

**CARMAN WATERSHED RESTORATION PROJECT PHASE 2  
POST-PROJECT and ADAPTIVE MANAGEMENT  
MONITORING REPORT**

**SITES 1, 2, 4, AND 8**

**(California Department of Fish and Wildlife Watershed Restoration  
Grant Program Agreement #P1796015)**



*Prepared by*  
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*Prepared for*  
**Sierra Valley Resource  
Conservation District**  
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**Loyalton, CA 96118**

**U.S. Forest Service Tahoe National Forest  
and  
California Department of Fish and Wildlife**

**March 2020**

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**2020**

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**March 2020**

## ABSTRACT

The Carman Watershed Restoration Project Phase 2 Post-Project and Adaptive Management Monitoring Report summarizes early season (February-March 2020) post-project condition of the Carman Watershed Restoration Phase 2 projects. Phase 2 project sites include Site #1 Folchi Meadows, Site #2 Folchi Meadows Railroad Grade, Site #4, and Site #8. Project sites are located in Plumas and Sierra Counties in the northern portion of the Sierraville Ranger District of Tahoe National Forest (TNF) approximately 2-miles north of Calpine, California

The Carman Creek Watershed Restoration Phase 2 project was funded under a California Department of Fish and Wildlife Proposition 1 Grant (P1796015) with the Sierra Valley Resource Conservation District (SVRCD) as grantee, in cooperation with the Carman Valley Watershed Partnership, and the TNF Sierraville Ranger District. 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 permits and designs, conduct baseline and post-construction monitoring, and supervise restoration construction.

Project construction was initiated during July 2019 and completed in September 2019. Meadow and floodplain restoration included reconnecting natural channels and floodplain features by filling eroded gullies (full gully fill) and removing railroad grade berms. Approximately 10,000 lineal feet of gully was restored for all four sites combined with approximately 30,000 yds<sup>3</sup> of upland and railroad grade borrow soil material placed into the eroded gullies and channels. Successful restoration of the degraded meadows and streams/drainages effectively resulted in direct ecological functional benefit of over 375 acres of mountain meadow and approximately 2 miles of associated stream corridor within the Carman Watershed.

Extensive pre-project baseline and construction monitoring was conducted at all four restoration sites during 2016-19. These monitoring efforts documented pre-project vegetation and hydrology data, photo monitoring, and construction activities and are included in the ***Carman Watershed Restoration Project Phase 2 Monitoring Report*** (K.A. Smith Consulting, Inc. 2020).

Post-project monitoring was conducted during February-March 2020 to assess restoration effectiveness and determine whether adaptive management measures are necessary to ensure long term project success. As the CDFW grant required all monitoring and final reporting to be submitted by March 31, 2020 it was not possible to collect first growing season vegetation and hydrology data during the height of the growing season (July 2020). Early season (February-March 2020) post-project monitoring implemented at Site #1 Folchi Meadows, Site #2 Folchi Meadows Railroad Grade, Site #4, and Site #8 indicated that gully fill, wetland vegetation replacement, and access road and borrow area rehabilitation efforts were successfully implemented with no significant erosion or site instability observed.

Early season (February-March 2020) post-project monitoring of hydrologic response at Site #1 Folchi Meadows included surface water overland flow from existing raised peat bog springs expanding across gully fill areas and the associated meadow floodplain. Groundwater observed in constructed and retained water features confirmed a rise in the water table level. Flows within the enhanced Carman Creek channel were at bank full allowing successful hydrologic improvement of adjacent floodplain meadows and peat bog spring complexes. Successful hydrologic response observed at Site #4 included a rise in groundwater levels observed in retained open water features and soil saturation spreading throughout the re-connected meadow. Successful vegetation response was observed at Site #1 Folchi Meadows and Site #4 where salvaged wetland vegetation was replaced over gully fill areas during construction implementation.

Bottom fill areas of Site #1 Folchi Meadows and Carman Creek are exhibiting some minor settling and erosion. Adaptive management measures to stabilize these areas are included in this report and will be implemented by the TNF during 2020 to ensure proper long-term function and restoration success.

Restoration goals and objectives attained/expected to be attained in the long term as a result of successful project implementation 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.

Secondary 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 muscosa*). 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* may 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.

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## I. INTRODUCTION

### 1. Project Background

The Carman Watershed Restoration Project Phase 2 Post-Project and Adaptive Management Monitoring Report summarizes early season (February-March 2020) post-project condition of the Carman Watershed Restoration Phase 2 projects. Phase 2 project sites include Site #1 Folchi Meadows, Site #2 Folchi Meadows Railroad Grade, Site #4, and Site #8. Project sites are located in Plumas and Sierra Counties in the northern portion of the Sierraville Ranger District of Tahoe National Forest (TNF) approximately 2-miles north of Calpine, California (T21N, R13E, Sections 1, 2 11, 12; T21N, R14E, Section 5; T22N, R13E, Sections 26, 35, 36; and T22N, R14E, Sections 20, 31, 32) (Exhibits 1 and 2).

The Carman Creek Watershed Restoration Phase 2 project was funded under a California Department of Fish and Wildlife Proposition 1 Grant (#P1796015) with the Sierra Valley Resource Conservation District (SVRCD) as grantee, in cooperation with the Carman Valley Watershed Partnership, and the TNF Sierraville Ranger District. The Carman Creek Watershed Restoration Phase 2 project is consistent with Proposition 1 priorities of protecting and restoring mountain meadow ecosystems and managing headwaters for multiple benefits. The project is also consistent with aspects of the Clean Water Action Plan, State Wildlife Action Plan, Sierra Nevada Watershed Improvement Plan Sierra Nevada Conservancy 2016), Tahoe Nation Forest Land and Resource Management Plan (U.S. Forest Service 1990), and the National Fish and Wildlife Foundation Sierra Nevada Meadows Business Plan (National Fish and Wildlife Foundation 2010).

To fulfill the grant objectives of meadow restoration, 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 in coordination with the TNF to complete final project permits and designs, conduct baseline and post-construction monitoring, and supervise restoration construction. Project construction was initiated during July 2019 and completed in September 2019.

Channel and floodplain restoration included reconnecting remnant natural channels and floodplain features by filling eroded gullies (full gully fill) and ditches and removing railroad grade berms. Approximately 10,000 lineal feet of gully was restored for all four sites combined with approximately 30,000 yds<sup>3</sup> of upland and railroad grade borrow soil material placed into the eroded gullies and channels. Successful restoration of the degraded meadows and streams/drainages effectively resulted in direct ecological functional benefit of over 375 acres of mountain meadow and approximately 2 miles of associated stream corridor within the greater Carman Creek watershed area. Extensive pre-project baseline and construction monitoring was conducted at all four restoration sites during 2016-19. These monitoring efforts documented pre-project vegetation and hydrology data and successful project implementation and are included in the ***Carman Watershed Restoration Project Phase 2 Monitoring Report*** (K.A. Smith Consulting, Inc. 2020).



