Severe red spruce winter injury in 2003 creates unusual ecological event in the northeastern United States

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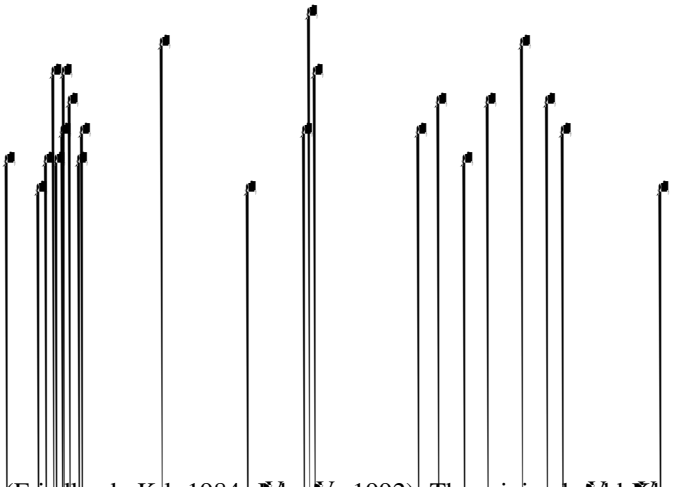
Abstract: Abundant winter injury to the current-year (2002) foliage of red spruce (*Picea rubens* Sarg.) became appar-



(F iedla d eKal. 1984; Wh W 1992). The i i al oVld KVle a ce Vf ed ce, oV bi ed iKn ed cKV i oVld hadi e d e KV acidic de V iKV a d VKe a KnVVge ic facKV , oV Kib Ke KV i Ke i j e i Vde V e ild, VKe e e e he Kee a e e V ed KV a V f ee i g Ke e (e.g., V i i Ke e aK e , f ee e Kna c cle , a id f ee i g) (ee e ie b Schabe g a d DeHa e 2000). B d VKliK ca acoV a i Ke i j (Pea KeK

jury. Spearman’s rank correlation was also used to relate fo-

Colebrook plantation, which indicate that the 2003 winter injury event was unusually severe.

Ecological implications

In addition to highlighting the unusual severity of the 2003 winter injury event, data from the Colebrook plantation show that repeated or severe winter injury was associated with increased tree mortality. Eighty-nine trees in the plantation (16%) died between 1992 and 2000. In comparison with the 469 that remained alive, these 89 trees showed significantly more winter injury each year from 1986 to 1992 (*t* tests for unequal variances, $P < 0.001$ in all cases). Trees that died averaged 18% injury to current-year foliage between 1986 and 1992, while trees that survived averaged 8% injury during the same period. Average maximum injury between 1986 and 1992 was also greater for trees that died (42%) than for trees that lived (24%). As far as we know, this tree

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