Comprehensive Agreement No. 1

Sixth Annual Report

FY19
(July 1, 2018 – June 30, 2019)

Prepared by:

CITY OF PRESCOTT ARIZONA

PRESCOTT VALLEY

SRP®

September 30, 2019

Comprehensive Agreement #1
Prescott/Prescott Valley/SRP
Monitoring/Modeling Committee
FY19 Annual Report
(July 1, 2018 – June 30, 2019)

Introduction

The sixth annual report documents the progress of the Monitoring and Modeling Committees (Committees) established by Comprehensive Agreement #1 (CA#1). Since late 2012, the Committees have worked to implement the Data Collection and Monitoring Plan (DCMP) for the purposes of developing an improved numerical groundwater flow model of the Big Chino Sub-basin as described in the exhibits attached to CA#1. These efforts include the installation of monitoring equipment required to generate the data sets necessary for an improved groundwater flow model, to establish long-term hydrologic records, and to provide information for future adaptive management approaches in the basin. This report contains: project background, Fiscal Year 2019 (FY19) accomplishments, financial summaries, and the ongoing monitoring and modeling efforts required to fully execute the CA#1 objectives.

Background

At a joint meeting on September 19, 2012, the Councils for the City of Prescott and the Town of Prescott Valley unanimously approved a comprehensive water monitoring and groundwater modeling agreement with Salt River Project and the Salt River Valley Water Users' Association (SRP) regarding the City's Big Chino Water Ranch Project. The CA#1 agreement was authorized by SRP's Board on September 10, 2012.

CA#1 evolved over two years of discussions among Prescott, Prescott Valley, and SRP ("the Parties") to implement a plan consistent with the February 11, 2010, Agreement in Principle (AIP) among the same Parties. The AIP resolved longstanding differences pertaining to water rights in the Big Chino sub-basin, set forth a framework for future agreements, and ended litigation regarding plans to pump groundwater from the Big Chino Sub-basin as authorized by Arizona state law.

CA#1 set forth a program for enhanced water monitoring and modeling of groundwater flows in the Big Chino, confirmed rights to water arising from within the Prescott Active Management Area, and achieved a mutual agreement by all Parties not to challenge

those rights. CA#1 is a long-term commitment to construct, implement, and maintain the monitoring and modeling program, with the Parties sharing in the long-term cost.

The goals of the DCMP are to:

- Improve the understanding of the hydrologic relationship between groundwater and surface water in the Upper Verde River area.
- Act as an early warning system for the Upper Verde Springs.
- Collect data that may be used to distinguish groundwater pumping from the Big Chino Water Ranch from the impacts of groundwater pumping by others, and natural system variability.
- Develop the ability to relate regional groundwater and surface water observations to future groundwater model calibration and verification.
- Determine if additional data are needed.
- Provide data for development of a numerical groundwater flow model.

Summary of Annual Accomplishments

Meetings

- Monthly meetings of the Monitoring and Modeling Committees
- Supplemental meetings to discuss technical issues with contract holders, Specialized Technical Consultants (STC) and/or Golder Associates, Inc. (9/19/2018, 10/1/18, 11/5/18, 11/6/18, 11/28/18, 3/29/19, 5/8/19, 6/3/19, 6/26/19)

Executed Documents or Coordinated Activities

- USGS - City Contract No. 2014-160A3 (July 2018) increased funding with a USGS cost share of $60,175.00
- Golder – City Contract No. 2017-246 (December 2018) contract allowance authorization #2
- USGS - City Contract No. 2017-143A1 (April 2019) a not cost extension

Funding Contributions -All parties made monetary contributions for the Monitoring and Modeling Plan for FY19 per CA#1

Public Information

- City of Prescott website – continual updates
- City of Prescott Council Subcommittee for Water Issues
- City Water Education Series – WaterSmart Drop by Drop (September 2018)
- Town of Prescott Valley website
- SRP website *http://watershedconnection.com* that includes an overview about the CA#1 Monitoring and Modeling program.

Reports Completed

- Big Chino Sub-basin Water Monitoring Project, July 1, 2018 – June 30, 2019 Annual Report. See **Appendix I**
- Phase 1 – Scope of Work Comprehensive Agreement No.1 Big Chino Sub-basin Data Collection and Monitoring Program (SGC a Division of Matrix New World, May, 2019)
- Phase 2 – Big Chino Sub-Basin Data Collection and Monitoring Program (SGC a Division of Matrix New World, February, 2019)
- Aquifer Storage Change and Storage Properties, 2010-2017, in the Big Chino Sub basin, Yavapai County, Arizona (USGS SIR 2019-5060)

Accounting/Budget

In accordance with CA#1, the Parties fund the project with annual contributions to an account managed by the City of Prescott as the fiduciary. The budget for the period of this annual report (FY19) is shown in **Table 1** as Year 6. It is important to note that the Communities and SRP do not have the same fiscal calendars. This project operates on a July 1st to June 30th timeframe. Further, SRP adjusted their contributions to increase their contributions in the early years of the project, but their overall project contributions total was unchanged.

A detail of expenditures for FY19 only is shown in **Table 2**. Since the CA#1 commenced, the monitoring project account balance and expenditures as of June 30, 2019 are $1,354,552.75 and $2,980,012.82, respectively. Similarly, the modeling project account balance and expenditure as of June 30, 2019 are $715,279.37 and $555,324.30, respectively. The overall project funds have encumbrances with ongoing contracts, but those encumbrances are not reflected in the values shown in **Table 2**. In February 2017, the Parties entered into a contract (City Contract No. 2017-246) with Golder Associates Inc., for the completion of a groundwater flow model. Toward the end of the FY17, the Parties were completing contract negotiations with Southwest Groundwater Consultants, Inc. (SGC) for monitor well drilling oversight. The SGC contract (City Contract No. 2016-296A1) was approved by City Council on July 25, 2017 (FY18). The accumulation of funds in the accounts anticipated the large project cost for the modeling contract and for the monitor well drilling contract. The monitor well drilling contract (City Contract No. 2018-114) was completed and closed (November 2018). The contract was under budget even with onsite drilling challenges. The contract amount was $1,369,928.00 and the final cost was $1,090,560.75.

Table 1 – Contributions by CA #1 Parties in FY19

	Year 6 (FY19)		Year 5 (FY18)	
Entity	**Monitoring**	**Modeling[1]**	**Monitoring**	**Modeling**
Prescott	$114,649	$0	$114,649	$108,298
Prescott Valley	$97,271	$0	$97,271	$91,883
SRP	$105,854	$0	$105,960	$100,091

[1] All Parties have completed funding requirements in accordance with City Contract No. 2013-058

Table 2 – Contract Expenditures in FY19

	Monitoring		
Contractor Name, Number	**Description**	**Amount**	**Payment Date(s)**
SRP, Contract No. 2014-001, 001A1, 001A2	New Stream Gages (Flowtography and weather equipment)	$83,138.53	09/07/18, 10/30/18, 02/19/19
SRP, Contract No. 2014-001	Existing Stream Gages	$1,713.95	09/07/18,10/30/18, 03/05/19
SRP, Contract No. 2014-001	Existing Well Monitoring	$410.47	10/30/18, 03/05/19
USGS, 2014-160, 160A1, 160A2, 160A3	Geophysics	$51,899.99	08/08/18, 09/18/18, 02/18/19, 03/05/19, 04/23/19
USGS, Contract No. 2017-143, 143A1	Geochemistry	$65,802.50	08/08/18, 10/30/18, 11/19/18, 04/23/19, 06/30/19
Southwest Groundwater Consultants,	Well Drilling Oversight	$70,275.68	08/03/18, 09/13/18, 10/01/18, 11/7/18,

Contract No. 2016-296, 296A1			12/12/18, 01/07/19, 02/05/19, 03/11/19, 05/14/19
	Monitoring Total	$273,241.12	

	Modeling		
	Description	**Amount**	**Payment Date(s)**
Golder Associates, Contract No. 2017-246	Modeling Contract	$158,123.39	09/04/18, 10/01/18, 11/14/18, 12/12/18, 01/07/19, 01/22/19, 04/09/19, 04/30/19, 06/17/19, 06/30/19
	Modeling Total	$158,123.39	
	Combined Total	**$431,364.51**	

Monitoring Project - Equipment

Since the commencement of this project, the CA#1 Parties and their specialized technical consultants worked with ADWR, USGS, Yavapai County Flood Control District and others to develop and monitor a network of equipment, both new and existing in the Big Chino Sub-basin. This equipment and data inventory supports the groundwater flow model that is currently underway. Although not all data collection to date is reflected in this annual report, new equipment installed during the fiscal year is identified in this section. Completed and existing equipment will be shown in table format, by type, in **Appendix II**.

Groundwater Level Monitoring

- The drilling of all new monitor wells was completed in FY18.
- The CA1 parties and ADWR have been in ongoing meetings to implement a plan to manually or electronically measure water levels in the newly drilled wells and the "alternative existing wells". All well have been added into ADWR's Groundwater Site Inventory (GWSI) database.
- See **Appendix II** and **Appendix III, Maps 1 and 2** for ongoing water level monitoring locations and data.

Stream flow Monitoring

- The flow monitoring network is essentially complete. No new sites were added in FY19. Site maintenance and data collection continued. The Upper Walnut Creek at Bridge site (at Williamson Valley Road bridge crossing) location was reassessed with USGS in May 2019. Stage-flow relationships at this location are subject to frequent changes due to vegetation growth and/or erosion/aggradation of the channel. This location remains of interest to the Parties.
- See **Appendix I** and **Appendix III, Maps 3-5**

Weather Monitoring

- No additional sites were added to the weather monitoring network. The network continued to collect a variety of weather data that will be used to help define the water budget for the Big Chino Sub-basin.
- See **Appendix III, Map 6-6a**

Geochemical Surveys

The USGS Arizona Water Science is engaged in City Contract No. 2017-143 (and associated amendment) for geochemical data collection to improve the understandings of recharge pathways, both water rock interactions and residence times. A report is to be published in late calendar year 2019 or early 2020. At the time of this annual report, all geochemical samples have been collected (FY11-18) and analyzed by USGS water quality laboratories. These data are published and publicly available on the USGS National Water Information System (NWIS). During FY19, two stable isotope samples were collected, at the Williamson Valley and Verde Paulden surface water gages.

- https://waterdata.usgs.gov/nwis
- See **Appendix II** for list of sampling locations
- See **Appendix III, Map 7** showing the Geochemical sampling sites.

Aquifer Storage Monitoring and Geophysical Surveys

The USGS Arizona Water Science Center has been engaged in data collection, data interpretation, and reports as described in City Contract No. 2014-160 (and associated amendments) related to two geophysical methods, CSAMT and gravity studies. During FY19, both scientific efforts had manuscripts ready for cooperator

(CA1 Parties) courtesy review. Prior to the close of the fiscal year, one report was released and the second continued to final layout and production with an anticipated release in late summer 2019. Both reports are identified below.

- *Aquifer Storage Change and Storage Properties, 2010-2017, in the Big Chino Subbasin, Yavapai County, Arizona*
    - Interpreted changes in aquifer conditions through the application of microgravity techniques and groundwater-level monitoring
    - Scientific Investigations Report 2019-5060
    - https://pubs.usgs.gov/sir/2019/5060/sir20195060.pdf
    - Data collection will continue in accordance with City Contract No. 2014-160A3.
    - See **Appendix III, Map 8**

- *Characterization of Big Chino Subbasin Hydrogeology near Paulden, Arizona, Using Controlled Source Audio-Frequency Magnetotelluric Surveys*
    - Discusses the use of geophysical and geological techniques to characterize the hydrogeology in the Big Chino subbasin for the purpose of improving the conceptual model of the aquifer
    - Draft SIR in final production (notification on 8/7/2019)
    - At this time, no additional data collection is planned

<u>Crop Surveys and Estimated Crop Water Use</u>

The USGS, in contract with ADWR, conducts crop surveys in the Big Chino Sub-basin including in FY 2018, see **Table 3**. Each year the CA1 Parties seek the compiled data for inclusion in their annual report. This year, USGS notified the Parties that they had determined a discrepancy from one year to the next for the Williamson Valley and Walnut Creek areas due to either mislabeling or a report table mix-up. The basic conclusions that can be drawn from 2018 data include:

- Approximately 41% of the irrigable lands that were surveyed were being irrigated in 2018 (1,595 acres cropped).
- Approximately 2,292 acre-feet were withdrawn to irrigate this year's cropping pattern.
- Approximately 1.4 acre-feet was used per crop acre.

The recommendation remains that the USGS methodology for calculating consumption use and irrigation efficiency should be examined and local climate

data collected at the station on Big Chino Water Ranch should be incorporated in consumptive use estimates before these values are used in a groundwater model.

Table 3 – 2018 Crop Survey – Acres Irrigated

Crops	Upper Big Chino	Paulden	Walnut Creek	Williamson	Turkey Canyon	Total Crop Acres
ALFALFA	157		7	8		172
GRASS	168	116	28	494	63	869
OATS						0
PASTURE		51	108	341		500
SOD		36				36
VEGETABLE		18				18
Total Crop Acres	**325**	**221**	**143**	**843**	**63**	**1595**
No Crop Evident	**1552**	**254**	**107**	**352**	**38**	**2303**

Monitoring Project - Analytical Results and Data Collected

The results of the data collection and data interpretation efforts are provided in separate reports or databases produced and managed by the responsible agency. One of the duties of the CA#1 Monitoring Committee is to coordinate and monitor these data collection and reporting efforts so that the results are useful for the groundwater modeling and monitoring purposes outlined in CA#1. An explanation of how these efforts are reported or recorded is provided below.

Groundwater Monitoring

Groundwater level monitoring efforts are being completed both under contract with the CA#1 program (e.g. aquifer storage monitoring and continuous water level monitoring under the USGS contract) and through traditional water level monitoring efforts conducted by the Arizona Department of Water Resources.

- Efforts by the USGS

The USGS has completed one Scientific Investigations Report and the second was released after the close of the FY19. No further work will be done to

characterize the basin through CSAMT. There will be ongoing gravity measurement through September 2019. The USGS also monitors several wells in the Big Chino Sub-basin including two on the City's Big Chino Water Ranch.

- Efforts by ADWR

In July 2019 (after the close of FY19), ADWR provided updated information on the number of wells (index) that are monitored in the Big Chino sub-basin. There are 99 index wells with the following monitoring frequency: 17 annual, 61 semi-annual, 12 quarterly, and 9 automated. The last well sweep conducted in the Big Chino Sub-basin was during the spring of 2017.

Stream flow Monitoring

Stream flow monitoring efforts in the Big Chino Sub-basin are conducted by SRP Field Services Division and by the USGS under contracts with the CA#1 program. The USGS also maintains another stream gage outside of the CA#1 Contract. Additional flow stage data is collected by YCFCD for flood control purposes.

- Efforts by SRP

SRP Measurement Services collects stream flow data and other information at thirteen (13) locations in the Big Chino Sub-basin under contract with the CA#1 program. The full report for FY19 documenting the results of the flow monitoring program is attached as **Appendix I**. The annual hydrographs are located in **Appendix III, Maps 4 and 5**.

- Efforts by USGS

The USGS operates two stream gages in the Big Chino Sub-basin. The Williamson Valley Wash near Paulden gage is funded through the CA#1 program and the Verde River near Paulden gage is funded through a separate program with SRP, the U.S. Forest Service and the USGS. Stream flow records for these sites are maintained by the USGS in their on-line database: http://waterdata.usgs.gov/az/nwis/rt

- Efforts by Yavapai County Flood Control District (YCFCD)

YCFCD collects flow stage data at four (4) locations in the Big Chino Sub-basin; Ashfork Draw at I-40, Partridge Creek at I-40, Big Chino Wash at Highway 89, and Walnut Creek at Walnut Creek Bridge. The CA#1 Committee and SRP

Field Services evaluated these sites for their usefulness in converting flood stage data into stream flow records. Of the listed sites only the Walnut Creek Bridge stage data will be used for calculating stream flow. Data is available the YCFCD ALERT System webpage.

Modeling Project

The Big Chino Groundwater Modeling Project is an intensive 3-year effort to develop a detailed computerized groundwater model of the Big Chino Sub-basin; the contract with Golder Associates, Inc. (Golder) was executed in March 2017. In FY18 the model team focused on meeting the contract requirements related to data compilation, model domain, geologic cross-sections, and well drilling and aquifer tests. Similar to FY18, in FY19 other contract holders and the parties' Specialized Technical Consultants (STC) worked with Golder to move data in a timely manner or convene conference calls to discuss information at key junctures. The Golder team marked several accomplishments in FY19 with the CA #1 Committee and STCs providing coordinated reviews and comments:

- July 2018 - September 2018 – Eight (8) cross-sections for use in the Leapfrog model were provided for review. They were supported by the data compiled and reviewed to date.
- October 2018 - March 2019 – Multiple reviews and discussion with USGS on cross-sections and how the CSAMT data compares or help interpret geologic layers and structures. Technical Memo 2 in final draft to the Parties. Contract Allowance Authorization No. 2 executed.
- April 2019 – June 2019 – Technical Memo 6 (Conceptual Model) continued to be under development as the firm prepared for the Multi-Agency Meeting (held July 25 and 26, 2019). In April 2019, Golder entered into a Sub-consultant Services Agreement with Betsy Semmens (BAS Groundwater Consulting Inc.).

Conclusions

The FY19 project year involved dedicated collaboration among the multiple contract holders, discussing and moving data to the modeling team was a priority. The Parties evaluated the project's Data Collection and Monitoring Plan (reference the CA1 Contract,

Exhibit 4) to determine if the monitoring efforts to date have met the objectives. It was confirmed the project is on track.

Expectations for FY20 monitoring are 1) USGS CSAMT report release; 2) USGS Geochemistry report release; 3) ADWR equipping or re-equipping 3 wells (BMW-2, BWM-3, and MW-4e); and 4) ADWR IGA to monitor the remaining 7 wells. Expectations for FY20 modeling are 1) increase meeting frequency as the model is built; and 2) execute Contract Amendment No. 1.

The project's financial condition remains strong and cost savings measures continue to be assessed and taken when possible. The Parties plan that the Golder contract will be amended to replace funding that was shifted early in the project to meet greater data compilation needs than anticipated, and increase the number of geologic cross-sections to improve the LeapFrog model which informs the model construction. The overall project has cost saving in the monitoring portion of the project that will be shifted to the modeling portion of the project. Communications among the Parties, with their STCs, and with the agencies will continue as the need arises.

APPENDIX I

Big Chino Sub-basin Water Monitoring Project, July 1, 2018 – June 30, 2019 Annual Report

Big Chino Sub-basin Water Monitoring Project

July 1, 2018 – June 30, 2019 Annual Report for CA1 Monitoring Committee
City of Prescott, Town of Prescott Valley, and Salt River Project

Prepared by SRP Water Measurement Staff
9-1-2019

Delivering water and power™

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Cover photo credit: SRP Flowtography® at Upper Big Chino Wash on 2/23/2019 at 6:12 p.m.

INTRODUCTION

This report has been developed for the CA1 Monitoring Committee as part of the Big Chino Sub-basin Water Monitoring Project (City Contract No. 2014-001, A1, and A2) in collaboration with the City of Prescott, Town of Prescott Valley, and Salt River Project (SRP).

A summary of flow events observed during the 2019 monitoring period (July 1, 2018 to June 30, 2019) is contained within this report.

SEASONAL FLOW SUMMARY

For this report, the 2019 annual reporting period refers to July 1, 2018 through June 30, 2019.

Surface water flow was observed at each SRP Flowtography® site during the 2019 annual reporting period. The flow event start date, an estimate of the magnitude of the flow, and the locations where surface water flow was observed are shown in Table 1 and Figure 1.

Overview of the estimated flow observed in the sub-basin during the 2019 reporting period:

- All sites experienced flow events related to both monsoon and winter precipitation events.
- Five (5) sites including PC, LWCCP, LWVW, LBCW, and VHCR experienced flow events that exceeded the discharge rating.
- Sixteen (16) separate flow events were observed at Big Chino Wash below Partridge Creek, the most at any location during the monitoring period.
- Five (5) separate flow events were observed at Lower Walnut Creek at Charney Property, the least amount of flow events at one location during the monitoring period.
- The lowest estimated surface water flow volume for a single site for the 2019 annual reporting period was 60 AF observed at Upper Big Chino Wash.
- The largest estimated surface water flow volume for a single site for the 2019 annual reporting period was 13,780 AF[1] at Lower Williamson Valley Wash.
- The estimated total surface water flow volume for all sites in the Big-Chino sub-basin for the 2019 annual reporting period was 23,262 AF[1]. Of that estimate, 21,144 AF[1] or 91% occurred after the 2018 monsoon season (from October 1, 2018 through June 30, 2019; sites not included in this estimate are Upper Walnut Creek at Forest Service, Upper Walnut Creek at Bridge, and Sullivan Dam due to discharge not calculated at those sites and Partridge Creek as there is no monitoring equipment located directly on the Partridge Creek channel itself).

[1] This estimated total flow volume excludes flows that exceeded the existing site discharge rating. Flows at or below this limit are included here.

TABLE 1. BIG CHINO SUB-BASIN JULY 1, 2018 – JUNE 30, 2019 FLOW EVENT SUMMARIES INCLUDING THE ESTIMATED TOTAL ACRE-FEET (AF)

Start Date[2]	Upper Big Chino Wash (UBCW)	Big Chino Wash below Partridge Creek (BCWPC)[3]	Partridge Creek[4]	Pine Creek (PC)	Upper Walnut Creek at Forest Service (UWCFS)[5]	Upper Walnut Creek at Bridge (UWCB)[5]	Lower Walnut Creek at Charney Property (LWCCP)	Williamson Valley Wash at XU Ranch (WVWXU)	Lower Williamson Valley Wash (LWVW)	Lower Big Chino Wash (LBCW)	Sullivan Dam (SD)[6]
7/7/2018					no flow	no flow		< 1			no flow
7/14/2018	< 1	4	3		no flow	no flow			53	7	no flow
7/17/2019					no flow	no flow				4	no flow
7/18/2018	17	1			no flow	no flow			48		yes
7/19/2018		1	1		no flow	no flow		3		4	yes
7/20/2019					no flow	no flow				114	yes
7/28/2018		< 1	< 1		no flow	no flow			158	148	yes
7/31/2018	6				no flow	no flow					no flow
8/1/2019					yes	yes				92	yes
8/9/2018	11	11			no flow	no flow					no flow
8/10/2018		7	7		no flow	no flow	4				no flow
8/11/2018		163	163		no flow	no flow					no flow
8/12/2018	2				yes	yes					no flow
8/14/2018				16	no flow	no flow					no flow
8/15/2018		51	51	< 1	no flow	no flow					no flow
8/16/2018					no flow	no flow	4				no flow
8/17/2018	< 1	75	74		no flow	no flow		11			no flow
8/18/2018					no flow	no flow			131		yes
8/19/2018					no flow	no flow			105	111	no flow
8/20/2018	< 1				no flow	no flow					no flow
8/22/2018	16	205	189	222[7]	no flow	no flow	29	< 1			no flow
8/23/2018					no flow	no flow				229	yes
8/24/2018	< 1				no flow	no flow					no flow
8/25/2018	2				no flow	no flow					no flow
9/2/2018	< 1				no flow	no flow					no flow

[2] Flow events may start just prior to date indicated or continue into the following day

[3] UBCW flows may be included in these numbers as the BCWPC gage is located 1.2 miles downstream

[4] These flows were derived by subtracting the UBCW contribution from the flows at BCWPC. These are estimated flows, as there is no monitoring equipment located directly on the Partridge Creek channel itself

[5] Surface water flow observed at this site during the reporting period. A 'yes'/'no' will indicate a visible increase in flow, 'no flow' will indicate that there was no flow at the site, and 'not visible' will indicate that it is not visible and we were unable to determine if there was flow or not at the site

[6] Sullivan Dam spill crest is not rated for discharge measurement estimates.

[7] Estimated flow volumes for flow events where the flow exceeded the site discharge ratings may be lower than the actual flow.

TABLE 1. CONTINUED

Start Date[8]	Upper Big Chino Wash (UBCW)	Big Chino Wash below Partridge Creek (BCWPC)[9]	Partridge Creek[10]	Pine Creek (PC)	Upper Walnut Creek at Forest Service (UWCFS)[11]	Upper Walnut Creek at Bridge (UWCB)[11]	Lower Walnut Creek at Charney Property (LWCCP)	Williamson Valley Wash at XU Ranch (WVWXU)	Lower Williamson Valley Wash (LWVW)	Lower Big Chino Wash (LBCW)	Sullivan Dam (SD)[12]
9/3/2018		50	50		no flow	no flow					no flow
10/6/2018	< 1				no flow	no flow					no flow
10/7/2019		41	41		no flow	no flow			60	14	yes
1/15/2019	3	185	182	70	yes	yes	114	1,161			no flow
1/16/2019					yes	yes			831	249[13]	yes
2/3/2019					no	yes		48			no flow
2/6/2019					no	yes			691	297	yes
2/14/2019				61	yes	yes	472[13]	884	4,927[13]		no flow
2/15/2019					yes	yes				409[13]	no flow
2/16/2019		429	429		yes	yes					no flow
2/23/2019					no	no		247			no flow
2/26/2019					no	no			5,761[13]		no flow
2/27/2019				60	no	no				1,535[13]	yes
3/1/2019		367	367		no	no					no flow
3/11/2019					yes	yes		227			no flow
3/13/2019				58	no	no			1,015	470[13]	yes
3/14/2019		458	458		no	no					no flow
Estimated Total Flow	**60**	**2,048**	**2,015**	**487[14]**			**623[14]**	**2,581**	**13,780[14]**	**3,683[14]**	

[8] Flow events may start just prior to date indicated or continue into the following day

[9] UBCW flows may be included in these numbers as the BCWPC gage is located 1.2 miles downstream

[10] These flows were derived by subtracting the UBCW contribution from the flows at BCWPC. These are estimated flows, as there is no monitoring equipment located directly on the Partridge Creek channel itself

[11] Surface water flow observed at this site during the reporting period. A 'yes'/'no' will indicate a visible increase in flow, 'no flow' will indicate that there was no flow at the site, and 'not visible' will indicate that it is not visible and we were unable to determine if there was flow or not at the site

[12] Sullivan Dam spill crest is not rated for discharge measurement estimates.

