2019 Annual Report

Nestlé Waters North America Inc.

Chaffee County 1041 Permit

Submitted

Tuesday, March 3, 2020

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List of Exhibits

Exhibit 1	NWNA 2019 Bighorn Springs Grazing Management Plan
Exhibit 2	NWNA 2019 Ruby Mountain Springs Annual Monitoring Report
Exhibit 3	NWNA 2019 Surface Water and Groundwater Monitoring Report, Chaffee County, Colorado
Exhibit 4	NWNA 2019 Bighorn Springs Wetlands Monitoring Report
Exhibit 5	NWNA 2019 Summary Trucking Operations
Exhibit 6	NWNA's 2019 Annual Accounting Report Regarding Well Pumping Operations and Augmentation Releases
Exhibit 7	UAWCD Augmentation Water Documentation
Exhibit 8	NWNA's 2019 Accounting Upper Arkansas Water Conservancy District Supply and Demands

NESTLÉ WATERS NORTH AMERICA INC.

The Healthy Hydration Company™

March 3, 2020

Mr. Jon Roorda
Planning Manager
Chaffee County
104 Crestone Avenue, Rm 125
P.O. Box 699
Salida, Colorado 81201

Dear Mr. Jon Roorda,

Nestlé Waters North America Inc. (NWNA) is pleased to submit this 1041 Permit Annual Report for 2019 to Chaffee County, in compliance with Condition 4.8 of the Permit.

By signing below, I certify that the information contained herein represents NWNA's activities in Chaffee County and demonstrates NWNA's continued compliance with its 1041 Permit in 2019.

In addition to the Annual Report, in response to a Chaffee County request, presented herein is a report from S.S. Papadopulos & Associates, Inc. detailing the expected water use from Ruby Mountain Springs over the next ten years.

If Chaffee County needs clarification of the information presented herein, or additional information to meet compliance with the 1041 Permit Condition for Annual Reporting, please contact me.

Sincerely,

Larry Lawrence
Natural Resources Manager
Nestlé Waters North America Inc.
5772 Jurupa Street
Ontario, CA 91716

Section 1
Introduction

Nestle Waters North America (NWNA) applied to Chaffee County (County) for a 1041 Permit and Special Land Use Permit (Permits) in November 2008 to construct and operate a spring water withdrawal and transport project (Project) at the Ruby Mountain Springs in Chaffee County. The County granted approval of NWNA's Permits on September 23, 2009. In accordance with Section 4.8 of the 1041 Permit, NWNA must submit an Annual Report to Chaffee County regarding its compliance with its Permits as well as its operations and activities in Chaffee County.

This report covers NWNA's operations and activities from January 1 through December 31, 2019, (Report Period). For continuity, this 2019 Annual Report may contain information addressing NWNA's compliance with all requirements specified in the Permits for the Reporting Period as well as compliance to date.

Section 2
Compliance with 1041 Permit Conditions

NWNA presents this annual report in accordance with recommendations of County staff made in the review letter dated April 7, 2010. NWNA's 2019 activities and compliance with 1041 permit conditions are presented subsequently being organized by condition number (e.g. Section 4.1) as presented in Chaffee County Resolution 2009-42 and as amended by Resolution 2010-20, and Resolution 2013-35.

2.4.1 Scope of Permit

Condition is County proviso. No submittal is required.

2.4.2 Technical Revision or Permit Amendment

According to NWNA's 1041 Permit Section 5.1, NWNA may seek and be granted by the County Technical Revisions to its Permits and permit conditions if certain provisions in permit Section 5 are met. Additionally, according to Section 5.2 NWNA may seek and be granted by the County an amendment to its Permits if provisions within Section 5 are met. NWNA has applied for 13 Technical Revisions and received approval for 12 Technical Revisions to date (see below). NWNA has also received 2 Permit Amendments subsequent to initial issuance of NWNA's Permits granted by Resolutions 2009-42 and 2009-43.

2.4.3 Dispute Resolution

There are no NWNA-County disputes and no submittal in required.

2.4.4 Term of Permit

The 10-year term of NWNA’s Chaffee County 1041 Permit Resolution No. 2009-42 was granted a 6-month extension on October 15, 2019 valid until April 23, 2020 by the Chaffee County Board of County Commissioners (BOCC).

2.4.5 Commencement of Project

NWNA has fully satisfied this permit condition.

2.4.6 Transfer of Permit

NWNA does not request a transfer of, nor has it transferred, its rights under this Permit to any parties.

2.4.7 Permit Violation

NWNA has not been notified by Chaffee County, or any other permit authority, of any violations of permits.

2.4.8 Annual Reporting

This report is submitted to Chaffee County for 2019 in compliance with this condition.

2.4.9 Hagen Exception

The metes and bounds description of the Hagen exclusion to the NWNA 1041 Permit Application has not changed. NWNA took no action on this exclusion in 2019. The land covered by the exclusion is grazed according to the NWNA's 2019 Grazing Management Plan.

2.4.10 Financial Security

NWNA continues to maintain the Reimbursement Fund to cover County costs associated with administration of NWNA's 1041 Permit. There were no construction projects requiring a County permit in 2019.

2.4.11 Compliance with Other Permits

NWNA is and has been in compliance with all permits associated with its Chaffee County operations issued to date.

2.4.12 Cost Reimbursement Fund and Application Review Costs

In compliance with this section of the 1041 Permit, NWNA has maintained its Cost Reimbursement Fund balance per County requirements. The Chaffee County Finance Director confirmed that no balance changes occurred in 2019.

2.4.13 Bighorn Springs Land Management Plan

The County approved NWNA's Final Bighorn Springs Parcel Land Management Plan on May 5, 2010.

According to the NWNA-County ROW dedication agreement, the County applied dust suppression on CR300 adjacent to the Bighorn Springs Parcel during July 2019.

NWNA did not observe noxious weeds on the property and did not receive notification from the County concerning noxious weeds, so conducted no weed control on the parcel.

The Colorado Mountain College Natural Resources Management department (CMC NRM) prepared NWNA's 2019 Bighorn Springs Grazing Management Plan.

NWNA submitted its 2019 Bighorn Springs grazing report, contained in NWNA's 2019 Bighorn Springs Parcel Grazing Management Plan (Exhibit 1), to Colorado Parks and Wildlife and NRCS.

The Bighorn Springs Property was not grazed in 2019 due to the difficulty of finding available livestock to graze for short periods of time in mid-summer, and in consideration of the drought conditions present in 2018. Precipitation and Snow Water Equivalent (SWE) during winter months in 2019 was above average, replenishing the moisture content and vegetative cover that was lacking in 2018. NWNA will work closely with CMC and the agencies to evaluate if the land has stabilized enough for grazing in 2020, dependent on available livestock, as well as if other options need to be considered to improve soil health.

2.4.14 Ruby Mountain Springs Land Management Plan

The County approved NWNA's Final Ruby Mountain Springs Parcel Land Management Plan on May 5, 2010. Planned grazing has not been permitted on the property in accordance with the approved Ruby Mountain Springs Parcel Land Management Plan. According to the NWNA-County ROW dedication agreement, the County applied dust suppression on CR300 adjacent to NWNA's Ruby Mountain Springs Parcel during July 2019.

NWNA conducted a site visit with Alpine Eco to assess the need for invasive/noxious weed removal at Ruby Mountain Springs. Two noxious weed species were noted and NWNA will continue to work with Alpine Eco in 2020 to create a management plan, including the removal of invasive species and introduction of appropriate native species to promote the future health of the ecosystem.

The County did not notify NWNA of the presence of noxious weeds on the property, so NWNA did not perform weed mitigation during 2019.

NWNA performed removal of the old hatchery, habitat reclamation, and revegetation on the parcel in 2012 (discussed in the Section below). Revegetation has been periodically inspected and the 2019 wetlands monitoring report was prepared by CMC NRM. In 2019, NWNA contracted a local wildlife specialist, in accordance with Colorado Parks and Wildlife regulations, to trap and remove beavers from the reconstructed channel/pond system due to repetitive damming of the channel and lower measuring weir that rechanneled water flow and threatened washing out the berm adjacent to the river.

2.4.15 Habitat Reclamation of old Hatchery Site

The County approved NWNA's Final Ruby Mountain Springs Hatchery Restoration Plan on April 26, 2010. CMC NRM completed a site inventory and documentation on July 1, 2010. NWNA removed the residential structures, rubbish, the old fish hatchery building and associated non-fixed equipment and structures from the property in 2010. Fish were also removed from the hatchery ponds and raceways at the request of the Colorado Division of Wildlife (CDOW).

Upon completion of the stakeholder process, CMC NRM completed The Ruby Mountain Springs Hatchery Reclamation Plan and submitted the plan to the stakeholders, including the County, on January 20, 2012. NWNA received fromthe USACE a Nationwide 27 Stream and Wetlands Restoration Permit on February 1, 2012. Construction of the reclamation project was completed by the end of 2012.

The USACE performed a final inspection of the restored habitat in the fall of 2013 and NWNA received a letter from the USACE dated February 7, 2014 confirming closure of this permit.

CMC performed a site inventory of the reclaimed habitat in summer and late fall of 2019 and prepared the NWNA Ruby Mountain Springs 2019 Annual Monitoring Report (Exhibit 2). Vegetative growth was vigorous in 2019 with continued increase in coverage

and diversity being observed. In 2019, active and on-going willow removal has been implemented as a management strategy to promote natural revegetation and prevent dense vegetation from inhibiting access to walking paths and ponds. NWNA will work closely with CMC (and Alpine Eco) to address their recommendation of actively managing the aggressive spreading of two invasive vegetative species observed on site (oxeye daisy and stinging nettle) in 2020.

The aquatic and riparian habitat continued to be occupied by wildlife including ducks, geese, kingfisher, raptors, muskrat, beaver, squirrels, deer and Bighorn Sheep. Significant numbers of trout of all life stages continue to be observed the pond and stream channel system were observed in 2019.

Over the past several years NWNA has had conversations with various entities regarding holding a permanent conservation easement on the Ruby Mountain and Bighorn Springs properties. In 2019, NWNA submitted documents to the State of Colorado and is waiting for confirmation of next steps to complete the conservation easement.

NWNA created and posted educational posters in 2019, in anticipation of public access and educational uses of the site.

2.4.16 Surface Water, Groundwater and Wetlands Monitoring

Surface Water and Groundwater Monitoring

The County approved NWNA's Final Surface- and Groundwater Monitoring and Mitigation Plan (SGWMMP) on May 5, 2010 (provided in Appendix A of Exhibit 3), which includes a provision for wetlands monitoring of the Bighorn Springs property. and

Exhibit 3 provides the 2019 Surface Water and Groundwater Monitoring report (SSPA, 2020) that presents observations for the 2019 water year (November 1, 2018 to October 31, 2019). The report summarizes of surface flow measurements collected on the Ruby Mountain Springs and Bighorn Springs Parcels, groundwater level data for wells in the monitoring well network, water quality data from approved monitoring locations, local and regional precipitation data, Arkansas River flows, and irrigation diversions for ditches that flow onto the local aquifer. Additionally, the report provides an analysis of seasonal water levels relative to previously monitored years, as well as an evaluation of any affects that NWNA's pumping causes on spring flow and groundwater levels in nearby monitoring wells.

Similar to previous years' observations, the 2019 hydrogeological report demonstrated that NWNA's production pumping is detectable by only very slight, reduced flows through the lower Ruby Mountains Springs weir, and slightly lower groundwater levels in immediately adjacent monitoring wells. Conversely, recovery of flows in the weir and groundwater levels in immediately adjacent monitoring wells can be seen associated with pumping cessation events. Further, the monitoring data reveal no influence of NWNA's withdrawals on groundwater levels in upgradient monitoring wells on either the adjacent Jacobson parcel or the Bighorn Springs parcel, demonstrating that NWNA's spring water

production continues to have only the predicted, minimal, and localized effect on aquifer water levels.

Water quality results for Ruby Mountain Springs throughout the long-term monitoring program for Ruby Mountain Springs show that spring water quality has remained consistently high and has not been adversely impacted by NWNA operations (SSPA, 2020).

Bighorn Springs Wetlands Monitoring

Exhibit 4 provides the 2019 Bighorn Springs Wetlands Monitoring Report (CMC, 2019) that presents the results of annual wetlands monitoring at the Bighorn Springs. Measurements of vegetative cover and species representation indicate that from year to year the percentage of land cover within the same transect is variable and , as shown in several plots, vegetative cover appears to coincide with moisture in any given year.

On average when the eight transects are considered, there was a decrease in vegetative coverage of about 8% in 2019 from the 2010 to 2018 average cover and bare ground was 7% greater than the 9-year average across the site; however, both of these figures indicate an increase in site productivity from the previous year (more open water has been observed throughout the springs site, and accounts for increased bare ground).

To reliably identify long-term trends, either the number of variables in an analysis needs to be small to limit the combined random variation, or it is necessary to collect a large amount of multi-year data. It is reasonable to expect that several additional sampling events/years may be necessary to reliably establish any trends in vegetation distribution and density throughout the site.

2.4.17 Education Endowment and Annual Programmatic Contributions

NWNA becomes an active corporate citizen in the communities in which we operate. From Chaffee County citizen input, NWNA focused its community partnering primarily in the area of education, but also supports other local causes including recycling, conservation, emergency response, community health and other community-specific events and needs. The following presents a brief summary of NWNA's 2019 community partnering in Chaffee County.

Support of Education

In December of 2009, NWNA funded science education endowments to the Buena Vista Education Assistance Fund (BVCEAF) and to Support Our Schools Salida! (SOSS), each in the amount of $250,000.

Since the inception of these endowments:

- BVCEAF has received more than $133,000 for programmatic giving, while the principal balance of the BVCEAF has grown to $288,592 at year end 2019.
- SOSS received nearly $137,000 in distributions for worthy education causes while seeing the SOSS fund principal grow to $290,906.

The BVCEAF received $14,081 in distribution from its endowment fund in 2019, and SOSS received no distribution in 2019.

Since the fund's inception, the BVCEAF has awarded $62,500 in scholarships to worthy students entering science-oriented college programs. The remainder of historical disbursements to the BVCEAF have funded science, math and technological grants. Grant disbursements in 2019 will be used by BVCEAF in 2020 and summarized in next year's report.

Since the fund's inception, SOSS has reportedly awarded $22,000 in scholarships. No grants or scholarships were issued by SOSS from the NWNA Endowment in 2019, but historically such grants have served students and faculty in supporting education in health, math, science, and technology.

The following tables present a summary of BVCEAF and SOSS 2019 endowment funds and distributions made in 2019.

Annual Report 2019: BVCEAF-Nestle Waters Science Education Endowment

Summary Denver Foundation Endowment Fund	
Beginning fund balance 2019	$262,776
Investment earnings	$41,701
Denver foundation admin fee	$2,804
less disbursement to the BVCEAF	$14,081
Ending fund balance 2019	**$288,592**

Scholarships awarded Fall 2019	
Levi Dewalt	$1,750
Owen Hoal	$1,750
Andy Limoncelli	$1,750
Elizabeth Wiswell	$1,750
Total scholarship awarded 2019	**$7,000**

Annual Report 2019: SOSS-Nestle Waters Science Education Endowment

Summary Denver Foundation Endowment Fund	
Beginning fund balance 2019	$252,486
Investment earnings	$40,115
Denver foundation admin fee	$2,695
less disbursement to the SOSS	$0
Ending fund balance 2019	**$290,906**

Community Partnering

In addition to supporting education and schools in Chaffee County, NWNA has remained an active supporter of other community organizations and activities. The following table summarizes the $21,100 in financial contributions NWNA made to local organizations in 2019.

NWNA Chaffee County 2019 Financial Donation Summary

Organization/Event	**Amount**
The Denver Foundation	$2,000
Boys & Girls Clubs of Chaffee	$1,000
Trout Unlimited	$2,500
Quilts of Valor Foundation	$1,500
The Optimist Club of Buena Vista	$2,000
Chaffee County Community	$10,000
One Time Vendor	$400
One Time Vendor	$1,500
TOTAL	**$21,100**

NWNA contributed over 142,000 bottles of water to Chaffee County organizations and events in 2019 as part of its programmatic giving, equaling a total value of $48,778. NWNA is pleased to have provided healthy hydration to so many worthy causes and organizations including emergency responders, local health fairs, schools and athletic clubs, and community fundraising events. The following table lists the organizations and events that NWNA donated bottled water to in 2019.

Organization/Event	Cases*	Bottles
9Health Fair	14	448
Ability Connection Colorado	12	288
Adams County Animal Shelter	7	105
Clear the Shelter Event	7	224
Arapahoe High School	60	1,680
Autism Speaks Walk	41	1,148
BACA County	189	5,337
Booshway Fundraiser	6	210
Brush Police Department	60	1,680
Buffalo Ridge Elementary	15	525
Chaffee County Fire Protection (Annual)	14	336
Chaffee County Fire Protection (Decker Fire)	108	3,024
Christmas Caravan for Kids	35	1,225
Clear Creek Cleanup	10	295
CureSMA	18	576
Ducks Unlimited	6	210
Families Against Violent Act	45	1,080
Food Bank of the Rockies	4,781	105,949
Girls Gone Rx	23	805
LGBTQA Softball Tournament	42	1,890
Guardian of the Flame	48	1,920
Touchdown Club	57	2,565
Joyful Journeys	14	490
Little Sisters of the Poor	108	3,780
Runnin for Research	5	175
Salida Cyclone Swim Team	40	480
Salvation Army Vol Event	16	240
Shiloh Temple	21	945
Special Olympics Colorado	89	3,896
Volunteers of America	5	120
Wellspring Community Walk	18	432
TOTAL	**5,914**	**142,078**

*Case sizes vary between 8 and 48 bottles

In accordance with NWNA's 1041 Permit hearing testimony, NWNA will continue its annual discretionary community programmatic support of worthy local organizations, events, and causes for as long as it operates in Chaffee County.

2.4.18 Right-of-Way

The NWNA-Chaffee County Right-of-Way (ROW) Agreement requires NWNA to re-iterate to the County in each Annual Report certain deed restrictions NWNA instituted when it granted to the County a ROW for County Road (CR) 300 through NWNA's properties. These deed restrictions require that the County notify NWNA annually of

planned dust suppression, weed control, or construction activities on CR 300 adjacent to NWNA's Bighorn Springs and Ruby Mountain Springs properties.

In late 2018, the County Road and Bridge Superintendent indicated to NWNA that the County would apply dust suppression on CR 300 adjacent to the NWNA Bighorn Springs and Ruby Mountain Springs parcels in May 2019 with the same method and at the same rate as in 2018 (½ normal strength). NWNA notified the County that it agreed to the County applying dust suppression on CR 300 in 2019 along both NWNA properties as long as the same compound and application rate and method are used. To NWNA's understanding, the same compound, application rate and method agreed on in 2018 was used in 2019. Actual dust suppression activities occurred in July 2019. NWNA requests notification from the County if it intends to continue its dust suppression procedures in 2020.

NWNA did not observe any noxious weeds on its properties along CR 300 and therefore did no weed mitigation along those ROWs. NWNA requests notification of any weed control activities by the County in 2020.

The traffic signal installed in 2018 along CR 300 adjacent to NWNA's Ruby Mountain Springs property in the vicinity of the borehole buildings and near the NWNA Ruby Mountain public fishing access has not been repaired to date.

The County has communicated no specific plans for signal repair, other road construction or weed control along CR 300 for 2020, although the County has notified NWNA of a grant funding application submittal for an expansion of CR 300 near the NWNA Ruby Mountain springs channel in the near future. NWNA will continue to support the proposed road expansion in 2020, when possible.

2.4.19 Wildlife Friendly Fencing

This condition is satisfied.

2.4.20 River Wade Fishing on Bighorn and Ruby Mountain Springs Parcels

On May 24, 2011, NWNA and CDOW finalized and signed permanent fishing easement agreement on the Ruby Mountain and Bighorn Springs parcels, to be managed by Colorado Parks and Wildlife. Colorado Parks and Wildlife installed an information sign in the Fisherman Parking Area next to the Ruby Mountain Springs site and posted additional signage in 2014 as part of its management of these easements.

2.4.21 Fishing Access on Bighorns Springs Parcel

On May 24, 2011, NWNA and CDOW finalized a permanent fisherman-parking-and-access easement agreement on the Bighorn Springs parcel, to be managed by Colorado Parks and Wildlife. Colorado Parks and Wildlife has completed construction of the access road, parking area, signage, and trail on the Bighorn Springs Parcel.

2.4.22 Pipeline Requirements

This condition is satisfied.

2.4.23 Buildings and Structures

NWNA did not construct or modify any buildings or structures in 2019.

2.4.24 Construction Conditions Imposed by Special Land Use Permit

NWNA did not perform any construction in 2019.

2.4.25 Local Construction Jobs and Local Purchasing

This 1041 Permit condition requires NWNA to hire local firms and purchase materials for the construction of the Ruby Mountain Springs Project to the degree that it is commercially practical. NWNA's corporate policy toward supporting the local communities in which it operates supports the objective of this permit condition, and therefore in 2019 NWNA made every attempt at achieving local hiring and purchasing of materials for the project.

Construction Contractors & Material and Equipment Purchases

In 2019, NWNA purchased a prefabricated shed for the load station. The cost of the shed and installation was approximately $2,900 and was performed entirely by Chaffee County contractors.

In addition, NWNA required services and materials for system operation, maintenance, and equipment up-grades in 2019. These services and supplies were supplied to NWNA from local and non-local contractors and suppliers, as dictated by local availability. NWNA's local contractor and supply expenditures amounted to approximately $37,327, while NWNA's non-local contractor and supply expenditures for specialized equipment installation and Alliance for Water Stewardship certification was about $67,600.

Professional Service Contractors

NWNA employed one part-time employee and local professional service contractors including community relations, technical consulting, operations and monitoring assistance, etc. In 2019 this amounted to approximately $37,100 of local expenditure. NWNA also employed non-local professional service contractors largely due to either their specialized service not available locally, or they were NWNA's national consultants (e.g. legal counsel, water resource specialists, etc.). In 2019, NWNA, in support of its Ruby Mountain Springs project, employed non-local specialized professional service and legal contractors totaling about $207,400.

NWNA’s Other Local Spending

NWNA paid approximately $29,900 for local utilities associated with project operations in 2019. NWNA made payments in 2019 to the UAWCD for water augmentation in the amount of $152,174. NWNA also paid approximately $9,800 to local service providers in 2019 for waste management, telecommunications, security and other miscellaneous items.

NWNA, through its trucking contractor, endeavors to hire local truck drivers to make hauls of spring water to the NWNA Denver bottling plant. In 2019, 46% of the 3,122 trips to the bottling plant were made by local drivers whose pay totaled approximately $482,031.

NWNA's Taxes Paid

NWNA's real property taxes payable and paid in 2019 was $25,931.02.

2.4.26 Local Drivers

In 2019, NWNA's trucking contractor (DG Coleman) employed a total of 13 drivers throughout the year to haul water from the NWNA TLF to the Denver Bottling Plant. Of the 13 drivers employed throughout the course of the year, 5 were local. Local drivers conducted 1,444 round-trips, and non-local drivers conducted 1,663 round- trips.

NWNA and its trucking contractor have made continuous efforts since May 13, 2010 to recruit local drivers. Specifically in 2019:

- NWNA and DG Coleman ran 28 job postings in various online and print media sources.
- Coleman again offered signing bonuses and referral bonuses throughout 2019.
- For portions of 2019, Coleman offered relocation assistance (four drivers relocated to Chaffee County in 2019, two from Denver, two new hires).
- Coleman guaranteed minimum 40 hours per week paid for all Chaffee drivers.

New drivers are now able to start at the top of the pay scale to attract better talent.

The ability to maintain the 50% quota for Chaffee County drivers is considered at risk going forward despite relocation and recruitment efforts. NWNA and Coleman have approached the County and through TR 13 have received relief from this permit condition, provided NWNA and Coleman efforts to recruit and retain Chaffee County drivers continue and are documented.

More detailed information regarding NWNA's 2019 trucking operations is presented in Exhibit 5.

2.4.27 Project Impacts Related to Well Pumping

Condition is County permit proviso. No submittal is required.

2.4.28 Augmentation Water Source Restrictions

NWNA operated wells RMBH2 and RMBH3 from January 1, 2019 until December 31, 2019 pursuant to the terms of the augmentation certificates issued by UAWCD. The sources of supply during that period were (a) water leased by UAWCD from the Pueblo Board of Water Works (the "Pueblo Board") pursuant to the "Water Lease Agreement" dated May 20th, 2009 (the" UAWCD-PBWW Lease"); (b) project water available to UAWCD from the Fryingpan-Arkansas Project; and (c) any water derived from shares owned by UAWCD in the Twin Lakes Reservoir and Canal Company or any water

acquired by UAWCD that is derived from Twin Lakes shares owned or controlled by others". The State Engineer confirmed that the NWNA wells are included in the Upper Arkansas Water Conservancy District's ("UAWCD") regional augmentation plans as decreed in Case Nos. 92CW84, 94CW5, 94CW41, 94CW42, 96CW17, 03CW55 and 06CW32. (Exhibits 6 and 7).

2.4.29 Limitation on Project Depletions

This permit condition requires that NWNA's water depletions to the Arkansas River be limited to the net amount (196.0 acre-feet which accounts for transit losses) of replacement water available to the Arkansas River in time, place and amount and that releases of augmentation water comply with the terms contained in NWNA's 1041 Permit as specified in Chaffee County Resolution 2013-35 for NWNA's augmentation source provider UAWCD. NWNA's compliance with the water augmentation operational terms of the 1041 Permit is presented in NWNA's monthly reports to Chaffee County and in NWNA's 2019 Annual Accounting Report Regarding Well Pumping Operations and Augmentation Releases (Exhibit 6).

2.4.30 Approved Augmentation Plan Required

NWNA operated wells RMBH2 and RMBH3 from January 1, 2019 until December 31, 2019 pursuant to the terms of the augmentation certificates issued by UAWCD. The sources of supply during that period were the sources set forth in the Upper Arkansas Water Conservancy District plan for augmentation summarized in Case No. 06CW32. The State Engineer confirmed that the NWNA wells are included in the Upper Arkansas Water Conservancy District's ("UAWCD") regional augmentation plans as decreed in Case Nos. 92CW84, 94CW5, 94CW41, 94CW42, 96CW17, 03CW55 and 06CW32.

2.4.31 Augmentation Water Delivery Restrictions

This 1041 Permit condition requires that NWNA's depletions be replaced by augmentation water released up-stream of the Ruby Mountain Springs on the Arkansas River. NWNA's compliance with this permit condition is presented in NWNA's 2019 Annual Accounting Report Regarding Well Pumping Operations and Augmentation Releases (Exhibit 6).

2.4.32 Accounting and Reporting for Augmentation Water Source

NWNA has provided the County with monthly reports presenting the UAWCD's water operations on the Arkansas River and augmentation of NWNA's depletions which demonstrate NWNA's compliance with this permit condition. NWNA's compliance during 2019 with this water augmentation operational term of the 1041 Permit is summarized in the UAWCD District Supply and Demands Report (Exhibit 8).

2.4.33 Pumping Well Operational Restrictions

Based on the County approval of Technical Revision 11, this 1041 Permit condition now allows for NWNA to operate RMBH2 and RMBH3 simultaneously, but limits diversions from the wells to 200 gallons per minute, 1 acre-foot per day, and 16.6 acre-feet per month.

In 2019, NWNA operated RMBH3 as the primary production well. NWNA produced 88.87 acre-feet of water from RMBH-3 in 2019. NWNA has provided the County with monthly reports presenting NWNA's pumping, and NWNA's 2019 Annual Accounting Report Regarding Well Pumping Operations and Augmentation Releases (Exhibit 6) summarizes these data.

In 2019, NWNA's diversions from RMBH2 and RMBH3 complied with the provisions of this permit condition not exceeding the daily limit of 1 acre-foot or the monthly limit of 16.6 acre-feet. NWNA operated its production wells well below the permitted limits

2.4.34 Construction of Pumping Wells

NWNA constructed RMBH2 and RMBH3 in accordance with the County-approved provisions of the Technical Revision to the 1041 Permit.

2.4.35 Surface Water Flow Measurements

The NWNA 2019 Surface Water and Groundwater Monitoring Report (Exhibit 3) presents surface flow measurements observed during the 2019 water year from the required locations on the Ruby Mountain Springs Parcel (ie., the lower weir "RMS-Weir" and the upper Parshall flume "RMS-Flume")and two locations on the Bighorn Springs Parcel (i.e., the upper Parshall flume "BHPF-1" and the lower, combined flow Parshall flume "BHPF-3"). The report also summarizes measured flows along the Arkansas River and irrigation ditch diversions relevant to the Ruby Mountain Springs aquifer.

As shown in the 2019 monitoring report and prior years observations, surface water flow at the Ruby Mountain Springs and Bighorn Springs are predominantly controlled by seasonal groundwater level fluctuations. Further, NWNA has demonstrated that production pumping from borehole RMBH-3 has a measurable, though very minor effect on flows at the Ruby Mountain Springs but no influence at the Bighorn Springs is detectable.

2.4.36 Suspension of Pumping – Adverse Effects on Reconstructed Wetlands

NWNA completed its habitat reclamation project in 2012. The restored habitat has been monitored since 2014 to evaluate the success of revegetation and function of created habitat and the results have been outstanding. Sufficient success of the re- established habitat was observed that the USAGE closed out its reclamation permit ahead of the full monitoring term in early 2014.

NWNA's 2019 Surface Water and Groundwater Monitoring Report (Exhibit 3) demonstrates that production pumping from RMBH3 has a measurable, but very minor effect on spring flows consistent with studies conducted prior to permitting of operations. Therefore, NWNA does not anticipate the need for suspension of operations. In compliance with NWNA's 1041 Permit, monitoring of groundwater levels and spring flows in relation to water withdrawals will continue to be made on a systematic basis during operations in order to evaluate and mitigate any negative effect on the Ruby Mountain Springs and associated wetlands.

2.4.37 Inclusion of Reconstructed Wetlands in SWSP or Augmentation Plan

NWNA has not included reconstructed wetlands augmentation in any of its SWSPs or its augmentation plan with UAWCO since the habitat reclamation project entailed a significant reduction in water surface area and consumptive water use (1,150 cubic feet per year). NWNA does not anticipate the need for augmentation in the future for the reclaimed habitat at the old hatchery site since the habitat continues to flourish.

2.4.38 Cessation of Diversions upon Termination

The UAWCO augmentation water for NWNA's Ruby Mountain Springs operations remained in full force and effect in 2019. NWNA's 1041 Permit term was temporarily extended in October 2019 and remains effective through April 22, 2019.

2.4.39 Restrictions on Acquisition of Additional Water Rights in County

In 2019, NWNA relied on UAWCO augmentation plan water solely to replace depletions. The NWNA-UWACO lease has not been amended or modified in any way.

2.4.40 Water Rights Filing and Administrative Costs

NWNA continues to operate its production wells under the UAWCO augmentation plan and anticipates no future water court filings throughout the term of its 35-year lease with UAWCO. Notwithstanding, NWNA will continue to maintain sufficient funds in its Chaffee County Reimbursement Account to cover the County 's expenses associated with review of any changes to NWNA's water augmentation.

2.4.41 Trout Creek Pass Improvements Lobbying

NWNA did not receive notification or request from Chaffee County regarding lobbying actions with COOT for improvements to US Highway 285 in 2019. Therefore, NWNA did not directly or indirectly lobby COOT for such improvements in 2018. However, COOT completed construction of east-bound passing (uphill climbing) lanes on Trout Creek Pass in 2016. These lanes now provide opportunities for faster moving traffic to safely pass slower moving traffic including loaded NWNA transports.

2.4.42 Limits on Truck Traffic

This permit condition places certain restrictions on NWNA's trucking activity to limit impacts on the Trout Creek Pass portion of US Highway 285. These limitations include no more than 25 loaded trucks per day, with no more than two trucks per hour. During the restricted peak-hours period of 11:00 am to 6:00 pm from the Friday of Memorial Day weekend through the Labor Day weekend, truck traffic is limited to no more than two loaded trucks per hour, with an average of one truck per hour for the peak-hours period of each day.

Detailed information regarding NWNA's 2019 trucking operations is presented in Exhibit 5. NWNA made a total 3,102 truck trips in 2019 from the Truck Loading Facility to the Denver Bottling Plant. NWNA utilized almost exclusively 8,200-gallon tankers in 2019, with minor usage of two 6,500-gallon tankers.

The maximum number of tanker trips on any given day in 2019 was 20. (In 2014, NWNA's Process Logic Controller (PLC computer) at the Truck Loading Facility in Johnson Village was programmed to allow the filling of no more than 1 truck per hour during the seasonally restricted dates and times.) The maximum number of truck trips for the 1-hour period for any day during the restricted period was 2 and the average trucking volume for the 1-hour restricted period was no more than 1 truck per hour. NWNA is not aware of any violations of the limitations of this permit condition.

2.4.43 Emission Standards

NWNA employed the use of tanker trucks for water shipments meeting the sample specifications that were submitted as part of the initial 1041 Application and subsequent Technical Revision (TR #7). In 2019, NWNA used almost exclusively 2017 and 2018 model tractors. All tractors are 500 horsepower models and meet all federal and state emission standards. See Exhibit 5 for more detailed information.

2.4.44 No Idling During Loading

In compliance with its Permits, NWNA has not allowed its trucks to idle during loading. Limited idling only occurs as required for cold-weather start-up.

2.4.45 Emergency River Access

This condition is completely satisfied.

2.4.46 River Crossing Revegetation and CDOW Approval

This condition is completely satisfied.

2.4.47 River Crossing Construction Plans

This condition is completely satisfied.

2.4.48 Army Corps of Engineers

This condition is completely satisfied.

2.4.49 Town of Buena Vista Water Pipeline

This condition is completely satisfied.

Exhibit 1

NWNA 2019 Bighorn Springs Grazing Management Plan

Nestlé Waters North America Inc.

BIGHORN SPRINGS PARCEL GRAZING MANAGEMENT PLAN 2019

Prepared By
Colorado Mountain College
Natural Resource Management Program
(CMC NRM)
For: Nestlé Waters North America, Inc.

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INTRODUCTION

This document provides a grazing management plan for the Néstle Waters North America, Inc. (NWNA), Bighorn Springs (BHS) parcel 121809 located in the Southwest Quarter of the Northeast Quarter (SW1/4 NE 1/4) and the Southeast Quarter of the Northeast Quarter (SE 1/4 NE1/4) of Section 11, Township 15 South, Range 78 West of the Sixth Principle Meridian, Chaffee County, CO (NWNA, 2010). NWNA is directed under the Bighorn Springs Land Management Plan, Chaffee County permit 1041, to provide Chaffee County, the Colorado Parks and Wildlife (CPW), and the United States Department of Agriculture (USDA)-Natural Resources Conservation Service of Colorado (NRCS) an annual grazing management plan for the BHS parcel.

The grazing plan is formulated to ensure long-term protection of the site, including the associated springs, and improve wetland, riparian, and upland habitats for the benefit of wildlife. This grazing management plan is the product of a cooperative effort of several entities including; NWNA, CPW, NRCS, CMC NRM, and a certified holistic grazing management instructor/manager. The BHS grazing management plan will be amended annually, based on monitoring and evaluation, to address decisions including but not limited to: goals, needs, criteria, stocking rates, grazing timing and intensity, plant recovery, unforeseen problems, ecosystem succession and productivity that can change within the property from year to year. The updated grazing management plan will be adjusted in a way that utilizes adaptive management strategies based on monitoring and evaluation.

SITE CHARACTERISTICS

The BHS parcel is located in a semi-arid region within the Arkansas River basin, bordered on the west by the Arkansas River, while Sugarloaf Mountain dominates the eastern boarder of the property. The parcel varies slightly in elevation from 7,640 to 7,720 feet. (See Figure 1 for a map of the BHS parcel). The mean annual precipitation is approximately ten inches with the highest precipitation occurring during April/May, and July/August (WRCC, 2010). Several wildlife species (bighorn sheep, elk, deer, raptures, and waterfowl) are documented to have habitat ranges within or near the BHS property including the Gunnison prairie dog, which is a "Special Status Species" (NWNA, 2010).

BHS is comprised of two primary management units; a riparian/wetland unit, with transitional zones, and an upland unit. The portion of the BHS parcel available for grazing comprises approximately 53.94 acres. The riparian/wetland area is sustained by several springs and seeps.

A disturbed and revegetated section of ground exists within the parcel from NWNA's installation of an underground pipeline. The construction is complete and the impacted area has been reseeded. The two primary management units are enclosed and separated by a wildlife friendly stock fence. The BHS parcel is bounded on the north by property owned by Colorado Department of Correction (CDOC) and on the south by privately-owned property. These boundaries have been altered slightly due to a Boundary Line Adjustment following a land swap finalized in 2019. Updated maps will be included in the 2020 GMP Report.

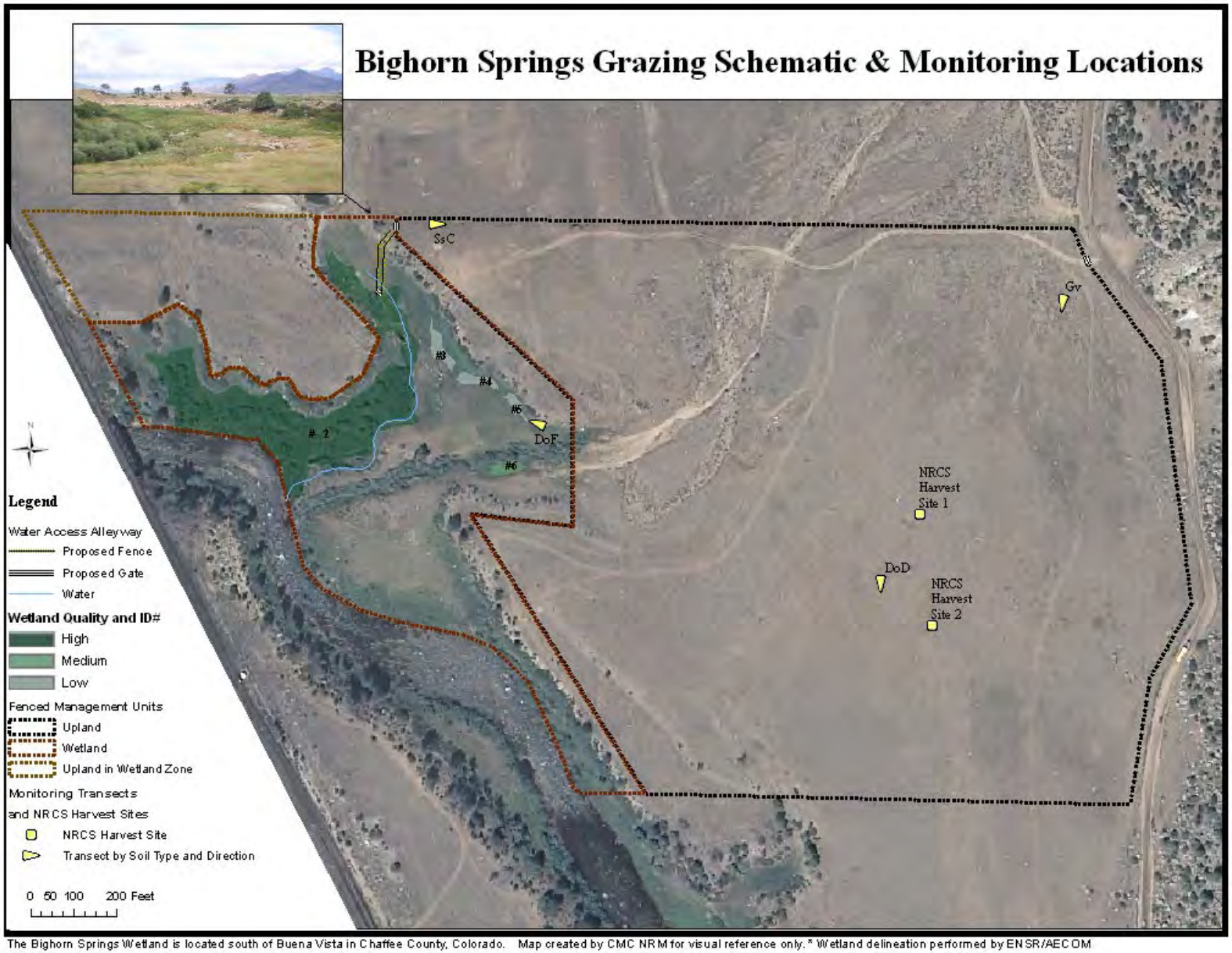


Figure 1 Map of the BHS Parcel with locations of transects completed for grazing management (CMC NRM).

