Deschutes Subbasin Wildlife Assessment

Presented to the

Deschutes Resources Conservancy
In fulfillment of contract 220019

For services in conjunction with development of a Subbasin Plan
for the Deschutes River Subbasin
as part of the

Northwest Power and Conservation Council
Provincial/Subbasin Planning program
under the Northwest Power Act

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*Section numbering follows outline in *Oregon Specific Guidance*, Sept. 15, 2003.

List of Tables

Deschutes Subbasin Wildlife Assessment

1. Executive Summary

The Deschutes Subbasin is made up of diverse wildlife habitats, including Cascade Mountains east slopes, the Deschutes River and many tributary valleys, and arid steppe habitats characteristic of the Great Basin. Significant changes to wildlife habitats have occurred in the subbasin since historic times, resulting from agricultural development in the river valleys and steppe habitats, management of the forests for wood resources, and more recently an influx of people seeking the desirable living environment of Central Oregon. These changes have resulted in the loss of wildlife habitats, most notably the nearly complete loss of wild grasslands, and changes in remaining habitats such as forests, where forest tree species composition in the Cascades have shifted toward mixed conifers from pine forest types. These changes in habitat have resulted in changes in the wildlife species found in the subbasin.

2. Introduction

2.1. Description of Planning Entity.

This report will assemble and analyze wildlife information for the Deschutes Subbasin as part of the Northwest Power and Conservation Council's Provincial/Subbasin Planning program conducted under the Northwest Power Act (Northwest Power Planning Council 2001.)

2.2. List of Participants.

Wildlife biologists with government agencies working within the subbasin volunteered to serve on the Deschutes Subbasin Wildlife Team (2003) to provide input during the plan development. Members of the Deschutes Coordinating Council (2003) also provided comments on early development of wildlife information.

2.3. Approach.

The status of wildlife in the Deschutes Subbasin (herinafter "subbasin") will be described by designating a short list of *focal wildlife species* from the full range of species occurring within the subbasin, and by designating a short list of *focal wildlife habitats* from the full range of habitats in the subbasin. Available data pertaining to the focal species and focal habitats in the subbasin will then be summarized and presented, and opportunities for conservation or restoration of the focal species and focal habitats will be outlined at the end of the assessment.

Wildlife information will be presented at three different levels of detail for the subbasin: the Columbia Plateau Ecoprovince, a larger study area that is made up of 11 subbasins including the Deschutes subbasin; the assessment unit level, of which there are 8 in the subbasin; and the hydrogic unit code

(HUC) 6th level subwatershed level, at the 1:24,000 scale. There are 341 HUC6 fields in the Deschutes Subbasin (O'Neil p.c.)

Information from the Northwest Habitat Institute Interactive Biological Information System (IBIS) will be used as the primary source of wildlife information for this assessment.

Wildlife information will be organized according to instructions and outlines in the following reports: *Oregon Specific Guidance* (Anon. 2003,) *A technical Guide for Developing Wildlife Elements of a Subbasin Pla*n (Scheeler et al. 2003,) and *An Oregon Technical Guide for Developing Wildlife Elements of a Subbasin Pla*n (Anon. 2003.) Sections of this report will be numbered after *Appendix C: Outline for Oregon Subbasin Plan, revised 4/6/2003* from *Oregon Specific Guidance* to simplify the inclusion of this wildlife assessment report into the subbasin plan, and to present information in the expected format. Font style and outline format are kept as simple as possible to facilitate the integration of this report into the final subbasin plan. Most of the tables and figures presented in this assessment will appear as appendices, due to the length and numbers of tables and figures.

The term "wildlife" will include amphibians, reptiles, birds, and mammals. Although the word "terrestrial" will be used in reference to wildlife, it will be understood that aquatic environments are required by some wildlife species, and that this term will be a general descriptive term only.

3. Wildlife Assessment

Regional context. The Deschutes River flows into the Columbia River from Oregon on the south near the community of The Dalles, draining the eastern slope of the northern Cascade Mountains and the western edge of the Blue Mountains in Oregon. The Deschutes subbasin is bordered by the Willamette Subbasin on the West, the Klamath Subbasin on the south, and the John Day Subbasin on the east. The subbasin takes in most of Wasco and Sherman counties, and all of Jefferson, Crook, and Deschutes counties. The subbasin is part of the Columbia Plateau Ecoprovince, along with 10 other subbasins in Oregon and Washington, in the Northwest Power and Conservation Council planning framework. Wildlife resources in the subbasin will also be presented within the context of the Columbia Plateau Ecoprovince.

3.1. Focal species selection..

In order to select focal species, various lists of species of special status occurring within the subbasin were examined.

Lists of all species thought to occur in the subbasin historically (1860) and currently (1999) and scientific names are presented in Appendix tables A and B respectively. A list comparing historic and current lists of wildlife, showing species added to the subbasin and lost to the subbasin since historic times, with notes on suggested additions and deletions, is presented in Appendix table C.

Threatened, endangered, or sensitive species listed by state or federal government entities that are thought to occur currently in the subbasin are listed in Appendix table D.

Wildlife recognized by local biologists as rare or significant to local areas in the subbasin are shown in Table 1, with reference to assessment units (AUs.) Maps of historic and current wildlife habitats in the subbasin, with AU boundaries shown, are presented in the Appendix.

Table 1. Wildlife species recognized as rare or significant to a local area.		
Species	Significance	Assessment Unit(s) Locations of Local Areas
Mule deer (white-tailed deer and black-tailed deer are also present in the subbasin)	Ungulate winter range degradation (George, p.c.)	Lower Westside Deschutes, Middle Deschutes.
Bighorn sheep (reintroduced population)	Ungulate winter range degradation (Kunkel, p.c.)	Lower Westside Deschutes, Lower Eastside Deschutes.
Mountain goat (former population)	ungulate winter range degradation (ODFW 2003b)	White River, Lower Deshutes, Middle Deschutes
Sharp-tailed grouse (former population) habitat	Habitat loss, grasslands (Kunkel p.c.)	LOWER EASTSIDE DESCHUTES, Upper Crooked, Lower Crooked
Greater sage grouse	Habitat degradation, shrub-steppe (Hanf, p.c.)	Lower Crooked River, Upper Crooked River
Golden eagle habitat	Threat of habitat degradation, rimrock and cliff nesting sites (Gilbert p.c.)	All except Cascade Highlands

Managed Wildlife Species. Currently, 68 wildlife species are harvested during hunting seasons in the subbasin (Appendix table E.)

HEP Wildlife Species (those used in loss assessments for hydrosystem development.) Twenty-four wildlife species used in the HEP process are thought to occur currently in the subbasin (Appendix table F.)

Partners in Flight high priority bird species used for monitoring. A total of 111 species occurring in the subbasin were listed by the Partners in Flight organization (Appendix table G.)

Critical functionally linked species. A list of critical functionally linked species thought to occur historically in the subbasin are listed in Appendix H.

Species of special cultural significance. Biologists with the Confederated Tribes of the Warm Springs Reservation of Oregon declined to draw up a list of especially important wildlife species, stating that tribal members consider all forms of wildlife to be culturally important. Although some species are important primarily for one purpose, such as food, often a single species is important for several reasons. For example, mule deer are important as food, but non-food parts of each animal could be valuable for clothing, regalia, medicine, and other uses. The presence of frogs in a small spring might indicate that the water is safe to drink. The complex relationship between tribal members and wildlife of all species in the subbasin is a fundamental part of tribal culture (Calvin 2004.)

Focal wildlife species selected. Focal species were selected by considering listed species, and by considering species of concern by local biologists. Focal species were chosen to represent a “guild” of species whenever possible, for example, the sharp-tailed grouse could represent grassland species, and the sage grouse could represent shrub-steppe species. Seven species were selected (Table 2.)

Table 2. Focal species selected and rationale for selection, and associated habitats.		
Focal Species	Rationale for Selection*	Associated Habitats
American beaver	Riparian habitat species, modifies habitat. On list 4, 5 and 6.	Riparian, herbaceous wetlands.
Columbia spotted frog	Riparian habitat and herbaceous wetlands habitat species. List 1 and 2.	Riparian, herbaceous wetlands
White-headed woodpecker	Large ponderosa pine tree habitat species. List 1, 2 and 3.	Ponderosa pine forest and woodlands.
Mule deer	Ungulate winter range habitat species. Lists 2, 4, and 5.	Ungulate winter range.
Greater sage grouse	Shrub-steppe habitat species. Lists: 1,2,3,4,5.	Shrub-steppe.
Columbian sharp-tailed grouse	Grassland species. List 2 and 3.	Lower Eastside Deschutes interior grasslands.
Golden eagle	Cliff and rimrock habitat, grassland, shrub-steppe habitat species. List 2.	Cliff and rimrock habitats, grassland, shrub-steppe.

* 1=threatened, endangered, and state sensitive species, 2=species recognized as rare or significant to a local area, 3=Partners in Flight species, 4=HEP species, 5=game species, 6=critically functionally-linked species.

3.2. Focal species characterization.

Species accounts for each focal species are presented in the Appendix. These accounts present biological, populations and trends data if available. A summary of status for each focal wildlife species in the subbasin is presented in Table 3. Of the focal species selected, only the sharp-tailed grouse has been extirpated from the subbasin (Csuti, et.al 2001.) American beaver are thought by local biologists to be extirpated from many former habitat areas in the subbasin, as are Columbia spotted frogs. No introduced species were chosen as focal species.

Table 3. Focal species distribution, populations, and trends.		
Species	Distribution in Assessment Units	Population and trends
American beaver	All	Historically depleted, but now recovered. Currently harvested during hunting and trapping season, population tracked by ODFW.
Columbia spotted frog	Upper Crooked River	Remnant population. Declining.
White-headed woodpecker	All	Status unknown.

Table 3. Focal species distribution, populations, and trends.		
Species	Distribution in Assessment Units	Population and trends
Mule deer	All	Game animal. Population tracked by ODFW. Declining in some areas due to development on winter ranges.
Greater sage grouse	Upper Crooked River, Lower Crooked River.	Game bird. Population tracked by ODFW. Declining.
Columbian sharp-tailed grouse	Extirpated.	Extirpated.
Golden eagle	All.	57 active nest territories counted in 2000 (Clowers 2004.) Population trend unknown in Oregon (Ibid, Marshall 2003.) Some indications of decline in the general region of northern Great Basin (Marshall 2003 p. 162.)

3.3. Environmental conditions for focal species.

Rather than attempt to describe the status of all habitats in the subbasin, a shorter list of *focal habitats* were selected to represent environmental conditions in the subbasin for focal species. Focal habitats were selected from the complete list of habitats in the subbasin by examining current habitats compared to historic habitats *at the subbasin level* as presented by IBIS data, and selecting those habitats that were reduced significantly from historic acreages. Some focal habitats, habitat attributes, and habitat components occurring within the more general habitats were also selected based on concerns by local biologists and others, even though IBIS information was not available to assess the status of these habitats, attributes, and components.

As additional information, focal habitats status in the subbasin were compared to status at the larger ecoprovince level to discover if the focal habitats status in the subbasin were similar to the status if those habitats on a larger scale. Then, focal habitats status at the smaller assessment unit level within the subbasin are presented, followed by focal habitats status at the smallest unit, the HUC 6 small watershed level. Condition, trend, connectivity, and spatial issues for focal habitats are presented, as is the protection status of focal habitats. Projected future status of focal habitats with no future actions is also presented.

3.3.1. Selection of focal habitats at the subbasin level.

IBIS Map Data. Historic and current habitat maps of habitats for the entire subbasin from IBIS show substantial changes since 1850. The historic map (see Appendix maps) shows broad bands of habitats running north and south. Beginning on the west side of the subbasin, a band of mountain fir and hemlock forest habitat types is shown in higher elevations of the Cascade Mountains. Then, a band of ponderosa pine forest, mixed with some lodgepole pine forest, is shown running from the Columbia River southward, approximately along the eastern foot of the Cascades. At the southern end of this band of mostly ponderosa pine woodland, larger blocks of lodgepole pine forest begin to break into the band of ponderosa pine. East of the Deschutes River, a band of mostly shrub-steppe habitat with interspersed interior grassland and Western juniper woodland areas again runs north-south, with a large block of shrub

steppe habitat shown in the southeastern section of the subbasin, and a large block of Western juniper woodland southeast of Redmond. Along the east edge of the subbasin, an area of ponderosa pine forest is shown in the Blue Mountains east of Prineville, and a large block of interior grassland habitat is shown in the northeastern section of the subbasin southeast of The Dalles.

The current habitat map of the subbasin shows fragmentation of the large blocks of ponderosa pine, lodgepole pine, and shrub-steppe habitats formerly existing in the subbasin, and the complete loss of the grassland habitats thought to have existed in 1860. The band of mixed conifer forests running north-south in the Cascade Mountains on the west side of the subbasin is shown to have encroached into the lower-elevation ponderosa pine and lodgepole pine forests along the eastern foot of the Cascades. The large block of juniper woodland south and east of Redmond and Prineville is shown to have spread throughout the former shrub-steppe habitat running through the center and into the southeastern part of the subbasin, fragmenting the shrub-steppe habitat. Other conifer forest types are shown to have encroached into the former ponderosa pine forests in the Blue Mountains east of Prineville.

Acreages from IBIS Maps. Historic and current habitat acreages reflect the proportions shown on the habitat maps, since the acreage information is derived from the maps, but shows the habitat information in a quantitative format (Table 4).

Riparian and herbaceous wetland habitats are not shown in sufficient accuracy of scale on the IBIS maps to be useful (O'Neil, p.c.,) and this was a concern for local biologists, who considered these two habitats to be the highest priority habitats for restoration or conservation in the subbasin. Due to the linear nature and small areas of occurrence of riparian wetlands, this habitat was not considered to be displayed in accurate scale. The interpretation of satellite imagery for herbaceous wetlands was felt to be possibly inaccurate due to similarity in the light reflection signature of agricultural areas.

Although riparian habitat quality is also considered in the fish habitat models presented in this plan, it is only considered at a minimal level, rating vegetation shading on the immediate shoreline. The riparian wetland and herbaceous wetland habitat descriptions for wildlife include much wider areas out from the stream channel in many areas, including important areas such as oxbow sloughs, backwaters, marshes, seasonal wetland areas, and near-stream springs and seep areas which are important habitat. It is suggested that the riparian evaluations for fisheries habitat models would not correspond to an evaluation of riparian wetlands and herbaceous wetlands for wildlife. Therefore, it is apparent at the very beginning of this evaluation that there is a lack of data for riparian wetlands and herbaceous wetlands in the subbasin, since no alternate source of data on historic or current riparian wetlands or herbaceous wetlands is known.

Other habitats also are not shown in large enough scale or for other reasons are not considered to show significant results (Ibid.) Canyon shrublands, for example, were a recent addition to the habitat type list, and could not be compared with historic data, and also was an unsuccessful attempt to display a linear habitat, therefore this habitat is not discussed. These habitats and other habitats that were not thought to be shown as useful acreages for comparison are indicated as "n/a" under the percent change column in Table 4.

Table 4. Current and Historic Wildlife-Habitat Acreage Changes, Deschutes Subbasin

Habitat ID	Habitat Name	Current Acreage	Historic Acreage	Change from Historic	Percent change
1	Mesic Lowlands Conifer-Hardwood Forest	2,267	34,970	-32,703	n/a
3	Southwest Oregon Mixed Conifer-Hardwood Forest	173	0	173	n/a
4	Montane Mixed Conifer Forest	546,968	194,288	352,680	182%
5	Interior Mixed Conifer Forest	676,086	350,133	325,953	93%
6	Lodgepole Pine Forest and Woodlands	213,432	532,706	-319,274	-60%
7	Ponderosa Pine & Interior White Oak Forest and Woodlands	1,320,270	1,860,264	-539,994	-29%
8	Upland Aspen Forest		741	-741	n/a
9	Subalpine Parkland	38,839	25,361	13,478	n/a
10	Alpine Grasslands and Shrublands	14,636	12,425	2,211	n/a
12	Ceanothus-Manzanita Shrublands	2,996	0	2,996	n/a
13	Western Juniper Woodlands	1,347,101	790,348	556,753	70%
14	Interior Canyon Shrublands	82,856	0	82,856	n/a
15	Interior Grasslands	4,684	630,630	-625,946	-99%
16	Shrub-steppe	1,982,194	2,299,065	-316,871	-14%
17	Dwarf Shrub-steppe	127,843	5,683	122,160	n/a
18	Desert Playa and Salt Scrub Shrublands	3,225	1,418	1,807	n/a
19	Agriculture, Pastures, and Mixed Environs	337,369	0	337,369	n/a
20	Urban and Mixed Environs	22,026	0	22,026	n/a
21	Open Water - Lakes, Rivers, and Streams	57,774	76,139	-18,365	n/a
22	Herbaceous Wetlands	51,512	20,263	31,249	n/a
24	Montane Coniferous Wetlands	15,781	0	15,781	n/a
25	Interior Riparian-Wetlands	7,568	21,251	-13,683	n/a
	Total Acres:	6,855,591	6,855,680		
*Acreages are estimates only. Subbasin total acreage may vary slightly between Current and Historic due to mapping procedures.					
*Copyright 1998-2003. Please visit the IBIS web site (www.nwhi.org/ibis) for Copyright and Terms of Use limitations. This data is continually updated and therefore subject to change.					
*Subbasin Habitat Acreages Generated by IBIS on 10/13/2003 11:45:52 AM.					

Large-scale losses in habitats in the subbasin. The loss of over 600,000 acres of estimated historical interior grassland habitat in the subbasin, nearly all of the grassland in the subbasin, is a large-scale shift in habitat. The indicated loss of over 300,000 acres of shrub-steppe habitat in the subbasin, although amounting to a relatively low percentage of 14 percent of the estimated historic shrub-steppe acreage, is also a significant change in habitat area. The apparent loss of ponderosa pine and lodgepole pine forests due to encroachment of other conifer forest types indicated on the historic and current maps is reinforced by the acreage data showing an increase of nearly 700,000 acres in other conifer habitats since historic estimates, with corresponding decreases in ponderosa pine forest and lodgepole pine forests of over 500,000 acres and over 300,000 acres respectively, for a loss of over 800,000 acres combined of ponderosa and lodgepole forests, a significant major habitat shift in the subbasin.

Large-scale increases in habitats in the subbasin that may explain large-scale losses. Increases in mixed conifer forests, juniper woodlands, and agriculture areas are large-scale changes in habitat in the subbasin. The increase in agriculture acreage would be expected, but the acreage number shown of 337,000 acres should be considered only an approximation in light of the known coarseness of the interpretation of the satellite data related to this habitat, which is especially difficult to define (O'Neil, p. c.) The increases in mixed conifer forests would also be expected, since it is apparent from inspection of the historic and current habitat maps that these habitats have encroached on the pine habitats at lower elevations along the Cascades. The increase in juniper woodland might also be expected, since the loss of grassland habitat in the subbasin could be partially attributed to encroachment by juniper woodland, as well as conversion to agriculture.

Selection of three focal habitats on the basis of IBIS maps and acreage data at the subbasin level. Based on the above maps and acreage data at the subbasin level, the following habitats were selected as focal habitats. Focal habitats were designated as those habitats that have been reduced more than 25% in acreage from historic levels in the subbasin:

- Interior grasslands (99% reduction)
- Lodgepole pine forest and woodlands (60% reduction)
- Ponderosa pine forest and woodlands (29% reduction)

Selection of focal habitats on the basis of concern by biologists and others. Local biologists and others also identified habitats attributes and habitat components that are thought to be reduced in acreage or reduced in quality from historic levels, although IBIS data or other data were not available to support these hypotheses. These habitats and components are:

- Riparian and wetland habitats (loss of water suppy, loss of vegetation, loss of channel structures such as backwaters and oxbow sloughs, loss of springs and seeps)
- Shrub Steppe habitats (loss of plant diversity, succession advanced to juniper woodland habitat, or other vegetations)
- Habitat structure: large tree (late seral stage) structure, snag structure, rock structure such as cliffs and rimrocks degraded by development such as rock pits and dwellings).
- Habitat plant diversity: dwarf shrub-steppe brush species (loss,) quaking aspen (loss,) white oak (loss,) and cottonwood groves (loss.)
- Ungulate winter range areas (degradation.)

- CRP lands which provide grassland habitats for wildlife (gain in grassland habitat on land classed as agricultural land.)

Summary of focal habitats selected. If the habitats selected by biologists and others are combined with the habitats that are more than 25% reduced from historic levels as displayed by current vs. historic IBIS maps and acreage data, the following list of focal habitats and habitat attributes and components is produced (Table 4A.)

Table 4A. Focal habitats selected for the Deschutes subbasin.

Focal habitat	Description of focal habitat
Interior grasslands	IBIS Habitat 15.
Lodgepole pine forest and woodland	IBIS Habitat 6.
Ponderosa pine forest and woodland	IBIS Habitat 7.
Lower Eastside Deschutes Interior Riparian-Wetlands	IBIS Habitat 25. (no IBIS data)
Herbaceous Wetlands	IBIS Habitat 22. (no IBIS data)
Shrub Steppe habitats	IBIS Habitat 16.
Habitat structure: large tree structure (late seral,) rock structure.	Habitat attribute within other habitat designations.
Habitat plant diversity: dwarf shrub-steppe brush species, quaking aspen, white oak, and cottonwood groves.	Habitat attribute within other habitat designations.
Ungulate winter range areas.	Habitat attribute within other habitat designations.
CRP lands which provide grassland habitats.	Farmed land condition producing grassland habitat.

3.3.2. Focal habitats status for the Columbia Plateau Ecoprovince.

The Deschutes Subbasin is part of the larger Columbia Plateau Ecoprovince, which is made up of eleven subbasins, including the Deschutes Subbasin. Wildlife habitats thought to occur historically and currently in the Columbia Plateau Ecoprovince are displayed in the Appendix maps. These maps show that some changes that have occurred in the larger ecoprovince are similar to changes that have occurred in the Deschutes Subbasin. Specifically, changes to the four focal habitats that are shown by IBIS historic and current data for the Deschutes subbasin are shown as changing for the ecoprovince in a similar manner. Shrub-steppe and grassland habitats have been largely replaced by agricultural uses, and ponderosa pine and lodgepole pine habitats have been reduced and fragmented. Montane mixed conifer habitats have apparently increased, as have juniper woodlands. These changes are further displayed in color-coded maps presented in the Appendix maps

3.3.3. Focal habitats status for the assessment unit level.

In order to display more local information, the subbasin was divided into eight smaller areas designated as *assessment units* (AU's) (see subbasin Appendix maps.) The changes in wildlife habitats within the AU's as indicated by map data are summarized and discussed in the following sections. Since no map data are available for riparian or herbaceous wetlands, these habitats are not discussed.

Cascade Highlands AU. This higher-elevation AU was historically covered predominately with ponderosa pine forest, with substantial acreages of lodgepole pine forest and mixed conifer forest also present (see Appendix table I.) Currently, 80 percent of the former lodgepole and ponderosa pine forests have been lost. The losses in pine forests are accounted for in the increases in other mixed conifer forests.

Upper Deschutes AU. This AU was historically predominately covered with ponderosa pine and lodgepole pine forests. Over 179,000 acres of lodgepole pine forest habitat have been lost, representing 50 percent of the historic area of this habitat. All of the former grassland existing in this AU, an area of approximately 37,000 acres most of which was located between Tumalo and Sisters, has also apparently been converted to other uses or habitats. A substantial loss of shrub-steppe habitat amounting to approximately 29,000 acres, representing 57 percent of the historic habitat area, has also been lost. These losses are largely balanced by gains in mixed conifer forests (145,000 acres,) and agriculture and urban areas (55,000 acres.) Another 30,000 acres of habitat gains are indicated in montane coniferous wetlands and herbaceous wetlands categories, but the location and status of these habitats in the AU are not known. The accuracy of these latter classifications is somewhat doubtful until ground-truthing can be carried out and these habitat descriptions are further clarified (O'Neil, p.c.)

Middle Deschutes AU. Over 15,000 acres of grassland, or 100 percent of the historic grassland which is thought to have occurred in this AU has been lost. Map data also indicates a loss of mesic lowlands conifer-hardwood forest of over 16,000 acres. This habitat description was originally meant to describe habitats on the west side of the Cascades that included red alder and bigleaf maple intermixed with conifer species. The mapping data that indicates this habitat east of the Cascades could be recognizing areas of quaking aspen, black cottonwood, and possibly willow intermixed with conifer species. If this is the case in this AU, this mapping data could indicate a loss of substantial acreage of these mixed hardwood areas. It should be remembered that the historic habitat areas are largely educated estimates by vegetation and soils specialists, therefore this indicated loss would be an estimate by specialists. Substantial losses in pine forest areas are also indicated in this AU, with a combined estimated loss of over 156,000 acres of ponderosa pine and lodgepole pine forest, or about 48 percent of the historic area. These losses are again balanced by substantial increases in other mixed conifer forests.

Lower Westside Deschutes AU. Substantial losses in pine forest habitats have occurred since historic conditions in this AU, mostly consisting of losses in ponderosa pine forests, where a loss of over 85,000 acres or 37 percent of the former area is thought to have occurred. Three large areas of former grassland in the center and north end of the AU amounting to over 99,000 acres were also lost. These losses are balanced by gains in shrub-steppe habitat and forested habitats, as well as conversion to agriculture. Groves of white oak are present in this AU, and are thought to have declined from former acreages and to be threatened with future continued declines in acreage. White oak groves are probably included in the ponderosa pine and lodgepole pine forest classifications.

White River AU. A substantial loss of over 56,000 acres (57 percent) of ponderosa pine forest is indicated in this AU, as well as a loss of over 26,000 acres (36 percent) of shrub-steppe habitat. These losses are balanced by gains in mixed conifer forest and agriculture lands. Substantial groves of Oregon white oak are present in this AU, according to local biologists, and these groves are probably included in the ponderosa pine and lodgepole pine forest classifications.

LOWER EASTSIDE DESCHUTES AU. This AU is where most of the historic grasslands in the subbasin were located. All of these grasslands were lost, a loss of an estimated 371,000 acres of habitat. This habitat loss was balanced by similar large increases in shrub-steppe and juniper woodlands habitats

(160,000 acres) mixed conifer forest habitat, agriculture (71,000 acres) and some loss can be put down to a change in habitat description where part of the former grasslands may have been classified into a habitat classification called canyon shrublands, although this habitat description needs clarification.

Lower Crooked AU. This AU was historically predominately composed of pine forests, juniper forest, shrub-steppe, and grassland, with shrub-steppe the largest area of habitat at over 464,000 acres. The grassland habitat was lost (35,000 acres.) Eighty-nine percent of the lodgepole pine forests were also lost (75,000 acres.) Substantial acreages of juniper forest, ponderosa pine forest, and shrub-steppe were also lost, although the percentage losses ranged only between 8-11 percent. These losses in habitat were balanced somewhat by gains in mixed conifer forest (14,000 acres,) but mostly by gains in agriculture and dwarf shrub-steppe habitat. Large areas of the eastern part of this AU indicated on the current habitat map as dwarf shrub-steppe habitat actually were cleared of sagebrush in the past and planted to exotic perennial grasses, and subsequently used intensively as livestock rangeland, and it is thought by local biologists that this area may have been incorrectly labeled as dwarf shrub-steppe if that classification was the closest to the spectral analysis results. This habitat question needs clarification.

Upper Crooked AU. This AU was historically predominately covered with shrub-steppe habitat, at an estimated 1 million acres. Next in acreage were ponderosa pine forests at 454,000 acres, followed by juniper woodlands at 179,000 acres. Shrub-steppe and ponderosa pine forests were reduced from historic acreages in the AU by 38 and 35 percent respectively, amounting to a substantial habitat shift in the AU. These losses were balanced out by gains in juniper woodlands (401,000 acres) and mixed conifer forests (111,000 acres.) Scattered areas of grasslands amounting to nearly 61,000 acres were also historically present in this subbasin, and these grasslands were reduced by an estimated 93 percent to the remaining small area of about 4,000 acres. Areas of historic lodgepole pine forests amounting to an estimated 17,000 acres were also lost in the AU.

3.3.4. Focal habitats status at the HUC 6 level.

A total of 341 HUC6 (habitat unit code 6th level) small watersheds are present in the subbasin. Focal habitats data at the HUC6 level are displayed as color-coded changes from historic levels to current levels (see last 12 maps in the Appendix.) Two disclaimers must be remembered when looking at these color-coded maps, however. First, if a HUC6 is shown in red, for example, that would indicate a greater than 75% decrease in habitat area, but it must be remembered that this may indicate a decrease from only 10 acres of habitat to 1 acre of habitat, to present an extreme example. The point being that the acreages that the color-coded data was drawn from are not shown, nor are the locations of the historic habitat within the HUC6. Second, it is not clear from the maps if the non-colored (white) HUC6s are areas where the focal habitat did not occur, or if it is an area where the habitat did occur historically, but the change in area fell within the 49% increase to 49% decrease category. Ideally, the acreage and location data for each HUC6 would be displayed on a table linked to each map HUC6, along with other detailed data concerning past and ongoing projects and stream reach priorities. This level of detail was not attained in this report but will remain as a goal for future work. For the present, the approximate locations of past and ongoing projects and priority stream reaches for restoration and conservation are shown on the background of wildlife habitat changes on these maps. The maps are also supplied on CD format so the maps can be manipulated using Adobe software to increase the detail, so that stream names, for example, can be seen.

From these maps, it is apparent that a significant number of past and ongoing projects have been and are being initiated in the subbasin. These maps will be a possible starting point to begin coordinating the approach to restoring priority wildlife and fisheries habitats within the guidelines given in this plan.

3.3.5. Condition, trend, connectivity and spatial issues for focal habitats.

A summary of condition, trend, connectivity and spatial issues for focal habitats at the AU level is presented in Table 5. These issues will be evaluated at the HUC 6 level in later drafts.

Table 5. Habitat Condition, Trend, Connectivity and Spatial Issues in Assessment Units.

Assessment Unit	Habitat	Condition	Trend	Connectivity	Spatial
Cascade Highlands	Ponderosa pine forest	Loss large trees	Losses in acreage	Fragmented	Higher-elevation losses
Upper Deschutes	Lodgepole pine forest	Loss dead and large trees	Losses in acreage	Fragmented	Loss of two large areas
Upper Deschutes	Grassland	n/a	n/a	n/a	Loss of one large area
Middle Deschutes	Ponderosa and lodgepole pine	Loss dead and large trees	Losses in acreage	n/a	Higher-elevation losses
Lower Westside Deschutes	Ponderosa pine forest	Loss large trees	Losses in acreage	n/a	Higher elevation losses
Lower Westside Deschutes	Grassland	n/a	n/a	n/a	Loss of three large areas
Lower Westside Deschutes	Oak groves	n/a	Losses in acreage	n/a	n/a
White River	Oak groves	n/a	Losses in acreage	n/a	n/a
White River	Ponderosa pine	Loss large trees	Losses in acreage	n/a	Higher elevation losses
White River	Shrub-steppe	n/a	Loss in acreage	Fragmented	n/a
LOWER EASTSIDE DESCHUTES	Grasslands	n/a	Loss of all acreage	n/a	n/a
Lower Crooked	Grasslands	n/a	Loss of all acreage	n/a	n/a
Lower Crooked	Lodgepole pine	Loss large trees and dead	Loss of acreage	Fragmented	Higher elevation losses
Lower Crooked	Dwarf shrub-steppe	Mis-classified	n/a	n/a	n/a
Upper Crooked	Shrub-steppe	Changes in composition	Loss of acreage	Fragmented	n/a
Upper Crooked	Ponderosa pine	Losses of large trees	Loss of acreage	Fragmented	Higher elevation losses
Upper Crooked	Grassland	n/a	Loss of all acreage	n/a	Stream valley losses

3.3.6. Protection classes for focal habitats.

Protection classes for three focal habitats at the subbasin level are shown in Table 6. Since grassland habitat are no longer present in the subbasin, no protection status is shown. Approximately 1/3 of ponderosa pine habitat are thought to have no protection from future degradation, and the remaining 2/3 is thought to have only low protection from degradation in the future. Approximately 1/4 of lodgepole pine forests have no protection from future degradation, and nearly all of the remaining habitat is thought to have only low protection from future degradation. Descriptions of protection classes are shown after Table 6.

Table 6. Protection levels for three focal habitats for the entire subbasin.

Habitat	Protection	Acres
Lodgepole pine forest and woodlands		213,359
	High	2,241
	Low	158,902
	Medium	223
	None	48,136
	(blank)	3,857
Ponderosa pine forest and woodlands		1,319,771
	High	13,196
	Low	807,038
	Medium	17,244
	None	472,092
	(blank)	10,201
Shrub-steppe		1,981,496
	High	5,831
	Low	742,581
	Medium	76,800
	None	1,144,492
	(blank)	11,792
Grand Total		3,514,625

Base data from IBIS 2004, and Barrett 2003. Tabulated and summarized by Mark Garner, Natural Resources Consulting, Inc., Bend, OR.

[1] Protection class descriptions:

High

- An area having permanent protection from conversion of natural land cover and a mandated management plan in operation to maintain a natural state within which disturbance events (of natural type, frequency, intensity, and legacy) are allowed to proceed without interference or are mimicked through management.

Medium

- An area having permanent protection from conversion of natural land cover and a mandated management plan in operation to maintain a primarily natural state, but which may receive uses or management practices that degrade the quality of existing natural communities, including suppression of natural disturbance.

Low

- An area having permanent protection from conversion of natural land cover for the majority of the area, but subject to extractive uses of either a broad, low-intensity type (e.g., logging) or localized intense type (e.g., mining). It also confers protection to federally listed endangered and threatened species throughout the area.

None

- There are no known public or private institutional mandates or legally recognized easements or deed restrictions held by the managing entity to prevent conversion of natural habitat types to anthropogenic habitat types. The area generally allows conversion to unnatural land cover throughout.

Some protections are in place for focal habitat attributes and components (Table 6A.)

Table 6A. Protections in place for focal habitat attributes and components.

Habitat Attribute or Component	Protection mechanism in place currently
Tree species: aspen, cottonwood, oak.	Some mgt on public land for aspen
Structure: large diameter trees, rimrocks, cliffs	Some mgt on spotted owl nest areas for large trees, some setbacks through Deschutes county planning for rimrocks.
Ungulate winter ranges	County planning department ordinances in place in most counties providing some protections.
CRP	Some protections in place as long as contracts are in force.

3.3.7. Potential and projected future condition of focal habitats *with no future actions.*

Estimated potential and projected future condition of focal habitats and focal habitat attributes and components with no future actions are shown in Table 7. A discussion of the table summary follows.

Table 7. Projected and potential future condition of focal habitats and focal habitat components and attributes, with no future actions.

Habitat or component	Best potential condition	Worst potential condition	Projected future condition (20 yrs.)
Riparian, herbaceous wetlands	Slower loss	Increasing loss	Continued loss. Although no trand data are available, losses are thought to far exceed restoration work. Restoration may take years, but permanent losses occur within

Table 7. Projected and potential future condition of focal habitats and focal habitat components and attributes, with no future actions.			
Habitat or component	Best potential condition	Worst potential condition	Projected future condition (20 yrs.)
			hours or days.
Grasslands steppe	Restoration of some areas.	No restoration.	Some restoration on Crooked River Natl Grasslands
Shrub steppe	Slower loss, some restoration on public and private lands	Loss private lands, continued degrade on public lands	Continued loss and degradation due to vegetative succession and changes. Some restoration on public, private lands.
Ponderosa pine forests	Slower loss private, some mgt on public	Continued loss private and public	Continued loss public and private
Lodgepole pine forests	Slower loss	Loss of all except public	Loss of all except public
Habitat structure	Slower loss	Accelerated losses	Accelerated losses
Plant diversity	Some mgt public and private lands	Continued loss	Some mgt private and public
Ungulate winter range	Slower degradation	Accelerated loss and degradation	Accelerated losses and degradation
CRP lands	Improved mgt of contracted acreage for grassland habitat	Losses of lands from program	Unknown

Riparian wetlands and herbaceous wetlands. Although historic and current map and acreage data from IBIS is not useful to indicate the status of these habitats in the subbasin, these habitats are thought to be greatly reduced from historic conditions, and are considered to be extremely valuable for species diversity within the subbasin. The future status of remaining habitats with no action is thought to be continued loss from conversion to various other uses.

Interior Grassland Habitat. With no future actions, it is estimated that most of the remaining small areas of grassland will be lost. Some acreage of grassland on the Crooked River National Grasslands near Madras will be conserved or restored, and some areas of grassland currently in CRP contract lands may be managed for natural grassland habitat in the future, but these will amount to relatively small acreages.

Shrub-steppe Habitat. Over 1/3 of the acreage of remaining shrub-steppe habitat is thought to have no protection from degradation in the future, and nearly another 1/3 of the total acreage has only low protection status. With no future actions, it is projected that shrub-steppe habitat will continue to decline as juniper invasion continues and vegetation becomes more decadent.

Ponderosa pine forest and oak woodlands. Although the apparent result of the decline in ponderosa pine forest is increased acreage of other conifer forests, the mechanisms causing the change are unknown, therefore the future trend with no action is unknown.

Lodgepole pine forests. These forests occur in the same general zone as ponderosa pine, and are shown in the IBIS maps to have been reduced by over 300,000 acres, or 60 percent of the historic habitat acreage. It should be noted that the remaining acreage of this habitat is only approximately 200,000 acres, compared to ponderosa pine at 1.3 million acres in the subbasin. Remaining acreages of lodgepole pine forest are also fragmented. Much of the former area of lodgepole pine forest existed north of Bend in the Sunriver-Lapine area, and this is an area of continued development for dwellings and suburban and urban uses, therefore it is thought that lodgepole pine forests will continue to decline in this area with no action. The mechanisms causing declines in other areas are unknown, therefore the future status of the lodgepole pine forests in these areas with no action taken is unknown.

