

Road Rehabilitation Program – Francois Lake

STUART NECHAKO NATURAL RESOURCE DISTRICT

November 30, 2018

Prepared for:

*Society for Ecosystem Restoration in North Central BC (SERNBC)
c/o: John DeGagne
PO Box 190
1560 Highway 16 East
Vanderhoof, BC V0J 3A0*



Forest Enhancement
Society of British Columbia

Prepared by:

*Forsite Consultants Ltd.
1274 McGill Road
Kamloops, BC V2C 6N6
dfodor@forsite.ca
250-372-0444 ext. 307*



Acknowledgements

This project was made possible by the funding contributions of the Forest Enhancement Society of BC (FESBC), and was completed by a team from Forsite Consultants Ltd. (Forsite) with valuable contributions from the following:

- John DeGagne, RPF – President, SERNbc; Stewardship Forester, FLNRORD
- Marc Steynen – Manager, SERNbc
- Steve Thompson – Soil Scientist, Consultant
- Chuck Bulmer – Soil Scientist, FLNRORD
- Cathy Middleton – Authorizations Officer, FLNRORD
- Brendan Miller, P.Geo – Research Soil Scientist, FLNRORD
- Ronald Meister, RPF, P.Ag. – Forestry Consultant
- Jaret van der Giessen – Planning Superintendent, West Fraser Mills Ltd.
- Sara Johnson – Silviculture Superintendent, West Fraser Mills Ltd.
- Larry Clark – Forestry Supervisor, Canadian Forest Products Ltd.
- Blake Forde – Forestry Supervisor, Canadian Forest Products Ltd.
- Jill Park – Forestry Coordinator, Canadian Forest Products Ltd.
- Bill Chapman – Emeritus Research Scientist, FLNRORD – development of original algorithm
- Chartwell Consultants – development of original algorithm
- Olga Kovalchuk – GIS Specialist, Forsite
- Mike Bandstra, RPF – Operations Manager, Forsite
- Chelsea Hayer, RPF – Forestry Supervisor, Forsite
- Randy Spyksma, RPF – Senior Planner, Forsite
- Darcie Fodor, RPF – Strategic Planning Forester, Project Manager, Forsite

Executive Summary

The Road Rehabilitation program was initiated in the Stuart Nechako Natural Resource District in 2016 in part as a result of the significant salvage timber harvesting that occurred in response to the Mountain Pine Beetle outbreak. The Francois Lake Road Rehabilitation project is part of the larger, multi-phased process to identify and rehabilitate roads that are no longer required on the land base. The primary objective was to identify temporary access roads that are suitable candidates for road rehabilitation and reforestation while ensuring minimal impacts to other users on the land base. Roads selected as candidates were refined through engagement with various stakeholder groups that may be affected by these decisions.

The Road Rehabilitation Program was developed and piloted in the Francois Lake project area as a multi-phase planning and operational process with the following key steps:

1. Planning & Collaboration
2. Data Preparation & Algorithm Analysis
3. Desktop Review & Candidate Identification
4. Field Assessments
5. Treatment Prescriptions
6. Information Sharing
7. Plan Implementation & Treatments

Through this project, the first 3 steps (planning, analysis and review) were completed in full, with steps 4 (field assessments) and 5 (treatment prescriptions) completed on a portion of the project area. The final steps 6 (information sharing) and 7 (implementation of treatments) were not completed due to weather delays in the fall 2017 field season and impacts from the Island Lake wildfire in 2018.

Field assessments were completed in October 2017 which evaluated 80.6 km (40.3 ha) of roads to verify their eligibility in the program. Of this, 53.3 km (26.7 ha) of road was confirmed as an opportunity for rehabilitation, resulting in a 66% success rate from the desktop review to opportunities realized on the ground. Assuming this success rate is consistent across the project area, there is potentially 240.2 km (120.1 ha) of roads (not including right-of-ways) eligible for rehabilitation and reforestation treatments within the Francois Lake defined project area.

This report documents the approach and results of the Road Rehabilitation Program completed in the Francois Lake project area from 2017 to 2018. The development of the planning and operational process that supports the Road Rehabilitation Program has been documented further in the accompanying report *Road Rehabilitation Program – Planning Process* (SERNbc, 2018).

Table of Contents

ACKNOWLEDGEMENTS	I
EXECUTIVE SUMMARY	II
INTRODUCTION	1
Project Objectives.....	1
Study Area.....	1
APPROACH	3
1. Planning & Collaboration	3
2. Data Preparation & Algorithm Analysis	4
3. Desktop Review & Candidate Identification	4
4. Field Assessments.....	5
5. Treatment Prescriptions	6
6. Information Sharing	7
7. Plan Implementation & Treatments	7
8. Deliverables	7
RESULTS	7
Planning & Program Development	7
Standards & Protocols.....	8
Assessments & Prescriptions	8
Classification Accuracy	8
Expanding Project Area	9
Treatment Prescriptions.....	10
Incomplete Assessments	11
Weather Delay & Island Lake Wildfire	11
Information Sharing	12
Tender & Implementation	13
DISCUSSION	13

