1963

A description and classification, by composition, of the aspen stands in the Sierra Madre Mountains, Wyoming

Kieth E. Severson

WYOMING RANGE MANAGEMENT
ISSUE NUMBER 214

Oct.- Dec., 1965
Laramie, Wyoming

A DESCRIPTION AND CLASSIFICATION, BY COMPOSITION, OF THE ASPEN STANDS IN THE SIERRA MADRE MOUNTAINS, WYOMING

by Kieth E. Severson*

Review of Literature

Aspen

Taxonomy and Distribution of Aspen: The western form of the aspen, Populus tremuloides Michx., has been split into the separate variety aurea (Tidestr.) Daniels on the basis of size and shape of the leaf and on differences in autumnal coloration. Sudsworth (1934), as reported in Harlow and Harrar (1958), stated that the characteristics now relied upon to separate the eastern and western forms of aspen will not be appreciated because they are relatively trivial. These forms are considered as one species, of two geographic forms, in the current Forest Service Check List (Little, 1953).

Other common names used to describe the aspen are quaking aspen, golden aspen, mountain aspen, trembling aspen, Vancouver aspen, poplar, popple and alamo blanco (Little, 1953).

Quaking aspen (hereafter referred to as aspen), a member of the Salicaceae (willow or poplar family), is probably the most widely distributed tree in North America (Harlow and Harrar, 1958; and Baker, 1925). Its range extends from Newfoundland and Labrador west across Canada (along the northern limit of trees) to northwestern Alaska, south to Washington, and again south in the mountains of the western United States into Arizona and Trans-Pecos Texas. Thence eastward, out of the mountains, northeast of a line through eastern North Dakota, Iowa, Ohio and northern Virginia (Little, 1953).

Stand Characteristics: Aspen exists typically in even aged stands on the more mesic sites (Baker, 1925). Reed (1952) noted two distinct types in the Jackson Hole region of Wyoming: the open stands on the xeric hillsides and the densely shaded groves of the flatter terrain. Such sites on the hillsides are the most arid in the region and those on the flatter terrain are as mesic as any of the other forest communities of the region.

Aspen exists as a scrubby tree along creekbanks at its lower elevational limits in the Rocky Mountain region. As elevation increases it spreads out from the creekbanks. At its higher elevational limits (upper spruce-fir zone) the

---

*Excerpts from thesis "A Description and Classification, by Composition, of the Aspen Stands in the Sierra Madre Mountains, Wyoming" presented for partial fulfillment of the requirements for a M.S. degree in Plant Science (Range Management) at the University of Wyoming, by Kieth E. Severson. Full thesis deposited in the University of Wyoming Library.

aspen is confined to the west and south slopes although it may go to timberline as a stunted form. The aspen reaches best development in the lower spruce-fir zone where it enters competition with lodgepole pine, Pinus contorta (Baker, 1925).

Aspen Reproduction: Aspen has been described as a prolific seeder by several workers (Harlow and Harrar, 1958; Curtis, 1959; and Montgomery, 1959). The eastern form of aspen reproduces very readily by seed, but in the absence of a suitable seed source the aspen will maintain itself by root sprouting (Curtis, 1959). Although the trees of the western form produce a high percentage of viable seed, seedling establishment is very rare because of the critical lack of moisture during the time of seed drop and the short life of the seed (Montgomery, 1959). Almost all reproduction by the western form is limited to vegetative root suckering by the extensive, shallow roots of the parent trees (Peattie, 1953; and Montgomery, 1959). Strain (1961) and Montgomery (1959) conducting studies on aspen in the Medicine Bow Mountains of Wyoming were unable to find as aspen seedling. Larson (1944) and Ellison (1943) have published reports on the discovery of aspen seedlings in Utah, but the general consensus is that propagation of aspen by seed is very rare for the western form of the species.

