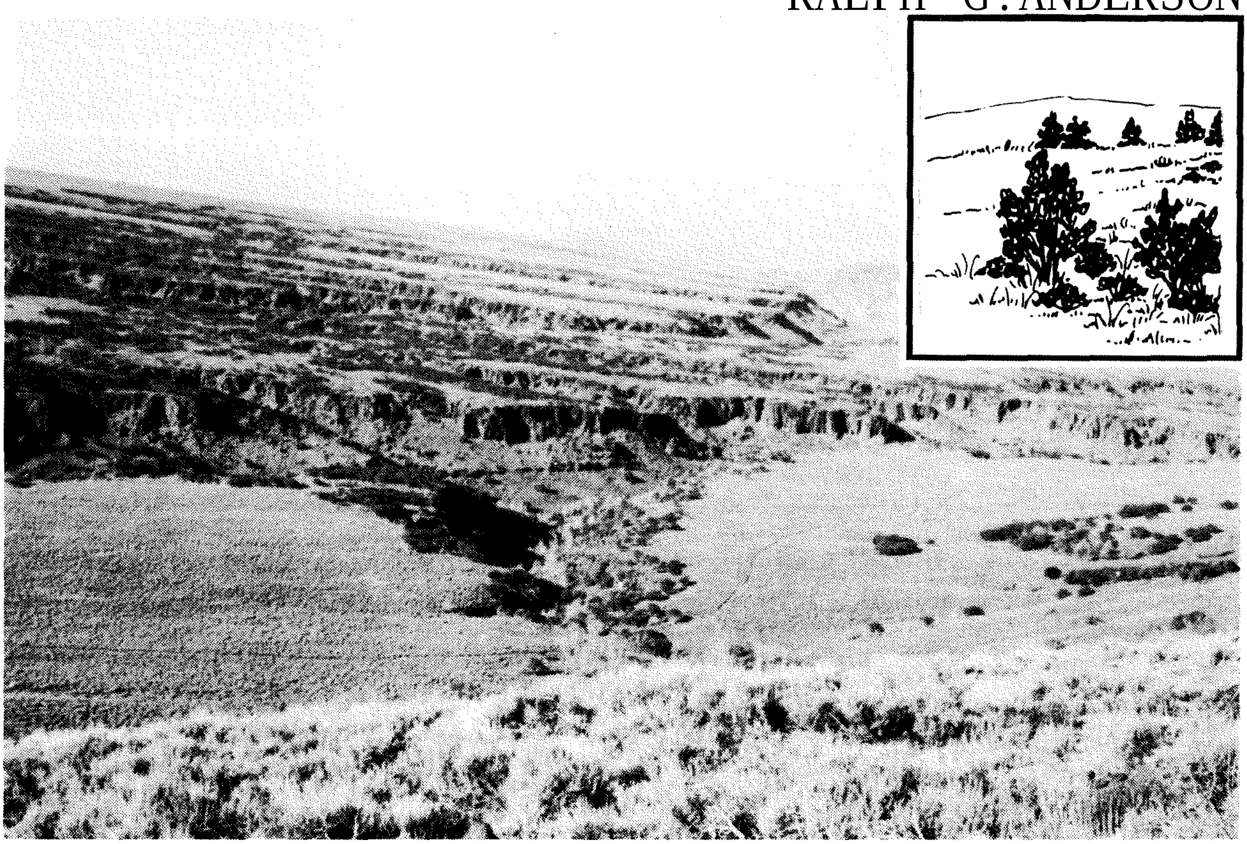
GENERAL TECHNICAL REPORT PNW-172
PART1 OF 2 1984

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

THE RELATIONSHIP OF TERRESTRIAL VERTEBRATES TO PLANT COMMUNITIES AND STRUCTURAL CONDITIONS

CHRIS MASER
JACK WARD THOMAS
RALPH G.ANDERSON



PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION
FOREST SERVICE U. S. DEPARTMENT OF AGRICULTURE

ABSTRACT

The relationships of terrestrial vertebrates to plant communities, structural conditions, and special habitats in the Great Basin of southeastern Oregon are described. The importance of habitat components to wildlife and the predictability of management activities on wildlife are examined in terms of managed rangelands. The paper does not provide guidelines but rather shows a method of determining the consequences of potential management actions. The series of relationships discussed in Part 1 are given in the appendices that are in a companion publication, General Technical Report PNW-172, Part 2.

THE AUTHORS

CHRIS MASER is Research Wildlife Biologist, U.S. Department of the Interior, Bureau of Land Management, Corvallis, Oregon. JACK WARD THOMAS is Chief Research Wildlife Biologist, U.S. Department of Agriculture, Forest Service, La Grande, Oregon. RALPH G. ANDERSON is Biological Technician, U.S. Department of Agriculture, Forest Service, Joseph, Oregon.

This publication is part of the series **Wildlife Habitats in Managed Rangelands-The Great Basin of Southeastern Oregon.** The purpose of the series is to provide a range manager with the necessary information on wildlife and its relationship to habitat conditions in managed rangelands in order that the manager may make fully informed decisions.

The information in this series 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 purpose of the series is to provide specific information for a particular area but in doing so to develop a process for considering the welfare of wildlife when range management decisions are made.

The series is composed of 14 separate publications designed to form a comprehensive whole. Although each part will be an independent treatment of a specific subject, when combined in sequence, the individual parts will be as chapters in a book.

Individual parts will be printed as they become available. In this way the information will be more quickly available to potential users. This means, however, that the sequence of printing will not be in the same order as the final organization of the separates into a comprehensive whole.

A list of the publications in the series, their current availability, and their final organization is shown on the inside back cover of this publication.

Wildlife Habitats in Managed Rangelands—The Great Basin of Southeastern Oregon is a cooperative effort of the USDA Forest Service, Pacific Northwest Forest and Range Experiment Station, and United States Department of the Interior, Bureau of Land Management.

Introduction

The Federal rangeland manager must account for the impacts-whether good or bad-of management activities on all species of wildlife. The legal challenges, reviews, and court opinions that have emerged from conflicts over management of Federal rangeland have raised questions for which the land manager has had inadequate answers.

"Wildlife" has assumed a broader meaning in the last decade. No longer is wildlife defined by most land managers in terms of game species or confined to a relatively few species of special interest. The increasing recognition of ecological principles-everything is connected to everything else, and there is no such thing as a "free lunch" (Commoner 1971)—makes it mandatory that managers take a more holistic view of the system that they manage (Likens and Bormann 1972, McKell 1975, Maser and Thomas 1978, Odum 1969). For example, which species of wildlife will be adversely influenced, which benefited, and which unaffected by range management activities? What is the degree of impact on those species? How will the influences vary over time? Which negative impacts are irreversible and which can be reduced by appropriate management activity? Which species are especially sensitive to habitat change and how will they respond to habitat alterations? Which species are threatened and endangered and how will they be influenced?

Our purpose is to show how the range manager can deal with these problems in range management planning. The system described is designed to handle a large volume of technical information about wildlife and their habitats in a way that makes sense to the range manager. The approach was adapted from the work of Thomas et al. (1979) that, along with the contributions of Patton (1978), forms the basis for the Wildlife Habitats Relationships program of the USDA Forest Service. This national program will provide the approach and data base for the consideration of wildlife habitat in land-use planning on the National Forests. It is our intent to demonstrate the applicability of the technique and the approach to planning efforts on managed rangelands.

The first task was to assemble all pertinent data for the 341 species of vertebrates in the Great Basin of southeastern Oregon. The amount of data varied from extensive for some species to almost nothing for others. This presented two problems-what to do when information was inadequate and how to present information on a large number of species without overwhelming the manager with detail.

The second task was to weigh the impacts of range management activities on wildlife. There are basically two ways to consider wildlife in rangeland planning and management (Call 1978). The more traditional way is to develop management plans for one or several species of prime interest. But this does not take into account the habitat needs of all species. The approach used here is to consider habitat as the prime determinant of wildlife welfare and to associate wildlife with habitat condition.

Wildlife habitats also had to be identified in such a way that they could be considered simultaneously with range management for livestock. This was done by equating plant communities and their structural conditions with habitats for wildlife. (These structural conditions are: grass-forb → low shrub → tall shrub → tree → tree/shrub. As a plant community progresses from the grass-forb condition through the tree/shrub condition, the cumulative effect of the existing plant species' growth forms increases the structural diversity of the plant community or condition. For example, a grass + a forb condition has a certain diversity of structure, but a grass + a forb + a shrub + a tree obviously has a far greater diversity of structure. Since this structural diversity is measurable, both qualitatively and quantitatively, we use the term structural condition.)