Table of Figures

Figure 1: Overview of the Francois Lake Project Area (blue) in relation to Vanderhoof (star)	2
Figure 2: Forest Service Roads within the Project Area	2
Figure 3: Roads Reviewed (highlighted blue) during the 2017 Field Assessments.....	9
Figure 4: Expanded Project Area	10
Figure 5: Island Lake Wildfire impact on the Project Area	12

Table of Tables

Table 1: Biogeoclimatic Zones within the Project Area.....	1
Table 2: Site Data Collected in Field Assessments	5
Table 3: Treatment Prescription Recommendations	6
Table 4: Results of Francois Lake Field Assessments	8
Table 5: Summary of Mechanical Site Preparation Treatment Prescriptions (2017 Field Assessments).....	10
Table 6: Summary of Planting Prescriptions (2017 Field Assessments)	11

Introduction

The Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD) initiated Road Rehabilitation planning work in the Stuart Nechako Natural Resource District (the District) in 2016 in part as a result of the significant salvage timber harvesting that occurred in response to the Mountain Pine Beetle outbreak. This project is part of the larger, multi-phased process started in the District to identify and rehabilitate roads that were constructed for temporary access or are no longer required. The Society for Ecosystem Restoration in Northern BC (SERNBC), a non-governmental organization with a mandate to coordinate programs focused on restoration of vulnerable and degraded ecosystems for a broad range of values, has continued the delivery of this initiative from planning and analysis to its implementation phases.

This report documents the approach and results of the Road Rehabilitation Program completed in the Francois Lake project area from 2017 to 2018. The development of the planning and operational process that supports the Road Rehabilitation Program has been documented further in the accompanying report *Road Rehabilitation Program – Planning Process* (SERNBC, 2018).

PROJECT OBJECTIVES

The primary objective was to identify temporary access roads within the District that are suitable candidates for road rehabilitation while ensuring minimal impacts to other users on the land base. Roads selected as candidates were refined through engagement with various stakeholder groups that may be affected by these decisions. The project will assist in meeting a number of objectives, including but not limited to improving timber supply, managing access, ameliorating hydrological impacts, improving water flow and fish passage, and enhancing wildlife habitat.

STUDY AREA

The Francois Lake Road Rehabilitation project area (the project area) is located immediately south of Francois Lake Provincial Park, approximately 10 km southwest of the Village of Fraser Lake and 50 km west of Vanderhoof (Figure 1). It is accessible by the Holy Cross-Binta Forest Service Road (FSR) (Figure 2). The biogeoclimatic (BEC) zones occurring in the project area are listed in Table 1. The project area is close to 36,890 ha with approximately 815 km of roads identified in available spatial data. Assuming an average road width of 5.0 metres (not including the right-of-way), this equates to over 400 ha of potential rehabilitation and reforestation opportunity.

Table 1: Biogeoclimatic Zones within the Project Area

BEC Zones	Area (ha)	Percent (%)
SBSmc2 <i>Babine Moist Cold Sub-Boreal Spruce</i>	23,724 ha	64%
SBSdk <i>Dry Cool Sub-Boreal Spruce</i>	7,060 ha	19%
ESSFmv1 <i>Nechako Moist Very Cold Englemann Spruce-Sub-Alpine Fir</i>	6,105 ha	17%

Approach

The Road Rehabilitation Program was developed as a multi-phase planning and operational process with the following key steps:

1. **Planning & Collaboration** – Identify¹ priority locations (project areas) and values or objectives for road rehabilitation efforts in collaboration with First Nations, government, licensees, and key stakeholders.
2. **Data Preparation & Algorithm Analysis** – Identify data and information requirements, prepare data and define assumptions, and run GIS algorithm to produce a classified road dataset.
3. **Desktop Review & Candidate Identification** – Perform a desktop review and modify the road classification using additional data, information, satellite imagery, and values or information captured through stakeholder consultation. Engage with licensees during this review process to consider and incorporate future development plans and outstanding obligations.
4. **Field Assessments** – Conduct assessments to verify rehabilitation or reforestation opportunities, and collect sufficient data with supporting rationale to develop treatment prescriptions.
5. **Treatment Prescriptions** – Develop Site Plans with rehabilitation treatment activities identified, including method of mechanical site preparation and planting prescriptions, as well as activities to address natural drainage concerns and access control. Roads can be grouped based on similar treatment types or based on location (i.e. selecting roads in close proximity).
6. **Information Sharing** – Provide Site Plans and supporting information to forest licensees, First Nations and identified stakeholders for a referral of proposed treatment activities.
7. **Plan Implementation & Treatments** – Implementation of the rehabilitation and reforestation Site Plans through the completion of on-the-ground treatment activities (i.e. site preparation to decompact the road prior to planting).
8. **Deliverables** – Includes a spatial database with identified rehabilitation and/or reforestation opportunities, completed field assessment forms, Site Plan treatment prescriptions, and final reporting (provided in this document).

