Summit Creek Phase 1 Monitoring Plan

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Overview

This document provides an overview of the various types of monitoring that have been and will continue to be conducted within the Summit Creek valley bottom in conjunction with floodplain restoration.

Habitat within Summit Creek has been degraded through anthropogenic activities, principally beaver removal, cattle grazing, timber harvest and associated railroad (extensive railroad logging in the 1950's), road building, and fire suppression. These activities led to channel incision which reduced the floodplain inundation frequency and connectivity of the creek to an extensive side-channel network. Historic photos from the mid-1900s of cattle grazing on Summit Creek and nearby streams in the headwaters of the Malheur River show that historic grazing practices left depositional valley bottoms completely devoid of vegetation (aka "grazed to dirt"). Loss of root strength provided by riparian vegetation, combined with excessive trampling facilitated streambank erosion, channel capture, and increased stream power in what has become the "primary" stream channel of Summit Creek. Channel erosion caused the streambed to incise until bedrock and larger boulders halted channel lowering. Soil profiles along the incised streambanks contain 1-3 feet of fine sediment and gravel deposits, indicating that for many years this reach was a depositional environment with very low stream-power. Today exposed bedrock and large boulders dominate the channel bed as a result of high stream power confined to a simple channel with inadequate floodplain connectivity, also known as the "fire hose effect".

The purpose of this restoration is to improve ecological function and biological productivity for ESA Threatened Bull Trout, as well as other native species, while restoring connectivity and complexity within the Summit Creek valley bottom. By raising the stream bed back to its historic elevation, floodplain restoration is expected to return the stream network to an anastomosing, naturally aggrading state where it can remain hydrologically dynamic in perpetuity and retain water, sediment, and nutrients for longer periods of time. Once fully reconnected to its historic floodplain and roughened with large wood, Summit Creek will hopefully once again be able to inundate the valley bottom and soils from toe-slope to toe-slope year-round, maximizing potential rearing and spawning habitat, improving groundwater storage and water temperatures and creating additional area for riparian and wetland obligate vegetation to re-colonize.

Phase 1 of implementation (see Figures 3&4) is scheduled to be completed in summer 2022, with additional upstream segments potentially treated once we have a better understanding of post-restoration effects within the valley bottom. We have chosen a broad array of monitoring techniques (see Table 1) to test our hypotheses regarding floodplain restoration and provide data to inform our decision making moving forward.

Monitoring Type	Description of Future Field Work	Pre-Implementation Data Range	Post-Implementation Monitoring Timeline	Resource Needs
Amphibian Surveys	Collecting amphibian species & population data within & adjacent to treatment reach	2020-21	Annual surveys (springtime)	2 surveyors per reach; full day
Fish & Macroinvertebrate Sampling	Electrofishing to determine relative fish species composition within & adjacent to treatment reach; macroinvertebrate sampling within same reaches	2020-21	2 weeks total (summer)	3 surveyors per day; 8 days total
Stream temperature monitoring	Deploying up to 10 data loggers within & adjacent to treatment reach for duration of summer	2000-2021, up to 15 years at long-term sites; 1 year of data at new sites within the project area	Spring deployment at each site; fall retrieval	1 temperature data logger per site; 1 person, 1/2 day
Groundwater monitoring	Field-reading level loggers @ well sites using HOBO "shuttle"; manually checking groundwater elevation within wells	June 2021-Present	Every 4-6 months	1 person, 2-3 hours
Discharge measurements	Field-reading level logger within stream gage; collecting discharge data at gage site to develop a rating curve	July 2021-Present	Readouts every 4-6 months; 7-10 additional discharge measurements	2 people, 1 hour per discharge measurement
Photo Point monitoring	Taking repeat photos at 15 sites within the project area	Summer 2021	Every Summer @ or near baseflow conditions	1 person, 2 hours
GRTS Point surveys	Collecting data @ 100 survey points within project area using existing questionnaire	2021	Annual surveys, @ or near baseflow conditions	2 people, 2-3 days

Table 1. Overview of monitoring types and future data collection needs

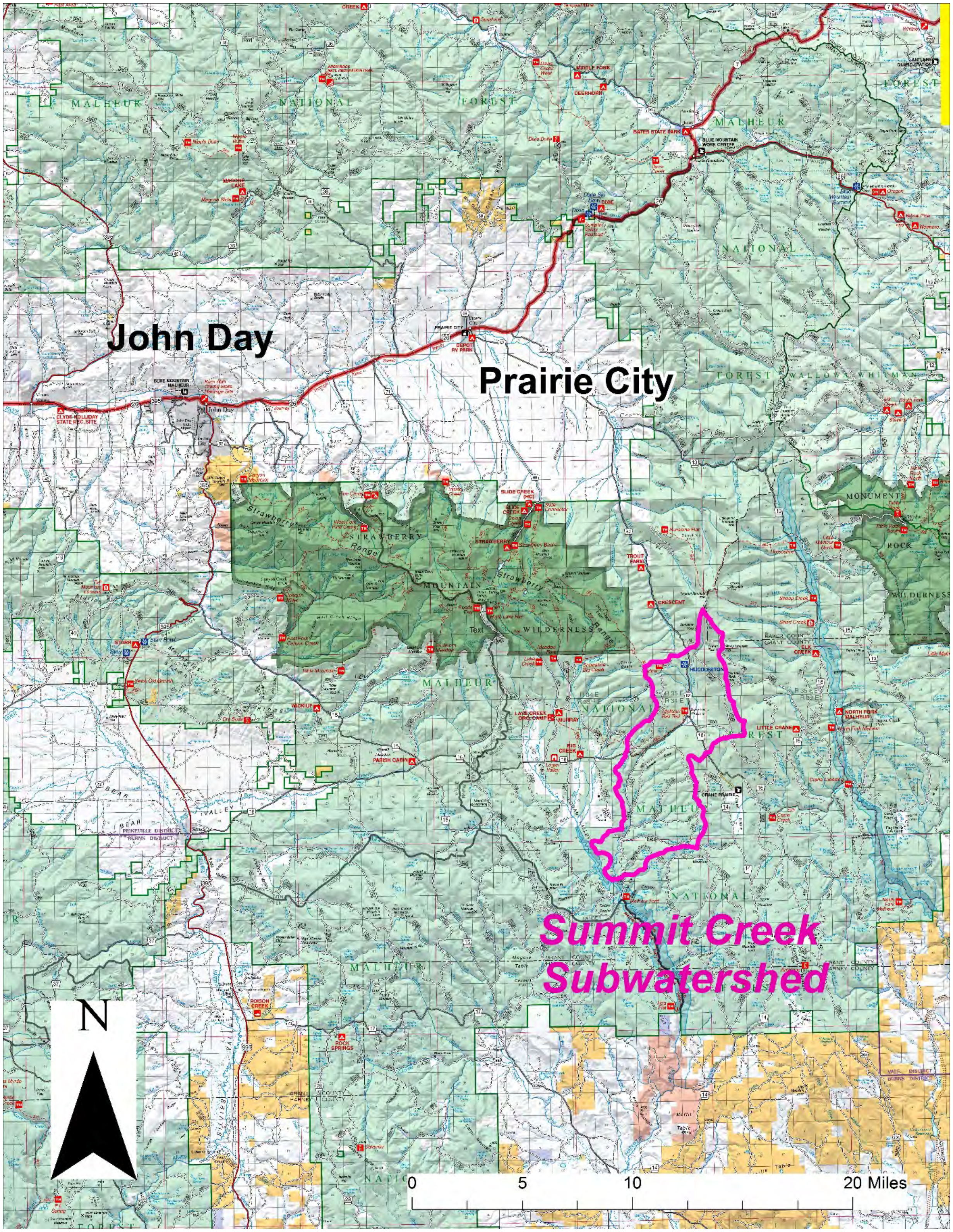


Figure 2. Summit Creek subwatershed location within the Malheur National Forest

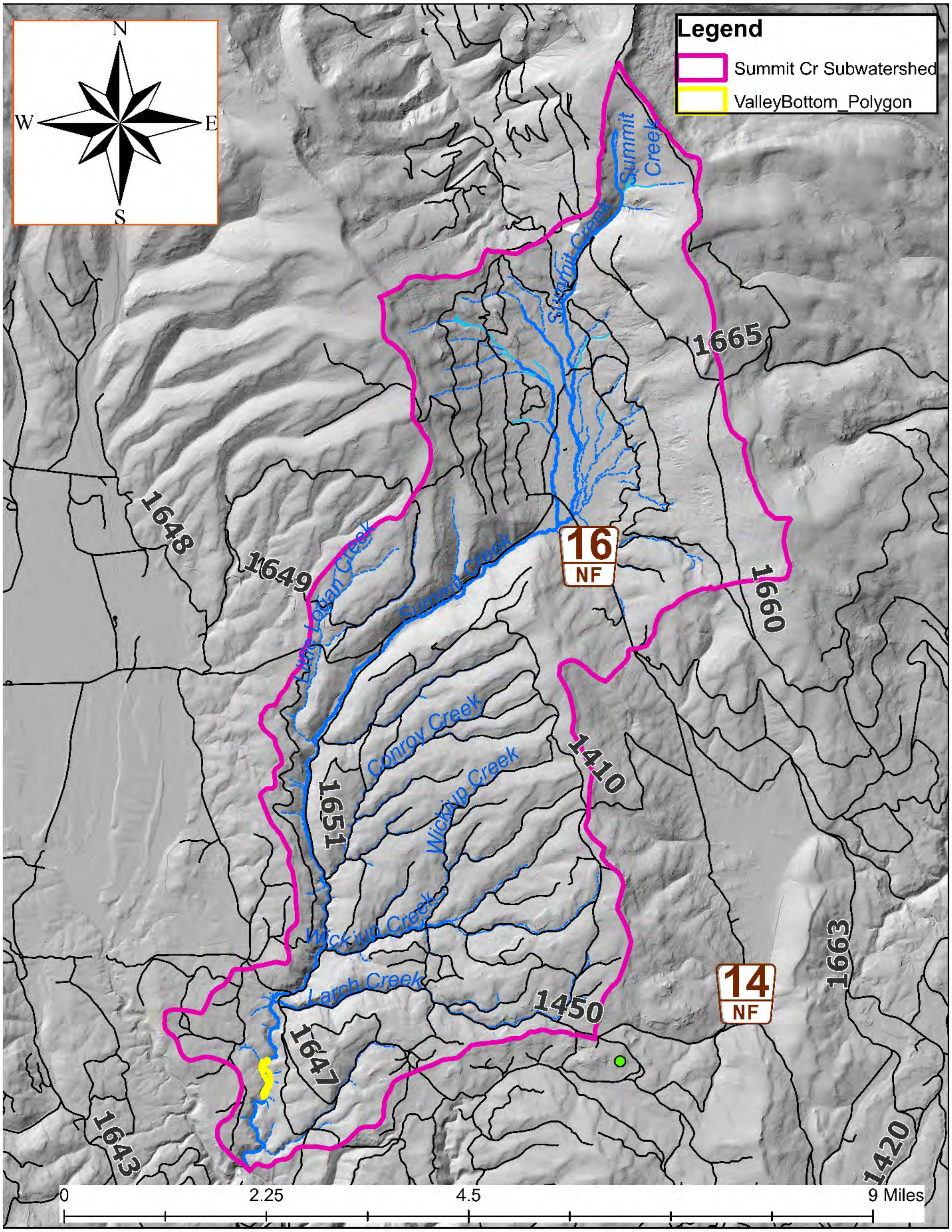


Figure 3. Phase 1 Floodplain Restoration valley bottom extent within Summit Creek subwatershed

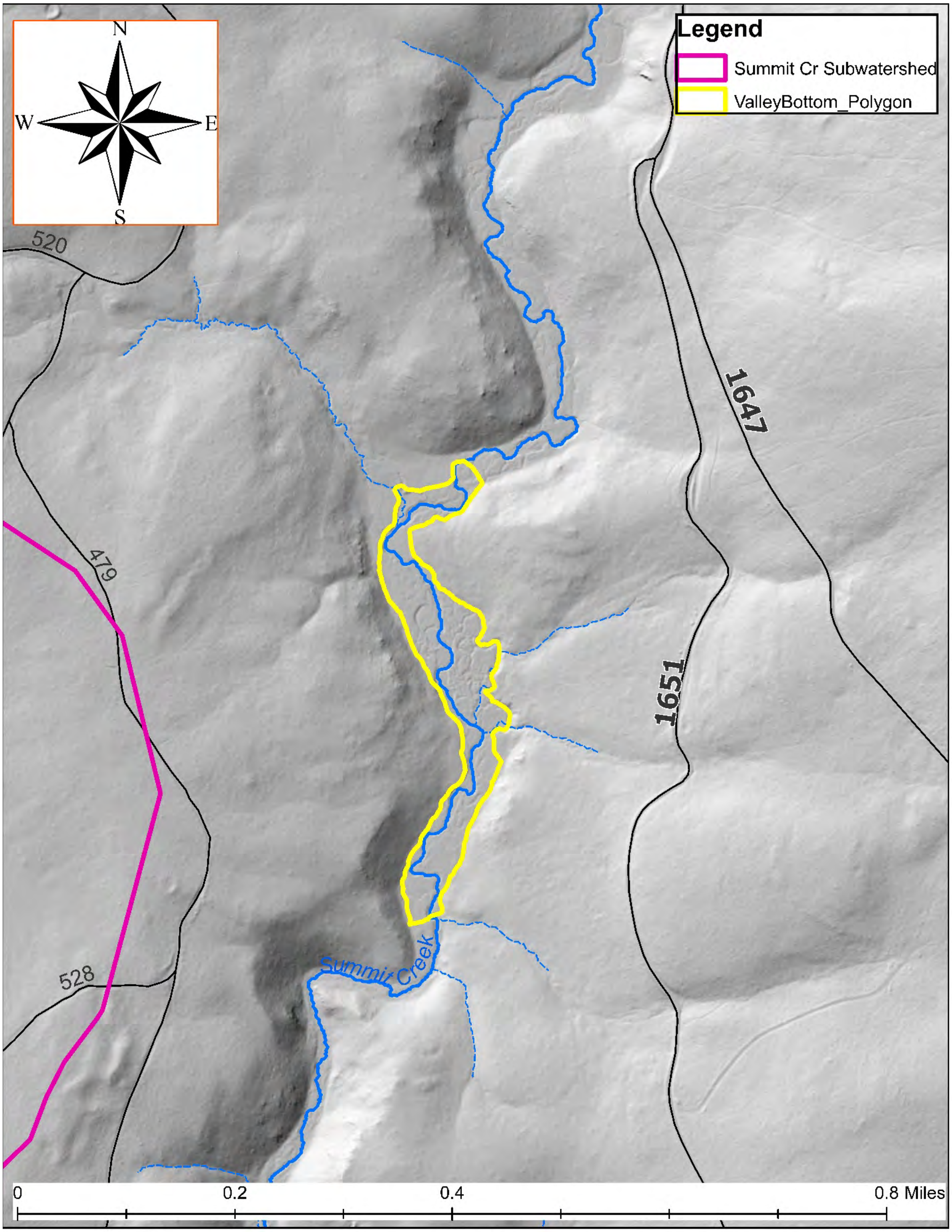


Figure 4. Phase 1 valley bottom extent in relation to Summit Creek & the 1651 rd

Amphibian Surveys:

In the spring of 2020 & 2021 the Burns Paiute Tribe (BPT) with support from PCRD aquatics staff surveyed 3 reaches on Summit Creek, tallying juvenile and adult amphibians and their corresponding egg masses. Each reach was walked by 2 surveyors recording survey minutes, species observed, life stage (adult, juvenile, or egg mass) and GPS tracks. Of the three reaches, the lowest (Treatment 1) includes the portion of Summit Creek that will be treated in 2022 as part of floodplain restoration. The uppermost reach (Treatment 2) includes portions of Summit Creek that will potentially be treated several years down the road, whereas the middle (Control) reach is not expected to receive any restoration work. These surveys are expected to continue annually after Phase 1 has been completed and will provide us with an idea of the before and aftereffects of floodplain restoration on local amphibian populations.

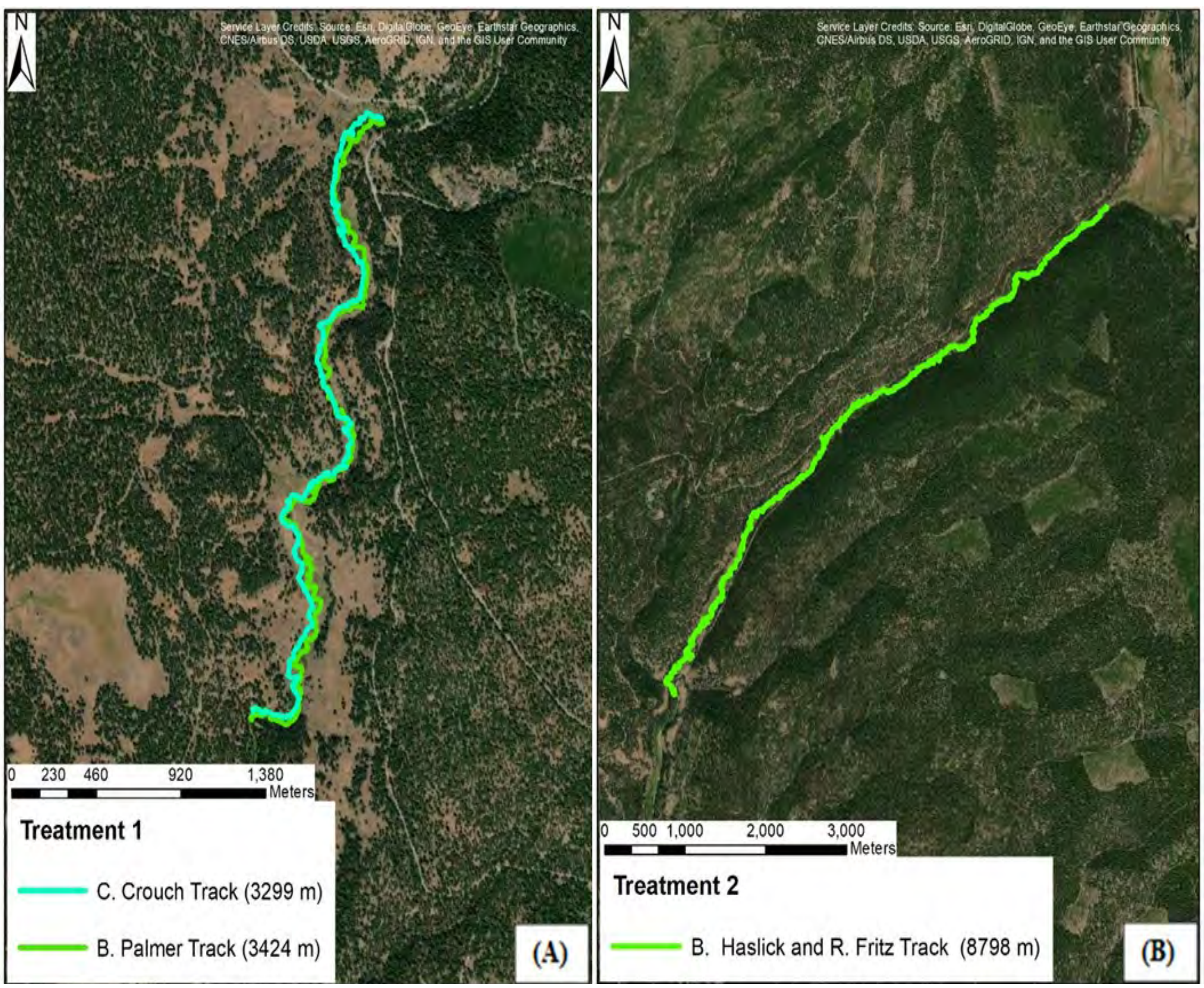


Figure 5. Tracks and distances of surveyors at Treatment 1 (A) and Treatment 2 (B) on Summit Creek on May 11th, 2020. "Treatment 1" extends from approximately the 1651 road bridge down to the lowermost fen complex along Summit Creek. "Treatment 2" extends from approximately the south end of Summit Prairie (private) to the Summit Creek confluence with Little Logan Creek.

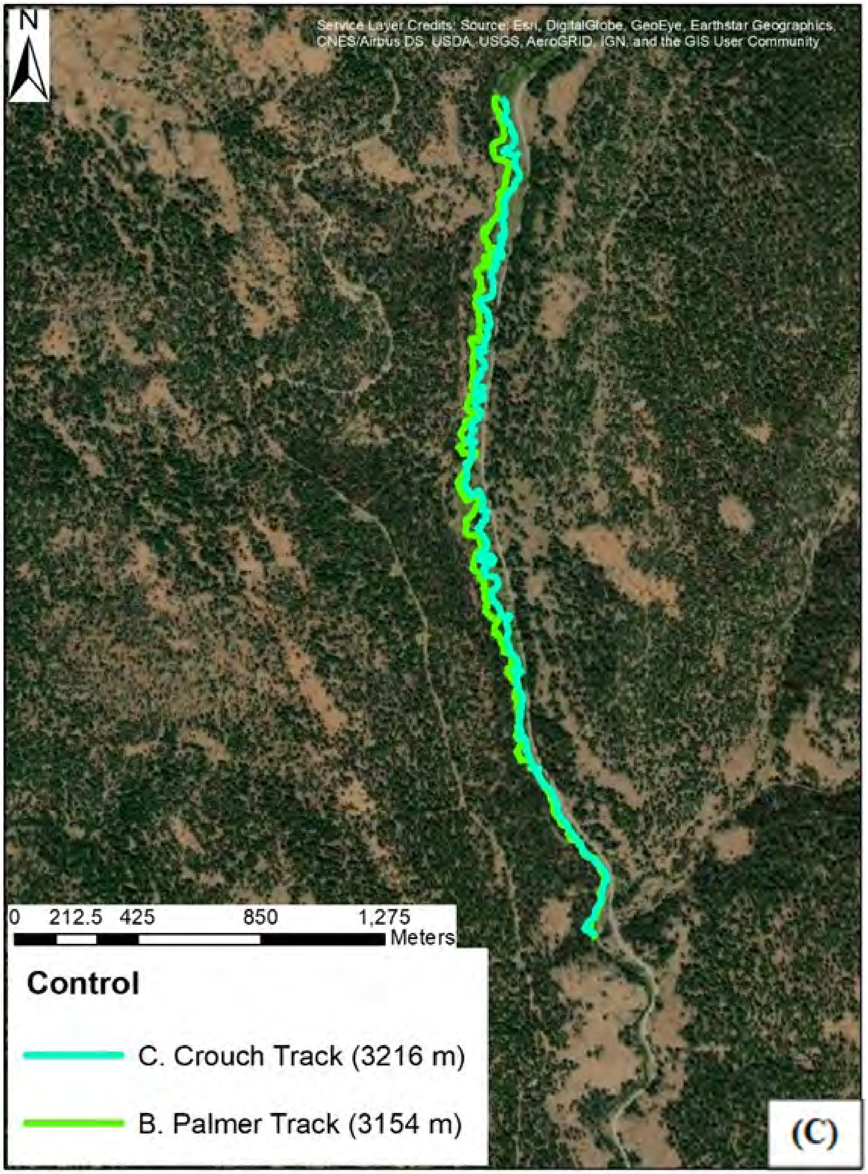


Figure 6. Tracks and distances of surveyors at the Control (C) reach on Summit Creek on May 11th, 2020. This reach extends from approximately the Summit Creek/Little Logan confluence downstream to the Conroy Creek confluence.

Amphibian Surveys Pre-Implementation Results

	Treatment 1					Treatment 2				
	Survey Minutes	Egg mass tally		Juveniles and adults		Survey Minutes	Egg mass tally		Juveniles and adults	
		Tally	per minute	Tally	per minute		Tally	per minute	Tally	per minute
2020	229	34	0.15	16	0.07	234	5	0.02	7	0.03
2021	174	10	0.06	6	0.03	222	15	0.07	4	0.02

	Control				
	Survey Minutes	Egg mass tally		Juveniles and adults	
		Tally	per minute	Tally	per minute
2020	243	35	0.14	11	0.05
2021	228	31	0.14	10	0.04

Table 1. Columbia spotted frog numbers from the Treatment and Control sections on Summit Creek in 2020-2021.

Fish & Macroinvertebrate Sampling:

In 2020 & 2021 the BPT Fishery Program gathered baseline biological data on Summit Creek for proposed future stream restoration by the USFS. Using electrofishing, BPT sampled the Summit Creek fish populations for one week in July 2020. BPT then returned the following week to collect macroinvertebrate samples from the same sites.

Ten, 100-meter, sites were randomly selected for surveys among the Lower, Middle, and Upper Summit treatment reaches. These treatment reaches are the same sections of Summit Creek referenced in the previous section which have also been surveyed for amphibians in spring 2020 & 2021. In 2020, two sites were sampled in Lower Summit, two sites in Middle Summit, and six sites were sampled in Upper Summit Creek.

Once at the site location, BPT measured 100-meters using a tape to delineate the survey area. Fisheries used a LR24 Smith-Root backpack Electrofisher to survey the fish at each site. Electrofisher settings were maintained as the lowest levels as which fish could be caught and no electrofishing was conducted if stream temperatures had exceeded 18° C. Trout fry (salmonid fry < 50 mm) were counted and released during the survey. Redside shiner and dace spp. Were also counted and released to avoid mortalities. Other species, salmonids (redband and brook) and suckers (bridgelip) were collected in an aerated bucket, identified to species, measured (fork length), weighed, and released back into stream. Upstream and downstream photos were taken of each site start and end.

BPT protocol for collecting macroinvertebrate samples was adapted from the Pacific Northwest Aquatic Monitoring Partnership (PNAP) (Hayslip 2007). BPT mapped out all riffle habitat in each electrofishing survey site and then measured the length from a GPS datapoint taken at the top and bottom of each riffle. Each sample (a total of eight per site) was collected using a 1 ft^2 Surber Sampler and net (500 µm). The Surber Sampler was placed on the substrate and the substrate was agitated for 60 seconds. The sample was collected in a bottle with 99% isopropyl. Individual samples were taken from each randomly selected riffle using the grid method. Due to few (< 8 riffles) at many of the sites, eight samples were taken evenly divided among the number of riffles at each site. If samples could not be evenly divided among the number of given riffles, any riffles resampled were randomly selected. Also, one (or more) of the eight ‘quadrants’ on the sampling grid were randomly assigned to each riffle using the microsecond setting on a stopwatch. Each site would have a total of 8 macroinvertebrate samples collected and then combined into a single site sample.

Fish & Macroinvertebrate Sampling Pre-Implementation Results

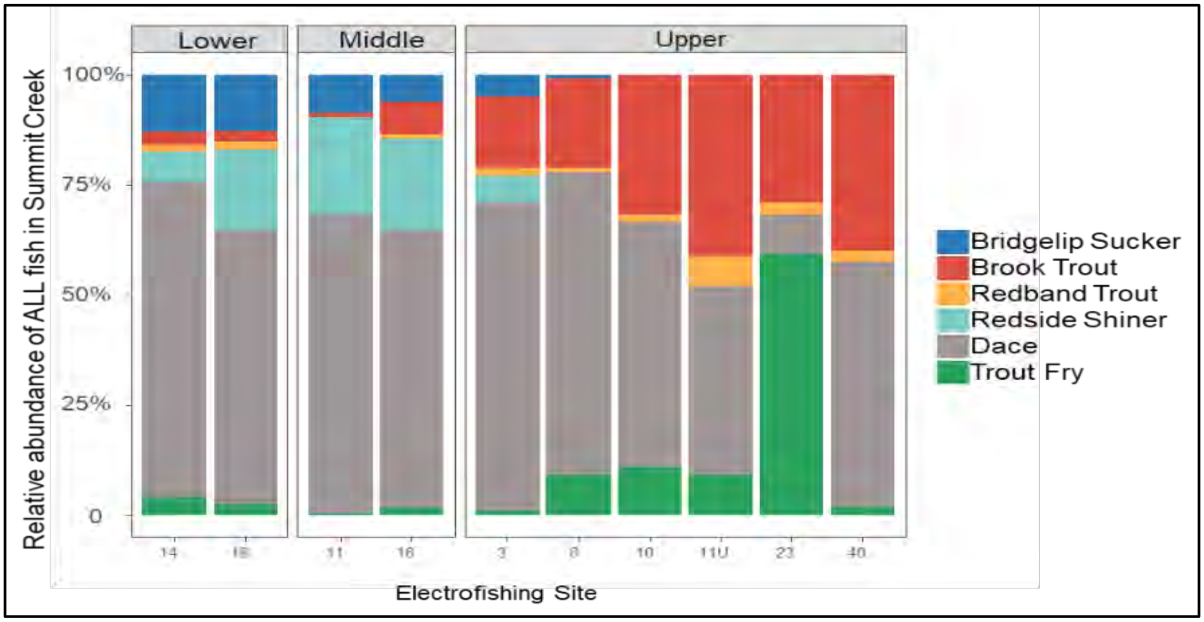


Figure 7. 2020: Relative abundance of all fish species encountered during electrofishing surveys in Lower Summit, Middle Summit, and Upper Summit

In 2020, electrofishing sites were dominated by dace species (largely, speckled dace and a few longnose dace) (Table S.1) however, the upper Summit Creek sites show an increase in the presence of invasive brook trout. This trend is even more evident when comparing the relative abundance brook trout compared to only redband trout and bridgelip suckers (Figure S.2 B). Bridgelip suckers were found in abundance in the lower reaches of Summit Creek.

Species	*Total # Fish Captured*	*% Abundance*
Dace spp.	951	59.3 %
Brook Trout	247	15.4 %
Redside Shiner	169	10.5 %
Trout Fry	118	7.3 %
Bridgelip Sucker	91	5.6 %
Redband Trout	27	1.7 %
Grand Totals	**1603**	**100%**

Table 2. 2020 fish species captured totals and % abundance

The preliminary data presented here are to provide baseline information on the biota in Summit Creek for a proposed restoration project led by the USFS. The benthic macroinvertebrate samples have not been analyzed as of fall 2021. BPT also recorded presence of Signal Crayfish *Pacifastacus leniusculus* and took noted locations where there were freshwater Western Pearlshell Mussels *Margaritifera falcata.*

Stream Temperature Monitoring:

PCRD Aquatics consulted specialists who have participated in floodplain restoration projects on other forests and concluded that deploying additional temperature loggers was the best course of action for continuously monitoring stream temperature within the PA. Five new sites were established in and adjacent to the PA in June 2021, with TidbiT temperature data loggers deployed at each site. These loggers are set to record temperature hourly and have been used on an annual basis at 60+ locations across PCRD to capture 7 Day Average Daily Max (7DADM) temperatures critical for fish reproduction and survival. In addition to the five new sites, 4 long-term temperature sites exist on Summit Creek with summer data extending back several decades in some cases.

In the context of this project, stream temperature data will be used to determine the effects of floodplain restoration on local water quality as well as potential habitat suitability for desired fish species including Bull Trout. Viewed in conjunction with stream gauge and piezometer data, this data will provide us with a better idea of the interactions between groundwater, stream discharge, and stream temperature throughout the PA. Temperature data collected within the fen adjacent to Summit Creek will serve to demonstrate the effects of restoration, if any, on GDE health as well as effects of fen seepage on nearby surface water quality.

It's likely that the temperature sites within the PA will change in 2022 due to the anticipated ground disturbance, though the sites above and below will remain the same. Pending additional funding more loggers will be purchased for deployment within newly activated channels across the PA valley bottom.

Figure 8. Photo of temperature monitoring site below Summit Creek PA. Logger is attached to rebar secured within the streambed and flagged for future reference.

