

# Discovery of a placer gold-bearing fluvial bench on the middle-reaches of Canyon Creek

by Lory Cail and Jeffrey Bond



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## Introduction

This report documents the discovery of a bench gravel on the middle reaches of Canyon Creek, Yukon. The discovery was made by Lory Cail and Jeffrey Bond on September 10<sup>th</sup>, 2018. Prospecting was completed using an excavator to dig a series of test pits on the right limit of Canyon Creek on Don Loewen's claims.

## Geomorphology and the paystreak

The hypothesis of a right limit bench extending into upper Canyon Creek has persisted for some time, but has never been verified. The morphology of the valley, as visible from the headwaters, shows that Canyon Creek is offset to the eastern side of the valley and a broad gentle slope occurs on the western side (right limit, Fig. 1).



*Figure 1. View looking south down Canyon Creek from the Bonanza-Hunker Road. The broad gentle slope on the right hand side of the valley bottom was the target landform for prospecting a potential bench gravel.*

Benches or fluvial terraces are common landforms in the Klondike. The highest level bench is termed the White Channel Gravel and was deposited between 3 to 4 million years ago during the Pliocene. At the onset of continental glaciation 2.84 millions ago, the Yukon River was diverted into Alaska and resulted in fluvial down-cutting or erosion below the Pliocene base level. This down-cutting initiated erosion in all of the Yukon River's tributaries resulting in terrace development in many valleys. The process of incision to the modern creek level occurred gradually over the last 2.8 million years and in places, intermediate level terraces or benches also developed.

Confirmation of bench gravel is often hampered by variable thicknesses of frozen colluvium (slide rock) and muck (silt + organics). These deposits are a product of the cooler Pleistocene climate and tend to accumulate (and flow) on cold-aspect slopes (ie. east or north-facing). Their accumulation occurs gradually over time and results in stream channel migration toward the warmer aspect slopes where permafrost is less prevalent. This process of forced channel migration appears to have occurred in Canyon Creek and the modern channel eroded in a position offset to the left limit of the ancient Pliocene valley profile.

The position of the modern creek channel within the Pliocene valley is an important consideration for understanding placer gold reworking and the economics of potential bench ground. The majority of placer gold mined from modern creek channels in the Klondike was likely derived from reworking Pliocene (high-level) channels. If a modern creek channel eroded all or most of the Pliocene paystreak then very little gold would occur on the bench ground. Conversely, if the modern creek channel down-cut in a position marginal to the Pliocene paystreak then the bench ground becomes far more prospective. The challenge in realizing this prospectivity is we often don't understand the location, width and trajectory of the Pliocene paystreak. This is affected by two factors: gold sources and the geography of the valley. For Canyon Creek, the sources are *assumed* to be from fairly widespread quartz veins in the drainage. This would imply that neither limit would be preferentially enriched. The geographic curvature of the valley would also affect the ancient paystreak, whereby the paystreak should follow a more direct line within the middle of the Pliocene valley. The approximate location of the Pliocene paystreak is illustrated in figure 2.

Throughout the Klondike, intermediate or mid-level benches have been mined. The post-Pliocene down-cutting was a gradual process that resulted in one or more flights of terraces preserved between the high-level terrace and modern creek channel. Intermediate-level benches often have a thinner accumulation of gravel compared to the high-level benches. As a result, concentrations of placer gold can be higher in the intermediate deposits than in the high-level gravel, but only if the ancient paystreak was reworked or at least partially reworked.