GRAZING MANAGEMENT GOALS

1. Maintain and enhance productive capacity of forage species.
2. Minimize soil loss and runoff by increasing the biomass of native plants and litter cover on the soil surface.
3. Ensure a sustainable supply of forage for both livestock and wildlife (e.g. bighorn sheep, elk and deer).
4. Increase plant diversity and productivity through controlled frequency and duration of grazing and allowing adequate re-growth opportunity between grazing events.

CRITERIA

- Cattle will be the livestock tool utilized on the parcel. High intensity, short duration grazing will insure minimal interaction between cattle and wildlife.
- Insure riparian and wetland areas located on the property are maintained and are not degraded by grazing impacts.
- The grazing plan will follow the guidelines of the NRCS code 528 for prescribed grazing (NRCS, 2010a).
- Operator(s) must maintain a secure livestock holding area and provide the necessary resources required for livestock operations and management.
- This plan will maintain the objectives of the NWNA weed management plan (NWNA, 2010).

OWNERS, OPERATORS, MANAGERS, AND STAKEHOLDERS

The BHS parcel is owned by NWNA. Oversight of this property is led by Larry Lawrence, Natural Resource Manager – Colorado for NWNA.

NRCS and the CPW are key stakeholders providing technical expertise for review of the planned grazing management at the BHS property. CMC NRM will complete the prescribed monitoring, data collection, and reporting required for the grazing management plan with continued communications with the NRCS, CPW, and NWNA.

Operator(s)/manager(s) for the utilization of livestock and the day to day operations associated with grazing schedules, movement of livestock, etc., will likely be provided by a private cattle rancher in Chaffee County. Cattle rancher(s) may change from year to year depending on the availability of livestock.

WATER DEVELOPMENT

Water resources on the parcel consist of two perennial, spring- and seep-fed drainages, with three developed monitoring wells located on the upland unit. The Arnold Gulch spring is located within both management units, but due to seasonal fluctuations, does not flow on the fenced upland unit except in the fall during groundwater high flow. Use of the existing water resources in the riparian/wetland unit is the most practical source for cattle watering.

Livestock water development within the riparian and wetland unit must not compromise the functions associated with wetland and riparian areas. To accomplish this, the watering area established in 2011, was constructed in such a manner as to minimize impacts to the resources by implementing a short grazing period to allow adequate plant recovery, and to reduce stream bank

erosion and sedimentation. Construction of an alleyway water-access point for upland livestock containment has been installed. See Figure 2 for the installed water access alleyway. Its use in 2012-2014 was a success.

No repair work or other site work was conducted in 2017. Repairs to fencing and exclusion structures around springs are recommended before livestock are reintroduced to the units. It appears that excessive runoff in 2017 resulted in accumulation of debris along structures, pushing them over and rendering them ineffective. No maintenance was scheduled or performed in 2018 or 2019.

Figure 2. Alleyway installed in 2011 on BHS property to allow cattle water access when grazing the upland area

SITE INVENTORY

A site reconnaissance was conducted by the NRCS and CMC NRM in September, 2010. NRCS provided educational training and technical expertise to evaluate site conditions and potential grazing practices to meet management goals. The site reconnaissance determined forage, animal unit (cattle) stocking rates, and evaluated ecological data, which are key components of the grazing management planning process.

To better understand grazing practices and planning as it relates to improving ecological/biological conditions for pasture/range lands and wildlife habitat, in 2011, a two day holistic grazing management workshop was held at Colorado Mountain College-Leadville/Buena Vista, and on-site. The workshop was conducted by a certified holistic grazing manager and participants included NWNA, NRCS, CMC NRM, CMC students, and a local rancher. The

workshop was open to the public and provided a tool for educational outreach and community involvement. These events provided essential site information and key principles for determining existing baseline conditions and developing site specific land management outcomes necessary to meet the grazing plan goals.

The following sections contain information inventoried at the site to determine appropriate grazing practices within the BHS parcel. Riparian/wetlands are separated within the plan due to the complexities associated with habitat protection of a sensitive ecosystem and current fence placement.

RANGE SITE DESCRIPTIONS

Upland Unit
The upland unit is categorized as dry mountain outwash containing four soil types (USDA, 1977):

- DoD – Dominson gravelly sandy loam, 1 to 9 percent slopes
- DoF – Domison gravelly sandy loam, 9 to 45 percent slopes
- Gv – Gravelly alluvial land
- SsC – San Isabel stony sandy loam, 1 to 5 percent slopes

Potential native vegetation includes grasses with scattered forbs and brush. Dominate native grasses include; native bluegrass, junegrass, Western wheatgrass, Indian ricegrass, blue grama, and several others (USDA, 1977). A comprehensive description of the site characteristics and potential native flora can be found in Appendix A.

Riparian/Wetland Unit
This portion of the BHS parcel is categorized as mountain meadow containing a Dominson gravelly sandy loam (DoF) soil, with 9 to 45 percent slopes (USDA, 1975). Potential native vegetation are grasses and sedges (Nebraska sedge and tufted hairgrass are primary dominate grasses) with forbs comprising up to 20 percent of the potential annual yield (USDA, 1975). See Appendix A for a more comprehensive range site description.

The wetlands located on the BHS parcel have been delineated by the United States Fish and Wildlife Service (USFWS, 1985) and by ENSR/AECOM, a private environmental consulting firm hired by NWNA. Three wetland types were identified; Palustrine-Scrub/Shrub-Saturated (PSSB), Palustrine-Emergent-Saturated (PEMB), and Palustrine-Emergent-Seasonally-Flooded (PEMC) wetlands. Five individual wetland areas are found within the site containing one high quality wetland, one medium quality wetland, and three low quality wetlands (ENSR/AECOM, 2008). CMC NRM has recently collected baseline data and is responsible for the annual monitoring of the riparian/wetlands unit.

FORAGE, STOCKING RATES, AND ECOLOGICAL EVALUATIONS

Upland Unit
The NRCS estimation and harvesting (double sampling) methodology (USDA, 2003) identified plant species located on the upland site, forage productivity, and the general status of the ecological condition. Estimated percent dry weight of available forage, to formulate animal units per area and time, was calculated using the NRCS double sampling method. The development of baseline conditions for the purpose of annual monitoring and evaluation was conducted using a

comprehensive biological monitoring transect method (Butterfield *et al*, 2006). This method incorporated several essential elements (i.e. mineral cycle, water cycle, terrestrial biology) that can be assessed year to year. This method was conducted within each of the four soil types present at the site.

The evaluations of the upland unit determined the site has been over-rested resulting in undesirable plant species, lack of desired plant species, fair to poor mineral cycle, and a fair to poor water cycle. The upland site was functioning at approximately thirty percent of its natural potential. A primary concern is the lack of cool season perennials and annual grasses, with an overabundance of undesirable plants such as kochia, lambs quarter, and Russian thistle. The NRCS site inventory calculated five and a half animal units per month (AUM) for the upland pasture of approximately forty three acres. Data compiled from the baseline monitoring of the uplands can be found in the grazing management plans in 2010 and 2011.

Riparian/Wetland Unit

Baseline conditions and a comprehensive list of plant species have been documented for the riparian/wetland unit through monitoring by CMC NRM (CMC NRM, 2010). A comprehensive biological monitoring transect was also conducted by CMC NRM within the management unit.

Based on information gathered the riparian/wetlands functioning condition was fair to good. Many weed species have been documented in the unit (i.e. Canadian Thistle, Bindweed, Curly Dock, etc.). A transition zone of banked slopes exists around the perimeter of the management unit and is dominated primarily by woody plants. NRCS, based on previous data collection and site knowledge, calculated five AUM within the riparian/wetland unit of ten acres. Willow complexes (approximately two acres) within the unit are considered inedible by the NRCS (NRCS, 2010b) and are not included with the total area to calculate forage and stocking rates. See Appendix C for the data collected for the riparian/wetlands unit (DoF).

2017-2019 GRAZING MANAGEMENT EFFORTS

2019 was a banner year for snowfall in the Colorado Rocky Mountains. The Arkansas Valley saw above average Snow Water Equivalent during winter snowfall months, November – June (Figure 3). This trend continued through summer months with above average precipitation continuing into September 2019 (Figure 4). This significant increase in available water yield resulted in an abundance of biomass on the site, which, with no active grazing will result in additional litter following the growing season and into 2020.

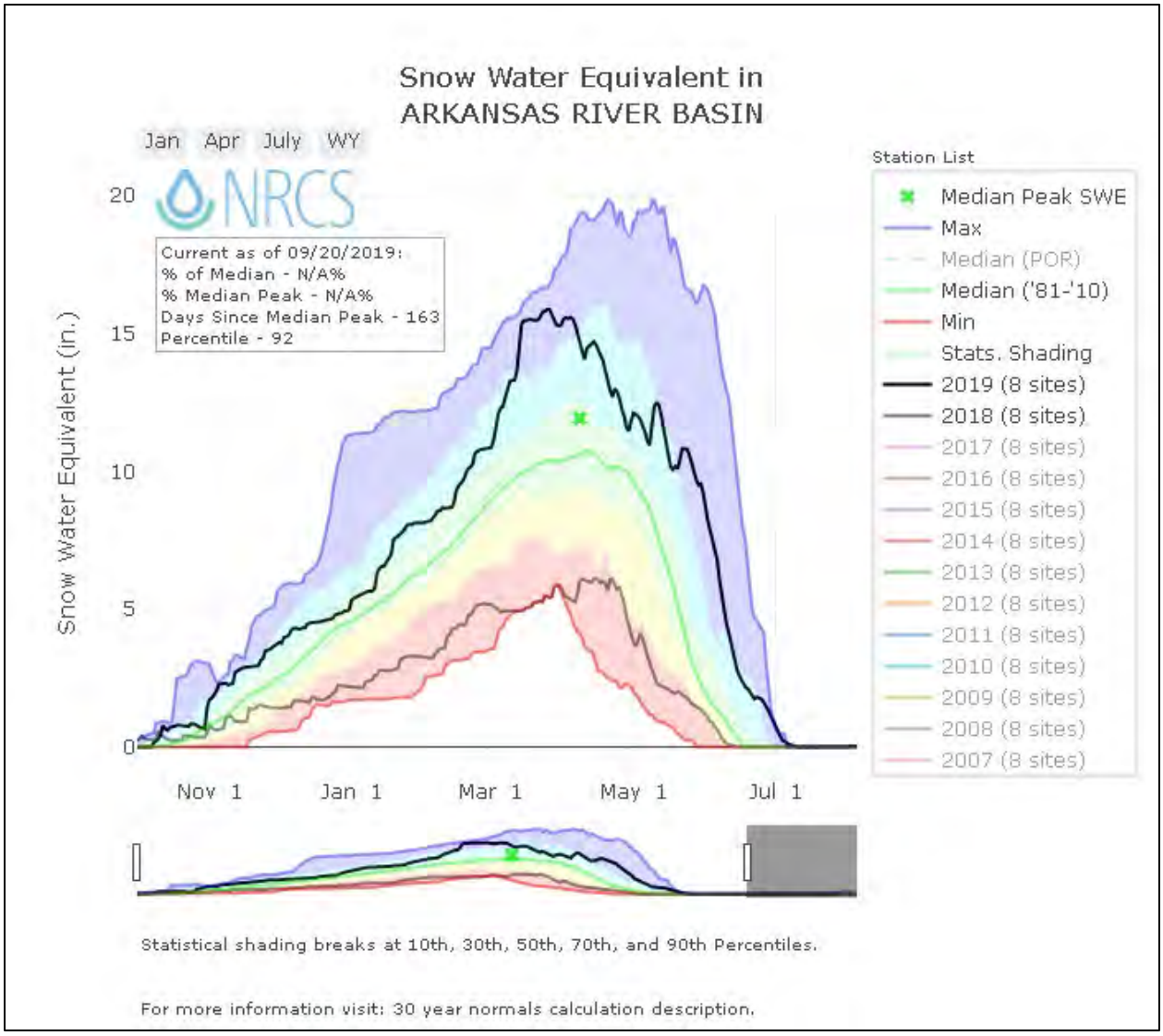


Figure 3. Annual SWE comparison for 2018, 2019 against 30 year average values

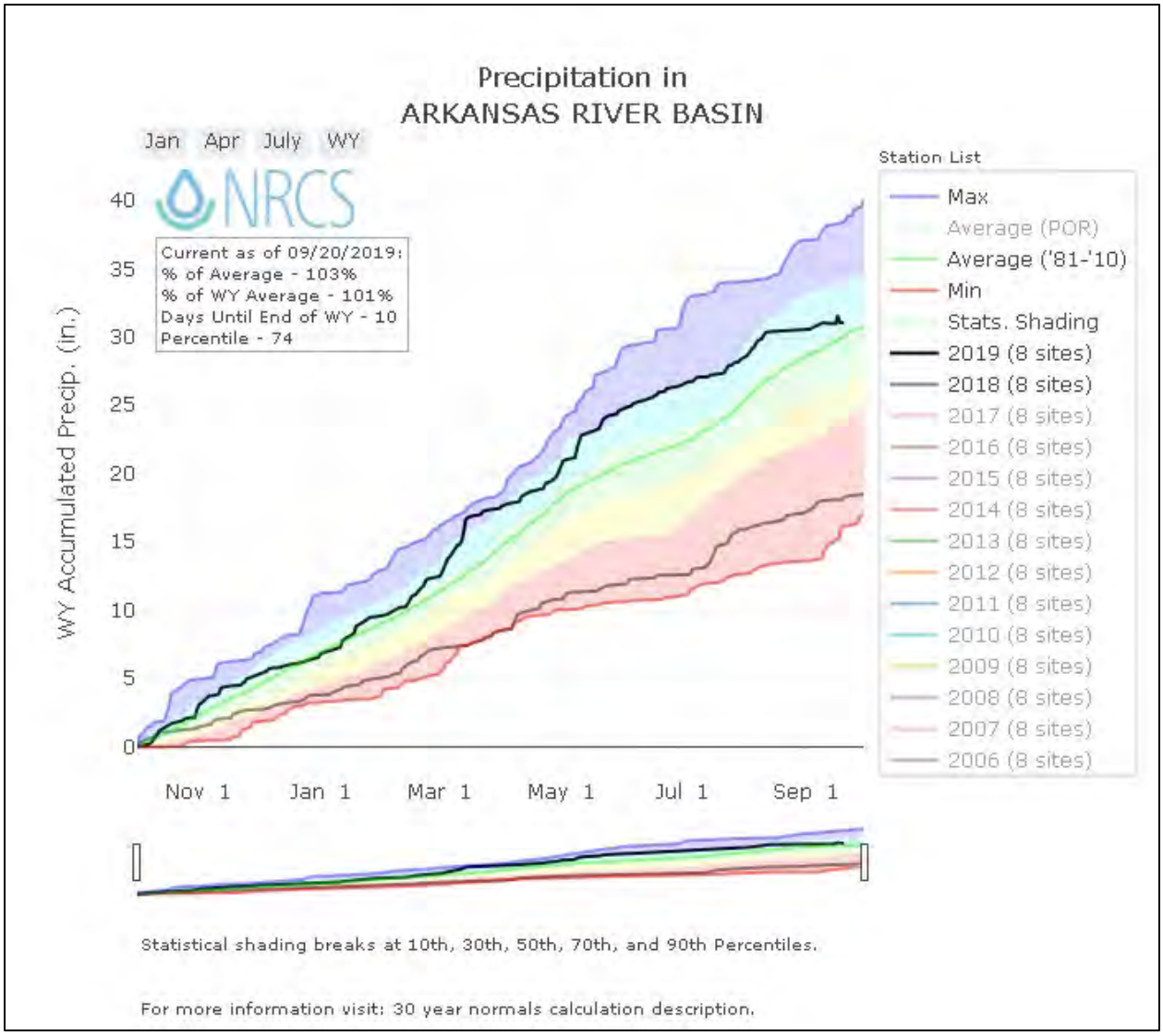


Figure 4. Annual Precipitation comparison for 2018, 2019 and 30 year average values

In 2018, no grazing occurred on the property due to continued drought conditions, a lack of vegetative production throughout the upland area, and inability to secure an operator to supply cattle. It is recognized that multiple, consecutive non-grazing years could negatively impact the site soil. Continued efforts will be made to create a suitable grazing management plan for the future.

Due to the lack of livestock grazing on-site in 2017, 2018 and 2019, standing dead material and litter from previous years' growth was abundant and will continue to form a dense thatch in subsequent years as the unit is not actively managed with grazing. Hoof prints and scat from native ungulates were identified throughout the unit.

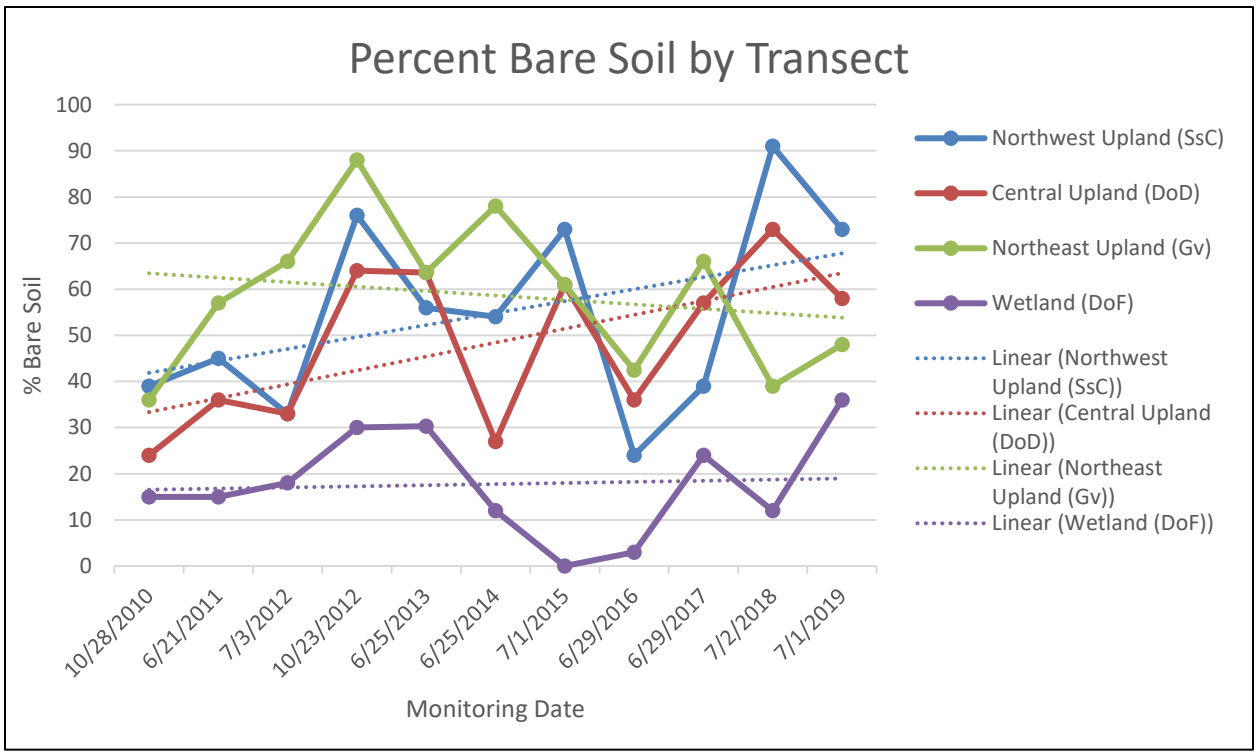


Figure 5. Percentage bare soil recorded in Big Horn Springs upland transects 2011-2019 with trend lines.

In order to monitor the grazing efforts at the site, biological monitoring occurred on July 1, 2019. This method follows the holistic grazing monitoring protocol, and provides a tool to determine improvement or decline of the health of the parcel's productivity. Figure 5 shows the trend analysis of percent bare ground throughout the site. The relative trend of ground cover appears to follow a similar relationship with trends in annual and monthly moisture observed in Buena Vista (Figure 6).

Historically, the mean annual precipitation in Buena Vista is 9.86 inches (1899-2015). In 2011, a wetter than average year across most of Colorado, Buena Vista received 7.61 inches of moisture. In 2012, a dryer than average year across most of Colorado, Buena Vista received 8.56 inches of moisture. In 2013 Buena Vista received 10.58 inches of moisture, mainly in July (monsoons) and September (during the same time period the Front Range experienced historical 500-year flooding). In 2014, Buena Vista received a total of 8.84 inches; although the precipitation received was more evenly distributed during the growing season than it was in 2013. In 2015, Buena Vista received 14.83 inches of rain, and anecdotally the site seemed wetter than has been observed in recent history. Additionally, photo monitoring shows the site to be much greener than in previous years. In 2016 precipitation was closer to "average", 10.36 inches, and vegetation density appeared to be greater than previous years; possibly due to heavy moisture delivered in 2015 and early 2016 prior to the growing season. 2017 proved to be a significantly drier spring than the previous 2 years, reporting 9.75 inches of precipitation between Oct of the previous year and Sept of the reported growing season (www.usclimatedata.com). Bare soil was greatly reduced in 2016 due to a wet spring, but without that boost to early-season growth, 2017 bare soil totals have once again climbed to greater than 50% in two of the units. 2018 proved to be the driest year on record (5.77 in.) at this site since data collection for NWNA began in 2010. 2019 data is incomplete at the time of reporting (Figure 6.).

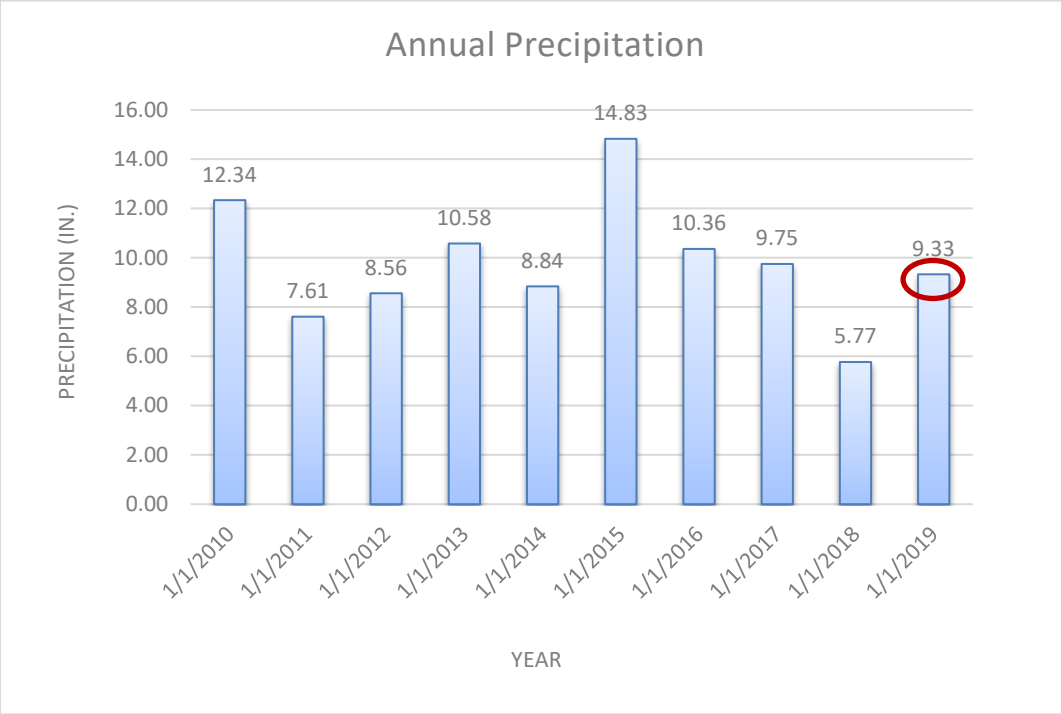


Figure 6. Annual Precipitation as it relates to growing season (Oct1-Sept30), annually) for Buena Vista, CO 2011-2017 (2019 is incomplete data from Oct1, 2018-Aug30, 2019).

GRAZING MANAGEMENT PLAN- 2019

GRAZING UNIT(S)

The grazing units established in the 2012 Grazing Management Plan, which include two units, the upland and wetland units, were unable to be utilized in 2019. Depending on the availability of livestock and owner management, it is recommended to continue to pursue this as a management option. It was recommended by CMC to begin pursuing alternative options to grazing cattle on the property such as mechanical manipulation, domestic sheep, or prescribed fire applications. None of these methods were deemed to be viable options during subsequent talks between NWNW and NRCS representatives due to concerns regarding introduction of invasive weed species, vectors of disease and the health of native bighorn sheep populations, and liability/risk relating to the use of fire.

GRAZING SCHEDULE

To accomplish the grazing management goals of (1) increasing plant diversity and productivity through controlled frequency and duration of grazing and (2) allowing adequate re-growth opportunity between grazing events, it is suggested that livestock operations should begin the first part of August. This is subject to change depending upon the grazing operator's scheduling for the placement of livestock on the property. Timing of grazing is critical to utilize both management units in succession, which will promote adequate plant re-growth and increase plant diversity. NRCS representatives suggest and support a rest-rotation grazing management plan to allow for short, intense periods of grazing in between rest years in an effort to not exert too much pressure on drought stricken plants. Grazing livestock within the riparian/wetlands unit prior to the uplands may promote propagation of desired plants species, such as Kentucky bluegrass, within the upland unit through livestock feces. It is not recommended to begin grazing until 2019 due to lack of precipitation in 2018 and to pursue an alternating spring/fall grazing rotation going forward.

The calculated upland unit forage could support 48 animal units for three days while the riparian/wetlands unit can support 40 animal units for three days. Since these numbers are close in comparison, 40 animal units should be utilized within each management unit, in succession, for three days totaling six grazing days in the BHS parcel. Depending upon the availability of livestock, the animal units and number of days can be proportionately adjusted to maintain the appropriate AUM.

MONITORING AND EVALUATION

This document provides baseline data collected during site monitoring in 2010-2019. Annual site monitoring will continue to evaluate site conditions from year to year to determine if desired outcomes are being achieved through the planned grazing management. The comprehensive biological monitoring transect method (Butterfield *et al*, 2006) will be conducted annually, during the last week of June or first week of July, at each of the four designated transect sites on the parcel (DoD, DoF, GV, SsC). In previous years the site was monitored semi-annually (summer/fall); however it was determined that a single annual event (summer) conducted at the same time each year provided more valuable comparative data then two different events. Each transect site was staked and documented using a Global Positioning System (GPS) for recording and mapping purposes. The semi-annual monitoring will provide important information documenting plant species present during the primary growing season, amount of bare ground at

the site, diversity of perennials on the site, and if perennials are being properly grazed. The NRCS methodology (USDA, 2003) will be used when site conditions and evaluations determine it is appropriate to re-calculate forage production to determine appropriate stocking rates for the site. Photographic documentation is conducted during the monitoring for year to year comparisons (see Appendix C). Compilation of all monitoring information will be stored at CMC within the NRM server database.

GRAZING MANAGEMENT OBJECTIVES

- Increase forage productivity
- Increase cool season flora (grasses) within the upland unit
- Decrease the percentage of bare ground
- Decrease undesirable plants
- Increase soil nutrients and bioaccumulation
- Reduce soil capping
- Increase water infiltration and storage
- Maintain or improve existing riparian/wetlands ecosystems

ACHIEVED AND DESIRED OUTCOMES

No grazing occurred during the 2019 season. It is an unusual year in which there is adequate forage sufficient to graze prior to the monsoon season in late July, early August. An even bigger obstacle to the grazing management program is having sufficient numbers of animals readily available to move on and off the property in the short, August to early September time-frame. It has been an obstacle to find a rancher willing to mobilize 50 or more head of cattle to graze a relatively small parcel for a single week. Despite high intensity-short duration grazing occurring annually from 2011 to 2014, there has been no organized livestock presence on the unit in 5 growing seasons. The goal of meeting grazing management objectives has subsequently not been met, but are being addressed through discussions with NRCS representatives. The need to increase hoof impact and soil disturbance at the site still exists. This will reduce soil capping, increase soil nutrients and bioaccumulation, decrease bare ground and, in the long term, increase forage productivity and increase diversity at the site. Ideal grazing at the site would include fenced off areas, where short term, high intensity grazing could occur. However, due to the lack of sufficient upland forage, water, and high management output that would be required, it is unlikely that the herd operator would be able to accomplish this at the BHS property.

The upland unit continues to show little or no improvement in regard to over-rested soil and reduced bare soil. Without reintroduction of grazing, sufficient annual precipitation, and appropriate timing of these events, there will likely be a continued increase in bare soil and soil capping, and a decrease in unit productivity.

References

Butterfield, Jody. Bingham, Sam. Savory, Allan. (2006). Holistic Management Handbook – Healthy Land, Healthy Profits. ISBN-13: 978-1-55963-885-2. ISBN-10: 1-55963-885-0. Island Press, 1718 Connecticut Avenue NW, Suite 300, Washington, DC 20009, USA.

Colorado Mountain College-Natural Resource Management. (2010 Draft). Bighorn Springs Wetland Baseline Report.

ENSR/AECOM. (2008). Nestle Waters North America, Inc. 1041 Permit Application, Appendices "M" and "N".

George, J.L. Kahn, R. Miller, W. Watkins, B. (2009). Colorado Division of Wildlife, Terrestrial Resources. Colorado Bighorn Sheep Management Plan. Special Report No. 81. DOW-R-S-81-09. ISSN 0084-8875. February.

Natural Resources Conservation Service. (2010a). Conservation Practice Standard. Prescribed Grazing (Ac.) Code 528. NE T.G. Notice 619. Section IV. NRCS-September 2010.

Natural Resources Conservation Service of Colorado. (2010b). Soils Map Bighorn Springs, Chaffee County, CO. Upper Arkansas Conservation District. Received via e-mail from: NRCS 11/18/10. 9/22/10.

Nestle Waters North America, Inc. (2010). Bighorn Springs Land Management Plan Chaffee County, Colorado. April.

United States Department of Agriculture. (2003). Natural Resource Conservation Service. National Range and Pasture Handbook. Grazing Lands Technology Institute. Revision 1, December.

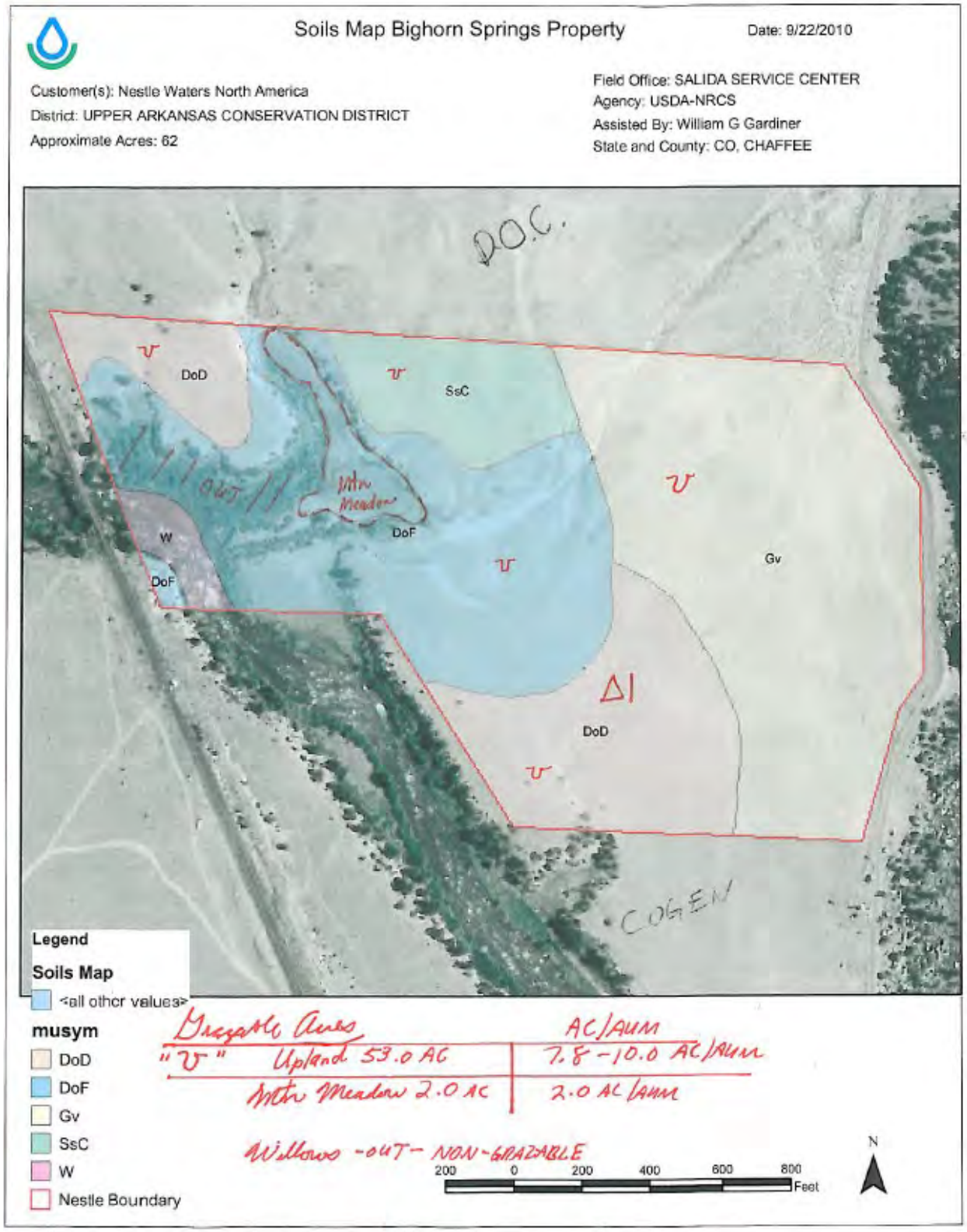
United States Department of Agriculture. (1977). Range Site Description For Dry Mountain Outwash. Land Resource Area: Southern Rocky Mountains (48). Technical Guide Section II E. Range Site NO. 316. Soils Conservation Service, Canon City, Colorado, Field Office. February.

United States Department of Agriculture. (1975). Range Site Description For Mountain Meadow. Land Resource Area: Southern Rocky Mountains (48). Technical Guide Section II E. Range Site NO. 241. Soils Conservation Service, Canon City, Colorado, Field Office. August.

United States Fish and Wildlife Service. (1985). Wetlands Mapper. Retrieved September 8, 2010, from: < http://137.227.242.85/wetland/wetland.html>.

Western Regional Climate Center (WRCC). (2010). Buena Vista, CO, Climate Data. Retrieved December 2010, from: <http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?cobuen>.

Appendix A. NRCS Soil Map.



Appendix B. Comprehensive Biological Transect Data Tables.

