Seattle Public Utilities

# Taylor Creek Restoration Project

**Frequently Asked Questions | October 2022**

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## 1. ABOUT TAYLOR CREEK AND DEAD HORSE CANYON

### 1.1. How was Taylor Creek formed?

Taylor Creek is a naturally formed historic creek in one of South Seattle's drainage pathways. Logs that fell into the creek would help to reduce erosion, maintaining a healthy ecosystem in the creek. Human impacts such as logging, urban development, and runoff caused the creek to become steeper, with faster flows. This, in turn, causes more erosion because faster water can erode material, including large rocks, quickly.

### 1.2. How did settlement impact Dead Horse Canyon?

In the 1880's the name of the creek was changed from Harpers Creek to Taylor Creek when Taylor's Mill relocated from Leschi to the mouth of the creek on the shores of Lake Washington. With early settlement came the need for lumber, and most of the forest in Southeast Seattle was logged in the early 1900's, including most of the trees in Dead Horse Canyon. This extensive logging was the primary factor in removal of wood that could contribute to natural woody debris falling into the creek. With fewer trees available to fall into the creek naturally, the creek continued its trajectory towards higher erosion. There are significantly fewer trees on the east slope of the ravine. There have been many landslides that have removed trees and contributed to oversteepening of this slope.

### 1.3. How has the City of Seattle impacted Dead Horse Canyon?

The property was annexed to the City of Seattle, and Seattle Parks and Recreation (SPR) assumed ownership. An existing King County sewer treatment plant and all sewer lines within the canyon were transferred to Seattle Public Utilities. By the late 1990s, a sewer line buried along the east canyon wall had been impacted by repeated landslides, so SPU relocated it to the west canyon wall, which was less steep. The new sewer line was meant to be directionally drilled down the slope, which would not have required much excavation. However, problems with access, topography and geology prevented the drilled pipe from being installed. SPU was forced to excavate a trench to lay the sewer line. This sewer line collects sewage and drainage from the backyards of houses on 71st Pl S and routes it through the canyon, where it connects to a sewer in Holyoke Way S and continues to a combined King County sewer line. As concession for allowing the sewer line to be relocated, SPR required SPU to build a trail over the sewer line so that parks users could better access the upper watershed. The Dead Horse Canyon trail was built in 1997. SPU also installed two bridges that the sewer line is suspended under (one across the main channel, and one that crosses two drainage ditches). SPR maintains the surface features of the bridge and SPU is responsible for the bridge foundations.

### 1.4. When did SPU's Restoration Project start? How did the project change over time?

The restoration project started more than a decade ago prompted by repeated flooding events around the Rainier Ave S. roadway culvert. The creek, which had become channelized due to extensive development along its lower banks, was experiencing frequent flooding events that impacted neighboring properties. SPU purchased five properties along the lower channel and around Rainier Ave S. to complete culvert replacement and creek restoration. Initially, the project was focused on replacing the Rainier Ave S culvert and restoring channel downstream of the culvert to the shoreline. A sediment pond was to be installed upstream of the culvert to deal with the sediment coming down from the canyon, which we thought was about 200 cubic yards per year (about 14 dump truck loads). As SPU designed the project, we realized that by not addressing the source of the problem, we were not ensuring the project would have a successful outcome long term. There are a lot of other problems in the watershed that need to be addressed including landslides, erosion, sediment deposition, fish passage, and habitat degradation. We realized this was an opportunity for the City to fix some of these problems and take a more holistic

watershed restoration approach. SPU identified erosion in Dead Horse Canyon as a result of, and contributor to landslide activity and the significant sediment load being delivered to the culvert and delta. We now know there are about 600 cubic yards of sediment coming down the canyon in Taylor Creek each year; this is the equivalent of about 42 dump truck loads! SPU's project team concluded that if the erosion and sediment issue is not addressed, work in the lower channel could be quickly ruined. Therefore, in 2020, SPU expanded the project area to include Dead Horse canyon/Lakeridge Park to develop and implement a long-term sediment management solution.

### 1.5. What issues does the project aim to address?

The project aims to address issues in the Taylor Creek watershed that are caused by urban development with an emphasis on fish passage, habitat restoration, sediment deposition and erosion. Nearly all the shoreline, floodplain, wetland, and creek channel habitat in the lower channel has been lost due to development. Fish passage barriers prevent salmon from migrating upstream. During large storm events, water stays in the deep channel, it is no longer able to reach the former floodplain areas and soak slowly into the ground due to urban development. Instead, rain events result in more runoff entering the creek, causing erosion. In the canyon, stormwater outfalls, and drainage running off impermeable surfaces (roads, driveways, and roofs) around the top of the canyon further add to increased stormwater flow and erosion. This erosion and the sediment it produces causes landslides and flooding, and will continue to reduce habitat quality along the entire stream if left unchecked.

