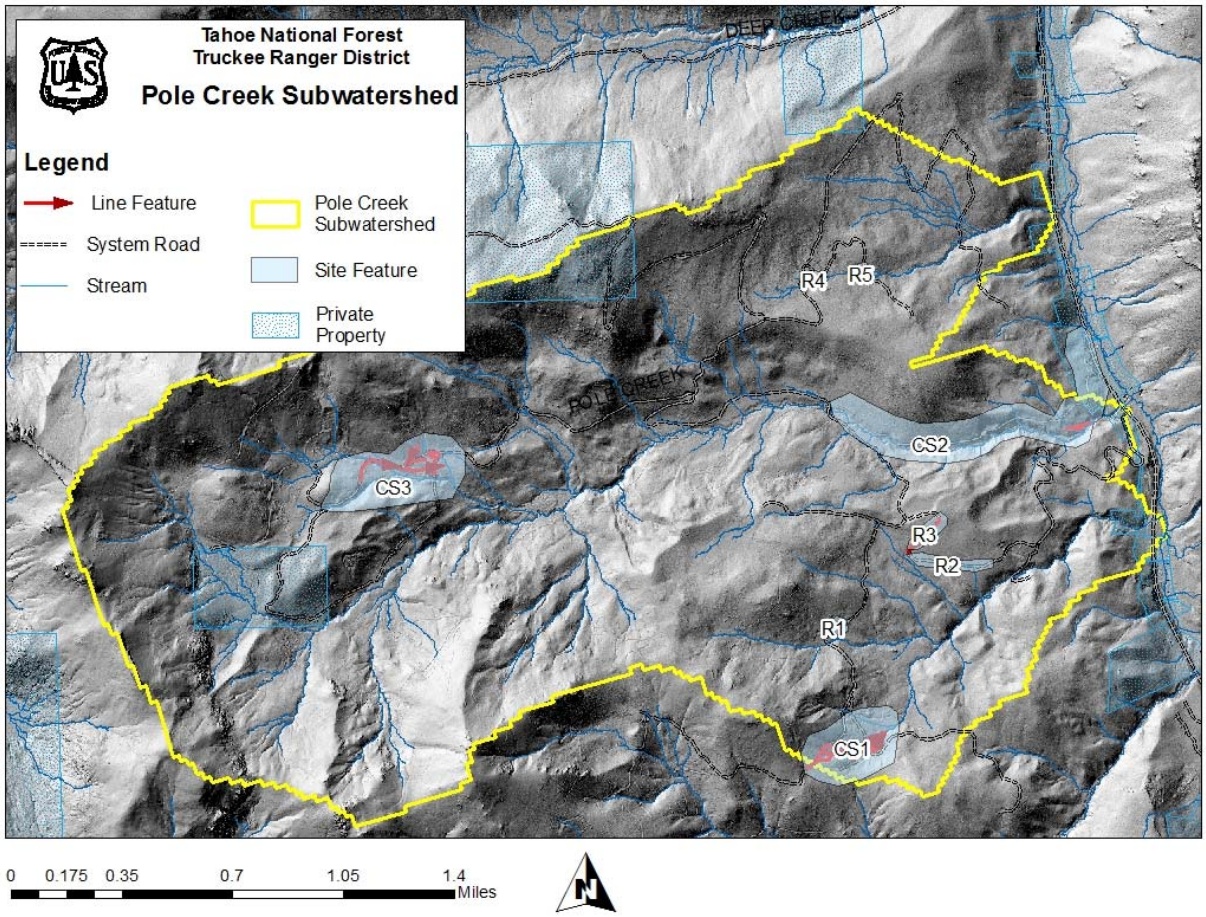
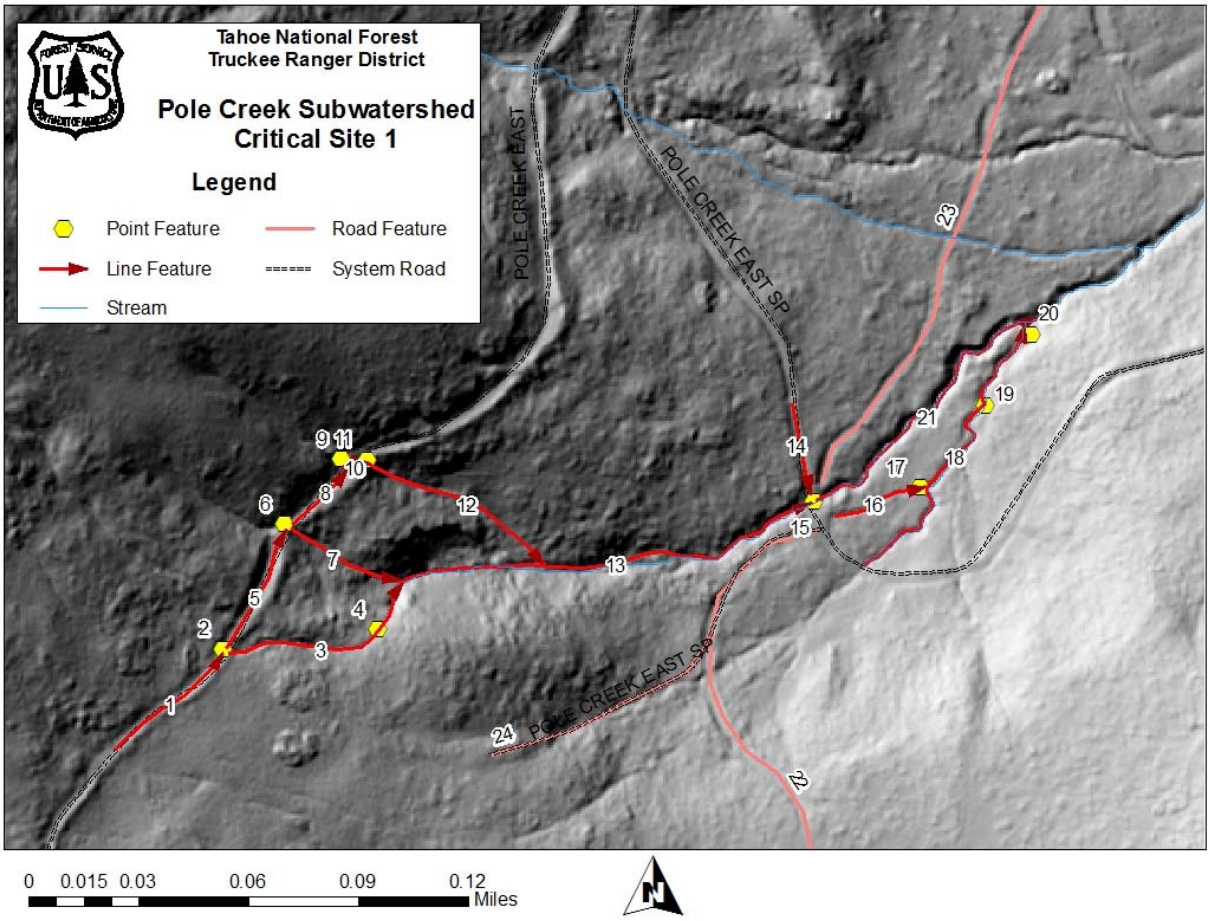
Excerpt from Tributaries Assessment - Pole Creek

