

# Silvertip Ranch Wetland Restoration Project

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**PREPARED FOR:**

Fish and Wildlife Compensation Program

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## Executive Summary

The Nature Trust of British Columbia (NTBC) and its partners planned and implemented a stream and wetland restoration project at its Silvertip Ranch Conservation Property, in an effort to reverse the loss of a productive stream and wetland complex.

Located approximately 7 kilometres east of the community of Bull River, the property possesses a mosaic of habitat types that provide important wildlife habitat and biodiversity values.

Douglas Creek bisect the property, an ephemeral creek that has been moved 2-3 times since European settlement for agricultural productivity. Prior to the restoration project, the creek was confined to a metal flume and a series of eroding ditches, with impaired ecological health and function. It is believed that a series of wet meadows and ephemeral wetlands would have been historically connected to Douglas Creek but, were lost decades ago to a hay field.

The restoration project took place in October and November 2018, after almost two years of planning and preparation, supported by a number of funding partners, consultants and contractors.

The project aimed to restore a naturally appearing and functioning creek channel, floodplain, wet meadow and ephemeral wetland complex along a length of Douglas Creek. By doing so, the project would: increase and improve stream and wetland habitat in the area, increase biodiversity, protect and manage ecosystems and species-at-risk, improve water filtration and groundwater recharge, enhance ecosystem health and function, increase social connection to the natural world as well as, support of conservation efforts.

The project was aligned with two FWCP Action Plans for the Columbia Basin. The project linked to The Riparian and Wetlands Action Plan, specifically habitat-based actions related to Action 12 to restore and create wetland and riparian habitat. While not a major component of the project, it also linked to the Species of Interest Action Plan, and habitat actions specific to the American Badger. Soil overburden and disturbance on upland areas associated with the project was placed in a 'rough and loose' manner in an effort to support Columbia ground squirrel colonies, a key prey species for badgers.

By using heavy equipment, 564 metres of Douglas Creek was restored with a creek channel and floodplain that averaged 10 metres across, having gradual slopes that should produce over 5,000 square metres of wet meadow habitat. In addition, 14 ephemeral wetland basins of varying sizes and depths connected to the floodplain were restored, totaling over 2,500 square metres. The project also included the removal and rehabilitation of a 24-metre metal flume and the disabling and rehabilitation of over 700 metres of narrow ditches. Over 2,000 square metres of upland soils disturbed from the project were manipulated to loosen soils to encourage Columbia ground squirrel and American badger use. A nearby borrow pit of 61

square metres was restored and culverts were cleaned out as part of the project. Invasive plant management and seeding and mulching disturbed areas were critical components that followed the earthworks.

Planning and implementation by experienced consultants and contractors is expected to produce a project result that meets the goals and objectives identified in the prescription, while also meeting the habitat based actions in FWCP's Riparian and Wetlands and Species of Interest Action Plans. However, regular and ongoing monitoring by NTBC and its partners over several years will be necessary in order to make this determination.

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## 1. Introduction

Wetlands function as critical habitats, possessing high biodiversity values and contributing essential ecological goods and services. Action is required to offset the rapid loss and alteration that healthy, function wetland ecosystems are facing. In some regions of British Columbia, up to 85% of wetlands have been lost through various land use activities (Source: BC Government) and the Kootenay region is no different.

The Nature Trust of British Columbia (NTBC) acquired the Silvertip Ranch Conservation Property in 2011, in large part for the protection of its ephemeral water, forest and grassland ecosystems in the Bull River area, an important valley for wildlife populations. According to the former ranch owners, one of its water features - Douglas Creek has been altered two to three times since the land was broke for agriculture, over 100 years ago.

The ephemeral creek and its associated wetland complex were removed to make way for a four-hectare hayfield, with the water diverted through a series of ditches and a metal flume. In the lower reaches of the property, the watercourse was totally altered, causing erosion and confining the surface and subsurface water regime to a narrow band. Historically a shallow valley containing a diversity of wetlands would have existed.

In 2016, a Management Direction Plan for the Silvertip Ranch Conservation Property was completed. The plan identified a series of management actions for the property, including the exploration and possible implementation of a stream and wetland restoration project along Douglas Creek. The concept was one that NTBC and the former owners/life estate tenants had previously discussed and its inclusion in the management plan was the genesis for the restoration project. In 2016 and 2017, consultants were hired to determine the feasibility of a restoration project and, then developed a detailed prescription and budget.

Next, NTBC secured the requisite funding, permitting and contractors to undertake the project. Fall 2018 was selected as the ideal work window for the project. Now complete, the project will restore Douglas Creek and its wetland complex to a healthy and functioning ecosystem, reminiscent of its past condition. Doing so is expected to reverse the loss and conversion of wetland habitat experienced at this site. Once the site has been re-naturalized, it is expected to increase biodiversity values and restore critical habitat for species of conservation concern, and may others. The project is also anticipated to restore vital ecosystem functions such as water filtration and groundwater recharge. Finally, the project hoped to achieve social benefits including an increase of connection to the natural world as well as, support of conservation efforts.

The following report seeks to provide the Fish and Wildlife Compensation Program, as a major funder of the project, a detailed description and analysis of the completed project.

## **2. Goals & Objectives & Linkage of FWCP Action Plans and specific Action(s)**

The Silvertip Ranch Wetland Restoration Project had the following goals, as identified in the prescriptive plan and contained with NTBC's application to FWCP:

1. Increased and improved wetland habitat;
2. Increased biodiversity;
3. Protection and management of ecosystems and Species-at-Risk;
4. Improved water filtration and groundwater recharge;
5. Biological integrity and ecosystem health and function;
6. Social/human connection to the natural world and support of conservation efforts.

