0.26	137
10/8/09	4/24/10	0.91	198
4/24/10	10/10/10	0.20	169
10/10/10	5/11/11	1.10	213
5/11/11	10/9/11	0.32	151
10/9/11	6/3/12	0.42	238
6/3/12	10/22/12	0.08	141
10/22/12	5/18/13	0.63	208
5/18/13	10/18/13	0.29	153
10/18/13	5/10/14	0.49	204
5/10/14	10/16/14	0.28	159
10/16/14	10/5/15	1.17	354
10/5/15	6/12/16	0.98	251
6/12/16	10/22/16	0.18	132
10/22/16	5/4/17	1.81	194
5/4/17	10/31/17	0.17	180
LV13			
9/11/98	10/13/98	0.16	32
10/13/98	12/29/98	0.26	77
12/29/98	1/29/99	0.28	31
1/29/99	2/16/99	0.20	18
2/16/99	4/22/99	0.19	65
4/22/99	5/3/99	0.03	11
5/3/99	5/4/99	0.00	1
5/4/99	6/17/99	0.02	44
6/17/99	8/16/99	0.07	60
8/16/99	10/12/99	0.02	57
10/12/99	12/22/99	ND	71
12/22/99	3/17/00	0.52	86
3/17/00	5/30/00	0.14	74
5/30/00	8/9/00	0.02	71
8/9/00	8/28/00	0.00	19
8/28/00	10/10/00	0.01	43
10/10/00	11/4/00	0.03	25

11/4/00	12/14/00	0.09	40
12/14/00	3/19/01	0.18	95
3/19/01	4/26/01	0.09	38
4/26/01	7/7/01	0.01	72
7/7/01	9/29/01	0.00	84
9/29/01	3/2/02	0.41	154
3/2/02	4/27/02	0.09	56
4/27/02	10/5/02	ND	161
10/5/02	10/25/02	ND	20
10/25/02	3/7/03	0.39	133
3/7/03	5/17/03	0.28	71
5/17/03	7/12/03	0.01	56
7/12/03	9/20/03	0.08	70
9/20/03	10/12/03	0.01	22
10/12/03	2/14/04	0.35	125
2/14/04	4/24/04	0.14	70
4/24/04	7/10/04	0.15	77
7/10/04	10/10/04	0.03	92
10/10/04	4/23/05	0.90	195
4/23/05	7/16/05	0.17	84
7/16/05	10/15/05	0.05	91
10/15/05	2/12/06	0.62	120
2/12/06	4/29/06	0.59	76
4/29/06	6/10/06	0.05	42
6/10/06	8/12/06	0.05	63
8/12/06	9/30/06	0.00	49
9/30/06	2/4/07	0.19	127
2/4/07	3/11/07	0.22	35
3/11/07	5/15/07	0.15	65
5/15/07	8/4/07	0.03	81
8/4/07	10/20/07	0.07	77
10/20/07	3/29/08	0.64	161
3/29/08	6/30/08	0.09	93
6/30/08	10/4/08	0.03	96
10/4/08	5/24/09	0.65	232
5/24/09	10/8/09	0.21	137
10/8/09	4/24/10	0.90	198
4/24/10	10/10/10	0.17	169
10/10/10	5/11/11	1.13	213
5/11/11	10/9/11	0.25	151
10/9/11	6/3/12	ND	238
6/3/12	10/22/12	0.05	141
10/22/12	5/18/13	0.53	208

5/18/13	10/18/13	0.20	153
10/18/13	5/10/14	0.48	204
5/10/14	10/16/14	0.26	159
10/16/14	10/5/15	0.90	354
10/5/15	5/12/16	0.95	220
5/12/16	10/22/16	0.15	163
10/22/16	5/4/17	1.57	194
5/4/17	10/31/17	0.19	180
LV14			
9/11/98	10/13/98	0.17	32
10/13/98	12/29/98	0.30	77
12/29/98	1/29/99	0.34	31
1/29/99	2/16/99	0.20	18
2/16/99	4/22/99	0.36	65
4/22/99	5/3/99	0.04	11
5/3/99	5/4/99	0.01	1
5/4/99	6/17/99	0.01	44
6/17/99	8/16/99	0.06	60
8/16/99	10/12/99	0.03	57
10/12/99	12/22/99	0.10	71
12/22/99	3/17/00	0.74	86
3/17/00	5/30/00	0.16	74
5/30/00	8/9/00	0.07	71
8/9/00	8/28/00	0.00	19
8/28/00	10/10/00	0.01	43
10/10/00	11/4/00	0.04	25
11/4/00	12/14/00	0.10	40
12/14/00	3/19/01	0.24	95
3/19/01	4/26/01	0.12	38
4/26/01	7/7/01	0.02	72
7/7/01	9/29/01	0.02	84
9/29/01	3/2/02	0.64	154
3/2/02	4/27/02	0.12	56
4/27/02	10/5/02	0.24	161
10/5/02	10/25/02	0.00	20
10/25/02	3/7/03	0.86	133
3/7/03	5/17/03	0.31	71
5/17/03	7/12/03	0.02	56
7/12/03	9/20/03	0.09	70
9/20/03	10/12/03	0.01	22
10/12/03	2/14/04	0.41	125
2/14/04	4/24/04	0.37	70

4/24/04	7/10/04	0.18	77
7/10/04	10/10/04	0.05	92
10/10/04	4/23/05	1.38	195
4/23/05	7/16/05	0.22	84
7/16/05	10/15/05	ND	91
10/15/05	2/12/06	0.81	120
2/12/06	4/29/06	0.63	76
4/29/06	6/10/06	0.06	42
6/10/06	8/12/06	0.06	63
8/12/06	9/30/06	0.00	49
9/30/06	2/4/07	0.25	127
2/4/07	3/11/07	0.26	35
3/11/07	5/15/07	0.21	65
5/15/07	8/4/07	0.04	81
8/4/07	10/20/07	0.07	77
10/20/07	3/29/08	1.10	161
3/29/08	6/30/08	0.11	93
6/30/08	10/4/08	0.03	96
10/4/08	5/24/09	1.00	232
5/24/09	10/8/09	0.26	137
10/8/09	4/24/10	1.27	198
4/24/10	10/10/10	0.21	169
10/10/10	5/11/11	1.43	213
5/11/11	10/9/11	0.34	151
10/9/11	6/3/12	0.51	238
6/3/12	10/22/12	0.08	141
10/22/12	5/18/13	0.81	208
5/18/13	10/18/13	0.28	153
10/18/13	5/10/14	0.59	204
5/10/14	10/16/14	0.28	159
10/16/14	10/5/15	1.09	354
10/5/15	5/12/16	1.28	220
5/12/16	10/22/16	0.21	163
10/22/16	5/4/17	1.59	194
5/4/17	10/31/17	0.25	180
<hr/> LV15 <hr/>			
9/11/98	10/13/98	0.19	32
10/13/98	12/29/98	0.27	77
12/29/98	1/29/99	0.26	31
1/29/99	2/16/99	0.14	18
2/16/99	4/22/99	0.15	65
4/22/99	5/3/99	0.03	11