Temp logger sites established in 2021 & Deployment Dates:

- Summit Creek Above Project (06/14)
- Summit Creek Top of Project (06/16)
- Summit Creek Below Project (06/14)
- Summit Creek in Middle of PA (06/23)
- Fen in PA adjacent to Summit Creek (06/29)

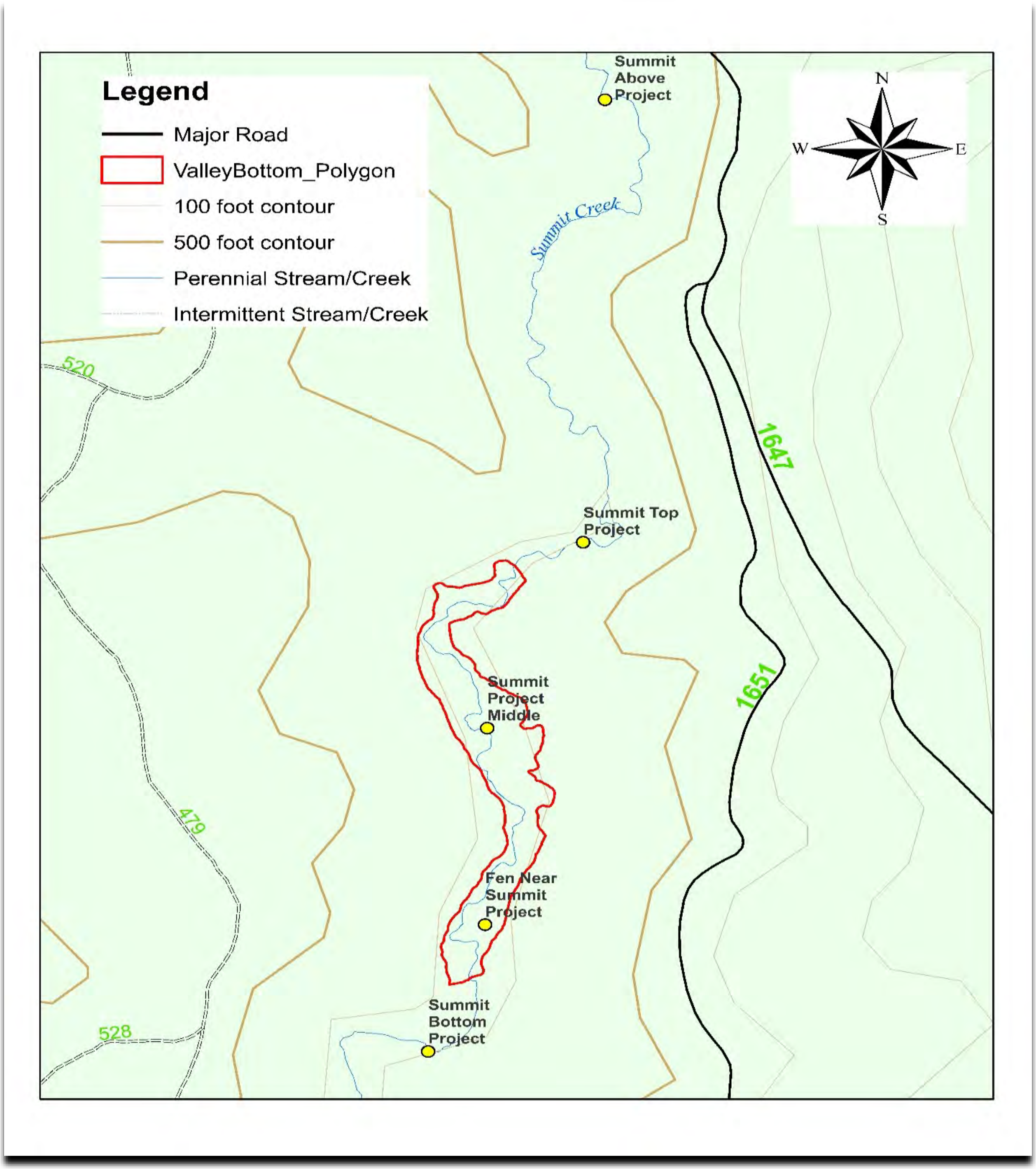


Figure 9. Location of 2021 temperature sites in and adjacent to the Summit Creek PA

Long-Term temperature monitoring sites on Summit Creek & distance from project area:

- Above Project Area:
  - Summit Creek ODFW
  - Summit Creek Upper LTWT
  - Summit Creek Lower LTWT
- Below Project Area:
  - Summit Creek Mouth

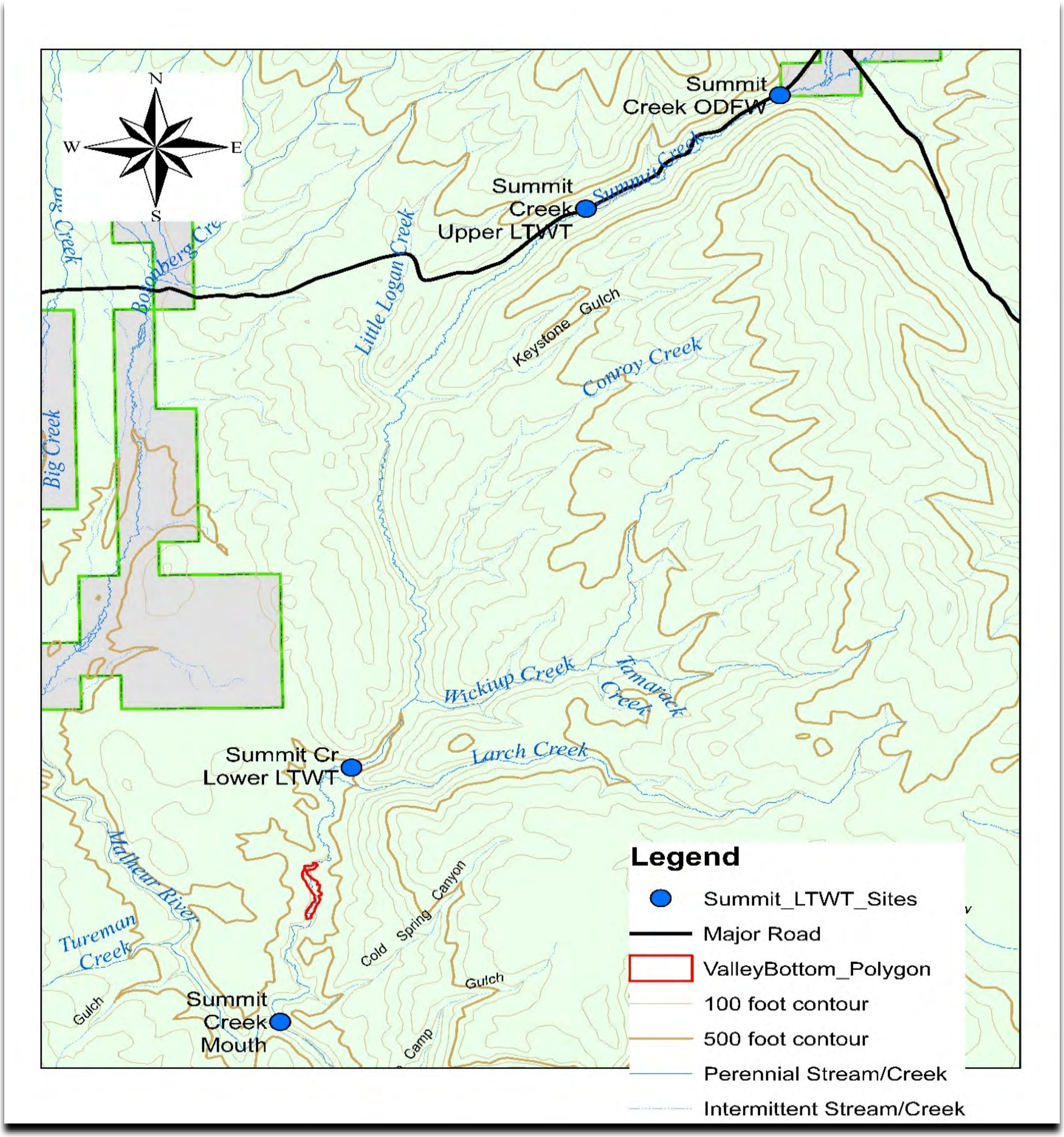


Figure 10. Mapped long-term temperature monitoring sites along Summit Creek

Temperature Monitoring Pre-Implementation Results

Year	SummitCreekLower_ LTWT 7DADM	SummitCreekMouth_ LTWT 7DADM	SummitCreekODFW_ LTWT 7DADM	SummitCreekUpper_ LTWT 7DADM
2000			27.13	
2001		25.55	26.82	
2002				
2003		27.64		
2004	18.95	25.89		18.95
2005	19.60			19.60
2006	20.08			20.08
2007	19.50	26.67		19.50
2008		23.69		
2009	19.27			19.27
2010	19.12	23.86		19.12
2011	19.94	23.08		19.94
2012	19.70	25.44		19.70
2013	20.33	23.14		20.33
2014	19.64	22.78		19.64
2015	20.06	26.60	23.22	20.06
2016	19.27	24.34	24.42	19.27
2017	19.80	24.42	24.47	19.80
2018	18.67	24.17	21.96	18.67
2019	18.96	22.94	22.49	18.96
2020	18.92	23.43	22.21	18.92
2021	24.9	24.93	28.68	20.17

Table 3. Long-Term Water Temperature (LTWT) Sites 7-Day-Average Daily Max (7DADM) Temperature by Year:

Site Name	Years Averaged	7DADM Average (Celsius)
SummitCreekLower_LTWT	2000, 2001, 2003-2009, 2011-2020	19.81
SummitCreekMouth_LTWT	2001, 2003, 2004, 2007, 2008, 2010-2020	24.62
SummitCreekODFW_LTWT	2000, 2001, 2015-2020	24.60
SummitCreekUpper_LTWT	2004-2007, 2009-2020	19.53

Table 4. LTWT Site 7DADM Averages:

Site Name	2021 7DADM
FenNearSummitProject	16.67
SummitAboveProject	24.39
SummitTopProject	24.27
SummitProjectMiddle	24.61
SummitBottomProject	25.37

Table 5. Summit Creek Project temperature sites 7-Day-Average Daily Max (7DADM) temperatures for 2021

Groundwater Monitoring:

Based on advice from a USFS hydrogeologist, shallow groundwater well sites were selected in the fall of 2020 at 4 locations within the PA valley bottom and at 1 site above the PA in an untreated "control" reach. Each of these sites is situated 3 to 4" above the adjacent streambed and is within a section of the valley bottom where ground disturbance will be limited but baseflow water table elevations are expected to rise significantly post-implementation (apart from the control well).

Wells were installed by hand in the summer of 2021 using a gas-powered T-post driver and sledgehammers. Each well consists of a 2" X 3' mesh-screened well point, 2" X 5' steel pipe, and 2 drive couplings for a total assembly length of roughly 8.5'. Onset U-20 Water Level Data Loggers were installed in each well at a maximum possible depth above the existing sediment layer within the pipes. A laser level was then used to determine the relative elevation of the logger to the adjacent ground surface, streambed, and groundwater level at the time of deployment.

These level loggers are set to record absolute pressure within each well every 4 hours and are calibrated using a separate U-20 logger recording barometric pressure above the ground surface within the PA. Once corrected for barometric pressure and using a known groundwater surface elevation at the time of deployment/readout, the loggers will be able to provide us with continuous water table elevation readings year-round. This dataset will be used to show changes in groundwater elevation as a result of the floodplain restoration, which is expected to raise the streambed elevation throughout the PA and thus store additional water across the valley bottom. Coupled with transect data showing the relative elevation of various geomorphic features in relation to the wells, we'll be able to infer groundwater-to-surface water interactions at various points during the year.

Figure 11. Photo of Well #3 facing west towards Summit Creek BDA & Well #4

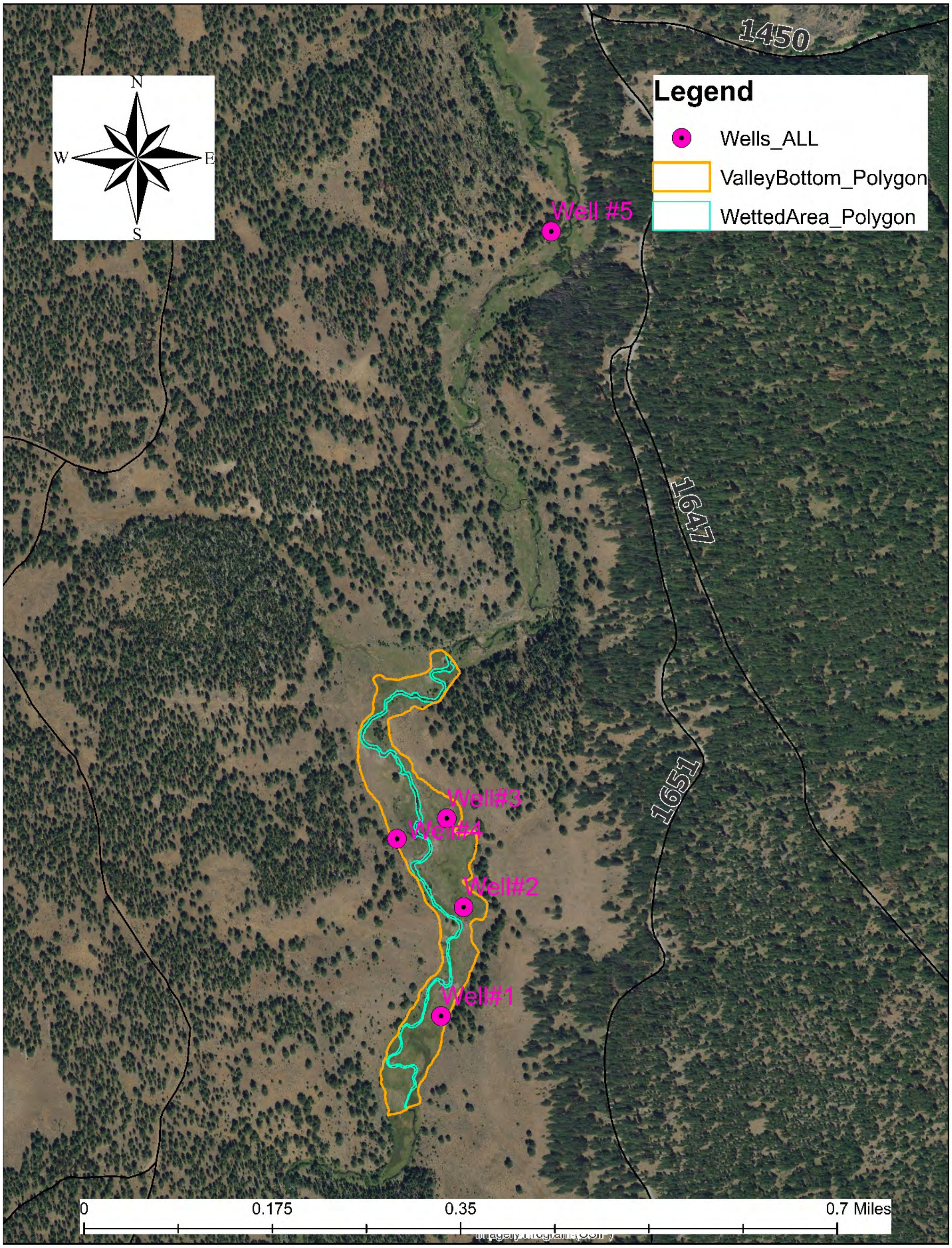


Figure 12. Map of groundwater monitoring well locations in relation to the Summit Creek PA. Wells #1-4 are within the 2022 PA; Well #5 is outside of the PA in a control (untreated) reach.

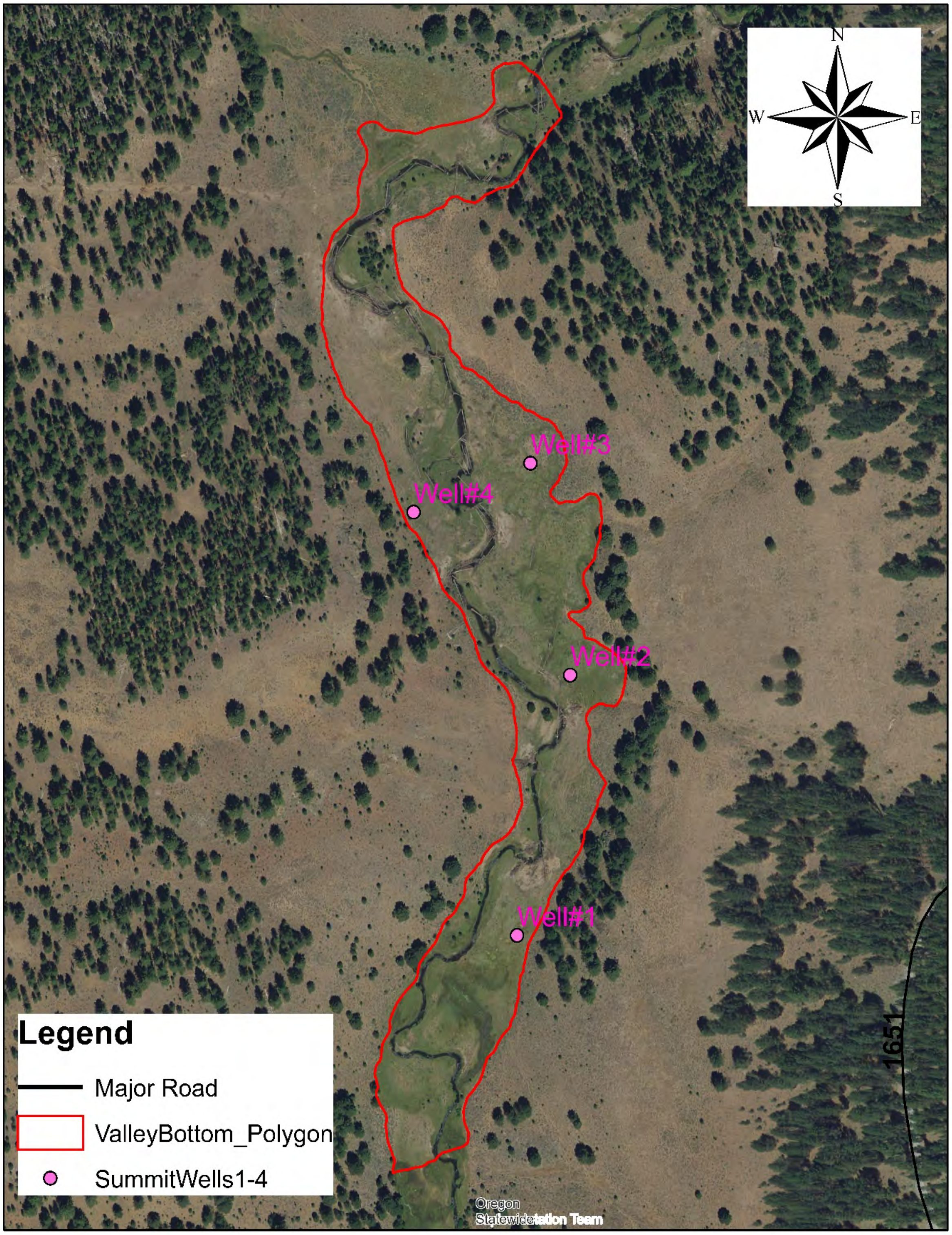


Figure 13. Map of Wells 1-4 in relation to the Summit Creek project area valley bottom

Groundwater Monitoring Pre-Implementation Results

Due to the monitoring wells being installed long after annual high-water conditions within the valley bottom, we don't yet have an idea of high water table elevations at the individual well sites. We do, however, see in the level logger data a trend over the course of the summer months (June, July, August) of the water table dropping up to several feet below the ground surface before plateauing and eventually rebounding in September & October. When these water table elevations are plotted next to channel thalweg, baseflow channel water level, and bankfull elevations it becomes apparent that there is significant change in "gaining" and "losing" conditions within the Phase 1 treatment reach.

At the Well #1 & Well #2 sites the water table elevation remained above the active channel thalweg for the duration of the summer, implying that this section of stream is "gaining", or receiving water from the adjacent valley bottom. In the case of Well #1 this was especially pronounced as the water table elevation did not fall below even the baseflow water level elevation and was thus at a higher elevation relative to the active channel all summer. These observations make sense knowing that these wells are situated towards the downstream end of the project area and are thus closer to several large fen complexes with locally high, stable water tables.

Towards the upstream end of the PA at Well #3 & Well #4 we see that the water table dropped below the active channel thalweg for most of the summer before eventually rebounding in September to an elevation at or near the Summit Creek thalweg. These wells are located on opposite sides of the valley bottom from each other and indeed have very similar water table trajectories. They area also outside the influence of any apparent springs and appear to be in a "losing" reach where the streambed is generally higher than the surrounding valley bottom water table.

Well #5 was not installed until September and thus has a very limited dataset for 2021. It does appear to be in another "losing" reach where the valley bottom water table is lower than the adjacent stream channel. This site will serve as a control dataset with which to compare the other four wells in Phase 1.

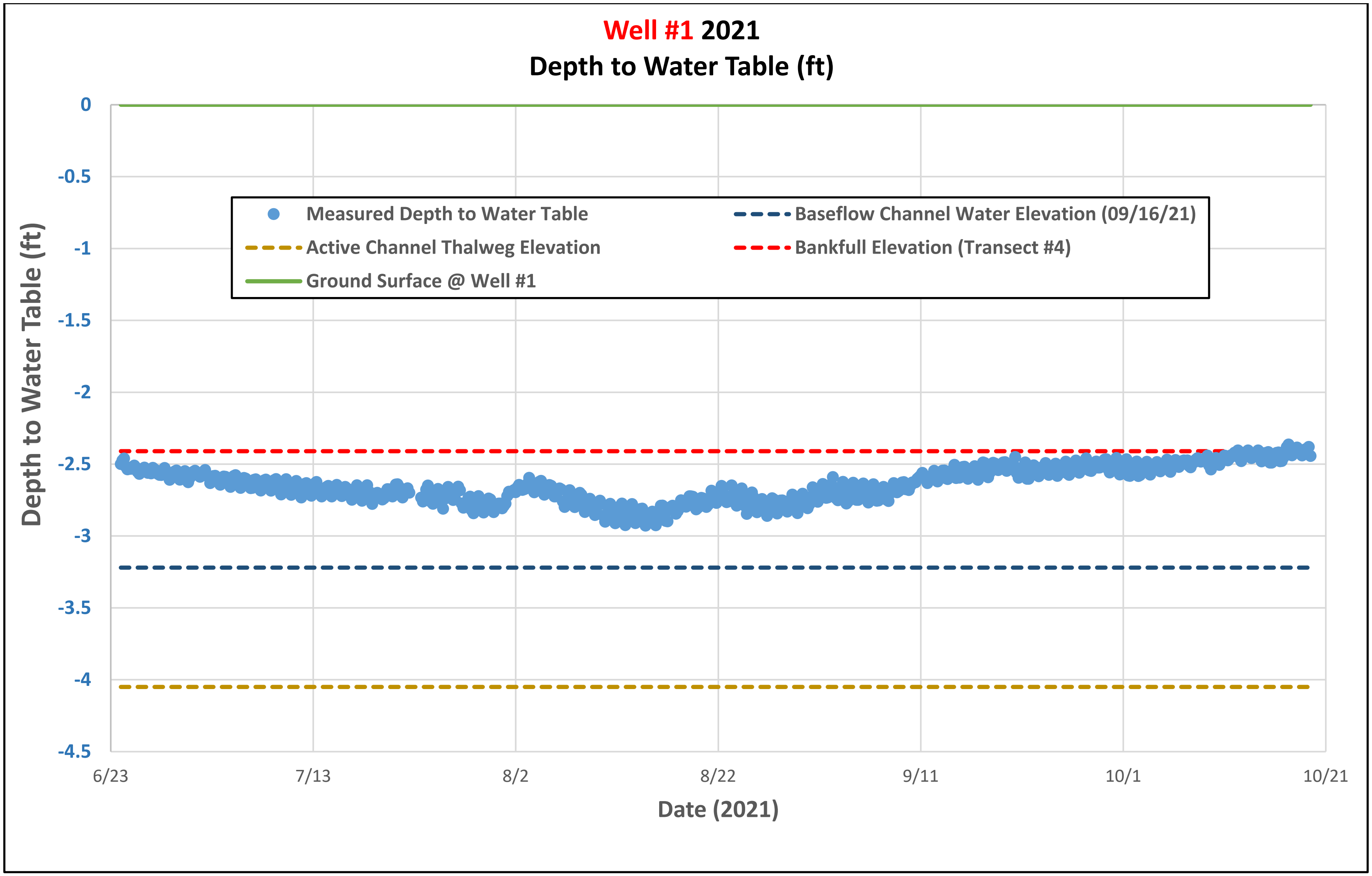


Figure 14. Level logger readings within Well #1 expressed as "depth to water table" & adjacent Summit Creek feature (bankfull, thalweg) elevations taken from Transect #4

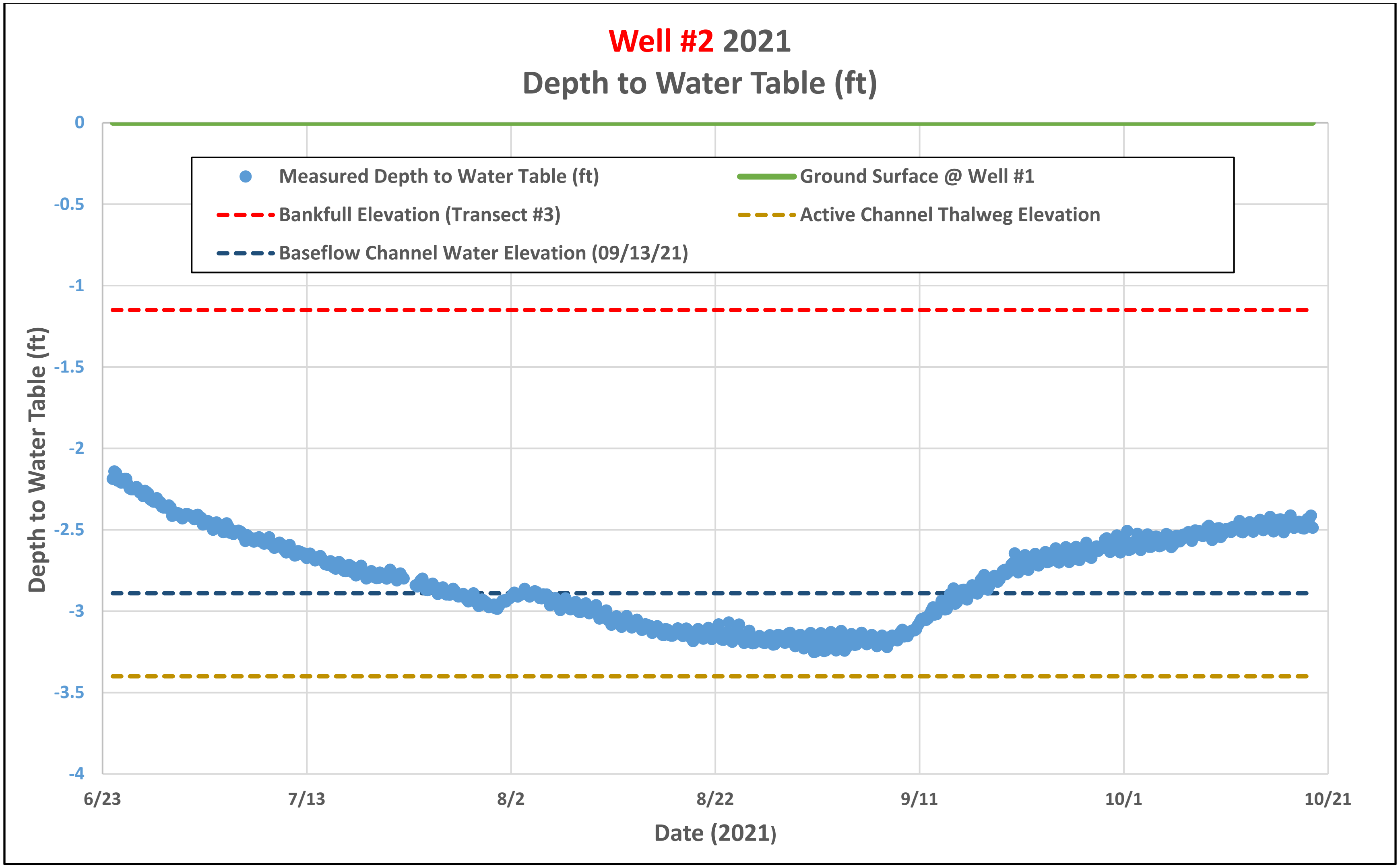


Figure 15. Level logger readings within Well #2 expressed as "depth to water table" & adjacent Summit Creek feature (bankfull, thalweg) elevations taken from Transect #3

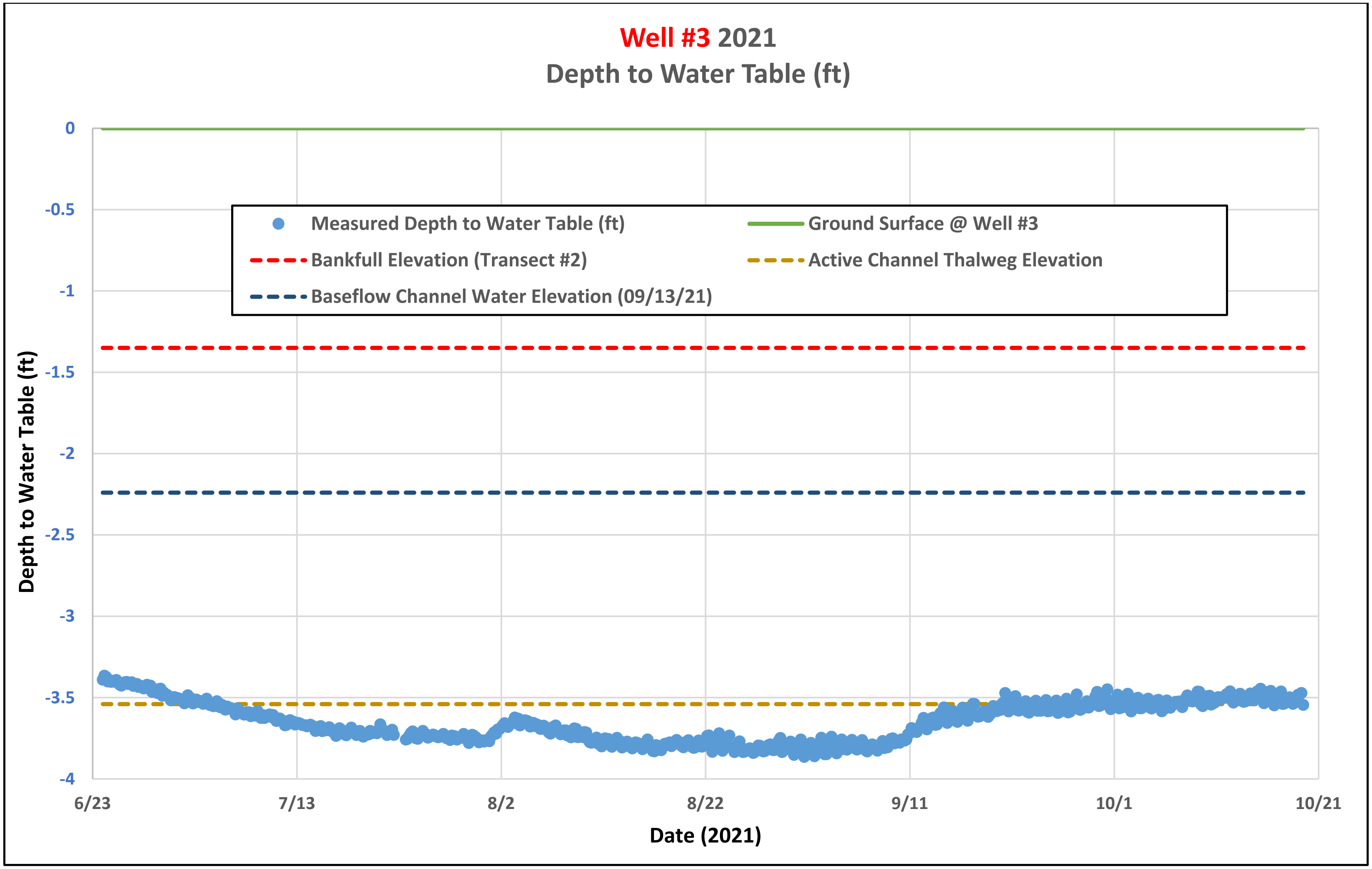


Figure 16. Level logger readings within Well #3 expressed as "depth to water table" & adjacent Summit Creek feature (bankfull, thalweg) elevations taken from Transect #2

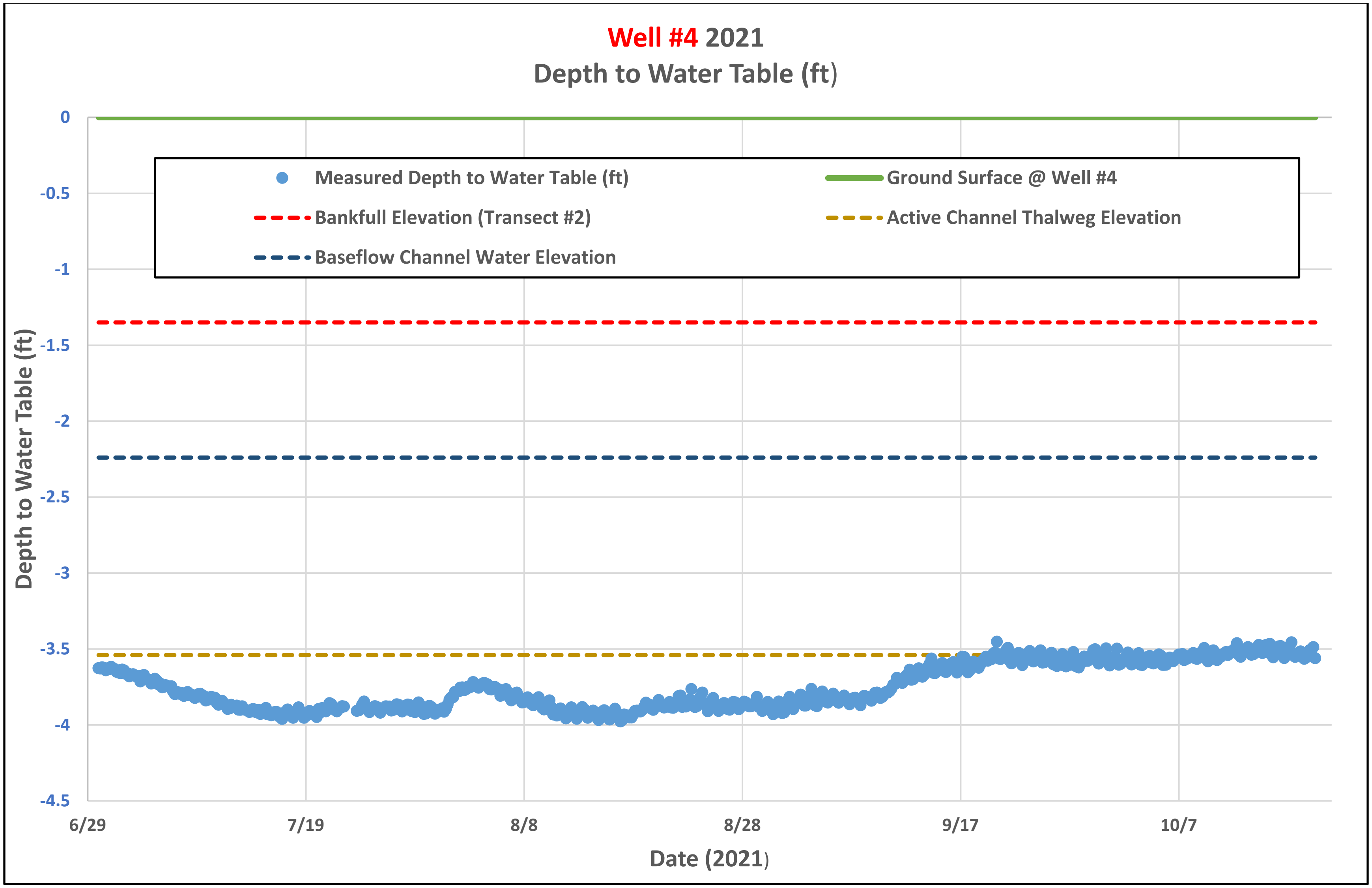


Figure 17. Level logger readings within Well #4 expressed as "depth to water table" & adjacent Summit Creek feature (bankfull, thalweg) elevations taken from Transect #2

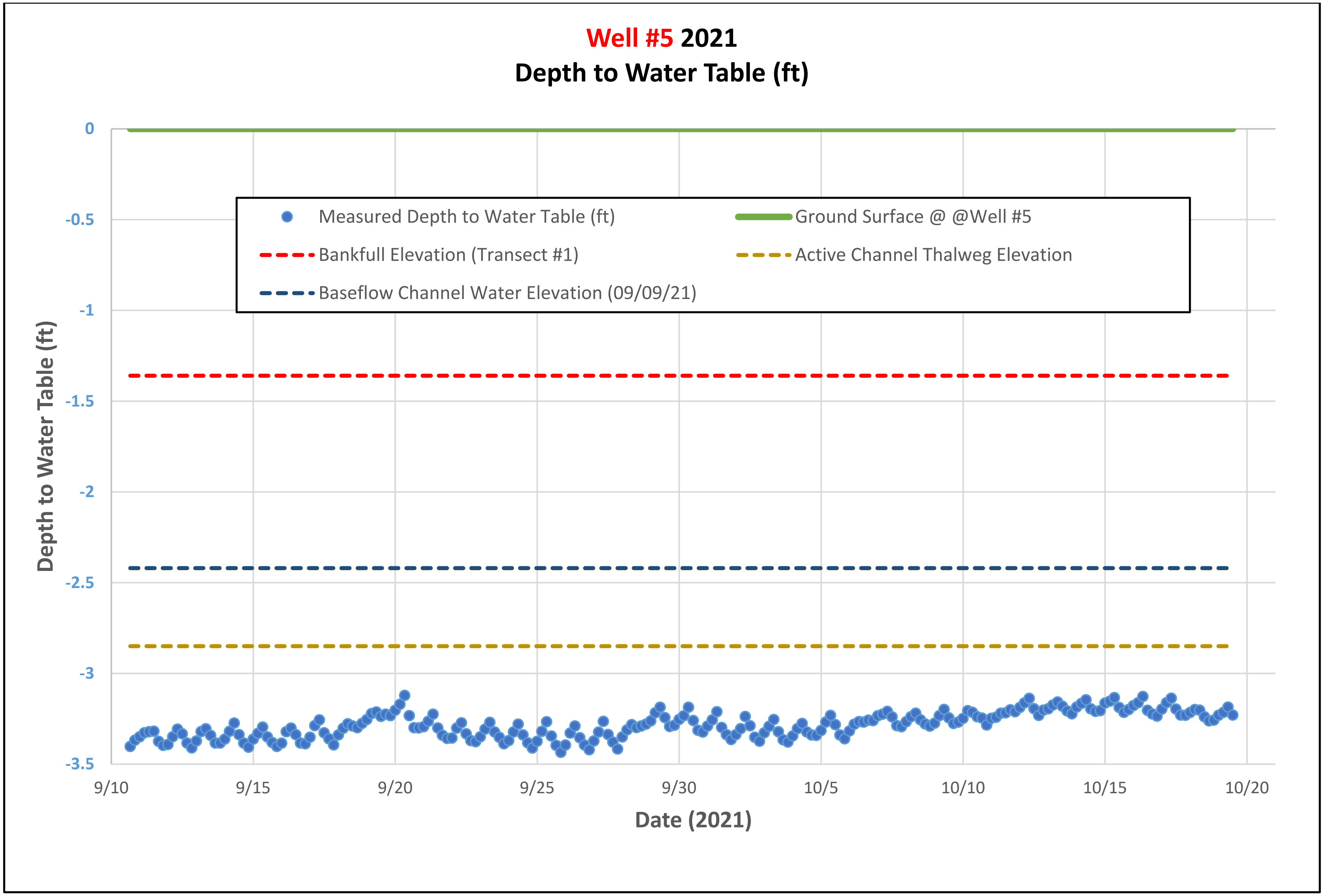


Figure 18. Level logger readings within Well #5 expressed as "depth to water table" & adjacent Summit Creek feature (bankfull, thalweg) elevations taken from Transect #1

Summit Creek Discharge Monitoring:

To capture streamflow data on Summit Creek a stream gauge was installed in July 2021 immediately below the PA. This gauge consists of an Onset U-20 level logger anchored to a T-post and submerged at a known elevation above the streambed. Every hour the logger records absolute pressure, which when calibrated using the methods described in the *Groundwater Monitoring* section provides us with continuous water level (stage) data for the site. To translate this water level data to streamflow information a stage-discharge relation, or rating curve, will be developed for the site. This is achieved by measuring discharge at a known time/water elevation over a range of different flows at or near the stream gauge site.