Accordingly, the objectives necessary to support the broad goals listed above, included:

1. Restoration of a naturally appearing and functioning wet meadow and ephemeral wetland complex along a section of Douglas Creek, within an established conservation property;
2. Restoration of a section of Douglas Creek that was diverted 2-3 times over time, channeled and placed in a flume, negatively influencing its health and function;
3. Increased habitat diversity and attributes on the landscape, through enhancement of a stream and a wet meadow and ephemeral wetland complex.
4. Prolonged hydro periods of the Douglas Creek system and the resultant ecosystem goods and services benefits;
3. Improved habitat for listed species including American Badger, Grizzly Bear, Long Billed Curlew and Western Toad, among others;
4. Improved habitat for elk, white tailed deer, mule deer, wild turkey, shorebirds and amphibians;
5. Increased wildlife viewing and hunting opportunities.

The project aligns with two FWCP Columbia Region Action Plans: i) Riparian and Wetlands Action Plan and, ii) Species of Interest Action Plan.

Under the Riparian and Wetlands Action Plan, this project sought to address Action 12 which is to *"Restore and create wetland and riparian area habitat in this focal area, where feasible to address impacted, degraded or lost habitat (including but not limited to gravel pits where they exist on the floodplain, oxbows and side channels) - P1"*. Specifically, the project aimed to restore Douglas Creek and its wetland complex to a healthy and functioning ecosystem reminiscent of its past condition.

Meanwhile, the project also addressed the Species of Interest plan, specific to the habitat actions for American Badger by “*Restoring dry forest and grassland to improve conditions for Columbia ground squirrels, the main prey species for badger – P2*”. Soil overburden and disturbance from the project was piled using a ‘rough and loose’ technique on adjacent upland areas. This is thought to stimulate Columbia Ground Squirrel colonies that have difficulty burrowing into compacted soils. While it was not a primary objective in the project, it was certainly considered in project design and implementation.

### **3. Study Area**

NTBC’s Silvertip Ranch Conservation Property is located in the East Kootenay Region of British Columbia, approximately 6.7 km east of the community of Bull River, along the Bull River Forest Service Road, with a civic address of 2551 Bull River Road. The approximate center of project area is located at 49°29’22.50” N 115°21’31.86” W.

The Nature Trust of British Columbia purchased the 137.66-hectare property in 2011 as a property that contains remnant grasslands and provides important ungulate winter range in a valley with high wildlife populations. The property also contains a mosaic of agricultural fields, dry forests, wetlands, an ephemeral lake and creek that provide important biodiversity values. The property was purchased with a life estate agreement, allowing the Logan-Allen Family, as former owners to continue to live on-site and carry out a small organic beef ranching operation.

A map shown in Figure 1 depicts Silvertip Ranch Conservation Property and its boundaries. The restoration project took place within the northwest portion of the property, along the edge of a hayfield that is clearly visible next to the road.



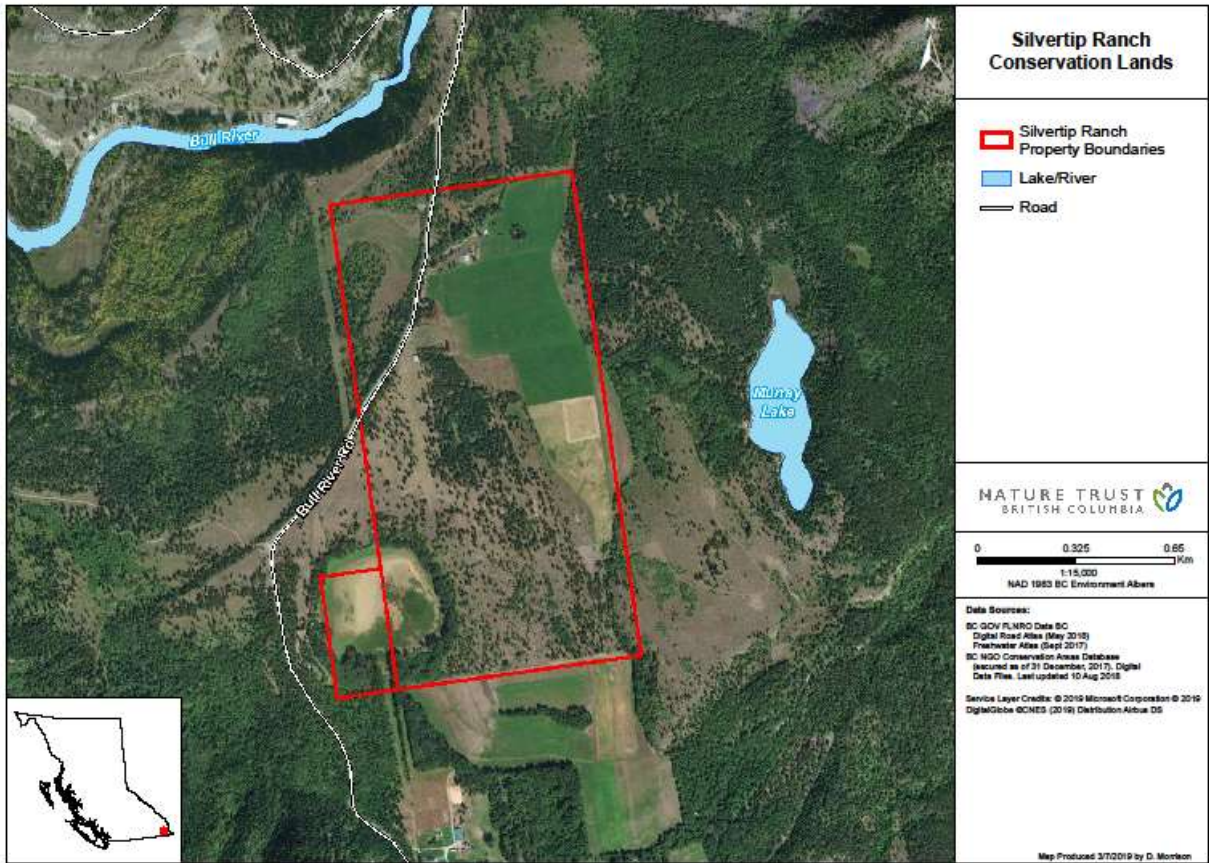


Figure 1: Map showing NTBC’s Silvertip Ranch Conservation Property, alongside the Bull River Road, approximately 7 kilometres east of the community of Bull River, BC.

