A Selected and Annotated Bibliography of Understory - Overstory Vegetation Relationships

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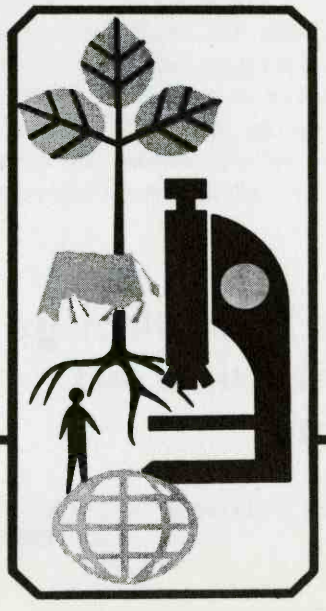

A Selected and Annotated Bibliography

Of

Understory-Overstory Vegetation Relationships

by Peter F. Ffolliott and Warren P. Clary*

Forward

The purpose of this bibliography is to provide a summary of selected literature on understory-overstory relationships, published through 1971. The bibliography is intended to be a working tool for natural resource specialists attempting to describe (a) understory production, density, composition, etc., associated with overstories of varying densities and compositions, or (b) changes in understory production, density, composition, etc., resulting from conversion or modification of overstories.

The terms *understory* and *overstory* are somewhat arbitrary. To qualify for listing in the bibliography, a reference had to present information regarding interactions in production, density, composition, etc., between two levels of plant forms within a vegetation community.

References contained in the bibliography include popular as well as scientific articles which, generally, can be found in readily available sources. Only references presenting quantitative data (e.g., tables, graphs, etc.) have been listed however. Annotations include (a) identification of major plant species, if given; (b) location of study area, if not included in title; and (c) form of data presentation (e.g., tables, graphs, etc.).

The bibliography has been organized by five overstory categories: (1) coniferous, (2) deciduous, (3) mixed coniferous-deciduous, (4) shrub, and (5) other. Scientific names of plant species are given if included in the reference.

An index of authors is included to facilitate use of the bibliography. This index, arranged alphabetically by authors' surnames and initials, lists for each author or co-author the numbers of references in the bibliography.

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* ASSISTANT PROFESSOR, DEPARTMENT OF WATERSHED MANAGEMENT, AND PLANT ECOLOGIST, ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION, U.S. FOREST SERVICE, FLAGSTAFF, RESPECTIVELY.

BIBLIOGRAPHY

CONIFEROUS OVERSTORY

1. Adams, Lowell, and David J. Dunaway.
   1960. The effect of timber overstory on deer habitat in mixed conifer type. U.S. Dept. Agr., Forest Serv., Pacific Southwest Forest and Range Exp. Sta., Res. Note 158, 2 p. Berkeley, Calif.

   A logarithmic relationship between understory and overstory densities is graphically illustrated for a study area on the west slope of the Sierra Nevada in California.

2. Agee, James K., and Harold H. Biswell.
   1970. Some effects of thinning on ponderosa pine and understory vegetation. J. Forest. 68: 709-711.

   In California, herbaceous vegetation production under thinned, fertilized ($(NH_4)_2SO_4$), thinned and fertilized, and no treatment (control) stands of ponderosa pine (*Pinus ponderosa*) overstory is described.

3. Ahlgren, Clifford E.
   1960. Some effects of fire on reproduction and growth of vegetation in northeastern Minnesota. Ecology 41: 431-445.

   Plant frequencies of understory vegetation are presented (tables) for burned-and-unburned study sites in the coniferous forests of the Lake States.

4. Anderson, R.C., O.L. Loucks, and A.M. Swain.
   1969. Herbaceous response to canopy cover, light intensity, and throughfall precipitation in coniferous forests. Ecology 50: 255-263.

   A linear equation defines relationship between herbaceous understory cover and percent of overstory canopy cover for two stands of red pine and white pine in northern Wisconsin. Also, the relationship is graphically illustrated.

5. Arnold, Joseph F.
   1950. Changes in ponderosa pine bunchgrass ranges in northern Arizona resulting from pine regeneration and grazing. J. Forest. 48: 118-126.

   Tables and graphs describe relationships between herbaceous density and percent of ground covered by ponderosa pine overstory.

6. Arnold, Joseph F.
   1953. Effect of heavy selection logging on herbaceous vegetation in a ponderosa pine forest in northern Arizona. J. Forest. 51: 101-105.

   Herbaceous density is presented (tables) before-and-after logging, and in terms of surface disturbances, slash accumulation, and change in canopy after logging.

7. Arnold, Joseph F.
   1956. Economic aspects of converting juniper and pinyon to grasslands. *In* Recovering rainfall. Dept. Agr. Econ., Univ. of Ariz., pp. 67-89. Tucson, Ariz.

   Herbage yield before-and-after conversion (dozing, chopping) of juniper and pinyon woodland overstories is presented (tables) for Arizona.

8. Arnold, Joseph F.
   1956. Conversion of poor and non-commercial pine stands to grasslands. *In* Recovering rainfall. Dept. Agr. Econ., Univ. of Ariz., pp. 90-99. Tucson, Ariz.

   Herbage yield before-and after conversion (cutting, dozing, chopping) of ponderosa pine overstory is presented (table) for Arizona.

9. Arnold, Joseph F.
   1964. Zonation of understory vegetation around a juniper tree. J. Range Manage. 17: 41-42.

   Herbage production is presented (table) by zones around a one-seed juniper (*Juniperus monosperma*) tree in a pinyon-juniper woodland of east-central Arizona.

10. Arnold, Joseph F., and W.L. Schroeder.
1955. Juniper control increases forage production on the Fort Apache Indian Reservation. U.S. Dept. Agr., Forest Serv., Rocky Mts. Forest and Range Exp. Sta., Sta. Paper 18, 35 p. Ft. Collins, Colo.

Tables and bar graphs describing understory yields before-and-after removal of one-seed juniper (*Juniperus monosperma*), other juniper, and pinyon (*Pinus edulis*) are presented for a study area in east-central Arizona. Also, relationships between herbage yields and overstory density are given.

11. Arnold, Joseph F., Donald A. Jameson, and Elbert H. Reid.
1964. The pinyon-juniper type of Arizona: Effects of grazing, fire, and tree control. U.S. Dept. Agr., Prod. Res. Rep. 84, 28 p.

Relationships between herbage cover and yield and percent canopy intercept of pinyon and juniper overstory are graphically illustrated. Overstory is dominated by Utah (*Juniperus osteosperma*), one-seed (*J. monosperma*), and alligator juniper (*J. deppeana*).

12. Aro, Richard S.
1971. Evaluation of pinyon-juniper conversion to grassland. J. Range Manage. 24: 188-197.

Forage production with-and-without the application of different pinyon-juniper conversion techniques (burning, dozing, and chaining) is described for public lands in Colorado, Utah, Arizona, and New Mexico.

13. Barrett, James W.
1965. Spacing and understory affect growth of ponderosa pine saplings. U.S. Forest Serv. Res. Note PNW-27, 8 p. Pacific Northwest Forest and Range Exp. Sta., Portland, Ore.

In Oregon, the influence of the removal of understory vegetation on diameter and height increments of suppressed ponderosa pine (*Pinus ponderosa*) saplings after harvest of overstory are graphically illustrated.

14. Barrett, James W.
1968. Response of ponderosa pine pole stands to thinning. U.S. Forest Serv. Res. Note PNW-77, 11 p. Pacific Northwest Forest and Range Exp. Sta., Portland, Ore.

Three years after thinning ponderosa pine (*Pinus ponderosa*) overstories in north-central Washington, understory yield was greater on thinned than on unthinned plots.

15. Barrett, James W.
1970. Ponderosa pine saplings respond to control of spacing and understory vegetation. U.S. Forest Serv. Res. Paper PNW-106, 16 p. Pacific Northwest Forest and Range Exp. Sta., Portland, Oreg.

A tree spacing study in central Oregon showed that thinning ponderosa pine overstories will stimulate growth of understory vegetation, with greater amounts of understory vegetation at wider spacings. Data are graphically illustrated.

16. Barrett, James W., and C.T. Youngberg.
1965. Effect of tree spacing and understory vegetation on water use in pumice soil. Soil Sci. Soc. Amer. Proc. 29: 472-475.

The effects of understory vegetation and forest stand density on growth (diameter) of ponderosa pine (*Pinus ponderosa*) are described for a study area in central Oregon.

17. Basile, Joseph V., and Chester E. Jensen.
1971. Grazing potential on lodgepole pine clearcuts in Montana. U.S. Forest Serv. Res. Paper INT-98, 11 p. Intermountain Forest and Range Exp. Sta., Ogden, Utah.

Production of understory vegetation following clearing of lodgepole pine (*Pinus contorta*) is described by multiple regression sets identifying combinations of environmental factors that affect understory vegetation production.

18. Blair, Robert M.
1960. Deer forage increased by thinnings in a Louisiana loblolly pine plantation. J. Wildl. Manage. 24: 401-405.

Understory vegetation production, including grasses, forbs, and browse, under loblolly pine (*Pinus taeda*) stands following different intensities of thinning is given in tabular form.

19. Bower, David R., and Edwin R. Ferguson.
1968. Understory removal improves shortleaf pine growth. J. Forest. 66: 421-422.

In the Ouachita Mountains of Arkansas, complete-and-partial removal of hardwood understory increased growth of shortleaf pine (*Pinus echinata*) overstory. Linear prediction equations are presented to describe growth response.

20. Brown, Harry E.
1965. Preliminary results of cabling Utah juniper, Beaver Creek watershed evaluation project. Annu. Ariz. Watershed Symp. Proc. 9: 16-21.

Production of grasses, forbs, half-shrubs, and shrubs before-and-after mechanical removal of Utah juniper overstory in northcentral Arizona is presented in tabular form.

21. Brown, Harry E.
1971. Evaluating watershed management alternatives. Amer. Soc. Civil Eng., J. Irrig. and Drain. Div. 97 (IR1): 93-108.

Changes in herbage production following implementation of different land management systems (clearing of timber overstories, reduction of timber overstory densities) are given (tables) for experimental sites in northcentral Arizona. Vegetation types include pinyon-juniper woodland and ponderosa pine forest.

22. Brown, James H., and Calvin B. Dunwoody.
1961. Aerial spraying of 2, 4, 5-T for releasing conifers in Rhode Island. J. Forest. 59: 882-884.

Tables describe the effect of different applications of 2, 4, 5-T on hardwood understory. The spraying objective was to release high-value white pine (*Pinus strobus*).

23. Buckman, Robert E.
1964. Effects of prescribed burning on hazel in Minnesota. Ecology 45: 626-629.

The density of hazel (*Corylus spp.*) associated with burning red pine (*Pinus resinosa*) overstory is presented in tabular form.

24. Burkhardt, J. Wayne, and E.W. Tisdale.
1969. Natural and successional status of western juniper vegetation in Idaho. J. Range Manage. 22: 264-270.

Foliage cover and density of woody understory vegetation are presented (table) in climax and serial stands of western juniper (*Juniperus occidentalis*).

25. Campbell, Robert S.
1955. Vegetational changes and management in the cutover longleaf-slash pine area of the Gulf Coast. Ecology 36: 29-34.

A literature review, including examples of changes in herbaceous understory vegetation as related to timber cutting, burning, and grazing, is presented for the Coastal Plain.

26. Campbell, Robert S., and John T. Cassady.
1949. Determining forage weight on Southern forest ranges. J. Range Manage. 2: 30-32.

Grass production under longleaf pine forest overstory is described for Louisiana.

27. Cassady, John T.
1951. Bluestem range in the piney woods of Louisiana and east Texas. J. Range Manage. 4: 173-177.

Grass production under different forest overstory stand conditions and species composition is given. Overstory is dominated by longleaf pine and slash pine.

28. Clary, Warren P.
1969. Increased sampling precision for some herbage variables through knowledge of the timber overstory. J. Range Manage. 22: 200-201.

In Arizona, relationships of herbage production, perennial grass production, and forage consumed to percent ponderosa pine (*Pinus ponderosa*) crown cover are logarithmic.

29. Clary, Warren P.
1970. The relationship of herbage production to Springerville soils to Utah juniper overstory and precipitation. Abstr. of Pap., 23 rd Annu. Meet., Amer. Soc. Range Manage., Denver, 1970, p. 69.

Herbage and perennial grass yields associated with intact Utah juniper overstory and overstory removed by cabling are described for a study area in north central Arizona.

