Kootenay Region 2016 Wildlife Tree Creation Project

(Contract # 1070-20/GS17NLE028)

Final Report – 24 November 2016

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Background and Treatment Areas

Wildlife trees provide critical nesting, denning, roosting, feeding and perching habitat to over 70 species of birds, mammals and amphibians in British Columbia (Fenger et al. 2006). These include some species which are considered at risk provincially and federally. Dependent on the age, condition and disturbance history of the forested landscape, wildlife trees can be in short supply in some areas. This is the case at most of the 2016 treatment sites located in the Kootenay Region of southeastern BC (Figure 1): Strauss Road, Earl Ranch (Newgate Wildlife Property), Kikomun Creek Provincial Park, Wycliffe Conservation Area, Johnson's Lake, Findlay Creek, Duncan Lardeau-Cooper Creek and Marsden Face. These areas have high habitat capability for cavity-dwelling wildlife but currently lack complex stand structural attributes and a sufficient supply of wildlife trees in moderate-advanced stages of decay. Increasing stand structural complexity and old growth forest-like attributes, including the abundance of wildlife trees (i.e., large live trees with internal decay and dead trees) are recommended objectives for these areas (e.g., Krebs et al. 2012).

Wildlife tree enhancement treatments were conducted at the above 8 sites in October 2016 and are expected to increase nesting, roosting and feeding habitat supply for a variety of cavity dependent wildlife species, including Lewis's Woodpecker (*Melanerpes lewis*), Williamson's Sapsucker (*Sphyrapicus thyroideus nataliae*), Flammulated Owl (*Psiloscops flammeolus*), Western Screech-Owl (*Megascops kennicottii macfarlanei*) and Northern Pygmy-Owl (*Glaucidium gnoma*).

Project Goal and Objectives

The overall goal of this project was to enhance wildlife tree habitat supply and quality in the project area. The advantages and benefits of using fungal inoculation as a wildlife tree creation technique have been described by various researchers in the Pacific Northwest (Bull and Partridge 1986; Parks et al. 1996; Lewis 1998; Brandeis et al. 2002; Manning 2008; Manning 2009; Manning 2010; Manning 2011; Bednarz et al. 2013; Hennon and Mulvey 2014; Manning 2014; Manning and Manley 2014).

Specific project objectives were:

i) to enhance overall wildlife tree habitat supply in areas which currently lack wildlife trees; and

ii) to increase the abundance of wildlife trees in areas with high habitat capability for Lewis's Woodpecker, Williamson's Sapsucker, Flammulated Owl, Western Screech-Owl and other cavity-dependent wildlife (e.g., Pileated Woodpecker (*Dryocopus pileatus*), American Marten (*Martes america*)).