#### **4. Methods**

As with any restoration or enhancement project, the success of a project depends on detailed assessment and preparation. In 2016, Robin Annschild, Principal of Wetland Restoration Consulting, was able to visit the property to make a determination that the site would be a good candidate for a stream and wetland restoration project. Then, in 2017, Tom Biebighauser of Wetland Restoration and Training LLC was contracted by The Ministry of Forests, Lands, Natural Resource Operations and Rural Develop – FWCP Section to develop a prescription.

Over the course of two days in July 2017, with help from the Kootenay Conservation Land Manager and three Conservation Youth Crew members from NTBC, a detailed site survey was completed. This included taking soil samples, documenting a series of elevations to determine a suitable restoration area, historical research and discussion with the life estate tenants about the benefits and drawbacks of several potential options. This led to the completion of a project

prescription and budget in September 2017, used as the basis to acquire funding over the following months.

Several important steps were still necessary before moving ahead with the project, NTBC hired a fisheries consultant from VAST Resource Solutions to confirm that Douglas Creek was not a fish-bearing creek and submitted this information to the Water Stewardship Branch. NTBC coordinated a site visit with a Water Stewardship Officer from the Ministry of Forests, Lands, Natural Resource Operations and Rural Development to review the proposed project, which was essential to receiving a Section 11 Approval under the BC Water Stewardship Act. Because the project would alter hydrodynamics near a BC Hydro distribution line, NTBC conducted a site visit with local BCH staff, who had no concerns the project would pose threats to infrastructure. Concurrent to all of these meetings, a Request for Quotations were sent to contractors experienced in wetland restoration, proposals were assessed and, a contract awarded.

In October 2018, the project commenced after a pre-work meeting with the consultant, contractor, life estate tenants and NTBC. Implementation of the project involved the extensive use of heavy equipment to build a new floodplain, creek channel and wetlands alongside Douglas Creek, which had been confined to a flume and ditch system for decades.

The BC Wildlife Federation was retained as the consultant for the project, with Tom Biebighauser serving as project manager. Tom was on-site for the entire duration of the project, directing heavy equipment operators in the completion of the project.

Fiorentino Brothers Contracting Ltd. of Cranbrook was awarded the work through a competitive bid process and, provided the following heavy equipment with skilled operators:

1. Caterpillar D6T Dozer LGP
2. Caterpillar 329EL Excavator
3. Caterpillar 320DLRR Excavator
4. Tandem Dump Truck

The restoration site was located along the edge of the hayfield, in an effort to balance the ecological restoration objectives of the project, while still allowing hay to be cultivated on agricultural fields. A bulldozer and two excavators carved out a sinuous floodplain, approximately 500 metres in length by 10 metres in width, having a gentle cross section of only a few degrees. The floodplain and channel were restored with a gradual slope (Figure 2), with more than a dozen wetland basins created beyond the floodplain, in an effort to resemble historical attributes of the original watercourse (Figure 3). This was done so that water would spread out and saturate the ground, forming wet meadow and ephemeral wetland basins connected to the channel.



Figure2: Typical profile view showing the restored floodplain for the sedge-meadow wetland

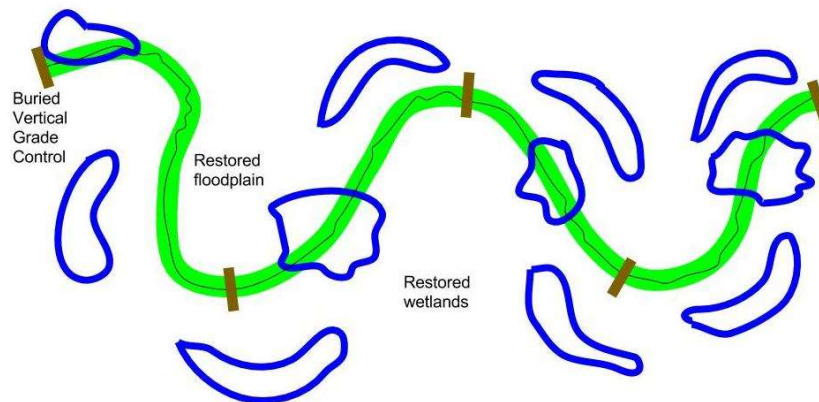


Figure 3: Typical plan view showing restored wet-meadow and ephemeral wetlands, not to scale. Green band represents the creek channel & floodplain, the brown lines are boulders used for grade control, with ephemeral wetlands adjacent.

Rock was used to armor steeper sections of the restored streambed to control erosion and was covered with a thin layer of soil to grow vegetation and blend into the environment. Originally, rock was to be purchased and trucked to the site. However, thousands of rocks were removed from the hayfields over the years and, piled in several locations. As a result, a tandem dump truck was mobilized to transport approximately 23 loads from the upper fields to the project area.

Large boulders were also used to control erosion in the restored stream, and were placed to improve wildlife habitat diversity. Boulders were also obtained from the ranch property, having been moved when the Bull River Road was upgraded. Approximately 15-dump truckloads of boulders were re-purposed for the project.

The Patricia Logan and several volunteers from the ranch removed the metal flume and irrigation pipes used to divert the water from Douglas Creek, over a two-day period. The metal and non-treated wood posts were salvaged for ranch use. A section of barbed wire fence was also removed to allow machine access and was later rebuilt.

The location of the flume was rehabilitated using an excavator in much the same way, as roads are decommissioned. Excavators disabled hundreds of metres of ditches used to carry water away from the property, having little habitat value. The operators filled in the ditches to grade and covered with organics to quicken recovery. A small borrow pit that was used to build ditches many years ago was also rehabilitated at the site.

Culverts were designed to channel water under the Bull River Road yet, were partially clogged and necessitated a clean out. Areas around the culverts were armored with rock to prevent erosion during high flows.

On the last day of the project, equipment operators put the finishing touches on the project, ensuring that the site was contoured to blend into the surrounding topography. Woody debris was added to wetland basins as microhabitat features and, the edge of the project area was graded level to limit disturbance to haying of the adjacent fields. Loosening soils in one area was done to provide encourage ground squirrel colony excavations, a key food source for badgers.

