Alpine Watershed Group
Protecting the Headwaters of the California Alps

December 31, 2021

Lahontan Regional Water Quality Control Board
2501 Lake Tahoe Blvd
South Lake Tahoe, CA 96150

Attn: Liz van Diepen

Re: Hope Valley Restoration and Aquatic Habitat Enhancement Project
General 401 Water Quality Certification WDID# 6A022004007
Annual Monitoring Report

Dear Ms. van Diepen,

I am submitting documentation for the second year of Hope Valley Restoration and Aquatic Habitat Enhancement Project monitoring requirements as noted in the General 401 Water Quality Certification WDID# 6A022004007. Documentation includes the following data: water quality, photo points, percent vegetation coverage, and California Rapid Assessment Method.

The Hope Valley Restoration and Aquatic Habitat Enhancement Project was completed in October 2020 through implementation of bank stabilization restoration activities at two project locations in Hope Valley on California Department of Fish and Wildlife (CDFW) land. Monitoring continued in 2021 with photo monitoring, water quality monitoring, and vegetation monitoring.

Project access routes were also monitored for rehabilitation, and pending one more approval from CDFW, as well as the approval from Lahontan Regional Water Quality Control Board, will be removed from further monitoring in 2022.

If you require any further information, or have any questions, please do not hesitate to contact me at awg.rachel@gmail.com or (530) 694-2327.

Sincerely,

Rachel Kieffer

Rachel Kieffer
Watershed Coordinator

Hope Valley Restoration and Aquatic Habitat Enhancement Project

2021 Annual Monitoring Report

Prepared by Mo Loden, Watershed Program Manager and Rachel Kieffer, Watershed Coordinator

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Introduction

Alpine Watershed Group with project engineers, Waterways Consulting, Inc., and construction firm, Hanford Applied Restoration and Conservation, completed bank stabilization activities at two reaches aimed at repairing approximately 450 feet of river bank in Hope Valley. The purpose of the Hope Valley Restoration and Aquatic Habitat Enhancement Project is to help reduce erosion and sedimentation in the West Fork Carson River at the two project locations. The long-term goals of this project are to improve water quality and aquatic habitat and create a more connected and functional channel and floodplain.

In the mid-1800s, Hope Valley served as a stop-off point along the Mormon Emigrant Trail (Dustman, 2017). During that period, this Washoe homeland transformed into a settlement where pioneers initiated heavy grazing that caused lasting impacts to the meadow and stream channel. Recovery of Hope Valley hydrological functions may require many projects over many years, and therefore this project is considered a small piece in the bigger puzzle of reconnecting the West Fork Carson River with its adjacent floodplain.

Hope Valley Restoration and Aquatic Habitat Enhancement Project construction began on September 28, 2020. Heavy equipment construction was completed on October 8, and light handwork and watering tasks extended through the month of October.

Lead Agency is Alpine Watershed Group (AWG).

Partners of the project included landowner California Department of Fish and Wildlife (CDFW), American Rivers, Friends of Hope Valley, United States Forest Service (USFS), Washoe Tribe of Nevada and California, and Carson Water Subconservancy District.

Project Funding for construction was provided by the National Fish and Wildlife Foundation and the CDFW Office of Spill Prevention and Response as part of the settlement of a State Water Board enforcement action through the Central Valley Regional Water Quality Control Board. Funding for planning and design was provided as part of the settlement of a State Water Board enforcement action through the Lahontan Regional Water Quality Control Board.

Project Goal is to help reduce erosion and sedimentation in the West Fork Carson River in Hope Valley at the two project locations. The long-term goals of this project are to improve water quality and aquatic habitat and create a more connected and functional channel and floodplain. This project contributes to reestablishing a functional floodplain and meadow system to allow the river corridor to accommodate variable flows in the future. In addition, due to the potential for earlier spring runoff because of climate change, it will be important for these meadowlands to serve as natural storage areas.

Location of the project area is in Alpine County near the town of Woodfords outside of Markleeville. The West Fork Carson River meanders from its headwaters at Lost Lakes down through Hope Valley and then into the Carson Valley. The project area consists of two meanders in lower Hope Valley—Project Site 1 is the first meander approximately 300 feet downstream of the Highway 88 bridge, and Project Site 2 is approximately 0.5 miles farther downstream at the log crib/2015 American Rivers restoration site. Both project areas are located on CDFW land adjacent to Highway 88 in Hope Valley. See Figure 1.

Project Description of restoration techniques at Site 1 mimic an abandoned oxbow feature. A floodplain bench was created behind the failing bank and filled with live sod blocks, willow stakes, and live willow shrubs. The design plans for a more stable and capable streambank behind the current failing bank. The river will continue eroding the failing bank, and in the meantime the willows and sod in the newly created floodplain bench will have time to establish and serve as good habitat for birds and amphibians in the interim and eventually be vital fish habitat when the erosion pushes back that far.

At Project Site 2, updates were needed to divert stream energy from scouring behind the 2015 American Rivers project, a log crib structure. A basic approach of installing slash at the ends of Site 2's reach will add the stability needed. Minor excavation of the downstream bank occurred to smooth out the bend and accommodate the introduction of new vegetative material. Sod was salvaged from the meadow toe during excavation and placed near the waterline below the slash to further assist with bank stabilization. Vertically placed anchor logs were installed with heavy equipment as far down as possible and slash was woven and secured with sisal rope in between the anchor logs. Willow stakes were placed at approximately 5-feet on center and also at strategically targeted locations throughout Site 2.

The project was executed according to the 100% design plans with one in-field adjustment. As part of the pre-construction kickoff meeting on September 28, 2020, a discussion of current in-field conditions was had by project engineers, CDFW staff, AWG staff, related permitting staff, attending partners, and the construction contractor. After close inspection, it was decided that the upstream end of the reach was not experiencing as much deterioration as the downstream end and, therefore, 90% of the upstream work was added on to the downstream end.

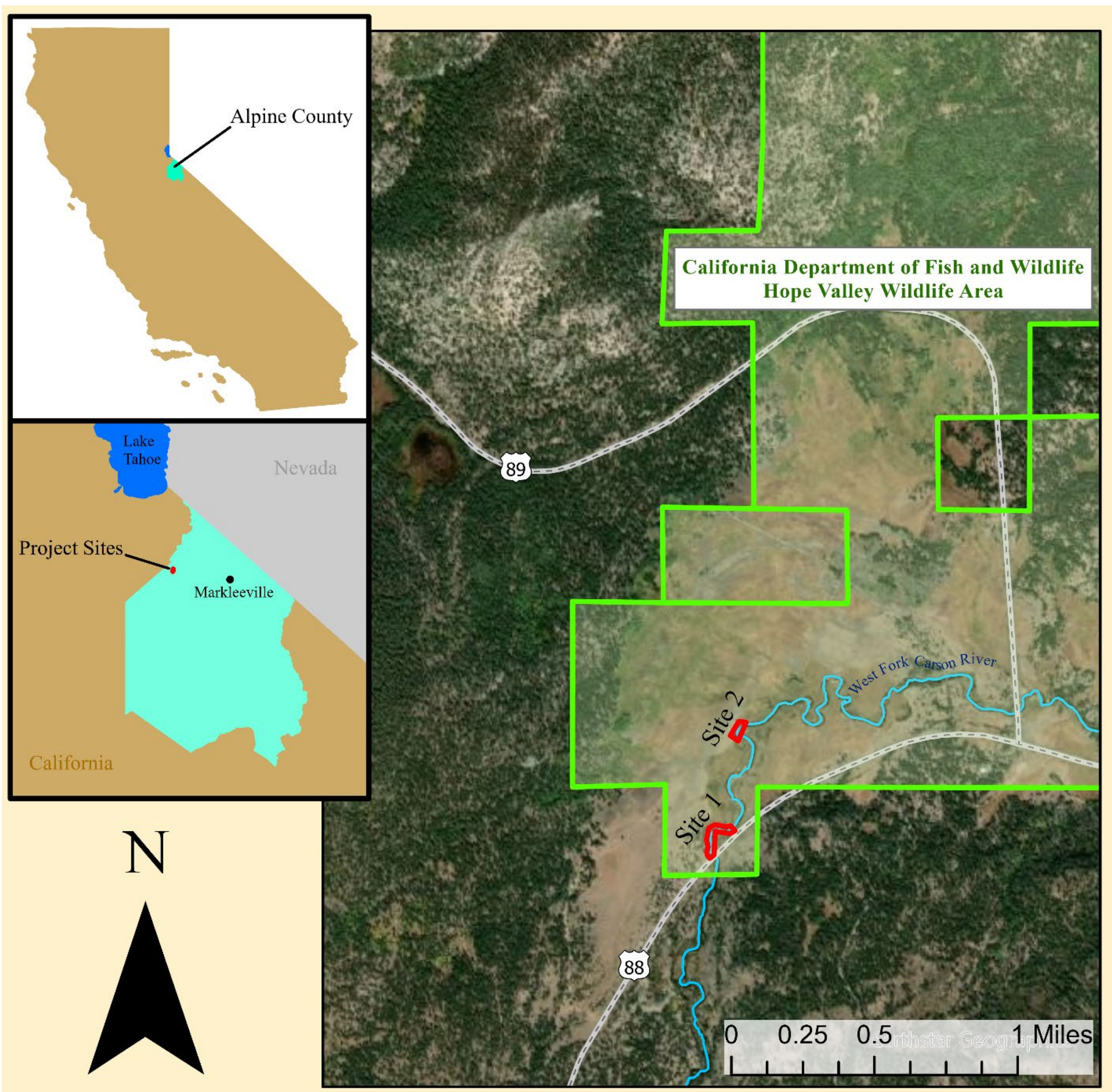


Figure 1: Overview Map

Monitoring

Pre-project monitoring began before project construction to capture pre-existing conditions.

Figure 2: Map of Alpine Watershed Group's river monitoring locations

Water Quality data is collected by AWG volunteers at eight locations four times a year as part of the routine River Monitoring program. Data from a 10-year period starting in 2004, the year of AWG's River Monitoring program inception, to 2014 at sites closest to the project area were chosen to establish baseline conditions. Site #6 West Fork-Picketts Junction (WF-PKT) is located approximately one mile downstream, and Site #9 Red Lake Creek-Blue Lakes Road (RLC-BLR) is located approximately three miles upstream from the project locations. See Figure 2 to view the AWG river monitoring locations.

Water quality data collections include the following parameters: dissolved oxygen, pH, water temperature, specific conductance, and turbidity. These water quality measures of streams give very specific information on the health of water systems and their ability to support wildlife and vegetation. No increase in the water quality parameters is expected until the failing bank erodes back to the well-established floodplain bench, which may take years or may not happen at all. Nevertheless, the project would still be considered a success by providing bird and frog habitat within the floodplain bench area. See Table 1 and Figures 3 and 4 to review summaries of 2019-2021 water quality data. Please note that site 9 was only sampled three times in 2021 due to the creek being frozen for the March collection.