General Information			Entry Point						6" Radius from Point								Describe Nearest Perennial								
Date	Team	Soil Type Transect	Bare Soil	Litter 1	Litter 2	Rock	Plant Base	Canopy Above Point	Mature Cap	Immature Cap	Recent Cap	Broken	Covered	Animal Sign-I,W,B,S,L	Annuals Present	Soil Movement	Grass	Rush or Sedge	Forb	Shrub	Tree	AVG. Distance (inches)	Dry	Middle	Wet
Northwest Upland																									
11/5/2010	DM, CN	SsC	39	54	0	0	6	30	15	30	9	12	36	21	96	66	63	3	33	0	0	70	99	0	0
6/20/2011	MW, KK	SsC	45	33	0	3	18	12	9	48	3	3	36	42	63	27	24	9	0	12	0	7.25	99	0	0
7/2/2012	MH ,MC	SsC	33	9	24	0	30	0	15	81	0	0	0	39	0	33	75	0	0	24	0	4.24	99	0	0
10/31/2012	JM, DP	SsC	76	21	0	3	0	3	2	90	0	6	2	76	82	6	100	0	0	0	0	4.9	100	0	0
6/25/2013	TC,MJ,TK,RW	SsC	56	24	3	3	15	9	9	91	0	0	0	81	0	12	45	0	54	3.	0	2.12	100	0	0
6/25/2014	TLH, SAS	SsC	54	33	0	3	9	27	15	60	0	0	24	24	0	0	18	0	84	0	0	1.05	100	0	0
7/1/2015	KJ, JP	SsC	73	12	0	3	12	6	0	85	0	0	15	42	0	0	27	0	67	6	0	1.9	100	0	0
6/29/2016	JSM,TM	Ssc	24	37	9	0	30	0	6	79	0	0	15	76	82	0	100	0	0	0	0	8.83	100	0	0
6/29/2017	KW,KK,MO	SsC	39	36	0	0	24	0	0	12	15	0	72	61	0	0	72	0	9	18	0	1.2	100	0	0
7/2/2018	TS, SP, KKM	SsC	91	6	3	0	0	0	0	6	3	91	0	91	24	3	70	0	27	0	0	8.2	97	0	0
7/1/2019	KM, JS, MR	SsC	73	0	0	3	24	55	3	48	0	36	12	42	100	3	67	0	33	0	0	16.1	100	0	0
	Average		55%	24%	4%	2%	15%	13%	7%	57%	3%	13%	19%	54%	41%	14%	60%	1%	28%	6%	0%	11.4	99%	0%	0%
Central Upland																									
11/5/2010	DM, CN	DoD	24	57	0	0	21	42	30	39	24	0	3	27	72	99	75	0	12	6	0	2.40	99	0	0
6/21/2011	CB,MH,SD	DoD	36	9	18	0	36	63	27	36	24	0	12	66	0	10	87	0	6	12	0	0.94	99	0	0
7/3/2012	JF, MC	DoD	33	12	3	3	51	12	21	36	0	3	39	63	0	0	75	0	0	21	0	3.13	99	0	0
10/23/2012	MW, DP	DoD	64	15	6	0	15	15	21	66	0	3	10	79	24	29	91	0	0	9	0	2.27	100	0	0
6/25/2013	MB, AM	DoD	63	18	0	0	18	3	18	82	0	0	0	33	0	0	21	0	76	3	0	1.65	100	0	0
6/25/2014	BLH, JSM	DoD	27	30	3	0	39	0	0	94	0	0	15	60	0	0	57	0	39	3	0	0.92	100	0	0
7/1/2015	JG, NW	DoD	61	30	3	0	6	15	0	100	0	0	0	12	15	0	36	0	64	0	0	1.85	100	0	0
6/29/2016	MS, MB	DoD	36	24	6	3	31	0	18	39	0	0	43	48	84	0	100	0	0	0	0	3.3	100	0	0
6/29/2017	KM, MO, KK	DoD	57	21	9	0	12	0	0	39	12	0	48	48	0	3	51	0	0	1	0	1.2	1	0	0
7/2/2018	DR,KW, KEM	DoD	73	15	3	0	9	15	0	88	0	0	12	55	0	0	79	0	7	0	0	1.7	100	0	0
7/1/2019	KM, MR, JS	DoD	58	39	3	0	0	27	0	61	0	0	39	48	97	48	88	0	0	12	0	2.9	100	0	0
	Average		48%	25%	5%	1%	22%	17%	12%	62%	5%	1%	20%	49%	27%	17%	69%	0%	19%	6%	0%	2.0	91%	0%	0%

General Information			Entry Point						6" Radius from Point								Describe Nearest Perennial								
Date	Team	Soil Type Transect	Bare Soil	Litter 1	Litter 2	Rock	Plant Base	Canopy Above Point	Mature Cap	Immature Cap	Recent Cap	Broken	Covered	Animal Sign-I,W,B,S,L	Annuals Present	Soil Movement	Grass	Rush or Sedge	Forb	Shrub	Tree	AVG. Distance (inches)	Dry	Middle	Wet
Northeast Upland																									
11/5/2010	DM, CN	Gv	36	45	0	0	18	48	12	6	57	18	6	39	60	87	24	0	69	6	0	11.14	99	0	0
6/21/2011	AH, JK	Gv	57	36	0	0	6	24	9	54	0	0	36	21	24	0	32	3	0	0	0	37.6	99	0	0
7/2/2012	SH,MH,MC,CB	Gv	66	24	9	0	0	3	18	69	0	0	18	60	66	69	48	0	0	51	0	3.72	99	0	0
10/31/2012	JM DP	Gv	88	3	0	0	9	12	15	79	0	3	3	76	76	12	100	0	0	0	0	13.39	100	0	0
6/25/2013	CB, MB, JM	Gv	64	21	0	0	15	0	3	97	0	0	0	39	0	0	9	0	91	0	0	1.1	100	0	0
6/25/2014	TLH, SAS	Gv	78	21	0	0	0	12	6	75	0	3	15	15	0	3	48	0	51	0	0	2.15	100	0	0
7/1/2015	JLM, SJB	Gv	61	33	0	0	6	0	0	43	30	0	27	43	0	0	9	0	91	0	0	3.23	100	0	0
6/29/2016	AS, TP	Gv	42	58	0	0	0	0	18	82	0	0	0	61	61	0	58	0	0	42	0	8.3	100	0	0
6/29/2017	CH, KW, KM	Gv	66	30	3	0	0	0	0	6	54	0	39	63	24	0	51	0	24	39	0	6.1	100	0	0
7/2/2018	KW, DR, KEM	Gv	39	33	6	0	21	18	0	58	0	0	42	48	24	0	70	0	30	3	0	1.68	100	0	0
7/1/2019	KM,MR,JS	Gv	48	21	12	0	18	24	9	39	12	6	33	88	97	6	21	0	0	79	0	4.1	100	0	0
	Average		59%	30%	3%	0%	8%	13%	8%	55%	14%	3%	20%	50%	39%	16%	43%	0%	32%	20%	0%	8.4	100%	0%	0%
Wetland																									
10/28/2010	DM, JF	DoF	15	3	45	6	30	60	3	3	18	21	54	30	33	24	57	30	9	0	0	0.40		69	24
6/21/2011	TM, WM, JF	DoF	15	6	3	3	69	66	0	0	0	24	72	87	15	0	45	42	0	0	0	0.15	60	33	0
7/3/2012	MW,CB	DoF	18	27	0	0	66	3	0	27	0	0	75	99	75	45	69	15	0	0	0	3.4	69	18	6
10/23/2012	MW, DP	DoF	30	28	30	0	12	0	0	15	12	15	58	100	61	52	76	21	0	3	0	1.76	0	67	33
6/25/2013	TJC, TK, RW	DoF	30	3	3	0	64	3	76	24	0	0	0	79	0	6	64	12	18	6	0	>1	88	9	0
6/25/2014	BLH, JSM	DoF	12	3	0	0	84	18	6	15	0	0	78	63	0	9	48	30	21	0	0	0.157	6	66	27
7/1/2015	JSM, JP, KJ	DoF	0	3	0	6	91	0	0	0	0	0	100	0	100	0	61	36	3	0	0	0.006	0	0	33
6/29/2016	BS, KS	DoF	3	18	0	0	79	0	6	0	0	0	94	64	45	21	9	61	24	3	0	2.05	6	45	49
6/29/2017	CH, KM	DoF	24	48	0	0	27	0	0	3	0	6	90	30	57	0	0	24	27	9	0	6.39	57	42	0
7/2/2018	TS,SP,HC,KKM	DoF	12	58	9	0	21	45	0	6	0	21	73	0	52	0	0	24	15	24	0	6.6	100	0	0
7/1/2019	KW,DR,TS,PG	DoF	36	36	12	3	12	45	0	36	0	0	64	45	67	0	30	52	6	12	0	3.9	82	18	0
	Average		18%	21%	9%	2%	50%	22%	8%	12%	3%	8%	69%	54%	46%	14%	46%	32%	11%	5%	0%	2.5	47%	33%	16%

General Information			Describe Nearest Perennial										Biological Totals					Grass Type Totals			
Date	Team	Soil Type Transect	Seedling	Young	Mature	Decadent	Resprout	Normal	Overgrazed	Overbrowsed	Overrested	Dead	Insect Total	Worm Total	Beetle Total	Small Mammal Total	Large Mammal Total	Cool Season Total	Warm Season Total	Year Green Total	Unknown Total
Northwest Upland																					
11/5/2010	DM, CN	SsC	0	12	33	0	3	36	0	12	0	0	3	0	0	3	15	0	12	0	54
6/20/2011	MW, KK	SsC	0	57	36	6	0	75	0	0	24	0	27	0	0	6	18	0	72	0	0
7/2/2012	MH,MC	SsC	0	27	63	3	0	93	0	0	0	6	12	0	0	6	21	0	75	0	24
10/31/2012	JM, DP	SsC	0	76	24	0	0	43	24	0	3	30	0	0	0	0	0	15	85	0	0
6/25/2013	TJC, TK, RW	SsC	0	79	3	12	0	82	0	0	12	3	17	0	0	8	2	0	15	0	0
6/25/2014	TLH, SAS	SsC	0	66	18	6	9	87	3	0	0	6	0	0	0	0	24	0	100	0	0
7/1/2015	KJ, JP	SsC	18	55	6	21	0	82	9	3	0	6	-	-	-	-	-	-	-	-	-
6/29/2016	TM, JSM	SsC	0	52	45	3	0	60	3	22	15	0	-	-	-	-	-	-	-	-	-
6/29/2017	KW,KK,MO	SsC	0	3	96	0	0	69	0	30	0	0	21	0	0	2	45	72	0	0	0
7/2/2018	TS, HC, KKM	SsC	12	52	30	6	0	42	0	58	0	0	0	0	0	26	0	-	-	-	-
7/1/2019	KM, JS, MR	SsC	0	36	58	6	0	100	0	0	0	0	36	0	0	12	3	-	-	-	-
	Average		3%	48%	35%	6%	1%	67%	4%	13%	5%	5%	13%	0%	0%	7%	14%	62%	2%	0%	13%
Central Upland																					
11/5/2010	DM, CN	DoD	6	0	93	27	0	31	15	0	31	0	9	0	0	3	15	0	72	6	12
6/21/2011	CB,MH,SD	DoD	0	15	78	6		30	6	0	66	0	14	0	0	3	6	0	84	3	9
7/3/2012	JF, MC	DoD	0	0	21	0	3	99	0	0	0	12	36	0	0	3	27	0	75	0	24
10/23/2012	MW, DP	DoD	0	39	15	46	0	36	3	0	6	55	0	0	0	6	73	0	91	0	0
6/25/2013	MB, AM	DoD	0	82	18	0	0	82	0	0	18	0	9	6	0	9	9	0	100	0	0
6/25/2014	BLH, JSM	DoD	3	6	63	24	3	57	15	3	15	9	45	0	0	0	15	0	100	0	0
7/1/2015	JG. NW	DoD	0	39	55	6	0	91	3	0	0	6	-	-	-	-	-	-	-	-	-
6/29/2016	MS, MB	DoD	0	3	0	0	96	94	0	0	6	0	-	-	-	-	-	-	-	-	-
6/29/2017	MS, MB	DoD	0	0	1	0	0	1	0	0	0	0	9	0	0	15	24	51	0	0	0
7/2/2018	DR,KW, KEM	DoD	0	27	70	3	0	45	55	0	0	0	2	0	0	0	16	-	-	-	-
7/1/2019	KW,DR,TS,PG	DoD	0	15	79	6	0	36	64	0	0	0	24			39		-	-	-	-
	Average		1%	21%	45%	11%	10%	55%	15%	0%	13%	8%	16%	1%	0%	9%	21%	82%	0%	2%	8%

*Biological variation (insects, worms, beetles, etc…) and Grass Type totals were not calculated in 2015/16, only presence/absence was noted in the 6" radius columns.

General Information			Describe Nearest Perennial										Biological Totals					Grass Type Totals			
Date	Team	Soil Type Transect	Seedling	Young	Mature	Decadent	Resprout	Normal	Overgrazed	Overbrowsed	Overrested	Dead	Insect Total	Worm Total	Beetle Total	Small Mammal Total	Large Mammal Total	Cool Season Total	Warm Season Total	Year Green Total	Unknown Total
Northeast Upland																					
11/5/2010	DM, CN	Gv	0	9	93	0	0	99	0	0	99	0	15	0	0	3	21	0	12	0	12
6/20/2011	MW, KK	Gv	6	69	24	0	0	67	0	0	15	0	16	0	0	2	3	0	32	0	0
7/2/2012	MH,MC	Gv	0	78	3	18	0	81	0	0	0	18	6	0	0	36	27	0	48	0	51
10/31/2012	JM, DP	Gv	0	36	61	3	0	3	45	0	12	40	0	0	0	0	76	3	97	0	0
6/25/2013	TJC,TK,RW	Gv	0	85	12	3	0	97	0	0	0	3	18	0	0	12	9	0	91	0	0
6/25/2014	TLH, SAS	Gv	9	48	33	9	0	90	0	0	0	9	0	0	0	0	15	0	100	0	0
7/1/2015	KJ, JP	Gv	34	39	18	9	0	91	6	0	0	3	-	-	-	-	-	-	-	-	-
6/29/2016	AS, TP	Gv	0	18	82	0	0	82	0	0	18	0	-	-	-	-	-	-	-	-	-
6/29/2017	CH,KW,KM	Gv	0	27	72	0	6	1	0	0	0	0	12	0	0	30	21	48	3	0	0
7/2/2018	KW, DR, KEM	Gv	6	39	55	0	0	64	36	0	0	0	1	0	0	0	15	-	-	-	-
7/1/2019	KM,MR,JS	Gv	0	61	30	9	0	94	3	0	0	3	48	0	0	73	3	-	-	-	-
	Average		5%	46%	44%	5%	1%	70%	8%	0%	13%	7%	13%	0%	0%	17%	21%	49%	1%	0%	11%
Wetland																					
11/5/2010	DM, CN	DoF	0	48	42	0	6	93	0	0	0	3	18	0	0	3	21	0	30	0	66
6/21/2011	CB,MH,SD	DoF	0	15	63	18	0	66	21	0	3	6	6	0	0	0	78	0	36	0	42
7/3/2012	JF, MC	DoF	3	9	51	18	9	87	0	0	9	15	51	0	0	45	54	0	69	0	27
10/23/2012	MW, DP	DoF	0	58	39	3	21	97	0	0	0	3	0	0	0	27	73	6	70	0	24
6/25/2013	MB, AM	DoF	12	73	3	12	0	36	0	0	52	3	6	0	0	18	58	0	64	0	0
6/25/2014	BLH, JSM	DoF	20	21	48	0	0	94	6	0	0	0	51	0	0	0	12	100	0	0	0
7/1/2015	JG. NW	DoF	34	39	18	9	0	91	6	0	0	3	-	-	-	-	-	-	-	-	-
6/29/2016	BS, KS	DoF	0	39	52	9	0	82	6	9	3	0	-	-	-	-	-	-	-	-	-
6/29/2017	CH, KM	DoF	3	38	39	9	0	93	0	0	0	0	1	0	0	12	6	18	21	0	0
7/2/2018	TS, SP, KKM	DoF	6	36	48	9	0	100	0	0	0	0	0	0	0	6	0	-	-	-	-
7/1/2019	KM,DR,TS,PG	DoF	3	58	39	0	0	94	6	0	0	0	30	0	0	33	0	-	-	-	-
	Average		7%	40%	40%	8%	3%	85%	4%	1%	6%	3%	18%	0%	0%	16%	34%	41%	18%	0%	27%

*Biological variation (insects, worms, beetles, etc…) and Grass Type totals were not calculated in 2015/16, only presence/absence was noted in the 6" radius columns.

Appendix C. Transect Photographs from 2010 to 2019.

Transect DoD, looking south at Table Top Hill

DoD_South_Nov5,2010

DoD_South_June20,2011

DoD_South_July2,2012

DoD_South_Oct23,2012

DoD_South_June25, 2013

DoD_South_June25,2014

DoD_South_July1,2015

DoD_South_June29,2016

DoD_South_June29, 2017

DoD_South_July2, 2018

DoD_South_July1, 2019

Transect GV, view looking south at Table Top Hill.

Gv_South_Nov5,2010

Gv_South_June20,2011

Gv_South_July2,2012

Gv_South_Oct23,2012

*No photo taken in 2016

Gv_South_June25,2013

Gv_South_June25,2014

Gv_South_July1,2015

Gv_South_June29,2017

Gv_South_July2,2018

Gv_South_July1,2019

Transect SsC, view looking east at Sugarloaf Mountain.

SsC_East_Nov5,2010

SsC_East_June20,2011

SsC_East_July2,2012

SsC_East_Oct23,2012

SsC_East_June25,2013

SsC_East_June25,2014

SsC_East_July1,2015

SsC_East_June29,2016

SsC_East_June29,2017

SsC_East_July2,2018

SsC_East_July1,2019

Transect DoF, view looking northwest at Mount Harvard. 2010 Photo is from North looking South of the same general area as other photos.

DoF_NW_Nov5,2010

DoF_NW_June20,2011

DoF_NW_Oct23,2012

DoF_NW_June25,2013

DoF_NW_June25,2014

DoF_NW_July1,2015

DoF_NW_June28,2016

DoF_NW_June29,2017

DoF NW July2,2018

DoF_NW_July1,2019

Exhibit 2

NWNA 2019 Ruby Mountain Springs Annual Monitoring Report

2019
RUBY MOUNTAIN SPRINGS MONITORING REPORT

Prepared by: Colorado Mountain College Natural Resource Management Program
Prepared for: Nestlé Waters North America
November, 2019

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General Information

Introduction

The Ruby Mountain Springs Site is located in Chaffee County on the banks of the Arkansas River near Nathrop, Colorado (Appendix A – Map 1). Nestlé Waters North America (NWNA) purchased the site in 2009 due to the presence of several perennial springs. The presence of these springs perpetuated the site's history as a private fish hatchery from the early 1960s through the 1990s. As part of NWNA's dedication to environmental protection and natural resource management, NWNA voluntarily committed to reclamation of the fish hatchery to a more natural state thereby enhancing the value of wetland and riparian habitat of the spring's site. NWNA's commitment was subsequently made part of NWNA's 1041 Permit and Special Land Use Permit (SLUP) issued by Chaffee County.

Colorado Mountain College Natural Resource Management (CMC NRM) program was contracted by NWNA to produce a reclamation plan and project specifications based on input from members of a stakeholder committee. The stakeholder committee was composed of regulatory, scientific, and educational members in order to provide a diverse knowledge base and a comprehensive and feasible reclamation design. The group was comprised of members from Colorado Parks and Wildlife (fishery biologists, wildlife biologists, and amphibian specialists), Trout Unlimited, Ducks Unlimited, Chaffee County, adjacent landowners, Chaffee County High School, NWNA, Apex Development Services, and CMC NRM. At a preliminary conceptual planning meeting in September 2010 the stakeholder group convened to discuss feasible reclamation options for the Site and provide a forum to raise concerns, requirements, and address next steps.

Site and Project History

The exact timing of when the Ruby Mountain Springs site became operational as a fish hatchery is unknown, but when it was purchased by the Dowell Family in 1965 it was already a primitive hatchery. The site had been altered with construction of a terrace, which parallels the Arkansas River. The constructed terrace is approximately 1,000 feet long and over 100 feet wide and the initial trout runs that were established on this bench were entirely native clay, sand and gravel. The hatchery property was sold to Professor Harold Hagen in 1970 and was operational under the identity of "Hagen Western Hatcheries" until 1997. During this time, the hatchery was expanded to include numerous concrete-lined runs, a groundwater piping system, as well as multiple hatchery buildings (Appendix A – Map 2). The Hagens lived on-site until 2010 when NWNA took possession of the property.

Historic and Ongoing Reclamation Activities

Site cleanup and construction activities were completed during the spring and summer of 2012. Miles Construction completed heavy equipment activities on the Site including extensive excavation of concrete structures and water piping remnants from the former fish hatchery operation. Additionally, Miles Construction provided heavy machinery and operators for the construction of all new site features including ponds, waterfalls, and several hundreds of feet of new stream channel (Appendix A – Map 1).

CMC NRM students and staff provided project plans and specifications for the construction project, and assisted with necessary storm water management planning and Army Corps of Engineering permitting. CMC NRM provided hand labor throughout the duration of construction activities. The students and staff constructed approximately 250 feet of bioengineered streambank, assisted with the construction of the lower stream channel including delicate placement of key stream features, and completed extensive site revegetation utilizing onsite transplants, transplants from other nearby wetlands, and commercial containerized native plants. Photos from the 2012

construction season have been removed from the report, but are availabel upon request to CMC NRM Field Institute.

Initial Reclamation Goals

The initial goals of the reclamation project, as developed with the participating stakeholders were as follows:

- Replace fish hatchery features with a natural stream/pond aquatic and riparian environment to enhance all aspects of the ecosystem.
- Maintain the Lower Weir to comply with monitoring requirements.
- Decrease or maintain surface water exposure in order to decrease or maintain historic consumptive use via evaporation.
- Incorporate a conservation easement on the property to allow fishing in the Arkansas River; below the high water mark, along the property boundary.
- Mitigate noxious weeds on the property without the use of chemicals in order to preserve and protect Site water quality.
- Incorporate educational signage and educational opportunities for local school districts, colleges, and non-profit groups.
- Study and implement strategies to make the Site long-term self-sustainable.

Vegetation and Soil

Photo points were established during the November 2013 visit in order to document baseline and vegetative changes in future years. Photo points were selected based on the availability of photos from previous years, and ability of the point to highlight key area features that would best reflect change throughout time. Appendix B presents a compilation of photos taken at each of the 10 photo points.

Revegetation efforts performed in 2012 continue to show success today as few containerized wetland and transition-land plants have died, and seeded grasses, transplants, and other native species appeared to be spreading and filling in the void spaces left after construction. Aquatic vegetation also is flourishing in the ponds and stream-channel system. Photos taken at the photo points clearly demonstrate continuous improvement of vegetative cover throughout the site. Wetland and transition land plants had more success than upland plants. Few containerized plants and transplants survived in the upland environment.

No noticeable additional erosion was noted throughout the reclamation Site in 2015 with the exception of the Upper Pond area noted below. Deposition of sediment into the Lower Pond continued in 2017 mainly in response to large rain events and drainage originating from Sugarloaf Mountain. Drainage from Sugarloaf Mountain crosses CR 300 near the top of the Lower Pond, and sediment is washed directly into the pond.

In 2015, the berm between the Arkansas River and the Lower Pond was raised between 12-18 inches. This berm naturally revegetated during 2016.

Invasive plant species identified at the site in 2018 and again in 2019 include mullein (*Verbascum thapsus*), oxeye daisy (*Leucanthemum vulgare*), and stinging nettle (*Urtica dioica).* Although considered a native species, stinging nettle is given the distinction of an invasive native species and is commonly found to aggressively colonize disturbed areas. The leaves of nettles are covered with tiny hairs that contain formic acid and are a skin irritant in humans. The plant has been managed on the property in the past due to significant patches of it which prohibit access to photo monitoring points. It is strongly recommended that this species be added to the list of plants for future maintenance and management.

Photo 1. Oxeye daisy infestation 2019

2019 site visits concluded that mullein and oxeye daisy continue to be an invasive problem and will require active management to reduce their spread. Due to transitions in NWNA site management and vegetation management, willows and other native plant species have grown unimpeded over the last few years. Discussions in fall of 2018 with NWNA concluded that future management would shift back toward maintenance of natural revegetation along pathways and around water features. In 2019, active and on-going cutting of willows has been implemented as a management strategy to prevent the dense vegetation frominhibiting access to walking paths and ponds .

Fish

Fish numbers in the project Site are visually estimated each year. Before any construction activities were begun in 2012, Colorado Parks and Wildlife and CMC NRM performed electrofishing in order to clear the project Site of fish. Within a few weeks after the major construction activities were completed and water was “turned on” to the project Site, fish began to travel up from the Arkansas River and recolonize the Site. Each year after 2012, many fish of all life stages have been observed throughout the project Site. The Site has essentially reverted to a “natural” fish hatchery.

By observing the quick rebound of fish population numbers following construction and in the subsequent years, we are able to conclude that fish are able to enter the project Site through the outfall to the Arkansas River, including passage over the Lower Weir outfall. In 2018 and 2019, many trout of all life stages were noted throughout the pond/stream system, and anecdotally it appears the site continues to function as a natural fish hatchery.

Birds and Mammals

Several types of upland, riparian, and aquatic birds such as goldfinch, kingfisher ducks, geese, and raptors were commonly observed during site visits following the 2012 construction. Mammal activity at the site includes regular visits by bighorn sheep, muskrat, and a prolific beaver population.

During the past several summers, beavers have periodically blocked the outlet stream at the Upper and Lower Ponds, causing the ponds to temporarily overflow until the blockages can be removed. Monitoring the pond elevation level and beaver activity continue with regular monitoring from a local beaver trapper to help mitigate any detrimental activity. Although it is desirable to achieve a self-sustainable ecosystem, inclusive of beaver activity, that goal cannot be achieved while also maintaining the Lower Weir monitoring point which is currently required by NWNA’s 1041 Permit.

Site Maintenance

During the fall of 2015, CMC NRM spent several days at the Site performing maintenance tasks, including the following:

- Raising the berm between the Lower Pond and the Arkansas River by approximately 12-18 inches
- Cleanup of willow cuttings and other natural and man-made debris
- Construction of a wider observation platform at the Lower Weir
- Construction of a wider "lower bridge" to accommodate smaller heavy equipment
- Construction of a new bridge at the upper waterfall

During the summer/fall of 2016, CMC NRM completed the following maintenance tasks:

- Repaired lower bridge
- Cleared debris along top of Arkansas River bank throughout Site
- Continued to clear stream-flow obstructions and site-wide debris
- Installed new photo point monuments

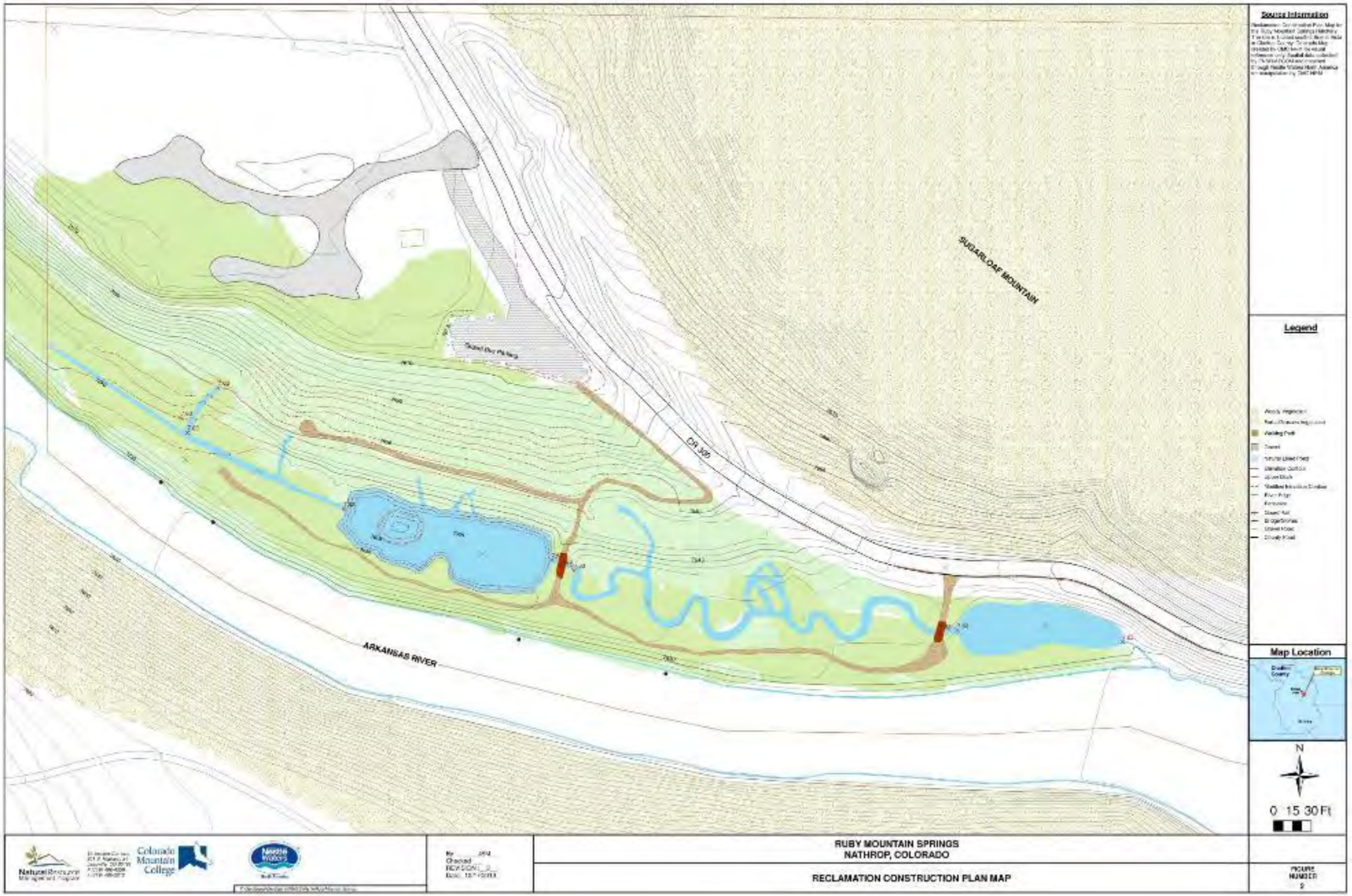
Site maintenance was not performed in 2017, with minimal cutting and burning of willows implemented in 2018.

Regular maintenance has begun again in 2019 under the direction of NWNA Natural Resource Manager Larry Lawrence.

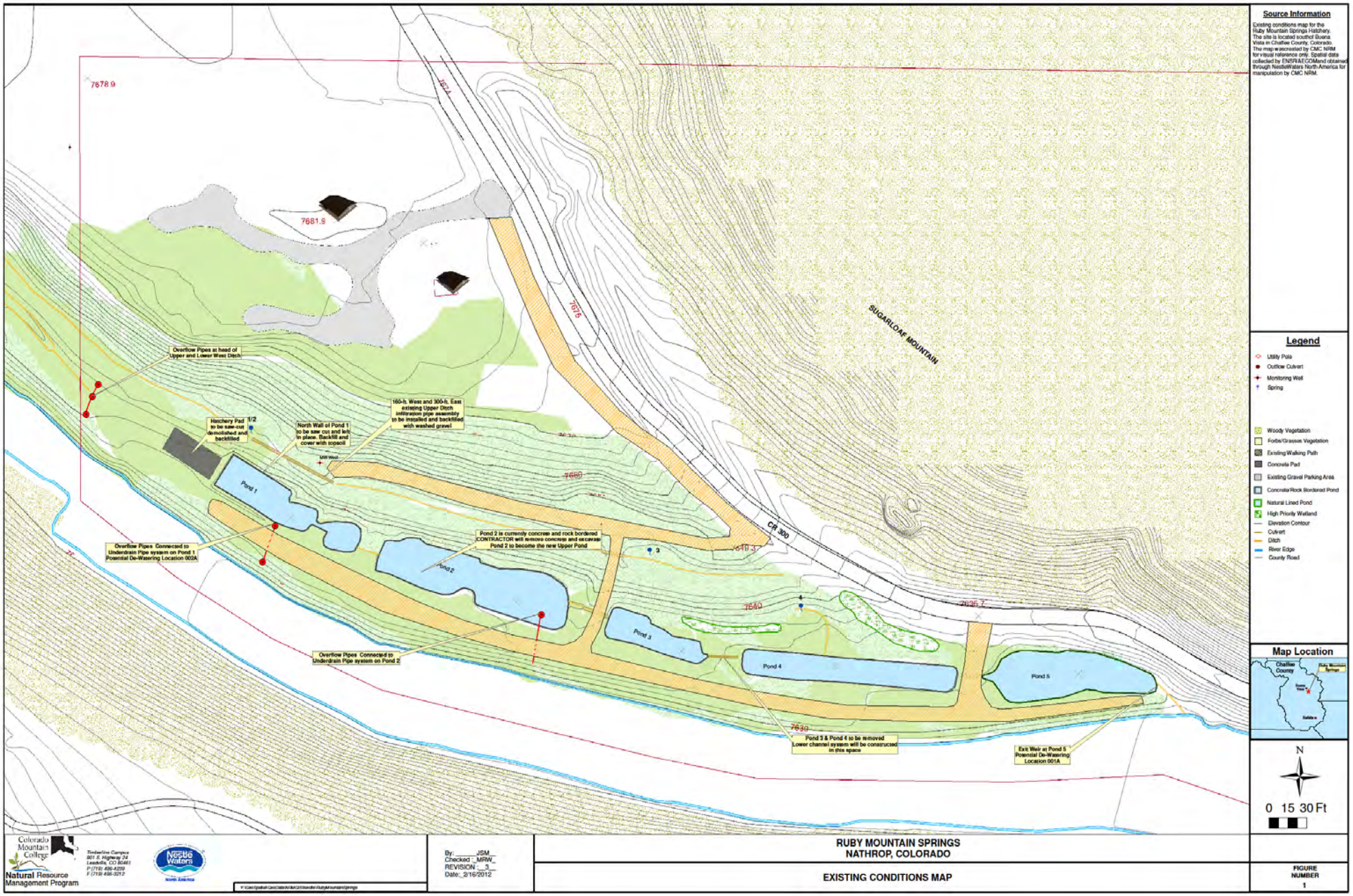
Photo 2. Photo point monument installed in 2016

Appendix A. Site Maps

Map 1 – Post-Reclamation Site Map



Map 2 – Pre-Reclamation Site Map



Appendix B. Photo Points.

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RMS-PP-1 06-10-15

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RMS-PP-1 06-26-17

RMS-PP-1 07-02-19

RMS-PP-1 11-16-12

RMS-PP-1 11-15-13

RMS-PP-1 11-18-15

RMS-PP-1 11-15-16

RMS-PP-1 11-15-17

RMS-PP-1 11-15-18

RMS-PP-1 11-14-19

RMS-PP-2 06-08-12

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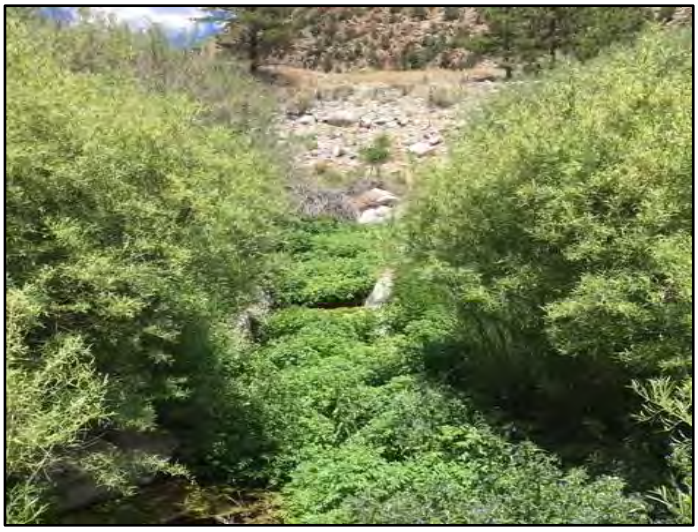

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RMS-PP-2 11-15-18

RMS-PP-2 11-14-19

RMS-PP-3 06-08-12

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RMS-PP-3 11-18-15

RMS-PP-3 11-15-16

RMS-PP-3 11-15-17

RMS-PP-3 11-15-18

RMS-PP-3 11-14-19

RMS-PP-4 06-12-12

RMS-PP-4 06-10-14

RMS-PP-4 06-10-15

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RMS-PP-4 06-26-17

RMS-PP-4 07-02-19

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RMS-PP-5 06-12-14

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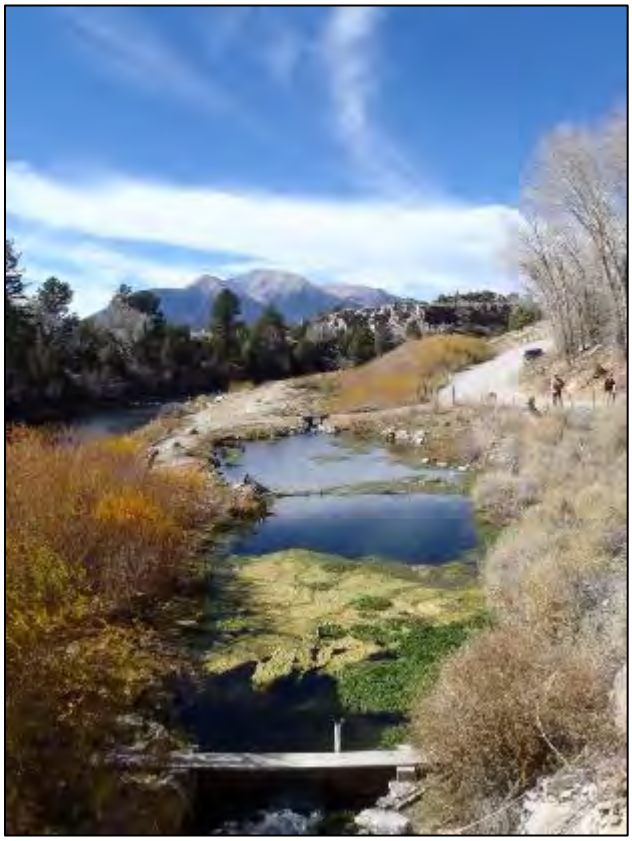

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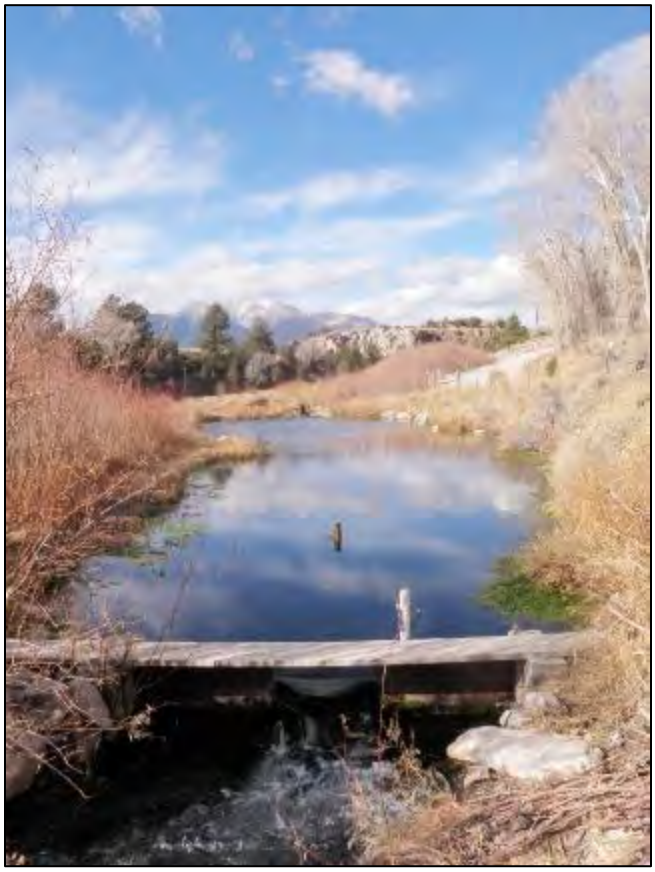

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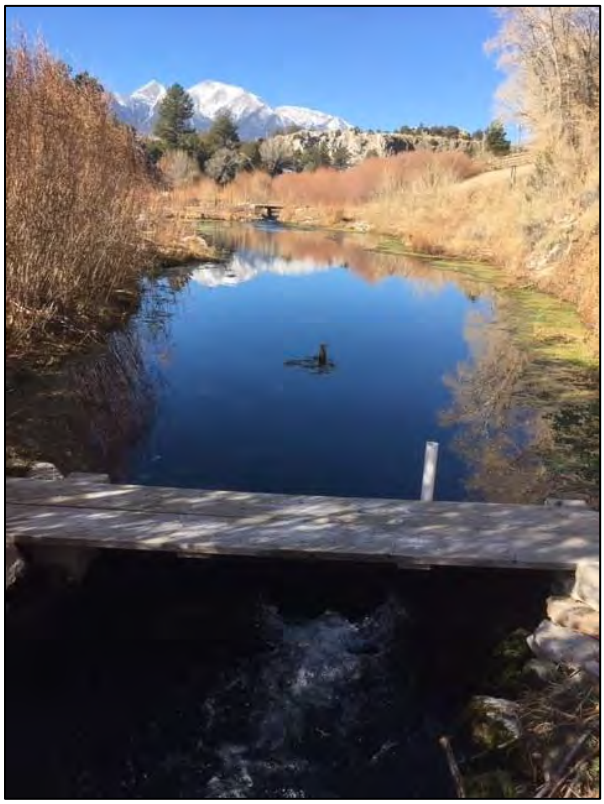

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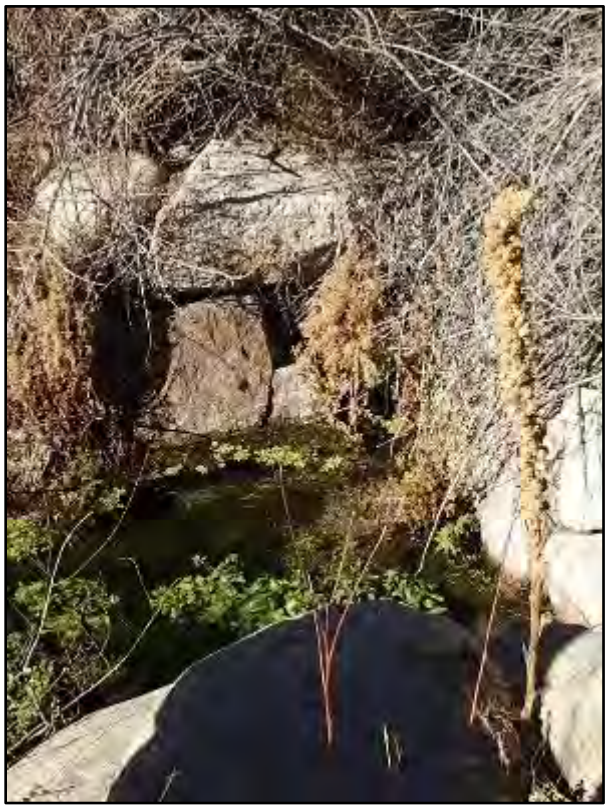
RMS-PP-9 11-18-15



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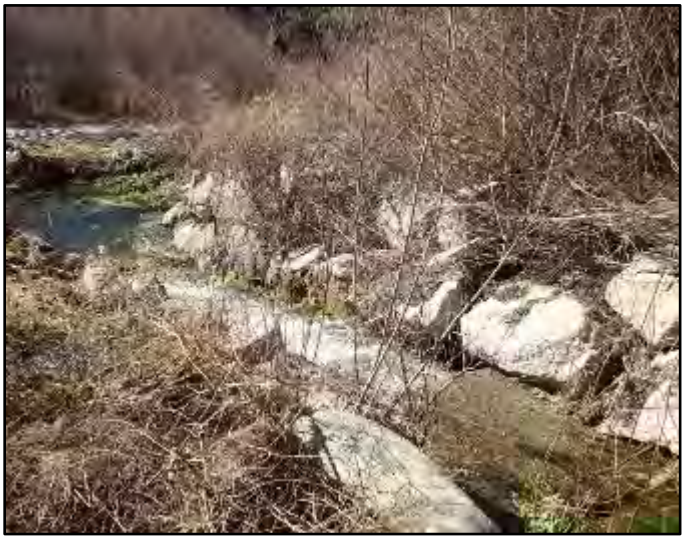

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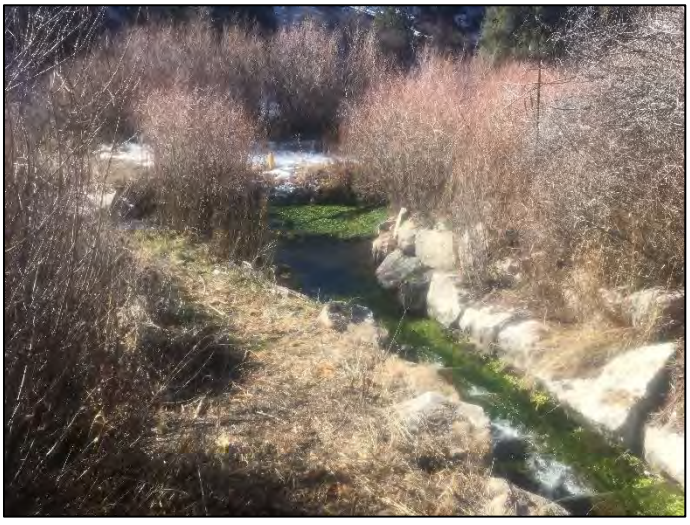

RMS-PP-10 11-15-18

RMS-PP-10 11-14-19

Exhibit 3

NWNA 2019 Surface Water and Groundwater Monitoring Report, Chaffee County, Colorado

2019 Annual Monitoring Report
Ruby Mountain Springs
Chaffee County, Colorado

S.S. PAPADOPULOS & ASSOCIATES, INC.
Boulder, Colorado

March 1, 2020

3100 Arapahoe Avenue, Suite 203, Boulder, Colorado 80303-1050 • (303) 939-8880

2019 Annual Monitoring Report
Ruby Mountain Springs
Chaffee County, Colorado

Prepared for:

Nestlé Waters North America Inc.