*Figure 2. Hypothetical location of the Pliocene Canyon Creek paystreak (dashed line). Width of the paystreak is unknown.*

### **Exploration Program**

Over the last year, in order to confirm the presence of a bench deposit, Lory Cail excavated a number of test pits on the right limit of Canyon Creek. None of these test pits encountered a bench deposit and most were unable to excavate through overburden. Jeffrey Bond of the Yukon Geological Survey (YGS) agreed to assist Lory Cail in his exploration program by spending a day on the property evaluating additional test pit exposures in hopes that a bench deposit could be discovered. This gave the YGS an educational opportunity to confirm a geological theory based on the valleys morphology and it assisted Lory Cail with technical expertise. On September 10, 2018 a total of six test pits were excavated to an average depth of 8 to 10 feet. The first three pits did not break through the frozen overburden and were backfilled. The fourth pit was abandoned due to soft ground. The fifth pit encountered a thick deposit of thawed

strippings and was abandoned. The sixth and final pit was cited near the upper edge of the previous stripping disturbance on the Gary1 claim. At this location, 3 ft of thawed strippings was encountered, 2 ft of thawed undisturbed muck and 4 ft of frozen mixed muck and slide rock. At the 9 ft depth, a beige-coloured sandy gravel was discovered containing rounded cobbles and small boulders. The thickness of this unit was 2 ft and was underlain by a clay-rich unit containing some rounded gravel clasts. This lower unit is interpreted to be a mixed zone of decomposed bedrock and gravel. Lory excavated 1.5 ft into the lower unit before it was decided to extend the pit into a trench to evaluate the width of the bench gravel (Fig. 3, 4 and 5). One pan sample of the gravel was processed and contained approximately 7.5 mg of placer gold (1 piece) along with a significant amount of coarse heavy minerals.



*Figure 3. Discovery test pit showing gravel at the base below frozen muck. UTM coordinates: 596114 E, 7079906 N*