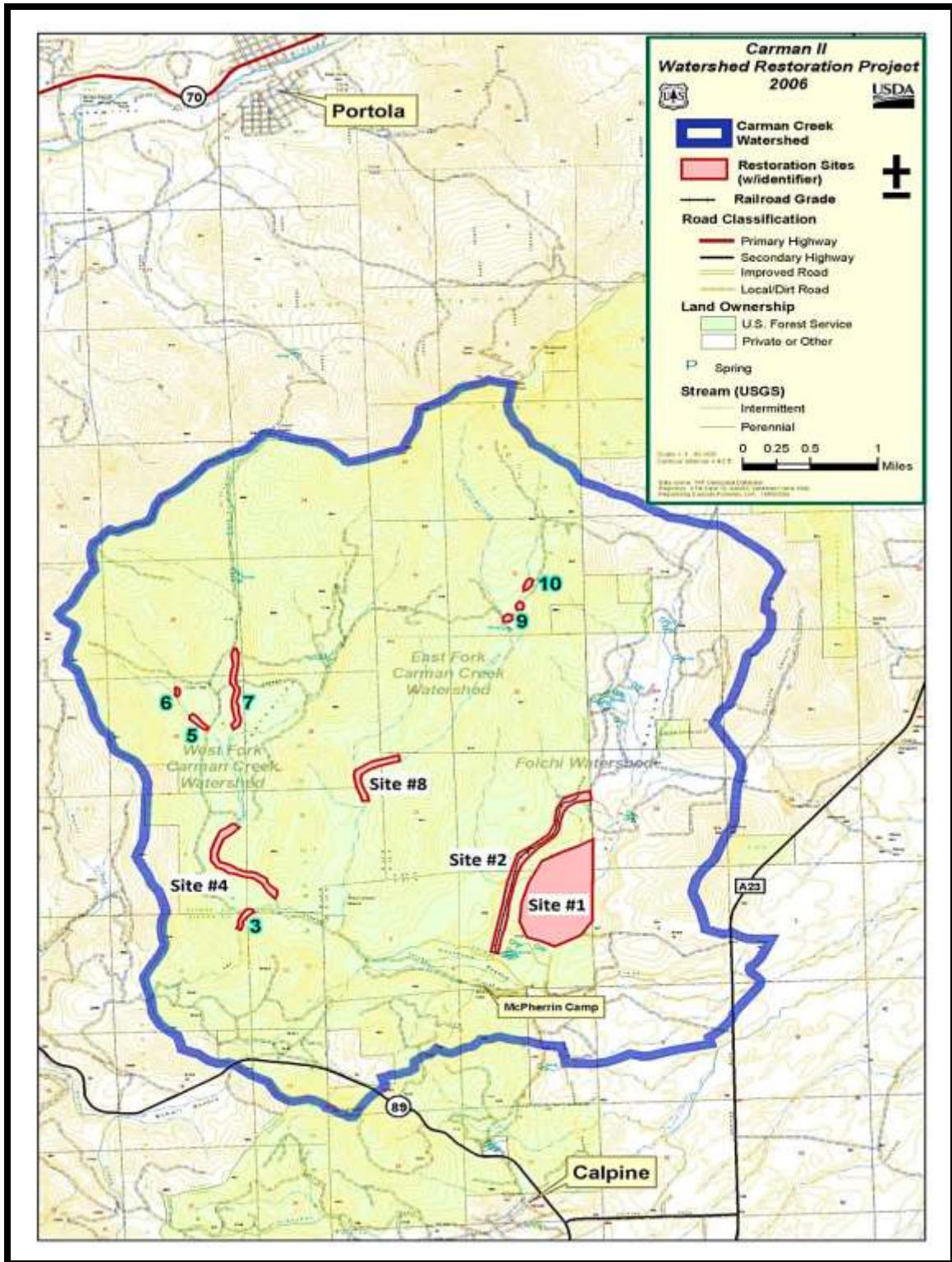
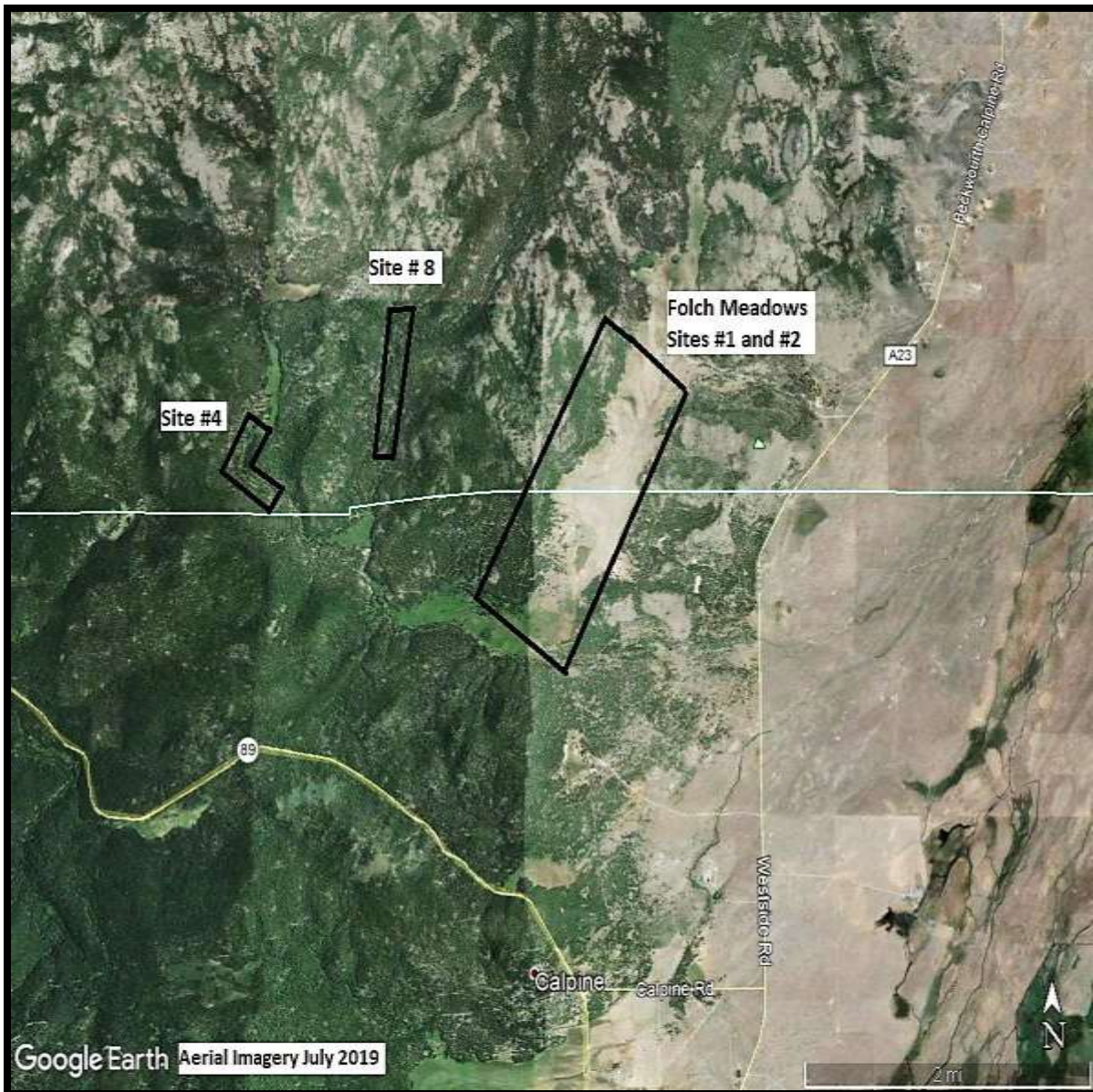