Prepared by:

S.S. PAPADOPULOS & ASSOCIATES, INC.
Boulder, Colorado

March 1, 2020

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Section 1
Physical Setting and General Information

The Ruby Mountain Springs are located in the Upper Arkansas River Valley near Buena Vista, Chaffee County, Colorado, on the east bank of the Arkansas River (Figure 1.1). This Annual Report is prepared in accordance with Condition 4.8 of Resolution No. 2013-35, which states that NWNA "…shall submit an annual report to the County … that describes progress on the Project and compliance with Permit conditions, including but not limited to water pumping operations; [and] wetland and groundwater monitoring…" The Surface- and Ground-Water Monitoring and Mitigation Plan (SGWMMP), submitted by NWNA to Chaffee County on April 29, 2010 (Appendix A), satisfies Condition 4.16 of Resolution No. 2013-35, and provides an outline for developing a baseline characterization of hydrologic conditions, and sets requirements for monitoring and evaluating any impacts on local water resources due to pumping at the Ruby Mountain Springs site.

Spring water is collected from two boreholes (RMBH-3 and backup borehole RMBH-2) located a few hundred feet upslope of the Ruby Mountain Springs. The production boreholes are screened at depths of approximately 40 to 55 feet below ground surface (bgs) in a sand and gravel aquifer. Spring water is then piped 6 miles to a 30,000 gallon water silo at a tanker-truck loading station, where it is transported by truck to the NWNA bottling plant in Denver. Withdrawals from production borehole RMBH-2 began in June 2010 and production of bottled water commenced the following August. On April 29, 2011, pumping for production of water was transitioned from RMBH-2 to RMBH-3. From the beginning of operations to present, the production boreholes have not been operated simultaneously; however, Technical Revision 11 to the 1041 Permit allows concurrent pumping.

NWNA has committed to Chaffee County to conduct periodic surface water and groundwater monitoring as a means to characterize hydrologic conditions and to document any effects, if observed, from diversions by NWNA. Annual diversions are not to exceed 196 acre-feet. The typical instantaneous pumping rate for the RMBH-3 borehole is approximately 100 gallons per minute (gpm) and is operated on an on-demand schedule driven by water tanker movements at the tanker load station. Details on average monthly pumping rates can be found in Section 2.7. Effects from withdrawals to present have been shown to be minimal, localized, and have not produced adverse impacts to surface water, groundwater, wetlands, nearby water resources or neighbors.

1.1 Definition of Sustainable Use

The accepted definition of sustainable use for NWNA is "the current use of this resource does not endanger future use of this resource under normal, known, or projected conditions for continued business operation. Future use of the resource may be modified from current usage to enable this." This report presents background information and current conditions for Ruby Mountain Springs in Chaffee County, Colorado, and aims to assess the sustainability of the resource under current and projected conditions.

1.2 Existing Sustainability Assessments

USGS Scientific Investigations Report "*Hydrogeology and Quality of Groundwater in the Upper Arkansas River Basin from Buena Vista to Salida, Colorado, 2000-2003*" (Watts, 2005), describes the hydrogeology and quality of groundwater in the principal aquifers in the Upper Arkansas River Basin. Watts notes that depletion of groundwater storage could have the largest effects on groundwater sustainability in areas in which the alluvial outwash and basin fill aquifers are not readily recharged by infiltration from streams, mountain front recharge, or infiltration of surface water diversions because recharge from precipitation is small to non-existent. The report estimates future withdrawals and consumptive use by domestic and household wells from 2003 to 2030 and concludes that if consumptive use rates and return rates are correct, then augmentation plans will be required for new water supply wells in the study area, except possibly near perennial streams or areas irrigated with surface water diversions.

A related 2006 USGS Fact Sheet entitled "*Sustainability of Ground-Water Resources in the Upper Arkansas River Basin between Buena Vista and Salida, Colorado 2000-2003*" (Watts, 2006) further outlines the importance of groundwater resources for the growing populace in Chaffee County. The fact sheet presents a preliminary assessment of groundwater resources for 2003 conditions and projected 2030 conditions and concludes that 2003 withdrawals are approximately one percent of reasonably accessible groundwater resources. Watts concludes that groundwater resources are generally sustainable for projected 2030 population growth scenarios; however, local groundwater depletion is possible within the basin where withdrawals are high and recharge is low.

1.3 Setting

The Ruby Mountain Springs and Bighorn Springs sites are located in the Upper Arkansas River Valley approximately 90 miles (125 highway miles) southwest of Denver and seven miles south-southeast of Buena Vista in Chaffee County, Colorado (Figure 1.1). The Upper Arkansas River Valley flows north-south within an intermountain basin flanked by the Sawatch Mountain Range and Continental Divide to the west, the Southwest Front Range (also referred to as the Arkansas Hills) to the east, and the Mosquito Range to the northeast. The climate is semiarid and largely influenced by the mountain ranges bounding the valley. Surface waters near the springs in the eastern valley include the Arkansas River, Trout Creek, Arnold Gulch, and irrigation diversions.

Ruby Mountains Springs (previously named the Hagen Springs) emanates at the site of a former fish hatchery on the east bank of the Arkansas River located 0.7 river miles (3,600 feet) downstream from Bighorn Springs (previously named Arnold Gulch Springs). Both springs discharge groundwater from the unconsolidated, coarse sand-and-gravel deposits associated with the Pinedale outwash aquifer (ENSR/AECOM, 2008a) into localized drainages which empty into the adjacent Arkansas River, which is lower in elevation. The Ruby Mountain Springs production boreholes are located approximately 200 to 500 feet north of the springs discharges and intercept the same water-bearing strata in the Pinedale outwash as the associated springs. The U.S Food and Drug Administration (FDA) Standard of Identity (SOI) for spring water boreholes were

demonstrated during pumping tests performed at RMBH-2 in January 2008 (ENSR/AECOM, 2008b) and at RMBH-3 in December 2011 (Malcolm 2011).

In compliance with permitting for the development of a spring water source, NWNA augmented existing information with a network of monitoring locations throughout the east valley up-gradient of the springs (Figure 1.2). Three monitoring programs are maintained in accordance with the SGWMMP (Appendix A): 1) up-gradient monitoring; 2) Bighorn Springs monitoring; and 3) Ruby Mountain Springs monitoring. Station locations and parameters measured for the monitoring network are listed in Table 1.1.

Spring flow and water level monitoring at the Ruby Mountain Springs and Bighorn Springs sites began in January 2007. Expansion of the monitoring network continued through 2010 and included installation of surface water gauges near the springs (including 2 staff gauges, 3 flumes, and 1 weir) and groundwater monitoring wells throughout the valley east of the Arkansas River (from north of Highway 24/285 to Ruby Mountain Springs). Automatic dataloggers were installed in many of the wells and gauges within the network in April 2008. In addition, weather and precipitation monitoring data and irrigation diversions in the valley are also compiled from monitoring conducted by others.

1.3.1 Up-gradient Monitoring

Groundwater levels in the Pinedale outwash aquifer are monitored through a network of 10 monitoring wells shown on Figure 1.2. Five of these wells are required monitoring locations in accordance with the SGWMMP (Table 1.1). The wells were completed by NWNA (except for Well A, which was converted from an existing water supply well to a monitoring well) and monitoring was initiated in April 2008.

1.3.2 Bighorn Springs Monitoring

Bighorn Springs emerge from coarse alluvial deposits of the Pinedale outwash aquifer along a tributary drainage of Arnold Gulch, an ephemeral dry wash that extends from an alluvial fan at the base of the foothills to the river at the southern end of the spring site. Bighorn Spring #1 (upper Bighorn Spring) is located 7,675 feet above mean sea level (feet amsl), and Bighorn Spring #3 (lower Bighorn Spring) is located 7,658 feet amsl. The property is grassland used for periodic, short-term cattle grazing and contains no existing structures other than monitoring stations.

Spring flow monitoring of the upper Bighorn Spring (Bighorn Parshall Flume 1 {BHPF-1}) began in 2007. The monitoring network was expanded in 2008 and 2009 to include a combined spring discharge flow gauge (Bighorn Parshall Flume 3 {BHPF-3}), a staff gauge, a network of piezometers to monitor shallow water levels for wetlands delineation, and four groundwater monitoring wells (BHMW-1, BHBH-1, BHBH-2, and BHBH-3). Daily average flows for BHPF-1 and BHPF-3 are calculated from automated stage measurements using the USBR equations for a Parshall flume (USBR, 2001). In July 2017, a piezometer was installed upstream of the Bighorn Parshall Flume 1 (BHS-P1) to collect spring water samples on a quarterly basis.

Well BHMW-1 was installed concurrently with the up-gradient monitoring wells in April 2008. BHBH-1 and BHBH-2 are test boreholes installed in November and December 2007,

respectively, as part of NWNA work to evaluate the development potential of Bighorn Springs as a production water source. Preliminary aquifer tests were performed for BHBH-1 and BHBH-2 in early May 2008 (ENSR/AECOM, 2008b), and BHBH-2 was further investigated during an additional aquifer test in February 2009 (ENSR/AECOM, 2009). The Bighorn Springs have never been developed or used as a source of spring water for NWNA's operations.

1.3.3 Ruby Mountain Springs Monitoring

The Ruby Mountain Springs site, which was purchased by NWNA in 2009, includes several spring discharges that emanate from the east bank of the Arkansas River between 7,650 to 7,630 feet amsl near the base of Sugarloaf Mountain (Figure 1.2). The former fish hatchery, which operated until 1997, included concrete-lined fish runs, a groundwater piping system, and multiple buildings on a terrace that parallels the Arkansas River. As part of NWNA's dedication to environmental protection and natural resource management, NWNA voluntarily committed to reclamation of the fish hatchery to a more natural state thereby enhancing the value of wetland and riparian habitat at the springs site.

Reclamation of the former fish hatchery infrastructure was completed in March through May 2012 where the former hatchery infrastructure was removed, and functional wildlife and trout habitat restored. Construction activities included creation of a new pond, revitalization of the stream channel system and associated wetland areas, and elimination of ungauged overland surface flows that were previously discharging to the Arkansas River upstream of the weir and downstream of the Parshall Flume. Also, the Upper Ditch, which was created to convey oxygenated flows to the upper reaches of the former hatchery, was replaced with a buried perforated pipe.

Spring flow monitoring at the Ruby Mountain Springs site began in September 2007, concurrent with the installation of the upper flume at Bighorn Springs. The monitoring network near the springs was expanded in 2009 and 2010, including installation of a flume up-gradient of the springs (Hagen Parshall Flume). Surface flows are calculated from automated stage measurements using the U. S. Bureau of Reclamation (USBR) equations for a Parshall flume and a contracted, sharp-crested, rectangular weir, respectively (USBR, 2001). Spring water discharge, as surface flow, is measured at the down-gradient Ruby Mountain weir, located at the terminus of the former hatchery channel immediately prior to confluence with the Arkansas River. The up-gradient Hagen Parshall Flume collects flow data in the upper reaches of the Ruby Mountain channel prior to entering the former hatchery area. The down-gradient Ruby Mountain weir, therefore, measures combined flow from the Hagen Flume and from Ruby Mountain Springs discharges. The difference between flows at the two stations approximates the discharge from the Ruby Mountain Springs on NWNA property.

Groundwater levels at Ruby Mountain Springs are measured at monitoring wells BVMW-10, BVMW-11, BVMW-12, BVMW-13, and RMBH-1 and at production boreholes RMBH-2 and RMBH-3. Boreholes RMBH-1 and RMBH-2 were completed in November and December 2007 as test boreholes for the Ruby Mountain Springs. RMBH-1 is now used as a monitoring well and RMBH-2 is a backup production borehole. Monitoring well BVMW-10 is located approximately midway between Bighorn Springs and Ruby Mountain Springs and was completed concurrently with the up-gradient monitoring network in April 2008. Monitoring wells BVMW-11, BMWH-

12, and BVMW13 were completed in August and October 2010 and monitoring began in December 2010. Production borehole RMBH-3 was completed in October 2010 and currently is the primary production source at the springs. Reclamation activities that occurred in 2012 have slightly influenced groundwater levels at the springs due to the changes in pressure head from removal of underground piping, redesign of the upper pond, and installation of the perforated pipe where the Upper Ditch previously existed; however, changes are minimal and localized (near BVMW-12 and BVMW-13).

A preliminary aquifer test was conducted for RMBH-2 in late January 2008, and supplemental pumping tests were performed in late April through early May 2008 and in February 2009. An aquifer test was conducted for RMBH-3 in November 2010. Boreholes RMBH-2 and RMBH-3 are hydraulically connected to the Pinedale outwash aquifer and to Ruby Mountain Springs, as was demonstrated by aquifer pumping tests that resulted in temporarily reduced flows from the springs, and a similar chemical fingerprint between the springs and boreholes (ENSR/AECOM, 2008b; Malcolm-Pirnie, 2011).

In June 2014, the Well Use Permit was re-issued by the DWR and in January 2016 Chaffee County approved Technical Revision 11 to the 1041 Permit allowing NWNA to simultaneously pump RMBH-2 and RMBH-3, and to divert up to a total of 200 gpm from the boreholes. Per the DWR Well Use Permit, the combined annual pumping is not to exceed 0.884 acre-feet per day (288,052 gallons per day), or 16.6 acre-feet in any month, or 196 acre-feet per year. Simultaneous pumping would provide a real-time backup in the case of pump failure or other operational disruption. NWNA redeveloped RMBH-2 in December 2019 after being idle for many years and may conduct additional investigations and testing prior to implementing simultaneous pumping.

1.4 Topography

The general physiographic setting of the area and the Trout Creek Watershed located between the Mosquito Range, east of Buena Vista, and the Southwest Front Range (Arkansas Hills), east of Ruby Mountain Springs, is shown on Figure 1.3. The topography is characterized by relatively flat terrain in the valley where the spring sites are located bounded by the rolling tops of the Southwest Front Range Mountains to the east and the massive Sawatch Range to the west. The surface of the alluvial outwash plain slopes southwest 1 to 2 degrees toward the Arkansas River. Near the spring sites, the relief from the top of the alluvium to the Arkansas River is about 50 to 60 feet.

The Trout Creek Watershed is approximately 58.5 square miles (37,409 acres) and is situated in the Southwest Front Range with peaks ranging in elevations between 9,500 to 10,500 feet amsl. The valley at the mouth of Trout Creek is approximately 7,860 feet amsl. Above the valley, and prior to Trout Creek reaching the alluvial plane is the Trout Creek Reservoir at an elevation of approximately 7,970 feet amsl.

The Mosquito Range trends approximately 40 miles north-south from the north end of Park County near Blue River, Colorado, and along the Lake County boundary to east of Buena Vista. The range constitutes the barrier between the Arkansas River headwaters and the South Platte River headwaters. In contrast, the extensive Sawatch Range is generally higher in elevation with

several peaks that exceed 14,000 feet amsl and constitutes the continental divide. The range extends approximately 80 miles from near Avon, Colorado to near Saguache, Colorado. The Sawatch forms a divide between the Arkansas River headwaters and tributaries of the Colorado River headwaters.

1.5 Climate

The climate near Buena Vista is semiarid with low humidity and mild temperatures. Precipitation and snowfall are influenced by the bordering mountain ranges; observations indicate moisture is dropped via rain and snow on the western slopes of the valley leaving drier conditions from lack of atmospheric water vapor on the eastern side of the Arkansas River.

Daily precipitation is measured and recorded by NWNA at the Ruby Mountain Springs Rain Gauge (RM-PPT) and reported for the Buena Vista 2S (BV2S) National Weather Service Station located at the Chaffee County Regional Airport, approximately seven miles north-northwest of Ruby Mountain Springs (Figure 1.1). The spring site rain gauge was installed in July 2010, and records precipitation rate using a Texas Electronics Series 525 heated tipping bucket rainfall sensor with an accuracy of 1.0 percent. The BV2S station has provided long-term daily and monthly precipitation since August 1, 1899 and represents climate on the western bank of the Arkansas River. The moisture gradient from west to east is reflected in typically higher precipitation totals at BV2S compared to RM-PPT. See Section 2.1 for details.

Long-term average precipitation and temperature by month from January 1989 to December 2010 is provided in Table 1.2. Average temperatures range from 82 degrees Fahrenheit (°F) to 10°F between summer highs and winter lows. Long-term average total precipitation at BV2S is 10.20 inches per year, and average total snow fall is 45.7 inches per year (Western Regional Climate Center, 2017).

Precipitation as snow water equivalent (SWE) is recorded at U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) SNOwpack TELemetry (SNOTEL) stations in the Mosquito range 25 miles to the north (Rough and Tumble site) and Sawatch Mountain Range 20 miles to the west (Saint Elmo site) shown on Figure 1.1. Both SNOTEL stations are approximately 2,500 to 2,900 feet above the elevations of the springs. Neither SNOTEL stations provide a quantitative measure of SWE in the mountains east of the area contributing to Ruby Mountain Springs recharge; however, they show the general relationship between the east and west sides of the valley and observations at Rough and Tumble possibly reflect trends in recharge from snowmelt in the Mosquito Range (Figure 1.4).

1.6 Surface Water

Surface water features are shown on Figure 1.5, including the Arkansas River, Trout Creek, Arnold Gulch, and major diversions near Ruby Mountain Springs. Several smaller canal ditches are operated up-valley from the springs during the irrigation season, but these waterways have not been mapped. River discharge monitoring stations for the Arkansas River are located near Nathrop and at Salida.

1.6.1 Arkansas River

The upper Arkansas River stretches from its alpine headwaters near Leadville, Colorado, to the Great Plains physiographic province near Pueblo, Colorado (Topper et al., 2003). Throughout the mountainous region, the river is primarily gaining along its course from groundwater discharges. Source water originates from precipitation, seasonal snowmelt and runoff, baseflow from discontinuous alluvial aquifers (such as valley fill material near Buena Vista), releases from water storage reservoirs, and trans-basin and trans-mountain diversions[1]. River flows are relatively steady from October through April, then rise sharply in response to snowmelt runoff in May and June. Primary use of the Arkansas River near Buena Vista area is recreational (whitewater rafting and fishing).

The nearest river gauging station, Arkansas River near Nathrop (USGS 07091200), is located approximately 7 miles south of Ruby Mountain Springs (elevation 7,350 feet amsl). The drainage basin above the station is 1,055 square miles. Daily discharge records exist from October 1964 through September 1993; however, since 1993, daily discharge has only been recorded seasonally from April through September. Average monthly flows range from 242 cubic feet per second (cfs) in January to 1,892 cfs in June based on the period of record for continuous measured flows.

The Arkansas River at Salida monitoring station (DWR 07091500) is located approximately 15 miles south of Ruby Mountain Springs. The watershed area is 1,218 square miles and monitoring is measured every fifteen minutes throughout the year since October 1909. Historical average monthly flows range from 258 cfs in February to 1,983 cfs in June. Flows are typically higher at the Salida station compared to the Nathrop gauge, but the discharge pattern is similar from year to year.

1.6.2 Tributaries of the Arkansas River

Approximately 3.5 miles north of the Ruby Mountain Springs, Trout Creek drains the Trout Creek Watershed east of the Arkansas River **(**Figure 1.3**)**. Prior to 2001, Trout Creek ephemerally discharged out across the river terrace alluvium north of the springs. The Trout Creek Dam, which is located downstream of a narrowly incised bedrock valley above the valley floor at the east edge of the alluvial terrace, was completed in 2000, and the impoundment behind the dam was allowed to fill over a 5-month period between January and May 2001. Since the dam was completed, there has been little flow in Trout Creek below the dam. Water that is discharged from the dam, roughly at the break in slope of the valley, is used for local irrigation purposes and a portion of the water infiltrates to recharge the alluvial outwash aquifer.

The Arnold Gulch drainage emerges onto the alluvial valley approximately one mile north of the Ruby Mountain springs and east of Bighorn Springs. Arnold Gulch only flows during and immediately after precipitation events. Several smaller springs have been observed along Arnold

1 Water is diverted from the western slope from the Fryingpan River and tributaries of the Roaring Fork River to the Arkansas River basin on the eastern slope. Diversions to the upper Arkansas in 1998 through tunnels and ditches amounted to 144,288-acre feet, or about 15 percent of total discharge in the Arkansas River drainage (CSU, 2002).

Gulch in the foothills and are likely tied to faults or fractures in the crystalline bedrock (ENSR/AECOM, 2008)[2]. These upper springs have not been evaluated for discharge and only one has been sampled for water quality.

1.6.3 Irrigation Diversions

The "Trout Creek Ditch-Cottonwood" provides the most significant surface flow to diversions on the east valley; however, it is sourced from Cottonwood Creek located on the west side of Arkansas River (Figure 1.5). The headwaters of Cottonwood Creek begin at Cottonwood Pass in the Sawatch Range and flow easterly towards the Town of Buena Vista. Water is diverted on the west side of the valley and conveyed across the Arkansas River near a bridge north of Johnson Village, approximately five miles north of Ruby Mountain Springs.

Other significant diversions on the east valley are sourced from either the Arkansas River or from the eastern mountain range. The Helena Ditch and Bray-Allen Ditch are sourced from the river, whereas the Trout Creek Ditch, Cogan Ditch, and Trout Creek Reservoir are sourced from Trout Creek.

Ditch waters supply center pivot irrigation operations for landowners on the east valley, including Mr. Paul Moltz and the Department of Corrections (DOC). Irrigation activities support haying operations but may also be used to maintain water rights. This is supported by observations during the summers of 2013 and 2014, when overland flooding was observed at the terminus of ditches located upstream of Bighorn Springs in fallow areas.

1.7 Ecological/Biological Setting

1.7.1 Regional Setting

The Natural Resources Conservation Service (NRCS) has classified the Arkansas Headwaters Watershed as a Southern Rocky Mountains – High Mountains and Valleys Common Resource Area (CRA). Landscape conditions, soil, climate, human considerations, and other natural resource information are used to determine the geographical boundaries of the CRA. Very broadly, the temperature regimes are frigid and cryic (mean annual temperature higher than 32°F and less than 46°F); moisture regimes are mainly ustic (moisture is limited but present during the time when conditions are suitable for plant growth). Vegetation is sagebrush-grass at low elevations, and with increasing elevation transitions from coniferous forest to alpine tundra.

Important wildlife species in the area include black bear, elk, mule deer, mountain lion, beaver, and trout throughout most of the watershed; Merriam's wild turkey in the foothills and montane zones; and pronghorn (antelope) in lower elevation shrub and grasslands. A 102-mile reach of the Arkansas River, stretching from Leadville to the Parkdale, Colorado (including the Ruby Mountain and Big Horn spring sites) was identified by Colorado Parks and Wildlife as "Gold

2 During August 2007, a flash flood event in Arnold Gulch washed out County Road 300 east of Bighorn Springs. Shortly after this event, a new spring vent was observed 500 feet southeast of the Bighorn Springs, in response to apparent changes in groundwater flow patterns.

Medal Trout Water" in 2014. Gold medal designation[3] indicates that the Arkansas River is an area of exceptional biological productivity.

Wetlands near the Ruby Mountain Springs and Bighorn Springs sites were identified during the Environmental Impacts Analysis Groundwater Investigation (ENSR/AECOM, 2008a) and are generally shown on Figure 1.6. Since the summer of 2010, the Colorado Mountain College (CMC) has collected and reports wetland monitoring data annually for the sites in agreement with NWNA and the SGWMMP.

1.7.2 Ruby Mountain Springs Wetlands

Prior to NWNA's purchase of the Ruby Mountain Springs site in 2009, the springs and associated riparian habitat had been developed as a private fish hatchery (date of hatchery development is unknown). The site had been altered with construction of a 100-foot wide and 1,000-foot long terrace, which parallels the Arkansas River, to house trout runs that were initially native clay, sand, and gravel. The hatchery infrastructure was later expanded to include numerous concrete-lined runs, a groundwater piping system, and buildings (CMC, 2015).

Figure 1.7a and Figure 1.7b show the pre- and post-reclamation site maps, respectively. The 2012 reclamation activities included removing the former hatchery infrastructure, enhancing two small ponds, adding geosynthetic clay liners to a connecting channel, and re-vegetating the area with native species. Two small palustrine emergent wetlands covering 0.05 acres were preserved during the construction efforts. Efforts were made to ensure that no net-water-loss through evaporation and transpiration would result from the new features. The ecological reclamation of the Ruby Mountain Springs riparian area has been successful and aquatic plants are proliferating in the restored river channel and pools (CMC, 2016b).

1.7.3 Bighorn Springs Wetlands

The Bighorn Springs wetlands were delineated by the U.S. Fish and Wildlife Service (USFWS) in 1985 and ENSR/AECOM in 2008. USFWS delineated three types of wetlands in the project area: Palustrine-Scrub/Shrub-Saturated (PSSB), Palustrine-Emergent-Saturated (PEMB), and Palustrine-Emergent-Seasonally flooded (PEMC). ENSR/AECOM determined there were five different wetland areas that CMC used as the basis for the annual wetland monitoring report: one high quality wetland, one medium quality wetland, and three low quality wetlands. CMC established vegetation transects (shown on Figure 1.8) conducts soil core extraction, collects shallow groundwater level measurements, and provides photo documentation annually (CMC, 2010). The scale of the studies are designed to measure changes in wetlands and biological diversity and are sufficient for characterizing impacts.

[3] In order to receive a Gold Medal listing, a river must consistently support a standing stock of trout weighing at least 60 pounds per acre and a minimum average of 12 quality trout (larger than 14 inches) per acre.

1.8 Geology

The Southwest Front Range Mountains and the Mosquito Range are part of the Sawatch Uplift that formed during the Laramide orogeny in the Early Tertiary (approximately 65 million years ago). These mountains were originally contiguous with the Sawatch Range, however a northwest-southeast trending, fault-bounded rift valley that developed about 35 million years ago (during the Oligocene) now separates the two mountain ranges. The Arkansas River occupies this fault-bounded valley until it turns to the southeast just south of Salida.

The upper Arkansas River Basin is in the northernmost structural basin of the Rio Grande Rift (Chapin and Cather, 1994). Uplift of the Sawatch and the Mosquito Ranges formed a graben (a deep structural basin bounded by normal faults), which is referred to as the "upper Arkansas Valley graben" (Scott, 1975), and includes two distinct structural basins: the Buena Vista–Salida and Leadville structural basins (Scott, 1975). The springs are located in the Buena Vista–Salida structural basin, in an area where the surrounding bedrock converges, and the alluvium outwash narrows compared to the upper east valley near Trout Creek (Figure 1.9).

1.8.1 Bedrock

The bedrock exposed along the foothills near the spring sites, including Sugarloaf Mountain, Dorothy's Butte, and Ruby Mountain, are comprised of the Tertiary (Oligocene) Nathrop Volcanics. These volcanic assemblages consist of tuffs, tuff breccias, vitrophyres and flow-banded rhyolites. Field mapping indicates that the flow banded rhyolite of Sugarloaf Mountain directly east of the Ruby Mountain Springs extends westward across the Arkansas to Dorothy's Butte and is exposed in the river channel. The rhyolite at Sugarloaf Mountain and Dorothy's Butte are compositionally similar (Honea, 1955). North of Sugarloaf Mountain the bedrock consists of Precambrian granitic rocks. Locally these are spheroidally weathered and grussified and as such may have a significant component of secondary permeability. It is also likely that zones of enhanced secondary (fracture-induced) permeability occur in association with the many mapped northwest trending faults in the area.

1.8.2 Surficial Geology

As previously mentioned, the springs are located in the unconfined Pinedale outwash aquifer (considered to be of Late Pleistocene age), which is comprised of yellowish-gray crudely stratified alluvium containing well-rounded to sub-rounded boulders, cobbles, pebbles, and sand (Keller et al., 2004). According to current interpretations, the Pinedale outwash was deposited when glacial ice dams in the vicinity of Pine Creek (located about 18 to 19 miles up the valley from Buena Vista) were catastrophically breached on several occasions (Scott, 1975). Deposits across the valley are laterally discontinuous.

Test holes advanced though the alluvium consistently encountered well-graded mixtures of sand and gravel throughout the alluvium (ENSR/AECOM, 2008). Sand fractions were fine-to-coarse grained and gravel size ranged from cobbles to boulders that were several feet across. In general, larger boulders appeared to be present within the upper 20 feet of the alluvium, particularly at the Bighorn Springs site. Spring vents appear to be localized within coarser grained

channels contained in the alluvial unit, particularly where the outwash plain narrows along the east side of the Arkansas River.

The Tertiary Dry Union formation is composed of interbedded layers of clay, silt, sand, and gravel (siltstone) with some layers cemented by calcium carbonate (Keller et al., 2004). This surficial unit is inferred to have lower bulk permeability than the Pinedale outwash deposits and likely acts as the western boundary of the alluvial outwash aquifer beyond the Arkansas River.

1.9 Hydrogeology and Water Level Data

1.9.1 Pinedale Outwash Aquifer

The Pinedale alluvial outwash aquifer is characterized as moderately to very permeable and approximately isotropic (i.e., having roughly equal vertical and horizontal hydraulic conductivity) (Watts, 2005). The NWNA test borehole program and inspection of the terrace faces exposed along the river valley between Ruby Mountain and Bighorn Springs revealed consistently coarse grained, unconsolidated, well-graded deposits of sand to gravel and boulders of high bulk permeability.

The test boreholes showed that the Pinedale outwash thickness is on the order of 60 feet beneath the Ruby Mountain Springs site and increases to the north and along the foothills (AECOM, 2008). Monitoring well BHMW-1 (Figure 1.2), constructed northwest of the base of Sugarloaf Mountain, penetrated 72 feet of alluvium without reaching bedrock. A similar range of aquifer thicknesses is inferred to exist between the Bighorn and Ruby Mountain springs. Test borehole BHBH-3, located near Bighorn Springs was drilled in alluvium to 64 feet bgs. Further north, BVMW-6, which is near the Arkansas River, was drilled in alluvium to a depth of 89 feet bgs.

Ruby Mountain Springs monitoring network groundwater level data show that flow in the Pinedale aquifer is generally north to south with discharge into the Arkansas River (SSPA, 2018). The Pinedale outwash aquifer has relatively large seasonal changes in water levels over the entire extent of the aquifer. The timing of highest and lowest water levels, and the amount of fluctuation, are dependent on the location within the aquifer and recharge conditions during the year.

1.9.2 Bedrock Groundwater Flow

The Southwest Front Range Mountains which define the east edge of the Pinedale outwash aquifer and rise to elevations approaching 11,000 feet amsl east of the valley floor, consist primarily of Precambrian crystalline bedrock (intrusive igneous source), with scattered areas of Tertiary volcanic bedrock outcrops. These rocks have very low porosity except where they are at or near the ground surface and are weathered, and where they are fractured. They are likely saturated at variable depths below the ground surface by recharge from direct precipitation (both rainfall and snowmelt). In drainages incised into the bedrock, the groundwater can be shallow enough to produce spring flow and to support perennial surface water flow.

There is very little monitoring data from the mountains east of Ruby Mountain Springs. USGS well 384907106052600 is located in the east valley approximately 4.5 miles north of Ruby

Mountain Springs, 0.25 miles north of US Highway 24/285, and 0.75 miles west of the Arkansas River (Figure 1.10). This well is 140 feet deep and was completed in May 1972 in Precambrian crystalline bedrock that has sufficient weathering and/or fracture porosity to produce useable amounts of groundwater. The USGS has been measuring water levels semi-annually since 1980, typically in the spring (March through May) and fall (September or October); however, nearby pumping at the KOA campground effects ambient water level trends. Groundwater levels have showed a slight decreasing trend over the period of record; however, there is appears to be an increasing trend in the last decade (Figure 1.11).

1.9.3 Pinedale Outwash Aquifer Recharge

Recharge for the Pinedale aquifer comes from mountain front underflow from the Mosquito Range/Arkansas Hills east of the alluvial aquifer (SSPA, 2010), infiltration of diversion water in irrigation ditches and center pivots, intermittent surface water runoff, infiltration from the Trout Creek watershed[4] and, in rare cases, from direct precipitation (a very small contribution). Discussion of recharge mechanisms and rates are in Section 1.11 below.

1.10 Water Quality and Groundwater Chemistry

The groundwater at the Ruby Mountain Springs and Bighorn Springs sites is of high quality based on the multiple samples collected from the boreholes and springs since March 2007. Samples from the production boreholes (RMBH-2 and RMBH-3) and monitoring well BVMW-10 are collected annually and analyzed for general water quality parameters, physical properties (color, odor, and turbidity), primary and secondary inorganic parameters and metals, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, and bacteria. The analytical results to present from the Ruby Mountain Springs and Bighorn Springs sites meet all applicable U.S. EPA Safe Drinking Water Act (SDWA) standards and Colorado Primary Drinking Water Regulations (5 CCR 1003-1).