Site	Parameter	2004-2014 Average	2019 Average	2020 Average	2021 Average
6# WF-PKT	Dissolved Oxygen (mg/L)	8.74	10.50	8.75	9.15
	pH	7.26	8.27	7.72	7.71
	Water Temperature (°C)	6.92	6.68	11.73	8.89
	Turbidity (NTU)	1.28	1.39	0.95	0.81
	Specific Conductance (μS/cm)	74.73*	64.40	73.53	86.76
9# RLC-BLRD	Dissolved Oxygen (mg/L)	8.28	8.88	9.75	8.82
	pH	7.77	8.10	8.69	8.30
	Water Temperature (°C)	6.97	9.80	9.13	10.27
	Turbidity (NTU)	0.90	2.07	1.72	1.28
	Specific Conductance (μS/cm)	94.58*	67.56	85.93	99.31

Table: 1 ***Before 2019, AWG used handheld Oakton brand total dissolved solids (TDS) meters in the monitoring program. While these meters are labeled TDS, they actually measure conductivity and use a conversion factor internally to estimate the TDS of the sample. In 2019, AWG started using more advanced YSI Pro2030 meters to measure specific conductance. Because AWG doesn't have a record of the conversion factor set for the Oakton brand TDS meters, results before 2019 are not considered reliable. It is likely the conversion was set to 0.64 which is considered the standard estimate, but until AWG is able to verify the conversion factor used prior to 2019, previous measurements and current measurements may not be comparable (Fillmore, 2020).***

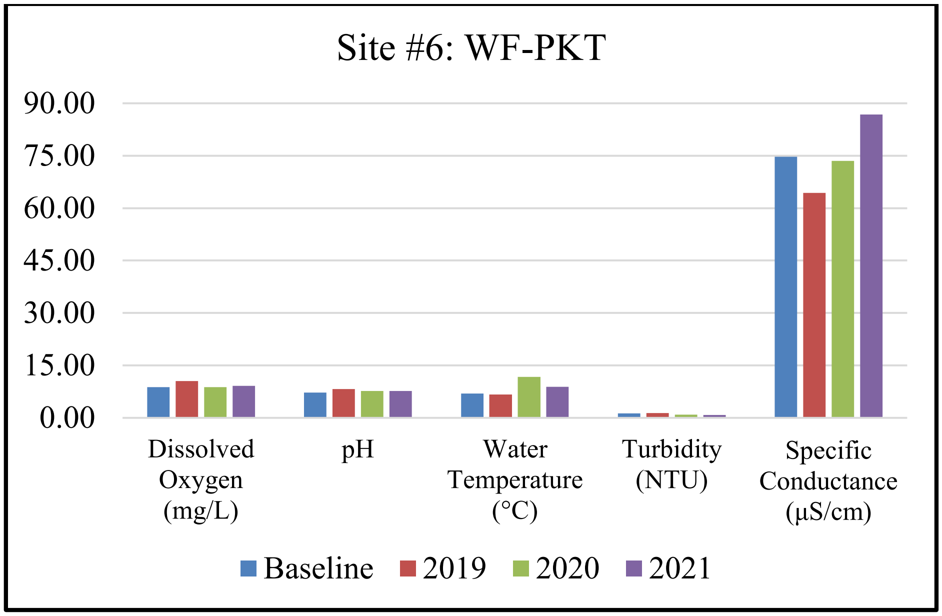


Figure 3

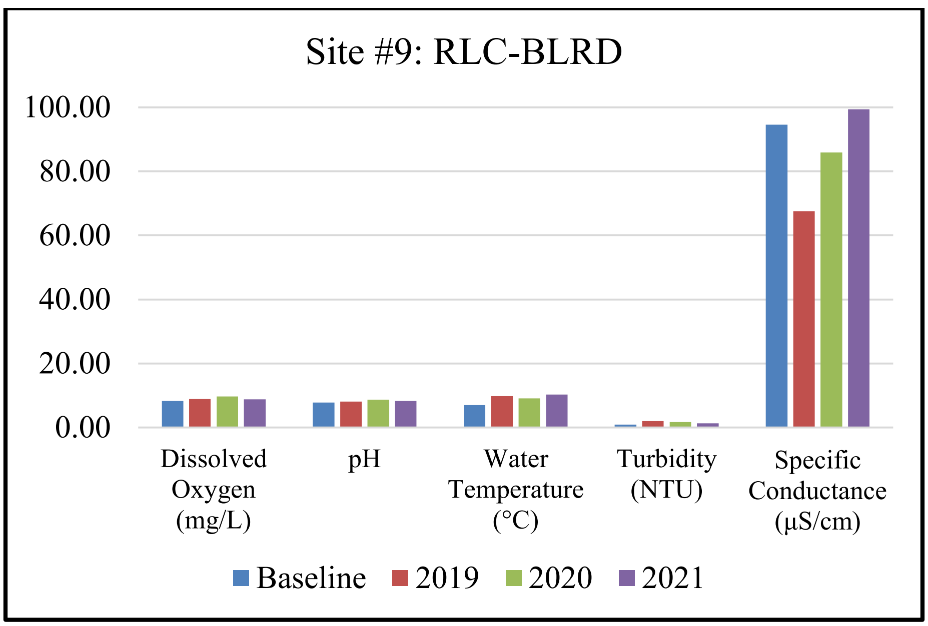


Figure 4

Photo Monitoring was employed to capture qualitative observations and assist in the evaluation of any project geomorphology or function changes. Project sites are expected to evolve somewhat following construction regrading. The project employed two standard types of photo monitoring:

FEATURE PHOTO POINT METHOD documents visual changes occurring at a fixed point through time. This method is used to document change resulting from a restoration activity, where photos are taken before, during, and immediately after construction. These photos are also scheduled be replicated in June and November through 2024 to demonstrate the long-term effectiveness of the project. For each photo point, a GPS location was recorded with detailed directions to relocate the point and take photos. See Figure 5 of project feature photo point locations.

The majority of the feature photo points were established on June 26, 2019. Access route photo points were set up the day of construction on September 28, 2020, when AWG staff, project engineer, construction project manager, access route landowners (CDFW and USFS), and related access route permitting staff were able to meet onsite and determine access routes collectively.

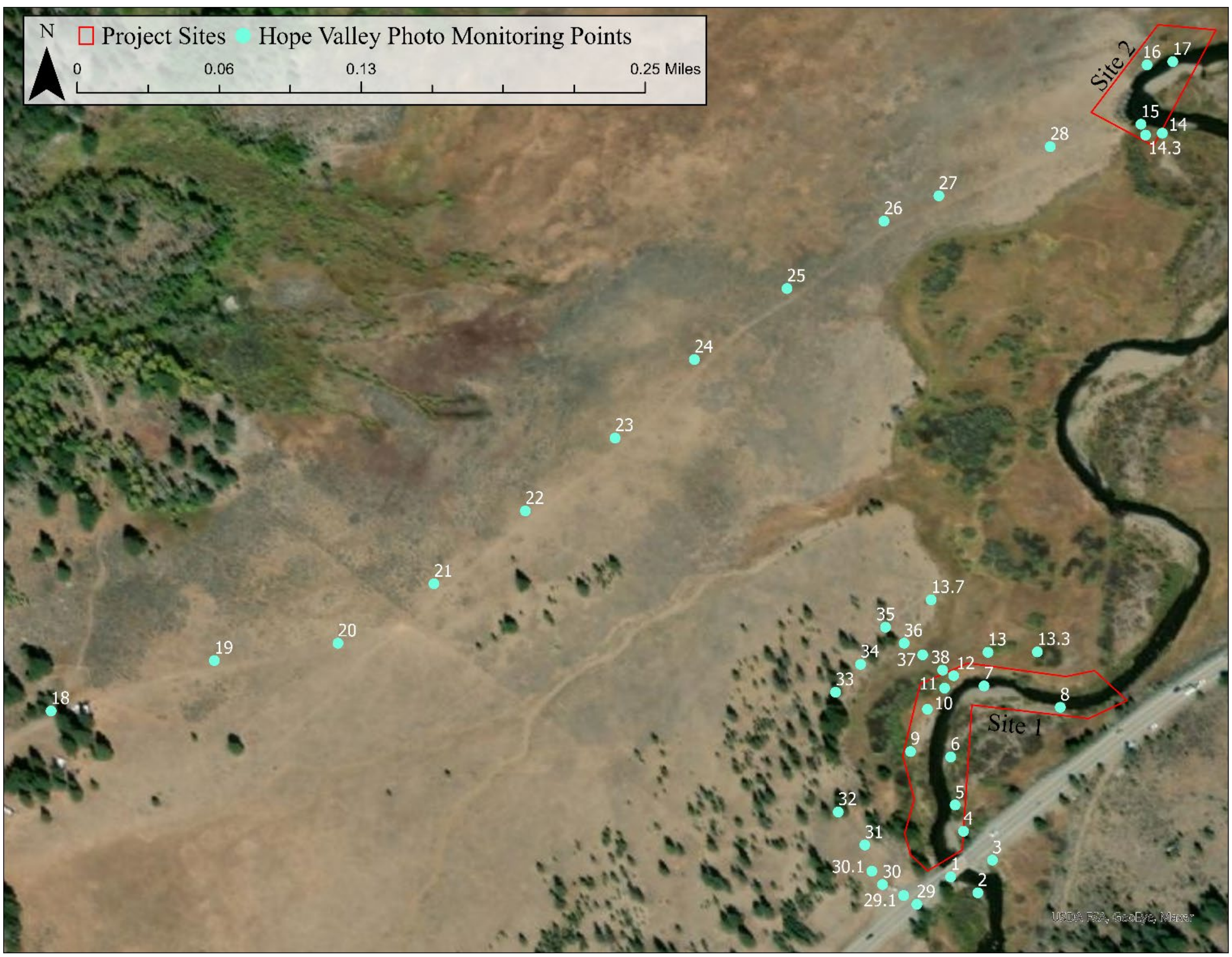


Figure 5: Project Feature Photo Points

Feature photo points were repeated on November 18, 2019; June 17, 2020 (before construction); October 3, 2020 (during construction); and October 12, 2020 (after construction): June 25 through July 1, 2021; and October 18 through 21, 2021. The 2021 photo monitoring dates ranged due to not being able to access all spots on the same day. The fall 2021 monitoring took place in October to capture the photographs before the snow fell.

OPPORTUNISTIC PHOTOS are not taken from a permanently-marked location and are not intended to be formally repeated. They provide valuable information when taken during construction activities.

See Appendix B to view select feature photo points displaying project changes from before construction to afterwards. Contact Alpine Watershed Group's Watershed Coordinator at (530) 694-2327 to request a comprehensive collection of the photo monitoring data.

Site 1 Percent Coverage Monitoring is conducted in June of each year and will help the project team track vegetation reestablishment. Site 1 goal of percent cover is greater than 50% by year 2 (2022), greater than 75% by year 3 (2023), and to meet pre-project percent coverage by year 4 (2024), which is approximately 90% coverage. If benchmarks are not met, revegetation plans will be assessed.