### 1.6. What other agencies and departments are involved in this project? Where is the funding coming from?

This project is primarily funded by SPU drainage and wastewater rates and SPU is the lead agency for this project. SPU has partnered with Parks to understand and implement requirements around greenspace management for the portion of project work that is on Seattle Parks and Recreation's (SPR) property, Lakeridge Park (Dead Horse Canyon). Together, SPR and SPU are making decisions about the project, considering feedback from the community, private and public property owners, and other stakeholders like King County and regulatory agencies responsible for issuing project permits such as the United States Army Corps of Engineers and the Washington Department of Fish and Wildlife, among many others; and grant funding agencies who review the project designs.

This project has received funding from the King County Flood Control District's Cooperative Watershed Management Grant Program, the Washington Salmon Recovery Funding Board, and Puget Sound Acquisition and Restoration.

### 1.7. What would happen if we did nothing?

A "do nothing" scenario would be detrimental to the long-term health of the watershed. Without restoration, erosion of the canyon caused by development, runoff, and more frequent storm events due to climate change will result in tons (literally) of sediment being delivered to the mouth of the creek, or delta at Lake Washington. The sediment coming downstream could block the channel and the Rainier Ave. S culvert and cause flooding that impacts homeowners, businesses, pedestrians, and traffic. As the sediment accumulates at the mouth of the creek it will block salmon from entering the stream. Erosion is an exponential process: it will continue creating a steeper slope and faster moving water which results in even more erosion, including additional landslides and the loss of more trees and habitat. We could slow and even stop this erosion and damage to the downstream channel and delta and to prevent flooding by installing large woody materials in the canyon.

*Read on to understand the elements and goals of the restoration and the design options for installing large woody materials in the creek.*

## 2. REDUCING EROSION AND MANAGING SEDIMENT

*This project aims to install large woody materials to reduce erosion, manage sediment, and reconnect the creek to the floodplain.*

### 2.1. Why is so much sediment being washed out of Taylor Creek?

As landslides occur, they deliver sediment to the stream channel. Then, during high flows from big storm events, this sediment is transported downstream. High stream flows also erode the creek channel and transport material downstream; this creates more instability throughout the canyon and reduces valuable habitat within and around the creek.

### 2.2. What impact does sediment have in the creek and downstream?

Downstream of Lakeridge Park, the creek is highly channelized due to development; this acts like a chute, delivering material farther downstream than it normally would be carried. Sediment can get stuck at a bend or a driveway culvert and quickly build up, leading to flooding that causes property damage. Near the shoreline, sediment settles out in the downstream areas and on the delta where the slope is less steep and the water velocity slows. The delta already is armored with large sediment that is unable to be moved by regular wave action and at times prevents salmon from accessing the mouth of the channel; this will continue to occur, eventually blocking salmon from the creek entirely, without restoration.

### 2.3. How do large woody materials work to reduce erosion and manage sediment?

Large Woody Material (LWM, also referred to as large woody debris) are trees, branches, limbs, and logs that are located within a creek or riverine corridor that have been left there naturally by flooding, landslides, or simply dying and falling into the creek. LWM is the historical framework of streams in Western Washington, but logging and other human impacts have often removed them. Restoration of instream LWM has therefore become a common restoration practice in Washington State and throughout the Pacific Northwest. Restorative LWM often includes additional measures to control erosion and support surrounding banks such as timbers anchored along slopes (called timber frames for this project) and revegetating the banks to provide soil stability through root support. The LWM provides natural streambank stability and habitat cover, and traps sediment, which helps the water slow down, form natural pools and maintains a healthy creek bed. A healthy creek bed is one that has a variety of gravel and sand sizes that provides habitat for fish and other water animals and organisms.

### 2.4. What are the sediment management options SPU is considering for this project?

Option 1 features larger woody materials (think huge logs) that would be anchored in the banks, because it would be placed by machines. This means it would be more effective for a longer period of time. It would also require less maintenance construction over time, which means fewer disturbances to the community and creek bed. It would require a temporary access road but would also feature an improved trail after construction. It is a “one and done” investment and was the preferred option because it would capture the greatest amount of sediment and the structures would be the most sustainable over time. Find out more here.