1. PLANNING & COLLABORATION

The Francois Lake project area was identified through the initial planning work completed by the District (FLNRORD, 2017). The Francois Lake project area was determined to be a high priority area through discussions with FLNRORD staff, major forest licensees and First Nations, by evaluating areas within the District that experienced the highest density of roads and least amount of future fibre opportunity or outstanding obligations. While the District report identified four areas of opportunity, Francois Lake received the strongest support from the local forest licensee. For this reason, the Francois Lake project area was selected as the ‘pilot’ location and used as a framework to develop the Road Rehabilitation Program.

¹ This step was completed through the District-led project as reported in *Facilitating Road Rehabilitation Discussions – Vanderhoof Forest District* (FLNRORD, 2017).

2. DATA PREPARATION & ALGORITHM ANALYSIS

In order to shortlist roads as candidates for rehabilitation, a Road Rehabilitation GIS Algorithm was previously developed² and utilized in this project. The long-term objective of the algorithm is to develop a process that can be adapted and applied to any land base in the province. To achieve this, the algorithm was modified and tested on a smaller land base with the intended application for any low relief terrain in the Interior of the province. The algorithm classifies existing access structures as a Reforestation Opportunity (ROP) or No Opportunity Expected (NOE) to support road rehabilitation program implementation. This classification differs from the ‘temporary’ and ‘permanent’ classification defined in the Forest Planning and Practices Regulation because not all temporary access will qualify for reforestation, and in some cases permanent roads are no longer required for access which represents an opportunity.

The road rehabilitation algorithm was applied to a consolidated road dataset compiled from multiple data sources. The data inputs, assumptions and methodology applied in the algorithm, as well as the methodology applied during the desktop review (step 3), are provided in detail within the final report for the *Road Rehabilitation Algorithm – Modeling Update* (SERNBC, 2018) project. The key factors driving road classification are:

- The definition of future harvest opportunity;
- The geographic location of roads relative to the opportunity;
- Free growing status of a cutblock; and
- Constraints limiting road construction and harvesting.

In general, in-block roads, spur roads, and general access roads with no future timber harvest opportunities or ongoing silviculture obligations are identified as potential candidates for rehabilitation (ROP). All other roads that represent main access routes or FSRs are labelled as not a rehabilitation opportunity (NOE).

3. DESKTOP REVIEW & CANDIDATE IDENTIFICATION

The classified road dataset produced by the algorithm was reviewed in conjunction with satellite imagery, known development planning, information regarding outstanding obligations, and additional local knowledge. This further refines road classification to be reflective of current practices, better ensures that recommendations are operationally realistic, and avoids rehabilitating roads that are required for future operational needs or general access requirements in the area.

Once this in-depth review is complete, a list of candidate roads for rehabilitation were developed and mapped, which established the referral package delivered to the forest licensees for review. The referral package was delivered to forest licensees with operating areas that overlap with the project area, which included West Fraser Mills Ltd. and Canadian Forest Products Ltd. Licensees were requested to review and refine the list of candidate roads selected based on their local and operational knowledge. Engagement with licensees at this stage of the project allows for integration of future operational plans and ongoing silviculture obligations into the road classification algorithm, resulting in road selections that better reflect operational realities.

² Original GIS Algorithm was developed by Chartwell Consultants in collaboration with Steve Thompson and Bill Chapman. The algorithm was modified and updated through the *Road Rehabilitation Algorithm – Modeling Update* (FLNRORD, 2017) project. This updated version was used in the Francois Lake analysis.

This information package was also provided to the Lands and Natural Resource Manager at Saik’uz First Nation who previously expressed interest in the Road Rehabilitation Program within their traditional territory (which overlaps with the project area). In-person meetings and conference calls with West Fraser, Canfor and Saik’uz First Nation were organized to discuss their feedback and come to an agreement on a final classification and list of roads for on-the-ground assessments.

4. FIELD ASSESSMENTS

A standardized process was developed in order to complete field assessments and confirm the suitability of each road for rehabilitation. The methodology and resulting standards are described in further detail in *Road Rehabilitation Program – Planning Process* (SERNbc, 2018), including the Field Assessment Form and supporting guidance documents. The template field form was utilized to complete the field assessments and develop prescription recommendations in the Francois Lake project area.

Field assessments were developed and completed in order to:

- Confirm the list of roads identified are eligible candidates for rehabilitation;
- Identify any additional operational issues or constraints that may exist but have not been previously defined or considered in the process; and
- Collect data and prepare recommendations for proposed rehabilitation treatments (site preparation, if necessary, and planting prescriptions).

The observations and data collected during the field assessments, summarized in Table 2, provided the basis for developing treatment prescription recommendations.

