

AGREEMENT #P1796015
SIERRA VALLEY RESOURCE CONSERVATION DISTRICT

FINAL
CARMAN WATERSHED RESTORATION PROJECT PHASE 2
WETLAND RESTORATION GRANT PROGRAM
PROJECT CLOSE-OUT SUMMARY REPORT

THE CARMAN WATERSHED RESTORATION PROJECT PHASE 2 is identified as Grant No. P1796015 for the Wetland Restoration Grant Program.

1. Project Background Information:

Including, but not limited to: History; purpose of project and goals; precise location; eozone; map of project location; etc.

Project Background/Location

The Carman Creek Watershed Restoration Phase 2 project was funded under a California Department of Fish and Wildlife (CDFW) Proposition 1 Grant with the Sierra Valley Resource Conservation District (SVRCD) as grantee, in cooperation with the Tahoe National Forest (TNF) Sierraville Ranger District. The grant term was January 1, 2018 - April 30, 2020. Phase 2 project sites include Site #1 Folchi Meadows, Site #2 Folchi Meadows Railroad Grade, Site #4 West Fork Carman Creek, and Site #8 East Fork Carman Creek. Project sites are located in Plumas and Sierra Counties in the northern portion of the TNF Sierraville Ranger District approximately 2-miles north of Calpine, California (Exhibit 1).

The TNF prepared restoration designs and acquired project permits over many years until being awarded the CDFW Proposition 1 grant to complete restoration construction and project monitoring. In 2018, Former TNF Eastside Watershed Program Manager (Randy Westmoreland) and Karri A. Smith, Professional Wetland Scientist/Restoration Ecologist (K.A. Smith Consulting, Inc.) were contracted by the SVRCD to complete final project designs and permits, conduct baseline and post-construction monitoring, and supervise restoration construction. Restoration construction activities were initiated during July 2019 and completed in September 2019.

Large-scale meadow and stream channel restoration activities included filling large eroded gullies (full gully fill) and removing railroad grade berms which had degraded the areas by lowering meadow ground water levels, truncating tributary drainage channels, and promoting conversion of wetland and riparian habitat to dry upland sagebrush scrublands. Restoration resulted in successfully reconnecting Folchi Meadows, West Fork Carman Creek, and East Fork Carman Creek remnant meadow channels and tributary drainages with historic floodplains and restoring hydrologic function to the degraded areas. Approximately 10,000 lineal feet of gully was filled for all four sites combined with approximately 30,000 yds³ of upland and railroad grade borrow soil material placed into eroded gullies and incised channels. Successful restoration of the degraded meadows and streams/drainages effectively resulted in direct ecological functional benefit of over 375 acres of mountain meadow habitat and approximately 2 miles of Carman Creek stream corridors within the Carman Watershed.

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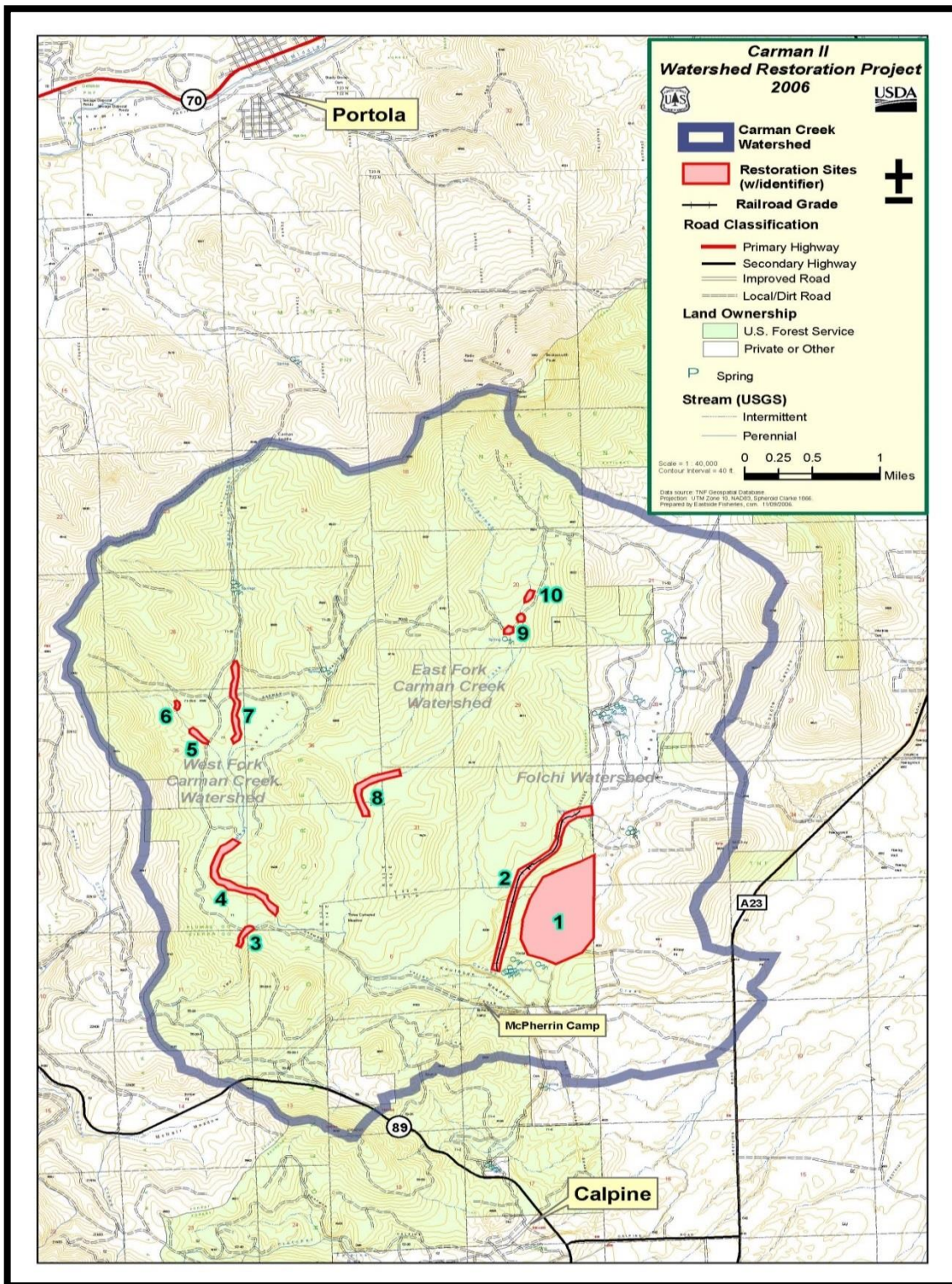