**Note: The area of interest, identified areas of concern and proposed actions encompass a portion of the area delineated for Assessment/Inventory in the current Pole Creek Request for Proposals - April 10, 2023*



Area/Critical Site 1

The main feature of this site is a deeply incised channel downstream of a crossing with Pole Creek East Spur Road. Average incision depth is 6ft. Geomorphology suggest this channel is unnatural as it is not the low point in the valley. Another, more stable, channel is found southeast at a lower elevation. There are signs of what may be the original flow path of the incised channel, but the development of the spur roads to the southwest and northeast of the crossing may have caused the relocation of the channel. Discharge in this incised channel has also increased due to the large amounts of road surface runoff entering the channel from the Pole Creek East road found uphill from the crossing. Poor maintenance and placement of road surface drainages have allowed road runoff to accumulate to amounts high enough to incise leadout outlets and adjacent fillslopes. This has allowed unnatural flow paths to lead into the headwaters of the incised channel downstream. Sediment from the erosion of the road and fillslopes enter the channel.



List of Features

1.1: Road surface runoff from this length of Pole Creek East road accumulates and exits at leadout 1.2.

1.2: Leadout for road surface runoff from 1.1. Runoff is high enough that it has incised the outlet and fillslope, forming a flow path (1.3).

1.3: A flow path in a meadow from accumulated runoff from the Pole Creek East road. This flow path has incised enough to expose bedrock at 1.4. This flow path ultimately feeds the headwaters of the incised channel downstream.

1.4: Bedrock is exposed at this point due to scouring from flow path 1.3.

1.5: Length of Pole Creek East road where runoff accumulates. The runoff drains above the outlet of a stream crossing culvert (1.6), incising around the culvert and fillslope.

1.6: Stream crossing culvert. Surface runoff from the Pole Creek East road flows over the outlet of this culvert, and has been eroding the surrounding fillslope. The outlet now shotguns, giving discharge from the stream more potential energy to scour the channel downstream.

1.7: Flow path of an ephemeral channel with surface runoff from Pole Creek East road. This channel flows into the main incised channel downstream.

1.8: Segment of Pole Creek road that accumulates surface runoff. This runoff flows into a stream that has flowed onto the road.

1.9: Ephemeral channel flows along Pole Creek East road for ~20ft (1.10). The channel and road surface runoff exits at leadout 1.11 and flows into the headwaters of the incised channel downstream.

1.10: Segment of Pole Creek East road where an ephemeral channel flows onto. The channel leaves the road at leadout 1.11.

1.11: Leadout where surface runoff from Pole Creek East road and an ephemeral channel leave the road.

1.12: This channel formed from combined runoff from an ephemeral channel and the Pole Creek East road.

1.13: This channel accumulates flow from multiple flow paths coming off of the Pole Creek East road. Due to the unnatural nature of these flow paths, that amount of water in this channel is above natural. This channel is crossed by the Pole Creek East Spur road downstream at feature 1.15, and becomes heavily incised after crossing the road.

1.14: Surface runoff from this length of Pole Creek East Spur road flows into the channel crossing 1.15, contributing to the discharge of the incised channel.

1.15: Channel crossing for Pole Creek East Spur road. The crossing is a ford that is lined with rocks as armor. Downstream of this crossing, the channel becomes deeply incised. The installation of this crossing may have diverted this channel to create an unnatural flow path, indicated by the high amounts of incision and lack to bank stability.

1.16: Possible channel in which water from the incised channel use to flow naturally in. This channel is topographically lower than the current incised channel. Water would have preferred this flow path, but the installation of the Pole Creek East Spur roads may have forced the diversion of this channel.

1.17: Headcut on the old channel 1.16.

1.18: This natural channel is topographically the lowest point in this valley, indicating it may be the overall preferred flow path.

1.19 and 1.20: Headcuts in the natural channel 1.18 south of the main incised channel.

1.21: The current channel downstream of crossing 1.15. This channel is highly incised with average depths of 6 ft. The slope banks are bare and allow for mass movement into the channel. This channel is unnatural and may have formed due to the installation of the Pole Creek East Spur road crossing and the spur roads to the north and south.

1.22: Spur road that connects to the south end of the Silver Creek subwatershed. This spur road is not listed as a Forest Service system road. Vehicle access for the road ends at the next drainage crossing. The south end of this spur road is inaccessible because it abruptly ends when it meets Silver Creek.

1.23: Another spur road that is not list as a Forest Service system road. The south end at this spur road ends at crossing 1.15 with Pole Creek East Spur Road. The south end entrance may have been removed during the installation of the crossing. Motor Vehicle entrance at the south end is nonexistent. Access on the north end of this spur road is developed enough for OHVs.