Table 2: Site Data Collected in Field Assessments

Data	Description
<i>Road Profile</i>	<ul style="list-style-type: none"> ▪ Road width – minimum and average ▪ Road grade – average ▪ Side slope grade – average ▪ Road type – i.e. winter, surfaced
<i>Soil</i>	<ul style="list-style-type: none"> ▪ Texture – fine, moderate, coarse ▪ Coarse fragment content ▪ Compaction ▪ Organic materials
<i>Vegetation – Adjacent Stand</i>	<ul style="list-style-type: none"> ▪ Silviculture label – species, percent, age, height, crown closure, damage agents present
<i>Vegetation – Road Prism</i>	<ul style="list-style-type: none"> ▪ Silviculture label (defined above) ▪ Presence of non-tree species ▪ Presence of invasive/noxious weeds ▪ Evidence of cattle use
<i>Hydrology</i>	<ul style="list-style-type: none"> ▪ Distance to riparian areas ▪ Presence of stream crossings and structures/ culverts ▪ Stream classification, width, gradient ▪ Evidence (or potential) of erosion or instability
NOTES	Describe any conditions observed on site that has the potential to influence treatment prescriptions

From these site observations and data collected, recommendations for treatment prescriptions were developed in the field and refined in the office with additional information. The majority of treatment recommendations were developed on site and accounted for current conditions, potential conditions, and other observed factors unique to the road. The type of information considered in developing treatment recommendations is described in Table 3.

Table 3: Treatment Prescription Recommendations

Consideration	Description / Options
<i>Mechanical Site Preparation (MSP)</i>	<ul style="list-style-type: none"> ▪ Cat with ripper ▪ Mini excavator ▪ Excavator ▪ Other – please describe
<i>Planting</i>	<ul style="list-style-type: none"> ▪ Species ▪ Percent ▪ Target density
<i>Hydrology</i>	Actions required to address restoration of natural drainage patterns (i.e. waterbars, cross-ditches)
<i>Access Control</i>	Type and location
<i>Alternative Treatment</i>	<ul style="list-style-type: none"> ▪ Multiple treatments (MSP, planting) ▪ Efficiencies with equipment and resources on-site treating adjacent roads
<i>Priority</i>	Due to concerns not captured above

Data collected during this step can be used to analyze results (from the GIS algorithm, desktop review and field assessments) and identify trends or issues that could be resolved through future iterations or modifications to the algorithm.

5. TREATMENT PRESCRIPTIONS

Site Plans were developed once all field assessments had been completed. The strategy to group and name roads was based on their relative location to the nearest main access route or where they were a part of the same general road system. To delineate these groupings, road junctions were identified that represented main lines (i.e. FSRs, permitted roads) and roads identified for rehabilitation were selected from the last logical junction or access point. Alternatively, roads could be grouped based on their recommended treatments and associated site preparation equipment (i.e. mini excavator).

Site Plans were developed in order to implement rehabilitation activities, covering all timber and non-timber resource values, proposed treatments, and reforestation objectives. Operational standards or guidelines for are provided under *Road Rehabilitation Program – Planning Process* (SERNBC, 2018). The scope of prescriptions varied and were driven by the land base, ecosystems, and values previously identified by FLNRORD, licensees, First Nations, and other stakeholders.

6. INFORMATION SHARING

Although First Nations and stakeholder engagement was completed in advance through the District-led planning project, re-engagement was necessary once specific treatment prescriptions were identified. This ensured that prescriptions would not negatively impact other land users.

A contact list was developed through the previous District-led project, resulting in a list of tenured stakeholders including trappers, guide outfitters, ranchers, and recreational groups. In addition, a list of local First Nations that could have interests in proposed activities was prepared using the provincial government's Consultative Areas Database and discussions with the District. First Nations identified included Saik'uz First Nation, Lhoosk'uz Dene Nation, Ulkatcho First Nations, Cheslatta Carrier Nation, Nadleh Whut'en Band, and Stelat'en First Nation.

A project web-map was set-up as a tool to facilitate discussions and support engagement with the District, forest licensees, First Nations, and additional stakeholders. The web-mapping environment provided users with the ability to review the proposed rehabilitation candidates with additional data (i.e. location of old growth reserves or wildlife habitats) and other pertinent information.

7. PLAN IMPLEMENTATION & TREATMENTS

Once prescriptions were complete, tender documents are developed and tendered on the open market to secure competitive bids for the work to be completed in subsequent years. Tenders for rehabilitation (i.e. mechanical site preparation) and reforestation activities are completed under separate tendering processes. Detailed treatment contracts are then developed and entered into with successful bidders, as determined by SERNbc's tender selection process. Contracts are managed to ensure overall objectives of rehabilitation and reforestation treatments, as well as the overall Road Rehabilitation Program, are met.

8. DELIVERABLES

The deliverables for the Francois Lake Road Rehabilitation project include:

1. A classified road dataset with identified rehabilitation and reforestation opportunities;
2. Completion of field assessments forms in support of treatment prescription development;
3. Site Plans with recommended treatment prescriptions, including mapping products; and
4. Final Report describing the approach and results of the Francois Lake Road Rehabilitation Program.

Results

PLANNING & PROGRAM DEVELOPMENT

The Road Rehabilitation Program is a multi-phase process with seven key steps from planning and analysis through to treatment prescription and implementation of rehabilitation works. Through the Francois Lake Road Rehabilitation project the first 3 steps were completed in full (planning, analysis and review), with steps 4 (field assessments) and 5 (treatment prescriptions) completed on a portion of the project area. The final steps 6 (information sharing) and 7 (implementation of treatments) were not completed due to weather delays in the fall 2017 field season and impacts from the Island Lake wildfire in 2018.

