



**CARCROSS/TAGISH
ENERGY CORPORATION**

"Nothing done today shall diminish the wealth of future generations."

Yukon Fish and Wildlife Enhancement Trust

Carcross / Tagish Energy Corporation – Final Report

PROJECT ACTIVITIES

The *Carcross / Tagish Wildlife Habitat Restoration Project: Waste Survey & Brownfield Revegetation* initially proposed to have two main components: a waste survey of Windy Arm – Tagish Lake, and the restoration of brownfield sites using traditional and contemporary ethnobotany knowledge and techniques. The aim of these two components was to protect wildlife and fish from potential contaminants and restore disturbed land into thriving habitat.

Waste Survey

Initially, it was planned that the waste survey would include a two to three-day orientation and field survey of selected areas of Windy Arm – Tagish Lake near the 1970 Venus Mill Complex, an abandoned mine. The main purpose of the survey is to search for and document rumored barrels of cyanide that were dumped into the lake in the mid-1970s.

Unfortunately, in the winter of 2019, the subcontractor for this work was hospitalized and unable to do ROV survey training for cyanide barrels.

In lieu of the surveys, the CTEC Stewards & Senior Management Team improvised and developed training modules providing equivalent training of the ROV Survey Module – Field Survey and Orientation to different Field Survey Methods and Models.

With the use of some alternative activities providing similar and valuable training components including environmental reclamation experience with many relevant, *"ON the Land"* Stewardship activities. These included Tlingit traditional & indigenous science field practices, to go with their daily field activities, and work with their Environmental / Engineering Technical Team from Jacobs & Azimuth.

By joining, they were able to complete a "Site Characterization Survey" and a *"Ground Truth"* component, for the purposes of inclusion in the remediation & reclamation "Options Planning Documents for both Arctic Gold and Silver & Venus mine sites.

The C/TEC Stewards, Senior Site Supervisor and Operations Manager, as well as the Environmental Technical Team, did complete an extensive ground truth survey to determine solid waste conditions at both sites.

Ground Truth Definition:

To confirm or validate directly (information or data derived indirectly), especially (in remote sensing) by direct observation on the ground, rather than by interpretation of remotely obtained data; to make observations of (land, an area, etc.) directly on the ground, especially in order to confirm or validate data obtained indirectly

The C/TEC Stewards gathered AGS Site background information, reports, maps, archived documents, discussions and participated in **"Elders Stewardship Teachings"** site tours and demonstrations. Each Steward gathered information as part of the training exercise.

This preparation for C/TEC Stewardship Training component was designed to empower the C/TEC Stewards, to practice the exercise of blending and combining, their learned and expanding, their own personal & professional knowledge of; Tlingit traditional knowledge & indigenous science and how does that fit and work with the new and emerging technologies, that are being used to study, document, report and begin to understand and protect their land and resources.

The C/TEC Stewards have been working actively on the AGS site, participating in activities which provided opportunities to learn about the various trades and skills involved with this type of project. The result has been an eager workforce who has an intimate understanding of the project and is invested in its success as well as their own success in the cleanup of their land and water.

Traditional Knowledge gathering provides the Stewards with an understanding of how to respectfully and confidentially collect traditional and local knowledge and how to connect that knowledge to their current projects, sites, engagement plans and activities, community, and reporting.

Montana Mountain is a very important and valuable heritage area, and will be investigated and assessed again in 2020 as part of the next steps of the "Site Characterization and Understanding for the Development of Remediation & Reclamation" proposed project options to fully clean the land and make it safe for Public Use.

A formal introduction to Traditional Knowledge and cultural resource management provided the C/TEC Stewards with the ability to identify important cultural resources which should be avoided, documented and reported to C/TFN Lands, Heritage and Natural Resources Department, Environmental Monitors and Elders.

Traditional Knowledge was used informally throughout the Stewards activities on the AGS site. Knowledge gathered from Elders and land-users (mountain bike trail riders, tourists) has provided, valuable information, concerning the past land-uses on the site, specifically those associated with potential cleanup requirements and locations of buried materials.