For this site a cross-section was chosen approximately 50' below the stream gauge and a Marsh-McBirney Model 2000 Flo-Mate mechanical current meter was used to measure velocity. Coupled with width & depth measurements, these velocity measurements were used to calculate total discharge for the site. Viewed over the course of several years pre-and-post implementation, streamflow data will provide us with a better understanding of the restoration effects on peak flow events as well as baseflow conditions.

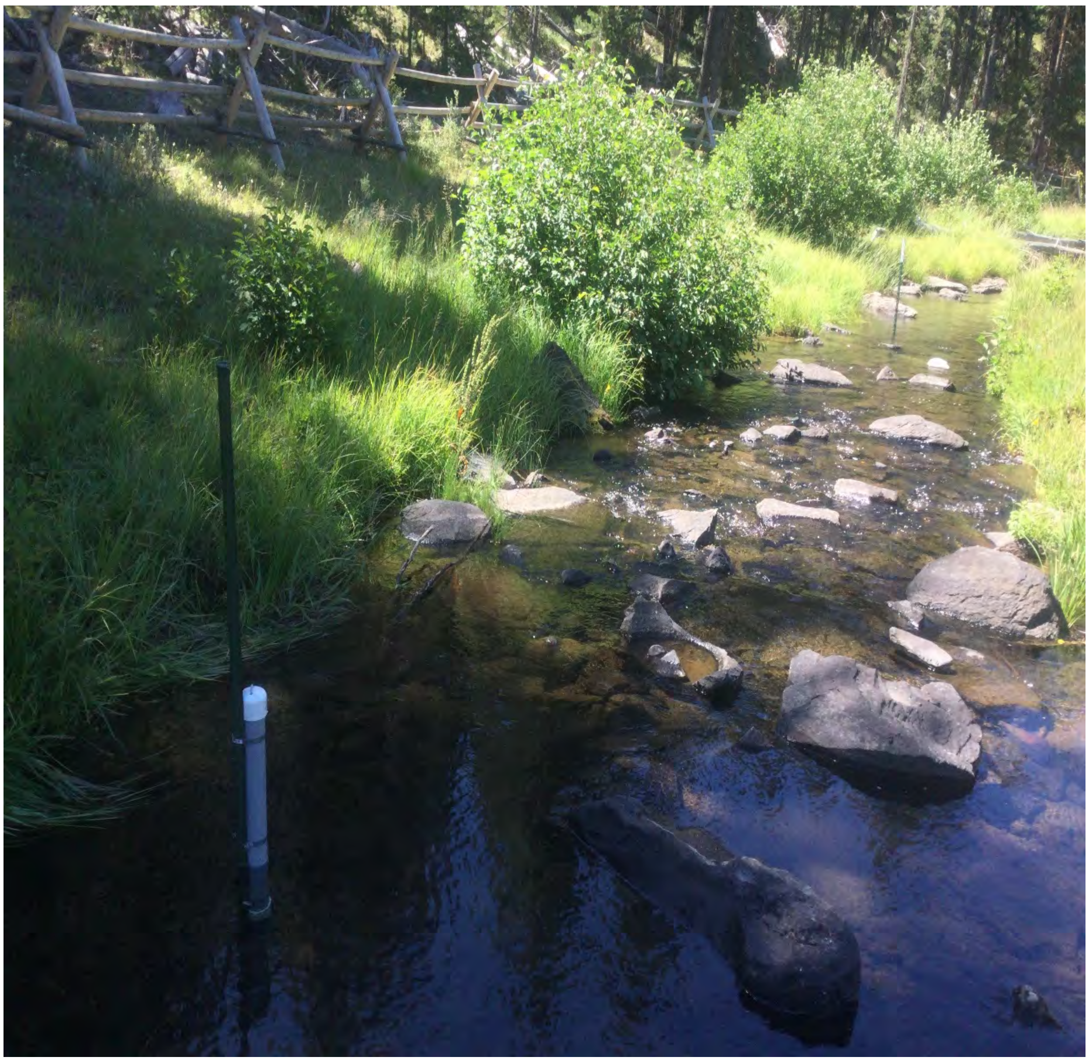


Figure 19. Photo of stream gage station facing DS towards discharge site marked by T-post

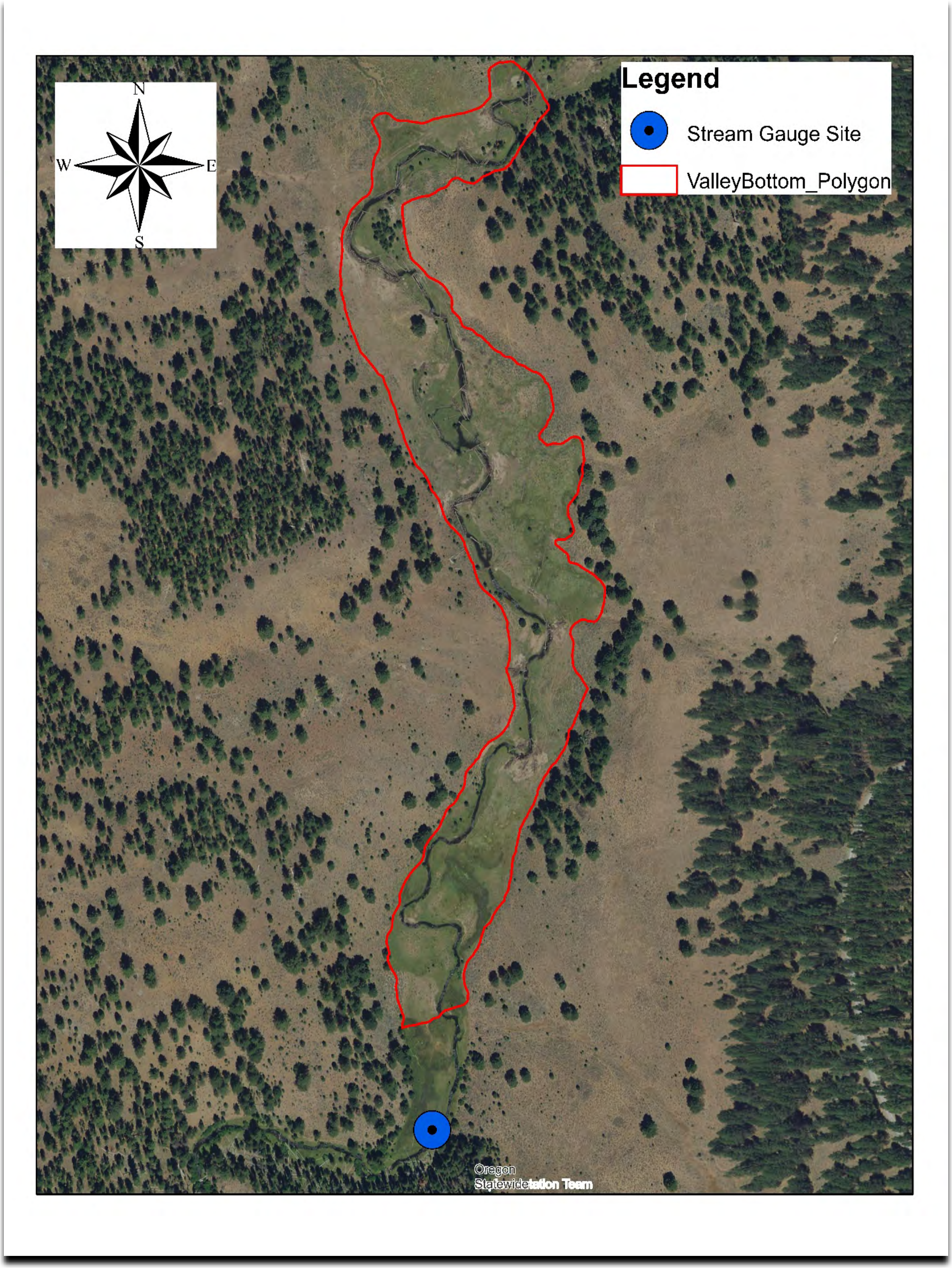


Figure 20. Map of stream gage site in relation to PA valley bottom.

Stream Discharge & Rating Curve Pre-Implementation Data

A rating curve has not yet been developed to provide continuous streamflow data at the stream gage site. Additional discharge measurements will be collected in Fall 2021 & Spring 2022 to develop the rating curve.

Photo Point Monitoring (OWEB):

In July 2021 a total of 15 photo points were established in & around the project area. These photos will provide reference points for summer valley bottom conditions pre-and-post restoration and serve to document vegetative recovery for years to come.

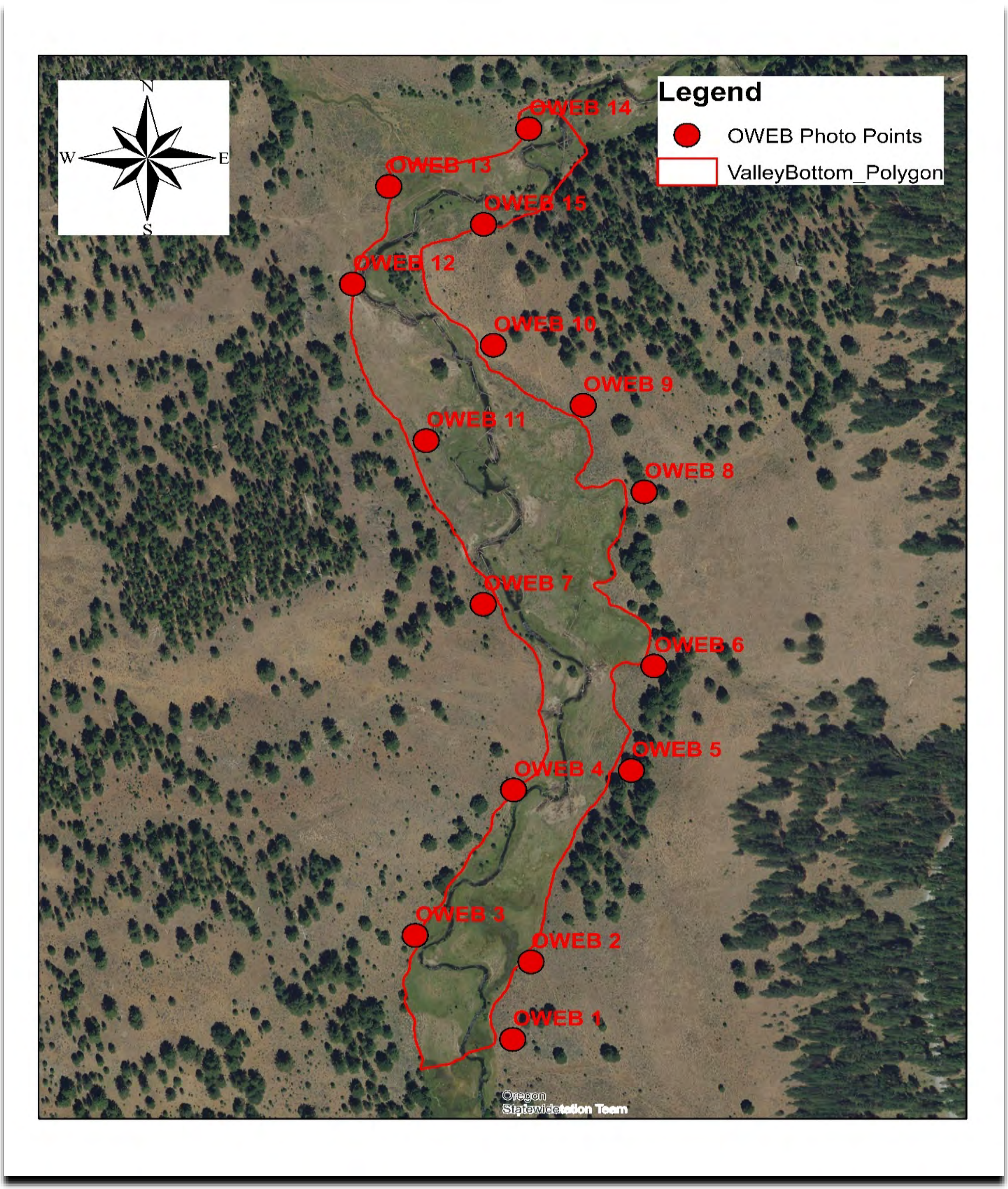


Figure 21. Map of Photo Point locations in & around the Summit Creek PA

Valley Bottom Cross-Sections (Transects):

To provide a pre-implementation view of the Summit Creek valley bottom a total of 5 cross-section surveys were completed in September 2021. These surveys utilize laser level devices to record relative elevation between the valley toe slopes, noting major changes in height, different geomorphic unit types (terrace, floodplain) and streamflow indicators (water level, bankfull) along the way. Four out of the five survey sites were chosen to intersect groundwater monitoring wells situated within the valley bottom. The fifth transect intersects a large fen feature with a locally high water table and a known, stable groundwater elevation.

By identifying the relative elevation of features such as seasonal & relic channels, terraces, and floodplain, these cross sections paint a picture of what Summit Creek might have looked like as an anastomosing wet meadow system, prior to channel incision. Additionally, documenting bankfull height, water level, and streambed elevation allows us to calculate the extent of Summit Creek's current incision with metrics such as flood-prone width & entrenchment ratio. By positioning the transects near groundwater wells, we'll be able to compare local water table elevations to the adjacent water levels in Summit Creek and infer groundwater-to-stream interactions throughout the year.

Each of these surveys will be repeated in the years following implementation to document both the immediate effects of restoration on geomorphic diversity & composition as well as the dynamism and long-term effects associated with channel adjustment. One of the cross-sections (Transect #1) is situated well above the project area adjacent to Well #5 and will serve as a control site with which to compare the treated areas.

Figure 22. Photo of Transect #2 facing west to east and crossing Well #4 along the Summit Creek Valley Bottom

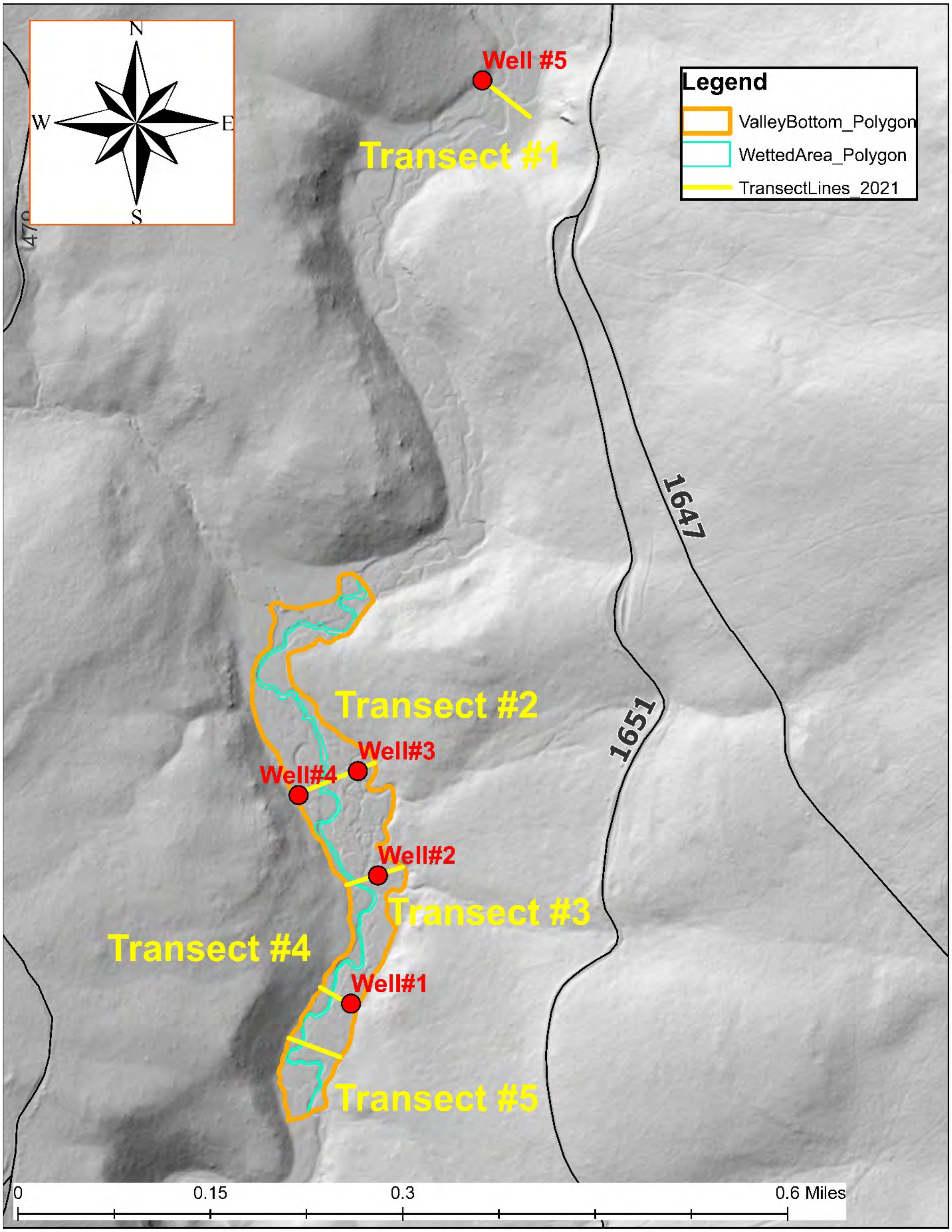


Figure 23. Map of all 2021 Transects in relation to the Summit Creek project valley bottom and adjacent groundwater monitoring wells

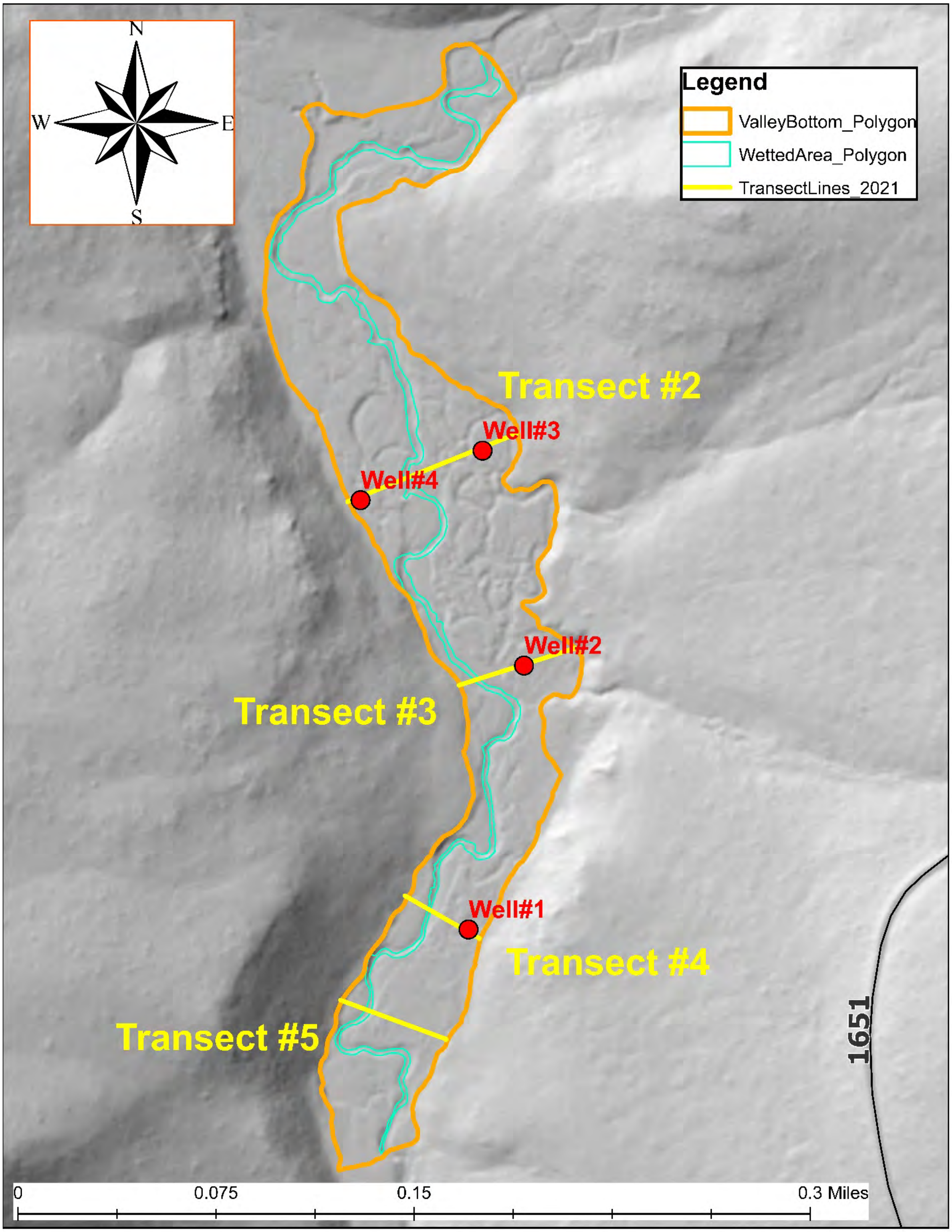


Figure 24. Location of 2021 Transects 2-5 in relation to the Summit Creek project valley bottom and groundwater monitoring well locations.

Valley Bottom Transect Pre-Implementation Data

Relative elevation charts (Figures 25-29) of the five valley bottom transects taken prior to Phase 1 implementation reveal a relatively wide valley bottom (175-363') bordering Summit Creek with numerous relic and seasonally active flowpaths. The active channel, however, is often connected only to a relatively narrow portion of the valley bottom with one or two seasonally active channels at or below bankfull stage. In sections of the valley bottom currently identified as floodplain we see numerous depressions, most likely historic flowpaths or relic channels, which are only currently active during high flow events above bankfull. This data supports our hypotheses that this section of Summit Creek was once an anastomosing network of low-relief, low-energy channels with extensive lateral connectivity from toe slope to toe slope. It also effectively shows the extent to which the current active channel has incised to a depth where it no longer connects via surface flow to its historic channel network on a regular basis.

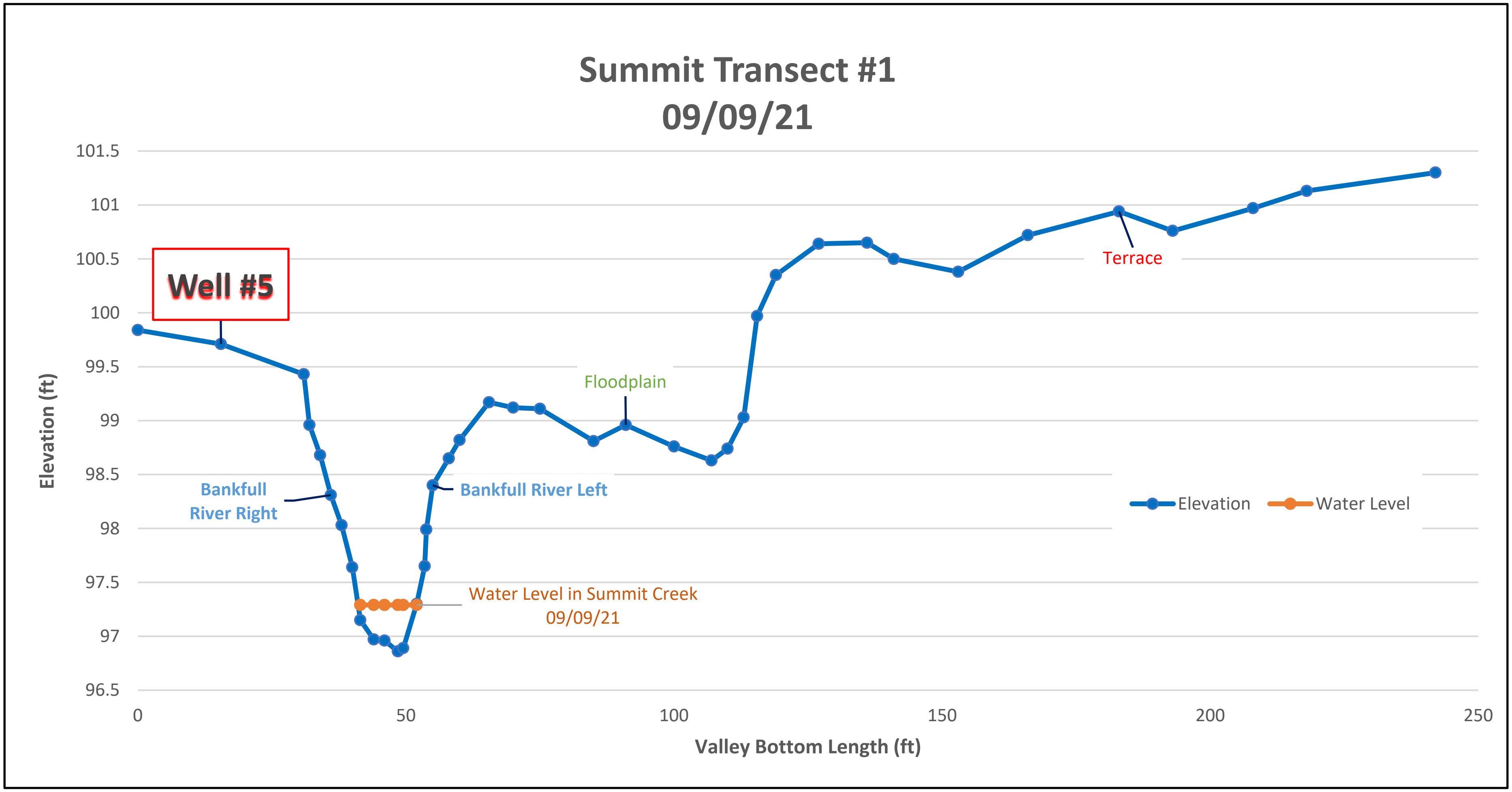


Figure 25. Scatter plot graph of Transect #1, located above Summit Creek PA & intersecting groundwater monitoring Well #5

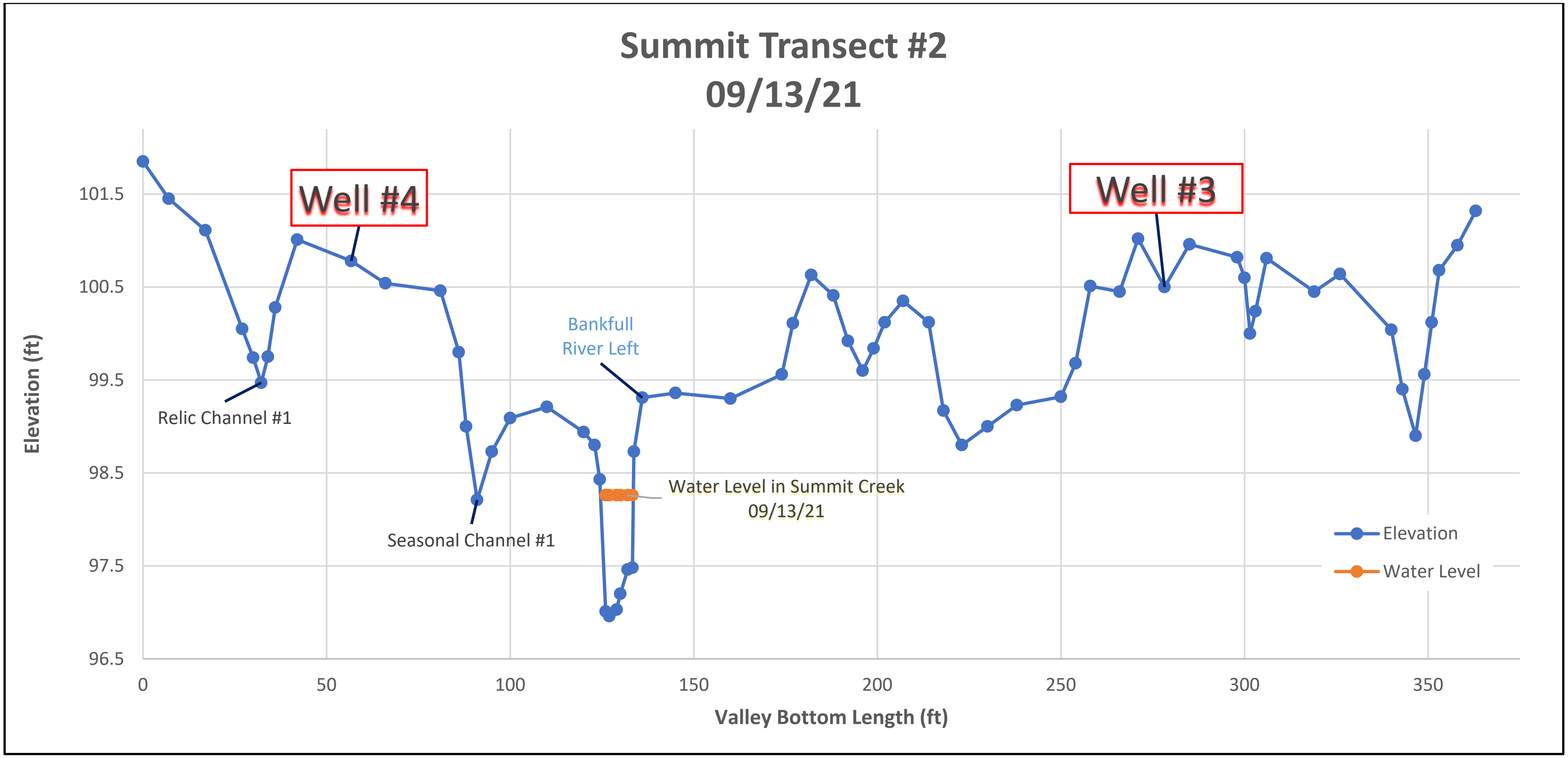


Figure 26. Scatter plot graph of Transect #2, located within Summit Creek PA & intersecting groundwater monitoring Wells #3 & 4