[13] Estimated flow volumes for flow events where the flow exceeded the site discharge ratings may be lower than the actual flow.

[14] This estimated total flow volume excludes flows that exceeded the existing site discharge rating. Flows at or below this limit are included here.

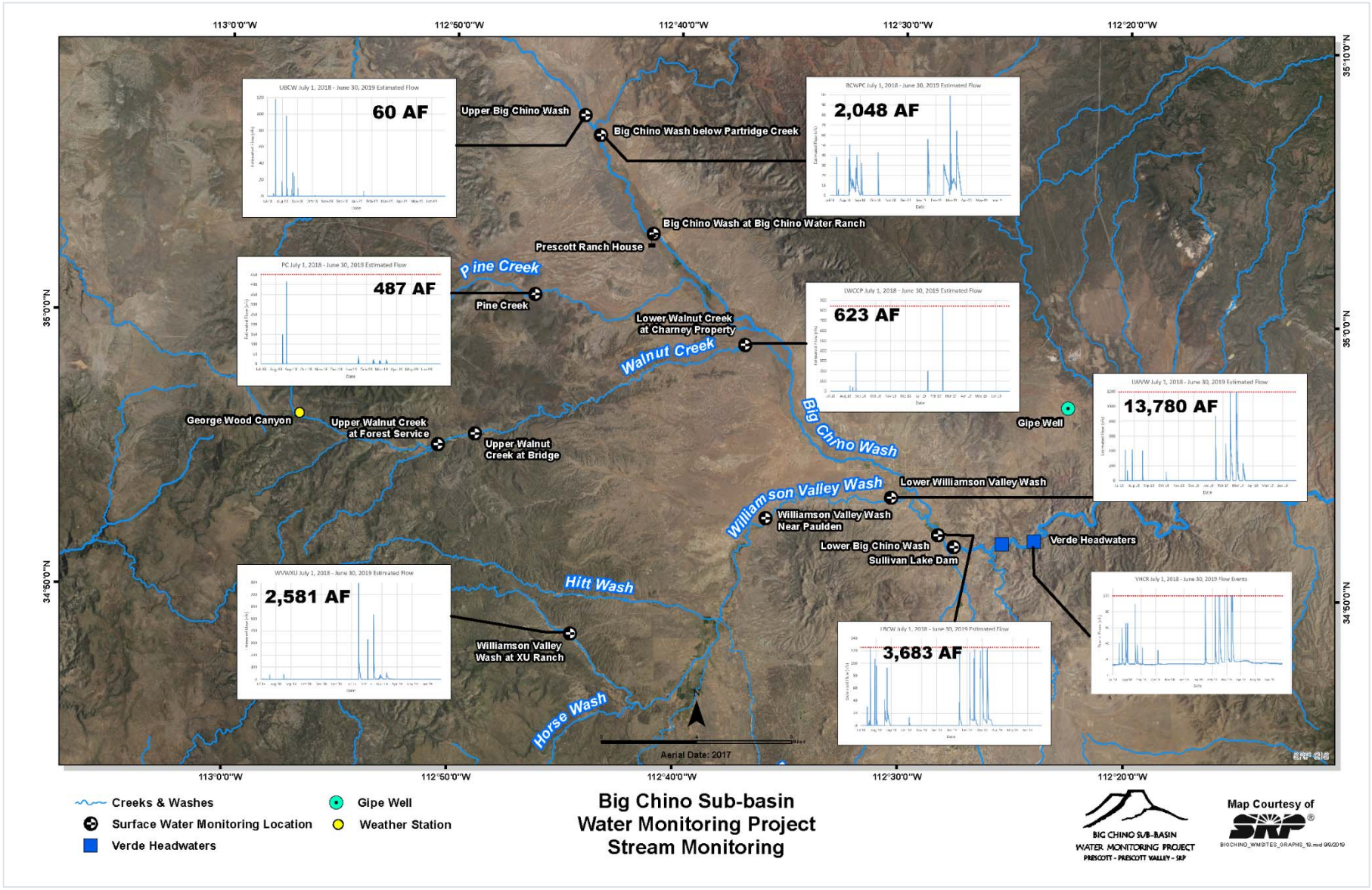


FIGURE 1. BIG CHINO SUB-BASIN MAP

LOCATION SUMMARIES

UPPER BIG CHINO WASH (UBCW)

Thirteen (13) events with measurable ephemeral flow were observed at UBCW during the 2019 annual monitoring period. UBCW responded to monsoon and winter related precipitation events. Peak discharge for the year was an estimated 118 cubic feet per second (cfs) observed on 7/18/2018. The flow event on 8/9/2018 was the longest lasting, with a duration of 33.75 hours, resulting in an estimated total flow volume of 11 AF or 18% of the annual volume at the site. The flow event on 7/18/2018 resulted in the largest estimated flow volume at 17 AF, or 28% of the annual volume of the site. The total estimated volume recorded at the site for the 2019 reporting period was 60 AF. Flow events, durations, and estimated flow volumes for the annual reporting period are outlined in Table 2 and Figures 2-4.

TABLE 2. UBCW JULY 2018 – JUNE 2019 FLOW EVENTS

Start Date	Start Time[15]	Duration[16] (hours)	Peak Stage (feet)	Peak Discharge (cfs)	Total Volume (AF)
7/14/2018	2:15 p.m.	4	0.5	3	<1
7/18/2018	6:15 p.m.	16.75	2.46	118	17
7/31/2018	5:00 p.m.	9	1.06	18	6
8/9/2018	4:45 p.m.	33.75	2.25	98	11
8/12/2018	4:15 p.m.	10.75	0.80	9	2
8/17/2018	11:30 p.m.	8	0.29	< 1	<1
8/20/2018	12:15 p.m.	3	0.75	8	<1
8/22/2018	5:15 p.m.	24.75	1.30	29	16
8/24/2018	1:30 p.m.	12	0.50	3	<1
8/25/2018	3:00 p.m.	3.5	1.20	24	2
9/2/2018	6:30 p.m.	2.5	0.80	9	<1
10/6/2018	11:30 p.m.	9.5	0.36	1	<1
1/15/2019	12:00 a.m.	20.5	0.66	6	3
		158 (total hours)			**60 (total AF)**

The UBCW was visited a total of eight (8) times during the 2019 reporting period. In addition to routine maintenance and data collection, the following adjustments were made at the site:

- Replaced upstream and downstream event gages
- Replaced the downstream pressure transducer and cable
- Replaced the primary and backup batteries
- Replaced one (1) cellular modem
- Upgraded site to 4G camera technology (2G hardware no longer supported by Verizon Wireless)
- Installed tint on flash for new camera

[15] Start times are approximate and actual start time are within ±15 minutes of the noted time. Events may also continue into the next day(s).

[16] Flow event duration is based on discharge calculated using the existing site rating.

- Updated camera firmware on primary and backup cameras

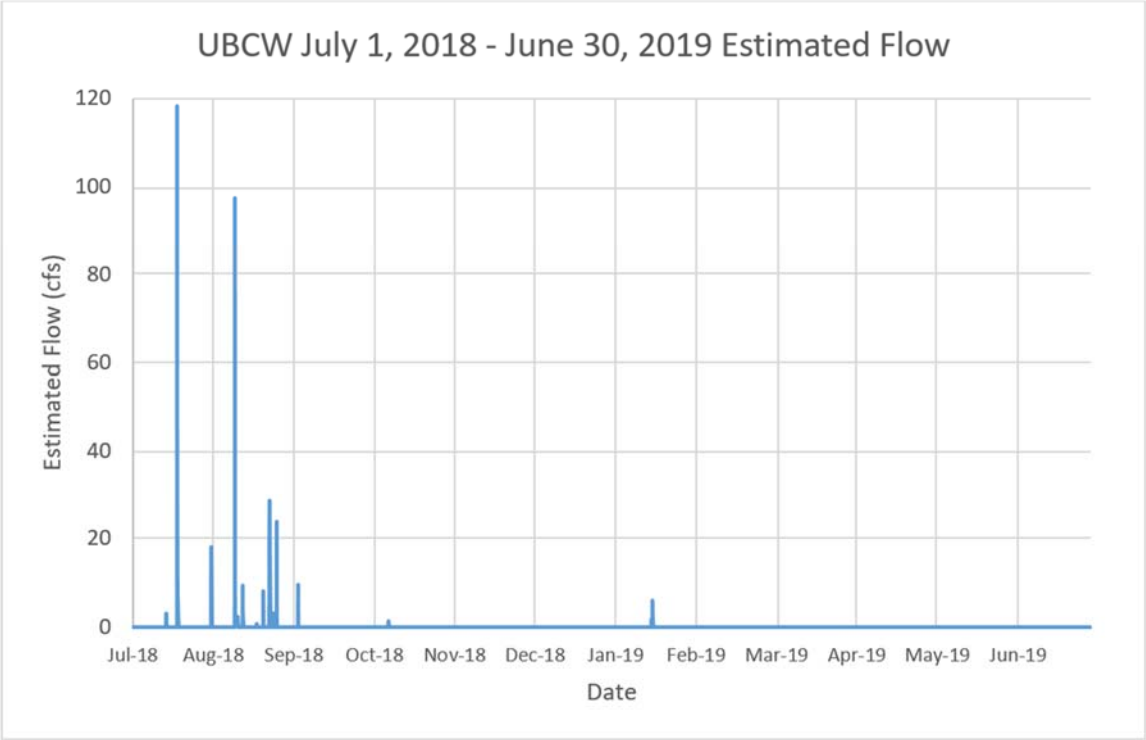


FIGURE 2. UBCW JULY 1, 2018 – JUNE 30, 2019 ANNUAL FLOW EVENTS

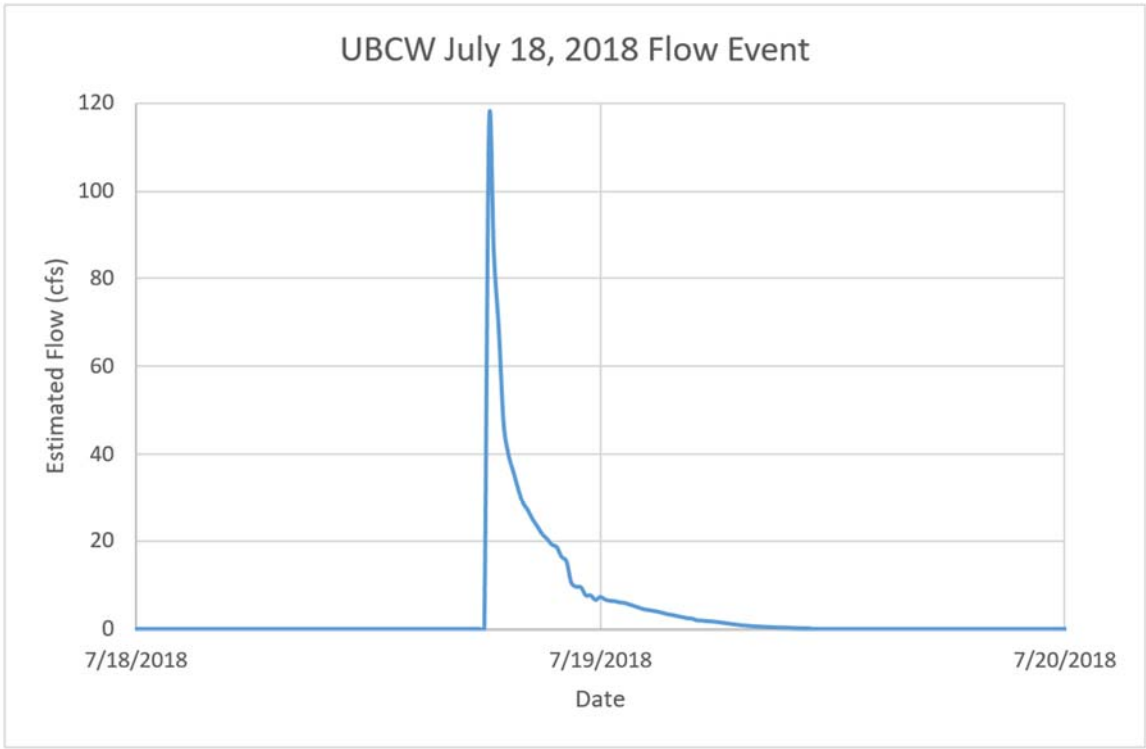


FIGURE 3. UBCW JULY 18, 2018 FLOW EVENT

UBCW at the start of the 2019 reporting period:

Greenup after 2018 monsoon events:

Peak of 7/18/2018 flow event:

Snowfall at UBCW

UBCW at the end of the 2019 reporting period:

FIGURE 4. UBCW IMAGE DATA

BIG CHINO WASH BELOW PARTRIDGE CREEK (BCWPC)

Sixteen (16) events with measurable ephemeral flow were observed at BCWPC during the 2019 annual monitoring period. BCWPC responded to monsoon and winter related precipitation events. Peak discharge for the year was an estimated 99 cfs observed on 3/1/2019. The 2/16/2019 event was the longest lasting event observed at the site for the reporting period with a duration of 313.5 hours, resulting in an estimated total flow volume of 429 AF or 21% of the annual volume at the site. The 3/14/2019 flow event resulted in the largest estimated flow volume at 458 AF or 22% of the annual volume at the site. The total estimated volume recorded at the site for the 2019 reporting period was 2,048 AF. BCWPC flow events, durations, and estimated volumes for the 2019 reporting period are outlined in Table 3 and Figures 5-7.

TABLE 3. BCWPC JULY 2018 – JUNE 2019 FLOW EVENTS

Start Date	Start Time[17]	Duration[18] (hours)	Peak Stage (feet)	Peak Discharge (cfs)	Total Volume (AF)
7/15/2018	10:15 p.m.	11.75	2.7	38	4
7/18/2018	11:15 a.m.	14	1.24	5	1
7/19/2018	11:15 p.m.	6	1.38	6	1
7/28/2019	11:45 p.m.	2	0.72	< 1	< 1
8/9/2018	5:45 p.m.	18.25	2.65	35	11
8/10/2018	12:15 p.m.	11.75	1.59	10	7
8/11/2018	12:15 a.m.	119	3.04	50	163
8/15/2018	11:30 p.m.	46.5	1.97	17	51
8/17/2018	10:15 p.m.	119.25	1.88	15	75
8/22/2018	9:45 p.m.	289.75	2.78	40	205
9/3/2018	11:45 p.m.	76.5	2.54	32	50
10/07/2018	10:30 a.m.	54	2.87	43	41
1/15/2019	11:45 a.m.	90.25	3.19	56	185
2/16/2019	3:15 a.m.	313.5	2.5	31	429
3/1/2019	5:00 a.m.	311.75	3.97	99	367
3/14/2019	5:00 a.m.	243.5	3.37	64	458
		1,727.75 (total hours)			**2,048 (total AF)**

The BCWPC was visited a total of nine (9) times during the 2019 reporting period. In addition to routine maintenance and data collection, the following adjustments were made at the site:

- Installed temporary t-post event gage while site experienced prolonged pooling
- Replaced one (1) camera
- Serviced event gages
- Replaced the primary and backup batteries
- Upgraded site to 4G camera technology (2G hardware no longer supported by Verizon Wireless)

[17] Start times are approximate and actual start time are within ±15 minutes of the noted time. Events may also continue into the next day(s).
[18] Flow event duration is based on discharge calculated using the existing site rating.

- Updated camera firmware on primary and backup cameras

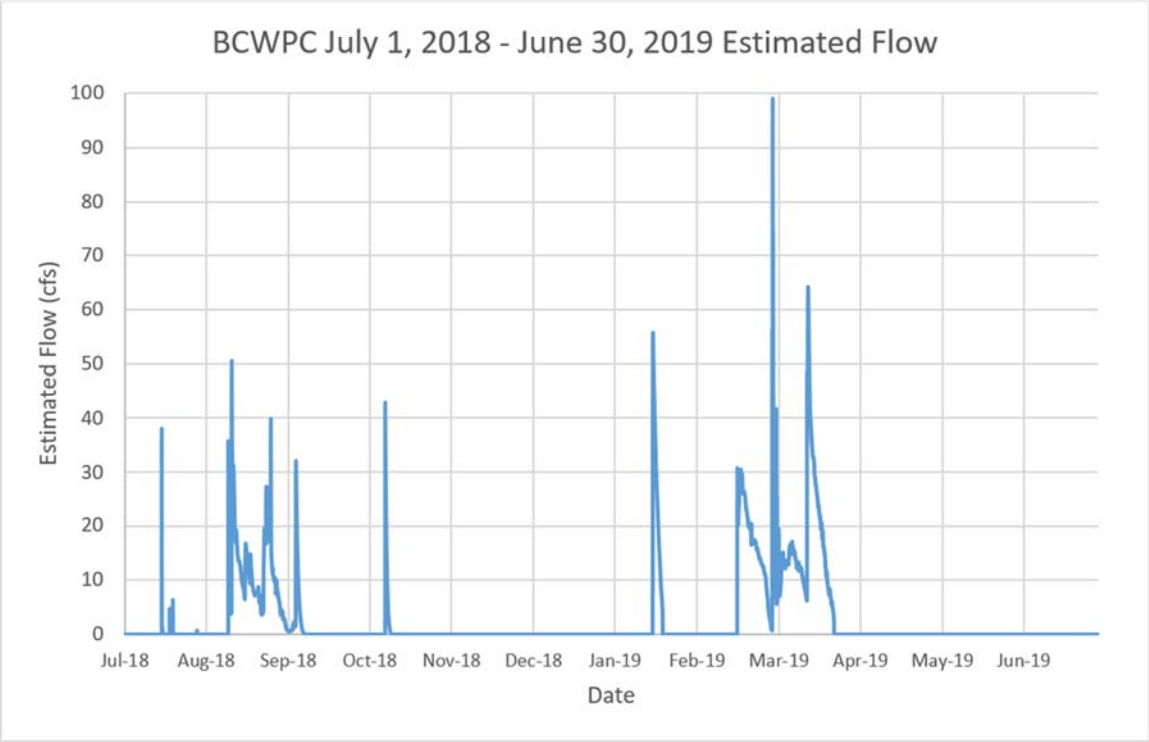


FIGURE 5. BCWPC JULY 2018 – JUNE 2019 ANNUAL FLOW EVENTS

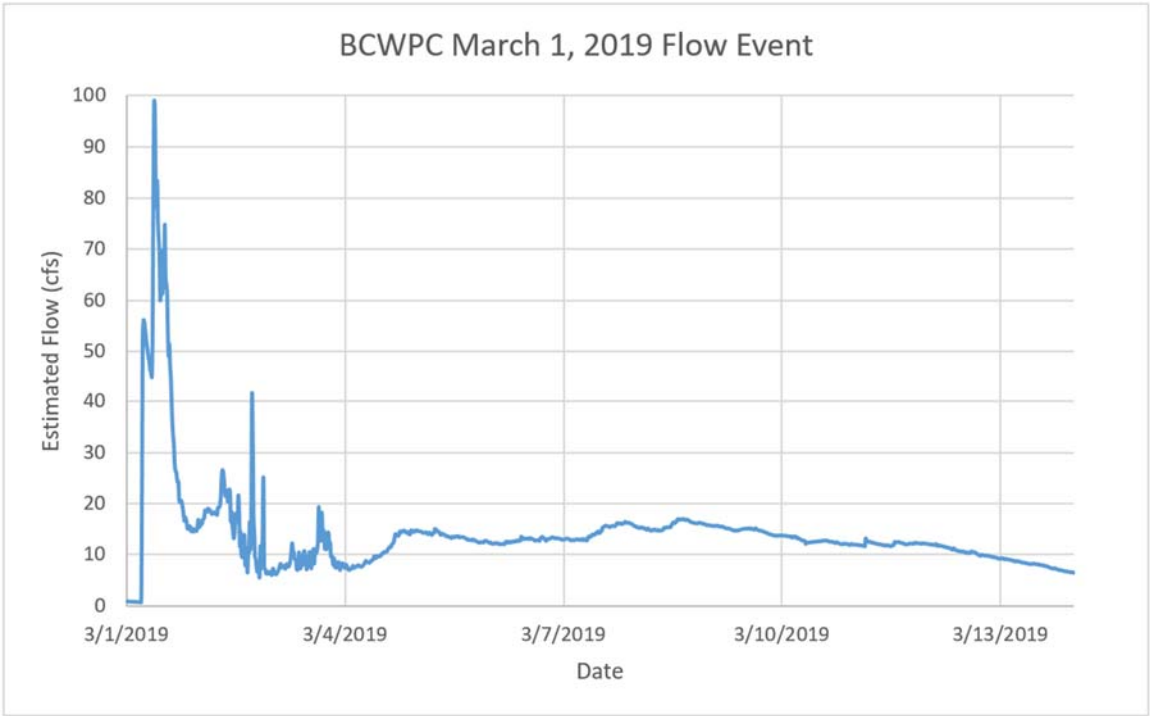


FIGURE 6. BCWPC MARCH 1, 2019 FLOW EVENT

BCWPC at the start of the 2019 reporting period:

Greenup after 2018 monsoon events:

Start of flow event on 2/28/2019:

Peak of flow event on 3/1/2019:

Flow event on 10/7/2018 before peak:

Peak of flow event on 10/7/2018:

BCWPC at the end of the 2019 reporting period:

FIGURE 7. BCWPC IMAGE DATA

BIG CHINO WASH AT BIG CHINO WATER RANCH (BCWR)

Precipitation was observed at BCWR on seventy-two (72) days during the 2019 annual monitoring period. Snow accumulation was visible on eleven (11) of those days. None of the observed events resulted in water pooling at the surface. BCWR site images for the annual reporting period can be seen in Figure 8 below.

The BCWR location was visited a total of four (4) times during the 2019 annual reporting period. In addition to routine maintenance and data collection, the following adjustments were made at the site:

- Upgraded site to 4G camera technology (2G hardware no longer supported by Verizon Wireless)
- Updated camera firmware on primary and backup cameras

BCWR at the start of the 2019 reporting period:

Greenup after 2018 monsoon events:

Snow accumulation on 2/23/2019:

Greenup after 2019 winter events:

BCWR at the end of the 2019 reporting period:

FIGURE 8. BCWR IMAGE DATA

PINE CREEK (PC)

Six (6) events with measurable ephemeral flow and one (1) flow event that exceeded the site rating were observed at PC during the 2019 annual monitoring period. PC responded to monsoon and winter related precipitation events. The flow event on 8/22/2018 lasted for 20.5 hours and had an estimated peak stage of 4.5 feet; the peak discharge was greater than 450 cfs. The 2/14/2019 flow event was the longest lasting event observed at the site for the reporting period with a duration of 75.5 hours, resulting in an estimated total flow volume of 61 AF or 13% of the annual volume at the site. The total estimated volume recorded at the site for the 2019 reporting period was greater than 487 AF[19]. PC flow events, durations, and estimated flow volumes for the annual reporting period are outlined in Table 4 and Figures 9-11.

TABLE 4. PC JULY 2018 – JUNE 2019 FLOW EVENTS

Start Date	Start Time[20]	Duration[21] (hours)	Peak Stage (feet)	Peak Discharge (cfs)	Total Volume (AF)
8/14/2018	2:00 p.m.	6.25	1.59	143	16
8/15/2018	6:45 p.m.	15	0.10	<1	<1
8/22/2018	3:30 p.m.	20.5	4.50	450[22]	222[23]
1/15/2019	9:15 a.m.	42	0.82	38	70
2/14/2019	5:30 p.m.	75.5	0.61	21	61
2/27/2019	4:15 p.m.	74.75	0.54	17	60
3/13/2019	3:45 a.m.	69	0.60	21	58
		303 (total hours)			**487 (total AF)[19]**

The PC was visited a total of seven (7) times during the 2019 reporting period. In addition to routine maintenance and data collection, the following adjustments were made at the site:

- Replaced upstream and downstream event poles
- Replaced upstream and downstream pressure transducers and cables
- Upgraded site to 4G camera technology (2G hardware no longer supported by Verizon Wireless)
- Updated camera firmware on primary and backup cameras

[19] This estimated total flow volume excludes flows that exceeded the existing site discharge rating. Flows at or below this limit are included here.
[20] Start times are approximate and actual start time are within ±15 minutes of the noted time. Events may also continue into the next day(s).
[21] Flow event duration is based on discharge calculated using the existing site rating.
[22] The peak discharge noted is the maximum calculated discharge for the site according to the existing discharge rating. Actual peak discharge may be greater than this.
[23] Estimated flow volumes for flow events where the flow exceeded the site discharge ratings may be lower than the actual flow.

