SIFCo CFA K2R

Implementation of Slocan Valley Strategic Landscape Level Wildfire Protection Plan

November 2017

Stephan Martineau,
Manager

Tom Bradley, RFT 0452
Forestry Supervisor

Contact:
Slocan Integral Forestry Coop (SIFCo)
Box 189
Winlaw BC, V0G2J0
250-226-7012
stephan@sifco.ca

Table of Contents

Implementation of Slocan Valley Strategic Landscape-Level Wildfire Protection Plan

1. Project Design and Rationale

The project described in this proposal and accompanying maps will complete the implementation of a Strategic Landscape-Level Fuel Management Plan on Community Forest Agreement (CFA) K2R.

SIFCo manages CFA K2R with climate change adaptation and wildfire preparedness in mind, and has been involved in planning and carrying out fuel management treatments on and adjacent to the CFA since 2009. To date, we have completed over 400 ha of fuel management treatments, representing an investment of approximately $2.6 million. This proposal is a multi-year program that builds on all of this previous work and brings to completion this Strategic Plan while simultaneously creating a model resilient region in British Columbia.

The main outcome from this work plan is a completed set of 12 landscape-scale fuel breaks located across main fire movement paths as outlined by SIFCo's fire behaviour model.

This section describes the analytical methods and procedure used to design and support the Strategic Plan.

1.1 Fire Behaviour Modeling

SIFCo used the FlamMap 5 fire simulator from the US Bureau of Land Management to model fire behaviour on the CFA landbase and adjacent areas.

The goals of the modeling exercise were:

(a) to examine potential fire behaviour during typical hot, dry summers in the West Kootenay ecosystem, and

(b) to look for fire movement paths determined by terrain and fuel types within the landscape.

The modeling illustrated that the rate of spread and impact of fires under the typical summer Fire Danger Class 5 conditions were alarming and dangerous to public safety. This information has helped increase community awareness of the fire risk level.

Fire movement paths in the landscape were also revealed, generally associated with air movement up east/west valleys and fuel-rich ecosystems on south-facing slopes. This information has informed the strategic planning process.

The fire behaviour modeling is discussed in more details in Appendix 1.

1.2 Strategic Fuel Management Plan

The Strategic Fuel Management Plan identifies locations where is it desirable and feasible to create a strategic fuel break, considering:

- major fire path locations,
- vegetation and fuel types,
- terrain and slope,
- access (potential and existing),

- forestry staff local knowledge, and
- land ownership

Guiding principles for choosing strategic fire break locations were:

- Strategic fire breaks should be located to interrupt identified fire movement paths.
- Strategic fire breaks should break the landscape into sub-units, with the goal of providing suppression options to prevent the growth of local fires into landscape-scale fires.
- Strategic fire breaks should reduce the chances of fires moving from crown forest land to private and municipal land.
- Strategic fire breaks should be at least 200m wide and preferably wider.
- Strategic fire breaks should be as continuous as possible, to minimize potential fire pathways through the fire break.
- Fuel management treatments are only feasible on slopes < 60% (minor inclusions of steeper slopes are acceptable).
- Treatment areas must be accessible.
- Strategic fire breaks should expand from existing fuel treatments and natural low fuel areas wherever possible.
- Strategic fire breaks consider ecosystem restoration needs in ecosystems adapted to frequent fire intervals (NDT 4 ecosystems).

These principles were used to identify the contiguous operable and accessible strategic fire breaks shown on the Strategic Fuel Management Plan maps (Appendix 2).

1.3 Climate Change Adaptation and Ecosystem Resilience

The Strategic Fuel Management Plan aligns with current thinking on forest management for ecosystem resiliency and climate change adaptation.

SIFCo participated in the West Kootenay Resilience project from 2010 to 2012, which led us to consider the following concepts in our strategic planning:

1. Climate change will result in dramatic shifts in species composition and vegetation density within our CFA over the next 60 years.
2. Species currently at the edge of their ecological/climate niche (e.g. red cedar in much of the southern CFA) will no longer establish themselves and grow. Mature individual trees may, however, survive for many years.
3. Drought tolerant and fire resistant species with low current presence on much of the landbase (e.g. ponderosa pine) will become the most ecologically suitable species on many low elevation sites, and should be introduced as quickly as possible.
4. Current forest density in the ICH subzones will not be supportable under coming moisture and temperature regimes. Forest density will be reduced by management (harvesting, thinning, fuel management) or by wildfire. As temperatures rise and summer moisture inputs decrease, wildfires will more likely be catastrophic events that degrade soil and water resources and negatively impact forest structure, composition and function.

5. Retaining established large trees of fire resistant species in a reduced forest density/ fuel load environment is the key to building ecosystem resiliency. These trees will have the best chance of surviving the coming drought stress and fire events, and will maintain forest ecosystem values over time.