5/3/99	5/5/99	0.01	2
5/5/99	6/17/99	0.05	43
6/17/99	8/16/99	0.03	60
8/16/99	10/12/99	0.04	57
10/12/99	12/22/99	0.09	71
12/22/99	3/17/00	0.60	86
3/17/00	5/30/00	0.19	74
5/30/00	8/9/00	0.09	71
8/9/00	8/28/00	0.00	19
8/28/00	10/10/00	0.03	43
10/10/00	11/4/00	0.04	25
11/4/00	12/14/00	0.10	40
12/14/00	3/19/01	0.25	95
3/19/01	4/26/01	0.15	38
4/26/01	7/7/01	0.02	72
7/7/01	9/29/01	0.01	84
9/29/01	3/2/02	0.60	154
3/2/02	4/27/02	0.14	56
4/27/02	10/5/02	0.29	161
10/5/02	10/25/02	0.00	20
10/25/02	3/7/03	0.47	133
3/7/03	5/17/03	0.36	71
5/17/03	7/12/03	0.02	56
7/12/03	9/20/03	ND	70
9/20/03	10/12/03	0.00	22
10/12/03	2/14/04	0.37	125
2/14/04	4/24/04	0.19	70
4/24/04	7/10/04	0.24	77
7/10/04	10/10/04	0.02	92
10/10/04	4/23/05	0.69	195
4/23/05	7/16/05	0.25	84
7/16/05	10/15/05	0.04	91
10/15/05	2/12/06	0.70	120
2/12/06	4/29/06	0.66	76
4/29/06	6/10/06	0.08	42
6/10/06	8/12/06	0.09	63
8/12/06	9/30/06	0.00	49
9/30/06	2/4/07	0.28	127
2/4/07	3/11/07	0.19	35
3/11/07	5/15/07	0.22	65
5/15/07	8/4/07	ND	81
8/4/07	10/20/07	0.09	77
10/20/07	3/29/08	1.16	161

3/29/08	6/30/08	0.15	93
6/30/08	10/4/08	0.03	96
10/4/08	5/24/09	0.79	232
5/24/09	10/8/09	ND	137
10/8/09	4/24/10	1.18	198
4/24/10	10/10/10	0.27	169
10/10/10	5/11/11	ND	213
5/11/11	10/9/11	0.40	151
10/9/11	6/3/12	0.58	238
6/3/12	10/22/12	0.10	141
10/22/12	5/18/13	0.75	208
5/18/13	10/18/13	0.24	153
10/18/13	5/10/14	0.61	204
5/10/14	10/16/14	0.27	159
10/16/14	10/5/15	0.69	354
10/5/15	5/12/16	1.20	220
5/12/16	10/22/16	0.28	163
10/22/16	5/4/17	1.53	194
5/4/17	10/31/17	0.44	180
LV16			
9/8/98	10/13/98	0.22	35
10/13/98	1/4/99	0.22	83
1/4/99	1/29/99	0.20	25
1/29/99	2/16/99	0.21	18
2/16/99	4/22/99	0.17	65
4/22/99	5/5/99	0.02	13
5/5/99	6/17/99	0.01	43
6/17/99	8/16/99	0.04	60
8/16/99	10/12/99	0.02	57
10/12/99	12/22/99	0.06	71
12/22/99	3/17/00	0.53	86
3/17/00	5/30/00	0.13	74
5/30/00	8/9/00	0.06	71
8/9/00	8/28/00	0.00	19
8/28/00	10/10/00	0.02	43
10/10/00	11/4/00	0.02	25
11/4/00	12/14/00	0.09	40
12/14/00	3/19/01	0.17	95
3/19/01	4/26/01	0.07	38
4/26/01	7/7/01	0.01	72
7/7/01	9/29/01	0.03	84
9/29/01	3/2/02	0.49	154

3/2/02	4/27/02	0.09	56
4/27/02	10/5/02	0.14	161
10/5/02	10/25/02	0.00	20
10/25/02	3/7/03	0.48	133
3/7/03	5/17/03	0.25	71
5/17/03	7/12/03	0.01	56
7/12/03	9/20/03	0.10	70
9/20/03	10/12/03	0.01	22
10/12/03	2/14/04	ND	125
2/14/04	4/24/04	0.12	70
4/24/04	7/10/04	0.08	77
7/10/04	10/10/04	0.07	92
10/10/04	4/23/05	0.91	195
4/23/05	7/16/05	0.19	84
7/16/05	10/15/05	0.06	91
10/15/05	2/12/06	0.63	120
2/12/06	4/29/06	0.55	76
4/29/06	6/10/06	0.06	42
6/10/06	8/12/06	0.04	63
8/12/06	9/30/06	0.00	49
9/30/06	2/4/07	0.19	127
2/4/07	3/11/07	0.20	35
3/11/07	5/15/07	0.12	65
5/15/07	8/4/07	0.09	81
8/4/07	10/20/07	0.07	77
10/20/07	3/29/08	0.49	161
3/29/08	6/30/08	0.06	93
6/30/08	10/4/08	ND	96
10/4/08	5/24/09	ND	232
5/24/09	10/8/09	0.26	137
10/8/09	4/24/10	0.80	198
4/24/10	10/10/10	0.18	169
10/10/10	5/11/11	0.88	213
5/11/11	10/9/11	0.30	151
10/9/11	6/3/12	0.35	238
6/3/12	10/22/12	0.05	141
10/22/12	5/18/13	0.53	208
5/18/13	10/18/13	0.19	153
10/18/13	5/10/14	0.34	204
5/10/14	10/16/14	0.26	159
10/16/14	10/5/15	1.06	354
10/5/15	5/12/16	0.81	220
5/12/16	10/22/16	0.20	163

