2020 Fuel Management Prescription Guidance

Provided by BC Wildfire Service

Contents

1 PURPOSE

The purpose of this document is to provide direction to forest professionals on fuel management components for stand level prescriptions that are being prepared for a wildfire risk reduction (WRR) objective (otherwise known as "fuel management prescriptions") that are funded by the Forest Enhancement Society of BC (FESBC), the Community Resiliency Investment (CRI) program or other government programs. This document assumes that all other approaches to, and components within, the prescription meet legal requirements and follow Association of BC Forest Professionals (ABCFP) published guidance, specifically around quality prescription development including, but not limited to: Standards of Professional Practice: Guidelines for Interpretation, Interim Guidelines – Fire and Fuel Management; Guidance for Professional Quality Field work, and Guidance for Professional Quality Rationales and Comments.

BC Wildfire Service (BCWS) has developed a suite of tools to support fuel management activities that are located on the BCWS Tools for Fuel Management webpage. These tools and other direct supporting information are hyperlinked in this document.

In addition, this document is not meant to cover all aspects of fuel management and fire behaviour and is directed towards experienced professionals working well within their scope of practice as outlined in the 2013 ABCFP released Interim Guidelines – Fire and Fuel Management;

> *"Practicing in the field of fire and fuels management requires a specific education and training in subjects such as, but not limited to: fire ecology, fire effects, fire behaviour, fire regimes, conditions classes, fuel types, fuel moisture content, fire suppression, prescribed burning, fire behaviour modelling, and fire weather in addition to forestry subject. Education provided at post-secondary school is insufficient and often additional expertise is obtained through experience fighting wildfires or working with a competent forest professional already practicing in the field."*

2 PRINCIPLES

The primary objective of any fuel treatment is fuel reduction to effectively reduce the potential fire behaviour over an area to a level that allows for the best chance of a successful suppression opportunity by wildfire crews (i.e. direct attack firefighting, establishment of sprinkler lines, burn-out/burn off operations). Fuel treatments are generally located within the wildland urban interface but may be applied at the landscape scale for an isolated value (e.g. critical infrastructure), with a specific community risk reduction objective or as a predetermined control line to action future wildfires. It is the expectation that fuel treatments meet fire behaviour targets, legal requirements, and other considerations outlined below. When the primary objective is for habitat, ecosystem restoration or a ecosystem resiliency outcome and the secondary or tertiary objective is for fuel management, then other targets for fire behaviour may be applied that are consistent with the primary objective.

A fuel management prescription is a document that describes the recommended fuel management activities in an identified area that will reduce fire behaviour attributes. It is expected that the post treatment stand conditions will result in reduced fire behaviour such as a decrease in surface fire intensity and rate of spread, crown fire initiation and spread, and the potential for sustained ignition. Fuel management prescriptions must ensure a cost effective and measurable reduction in expected fire behaviour with the consideration and management of other values on the landscape (e.g. ungulate winter range, visual requirements, etc.). Prescriptions are consistent with all the principles outlined below and meet government objectives for fuel management. Fuel management prescriptions need to be reviewed after two years to ensure consistency with updated legislation, First Nations consultation, prescription standards, and new activities (e.g prescribed fire). A team approach is required with land managers, BCWS prescribing and qualified professionals working together to determine the final outcomes.

Prescriptions need to consider the balance between potential fire behaviour implications, resource, and conservation values to meet legislative and non-statutory requirements in relation to their proximity to communities and values at risk (e.g treatments closest to the value are treated more intensively). Fuel management treatments occur on various jurisdictional lands and requires a sound understanding of each land managers' mandate and legislation in order to prepare a sound prescription (e.g conservation areas, municipal and First Nations lands). For example, BC Parks has developed a template to support prescribing foresters to work with BC Parks in recognition of the unique legislation and mandate for BC Parks. For more information on legislation, policies, planning and values within BC Parks, please utilize the specific BC Parks Template and Guidance and the BC Parks Team.

A sound fuel management prescription follows three guiding principles: (1) it prescribes specific and measurable targets for fire behaviour reduction; (2) it contains site specific considerations tied to WRR objectives; and (3) it meets with other legal, resource management and non-statutory objectives including First Nation consultation requirements.

2.1 Specific and Measurable Targets for Fire Behaviour Reduction

For each treatment unit, specific and measurable fuel reduction targets are described so that post treatment outcomes can be measured and verifiable.

- Prescribed fuel reduction targets should be sufficient to be effective to meet treatment objectives of reduced fire behaviour under 90th Percentile Fire Weather Index Conditions (FFMC, ISI, BUI), which will be available on the Tools for Fuel Management webpage. For more information please contact BCWSPrevention@gov.bc.ca.
- Reducing forest stand structure fuel loading and continuity to effectively affect fire behaviour

prioritizes surface and ladder fuel modification and reduction over canopy modification[1]:

- Prescribed treatments focus on reducing the potential for sustained ignition and crown fire initiation by reducing surface fuel loading to achieve potential surface fire intensity levels below 2,000 kilowatts per metre. If the critical surface fire intensity threshold is below 2,000 kW/m, then the fuel treatment should meet this lower intensity threshold value.
- Increase the height to live crown through a reduction in ladder fuels (crown base height) to reduce potential for crown fire ignition.
- Reduce crown closure and canopy bulk density (volume/density/basal area/stems per hectare) as necessary to reduce crown fire spread rate and potential (e.g. spotting) and to encourage crown to surface fire transition. This is only applicable in specific forest types and will vary depending on site circumstances.

2.2 SITE SPECIFIC CONSIDERATIONS TIED TO (WRR) OBJECTIVES

For each treatment unit, fuel management objectives are developed in accordance with the unique fuel attributes, fire behaviour, and proximity to communities.

- Fuel treatments consider firefighter safety as a primary objective including consideration for rate of spread in fine flashy fuels and mobility (road access, easy walking, etc.) for fire fighters. Contact BCWS Wildfire Prevention Officer for more information on whether there are additional targets and measurables regarding surface fuel loading and crown base height.