*Figure 4. Stratigraphic section of the discovery test pit.*

Stratigraphic section at discovery test pit located at upslope end of trench

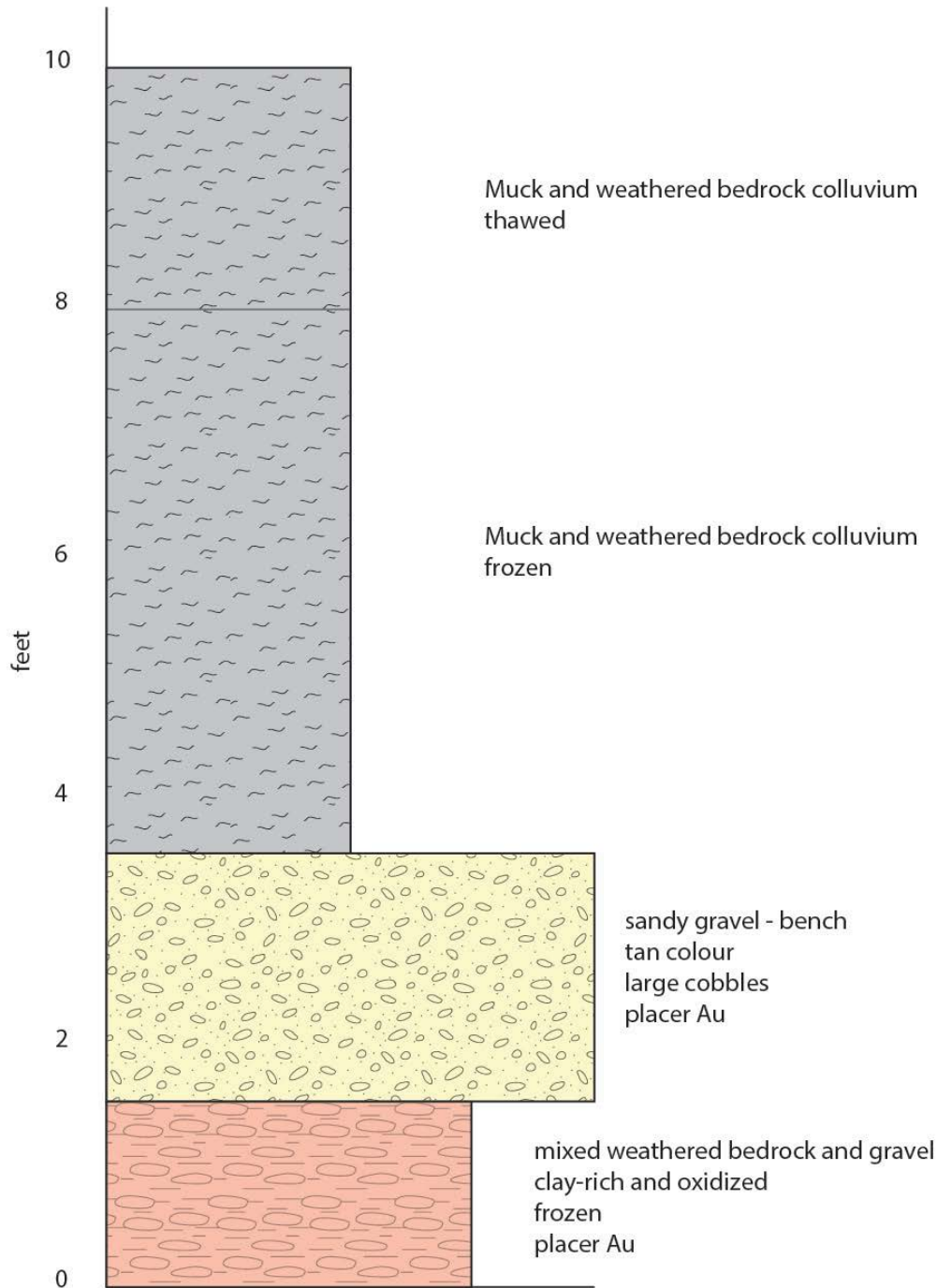


Figure 5. Stratigraphic section of the discovery bench test pit on Canyon Creek. The full thickness of the mixed-weathered bedrock and gravel has not been determined.

The stratigraphic information obtained from the test pit confirmed a relatively thin gravel unit. This thickness of gravel would suggest that an intermediate-level bench was discovered rather than a high-level, White Channel equivalent deposit. The intermediate-level bench gravel consists of sand and gravel with small boulder-size clasts present. Clasts tend to be subrounded to rounded in shape (Fig. 6). Larger boulders were discovered after the pit was extended into a trench.



*Figure 6. Stockpile of bench gravel derived from the discovery test pit.*

Once the discovery was made it was decided to extend the pit into a trench to locate the outer edge of the bench. Gravel tapered off after 60 ft and a low angle rim was encountered for an additional 60 ft. The rim material consisted of clayey decomposed bedrock and some rounded gravel clasts. Three boulders were encountered in a cluster on the rim, which may be associated with the paleo-paystreak. Gold colours were also derived from panning the low-angle bench rim surface. At the 120 ft length of the trench, the bedrock rim dropped off and the trench bottomed in frozen muck (Fig. 7 and 8).



*Figure 7. Completed trench looking downslope toward Canyon Creek. The far end of the trench bottoms on muck due to a drop in the bedrock surface.*