We are also familiar with the current work of the Climate Leadership Team and the Southern Region Research Ecologist.

SIFCo has WUI stocking standards in its approved Forest Stewardship Plan for areas adjacent to settlement and infrastructure. The WUI standards have a target stocking standard of 400 stems/hectare, elevate deciduous tree species (which have limited flammability) to preferred, and contain ponderosa pine as a preferred or acceptable species in all but the ICH subzone wettest sites. The standards are intended to facilitate addressing the climate change adaptation concepts above.

1.4 Private Land

Treatments done and/or proposed in the Strategic Plan are on crown or municipal land.

However, all parties are aware of the potential fire travel paths on adjacent private land. Our fire simulation modeling tells us that fires will find and burn rapidly through untreated fuels adjacent to treated areas. Untreated fuels on private land can carry fires past the flanks of fuel managed areas on crown land, and thus directly threaten dwellings and community infrastructure.

Leaving fire pathways with high fuel loads on private land in locations that will carry fire through or around strategic fire breaks on crown land reduces the effectiveness of the crown land investment. The Strategic Plan maps, therefore, identify areas of private land where fuel management work would augment planned work on the crown land to complete or enhance a fire break.

1.5 Regulatory Regime

SIFCo holds Community Forest Agreement K2R, an area-based tenure over the crown forests within the defined CFA boundaries.

SIFCo operates with the legal framework of the Forest and Range Practices Act (FRPA), the Forest Planning and Practices Regulation (FPPR), the CFA Licence Agreement, and our Forest Stewardship Plan (FSP).

1.6 Unconventional Fibre Utilization

At this time, SIFCo is not able to find a viable approach to move sub-merchantable (< 17.5 cm diameter, and mostly < 10 cm diameter) understory wood from fuel management treatments into a fibre utilization pathway.

SIFCo has, however, initiated discussions with Mike Lynn, the Assistant Fibre Manager at Mercer International's Zellstoff Celgar pulp mill in Castlegar, BC, about utilizing small diameter and dead wood fibre from WUI harvest operations as feedstock. Celgar works with Arbor Sentinel, another Mercer owned company, to acquire and ship unconventional fibre. Their goals are to improve utilization, decrease waste, and address mid-term timber supply issues following the mountain pine beetle. Their minimum log size is 12 feet long to a 1 inch top. Their focus to date has been on the small and dead wood component of conventional harvesting, but the same material will be generated by fuel management harvesting, and is a natural fit with their program. The WUI treatment

landbase on the SIFCo CFA landbase is within a feasible 3.5 to 4.5 hour hauling cycle time of the Celgar mill.

Zellstoff Celgar is aware and supportive of our Fuel Management Plan, and we hope that their current objectives allows for collaboration during the implementation of the Plan.

SIFCo will also continue to actively seek a solution that will allow us to achieve utilization rather than disposal.

2. Alignment with FESBC Purposes

A: Wildfire risk reduction and mitigation is the primary focus of the plan. A landscape-level approach to fuel management is required to reduce the opportunities for fires to expand from the local to the landscape scale, and thus avert the large fires that cause the most damage. SIFCo sees a landscape-level approach as the best method to protect communities, critical infrastructure and the substantial investments in fuel management made over the last nine years by the local, provincial and federal governments. The plan includes 12 strategic fuel break zones, located to take advantage of terrain features, natural and man-made low fuel areas, and to cut major fire movement paths.

B: Wildlife Habitat enhancement. The south valley planning area contains three ecological zones of moderately steep to steep south-west facing slopes with a hot dry micro-climatic regime. These sites support a grassland to forest transition ecotone of scattered large trees, low shrubs, grasses and herbs that is typical of dryer biogeoclimatic zones, and not common in the surrounding landscape. This provides a unique habitat in the landscape for ungulates, small mammals, reptiles and birds, and is part of a regionally significant ungulate winter range area. These ecosystems were formerly maintained by a frequent fire regime, and are now threatened by forest encroachment and high fuel accumulations from live and dead regeneration. The accumulated fuel would support a very hot fire that would kill many biota, damage soils, and the ecologically valuable large trees, as well as pose an extreme treat to adjacent communities and infrastructure. Restoration proposed here is required to reduce fuel loads, reintroduce fire, and restore ecosystem health and resiliency

C: Rehabilitation of low value stands and/or MPB killed stands. The valley suffered a mountain pine beetle epidemic between 2005 and 2008. Two of the Strategic Fuel Break Zones are located in beetle killed pine stands. Current replacement stands in these areas are dominated by poorly formed, off-site cedar and hemlock. The fuel management work on these sites will reduce or eliminate the low value understory, and lead to establishment of more suitable pine, larch and Douglas-fir.