Successional Position of Aspen: In the eastern parts of its range the successional importance of aspen is well established, that is, as a pioneer species, particularily after fire (Curtis, 1959). In the west, however, because of the fewer species and more distinct forest types, the aspen stand tends to appear as a permanent forest type. Featherolf (1917) contended that no conifer had exactly the same requirements and qualities as aspen, hence there is a strip where no native conifer can replace it. He also listed the prolific root sprouting habit, destruction of conifers by a fungus that lived in aspen litter and destruction of conifers by snowshoe rabbits as additional factors that tended to keep an area in aspen. Featherolf (1917) also stated that there has been no proof (i.e., charcoal specimens or mounds of soil left by upturned conifers) that these areas were ever occupied by conifers. Baker (1918) disagreed with Featherolf by stating that this "permanent" strip occupied by aspen would eventually revert to Douglas fir and white spruce as the seed source became available. He also said that the fungi and snowshoe rabbits were not of enough consequence to keep an area from reverting to conifers.

In a later article, Baker (1925) expressed the yet prevalent ideas on aspen succession, saying, "In the west aspen appears to be permanent over large areas owing to the lesser aggressiveness of the conifers (than in the east), but even here there is always a successional tendency working in aspen stands, tending more or less successfully to transform them into conifer stands". Beetle (1961) helped confirm this by stating that - (in Teton County, Wyoming) - "According to the fossil record aspen is as old as lodgepole pine (from early tertiary) but has not been as successful in attaining a clear position of dominance . . . Aspen does not seem to be a subclimax type. On stabilized slides in bentonite outcrops, aspen may be the sole dominant, but when these are disturbed by road building, lodgepole seedlings may be the pioneers". He also added that this may be due, in part, to the fact that aspen cannot reproduce by seed and its severe repression by game animals in this region.

Uses of Aspen: The uses of aspen are relatively few from a commercial standpoint. Fuel, corral posts, barn floors, boxwood, mine props, rail fences, excelsior and matchsticks are those listed by Peattie (1953) and Sampson (1919). The rancher, wildlife manager and watershed manager, however, may consider the aspen stand as being very valuable. Sheep, cattle and goats relish the aspen shoots (Peattie, 1953). Beneath the aspen is usually a luxuriant understory of grasses, weeds and browse that is readily grazed by all kinds of livestock (Sampson, 1919). Moose, elk, beaver, black bears, snowshoe hares, porcupines, deer and cottontail rabbits all include aspen in their diet (Peattie, 1953). Beetle (1962) stated that aspen is intimately woven into the migration paths of elk and into all but their summer forage requirements.

Utilization of aspen in the Yellowstone Park area has been so great that Murie (1944) claimed that aspen groves are on their way out. Beetle (1962) also admitted that depredation of aspen by elk has resulted in the destruction of some aspen stands. Sampson (1919) claimed that utilization of aspen twigs by livestock often badly injures or even kills aspen reproduction.

As a protective cover for the watershed, aspen is probably more valuable than any other tree with which it is found because of its extensive lateral root system (Sampson, 1919).

Understory Vegetation: The species composition of the aspen understory may contain any proportion of grasses, forbs, sedges and shrubs. Houston (1954) said that although the presence of a single dominant - aspen - may suggest uniformity, some 300 species have been identified on aspen ranges and that the combinations of these 300 species are almost limitless.

The herbaceous and shrubby flora associated with aspen is rich and varied, although it does not characterize the community as unique as does the flora of the lodgepole pine community (Beetle, 1961).

Reed (1952) noted several forbs characteristic of the dry and mesic aspen stands described previously. The most conspicuous forbs found on the dry hillsides, but not in the more mesic stands were; Agastache urticifolia, Balsamorhiza sagittata, Erigeron speciosus, Geranium nervosum and Viguiera multiflora. Those forbs that characterize the mesic aspen stand, but are not found on the drier sites include; Angelica pinnata, Delphinium occidentale, Epilobium angustifolium, Hackelia diffusa, Pedicularis paysoniana, Smilacina stellata, Thalictrum fendleri and Valeriana obovata. Those forbs found on both sites are; Aster integrifolius, Helianthella quinquenervis, Lupinus parviflorus, Osmorhiza obtusa, Perideria gairdneri, Senecio serra and Valeriana occidentalis.

Peek (1963) working in southwestern Montana listed the dominant species in aspen groves below 8800 feet as being Thalictrum occidentale, Geranium viscosissimum, Bromus marginatus, Calamagrostis rubescens and Heracleum lanatum.