1.24: Segment of the Pole Creek East spur road that is listed as a Forest Service system road, however does not exist here.

Proposed Actions

Reshaping the problematic segments of the Pole Creek East road into an outsloped road shape will allow overland sheet flow to return to the meadow and remove unnatural flow paths. When not possible, additional waterbars/dips should be installed and current ones maintained. Road surface runoff should be widely dispersed into overland flow, directing water into other nearby natural channels and decreasing the amount of discharge flowing into the incised channel. A culvert crossing structure should be installed at crossing 1.9 to prevent direct road surface runoff to flow into the stream.

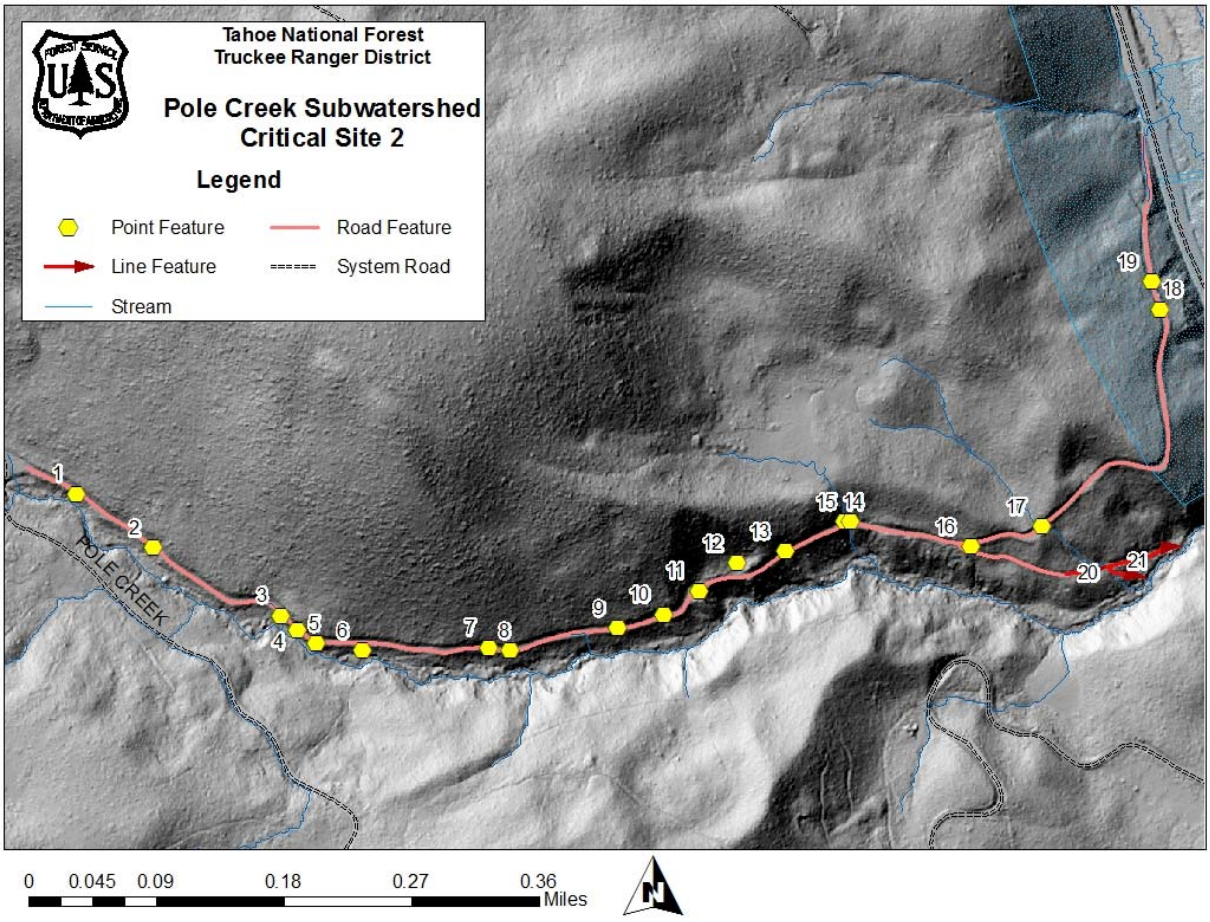
Similarly at the downstream end of the site, waterbars/dips should be installed on the road north of the crossing with the main incised channel to mitigate road surface discharge into the channel. This crossing should be reinstalled to allow the flow path to follow its original natural channel, 1.16. Afterwards, the incised channel should be buried. Multiple headcuts were identified on the original channel and an adjacent tributary to the south. They should be repaired to prevent further erosion.