Previous applications of this approach have used plant communities and successional stages as the primary habitat classification (Thomas et al. 1979, Verner and Boss 1980). These efforts dealt primarily with forested areas where succession is better understood, more predictable, and more obvious than in rangeland conditions. Within rangeland plant communities, however, there is an array of structural conditions that are recognizable and can be interpreted as a habitat condition. We therefore used structural conditions by plant community as the descriptor of habitats. These structural conditions are the result of the natural growth and development of plant communities, as altered by management activities such as controlling brush, grazing with domestic livestock and wild ungulates, fencing, maintenance of grazing systems, planting or seeding trees or grass, and thinning forest stands. The plant community was accepted as an integrator of all environmental variables on the site (Daubenmire 1975, 1976; Feldhamer 1979; Sauer and Uresk 1976). By associating individual wildlife species and groups of species with plant communities and an array of structural conditions (fig. 1), the rangeland manager can translate standard range inventories into information on wildlife habitats.

Only enough information is presented in this paper (Part 1) to describe the principles and procedures on which the wildlife relationships for the Great Basin in southeastern Oregon are based. Ecological information for all terrestrial vertebrates is included in the appendices that form Part 2 of General Technical Report PNW-172. This companion publication is primarily of interest to persons working in the geographical area described. Those who need the appendices should refer to the following:

Maser, Chris; Thomas, Jack Ward; Anderson, Ralph G. Wildlife habitats in managed rangelands-the Great Basin of southeastern Oregon: the relationship of terrestrial vertebrates to plant communities and structural condition. Gen. Tech. Rep. PNW-172, part 2 of 2 parts. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station; 1984. 237 p.

Copies may be obtained from either of the following:

Oregon State Office
Bureau of Land Management
P.O. Box 2965
Portland, OR 97208

USDA Forest Service
Pacific Northwest Forest & Range Experiment Station
P.O. Box 3890
Portland, OR 97208

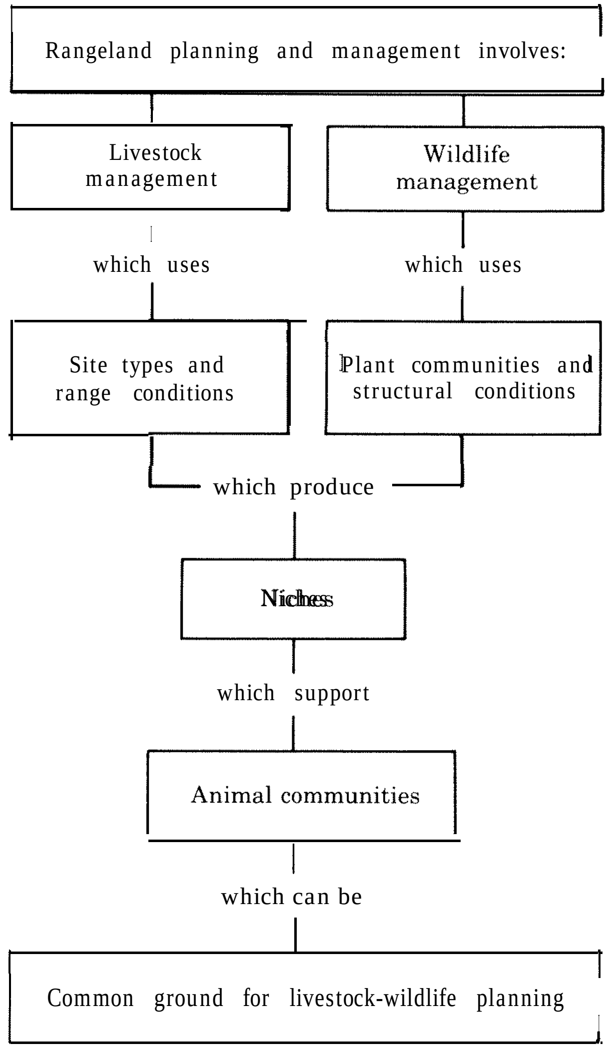


Figure 1 .-Plant communities and their structural conditions can be a common ground for livestock-wildlife planning.

Plant Community Descriptions

The starting point for describing the plant communities was the classification of the ecosystems of the Great Basin in southeastern Oregon by Dealy et al. (1981). This classification required some modification to bring it in line with other systems already in use by rangeland managers. Because most wildlife respond more to vegetative structure than to plant species composition (Black 1968, Larrison and Johnson 1973, Maser and Thomas 1978, Olson

1974, Rotenberry and Wiens 1980, Tester and Marshall 1961, Turcek 1972), structurally similar ecosystems were grouped and others were divided or identified as structurally distinct and important wildlife habitats. In other words, ability of plant ecologists to differentiate between plant communities exceeds the present ability of wildlife biologists to detect differences in animal communities. When no demonstrated differences existed in animal communities between structurally similar plant communities, the communities were combined.

The modifications described in figure 2 show the relationship between the ecosystems described by Küchler (1964) and Dealy et al. (1981).

Wildlife Habitat Relationships

Wildlife habitats and their structural conditions have unique environmental conditions that are ecologically important as habitat niches for wildlife species (fig. 3). The habitat niches are a product of the plant community, its structural conditions, and other environmental factors-including soil type, moisture regime, microclimate, slope aspect, elevation, and temperature. The complex interactions of site and plant community structure could be dissected and the more precise influence of each on the animal community determined. If such information existed, it would probably be too complex to use readily. The plant community type, however, can be considered an integrator of the many factors interacting on the site.

Wildlife species are individually adapted to combinations of plant community and structural condition for feeding, or reproduction, or both. These wildlife-habitat relationships provide the basic information from which the informational displays (tables, figures, and companion appendices) were developed. Depending on their requirements, rangeland managers and planners can extract information at four levels of detail. The amount of detail increases with each level:

Level 1. The relationship of animal life forms for feeding and reproduction to plant communities and plant community structural conditions. Life forms are groups of wildlife species that exhibit similar habitat requirements for both feeding and reproduction.

Level 2. The relationship of individual species for feeding and reproduction to plant communities and plant community structural conditions.

Level 3. A summary of the available biological data for each species.

Level 4. Selected references on habitat relationships for each species. Examination of these references and their bibliographies can provide the user with more detailed data and additional sources of information.

The information on each species in level 2 has been used to develop a relative measure of vulnerability of each species to habitat manipulation. This is another source of information for the manager's use.

The informational displays were constructed from: (1) the literature, (2) interpretation and extrapolation of information in that literature, (3) 3 years of fieldwork in the area, and (4) a consensus of cooperating wildlife biologists. In all cases, in our judgment, the best available information was used. If the literature was specific to the Great Basin of southeastern Oregon and, in our opinion, contained the required information, it was used. If the literature was not specific to the area or habitat condition, it was adapted as appropriate. In the absence of published information or field data, the relationship of the species to habitat was determined by consensus of the consulting biologists. Data for the most intensively studied species were, naturally, more voluminous and detailed than for relatively obscure species. As new information becomes available, it can be added to the system.

Natural vegetation as described by Küchler (1964)	Communities of the Great Basin in southeastern Oregon as described by Dealy et al. (1981)	Plant communities as used here to describe animal habitats
37 Mountainmahogany-oak shrub (similar position-not equal)	Curlleaf mountainmahogany/mountain big sagebrush/bunchgrass Curlleafmountainmahoganyimountain snowberry/grass	Curlleaf mountainmahogany/shrub
	Curlleafmountainmahoganyipinegrass	Curlleafmountainmahoganyipinegrass
	Curlleaf mountainmahogany/Idaho fescue Curlleaf mountainmahogany/bearded bluebunch wheatgrass Idaho fescue	Curlleafmountainmahogany/ bunchgrass
No provision	Squaw applelbunchgrass	Squaw applelbunchgrass
55 Sagebrush steppe (with juniper)	Western juniper/big sagebrush/bearded bluebunch wheatgrass Western juniper/big sagebrush/Idaho fescue	Juniperisagebrushibunchgrass
55 Sagebrush steppe	Basin big sagebrushibunchgrass Wyoming big sagebrush/bunchgrass Mountain big sagebrushlbunchgrass Threetip sagebrushibunchgrass Bolander silver sagebrushibunchgrass Mountain silver sagebrushibunchgrass Subalpine big sagebrushibunchgrass	Tall sagebrushlbunchgrass
	Stiff sagebrushibunchgrass Low sagebrushlbunchgrass Cleftleaf sagebrush/bunchgrass Early low sagebrush /bunchgrass Black sagebrushibunchgrass	Low sagebrush/bunchgrass
40 Saltbush-greasewood	Black greasewoodigrass	Black greasewood/grass
	Shadscale saltbush/bunchgrass	Shadscale saltbush/bunchgrass
No provision	Riparian	Riparian
	Permanently wet meadows	Permanently wet meadows
	Seasonally wet meadows	Seasonally wet meadows
	Quaking aspen/mountain big sagebrush	Quaking aspen/mountain big sagebrush/bunchgrass
	Quaking aspen/grass	Quaking aspen/grass
52 Alpine meadows and barren (similar-not equal)	Subalpine bunchgrass	Subalpine bunchgrass
No provision	No provision	Crested wheatgrass (seeded)

[1] Scientific names are given in appendix 14.