STANDARDS & PROTOCOLS

A key outcome of initiating the Road Rehabilitation Program was the development of standardized processes and protocols that are intended to guide future road rehabilitation planning and program implementation. These standards and supporting documents were developed after reviewing the existing literature, standards, guidebooks, and best management practices for road and soil rehabilitation, as well as considering reforestation efforts, and identifying a need for a documented planning process. Subject matter experts were engaged with throughout program development to discuss the overall approach and key factors for consideration in the process.

The Road Rehabilitation Program planning standards and guidance documents are intended to be used on any land base in the province in support of road rehabilitation efforts. These documents contain:

- The process to solicit data and modify assumptions in support of the GIS algorithm analysis and resulting classified road dataset;
- Field assessment guidelines and forms to confirm a roads candidacy for rehabilitation;
- Road rehabilitation treatment prescription (Site Plan) development guidelines; and
- Operational guidance documents (best management practices) to implement rehabilitation treatments, from site preparation to reforestation.

The approach and outcomes of developing the standardized process to support road rehabilitation planning at a broader scale are described further in the companion document *Road Rehabilitation Program – Planning Process* (SERNBC, 2018).

ASSESSMENTS & PRESCRIPTIONS

CLASSIFICATION ACCURACY

The algorithm identified potential road candidates which, after refinement, established the list of roads to be assessed in the field and confirmed as candidates for rehabilitation. Roads were assessed in the fall of 2017 (October 17 – 27, 2017), the results of which are described in Table 4. Road area was estimated based on an average observed road width of 5.0 metres (not including the right-of-way) within the assessed portion of the project area.

Table 4: Results of Francois Lake Field Assessments

Road Candidates	Length (km)	Area (ha)
<i>GIS Algorithm</i>	352.8	176.4
<i>Desktop Review</i>	364.0	182.0
<i>Field Assessed (2017)</i>	80.6	40.3
<i>Confirmed Rehab Candidates</i>	53.3	26.7

The algorithm initially identified 352.8 km (176.4 ha) of roads which was refined through the desktop review process to 364.0 km (182.0 ha). Additional area was captured for field assessments as a result of the licensee review and an open willingness to include as much area as operationally feasible in support of this program.

During the 2017 field assessments 80.6 km (40.3 ha) of roads were reviewed (Figure 3), which is approximately 22% of the total road length identified for field assessments after the desktop review. Of the roads assessed in the field, 53.3 km (26.7 ha) were realized as rehabilitation candidates. This is a

success rate of 66% from the office review to field assessment. There was 15.6 km (7.8 ha) not identified by the algorithm (misclassified or missing spatial data) that was confirmed as a rehabilitation candidate in the field. In contrast, there was 23.8 km (11.9 ha) of roads identified as an opportunity in the algorithm that was not realized in the field. This highlights the importance of the multi-step approach and iterative review process to planning these large-scale programs.

