

Three Years of Bark and Wood Boring Beetle Activity Following Pacific Coast Windstorm

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Introduction and Objective:

- Severe windstorms along the coast of Washington over three days in December 2007 resulted in substantial amounts of windthrown trees in some areas (Fig. 1). In a March 2008 special aerial survey of coastal areas, the Washington Department of Natural Resources (WDNR) mapped a total of 29,000 acres with windthrow. The most severe damage occurred south of Grays Harbor (Fig. 2). Monitoring for bark and wood boring beetle activity at three windthrow sites on state lands began spring 2008.
- The **objective** was to monitor changes in the bark and wood boring beetle community in un-salvaged areas for three years following storm damage.



Figure 1. Severe windthrow at the edge of a harvested area.

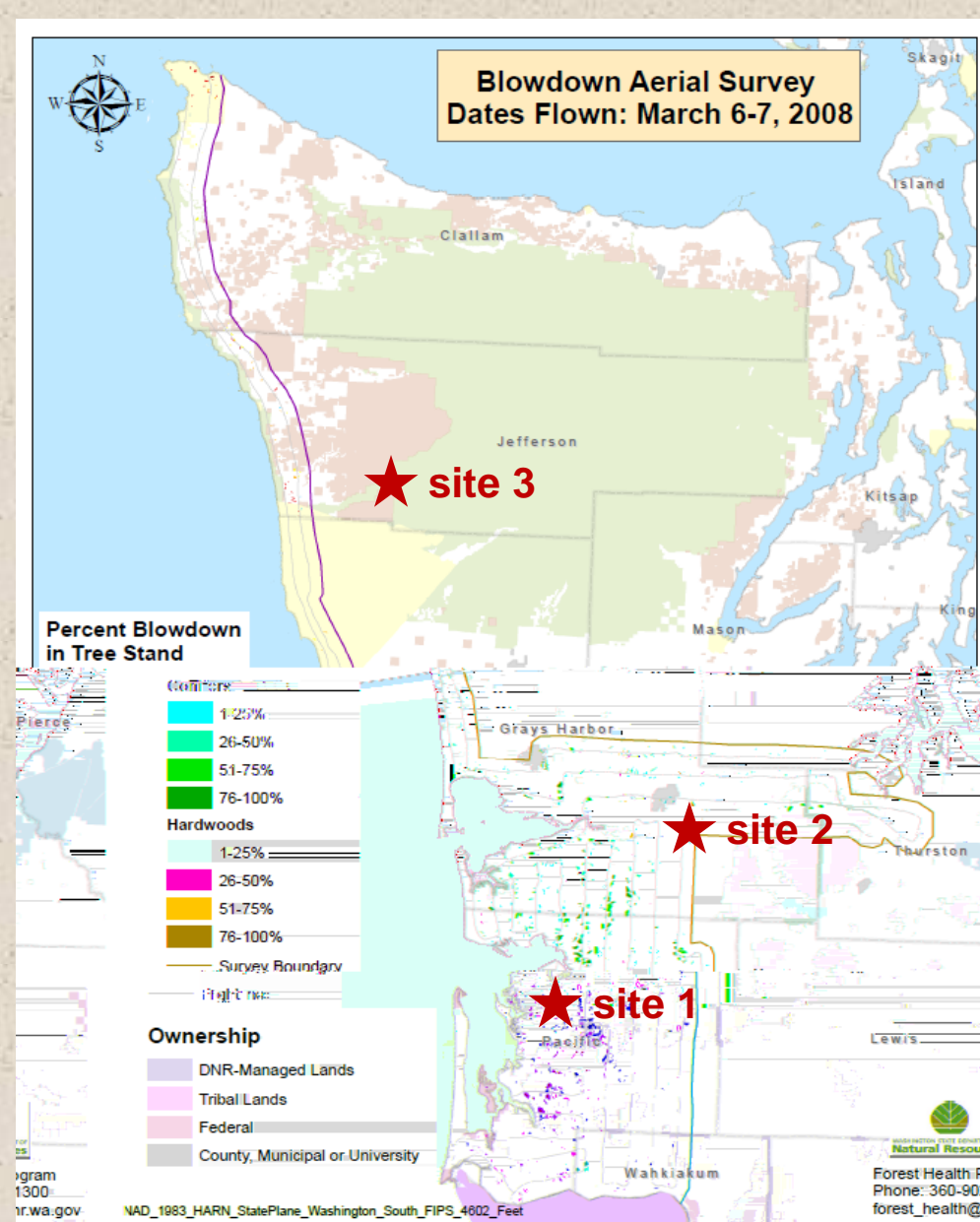


Figure 2. Three monitoring sites in western Washington.

Methods:

- Three funnel traps baited with generic host volatiles ethanol and alpha-pinene (Fig. 3) and three passive flight intercept traps (Fig. 4) were placed at each site.
- Traps were maintained for three years (2008-2010) except at site 3, which was salvaged in early 2010. Traps were emptied every three to four weeks.
- In July 2008 and April 2009, three bolts were cut per tree species at each site and placed in emergence traps.
- Stand composition.** Site 1 was 50% western hemlock (WH), 30% red alder (RA), and 20% Douglas-fir (DF); site 2 was 98% DF and 2% RA; site 3 was 90% WH and 10% Pacific silver fir. Windthrown trees comprised 30-57% of pre-storm basal area.