## Canyon Creek 2018 trench map

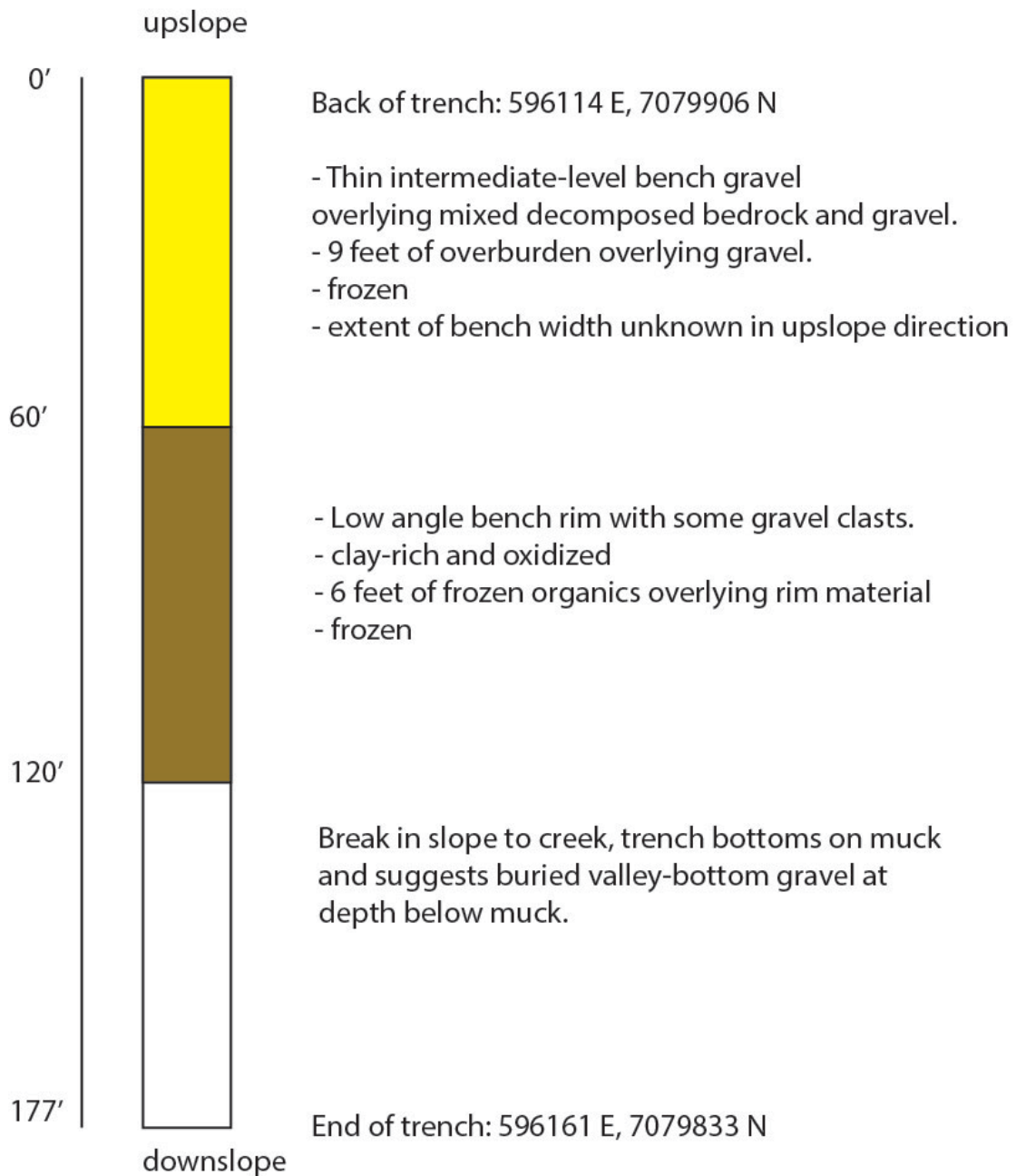


Figure 8. Plan view of the discovery trench with notes.

Subsequent to the initial panning, approximately 2 cubic yards of gravel was processed from the discovery zone. Approximately 1 gram of placer gold was recovered from the sample despite portions of the sample remaining frozen (Fig. 9, L. Cail, personal communication).



*Figure 9. Placer gold recovered from a 2 cubic yard test of the bench gravel (L. Cail photo).*

### **Implications of Discovery**

Identification of a bench gravel above the modern Canyon Creek channel represents a significant find for the claim owner. Mining in the modern Canyon Creek channel was nearing completion and new reserves were needed to keep the mine in production. The discovery of bench ground could substantially increase the amount of mineable ground on the property and warrants additional exploration to define its extent. Satellite images were evaluated to attempt mapping the extent of the bench. To the south on Schmidt Mining's claims, an intermediate-

level bench landform appears to have surface expression. Based on this expression, the approximate extent of the bench was mapped to include the discovery on D. Loewen's claims (Fig. 10 and 11). The total upstream and downstream extent of the bench is not mapped and therefore this is considered a minimum extent. It is highly likely that the intermediate-level bench extends for at least 1 km upstream from the discovery pit, however this will have to be determined through exploration and mining.

