APPENDIX 3 - Windfirming

Sample prescription

The following is the prescription followed after the 2006 windstorm. It is to be used a guide for developing new prescriptions, should the need arise.

Rationale

Newly created edges in certain types of forests are unstable. The roots of edge trees are often partially damaged by the storm. Undamaged new edge trees are more susceptible to being blown over because their inherent stabilization processes have not had time to react fully to the increased wind forces. It takes several years for them to become independently wind resistant. There is therefore a tendency for unmanaged windthrow edges to continue to expansively change until limited by improving stand conditions, soil or hydrological dynamics, or lessened wind exposure.

Windthrow events are frequent occurrences in BC's forest. For perspective, there is more timber lost to windthrow every year than is harvested in all logging operations combined. In response; the forestry community has conducted research on its distribution and causes, and are becoming closer to being able to predict and prevent these events. The Park Board is tapping into this developing expertise in order to ensure that the best practices available are applied both effectively and efficiently.

The prediction of windthrow risk is accomplished by inputting known parameters of stand conditions, soil characteristics, topography, and wind data into computer models. Dr Stephen Mitchell at the UBC Faculty of Forestry has been centrally involved in developing and testing these models, and will be generating stand vulnerability maps for the Park Board as the input information becomes available.

The likelihood of windthrow is reduced when newly created forest edges are stabilized by a process called windfirming. In dense stands, this work involves the feathering of the forest edge by selectively falling or stubbing trees most likely to cause further damage. Dense and open stands receive crown reduction pruning within a specified distance from the edge. The intent is to remove enough wind resistance from the crowns of the retained trees to allow them time to react by strengthening their roots and trunks; but not so much that the wind penetrates unimpeded into the trees behind. Done properly, the wind force is dissipated gradually as it enters the new edge. The thinned trees will grow back new branching with time and are intended to become the new adjusted edge trees. Research has shown that this method is effective at reducing post catastrophic event windthrow spread.

Determine susceptible edges and prioritize work

Map out damage

A digital aerial photograph of the park was taken on December 16 , 2007. The areas of the forest immediately known to have new openings were approximately marked on the photo. A flyover by helicopter allowed further confirmation of windthrow areas. Foresters Paul Lawson and Jeff Irwin flagged the edges in the field. Diamond Head Consultants were retained to assess danger trees in these openings in preparation for the coming cleanup and silvacultural operations. They

used GPS devices to log the flagged boundary coordinates, which were in turn added back in as a layer to Park Board and Diamond head GIS systems.

A more detailed map of the windthrow areas was made by Dr Stephen Mitchell, based upon highly zoomed in images of the December '06 photo.

Analysis of the pattern of windthrow within the park looked at a variety of factors: wind exposure, topography, hydrology/soil moisture, and stand conditions. The stand conditions of specific interest were species composition, height, age, density, live crown ratio and trunk taper, as well as observed disease incidence. These inputs are sufficient for Dr Mitchell to begin the preparation of a computer generated windthrow prediction model based upon extensive research of their behaviour in west coast forests.

Several areas are of obvious first concern and are to be treated immediately for safety reasons. These are segments of the forest that have a high target potential and are of moderate to high risk of continued activity. They are at the leading edges of the windthrows near the west side of the causeway, and at the trailing edges of the windthrows on the east side of the causeway which are now exposed to easterly storms . These areas are to be treated as the first phase of the windfirming work, and will be attended to as soon as possible. The second phase addresses areas that are adjacent to recent windthrows and where the probability of it spreading is moderate or high; and where the target rating is moderate or low. Moderate target areas are to be done first within phase 2, though low target areas might also be thinned at the same time if their locale suggests an efficiency gain.

The windfirming of high risk of failure areas that are not adjacent to windthrow areas is being considered, but are not in the work plan at this time. There are other stands within the park that are of moderate risk of wind throw but growth will soon shift them into a high risk rating.

<u>Prescription</u>

Higher exposure Work within one tree length of the windthrow edge.

For Cedar and Douglas fir, remove 50 % of the original crown of the edge trees using the spiral pruning method, with a slight preference for cutting on the windward side of the crowns. Branches that fell during the storm events count toward the 50 % figure. Trees two crowns in from the edge should be reduced by 40 % , the third crown trees need only be thinned by 30 %. For new edge hemlocks, and those two crowns in, remove the tops of the new edge trees, bringing them down to about 2/3 of their original height. Hemlocks three crowns in will be spiral thinned by 30 %, in the same fashion as the third crown Cedars and Douglas fir

Lower exposure Work within ½ a tree length from the windthrow edge.

Spiral thin all coniferous species by 30 %, with a slight preference for cutting the windward side of the crowns.