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WILDLIFE HABITATS IN MANAGED RANGELANDS-- THE GREAT BASIN OF SOUTHEASTERN OREGON

INTRODUCTION

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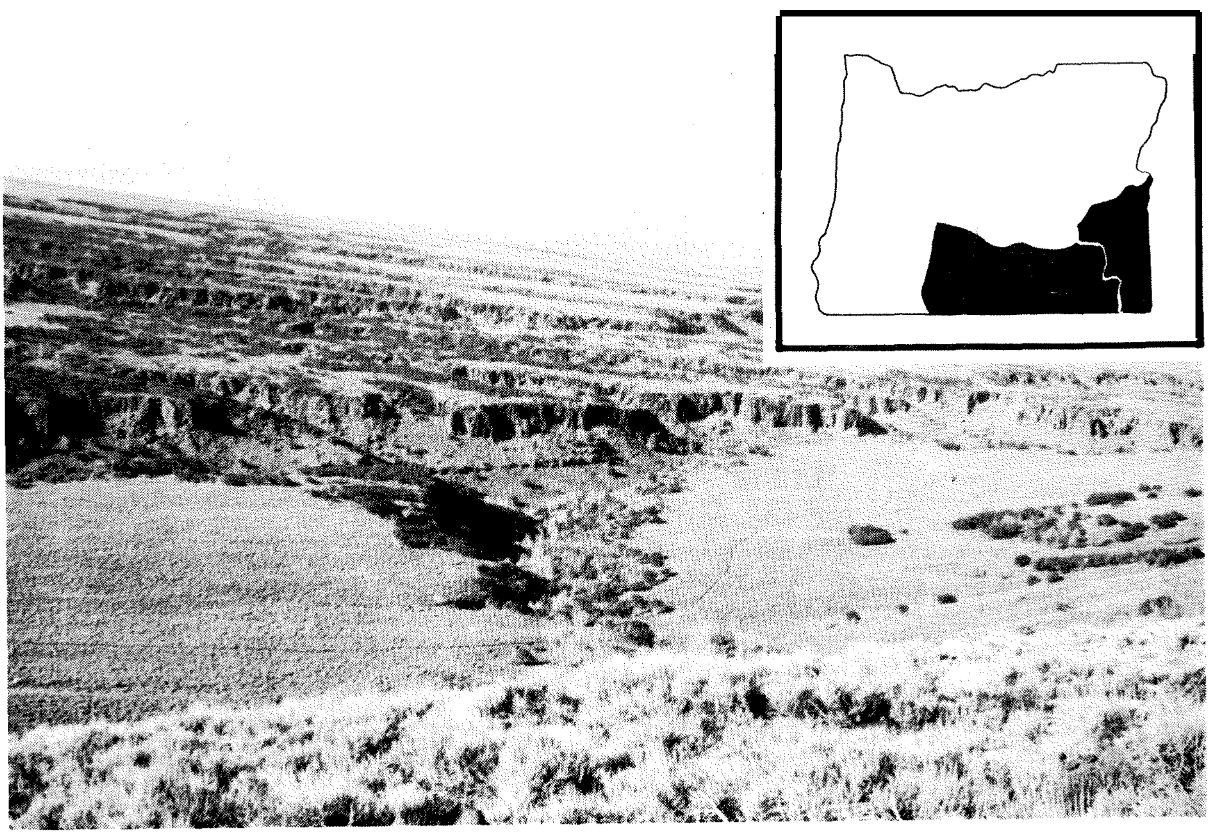

PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION

ABSTRACT

The need for a way by which rangeland managers can account for wildlife in land-use planning, in on-the-ground management actions, and in preparation of environmental impact statements is discussed. Principles of rangeland-wildlife interactions and management are described along with management systems. The Great Basin of southeastern Oregon was selected as a well-defined area for which to develop and display the rangeland-wildlife management principles. This paper introduces the 14-chapter series and outlines each briefly.

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This publication is part of the series Wildlife Habitats in Managed Rangelands-The Great Basin of Southeastern Oregon. The series on rangelands is adapted from "Wildlife Habitats in Managed Forests-the Blue Mountains of Oregon and Washington" (Thomas 1979), and though parts of the series on rangelands resemble those on the forest, others are completely new. The series provides range managers with information on wildlife and its relationship to habitat conditions in managed rangelands.

The setting for this series of papers is the Great Basin of southeastern Oregon-the Basin and Range and Owyhee Upland Provinces of Franklin and Dyrness (1973) (fig. 1). The information is specific to the Great Basin of southeastern Oregon and is generally applicable to the shrub-steppe areas of the Western United States. The principles and processes described, however, are generally applicable to all managed rangelands.

The series includes 14 separate publications. Although each part is an independent treatment of a specific subject, when combined in the sequence in which they appear on the inside back cover, the individual parts will be as chapters in a book.

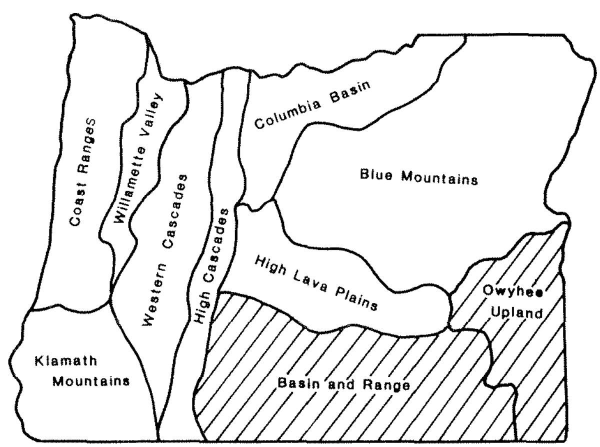

Figure 1 .-The physiographic and geological provinces of Oregon (after Franklin and Dyrness 1973). The shaded portion is the area referred to in this report as the "Great Basin of southeastern Oregon."