10/22/16	5/4/17	ND	194
5/4/17	10/31/17	0.33	180
LV17			
9/9/98	10/14/98	0.20	35
10/14/98	12/30/98	0.39	77
12/30/98	2/1/99	0.41	33
2/1/99	2/12/99	0.36	11
2/12/99	5/10/99	0.29	87
5/10/99	8/17/99	0.07	99
8/17/99	10/11/99	0.02	55
10/11/99	12/22/99	0.15	72
12/22/99	3/20/00	0.80	89
3/20/00	5/31/00	0.13	72
5/31/00	8/11/00	0.02	72
8/11/00	8/30/00	0.00	19
8/30/00	10/9/00	0.00	40
10/9/00	12/19/00	0.20	71
12/19/00	3/21/01	0.22	92
3/21/01	4/30/01	0.09	40
4/30/01	7/7/01	0.02	68
7/7/01	9/29/01	0.04	84
9/29/01	5/10/02	0.99	223
5/10/02	10/20/02	0.04	163
10/20/02	3/12/03	0.76	143
3/12/03	5/18/03	0.28	67
5/18/03	7/20/03	0.02	63
7/20/03	9/21/03	0.14	63
9/21/03	10/20/03	0.00	29
10/20/03	2/14/04	0.47	117
2/14/04	4/24/04	0.26	70
4/24/04	7/11/04	0.07	78
7/11/04	9/30/04	0.02	81
9/30/04	5/7/05	1.10	219
5/7/05	7/16/05	0.10	70
7/16/05	9/11/05	0.02	57
9/11/05	10/9/05	0.01	28
10/9/05	5/14/06	ND	217
5/14/06	8/12/06	0.03	90
8/12/06	10/15/06	0.05	64
10/15/06	2/4/07	0.20	112
2/4/07	5/22/07	0.37	107
5/22/07	7/28/07	0.02	67

7/28/07	10/19/07	0.06	83
10/19/07	4/20/08	1.01	184
4/20/08	6/16/08	0.07	57
6/16/08	10/18/08	0.19	124
10/18/08	6/29/09	0.91	254
6/29/09	10/8/09	0.04	101
10/8/09	6/2/10	1.26	237
6/2/10	10/14/10	0.21	134
10/14/10	5/12/11	1.46	210
5/12/11	10/23/11	ND	164
LV19			
9/9/98	10/14/98	0.12	35
10/14/98	12/30/98	0.36	77
12/30/98	1/4/99	0.07	5
1/4/99	1/5/99	0.00	1
1/5/99	2/1/99	0.35	27
2/1/99	2/11/99	1.24	10
2/11/99	3/22/99	0.18	39
3/22/99	5/10/99	0.27	49
5/10/99	6/22/99	0.05	43
6/22/99	8/17/99	0.05	56
8/17/99	10/11/99	0.03	55
10/11/99	12/22/99	0.16	72
12/22/99	4/14/00	0.82	114
4/14/00	5/31/00	0.15	47
5/31/00	8/11/00	0.02	72
8/11/00	8/30/00	0.00	19
8/30/00	10/9/00	0.02	40
10/9/00	12/19/00	0.25	71
12/19/00	3/21/01	0.34	92
3/21/01	4/30/01	0.12	40
4/30/01	7/7/01	0.04	68
7/7/01	9/29/01	0.04	84
9/29/01	5/10/02	1.26	223
5/10/02	10/20/02	0.16	163
10/20/02	3/12/03	0.68	143
3/12/03	5/18/03	0.33	67
5/18/03	7/20/03	0.04	63
7/20/03	9/21/03	0.13	63
9/21/03	10/20/03	0.00	29
10/20/03	4/28/04	0.96	191
4/28/04	7/11/04	0.09	74

7/11/04	9/30/04	0.05	81
9/30/04	5/28/05	1.27	240
5/28/05	6/16/05	0.08	19
6/16/05	7/16/05	0.01	30
7/16/05	9/11/05	0.02	57
9/11/05	10/9/05	0.00	28
10/9/05	5/14/06	ND	217
5/14/06	8/12/06	0.05	90
8/12/06	10/15/06	0.05	64
10/15/06	2/4/07	0.26	112
2/4/07	5/22/07	0.49	107
5/22/07	7/28/07	0.02	67
7/28/07	10/19/07	0.09	83
10/19/07	4/20/08	1.03	184
4/20/08	6/16/08	0.10	57
6/16/08	10/18/08	0.04	124
10/18/08	6/29/09	1.12	254
6/29/09	10/8/09	0.04	101
10/8/09	6/2/10	ND	237
6/2/10	10/14/10	0.28	134
10/14/10	5/12/11	ND	210
5/12/11	10/23/11	0.35	164
10/23/11	7/1/12	0.67	252
7/1/12	8/4/13	0.99	399
8/4/13	10/10/13	0.07	67
10/10/13	10/16/14	1.01	371
10/16/14	10/14/15	1.25	363
10/14/15	5/12/16	1.81	211
5/12/16	10/21/16	0.31	162
10/21/16	5/9/17	1.26	200
5/9/17	10/3/17	0.16	147

LV20

9/9/98	10/14/98	0.18	35
10/14/98	12/30/98	0.36	77
12/30/98	2/1/99	0.25	33
2/1/99	2/12/99	0.52	11
2/12/99	3/22/99	0.05	38
3/22/99	5/10/99	ND	49
5/10/99	6/22/99	0.04	43
6/22/99	8/17/99	0.03	56
8/17/99	10/11/99	0.03	55
10/11/99	12/22/99	0.13	72