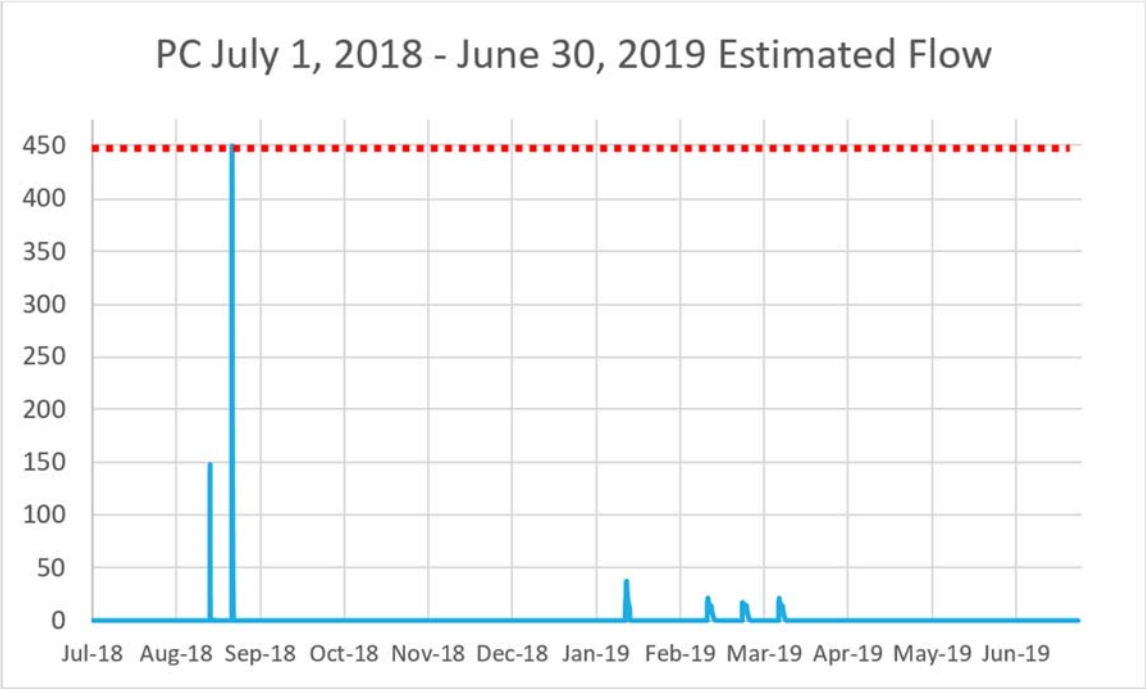


Figure 9. PC July 2018 – June 2019 Annual Flow Events[24]

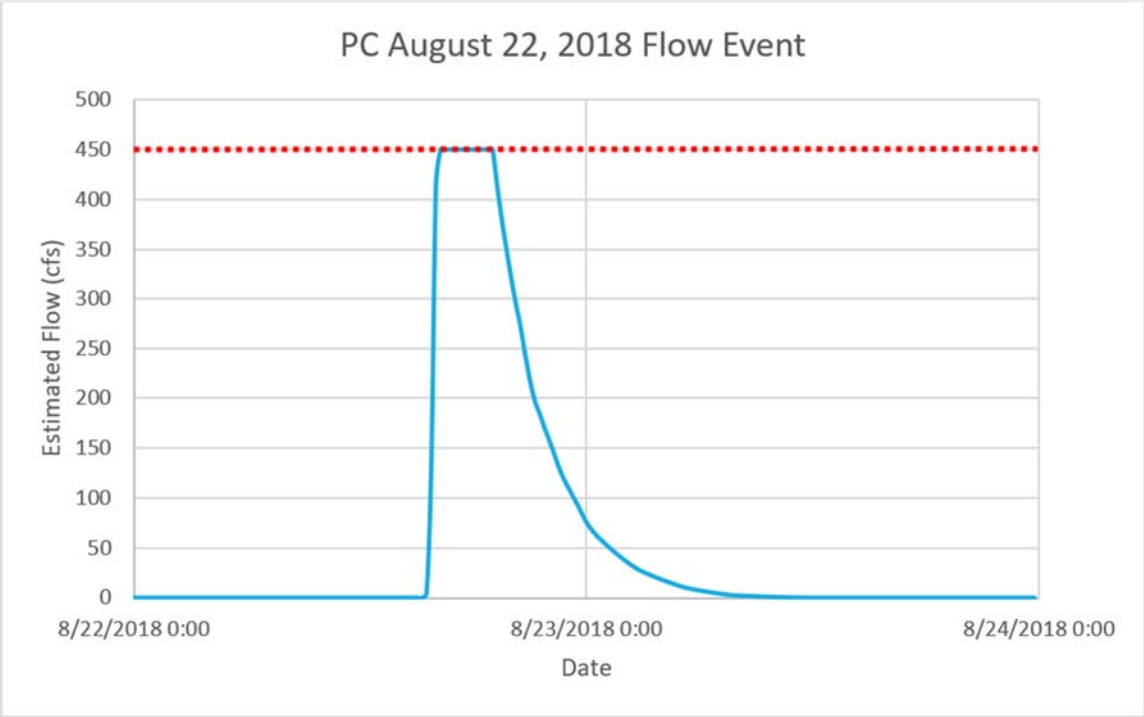


FIGURE 10. PC AUGUST 22, 2018 FLOW EVENT[24]

[24] Discharge is not calculated when flow exceeds the existing site rating. Flow was above the discharge rating for 3 hours.

PC at the start of the 2019 reporting period:

Greenup after 2018 monsoon events:

Start of flow event on 8/22/2018:

Peak of flow event on 8/22/2018:

PC at the end of the 2019 reporting period:

FIGURE 11. PC IMAGE DATA

GEORGE WOOD CANYON (GWC)

The GWC weather station collected precipitation, barometric pressure, air temperature, wind direction, peak gust, relative humidity, wind speed, and SRP Snowtography™ images of snow depth during the 2019 annual reporting period.

Ten (10) snow accumulation events were observed during the 2019 reporting period. For eight (8) of the observed events, snow depth never surpassed 0.1 feet (see Table 5). Two (2) events occurred back-to-back from 2/17/2019 through 2/27/2019. The first lasted three (3) days with a peak snow depth < 0.5 feet. After the snow melted a second, larger storm dropped just under one (1) foot of new snow. The snowpack lasted approximately seven (7) days. On 5/23/2019, a late season storm dropped enough snow to cover most of the ground surface (see Figure 19)

GWC Snow accumulation and weather station data for the 2019 reporting period are outlined in Table 5 and Figures 12-19. Some observations made during the reporting period:

- 22.7" of precipitation was observed during the 2019 reporting period
- The predominant wind direction was WNW with higher velocity winds tending from the NNE
- Air temperature ranged from a maximum of 93.2°F in August 2018 to a minimum of 12.2°F in February 2019

TABLE 5. GWC JULY 2017 – JUNE 2018 SNOW ACCUMULATION EVENTS

Start Date	End Date[25]	Snow Visible	Peak Snow Depth
12/31/2018	1/1/2019	1 day	<0.1 feet
1/6/2019	1/6/2019	<1 day	<0.1 feet
1/13/2019	1/13/2019	<1 day	<0.1 feet
2/6/2019	2/7/2019	<1 day	<0.1 feet
2/11/2019	2/12/2019	<1 day	<0.1 feet
2/17/2019	2/20/2019	3 days	<0.5 feet
2/20/2019	2/27/2019	7 days	<1.0 feet
3/12/2019	3/13/2019	<1 day	<0.1 feet
3/22/2019	3/22/2019	<1 day (light dusting)	<0.1 feet
5/23/2019	5/23/2019	<1 day	<0.1 feet
Totals		**> 14 days**	**> 1.0 feet**

The GWC was visited a total of four (4) times during the 2019 reporting period. In addition to routine maintenance and data collection, the following adjustments were made at the site:

- Replaced the weather station solar panel and battery
- Upgraded site to 4G camera technology (2G hardware no longer supported by Verizon Wireless)
- Updated camera firmware on primary and backup cameras

[25] Snow may be visible in shaded areas after this date.

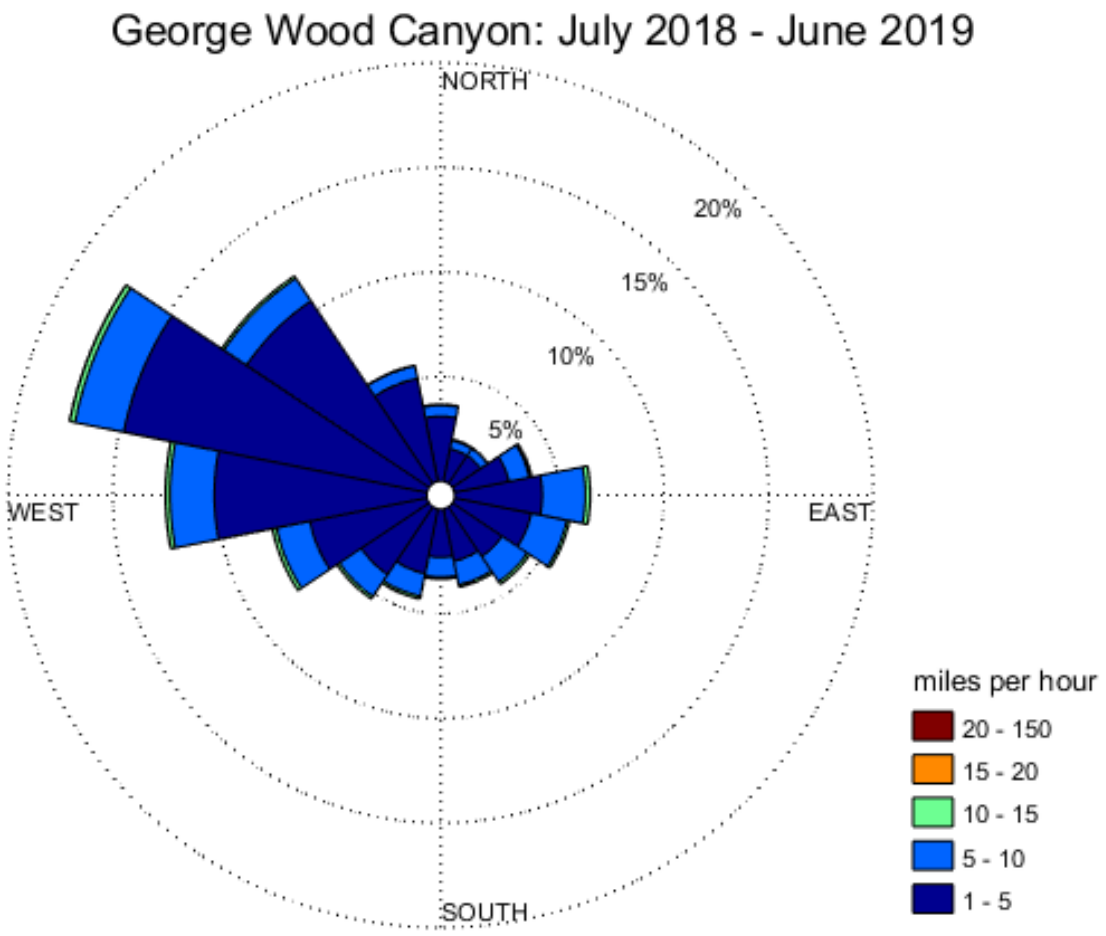


FIGURE 12. GWC JULY 2018 – JUNE 2019 WIND ROSE

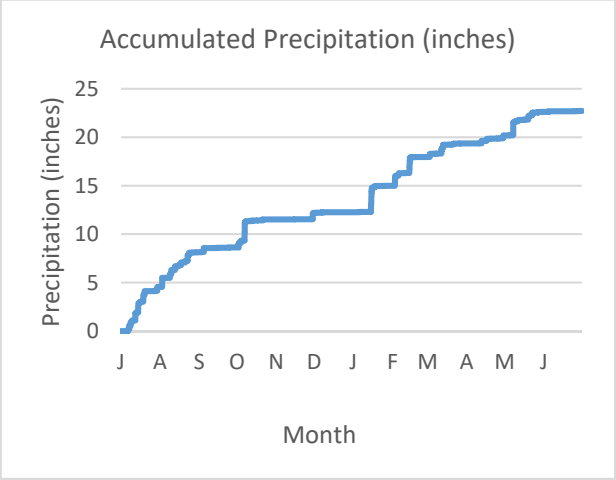


FIGURE 13. GWC JULY 1, 2018 – JUNE 30, 2019 ACCUMULATED PRECIPITATION

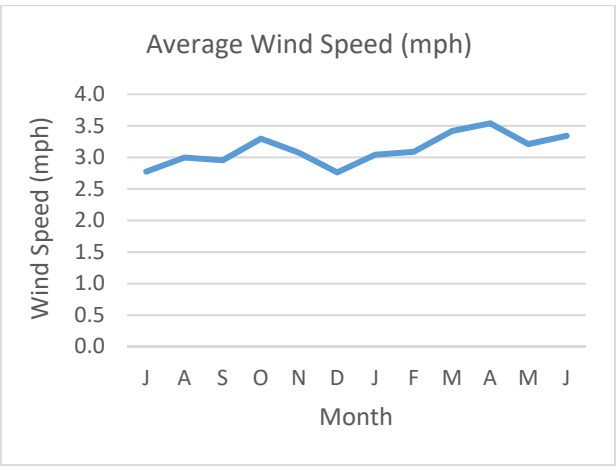


FIGURE 14. GWC JULY 1, 2018 – JUNE 30, 2019 AVERAGE WIND SPEED

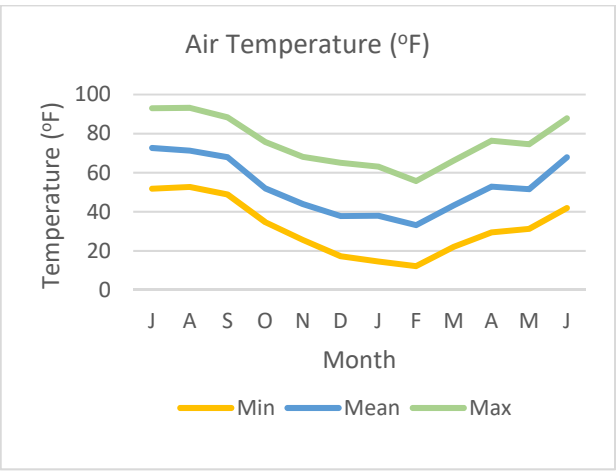


FIGURE 15. GWC JULY 1, 2018 – JUNE 2019 AIR TEMPERATURE

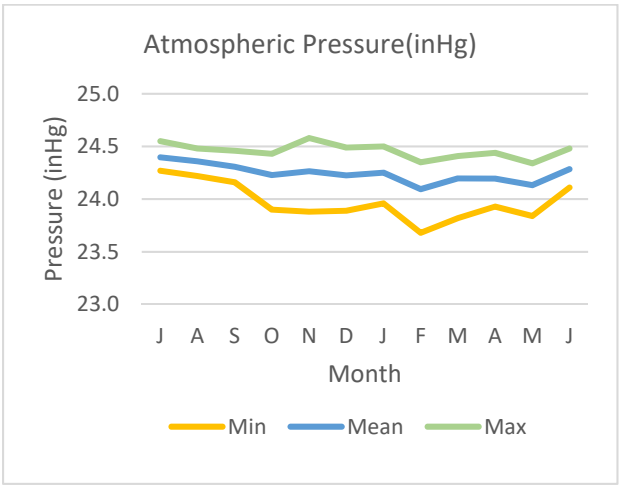


FIGURE 16. GWC JULY 1, 2018 – JUNE 30, 2019 ATMOSPHERIC PRESSURE

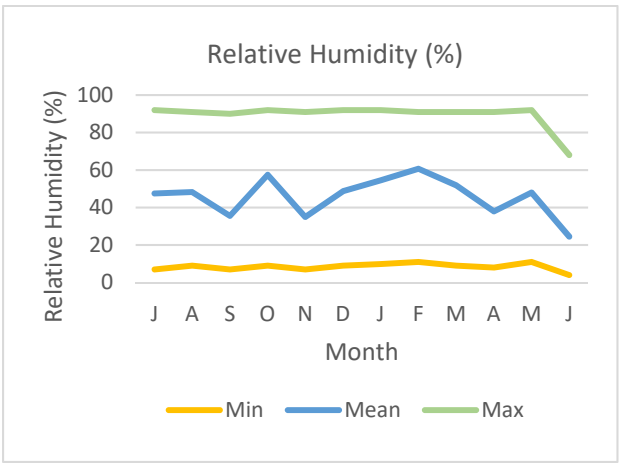


FIGURE 17. GWC JULY 1, 2018 – JUNE 30, 2019 RELATIVE HUMIDITY

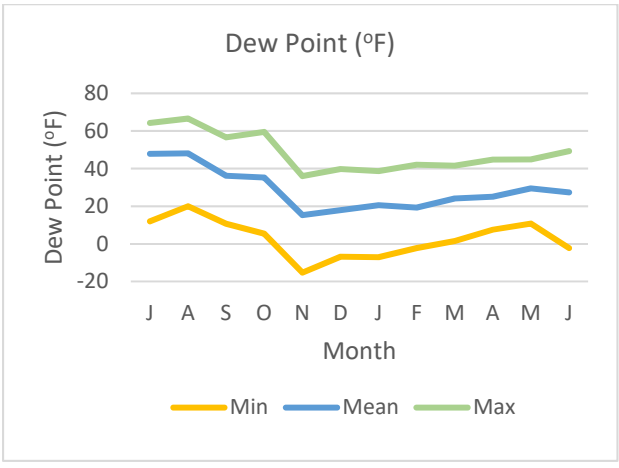


FIGURE 18. GWC JULY 1, 2018 – JUNE 30, 2019 DEW POINT

GWC at the beginning of the 2019 reporting period:

GWC at the end of the 2019 reporting period:

Snow accumulation event on 2/22/2019:

Snow accumulation event on 5/23/2019:

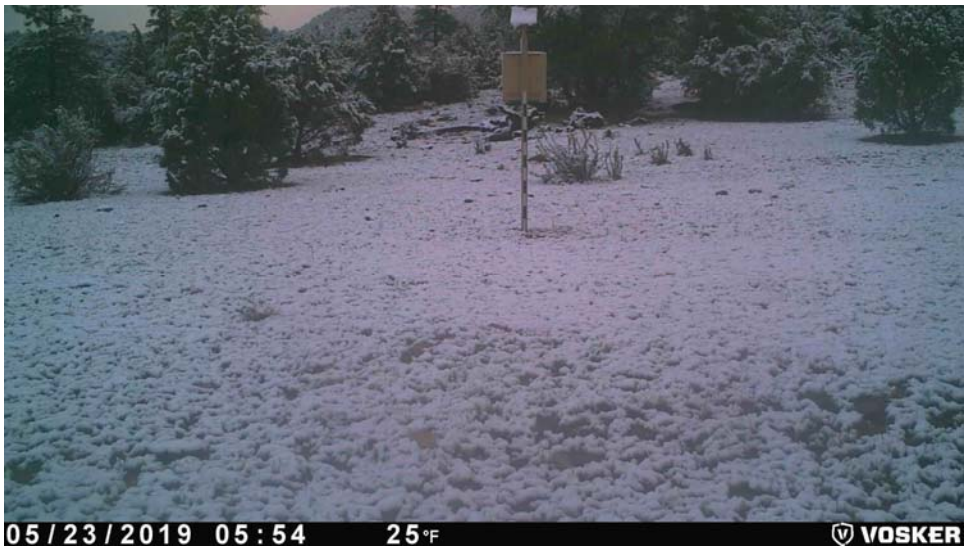


FIGURE 19. GWC IMAGE DATA

UPPER WALNUT CREEK AT FOREST SERVICE (UWCFS)

There are no estimates of flow at this site following the removal of the flume on December 22, 2016, other than visual wet/dry conditions. UWCFS site images are shown in Figure 20 below. UWCFS was dry (the site had no surface flow) from 6/30/2018 through 11/19/2018, with the exception of one monsoon flow event that started on 8/2/2018 at approximately 2:00 p.m., and lasted through the end of the day on 8/4/2018.

The UWCFS was visited a total of three (3) times during the 2019 reporting period. All site visits were for routine site service and data collection.

UWCFS at the start of the 2019 reporting period:

UWCFS at the end of the 2019 reporting period:

Flow event on 1/15/2019:

FIGURE 20. UWCFS IMAGE DATA

UPPER WALNUT CREEK AT BRIDGE (UWCB)

No surface water is visible at the start or the end of the 2019 annual monitoring period (see Figure 21). Maturing plant and vegetation growth block a clear view of the channel at both of these times, and for much of the reporting period.

The UWCB was visited a total of four (4) times during the 2019 reporting period. In addition to routine maintenance and data collection, the following adjustments were made at the site:

- Installed a temporary additional backup camera
- Upgraded site to 4G camera technology (2G hardware no longer supported by Verizon Wireless)
- Updated camera firmware on primary and backup cameras

UWCB at the start of the 2019 reporting period:

UWCB at the end of the 2019 reporting period:

UWCB flow event on 1/15/2019:

UWCB snow accumulation and flow on 2/22/2019:

FIGURE 21. UWCB IMAGE DATA

LOWER WALNUT CREEK AT CHARNEY PROPERTY (LWCCP)

Four (4) events with measurable ephemeral flow and one (1) flow event that exceeded the site rating were observed at LWCCP during the 2019 annual monitoring period. LWCCP responded to monsoon and winter precipitation events. The flow event on 2/14/2019 lasted for 24.5 hours and had an estimated peak stage of 4.95 feet; the peak discharge was greater than 850 cfs. The total estimated volume recorded at the site for the 2019 reporting period was greater than 623 AF[26]. LWCCP flow events, durations, and estimated flow volumes for the annual reporting period are outlined in Table 6 and Figures 22-24.

TABLE 6. LWCCP JULY 2018 – JUNE 2019 FLOW EVENTS

Start Date	Start Time[27]	Duration[28] (hours)	Peak Stage (feet)	Peak Discharge (cfs)	Total Volume (AF)
8/10/2018	9:15 p.m.	2.5	0.75	53	4
8/16/2018	4:15 p.m.	3.5	0.60	36	4
8/22/2018	5:00 p.m.	9.75	2.25	371	29
1/15/2019	8:15 p.m.	21.25	1.59	198	114
2/14/2019	11:30 p.m.	24.5	4.95	850[29]	472[30]
		61.5 (total hours)			**623 (total AF)[26]**

The LWCCP was visited a total of seven (7) times during the 2019 reporting period. In addition to routine maintenance and data collection, the following adjustments were made at the site:

- Replaced upstream and downstream event poles
- Replaced upstream and downstream pressure transducers and cables
- Replaced the primary and backup batteries
- Replaced one (1) cellular modem
- Upgraded site to 4G camera technology (2G hardware no longer supported by Verizon Wireless)
- Updated camera firmware on primary and backup cameras

[26] This estimated total flow volume excludes flows that exceeded the existing site discharge rating. Flows at or below this limit are included here.
[27] Start times are approximate and actual start time are within ±15 minutes of the noted time. Events may also continue into the next day(s).
[28] Flow event duration is based on discharge calculated using the existing site rating.
[29] The peak discharge noted is the maximum calculated discharge for the site according to the existing discharge rating. Actual peak discharge may be greater than this.
[30] Estimated flow volumes for flow events where the flow exceeded the site discharge ratings may be lower than the actual flow.

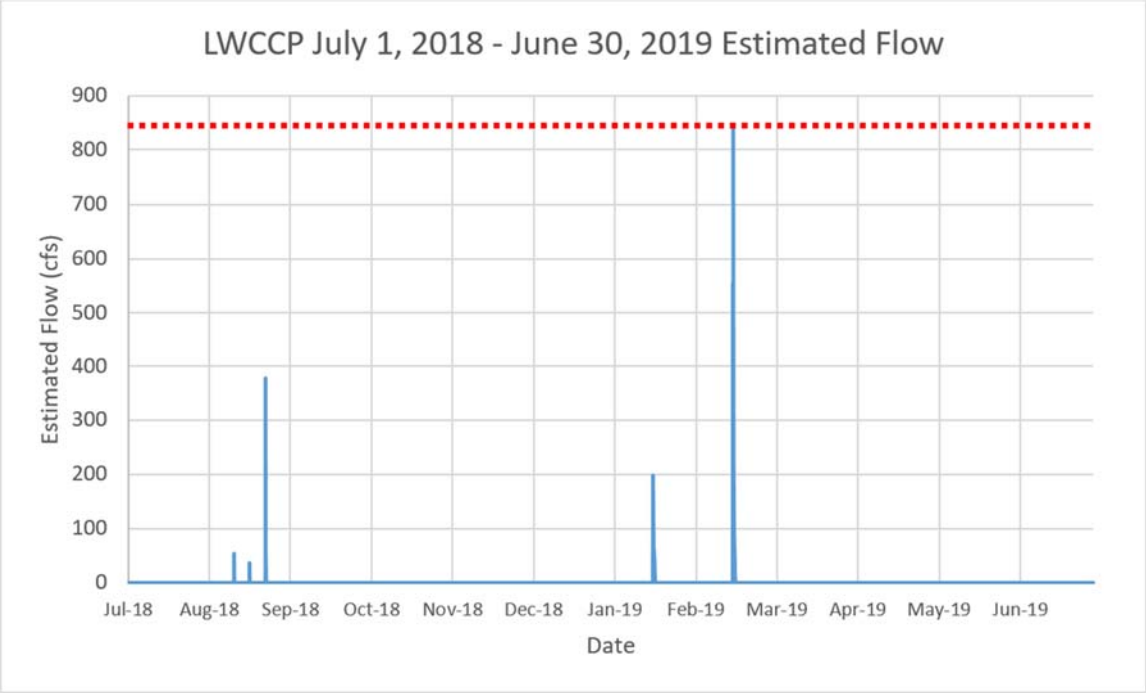


FIGURE 22. LWCCP JULY 2018 – JUNE 2019 ANNUAL FLOW EVENTS[31]

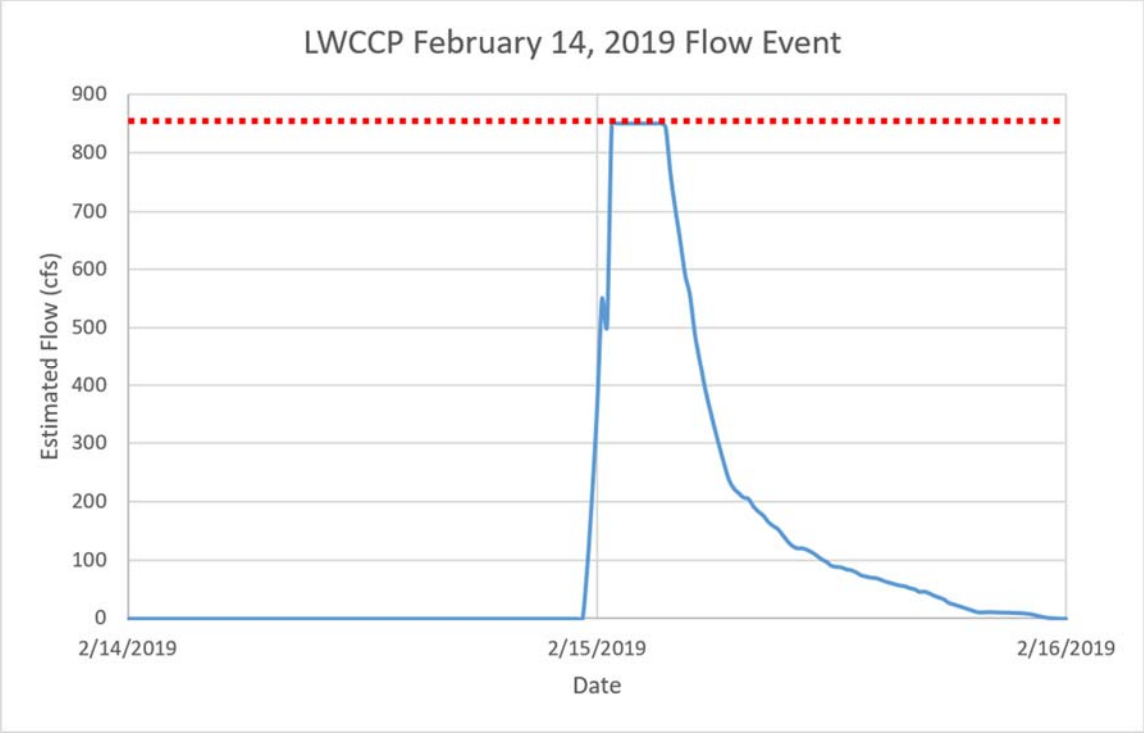


FIGURE 23. LWCCP FEBRUARY 14, 2019 FLOW EVENT[31]

[31]Discharge is not calculated when flow exceeds the existing site rating. Flow was above the discharge rating for 2.75 hours.