Skills learned in Yukon Fish & Wildlife Enhancement Trust Funding Program has assisted the C/TEC Stewards to gather traditional and community knowledge that can help to further identify sources of solid-waste and areas requiring further attention for remediation. Traditional Knowledge will also help inform the re-development process as this redevelopment should honor traditional values and land use.

In June 2019, C/TEC Stewards were joined by 10 Southridge High School Students from Vancouver Island. The Students had travelled specifically to Carcross, Yukon, to spend time with the C/TEC Stewards: **Learning Stewardship “On the Land”**.

The high school students joined the C/TEC Stewards in Stewardship Daily Tasks, necessary to support the “Site Characterization” and “Ground Truth Survey” for the purposes of remediation and reclamation “Options Plans”.

The C/TEC Senior Management Team and Stewards designed an additional program to make up for the ROV Component, that they were unable to complete:

“AGS Waste Survey & Collection Plan” and conducted an AGS - Edge of Mining Disturbed Areas & Mountain Bike Trails Waste Location Survey & Clean Up Training Program.



During the 10 days, the Southridge High School Students were visiting the C/TEC Stewards, the crews were active in waste identification, environmental contamination assessment methods, and safe removal methods.

The crews also had the opportunity to participate in Tlingit Language Classes with Elders at the Haa Shagóon Hídi (Tlingit for “Our Ancestors House, also known as the Carcross Learning Centre), participated in a community tour with Elders, and spent three days restructuring mountain bike trails, and participated in traditional Tlingit carving at the Carving House.



Ethnobotany Brownfield Restoration

This component focused on the restoration of habitat in brownfield sites, particularly at the abandoned Arctic Gold and Silver Mine. CTFN Stewards engaged in both traditional and western academic knowledge of ethnobotany and were supported in using these skills in revegetation and restoration of the disturbed sites. The rationale behind the ethnobotany component was in recognition of restoring wildlife populations through restoring native vegetation and ecological matrices. By growing native and traditional vegetation on the brownfield sites, they can help restore wildlife populations that depend on them. Target species include migrating birds, stone sheep, caribou, brown bears, and lynx, amongst many others.

The final report is attached for detailed information regarding methods and results.

COMMUNICATIONS

C/TEC Stewards, subcontractors and consultants hosted a seed-collection workshop on August 27, 2019.

The intent of this workshop was to spend the day on the land, collecting seeds suitable for use in the restoration of the historic mine sites on Montana Mountain (poster attached). The primary species of interest was wheatgrass (*Elymus spp.*), a native perennial grass, fast-spreading and suitable for broadcast seeding as required in large site remediation projects (pamphlet attached for interest).

In addition to this workshop, Stewards and C/TEC contractors met collaboratively with Carcross/Tagish First Nation Administration, Elder's Council, and Land Management Board to provide continuous project updates.

FINANCIAL REPORTS

Below provides a summary of the costs associated with this project. Asterix (*) indicates invoice back-up is attached in the following pages.

EXPENDITURE CATEGORY	BUDGET ITEM	PROJECTED COST	ACTUAL COST
1.Capital Expenses (equipment, machinery)	Subcontractor capital expenses included in contract services cost	n/a	n/a
2. Wages, Contract Services	1. Staff Hours for Waste Survey	1. \$1,127.00	\$1,127.00
	2. Staff hours for Ethnobotany project	2. \$3,220.00	\$3,220.00
	3. CTMC Contract services for waste survey	3. \$403.00	\$403.00
	4. CTMC Contract services for ethnobotany project	4. \$374.00	\$375.00
	5. Subcontractor services for AGS Waste Survey & Stewardship Training - CSR Management – R. Lewis – 7 days @ \$1,000.00 / 10 hour - Day includes – 3 days preparation for Southridge School Students Site Visit	5. \$6,900.00	\$7, 000.00