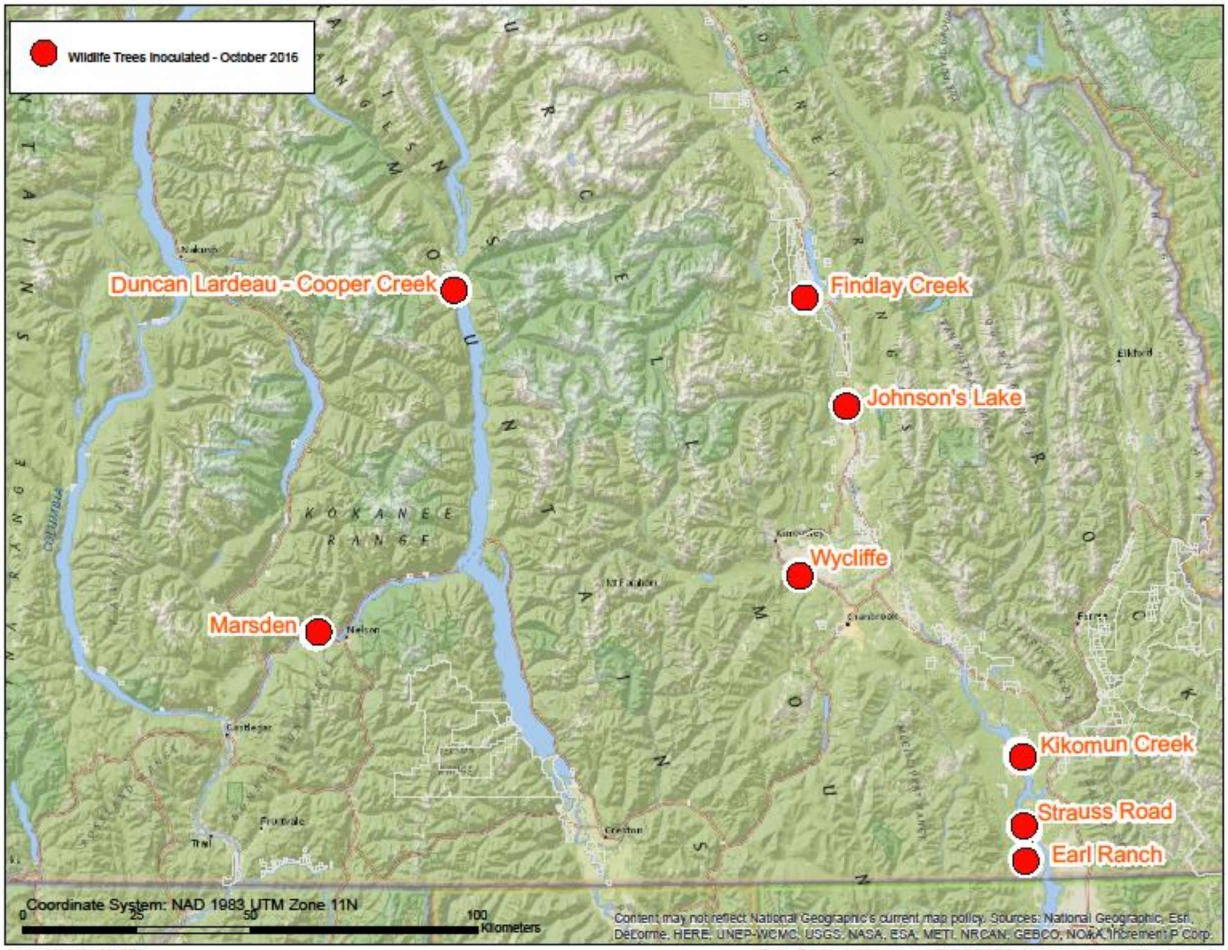

Figure 1. Location of the 2016 fungal inoculation treatment sites in SE British Columbia.

Field Methods

Trees intended for treatment were selected, measured and marked prior to or concurrent with the wildlife tree enhancement treatments. Four types of wildlife tree creation treatments were applied to these trees. The first treatment is termed 'window' treatment (Figure 2) – this involves limbing (pruning) a 2-3 m section in the mid-upper portion of the bole (approx. 7-15 m above ground), then applying two ½ circumference stem ring girdles (intended to stress the tree but not kill it, and more importantly to reduce sapflow and sapwood moisture content in the portion of the stem between the girdles) – this section of the stem is then inoculated in most cases with the native heart rot fungi *Fomitopsis officinalis,* which was previously cultured in the lab on 8 cm x 1.3 cm wooden doweling. In addition, the stem is "scarred up" with a chainsaw in order to further stress the tree and to provide a visual stimulus to cavity excavators that this part of the tree is potentially damaged/decayed. Cottonwood trees which received window treatments were inoculated with the heartrot fungi *Spongipellis delectans*[1] or *Ganoderma applanatum*.

The second treatment called 'dead top' involves removing the original live tree top (growth leader) and leaving a 2-4 m partially limbed section as the remaining top (Figure 3); a full-ring stem girdle is applied immediately beneath this section in order to kill the upper part of the tree; this upper section is then inoculated with either *F. pinicola* or *Ganoderma applanatum* which are heartrot fungi that colonize dead woody tissue (Allen et al. 1996).