12/22/99	4/14/00	0.90	114
4/14/00	5/31/00	0.13	47
5/31/00	8/11/00	0.01	72
8/11/00	8/30/00	0.02	19
8/30/00	10/9/00	0.02	40
10/9/00	12/19/00	0.18	71
12/19/00	3/21/01	0.35	92
3/21/01	4/30/01	0.15	40
4/30/01	7/7/01	0.03	68
7/7/01	9/29/01	0.06	84
9/29/01	5/10/02	1.61	223
5/10/02	10/20/02	0.16	163
10/20/02	5/18/03	ND	210
5/18/03	7/20/03	0.05	63
7/20/03	9/21/03	0.14	63
9/21/03	10/20/03	0.01	29
10/20/03	4/28/04	0.95	191
4/28/04	7/11/04	0.12	74
7/11/04	9/30/04	0.05	81
9/30/04	5/28/05	1.68	240
5/28/05	6/16/05	0.08	19
6/16/05	7/16/05	0.00	30
7/16/05	9/11/05	0.06	57
9/11/05	10/9/05	0.00	28
10/9/05	5/14/06	1.55	217
5/14/06	8/12/06	0.07	90
8/12/06	10/15/06	0.06	64
10/15/06	2/4/07	0.28	112
2/4/07	5/22/07	0.53	107
5/22/07	7/28/07	0.02	67
7/28/07	10/19/07	0.10	83
10/19/07	4/20/08	0.96	184
4/20/08	6/16/08	0.14	57
6/16/08	10/18/08	0.06	124
10/18/08	6/29/09	1.44	254
6/29/09	10/8/09	0.06	101
10/8/09	6/2/10	1.39	237
6/2/10	10/14/10	0.45	134
10/14/10	5/12/11	1.33	210
5/12/11	10/23/11	0.35	164
10/23/11	7/1/12	0.61	252
7/1/12	8/4/13	1.87	399
8/4/13	10/10/13	0.07	67

10/10/13	10/16/14	1.04	371
10/16/14	10/14/15	1.22	363
10/14/15	5/12/16	2.09	211
5/12/16	10/21/16	0.29	162
10/21/16	5/9/17	1.72	200
5/9/17	10/3/17	0.13	147
LV22			
9/10/98	10/14/98	0.20	34
10/14/98	2/1/99	0.79	110
2/1/99	2/11/99	0.27	10
2/11/99	5/5/99	0.32	83
5/5/99	6/21/99	0.03	47
6/21/99	8/17/99	0.05	57
8/17/99	10/11/99	0.02	55
10/11/99	12/22/99	0.16	72
12/22/99	3/20/00	0.89	89
3/20/00	5/31/00	0.14	72
5/31/00	8/11/00	0.03	72
8/11/00	8/30/00	0.00	19
8/30/00	10/9/00	0.03	40
10/9/00	12/18/00	0.21	70
12/18/00	3/21/01	0.23	93
3/21/01	4/30/01	0.14	40
4/30/01	7/7/01	0.03	68
7/7/01	10/1/01	0.05	86
10/1/01	5/10/02	1.06	221
5/10/02	10/13/02	0.10	156
10/13/02	3/11/03	0.91	149
3/11/03	5/18/03	0.33	68
5/18/03	7/12/03	0.05	55
7/12/03	9/14/03	0.10	64
9/14/03	10/12/03	0.01	28
10/12/03	4/28/04	0.92	199
4/28/04	7/10/04	0.09	73
7/10/04	5/29/05	ND	323

Table A7. Observation Peak

Measurement period start	Measurement period end	Total precipitation (ft)	Number of days in period
OP			
9/28/04	5/15/05	0.90	229
5/15/05	7/17/05	0.11	63

7/17/05	10/16/05	0.47	91
10/16/05	5/19/06	1.10	215
5/19/06	10/16/06	0.08	150
10/16/06	4/7/07	0.43	173
4/7/07	5/16/07	0.12	39
5/16/07	10/13/07	0.13	150
10/13/07	6/14/08	0.62	245
6/14/08	9/20/08	0.00	98
9/20/08	9/20/08	0.83	
9/20/08	7/26/09	0.02	309
7/26/09	10/5/09	0.01	71
10/5/09	6/7/10	0.77	245
6/7/10	11/17/10	0.22	163
11/17/10	7/8/11	1.04	233
7/8/11	10/22/11	0.09	106
10/22/11	6/20/12	0.55	242
6/20/12	10/21/12	ND	123
10/21/12	7/20/13	0.76	272
7/20/13	10/18/13	0.08	90
10/18/13	5/26/14	0.55	220
5/26/14	10/13/14	0.11	140
10/13/14	10/1/15	ND	353
10/1/15	6/2/16	0.87	245
6/2/16	6/29/17	1.74	392
6/29/17	10/5/17	0.17	98

OP2			
6/14/08	9/20/08	0.00	98
9/20/08	9/20/08	0.71	
9/20/08	10/5/09	0.04	380
10/5/09	6/7/10	0.70	245
6/7/10	11/17/10	0.20	163
11/17/10	7/8/11	0.92	233
7/8/11	10/22/11	0.07	106
10/22/11	6/20/12	0.44	242
6/20/12	10/21/12	0.00	123
10/21/12	7/20/13	0.56	272
7/20/13	10/18/13	0.08	90
10/18/13	5/26/14	0.47	220
5/26/14	10/13/14	0.11	140
10/13/14	10/1/15	1.16	353
10/1/15	6/2/16	0.83	245
6/2/16	6/29/17	ND	392

6/29/17	10/5/17	0.13	98
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Table A8. Virginia Peak

Measurement period start	Measurement period end	Total precipitation (ft)	Number of days in period
VP			
5/16/01	5/9/02	0.65	358
5/9/02	10/20/02	0.11	164
10/20/02	3/13/03	0.37	144
3/13/03	5/15/03	0.24	63
5/15/03	7/24/03	0.01	70
7/24/03	9/21/03	0.14	59
9/21/03	5/5/04	0.46	227
5/5/04	10/7/04	0.14	155
10/7/04	6/15/05	1.19	251
6/15/05	5/18/06	1.00	337
5/18/06	8/30/06	0.09	104
8/30/06	10/16/06	0.00	47
10/16/06	4/7/07	0.34	173
4/7/07	5/30/07	0.18	53
5/30/07	10/17/07	0.13	140
10/17/07	10/20/07	0.04	3
10/20/07	6/17/08	0.85	241
6/17/08	9/16/08	0.01	91
9/16/08	7/13/09	0.82	300
7/13/09	10/5/09	0.00	84
10/5/09	6/8/10	0.98	246
6/8/10	10/15/10	0.17	129
10/15/10	7/13/11	1.05	271
7/13/11	9/11/11	0.04	60
9/11/11	6/18/12	0.38	281
6/18/12	10/21/12	0.10	125
10/21/12	7/21/13	0.60	273
7/21/13	10/11/13	0.06	82
10/11/13	5/26/14	0.61	227
5/26/14	10/13/14	0.32	140
10/13/14	10/17/14	2.84	4
10/17/14	10/14/15	0.43	362
10/14/15	6/3/16	0.82	233
6/3/16	6/27/17	1.56	389
6/27/17	10/7/17	0.24	102
VP2			