Figure 2.—Relationships between plant communities described in this chapter and two other plant classification systems.

Environmental variable	Structural conditions: Grass-forb	Low shrub	Tall shrub	Tree	Tree/shrub
Vegetation height	•	••	•••	•••••	•••••
Canopy closure	•	•••	••••	•••	•••••
Canopy volume	•	•••	••••	•••	•••••
Plant diversity	••	•••	•••	•	•••
Structural diversity	•	••	•••	••••	•••••
Forage production	•••••	•••	••••	••	•
Browse production	•	••••	• [illegible]	••	•••
Animal diversity	•	••	[illegible]	••••	• [illegible]

Figure 3.—Generalized structural conditions of range and related environmental variables. The number of dots do not reflect relative values, but a range from • = least to ••••• = most.

Level 1: Life Form Association With Plant Communities And Successional Stages

The large number of wildlife species present in most areas makes it difficult for the land manager to account for them in the land-use planning process. In the case of the Great Basin this number was reduced from 341 species (appendix 1, Part 2) to 16 life forms (table 1, this paper). The relationship of the species to their habitats is the basis for grouping them into life forms. This life form concept was adapted by Thomas et al. (1979) from Haapanen's (1965) division of birds of the Finnish forests into groups based on specific combinations of habitat requirements for reproduction and feeding. The concept was expanded to include all terrestrial vertebrates. The species are also listed phylogenetically by their common and scientific names in appendix 1 and alphabetically by computer codes in appendix 2.

Grouping species by life forms is distinctly different from the usual grouping of species by morphological characteristics. It enables the rangeland manager to evaluate the response of wildlife to habitat much more readily than if each species were considered individually. If this concept is applicable in land-use planning, new and different life forms will most likely be developed. They can be changed as needed to fit the circumstances. This concept can be used to satisfy the planning requirements of the regulations issued pursuant to the Federal Land Policy and Management Act (U.S. Laws, Statutes, etc., Public Law 94-579, 1976) and to the National Forest Management Act (U.S. Laws, Statutes, etc., Public Law 94-588, 1976), which requires management by "indicator species" and requires identification of the wildlife where welfare is reflected by the welfare of the indicator.

The relationship of vertebrate life forms to plant communities and structural conditions is shown in appendix 3, to overstory and understory in table 2, and is summarized by overstory in appendix 4. Seventy-two of the 341 species that occur in the Great Basin of southeastern Oregon do not appear in this listing or in subsequent discussions. Seventy bird species either migrate through or are incidental in the Great Basin of southeastern Oregon. The bullfrog and the spotted frog, the only species in life form 1, have also been omitted as they are semiterrestrial. The 70 bird species and the 2 mammals excluded are listed in appendix 5.

Life form 7 is used as an example of how the system works. The species in life form 7 feed in shrubs, trees, or air, and reproduce in shrubs. In the Great Basin in southeastern Oregon, the life form contains 29 species.

Much useful information can be derived from the following data sets. Table 2, for example, shows that: (1) life form 7 is strongly associated with shrub-dominated communities, (2) some shrub-dominated communities, such as juniper/sagebrush/bunchgrass, curlleaf mountain-mahogany/shrub, quaking aspenlbunchgrass,

Table 1-Life form descriptions

Life form		Feeds	No. of species[1]	Examples
1	in water	in water	2	bullfrog
2	in water	on ground, in shrubs and/or trees	6	long-toed salamander, western toad, Pacific treefrog
3	on ground around water or on floating or emergent vegetation	in water, on ground, in shrubs and trees	44	common garter snake, killdeer
4	in cliffs, caves, rims, and/or talus	on ground or in air	33	western fence lizard, common raven, spotted skunk
5	on ground without specific water, cliff, rim, or talus association	on ground	45	short-horned lizard, northernjunco, mule deer
6	on ground	in shrubs, trees, or air	4	common nighthawk, orange-crowned warbler
7	in shrubs	on ground, in water or air	29	American robin, Swainson's thrush, chippingsparrow
8	in shrubs	in shrubs, trees, or air	5	yellow-billed cuckoo, bushtit
9	primarily in deciduous trees	in shrubs, trees, or air	3	house finch
10	primarily in conifers	in shrubs, trees, or air	10	pinyonjay, Townsend's warbler
11	in trees	on ground, in shrubs, trees, or air	13	sharp-shinned hawk, American crow
12	on very thick branches	on ground or in water	6	great blue heron, golden eagle
13	excavates own hole in a tree	on ground, in shrubs, trees, or air	9	common flicker, Williamson's sapsucker
14	in a hole made by another species or naturally occurring	on ground, in water, or air	25	American kestrel, mountain bluebird
15	underground burrow	on or underground	32	burrowing owl, kit fox
16	underground burrow	in water, on ground, or in air	9	bankswallow, muskrat
	Total species		275	

[1] Species assignment to life form is based on predominant habitat-use patterns.

Table 2-Relative degree of use of plant communities and structural conditions by wildlife species in life form 7 (source: appendix 3)

R-reproduction
F-feeding
B.G. -bare ground
Ann. - annuals
Bunch. -native bunchgrass

Plant community	Function	grass-forb B.G.	grass-forb Ann.	grass-forb Bunch.	low shrub B.G.	low shrub Ann.	low shrub Bunch	tall shrub B.G.	tall shrub Ann.	tall shrub Bunch.	tree B.G.	tree Ann.	tree Bunch.	tree/shrub B.G.	tree/shrub Ann.	tree/shrub Bunch.
crested wheatgrass (seeded)	R 0		0	0	These plant communities do not achieve a habitat form like that characterized by these structural conditions.											
	F 1		1	1												
subalpine bunchgrass	R 0		0	0												
	F 1		1	1												
permanently wet meadows	R 3		3	0												
	F 10		8	1												
seasonally wet meadows	R 3		3	0												
	F 10		8	0												
shadscale saltbush/ bunchgrass	R 0		0	0		0	0									
	F 9		4	1		6	4									
low sagebrush/bunchgrass	R 4		0	0		0	0									
	F 14		5	2		8	6									
black greasewood/grass	R 1		0	0		0	0		0	1						
	F 12		5	2		9	6		12	9						
tall sagebrush/bunchgrass	R 18		3	0		6	3		18	14						
	F 21		5	2		12	10		21	18						
squaw apple/bunchgrass	R 2		0	0		1	1		2	2						
	F 15		4	1		11	8		15	12						
curlleaf mountainmahogany/ bunchgrass	R 4		0	0		1	1		4	4		2	2			
	F 19		6	2		13	10		19	16		14	12			
curlleaf mountainmahogany/ pinegrass	R 4		0	0		1	1		4	4		2	2			
	F 19		6	2		13	10		19	16		14	12			
juniper/sagebrush/ bunchgrass	R 18		2	0		4	2		17	13		11	7		18	14
	F 25		8	2		15	11		25	20		19	15		25	21
curlleaf mountainmahogany/ shrub	R 14		0	0		2	2		13	11		7	4		13	10
	F 26		8	2		15	11		26	21		20	16		26	22
quaking aspenlgrass	R 19		3	0		4	1		19	11		14	7		18	11
	F 24		9	2		14	10		24	17		20	14		24	18
quaking aspen/mountain big sagebrush/bunchgrass	R 25		3	0		6	3		25	17		15	8		24	17
	F 28		9	2		15	11		28	21		22	16		28	22
riparian	R 23		3	0		4	1		21	14		14	7	1	22	15
	F 25		10	3		14	10		24	17		20	14	0	24	18

quaking aspen/mountain big sagebrush, and riparian, are disproportionately important, and (3) the tall shrub, tree, and tree/shrub structural conditions are critical. Reproductive and feeding orientation to plant community types and plant community structural conditions can be determined for the entire life form.

By examining the relationship of the life form to plant communities and their structural conditions, the rangeland manager can judge the impact of range mangement practices on the life form (Reynolds and Trost 1979, 1980, 1981; Rogers and Hedlund 1980). This is done by determining the importance (expressed by the number of species) of a particular structural condition of a community. The impact of a contemplated management action is determined by comparing the two numbers for the structural conditions involved.