The third treatment is called a 'combination' treatment and involves dead-topping along with a mid-stem window treatment (as per descriptions above); this treatment results in a tree with a short dead top section and a limbed/inoculated middle 'window' section.

A fourth 'tall stub' treatment (Figure 4) was applied to some of the larger diameter conifers (i.e., generally >50 cm dbh), particularly those which had few existing limbs in the lower ½ of the tree bole. The 'tall stub' treatment consisted of full-girdling the tree below the lowest live limbs and inoculating above this point with *F. pinicola* or *G. applanatum*. As well, these trees were topped at approximately 10-15 m height. Tall stubbing is intended to kill the tree, leaving a moderate height snag (i.e., a "stub tree") which will quickly develop heartrot decay as well as natural sap rot in the outer sapwood – the result is a useable snag in the near term (resembling a natural class 6 tree[2] in appearance), providing both feeding substrate and opportunities for excavation of nest cavities.

Trees were inoculated three times for the dead top treatments and six times for the window treatments (i.e., inserted 3 or 6 cultured dowels in conjunction with the respective topping or stem girdling-window treatments). The tall stub tree treatments were inoculated six times. All inoculation points were located within a 3-4 m vertical spread on the east or north sides of the tree bole. For additional detail concerning field methods, refer to Manning and Manley (2014).

[1] *Spongipellis delectans* is a heartrot fungi strongly associated with decay in poplars (Callan 1998; Allen et al. 1996).

[2] The BC MFLNRO Forest and Range Evaluation Program (FREP) stand-level biodiversity monitoring protocol (http://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/integrated-resource-monitoring/forest-range-evaluation-program/frep-monitoring-protocols/biodiversity) uses a 9-class coniferous tree classification system. Tree class 6 is a standing dead tree where approximately 1/3-1/2 of the original tree height has broken away. Stem wood condition in natural class 6 trees exhibits moderate to advanced decay.

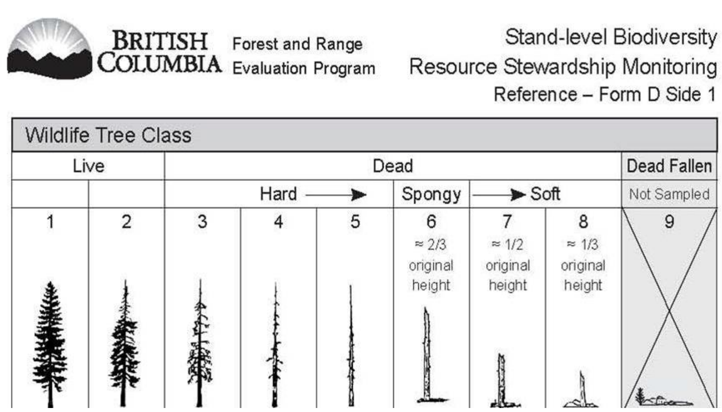

Figure 2. Window treatment in a western Larch at Kikomun Creek Park (Oct. 2016). This type of treatment is intended to introduce heart rot decay into the middle portion of the tree stem.

Figure 3. Natural looking dead top treatment in a Douglas-fir at Strauss Road (Oct. 2016).

Figure 4. A tall stub treatment applied to a ponderosa pine at Earl Ranch (Oct. 2016). Note full-ring girdle at feet-level of the arborist. Large diameter standing dead trees (snags) of this nature are in relatively short supply in the area. This tree may provide future nesting opportunities for cavity nesting ducks which use the nearby wetland.

Results

In total, 140 trees [22 Douglas-fir (*Pseudotsuga menziesii*), 72 ponderosa pine (*Pinus ponderosa*), 26 western larch and 20 black cottonwood] were inoculated and mechanically modified in order to enhance or create wildlife tree habitat at the 8 treatment sites between Oct. 5-20, including 100 trees in the east Kootenay region and 40 trees in the west Kootenays (refer to Tables 1 and 2 for an area by tree species and treatment summary).