Option 2 utilizes smaller woody materials because they would need to be transported and installed in the creek by hand. They would not be anchored as well without the machinery, which means they would move over time and would not be very effective at managing sediment and erosion. To fix the movements, construction crews would need to regularly access the creek to perform maintenance, which would make this option the most expensive over time. It would not require an access road, but would also not have an improved trail. Find out more here.

Option 3 is a combination – machine placed LWM would be used in the lower half of the canyon where erosion is the worst, while hand placed would be used in the upper half. Therefore, the pros and cons of option 1 would be realized in the lower half, while those for Option 2 would be realized in the upper half. Find out more here.

### 2.5. Why does raising the creek bed matter?

When the creek bed begins to rise due to sediments and gravel being deposited along the bottom, it reduces the slope of the creek. In turn, this lowers the flow velocity and the erosion power of the water as the creek channel becomes wider. The reduced steepness of the channel also supports the creek banks, reducing landslides and allowing vegetation to grow. Slowing and widening the creek will allow for meandering that creates a diverse and healthy habitat in the channel and surrounding banks.

### 2.6. Why does reconnecting the floodplain matter? Will it increase flooding in the community?

A floodplain is a normally dry (can be wetland) area adjacent a watercourse that is periodically inundated with water during times of higher flows. When a creek is connected to its floodplain, high water flows can enter the floodplain and spread out, slowing flow and creating temporary storage. This is all water that is prevented from flowing downstream and creating flooding hazards. By having a designated natural space for excess water, floods in the community are reduced.

### 2.7. What are timber frames and micropiles? How would they stabilize the canyon walls?

For this project, timber frames would be placed around the sides of LWM to ensure the water doesn't create a flow path around the LWM, while at the same time supporting the overly steep banks. The timber frames would act as a crib wall to stabilize the slopes at the base. SPU would place vegetation inside the timber frames to further stabilize the banks.

Micropiles are small diameter steel poles that are pushed or vibrated into the ground surface. After they are installed, they are invisible in the soil. When many micropiles are placed in a line, this creates a "wall" underground. The "wall" extends through many soil layers and provides stability that prevents the upper layers of soils from continuing to move.

## 3. IMPROVING INFRASTRUCTURE

*This project would tightline drainage outfalls, improve sewer access, and replace the aging culvert under Rainier Ave. S.*

### 3.1. What is a drainage outfall? What does it mean to "tightline" one of them?

A drainage outfall is a pipe that collects stormwater from neighborhoods. With this project, SPU aims to improve two drainage outfalls that currently discharge water directly onto the steep slope at the top of the east side of the canyon. This water erodes the canyon and contributes to the sediment coming down Taylor Creek; it also contributes to slope de-stabilization and landslides.

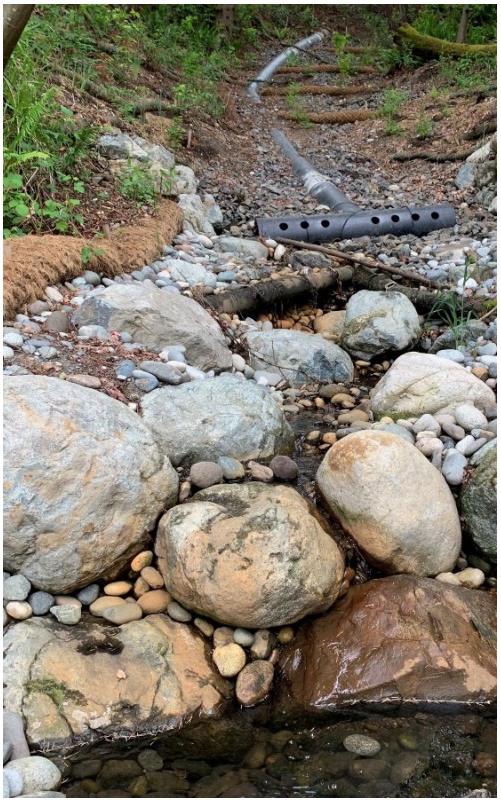
Here is a picture of one of the outfalls we plan to work on:

Water flows out the end of the pipe and drops onto the side of the canyon below. This causes significant erosion. SPU will "tightline" two drainage outfalls to prevent further erosion of the canyon while still delivering the water to the creek. Tightlines are essentially pipes placed on the ground surface that connect to a pipe exiting from underground such as an outfall.