Exhibit 1. Carman Watershed Restoration Project Phase 2 Project Location Map
(Sites #1, #2, #4, and #8)

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Secondary project benefits include expanding and enhancing wetland and riparian habitat for sensitive plant and wildlife species including State Listed Threatened and Endangered (T&E) species such as the endangered Willow flycatcher (*Empidonax traillii*) and State and Federally listed Sierra Nevada yellow-legged frog (*Rana mucosa*). Forest Service listed sensitive plant species such as Plumas ivesia (*Ivesia sericoleuca*) and sticky goldenweed (*Pyrrocoma lucida*) will also benefit from improved soil and hydrology condition. Peat wetland-dependent sensitive plants such as *Botrychium* spp., *Meesia triquetra*, and *M. uliginosa* are expected to increase in frequency in hydrologically enhanced raised peat bog spring complexes located within the Folchi Meadows area.

Climate change resilience from increased carbon storage and sequestration is expected and fire threat will be reduced as a result of fire-adapted invasive plant species such as cheat grass being replaced by wetland-dependent native willows, sedges and rushes.

History/Project Purpose

Prior to European settlement, the Carman Watershed meadows and streams were ecologically stable and effectively attenuated flood flows mainly through absorption and groundwater recharge. Historic grazing, agriculture, logging and railroad construction in the 1920's and 1930's resulted in ecosystem degradation adversely affecting the ability of the watershed to function normally. Meadows and streams became severely degraded with large gully formations, accelerated erosion and sediment production, decreased water table levels and aquifer storage, wildlife habitat impacts, and impaired water quality in receiving streams including the Feather River.

Successful implementation of the Carman Watershed Restoration Project Phase 2 project completed Folchi Meadows and Carman Creek restoration projects with significant improvements to degraded meadow and stream ecosystems and promoted continued collaboration between the Sierra Valley Resource Conservation District (SVRCD) and the U.S. Forest Service (USFS) Tahoe National Forest (TNF) in completing watershed improvements.

Regional Significance

The Carman Watershed is a montane meadow ecosystem of approximately 15,000 acres located in the northern Sierra Nevada mountain range within the Upper Middle Fork of the Feather River Watershed. The area is dominated by granitic and volcanic mountains and pine forested hills with higher elevation meadows, streams and riparian areas, and fen and peat bog springs located within low grade valley bottoms.

Prior to completion of the Carman Watershed restoration projects, the watershed was listed as the most severely deteriorated watershed in the Tahoe National Forest. The Carman Watershed is identified as a restoration priority in the National Fish and Wildlife Foundation Sierra Nevada Meadows Business Plan, and the IPB Willow Flycatcher Habitat Assessment. The Carman Watershed is also identified as the first Priority Watershed on the Tahoe National Forest and a priority for the Sierra Valley Resource Conservation District. The Carman Watershed meadow complex has statewide significance due to its location within the Sierras, size, and regional importance for sensitive plant and wildlife species. The

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Carman Watershed is also important for Sierra Valley ecosystem health and supports high quality resting, nesting, and rearing and feeding habitat for migratory birds including the sandhill crane, a sensitive species. The Carman Watershed has one of the largest complexes of mountain meadows in the Upper Feather River located on public lands, providing the best opportunity for restoration of important habitat for multiple T&E, sensitive, and rare plant and animal species.