Exhibit 1. Carman Watershed Restoration Phase 2 Sites #1, #2, #4 and #8 Location



**Exhibit 2. Carman Watershed Restoration Sites #1, #2, #4 and #8 (Aerial Imagery 2018)**



## II. RESTORATION GOALS AND OBJECTIVES

The Carman Watershed Phase 2 Restoration project goals and objectives as stated in the California Department of Fish and Wildlife Proposition 1 Grant application are as follows:

### **Carman Watershed Restoration Goals:**

- *Restore the natural hydrologic regime and pattern across the watershed, including water groundwater storage in meadows, floodplain function and sediment regime.*
- *Restore wet meadow habitat through restoring the natural meadow water table, increasing the extent and quality of habitat in wet meadows and riparian areas for T&E and rare plants and wildlife species.*
- *Improve water quality through reducing sediment from stream channel erosion and roads.*
- *Increase resiliency of the watershed to predicted climate changes, including reduced snowpack and reduced streamflow.*

### **Carman Watershed Restoration objectives:**

- *Restore the natural hydrologic regime to Folchi Meadows (Site #1 and Site #2) and two other sites in the West Fork and the East Fork of Carman Creek (upper Site #4 and Site #8) which would increase groundwater storage, attenuate flood flows and improve summer flows from these meadow systems. Active erosion of these sites would be significantly reduced.*
- *Restore connectivity to 6 miles of stream channels in the Carman Watershed*
- *Increase wet and seasonally wet meadow habitat by 300 acres in Folchi Meadows.*
- *Increase carbon sequestration in the meadow.*
- *Restore 75 acres of riparian vegetation and floodplain function to Folchi and the east and west forks of Carman Creek.*
- *Restore habitat for Willow flycatcher. This area has been identified as a priority for restoration.*
- *Restore habitat for multiple Forest Service Sensitive plant species.*
- *Reduce Sediment from Forest Service roads, 71 & 71.10.*

### **III. POST-PROJECT QUALITATIVE MONITORING PROTOCOL**

Post-project monitoring was conducted during February and March 2020 to qualitatively (visually) assess restoration effectiveness and determine whether adaptive management measures are necessary to ensure long term project success. Unfortunately, as the SVRCD CDFW grant required all monitoring and final reporting to be submitted by March 31, 2020 it was not possible to collect quantitative first growing season vegetation and hydrology data during the height of the growing season (July 2020). The Carman Watershed restoration pre-project (baseline) monitoring protocol was developed per standard methodologies which enable rapid field assessment and are readily repeatable. All pre-project monitoring data is included in the Carman Watershed Restoration Monitoring Report (K.A. Smith Consulting, Inc. 2020).

### **IV. POST-PROJECT MONITORING RESULTS**

#### **1. Site #1 - Folchi Meadows**

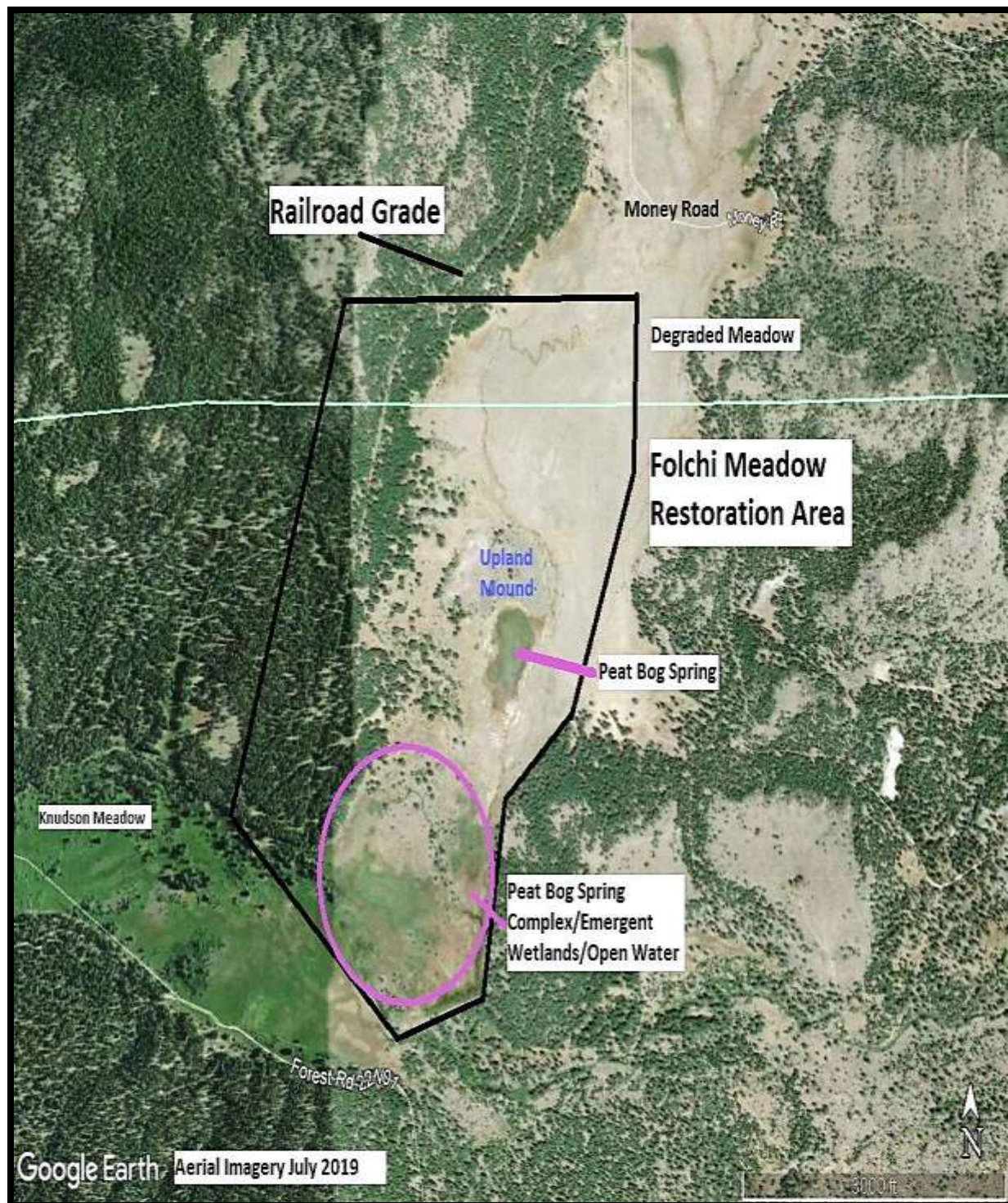
Folchi Meadows is located within the Folchi Creek watershed just north of Carman Creek and the waterfowl impoundment area (Exhibits 1-3).

