It may be difficult to aggregate forage values to seral stage at the national level of reporting without segregating the seral stages to the sites; however, it may be possible to indicate percentages of the seral stage acreage that are in different forage value classes and meeting management objectives. Again, the main values of resource value ratings are as an aid or tool to better identify and analyze impacts, outputs, values of a variety of resources; to improve objective setting and monitoring; and also to display and communicate tradeoffs, management objectives, and accomplishments.

In 1984, BLM established a work group to consider procedures for resource value ratings as they relate to livestock grazing. BLM has since recommended to the SCS that further work on resource value ratings for livestock grazing be accomplished as part of the National Range Handbook rewrite. The intent is to strive for interagency development and adoption of the procedures.

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Rangeland Vegetative Succession—Implications to Wildlife

Robert R. Kindschy

In 1928, Frederic Clements, in his epoch work "Plant Succession and Indicators" stated: "The nature of the climax as the final condition of the vegetation of a climatic region—through a climatic period—makes unavoidable its use as the primary basis for the classification of existing seres."

Oosting, in 1950, further observed: "Plant communities are never completely stable. They are characterized by constant change, sometimes radical and abrupt, sometimes so slow as to be scarcely discernible over a period of years. These changes are not haphazard, for within a climatic area, they are predictable for a given community in a particular habitat. This means, of course, that similar habitats within a climatic area support a sequence of dominants that tend to succeed each other in the same order. Contrasting habitats do not support the same sequence of communities. As a result, any region with several types of habitats will have an equal number of possible successional trends".

Robert Kindschy has been associated with the range management and wildlife habitat programs of the Vale district of the Bureau of Land Management in southeastern Oregon since 1958. His address is P.O. Box 700, Vale, Ore. 97918.

Pronghorn of the tall sagebrush-dominated Great Basin often benefit from reduction in brush overstory.

Forest succession has been observed for a long period of time. Implications to wildlife are well known to Idaho ecologists due to the well documented relationship of elk to the early successional seres following the extensive forest fires in north-central Idaho during the early part of this century. The more subtle changes in rangeland vegetation were less apparent. Surely wildfire played a major role in the successional disturbance of our intermountain rangeland ecosystems. Dr. Peter Mehringer of Washington State University (in press) has examined sediment deposition in several small, permanent, lakes in southeastern Oregon. It is apparent, based upon the abundance of pollen, that the grasses dominated for periods of time—followed by a dominance of the sagebrush species. The pattern was cyclic and probably indicative of periodic climatic changes as well as the occurrence of wildfires after which natural successional advancement enabled the establishment—and perhaps dominance of the climax shrub—sagebrush.

Recent investigations (Heady and Bartolome 1977) and research on relic sites in the intermountain West leave no doubt that sagebrush is one of the so-called "climax" species within these communities. It is probable—depending on the specific site—that sagebrush provided an average of <25% ground cover under pristine conditions.

These facts are important because our native wildlife species evolved within these environments. Normally we are dealing with between 200 and 300 species of vertabrate animals when the "non-game" species are considered. Each species, or more accurately groups or "guilds" of these varied species, have habitat preferences. Some are obligatory to certain habitat conditions—without which they disappear from the local fauna. Perhaps the sage grouse is the most cited example although Brewer's sparrow, sage thrasher, and other species of birds, mammals, and reptiles are equally obligatory to the presence of sagebrush.

Conversely, other species such as some ground squirrels, horned lark, and meadowlark prosper in habitats nearly devoid of sagebrush. The pronghorn antelope, although dependent on sagebrush for forage during winter, was evidently restricted by the superabundance of excessively tall and dense brush prevalent in much of the Intermountain West. I have done a good deal of work with this species within the Vale District of the Bureau of Land Management. Pronghorn habitat is marginal in southeastern Oregon and apparently always has been. Early reports and census data show numbers in the hundreds. In fact, prior to the Vale Project, an extensive vegetative manipulation and water development effort conducted between 1962 and 1973, the winter count of pronghorn averaged less than 1,000. Two habitat limitations were apparent: The prevalence of sagebrush of excessive height and a scarcity of drinking water. The project eased both limitations. Pronghorn responded dramatically with the present census counts in the range of 3 to nearly 5 thousand.

Crested wheatgrass seedings in the Rome area of southeastern Oregon normally winter herds of pronghorn and mule deer. Autumn green-up is typical and adjacent range supports a variety of shrubs and forbs.

Wildfire used to play a significant role in providing "prairie" habitats for pronghorn prior to the extensive grazing of domestic livestock. The latter effectively removed much of the fuel annually which greatly limited the occurrence of extensive range fires and thus allowed successional advancement of sagebrush, juniper, and other fire intolerant species. It is important to note, however, that mule deer, once quite uncommon to most ranges in the Intermountain West, benefitted greatly from the change from grassland to brushlands. Of course additional factors associated with the livestock industry helped the mule deer population increase: examples include hay meadow development, salting, and increased drinking water distribution.