30. Clary, Warren P.
1971. Effects of Utah juniper removal on herbage yields from Springerville soils. J. Range Manage. 24: 373-378.

Relationships between total understory (linear) and perennial grasses (curvilinear), and crown cover of Utah juniper (*Juniperus osteosperma*) and pinyon (*Pinus edulis*) overstory are graphically illustrated for a study area in north central Arizona. Also, herbage yields with-and-without removal (mechanical) of overstory (table), and perennial grass production trends through time (graph) are presented.

31. Clary, Warren P., and Peter F. Ffolliott.
1966. Differences in herbage-timber relationships between thinned and unthinned ponderosa pine stands. U.S. Forest Serv. Res. Note RM-74, 4 p. Rocky Mt. Forest and Range Exp. Sta., Fort Collins, Colo.

Herbage production under thinned-and-unthinned ponderosa pine (*Pinus ponderosa*) stands are compared by logarithmic equations for a study area in north central Arizona.

32. Clary, Warren P. and Frederic R. Larson.
1971. Elk and deer use are related to food sources in Arizona ponderosa pine. U.S. Forest Serv. Res. Note RM-202, 4 p. Rocky Mt. Forest and Range Exp. Sta., Fort Collins, Colo.

Herbage production associated with alligator juniper (*Juniperus deppeana*) and ponderosa pine (*Pinus ponderosa*) overstories is discussed.

33. Clary, Warren P., Peter F. Ffolliott, and Donald A. Jameson.
1968. Relationship of different forest floor layers to herbage production. U.S. Forest Serv. Res. Note RM-98, 4 p. Rocky Mt. Forest and Range Exp. Sta., Ft. Collins, Colo.

In north central Arizona, logarithmic equations describe relationships between herbage production and individual layers and total depth of ponderosa pine (*Pinus ponderosa*) forest floor.

34. Clary, Warren P., Peter F. Ffolliott, and Almer D. Zander.
1966. Grouping sites by soil management areas and topography. U.S. Forest Serv. Res. Note RM-60, 4 p. Rocky Mt. Forest and Range Exp. Sta., Ft. Collins, Colo.

Relationships between herbage production and ponderosa pine (*Pinus ponderosa*) overstory density for different productivity strata are graphically illustrated for a study area in north central Arizona.

35. Cooper, Charles F.
1960. Production of native and introduced grasses in the ponderosa pine region of Arizona. J. Range Manage. 13: 214-215.

A linear equation describing a relationship between grass production and percent crown cover of ponderosa pine overstory is given for a study area on the San Carlos Indian Reservation in east central Arizona.

36. Crouch, Glenn L.
1968. Forage availability in relation to browsing of Douglas-fir seedlings by black-tailed deer. J. Wildl. Manage. 32: 542-553.

Deer forage production associated with different plant communities common to northwestern Oregon is given in tabular form.

37. Cushwa, Charles T., and M.B. Jones.
1969. Wildlife food plants on chopped areas in the Piedmont of South Carolina. U.S. Forest Serv. Res. Note SE-119, 4 p. Southeastern Forest Exp. Sta., Asheville, N.C.

The frequency of occurrence and abundance of legume plants and herbaceous plants other than legumes on study areas where loblolly pine overstory has been clearcut and chopped (drum chopper), and left uncut, are presented in tabular form.

38. Cushwa, Charles T., and John B. Redd.
1966. One prescribed burn and its effect on habitat on the Powhatan game management area. U.S. Forest Serv. Res. Note SE-61, 2 p. Southeastern Forest Exp. Sta., Asheville, N.C.

A comparison between number, kind, and production of game food plants in cut-burned-and-untreated pine stands in the Piedmont of Virginia is given in tabular form.

39. Cushwa, Charles T., Ernst V. Brender, and Robert W. Cooper.
1966. The response of herbaceous vegetation to prescribed burning. U.S. Forest Serv. Res. Note SE-53, 2 p. Southeastern Forest Exp. Sta., Asheville, N.C.

Herbaceous plant response to burning of loblolly pine (*Pinus taeda*) overstory is described (tables) for a study area on the Hitchiti Experimental Forest in Georgia.

40. Cushwa, Charles T., Melvin Hopkins, and Burl S. McGinnes.
1970. Response of legumes to prescribed burns in loblolly pine stands of the South Carolina Piedmont. U.S. Forest Serv. Res. Note SE-140, 6 p. Southeastern Forest Exp. Sta., Asheville, N.C.

The frequency of occurrence of leguminous plants before-and-after burning on study sites dominated by loblolly pine (*Pinus taeda*) overstory is given in tabular form.

41. Dealy J. Edward.
1966. Bitterbrush nutrition levels under natural and thinned ponderosa pine. U.S. Forest Serv. Res. Note PNW-33, 6 p. Pacific Northwest Forest and Range Exp. Sta., Portland, Ore.

Tables and graphs describing nutritional differences in antelope bitterbrush (*Purshia tridentata*) as influenced by different ponderosa pine (*Pinus ponderosa*) stocking levels are presented for a study area on the Pringle Falls Experimental Forest in central Oregon.

42. Duvall, V.L., and L.K. Halls.
1962. Outlook for beef cattle on southern forest ranges. Proceed. Soc. Amer. Forest. 1962: 76-79.

Herbaceous growth under different timber conditions and prescribed burning schedules is given (tables) for longleaf and slash pine stands in the eastern Gulf and Atlantic Coastal States.

43. Duvall, V.L. and J.B. Hilmon.
1965. New grazing research programs for southern forest ranges. J. Range Manage. 18: 132-136.

Average herbage yields under heavily stocked longleaf pine and slash pine stands, and where stands are scattered or absent, are stated for Coastal Plain, from east Texas to South Carolina.

44. Duvall, Vinson L., and Harold E. Grelen.
1967. Fertilization uneconomic for forage improvement in Louisiana pine plantations. U.S. Forest Serv. Res. Note SO-51, 3 p. Southern Forest Exp. Sta., New Orleans, La.

Herbage yield and quality associated and different fertilizer treatments (N, P, and K) applied on slash pine (*Pinus elliottii*) plantations are described in tabular form.

45. Dwyer, Don D., and Rex D. Pieper.
1967. Fire effects on blue grama-pinyon-juniper range and in New Mexico. J. Range Manage. 20: 359-362.

Production of grasses and forbs is is described (table) for burned-and-unburned pinyon-juniper woodlands in south-central New Mexico. Pinyon (*Pinus edulis*) and one-seed juniper (*Juniperus monosperma*) are dominant overstory species.

46. Dyress, C.T.
1965. The effect of logging and slash burning on understory vegetation in the H.J. Andrews experimental forest. U.S. Forest Serv. Res. Note PNW-31, 13 p. Pacific Northwest Forest and Range Exp. Sta., Portland, Ore.

Tables and graphs describe understory plant cover before logging, after logging, and after slash burning on a study area in the western Cascades. The timber before logging was dominantly Douglas-fir (*Pseudotsuga menziesii*) mixed with varying amounts of western hemlock (*Tsuga heterophylla*).

47. Edgerton, Paul J., and Justin G. Smith.
1971. Seasonal forage use by deer and elk on the Starkey Experimental Forest and Range, Oregon. U.S. Forest Serv. Res. Paper PNW-12, 12 p. Pacific Northwest Forest and Range Exp. Sta., Portland, Ore.

Forage production on open forest, dense forest, and grassland sites in the ponderosa pine-Douglas-fir (*Pinus ponderosa-Pseudotsuga menziesii*) type for different seasons (spring, summer, and fall) is discussed.

48. Ehrenreich, John H.
1960. Usable forage under pine stands. U.S. Dept. Agr., Forest Serv., Central States Forest Exp. Sta., Sta. Note 142, 2 p. Columbus, Ohio.

Herbage production in relation to thinning intensity and time since thinning is described (graph) for a natural shortleaf pine stand on the Sinkin Experimental Forest in southern Missouri.

49. Ffolliott, Peter F., and David P. Worley.
1965. An inventory system for multiple use evaluations. U.S. Forest Serv. Res. Paper RM-17, 15 p. Rocky Mt. Forest and Range Exp. Sta., Fort Collins, Colo.

A localized predicting equation describing herbage production as a function of ponderosa pine overstory density is logarithmic for a study area in north central Arizona.

50. Gaines, E.M., R.S. Campbell, and J.J. Brasington.
1954. Forage production on longleaf pine stands of southern Alabama. Ecology 35: 59-62.

A polynomial predicting equation describes herbage production as a function of forest overstory density. Also, a linear equation relating herbage production to forest overstory litter is given. The overstory is dominated by longleaf pine (*Pinus palustris*).

51. Gaines, Edward M., Harry R. Kallander, and Joe A. Wagner.
1958. Controlled burning in southwestern ponderosa pine: results from the Blue Mountain plots, Fort Apache Indian Reservation. J. Forest. 56: 323-327.

Grass density before-and-after controlled burning of ponderosa pine overstory is described (tables) for a study area in eastern Arizona.

52. Gordon, Donald T.
1962. Growth response of east side poles to removal of low vegetation. U.S. Dept. Agr., Forest Serv., Pacific Southwest Forest and Range Exp. Sta. Res. Note 209, 3 p. Berkeley, Calif.

Differences in growth of ponderosa and Jeffrey pine are presented (tables) after removal of grasses, broad-leaved plants, and all understory vegetation for a study area in north eastern California.

53. Grano, Charles X.
1970. Small hardwoods reduce growth of pine overstory. U.S. Forest Serv. Res. Paper SO-55, 9 p. Southern Forest Exp. Sta., New Orleans, La.

In Arkansas, the growth of loblolly (*Pinus taeda*) and shortleaf pine (*P. echinata*) before-and-after control (2, 4, 5-T) of a hardwood understory are graphically illustrated.

54. Grelen, H.E., and E.A. Epps, Jr.
1967. Herbage response to fire and litter removal on southern bluestem range. J. Range Manage. 20: 403-404.

Periodic herbage yields after burning and mowing sites clearcut of longleaf pine (*Pinus palustris*) overstory are given (table) for a study area in central Louisiana.

55. Hall, Dale O., and James D. Curtis.
1970. Planting method affects height growth of ponderosa pine in central Idaho. U.S. Forest Serv. Res. Note INT-125, 8 p. Intermountain Forest and Range Exp. Sta., Ogden, Utah.

The effect of understory removal (stripped, stripped and furrowed) on survival and growth (height) of planted ponderosa pine (*Pinus ponderosa*) is described in tabular form.

56. Halls, Lowell K.
1955. Grass production under dense longleaf-slash pine canopies. U.S. Dept. Agr., Forest Serv., Southeastern Forest Exp. Sta. Res. Note 83, 2 p. Asheville, N.C.

Grass production declines as overhead longleaf pine and slash pine canopies increase, as graphically illustrated for a study area on the Alapaha Experimental Range in Georgia.

57. Halls, L.K., and R.F. Suman.
1954. Improved forage under Southern pines. J. Forest. 52: 848-851.

A relationship between herbaceous growth and tree canopy under different site conditions and fertilizer treatments is graphically presented for a study area in southern Georgia. Overstory dominated by longleaf (*Pinus palustris*) and slash pine (*P. eliottii*) of pole and small sawtimber size.

58. Hart, Richard H., Ralph H. Hughes, Clifford E. Lewis, and Warren G. Monson.
1970. Effect of nitrogen and shading on yield and quality of grasses grown under young slash pines. Agron. J. 62: 285-287.

The yield of planted grasses under slash pine (*Pinus elliottii* var. *elliottii*) overstory after treatment with different rates of nitrogen fertilization is presented (table and graph) for a study area on the Coastal Plains of Georgia.

59. Hodgkins, Earl J.
1958. Effects of fire on undergrowth vegetation in upland southern pine forests. Ecology 39: 36-46.

A literature review, including a description of the change in understory vegetation following burning upland southern pine forests, is presented for an experimental area in north western Alabama.

60. Hughes, Ralph H., George W. Bengtson, and Thaddeus A. Harrington.
1971. Forage response to nitrogen and phosphorus fertilization in a 25-year-old plantation of slash pine. U.S. Forest Serv. Res. Paper SE-82, 7 p. Southeastern Forest Exp. Sta., Asheville, N.C.

Production of herbaceous vegetation following the application of fertilizer to an old-field plantation of slash pine (*Pinus elliottii* var. *elliottii*) near Olustee, Florida is graphically illustrated.