#### **Hydrology Monitoring**

Groundwater monitoring wells were installed prior to restoration construction activities throughout the Folchi Meadows restoration area during 2017 (Exhibit 5). Site #1 Folchi Meadows groundwater data was not collected during the February – March early season monitoring. Visual observations of ground water in retained water features near Wells #1 and #2 indicated that the water table was rising but was still near pre-construction levels (Exhibit 4).

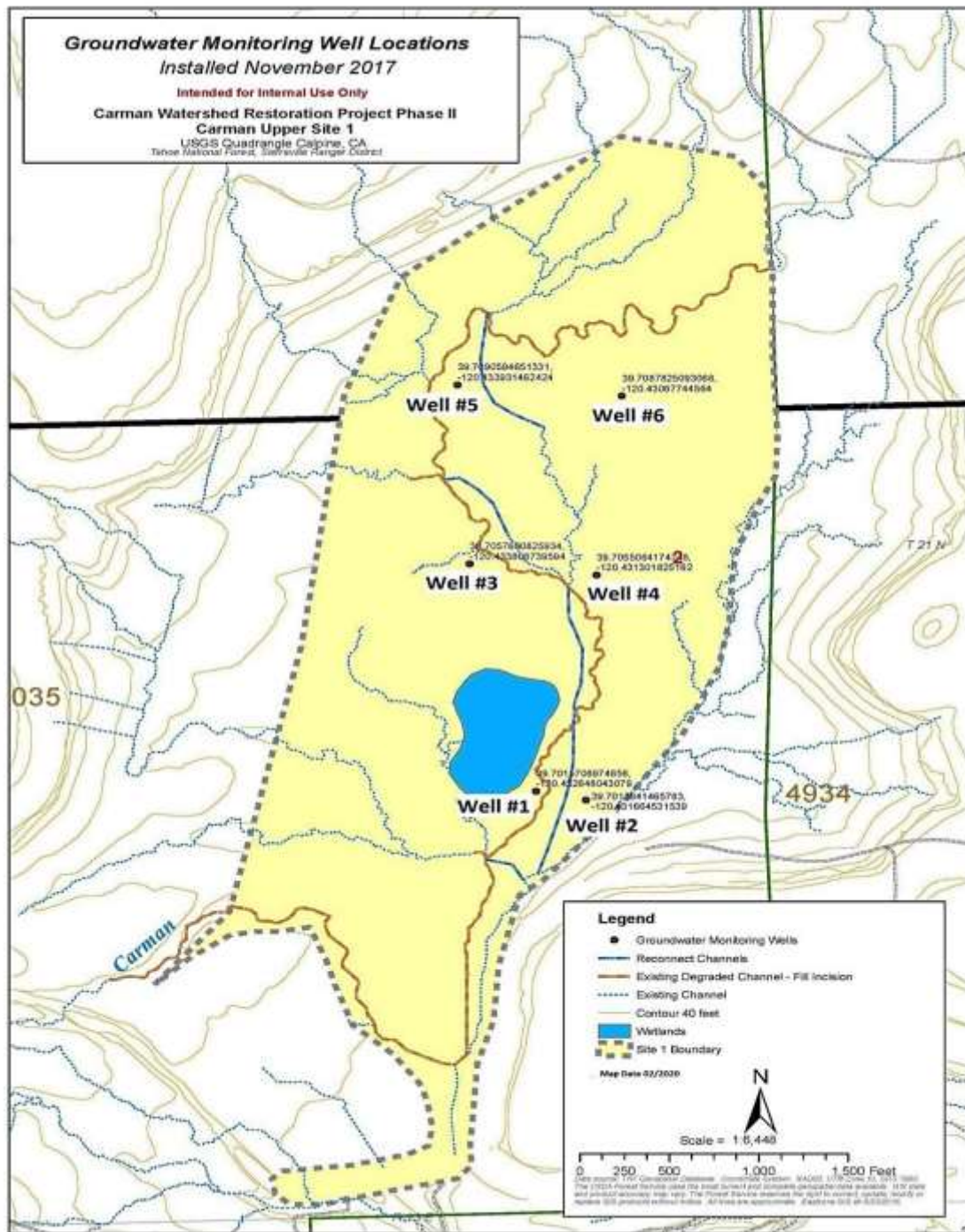
Qualitative visual observations of surface water indicated that overland flow from the existing centrally located peat bog spring was spreading eastwards across the filled gully and meadow floodplain near Wells #1 and #2. Flows within the main east and west channels south of Wells #1 and #2 were ponding on the Folchi Meadow floodplain and behind strategically placed filled/plugged areas designed to enhance overland sheet flow, increase soil saturation, and increase infiltration and groundwater recharge. Flows entering Folchi Meadows near the north Forest Service boundary are elevated due to gully fill and are being effectively conveyed into re-connected main remnant channels traversing north-south throughout the meadow floodplain. Flows within the re-connected remnant channels is being conveyed near Wells #5 and #6 enhance overland sheet flow, increase soil saturation, infiltration and groundwater recharge (Exhibit 4).

Meadow tributary channels originating from the restored railroad grade area which distribute water across the meadow near Wells #3 and #4 had not begun to transport surface runoff in February or March, however, flows expected to peak during spring will most likely result in enhanced overland sheet flow and increased groundwater storage (Exhibit 4).



**Exhibit 3. Folchi Meadows Site #1 and Site #2 Restoration Area Aerial Photograph (6/2018)**





**Exhibit 4. Site #1 Folchi Meadows Groundwater Well Monitoring Locations**





**Carman Creek Ponding and Increased Surface Water Levels  
Due to Downstream Fill Feature March 2020 (View E)**



**Carman Creek Ponding and Increased Surface Water Levels  
Just Above Downstream Fill Features March 2020 (View SW)**



**Carman Creek East Fill Feature Minor Erosion (View W)**





**Southeast Channel Inflow Ponding Just North of Photo Monitoring Station #1  
and South Boundary Fence March 2020 (View N)**



**Southeast Channel Inflow North of South Boundary Fence  
March 2020 (View NE)**



**Folchi Meadows**  
**Photo Monitoring Station #1 Impounded Flow From East Channel**  
**and Minor Erosion of South Boundary Fence Filled Feature March 2020 (View N)**





**Folchi Meadows South and Mid-Central Overland Flow Originating from West Peat Bog Spring March 2020 (View SW)**



**Photo Monitoring Station #2 Showing Overland Flow Originating From Existing Peat Bog Spring Across Filled Gully (View S)**



**Photo Monitoring Station #2 Water Feature Near Groundwater Well #1  
March 2020 (View NW)**



**Overland Flow From  
Existing Peat Bog Spring  
Spreading Across Filled  
Gully and Meadow  
Floodplain From West to  
East March 2020 (View N)**





**Folchi Meadows North Forest Service Boundary Restoration Area Inflow  
Ponding and Conveyance to Re-Connected Remnant Floodplain Channels  
February 2020 (View SW)**



**Hydrologic Conveyance Within Re-Connected Remnant Floodplain Channels (View S)**



## **Vegetation Monitoring**

Site #1 Folchi Meadows baseline vegetation monitoring included establishing vegetation monitoring transects perpendicular to the Folchi Meadows gully at representative locations in the south and mid central meadow areas (Exhibit 5). Folchi Meadows photo monitoring points are shown in Exhibit 5.