This is an example of a "tightlined" pipe that continues to allow drainage to reach the creek without causing uncontrolled erosion of the hillslope. Water exits the pipe through a dissipation tee, which slows down the velocity of the water before it exits the pipe and is then allowed to flow overland a short distance to the waterbody.

**3.2. Why does the culvert need to be replaced?**

The culvert is old and deteriorating. It is undersized for current and future creek flows. The pipe is too small for fish passage, and too small to pass the large amount of sediment that comes down from the canyon; it often is blocked with sediment during storm events, leading to local flooding. When the City replaces culverts, the design of the new culverts must meet fish passage design requirements and be large enough for the increased rainfall we expect in the future due to climate change. These requirements ensure that the culvert will be resilient to future conditions and has a minimal impact on the creek habitat. The Rainier Ave S culvert will be replaced with a 17-foot-wide bridge structure with an opening underneath of about 6 feet tall. The creek will meander through the culvert as flows make their way towards Lake Washington.



**3.3. What sewer improvements does SPU want to make?**

The sewer under the existing trail is very hard to perform maintenance on. Depending on the option chosen, this project could improve sewer access via new maintenance holes at several points so that SPU can ensure that the sewer is in good condition and reduce risks of pollution in Taylor Creek.

## 4. RESTORING THE ECOSYSTEM FOR CLIMATE RESILIENCY

*This project aims to restore the overall ecosystem for the Taylor Creek watershed while making it more resilient to climate change.*

### 4.1. What are the goals of this project for wildlife and the broader ecosystem?

This restoration project has taken a holistic approach to the aspects of the ecosystem with an emphasis on the exponential effects of erosion caused by the lack of large woody materials in the creek. The sediment washing downstream due to current erosion conditions has caused local flooding and blocks salmon from migrating upstream. Erosion also causes landslides, which cause a loss of vegetation and habitat. The project team is also looking at ways to minimize impacts to trees and wildlife while still getting the maximum benefit of large wood and sediment retention in the creek. We are contracting with a third-party arborist to evaluate the health and condition of the existing canopy, soil and vegetation in the area of construction impacts. That information will be used to evaluate impacts from the sediment management options. By implementing a long-term erosion solution in the canyon, coupled with new shoreline habitat and a floodplain, the overall ecosystem would perform more naturally, become more stable in storm events, be more resilient to climate change, and would provide better habitat for vegetation and animals.

### 4.2. Why is salmon habitat such a big deal? What about habitat for other animals?

Salmon are an icon of the Pacific Northwest, and their health is an indicator of the overall health of our watersheds. They are culturally and spiritually important for local Tribes, provide a necessary food source for orcas and other mammals, and are essential to the riverine biological ecosystem. Migrating fish have been blocked from most of the habitat in the watershed, and the limited habitat available in the lower creek channel was of poor quality. Addressing the habitat needs of salmon would also address watershed-wide habitat issues that would help other animals in the long run, including by increasing climate resiliency.

### 4.3. How do the LWM structures and new culverts help with salmon habitat?

The project will reconnect and enhance the creek mouth and restore shallow water rearing and refuge habitat for endangered chinook salmon. The new culvert will allow salmon to migrate further upstream. The LWM structures would directly provide habitat cover, while the effects of slowing and widening the channel would make migration easier.

## 5. PROVIDING PUBLIC ACCESS, ART, AND EDUCATIONAL OPPORTUNITIES

*This project will increase the amount of publicly accessible green space in Southeast Seattle and will provide new educational opportunities and public art for the community.*

### 5.1. Will the public be able to access the new shoreline habitat area and lake?

Yes! This project will provide shoreline access for an area within the south Seattle community that has very few options for shoreline access. This will include a walking path along the newly restored creek that goes out to the shoreline.

### 5.2. Will the Lakeridge Park/Dead Horse Canyon trail be improved?

This will depend on the sediment management strategy that is chosen, described in the next section. If Option 1 Machine-placed LWM is chosen, a temporary construction road would be built. After removal, the trail would be re-

graveled and any existing steps that are impacted would be replaced. If Option 2 Hand-placed LWM is chosen, a road would not be needed, so no trail improvements would be completed. If Option 3 Hybrid placement LWM is chosen, a construction road would be needed for approximately half of the canyon, so the trail there would be re-graveled, and any existing steps that are impacted would be replaced. For more explanation, please read the following section.