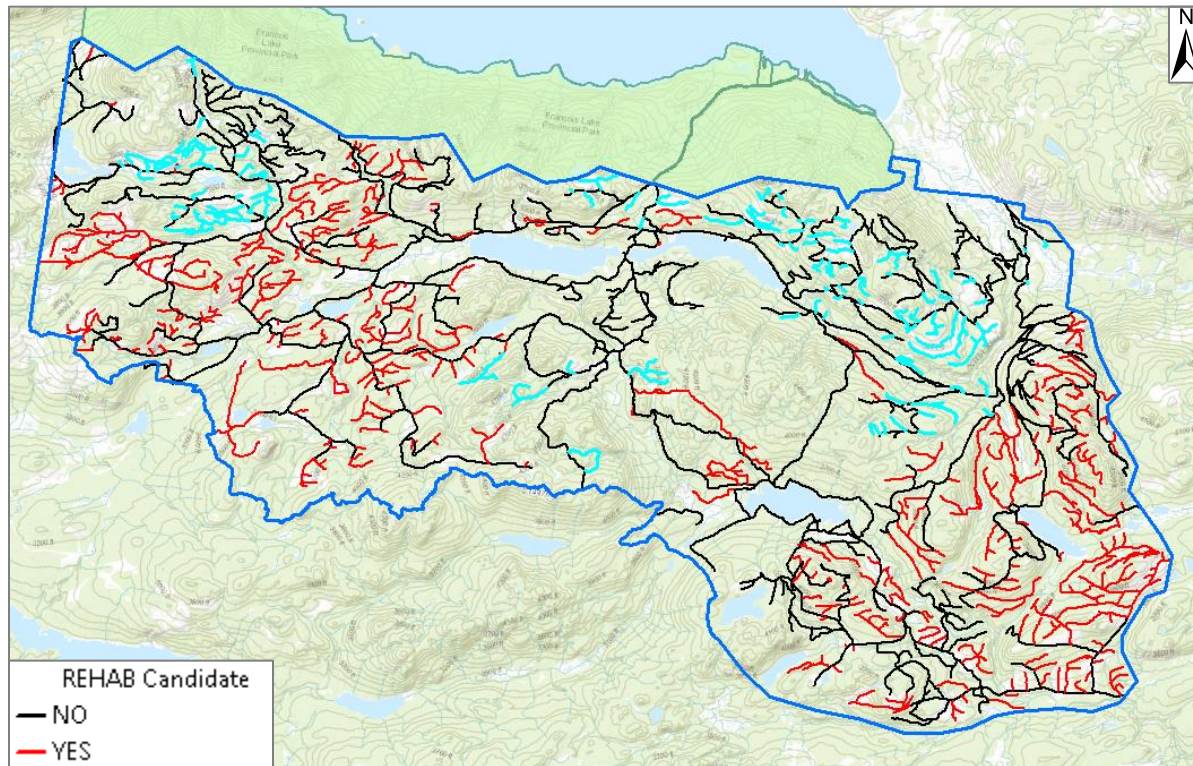


Figure 3: Roads Reviewed (highlighted blue) during the 2017 Field Assessments

Not all roads identified through the desktop review were assessed in the field due to unexpected delays. The values reported here are only for the field assessments completed in October 2017 and do not represent the entire Francois Lake project area.

The assessed area is an approximate value. If a road had potential and an assessment was completed, the average road width was recorded. In some cases a range was provided if the road width varied more than a metre along the entire corridor; in these situations the median was used to calculate the approximate area. If a road was not a candidate for rehabilitation, then the road widths may not have been recorded. To calculate the approximate area, an average road width of 5.0 metres was used based on the road widths observed in the 2017 field assessments. This area does not include the right-of-way outside of the ground disturbed area, including the road running surface, ditch lines, and cut/fill slopes.

EXPANDING PROJECT AREA

Through the iterative review process and results from the initial field assessments, an additional area to the southeast of the project area was identified for inclusion in the program in order to achieve the target hectares (460 ha) for treatment as proposed in the FESBC funding application. Once this additional area was identified and approved by the forest licensees (West Fraser), the road dataset went through the same refinement and classification process as described above.

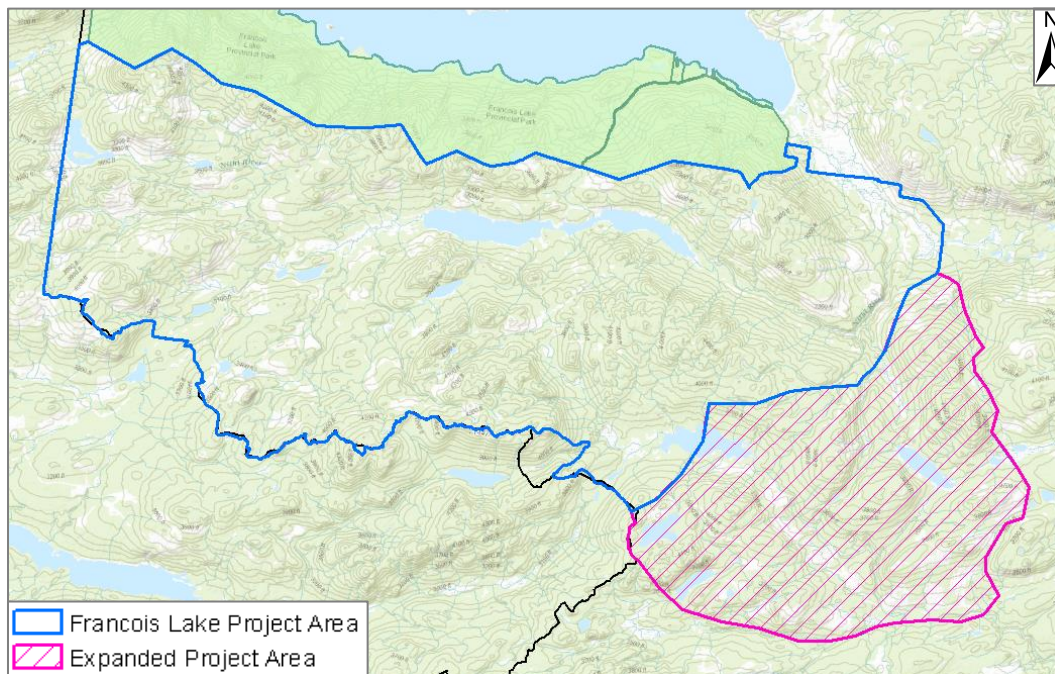


Figure 4: Expanded Project Area

TREATMENT PRESCRIPTIONS

Once a road was confirmed a candidate for rehabilitation, the field form was completed to acquire the sufficient data and develop treatment prescriptions in support of reforestation efforts. A template for Site Plans was developed for the assessed portion of the project area. The Site Plans completed as a result of the 2017 field assessments are provided under separate cover. A summary of the recommended treatment prescriptions are provided in Table 5 and Table 6.