Consider, for instance, the importance of the juniper/sagebrush/bunchgrass community in the tree/shrub/annuals structural condition. Of the 29 species in the life form, 25 feed and 18 reproduce there. Suppose a manager is contemplating two courses of action on a particular area: (1) removing the trees and shrubs to enhance forage production for domestic and wild ungulates, thereby altering the vegetative condition to the grass-forb stage or (2) encourage the replacement of the annual vegetation with mature bunchgrasses. What are the consequences of each alternative to life form 7?

Reduction to the grass-forb structural condition would reduce to 0 the number of species reproducing and to 2 the number finding feeding habitat. This extremely adverse impact would continue for about 10-20 years after initial regeneration of the juniper and sagebrush. At that time, the stand would enter the structural condition (tall shrub with bunchgrasses) where 20 species feed and 13 reproduce. Full recovery of the habitat for life form 7 would not occur until the stand was about 40-60 years old and had returned to the tree/shrub/annuals structural condition.

A decision to allow the stand to progress from the tree/shrub/annuals structural condition to the tree/shrub/bunchgrass state would have a small negative effect on the life form because 21 species feed and 14 species reproduce there.

Obviously, if the manager considered factors such as the percentage of the area affected, the distribution of plant communities and structural conditions, and anticipated changes over time, a more sophisticated analysis could be made. But the same basic comparisons would be used.

The displays in appendix 3 can be used to predict the response of animal life to all alterations in the plant community, whether artificial or natural. Such alterations could result from natural phenomena, such as fire, insect infestation, or windstorm, or from management activities like seeding, planting, herbicide treatment, or fertilization.

Any of these actions would change the structural condition to another state-usually a more simplified one (table 3) (Mack 1981, Rickard and Cline 1980, Thomas et al. 1979). For example, planting trees introduces another vegetative layer and adds diversity, but wildfire removes trees and shrubs and simplifies the vegetative structure. Because wildlife is mainly a product of the vegetative structure of a community and not the age of the vegetation, it is possible to predict the effect of various manipulations of vegetation on wildlife.

Level 2: Relationship of Species To Plant Communities And Structural Conditions

The responses of vertebrate life forms to plant communities and structural conditions can be generalized. But the response of each species within a life form varies because of specific habitat requirements. Level 2 shows orientation to plant community and structural conditions for each species. Species are grouped by life form to facilitate comparison with information in level 1. The primary orientation to plant communities by species within life forms is illustrated for life form 7 in table 4. Similar information for all life forms is in appendix 6. Information on species orientation to structural conditions is illustrated in table 5; complete information for all life forms is in appendix 7.

Table 3-Anticipated changes in range-community structural conditions due to management action

Management action	Grass-forb	Low shrub	Tall shrub	Tree	Tree/shrub
Weed control	◄	➤	➤	–	–
Brush control:					
Chemical		◄	◄		◄
Mechanical		◄	◄		◄
Biological		◄	◄		◄
Tree control:					
Chain and doze				◄	◄
Clearcutting				◄	◄
Shelterwood				◄	◄
Thin				◄	◄
Salvage				◄	◄
Debris disposal				◄	◄
Controlled burn:					
Cold	◄	◄	◄	–	◄
Hot	◄	◄	◄	◄	◄
Seeding and planting:					
Grasses and forbs	➤	◄	◄	◄	◄
Shrubs	➤	–	–	➤	–
Trees	➤	➤	➤	–	–
Fertilization	–	◄➤	◄➤	◄➤	◄➤
Mechanical soil treatment:					
Pitting	◄	◄	◄	◄	◄
Contouring	◄	◄	◄	◄	◄
Water:					
Water spreading	◄	◄	◄	◄	◄
Drainage	➤	➤	➤	➤	➤
Water development	◄	◄	◄	–	–
Grazing:					
Cattle	◄➤	◄➤	◄➤	–	–
Horses	◄➤	◄➤	◄➤	–	
Sheep	◄➤	◄	◄	–	◄
Goats	◄➤	◄	◄		◄

➤ increased structural diversity;
◄ decreased structural diversity;
◄➤ increases or decreases structural diversity depending upon type and/or level of application;
no effect on structural diversity;
(blank space) not a viable practice.

Table &Orientation of wildlife species in life form 7 to plant communities (source: appendix 6)

• – Primary (≥40%) reproduction and feeding

r Secondary (< 40%) reproduction only

0 -Secondary (< 40%) reproduction and feeding

F -Primary (≥40%) feeding only

R-Primary (≥40%) reproduction only

f - Secondary (< 40%) feeding only

Letter code	Species	crested wheatgrass (seeded)	subalpine bunchgrass	perm. wet meadows	seasonally wet meadows	shadscale saltbush/bunchgr.	low sagebrush/bunchgrass	black greasewood/grass	tall sagebrush/bunchgrass	squaw apple/bunchgrass	curlleaf mountainmahogany/bunchgr.	curlleaf mountainmahogany/pinegr.	juniper/sagebrush/bunchgr.	curlleaf mountainmahogany/shrub	quaking aspen/grass	quaking aspen/mountain big sagebrush/bunchgrass	riparian	Number of plant communities used by each species for: R	F
	BIRDS																	R	F
BUST	green heron																•	1	1
BUIB	cattle egret	f		F	F				0						•	•	•	3	5
NYNY	black-crowned night heron			F	F				0						•	•	•	3	5
BUSW	Swainson's hawk			f	f	f	F	F	.	f	F	F	•	F	.	.	.	5	10
STCAL	calliope hummingbird			F	F								[illegible]	•	•	•	[illegible]	5	7
CAAN	Anna's hummingbird			F	F								•	•	•	•	•	5	[illegible]
TYTY	eastern kingbird						f	f	•	f	F	F	•	•	•	•	•	6	8
EMTR	willow flycatcher					F	F	F	F	F	F	F	F	F	.	.	.	3	12
EMWR	gray flycatcher					F	F	F	•	F	•	•	•	•	•	•	F	7	12
APCO	scrub jay			F	F		f	f	•	f	•	•	.	.	F	F	.	6	10
PIPI	black-billed magpie	F	F	F	F	F	F	F	[illegible]	[illegible]	[illegible]	[illegible]	•	•	•	•	•	9	16
DUCA	gray catbird						f	f	F	F	F	F	F	F	•	•	•	3	9
TORV	brown thrasher					f	.	F	.	F	F	F	•	.	F	.	.	6	11
ORMO	sage thrasher						F	F	•	F	f	f	•	•	f	•	f	4	7
TUMI	American robin			F	F				f		F	F	F	F	•	•	•	3	9
CAUS	Swainson's thrush						f	f	•	f	F	F	F	F	•	•	•	4	8
PACAE	blue-gray gnatcatcher								•	f	f	f	•	F	F	•	F	3	6
LALU	loggerhead shrike					F	F	.	.	F	F	F	.	.	F	F	.	5	12
AGPH	red-winged blackbird			•		[illegible]	[illegible]	[illegible]	[illegible]	F	F	F	F	F	.	.	•	6	14
EUCY	Brewer's blackbird	f		.	.	F	F	F	•	F	F	F	.	F	.	.	.	7	14
MOAT	brown-headed cowbird	f		•	•	F	F	F	.	F	F	F	.	F	•	.	.	7	14
PAAMO	lazuli bunting								f	f	f	f	f	F	•	•	•	3	4
CAPS	lesser goldfinch								f	F	F	F	F	•	•	•	•	4	8
PICH	green-tailed towhee					F	F	F	•	•	•	•	F	•	F	.	f	6	11
PIER	rufous-sided towhee					f	f	f	•	F	F	F	•	•	•	•	•	6	9
AMBE	sage sparrow						•	f	•	f	f	f	•	•	f	•	f	5	5
SPPA	chipping sparrow							f	F	F	F	F	•	•	[illegible]	•	•	5	9
SPBRE	Brewer's sparrow						•	f	•	f	f	f	•	F	f	•	f	4	5
NEMEL	song sparrow					F	.	F	•	F	F	F	.	F		F	.	4	11
	Total R	O	O	3	3	0	4	1	18	2	4	4	18	14	19	25	23		
	F	1	1	10	10	9	14	12	21	15	19	19	25	26	24	28	25		

Table &--Orientation of wildlife species in life form 7 to structural conditions (source: appendix 7)