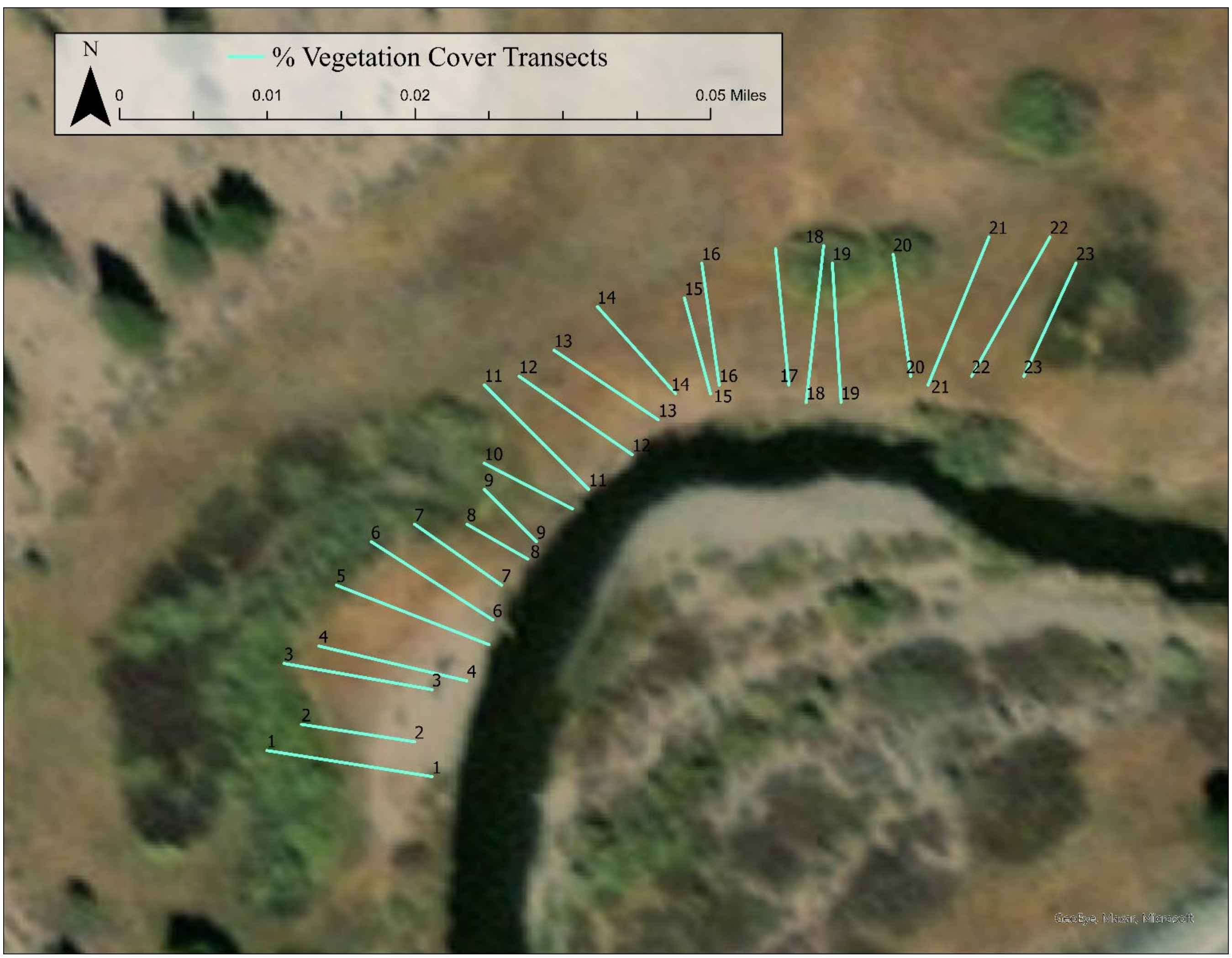


Figure 6: Site 1 Percent Vegetation Cover Transects

Percent coverage monitoring was established at Site 1 on June 17, 2019, at 23 transects and repeated the following years on June 21, 2020 and June 28, 2021. See Figure 6 and Table 3. Vegetation coverage was estimated within one square yard at 11 monitoring points evenly spaced along 15-meter-long transects. In 2019, some transects were marked with a medium-size nail in the meadow at the meadow edge farthest from the riverbank to assist with relocation of marked transects. Unfortunately, either the nails were found and removed by a Hope Valley visitor, which is highly likely due to the ease of access and popularity at the site, or the combined use of AWG's Garmin GPS 64st and PYLE-SPORT PMD38 metal detector were not adequate enough to locate most markers. June 2020 data collections were based solely on GPS coordinates to relocate transects, as will future years be.

	Percent Cover		
Transect	**2019**	**2020**	**2021**
1	74.7	72.7	44.0
2	65.2	50.8	44.1
3	66.0	68.2	43.6
4	69.2	38.5	38.6
5	83.9	83.2	41.0
6	85.4	71.8	42.2
7	96.9	88.8	47.2
8	100.0	95.0	71.3
9	100.0	NA	52.5
10	99.9	99.3	75.6
11	99.9	98.6	48.2
12	96.3	99.1	31.5
13	98.4	97.7	36.7
14	98.5	100.0	55.0
15	96.3	99.6	48.2
16	97.6	95.4	52.5
17	85.5	75.6	36.4
18	97.5	90.6	51.8
19	95.0	98.5	56.0
20	99.1	100.0	55.5
21	99.8	100.0	55.0
22	100.0	99.5	72.5
23	100.0	100.0	93.8
TOTAL	**91.5%**	**86.8%**	**51.9%**

Table 3

Subject matters not considered when percent coverage goals were set is the increased surface area in the newly created floodplain bench and difference in plant species. The U-shaped floodplain bench constructed at Site 1 formed approximately 30% more surface area than the mostly flat meadow ground that existed before the project. The salvaged sod was strategically placed back in the bench to offer the most coverage available. Additionally, the pre-project meadow surface was primarily covered by grasses, but it now has been filled vigorously with willow shrubs and stakes which may affect how grasses take root in this area. It is also noteworthy that the 90% coverage goal was set after collecting just one year of transect data (2019); 2019 was a particularly wet winter with snowmelt into Hope Valley continuing well into July.

The Monitoring Plan (Appendix A) called for at least ten transects to be selected for Site 1 vegetation monitoring. In attempts to be thorough, to not miss any major area of the unbuilt bench, and to provide as much data as possible, more transects than necessary were monitored in June 2019 and June 2020. The project team may choose to scale the vegetation monitoring down to no less than ten transects in following years. Vegetation monitoring yearly goals in conjunction with photo monitoring will help the project team asses if further revegetation work needs to be done.

Access Route Percent Coverage Monitoring was conducted on September 28, 2020, before use took place on either Site 1 or Site 2's paths. See Figure 7 and Table 4. As mentioned before, access route determination was a collective decision with pertinent team members on the first day of construction, and therefore its vegetation monitoring was not feasible in June 2020 as planned in Appendix A. Access route percent coverage was conducted at one monitoring location within the access route and one adjacent to the access route at evenly spaced transects along each route. Access routes were selected to cause the least amount of impact by using paths in dry and minimally-vegetated areas. Access route percent coverage monitoring was repeated on June 28, 2021 to better align with other project vegetation data collections and peak phenology and therefore shows higher percent coverage.

		2020 Percent Cover		**2021 Percent Cover**	
Access Route	**Transect**	**In Access Route**	**Adjacent to Route**	**In Access Route**	**Adjacent to Route**
Site 1	1	5	75	30	30
	2	10	15	25	30
	3	15	20	25	30
	4	5	5	0	0
	5	5	0	0	10
	6	2	5	20	50
	7	5	7	20	10
	8	7	7	90	90
	9	20	20	80	80
	10	85	85	90	90
		15.9%	**23.9%**	**38.0%**	**42.0%**
Site 2	1	10	15	30	30
	2	15	20	20	25
	3	20	20	20	20
	4	0	5	5	10
	5	2	5	5	5
	6	7	7	10	5
	7	5	10	20	25
	8	10	15	90	75
	9	7	15	50	30
	10	10	15	25	25
	11	15	15	25	25
		9.2%	**12.9%**	**27.3%**	**25.0%**

Table 4

Concerns about Site 2's access route use was brought up during the project's September 28 pre-construction kickoff meeting. During this meeting, the access route was observed as rutted and sparsely vegetated in the tire tracks—far more than expected since its last permitted use for the American Rivers 2015 log crib project. It is assumed the route has been experiencing unauthorized vehicle use and, consequently, the route conditions were considered impacted before AWG's project implementation began. See Appendix C to view a Google Earth analysis showing how the access route was displaying signs of self-healing after the 2015 log crib project up until August 2019. Additional unauthorized vehicle use was observed across the meadow in Hope Valley on August 19, 2021. These tracks were reported to appropriate CDFW staff and are not believed to be related to the 2020 instances. However, the Site 2 unauthorized vehicle use observed in 2020 does not appear be a continued problem at this time. Google Earth analysis from 2021 does not show an increase in disturbance and further indicates that this may not be a continuing issue.

At Site 2 access route, transects 1-5 are on USFS land and transects 6-11 are on CDFW land. AWG's project team, with USFS and CDFW landowners, agreed to restore Site 2's access route to pre-project conditions as found on September 28, 2020. The agreed-upon approach to restore Site 2's route was to use a water truck to emulate a rain event and then provide selective hand-raking that protected the sparse vegetation already established in the wheel wells while further camouflaging the path. This technique dissolved the tire tracks caused by AWG's project, but it did not remove the rutting that existed prior to project commencement. AWG staff will continue conversations with the USFS Rangeland Biologist who manages the grazing lease in Hope Valley to try to identify responsible parties and then stop the detrimental use of the route. Achieving pre-project conditions or better at Site 2 may be unattainable if the access route continues to receive the amount and type of use that has transpired since summer of 2019.

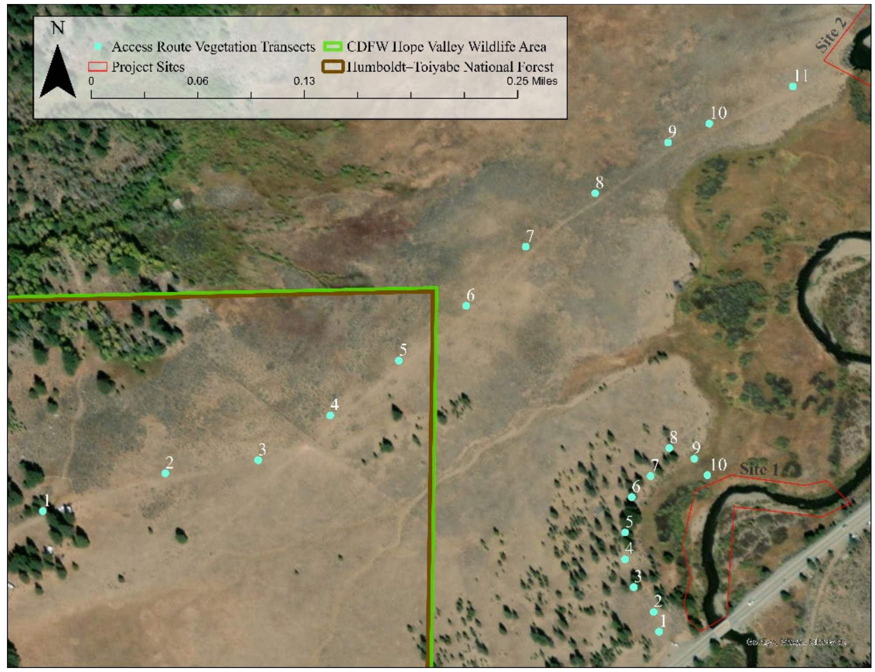


Figure 7: Site 1 and Site 2 Access Routes' Percent Vegetation Cover Transects

Access route seeding was executed at Site 1 as weather allowed in spring of 2021, but no seeding took place at Site 2. On May 27, 2021, AWG staff toured the site with the USFS project liaison, and the liaison deemed that AWG had met USFS expectations for rehabilitation from the USFS campground to Site 2 and did not need to do any seeding. Site 1's access route is recovering equally as well, but due to wildfires limiting road access, AWG has not toured the site with our primary CDFW liaison. However, AWG did receive preliminary approval of satisfactory rehabilitation from other CDFW staff on August 25, 2021. After our primary CDFW liaison signs off on the access routes' post-project condition, AWG will work with the Lahontan Regional Water Quality Control Board on whether further monitoring (vegetation or photo) will be needed.

Site 2 Percent Success Monitoring began on June 28, 2021. Willow stakes installed during this project's implementation were being tagged and recorded as dead, alive, or unknown.