61. Ingram, Douglas C.
1931. Vegetative changes and grazing use on Douglas fir cut-over land. J. Agr. Res. 43: 387-417.

Density of understory vegetation before-and-after cutting and burning Douglas fir (*Pseudotsuga taxifolia*) overstory is given (table) for the Cascade Mountains in Oregon and Washington.

62. Jameson, Donald A.
1962. Effects of burning on a galleta-black grama range invaded by juniper. Ecology 43: 760-763.

The production of grasses is given (table) for burned-and-unburned one-seed juniper (*Juniperus monosperma*) forest stands on a study area in north central Arizona.

63. Jameson, Donald A.
1966. Pinyon-juniper litter reduces growth of blue grama. J. Range Manage. 19: 214-217.

Pinyon (*Pinus spp.*) and juniper (*Juniperus spp.*) litter is reported to be the major overstory factor associated with the reduction of blue grama (*Bouteloua gracilis*) on a study area in north central Arizona.

64. Jameson, Donald A.
1967. The relationship of tree overstory and herbaceous understory vegetation. J. Range Manage. 20: 247-249.

The use of a 5-parameter transition sigmoid growth curve to express the relationship between herbaceous understory and tree overstory is described and illustrated with data from north central Arizona. Overstories considered are pinyon (*Pinus edulis*), juniper (*Juniperus spp.*), and ponderosa pine (*P. ponderosa*).

65. Jameson, Donald A.
1970. Juniper root competition reduces basal area of blue grama. J. Range Manage. 23: 217-218.

A table of blue grama (bouteloua gracilis) basal area with-and-without one-seed juniper (Juniperus monosperma) root competition is presented for a study area in northern Arizona.

66. Jameson, Donald A.
1971. Optimum stand selection for juniper control on southwestern woodland ranges. J. Range Manage. 24: 94-99.

Equations describe relationships between herbage production and pinyon-juniper (*Pinus edulis, P. monophylla,* and *Juniperus spp.*) overstory with different grass growth-forms and soils. The equation model used is a 5-parameter transition sigmoid growth curve.

67. Jameson, Donald A., and J.D. Dodd.
1969. Herbage production differs with soil in the pinyon-juniper type of Arizona. U.S. Forest Serv. Res. Note RM-131, 4 p. Rocky Mt. Forest and Range Exp. Sta., Fort Collins, Colo.

Herbage production associated with different soil series and pinyon-juniper overstory densities is given in tabular form.

68. Johnsen, Thomas N., Jr.
1962. One-seed juniper invasion of northern Arizona grasslands. Ecol. Monog. 32: 187-207.

Distribution of herbaceous vegetation around individual one-seed juniper (*Juniperus monosperma*) trees is graphically illustrated and detailed in tabular form.

69. Johnson, W.M.
1953. Effect of grazing intensity upon vegetation and cattle gains on ponderosa pine-bunchgrass ranges of the front range of Colorado. U.S. Dept. Agr., Circ. 929, 36 p.

Herbage ground cover in grassland park, sparse ponderosa pine *(Pinus ponderosa)* overstory, dense ponderosa pine overstory, and abandoned field situations is presented in tabular form for a study on the Manitou Experimental Forest. Also, a table of herbage production in grassland and open timber situations is given.

70. Krefting, L.W., and R.L. Phillips.
1970. Improving deer habitat in upper Michigan by cutting mixed-conifer swamp. J. Forest. 68: 701-704.

Available browse production associated with different cutting practices is given in tabular form. The major overstory trees are white cedar (*Thuja occendentalis*), black (*Picea mariana*) and white spruce (*P. glauca*), and balsam fir (*Abies balsamea*).

71. Laessle, Albert M.
1965. Spacing and competition in natural stands on sand pine. Ecology 46: 65-72.

In Florida, the density of ground cover and spacing of sand pine (*Pinus clausa*) canopy trees is discussed.

72. Larson, M.M., and Gilbert H. Schubert.
1969. Root competition between ponderosa pine seedlings and grasses. U.S. Forest Serv. Res. Paper RM-54, 12 p. Rocky Mt. Forest and Range Exp. Sta., Fort Collins, Colo.

Relationships between different perennial grass cover types and ponderosa pine (*Pinus ponderosa*) seedling growth is given (tables and graphs) for the Fort Valley Experimental Forest in north central Arizona.

73. Lay, Daniel W.
1957. Browse quality and the effects of prescribed burning in Southern pine forests. J. Forest. 55: 342-347.

The percent of forage in browse is given (table) by date and burning history (burned-or-unburned) for a loblolly pine forest on the Siecke State Forest in Texas.

74. Lay, Daniel W.
1967. Browse palatability and the effects of prescribed burning in southern pine forests. J. Forest. 65:826-828.

Availability of deer browse before-and-after prescribed burning of longleaf pine is given (table) for a study site on the Siecke State Forest in Texas.

75. Lemon, Paul C.
1949. Successional responses of herbs in the longleaf-slash pine forest after fire. Ecology 30: 135-145.

Changes in density of herbaceous understory on areas having different fire histories is described (tables) for a study area on the Alapaha Experimental Range in Georgia. The forest cover is second growth longleaf pine and slash pine.

76. McConnell, Burt R., and Justin G. Smith.
1965. Understory response three years after thinning pine. J. Range Manage. 18: 129-132.

Linear predicting equations describe increase in yield of understory vegetation after thinning ponderosa pine (*Pinus ponderosa*) overstory as a function of residual growing area per tree, percent overstory canopy, and overstory density. The equations represent data from a study area in north central Washington.

77. McConnell, Burt R., and Justin G. Smith.
1970. Response of understory vegetation to ponderosa pine thinning in eastern Washington. J. Range Manage. 23: 208-212.

A curvilinear (positive) relationship between increase in yield of understory vegetation 8-years after thinning ponderosa pine (*Pinus ponderosa*) and residual tree spacing is described. Also, a linear (negative) relationship between increase in yield of understory vegetation and percent overstory canopy is given.

78. McConnell, Burt R., and Justin G. Smith.
1971. Effect of ponderosa pine needle litter on grass seedling survival. U.S. Forest Serv. Res. Note PNW-155, 6 p. Pacific Northwest Forest and Range Exp. Sta., Portland, Ore.

Density of hard fescue (*Festuca ovina* var. *duriuscula*) under different levels of ponderosa pine (*Pinus ponderosa*) needle accumulation is illustrated (graph) for a study area in Washington.

79. McCulloch, Clay Y.
1966. Cliffrose browse yield on bulldozed pinyon-juniper areas in northern Arizona. J. Range Manage. 19: 373-374.

Production of cliffrose (*Cowania mexicana* var. *stansburiana*) browse associated with bulldozed and unbulldozed stands of pinyon-juniper (*Pinus edulis,Juniperus spp.*) overstory is presented in tabular form.

80. McCulloch, Clay Y.
1969. Some effects of wildfire on deer habitat in pinyon-juniper woodland. J. Wildl. Manage. 33: 778-784.

Herbaceous forage available 13-15 years after a wildfire is given (table) for burned-and-unburned pinyon (*Pinus edulis*) and juniper (*Juniperus osteosperma*) woodland type on the Hualapai Indian Reservation in northern Arizona.

81. McLean, A., T. M. Lord, and A. J. Green.
1971. Utilization of the major plant communities in the Similkameen Valley, British Columbia. J. Range Manage. 24: 346-351.

Herbage yields associated with climax plant communities are given in tabular form. Plant communities evaluated include ponderosa pine-Idaho fescue, Douglas fire-bluebunch wheatgrass, Douglas fir-Idaho fescue, Douglas fir-pinegrass and Idaho fescue-eriogonum.

82. Moir, William H.
1966. Influence on ponderosa pine on herbaceous vegetation. Ecology 47: 1045-1048.

In Washington, field and experimental data presented (tables and graphs) suggest that ponderosa pine (*Pinus ponderosa*) developed past the seedling stage suppress herbaceous vegetation.

83. Neiland, Bonita J.
1958. Forest and adjacent burn in the Tillamook burn area of north western Orgeon. Ecology 39: 660-671.

The composition of herbaceous vegetation is presented (tables) for burned-and-unburned coniferous forests in the Oregon Coast Range. Dominant overstory species include Douglas-fir (*Pseudotsuga taxifolia*), western hemlock (*Tsuga heterophylla*), western redcedar (*Thuja plicata*), and various true firs (*Abies spp.*)

84. Oosting, Henry J.
1944. The comparative effect of surface and crown fire on the composition of a loblolly pine community. Ecology 25: 61-69.

Density, frequency, and basal area of shrubs and woody vines found in three areas of a loblolly pine (*Pinus taeda*) stand subjected to surface fire or crown fire, or unburned are described (table) for a study area on the Duke Forest in North Carolina. Also, the change in frequencies of herbs is given for the three areas.

85. O'Rourke, J.T., and P.R. Ogden.
1969. Vegetation response following pinyon-juniper control in Arizona. J. Range Manage. 22: 416-418.

A table describing perennial grass production with-and-without (mechanically removed) pinyon (*Pinus edulis*) and *juniper (Juniperus monosperma* and *J. osteosperma*) is presented.

86. O'Rourke, J.T., and P.R. Ogden.
1970. Pinyon-juniper control: Where? Why? Prog. Agr. in Arizona. 22(1): 12-15.

Total perennial grass and blue grama (*Bouteloua gracilis*) production on controlled (mechanical) and uncontrolled pinyon-juniper sites in east central Arizona is graphically illustrated. Overstory is dominated by one-seed (*Juniperus monosperma*) and Utah juniper (*J. osteosperma*), and pinyon (*Pinus edulis*).

87. Orr, Howard K.
1957. Effects of plowing and seeding on some forage production and hydrologic characteristics of a subalpine range in central Utah. U.S. Dept. Agr. Forest Serv., Intermountain Forest and Range Exp. Sta. Res. Paper 47, 23 p. Ogden, Utah.

Ground cover and forage production are given (tables) on treated (plowed and seeded) and untreated study plots on subalpine-herbaceous range. Overstory includes Engelmann spruce, alpine fir, and limber pine.

88. Pase, Charles P.
1958. Herbage production and composition under immature ponderosa pine stand in the Black Hills. J. Range Manage. 11: 238-243.

Herbage production under varying ponderosa pine (*Pinus ponderosa*) overstory densities is described in tabular and graphic forms. Also, logarithmic prediction equations relating herbage production to different expressions of ponderosa pine density is given.

89. Pase, Charles P., and Richard M. Hurd.
1957. Understory vegetation as related to basal area, crown cover and litter produced by immature ponderosa pine stands in the Black Hills. Proceed. Soc. Amer. Forest. 1957: 156-158.

A logarithmic predicting equation describing herbage yields as a function of the density of ponderosa pine (*Pinus ponderosa*) overstory is described. Also, the curvilinear relationship illustrating the equation is given.

90. Patton, David R.
1969. Deer and elk use of a ponderosa pine forest in Arizona before and after timber harvest. U.S. Forest Serv. Res. Note RM-139, 7 p. Rocky Mt. Forest and Range Exp. Sta., Fort Collins, Colo.

Herbage production and the number of browse plants before-and-after logging ponderosa pine overstory is described.

91. Patton, David R., and B. Ira Judd.
1970. The role of wet meadows as wildlife habitat in the Southwest. J. Range Manage. 23: 272-275.

Herbage production associated with met meadow, moist transition, and dry forest sites is presented (table) for a study area in east central Arizona. Also, the density and frequency of grasses and forbs are given (table) for the different vegetation sites.

92. Pearson, Henry A.
1965. Studies of forage digestibility under ponderosa pine stands. Proceed. Soc. Amer. Forest. 1964: 71-73.

A logarithmic equation describing herbage production as a function of ponderosa pine overstory density is given for experimental range units in north central Arizona.

93. Pearson, Henry A.
1967. Phenology of Arizona fescue and mountain muhly in the northern Arizona ponderosa pine type. U.S. Forest Serv. Res. Note RM-89, 4 p. Rocky Mt. Forest and Range Exp. Sta., Fort Collins, Colo.

Growth rate of Arizona fescue (*Festuca arizonica*) leaves as related to percent ponderosa pine canopy cover is presented in tabular form.

94. Pearson, Henry A., and Donald A. Jameson.
1967. Relationship between timber and cattle production on ponderosa pine range: the Wild Bill range. U.S. Forest Serv., 10 p. Rocky Mt. Forest and Range Exp. Sta., Fort Collins, Colo.