6/17/08	9/16/08	0.00	91
9/16/08	7/13/09	1.58	300
7/13/09	10/5/09	0.03	84
10/5/09	6/8/10	1.15	246
6/8/10	10/15/10	0.18	129
10/15/10	7/13/11	1.54	271
7/13/11	9/11/11	0.02	60
9/11/11	6/18/12	0.73	281
6/18/12	10/21/12	0.15	125
10/21/12	7/21/13	1.21	273
7/21/13	10/11/13	0.09	82
10/11/13	5/26/14	1.08	227
5/26/14	10/13/14	0.38	140
10/13/14	10/14/15	0.44	366
10/14/15	6/3/16	1.23	233
6/3/16	6/27/17	1.34	389
6/27/17	10/7/17	0.32	102

Table A9. Smoke Creek Desert

Measurement period start	Measurement period end	Total precipitation (ft)	Number of days in period
SC1			
9/27/03	5/15/04	0.31	231
5/15/04	9/3/04	0.05	111
9/3/04	10/5/04	0.01	32
10/5/04	6/4/05	0.70	242
6/4/05	7/23/05	0.04	49
7/23/05	9/17/05	0.03	56
9/17/05	5/20/06	0.99	245
5/20/06	8/5/06	0.07	77
8/5/06	10/1/06	0.00	57
10/1/06	3/24/07	0.30	174
3/24/07	5/19/07	0.05	56
5/19/07	9/2/07	0.02	106
9/2/07	10/7/07	0.05	35
10/7/07	4/12/08	0.44	188
4/12/08	7/3/08	0.03	82
7/3/08	9/27/08	0.02	86
9/27/08	5/30/09	0.38	245
5/30/09	10/3/09	0.06	126
10/3/09	5/15/10	0.51	224
5/15/10	10/17/10	ND	155

10/17/10	6/21/11	0.76	247
6/21/11	10/15/11	0.10	116
10/15/11	5/12/12	0.20	210
5/12/12	10/6/12	0.04	147
10/6/12	8/3/13	0.53	301
8/3/13	10/14/13	0.04	72
10/14/13	6/14/14	0.31	243
6/14/14	10/11/14	0.08	119
10/11/14	10/13/15	0.77	367
10/13/15	6/24/16	0.63	255
6/24/16	6/14/17	1.03	355
6/14/17	11/1/17	0.08	140
SC2			
9/27/03	5/15/04	0.30	231
5/15/04	9/3/04	0.06	111
9/3/04	10/5/04	0.01	32
10/5/04	6/4/05	0.68	242
6/4/05	7/23/05	0.04	49
7/23/05	9/17/05	0.03	56
9/17/05	5/20/06	1.04	245
5/20/06	8/5/06	0.04	77
8/5/06	10/1/06	0.00	57
10/1/06	3/24/07	0.33	174
3/24/07	5/19/07	0.06	56
5/19/07	9/2/07	0.03	106
9/2/07	10/7/07	0.04	35
10/7/07	4/12/08	0.47	188
4/12/08	7/3/08	0.05	82
7/3/08	9/27/08	0.01	86
9/27/08	5/30/09	0.39	245
5/30/09	10/3/09	0.09	126
10/3/09	5/15/10	0.53	224
5/15/10	10/17/10	0.23	155
10/17/10	6/21/11	0.81	247
6/21/11	10/15/11	0.13	116
10/15/11	5/12/12	0.23	210
5/12/12	10/6/12	0.05	147
10/6/12	8/3/13	0.53	301
8/3/13	10/14/13	0.06	72
10/14/13	6/14/14	0.36	243
6/14/14	10/11/14	0.13	119
10/11/14	10/13/15	0.87	367

10/13/15	6/24/16	0.64	255
6/24/16	6/14/17	1.15	355
6/14/17	11/1/17	0.12	140
SC3			
9/27/03	5/15/04	0.21	231
5/15/04	9/3/04	0.10	111
9/3/04	10/3/04	0.00	30
10/3/04	6/4/05	0.60	244
6/4/05	7/23/05	0.03	49
7/23/05	9/17/05	0.03	56
9/17/05	5/20/06	0.92	245
5/20/06	8/5/06	0.07	77
8/5/06	10/1/06	0.00	57
10/1/06	3/24/07	0.26	174
3/24/07	5/19/07	0.05	56
5/19/07	9/2/07	0.02	106
9/2/07	10/7/07	0.04	35
10/7/07	4/12/08	0.46	188
4/12/08	7/3/08	0.02	82
7/3/08	9/1/08	0.00	60
9/1/08	9/27/08	0.01	26
9/27/08	5/9/09	0.36	224
5/9/09	5/30/09	0.00	21
5/30/09	10/3/09	0.11	126
10/3/09	5/15/10	0.49	224
5/15/10	10/17/10	ND	155
10/17/10	6/21/11	ND	247
6/21/11	10/15/11	0.10	116
10/15/11	5/12/12	0.19	210
5/12/12	10/6/12	0.02	147
10/6/12	8/3/13	ND	301
8/3/13	10/14/13	0.03	72
10/14/13	6/14/14	ND	243
6/14/14	10/11/14	0.10	119
10/11/14	10/13/15	ND	367
10/13/15	6/24/16	ND	255
6/24/16	6/14/17	ND	355
6/14/17	11/1/17	0.08	140
SC4			
9/27/03	5/15/04	ND	231
5/15/04	6/7/04	0.05	23
6/7/04	9/3/04	0.11	88

