Determining Wildfire Threat and Risk at a Local Level

Identifying stand structure attributes and the local fuel hazard information from the WTA worksheets will help to identify fuel type changes and aid in the final wildfire threat and risk classification. Key information gathered from the WTA Worksheets is used to inform the local wildfire threat classification which is then used to develop a wildfire risk classification. The wildfire risk classification includes; proximity (proximity of fuel treatment area to value/interface), fire spread patterns (predominant wildfire spread direction), slope position of value and slope percent components. The 'local fuel hazard' as defined through the Fuel Assessment Site Level Scoring process of the WTA is also part of the final wildfire risk class assignment The final wildfire risk class is based on the local wildfire risk score and the local fuel hazard as determined through the Fuel Assessment (Site Level) final score (E/H/M/L). The final decision on how to assign within these components is left to the professional's judgement. Where local factors are enough to justify changes to the local wildfire risk values provided a rationale is required.

The local threat assessment (updated PSTA) and wildfire risk class are meant to highlight areas for more focused review and aid in the final fuel treatment design. The PSTA, updated fuel types, local wildfire threat, final wildfire risk classification are all key drivers of final fuel treatment design as well as any additional relevant local and professional knowledge. Treatment areas should be anchored, logical and driven by key fire behavior characteristics including wind spread direction. The final wildfire risk class, in combination with professional judgment, should drive the design of tactical fuel treatments or fuel breaks to address each unique wildfire risk situation.

Wildfire Threat

The goal of the 2020 Wildfire Threat Assessment (WTA) Process is to link the PSTA to updated fuel assessment so the PSTA will reflect a local wildfire threat. Consistency in the approach to updating the PSTA for a local wildfire threat is a fundamental outcome. The entire area of interest would have to be assessed and confirmed during the process. The subsequent local wildfire risk classification process builds from the local wildfire threat score to include additional fire behavior and values information gathered through the WTA process.

The PSTA is a starting point meant to aid in the identification of areas requiring further review. Updating the PSTA to produce the local wildfire threat score is predominately linked to fuel type updating. The BCWS, through the development of the BCWS Fuel Type Mapping and Summary Document has developed a set of principles that are used to assign a fuel type to all polygons in B.C. Detailed information on the approach, assumptions and principles is provided in the BC Fuel Type Map Document.

Developing a New PSTA score for the Assessed Area

Once the above assessment and scoring has been completed you can develop a new value for the PSTA for that area. You will need to acquire the PSTA scoring for wildfire density and spotting impact. These scoring do not change because of the vegetation changes in the assessed polygon, these scores are based on landscape assessments.

Once you have acquired the scores for wildfire density and spotting impact you will need to have a score for the Fuel assessment Rating from the fuel assessment worksheet score. This scoring will be based on your class for the fuel assessment rating as follows:

Fuel Assessment Rating	Score used for Fuel Assessment
Low	2
Moderate	5
High	8
Extreme	10

Table 1: Fuel assessment rating scoring

The values will then be placed in the appropriate category to calculate the "new" PSTA for the assessed area. To help with this process the Crosswalk of the PSTA Scoring spreadsheet can be used.

This example shows an assessed area with a **high score** form the Wildfire Threat Assessment Worksheet Fuel Assessment sub-section and values for the wildfire density and spotting impact:

	Crosswalk of PSTA scoring			
Polygon #	New Fuel Assessment Score	Wildfire Density	Spotting Impact	Revised PSTA Score
1	8	3	7	6.4