Spur roads 1.22 and 1.23 should be obliterated. Both spur roads are not listed as Forest Service system roads and have poor access and development for motor vehicle use. The roads have poorly maintained road surface drainages, which is allowing runoff to accumulate on roads, creating erosional features such as rills and incisions at the outlets. The removal of both roads would remediate these issues and return proper overland sheet flow, providing more infiltration time of sediments before entering the nearest channel.

Spur road 1.24 is shown as a Forest Service system road, but does not actual exist. This spur road should be removed from the system.

Area/Critical Site 2

This site consists of a decommissioned road found directly north of Pole Creek. This road likely served as another way to access the Pole Creek watershed from Highway 89. The entire length of the road parallels Pole Creek before turning north and running semi parallel to the highway. This road sees no usage from any motor vehicles as access on the west and east end of the road is barricaded by multiple boulders. Due to its status as a decommissioned and unauthorized road, maintenance for its drainage features is nonexistent. Many waterbars and dips are no longer functional, and allow for runoff to accumulate to high amounts. This has allowed the formation of rillings on the road, and incision at leadouts and fillslopes. The eroded sediment from the roads and fillslope are allowed to flow directly into Pole Creek due the short length of buffer. A portion of the road appears have been built on the toe of a landslide, with the fillslope consisting of the moved mass. The road may have allowed for a washout event, causing a large amount of the fillslope to fail and deposit into the channel.



List of Features

2.1 and 2.2: Leadout catching excessive amounts of runoff from road. Incision at the outlet and fillslope occurs.

2.3: Fillslope is failing and has exposed and bare soils.

2.4: Leadout is eroding back and incising fillslope.

2.5: Fillslope is failing and has exposed and bare soils.

2.6: Fillslope material appears to have failed and collected at the slope base and in the channel.

2.7-2.10: Leadout catching excessive amounts of runoff from road. Incision at the outlet and fillslope occurs. Fillslope is failing.

Example of leadout and fillslope incision.

2.11: Segment of road built on toe of a landslide. A washout event may have allowed mass failure of the fillslope. Mass amounts of fillslope is no longer present and has left the remaining fillslope with low vegetation and bare soils.

2.11 (cont.)

2.12: Exposed cutslope allowing for mass movement of sediment.

2.13: Failing cutslope. Mass movement is collecting on road.

2.14: Stream crossing. Stream is incising fillslope.

2.15: Gully is forming in inside ditch.

2.16: Trough of the inside ditch. Runoff and sediment pools here. Skid trail starts here and moves southeast.

2.17: Inside ditch continues here and enters an ephemeral channel. Ephemeral channel flows down into Pole Creek, however, surface runoff from a skid trail connects to this channel.

2.18: On private property. Leadout is catching excessive amounts of runoff from the upslope portion of road. Incision at the outlet of the leadout and fillslope occurs.

2.19: On private property. Fillslope is failing and exposing bare soils.

2.20: Surface runoff along this length of skid trail collects and flows into the ephemeral channel.

2.21: Skid trail east of the ephemeral channel is catching some flow and connects with Pole Creek.