Stiff plots of water quality parameters for samples collected from the Ruby Mountain Springs monitoring area in spring, summer and fall, of 2008 and winter of 2009 are shown in Figures 1.12a through Figure 1.12d. Samples were collected from the NWNA groundwater monitoring wells, as well as several surface water locations, including Trout Creek (TC-1) and Cottonwood Ditch (CC-1), the Arkansas River (ARKUP-1 and ARKDN-1), and Arnold Gulch (AG-1 and UAG). The plots show distinct differences in major ion composition of water samples collected on the north and west side of the Pinedale terrace compared to groundwater samples collected near the mountain front, in the mountains (UAG) and at the springs. Surface water and groundwater in and near canals have lower dissolved solids concentrations than the mountain front groundwater and springs samples. Samples from intermediate locations demonstrate varying degrees of mixing of the two distinct water types depending on the time of sampling relative to

[4] Prior to 2001 when the filling of the Trout Creek impoundment began, Trout Creek flowed onto the Pinedale terrace and recharged the outwash aquifer. In 2001, the former property owners of Ruby Mountain Springs reportedly noticed a significant decline in spring discharges on their property, and noted that flow from some of the springs ceased altogether (Ayres and Associates, 2003). Curtailment in irrigation and below average precipitation probably also contributed to the reduced flows in 2001. By 2004, with the return of closer-to-normal precipitation patterns and stream-flow conditions, water levels within the aquifer recovered, rising to near-pre-2001 levels.

irrigation (AECOM, 2009). For the mountain front and springs groundwater, there is relatively little change in the groundwater composition from season to season.

In 2017, quarterly water quality monitoring was implemented at a piezometer installed near the Bighorn Springs (BHS-1) and at BVMW-10. Quarterly samples have been analyzed for general water quality parameters only (inorganic anions, cations and metals). Results to present have been within the range of historical observations (see Section 2.7 for current water year sampling results and comparison to long-term monitoring observations).

1.11 Conceptual Site Model

An illustration of the physical conceptual site model (CSM) is shown in Figure 1.13. This CSM, which is updated from the CSM originally developed by ENSR/AECOM (2008), is based on a review of published scientific literature, unpublished technical reports, and site-specific data acquired to present, and considers the geomorphology and geology, the hydrogeology, and the climatic characteristics of the region encompassing Ruby Mountain Springs.

1.11.1 Spring Occurrence

As described previously, the Ruby Mountain Springs discharge from the unconsolidated coarse-grained alluvium of the Pinedale outwash aquifer at a relatively flat river terrace plain that extends on the east side of the Arkansas River from north of Johnson Village to immediately south of the springs where it is truncated between the river and the Tertiary volcanic rocks that form the west side of Sugarloaf Mountain[5] (Figure 1.9). The river terrace plain and its unconsolidated alluvial deposits extend west of the Arkansas River both north and south of Ruby Mountain Springs, however, their importance relative to the CSM for the springs area, is diminished because the river, which is a regional groundwater discharge zone, forms a divide that largely separates the groundwater flow characteristics and conditions east of the river from those to the west.

1.11.2 Recharge to Discharge

Hydrogeologically, there are two areas that are key to understanding the springs and their flow conditions: the alluvial Pinedale outwash aquifer and the crystalline bedrock mountains to the east of the alluvial aquifer. The alluvial aquifer is considered to be highly transmissive over the entire area south of Highway 24/285 and has an overall north to south groundwater flow direction. Near the Arkansas River, flow directions become more westerly due to lower elevation of the river. Groundwater discharge from the aquifer occurs all along its boundary with the Arkansas River and, as evidenced by Ruby Mountain Springs, is especially enhanced at the southern terminus of the aquifer where it is truncated by Tertiary volcanic rocks that outcrop immediately to the east and west, as well as in the river bottom.

In contrast to the river terrace plain and the alluvial Pinedale outwash aquifer, the Southwest Front Range Mountains form a significant highland area and consist of crystalline

[5] The Tertiary volcanic rocks are also exposed in the bottom of the Arkansas River bed just north of the springs site and on the butte west of the river (Dorothy's Butte), demonstrating the narrowing of the river channel near the springs.

bedrock that is much less transmissive than the unconsolidated alluvial aquifer. Primary flow of groundwater in the mountains is through the near surface weathered portions of the crystalline bedrock and on a larger scale through fractures that occur in the bedrock. The direction of this flow locally is towards the drainages formed by upland streams that are tributary to the Arkansas River and regionally westward towards the Arkansas River valley.

The location of the mountains and bedrock aquifer relative to Ruby Mountain Springs are important for the following reasons:

1. The intersection of the Tertiary volcanic rocks with the Arkansas River at Ruby Mountain Springs significantly reduces the extent of the Pinedale outwash aquifer both laterally and vertically. Because the Tertiary bedrock is much less permeable than the alluvium, water in the Pinedale aquifer stays consistently at elevations that intersect the east side of the river bank well above the water level in the river. As a result, there is a significant discharge of groundwater into the Ruby Mountain Springs and the adjacent wetlands.
2. The Southwest Front Range Mountains receive more precipitation than the Arkansas River valley below. This water does not reach the Pinedale terrace as surface water. It is likely that the majority of the eastern mountains precipitation that infiltrates to the underlying bedrock flows towards the Arkansas River and that some proportion of it flows into the Pinedale alluvial aquifer as mountain front recharge. This is consistent with findings from groundwater modeling conducted by SSPA (2010) that strongly suggests that underflow of groundwater from the mountains constitutes a significant portion of the recharge to the Pinedale aquifer.

The geochemical characteristics of the Pinedale aquifer and local surface water provide additional support for the assertion that underflow of mountain groundwater into the alluvial aquifer is significant and important. The geochemical characteristics of Ruby Mountain Springs water is similar to samples from monitoring wells along the east side of the Pinedale outwash aquifer and from an upland spring in Arnold Gulch and does not reflect influence of the surface water that infiltrates into the aquifer from the irrigation ditches and irrigated areas north of the springs (AECOM, 2009). While the fluctuation of groundwater levels in the Pinedale aquifer tends to reflect recharge by irrigation water, the water quality in the Ruby Mountain Springs is consistent and is not affected by the seasonal influxes of the irrigation water into the alluvial aquifer.

In summary, for the CSM, it is the downgradient termination of the Pinedale outwash aquifer east of the Arkansas River and the recharge into the aquifer from underflow from the mountains to the east that create the robust level of spring discharge and the consistency of the geochemistry of the spring water, even with the presence of nearby seasonally variable irrigation. During the history of NWNA monitoring, irrigation diversions and groundwater recharge have been relatively consistent.

1.12 Pinedale Aquifer Groundwater Use

According to the Colorado Division of Water Resources Decision Support System (DWR CDSS) database, there are 23 permitted wells located within the alluvial outwash aquifer east of the Arkansas River and up-gradient of the springs (wells located in alluvium west of the river are hydraulically isolated from the aquifer east of the river); however, the accuracy of location data is

questionable for many of the wells[6]. Figure 1.10 shows locations of other wells in the Pinedale aquifer and Table 1.3 provides information from the CDSS database. Wells shown near the Arnold Gulch watershed are questionable locations and have not been visually observed during field investigations. The closest known well with potential impacts to Ruby Mountain Springs is a stock well (Permit Number 243937) located southeast of the central irrigation pivot in the valley (approximately 2.8 miles north-northwest of the production boreholes). This well may be used to supplement surface water irrigation; however, it is unlikely that withdrawals from the aquifer are used for large-scale agricultural irrigation. All other wells are designated for domestic or household use, except for the Buena Vista Sanitation District well located adjacent to the river.

[6] This does not include 19 wells that have been permitted and that are reportedly located in the small portion of the alluvial aquifer that exists north of Highway 24.

Section 2
2019 Water Year and Long-Term Monitoring Data

Observations and details for the 2019 water year (constituting November 1, 2018, to October 31, 2019) for the Ruby Mountain Springs monitoring network are provided in this Section.

2.1 Precipitation and Mountain Front Recharge

2.1.1 Precipitation

Precipitation is measured at the Buena Vista National Weather Service Station (BV2S) and the Ruby Mountain Rain Gauge (RM-PPT) (described in Section 1.5). Monthly precipitation measurements from January 2008 through October 2019 are shown in Figure 2.1. For comparison purposes, the long-term monthly 30-year average precipitation (based on 1981 to 2010 observations) at BV2S and the deviation from normal precipitation for the period of record shown (the "cumulative departure") are shown. Ruby Mountain Springs Rain Gauge does not have sufficient data to calculate a long-term average.

The RM-PPT datalogger was malfunctioning from January 1, 2018 to October 2, 2018 when it was successfully repaired, and again from October 6, 2018 when the datalogger cable was damaged by wildlife until repaired on January 4, 2019. There is no data for RM-PPT for the first two months of the 2019 water year.

During the 2019 water year, a total of 9.31 inches of precipitation were recorded at BV2S, which is 12 percent (1.27 inches) less than the 30-year long-term average (10.58 inches). Precipitation was below average at the beginning of the water year in November 2018, above average in the spring of 2019 and then consistently below average through October 2019. Overall below average precipitation during of the 2019 water year in addition to the dry conditions of the previous water year resulted in below average cumulative departure from normal conditions at BV2S.

Historical observations indicate moisture is dropped via rain and snow on the western slopes of the valley leaving drier conditions from a lack of precipitation on the eastern side of the Arkansas River for most of the year except during the summer months (July/August) when precipitation is typically higher on the eastern valley due to a more influential southerly monsoonal flow. During the 2019 water year this weather pattern shifted earlier, with significantly more precipitation in March and May and less in the typical monsoon season (July/August).

2.1.2 SNOTEL Stations

Potential recharge from snowmelt is approximated from the SWE measured at the two nearest SNOTEL stations, Rough and Tumble and Saint Elmo (described in Section 1.5). Figure 2.2a and Figure 2.2b show measured SWE for the 2007 to 2019 water years at Rough and Tumble and Saint Elmo SNOTEL stations, respectively.

Winter precipitation in the Sawatch Range to the west is typically higher than in the Mosquito Range to the east. For the winter of 2018/2019, measured SWE was higher in magnitude at the Saint Elmo station (western mountains) compared to Rough and Tumble (eastern mountains). The maximum SWE observed during the 2019 water year at Rough and Tumble was 8.8 inches on April 8, which is above average and earlier than the long-term average (7.7 inches on April 26 for available historical observations). The maximum SWE measured at Saint Elmo in 2019 was 15.1 inches on April 16. Long-term observations for the Saint Elmo station are not available since reporting began on September 10, 2007; however, based on the available 12 seasons of data, the median peak SWE for Saint Elmo is 12 inches occurring in early April, indicating the Sawatch Range snowpack was above average and the timing of peak accumulation was later than average. In comparison to the previous 12 years, the duration of snowpack persistence in the 2019 water year was approximately 10 percent and 14 percent longer at Rough and Tumble and at Saint Elmo, respectively.

2.2 Arkansas River Flow

Hydrographs of average daily flows in the upper Arkansas River for the 2019 water year and long-term average flow data collected from the Arkansas River gauges near Nathrop and at Salida are shown on Figure 2.3. Observations for the year compared to the long-term average indicate the Arkansas River peaked higher than average in during the summer months (June through mid-August), then was slightly below average through the end of the 2019 water year. Flows for the month of June (when peak flows historically are at their highest) were 54 percent higher than normal near Nathrop and 49 percent higher than normal at Salida. The 2019 cumulative departure from normal flows during the seasonal gaging period (April through September) were approximately 105,000 acre-feet above average at Salida and 127,000 acre-feet above average at Nathrop. For comparison, flows at Nathrop have been above average from in 2011, 2014, 2015 and 2017 (ranging from 31,000 to 112,000 acre-feet above normal) and were below average in 2012, 2013, 2016 and 2018 (ranging from 45,000 to 214,000 acre-feet below normal, respectively). The high river flows in the 2019 water year are above the range of previous wet years (2011 and 2014).

Flows at the Nathrop and Salida gauges are similar from year to year and are partially controlled by the operation of reservoirs on streams that are tributary to the river and upstream of the Ruby Mountain Springs site. Daily average observed and long-term normal flows for these gauges during the 2019 water year are provided in Appendix B.

2.3 Irrigation Diversions

Annual diversions for Trout Creek Ditch sourced from Cottonwood Creek (Trout Creek Ditch-Cottonwood), Trout Creek Ditch sourced from Trout Creek (Trout Creek Ditch), Bray-Allen Ditch, Helena Ditch, Cogan Ditch, and Trout Creek Reservoir are reported by the DWR. Diversion records for the 2019 water year were made available for this report by the Chaffee County Water Commissioner (except for the Trout Creek Reservoir, which has no records available; however, the reservoir was full and spilling throughout the year). All data for 2019 are provisional.

Monthly diversions for the 2018 and 2019 irrigation season are included in Table 2.2a, and a summary of total diversions for each water year, from 2008 through 2019, is shown in Table 2.2b. The approximate locations of canals near the monitoring network (high accuracy location data for canals are not available at this time) are shown on Figure 1.5. Combined total monthly diversions for 2008 through 2019 are shown on Figure 2.4 reflecting the timing and magnitude of ditch flows in the valley.

Diversion flows during the 2019 water year were average compared to years 2008 through 2018. The magnitude of release was the third highest since 2008, and the timing of release was typical compared to historical observations. Historical average diversions for available years from the Bray-Allen ditch since 1946 are approximately 1,400 acre-feet[7]. Historical average diversion for available years from the Trout Creek Ditch since 1911 is approximately 580 acre-feet[8]. Cogan Ditch is operated under a futile call. Flows from the Trout Creek Reservoir are negligible (Trout Creek Reservoir accounts for less than 1% of the annual diversion total[9]).

2.4 Drought Conditions

The U.S. Drought Monitor (USDM) was established in 1999 as a joint venture by the National Oceanic and Atmospheric Administration, the U.S. Department of Agriculture, and the National Drought Mitigation Center (NDMC) at the University of Nebraska-Lincoln. The USDM produces weekly drought maps of the entire U.S. based on measurements of climatic, hydrologic and soil conditions as well as reported impacts and observations from more than 350 contributors around the country.

Quarterly USDM maps were compiled for the region surrounding the Trout Creek Watershed and Ruby Mountain and Bighorn Springs (Figures 2.5a, 2.5b, 2.5c, and 2.5d). The NDMC datasets indicate that abnormally dry to extreme drought conditions existed in the first quarter of 2019, moderate drought conditions were observed the last quarter of 2019, and no drought impact in the second and third quarters.

Figure 2.6 shows statewide drought conditions for the end of August from 2012 to 2019. During late summer in years 2012 and 2018, the Ruby Mountain Springs site was in extremely dry zones, and 2013 was a severely dry summer for central Colorado. Conditions during late summer in years 2014 to 2017 and 2019 showed minimal drought impacts.

2.5 Springs Discharge

Surface water monitoring at both the Ruby Mountain Springs and Bighorn Springs is monitored by two spring flow measurement stations at each site (see Sections 1.3.2 and 1.3.3).

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[7] According to information provided by the DWR, no diversion flow data is available for the Bray-Allen Ditch for the 2008 irrigation season because the flume washed out in August of 2007.

[8] No data is available for the Trout Creek Ditch (not the Trout Creek Ditch – Cottonwood Creek) for the 2010 irrigation season because of recording equipment failure.

[9] No data for the Trout Creek Reservoir is available since 2009 from the Colorado Department of Natural Resources, Water Conservation Board, Colorado's Decision Support Systems.

Some of the surface-water monitoring data associated with the gauges showed anomalous measurements during periods of the 2019 water year. Challenges arose from the need to maintain the integrity of monitoring structures on a continual basis, most commonly by clearing tumbleweeds, aquatic plants, and incipient animal activity (beaver dams) from the measurement structures and associated channels.

2.5.1 Ruby Mountain Springs Discharge

Spring discharge is estimated by flow at the Ruby Mountain Weir less the up-gradient channel flow at the Hagen Parshall Flume. Table 2.3a shows monthly measured flows for the springs for the 2019 water year, and average daily flow measurements for the 2019 water year are included in Appendix C. Figure 2.7 shows historical Ruby Mountain weir and Hagen Parshall flume flows after reclamation was completed (2012), the 2019 water year average daily measured flows, precipitation at BV2S, and total daily pumping withdrawals.

There were several periods during the 2019 water year when weir data were not representative of actual springs discharge conditions. Beaver activity at Ruby Mountain Springs started in late-June and continued sporadically through the end of September 2019 (with a licensed trapper contacted, and multiple beavers captured and released). Naturally occurring debris and algae were removed along the conveyance system and from the weir periodically throughout the year. The channel was continually monitored and has been temporarily repaired until a long-term solution can be resolved. NWNA is reviewing alternative methods for monitoring spring flow due to the challenges posed by the continuous changes in the channel. Flows more reflective of natural conditions during these periods, as summarized in Table 2.3a and shown in Figure 2.7, were estimated based on a rising water level curve and visual observations.

Flow through the Hagen Parshall flume ceased on March 11, 2019, and began again on July 21, 2019, which is within the range of observations from previous years' patterns. Flows through the flume were affected by occasional debris blockages and ponding interference.

The average monthly discharges from Ruby Mountain Springs (weir flows minus Hagen Parshall flume flows) during water year 2019 are shown on Table 2.3a. Total springs discharge varied from a high of 4.2 cfs (255 acre-feet) in October 2019 to a low of 1.0 cfs (63 acre-feet) in May 2019. Seasonal trends were similar to those observed in previous years.

For comparison, total discharge from the springs for the previous water years of record are shown on Table 2.3b. The total spring surface water discharge was 1,573 acre-feet for the 2019 water year. The seasonal trends are similar to those observed in previous years. Springs discharge was lowest in the 2012 water year. From 2012 to 2016, spring discharge increased but has declined since 2017.

2.5.2 Bighorn Springs Discharge

Historical BHPF-1 and BHPF-3 flows from 2011 to the 2019 water year and daily precipitation records for the 2019 water year, are shown in Figure 2.8. The datalogger at BHPF-1 failed on July 6, 2018 and was replaced on November 16, 2018; there is no data for the first few weeks of the 2019 water year. Observed and estimated monthly and annual measurements are

shown in Table 2.4a, and average daily flow measurements are included in Appendix-D. Based on estimated (actual) flows, the total gain in spring flows between BHPF-1 and BHPF-3 was 0.41 cfs (298 acre-feet) for the 2019 water year. The seasonal trends are similar to those observed in previous years. Similar to Ruby Mountain Springs the total springs discharge (represented by BHPF-3) has been declining since the 2016 water year (Table 2.4b).

Measured flows at the upper flume (BHPF-1) and the lower flume (BHPF-3) were occasionally obstructed due to the buildup of vegetation and debris in and around the flumes. There remains a persistent flow circumventing BHPF-3 and actual flows are greater than measured throughout the 2019 water year. During high flow conditions, water was observed bypassing the flume; however, it is difficult to visually observe the bypass during low flow conditions. Vegetation is cleared during routine maintenance visits, but debris and sediment buildup continues to be challenging. Options for maintaining these flow stations, or removing them, are being evaluated.

2.6 Groundwater Monitoring

2.6.1 Up-gradient Monitoring

Hydrographs for the up-gradient monitoring wells from 2008 to present (Figure 2.9) show that the Pinedale outwash aquifer has relatively large seasonal changes in water levels over the entire extent of the aquifer. Lowest levels are observed March through June and highest water levels are observed August through October. The actual timing of highest and lowest water levels, and the amount of fluctuation between the highest and lowest levels, are dependent on the location within the aquifer and recharge conditions during the year.

The variability in water level fluctuations for up-gradient, Bighorn Springs, and Ruby Mountain Springs monitoring wells for the 2019 water year is illustrated in Figure 2.10, which provides a map view illustration of the magnitude of the groundwater fluctuations within the aquifer during the 2019 water year. Of the up-gradient wells required to be monitored by the SGWMMP, annual water levels fluctuated from 12 feet to 21 feet. As in previous years, the magnitude of fluctuations was higher in wells near irrigation ditches and center pivots (e.g., BVMW-5). These wells show relatively rapid and significantly large responses to periods of active irrigation. Additionally, fluctuations are typically slightly higher on the eastern side of the valley (although this is only demonstrated near wells BMVW-5 and BVMW-8 in the 2019 water year) and lower near the groundwater discharge points (i.e., the Arkansas River to the west or the Ruby Mountain and Bighorn Springs to the south).

During the 2019 water year, peak seasonal water levels in up-gradient wells were average compared to all previous water years of record. Minimum water levels in up-gradient wells decreased by an average of 1.48 feet from 2018 to 2019 and were within the bounds of previous year's records. The minimum water level trends in wells declined from 2008 to 2013, rose from 2014 to 2015, and declined in 2016 to 2019. These changes in water levels are clearly independent of pumping at Ruby Mountain Springs, which did not begin with regularity until July 2010.

Groundwater flow in the aquifer throughout the 2019 water year was north to south and southwest with discharge to the west into the Arkansas River. These flow directions are consistent with previous years (SSPA, 2018). Figure 2.11 is a map of water level contours for the aquifer during the low seasonal groundwater levels on April 3, 2019. High seasonal groundwater levels are depicted on Figure 2.12 showing conditions on October 3, 2019. Average daily water levels, temperature, and conductivity for up-gradient wells for the 2019 water year are provided in Appendix E.

2.6.2 Ruby Mountain Springs and Bighorn Springs Monitoring

Hydrographs for the Ruby Mountain Springs and Bighorn Springs groundwater monitoring stations that are required by the SWGMMP are shown in Figure 2.13[10]. The hydrographs are overlain with pumping from the production borehole RMBH-3[11] (RMBH-2 was pumped minimally and only for testing purposes during the 2019 water year) to illustrate any relationships between pumping and water level changes in the wells. Seasonal changes in groundwater levels in monitoring wells located near springs (e.g., RMBH-1 and BHBH-2) typically fluctuate less than groundwater levels in monitoring wells located away from the springs (e.g., BVMW-10 and BHMW-1). Similar to up-gradient monitoring wells, seasonal groundwater level trends at wells near Ruby Mountain and Bighorn springs have declined since 2017 but exhibited a rebound during peak water levels in the fall of 2019. Compared to 2018 groundwater levels, minimum levels decreased by an average of 1.16 feet and maximum levels increased by an average of 3.27 feet in 2019.

A declining trend in groundwater levels that began prior to NWNA's production was present for the years 2008 to 2010. In 2011, this trend was reversed with a majority of the water levels within the monitoring network exceeding observed water levels in the previous water years. The effects of regional drought conditions during water year 2012 were apparent in the low maximum and minimum water levels measured in all wells. After water year 2013 (a year of near average precipitation) seasonal low groundwater levels at the springs showed an increasing trend until 2016 when the trend reversed and groundwater levels continued to decrease through 2018. The increasing maximum water levels in the 2019 water year indicates a possible beginning of another trend reversal.

Figure 2.14 details groundwater levels at Ruby Mountain Springs for the 2019 water year and shows the relationship and minimal changes in water levels associated with production withdrawals.

In addition to water level and temperature measurements, specific conductance is recorded in boreholes RMBH-2 and RMBH-3, and monitoring wells BHBH-2, BHMW-1, and BVMW-10.

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[10] The in-line sensor datalogger or the electronic recording system associated with RMBH-2 failed during the WannaCry malware attack on May 12, 2017. After several unsuccessful attempts to restore the system, a new datalogger was installed in RMBH-2 on March 16, 2018; however, the datalogger was later lost due to corrosion in the wellhead and data are not available from August 7, 2018 to September 6, 2018 when another datalogger was installed.

[11] RMBH-3 data for the third quarter of 2019 has been revised since the submission of the quarterly report to Chaffee County on November 15, 2019. Corrected data can be found in Figure 2.13, Figure 2.14 and Appendix E.

Average daily water levels, temperature, and conductivity for springs site wells for the 2019 water year are provided in Appendix E.

2.7 Groundwater Quality

NWNA performs annual water quality sampling for the production wells and BVMW-10 during the same seasonal period from year to year and analyzed for the full suite of parameters listed in Section 1.10. Water quality samples were collected on February 28, 2019 at RMBH-3, on July 9, 2019 at BVMW-10 and the Bighorn Springs piezometer (BHS-1)[12]. Additionally, RMBH-2 was not sampled due to the fact that it is currently inoperable as a production borehole. EPA approved methods were used in the analyses of samples from the production wells. All sample results are presented in Appendix F.

For the samples collected in 2019, the pH for RMBH-3 and BVMW-10 was 7.8 and 8.0, respectively, and specific conductance was 410 µohm/cm and 370 µohm/cm, respectively. Total Dissolved Solids (TDS) was 250 mg/L for RMBH-3 and 210 mg/L for BVMW-10. All primary and secondary inorganic parameters and metals concentrations in the production borehole and BVMW-10 were below Colorado Basic Standards for Ground Water (5 CCR 1002-41). There were no reported VOCs, SVOCs, or pesticides in any of the samples, except for a low detection of an herbicide that was resampled on October 17, 2019 and was non-detect. During the 2019 water year, water quality parameters were within the range of historical observations and were below the federal Maximum Contaminant Levels (MCLs) for all quarterly sampling at BVMW-10 and Bighorn Parshall Flume 1 (BHS-P1).

2.8 Evapotranspiration

The Colorado Climate Center[13] maintains a CoAgMet Station that measures evapotranspiration (ET). The station is located southwest of Buena Vista between the town and the BV2S Weather Station at 7,900 feet amsl (Figure 1.1). The station has recorded hourly observations since October 12, 2010. The reference ET value provided in CoAgMet outputs are computed using the 1982 Kimberly-Penman equation. Reference ET values are for conditions where soil moisture is not limiting (greater than 50% capacity). If moisture does become limiting, a soil coefficient value can be applied.

For the 2019 water year, the average daily Reference ET was 0.14 inches (0.14 inches for the 2019 calendar year) and the total annual Reference ET was 50.61 inches (50.09 inches for the 2019 calendar year) (CSU, 2020). ET in the Buena Vista and Ruby Mountain Springs area is limited by lack of precipitation, which is approximately 10 inches per year, and the dry conditions in the valley likely affect soil moisture such that a much lower ET is realized.

[12] Water quality sampling at Bighorn Springs started in 2017 for seasonal water quality characterization but may be discontinued since all analytical results have been below SDWA standards and Colorado Primary Drinking Water Regulations (5 CCR 1003-1), and quarterly sampling has been consistent from year to year.

[13] The station is operated in cooperation with the Upper Arkansas Water Conservancy District, the Colorado Division of Wildlife, Southeastern Colorado Water Conservancy District, and the Board of Water Works Pueblo.

2.9 Ecological/Biological Monitoring

Annual wetlands monitoring at the Ruby Mountain Springs and Bighorn Springs sites are provided by the Colorado Mountain College in a separate report (CMC, 2020).

2.10 Production

A summary of total monthly and annual production withdrawals for the 2019 water year are shown on Table 2.5. Figure 2.15 exhibits total daily pumping from each production borehole for the 2019 water year. Total daily withdrawals in acre-feet for RMBH-2 and RMBH-3 are provided in Appendix G.

For the 2019 water year, a total of 88.97 acre-feet of water was pumped from the production boreholes; RMBH-3 was the primary production source (88.87 acre-feet) and RMBH-2 was pumped in June for well purging and sampling (0.10 acre-feet). Maximum pumping from primary production borehole RMBH-3 occurred on May 12, 2019 at a rate of 118.8 gpm, which is below the permitted limit of 200 gpm. The maximum daily withdrawal occurred on April 3, 2019, at a total of 141,060 gallons per day (gpd), which is well below the permitted limit of 288,000 gpd. The average daily withdrawal over the 2019 water year was 79,337 gpd (55.09 gpm) and the average daily maximum pumping rate was 87.6 gpm. The daily, monthly, and annual production withdrawals are well below the limits established in the Well Use Permit.

2.11 Summary of 2019 Monitoring Network Observations

For the 2019 water year, NWNA conducted surface water, groundwater, flow monitoring, and other activities specified in Chaffee County Resolution 2013-35 and the SGWMMP. During the year, NWNA responded to changing conditions (e.g., blockages of the flumes and weir) and sporadic problems that occurred with dataloggers in the monitoring network. As of the end of 2019, conditions at the surface water measurement stations were being field-checked on a frequent basis, all dataloggers were functioning correctly, and monitoring data were acquired according to SGWMMP requirements.

Seasonal surface water flows from both Ruby Mountain and Bighorn springs are generally at a minimum from April through June and at a maximum from September through December (Figure 2.7 and Figure 2.8, respectively). During the first half of the 2019 water year (November 2018 through April 2019), flows at the Ruby Mountain weir were below average compared to available historical observations. From May 2019 through the end of the water year, flow increased and maintained an average level compared to the last 10 years. Minimum flows at the Ruby Mountain springs weir and upstream Ruby Mountain Hagen Flume were average relative to previous seasonal observations. Surface flows at the Bighorn springs flumes are difficult to interpret because of incomplete capture at the gauge due to upstream bypass and scouring of the inlet walls; however, Bighorn springs flows were within the range of previous seasonal observations.

The timing and magnitude of maximum and minimum groundwater levels in the Ruby Mountain Springs monitoring system were generally similar to spring surface flow observations (Figure 2.9 and Figure 2.13). Minimum water levels were similar or slightly lower when compared

to years previously recorded; peak levels were higher than the previous year, indicating an upward trend. Wells located further up-gradient reached maximum and minimum levels earlier than wells located down gradient. The smallest seasonal variations in groundwater water levels occurred in the wells closest to groundwater discharge points (e.g., BVMW-12 and BVMW-13), as shown in Figure 2.10.

The correlation between irrigation and groundwater levels has been noted previously for the Pinedale Outwash aquifer (ENSR/AECOM, 2008), and review of previous years timing of irrigation diversions with the timing and magnitude of water level increases, confirms this relationship. Seepage from irrigation diversions influenced groundwater levels in wells located near canals and center pivots as demonstrated in Figure 2. 9 (e.g., BVMW-5). As shown in Figure 2.4 and Table 2.2b, total irrigation diversions for 2019 (9,584 acre-feet) were slightly above the previous 10-year recorded average (9,375 acre-feet for 2008 through 2018).

Precipitation measurements at the Buena Vista 2S weather station were above average for the winter and spring of 2019 (January to May) but were below average compared to the long-term records for all other months and for the water year total (Figure 2.1 and Table 2.1). As in the past, the effect of local precipitation in the Arkansas River Valley on the aquifer appears to be minimal.

Aquifer recharge via groundwater inflows from the mountains directly east of the Pinedale Outwash aquifer is significant (ENSR/AECOM, 2008). The closest SNOTEL precipitation monitoring station east of the Arkansas River is the Rough and Tumble station, which is located more than 20 miles north of Ruby Mountain and Bighorn Springs. From a general perspective, the station shows that the peak SWE for the 2018/2019 snowpack in the Mosquito Range was above average compared to the 30-year median (8.8 inches compared to 7.7 inches), and snowpack persistence was above average duration (243 days compared to 212 days). Weather patterns appear to be typical such that more precipitation fell on the Sawatch Range than on the Mosquito Range to the east (Figure 2.2a and 2.2b).

RMBH-2 and RMBH-3 are hydraulically connected to the Pinedale outwash aquifer and to Ruby Mountain Springs, as was demonstrated by the aquifer pumping test that resulted in reduced flows from the springs (ENSR/AECOM, 2008; Malcolm-Pirnie, 2010). The sole source of withdrawals for the production of water was from Ruby Mountain Springs production borehole RMBH-3 for the 2019 water year. Production borehole RMBH-2 was pumped minimally for testing purposes only. Slight increases in flows from Ruby Mountain Springs that are coincident with cessation of withdrawals from the production boreholes can be seen on Figure 2.16, although effects are small. As in prior years, comparison of periods of pumping with surface flow levels at Bighorn Springs located approximately 3,000 feet northwest of the production boreholes show no effects from pumping during the 2019 water year.

Figure 2.17 shows groundwater levels at the production boreholes and nearby monitoring well RMBH-1 compared to pumping and recharge from precipitation and SWE. Similarly, Figure 2.18 shows precipitation versus RMBH-3 production[14], and RMBH-2 and RMBH-3 water levels

[14] There has been little to no production from RMBH-2 over the 7-year time period shown.

since the beginning of 2013. Important observations from the 2019 measurements of precipitation and SWE, irrigation diversions, groundwater levels, and water production data are that 1) changes due to precipitation are minimal, if observed at all, 2) effects from pumping are minimally observed at nearby well RMBH-1 but are not observed at other up-gradient wells, and 3) the seasonal groundwater level fluctuations, while having an apparent relationship to SWE and snowmelt/runoff, are more likely due to seasonal irrigation diversions.

Section 3
References

Abbott, P.O., 1985. *Description of water-systems operations in the Arkansas River Basin, Colorado*: U.S. Geological Survey Water-Resources Investigations Report 85–4092, p. 67.

AECOM, Inc., 2009. Phase II Hydrogeologic Report for the Buena Vista Spring Sites, Draft. Prepared for Nestle Waters North America, Inc.

Alley, W.M., Reilly, T.E., and Franke, O.L., 1999. *Sustainability of Groundwater Resources*: U.S. Geological Survey Circular 1186, p. 79

Bureau of Land Management (BLM), 1998. *State of Colorado, Annual precipitation map*: digital coverage, accessed August 16, 2004, at URL http://www.co.blm.gov/

Caratti, J.F. 2006. *Point Intercept (PO). RMRS GTR 164 CD*. Fort Collins, CO: Rocky Mountain Research Station, U.S Forest Service

Chapin, C.E., and Cather, S.M., 1994. *Tectonic setting of the axial basins of the northern and central Rio Grande rift*: Geological Society of America Special Paper 291, p. 5–21.

CMC, 2010. *Bighorn Springs Wetland Monitoring Report.* Prepared by Colorado Mountain College Natural Resource Management Program for Nestle Waters North America.

CMC, 2011. *Ruby Mountain Springs Conceptual Reclamation Plan, Revised Draft*. Prepared by Colorado Mountain College Natural Resource Management Program for Nestle Waters North America.

CMC, 2016a. *2015 Bighorn Springs Wetland Monitoring Report*. Prepared by Colorado Mountain College Natural Resource Management Program for Nestle Waters North America.

CMC, 2016b. *2015 Ruby Mountain Springs Wetland Monitoring Report*. Prepared by Colorado Mountain College Natural Resource Management Program for Nestle Waters North America.

CMC, 2017a. *2016 Bighorn Springs Wetland Monitoring Report*. Prepared by Colorado Mountain College Natural Resource Management Program for Nestle Waters North America.

CMC, 2017b. *2016 Ruby Mountain Springs Wetland Monitoring Report*. Prepared by Colorado Mountain College Natural Resource Management Program for Nestle Waters North America.

CMC, 2018a. *2017 Bighorn Springs Wetland Monitoring Report*. Prepared by Colorado Mountain College Natural Resource Management Program for Nestle Waters North America.

CMC, 2018b. *2017 Ruby Mountain Springs Wetland Monitoring Report*. Prepared by Colorado Mountain College Natural Resource Management Program for Nestle Waters North America.

CMC, 2019a. *2018 Bighorn Springs Wetland Monitoring Report*. Prepared by Colorado Mountain College Natural Resource Management Program for Nestle Waters North America.

CMC, 2019b. *2018 Ruby Mountain Springs Wetland Monitoring Report*. Prepared by Colorado Mountain College Natural Resource Management Program for Nestle Waters North America.

CSU, 2002. Colorado State University *Colorado Water Knowledge Web Page – Arkansas River Basin*: http://www.waterknowledge.colostate.edu/arkansas.html

CSU, 2016. Colorado State University *Colorado Wetland Information Center Web Page*: http://www.cnhp.colostate.edu/cwic/

CSU, 2020. Colorado State University CoAgMet Crop ET Access Page: Retrieved January 14, 2020 from http://ccc.atmos.colostate.edu/cgi-bin/extended_etr_form.pl

ENSR/AECOM, 2008a. *Environmental Impacts Analysis, Groundwater Investigation*. Prepared for Nestlé Waters North America, Inc.

ENSR/AECOM, 2008b. *Phase I Hydrogeologic Report for the Buena Vista Springs Sites*. Prepared for Nestle Waters North America, Inc. October 2008.

ENSR/AECOM, 2009. Draft *Phase II Hydrogeologic Report for the Buena Vista Springs Sites*. Prepared for Nestle Waters North America, Inc. August 2009.

Harbaugh, A.W., 1990, A computer program for calculating subregional water budgets using results from the U.S. Geological Survey modular three-dimensional ground-water flow model: U.S. Geological Survey, Open-File Report 90–392, p. 46.

Honea, R. M. 1955. *Volcanic geology of the Ruby Mountain area, Nathrop, Colorado*: University of Colorado, Boulder, Colorado, unpublished M.S. thesis, p. 31.

Keller, J. W., McCalpin, J. P., and Lowry, B. W., 2004. *Geologic map of the Buena Vista East Quadrangle, Chaffee County, Colorado*: Colorado Geological Survey, Division of Minerals and Geology, Department of Natural Resources, Open-File Report 04-4, p. 65 with 1:24,000-scale map.

Malcolm Pirnie, 2011. *RMBH-3 Hydrogeological Report for the Ruby Mountain Spring Site, Chaffee County, Colorado*. Prepared by Malcolm Pirnie, Inc., for Nestle Waters North America. January 24, 2011.

NDMC - UNL, 2019. National Drought Mitigation Center – University of Nebraska at Lincoln *United States Drought Monitor: Maps and Data.* Web page Retrieved February 7, 2019. https://droughtmonitor.unl.edu/Data/GISData.aspx

NWNA, 2010. Surface- and Ground-Water Monitoring and Mitigation Plan, Ruby Mountain and Bighorn Springs Sites, Chaffee County, Colorado. Prepared by Nestle Waters North America for Chaffee County. April 29, 2010.

Scanlon, B. R., Healy, R. W., Cook, P. G., 2002. *Choosing appropriate techniques for quantifying groundwater recharge*, Hydrogeology Journal, 10-1, p. 18-39.

SSPA, 2010. *Evaluations of Groundwater Flow at the Buena Vista Springs Sites, Chaffee County, Colorado*. Technical memorandum from C. Andrews to B. McLead prepared for Nestle Waters North America, Inc.

SSPA, 2011. *2010 Annual Monitoring Report, Ruby Mountain Springs, Chaffee County, Colorado*. Prepared by S.S. Papadopulos & Associates, Inc., for Nestle Waters North America, Inc.

SSPA, 2012. *2011 Annual Monitoring Report, Ruby Mountain Springs, Chaffee County, Colorado*. Prepared by S.S. Papadopulos & Associates, Inc., for Nestle Waters North America, Inc.

SSPA, 2013. *2012 Annual Monitoring Report, Ruby Mountain Springs, Chaffee County, Colorado*. Prepared by S.S. Papadopulos & Associates, Inc., for Nestle Waters North America, Inc.

SSPA, 2014. *2013 Annual Monitoring Report, Ruby Mountain Springs, Chaffee County, Colorado*. Prepared by S.S. Papadopulos & Associates, Inc., for Nestle Waters North America, Inc.

SSPA, 2015. *2014 Annual Monitoring Report, Ruby Mountain Springs, Chaffee County, Colorado*. Prepared by S.S. Papadopulos & Associates, Inc., for Nestle Waters North America, Inc.

SSPA, 2016a. *2015 Annual Monitoring Report, Ruby Mountain Springs, Chaffee County, Colorado*. Prepared by S.S. Papadopulos & Associates, Inc., for Nestle Waters North America, Inc.