Project Goals

Restoration goals and objectives attained/expected to be attained in the long term as a result of successful meadow and stream restoration function include: 1) Reducing or stopping active erosion and gully formation; 2) Restoring seasonal water table levels to support desirable meadow and riparian vegetation; 3) Improving wildlife and aquatic habitat quality and overall meadow and riparian ecosystem health; 4) Increasing ground water storage and extending seasonal flow regimes; 5) Reconnecting remnant channels and floodplains such that flood flow energy is dissipated reducing sediment conveyance to Carman Creek and the Feather River; and 6) Increasing wildlife and livestock forage.

Secondary benefits include expanding and enhancing wetland and riparian habitat for sensitive plant and wildlife species including State Listed T&E species such as the endangered Willow flycatcher (*Empidonax traillii*) and State and Federally listed Sierra Nevada yellow-legged frog (*Rana mucosa*). Forest Service listed sensitive plant species such as Plumas ivesia (*Ivesia sericoleuca*) and sticky goldenweed (*Pyrrocoma lucida*) will also benefit from improved soil and hydrology condition. Peat wetland-dependent sensitive plants such as *Botrychium* spp., *Meesia triquetra*, and *M. uliginosa* are expected to increase in frequency in hydrologically enhanced raised peat bog spring complexes located within the Folchi Meadows area.

Climate change resilience from increased carbon storage and sequestration is expected and fire threat will be reduced as fire-adapted invasive plant species such as cheat grass will be replaced by wetland-dependent native willows, sedges and rushes.

Consistency with Proposition 1 Grant Goals

The Carman Watershed Restoration Project Phase 2 project supports the goals of the CDFW Proposition 1 Wetland Restoration Grant Program by completing final restoration of the four remaining degraded meadow and riparian areas within the Carman Watershed (Site #1 Folchi Meadows, Site #2 Folchi Meadows Railroad Grade, Site #4 West Fork Carman Creek, and Site #8 East Fork Carman Creek). Additionally, the Carman Watershed Restoration Phase 2 project is consistent with Proposition 1 priorities: 1) Protecting and Restoring Mountain Meadow Ecosystems, 2) Managing Headwaters for Multiple Benefits, and 3) Habitat Restoration, Conservation, and Enhancement. The Carman Watershed Restoration Phase 2 project is also consistent with aspects of the Clean Water Action Plan, State Wildlife Action Plan, Sierra Nevada Watershed Improvement Plan, Tahoe National Forest Land and Resource Management Plan, and the National Fish and Wildlife Foundation Sierra Nevada Meadows Business Plan.

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Proposition 1 Priorities

Protect and Restore Mountain Meadow Ecosystems

The Carman Watershed Restoration Phase 2 project accomplished this objective by restoring/enhancing over 375 acres of mountain meadow ecosystems in three primary areas in the Carman Watershed including Folchi Meadows and its large complex of peat bog springs degraded by gully erosion and a lowering of the groundwater table. These Projects increased groundwater storage, reduced and delayed peak flows on streams that flow through meadow systems, improved water quality, and restored and expanded habitat for native species.

Manage Headwaters for Multiple Benefits

The Carman Watershed Restoration Phase 2 project sites are all located within the headwaters of the Middle Fork of the Feather River. Completing restoration of these sites continued collaborative watershed efforts ongoing since 2000 for restoring meadow and riparian areas, improving Forest Service roads and reducing erosion and sediment production, and managing timber and fuels production. Successful restoration of Folchi Meadows and the Carman Creek sites will also provide benefit by increasing groundwater storage and late season base flows, improving water quality of receiving streams, and enhancing and expanding wildlife and aquatic species habitat. Restoring degraded meadow vegetation to more desirable wetland and riparian vegetation also reduces catastrophic wildfires, ameliorates adverse effects of global warming, and increases carbon sequestration.

Sensitive plant and animal species habitat will be enhanced and improved and State Listed T&E species such as the State of California endangered Willow flycatcher (*Empidonax traillii*) will benefit. Local ranches will benefit by an increase in livestock forage production.

Habitat Restoration, Conservation, and Enhancement

The Carman Watershed Restoration Phase 2 project accomplished this objective by protecting, restoring, and enhancing stream and wetland water dependent habitat for fish and wildlife.

2. Objectives:

Including, but not limited to: Hypotheses tested; proposed work; etc.