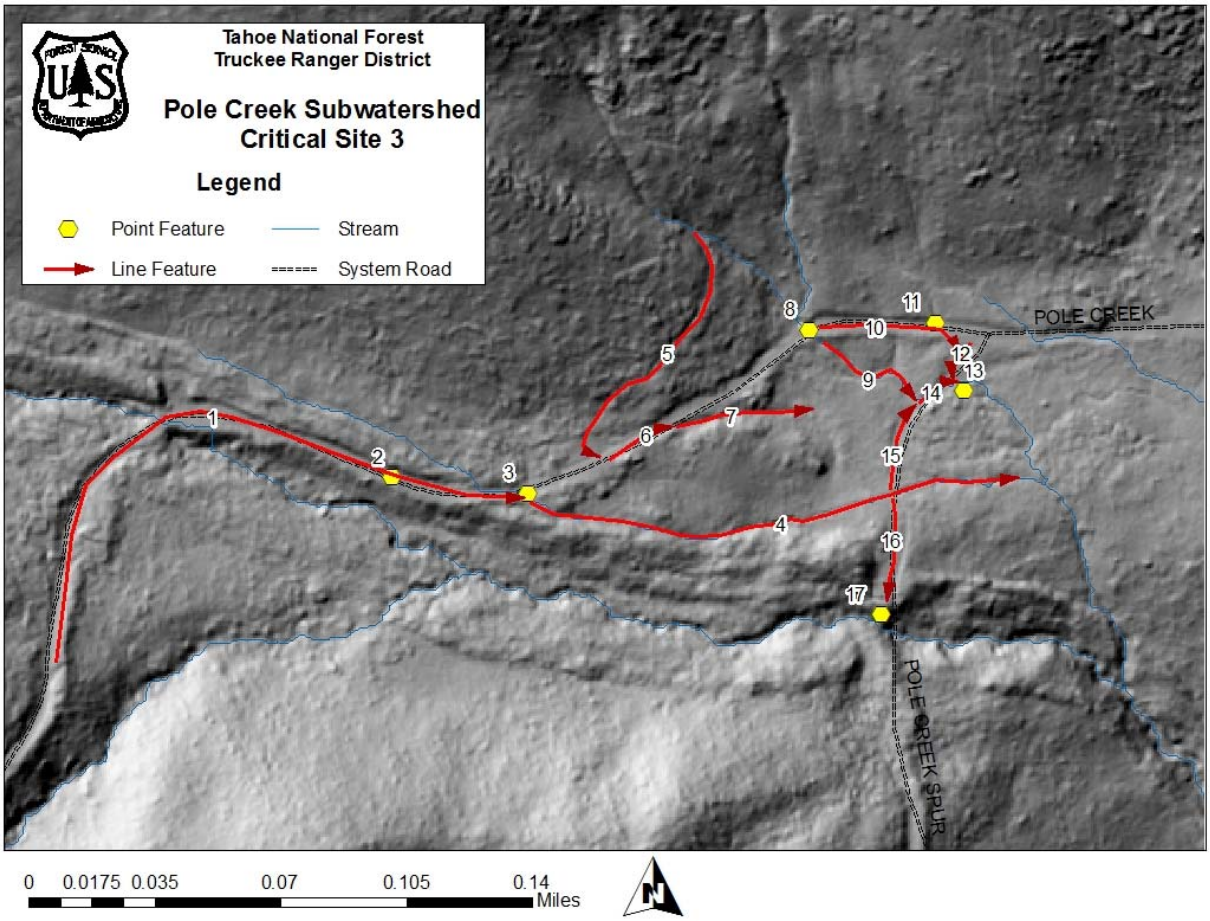
2.22: Unnatural flow path downslope of the skid trail that connects with Pole Creek.

Proposed Action

The entire length of road should be obliterated and recontoured to a natural slope gradient. The road is no longer used or maintained. Returning the entire length of road will effectively remove all erosional features from this area and return natural sheet flow over the hillslope.