9/3/04	10/5/04	0.00	32
10/5/04	6/5/05	ND	243
6/5/05	6/17/05	0.02	12
6/17/05	7/23/05	0.01	36
7/23/05	9/17/05	0.00	56
9/17/05	5/20/06	1.00	245
5/20/06	8/5/06	0.07	77
8/5/06	10/1/06	0.00	57
10/1/06	3/24/07	0.35	174
3/24/07	5/19/07	0.05	56
5/19/07	9/2/07	0.04	106
9/2/07	10/7/07	0.05	35
10/7/07	4/12/08	0.51	188
4/12/08	7/3/08	0.02	82
7/3/08	9/27/08	0.01	86
9/27/08	5/30/09	0.47	245
5/30/09	10/3/09	0.11	126
10/3/09	5/15/10	0.54	224
5/15/10	10/17/10	0.41	155
10/17/10	6/21/11	0.81	247
6/21/11	10/15/11	0.09	116
10/15/11	5/12/12	0.28	210
5/12/12	10/6/12	0.04	147
10/6/12	8/3/13	0.72	301
8/3/13	10/14/13	0.04	72
10/14/13	6/14/14	0.42	243
6/14/14	10/11/14	0.09	119
10/11/14	10/11/15	0.90	365
10/11/15	6/24/16	0.62	257
6/24/16	6/14/17	1.13	355
6/14/17	11/1/17	0.12	140

SC5

9/28/03	5/15/04	0.43	230
5/15/04	10/2/04	0.05	140
10/2/04	6/4/05	1.09	245
6/4/05	7/23/05	0.04	49
7/23/05	9/17/05	ND	56
9/17/05	5/21/06	1.14	246
5/21/06	8/6/06	ND	77
8/6/06	10/1/06	0.01	56
10/1/06	3/24/07	ND	174
3/24/07	5/19/07	0.10	56

5/19/07	9/2/07	0.01	106
9/2/07	10/7/07	0.07	35
10/7/07	4/12/08	0.54	188
4/12/08	7/3/08	0.16	82
7/3/08	9/27/08	0.01	86
9/27/08	5/30/09	0.61	245
5/30/09	10/3/09	0.18	126
10/3/09	5/15/10	0.73	224
5/15/10	11/18/10	0.51	187
11/18/10	6/21/11	0.84	215
6/21/11	10/15/11	0.12	116
10/15/11	5/12/12	0.28	210
5/12/12	10/6/12	0.06	147
SC6			
9/28/03	5/15/04	0.31	230
5/15/04	10/2/04	0.05	140
10/2/04	6/4/05	ND	245
6/4/05	7/23/05	0.02	49
7/23/05	9/17/05	0.01	56
9/17/05	5/21/06	0.96	246
5/21/06	8/6/06	0.12	77
8/6/06	10/1/06	0.01	56
10/1/06	3/24/07	0.33	174
3/24/07	5/19/07	0.06	56
5/19/07	9/2/07	0.03	106
9/2/07	10/7/07	0.06	35
10/7/07	4/12/08	0.46	188
4/12/08	7/3/08	0.14	82
7/3/08	9/27/08	0.00	86
9/27/08	5/30/09	0.52	245
5/30/09	10/3/09	0.15	126
10/3/09	5/15/10	0.63	224
5/15/10	11/18/10	0.44	187
11/18/10	6/21/11	0.76	215
6/21/11	10/15/11	0.10	116
10/15/11	5/12/12	0.24	210
5/12/12	10/6/12	0.04	147
10/6/12	8/3/13	0.61	301
8/3/13	10/14/13	0.05	72
10/14/13	6/14/14	0.54	243
6/14/14	10/11/14	0.14	119
10/11/14	10/12/15	1.11	366

10/12/15	6/14/16	0.54	246
6/14/16	6/30/17	1.05	381
SC7			
9/28/03	5/15/04	0.23	230
5/15/04	10/2/04	0.06	140
10/2/04	6/4/05	0.74	245
6/4/05	7/23/05	0.02	49
7/23/05	9/17/05	0.00	56
9/17/05	5/21/06	0.80	246
5/21/06	8/6/06	0.08	77
8/6/06	10/1/06	0.00	56
10/1/06	3/24/07	0.28	174
3/24/07	5/19/07	ND	56
5/19/07	9/2/07	ND	106
9/2/07	10/7/07	0.05	35
10/7/07	4/12/08	0.39	188
4/12/08	7/3/08	0.09	82
7/3/08	9/27/08	0.01	86
9/27/08	5/30/09	0.27	245
5/30/09	10/3/09	ND	126
10/3/09	5/15/10	0.45	224
5/15/10	11/18/10	ND	187
11/18/10	6/21/11	0.51	215
6/21/11	10/15/11	0.08	116
10/15/11	5/12/12	ND	210
5/12/12	10/6/12	0.03	147
10/6/12	8/3/13	ND	301
8/3/13	10/14/13	ND	72
10/14/13	6/14/14	0.40	243
6/14/14	10/11/14	0.13	119
10/11/14	10/12/15	ND	366
10/12/15	6/14/16	0.46	246
6/14/16	6/30/17	ND	381
SC8			
9/28/03	5/15/04	0.34	230
5/15/04	10/2/04	0.11	140
10/2/04	6/4/05	1.01	245
6/4/05	7/23/05	0.05	49
7/23/05	9/17/05	0.02	56
9/17/05	5/21/06	0.93	246
5/21/06	8/6/06	0.09	77
8/6/06	10/1/06	0.01	56

