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Impact of leafy spurge on the plant community

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The annual rate of spread and impact of leafy spurge on the grass and broadleaf plant community was studied at five locations in Montana from 1984 to 1986. Four study sites were initiated in 1984 (Bozeman, Ekalaka, Big Timber, and Choteau) and a fifth was added near Missoula, MT in 1985.

Three clones of leafy spurge were chosen at each location. All spurge plants on the edge of the clones were marked with painted nails to delineate the annual rate of spread in subsequent years. Annual increments of spread (as measured by the average clonal radii) observed for the Ekalaka, Big Timber, and Choteau sites were 10.4, 40.6, and 12.7 cm, respectively. Unfortunately the Bozeman study plot was destroyed from a real estate development project and hence no information on the annual rate of spread is available from that site.

To obtain information on the impact of leafy spurge on the plant community, 2 transects (at right angles) were established for each of the fifteen clones (5 locations). Transects extended through the clones and into the plant community outside the clones. Daubenmire frame samples (each 0.1 m) were taken along each of the transects at 1 m intervals and species composition, percent coverage of all plant species, and percent litter/bare ground were estimated.

Plant information (collected inside the leafy spurge clones at four sites [Choteau, Big Timber, Ekalaka, and Bozeman] in 1984 and a single site [Missoula] in 1985) was averaged over all quadrats taken within clones at each of the respective sites. In contrast, data collected in 1985 from Big Timber, Ekalaka, and Bozeman, MT was categorized as to plant material from low spurge densities (1-90 leafy spurge stems per sq. m), medium spurge densities (91-250 leafy spurge stems per sq. m), and high spurge densities (> 250 leafy spurge stems per sq. m). Plant material taken inside the leafy spurge clones was also categorized by leafy spurge height at the Bozeman site in 1986, in addition to categorization by leafy spurge density.

Choteau site

The mean percent coverage of grasses increased 7% inside the leafy spurge clones as compared to the outside in 1984. The sparse population of spurge and relatively large amount of bare ground inside the clones could have influenced this result. In contrast, the

mean percent cover of broadleaves was significantly reduced 67% inside the clones as compared to the outside ($p < 0.05$). Similar results were obtained at the Choteau site in 1985 with the grasses showing on average a 16% increase inside the leafy spurge clones as compared to outside, while the broadleaves showed a reduction inside the clones of 68%.

Big Timber site

Mean percent cover of grasses was reduced 18% inside the leafy spurge clones as compared to outside in 1984, while the broadleaves were significantly reduced by 62% inside the clones reduced by 48% inside the leafy spurge clones at spurge densities averaging 133 stems per square meter ($p < 0.01$; 1985). Similarly, the broadleaves were reduced by 75% at similar spurge densities, however these differences were not significantly different.

Ekalaka site

The mean percent cover of grasses was significantly reduced 44% inside the clones as compared to the outside in 1984 ($p < 0.01$). In contrast, the mean percent cover of broadleaves showed an increase of 17% inside the clones as compared to the outside. This result was likely due to the contribution of one of three clones at the site that had an abnormally high level of broadleaves inside the clone. The mean percent cover of grasses was reduced in 1985 by 19% at low spurge densities (on avg. 41 leafy spurge stems per sq. m) and significantly reduced by 76% at high spurge densities (on avg. 385 leafy spurge stems per sq. m; $p < 0.05$). In contrast, broadleaf cover showed a significant increase of 72% inside the clones at low spurge densities of 41 leafy spurge stems per sq. meter, again primarily from the contribution of one of three clones which had an abnormally high level of forbs. However, at high spurge densities (on avg. 385 leafy spurge stems per sq. m) broadleaf cover was reduced by 67% inside the clones as compared to outside.

Missoula site

The mean percent cover of grasses was reduced by 20% inside the leafy spurge clones as compared to the outside (1985). Similarly, the broadleaf cover was reduced on average 30% inside the leafy spurge clones.

Bozeman site

Mean percent cover of grasses was reduced 27% inside the leafy spurge clones as compared to outside the clones in 1984. A significant reduction of 89% was observed for broadleaf cover inside the clones as compared to outside. Significant reductions of grasses and broadleaves of 96 and 100%, respectively, were observed inside the leafy spurge clones as compared to outside in 1985 ($p < 0.01$) for high spurge densities (on avg. 428 leafy spurge stems per sq. m). Similar reductions in grasses and broadleaves

were observed in 1986 at the Bozeman site. Grass and broadleaf cover was significantly reduced by 93 and 100%, respectively, for high spurge densities which averaged 446 leafy spurge stems per sq. meter ($p < 0.05$ and $p < 0.01$, respectively).

In summary, a general reduction of grasses and broadleaves was observed inside the leafy spurge clones as compared to outside the clones for the five study sites considered (from 1984-1986). Broadleaves and bunch grasses appeared to be the first plant groups to be reduced or eliminated as the densities of leafy spurge increased, often leaving behind the rhizomatous grass species. Our conclusion is that leafy spurge is having a substantial impact on many native and naturalized grass and forb species. At higher spurge densities we see not only a decrease in plant species, but a tendency towards wetter site and/or introduced species.