Beetle (1961) found the following species within the aspen stands of Teton County, Wyoming:

Shrubs
Amelanchier alnifolia
Juniperus communis
Prunus melanocarpa
Rosa arkansana
Shepherdia canadensis
Salix scouleriana
Symphoricarpos albus
Symphoricarpos tetoensis

Grasses
Agropyron subsecundum
Agropyron trachycaulum
Bromus anomalus
Calamagrostis rubescens
Elymus glaucus

Sedges
Carex hoodii
Carex raynoldsii

Forbs
Achillea lanulosa
Actea rubra
Agoseris glauca
Antennaria rosea
Campanula rotundifolia
Epilobium angustifolium
Frasera speciosa
Galium boreale
Geranium richardsonii
Geum macrophyllum
Lupinus parviflorus
Osmorphiza occidentalis
Potentilla gracilis
Smilacine stellata
Thalictrum fendleri
Valeriana obovata

The natural undisturbed understory of the aspen in the intermountain region appears to have consisted of a mixture of tall, succulent forbs, sedges, shrubs and grasses. Among these, the following were conspicuous (Houston, 1954):

Shrubs
Symphoricarpos spp.
Pachistima myrsinites

Grasses
Agropyron trachycaulum
Bromus carinatus
Elymus glaucus

Sedges
Carex spp.

Forbs
Agastache urticifolia
Aquilegia coerulea
Aster engelmanni
Delphinium barbeyi
Heracleum lanatum
Mertensia leonardi
Osmorhiza occidentalis
Senecio serra
Thalictrum fendleri
Valeriana occidentalis

Aspen Openings: Houston (1952) defined an aspen opening as an area of ten acres or less, or those open areas within an aspen stand of a small enough size to be influenced by the aspen canopy. Large differences in species composition, vegetation and litter density and soil conditions often exist between the areas directly under the canopy and the aspen openings. Generally these openings were occupied by the more dwarfed, more drought resistant and less palatable species, but Houston concluded that these open areas produced from three to four times as much forage as the areas directly under the aspen canopy. He attributed this diffence to the root competition by the aspen trees. Houston (1954) considered these openings as key areas - or areas which carried the bulk of the grazing load and further stated that ". . . if these areas are managed as to maintain their soil stability and forage productivity, and improve in condition, the less heavily grazed portions of the range and those less susceptible to damage may also be expected to improve".

Classification as Range Sites

The present classification systems used by the federal and management agencies vary to a considerable degree. The US Forest Service, which has perhaps more aspen lands under its jurisdiction than any other management agency, used a simple "aspen-weed" or "aspen-grass" designation in its classification system, the criteria being whether the dominant species in the understory are such "weeds" as Heracleum, Angelica, Ligusticum or Osmorhiza, or such grasses as Bromus, Agropyron or Elymus. The condition class is based on vegetation, unless the type has deteriorated to such an extent that soil loss is occurring, then soil stability is used to govern the condition class rating (USDA-USFS, 1955).

The Soil Conservation Service based their description of an aspen site on the condition of the aspen alone, the reasoning being that, "When aspen is the dominant tree on the site, the understory of usable forage plants is greater than on the conifer sites of the same woodland soil suitability groups" (USDA-SCS, 1961).

The method employed by the Park Service in Teton National Park is based on the work of Daubenmire (1953), who maintained that any classification system should be based on the climax type because this type best expresses the potential productivity of a given set of environmental factors and because such a classification would best describe the intergrading relationships of all kinds of vegetation patterns (Cole, 1960).

The most complete method for classifying the aspen understory comes from the agency which has less to do with aspen lands than any other mentioned thus far, the Bureau of Land Management. It should also be pointed out, however, that the BLM is more concerned with land management from a range standpoint than are any of the before mentioned agencies. The BLM uses the ocular reconnaissance method (described in Stoddart and Smith, 1955, pp. 172-173) for most of its range surveys. "Any forage in the aspen stand would be set out as to composition, density and given a forage rating". The Deming Two Phase method (described by Vosler, 1962) is used for condition and trend studies (Springer, 1963).

Literature Cited

Baker, F. S. 1918. Aspen as a temporary forest type. Jour. For. 16(3):294-303.

Baker, F. S. 1925. Aspen in the Central Rocky Mountain region. USDA Bull. 1291, 45 pp.