	6. Subcontractor services for ethnobotany project	6. \$3,381	\$2,626.74*
3. Office & Administrative Expenses (telephone, printing, postage)	Administration - office services, printing, supplies	\$1,800.00	\$1,800.00
4. Travel Expenses (accommodation, food, transportation)	Staff and C/TC travel expenses – Senior Site Supervisor & Operations Manager travel expenses to AGS & Venus Sites – See Montana Services – Fuel Expenses – June 2019 (Subcontractor travel expenses included in contract services cost)	\$592.00	\$1,762.49
5. Materials & Supplies	Materials for ethnobotany project (hand tools, plants)	\$2,056.00	\$2,118.98
6. Facility Expenses	N/A	N/A	N/A
7. Other	N/A	N/A	N/A
TOTAL		\$19,853.00	\$20,433.21

Arctic Gold & Silver Abandoned Mine Site Tailings Impound Facility



Arctic Gold & Silver Abandoned Mine Site - Mine Made Lake



Ethnobotany Brownfield Restoration Project

Final Report and Photo Log



October 24, 2019

Prepared For:
Carcross Tagish Management Corporation

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ACKNOWLEDGEMENTS

The author would like to thank the Carcross/Tagish First Nation for the privilege to work on their Traditional Territory. A most grateful thank you goes to CTMC Stewards Johnny C. Johns, Josslynn James, Suezanna James, Dominic Smith-Johns, Bill Smarch and Krystie Smarch. Their hard work made this project possible. Thank you also to the CTMC staff Stuart Lewis and Kristina Gardner for your support in coordinating and delivering activities. Gunalchéesh.



1.0 INTRODUCTION

In the spring of 2017, the Carcross Tagish Management Corp. (CTMC) assembled a team of Environmental Stewards from Carcross to begin the process of site clean-up at several contaminated sites in the Carcross/Tagish First Nation's Traditional Territory. Several sites are abandoned mines and exploration sites. The Arctic Gold and Silver Tailings Facility (AGS) on Montana Mountain was abandoned in the late 1960's and partially remediated in 2000. Natural vegetation has been slow to establish on the covered tailings and further research into revegetation is needed.

With the support of the Yukon Fish and Wildlife Enhancement Trust, CTMC retained Krystal Isbister of FloraTek Consulting to facilitate the establishment revegetation trial plots near the AGS site.

2.0 SITE SELECTION AND PLOT PREPARATION

On August 20th, 2019, a survey of potential locations was completed with the CTMC Stewards to identify a site with similar environmental conditions to the AGS tailings, but without hazardous arsenic concentrations in the soil. Recreational access was also considered as vehicle, bike or human traffic could disrupt the revegetation process.

A location just upwind of the AGS tailings had been recently disturbed and provided the desired conditions (Figure 1.). A steep bank separates the relatively flat site and the adjacent roadway which minimizes recreational traffic.

Three 4 m x 7 m plots were delineated with a minimum of 1 m between them. Treatments were as follows:

Plot 1: Seeding of native species from locally gathered seed collections

Plot 2: CTMC nursery-grown and locally gathered transplants

Plot 3: Natural regeneration

Plot 1 and 2 were completely cleared of persisting vegetation with hand tools on August 23rd. Vegetation in Plot 3 was left intact with the exception of two pine saplings. The Senior Steward, Johnny C. Johns, felt the pines had established prior to the recent disturbance and did not represent natural regeneration timelines. Spray-painted corner stakes and a border of stones were established around the plots to identify the locations of each plot.