Qualitative visual observation of early season salvaged wetland vegetation placed on the filled gully indicates significant “greening up” of transplanted vegetation mats is occurring. It is anticipated that vegetation cover response on the filled gully will be excellent during the first growing season. Plant community species composition will trend towards a prevalence of desirable meadow, wetland, and riparian plant species over the next two to three growing seasons with excellent vegetation response anticipated in the long-term.

## **2. Site #2 – Folchi Meadows Railroad Grade**

Folchi Meadows Site #2 is comprised of the railroad grade constructed west of Folchi Meadows (Exhibits 1, 3 and 6).

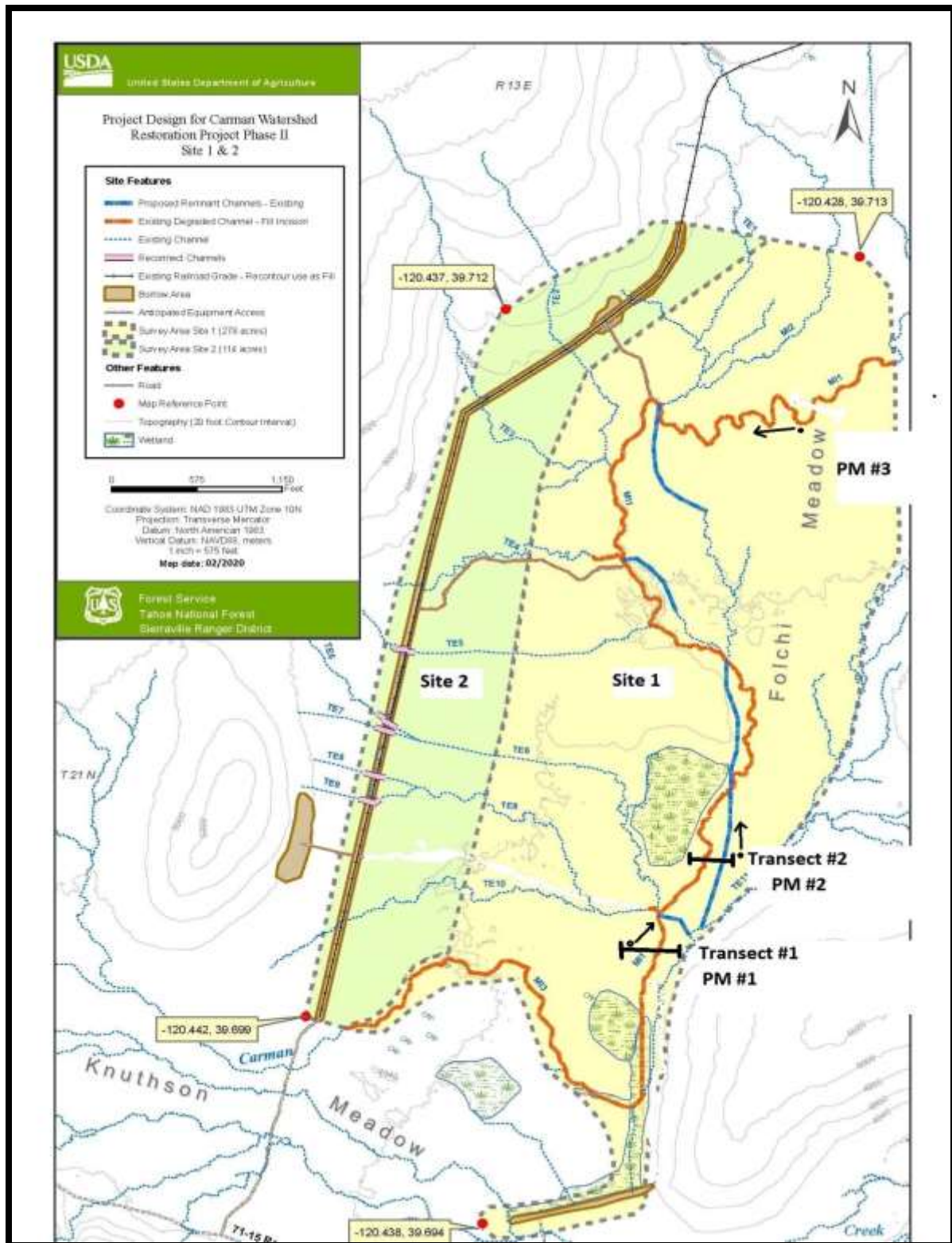
## **Hydrology Monitoring**

Surface water was not yet observed in re-connected tributary drainages at Site #2; however, ponding was observed in some areas where lower lying areas were retained adjacent to the removed railroad grade to preserve sensitive plant habitat.

## **Vegetation Monitoring**

Vegetation monitoring transects were not established along the railroad grade. Qualitative visual observation of early season (February-March 2020) growth indicates grass seedling establishment is beginning on the restored railroad grade area and at rehabilitated borrow areas.

It is anticipated that vegetation cover response on the restored railroad grade area will be excellent during the first growing season. Plant community species composition will trend towards a prevalence of desirable forest upland plant species over the next two to three growing seasons with excellent vegetation response anticipated in the long-term.