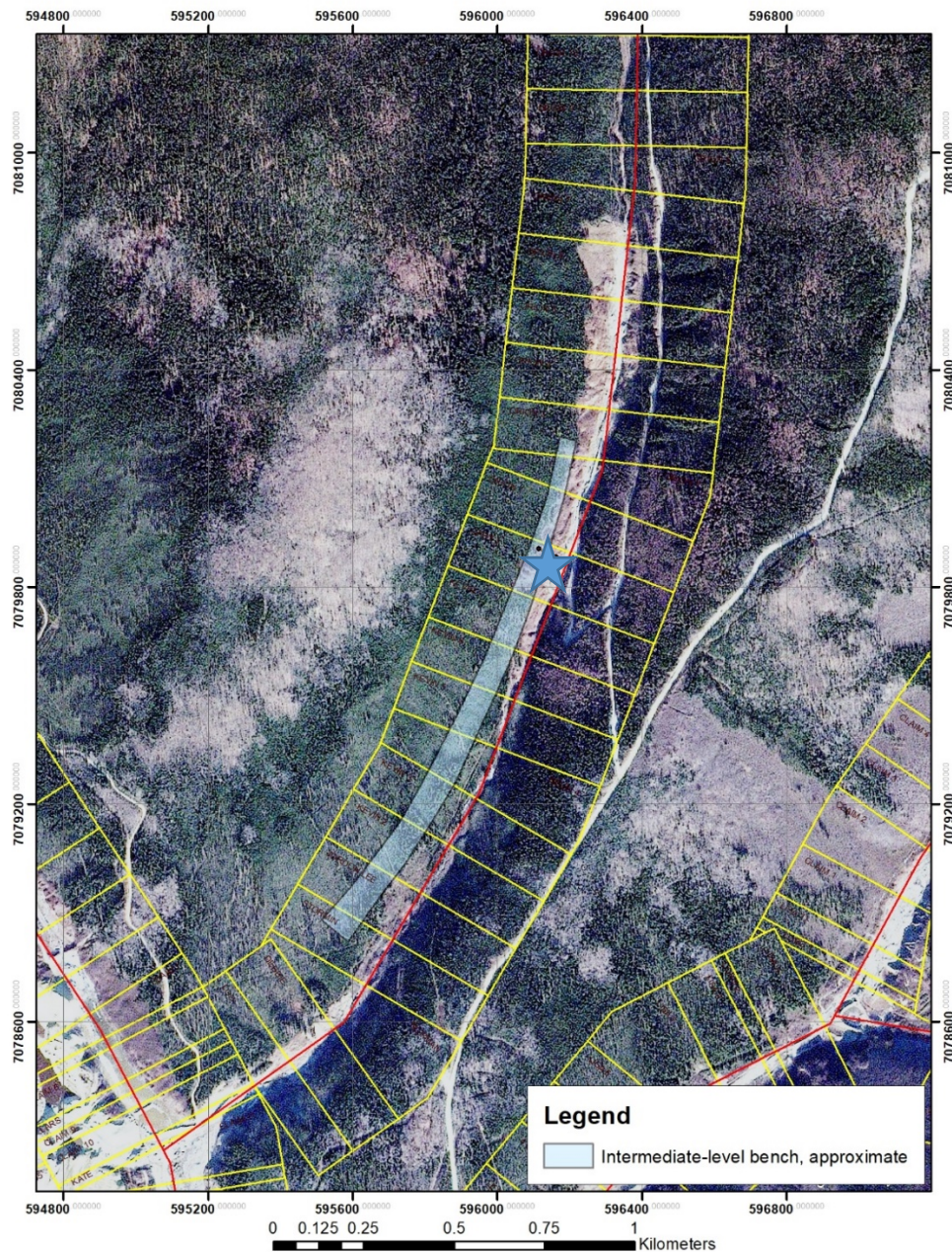


Figure 10. Minimum distribution of the intermediate-level bench in Canyon Creek. The discovery pit and trench is shown by the blue star. Satellite image is from 2017.

