# BC Hydro Columbia Basin Fish and Wildlife Compensation Program

# Hoodoo/Hofert Property Wildlife Tree Creation
# (Contract # 0028810)

## Final Report – January 2008

**Prepared for:** **Fish and Wildlife Compensation Program – Columbia Basin**
***and***
**The Nature Trust of British Columbia**


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FISH & WILDLIFE COMPENSATION PROGRAM COLUMBIA BASIN

The Nature Trust of British Columbia

## Background

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 the Hoodoo/Hofert property, situated in the East Kootenay region of British Columbia, near Invermere. This 4037 ha property was acquired by The Nature Trust of British Columbia in 2003, and is composed of a number of significant habitats including wetlands, grasslands and forested areas. It is managed by the Nature Trust of BC and the BC Ministry of Environment for biodiversity conservation. Several species at risk have been identified or are suspected to occur on the Hoodoo/Hofert property, including the Lewis' Woodpecker (*Melanerpes lewis*) and Flammulated Owl (*Otus flammeolus*), both of which are wildlife tree dependent species (TNT 2004).

## Goal and Objectives

The overall goal of this project is to enhance wildlife tree habitat quality on the Hoodoo/Hofert property, and to evaluate the use of fungal inoculation to create future wildlife trees suitable for cavity nesting wildlife species. 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 Partridge1986; Parks et al. 1996; Lewis 1998; Brandeis et al. 2002).

Specific project objectives are:

- i) to enhance wildlife tree habitat in areas which currently lack wildlife trees;
- ii) to increase the abundance of wildlife trees in areas with high habitat capability for Lewis's Woodpecker, Flammulated Owl and cavity nesting waterfowl; and
- iii) to establish an evaluation procedure for treated trees to document tree decay and determine the effectiveness and suitability of created trees for wildlife.

## Methods

### *Laboratory Methods*

Trees intended for treatment were pre-selected, measured and marked by BC Hydro staff prior to wildlife tree enhancement treatments. A field specimen of the native heartrot fungus *Fomitopsis officinalis* was collected by the author in July 2007 and subsequently isolated into pure cultures in the laboratory. These, along with pure cultures (Figure 1) of two additional native heartrot fungi (*Fomitopsis pinicola* and *Phellinus pini*) were used to colonize 8 cm long softwood dowels in the laboratory (Figure 2). The dowels were kept in the lab under sterile, dark, warm conditions for approximately 2 ½ months, which facilitated adequate colonization by the selected fungi. A more detailed description of laboratory methods can be found in Manning (2003).


**Figure 1**. *F. pinicola* growing on culture medium.

**Figure 2**. Wooden dowels in sterile bags with growth medium.

*Field Methods*

The following inoculation and mechanical modification techniques were used to treat Douglas-fir (*Pseudotsuga menziesii*) and ponderosa pine trees (*Pinus ponderosa*) on the Hoodoo/Hofert property.

i) Tree climbing with drilling and insertion of two 8-cm wooden dowels cultured with either *F. pinicola, F. officinalis* or *P. pini.* These species occur on various native coniferous trees in British Columbia forests (Allen et al. 1996), and cause significant heartrot decay in infected trees. Cultured dowels were inserted into drill holes at two positions, usually at 90$^{o}$ orientation relative to each other, at approximate south and westerly aspects. All drill holes were located between 5-13 m above ground (Figure 3). All drill holes (with dowels inserted) were left “unplugged”. The tree will seal over this wound/infection court, creating a dark, low aerobic environment which is thought to be more amendable to fungal colonization and growth (Manning in prep.). This procedure also replicates the natural infection process of trees by airborne fungal spores, which most commonly enter the stem through broken branches and other stem wounds (Hunt and Etheridge 1995). This procedure is a modification to methods previously used by Manning (2003) and others (Parks et al. 1996), where a PVC tube was inserted into the drill hole in order to keep the wound open to light and oxygen.