D. Opportunities to attain carbon benefits. Over the six-year proposed implementation of the Slocan Valley Strategic Landscape Level Wildfire Protection Plan, the planned treatments will generate over 60,000 tonnes of non-merchantable woody biomass. Using our current debris disposal methods, we estimate that 15% of this volume will be chipped and 85% of this volume will be burned. SIFCo's goal is to acquire a tracked chipper and an excavator mulching head to enable us to increase the proportion of non-merchantable biomass that can chipped or mulched in the woods so the carbon content is stored in the forest soil. Switching debris disposal technology will enable us to move to approximately 25% burning and 75% chipping/mulching/carbon storage, thus reducing burned biomass weight by 36,000 tonnes. Moving to a multi-year agreement with FESBC would allow us to create a business plan to acquire this disposal technology quickly and reduce our carbon outputs. This goal is much harder to attain on an annual funding cycle.

3. Work Plan

The work plan and the Strategic Fuel Management Plan propose five treatment regimes. The specific operations in each treatment unit will be documented in professionally prepared operational plan and/or prescriptions. The costs associated with these are included in the overall proposal. All requirements of the FRPA regulatory regime will be met.

3.1 Type 1 - Wildland Urban Interface Fuel Management

The Type 1 treatment method addresses dead and non-merchantable live fuels in a forest area to achieve fuel management goals. Most Type 1 work is carried out by hand crews. Machine piling of cut fuels is an option in gently sloped terrain.

A professional treatment prescription will be developed prior to treatment. The standard Type 1 treatment parameters are:

- Tree Removal
  - Overstory stems > 17.5 cm will be retained.
  - Understory conifers < 17.5 cm in diameter will be thinned to create a final stand density of 500 to 700 stems/ha, or approximately 4 m intertree spacing.
  - Understory leave tree spacing and density will vary depending on overstory tree distribution prior to treatment.
  - Small clumps of conifer regeneration < 17.5 cm in diameter may be retained for structural diversity and habitat values. Areas which provide a visual screen for part of the unit will be the first priority for clump location. Retained clumps may occupy up to 5% of the treatment Area. The clumps may not create a fire pathway within the treated unit, considering terrain, wind patterns and adjacent vegetation types/fuel types.
  - Deciduous trees and western yew will be to be retained as 'ghost trees' and do not count towards target density.
- Pruning
  - All retained conifer stems outside of retained clumps will be pruned to a height of 2.5 m or 1/3 of total height, whichever is less, to remove ladder fuels.
  - Live branches and dead branches which retain needles and fine branches will be pruned.
- Fine Fuel Abatement
  - Reduce accumulations of fine surface fuels <7 cm diameter to approximately 0.5 kg/m2 (5 tonnes per hectare).
  - Reduce accumulations of fuels 7 to 12 cm diameter to approximately 2.5 kg/ m2 (25 tonnes per hectare).
  - Discontinuous areas of fine fuels up 10 m x 10 m in size may be left untreated to retain biodiversity values. Untreated fine fuel area may occupy up to 4% of the treatment area.
- Coarse Woody Debris
  - A minimum of 10 logs per ha of coarse woody debris, each >5 meters in length and >20 cm diameter, will be retained if present.
- Debris Disposal
  - Cut stems and other fuels will be disposed of by chipping or by piling and burning.
  - Burn piles will be a maximum of 5 meters in diameter and 5 meters high. Piles will be located away from retained trees.
  - All pile burning will be done in accordance with the Wildfire Act and Regulations.
- Smoke Management
  - Burning will be conducted in accordance with Ministry of Environment regulations.

- Safety
  - All will be carried out in compliance with applicable Worksafe BC regulations.
- Reserves
  - Riparian reserves will be established per FPPR and the K2R FSP and will not be treated.
  - Slopes >60% may not be treated if terrain and site conditions create an unsafe workspace.
  - Additional reserves may be established based on site specific factors. Any additional reserves will be mapped and supported with a rationale.
- Revegetation
  - Disturbed areas from machine traffic will be seeded with an appropriate revegetation seed mix of Canada #1 grade seed within 18 months of disturbance.
- Information Sharing
  - Information on planned activities will be shared with all holders of a government tenure or licence, First Nations per CAD database, and adjacent landowners a minimum of 30 days prior to work start.

Before and after pictures from a Wildland Urban Interface Fuel Management area, showing impact of treatment on fuel load. Pictures taken from exact same location.

3.2 Type 2 - Post-Harvest Fuel Management

This treatment method is used in areas that have been previously harvested to reduce fuel loads and initiate climate change adaptation using a merchantable understory removal / overstory retention approach. The harvest pass creates an open forest of established large trees of fire resistant species, per the SIFCo WUI stocking standards. Post harvest fuel assessment and abatement per the wildfire regulations will be carried out by licensee.

The Type 2 post harvest treatment completes the creation of a fuel managed area by removing sub-merchantable understory stems, ladder fuels, and fine fuels.

Type 2 treatment uses an excavator to pile concentrations of fine and medium fuels for disposal. Following the machine piling phase, the hand treatment crew will go thought the unit to address remaining fuel loads.

