White Paper

Incorporating Fisher Habitat Conditions and Targets into Forest Planning:

Recommendations for Harvesting Operations during Wildfire Salvage

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Executive Summary

The following summarizes recommendations for applying fisher habitat retention targets to wildfire salvage operations:

- Small, dispersed fires and low-intensity fires will have negligible impact on fishers while moderate to large-sized intense fires will receive little use by fishers until the forest recovers sufficiently to provide concealment cover.
- Salvage harvesting of burned timber degrades the habitat quality for fishers and their prey. Land managers are encouraged to leave small burn patches and low intensity burns un-salvaged to provide for fishers and other forest dependant wildlife.
- For large fires, stratification of the burn to identify fire skips, small burn patches, and areas of low intensity burns for retention will help provide landscape connectivity.
- Meeting some fisher habitat targets in large intense fires may be challenging if the elements are not available in residual live forest. To the extent possible, identify trees meeting the conditions of fisher primary and contingency den and rest trees in retention areas. Fisher will also use sound snags with cavities for denning and resting in openings once the stand regenerates sufficiently to provide cover. Dead spruce will not provide fisher resting habitat and land managers should reserve any live spruce in or adjacent to the openings.
- Fisher piles require logs ≥3m long and with at least 30% of pieces ≥20 cm in diameter which will generally be plentiful after fire. Dispersed single piece targets may be more difficult to achieve since many logs are brittle, with a potentially limited availability of logs ≥35 cm diameter and ≥7 m long. We provide rules in this document for building small fisher piles in locations where large diameter logs are not available that can count for up to 3 dispersed single logs. The dispersed CWD target should be distributed across openings for the greatest benefit to fishers.

1.0 Introduction

Fishers (*Pekania pennanti*) are forest-dependent carnivores in the weasel family that can be negatively impacted by both largescale fire and subsequent salvage harvesting of timber. The impacts of fire include the direct removal of forest attributes used by fishers, such as overhead cover, denning trees, resting trees, and woody debris, as well as changes in prey availability. The size and severity of wildfires also appears to influence the probability of fisher using the landscape. Small, dispersed fires of low to moderate intensity can provide increased habitat and prey diversity which can benefit fishers and other small carnivores, while large areas of moderate to high severity fire are largely avoided by fishers (Thompson et al. 2021, Green et al. 2022). The effects of salvage harvesting on fishers has not been well studied; however, marten have relatively high habitat overlap with fishers and a recent study found that the additional disturbance created by salvage harvesting was substantially more harmful to marten than the original fire (Volkmann and Hodges 2022). Given this, forest companies should strive to meet conditions and targets provided by the BC Fisher Working Group[1] on how to maintain important elements of fisher habitat during timber salvage operations.

We recognize that large and intense wildfires may make meeting certain habitat retention targets difficult or impossible to achieve in some circumstances. This white paper provides direction for salvage harvesting operations to help retain forest elements important for fishers after fire. It is important to remember that retention targets are meant to benefit fisher through a rotation and even severely burned areas can contribute to the availability of fisher habitat through the retention of identified fisher habitat features.

2.0 Maintaining Fisher Conditions and Targets after Fire

Small Scale Fires

Fishers can benefit from lower intensity and small-scale fire disturbances due to the creation of a matrix of older forest with patches of young forest, abundant snags, and complex woody debris. These aspects of fire create habitat heterogeneity which provide niche spaces for a diversity of prey species and can facilitate fishers using the habitat. To help maintain fisher habitat after disturbance, small burn areas and low intensity burns should not be harvested where possible. Where harvesting must proceed due to forest health concerns, minimizing the impact on important elements of fisher habitat may help lessen the impact. Access infrastructure and skid trails should avoid healthy fisher den and rest trees and focus on the timber that is at risk of insect attack. Coarse woody debris targets in low intensity burns should generally be easy to meet as there is often abundant woody debris from the fire as well as material maintained from before the disturbance. Targets for woody debris are also likely to be low since the area harvested will generally be limited (i.e., CWD targets are roughly one fisher pile and one ≥35cm diameter 7m long log per 4 ha of harvested area).