In addition, each tree stem was ½ ring-girdled ($180^o$ around circumference of stem) with a chainsaw (Figure 4), approximately 1-2 m below the drill holes (inoculation points) in an attempt to stress the live tree. It is likely that the combination of fungal infection coupled with other stressors on the tree (i.e., simulated by ½ ring-girdling), may aid the colonization of the fungus and eventual advancement of heartrot decay within the tree in this region (Manning in prep.).

ii) A subsample of trees received mechanical modifications in addition to the fungal inoculation treatment. These trees were topped with chainsaw at approximately 12 m above ground, and then stem ring-girdled ($360^o$ around circumference of stem) at 2-3 m below the top in order to create a dead top portion on that tree (Figure 5); this top portion was also limbed and then inoculated with *F. pinicola* – this species of fungi is known to prefer dead trees and dead or damaged portions of live trees (Allen et al. 1996). In some cases, the lower portion of the stem was also inoculated with either *F. officinalis* or *P. pini*, and pruned as per method (iii) below.

iii) For those trees which were inoculated in the mid-bole (i.e., not in the topped upper portion of the stem), live limbs were pruned from the stem for a distance of approximately 2m vertically adjacent to the inoculation points. This created a “visual window” within the foliage along the stem, potentially enticing woodpeckers to explore this “damaged” region of the tree bole for signs of decay within (Figure 6).

**Figure 3**. Climbing and drilling approximately 10 m above ground (followed by insertion of a fungal dowel cultured with heartrot fungi). Also note limbs which have been pruned from this region of the tree – this creates a “visual window” in the foliage, potentially attracting woodpeckers to this part of the stem.

**Figure 4**. ½ ring-girdle visible on the stem below position of fungal inoculation.

**Figure 5**. Drilling a topped tree for insertion of *F. pinicola* heartrot fungus. Note ring girdle (light colored area just above right boot) and yellow wildlife tree sign (attached to the top of the stem).

**Figure 6**. Treated Douglas-fir trees. The tree at left foreground received fungal inoculation treatment and limb pruning to “open up” the appearance of the stem in the area where inoculation occurred (red arrow). The tree at right background was topped (green arrow), stem ring-girdled and inoculated.

**Results**

107 live trees were treated at the Hoodoo/Hofert property during Nov. 6-16, 2007. These included 105 Douglas-fir and two ponderosa pine. The mean diameter at breast height (dbh) of these trees was 46.2 cm.

Of the total 107 treated trees, 68 trees were inoculated with the native heartrot fungus *Fomitopsis pinicola*, 24 trees were inoculated with *F. officinalis*, and 15 trees were inoculated with *Phellinus pini*. Of this total, 13 trees were also chainsaw topped, limbed, ring-girdled and inoculated (as per Field Method (ii) described above). Of this subtotal, 10 trees received inoculation with *F. pinicola* in the top portion of the stem (which had been mechanically topped) as well as inoculation with either *F. officinialis* or *P. pini* in the lower portion of the same stem.

A complete data summary of the treated trees, including tree number, species, dbh, treatment type and location (UTM coordinates) is provided as a separate Appendix to this report.

*Anecdotal Observations*

While conducting field treatments at the Hoodoo/Hofert property in November 2007, there was observed to be a significant lack of standing dead trees (snags) and older live trees, especially those of larger diameter with evidence of internal decay, suitable as cavity-dwelling structures. This is a combined result of past activities and the disturbance history of this area (Figure 7). Consequently, given this lack of "standing dead or damaged wood", there is a concomitant shortage of refugia for naturally occurring heartrot decay fungi in the forest stands. This is a "catch 22" situation: with a shortage of suitable "habitat" for wood decay fungi, these same organisms are absent from the forest stands; this in turn results in fewer standing dead or decayed trees which can be used by primary and secondary cavity dwelling wildlife.

**Figure 7**. Old Douglas-fir stump (which had been logged) with fruiting body (conk) of *F. officinalis*, located near one of the treatment trees. This is one of the few observations of naturally occurring heartrot organisms in the area.

## Recommendations

The following recommendations are provided in order to evaluate the effectiveness of the 2007 fungal inoculation and mechanical treatments for creating/enhancing wildlife tree habitat supply on the Hoodoo/Hofert property.

1. visually monitor treated trees for evidence of wildlife activity/use (feeding or nest cavity excavations), and evidence of decay or stem breakage (visible fungal conks, either saprots or heartrots, other stem damage).

2. in order to confirm the viability of the fungal organisms which were inserted into treatment trees in 2007, a small subsample (n=5) of these trees should be destructively sampled 3 years post-treatment. This type of destructive sampling (which involves tree felling and bucking adjacent to the inoculation points) will confirm whether the fungi are still active within the tree stem, and also provide visual confirmation and quantification of the extent of decay at this time.

The above two initiatives **should be conducted in the fall of 2010**.

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All photographs courtesy of Todd Manning.

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