Wildlife Habitats in Managed **Rangelands—** The Great Basin of Southeastern Oregon is a cooperative effort of the U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station, and the U.S. Department of the Interior, Bureau of Land Management, Oregon State Office.

Introduction

Until a few years ago, a rangeland manager's only concern with wildlife was with “predators” and “big game.” The law neither recognized nor required an accountability for wildlife. But times, laws, public demands, and politics have changed. Public rangelands are now considered a prime supplier of livestock and recreation. In fact, they are becoming ever more intensively managed to meet the Nation's burgeoning demands for minerals, water, recreation, grazing, and wildlife. Rangeland managers are under increasing pressure to account for wildlife in management activities, particularly land-use planning. And wildlife means all species-not just species that are hunted, or are esthetically pleasing, or are classified as threatened or endangered. Specific responsibilities for protection and enhancement of wildlife habitats on managed rangelands have been set forth by Federal laws and other legislation. This series of publications is designed to help managers deal more effectively with these new responsibilities.

In turn, the managers are asking more and tougher questions about how range management practices will affect wildlife. The response of wildlife biologists too often varies from “Don't do it” to “We don't know enough to give you an answer.” Neither response helps a manager make the necessary evaluations and decisions, and to do nothing is seldom a realistic alternative-economically, politically, or biologically.

Although we probably will never have enough knowledge to make a perfect analysis of the impacts of rangeland management action on wildlife habitat, more information is available than has been used. To be useful, however, it must be organized to make sense biologically and in terms of livestock management.

Past wildlife management in rangelands has been considered from a limited viewpoint in that single species or small numbers of species have been studied and planned for. As a result, wildlife biologists and range specialists have been able to effectively evaluate the impacts of management on only a few species of wildlife.

Perhaps the greatest challenge to professionals engaged in range research and management is to organize knowledge and insights into analytical tools and management strategies that can be readily applied. We began by asking a simple question. What do rangeland managers do that affects wildlife? They manage habitat. Every decision a manager makes that changes the landscape alters wildlife habitat. Habitat is an entity that can be qualified and quantified and for which a manager can be held accountable. And because maintenance of appropriate habitat is the foundation of all wildlife management, it is the key to organizing the knowledge about wildlife so it can be used in managing rangelands. We provide a framework for planning that uses habitat as the key to managing wildlife and thereby makes managers accountable for their actions.

The information presented is a reasonable facsimile of the way managed rangelands and wildlife interrelate. The series may be considered a working hypothesis. It is a place to start-a way to derive responses to questions for which there are no certain answers. As Taylor (1956, p. xi) said: “no . . . book dealing with living creatures is in any sense final. The subject . . . is so fascinatingly complicated that no contribution can be . . . more than a progress report.”

Much of the Nation's vast rangelands have changed dramatically in the last 200 years. They can no longer be considered wild because they are now managed to produce multiple benefits, dominated by livestock production but including wildlife. Private lands, of course, are managed to meet the owner's objective-usually production of livestock. Management to enhance livestock production alters wildlife habitat more than any other range management activity.

This series has three purposes: (1) to develop a common understanding of wildlife habitats on managed rangelands; (2) to provide a system for predicting the impacts of range management practices on wildlife; and (3) to show how the system can be applied to a specific area-in this case, the Great Basin in southeastern Oregon.

With the information provided, resource specialists can work together to assure the continued existence of most, if not all, wildlife habitats in managed rangelands.

Livestock management and wildlife habitat management are compatible on public rangelands, but only if the needs of wildlife are recognized and accounted for along with the needs of livestock. Their compatibility can be realized through a better understanding of plant and animal communities, how they change over time, and how they respond to livestock grazing and vegetative manipulation.

By long-standing agreement, the manipulation of nonmigratory wildlife populations or regulation of the harvest of such wildlife on federally managed land is the prerogative of the States. Habitat management on public land is the responsibility of the agencies assigned to manage federally owned lands. Close cooperation is therefore required in setting and achieving wildlife management goals because management of wildlife on public lands is the joint responsibility of both State and Federal governments.

Wildlife as a Product of Rangeland Management

Management of rangelands is the process of controlling the environment to produce a mix of desired products. That mix changes with time, economic conditions, and capability of the land. Congress, through laws, determines what these products, including wildlife, on public lands shall be (fig. 2). The "granddaddy" law of public rangelands was the 1934 Taylor Grazing Act, which directed the Secretary of the Interior to preserve wildlife (Bean 1977). A number of laws (fig. 2) specify or intimate that wildlife shall be a product of Federal lands and that wildlife shall be considered in every management decision. Other regulations result from agency and court interpretations of these laws. Managers of State lands and private landowners are influenced by applicable State laws.

Wildlife habitat, on most managed rangelands, has been a byproduct of management to enhance production of livestock. As demands have grown for the products of rangelands, it has become obvious that such cliches as "good range management is good wildlife management" will no longer suffice. Passage of the National Environmental Policy Act of 1969 (U.S. Laws, Statutes, etc.; Public Law 91-190) required that the environmental effects and trade-offs of any federally financed project must be fully evaluated.

The Need

How is a public rangeland manager to balance demands for rangelands, including wildlife, and still maintain a sustained yield of livestock forage? How can managers account for the needs of all wildlife? In seeking answers to these questions, the wisdom of two of Commoner's (1971) "laws" of ecology becomes apparent-"everything is connected to everything else," and "there is no such thing as a free lunch." Any action that alters vegetation has an influence on wildlife habitat and, in turn, on wildlife. If wildlife is of concern, goals for wildlife must be established and all management actions must be judged against those goals. Rangeland managers must not be solely livestock managers. They must take a more holistic view.