Area/Critical Site 3

This site is found off Pole Creek road, in the northwest section of the watershed. It exists due to an old spur road built across the western end of the meadow in this area. The road is no longer used, but has caused the diversion of natural flow paths in this meadow. Pole Creek road connects to this spur road and contains poorly placed or failing drainage structures. These poor drainage structures have allowed excessive runoff to enter the vicinity of the spur road, furthering the development of unnatural flow paths here. The spur road continues south to a crossing. At another point in time, this crossing was functional and allowed the spur road to continue south. That crossing has been removed since, and now is being incised by the natural channel flowing here. The banks at this crossing are bare and exposed. A section of the spur road slopes toward the channel, allowing road runoff to enter the channel at this crossing. Continued existence of these problems will allow further incision of the channel at the crossing, erosion and formation of nick points in the meadow, and sediment to deposit in the meadow and in the channel.



List of Features:

3.1: Length of Pole Creek road where runoff is not drained off properly. Road runoff accumulates due to the lack of functioning waterbars or dips. The accumulated runoff exits out through dip 3.3, where it has created an unnatural drainage (3.4).

3.2: Location of a failed dip along the length of 3.1.

3.3: Leadout that collects road surface runoff from Pole Creek road. The runoff collected here has created a small channel that flows into the meadow.

3.4: Unnatural drainage created by the excess runoff from Pole Creek road. This drainage bisects the spur road in the meadow.

3.5: An old skid trail that collects surface runoff and drains down towards Pole Creek road.

3.6: Surface runoff from this length of Pole Creek road flows into an unnatural flow path in the meadow.

3.7: An unnatural flow path for the accumulated runoff from Pole Creek road.

3.8: A culvert crossing that has been aligned wrong, allowing the channel to create an unnatural flow path (3.9).

3.9: The unnatural channel that was created from the incorrect installation of the culvert crossing.

3.10: Length of Pole Creek road that collects surface runoff that flows into unnatural flow path 3.12.

3.11: Channel crossing. Channel flows onto Pole Creek road, combines with surface runoff from Pole Creek road, and continues into flow path 3.12.

3.12: Small incised flow path from the accumulated runoff of Pole Creek road and the channel that flows onto it.

3.13: Unnatural runoff diversion for surface runoff from the Pole Creek Spur road. Runoff from Pole Creek road that reaches the spur road flows out into the meadow here as well.

3.14: Segment of spur road in meadow that accumulates some runoff from Pole Creek road.

3.15: Segment of Pole Creek spur road that contributes to the accumulated flow exiting at the unnatural runoff diversion 3.13.

3.16: Length of Pole Creek spur road that flows into the channel at its crossing.

3.17: Fill placed in channel to provide a crossing when the spur road was functional. It is now being incised by the natural channel, eroding the fill and allowing sediment to enter the channel.

3.18: Fill placed in channel to provide for road crossing at west end of the Pole Creek Spur road. 3.18 is found further west on Pole Creek road from the rest of the features.

Proposed Action

Managing surface runoff properly on segments of Pole Creek road upland of the site would help mitigate runoff issues into the meadow. Problematic road segments should have additional waterbars/dips installed and existing ones maintained to prevent the further inset of unnatural flow paths. Any segments directly upland of the meadow should be reshaped to an outsloped design, returning overland sheet flow to the meadow. The skid trail that comes off Pole Creek road to the north should be obliterated to prevent surface runoff to accumulate on the road. The culvert crossing 3.8 will need to be reinstalled and reoriented to direct the channel south instead of southeast from the outlet, following its more natural flow path. The Pole Creek spur road running north and south in the meadow should be obliterated to prevent road surface runoff to accumulate and discharge into unnatural flow paths. The unnatural flow paths in the meadow currently should be recontoured to allow dispersed sheet flow in the meadow. The fill material used for the spur road crossing will need to be removed so the natural V-shape seen upstream can return and prevent further fill material to be eroded into the stream.

Other Notes

Further west on Pole Creek road, the road again crosses the same channel incising the fill of feature 3.17. A similar problem exists where fill was placed into the channel to allow for a road crossing. Currently, the fill appears to be stable due to the large amount of established vegetation here. There are currently no proposed action for this feature as remediation might be more detrimental than leaving it in its current condition. Further monitoring will continue to ensure its stability and/or determine a proposed action when it is deemed beneficial.