LWCCP at the start of the 2019 reporting period:

Greenup after 2018 monsoon events:

Before the flow event on 2/14/2019:

Aftermath of peak of flow event on 2/14/2019:

LWCCP at the end of the 2019 reporting period:

FIGURE 24. LWCCP IMAGE DATA

WILLIAMSON VALLEY WASH AT XU RANCH (WVWXU)

Nine (9) events with measurable ephemeral flow were observed at WVWXU during the 2019 annual monitoring period. WVWXU responded to monsoon and winter related precipitation events. Peak discharge for the year was an estimated 793 cfs, observed on 1/15/2019. That event produced the largest estimated flow volume of 1,161 AF, or 45% of the annual volume at the site. The total estimated volume observed at the site for the 2019 reporting period was 2,581 AF. WVWXU flow events, durations, and estimated flow volumes for the annual reporting period are outlined in Table 7 and Figures 25-27 below.

TABLE 7. WVWXU JULY 2018 – JUNE 2019 FLOW EVENTS

Start Date	Start Time[32]	Duration[33] (hours)	Peak Stage (feet)	Peak Discharge (cfs)	Total Volume (AF)
7/7/2018	4:00 p.m.	3.25	0.50	5	<1
7/19/2018	2:15 p.m.	5.5	1.00	35	3
8/17/2018	6:15 a.m.	4	1.03	39	11
8/22/2018	12:45 p.m.	2	0.50	5	<1
1/15/2019	12:15 p.m.	202.75	3.01	793	1,161
2/3/2019	2:45 a.m.	36.75	2.10	328	48
2/14/2019	1:30 p.m.	202.25	2.52	533	884
2/23/2019	2:30 a.m.	349.5	1.01	37	247
3/11/2019	5:30 p.m.	706	1.14	56	227
		1,512 (total hours)			**2,581 (total AF)**

The WVWXU was visited a total of eight (8) times during the 2019 reporting period. In addition to routine maintenance and data collection, the following adjustments were made at the site:

- Installed temporary event gage while site experienced prolonged pooling
- Serviced event gages
- Replaced the primary and backup batteries
- Performed current meter measurement during prolonged winter flow
- Upgraded site to 4G camera technology (2G hardware no longer supported by Verizon Wireless)
- Updated camera firmware on primary and backup cameras

[32] Start times are approximate and actual start time are within ±15 minutes of the noted time. Events may also continue into the next day(s).

[33] Flow event duration is based on discharge calculated using the existing site rating.

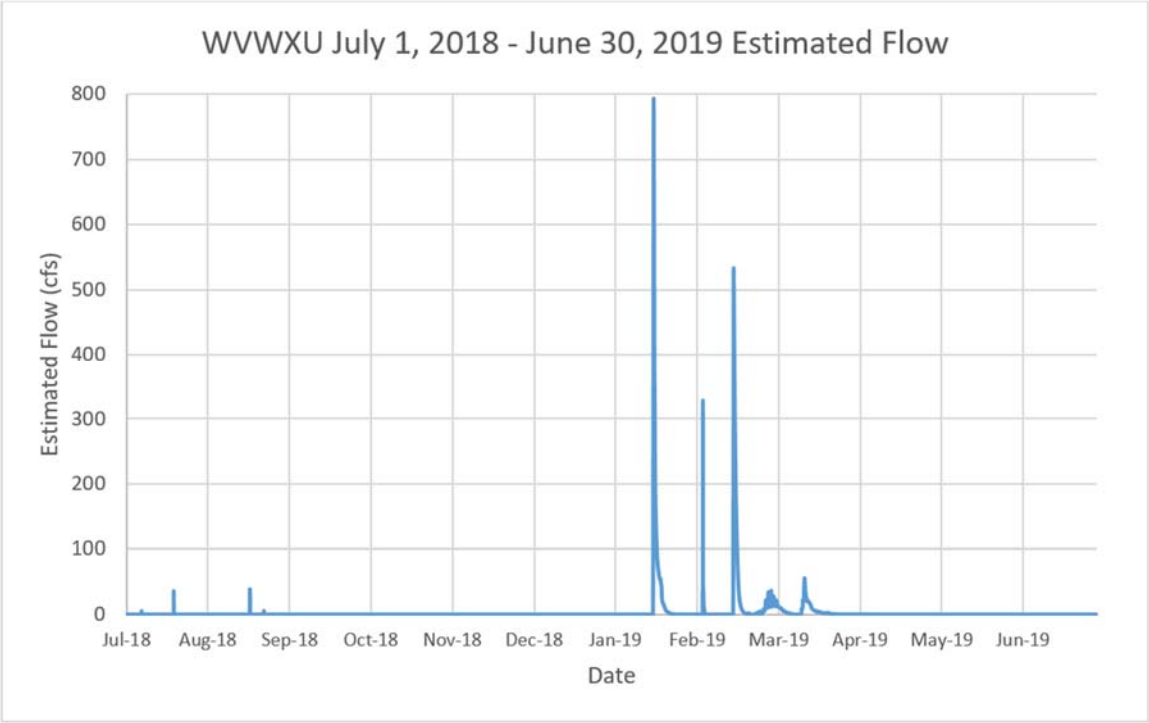


FIGURE 25. WVWXU JULY 2018 – JUNE 2019 ANNUAL FLOW EVENTS

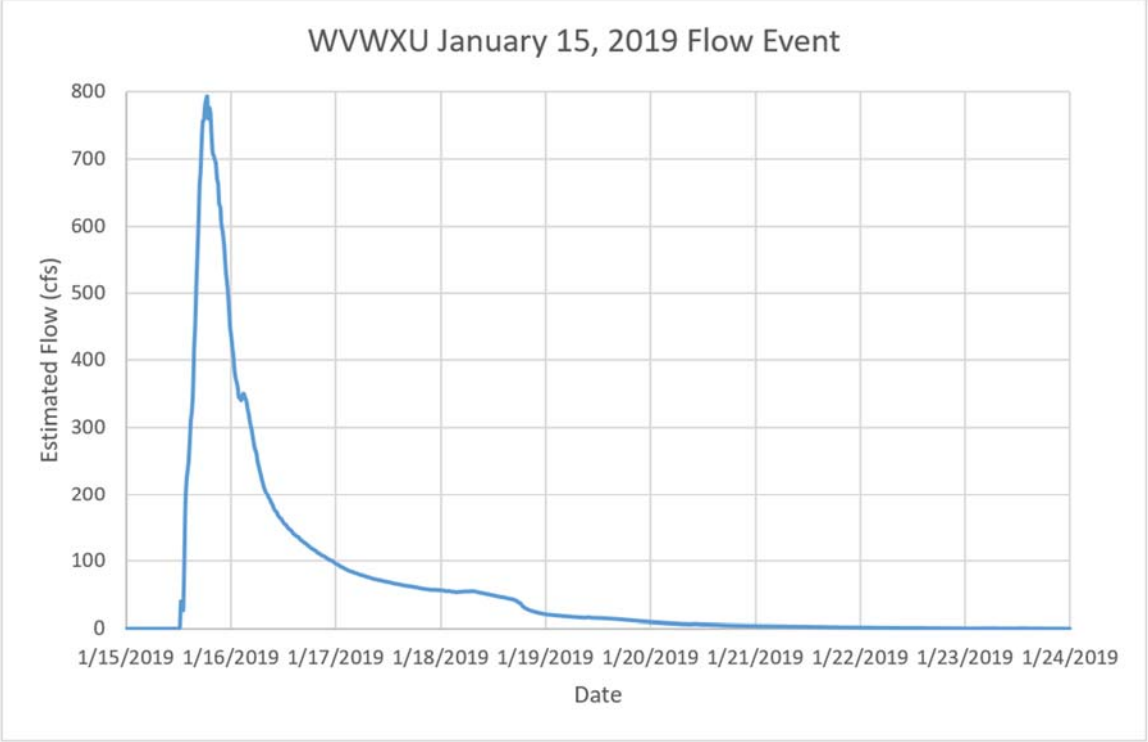
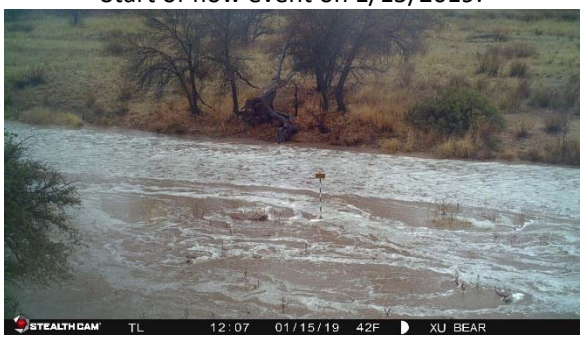


FIGURE 26. WVWXU JANUARY 15, 2019 FLOW EVENT

WVWXU at the start of the 2019 reporting period:

WVWXU site after monsoon events:

Start of flow event on 1/15/2019:



Near peak of flow event on 1/15/2019:

WVWXU at the end of the 2019 reporting period:

FIGURE 27. WVWXU IMAGE DATA

LOWER WILLIAMSON VALLEY WASH (LWVW)

Nine (9) events with measurable ephemeral flow and two (2) flow events that exceeded the site rating were observed at LWVW during the 2019 annual monitoring period. LWVW responded to monsoon and winter related precipitation events. The event on 2/26/2019 was the longest lasting with a duration of 203.75 hours and an estimated peak stage of 3.10 feet; the peak discharge was greater than 1,200 cfs. The flow event with the highest estimated stage occurred on 2/14/2019 with an estimated peak stage of 4.21 feet. The total estimated volume recorded at the site for the 2019 reporting period was greater than 13,780 AF[34]. LWVW flow events, durations, and estimated flow volumes for the annual reporting period are outlined in Table 8 and Figures 28-30 below.

TABLE 8. LWVW JULY 2018 – JUNE 2019 FLOW EVENTS

Start Date	Start Time[35]	Duration[36] (hours)	Peak Stage (feet)	Peak Discharge (cfs)	Total Volume (AF)
7/14/2018	12:45 p.m.	13.25	1.80	409	53
7/18/2018	3:30 p.m.	15	1.07	131	48
7/28/2018	7:30 p.m.	19	1.82	417	158
8/18/2018	9:30 p.m.	14	1.79	403	131
8/19/2018	11:45 a.m.	27	1.44	255	105
10/7/2018	12:00 a.m.	21.5	1.03	119	60
1/16/2019	5:45 a.m.	52.5	2.57	868	831
2/6/2019	7:00 a.m.	89	1.97	496	691
2/14/2019	11:00 p.m.	172.5	4.21	1,200[37]	4,927[38]
2/26/2019	11:30 p.m.	203.75	3.10	1,200[37]	5,761[38]
3/13/2019	1:00 p.m.	142.5	1.39	235	1,015
		770 (total hours)			**13,780 (total AF)[34]**

The LWVW was visited a total of seven (7) times during the 2019 reporting period. In addition to routine maintenance and data collection, the following adjustments were made at the site:

- Replaced the downstream event gage and pressure transducer and cable
- Replaced the primary and backup batteries
- Performed current meter measurement during prolonged winter flow
- Upgraded site to 4G camera technology (2G hardware no longer supported by Verizon Wireless)
- Updated camera firmware on primary and backup cameras

[34] This estimated total flow volume excludes flows that exceeded the existing site discharge rating. Flows at or below this limit are included here.
[35] Start times are approximate and actual start time are within ±15 minutes of the noted time. Events may also continue into the next day(s).
[36] Flow event duration is based on discharge calculated using the existing site rating.
[37] The peak discharge noted is the maximum calculated discharge for the site according to the existing discharge rating. Actual peak discharge may be greater than this.
[38] Estimated flow volumes for flow events where the flow exceeded the site discharge ratings may be lower than the actual flow.

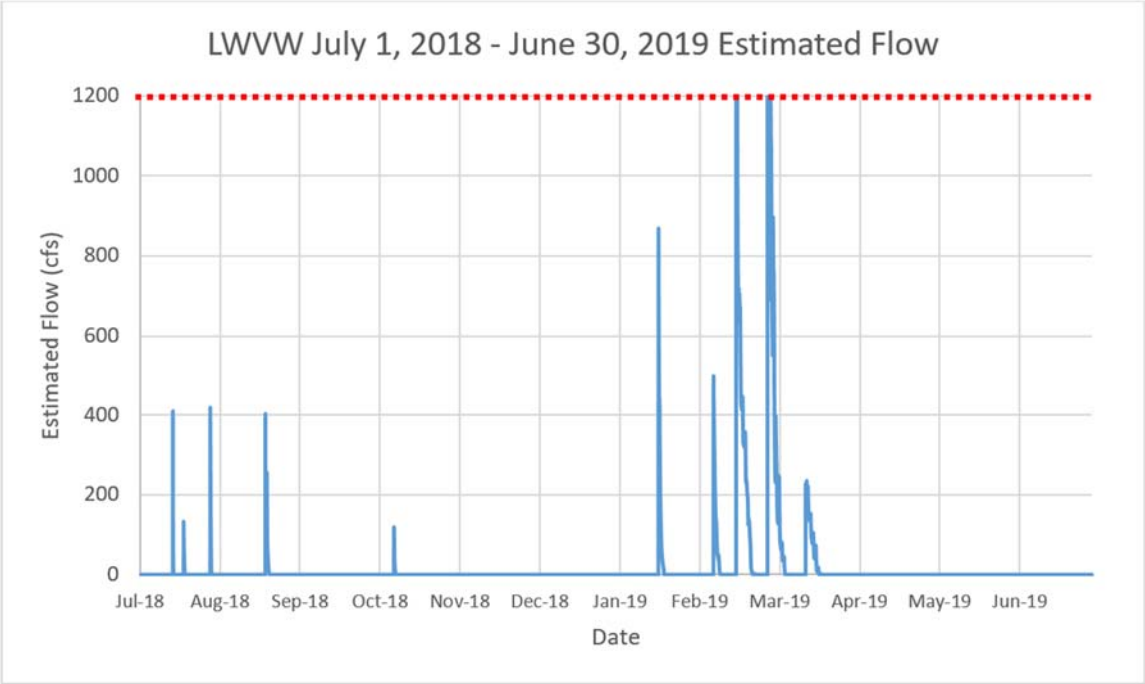


FIGURE 28. LWVW JULY 2018 – JUNE 2019 ANNUAL FLOW EVENTS[39]

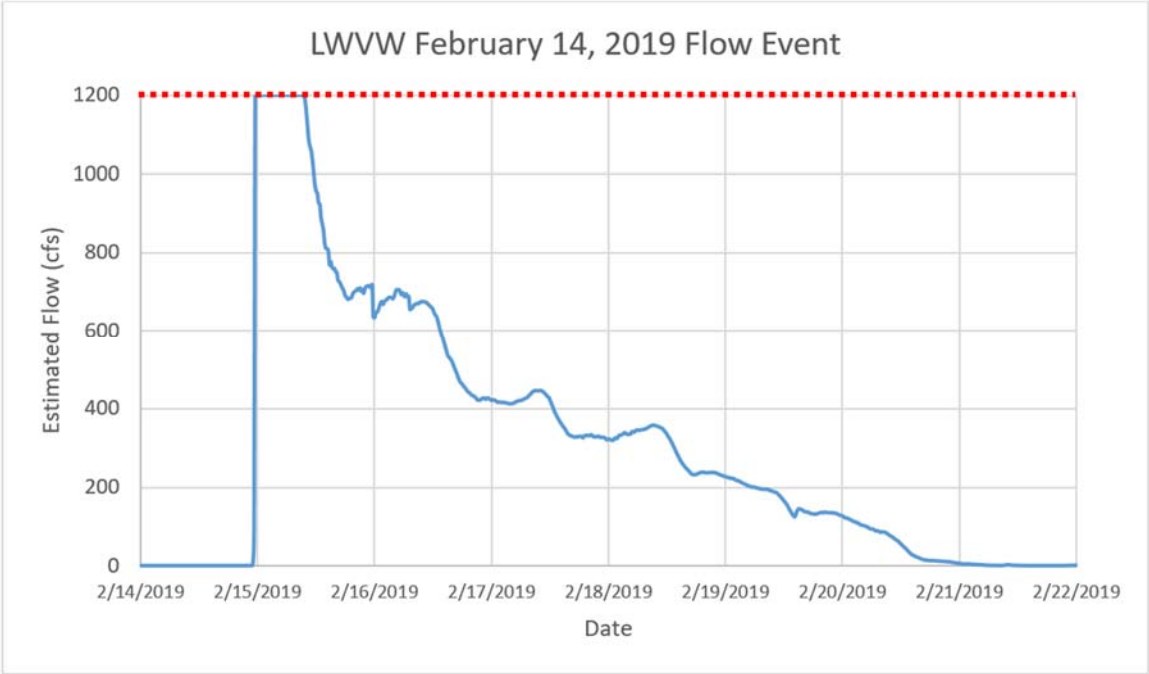


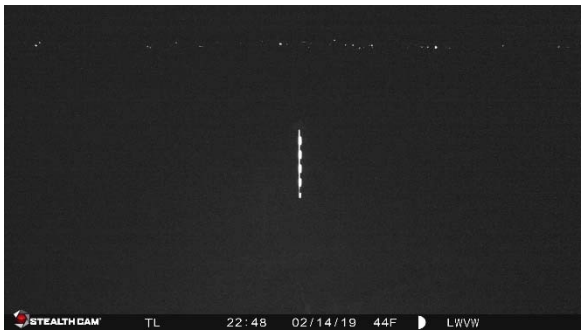
FIGURE 29. LWVW FEBRUARY 14, 2019 FLOW EVENT[39]

[39] Discharge is not calculated when flow exceeds the existing site rating. Flow was above the discharge rating for 10.25 hours.

LWVW at the start of the 2019 reporting period:

Greenup after 2018 monsoon events:

Start of flow event on 2/14/2019:



LWVW on 2/15/2019 with flow above bank full conditions:

LWVW at the end of the 2019 reporting period:

FIGURE 30. LWVW IMAGE DATA

LOWER BIG CHINO WASH (LBCW)

Ten (10) events with measurable ephemeral flow and four (4) flow events that exceeded the site rating were observed at LBCW during the 2019 annual monitoring period. LBCW responded to monsoon and winter related precipitation events. The event on 2/27/2019 was the longest lasting with a duration of 344 hours and an estimated peak stage of 4.86 feet; the peak discharge was greater than 126 cfs. The total estimated volume recorded at the site for the 2019 reporting period was greater than 3,683 AF[40]. LBCW flow events, durations, and estimated flow volumes for the annual reporting period are outlined in Table 9 and Figures 31-37 below.

TABLE 9. LBCW JULY 2018 – JUNE 2019 FLOW EVENTS

Start Date	Start Time[41]	Duration[42] (hours)	Peak Stage (feet)	Peak Discharge (cfs)	Total Volume (AF)
7/14/2018	3:15 p.m.	40	2.32	30	7
7/17/2018	2:45 p.m.	34.5	1.83	4	4
7/19/2018	1:30 a.m.	31	1.95	8	4
7/20/2018	6:45 p.m.	69.5	3.25	126	114
7/28/2018	11:45 p.m.	89.25	3.05	107	148
8/1/2018	5:15 p.m.	66.5	3.00	96	92
8/19/2018	12:00 a.m.	107.75	2.48	41	111
8/23/2018	12:00 p.m.	193	2.85	93	229
10/7/2018	4:30 p.m.	58.25	1.94	13	14
1/16/2019	8:30 a.m.	133.75	4.37	126[43]	249[44]
2/6/2019	10:00 a.m.	206.25	3.71	118	297
2/15/2019	12:30 a.m.	184.75	7.75	126[43]	409[44]
2/27/2019	7:45 a.m.	344	4.86	126[43]	1,535[44]
3/13/2019	4:00 p.m.	281.25	4.37	126[43]	470[44]
		1,839.75 (total hours)			**3,683 (total AF)[40]**

The LBCW was visited a total of five (5) times during the 2019 reporting period. In addition to routine maintenance and data collection, the following adjustments were made at the site:

- Replaced the primary and backup batteries
- Performed current meter measurement during prolonged winter flow
- Upgraded site to 4G camera technology (2G hardware no longer supported by Verizon Wireless)
- Updated camera firmware on primary and backup cameras

[40] This estimated total flow volume excludes flows that exceeded the existing site discharge rating. Flows at or below this limit are included here.
[41] Start times are approximate and actual start time are within ±15 minutes of the noted time. Events may also continue into the next day(s).
[42] Flow event duration is based on discharge calculated using the existing site rating.
[43] The peak discharge noted is the maximum calculated discharge for the site according to the existing discharge rating. Actual peak discharge may be greater than this.
[44] Estimated flow volumes for flow events where the flow exceeded the site discharge ratings may be lower than the actual flow.

The LBCW is located ~ 2.5 miles southeast and ~ 3.8 river miles downstream of LWVW. Between the two sites are a series of meandering bends. The flow relationship between the two sites has behaved as it has in the past several years, where larger accumulated flows were observed at LWVW than at LBCW. The LBCW has a much smaller flow area than at the LWVW, so many times the site experiences flows that exceeds its rating. See Figure 31 below for an aerial image of the sites.

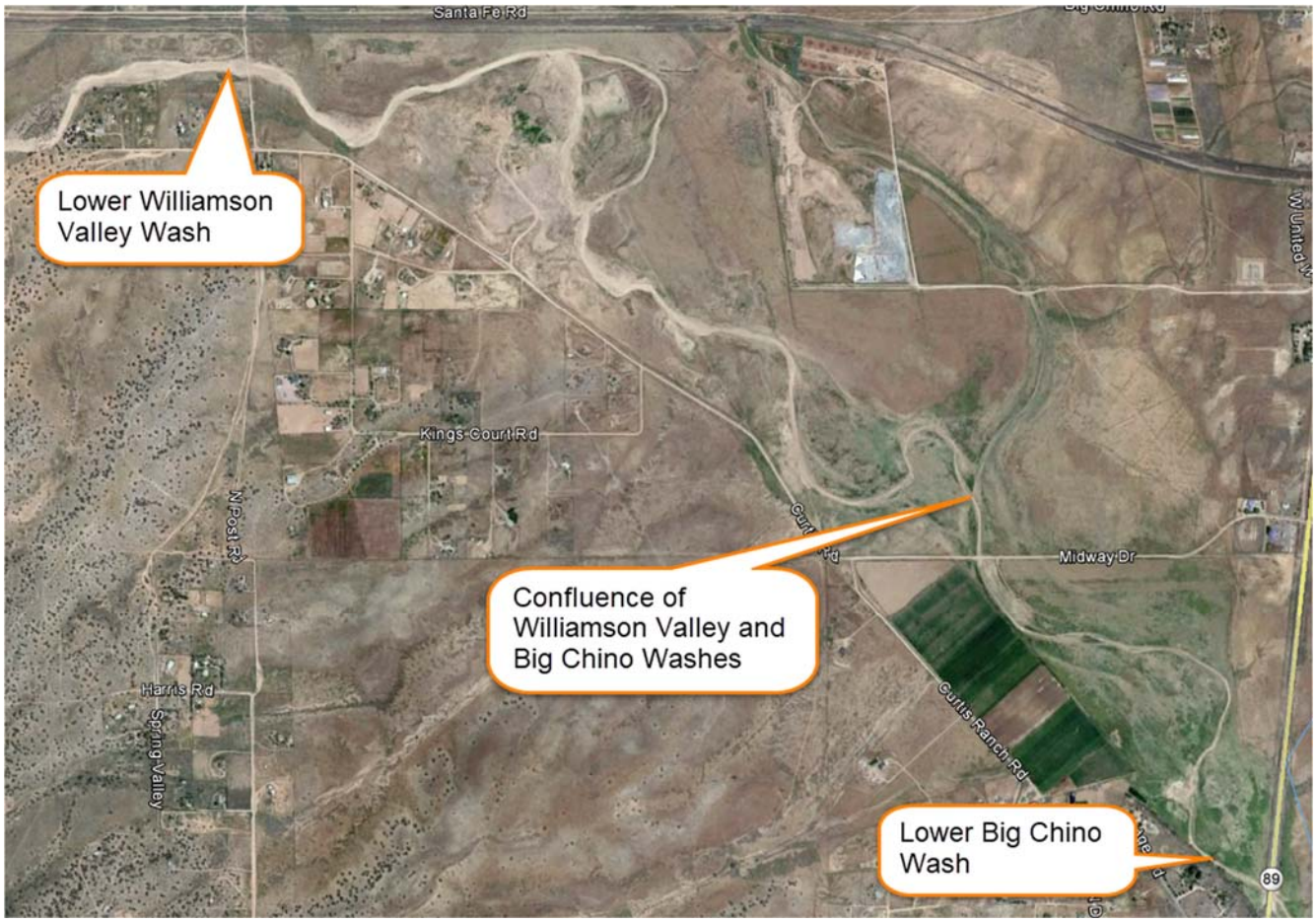


FIGURE 31. AERIAL IMAGE OF WILLIAMSON VALLEY WASH CONFLUENCE WITH BIG CHINO WASH BETWEEN LWVW AND LBCW

As of this report, the wetted area and its infiltration rate between the the two locations is not defined, see Figure 31. The accumulated flow differences between the two sites are detailed in Figures 32-34 which provide aerial imagery coupled with flow details of three events of magnitude. In addition to the CA1 Monitoring locations, the accumulated flows as defined at the USGS gage sites at Lower Williamson Valley Wash (upstream) and the USGS Big Chino Wash at Paulden, Az gage (downstream of the LBCW) are shown.