A relationship between herbage production and ponderosa pine overstory density is graphically illustrated for a study area in north central Arizona.

95. Pengelly, W. Leslie
1963. Timberlands and deer in the Northern Rockies. J. Forest. 61: 734-740.

In Idaho, comparison of ground cover and botanical composition of forage on logged-and-unlogged Douglas-fir (*Pseudotsuga menziesii*) forests are presented in tabular and graphic form.

96. Reid, Elbert H.
1965. Forage production in ponderosa pine forests. Proceed. Soc. Amer. Forest. 1964: 61-64.

A literature review, including a summary of forage values and the influence of tree overstory on herbage production, is presented for the ponderosa pine forest type in the West.

97. Reynolds, Hudson G.
1962. Effect of logging on understory vegetation and deer use in a ponderosa pine forest of Arizona. U.S. Dept. Agr., Forest Serv., Rocky Mt. Forest and Range Exp. Sta. Res. Note 80, 7 p. Fort Collins, Colo.

A table of understory vegetation production on logged-and-unlogged areas on ponderosa pine is presented. Also, a graph illustrating the relationship between herbage yields and coniferous forest (ponderosa pine and Douglas-fir) overstory is given.

98. Reynolds, Hudson G.
1966. Slash cleanup in a ponderosa pine forest affects use by deer and cattle. U.S. Forest Serv. Res. Note RM-64, 3 p. Rocky Mt. Forest and Range Exp. Sta., Fort Collins, Colo.

Production of herbaceous vegetation on sample plots with slash cleared and slash undisturbed after logging ponderosa pine (*Pinus ponderosa*) overstory is presented (table) for a study area in northern Arizona.

99. Reynolds, Hudson G.
1969. Improvement of deer habitat on Southwestern forest lands. J. Forest. 67: 803-805.

Relations of herbaceous understory to ponderosa pine (*Pinus ponderosa*) overstory densities of mature and unmature tree age groups are presented (table) for a study area on the Kaibab Plateau in northern Arizona.

100. Rogers, Nelson F., and K.A. Brinkman.
1965. Shortleaf pine in Missouri: understory hardwoods retard growth. U.S. Forest Serv. Res. Paper CS-15, 9 p. Central States Forest Exp. Sta., Columbus, Ohio.

Relationship between control of hardwood understory and shortleaf pine (*Pinus echinata*) is presented in tabular form.

101. Rummell, Robert S.
1951. Some effects of livestock grazing on ponderosa pine forest and range in central Washington. Ecology 32: 594-607.

Average densities of herbaceous vegetation are described (table and graph) for open ponderosa pine (*Pinus ponderosa*), mixed ponderosa pine-Douglas-fir (*Pseudotsuga taxifolia*), and grassland vegetative types.

102. Smith, Dwight R.
1967. Effects of cattle grazing on a ponderosa pine bunchgrass range in Colorado. U.S. Dept. Agr. Forest Serv. Tech. Bull. 1371. 60 p.

A graph describes herbage production under dense timber, open timber, and grassland situations on the Manitou Experimental Forest. The overstory is dominated by ponderosa pine (*Pinus ponderosa*).

103. Smith, L.F., R.S. Campbell, and Clyde F. Blount.
1955. Forage production and utilization in longleaf pine forests of south Mississippi. J. Range Manage. 8: 58-60.

Grass production under dense stands, moderately stocked stands, and open stands of longleaf pine (*Pinus palustris*) overstory is described for the McNeil Experimental Forest.

104. St. Andre, G., H.A. Monney, and R.D. Wright.
1965. The pinyon woodland zone in the White Mountains of California. Amer. Midl. Natur. 73: 225-239.

Understory (herbaceous and shrubby) cover and density are compared (table) to singleleaf pinyon (*Pinus monophylla*) overstory cover and density.

105. Thompson, Wesley W., and F. Robert Gartner.
1971. Native forage response to clearing low quality ponderosa pine. J. Range Manage. 24: 272-277.

Forage production and species composition under ponderosa pine (*Pinus ponderosa*) overstory and on sites where ponderosa pine was removed (cutting) are described (tables) for different aspects on a study area in the Black Hills of South Dakota.

106. Trousdell, Kenneth B.
1970. Disking and prescribed burning: six-year residual effects on loblolly pine and competing vegetation. U.S. Forest Serv. Res. Note SE-133, 6 p. Southeastern Forest Exp. Sta., Asheville, N.C.

Graphs and a table describe relationships between shrubs and small hardwoods, and loblolly pine (*Pinus taeda*) six years after disking and burning were used to control understory vegetation on a study area in the Virginia Coastal Plain.

107. Wahlenberg, W.G., S.W. Green, and H.R. Reed.
1939. Effects of fire and cattle grazing on longleaf stands as studies at McNeill, Mississippi. U.S. Dept. Agr. Tech. Bull. 683, 52 p.

The changes in herbaceous vegetation following burning of loblolly pine (*Pinus taeda*) overstory are described in graphs and tables.

108. Williamson, Malcolm J.
1964. Burning does not control young hardwoods on shortleaf pine sites in the Cumberland Plateau. U.S. Forest Serv. Res. Note CS-19, 4 p. Central States Forest Exp. Sta., Columbus, Ohio.

The density of hardwood understory before-and-after burning of shortleaf pine is graphically illustrated for a study site in Kentucky.

109. Young, J.A., and D.W. Hedrick, and R.F. Keniston.
1967. Forest cover and logging – herbage and browse production in mixed coniferous forest of northeastern Oregon. J. Forest. 65: 807-813.

Table describing herbage and browse production under overstory cover classes is given. Mixed coniferous overstory is predominantly grand fir (*Abies gradis*), Douglas-fir (*Pseudotsuga menziesii*), and western larch (*Larix occidentalis*).

110. Ahlgren, H.L., M.L. Wall, R.J. Meckenhirn, and J.M. Sund.
1946. Yields of forage from woodland pastures on sloping land in southern Wisconsin. J. Forest. 44: 709-711.

Forage yields are presented (tables) for woodland, natural openings, and renovated openings.

111. Baskett, Thomas S., Robert L. Dunkeson, and S. Clark Martin.
1957. Responses of forage to timber stand improvement in the Missouri Ozarks. J. Wildl. Manage. 21: 121-126.

The production of browse, grass, and forbs following release through girdling a post oak – blackjack oak forest in Missouri is presented with tables and graphs. The dominant overstory consisted of post (*Quercus stellata*), blackjack (*Q. marilandica*), and black oak (*Q. velutina*), and hickory (*Carya texana*).

112. Baskett, Thomas S., Robert L. Dunkeson, and S. Clark Martin.
1958. Ten-year timber-cutting cycle provides a continuous supply of forage. U.S. Dept. Agr., Forest Serv., Central States Forest Exp. Sta., Sta. Note 125, 2 p. Columbus, Ohio.

The changes in frequencies of forbs, grasses, and browse following release (cutting) in a white oak stand are compared with the understory vegetation in uncut white oak for a study area in the Missouri Ozarks.

113. Brown, James H., Jr.
1960. The role of fire in altering the species composition of forests in Rhode Island. Ecology 41: 310-316.

The relative density of understory vegetation is described (tables) for burned-and-unburned upland sites in the woodlands of Rhode Island. Scarlet (*Quercus coccinea*), white (*Q. alba*), and black oak (*Q. velutina*) are the major overstory occupants.

114. Cassady, John T.
1952. Grass production doubled by control of scrub oak. J. Forest 50: 462-463.

In Louisiana, grass production is presented (tables) after controlling (girdling and poisoning with Ammate) blackjack (*Quercus marilandica*) and post oak (*Q. stellata*) overstory.

115. Cook, David B.
1939. Thinning for browse. J. Wildl. Manage. 3: 201-202.

The effect of thinning second-growth northern hardwoods upon browse production is described for a study tract in New York.

116. Cox, Maurice, and Harry M. Elwell.
1944. Brush removal for pasture improvement. Agr. Eng. 25: 253-261.

Grass densities under various amounts of blackjack and white oak canopy are given (table) for a study site in central Oklahoma.

117. Crawford, Hewlette S.
1960. Effect of aerial 2, 4, 5-T sprays on forage production in west-central Arkansas. J. Range Manage. 13: 44.

Tables describing grass, forb, and browse production under sprayed (2, 4, 5-T) and unsprayed stands of post (*Quercus stellata*) and blackjack oak (*Q. marilandica*), and hickories (*Carya spp.*) are presented for a study area in the Ozark Mountains.

118. Crawford, Hewlette S.
1971. Wildlife habitat changes after intermediate cutting for even-'aged management. J. Wildl. Manage. 35: 275-286.

Multiple regression analyses describe the relationships between growth of understory vegetation and forest overstory density and site quality for a study area in south-central Missouri. Also, growth of understory vegetation is described (tables) for different forest overstory density levels and site quality classes. The overstory is dominated by black (*Quercus velutina*), white (*Q. alba*), scarlet (*Q. coccinea*), and northern red oak (*Q. rubra*).

119. Crawford, H.S., and A.J. Bjugstad.
1967. Establishing grass range in the southwest Missouri Ozarks. U.S. Forest Serv. Res. Note NC-22, 4 p. North Central Forest Exp. Sta., St. Paul, Minnea.

A comparison between grass production on study sites seeded-and-unseeded after spraying (2, 4, 5-T) burning, and fertilizing in hardwood stands is graphically illustrated. Overstory trees are primarily post and blackjack oak.

120. Crawford, Hewlette S., and Wayne M. Harrison.
1971. Wildlife food on three Ozark hardwood sites after regeneration cutting. J. Wildl. Manage. 35: 533-537.

Understory vegetation production is described (table) by site class and growing seasons after regeneration (clear) cutting black (*Quercus velutina*) and scarlet oak (*Q. coccinea*) on the Ozark Plateau of south central Missouri.

121. Dalke, Paul D.
1941. The use and availability of the more common winter browse plants in the Missouri Ozarks. Trans. N. Amer. Wildl. Conf. 6: 155-160.

The yield of browse species in post oak-blackjack oak, black oak-hickory, and ravine forest cover types is given in tabular form.

122. Dalrymple, R.L., Don D. Dwyer and P.W. Santelmann.
1964. Vegetational responses following winged elm and oak control in Oklahoma. J. Range Manage. 17: 249-253.

Herbage yields under overstory killed (2, 4, 5-T) and alive situations are presented in tabular form. Overstory is dominated by blackjack (*Quercus marilandica*) and post oak (*Q. stellata*), and winged elm (*Ulmus alata*).

123. Darrow, Robert A., and Wayne G. McCulley.
1959. Brush control and range improvement in the post oak-blackjack oak area of Texas. Texas Agr. Exp. Sta. Bull. 942, 16 p. College Station, Texas.

Forage yields and composition on post oak-blackjack oak woodlands subjected to partial and complete removal (mechanical and chemical) of overstory are compared (tables) to undisturbed sites.

124. Diller, Oliver D.
1937. The forage cover in heavily grazed farm woods of northern Indiana. J. Amer. Soc. Agron. 29: 924-933.

Frequency and percent cover of understory vegetation under oak-hickory and beech-maple overstories are graphically illustrated.

125. Ehrenreich, John H., and Robert F. Buttery.
1960. Increasing forage on Ozark wooded range. U.S. Dept. Agr., Forest Serv., Central States Forest Exp. Sta. Tech. Paper 177, 10 p. Columbus, Ohio.

Forage production associated with the elimination of woody overstory, artificial seeding, and fertilization is described (graph) for study sites in the Missouri Ozarks. Overstory includes black (*Quercus velutina*), blackjack (*Q. marilandica*), scarlet (*Q. coccinea*), and post oak (*Q. stellata*).

126. Ehrenreich, John H., and John S. Crosby.
1960. Herbage production is related to hardwood crown cover. J. Forest. 58: 564-565.

Relationship between herbage production and hardwood overstory crown cover is graphically illustrated for the Missouri Ozarks. Overstory is dominated by blackjack (*Quercus marilandica*) and post oak (*Q. stellata*).

127. Ehrenreich, John H., and John S. Crosby.
1960. Forage production on sprayed and burned areas in the Missouri Ozarks. J. Range Manage. 13: 68-70.

Tables of herbage yields on sprayed (2, 4, 5-T) burned, and untreated (control) areas of blackjack (*Quercus marilandica*) and post oak (*Q. stellata*) are given.