Following the earthworks, NTBC staff and ranch volunteer's hand-seeded areas of soil disturbance. An organic seed mix of grasses and forbs was used. Next, all areas of soil disturbance were covered with approximately 200 bales of straw and hay mulch. Mulch was laid to reduce the chance of erosion, build a layer of organics into the soil horizon, reduce the threat of invasive plant establishment and retain moisture to assist with seed germination.

The stream and wetland restoration project did not use dams, pipes, water control structures or pumps that would require a high level of maintenance. All works were undertaken 'in the dry', at a time when the ephemeral Douglas Creek was not carrying water.

## **5. Results and Outcomes:**

Having a project manager on-site for the entire project had many advantages. One was that a detailed photo and work log could be kept each day. Tom Biebighauser also used a GPS to record spatial data. Details were carefully recorded in a field book and spatial data plotted into basic map products. A summary of project results and outcomes are listed below:

1. In total, 564 meters of Douglas Creek was restored. This included shaping a new channel and floodplain that averaged 10 metres in width. A sheet flow of water will be returned to the restored floodplain, returning a wide ribbon of wet-meadow habitat in spring 2019, when the spring freshet arrives. Up to 5,640 square metres of wet meadow habitat was created in the floodplain;

2. In total, 752 metres of ditches previously used to collect and drain water from the property were filled in, brought to grade and therefore, disabled. The ditches confined the flow of water, were eroding through head-cuts and had limited ecosystem health and function;
3. In total, 24 metres of a metal flume was permanently removed and the ground rehabilitated. The flume had been leaking and causing erosion alongside steep hillsides throughout its length. The flume required constant maintenance and repairs during spring runoff;
4. In total, 14 ephemeral wetland basins were created along the restored floodplain of Douglas Creek, totaling up 2,526 square metres in size;
5. A historic borrow pit located next to the project area, measuring 61 square meters was contoured and re-naturalized;
6. Over 2,000 square meters of habitat was created for Columbia Ground Squirrels and American Badgers. This was accomplished by loosening compacted soils and by building natural ridges, as part of soil disturbance associated with the project, located on upland areas beside the restored floodplain;
7. Two culverts located under the Bull River Road were unplugged and erosion control measures were taken by placement of rip rap. The plugged culverts were causing erosion through head-cuts upstream of the road. An irrigation pipe routed through a culvert was also removed, as it was no longer required;
8. Approximately, 700 lbs. of certified organic seed (Meadow Brome grass, Alsike Clover, Alfalfa) was hand seeded on all areas of soil disturbance associated with the project.
9. Approximately 200 bales of organic straw and hay mulch were hand placed on disturbed areas, in an effort to guard against erosion, to protect seed, limit invasive plant establishment and to retain moisture and temperatures necessary to incubate the seed.
10. Approximately 75 metres of livestock fencing was removed in the project area, allowing heavy equipment access. It was later replaced.

The following maps and tables provide further details on stream and wetland restoration activities. In figure 4 below, the map clearly shows the restored stream and wetlands, shown in

blue. One can count a total of 14 wetland basins attached to Douglas Creek from top to bottom. The reclaimed gravel pit next to the project site is shown as a green dot. Soil disturbance along a ridge associated with the project is shown in brown. It was here that soils were further loosened to allow easier excavations for Columbia Ground Squirrel colonies.

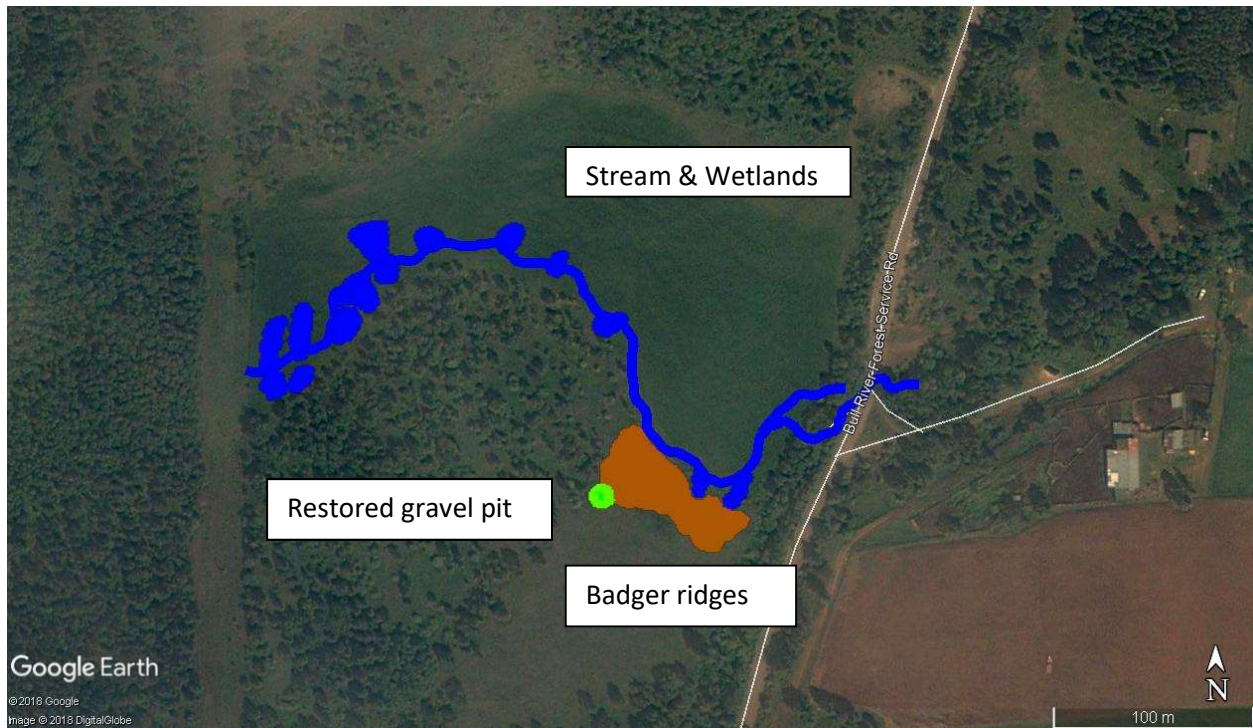


Figure 4: Map showing the areas of stream and wetland restoration, gravel pit rehabilitation and areas of soil disturbance that were further loosened for fossorial species habitat

Meanwhile, the map in Figure 5 below shows additional restoration activities associated with the project. The red line at the top of the map represents the centre of the channel of the newly restored Douglas Creek. The second red line that lies in a southwest orientation represents the ditch system that was disabled. The short yellow line shows the location where the flume was removed and restored. The 'badger ridges' and reclaimed borrow pit are also represented on this map in brown and green, respectively.