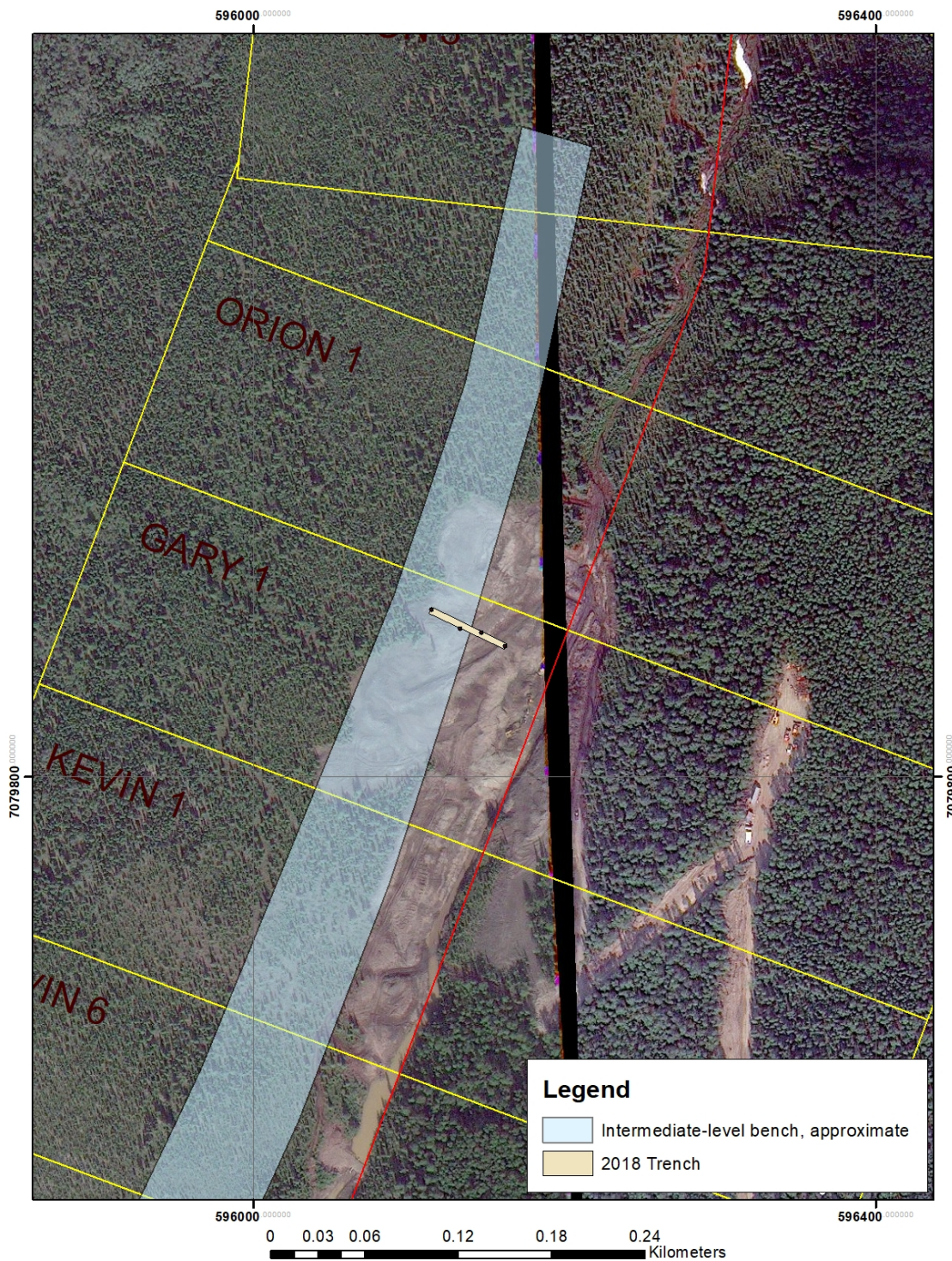