A professional treatment prescription will be developed prior to treatment. The standard Type 2 treatment parameters are:

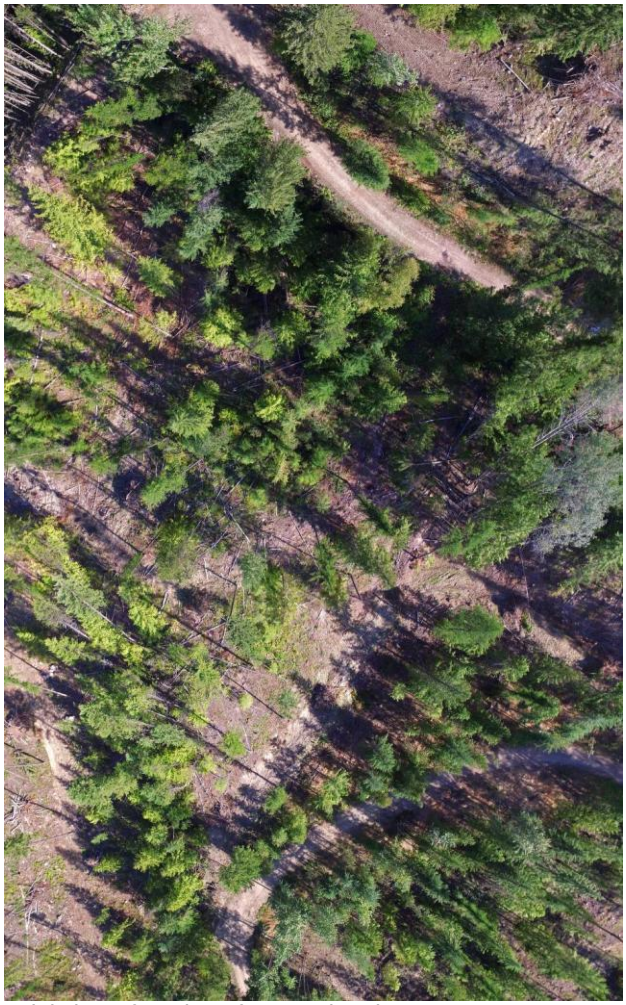
- Tree Removal
  - Overstory stems > 17.5 cm will be retained.
  - Understory conifers < 17.5 cm in diameter will be thinned to create a maximum final stand density of 500 to 700 stems/ha, or approximately 4 m intertree spacing. Poor quality stems with low live crown percentage, deformed stems, severe suppression and/or logging damage will not be retained.
  - Final understory leave tree spacing and density will vary depending on (a) overstory tree distribution prior to treatment and (b) existence of suitable understory leave trees.
  - Clumps of conifer regeneration < 17.5 cm in diameter may be retained for structural diversity and habitat values. Areas where no overstory harvest took place and areas which provide a visual screen from roads or trails will be the first priority for clump location. Retained clumps may occupy up to 15% of the treatment Area. The clumps may not create a fire pathway within the treated unit, considering terrain, wind patterns and adjacent vegetation types/fuel types.

    - Deciduous trees and western yew will be to be retained as ‘ghost trees’ and do not count towards target density.
- Fine Fuel Abatement
    - Reduce accumulations of fine surface fuels <7 cm diameter to approximately 0.5 kg/m2 (5 tonnes per hectare).
    - Reduce accumulations of fuels 7 to 12 cm diameter to approximately 2.5 kg/ m2 (25 tonnes per hectare).
    - Discontinuous areas of fine fuels up 10 m x 10 m in size may be left untreated to retain biodiversity values. Untreated fine fuel area may occupy up to 4% of the treatment area.
- Debris Disposal
    - Cut stems and other fuels will be disposed of by chipping or by piling and burning.
    - Burn piles will be a maximum of 5 meters in diameter and 5 meters high. Piles will be located away from retained trees.
    - Machine piling of fuels will be used in locations with slopes < 35% and stable soils that are suitable for machine travel.
    - All pile burning will be done in accordance with the Wildfire Act and Regulations.
- Reserves
    - Riparian reserves established per FPPR and the K2R FSP and will not be treated.
    - Slopes >60% may not be treated if terrain and site conditions create an unsafe workspace.
- Coarse Woody Debris, Smoke Management, Safety, Revegetation and Information Sharing
    - Same targets and standards described under Type 1 treatments.

Completed Type 2 treatment from 2017. Fuel loads abated and forest ecosystem values retained.

Type 2 treatment in progress in 2017. An investment in a track chipper by SIFCo would reduce the use of fires dramatically and create carbon benefits.

Completed Type 2 treatment from 2017



Aerial view of portion of a completed Type 2 treatment area.