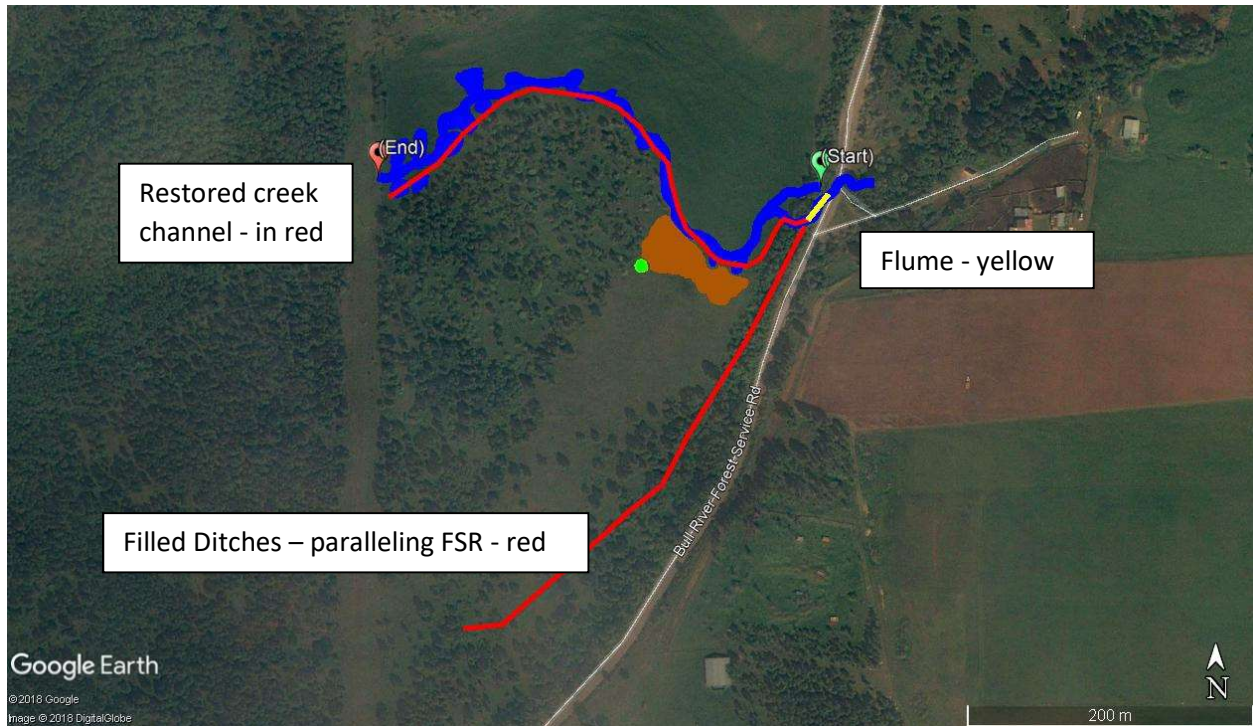


Figure 5: Map showing the areas in which the flume and ditches were reclaimed as well as, the centre of the restored Douglas Creek channel, shown as the top red line through the middle of the floodplain and wetland basins.

Table 1 illustrates the area based outcomes for the wetland basins, ‘badger ridges’ and the reclaimed borrow pit. The table also details the length of creek restored, ditches disabled and length of metal flume that was removed and restored.

RESTORATION FEATURE	AREA (m <sup>2</sup> )
<b>Wetland Basins</b>	
Douglas Creek Restored Wetland 1	148
Douglas Creek Restored Wetland 2	243
Douglas Creek Restored Wetland 3	272
Douglas Creek Restored Wetland 4	119
Douglas Creek Restored Wetland 5	236
Douglas Creek Restored Wetland 6	321
Douglas Creek Restored Wetland 7	133
Douglas Creek Restored Wetland 8	309
Douglas Creek Restored Wetland 9	140
Douglas Creek Restored Wetland 10	155
Douglas Creek Restored Wetland 11	96
Douglas Creek Restored Wetland 12	144
Douglas Creek Restored Wetland 13	81
Douglas Creek Restored Wetland 14	129
<b>Total of restored wetland basins</b>	<b>2526</b>

<b>Badger Habitat Ridges</b>	<b>2000</b>
<b>Rehabilitated borrow pit</b>	<b>61</b>
<b>RESTORED CREEK</b>	<b>LENGTH (m)</b>
<b>Restored creek length</b>	<b>564</b>
<b>INFRASTRUCTURE REMOVED</b>	<b>LENGTH (m)</b>
<b>Ditches disabled</b>	<b>752</b>
<b>Flume removed</b>	<b>24</b>
<b>Total linear infrastructure removed</b>	<b>776</b>

Table 1: Shows the quantifiable results associated with the restoration project

## **6. Discussion**

The work undertaken at Silvertip Ranch represents the sixth wetland restoration project that NTBC has completed within the Kootenay region, in recent years. Of these projects, only one, besides Silvertip Ranch, combined stream and wetland restoration in the same site.