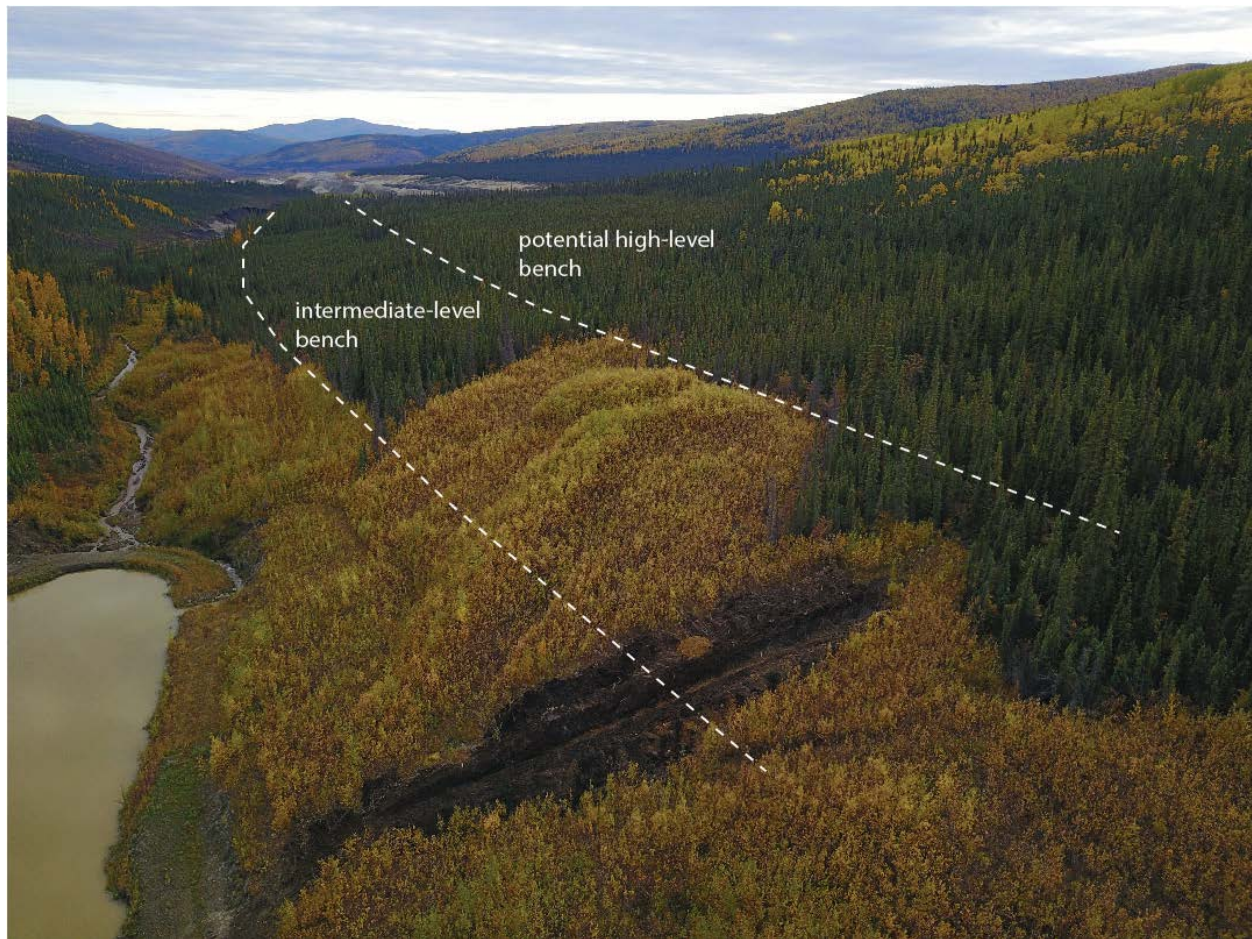