Structure: Large late-seral tree forest component, large ponderosa pine trees. Local biologists indicate the continued need to consider the structural diversity within forests as a measure of the forest wildlife species productivity. For example, the structural diversity provided by large ponderosa pine groves in a late-seral condition are thought by local biologists to contribute valuable structural diversity to pine forests, and to provide habitat for a wider array of wildlife species than would otherwise exist in these forests. Large late seral ponderosa trees are thought to be required by species such as the white-headed woodpecker. Another example would be large-tree riparian cottonwood forests, a structural component of riparian wetlands habitat. Large-tree cottonwood riparian forests are thought by local biologists to have been nearly lost in the subbasin. Similarly, groves or stands of large late seral tree component within other conifer forests such as true fir, hemlock, and Douglas fir provide valuable structural diversity within these forests for a variety of wildlife species. Some protections are thought to be in place for large tree stands or groves of Douglas fir forest in a late seral condition within spotted owl nest areas; however, in other areas or tree species with protections are known, therefore, the future status of this component in the subbasin with no action is thought to be continued decline as harvest and loss from other causes occurs.

Structure: Large late-seral tree forest component large juniper trees. Juniper forests composed of large trees up to 1,500 years old that occur in an area east of Bend and Redmond may be threatened by the broad perception that juniper forests are of little value or actually threaten other habitats and therefore should be removed. This perception among biologists has been apparently fostered by the observed encroachment by juniper woodland into former shrub-steppe habitats in the controlled-wildfire environment in the subbasin. This encroachment has long been a concern among fisheries and wildlife biologists in the subbasin according to local biologists, since the expansion of juniper was perceived as a loss of shrub-steppe habitat that is a component of high-quality mule deer and pronghorn antelope habitat, and was also observed to impact surface and subsurface water runoff in stream systems (as the junipers grew in, surface water runoff gradually disappeared, removing surface water from the system.) Projects have been undertaken to manually cut away younger-age junipers in some fairly large areas in the subbasin. Local biologists assert that older-age large-tree-component juniper forests are a valuable part of the wildlife habitat in the subbasin, that a wide array of wildlife occur in these forests, and that these large-tree forests should be managed for conservation in the future. Although some protections are thought to be in place, the areas and details are not known, therefore the status of this forest component in the future with no action is thought to be continued decline as losses of trees occur for various reasons.

Structure: Rimrock and cliff habitats. Rock habitats are not described by the IBIS data source as a separate habitat, but are listed within habitat types as a structural component. No known source of mapped rock habitat areas or acreage estimates are known. Of concern by local biologists are the river canyon rimrocks, tableland rimrocks, and cliff habitats which are threatened by suburban homesite uses or

other uses such as rock mining. The future status of these habitats with no action is expected to be further decline in quality and availability to wildlife.

Plant diversity: Oregon white oak groves. The oak forest component of ponderosa pine forest habitat is thought by local biologists to occur as mosaic or as isolated groves along the lower foothills of the Cascades from the town of Warm Springs north to The Dalles (Team 2003.) Some oak groves were also present in the Lower Eastside Deschutes AU historically, and remnant groves are still present in that area. Oak habitat is not shown in the IBIS data, but is thought by local biologists to be much reduced from historic levels, and is thought to be threatened by development for homesites and other future changes in land use (Calvin and Kohl p.c.) The future trend for the oak component of oak grove habitat with no action is thought to be a continued decline due to conversion to other land uses such as suburbanization or clearing for agricultural use.

Plant diversity: dwarf shrub-steppe. This habitat is considered by local biologists to be a valuable part of the structural diversity within the steppe habitat landscape. Since this habitat is not thought to be displayed accurately in the IBIS current habitat map, further work needs to be done to define this habitat in the subbasin, and the trend in the status of this habitat is unknown.

Plant diversity: aspen groves. This habitat occurs as smaller patches within other habitats in the subbasin, according to local biologists, and these smaller patches are referred to as aspen groves rather than forests for this reason. Although this habitat is described as a habitat type in the IBIS system, it is not thought to be represented accurately by mapped data, and no data is available to compare historic and current status. However, it is thought by local biologists that aspen groves are much reduced from historic times in the subbasin, and that this habitat is valuable to the species diversity in the subbasin. While no mapped data is available from IBIS, some map data of existing aspen groves in the subbasin is thought to exist in local US Forest Service and US Bureau of Land Management offices, since aspen groves have been identified as a habitat project item in some of these offices, and field activities to re-establish former aspen groves have been conducted out of some of these offices. Aspen forests and smaller groves are of concern among biologists and others in the Western states in general (Shepperd et al. 2001.) The future status of aspen groves in the subbasin with no action is thought to be continued loss as groves are harvested or lost for various reasons.

Plant diversity: cottonwood groves. Cottonwood groves once occurred along lower and middle reaches of streams and rivers in the subbasin, but are thought to be almost entirely gone from the subbasin, with only isolated groves remaining.

Ungulate Winter Ranges. Ungulate winter ranges occur over large areas of the subbasin, and are not necessarily defined by existing vegetation, but by elevation, aspect, and historic use by ungulates. Ungulate species such as mule deer, elk, pronghorn antelope, bighorn sheep, and mountain goats require winter range habitat areas. Ungulate winter ranges for mule deer southwest of Bend are thought by local biologists to have declined in productivity due to encroachment by suburban and other uses, and by changes in vegetation. Acreage data from some ungulate winter ranges in the subbasin were obtained, and analyzed to show the historic and current wildlife habitats which make up these areas. This is not a complete inventory of all winter ranges in the subbasin, but is a significant proportion, to provide an example of information that can be obtained and used for management of winter ranges. The current habitats represented in the highest acreages within ungulate winter ranges in the subbasin are juniper woodlands, shrub steppe and ponderosa pine woodland (Table 9.) Shrub-steppe and ponderosa pine woodlands make up the highest acreages of focal habitats in winter ranges (Table 9A.) Other acreages of

habitats in winter ranges, including historic acreages, and also shown by AU, are presented in 9B, 9C, and 9D. More work needs to be done to obtain complete information for the subbasin on ungulate winter ranges, and to analyze the habitat information in more detail. The future status of ungulate winter ranges with no action is expected to be further declines in quality and availability to wintering animals.

Table 8. Acreages of all habitats within ungulate winter ranges, from current habitats map.

Habitat	Acres
Lower Eastside Deschutes (interior) grasslands	2990
Lodgepole pine forest and woodlands	8504
Montane mixed conifer forest	28026
Dwarf shrub-steppe	29003
Agriculture, pasture and mixed environs	43086
Lower Eastside Deschutes (interior) mixed conifer forest	200764
Ponderosa pine forest and woodlands	401652
Shrub-steppe	510439
Western juniper and mountain mahogany woodlands	703891
Grand Total	1928355

Table 9 Acreages of all habitats within ungulate winter ranges, from historic habitats map.

Habitat	Acres
Lower Eastside Deschutes (interior) grasslands	70230
Lower Eastside Deschutes (interior) mixed conifer forest	75944
Lodgepole pine forest and woodlands	55529
Ponderosa pine forest and woodlands	626710
Shrub-steppe	784424
Western juniper and mountain mahogany woodlands	319896
Grand Total	1932733

Table 9A. Acreages of focal habitats within winter ranges, from current habitats map.

Habitat	Acres
Ponderosa pine forest and woodlands	401652
Shrub-steppe	510439
Grand Total	912091

Table 9B Acreages of focal habitats within winter ranges, from historic habitats map.

Habitat	Acres
Lower Eastside Deschutes (interior) grasslands	70230
Lodgepole pine forest and woodlands	55529
Ponderosa pine forest and woodlands	626710
Shrub-steppe	784424
Grand Total	1536893

Habitat benefits from farmed land: Conservation Reserve Program (CRP) Agricultural Lands. This habitat is not shown in the IBIS database as a separate habitat, but is lumped in with agricultural lands. As an example, a map of CRP lands in the lower subbasin is presented in the Appendix. Acreages enrolled in CRP that are within historic focal wildlife habitat areas are shown in Table 9. This table shows nearly 32,000 acres of CRP lands enrolled within historic grasslands in the Lower Eastside Deschutes AU, which indicates potential acreage for grassland habitat if these CRP lands are managed with the goal of providing grassland habitat. Agricultural acreages enrolled under this federal program are usually planted to a mixture of grasses, and generally are left undisturbed without mowing or grazing, and therefore could be considered to be grasslands wildlife habitat. Although past CRP areas have been planted to domestic grass types, in recent years these acreages have been planted to a mixture of native grasses and legumes (Todd Peplin, p.c.) These agricultural lands, whether planted to propogated or native grasses, provide habitat for grassland wildlife species. While this acreage is not comparable to the 630,000 acres of grassland habitat formerly existing in the subbasin, there is some potential for future habitat. A sentence from recent literature on the decline of prairie grouse states: "Landscape-level habitat restoration through federal conservation programs may be the only option available to prevent several of these [prairie grouse] species from declining to dangerously low levels." (Riley 2004 p.83) The future status of these areas without action is unknown, however, since economic decisions by the landowners and government entities involved will influence the area under agreements.

Table 9C. CRP-enrolled acreages within historic wildlife habitats in the LOWER EASTSIDE DESCHUTES, Lower Westside Deschutes, and White River AUs (Wasco and Sherman Counties).

Assessment Unit	Habitat	Acres
LOWER EASTSIDE DESCHUTES		39625.47221
	Lower Eastside Deschutes (interior) grasslands	31977.98603
	Shrub-steppe	7647.486183
LOWER WESTSIDE DESCHUTES		12195.81758
	Desert playa and salt scrub shrublands	126.2443409
	Lower Eastside Deschutes (interior) grasslands	3496.669954
	Herbaceous wetlands	126.5704522
	Open water - lakes, rivers, streams	13.63975541
	Ponderosa pine forest and woodlands	77.55271489
	Shrub-steppe	8355.140358
WHITE RIVER		3151.487733
	Lower Eastside Deschutes (interior) grasslands	109.3763954
	Herbaceous wetlands	310.8456137
	Ponderosa pine forest and woodlands	155.647107
	Shrub-steppe	2575.618617

Table 9C. CRP-enrolled acreages within historic wildlife habitats in the LOWER EASTSIDE DESCHUTES, Lower Westside Deschutes, and White River AUs (Wasco and Sherman Counties).		
Grand Total		54972.77752

Original data from IBIS and U.S. Natural Resources Conservation Service offices. Summarized by Mark Garner, Natural Resources, Inc., Bend, Oregon.

3.3.8. Out of subbasin effects: out-of-subbasin harvest of managed species

Mule deer are subject to harvest during deer season when they migrate out of the subbasin. They are also susceptible to diseases. No out of subbasin harvest occurs on American beaver, the only other harvested focal species.

3.3.9. Basin-wide assumptions: effects on productivity and sustainability.

3.4. Environment/Population Relationships
3.4.1. Optimal characteristics of KECs and environmental potential for KECs

Important environmental factors for species survival by life stage are referred to as key environmental correlates (KECs.) KECs for the focal species, optimal characteristics of the KECs, and environmental potential for the KECs are presented in Appendix table L.

3.4.2. Long-term viability of focal species based on habitat availability and condition

Estimated long-term viability for focal species based on projected habitat availability and condition are presented in Table 10.

Table 10. Long-term viability of populations of focal species based on habitat availability and condition.	
Species	Long-term viability
American beaver	Increasing in areas where riparian area is recovering. Decreasing in areas where riparian degradation continues.
Columbia spotted frog	Increasing in areas where riparian area is recovering. Decreasing in areas where riparian degradation continues.
White-headed woodpecker	Stable or increasing in areas where restoration projects occur and habitat is recovering. Stable or declining in areas with continued loss of large-diameter ponderosa pine trees and snags due to increasing human population and more intensive forest management.
Mule deer	Decreasing. Continued loss or fragmentation of winter range capability due to increasing human population.
Greater sage grouse	Decreasing. Continued vegetative succession is

Table 10. Long-term viability of populations of focal species based on habitat availability and condition.	
	expected to degrade shrub-steppe habitat in the absence of vegetative management options such as controlled burning.
Golden eagle	Decreasing. Loss of cliff and large tree nest sites will occur to due increasing human population, and other sources of mortality will increase.
Sharp-tailed grouse	(presently extirpated) Continued absence, unless action is taken by wildlife and habitat managers to restore populations.

3.4.3. Determination of key ecological functions (KEF's) and functional redundancy as a key indicator for ecological processes

The KEFs for the focal species are shown in Appendix table M, sorted by focal species to show functional redundancy. Functional redundancy refers to more than one species performing an ecological function; therefore, if two or more species are shown with the same KEF, functional redundancy is indicated. Functional redundancy would be shown at the most specific end of the KEF hierarchy. For example, both the Columbia spotted frog and the American beaver are heterotrophic consumers, but this would not show a high degree of functional redundancy until carried down the hierarchy to the lowest level where both species are shown to be aquatic herbivores. Another example of functional redundancy by two species from the table is the fact that both sage grouse and sharp-tailed grouse are bud and catkin feeders (KEF 1.1.1.10.)

3.4.4. Functional specialist species and critical functional link species.

Functional specialists are wildlife that perform very few ecological roles, and *critical functional link species* are wildlife that are the only species or are one of only a few species that perform a particular key ecological function in a particular wildlife habitat. Of the focal species, none were found to be functional specialists in the subbasin, and one, American beaver, was found to be a critical functional link species. The KEFs performed by the beaver are listed in Table 11.

Table 11. KEFs performed by American beaver, a critical functional link species, in habitats in the Deschutes Subbasin.		
KEF Description	Wildlife Habitat	Other species that perform KEF
bark/cambium/bole feeder	Open water	Black bear
Creation of aquatic structures	Forest habitats	None
Impounds water by damming or diverting	Forests, wetlands, open water	None
Creation of ponds or wetlands by wallowing	Open water, forest habitats	Rocky Mountain elk

3.4.5. Wildlife Interspecies relationships

Inter-specific relationships between the focal species can be obtained by examining the KECs and KEFs lists, sorted by KECs and KEFs. These lists are shown as Appendix M indicating KEFs and redundancy, and Appendix N showing interdependence of focal species utilizing the same habitat correlates.

The first indication of inter-specific relationships might be shared KEFs or KECs between two or more species. For example, both sharp-tailed grouse and white-headed woodpeckers share a KEF in that they both disperse seeds through ingestion or caching. Similarly, both golden eagles and white-headed woodpeckers share the KEC of utilizing snags.

Other indications of relationships might be more difficult to recognize. For example, one KEF for the golden eagle is that this species is a vertebrate consumer or predator. What this actually means is that the golden eagle could (and would) prey on all other 6 focal wildlife species, which would indicate a type of inter-specific relationship. This is also shown by the KEC information that shows all 6 other focal species as "prey for secondary or tertiary consumer."

3.4.6. Key relationships between fish and wildlife

Of the 7 focal species, beaver and the golden eagle are shown to interact with salmon. Beaver play an important role in maintaining functional riparian communities and floodplains. Golden eagle utilize salmon carcasses as food (Table 12.)

Table 12. Focal species interaction with salmonids.

Common Name	Salmonid-wildlife-Relationship Description*	Salmonid-wildlife Stages Description
Golden Eagle	Recurrent relationship	Carcasses
Golden Eagle	Recurrent relationship	Spawning - freshwater
Sage Grouse	No relationship	Not known or none
Sharp-tailed Grouse	No relationship	Not known or none
White-headed Woodpecker	No relationship	Not known or none
Mule Deer	No relationship	Not known or none
Columbia Spotted Frog	No known relationship	Not known or none
American Beaver	Recurrent relationship	Habitat diversity
SW-Relationship Description	Carcasses	Spawning - freshwater
Recurrent relationship	1	1

Table supplied by NHI, 2004.

3.5. Analysis of Limiting Factors
3.5.1. Limiting factors and opportunities for action inside the subbasin.

Disturbance factors limiting populations and ecological processes, with opportunities to have a beneficial effect or that can be corrected are shown in Table 12A.

Table 12A. Disturbance factors inside Deschutes subbasin limiting populations, and opportunites for action in assessment units.

Focal species or habitat/limiting factors	Assessment Unit(s)	Opportunties for action
American beaver	All	
Overharvest/eradication of local beaver populations (colonies)		Localized harvest regulation
No nearby local population to repopulate		Relocation of beaver to suitable habitat
Loss of riparian vegetation		Restore riparian vegetation
Loss of permanent water habitats due to other water uses		Restore permanent (year-around) water habitats
Columbia spotted frog	Upper Crooked only	
Competition/predation by exotics		Eradication of exotic plants, animals, fish in habitats
Loss of riparian vegetation		Restoration of riparian vegetation
Loss of oxbows, backwaters		Restoration of oxbows, backwaters
Spring development for livestock water		Restoration of springs habitats
Loss of permanent water habitat due to other water uses.		Restoration of permanent (year-around) water habitat.
White-headed woodpecker	All	
Lack of large-diameter ponderosa pine stands		Forest management for stands of large ponderosa pine.
Mule deer	All except Cascade Highlands	
Human disturbance on winter ranges		Controlled access on winter ranges
Poaching on winter ranges		Increased enforcement on winter ranges
Construction of dwellings, other development on winter ranges		Implement/develop protections
Reduced quality/quantity of forage on winter range		Management of plant communities on winter ranges to provide high quality/quantity forage.
Greater sage grouse	Upper Crooked and Lower Crooked	
Disturbance/destruction of lek sites		Implement/develop protections
Lack of knowledge of habitat requirements		Continued research

Table 12A. Disturbance factors inside Deschutes subbasin limiting populations, and opportunites for action in assessment units.		
Focal species or habitat/limiting factors	Assessment Unit(s)	Opportunties for action
Lack of knowledge of plant community manipulation methods needed to produce suitable habitat		Plant community research/management experiments
Columbian sharp-tailed grouse	Lower Eastside Deschutes, Upper Crooked, Lower Crooked, Middle Deschutes	
Lack of grassland habitat		CRP management for grassland habitat
Lack of grassland habitat		Management of Crooked River Natl Grassland for grassland habitat.
Local populations extirpated		Relocation of grouse to suitable habitat from Washington or as available
Golden eagle	All except Cascade Highlands	
Illegal shooting		Regulatory measures
Electrocution on power lines		Power pole modifications
Construction of dwellings near cliff nest sites		Implement/develop protections
Riparian habitats (See American beaver, Columbia spotted frog)	All	1. Replant riparian plants 2. Reconstruct backwaters, oxbow sloughs, natural meander 3. Establish beaver colonies.
Grassland habitat (see sharp-tailed grouse)	Lower Lower Eastside Deschutes Deschutes, Upper and Lower Crooked, Middle Deschutes	1. Use fire to re-establish former grasslands. 2. Eradicate noxious weeds and exotic grasses in former grasslands. 3. Eradicate juniper, brush that has encroached in former grasslands.
Shrub steppe habitat (see greater sage grouse)	Upper Crooked River, Lower Crooked River, Lower Lower Eastside Deschutes Deschutes, Lower Westside Deschutes.	1. Eradicate noxious weeds and exotic grasses. 2. Use fire to restore early successional stages.
Ponderosa pine forests (see white-headed woodpecker)	All AU's.	1. Inventory functional large-tree (late seral) stands. 2. Manage late-seral stands to

Table 12A. Disturbance factors inside Deschutes subbasin limiting populations, and opportunites for action in assessment units.		
Focal species or habitat/limiting factors	Assessment Unit(s)	Opportunties for action
		maintain connectivity.
Lodgepole pine forests	All	Inventory large-tree (late seral) stands.
Loss of large diameter lodgepole pine		Management for large diameter lodgepole.
Loss of insect irruption areas		Management of insect irruption areas for habitat.
Loss of fire-killed areas		Management of fire-killed areas for habitat.
Ungulate winter ranges (see mule deer also)	All	Inventory status of functional winter ranges.
Dwellings and other development in winter ranges.		Assess effectiveness of regulatory rules in place. Develop effective rules if needed.
Exotic ungulates and domestic livestock degrading vegetation on winter ranges.		Assess impacts of exotic and domestic livestock on winter range vegetation.
Exotic ungulates and domestic livestock communicating diseases to wild ungulates on winter ranges.		Assess impacts of disease on wild ungulate winter ranges. Example bighorn sheep are vulnerable to domestic sheep diseases, and wild elk are vulnerable to domestic livestock and exotic wild ungulate diseases.
Structure: rock cliffs, rimrocks (see also golden eagle).	Lower Eastside Deschutes, Lower Westside Deschutes, Upper Crooked and Lower Crooked, Upper Deschutes, Middle Deschutes	Inventory rimrock and cliff areas to assess impacts of development near cliffs and rimrocks
Structure: large diameter trees (late seral forest stages) (see white-headed woodpecker)	All	Inventory late-seral stage forest stands to assess connectivity.
CRP lands (see sharp-tailed grouse)	White River, Lower Eastside Deschutes, Lower Crooked River.	Inventory CRP lands where opportunity for grassland management exists.
Decadent CRP grass stands: invasion by brush		Restore grass areas
Mowing, grazing of CRP grass stands		Manage mowing or grazing to protect grassland habitat values
Vegetation species diversity:	All	Inventory aspen stands to assess

Table 12A. Disturbance factors inside Deschutes subbasin limiting populations, and opportunites for action in assessment units.		
Focal species or habitat/limiting factors	Assessment Unit(s)	Opportunties for action
aspen groves		connectivity.
Grazing: destruction of young aspen trees.		Protect young trees from grazing
Vegetation species diversity: cottonwood groves	All	Inventory cottonwood groves and seral stages to assess connectivity.
Grazing: destruction of young cottonwood trees		Protect young trees from grazing
Clearing of cottonwood groves		Replace groves in former areas
Cutting of large cottonwood trees/snags for firewood, other uses		Protect large trees/snags (late seral groves) from cutting for firewood or other uses.

3.5.2. Limiting factors outside the subbasin.

The only focal species that has been identified as being influenced by out-of-subbasin factors is a population of mule deer in the Middle Deschutes AU which migrates to summer range partly or entirely outside the subbasin. In the summer of 2003 a wildfire occurred on both the summer range (outside the subbasin) and winter range (inside the subbasin) of this herd, and this could have an effect on this population. Since this herd migrates between two different wildlife management units that are used to manage hunting seasons for deer, the hunting season on the out-of-subbasin summer range, that is in a different wildlife management unit than the winter range, could have an effect on this deer population.

Opportunities to have a beneficial effect, or conditions that can be corrected. Hunting seasons are monitored by the Oregon Department of Fish and Wildlife to make sure that overharvest does not occur on the migratory mule deer population in the Middle Deschutes AU. If overharvest or other impact to the mule deer population in the Middle Deschutes AU occurs, the hunting season can be modified.

3.6. Synthesis.
3.6.2. Working hypotheses.

Working hypotheses are presented in Table 13. Where no supporting evidence is indicated, no supporting data from IBIS sources or readily-available sources such as watershed assessments were found. A more complete listerature search for those items where no supporting evidence is indicated could produce evidence such as historic narratives supporting the hypotheses.

Table 13. Habitat hypotheses, species hypotheses, and supporting evidence.		
Number	Terrestrial working hypothesis	Evidence supporting hypothesis
1.	Large areas of riparian and wetland habitats have been lost or degraded since 1850.	No objective data were found. This is identified as a data gap.

Table 13. Habitat hypotheses, species hypotheses, and supporting evidence.		
Number	Terrestrial working hypothesis	Evidence supporting hypothesis
2.	Nearly all grassland habitats have been lost since 1850	1. Comparison of historical and current wildlife habitat maps from IBIS indicates loss of 99 percent of interior grasslands.
3.	Shrub steppe habitat has been reduced in area since 1850.	1. Comparison of historic and current wildlife habitat maps from IBIS indicates a 14 percent loss in shrub steppe since 1850.
4.	Large areas of lodgepole pine forest have been lost since 1850.	1. Comparison of historic and current wildlife habitat maps from IBIS indicates a 60 percent loss in lodgepole pine forest since 1850.
5.	Large areas of ponderosa pine forest have been lost since 1850.	1. Comparison of historic and current habitat maps from IBIS indicate a 29 percent loss in ponderosa pine habitat since 1850.
6.	Habitat structure such as large tree structure and cliff/rimrock structure has been lost or degraded as golden eagle nesting habitat since 1850.	See golden eagle species account.
7.	Aspen, cottonwood, and white oak groves have been lost since 1850	See habitat discussion sections.
8.	Ungulate winter ranges have been degraded since 1850.	See discussion in winter range section.
9.	CRP lands provide potential grassland habitat for wildlife.	See discussion in Columbian sharp-tailed grouse species account.
10.	American beaver populations have been greatly reduced since 1850 due to loss of habitat.	See discussion in species account section.
11.	Columbia spotted frog populations have declined in the Upper Crooked River AU as a result of loss of habitat.	See discussion in species account section.
12.	White-headed woodpecker populations have been reduced or lost as a result of loss of large-ponderosa pine-tree breeding habitat.	See discussion in species account section. See discussion in ponderosa pine forest habitat section.
13.	Mule deer populations have been reduced or lost as a result of loss or degradation of winter range habitat (see ungulate winter range.)	See discussion in species account section.
14.	Greater sage grouse populations have been reduced or lost as a result of loss or degradation of shrub steppe habitats.	See discussion in species account section.
15.	Columbian sharp-tailed grouse populations have been lost as a result of the loss of grassland habitat.	See discussion in species account section.
16.	Golden eagle populations have been lost or are threatened as a result of loss or threatened loss of foraging habitat in	See discussion in species account section.

Table 13. Habitat hypotheses, species hypotheses, and supporting evidence.		
Number	Terrestrial working hypothesis	Evidence supporting hypothesis
	grasslands and shrub-steppe habitats and other factors such as shooting and electrocution, and as a result of disturbance of nesting sites in rimrock and cliff nesting habitat.	

3.6.2. Desired future conditions

Listed species recovery goals. Of the focal species, only the Columbia spotted frog is a priority 3 candidate for federal listing in the subbasin (see species account.) No recovery goals have been set for this species by the US Fish and Wildlife Service.

Desired future conditions for focal species and focal habitats in the subbasin are summarized in Table 14.

Table 14. Desired future conditions for focal species and focal habitats.	
Focal species or focal habitat	Desired future condition
Riparian habitat.	50 percent of former riparian habitat (1850) in functional condition.
Shrub steppe habitat	50 percent of habitat existing in 1850 in functional condition.
Grassland steppe habitat	10 percent of former habitat (1850) in functional condition, including CRP grasslands as functional habitat where applicable.
Ponderosa pine habitat	Late seral single-story large tree structure stands restored to functional condition across the ponderosa pine forest landscape, including adequate connectivity between late seral stands.
Lodgepole pine habitat	50 percent of habitat existing in 1999 restored to functional condition, including stands of bug-killed and fire-killed trees and late seral stands.
Habitat structure: large late seral trees, rimrocks, cliffs.	See lodgepole and ponderosa pine habitats. For rimrocks and cliffs, local protections should be installed to conserve remaining structures as functional habitat.
Plant diversity: aspen, oak, cottonwood groves	50 percent of historic groves restored to functional condition.
Ungulate winter range	100 percent of habitat existing in 1999 in functional condition.
American beaver	50 percent of adequate habitat in each AU occupied by beaver measured in colonies per mile of linear stream and riverine habitat.
Columbia spotted frog	Establish 10 genetically connected viable populations in the Upper Crooked River AU.

Table 14. Desired future conditions for focal species and focal habitats.	
Focal species or focal habitat	Desired future condition
	Establish populations in other AU's which may be identified as areas of former occurrence.
White-headed woodpecker	100 percent of ponderosa pine forest existing in 1999 in adequate reproducing habitat condition which includes some large diameter tree stands for reproduction.
Mule deer	Five-year average population levels maintained at ODFW population management objective levels as measured on winter ranges annually.
Greater sage grouse	Five-year average population level maintained at 1990-1999 average as measured on leks annually.
Coumbian sharp-tailed grouse	Two viable populations established including at least two leks for each population on the Crooked River National Grasslands in the Lower Lower Eastside Deschutes Deschutes, Lower Crooked, and Middle Deschutes AUs.
Golden eagle	60 viable nest territories maintained in the subbasin.

3.6.3. Opportunities for conservation and restoration

All focal habitats and focal species are designated as high priority for protection or restoration in the subbasin. Findings, goals, some potential strategies, and priority areas at the AU level are presented in Table 15. This list of potential strategies should not be considered a complete list. More work needs to be done to discover additional strategies that may be most effective in local areas. Much more work needs to be done to formulate an overall plan for restoration and conservation work based on a more complete inventory of habitats such as riparian habitats, where no data is available to show linear miles or acres of habitat and the degree of functionality of the habitat.

Opportunities for conservation and restoration of both fish and wildlife habitats are shown at the HUC 6 level in the Appendix maps as colored stream reaches and indicated changes in wildlife habitat from historic estimates. On these maps (a group of 12 maps) priority stream reaches are color coded as candidates for conservation, restoration, or both. These priority stream reaches are overlain on each of four focal habitat maps that are color-coded to show decreases or increases in habitat levels in each HUC6 compared to historic levels. Also shown on one set of four maps are past and ongoing habitat projects, both aquatic and terrestrial. With this information, a proposed project can be evaluated, or a project strategy can be formulated for a HUC6 or larger geographic unit, using the aquatic and terrestrial priorities presented in this plan. As previously mentioned, wildlife habitat acreages and stream miles evaluated for functionality at the HUC6 level would be useful for designing future work in the subbasin.

Table 15. Key findings, goals, potential strategies, and priority areas for management of focal habitats and species.				
Species or Habitat	Key findings	Goals	Potential Strategies	Priority Areas
Riparian habitats and herbaceous wetlands.	Many degraded areas, and converted to other uses.	Restore seasonal water regime	1. Purchase water rights.	All streams, all AUs.
Riparian habitats and herbaceous wetlands.	Large areas have been degraded or destroyed since historic times.	1. Restore riparian vegetation to functional status in 90 percent of stream reaches. 2. Restore 25 percent of former acreage of herbaceous wetlands in 25 percent of historic areas.	1. inventory non-functional riparian zones and former herbaceous wetland areas. 2. Purchase wetland areas and riparian zones or obtain natural resource easements.	All stream and river valleys and canyons. All AUs.
Lodgepole pine forests	Fragmented	Restore 4 large blocks of forest	1. Inventory remaining blocks. 2. Inform forest managers.	South half of Upper Deschutes AU.
Lodgepole pine forests	Lack of large trees, dead trees, late seral stage stands.	Restore tree size and snag diversity in 50 percent of remaining stands.	1. Inventory remaining diverse stands, assess connectivity values. 2. Inform forest managers.	South half of Upper Deschutes AU.
Ungulate winter range (mule deer, bighorn sheep, antelope, elk)	Degraded	Protect remaining habitat, restore degraded habitat.	1. Inventory winter ranges. 2. Purchase winter ranges or purchase easements. 3. Purchase grazing rights on winter ranges.	Designated areas in each AU, all AUs.
Sage grouse (shrub steppe)	Declining in numbers	Maintain minimum population of 1990-99 average as measured on leks.	1. Inventory populations. 2. Continue population management to prevent overharvest. 3. Release birds into old and new habitat	East half of Upper Crooked AU, east half of Lower Crooked, Lower Eastside Deschutes, Middle Deschutes..

Table 15. Key findings, goals, potential strategies, and priority areas for management of focal habitats and species.				
Species or Habitat	Key findings	Goals	Potential Strategies	Priority Areas
			areas to diversify genetics. 4. Construct new habitat centers (leks.) 5. Identify potential habitat areas. 6. Inform land managers. 7. Purchase grazing rights, pay for fire management, scarification if needed.	
Dwarf shrub steppe	Declining in area, decadent stands	Protect remaining, restore to 50 percent of historic area.	1. Inventory remaining dwarf shrub habitats. 2. Manage grazing, fire, planting, scarification, if needed.	Historic area of habitat in the Lower Crooked AU, Upper Crooked, Lower Lower Eastside Deschutes Deschutes.
C. spotted frog	Loss in distribution in former range.	Restore or establish 10 populations. Restore connectivity of populations and habitats.	1. Inventory former springs and other habitats. 2. Restore habitats obtained through purchase or easement.	Upper Crooked AU.
Ponderosa pine forests (white-headed woodpecker)	Declining in area and large tree (late seral stage) component	Identified large tree stands maintained throughout ponderosa pine forests to allow connectivity between stands for species such as white-headed woodpecker.	1. Inventory late seral stands remaining, and evaluate functional status such as connectivity. 2. Inform forest mgrs.	Historic ponderosa pine forested areas in all AUs.
Grasslands.	Formerly 600,000 acres in subbasin, now 99 percent gone.	Restore functional blocks of grasslands in areas of AUs where grasslands	2. Add to small existing remaining areas, in Crooked River Natl Grasslands, or near	Lower Lower Eastside Deschutes Deschutes, Lower and Upper

Table 15. Key findings, goals, potential strategies, and priority areas for management of focal habitats and species.				
Species or Habitat	Key findings	Goals	Potential Strategies	Priority Areas
		formerly occurred..	CRP lands, for example, by informing managers or buying easements or land.	Crooked, Middle Deschutes AUs.
Aspen groves, cottonwood groves	Declining in numbers	Protect remaining groves, restore groves to 50 percent of historical locations and arcreages.	1. Inventory remaining groves, and areas of former groves. 2. Inform managers, buy easements or land.	Historic groves sites in all AUs.
White oak groves	Declining in numbers and area	Protect remaining groves, restore groves to 50 percent of historic acreages and areas.	1. Inventory historic areas and acreages. 2. Inform mgrs, buy easements or land.	Historic groves sites, Lower Westside and Lower Lower Eastside Deschutes Deschutes, White River AUs.
Cliffs, rimrocks	Threatened by future development	Protect remaining cliffs, rimrocks that are undeveloped.	1. Inventory cliffs and rimrocks. 2. Inform local govt 3. Buy easements or land.	Inventory may be needed. All AUs except Cascade Highlands.
Golden eagle	Threatened by shooting, disturbance at nest sites, loss of foraging habitat	Maintain at least 60 nesting territories (pairs) in the subbasin.	1. Inventory nesting territories. 2. Inform local govt. 3. Identify threats to each territory or pair.	Inventory may be needed. All AUs except Cascade Highlands.
C. sharp-tailed grouse	Extirpated	Establish two populations of at least 500 birds each.	1. Identify sources of proper race of birds to transplant. 2. Construct leks, water sources, inventory habitat attributes in release areas. 3. Monitor populations.	Suitable habitat in Lower Lower Eastside Deschutes Deschutes, Lower and Upper Crooked, Middle Deschutes AUs.

4. Inventory

Visual presentations of past and ongoing stream and upland restoration projects in the subbasin are shown with wildlife habitat information in the Appendix maps. Projects are displayed as points on each of four focal wildlife habitat maps showing color-coded changes in focal wildlife habitats from historic levels, by HUC6 geographical unit. Projects are also color-coded according to 11 categories of projects on these maps, e.g. instream habitat restoration, wetlands restoration, upland habitat restoration, and so on. Appendix maps are included on a CD in Adobe format, so they can be viewed in more detail. Since the restoration projects represent projects that are ongoing or were completed within the past 5 years, it is apparent that a significant number of projects have been completed or are ongoing in the subbasin.

A summary of past and ongoing projects in the subbasin is also presented in table form in the Management Plan section of the main document.

5. Management Plan
5.1.Vision for the subbasin.

The full spectrum of indigenous wildlife and wildlife habitats should be present in the subbasin, but some habitats and populations would be expected to be at lower levels than historically. Degraded habitats should be restored to functional status where not permanently committed to other uses, and existing functional habitats should be conserved and managed to insure that they remain viable into the future.

5.2. Biological and habitat objectives and key findings.

See main plan document for combined fish and wildlife biological and habitat objectives and key findings.

5.3. Prioritized strategies

See main plan document for combined fish and wildlife prioritized strategies.

5.4. Consistency with ESA Requirements

All proposals for action in this assessment are consistent with ESA requirements according to available literature information reviewed for this assessment.

5.5. Research, Monitoring and Evaluation

See Table 15 for summaries of research, monitoring, and evaluation opportunities, and main plan document for combined fish and wildlife monitoring and evaluation opportunities.

6. Appendices

6.1. Species Accounts.

6.2. List of appendix tables.	
Appendix table	Subject
A	List of historic wildlife species in the Deschutes subbasin.
B	List of current wildlife species in the Deschutes subbasin.
C	Comparison of historic and current species, and suggested additions and deletions.
D	Threatened, endangered, and sensitive wildlife species in the Deschutes Subbasin.
E	Wildlife species currently harvested by hunters in the Deschutes Subbasin.
F	HEP wildlife species in the Deschutes Subbasin.
G	Partners in Flight listed species in the Deschutes Subbasin.
H	Critical functional link species in the Deschutes Subbasin.
I	Changes in acreages within assessment units of wildlife habitats thought to occur historically (1860) and currently (1999.)
J	Acreages of focal habitats within ungulate winter ranges by Assessment Unit, from current habitats map.
K	Acreages of Focal Habitats within ungulate winter ranges by Assessment Unit, from historic habitats map.
L	Optimal conditions and environmental potential for Key Environmental Correlates (KECs) for focal species.
M	Key ecological functions (KEFs) for focal species, sorted to show redundancy.
N	KECs sorted to show interspecific relationships.