3.3 Type 3 - Machine Based Interface Cleanup

This treatment method is similar to Type 2 – Post-Harvest Fuel Management – but will be carried out in interface areas where combinations of insect attack, root disease, blowdown and past high-grading have depleted the stock of merchantable timber to the point where no viable harvest volume remains.

The Type 3 treatment reduces the extreme fuel loads on these sites, while retaining an open overstory of established large trees of fire-resistant species. The density of retained large trees will be determined by the stocking on site, and may be very low. The SIFCo WUI stocking standards will generally be met by natural regeneration.

Type 3 treatment uses an excavator to pile fine and medium fuels for disposal, or to mulch fuels in lace using a mulching head. The machine access routes will create open strips in the treated area, but machine access will be constrained to limit impacts on stocking density and soil disturbance.

If financially feasible, the hand treatment crew will go thought the unit to address remaining fuel loads following the machine piling/mulching phase.

The Type 3 treatment meets fuel management and climate change adaptation goals.

A professional treatment prescription will be developed prior to treatment. The standard Type 3 treatment parameters are:

- Tree Removal
  - Where present, overstory stems > 17.5 cm will be retained. Creation of machine access trails may require that some overstory stems be felled. This will be minimized as much as possible.
  - Understory conifers < 17.5 cm in diameter will be thinned to create a maximum final stand density of 400 to 700 stems/ha, or approximately 4 m intertree spacing. Poor quality stems with low live crown percentage, deformed stems, and/or severe suppression will not be retained.
  - Final understory leave tree spacing and density will vary depending on (a) overstory tree distribution prior to treatment and (b) existence of suitable understory leave trees.
  - Clumps of conifer regeneration < 17.5 cm in diameter may be retained for structural diversity and habitat values. Areas which provide a visual screen from roads or trails are the first priority for clump location. Retained clumps may occupy up to 25% of the treatment Area. The clumps may not create a fire pathway within the treated unit, considering terrain, wind patterns and adjacent vegetation types/fuel types.
  - Deciduous trees and western yew may be retained as 'ghost trees' and do not count towards target density.
- Fine Fuel Abatement
  - Reduce accumulations of fuels 7 to 12 cm diameter to approximately 2.5 kg/ m2 (25 tonnes per hectare).
  - Discontinuous areas of fine fuels up 10 m x 10 m in size may be left untreated to retain biodiversity values. Untreated fine fuel area may occupy up to 4% of the treatment area.
- Debris Disposal
  - Fuels will be disposed of by chipping or by piling and burning.
  - Burn piles will be a maximum of 5 meters in diameter and 5 meters high. Piles will be located away from retained trees.
  - Machine piling of fuels will be used in locations with slopes < 35% and stable soils that are suitable for machine travel.
  - All pile burning will be done in accordance with the Wildfire Act and Regulations.
- Reserves
  - Riparian reserves will be established per FPPR and the K2R FSP and will not be treated.
  - Slopes >60% may not be treated if terrain and site conditions create an unsafe workspace.
- Coarse Woody Debris, Smoke Management, Safety, Revegetation and Information Sharing
  - Same targets and standards described under Type 1 treatments.

This forest is within a planed Type 3 treatment area.

3.4 Type 4 - Fuel Management for Habitat Restoration and Ecosystem Resiliency

The southern portion of the CFA contains several isolated areas of dry site NDT 4 ecosystems on steep south facing slopes.

These areas have locally unique plant communities that are more commonly associated with the dry Interior Douglas Fir biogeoclimatic zone. Large ponderosa pine (Py) are common, and open pine forests with a fire adapted shrub/herb understory are the desired future condition. These areas are not part of the timber harvesting landbase. These sites are the western end of a belt of deer and elk winter/spring range that runs for 25 km to Nelson.

From a climate change adaptation perspective, these units contain outposts of the biota that should thrive in surrounding areas as the climate warms. These areas are, however, currently being reduced and degraded by coniferous ingress. Further, if/when these areas burn under current fuel loads, the fire is highly likely to be intense, fast moving, and uncontrollable due to combinations of steep slopes, upslope winds, high fine fuel loads, and generally dry conditions. A fire under current conditions will likely (a) kill many of the locally rare and ecologically valuable species on the site, which are not well adapted to extreme fire events, (b) kill many or all of the ecologically valuable leave trees, and (c) transition from local to landscape scale.

The ecosystem and strategic fire management benefits of managing these areas with low intensity, frequent fires are significant. Reintroduction of fire will also improve and maintain ungulate range and forage values.

Type 4 treatments in these areas will be designed to facilitate the return of fire to the ecosystem. The treatment regime will include:

- Machine piling and/or mulching of fuels and debris where terrain conditions are suitable.
- Hand treatment as required to reduce fuel loads adjacent to the stems and above the rooting area of large leave trees to reduce fire intensity, and soil and bark heating.
- Hand treatment to reduce the fuel loads in dense regeneration thickets to moderate fire intensity.
- Creation of very low fuel load fire breaks along the boundary of the burn area.
- Development of a professional burn plan.
- Reintroduction of fire, as well as post fire surveys and documentation (under separate funding in collaboration with the Southeast Fire Center).

