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The Distribution of *Artemisia rigida* in Washington: A Challenge to Ecology and Geology

Abstract

The distribution of *Artemisia rigida* in eastern Washington reveals some peculiar features which suggest a high degree of sensitivity to the substrate, climate, and/or geologic history of the area.

Early in the course of investigating the vegetation of eastern Washington (Daubenmire and Daubenmire 1968, Daubenmire 1970), some peculiarities in the distribution of *Artemisia rigida* (Nutt.) Gray became apparent, and thereafter dots were accumulated on a map (Fig. 1) to show the location of all stands that were seen during subsequent field work.

This dwarf shrub is everywhere restricted to shallow stony soils over bedrock, but has been seen only where the parent rock is basalt. Other rock types occur in the region, but even where these are contiguous with basalt outcroppings, the plant fails to colonize them.

Another major peculiarity involves the absence of the plant in a large area centered in Franklin County (Fig. 1). The existence of this void is especially challenging, and four possible working hypotheses for its explanation are suggested.

First, since the plant is sensitive to the difference between basalt and granitic bedrock, the chemical composition of the basalt outcrops in the void may differ from those of the surrounding area in some subtle manner. However, the Columbia Basin of eastern Washington was floored with nearly horizontal basalt flows, with later down-warping accentuating the intermountain basin, so this hypothesis is suspect. Planting seeds from the adjacent area on outcrops within the void would be a sound experimental procedure for testing this hypothesis, as well as the two which follow.

Second, physical features of the basalt may be more critical than its chemistry, for in many places *Artemisia rigida* gives way abruptly to stands of *Eriogonum niveum* on what appears to be the same homogeneous expanse of basaltic outcrop. Experiments (Daubenmire 1970) indicate that soil chemistry or antagonism are not involved at these ecotones, and it has been suggested that perhaps the jointing pattern of the basalt beneath the thin stony soil profile may differ critically.

Third, the climate of the void, which coincides approximately with the lower part of the Columbia Basin, might be too hot or too dry for *Artemisia rigida*. But this hypothesis seems ruled out by the existence of those stands close to the Columbia River in the northeastern corner of Benton County, and especially by the plants close to this river in Klickitat County. Both sites are lower in altitude, therefore probably either hotter or drier than parts of the void. Still other subtle climatic conditions may indeed be important, as suggested by the abundance of the shrub to the east of the Blue Mountains, whereas it appears to be completely absent on the west slopes of these mountains

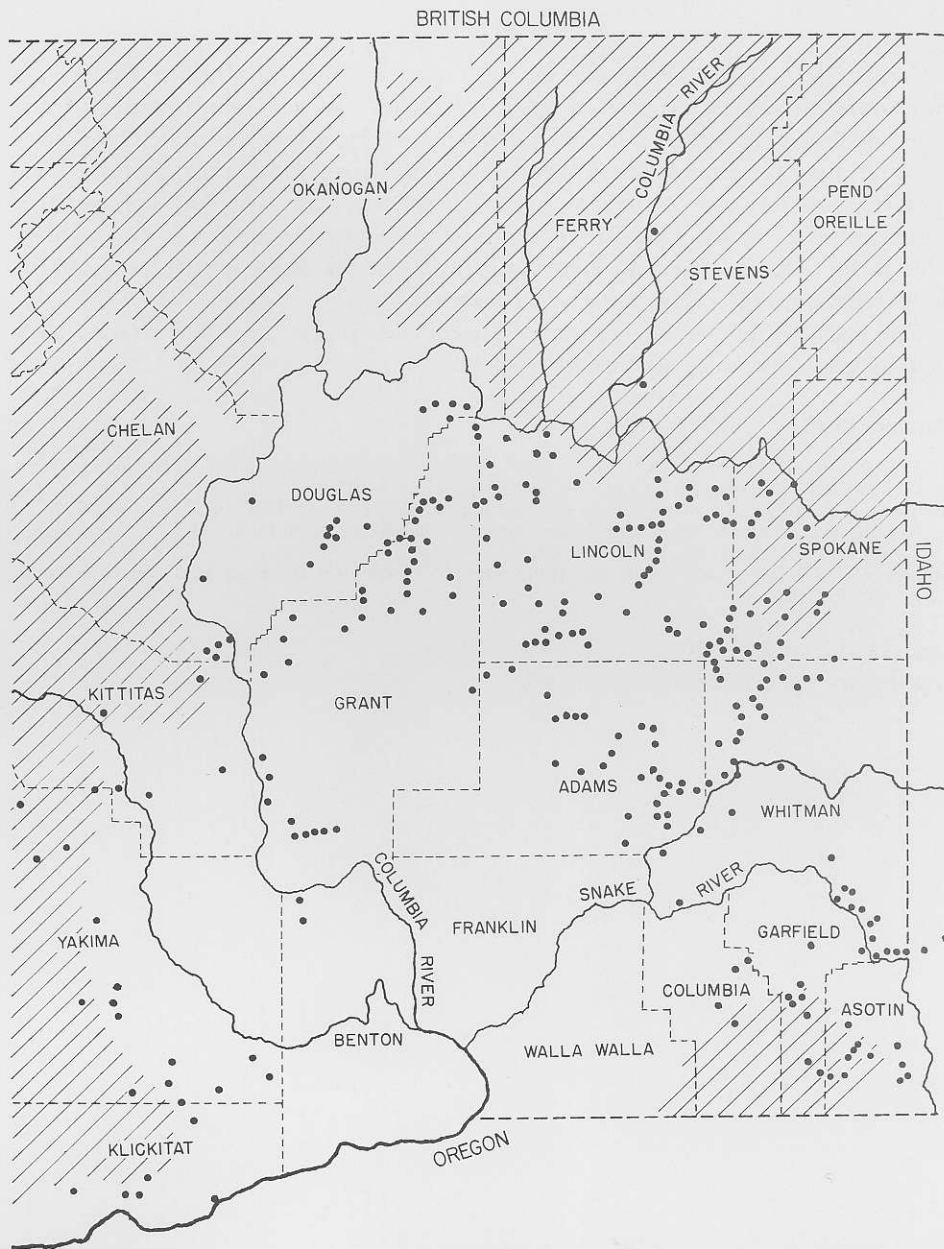


Figure 1. Distribution of *Artemisia rigida* as observed in Eastern Washington and adjacent Idaho.

at the same latitude. Furthermore, on the east slope of the Cascade Mountains the plant spans a climatic range from the *Pseudotsuga menziesii* belt at 1320 m down to the *Artemisia tridentata*/*Agropyron spicatum* belt at 190 m, whereas in eastern Washington it is completely absent over a large tract which exhibits a homologous vegetation catena.

Fourth, an historic factor may be involved. The vacant area in the range coincides at least roughly with the area below about 400 m, which is the area covered by glacial Lake Lewis that may have formed repeatedly during glacial times (Bretz *et al.* 1956,

McMacken 1927). The stands close to the Columbia River in Klickitat County are downstream of Wallula Gap, which restricted floodwaters and caused water to back up as Lake Lewis. Thus these stands were beyond the Lake. The stands in Benton County are within the Lake area. Although these plants may have invaded after the floods, this raises a question as to why invasion has not been more extensive. Any hypothesis of historic causes associated with glaciation must also account for the plants just north of Rice on the Columbia River in Stevens County, for these plants are far north of the southern terminus of at least one glacial advance.

Few plants of the Washington steppe present such a clear-cut and interesting challenge for both autecology and historic geology.

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