6.3. List of appendix maps.
Map of historic wildlife habitats in the Deschutes Subbasin and assessment units.
Map of current wildlife habitats in the Deschutes Subbasin and assessment units.
Map of wildlife habitats thought to occur historically (1860) in the Columbia Plateau Ecoprovince
Map of wildlife habitats thought to occur currently (1999) in the Columbia Plateau Ecoprovince.
Map of Columbia Plateau Ecoprovince, showing percent change from historic conditions in interior grasslands wildlife habitat in each subbasin, including the Deschutes Subbasin.
Map of Columbia Plateau Ecoprovince, showing percent change from historic conditions in shrub steppe wildlife habitat in each subbasin, including the Deschutes Subbasin
Map of Columbia Plateau Ecoprovince, showing percent change from historic conditions in ponderosa pine and oak wildlife habitat in each subbasin, including the Deschutes Subbasin.
Map of Columbia Plateau Ecoprovince, showing percent change from historic conditions in lodgepole pine forest wildlife habitat in each subbasin, including the Deschutes Subbasin.
Map of Columbia Plateau Ecoprovince, showing percent change from historic conditions in Western juniper wildlife habitat in each subbasin, including the Deschutes Subbasin.
Map of Columbia Plateau Ecoprovince, showing percent change from historic conditions in montane mixed conifer wildlife habitat in each subbasin, including the Deschutes Subbasin.
Map of CRP lands in the LOWER WESTSIDE DESCHUTES subbasin.
Map of some ungulate winter ranges in the Deschutes subbasin.
Maps (group of 12) of color-coded changes in each of the four focal wildlife habitats from historic levels by HUC6, with restoration project locations and priority stream reaches indicated.

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End wildlife assessment

See attached appendices.

Appendix

Species Accounts

Appendix A. Focal wildlife species accounts, Deschutes subbasin, Oregon.

Contents

1. American Beaver.

Note: much of this account is abstracted from Ashley and Stovall, 2004.

Distribution

The beaver occurs throughout most of the U.S. and Canada and into northern Mexico, except for the Arctic northern fringe, southern Florida and California, and the southern half of Nevada (Burt 1976.) In Oregon, the beaver occurs throughout the state (Verts and Carraway 1998.) The subspecies *Castor Canadensis leucodontus*, a large chestnut-brown colored variation, occurs in the northern two-thirds of Oregon east of the Cascade Range, including the Deschutes Subbasin (Ibid p. 257.)

Historic and current populations, and population trends

No estimates of beaver populations are available for Oregon and, in the absence of systematic population estimates, harvest and damage complaint levels are considered to be indicative of the population levels in local areas and statewide (Ibid.) From 1981 to 1991, over 5,000 complaints of beaver damage were received by the Oregon Department of Fish and Wildlife (Ibid.) During the 1930s many beaver were transplanted in Oregon from areas of damage to areas of suitable habitat with no beaver (Ibid.) The range of reported annual beaver harvests for the counties within the Deschutes Subbasin for the years 1990-95 are shown in Table . If the harvest ranges

in the Deschutes Subbasin counties are compared to Clatsop County, it can be inferred that the populations are much lower in the subbasin counties than in Clatsop County, which is smaller than all of the counties in the subbasin except for Hood River, which is smaller, and Sherman, which is about the same size as Clatsop. About 10,000 beaver a year are trapped in Oregon (Csuti 2001.) Special beaver harvest regulations in place within the subbasin for July 1, 2002 through June 30, 2004 were (ODFW 2002 p. 2):

1. Prineville Reservoir up to the high water line and the Ochoco National Forest were closed to beaver harvest.
2. That portion of Willow Creek and its tributaries within the Crooked River National Grassland was closed to beaver harvest.

Table 1. Range of Annual Beaver Harvest for the Years 1990-95 for counties in the Deschutes Subbasin . Clatsop County harvest range is shown for comparison.

County	Range of Numbers of Beaver Harvested Annually, 1990-95.
Clatsop	212-821
Deschutes	31-63
Crook	13-50
Hood River	18-40
Jefferson	4-31
Sherman	No numbers shown (previous 5 years: 0-8)
Wasco	24-86

Habitat

All wetland cover types (e.g., herbaceous wetland and deciduous forested wetland) must have a permanent source of surface water with little or no fluctuation in order to provide suitable beaver habitat (Slough and Sadleir 1977). Water provides cover for the feeding and reproductive activities of the beaver. Lakes and reservoirs that have extreme annual or seasonal fluctuations in the water level will be unsuitable habitat for beaver. Similarly, intermittent streams, or streams that have major fluctuations in discharge (e.g., high spring runoff) or a stream channel gradient of 15 percent or more, will have little year-round value as beaver habitat. Assuming that there is an adequate food source available, small lakes [< 8 ha (20 acres) in surface area] are assumed to provide suitable habitat. Large lakes and reservoirs [> 8 ha (20 acres) in surface area] must have irregular shorelines (e.g., bays, coves, and inlets) in order to provide optimum habitat for beaver.(The foregoing paragraph was excerpted from Ashley and Stovall 2004.)

Beavers can usually control water depth and stability on small streams, ponds, and lakes; however, larger rivers and lakes where water depth and/or fluctuation cannot be controlled are often partially or wholly unsuitable for the species (Murray 1961; Slough and Sadleir 1977). Rivers or streams that are dry during some parts of the year are assumed to be unsuitable beaver

habitat. Beavers are absent from sizable portions of rivers in Wyoming, due to swift water and an absence of suitable dwelling sites during periods of high and low water levels (Collins 1976b). (The foregoing paragraph was excerpted from Ashley and Stovall 2004.)

In riverine habitats, stream gradient is the major determinant of stream morphology and the most significant factor in determining the suitability of habitat for beavers (Slough and Sadleir 1977). Stream channel gradients of 6 percent or less have optimum value as beaver habitat. Retzer *et al.* (1956) reported that 68 percent of the beaver colonies recorded in Colorado were in valleys with a stream gradient of less than 6 percent, 28 percent were associated with stream gradients from 7 to 12 percent, and only 4 percent were located along streams with gradients of 13 to 14 percent. No beaver colonies were recorded in streams with a gradient of 15 percent or more. Valleys that were only as wide as the stream channel were unsuitable beaver habitat, while valleys wider than the stream channel were frequently occupied by beavers. Valley widths of 46 m (150 ft) or more were considered the most suitable. Marshes, ponds, and lakes were nearly always occupied by beavers when an adequate supply of food was available. (The foregoing paragraph was excerpted from Ashley and Stovall 2004.)

Feeding

Beavers are generalized herbivores; however, they show strong preferences for particular plant species and size classes (Jenkins 1975; Collins 1975a; Jenkins 1979). The leaves, twigs, and bark of woody plants are eaten, as well as many species of aquatic and terrestrial herbaceous vegetation. Food preferences may vary seasonally, or from year to year, as a result of variation in the nutritional value of food sources (Jenkins 1979). (The foregoing paragraph was excerpted from Ashley and Stovall 2004.)

An adequate and accessible supply of food must be present for the establishment of a beaver colony (Slough and Sadleir 1977). The actual biomass of herbaceous vegetation will probably not limit the potential of an area to support a beaver colony (Boyce 1981). However, total biomass of winter food cache plants (woody plants) may be limiting. Low marshy areas and streams flowing in and out of lakes allow the channelization and damming of water, allowing access to, and transportation of, food materials. Steep topography prevents the establishment of a food transportation system (Williams 1965; Slough and Sadleir 1977). Trees and shrubs closest to the pond or stream periphery are generally utilized first (Brenner 1962; Rue 1964). Jenkins (1980) reported that most of the trees utilized by beaver in his Massachusetts study area were within 30 m (98.4 ft) of the water's edge. However, some foraging did extend up to 100 m (328 ft). Foraging distances of up to 200 m (656 ft) have been reported (Bradt 1938). In a California study, 90 percent of all cutting of woody material was within 30 m (98.4 ft) of the water's edge (Hall 1970). (The foregoing paragraph was excerpted from Ashley and Stovall 2004.)

Woody stems cut by beavers are usually less than 7.6 to 10.1 cm (3 to 4 inches) DBH (Bradt 1947; Hodgdon and Hunt 1953; Longley and Moyle 1963; Nixon and Ely 1969). Jenkins (1980) reported a decrease in mean stem size cut and greater selectivity for size and species with

increasing distance from the water's edge. Trees of all size classes were felled close to the water's edge, while only smaller diameter trees were felled farther from the shore. (The foregoing paragraph was excerpted from Ashley and Stovall 2004.)

Beavers rely largely on herbaceous vegetation, or on the leaves and twigs of woody vegetation, during the summer (Bradt 1938, 1947; Brenner 1962; Longley and Moyle 1963; Brenner 1967; Aleksiuk 1970; Jenkins 1981). Forbs and grasses comprised 30 percent of the summer diet in Wyoming (Collins 1976a). Beavers appear to prefer herbaceous vegetation over woody vegetation during all seasons of the year, if it is available (Jenkins 1981). (The foregoing paragraph was excerpted from Ashley and Stovall 2004.)

Reproduction

The basic composition of a beaver colony is the extended family, comprised of a monogamous pair of adults, subadults (young of the previous year), and young of the year (Svendsen 1980). Female beavers are sexually mature at 2.5 years old. Females normally produce litters of three to four young with most kits being born during May and June. Gestation is approximately 107 days (Linzey 1998). Kits are born with all of their fur, their eyes open, and their incisor teeth erupted. (The foregoing paragraph was excerpted from Ashley and Stovall 2004.)

Dispersal of subadults occurs during the late winter or early spring of their second year and coincides with the increased runoff from snowmelt or spring rains. Subadult beavers have been reported to disperse as far as 236 stream km (147 mi) (Hibbard 1958), although average emigration distances range from 8 to 16 stream km (5 to 10 mi) (Hodgdon and Hunt 1953; Townsend 1953; Hibbard 1958; Leege 1968). The daily movement patterns of the beaver centers around the lodge or burrow and pond (Rutherford 1964). The density of colonies in favorable habitat ranges from 0.4 to 0.8/km2 (1 to 2/mi2) (Lawrence 1954; Aleksiuk 1968; Voigt *et al.* 1976; Bergerud and Miller 1977 cited by Jenkins and Busher 1979). (The foregoing paragraph was excerpted from Ashley and Stovall 2004.)

Limiting Factors

A primary predator of the beaver historically was the wolf, now extirpated in Oregon, but other predators known to take beaver in Oregon are coyotes, red foxes, mink, and river otter (Verts and Carraway 1998.) Water is a limiting factor for beaver. Beaver require a permanent source of water, preferably small ponds or slow streams meandering through low-gradient valleys (Ibid p. 257,) therefore, lack of water in a stream or pond during part of the year would render the stream or pond unusable for beaver. In addition, relatively stable water level is more favorable, thus river or streams with wide variation in levels during the year are not habitable. Due to the impact of beaver on their habitat, which may be a plus or minus depending on the point of view in each situation, beaver numbers are often controlled most importantly by humans.

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2. Columbia Spotted Frog in the Deschutes Subbasin

Note: this account is mostly exerpted from an account written by Kieth Paul, US Fish and Wildlife Service, LaGrande, Oregon.

Identification

The adult Columbia spotted frog (*Rana luteiventris*) is about 4 in. long, not including the legs. The adult frogs are green to greenish-brown, with large black spots on the back. Eggs are deposited in a soft, orange-sized egg masses, sometimes several egg masses on top of one

another, and the egg masses may separate and float on the top of the water in a frothy mass before hatching. Tadpoles are small, from 0.25 in. to 1.5 in. long (Corkran and Thoms 1996.).

Similar species

The Columbia spotted frog is similar in appearance to the Oregon spotted frog (*R. pretiosa*), which also occurs in the Deschutes Subbasin, but currently is only present in a small remnant population in the southern end of the subbasin (Csuti et al. 2001.) Also similar in appearance is the Cascades frog (R. cascadae) that occurs at higher elevations in the Cascade Mountains in the subbasin, and the Northern leopard frog (*R. pipiens*) that formerly occurred in the subbasin but is thought to be currently extirpated.

Distribution

This frog occurs from British Columbia south into Eastern Oregon and Northern Nevada and Utah in small isolated populations (Csuti et al. 2001.) In the Deschutes Subbasin, small areas of occurrence are Indicated in eastern Crook County in the upper Crooked River Valley (Ibid.)

Habitat and feeding behavior (this section was excerpted from Paul, 2004.)

This species is relatively aquatic and is rarely found far from water. It occupies a variety of still water habitats and can also be found in streams and creeks (Hallock and McAllister 2002). CSF's are found closely associated with clear, slow-moving or ponded surface waters, with little shade (Reaser 1997). CSF's are found in aquatic sites with a variety of vegetation types, from grasslands to forests (Csuti 1997). A deep silt or muck substrate may be required for hibernation and torpor (Morris and Tanner 1969). In colder portions of their range, CSF's will use areas where water does not freeze, such as spring heads and undercut streambanks with overhanging vegetation (IDFG et al. 1995). CSF's may disperse into forest, grassland, and brushland during wet weather (NatureServe 2003). They will use stream-side small mammal burrows as shelter. Overwintering sites in the Great Basin include undercut banks and spring heads (Blomquist and Tull 2002). The CSF eats a variety of food including arthropods (e.g., spiders, insects), earthworms and other invertebrate prey (Whitaker et al. 1982). Adult CSFs are opportunistic feeders and feed primarily on invertebrates (Nussbaum et al. 1983). Larval frogs feed on aquatic algae and vascular plants, and scavenged plant and animal materials (Morris and Tanner 1969).

Reproduction (this section was excerpted from Paul, 2004.)

Reproducing populations have been found in habitats characterized by springs, floating vegetation, and larger bodies of pooled water (e.g., oxbows, lakes, stock ponds, beaver-created ponds, seeps in wet meadows, backwaters) (IDFG et al. 1995; Reaser 1997). Breeding habitat is

the temporarily flooded margins of wetlands, ponds, and lakes (Hallock and McAllister 2002). Breeding habitats include a variety of relatively exposed, shallow-water (<60 cm), emergent wetlands such as sedge fens, riverine over-bank pools, beaver ponds, and the wetland fringes of ponds and small lakes. Vegetation in the breeding pools generally is dominated by herbaceous species such as grasses, sedges (Cares spp.) and rushes (Juncus spp.) (Amphibia Web 2004).

Migration (this section was excerpted from Paul, 2004.)

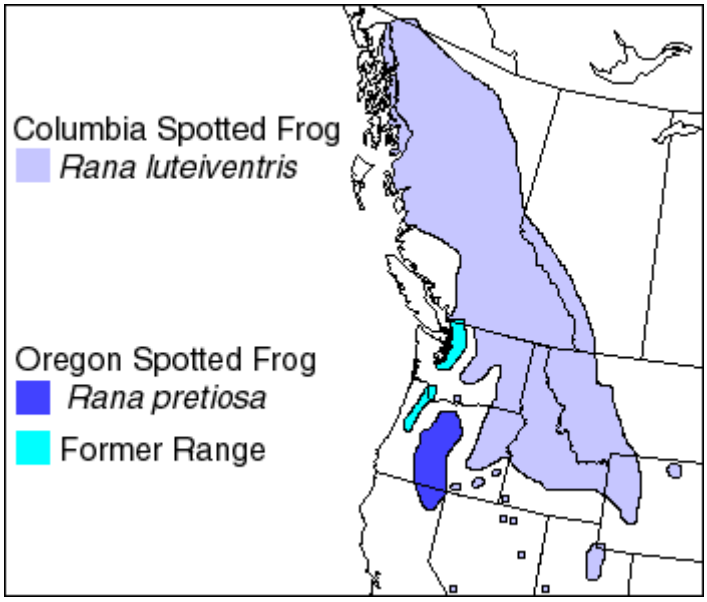
[Though movements exceeding 1 km (0.62 mi) and up 5 km (3.11 mi) have been recorded, these frogs generally stay in wetlands and along streams within 0.6 km (0.37 mi) of their breeding pond (Turner 1960, Hollenbeck 1974, Bull and Hayes 2001). Frogs in isolated ponds may not leave those sites (Bull and Hayes 2001) (NatureServe 2003)].

Historic and current populations and population trends (This section was excerpted from Paul, 2004.)

[Surveys conducted in the Raft River and Goose Creek drainages in Idaho failed to relocate spotted frogs (Reaser 1997; Shipman and Anderson 1997; Turner 1962). In 1994 and 1995, the Bureau of Land Management (BLM) conducted surveys in the Jarbidge and Snake River Resource Areas in Twin Falls County, Idaho. These efforts were also unsuccessful in locating spotted frogs (McDonald 1996). Only six historical sites were known in the Owyhee Mountain range in Idaho, and only 11 sites were known in southeastern Oregon in Malheur County prior to 1995 (Munger et al. 1996) (USFWS 2002c)]. (The preceding paragraph was excerpted from Paul, 2004.)

Currently, Columbia spotted frogs appear to be widely distributed throughout southwestern Idaho (mainly in Owyhee County) and eastern Oregon, but local populations within this general area appear to be isolated from each other by either natural or human induced habitat disruptions. The largest local population of spotted frogs in Idaho occurs in Owyhee County in the Rock Creek drainage. The largest local population of spotted frogs in Oregon occurs in Malheur County in the Dry Creek Drainage (USFWS 2002c). (The preceding paragraph was excerpted from Paul, 2004.)

Figure . Current range of the Columbia and Oregon spotted frog.



USGS, Northern Prairie Wildlife Research Center; range acquired from Green et al. 1997. (map exerpted from Paul 2004)

Legal status

In 1989, the U.S. Fish and Wildlife Service (USFWS) was petitioned to list the spotted frog (referred to as *Rana pretiosa*) under ESA (Federal Register 54[1989]:42529). The USFWS ruled on April 23, 1993, that the listing of the spotted frog was warranted and designated it a candidate for listing with a priority 3 for the Great Basin population, but was precluded from listing due to higher priority species (Federal Register 58[87]:27260). The major impetus behind the petition was the reduction in distribution apparently associated with impacts from water developments and the introduction of nonnative species. On September 19, 1997 (Federal Register 62[182]:49401), the USFWS downgraded the priority status for the Great Basin population of Columbia spotted frogs to a priority 9, thus relieving the pressure to list the population while efforts to develop and implement specific conservation measures were ongoing. As of January 8, 2001 (Federal Register 66[5]:1295- 1300), however, the priority ranking has been raised back to a priority 3 due to increased threats to the species. This includes the Great Basin DPS Columbia spotted frog populations. (The preceding paragraph was excerpted from Paul, 2004.)

Limiting factors (this entire section was excerpted from Paul, 2004.)

<u>The present or threatened destruction, modification, or curtailment of its habitat or range</u>

[Spotted frog habitat degradation and fragmentation is probably a combined result of past and current influences of heavy livestock grazing, spring development, agricultural development, urbanization, and mining activities. These activities eliminate vegetation necessary to protect

frogs from predators and UV-B radiation; reduce soil moisture; create undesirable changes in water temperature, chemistry and water availability; and can cause restructuring of habitat zones through trampling, rechanneling, or degradation which in turn can negatively affect the available invertebrate food source (IDFG et al. 1995; Munger et al. 1997; Reaser 1997; Engle and Munger 2000; Engle 2002). Spotted frog habitat occurs in the same areas where these activities are likely to take place or where these activities occurred in the past and resulting habitat degradation has not improved over time. Natural fluctuations in environmental conditions tend to magnify the detrimental effects of these activities, just as the activities may also magnify the detrimental effects of natural environmental events (USFWS 2002c)].

[Springs provide a stable, permanent source of water for frog breeding, feeding, and winter refugia (IDFG et al. 1995). Springs provide deep, protected areas which serve as hibernacula for spotted frogs in cold climates. Springs also provide protection from predation through underground openings (IDFG et al. 1995; Patla and Peterson 1996). Most spring developments result in the installation of a pipe or box to fully capture the water source and direct water to another location such as a livestock watering trough. Loss of this permanent source of water in desert ecosystems can also lead to the loss of associated riparian habitats and wetlands used by spotted frogs. Developed spring pools could be functioning as attractive nuisances for frogs, concentrating them into isolated groups, increasing the risk of disease and predation (Engle 2001). Many of the springs in southern Idaho, eastern Oregon, and Nevada have been developed (USFWS 2002c)].

[The reduction of beaver populations has been noted as an important feature in the reduction of suitable habitat for spotted frogs. Beaver are important in the creation of small pools with slow-moving water that function as habitat for frog reproduction and create wet meadows that provide foraging habitat and protective vegetation cover, especially in the dry interior western United States (St. John 1994). Beaver trapping is still common in Idaho and harvest is unregulated in most areas (IDFG et al. 1995). In some areas, beavers are removed because of a perceived threat to water for agriculture or horticultural plantings. As indicated above, permanent ponded waters are important in maintaining spotted frog habitats during severe drought or winter periods. Removal of a beaver dam in Stoneman Creek in Idaho is believed to be directly related to the decline of a spotted frog subpopulation there. Intensive surveying of the historical site where frogs were known to have occurred has documented only one adult spotted frog (Engle 2000) (USFWS 2002c)].

[Fragmentation of habitat may be one of the most significant barriers to spotted frog recovery and population persistence. Recent studies in Idaho indicate that spotted frogs exhibit breeding site fidelity (Patla and Peterson 1996; Engle 2000; Munger and Engle 2000; J. Engle, IDFG, pers. comm., 2001). Movement of frogs from hibernation ponds to breeding ponds may be impeded by zones of unsuitable habitat. As movement corridors become more fragmented due to loss of flows within riparian or meadow habitats, local populations will become more isolated (Engle 2000; Engle 2001). Vegetation and surface water along movement corridors provide relief from high temperatures and arid environmental conditions, as well as protection from predators. Loss of vegetation and/or lowering of the water table as a result of the above

mentioned activities can pose a significant threat to frogs moving from one area to another. Likewise, fragmentation and loss of habitat can prevent frogs from colonizing suitable sites elsewhere (USFWS 2002c)].

[Though direct correlation between spotted frog declines and livestock grazing has not been studied, the effects of heavy grazing on riparian areas are well documented (Kauffman et al. 1982; Kauffman and Kreuger 1984; Skovlin 1984; Kauffman et al. 1985; Schulz and Leininger 1990). Heavy grazing in riparian areas on state and private lands is a chronic problem throughout the Great Basin. Efforts to protect spotted frog habitat on state lands in Idaho have been largely unsuccessful because of lack of cooperation from the State. In northeast Nevada, the Forest Service has completed three riparian area protection projects in areas where spotted frogs occur. These projects include altering stocking rates or changing the grazing season in two allotments known to have frogs and constructing riparian fencing on one allotment. However, these three sites have not been monitored to determine whether efforts to protect riparian habitat and spotted frogs have been successful. In the Toiyabe Range, a proposal to fence 3.2 kilometers (km) (2 miles (mi)) of damaged riparian area along Cloverdale Creek to protect it from grazing is scheduled to occur in the summer of 2002. In addition to the riparian exclosure, BLM biologists located a diversion dam in 1998 on Cloverdale Creek which was completely de- watering approximately 1.6 km (1 mi) of stream. During the summer of 2000, this area was reclaimed and water was put back into the stream. This area of the stream is not currently occupied by spotted frogs but it is historical habitat (USFWS 2002c)].

[The effects of mining on Great Basin Columbia spotted frogs, specifically, have not been studied, but the adverse effects of mining activities on water quality and quantity, other wildlife species, and amphibians in particular have been addressed in professional scientific forums (Chang et al. 1974; Birge et al. 1975; Greenhouse 1976; Khangarot et al. 1985) (USFWS 2002c)].

Disease or predation

[Predation by fishes is likely an important threat to spotted frogs. The introduction of nonnative salmonid and bass species for recreational fishing may have negatively affected frog species throughout the United States. The negative effects of predation of this kind are difficult to document, particularly in stream systems. However, significant negative effects of predation on frog populations in lacustrine systems have been documented (Hayes and Jennings 1986; Pilliod et al. 1996, Knapp and Matthews 2000). One historic site in southern Idaho no longer supports spotted frog although suitable habitat is available. This may be related to the presence of introduced bass in the Owyhee River (IDCDC 2000). The stocking of nonnative fishes is common throughout waters of the Great Basin. The Nevada Division of Wildlife (NDOW) has committed to conducting stomach sampling of stocked nonnative and native species to determine the effects of predation on spotted frogs. However, this commitment will not be fulfilled until the spotted frog conservation agreements are signed. To date, NDOW has not altered fish stocking rates or locations in order to benefit spotted frogs (USFWS 2002c)].

[The bull frog (Rana catesbeiana), a nonnative ranid species, occurs within the range of the spotted frog in the Great Basin. Bullfrogs are known to prey on other frogs (Hayes and Jennings 1986). They are rarely found to co-occur with spotted frogs, but whether this is an artifact of competitive exclusion is unknown at this time (USFWS 2002c)].

[Although a diversity of microbial species is naturally associated with amphibians, it is generally accepted that they are rarely pathogenic to amphibians except under stressful environmental conditions. Chytridiomycosis (chytrid) is an emerging panzootic fungal disease in the United States (Fellers et al. 2001). Clinical signs of amphibian chytrid include abnormal posture, lethargy, and loss of righting reflex. Gross lesions, which are usually not apparent, consist of abnormal epidermal sloughing and ulceration; hemorrhages in the skin, muscle, or eye; hyperemia of digital and ventrum skin, and congestion of viscera. Diagnosis is by identification of characteristic intracellular flask-shaped sporangia and septate thalli within the epidermis. Chytrid can be identified in some species of frogs by examining the oral discs of tadpoles which may be abnormally formed or lacking pigment (Fellers et al. 2001) (USFWS 2002c)].

[Chytrid was confirmed in the Circle Pond site, Idaho, where long term monitoring since 1998 has indicated a general decline in the population (Engle 2002). It is unclear whether the presence of this disease will eventually result in the loss of this subpopulation. Two additional sites may have chytrid, but this has yet to be determined (J. Engle, pers. comm., 2001). Protocols to prevent further spread of the disease by researchers were instituted in 2001. Chytrid has also been found in the Wasatch Columbia spotted frog distinct population segment (K. Wilson, pers comm., 2002). Chytrid has not been found in Nevada populations of spotted frogs (USFWS 2002c)].

The inadequacy of existing regulatory mechanisms

[Spotted frog occurrence sites and potential habitats occur on both public and private lands. This species is included on the Forest Service sensitive species list; as such, its management must be considered during forest planning processes. However, little habitat restoration, monitoring or surveying has occurred on Forest Service lands (USFWS 2002c)].

[In the fall of 2000, 250 head of cattle were allowed to graze for 45 days on one pasture in the Indian Valley Creek drainage of the Humboldt-Toiyabe National Forest in central Nevada for the first time in 6 years (M. Croxen, pers. comm., 2002). Grazing was not allowed in this allotment in 2001. Recent mark-recapture data indicated that this drainage supports more frogs than previously presumed, potentially around 5,000 individuals (K. Hatch, pers. comm., 2000). Perceived improvements in the status of frog populations in the Indian Valley Creek area may be a result of past removal of livestock grazing. The reintroduction of grazing disturbance into this relatively dense area of frogs has yet to be determined (USFWS 2002c)].

[BLM policies direct management to consider candidate species on public lands under their jurisdiction. To date, BLM efforts to conserve spotted frogs and their habitat in Idaho, Oregon, and Nevada have not been adequate to address threats (USFWS 2002c)].

[The southernmost known population of spotted frogs can be found on the BLM San Antone Allotment south of Indian Valley Creek in the Toiyabe Range. Grazing is allowed in this area from November until June (L. Brown, pers. comm., 2002). The season of use is a very sensitive portion of the spotted frog annual life cycle which includes migration from winter hibernacula to breeding ponds, breeding, egg laying and hatching, and metamorphosing of young. Additionally, the riparian Standards and Guidelines were not met in 1996, the last time the allotment was evaluated (USFWS 2002c)].

[The status of local populations of spotted frogs on Yomba-Shoshone or Duck Valley Tribal lands is unknown. Tribal governments do not have regulatory or protective mechanisms in place to protect spotted frogs (USFWS 2002c)].

[The Nevada Division of Wildlife classifies the spotted frog as a protected species, but they are not afforded official protection and populations are not monitored. Though the spotted frog is on the sensitive species list for the State of Idaho, this species is not given any special protection by the State. Columbia spotted frogs are not on the sensitive species list for the State of Oregon. Protection of wetland habitat from loss of water to irrigation or spring development is difficult because most water in the Great Basin has been allocated to water rights applicants based on historical use and spring development has already occurred within much of the known habitat of spotted frogs. Federal lands may have water rights that are approved for wildlife use, but these rights are often superceded by historic rights upstream or downstream that do not provide for minimum flows. Also, most public lands are managed for multiple use and are subject to livestock grazing, silvicultural activities, and recreation uses that may be incompatible with spotted frog conservation without adequate mitigation measures (USFWS 2002c)].

<u>Other natural or manmade factors affecting its continued existence</u>

[Multiple consecutive years of less than average precipitation may result in a reduction in the number of suitable sites available to spotted frogs. Local extirpations eliminate source populations from habitats that in normal years are available as frog habitat (Lande and Barrowclough 1987; Schaffer 1987; Gotelli 1995). These climate events are likely to exacerbate the effects of other threats, thus increasing the possibility of stochastic extinction of subpopulations by reducing their size and connectedness to other subpopulations (see Factor A for additional information). As movement corridors become more fragmented, due to loss of flows within riparian or meadow habitats, local populations will become more isolated (Engle 2000). Increased fragmentation of the habitat can lead to greater loss of populations due to demographic and/or environmental stochasticity (USFWS 2002c)].

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End

3. White-headed Woodpecker.

Identification

The white-headed woodpecker (*Picoides albolarvatus*) is a robin-sized black woodpecker with white wing patches which are visible in flight, and is the only woodpecker in Oregon with a white head, although the acorn woodpecker (*Melanerpes formicivoris*) is somewhat similar with some white on the head (Robbins 1966.)

Distribution, historic and current populations and population trends.

This woodpecker is found from interior British Columbia south to Nevada and southern California. In Oregon, it is found in the Ochoco, Blue, and Wallowa mountains in Eastern Oregon, and also in some areas in the Siskiyou Mountains and on the "north part of the east slope of the Cascades" (Marshall et al. 2003.) The range in Oregon appears not to have changed from that reported by Gabrielson and Jewett in 1940, but "…seems to have become more patchy because of habitat deterioration (Ibid.) White-headed woodpecker density found in 1997 on five study areas in the Deschutes NF were calculated to be 0.03-1.54 birds per 100 acres, however, the population is thought to be declining in the Deschutes NF, in spite of the fact that some of the best remaining white-headed woodpecker habitat in Oregon is thought to exist in the Deschutes and Winema NFs (Ibid.)

Habitat

The white-headed woodpecker is referred to by Gabrielson and Jewett (1970) as "…a regular permanent Oregon resident wherever the yellow pine is found in good stands." Marshall et al. (2003) states that this bird occurs in "…open ponderosa pine or mixed-conifer forest dominated by ponderosa pine." It may occur in areas dominated by large-diameter ponderosa pine even if the stand has undergone silvicultural treatments such as thinning (Ibid.)

Feeding

Although the diet varies somewhat for this bird depending on local availability, ponderosa pine seeds, insects, and sap are main food items (Ibid.) In Oregon, ponderosa pine seeds are the most important plant item (Ibid p. 365.) Birds have been observed feeding on spruce budworms, larvae, ants and cicadas (Ibid.)

Reproduction

White-headed woodpeckers Excavate nests in large-diameter snags, stumps, leaning logs, and dead tops of live trees. Mean dbh of nest trees in the Deschutes National Forest was found to be 25.6 in. or 65 cm for 43 nests observed (Ibid p. 365.) Nesting activities occur in May and June, and young birds fledge in June and July.

Migration

This woodpecker is non-migratory. Some seasonal wandering outside the nesting territory occurs (Ibid. p. 366.)

Limiting Factors

Lack of large-diameter ponderosa pine trees in an open forest setting for nesting is apparently a limiting factor for this bird. Large-diameter ponderosa pine forests are thought to have been reduced by more than 90 percent in Oregon and Washington compared to what existed prior to pioneer settlement (Ibid.) Large-diameter ponderosa pine forests have been reduced by: timber harvest that has concentrated on large-diameter ponderosa pines; fire suppression that precludes natural thinning and results in replacement of ponderosa pines with firs; and livestock grazing that reduced grasses needed to carry ground fires; and shrub growth on the forest floor resulting from fire suppression that may have facilitated predation by avian and mammalian predators(Ibid.)

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4. Mule Deer.

Distribution and habitat

The Rocky Mountain Mule Deer (Odocoileus hemionus hemionus) is a native species to Oregon, and occurs generally east of the crest of the Cascade Mountains, including the entire Deschutes Subbasin (ODFW 2003.) Mule deer occupy all terrestrial habitats in the subbasin (IBIS 2004.)

Food Habits and Nutrition

Mule deer are ruminants, like cattle. Deer feed on a wide variety of grasses, small weedy plants, and leaves and twigs in a selective manner, choosing the best pieces of forage on the basis of smell, taste, appearance, and touch, and the physical form of their long nose and teeth are well suited to this selective feeding (Wallmo 1981 p. 99.) During critical winter months, new growth on the ends of twigs on shrubs and trees are important as food for mule deer. Sagebrush (Artemesia spp.), bitterbrush (Purshia tridentata), rabbitbrush (Chrysothamnos spp.), juniper

Juniperus occidentalis), and mountain mahogany (Cercocarpus spp.) are utilized during the winter (Verts and Carraway 1998.) Deer will also eat acorns, legume seeds, and fleshy fruits, and mushrooms and other fungi, all of which are highly digestible for the deer digestive system (Wallmo 1981 p. 114.) A diet that provides 15-16 percent protein during the summer when fawning and lactation occurs, and a diet providing 10 percent protein during winter maintenance periods "probably are adequate for deer." (Ibid p. 110)

Mule deer are adapted to the cycle of food availability during the year, so that they are able to maintain functions during cold winters when food is scarce, and then are able to take advantage of food abundance in the summer for reproduction and for storing fat reserves for winter (Ibid p. 99.) During winter, mule deer utilize snow as a source of water, but require free water during other times of the year, especially nursing females and fawns (Ibid p. 111.) Supplemental winter feeding may or may not be effective in saving deer which are starving, depending on when the feeding is started and what feed is provided to the deer (Ibid p. 126.)

Reproduction

Breeding occurs in the fall and winter from October through early January, and 1-3 fawns are borne by each doe the following May through July (Verts and Carraway 1998.) A buck deer will seek out and mate with many females, and there is no pair fidelity. The female cares for the fawn (Ibid.)

Migration

Mule deer generally summer at higher elevations, then move to lower elevations for the winter (Ibid p. 474.) These lower elevation areas are referred to as winter ranges.

Population Limiting Factors

Mule deer numbers are limited by some combination of effects from weather, food supply, predation, hunting, parasites and diseases, and human activities in deer habitat (Wallmo 1981 p. 245.) Many managers believe that of these effects, the most important limiting factor generally is the food supply (Ibid p. 247.) Food supply evaluation for mule deer is complex, and generally methods satisfactory to most managers have not been developed (Ibid p. 421.)

Weather affects mule deer through the quantity and quality of the food supply, when rain or lack of rain affects growth, for example, or indirectly by covering up food supplies with snow or through extremely low temperatures for extended periods during the winter causing the deer to starve to death from lack of forage of adequate nutritive value and depleted body fat reserves (Ibid p.248.)

Hunting management is based on the premise that numbers of deer can be harvested each year without reducing the base population, and this is the goal of hunting season managers. This being said, it is known that hunting harvest changes the population size and composition of deer populations (Ibid p. 253.)

“Predators on many ranges kill substantial numbers of mule and black-tailed deer, but only by careful local study can it be determined whether such predation causes the deer to be less numerous than they would be in the absence of predation.” “In no case has predation by coyotes or mountain lions been documented as the principal cause of a mule deer population decline.” (Wallmo 1981 p.)

Diseases can be a primary mortality factor for deer, or can be the result of conditions such as overcrowding in the habitat or low nutrition, among many other causes (Ibid p.129.) “Mule deer populations that are relatively stable and that are found in good habitat rarely are in danger of disease epizootics [outbreaks].” (ODFW 2003.) This is not to say that disease outbreaks do not occur or that they will not reduce a population of mule deer. Diseases and parasites do impact deer populations, but the exact numbers of deer removed from a population is difficult to measure, and often all a manager can say is that an outbreak has occurred (Wallmo 1981.)

On the Warm Springs Reservation in the Deschutes Subbasin, a lack of quality winter range is thought to be a limiting factor to mule deer population (CTWSR 1999 p.E-III-71.) Degradation of designated big game winter range areas by development and changes in vegetation is thought to be a limiting factor for mule deer populations south and west of Bend (Team 2004.)

A wide array of changes to habitat and conflicts with human activities that are detrimental to deer have been documented (Wallmo 1981 p. 509-535.) Some of these detrimental changes and conflicts are: overgrazing; conversion of habitat to cropland, highways, subdivisions, reservoirs, subdivisions and homesites; mining; fencing; and free-roaming dogs (Ibid.)