128. Ehrenreich, John H., and Robert A. Ralston.
1963. Forage and timber production alternatives on shallow soils in the Ozarks. Proceed. Soc. Amer. Forest. 1963: 80-83.

Forage production associated with clearing of hardwood (oak-hickory) overstory is discussed.

129. Ehrenreich, John H., Robert F. Buttery and Charles W. Gehrke.
1960. How good is Ozark forage? Univ. Mo. Agr. Exp. Sta. Bull. 759, 7 p. Columbia, Mo.

Forage produced on forest range is discussed.

130. Ellison, Lincoln, and Walter R. Houston.
1958. Production of herbaceous vegetation in openings and under canopies of western aspen. Ecology 39: 337-345.

Production of different artificially seeded herbaceous species under aspen (*Populus tremuloides*) canopies and in openings is given (tables) for a study area in central Utah.

131. Elwell, Harry M.
1953. New herbicide controlled oak brush and resulted in increase native grass production. Weeds 2: 302-303.

The increase in production of native grasses following chemical control (2, 4, 5-T) of post oak and blackjack oak is described for a study area at the Red Plains Conservation Experiment Station.

132. Elwell, Harry M.
1960. Land improvement through brush control. Soil Cons. 26: 56-59.

Production of native grasses with-and-without chemical control (2, 4, 5-T) of woody overstory is described for Oklahoma and nearby states. Overstory species include post, blackjack, and dwarf chinquipin oaks and scrub hickory.

133. Elwell, Harry M.
1964. Oak brush control improves grazing lands. Agron. J. 56: 411-415.

Native grass yields are presented (table) with and without control (2, 4, 5-T) of overstory dominated by post (*Quercus stellata*) blackjack (*Q. marilandica*), and dwarf chinquipin oak (*Q. prinoides*) for study areas throughout eastern Oklahoma.

134. Erdmann, Gayne G.
1967. Chemical weed control increases survival and growth in hardwood plantings. U.S. Forest Serv. Res. Note NC-34, 4 p. North Central Forest Exp. Sta., St. Paul, Minn.

A relationship between chemical removal (atrazine, simazine) of herbaceous ground cover and resulting survival and growth of hardwood tree species is described (table) for a study area in east central Iowa. Tree species include black walnut (*Juglans nigra*), red oak (*Quercus rubra*), yellow-poplar (*Liriodendron tulipifera*), and white ash (*Fraxinus americana*).

135. Gysel, Leslie W.
1957. Effects of silvicultural practices on wildlife food and cover in oak and aspen types of northern Michigan. J. Forest. 55: 803-809.

The frequency and production of understory plants associated with different cultural practices designed to eliminate oak overstory to release pine, and associated with different harvest cutting practices for aspen are described. Cultural treatments analyzed included girdling, basal spraying with mixture of 2,4-D and 2, 4, 5-T, 2, 4, 5-T applied in frills, and aerial spraying with 2, 4, 5-T. Aspen cutting experiments were complete clearcut and commercial clearcut.

136. Gysel, Leslie W., and Forest Stearns.
1968. Deer browse production of oak stands in central lower Michigan. U.S. Forest Serv. Res. Note NC-48, 4 p. North Central Forest Exp. Sta., St. Paul, Minn.

Browse production is described (tables) in old-growth (closed) and recently cut (open) oak stands. Overstory includes white (*Quercus alba,*) northern red (*Q. rubra*), and northern pin oak (*Q. ellipsoidalis*), and red maple (*Acer rubrum*).

137. Halls, L.K., and H.S. Crawford.
1965. Vegetation response to an Ozark woodland spraying. J. Range Manage. 18: 338-340.

Tables of grass, forb, and browse yields under sprayed (2, 4, 5-T) and unsprayed stands of post (*Quercus stellata*) and blackjack oak (*Q. marilandica*) are presented for a study area in west-central Arkansas.

138. Holch, A.E.
1932. Forest vegetation in southeastern Nebraska. J. Forest. 30: 72-74.

A census of trees, shrubs, and vines in three forest habitats is presented in tabular form. Habitats evaluated include a basswood forest, a red oak forest, and bur oak forest.

139. Hook, Donal D., and Jack Stubbs.
1967. An observation of understory growth retardation under three species of oak. U.S. Forest Serv. Res. Note SE-70, 7 p. Southeastern Forest Exp. Sta., Asheville, N.C.

The degree of understory vegetation commonly associated with seven species of seed trees is presented (table) for the Santee Experimental Forest in South Carolina.

140. Johnson, Walter, Cyrus M. McKell, Raymond A. Evans, and L.J. Berry.
1959. Yield and quality of annual range forage following 2, 4-D application on blue oak trees. J. Range Manage. 12: 18-20.

Botanical composition, yield, percent crude protein, and percent phosphorus of herbage under treated (2, 4-D) and untreated stands of blue oak (*Quercus douglasii*) and presented (tables) for the Sierra-Nevada foothills of California.

141. Knierim, Philip G., Kenneth L. Carvell, and John D. Gill.
1971. Browse in thinned oak and cove hardwood stands. J. Wildl. Manage. 35: 163-168.

Density of seedling-origin and sprout-origin browse associated with different thinning patterns and intensities is given (tables) for study plots on the West Virginia University Forest. The dominant species in the oak plots were scarlet (*Quercus coccinea*), northern red (*Q. rubra*), and white oak (*Q. alba*); the dominant species in the cove hardwood plots were yellow-poplar (*Liriodendron tulipifera*), black cherry (*Prunus serotina*), and northern red oak.

142. Martin, S. Clark, Robert L. Dunkeson, and Thomas S. Baskett.
1955. Timber harvests help offset forage decline in Missouri's managed forests. J. Forest. 53: 513-516.

The frequency and composition of forage plants in openings and under a white (*Quercus alba*) and black oak (*Q. velutina*) forest canopy are compared graphically and in tables.

143. Marston, Richard B., and Odell Julander.
1961. Plant cover reductions by pocket gophers following experimental removal of aspen from a watershed area in Utah. J. Forest. 59: 100-102.

A table presents the increase in herbaceous ground cover before-and-after aspen (*Populus tremuloides*) removal.

144. Murphy, Alfred H., and Beecher Crampton.
1964. Quality and yield of forage as affected by chemical removal of blue oak (*Quercus douglasii*). J. Range Manage. 17: 142-144.

Herbage yields under treated (2, 4-D) blue oak stands, untreated blue oak stands, and in open areas are described for the grass-woodland cover type in California.

145. Murphy, Dean A., and Hewlette S. Crawford.
1970. Wildlife foods and understory vegetation in Missouri's National Forests. Mo. Dep. Cons. Tech. Bull. 4, 47 p.

A relationship between average understory yields and average overstory density is described for different forest types. Also, production of preferred wildlife foods as related to overstory density, and understory production in relation to logging and TSI work is presented in tabular form. Black-scarlet oak(*Quercus velutina* and *Q. coccinea*) forest type is the most abundant, with lesser acreage of white oak (*Q. alba*), post-blackjack oak (*Q. stellata* and *Q. marilandica*), and other forest types.

146. Murphy, Dean A., and John H. Ehrenreich.
1965. Fruit-producing trees and shrubs in Missouri's Ozark forests. J. Wildl. Manage. 29: 497-503.

The abundance of fruit-producing trees and shrubs as related to forest types, and the abundance and fruiting of trees and shrubs as related to percent of overstory crown cover are presented in tabular form.

147. Ovington, J.D., Dale Heitkamp, and Donald B. Lawrence.
1963. Plant biomass and productivity of prairie, savanna, oakwood, and maize field ecosystems in central Minnesota. Ecology 44: 52-63.

Total production of understory and overstory is presented (tables) for the Cedar Creek Natural History Area. The overstory is dominated by bur (*Quercus macrocarpa*) and northern red oak (*Q. borealis*).

148. Peters, Elroy J., and Willis G. Vogel.
1963. Increasing forage production on Ozark ranges by spraying seeding, and fertilizing. Agron. Abstr. 1963: 121.

Herbage production following spraying (2, 4, 5-T), seeding (mixture of perennial grasses), and fertilizing (8-24-8) on a forest range is discussed. Overstory species include post (*Quercus stellata*), blackjack (*Q. marilandica*), white (*Q. alba*), and black oak (*Q. velutina*).

149. Phillips, John J.
1963. Advance reproduction under mature oak stands of the New Jersey Coastal Plain. U.S. Forest Serv. Res. Note NE-4, 5 p. Northeastern Forest Exp. Sta., Upper Darby, Pa.

The average density of woody understory vegetation under oak stands is given (table) by sites, including wet, moist, and dry.

150. Read, Ralph A.
1951. Woodland forage in the Arkansas Ozarks. J. Range Manage. 4: 391-396.

A relationship between herbage production and forest (primarily oak-history) overstory density is described (graphically) for upland hardwood range in the Ozarks.

151. Russell, T.E.
1969. Underplanting shortleaf pine. Forest Farmer 29: 10-17.

Growth and survival of underplanted shortleaf pine after release (girdle, 2, 4, 5-T) of hardwood overstory are discussed.

152. Tierson, William C., Earl F. Patric, and Donald F. Behrend.
1966. Influence of white-tailed deer on the logged northern hardwood forest. J. Forest. 64: 801-805.

Average height and density of woody shrubs at different time periods following partial cutting of sugar maple (*Acer saccharium*), beech (*Fagus grandifolia*), and yellow birch (*Betula alleghaniensis*) overstory, are graphically illustrated for deer exclosures in the central Adirondacks of New York.

153. Vogel, Willis G., and Elroy J. Peters.
1961. Spraying, seeding and fertilizing increase forage on Ozark forest ranges. U.S. Dept. Agr., Forest Serv., Central States Forest Exp. Sta., Sta. Note 152, 2 p. Columbus, Ohio.

Herbage yields before-and-after spraying (2, 4, 5-T) post oak (*Quercus stellata*) overstory, and associated with different seeding and fertilizing treatments are given.

154. Young, Vernon A.
1952. More grass with post oak gone. The Cattleman 38 (10): 35, 44.

Density, composition, and condition classes of herbage associated with cut-and-uncut post oak overstory in southern Texas is discussed.

155. Biswell, H.H.
1956. Manipulating plant cover on the Salt River watershed to increase water yield. *In* Recovering rainfall. Dept. Agr. Econ., Univ. Ariz., pp. 115-136. Tucson, Ariz.

Changes in forage production associated with different vegetation management practices is discussed for various overstory types (Pinyon-juniper, ponderosa pine, aspen, spruce-fir, chaparral, and stream-course) in Arizona.

156. Bjugstad, Ardell J., Dean A. Murphy, and Hewlette S. Crawford.
1968. Poor returns from Ozark woodland grazing. U.S. Forest Serv. Res. Note NC-60, 2 p. North Central Forest Exp. Sta., St. Paul, Minn.

Production of forage, including grasses and forbs, is given (table) for commercial forest types in the Missouri Ozarks. Forest types include black-scarlet oak, pine, pine-oak, mixed hardwood, and white oak.

157. Blair, Robert M.
1967. Deer forage in a loblolly pine plantation. J. Wildl. Manage. 31: 432-437.

Multiple linear and logarithmic functions describing browse yields as functions of midstory hardwoods and loblolly pine (*Pinus taeda*) overstory density are given for a study area in central Louisiana. Also, tables of browse and herbage yields under loblolly pine stands thinned to different levels are presented.

158. Blair, Robert M.
1969. Timber stand density influences food and cover. *In* White-Tailed Deer in the Southern Forest Habitat. Proceed. of Symp. U.S. Forest Serv. Southern Forest Exp. Sta., in coop. with The Wildlife Society and Stephen F. Austin State University, pp. 74-76.

A literature review, including a discussion of the production of grasses, forbs, and browse as related to overstory density, is presented for white-tailed deer habitat in the South.

159. Blair, Robert M.
1971. Forage production after hardwood control in a southern pine-hardwood stand. Forest Sci. 17: 279-284.

Herbage and browse yields before-and-after four intensities and two methods (girdle, Ammate) of hardwood removal are given (table) for a study area in central Louisiana. Predominant overstory species include loblolly (*Pinus taeda*) and shortleaf pine (*P. echinata*), with post oak (*Quercus stellata*) comprising 75 percent of the hardwood stocking.

160. Buell, Murray F., and John E. Cantlon.
1953. Effects of prescribed burning on ground cover in the New Jersey pine region. Ecology 34: 520-528.