- A fuel break or fuel polygon is not expected to stop a wildfire that is approaching, but to transition and keep the crown fire to the surface where wildfire crews have suppression opportunities. A plan for suppression should be considered when designing a fuel break.

- Treatment targets utilize a zoned approach generally within 2 kilometers of the value (the wildland urban interface); fuels are more intensively (2000kw/m) treated closest to the value of concern. A zoned approach will allow for identification of different management goals (e.g recreation, cultural or preservation of rare ecosystems) and associated measurable objectives that will result in more intense treatments in closer proximity to values at risk defined as a minimum of 100m, while less intense treatments further out that seek to balance all resource and land management objectives.

- A prescription considers the unique variability that exists in each stand, including but not limited to: vertical fuel strata, horizontal fuel continuity, extent of the surrounding fuel, fire weather

[1] Martinson, Erik J.; Omi, Philip N. 2013. Fuel treatments and fire severity: A metanalysis. Res. Pap. RMRS-RP-103WWW. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 38 p.

components, topography, and values at risk, and is stratified out if required.

- Fuel break and/or fuel polygons widths must be adjusted to account for topographic effect (slope) on fire behaviour and the consideration of the potential fire behaviour associated with the untreated adjacent fuel type. The treatment area will be managed to the 2,000 kW/m or critical surface fire thresholds as stated above.

- Fuel Break – A fuel break is defined as a linear feature placed appropriately on the landscape to mitigate wildfire risk to a value(s) and will be at least 1 km in length if feasible. All fuel breaks must begin and end at an anchor point.

    - To be effective under 90th percentile fire weather conditions, fuel breaks should be a minimum of 100 meters wide closest to the value and reduce fire behaviour associated with surface fires to an intensity less than 2,000 kW/m (or if the critical surface intensity is less than 2,000 kW/m, below the threshold of the critical surface intensity). Note: this width may drop a crown fire to the ground but does not factor in a crown fire spotting over this feature.
    - For any fuel break width in excess of the zonation defined above as to what a fuel break is, the subsequent area will reduce fire behaviour associated with surface fires to an intensity less than 4,000 kW/m or if the critical surface intensity is less than 4,000 kW/m, below the threshold of the critical surface intensity. This subsequent area should be targeted be on the approaching 'fire side' of the fuel break, with the most intensely treated area of the fuel break on the community side.

- Polygon treatment area – A polygon treatment is a fuel treatment that does not form part of a continuous fuel break unit and is not necessarily anchored into an anchor point.

    - A polygon treatment area will reduce fire behaviour associated with surface fires to an intensity less than 2000 kW/m or if the critical surface intensity is less than 2000 kW/m, below the threshold of the critical surface intensity. The measurable is for the entire area of the fuel treatment polygon.

- Fuel treatment location design maximizes opportunities to anchor to non-fuel or low flammability areas such as water bodies, wetlands and roads and provides adequate breaks in continuous fuels (e.g. wildlife tree patches, riparian reserves etc.).

- Treatments are appropriate for the given Biogeoclimatic Ecosystem Classification (BEC) zone and consider factors such as rate of decay for slash and retaining suitable residual species that are resilient to the post treatment conditions, including but not limited to natural disturbance (wildfire, insect, disease, and windthrow). It's also important to understand the subzone level of the area to ensure proper tree and plant species are being left on site that are both suitable for

the area and will help in reducing the intensity of wildfire.

2.3 LEGAL, NON-STATUTORY AND RESOURCE MANAGEMENT OBJECTIVES Interim Measure

Recognizes overlapping legal objectives relevant to the prescribed area (e.g., mule deer winter range, BC Parks land management) in conjunction with fuel managementobjectives. Note: overlapping objectives should be identified and reconciled at the initial higher-level planning stage when determining strategic placements and design of potential fuel treatments.

- Where 'overlapping legal objectives' exist that have not been identified through a previous planning exercise resolution is required prior to final prescription approval. This may involve further consideration to the physical location of the treatment area, adapting boundary location & size of treatment areas, and/or revised focus on removal of specific components of the stand and fuel structure.
    - When overlapping objectives are encountered in fuel (e.g minimum of 100m for fuel break or 100% of the fuel polygon areas around communities) consideration to potentially modify land management objectives to the extent required to meet the fire behaviour outcome and targets.
    - Where the public value of WRR implementation is seen to outweigh other established legal values, the development of a detailed rationale will support the process, should the land manager agree on this approach.
    - BC Parks and Protected area legislation is unique in that it is specific to each individual park and protected area and based on the specific values and uses that are defined. These values and uses are described in the individual park or protected area strategic management planning documents (management plan, purpose statement and zoning plan, or direction statement).
        - Within BC parks and protected area boundaries, specific park values require further discussion with BCWS and the land manager. In these circumstances, a variance **may be necessary** to meet BC parks and protected area legislation, Conservation Policy and impact assessment processes.
- Seeks to align with other forest stand improvement and collaborative management opportunities to maximize cost effectiveness. Such as MDWR or SAR habitat in dryer ecosystems with forest encroachment where stand improvements are meeting multiple objectives. Opportunities should focus on identification of management objectives that have similar desired future conditions required for wildfire mitigation, such as ecosystem restoration objectives in NDT4 ecosystems. This will also provide opportunities for accessing/leveraging of additional funding to support wildfire mitigation initiatives.

