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Two decades of Western spruce budworm outbreaks in the Pacific Northwest

Nathan Roueche

Western Washinton University

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Twenty Years of Western Spruce Budworm Outbreaks in the Inland Northwest



Adult female

Nathan Roueché¹, Aquila Flower²

¹ Biology Department, Western Washington University ² Geography Department, Western Washington University



Larva



Adult male

Background

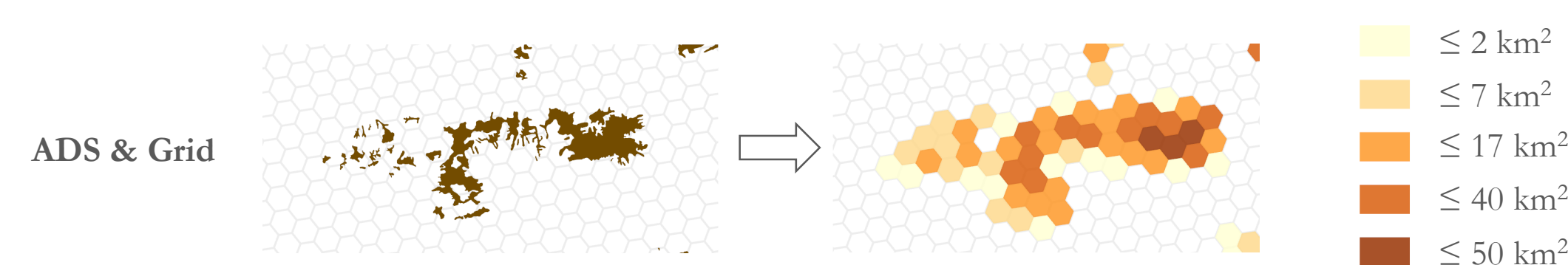
- Western spruce budworm (*Choristoneura occidentalis*) (WSB) is the most widespread conifer-defoliating insect in western North America.
- Predominantly associated with Douglas-fir trees (*Pseudotsuga menziesii*) although other conifers serve as hosts to a lesser extent.
- Populations undergo dramatic periodic increases or “outbreaks” followed by subsequent declines in following years.
- Life history is univoltine, with foliage consumed by larvae in late spring/early summer and adult dispersal in late summer.
- Outbreaks are believed to occur at least in part due to regional climate variation, but previous investigations have given conflicting results.
- The role and significance of dispersal in WSB outbreak dynamics is largely unknown.

Goals

- Compile a comprehensive dataset of all observed WSB outbreaks in the PNW.
- Quantify timing and extent of WSB outbreaks from 1980-2000.
- Assess the scale and rate of outbreak spread.
- Compare outbreak occurrences to exogenous factors such as climate variation.

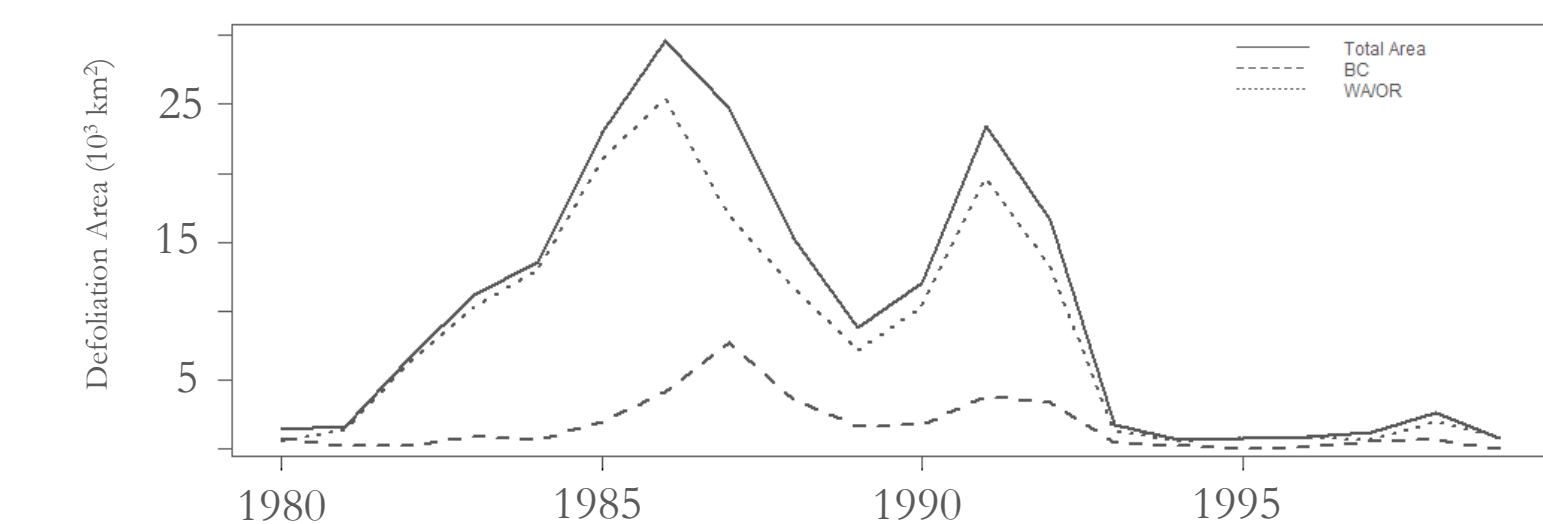
Data & Processing

- Forest health inventory aerial detection survey digital maps are created annually covering forested landscapes in the US and Canada.
- WSB-defoliated areas from each year were extracted and aggregated into a 50 km² hexagonal tessellation network, unifying discrete ADS data from multiple agencies.



Results

- The combined ADS data sets of WSB outbreaks in Washington, Oregon and British Columbia spanning the study period 1980-1999 appear to show a pattern of outbreak spread and dispersal from disjunct initiation points when viewed as a time-series chronology.
- Initiation of outbreaks in the early 1980s appear to begin in a few discrete locations and emanate outwardly in successive years.
- The spread of WSB outbreaks is often not captured within a single management jurisdiction, supporting the importance of a range-wide approach to further investigation.



Discussion

The visual review of the WSB outbreak data for the study region provide interesting insights into the initiation and spread of outbreak conditions. This preliminary analysis of ADS data demonstrates the ability of these regional data sets to provide further understanding and new knowledge of WSB outbreak dynamics across both regional and subcontinental landscape scales.

Future Research Goals

- Expand data and analysis to the full range of WSB, from Canada to the American Southwest, for the period from 1970 to 2018.
- Assess the role of climate variability in outbreak initiation, cessation, and spread.
- Determine dispersal kernel of WSB outbreaks and assess the kernel variation across spatiotemporal scales and ecological regions.