The density of herbaceous vegetation with-and-without burning of pine-oak forest overstories is graphically illustrated.

161. Campbell, R.S.
1946. Determination of grazing values of native vegetation of southern pine forest ranges. Ecology 27: 195-204.

Herbage production under burned-and-unburned pine-oak stands is given (tables) for a study area on the Kisatchie National Forest in Louisiana. The major overstory trees include longleaf (*Pinus palustris*) and slash pine (*P. caribea*) and blackjack oak (*Quercus marilandica*).

162. Campbell, Robert S., and John T. Cassady.
1951. Grazing values for cattle on pine forest ranges in Louisiana. La. Agr. Exp. Sta. Bull. 452, 31 p. Baton Rouge, La.

Grass production associated with different forest grazing types is presented in tabular form. Grazing types considered include creek bottom hardwoods, loblolly pine-hardwoods, scrub oak, longleaf pine, open forest, and grassland.

163. Deitschman, Glenn H.
1956. Growth of underplanted hardwoods in black locust and shortleaf pine plantations. U.S. Dept. Agr., Forest Serv., Central States Forest Exp. Sta., Sta. Note 94, 2 p. Columbus, Ohio.

Growth (height) of planted hardwood understory is presented (table) for black locust and shortleaf pine overstories for plantations in southern Illinois.

164. Ehrenreich, John H.
1959. Releasing understory pine increased herbage production. U.S. Dept. Agr., Forest Serv., Central States Forest Exp. Sta., Sta. Note 139, 2 p. Columbus, Ohio.

In Missouri, changes in forage production on sprayed (2, 4, 5-T) and unsprayed study areas are graphically illustrated. The spraying objective was to release underplanted pine in mixed pine-oak woodlands.

165. Ehrenreich, John H., and Dean A. Murphy.
1962. A method of evaluating habitat for forest wildlife. Trans. N. Amer. Wild. and Nat. Res. Conf. 27: 376-384.

Grass, forb, and browse production in different stand-size and stocking classes, and in several forest types, is given (tables) for the Missouri Ozarks.

166. Gills, Gary G.
1970. Effects of prescribed burning on deer browse. J. Wildl. Manage. 34: 540-545.

Available browse is graphically illustrated for burned-and-unburned study areas on the Cumberland Plateau in Tennessee. The vegetation composition of the area consisted of shortleaf pine (*Pinus echinata*), the predominant pine species, and white (*Quercus alba*) and chestnut oak (*Q. Prinus*) the predominant hardwood species.

167. Halls, Lowell K.
1970. Growing deer food amidst southern timber. J. Range Manage. 23: 213-215.

A literature review, including a summary of the influence of forest overstories on forage production, is presented for the pine-hardwood forests of the South.

168. Halls, L.K., and R. Alcaniz.
1971. Forage yields in an east Texas pine-hardwood forest. J. Forest. 69: 25-26.

Forage yield increased in a mature, upland pine-hardwood forest after thinning and prescribed burning. The forest is dominated by shortleaf (*Pinus echinata*) and loblolly pine (*P. taeda*), with a midstory of southern red (*Quercus falcata*) and post oak (*Q. stellata*), hickories (*Carya spp.*), and sweetgum (*Liquidambar styraciflua*).

169. Halls, L.K., and W.B. Homesley.
1966. Stand composition in a mature pine-hardwood forest of southeastern Texas. J. Forest. 64: 170-174.

Crown cover, frequency, and density of understory vegetation associated with burned-over loblolly-shortleaf pine-hardwood stands is presented (tables and graphs) for a study area on the San Jacinto Experimental Forest.

170. Halls, Lowell K., and Hewlette S. Crawford.
1960. Deer-forest habitat relationships in north Arkansas. J. Wildl. Manage. 24: 387-395.

The production and availability of forage, as influenced by timber types, age class, crown closure, and grazing, is discussed. Timber types include oak-hickory, cedar-greenbrier, and pine-oak.

171. Halls, Lowell K., and Joseph L. Schuster.
1965. Tree-herbage relations in pine-hardwood forest of Texas. J. Forest. 63: 282-283.

Logarithmic equations describe grass and herbage production as functions of expressions of forest overstory density. The main tree species forming the overstory are loblolly (*Pinus taeda*) and shortleaf pine (*P. echinata*), southern red (*Quercus falcata*) and post oak (*Q. stellata*), sweetgum (*Liquidambar styraciflua*), and hickories (*Carya spp.*).

172. Hungerford, C.R.
1970. Response of Kaibab mule deer to management of summer range. J. Wildl. Manage. 34: 852-862.

The proportion of ground covered with plants associated with different forest types changed by seeding, logging and fire is described (graphs) for a study area in northern Arizona. Forest types include ponderosa pine (*Pinus ponderosa*) and mixed-conifer-aspen (*Populus tremuloides*).

173. Lay, Daniel W.
1956. Effects of prescribed burning on forage and mast production in Southern pine forest. J. Forest. 54: 582-584.

Forage production on burned-and-unburned pine-hardwood sites in described (tables) for a study area in southeast Texas.

174. Lewis, Clifford E.
1964. Forage response to month of burning. U.S. Forest Serv. Res. Note SE-35, 4 p. Southeastern Forest Exp. Sta., Asheville, N.C.

A relationship between herbage yield and time of burning of cutover pine-palmetto flatwoods is described (table and graphs) for study areas in southern Florida.

175. Lutz, H.J.
1932. Relation of forest site quality to number of plant individuals per unit area. J. Forest. 30: 34-38.

A comparison between the number of herbaceous and shrubby individuals and the number of trees on good-and-poor sites is described for a study area in Connecticut.

176. Murphy, Dean A., and John H. Ehrenreich.
1965. Effects of timber harvest and stand improvement on forage production. J. Wildl. Manage. 29: 734-739.

Forage production following timber harvest or timber stand improvement of different forest types in Missouri Ozarks is given in tabular form. Forest types considered were pine (*Pinus echinata*), oak-pine, black oak-scarlet oak, white oak and red cedar.

177. Patten, D.T.
1969. Succession from sagebrush to mixed conifer forest in the northern Rocky Mountains. Amer. Midl. Natur. 82: 229-240.

The frequency and aerial cover of herbaceous plants and shrubs, and the frequency, density, and basal area of young mixed conifers are described (table) in relation to sagebrush (*Artemisia tridentata*) and lodgepole pine (*Pinus contorta*) overstory conditions. The study site was in Yellowstone National Park.

178. Patton, David R., and Burd S. McGinnes.
1964. Deer browse relative to age and intensity of timber harvest. J. Wildl. Manage. 28: 458-463.

In Virginia, logarithmic equations describe production of available browse as a function of overstory thinning intensity and age of cut. Overstory components include white (*Quercus alba*), scarlet (*Q. coccinea*), chestnut (*Q. prinus*) and black oak (*Q. velutina*), and Virginia (*Pinus virginiana*), and pitch pine (*P. rigida*).

179. Pruett, Emerson W., and Gordon E. Gatherum.
1962. Control of herbaceous vegetation in forest plantings. Iowa Acad. of Sci. 68: 153-161.

Relationships between control (chemical and mechanical) of herbaceous vegetation and survival and growth of planted tree species on a study area in east central Iowa are discussed. Tree species include eastern white (*Pinus strobus*) and jack pine (*P. banksiana*), black walnut (*Juglans nigra*), and eastern cottonwood (*Populus deltoides*).

180. Reynolds, Hudson G.
1962. Some characteristics and uses of Arizona's major plant communities. J. Ariz. Acad. Sci. 2: 62-71.

A literature review, including a description of relationships between herbage production and tree overstory, is presented for different vegetation types in Arizona.

181. Reynolds, Hudson G.
1964. Elk and deer habitat use of a pinyon-juniper woodland in New Mexico. Trans. N. Amer. Wildl. and Nat. Resource Conf. 29: 438-444.

Relations among perennial grasses, forbs, shrubs, and overstory density are presented in tabular form. The main overstory trees include pinyon (*pinus edulis*), alligator (*Juniperus deppeana*) and Utah juniper (*J. osteosperma*), and wavyleaf oak (*Quercus undulata*).

182. Reynolds, Hudson G.
1969. Aspen grove use by deer, elk, and cattle in southwestern coniferous forest. U.S. Forest Serv. Res. Note RM-138, 4 p. Rocky Mt. Forest and Range Exp. Sta., Fort Collins, Colo.

A table describing understory production, including aspen (*Populus tremuloides*) sprouts, under aspen and under mixed conifer forest types is presented for north central Arizona. Mixed conifer species include Douglas-fir (*Pseudotsuga menziesii*), subalpine fir (*Abies lasiocarpa*), Engelmann spruce, (*Picea engelmannii*), and ponderosa pine (*Pinus ponderosa*). Also, a graph illustrating understory production in thinned-and-unthinned aspen groves is given.

183. Rhodes, Robert R.
1952. Timber and forage production in a pine-hardwood stand in Texas. J. Forest. 50: 456-459.

Relationship between forage production and forest overstory density is graphically illustrated. Forest composition is predominantly loblolly pine, shortleaf pine, post oak, southern red oak, and hickories.

184. Schuster, Joseph L.
1967. The relation of understory vegetation to cutting treatments and habitat factors in an east Texas pine-hardwood type. Southwest, Natur. 12: 339-364.

The composition, frequency, and production of understory vegetation associated with various stands of loblolly-shortleaf pine-hardwood forest are described in tabular form.

185. Schuster, J.L., and L.K. Halls.
1963. Timber overstory determines deer forage in shortleaf-loblolly pine-hardwood forest. Proceed. Soc. Amer. Forest. 1962: 165-167.

Forage production associated with pine-hardwood forest stands cut by various silvicultural systems is presented (table) for a study area on the Kurth Experimental Forest in Texas.

186. Segelquist, Charles A., and Walter E. Green.
1968. Deer food yields in four Ozark forest types. J. Wildl. Manage. 32: 330-337.

In Arkansas, yield of potential deer food under different forest types is presented in tabular form. Forest types evaluated are upland hardwood, upland pine-hardwood, cedar glade, and stream-bottom hardwood. Combining all forest types, yield of potential deer food increased linearly with decreasing overstory density.

187. Segelquist, Charles A., Fred D. Ward, and Robert G. Leonard.
1969. Habitat deer relations in two Ozark enclosures. J. Wildl. Manage. 33: 511-520.

Comparisons of available vegetation in two enclosures of different overstory density are presented (table) for a study area in northern Arkansas. Four definable forest types are in each enclosure: upland hardwoods, upland-pine hardwoods, stream-bottom hardwoods, and cedar glades.

188. Whittaker, R.H.
1966. Forest dimensions and production in the Great Smoky Mountains. Ecology 47: 103-121.

Production of different plant life-forms associated with a forest overstory of many species, principally hardwoods, is given in tabular form.

189. Whittaker, R.H., and G.M. Woodwell.
1969. Structure, production and diversity of the oak-pine forest at Brookhaven, New York. J. Ecology 57: 155-174.

Tables are presented to describe the production of different plant life-forms on a study site in New York. The overstory is dominated by white (*Quercus alba*) and scarlet oak (*Q. coccinea*).

190. Young, James A., and Raymond A. Evans.
1970. Invasion of medusahead into the Great Basin. Weed Sci. 18: 89-97.

Cover, frequency, and constancy of herbaceous communities infested with medusahead (*Taeniatherum asperium*) under different woodland communities are given in tabular form. Woodland communities include low sagebrush-western juniper, big sagebrush-western juniper, and ponderosa pine.

SHRUB OVERSTORY

191. Alley, Harold P.
1956. Chemical control of big sagebrush and its effect upon production and utilization of native grass species. Weeds 4: 164-173.

Production of native grasses associated with different levels of control (2, 4-D, 2, 4, 5-T) of big sagebrush (*Artemisia tridentata*) is given (table) for a study area in northern Wyoming.

192. Bailey, Arthur W.
1970. Barrier effect of the shrub *Elaeagnus commutata* on grazing cattle and forage production in central Alberta. J. Range Manage. 23: 248-251.

Herbage production under-and-between shrub overstory of silverberry (*Elaeagnus commutata*) is presented in tabular form.

193. Blaisdell, James P.
1953. Ecological effects of planned burning of sagebrush-grass range of the Upper Snake River plains. U.S. Dep. Agr. Tech. Bull. 1075, 39 p.

Herbage production in relation to different intensities of burning, including no burning, is given for big sagebrush (*Artemisia tridentata*) stands in Idaho.