Project Objectives Achieved

All proposed project objectives were achieved by restoring the degraded meadow and stream channels and completing TNF road improvements. Project objectives achieved per stated Performance Measures (Exhibit 2) include: 1) Restored the natural hydrologic regime to Folchi Meadows (Site #1 and Site #2), the West Fork Carman Creek (Site #4), and the East Fork Carman Creek (Site 8) sufficient to successfully increase groundwater storage, attenuate flood flow, improve summer flow from associated restored meadow systems, and

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EXHIBIT 2 – PERFORMANCE MEASURES

Project Objectives	Project Output Performance Measures	Project Outcome Performance Measures	Metrics
1. Reconnect the streams to the historic floodplains	PM 1a. Incised streams are filled and flows returned to remnant channels on the meadow surface	PM 1b. Historic floodplains are inundated during average or above average spring runoff at all project sites starting first spring after project completion	Flooding: <ul style="list-style-type: none"> Return rate Flow across restored floodplain
2. Increase wet and seasonally wet meadow habitat by 300 acres	PM 2a. 300 acres of degraded meadow / riparian habitat restored by 2019	PM 2b. Meadow vegetation is changing from upland species to a mosaic of mesic, facultative and obligate species and increases in cover.	Vegetation composition Vegetation cover
3. Raise seasonal groundwater elevations	PM 3a. Incised streams are filled and flows returned to remnant channels	PM 3b. Shallow groundwater elevation come up higher and stay higher longer in summer.	Groundwater elevations
4. Reduce active stream erosion of bed, banks and at head cuts	PM 4a. Degraded eroding streams in all treatment areas have been returned to historic floodplain channels	PM 4b. Water has been spread on floodplain keeping the flow energy low. Erosion of bed, banks and head cuts has been stopped or significantly reduced	Headcuts are stabilized and revegetating. Stream channel elevations stabilize, sediment regime resembles natural levels.
5. Reduce sediment from three miles of USFS roads	PM 5a. Three miles of USFS roads have been treated with water dips, water bars, and/or gravel. Problem stream crossings have been hardened.	PM 5b. Treated roads are not capturing water, reducing erosion from road surfaces. Stream crossings are stable	Road erosion is reduced to minimal levels. Roads are well drained and do not concentrate water Stream crossings are stable.

significantly reduce erosion and sediment production; 2) Restored connectivity to approximately 6 miles of stream channels in the Carman Watershed; 3) Increased wet and seasonally wet meadow habitat by approximately 300 acres in Folchi Meadows and increased carbon sequestration; 4) Restored approximately 75 acres of riparian vegetation and floodplain function to Folchi Meadows and the east and west forks of Carman Creek; 5) Restored priority sensitive habitat for the Willow flycatcher; 6) Restored and enhanced priority sensitive peat bog spring habitat for multiple wetland-dependent sensitive plant species; and 7) Reduced Forest Service Road (NFSR 71 and 71.10) sediment production through implementation of BMP's and road base gravel.

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Hypothesis Tested

The Carman Watershed Restoration Phase 2 projects were expected to be successful based upon scientific support of similar watershed restoration projects implemented in the Carman Watershed and other nearby areas. Similar projects have been successful in curtailing erosion, restoring meadow function, recharging the groundwater table, and improving water quality and wildlife habitat.

1. Restoring the natural hydrologic regime to Folchi Meadows would increase groundwater storage, attenuate flood flows and improve summer flows from this meadow system.

Groundwater storage has been shown to increase in restored meadows throughout the Sierra Nevada. Studies of restored meadows in the Feather River Watershed found increased water table levels. Additionally, groundwater levels rose in response to meadow restoration on Trout Creek, south of Lake Tahoe. The project would incrementally address summer flows by retaining water later into the season in shallow mountain meadow floodplain aquifers.

2. Restore connectivity to 6 miles of stream channels in the Carman Watershed

Eleven tributaries have been diverted and/or disconnected by railroad grades. Removing railroad grades and restoring stream channels through the project areas reconnects ephemeral and intermittent tributaries restoring watershed hydrologic function.

3. Increase wet and seasonally wet meadow habitat by 300 acres in Folchi Meadows.

It is well documented that water table depth determines plant species and richness in wet and moist meadows. Where meadow gullies have been obliterated (filled) in past projects areas such as the Middle Perazzo Meadows, 5 years post after plug and pond (gully fill) hundreds of acres of high quality riparian and meadow habitat has been produced.

Shallow groundwater levels are expected to rise throughout restored meadows as a result of gully fill. Shallow ground water monitoring in Knuthson Meadows, located adjacent to Folchi Meadows, have shown that meadow water table levels rise earlier in spring and is retained later into the summer. Vegetation response was significant indicating more.

4. Restore 75 acres of riparian vegetation and floodplain function to the East Fork Carman Creek and West Fork Carman Creek.