The Federal Land Policy and Management Act of 1976 (U.S. Laws, Statutes, etc.; Public Law 90-2743) requires that detailed and holistic plans be prepared for the management of public rangelands. Further, the National Environmental Policy Act of 1969 (U.S. Laws, Statutes, etc.; Public Law 91-190) requires that the environmental impacts and consequences of planned actions involving Federal funds be examined and revealed. One of the weakest aspects of such planning has been the inability of managers to predict the effects of management alternatives on wildlife populations. This has frequently resulted in criticism of land-use plans and environmental impact statements by the public, other agencies, and the courts.

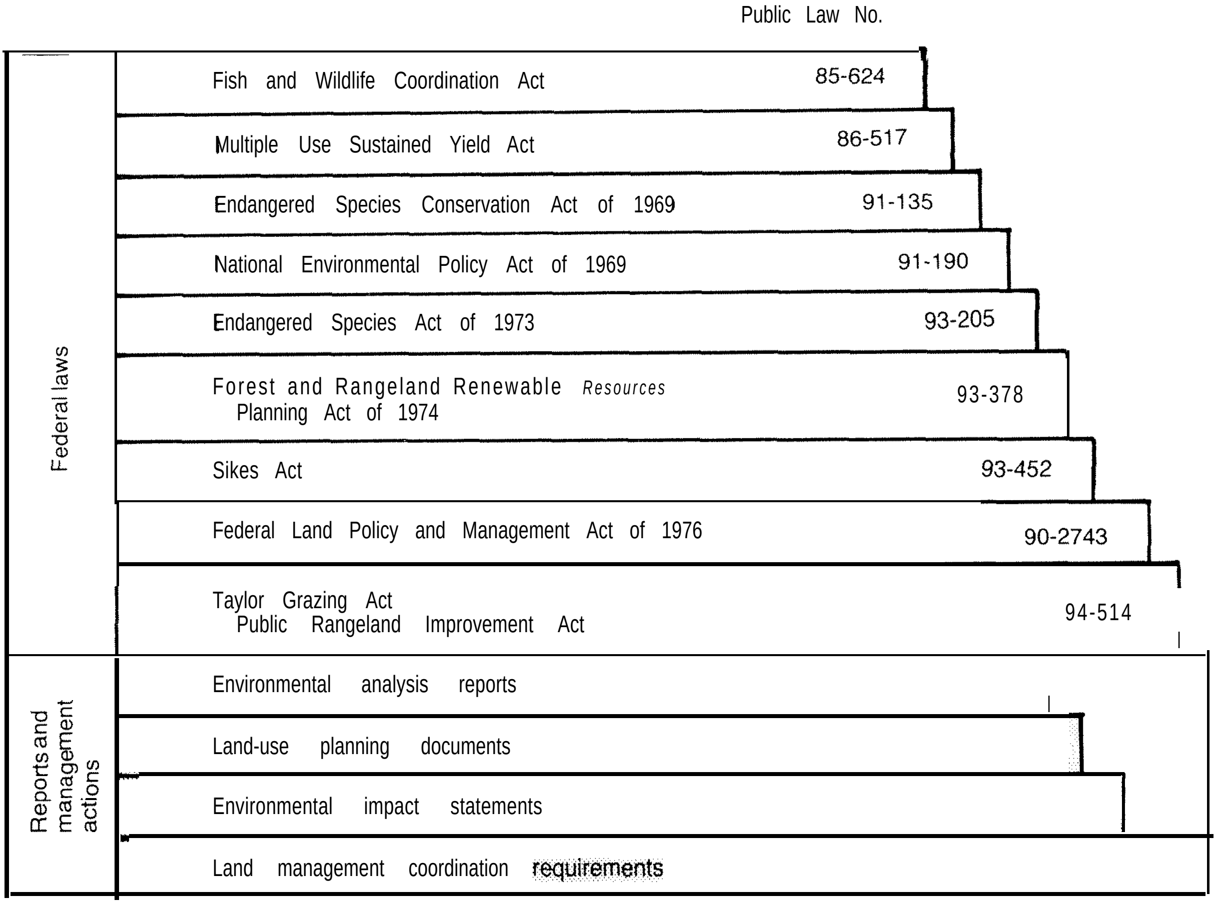

Figure 2.—Some major Federal laws and planning requirements that influence wildlife habitat management on public lands (adapted from Thomas 1979).

General criticism of rangeland management and land-use planning by conservationists and wildlife biologists does little to help wildlife. What will help are better techniques to predict the consequences of management on wildlife, whether good or bad. Managers need a conceptual framework that will enable them to: (1) account for habitat needs of all vertebrate wildlife, (2) emphasize management of particular wildlife species, and (3) identify habitats that require special attention. The greatest challenge is to integrate existing information so it can be readily used in resource planning. Giles (1962, p. 404-405) described the problem as follows:

> Certainly, research is needed, but while waiting, we need to work with what we have. Work to be done is not for the research staff, but the management team who sees the needs, recognizes limitations, and can make modifications to fit existing conditions. The "applied ecologist" needs to start applying.

Development of a process to consider the impacts of management on wildlife is needed. Land-use planning continues at full speed; large-scale conversions of sagebrush-dominated rangelands to crested wheatgrass and other species are being contemplated and implemented; and the demand for increased forage production (that is, increased livestock grazing) from public lands is incessant. Some say it is too soon to undertake such a task, that there is too little “hard” data. But there are really only two choices-too soon or too late. The first is preferable. With intensified management of rangelands, impacts on wildlife are magnified. We need to get on with the job.

Managers need more flexibility in applying technical information to local situations. The information is presented as a system to predict the consequences of management alternatives on wildlife, rather than as specific guidelines. Thus, a manager has the ability to respond to particular situations while being fully accountable for the impacts of such decisions on wildlife habitat. Managers can survey alternatives, make trade-offs, and account for those decisions.