● -Primary (≥40%) reproduction and feeding

0 -Secondary (< 40%) reproduction and feeding

R – Primary (≥40%) reproduction only

r -Secondary (< 40%) reproduction only

F -Primary (≥40%) feeding only

f – Secondary (< 40%) feeding only

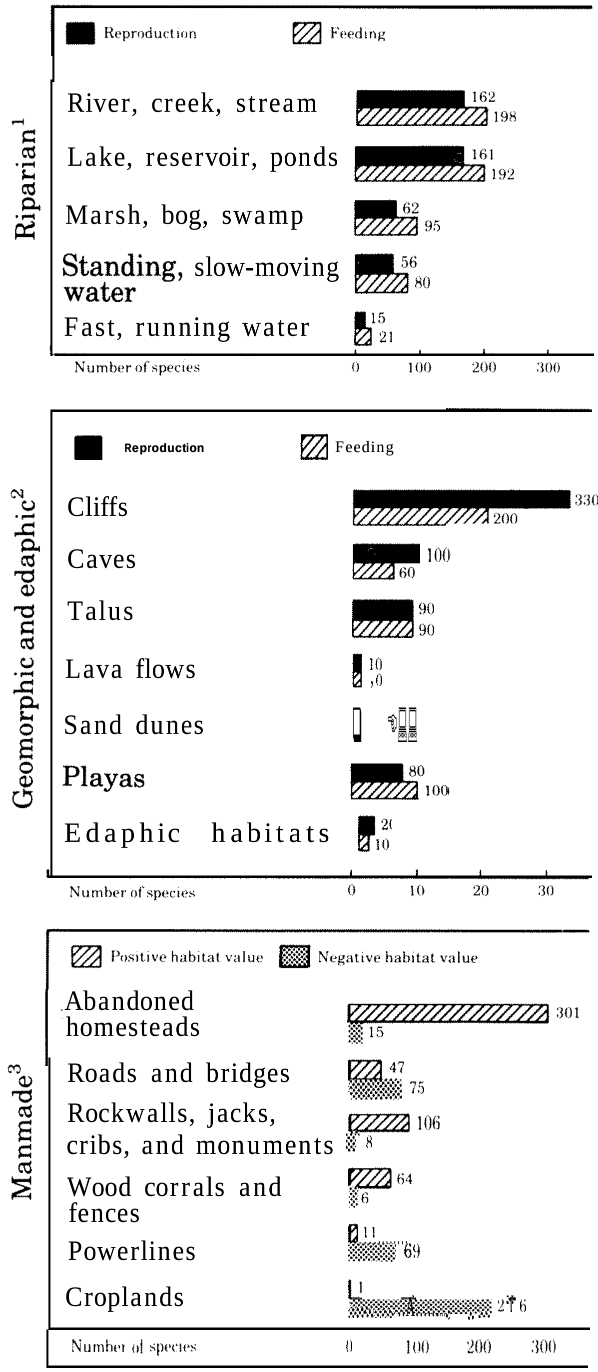
		Structural conditions																
		Grass-forb			Low shrub			Tall shrub			Tree			Tree / shrub				
Letter code	Species	bare ground	annuals	bunchgrass	bare ground	annuals	bunchgrass	bare ground	annuals	bunchgrass	bare ground	annuals	bunchgrass	bare ground	annuals	bunchgrass	R	F
	BIRDS																	
BUST	green heron		F	F		F	F							R	R	R	3	4
BUIB	cattle egret		F						•			●			●		3	4
NYNY	black-crowned night heron								✍			●			.		3	3
BUSW	Swainson's hawk		F	F		F	F		•	●		●	●		•	.	6	10
STCAL	calliope hummingbird		F			F			•			●			●		3	5
CAAN	Anna's hummingbird		F						●			●			✍		3	4
TYTY	eastern kingbird						F		●	F		●	F		•	F	3	7
EMTR	willow flycatcher					F	F		●	●		•	●		•	●	6	8
EMWR	gray flycatcher								●	●		●	●		●	●	6	6
APCO	scrub jay								•	•		F	F		●	•	4	6
PIP1	black-billed magpie		F	F		F	F		●	●		●	●		●	●	6	10
DUCA	gray catbird					F	F		●	●		f	f		•	●	4	6
TORV	brown thrasher					F	F		●	•					●	✍	4	6
ORMO	sage thrasher								•	●					●	✍	4	4
TUMI	American robin		F			F	f		●	●		.	•		✍	●	6	8
CAUS	Swainson's thrush								•	●		F	F		●	●	4	6
PACAE	blue-gray gnatcatcher								●	●		●	●		●	●	6	6
LALU	loggerhead shrike					F	F		F	●		●	.		●	✍	5	8
AGPH	red-winged blackbird		•			•			●			.			●		5	5
EUCY	Brewer's blackbird		•			●			●			•			•		5	5
MOAT	brown-headedcowbird		•			●			●			●	•		✍	•	7	7
PAAMO	lazuli bunting								●	•		F	F		•	●	4	6
CAPS	lesser goldfinch					F	F		•	●		F	F		F	F	2	8
PICH	green-tailed towhee					●	●		●	●					.	●	6	6
PIER	rufous-sided towhee					●	●		●	●					•	.	6	6
AMBE	sage sparrow								●	✍		F	F		✍	●	4	6
SPPA	chipping sparrow								●	●		●	.		●	•	6	6
SPBRE	Brewer's sparrow					●	●		✍	●		F	F		●	●	6	8
NEMEL	song sparrow								●	●					●	•	4	4
	Total R	0	3	0	0	6	3	0	27	20	0	16	9	1	28	21		
	F	0	10	3	0	16	12	0	28	21	0	22	16	0	28	22		

The use of plant communities and structural conditions by a particular species can be determined from appendices 6 and 7. Table 4 contains information on the orientation of species to plant communities for feeding and reproduction. Table 5 shows the use of structural conditions by each species. The two sets of information must be considered in tandem-one before the other. For example, the willow flycatcher shows orientation to the community for feeding only (table 4). This means that information on reproduction in table 5 should be disregarded for the willow flycatcher in the juniper/sagebrush/bunchgrass community.

Wildlife obviously have habitat requirements other than plant community and structural condition. Orientations to special habitat components are shown for all life forms in appendix 8. Orientation of species to artificial habitats is discussed by Maser et al. (1979b) and association with geomorphic and edaphic habitats by Maser et al. (1979a). The importance of these special and unique habitat components, as reflected by the number of wildlife species using them, is shown in figure 4.

Additional information may be derived from appendices 6 and '7. The total number of species oriented to each plant community and structural condition for feeding and reproduction was used to produce appendix 3 and table 2, which demonstrate the orientation of the life form. In other words, to develop the information on life form (level 1) the information for individual species in level 2 must first be completed.

The information in level 2 has a variety of uses. For example, the importance of each community and structural condition can be evaluated in terms of its ability to provide habitat for different species. In each planning scenario, the rangeland manager can examine the impact of proposed management actions on wildlife-individual species or all wildlife. The information can also be used to determine the role of plant communities as habitat for featured species or for rare and endangered species.



[1] Source: appendix 8.
[2] Source: Maser et al. 1979b.
[3] Source: Maser et al. 1979a.

Figure 4.—Number of terrestrial vertebrate wildlife species using special and unique habitats.