Table 5: Summary of Mechanical Site Preparation Treatment Prescriptions (2017 Field Assessments)

Treatment Types	Primary Treatment		Alternative Treatment	
	Length (km)	Area (ha)	Length (km)	Area (ha)
<i>Cat with Ripper</i>	35.6	17.8	1.9	1.0
<i>Mini Excavator</i>	8.7	4.4	7.3	3.6
<i>Excavator</i>	-	-	0.9	0.5
<i>No MSP (plant only)</i>	9.0	4.5	4.5	2.3

The dominant MSP treatment prescribed was the use of a cat with ripper attachment. This treatment was selected because it is an inexpensive option (while remaining effective) in comparison to other equipment choices, like an excavator. There was some opportunity for spot treatments using the mini excavator, which suggests some healthy natural regeneration is occurring on select sites. In addition, nearly 9.0 km was identified as direct planting with no MSP treatment, which indicates that soil compaction is not a concern on these sites.

The alternative treatments most recommended were mini excavator and no MSP-direct plant. Mini excavator was recommended as an alternative option to treating with the cat and ripper due to varying site conditions (i.e. levels of compaction) and partial regeneration on roads that could potentially be retained through spot treatments. These alternative treatments were provided primarily for planning MSP treatments across the project area, therefore if sufficient adjacent area is identified for spot

treatment (by evaluating the recommended primary and alternative treatments) then these roads may be treated differently than the primary treatment recommends. Direct planting was recommended as a treatment option contingent on the level of soil compaction at the time of treatment.

Table 6: Summary of Planting Prescriptions (2017 Field Assessments)

Tree Species	Total # of Trees	% of Assessed Area
<i>Lodgepole pine (Pli)</i>	33,284	47.6
<i>Spruce hybrid (Sx)</i>	27,259	38.9
<i>Balsam fir (Bl)</i>	4,743	6.8
<i>Douglas-fir (Fd)</i>	3,256	4.6
<i>Trembling aspen (At)</i>	675	1.0
<i>Black cottonwood (Act)</i>	342	0.5
<i>Paper birch (Ep)</i>	181	0.3
Total 2017 Candidates	69,739	100%

The results of the planting prescriptions show a preference for lodgepole pine and spruce (hybrid), with smaller components of balsam fir, Douglas-fir, trembling aspen, black cottonwood, and paper birch. Species selected are reflected in the applicable Climate Change Stocking Standards as preferred and acceptable species, depending on the site series. For example, in the ESSFmv1 the climate change stocking standards includes balsam fir, Douglas-fir and western larch as acceptable species. While no western larch was prescribed during the 2017 field assessments there is potential for this species to be planted in the project area based on microsite conditions.

Deciduous species were selected adjacent to riparian areas and included aspen, cottonwood and birch. Douglas-fir was selected based on microsite conditions, with recommendations for this species to be planted in coarser soils, where the bedrock is shallow, on “knolls”, or in locations with potential cold air drainages. Spruce was primarily selected for planting in wetter and shaded areas. Where the adjacent cutblock was recently harvested it was recommended that planting of the road occurred at the same time as planting on the block, which would reduce costs through efficiencies realized by treating both areas simultaneously.

INCOMPLETE ASSESSMENTS

Field assessments and treatment prescriptions were not completed due to reasons described below. There remains 283.4 km (141.7 ha) of roads identified as candidates for further assessment dispersed throughout the project area. Based on the success rate realized during the 2017 field assessments (66%) there is the potential for 240.2 km (120.1 ha) of roads eligible for rehabilitation and reforestation treatments.

WEATHER DELAY & ISLAND LAKE WILDFIRE

Field work took place in the late fall of 2017 and was stopped due to snowfall and frozen ground which made it difficult to determine soil compaction levels or observe all the required site conditions to complete the field assessment forms. Some access issues were also experienced during the field work, such as roads already deactivated or access control structures not previously identified in the office, causing field crews to move to different locations within the project area as opposed to assessing all road candidates within one area. Due to these reasons, field work was completed on October 27, 2017 with the intention of resuming in the spring of 2018 after snowmelt.

On August 1, 2018, wildfire R11921 was discovered near Island Lake due to a lightning strike. The fire originated west of the project area and burned 21,381 ha south of Francois Lake including the Francois Lake Provincial Park. Due to easterly prevailing winds, the wildfire travelled eastward and impacted 12,847 ha (35%) of the project area (Figure 5). Two additional lightning strikes (G40645 and G40647) occurred in the eastern portion of the project area but did not result in any notable wildfire activity.