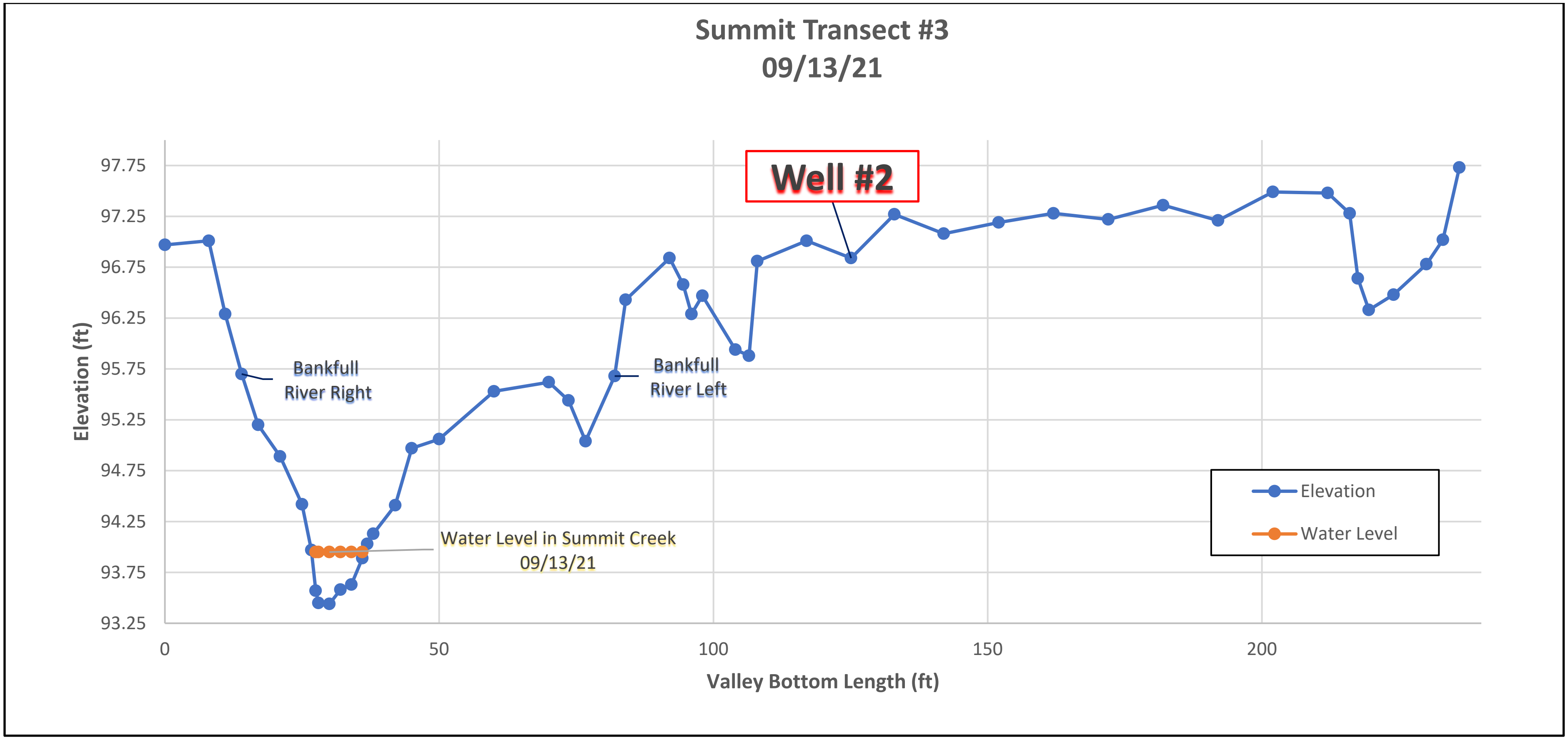


Figure 27. Scatter plot graph of Transect #3, located within Summit Creek PA & intersecting groundwater monitoring Well #2

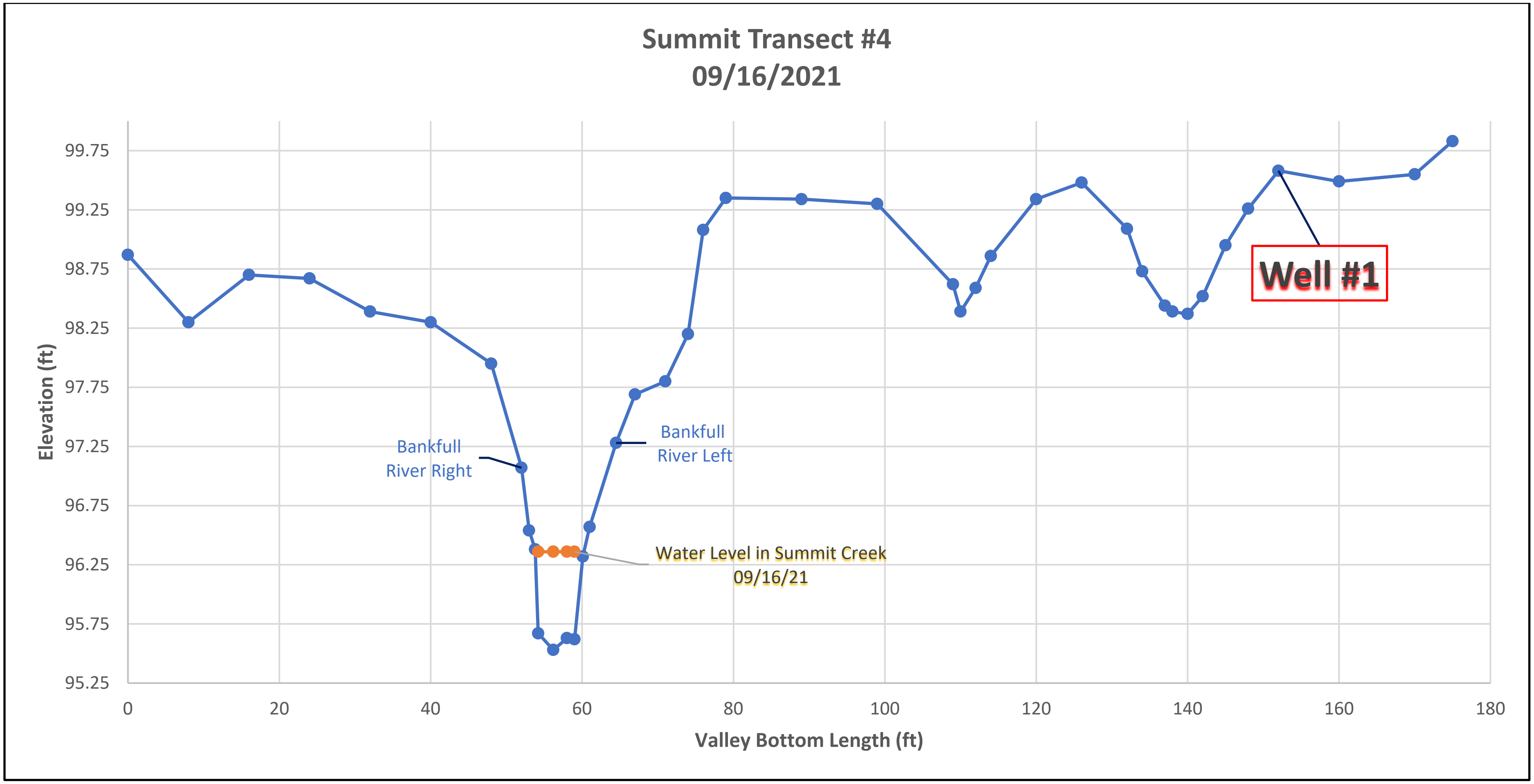


Figure 28. Scatter plot graph of Transect #4, located within Summit Creek PA & intersecting groundwater monitoring Well #1

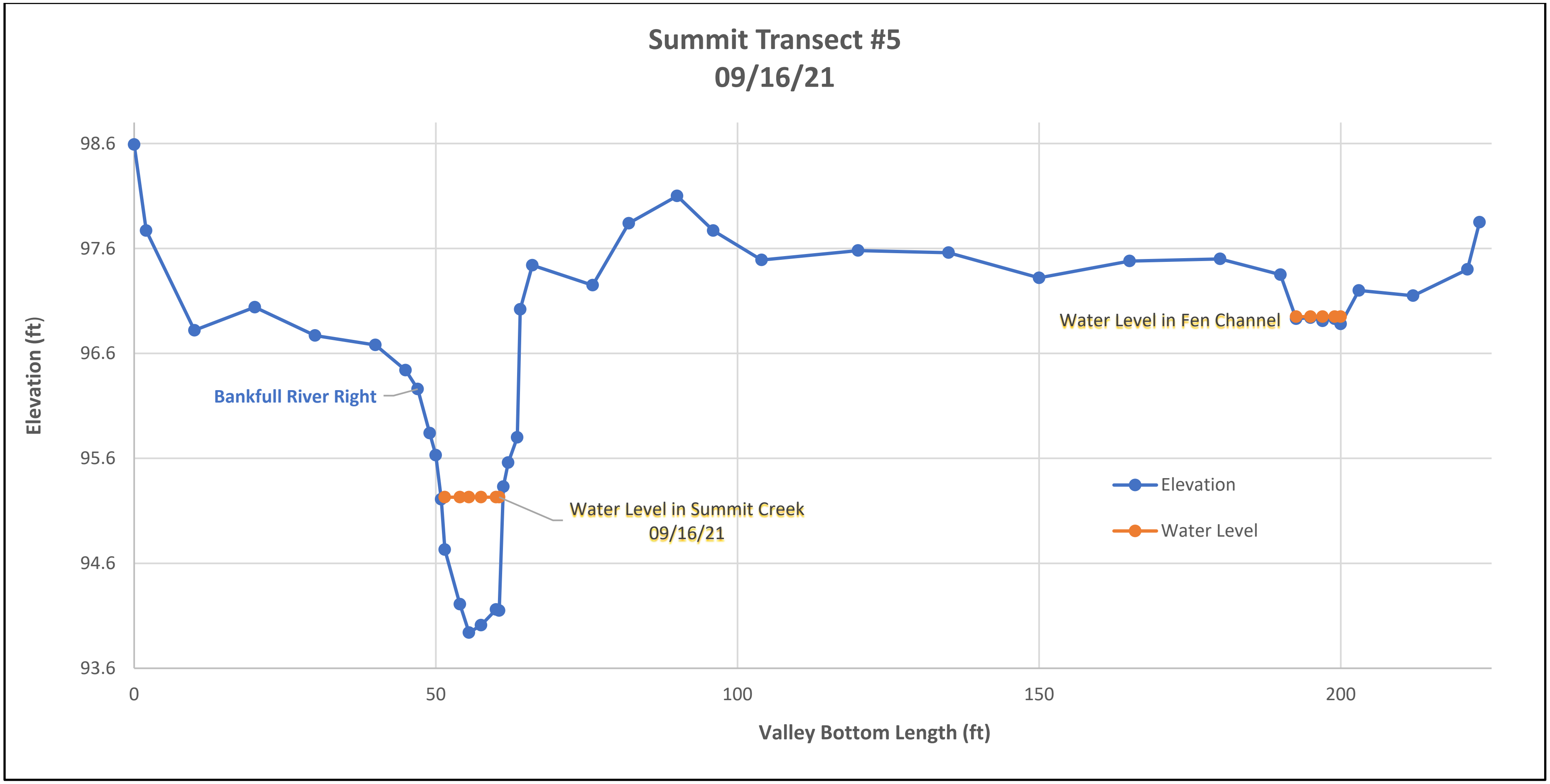


Figure 29. Scatter plot graph of Transect #5, located above Summit Creek PA & intersecting groundwater monitoring Well #5

GRTS Point Surveys:

After consulting with aquatics specialists experienced in floodplain restoration monitoring, a Generalized Random Tesselation Stratified (GRTS) approach was chosen to survey the Summit Creek valley bottom pre-and-post implementation. GRTS is a sampling design used to generate spatially balanced points within a project area, and thus support design-based inferences for that entire area. For this project a track was taken along the entire Summit Creek valley bottom (the area including active channels, floodplain, and terraces) using a Geode GPS unit that provides sub-meter accuracy. A separate track was then taken for just the "baseflow wetted area" portion of the valley bottom (the area with current surface water) and both tracks were used to create polygon layers within ArcMap. Once the polygons were finalized, 100 total GRTS points were created within the valley bottom and 30 within the wetted area to serve as survey locations.

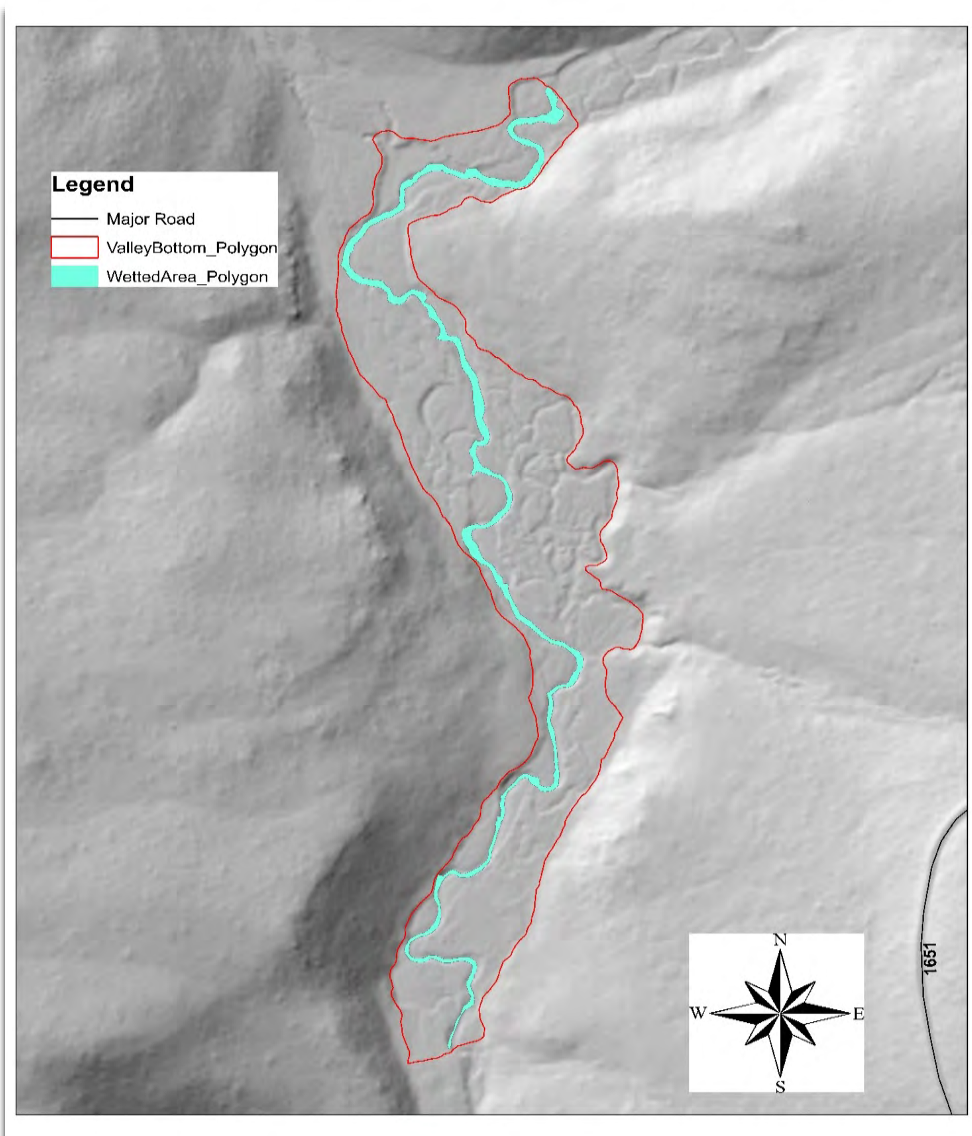


Figure 30. Mapped valley Bottom and baseflow wetted area survey polygons for the Summit Creek Phase 1 PA. The total acreage for the surveyed valley bottom area is 12.12 acres and 0.935 acres for the baseflow wetted area.

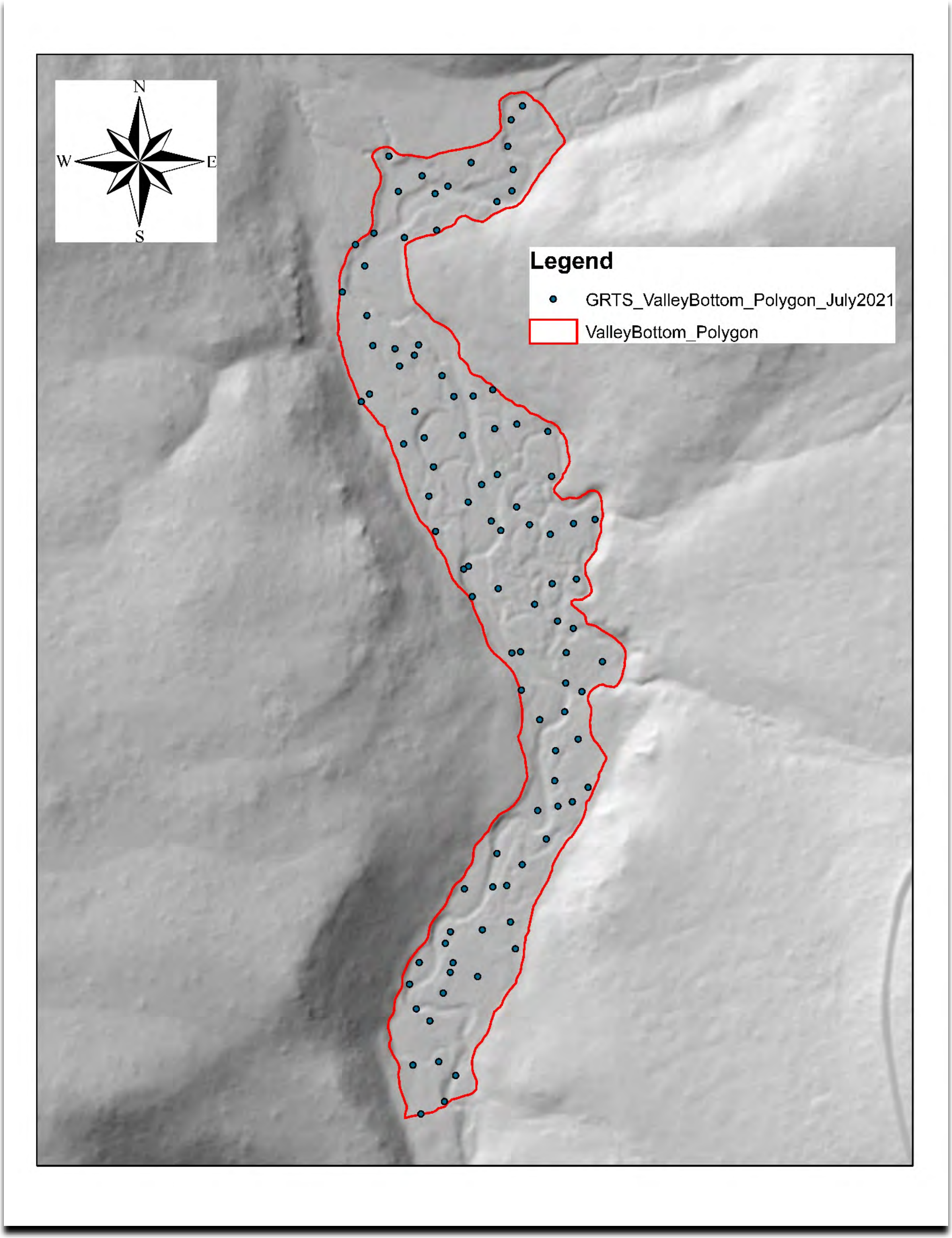


Figure 31. Map of GRST survey point locations within the Summit Creek PA valley bottom polygon. 100 total survey points were collected within this area in September 2021.

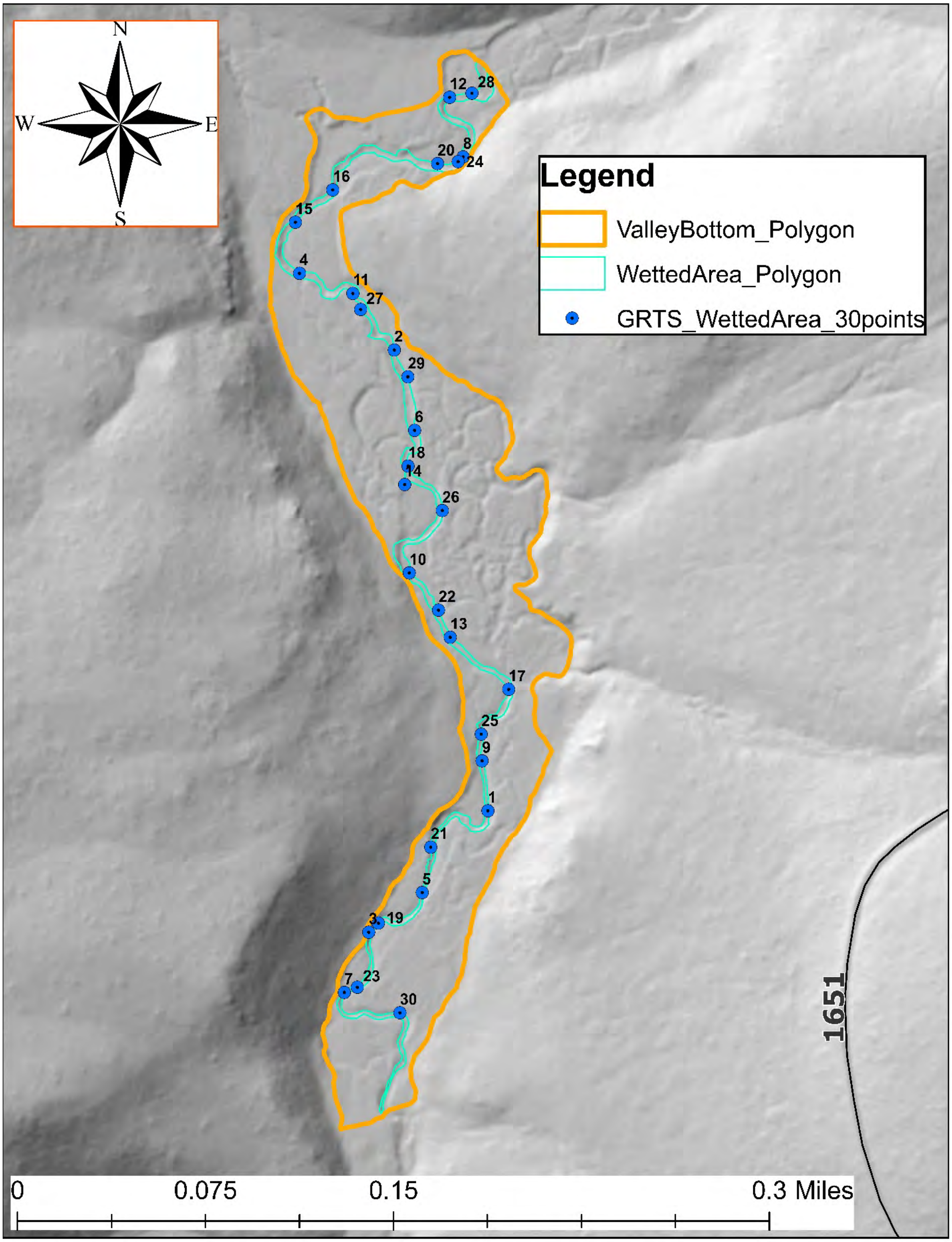
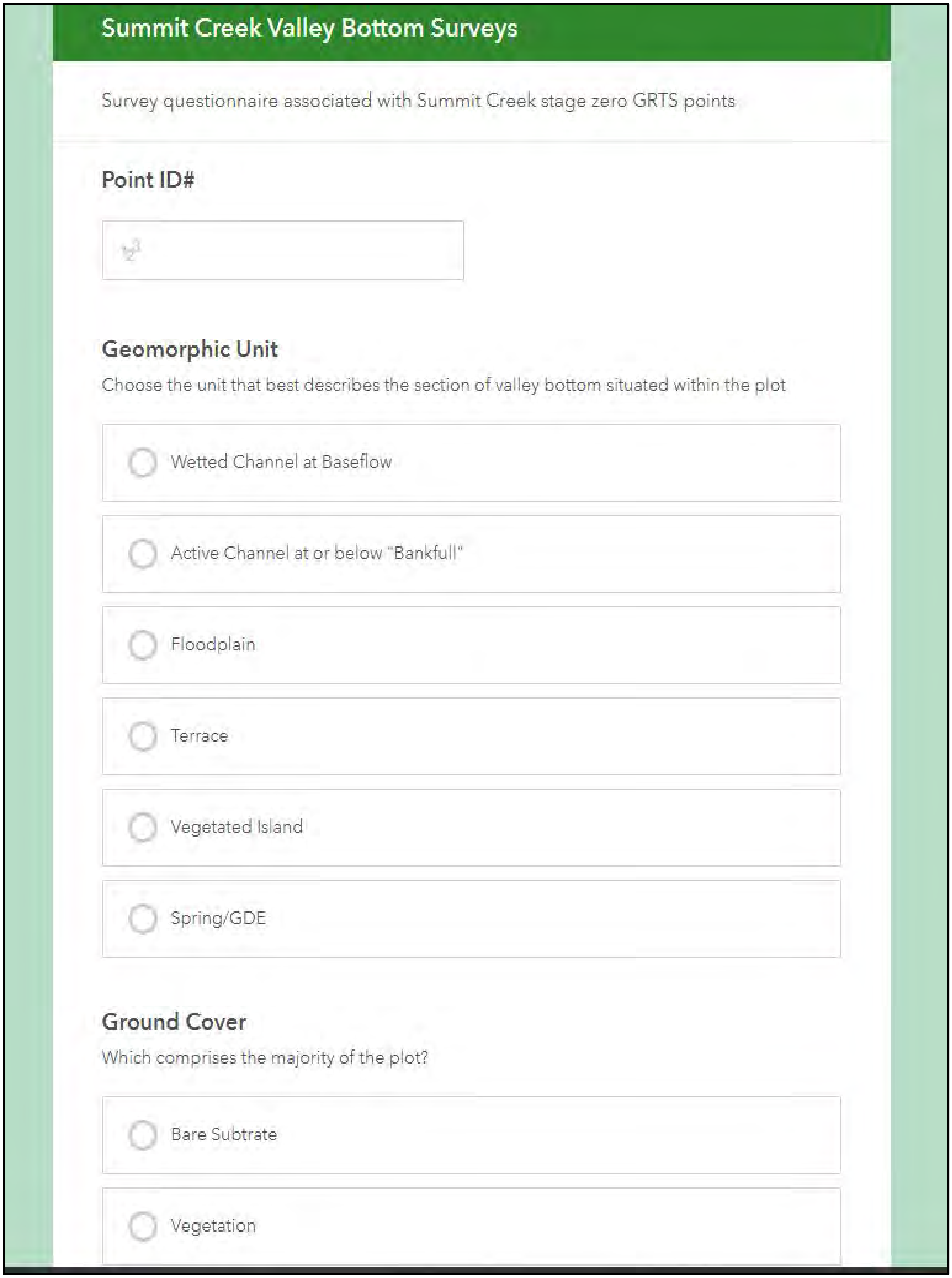


Figure 32. Map of GRTS survey locations within the Summit Creek PA baseflow wetted area polygon. 30 total survey points were collected within this area in September 2021

For GRTS point data collection a Survey123 questionnaire was developed incorporating elements of past floodplain restoration monitoring including geomorphic unit (e.g. floodplain, active channel), habitat type (e.g. pool, riffle), ground cover (e.g. vegetated, bare substrate), and large wood presence questions. Individual questions and survey parameters are outlined in the "Survey Definitions" section below. All data was collected on tablets in the field using the Survey123 app and exported via ArcGIS Online.

A total of 100 survey points were collected within the 12.12-acre valley bottom polygon in August & September of 2021 to provide pre-implementation data in both upland and baseflow wetted areas throughout the PA. An additional 30 survey points were collected specifically within the 0.935-acre wetted area polygon to provide additional data specific to wetted channel conditions within Summit Creek. Each survey point was centered around a $1m^2$ plot on which the questions are based. The Geode GPS unit was again used to ensure sub-meter accuracy and the plots were oriented north to reduce placement bias. For plots that intersected wetted areas on Summit Creek the Model 2000 Flo-Mate was again used to measure stream depth and velocity, while a Solmetric SunEye 210 shade device was used to measure stream shade. Where vegetation was recorded as the dominant ground cover, a botanist was present and informed the dominant species recordings within each plot.

Data collected at the GRTS sites will be used to provide a picture of geomorphic complexity, roughness, and ground cover within the valley bottom before and after restoration. Currently only about 8% of the total project area consists of wetted channel during baseflow conditions. Most of the existing valley bottom is comprised of relic channels, floodplain, and terrace where there is rarely if ever surface connectivity to Summit Creek. We expect to see the ratio of active channel to valley bottom change dramatically post-implementation, with geomorphic unit, ground cover, and roughness variables adjusting accordingly. By returning to survey the GRTS points on an annual basis under baseflow conditions we'll be able to measure dynamism and identify trends amongst geomorphic indicators that will help us to determine project success and make improvements moving forward.


Summit Creek Valley Bottom Surveys

Survey questionnaire associated with Summit Creek stage zero GRTS points

Point ID#

Geomorphic Unit

Choose the unit that best describes the section of valley bottom situated within the plot

- Wetted Channel at Baseflow
- Active Channel at or below "Bankfull"
- Floodplain
- Terrace
- Vegetated Island
- Spring/GDE

Ground Cover

Which comprises the majority of the plot?

- Bare Subtrate
- Vegetation

Figure 33. Example of Survey123 "Valley Bottom" questionnaire

Valley Bottom GRTS Pre-Implementation Results

Overall, the pre-implementation GRTS surveys have confirmed many of our assumptions about Summit Creek and the degree to which it is currently disconnected from its valley bottom. First, we see from GPS tracks taken in July 2022 that under baseflow conditions just around 8% of the total valley bottom consists of "wetted channel" areas, or sections of stream with current flow. This is reflected in the total # of GRTS points (8) that overlapped with the baseflow wetted channel in September when surveys were completed.

Looking closer at the breakdown of geomorphic units we see that the amount of "active channel" units, or areas that we expect to be wetted at or below bankfull conditions, comprises just 27% of the total valley bottom and is dominated by "seasonally active flowpath(s)" (15%) as opposed to "wetted channel at baseflow" units (8%). In fact, most of the valley bottom consists of floodplain (46%), areas where we only see flow above bankfull, and terraces (23%), areas where don't expect to see streamflow at all. Within the floodplain there are signs of "relic channels" or now-disconnected branches of Summit Creek that rarely see surface water due to adjacent stream incision. Similarly, some of the areas currently identified as terrace due to their position well above the present active channel are likely in fact historic floodplain that have become even more disconnected from Summit Creek as the channel has cut deeper into its alluvium.

Not surprisingly, when we look at ground cover within the valley bottom we notice that it is dominated by vegetation (90%), rather than the bare substrate (10%) we'd expect to see within an anastomosing reach with multiple active streambeds. Within the vegetated plots, only 50% of plant species identified as the dominant ground cover were listed as "facultative wetland" or "obligate" (Lorenzana et al., 2017). In other words, the other half of dominant ground cover species within the valley bottom are not associated with, or expected to occur in, wetlands. Additionally, when we look at the Greenline Stability Rating, a measure of erosion control assigned to each plant species, we see that over 55% of vegetated plots had a stability class of 5 or less and the rating for the valley bottom as a whole was just 5.8 out of 10 (see Table 7).

Within the "wetted channel at baseflow" units we see that stream shade for the month of July is very low at just 17.5%. Though more than a third of these in-stream plots were counted as pools, the streambed in the Phase 1 reach is dominated by relatively coarse and fine substrate, lacking the medium-to-small gravel we'd hope to see for Bull Trout spawning habitat (Guzevich et al,. 2017). For more in-depth data about conditions within Summit Creek during baseflow, see the "Wetted Area" GRTS pre-implementation results. This dataset is based on a larger sample size of plots (30) and likely more representative of current channel characteristics.