The project concept was identified in a 2016 Management Direction Plan for the property. For this project, NTBC again collaborated with both Robin Annschild and Tom Biebighauser. Recognized as two of the leading wetland restoration practitioners in Canada, Robin conducted the initial feasibility study in 2016. Then, in the following year, Tom undertook a detailed site survey and developed a prescription and budget. Tom also led procurement efforts in securing a heavy equipment contractor. Working for the BC Wildlife Federation (BCWF), Tom served as project consultant during the physical works in October 2018. Having worked together on previous projects, Tom and NTBC's Kootenay Region Land Management Staff have a good working relationship and complement one another in project management.

Chris Bosman, NTBC Kootenay Conservation Land Manager was actively involved in the project throughout the process. He lead the efforts to acquire funding, secure the necessary permits, coordinated volunteer efforts with the life estate tenants and looked after most project administration. Joe Strong, NTBC Kootenay Conservation Land Coordinator worked closely with Silvertip Ranch life estate tenants and their volunteers following the earthworks to seed and mulch the project area before winter.

The major funder to the project was the Fish and Wildlife Compensation Program, who provided \$32, 175.00. A minor funder to the program was the Columbia Basin Trust, who provided \$4,978.58 towards project expenses. CBT funds were allocated towards contractor and consultant costs, supply and shipping of organic grass seed, fence replacement supplies



and application costs to the Province for a S. 11 Approval under the Water Stewardship Act. CBT's contribution would have been higher to the project but it came in under budget. As a result, if there are any repairs or modifications required to the project area during the first spring runoff event in 2019, then CBT has committed funds for any such expenses. The BC Wildlife Federation applied to the Habitat Conservation Trust Foundation for project funding on behalf of NTBC but was unsuccessful. NTBC staff put in many hours of work on this project, more than were forecast. A disproportionate amount of time was involved in securing the approval through Section 11 of the BC Water Stewardship Act and in reporting out. Fortunately, both funders to the project allowed for an administrative fee to be incorporated into their grants, which covered some staff time, the remainder being an in-kind contribution.

Following confirmation of funding, NTBC and Tom worked to tighten up the budget to reflect the smaller pool of secured dollars, being careful not to alter the project scope. Tom has worked to design and build similar stream and wetland restoration projects in the US. When restoration projects use rock, they are typically associated with a cost of up to \$1,975/metre (CDN).

The Silvertip Restoration project came in under the estimated budget, at a total cost of \$41,966.08. This was unexpected and due to a number of factors. First, the heavy equipment provided by Fiorentino Brothers Construction Ltd. was new and, in great working order. There was no lost time on the project due to mechanical breakdowns. Second, the heavy equipment operators were highly skilled and experienced in stream and wetland restoration. Tom remarked that he had never worked with such productive operators. Originally, the earthworks were expected to take up to six days but were reduced to five working days, thus reducing project costs. Third, rock and logs were to be supplied by vendors off-site. Rock was to be used for erosion control, while logs were intended for habitat features. However, this was not necessary since an adequate supply of both were sourced from the ranch, saving supply and transport costs. Next, the supply of grass seed was slightly less than expected. So too were costs associated with miscellaneous project supplies. Finally, Silvertip Ranch life estate tenants Patricia Logan and Greg Allen and their volunteers provided invaluable in-kind contributions of labour, equipment and hay/straw mulch to the project. Their enthusiastic support of the project was reflected in the original project budget and helped to keep project costs down. Silvertip Ranch generously provided 200 bales of mulch valued at \$5/bale for a total of \$1000 in-kind of supplies. The rancher and volunteers also provided 76.5 hours valued at \$25/per hour for a total of \$1,912.50. This exceeded what was originally forecast to be 40 volunteer hours. NTBC also contributed \$1900 in staff wages to the project, for a total of \$4,812.50 as total in-kind support to the project. While the in-kind contribution was higher than expected, it likely helped to keep consultant and contractor costs down and was a great example of a collaborative partnership.

The earthworks took place from October 15-19, 2018 under cool and dry conditions. After the first day, it was determined that the Caterpillar D6 LGP Dozer would be of limited use in the project and that a second excavator would be more productive. A second excavator was brought in, with the dozer used intermittently over the remaining days. Once it was discovered that a substantial stockpile of suitable rock was on-site, the contractor provided a tandem dump truck and driver to move the rock efficiently. This equipment was unexpected for the project but resulted in savings from hiring a sub-contractor to supply and transport rock from a nearby quarry. A logging truck of logs was not deemed necessary due to an adequate supply of deadfall near the project site and the fact that NTBC didn't want too much woody debris on site. The disabling of the ditches and flume went as planned but, the gravel pit rehabilitation and repairs to culverts under the Bull River Road were not. These activities simply made sense to address while the contractors were present, likely leading to a more successful overall project result. After making these modifications to the project, the work progressed smoothly without any issues.

The project restored Douglas Creek, and a complex of wet meadows within the floodplain. Attached and adjacent to the floodplain, a series of ephemeral wetland basins were incorporated into the project. The Silvertip Ranch Wetland Restoration Project aimed to accomplish a number of ecosystem and habitat based goals identified in a previous section of this report. Since Douglas Creek is not fish-bearing watercourse, the project did not consider fish values and presence in its design and implementation.

It is important to reinforce that the project was finished just before winter. At the time of reporting, melting of mid and high elevation snowpack had not yet begun. Therefore, the next 6-8 months will be critical in evaluating whether the project has begun to meet its intended goals and objectives.

Having said that, the restored stream, floodplain, wet meadows and ephemeral wetlands are expected to contain water seasonally. The project design and construction intended to capture snowmelt and runoff, slowly injecting this water into the ground, recharging groundwater. This natural sub-irrigation will moisten soils in the area, changing dry areas into productive wet-meadows and ephemeral wetlands containing a diversity of sedges and rushes. One would most likely find the restored stream and wetlands dry by midsummer. However, a portion of Douglas Creek is diverted further upstream for overland flood irrigation of the ranch. When this water is permanently re-directed to the system, an even longer hydro-period would be expected. It is essential that the Douglas Creek watershed flows are re-introduced gradually to reduce the risk of erosion and undesired impacts on the project.