A Basic Assumption

A basic assumption about wildlife habitat in rangelands managed for multiple use is that management must be carried out in coordination with livestock management. On public rangelands in the Great Basin of southeastern Oregon, as in many other parts of North America, livestock production is the dominant land use. Large-scale alterations of wildlife habitat usually result from the manipulation of vegetation primarily to enhance livestock production. Management for livestock production, therefore, is de facto wildlife management. The degree to which it is good wildlife management depends on how well habitat is manipulated to achieve wildlife goals. These interrelationships are shown in figure 3.

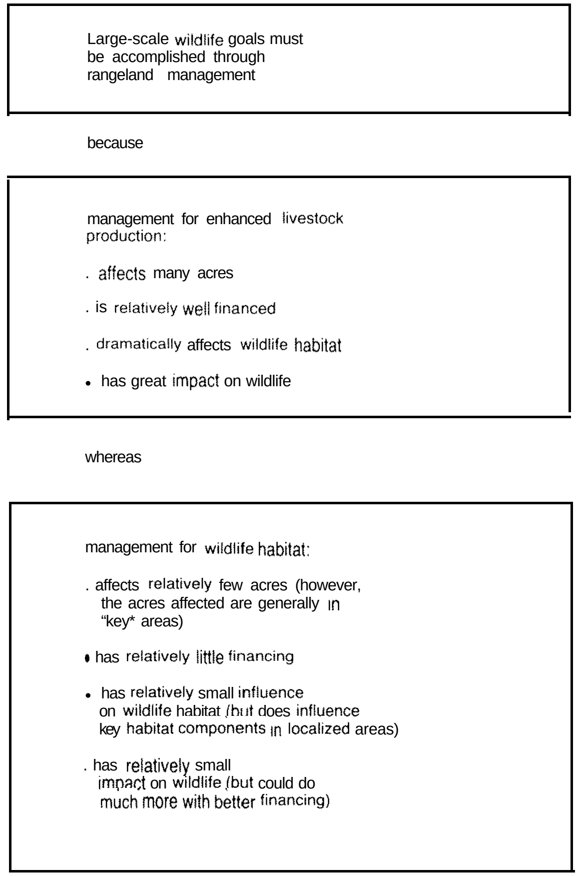

Figure 3.-Large-scale management of wildlife habitat must be mainly accomplished through range. land management (adapted from Thomas 1979).

Wildlife habitat management may require control of vegetation, but this is usually too expensive solely for wildlife purposes. There are exceptions, however, such as the establishment of special watering sources and protection of particular habitats from livestock grazing. Management practices undertaken to enhance livestock production can cause dramatic changes in wildlife habitat; these practices, when correctly planned and executed, can be a practical way to achieve wildlife habitat goals.

A wildlife biologist is normally responsible for making the manager aware of the ramifications of proposed management activities on wildlife habitats. A manager normally considers advice from many staff specialists and selects a course of action. But it is the field range specialist who actually manipulates the vegetation and alters habitat. It is therefore essential that range managers, range specialists, and wildlife biologists work closely together.

To paraphrase Giles (1962, p. 406), it is time to concede that the production of livestock has more intense, widespread influence on wildlife than any technique applied by a wildlife biologist to enhance habitat. In one large-scale manipulation of vegetation to enhance forage production for livestock, a rangeland manager can influence more habitat over a longer time than a wildlife manager, acting alone with current levels of funding, can create in a decade. Wildlife biologists, to be really effective, must simultaneously realize the potential of these rangeland manipulations to enhance forage for livestock and must increase their effectiveness in obtaining modifications in these practices to make them the least damaging, or even to enhance wildlife habitat.

Principles of Rangeland-Wildlife Management

Resource management professionals come from varied backgrounds: range management, ecology, geology, wildlife biology, fisheries biology, engineering, animal husbandry, and landscape architecture, to name a few. To work together, they need a common vocabulary and understanding of range management principles, plant and animal ecology, and wildlife management. The relationship between terms used in range and wildlife habitat management is shown in figure 4. Touched on by Odum (1963), Leopold (1933), and Hylander (1966), these definitions are mainly from Thomas (1979).

Habitat is the place where an animal finds the required arrangement of food, cover, and water to meet its biological needs. Each species is adapted to a **habitat niche** or specific arrangement and amount of food, cover, and water. The role a particular wildlife species plays in the environment is referred to as its **ecological niche.**

A **plant community type** is a unique combination of plants that occurs in particular locations under certain environmental influences. The plant community type reflects the environmental influences of the site, such as soil, temperature, elevation, solar radiation, slope, aspect, and rainfall as they influence vegetation (Daubenmire 1976).

Plant communities, as described in chapter 2 (Dealy et al. 1981), are defined in terms of dominant overstory and understory species of climax vegetation. Several plant community types may be included. A plant community evolves through a general series of conditions as it progresses from bare ground to **climax** stage. This process is called **succession,** and the various stages are known as **successional stages.** But in rangeland communities in which the vegetation is manipulated, singly or in combination, by fire, mechanical means, herbicides, and ungulate grazing, succession is commonly so radically modified that when a relatively stable state is maintained by people or their domestic animals it can be called a stage of **disclimax** (= disturbance climax) or **anthrogenic subclimax** (= human generated) (Odum 1971). In this series, these disclimax states are referred to as **structural conditions.**

Each combination of a plant community and a successional stage or structural condition produces a unique set of habitat niches. The wildlife supported by these habitat niches make up the attendant **animal community.** The animals fill various ecological niches and, in turn, influence the plant community. Individual species may use a particular habitat on a seasonal or a yearlong basis. See also reviews of Meslow and Wight (1975) and Thomas et al. (1975).