SSPA, 2016b. *2015 Sustainability Report, Ruby Mountain Springs, Chaffee County, Colorado*. Prepared by S.S. Papadopulos & Associates, Inc., for Nestle Waters North America, Inc.

SSPA, 2017a. *2016 Annual Monitoring Report, Ruby Mountain Springs, Chaffee County, Colorado*. Prepared by S.S. Papadopulos & Associates, Inc., for Nestle Waters North America, Inc.

SSPA, 2017b. *2016 Sustainability Report, Ruby Mountain Springs, Chaffee County, Colorado*. Prepared by S.S. Papadopulos & Associates, Inc., for Nestle Waters North America, Inc.

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SSPA, 2018b. *2017 Sustainability Report, Ruby Mountain Springs, Chaffee County, Colorado*. Prepared by S.S. Papadopulos & Associates, Inc., for Nestle Waters North America, Inc.

SSPA, 2019a. *2018 Annual Monitoring Report, Ruby Mountain Springs, Chaffee County, Colorado*. Prepared by S.S. Papadopulos & Associates, Inc., for Nestle Waters North America, Inc.

SSPA, 2019b. *2018 Sustainability Report, Ruby Mountain Springs, Chaffee County, Colorado*. Prepared by S.S. Papadopulos & Associates, Inc., for Nestle Waters North America, Inc.

Smith, M., Allen, R., Montieth, J., Perrier, A., Pereira, L., and Segeren, A., 1991. Report of the expert consultation on procedures for revision of FAO guidelines for prediction of crop water requirements. UN-FAO, Rome, Italy, 54p.

Scott, G. R., 1975. *Reconnaissance geologic map of the Buena Vista Quadrangle, Chaffee and Park Counties, Colorado*: U.S. Geological Survey, Miscellaneous Field Studies Map MR-657, 1/62,500-scale.

Topper, R., K. L. Spray, W. H. Bellis, J. L. Hamilton, and P. E. Barkmann, 2003. *Groundwater Atlas of Colorado*. Colorado Geological Survey, Department of Natural Resources, Special Publication 53.

USDA, 1961. *Soil Survey, Trout Creek Watershed, Colorado*. Series 1958, No. 5. Prepared by United States Department of Agriculture.

USGS, 2013. *National Hydrography Dataset*. Retrieved March 29, 2017, from https://viewer.nationalmap.gov/basic/

Watts, K.R., 2005. Hydrogeology and quality of groundwater in the upper Arkansas River Basin from Buena Vista to Salida, Colorado, 2000-2003: U.S. Geological Survey Scientific Investigations Report 2005-5179, p. 61.

WCED, 1987. Our Common Future (aka. Brundtland Report). Prepared by the World Commission on Environment and Development (WCED). Oxford: Oxford University Press.

Western Regional Climate Center, 2016. *Colorado climate summaries*: Retrieved February 27, 2016, from http://www.wrcc.dri.edu/summary/coF.html

Figures

Figure 1.1 Project Location within the Upper Arkansas River Valley and Other Monitoring Stations

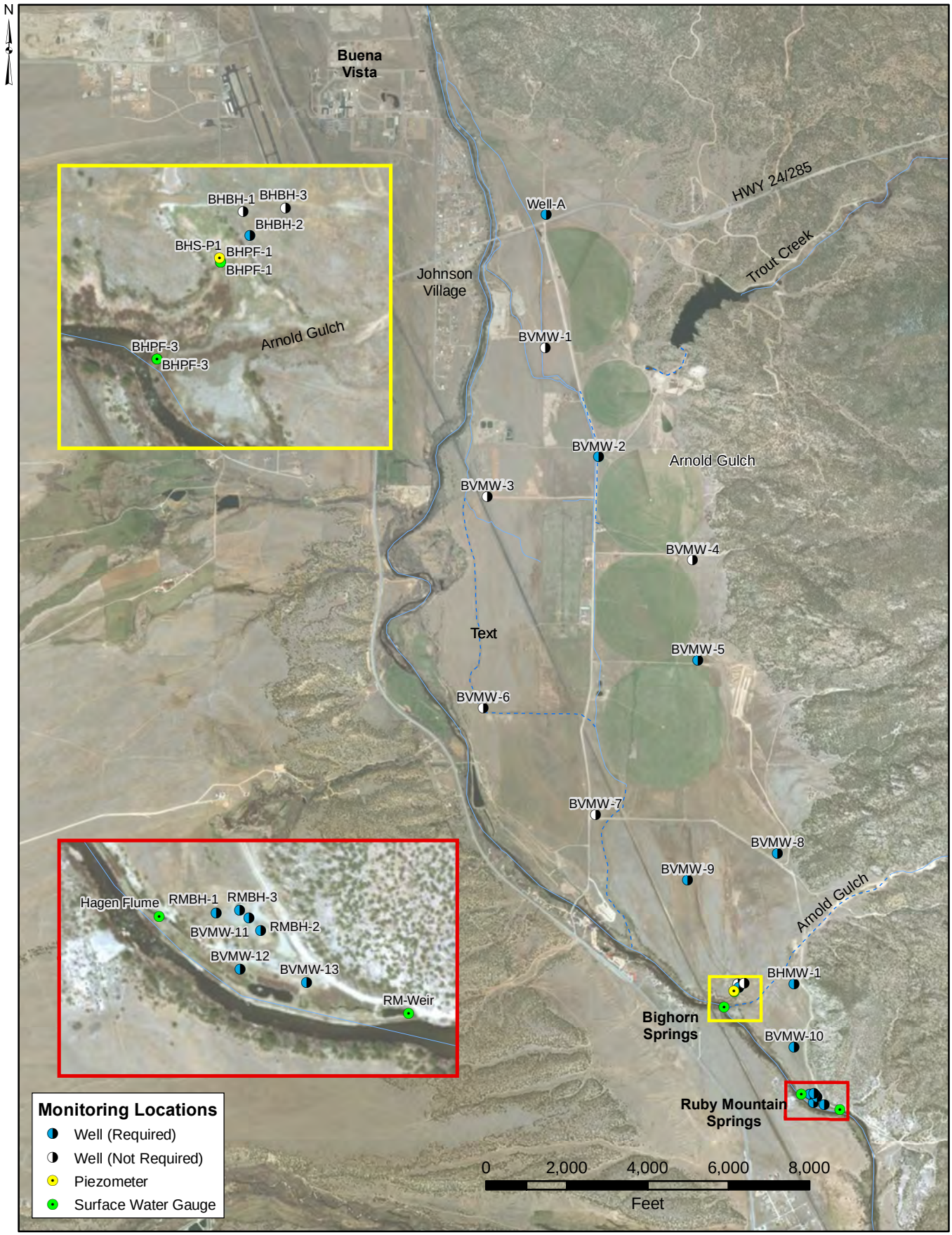


Figure 1.2 Monitoring Locations in the Ruby Mountain Springs Network

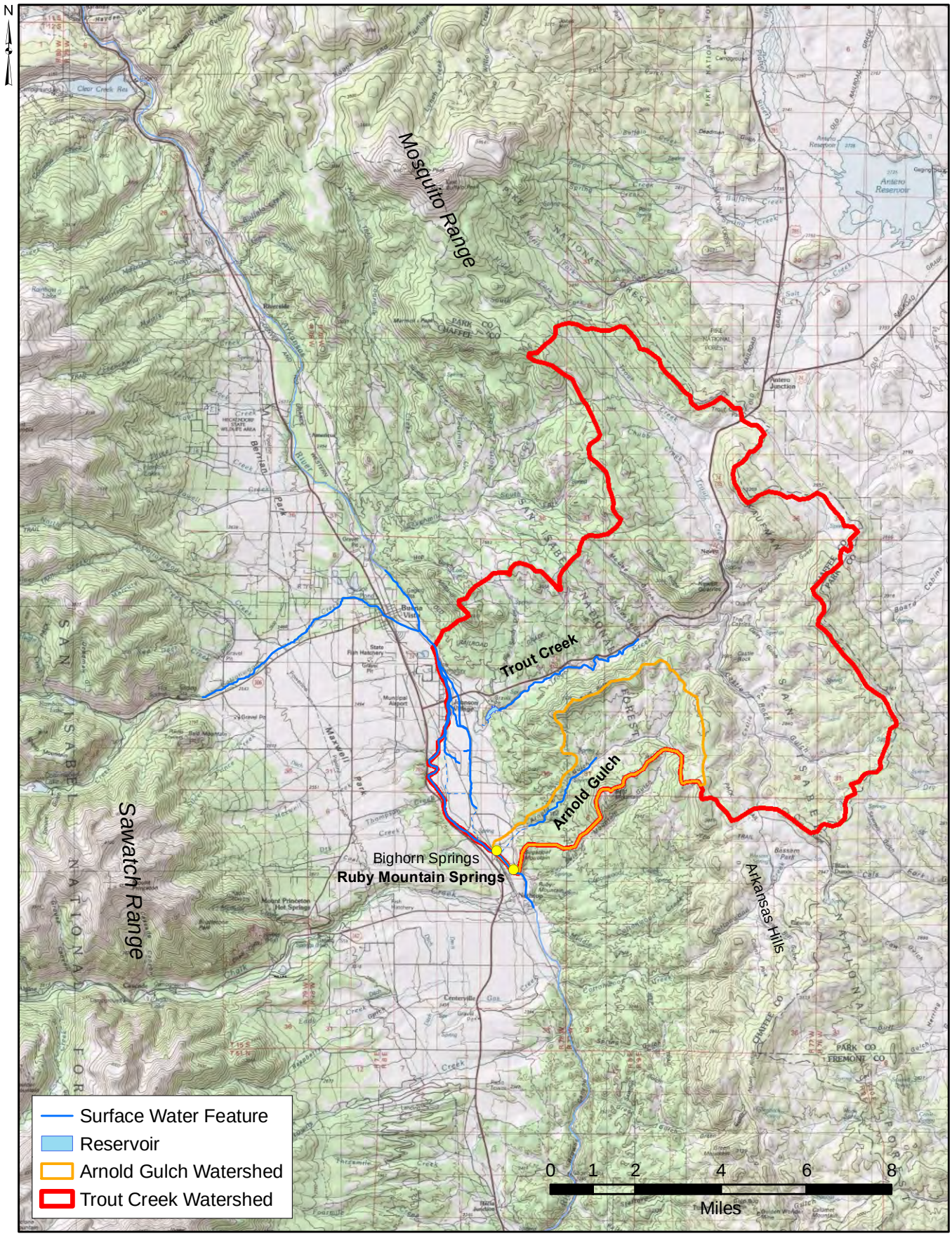


Figure 1.3 Physiography of the Area

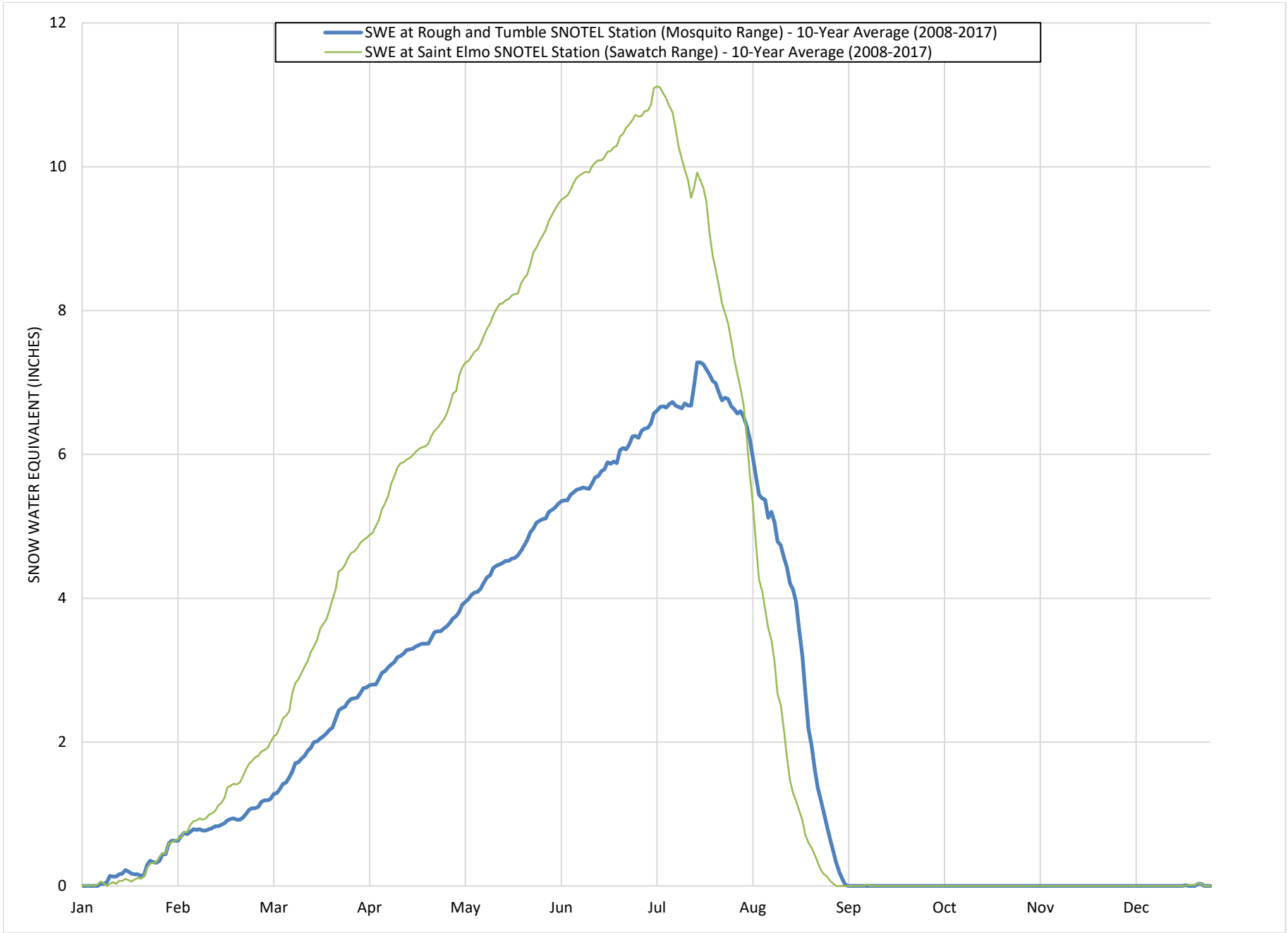


Figure 1.4. Average SNOTEL Snow Water Equivalent (SWE) near Ruby Mountain Springs

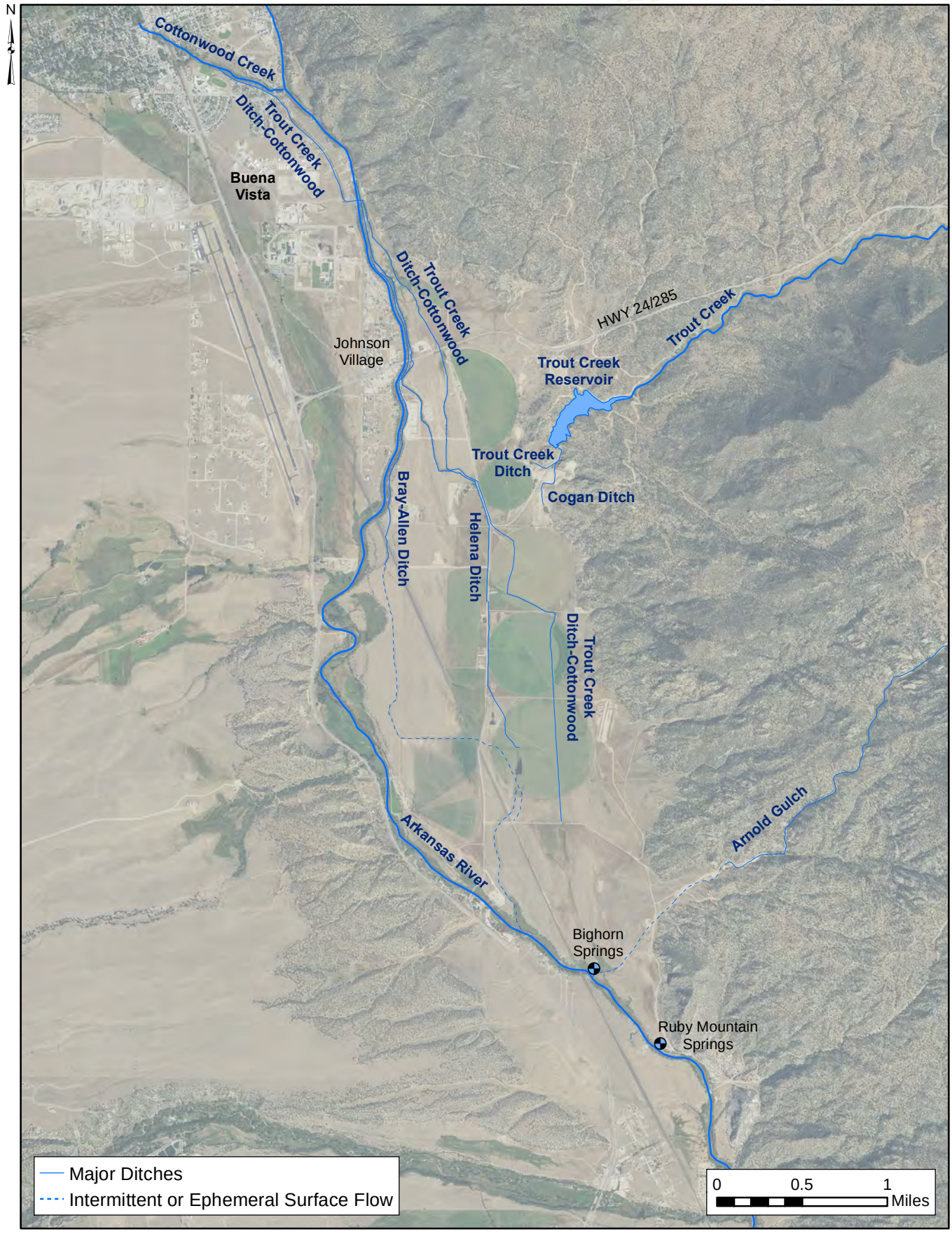


Figure 1.5 Surface Waters near Ruby Mountain Springs

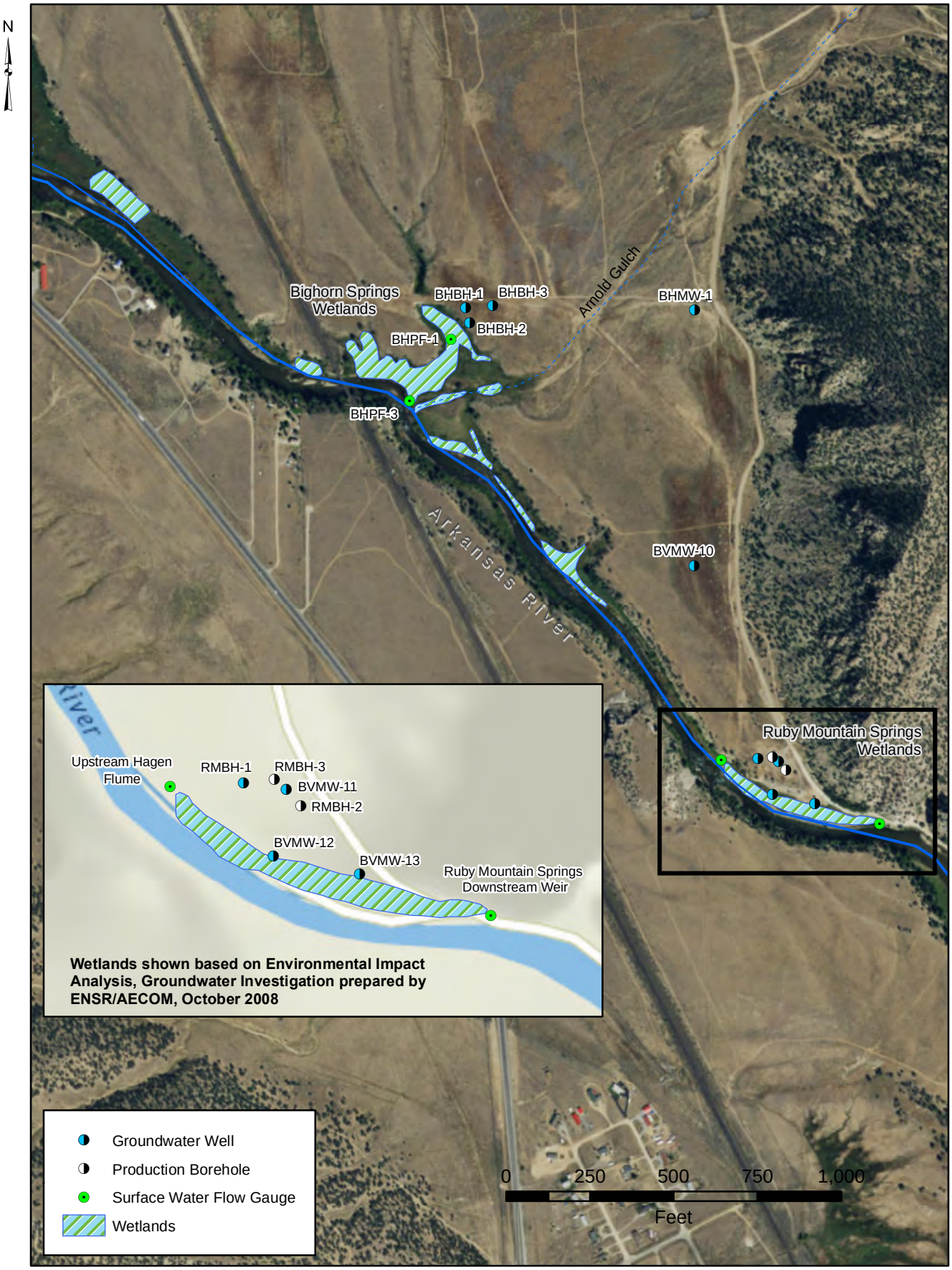


Figure 1.6 Wetland Areas near Bighorn Springs and Ruby Mountain Springs

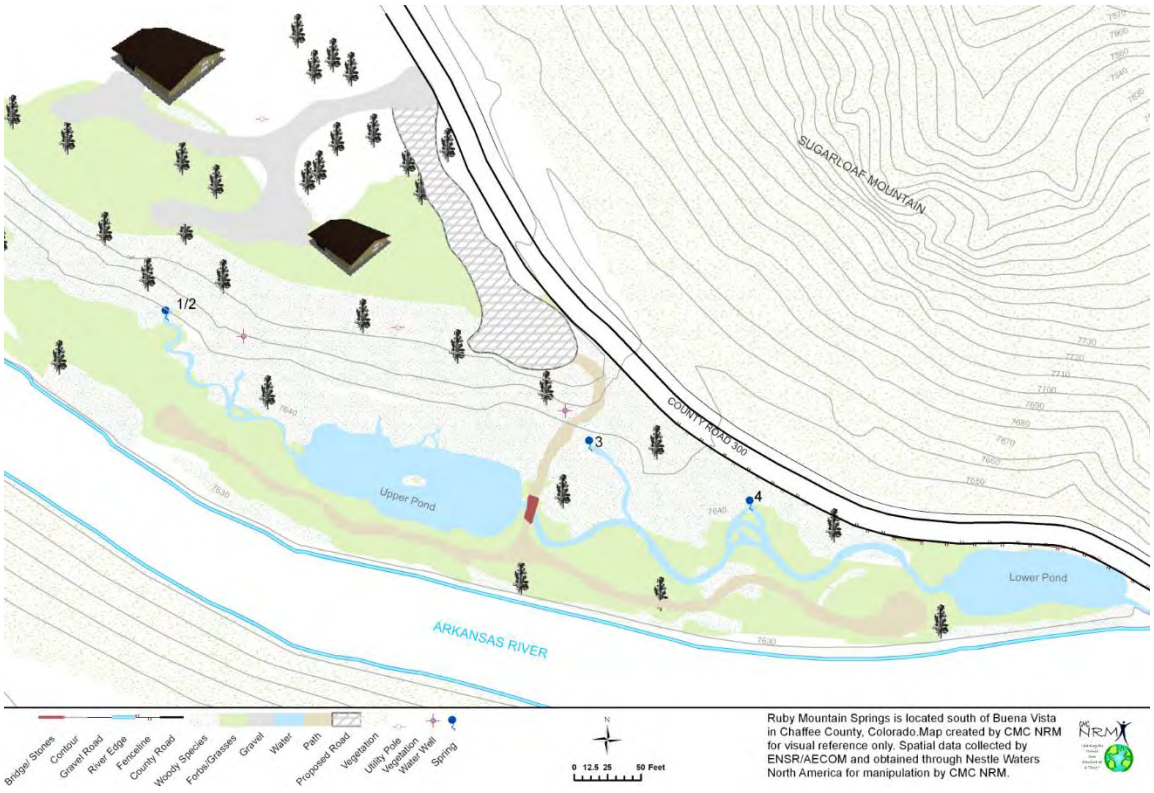


Figure 1.7a. Pre-Reclammation Site Conditions, Ruby Mountain Springs (CMC, 2011)

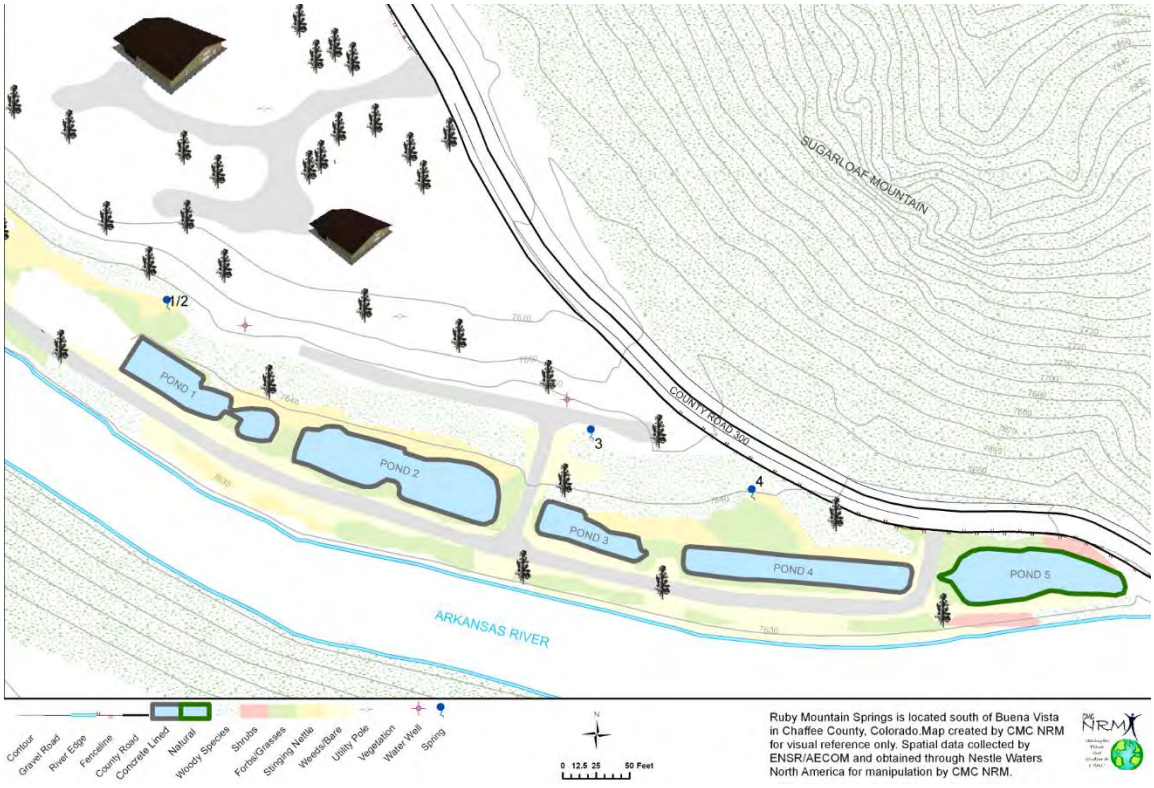


Figure 1.7b. Post-Reclammation Site Conditions, Ruby Mountain Springs (CMC, 2011)

Figure 1.8. Bighorn Springs Wetland Vegetation Transects, Photo Points, and Wetland Identification Number (CMC, 2017a)

Note:
1. Data Source: Colorodo Geologic Survey - Buena Vista East Quadrangle (2004)
2. Open-File Report 04-4. Original Map Scale = 1:24,000

RUBY MOUNTAIN SPRINGS

Sugarloaf Mountain

Dorothy's Butte

Ruby Mountain

Miles
0 0.25 0.5 1

1830 000 FEET

Legend

af	Artificial fill (latest Holocene)	Qn	Nussbaum (?) Alluvium (early Pleistocene)	Td?	
Qal	Stream-channel, flood-plain, and low-terrace alluvium (Holocene)	Qc	Colluvium (Holocene and late Pleistocene)	Tnt	Tuff and tuff breccia of the Nathrop Volcanics (middle Oligocene)
Qaly	Stream-channel, flood-plain, and low-terrace alluvium (Holocene)	Qt	Talus deposits (Holocene)	Tnv	
Qat	Younger terrace alluvium (Holocene)	Qls	Landslide deposits, undifferentiated (middle? Pleistocene to Holocene)	Tnr	Rhyolite of the Nathrop Volcanics - (middle Oligocene)
Qpoy (1-3)	Pinedale outwash deposits, younger (late Pleistocene)	Qac	Alluvium and colluvium, undivided (Holocene and late Pleistocene)	Tan	Andesite (late Eocene?)
Qpoo	Pinedale outwash deposits, older (latest Pleistocene)	Qaco	Alluvium and colluvium, older (Pleistocene)	Ttr	Triad Ridge Tuff (late Eocene)
Qboy	Bull Lake outwash deposits, younger (late Pleistocene)	Qf	Alluvial-fan deposits, undifferentiated (Holocene and late Pleistocene)	Tdd	
Qao	Old alluvium (early to middle Pleistocene)	Qfy	Alluvial-fan deposits, younger (Holocene)	YXp	Pegmatite (Early or Middle Proterozoic)
Qaof		Qfi		YXg	Granite (Early or Middle Proterozoic)
Qk	Kansan (?) alluvium (middle Pleistocene)	Qfo	Alluvial-fan deposits, older (late Pleistocene)	Xqd	Quartz diorite (Early Proterozoic)
Qna	Nebraskan (?) alluvium (early Pleistocene)	Qbf		Xgd	Granodiorite (Early Proterozoic)
		Td	Dry Union Formation (Pliocene and Miocene)	Lake	

ENSR | AECOM

CHAFFEE COUNTY 1041 REPORT
NESTLE WATERS NORTH AMERICA INC.
CHAFFEE COUNTY, CO

GEOLOGY

DATE: 10/17/08 | DWRN: CBB/ftc | Revision: 0 | FIGURE 2

Figure 1.9 Geologic Map of the Area (AECOM, 2009)

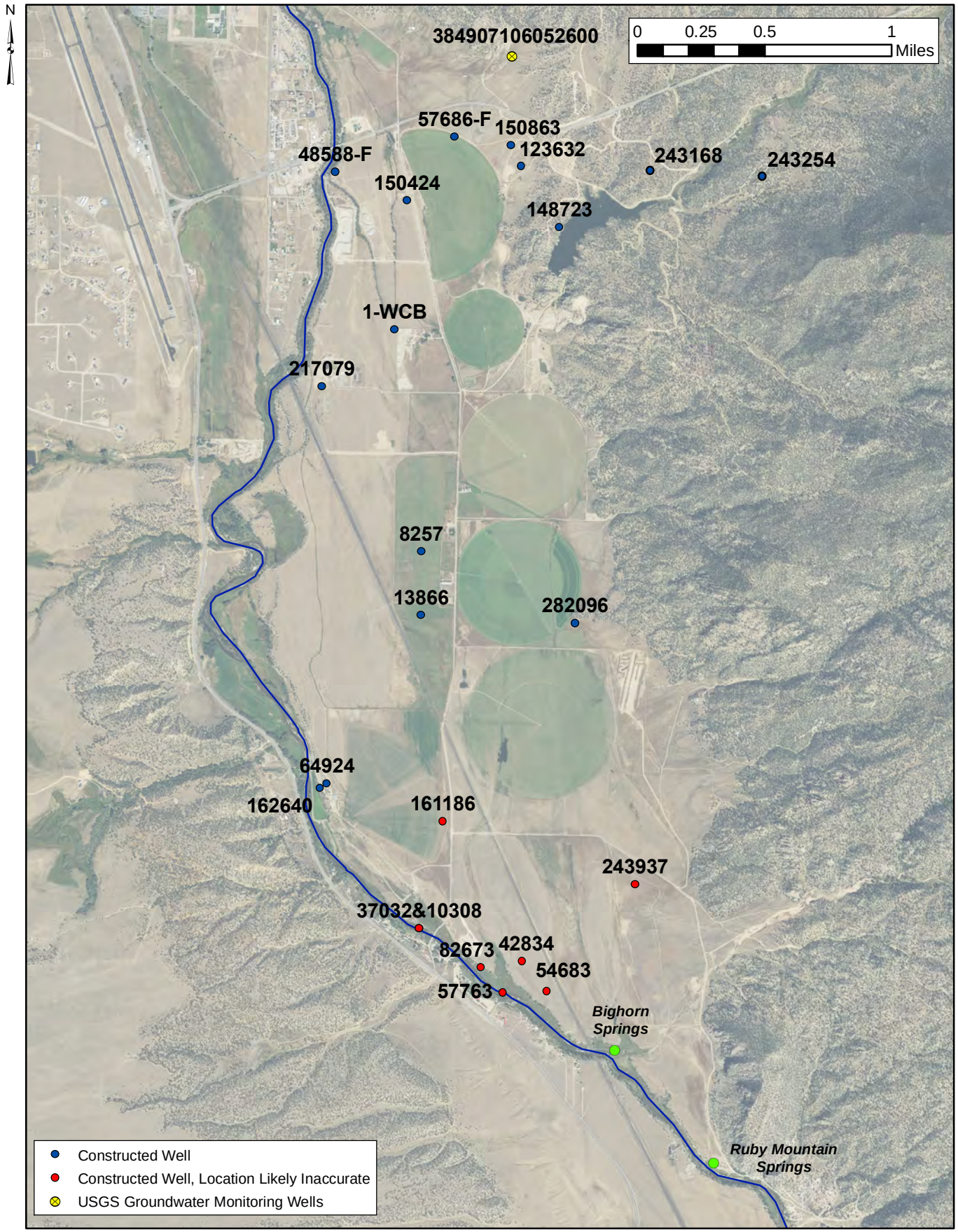


Figure 1.10 Locations of Other Groundwater Wells in the Ruby Mountain Springs Area

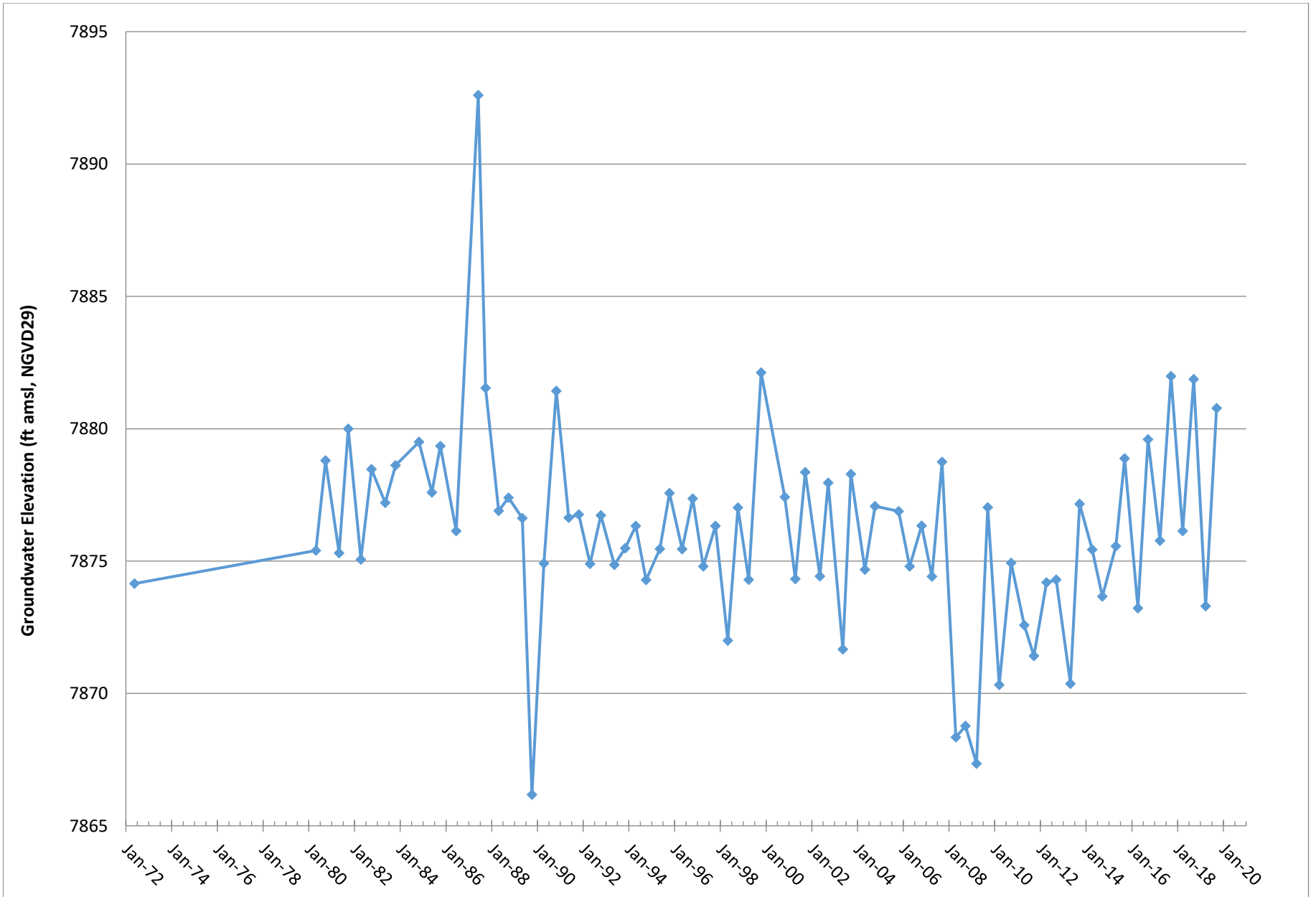
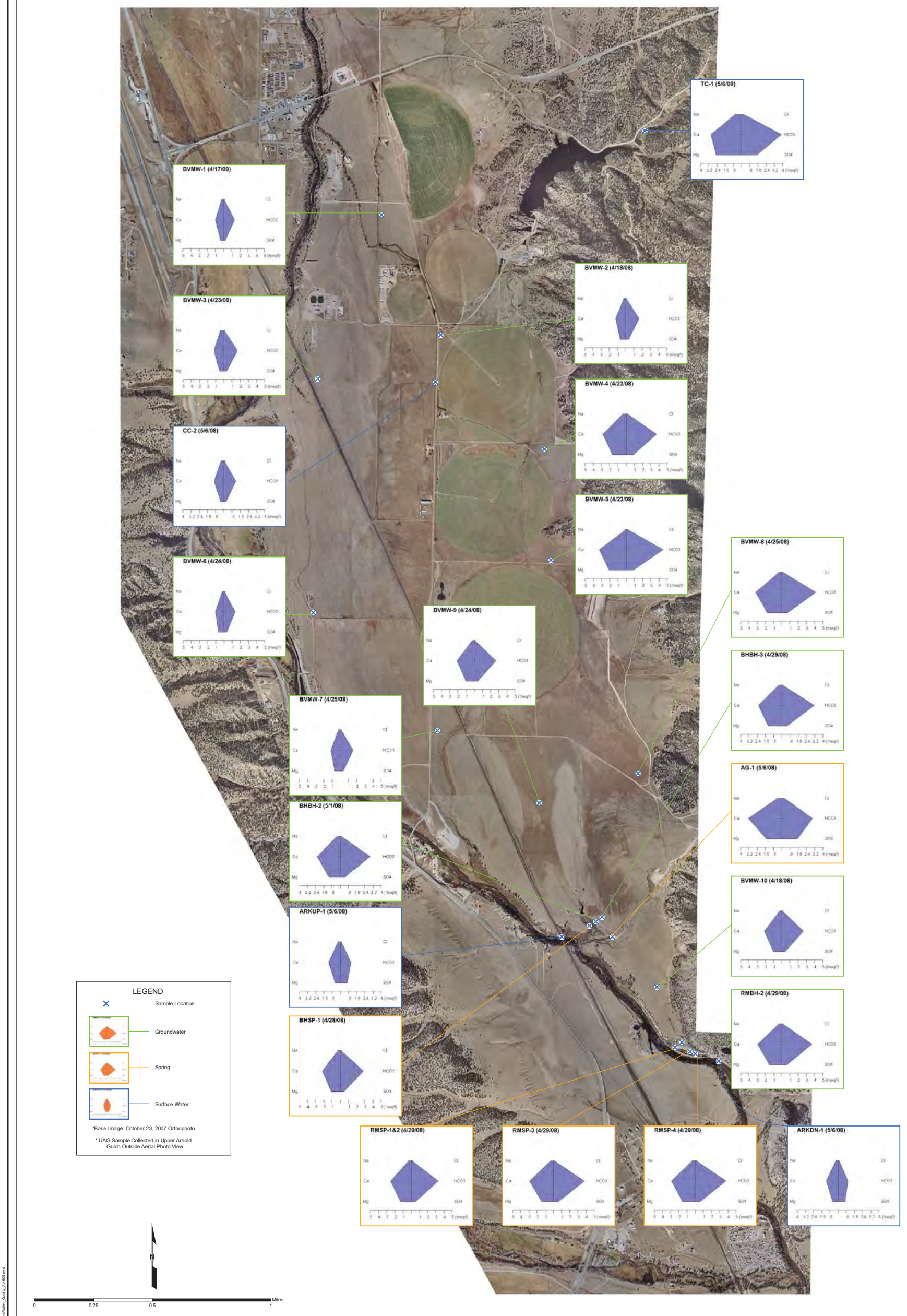