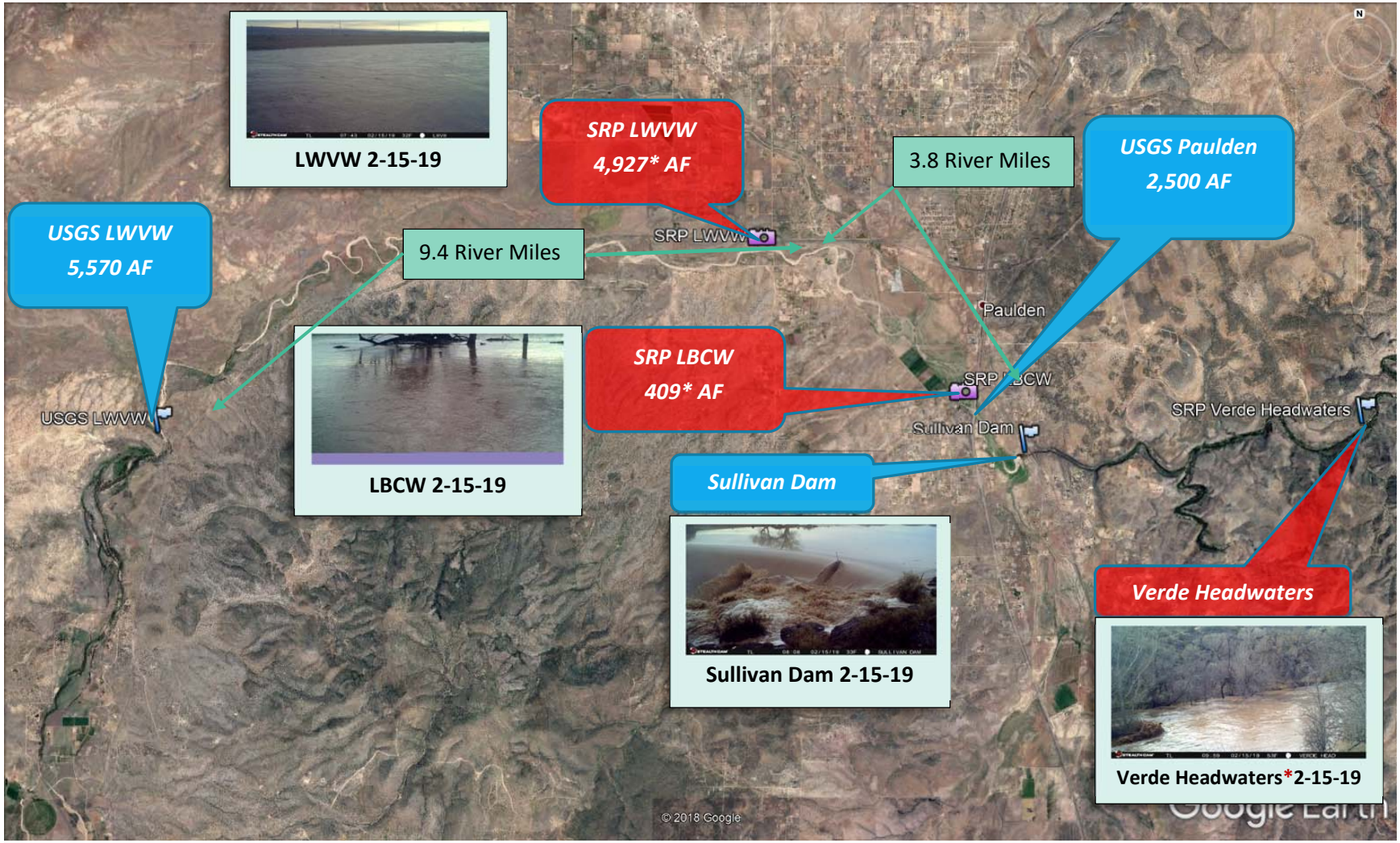


FIGURE 32. AERIAL IMAGE OF WILLIAMSON VALLEY WASH CONFLUENCE WITH BIG CHINO WASH - TOTAL ACRE FEET FOR 2/15/2019 EVENT (8 DAYS)

USGS LWVW AF was obtained from the USGS website.	**SRP LWVW*** Estimated flow volumes for flow events where the flow exceeded the site discharge ratings may be lower than the actual flow.
USGS Paulden AF was obtained from the USGS website.	**SRP LBCW*** Estimated flow volumes for flow events where the flow exceeded the site discharge ratings may be lower than the actual flow.
Sullivan Dam is not measured.	**Verde Headwaters*** Estimated flow volumes for flow events where the flow exceeded the site discharge ratings may be lower than the actual flow.

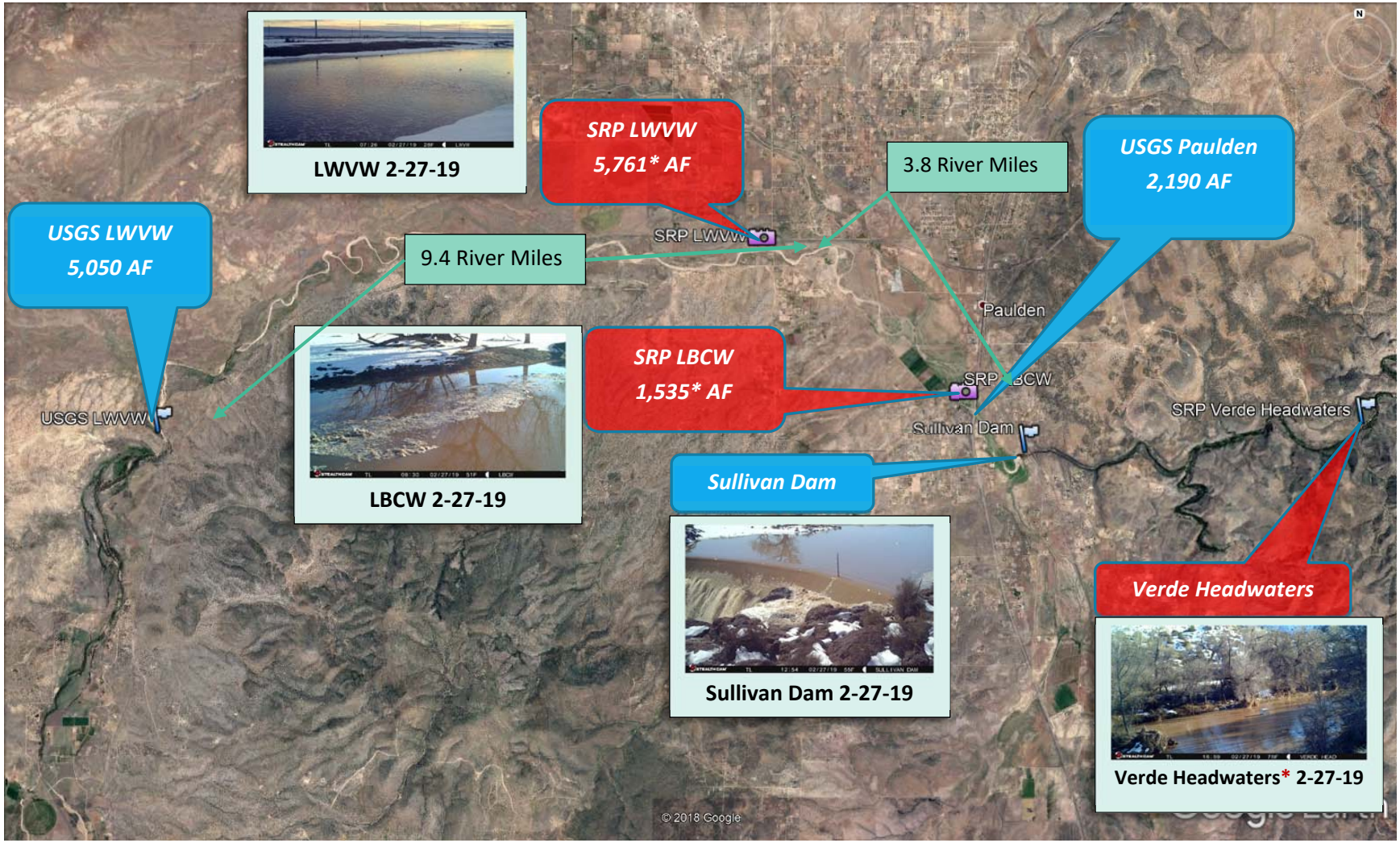


Figure 33. Aerial image of Williamson Valley Wash confluence with Big Chino Wash - Total Acre Feet for 2/27/2019 Event (15 Days)

USGS LWVW AF was obtained from the USGS website. **USGS Paulden** AF was obtained from the USGS website. **Sullivan Dam** is not measured.	**SRP LWVW*** Estimated flow volumes for flow events where the flow exceeded the site discharge ratings may be lower than the actual flow. **SRP LBCW*** Estimated flow volumes for flow events where the flow exceeded the site discharge ratings may be lower than the actual flow. **Verde Headwaters*** Estimated flow volumes for flow events where the flow exceeded the site discharge ratings may be lower than the actual flow.

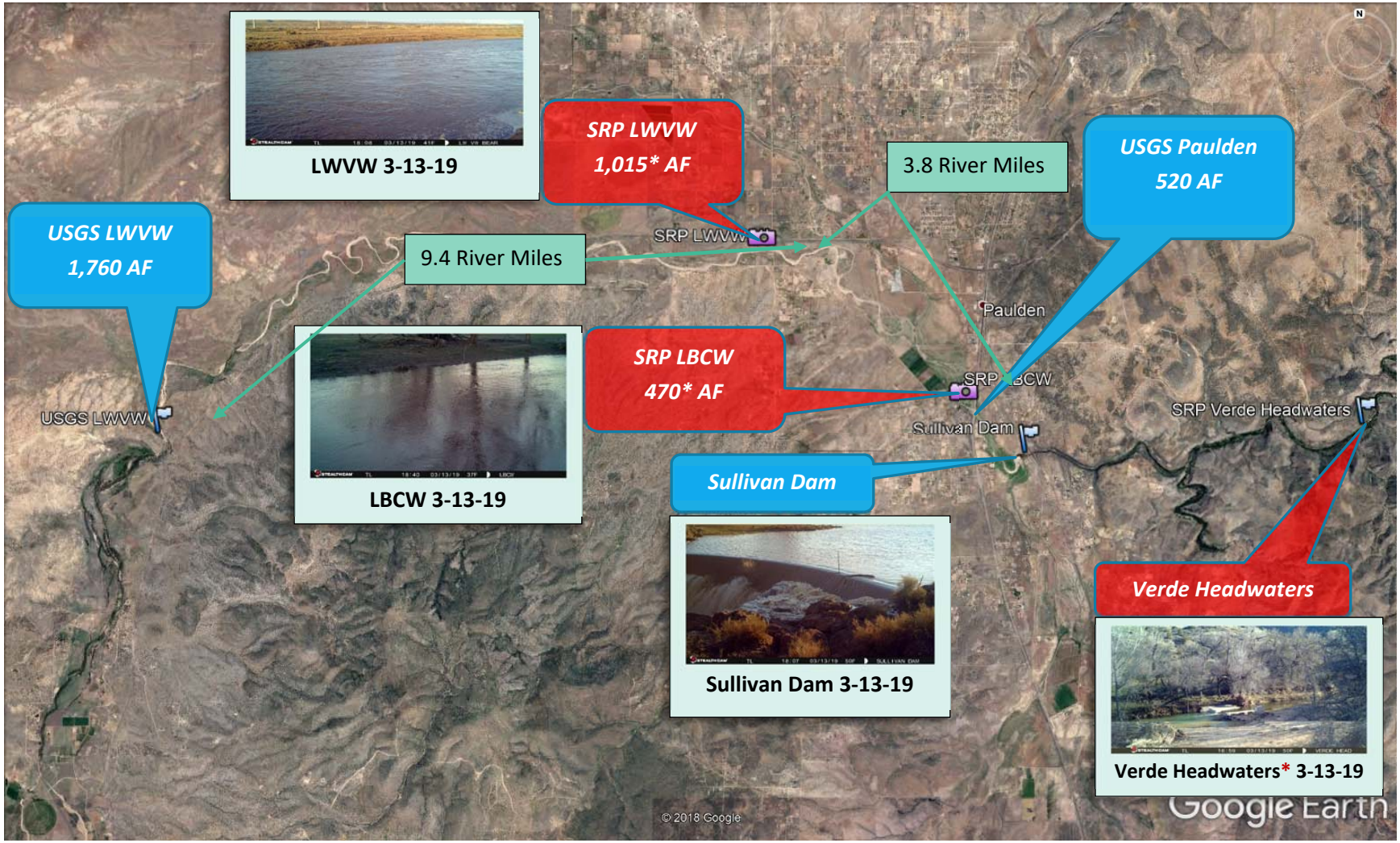


FIGURE 34. AERIAL IMAGE OF WILLIAMSON VALLEY WASH CONFLUENCE WITH BIG CHINO WASH - TOTAL ACRE FEET FOR 3/13/2019 EVENT (12 DAYS)

USGS LWVW AF was obtained from the USGS website.	**SRP LWVW*** Estimated flow volumes for flow events where the flow exceeded the site discharge ratings may be lower than the actual flow.
USGS Paulden AF was obtained from the USGS website.	**SRP LBCW*** Estimated flow volumes for flow events where the flow exceeded the site discharge ratings may be lower than the actual flow.
Sullivan Dam is not measured.	**Verde Headwaters*** Estimated flow volumes for flow events where the flow exceeded the site discharge ratings may be lower than the actual flow.

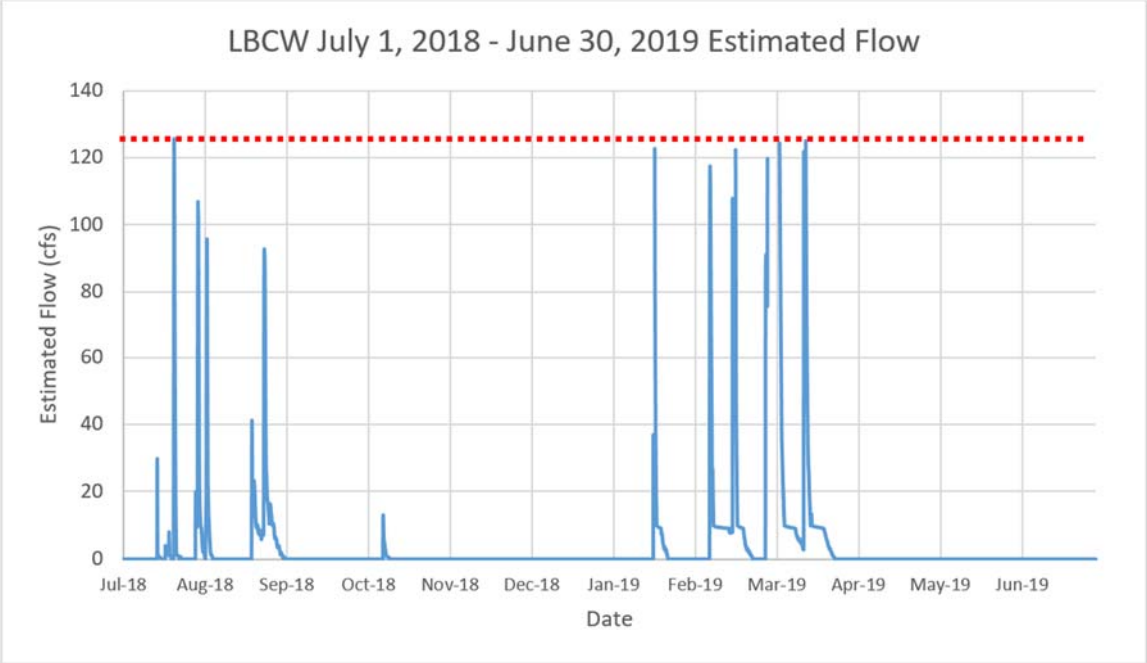


FIGURE 35. LBCW JULY 2018 – JUNE 2019 ANNUAL FLOW EVENTS[45]

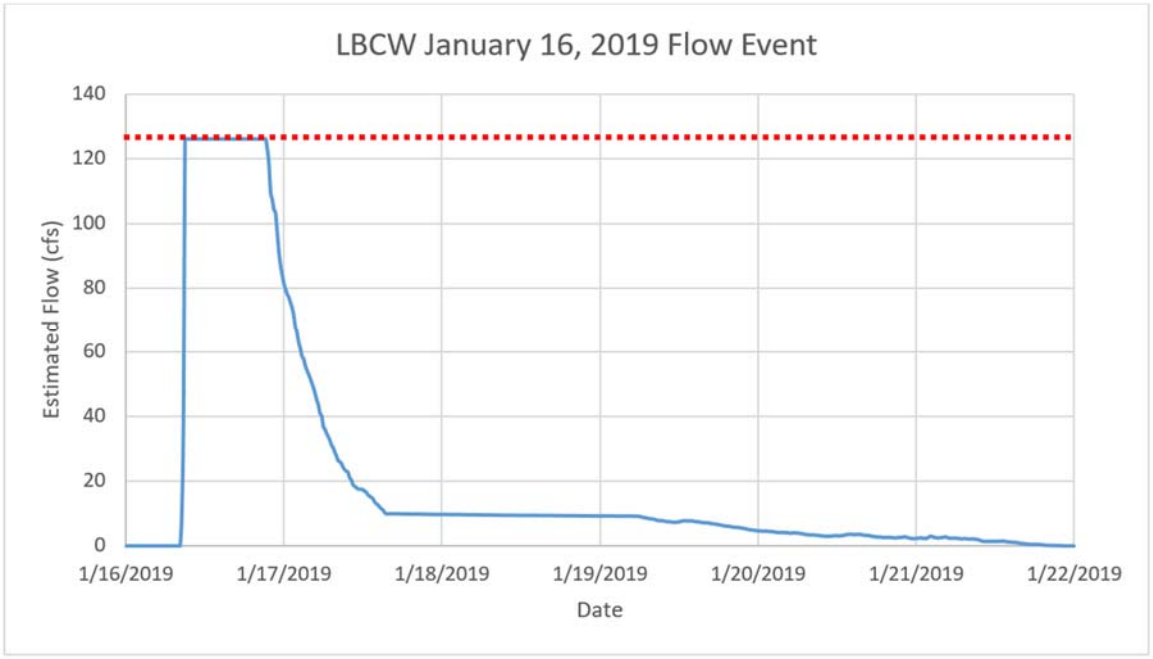


FIGURE 36. LBCW JANUARY 16, 2019 FLOW EVENT[45]

[45] Discharge is not calculated when flow exceeds the existing site rating. Flow was above the discharge rating for 12.5 hours.

LBCW at the start of the 2018 reporting period:

Snow and Ice at the LBCW site after a winter event:

Afternoon before the peak flow event 2/14/2019:

Peak of flow event on 2/15/2019:

LBCW at the end of the 2019 reporting period:

FIGURE 37. LBCW IMAGE DATA

SULLIVAN DAM (SD)

Thirteen (13) events were observed at SD during the 2019 annual monitoring period. SD responded to monsoon and winter related precipitation events. Standing surface water was visible behind the dam starting on 7/14/2018 up to the start of the 2019 reporting period. Stage represents the water depth of water spilling over the SD structure crest. There is no stage to discharge relation for the site, therefore no flow data is assumed. SD events, durations, and peak stages for the annual reporting period are outlined in Table 10 and Figures 38-40.

TABLE 10. SD JULY 2018 – JUNE 2019 FLOW EVENTS

Start Date	Start Time[46]	Duration[47] (hours)	Peak Stage (feet)	Peak Discharge (cfs)	Total Volume (AF)
7/18/2018	8:15 a.m.	18	0.06		
7/19/2018	2:30 a.m.	35.75	0.10		
7/20/2018	9:15 p.m.	70.25	0.32		
7/29/2018	3:45 a.m.	87.75	0.30		
8/1/2018	7:45 p.m.	68.25	0.30		
8/18/2018	11:15 p.m.	68	0.65		
8/23/2018	1:15 p.m.	101.5	0.27		
10/7/2018	2:30 a.m.	46.75	0.22		
1/16/2019	10:30 a.m.	110.5	0.53		
2/6/2019	12:00 p.m.	75	0.50		
2/14/2019	6:15 p.m.	145.5	2.30		
2/27/2019	9:15 a.m.	213.75	0.50		
3/13/2019	4:15 p.m.	88.25	0.6		
		1129.25 (total hours)			

The SD was visited a total of six (6) times during the 2019 reporting period. In addition to routine maintenance and data collection, the following adjustments were made at the site:

- Upgraded site to 4G camera technology (2G hardware no longer supported by Verizon Wireless)
- Updated camera firmware on primary and backup cameras

[46] Start times are approximate and actual start time are within ±15 minutes of the noted time. Events may also continue into the next day(s).
[47] Stage event duration is based on stage data, no discharge data available.