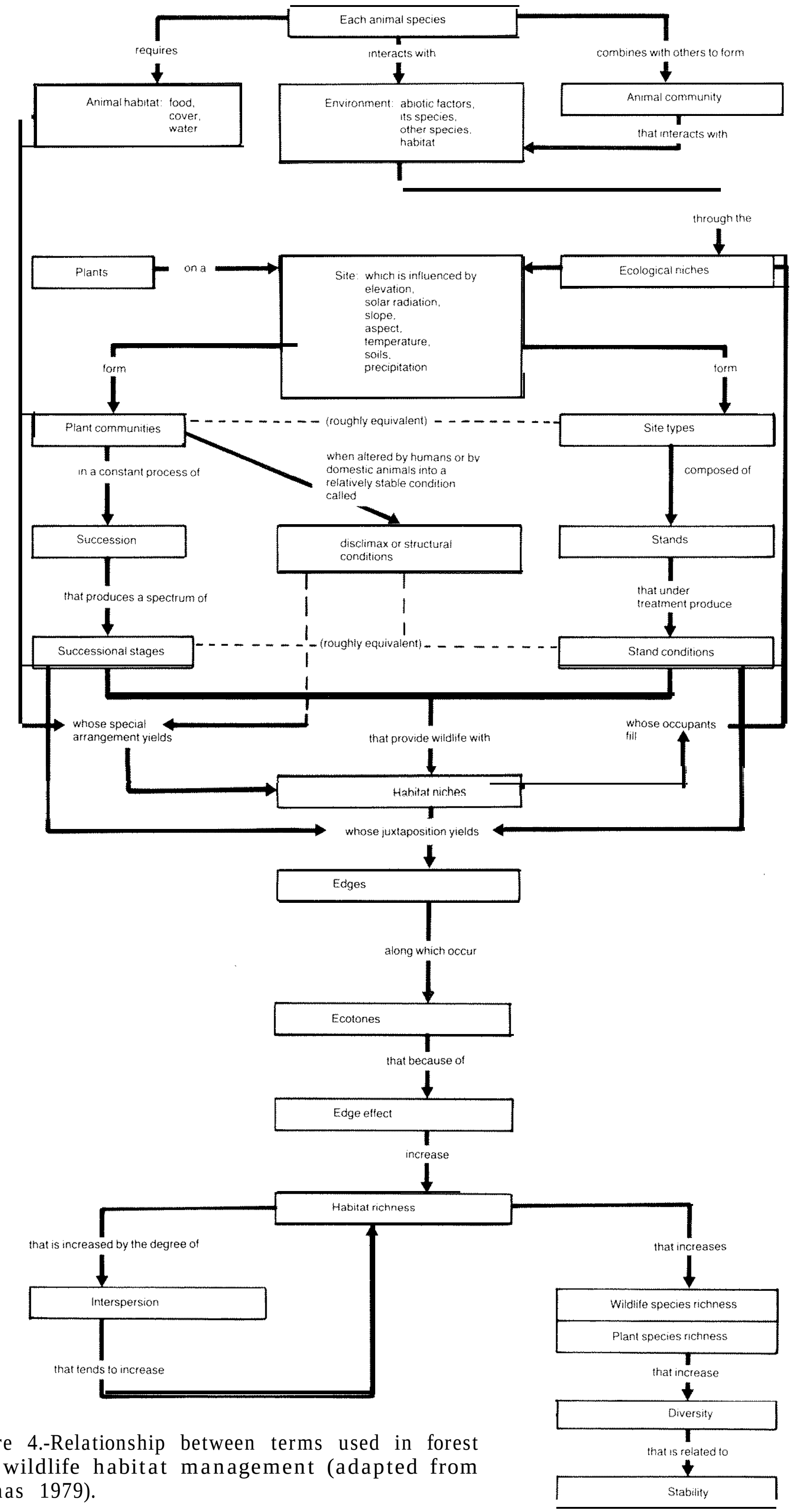

Figure 4.-Relationship between terms used in forest and wildlife habitat management (adapted from Thomas 1979).

Some of the terms already discussed have counterparts that are used primarily in range management. It is important to understand their relationship to the language of ecology and wildlife biology.

A site is an area considered in terms of its environment, particularly as this determines the type and quality of the vegetation the area can support. Sites are qualitatively classified into site types by their climate, soil, and vegetation. Site type is roughly analogous to the plant community.

Each site is occupied by one or more stands. A stand is a plant community that has sufficient uniformity of composition, size, density, age, spatial arrangement, and condition to distinguish it from adjacent communities. Stands are the common basis on which prescriptions to manipulate vegetation are considered. The stand condition can be described by measuring these factors. Manipulation of vegetation alters stand condition. When wildlife habitat is considered, stand condition is roughly analogous to successional stage or structural condition because both reflect the composition and structure of the stand.

The juxtaposition of plant communities, successional stages, or stand conditions within communities produces edge. The area where communities or successional stages overlap or produce a distinct combination of plants or structure is called the ecotone. Edges and their ecotones are rich habitat for wildlife because they have attributes of the edge itself plus those of the adjoining communities or successional stages (Leopold 1933). The influence of this phenomenon on animal populations is called edge effect.

Increasing the amount of edge increases habitat richness, which is a measure of the number of wildlife species resident within an area. Interspersion is a measure of the degree to which plant communities or successional stages mix. An increase in interspersion increases the amount of edge. In turn, this may increase diversity or the variety that exists in plant and animal communities (Patton 1975). Increased diversity in plant communities provides an increasing number of habitat niches that, in turn, support more animal species. A rangeland with a high degree of diversity of communities and successional stages provides habitat for a wide variety of wildlife (Odum 1971).