[1] BC Fisher Habitat – British Columbia Fisher Habitat and Web Module – Habitat Tools. Accessed January 18, 2023 at https://www.bcfisherhabitat.ca/habitat-tools/.

Summary

- Fishers will benefit from not harvesting smaller scale burns and lightly burned forest through the resulting increase in habitat heterogeneity and prey diversity.
- Where harvesting must occur due to forest health concerns, focus timber removal on at-risk tree species and avoid impacting healthy trees that have value as fisher denning and resting habitat.
- Where harvesting must occur, strive to meet CWD targets using dead wood which should generally be abundant after a disturbance.

Moderate to Large-scale Fires

Moderate to large-scale fires will usually include a mosaic of disturbed areas. These may range from large, high-intensity patches where no living trees survive to small, unburned patches and lightly burned areas containing a mix of live and dead trees. Identifying and preserving areas such as unburned patches and lightly burned areas will be important in maintaining fisher habitat. In many cases, these areas may overlap with riparian features making preservation easier to achieve. Such areas should follow the advice given above for small scale fires if some harvesting must occur to meet forest health objectives.

Thompson et al. (2021) examined fisher responses to fire in the western USA and found that recolonization of fishers in burned areas was focussed on unburned or lightly burned patches within the fire perimeter, likely due to the increased security cover provided by intact vegetation when compared to more heavily burned areas. Fisher also used fine-scale topographic features, such as gullies or depressions, as movement corridors (Thompson et al. 2021). These habitats often have riparian features that are less likely to burn and recover more quickly due to the increased moisture present (Coogan et al. 2021). Thompson et al. (2021) suggest that preserving unburned and lightly burned areas in large fires and connecting these areas using riparian corridors may more rapidly promote landscape recovery and connectivity for fishers and other wildlife. Given this, foresters are encouraged to retaining wider riparian reserves in topographic features where forests are unburned or lightly burned to help maintain viable corridors for forest dependant wildlife.

Marten use of fire salvaged areas indicates that the presence of residual structure after disturbance is also important (Volkmann and Hodges 2022). In burned areas, marten selected areas with lower burn severity, greater canopy closure, greater sapling cover, and greater structurally complexity. In contrast, marten rarely used salvage logged areas and moved more quickly through areas with low canopy cover (Volkmann and Hodges 2022). Similarly, another study examined salvage harvesting impacts on prey species. Post-fire salvaged burns generally had unsuitable habitats for snowshoe hare, red squirrels, and southern red-backed voles while naturally regenerating sites provided habitat for these species (Kelly 2016). The habitat and prey species overlap between fishers and marten is relatively high and it is likely that fishers respond similarly to marten from the impacts of salvage harvesting. Volkmann and Hodges (2022) recommend prioritising the retention of residual live trees in areas of low to moderate burn intensity to mitigate impacts on forest specialist species.

In larger patches of moderate to high-intensity burns, maintaining a component of large diameter snags and woody debris can benefit fishers and other wildlife once the stand regenerates sufficiently to provide cover for wildlife. Fishers will use intact snags with cavities for reproductive and resting dens; therefore, retaining large diameter lightly burned trees with cavities, where they exist, will help meet targets for denning habitat. Spruce resting trees are generally very flammable and unlikely to retain any

of the attributes that fisher use (e.g. rust brooms). Spruce trees are best retained in unburned patches and these are more likely to be associated with riparian features, especially in drier ecosystems. Meeting targets for spruce may not be achievable in larger, high-intensity burns. Nonetheless, foresters should strive to preserve any live spruce associated with fire skips and other unburned areas.