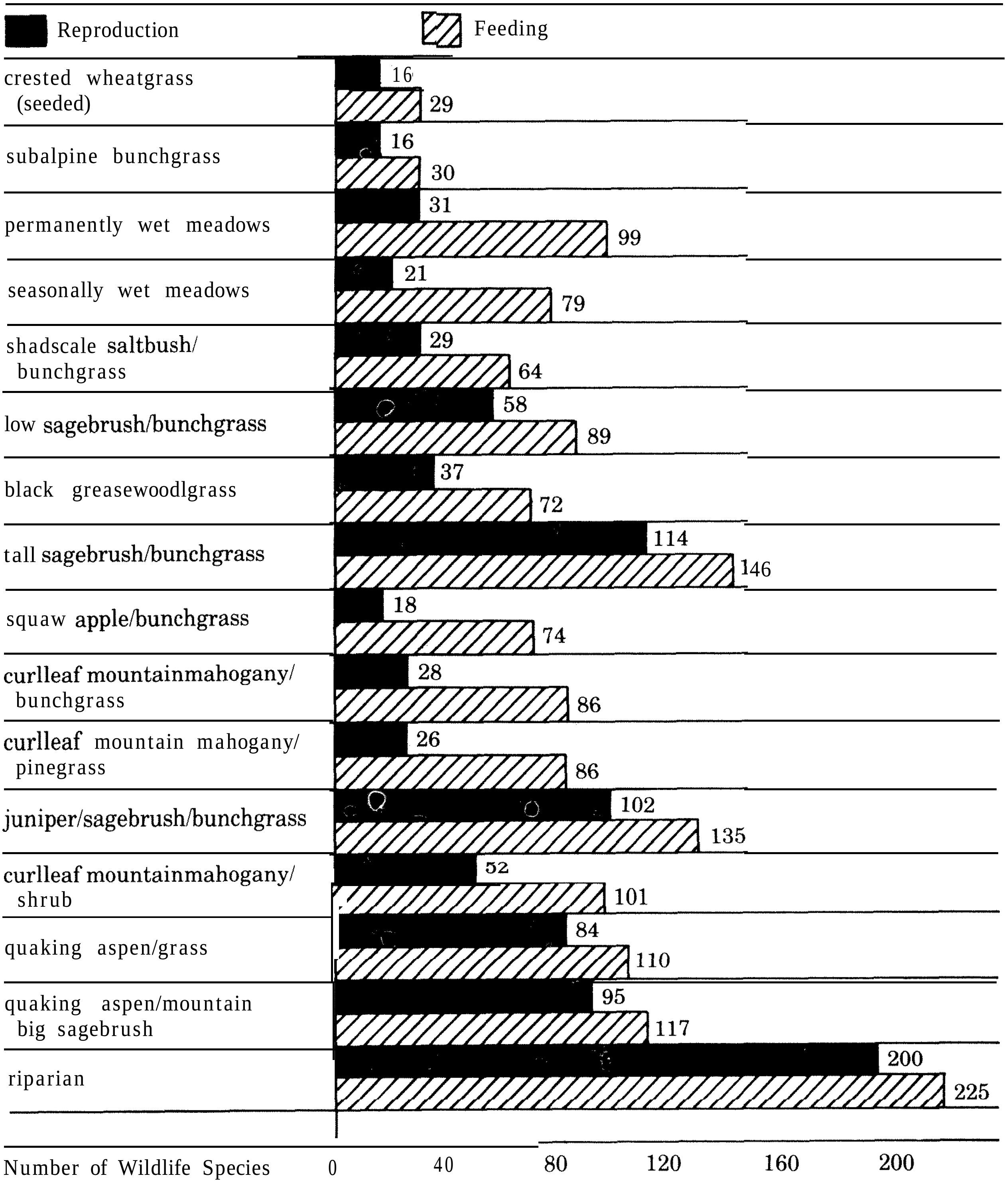


Figure S.-Number of wildlife species oriented to desert-steppe plant communities for feeding and reproduction (source: appendix 6).

Some rangeland communities obviously produce more species of wildlife than others (fig. 5). The tall sagebrushibunchgrass, juniper/ sagebrushibunchgrass, and riparian communities in the Great Basin of southeastern Oregon-those communities most affected by range management when enhancing forage production for domestic and wild ungulates-are also the most productive in terms of wildlife.

Figure 6 shows that the more complex structural conditions (tall shrub, tree, or tree/shrub) in the juniper/sagebrush/bunchgrass community are important to more species than are the simpler structural conditions (grass-forb and low shrub). Habitat for reproduction is also more restrictive than habitat for feeding. A similar display for all plant communities is shown in appendix 9.

Using the same data, the rangeland manager can predict the response of individual species to alterations in a structural condition. For example, a series of shrub and tree removal operations might be planned in an extensive area covered by the tree/shrub structural condition of the juniper/sagebrush/bunchgrass plant community. The intentions of the operation are to remove most of the tree and shrub canopy and to increase the density and biomass of the bunchgrasses and forbs. What wildlife species are likely to be affected? In an actual analysis, the information on each species in each life form would be examined (appendices 5 and 6). As an example, consider the data for life form 7 (table 4). Of the 29 species in life form 7, 18 (see table 4 for species' names) have a primary association with the juniper/sagebrush/bunchgrass plant community for both feeding and reproduction. In addition, seven species have a primary association and one has a secondary association for feeding only.

In this situation, what effect would removal of most of the tall shrubs and mature juniper cover have on those species? Removal or killing of the shrubs and trees would put those areas into the grass-forb structural condition. Table 5 shows that 14 of the 18 species are primarily associated with the tree/shrub/bunchgrass structural condition for both feeding and reproduction as are six of the seven showing primary orientation for feeding only. One species shows primary association to the plant community for both feeding and reproduction but only feeds in the tree/shrub/bunchgrass structural condition and reproduces in the tree/shrub/annuals structural condition. It can be concluded that such action will reduce habitat for those species by approximately 35 percent for at least 40-50 years-the time required for the stand to regenerate and reach a structural condition suitable for reoccupancy.

At the same time, some species would benefit from the early structural conditions that follow tree and shrub removal. Table 5 (or appendix 7) shows that two species (red-winged blackbird and Brewer's blackbird) would find primary nesting and feeding habitat in the changed condition and four species (cattle egret, Swainson's hawk, calliope hummingbird, and Anna'a hummingbird) would feed in such conditions. These species would gradually drop out as conditions changed back toward the original state and the original species that occupied the site might be expected to reappear.

As another example, consider the generalized relationship of wildlife in the Great Basin of southeastern Oregon to structural conditions of rangeland communities (fig. 7). This shows why many people are concerned about the effects of intensive range management to improve domestic and wild ungulate grazing on wildlife diversity and on the welfare of species that are narrowly adapted to certain structural conditions, particularly tall shrub, low shrub, tree, and tree/shrub (Baker et al. 1976, Maser and Gashwiler 1978).

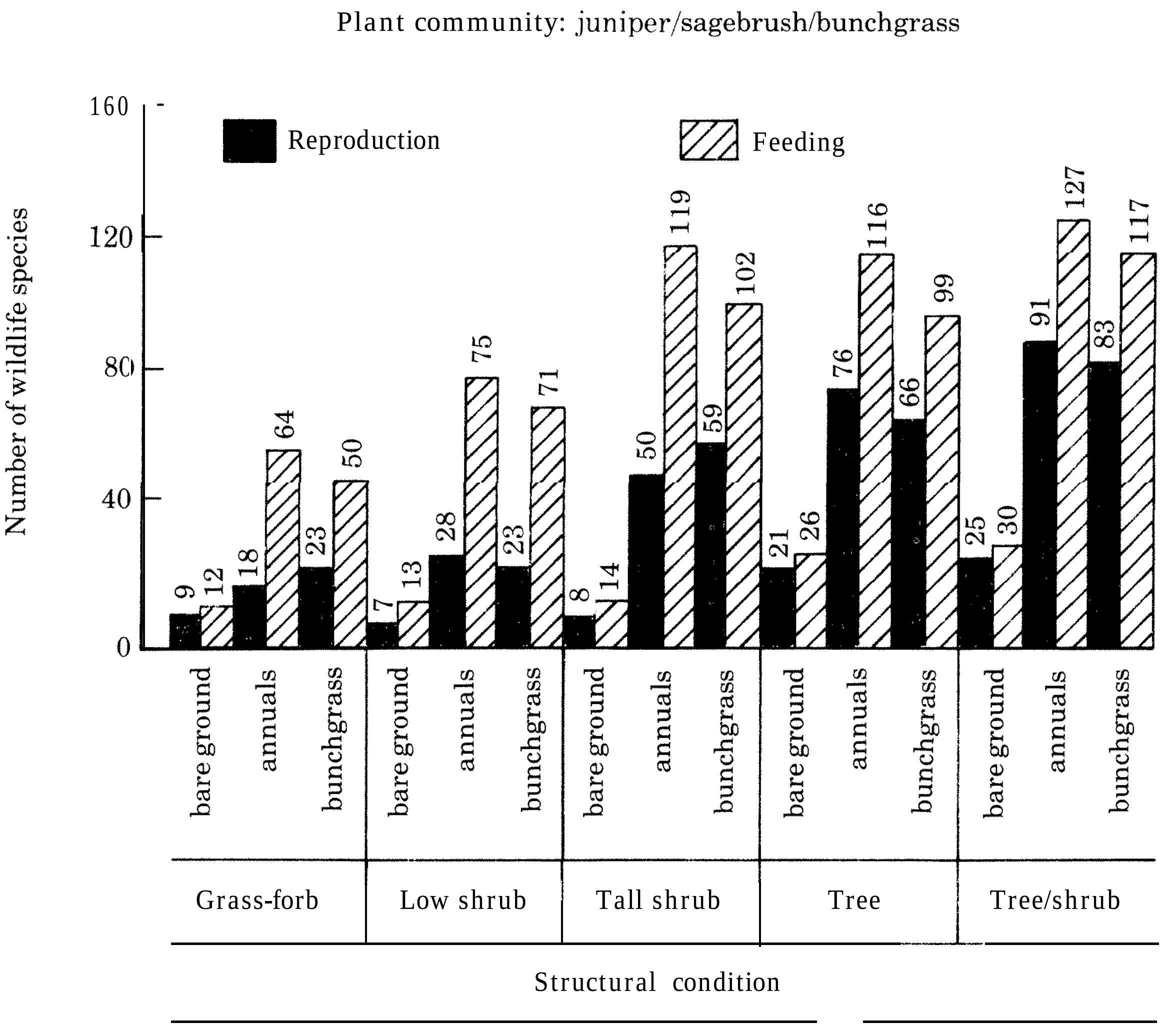


Figure 6.—Number of wildlife species associated with structural conditions in the juniper/sagebrush/bunchgrass community (source: appendix 9).