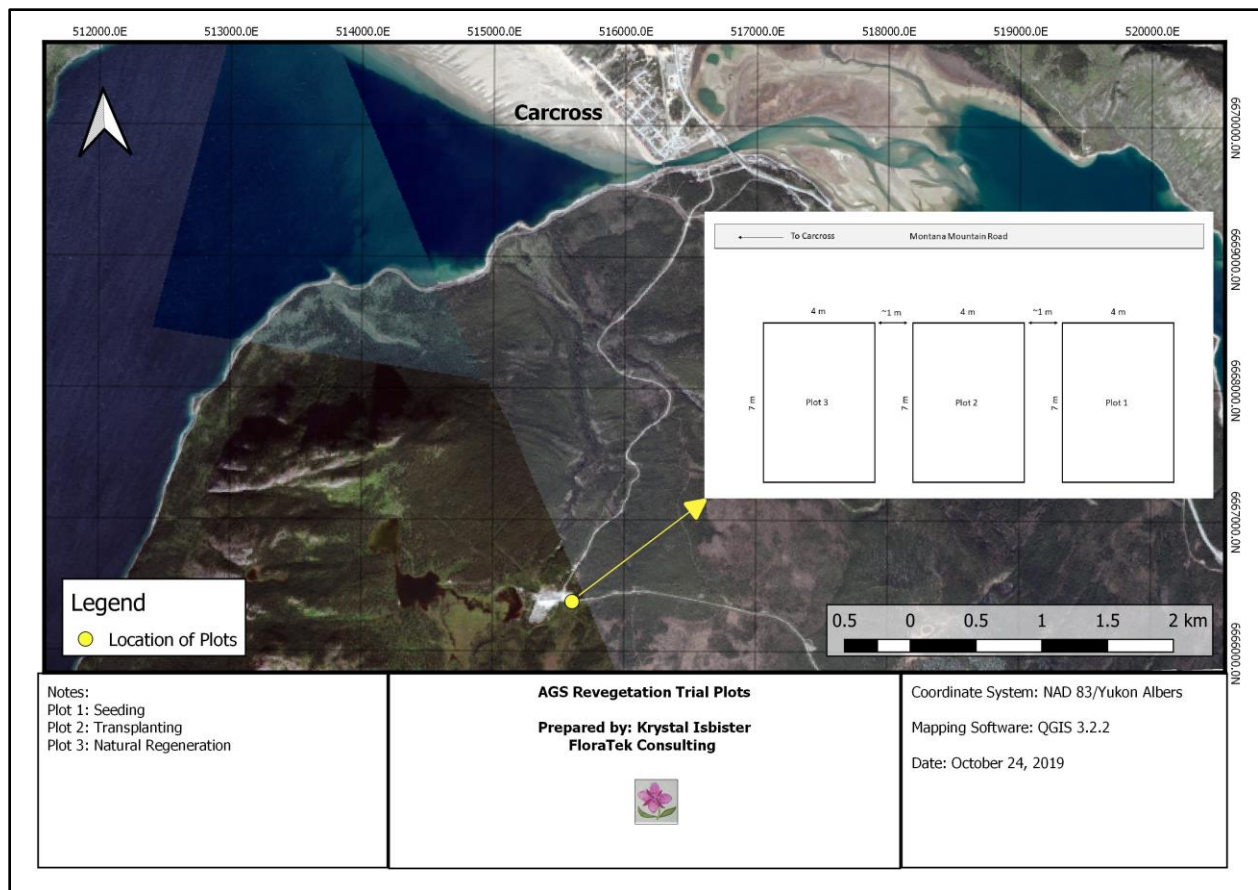


Figure 1. Location of the AGS Revegetation Trial Plots

3.0 SEED COLLECTION WORKSHOP

A Seed Collection Workshop was hosted on August 27th, at the CTMC Stewards Camp, near Carcross. Three Stewards participated as well as CTMC's project manager. As a group, we toured the AGS tailings facility to discuss revegetation options for the site, assess natural revegetation already occurring and evaluate the impact of invasive species. The workshop provided a valuable opportunity for the Stewards to share their perspectives and concerns about AGS, and be involved in the reclamation planning process.

After the site tour, seed collection basics were reviewed and the afternoon was spent on Montana Mountain collecting seeds for both the trial plots and CTMC's small seed bank.