10/1/06	3/24/07	0.33	174
3/24/07	5/19/07	0.12	56
5/19/07	9/2/07	0.03	106
9/2/07	10/7/07	0.09	35
10/7/07	4/12/08	0.71	188
4/12/08	7/3/08	0.17	82
7/3/08	9/27/08	0.01	86
9/27/08	5/30/09	0.54	245
5/30/09	10/3/09	0.25	126
10/3/09	5/15/10	0.73	224
5/15/10	11/18/10	0.45	187
11/18/10	6/21/11	0.84	215
6/21/11	10/15/11	0.09	116
10/15/11	5/12/12	0.28	210
5/12/12	10/6/12	0.05	147
10/6/12	8/3/13	0.69	301
8/3/13	10/14/13	0.09	72
10/14/13	6/14/14	0.66	243
6/14/14	10/11/14	0.17	119
10/11/14	10/14/15	1.44	368
10/14/15	10/8/15	1.40	-6
10/8/15	6/14/16	0.67	250
6/14/16	6/30/17	1.10	381
SC9			
5/22/04	10/5/04	0.00	136
10/5/04	6/5/05	0.92	243
6/5/05	7/17/05	0.06	42
7/17/05	9/18/05	0.04	63
9/18/05	5/28/06	1.16	252
5/28/06	8/5/06	0.03	69
8/5/06	10/3/06	0.02	59
10/3/06	3/25/07	0.35	173
3/25/07	5/20/07	0.12	56
5/20/07	9/1/07	0.04	104
9/1/07	10/6/07	0.05	35
10/6/07	7/3/08	ND	271
7/3/08	10/10/08	0.04	99
10/10/08	5/31/09	0.76	233
5/31/09	10/4/09	0.13	126
10/4/09	5/16/10	0.61	224
5/16/10	10/16/10	0.33	153
10/16/10	6/22/11	1.08	249

6/22/11	9/10/11	ND	80
9/10/11	5/13/12	0.50	246
5/13/12	10/7/12	0.07	147
10/7/12	8/5/13	0.94	302
8/5/13	10/15/13	0.08	71
10/15/13	6/15/14	0.60	243
6/15/14	10/12/14	0.11	119
10/12/14	10/10/15	1.28	363
10/10/15	6/24/16	0.87	258
6/24/16	6/13/17	1.04	354
6/13/17	10/14/17	0.19	123
SC10			
5/23/04	10/5/04	0.01	135
10/5/04	6/5/05	0.07	243
6/5/05	7/23/05	0.03	48
7/23/05	9/18/05	0.01	57
9/18/05	5/20/06	0.10	244
5/20/06	8/5/06	0.07	77
8/5/06	10/3/06	0.00	59
10/3/06	3/24/07	0.08	172
3/24/07	5/19/07	ND	56
5/19/07	9/2/07	0.02	106
9/2/07	10/7/07	0.03	35
10/7/07	4/13/08	0.03	189
4/13/08	7/3/08	0.06	81
7/3/08	9/1/08	0.00	60
9/1/08	9/27/08	0.00	26
9/27/08	5/31/09	ND	246
5/31/09	10/4/09	0.04	126
10/4/09	5/15/10	ND	223
5/15/10	10/17/10	0.29	155
10/17/10	6/21/11	ND	247
6/21/11	10/15/11	0.07	116
10/15/11	5/12/12	0.16	210
5/12/12	10/6/12	0.03	147
10/6/12	8/5/13	0.47	303
8/5/13	10/14/13	0.04	70
10/14/13	6/14/14	0.42	243
6/14/14	10/12/14	0.09	120
10/12/14	10/11/15	0.83	364
10/11/15	6/24/16	0.50	257
6/24/16	6/14/17	0.85	355

6/14/17	11/1/17	0.12	140
SC11			
5/23/04	10/5/04	0.01	135
10/5/04	6/5/05	ND	243
6/5/05	7/23/05	0.03	48
7/23/05	9/18/05	0.00	57
9/18/05	5/20/06	0.66	244
5/20/06	8/5/06	0.06	77
8/5/06	10/3/06	0.02	59
10/3/06	3/24/07	ND	172
3/24/07	5/19/07	0.09	56
5/19/07	9/2/07	0.01	106
9/2/07	10/7/07	0.02	35
10/7/07	4/13/08	0.32	189
4/13/08	7/3/08	0.05	81
7/3/08	9/27/08	0.02	86
9/27/08	5/31/09	0.31	246
5/31/09	10/4/09	1.09	126
10/4/09	5/15/10	ND	223
5/15/10	10/17/10	0.30	155
10/17/10	6/21/11	0.44	247
6/21/11	10/15/11	0.07	116
10/15/11	5/12/12	0.15	210
5/12/12	10/6/12	0.02	147
10/6/12	8/5/13	0.66	303
8/5/13	10/14/13	0.03	70
10/14/13	6/14/14	0.38	243
6/14/14	10/12/14	0.10	120
10/12/14	10/11/15	0.80	364
10/11/15	6/24/16	0.45	257
6/24/16	6/14/17	0.49	355
6/14/17	11/1/17	0.09	140
SC12			
5/24/04	10/3/04	0.02	132
10/3/04	6/5/05	0.71	245
6/5/05	7/24/05	0.03	49
7/24/05	9/18/05	0.00	56
9/18/05	5/28/06	0.90	252
5/28/06	8/5/06	0.00	69
8/5/06	10/3/06	0.03	59
10/3/06	3/25/07	0.26	173
3/25/07	5/20/07	0.08	56

5/20/07	9/1/07	0.01	104
9/1/07	10/6/07	0.08	35
10/6/07	4/13/08	0.74	190
4/13/08	7/4/08	0.06	82
7/4/08	9/28/08	0.01	86
9/28/08	5/31/09	0.59	245
5/31/09	10/4/09	0.17	126
10/4/09	5/16/10	0.48	224
5/16/10	10/16/10	0.37	153
10/16/10	6/22/11	0.64	249
6/22/11	10/16/11	0.07	116
10/16/11	5/13/12	0.24	210
5/13/12	10/7/12	0.03	147
10/7/12	8/5/13	0.60	302
8/5/13	10/15/13	0.04	71
10/15/13	6/15/14	0.34	243
6/15/14	10/12/14	0.05	119
10/12/14	10/13/15	0.99	366
10/13/15	6/26/16	0.60	257
6/26/16	6/14/17	0.99	353
6/14/17	11/1/17	0.16	140
SC13			
5/24/04	10/3/04	0.03	132
10/3/04	6/5/05	ND	245
6/5/05	7/24/05	0.04	49
7/24/05	9/18/05	0.02	56
9/18/05	5/28/06	0.98	252
5/28/06	8/5/06	0.02	69
8/5/06	10/3/06	0.01	59
10/3/06	3/25/07	0.30	173
3/25/07	5/20/07	0.07	56
5/20/07	9/1/07	0.02	104
9/1/07	10/6/07	0.05	35
10/6/07	4/13/08	0.40	190
4/13/08	7/4/08	0.03	82
7/4/08	9/28/08	0.01	86
9/28/08	5/31/09	0.51	245
5/31/09	10/4/09	0.15	126
10/4/09	5/16/10	0.55	224
5/16/10	10/16/10	0.39	153
10/16/10	6/22/11	0.64	249
6/22/11	10/16/11	0.09	116