Sixty-six trees received dead top treatments, 55 received window treatments, two received combination treatments (dead top + window), and 17 trees received tall stub treatments. A summary of the treatment statistics is shown in Table 2. A full data summary of the treated trees, including tree number, species, diameter at breast height, treatment type and associated inoculant fungus, and tree locations (UTM coordinates), is provided in Appendix 1 (separate document). All trees, except one, were live and appeared to be relatively healthy with no major visible stem damage or evidence of root disease at pre-treatment. Six trees, however, had existing live forked or multiple tops at the time of treatment, which were subsequently modified using 'dead top' treatments. In addition, one tree at Strauss Road (tree #02, ponderosa pine) had been recently killed by lightning --- a 'tall stub' treatment was applied to this tree.

Pre-treatment tree heights were variable, but ranged from approximately 15-40 m. Median diameter at breast height (dbh outside bark, all trees) was 61.5 cm, with diameters ranging from 35.6 – 114.6 cm.

Six trees were explicitly noted as good candidates for future monitoring. These included four tall stub treatment trees, one window treatment at Earl Ranch which contained a natural cavity occupied by a Northern Flying Squirrel (*Glaucomys sabrinus*) at the time of treatment, and a cottonwood at Duncan Lardeau with a stem window treatment (Figure 5) intended to provide a future den entrance court for furbearers such as American Marten.

Table 1. Number of trees by species treated at each field site location in 2016.

Field Site	**Region**	**Douglas-fir**	**Ponderosa Pine**	**Western Larch**	**Black Cottonwood**	**Total**
Strauss Road	E. Kootenay	7	8	3	0	18
Earl Ranch	E. Kootenay	3	18	9	0	30
Kikomun Creek Provincial Park	E. Kootenay	2	8	10	0	20
Wycliffe Conservation Area	E. Kootenay	0	6	4	0	10
Johnson's Lake	E. Kootenay	1	9	0	0	10
Findlay Creek	E. Kootenay	1	11	0	0	12
Duncan Lardeau-Cooper Creek	W. Kootenay	0	0	0	20	20
Marsden Face	W. Kootenay	8	12	0	0	20
Total		**22**	**72**	**26**	**20**	**140**

Table 2. Summary of fungal inoculation treatments at each field site location in 2016.

Treatment Type	**Strauss Road**	**Earl Ranch**	**Kikomun Creek**	**Wycliffe**	**Johnson's Lake**	**Findlay Creek**	**Duncan Lardeau**	**Marsden Face**	**# of trees treated**
Dead top (DT)	9	14	9	4	3	5	10	12	66
Window (WI)	5	7	8	4	6	7	10	8	55
Combination (DT+WI)	0	1	0	0	1	0	0	0	2
Tall stub (TS)	4	8	3	2	0	0	0	0	17
Total	**18**	**30**	**20**	**10**	**10**	**12**	**20**	**20**	**140**

Figure 5. Stem window treatment on a cottonwood at Duncan Lardeau (Oct. 2016). Note vertical stem scarring intended to simulate a frost crack, and applied in order to initiate a future den entrance court for furbearers such as American Marten.

Discussion

Overall, the dead top treatment was applied to just under one-half (66/140) of the treated trees, with remainder receiving window (55), combination (2) or tall stub (17) treatments. These varied treatments will produce different types of wildlife trees. For example, trees with the window treatment or combination treatment (dead top + window) remain alive and provide habitat value for many years. This is particularly important in areas such as Strauss Road where increasing nesting habitat supply for the federally endangered Williamson's Sapsucker[3] within its 'Area of Occupancy' in the east Kootenay region of SE British Columbia, is a key component of provincial and federal recovery goals for this species (Environment and Climate Change Canada 2016).

[3] Current population estimates for the *nataliae* subspecies are approximately 40 individuals in the east Kootenay Area of Occupancy (Environment and Climate Change Canada 2016).