Only a few uses of such data have been illustrated. There are as many others as there are specific management questions, and new applications are being found as managers begin to use this system.

Level 3: Summary of Biological Data by Species

Level 3 is a one-line summary of key information on each species. Some of the information was derived from the appendices and some from literature reviews. Other information was drawn from the experience of wildlife biologists.

Details for each species are presented in appendix 8. Eleven species from the 29 in life form 7 are shown here as an example (table 6).

Table 6—Key information on species in life form 7 (source: appendix 8)

Reproduction orientations
- ▀▀, ● Primary (>40%)
- ////, ○ Secondary (<40%)

Feeding orientations
- ░░, · Primary (>40%)
- ██, □ Secondary (<40%)

L -Low
M – Medium
H – High

Letter code	Life form number	Species	Versatility rating	Activity/seasonal occurrence: January	February	March	April	May	June	July	August	September	October	November	[illegible]	Reproduction capacity, potential/year	Home range (h.r.)/territory (t.) size
BUST	7	green heron														3-6; avg. 4-5	
NYNY	7	black-crowned night heron	L													3-6	colonial nester
BUSW	7	Swainson's hawk	M													2-4	
STCAL	7	calliope hummingbird	L													2	
TYTY	7	eastern kingbird	L													3-5	aspen 3.8 ha (9.3 ac)/pr.
EMTR	7	willow flycatcher	M													3-4	
EMWR	7	gray flycatcher	M													3-4	
PIP1	7	black-billed magpie	M													6-9	
TUMI	7	American robin	M													3-5	juniper 1.9-3.4 ha/pr., aspen 2.3 ha (5.6 ac)/pr.
EUCY	7	Brewer's blackbird	M													4-6	
MOAT	7	brown-headed cowbird	M													4-6	

*Positive (+), negative (–), or neutral (0) net hal at associations (see chapter 13, Manmade Habitats, for fuller descriptions).

Minimum habitat required/ pair or population ac – acres ha – hectares	Plant community groups (habitat)																Special habitats Riparian						
	crested wheatgrass (seeded)	subalpine bunchgrass	perm. wet meadows	seasonally wet.meadows	shadscale saltbush/bunchgrass	low sagebrush/bunchgrass	black greasewood/grass	tall sagebrush/bunchgrass	squaw apple/bunchgrass	curlleaf mountainmahogany/bunchgr.	curlleaf mountainmahogany/pinegr.	juniper/sagebrush/bunchgrass	curlleaf mountainmahogany/shrub	quaking aspen/grass	quaking aspen/mountain big sagebrush/ bunchgrass	Riparian	River, creek, stream	Lake, reservoir, ponds	Marsh, bog, swamp	Standing, slow-moving water	Fast, running water	Geomorphic and/or edaphic	Manmade habitats[1]
																● ■	● ■	● ●		● ■		□	▯
0.4 to 4.0 ha (1-10 ac)/ colony			■	■				0 ❑						● ■	● ●		● ●	● ■	m	●		❑	▯
nesting home range 1 pair per 6.7 km^2			❑	0	0	m	m	● 8	0	m	● m	m	● m	m	● m		• ■	• ■		▯ □	▯ □	□	+
			■	■								● ■	● ■	● ●	● ■		• ●		♍	▯ ●	▯ □	□	▯
						□	□	● ■	□	● ■	■	● ■	● ■	■	● ■		• ■	• ■		▯ □	▯ □	□	▯
breeding density: ≃0.8 halpr -juniper; 1.3 halpr – p. nine: 2.5 ha/pr aspen					■		m	8	m	m	m	m	m	● m	● m		• ■	• ■	■	▯ □	▯ □	□	▯
breeding density: ≃0.8 ha/pr -juniper; 1.3 ha/pr – p. pine; 2.5 halpr aspen					■		m	• m	m 8	● m	m	♏ m	♏ m	♏ m	♏ ♏ m		■	■		□	□	♍●	▯
	■		m	m	m	m	m	● m m	● 8	● m	● m	● m	● m	● m	● m		● ■	●	m	▯ m	▯ n	0 0	▯
			■	■				□		■	8	m	m	● m	● m		● ■	● ■		▯ ♍●	▯ □	□	▯
	□		● ■	● ■	■	■	■	• ■	■	■	■	• ■	■	● ■	● ■		● ■	● ■		▯ □	▯ □	□	▯
	□		● ■	● ■	■	■	■	• ■	■	■	■	• ■	■	● ■	● ■		● ■	● ■	● ■	▯ □	▯ □	□	▯

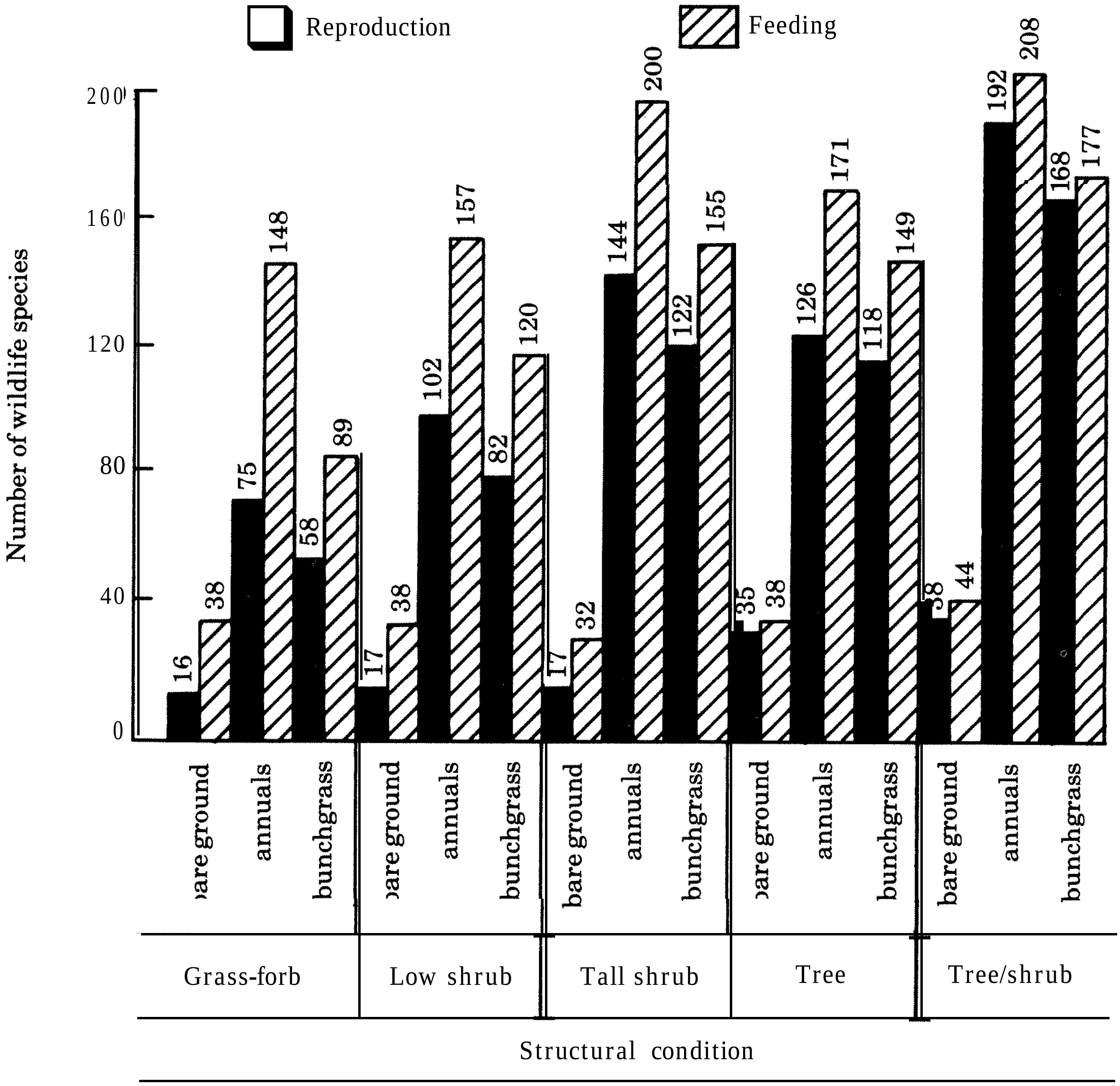


Figure 7.—Number of wildlife species oriented to desert-steppe structural conditions and the potential effect of intensive management (source: appendix 7).