Figure 3. Ethanol and alpha-pinene baited funnel trap.



Figure 4. Passive flight intercept trap.

Results and Discussion:

- 13,019 specimens of bark and ambrosia beetles representing 24 species in 16 genera were collected over three years.
- Gnathotrichus* spp. ambrosia beetles were by far the most abundant beetles collected. They were the only species to have a second peak flight in fall the year after the storm; likely first wave adults re-emerging for second attacks (Table 1). *Gnathotrichus* spp. adults also emerged from bolts in fall 2008.
- Gnathotrichus* spp., *Xyleborinus saxeseni*, *Hylastes nigrinus*, alder bark beetle (*Alniphagus aspericollis*), and *Anisandrus dispar* flights were largest in the third year (Fig. 5a&b).
- Ten times more alder bark beetles, *A. aspericollis*, were collected in passive flight intercept traps (102) than in baited funnel traps (10). Ethanol and alpha-pinene are not likely suitable attractants for hardwood infesting bark beetles.
- Douglas-fir beetle (DFB), *Dendroctonus pseudotsugae*, adult collections increased in the second spring after the storm, and remained high for two years (Fig. 5b). DFB attacks of standing live trees were observed in 2009 at sites 1 and 2.
- Flight collection of adult wood borers decreased by the third year, possibly due to lack of fresh windthrow suitable for oviposition and long-lived larvae (Fig. 5c).

Table 1. Most abundant bark and ambrosia beetles collected over three years.

Species	Total collected	Peak flight period
<i>Gnathotrichus</i> spp.*	8,885	May & Sep. (2008); May-July (2009 & 2010)
<i>Xyleborinus saxeseni</i>	1,818	May (2008); May-July (2009 & 2010)
<i>Hylastes nigrinus</i>	1,158	May-June (2008-2010)
<i>Dendroctonus pseudotsugae</i> (Douglas-fir beetle)	555	April-May (2009); May (2010)
<i>Trypodendron lineatum</i>	326	July (2008); May & Aug. (2009)
<i>Alniphagus aspericollis</i> (alder bark beetle)	112	April (2009); June (2010)
<i>Pseudohylesinus sericeus</i> (silver fir beetle)	47	May (2009)
<i>Pseudohylesinus nebulosus nebulosus</i> (Douglas-fir pole beetle)	44	unknown
<i>Anisandrus dispar</i>	39	May (2010)
<i>Scolytus unispinosus</i> (Douglas-fir engraver)	13	unknown

* *Gnathotrichus retusus* and *Gnathotrichus sulcatus*

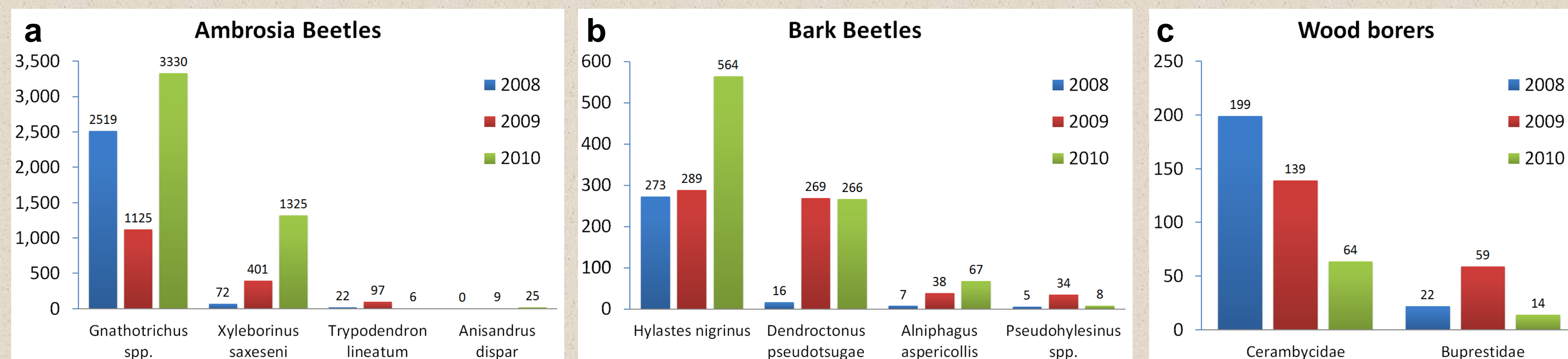


Figure 5. Number of adult ambrosia beetles (a), bark beetles (b), and wood borers (c) collected over three years at sites 1 and 2.

- Emergence traps.** No Douglas-fir beetles were collected from emergence traps until 2009. Very few silver fir beetles (SFB), *Pseudohylesinus sericeus*, were collected in the field in 2008. However, 317 SFB adults emerged from Pacific silver fir bolts in 2008. These were likely reemerging for second attacks. Two SFB adults also emerged from western hemlock bolts. *Gnathotrichus* spp. and *Trypodendron lineatum* adults emerged from both western hemlock and Douglas-fir in 2008 and 2009.
- Conclusion.** Most bark and ambrosia beetles increased populations in windthrown trees, resulting in higher adult flights in the second and/or third years following the storm. Most wood damage and introduction of decay fungi likely occurred during the first two years while broods were increasing.

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