- Considers retention of large size trees to increase resiliency to wildfire and forest health factors and the resiliency of broadleaf trees. The Fire Management Stocking Standards Guidance Document provides a summary of the fire resistance and fire resiliency characteristics of all trees in B.C.
- Meets the Chief Forester's guidance for coarse woody debris "*lower amounts of CWD are appropriate where fire hazard is high*" (pg. 2) and/or other applicable guidance (BC Parks CWD Policy).
- Meets provincial and local land manager requirements for First Nations Consultation. This includes consideration of the new DRIPA legislation as well as the Modernized Land Use Planning framework.
- Consultation with the appropriate authorizations' government staff is required during the development of the prescriptions and all permits need to be in place prior to any and all activities. Permitting options must consider all existing tenures and land management objectives, including other variables such as fibre utilization, tenure type, ownership, legal objectives, cut control, timber supply review and many other factors that control or limit tree removal, according to the tenure.
- Targets fibre utilization as a primary debris management strategy when consistent with objectives of the prescription. Where surface fuel reduction targets cannot be achieved through fibre utilization, additional activities are prescribed to manage material (e.g. broadcast or pile burning, etc.). Opportunities to access carbon sequestration funding should also be investigated to reduce or eliminate the need to burn debris resulting from fuel treatments.
- When prescribed fire is part of the prescription treatments, considers future Burn Plan development where an identified containment area may span beyond the identified treatment unit boundary. It is beneficial to include the proposed containment area boundaries at the prescription phase to inform operational treatment planning. Boundary locations may need to be adjusted as a result of the referral process.
- Units are designed to consider the full lifespan of the treatment (e.g. logical burn units for maintenance burns and/or appropriate Fire Management Stocking Standards) and to avoid undesirable consequences such as:
    - increased risk to forest health concerns;
    - significant reduction in fuel moisture content and susceptibility to wind in the understory;
    - unacceptable windthrow levels post treatment;
    - excessive overstory thinning, grass or shrub ingrowth and surface fuel loading (e.g. chipping);

- chipping in areas may cause increased surface fuel loading and create more of a hazard within the treatment. If chipping is being done, a plan for removal or burning of the chips should be in place;
- mortality along treatment unit edge exposed to wildfire from adjacent stands.
- creation of conditions favourable to establishment or proliferation of noxious or invasive weeds.

3 CONTENT REQUIREMENTS

The prescription must identify treatment unit objectives and measurables for the modification of fire behaviour (head fire intensity, crown fire initiation and spread, spotting, etc.) that will guide the development of fuel treatment targets consistent with the principles described above.

3.1 FUEL MANAGEMENT OBJECTIVES WITH RATIONALE

Fuel management objectives must be specified and will drive the rationale for treatment unit placement and treatment method selection. Fuel management objectives need to:

- Provide a rationale for the fuel treatment with specified objectives (e.g. improved suppression opportunities around communities by reducing the potential for crown fire initiation).
- Describe fuel management specific strategies that outline how the treatment units are designed to be anchored, accessible and defensible as well as designed according to expected fire spread and intensity.
- Provide clearly defined objectives and measurable target conditions for fuel management that include measurable fuel load reduction targets and measures for expected fire behaviour outcomes post treatment (e.g. reducing crown fire initiation potential by XX and rate of spread by XX from the adjacent stand by reducing surface fuel loading to XX and increasing height to live crown to XX).
- Include relevant supporting details such as fire history, probability of ignition and spread, fuel type and continuity including stand structure, weather trends (i.e. prevailing winds) that support the treatment as a priority to mitigate negative impacts to the identified values at risk to help build the rationale.
- Address legal objectives such as ungulate winter range, grassland benchmarks, visual quality and recreation; and describe the associated management considerations. Indicate how the prescription seeks to balance the objectives seek to balance or support through common desired future conditions while meeting the targets.
    - If overlapping objectives are too broad or there are too many, need to consider the viability of the project as designed and alternative location and design should be

considered at this stage.

- Provide information on how this target is being achieved (e.g., use of residual basal area, DBH distribution, BDq, etc).

3.2 FUEL TREATMENT UNIT SUMMARY

Each fuel treatment unit (FTU) is described by site characteristics, location, treatment type, and fuel type hazard distribution.

3.2.1 GENERALIZED SITE CHARACTERISTICS

Describe the treatment area and its boundaries in the context of the local terrain including terrain characteristics (e.g. flat, rolling, etc.) or features, any landscape/topographic limitations to wildfire, and any other physical characteristics. For example: "The treatment unit (TU) is uniformly sloped with a few rocky outcrops that were excluded from the net treatment area. The TU is located between the Chapman Road and the lake, being bounded on the east by Deep Creek and on the west by the BC Hydro campground". Include a description on forest health factors that will influence fire behaviour such as beetle mortality.

3.2.2 STAND DESCRIPTION

This section describes the existing and desired characteristics of the forest stand within the treatment unit. This information is essential in ensuring the prescription is meeting the established objectives with measurable specifications. In all cases, the stand should be sampled to a level that provides sufficient and accurate data required to determine the desired treatment specifications, measured fuel loading, and assist with harvest/treatment planning and valuation (if applicable).

Pre and post-treatment stand data should be collected in accordance with the principles outlined in the Silviculture Surveys Procedures Manual 2020.

Surface fuel data collection should be consistent with the general methodologies outlined in the documents located under the heading Inventorying Downed Woody Material.

3.2.3 TIMBER TYPE

Enter major tree species and percent species composition. For example, Fd7 Lw3 (Py) denotes a stand dominated by Douglas fir (70%) followed by Western larch (30%), with a minor component (<10% which is denoted in brackets) of Yellow pine.

3.2.4 STAND AND STOCK TABLE

The stand and stock table (SST) is required for all treatment methods other than clear-cut and should include both pre- and post-treatment density measures. An example SST is provided in the Example Fuel Management Prescription FRPA located in the Appendix.

SPECIES AND DIAMETER CLASS: Fill in a separate line for each species by layer / diameter class. Use appropriate diameter classes to ensure adequate data for treatment specifications and for fire behaviour model inputs. Include total dead potential and total live.

CROWN BASE HEIGHT: Record the conifer Crown Base Height (CBH). CBH is a measure from the ground to the live or dead crown in the veteran dominant and co-dominant coniferous canopy layers and provides a measure of the fuel stratum gap. Dead crowns are only measured when they are of sufficient density to allow vertical wildfire to spread. Individual dead limbs should not be considered. Full whorls of dead limbs, especially with needles and fine branches or volatile mosses or lichens should be considered as part of the live crown in this measurement.