Perhaps one of the most illustrative portrayals of successional implications was one that Chris Maser used in several of his lectures during the mid-1970's: "Think of an ecosystem as though it were a play, complete with stage, props, and actors. As plays are governed by scripts, so ecosystems are governed by biological principles that differ only in the degree of magnitude with which they affect a given system. The living components of an ecosystem are the plant and animal communities. These communities progress through a series of successional stages, or acts, from pioneering through climax. The term 'successional stage' was coined by botanists and is generally considered only in terms of plants. However, a successional stage has two components—plants and animals. As the plant community changes, so does the animal community. These changes are predictable. Wildlife does not respond to the species composition of a plant

Blacktailed jackrabbits are obligatory to sagebrush range in early to middle successional stage. A principal prey species, their abundance may affect the welfare of numerous buffer prey species.

community or a successional stage per se. Wildlife responds primarily to the structure of the plant community or stage. In other words, a plant community or successional stage has two components—its structure and its function. The function of a plant community or successional stage is the use that wildlife make of it."

These predictive responses were developed by Maser and Jack Ward Thomas, in collaboration with other ecologists, in the book *Wildlife Habitats in Managed Forests—the Blue Mountains of Oregon and Washington* (1979). A subsequent treatment of rangeland communities is nearing completion. A series of chapters have been released concerning featured wildlife species and special habitat features. All appear under the main title of *Wildlife Habitats in Managed Rangelands—The Great Basin of Southeastern Oregon.* These unique and excellent guides are applicable to the majority of the sagebrush habitats of western North America.

I have mentioned case histories of the pronghorn and mule deer as occupying somewhat opposite poles of the spectrum insofar as rangeland succession is concerned. Perhaps additional illustrations will show the complexity of the role succession may well play in wildlife resources. I should add, at this point, that the following is my own conjecture and may, or may not, be shared by other biologists.

Some 22 years ago a lightning-caused fire burned several thousand acres immediately south of Vale. The site had supported a typical early successional stand of cheatgrass, mustard, and a Wyoming sagebrush overstory. We drilled crested wheatgrass into suitable sites and were successful in establishing a good stand with the passage of time. Townsend ground squirrels had been occasional residents of the area but—what with an unlimited forage supply and favorable soils for denning—proliferated to extremes never before seen. This species is normally quite cyclic in population but

Townsend ground squirrels have prospered in sagebrush-free rangelands, especially in crested wheatgrass seedings. Their abundance seems to be paralleled by that of ferruginous hawks and other raptors.

under these seemingly ideal conditions the population "peak" persisted for 14 years. Ground squirrels afford an excellent prey base for many carnivores, including raptors. A population of ferruginous hawks (a species of concern due to comparative rarity) became breeding residents and fledged more successfully than heretofore observed by avian biologists (Lardy 1980). Eventually, in 1982, disease (most likely plague) decimated the squirrels. The hawks and other predators thinned correspondingly to areas of better foraging. The point is that successional change in vegetation due to fire and, in part, to the introduction of an exotic perennial grass, set the stage for a prey species which ultimately benefitted a favored predatory species.

Sage grouse may locally be a part of a more complex successional interrelationship of plants and animals. Researchers have documented repeatedly that the most prevalent problem with sage grouse is a lack of recruitment. The adults breed but young do not survive to replace the normal mortality of aged adults. Predation is highly suspect as the principal cause of this juvenile loss. Some predation by hawks, eagles, crows, ravens, magpies and other avian species has been recorded. Mammalian predation may also play a role from coyote, bobcat, badger, and other species. Why is this? What has changed to cause this increased impact of predation on sage grouse? In our area of southeastern Oregon the population of blacktailed jackrabbits has been very low to almost absent since the completion of the Vale Project and the intensive range management which all the seedings, fences, water developments, and related management facilities enabled. The range has definitely experienced successional advancement toward climax resulting in more perennial grass and forb species and less brush overstory; coupled with this are the associated zoologic successional changes. Blacktailed jackrabbits are best suited to early successional seres. Their habitat has changed from what had been good to excellent to that which is poor and very restrictive. Dependent predators, however, have shifted to other prey bases, the so-called "buffer species," of which the sage grouse may qualify. It would be interesting to observe sage grouse chick survival at a time when jackrabbits were once again abundant. Everything in the ecosystem is "hooked together"!

Range management has seemingly always professed a singular goal of "improving range conditions". While this is admirable, it surely must be qualified—improved range conditions for what? We can no longer speak of range conditions as being "poor, fair, good or excellent"; rather we must speak of the successional sere or stage as "early, middle, late or climax" or intergradations thereof. This is also politically good. No one would want to design management schemes for a "poor" or even a "fair" condition range. Yet many wildlife species require succession in the "mid" stage. In fact, I believe maximum diversity of habitat and the associated wildlife diversity normally occurs at the mid or mid-late successional sere.

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Evaluation of Resource Values in the Northern Region of the Forest Service

Wendel J. Hann.

A resource value rating is considered to be the value of a unit of land for a given resource. This resource may range from livestock carrying capacity or diet quality to elk habitat value. Rangelands of the National Forest and Grasslands of the Northern Region, which includes northern Idaho, Montana, North Dakota, and northwestern South Dakota, contain a large amount of variability in both vegetation and site characteristics. Variability of the site potential for a given land unit can be stratified by mapping habitat types (Daubenmire 1952). This stratification produces land units that will produce one type of potential natural community and contain relatively uniform physical site characteristics. These land units are further stratified by type of existing vegetation and suitability for the resource use. The ecological status of the land unit is determined by comparing the composition and structure of the existing vegetation with the potential natural vegetation for the habitat type. This comparison is used to rate the plant community into the early seral, mid seral, late seral, or potential natural stage for the habitat type.

The author is ecologist, Range, Watershed, and Ecology Staff Group, Northern Region USDA Forest Service, Box 7669 Federal Building, Missoula, Mont. 59807.