10/16/11	5/13/12	0.26	210
5/13/12	10/7/12	0.04	147
10/7/12	8/5/13	0.58	302
8/5/13	10/15/13	0.05	71
10/15/13	6/15/14	ND	243
6/15/14	10/12/14	0.08	119
10/12/14	10/13/15	0.97	366
10/13/15	6/26/16	0.67	257
6/26/16	6/14/17	1.04	353
6/14/17	11/1/17	0.14	140
SC14			
5/24/04	10/3/04	0.05	132
10/3/04	6/5/05	0.89	245
6/5/05	7/24/05	0.05	49
7/24/05	9/18/05	0.00	56
9/18/05	5/28/06	ND	252
5/28/06	8/5/06	0.01	69
8/5/06	10/3/06	0.01	59
10/3/06	3/25/07	0.33	173
3/25/07	5/20/07	0.07	56
5/20/07	9/1/07	0.04	104
9/1/07	10/6/07	ND	35
10/6/07	4/13/08	0.49	190
4/13/08	7/4/08	0.06	82
7/4/08	9/28/08	0.02	86
9/28/08	5/31/09	0.55	245
5/31/09	10/4/09	0.04	126
10/4/09	5/16/10	0.56	224
5/16/10	10/16/10	0.27	153
10/16/10	6/22/11	0.73	249
6/22/11	10/16/11	0.09	116
10/16/11	5/13/12	0.26	210
5/13/12	10/7/12	0.02	147
10/7/12	8/5/13	0.60	302
8/5/13	10/15/13	0.07	71
10/15/13	6/15/14	0.37	243
6/15/14	10/12/14	0.12	119
10/12/14	10/13/15	0.94	366
10/13/15	6/26/16	0.78	257
6/26/16	6/14/17	0.81	353
6/14/17	11/1/17	0.09	140
SC15			

5/24/04	10/3/04	0.06	132
10/3/04	6/5/05	ND	245
6/5/05	7/24/05	0.07	49
7/24/05	9/18/05	0.00	56
9/18/05	5/28/06	1.08	252
5/28/06	8/5/06	0.00	69
8/5/06	10/3/06	0.01	59
10/3/06	3/25/07	0.41	173
3/25/07	5/20/07	ND	56
5/20/07	9/1/07	0.04	104
9/1/07	10/6/07	0.04	35
10/6/07	4/13/08	0.58	190
4/13/08	7/4/08	0.08	82
7/4/08	9/28/08	0.01	86
9/28/08	5/31/09	ND	245
5/31/09	10/4/09	0.09	126
10/4/09	5/16/10	0.49	224
5/16/10	10/16/10	0.32	153
10/16/10	6/22/11	0.78	249
6/22/11	10/16/11	0.10	116
10/16/11	5/13/12	0.33	210
5/13/12	10/7/12	ND	147
10/7/12	8/5/13	0.67	302
8/5/13	10/15/13	0.06	71
10/15/13	6/15/14	0.48	243
6/15/14	10/12/14	0.21	119
10/12/14	10/13/15	1.12	366
10/13/15	6/26/16	0.77	257
6/26/16	6/14/17	1.06	353
6/14/17	11/1/17	0.12	140

SC16

5/24/04	10/3/04	0.19	132
10/3/04	6/5/05	0.87	245
6/5/05	7/24/05	0.13	49
7/24/05	9/18/05	0.01	56
9/18/05	5/28/06	1.12	252
5/28/06	8/5/06	ND	69
8/5/06	10/3/06	0.00	59
10/3/06	3/25/07	0.39	173
3/25/07	5/20/07	0.10	56
5/20/07	9/1/07	0.04	104
9/1/07	10/6/07	0.04	35

10/6/07	4/13/08	0.53	190
4/13/08	7/4/08	0.10	82
7/4/08	9/28/08	0.04	86
9/28/08	5/31/09	0.63	245
5/31/09	10/4/09	0.08	126
10/4/09	5/16/10	0.57	224
5/16/10	10/16/10	0.28	153
10/16/10	6/22/11	ND	249
6/22/11	10/16/11	0.08	116
10/16/11	5/13/12	0.40	210
5/13/12	10/7/12	0.05	147
10/7/12	8/5/13	0.75	302
8/5/13	10/15/13	0.13	71
10/15/13	6/15/14	0.47	243
6/15/14	10/12/14	0.12	119
10/12/14	10/13/15	ND	366
10/13/15	6/26/16	0.76	257
6/26/16	6/14/17	0.86	353
6/14/17	10/14/17	0.07	122
PM			
10/5/04	10/16/04	0.00	11
10/16/04	6/5/05	1.16	232
6/5/05	7/17/05	0.07	42
7/17/05	9/18/05	0.02	63
9/18/05	5/28/06	1.17	252
5/28/06	8/5/06	0.06	69
8/5/06	10/3/06	0.00	59
10/3/06	3/25/07	0.36	173
3/25/07	5/20/07	0.12	56
5/20/07	6/3/07	0.00	14
6/3/07	9/1/07	0.04	90
9/1/07	10/6/07	0.05	35
10/6/07	7/3/08	0.68	271
7/3/08	10/10/08	0.03	99
10/10/08	5/31/09	0.84	233
5/31/09	10/4/09	0.14	126
10/4/09	5/16/10	0.75	224
5/16/10	10/16/10	0.30	153
10/16/10	6/22/11	1.06	249
6/22/11	9/10/11	0.03	80
9/10/11	5/13/12	0.48	246
5/13/12	10/7/12	0.03	147

10/7/12	8/5/13	0.92	302
8/5/13	10/15/13	0.03	71
10/15/13	6/15/14	0.57	243
6/15/14	10/12/14	0.10	119
10/12/14	10/17/14	0.03	5
10/17/14	10/8/15	1.23	356
10/8/15	6/24/16	0.80	260
6/24/16	6/13/17	1.37	354
6/13/17	10/14/17	0.16	123