TREE HEIGHT: Record the average tree height for each species within each diameter class.

STEMS AND VOLUME PER HECTARE: Existing, cut and leave number of stems per hectare (sph) are required. Where volume-based data are preferred, also populate the volume per hectare section.

3.2.5 SURFACE FUEL LOADING

Provide the dry weight of combustible materials per unit area and describe the distribution (i.e. scattered, continuous, elevated, etc.). Recommended units are kilograms per square metre (kg/m2) and tonnes per hectare (tonnes/ha) (0.5 kg/m2 is equivalent to 5 tonnes/ha).

Describe the composition and the continuity of surface fuel including the duff depth, moisture type, vegetative material composition, and % cover of both woody material </= 7.0cm in diameter and >7.0cm in diameter, including grass fuel types. Describe methods for determining this value at the pre- and post-treatment stages.

For a treatment to be effective under 90th percentile fire weather conditions, loading of dead, woody surface fuel </= 7.0cm in diameter must generate surface fire intensity less than 2,000 kW/m or if the critical surface fire intensity is less than 2,000 kW/m, then below that threshold for the critical surface intensity. When including surface fuel loading in the prescription, it is expected that </= 7.0cm in diameter woody debris, as well as >7.0cm in diameter woody material will be broken out into T/ha, these will be done separately.

As an alternative, surface fuel loading associated with all treated areas will need to meet the intent of '[A Guide to Hazard Assessment and Abatement in British Columbia]' for areas in the severe category. The expectation is areas are lowered below the rating of "severe" for the Fuel Hazard Threshold. Standard within this 2012 Guideline apply to the management of post harvest debris associated with fuel management activities. Fuel management treatments will meet the 5t/ha target for surface fuel loading of </=7.0cm woody debris outlined within the hazard abatement guide. The Guide does provide "flexibility for the forest professionals to set site specific targets for fuel loading" or vary from the guide, assuming they are operating within their scope of practice and provide a specific written rationale.

"Conducting a fire hazard assessment and the development of a fire hazard abatement strategy falls under the scope of practice of a professional (see definition) as part of fuel management work. A professional can also prepare, review, amend and create hazard abatement strategies in accordance with "professional document" as defined in the [Foresters Act]."

Note: the requirement to meet timelines associated with Fire Hazard Assessment and Abatement as defined in the Wildfire Regulation (Div. 2, Sec. 11) apply to fuel management treatments.

3.2.6 CROWN CLOSURE AND CANOPY BULK DENSITY

Describe the stand in terms of canopy bulk density through the vertical profile as well as crown closure. Removing overstory trees results in a reduction of canopy bulk density and subsequent crown fire behaviour. However, final outcomes are related to where in the canopy the reduction occurs. Estimate the percentage of the crown touching and effectively blocking sunlight from reaching the forest floor. If there is a deciduous component to the stand, provide percent of crown closure for both the live and dead components.

3.3 FUEL TREATMENT DESCRIPTION

3.3.1 TREATMENT SPECIFICATION RATIONALE

Provide a summary as to how the treatment specifications and treatment unit widths were determined and how they will meet the prescription objectives. The rationale should describe the retention strategy and associated fire behaviour outcomes including a summary of adjacent fuel types and values at risk. Include consideration of site-specific fire behaviour components, fire history, design and anchoring of treatment units. Targets further out from the value can consider a time objective linked to rate of decay for fine and coarse surface fuels. Also include specifics around determination of treatment targets (e.g. surface fuel loading, pruning height, and thinning density). Attach any supporting documentation (e.g. model runs, references, etc.).

3.3.2 STAND MODIFICATION TREATMENTS

This section describes the treatment phases for each FTU including post treatment targets and associated fire behaviour outcomes (e.g. surface fire flame length to avoid crown fire). Enough detail is required to ensure transparency with prescription objectives and the management of identified values and concerns. BCWS has developed a Fuel Treatment Design Wildfire Intensity Tool that can be used to support the determination of wildfire intensities for surface fuel components.

3.3.3 TREATMENT SPECIFICATIONS

BRUSHING: Provide details such as target species and size for removal, as well as desired post-treatment density.

PRUNING: Describe the target crown base height or fuel strata gap, and the live crown ratio that will result.

DEBRIS MANAGEMENT: Describe activities to achieve the target surface fuel outcomes including the fire behaviour targets on page 3 (90th percentile weather) and surface fuel loading, section 3.2.5. If prescribed fire (i.e. broadcast and/or under burning) is being prescribed, a contingency activity should be identified should a suitable burn window not materialize.

COARSE WOODY DEBRIS MANAGEMENT: Describe the activities to meet the Chief Forester's Guidance (fuel

management guidance portion), or other land manager objectives (e.g. BC Parks). Topics such as how much CWD needs to be removed or retained; what size and decay classes should be removed/retained; what should be the distribution pattern of the retained CWDs, etc. can be described briefly.

PRESCRIBED BURNING: For treatment units where resource management open fire is in a fuel management prescription, a burn plan must be completed on the BCWS Burn Plan Template. A prescription must accompany the operational burn plan. The prescription should include the historical fire dependence of the ecosystem, approximate fire cycle and return interval. Generally, the prescription should include the objectives and desired effect(s) of the prescribed fire (i.e. desired amount of duff consumption; surface fuel reduction targets: type and size of material to be consumed, % burn coverage, crown fraction burned or desired tree mortality, crown base height targets; acceptable % leave tree mortality; % acceptable understory survival, etc.). Provide a specific, measurable, realistic, and time-bound range of outcomes for each of these objectives, so that burn objectives are achievable and can be easily incorporated to a prescribed fire burn plan.

FTU design should include logical burn units to incorporate natural, existing, or other control lines to be utilized during implementation of the burn. Development of these burn units should be considered and carried out during the implementation of earlier phases of operational treatments to maximize efficiencies and help set up the treatment unit for subsequent burning.

The Containment Area (see Appendix A definitions) that will be incorporated within the prescribed fire burn plan should be identified on the prescription map and attached to the prescription.