At Site #4 – West Fork Carman Creek and Site #8 – East Fork Carman Creek the project proposed reconnecting eroded drainage channels truncated by railroad construction. Past projects have shown that drainages reconnected by removing railroad grade and re-introducing historic flow to remnant channels resulting in a direct increase of riparian and meadow habitat.

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5. Reduce Forest Service Road Erosion and Sediment Production

Forest Service roads treated to reduce erosion by adding drainage dips, waterbars, hardened low water crossings on ephemeral and intermittent drainages, and graveling

Significance of Achieving Project Objectives

Completing the Carman Creek Watershed Phase 2 projects, in addition to completing previous meadow restoration and road work within the watershed, will accomplish restoration of over 75% of the Carman Watershed degraded meadows and streams within the watershed. In combination with the previous phases of the Carman Watershed restoration projects, wet meadow habitat will be increased by over 500 acres.

Probability of Success

The probability of success of the Carman Watershed Restoration Project Phase 2 projects is high given proven long term success of similar projects implemented within the Tahoe National Forest, Plumas National Forest, and at many similar areas within the Sierra Nevada. Perazzo Meadows and Knudson Meadows, both nearby “pond and plug” show significant wet meadow expansion.

3. Results and Findings:

Including, but not limited to: What was actually implemented or performed; expected outcomes and actual outcomes; data obtained/measured during the course of the project and why; electronic and paper reports and summaries of calculated findings; etc.

Restoration Activities Implemented/Performed

Site #1 Folchi Meadows

Restoration activities included filling the large eroded meadow gully and re-connecting tributary channels to restore surface overland flow and recharge the ground water table. Restoration activities included moving the flow out of the eroded gully into stable remnant channels on the floodplain surface. The existing gully was obliterated using full gully fill techniques. Approximately 6,000 feet of the gully was filled with a few water features retained for wildlife habitat. Approximately 300 acres of floodplain was hydrologically re-activated by re-connecting remnant channels. All existing wetland vegetation within the gully was salvaged, stockpiled, watered, and replaced onto the filled gully area following gully fill. Access roads and borrow areas were rehabilitated by scarifying compacted surfaces and spreading native mulch and logs throughout the areas to promote revegetation success, curtail erosion, and preclude vehicular use of the areas.

Site #2 Folchi Meadows Railroad Grade

Restoration activities included reconnecting natural drainages truncated by the railroad grade by removing all of the railroad grade material. Railroad grade material and soil from two borrow areas just west of the grade was used to fill the Folchi Meadows gully. The railroad grade area and re-connected drainage channels were re-contoured to near original

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topography. The lower lying areas located behind the railroad grade receiving seasonal drainage channel flow supporting sticky goldenweed (*Pyrrocoma lucida*), a sensitive plant species, were flagged to protect plant habitat while final grading incorporated contouring to retain seasonal hydrology necessary to continue to support existing plant populations. Archeological sites along the railroad grade were flagged by the Tahoe National Forest Archaeologist and protected during construction and rehabilitation activities. Access roads and borrow areas were rehabilitated by scarifying compacted surfaces and spreading native mulch and logs throughout the areas to promote revegetation success, curtail erosion, and preclude vehicular use of the areas.

Site #4 West Fork Carman Creek

Restoration activities included removing the existing railroad grade that was diverting natural stream flow into an eroded gully within the meadow floodplain area, relocating flows into remnant channels on the abandoned meadow floodplain and obliterating the eroded gully by full gully fill/obliteration techniques. The gully was filled with borrow soil from the railroad grade and one borrow area in the northwest project area. Approximately 1,500 feet of existing degraded gully was obliterated with approximately 15 acres of degraded floodplain restored. All existing wetland vegetation within the gully was salvaged, stockpiled, watered, and replaced onto the filled gully area following gully fill. Access roads and borrow areas were rehabilitated by scarifying compacted surfaces and spreading native mulch and logs throughout the areas to promote revegetation success, curtail erosion, and preclude vehicular use of the areas.

Site #8 East Fork Carman Creek

Restoration activities included redirecting flow from the degraded section of the drainage and returning seasonal flows to original or remnant channels. All eroded areas were filled using gully fill/obliteration techniques using railroad grade and borrow area soil. Approximately 2,500 feet of channel/meadow was restored with approximately 10 -15 acres of degraded floodplain restored. Access roads and borrow areas were rehabilitated by scarifying compacted surfaces and spreading native mulch and logs throughout the areas to promote revegetation success, curtail erosion, and preclude vehicular use of the areas.

Restoration Site Erosion Control and Revegetation

Erosion control and revegetation at Folchi Meadows Sites #1 and #2 and West Carman Creek included intensive salvage of existing wetland vegetation and direct replacement of vegetation mats immediately following gully fill activities. Prudent attention to this particular aspect of the restoration process is extremely effective at minimizing erosion and sediment production from previously disturbed sites. In addition to salvaged vegetation placement a large amount of site generated large woody debris, forest floor duff and pine needles was spread on all disturbed access roads and borrow areas.

