

# Assessment of Landscape Correlates of Eastern Hemlock Decline Due to Hemlock Woolly Adelgid

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Eastern hemlock (*Tsuga canadensis*) is in decline throughout its range in the eastern US due to infestation by an exotic insect pest, the hemlock woolly adelgid (*Adelges tsugae*). In Shenandoah National Park, the hemlock woolly adelgid (HWA) rapidly killed many stands of hemlock after first appearing in the late-1980's, while having only minor impact in other stands. At present, few investigators have examined the mechanisms that produce this discontinuous impact, although landscape factors are predicted to play a major role (Orwig and Foster, 1998; Perry 1988). In an effort to address possible landscape correlates to hemlock decline, we conducted a preliminary analysis of 5 years of hemlock health estimates in comparison to measures of terrain, stand isolation, and potential dispersal corridors at the stand level. We found that elevation, slope, light

conditions, and distance to streams all exhibited relatively strong correlation with hemlock decline, although the relationship varied by year. In addition, there appears to be some evidence of spatial autocorrelation in decline, suggesting that similar environmental conditions are either controlling the adelgid or making hemlock stands more susceptible to HWA. We are using the results of this preliminary analysis to guide more detailed efforts aimed at modeling hemlock stand vulnerability as a result of site, landscape, and regional factors.

## References

- Orwig, D. A.; Foster, D. R. 1998. **Forest response to the introduced hemlock woolly adelgid in southern New England, USA.** Journal of the Torrey Botanical Society. 125 (1): 60-73.
- Perry, D. A. 1988. **Landscape pattern and forest pests.** The Northwest Environmental Journal. University of Washington, Seattle. 4: 213-228.

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