Figure. 1.11 Groundwater Levels for USGS 384907106052600



AECOM

NESTLÉ WATERS NORTH AMERICA INC. CHAFFEE COUNTY, CO			MONITORING NETWORK GEOCHEMISTRY APRIL AND MAY 2008 BUENA VISTA PHASE II REPORT
DATE: 6/12/08	DRWN: CBB/ftc	Revision: 0	FIGURE 3.10a

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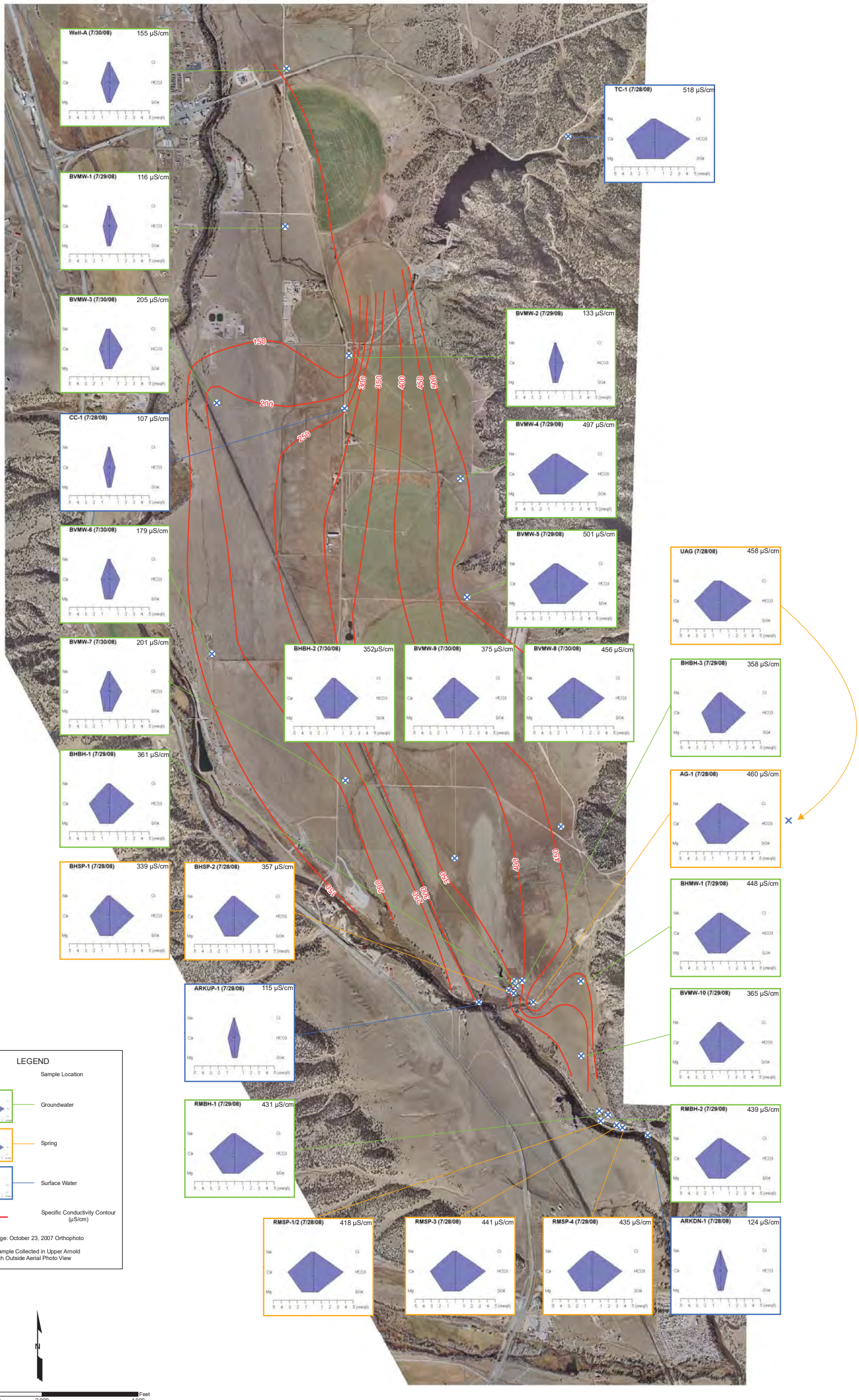
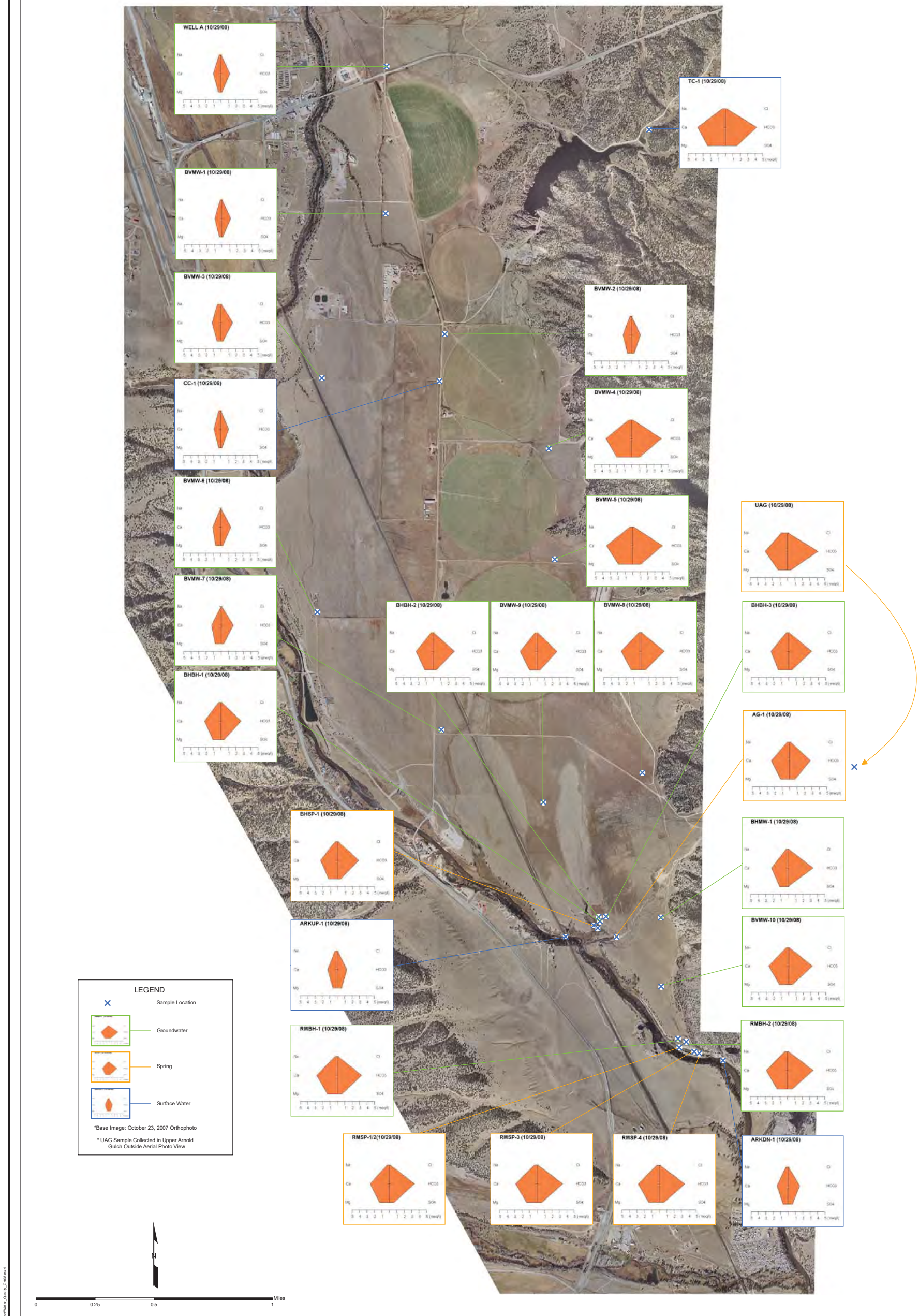
Figure 1.12a Groundwater Geochemistry for the NWNA Monitoring Network, April and May 2008 (AECOM, 2009)



AECOM

NESTLÉ WATERS NORTH AMERICA INC. CHAFFEE COUNTY, CO			MONITORING NETWORK GEOCHEMISTRY JULY 2008 BUENA VISTA PHASE II REPORT
DATE: 05/15/2009	DRWN: CBB/ftc	Revision: 1	FIGURE 3.10b

Figure 1.12b Groundwater Geochemistry for the NWNA Monitoring Network, July 2008 (AECOM, 2009)



AECOM

NESTLÉ WATERS NORTH AMERICA INC.			MONITORING NETWORK GEOCHEMISTRY OCTOBER 2008 BUENA VISTA PHASE II REPORT
CHAFFEE COUNTY, CO			
DATE: 03/13/09	DRWN: CBB/ftc	Revision: 0	FIGURE 3.10c

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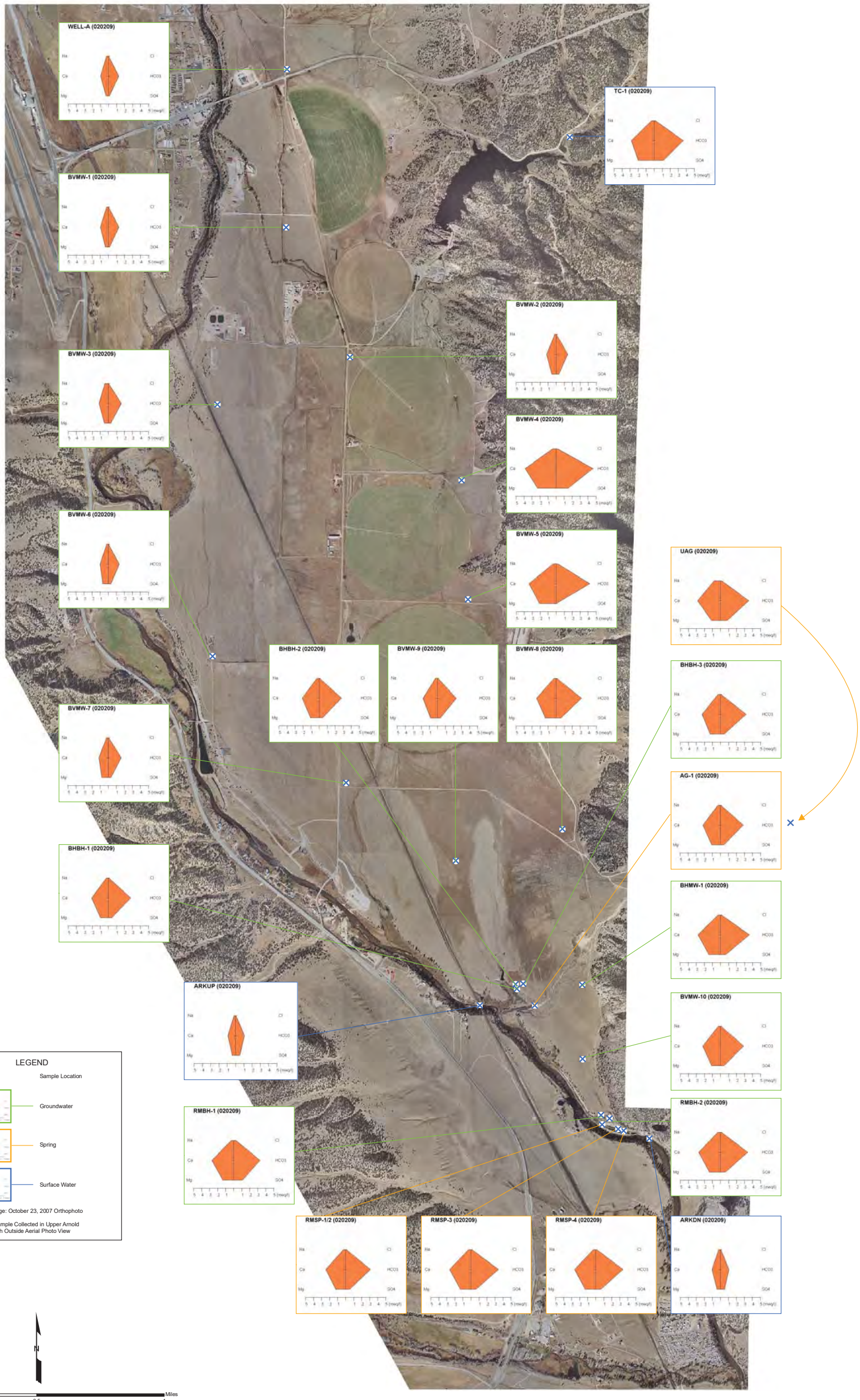
Figure 1.12c Groundwater Geochemistry for the NWNA Monitoring Network, October 2008 (AECOM, 2009)



AECOM

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CHAFFEE COUNTY, CO			
DATE: 07/20/09	DRWN: CBB/ftc	Revision: 0	FIGURE 3.10d

Figure 1.12d Groundwater Geochemistry for the NWNA Monitoring Network, February 2009 (AECOM, 2009)

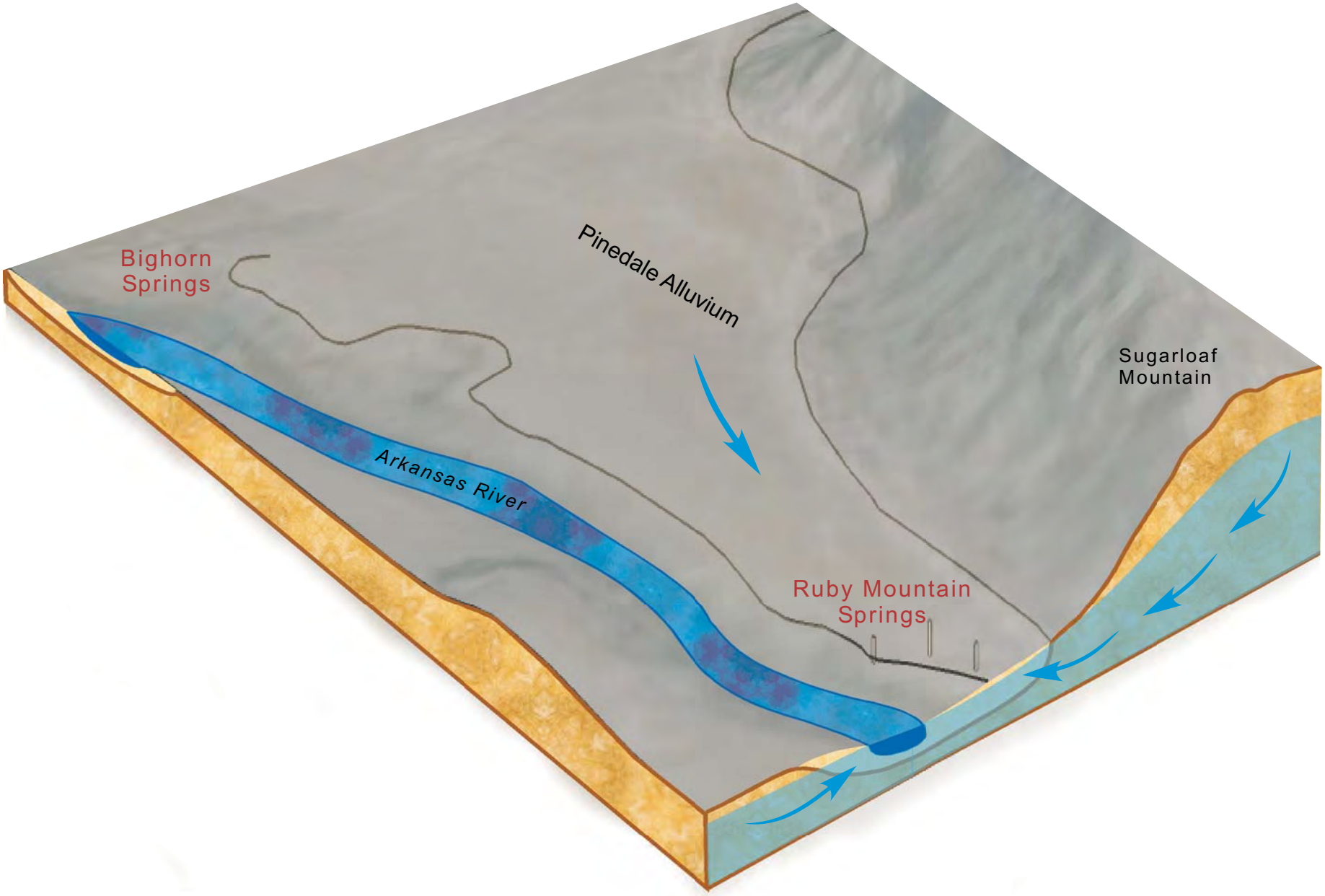

Figure 1.13 Conceptual Site Model

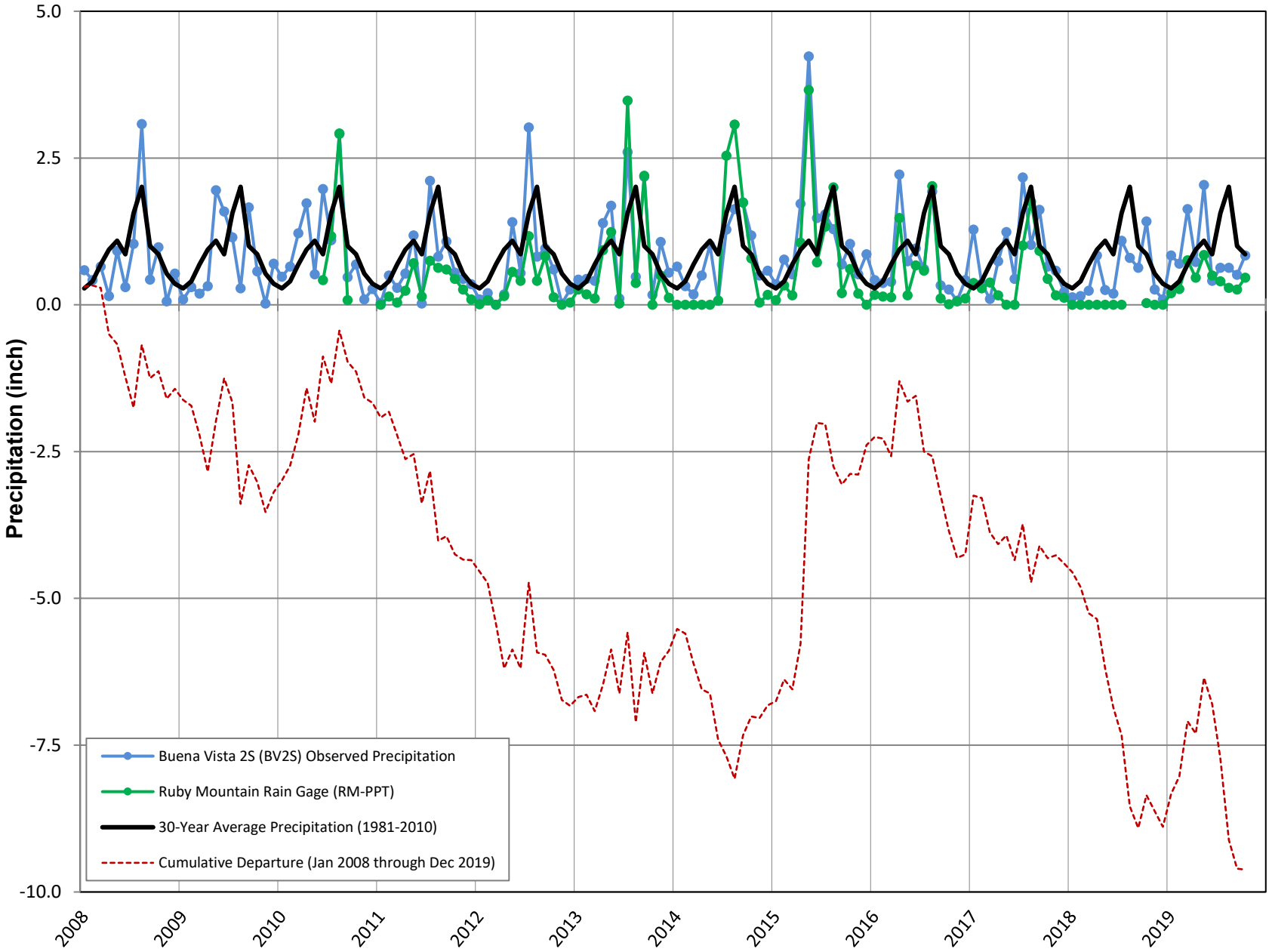

Figure 2.1 Monthly Precipitation and Cumulative Departure from Normal

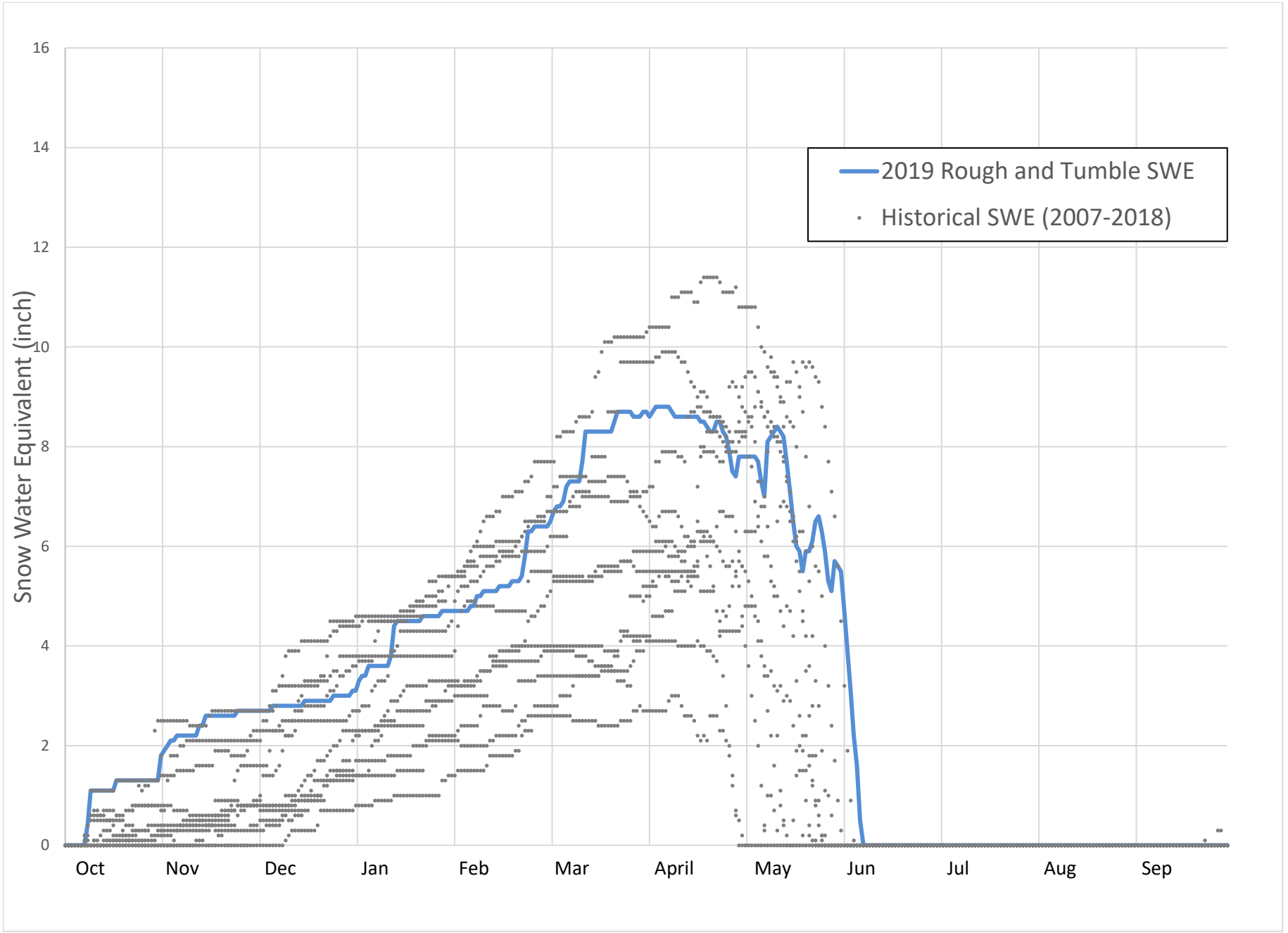

Figure 2.2a. SNOTEL Snow Water Equivalent (SWE) at Rough and Tumble SNOTEL Station

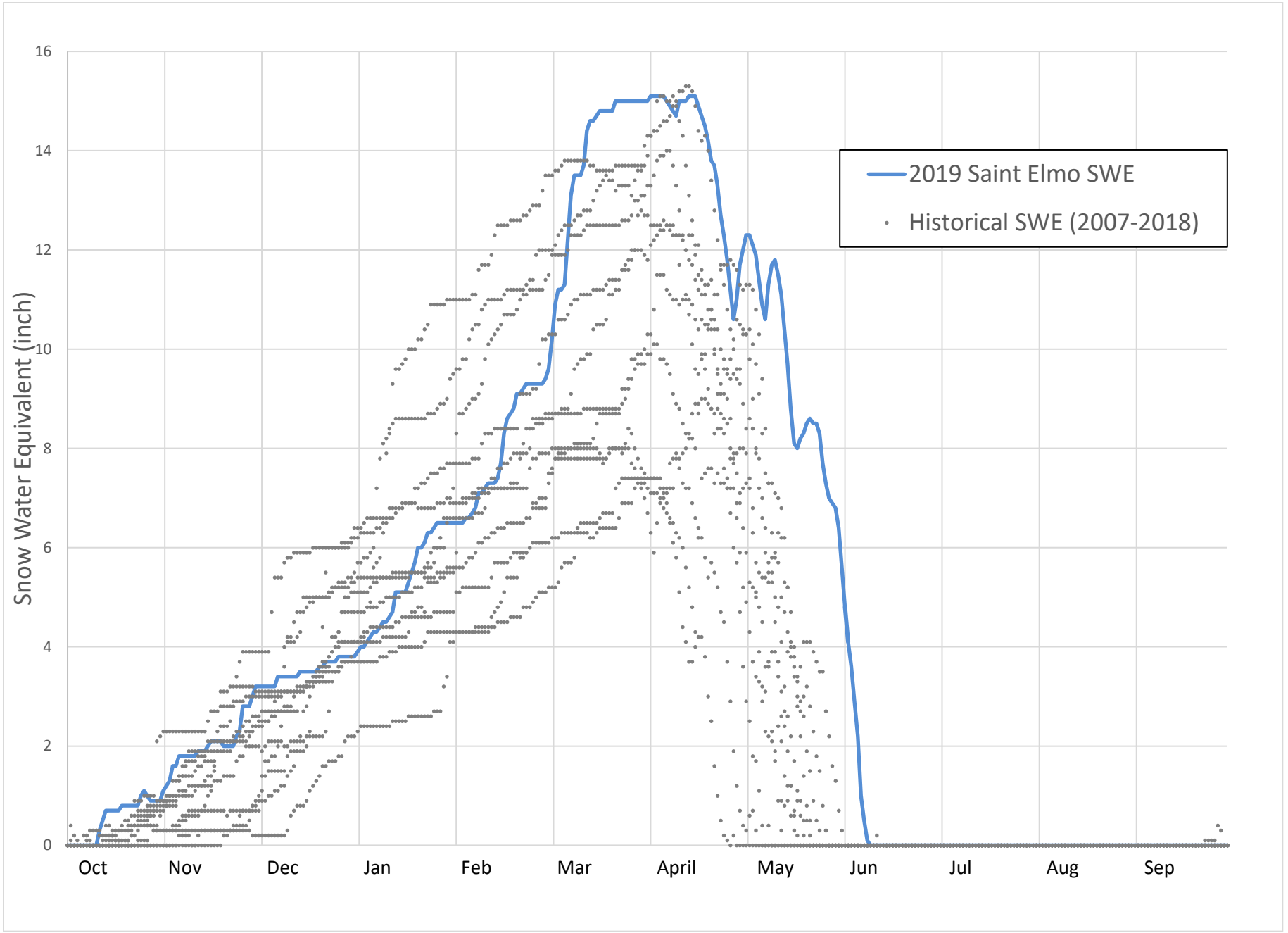

Figure 2.2b. SNOTEL Snow Water Equivalent (SWE) at Saint Elmo SNOTEL Station

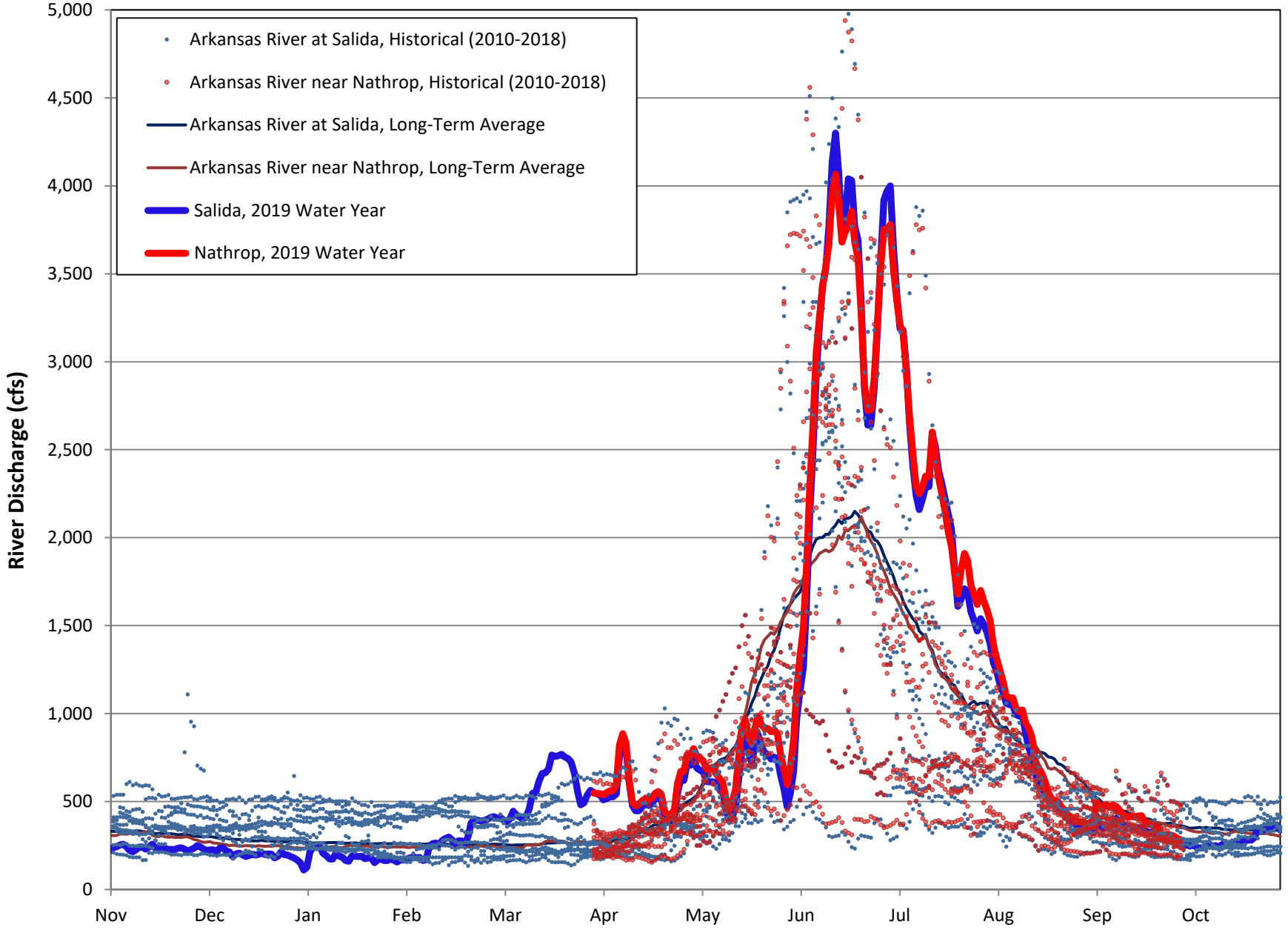

Figure 2.3 Average Daily Flow and Long-Term Flow for Gages at the Arkansas River near Nathrop and at Salida, 2010-2019 Water Years