All access roads and borrow areas at all four restoration sites were rehabilitated by scarifying compacted surfaces and spreading native mulch and logs throughout the areas to promote revegetation success, curtail erosion, and preclude vehicular use of the areas.

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Small Conifer Removal

Small and medium sized conifer removal was conducted at Folchi Meadows Site #1 and Site #2 and within the Site #4 West Carman Creek meadow floodplain. Hundreds of conifers established within the degraded meadows were cut by chainsaw and spread in place to provide overland flow floodplain grade control and site roughness, and wildlife habitat.

Expected Outcomes and Actual Outcomes

Actual project restoration outcome at each project site is that which was expected. All proposed restoration and rehabilitation activities were implemented in completion and post project monitoring indicates that all four project site are functioning as planned.

Restoration goals and objectives attained/expected to be attained in the long term as a result of successful construction include: 1) Reducing or stopping active erosion and gully formation; 2) Restoring seasonal water table levels to support desirable meadow and riparian vegetation; 3) Improving wildlife and aquatic habitat quality and overall meadow and riparian ecosystem health; 4) Increasing ground water storage and extending seasonal flow regimes; 5) Reconnecting remnant channels and floodplains such that flood flow energy is dissipated reducing sediment movement downstream to Carman Creek and the Feather River; and 6) Increasing wildlife and livestock forage.

Data Obtained/Measured During Project and Why

Project data obtained included pre-project vegetation and groundwater monitoring, construction monitoring, and post project early season photo monitoring of surface water, vegetation, and overall site condition. Pre-project monitoring was conducted to determine baseline condition and show difference in pre- vs. post-construction condition and ecological function.

Pre- Project, Construction and Post Project Monitoring

Pre-project monitoring was initiated prior to restoration implementation at all four Carman Watershed Phase 2 sites. The Carman Watershed restoration pre-project monitoring protocol was developed per standard methodologies which enable rapid field assessment and are readily repeatable. Pre-project qualitative and quantitative monitoring was initiated by the TNF during 2016-2018. The TNF did not collect pre-project vegetation monitoring data. During 2018-2019, K.A. Smith Consulting, Inc. collected pre-construction baseline vegetation data and pre-project and construction photo monitoring. All photo monitoring transects/points, vegetation transects, and groundwater well locations are identified on project maps included in the monitoring reports.

During 2016-2019 baseline photo monitoring was conducted at all four sites and baseline groundwater data was collected at Site #1 Folchi Meadows. During 2018-2019, K.A. Smith Consulting, Inc. collected pre-construction baseline vegetation data and pre-construction and construction photo monitoring. During February-March 2020, K.A. Smith Consulting, Inc. and R. Westmoreland, in cooperation with the TNF, conducted post-construction early season photo monitoring of all four sites to assess restoration effectiveness and determine

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whether adaptive management measures are necessary to ensure long term project success. Surface hydrology and vegetation response was documented in project photographs.

Photo Point Monitoring

Photo point monitoring stations were established at all four project sites by K.A. Smith Consulting, Inc. and the TNF prior to initiation of construction restoration activities.

Vegetation Monitoring

Vegetation monitoring was conducted according to standard random stratified sampling methodologies per Forest Service Long Term Range Monitoring and Multiple Indicator Monitoring and California Native Plant Society (CNPS) protocol. Quantitative (plots) and qualitative (photo monitoring) analysis of existing vegetation was conducted to determine ground cover and plant community species composition and plant species diversity. Vegetation monitoring methods included establishing 100-foot vegetation monitoring transects perpendicular to existing gullies and across degraded meadows at representative locations throughout Site #1, Site #4, and Site #8. Ten (10) 1mx1m plots randomly located along the line transects were evaluated to obtain ground cover data. Ground cover assessments of vegetation, litter, rock, and bare ground were attained by ocular estimate according to the CNPS ground cover value chart developed to estimate plot cover. Plant community composition and species diversity was determined following field data collection. Total vegetation cover values were obtained by calculating the percent (%) cover of each plant species in all plots and dividing by the total number of plots evaluated then multiplying by 100. Litter, rock, and bare ground cover values were estimated in the same manner. Desirable wetland plant species diversity was calculated by adding the total number of obligate, facultative wet, and facultative plant species divided by the total number of plant species multiplied by 100.

Results of pre-construction baseline vegetation and hydrology monitoring indicated the project areas were in a degraded condition with meadow floodplains dominated by upland plant species. Site #1 Folchi Meadows total vegetation cover (77.3%) was comprised of wetland species (24.3%) and upland species (53%). Site #4 total vegetation cover (59.6%) was comprised of wetland species (28.8%) and upland species (30.8%). Site #8 total vegetation cover (55.8%) was comprised of wetland species (1.7%) and upland species (54.1%).

