



Insect Outbreaks

Roughly 1.5 million hectares (3.7 million acres) of white spruce in southcentral Alaska has been killed by the spruce beetle (*Dendroctonus rufipennis*) over the last quarter century. The recent spruce beetle outbreaks, and the spread of the non-native spruce aphid (*Elatobium abietinum*) into southcentral Alaska, have been attributed to regional warming. Warm winters have resulted in lower overwinter mortality of both beetles and aphids. Warm summers accelerate larval development in the spruce beetle, reducing generation time from a two-year life cycle to a single year and supporting rapid population growth. Above-average spring and summer temperatures can also contribute to moisture stress in white spruce, weakening them and making them vulnerable to spruce beetle attack (Csank et al. 2016). These warming-related effects have resulted in extensive damage to spruce stands and changes in stand structure and composition. Long-term forest monitoring and tree-ring studies are helping us to better understand the timing, frequency, and ecological effects of these outbreaks.

A New Beetle Outbreak in Southcentral Alaska

Annual aerial surveys conducted by the U.S. Forest Service and Alaska Department of Natural Resources track general trends in spruce beetle activity. In 2017, beetle activity flared up on the northern Kenai Peninsula, the Susitna River valley, and in Katmai National Park and Preserve, which showed a nearly 15-fold increase in activity over 2016 levels (8,090 acres; U.S. Forest Service 2018; Figure 1). Mortality has been reported in a range

of diameter classes and in non-host species, including black spruce, suggesting that the current outbreak could result in severe damage across the affected area. Spruce beetle activity in Lake Clark National Park and Preserve remained relatively light in 2017 (963 acres), but the current outbreak in the Susitna River basin has the potential to spread south and affect additional stands in the park and around Lake Iliamna.

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Beetle-killed trees along the Brooks Falls Trail, Katmai National Park and Preserve.

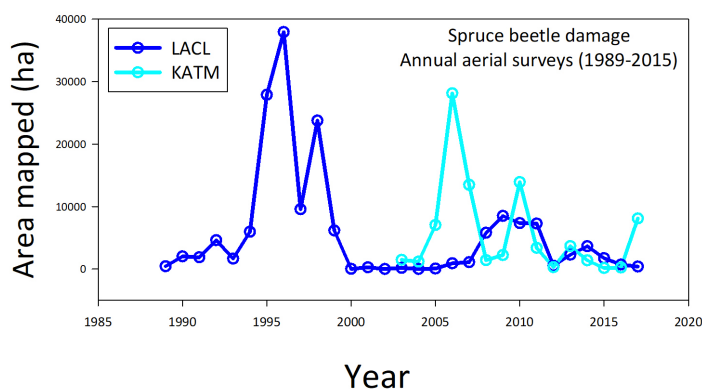


Figure 1. Annual mapped area (hectares) of spruce beetle damage by park and year, from U.S. Forest Survey aerial survey data (1989-2017; <http://foresthealth.fs.usda.gov/portal/>). Area mapped is dependent on flight line locations and may not include all areas affected in a given year, or areas affected in prior years.



Widespread Hardwood Defoliation on the Northern Alaska Peninsula

In 2016, roughly 160,000 acres in southwest Alaska were affected by the speckled green fruitworm (*Orthosia hibisci*) and other native defoliators (U.S. Forest Service 2018; Figure 2), with activity centered in the Upper Yentna, Lake Clark, Wood-Tikchik, and Holy Cross drainages. The damage was first reported in 2015, when roughly 9,880 ha (24,410 acres) of defoliation and dieback were observed across alder and willow stands in Lake Clark National Park and Preserve. Aerial survey data showed a sharp decline in defoliator activity in 2017, relative to 2016 levels.

Spruce Aphid Declines in 2017

The spruce aphid (*Elatobium abietinum*; Figure 3) was introduced to the Pacific Northwest in 1910, and has been established in Southeast Alaska since at least the early 1960s. It was first observed on the Kenai Peninsula in 2015, primarily around Homer and Halibut Cove (Figure 3). Activity along the outer coast of Kenai Fjords was mapped at 121 ha (298 acres) in 2015, increasing to 397 ha (982 acres) in 2016, when activity on the western Kenai also peaked (U.S. Forest Service 2018). No activity was recorded in Kenai Fjords in 2017, presumably due to the cold winter of 2016-2017. The spruce aphid has not yet been detected in Lake Clark or Katmai national parks and preserves.



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Figure 2. Speckled green fruitworm (*Orthosia hibisci*) damage on a willow at Telaquana Lake, Lake Clark National Park and Preserve, 2016.



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Figure 3. Spruce aphid (*Elatobium abietinum*) damage on white spruce.

References

Csank, A. Z., A. E. Miller, R. L. Sherriff, E. E. Berg, and J. M. Welker. 2016. [Tree-ring isotopes reveal drought sensitivity in trees killed by spruce beetle outbreaks in southcentral Alaska](#). *Ecological Applications* 26:2001-2020.

U.S. Forest Service. 2018. [Forest Health Conditions in Alaska – 2017](#). U.S. Forest Service, Alaska Region, Anchorage, AK. Publication R10-PR-43, 74 pp.



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A view of spruce aphid damage from Halibut Cove showing infested trees with red needles.