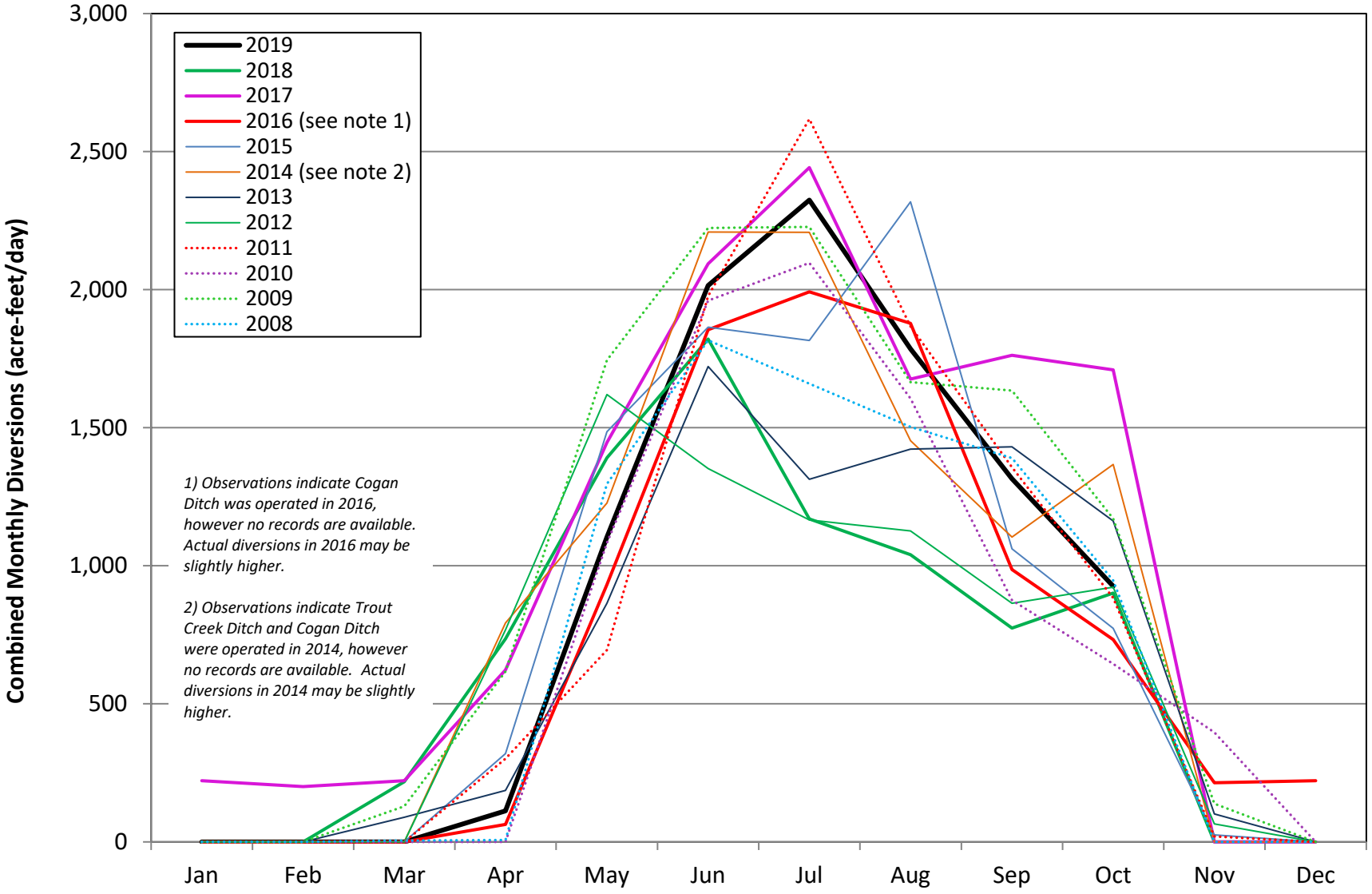

Figure 2.4 Combined Monthly Total Diversions, 2008 to 2019

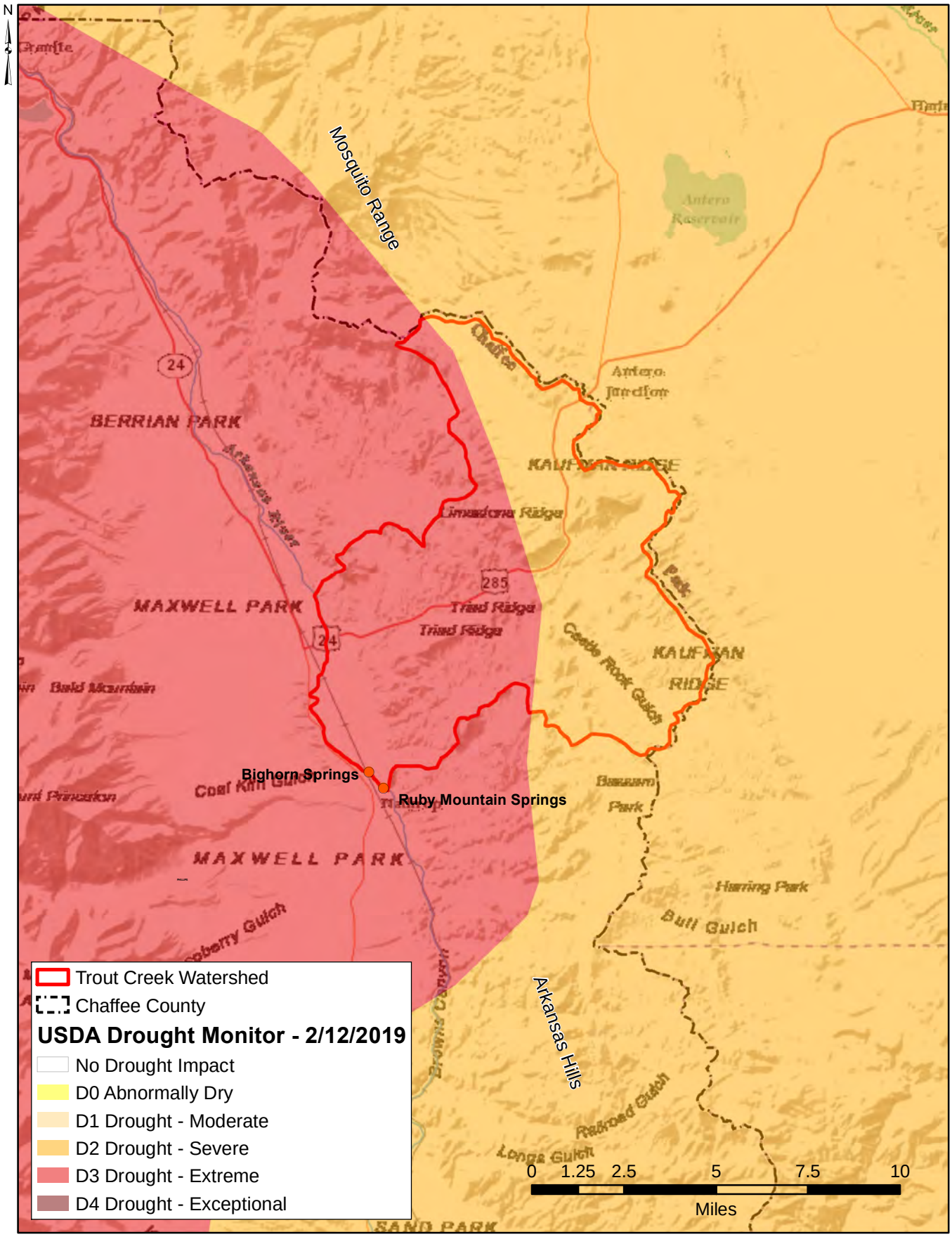

Figure 2.5a USDA Drought Monitor Map Q1 2019 - Chaffee County

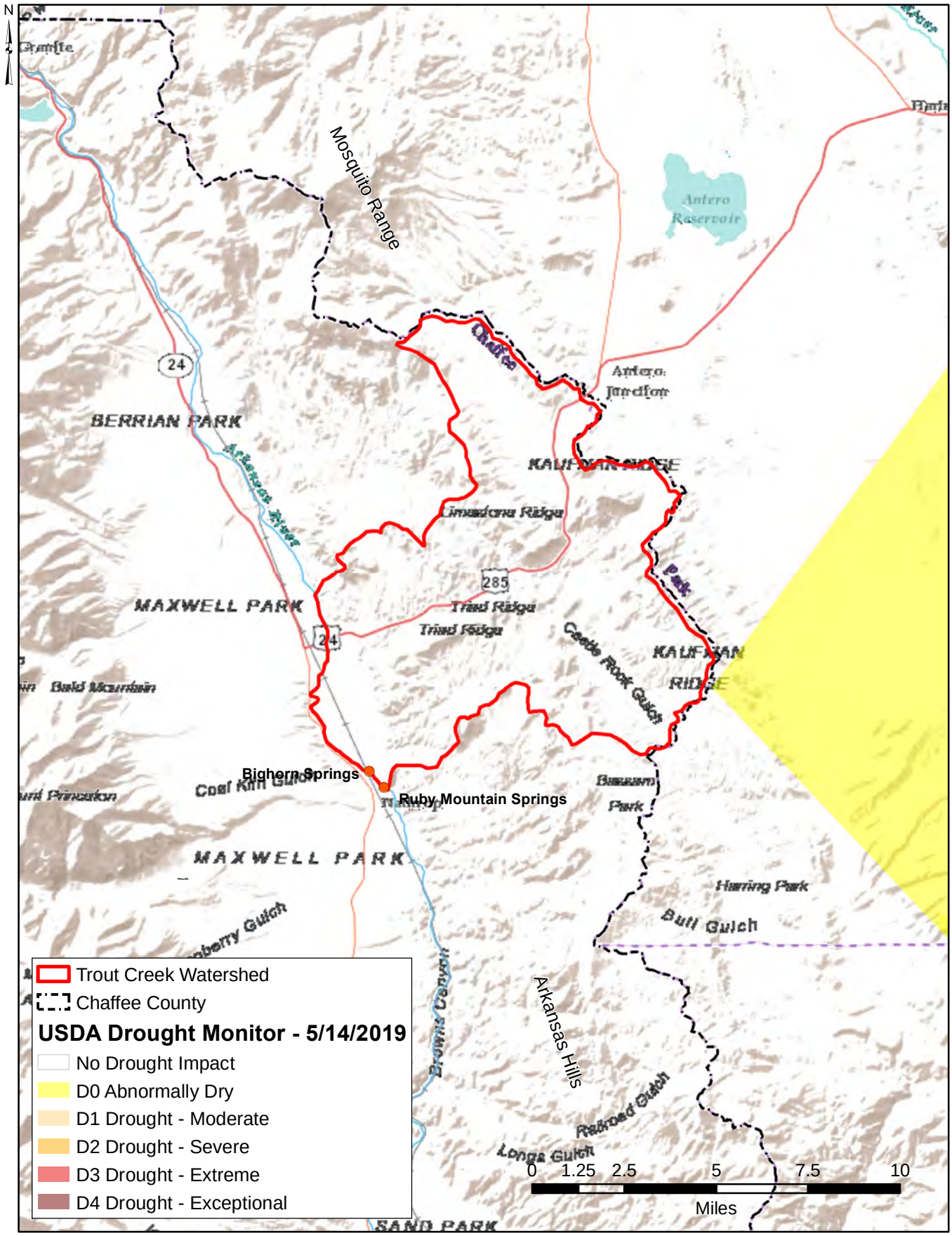

Figure 2.5b USDA Drought Monitor Map Q2 2019 - Chaffee County

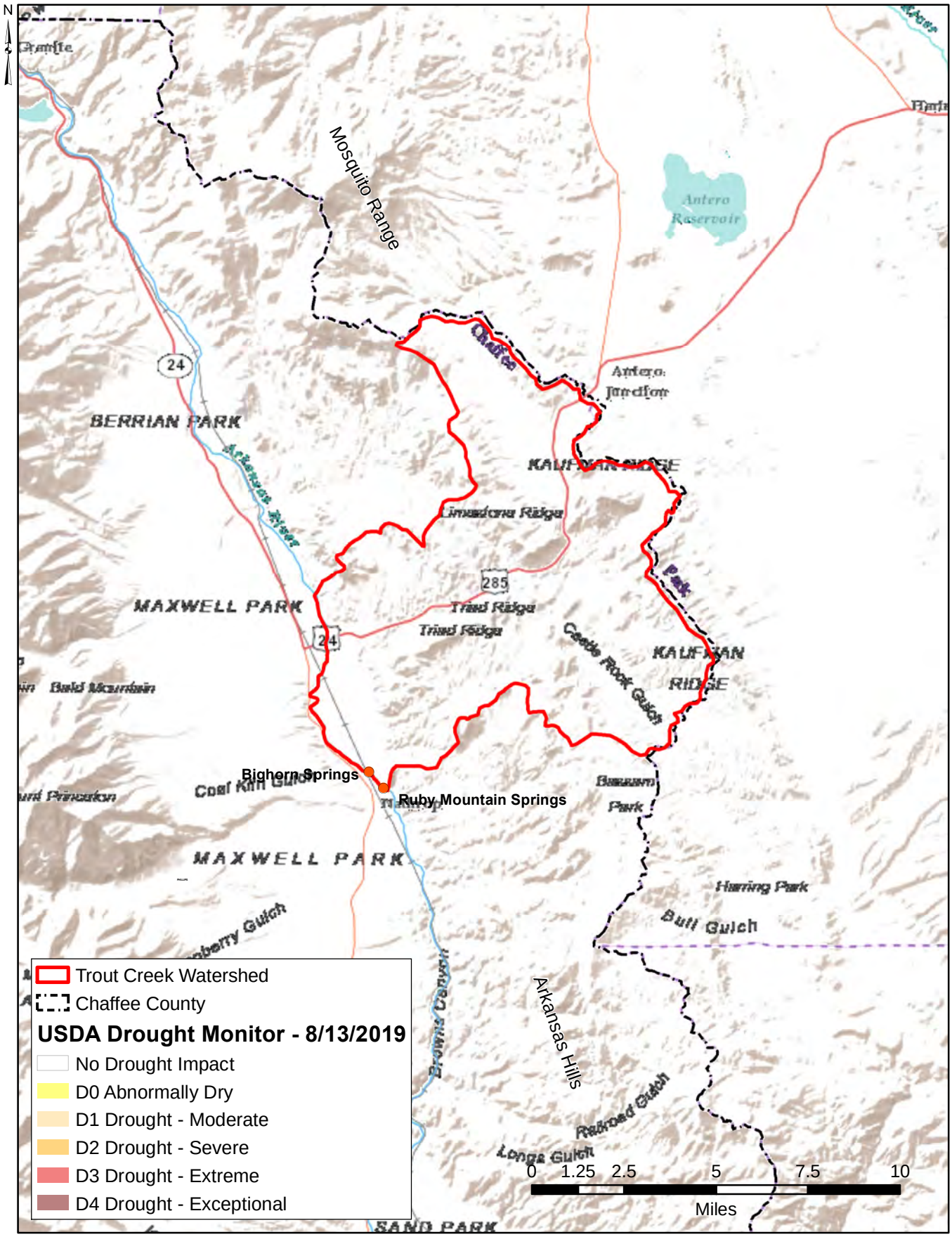

Figure 2.5c USDA Drought Monitor Map Q3 2019 - Chaffee County

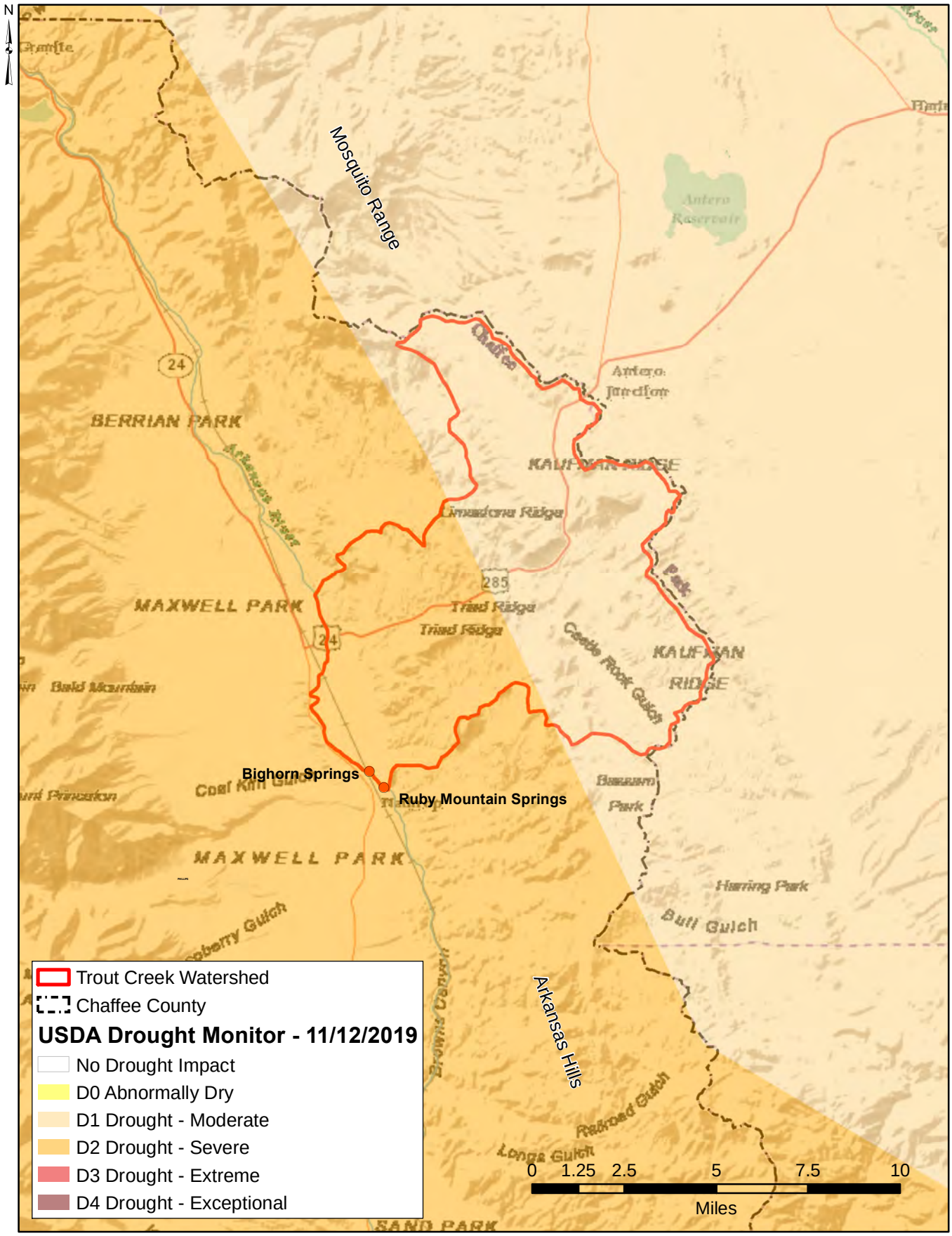

Figure 2.5d USDA Drought Monitor Map Q4 2019 - Chaffee County

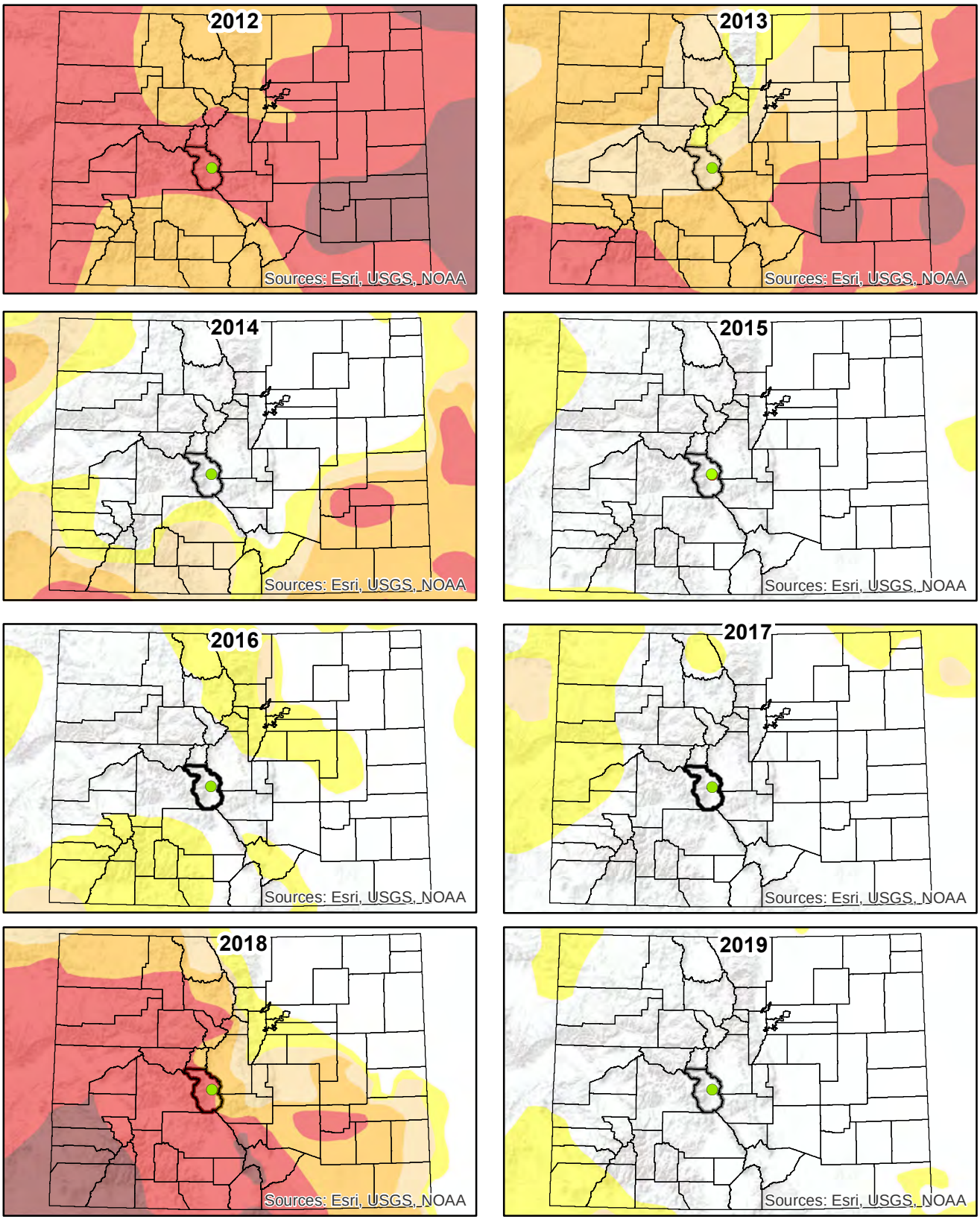

Figure 2.6 USDA Drought Monitor Map Q3 2012-2019

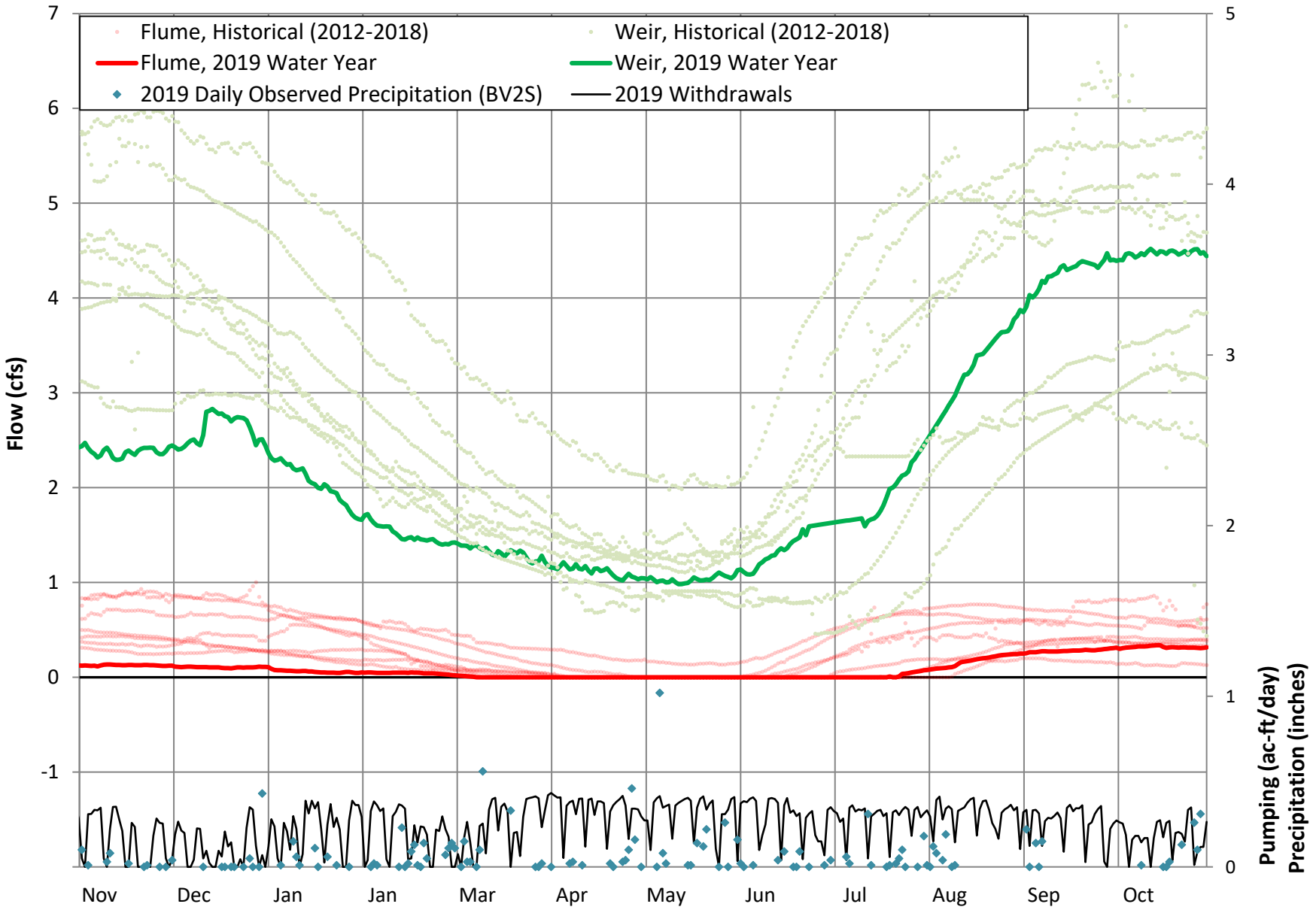

Figure 2.7 Average Daily Discharge, Ruby Mountain Springs, 2019 Water Year

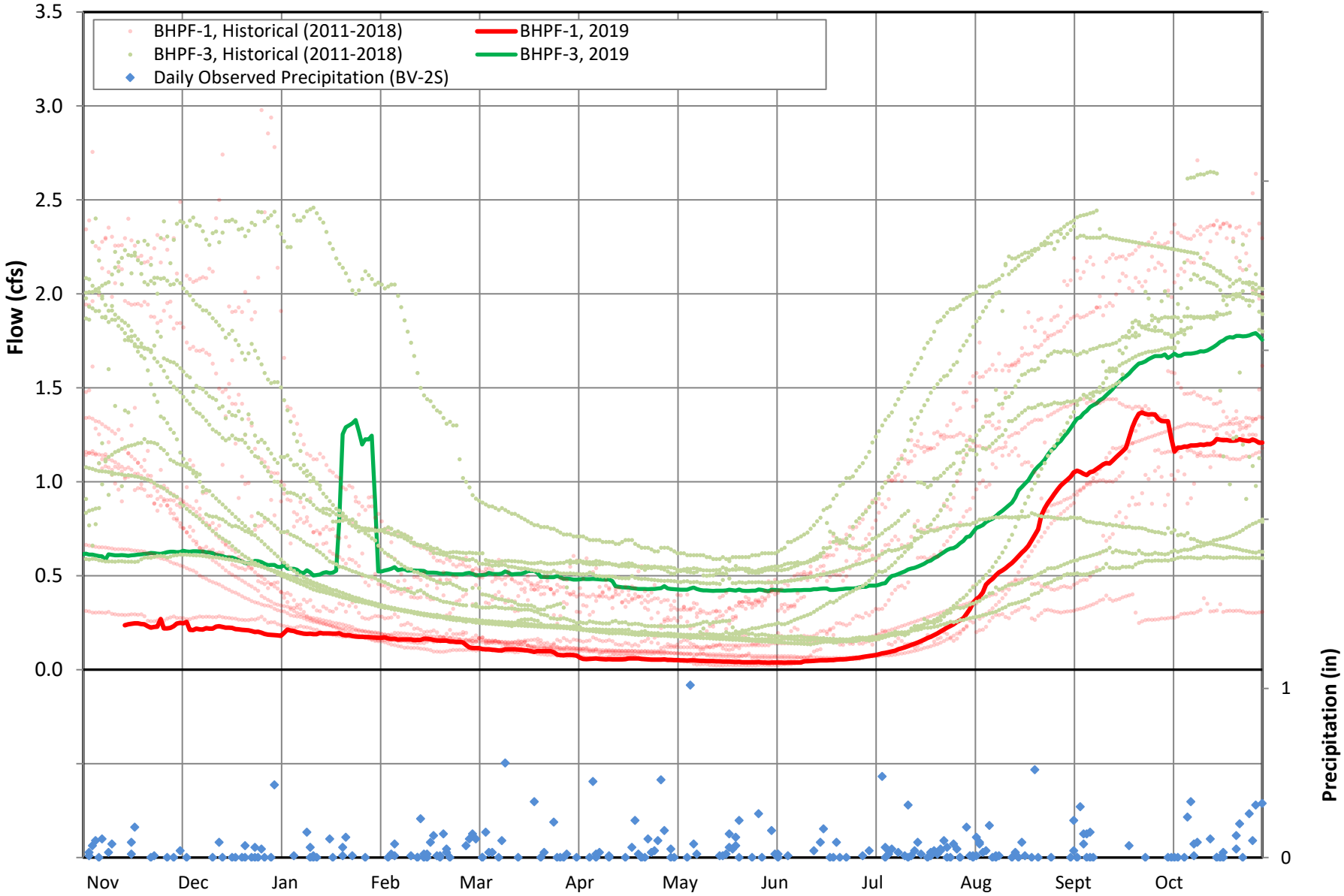

Figure 2.8 Average Daily Discharge, Bighorn Springs, 2019 Water Year

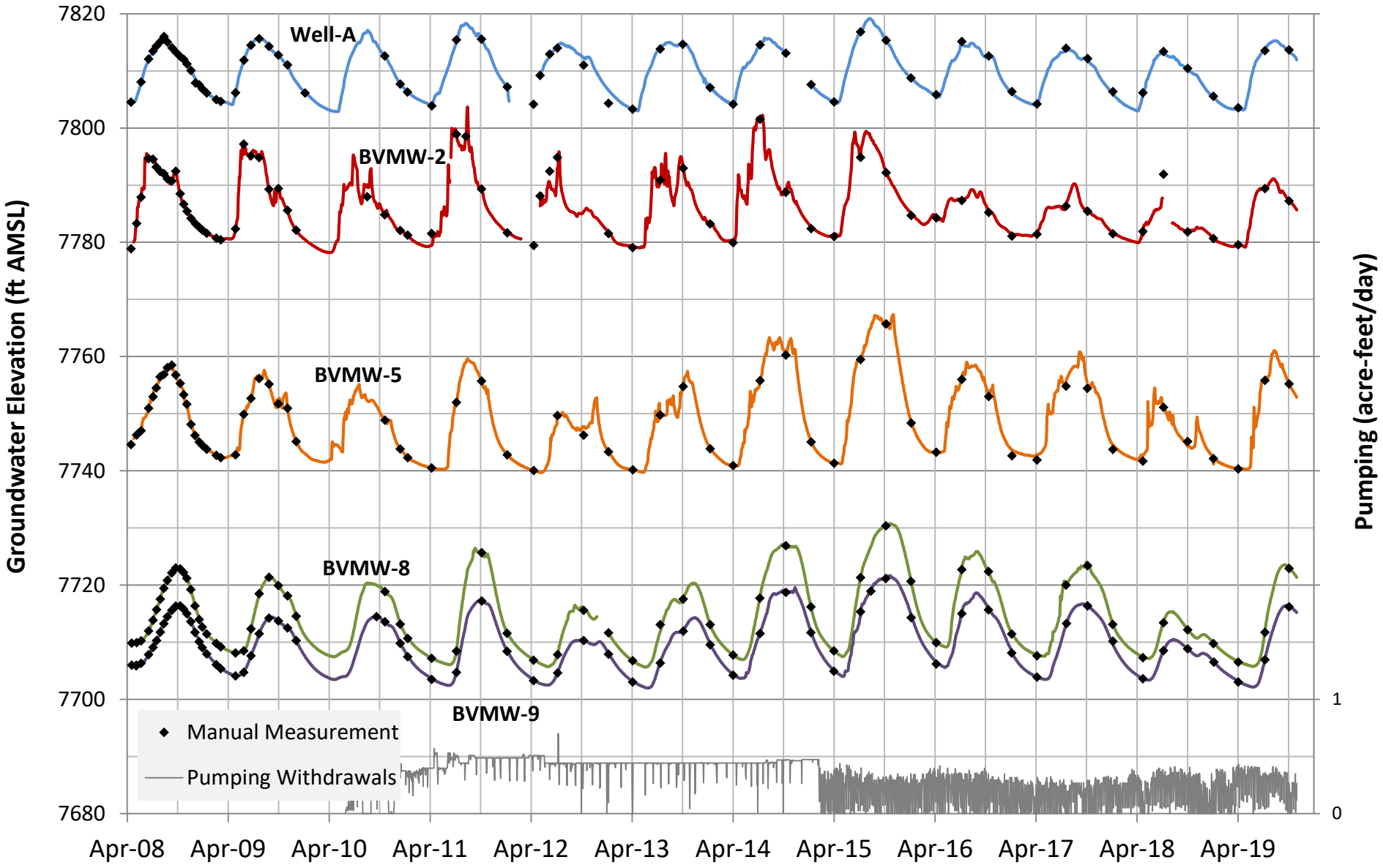

Figure 2.9 Groundwater Elevation Hydrographs, Up-gradient Wells

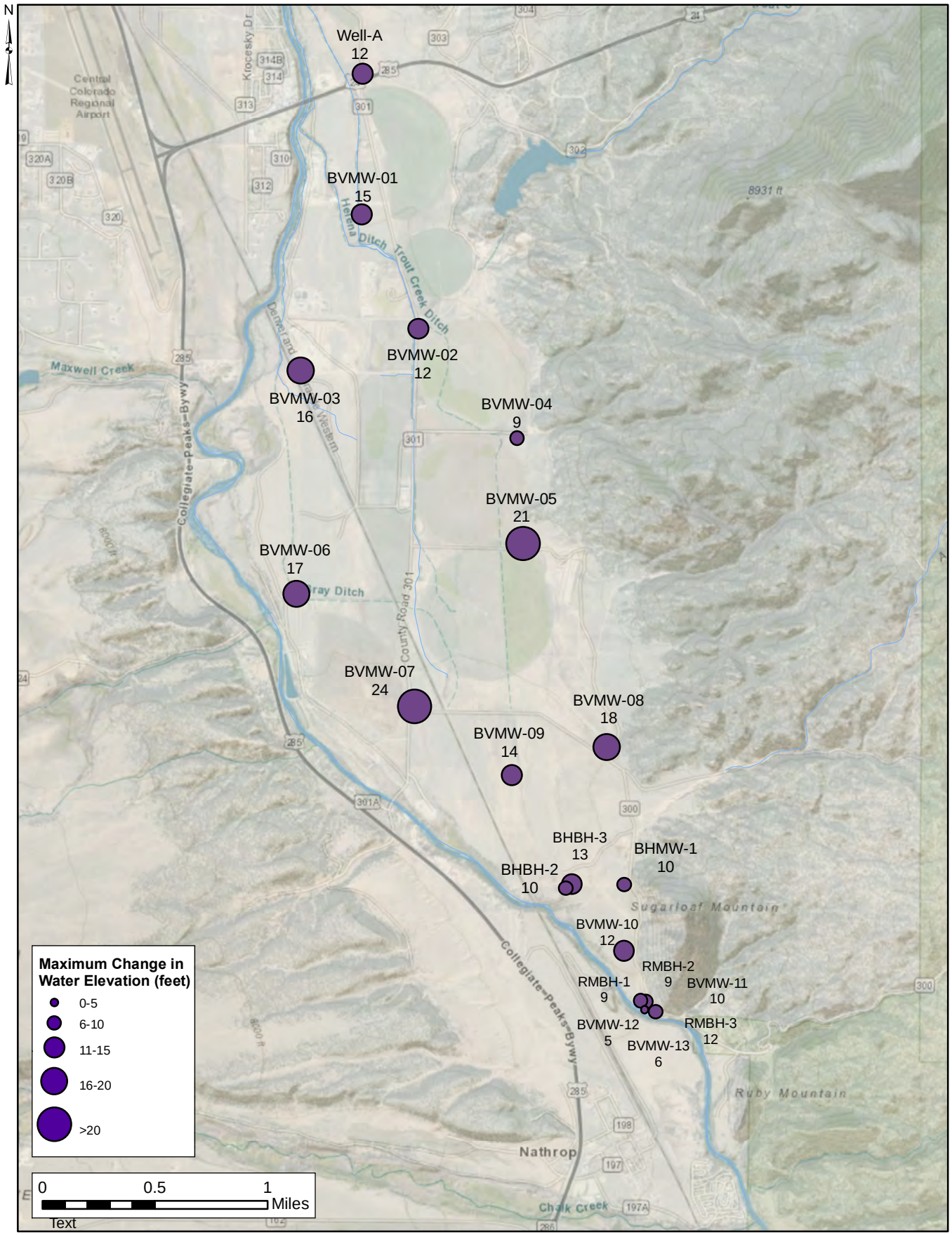

Figure 2.10 2019 Water Year Maximum Change in Water Levels

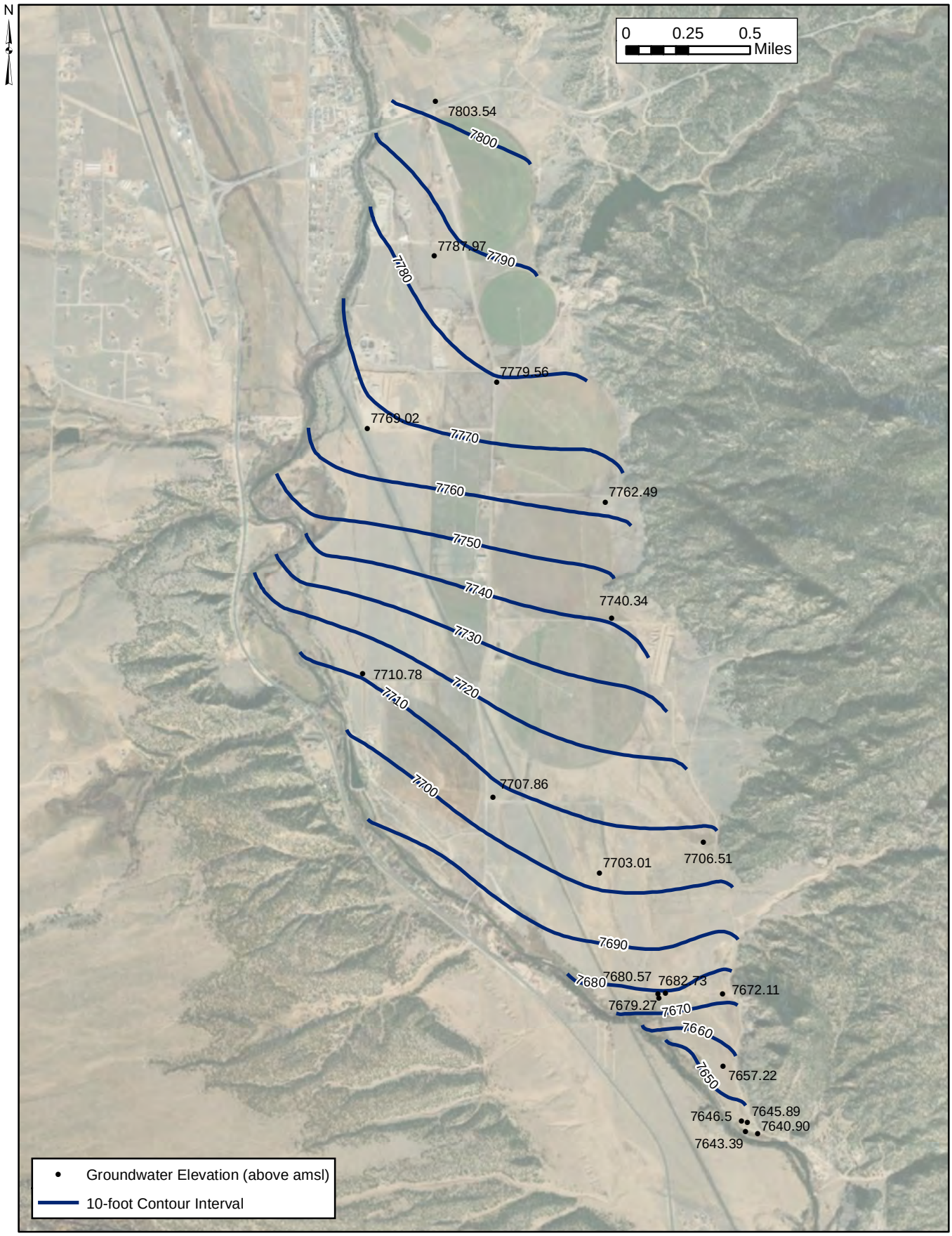

Figure 2.11 Groundwater Contour Map, April 3, 2019