Table 2: Example of new PSTA score from the crosswalk table

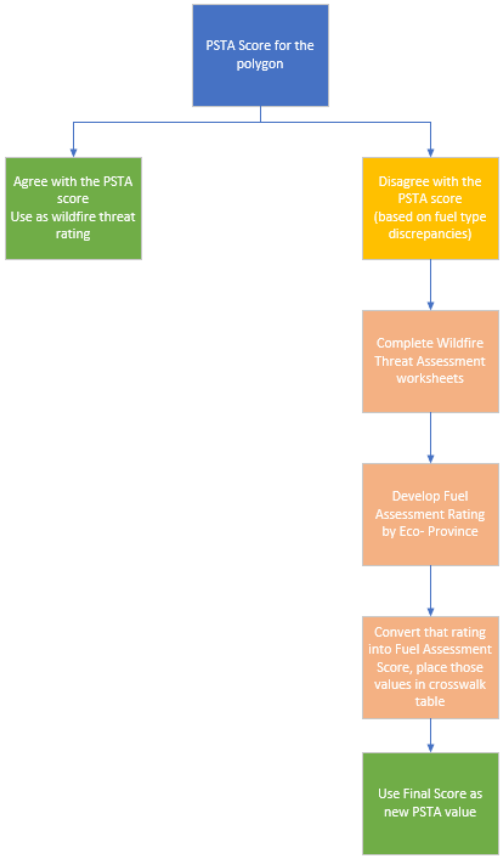

Figure 1: Flowchart for updating Wildfire Threat at a local level

Wildfire Risk

As part of the wildfire risk analysis, local wildfire risk will need to be determined. The following factors are assessed to determine the local wildfire risk score. Each category is described in detail in Appendix 1.

1. Corrected wildfire threat based on described above of the PSTA score. This category is weighted at 30% of the total risk score.
2. Proximity - This weighs the risk of fuel based on distance from the community, giving a higher score for risk nearest to the values at risk in the community. This is described as "working from the value outward to mitigate risk". This category is weighted at 30% of the total risk score.
3. Fire spread patterns use ISI roses and fire perimeter history to forecast the most likely potential fire spread direction for an approaching wildfire to the relative position of the community. Stratify the WUI into areas that tend to be downwind, upwind, or off-set, to these fire spread patterns. Due to the high variability of this information from community to community, generic relative weightings are not provided here, and local evaluation and weightings based on the strength of the local wind direction and intensity patterns is required. This category is weighted at 30% of the total risk score (when clear patterns are evident).
4. Topography is an important factor in increasing the rate of spread and the resulting head fire intensity of a wildfire. Slope may have little influence depending on the area of the province where the community is located. This category is weighted at 10% (5% for position and 5% for slope class) of the total risk score.

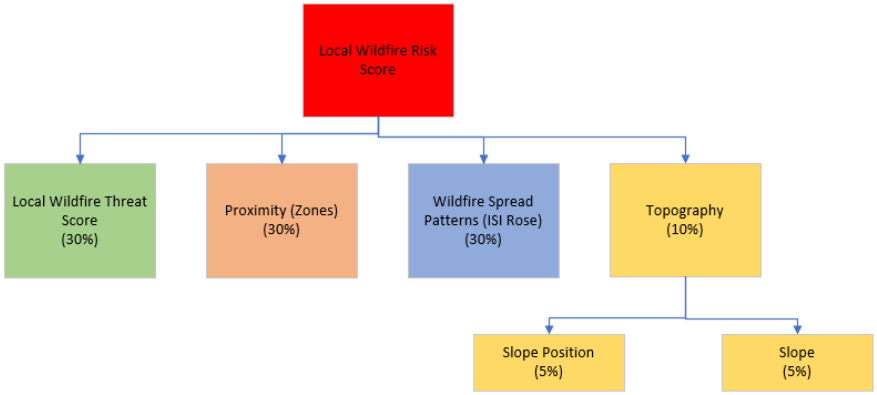

Table 1: The explaining the weightings used in determining local wildfire risk are provided below:

Local Threat Score (30%)	**Proximity (30%)**	**Fire Spread Patterns (30%)**	**Slope Position (5%)**	**Slope Percent (5%)**	**Wildfire Risk Score (100%)**
6.6/10	10/10 (within 100 m of value)	8/10 (west of community with predominant SW to NE wildfire spread pattern)	2/10 (lower part of the slope)	5/10 (30% slope)	7.73/10 (High)
Weighted Values					
1.98	3	2.4	0.1	0.25	7.73

NB: Example of the process, not actual values used.