Historic Populations and Trends

On his expedition through Eastern Oregon in 1826 and 1827, Peter Skene Ogden wrote in his journal that deer were scarce, and John Fremont saw few deer or other big game animals in Southeastern Oregon during the 1840’s. Mule deer were reported to be abundant in Eastern Oregon in the 1920’s and 30’s, and deer populations increased through the 30’s and 40’s until peaking in the mid-1950’s (ODFW 2003.) By the late 1960’s, however, mule deer populations throughout the west started to decline, and have remained at lower populations since then with some fluctuations (Wallmo 1981 p. 236) (ODFW 2003.)

Current Populations

Oregon Department of Fish and Wildlife biologists survey mule deer in Oregon each year to estimate the populations in each of the wildlife management units (wmu’s) that make up the

Eastern Oregon mule deer range. As can be seen from Figure 1, 9 wmu's take in the approximate area of the Deschutes Subbasin (checked,) along with the Warm Springs Reservation (WSR) which is managed by the Confederated Tribes of the Warm Springs Reservation (CTWSR.) The population objectives for each of these 9 wmu's established in 1990, a spring population estimate for the WSR calculated in 1998, and a total of 71,500 deer is shown in Table 1. This total could be considered an estimate of the current deer population in the Deschutes Subbasin.

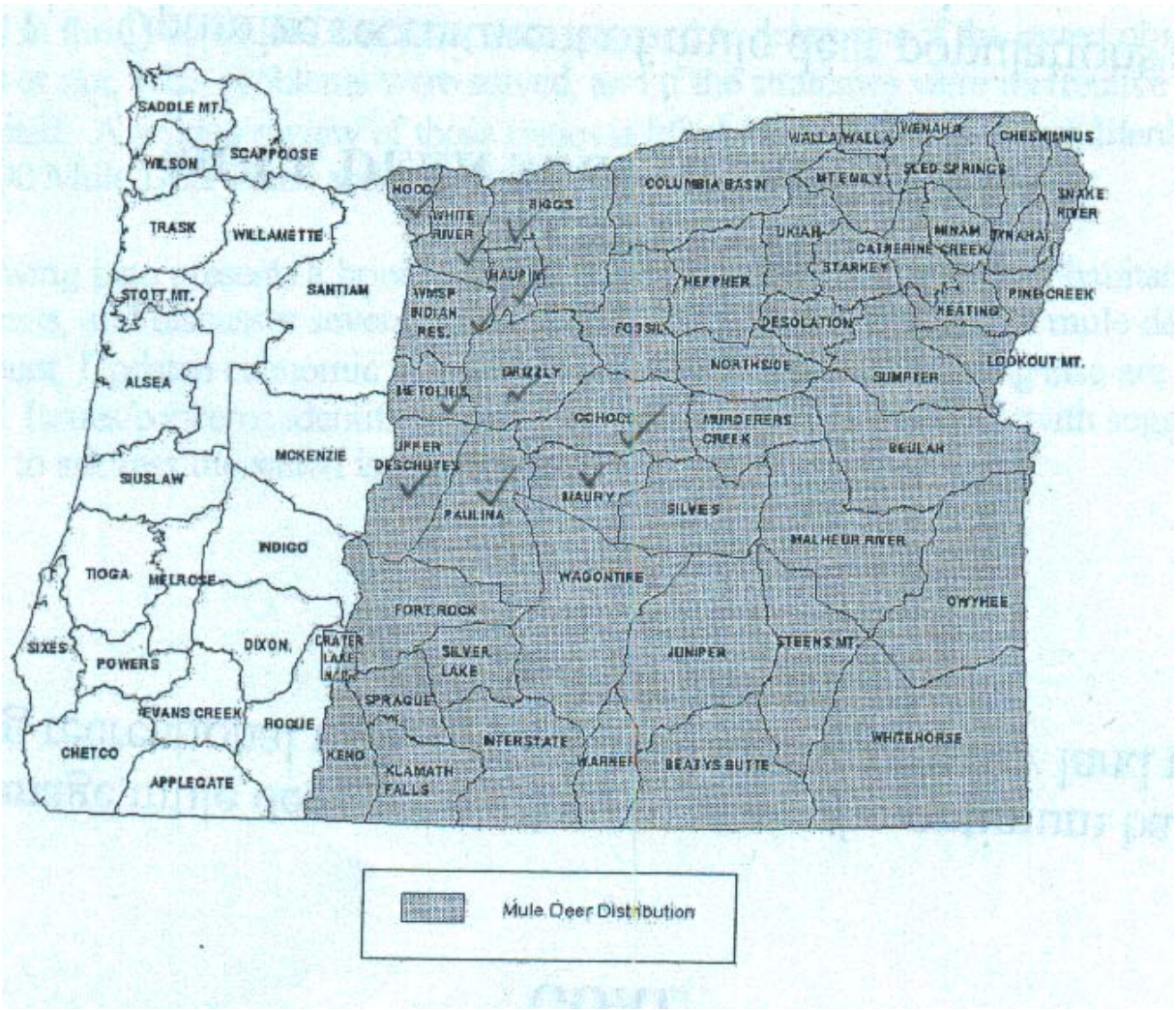

Figure 1. Range of mule deer in Oregon, with wildlife management units and the Warm Springs Reservation also indicated (ODFW 2003.)

Table 1. Population management objectives for mule deer for 9 wildlife management units that approximately make up the Deschutes Subbasin, Oregon; mule deer population estimate

for Warm Springs Reservation; and hunting tags issued, hunter-days expended, and deer harvest estimates for 1996 for the 9 wildlife management units and the Warm Springs Reservation.

Wildlife management unit	1996 Hunting Tags	1996 Hunter-days used	1996 Hunting Harvest	Population management objective (1990)
Ochoco	6324	34,959	1199	20,500
Grizzly	2843	15,823	810	8,500
Maury	1035	4,804	273	5,200
Maupin	355	1,167	198	3,000
White River	2920	12,977	826	9,000
Hood	641	2,923	118	400
Metolius	2307	11,420	581	6,200
Paulina	3425	20,088	705	16,500
Upper Deschutes	4425	26,971	679	2,200
Warm Springs Reservation	1300	--	455	7,100*
Total	25,575	131,132	5844	71,500

Table data in from ODFW (2003) and (1997.)

*Population estimate calculated by biologists in the spring of 1998 (Conf. Tribes of the WSR 1999 p.E-III-72.)

Population trends

Hunting Seasons and Harvest

Oregon's first deer season was set in 1901 for a season running July 15-Oct. 31. Mule deer hunting seasons occur during the late summer and fall (ODFW 2003a.) As can be seen from Table , over 25 thousand persons hunted deer in the subbasin in 1996, harvesting nearly 6 thousand deer that represents approximately 8 percent of the population. An estimated 131 thousand hunter days were expended, not including the WSR.

Economic Impact of Mule Deer Hunting

In 1994, an estimate of the mean net economic value per day of deer hunting in Oregon was $59 (ODFW 2003.) If this number is applied to the number of hunter-days for 1996 in the subbasin,

the result is an estimate of $7.7 million dollars net economic value to Oregon for deer hunting in the area approximating the Deschutes Subbasin.

end

5. Greater Sage Grouse.

Identification

The greater sage grouse is a pheasant-sized bird. The male has black markings on the belly and throat and neck, while the female appears uniformly gray (Robbins et al. 1966.)Of the three subspecies of sage grouse, the subspecies occupying areas in the Deschutes Subbasin is *Centrocercus urophasianus urophasianus* (Marshall et al. 2003.)

Distribution

Once found across most of the Western U.S. and into Canada, the sage grouse "…now has a local reduced population in the central part of western North America." "…from Eastern Washington to North Dakota." (Csuti et al, 2001.) Marshall (2003 p. 178) states that sage grouse had contracted in range in Oregon by 50 percent from previous population levels by the 1940's, and that populations were lost in the Blue Mountains and Columbia Plateau ecoregions of Oregon by that time. In the Deschutes Subbasin, sage grouse are currently found in eastern Crook and Deschutes counties (Ibid,) within the Upper Crooked and Lower Crooked AUs.

Migration

No regular migration occurs, but sage grouse may move several miles between feeding and brooding areas to find suitable forage, and will move several miles to areas where sage is not covered by snow to obtain forage in the winter (Marshall et al. 2003.)

Diet and feeding behavior

Sage grouse primarily eat the leaves of sagebrush throughout the year, but small weedy plants and insects are important during the nesting and brood seasons. Grasses are not eaten. (Marshall et al. 2003.)

Reproduction

Male sage grouse gather on display areas, or leks, in late February, and strut early in the mornings, beginning before dawn, to attract females. Females are attracted from surrounding habitat by the males displaying, and may choose a single male in a certain area of the lek as the primary breeding male. Leks are usually areas of sparse vegetation within sagebrush habitat. New leks have been established on recently burned sites. Nests are established as shallow depressions lined with grass, usually under a sagebrush, and usually in taller sagebrush habitat. Eggs are laid in May, and hatch in late May to mid-June. Nest success from an area near Prineville was 31 percent, with most unsuccessful nests the victims of predators. Hens may return to the lek and then renest after losing the first nest. Nest success in Oregon is lower than that reported from other areas states. (Marshall 2002.)

Historic and current populations, and population trends

The sage grouse range in in the Western U.S., and in states that it occupies, has become smaller (Marshall et al. 2003.) Formerly widespread in Eastern Oregon sagebrush prairies, by the 1940's sage grouse range had "contracted by about 50 percent" (Ibid.) "In Oregon, numbers of males counted at leks declined approximately 60% from the late 1950s to the early 1980s." (Ibid.)

Limiting factors

"Although the sage grouse is a game species in Oregon, the season is closed in much of the State." (Csuti et al. 2001.) Human disturbance at display leks can cause abandonment (Marshall et al. 2003.) The sage grouse is thought to require large areas of sagebrush with healthy native plant understory (Ibid.) Habitat loss primarily as a result of conversion to agriculture use is thought to be a major factor in the decline of sage grouse, as is encroachment by juniper into sagebrush prairies; fragmentation of habitat from roads and other changes; and changes in the composition of the sagebrush vegetation communities as a result of grazing, fire suppression or higher frequency of fires, and herbicide use (Ibid.)

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6. Columbian Sharp-tailed Grouse.

Introduction

Sharp-tailed grouse were called prairie chickens by early Oregon residents, and these birds were abundant in grasslands and foothills in Eastern Oregon "prior to the late 1800s" (Marshall, 2003 p. 183.) Although sharp-tailed grouse have not been found in Eastern Oregon or the Deschutes Subbasin since the 1970s, it is thought by local biologists to be a good candidate for future re-introduction in the subbasin. An usuccessful re-introduction of the plains sharp-tailed grouse subspecies *Tympanuchus phasianellus jamesi* was conducted in Jefferson and Wasco counties in 1963 (Marshall et al. 2003.) Columbian sharp-tailed grouse (*Tympanuchus phasianellus columbianus* are being re-introduced in an ongoing effort near Enterprise in Wallowa County, Oregon that was started in 1991, and some success seems to have occurred. The Oregon Department of Fish and Wildlife was reported to be considering areas for restoration of sharp-tailed grouse populations west of the Blue Mountains prior to 2003 (Ibid.)

Identification

The sharp-tailed grouse is a pheasant-sized bird with an overall light gray-brown coloration. Sexes are similar in appearance. When in flight, the narrow pointed tail is edged in white, distinguishing the sharp-tail from pheasants (Robbins et al. 1966.) Of six subspecies, only the Columbian sharp-tailed grouse (*Tympanuchus phasianellus columbianus*) was found in Oregon (Marshall et al. 2003.)

Similar species

The greater sage grouse also occurs in the subbasin, and the habitats of sage grouse and sharp-tailed grouse probably overlapped in some areas in historic times.

Distribution

Found from Alaska and Canada south through the Great Plains states to New Mexico. In Oregon, the following status was described by Gabrielson and Jewett (1970) as existing in 1940: " found over most of Eastern Oregon, but now, greatly reduced in numbers, and uncommon resident of a few counties. Recorded in recent years [prior to 1940] in Wasco, Sherman, Morrow, Unatilla, Wallowa, Union, Baker, and Harney Counties."

Habitat and Nesting and Feeding Behavior

Sharp-tailed grouse inhabit grasslands or grass-shrublands and utilize deciduous shrubs and trees for wintering (Marshall et al. 2003.) Adult birds feed extensively on small weedy plants, and chicks require insects for feed (Ibid.) In the winter, when snow covers ground plants, birds feed on the buds of quaking aspen, chokecherry, black hawthorn, and willow (Ibid.) In Wallowa County, Oregon where Columbian sharp-tailed grouse are being released to establish new populations, birds can be seen in the winter perched in shrubs and small trees, presumably feeding on buds. Marshall (2003) reports that birds moved as far as 4 miles to deciduous shrub patches after a heavy snowfall. In Wallowa County, Oregon released birds used CRP program agricultural fields that were planted to perennial grasses and small weedy plants for lek sites and for late summer and fall feeding (Ibid p. 184.) In Wallowa County, native prairie was used by released birds for early spring feeding and nesting, and early summer brood rearing (Ibid p. 184.)

Reproduction

Male birds display on special openings in the grasslands or grass-shrubland called *leks* from early March through early June, attracting females for breeding. Nesting occurs in May and June. Two nests found near the mouth of the Deschutes in 1935 consisted of slight hollows in the ground of an agricultural grainfield lined with grasses, grains, stems, and feathers (Gabrielson and Jewett 1970.)

Migration

Columbian sharp-tailed grouse are non-migratory, but may move several miles away from the lek during the year (Csuti et al. 2001 p. 136.) The grouse form flocks during the winter (Ibid.)

Historic and current populations, and population trends

Although sharp-tailed grouse populations still exist in several midwest states, and remnant populations of the Columbian sharp-tailed grouse are present as close as Washington state (Ashley and Stoval 2004), sharp-tailed grouse are of concern in connection with disappearing habitat nationwide, and a recent publication states: “Prairie grouse [*Tympanuchus spp*] populations throughout North America have declined sharply in the last 3 decades.” Silvy and Hagen 2004 p. 2)

In Oregon, specimens of sharp-tailed grouse were taken by the Lewis and Clark expedition along the Columbia River and was described in documents written in 1815. In 1857 sharp-tailed grouse were reported as occurring “from the Deschutes to The Dalles” (Gabrielson and Jewett 1970.) However, as early as 1940 the status of the sharp-tail in Oregon was described as “precarious” due to “continual persecution and shooting.”(Ibid.) Sharp-tailed grouse were considered extirpated in Oregon by the 1970s (Marshall et al. 2003.)

Limiting factors

In 1940, Gabrielson and Jewett (1970) indicated that human encroachment on the breeding grounds was threatening populations of sharp-tailed grouse, along with "continual persecution and shooting." In Wallowa County, Oregon predation has been a barrier to establishing new populations (Marshall et al. 2003.) Suitable habitat is apparently present in Wallowa County, Oregon where restoration of grassland and riparian areas has occurred, and where large grain fields have been replaced by CRP lands planted to permanent grasses and forbs (Marshall et al. 2003. p. 184.) (Gabrielson and Jewett 1970.)

Literature Cited

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7. Golden Eagle.

Introduction

Golden eagles are a native species to the subbasin. The first recorded listing of golden eagles in Oregon was in 1839 (Jewett and Gabrielson, 1970.) Since then observations on road surveys and other surveys have recorded substantial numbers of golden eagles in various areas of Eastern Oregon.

Identification

The golden eagle (Aquila Chrysaetos) is one of two eagles occurring in Oregon, the other being the bald eagle. The golden and bald eagle are the largest raptors currently occurring in Oregon, formerly being exceeded in size only by the condor. Adult golden eagles are colored a rich brown with lighter golden nape feathers, and the sexes are similarly colored. Adult and juvenile golden eagles are easily confused with immature bald eagles, all three birds being generally dark colored at a distance (Robbins 1966.)

Similar species

Bald eagle juveniles and golden eagle adults juveniles are easily confused. Vulture, red-tail hawk, rough-legged and ferruginous hawks appear similar (Wheeler 2003 p. 415.)

Distribution

The golden eagle occurs worldwide. In North America, it occurs in Alaska and Canada, and in western North American south to Mexico (Csuti et al. 2001.) Golden eagles occur most commonly east of the Cascades in Oregon, and have been noted from all Eastern Oregon counties, including all counties in the Deschutes Subbasin (Marshall et al. 2003.)

Migration

Generally golden eagles in Oregon are considered resident birds, but out-of-state migrant golden eagles from northern regions have been recorded passing through the State (Ibid.)

Diet and feeding behavior

Unlike the bald eagle, golden eagles are aggressive hunters. The black-tailed jackrabbit is considered to be historically a basic food item for golden eagles, but other animals such as marmots, ground squirrels, birds such as sage grouse and sharp-tailed grouse, and other species are taken. Golden eagles are known to kill deer and pronghorn fawns, wild and domestic lambs, and will eat fresh carrion and will steal prey from other raptors (Ibid.)

Reproduction

Nests are established most frequently in cliffs (65 percent of 506 occupied nests in Oregon in 1982), but nests are also built in large trees greater than 30 in. dbh, and occasionally on electric towers. Egg-laying occurs from late February to mid-April and young are fledged between Late June and early August. Breeding territories range in size between 10-40 sq. mi., and may include several habitat types. Alternate nest sites, consisting of partially-built or complete nests, within the same nesting territory may be maintained. Tolerance to human disturbance at nest sites varies widely among individual nesting pairs; some are very tolerant, others will abandon the nest if disturbed (Ibid.)

Historic and current populations, and population trends.

Numbers of golden eagles in Oregon were estimated to number 1,000-1,500 in 1982 (Marshall et al 2003.) Numbers of golden eagles observed during mid-winter bald eagle surveys in Oregon during 1992-2001 have averaged 97 (Ibid.) Number of observed active golden eagle nesting territories in the Deschutes Subbasin was 57 in 2000 (Clowers 2004.) Taking into account areas not inventoried by past surveys, a reasonable current estimate (2004) of nesting territories in the subbasin is considered to be 60 (Carey 2004.)

Golden eagle populations in the Northern Great Basin, especially Idaho and Northern Utah, have been reported to be declining (Marshall et al 2003.) The population trend of golden eagles in Oregon, or the Deschutes subbasin is basically unknown (Marshall et al. 2003, Clowers, 2004.)

Legal status

Golden eagles are protected by the Bald Eagle Protection Act through special provisions added in 1962 due to declining numbers of eagles and similarity of appearance between golden and bald eagle immature birds. It is unlawful to possess any part of any eagle except by federal permit. Four counties in the Deschutes subbasin have adopted ordinances designed to protect golden eagle nest sites by regulating development within a 0.25-mile zone around the nest: Deschutes, Jefferson, Crook, and Wasco counties. (Ibid.)

Limiting factors

It is reported that some nest territories in Central Oregon have been lost due to "…urban sprawl, residential developments, and disturbing recreational activities such as off-highway vehicles." (Ibid.) Other causes of mortality are electrocution on power line utility poles, poisoning from application of chemicals meant to kill other pests, collisions with wind-turbines, occasional shooting although this doesn't seem to be as much of a problem as before the bird became federally protected, and vehicle strikes when eagles land near highways to feed on road-kills (Wheeler 2003. p. 414-415.)

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End Species Accounts

Appendix

Tables

Appendix A. Wildlife species thought to occur in the Deschutes subbasin historically (1850.)			
	Common Name	**Scientific Name**	
Amphibians			
	Tiger Salamander	*Ambystoma tigrinum*	
	Northwestern Salamander	*Ambystoma gracile*	
	Long-toed Salamander	*Ambystoma macrodactylum*	
	Cope's Giant Salamander	*Dicamptodon copei*	
	Pacific Giant Salamander	*Dicamptodon tenebrosus*	
	Southern Torrent Salamander	*Rhyacotriton variegatus*	
	Cascade Torrent Salamander	*Rhyacotriton cascadae*	
	Rough-skinned Newt	*Taricha granulosa*	
	Dunn's Salamander	*Plethodon dunni*	
	Larch Mountain Salamander	*Plethodon larselli*	
	Western Red-backed Salamander	*Plethodon vehiculum*	
	Del Norte Salamander	*Plethodon elongatus*	
	Ensatina	*Ensatina eschscholtzii*	
	Clouded Salamander	*Aneides ferreus*	
	Oregon Slender Salamander	*Batrachoseps wrighti*	
	Tailed Frog	*Ascaphus truei*	
	Great Basin Spadefoot	*Scaphiopus intermontanus*	
	Western Toad	*Bufo boreas*	
	Pacific Chorus (Tree) Frog	*Pseudacris regilla*	
	Red-legged Frog	*Rana aurora*	
	Cascades Frog	*Rana cascadae*	
	Columbia Spotted Frog	*Rana luteiventris*	
	Foothill Yellow-legged Frog	*Rana boylii*	
	Northern Leopard Frog	*Rana pipiens*	
	Bullfrog	*Rana catesbeiana*	
	Total Amphibians:	**25**	**Total:**
Birds			
	Common Loon	*Gavia immer*	
	Pied-billed Grebe	*Podilymbus podiceps*	
	Horned Grebe	*Podiceps auritus*	
	Red-necked Grebe	*Podiceps grisegena*	
	Eared Grebe	*Podiceps nigricollis*	
	Western Grebe	*Aechmophorus occidentalis*	
	Clark's Grebe	*Aechmophorus clarkii*	
	American White Pelican	*Pelecanus erythrorhynchos*	
	Double-crested Cormorant	*Phalacrocorax auritus*	
	American Bittern	*Botaurus lentiginosus*	
	Least Bittern	*Ixobrychus exilis*	

Appendix A. Wildlife species thought to occur in the Deschutes subbasin historically (1850.)		
	Common Name	**Scientific Name**
	Great Blue Heron	*Ardea herodias*
	Great Egret	*Ardea alba*
	Snowy Egret	*Egretta thula*
	Cattle Egret	*Bubulcus ibis*
	Green Heron	*Butorides virescens*
	Black-crowned Night-heron	*Nycticorax nycticorax*
	White-faced Ibis	*Plegadis chihi*
	Turkey Vulture	*Cathartes aura*
	Greater White-fronted Goose	*Anser albifrons*
	Snow Goose	*Chen Ccaerulescens*
	Ross's Goose	*Chen rossii*
	Canada Goose	*Branta canadensis*
	Trumpeter Swan	*Cygnus buccinator*
	Tundra Swan	*Cygnus columbianus*
	Wood Duck	*Aix sponsa*
	Gadwall	*Anas strepera*
	Eurasian Wigeon	*Anas penelope*
	American Wigeon	*Anas americana*
	Mallard	*Anas platyrhynchos*
	Blue-winged Teal	*Anas discors*
	Cinnamon Teal	*Anas cyanoptera*
	Northern Shoveler	*Anas clypeata*
	Northern Pintail	*Anas acuta*
	Green-winged Teal	*Anas crecca*
	Canvasback	*Aythya valisineria*
	Redhead	*Aythya americana*
	Ring-necked Duck	*Aythya collaris*
	Greater Scaup	*Aythya marila*
	Lesser Scaup	*Aythya affinis*
	Harlequin Duck	*Histrionicus histrionicus*
	Surf Scoter	*Melanitta perspicillata*
	Bufflehead	*Bucephala albeola*
	Common Goldeneye	*Bucephala clangula*
	Barrow's Goldeneye	*Bucephala islandica*
	Hooded Merganser	*Lophodytes cucullatus*
	Common Merganser	*Mergus merganser*
	Red-breasted Merganser	*Mergus serrator*
	Ruddy Duck	*Oxyura jamaicensis*
	Osprey	*Pandion haliaetus*
	White-tailed Kite	*Elanus leucurus*
	Bald Eagle	*Haliaeetus leucocephalus*
	Northern Harrier	*Circus cyaneus*
	Sharp-shinned Hawk	*Accipiter striatus*

Appendix A. Wildlife species thought to occur in the Deschutes subbasin historically (1850.)		
	Common Name	**Scientific Name**
	Cooper's Hawk	*Accipiter cooperii*
	Northern Goshawk	*Accipiter gentilis*
	Red-shouldered Hawk	*Buteo lineatus*
	Swainson's Hawk	*Buteo swainsoni*
	Red-tailed Hawk	*Buteo jamaicensis*
	Ferruginous Hawk	*Buteo regalis*
	Rough-legged Hawk	*Buteo lagopus*
	Golden Eagle	*Aquila chrysaetos*
	American Kestrel	*Falco sparverius*
	Merlin	*Falco columbarius*
	Gyrfalcon	*Falco rusticolus*
	Peregrine Falcon	*Falco peregrinus*
	Prairie Falcon	*Falco mexicanus*
	Chukar	*Alectoris chukar*
	Gray Partridge	*Perdix perdix*
	Ring-necked Pheasant	*Phasianus colchicus*
	Ruffed Grouse	*Bonasa umbellus*
	Sage Grouse	*Centrocercus urophasianus*
	Blue Grouse	*Dendragapus obscurus*
	Sharp-tailed Grouse	*Tympanuchus phasianellus*
	Wild Turkey	*Meleagris gallopavo*
	Mountain Quail	*Oreortyx pictus*
	California Quail	*Callipepla californica*
	Northern Bobwhite	*Colinus virginianus*
	Yellow Rail	*Coturnicops noveboracensis*
	Virginia Rail	*Rallus limicola*
	Sora	*Porzana carolina*
	American Coot	*Fulica americana*
	Sandhill Crane	*Grus canadensis*
	Black-bellied Plover	*Pluvialis squatarola*
	Pacific Golden-Plover	*Pluvialis fulva*
	Snowy Plover	*Charadrius alexandrinus*
	Semipalmated Plover	*Charadrius semipalmatus*
	Killdeer	*Charadrius vociferus*
	Black-necked Stilt	*Himantopus mexicanus*
	American Avocet	*Recurvirostra americana*
	Greater Yellowlegs	*Tringa melanoleuca*
	Lesser Yellowlegs	*Tringa flavipes*
	Solitary Sandpiper	*Tringa solitaria*
	Willet	*Catoptrophorus semipalmatus*
	Spotted Sandpiper	*Actitis macularia*
	Upland Sandpiper	*Bartramia longicauda*
	Long-billed Curlew	*Numenius americanus*

Appendix A. Wildlife species thought to occur in the Deschutes subbasin historically (1850.)		
	Common Name	**Scientific Name**
	Marbled Godwit	*Limosa fedoa*
	Black Turnstone	*Arenaria melanocephala*
	Sanderling	*Calidris alba*
	Semipalmated Sandpiper	*Calidris pusilla*
	Western Sandpiper	*Calidris mauri*
	Least Sandpiper	*Calidris minutilla*
	Baird's Sandpiper	*Calidris bairdii*
	Pectoral Sandpiper	*Calidris melanotos*
	Dunlin	*Calidris alpina*
	Stilt Sandpiper	*Calidris himantopus*
	Ruff	*Philomachus pugnax*
	Short-billed Dowitcher	*Limnodromus griseus*
	Long-billed Dowitcher	*Limnodromus scolopaceus*
	Common Snipe	*Gallinago gallinago*
	Wilson's Phalarope	*Phalaropus tricolor*
	Red-necked Phalarope	*Phalaropus lobatus*
	Franklin's Gull	*Larus pipixcan*
	Bonaparte's Gull	*Larus philadelphia*
	Mew Gull	*Larus canus*
	Ring-billed Gull	*Larus delawarensis*
	California Gull	*Larus californicus*
	Herring Gull	*Larus argentatus*
	Thayer's Gull	*Larus thayeri*
	Western Gull	*Larus occidentalis*
	Glaucous-winged Gull	*Larus glaucescens*
	Glaucous Gull	*Larus hyperboreus*
	Caspian Tern	*Sterna caspia*
	Common Tern	*Sterna hirundo*
	Forster's Tern	*Sterna forsteri*
	Black Tern	*Chlidonias niger*
	Marbled Murrelet	*Brachyramphus marmoratus*
	Rock Dove	*Columba livia*
	Band-tailed Pigeon	*Columba fasciata*
	Mourning Dove	*Zenaida macroura*
	Yellow-billed Cuckoo	*Coccyzus americanus*
	Barn Owl	*Tyto alba*
	Flammulated Owl	*Otus flammeolus*
	Western Screech-owl	*Otus kennicottii*
	Great Horned Owl	*Bubo virginianus*
	Snowy Owl	*Nyctea scandiaca*
	Northern Pygmy-owl	*Glaucidium gnoma*
	Burrowing Owl	*Athene cunicularia*
	Spotted Owl	*Strix occidentalis*

Appendix A. Wildlife species thought to occur in the Deschutes subbasin historically (1850.)		
	Common Name	**Scientific Name**
	Barred Owl	*Strix varia*
	Great Gray Owl	*Strix nebulosa*
	Long-eared Owl	*Asio otus*
	Short-eared Owl	*Asio flammeus*
	Boreal Owl	*Aegolius funereus*
	Northern Saw-whet Owl	*Aegolius acadicus*
	Common Nighthawk	*Chordeiles minor*
	Common Poorwill	*Phalaenoptilus nuttallii*
	Black Swift	*Cypseloides niger*
	Vaux's Swift	*Chaetura vauxi*
	White-throated Swift	*Aeronautes saxatalis*
	Black-chinned Hummingbird	*Archilochus alexandri*
	Anna's Hummingbird	*Calypte anna*
	Calliope Hummingbird	*Stellula calliope*
	Broad-tailed Hummingbird	*Selasphorus platycercus*
	Rufous Hummingbird	*Selasphorus rufus*
	Allen's Hummingbird	*Selasphorus sasin*
	Belted Kingfisher	*Ceryle alcyon*
	Lewis's Woodpecker	*Melanerpes lewis*
	Acorn Woodpecker	*Melanerpes formicivorus*
	Williamson's Sapsucker	*Sphyrapicus thyroideus*
	Red-naped Sapsucker	*Sphyrapicus nuchalis*
	Red-breasted Sapsucker	*Sphyrapicus ruber*
	Downy Woodpecker	*Picoides pubescens*
	Hairy Woodpecker	*Picoides villosus*
	White-headed Woodpecker	*Picoides albolarvatus*
	Three-toed Woodpecker	*Picoides tridactylus*
	Black-backed Woodpecker	*Picoides arcticus*
	Northern Flicker	*Colaptes auratus*
	Pileated Woodpecker	*Dryocopus pileatus*
	Olive-sided Flycatcher	*Contopus cooperi*
	Western Wood-pewee	*Contopus sordidulus*
	Willow Flycatcher	*Empidonax traillii*
	Least Flycatcher	*Empidonax minimus*
	Hammond's Flycatcher	*Empidonax hammondii*
	Gray Flycatcher	*Empidonax wrightii*
	Dusky Flycatcher	*Empidonax oberholseri*
	Pacific-slope Flycatcher	*Empidonax difficilis*
	Cordilleran Flycatcher	*Empidonax occidentalis*
	Black Phoebe	*Sayornis nigricans*
	Say's Phoebe	*Sayornis saya*
	Ash-throated Flycatcher	*Myiarchus cinerascens*
	Western Kingbird	*Tyrannus verticalis*

Appendix A. Wildlife species thought to occur in the Deschutes subbasin historically (1850.)		
	Common Name	**Scientific Name**
	Eastern Kingbird	*Tyrannus tyrannus*
	Loggerhead Shrike	*Lanius ludovicianus*
	Northern Shrike	*Lanius excubitor*
	Cassin's Vireo	*Vireo cassinii*
	Hutton's Vireo	*Vireo huttoni*
	Warbling Vireo	*Vireo gilvus*
	Red-eyed Vireo	*Vireo olivaceus*
	Gray Jay	*Perisoreus canadensis*
	Steller's Jay	*Cyanocitta stelleri*
	Western Scrub-Jay	*Aphelocoma californica*
	Pinyon Jay	*Gymnorhinus cyanocephalus*
	Clark's Nutcracker	*Nucifraga columbiana*
	Black-billed Magpie	*Pica pica*
	American Crow	*Corvus brachyrhynchos*
	Common Raven	*Corvus corax*
	Horned Lark	*Eremophila alpestris*
	Purple Martin	*Progne subis*
	Tree Swallow	*Tachycineta bicolor*
	Violet-green Swallow	*Tachycineta thalassina*
	Northern Rough-winged Swallow	*Stelgidopteryx serripennis*
	Bank Swallow	*Riparia riparia*
	Cliff Swallow	*Petrochelidon pyrrhonota*
	Barn Swallow	*Hirundo rustica*
	Black-capped Chickadee	*Poecile atricapillus*
	Mountain Chickadee	*Poecile gambeli*
	Chestnut-backed Chickadee	*Poecile rufescens*
	Oak Titmouse	*Baeolophus inornatus*
	Juniper Titmouse	*Baeolophus griseus*
	Bushtit	*Psaltriparus minimus*
	Red-breasted Nuthatch	*Sitta canadensis*
	White-breasted Nuthatch	*Sitta carolinensis*
	Pygmy Nuthatch	*Sitta pygmaea*
	Brown Creeper	*Certhia americana*
	Rock Wren	*Salpinctes obsoletus*
	Canyon Wren	*Catherpes mexicanus*
	Bewick's Wren	*Thryomanes bewickii*
	House Wren	*Troglodytes aedon*
	Winter Wren	*Troglodytes troglodytes*
	Marsh Wren	*Cistothorus palustris*
	American Dipper	*Cinclus mexicanus*
	Golden-crowned Kinglet	*Regulus satrapa*
	Ruby-crowned Kinglet	*Regulus calendula*
	Blue-gray Gnatcatcher	*Polioptila caerulea*

Appendix A. Wildlife species thought to occur in the Deschutes subbasin historically (1850.)		
	Common Name	**Scientific Name**
	Western Bluebird	*Sialia mexicana*
	Mountain Bluebird	*Sialia currucoides*
	Townsend's Solitaire	*Myadestes townsendi*
	Veery	*Catharus fuscescens*
	Swainson's Thrush	*Catharus ustulatus*
	Hermit Thrush	*Catharus guttatus*
	American Robin	*Turdus migratorius*
	Varied Thrush	*Ixoreus naevius*
	Wrentit	*Chamaea fasciata*
	Gray Catbird	*Dumetella carolinensis*
	Northern Mockingbird	*Mimus polyglottos*
	Sage Thrasher	*Oreoscoptes montanus*
	European Starling	*Sturnus vulgaris*
	American Pipit	*Anthus rubescens*
	Bohemian Waxwing	*Bombycilla garrulus*
	Cedar Waxwing	*Bombycilla cedrorum*
	Orange-crowned Warbler	*Vermivora celata*
	Nashville Warbler	*Vermivora ruficapilla*
	Yellow Warbler	*Dendroica petechia*
	Yellow-rumped Warbler	*Dendroica coronata*
	Black-throated Gray Warbler	*Dendroica nigrescens*
	Townsend's Warbler	*Dendroica townsendi*
	Hermit Warbler	*Dendroica occidentalis*
	Palm Warbler	*Dendroica palmarum*
	American Redstart	*Setophaga ruticilla*
	Northern Waterthrush	*Seiurus noveboracensis*
	Macgillivray's Warbler	*Oporornis tolmiei*
	Common Yellowthroat	*Geothlypis trichas*
	Wilson's Warbler	*Wilsonia pusilla*
	Yellow-breasted Chat	*Icteria virens*
	Western Tanager	*Piranga ludoviciana*
	Green-tailed Towhee	*Pipilo chlorurus*
	Spotted Towhee	*Pipilo maculatus*
	California Towhee	*Pipilo crissalis*
	American Tree Sparrow	*Spizella arborea*
	Chipping Sparrow	*Spizella passerina*
	Clay-colored Sparrow	*Spizella pallida*
	Brewer's Sparrow	*Spizella breweri*
	Vesper Sparrow	*Pooecetes gramineus*
	Lark Sparrow	*Chondestes grammacus*
	Black-throated Sparrow	*Amphispiza bilineata*
	Sage Sparrow	*Amphispiza belli*
	Savannah Sparrow	*Passerculus sandwichensis*

Appendix A. Wildlife species thought to occur in the Deschutes subbasin historically (1850.)			
	Common Name	**Scientific Name**	
	Grasshopper Sparrow	*Ammodramus savannarum*	
	Fox Sparrow	*Passerella iliaca*	
	Song Sparrow	*Melospiza melodia*	
	Lincoln's Sparrow	*Melospiza lincolnii*	
	Swamp Sparrow	*Melospiza georgiana*	
	White-crowned Sparrow	*Zonotrichia leucophrys*	
	Golden-crowned Sparrow	*Zonotrichia atricapilla*	
	Dark-eyed Junco	*Junco hyemalis*	
	Lapland Longspur	*Calcarius lapponicus*	
	Snow Bunting	*Plectrophenax nivalis*	
	Black-headed Grosbeak	*Pheucticus melanocephalus*	
	Lazuli Bunting	*Passerina amoena*	
	Bobolink	*Dolichonyx oryzivorus*	
	Red-winged Blackbird	*Agelaius phoeniceus*	
	Tricolored Blackbird	*Agelaius tricolor*	
	Western Meadowlark	*Sturnella neglecta*	
	Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	
	Brewer's Blackbird	*Euphagus cyanocephalus*	
	Brown-headed Cowbird	*Molothrus ater*	
	Bullock's Oriole	*Icterus bullockii*	
	Gray-crowned Rosy-Finch	*Leucosticte tephrocotis*	
	Black Rosy-finch	*Leucosticte atrata*	
	Pine Grosbeak	*Pinicola enucleator*	
	Purple Finch	*Carpodacus purpureus*	
	Cassin's Finch	*Carpodacus cassinii*	
	House Finch	*Carpodacus mexicanus*	
	Red Crossbill	*Loxia curvirostra*	
	White-winged Crossbill	*Loxia leucoptera*	
	Common Redpoll	*Carduelis flammea*	
	Pine Siskin	*Carduelis pinus*	
	Lesser Goldfinch	*Carduelis psaltria*	
	American Goldfinch	*Carduelis tristis*	
	Evening Grosbeak	*Coccothraustes vespertinus*	
	Total Birds:	**302**	**:**
Mammals			
	Virginia Opossum	*Didelphis virginiana*	
	Preble's Shrew	*Sorex preblei*	
	Vagrant Shrew	*Sorex vagrans*	
	Montane Shrew	*Sorex monticolus*	
	Baird's Shrew	*Sorex bairdi*	
	Fog Shrew	*Sorex sonomae*	
	Pacific Shrew	*Sorex pacificus*	
	Water Shrew	*Sorex palustris*	