2021 Percent Success Monitoring Results
Dead: 0%
Alive: 58.75%
Unknown: 41.25%

California Rapid Assessment Method (CRAM) is a tool for standardized and cost-effective assessment of wetland conditions. CRAM generates numerical scores based on field evaluations for multiple attributes of physical and biotic condition (https://www.cramwetlands.org). Consultant Karri Smith, with AWG AmeriCorps Member Marina Vance's assistance, completed Project Site 1's pre-project CRAM on July 28, 2018, which tallied an 83/100 index score. The project aims to increase the score by the end of the monitoring period in 2024. See Appendix D to view CRAM datasheets.

References

California Rapid Assessment Method. San Francisco Estuary Institute. Date of access: December 29, 2020 https://www.cramwetlands.org/

Dustman, K. *Hope Valley History*. Clairitage Press, October 2, 2017. https://www.clairitage.com/2017/10/02/hope-valley-history/

Fillmore, H. (2020). *Upper Carson River Watershed 2019 Water Quality Objectives Report*. Alpine Watershed Group.

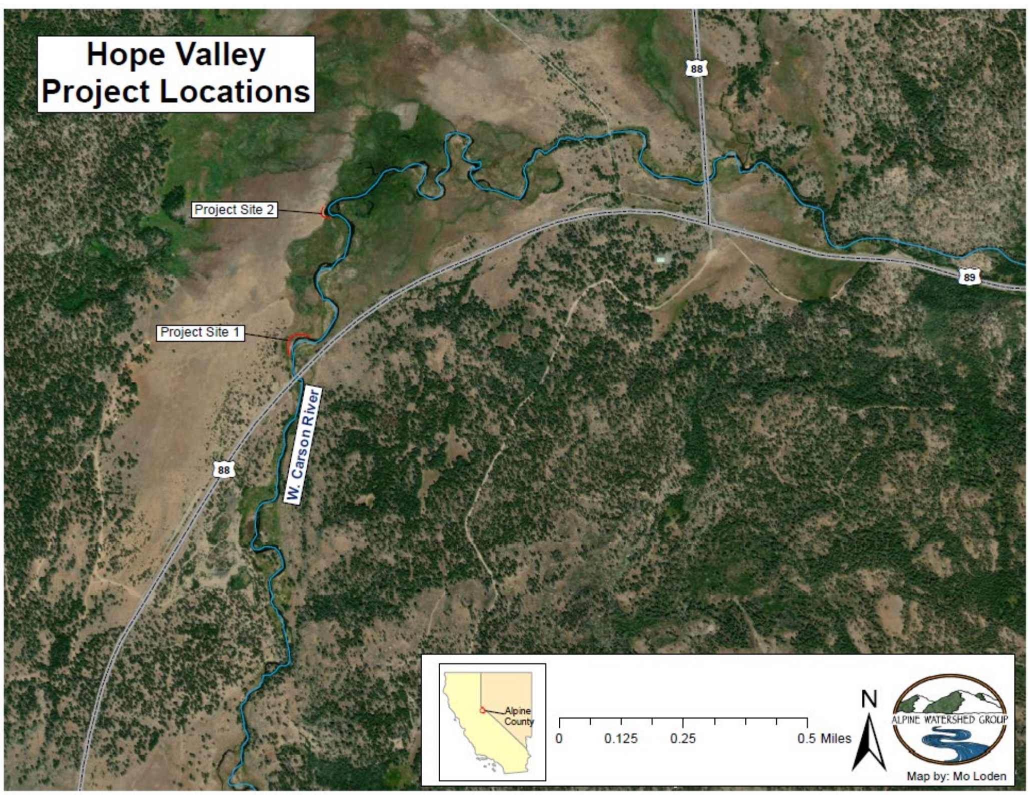
Hope Valley Restoration and Aquatic Habitat Enhancement Project Monitoring Plan (MP)

Reviewed and Approved by Technical Advisory Committee 5.4.2018
Reviewed and Approved by Jeff Brooks, Technical Contact at the
Lahontan Regional Water Quality Control Board 7.24.2018
Updated to reflect selected project design plans 3.17.2020
Updated to reflect SWB 401 permitting feedback 5.14.2020

Lead Agency: Alpine Watershed Group

Partners: American Rivers, Friends of Hope Valley, and the California Department of Fish and Wildlife (the landowner)

Location: Located in Alpine County near the town of Woodfords outside of Markleeville. The West Fork Carson River meanders from its headwaters at Lost Lakes down through Hope Valley and further into the Carson Valley. The project area consists of two meanders in lower Hope Valley— Project Site 1 is the first meander approximately 300 feet downstream of the Highway 88 bridge and Project Site 2 is approximately 0.5 miles further downstream at the log crib/2015 American Rivers restoration site. Both project areas are located on California Department of Fish and Wildlife land adjacent to Highway 88 in Hope Valley. See map below.



Function of Impacted Waters
The West Fork Carson River is a 303(d) listed water body in the California Integrated Report, and the pollutant categories this project aims to address are sediment, nutrients, and salinity. The project will help reduce erosion and sedimentation and provide shading in the West Fork Carson River at the two project sites.

Project Purpose and Goals
The project will enhance approximately 450 feet of stream banks located on California Department of Fish and Wildlife land, resulting in enhanced riparian vegetation and wildlife habitat, improved aquatic habitat, reduced erosion and sedimentation, and improved geomorphic and hydrologic function. This project is a part of the larger goal of reestablishing a functional floodplain and meadow system to allow the river corridor to accommodate variable flows in the future. In addition, due to the potential for earlier spring runoff, it will be important for these meadowlands to serve as natural storage areas. Meadow restoration projects have been demonstrated to increase water storage capacity. Reconnecting the meadow with its floodplain also reduces erosion and sediment delivery. In accordance with California Water Action Plan priorities and the Sierra Nevada Conservancy's Watershed Improvement Program, this current project addresses the river and meadow between the 2015 (downstream) and 2016 (upstream) American Rivers' projects, increasing ecological benefit by creating larger areas of connection of stream to meadow floodplains.

At Project Site 1, restoration techniques will mimic an abandoned oxbow feature by creating a trench behind the failing bank and filling it with live sod blocks, willow stakes, and live willow shrub transplants. It will be low impact and low risk. The trench construction will avoid disturbance of mature vegetation and produce approximately 500 cubic yards of soil to be hauled off site. The trench dimensions will be approximately 2.5 feet deep by 14 feet wide and will maintain a minimum 3-4 foot setback from top of river bank. Meadow sod blocks will be salvaged prior to excavation and reinstalled over the side slopes and bottom of the excavated floodplain bench during the revegetation phase. A temporary irrigation system will be installed to minimize plant stress and erosion by means of slow water delivery with low impact nozzles. The source of water will be from the West Fork Carson River. Temporary sprinklers will remain at Site 1 until November 15 or the first significant winter storm. The river will continue eroding the failing bank, and in the interim the willows and sod in the trench will have time to establish and serve as good habitat for birds and amphibians, and eventually will provide vital fish habitat when the erosion pushes back that far. The goal of this site's design is to avoid massive bank failure, but erosion is a feature in the project plans.

At Project Site 2, the restoration work's primary focus is to update the previous American Rivers 2015 project by installing slash to the ends of the reach to provide additional stability, diverting stream energy from scouring behind the current log crib structure. The 4-inch diameter slash will consist of conifer and willow cuttings, sourced locally, and will be weaved in between vertically placed 8-inch x 10-foot slash anchor logs to create brush mattresses. The brush mattresses will last approximately 5-6 years and will allow vertically placed willow stakes, installed down to or near groundwater, to establish. The slash anchor logs will be embedded 7 feet into the ground using an auger to drill 8-inch holes for placement. The ends of the reach will require slight regrading in order to maintain future stable bank conditions and to create easier work conditions to properly place the slash anchor logs. Approximately 9 cubic yards of soil will be excavated during the bank regrading and dispersed in the adjacent upland areas flagged by the engineer. Soil disbursement will not exceed a depth of 6 inches in the meadow. Spoils will be hand raked to further disperse material. The reach in between the ends will have live stakes installed at 5 feet on center average spacing.

Baseline Conditions
Monitoring will begin before any restoration or development changes are made in order to capture pre-existing or baseline conditions. Pre-project photos will be taken to establish a record of baseline conditions. Water quality monitoring data, as reported on CEDEN, denotes three distinct water monitoring locations: West Fork Carson River near Picketts Junction, Red Lake Creek near the West Fork

Carson River confluence (approximately four river miles upstream of Project Site 1), and at Highway 89 (Hope Valley). Two different organizations monitor water quality—Alpine Watershed Group and the Lahontan Reginal Water Quality Control Board. Since 2004, AWG has been monitoring five water quality parameters in Hope Valley at two sites. See map of overview of Hope Valley monitoring sites below. Also provided below is a table describing the sites historically monitored for chemical parameters in the project area.

Site ID	Responsible Party	Parameters Monitored	Frequency Monitored	Average Result	Unit
RLC-BLRD	AWG	Oxygen, Dissolved, Total	4x/year since 2004	8.04	mg/L
		pH		7.57	pH
		Temperature		7.63	C°
		Turbidity, Total		0.88	NTU
		Total Dissolved Solids, Total		91.55	mg/L
WF-PKT	AWG	Oxygen, Dissolved, Total	4x/year since 2004	8.59	mg/L
		pH		7.30	pH
		Temperature		7.55	C°
		Turbidity, Total		1.07	NTU
		Total Dissolved Solids, Total		75.65	mg/L
633WCR002	SWAMP	Oxygen, Dissolved, Total	≈4x/year 2003 - 2013	10.82	mg/L
		pH	≈4x/year 2003 - 2015	7.77	pH
		Temperature		7.84	C°
		Turbidity, Total		1.81	NTU
		Total Dissolved Solids, Total		48.84	mg/L

Monitoring Systems
Two types of monitoring will be conducted including implementation monitoring and performance monitoring. Implementation monitoring will be used to document the proper implementation of the project and mitigation measures. Performance monitoring will be used to measure the project's effectiveness.

Implementation Monitoring
Implementation monitoring will be conducted to assess whether the activities—restoration of bank stabilization and re-vegetation of banks—were carried out as planned. This will consist of observations and documentation of the treatment sites during restoration activities. The project engineer and watershed program manager will ensure that appropriate areas are restored according to planned techniques. Turbidity monitoring will occur hourly during Site 2's excavation construction at the above and below project site locations seen below.

Performance Monitoring
Project effectiveness monitoring will be conducted to assess the success of the project implementation activities in meeting performance standards and complying with best management practices.

Performance Standards
Goal 1: Reduce erosion and sedimentation at the two project sites and improve water quality
1.1 Conduct regular photo monitoring to document changes at project area
1.2 Conduct water quality monitoring above and below project sites
1.3 Conduct erosion surveys to assess rate of erosion at project Site 1
1.4 Conduct turbidity monitoring above and below Project Site 2 during excavation construction

Goal 2: Provide shading in the West Fork Carson River watershed at the two project sites and/or at meanders with close proximity to the project sites
2.1 Identify areas that have little to no vegetation growth
2.2 Begin multiple years of plantings with techniques such as jute matting and seeding with native grass blend, and planting willows as stakes and potentially more mature plants

Performance standard	Monitoring method
Goal 1: Reduce erosion and sedimentation at the two project sites	Photo monitoring, water quality monitoring, erosion surveys, CRAM assessment pre- and four years post project
Goal 2: Provide shading in the West Fork Carson River watershed	Photo monitoring, vegetation percent coverage monitoring at Site 1, percent successful surveys for willow stakes at Site 2

Monitoring Methods
To best monitor the success of this project, we will use the following monitoring methods: water quality monitoring, photo monitoring, vegetation monitoring, erosion surveys, and California Rapid Assessment Method (CRAM). See table below for monitoring details.