3.3.4 FOREST HEALTH CONSIDERATIONS AND TARGETS

Describe any forest health factors and mitigation measures relevant to treatment design including post treatment risks such as windthrow, Beetles (e.g Fd beetle), root rot, etc.

OTHER: Describe any treatment not specifically listed above or under prescribed burning; including the method, and the target results, and how debris will be disposed of (e.g., pile burning, chipping, composting, or biomass utilization). Explain how the treatment will meet the objectives of the prescription while addressing the identified values and issues.

3.3.5 TREATMENT SPECIFICATIONS SUMMARY

TREE REMOVAL/RETENTION STRATEGY BY SIZE/SPECIES: For each treatment unit, summarize the tree removal/retention strategy by size/species specifications that are outlined throughout the stand and stock table. For example: “Retain all Yellow pine (25 sph), Western larch (30 sph), hardwoods (15 sph), and 50% of Douglas fir greater than 40 cm. (15 sph). Remove all Douglas fir below 40 cm dbh, 50% of Douglas fir greater than 40 cm dbh, and all Lodgepole pine. Target density = 85 sph, with an acceptable range of 60 – 110 sph.”

3.4 POST TREATMENT

This section addresses silviculture obligations and the effects of the proposed treatments over time.

3.4.1 MAINTENANCE

EXPECTED VEGETATION RESPONSE: Describe the amount and type of vegetation expected to occupy the site because of the treatment(s).

MAINTENANCE PLAN: Include a maintenance plan based on the length of time the treatment will be effective in achieving the fire behaviour targets and outcomes. This section will include treatment objectives and triggers such as increased fuel load (kg/m2) or a reduction in inter tree spacing. Treatments should be monitored and re-treated at the most economical time frame. For example, it may be more economical to use prescribed fire to maintain forest encroachment while the regen is small enough to kill with understory fire. Once regeneration or grass loading is too advanced, a mechanical treatment will have to be conducted, which may be more expensive. This can be said for hand/mechanical treatments where an increased amount or larger debris is more expensive to treat and remove. Any prescribed maintenance treatment activity(s) not already identified in the treatment specifications should be described here to ensure that it is included within referral and consultation processes. (i.e. prescribed fire).

3.4.2 POST TREATMENT REPORT

Post treatment reporting should be thought about during the prescription development. During the treatment phase of the project as well as post treatment, monitoring by the practicing forester or qualified professional is important to ensure that the treatment meets the targets of the prescription and additional values on site are managed for. Measurement of post treatment surface fuel loading is critical to measure due to the potential for additional debris accumulation from the treatments activities themselves. Ensure that a post treatment report is completed after initial treatment is done. Post survey stems/ha, surface fuel loading (t/ha or Kg/m^2), before and after photos, as well as crown base height, all must be included in the post-treatment report.

3.5 SILVICULTURE OBLIGATIONS

In prescriptions where silvicultural obligations exist, develop the appropriate Fire Management Stocking Standards and request approval by the Natural Resource District Manager if required. Provide details around silviculture obligations (e.g. planting, stand tending, free to grow) if applicable. See the Appendix Two of the Fire Management Stocking Standards Guidance document for information on the fire resistance/resilience characteristics of common tree species used for reforestation in BC. Think about:

- Regenerating with deciduous species or mixed wood that have higher moisture content foliage and live stems, are less flammable, have reduced fire intensity, and have less crowning potential at most times of the year.
- Regenerating with fire resilient conifers (e.g. Larch, Douglas fir, Ponderosa pine) at low densities. Widely spaced trees reduce both the crown bulk density and the continuity of crown fuels, making crown fires unlikely however, care must be exercised with excessive crown spacing as it increases in stand wind speeds and solar radiation to the surface fuel bed).

PLANTING: Provide specific planting specifications not found in the stocking standards table. Any ribboning required should also be stated in the "Outstanding Works" section if not completed at the time of the prescription.

3.6 OUTSTANDING WORKS

Describe any outstanding work required prior to treatment (e.g. assessments, ribboning, authorization and tenure acquisition, sowing request, etc.). It is expected that the majority of work required for the prescribed treatment(s) will be completed at the prescription stage. If this is not possible it is expected that the local government, land manager and the Wildfire Prevention Officer (WPO) are informed and that details are provided in this section.

3.7 ATTACHMENTS

If a professional assessment was completed, indicate the date the report was completed and the professional who completed the work and incorporate supporting assessment into the final prescription package.

3.8 OTHER CONSIDERATIONS

Due to the complexities associated with planning for and prescribing fuel treatments It is fundamental to build the planning team early on to ensure that land and values managers, BCWS fire behaviour expertise, and qualified professionals are working together to design, locate and identify objectives. Prescribing Foresters and other qualified professionals (RP Biologist, Professional Agrologists etc.) working with the agency (B.C. Parks, FLNRORD) are required to work with the Fire Centre Wildfire Prevention Officer (contact information located on the Tools for Fuel Management website) for technical input to ensure that the prescription outcomes are consistent with government objectives for fuel management.

4 MAPPING STANDARDS

Include the following georeferenced map(s) accompanies with KML or shapefiles:

- Overview: General overview map of the project boundary in relation to communities and other major features and base data should be geo-located.
- Fuel Treatment Prescription Map
- PDF map accompanying the KML or shapefiles
- Previously treated and disturbed areas (blowdown, insect and disease, etc.) in close proximity to the treatment area.
- Any important legal boundaries

Prescription map should include:

- Treatment unit boundaries and should also include administrative boundaries, previously treated and disturbed areas (blowdown, insect and disease) in close proximity to prescription area if available.
- Prescription Map Legend Should include Treatment Unit (TU) Summary i.e. Gross Area, Less Reserves & Existing Roads to Arrive at Net Ha to be treated.
- Static Reserves (including wildlife tree retention areas, riparian reserve zones, etc.)
- Streams, Wetlands, Lakes including the class and identification number/name
- Existing and proposed roads and skid trails (labeled)
- Land ownership boundaries (if applicable)
- Existing or proposed stream crossing structures (culverts, bridges)
- Any other values or features that should be mapped (i.e. Goshawk nests, bear den, range fencing, power lines, a licensed waterworks that is within 100 m of proposed treatment, etc.)
- Natural range barriers that may be affected by treatment
- Any areas of safety concern (i.e. steep slopes, utility lines, etc.)
- Prescribed burning containment areas (if applicable) as per burn plan direction
- An easy to view scale