194. Box, Thadis W., Jeff Powell, and D. Lynn Drawe.
1967. Influence of fire on south Texas chaparral communities. Ecology 48: 955-961.

The frequency of shrubs on burned-and-unburned study plots and the canopy reduction following burning of a chaparral community are presented in tabular form.

195. Britton, Carlton M., and Henry A. Wright.
1971. Correlation of weather and fuel variables to mesquite damage by fire. J. Range Manage. 24: 136-141.

Grass production with-and-without burning mesquite (*Prosopis glandulosa* var *glandulosa*) overstory is given for a study area in Texas.

196. Brown, Harry E.
1958. Gambel oak in west central Colorado. Ecology 39: 317-327.

The occurrence, ground cover, and production of understory plants under Gambel oak (*Quercus gambelii*) overstory and in adjacent openings are given in tabular form.

197. Cable, Dwight R.
1957. Recovery of chaparral following burning and seeding in central Arizona. U.S. Dep. Agr., Forest Serv., Rocky Mt. Forest and Range Exp. Sta. Res. Note 28, 6 p. Ft. Collins, Colo.

Tables describing perennial grass basal density, estimated by line intercept, and shrub live oak (*Quercus turbinella*) crown density are given for a study area in the Pinal Mountains.

198. Cable, Dwight R.
1969. Competition in the semidesert grass-shrub type as influenced by root systems, growth habits, and soil moisture extraction. Ecology 50: 28-38.

Relationship between production of perennial grass and burroweed (*Aplopappus tenuisectus*) crown cover is given (graph) for a study area on the Santa Rita Experimental Range in southern Arizona.

199. Cable, Dwight R.
1971. Lehmann lovegrass on the Santa Rita experimental range. 1937-1968. J. Range Manage. 24: 17-21.

The relation of native grasses and Lehmann lovegrass (*Eragrostis lehmanniana*) production to velvet mesquite (*Prosopis juliflora* var. *velutina*) density and removal (2, 4, 5-T) is described for a study site in southern Arizona.

200. Cable, Dwight R., and S. Clark Martin.
1964. Forage production and stocking rates on southern Arizona ranges can be improved. U.S. Forest Serv. Res. Note RM-30, 11 p. Rocky Mt. Forest and Range Exp. Sta., Ft. Collins, Colo.

Annual and perennial grass basal area and herbage production under velvet mesquite (*Prosopis juliflora* var. *velutina*) killed and velvet mesquite alive situations on the Santa Rita Experimental Range are given in tabular form.

201. Cable, Dwight R., and Fred H. Tschirley.
1961. Responses of native and introduced grasses following aerial spraying of velvet mesquite in southern Arizona. J. Range Manage. 14: 155-159.

Tables describing grass production under sprayed (2, 4, 5-T) and unsprayed stands of velvet mesquite (*Prosopis juliflora* var. *velutina*) are presented for the Santa Rita Experimental Range.

202. Cook, C. Wayne, and Clifford E. Lewis.
1963. Competition between big sagebrush and seeded grasses on foothill ranges in Utah. J. Range Manage. 16: 245-250.

Seeded grass production is presented (table) for sprayed (2, 4-D) and unsprayed areas of big sagebrush (*Artemisia tridentata*).

203. Cornelius, Donald R., and Charles H. Graham.
1951. Selective herbicides for improving California forest ranges. J. Range Manage. 4: 95-100.

Grass production under sprayed (2, 4-D) and unsprayed sagebrush (*Artemisia tridentata*) is given for the ponderosa-Jeffrey pine forest zone of northeastern California.

204. Frischknecht, Neil C.
1963. Contrasting effects of big sagebrush and rubber rabbitbrush on production of crested wheatgrass. J. Range Manage. 16: 70-74.

Grass production on study plots with-and-without big sagebrush (*Artemisia tridentata*) and rubber rabbitbrush (*Chrysothamnus nauseosus*) is described for the Benmore Experimental Range in west central Utah.

205. Gaylord, Vernon J., and Stanley E. Westfall.
1971. Wedgeleaf ceanothus canopy does not affect total herbage yield. U.S. Forest Serv. Res. Note PSW-253, 4 p. Pacific Southwest Forest and Range Exp. Sta., Berkeley, California.

Herbage yield associated with wedgeleaf ceanothus (*Ceanothus cuneatus*) overstory is presented (tables) for a study area on the San Joaquin Experimental Range in central California.

206. Glendening, G.E., C.P. Pase, and P. Ingebo.
1961. Preliminary hydrologic effects of wildfire in chaparral. Annu. Ariz. Watershed Symp. Proceed. 5: 12-15.

Recovery of shrubs, forbs, and grasses following burning of chaparral overstory, and under different cultural treatments (seeding, seeding and spraying with 2, 4, 5-T, control) is described (table) for a study area in central Arizona.

207. Hanes, Ted. L., and Harold W. Jones.
1967. Postfire chaparral succession in southern California. Ecology 48: 259-264.

Comparisons of pre-and-postfire vegetation are made (table and graphs) for two chaparral stands in the San Gabriel Mountains.

208. Hedrick, D.W., D.N. Hyder, F.A. Sneva, and C.E. Poulton.
1966. Ecological response of sagebrush-grass range in central Oregon to mechanical and chemical removal of *Artemisia.* Ecology 47: 432-439.

Herbage yields before-and-after removal (rotobeating and spraying with 2, 4-D) of sagebrush (*Artemisia tridentata*) overstory are graphically illustrated.

209. Hibbert, Alden R.
1971. Increase in streamflow after converting chaparral to grass. Water Resour. Res. 7:71-80.

Shrub cover and herbaceous production preceding-and-following a wildfire in chaparral are graphically illustrated for an area in central Arizona. Shrub live oak (*Quercus turbinella*) and birchleaf mountain mahogany (*Cercocarpus betuloides*) are the dominant species in the overstory.

210. Hibbert, Alden R., and Paul A. Ingebo.
1971. Chaparral treatment effects on streamflow. Annu. Ariz. Watershed Symp. Proc. 15: 25-34.

Herbaceous production before-and-after conversion (burning, herbicide) of chaparral overstory is discussed for a study area in central Arizona.

211. Hull, A.C., Jr., N.A. Kissinger, Jr., and W.T. Vaughn.
1952. Chemical control of big sagebrush in Wyoming. J. Range Manage. 5: 398-402.

A table describes the relationship between grass production and sagebrush (*Artemisia tridentata*) kill (2, 4-D, 2, 4, 5-T).

212. Hyder, Donald N.
1954. Spray to control big sagebrush. Oregon Agr. Exp. Sta. Bull. 538, 12 p. Corvallis, Ore.

Herbage production before-and-after chemical control (2, 4-D) of big sagebrush (*Artemisia tridentata*) is discussed.

213. Hyder, Donald N., and Forrest A. Sneva.
1956. Herbage response to sagebrush spraying. J. Range Manage. 9: 34-38.

Grass and herbage yields are compared (table) among sprayed (2, 4-D, 2, 4, 5-T), grubbed, and untreated areas of sagebrush (*Artemisia tridentata*) overstory in Oregon.

214. Jefferies, Ned W.
1965. Herbage production on a Gambel oak range in southwestern Colorado. J. Range Manage. 18: 212-213.

Herbage yields under an overstory of Gambel oak (*Quercus gambelii*) and in adjacent openings are given (table) for a study at the San Juan Experimental Station.

215. Jordan, Gilbert L., and Michael L. Maynard.
1970. The San Simon watershed: revegetation. Progr. Agr. in Ariz. 22(3): 4-7.

The production of Lehmann lovegrass (*Eragrostis lehmanniana*) associated with different seedbed preparations (root plowed, disked plowed, and chained) is presented (table) for creosotebush (*Larrea tridentata*), mesquite (*Prosopis juliflora* var. *glandulosa*), and mixed creosotebush-mesquite communities in southeastern Arizona.

216. Kincaid, D.R., G.A. Holt, P.D. Dalton, and J.S. Tixier.
1959. The spread of Lehmann lovegrass as affected by mesquite and native perennial grasses. Ecology 40: 738-742.

In Arizona, the effects of competition between Lehmann lovegrass (*Eragrostis lehmanniana*), perennial grasses, and velvet mesquite (*Prosopis juliflora* var. *velutina*) overstory are graphically illustrated.

217. Kissinger, N.A., Jr., A.C. Hull, Jr., and W.T. Vaughn.
1952. Chemical control of big sagebrush in central Wyoming. U.S. Dept. Agr., Forest Serv., Rocky Mt. Forest and Range Exp. Sta., Sta. Paper 9, 14 p. Fort Collins, Colo.

Grass production is compared (table) with percent big sagebrush (*Artemisia tridentata*) overstory killed (2, 4-D, 2, 4, 5-T).

218. Kissinger, N.A., Jr., and Richard M. Hurd.
1953. Control big sagebrush with chemicals and grow more grass. U.S. Dep. Agr., Forest Serv., Rocky Mt. Forest and Range Exp. Sta., Sta. Paper 11, 23 p. Fort Collins, Colo. (In cooperation with U.S. Dept. Int., Bureau of Land Management.)

Grass production under sprayed (2, 4-D, 2, 4, 5-T) and unsprayed stands of big sagebrush (*Artemisia tridentata*) overstory is described for a study area in Wyoming.

219. Laycock, William A., and Thomas A. Phillips.
1968. Long-term effects of 2, 4-D on lanceleaf rabbitbrush and associated species. J. Range Manage. 21: 90-93.

In Nevada, herbage yields on sprayed (2, 4-D) and unsprayed areas supporting lanceleaf rabbitbrush (*Chrysothamnus viscidiflorus* var. *lanceolatus*) overstory are given in tabular form.

220. Lommansson, T.
1948. Succession in sagebrush. J. Range Manage. 1: 19-21.

The percent composition of grasses and grasslike plants, big sagebrush, and weeds, and the total vegetation cover are presented for a study area in south western Montana.

221. Lord, Philip B., and William H. Sanderson.
1962. An eastside Sierra Nevada aerial spraying project. J. Range Manage. 15: 200-201.

Plant frequency of herbaceous plants and shrubs is given before-and-after spraying (2, 4-D) overstory of big (*Artemisia tridentata*) and black sagebrush (*A. arbuscula*), and antelope bitterbrush (*Purshia tridentata*).

222. Martin S. Clark.
1963. Grow more grass! by controlling mesquite. Prog. Agr. in Ariz. 15 (4): 15-16.

Relation of grass produced by inch of summer rainfall received at the Santa Rita Experimental Range in southern Arizona, and the number of mesquite trees on the site is graphically illustrated.

223. Martin, S. Clark.
1966. The Santa Rita experimental range. U.S. Forest Serv. Res. Paper RM-22, 24 p. Rocky Mt. Forest and Range Exp. St., Fort Collins, Colo.

A graph describes the relationship between the proportion of full production of grasses and velvet mesquite (*Prosopis juliflora* var. *velutina*) overstory density for study area in southern Arizona.

224. Martin S. Clark.
1968. Improving semidesert ranges in southern Arizona. U.S.A. by grazing management and shrub control. Ann. of Arid Zone 7: 235-242.

Perennial grass production with-and-without chemical control (2, 4, 5-T) of velvet mesquite (*Prosopis juliflora* var. *velutina*) overstory is presented (table) for the Santa Rita Experimental Range.

225. Martin, S. Clark.
1970. Vegetation changes on semi-desert range during 10 years of summer, winter, and year-long grazing by cattle. XI*th* Internatl. Grassl. Congr. Proc. 11: 23-26.

Relationships between herbage production and density, and density of burro-weed (*Haplopappus tenuisectus*) are given (table) for different grazing periods on the Santa Rita Experimental Range in southern Arizona.

226. Martin, S. Clark., and Dwight R. Cable.
1962. Grass production high 14 years after mesquite control. Ariz. Cattlelog 18 (12): 58-61.

Grass production with mesquite overstory thinned, cleared, and undisturbed is given (table) for sites at different elevations on the Santa Rita Experimental Range in southern Arizona.

227. Moinat, A.D.
1956. Comparative yields of herbage from oak scrub and interspersed grassland in Colorado. Ecology 37: 852-854.

Herbage production associated with grass parks and adjacent Gambel oak (*Quercus gambelii*) is presented in tabular form.

228. Mueggler, Walter F., and James P. Blaisdell.
1958. Effects on associated species of burning, rotobeating, spraying, and railing sagebrush. J. Range Manage. 11: 61-66.