Water Quality Monitoring will be conducted above and below the project area. The parameters monitored are considered vital signs of stream health. These parameters include: water/air temperature, dissolved oxygen, pH, specific conductance, and turbidity. These water quality measures and physical attributes of streams give very specific information on the health of waters systems and their ability to support wildlife and vegetation. We do not expect an increase in the water quality parameters until the failing bank erodes back to the well-established trench.

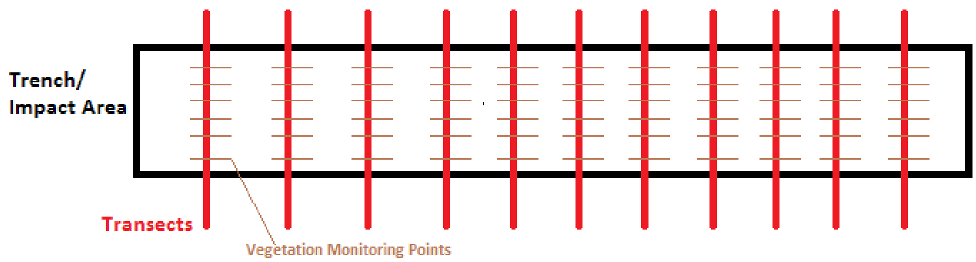
Photo Monitoring will employ qualitative observation and evaluation of any changes in geomorphology or function. Project sites are expected to evolve somewhat following regrading. The project will employ two standard types of photo monitoring:

FEATURE PHOTO POINT METHOD documents visual changes occurring at a fixed point through time. This method is used to document change resulting from a restoration activity, where photos are taken before, during, and immediately after construction. The photos are periodically replicated thereafter to demonstrate the long-term effectiveness of the restoration. For each photo point, a marker will be placed in the field, record the GPS location, record detailed direction for locating the point and taking the photo, and develop a map of photo points. These photo points will be repeated annually in June and November for at least three years after construction is complete.

OPPORTUNISTIC PHOTOS are not taken from a permanently marked location and are not intended to be formally repeated. They provide valuable information when taken during construction activities, when used to document damages to a site that may require follow-up actions (such as high water events, fire, etc.), or as part of a vegetation/soil monitoring protocol to visually document a sample point.

Vegetation Monitoring
Percent coverage monitoring will be conducted in June of each year to best capture peak site phenology of both perennial and annual species at Site 1. Goal of percent cover is greater than 50% by year 2, greater than 75% by year 3, and finally to meet pre-project percent coverage by year 4, which is approximately 90% coverage. If benchmarks are not met, revegetation plans will be assessed.

Percent coverage monitoring will be conducted by selecting at least ten permanent transects across the trench and estimating vegetation cover within 1 square yard at 11 monitoring points evenly spaced along the transects. Some transects will be marked with a medium size nail in the meadow at the meadow edge farthest from the riverbank. Using a metal detector, data collections can be planned for the same area year after year. All transects will have recorded GPS coordinates of both the meadow edge and the stream edge.



Percent successful surveys will be conducted at Site 2 to monitor willow stake survival rates. During the monitoring period, other observations such as site stability and signs of excessive erosion will be conducted annually to gauge whether or not revegetation plans should be considered.

Erosion Surveys will allow us to monitor erosion rates. Using three of the same vegetation transects at top, mid, and end of reach, we will measure the distance from the nail in meadow to river bank in October after high flows have dissipated. This parameter only informs the monitoring team and will not need a trigger level set.

California Rapid Assessment Method (CRAM) For wetlands and riparian areas, CRAM is a tool for standardized and cost-effective assessment of wetland condition. CRAM generates numerical scores based on field evaluations for multiple attributes of physical and biotic condition. Scores are relative to the best achievable condition based on statewide surveys. It can also be used to assess ambient baseline conditions at any spatial scale, from statewide to local watersheds. As a standard method for assessing projects, CRAM can be used to evaluate how ambient conditions are affected by projects. Project Site 1's 2018 Index Score was 83/100. The project aims to increase the score by the end of the monitoring period in 2024.

Monitoring Parameter	Monitoring Parameters	Sampling Frequency	# Sites	Sampling Dates
Water Quality	pH, dissolved oxygen, specific conductance, air/water temp, and turbidity	4 times/ year	2	March June August September
Sedimentation	Turbidity	Hourly	2	Every day during Site 2's excavation construction
Photo Monitoring	Visual Observations	Twice/year	20	June/November
Vegetation	Percent Coverage	Once/year	Project Site 1	June
Vegetation	Percent Successful	Once/year	Project Site 2	June
Erosion Surveys	Bank Erosion Rate	Once/year	3	October
CRAM	Assessment of wetland condition	One pre- and four years post project	1	June 2017 & June 2024

Monitoring Timeline

Monitoring will take place from 2019 to 2024 as outlined in the above table.

Reporting

The data collected from the monitoring of Hope Valley will be reported to the CEDEN (online database for water quality parameters within California). Alpine Watershed Group will submit a monitoring program report to the State Water Board annually in December every year.

Adaptive Management Strategies

Photo points may be added or abandoned to better capture restoration progress or effectiveness, but photo points will never be moved. Additional water quality parameters or sampling events may be added, based on available funds, to better capture restoration progress or effectiveness.

Special Environmental Considerations (Permits)

Alpine Watershed Group obtained a River Monitoring Letter of Authorization from California Department of Fish & Wildlife to conduct sampling on Hope Valley Wildlife Area property.

Site 1

HVPM 6.1: Looking at upstream end of Site 1 from across river on river right*


June 17, 2020 (Pre-construction)


October 3, 2020 (During Construction)


October 12, 2020 (After Construction)


June 25, 2021


October 21, 2021

HVPM 7.0: Looking at upstream end of Site 1 from across river on river right*


June 17, 2020 (Pre-construction)


October 3, 2020 (During Construction)


October 12, 2020 (After Construction)


June 25, 2021


October 21, 2021

HVPM 10.1: Looking downstream at Site 1 on river left*


June 17, 2020 (Pre-construction)


October 3, 2020 (During Construction)


October 12, 2020 (After Construction)


June 28, 2021


October 20, 2021

**River right and river left are determined when looking downstream*

HVPM 13.2: Looking upstream at Site 1 on river left*


June 17, 2020 (Pre-construction)


October 3, 2020 (During Construction)


October 12, 2020 (After Construction)


June 25, 2021


October 20, 2021

Site 1 Access Route

HVPM 30.0: At entrance of Site 1 access route near Highway 88 pull off


September 28, 2020 (Pre-construction)


October 12, 2020 (After Construction)


June 28, 2021


October 21, 2021

HVPM 31.1: At entrance of Site 1 access route looking back at Highway 88 pull off


September 28, 2020 (Pre-construction)


October 12, 2020 (After Construction)


June 28, 2021


October 21, 2021

**River right and river left are determined when looking downstream*

HVPM 34.0: Mid-route via Site 1 access route


September 28, 2020 (Pre-construction)


October 12, 2020 (After Construction)


June 28, 2021


October 21, 2021

HVPM 37.0: Site 1 access route near end at project site in wetland area


September 28, 2020 (Pre-construction)


October 12, 2020 (After Construction)


June 28, 2021


October 21, 2021

HVPM 37.1: Site 1 access route near end at project site in wetland area looking back at upland area


September 28, 2020 (Pre-construction)


October 12, 2020 (After Construction)


June 28, 2021


October 21, 2021

**River right and river left are determined when looking downstream*

Site 2

HVPM 14.0: Looking downstream at Site 2 on river left*

June 17, 2020 (Pre-construction)

October 3, 2020 (During Construction)

October 12, 2020 (After Construction)

June 28, 2021

October 20, 2021

HVPM 15.1: Looking downstream at Site 2 on river left*

June 17, 2020 (Pre-construction)

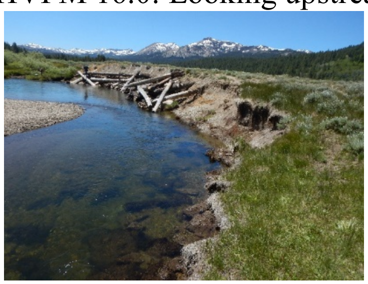
October 3, 2020 (During Construction)

October 12, 2020 (After Construction)

June 28, 2021

October 20, 2021

HVPM 16.0: Looking upstream at Site 2 on river left*



June 17, 2020 (Pre-construction)

October 3, 2020 (During Construction)

October 12, 2020 (After Construction)

June 28, 2021

October 20, 2021

**River right and river left are determined when looking downstream*

HVPM 17.0: Looking upstream at Site 2 on river right*


Log Crib Pre-2015 Construction


July 2018 (Pre-construction)


October 3, 2020 (During Construction)


October 12, 2020 (After Construction)


June 28, 2021


October 21, 2021

<u>Site 2 Access Route</u>

HVPM 18.1: At entrance of Site 2 access route near USFS dispersed camping area


September 28, 2020 (Pre-construction)


October 12, 2020 (After Construction)


July 1, 2021


October 21, 2021

**River right and river left are determined when looking downstream*

HVPM 19.0: Near entrance of Site 2 access route near USFS dispersed camping area


September 28, 2020 (Pre-construction)


October 12, 2020 (After Construction)


July 1, 2021


October 21, 2021

HVPM 24.0: Mid-route via Site 2 access route


September 28, 2020 (Pre-construction)


October 12, 2020 (After Construction)


July 1, 2021


October 20, 2021

HVPM 28.0: Site 2 access route near end at project site


September 28, 2020 (Pre-construction)


October 12, 2020 (After Construction)


July 1, 2021


October 20, 2021

**River right and river left are determined when looking downstream*

4.16.2015 | 6.22.2016 | 8.11.2017 | 6.7.2018 | 8.11.2019 | 5.30.2021

Appendix C:
Site 2 Google Earth
Access Road Analysis

Basic Information Sheet: Riverine Wetlands

Assessment Area Name: W. Fork Carson River	
Project Name: Hope Valley W. Fork Carson Restoration & Aquatic Habitat Enhancement Project	
Assessment Area ID #: 1	
Project ID #: 1	**Date:** 7/26/2018
Assessment Team Members for This AA: Karri A. Smith, PWS and Marina Vance, AWG	

Average Bankfull Width: 16.6m

Approximate Length of AA (10 times bankfull width, min 100 m, max 200 m): 166 m

Upstream Point Latitude: 38°46'21.87"N **Longitude:** 119°56'04.13"W 7085'

Downstream Point Latitude: 38°46'24.30"N **Longitude:** 119°55'58.83"W 7087'

Wetland Sub-type:

☐ Confined ☒ Non-confined

AA Category:

☒ Restoration ☐ Mitigation ☐ Impacted ☐ Ambient ☐ Reference ☐ Training

☐ Other:

Did the river/stream have flowing water at the time of the assessment? ☒ yes ☐ no

What is the apparent hydrologic flow regime of the reach you are assessing?

The hydrologic flow regime of a stream describes the frequency with which the channel conducts water. *Perennial* streams conduct water all year long, whereas *ephemeral* streams conduct water only during and immediately following precipitation events. *Intermittent* streams are dry for part of the year, but conduct water for periods longer than ephemeral streams, as a function of watershed size and water source.

☒ perennial ☐ intermittent ☐ ephemeral

Photo Identification Numbers and Description:

	Photo ID No.	Description	Latitude	Longitude	Datum
1	C1U	Upstream	38°46'20.85"N	119°56'04.25"W	
2	C2ML	Middle Left	38°46'23.30"N	119°56'01.68"W	
3	C3MR	Middle Right	38°46'22.26"N	119°56'01.93"W	
4	C4DS	Downstream	38°46'24.68"N	119°55'58.77"W	
5					
6					
7					
8					
9					
10					

Site Location Description:

1.49 Km West of Picketts Junction (Hwy 88 and Hwy 89 Junction) Hope Valley California.
AA begins approximately 92 m downstream of Hwy 88 Bridge crossing.