4.0 SEEDING AND TRANSPLANTING

Seeding and transplanting was completed on August 28th. In Plot 1, a seedbed was prepared with rakes, seeds were broadcast by hand, raked a second time and lightly packed to ensure sufficient seed-soil contact. Nursery stock were removed from containers and transplanted with tree planting shovels in Plot 2. Additional wild stock were harvested the day before, held overnight in plastic containers and transplanted with large shovels. See



Tables 1 and 2 for species lists. No site preparation was completed at Plot 3 with the exception of pine sapling removal. A photo log of all activities can be found in Appendix 1.

Table 1. Species seeded in Plot 1.

Species Name	Common Name
<i>Achillea millefolium</i>	Yarrow
<i>Polemonium pulcherrimum</i>	Showy Jacob's Ladder
<i>Antennaria</i> sp.	Pussy Toes
<i>Hedysarum alpinum</i>	Bear Root
<i>Solidago simplex</i>	Goldenrod
<i>Juniperus horizontalis</i>	Creeping Juniper
<i>Eurybia sibirica</i>	Siberian Aster
<i>Elymus trachycaulus</i>	Slender Wheatgrass

Table 2. Species transplanted in Plot 2

Stock Type	Species Name	Common Name
Nursery-grown	<i>Achillea millefolium</i>	Yarrow
Nursery-grown	<i>Alnus viridis</i> subsp. <i>crispa</i>	Green Alder
Nursery-grown	<i>Aquilegia brevistyla</i>	Blue Columbine
Nursery-grown	<i>Artemisia alaskana</i>	Alaskan Wormwood
Nursery-grown	<i>Calamagrostis canadensis</i>	Bluejoint Reedgrass
Nursery-grown	<i>Chamerion angustifolium</i>	Fireweed
Nursery-grown	<i>Chamerion latifolium</i>	Dwarf Fireweed
Nursery-grown	<i>Deschampsia cespitosa</i>	Tufted Hairgrass
Nursery-grown	<i>Elymus trachycaulus</i>	Slender Wheatgrass
Nursery-grown	<i>Hedysarum alpinum</i>	Bear Root
Nursery-grown	<i>Lupinus arcticus</i>	Arctic Lupine
Wild	<i>Pinus contorta</i> var. <i>latifolia</i>	Lodgepole Pine
Nursery-grown	<i>Polemonium pulcherrimum</i>	Showy Jacob's Ladder
Wild	<i>Shepherdia canadensis</i>	Soapberry



5.0 CONCLUSIONS AND RECOMMENDATIONS

The Ethnobotany Brownfield Restoration Project successfully established three revegetation trial plots near the AGS tailings facility. This project complemented the CTMC Stewards' ongoing native plant nursery research and provided an opportunity to test the performance of their seed collections and seedlings. The selected species represent both ecologically and culturally significant plants of the Carcross/Tagish Traditional Territory.

There was limited community participation in the seed collection workshop, likely attributable to timing rather than overall interest. August is the harvest season for many traditional foods and hunting/berry picking were probably prioritized. Future seed collection workshops could be delivered in late July when species such as bear root and locoweed are fruiting.

Documenting seed germination and overwinter survival at the plots is recommended for the summer of 2020. Information on species performance will be invaluable for reclamation planning at AGS. Signs of animal visitation (scats, tracks, herbivory) should also be recorded at this time. The location also provides great outreach potential to start community conversations around revegetation visions and goals for AGS. A tangible representation of revegetation options may facilitate more engaging discussions than maps or written reports.



APPENDIX 1: PHOTO LOG



Photo 1: Site conditions prior to site preparation



Photo 2: Johnny C. Johns and Dominic Smith-Johns preparing the plots





Photo 3: Vegetation removal from Plots 1 & 2



Photo 4: Plots 1 & 2 after site preparation (pine trees were removed the following day)





Photo 5: Krystie Smarch collecting seeds on Montana Mountain.



Photo 6: Slender wheatgrass (*Elymus trachycaulus*) was a target species for seed collection





Photo 7: Nursery-grown seedlings and wild transplants ready for planting.



Photo 8: Showy Jacob's ladder (*Polemonium pulcherrimum*) grown from seed by the CTMC Stewards





Photo 9: Bill Smarch and Krystie Smarch packing the seedbed after seeding Plot 1.