**Exhibit 5. Site #1 Folchi Meadows Photo Monitoring Points and Vegetation Transects**

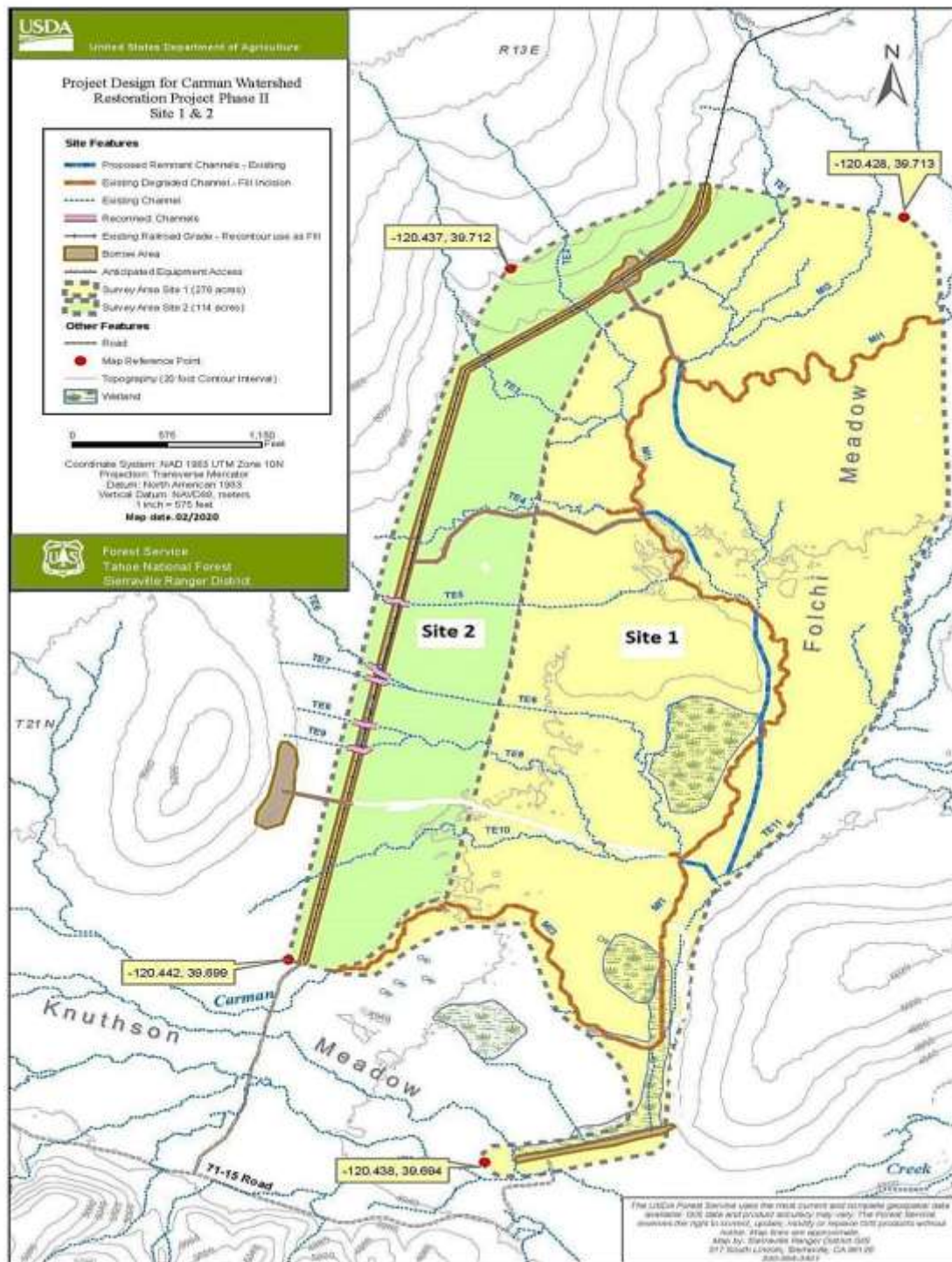


Exhibit 6. Site #2 Railroad Grade Restoration Area





**Restored Railroad Grade Water Feature Supporting Sticky Pyrrocoma Habitat  
February 2020 (View SW)**



**Carman Creek Access Road Rehabilitation Through Archeological Site  
March 2020 (View S)**

### **3. Site #4**

Site #4 is located along the West Fork of Carman Creek between Three Cornered Meadow and Carman Valley (Exhibits 1, 3, and 7).

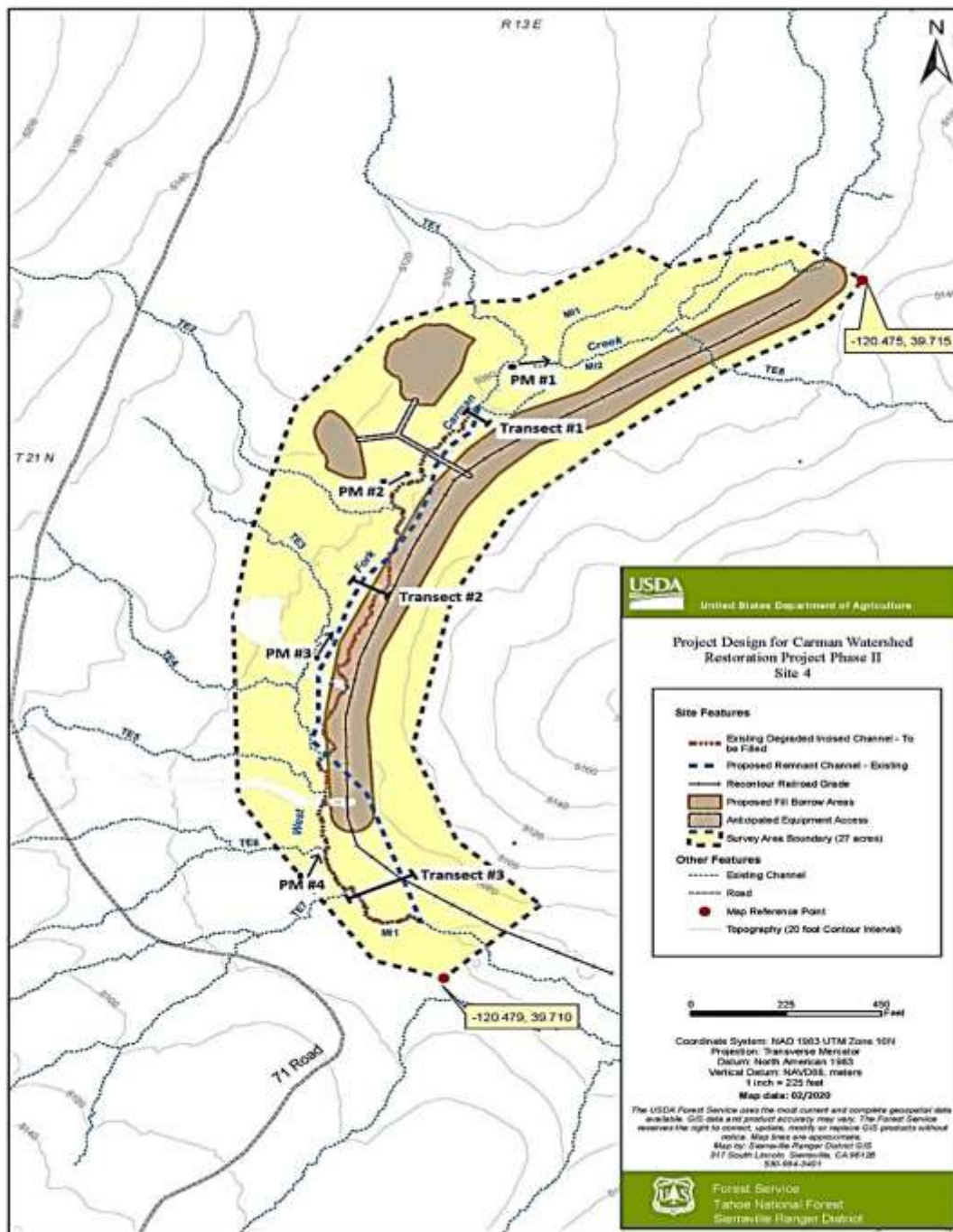
#### **Hydrology Monitoring**

Surface water was not yet observed in re-connected tributary drainages at Site #4; however, groundwater observed in retained water features indicated water levels had risen approximately 2 feet. Outflow from the south spring pond has increased and is being successfully retained/slowed by installed log grade control structures.

#### **Vegetation Monitoring**

Site #4 baseline vegetation monitoring included establishing vegetation monitoring transects perpendicular to the gully and abandoned meadow at representative locations (Exhibit 7). Photo monitoring points are shown in Exhibit 7.

