

PACIFIC SOUTHWEST Forest and Range Experiment Station

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WEDGELEAF CEANOTHUS CANOPY DOES NOT AFFECT TOTAL HERBAGE YIELD

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Wedgeleaf ceanothus (*Ceanothus cuneatus*)¹ is a major component of browse plants in the foothills of central California (fig. 1). Browse plants cover 10 to 15 percent of the San Joaquin Experimental Range, Madera County, Calif. On a year's basis, they contribute 1 to 2 percent of the feed for livestock. The shrubs provide another benefit—shade for cattle that probably helps improve weight gains during the hot summers.

Cattle are not the only animals that feed on wedgeleaf ceanothus. Deer browse on it, and smaller animals use it for shelter, nesting, and food. For example, wood rats (*Neotoma fuscipes*),² pocket gophers (*Thomomys bottae*), and ground squirrels (*Citellus beecheyi*) feed on the roots and upper stem and leaves. California quail (*Lophortyx californica*) and mourning dove (*Zenaidura macroura*) use the shrubs for roosting, nesting, dusting, or cover.³

Litter from wedgeleaf ceanothus accumulates directly beneath the shrubs to form a mulch that reduces moisture evaporation and enriches the soil.⁴ Conceivably, mulching could result in greater herbage yield beneath a shrub than away from it.

The varying effects of wedgeleaf ceanothus canopies on the composition and production of herbaceous species have been observed, although we know of no research on the subject. Under some shrubs, we have observed virtually no plant growth; under others, species composition and growth appear better than away from the shrubs.

In a study on the San Joaquin Experimental Range, we found that wedgeleaf ceanothus canopy did not (on the particular site studied) significantly influence total herbage yield. But some individual species grew better beneath the canopy while other species grew better outside the canopy. And individual species showed a preference to direction from the shrubs. The net result was a balancing or uniform

Abstract: A major browse plant in the central California foothills, wedgeleaf ceanothus (*Ceanothus cuneatus*) is used by a variety of animals. The canopy effect of the species was studied on the San Joaquin Experimental Range. Total herbage yield was not significantly affected by the canopy. But herbage yields of some individual species were affected by both the position in relation to canopy edge and the direction from a wedgeleaf ceanothus shrub. Range managers concerned about herbage yields will need to consider these effects.

Oxford: 268.5(794):176.1 *Ceanothus cuneatus* [+ 175.2 *Festuca* spp. + 176.1 *Erodium botrys*].

Retrieval Terms: *Ceanothus cuneatus*; canopy effects; herbage yields; *Bromus mollis*; *Bromus rigidus*; *Erodium botrys*; *Festuca megalura*.

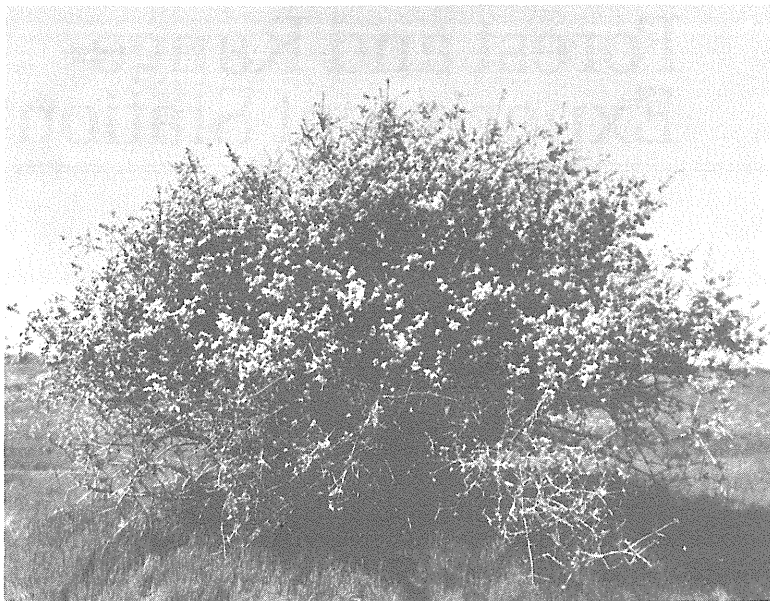


Figure 1—*Wedgeleaf ceanothus* grows to a height of about 10 feet on the San Joaquin Experimental Range. This species is widely used as a browse plant.

distribution of total herbage yield. The presence of wedgeleaf ceanothus reduced yields of soft chess and broadleaf filaree, however, while increasing riggut brome and foxtail fescue yields.