Meeting coarse woody debris targets while salvaging moderate to large high-intensity fires will be important in providing escape terrain for fishers and habitat for prey for the mid- to long- term. However, the impacts of high-intensity fires can include the breakage of logs due to the extreme heat making the stems brittle and resulting in a low supply of large diameter and long pieces (e.g., ≥35cm diameter and ≥7m long). Instead, there is usually a plentiful supply of large diameter logs that are relatively short (<5m long). This results in plentiful material for constructing fisher piles which require a component of logs >20cm diameter and >3m long to provide fisher sized spaces within the structures. Under these circumstances, salvage harvesting contractors should not have problems meeting the targets for fisher piles but meeting the dispersed CWD target may be challenging.

For salvage harvesting where the supply of large diameter long logs is limited, operators can opt to construct small piles (>1m high, 5m in diameter, and containing at least 3 logs >3 m long) to help meet the dispersed CWD target. The dispersed CWD criterion provides cover that is the equivalent of ≥2.45m^2 of overhead cover (i.e., 0.35 m x 7 m = 2.45 m^2). To count as rest logs in these small piles, they must be ≥20 cm in diameter and ≥3m long, and ≥50% of the pile volume must be comprised of logs ≥20 cm diameter. Under this scenario a contractor would apply the cover equivalency factor (2.45 m^2) to the area of cover provided by eligible logs in the pile. For example, if a pile has 4 logs averaging 0.25 m diameter and 5 m long, that are elevated ≥0.25 m off the ground on at least one end, it will have the equivalent of 5 m^2 of overhead cover and the pile would be the equivalent of 2 rest logs when rounded to the nearest log (e.g., 4 x 0.25 x 5 = 6 m^2 ÷ 2.45 m^2 = 2.04 dispersed logs; see Figure 1 and Photograph 1). It is important to note that the dispersed rest log target is intended to result in a distribution of logs that have features that can be used by fishers across cutblocks. Given this, we are placing a 3-log cap on the number of rest logs equivalents that these small piles would count for to ensure a more widespread distribution rest log habitat across cutblocks.

Summary

- Large-scale fires are usually of mixed severity containing patches with a range of high to low burn intensities, including fire skips.
- Low burn intensity areas **should not be salvage harvested** to help preserve habitat for fishers and other wildlife. Identify areas of intact forest, fire skips, and low intensity patches within the burn area to exclude from harvest.
- Identify and retain linkages between fire skips, lightly burned forest, and unburned forest using riparian areas and moist gullies across burned landscapes to promote connectivity. Riparian reserves that are unburned or only lightly burned should be expanded up to 100 m wide to protect sufficient habitat and movement corridors for wildlife.
- Where harvesting must proceed in lightly burned or small burn patches to address forest health concerns, focus timber removal on at-risk trees and avoid impacting healthy trees that have value as denning and resting primary and contingency habitat.

- Areas of moderate to high intensity burns may still have snags that are valuable to fishers and other wildlife. Preserve intact large-diameter snags, as these may still be used for future denning and resting habitat.
- Meeting the target for spruce resting trees will be more difficult to achieve unless there are spruce in unburned fire skips, such as in riparian areas. Preserve any live spruce within or adjacent to burned areas to help meet this target.
- Fisher piles can generally be met without major problems due to the amount of woody debris present after fires. Strive to place piles throughout harvested openings and especially in areas that will provide linkages to riparian areas or intact live forest.
- The dispersed single log habitat targets may be difficult to achieve in areas with high intensity fire due to breakage of stems. Where large, long logs (e.g., ≥35 cm diameter and ≥7 m long) are not available, small piles (>1m high, 5m in diameter, and containing at least 3 logs >3 m long) can be used instead.
- Use a cover equivalency factor of 2.45 m^2 to identify how many logs within the pile can be counted to a maximum of 3 dispersed single logs/pile (e.g., a pile with 3 logs averaging 0.25 m diameter, 4 m long and elevated ≥25 cm off the ground would have 3 x .25 x 4 = 5 m^2 ÷ 2.45 m^2 = 2 dispersed single logs).