Valley Bottom Area Type	Acreage	% of Total Valley Bottom	# of GRTS Survey Points
Wetted Channel at Baseflow	0.935	8%	8
Non-wetted Valley Bottom	11.185	92%	92

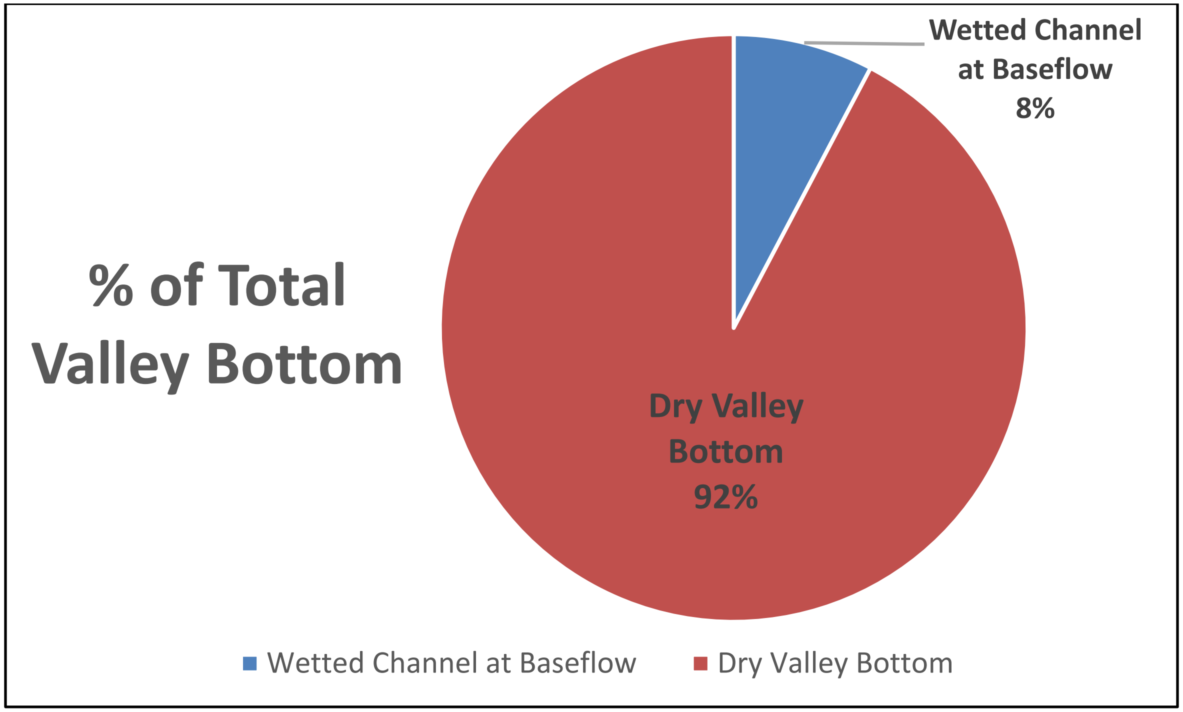


Figure 34. Summary of Valley Bottom area by presence of surface water during baseflow conditions (September 2021)

Geomorphic Unit Type	% of Total Valley Bottom Area	Valley Bottom Acreage
Spring/GDE	**4%**	**0.48**
Terrace	**23%**	**2.79**
Active Channel Units	**27%**	**3.27**
Active Channel at or below Bankfull	19%	2.30
Erosional Bank Feature	*1%*	*0.12*
Depositional Bar	*3%*	*0.36*
Seasonally Active Flow path	*15%*	*1.82*
Wetted Channel at Baseflow	8%	0.97
Floodplain	**46%**	**5.58**
Relic Channel	*5%*	*0.61*
Other floodplain feature	*41%*	*4.97*
Grand Total	**100%**	**12.12**

Table 6. Summary of Valley Bottom area by geomorphic unit type. "Active Channel Units" include both the "active channel at or below bankfull" & "wetted channel at baseflow" points. Valley bottom acreage is determined by the % of each unit within the total area (12.12 acres)

Geomorphic Unit Type	% of Total Valley Bottom	Valley Bottom Acreage (12.12 total)
Spring/GDE	4	0.48
Wetted Channel at Baseflow	8	0.97
Active Channel at or below Bankfull	19	2.30
Terrace	23	2.79
Floodplain	46	5.58

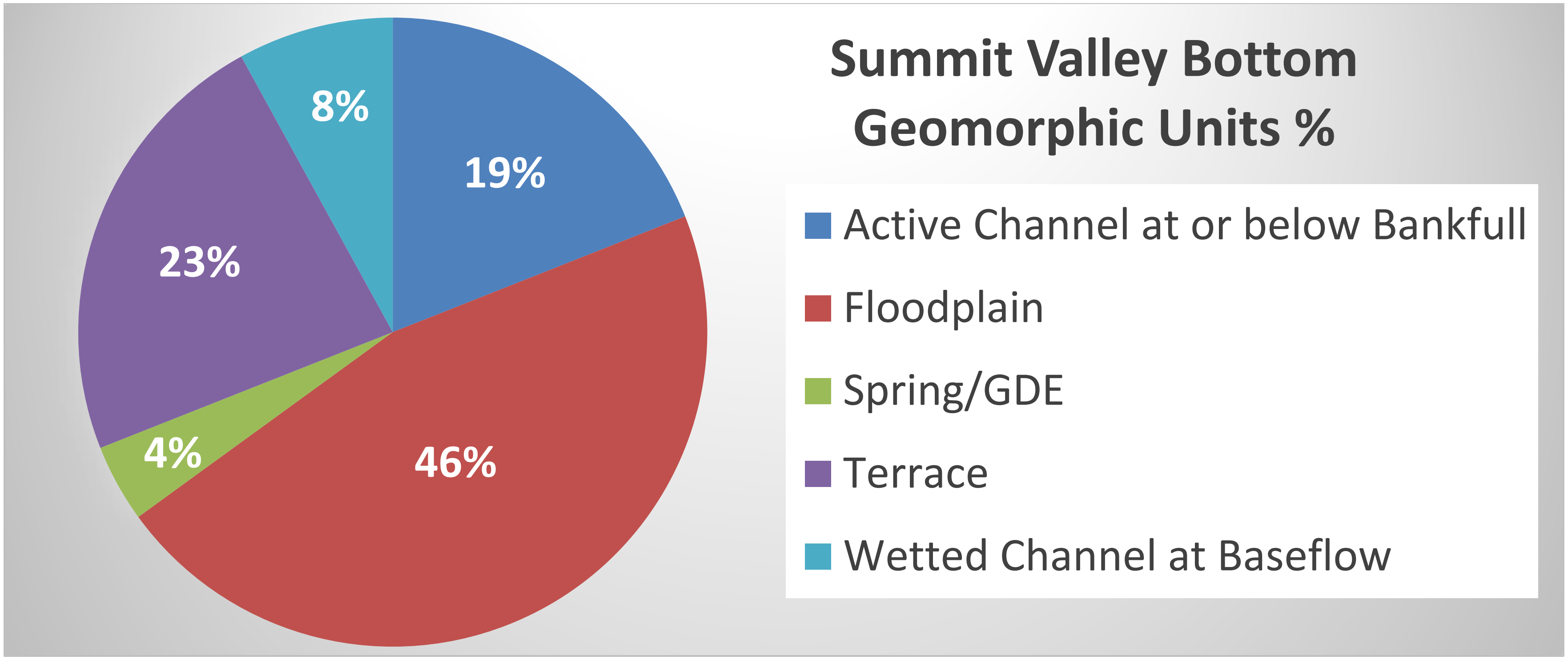


Figure 35. Summary of Valley Bottom area by geomorphic unit type. Note that for this summary the "wetted channel at baseflow" and "active channel at or below bankfull" units are listed separately

Active Channel Type	% of Total Valley Bottom	% of Total Active Channel Units	Valley Bottom Acreage (12.12 total)
Erosional Bank Feature	1%	4%	0.12
Depostional Bar	3%	11%	0.36
Wetted Channel at Baseflow	8%	30%	0.97
Seasonally Active Flowpath	15%	56%	1.82

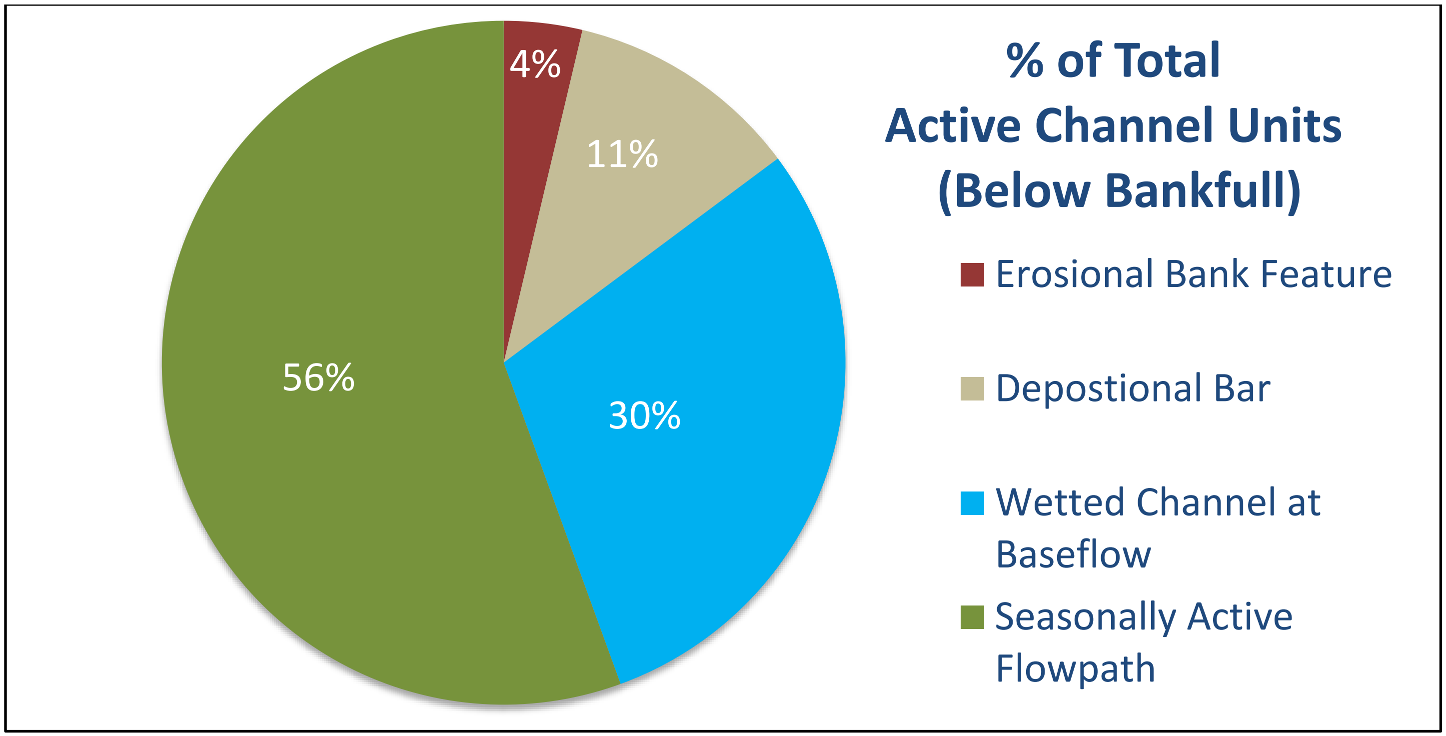


Figure 36. Active Channel unit types by % of total. Note that this includes all points situated below bankfull elevation

Valley Bottom Ground Cover	% of Total	Valley Bottom Acreage (12.12 total)
Bare Substrate	10	1.212
Vegetation	90	10.908

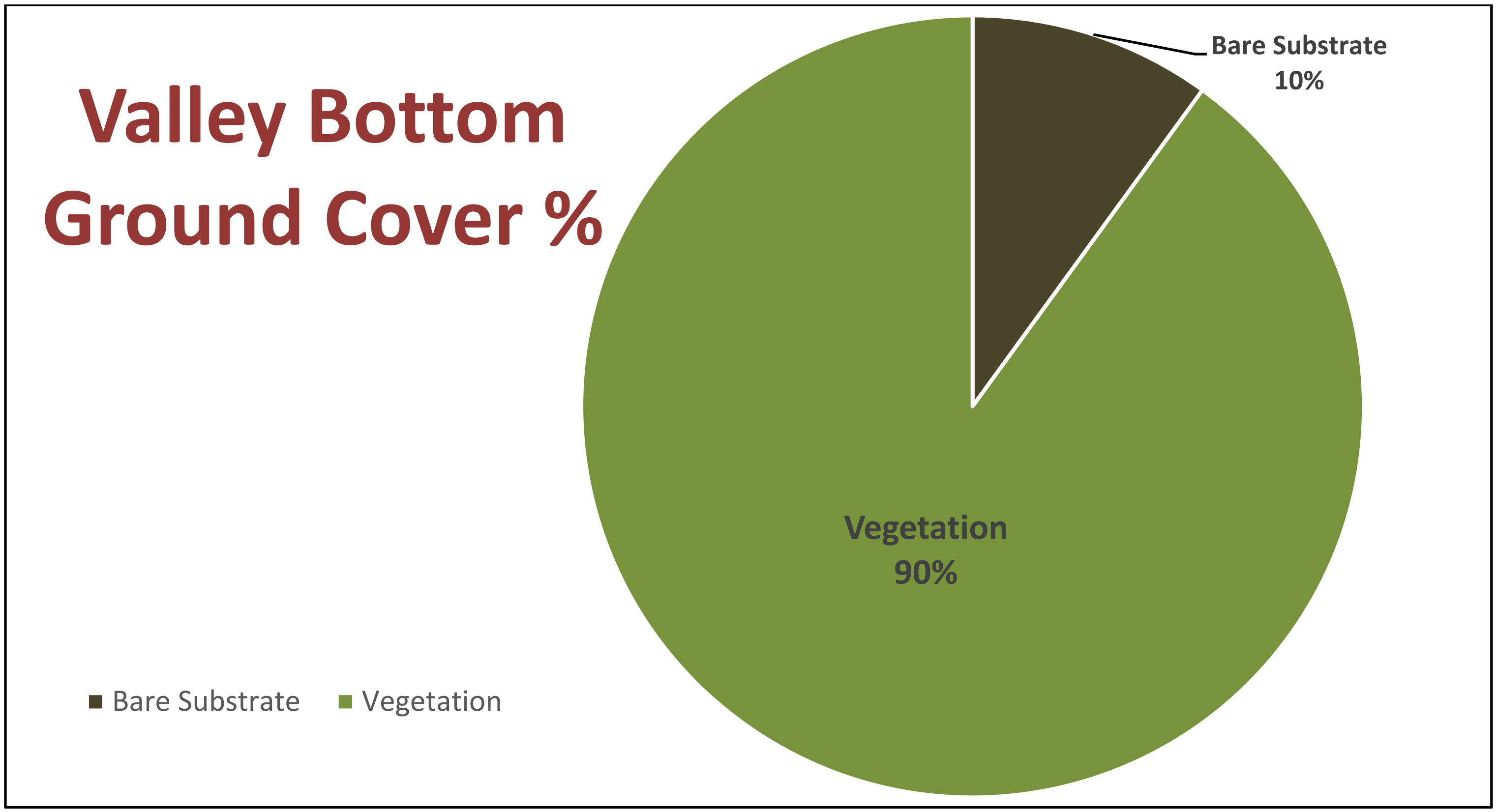


Figure 37. Valley Bottom area by % total ground cover. Note that "bare substrate" includes both sediment within the streambed/active channel area as well as sediment in upland sections of the valley bottom

Wetland Rating	Total # of Plots	% of Total	Valley Bottom Acreage
Facultative (FAC)= Equally likely to occur in wetlands or non-wetlands (34-66%)	25	27.8	3.0
Facultative Upland (FACU)= Not usually (1-33%)	10	11.1	1.2
Facultative Wetland (FACW)= Usually (67-99%)	33	36.7	4.0
Obligate (OBL)= Almost always (99%)	12	13.3	1.5
Upland (UPL)= Almost never (1%)	10	11.1	1.2
Grand Total	**90**	**100.0**	**10.9**

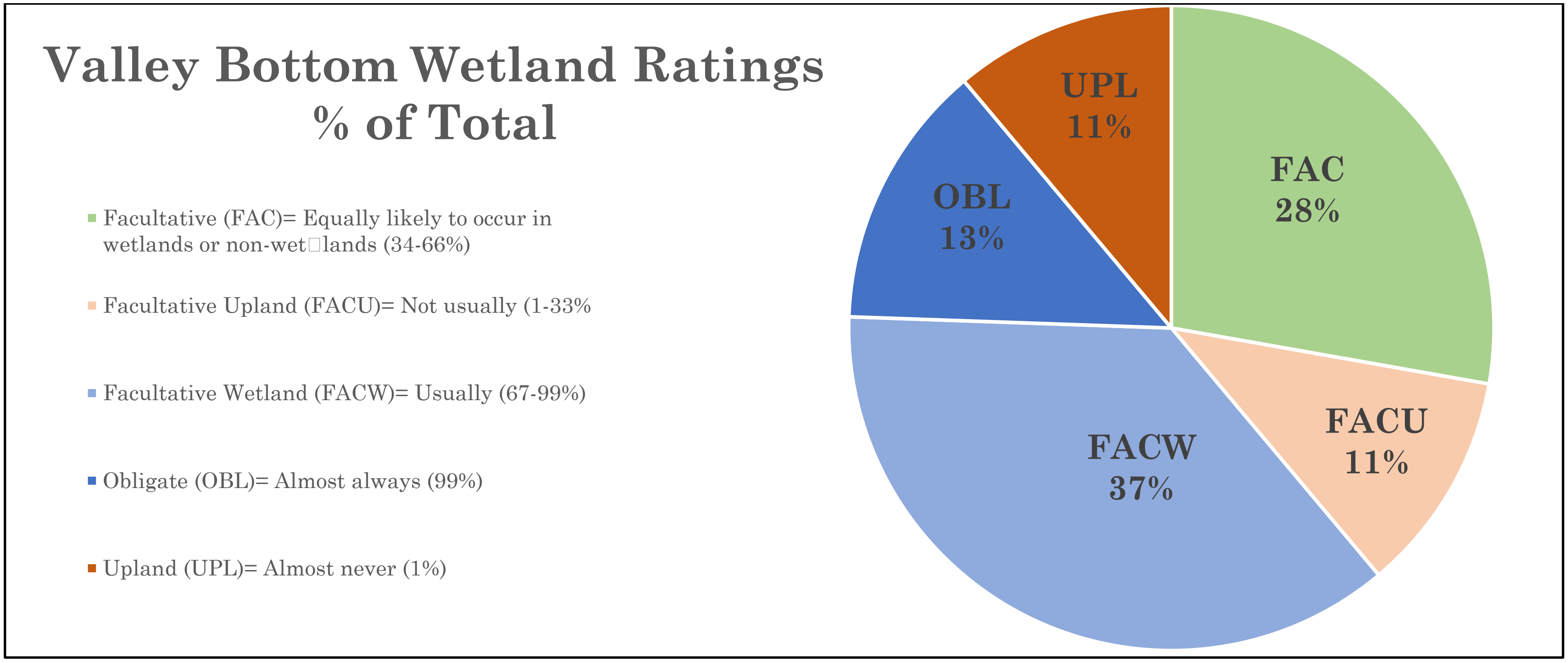


Figure 38. Wetland ratings within plots where primary ground cover was vegetation. Ratings based on dominant plant species identified within 1m-squared plot

Wetland Rating	Wetland Rating Total Plots in Active Channel Units	Wetland Rating % in Active Channel Units
Facultative (FAC)= Equally likely to occur in wetlands or non-wetlands (34-66%)	0	0%
Facultative Upland (FACU)= Not usually (1-33%)	0	0%
Facultative Wetland (FACW)= Usually (67-99%)	12	63%
Obligate (OBL)= Almost always (99%)	7	37%
Upland (UPL)= Almost never (1%)	0	0%

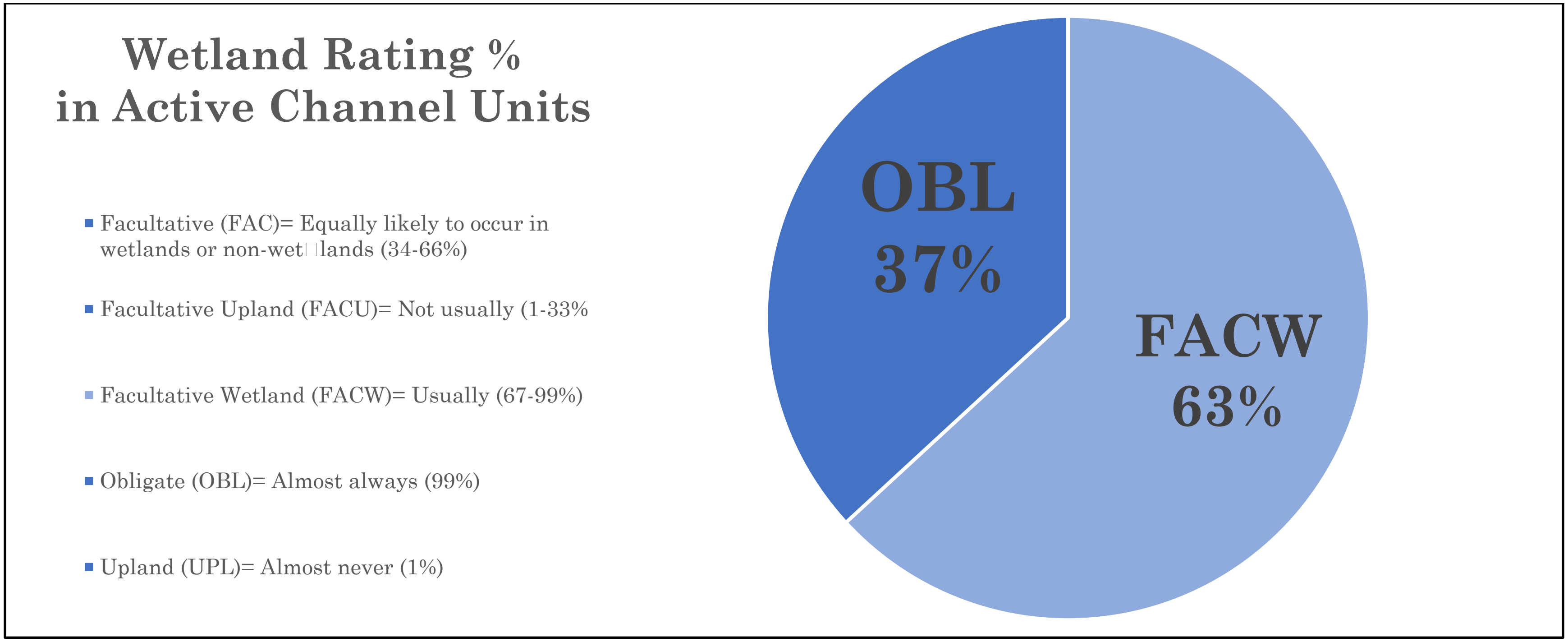


Figure 39. Wetland ratings for plots within active channel units (below bankfull elevation). This does not include "wetted at baseflow" units where ground cover was bare substrate. Ratings are taken from the US Army Corps of Engineers 2018 "National Wetland Plant List"

Greenline stability rating (= channel bank stability rating) The ability of a plant to stabilize streambanks and provide protection against erosion is termed the Greenline Stability Rating (from Winward 2000). This is also synonymous with a stream channel bank stability rating. The type of rooting system, the strength of the roots, and the below-ground coverage of the root system determines the ability of a plant to stabilize streambanks. Each plant species has been assigned a stability class ranking, ranging from 1 (least) to 10 (greatest), rating its ability to buffer the forces of moving water (Lorenzana, et al., 2017)

Greenline Stability Rating	Total # of Plots	% of Total	Total Valley Bottom Acreage
1	0	0.00%	0.00
2	14	15.56%	1.70
3	18	20.00%	2.18
4	16	17.78%	1.94
5	2	2.22%	0.24
6	2	2.22%	0.24
7	0	0.00%	0.00
8	0	0.00%	0.00
9	38	42.22%	4.60
10	0	0.00%	0.00
Grand Total	**90**	**100.00%**	**10.9**

Table 7. Overview of Greenline Stability Ratings within all plots (90 total) where the primary ground cover is vegetation. GSR ratings are taken from the USDA's Region 5 "Plant Guide for Resource Managers" (Lorenzana et al., 2017)

Figure 40. Summary of Greenline Stability Rating by total # of plots within the valley bottom

Greenline Stability Rating (GSR) Average	GSR Average in Active Channel Units
5.7	8.1

"Wetted Channel at Baseflow" Overview								
Total # of Plots	**Total Valley Bottom Acreage Represented**	**Average Stream Shade (%)**	**Mean Depth Avg (ft)**	**Max Depth avg (ft)**	**Mean Velocity avg (ft/sec)**	**Pools Mean Depth avg (ft)**	**Pools Max Depth avg (ft)**	**Pools Mean Velocity avg (ft/s)**
8	0.97	17.5%	0.80	1.04	0.40	1.23	1.53	0.17

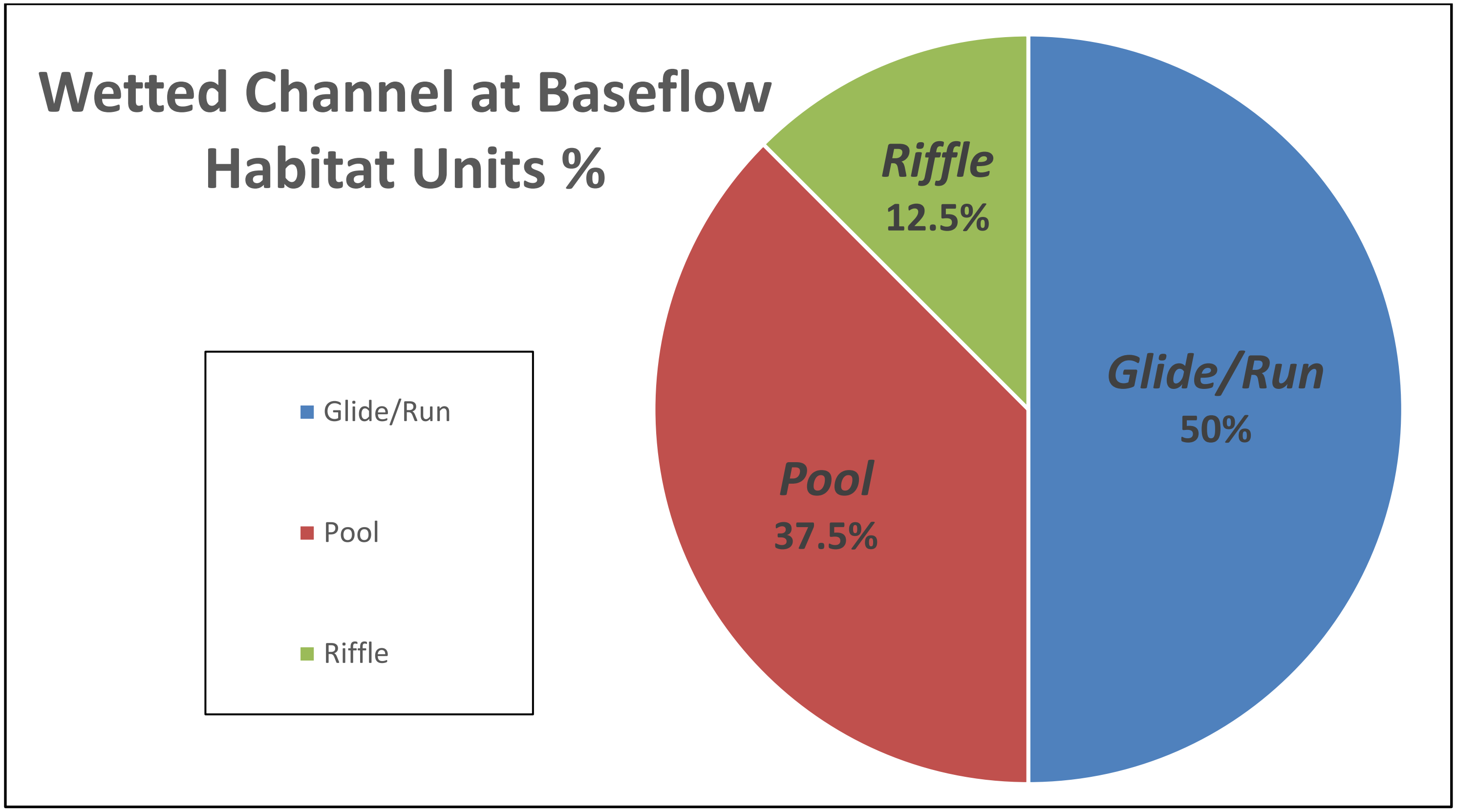
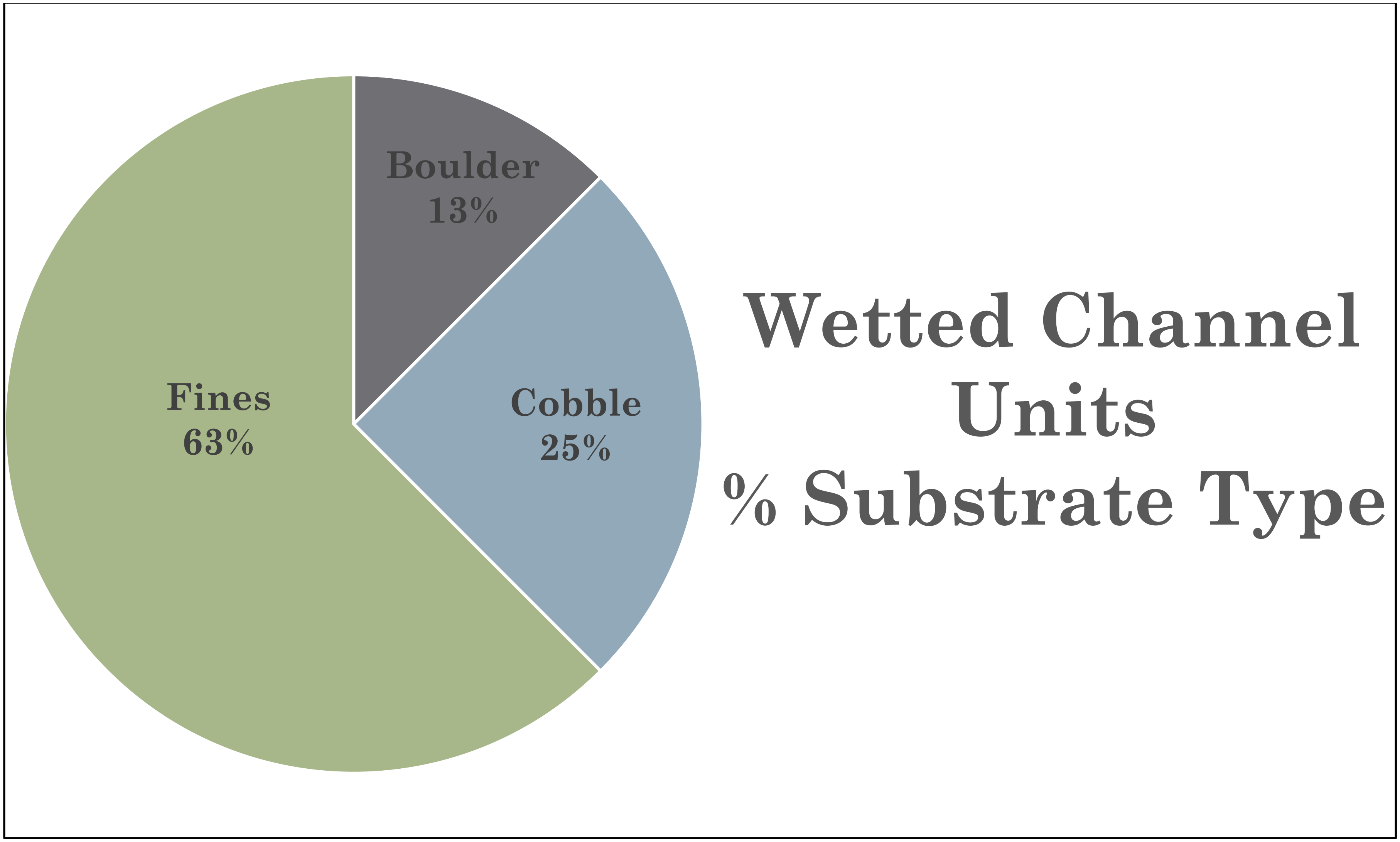


Figure 41. Habitat unit % within "wetted channel at baseflow" plots (8 total)


Boulder
13%
Cobble
25%
Fines
63%
Wetted Channel
Units
% Substrate Type

Wetted Area GRTS Pre-Implementation Results

Total # of Survey Plots	Total Wetted Area Acreage Represented	Stream Shade % Average	Mean Depth Avg (ft)	Max Depth Avg (ft)	Mean Velocity Avg (ft/sec)	Pools Mean Depth Avg (ft)	Pools Max Depth Avg (ft)	Pools Mean Velocity Avg (ft)
30	0.935	15.43%	0.69	0.89	0.585	1.11	1.375	0.22

Whereas the "wetted channel at baseflow" unit data seen in the previous section was taken from 8 plots out of the 100 total GRTS points surveyed within the valley bottom as a whole, the data presented in this section is taken from 30 plots surveyed specifically within a pre-mapped "baseflow wetted area" polygon captured in summer 2021. These extra survey points were taken to supplement the limited in-stream data captured by the "valley bottom" surveys, which had relatively few points fall within the wetted channel due to Summit Creek's current single-thread, incised channel type.

Overall, we see that data from the "valley bottom" and "wetted area" surveys matches up fairly well, with some key differences in habitat unit & substrate composition data. Specifically, we notice the presence of gravel identified in the "Wetted Area" surveys, whereas in the valley bottom surveys we do not. We also see a higher proportion of "Riffle" habitat units within the "Wetted Area" surveys and a slightly lower proportion of "Glide/Run" units. This is likely due to the limited sample size of "wetted channel" units within the valley bottom dataset and we can assume that the "Wetted Area" survey data provides a more accurate picture of in-stream conditions within the Phase 1 treatment area. There may be a need for additional surveying specifically within wetted channel units post-implementation, though we expect the total area of baseflow wetted area to increase dramatically within the valley bottom and thus the GRTS point overlap with these "baseflow wetted" units to change accordingly.

Looking at the pre-implementation data it's clear that the 15% average July stream shade is a key contributor to the high 7DADM water temperatures we see in & adjacent to the treatment reach. Though there are some medium gravels present within the channel these comprise a relatively low percentage of total substrate within the reach (17%) and the stream is lacking in pea gravels (2-8mm) which we would expect to provide suitable habitat for Bull Trout spawning (Guzevich et al,. 2017). In pool tailouts specifically we see fines and coarse substrate (coarse gravel, cobble, boulder) dominate within the reach. Though pools comprise approximately a third of the total baseflow wetted area, the current shade and substrate conditions do not make this reach of Summit Creek a quality candidate for Bull Trout spawning and may limit its potential for rearing habitat as well.