Appendix A. Wildlife species thought to occur in the Deschutes subbasin historically (1850.)		
	Common Name	**Scientific Name**
	Pacific Water Shrew	*Sorex bendirii*
	Trowbridge's Shrew	*Sorex trowbridgii*
	Merriam's Shrew	*Sorex merriami*
	Shrew-mole	*Neurotrichus gibbsii*
	Townsend's Mole	*Scapanus townsendii*
	Coast Mole	*Scapanus orarius*
	Broad-footed Mole	*Scapanus latimanus*
	California Myotis	*Myotis californicus*
	Western Small-footed Myotis	*Myotis ciliolabrum*
	Yuma Myotis	*Myotis yumanensis*
	Little Brown Myotis	*Myotis lucifugus*
	Long-legged Myotis	*Myotis volans*
	Fringed Myotis	*Myotis thysanodes*
	Long-eared Myotis	*Myotis evotis*
	Silver-haired Bat	*Lasionycteris noctivagans*
	Western Pipistrelle	*Pipistrellus hesperus*
	Big Brown Bat	*Eptesicus fuscus*
	Hoary Bat	*Lasiurus cinereus*
	Spotted Bat	*Euderma maculatum*
	Townsend's Big-eared Bat	*Corynorhinus townsendii*
	Pallid Bat	*Antrozous pallidus*
	Brazilian Free-tailed Bat	*Tadarida brasiliensis*
	American Pika	*Ochotona princeps*
	Pygmy Rabbit	*Brachylagus idahoensis*
	Brush Rabbit	*Sylvilagus bachmani*
	Eastern Cottontail	*Sylvilagus floridanus*
	Nuttall's (Mountain) Cottontail	*Sylvilagus nuttallii*
	Snowshoe Hare	*Lepus americanus*
	White-tailed Jackrabbit	*Lepus townsendii*
	Black-tailed Jackrabbit	*Lepus californicus*
	Mountain Beaver	*Aplodontia rufa*
	Least Chipmunk	*Tamias minimus*
	Yellow-pine Chipmunk	*Tamias amoenus*
	Townsend's Chipmunk	*Tamias townsendii*
	Allen's Chipmunk	*Tamias senex*
	Siskiyou Chipmunk	*Tamias siskiyou*
	Yellow-bellied Marmot	*Marmota flaviventris*
	White-tailed Antelope Squirrel	*Ammospermophilus leucurus*
	Townsend's Ground Squirrel	*Spermophilus townsendii*
	Merriam's Ground Squirrel	*Spermophilus canus*
	Piute Ground Squirrel	*Spermophilus mollis*
	Belding's Ground Squirrel	*Spermophilus beldingi*
	Columbian Ground Squirrel	*Spermophilus columbianus*

Appendix A. Wildlife species thought to occur in the Deschutes subbasin historically (1850.)		
	Common Name	**Scientific Name**
	California Ground Squirrel	*Spermophilus beecheyi*
	Golden-mantled Ground Squirrel	*Spermophilus lateralis*
	Eastern Fox Squirrel	*Sciurus niger*
	Western Gray Squirrel	*Sciurus griseus*
	Red Squirrel	*Tamiasciurus hudsonicus*
	Douglas' Squirrel	*Tamiasciurus douglasii*
	Northern Flying Squirrel	*Glaucomys sabrinus*
	Northern Pocket Gopher	*Thomomys talpoides*
	Western Pocket Gopher	*Thomomys mazama*
	Townsend's Pocket Gopher	*Thomomys townsendii*
	Great Basin Pocket Mouse	*Perognathus parvus*
	Little Pocket Mouse	*Perognathus longimembris*
	Dark Kangaroo Mouse	*Microdipodops megacephalus*
	Ord's Kangaroo Rat	*Dipodomys ordii*
	Chisel-toothed Kangaroo Rat	*Dipodomys microps*
	California Kangaroo Rat	*Dipodomys californicus*
	American Beaver	*Castor canadensis*
	Western Harvest Mouse	*Reithrodontomys megalotis*
	Deer Mouse	*Peromyscus maniculatus*
	Canyon Mouse	*Peromyscus crinitus*
	Pinon Mouse	*Peromyscus truei*
	Northern Grasshopper Mouse	*Onychomys leucogaster*
	Desert Woodrat	*Neotoma lepida*
	Dusky-footed Woodrat	*Neotoma fuscipes*
	Bushy-tailed Woodrat	*Neotoma cinerea*
	Southern Red-backed Vole	*Clethrionomys gapperi*
	Western Red-backed Vole	*Clethrionomys californicus*
	Heather Vole	*Phenacomys intermedius*
	White-footed Vole	*Phenacomys albipes*
	Red Tree Vole	*Phenacomys longicaudus*
	Montane Vole	*Microtus montanus*
	California Vole	*Microtus californicus*
	Townsend's Vole	*Microtus townsendii*
	Long-tailed Vole	*Microtus longicaudus*
	Creeping Vole	*Microtus oregoni*
	Water Vole	*Microtus richardsoni*
	Sagebrush Vole	*Lemmiscus curtatus*
	Muskrat	*Ondatra zibethicus*
	Western Jumping Mouse	*Zapus princeps*
	Pacific Jumping Mouse	*Zapus trinotatus*
	Common Porcupine	*Erethizon dorsatum*
	Nutria	*Myocastor coypus*
	Coyote	*Canis latrans*

Appendix A. Wildlife species thought to occur in the Deschutes subbasin historically (1850.)		
	Common Name	**Scientific Name**
	Red Fox	*Vulpes vulpes*
	Kit Fox	*Vulpes velox*
	Gray Fox	*Urocyon cinereoargenteus*
	Black Bear	*Ursus americanus*
	Grizzly Bear	*Ursus arctos*
	Ringtail	*Bassariscus astutus*
	Raccoon	*Procyon lotor*
	American Marten	*Martes americana*
	Fisher	*Martes pennanti*
	Ermine	*Mustela erminea*
	Long-tailed Weasel	*Mustela frenata*
	Mink	*Mustela vison*
	Wolverine	*Gulo gulo*
	American Badger	*Taxidea taxus*
	Western Spotted Skunk	*Spilogale gracilis*
	Striped Skunk	*Mephitis mephitis*
	Northern River Otter	*Lutra canadensis*
	Mountain Lion	*Puma concolor*
	Lynx	*Lynx canadensis*
	Bobcat	*Lynx rufus*
	Feral Pig	*Sus scrofa*
	Elk	*Cervus elaphus*
	Mule Deer	*Odocoileus hemionus*
	White-tailed Deer	*Odocoileus virginianus*
	Pronghorn Antelope	*Antilocapra americana*
	Mountain Goat	*Oreamnos americanus*
	Bighorn Sheep	*Ovis canadensis*
	Total Mammals:	**121** **:**
Marine Mammals		
	Northern (Steller) Sea Lion	*Eumetopias jubatus*
	Harbor Seal	*Phoca vitulina*
	Total Marine Mammals:	**2**
Reptiles		
	Snapping Turtle	*Chelydra serpentina*
	Painted Turtle	*Chrysemys picta*
	Western Pond Turtle	*Clemmys marmorata*
	Northern Alligator Lizard	*Elgaria coerulea*
	Southern Alligator Lizard	*Elgaria multicarinata*
	Mojave Black-collared Lizard	*Crotaphytus bicinctores*
	Long-nosed Leopard Lizard	*Gambelia wislizenii*
	Short-horned Lizard	*Phrynosoma douglassii*
	Desert Horned Lizard	*Phrynosoma platyrhinos*
	Sagebrush Lizard	*Sceloporus graciosus*

Appendix A. Wildlife species thought to occur in the Deschutes subbasin historically (1850.)			
	Common Name	**Scientific Name**	
	Western Fence Lizard	*Sceloporus occidentalis*	
	Side-blotched Lizard	*Uta stansburiana*	
	Western Skink	*Eumeces skiltonianus*	
	Western Whiptail	*Cnemidophorus tigris*	
	Plateau Striped Whiptail	*Cnemidophorus velox*	
	Rubber Boa	*Charina bottae*	
	Racer	*Coluber constrictor*	
	Sharptail Snake	*Contia tenuis*	
	Ringneck Snake	*Diadophis punctatus*	
	Night Snake	*Hypsiglena torquata*	
	Common Kingsnake	*Lampropeltis getula*	
	California Mountain Kingsnake	*Lampropeltis zonata*	
	Striped Whipsnake	*Masticophis taeniatus*	
	Gopher Snake	*Pituophis catenifer*	
	Pacific Coast Aquatic Garter Snake	*Thamnophis atratus*	
	Western Terrestrial Garter Snake	*Thamnophis elegans*	
	Northwestern Garter Snake	*Thamnophis ordinoides*	
	Common Garter Snake	*Thamnophis sirtalis*	
	Western Rattlesnake	*Crotalus viridis*	
	Total Reptiles:	**29**	**:**
	Total Species:	**479**	
Subbasin Species Occurrences Generated by IBIS on 10/13/2003 12:00:16 PM.			
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Appendix B. Wildlife thought to occur in the Deschutes subbasin currently (1999.)		
	Common Name	**Scientific Name**
Amphibians		
	Tiger Salamander	*Ambystoma tigrinum*

Appendix B. Wildlife thought to occur in the Deschutes subbasin currently (1999.)		
	Common Name	**Scientific Name**
	Northwestern Salamander	*Ambystoma gracile*
	Long-toed Salamander	*Ambystoma macrodactylum*
	Cope's Giant Salamander	*Dicamptodon copei*
	Pacific Giant Salamander	*Dicamptodon tenebrosus*
	Southern Torrent Salamander	*Rhyacotriton variegatus*
	Cascade Torrent Salamander	*Rhyacotriton cascadae*
	Rough-skinned Newt	*Taricha granulosa*
	Dunn's Salamander	*Plethodon dunni*
	Larch Mountain Salamander	*Plethodon larselli*
	Western Red-backed Salamander	*Plethodon vehiculum*
	Del Norte Salamander	*Plethodon elongatus*
	Ensatina	*Ensatina eschscholtzii*
	Clouded Salamander	*Aneides ferreus*
	Oregon Slender Salamander	*Batrachoseps wrighti*
	Tailed Frog	*Ascaphus truei*
	Great Basin Spadefoot	*Scaphiopus intermontanus*
	Western Toad	*Bufo boreas*
	Pacific Chorus (Tree) Frog	*Pseudacris regilla*
	Red-legged Frog	*Rana aurora*
	Cascades Frog	*Rana cascadae*
	Columbia Spotted Frog	*Rana luteiventris*
	Foothill Yellow-legged Frog	*Rana boylii*
	Northern Leopard Frog	*Rana pipiens*
	Bullfrog	*Rana catesbeiana*
	Total Amphibians:	**25**
Birds		
	Common Loon	*Gavia immer*
	Pied-billed Grebe	*Podilymbus podiceps*
	Horned Grebe	*Podiceps auritus*
	Red-necked Grebe	*Podiceps grisegena*
	Eared Grebe	*Podiceps nigricollis*
	Western Grebe	*Aechmophorus occidentalis*
	Clark's Grebe	*Aechmophorus clarkii*
	American White Pelican	*Pelecanus erythrorhynchos*
	Brown Pelican	*Pelecanus occidentalis*
	Double-crested Cormorant	*Phalacrocorax auritus*
	American Bittern	*Botaurus lentiginosus*
	Least Bittern	*Ixobrychus exilis*
	Great Blue Heron	*Ardea herodias*
	Great Egret	*Ardea alba*
	Snowy Egret	*Egretta thula*
	Cattle Egret	*Bubulcus ibis*
	Green Heron	*Butorides virescens*

Appendix B. Wildlife thought to occur in the Deschutes subbasin currently (1999.)		
	Common Name	**Scientific Name**
	Black-crowned Night-heron	*Nycticorax nycticorax*
	White-faced Ibis	*Plegadis chihi*
	Turkey Vulture	*Cathartes aura*
	Greater White-fronted Goose	*Anser albifrons*
	Snow Goose	*Chen Ccaerulescens*
	Ross's Goose	*Chen rossii*
	Canada Goose	*Branta canadensis*
	Trumpeter Swan	*Cygnus buccinator*
	Tundra Swan	*Cygnus columbianus*
	Wood Duck	*Aix sponsa*
	Gadwall	*Anas strepera*
	Eurasian Wigeon	*Anas penelope*
	American Wigeon	*Anas americana*
	Mallard	*Anas platyrhynchos*
	Blue-winged Teal	*Anas discors*
	Cinnamon Teal	*Anas cyanoptera*
	Northern Shoveler	*Anas clypeata*
	Northern Pintail	*Anas acuta*
	Green-winged Teal	*Anas crecca*
	Canvasback	*Aythya valisineria*
	Redhead	*Aythya americana*
	Ring-necked Duck	*Aythya collaris*
	Greater Scaup	*Aythya marila*
	Lesser Scaup	*Aythya affinis*
	Harlequin Duck	*Histrionicus histrionicus*
	Surf Scoter	*Melanitta perspicillata*
	Bufflehead	*Bucephala albeola*
	Common Goldeneye	*Bucephala clangula*
	Barrow's Goldeneye	*Bucephala islandica*
	Hooded Merganser	*Lophodytes cucullatus*
	Common Merganser	*Mergus merganser*
	Red-breasted Merganser	*Mergus serrator*
	Ruddy Duck	*Oxyura jamaicensis*
	Osprey	*Pandion haliaetus*
	White-tailed Kite	*Elanus leucurus*
	Bald Eagle	*Haliaeetus leucocephalus*
	Northern Harrier	*Circus cyaneus*
	Sharp-shinned Hawk	*Accipiter striatus*
	Cooper's Hawk	*Accipiter cooperii*
	Northern Goshawk	*Accipiter gentilis*
	Red-shouldered Hawk	*Buteo lineatus*
	Swainson's Hawk	*Buteo swainsoni*
	Red-tailed Hawk	*Buteo jamaicensis*

Appendix B. Wildlife thought to occur in the Deschutes subbasin currently (1999.)		
	Common Name	**Scientific Name**
	Ferruginous Hawk	*Buteo regalis*
	Rough-legged Hawk	*Buteo lagopus*
	Golden Eagle	*Aquila chrysaetos*
	American Kestrel	*Falco sparverius*
	Merlin	*Falco columbarius*
	Gyrfalcon	*Falco rusticolus*
	Peregrine Falcon	*Falco peregrinus*
	Prairie Falcon	*Falco mexicanus*
	Chukar	*Alectoris chukar*
	Gray Partridge	*Perdix perdix*
	Ring-necked Pheasant	*Phasianus colchicus*
	Ruffed Grouse	*Bonasa umbellus*
	Sage Grouse	*Centrocercus urophasianus*
	Blue Grouse	*Dendragapus obscurus*
	Sharp-tailed Grouse	*Tympanuchus phasianellus*
	Wild Turkey	*Meleagris gallopavo*
	Mountain Quail	*Oreortyx pictus*
	California Quail	*Callipepla californica*
	Northern Bobwhite	*Colinus virginianus*
	Yellow Rail	*Coturnicops noveboracensis*
	Virginia Rail	*Rallus limicola*
	Sora	*Porzana carolina*
	American Coot	*Fulica americana*
	Sandhill Crane	*Grus canadensis*
	Black-bellied Plover	*Pluvialis squatarola*
	Pacific Golden-Plover	*Pluvialis fulva*
	Snowy Plover	*Charadrius alexandrinus*
	Semipalmated Plover	*Charadrius semipalmatus*
	Killdeer	*Charadrius vociferus*
	Black-necked Stilt	*Himantopus mexicanus*
	American Avocet	*Recurvirostra americana*
	Greater Yellowlegs	*Tringa melanoleuca*
	Lesser Yellowlegs	*Tringa flavipes*
	Solitary Sandpiper	*Tringa solitaria*
	Willet	*Catoptrophorus semipalmatus*
	Spotted Sandpiper	*Actitis macularia*
	Upland Sandpiper	*Bartramia longicauda*
	Whimbrel	*Numenius phaeopus*
	Long-billed Curlew	*Numenius americanus*
	Marbled Godwit	*Limosa fedoa*
	Black Turnstone	*Arenaria melanocephala*
	Red Knot	*Calidris canutus*
	Sanderling	*Calidris alba*

Appendix B. Wildlife thought to occur in the Deschutes subbasin currently (1999.)		
	Common Name	**Scientific Name**
	Semipalmated Sandpiper	*Calidris pusilla*
	Western Sandpiper	*Calidris mauri*
	Least Sandpiper	*Calidris minutilla*
	Baird's Sandpiper	*Calidris bairdii*
	Pectoral Sandpiper	*Calidris melanotos*
	Dunlin	*Calidris alpina*
	Stilt Sandpiper	*Calidris himantopus*
	Ruff	*Philomachus pugnax*
	Short-billed Dowitcher	*Limnodromus griseus*
	Long-billed Dowitcher	*Limnodromus scolopaceus*
	Common Snipe	*Gallinago gallinago*
	Wilson's Phalarope	*Phalaropus tricolor*
	Red-necked Phalarope	*Phalaropus lobatus*
	Franklin's Gull	*Larus pipixcan*
	Bonaparte's Gull	*Larus philadelphia*
	Heermann's Gull	*Larus heermanni*
	Mew Gull	*Larus canus*
	Ring-billed Gull	*Larus delawarensis*
	California Gull	*Larus californicus*
	Herring Gull	*Larus argentatus*
	Thayer's Gull	*Larus thayeri*
	Western Gull	*Larus occidentalis*
	Glaucous-winged Gull	*Larus glaucescens*
	Glaucous Gull	*Larus hyperboreus*
	Caspian Tern	*Sterna caspia*
	Common Tern	*Sterna hirundo*
	Forster's Tern	*Sterna forsteri*
	Black Tern	*Chlidonias niger*
	Marbled Murrelet	*Brachyramphus marmoratus*
	Rock Dove	*Columba livia*
	Band-tailed Pigeon	*Columba fasciata*
	Mourning Dove	*Zenaida macroura*
	Yellow-billed Cuckoo	*Coccyzus americanus*
	Barn Owl	*Tyto alba*
	Flammulated Owl	*Otus flammeolus*
	Western Screech-owl	*Otus kennicottii*
	Great Horned Owl	*Bubo virginianus*
	Snowy Owl	*Nyctea scandiaca*
	Northern Pygmy-owl	*Glaucidium gnoma*
	Burrowing Owl	*Athene cunicularia*
	Spotted Owl	*Strix occidentalis*
	Barred Owl	*Strix varia*
	Great Gray Owl	*Strix nebulosa*

Appendix B. Wildlife thought to occur in the Deschutes subbasin currently (1999.)		
	Common Name	**Scientific Name**
	Long-eared Owl	*Asio otus*
	Short-eared Owl	*Asio flammeus*
	Boreal Owl	*Aegolius funereus*
	Northern Saw-whet Owl	*Aegolius acadicus*
	Common Nighthawk	*Chordeiles minor*
	Common Poorwill	*Phalaenoptilus nuttallii*
	Black Swift	*Cypseloides niger*
	Vaux's Swift	*Chaetura vauxi*
	White-throated Swift	*Aeronautes saxatalis*
	Black-chinned Hummingbird	*Archilochus alexandri*
	Anna's Hummingbird	*Calypte anna*
	Calliope Hummingbird	*Stellula calliope*
	Broad-tailed Hummingbird	*Selasphorus platycercus*
	Rufous Hummingbird	*Selasphorus rufus*
	Allen's Hummingbird	*Selasphorus sasin*
	Belted Kingfisher	*Ceryle alcyon*
	Lewis's Woodpecker	*Melanerpes lewis*
	Acorn Woodpecker	*Melanerpes formicivorus*
	Williamson's Sapsucker	*Sphyrapicus thyroideus*
	Red-naped Sapsucker	*Sphyrapicus nuchalis*
	Red-breasted Sapsucker	*Sphyrapicus ruber*
	Downy Woodpecker	*Picoides pubescens*
	Hairy Woodpecker	*Picoides villosus*
	White-headed Woodpecker	*Picoides albolarvatus*
	Three-toed Woodpecker	*Picoides tridactylus*
	Black-backed Woodpecker	*Picoides arcticus*
	Northern Flicker	*Colaptes auratus*
	Pileated Woodpecker	*Dryocopus pileatus*
	Olive-sided Flycatcher	*Contopus cooperi*
	Western Wood-pewee	*Contopus sordidulus*
	Willow Flycatcher	*Empidonax traillii*
	Least Flycatcher	*Empidonax minimus*
	Hammond's Flycatcher	*Empidonax hammondii*
	Gray Flycatcher	*Empidonax wrightii*
	Dusky Flycatcher	*Empidonax oberholseri*
	Pacific-slope Flycatcher	*Empidonax difficilis*
	Cordilleran Flycatcher	*Empidonax occidentalis*
	Black Phoebe	*Sayornis nigricans*
	Say's Phoebe	*Sayornis saya*
	Ash-throated Flycatcher	*Myiarchus cinerascens*
	Western Kingbird	*Tyrannus verticalis*
	Eastern Kingbird	*Tyrannus tyrannus*
	Loggerhead Shrike	*Lanius ludovicianus*

Appendix B. Wildlife thought to occur in the Deschutes subbasin currently (1999.)		
	Common Name	**Scientific Name**
	Northern Shrike	*Lanius excubitor*
	Cassin's Vireo	*Vireo cassinii*
	Hutton's Vireo	*Vireo huttoni*
	Warbling Vireo	*Vireo gilvus*
	Red-eyed Vireo	*Vireo olivaceus*
	Gray Jay	*Perisoreus canadensis*
	Steller's Jay	*Cyanocitta stelleri*
	Western Scrub-Jay	*Aphelocoma californica*
	Pinyon Jay	*Gymnorhinus cyanocephalus*
	Clark's Nutcracker	*Nucifraga columbiana*
	Black-billed Magpie	*Pica pica*
	American Crow	*Corvus brachyrhynchos*
	Common Raven	*Corvus corax*
	Horned Lark	*Eremophila alpestris*
	Purple Martin	*Progne subis*
	Tree Swallow	*Tachycineta bicolor*
	Violet-green Swallow	*Tachycineta thalassina*
	Northern Rough-winged Swallow	*Stelgidopteryx serripennis*
	Bank Swallow	*Riparia riparia*
	Cliff Swallow	*Petrochelidon pyrrhonota*
	Barn Swallow	*Hirundo rustica*
	Black-capped Chickadee	*Poecile atricapillus*
	Mountain Chickadee	*Poecile gambeli*
	Chestnut-backed Chickadee	*Poecile rufescens*
	Oak Titmouse	*Baeolophus inornatus*
	Juniper Titmouse	*Baeolophus griseus*
	Bushtit	*Psaltriparus minimus*
	Red-breasted Nuthatch	*Sitta canadensis*
	White-breasted Nuthatch	*Sitta carolinensis*
	Pygmy Nuthatch	*Sitta pygmaea*
	Brown Creeper	*Certhia americana*
	Rock Wren	*Salpinctes obsoletus*
	Canyon Wren	*Catherpes mexicanus*
	Bewick's Wren	*Thryomanes bewickii*
	House Wren	*Troglodytes aedon*
	Winter Wren	*Troglodytes troglodytes*
	Marsh Wren	*Cistothorus palustris*
	American Dipper	*Cinclus mexicanus*
	Golden-crowned Kinglet	*Regulus satrapa*
	Ruby-crowned Kinglet	*Regulus calendula*
	Blue-gray Gnatcatcher	*Polioptila caerulea*
	Western Bluebird	*Sialia mexicana*
	Mountain Bluebird	*Sialia currucoides*

Appendix B. Wildlife thought to occur in the Deschutes subbasin currently (1999.)		
	Common Name	**Scientific Name**
	Townsend's Solitaire	*Myadestes townsendi*
	Veery	*Catharus fuscescens*
	Swainson's Thrush	*Catharus ustulatus*
	Hermit Thrush	*Catharus guttatus*
	American Robin	*Turdus migratorius*
	Varied Thrush	*Ixoreus naevius*
	Wrentit	*Chamaea fasciata*
	Gray Catbird	*Dumetella carolinensis*
	Northern Mockingbird	*Mimus polyglottos*
	Sage Thrasher	*Oreoscoptes montanus*
	European Starling	*Sturnus vulgaris*
	American Pipit	*Anthus rubescens*
	Bohemian Waxwing	*Bombycilla garrulus*
	Cedar Waxwing	*Bombycilla cedrorum*
	Orange-crowned Warbler	*Vermivora celata*
	Nashville Warbler	*Vermivora ruficapilla*
	Yellow Warbler	*Dendroica petechia*
	Yellow-rumped Warbler	*Dendroica coronata*
	Black-throated Gray Warbler	*Dendroica nigrescens*
	Townsend's Warbler	*Dendroica townsendi*
	Hermit Warbler	*Dendroica occidentalis*
	Palm Warbler	*Dendroica palmarum*
	American Redstart	*Setophaga ruticilla*
	Northern Waterthrush	*Seiurus noveboracensis*
	Macgillivray's Warbler	*Oporornis tolmiei*
	Common Yellowthroat	*Geothlypis trichas*
	Wilson's Warbler	*Wilsonia pusilla*
	Yellow-breasted Chat	*Icteria virens*
	Western Tanager	*Piranga ludoviciana*
	Green-tailed Towhee	*Pipilo chlorurus*
	Spotted Towhee	*Pipilo maculatus*
	California Towhee	*Pipilo crissalis*
	American Tree Sparrow	*Spizella arborea*
	Chipping Sparrow	*Spizella passerina*
	Clay-colored Sparrow	*Spizella pallida*
	Brewer's Sparrow	*Spizella breweri*
	Vesper Sparrow	*Pooecetes gramineus*
	Lark Sparrow	*Chondestes grammacus*
	Black-throated Sparrow	*Amphispiza bilineata*
	Sage Sparrow	*Amphispiza belli*
	Savannah Sparrow	*Passerculus sandwichensis*
	Grasshopper Sparrow	*Ammodramus savannarum*
	Fox Sparrow	*Passerella iliaca*

Appendix B. Wildlife thought to occur in the Deschutes subbasin currently (1999.)		
	Common Name	**Scientific Name**
	Song Sparrow	*Melospiza melodia*
	Lincoln's Sparrow	*Melospiza lincolnii*
	Swamp Sparrow	*Melospiza georgiana*
	White-throated Sparrow	*Zonotrichia albicollis*
	Harris's Sparrow	*Zonotrichia querula*
	White-crowned Sparrow	*Zonotrichia leucophrys*
	Golden-crowned Sparrow	*Zonotrichia atricapilla*
	Dark-eyed Junco	*Junco hyemalis*
	Lapland Longspur	*Calcarius lapponicus*
	Snow Bunting	*Plectrophenax nivalis*
	Black-headed Grosbeak	*Pheucticus melanocephalus*
	Lazuli Bunting	*Passerina amoena*
	Bobolink	*Dolichonyx oryzivorus*
	Red-winged Blackbird	*Agelaius phoeniceus*
	Tricolored Blackbird	*Agelaius tricolor*
	Western Meadowlark	*Sturnella neglecta*
	Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*
	Brewer's Blackbird	*Euphagus cyanocephalus*
	Brown-headed Cowbird	*Molothrus ater*
	Bullock's Oriole	*Icterus bullockii*
	Gray-crowned Rosy-Finch	*Leucosticte tephrocotis*
	Black Rosy-finch	*Leucosticte atrata*
	Pine Grosbeak	*Pinicola enucleator*
	Purple Finch	*Carpodacus purpureus*
	Cassin's Finch	*Carpodacus cassinii*
	House Finch	*Carpodacus mexicanus*
	Red Crossbill	*Loxia curvirostra*
	White-winged Crossbill	*Loxia leucoptera*
	Common Redpoll	*Carduelis flammea*
	Pine Siskin	*Carduelis pinus*
	Lesser Goldfinch	*Carduelis psaltria*
	American Goldfinch	*Carduelis tristis*
	Evening Grosbeak	*Coccothraustes vespertinus*
	House Sparrow	*Passer domesticus*
	Total Birds:	**309**
Mammals		
	Virginia Opossum	*Didelphis virginiana*
	Preble's Shrew	*Sorex preblei*
	Vagrant Shrew	*Sorex vagrans*
	Montane Shrew	*Sorex monticolus*
	Baird's Shrew	*Sorex bairdi*
	Fog Shrew	*Sorex sonomae*
	Pacific Shrew	*Sorex pacificus*

Appendix B. Wildlife thought to occur in the Deschutes subbasin currently (1999.)		
	Common Name	**Scientific Name**
	Water Shrew	*Sorex palustris*
	Pacific Water Shrew	*Sorex bendirii*
	Trowbridge's Shrew	*Sorex trowbridgii*
	Merriam's Shrew	*Sorex merriami*
	Shrew-mole	*Neurotrichus gibbsii*
	Townsend's Mole	*Scapanus townsendii*
	Coast Mole	*Scapanus orarius*
	Broad-footed Mole	*Scapanus latimanus*
	California Myotis	*Myotis californicus*
	Western Small-footed Myotis	*Myotis ciliolabrum*
	Yuma Myotis	*Myotis yumanensis*
	Little Brown Myotis	*Myotis lucifugus*
	Long-legged Myotis	*Myotis volans*
	Fringed Myotis	*Myotis thysanodes*
	Long-eared Myotis	*Myotis evotis*
	Silver-haired Bat	*Lasionycteris noctivagans*
	Western Pipistrelle	*Pipistrellus hesperus*
	Big Brown Bat	*Eptesicus fuscus*
	Hoary Bat	*Lasiurus cinereus*
	Spotted Bat	*Euderma maculatum*
	Townsend's Big-eared Bat	*Corynorhinus townsendii*
	Pallid Bat	*Antrozous pallidus*
	Brazilian Free-tailed Bat	*Tadarida brasiliensis*
	American Pika	*Ochotona princeps*
	Pygmy Rabbit	*Brachylagus idahoensis*
	Brush Rabbit	*Sylvilagus bachmani*
	Eastern Cottontail	*Sylvilagus floridanus*
	Nuttall's (Mountain) Cottontail	*Sylvilagus nuttallii*
	Snowshoe Hare	*Lepus americanus*
	White-tailed Jackrabbit	*Lepus townsendii*
	Black-tailed Jackrabbit	*Lepus californicus*
	Mountain Beaver	*Aplodontia rufa*
	Least Chipmunk	*Tamias minimus*
	Yellow-pine Chipmunk	*Tamias amoenus*
	Townsend's Chipmunk	*Tamias townsendii*
	Allen's Chipmunk	*Tamias senex*
	Siskiyou Chipmunk	*Tamias siskiyou*
	Yellow-bellied Marmot	*Marmota flaviventris*
	White-tailed Antelope Squirrel	*Ammospermophilus leucurus*
	Townsend's Ground Squirrel	*Spermophilus townsendii*
	Merriam's Ground Squirrel	*Spermophilus canus*
	Piute Ground Squirrel	*Spermophilus mollis*
	Belding's Ground Squirrel	*Spermophilus beldingi*

Appendix B. Wildlife thought to occur in the Deschutes subbasin currently (1999.)		
	Common Name	**Scientific Name**
	Columbian Ground Squirrel	*Spermophilus columbianus*
	California Ground Squirrel	*Spermophilus beecheyi*
	Golden-mantled Ground Squirrel	*Spermophilus lateralis*
	Eastern Gray Squirrel	*Sciurus carolinensis*
	Eastern Fox Squirrel	*Sciurus niger*
	Western Gray Squirrel	*Sciurus griseus*
	Red Squirrel	*Tamiasciurus hudsonicus*
	Douglas' Squirrel	*Tamiasciurus douglasii*
	Northern Flying Squirrel	*Glaucomys sabrinus*
	Northern Pocket Gopher	*Thomomys talpoides*
	Western Pocket Gopher	*Thomomys mazama*
	Camas Pocket Gopher	*Thomomys bulbivorus*
	Botta's (Pistol River) Pocket Gopher	*Thomomys bottae*
	Townsend's Pocket Gopher	*Thomomys townsendii*
	Great Basin Pocket Mouse	*Perognathus parvus*
	Little Pocket Mouse	*Perognathus longimembris*
	Dark Kangaroo Mouse	*Microdipodops megacephalus*
	Ord's Kangaroo Rat	*Dipodomys ordii*
	Chisel-toothed Kangaroo Rat	*Dipodomys microps*
	California Kangaroo Rat	*Dipodomys californicus*
	American Beaver	*Castor canadensis*
	Western Harvest Mouse	*Reithrodontomys megalotis*
	Deer Mouse	*Peromyscus maniculatus*
	Canyon Mouse	*Peromyscus crinitus*
	Pinon Mouse	*Peromyscus truei*
	Northern Grasshopper Mouse	*Onychomys leucogaster*
	Desert Woodrat	*Neotoma lepida*
	Dusky-footed Woodrat	*Neotoma fuscipes*
	Bushy-tailed Woodrat	*Neotoma cinerea*
	Southern Red-backed Vole	*Clethrionomys gapperi*
	Western Red-backed Vole	*Clethrionomys californicus*
	Heather Vole	*Phenacomys intermedius*
	White-footed Vole	*Phenacomys albipes*
	Red Tree Vole	*Phenacomys longicaudus*
	Montane Vole	*Microtus montanus*
	Gray-tailed Vole	*Microtus canicaudus*
	California Vole	*Microtus californicus*
	Townsend's Vole	*Microtus townsendii*
	Long-tailed Vole	*Microtus longicaudus*
	Creeping Vole	*Microtus oregoni*
	Water Vole	*Microtus richardsoni*
	Sagebrush Vole	*Lemmiscus curtatus*
	Muskrat	*Ondatra zibethicus*

Appendix B. Wildlife thought to occur in the Deschutes subbasin currently (1999.)		
	Common Name	**Scientific Name**
	Black Rat	*Rattus rattus*
	Norway Rat	*Rattus norvegicus*
	House Mouse	*Mus musculus*
	Western Jumping Mouse	*Zapus princeps*
	Pacific Jumping Mouse	*Zapus trinotatus*
	Common Porcupine	*Erethizon dorsatum*
	Nutria	*Myocastor coypus*
	Coyote	*Canis latrans*
	Red Fox	*Vulpes vulpes*
	Kit Fox	*Vulpes velox*
	Gray Fox	*Urocyon cinereoargenteus*
	Black Bear	*Ursus americanus*
	Grizzly Bear	*Ursus arctos*
	Ringtail	*Bassariscus astutus*
	Raccoon	*Procyon lotor*
	American Marten	*Martes americana*
	Fisher	*Martes pennanti*
	Ermine	*Mustela erminea*
	Long-tailed Weasel	*Mustela frenata*
	Mink	*Mustela vison*
	Wolverine	*Gulo gulo*
	American Badger	*Taxidea taxus*
	Western Spotted Skunk	*Spilogale gracilis*
	Striped Skunk	*Mephitis mephitis*
	Northern River Otter	*Lutra canadensis*
	Mountain Lion	*Puma concolor*
	Lynx	*Lynx canadensis*
	Bobcat	*Lynx rufus*
	Feral Pig	*Sus scrofa*
	Elk	*Cervus elaphus*
	Mule Deer	*Odocoileus hemionus*
	White-tailed Deer	*Odocoileus virginianus*
	Pronghorn Antelope	*Antilocapra americana*
	Mountain Goat	*Oreamnos americanus*
	Bighorn Sheep	*Ovis canadensis*
	Total Mammals:	**128**
Marine Mammals		
	Northern (Steller) Sea Lion	*Eumetopias jubatus*
	Harbor Seal	*Phoca vitulina*
	Total Marine Mammals:	**2**
Reptiles		
	Snapping Turtle	*Chelydra serpentina*
	Painted Turtle	*Chrysemys picta*