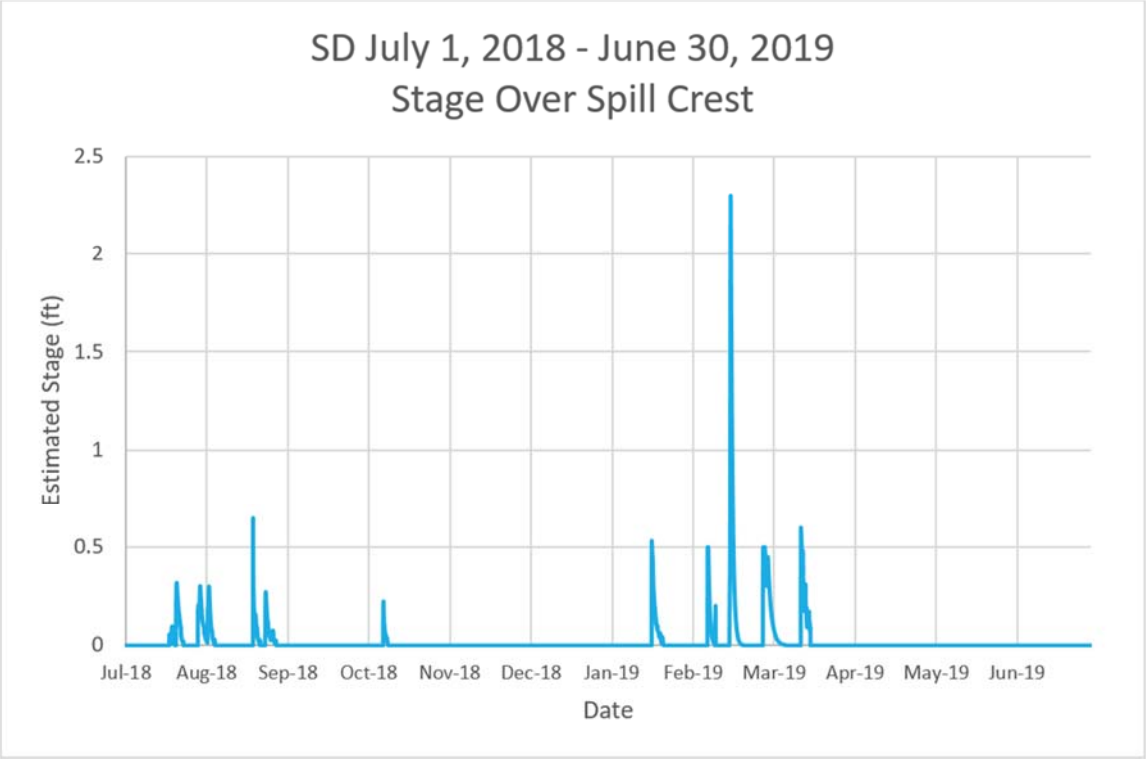


FIGURE 38. SD JULY 2018 - JUNE 2019 STAGE DATA

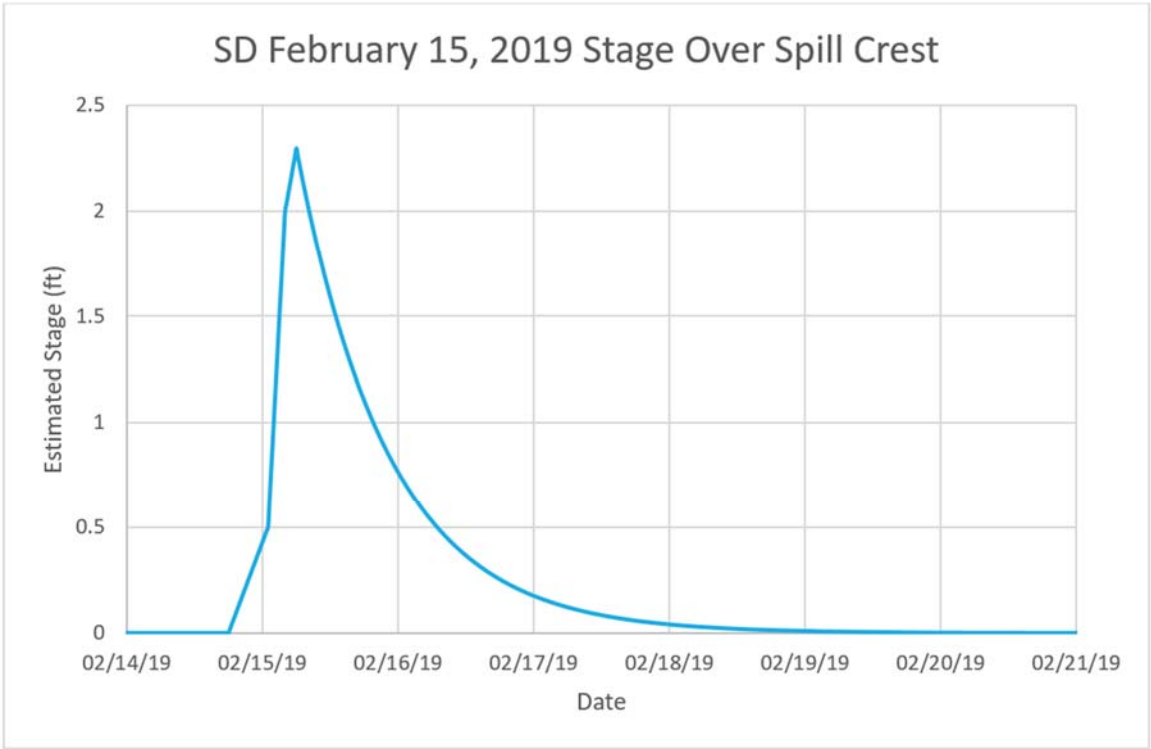


FIGURE 39. SD JULY 2018 – JUNE 2019 STAGE EVENT

SD at the start of the 2019 reporting period:

Greenup at SD after monsoon events:

Start of flow event on 2/14/2019:

Continued flow event on 2/15/2019:

SD at the end of the 2019 reporting period:

FIGURE 40. SD IMAGE DATA

VERDE HEADWATERS AT CAMPBELL RANCH (VHCR)

Thirteen (13) events were observed at VHCR during the 2019 annual monitoring period (for this site and report, a flow event was defined as exceeding a flow rate of over 20 cfs). Five (5) flow events exceeded the flume flow design limit of 100 cfs. VHCR flow events for the annual reporting period are outlined in Table 11 and Figures 41-43.

The USGS Verde River near Paulden, AZ stream gage is approximately 6 river miles downstream of VHCR. Flow events observed at VHCR were also observed at the USGS gage (see Table 11 and Figure 44 below).

TABLE 11. VHCR AND VERDE RIVER NEAR PAULDEN, AZ USGS JULY 2018 – JUNE 2019 PEAK FLOW EVENT DATA

Date	**VHCR**	**USGS Verde River near Paulden, AZ**
7/15/2018	40.32 cfs	56.2 cfs
7/21/2018	58.70 cfs	44.8 cfs
7/30/2018	65.21 cfs	60.3 cfs
8/2/2018	65.21 cfs	60.3 cfs
8/19/2018	89.38 cfs	56.2 cfs
8/24/2018	38.51 cfs	38.1 cfs
9/3/2018	35.16 cfs	226.0 cfs
10/7/2018	31.40 cfs	64.6 cfs
1/16/2019	100+ cfs (exceeded flume)	246.0 cfs
2/6/2019	100+ cfs (exceeded flume)	134.0 cfs
2/15/2019	100+ cfs (exceeded flume)	3890.0 cfs
2/27/2019	100+ cfs (exceeded flume)	717.0 cfs
3/13/2019	100+ cfs (exceeded flume)	362.0 cfs

The VHCR was visited a total of nine (9) times during the 2019 reporting period. In addition to routine maintenance and data collection, the following adjustments were made at the site:

- Replaced site battery
- Pumped stilling well two (2) times
- Replaced solar voltage regulator
- Performed six (6) current meter measurements

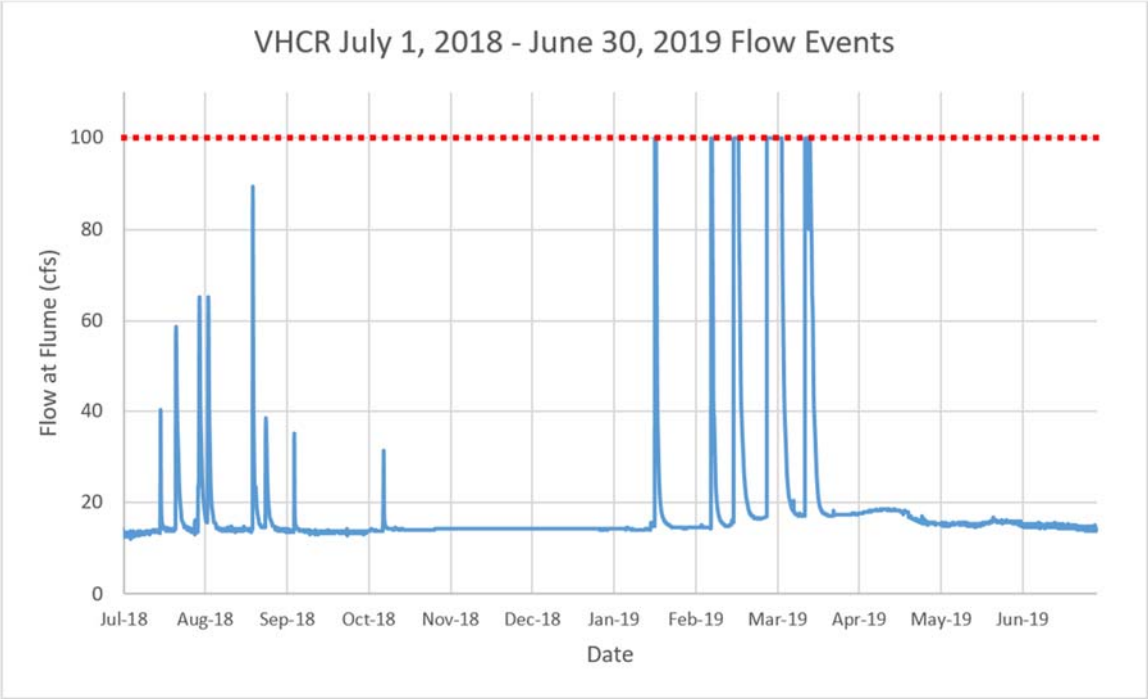


FIGURE 41. VHCR JULY 2018 – JUNE 2019 ANNUAL FLOW EVENTS[48]

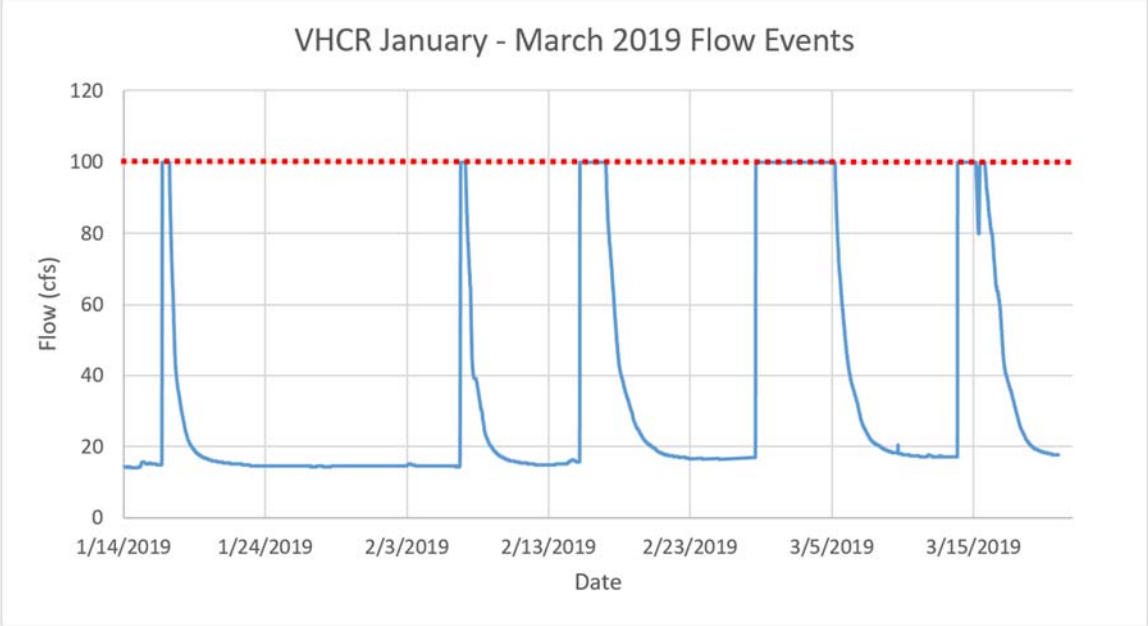


FIGURE 42. VHCR JANUARY THROUGH MARCH 2019 FLOW EVENTS[48]

[48] Discharge is not calculated when flow exceeds the existing site rating. Flow was above the discharge rating for 238 hours from January through March 2019.

VHCR before flow event on 2/15/2019:

VHCR during flow event on 2/15/2019:

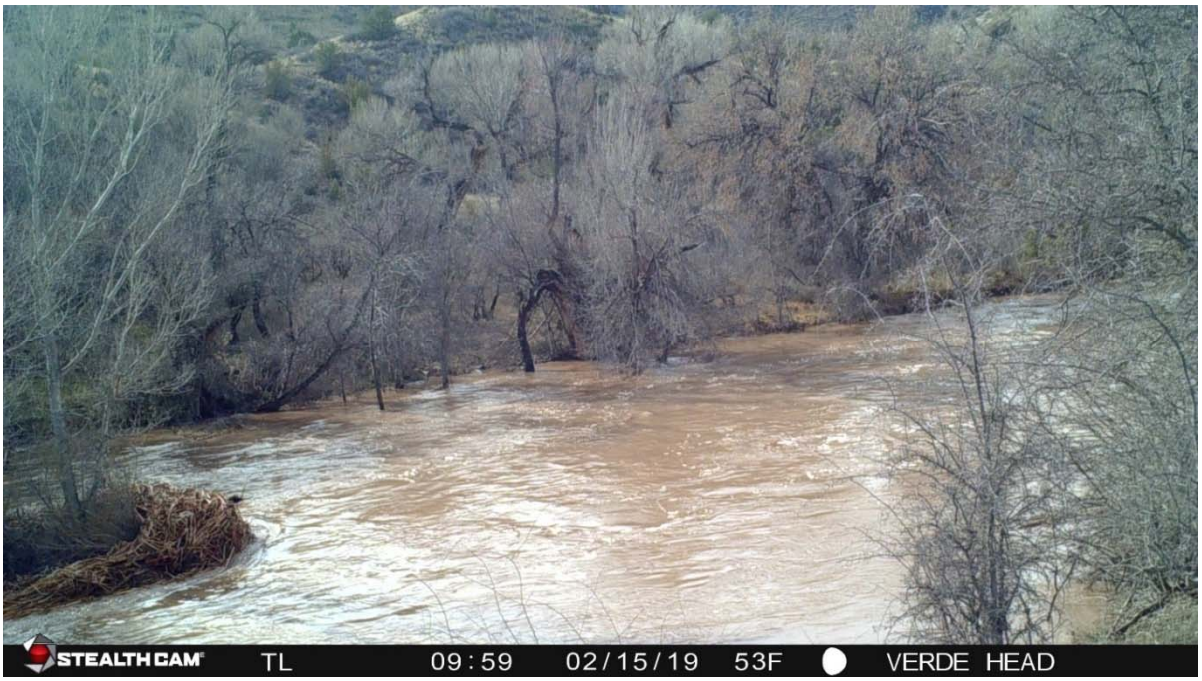


FIGURE 43. VHCR SITE IMAGES

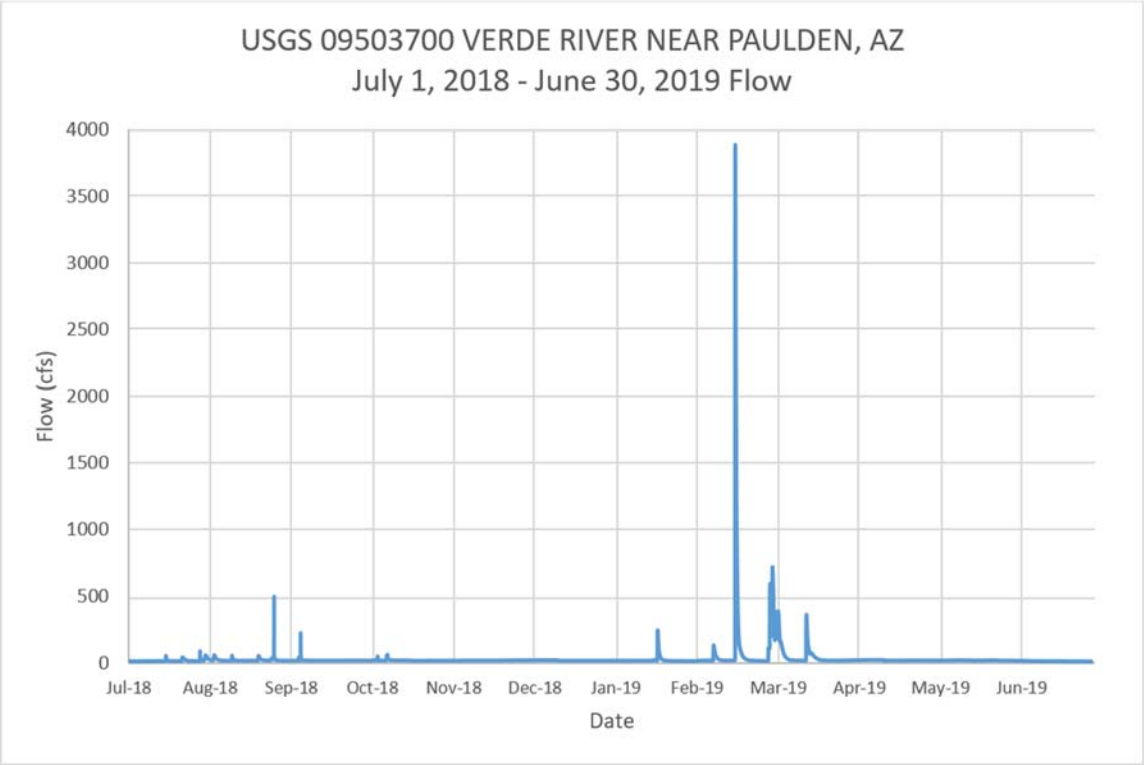


FIGURE 44. USGS VERDE RIVER NEAR PAULDEN, AZ JULY 2018 – JUNE 2019 FLOW EVENTS

GIPE WELL (GW)

The GW location records the distance from land to water (stage in feet below land surface). Between July 2018 and June 2019, the overall water level increased 0.43 feet (see Figures 45-47 below).

The GW site was visited a total of three (3) times during the 2018 reporting period. All site visits were for routine maintenance and data collection.

FIGURE 45. GW SITE IMAGE FOR REFERENCE

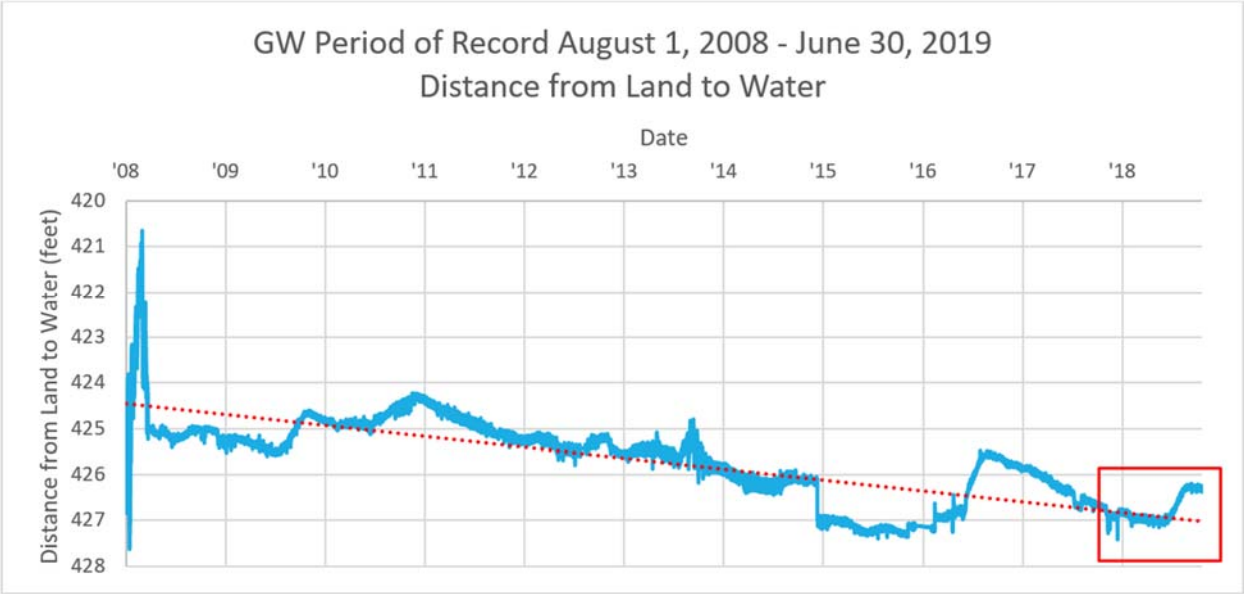


FIGURE 46. GIPE WELL PERIOD OF RECORD 8/1/2008 - 6/30/2019 DISTANCE FROM LAND TO WATER

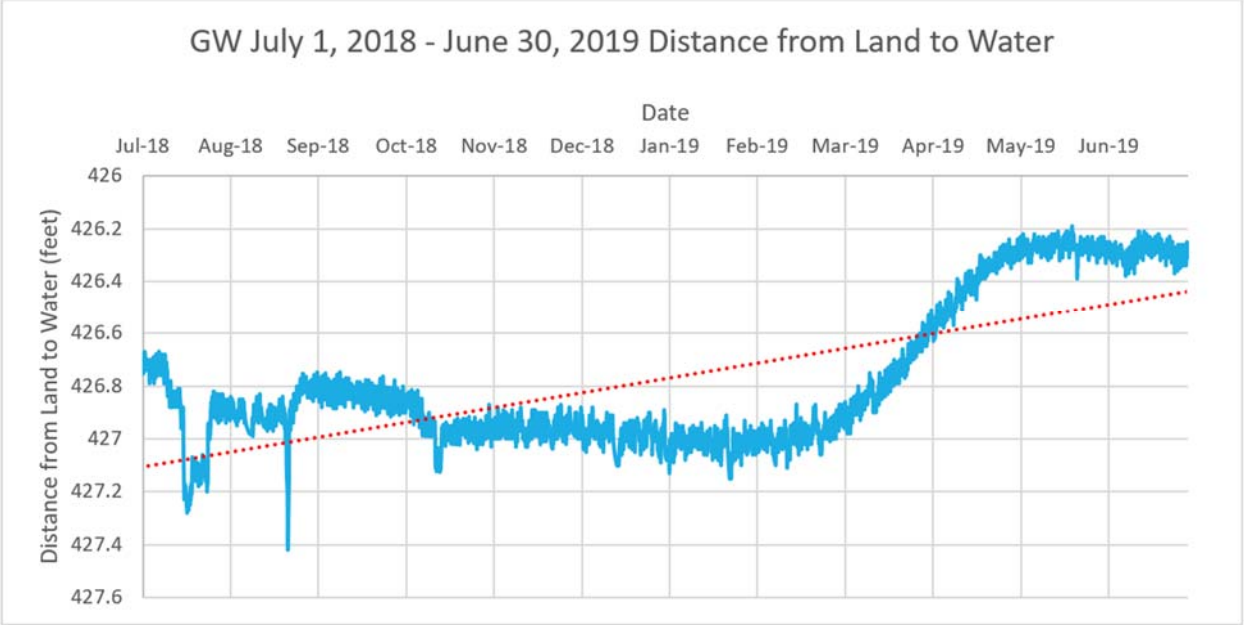


FIGURE 47. GW JULY 2018 – JUNE 2019 DISTANCE FROM LAND TO WATER

SUMMARY

All sites within the Big Chino sub-basin experienced flow at various times during the annual 2019 reporting period, during both the monsoon and winter seasons.

Over half of the total estimated AF produced in the sub-basin during the 2019 annual reporting period was from the Lower Williamson Valley Wash for an estimated 13,780 acre-feet (AF) or 59% of observed AF.

The site with the fewest observable flow events was Lower Walnut Creek at Charney Property with five (5) observed events for an estimated total of greater than 623 AF.

The site that experienced the lowest estimated total flow volume was Upper Big Chino Wash, with 60 AF.

The largest flow event for an estimated total of greater than 5,761 AF occurred at Lower Williamson Valley Wash starting on February 26, 2019.

There were several events that produced less than an estimated 1 AF at the following sites: Upper Big Chino Wash, Big Chino Wash below Partridge Creek, Pine Creek and Williamson Valley Wash at XU Ranch.

Almost 23 inches of precipitation was recorded at the George Wood Canyon site during the reporting period, with approximately 40% of the precipitation occurring during the 2018 monsoon season. The remaining 60% of recorded precipitation coincided with observable flow at most sites within the sub-basin during the fall and winter seasons. All winter precipitation events resulted in approximately 1 foot of observable snow accumulation.

There was no water in storage behind Sullivan Dam at the beginning of the 2019 annual reporting period. Water started to pool on 7/14/2018, and the first spill event occurred on 7/18/2018. After the 2018 monsoon precipitation events, the water behind Sullivan Dam was present through the end of the calendar year. Winter precipitation events resulted in five (5) observed spill events over Sullivan Dam. Water remained pooled behind Sullivan Dam for the remainder of the reporting period.

At Gipe Well, the water level increased 0.43 feet during the 2019 annual monitoring period. It is not known if livestock watering operations were in service during this period.

Prolonged flows at several sites were observed during the 2019 winter season. SRP Water Measurement staff attempted to collect current meter measurements on several occasions, but were unable to due to site conditions that were not safe for an in-stream measurement on all but two occasions. One (1) current meter measurement was performed at Williamson Valley Wash at XU Ranch and one (1) at Lower Williamson Valley Wash during a period of prolonged winter flows. Both current meter measurements were used to enhance the site discharge ratings at those locations.

SRP Water Measurement continues to maintain the sites and process pressure transducer and SRP Flowtography® and SRP Snowtography™ images collected at the monitoring locations.

The data presented within this report are provisional in nature, and is reflective of the best available data at the time this report was prepared.