Comments:

Scoring Sheet: Riverine Wetlands

AA Name: W. FORK CARSON RIVER

Date:

Attribute 1: Buffer and Landscape Context (pp. 11-19)

Metric	Alpha.	Numeric	Comments
Stream Corridor Continuity (D)	A	12	
Buffer:			Bridge HWY 88
Buffer submetric A: Percent of AA with Buffer	A	12	
Buffer submetric B: Average Buffer Width	B	9	
Buffer submetric C: Buffer Condition	A	12	
Raw Attribute Score = D+[C x (A x B)½]½		23.2	**Final Attribute Score = (Raw Score/24) x 100** 96.5

Attribute 2: Hydrology (pp. 20-26)

Metric	Alpha.	Numeric	Comments
Water Source	A	12	
Channel Stability	B	9	
Hydrologic Connectivity	A	12	
Raw Attribute Score = sum of numeric scores		33	**Final Attribute Score = (Raw Score/36) x 100** 91.6

Attribute 3: Physical Structure (pp. 27-33)

Metric	Alpha.	Numeric	Comments
Structural Patch Richness	A	12	
Topographic Complexity	B	9	
Raw Attribute Score = sum of numeric scores		21	**Final Attribute Score = (Raw Score/24) x 100** 87.5

Attribute 4: Biotic Structure (pp. 34-41)

Plant Community Composition (based on sub-metrics A-C)

Metric	Alpha.	Numeric	Comments
Plant Community submetric A: Number of plant layers	A	12	
Plant Community submetric B: Number of Co-dominant species	B	9	
Plant Community submetric C: Percent Invasion	A	12	
Plant Community Composition Metric *(numeric average of submetrics A-C)*		11	
Horizontal Interspersion	C	6	
Vertical Biotic Structure	C	6	
Raw Attribute Score = sum of numeric scores		23	**Final Attribute Score = (Raw Score/36) x 100** 63

Overall AA Score (average of four final Attribute Scores)	

Worksheet for Stream Corridor Continuity Metric for Riverine Wetlands (P.12)

office

Lengths of Non-buffer Segments For Distance of 500 m Upstream of AA		Lengths of Non-buffer Segments For Distance of 500 m Downstream of AA	
Segment No.	Length (m)	Segment No.	Length (m)
1	10	1	10
2		2	
3		3	
4		4	
5		5	
Upstream Total Length	10	Downstream Total Length	10

A

Percent of AA with Buffer Worksheet

In the space provided below make a quick sketch of the AA, or perform the assessment directly on the aerial imagery; indicate where buffer is present, estimate the percentage of the AA perimeter providing buffer functions, and record the estimate amount in the space provided.

SEE AERIAL photo

Percent of AA with Buffer: ______ %

Worksheet for calculating average buffer width of AA

B

Line	Buffer Width (m)
A	250 m.
B	250 m
C	250 m
D	250m
E	24m
F	12.5M
G	11m
H	40M
Average Buffer Width *Round to the nearest integer*	1087 ÷ 8 = 136M

Worksheet for Assessing Channel Stability for Riverine Wetlands

Condition	Field Indicators (check all existing conditions)
Indicators of Channel Equilibrium	☑ The channel (or multiple channels in braided systems) has a well-defined bankfull contour that clearly demarcates an obvious active floodplain in the cross-sectional profile of the channel throughout most of the AA.
	☑ Perennial riparian vegetation is abundant and well established along the bankfull contour, but not below it.
	☑ There is leaf litter, thatch, or wrack in most pools (if pools are present).
	☑ The channel contains embedded woody debris of the size and amount consistent with what is naturally available in the riparian area.
	☐ There is little or no active undercutting or burial of riparian vegetation.
	☑ If mid-channel bars and/or point bars are present, they are not densely vegetated with perennial vegetation.
	☑ Channel bars consist of well-sorted bed material (smaller grain size on the top and downstream end of the bar, larger grain size along the margins and upstream end of the bar).
	☑ There are channel pools, the spacing between pools tends to be regular and the bed is not planar throughout the AA
	☐ The larger bed material supports abundant mosses or periphyton.
Indicators of Active Degradation	☑ The channel is characterized by deeply undercut banks with exposed living roots of trees or shrubs.
	☑ There are abundant bank slides or slumps.
	☑ The lower banks are uniformly scoured and not vegetated.
	☐ Riparian vegetation is declining in stature or vigor, or many riparian trees and shrubs along the banks are leaning or falling into the channel.
	☐ An obvious historical floodplain has recently been abandoned, as indicated by the age structure of its riparian vegetation.
	☐ The channel bed appears scoured to bedrock or dense clay.
	☐ Recently active flow pathways appear to have coalesced into one channel (i.e. a previously braided system is no longer braided).
	☐ The channel has one or more knickpoints indicating headward erosion of the bed.
Indicators of Active Aggradation	☐ There is an active floodplain with fresh splays of coarse sediment (sand and larger that is not vegetated) deposited in the current or previous year.
	☐ There are partially buried living tree trunks or shrubs along the banks.
	☐ The bed is planar (flat or uniform gradient) overall; it lacks well-defined channel pools, or they are uncommon and irregularly spaced.
	☐ There are partially buried, or sediment-choked, culverts.
	☐ Perennial terrestrial or riparian vegetation is encroaching into the channel or onto channel bars below the bankfull contour.
	☐ There are avulsion channels on the floodplain or adjacent valley floor.
Overall	☑ **Equilibrium** ☐ **Degradation** ☐ **Aggradation**

Riverine Wetland Entrenchment Ratio Calculation Worksheet

The following 5 steps should be conducted for each of 3 cross-sections located in the AA at the approximate midpoints along straight riffles or glides, away from deep pools or meander bends. An attempt should be made to place them at the top, middle, and bottom of the AA.

Steps	Replicate Cross-sections ⟶	TOP	MID	BOT	X̄
1 Estimate bankfull width.	This is a critical step requiring familiarity with field indicators of the bankfull contour. Estimate or measure the distance between the right and left bankfull contours.	17.8m	15.5	16.6 m	16.6m
2: Estimate max. bankfull depth.	Imagine a level line between the right and left bankfull contours; estimate or measure the height of the line above the thalweg (the deepest part of the channel).	1.0m	1m	1m	1m
3: Estimate flood prone depth.	Double the estimate of maximum bankfull depth from Step 2.	2m	2m	2m	2m
4: Estimate flood prone width.	Imagine a level line having a height equal to the flood prone depth from Step 3; note where the line intercepts the right and left banks; estimate or measure the length of this line.	32.8m	63.7m	150 m	82m
5: Calculate entrenchment ratio.	Divide the flood prone width (Step 4) by the bankfull width (Step 1).	1.84	4.1	9.04	5
6: Calculate average entrenchment ratio.	Calculate the average results for Step 5 for all 3 replicate cross-sections. Enter the average result here and use it in Table 13a or 13b.			5	

Structural Patch Type Worksheet for Riverine wetlands

Circle each type of patch that is observed in the AA and enter the total number of observed patches in Table below. In the case of riverine wetlands, their status as confined or non-confined must first be determined (see page 6) to determine with patches are expected in the system (indicated by a "1" in the table below). Any feature onsite should only be counted once as a patch type. If a feature appears to meet the definition of more than one patch type (i.e. swale and secondary channel) the practitioner should choose which patch type best illustrates the feature. Not all features at a site will be patch types.

**Please refer to the CRAM Photo Dictionary at www.cramwetlands.org for photos of each of the following patch types.*

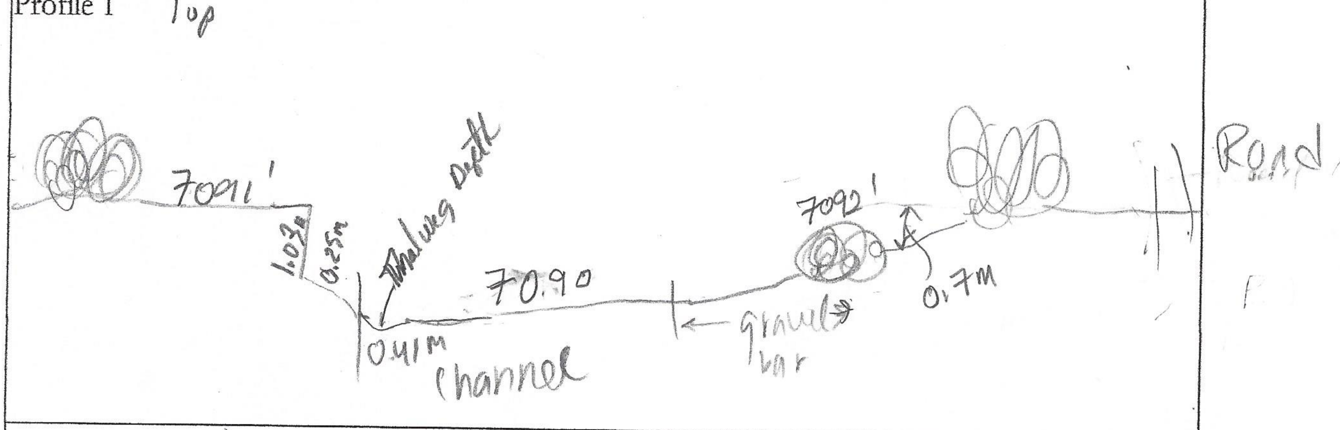
STRUCTURAL PATCH TYPE (circle for presence)	Riverine (Non-confined)	Riverine (Confined)
Minimum Patch Size	3 m^2	3 m^2
Abundant wrackline or organic debris in channel, on floodplain	1	1
Bank slumps or undercut banks in channels or along shoreline	1	1
Cobbles and/or Boulders	1	1
Debris jams	1	1
Filamentous macroalgae or algal mats	1	1
Large woody debris	1	1
Pannes or pools on floodplain	1	N/A
Plant hummocks and/or sediment mounds	1	1
Point bars and in-channel bars	1	1
Pools or depressions in channels (wet or dry channels)	1	1
Riffles or rapids (wet or dry channels)	1	1
Secondary channels on floodplains or along shorelines	1	N/A
Standing snags (at least 3 m tall)	1	1
Submerged vegetation	1	N/A
Swales on floodplain or along shoreline	1	N/A
Variegated, convoluted, or crenulated foreshore (instead of broadly arcuate or mostly straight)	1	1
Vegetated islands (mostly above high-water)	1	N/A
Total Possible	17	12
No. Observed Patch Types (enter here and use in Table 14 below)	12	

Worksheet for AA Topographic Complexity

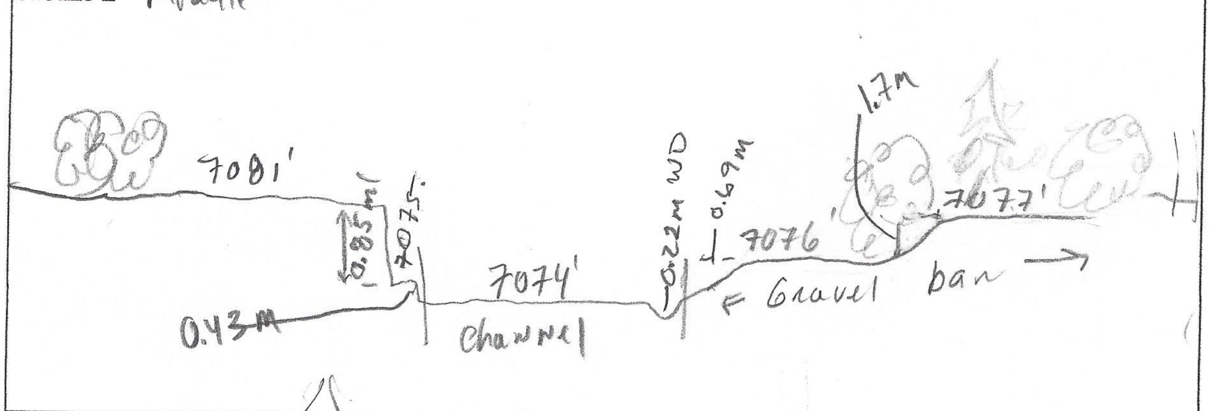
B2

At three locations along the AA, make a sketch of the profile of the stream from the ~~AA boundary~~ down to its deepest area then back out to the other AA boundary. Try to capture the benches and the intervening micro-topographic relief. To maintain consistency, make drawings at each of the stream hydrologic connectivity measurements, always facing downstream. Include the water level, an arrow at the bankfull contour, and label the benches. Based on these sketches and the profiles in Figure 10, choose a description in Table 16 that best describes the overall topographic complexity of the AA.