Photo 10: Plot 2 after transplanting was completed.





Photo 11: Plot 3 with pine saplings removed, but all other natural vegetation left in place.





Carcross Tagish Energy Corporation

***"Nothing done today shall diminish the wealth
of future generations."***

The CTEC Stewards invite you to a Seed Collection Workshop

Tuesday, August 27th, 2019

@ the Stewards Camp

on the Tagish Road

10:00-3:00

**Join the CTEC Stewards for a day
exploring why and how we collect
seeds for revegetation. The seeds will
be used to establish revegetation plots
on Montana Mountain.**

A light lunch will be provided.

**Please bring warm clothes and sturdy footwear as
most activities will be outdoors ☺**

Gunalchéesh

For more info please contact Josslynn James @ 333-9787

CTMC Plant Profile



DESCRIPTION

- LARGE BUNCHGRASSES WITH WIDE LEAVES
- SPIKELETS ARE RELATIVELY LARGE AND ATTACHED DIRECTLY TO THE STEM
- ONE SPIKELET AT EACH NODE

HARVESTING

TIME: LATE AUGUST TO MID SEPTEMBER

METHOD: CLIP HEADS

NAMES

TAGISH:

TLINGIT:

ENGLISH: WHEATGRASS

SCIENTIFIC: *ELYMUS* SPP.

USES

MEDICINE: UNKNOWN

FOOD: UNKNOWN

TOOLS: UNKNOWN

CEREMONY: UNKNOWN

REVEGETATION: YES,
ESTABLISHES QUICKLY BUT
LEAVES ROOM FOR OTHER
PLANTS TO GROW

HABITAT

- OPEN WOODS, MEADOWS
- PREFERS FULL SUN
- LOW NUTRIENT REQUIREMENTS
- OFTEN FOUND IN DISTURBED AREAS



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1114 Front St. – Suite 15, Whitehorse YT Y1A 1A3
(867) 393-2356

CLEANING

METHOD: THRESH AND DRY SIEVE

EQUIPMENT: PILLOW CASE AND 4 MM SIEVE

STORAGE

METHOD: DRY AND FREEZE

LENGTH: UNKNOWN



GERMINATION

?: 50

TIME: AT LEAST SIX WEEKS

DORMANCY: YES, NEEDS COLD
MOIST STRATIFICATION FOR AT
LEAST 28 DAYS; LONGER MAY BE
BETTER

NOTES

REFERENCES:

MACKINNON A, POJAR J AND COUPÉ R (EDS.). 1999. PLANTS OF NORTHERN BRITISH COLUMBIA 2ND ED.
BC MINISTRY OF FORESTS AND LONE PINE PUBLISHING. 351 P.



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GST# 81819-7030

Invoice No.: 017-19

Invoice Date: October 24, 2019

Due Date: November 24, 2019

INVOICE

BILL TO:

Nelson Lepine

Carcross Tagish Management Corporation

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Whitehorse, YT Y1A 1A3

DESCRIPTION	AMOUNT
<u>Human Resources Total (Ethnobotany Brownfield Restoration Project)</u>	<u>\$2,340.00</u>
36 hours @\$65/hr	
<u>Expenses Total</u>	<u>\$169.74</u>
Mark's - \$99.69	
Independent - \$70.05	
GST	\$117.00
TOTAL	\$2,626.74

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2722600 MULTIGR RYE SAND GMR 4.49
2725600 SANDWICH EGG SLD GMR 3.99

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TOTAL 70.05

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TRAFFIC VEST, STANDARD

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Qty: 1 Base Price: \$9.99

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\$9.99 G

400005178269

GLOVE, WATSON MIRACLE WORKER NITRILE

Clr: Grey Sz: Small

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GLOVE, WATSON MIRACLE WORKER NITRILE

Clr: Grey Sz: Small

Qty: 1 Base Price: \$9.99

\$9.99 G

Sub Total

\$94.94

GST 5.000%

\$4.75

Total

\$99.69

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