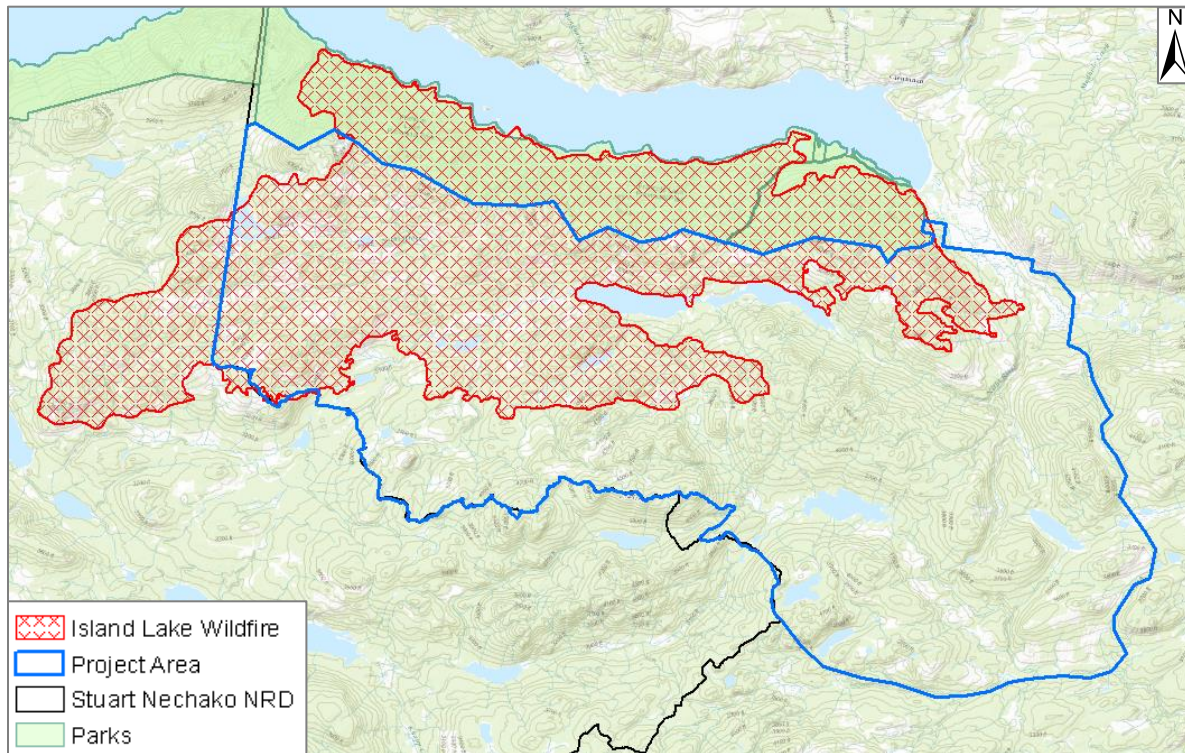


Figure 5: Island Lake Wildfire impact on the Project Area

Due to the large scale impact of the Island Lake wildfire, compounded by the catastrophic impacts experienced in this part of the province in the 2018 wildfire season, the Road Rehabilitation Program in Francois Lake was shut down. Further field assessments and rehabilitation works are required at a broader scale across the wildfire impacted landscape in the District and neighbouring communities, with opportunities for road rehabilitation as one potential treatment activity in the restoration toolbox.

INFORMATION SHARING

The web-map service was used during the review period with First Nations and stakeholders. It was provided as an opportunity to view proposed road rehabilitation candidates for field assessments on a site-specific basis while viewing other pertinent layers, such as access to recreation sites, designated wildlife habitats, operational considerations (i.e. silviculture obligations), and satellite imagery.

Engagement with First Nations and stakeholders was completed in previous phases of this project as reported in *Facilitating Road Rehabilitation Discussions – Vanderhoof Forest District* (FLNRO, 2017). The intent of this project was to re-engage with First Nations and stakeholders to review the proposed Site Plans and solicit their input before commencing any activities. This was to be completed once all Site Plans were developed and prior to tendering out any site preparation or planting contracts. This step would have also included engaging with the District to secure the necessary authorizations to

implement treatment prescriptions on non-status roads. However, since all activities stopped after the Island Lake wildfire, this phase of the project was not completed.

TENDER & IMPLEMENTATION

Once Sites Plans were developed for the entire project area, tender documents would have been developed to secure competitive bids for site preparation work in the summer and planting in the fall. Based on the outcomes of the field assessments and the types of mechanical site preparation recommended (predominately cat with ripper and mini excavator), multiple contracts may be needed based on contractor and equipment resources. Completion of site preparation and planting treatments would be based on the tenders received. However, as with the information sharing phase, this phase was not completed as the project was terminated during the field assessment phase.

Discussion

The implementation of the Road Rehabilitation Program in the Francois Lake project area was a successful effort to develop a planning and operational process and pilot it on a smaller land base, testing out the assumptions and approach of working in collaboration with various types of land managers and resource professionals from government, First Nations, and forest licenses. The concept of road rehabilitation was widely supported by all contacted interested parties and no concerns were raised with the proposed approach presented here and in further detail in the accompanying *Road Rehabilitation Program – Planning Process* (SERNbc, 2018) report.

There are opportunities for refinement to the GIS Algorithm to better predict rehabilitation opportunities. Although the completed assessments in Francois Lake represent a small sample size, this field data could be analyzed to identify any trends or indicating factors that could be used to modify the algorithm assumptions. For example, a minimum road width (i.e. < 3.0 metres) and adjacent stand age (i.e. > 20 years) could be considered as occupying the road due to reaching roots and branches.

It is not recommended that road rehabilitation in the Francois Lake project area continue independently of other rehabilitation and restoration efforts occurring in response to the 2018 wildfire season. The project objective and process was developed for linear road features that assumed adjacent areas were inaccessible for treatment. Now the landscape has changed significantly and these linear features can no longer be consider and treated in isolation. The area should be assessed within the context of the broader landscape and restoration plans should be developed that prioritized multiple objectives and consider a wider range of treatment opportunities.