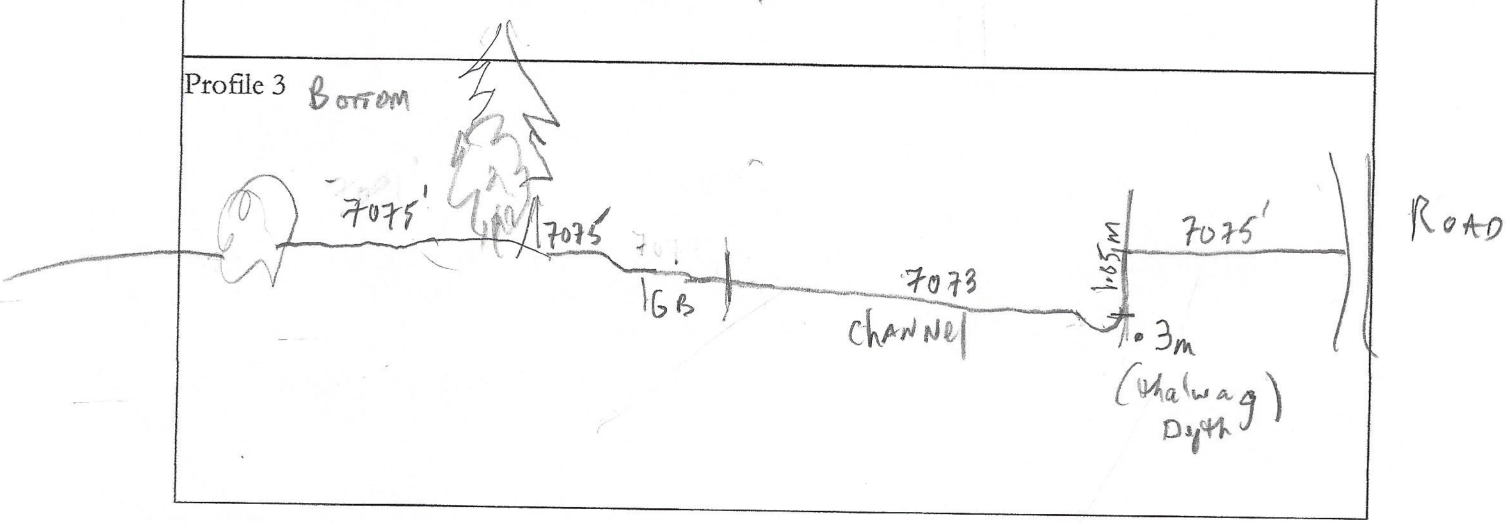
Profile 1



Profile 2



Profile 3



Plant Community Metric Worksheet: Co-dominant species richness for Riverine wetlands
(A dominant species represents ≥10% *relative* cover)

Special Note:

** Combine the counts of co-dominant species from all layers to identify the total species count. Each plant species is only counted once when calculating the Number of Co-dominant Species and Percent Invasion submetric scores, regardless of the numbers of layers in which it occurs.*

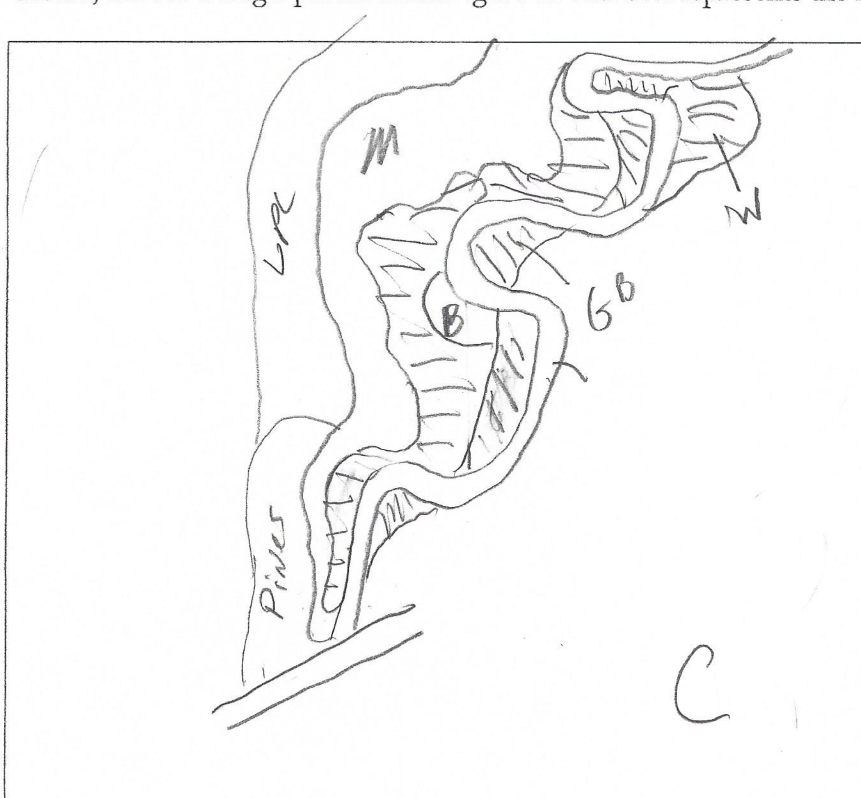
Floating or Canopy-forming (non-confined only)	Invasive?	Short (<0.5 m)	Invasive?
		Eleocharis palustris	
		Juncus balticus	
		Poa pratensis	
		Carex filifolia	
		Poa cusickii	

Medium (0.5-1.5 m)	Invasive?	Tall (1.5-3.0 m)	Invasive?
Carex nebrascensis		Salix lemmonii	
Carex utriculata			
Carex athrostachya			

Very Tall (>3.0 m)	Invasive?		
Pinus contorta		Total number of co-dominant species for all layers combined (enter here and use in Table 18)	10
		Percent Invasion *Round to the nearest integer* (enter here and use in Table 18)	0

Horizontal Interspersion Worksheet.

Use the spaces below to make a quick sketch of the AA in plan view, outlining the major plant zones (this should take no longer than 10 minutes). Assign the zones names and record them on the right. Based on the sketch, choose a single profile from Figure 12 that best represents the AA overall.



Assigned zones:

1) Gravel Bar
– early successional
2) Willow (Riparian) W
willow/Herb understory
3) Bare/Sand (B)
(No Veg)
4) Meadow (M)
5) Channel (OW)
6) Trees (Pines)
Herb/graminoid Understory
– Carex/Shrub UPL

Worksheet for Wetland disturbances and conversions

Has a major disturbance occurred at this wetland?	Yes	No		
If yes, was it a flood, fire, landslide, or other?	flood	fire	landslide	other
If yes, then how severe is the disturbance?	√ likely to affect site next 5 or more years	likely to affect site next 3-5 years	likely to affect site next 1-2 years	
Has this wetland been converted from another type? If yes, then what was the previous type? N/A	depressional	vernal pool	vernal pool system	
	non-confined riverine	confined riverine	seasonal estuarine	
	perennial saline estuarine	perennial non-saline estuarine	wet meadow	
	lacustrine	seep or spring	playa	

Historic Grazing –

Stressor Checklist Worksheet

HYDROLOGY ATTRIBUTE (WITHIN 50 M OF AA)	Present	Significant negative effect on AA
Point Source (PS) discharges (POTW, other non-stormwater discharge)		
Non-point Source (Non-PS) discharges (urban runoff, farm drainage)	✓ (ROAD)	
Flow diversions or unnatural inflows		
Dams (reservoirs, detention basins, recharge basins)		
Flow obstructions (culverts, paved stream crossings)	✓ Bridge	Somewhat
Weir/drop structure, tide gates		
Dredged inlet/channel		
Engineered channel (riprap, armored channel bank, bed)	✓ (DOWNSTREAM)	
Dike/levees		
Groundwater extraction		
Ditches (borrow, agricultural drainage, mosquito control, etc.)		
Actively managed hydrology		

Comments

PHYSICAL STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present	Significant negative effect on AA
Filling or dumping of sediment or soils **(N/A for restoration areas)**		
Grading/ compaction **(N/A for restoration areas)**		
Plowing/Discing **(N/A for restoration areas)**		
Resource extraction (sediment, gravel, oil and/or gas)		
Vegetation management		
Excessive sediment or organic debris from watershed	✓	
Excessive runoff from watershed		
Nutrient impaired (PS or Non-PS pollution)		
Heavy metal impaired (PS or Non-PS pollution)		
Pesticides or trace organics impaired (PS or Non-PS pollution)		
Bacteria and pathogens impaired (PS or Non-PS pollution)		
Trash or refuse		

Comments

BIOTIC STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present	Significant negative effect on AA
Mowing, grazing, excessive herbivory (within AA)		
Excessive human visitation	(Fishing/trails top of bank/willow	
Predation and habitat destruction by non-native vertebrates (e.g., *Virginia opossum* and domestic predators, such as feral pets)	seedling trampling	
Tree cutting/sapling removal		
Removal of woody debris		
Treatment of non-native and nuisance plant species	✓(?) FOHV	
Pesticide application or vector control		
Biological resource extraction or stocking (fisheries, aquaculture)		
Excessive organic debris in matrix (for vernal pools)		
Lack of vegetation management to conserve natural resources		
Lack of treatment of invasive plants adjacent to AA or buffer		

Comments

BUFFER AND LANDSCAPE CONTEXT ATTRIBUTE (WITHIN 500 M OF AA)	Present	Significant negative effect on AA
Urban residential		
Industrial/commercial		
Military training/Air traffic		
Dams (or other major flow regulation or disruption)		
Dryland farming		
Intensive row-crop agriculture		
Orchards/nurseries		
Commercial feedlots		
Dairies		
Ranching (enclosed livestock grazing or horse paddock or feedlot)	✓ Historic	Y
Transportation corridor	✓	Y
Rangeland (livestock rangeland also managed for native vegetation)	✓ Historic	Y
Sports fields and urban parklands (golf courses, soccer fields, etc.)		
Passive recreation (bird-watching, hiking, etc.)	✓	
Active recreation (off-road vehicles, mountain biking, hunting, fishing)	✓	Fishing trails prevent willow growth
Physical resource extraction (rock, sediment, oil/gas)		
Biological resource extraction (aquaculture, commercial fisheries)		