Qualitative visual observation of early season salvaged wetland vegetation placed on the filled gully indicates significant “greening up” of transplanted vegetation mats is occurring. It is anticipated that vegetation cover response on the filled gully will be excellent during the first growing season. Plant community species composition will trend towards a prevalence of desirable meadow, wetland, and riparian plant species over the next two to three growing seasons with excellent vegetation response anticipated in the long-term.



**Exhibit 7. Site #4 Photo Monitoring Points and Vegetation Transects**





**Transect #1 Transplanted Salvaged Vegetation Greening Up on Filled Gully Area**



**PM #1 Upper Meadow at North Project Area Boundary**





**Upper Retained Water Feature Post-Project Groundwater Level February 2020 (View S)**



**Lower Retained Water Feature Post-Project Groundwater Level February 2020 (View N)**





**Photo Monitoring Location #3 (View N)**



**Southeast Retained Spring Pond March 2020 (View NE)**





**Southeast Log Grade Control Structure Slowing Pond Runoff (Bottom)(View E)**



**South Log Grade Control Structures Effectively Detaining and Ameliorating Retained Spring Pond Outflow and Preventing Erosion March 2020 (Mid-Slope) (View W)**

#### **4. Site #8**

Site #8 is located in the central drainage area of the East Fork of Carman Creek between Three Cornered Meadow and Forest Service 71 Road (Exhibits 1, 3, and 8).

##### **Hydrology Monitoring**

Surface water was not observed at Site #8 during early season monitoring (February-March 2020); however, a small seep in the north project area was releasing water onto the filled gully with no erosion observed.

##### **Vegetation Monitoring**

Site #8 vegetation monitoring transects are located perpendicular to the eroded channels at representative locations in the west, mid central, and north meadow areas (Exhibit 8). Photo monitoring points are shown in Exhibit 8.

Qualitative visual observation of early season vegetation indicates significant grass seedling establishment is occurring on rehabilitated access areas where topsoil and forest duff was spread over disturbed areas.

Minimal seedling establishment was observed within the filled gully areas as a majority of the restored channel is rock/gravel. Plant community species composition will trend towards a prevalence of desirable meadow and forest upland plant species over the next two to three growing seasons with excellent vegetation response anticipated in the long-term.

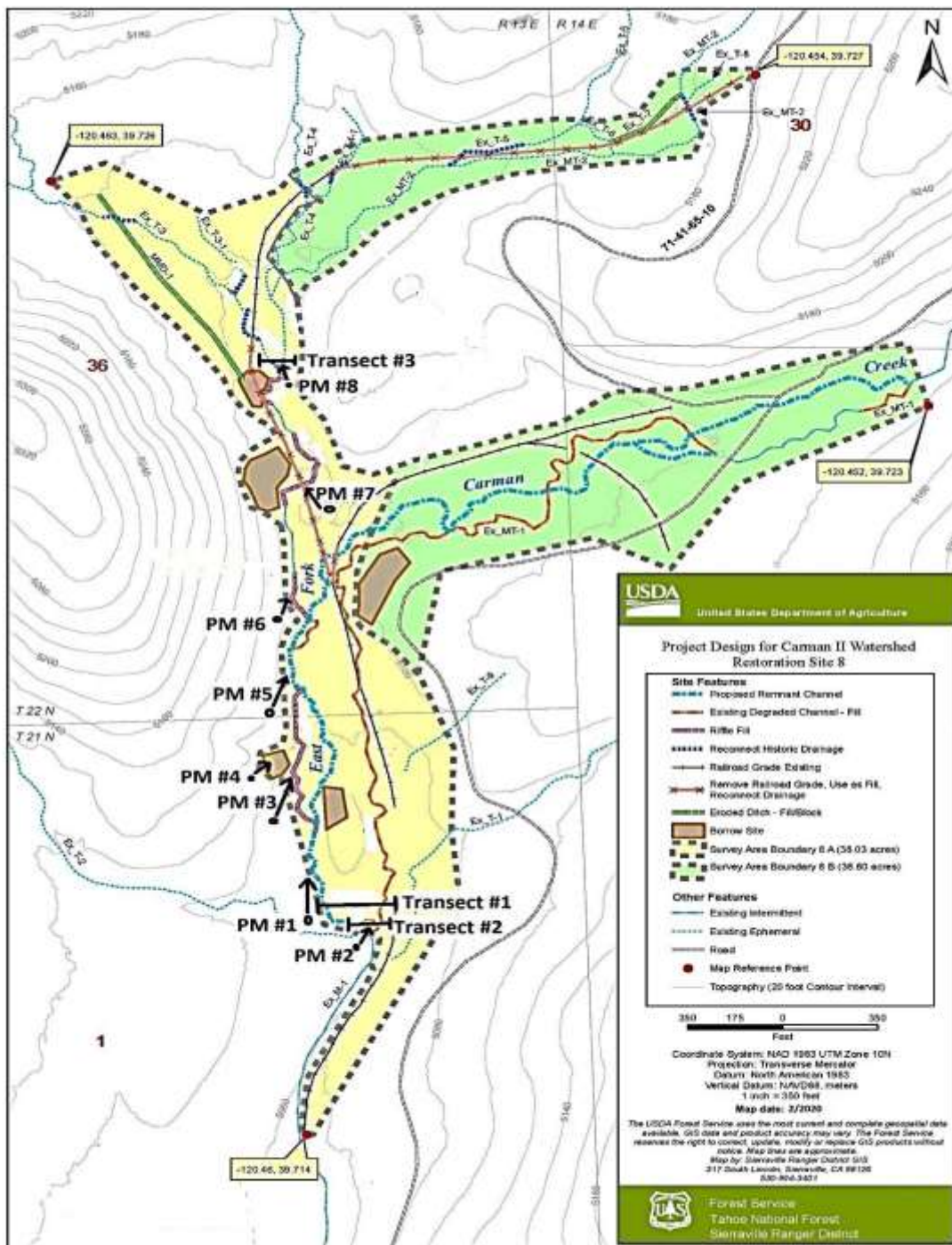


Exhibit 8. Site #8 Photo Monitoring Points and Vegetation Transects





**Photo Monitoring Station #1 March 2020 (View N)**



**Photo Monitoring Station #2 March 2020 (View N)**





**Photo Monitoring Station #3 March 2020 (View N)**



**Photo Monitoring Station #3 Borrow Access March 2020 (View SE)**





**Photo Monitoring Station #4 and Borrow Site Rehabilitation March 2020 (View NW)**



**Photo Monitoring Station #5 Rock and Log Grade Control March 2020 (View S)**





**Photo Monitoring Station #5 Rock and Log Grade Control March 2020 (View N)**



**Photo Monitoring Station #6 Above Seep March 2020 (View S)**





**Photo Monitoring Station #6 Seep March 2020 (View S)**



**Photo Monitoring Station #7 Road Rehabilitation and North Borrow Area March 2020 (View NW)**





**Photo Monitoring Station #8 North Meadow Log Grade Control February 2020 (View SW)**



**Photo Monitoring Station #8 North Meadow Log Grade Control March 2020 (View NE)**





**Log Grade Control #1 in Meadow Gully South of North Meadow March 2020 (View S)**



**Log Grade Control #1 and Adjacent Degraded Meadow March 2020 (View N)**





**Log Grade Control #2 and #3 in Meadow Gully March 2020 (View N)**



**Log Grade Control #2 and #3 in Meadow Gully March 2020 (View S)**





**Log Grade Control #4 in Meadow Gully March 2020 (View S)**



**Access Road  
Rehabilitation and  
Natural Revegetation  
March 2020**





## V. ADAPTIVE MANAGEMENT

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, and Site #8). 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.