Level 4: Selected References

If the information displayed so far is not sufficient, additional sources may be consulted. The most appropriate references, in our opinion, for each species are listed in appendix 10, illustrated here by table 7 for 11 species selected from life form 7. If the user, after consulting the sources suggested, still does not have sufficient information, the literature cited sections of these sources may provide useful leads.

Versatility Index

Each wildlife species exhibits a different degree of versatility (adaptability) in the number of plant communities and structural conditions it can use for feeding and reproduction. The sensitivity of each species to habitat change is directly related to that versatility. The most versatile species are the least sensitive to habitat manipulation; the least versatile are the most sensitive.

Data in appendices 6 and 7 (illustrated by tables 4 and 5) were used to develop a versatility score (V score) for each species. The V scores can be used to rate the versatility of individual species. Collectively, the scores also provide an index to the relative versatility of all resident wildlife species. Remember, the versatility index is meaningful only for the particular area and conditions for which it is derived. Do not try to make comparisons between different areas and conditions; i.e., do not compare the indices derived for the Blue Mountains of Oregon (Thomas et al. 1979) to those derived for the Great Basin of southeastern Oregon.

The V score for each species is derived by determining the total number of plant communities and the total number of structural conditions to which the species show primary orientation for feeding and reproduction:

$$V = (C_r + S_r) + (C_f + S_f);$$

where V is the versatility score, C_r is the number of communities used by the species for reproduction, S_r is the number of structural conditions used for reproduction, C_f is the number of communities used for feeding, and S_f is the number of structural conditions used for feeding.

Table 7—Selected references for species in life form 7 (source: appendix 10)

Common name	References
Green heron	Kushlan 1976
Black-crowned night heron	Allen and Mangels 1938-39, Hoffman and Prince 1975, Nickell 1966, Wolford and Boag 1971
Swainson's hawk	Dunkle 1977, Fitzner 1978, Olendorff 1972
Calliope hummingbird	Calder 1971, 1973
Eastern kingbird	Dick and Rising 1965, Hespenheide 1964, Morehouse and Brewer 1968
Willow flycatcher	Aldrich 1955, King 1955, Robbins 1974
Gray flycatcher	Johnson 1963, Lavers 1975, Russell and Woodbury 1941
Black-billed magpie	Bock and Lepthien 1975, Brown 1957, Erpino 1968, Jones 1960
American robin	Farner 1949, Henny 1972, James and Shugart 1974
Brewer's blackbird	Hansen and Carter 1963, Horn 1968, Stepney 1975, Williams 1952
Brown-headed cowbird	Friedmann 1963, Hill 1976, Payne 1976

V scores for all wildlife species in the Great Basin of southeastern Oregon are shown in appendix 11 and illustrated here by table 8. The V score for each species can be used to derive a V score for the life form as a whole as illustrated in table 9 and shown for all life forms in appendix 12. These scores reflect the versatility of species only in the Great Basin of southeastern Oregon. It is possible for a nationally common and very versatile species to have a low V score in a particular area because suitable habitat is limited.

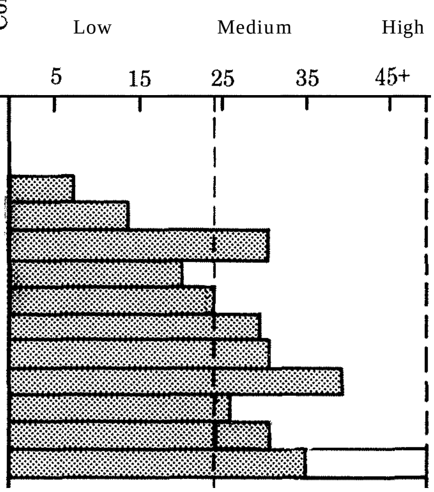
Potentially rare or threatened species are identified in appendix 13 (illustrated by table 10). These species were identified by Dyrness et al. (1975), Arbib (1978), and the U.S. Department of the Interior, Bureau of Sport Fisheries and Wildlife (1973) among others. More complete data on rare, threatened, and endangered species are given in appendix 13.

A Data Base For Planners

The informational displays presented here are a data base from which the rangeland manager may draw information at various levels. The system has been tested in preparation of land-use plans, environmental impact statements, and environmental analysis reports. It has enabled the users to produce better, more comprehensive, and more accurate results in less time.

Table 8— Versatility rating for wildlife species in life form 7 (source: appendix 11)

		Reproductive orientation			Feeding orientation			Plant community/structural condition versatility rating
Letter code	Species	No. of plant communities used (1)	No. of structural conditions used (2)	Columns 1 & 2 (3)	No. of plant communities used (4)	No. of structural conditions used (5)	Columns 4 & 5 (6)	Versatility score Columns 3 & 6 (7)
	BIRDS							
BUST	green heron	1	3	4	1	4	5	9
NYNY	black-crowned night heron	3	3	6	5	3	8	14
BUSW	Swainson's hawk	5	6	11	10	10	20	31
STCAL	calliope hummingbird	5	3	8	7	5	12	20
TYTY	eastern kingbird	6	3	9	8	7	15	24
EMTR	willow flycatcher	3	6	9	12	8	20	29
EMWR	gray flycatcher	7	6	13	12	6	18	31
PIPI	black-billed magpie	9	6	15	15	10	25	40
TUMI	American robin	3	6	9	9	8	17	26
EUCY	Brewer's blackbird	7	15	12	14	5	19	31
MOAT	brown-headed cowbird	7	7	14	14	7	21	35



The information system presented in this chapter is best suited for use in broad-scale land-use planning. The smaller the area and the greater the detail of the plan, the less likely these data are to predict results accurately. The general predictive ability should hold, but the inherent biological variability is more apt to become noticeable as size of the area diminishes.

If this information base is applied without proper interpretation, qualification, and sensitivity to individual conditions, the results will be less accurate. It is not intended to replace the trained and experienced wildlife biologist; rather, it is a tool for use by the wildlife biologist.

Table 9—Life form versatility rating for life form 7 (source: appendix 12)

Life form[1]	Number of species[2]	Range of versatility scores[3]	Mean versatility score	Life form versatility rating[4] (median scale)
7	29	9 to 40 (29)	24.5	High

[1] See table 1 for life form descriptions.
[2] The total number of species in life form.
[3] Refers to the range of versatility scores for the lowest scoring species to the highest scoring species within the life form.
[4] Versatility ratings: “low” = 12.0-17.6, “medium” = 17.7-23.4, “high” = 23529.0.

Table 10—Some species in southeastern Oregon are of special interest because of their potentially threatened or endangered status (source: appendix 13)

Letter code	Life form	Species	1	2	3	4	5	6	7	8
CRCO	4	collared lizard					X			
CRVI	5	western rattlesnake				SI	x			
NYNY	7	black-crowned night heron						X		
BOLE	3	American bittern				SI		X		
SOPR	16	Malheur shrew				R	R			
VUMA	15	kit fox		T	T	T	E			
Letter code	Life form	E – Endangered P Peripheral R – Rare SI – Species of special interest SU – Status undetermined T – Threatened U – Unique X – Occurs on list	Federal register (endangered)	Oregon State (endangered or threatened)	U.S. Dep. Inter. Fish & Wildl. Serv. "Red Book"	USDA FS RNA "Yellow Book"	OSU endangered plants and animals of Oregon	Audubon – Blue list for 1979		
			1	2 (a)[1]	3	4	5 (a,b,c)[1]	6	7	8

[1] The following references were used, respectively, as sources for the 6 status classification columns.

1 U.S. Fish and Wildlife Service (1979)
2a Oregon Department of Fish and Wildlife (1977)
2b Shay (1973)
3 U.S. Department of the Interior, Bureau of Sport Fisheries and Wildlife (1973)
4 Dyrness et al. (1975)
5a Storm (1966)
5b Marshall (1969)
5c Olterman and Verts (1972)
6 Arbib (1978)

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WILDLIFE HABITATS IN MANAGED RANGELANDS-THE

GREAT BASIN OF SOUTHEASTERN OREGON

Technical Editors

JACK WARD THOMAS, US. Department of Agriculture, Forest Service

CHRIS MASER, U.S. Department of the Interior, Bureau of Land Management

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Experiment Station
319 SW. Pine St.
PO. Box 3890
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