Increased diversity is thought to be related to community stability. Stability is the ability of a community to withstand catastrophe (Margalef 1969) or to return it to its original state after severe alteration. Diversity is assumed to provide flexibility to managers by insuring resilience to recover from disturbance to the "system." Such a cause and effect is suspected but has not been proved. Odum (1971, p. 256) stated:

> If it can be shown that biotic diversity does indeed enhance physical stability in the ecosystem, or is the result of it, then we would have an important guide for conservation practice. . . . is variety only the spice of life or is it a necessity for the long life of the total ecosystem comprising man and nature?

A rangeland ecosystem is a dynamic complex of plant and animal communities, along with the abiotic environment that comprises one functioning whole. Any change in vegetative structure or composition will favor some wildlife species while adversely affecting others. Such changes can affect the number and type of wildlife species and their use of habitat.

Rangeland-Wildlife Management Systems

Wildlife management is the scientifically based art of skillfully controlling habitat to enhance conditions for a selected species or of manipulating animal populations to achieve other desired ends (fig. 5). The term "wildlife management" implies the ability and managerial flexibility to control habitat factors or animal populations, or both (Giles 1971, Leopold 1933, Trippensee 1948).

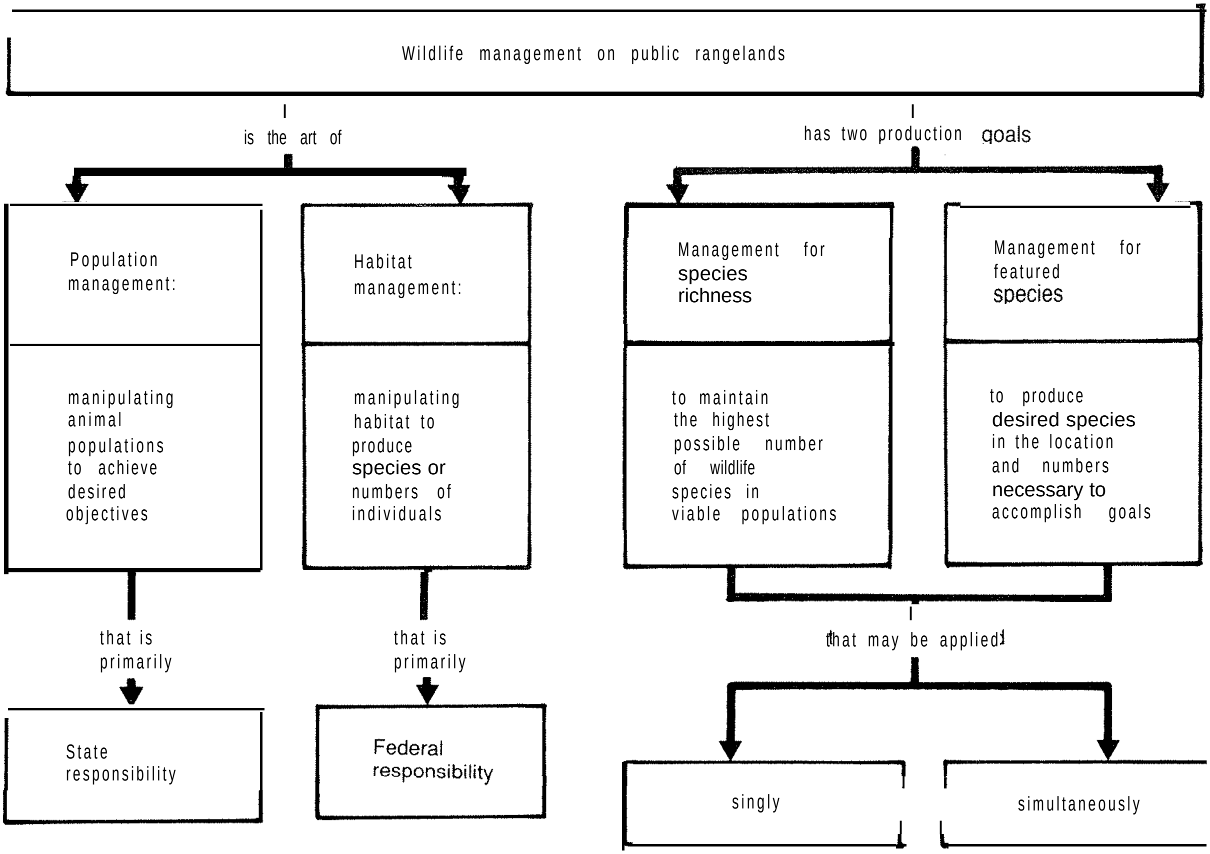

Figure 5.—The art and goals of wildlife management on public rangelands (adapted from Thomas 1979).

There are two general production goals in wildlife management-management for species richness (Evans 1974; Siderits 1975; USDA Forest Service 1973, 1975) and management for featured species (Holbrook 1974, USDA Forest Service 1971, Zeedyk and Hazel 1974) (fig. 6).

The goal of management for species richness is to insure that most resident wildlife species are maintained in viable numbers in the managed area (King 1966). Hence, all species are important. Management for species richness can be achieved by providing a broad spectrum of habitat conditions; characteristic stages or structural conditions of adequate size of each plant community should be represented in the vegetative mosaic. It is therefore necessary to have information on the habitat needs of each species. This must then be incorporated into guides to protect the integrity, stability, and diversity of the rangeland ecosystem. The result should be a relatively stable and varied wildlife population.

Under management for featured species, the goal is to produce selected species in desired numbers in specific locations. This can be achieved by manipulating vegetation so the limiting factors of food, cover, and water are made less limiting for the desired species. These may be game species, threatened or endangered species, or species that have particular esthetic value.