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 should 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 should be manually removed 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 areas shown in this monitoring report 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 should be implemented as soon as weather/road access permits to ensure proper long-term hydrologic function and restoration success.*

## VI. DISCUSSION

Carman Creek Watershed Restoration Project Phase 2 construction and erosion control measures were successfully implemented under the direct supervision of K.A. Smith Consulting, Inc. and R. Westmoreland, in cooperation with the TNF, at all four degraded meadow and stream restoration sites during July-September 2019. Channel and floodplain restoration included reconnecting natural channels and floodplain features by filling eroded gullies (full gully fill) and ditches and removing railroad grade berms. Approximately 10,000 lineal feet of gully was restored for all four sites combined with approximately 30,000 yds<sup>3</sup> of upland and railroad grade borrow soil placed into the gullies and eroded channels. Successful restoration of the degraded meadows and drainages effectively resulted in direct ecological functional benefit of over 375 acres of mountain meadow and approximately 2 miles of associated streams and floodplain corridors within the greater Carman Creek watershed area.

Post-project monitoring was conducted during February-March 2020 to assess restoration effectiveness and determine whether adaptive management measures are necessary to ensure long term project success. As the CDFW grant required all monitoring and final reporting to be submitted by March 31, 2020 it was not possible to collect first growing season vegetation and hydrology data during the height of the growing season (July 2020). Early season (February-March 2020) post-project monitoring implemented at Site #1 Folchi Meadows, Site #2 Folchi Meadows Railroad Grade, Site #4, and Site #8 indicated that gully fill, wetland vegetation replacement, and access road and borrow area rehabilitation efforts were successfully implemented with no significant erosion or site instability observed.

Early season (February and March 2020) post-project monitoring implemented at Site #1 Folchi Meadows, Site #2 Folchi Meadows Railroad Grade, Site #4, and Site #8 indicated that gully fill, vegetation replacement, and access road and borrow area rehabilitation efforts were successfully implemented with no significant erosion or site instability noted. Meadow hydrologic function is being successfully reestablished within the Folchi Meadows meadow and peat bog spring areas and within the Carman Creek floodplain and meadow areas. Wetland vegetation salvaged from gullies prior to the fill process and replaced following fill and final grading is exhibiting significant “greening up” indicating healthy tuber and root systems ready to proliferate during spring-summer 2020. Erosion was not observed at Site #2, Site #4, or Site #8. Minimal erosion was observed at the Site #1 bottom fill feature and the Site #1 Carman Creek bottom fill feature. The Tahoe National Forest Hydrologist is aware of these areas and will be implementing adaptive management measures during 2020 to ensure proper long-term function and restoration success.

Restoration goals and objectives attained/expected to be attained in the long term as a result of successful project implementation 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.

Secondary 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 muscosa*). 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* may increase in frequency in hydrologically enhanced raised peat bog spring complexes located within the Folchi Meadows area.



## VII. REFERENCES

K.A. Smith Consulting, Inc. 2020. Carmen Watershed Restoration Project Phase 2 Monitoring Report. Prepared for Sierra Valley Resources Conservation District, U.S. Forest Service Tahoe National Forest and the State of California Department of Fish and Wildlife.

**APPENDIX A**

**PRE-CONSTRUCTION BASELINE**  
**PHOTO MONITORING POINT PHOTOGRAPHS**



**SITE #1  
FOLCHI MEADOWS**

**PRE-CONSTRUCTION BASELINE  
PHOTO MONITORING POINT PHOTOGRAPHS**



**PM #1 June 2018 (View NW)**



**PM #1 June 2018 (View SE)**





**PM #2  
June 2018  
(View N)**

**PM #2  
August 2019  
(View N)**



**PM #2  
June 2018  
(View S)**



**PM #3 June 2018 (View NE)**



**PM #3 June 2018 (View SW)**





**Gully Erosion Threatening to Cut Into Existing Peat Bog Spring June 2018 (View NW)**



**South Open Water Area/Emergent  
June 2018 (View N)**

**SITE #2**  
**FOLCHI MEADOWS RAILROAD GRADE**  
**PRE-CONSTRUCTION BASELINE**  
**PHOTO MONITORING POINT PHOTOGRAPHS**





**Railroad Grade Excavated Ditch  
Spring Ponding  
May 2018 (View N)**



**Railroad Grade and Excavated Ditch Transitional Meadow  
May 2018 (View N)**

**SITE #4**

**PRE-CONSTRUCTION BASELINE  
PHOTO MONITORING POINT PHOTOGRAPHS**





**PM #1 - Degraded Meadow Just South of North Fence May 2019  
(View SE)**



**PM #1 – Meadow Reference Area Just North of North Fence (View SW)**



**PM #2 – Gully Erosion and Meadow Degradation May 2019 (View N)**



**PM #2 – Gully Erosion and Meadow Degradation (View S)**





**PM #3 - Degraded Meadow Floodplain May 2019 (View N)**



**PM #3 - Degraded Meadow Floodplain (View S)**





**PM #4 - Vegetated Gully  
Supported By Ground Water  
May 2019 (View SE)**

**PM #4 - Degraded Slope  
Lower Fan  
(View SW)**



**Site #4 - Gully Erosion with 6-Foot High  
Exposed Banks and Bottom  
Ponding/Saturation Supported by Groundwater Interception May 2019 (View S)**

**SITE #8**

**PRE-CONSTRUCTION BASELINE  
PHOTO MONITORING POINT PHOTOGRAPHS**





**PM #1 – Degraded Meadow  
June 2018 (View N)**



**PM #2 – Gully Erosion and Degraded Meadow  
(View N)**



**PM #4 – Eroded Gully/Degraded Meadow and Forested/Sagebrush Borrow Area  
June 2018 (View S)**





**PM #5 – Broad Rocky Gully Swale And Degraded Meadow  
June 2018 (View NE)**



**PM #6 – Gully Erosion  
(View N)**



**PM #7 – Gully Erosion and Degraded Meadow  
June 2018 (View NE)**



**PM #7 – Degraded Meadow  
(View S)**





**PM #8 - Degraded Upper Meadow  
With Deep Gully Incision  
July 2019 (View E)**



**PM #8 - Degraded  
Meadow Gully  
Erosion with Spring  
Flow  
May 2019  
(View E)**





**North Project Area  
East Gully Erosion  
(Typical)  
June 2018 (View S)**

**North Project Area West Gully  
Erosion (Typical)  
(View S)**



**North Borrow Area  
June 2018**