A professional treatment prescription will be developed prior to treatment. SIFCo is working closely with the BC Wildfire Service - Arrow Fire Zone in the planning and execution of the restoration program. The pre-burn treatment parameters cannot be defined in detail at this time as they are largely determined by where fuel accumulations and more active fires are acceptable and where they are not, in the view of the fire professionals.

Safety, smoke management, reserve management and information sharing protocols will be the same as for treatment types 1 through 3.

Ecosystem restoration area after initial treatment, before reintroduction of fire. Fuel loads have been reduced around large leave trees and in the foreground. Areas of dense regen in the background are located where an intense fire is acceptable and have been left to burn.

Results of a small burn in an ecosystem restoration area. This area greened up with deciduous vegetation in three weeks, and large stem survivorship is close to 100%.

3.5 Type 5 - Wildland-Urban Interface Re-Treatment

WUI fuel management reduces potential fire intensity and rate of spread by reducing the fuel load in the lower forest canopy. The rate at which post-treatment coniferous regeneration increases fuel loads is moderated by shade from retained overstory, retention of deciduous shrub vegetation, and seeding disturbed areas with ground cover mixtures. Some restocking by conifers is, however, inevitable in a forest ecosystem. Maintenance re-treatment is required to retain the efficacy of the initial fuel management work.

Experience shows that a re-treatment 7 to 10 years after the initial WUI fuel management when coniferous regeneration is small and easily cut with brush saws is cost effective. Post-treatment cut fuel loads are light, and can be safely disposed of by lop and scatter.

Re-treatment on a shorter time frame is not required. Re-treatment on a longer time frame allows regeneration to grow to large size, resulting in rapidly increasing per hectare fuel management costs.

The Type 5 treatment meets fuel management goals and retains the value of previous fuel management investments. The original professional treatment prescription for each area will be reviewed and, if necessary, amended and developed prior to treatment.

The standard Type 5 treatment parameters are:

- Tree Removal
  - Overstory stems > 17.5 cm will be retained.
  - Understory conifers < 17.5 cm in diameter will be thinned to create a final stand density of 500 to 700 stems/ha, or approximately 4 m intertree spacing.
  - Understory leave tree spacing and density will vary depending on overstory tree distribution prior to treatment.
  - Small clumps of conifer regeneration < 17.5 cm in diameter may be retained for structural diversity and habitat values. Areas which provide a visual screen for part

of the unit will be the first priority for clump location. Retained clumps may occupy up to 5% of the treatment Area. The clumps may not create a fire pathway within the treated unit, considering terrain, wind patterns and adjacent vegetation types/fuel types.

    - Deciduous trees and western yew will be to be retained as 'ghost trees' and do not count towards target density.
- Fine Fuel Abatement
    - Fine fuels from windthrow and tree death since original treatment will be abated.
- Coarse Woody Debris
    - CWD levels will not be altered by re-treatment.
- Debris Disposal
    - Cut stems will be disposed of by lopping and scattering.
    - Fine fuels from windthrow will be disposed of by piling and burning.
    - All pile burning will be done in accordance with the Wildfire Act and Regulations.
- Reserves
    - All reserves established be previous prescription will be respected.
- Revegetation
    - Not required as no disturbance planned.
- Smoke Management, Pruning, Safety and Information Sharing
    - Same targets and standards described under Type 1 treatments.

4. Support for Implementation of Landscape-Level Wildfire Protection Plan

Over the years SIFCo has worked with many organizations on different aspects of this plan and its implementation. The following organizations support this Plan and wish to see it come to completion:

- Regional District of Central Kootenay
- Village of Slocan
- Village of New Denver
- Village of Silverton
- Columbia Basin Trust
- MoFLNRO
- Red Mountain Residents Association
- Winlaw Watershed Committee
- Elliott-Anderson-Christian- Trozzo Water Users Committee
- Zellstoff Celgar

5. Proponent Information

The following points provide background information on the Slocan Integral Forestry Cooperative, better known as SIFCo:

- SIFCo is a registered cooperative under the BC Cooperative Association Act, formed in 2006.
- SIFCo was issued Community Forest Agreement K2R in 2007. SIFCo manages the CFA using mainly internal resources, and hires professionals with required expertise as needed.
- We have been successfully completing fuel management projects for 9 years.
- We have a 10-person fuel management crew with all the required equipment. Most of our crew members are long-term employees.
- We created a Strategic landscape level Fuel Management Plan between 2009 and 2014 to create a clear vision of our objectives at an appropriate management scale.
- SIFCo has solid community support for fuel management work. We work directly adjacent to communities with their support.
- SIFCo completed one year of FESBC funded projects on November 22, 2017. We treated 164 ha with a total budget of $458,000, or $2,791/ha. SIFCo contributed $32,500 and FESBC $425,450. Budget and timeline commitments were achieved, and the agreed-upon program was delivered.
- SIFCo has treated over 440 hectares of land since 2009.