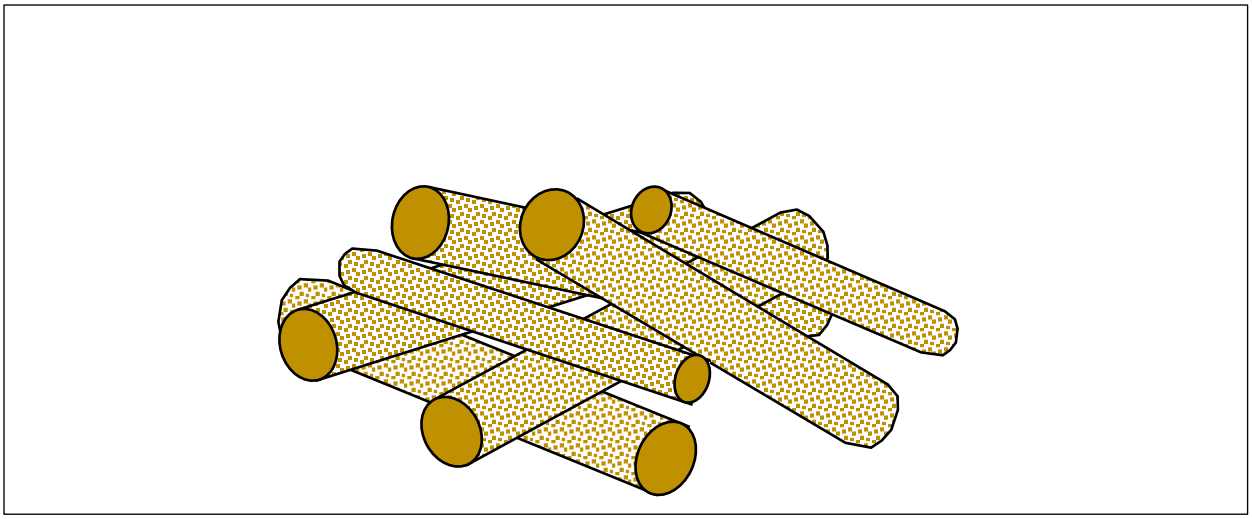

Figure 1. Pile of logs averaging 5m long and >17.5cm diameter that is >1m tall. Logs ≥20cm diameter and ≥25cm off the ground will count towards the dispersed woody debris target to a maximum of 3 logs/pile. In this example, there are 6 elevated logs (≥25cm off the ground on at least one end) that average 5m in length and 0.25m in diameter yielding 9 m^2 of cover and equal to 3 dispersed logs (e.g., 6 x 5 x 0.25 = 9m2 ÷ 2.45 = 3.06).

Photograph 1. Small pile with component of materials ≥20 cm diameter and 3m long that would provide the equivalent of 2 rest logs.

3.0 Discussion

Global temperatures are projected to increase between 1˚ – 2˚ C by mid-century (Meehl et al. 2007). Impacts of rising temperature on ecosystems have already been reported elsewhere and are likely to result in changes in habitat conditions for wildlife in British Columbia. Among the impacts of this climate change are conditions conducive to higher severity fires and projected increases in the area disturbed by fire through the current century (Coogan et al. 2021). Making the landscape more resilient to wildfire disturbances will involve creating more heterogenous landscapes (Coogan et al. 2021), and the recommendations for fisher habitat made here support this type of forest management. Planning at the landscape scale to preserve fire skips and lightly burned forest in a connected matrix will help reduce the potential extent and impact of future fires while also providing habitat for forest dependent wildlife. Protecting snags and retaining CWD within more intensely burned areas helps protect seedlings, retain moisture, cycle nutrients, and support soil micro-organisms (Stevens 1997). Providing CWD in complex vertical arrangements provides shelter for a wide range of wildlife including black bear, lynx, small mammals, forest birds, and fishers that are also important components of the forest ecological web. Forest practitioners are encouraged to employ the management practices described here to help sustain ecosystems in the context of climate change.

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