PROCEDURES

An unfertilized, moderately grazed, native range with a combination of wedgeleaf ceanothus and open areas on the Experimental Range were selected for the study.

The soil there is an Ahwahnee coarse sandy loam. It ranges in depth from 20 to 36 inches over a weathered quartz-diorite parent material. The site has a north-northeast exposure, a 5 to 15 percent slope, and is classed as open and rolling.⁵

Ten ceanothus shrubs were randomly selected. True north was fixed at the base of each shrub, and four plots (each 2-foot square) were established in each of the four quadrants for a total of 160 plots (fig. 2). Plot-1 was half the distance from the shrub trunk to the edge of the canopy. Plot 2 was just inside the canopy, and Plot 3, just beyond the canopy edge. Plot 4 was the same distance from the edge of Plot 1, but beyond the canopy.

Vegetation on each plot was protected from grazing by use of the San Joaquin Cage.⁶ Cages were placed in November 1969. Nine plots were destroyed—six by gophers and three by cattle. On March 24, 1970, each cage was removed and a 1-foot square area of the vegetation was clipped to a stubble height of

1/2 inch. Most of the vegetation appeared to be in the late vegetative and soft dough stages. Each sample was individually identified by shrub, quadrant, and plot number, and then air-dried in a greenhouse.

Total vegetation from each sample was weighed. The vegetation was then sorted and weighed in grams (air dry), by species or groups of species, according to

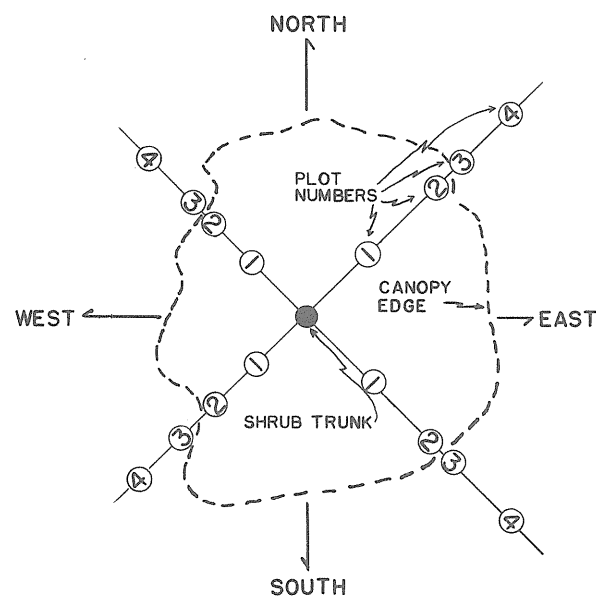


Figure 2—Around each of 10 wedgeleaf ceanothus plants, four plots were set up in each of four quadrants to test for effect of canopy.

the method described by Wagner.⁷ The following species were found in at least one of the 151 usable samples:

Grasses and Grasslike Plants

Bromus mollis (soft chess)
Bromus rigidus (ripgut brome)
Bromus rubens (red brome)
Bromus arenarius (Australian chess)
Avena barbata (slender oat)
Festuca megalura (foxtail fescue)

Broad-leaved Herbs

Erodium botrys (broadleaf filaree)
Lotus purshianus (Spanish clover)
Trifolium spp. (clover spp.)
Amsinckia douglasiana (Douglas fiddleneck)

Other Broadleaves

Baeria chrysostoma (goldfields)
Gilia tricolor (birdseye gilia)
Layia gaillardoides (layia)
Lotus strigosus (fine leaf lotus)
Lupinus bicolor (bicolor lupine)

Whether position in relation to the canopy or direction around the shrub or both significantly affected herbage yield was tested by analysis of variance.⁸ Total herbage yield and yields of four individual species—soft chess, ripgut brome, broadleaf filaree, and foxtail fescue—were tested. These four species contributed most of the total weight. Significant differences among means were determined by Duncan's Multiple Range Test.⁹

RESULTS

We found no statistically significant differences in total herbage yields attributable to plot location or direction. Average total yields, by plot location and quadrant, were computed (table 1). Yields of the four individual species (tables 2,3) were significantly affected by both plot location and direction around the shrubs.