Beetle, A. A. 1961. Range survey in Teton County, Wyoming. Part I. Ecology of range resources. Univ. Wyo. Ag. Expt. Sta. Bull. 376, 42 pp.

Beetle, A. A. 1962. Range survey in Teton County, Wyoming, Part II. Utilization and condition class. Univ. Wyo. Ag. Expt. Sta. Bull. 400, 38 pp.

Beetle, A. A. 1963. Louis E. Coughlin - Wyoming's contribution to the cause of conservation. Jour. Range Mgt. 16(2):99-100.

Bouyoucos, G. J. 1936. Directions for making mechanical analysis of soils by the hydrometer method. Soil Sci. 42:225-228.

Bruce, R. K. 1959. History of the Medicine Bow National Forest 1902-1910. Unpublished MS Thesis, Univ. Wyo. Library, 172 pp.

Cole, G. F. 1960. Vegetation classification. Unpublished paper. Library of Glen F. Cole, Moose, Wyoming, 5 pp.

Curtis, J. T. 1959. The vegetation of Wisconsin. Univ. of Wis. Press, Madison, 657 pp.

Daubenmire, R. F. 1953. Classification of the conifer forests of eastern Washington and northern Idaho. Northwestern Sci. 27(1):17-24.

Ellison, L. 1943. A natural seedling of western aspen. Jour. For. 41(1):767-768.

Featherolf, J. M. 1917. Aspen as a permanent forest type. Jour. For. 15(6): 757-760.

Harlow, W. M. and E. S. Harrar. 1958. Textbook of dendrology. McGraw-Hill Book Co., Inc. New York. 561 pp.

Houston, W. R. 1954. A condition guide for aspen ranges of Utah, Nevada, southern Idaho and western Wyoming. Intermtn. For. & Range Expt. Sta. Res. Paper 32, 17 pp.

Houston, W. R. 1952. A preliminary study of some factors affecting herbage production in the aspen type of central Utah. Unpublished MS Thesis. Univ. of Utah, Ogden.

Larson, C. G. 1944. More on seedlings of western aspen. Jour. For. 42(6):452.

Little, E. L. Jr. 1953. Check list of native and naturalized trees of the U.S. (including Alaska). Agr. Handbook 41. USDA, 472 pp.

Montgomery, D. H. 1959. A phenological study of aspen in the Medicine Bow Mountains. Unpublished Plan B. paper. Univ. Wyo. Library. 25 pp.

Murie, A. 1944. Our big game in winter. 9th N. Amer. Wildl. Conf. Rept. 173-176.

Peattie, D. C. 1953. A natural history of western trees. Houghton-Mifflin Co., Boston. 751 pp.

Peek, J. M. 1963. Appraisal of a moose range in southwestern Montana. Jour. Range Mgt. 16(5):227-231.

Reed, J. F. 1952. The vegetation of Jackson Hole Wildlife Park, Wyoming. Amer. Mid. Nat. 48(3):700-729.

Sampson, A. W. 1919. Effect of grazing upon aspen reproduction. USDA Bull. 741, 29 pp.

Springer, R. J. 1963. Personal communication.

Stoddart, L. A. and A. D. Smith. 1955. Range management. McGraw-Hill Book Co., Inc. New York. 433 pp.

Strain, B. R. 1961. Physiological ecology of Populus tremuloides. Unpublished MS Thesis. Univ. Wyo. Library, 62 pp.

Sudsworth, G. B. 1934. Poplars, principal tree willows, and walnuts of the Rocky Mt. Region. USDA Tech. Bull. 420, 111 pp.

USDA-SCS. 1961. Woodland site descriptions - Aspen. Sec. 11-F. Woodland. Statewide Wyoming, 2 pp.

USDA-USFS. 1955. Condition class scorecard. Aspen-weed (sheep) 4 pp.

Vosler, L. C. 1962. A review of the two phase range survey method. Unpublished paper. Range Mgt. Library, Univ. of Wyo. 9 pp.

Williams, C. 1963. Ecology of bluebunch wheatgrass in northwestern Wyoming. Unpublished Ph.D. Thesis. Univ. of Wyo. Library, 90 pp.