A graph and table of herbage yields associated with untreated big sagebrush(*Artemisia tridentata*) overstory and with overstory reduced by various methods are given for a study area on the Upper Snake River plains.

229. Parker, Kenneth W., and W.G. McGinnies.
1941. Mesquite – the silent invader. The Cattleman 27 (12): 35, 38-40.

A literature review, including a description of relationships between perennial grass cover and mesquite overstory, is presented for Texas.

230. Parker, Kenneth W., and S. Clark Martin.
1952. The mesquite problem on southern Arizona ranges. U.S. Dep. Agr. Circ. 908, 70 p.

Graphs and tables describe the relations of grass yields to overstory of velvet mesquite (*Prosopis juliflora* var. *velutina*) and burroweed (*Aplopappus tenuisectus*).

231. Pase, Charles P.
1970. Chaparral modification improves range forage and water yield in Arizona. Abstr. of Pap., 23rd Annu. Meet., Amer. Soc. Range Manage., Denver, 1970, p. 16.

Herbage production with-and-without chemical control (2, 4, 5-T, fenuron, picloram, others) of chaparral stands is described.

232. Pase, Charles P.
1971. Effect of a February burn on Lehmann lovegrass. J. Range Manage. 24: 454-456.

Herbage production following root plowing and before-and-after burning shrub live oak (*Quercus turbinella*) is given (table) for a study area in central Arizona.

233. Pase, Charles P., and A.W. Lindenmuth.
1971. Effects of prescribed fire on vegetation in oak-mountain mahogany chaparral. J. Forest. 69: 800-805.

Herbaceous and shrub cover before-and-after prescribed fire in chaparral is given (tables and graph) for a study site on the Sierra Ancha Experimental Forest in central Arizona. Shrub live oak (*Quercus turbinella*) and true mountain mahogany (*Cercocarpus mountanus*) dominate the overstory vegetation.

234. Pase, Charles P., and Floyd W. Pond.
1964. Vegetation changes following the Mingus Mountain burn. U.S. Forest Serv. Res. Note RM-18, 8 p. Rocky Mt. Forest and Range Exp. Sta., Fort Collins, Colo.

Comparative yields of grass, forbs, and shrubs following a wildfire are presented (tables) for an area in central Arizona. The overstory is dominated by shrub live oak (*Quercus turbinella*) and skunkbush sumac (*Rhus trilobata*).

235. Paulsen, Harold A., Jr., and John C. Miller.
1968. Control of Parry rabbitbrush on mountain grasslands of western Colorado. J. Range Manage. 21: 175-177.

Grass and forb production under Parry rabbitbrush (*Chrysothamnus parryi*) stands treated with herbicides (2, 4-D, Tordon) and under control stands is given in tabular form.

236. Pechanec, Joseph F., George Stewart, and James P. Blaisdell.
1954. Sagebrush burning good and bad. U.S. Dept. Agr. Farmers' Bull. 1948, 34 p.

Herbage production on burned-and-unburned big sagebrush (*Artemisia tridentata*) range on the Upper Snake River plains in Idaho is graphically illustrated.

237. Perry, Chester A., Cyrus M. McKell, Joe R. Goodin, and Thomas M. Little.
1967. Chemical control of an old stand of chaparral to increase range productivity. J. Range Manage. 20: 166-169.

Tables of grass production under sprayed (2, 4-D, 2, 4, 5-T) and unsprayed stands of purple sage (*Salvia lencophylla*), chamise (*Adenostoma fasciculatum*), and California lilac (*Ceanothus spp.*) are presented for study sites in southern California.

238. Pond, Floyd W.
1961. Basal area and production of weeping lovegrass under varying amounts of shrub live oak crown cover. J. Range Manage. 14: 335-337.

The basal area and production of weeping lovegrass (*Eragrostis curvula*) and the reduction of shrub live oak (*Quercus turbinella*) after burning are graphically illustrated. Also, a linear predicting equation relating grass production to reduction of overstory canopy is given.

239. Pond, Floyd W.
1961. Mechanical control of Arizona chaparral and some results from brush clearing. Annu. Ariz. Watershed Symp. Proceed. 5: 39-41.

Graphs describe relationship between basal area and production of weeping lovegrass (*Eragrostis curvula*) and reduction of shrub live oak (*Quercus turbinella*) canopy.

240. Pond, Floyd W.
1962. Shrub live oak limits production of weeping lovegrass. Ariz. Cattlelog 18 (12): 60-61.

Relationship between production of weeping lovegrass and reduction of shrub live oak canopy after burning is graphically illustrated for a study area in central Arizona.

241. Pond, Floyd W.
1964. Response of grasses, forbs, and half shrubs to chemical control of chaparral in central Arizona. J. Range Manage. 17: 200-203.

Herbage yields before-and-after spraying (2, 4-D, 2, 4, 5-T) shrub live oak (*Quercus turbinella*) overstory are presented (graphs) for the Sierra Ancha Experimental Forest.

242. Pond, Floyd W.
1968. Changes in grass production on ungrazed converted chaparral. U.S. Forest Serv. Res. Note RM-98, 4 p. Rocky Mt. Forest and Range Exp. Sta., Fort Collins, Colo.

Production and basal area of weeping lovegrass (*Eragrostis curvula*) related to control (2, 4-D, 2, 4, 5-T) of shrub live oak (*Quercus turbinella*) overstory are described in graphic form for a study area in eastern Arizona.

243. Pond, Floyd W.
1969. Grazing values on undisturbed chaparral versus areas converted to grass - the Tonto Springs range. U.S. Forest Serv., 14 p. Rocky Mt. Forest and Range Exp. Sta., Fort Collins, Colo.

Production of perennial grasses before-and-after root plowing of chaparral overstory is discussed for a study area in central Arizona.

244. Pond, Floyd W., and Dwight R. Cable.
1962. Recovery of vegetation following wildfire on a chaparral area in Arizona. U.S. Dept. Agr., Forest Serv., Rocky Mt. Forest and Range Exp. Sta. Res. Note 72, 4 p. Fort Collins, Colo.

A table of basal area of weeping lovegrass (*Eragrostis curvula*) as related to crown cover of shrub overstory inside-and-outside an exclosure is presented. The overstory is mainly shrub live oak (*Quercus turbinella*).

245. Pond, Floyd W. and Dixie R. Smith.
1971. Ecology and management of subalpine ranges on the Big Horn Mountains of Wyoming. Univ. of Wyo. Agr. Exp. Sta. Res. J. 53, 25 p. Laramie, Wyo.

A literature review, including a discussion of forage production as affected by control (herbicides) of big sagebrush (*Artemisia tridentata*) overstory, is presented.

246. Powell, Jeff, and Thadis W. Box.
1967. Mechanical control and fertilization as brush management practices affect forage production in south Texas. J. Range Manage. 20: 227-236.

Graphs of herbage yields with-and-without mechanical control of a complex of brush overstory species are presented.

247. Ray, Hurlon C.
1958. Aerial chemical reduction of hardwood brush as a range improvement practice in Arkansas. J. Range Manage. 11: 284-290.

Percent increase of native grass production as related to percent kill (2, 4, 5-T) of hardwood overstory is presented in tabular form.

248. Reynolds, Hudson G.
1959. Brush control in the Southwest. *In* Grasslands, American Association for the Advancement of Science, Publ. 53: 379-389.

The relative proportions of perennial grass and mesquite (*Prosopis juliflora*) overstory are graphically illustrated for southern Arizona and New Mexico.

249. Reynolds, H.G., and J.W. Bohning.
1956. Effects of burning on a desert grass-shrub range in southern Arizona. Ecology 37: 769-777.

Density and production of perennial grasses are described (tables and graphs) before-and-after burning overstory on the Santa Rita Experimental Range. The overstory included burroweed (*Aplopappus tenuisectus*), cholla (*Opunta spp.*), and mesquite (*Prosopis spp.*).

250. Reynolds, H.G., and F.H. Tschirley.
1957. Mesquite control on Southwestern rangeland. U.S. Dept. Agr. Leafl. 421, 8 p.

A relationship between forage production and mesquite abundance is graphically illustrated.

251. Reynolds, Hudson G., and S. Clark Martin.
1968. Managing grass-shrub cattle ranges in the Southwest. U.S. Dept. Agr. Forest Serv. Agr. Handb. 162, 44 p. (Revised).

The relation of proportion of full production of perennial grass and density of velvet mesquite (*Prosopis juliflora* var. *velutina*) is described (graph) for the Santa Rita Experimental Range in southern Arizona. Also, a graph illustrating average herbage production on sprayed (2, 4, 5-T) and unsprayed mesquite infected range at different points in time is presented.

252. Robertson, J.H.
1969. Yield of crested wheatgrass following release from sagebrush competition by 2, 4-D. J. Range Manage. 22: 287-288.

A table of crested wheatgrass (*Agropyron desertorum*) yields on sprayed (2, 4-D) and unsprayed study plots with sagebrush (*Artemisia tridentata*) overstory is given for Nevada.

253. Robertson, J.H.
1971. Changes on a sagebrush-grass range in Nevada ungrazed for 30 years. J. Range Manage. 24: 397-400.

Annual production of forage grasses on planted and cleared, seeded ranges is given (table) for big sagebrush-Sandberg bluegrass (*Artemisia tridentata - Poa secunda*) type.

254. Schmutz, Ervin M., and David W. Whitham.
1962. Shrub control studies in the oak-chaparral of Arizona. J. Range Manage. 15: 61-67.

Increase in grass yields as related to precent reduction (2, 4, 5-T and Silvex) in ground cover of shrub live oak (*Quercus turbinella*) overstory is illustrated (graphs) for a study area in central Arizona.

255. Shown, L.M., R.F. Miller, and F.A. Branson.
1969. Sagebrush conversion to grassland as affected by precipitation, soil, and cultural practices. J. Range Manage. 22: 303-311.

The yield of crested wheatgrass (*Agropyron desertorum*) is presented (table) for treated (plowing) and adjacent untreated areas of big sagebrush (*Artemisia tridentata*) in the West.

256. Tiedemann, Arthur R., and Ervin M. Schmutz.
1966. Shrub control and reseeding effects on the oak chaparral of Arizona. J. Range Manage. 19: 191-195.

Graphs illustrate the relationship between grass production and oak chaparral (*Quercus turbinella*) crown cover as modified by burning and an herbicide (Silvex).

257. Tiedemann, Arthur R., and James O. Klemmedson.
1971. Effect of mesquite (*Prosopis juliflora*) trees on vegetation and soils in the desert grassland. Abstr. of Pap., 24th Annu. Meet., Amer. Soc. Range Manage., Reno, 1971, p. 15-16.

Abundance of perennial grasses under canopies of mesquite overstory is described for a study area in southern Arizona.

258. Turner, George T.
1969. Responses of mountain grassland vegetation to gopher control, reduced grazing, and herbicide. J. Range Manage. 22: 377-383.

Production of grasses, forbs, and shrubs is given (table) for sprayed (2, 4-D) and unsprayed areas supporting silver sagebrush (*Artemisia cana*) in western Colorado.

259. Wilbert, Don E.
1963. Some effects of chemical sagebrush control on elk distribution. J. Range Manage. 16: 74-78.

Tables describing grass, forb, and brush production under sprayed (2, 4-D) and unsprayed stands of big sagebrush (*Artemisia tridentata*) are presented for the Teton National Forest in Wyoming.

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260. Jameson, Donald A.
1966. Competition in a blue grama-broom snakeweed-actinea community and responses to selective herbicides. J. Range Manage. 19: 121-124.

Table of correlation coefficients is given to illustrate the association among plant yields, including perennial grasses, broom snakeweed (*Gutierrezia sarothrae*), and Cooper actinea (*Hymenoxis cooperi*), on a study area in north central Arizona.

261. McCaleb, J.E., E.M. Hodges, and C.L. Dantzman.
1961. Effect of herbicidal control of saw palmetto on associated native forage plants in peninsular Florida. J. Range Manage. 14: 126-130.

Yields of grasses, forbs, and shrubs are related (tables) to percent kill and percent canopy reduction after spraying saw palmetto with various herbicides.

262. Pieper, Rex. D.
1971. Blue grama vegetation responds inconsistently to cholla cactus control. J. Range Manage. 24: 52-54.

A table describes herbage production on grubbed-and-ungrubbed cholla (*Opuntia imbricata*) sample plots in the Sacramento Mountains of New Mexico.

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