6. Cataloguing and Managing Data

SIFCo uses ESRI ArcMap GIS to manage and catalogue spatial data for internal use.

SIFCo reports all completed FES funded project work to RESULTS per specifications in the RESULTS Information Submission Specifications for Government Funded Silviculture Activities manual.

A final report will be produced at the end of each fiscal year and at the end of the project as per FESBC guidelines.

7. Communication and Distribution of Results

SIFCo is using multiple pathways to inform the community about fire risks, the Strategic Fuel Management Plan, and the benefits of fuel management treatments. These include:

1. Direct outreach through mailings, community meetings and one-on-one conversations with adjacent landowners and downstream water users.
2. Signage and demonstration. SIFCo erects display signs on project sites that explain the treatment, show the strategic plan for the area, and give credit to funders.
3. Educational evenings. SIFCo hosted two evening presentations and discussions on climate change in the West Kootenays in 2017, delivered by Greg Utzig, a key member of the Kootenay Resilience team. SIFCo also presented a summary of climate change adaptation / fuel management work in progress during these public presentations. More such events are planned for the winter of 2018.
4. SIFCo plans an education program in 2018 for landowners to demonstrate practical approaches to fuel management in hands-on workshops. The plan is to host meetings on 5 to 10 properties to discuss safety, fuel treatment goals, and fuel treatment methods.
5. SIFCo is preparing Community Wildfire Protection Plans for the north and south Slocan Valley. The CWPP process provides an opportunity to share information on the rationale for and the track record of fuel management works.
6. Field trips to treated areas with interested parties, local organizations, village councils and local residents happen regularly.
7. Press releases

8. Conclusion

As illustrated by the 2017 fire season, landscape-scale forest fires are a now a key factor in forest landscape management. SIFCo believes that moving toward a fire resistant, ecologically resilient landscape is the first priority.

The work contained in this proposal will deliver key elements of landscape-level fire resistance and create a model resilient area in British Columbia.

Appendix 1 - Fire Behaviour Modelling Methods

In 2014 SIFCo retained Bob Gray, Canadian fire researcher, for professional advice on modelling fire behaviour and fuel types on the CFA landbase.

Gray suggested that we use the FlamMap 5 fire simulator, from the Joint Fire Sciences Program, Rocky Mountain Research Station, US Bureau of Land Management, to model fire behaviour.

FlamMap requires a set of input data prepared as ASCII grids. These are:

1. Elevation
2. Slope
3. Aspect
4. Stand Height
5. Canopy Cover (crown closure)
6. Fuel Model
7. Canopy Base Height
8. Canopy Bulk Density

The stock TRIM digital elevation model was used or interpreted to derive input data grids 1 through 3.

The provincial vegetation resource inventory (VRI) data set was used for input data grid 4 - Stand Height.

Input 5 – Crown Closure – is also based on VRI data. Review showed, however, that the VRI crown closure rarely reflects current stand crown closure, especially in upper elevation areas. Crown closure was, therefore, checked and, where required, revised in all VRI polygons using ortho photos and Google Earth.

Input 6 – Fuel Model – is created by assigning a predefined or customized fuel model to each vegetation cover polygon. The goal is to choose fuel models that result in alignment between real world and predicted fire behaviour in various forest and fuel types. Each fuel model contains an estimate of fine fuel load, surface area to volume ratio, a packing ratio, and a fire extinction moisture content. The model predicts rate of spread and flame length, relative to wind speed.

The fuel models were assigned by an algorithm based on VRI vegetation cover. Further adjustment of VRI species composition and stand age were carried out, again mainly in upper slopes, to improve the consistency of fuel model assignment.