Comments

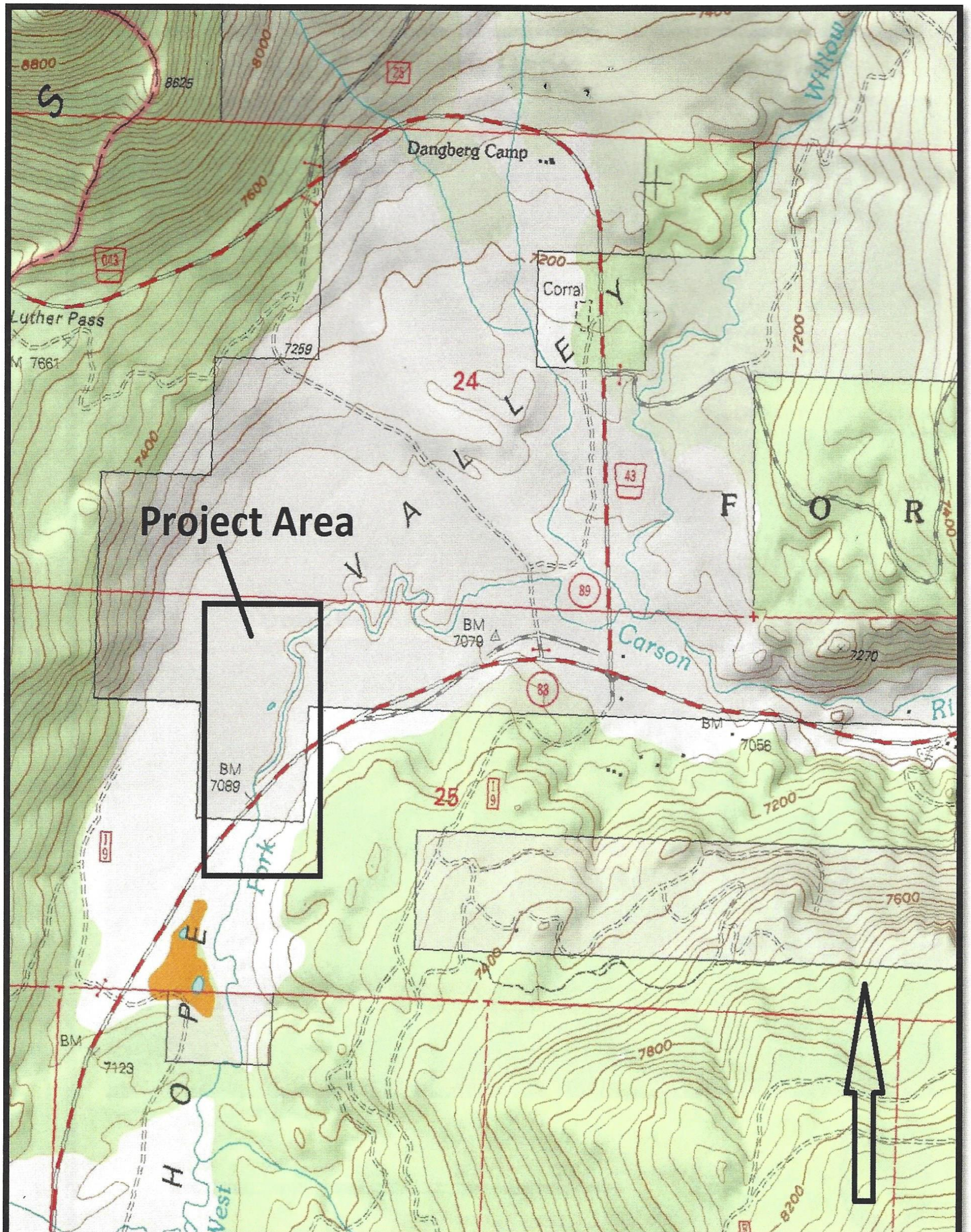
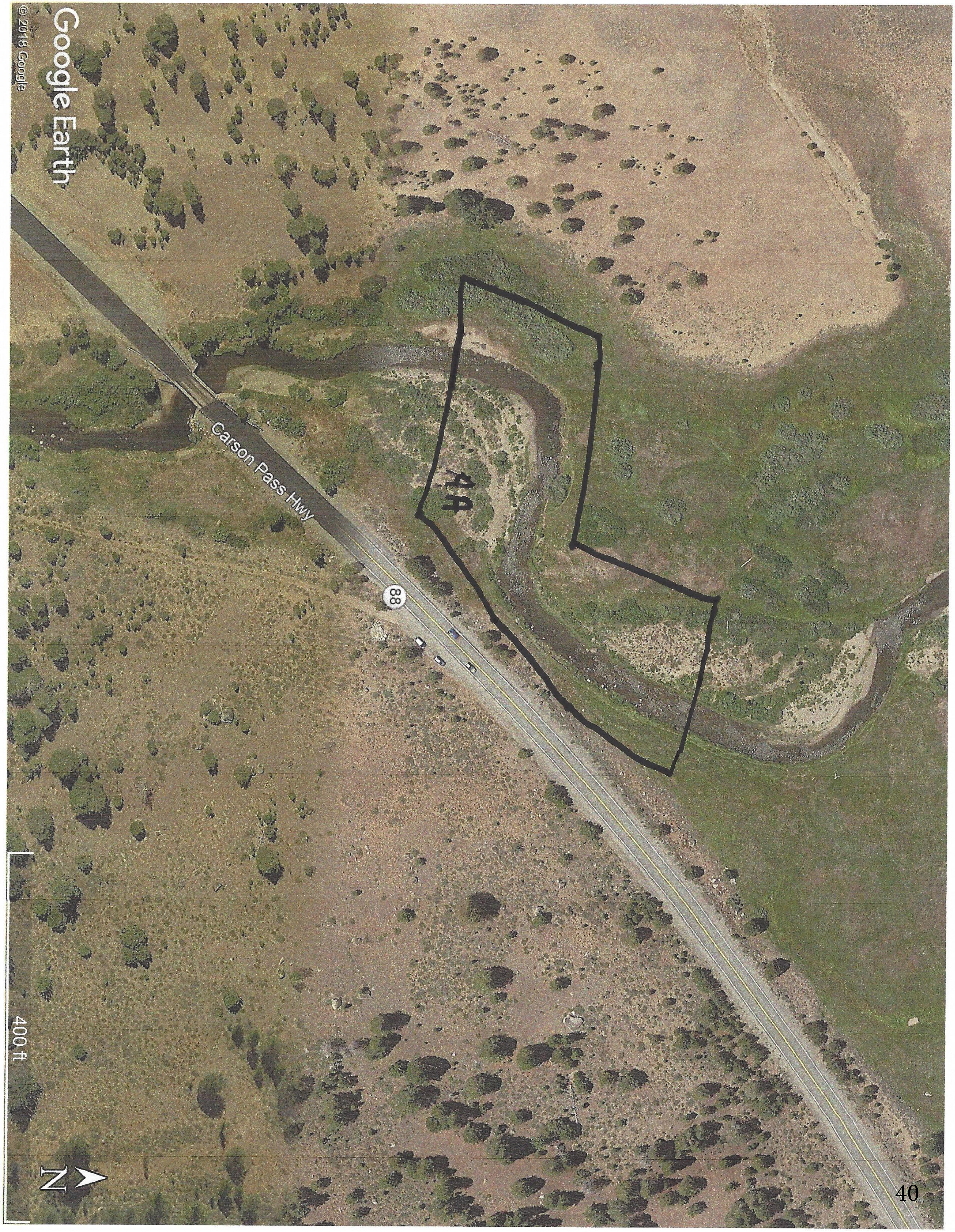
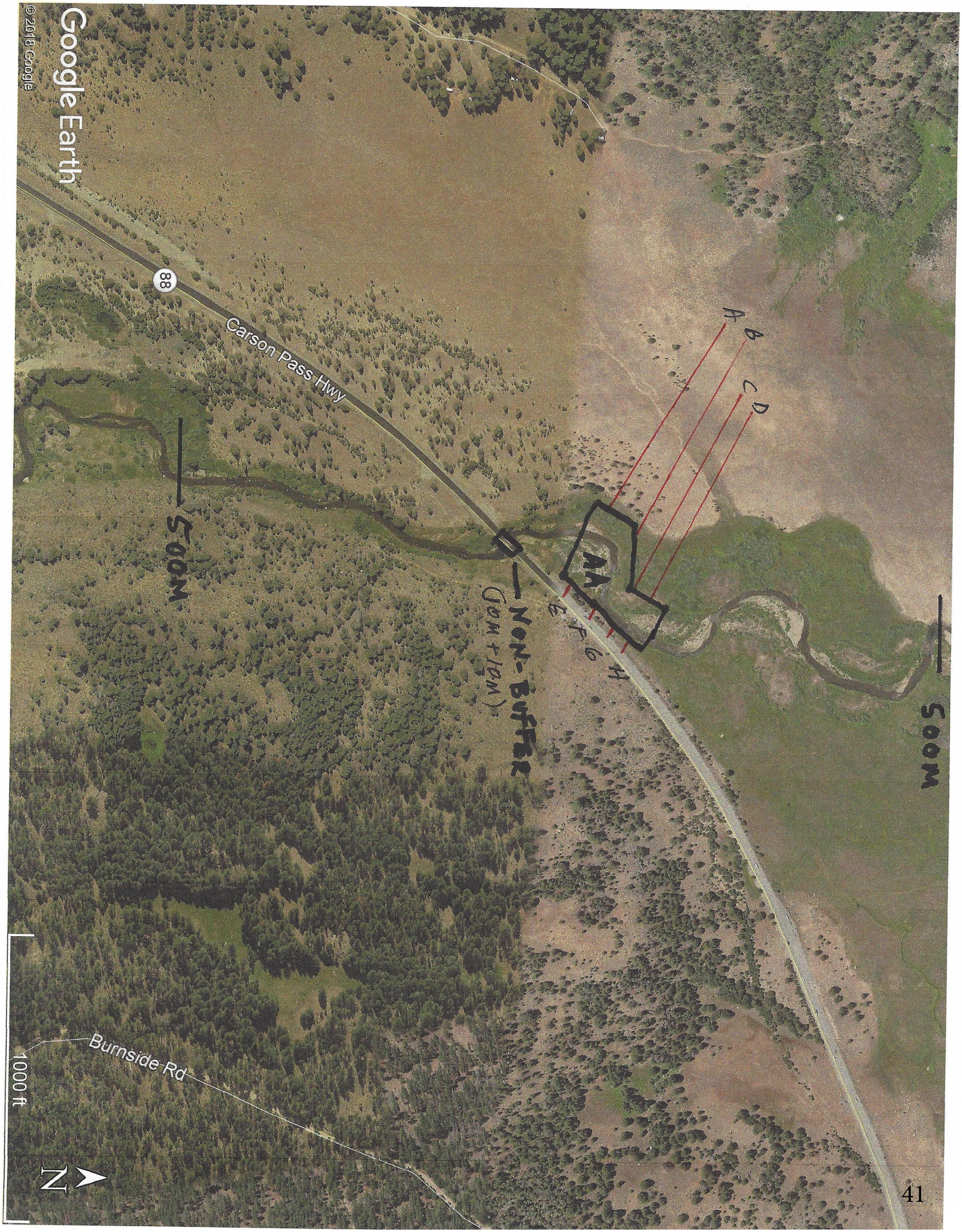


Exhibit 1. Hope Valley W. Fork Carson River Restoration and Aquatic Habitat Enhancement Project Location (USGS Topo Map)


Google Earth
© 2018 Google
Carson Pass Hwy
88
4A
400 ft
N


Google Earth
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88
Carson Pass Hwy
Burnside Rd
1000 ft
N
A
B
C
D
E
F
G
H
AA
500M
NON-BUFFER
(30M+10M)
500M

W. Fork Carson River
Write a description for your map.
Blue Lakes Rd
Burnside Lake Rd
Pickett's Peak Rd (Usfs)
Sorensens
88
89
Google Earth
N
WATERSHED 2KM