Appendix B. Wildlife thought to occur in the Deschutes subbasin currently (1999.)			
	Common Name	**Scientific Name**	
	Western Pond Turtle	*Clemmys marmorata*	
	Northern Alligator Lizard	*Elgaria coerulea*	
	Southern Alligator Lizard	*Elgaria multicarinata*	
	Mojave Black-collared Lizard	*Crotaphytus bicinctores*	
	Long-nosed Leopard Lizard	*Gambelia wislizenii*	
	Short-horned Lizard	*Phrynosoma douglassii*	
	Desert Horned Lizard	*Phrynosoma platyrhinos*	
	Sagebrush Lizard	*Sceloporus graciosus*	
	Western Fence Lizard	*Sceloporus occidentalis*	
	Side-blotched Lizard	*Uta stansburiana*	
	Western Skink	*Eumeces skiltonianus*	
	Western Whiptail	*Cnemidophorus tigris*	
	Plateau Striped Whiptail	*Cnemidophorus velox*	
	Rubber Boa	*Charina bottae*	
	Racer	*Coluber constrictor*	
	Sharptail Snake	*Contia tenuis*	
	Ringneck Snake	*Diadophis punctatus*	
	Night Snake	*Hypsiglena torquata*	
	Common Kingsnake	*Lampropeltis getula*	
	California Mountain Kingsnake	*Lampropeltis zonata*	
	Striped Whipsnake	*Masticophis taeniatus*	
	Gopher Snake	*Pituophis catenifer*	
	Pacific Coast Aquatic Garter Snake	*Thamnophis atratus*	
	Western Terrestrial Garter Snake	*Thamnophis elegans*	
	Northwestern Garter Snake	*Thamnophis ordinoides*	
	Common Garter Snake	*Thamnophis sirtalis*	
	Western Rattlesnake	*Crotalus viridis*	
	Total Reptiles:	**29**	
	Total Species:	**493**	
Subbasin Species Occurrences Generated by IBIS on 10/10/2003 4:56:56 PM.			
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Appendix C. Comparison of historic and current species occurrence in the Deschutes subbasin, and suggested additions and deletions (already added or deleted in table.)	
Historic spp	Current spp
Tiger Salamander	Tiger Salamander
Northwestern Salamander	Northwestern Salamander
Long-toed Salamander	Long-toed Salamander
Cope's Giant Salamander	Cope's Giant Salamander
Pacific Giant Salamander	Pacific Giant Salamander
Southern Torrent Salamander	Southern Torrent Salamander
Cascade Torrent Salamander	Cascade Torrent Salamander
Rough-skinned Newt	Rough-skinned Newt
Dunn's Salamander	Dunn's Salamander
Larch Mountain Salamander	Larch Mountain Salamander
Western Red-backed Salamander	Western Red-backed Salamander
Del Norte Salamander	Del Norte Salamander
Ensatina	Ensatina
Clouded Salamander	Clouded Salamander
Oregon Slender Salamander	Oregon Slender Salamander
Tailed Frog	Tailed Frog
Great Basin Spadefoot	Great Basin Spadefoot
Western Toad	Western Toad
Pacific Chorus (Tree) Frog	Pacific Chorus (Tree) Frog
Red-legged Frog	Red-legged Frog
Cascades Frog	Cascades Frog
Columbia Spotted Frog	
Oregon spotted frog	Oregon spotted frog
Foothill yellow-legged frog	Foothill Yellow-legged Frog
Northern Leopard Frog	
	Bullfrog
Common Loon	Common Loon
Pied-billed Grebe	Pied-billed Grebe
Horned Grebe	Horned Grebe
Red-necked Grebe	Red-necked Grebe
Eared Grebe	Eared Grebe
Western Grebe	Western Grebe
Clark's Grebe	Clark's Grebe

Appendix C. Comparison of historic and current species occurrence in the Deschutes subbasin, and suggested additions and deletions (already added or deleted in table.)	
Historic spp	Current spp
American White Pelican	American White Pelican
	Brown Pelican
Double-crested Cormorant	Double-crested Cormorant
American Bittern	American Bittern
Least Bittern	Least Bittern
Great Blue Heron	Great Blue Heron
Great Egret	Great Egret
Snowy Egret	Snowy Egret
Cattle Egret	Cattle Egret
Green Heron	Green Heron
Black-crowned Night-heron	Black-crowned Night-heron
White-faced Ibis	White-faced Ibis
Turkey Vulture	Turkey Vulture
Greater White-fronted Goose	Greater White-fronted Goose
Snow Goose	Snow Goose
Ross's Goose	Ross's Goose
Canada Goose	Canada Goose
Trumpeter Swan	Trumpeter Swan
Tundra Swan	Tundra Swan
Wood Duck	Wood Duck
Gadwall	Gadwall
Eurasian Wigeon	Eurasian Wigeon
American Wigeon	American Wigeon
Mallard	Mallard
Blue-winged Teal	Blue-winged Teal
Cinnamon Teal	Cinnamon Teal
Northern Shoveler	Northern Shoveler
Northern Pintail	Northern Pintail
Green-winged Teal	Green-winged Teal
Canvasback	Canvasback
Redhead	Redhead
Ring-necked Duck	Ring-necked Duck
Greater Scaup	Greater Scaup
Lesser Scaup	Lesser Scaup
Harlequin Duck	Harlequin Duck
Surf Scoter	Surf Scoter

Appendix C. Comparison of historic and current species occurrence in the Deschutes subbasin, and suggested additions and deletions (already added or deleted in table.)	
Historic spp	Current spp
Bufflehead	Bufflehead
Common Goldeneye	Common Goldeneye
Barrow's Goldeneye	Barrow's Goldeneye
Hooded Merganser	Hooded Merganser
Common Merganser	Common Merganser
Red-breasted Merganser	Red-breasted Merganser
Ruddy Duck	Ruddy Duck
Osprey	Osprey
White-tailed Kite	White-tailed Kite
Bald Eagle	Bald Eagle
Northern Harrier	Northern Harrier
Sharp-shinned Hawk	Sharp-shinned Hawk
Cooper's Hawk	Cooper's Hawk
Northern Goshawk	Northern Goshawk
Red-shouldered Hawk	Red-shouldered Hawk
Swainson's Hawk	Swainson's Hawk
Red-tailed Hawk	Red-tailed Hawk
Ferruginous Hawk	Ferruginous Hawk
Rough-legged Hawk	Rough-legged Hawk
Golden Eagle	Golden Eagle
American Kestrel	American Kestrel
Merlin	Merlin
Gyrfalcon	Gyrfalcon
Peregrine Falcon	Peregrine Falcon
Prairie Falcon	Prairie Falcon
	Chukar
	Gray Partridge
	Ring-necked Pheasant
Ruffed Grouse	Ruffed Grouse
Sage Grouse	Sage Grouse
Blue Grouse	Blue Grouse
Sharp-tailed Grouse	
	Wild Turkey
Mountain Quail	Mountain Quail
California Quail	California Quail
	Northern Bobwhite

Appendix C. Comparison of historic and current species occurrence in the Deschutes subbasin, and suggested additions and deletions (already added or deleted in table.)	
Historic spp	Current spp
Yellow Rail	Yellow Rail
Virginia Rail	Virginia Rail
Sora	Sora
American Coot	American Coot
Sandhill Crane	Sandhill Crane
Black-bellied Plover	Black-bellied Plover
Pacific Golden-Plover	Pacific Golden-Plover
Snowy Plover	Snowy Plover
Semipalmated Plover	Semipalmated Plover
Killdeer	Killdeer
Black-necked Stilt	Black-necked Stilt
American Avocet	American Avocet
Greater Yellowlegs	Greater Yellowlegs
Lesser Yellowlegs	Lesser Yellowlegs
Solitary Sandpiper	Solitary Sandpiper
Willet	Willet
Spotted Sandpiper	Spotted Sandpiper
Upland Sandpiper	Upland Sandpiper
	Whimbrel
Long-billed Curlew	Long-billed Curlew
Marbled Godwit	Marbled Godwit
Black Turnstone	Black Turnstone
	Red Knot
Sanderling	Sanderling
Semipalmated Sandpiper	Semipalmated Sandpiper
Western Sandpiper	Western Sandpiper
Least Sandpiper	Least Sandpiper
Baird's Sandpiper	Baird's Sandpiper
Pectoral Sandpiper	Pectoral Sandpiper
Dunlin	Dunlin
Stilt Sandpiper	Stilt Sandpiper
Ruff	Ruff
Short-billed Dowitcher	Short-billed Dowitcher
Long-billed Dowitcher	Long-billed Dowitcher
Common Snipe	Common Snipe
Wilson's Phalarope	Wilson's Phalarope

Appendix C. Comparison of historic and current species occurrence in the Deschutes subbasin, and suggested additions and deletions (already added or deleted in table.)	
Historic spp	Current spp
Red-necked Phalarope	Red-necked Phalarope
Franklin's Gull	Franklin's Gull
Bonaparte's Gull	Bonaparte's Gull
	Heermann's Gull
Mew Gull	Mew Gull
Ring-billed Gull	Ring-billed Gull
California Gull	California Gull
Herring Gull	Herring Gull
Thayer's Gull	Thayer's Gull
Western Gull	Western Gull
Glaucous-winged Gull	Glaucous-winged Gull
Glaucous Gull	Glaucous Gull
Caspian Tern	Caspian Tern
Common Tern	Common Tern
Forster's Tern	Forster's Tern
Black Tern	Black Tern
Marbled Murrelet	Marbled Murrelet
	Rock Dove
Band-tailed Pigeon	Band-tailed Pigeon
Mourning Dove	Mourning Dove
Yellow-billed Cuckoo	Yellow-billed Cuckoo
Barn Owl	Barn Owl
Flammulated Owl	Flammulated Owl
Western Screech-owl	Western Screech-owl
Great Horned Owl	Great Horned Owl
Snowy Owl	Snowy Owl
Northern Pygmy-owl	Northern Pygmy-owl
Burrowing Owl	Burrowing Owl
Spotted Owl	Spotted Owl
Barred Owl	Barred Owl
Great Gray Owl	Great Gray Owl
Long-eared Owl	Long-eared Owl
Short-eared Owl	Short-eared Owl
Boreal Owl	Boreal Owl
Northern Saw-whet Owl	Northern Saw-whet Owl
Common Nighthawk	Common Nighthawk

Appendix C. Comparison of historic and current species occurrence in the Deschutes subbasin, and suggested additions and deletions (already added or deleted in table.)	
Historic spp	Current spp
Common Poorwill	Common Poorwill
Black Swift	Black Swift
Vaux's Swift	Vaux's Swift
White-throated Swift	White-throated Swift
Black-chinned Hummingbird	Black-chinned Hummingbird
Anna's Hummingbird	Anna's Hummingbird
Calliope Hummingbird	Calliope Hummingbird
Broad-tailed Hummingbird	Broad-tailed Hummingbird
Rufous Hummingbird	Rufous Hummingbird
Allen's Hummingbird	Allen's Hummingbird
Belted Kingfisher	Belted Kingfisher
Lewis's Woodpecker	Lewis's Woodpecker
Acorn Woodpecker	Acorn Woodpecker
Williamson's Sapsucker	Williamson's Sapsucker
Red-naped Sapsucker	Red-naped Sapsucker
Red-breasted Sapsucker	Red-breasted Sapsucker
Downy Woodpecker	Downy Woodpecker
Hairy Woodpecker	Hairy Woodpecker
White-headed Woodpecker	White-headed Woodpecker
Three-toed Woodpecker	Three-toed Woodpecker
Black-backed Woodpecker	Black-backed Woodpecker
Northern Flicker	Northern Flicker
Pileated Woodpecker	Pileated Woodpecker
Olive-sided Flycatcher	Olive-sided Flycatcher
Western Wood-pewee	Western Wood-pewee
Willow Flycatcher	Willow Flycatcher
Least Flycatcher	Least Flycatcher
Hammond's Flycatcher	Hammond's Flycatcher
Gray Flycatcher	Gray Flycatcher
Dusky Flycatcher	Dusky Flycatcher
Pacific-slope Flycatcher	Pacific-slope Flycatcher
Cordilleran Flycatcher	Cordilleran Flycatcher
Black Phoebe	Black Phoebe
Say's Phoebe	Say's Phoebe
Ash-throated Flycatcher	Ash-throated Flycatcher
Western Kingbird	Western Kingbird

Appendix C. Comparison of historic and current species occurrence in the Deschutes subbasin, and suggested additions and deletions (already added or deleted in table.)	
Historic spp	Current spp
Eastern Kingbird	Eastern Kingbird
Loggerhead Shrike	Loggerhead Shrike
Northern Shrike	Northern Shrike
Cassin's Vireo	Cassin's Vireo
Hutton's Vireo	Hutton's Vireo
Warbling Vireo	Warbling Vireo
Red-eyed Vireo	Red-eyed Vireo
Gray Jay	Gray Jay
Steller's Jay	Steller's Jay
Western Scrub-Jay	Western Scrub-Jay
Pinyon Jay	Pinyon Jay
Clark's Nutcracker	Clark's Nutcracker
Black-billed Magpie	Black-billed Magpie
American Crow	American Crow
Common Raven	Common Raven
Horned Lark	Horned Lark
Purple Martin	Purple Martin
Tree Swallow	Tree Swallow
Violet-green Swallow	Violet-green Swallow
Northern Rough-winged Swallow	Northern Rough-winged Swallow
Bank Swallow	Bank Swallow
Cliff Swallow	Cliff Swallow
Barn Swallow	Barn Swallow
Black-capped Chickadee	Black-capped Chickadee
Mountain Chickadee	Mountain Chickadee
Chestnut-backed Chickadee	Chestnut-backed Chickadee
Oak Titmouse	Oak Titmouse
Juniper Titmouse	Juniper Titmouse
Bushtit	Bushtit
Red-breasted Nuthatch	Red-breasted Nuthatch
White-breasted Nuthatch	White-breasted Nuthatch
Pygmy Nuthatch	Pygmy Nuthatch
Brown Creeper	Brown Creeper
Rock Wren	Rock Wren
Canyon Wren	Canyon Wren
Bewick's Wren	Bewick's Wren

Appendix C. Comparison of historic and current species occurrence in the Deschutes subbasin, and suggested additions and deletions (already added or deleted in table.)	
Historic spp	Current spp
House Wren	House Wren
Winter Wren	Winter Wren
Marsh Wren	Marsh Wren
American Dipper	American Dipper
Golden-crowned Kinglet	Golden-crowned Kinglet
Ruby-crowned Kinglet	Ruby-crowned Kinglet
Blue-gray Gnatcatcher	Blue-gray Gnatcatcher
Western Bluebird	Western Bluebird
Mountain Bluebird	Mountain Bluebird
Townsend's Solitaire	Townsend's Solitaire
Veery	Veery
Swainson's Thrush	Swainson's Thrush
Hermit Thrush	Hermit Thrush
American Robin	American Robin
Varied Thrush	Varied Thrush
Wrentit	Wrentit
Gray Catbird	Gray Catbird
Northern Mockingbird	Northern Mockingbird
Sage Thrasher	Sage Thrasher
European Starling	European Starling
American Pipit	American Pipit
Bohemian Waxwing	Bohemian Waxwing
Cedar Waxwing	Cedar Waxwing
Orange-crowned Warbler	Orange-crowned Warbler
Nashville Warbler	Nashville Warbler
Yellow Warbler	Yellow Warbler
Yellow-rumped Warbler	Yellow-rumped Warbler
Black-throated Gray Warbler	Black-throated Gray Warbler
Townsend's Warbler	Townsend's Warbler
Hermit Warbler	Hermit Warbler
Palm Warbler	Palm Warbler
American Redstart	American Redstart
Northern Waterthrush	Northern Waterthrush
Macgillivray's Warbler	Macgillivray's Warbler
Common Yellowthroat	Common Yellowthroat
Wilson's Warbler	Wilson's Warbler

Appendix C. Comparison of historic and current species occurrence in the Deschutes subbasin, and suggested additions and deletions (already added or deleted in table.)	
Historic spp	Current spp
Yellow-breasted Chat	Yellow-breasted Chat
Western Tanager	Western Tanager
Green-tailed Towhee	Green-tailed Towhee
Spotted Towhee	Spotted Towhee
California Towhee	California Towhee
American Tree Sparrow	American Tree Sparrow
Chipping Sparrow	Chipping Sparrow
Clay-colored Sparrow	Clay-colored Sparrow
Brewer's Sparrow	Brewer's Sparrow
Vesper Sparrow	Vesper Sparrow
Lark Sparrow	Lark Sparrow
Black-throated Sparrow	Black-throated Sparrow
Sage Sparrow	Sage Sparrow
Savannah Sparrow	Savannah Sparrow
Grasshopper Sparrow	Grasshopper Sparrow
Fox Sparrow	Fox Sparrow
Song Sparrow	Song Sparrow
Lincoln's Sparrow	Lincoln's Sparrow
Swamp Sparrow	Swamp Sparrow
White-crowned Sparrow	White-throated Sparrow
	Harris's Sparrow
	White-crowned Sparrow
Golden-crowned Sparrow	Golden-crowned Sparrow
Dark-eyed Junco	Dark-eyed Junco
Lapland Longspur	Lapland Longspur
Snow Bunting	Snow Bunting
Black-headed Grosbeak	Black-headed Grosbeak
Lazuli Bunting	Lazuli Bunting
Bobolink	Bobolink
Red-winged Blackbird	Red-winged Blackbird
Tricolored Blackbird	Tricolored Blackbird
Western Meadowlark	Western Meadowlark
Yellow-headed Blackbird	Yellow-headed Blackbird
Brewer's Blackbird	Brewer's Blackbird
Brown-headed Cowbird	Brown-headed Cowbird
Bullock's Oriole	Bullock's Oriole

Appendix C. Comparison of historic and current species occurrence in the Deschutes subbasin, and suggested additions and deletions (already added or deleted in table.)	
Historic spp	Current spp
Gray-crowned Rosy-Finch	Gray-crowned Rosy-Finch
Black Rosy-finch	Black Rosy-finch
Pine Grosbeak	Pine Grosbeak
Purple Finch	Purple Finch
Cassin's Finch	Cassin's Finch
House Finch	House Finch
Red Crossbill	Red Crossbill
White-winged Crossbill	White-winged Crossbill
Common Redpoll	Common Redpoll
Pine Siskin	Pine Siskin
Lesser Goldfinch	Lesser Goldfinch
American Goldfinch	American Goldfinch
Evening Grosbeak	Evening Grosbeak
	House Sparrow
	Virginia Opossum
Preble's Shrew	Preble's Shrew
Vagrant Shrew	Vagrant Shrew
Montane Shrew	Montane Shrew
Baird's Shrew	Baird's Shrew
Fog Shrew	Fog Shrew
Pacific Shrew	Pacific Shrew
Water Shrew	Water Shrew
Pacific Water Shrew	Pacific Water Shrew
Trowbridge's Shrew	Trowbridge's Shrew
Merriam's Shrew	Merriam's Shrew
Shrew-mole	Shrew-mole
Townsend's Mole	Townsend's Mole
Coast Mole	Coast Mole
Broad-footed Mole	Broad-footed Mole
California Myotis	California Myotis
Western Small-footed Myotis	Western Small-footed Myotis
Yuma Myotis	Yuma Myotis
Little Brown Myotis	Little Brown Myotis
Long-legged Myotis	Long-legged Myotis
Fringed Myotis	Fringed Myotis
Long-eared Myotis	Long-eared Myotis

Appendix C. Comparison of historic and current species occurrence in the Deschutes subbasin, and suggested additions and deletions (already added or deleted in table.)	
Historic spp	Current spp
Silver-haired Bat	Silver-haired Bat
Western Pipistrelle	Western Pipistrelle
Big Brown Bat	Big Brown Bat
Hoary Bat	Hoary Bat
Spotted Bat	Spotted Bat
Townsend's Big-eared Bat	Townsend's Big-eared Bat
Pallid Bat	Pallid Bat
Brazilian Free-tailed Bat	Brazilian Free-tailed Bat
American Pika	American Pika
Pygmy Rabbit	Pygmy Rabbit
Brush Rabbit	Brush Rabbit
Eastern Cottontail	Eastern Cottontail
Nuttall's (Mountain) Cottontail	Nuttall's (Mountain) Cottontail
Snowshoe Hare	Snowshoe Hare
White-tailed Jackrabbit	White-tailed Jackrabbit
Black-tailed Jackrabbit	Black-tailed Jackrabbit
Mountain Beaver	Mountain Beaver
Least Chipmunk	Least Chipmunk
Yellow-pine Chipmunk	Yellow-pine Chipmunk
Townsend's Chipmunk	Townsend's Chipmunk
Allen's Chipmunk	Allen's Chipmunk
Siskiyou Chipmunk	Siskiyou Chipmunk
Yellow-bellied Marmot	Yellow-bellied Marmot
White-tailed Antelope Squirrel	White-tailed Antelope Squirrel
Townsend's Ground Squirrel	Townsend's Ground Squirrel
Merriam's Ground Squirrel	Merriam's Ground Squirrel
Piute Ground Squirrel	Piute Ground Squirrel
Belding's Ground Squirrel	Belding's Ground Squirrel
Columbian Ground Squirrel	Columbian Ground Squirrel
California Ground Squirrel	California Ground Squirrel
Golden-mantled Ground Squirrel	Golden-mantled Ground Squirrel
	Eastern Gray Squirrel
	Eastern Fox Squirrel
Western Gray Squirrel	Western Gray Squirrel
Red Squirrel	Red Squirrel
Douglas' Squirrel	Douglas' Squirrel

Appendix C. Comparison of historic and current species occurrence in the Deschutes subbasin, and suggested additions and deletions (already added or deleted in table.)	
Historic spp	Current spp
Northern Flying Squirrel	Northern Flying Squirrel
Northern Pocket Gopher	Northern Pocket Gopher
Western Pocket Gopher	Western Pocket Gopher
	Camas Pocket Gopher
	Botta's (Pistol River) Pocket Gopher
Townsend's Pocket Gopher	Townsend's Pocket Gopher
Great Basin Pocket Mouse	Great Basin Pocket Mouse
Little Pocket Mouse	Little Pocket Mouse
Dark Kangaroo Mouse	Dark Kangaroo Mouse
Ord's Kangaroo Rat	Ord's Kangaroo Rat
Chisel-toothed Kangaroo Rat	Chisel-toothed Kangaroo Rat
California Kangaroo Rat	California Kangaroo Rat
American Beaver	American Beaver
Western Harvest Mouse	Western Harvest Mouse
Deer Mouse	Deer Mouse
Canyon Mouse	Canyon Mouse
Pinon Mouse	Pinon Mouse
Northern Grasshopper Mouse	Northern Grasshopper Mouse
Desert Woodrat	Desert Woodrat
Dusky-footed Woodrat	Dusky-footed Woodrat
Bushy-tailed Woodrat	Bushy-tailed Woodrat
Southern Red-backed Vole	Southern Red-backed Vole
Western Red-backed Vole	Western Red-backed Vole
Heather Vole	Heather Vole
White-footed Vole	White-footed Vole
Red Tree Vole	Red Tree Vole
Montane Vole	Montane Vole
	Gray-tailed Vole
California Vole	California Vole
Townsend's Vole	Townsend's Vole
Long-tailed Vole	Long-tailed Vole
Creeping Vole	Creeping Vole
Water Vole	Water Vole
Sagebrush Vole	Sagebrush Vole
Muskrat	Muskrat
	Black Rat

Appendix C. Comparison of historic and current species occurrence in the Deschutes subbasin, and suggested additions and deletions (already added or deleted in table.)	
Historic spp	Current spp
	Norway Rat
	House Mouse
Western Jumping Mouse	Western Jumping Mouse
Pacific Jumping Mouse	Pacific Jumping Mouse
Common Porcupine	Common Porcupine
	Nutria
Coyote	Coyote
Gray wolf	
Red Fox	Red Fox
Kit Fox	Kit Fox
Gray Fox	Gray Fox
Black Bear	Black Bear
Grizzly Bear	
Ringtail	Ringtail
Raccoon	Raccoon
American Marten	American Marten
Fisher	Fisher
Ermine	Ermine
Long-tailed Weasel	Long-tailed Weasel
Mink	Mink
Wolverine	Wolverine
American Badger	American Badger
Western Spotted Skunk	Western Spotted Skunk
Striped Skunk	Striped Skunk
Northern River Otter	Northern River Otter
Mountain Lion	Mountain Lion
Lynx	Lynx
Bobcat	Bobcat
	Feral Pig
Elk	Elk
Mule Deer	Mule Deer
White-tailed Deer	
Pronghorn Antelope	Pronghorn Antelope
Mountain Goat	
Bighorn Sheep	Bighorn Sheep
Northern (Steller) Sea Lion	Northern (Steller) Sea Lion

Appendix C. Comparison of historic and current species occurrence in the Deschutes subbasin, and suggested additions and deletions (already added or deleted in table.)	
Historic spp	Current spp
Harbor Seal	Harbor Seal
	Snapping Turtle
Painted Turtle	Painted Turtle
Western Pond Turtle	Western Pond Turtle
Northern Alligator Lizard	Northern Alligator Lizard
Southern Alligator Lizard	Southern Alligator Lizard
Mojave Black-collared Lizard	Mojave Black-collared Lizard
Long-nosed Leopard Lizard	Long-nosed Leopard Lizard
Short-horned Lizard	Short-horned Lizard
Desert Horned Lizard	Desert Horned Lizard
Sagebrush Lizard	Sagebrush Lizard
Western Fence Lizard	Western Fence Lizard
Side-blotched Lizard	Side-blotched Lizard
Western Skink	Western Skink
Western Whiptail	Western Whiptail
	Plateau Striped Whiptail
Rubber Boa	Rubber Boa
Racer	Racer
Sharptail Snake	Sharptail Snake
Ringneck Snake	Ringneck Snake
Night Snake	Night Snake
Common Kingsnake	Common Kingsnake
California Mountain Kingsnake	California Mountain Kingsnake
Striped Whipsnake	Striped Whipsnake
Gopher Snake	Gopher Snake
Pacific Coast Aquatic Garter Snake	Pacific Coast Aquatic Garter Snake
Western Terrestrial Garter Snake	Western Terrestrial Garter Snake
Northwestern Garter Snake	Northwestern Garter Snake
Common Garter Snake	Common Garter Snake
Western Rattlesnake	Western Rattlesnake
	Species added from historic: 27
	Species lost from historic: 7

Appendix C. Comparison of historic and current species occurrence in the Deschutes subbasin, and suggested additions and deletions (already added or deleted in table.)	
Historic spp	Current spp
Suggested deletions *:	**Suggested deletions*:**
Bullfrog	Columbia spotted frog
Chukar	Northern leopard frog
Gray partridge	White-tailed deer
Ring-necked pheasant	Grizzly bear
Wild turkey	Sharp-tailed grouse
Northern bobwhite	Mountain goat
Rock dove	
Virginia opossum	T
Eastern cottontail	
Eastern fox squirrel	
Nutria	
Feral pig	
Snapping turtle	
Plateau striped whiptail	
Suggested additions*:	
Oregon spotted frog	**Suggested additions*:**
Gray wolf	Oregon spotted frog

Original tables supplied by IBIS, 2003.

* Csuti, et. al. 2001. Atlas of Oregon Wildlife.

Appendix Table D. Threatened, endangered, and Oregon-listed wildlife species thought to occur currently or historically in the Deschutes Subbasin.				
Common Name	**Scientific Name**	**State Status**		**Federal Status**
Cope's Giant Salamander	*Dicamptodon copei*	**OR**	Unclear Status	

Appendix Table D. Threatened, endangered, and Oregon-listed wildlife species thought to occur currently or historically in the Deschutes Subbasin.				
Common Name	**Scientific Name**	**State Status**		**Federal Status**
Columbia Torrent Salamander	*Rhyacotriton kezeri*	**OR**	Candidate Species	
Southern Torrent Salamander	*Rhyacotriton variegatus*	**OR**	Species listing avoidable	
Cascade Torrent Salamander	*Rhyacotriton cascadae*	**OR**	Species listing avoidable	
Larch Mountain Salamander	*Plethodon larselli*	**OR**	Species listing avoidable	
Del Norte Salamander	*Plethodon elongatus*	**OR**	Species listing avoidable	
Clouded Salamander	*Aneides ferreus*	**OR**	Unclear Status	
Oregon Slender Salamander	*Batrachoseps wrighti*	**OR**	Unclear Status	
Tailed Frog	*Ascaphus truei*	**OR**	Species listing avoidable	
Western Toad	*Bufo boreas*	**OR**	Species listing avoidable	
Red-legged Frog	*Rana aurora*	**OR**	combined status S-V and S-US	
Cascades Frog	*Rana cascadae*	**OR**	Species listing avoidable	
Oregon Spotted Frog	*Rana pretiosa*	**OR**	Candidate Species	Anticipated Candidate
Columbia Spotted Frog	*Rana luteiventris*	**OR**	Unclear Status	Anticipated Candidate
Foothill Yellow-legged Frog	*Rana boylii*	**OR**	Species listing avoidable	
Northern Leopard Frog	*Rana pipiens*	**OR**	Candidate Species	
Horned Grebe	*Podiceps auritus*	**OR**	Peripheral and Naturally Rare	
Red-necked Grebe	*Podiceps grisegena*	**OR**	Candidate Species	
American White Pelican	*Pelecanus erythrorhynchos*	**OR**	Species listing avoidable	
Brown Pelican	*Pelecanus occidentalis*	**OR**	Endangered	Endangered
Least Bittern	*Ixobrychus exilis*	**OR**	Peripheral and Naturally Rare	
Snowy Egret	*Egretta thula*	**OR**	Species listing avoidable	

Appendix Table D. Threatened, endangered, and Oregon-listed wildlife species thought to occur currently or historically in the Deschutes Subbasin.				
Common Name	**Scientific Name**	**State Status**		**Federal Status**
Harlequin Duck	*Histrionicus histrionicus*	**OR**	Unclear Status	
Bufflehead	*Bucephala albeola*	**OR**	Unclear Status	
Barrow's Goldeneye	*Bucephala islandica*	**OR**	Unclear Status	
Bald Eagle	*Haliaeetus leucocephalus*	**OR**	Threatened	Threatened
Northern Goshawk	*Accipiter gentilis*	**OR**	Candidate Species	
Swainson's Hawk	*Buteo swainsoni*	**OR**	Species listing avoidable	
Ferruginous Hawk	*Buteo regalis*	**OR**	Candidate Species	
Peregrine Falcon	*Falco peregrinus*	**OR**	Endangered	
Sage Grouse	*Centrocercus urophasianus*	**OR**	Species listing avoidable	
Mountain Quail	*Oreortyx pictus*	**OR**	Unclear Status	
Yellow Rail	*Coturnicops noveboracensis*	**OR**	Candidate Species	
Sandhill Crane	*Grus canadensis*	**OR**	Species listing avoidable	
Snowy Plover	*Charadrius alexandrinus*	**OR**	Threatened	Threatened
Upland Sandpiper	*Bartramia longicauda*	**OR**	Candidate Species	
Long-billed Curlew	*Numenius americanus*	**OR**	Species listing avoidable	
Franklin's Gull	*Larus pipixcan*	**OR**	Peripheral and Naturally Rare	
Marbled Murrelet	*Brachyramphus marmoratus*	**OR**	Threatened	Threatened
Yellow-billed Cuckoo	*Coccyzus americanus*	**OR**	Candidate Species	Anticipated Candidate
Flammulated Owl	*Otus flammeolus*	**OR**	Candidate Species	
Northern Pygmy-owl	*Glaucidium gnoma*	**OR**	Candidate Species	
Burrowing Owl	*Athene cunicularia*	**OR**	Candidate Species	
Spotted Owl	*Strix occidentalis*	**OR**	Threatened	Threatened
Great Gray Owl	*Strix nebulosa*	**OR**	Species listing avoidable	
Boreal Owl	*Aegolius funereus*	**OR**	Unclear Status	
Common Nighthawk	*Chordeiles minor*	**OR**	Candidate Species	
Black Swift	*Cypseloides niger*	**OR**	Peripheral and Naturally Rare	
Lewis's Woodpecker	*Melanerpes lewis*	**OR**	Candidate Species	

Appendix Table D. Threatened, endangered, and Oregon-listed wildlife species thought to occur currently or historically in the Deschutes Subbasin.				
Common Name	**Scientific Name**	**State Status**		**Federal Status**
Williamson's Sapsucker	*Sphyrapicus thyroideus*	**OR**	Unclear Status	
White-headed Woodpecker	*Picoides albolarvatus*	**OR**	Candidate Species	
Three-toed Woodpecker	*Picoides tridactylus*	**OR**	Candidate Species	
Black-backed Woodpecker	*Picoides arcticus*	**OR**	Candidate Species	
Pileated Woodpecker	*Dryocopus pileatus*	**OR**	Species listing avoidable	
Olive-sided Flycatcher	*Contopus cooperi*	**OR**	Species listing avoidable	
Willow Flycatcher	*Empidonax traillii*	**OR**	combined status S-V and S-US	
Loggerhead Shrike	*Lanius ludovicianus*	**OR**	Species listing avoidable	
Purple Martin	*Progne subis*	**OR**	Candidate Species	
Bank Swallow	*Riparia riparia*	**OR**	Unclear Status	
Pygmy Nuthatch	*Sitta pygmaea*	**OR**	Species listing avoidable	
Western Bluebird	*Sialia mexicana*	**OR**	Species listing avoidable	
Yellow-breasted Chat	*Icteria virens*	**OR**	Candidate Species	
Vesper Sparrow	*Pooecetes gramineus*	**OR**	Candidate Species	
Black-throated Sparrow	*Amphispiza bilineata*	**OR**	Peripheral and Naturally Rare	
Sage Sparrow	*Amphispiza belli*	**OR**	Candidate Species	
Grasshopper Sparrow	*Ammodramus savannarum*	**OR**	combined status S-V and S-PN	
Bobolink	*Dolichonyx oryzivorus*	**OR**	Species listing avoidable	
Tricolored Blackbird	*Agelaius tricolor*	**OR**	Peripheral and Naturally Rare	
Western Meadowlark	*Sturnella neglecta*	**OR**	Candidate Species	
Black Rosy-finch	*Leucosticte atrata*	**OR**	Peripheral and Naturally Rare	
Western Small-footed Myotis	*Myotis ciliolabrum*	**OR**	Unclear Status	
Long-legged Myotis	*Myotis volans*	**OR**	Unclear Status	
Fringed Myotis	*Myotis thysanodes*	**OR**	Species listing	

Appendix Table D. Threatened, endangered, and Oregon-listed wildlife species thought to occur currently or historically in the Deschutes Subbasin.				
Common Name	**Scientific Name**	**State Status**		**Federal Status**
			avoidable	
Long-eared Myotis	*Myotis evotis*	**OR**	Unclear Status	
Silver-haired Bat	*Lasionycteris noctivagans*	**OR**	Unclear Status	
Townsend's Big-eared Bat	*Corynorhinus townsendii*	**OR**	Candidate Species	
Pallid Bat	*Antrozous pallidus*	**OR**	Species listing avoidable	
Pygmy Rabbit	*Brachylagus idahoensis*	**OR**	Species listing avoidable	
White-tailed Jackrabbit	*Lepus townsendii*	**OR**	Unclear Status	
White-tailed Antelope Squirrel	*Ammospermophilus leucurus*	**OR**	Unclear Status	
Washington Ground Squirrel	*Spermophilus washingtoni*	**OR**	Endangered	Anticipated Candidate
Western Gray Squirrel	*Sciurus griseus*	**OR**	Unclear Status	
White-footed Vole	*Phenacomys albipes*	**OR**	Unclear Status	
Gray Wolf	*Canis lupus*	**OR**	Endangered	
Kit Fox	*Vulpes velox*	**OR**	Threatened	
Ringtail	*Bassariscus astutus*	**OR**	Unclear Status	
American Marten	*Martes americana*	**OR**	Species listing avoidable	
Fisher	*Martes pennanti*	**OR**	Candidate Species	
Wolverine	*Gulo gulo*	**OR**	Threatened	
Lynx	*Lynx canadensis*	**OR**		Threatened
Northern (Steller) Sea Lion	*Eumetopias jubatus*	**OR**	Species listing avoidable	Threatened
Painted Turtle	*Chrysemys picta*	**OR**	Candidate Species	
Mojave Black-collared Lizard	*Crotaphytus bicinctores*	**OR**	Species listing avoidable	
Long-nosed Leopard Lizard	*Gambelia wislizenii*	**OR**	Unclear Status	
Sharptail Snake	*Contia tenuis*	**OR**	Species listing avoidable	
Common Kingsnake	*Lampropeltis getula*	**OR**	Species listing avoidable	
California Mountain Kingsnake	*Lampropeltis zonata*	**OR**	Species listing avoidable	
Western Rattlesnake	*Crotalus viridis*	**OR**	Species listing	

Appendix Table D. Threatened, endangered, and Oregon-listed wildlife species thought to occur currently or historically in the Deschutes Subbasin.				
Common Name	**Scientific Name**	**State Status**		**Federal Status**
			avoidable	
Threatened and Endangered Species Status for the Columbia Plateau Ecological Province. Generated by IBIS on 11/12/2003 4:05:53 PM.				
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Appendix E. Wildlife species currently harvested by hunters in the Deschutes subbasin.			
No.	Common Name	Scientific Name	OR
1.	Greater White-fronted Goose	*Anser albifrons*	Game Bird
2.	Snow Goose	*Chen Ccaerulescens*	Game Bird
3.	Ross's Goose	*Chen rossii*	Game Bird
4.	Canada Goose	*Branta canadensis*	Game Bird
5.	Wood Duck	*Aix sponsa*	Game Bird
6.	Gadwall	*Anas strepera*	Game Bird
7.	Eurasian Wigeon	*Anas penelope*	Game Bird
8.	American Wigeon	*Anas americana*	Game Bird
9.	Mallard	*Anas platyrhynchos*	Game Bird
10.	Blue-winged Teal	*Anas discors*	Game Bird
11.	Cinnamon Teal	*Anas cyanoptera*	Game Bird
12.	Northern Shoveler	*Anas clypeata*	Game Bird
13.	Northern Pintail	*Anas acuta*	Game Bird
14.	Green-winged Teal	*Anas crecca*	Game Bird
15.	Canvasback	*Aythya valisineria*	Game Bird
16.	Redhead	*Aythya americana*	Game Bird
17.	Ring-necked Duck	*Aythya collaris*	Game Bird
18.	Greater Scaup	*Aythya marila*	Game Bird
19.	Lesser Scaup	*Aythya affinis*	Game Bird
20.	Harlequin Duck	*Histrionicus histrionicus*	Game Bird
21.	Surf Scoter	*Melanitta perspicillata*	Game Bird
22.	Bufflehead	*Bucephala albeola*	Game Bird
23.	Common Goldeneye	*Bucephala clangula*	Game Bird
24.	Barrow's Goldeneye	*Bucephala islandica*	Game Bird
25.	Hooded Merganser	*Lophodytes cucullatus*	Game Bird
26.	Common Merganser	*Mergus merganser*	Game Bird

Appendix E. Wildlife species currently harvested by hunters in the Deschutes subbasin.			
No.	Common Name	Scientific Name	OR
27.	Red-breasted Merganser	*Mergus serrator*	Game Bird
28.	Ruddy Duck	*Oxyura jamaicensis*	Game Bird
29.	Chukar	*Alectoris chukar*	Game Bird
30.	Gray Partridge	*Perdix perdix*	Game Bird
31.	Ring-necked Pheasant	*Phasianus colchicus*	Game Bird
32.	Ruffed Grouse	*Bonasa umbellus*	Game Bird
33.	Sage Grouse	*Centrocercus urophasianus*	Game Bird
34.	Spruce Grouse	*Falcipennis canadensis*	Game Bird
35.	Blue Grouse	*Dendragapus obscurus*	Game Bird
36.	Wild Turkey	*Meleagris gallopavo*	Game Bird
37.	Mountain Quail	*Oreortyx pictus*	Game Bird
38.	California Quail	*Callipepla californica*	Game Bird
39.	Northern Bobwhite	*Colinus virginianus*	Game Bird
40.	American Coot	*Fulica americana*	Game Bird
41.	Common Snipe	*Gallinago gallinago*	Game Bird
42.	Band-tailed Pigeon	*Columba fasciata*	Game Bird
43.	Mourning Dove	*Zenaida macroura*	Game Bird
44.	American Crow	*Corvus brachyrhynchos*	Game Bird
45.	American Beaver	*Castor canadensis*	Furbearer
46.	Muskrat	*Ondatra zibethicus*	Furbearer
47.	Nutria	*Myocastor coypus*	Furbearer
48.	Coyote	*Canis latrans*	Hunted
49.	Red Fox	*Vulpes vulpes*	Furbearer
50.	Gray Fox	*Urocyon cinereoargenteus*	Furbearer
51.	Raccoon	*Procyon lotor*	Furbearer
52.	American Marten	*Martes americana*	Furbearer
53.	Mink	*Mustela vison*	Furbearer
54.	Ermine	*Mustela erminea*	Furbearer
55.	Long-tailed Weasel	*Mustela frenata*	Furbearer
56.	American Badger	*Taxidea taxus*	Furbearer
57.	Western Spotted Skunk	*Spilogale gracilis*	Furbearer
58.	Striped Skunk	*Mephitis mephitis*	Furbearer
59.	Northern River Otter	*Lutra canadensis*	Furbearer
60.	Bobcat	*Lynx rufus*	Furbearer
61.	Western Gray Squirrel	*Sciurus griseus*	Game Mammal
62.	Feral Pig	*Sus scrofa*	Hunted
63.	Black Bear	*Ursus americanus*	Game Mammal
64.	Mountain Lion	*Puma concolor*	Game Mammal
65.	Rocky Mountain Elk	*Cervus elaphus nelsoni*	Game Mammal
66.	Black-tailed Deer	*O. hemionus columbianus*	Game Mammal

Appendix E. Wildlife species currently harvested by hunters in the Deschutes subbasin.			
No.	Common Name	Scientific Name	OR
67.	Mule Deer	*O. hemionus*	Game Mammal
68.	Pronghorn Antelope	*Antilocapra americana*	Game Mammal

Sources for data:
1. Game Species Listing for the Columbia Plateau Ecological Province. Generated by IBIS on 2/9/2004 5:25:42 PM. Copyright 1998-2003. Please visit the IBIS web site (www.nwhi.org/ibis) for Copyright and Terms of Use limitations. This data is continually updated and therefore subject to change.
2. Oregon Dept. of Fish and Wildlife. Big Game, Game Bird, and Furbearer hunting Rgulations, and Trapping Regulations. 2003.