By re-introducing a natural sub-irrigation regime, the project areas should produce a diversity of plants alongside Douglas Creek and within the floodplain. The watered plants in the floodplain will grow taller, increasing forage availability, while increasing hiding cover for other

species. The shallow ephemeral wetland basins should produce a diversity of aquatic plants that are high in sodium. These aquatic plants will provide important minerals and nutrients to white tailed deer, elk, mule deer and black and grizzly bear. The project was designed and built so the site doesn't become dominated by reed canary grass, cattails, or water shield by ensuring there are fluctuating water levels and irregular deep and shallow zones.

With an absence of fish in the system, the project areas should contain a high diversity of invertebrates, providing an important food source to a variety of wildlife species, including birds and amphibians. The restoration area is also expected to provide migration and nesting habitat for waterfowl, songbirds and shorebirds. Meanwhile, the use of a 'rough and loose' technique for disturbed soil on adjacent upland areas is meant to enhance habitat for Columbia Ground Squirrels, a key prey species for the red-listed American Badger.

The restoration prescription hypothesized that the restoration project may specifically benefit the following species, many of which are listed: Rocky Mountain Elk, White Tailed Deer, Mule Deer, Moose, Black and Grizzly Bears, Columbia Ground Squirrels, American Badgers, Barn Swallows, Long Billed Curlews, Long billed curlews, Little Brown Myotis, Western Toads and Sandhill Cranes. NTBC and the life estate tenants intend to undertake regular and on-going monitoring of the project area to determine wildlife utilization has met project goals and objectives.

The stream and wetland restoration was designed and built to require little, if any maintenance. The wetlands are expected to appear and function as natural wetlands, without the need of adding water using pumps, or the construction and maintenance of dikes and dams. If any maintenance or repairs are needed, it is anticipated that they will be related to erosion and will occur in the first year before the site has re-naturalized.

Strong efforts were made to control invasive plants as part of this project. Invasive plants were hand pulled prior to seed-set in the summer. All heavy equipment mobilized to the site was pressure washed beforehand and inspected upon delivery. Following the project, heavy equipment was again pressure washed before being mobilized to the next work site. Undoubtedly, the project resulted in significant soil disturbance. However, all disturbance was seeded with a mix of organic alksike clover, alfalfa and meadow brome grass. Because Silvertip Ranch has organic status, the seed needed to be carefully sourced from an organic seed distributor in Alberta. The revegetation seed mix was hand seeded at a rate above the recommended rate in an effort to increase germination success. Over 200 bales of straw and hay mulch were hand placed over the entire seeded area, to prevent erosion and invasive plants from taking hold. While not used before by NTBC on such a large project, the mulch is also anticipated to encourage seed germination and reduce the unsightly look of the soil disturbance. Mulch was sourced on-sight, was certified organic and clean of invasive plants. NTBC and the life estate tenant will regularly monitor the project site for seed germination as

well as, invasive species. If required, additional hand seeding will be undertaken. Invasive plants would be mechanically controlled by hand pulling and digging.

NTBC and the Logan-Allen family were thrilled to carry out this restoration project, reversing degraded stream and wetland habitat on the Silvertip Ranch Conservation Property. Planning and implementation by experienced consultants and contractors are expected to produce a result that meets the goals and objectives identified in the prescription, while also meeting the habitat based actions in FWCP's Riparian and Wetlands and Species of Interest Action Plans.

## **7. Recommendations**

After having completed this project, NTBC and BCWF's Tom Biebighauser have the following recommendations for future consideration. Some of these recommendations may be of interest and assistance to other landowners implementing similar restoration projects on their property in the future. Recommendations, in no particular order include:

1. If undertaking similar projects in future, it would be advisable to apply for a Section 11 Notifications or Approvals through BC's Water Stewardship Act at least six months in advance of the project, preferably eight-ten months out. The Water Stewardship Branch is extremely busy with similar requests and the time between submission and approval took about three months, which nearly resulted in a delayed project start.
2. Douglas Creek is currently diverted by Silvertip Ranch upstream of the project area, near its source. The diversion no longer serves a useful purpose to ranching operations and should be re-allocated to Douglas Creek. Re-diverting this water into the watercourse will increase surface and sub-surface water flows, thereby increasing the volume of water in the project area as well as, the timeframe in which the ephemeral creek and wetlands will hold water. However, this water should be re-introduced gradually following freshet so, as to not increase the threat of erosion. Particularly since the project area will be especially prone to erosion in year one, before vegetation has been re-established.
3. Monitor perimeter fencing on a regular basis to ensure that livestock from Silvertip Ranch and from the adjacent Crown Range Pastures do not gain access to the project area. The perimeter fences have a 5-10 year lifespan remaining and should be scheduled for replacement in the coming years.
4. From March – June 2019, NTBC and the life estate tenant should regularly (4-5x/week) monitor the project area for erosion. If erosion is occurring, it will be important to act quickly to contain damage and make modifications, as necessary. NTBC has secured

funding from CBT for 2019 to hire heavy equipment, if necessary to mitigate erosion. In subsequent years, regular monitoring should continue, albeit with reduced frequency.

5. Similarly, monitor the inlets of restored wetlands and adjust elevations, as needed to ensure they are filling with water from the stream. It will also be important to monitor the road culverts regularly – especially during freshet and periods of high flows (i.e. storms) and remove debris in a timely manner that could block flows.
6. Monitor the project area for re-vegetative response. If it is demonstrated that seed is not propagating, it may be necessary to re-seed soil disturbances. Steps were taken to reduce the threat of invasive plant introduction throughout the project. But, with any large-scale ground disturbance, there is a threat of invasive plant colonization and spread. Particularly, since there were invasive plants present in the project area prior. NTBC and the life estate tenants should carefully monitor whether invasive plants appear and take immediate and appropriate steps to control further establishment and spread.

## **8. Acknowledgements**

The Nature Trust of British Columbia wishes to acknowledge several organizations and individuals that made this project possible.

Firstly, The Nature Trust of British Columbia gratefully acknowledges the financial support of the Fish and Wildlife Compensation Program for its contribution to the Silvertip Ranch Wetland Restoration Project. Without FWCP's financial support, this project would simply not have been possible.