Production goal	Management for species richness	Management for featured species
Objective	Insure that all resident species exist in viable numbers. All species are important.	Produce selected species in desired numbers in designated locations. Production of selected species is of prime importance.
Process	Manipulate vegetation so that characteristic stages of each plant community are represented in the vegetative mosaic.	Manipulate habitat factors so that limiting factors are made less limiting.

Figure 6.—Production goals in wildlife management (adapted from Thomas 1979).

Management for featured species has also been called "key-species management" or "indicator-species management" if the species selected represents the habitat needs of several species. If the species to be featured are carefully selected and their habitat needs vary widely, then management for featured species will also insure habitat diversity. The result can be similar to management for species richness.

The two management systems can also be simultaneously used to insure species richness while favoring selected species in specific locations for particular purposes. For example, management for species richness can be accomplished by providing an approximate mix of successional stages or stand conditions (structural conditions) within each plant community. Management for featured species can be accomplished by arranging stand size and successional stages to provide both cover and forage for selected species.

Rangelands are managed-that is, the vegetational composition and structure are controlled-through one or a combination of the following: (1) shrubs are controlled by mechanical means, herbicides, or fire; (2) controlled areas are frequently seeded with grasses, forbs, and shrubs palatable and nutritious for livestock; and (3) grazing management, defined as ". . . manipulation of livestock grazing to accomplish a desired result" (Kothmann 1974, p. 36), is employed. Grazing management may include deferred grazing or use of a grazing system that is defined as "a specialization of grazing management which defines systematically recurring period of grazing and deferment for two or more pastures or management units" (Kothmann 1974, p. 36). Kothmann (1974) said there are many possible combinations of the four primary factors involved in any grazing system (number of pastures, number of herds, length of grazing periods, length of rest periods); but other factors, such as season of use, species of livestock, and class of livestock, must also be taken into account. In addition, such management involves livestock density and distribution of grazing within pastures or management units, which can be influenced by fencing, location of drinking water, or herding.

There are many options available to achieve the desired compositional and structural state of vegetation under the constraints of what the site can support, the availability of resources, and limitations of law, regulation, or custom. That the goals and objectives be clearly set and the progress toward those goals be periodically evaluated is of overriding importance. The goals and objectives must encompass both livestock production and wildlife habitat. It is essential that these goals and objectives be developed in conjunction with and cooperation between user groups and resource specialists and be stated in terms of vegetative condition first and numbers of outputs, such as animal unit months (AUM) of grazing or animal units (AU), second.

The Setting

The Great Basin of southeastern Oregon falls mainly into the Owyhee Upland physiographic province and partly in the Basin and Range physiographic province (Franklin and Dyrness 1973) (fig. 1). It includes portions of Malheur and Harney Counties. The landscape is mostly rolling plateau at 1 066 meters (3,500 ft) in elevation, but there are mountains, cliffs, and canyons. Annual precipitation ranges from 18 to 30 centimeters (7 to 12 inches) (Heady and Bartolome 1977).

The Great Basin rangelands in southeastern Oregon support 28 plant communities dominated by grasses, shrubs, or trees. Trees vary from conifers to deciduous and evergreen hardwoods. Big sagebrush[1] communities predominate, whereas tree-dominated and true grassland communities constitute the least common types. True grasslands occur as relict meadows, relict stands of valley bottom bunchgrass, and relict subalpine bunchgrass types (Dealy et al. 1981, Maser and Strickler 1978).

[1] Scientific names are listed in the appendix

Tree-dominated communities occur primar ily at elevations above the sagebrush steppe with the exception of low-elevation riparia willow and cottonwood communities. Quakin aspen is restricted primarily to mountain ripar ian zones associated with streams, seeps springs, ponds, lakes, or snowdrift sites. Wit the exception of relict ponderosa pine and whit fir, curlleaf mountainmahogany requires th most moisture of the dry-land tree types in th high desert mountains. Western juniper grow immediately below the curlleaf mountain mahogany and intermixes with it in transitio zones. These tree-dominated communities ar adjacent to and above the shrub zones (Dealy e al. 1981).

Big sagebrush, including several subspecies dominates the shrub communities. Other sig nificant tall shrub communities include blac greasewood, squaw apple, Bolander silve sagebrush, and mountain silver sagebrush Short shrub communities include shadscal saltbush, stiff sagebrush, low sagebrush, earl low sagebrush, black sagebrush, and cleftlea sagebrush (Dealy et al. 1981).

The diversity of topography and plant com munities made the Great Basin of southeaster Oregon an ideal place to develop and test th range-wildlife management systems discusse in this series of papers.

The land ownership in the Great Basin o southeastern Oregon is shown in table 1. Th Bureau of Land Management (BLM) control the majority of the land (66 percent); 29 percen is in private ownership.

Agriculture and grazing of domestic live stock are the activities that dominate manage ment of private land. Grazing of domestic live stock is the dominant use on BLM-administere lands. In 1980,373 permittees ran 116,806 hea of cattle and horses and 5,945 sheep composing 618,608 AUM on BLM lands (U.S. Departmen of the Interior, Bureau of Land Managemen 1981).

Table l-Land ownership in the Great Basin of southeastern Oregon

Ownership	Hectares	Acres	Percent
Bureau of Land Management	3025792	7,476,881	6 6
Other Federal	62506	154,456	1
State	174944	432,296	4
Private	1302875	3,219,467	2 9
Total	4 566 117	11,283,100	100

Livestock management was facilitated on BLM lands in the Vale and Burns Districts from 1934 through 1981 by the following actions: Vegetation was manipulated on 140 770 hectares (347,702 acres); crested wheatgrass was seeded on 211 682 hectares (522,856 acres); 7 192 kilometers (4,469 mi) of fence was constructed; 477 cattle guards were installed; 1 611 kilometers (1,001 mi) of road was constructed to move livestock; 1 286 kilometers (799 mi) of water pipe was laid; 927 water storage tanks were built; 2,119 reservoirs were constructed; 749 springs were developed; and 121 wells were drilled (U.S. Department of the Interior, Bureau of Land Management 1981).