Appendix F. HEP wildlife species thought to occur currently in the Deschutes subbasin.			
No.	Common Name	Scientific Name	Comments
1.	Spotted sandpiper	*Actitis macularia*	HEP Species used in the loss assessments for the lower four Columbia River Dam with existing models.
2.	Lesser scaup	*Aytha affinis*	HEP Species used in the loss assessments for the lower four Columbia River Dam with existing models.
3.	Canada goose	*Branta Canadensis*	HEP Species used in the loss assessments for the lower four Columbia River Dam with existing models.
4.	Great blue heron	*Ardea herodias*	HEP Species used in the loss assessments for the lower four Columbia River Dam with existing models.
5.	Yellow warbler	*Dendroica petechia*	HEP Species used in the loss assessments for the lower four Columbia River Dam with existing models.
6.	Black-capped chickadee	*Parus atricopillus*	HEP Species used in the loss assessments for the lower four Columbia River Dam with existing models.

Appendix F. HEP wildlife species thought to occur currently in the Deschutes subbasin.			
No.	Common Name	Scientific Name	Comments
7.	Mink	*Mustella vison*	HEP Species used in the loss assessments for the lower four Columbia River Dam with existing models.
8.	Western meadow lark	*Sturnella neglecta*	HEP Species used in the loss assessments for the lower four Columbia River Dam with existing models.
9.	California quail	*Lophortyx californicus*	HEP Species used in the loss assessments for the lower four Columbia River Dam with existing models.
10.	Mallard	*Anas platyrhynchos*	HEP Species used in the loss assessments for the lower four Columbia River Dam with existing models.
11.	Downy woodpecker	*Picoides puescens*	HEP Species used in the loss assessments for the lower four Columbia River Dam with existing models.
12.	Greater Sage Grouse	*Centrocercus urophasianus*	Use at Grand Coulie/Chief Joe
13.	Ruffed grouse	*Bonasa umbellus*	Use at Grand Coulie/Chief Joe
14.	Mourning Dove	*Zenaida macroura*	Use at Grand Coulie/Chief Joe
15.	Bald eagle	*Haliaeetus leucocephalus*	Use at Grand Coulie/Chief Joe
16.	Long-eared owl	*Asio otus*	Use at Grand Coulie/Chief Joe
17.	Northern Flicker	*Colaptes auratus*	Use at Grand Coulie/Chief Joe
18.	Beaver	*Castor canadensis*	Use at Grand Coulie/Chief Joe
19.	Ring-necked pheasant	*Phasianus colchicus*	Use at Grand Coulie/Chief Joe
20.	Lewis woodpecker	*Melanerpes lewis*	Use at Grand Coulie/Chief Joe
21.	Bobcat	*Lynx rufus*	Use at Grand Coulie/Chief Joe
22.	River Otter	*Lutra Canadensis*	Use for Minidoka Dam
23.	Mule deer	*Dendragapus obscurus*	Use by CTUIR for McNary/John Day and at other selected sites.
24.	Blue grouse	*Dendragapus obscurus*	Use by CTUIR for McNary/John Day and at other selected sites.

Basic table supplied by IBIS, 2003.

Appendix G. Partners in Flight listed species thought to occur in the Deschutes Subbasin.

No.	Common Name	PIF 1998-1999 Continental	PIF Ranking by Super Region Draft 2002	OR PIF Priority & Focal Species
1.	Ross's Goose	Yes		
2.	Trumpeter Swan	Yes		
3.	Northern Harrier			Yes
4.	Swainson's Hawk		MO (Intermountain West, Prairies)	Yes
5.	Ferruginous Hawk			Yes
6.	American Kestrel			Yes
7.	Sage Grouse		MA (Intermountain West, Prairies)	
8.	Blue Grouse		MA (Pacific, Intermountain West)	
9.	Sharp-tailed Grouse		MO (Prairies)	Yes
10	Mountain Quail		MO (Pacific)	
11	Yellow Rail	Yes		
12	Snowy Plover	Yes		
13	Willet	Yes		
14	Long-billed Curlew	Yes		
15	Black Turnstone	Yes		
16	Red Knot	Yes		
17	Stilt Sandpiper	Yes		
18	Short-billed Dowitcher	Yes		
19	Franklin's Gull	Yes		
20	Heermann's Gull	Yes		
21	Band-tailed Pigeon	Yes	MA (Pacific)	Yes
22	Yellow-billed Cuckoo			Yes
23	Flammulated Owl		MO (Pacific, Intermountain West, Southwest)	Yes
24	Northern Pygmy-owl		PR (Pacific)	
25	Burrowing Owl			Yes
26	Spotted Owl		IM (Pacific, Intermountain West, Southwest)	
27	Great Gray Owl			Yes
28	Short-eared Owl	Yes	MA (Arctic, Northern Forests, Intermountain West, Prairies)	Yes
29	Common Poorwill			Yes
30	Black Swift	Yes	IM (Pacific, Intermountain West)	Yes

Appendix G. Partners in Flight listed species thought to occur in the Deschutes Subbasin.				
No.	Common Name	PIF 1998-1999 Continental	PIF Ranking by Super Region Draft 2002	OR PIF Priority & Focal Species
31	Vaux's Swift			Yes
32	White-throated Swift		MA (Intermountain West, Southwest)	Yes
33	Calliope Hummingbird		MO (Intermountain West)	Yes
34	Rufous Hummingbird	Yes	MA (Pacific, Intermountain West)	Yes
35	Allen's Hummingbird	Yes	MO (Pacific)	
36	Lewis's Woodpecker	Yes	MO (Intermountain West, Prairies)	Yes
37	Acorn Woodpecker			Yes
38	Williamson's Sapsucker		MO (Intermountain West)	Yes
39	Red-naped Sapsucker		MO (Intermountain West)	Yes
40	Red-breasted Sapsucker		MO (Pacific)	Yes
41	Downy Woodpecker			Yes
42	White-headed Woodpecker	Yes	PR (Pacific, Intermountain West)	Yes
43	Black-backed Woodpecker		PR (Northern Forests)	Yes
44	Pileated Woodpecker			Yes
45	Olive-sided Flycatcher		MA (Pacific, Northern Forests, Intermountain West)	Yes
46	Western Wood-pewee			Yes
47	Willow Flycatcher		MA (Prairies, East)	Yes
48	Hammond's Flycatcher			Yes
49	Gray Flycatcher		PR (Intermountain West)	Yes
50	Dusky Flycatcher		MA (Intermountain West)	Yes
51	Pacific-slope Flycatcher		PR (Pacific)	Yes
52	Ash-throated Flycatcher			Yes
53	Loggerhead Shrike			Yes
54	Hutton's Vireo			Yes
55	Warbling Vireo			Yes
56	Red-eyed Vireo			Yes
57	Pinyon Jay		MA (Intermountain West)	
58	Clark's Nutcracker		PR (Intermountain West)	Yes
59	Horned Lark			Yes
60	Purple Martin			Yes
61	Bank Swallow			Yes
62	Chestnut-backed Chickadee		PR (Pacific)	
63	Oak Titmouse	Yes	MA (Pacific)	Yes
64	Bushtit			Yes
65	White-breasted Nuthatch			Yes

Appendix G. Partners in Flight listed species thought to occur in the Deschutes Subbasin.

No.	Common Name	PIF 1998-1999 Continental	PIF Ranking by Super Region Draft 2002	OR PIF Priority & Focal Species
66	House Wren			Yes
67	Winter Wren			Yes
68	American Dipper			Yes
69	Blue-gray Gnatcatcher			Yes
70	Western Bluebird			Yes
71	Mountain Bluebird		PR (Intermountain West)	
72	Townsend's Solitaire			Yes
73	Veery			Yes
74	Swainson's Thrush			Yes
75	Hermit Thrush			Yes
76	Varied Thrush			Yes
77	Wrentit		MA (Pacific)	Yes
78	Sage Thrasher		PR (Intermountain West)	Yes
79	American Pipit		PR (Arctic)	Yes
80	Orange-crowned Warbler			Yes
81	Nashville Warbler		PR (Northern Forests)	Yes
82	Yellow Warbler			Yes
83	Yellow-rumped Warbler			Yes
84	Black-throated Gray Warbler		MO (Pacific)	Yes
85	Townsend's Warbler			Yes
86	Hermit Warbler	Yes	MO (Pacific)	Yes
87	Macgillivray's Warbler			Yes
88	Wilson's Warbler			Yes
89	Yellow-breasted Chat			Yes
90	Western Tanager			Yes
91	Green-tailed Towhee		MO (Intermountain West)	Yes
92	Chipping Sparrow			Yes
93	Brewer's Sparrow	Yes	MA (Intermountain West)	Yes
94	Vesper Sparrow			Yes
95	Lark Sparrow			Yes
96	Black-throated Sparrow			Yes
97	Sage Sparrow	Yes	PR (Intermountain West)	Yes
98	Grasshopper Sparrow		MA (Prairies)	Yes
99	Fox Sparrow			Yes
10	Lincoln's Sparrow		PR (Northern Forests)	Yes
10	Harris's Sparrow	Yes	MA (Arctic, Northern Forests)	
10	Black-headed Grosbeak			Yes
10	Bobolink	Yes		
10	Tricolored Blackbird		MO (Pacific)	
10	Western Meadowlark			Yes

Appendix G. Partners in Flight listed species thought to occur in the Deschutes Subbasin.				
No.	Common Name	PIF 1998-1999 Continental	PIF Ranking by Super Region Draft 2002	OR PIF Priority & Focal Species
1(	Bullock's Oriole			Yes
1(	Black Rosy-finch		IM (Intermountain West)	
1(	Purple Finch			Yes
1(	Cassin's Finch		MA (Intermountain West)	
1:	Red Crossbill			Yes
1:	Lesser Goldfinch			Yes

Basic table supplied by IBIS, 2003.

Appendix H. Critical functional link species thought to occur in the Deschutes subbasin.			
KEF* Code	KEF Description	Species Common Name	Wildlife-Habitat Type
1_1_1_13	Trophic relationships:	American Beaver	Open Water - Lakes, Rivers, and Streams
	Heterotrophic consumer:		
	Primary consumer (herbivore):		
	Bark/cambium/bole feeder		
1_1_1_13	Trophic relationships:	Black Bear	Alpine Grasslands and Shrublands
	Heterotrophic consumer:		Interior Grasslands
	Primary consumer (herbivore):		Dwarf Shrub-steppe
	Bark/cambium/bole feeder		
1_1_1_7	Trophic relationships:	Northern Pocket Gopher	Desert Playa and Salt Scrub Shrublands
	Heterotrophic consumer:		
	Primary consumer (herbivore):		
	Root feeders		
1_1_1_8	Trophic relationships:	Black-chinned Hummingbird	Shrub-steppe
	Heterotrophic consumer:		Dwarf Shrub-steppe
	Primary consumer (herbivore):		Desert Playa and Salt Scrub Shrublands
	Nectivore (nectar feeder)		
1_1_2_1_3	Trophic relationships:	Long-toed Salamander	Alpine Grasslands and Shrublands
	Heterotrophic consumer		Interior Canyon Shrublands
	Secondary consumer		
	Invertebrate eater		
	Freshwater or marine zooplankton		
1_1_2_1_3	Trophic relationships:	Rough-skinned	Ceanothus-Manzanita

Appendix H. Critical functional link species thought to occur in the Deschutes subbasin.			
KEF* Code	KEF Description	Species Common Name	Wildlife-Habitat Type
	Heterotrophic consumer	Newt	Shrublands
	Secondary consumer		
	Invertebrate eater		
	Freshwater or marine zooplankton		
	Heterotrophic consumer:		Desert Playa and Salt Scrub Shrublands
	Cannibalistic		
1_1_6	Trophic relationships:	American Pika	Alpine Grasslands and Shrublands
	Heterotrophic consumer:		
	Coprophagous (feeds on fecal material)		
1_1_6	Trophic relationships:	Brush Rabbit	Ceanothus-Manzanita Shrublands
	Heterotrophic consumer:		
	Coprophagous (feeds on fecal material)		
1_1_6	Trophic relationships:	Nuttall's (Mountain) Cottontail	Western Juniper and Mountain Mahogany Woodlands
	Heterotrophic consumer:		
	Coprophagous (feeds on fecal material)		
1_1_6	Trophic relationships:	Snowshoe Hare	Lodgepole Pine Forest and Woodlands
	Heterotrophic consumer:		Ponderosa Pine & Interior White Oak Forest and Woodlands
	Coprophagous (feeds on fecal material)		Montane Coniferous Wetlands
1_1_7	Trophic relationships:	Mew Gull	Open Water - Lakes, Rivers, and Streams
	Heterotrophic consumer:		
	Feeds on human garbage/refuse		
1_1_7_1	Trophic relationships:	Mew Gull	Open Water - Lakes, Rivers, and Streams
	Heterotrophic consumer:		
	Feeds on human garbage/refuse:		
	Aquatic (e.g. offal and bycatch of fishing boats)		
3_3	Organismal relationships:	Rufous Hummingbird	Alpine Grasslands and Shrublands
	Pollination vector		
3_4_1	Organismal relationships:	Deer Mouse	Ceanothus-Manzanita Shrublands
	Transportation of viable seeds, spores, plants or animals:		
	Disperses fungi		
3_4_4	Organismal relationships:	Golden-mantled Ground Squirrel	Lodgepole Pine Forest and Woodlands

Appendix H. Critical functional link species thought to occur in the Deschutes subbasin.			
KEF* Code	KEF Description	Species Common Name	Wildlife-Habitat Type
	Transportation of viable seeds, spores, plants or animals:		Ceanothus-Manzanita Shrublands
	Disperses insects and other invertebrates		Interior Canyon Shrublands
3_4_6	Organismal relationships:	Golden-mantled Ground Squirrel	Ceanothus-Manzanita Shrublands
	Transportation of viable seeds, spores, plants or animals:		Western Juniper and Mountain Mahogany Woodlands
	Disperses vascular plants		Interior Canyon Shrublands
3_5	Organismal relationships:	Great Blue Heron	Open Water - Lakes, Rivers, and Streams
	Creates feeding, roosting, denning, or nesting opportunities for other organisms		
3_5	Organismal relationships:	Grizzly Bear	Interior Grasslands
	Creates feeding, roosting, denning, or nesting opportunities for other organisms		
3_5	Organismal relationships:	Mountain Lion	Ceanothus-Manzanita Shrublands
	Creates feeding, roosting, denning, or nesting opportunities for other organisms		
3_5_1	Organismal relationships:	Great Blue Heron	Open Water - Lakes, Rivers, and Streams
	Creates feeding, roosting, denning, or nesting opportunities for other organisms:		
	Creates feeding opportunities (other than direct prey relations)		
	Creates feeding, roosting, denning, or nesting opportunities for other organisms:		
	Creates feeding opportunities (other than direct prey relations)		
3_5_1	Organismal relationships:	Mountain Lion	Ceanothus-Manzanita Shrublands
	Creates feeding, roosting, denning, or nesting opportunities for other organisms:		
	Creates feeding opportunities (other than direct prey relations)		
3_5_1_1	Organismal relationships:	Williamson's Sapsucker	Western Juniper and Mountain Mahogany Woodlands
	Creates feeding, roosting, denning, or nesting opportunities for other organisms:		Interior Canyon Shrublands

Appendix H. Critical functional link species thought to occur in the Deschutes subbasin.			
KEF* Code	KEF Description	Species Common Name	Wildlife-Habitat Type
	Creates feeding opportunities:		
	Creates sapwells in trees		
3_5_1_1	Organismal relationships:	Red-breasted Sapsucker	Mesic Lowlands Conifer-Hardwood Forest
	Creates feeding, roosting, denning, or nesting opportunities for other organisms:		Southwest Oregon Mixed Conifer-Hardwood Forest
	Creates feeding opportunities:		
	Creates sapwells in trees		
3_5_2	Organismal relationships:	Great Blue Heron	Mesic Lowlands Conifer-Hardwood Forest
	Creates feeding, roosting, denning, or nesting opportunities for other organisms:		Open Water - Lakes, Rivers, and Streams
	Creates roosting, denning, or nesting opportunities		Herbaceous Wetlands
			Interior Riparian-Wetlands
3_5_2	Organismal relationships:	Red Squirrel	Montane Mixed Conifer Forest
	Creates feeding, roosting, denning, or nesting opportunities for other organisms:		Interior Mixed Conifer Forest
	Creates roosting, denning, or nesting opportunities		Lodgepole Pine Forest and Woodlands
			Ponderosa Pine & Interior White Oak Forest and Woodlands
3_6_2	Organismal relationships:	Dusky-footed Woodrat	Ceanothus-Manzanita Shrublands
	Primary creation of structures (possibly used by other organisms):		
	Ground structures		
3_6_2	Organismal relationships:	Bushy-tailed Woodrat	Montane Coniferous Wetlands
	Primary creation of structures (possibly used by other organisms):		Interior Riparian-Wetlands
	Ground structures		
3_6_3	Organismal relationships:	American Beaver	Mesic Lowlands Conifer-Hardwood Forest
	Primary creation of structures (possibly used by other organisms):		Southwest Oregon Mixed Conifer-Hardwood Forest
	Aquatic structures		Montane Mixed Conifer Forest
			Interior Mixed Conifer Forest
			Lodgepole Pine Forest and Woodlands

Appendix H. Critical functional link species thought to occur in the Deschutes subbasin.			
KEF* Code	KEF Description	Species Common Name	Wildlife-Habitat Type
			Ponderosa Pine & Interior White Oak Forest and Woodlands
			Subalpine Parkland
			Western Juniper and Mountain Mahogany Woodlands
			Montane Coniferous Wetlands
3_7_1	Organismal relationships:	Black Tern	Open Water - Lakes, Rivers, and Streams
	User of structures created by other species:		
	Aerial structures		
3_7_1	Organismal relationships:	Great Horned Owl	Ceanothus-Manzanita Shrublands
	User of structures created by other species:		Desert Playa and Salt Scrub Shrublands
	Aerial structures		
3_7_2	Organismal relationships:	Deer Mouse	Alpine Grasslands and Shrublands
	User of structures created by other species:		Desert Playa and Salt Scrub Shrublands
	Ground structures		
3_7_3	Organismal relationships:	Fisher	Subalpine Parkland
	User of structures created by other species:		
	Aquatic structures		
3_7_3	Organismal relationships:	Mink	Lodgepole Pine Forest and Woodlands
	User of structures created by other species:		Ceanothus-Manzanita Shrublands
	Aquatic structures		Western Juniper and Mountain Mahogany Woodlands
			Interior Canyon Shrublands
			Interior Grasslands
			Shrub-steppe
			Desert Playa and Salt Scrub Shrublands
3_8_1	Organismal relationships:	Redhead	Open Water - Lakes, Rivers, and Streams
	Nest parasite:		
	Interspecies parasite		
3_8_1	Organismal relationships:	Brown-headed Cowbird	Mesic Lowlands Conifer-Hardwood Forest

Appendix H. Critical functional link species thought to occur in the Deschutes subbasin.			
KEF* Code	KEF Description	Species Common Name	Wildlife-Habitat Type
	Nest parasite:		Southwest Oregon Mixed Conifer-Hardwood Forest
	Interspecies parasite		Montane Mixed Conifer Forest
			Interior Mixed Conifer Forest
			Lodgepole Pine Forest and Woodlands
			Ponderosa Pine & Interior White Oak Forest and Woodlands
			Subalpine Parkland
			Ceanothus-Manzanita Shrublands
			Western Juniper and Mountain Mahogany Woodlands
			Interior Canyon Shrublands
			Interior Grasslands
			Shrub-steppe
			Dwarf Shrub-steppe
			Desert Playa and Salt Scrub Shrublands
			Montane Coniferous Wetlands
3_8_2	Organismal relationships:	Greater Scaup	Open Water - Lakes, Rivers, and Streams
	Nest parasite:		
	Common interspecific host		
3_9	Organismal relationships:	Black Bear	Interior Grasslands
	Primary cavity excavator in snags or live trees		Dwarf Shrub-steppe
			Herbaceous Wetlands
4_2	Carrier, transmitter, or reservoir of vertebrate diseases:	Double-crested Cormorant	Open Water - Lakes, Rivers, and Streams
	Diseases that affect domestic animals		Herbaceous Wetlands
			Interior Riparian-Wetlands
4_3	Carrier, transmitter, or reservoir of vertebrate diseases:	Common Porcupine	Ceanothus-Manzanita Shrublands
	Diseases that affect other wildlife species		Montane Coniferous Wetlands
6_2	Wood structure relationships (either living or dead wood):	Black Bear	Alpine Grasslands and Shrublands
	Physically fragments standing wood		Dwarf Shrub-steppe

Appendix H. Critical functional link species thought to occur in the Deschutes subbasin.			
KEF* Code	KEF Description	Species Common Name	Wildlife-Habitat Type
			Herbaceous Wetlands
7_1	Water relationships:	American Beaver	Mesic Lowlands Conifer-Hardwood Forest
	Impounds water by creating diversions or dams		Southwest Oregon Mixed Conifer-Hardwood Forest
			Montane Mixed Conifer Forest
			Interior Mixed Conifer Forest
			Lodgepole Pine Forest and Woodlands
			Ponderosa Pine & Interior White Oak Forest and Woodlands
			Subalpine Parkland
			Western Juniper and Mountain Mahogany Woodlands
			Open Water - Lakes, Rivers, and Streams
			Herbaceous Wetlands
			Montane Coniferous Wetlands
			Interior Riparian-Wetlands
7_2	Water relationships:	American Beaver	Southwest Oregon Mixed Conifer-Hardwood Forest
	Creates ponds or wetlands through wallowing		Open Water - Lakes, Rivers, and Streams
7_2	Water relationships:	Rocky Mountain Elk	Alpine Grasslands and Shrublands
	Creates ponds or wetlands through wallowing		Interior Canyon Shrublands
			Interior Grasslands
			Shrub-steppe
			Dwarf Shrub-steppe
8_1	Vegetation structure and composition relationships:	Black Bear	Alpine Grasslands and Shrublands
	Creates standing dead trees (snags)		Interior Grasslands
			Dwarf Shrub-steppe
	Herbivory on trees or shrubs that may alter vegetation structure and composition (browsers)		
8_3	Vegetation structure and composition relationships:	Canada Goose	Open Water - Lakes, Rivers, and Streams

Appendix H. Critical functional link species thought to occur in the Deschutes subbasin.			
KEF* Code	KEF Description	Species Common Name	Wildlife-Habitat Type
	Herbivory on grasses or forbs that may alter vegetation structure and composition (grazers)		
8_3	Vegetation structure and composition relationships:	Rocky Mountain Elk	Mesic Lowlands Conifer-Hardwood Forest
	Herbivory on grasses or forbs that may alter vegetation structure and composition (grazers)		

Table supplied by NHI, 2004.
*Key Ecological Function

Appendix table I. Changes in acreages of wildlife habitats thought to occur historically (1860) and currently (1999) in Deschutes Subbasin Assessment Units.				
ASSESSMENT UNIT/HABITAT ID AND DESCRIPTION	HIST ACRES	CURR ACRES	% CHANGE	ACRES CHANGE
CASCADE HIGHLANDS				
15. Eastside (interior) grasslands	1963.85	0.00	-100%	-1963.85
25. Eastside (interior) riparian wetlands	247.02	0.00	-100%	-247.02
13. Western juniper and mountain mahogany woodlands	494.03	0.00	-100%	-494.03
1. Mesic lowlands conifer-hardwood forest	11855.62	0.00	-100%	-11855.62
7. Ponderosa pine forest and woodlands	92226.92	18100.19	-80%	-74126.73
6. Lodgepole pine forest and woodlands	31870.05	6370.06	-80%	-25499.99
21. Open water - lakes, rivers, streams	27690.06	26757.11	-3%	-932.95
5. Eastside (interior) mixed conifer forest	25865.13	31984.14	24%	6119.01
10. Alpine grassland and shrublands	4136.47	5804.31	40%	1667.84
4. Montane mixed conifer forest	96883.45	192829.77	99%	95946.32
9. Subalpine parkland	2809.62	10252.80	265%	7443.18
22. Herbaceous wetlands	0.00	2947.99	#DIV/0!	2947.99
24. Montane coniferous wetlands	0.00	995.97	#DIV/0!	995.97
TOTAL ACRES CASCADE HIGHLANDS AU	296042.22	296042.34		
LOWER EASTSIDE DESCHUTES				
6. Lodgepole pine forest and woodlands	3353.23	0.00	-100%	-3353.23
15. Eastside (interior) grasslands	371137.92	150.98	-100%	-370986.94
25. Eastside (interior) riparian wetlands	401.64	41.84	-90%	-359.80
7. Ponderosa pine forest and woodlands	67896.20	47702.59	-30%	-20193.61
21. Open water - lakes, rivers, streams	1162.29	924.79	-20%	-237.50
16. Shrub-steppe	305061.13	429084.68	41%	124023.55
13. Western juniper and mountain mahogany woodlands	41164.60	177853.70	332%	136689.10

Appendix table I. Changes in acreages of wildlife habitats thought to occur historically (1860) and currently (1999) in Deschutes Subbasin Assessment Units.				
ASSESSMENT UNIT/HABITAT ID AND DESCRIPTION	HIST ACRES	CURR ACRES	% CHANGE	ACRES CHANGE
5. Eastside (interior) mixed conifer forest	1481.98	26941.40	1718%	25459.42
19. Agriculture, pasture and mixed environs	0.00	71369.50	#DIV/0!	71369.50
14. Eastside (interior) canyon shrublands	0.00	34382.22	#DIV/0!	34382.22
22. Herbaceous wetlands	0.00	1081.51	#DIV/0!	1081.51
20. Urban and mixed environs	0.00	2126.02	#DIV/0!	2126.02
TOTAL ACRES LOWER EASTSIDE DESCHUTES ASSESSMENT UNIT	791658.99	791659.23		
LOWER CROOKED				
9. Subalpine parkland	1663.25	0.00	-100%	-1663.25
8. Upland Aspen forest	740.99	0.00	-100%	-740.99
15. Eastside (interior) grasslands	34592.84	125.97	-100%	-34466.87
6. Lodgepole pine forest and woodlands	84160.50	9019.54	-89%	-75140.96
13. Western juniper and mountain mahogany woodlands	388845.39	346629.64	-11%	-42215.75
7. Ponderosa pine forest and woodlands	124663.95	113520.54	-9%	-11143.41
16. Shrub-steppe	464796.99	428886.05	-8%	-35910.94
21. Open water - lakes, rivers, streams	1706.46	2609.15	53%	902.69
5. Eastside (interior) mixed conifer forest	15140.22	29950.91	98%	14810.69
22. Herbaceous wetlands	0.02	2019.94	10099600%	2019.92
19. Agriculture, pasture and mixed environs	0.00	94469.38	#DIV/0!	94469.38
18. Desert playa and salt scrub shrublands	0.00	57.58	#DIV/0!	57.58
17. Dwarf Shrub-steppe	0.00	85752.72	#DIV/0!	85752.72
25. Eastside (interior) riparian wetlands	0.00	774.08	#DIV/0!	774.08
4. Montane mixed conifer forest	0.00	87.38	#DIV/0!	87.38
20. Urban and mixed environs	0.00	2480.93	#DIV/0!	2480.93
TOTAL ACRES LOWER CROOKED AU	1116310.61	1116383.81		
LOWER WESTSIDE DESCHUTES				
18. Desert playa and salt scrub shrublands	1001.60	0.00	-100%	-1001.60
15. Eastside (interior) grasslands	99279.39	0.00	-100%	-99279.39
22. Herbaceous wetlands	11808.24	237.18	-98%	-11571.06
25. Eastside (interior) riparian wetlands	9244.58	499.13	-95%	-8745.45
1. Mesic lowlands conifer-hardwood forest	4831.69	334.12	-93%	-4497.57
10. Alpine grassland and shrublands	402.15	62.66	-84%	-339.49
6. Lodgepole pine forest and woodlands	6360.54	1700.99	-73%	-4659.55
7. Ponderosa pine forest and woodlands	227418.98	142177.79	-37%	-85241.19
16. Shrub-steppe	344183.95	370939.00	8%	26755.05
13. Western juniper and mountain mahogany woodlands	42244.98	53109.19	26%	10864.21
5. Eastside (interior) mixed conifer forest	94472.99	141490.65	50%	47017.66

Appendix table I. Changes in acreages of wildlife habitats thought to occur historically (1860) and currently (1999) in Deschutes Subbasin Assessment Units.				
ASSESSMENT UNIT/HABITAT ID AND DESCRIPTION	HIST ACRES	CURR ACRES	% CHANGE	ACRES CHANGE
9. Subalpine parkland	963.51	1478.58	53%	515.07
4. Montane mixed conifer forest	21202.70	44340.97	109%	23138.27
21. Open water - lakes, rivers, streams	1017.15	5845.91	475%	4828.76
19. Agriculture, pasture and mixed environs	0.00	52138.81	#DIV/0!	52138.81
14. Eastside (interior) canyon shrublands	0.00	47616.57	#DIV/0!	47616.57
24. Montane coniferous wetlands	0.00	1776.91	#DIV/0!	1776.91
3. Southwest Oregon mixed conifer-hardwood forest	0.00	40.45	#DIV/0!	40.45
20. Urban and mixed environs	0.00	730.23	#DIV/0!	730.23
TOTAL ACRES LOWER WESTSIDE DESCHUTES AU	864432	864519.14		
MIDDLE DESCHUTES				
15. Eastside (interior) grasslands	15686.87	0.00	-100%	-15686.87
25. Eastside (interior) riparian wetlands	1222.44	3.51	-100%	-1218.93
1. Mesic lowlands conifer-hardwood forest	16391.91	819.58	-95%	-15572.33
21. Open water - lakes, rivers, streams	11840.95	4922.30	-58%	-6918.65
10. Alpine grassland and shrublands	5525.30	2578.28	-53%	-2947.02
6. Lodgepole pine forest and woodlands	22910.88	11836.64	-48%	-11074.24
7. Ponderosa pine forest and woodlands	307650.56	162117.70	-47%	-145532.86
22. Herbaceous wetlands	1481.97	1575.58	6%	93.61
16. Shrub-steppe	30569.86	36036.10	18%	5466.24
9. Subalpine parkland	14129.77	19684.16	39%	5554.39
13. Western juniper and mountain mahogany woodlands	37417.47	67250.01	80%	29832.54
5. Eastside (interior) mixed conifer forest	53226.54	106881.34	101%	53654.80
4. Montane mixed conifer forest	18235.08	112138.08	515%	93903.00
19. Agriculture, pasture and mixed environs	0.00	9066.93	#DIV/0!	9066.93
12. Ceanothus-manzanita shrublands	0.00	74.41	#DIV/0!	74.41
24. Montane coniferous wetlands	0.00	717.69	#DIV/0!	717.69
20. Urban and mixed environs	0.00	587.53	#DIV/0!	587.53
TOTAL ACRES MIDDLE DESCHUTES AU	536289.60	536289.84		
UPPER CROOKED				
6. Lodgepole pine forest and woodlands	17304.74	0.00	-100%	-17304.74
15. Eastside (interior) grasslands	60817.21	4287.48	-93%	-56529.73
16. Shrub-steppe	1017733.63	635409.07	-38%	-382324.56
7. Ponderosa pine forest and woodlands	453939.94	295382.72	-35%	-158557.22
25. Eastside (interior) riparian wetlands	8150.78	5591.18	-31%	-2559.60

Appendix table I. Changes in acreages of wildlife habitats thought to occur historically (1860) and currently (1999) in Deschutes Subbasin Assessment Units.				
ASSESSMENT UNIT/HABITAT ID AND DESCRIPTION	HIST ACRES	CURR ACRES	% CHANGE	ACRES CHANGE
21. Open water - lakes, rivers, streams	5433.87	7343.16	35%	1909.29
13. Western juniper and mountain mahogany woodlands	179291.95	580551.59	224%	401259.64
5. Eastside (interior) mixed conifer forest	17388.46	128495.80	639%	111107.34
17. Dwarf Shrub-steppe	5681.08	42025.01	640%	36343.93
18. Desert playa and salt scrub shrublands	247.00	3166.75	1182%	2919.75
19. Agriculture, pasture and mixed environs	0.00	35773.18	#DIV/0!	35773.18
22. Herbaceous wetlands	0.00	25569.25	#DIV/0!	25569.25
4. Montane mixed conifer forest	0.00	2992.49	#DIV/0!	2992.49
TOTAL ACRES UPPER CROOKED AU	1765988.66	1766587.68		
UPPER DESCHUTES				
15.Eastside (interior) grasslands	36924.00	0.00	-100%	-36924.00
25. Eastside (interior) riparian wetlands	1976.33	309.39	-84%	-1666.94
21. Open water - lakes, rivers, streams	27205.35	8174.10	-70%	-19031.25
16. Shrub-steppe	51541.87	22183.95	-57%	-29357.92
6. Lodgepole pine forest and woodlands	359368.05	180282.48	-50%	-179085.57
7. Ponderosa pine forest and woodlands	479624.27	488853.53	2%	9229.26
9. Subalpine parkland	5531.42	6124.96	11%	593.54
13. Western juniper and mountain mahogany woodlands	100381.46	119662.78	19%	19281.32
5. Eastside (interior) mixed conifer forest	70568.06	124245.39	76%	53677.33
4. Montane mixed conifer forest	52867.35	144269.67	173%	91402.32
10. Alpine grassland and shrublands	1879.77	6022.71	220%	4142.94
19. Agriculture, pasture and mixed environs	0.00	39202.31	#DIV/0!	39202.31
12. Ceanothus-manzanita shrublands	0.00	2919.87	#DIV/0!	2919.87
22. Herbaceous wetlands	0.00	17601.51	#DIV/0!	17601.51
24. Montane coniferous wetlands	0.00	11936.06	#DIV/0!	11936.06
20. Urban and mixed environs	0.00	16079.66	#DIV/0!	16079.66
TOTAL ACRES UPPER DESCHUTES AU	1187868	1187868.37		
WHITE RIVER				
15. Eastside (interior) grasslands	3342.07	0.00	-100%	-3342.07
22. Herbaceous wetlands	6966.38	384.02	-94%	-6582.36
6. Lodgepole pine forest and woodlands	881.68	291.79	-67%	-589.89
7. Ponderosa pine forest and woodlands	98697.75	42277.17	-57%	-56420.58
16. Shrub-steppe	74043.03	47252.02	-36%	-26791.01
1. Mesic lowlands conifer-hardwood forest	1498.40	1080.71	-28%	-417.69
5. Eastside (interior) mixed conifer forest	67779.81	82914.74	22%	15134.93
10. Alpine grassland and shrublands	10.41	32.16	209%	21.75