NTBC also wishes to acknowledge the financial support that the Columbia Basin Trust provided to this project through its Environmental Stewardship Grant program. CBT's ability to contribute to this project filled a funding gap that was critical for implementation.

Irene Manley of FLNRORD's Fish and Wildlife Compensation Program ensured that there was seed money available to undertake a site assessment and develop a prescription for the project, which were necessary in obtaining funding and breaking ground a year later.

Thanks are also due to Robin Annschild of Wetland Restoration Consulting who completed an early site assessment to confirm that the project was feasible. Much gratitude is also due to Tom Biebighauser of the BC Wildlife Federation who oversaw the project prescription design, procurement, site supervision, mapping and reporting functions. Over the years, Neil Fletcher with BCWF and Tom Biebighauser have been important NTBC partners, allowing us to

undertake a variety of wetland restoration and enhancement projects on our Kootenay region conservation properties.

NTBC also wishes to acknowledge the various staff from the FLNRORD Water Stewardship Branch that assisted in administering the requisite permitting through the BC Water Stewardship Act. As well, staff from Vast Resource Solutions Ltd. and BC Hydro participated in key site visits during the planning and coordination stage, which were necessary to bring this project to reality. Fiorentino Brothers Construction was the contractor that provided the heavy equipment and personnel for the project. The skill and creativity of their operators, care of equipment, safety philosophy and administrative efficiency ensured that the project was completed safely and efficiently.

Finally, NTBC wishes to acknowledge and extend a special thankyou to the Logan and Allen Family, in particular Patricia Logan. As life estate tenants of Silvertip Ranch, the family was highly supportive of the project, from conceptualization through to implementation. Their historical knowledge of the property was helpful to delivering the project. They also provided substantial in-kind support to the project, and organized ranch volunteers to help during critical work phases. Without their support, this project would never have gotten 'off the ground'!

## **9. References**

The reference section contains a detailed photo gallery of the project, which provides a visual display of the project from start to finish. All photos by Tom Biebighauser or Chris Bosman.



**Photo 1:** Kiosk at the entrance to the Silvertip Ranch



**Photo 2:** This beautiful hayfield was made by moving Douglas Creek, by filling ephemeral wetlands, levelling the ground and installing ditches on its periphery.



**Photo 3:** Part of the project involved removal of a metal flume used to divert Douglas Creek



**Photo 4:** In the past, ditches (red line) had been dug to move Douglas Creek around the hayfield





**Photo 5:** Ditches (red line) had been dug in several places, to move Douglas Creek around the hayfield, carrying surface flows far from their original watercourse



**Photo 6:** Huge piles of rock moved from hayfields were used to restore the creek bed. Having this material on-site saved money by not having to haul it in from an aggregate pit.



**Photo 7:** Here a dozer is used to shape a new valley and floodplain for the restored creek along the edge of the existing hayfield.



**Photo 8:** Small rock was used to armour steeper sections of the restored creek. The rock was covered with a thin layer of soil so it could be seeded



**Photo 9:** Soil is spread over the rock so the restored floodplain will support a diversity of sedges and rushes without erosion and appear more natural looking within the site context



**Photo 10:** A sinuous floodplain and creek channel are shaped on a gradual slope, in which several wetland basins are designed alongside



**Photo 11:** The excavator shapes low banks with gradual slopes and loosens compacted soils on the restored floodplain.



**Photo 12:** The excavator gathers boulders from the edge of the hayfield to be used to create unique habitat features along the creek and wetlands



**Photo 13:** Here large boulders are being gathered for use in the restored stream



**Photo 14:** A new valley was restored to replace the flume, moving water from the culvert under the Bull River Forest Service Road into restored Douglas Creek



**Photo 15:** The flume was replaced with a natural rocky valley that would not erode



**Photo 16:** The excavator is used to fill and naturalize the ditches, as part of the overall project, thereby ensuring that flows from Douglas Creek would not be lost



**Photo 17:** A section of a former ditch is being filled and brought to grade



**Photo 18:** A filled and naturalized section of ditch.



**Photo 19:** A filled and naturalized section of ditch, in time it will blend in with the surroundings



**Photo 20:** This photo shows the two culverts carrying water from Douglas Creek under the Bull River Forest Service Road. The culverts were unplugged during the project, and erosion was controlled by placing rock salvaged alongside the FSR





**Photo 21:** Here a small borrow pit from years ago is being restored, beside the restored creek



**Photo 22:** The loosened soils in the restored gravel pit and alongside the creek bank may be used by the Columbian Ground Squirrel, and by the American Badger



**Photo 23:** Large areas of compacted soil were loosened to provide habitat for the American badger and Columbian ground squirrel, as part of the prescription. Sightings and evidence of both ground squirrel and badger use are relatively common on the property



**Photo 24:** Logs and branches were placed on the restored floodplain to improve wildlife habitat, as loafing and roosting features for birds and amphibians



**Photo 25:** Log, branches, root wads and boulders placed on the restored floodplain to break up homogeneity on the landscape and improve wildlife habitat by providing micro features.



**Photo 26:** Restored creek and floodplain in progress, looking upslope



**Photo 27:** Restored creek and floodplain in progress, looking downslope



**Photo 28:** Restored creek and floodplain, looking downslope. Note the boulder placement and re-planting of shrubs in the foreground and background



**Photo 29:** More than a dozen wetland basins feed off the creek channel as shown here



**Photo 30:** Many of the restored basins are located at the bottom of the creek channel



**Photo 31:** This wetland forms the terminus of the project area, property line is in the background



**Photo 32:** Restored wetland, looking upslope over the entire project area



**Photo 33:** Two excavators, a dozer, a dump truck and a tractor were used on the project



**Photo 34:** All ground disturbance was covered by hand with hay/straw mulch



**Photo 35:** Fences were re-built following earthworks to keep livestock out of the site





**Photo 36:** All ground disturbance associated with the project was seeded with an organic blend of grasses and forbs and covered by hand with mulch to stimulate growth and reduce the potential for erosion