Figure 11. Location of the discovery trench relative to the approximate distribution of the intermediate-level bench. Satellite image is from 2012.

An additional perspective of the discovery was obtained through drone images. In a view looking downstream from the discovery trench the intermediate-level bench is more clearly present on Schmidt Mining's claims (Fig. 12 and 13).



*Figure 12. Drone image showing the discovery trench and view down Canyon Creek valley. In the distance the intermediate-level bench appears to have surface expression and is better defined.*



*Figure 13. View looking upstream with the discovery trench in the foreground. The intermediate-level bench will be partially overlain by modern strippings of muck. A high-level bench may be present further upslope but will have thicker overburden accumulation.*

An idealized cross-section of the valley was drawn to outline the new discovery and theorize about additional prospects (Fig. 14). These prospects include missed areas of valley bottom pay that remain against the right limit and the potential for a high-level bench gravel. By-passed valley bottom pay will be intermittent and only correspond where the bedrock rim swung in toward the hillside. One of these targets is likely present at the far end of the discovery trench, adjacent to the settling pond. Exploration for a high-level deposit could be completed through step-out drilling once the width of the intermediate-level bench is understood. Overburden thicknesses on the high-level bench will be thicker, however may be manageable near the outer rim of the landform.

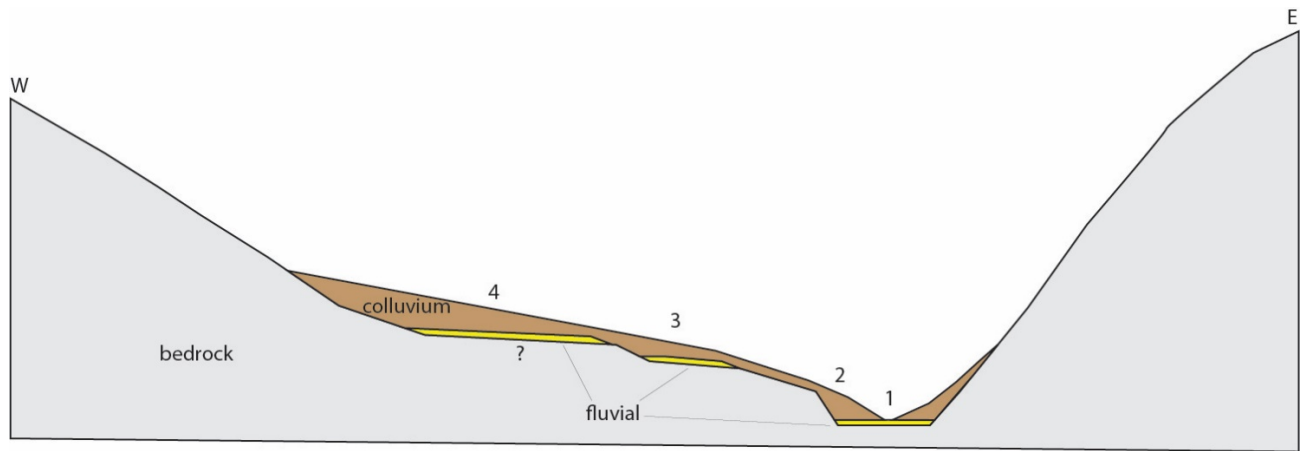


Figure 14. An idealized cross-section of Canyon Creek valley at the discovery trench (view upstream). The numbers refer to different targets in the valley. Target 1 is the modern creek channel, which has been largely mined out. Target 2 is valley bottom side pay located under thick deposits of muck. These targets will be intermittent and depend on the width of the modern valley bottom and thoroughness of previous mining. Target 3 is the intermediate-level bench gravel and associated low-angle bedrock rim surface. Target 4 is the unconfirmed high-level Pliocene gravel under thicker colluvium.

## Conclusion

Discovery of a placer gold-bearing bench gravel on the middle reaches Canyon Creek provides confirmation that the low angle western slope of the valley is at least partially underlain by a stream-cut bench. The width of the bench is a minimum of 60 ft in the discovery trench and is open in the upslope direction. In addition, the associated low angle rim surface has been confirmed to contain placer gold, which extends the potential width an additional 60 ft. The overall length of the bench has not been determined but appears to have surface expression to the south on Schmidt Mining's claims. There is a high probability the bench will extend upstream given the low angle western slope is clearly visible from the headwaters of the drainage. Future exploration should focus on drilling, test pitting and bulk sampling to delineate the relatively shallow landform and determine its economic potential.