Habitat Unit	# of Plots	% of Total
Glide/Run	12	40
Pool	10	33
Riffle	8	27

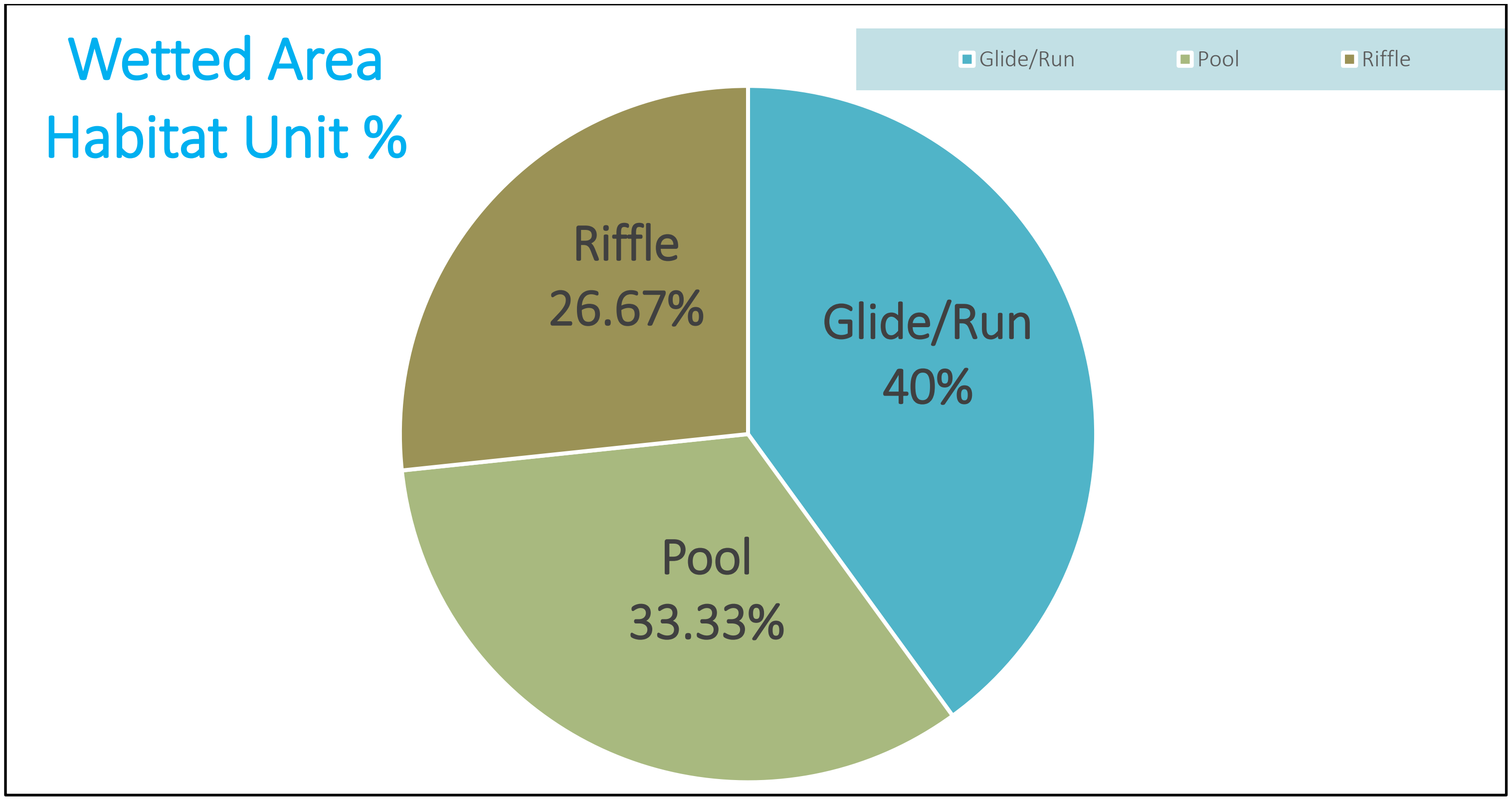


Figure 42. % of total Habitat Unit types within Summit Creek Phase 1 baseflow wetted area (0.935 acres)

Ground Cover Type	# of Plots	% of Total
Bare Substrate	29	97%
Embedded Wood	1	3%
Vegetation	0	0%

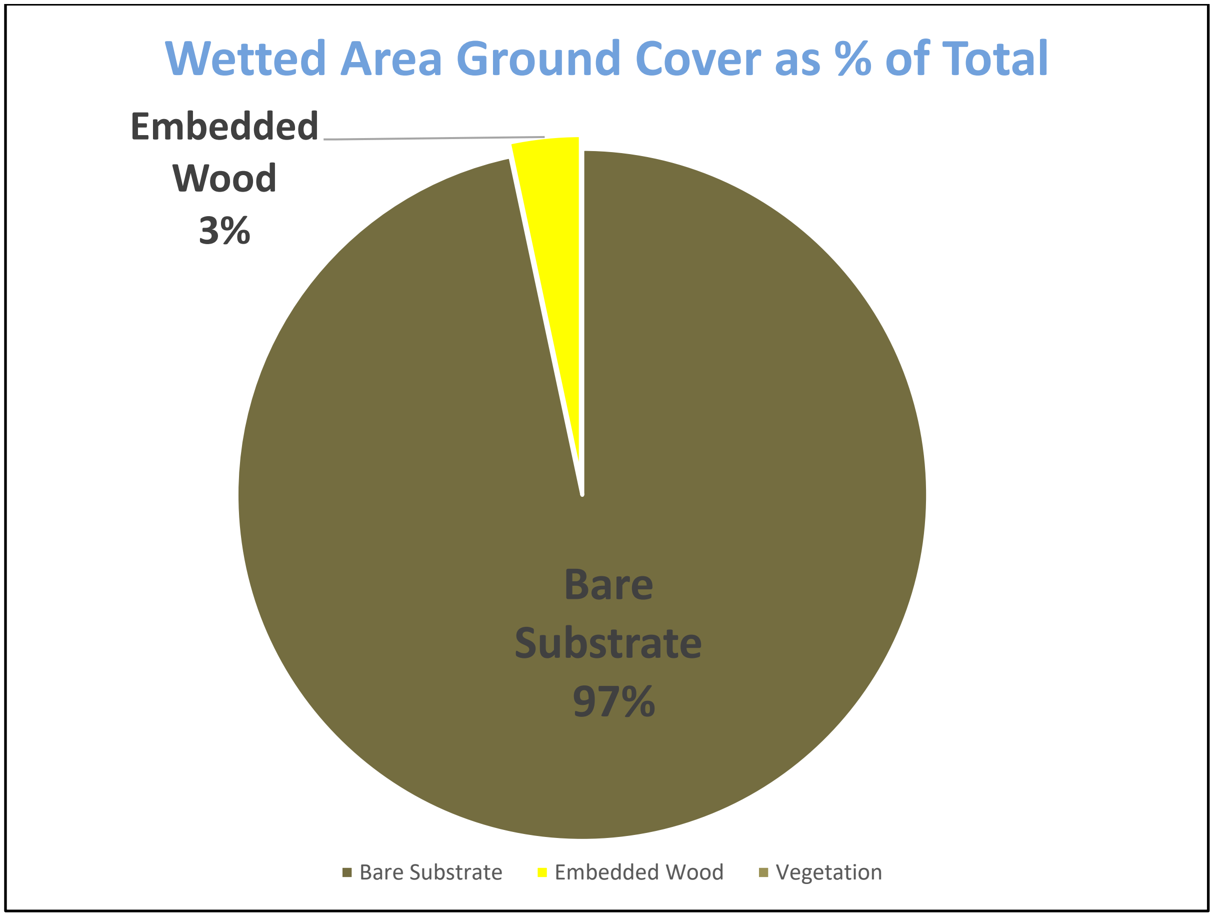


Figure 43. % of total Ground Cover types within Summit Creek Phase 1 baseflow wetted area

Substrate Size Class	Total # of Plots	% of Total
Fines= <2 mm	11	37.93%
Gravel (coarse)= 40 to <64 mm	4	13.79%
Gravel (medium)= 8 to <40 mm	5	17.24%
Cobble= 64 to <256 mm	9	31.03%

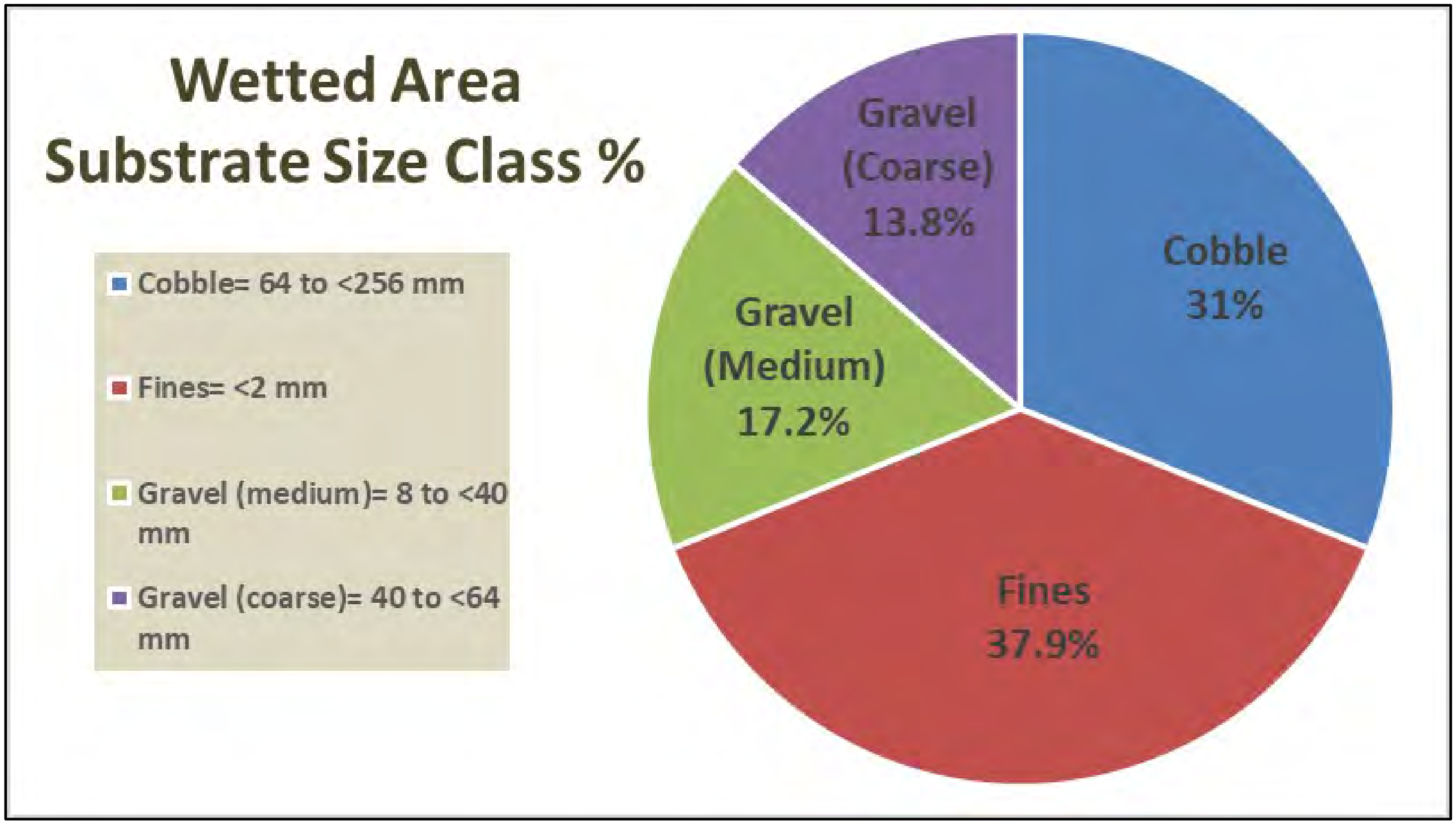


Figure 44. % of different Substrate Size Classes within Summit Creek Phase 1 baseflow wetted area

Pool Tailout Median Particle Size	# of Plots	% of Total
Fines= <2 mm	6	67%
Gravel (coarse)= 40 to <64 mm	1	11%
Boulder= 256 to <4096 mm	1	11%
Cobble= 64 to <256 mm	1	11%

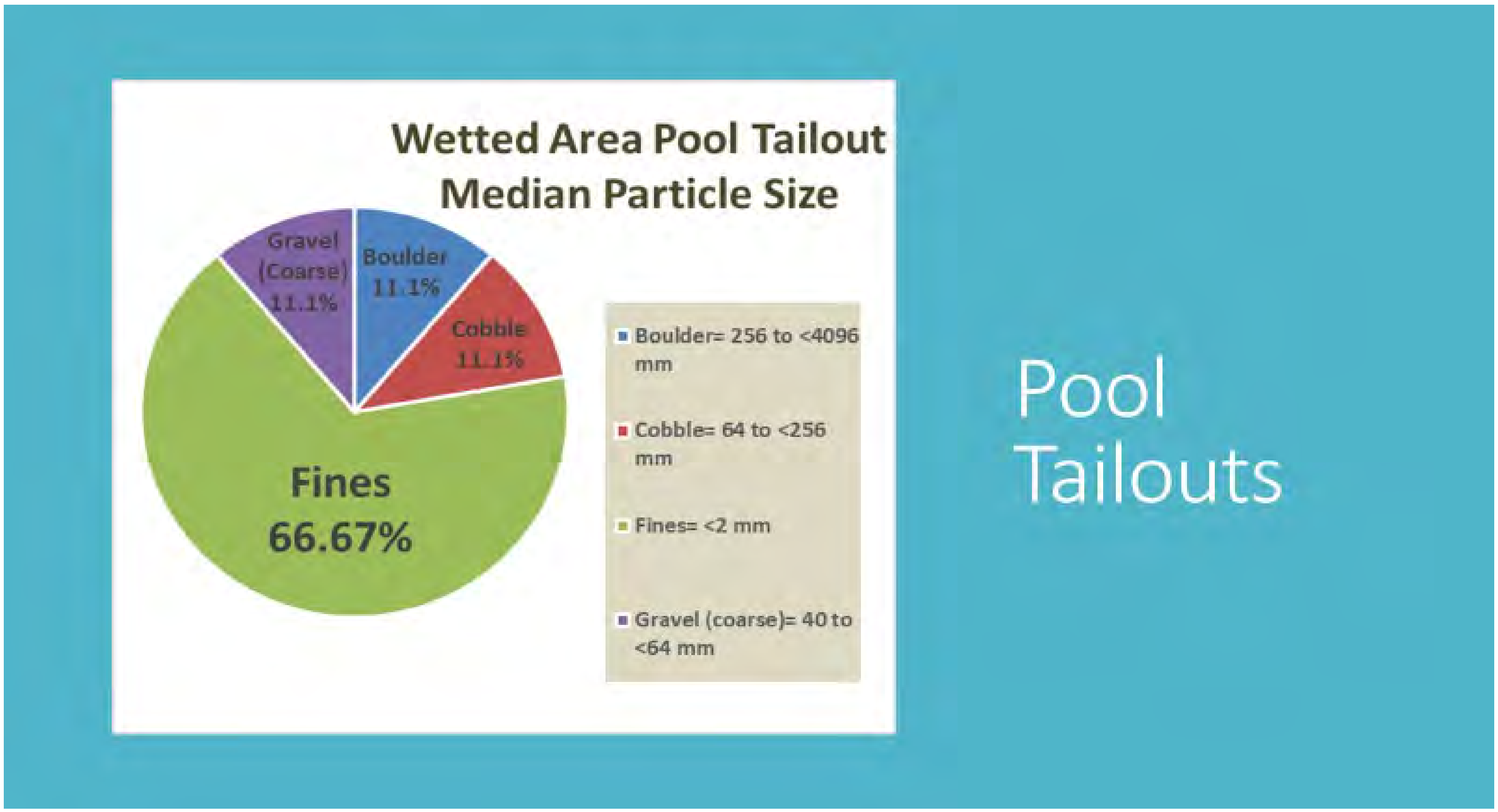


Figure 45. % of different Substrate Size Classes within pool tailouts

GRTS Survey Methods & Definitions:

The following definitions of questions and answer options correspond with the "Summit Creek Valley Bottom Survey" & "Summit Creek Wetted Area Survey" Survey123 questionnaires. Both surveys contain the same question and answer options, with the difference being that the "Wetted Area" survey only contains questions related to the "Wetted Channel at Baseflow" geomorphic unit answer. Questions are defined in the order that they appear on the "Valley Bottom" Survey123 questionnaire.

Point ID#: GRTS point number as labeled on the "Valley Bottom" and "Baseflow Wetted Area" maps; used to identify and navigate to individual plots

Geomorphic Unit: Areas within the *valley bottom* created or influenced by fluvial processes

- *Valley Bottom*: "The area encompassing active channels, floodplains, and terraces, bound laterally by hillslopes above the highest terrace. Does not include terraces that are considered perched on hillslopes (i.e., far above the modern valley bottom and likely inaccessible by modern fluvial erosion)" (Scott et al., 2019)
- *Wetted Channel at Baseflow*: currently wetted area during time of survey
    - in 2021 the "wetted area" polygon was captured in late June
- *Active Channel at or Below Bankfull*: areas in and adjacent to the stream channel that are not wetted at baseflow but are expected to have surface water every 1-2 years.
    - This definition of "bankfull" is based on the idea that "a discharge that recurs every 1-2 years transports the majority of suspended sediment" in many systems and is widely seen as "the most important flow magnitude for controlling channel process and form" (Wohl, 2020)
    - For the purposes of these surveys indicators such as bank slope, point bars, bank undercuts, and vegetation type were used to determine the "bankfull edge" along Summit Creek
        - These indicators are taken from the "Stream Inventory Training" handbook used by USFS personnel in Region 6
    - Seasonally active channels that aren't necessarily connected to the main channel via surface flow but are wetted on a semi-annual basis due to a locally high water table were included in this morphological grouping
- *Floodplain:* "Quasi-planar surfaces lower than adjacent terraces that show evidence of recent fluvial reworking are likely inundated at flows just above bankfull stage" (Scott et al., 2019)
    - Also includes "relic channels", or channels that are only active above bankfull due to adjacent primary channel incision
- *Terrace:* "Quasi-planar surfaces (although they may be hummocky or covered by hummocky deposits) higher in elevation than the contemporary floodplain that show evidence of being shaped by the same river currently occupying the valley bottom (to differentiate from alluvial fans) but are distinctly less active than contemporary floodplains" (Scott et al., 2019)
    - "Terraces should not show evidence of recent flooding (e.g., fluvial deposition by the same river currently occupying the valley bottom), and generally exhibit

distinct vegetation communities compared to contemporary floodplain (i.e., a greater abundance of flood-intolerant species)" (Scott et al., 2019)

- *Vegetated Island:* "Floodplain surfaces that are vegetated and likely surrounded on all sides by recently active (although not necessarily active at low flow) channels" (Scott et al., 2019)
- *Spring/GDE:* Distinct features within the valley bottom where groundwater is expressed at the surface
  - Within this project area there are several fens that have been surveyed separately and have unique identifiers that should be noted in the "comments" section

Habitat Unit: associated with the "wetted channel at baseflow" selection. Habitat unit definitions are taken from the NR9 Stream Inventory Handbook

- *Pool:* a "slow water unit" characterized by little to no surface gradient, a hydraulic control which spans the channel, and a residual pool depth
- *Riffle:* a "fast water unit" characterized by a gradient >0%, surface turbulence, and the presence of emergent substrate
- *Glide/Run:* an in-between unit that doesn't meet the characteristics of either a pool or riffle

Mean Depth: associated with the "wetted channel at baseflow" selection. A minimum of 4 depth measurements are taken within the $1m^2$ plot and averaged.

- Depth measurements are only taken in wetted parts of the plot so that no "0" values are recorded

Citations

Guzevich, J. W., & Thurow, R. F. (2017). Fine-Scale characteristics of Fluvial bull trout REDDS and adjacent sites in Rapid River, IDAHO, 1993–2007. *Northwest Science*, *91*(2), 198–213. https://doi.org/10.3955/046.091.0209

Lorenzana, J., Weixelman, D., & Gross, S. (2017, November). Plant Guide for Resource Managers: Field reference for common plant species in the Pacific Southwest Region. United States Department of Agriculture.

Scott, Daniel, and Brian Collins. "Deer Creek Stage 0 Restoration Geomorphic Complexity Monitoring Report." McKenzie Watershed Council, 2019, www.mckenziewc.org/wp-content/uploads/2020/04/Scott-Collins-2019-Deer-Creek-Stage-0-Restoration-Geomorphic-Complexity-Monitoring-Report.pdf.

Wohl, Ellen. *Rivers in the Landscape*. 2nd ed., Wiley-Blackwell, 2020.

Wohl, E., and Scott, D. N. (2017) **Wood and sediment storage and dynamics in river corridors**. *Earth Surf. Process. Landforms*, 42: 5– 23. doi: 10.1002/esp.3909.

Joint Permit Application

This is a joint application, and must be sent to all agencies (Corps, DSL, and DEQ). Alternative forms of permit applications may be acceptable; contact the Corps and DSL for more information.

Date Stamp

U.S. Army Corps of Engineers Portland District	Oregon Department of State Lands	Oregon Department of Environmental Quality
Action ID Number	Number	

(1) TYPE OF PERMIT(S) IF KNOWN (check all that apply)

Corps: ☐ Individual ☒ Nationwide No.: 27 ☐ Regional General Permit ________ ☐ Other (specify): ______

DSL: ☒ Individual ☐ GP Trans ☐ GP Min Wet ☐ GP Maint Dredge ☐ GP Ocean Energy ☐ No Permit ☐ Waiver

(2) APPLICANT AND LANDOWNER CONTACT INFORMATION

	Applicant	Property Owner (if different)	Authorized Agent (if applicable) ☐ Consultant ☐ Contractor
Name (Required)	Darren Cross		
Business Name	USDA Forest Service, Willamette National Forest, McKenzie River Ranger District		
Mailing Address 1	57600 McKenzie Hwy		
Mailing Address 2			
City, State, Zip	McKenzie Bridge, OR 97413		
Business Phone	(541) 822-3381		
Cell Phone			
Fax	(541) 822-7254		
Email	darren.cross@usda.gov		

(3) PROJECT INFORMATION

A. Provide the project location.

Project Name	Latitude & Longitude*
Deer Creek Floodplain Enhancement Project: Phase 2	Bottom: 44.240216 N, 122.058155 W Top: 44.260544 N, 122.065013 W

Project Address / Location	City (nearest)	County
N/A	McKenzie Bridge, OR	Lane and Linn

Township	Range	Section	Quarter / Quarter	Tax Lot
T15S	R06E	23, 14		1565000000077 (Lane) 55-24 (Linn)

Brief Directions to the Site:
Follow Hwy 126 approx. 70 miles east of Springfield. Turn left onto Deer Creek Road.

B. What types of waterbodies or wetlands are present in your project area? (Check all that apply.)

☑ River / Stream ☐ Non-Tidal Wetland ☐ Lake / Reservoir / Pond

☐ Estuary or Tidal Wetland ☐ Other ☐ Pacific Ocean

Waterbody or Wetland Name**	River Mile	6th Field HUC Name	6th Field HUC (12 digits)
Deer Creek	0 to 1.6	Deer Creek Subwatershed	170900040205

* In decimal format (e.g., 44.9399, -123.0283)
** If there is no official name for the wetland or waterbody, create a unique name (such as “Wetland 1” or “Tributary A”).

C. Indicate the project category. (Check all that apply.)

☐ Commercial Development	☐ Industrial Development	☐ Residential Development
☐ Institutional Development	☐ Agricultural	☐ Recreational
☐ Transportation	☑ Restoration	☐ Bridge
☐ Dredging	☐ Utility lines	☐ Survey or Sampling
☐ In- or Over-Water Structure	☐ Maintenance	☐ Other:

(4) PROJECT DESCRIPTION

A. Summarize the overall project including work in areas both in and outside of waters or wetlands.
The overall restoration project on Deer Creek is a multi-year, large-scale effort to improve river function, habitat conditions, and water quality on 1.6 miles and 49 acres of valley bottom, all on U.S. Forest Service Willamette National Forest lands. This project is a collaborative endeavor that is co-managed by the Willamette National Forest and the McKenzie Watershed Council and supported by many different partners. The overall project proposes to: (1) remove up to 12 acres of levees and other constructed features, (2) redistribute sediment in up to 13 acres of incised channels to raise stream bed elevation, (3) add up to 1,650 pieces of large woody material (LWM), and (4) reactivate a complex network of channels and wetlands that existed prior to Euro-American settlement. The project design follows a Stage 0 approach in order to maximize hydrologic connectivity and ecological benefits (Cluer and Thorne 2013; Powers et. al. 2018; see Attachment for References).

Phase 1 was completed in 2016 on 35 acres (see link to online Deer Creek StoryMap in Attachment). Two reaches totalling 0.6 miles in the middle of the valley were not treated due to the presence of powerlines operated by Eugene Water & Electric Board (EWEB), the municipal water provider and power utility company for the Eugene-Springfield area. Knowing these powerlines were slated for relocation at a later date, the plan was to treat these sections when that time came.

Phase 2 will be implemented on 49 acres of the Deer Creek valley. EWEB will be relocating the powerlines to the west side of the valley in 2020 as part of their relicensing agreement with FERC for the Carmen-Smith Hydroelectric Project. This presents a timely opportunity to leverage resources (LWM) available through the powerline relocation project and to supplement Phase 1 work based on lessons learned from four subsequent Stage 0 projects on the Willamette National Forest. Through the implementation and monitoring of these projects, project managers have gained valuable experience and knowledge of the elements and specifications for a successful Stage 0 project. One of the primary lessons learned through these projects is the value of high densities of LWM. The high LWM density is intended to provide a sufficient amount of roughness to discourage the concentration of flow back into a single-thread channel and to maintain low stream energy to facilitate sediment deposition. The high LWM densities in part serve as temporary measures while islands form and vegetation recovers and eventually provides the roughness needed to maintain a complex braided system over time. During Phase 1 on Deer Creek, LWM was placed at approximately 14 pieces/acre. Although aerial imagery analysis has shown that placed LWM has been retained within the system, subsequent field observations reveal large open areas lacking LWM, concentration of flow into fewer channels, and coarsening of substrates due to higher stream energy – all indications of the need for more LWM. Therefore, Phase 2 will also add LWM to areas treated in Phase 1.

Phase 2 activities will include:
- Dewatering fill zones and salvaging fish and other organisms
- Clearing vegetation off cut zones and staging trees for later placement
- Removing up to 8.58 acres of levees and other constructed features and redistributing that sediment into approximately 10.07 acres of incised channels to raise stream bed elevation to maximize hydrologic connectivity within the valley

- Placing up to 1,200 pieces of LWM throughout the Phase 2 project area
- Rehabilitating, replanting, and seeding disturbed areas
- Treating noxious weeds prior to and following implementation

This project will provide a net increase in aquatic resource function and ecological services, thereby restoring lower Deer Creek to an ecological reference condition expected for an unconfined, low gradient alluvial valley in the West Cascades.

Due to budget constraints, the work in Phase 2 may need to occur over the course of 1-3 years. Work will begin in July 2020 and will be completed by August 2022.

See Attachment for all figures and maps pertaining to the project.

B. Describe work within waters and wetlands.

Phase 2 activities within waters will include:
- Dewatering fill zones (i.e. incised channels) and salvaging fish and other organisms
- Redistributing sediment from up to 8.58 acres of levees and other constructed features into approximately 10.07 acres of incised channels to raise stream bed elevation to maximize hydrologic connectivity within the valley
- Placing up to 1,200 pieces of LWM throughout the Phase 2 project area

This restoration activity follows conditions outlined in ACOE Nationwide Permit #27 "Aquatic Habitat Restoration, Establishment, and Enhancement Activities. Specifically the restoration activities will include: the placement of in-stream habitat structures; modifications of the stream bed and/or banks to enhance, rehabilitate, or re-establish stream meanders; and removal of small water control structures, dikes, and berms.

We will eliminate all constructed barriers to lateral flow (i.e. fills, berms, levees) from within the project area - up to 40,000 cubic yards of alluvium. Because our target elevation for the new streambed is below the Ordinary High Water Mark (OHWM), up to 10,000 cubic yards of material will be removed from floodplain sediments that occur below the OHWM; the remaining material (up to 30,000 cubic yards) to be removed is above the OHWM. All material, which is naturally occurring native alluvium, from these features will be redistributed to confined and incised channels below the OHWM. The resulting modification to bed depth elevations will promote lateral connectivity with existing side channels and floodplain areas, thereby promoting natural hydrologic processes expected in a low gradient depositional reach.

Naturally occurring LWM is severely limited within the project area due to timber harvest and stream cleaning. The frequency and abundance of LWM accumulations (log jams) throughout the valley directly influence the natural maintenance of hydrologic processes and function through time. It is therefore essential to the success of the restoration action that LWM is placed throughout the project area. Up to 1,200 pieces of LWM (most with rootwads attached) will be distributed throughout the project area at a density of approximately 28 pieces per acre. Approximately 1/3 of those pieces have a DBH greater than 24" and will serve as key pieces. Approximately 1/3 of the total pieces will be partially buried for added stability. The mixture of complex LWM will support natural accumulations of debris throughout the Phase 2 project area. All LWM is native and will be sourced from within the Headwaters McKenzie River Watershed, outside of riparian areas, in close proximity to the project area. The total volume of added LWM (up to 25,516 cubic yards) is considered to be below the OHWM.

Prior to introducing any fill material below the OHWM, fish and other organisms will be collected and removed from the project area and water will be diverted away from fill sites. Machinery will be used to redistribute bedload materials into dewatered channels to target elevations determined with the Geomorphic Grade Line/Relative Elevation Model technique developed by Powers et. al. (2018; see Attachment for References). Once cut and fill zones are at target elevations, LWM will be distributed both above and below the OHWM to encourage energy dissipation, hydraulic complexity, and lateral flow and to provide cover and substrates for aquatic organisms.

The Oregon Department of Fish and Wildlife South Willamette Zone District Fish Biologist, Jeff Ziller, and staff are active partners in flow diversion and fish salvage planning and implementation. The fish salvage element (capture and haul) is covered under ARBOII. The timing of this restoration activity will be in accordance with ODFW's designated in-stream work window for the McKenzie River and its tributaries (July 1st to August 15th), or with approved exemptions.

Best Management Practices (BMP) to minimize in-stream turbidity under the Nationwide 401 Water Quality Certification and Oregon Administrative Rules Chapter 340 Division 41 will be utilized where applicable. Handheld turbidity measuring devices will be used both 100' upstream and downstream from disturbed sites. All in-stream activities will be halted if turbidity exceeds 10% of baseline.

The restoration site is considered perennial stream with a gradient of about 1.8% and wetland indicators were not identified within the project area. No wetlands will be cut or filled as a result of this restoration activity.

C. Construction Methods. Describe how the removal and/or fill activities will be accomplished to minimize impacts to waters and wetlands.

The following describes the methods and equipment used to complete the project activities within perennial waters:

1. Sediment Removal: Sediment removal areas (i.e. "Cut Zones") will initially be cleared of vegetation by excavators and/or other large equipment. All trees will be pushed over with rootwad intact and staged for later placement. Shrubs, small trees and other slash material will also be staged and incorporated into constructed log jams. After vegetation is removed, heavy equipment (large excavators and dozers) will begin excavation of the designated cut zones to the target elevation. Target elevation, based on the GGL/REM methodology, will be marked throughout the project area with spray paint. Excavated sediment will either be loaded into off-road dump trucks and hauled to sediment redistribution (fill) sites or will be pushed with a dozer directly into sediment redistribution (fill) sites. Up to 10,000 cubic yards of material will be removed from naturally occurring floodplain sediments that occur below the OHWM. An additional (up to) 30,000 cubic yards of material will be removed from floodplain sediments that occur above the OHWM. Excavated sediment from on-site Cut Zones will be hauled to (or pushed) and staged adjacent to incised channels prior to dewatering. This sequencing will minimize the amount of time that equipment will be required to work within wet conditions and help reduce the project's water quality impact.

2. Dewatering Fill Zones: Prior to introducing any fill material into active channels, all active channels will first be "salvaged", meaning a crew of biologists will pass through the fill reach with backpack electrofishers, handheld nets, and seines to collect as many aquatic organisms as possible and relocate them outside of the project area. Once each fill reach is salvaged, contractors will divert water away from fill reach into an existing side channel. Dewatering and aquatic organism salvage actions will be completed following guidelines outlined in the Aquatic Restoration Biological Opinion (ARBO II) to minimize impacts to listed fish and other organisms and will be accomplished in coordination with ODFW.

3. Sediment Redistribution into Incised Channels (Partial Fill): Once dewatering and aquatic organism salvage has been completed, the stockpiled sediment will be placed within incised sections of Deer Creek using heavy equipment (excavators and dozers). Incised channels will be aggraded to pre-determined levels that are designed to have perennially flowing water following implementation, hence the use of "partial" fill. Some sediment will be used to bury and create islands around placed logjams to facilitate stability of logjams and island development. Up to 40,000 cubic yards of alluvium will be used to partially fill waters within the project area.

4. Wood Placement: Up to 25,516 cubic yards of large woody material (LWM) will be placed below the OHWM throughout the project area. LWM will be sourced from a combination of upland sources outside of the project area and from sediment removal areas within the project area. LWM will range from approximately 12-36 inches in diameter and 40-100 feet long. Many of the pieces will have rootwad attached for ecological reasons and most of the pieces will have broken or roughed-up ends (instead of bucked) for visual reasons. LWM will be transported from the upland units to staging sites in the project area that are

outside of waters. Logjam structures will vary in size from about 5-10 pieces and follow general principals presented in Attachment, Figures 7 and 8. Up to 1,200 pieces of LWM will be placed with excavators during the process of sediment removal and partial channel fill. Logjam structures will be scattered throughout the valley bottom. In partial fill channels, logjam structures will be incorporated into fill material and follow general principals learned during implementation of Deer Creek Phase 1 and South Fork McKenzie River Phase 1 and 2. Slash material from sediment removal areas will be incorporated into as many logjams as available materials allow. While some trees will be partially buried in channels that will be aggraded with berm material, no anchoring with cable or hardware will be used or needed, given that stream energy will be distributed throughout several channels across the valley bottom and stream power per unit width will be greatly reduced upon completion of the project.

All machinery will be outfitted with spill kits and operating with ecofriendly fluids (e.g. vegetable oil based).

All disturbed areas above the OHWM will be replanted and/or seeded with native vegetation within one year, and non-native weed control techniques will be implemented.

In addition to the aforementioned strategies we will employ to minimize impacts to waters and biota, we will also follow design criteria developed by the USFS Interdisciplinary Team of specialists and design criteria found in the Aquatic Restoration Biological Opinion (ARBO II) that we are working under for ESA consultation. Best Management Practices, including those outlined under the Nationwide 401 Water Quality Certification and Oregon Administrative Rules Chapter 340 Division 41, will be utilized at all times (i.e. placement of sediment barriers, provisions of flow bypass, and other applicable measures are included in project design as necessary to control off-site movement of sediment).

Wetland areas were surveyed for both within and adjacent to the project area by US Forest Service specialists during the required National Environmental Policy Act (NEPA) project review. No wetland areas were found within the Deer Creek project area.

See Attachment for all figures and maps pertaining to the project.

(4) PROJECT DESCRIPTION (continued)

D. Describe source of fill material and disposal locations if known.

No cut or fill material is being brought into or removed from the project area. All material used to partially fill incised segments of the channel are naturally occurring bedload materials (cobbles, gravels, sands, and silt). These materials are sourced from the adjacent previously constructed berms.

E. Construction timeline.

What is the estimated project start date? July 1, 2020

What is the estimated project completion date? August 15, 2022

Is any of the work underway or already complete? ☐ **Yes** ☑ **No**

If yes, please describe.

No work in Phase 2 is underway. Phase 1 was implemented in 2016.

F. Removal Volumes and Dimensions (if more than 7 impact sites, include a summary table as an attachment)

	Removal Dimensions		**Material***

Wetland / Waterbody Name *	Length (ft.)	Width (ft.)	Depth (ft.)	Area (sq.ft. or ac.)	Volume (c.y.)	Time Removal is to remain**	
Deer Creek	4,478 ft.		2.89 ft.	373,745 sq.ft.	40,000 c.y.	Perm.	Alluvium

G. Total Removal Volumes and Dimensions

Total Removal to Wetlands and Other Waters	Length (ft.)	Area (sq. ft or ac.)	Volume (c.y.)
Total Removal to Wetlands			
Total Removal Below Ordinary High Water	4,478 ft.	373,745 sq. ft. (8.58 ac.)	10,000 c.y.
Total Removal Below Highest Measured Tide			
Total Removal Below High Tide Line			
Total Removal Below Mean High Water Tidal Elevation			

H. Fill Volumes and Dimensions (if more than 7 impact sites, include a summary table as an attachment)

Wetland / Waterbody Name*	Fill Dimensions					Time Fill is to remain**	Material***
	Length (ft.)	Width (ft.)	Depth (ft.)	Area (sq. ft. or ac.)	Volume (c.y.)		
Deer Creek	5,915 ft.		2.46 ft.	438,649 sq. ft.	40,000 c.y.	Perm.	Alluvium
Deer Creek	8,448 ft.			150,010 sq. ft.	25,516 c.y.	Perm.	Wood (LWM)

(4) PROJECT DESCRIPTION (CONTINUED)

I. Total Fill Volumes and Dimensions

Total Fill to Wetlands and Other Waters	Length (ft.)	Area (sq. ft or ac.)	Volume (c.y.)
Total Fill to Wetlands			
Total Fill Below Ordinary High Water	8,448 ft.	588,659 sq. ft. (13.51 ac.)	65,516 c.y.
Total Fill Below Highest Measured Tide			
Total Fill Below High Tide Line			
Total Fill Below Mean High Water Tidal Elevation			

*If there is no official name for the wetland or waterbody, create a unique name (such as “Wetland 1” or “Tributary A”).
**Indicate whether the proposed area of removal or fill is permanent or, if you are proposing temporary impacts, specify the days, months or years the fill or removal is to remain.
*** Example: soil, gravel, wood, concrete, pilings, rock etc.