Note: *If features or areas discussed above are not labeled, they should be included in the legend. A separate harvesting, road building, or planting map may be required depending on the treatment.*

5 Appendix A Key Definitions

Critical Surface Intensity - (based on Van Wagner's crown fire theory, 1977b).
The threshold intensity value (kW/m) of a surface fire where crown fire initiation will occur as a function of the crown base height (CBH) and foliar moisture content (FMC) characteristics of a forest stand.
Additional CSI information can be found on the 'explain' tab of the Critical Surface Intensity Worksheet located on the Tools for Fuel Management Webpage. Byram's formula for calculating surface fire intensity is located on the 'equations' tab of the same worksheet.

Critical Infrastructure: Publicly, provincially and First Nations owned critical infrastructure: Assets owned by the Provincial government, local government, public institution (such as health authority or school district), First Nation or Treaty First Nation that are either:

- Identified in a Local Authority Emergency Plan Hazard, Risk & Vulnerability Analysis and/or Critical Infrastructure assessment and/or
- Essential to the health, safety, security or economic wellbeing of the community and the effective functioning of government (such as fire halls, emergency operations centres, radio repeaters, etc.

Resource management open fire - means an open fire that

(a) burns unpiled slash over an area of any size, or

(b) is not a campfire or a category 2 or 3 open fire and is lit, fueled or used for silviculture treatment, forest health management, wildlife habitat enhancement, fire hazard abatement, ecological restoration or range improvement (BC *Wildfire Act* & Regulation).

Fire Effect(s) - Any change(s) on an area attributable to a fire, whether immediate or long-term, and on-site or off-site. May be detrimental, beneficial, or benign from the standpoint of forest management and other land use objectives (CIFFC 2003).

Fire Effects – The physical, biological, and ecological impacts of fire on the environment. (NWCG, 2012)

First Order Fire Effects – The effects that concern the direct or immediate consequences of fire, such as biomass consumption, crown scorch, bole damage, and smoke production. First order effects form an important basis for predicting secondary effects such as tree regeneration, plant succession, and changes in site productivity, but these involve interaction with many other non- fire variables (NWCG, 2012).

Second Order Fire Effects – The secondary effects of fire such as tree regeneration, plant succession, and changes in site productivity. Although second order fire effects are dependent, in part, on first order fire effects, they also involve interaction with many other non-fire variables. (NWCG, 2012)

Containment Area - An area outside of the intended project area where the application of fire has been identified, incorporated, and authorised by an Official in the approved Burn Plan. This is the area that fire may be considered as acceptable and whereby does not trigger the declaration of a wildfire until the prescribed fire escapes the containment area or is imminent to do so.

6 Appendix B Example Fuel Management Prescription FRPA

This is provided as an example of a Fuel Management Prescription for provincial Crown land. Not all legislation may apply to First Nations or local government lands. If treatments are being prescribed within BC Parks, please see BC Parks Treatment Template. Prescribing professionals need to ensure they are completing a fuel management prescription within parks and protected areas that speaks specifically to parks and protected area legislation, regulation and policy.

A. PROJECT IDENTIFICATION	
PROJECT ID AND UNIT ID:	LAND OR TENURE HOLDER:
LATITUDE/LONGITUDE:	GEOGRAPHIC DESCRIPTION:
HIGHER-LEVEL PLAN(s):	MAP REFERENCE NUMBER:

B. Fuel Treatment PROJECT DESCRIPTION	
Fuel Management OBJECTIVE:	
STRATEGIES:	
METHODS:	

C. TREATMENT UNIT (TU) SUMMARY

TU	NET AREA (ha)	GROSS AREA (ha)	LEAVE AREAS (ha)	NP (ha)	NAR (ha)	TREATMENT REGIME (i.e. PRU, THIN, PIL, BURN)	GENERAL DESCRIPTION
TOTALS							

D. SITE CHARACTERISTICS							
TU	CFFBPS FUEL TYPE	TIMBER TYPE	BGC SUBZONE, VARIANT & SITE ASSOC.	ELEVATION RANGE (m)	SLOPE POSITION	SLOPE RANGE (%)	ASPECT
FUEL TYPE DETERMINATION							

E. SOIL CHARACTERISTICS							
TU	SOIL TEXTURE	DUFF DEPTH (cm)	COARSE FRAGMENTS (%)	SOIL DISTURBANCE LIMIT (%)	SOIL HARZARD RATING		
					Compaction	Erosion	Displacement

F. VALUES – *FOREST AND RANGE PRACTICES ACT*				
RIPARIAN & LAKESHORE AREAS - Forest Planning and Practices Regulation (FPPR) division 3, Government Action Regulation (GAR) section 6, Forest and Range Practices Act (FRPA) sections 180 and 181				
Is the proposed cutting, modification or removal of trees, or site preparation, in an area that contains streams, lakes or? wetlands?	Yes	No		
RIPARIAN MANAGEMENT AREAS (RMAs) - FPPR sections 51 and 52				
STREAM, LAKE, WETLAND ID	CLASS	RRZ (m)	RMZ (m)	SPECIFICATIONS FOR RIPAIRAN OR LAKESHORE MANAGEMENT AREAS
TEMPERATURE SENSITIVE STREAMS - FPPR section 53, GAR section 15, FRPA sections 180 and 181				

Are there temperature sensitive streams or direct tributaries to temperature sensitive streams within or adjacent to the proposed treatment area?	Yes	No	