Williamson's Sapsucker preferentially nest in large diameter western larch trees with internal decay columns (Figure 6) where such trees are available (Environment and Climate Change Canada 2016; Fenger et al. 2006). Consequently, fungal inoculation window treatments applied to western larch trees in locations with suitable habitat for Williamson's Sapsucker (such as the Strauss Road area), will help fulfill habitat management and species recovery goals for this provincially Red-listed species.

The tall stub treatment trees are effectively dead post-treatment and will start to decay relatively soon with natural saprot beginning in a few months, particularly on ponderosa pine; these stubs, while not providing the same habitat longevity as the other inoculation treatments, provide very important shorter term habitat value (e.g., 10-20 years) and mimic natural dead stub trees (e.g., class 6 and 7 wildlife trees). Natural stubs often occur in open forest, partially treed grassland habitats and along forest edges (i.e., where they have broken due to previous stem injury/decay or wind-snap), and are frequently used for feeding and as cavity-nesting substrates by species such as Lewis' Woodpecker and Northern Flicker (*Colaptes auratus*) which prefer trees with more advanced internal decay.

Dead top treatment trees also provide cavity nesting habitat opportunities relatively quickly. Manning and Manley (2014) documented nest cavity construction by a Pileated Woodpecker in a dead top treatment ponderosa pine within three years post-treatment. The ecological benefits of this treatment are provision of dead-wood habitat structure within a short period of time while still maintaining a live, structurally sound tree over the long-term (Manning and Manley 2014).

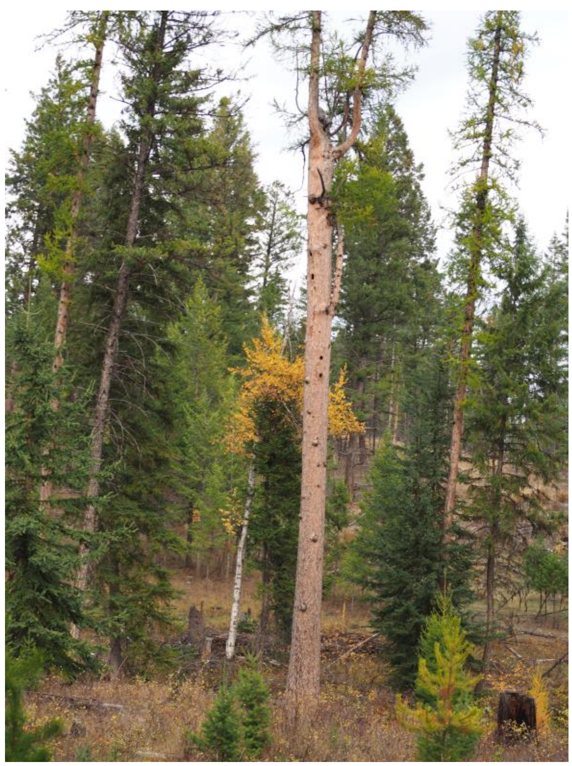

Figure 6. A natural western larch observed near the Strauss Road treatment area (Oct. 2016). This live tree contained numerous woodpecker nesting cavities and fungal conks.

Recommendations

1) Monitor future tree condition and wildlife use (i.e., stem breakage, presence of nest cavities, feeding excavations or fungal conks) of all treated trees 5 years post-treatment (ca. 2021).

2) In particular, monitor trees which have been noted in Appendix 1 for specific monitoring (e.g., tall stub trees #28, 93 and 117 at Earl Ranch, Kikomun Creek and Strauss Road, respectively, and window treatment tree #20 (potential marten den cavity) at Duncan Lardeau).

3) Continue to apply window, dead top and combination treatments of larger diameter (>50 cm dbh) western larch in areas with suitable habitat for Williamson's Sapsucker. More treatments of this nature should be conducted in the Strauss Road area.

Acknowledgements

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Photographs courtesy of Todd Manning, Ryan Murphy and Dan Holliday.

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