Productivity and Heartrot Incidence of Western Hemlock in the ICH Zone - FRDA Project 3.28

The Interior Cedar Hemlock (ICH) biogeoclimatic zone offers some major silviculture challenges. Western hemlock is currently considered to be of questionable value to forestry in the ICH due to its reputed poor growth and a propensity to heartrot. However, there is a lack of data to support these views as they apply to shorter rotation, second growth forests.

In 1986-1987, FRDA Project 3.28 was initiated as a problem analysis of the role of western redcedar and western hemlock in the ICH zone. The study involved a survey of attitudes, opinions and concerns of foresters working in the ICH. From 1987 to 1989, surveys of hemlock-dominated mixed stands in the ICH zone were undertaken to develop guidelines for the acceptability of western hemlock. As well, in 1989 preliminary work on cedar acceptability in the ICH zone was begun.

One hundred and nine hemlock stands were selected for sampling. The stands were chosen to represent the southern, central, and northern portions of the ICH zone (Figure 1). The stands selected were microclimatologically and stratified by biogeoclimatic subzone (dry, moist, wet and very wet) and aspect (north or south). In each stand, the incidence of heartrot and the age of ten sample hemlock trees were determined using increment bores. The productivity (height over age) of hemlock and other conifer species were sampled for three trees of each species in each stand.

**PRODUCTIVITY OF HEMLOCK**

The productivity of hemlock (site indices at age 50 using height and breast height age) was found to be greatest in the wet subzones (ICHb [vk] and ICHw [wk]) and the dry subzone (ICHa1 [dw]). In the dry subzone (ICHa1), however, the sample size was so small that additional data are required to verify the findings. In all eight subzones sampled, the productivity of hemlock was not significantly different (a=0.05) than that of Douglas-fir (Figure 2).

![Graphs showing productivity of hemlock, Douglas-fir, spruce, and cedar in different subzones](image)

**FIGURE 2.** Site indices (meters at age 50) ± 95% confidence limits for the subzones studied (no confidence limits were calculated when there were 3 or less values).
HEARTROT INCIDENCE:

Heartrot incidence in western hemlock in the ICH zone was found to vary significantly with stand age (Figure 3). Heartrot (due mainly to *Echinodontium tinctorium*) is lower in stands less than 90 years old (<7% infection) and increases rapidly from this age. The presence of infected trees of advanced age within a stand was correlated with increased infection levels in younger trees. The relationship between age and decay incidence is likely related to the infection courts and behaviour of *E. tinctorium*. Inoculation by this heartrot fungus requires a branchlet stub (1 to 2 mm in diameter). These stubs are present only when they occur on branch or stem portions that are 40 years or older. Upon establishment of inoculum in the branch or stem, the fungus goes dormant and can remain so for up to 100 years. It is believed that the dormant infections are stimulated to activate and cause heartrot by wounding (Etheridge et al. 1972) (Figure 4).

Heartrot incidence in hemlock was not found to vary due to biogeoclimatic subzone, aspect, or site quality. *Phellinus weirii* and *Polyergus sericeomollis* were the common fungi attacking cedar. Eighty-three percent of cedar stands studied had *P. weirii* infection while 57% had *P. sericeomollis* present. Western hemlock was found to be less susceptible to infection by the root rot *Phellinus weirii* in the study area.

The results indicate that western hemlock is a viable species for management of mesic sites in the ICH biogeoclimatic zone. Western hemlock should be accepted for restocking sites unless they regenerated before harvesting (advanced regeneration) and are greater than 0.5 m tall and more than twenty years old.

The acceptability of hemlock has the following potential benefits:

1. Where western hemlock natural regeneration ingress has occurred, the additional stocking obtained by accepting species may change NSR land to SR.

2. Western hemlock is a highly productive species and adds to those already available to managers in the ICH zone.

3. Western hemlock has the potential for use in natural seeding of cut-over lands in some areas of the ICH, thereby avoiding planting costs.

REFERENCE:

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FIGURE 4. The mode of action of the heartrot *E. tinctorium*. 

1. Branchlet stubs are formed on 40+ year old stems
2. Infection by basidiospores
3. Dormancy for many years
4. Stimulation of disease by wounding