APPENDIX II

Summary of Data Collection Equipment/Locations

Established Monitoring Efforts

Groundwater Level Monitoring

Well Name	ADWR 55 #	Land Owner	Cadastral	Depth (ft bgs)	Perf Interval (ft bgs)	Water Level (ft bgs)	Data Repository
MW-4b1	228266	USDA Forest Service	B(18-01)28BCD	460	340-460	320	GWSI
MW-4b2	228265	USDA Forest Service	B(18-01)19 ADC	520	420-520	400	GWSI
MW-4b3	228262	Arizona State Land Department	B(18-01)31 CCD	480	380-480	360	GWSI
MW-4d	228264 (c) 228472	Arizona State Land Department	B(17-02)11ABD	450	280-340 (LCS); 330-450 (PVC)	310	GWSI
MW-4e	228263	Arizona State Land Department	B(17-02)12CBD	340	240-340	225	GWSI
MW-4g	921236	Southwest Land & Cattle LLC (dba K Larson)	B(18-03)26BDD	1400	1000-1400	142	GWSI
BMW-2	921256	Kieckhefer, J.I.	B(18-04)01ACA	2000	1600-2000	180	GWSI
Glidden	631886	USDA Forest Service	B(18-01) 27ABD	230	150-219	192.4	GWSI
HR-2	527679	Civitan Foundation	B(17-02) W02DCC1	500	Not cased	328.3	GWSI
MW-4f.1 (Patton)[1]	803378	Southwest Land and Cattle Co.	B(18-01) 26BDD	92	25 to 60 and 80 to 90	15.5 to 18.3	GWSI
MW-4f.2 (Johnson)[1]	609259	Southwest Land and Cattle Co.	B(18-01) 26BDB1	320	37 to 320	119.4 to 141.8	GWSI
WMW-1 (Pump 7)[2]	624116	City of Prescott	B-20-04 19CBA	600	unk	66.2 to 103	GWSI

WMW-2 (200' N of Pump 3)[2]	210660	City of Prescott	B-20-04 33CBD2	100-160 and 310-400	0-420	30	NWIS and GWSI
WMW-3 (1000' SE of Pump 12)[2]	210659	City of Prescott	B-19-04 10CCB2	670	614-654	14-29	NWIS and GWSI
BMW-3	905773	Kieckhefer	B-18-04 01ACA2	1000' casing	499-999	155 (2008)	GWSI
BMW-1 (previously named BH-1)[2]	200027	Kieckhefer	B-18-04 11ACC	490	290-490	315.6 (2007)	
BCMW-1	211839		B-18-04 25AAA2	737	300-620	261.2 (2008)	GWSI
Gipe Well	511557	Gipe	B-18-01 17AAA	620	540-620	419-425	GWSI and SRP DB
Paulden South (PZ3)	524078	City of Prescott	B-17-02S 04DBC3	170	130-170	108 (2019)	GWSI

[1]Southwest Groundwater Consultants, January 4, 2017

[2]Southwest Groundwater Consultant, December 23, 2004

Stream flow Monitoring

Stream flow Monitoring Sites Funded By/Established Under CA#1

Name	Completion Date	Comments
Verde Headwaters at Campbell Ranch	4/2005	
Williamson Valley Wash Near Paulden, AZ	1965-1985 2002-Current	USGS Gage 09502800
Big Chino Wash below Partridge Creek	6/26/2014	
Lower Big Chino Wash	5/21/2014	
Lower Walnut Creek at Charney Property	6/10/2014	
Lower Williamson Valley Wash	5/22/2014	
Pine Creek	5/19/2014	
Upper Big Chino Wash	1/16/2014	
Upper Walnut Creek at Forest Service	10/1/2014	Displaced and removed
Williamson Valley Wash at XU Ranch	6/12/2014	
Upper Walnut Creek at Bridge	6/26/2014	Camera only
Upper Walnut Creek at Bridge	6/05/2015	Yavapai County Flood Control District radar stage gage
Big Chino Wash at Prescott Ranch	8/26/2015	Camera only, basin conditions
Sullivan Dam	5/25/2016	stage gage/transducer installed 10/12/2017

Climate Monitoring

Publicly Accessible Repositories for Climate Data

Agency Name	Data Portal
YCFCD	http://weather.ycflood.com/
USGS	http://waterdata.usgs.gov/az/nwis/rt
NWS-HADS (Camp Wood – CPWA3, Ashfork – ASFA3)	http://www.nws.noaa.gov/oh/hads/
Historic Climatic Data	http://www.wrcc.dri.edu/summary/climsmaz.html

Existing Weather Stations in the Big Chino Sub-basin[1]

Station Name	Responsible Agency	Data Collected
Granite Basin	YCFCD	Precipitation
Walnut Creek	YCFCD	Precipitation/Stage
Big Chino Wash @ SR 89	YCFCD	Precipitation/Stage
CYFD @ Outer Loop Rd	YCFCD	Precipitation
Hyde Mountain	YCFCD	Precipitation
Williamson Valley FD	YCFCD	Precipitation
Seligman Airport	YCFCD	Precipitation/Weather
Ash Fork Draw @ I-40	YCFCD	Precipitation/Stage
Partridge Creek @ I-40	YCFCD	Precipitation/Stage
Crookton	YCFCD	Precipitation
Big Chino Water Ranch[1]	YCFCD	Precipitation/Weather
Williamson Valley Wash near Paulden, AZ	USGS	Precipitation/Stage/Flow
Verde River @ Perkinsville	USGS	Precipitation/Stage/Flow
Camp Wood nr Bagdad CPWA3	National Weather Service	Precipitation
Ashfork 12 NW ASFA3	National Weather Service	Precipitation
George Wood Canyon	SRP	Precipitation/Weather

[1] Not all Weather Stations are included on Maps 6 and 6a.

Geochemistry Sampling Sites in the Big Chino Sub-basin

Station Name	Site type	ADWR ID	Common Name	Contributing Unit
B-16-05 06SBBC	Spring	NA		
A-17-01 07AAA UNSURV	Spring	NA		
B-16-01 07CBD1	Groundwater	55-589793		Clay, Sand, Gravel
B-16-03 17BBD1	Groundwater	55-589659		Sand, Clay, Malapai, Granite (lowest 15 ft)
B-16-04 14CCB1	Groundwater	55-605433		Basin Fill
B-17-02 03BBB1	Groundwater	55-561786		Basalt Limestone Conglomerate
B-17-02 10CAC1	Groundwater	55-519184		Malapai
B-17-02 12CAC1	Spring	NA	Greenbie Pool	
B-17-02 12CBD1	Groundwater	55-228263	4e	Dolomite, Sandstone
B-17-02 12CCA2	Spring	NA	UVS South	
B-17-02S04DBC3 [PZ1]	Groundwater	55-524078	pz1	Sandy Limestone, Limey Sand, Gravelly Sand
B-18-01 19ADC1	Groundwater	55-228265	4b2	Dolomite
B-18-01 31CCC1	Groundwater	55-228262	4b3	Limestone, Dolomite
B-18-02 21BAB1	Groundwater	55-512240		Limestone
B-18-02 26BBC1	Groundwater	55-912454		Chirt
B-18-02 28AAB1	Groundwater	55-581763		Conglomerate, Caving Gravels
B-18-02 35ABA1	Groundwater	55-917475		Limestone
B-18-03 26BDD2	Groundwater	55-921236	4g	Dolomite, Sandstone, Shale, Limestone
B-18-04 01ABD1	Groundwater	55-921256	BMW2	Dolomite, Sandstone
B-19-04 05ABA1	Groundwater	55-905230	Test Well #1	Basalt
B-19-04 10AAC	Groundwater	NA		
B-19-04 10CCB2 [WMW 3]	Groundwater	55-210659	wmw3	Basalt
B-20-03 11AAC1	Groundwater	55-588163		Sandstone and Limestone
B-20-04 33CBD2 [WMW 2]	Groundwater	55-210660	wmw2	Sand, Gravel

APPENDIX III

Maps

112°40'0"W 112°30'0"W 112°20'0"W

35°0'0"N

WMW-1
WMW-2
WMW-3
Pine Creek
Big Chino Wash
Walnut Creek
BMW-2
BMW-1
BCMW-1
Johnson
MW-4g
Patton
Big Chino Wash
Williamson Valley Wash
PZ-3
HR2
MW-4d
MW-4e
Verde River
Gipe Well
MW-4b2
MW-4b1
MW-4b3
Glidden
Hell Canyon
Rattlesnake Wash
Grindstone Wash
M C Canyon
Bear Canyon
Verde River

Johnson
MW-4G
Patton
SRP GIS

Area Detail

N

0 2.5 5 Miles

Aerial Date: 2017

SRP GIS

112°40'0"W 112°30'0"W 112°20'0"W

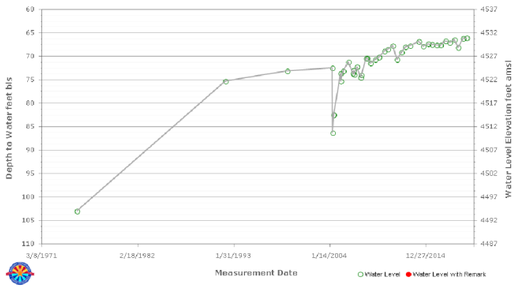
Existing Monitor Well
New Well Drilled

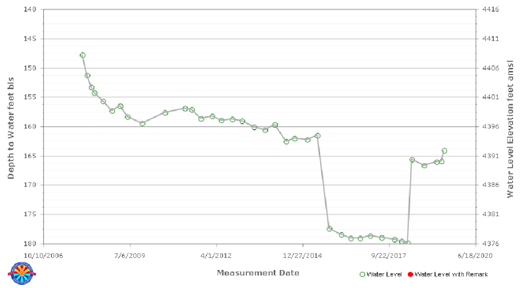
Map 1
Big Chino Sub-basin Water Monitoring Project

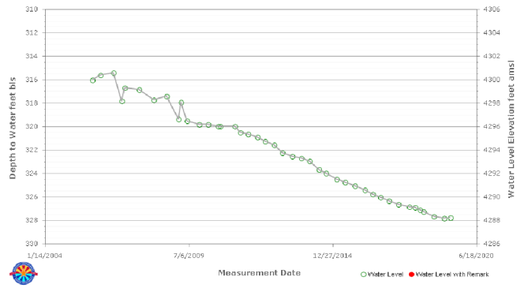
BIG CHINO SUB-BASIN WATER MONITORING PROJECT
PRESCOTT - PRESCOTT VALLEY - SRP

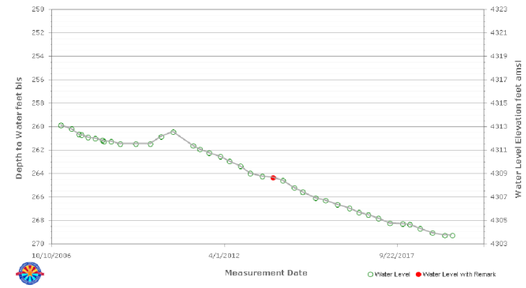
Map Courtesy of SRP®

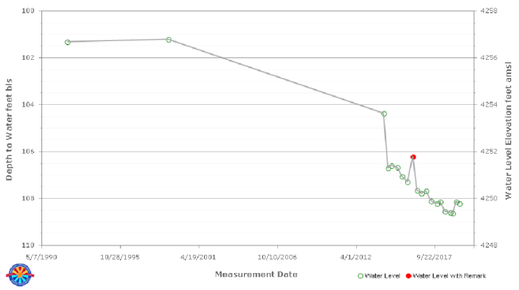
BIGCHINO_MAP1_19.mxd
9/10/2019

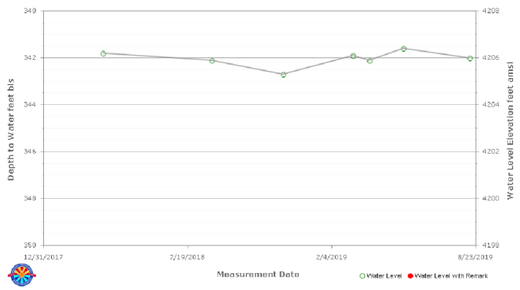


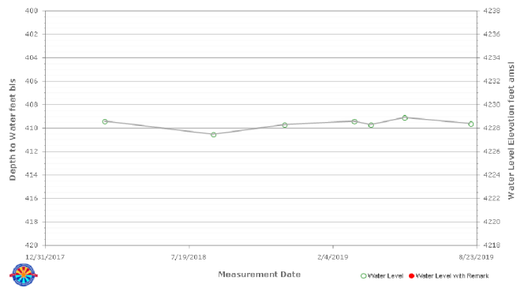


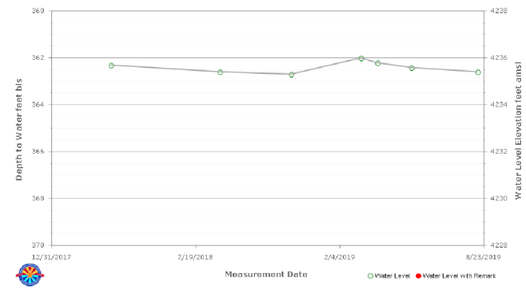


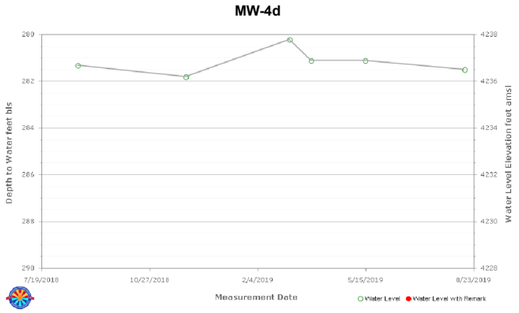


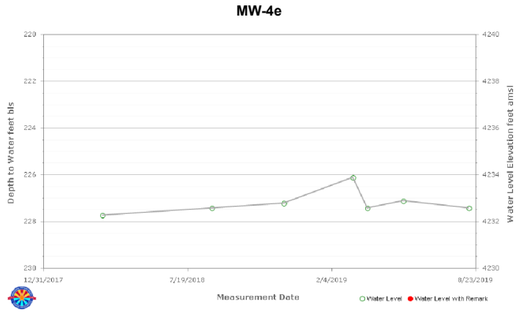


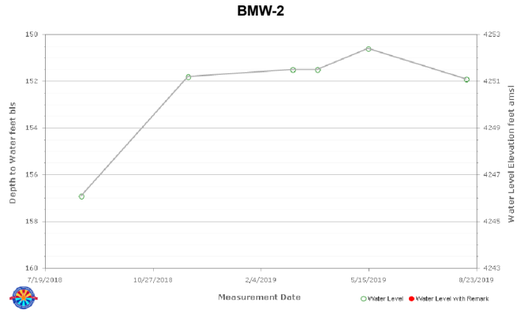


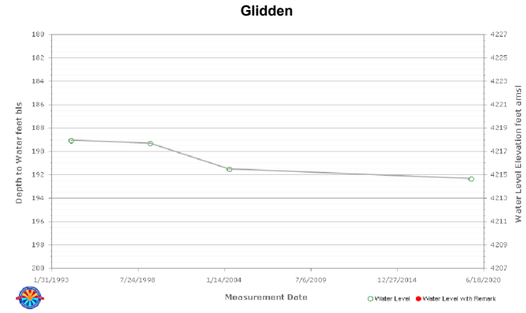


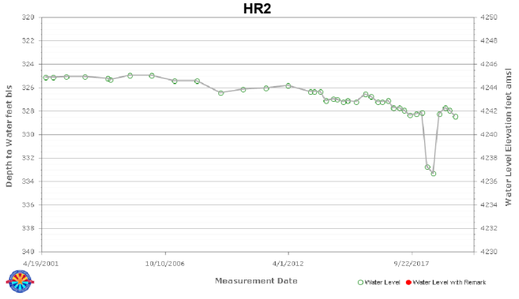


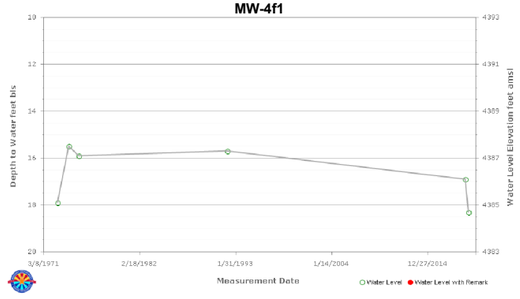


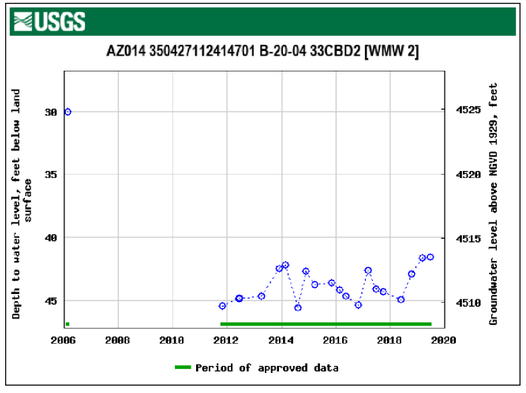




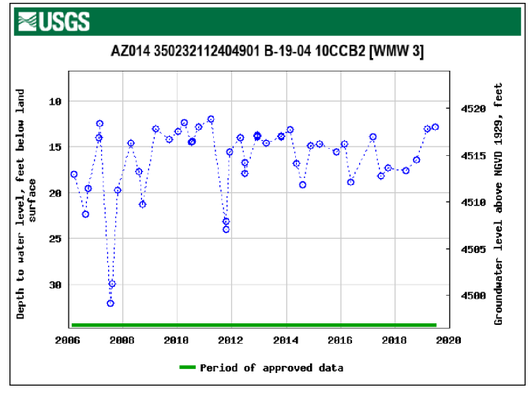








WMW-2



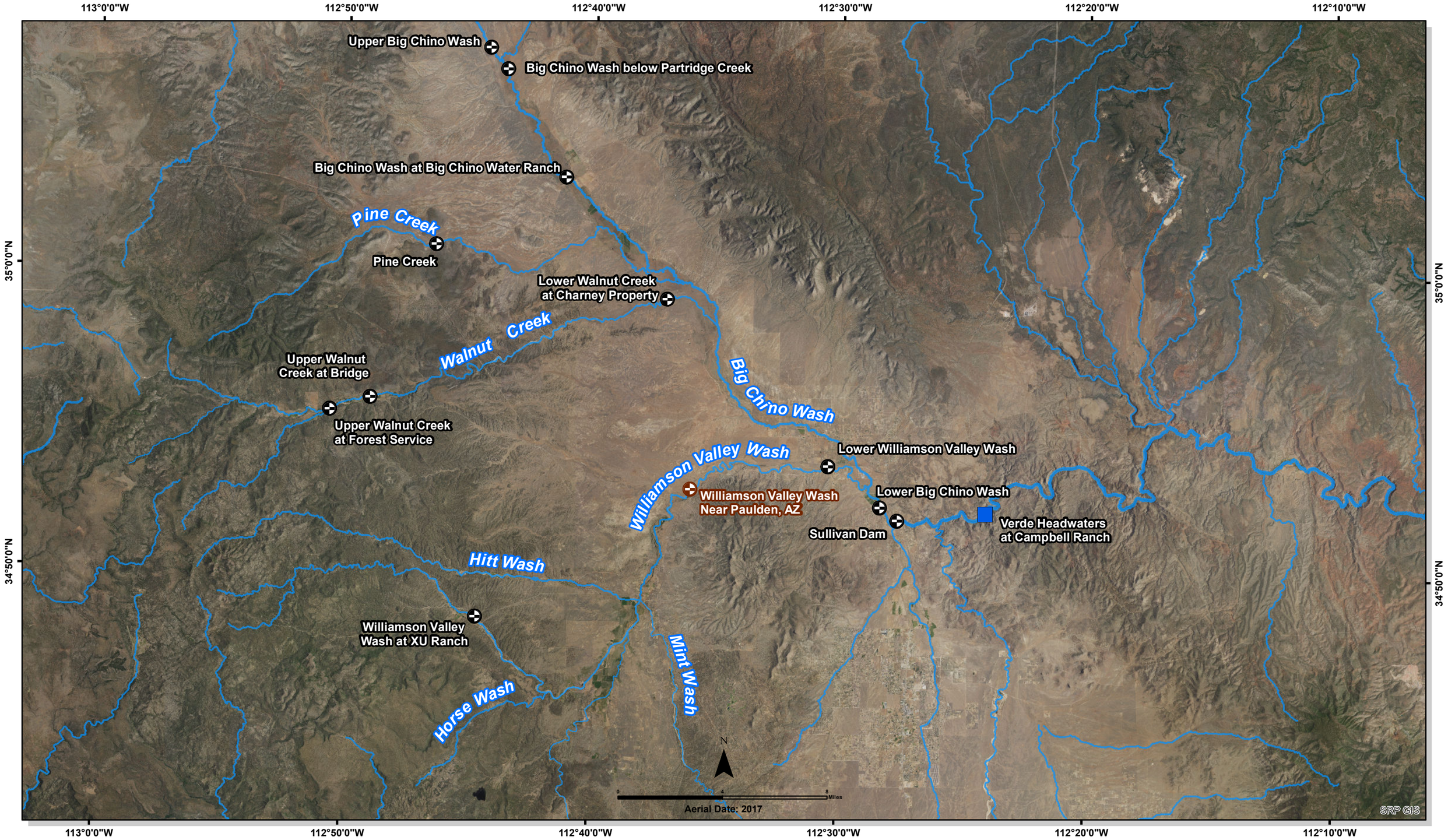
WMW-3

Map 2
Big Chino Sub-Basin Water Monitoring Project

BIG CHINO SUB-BASIN
WATER MONITORING PROJECT
PRESCOTT - PRESCOTT VALLEY - SRP

Map Courtesy of SRP®

BIGCHINO_MAP2_19.mxd 9/11/2019



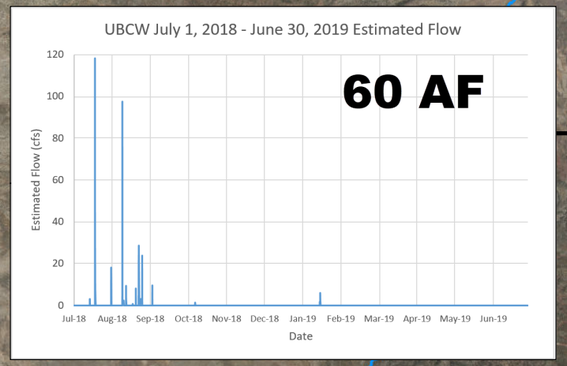
Surface Monitoring Location
USGS Gauge
Verde Headwaters
Creeks & Washes

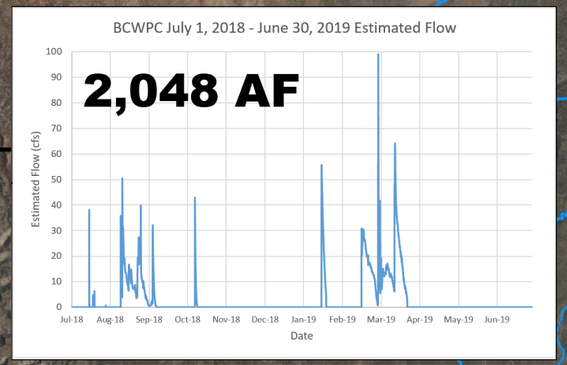
Map 3
Big Chino Sub-basin - Surface Water Monitoring
(existing flowtography, camera only sites and Verde Headwaters)

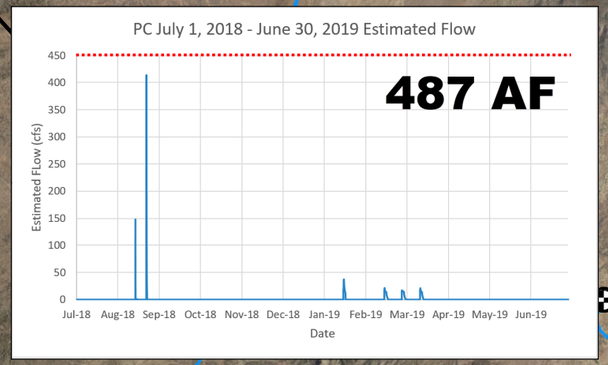
BIG CHINO SUB-BASIN WATER MONITORING PROJECT
PRESCOTT - PRESCOTT VALLEY - SRP

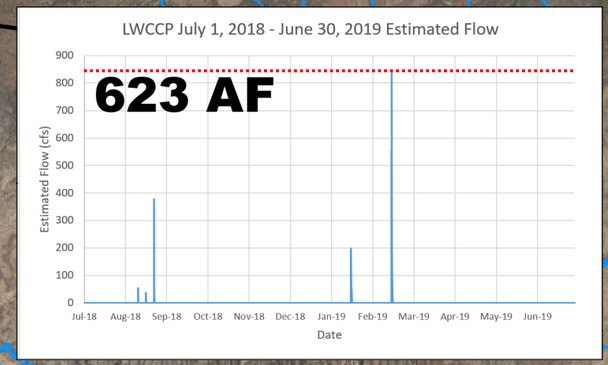
Map Courtesy of SRP®

BIGCHINO_MAP3_19.mxd 9/11/2019









Creeks & Washes

Surface Water Monitoring Location

Verde Headwaters

Map 4
Big Chino Sub-basin - Surface Water Monitoring Northern Hydrographs

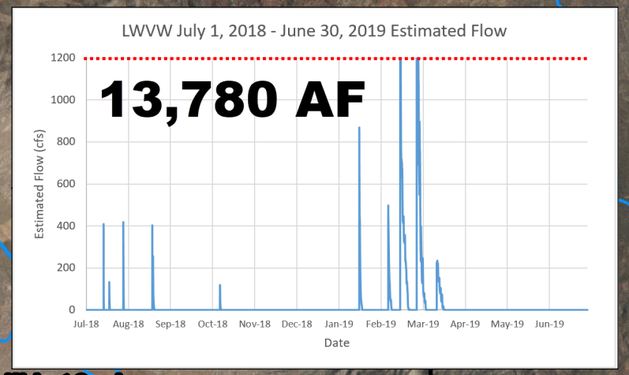
BIG CHINO SUB-BASIN WATER MONITORING PROJECT
PRESCOTT - PRESCOTT VALLEY - SRP

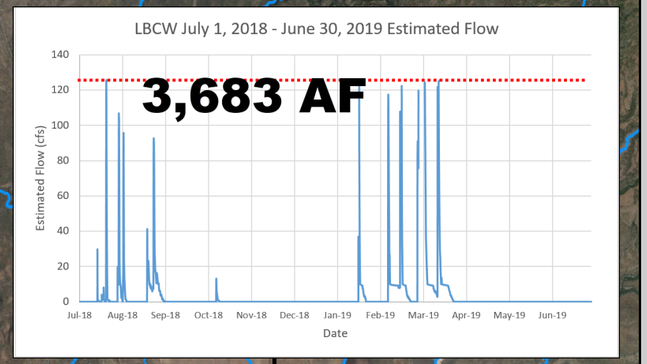
Map Courtesy of SRP®

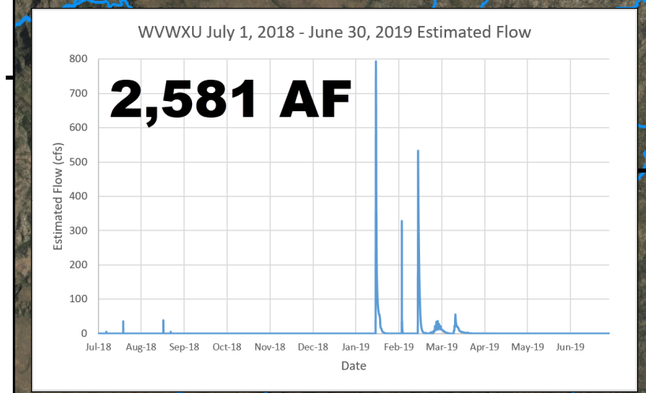
BIGCHINO_MAP4_19.mxd
9/11/2019

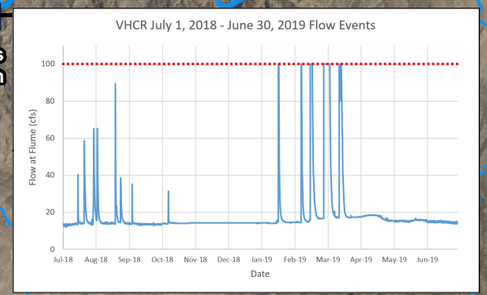
113°0'0"W
112°50'0"W
112°40'0"W
112°30'0"W
112°20'0"W
35°10'0"N
35°0'0"N
34°50'0"N