ROAD CONSTRUCTION IN RIPARIAN MANAGEMENT AREAS - FPPR section 50			
Is road construction proposed in riparian management areas within the treatment area or an associated road permit (RP)?	Yes	No	
STREAM CROSSINGS - FPPR section 55			
Will stream crossings be constructed within the proposed treatment area or a road permit road providing access to the treatment area?	Yes	No	
MAINTAINING STREAM BANK AND CHANNEL STABILITY ON S4, S5, and S6 STREAMS - FPPR section 52 (2)			
Is the proposed treatment in the RMZ of an S4, S5 or S6 stream that is directly tributary to an S1, S2 or S3 stream and the activity is likely to contribute significantly to the destabilization of the stream bank or the stream channel?	Yes	No	
DOMESTIC WATER LICENCES (inside or outside of community watershed) - FPPR section 59			
Does the proposed treatment area contain water sources that are? diverted for human consumption by a licensed waterworks?	Yes	No	
LICENCED WATER WORKS (inside or outside of a community watershed) - FPPR section 60			
Does the proposed treatment include areas that are within? 100 m of a licensed waterworks?	Yes	No	
FISHERIES SENSITIVE WATERSHED - GAR section 14, FPPR section 8.1			
Are any activities proposed within a fisheries sensitive watershed?	Yes	No	
COMMUNITY WATERSHED - GAR section 8, FPPR section 8.2, 61, 62 and 84			
Does the proposed treatment area include areas that are within a community watershed?	Yes	No	
Will this project require road construction or deactivation within a community watershed?	Yes	No	
WATERSHED ASSESSMENT CONSIDERATIONS - FRPA section 180 areas with "significant watershed sensitivity"			
Does the proposed treatment area include areas that have watershed assessment considerations?	Yes	No	

SOIL DISTURBANCE AND PERMANENT ACCESS STRUCTURES - FPPR sections 35 and 36				
Treatment Unit	Proposed Max. Allowable Soil Disturbance (%) (5% or 10%)	Proposed Max. Soil Disturbance for Roadside Work Areas (%)	Proposed Max. Permanent Access Structures (%)	Comments

Do the proposed Permanent Access Structures exceed 7% of the total area?	Yes	No	
LANDSLIDES AND TERRAIN STABILITY - FPPR section 37			
Does the proposed treatment area include areas where terrain stability is a concern?	Yes	No	
SUITABLE SECONDARY STRUCTURE - FPPR section 43.1			
Does the proposed treatment area include a “targeted pine leading stand”?	Yes	No	
UNGULATE WINTER RANGE - GAR section 12, FRPA sections 180 and 181, FPPR section 69			
Does the proposed treatment area include areas within an Ungulate Winter Range?	Yes	No	
WILDLIFE HABITAT AREA - GAR section 10, FRPA sections 180 and 181, FPPR section 69			
Does the proposed treatment area include any wildlife habitat areas (WHA)?	Yes	No	
OBJECTIVES SET BY GOVERNMENT FOR WILDLIFE - FPPR section 7			
Does the proposed treatment area include areas to which objectives for wildlife under FPPR section 7 apply?	Yes	No	
OBJECTIVES SET BY GOVERNMENT FOR BIODIVERSITY OBJECTIVES (Landscape Level) - FPPR Part 4 Division 5			
Does the proposed treatment area include areas to which objectives for landscape level biodiversity under FPPR section 9 apply?	Yes	No	
OBJECTIVES SET BY GOVERNMENT FOR BIODIVERSITY OBJECTIVES (Stand Level) - FPPR Part 4 Division 5			
Are considerations for maintaining stand structure (wildlife trees, wildlife tree reserves, etc.), coarse woody debris, and maintaining tree and vegetation species composition incorporated into this prescription?	Yes	No	
RECREATION FEATURES - FRPA section 56 and 149, FPPR section 70			

Does the proposed treatment area contain interpretive sites, recreation trails, recreation sites, recreation facilities that are of significant recreation value and are designated a resource feature?	Yes	No	

VISUAL QUALITY OBJECTIVES - GAR section 7, FRPA sections 180 and 181, FPPR section 9.2			
Is the proposed treatment within a scenic area?	Yes	No	
ARCHAEOLOGICAL RESOURCES/CULTURAL HERITAGE RESOURCES - FPPR section 10			
Are there any known archaeological sites or cultural heritage resources that are important to First Nations within the proposed area? No Referral to Land Manager is required if proposed TU is on the applicant's own First Nation Land.	Yes	No	
INVASIVE PLANTS - FRPA section 47 and FPPR section 17			
Is the introduction and spread of invasive plants likely as a result of the proposed treatment?	Yes	No	
NATURAL RANGE BARRIERS - FRPA section 48, FPPR section 18			
Are there natural range barriers within the proposed treatment area that are likely to be removed or rendered ineffective?	Yes	No	
SPECIES AT RISK – FPPA section 7			
Are there species at risk present within the boundaries of the prescribed treatment area?	Yes	No	
LAND USE OBJECTIVES (Higher Level Plans and objectives set by Government under the *Land Act*)			
Are there land use objectives (higher level plans or objectives under the *Land Act*) that apply to the proposed treatment area or a Road Permit necessary to provide access to the treatment area?	Yes	No	
Do the proposed activities conflict with land use objectives (higher level plans or objectives under the *Land Act*)?	Yes	No	
Known and potential species at risk, windthrow hazard, and old growth management areas	Yes	No	

G. OTHER CONSIDERATIONS AND REQUIREMENTS			
CONSULTATION – FIRST NATIONS			
FIRST NATION		CONCERNS IDENTIFIED AND MEASURES TO ADDRESS	
First Nations consultation complete?	Yes	No	
CONSULTATION – GENERAL			
EXISTING TENURE HOLDERS (Forest, Range, Guide Outfitters, Trappers)			
Tenure Holder	Concerns		Measures proposed to address licensee's concerns
	Yes	No	
	Yes	No	
	Yes	No	
PRIVATE PROPERTY			
Does private property border the proposed treatment area?	Yes	No	
SMOKE MANAGEMENT			
Does a smoke management plan exist for the proposed treatment area?	Yes	No	
SAFETY			
Have any specific safety concerns been identified in or adjacent to the proposed treatment area?	Yes	No	
UTILITIES			
Are utilities located in or adjacent to the proposed treatment area? i.e. power lines, gas lines, etc.	Yes	No	
ACCESS CONTROL			
Are there any foreseen issues with access and access control during and post treatment?	Yes	No	
TRAFIC CONTROL			
Is traffic control required at any point during operations?	Yes	No	
OTHER (E.g Public Notification)			