(5) PROJECT PURPOSE AND NEED

Provide a statement of the purpose and need for the overall project.

The purpose of the project is to:

1. Restore the natural physical, chemical, and biological processes that maintain a healthy, diverse, and resilient ecosystem;
2. Restore a hydrologically connected, well-functioning, complex channel network and floodplain;
3. Increase habitat availability, diversity, and quality for ESA-Threatened spring Chinook salmon and bull trout and other native species, including cutthroat trout, rainbow trout, harlequin duck, and beaver.

There is a need to restore the unconfined valley of lower Deer Creek because: (1) existing conditions are severely degraded, (2) the project area presents unique potential to restore high value floodplain habitat, (3) and we are guided to restore aquatic and riparian habitat based on the Forest Plan, Northwest Forest Plan, Endangered Species Act Recovery Plans, and other important guiding documents.The desired future outcome for Deer Creek is a return to a dynamic depositional valley with diverse aquatic, wetland, and riparian habitats across the entire valley bottom. Restored natural processes will create and maintain these habitats over time, benefitting numerous native species, and enhance aquatic ecosystem resiliency in the face of uncertainty due to climate change.

(6) DESCRIPTION OF RESOURCES IN PROJECT AREA

A. Describe the existing physical, chemical, and biological characteristics of each wetland or waterbody. Reference the wetland and waters delineation report if one is available. Include the list of items provided in the instructions.

The Deer Creek 6th field HUC is comprised of predominantly Western Cascades geology within the Cascades Range. The landforms in this area are a product of alpine glaciation and subsequent valley filling processes such as glacial outwash and moraine deposits. The deeply dissected landscape and steep side slope tributaries in this landform have historically carried heavy bedloads to Deer Creek that were then delivered to the upper McKenzie River.

The lower ~1.5 miles of Deer Creek lies within a broad unconfined valley with a stream gradient of 1.8%. Deer Creek has perennial flow with average annual flows ranging from about 10cfs to 2000cfs. Stream surveys over the past three decades reveal the persistence of a single-thread incised channel and hydrologic disconnection from the valley bottom with a D50 more indicative of a transport reach (>75mm). Riparian vegetation is dominated by alder and willow.

The unconfined and once gravel-rich lower reach of Deer Creek was once important to ESA-Threatened spring Chinook salmon spawning and rearing, but before Phase 1 was completed there had been no redds documented since 1993. One year after Phase 1 in 2017, three Chinook redds were confirmed and two more were documented in 2019. ESA-Threatened bull trout sub-adults and adults also use Deer Creek for foraging, as it was once a very productive stream for rainbow and cutthroat trout and Chinook salmon, all important prey sources for bull trout. Deer Creek is designated Critical Habitat for both listed species.

Other native fish species found in the project area include rainbow trout, cutthroat trout, and various sculpin species. Pacific giant salamander, tailed frog, and beaver are also common. No known non-native species are found in Deer Creek.

The McKenzie River where Deer Creek empties into is a national Wild and Scenic River and a State Scenic Waterway (classified as "Recreation"), whose boundaries extend a quarter mile up into Deer Creek. In 2016 a Wild and Scenic River Section 7 Determination was signed by the USFS Regional Forester and a State Scenic Waterway approval letter was issued by Oregon Parks and Recreation. Conditions for the project include:

1. All LWM that are in view from the mainstem McKenzie River shall have exposed ends roughened or broken so that no sawn ends are visible.
2. Existing native vegetation shall be retained and maintained to the maximum extent possible. Where native vegetation must be removed to complete the project, such as for access or staging, those areas

shall be re-planted with appropriate native riparian vegetation or natural re-growth of appropriate native vegetation that screens the disturbed areas from view must take place within 5 years.

3. Erosion control measures shall be used to ensure no soil is left exposed after the project is completed.

4. Debris, silt, chemicals, or other materials shall not be discharged into or allowed to reach the waters within the McKenzie River Scenic Waterway.

Approximately 2.5 acres of the Deer Creek project area lie within the FEMA Flood Hazard Zone Type "A" (areas with a 1% annual chance of flooding; because detailed analyses are not performed for "A" areas, no depths or base flood elevations are shown within these zones; see Attachment, Figure 9).

B. Describe the existing navigation, fishing and recreational use of the waterbody or wetland.

Deer Creek is a relatively remote montane stream approximately 70 miles east of Springfield, OR. No boat ramps or boatable segments occur within or upstream of the project area. Deer Creek is not a listed navigable river. Seasonal recreational bank angling has been observed. This restoration activity will support improved angling opportunities in the future.

The McKenzie River National Recreation Trail currently crosses Deer Creek within the project area and the trail bridge is nearing the end of its lifespan. The Willamette National Forest is currently undergoing NEPA to reroute the trail outside of the Deer Creek floodplain to accommodate full ecological restoration of the site. Before any restoration work is done around the existing footbridge an approved trail location will be developed to maintain recreational access in accordance with Wild and Scenice River and State Scenic Waterway policies.

(7) PROJECT SPECIFIC CRITERIA AND ALTERNATIVES ANALYSIS

Describe project-specific criteria necessary to achieve the project purpose. Describe alternative sites and project designs that were considered to avoid or minimize impacts to the waterbody or wetland.*[*]

Project-specific criteria necessary to achieve the project purpose include:

1. Removing artificial levees, fill, and riprap.
2. Raising the stream bed elevation of currently incised channels (aggrading) in order to reconnect water to the former floodplain.
3. Placing up to 1,200 pieces of large woody material throughout 49 acres of floodplain and multiple channels.

The proposed project will have some short-term impacts to existing waterways, but the project is predicted to result in at least a 100% increase in wetted area in the long-term. Following implementation of Phase 1, there was a 143% increase in wetted area.

The following alternatives were considered to avoid or minimize impacts to waterways:

1. Reduce the size of the project area - This alternative would reduce the extent of short-term impacts to waters, but it would also reduce the extent of long-term benefit.
2. Avoid placing sediment into (aggrading) existing waterways - Previous restoration projects in Deer Creek in the 1990s did not remove levees and did not aggrade the incised channel. Only LWM was added and those projects didn't result in any measureable ecological benefits. Without removing levees and aggrading the incised channels, they would never aggrade on their own and floodplain connectivity would never be restored. In order for the aggradation design concept to work, the project must aggrade

[*] Not required by the Corps for a complete application, but is necessary for individual permits before a permit decision can be rendered.

waterways at a consistent slope throughout the project area to prevent headcutting and maintain floodplain connectivity.

An alternative project area was not considered due to the unique potential to restore high value floodplain habitat within an unconfined alluvial valley and without many site constraints/limitations in Deer Creek.

(8) ADDITIONAL INFORMATION

Are there state or federally listed species on the project site?	☒ **Yes**	☐ **No**	☐ **Unknown**
Is the project site within designated or proposed critical habitat?	☒ **Yes**	☐ **No**	☐ **Unknown**
Is the project site within a national Wild and Scenic River ?	☒ **Yes**	☐ **No**	☐ **Unknown**
Is the project site within a State Scenic Waterway?	☒ **Yes**	☐ **No**	☐ **Unknown**
Is the project site within the 100-year floodplain?	☒ **Yes**	☐ **No**	☐ **Unknown**

If yes to any above, explain in Block 6 and describe measures to minimize adverse effects to those resources in Block 7.

Is the project site within the Territorial Sea Plan (TSP) Area?	☐ **Yes**	☒ **No**	☐ **Unknown**

If yes, attach TSP review as a separate document for DSL.

Is the project site within a designated Marine Reserve?	☐ **Yes**	☒ **No**	☐ **Unknown**

If yes, certain additional DSL restrictions will apply.

Will the overall project involve ground disturbance of one acre or more?	☒ **Yes**	☐ **No**	☐ **Unknown**

If yes, you may need a 1200-C permit from the Oregon Department of Environmental Quality (DEQ).

Is the fill or dredged material a carrier of contaminants from on-site or off-site spills?	☐ **Yes**	☒ **No**	☐ **Unknown**
Has the fill or dredged material been physically and/or chemically tested?	☐ **Yes**	☒ **No**	☐ **Unknown**

If yes, explain in Block 6 and provide references to any physical/chemical testing report(s).

Has a cultural resource (archaeological and/or built environment) survey been performed on the project area?	☒ **Yes**	☐ **No**	☐ **Unknown**
Do you have any additional archaeological or built environment documentation, or correspondence from tribes or the State Historic Preservation Office?	☒ **Yes**	☐ **No**	☐ **Unknown**

If yes, provide a copy of the survey and/or documentation of correspondence with this application to the Corps only. Do not describe any resources in this document. Do not provide the survey or documentation to DSL.

Is the project part of a DEQ Cleanup Site? No☒ Yes☐ Permit number ____________

DEQ contact. ________________

Will the project result in new impervious surfaces or the redevelopment of existing surfaces? Yes ☐ No ☒

If yes, the applicant must submit a post-construction stormwater management plan as part of this application to DEQ's 401 WQC program for review and approval, see https://www.oregon.gov/deq/FilterDocs/401wqcertPostCon.pdf

Identify any other federal agency that is funding, authorizing or implementing the project.

Agency Name	Contact Name	Phone Number	Most Recent Date of Contact

List other certificates or approvals/denials required or received from other federal, state or local agencies for work described in this application.

Agency	Certificate / approval / denial description	Date Applied

Other DSL and/or Corps Actions Associated with this Site (Check all that apply.)

☐ Work proposed on or over lands owned by or leased from the Corps (may require authorization pursuant to 33 USC 408). These could include the federal navigation channel, structures, levees, real estate, dikes, dams, and other Corps projects.

☐ State owned waterway	DSL Waterway Lease #:	
☐ Other Corps or DSL Permits	Corps #	DSL #
☐ Violation for Unauthorized Activity	Corps #	DSL #
☐ Wetland and Waters Delineation	Corps #	DSL #

Submit the entire delineation report to the Corps; submit only the concurrence letter (if complete) and approved maps to DSL. If not previously submitted to DSL, send under a separate cover letter

(9) IMPACTS, RESTORATION/REHABILITATION, AND COMPENSATORY MITIGATION

A. Describe unavoidable environmental impacts that are likely to result from the proposed project. Include permanent, temporary, direct, and indirect impacts.

Temporary negative impacts include increased turbidity, vegetation disruption, as well as the direct and indirect displacement of organisms within the project area. BMPs and regulatory guidance will be used at all times to monitor and evaluate these temporary negative effects.

Additional environmental impacts are described in the Attachment, Table 1, which is from the NEPA document for the project.

B. For temporary removal or fill or disturbance of vegetation in waterbodies, wetlands or riparian (i.e., streamside) areas, discuss how the site will be restored after construction to include the timeline for restoration.

All areas disturbed with heavy equipment as part of the project would be rehabilitated and replanted and/or seeded with native vegetation following project implementation as guided by the U.S. Forest Service District Silviculturist and Botanist. All disturbed locations have been surveyed to assess the appropriate course of action to ensure that native vegetation communities are recruiting effectively. Native plants will be added to the newly created riparian and wet areas, as well as any disturbed upland areas. Pollinator plant species will be of special interest, and non-native weed control techniques will be implemented to ensure the successful development of a diverse, resilient, and native ecosystem.

Compensatory Mitigation

C. Proposed mitigation approach. Check all that apply:

☐ Permittee-responsible Onsite Mitigation	☐ Permittee-responsible Offsite mitigation	☐ Mitigation Bank or In-Lieu Fee Program	☐ Payment to Provide (not approved for use with Corps permits)

D. Provide a brief description of proposed mitigation approach and the rationale for choosing that approach. If you believe mitigation should not be required, explain why.

Compensatory mitigation is not required under ACOE NWP-27 since the restoration activities result in a net increase in aquatic resource functions and service.

Mitigation Bank / In-Lieu Fee Information:

Name of mitigation bank or in-lieu fee project:

Type and amount of credits to be purchased:

If you are proposing permittee-responsible mitigation, have you prepared a compensatory mitigation plan?

☐ Yes. Submit the plan with this application and complete the remainder of this section.

☐ No. A mitigation plan will need to be submitted (for DSL, this plan is required for a complete

Mitigation Location Information (Fill out only if permittee-responsible mitigation is proposed)

Mitigation Site Name/Legal Description	Mitigation Site Address	Tax Lot #
County	City	Latitude & Longitude (in DD.DDDD format)

Township	Range	Section	Quarter/Quarter

(10) ADJACENT PROPERTY OWNERS FOR PROJECT AND MITIGATION SITE

☐ **Pre-printed mailing labels of adjacent property owners attached separately.**	**Project Site Adjacent Property Owners**	**Mitigation Site Adjacent Property Owners**

Contact Name
Address 1
Address 2
City, ST ZIP Code

Contact Name
Address 1
Address 2
City, ST ZIP Code

Contact Name
Address 1
Address 2
City, ST ZIP Code

(11) CITY/COUNTY PLANNING DEPARTMENT LAND USE AFFIDAVIT (TO BE COMPLETED BY LOCAL PLANNING OFFICIAL)

I have reviewed the project described in this application and have determined that:

- ☒This project is not regulated by the comprehensive plan and land use regulations
- ☐This project is consistent with the comprehensive plan and land use regulations
- ☐This project is consistent with the comprehensive plan and land use regulations with the following:
  - ☐Conditional Use Approval
  - ☐Development Permit
  - ☐Other Permit (explain in comment section below)
- ☐This project is not currently consistent with the comprehensive plan and land use regulations. To be consistent requires:
  - ☐Plan Amendment
  - ☐Zone Change
  - ☐Other Approval or Review (explain in comment section below)

An application or variance request has ☐ has not ☐ been filed for the approvals required above.

Local planning official name (print)	Title	City / County

Signature	Date

Comments:

(12) COASTAL ZONE CERTIFICATION

If the proposed activity described in your permit application is within the Oregon Coastal Zone, the following certification is required before your application can be processed. The signed statement will be forwarded to the Oregon Department of Land Conservation and Development (DLCD) for its concurrence or objection. For additional information on the Oregon Coastal Zone Management Program and consistency reviews of federally permitted projects, contact DLCD at 635 Capitol Street NE, Suite 150, Salem, Oregon 97301 or call 503-373-0050 or click here.

CERTIFICATION STATEMENT

I certify that, to the best of my knowledge and belief, the proposed activity described in this application complies with the approved Oregon Coastal Zone Management Program and will be completed in a manner consistent with the program.

Print /Type Applicant Name	Title
Applicant Signature	Date

(13) SIGNATURES

Application is hereby made for the activities described herein. I certify that I am familiar with the information contained in the application, and, to the best of my knowledge and belief, this information is true, complete and accurate. I further certify that I possess the authority to undertake the proposed activities. By signing this application I consent to allow Corps or DSL staff to enter into the above-described property to inspect the project location and to determine compliance with an authorization, if granted. I hereby authorize the person identified in the authorized agent block below to act in my behalf as my agent in the processing of this application and to furnish supplemental information in support of this permit application. I understand that the granting of other permits by local, county, state or federal agencies does not release me from the requirement of obtaining the permits requested before commencing the project. I understand that payment of the required state processing fee does not guarantee permit issuance.

To be considered complete, the fee must accompany the application to DSL. The fee is not required for submittal of an application to the Corps.

Fee Amount Enclosed	$
Applicant Signature (required) must match the name in Block 2	
Print Name	Title
Signature	Date
Authorized Agent Signature	
Print Name	Title
Signature	Date

Landowner Signature(s)*	
Landowner of the Project Site (if different from applicant)	
Print Name	Title
Signature	Date
Landowner of the Mitigation Site (if different from applicant)	
Print Name	Title
Signature	Date
Department of State Lands, Property Manager (to be completed by DSL)	
If the project is located on state-owned submerged and submersible lands, DSL staff will obtain a signature from the Land Management Division of DSL. A signature by DSL for activities proposed on state-owned submerged/submersible lands only grants the applicant consent to apply for a removal-fill permit. A signature for activities on state-owned submerged and submersible lands grants no other authority, express or implied and a separate proprietary authorization may be required.	
Print Name	Title
Signature	Date

* Not required by the Corps.

(14) ATTACHMENTS

☒ Drawings

- ☒ Location map with roads identified
- ☒ U.S.G.S topographic map
- ☒ Tax lot map
- ☒ Site plan(s)
- ☒ Plan view and cross section drawing(s)
- ☒ Recent aerial photo
- ☒ Project photos
- ☐ Erosion and Pollution Control Plan(s), if applicable
- ☐ DSL / Corps Wetland Concurrence letter and map, if approved and applicable

☐ Pre-printed labels for adjacent property owners (Required if more than 5)

☐ Incumbency Certificate if applicant is a partnership or corporation

☐ Restoration plan or rehabilitation plan for temporary impacts

☐ Mitigation plan

☐ Wetland functional assessments, if applicable

- ☐ Cover Page
- ☐ Score Sheets
- ☐ ORWAP OR, F, T, & S forms
- ☐ ORWAP Reports
- ☐ Assessment Maps
- ☐ ORWAP Reports: Soils, Topo, Assessment area, Contributing area

☐ Stream Functional Assessments, if applicable

- ☐ Cover Page
- ☐ Score Sheets
- ☐ SFAM PA, PAA, & EAA forms
- ☐ SFAM Report
- ☐ Assessment Maps
  - ☐ Aerial Photo Site Map and Topo Site Map (Both maps should document the PA, PAA, & EAA)

☐ Compensatory Mitigation (CM) Eligibility & Accounting Worksheet

- ☐ Matching Quickguide sheet(s)
- ☐ CM Eligibility & Accounting sheet

☐ Alternatives analysis

☐ Biological assessment (if requested by the Corps project manager during pre-application coordination)

☐ Stormwater management plan (may be required by the Corps or DEQ)

☐ Other

- ☐ Please describe:

For U.S. Army Corps of Engineers send application to:

USACE Portland District
ATTN: CENWP-ODG-P
PO Box 2946
Portland, OR 97208-2946
Phone: 503-808-4373
portlandpermits@usace.army.mil

Counties:
Baker, Benton, Clackamas, Clatsop, Columbia, Gilliam, Grant, Hood River, Jefferson, Lincoln, Linn, Malheur, Marion, Morrow, Multnomah, Polk, Sherman, Tillamook, Umatilla, Union, Wallowa, Wasco, Washington, Wheeler, Yamhill

U.S. Army Corps of Engineers
ATTN: CENWP-ODG-E
211 E. 7th AVE, Suite 105
Eugene, OR 97401-2722
Phone: 541-465-6868
portlandpermits@usace.army.mil

Counties:
Coos, Crook, Curry, Deschutes, Douglas, Jackson, Josephine, Harney, Klamath, Lake, Lane

For Department of State Lands send application to:

West of the Cascades:
Department of State Lands
775 Summer Street NE, Suite 100
Salem, OR 97301-1279
Phone: 503-986-5200

East of the Cascades:
Department of State Lands
1645 NE Forbes Road, Suite 112
Bend, Oregon 97701
Phone: 541-388-6112

For Department of Environmental Quality e-mail application to:

ATTN: DEQ 401 Certification Program
Water Quality
700 NE Multnomah St, Suite 600
Portland, OR 97232
401applications@deq.state.or.us