The wildfire risk assessment process outlined above provides a means to determine the wildfire risk as it applies to forest fuel hazard, proximity of fuel to the community, fire spread patterns and topography. These factors all influence how a wildfire could impact the community if ignition was to occur. It is also important for Professionals to consider and assess high forest fire risk activities, human use, and other environmental factors that affect wildfire threat and risk within different areas of the WUI. Note any additional local factors that influence (increase or decrease) the wildfire threat information that is unique to the community. For example, a review of human fire start history based on BCWS supplied data and BCWS Fire Centre Prevention Plans may identify high fire start areas that present a higher level of local wildfire threat. Contact the local Fuels Management Specialist for this information.

Discuss local factors with the fire services department to determine unique situations within the community that may have higher human ignition potential based on the historical fire response. This could include high use areas, reoccurring annual events, and known problem areas. Where local factors are enough to justify changes to the wildfire risk values determined above, document the rationale and provide a map of any alterations, as part of the CWPP. Considering all the factors noted above should allow the Professional to provide a comprehensive assessment of the wildfire hazard and risk.

Summarize the Relative Local Wildfire Risk Weighting in the following table:

Table 2: Local Wildfire Risk Weighting

Relative Risk	Weighting
Low	0 – 3.9
Moderate	4 – 6.9
High	7 – 8.9
Extreme	9+

NB: The scoring system is based on a maximum score of 10.

Appendix 1

The weightings and rationale will be described by the person completing the assessment.

Proximity of Fuel to the Community

Fuel closest to the community usually represents the highest hazard. The recommended approach is to treat fuels to achieve a desired level of hazard reduction, from the value or structure outward, ensuring mitigation continuity. Untreated areas between treatment areas and the value or structure may allow a wildfire to build in intensity and rate of spread, which can increase the risk to the value. To capture the importance of fuel proximity in the local wildfire threat assessment, the WUI is weighted more heavily from the value or structure outwards. Fuels adjacent to the values and/or structures at risk receive the highest rating followed by progressively lower ratings moving out.

The local wildfire threat assessment process subdivides the WUI into 3 areas – the first 100 meters (WUI 100), 101 to 500 meters (the WUI 500), and 501 to 1000 meters (the WUI 1000). These zones provide guidance for classifying threat levels and subsequent priorities of treatments.

Table 3: Proximity to the Interface

Proximity to the Interface	**Descriptor**[1]	**Explanation**
WUI 100	(0-100 m)	This Zone is always located adjacent to the value at risk. Treatment would modify the wildfire behaviour near or adjacent to the value. Treatment effectiveness would be increased when the value is FireSmart.
WUI 500	(101-500m)	Treatment would affect wildfire behaviour approaching a value, as well as the wildfire's ability to impact the value with short- to medium- range spotting; should also provide suppression opportunities near a value.
WUI 1000	(501-1000 m)	Treatment would be effective in limiting long - range spotting but short-range spotting may fall short of the value and cause a new ignition that could affect a value.
	>1 000 m	This should form part of a landscape assessment and is generally not part of the zoning process. Treatment is relatively ineffective for threat mitigation to a value, unless used to form a part of a larger fuel break / treatment.

[1] Distances are based on spotting distances of high and moderate fuel type spotting potential and threshold to break crown fire potential (100m). These distances can be varied with appropriate rationale, to address areas with low or extreme fuel hazards.

Apply the zoning principles to the WUI. Discuss the relevance and importance of the proximity of fuels to the values at risk, including a discussion of the non-linear relationship between hazard, fire behaviour, and distance as it related to the community.

Fire Spread Patterns (i.e. ISI Roses)
Wind speed, wind direction, and fine fuel moisture condition influences wildfire trajectory and rate of spread and is summarized in the ISI Rose(s) from the local representative BCWS weather station(s). Wildfire that occurs upwind of a value poses a much more significant threat to that value than a fire that occurs downwind.

Analyze the predominant summer fire spread patterns during the peak burning period using ISI Roses provided by BCWS. These were generated using the hourly ISI data and grouped into four daily time periods and displayed in a monthly graphical format. If the weather station data is not representative, consider local input from the community rather than using un-representative data. Consider the prevailing wind direction during periods of higher ISI values and associated fire behaviour implications and stratify the WUI into areas that tend to be downwind, upwind, or off-set, to these fire spread patterns. As an example, if the ISI Rose has the greatest spread potential from southwest winds, then it would be prudent to assign a higher level of risk (and to treat higher threat forest stands) to the SW quadrant of the community. The fire perimeter history for the area should also be reviewed for significant fire spread direction patterns. If no predominant wind pattern exists, this should also be discussed.