### 5.3. Who is the artist and how were they chosen?

Olalekan Jeyifous was chosen to design community art for the project through a competitive process led by the Office of Arts and Culture in partnership with the Public Arts Advisory Committee.

### 5.4. What types of interpretive signage are you planning and why?

We're planning on installing interpretive signage at the downstream overlook and within Lakeridge Park to provide more information to visitors about the site. Signs are a great way to point out specific features of a site and provide detailed information about those features and how they interact with the surrounding area. SPU is engaging the community this summer and fall via online surveys and in-person events to understand what they would like the interpretive signage to focus on.

## 6. I'M CONCERNED ABOUT…

### 6.1. Why does Option 1 require SPU to build a road and remove trees?

To deliver and install the size and amount of large wood that is part of the Option 1 design, it would need to be done by machines (construction equipment). The team would use the smallest machines possible to complete the work. These machines need a safe way to access the canyon; this would be via a temporary construction access road. The Park would be closed for approximately 4 months per year (approximately May through September, year 1 and July through October, year 2) for two years to accommodate road building, installation of structures, and removal of the road.

### 6.2. How would the road be created and removed?

Fill would be brought in and a mechanically stabilized earth (MSE) wall would be built mostly on the trail and downslope side of the trail. The access road was designed to minimize destabilizing excavation activities in the park.

### 6.3. What impact would the road have on habitat, shade, and community access? How would SPU mitigate these impacts?

SPU and its consultants are developing a Vegetation Restoration, Mitigation and Monitoring Plan which will outline impacts and mitigation measures; this document is not expected until late this fall. In this document, shade and habitat issues will be addressed and SPU will seek to mitigate impacts as much as possible.

### 6.4. Can you consider using animals to bring in the large woody materials instead?

SPU has looked at several alternate delivery options including animals, helicopters, and cable lines. Each method has tradeoffs in what can be achieved and the requirements to perform each. Animals could be used instead of machines to deliver materials, but they only offer delivery benefits. In other words, animals could *deliver* the materials but could not *place* them. Placement would still need to be done by human hands, so the size of logs and ability to anchor them would be limited. However, SPU is working with SPR and local community group, Friends of Dead Horse Canyon to evaluate whether animal assistance could be useful.

**6.5. Why can't hand-placed structures be made more effective?**

Hand placed structures are smaller by nature and therefore not as effective in capturing sediment and reducing erosional processes long term. They also cannot be anchored as securely by hand as they can by machines, so there is the potential for them to be moved during big storm events.

**6.6. How do you know that LWM would be effective? Have similar projects been done in the Seattle area?**

LWM is a common method of creek restoration in Western Washington and is supported by Washington State Department of Transportation for improving stability in riverine corridors (i.e. State roads that run along or over creeks and rivers). In Seattle, several stream restoration projects have been completed by SPU over the past decade including our Kingfisher Floodplain and Thornton Creek Confluence Restoration, as well as several along the shore of Lake Washington: Mapes creek restoration, Chinook Beach, Pritchard Beach, Martha Washington Park and Seward Park. While these are channel restoration sites that may have involved a culvert replacement and shoreline and habitat/channel restoration, Taylor Creek is a unique opportunity for investment in the intact headwater wetland, extensive watershed, and ravine that is an existing Parks owned property. None of the other projects have similar geography to Taylor Creek. Our consultant team has completed a site in Puyallup that is very similar in geography: Clark's Creek. This creek in a ravine underwent restoration with large woody materials in 2018 and has been performing extremely well.

**6.7. What wildlife lives in the Taylor Creek ecosystem? Which ones are endangered? How will you ensure impacts to them are limited?**

There are many creatures that call Dead Horse Canyon home, including squirrels, chipmunks, coyote, bats, and numerous birds including Pileated Woodpeckers and Cooper's Hawks. There are no known Federal or State designated vulnerable or endangered species living in Dead Horse Canyon.

All of our work is coordinated with and permitted by the United States Army Corps of Engineers and WA Dept of Fish and Wildlife. Our permitting applications will review/include Federally listed species and critical habitat in the watershed that could be impacted by the work. Regulatory agencies, via the permitting process, balance the requirements for construction that would impact other species and habitat. Our permitting process will start when an option on sediment management is chosen; then we can describe the details and impacts of the work so the agencies can evaluate and dictate permit requirements. The permit documents also have a public comment period.

**6.8. What impacts will adjacent property owners experience? Is there a risk of landslides?**

Property owners would experience construction noise during the work. No other impacts are expected. Homeowners whose properties overlap the project work area will be contacted about proposed work on their property.