Soft chess and broadleaf filaree produced their greatest yields beyond the influence of the canopies—generally increasing in yield from the trunk outward (table 2). Ripgut brome, on the other hand, grew well beneath, but decreased in yield beyond the canopy. Foxtail fescue yield was greatest just under the edge of the canopy.

Yields of soft chess and ripgut brome were greatest on the east side of the shrubs (table 3). However, the greatest yield of soft chess occurred in the southeast

Table 1—Average total herbage yield, by location of plot and quadrant around a wedgeleaf ceanothus shrub¹

Plot location	Northeast	Southeast	Southwest	Northwest
	Grams			
1	² 14.68a	12.38a	10.56a	11.69a
2	14.70a	11.73a	12.86a	13.73a
3	14.67a	14.78a	14.60a	12.75a
4	12.87a	15.55a	15.08a	12.76a

¹Data represent means for 10 ceanothus shrubs.

²Values followed by the same letter do not differ significantly at the 5 percent level.

Table 2—Effect of wedgeleaf ceanothus on herbage yield of four species, by location of plot around a shrub¹

Plot location	Soft chess	Ripgut brome	Broadleaf filaree	Foxtail fescue
	Grams			
1	² 18.58a	23.07c	1.75a	2.81ab
2	21.72b	13.63b	5.14b	8.03c
3	22.42b	9.82a	18.77c	4.29b
4	25.63c	8.35a	21.23d	2.07a

¹Data represent average means for 10 ceanothus shrubs.

²Values followed by the same letter do not differ significantly at the 5 percent level.

Table 3—Effect of wedgeleaf ceanothus on herbage yield of four species, by quadrant around a shrub¹

Quadrant	Soft chess	Ripgut brome	Broadleaf filaree	Foxtail fescue
	Grams			
Northeast	² 24.00c	24.05c	7.93a	3.55b
Southeast	28.52d	11.35b	8.37a	2.34ab
Southwest	20.88b	8.59a	16.45c	1.57a
Northwest	14.95a	10.88ab	14.14b	9.74c

¹Data represent average means for all 10 ceanothus shrubs.

²Values followed by the same letter do not differ significantly at the 5 percent level.

and that of ripgut brome in the northeast quadrants. Broadleaf filaree yield was greatest in the southwest quadrant. Foxtail fescue grew best in the northwest quadrant.

The net effect of wedgeleaf ceanothus canopies on total herbage yield is to cause a balancing or uniform distribution of yield around the shrubs. This occurs because of differences in species response to the canopy and direction from the shrubs.

Cattle and other animals browse wedgeleaf ceanothus. Hence, this species may be a desirable and important nutrient source for them—especially during

periods when herbaceous vegetation is either dry or in short supply. The influence of the shrubs on vegetative composition suggests the need for more research.

Future studies should encompass ceanothus populations of varying densities, with the aim of determining the best density to maintain livestock production while providing for the needs of wildlife. Specific studies would determine the effects of different soil depths, soil types, and exposures; and the nutritional values of wedgeleaf ceanothus as feed for livestock and game.

NOTES

¹Scientific names of plants follow Munz, P.A., and D. D. Keck, *A California flora*. Berkeley and Los Angeles: University of California Press, 1,681 p. 1959.

²Scientific names of animals as given by Hutchinson and Kotok, 1942. (See Note 3.)

³Hutchinson, C. B., and E. I. Kotok. *The San Joaquin Experimental Range*. Calif. Agr. Exp. Sta. Bull. 663: 1-49. 1942.

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⁸Dixon, Wilfred J., and Frank J. Massey, Jr. *Introduction to statistical analysis*. Ed. 2 New York: McGraw-Hill Book Co., Inc. p. 155-168. 1957.

⁹LeClerg, E. L. *Mean separation by the functional analysis of variance and multiple comparisons*. ARS-20-3 U.S. Department of Agriculture, Beltsville, Maryland. p. 23-31. 1957.

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The Station's range-wildlife environmental research unit, headquartered at Fresno, California, is developing the scientific base for multiple-use management of central California ecosystems. This report adds a facet of knowledge for the ecosystem of the Sierra Nevada foothills.