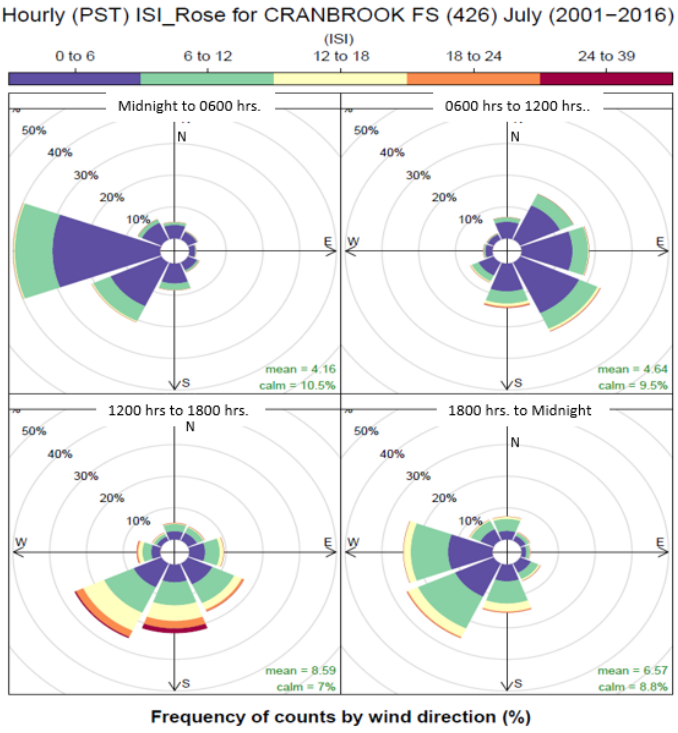

Figure 2: Initial Spread Index (ISI) Roses

Topography

Slope percentage and slope position of the value are both considered. Slope percentage influence a fires' trajectory and rate of spread. Slope position of the value relates to the ability of a wildfire to gain momentum during an uphill run and affects the potential impact to the value.

Slope Class

Determine slope percentages/classes for the WUI area. General fire behaviour implications of slope classes are summarized in the following table:

Table 4: Slope Percentage and Fire Behaviour Implications

Slope Percent Class	Fire Behaviour Implications
<20%	Very little flame and fuel interaction caused by slope, normal rate of spread.
21-30%	Flame tilt begins to preheat fuel, increase rate of spread.
31-45%	Flame tilt preheats fuel and begins to bathe flames into fuel, high rate of spread.
46-60%	Flame tilt preheats fuel and bathes flames into fuel, very high rate of spread.
>60%	Flame tilt preheats fuel and bathes flames into fuel well upslope, extreme rate of spread.

Slope Position of the Value

Slope position of a value relates to the ability of a wildfire to gain momentum during an uphill run. A value at the bottom of the slope is equivalent to a value on flat ground; a value on the upper 1/3 of the slope would be impacted by high preheating and faster rates of spread than a value on flat ground.

Determine the values' location relative to the slope (bottom, mid-slope on a bench, mid-slope on a continuous slope, upper 1/3 of slope). When different portions of the community are in different relative slope positions, assess the portions separately. General fire behaviour implications of slope position to the value are summarized in the following table:

Table 5: Slope Position of Value and Fire Behaviour Implications

Slope Position of Value	Fire Behaviour Implications
Bottom of Slope/ Valley Bottom	Impacted by normal rates of spread.
Mid Slope - Bench	Impacted by increase rates of spread. Position on a bench may reduce the preheating near the value. (Value is offset from the slope).
Mid slope – continuous	Impacted by fast rates of spread. No break in terrain features affected by preheating and flames bathing into the fuel ahead of the fire.
Upper 1/3 of slope	Impacted by extreme rates of spread. At risk to large continuous fire run, preheating and flames bathing into the fuel.