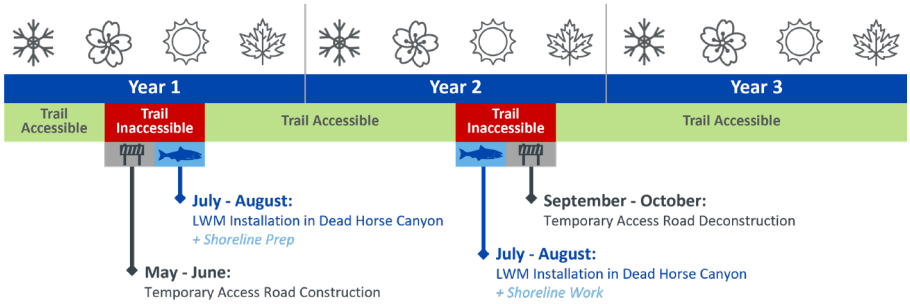
**6.9. Will the community be able to access the park during construction or in the off months?**

During the 4-month construction period for options 1 and 3, Dead Horse Canyon would not be accessible. It would be open during the off months. It would not be closed in Option 2, although there would be impacts to people using the trail as construction workers would use it as well. Please see the timelines at right.

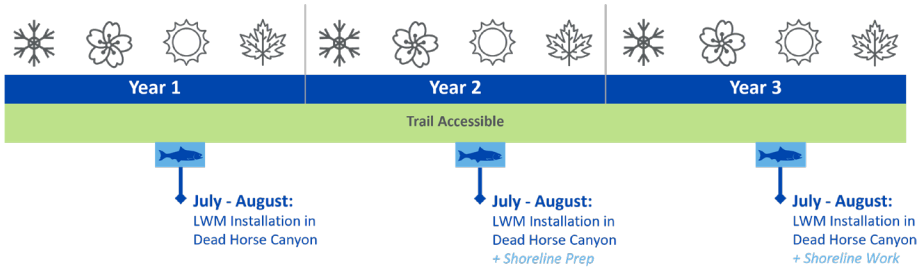
### 6.10. Survey Tag on Trees

You may have seen small metal tags on trees throughout the canyon. A tag on a tree does not mean it would be removed if a temporary access road is constructed. These are survey markers giving an ID number to each tree that has been georeferenced. Some have been there for several years, some are new. The work in the canyon has been added in phases and with each new area that is added, additional landscape and trees are surveyed. For example, in 2016, we surveyed trees around the west slope landslide. In 2020 we surveyed trees within a 50 ft buffer from the creek, and in 2021 we surveyed trees within a 50ft buffer from the location of a potential access road (Options 1 & 3). SPU only surveyed and tagged trees that are > 6-inches in diameter. Smaller trees are being logged now and will be added to the survey in the coming months.

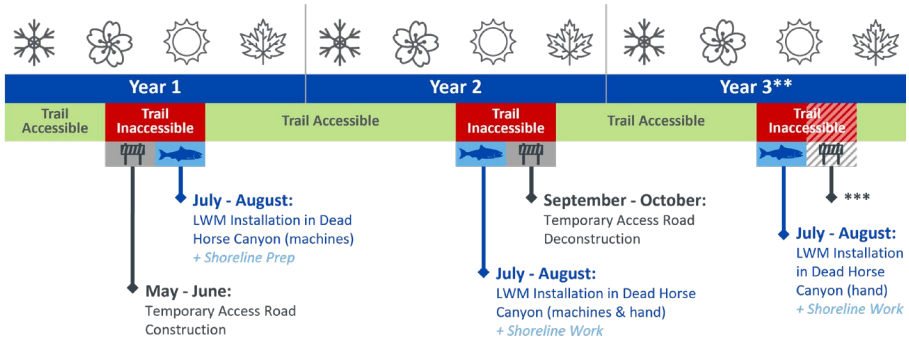
**Option 1: Machine Placed LWM in Dead Horse Canyon Work (estimated)**




**Option 2: Hand Placed LWM in Dead Horse Canyon Work (estimated)**




**Option 3: Hybrid Machine & Hand Placed LWM in Dead Horse Canyon Work (estimated*)**




* The temporary access road would only be built half-way up the canyon, this road would still be used to facilitate materials delivery to the upper watershed for the hand placed structures.

** This work could extend into year 3.

*** Depending on whether this work extends into year 3, the Temporary Access Road Deconstruction may occur during September – October of Year 3.