Appendix table I. Changes in acreages of wildlife habitats thought to occur historically (1860) and currently (1999) in Deschutes Subbasin Assessment Units.				
ASSESSMENT UNIT/HABITAT ID AND DESCRIPTION	HIST ACRES	CURR ACRES	% CHANGE	ACRES CHANGE
4. Montane mixed conifer forest	354.56	44148.78	12352%	43794.22
19. Agriculture, pasture and mixed environs	0.00	31538.27	#DIV/0!	31538.27
14. Eastside (interior) canyon shrublands	0.00	727.85	#DIV/0!	727.85
25. Eastside (interior) riparian wetlands	0.00	346.40	#DIV/0!	346.40
24. Montane coniferous wetlands	0.00	349.91	#DIV/0!	349.91
21. Open water - lakes, rivers, streams	0.00	1149.21	#DIV/0!	1149.21
3. Southwest Oregon mixed conifer-hardwood forest	0.00	107.13	#DIV/0!	107.13
9. Subalpine parkland	0.00	974.06	#DIV/0!	974.06
TOTAL ACRES WHITE RIVER ASSESSMENT UNIT	253574.22	253574.22		

Appendix Table J Acreages of focal habitats within winter ranges by assessment unit, from current habitats map.		
Assessment Unit	Habitat	Acres
LOWER EASTSIDE DESCHUTES		16787.13
	Eastside (interior) grasslands	17.85
	Shrub-steppe	1166.37
	Ponderosa pine forest and woodlands	15602.91
LOWER CROOKED		133242.54
	Eastside (interior) grasslands	90.50
	Herbaceous wetlands	552.95
	Lodgepole pine forest and woodlands	1849.73
	Dwarf shrub-steppe	2998.25
	Ponderosa pine forest and woodlands	39761.49
	Shrub-steppe	87989.62
LOWER WESTSIDE DESCHUTES		2660.19
	Lodgepole pine forest and woodlands	163.71
	Ponderosa pine forest and woodlands	2496.48
MIDDLE DESCHUTES		86184.78
	Eastside (interior) riparian wetlands	0.21
	Herbaceous wetlands	262.77
	Lodgepole pine forest and woodlands	1340.06
	Shrub-steppe	17344.62
	Ponderosa pine forest and woodlands	67237.11
UPPER CROOKED		606500.76
	Eastside (interior) grasslands	2881.77
	Eastside (interior) riparian wetlands	3774.33
	Herbaceous wetlands	17128.71

Appendix Table J Acreages of focal habitats within winter ranges by assessment unit, from current habitats map.		
Assessment Unit	Habitat	Acres
	Dwarf shrub-steppe	26005.35
	Ponderosa pine forest and woodlands	165167.09
	Shrub-steppe	391543.52
UPPER DESCHUTES		86050.20
	Eastside (interior) riparian wetlands	18.35
	Herbaceous wetlands	818.44
	Shrub-steppe	4005.91
	Lodgepole pine forest and woodlands	4858.71
	Ponderosa pine forest and woodlands	76348.79
WHITE RIVER		43994.73
	Herbaceous wetlands	274.54
	Lodgepole pine forest and woodlands	291.79
	Shrub-steppe	8389.87
	Ponderosa pine forest and woodlands	35038.53
Grand Total		975420.33

Appendix Table K. Acreages of Focal Habitats within ungulate winter ranges by Assessment Unit, from historic habitats map.		
Assessment Unit	Habitat	Acres
LOWER EASTSIDE DESCHUTES		31701.25
	Eastside (interior) grasslands	343.98
	Lodgepole pine forest and woodlands	513.27
	Ponderosa pine forest and woodlands	28618.63
	Shrub-steppe	2225.37
LOWER CROOKED		158718.01
	Eastside (interior) grasslands	9024.25
	Lodgepole pine forest and woodlands	17818.55
	Ponderosa pine forest and woodlands	68082.58
	Shrub-steppe	63413.31
	Upland aspen forest	379.32
LOWER WESTSIDE DESCHUTES		6283.21
	Ponderosa pine forest and woodlands	6234.61
	Shrub-steppe	48.60
MIDDLE DESCHUTES		125161.20
	Eastside (interior) grasslands	10054.64
	Herbaceous wetlands	347.88
	Ponderosa pine forest and woodlands	97895.72

Appendix Table K. Acreages of Focal Habitats within ungulate winter ranges by Assessment Unit, from historic habitats map.		
Assessment Unit	Habitat	Acres
	Shrub-steppe	16862.97
UPPER CROOKED		1013300.64
	Dwarf shrub-steppe	4392.74
	Eastside (interior) grasslands	40038.43
	Eastside (interior) riparian wetlands	7703.15
	Lodgepole pine forest and woodlands	16795.76
	Ponderosa pine forest and woodlands	260570.43
	Shrub-steppe	683800.13
UPPER DESCHUTES		111957.99
	Eastside (interior) grasslands	10174.46
	Lodgepole pine forest and woodlands	19768.44
	Ponderosa pine forest and woodlands	74078.16
	Shrub-steppe	7936.93
WHITE RIVER		102894.29
	Eastside (interior) grasslands	594.66
	Herbaceous wetlands	299.15
	Lodgepole pine forest and woodlands	633.38
	Ponderosa pine forest and woodlands	91230.40
	Shrub-steppe	10136.70
Grand Total		1550016.59

Appendix Table L. Optimal conditions and environmental potential for Key Environmental Correlates (KECs) for focal species.		
Species/KEC Description	Optimal Conditions[1]	Environmental Potential
Columbia Spotted Frog		
exotic species	No exotic species should be present. Exotic bullfrog, bass, brown, brook trout may prey on frogs.	High
beaver/muskrat activity (dams, lodges, ponds) (Positive only)	Beaver ponds and channels are used as habitat.	High
water depth	Sufficient depth to be permanent optimal, but shallow ephemeral edges also used for reproduction.	High
Channel changes	Permanent unchanging channel	High

Appendix Table L. Optimal conditions and environmental potential for Key Environmental Correlates (KECs) for focal species.		
Species/KEC Description	Optimal Conditions[1]	Environmental Potential
	optimal.	
water velocity	Ponded, slow-moving, or slack water optimal.	High
rivers & streams	Oxbows, backwaters used.	High
banks	Vegetated, undercut banks used for winter hibernation.	High
emergent vegetation	Eggs deposited among emergent vegetation.	High
ephemeral pools	Used as refuge during movement from wintering to breeding sites.	Low
lakes/ponds/reservoirs	Reservoirs not used.	
sand/mud	Soft muck bottom used for hibernation	High
floating mats	Required.	High
riverine wetlands	Larger areas of pooled or slack water used.	High
seasonal flooding	Seasonally flooded edges of permanent water areas used for reproduction.	High
toxic chemical use (indicate only documented affects)	Unknown.	
pesticides	Unknown	
hatchery facilities and fish	Stocked exotic fish are thought to impact frog populations.	High
Golden Eagle		
Forest, Shrubland, & Grassland Habitat Elements		
forest/woodland vegetative elements or substrates	Cliff sites are used for nesting.	High
snag size (dbh)	Large trees or snags greater than 30 in dbh may be used for nesting.	Low
giant tree >= 30” dbh	Large trees or snags greater than 30 in dbh may be used for nesting.	Low
shrubland/grassland vegetative elements or substrates	Cliff sites are used for nesting.	High
trees (located in a shrubland/grassland context)	Large trees or snags may be used for nesting	Low
Ecological Habitat Elements		

Appendix Table L. Optimal conditions and environmental potential for Key Environmental Correlates (KECs) for focal species.		
Species/KEC Description	Optimal Conditions[1]	Environmental Potential
exotic species (specify whether the species is negatively or positively influenced by the presence of introduced plants or animals)	No information.	Low
exotic plants	No information.	Low
Non-vegetative, Abiotic Habitat Elements	No information.	
cliffs	Used for nesting	High
rocky outcrops and ridges	Used for nesting	High
rock crevices	Used for nesting	High
Freshwater Riparian & Aquatic Bodies Habitat Elements		
seasonal flooding		
Anthropogenic-related Habitat Elements		
toxic chemical use (indicate only documented affects)	Birds are poisoned by chemicals used for other pests. No chemicals is optimal.	High
pesticides	Birds are poisoned by chemicals used for other pests. No chemicals is optimal.	High
powerlines/corridors	Will sometimes build nests on power poles, or perch on power poles. Electrocution of birds a source of mortality. No power lines is optimal.	High
harvest/persecution (of animals) (includes legal and illegal harvest, and incidental take)	Birds are sometimes killed. No illegal take is optimal.	High
Sage Grouse		
Forest, Shrubland, & Grassland Habitat Elements		
shrubland/grassland vegetative elements or substrates		
herbaceous layer	Full range of native herbaceous plants is optimal.	High
grasses	Full range of native grasses is optimal, nest areas were found to have a greater cover of grasses more than 7 in tall.	High

Appendix Table L. Optimal conditions and environmental potential for Key Environmental Correlates (KECs) for focal species.		
Species/KEC Description	Optimal Conditions[1]	Environmental Potential
flowers	Full range of native herbaceous plants is optimal.	High
shrub size (height)	Tall sagebrush stands are optimal.	High
percent shrub canopy cover	No information.	
forbs	Full range of native herbaceous plants is optimal.	High
Ecological Habitat Elements		
exotic species (specify whether the species is negatively or positively influenced by the presence of introduced plants or animals)	No exotic species present is optimal. Grazing removes needed grasses and other food and cover plants.	High
exotic plants	May displace native plants and affect fire periodocity; no exotic plants optimal.	High
habitat structure change	Tall sage and native grasses and forbs mix is optimal.	Jogj
Fire as a Habitat Element	Fire periodicity which maintains tall sage habitat with openings is optimal.	High
Anthropogenic-related Habitat Elements		
guzzlers and waterholes	No information.	
toxic chemical use (indicate only documented affects)	No information	
herbicides/fungicides	No herbicides is optimal; herbicides are used to eradicate big sage and other needed plants.	High
insecticides	No information	
powerlines/corridors	No information	
roads	No roads is optimal; roads fragment habitat areas.	High
Sharp-tailed Grouse		
shrub layer	Shrubs such as sage in mosaic pattern in grasslands optimal.	High
shrubland/grassland vegetative elements or substrates	Bunchgrasses minimum 20cm high optimal for nesting, brood rearing	High
herbaceous layer	Native herbaceous weeds optimal.	High
grasses	Bunchgrasses preferred over sod grasses	High

Appendix Table L. Optimal conditions and environmental potential for Key Environmental Correlates (KECs) for focal species.		
Species/KEC Description	Optimal Conditions[1]	Environmental Potential
edges	Mosaic pattern of shrublands, grasslands, riparian brushy habitats, and woodland edges are optimal.	High
exotic plants	Cheatgrass, thistle, and other exotic weeds may displace native plants. No exotics is optimal.	Low
exotic animals	Grazing degrades habitat by removing tall grasses needed for nesting and refuge, and by removing riparian brush needed for feeding and resting cover. Other exotic animals such as foxes prey on eggs or adults. Introduced exotic birds such as pheasant may communicate diseases.	High
habitat structure change	Permanent grass structure for nesting is optimal.	High
Freshwater Riparian & Aquatic Bodies Habitat Elements	Streams with riparian vegetation such as hawthorn, aspen, willow, are optimal.	High
rivers & streams	Stream and river brushy riparian zones optimal	High
seeps or springs	Brushy riparian zones around springs are optimal	High
Fire as a Habitat Element	Periodic fire if maintains grassland and brush areas is optimal.	High
Anthropogenic-related Habitat Elements		
toxic chemical use (indicate only documented affects)	No information.	
hedgerows/windbreaks	If natural patches of shrubs or riparian brushy areas are not available, planted areas would be optimal.	Low
powerlines/corridors	No information.	
roads	Roads fragment habitat, so low number of roads is optimal.	Low
White-headed Woodpecker		
forest/woodland vegetative elements or substrates	Open pine forests of two species of pine mixed with large ponderosa pine is optimal.	High

Appendix Table L. Optimal conditions and environmental potential for Key Environmental Correlates (KECs) for focal species.		
Species/KEC Description	Optimal Conditions[1]	Environmental Potential
trees	Large diameter ponderosa pine in open woodland condition is optimal.	High
snags	Large diameter snags with hard outer wood and soft heartwood optimal for nesting.	High
snag size (dbh)	Large-diameter snags optimal.	High
tree size (dbh)	Nest trees in the Deschutes NF mean dbh 25.6 inches.	High
fruits/seeds/nuts	Ponderosa pine seeds needed for food.	High
insect population irruptions (specify whether negative or positive relationship in comments)	Insects are needed as food.	Low
Fire as a Habitat Element	Fire is needed to maintain open pine forests which are optimal for nesting.	High
American Beaver		
trees	Aspen, cottonwood, alder are preferred for food.	High
shrubland/grassland vegetative elements or substrates	Herbaceous plants used for food.	High
shrubs	Willow, alder are preferred food items.	High
water characteristics (specify whether negative or positive relationship in comments)	Permanent water of stable water level and sufficient depth and area for refuge. Reservoirs are not suitable.	High
water velocity	Fast-flowing upper tributaries of gradient more than 15 percent are not suitable.	High
rivers & streams	Gradient less than 6 percent, with wide banks optimal, with minimal water level fluctuation.	High
intermittent	Not suitable for habitat.	Low
upper perennial	Fast-flowing upper tribs in v-shaped canyons not suitable habitat, but necessary to provide lower-area perennial water habitat.	High
open water	Protected open water needed for refuge.	Low

Appendix Table L. Optimal conditions and environmental potential for Key Environmental Correlates (KECs) for focal species.		
Species/KEC Description	Optimal Conditions[1]	Environmental Potential
shoreline	Large lakes must have irregular shoreline with bays and coves.	Low
lakes/ponds/reservoirs	Reservoirs usually not suitable due to water level fluctuation.	Low
ponds (<2ha)	Suitable if forage available.	Low
wetlands/marshes/wet meadows/bogs and swamps (Positive relationships only)	Permanent open water with forage available optimal.	High
Anthropogenic-related Habitat Elements	Agricultural areas not suitable habitat: clearing of riparian vegetation and conflicts with damming and cutting trees.	High
repellents	Used to prevent beaver damage.	Low
chemical (taste or smell)	No information.	
irrigation ditches/canals	Conflicts with beaver habitat.	Low
pollution	No information.	
chemical	No information.	
sewage	No information.	
Mule Deer		
Forest, Shrubland, & Grassland Habitat Elements	All habitats used.	
forest/woodland vegetative elements or substrates	Wide variety and high quality browse optimal.	Low
herbaceous layer	Vigorous, healthy plants optimal	Low
edges	Mosaic of vegetation and habitats optimal	Low
shrub layer	Vigorous, healthy plants optimal	Low
forbs	Vigorous, healthy plants optimal	Low
shrubland/grassland vegetative elements or substrates	Wide vegetative variety and high quality browse optimal.	Low
Ecological Habitat Elements		
exotic species (specify whether the species is negatively or positively influenced by the presence of introduced plants or animals)	No competition from other ungulates is optimal.	Low
exotic animals		
predation	Low or no numbers of predators such as coyote and cougar is optimal.	Low
direct displacement	No displacement by cattle, elk, or	Low

Appendix Table L. Optimal conditions and environmental potential for Key Environmental Correlates (KECs) for focal species.		
Species/KEC Description	Optimal Conditions[1]	Environmental Potential
	other grazing animals is optimal	
habitat structure change		
insect population irruptions (specify whether negative or positive relationship in comments)	May be beneficial if growth of shrubs, forbs, and grasses on the exposed forest floor is initiated.	High
mountain pine beetle	May be beneficial if growth of shrubs, forbs, and grasses on the exposed forest floor is initiated.	High
Non-vegetative, Abiotic Habitat Elements		
snow	Short time of snow and frequent snow cover is optimal, since plants will be adequately watered for greenup but not covered so they are not available to deer.	Low
snow depth (specify whether negative or positive relationship in comments)	Shallow depth and frequent snow during the precipitation season is optimal.	Low
Freshwater Riparian & Aquatic Bodies Habitat Elements		
water characteristics (specify whether negative or positive relationship in comments)	Free water throughout the habitat is optimal.	High
free water (derived from any source)	Free water availability is optimal.	High
wetlands/marshes/wet meadows/bogs and swamps (Positive relationships only)	No information.	
context		
forest		
non-forest		
Fire as a Habitat Element	Periodic fires in a mosaic pattern is optimal to rejuvenate brush and other vegetation for high quality forage.	High
Anthropogenic-related Habitat Elements		
guzzlers and waterholes	May improve habitat where natural free water is not available.	High
repellents	If repellent is effective in solving deer damage complaints, it would be considered optimal since deer would not have to be removed from the	Low

Appendix Table L. Optimal conditions and environmental potential for Key Environmental Correlates (KECs) for focal species.

Species/KEC Description	Optimal Conditions[1]	Environmental Potential
	damaged area	
chemical (taste or smell)	No unnatural taste or smell is optimal, since food items are chosen by deer partly on the basis of taste and smell.	Low
irrigation ditches/canals	No barriers in habitat is optimal. If t fencing presen to prevent drowning of deer, with overpass bridges is optimal. Water presence is beneficial.	Low
roads	No barriers in habitat is optimal. If present, underpasses or overpasses with fences to prevent deer-vehicle collisions is optimal. Access roads on winter ranges closed in winter optimal.	High
harvest/persecution (of animals) (includes legal and illegal harvest, and incidental take)	Well-regulated hunting seasons with no illegal harvest is optimal. If illegal harvest occurs, consideration along with legal harvest when setting harvest levels is optimal.	High
fences/corrals	No barriers in habitat is optimal.	High
supplemental food	No supplemental food is optimal.	Low

Table supplied by NHI, 2004.
[1] optimal conditions are taken from species accounts.

Appendix Table M. Key ecological functions (KEFs) for focal species, sorted to show redundancy.

Common Name	SHP-KEF*	KEF Description
Columbia Spotted Frog	1	Trophic relationships
American Beaver	1	Trophic relationships
Columbia Spotted Frog	1.1	heterotrophic consumer
American Beaver	1.1	heterotrophic consumer
Columbia Spotted Frog	1.1.1	primary consumer (herbivore) (also see below under Herbivory)
American Beaver	1.1.1	primary consumer (herbivore) (also see below under Herbivory)

Appendix Table M. Key ecological functions (KEFs) for focal species, sorted to show redundancy.

Common Name	SHP-KEF*	KEF Description
Sage Grouse	1.1.1.1	foliovore (leaf-eater)
Sharp-tailed Grouse	1.1.1.1	foliovore (leaf-eater)
American Beaver	1.1.1.1	foliovore (leaf-eater)
Mule Deer	1.1.1.1	foliovore (leaf-eater)
Sage Grouse	1.1.1.10	flower/bud/catkin feeder
Sharp-tailed Grouse	1.1.1.10	flower/bud/catkin feeder
Columbia Spotted Frog	1.1.1.11	aquatic herbivore
American Beaver	1.1.1.11	aquatic herbivore
Columbia Spotted Frog	1.1.1.12	feeds in water on decomposing benthic substrate
American Beaver	1.1.1.13	bark/cambium/bole feeder
Sharp-tailed Grouse	1.1.1.2	spermivore (seed-eater)
White-headed Woodpecker	1.1.1.2	spermivore (seed-eater)
American Beaver	1.1.1.3	browser (leaf, stem eater)
Mule Deer	1.1.1.3	browser (leaf, stem eater)
Mule Deer	1.1.1.4	grazer (grass, forb eater)
Sage Grouse	1.1.1.5	frugivore (fruit-eater)
Sharp-tailed Grouse	1.1.1.5	frugivore (fruit-eater)
Mule Deer	1.1.1.9	fungivore (fungus feeder)
Columbia Spotted Frog	1.1.2	secondary consumer (primary predator or primary carnivore)
Columbia Spotted Frog	1.1.2.1	invertebrate eater
Columbia Spotted Frog	1.1.2.1.1	terrestrial invertebrates
Golden Eagle	1.1.2.1.1	terrestrial invertebrates
Sage Grouse	1.1.2.1.1	terrestrial invertebrates
Sharp-tailed Grouse	1.1.2.1.1	terrestrial invertebrates
White-headed Woodpecker	1.1.2.1.1	terrestrial invertebrates
Columbia Spotted Frog	1.1.2.1.2	aquatic macroinvertebrates
Golden Eagle	1.1.2.2	vertebrate eater (consumer or predator of herbivorous vertebrates)
Golden Eagle	1.1.4	carrion feeder
Columbia Spotted Frog	1.2	prey relationships
American Beaver	1.2	prey relationships
Columbia Spotted Frog	1.2.1	prey for secondary or tertiary consumer (primary or secondary predator)
Sage Grouse	1.2.1	prey for secondary or tertiary consumer (primary or secondary predator)

Appendix Table M. Key ecological functions (KEFs) for focal species, sorted to show redundancy.		
Common Name	SHP-KEF*	KEF Description
Sharp-tailed Grouse	1.2.1	prey for secondary or tertiary consumer (primary or secondary predator)
American Beaver	1.2.1	prey for secondary or tertiary consumer (primary or secondary predator)
Mule Deer	1.2.1	prey for secondary or tertiary consumer (primary or secondary predator)
Columbia Spotted Frog	2	aids in physical transfer of substances for nutrient cycling (C,N,P, etc.)
American Beaver	2	aids in physical transfer of substances for nutrient cycling (C,N,P, etc.)
Golden Eagle	3	organismal relationships
Sharp-tailed Grouse	3	organismal relationships
White-headed Woodpecker	3	organismal relationships
American Beaver	3	organismal relationships
Mule Deer	3	organismal relationships
American Beaver	3.11	primary burrow excavator (fossorial or underground burrows)
American Beaver	3.11.1	creates large burrows (rabbit-sized or larger)
American Beaver	3.13	creates runways (possibly used by other species)
Mule Deer	3.13	creates runways (possibly used by other species)
Mule Deer	3.14	uses runways created by other species)
Mule Deer	3.16	interspecific hybridization
Golden Eagle	3.2	controls terrestrial vertebrate populations (through predation or displacement)
American Beaver	3.4	transportation ofviable seeds, spores, plants or animals
Sharp-tailed Grouse	3.4.5	disperses seeds/fruits (through ingestion or caching)
White-headed Woodpecker	3.4.5	disperses seeds/fruits (through ingestion or caching)
American Beaver	3.6	primary creation of structures (possibly used by other organisms)
Golden Eagle	3.6.1	aerial structures
American Beaver	3.6.3	aquatic structures

Appendix Table M. Key ecological functions (KEFs) for focal species, sorted to show redundancy.

Common Name	SHP-KEF*	KEF Description
White-headed Woodpecker	3.9	primary cavity excavator in snags or live trees
Sage Grouse	4	carrier, transmitter, or reservoir of vertebrate diseases
Sharp-tailed Grouse	4	carrier, transmitter, or reservoir of vertebrate diseases
Sage Grouse	4.3	diseases that affect other wildlife species
Sharp-tailed Grouse	4.3	diseases that affect other wildlife species
American Beaver	5	soil relationships
American Beaver	5.1	physically affects (improves) soil structure, aeration (typically by digging)
White-headed Woodpecker	6	wood structure relationships (either living or dead wood)
Mule Deer	6	wood structure relationships (either living or dead wood)
White-headed Woodpecker	6.1	physically fragments down wood
Mule Deer	6.1	physically fragments down wood
White-headed Woodpecker	6.2	physically fragments standing wood
American Beaver	7	water relationships
American Beaver	7.1	impounds water by creating diversions or dams
American Beaver	7.2	creates ponds or wetlands through wallowing
American Beaver	8	vegetation structure and composition relationships
American Beaver	8.1	creates standing dead trees (snags)
Mule Deer	8.2	herbivory on trees or shrubs that may alter vegetation structure and composition (browsers)
Mule Deer	8.3	herbivory on grasses or forbs that may alter vegetation structure and composition (grazers)

Table supplied by NHI, 2004.
*hierarchical number assigned from the table of KEF definitions.

Appendix Table N. KECs sorted to show interspecific relationships.	
Common Name	KEC_Description
Columbia Spotted Frog	Anthropogenic-related Habitat Elements
Golden Eagle	Anthropogenic-related Habitat Elements
Sage Grouse	Anthropogenic-related Habitat Elements
Sharp-tailed Grouse	Anthropogenic-related Habitat Elements
American Beaver	Anthropogenic-related Habitat Elements
Mule Deer	Anthropogenic-related Habitat Elements
Columbia Spotted Frog	banks
American Beaver	banks
Columbia Spotted Frog	beaver/muskrat activity (dams, lodges, ponds) (Positive only)
American Beaver	beaver/muskrat activity (dams, lodges, ponds) (Positive only)
American Beaver	chemical
American Beaver	chemical (taste or smell)
Mule Deer	chemical (taste or smell)
Golden Eagle	cliffs
American Beaver	coarse woody debris in streams and rivers
American Beaver	context
Mule Deer	context
White-headed Woodpecker	decay class
Columbia Spotted Frog	direct displacement
Mule Deer	direct displacement
Mule Deer	down wood (includes downed logs, branches, and rootwads, in any context)
Columbia Spotted Frog	Ecological Habitat Elements
Golden Eagle	Ecological Habitat Elements
Sage Grouse	Ecological Habitat Elements
Sharp-tailed Grouse	Ecological Habitat Elements
White-headed Woodpecker	Ecological Habitat Elements
American Beaver	Ecological Habitat Elements
Mule Deer	Ecological Habitat Elements

Appendix Table N. KECs sorted to show interspecific relationships.	
Common Name	KEC_Description
Golden Eagle	edges
Sharp-tailed Grouse	edges
Sharp-tailed Grouse	edges
American Beaver	edges
Mule Deer	edges
Mule Deer	edges
Columbia Spotted Frog	emergent vegetation
Columbia Spotted Frog	emergent vegetation
Columbia Spotted Frog	ephemeral pools
American Beaver	ephemeral pools
Columbia Spotted Frog	exotic animals
Sage Grouse	exotic animals
Sharp-tailed Grouse	exotic animals
Mule Deer	exotic animals
Golden Eagle	exotic plants
Sage Grouse	exotic plants
Sharp-tailed Grouse	exotic plants
Columbia Spotted Frog	exotic species (specify whether the species is negatively or positively influenced by the presence of introduced plants or animals)
Golden Eagle	exotic species (specify whether the species is negatively or positively influenced by the presence of introduced plants or animals)
Sage Grouse	exotic species (specify whether the species is negatively or positively influenced by the presence of introduced plants or animals)
Sharp-tailed Grouse	exotic species (specify whether the species is negatively or positively influenced by the presence of introduced plants or animals)
Mule Deer	exotic species (specify whether the species is negatively or positively influenced by the presence of introduced plants or animals)
Mule Deer	fences/corrals
Sage Grouse	Fire as a Habitat Element
Sharp-tailed Grouse	Fire as a Habitat Element
White-headed Woodpecker	Fire as a Habitat Element
Mule Deer	Fire as a Habitat Element
Columbia Spotted Frog	floating mats

Appendix Table N. KECs sorted to show interspecific relationships.	
Common Name	KEC_Description
Sage Grouse	flowers
Sharp-tailed Grouse	flowers
Sage Grouse	forbs
Sharp-tailed Grouse	forbs
Mule Deer	forbs
Mule Deer	forbs
American Beaver	forest
Mule Deer	forest
Golden Eagle	Forest, Shrubland, & Grassland Habitat Elements
Sage Grouse	Forest, Shrubland, & Grassland Habitat Elements
Sharp-tailed Grouse	Forest, Shrubland, & Grassland Habitat Elements
White-headed Woodpecker	Forest, Shrubland, & Grassland Habitat Elements
American Beaver	Forest, Shrubland, & Grassland Habitat Elements
Mule Deer	Forest, Shrubland, & Grassland Habitat Elements
Golden Eagle	forest/woodland vegetative elements or substrates
Sharp-tailed Grouse	forest/woodland vegetative elements or substrates
White-headed Woodpecker	forest/woodland vegetative elements or substrates
American Beaver	forest/woodland vegetative elements or substrates
Mule Deer	forest/woodland vegetative elements or substrates
American Beaver	free water (derived from any source)
Mule Deer	free water (derived from any source)
Columbia Spotted Frog	Freshwater Riparian & Aquatic Bodies Habitat Elements
Golden Eagle	Freshwater Riparian & Aquatic Bodies Habitat Elements
Sharp-tailed Grouse	Freshwater Riparian & Aquatic Bodies Habitat Elements
American Beaver	Freshwater Riparian & Aquatic Bodies Habitat Elements
Mule Deer	Freshwater Riparian & Aquatic Bodies Habitat Elements
White-headed Woodpecker	fruits/seeds/nuts

Appendix Table N. KECs sorted to show interspecific relationships.	
Common Name	KEC_Description
Golden Eagle	giant tree >= 30” dbh
Golden Eagle	giant tree >= 30” dbh
Golden Eagle	giant tree >= 30” dbh
Golden Eagle	giant tree >= 30” dbh
White-headed Woodpecker	giant tree >= 30” dbh
White-headed Woodpecker	giant tree >= 30” dbh
American Beaver	giant tree >= 30” dbh
American Beaver	giant tree >= 30” dbh
Sage Grouse	grasses
Sharp-tailed Grouse	grasses
Sage Grouse	guzzlers and waterholes
Mule Deer	guzzlers and waterholes
Columbia Spotted Frog	habitat structure change
Sage Grouse	habitat structure change
Sharp-tailed Grouse	habitat structure change
Mule Deer	habitat structure change
Golden Eagle	harvest/persecution (of animals) (includes legal and illegal harvest, and incidental take)
Mule Deer	harvest/persecution (of animals) (includes legal and illegal harvest, and incidental take)
Columbia Spotted Frog	hatchery facilities and fish
Sharp-tailed Grouse	hedgerows/windbreaks
Sage Grouse	herbaceous layer
Sharp-tailed Grouse	herbaceous layer
Mule Deer	herbaceous layer
Mule Deer	herbaceous layer
Sage Grouse	herbicides/fungicides
White-headed Woodpecker	insect population irruptions (specify whether negative or positive relationship in comments)
Mule Deer	insect population irruptions (specify whether negative or positive relationship in comments)
Sage Grouse	insecticides
Sharp-tailed Grouse	insecticides
American Beaver	intermittent
Columbia Spotted Frog	in-water substrate
American Beaver	irrigation ditches/canals
Mule Deer	irrigation ditches/canals
Columbia Spotted Frog	lakes/ponds/reservoirs

Appendix Table N. KECs sorted to show interspecific relationships.	
Common Name	KEC_Description
American Beaver	lakes/ponds/reservoirs
American Beaver	large – 6.6’ – 16.5’
Golden Eagle	large tree 20-29” dbh
Golden Eagle	large tree 20-29” dbh
Golden Eagle	large tree 20-29” dbh
Golden Eagle	large tree 20-29” dbh
White-headed Woodpecker	large tree 20-29” dbh
White-headed Woodpecker	large tree 20-29” dbh
American Beaver	large tree 20-29” dbh
Golden Eagle	live remnant/legacy trees
White-headed Woodpecker	live remnant/legacy trees
American Beaver	lower perennial
Sage Grouse	medium – 20”- 6.5’
American Beaver	medium – 20”- 6.5’
Golden Eagle	medium tree 15-19” dbh
Golden Eagle	medium tree 15-19” dbh
Golden Eagle	medium tree 15-19” dbh
Golden Eagle	medium tree 15-19” dbh
White-headed Woodpecker	medium tree 15-19” dbh
White-headed Woodpecker	medium tree 15-19” dbh
American Beaver	medium tree 15-19” dbh
American Beaver	medium tree 15-19” dbh
White-headed Woodpecker	moderate [class 3]
Mule Deer	mountain pine beetle
American Beaver	non-forest
Mule Deer	non-forest
Golden Eagle	Non-vegetative, Abiotic Habitat Elements
Mule Deer	Non-vegetative, Abiotic Habitat Elements
American Beaver	open water
American Beaver	open water
American Beaver	order and class
Columbia Spotted Frog	oxbows
American Beaver	oxbows
Sage Grouse	percent shrub canopy cover
Columbia Spotted Frog	pesticides
Golden Eagle	pesticides

Appendix Table N. KECs sorted to show interspecific relationships.	
Common Name	KEC_Description
Sharp-tailed Grouse	pesticides
American Beaver	pollution
American Beaver	ponds (<2ha)
American Beaver	pools
Golden Eagle	powerlines/corridors
Sage Grouse	powerlines/corridors
Sharp-tailed Grouse	powerlines/corridors
Columbia Spotted Frog	predation
Mule Deer	predation
American Beaver	repellents
Mule Deer	repellents
Columbia Spotted Frog	riverine wetlands
American Beaver	riverine wetlands
Columbia Spotted Frog	rivers & streams
Sharp-tailed Grouse	rivers & streams
American Beaver	rivers & streams
Sage Grouse	roads
Sharp-tailed Grouse	roads
Mule Deer	roads
Golden Eagle	rock crevices
Golden Eagle	rock substrates
Golden Eagle	rocky outcrops and ridges
Columbia Spotted Frog	sand/mud
American Beaver	sapling/pole 1-9” dbh
American Beaver	sapling/pole 1-9” dbh
Columbia Spotted Frog	seasonal flooding
Golden Eagle	seasonal flooding
American Beaver	seedling <1” dbh
American Beaver	seedling <1” dbh
Sharp-tailed Grouse	seeps or springs
American Beaver	sewage
American Beaver	shoreline
American Beaver	shoreline
Sharp-tailed Grouse	shrub layer
Mule Deer	shrub layer
Sage Grouse	shrub size (height)
American Beaver	shrub size (height)
Golden Eagle	shrubland/grassland vegetative elements or substrates
Sage Grouse	shrubland/grassland vegetative elements or substrates
Sharp-tailed Grouse	shrubland/grassland vegetative elements or substrates

Appendix Table N. KECs sorted to show interspecific relationships.	
Common Name	KEC_Description
American Beaver	shrubland/grassland vegetative elements or substrates
Mule Deer	shrubland/grassland vegetative elements or substrates
Golden Eagle	shrubs
Sage Grouse	shrubs
American Beaver	shrubs
Mule Deer	shrubs
American Beaver	size
Sage Grouse	small - <20”
American Beaver	small - <20”
American Beaver	small tree 10-14” dbh
American Beaver	small tree 10-14” dbh
Golden Eagle	snag size (dbh)
Golden Eagle	snag size (dbh)
White-headed Woodpecker	snag size (dbh)
American Beaver	snag size (dbh)
Golden Eagle	snags
White-headed Woodpecker	snags
Mule Deer	snow
Mule Deer	snow depth (specify whether negative or positive relationship in comments)
White-headed Woodpecker	spruce budworm
Columbia Spotted Frog	submergent vegetation
Columbia Spotted Frog	submergent vegetation
Mule Deer	supplemental food
Columbia Spotted Frog	toxic chemical use (indicate only documented affects)
Golden Eagle	toxic chemical use (indicate only documented affects)
Sage Grouse	toxic chemical use (indicate only documented affects)
Sharp-tailed Grouse	toxic chemical use (indicate only documented affects)
Golden Eagle	tree size (dbh)
Golden Eagle	tree size (dbh)
White-headed Woodpecker	tree size (dbh)
American Beaver	tree size (dbh)
Golden Eagle	trees

Appendix Table N. KECs sorted to show interspecific relationships.	
Common Name	KEC_Description
White-headed Woodpecker	trees
American Beaver	trees
Golden Eagle	trees (located in a shrubland/grassland context)
American Beaver	upper perennial
Columbia Spotted Frog	vegetation
Columbia Spotted Frog	vegetation
Columbia Spotted Frog	water characteristics (specify whether negative or positive relationship in comments)
American Beaver	water characteristics (specify whether negative or positive relationship in comments)
Mule Deer	water characteristics (specify whether negative or positive relationship in comments)
Columbia Spotted Frog	water depth
American Beaver	water depth
Columbia Spotted Frog	water velocity
American Beaver	water velocity
Columbia Spotted Frog	wetlands/marshes/wet meadows/bogs and swamps (Positive relationships only)
American Beaver	wetlands/marshes/wet meadows/bogs and swamps (Positive relationships only)
Mule Deer	wetlands/marshes/wet meadows/bogs and swamps (Positive relationships only)
American Beaver	zone
American Beaver	zone

Table supplied by NHI, 2004.

Appendix

Maps