H. STAND AND STOCK TABLE – not required if Clear Cut

Species and Diameter Class	Average Crown to Base Height (m)	Average Tree Height (m)	STEMS PER HECTARE (sph)			VOLUME PER HECTRARE (m^3/ha)			Basal Area
			Existing	Cut	Leave	Existing	Cut	Leave	
Layer 1 (> 22.5 cm - 27.5 cm dbh)* (Merchantability criteria can also be included here.									
Species									
Species									
Species									
Total Dead Potential									
Total Live									
Total All Species									
Total Conifers									
Layer 1 (> 17.5cm dbh - 22.5 cm dbh)									
Species									
Species									
Species									
Total Dead Potential									
Total Live									
Total All Species									
Total Conifers									
Layer 1 (≥ 12.5 cm - 17.5 cm dbh)									
Species									
Species									
Species									
Total Dead Potential									
Total Live									
Total All Species									
Total Conifers									
Total Layer 1									
Total Layer - All Species									
Total Layer - Conifers Only									
Layer 2 (≥ 7.5 - 12.5 dbh)									
Species									
Species									
Species									
Total Dead Potential									
Total Live									
Total Layer 2 - All Species									
Total Layer 2 - Conifers Only									
Layer 3 (≥ 1.3 cm - 7.5cm dbh)									

Species								
Species								
Total Layer 3 - All Species								
Total Layer 3 - Conifers								
Layer 4 (<1.3 cm dbh)								
Species								
Species								
Total Layer 4 - All Species								
Total Layer 4 - Conifers								
* Add additional diameter classes if required								

</= 7.0cm in diameter SURFACE FUEL LOADING (kg/m^2)	Existing Distribution:	Target Distribution:
	Method used to measure:	
>7.0cm in diameter SURFACE FUEL LOADING (kg/m^2)	Existing Distribution:	Target Distribution:
	Method used to measure:	
Crown Closure (%)	Existing:	Target:

BIODIVERSITY AND FOREST HEALTH CONSIDERATIONS AND TARGETS	
COARSE WOODY DEBRIS (CWD) RETENTION TARGET - sph and Distribution	
WILDLIFE TREE RETENTION TARGET	
FOREST HEALTH- Should include sections such as agent, affected species, incidence rating, mortality, and targets	

TREATMENT SPECIFICATIONS SUMMARY	
TU	TREE REMOVAL/RETENTION STRATEGY BY SIZE/SPECIES (Summarize specifications identified in table above)

TREATMENT SPECIFICATION RATIONALE (See notes to assist)

I. TREATMENT DESCRIPTION
MERCHANTABLE TIMBER HARVEST
ROADS, LANDINGS AND TRAILS:
FELLING:
YARDING/SKIDDING:
LOADING AND HAULING:
SLASH DISPOSAL:
SITE DISTURBANCE:
SPECIAL MEASURES:
STAND MODIFICATION TREATMENTS
MERCHANTABLE TIMBER UTILIZATION: Was commercial timber harvest considered? Yes ☐ No ☐ If commercial timber harvest not prescribed, explain:
BRUSHING:
PRUNING:
THINNING:
DEBRIS PILING:
PILE BURNING:
MULCHING:
MASTICATION:
GRINDING:
PRESCRIBED FIRE:
PLANTING:
OTHER:
AUTHORIZATION AND TIMBER TENURE
FRPA Section 52:
Forestry Licence to Cut (FLTC):
Park Use Permit:
Road Permit or Road Use Permit:
Other (i.e. local government, utilities, etc.):

J. POST TREATMENT
EXPECTED VEGETATION RESPONSE:
ADDITIONAL TREATMENTS OR MAINTENANCE:
SILVICULTURE OBLIGATIONS: Do silvicultural obligations apply to the treatment area? Yes ☐ No ☐

PLANTING: Is planting a treatment identified in this prescription or required as a legislative obligation? Yes ☐ No ☐												
STOCKING STANDARDS												
				Well Spaced Stem/ha				Minimum Height (m)				
					MSS							
TU	Stocking Standard ID	Pref. Spp.	Acc. Spp.	TSS	Pref. & Acc.	Pref.	MITD	Pl	Others	RTH (%)	Regen Delay	Free Growing (years)

K. Outstanding Works

L. ADMINISTRATION	
PREPARATION	
FOREST PROFESSIONAL NAME *(Printed)*	FOREST PROFESSIONAL SIGNATURE
MEMBER NUMBER	DATE

M. ATTACHMENTS			
MAPS:	Yes ☐ No ☐	FIELD DATA CARDS:	Yes ☐ No ☐
WUI WTA Plots and Photos:	Yes ☐ No ☐	CRUISE DATA:	Yes ☐ No ☐
AIR PHOTOS/IMAGERY:	Yes ☐ No ☐	BURN PLAN:	Yes ☐ No ☐
MODELING/DATA ANALYSIS:	Yes ☐ No ☐	OTHER:	Yes ☐ No ☐
BROWNS TRANSECT:	Yes ☐ No ☐		
TERRAIN STABILITY ASSESSMENT Completed By: Date:	Yes ☐ No ☐	VISUAL IMPACT ASSESSMENT Completed By: Date:	Yes ☐ No ☐
ARCHAEOLOGY IMPACT ASSESSMENT Yes ☐ No ☐ Completed By: Date:		BIOLOGIST ASSESSMENT Yes ☐ No ☐ Completed By: Date:	
ADDITIONAL COMMENTS:			