Groundwater Monitoring

Baseline groundwater and soil saturation data was collected by the Tahoe National Forest (TNF) during November 1-7, 2017 (Table 1 and Exhibit 4). During this time period the TNF installed six 2-inch diameter perforated ground water monitoring wells (piezometers) ranging from a depth of 9 to 12 feet in length. Average depth to a subsurface clay layer was measured at 5-6 feet. Depth to saturation ranged from 72-110 inches. Depth to water table ranged from 85 to 119.6 inches.

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On September 4, 2019, the TNF and K.A. Smith Consulting, Inc. collected pre-construction piezometer groundwater readings. Depth to water table ranged from 30 to 83.5 inches. However, as water levels measured in the piezometers were much higher than the 2017 readings, and as some of the readings did not represent the groundwater table level visually observed in nearby gully bottoms, it is not clear whether some of the piezometers may be clogged and/or filled with rain water or whether the 2017 readings were taken before groundwater levels equilibrated in the newly installed piezometers. Additionally, numerous piezometer caps were not present during 2019. Soil saturation data was not collected during 2019.

Surface Water Monitoring

A formal surface water program was not implemented by the TNF prior to restoration construction activities. During February-March 2020 early season monitoring which included qualitative photo documentation of surface hydrology and tributary drainage re-connection effectiveness was conducted.

**Pre-Project and Construction Monitoring and Post-Project Monitoring
Reports of Findings and Data Management**

Data Management/Website Uploads

The SVRCD coordinated all project data management including subcontractor contracts, quarterly invoices and reports, project permits, and pre-and post-project monitoring reports and monitoring data. SVRCD submitted all reports/data generated by the project to the CDFW Grant Manager during 2018-2020.

Per grant requirements, project information and reports were uploaded to the SVRCD website (www.sierravalley-rcd.org) and the EcoAtlas Project Tracker (www.ecoatlas.org) and U.C. Davis Sierra Meadows Data Clearinghouse (www.meadows.ucdavis.edu) websites. SVRCD was not able to upload Folchi Meadows groundwater data to the State Water Resources Control Board GeoTracker GAMA site (www.waterboards.ca.gov/gama) as the Program Manager (Aaron Butters) only accepts water quality data. Therefore, SVRCD is unable to provide proof of data submission to the CDFW Grant Manager for this task. SVRCD notified the CDFW Grant Manager that the State Water Resources Control Board GeoTracker GAMA site does not accommodate ground water data and provided contact information to the CDFW Grant Manager. Folchi Meadows groundwater data is included in the pre-project monitoring report *Carman Watershed Restoration Project Monitoring Report* (K.A. Smith Consulting, Inc. 2020).

SVRCD submitted to the CDFW Grant Manager the *Carman Watershed Restoration Project Monitoring Report* (K.A. Smith Consulting, Inc. 2020) and the *Carman Watershed Restoration Post-Project Monitoring and Adaptive Management Report* (K.A. Smith Consulting, Inc. 2020).

Pre-project baseline vegetation and hydrology data, site photographs taken at established photo monitoring stations, and a discussion of overall monitoring results are presented in the *Carman Watershed Restoration Project Monitoring Report* (K.A. Smith Consulting, Inc.

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2020). During February-March 2020, K.A. Smith Consulting, Inc. and R. Westmoreland, in cooperation with the TNF, conducted post-construction early season hydrology and vegetation qualitative monitoring to assess restoration effectiveness and determine whether adaptive management measures are necessary to ensure long term project success. Post-construction monitoring included general observations of site condition and stability and photographs of surface hydrology and vegetation at all four sites including Folchi Meadows peat bog spring overland flow and tributary Carman Creek channel water levels. Adaptive management measures are presented in the *Carman Watershed Restoration Post-Project Monitoring and Adaptive Management Report* (K.A. Smith Consulting, Inc. 2020).

4. Conclusions/Recommendations:

Including, but not limited to: What worked, what didn't work; will monitoring of project continue and how; total cost and time to complete project; how will information gained be used and disseminated; are other phases of this project planned; etc.

Project Implementation Success/Adaptive Management

Implementation of the Carman Watershed Restoration Project Phase 2 project was extremely successful. All project goals set for each restoration site were accomplished effectively and efficiently. Construction protocol sequencing including salvage of wetland vegetation, gully fill, final grading, replacement of salvaged wetland vegetation, final placement of grade and erosion control BMP logs and woody debris, and rehabilitation of access roads and borrow areas proceeded at each site in proper order and with great efficiency. Complete and successful restoration of each site was accomplished within proposed timeframes with all construction activities being implemented during July-September 2020.