Upper Big Chino Wash
Big Chino Wash below Partridge Creek
Big Chino Wash at Big Chino Water Ranch
Pine Creek
Pine Creek
Lower Walnut Creek at Charney Property
Walnut Creek
Upper Walnut Creek at Bridge
Upper Walnut Creek at Forest Service
Big Chino Wash
Lower Williamson Valley Wash
Williamson Valley Wash
Lower Big Chino Wash
Sullivan Dam
Verde Headwaters at Campbell Ranch
Hitt Wash
Williamson Valley Wash at XU Ranch
Horse Wash









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0 4 8 Miles
Aerial Date: 2017
SRP GIS

Creeks & Washes
Surface Water Monitoring Location
Verde Headwaters

Map 5
Big Chino Sub-basin - Surface Water Monitoring
Southern Hydrographs

BIG CHINO SUB-BASIN
WATER MONITORING PROJECT
PRESCOTT - PRESCOTT VALLEY - SRP

Map Courtesy of SRP®

BIGCHINO_MAP5_19.mxd
9/11/2019

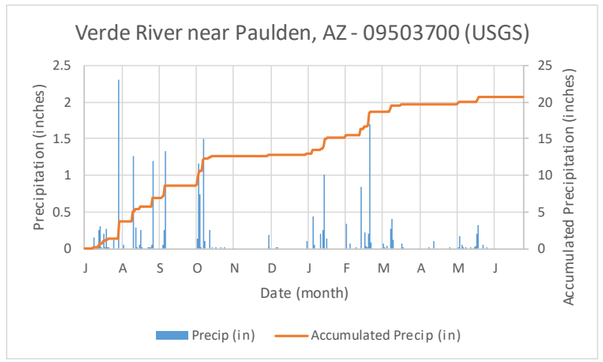
- Yavapai County Flood Control District Weather Station
- National Weather Service Hydrometeorological Automated Data System Station
- USGS Weather Station
- SRP Weather Station

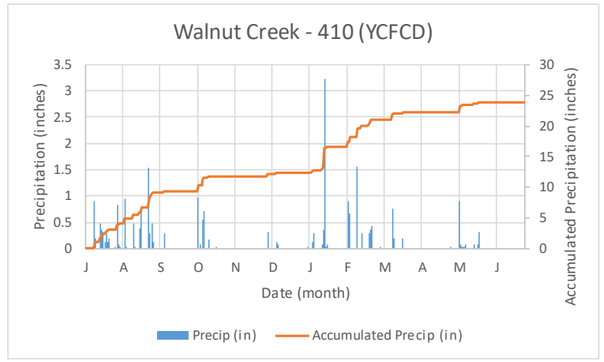
Map 6
Big Chino Area
Weather Stations

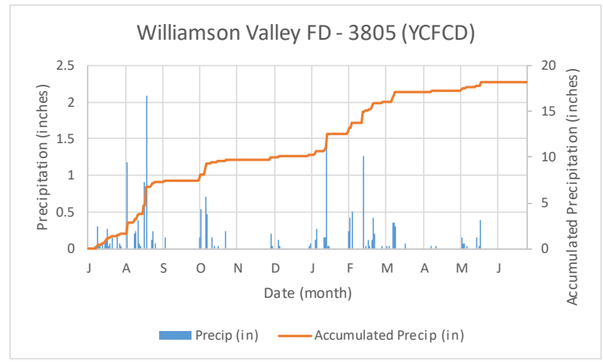
BIG CHINO SUB-BASIN
WATER MONITORING PROJECT
PRESCOTT - PRESCOTT VALLEY - SRP

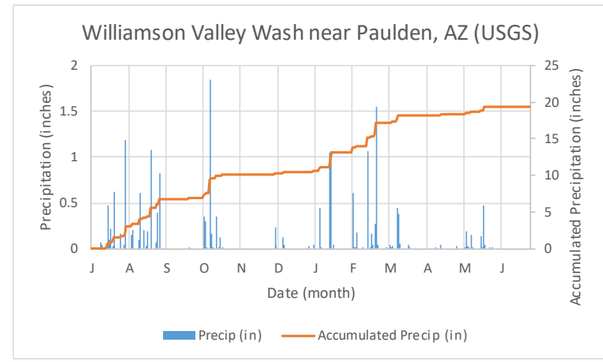
Map Courtesy of SRP®

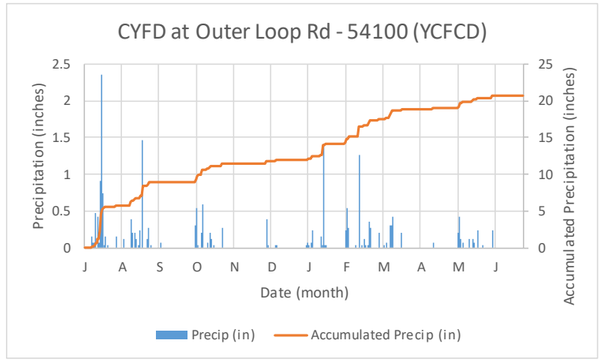
BIGCHINO_MAP6_19.mxd
9/10/2019

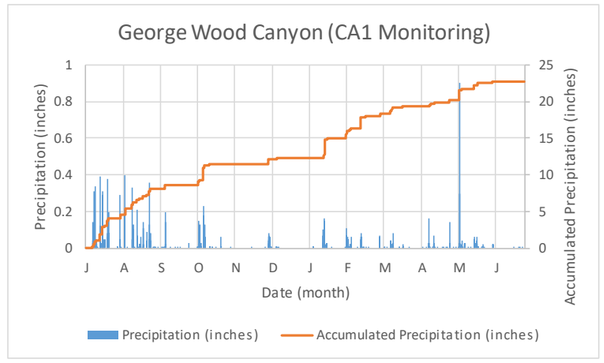


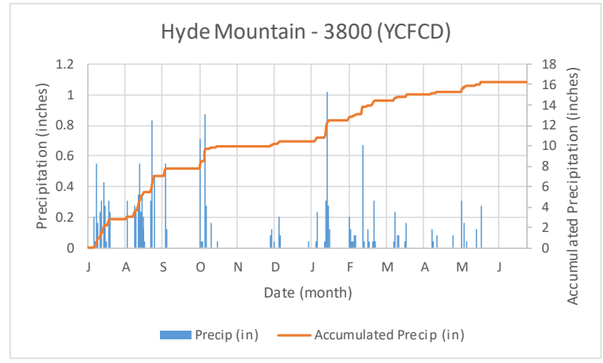


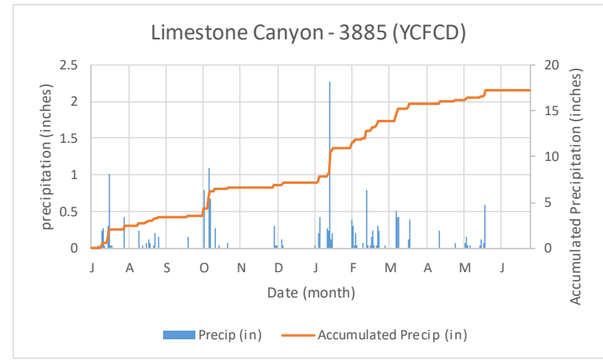


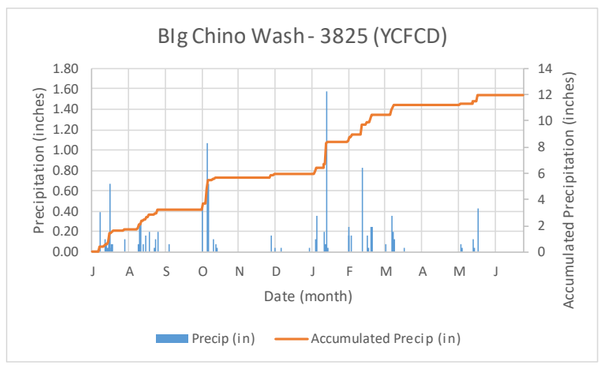


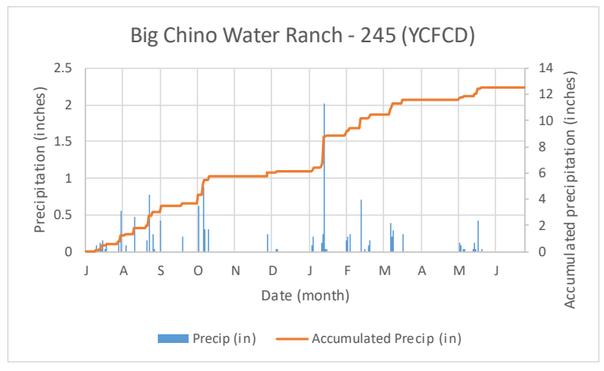


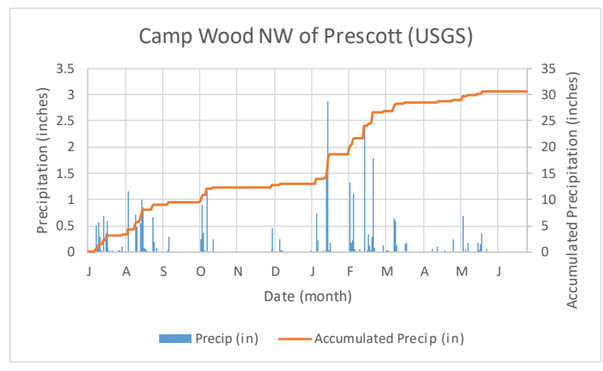


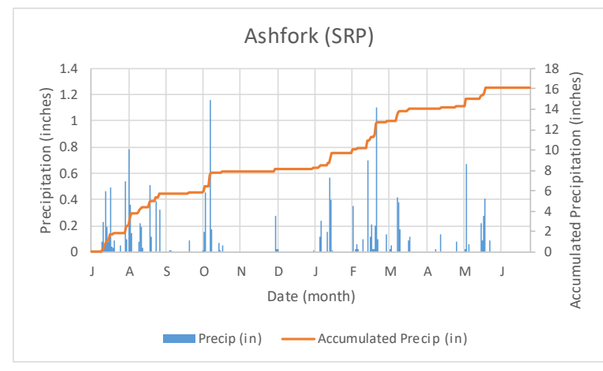










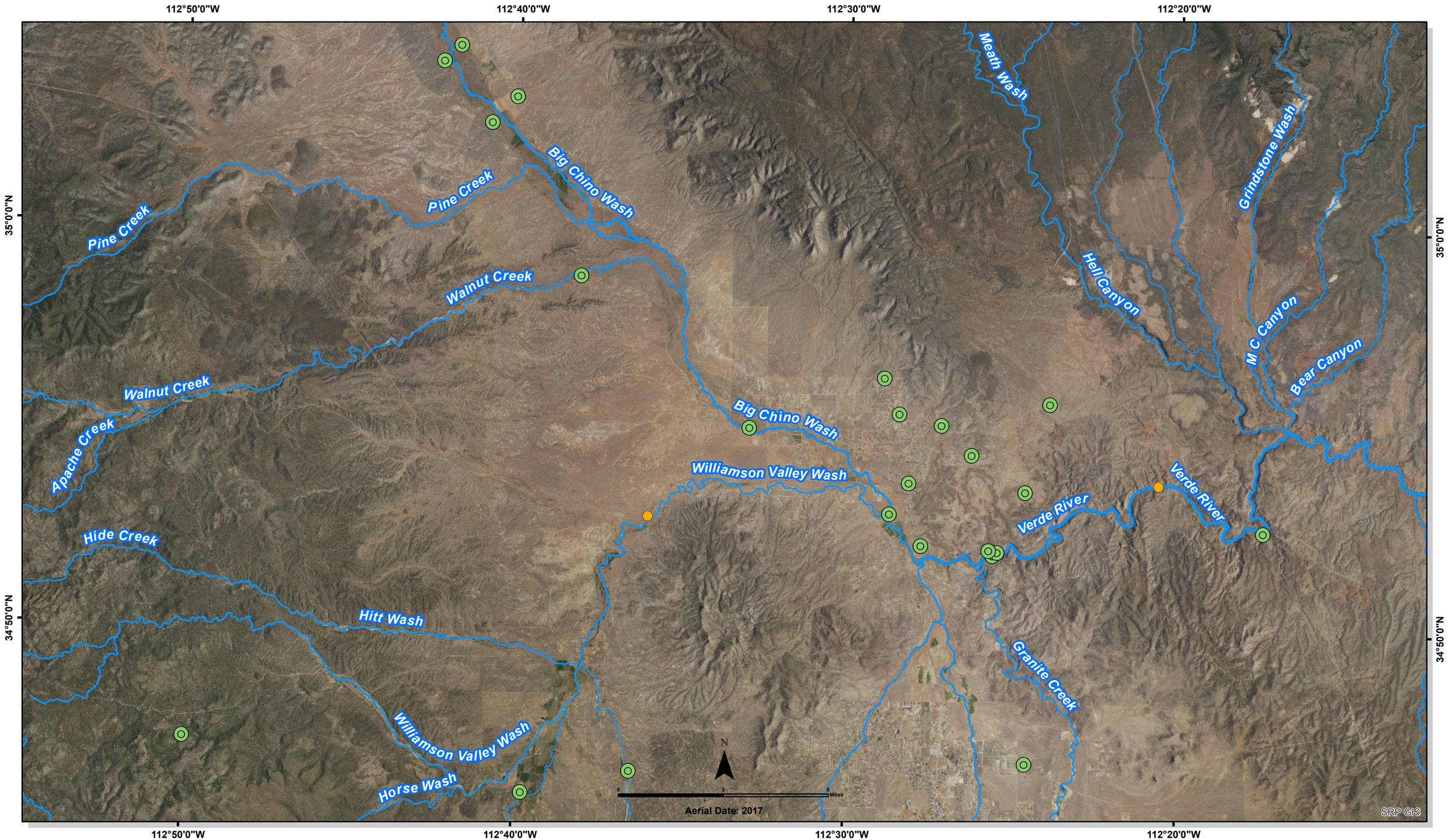


Map 6a
Big Chino Area
Weather Station Data

BIG CHINO SUB-BASIN
WATER MONITORING PROJECT
PRESCOTT - PRESCOTT VALLEY - SRP

Map Courtesy of SRP®

BIGCHINO_MAP6a_19.mxd 9/24/2019



Active Sample Sites

Samples Collected in FY19

Map 7
Big Chino Sub-basin Water Monitoring Project
Geochemical Study Sample Locations

BIG CHINO SUB-BASIN
WATER MONITORING PROJECT
PRESCOTT - PRESCOTT VALLEY - SRP

Map Courtesy of SRP®

BIGCHINO_MAP7_19.mxd 9/11/2019

113°0'0"W 112°50'0"W 112°40'0"W 112°30'0"W 112°20'0"W

35°0'0"N

Pine Creek

Walnut Creek

Big Chino Wash

Williamson Valley Wash

Hitt Wash

34°50'0"N

N

0 3 6 Miles

Aerial Date: 2017

SRP GIS

Map 8
Big Chino Sub-basin Water Monitoring Project
USGS Gravity Sites

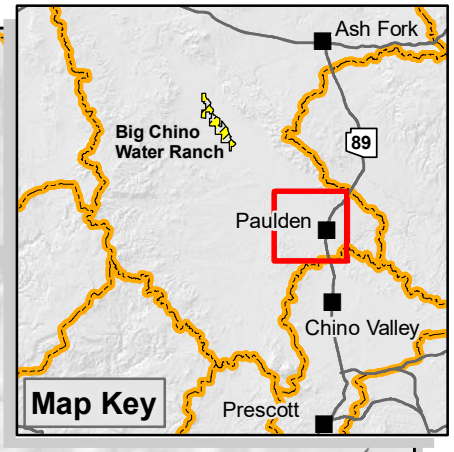
Active Data Collection

BIG CHINO SUB-BASIN
WATER MONITORING PROJECT
PRESCOTT - PRESCOTT VALLEY - SRP

Map Courtesy of SRP®

BIGCHINO_MAP8_19.mxd 9/13/2019

Map 9-1: Big Chino Crop Survey 2018 at Paulden



112°30'0"W

34°50'0"N

Big Chino Wash

Williamson Valley Wash

89

Verde River

BIG CHINO

LITTLE CHINO

0 1 2 Miles

N

112°30'0"W

34°50'0"N

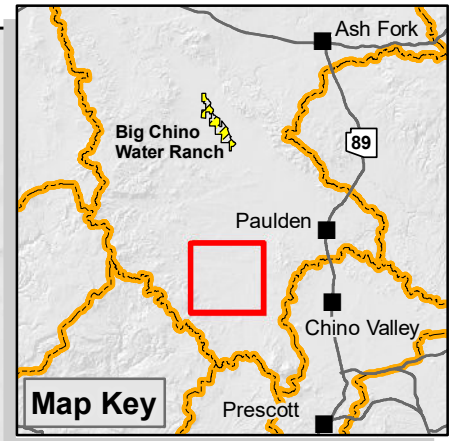
Alfalfa
Grass
Oats
Pasture
Sod
Vegetable
No Crop Evident (Abandoned/Fallow)
Groundwater Sub-basin (ADWR)

BIG CHINO SUB-BASIN WATER MONITORING PROJECT
PRESCOTT - PRESCOTT VALLEY - SRP

Map Courtesy of SRP

BIGCHINO_CROPSURVEY_19.mxd 9/11/2019

Map 9-2: Big Chino Crop Survey 2018 at Williamson Valley



112°40'0"W

34°50'0"N

Hitt Wash

Williamson Valley Wash

Mint Wash

Horse Wash

Strickland Wash

0 1 2 Miles

N

Alfalfa
Grass
Oats
Pasture
Sod
Vegetable
No Crop Evident (Abandoned/Fallow)
Groundwater Sub-basin (ADWR)

BIG CHINO SUB-BASIN WATER MONITORING PROJECT
PRESCOTT - PRESCOTT VALLEY - SRP

Map Courtesy of SRP

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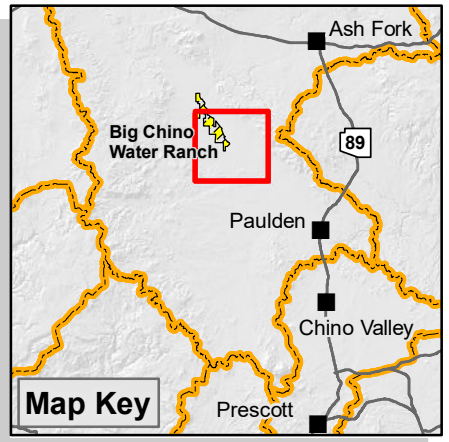
Map 9-3: Big Chino Crop Survey 2018 at Upper Big Chino



112°40'0"W

35°0'0"N

Big Chino Wash

Pine Creek

Walnut Creek

0 1 2 Miles

N

Alfalfa
Grass
Oats
Pasture
Sod
Vegetable
No Crop Evident (Abandoned/Fallow)
Groundwater Sub-basin (ADWR)

BIG CHINO SUB-BASIN WATER MONITORING PROJECT
PRESCOTT - PRESCOTT VALLEY - SRP

Map Courtesy of SRP®

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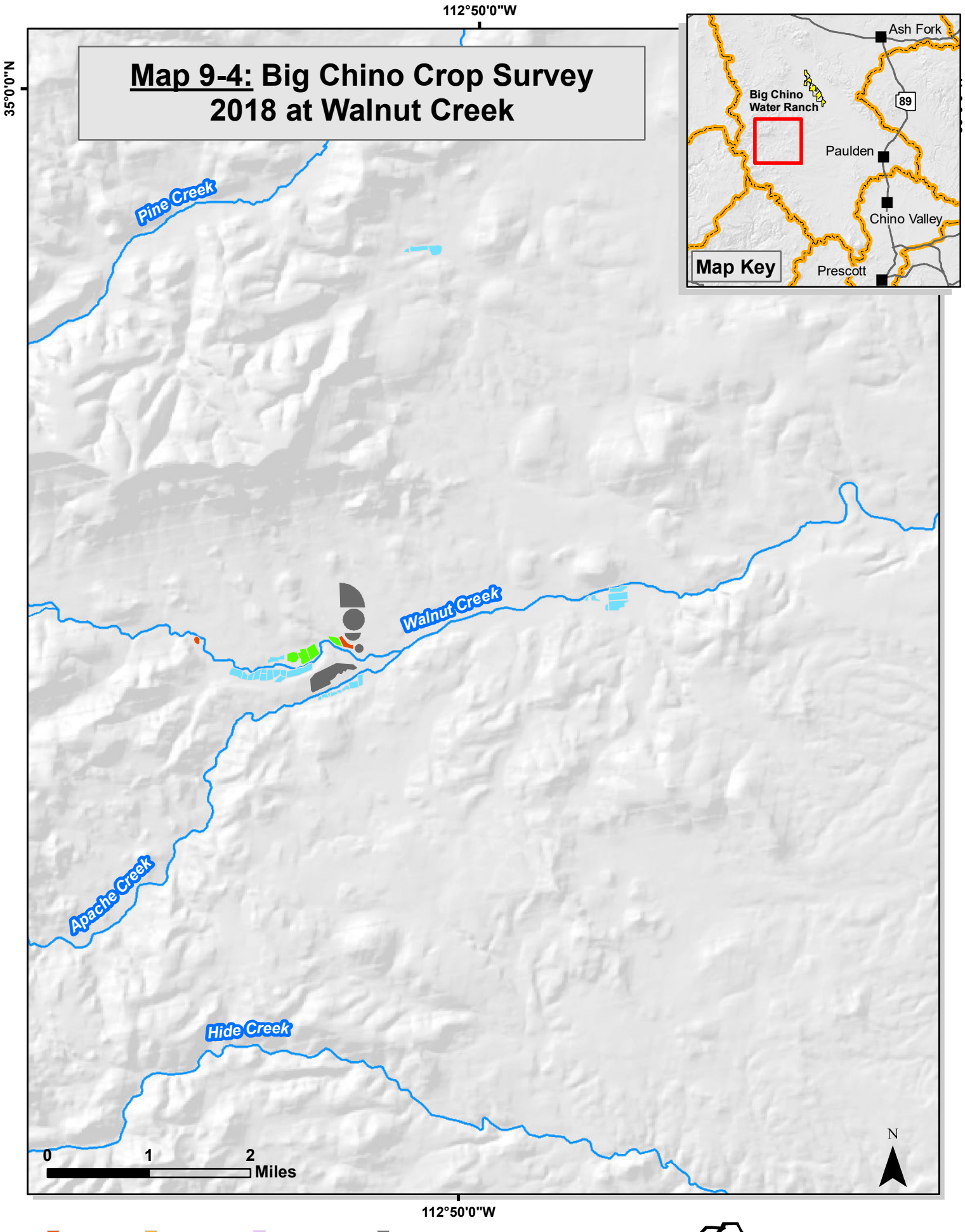
112°50'0"W
35°0'0"N
Map 9-4: Big Chino Crop Survey
2018 at Walnut Creek
Ash Fork
Big Chino
Water Ranch
89
Paulden
Chino Valley
Map Key
Prescott
Pine Creek
Walnut Creek
Apache Creek
Hide Creek
0
1
2
Miles
N
112°50'0"W
Alfalfa
Grass
Oats
Pasture
Sod
Vegetable
No Crop Evident (Abandoned/Fallow)
Groundwater Sub-basin (ADWR)
BIG CHINO SUB-BASIN
WATER MONITORING PROJECT
PRESCOTT - PRESCOTT VALLEY - SRP
Map Courtesy of
SRP
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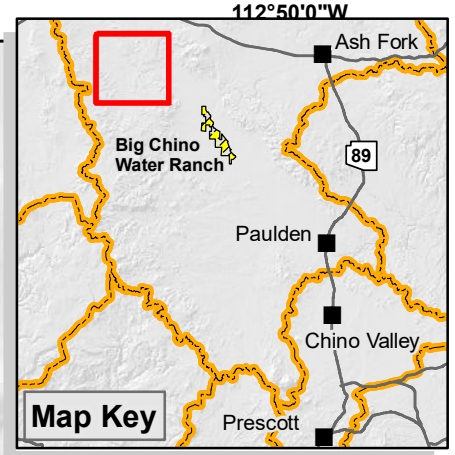
Map 9-5: Big Chino Crop Survey 2018 at Turkey Canyon



112°50'0"W

35°10'0"N

Big Chino Wash

Turkey Canyon

Big Chino Wash

0 1 2 Miles

N

Alfalfa
Grass
Oats
Pasture
Sod
Vegetable
No Crop Evident (Abandoned/Fallow)
Groundwater Sub-basin (ADWR)

BIG CHINO SUB-BASIN WATER MONITORING PROJECT
PRESCOTT - PRESCOTT VALLEY - SRP

Map Courtesy of SRP

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