Extensive public ownership increases pressure from local governments for more intensive livestock management that, in turn, increases employment.

Livestock grazing has been relatively constant since the 1870's (Maser and Strickler 1978). The livestock industry of the area is strongly dependent on public rangelands, and it seems likely that there will be increasing pressure on the public rangelands of southeastern Oregon to provide red meat to sustain the local economy.

At the same time, these rangelands are being increasingly used for recreation. The number of people hunting and fishing has continued to grow. This results in more pressure to produce and sustain large numbers of game animals. The number of "rock hounds" has also increased. Such special use allocation will heighten pressure from industry and the public on managers of public rangelands to produce more red meat on fewer hectares (acres) at less cost to the livestock industry.

Increasing demands for more red meat, wildlife, fish, recreation, wilderness, and water from a finite land area inevitably lead to conflicts. Careful, farsighted management is necessary to obtain the desired wildlife and wildlife-related recreational experiences from such heavily managed rangelands.

The Following "Chapters"

The following 13 "chapters" in this series are presented in a sequence designed to logically develop certain principles and ideas. Chapter 2 ("Plant Communities and Their Importance to Wildlife") describes the major plant communities and examines the importance of their structure and species composition to wildlife. It establishes the basis for discussion of vegetation and habitats that occur in all the chapters in this series.

Chapter 3, "The Relationship of Terrestrial Vertebrates to the Plant Communities," relates all terrestrial vertebrate species known to occur within the area to habitats associated by the plant communites described in chapter 2 and to subdivisions described by common structural conditions within those plant communities. The hypothesis is that each species is adapted to a particular habitat, and the likelihood of occurrence can be predicted by the quantity and quality of that habitat. The purpose is to allow the manager to deal simultaneously with all species in land-use planning or in preparing environmental analyses.

Chapters 4 through 9 were prepared in recognition that some species receive more attention than others in land-use planning and management. Or, as Orwell (1946, p. 112) put it: "All animals are equal but some animals are more equal than others." Federal agencies, for example, are required by law to pay particular attention to species designated as threatened or endangered. More attention is also paid to economically important species, such as game species, species trapped for furs, or species considered particularly interesting or esthetically pleasing. The chapters on native trout, ferruginous hawk, sage grouse, pronghorns, mule deer, and bighorn sheep are examples of how more extensive information can be provided for featured species.

Chapters 10 through 13 discuss special and unique habitats. Special habitats are biological in nature and can be at least partially controlled by the rangeland manager; they play a critical role in the lives of many species. These habitats include riparian zones and edges. Unique habitats are geomorphic in nature, usually cannot be easily manipulated to the advantage of wildlife, and are critical to certain species. These habitats are geomorphic and edaphic habitats and manmade habitats.

The chapter on management practices and options demonstrates how a manager can use management options to meet diverse wildlife goals and, at the same time, provide grazing for livestock. The message is that both wildlife and livestock management objectives can be met if the two are simultaneously derived and flexibility and careful planning are inherent in the process.

Together, these 14 chapters are an example of what can be done to provide the rangeland manager with the information necessary to fully consider wildlife in land-use planning, in preparing environmental impact statements, and in enhancing or protecting wildlife habitats.

Acknowledgment

Ira D. ("Dave") Luman, former biologist with the Bureau of Land Management dedicated his career to enhancement or protection of wildlife habitats in the managed rangelands and forests of Oregon. He was the moving force behind the development of this series and worked diligently to insure the resources needed to develop, publish, and distribute this series.

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Appendix

COMMON AND SCIENTIFIC NAMES

Common name	Scientific name
	MAMMALS[1]
Bighorn sheep	*Ovis canadensis*
Cattle	*Bos taurus*
Domestic sheep	*Ovis aries*
Horse	*Equus caballus*
Mule deer	*Odocoileus hemionus*
Pronghorn	*Antilocapra americana*
	BIRDS[2]
Ferruginous hawk	*Buteo regalis*
Sage grouse	*Centrocercus urophasianus*
	SHRUBS[3]
Big sagebrush	*Artemisia tridentata*
Black greasewood	*Sarcobatus vermiculatus*
Black sagebrush	*Artemisia nova*
Bolander silver sagebrush	*Artemisia cana* subsp. *bolanderi*
Cleftleaf sagebrush	*Artemisia arbuscula* subsp. *thermopola*
Early low sagebrush	*Artemisia longiloba*
Low sagebrush	*Artemisia arbuscula* subsp. *arbuscula*
Mountain silver sagebrush	*Artemisia cana* subsp. *viscidula*
Sagebrush	*Artemisia* sp.
Shadscale saltbush	*Atriplex confertifolia*
Squaw apple	*Peraphyllum ramosissimum*
Stiff sagebrush	*Artemisia rigida*
	TREES[3]
Cottonwood	*Populus* sp.
Curlleaf mountainmahogany	*Cercocarpus ledifolius*
Ponderosa pine	*Pinus ponderosa*
Quaking aspen	*Populus tremuloides*
Western juniper	*Juniper-us occidentalis*
White fir	*Abies concolor*
Willow	*Salix* sp.
	GRASS AND GRASSLIKE PLANTS[3]
Crested wheatgrass	*Agropyron cristatum* or *Agropyron desertorum*

[1] After Walker et al. (1975).
[2] After American Ornithologists' Union (1957).
[3] After Garrison et al. (1976).

WILDLIFE HABITATS IN MANAGED RANGELANDS — THE GREAT BASIN OF SOUTHEASTERN OREGON

Technical Editors

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