The Tahoe National Forest as land owner and project partner with the SVRCD will have long term responsibility to monitor restoration success at the four Carman Watershed Restoration Project Phase 2 project areas (Site #1 Folchi Meadows, Site #2 Folchi Meadows Railroad Grade, Site #4 West Fork Carman Creek, and Site #8 East Fork Carman Creek). Monitoring will be conducted on a periodic basis during spring-summer for the first 2-3 growing seasons and following all major runoff events to determine whether the sites are generally stable and returning to a desired future condition. Monitoring activities will include qualitative assessment of overall site stability i.e., visual and photo monitoring of vegetation, soils, surface water) and quantitative assessment of groundwater in established monitoring wells.

Results of periodic monitoring will aid in determining whether restoration efforts continue to be successful and whether adaptive management is necessary to ensure long-term site stability. Areas exhibiting erosion, runoff, or invasive plant species problems should be addressed as soon as possible to prevent minor problems from becoming more serious. Early intervention and implementation of best management practices to control erosion and sediment production and invasive plant species will be imperative.

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Best management practices to stabilize potential gully fill problem areas may include addition of additional fill, rock, or log materials to stabilize weakening/compromised features. Any required measures will be designed and implemented on an as needed basis under the direct supervision of the Sierraville Forest Service hydrologist.

Best management practices may include the removal or realignment of installed log features should the Forest Service hydrologist determine that a feature is not directing surface flows as intended or is in need of adjustment.

Invasive plant species will be manually removed by the TNF as soon as they are observed to prevent habitat degradation and competition with desirable plant species. Application of native seed during late fall and addition of forest duff and pine needles may be distributed over areas not exhibiting adequate native vegetation establishment.

Areas Currently in Need of Adaptive Management

Two areas within the Folchi Meadows project are currently in need of minor stabilization measures. These areas include: 1) Folchi Meadows bottom fill feature at south fence and 2) Carman Creek bottom fill area. Both of these fill features are exhibiting some minor settling and erosion. Adaptive management measures to stabilize these features will be implemented by the TNF as soon as weather/road access permits to ensure proper long-term hydrologic function and restoration success. Any required measures will be designed and implemented on an as needed basis under the direct supervision of the Sierraville Forest Service hydrologist.

Project Cost

Total project funding available to implement the Carman Watershed Restoration Project Phase 2 was \$681,732. Total funds actually used to implement and complete the project was \$654,977.49. Funding included \$589,732 from the California Department of Fish and Wildlife Proposition 1 Grant Wetland Restoration Grant Program and \$92,000 of matching funds from the U.S. Forest Service Tahoe National Forest.

Project Information Dissemination/Website Availability

Pre-project, construction, and post-construction monitoring reports and general project information is available on the Sierra Valley Resource Conservation District website (www.sierravalley-rcd.org). Information and reports have also been uploaded to the EcoAtlas Project Tracker (www.ecoatlas.org) and the U.C. Davis Sierra Meadows Data Clearinghouse (www.meadows.ucdavis.edu). Information gained can be accessed and used by other restoration ecologists/agencies in the Sierra region to develop future successful meadow restoration projects by learning about various design, construction and monitoring measures.

Monitoring reports include the *Carman Watershed Restoration Project Monitoring Report* (K.A. Smith Consulting, Inc. 2020) and the *Carman Watershed Restoration Post-Project Monitoring and Adaptive Management Report* (K.A. Smith Consulting, Inc. 2020). Pre-project baseline vegetation and hydrology data, site photographs taken at established photo

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monitoring stations, a discussion of overall monitoring results, and construction photographs are presented in the *Carman Watershed Restoration Project Monitoring Report* (K.A. Smith Consulting, Inc. 2020).

The *Carman Watershed Restoration Post-Project Monitoring and Adaptive Management Report* (K.A. Smith Consulting, Inc. 2020) includes results of early season hydrology and vegetation qualitative monitoring to assess restoration effectiveness and determine whether adaptive management measures are necessary to ensure long term project success. Monitoring included general observations of site conditions and stability and photographs of surface hydrology and vegetation at all four sites including Folchi Meadows peat bog spring overland flow and tributary Carman Creek channel water levels. Adaptive management measures are also presented. As the grant termination date of April 30, 2020 did not allow for a formal summer monitoring program to be conducted during the height of the growing season (July 2020) the post-project monitoring report mainly documents early season observations of vegetation “green up” and surface water originating from existing springs and snowmelt.

Appendix A

**Carman Watershed Restoration
Monitoring Reports**

Carman Watershed Restoration Project Monitoring Report
(K.A. Smith Consulting, Inc. 2020)

And

***Carman Watershed Restoration Post-Project Monitoring
and Adaptive Management Report***
(K.A. Smith Consulting, Inc. 2020)