Figure 1. Project Locator Map

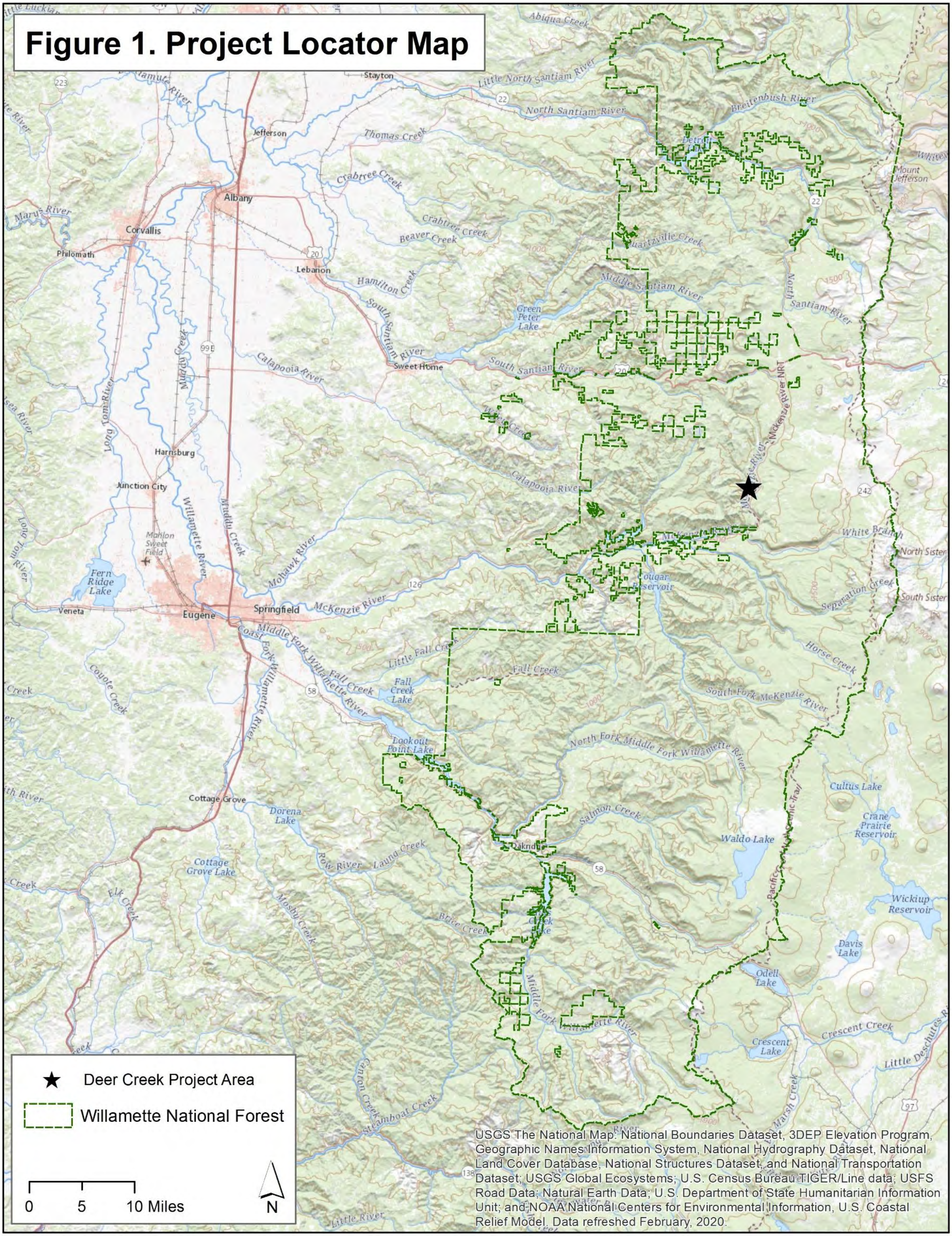


Figure 2. Project Vicinity Map

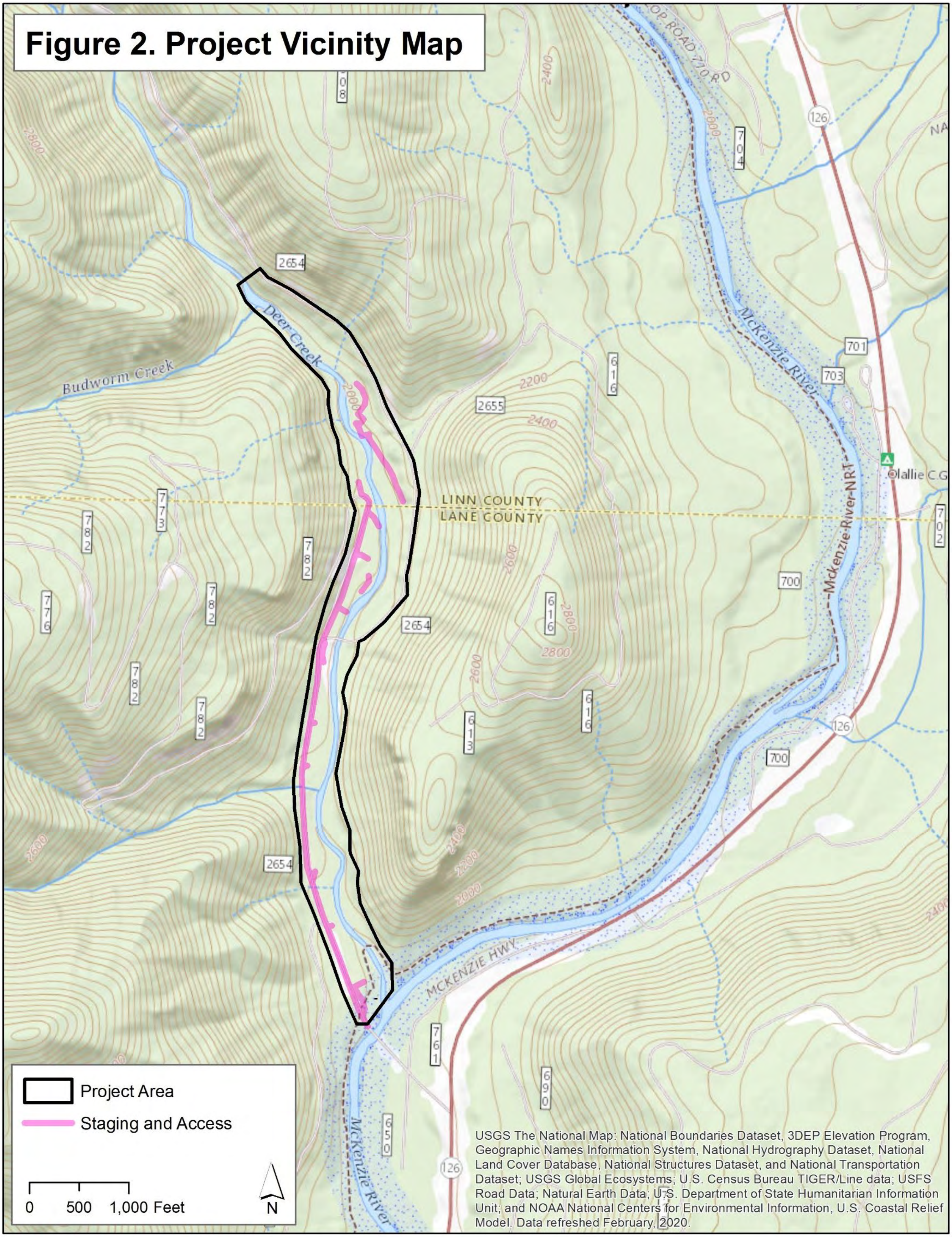


Figure 3. Sediment Removal and Fill

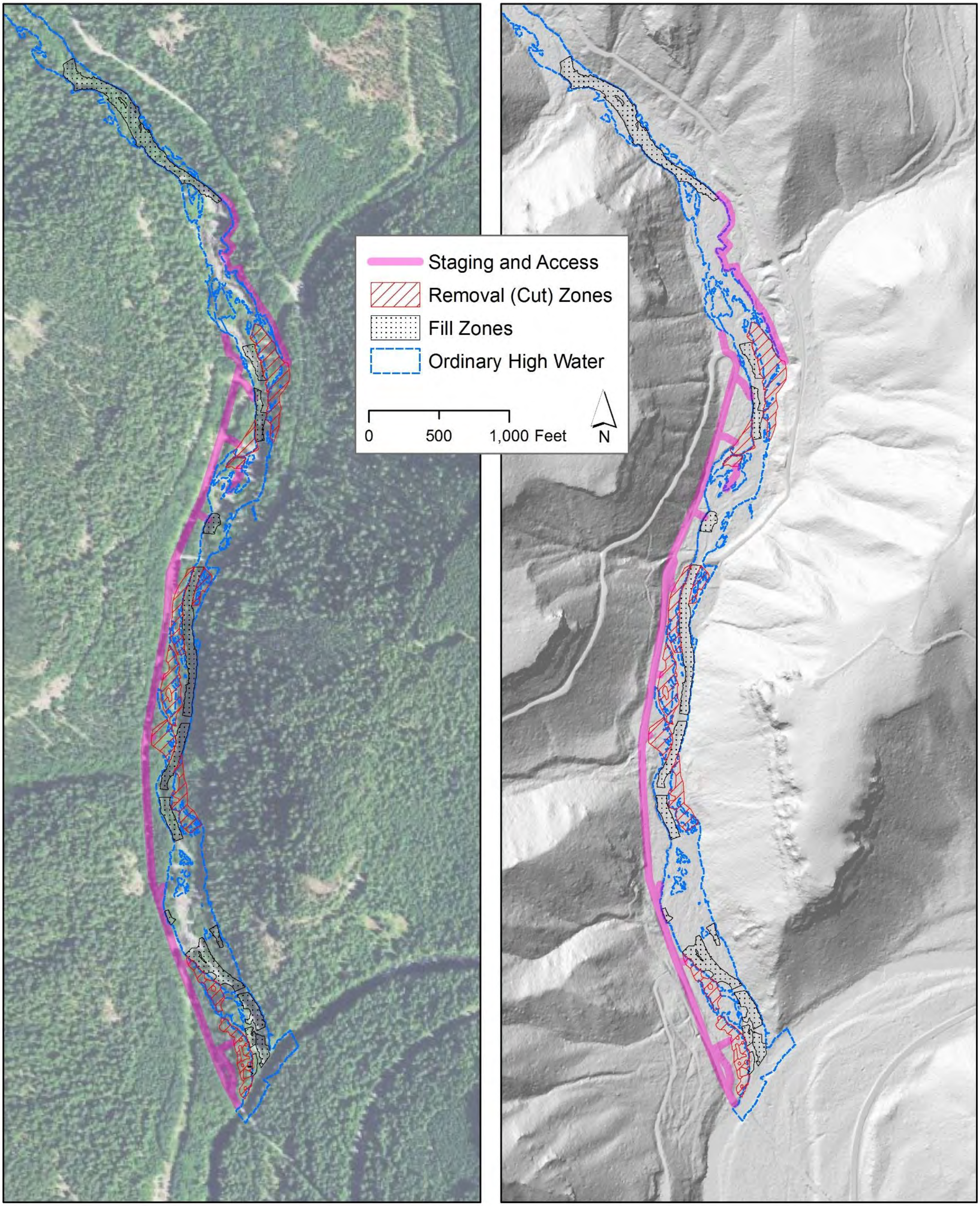


Figure 4. Wood Placement and Sediment Removal and Fill Lower Project Area

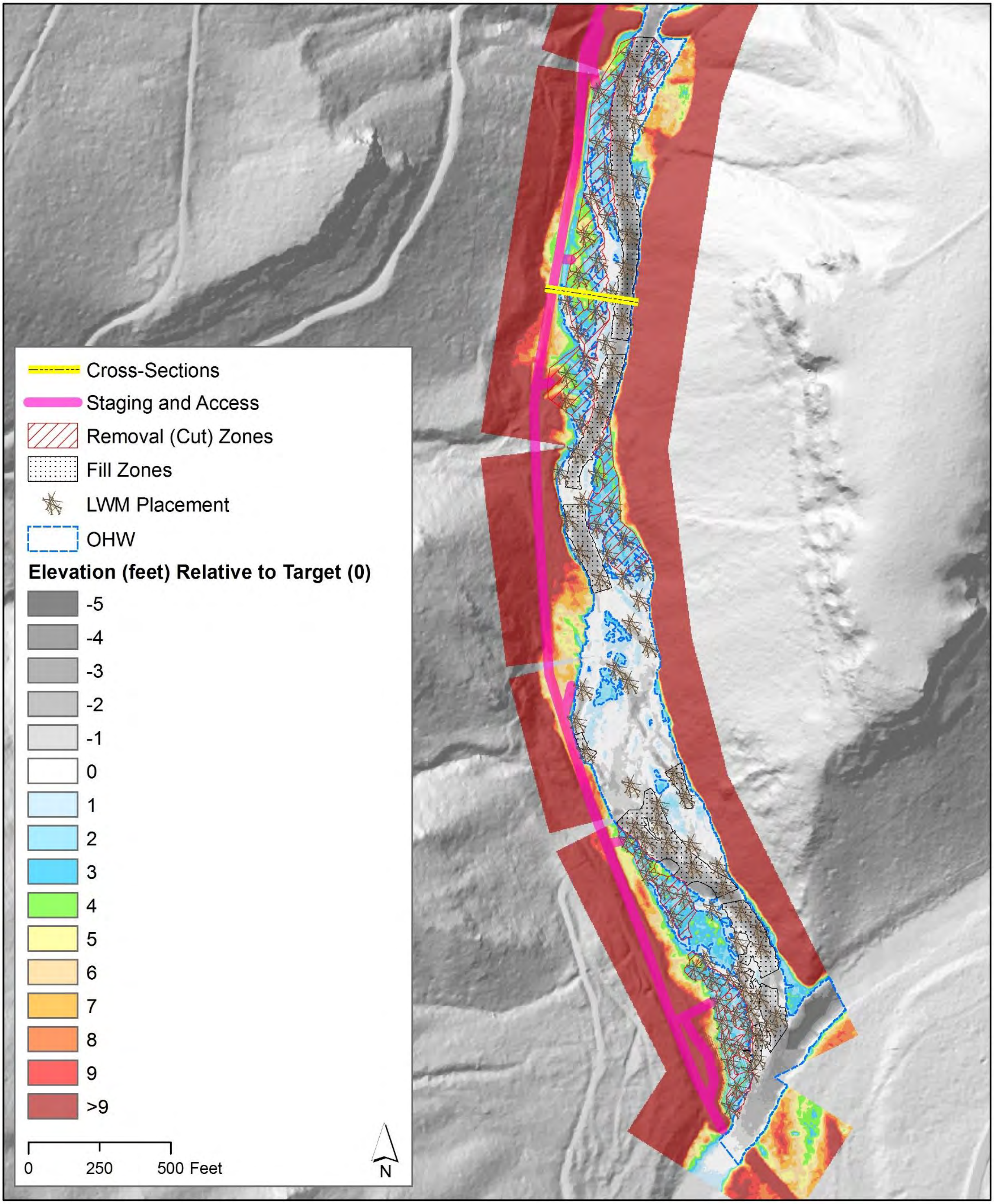


Figure 5. Wood Placement and Sediment Removal and Fill Upper Project Area

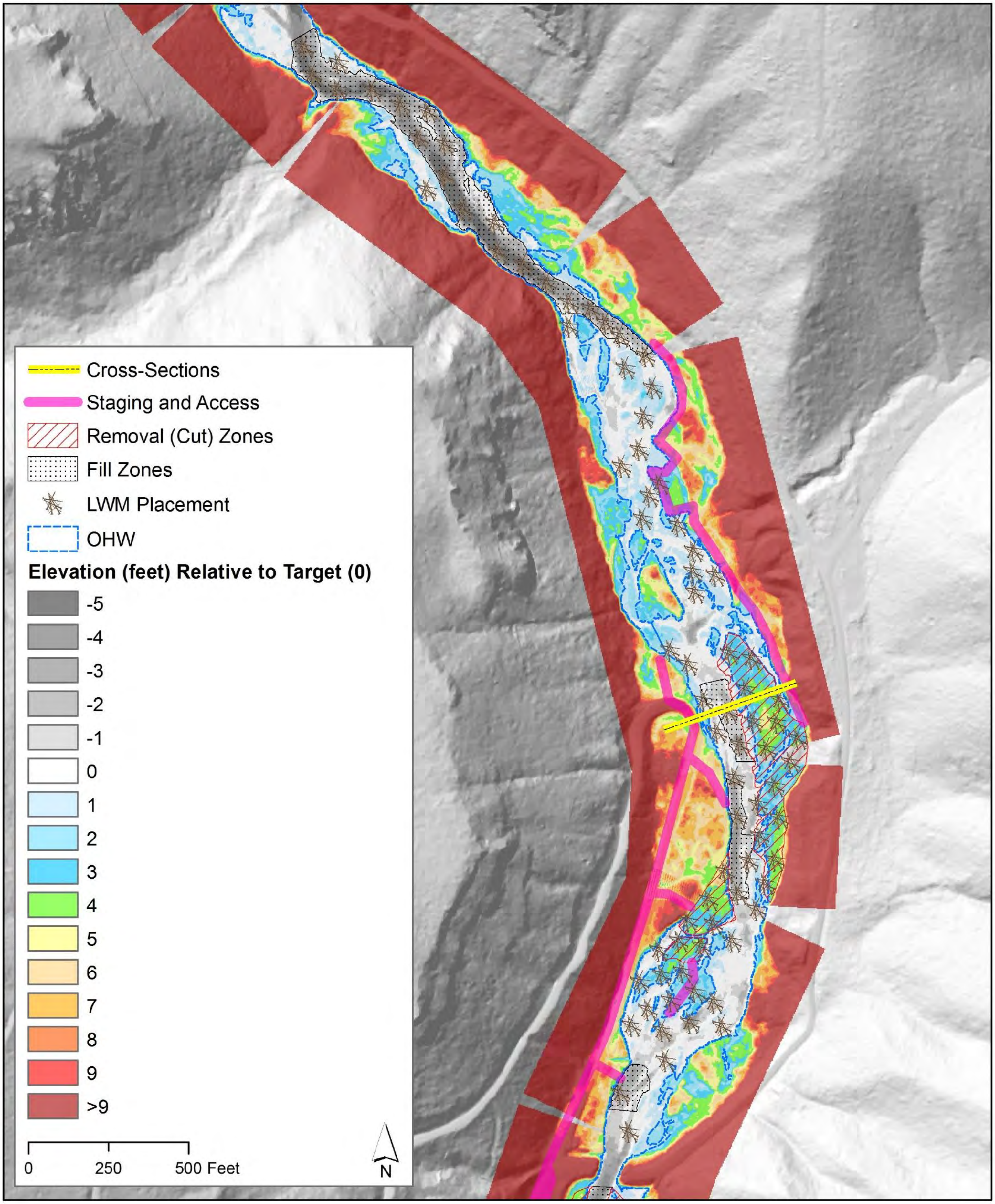


Figure 6. Valley Cross-Sections

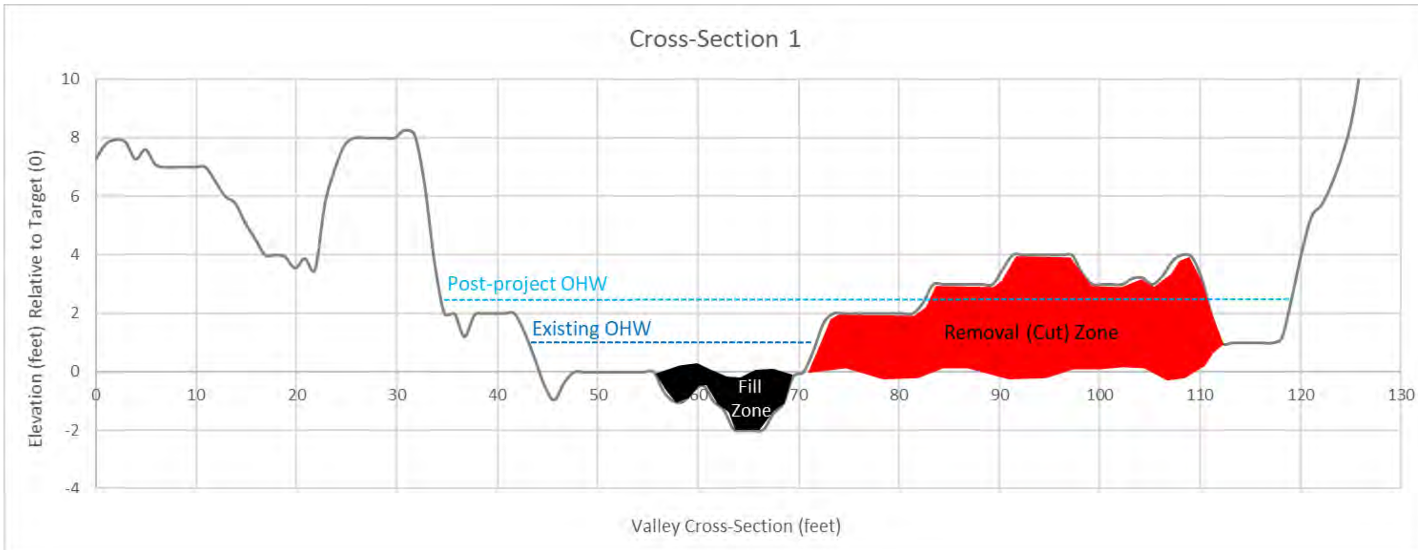
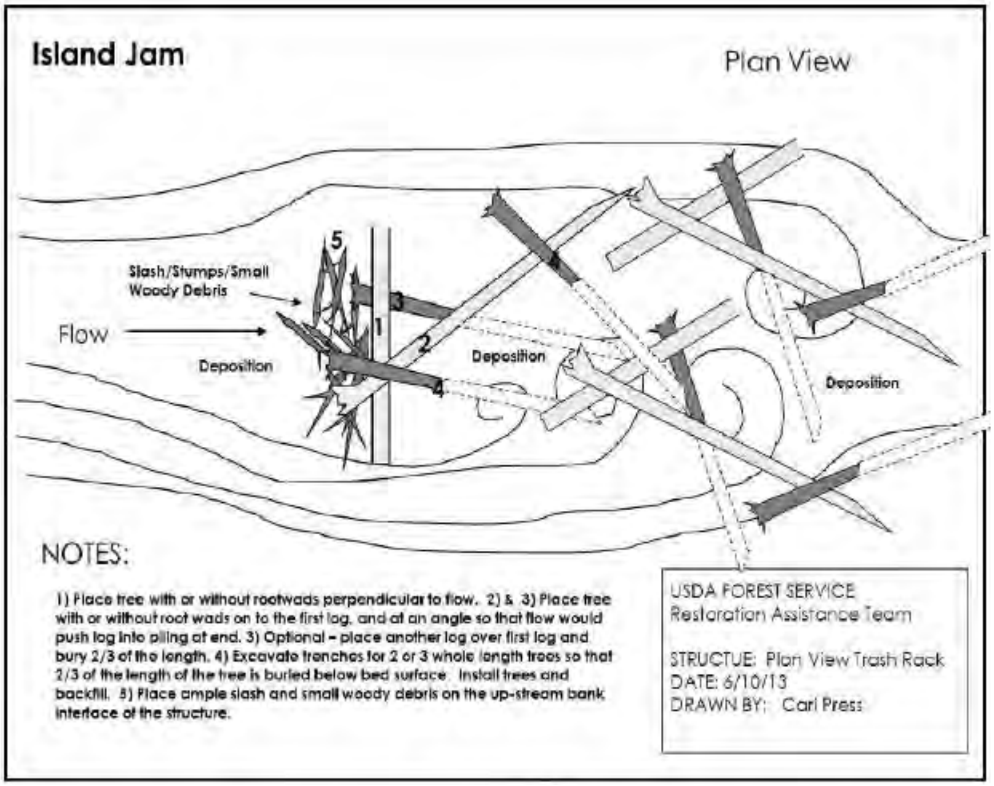


Figure 7. Wood Placement Typicals



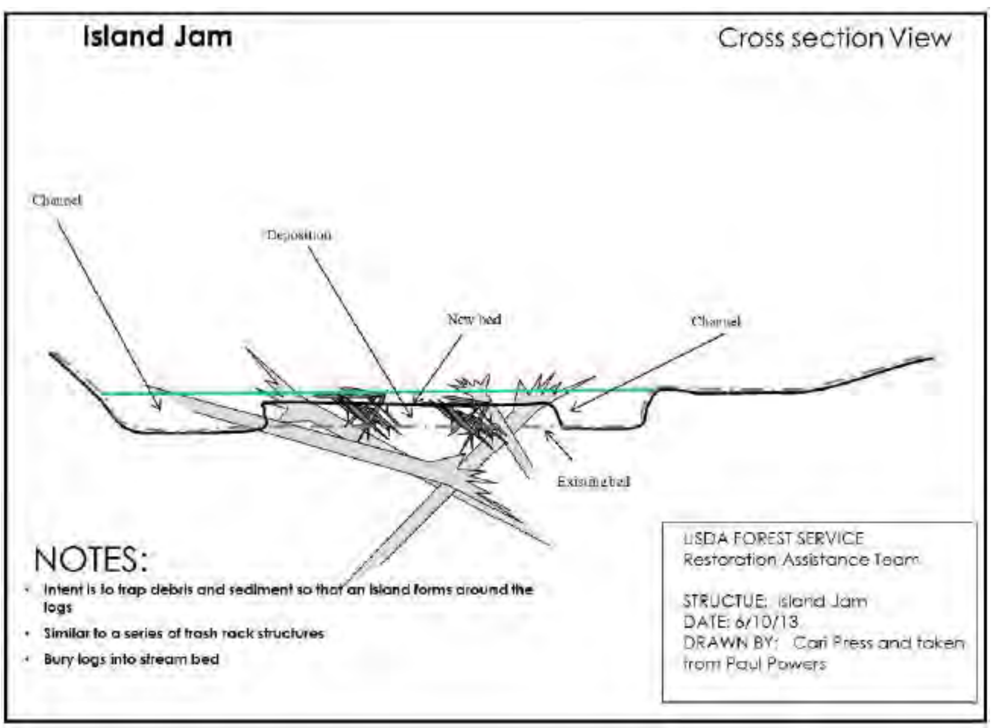


Figure 8. Photos from Deer Creek Phase 1, Implemented in 2016

Figure 9. National Flood Hazard Zone A for McKenzie River

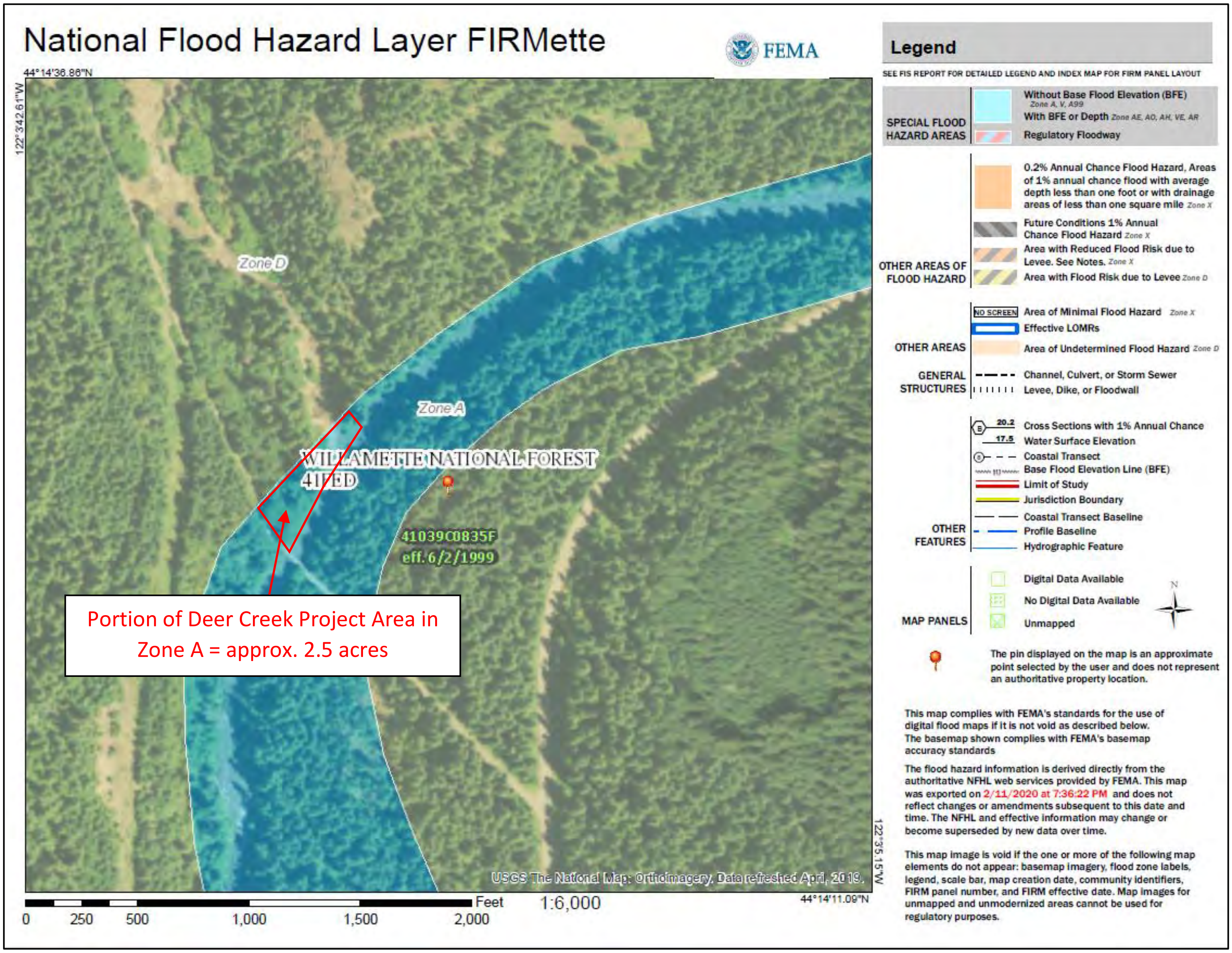


Figure 10. Lane County Tax Lot Map

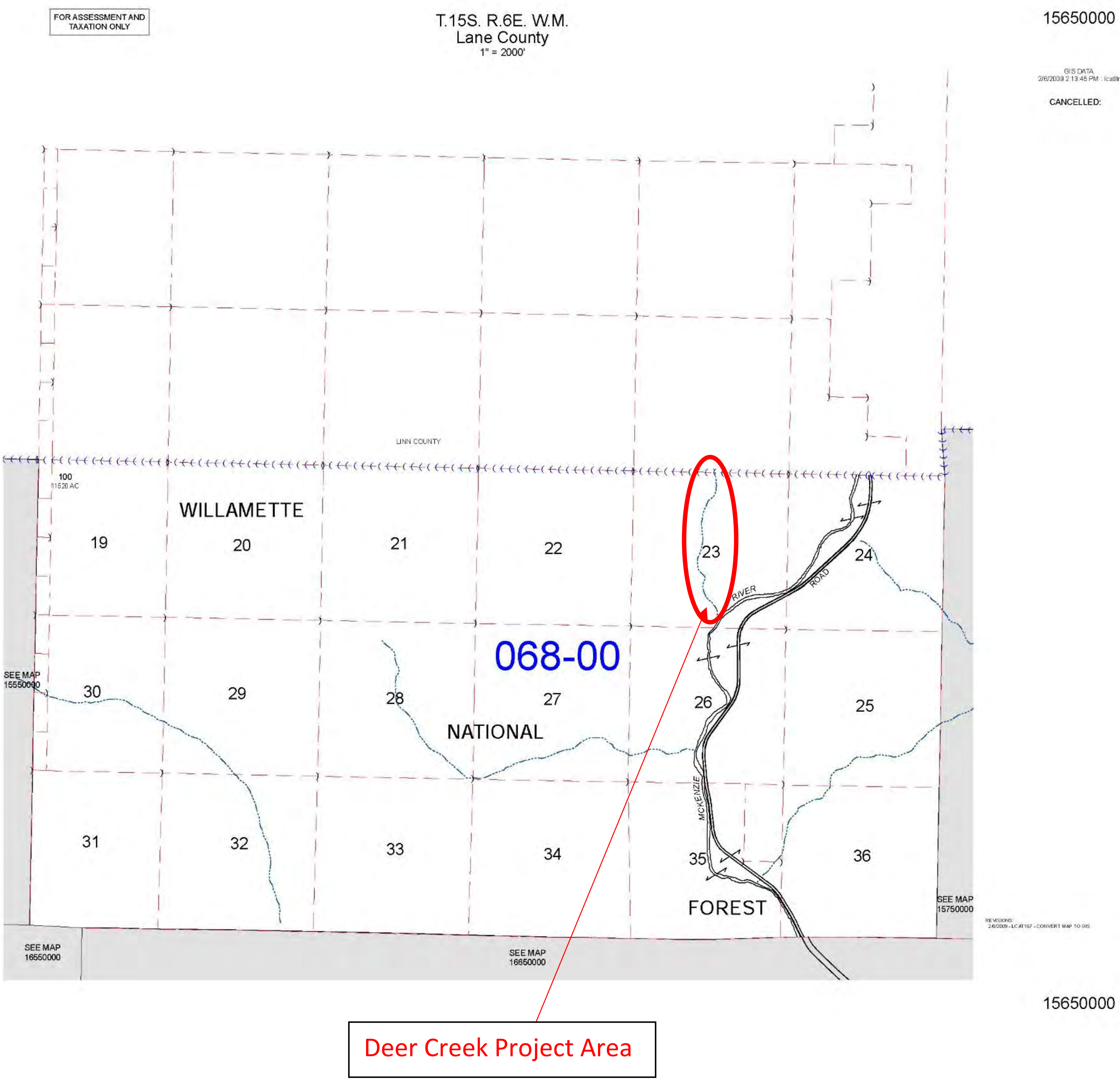


Figure 11. Linn County Tax Lot Map

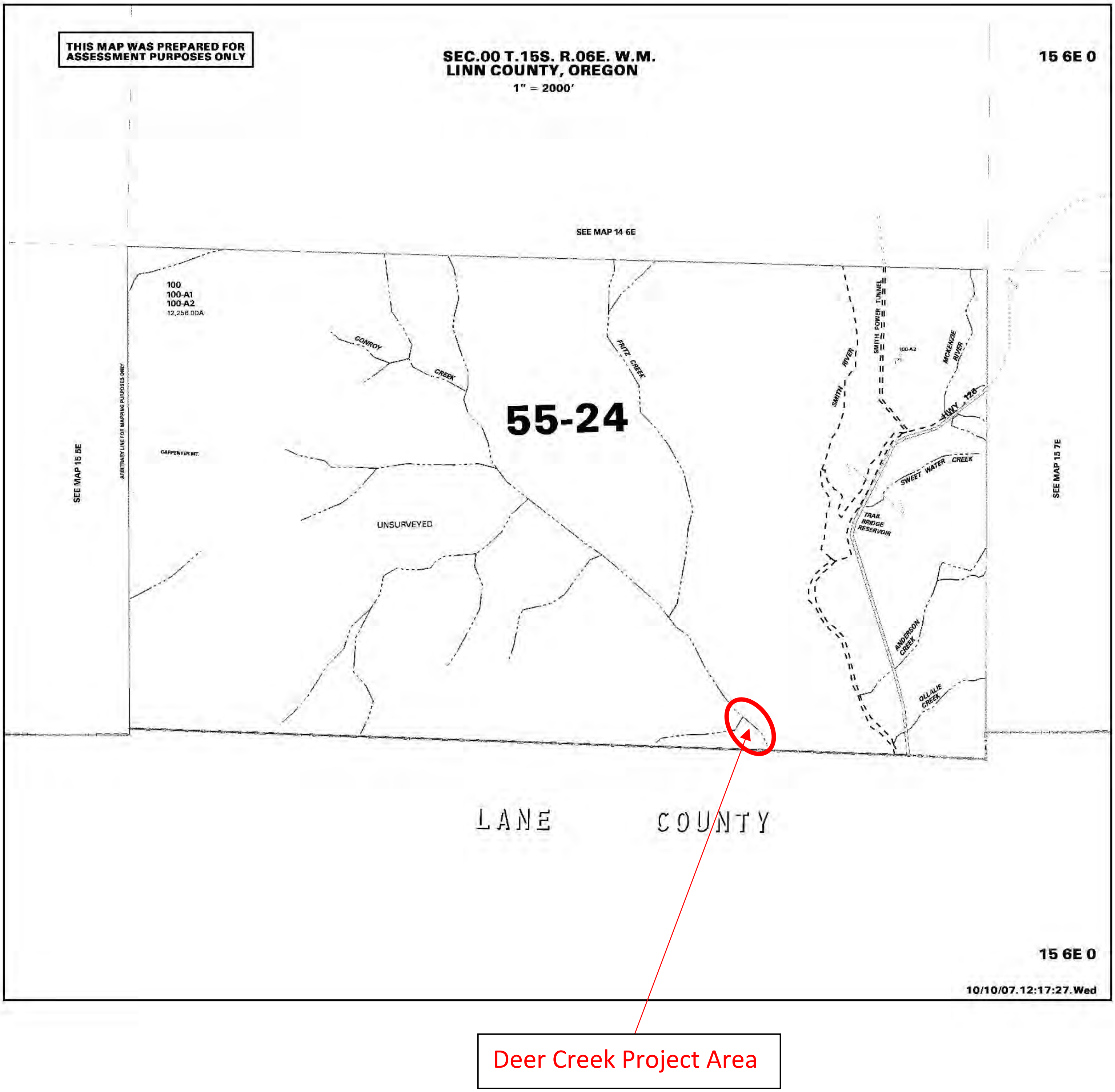


Table 1. Environmental Impacts Summarized in the Project NEPA Documentation

Extraordinary Circumstance to be Evaluated	Present? (Yes or No)	Degree of Potential Effect
Federally listed threatened or endangered species or designated critical habitat, species proposed for Federal listing or proposed critical habitat, or Forest Service sensitive species	Yes	**Listed/Proposed T and E Fish Species and Designated Critical Habitat -** ESA-Threatened spring Chinook salmon and bull trout may be present in the project area and Deer Creek is designated Critical Habitat for both species. This project is specifically designed to enhance habitat for these species. Based on effects analyzed in the Aquatic Restoration Biological Assessment II, the proposed actions are "likely to adversely affect" these species and Critical Habitat in the short-term (during implementation), but the long-term recovery benefits outweigh the short-term impacts and all of the following conditions are met: (1) The proposed action is regionally recognized as an activity meeting long-term recovery objectives for listed species; (2) Effects on other listed species are either "not likely to adversely affect" or "no effect"; (3) The proposed action is consistent with the programmatic consultation and Aquatic Restoration Biological Opinion II (ARBO II); and (4) The degree of the potential effect of the proposed action on resources (other than listed species) in 1909.15 (30.3) does not preclude use of the categorical exclusion. Please refer to the *Clarification of FSH 1909.15 Extraordinary Circumstances for Fish Habitat Restoration Activities* in the project record for additional information. **Listed/Proposed T and E Wildlife Species and Designated Critical Habitat -** ESA-Threatened Northern spotted owl may be present in the project area and portions of the project area are in designated Critical Habitat. Based on effects analyzed in the Wildlife Biological Evaluation and the Aquatic Restoration Biological Assessment II, the proposed actions are "not likely to adversely affect" this species or Critical Habitat. The fisher has been proposed for listing and has potential habitat in the project area. Based on effects analyzed in the Wildlife Biological Evaluation, the proposed action is "not likely to contribute to a trend towards federal listing." **FS Sensitive species** – FS Sensitive species that have potential habitat in the project area include the following with the associated effects determination: • Bald Eagle – No Impact/Beneficial Impact • Harlequin Duck – No Impact • Townsend's Big-eared Bat – Not Likely to Contribute to a Trend towards Federal Listing • Fringed Myotis – Not Likely to Contribute to a Trend towards Federal Listing • Cascades Axetail Slug – Not Likely to Contribute to a Trend towards Federal Listing • Crater Lake Tightcoil – Not Likely to Contribute to a Trend towards Federal Listing
Floodplains, wetlands, or municipal watersheds	Yes	The project is specifically designed to improve floodplain connectivity and function. The project area is within a municipal watershed and some turbidity will be produced during instream wood placement activities that may occur for up to 10 hours per day for up to 4 weeks. The extent of turbidity will be limited to less than 1 mile below the project area and the intake for the water supply is over 60 miles downstream. Therefore, there will be no impact to the municipal water source.
Congressionally designated areas such as wilderness, wilderness study areas or national recreation areas	Yes	Part of the project area is within the Upper McKenzie Wild and Scenic River. Based on effects analyzed in the Wild and Scenic River Section 7 analysis, the proposed action is consistent with Section 7 of the Wild and Scenic Rivers Act, and will have an indirect effect on the river, but not an adverse effect on the values for which the river was authorized by Congress.
Inventoried Roadless Areas or potential wilderness areas	No	No effect
Research Natural Areas	No	No effect
American Indians and Alaska Native religious or cultural sites	No	No effect
Archaeological sites, or historic properties or areas	No	Cultural resource surveys were performed in the project area, and no sites or historic properties were found.

Figure 12. SHPO Compliance Document

	Willamette
Ranger District:	**McKenzie River**
County:	**Lane/Linn**
Undertaking/Project Name	**Deer Creek Habitat Enhancement**
USGS Quads:	**Tamolitch Falls 7.5' and Echo Mtn./McKenzie Bridge 15'**

By signing this document, the Forest Specialist certifies that for this project the Forest complies with Section 106 of the National Historic Preservation Act, under the terms of the 2004 Programmatic Agreement (PA) for the State of Oregon. This form shall be kept on file as supporting documentation

	Stipulation III (A) 1	Undertaking meets the criteria listed in Appendix A of the PA
	Date:	Inspection, monitoring, or other identification will be submitted to the Forest Specialist.
	Stipulation III(A)2	Undertaking meets the criteria listed in Appendix B of the PA.
	Date:	Inspection, monitoring, or other identification will be submitted to the Forest Specialist.
	Stipulation III(A)3	Undertaking meets the criteria listed in Appendix C (Exempt/Non-undertaking).
X	Stipulation III (B)1	Undertaking meets the criteria in the PA for a No Historic Properties Affected determination.
	Stipulation III(B)2	Undertaking meets the criteria in the PA for a Historic Properties Avoided determination.
	Stipulation III(B)3	The Forest has notified interested Tribes and persons, as appropriate, of the findings and made the findings available to the public.
	Stipulation III(B)5 Date:	No Adverse Effect (No Historic Properties Affected). The Forest finds that there are historic properties but the undertaking will have no effect on them as defined by 36 CFR 800.16(i). SHPO review period (30-day) required.
	Stipulation III(B)6 Date:	Historic Properties Affected: The Forest Service shall consult according to 36 CFR 800.5.

There still remains the possibility that buried prehistoric or historic cultural resources are present and could be uncovered during project activities. If cultural resources are encountered during the course of this project, earth-disturbing activities in the vicinity of the find should be suspended, in accordance with federal regulations, and the zone archaeologist notified to evaluate the discovery and recommend subsequent courses of action. This must be included in all Contracts.

[illegible]	12/15/2015
North End Forest Specialist	**Date**

For SHPO USE: For Historic Properties Adversely Affected, please indicate your opinion of our determination by marking the appropriate box below, sign and return this form to the Forest.

	I concur with No Historic Properties Affected	
	I do not concur, because in my opinion	
	Date Received	
	SHPO Bibliographic Number:	

References

Cluer, B., & Thorne, C. (2013). A stream evolution model integrating habitat and ecosystem benfits. River Research and Applications, 30, 135–154. https://doi.org/10.1002/rra.2631

Powers PD, Helstab M, Niezgoda SL. A process-based approach to restoring depositional river valleys to Stage 0, an anastomosing channel network. River Res Applic. 2018;1‐11. https://doi.org/10.1002/rra.3378

Deer Creek Phase I Story Map:
https://usfs.maps.arcgis.com/apps/Cascade/index.html?appid=a1eab14df971439580ac2c17e308fa09

United States Department of Agriculture **Forest Service** **Pacific Northwest Region** **1220 SW Third Avenue (97204)**
PO Box 3623
Portland, OR 97208-3623

File Code: 2500, 2600 **Date:** October 1, 2019

Subject: Visit to West Fork Summit Creek, Prairie City Ranger District

To: District Ranger Ed Guzman, NR Staff Officer Amy Unthank
CC: Allen Taylor, Hazel Wood, Jordan Bass, Jeff Nelson

On September 9th, 2019, Johan Hogervorst, Forest Hydrologist on the Willamette National Forest and Paul Powers, District Fisheries Biologist on the Deschutes National Forest visited the newly completed West Fork Summit Creek Project as part of the Region 6 Restoration Assistance Team (RATs). Given the fact that we have helped with the planning, design and implementation of over 20 Stage 0 projects in Oregon, we were asked to review West Fork Summit Creek Project by Prairie City Ranger District aquatics employees, Allen Taylor, Hazel Wood, Jordan Bass and Jeff Nelson (pictured with Paul Powers below).

First of all, we would like to commend you on the accomplishment of the first Stage 0 valley bottom restoration project on the Malheur National Forest. What we saw on our visit was an excellent example of full valley bottom connection and restored water table in a valley that was once drained by an incised channel. The four of you took a bold step that we believe will now allow this valley bottom to reach full potential from an aquatic perspective. We were very impressed with the boldness of this team and the ecological results that are already clearly visible at this site. The West Fork of Summit Creek provides an excellent example of Stage 0 within your local ecoregion. It will be a very useful site for you and your partners to watch as this site evolves and understand what is possible on this landscape.

Here are some of the benefits that we saw, visiting the project:

- Restored water table. The alluvial aquifer has been raised to the valley floor elevation, which supports riparian vegetation establishment, hyporheic exchange and thermal heterogeneity.

- Complex and diverse fish and macroinvertebrate habitats
- The potential for wetland obligates such as native sedges and rushes to return. We saw evidence of this already occurring within weeks of project completion.
- Evidence of bacterial digestion within low energy and shallow groundwater upwelling areas. This is an important sign of recovery of the base level of the food web.

As you begin to discuss the project's results with your partners, here are a few items to share and recommendations for future work:

- As cited in Powers, Helstab and Neizgoda (2018), Stage 0 restoration will go through three stages:
    1. **post-construction as-built** – this is the current stage of disturbance on the site. It is quite raw but a necessary disturbance to reestablish water table and diminish stream power.
    2. **sediment and wood sorting** after the first few storm events, causing pool and island formation. Storm and flood cycles will accelerate the recovery of this site over the coming year. Sediments will be sorted and rough surfaces smoothed out.
    3. **wetland vegetation reestablishment on the fresh sediment deposits.** Riparian vegetation will rapidly colonize freshly deposited sediment. In systems such as the West Fork Summit, deposited sediments will likely be largely composed of suspend sediments such as silts. These steps will occur over the first few years in response to the initial disturbance. Given that energy will be very low in this environment most of the redistribution of sediment and wood/slash will be on the project site itself.

- We recommend using the Relative Elevation Model (REM) maps and fixed elevation monuments for the construction of future Stage 0 projects. While conditions on this site might have allowed you to achieve the desired outcomes without adhering to the REM, it could catch you on other projects. On a system of this size, six inches too high could result in a surface that does not function as part of the greater wetland.

- In your cut or borrow sites, lower those surfaces all the way down to the zero target elevation, which both increases the size of your wetland complexes and accelerates the recolonization of riparian vegetation.

- On other Stage 0 projects, partners have suggested that fish passage could be problematic due the lack of a clearly defined channel as existed in the pre-project condition. There are also often questions about the lack of deep pools. Aquatic habitats within Stage 0 projects appear to be vastly different from what people are accustomed to seeing. While habitats in Stage 0 look different, we have monitored much higher fish densities and overall numbers within these projects. If you are able, do some fish and macroinvertebrate sampling, even in the most disturbed state of your project. You will be able to document whether the biology is responding to the project and at what rate. What you will find is that the recovery of the water table and rapid recolonization of wetland obligates lead to a very productive environment for the biology on site, but the valley needs time to work through the initial disturbance, as discussed above.

- On site, we talked about the lower end of the project and how it transitions into the road crossing that will soon be reconstructed. We recommend that you redesign the crossing with an inlet elevation at the historic elevation in your Relative Elevation Model and do Stage 0 through the rest of the valley above the crossing. Stream energies will be very low and even at elevated flows, you will be able to collect flows at the bottom to pass through your new crossing. You will have to bring in fill material to raise the fill height over the culvert or bridge approaches to be able to put in a structure with maximum width, but it will be worth the extra habitat you will generate above it, doing Stage 0 on the rest of the valley.


Existing Culvert


One possible solution: a prefabricated bridge

We appreciated the opportunity to visit this important project and look forward to hearing about how conditions develop. If the implementation team has any questions on the recommendations or has other questions for the review team, please feel free to contact us. Again, congratulations on West Fork Summit Project.

Sincerely,

Paul Powers
District Fisheries Biologist
Crescent Ranger District
Deschutes National Forest
paul.powers@usda.gov
541-408-7465

Johan Hogervorst
Forest Hydrologist
Willamette National Forest
Springfield, OR 97477
johan.hogervorst@usda.gov
541-225-6430