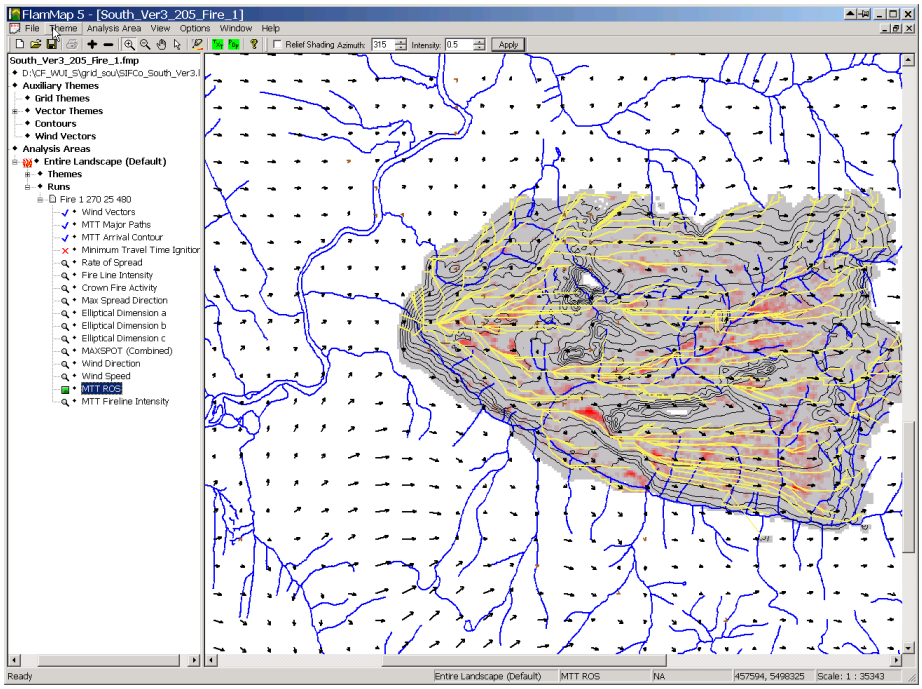
A custom fuel model with modified spread and flammability parameters was developed for closed canopy, low to mid elevation hemlock/cedar forests in the ICHmw subzone for greater modelling accuracy.

Inputs 7 and 8 – Canopy Base Height and Canopy Bulk Density – were assigned by an algorithm based on guidance from the fire modelling professional.

FlamMap also requires information on the weather conditions (temperature, wind speed and direction, cloud cover) for a series of days before the fire and on the day of fire. Weather conditions conducive to extreme fire behaviour but within the range of historical weather conditions were selected.

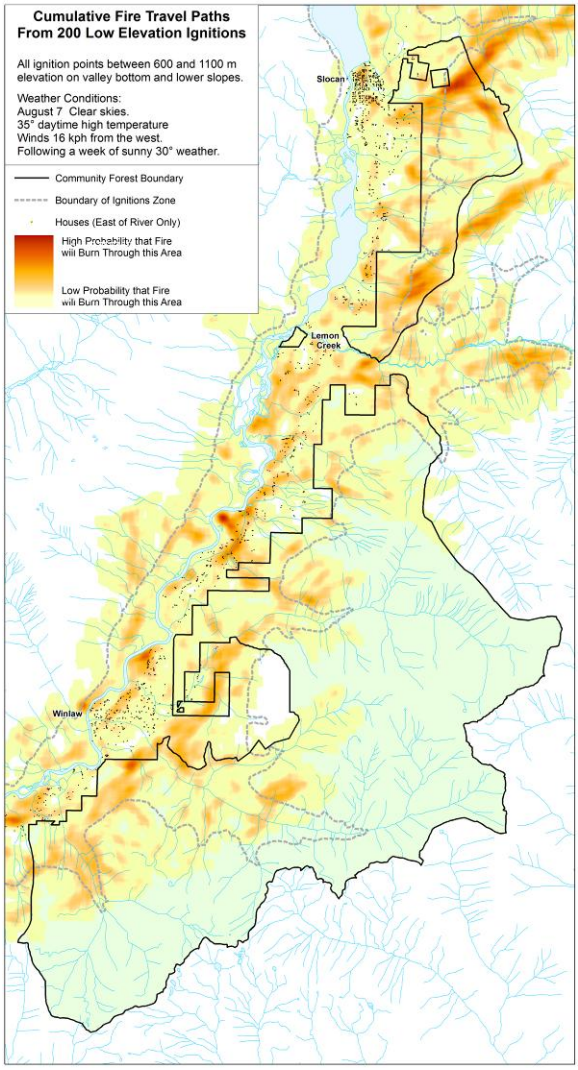
The WindNinja software module is housed inside FlamMap. WindNinja calculates wind patterns using fluid dynamics modelling to reflect the influence of topography and air temperature on wind direction and speed, which are significant in mountainous terrain. These localized wind patterns are used by FlamMap when modelling fire movement.

When all the data sets are prepared, the user can “light a fire” in the virtual landscape and see what happens.



The model produces a visual output of major paths (yellow lines), time of arrival contours, rate of spread, fireline intensity, etc. All outputs can be saved to an ArcMap friendly data format.

The power of FlamMap for strategic planning support lies in bulk processing. Lighting many fires at dispersed locations, potentially under varying wind directions, and accumulating the outcomes reveals landscape-scale fire movement patterns that are based on topography and fuel type. Areas within a fire movement path are the highest priority for location of strategic fuel breaks.



Outcome of 200 random ignitions, as probability surface of fire occurring within a 5 m raster grid.

The main fire movement paths identified by the FlamMap modelling analysis are represented by path vectors on the Strategic Fuel Management Plan maps.

Appendix 2 - Landscape Level Fuel Management Plan Maps

(Attached under separate cover)