Malheur River Subbasin Assessment and Management Plan For Fish and Wildlife Mitigation

Appendix A, Part 3 –Terrestrial Assessment

Malheur Watershed Council

And

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Malheur River Subbasin Assessment and Management Plan

For Fish and Wildlife Mitigation

Terrestrial

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1 INTRODUCTION

The assessment was completed in the Malheur Subbasin using existing information available at broad spatial scales tempered by the local knowledge of experienced wildlife professionals. Information on vegetation and habitat types mapped at the subbasin scale, such as derived from the Oregon Natural Heritage Program, have substantial errors, which were corrected to the extent possible by the Technical Wildlife Committee and incorporated into this document. However, these adjustments were made qualitatively, with no new mapping completed during the process. While not a quantitative method of assessment, objectivity was increased by balancing a variety of opinions and research from multiple scientists. Most of the information that follows is given on the Subbasin scale. Historic and current habitat characterization was broken down into watersheds (as defined by the watershed council) to enable potential correlation with the aquatic analysis.

The assessment includes terrestrial background information, descriptions of focal species chosen to represent wildlife habitat types in the subbasin, a comparison of historic and current wildlife habitat types, a description of limiting factors for both focal species and wildlife habitat types, and biological objectives for focal species and wildlife habitat types.

1.1 Organization of the Document

The Malheur River Subbasin Assessment and Management Plan for Fish and Wildlife Mitigation is comprised of several documents. Because of the size of the documents the primary documents are further divided into sections for the purpose of saving as electronic files. This document, the Terrestrial Assessment, provides the detail on terrestrial species within the subbasin, current status, and limiting factors. Other sections of the report include the Management Plan (of which this is an appendix), which provides a summary of the assessment and inventory and describes the strategies needed to protect and restore fish and wildlife habitats within the subbasin. Two other sections of Appendix A are the Subbasin Overview, which provides background information on the general subbasin characteristics and water resources; and the Aquatic Assessment, which provides the detail on aquatic species within the subbasin, current status, and limiting factors. An additional supporting document, the Inventory Document (Appendix B), provides a summary of and an assessment of existing programs implemented in the subbasin to protect and restore fish and wildlife habitats. All references are included in a separate document.

Note to Reviewers: To facilitate the electronic review of this document we have used hyperlinks to all figures, tables, and other sections of the document. To easily see where these hyperlinks have been inserted please choose **Tools** > **Options** > and on the "**View**" tab choose "always" under "Field Shading". All of the live fields will then be highlighted like this. Clicking on these hyperlinks will take you to that item in the document. Use the Back Arrow on the toolbar () to return to your original location. The Back Arrow is on the Web toolbar. To open the Web toolbar, place your cursor anywhere over the toolbar in Word, and right-click the mouse. When the menu pops up, make sure that the Web toolbar is enabled.

1.2 Malheur Wildlife Habitat Types

Table 1 lists the Wildlife-Habitat types of the Malheur Subbasin as identified in the IBIS database (IBIS 2003).

Table 1: Malheur Wildlife Habitat Types.

IBIS Wildlife-Habitat Type	Malheur Subbasin Acreage
Montane Mixed Conifer Forest	42,732
Interior Mixed Conifer Forest	234,922
Lodgepole Pine Forest and Woodlands	592
Ponderosa Pine Forest and Woodlands	102,046
Alpine Grasslands and Shrublands	6,422
Western Juniper and Mountain Mahogany Woodlands	152,174
Interior Grasslands	59,646
Shrub-steppe	2,265,271
Desert Playa and Salt Scrub Shrublands	502
Agriculture, Pastures, and Mixed Environs	128,640
Urban and Mixed Environs	1,140
Open Water - Lakes, Rivers, and Streams	9,550
Herbaceous Wetlands	27,941
Interior Riparian-Wetlands	603
Total Acres:	3,032,175

1.3 Malheur Special Status Species

Wildlife species that have special status on State or federal lists as threatened, endangered, sensitive and special concern are listed in **Table 2**.

Table 2: Special Status Wildlife Species.

Species	Latin Name	State or federal status
Birds		
Bald eagle	*Haliaeetus leucocephalus*	De-listed 8/99, monitoring to 2015
Peregrine falcon	*Falco peregrinus anatum*	Federal endangered
Northern goshawk	*Accipiter gentiles*	State sensitive/Federal concern
flammulated owl	*Otus flammeolus*	State sensitive
White-headed woodpecker	*Picoides albolarvatus*	State sensitive

Species	Latin Name	State or federal status
Pileated woodpecker	*Dryocopus pileatus*	State sensitive
Williamson's sapsucker	*Sphyrapicus thyroideus*	State sensitive
Pygmy nuthatch	*Sitta pymaea*	State sensitive
Northern pygmy owl	*Glaucidium gnoma*	State sensitive
Black rosy finch	*Leucosticte atrata*	State sensitive
Loggerhead shrike	*Lanius ludovicianus*	State sensitive
Ferruginous hawk	*Buteo regalis*	State sensitive/Federal concern
Burrowing owl	*Athene cunicularia hypugaea*	State sensitive/Federal concern
Swainsons hawk	*Buteo swainsoni*	State sensitive
Bobolink	*Dolichonyx oryzivorus*	State sensitive
Greater sandhill crane	*Grus Canadensis tabida*	State sensitive
Bank swallow	*Riparia riparia*	State sensitive
Black-throated sparrow	*Amphispiza bilineata*	State sensitive
Black tern	*Chlidonias niger*	Federal concern
Olive sided flycatcher	*Contopus cooperi*	Federal concern
Greater sage grouse	*Centrocerus urophasianus*	Federal concern
Yellow-billed Cuckoo	*Coccyzus americanus*	Federal candidate
Upland sandpiper	*Bartramia longicauda*	Federal concern
Willow flycatcher	*Empidonax traillii adastus*	Federal concern
Yellow-breasted chat	*Icteria virens*	Federal concern
Western least bittern	*Ixobrychus exilis hesperis*	Federal concern
Lewis' woodpecker	*Melanerpes lewis*	Federal concern
Mountain quail	*Oreortyx pictus*	Federal concern
White-headed woodpecker	*Picoides albolarvatus*	Federal concern
White-faced ibis	*Plegadis chihi*	Federal concern
Amphibians		
Northern leopard frog	*Rana pipiens*	State sensitive
Columbia spotted frog	*Rana luteiventris*	Federal candidate
Fish		
Bull trout	*Salvelinus confluentus*	Federal threatened
Interior redband trout	*Oncorhynchus mykiss*	Federal concern
Reptiles		
Mojave black-collared lizard	*Crotaphytus bicinctores*	State sensitive
Desert horned lizard	*Phrynosoma platyrhinos*	State sensitive
Northern sagebrush lizard	*Scleporus graciosus graciosus*	Federal concern
Western ground snake	*Sonora semiannulata*	State sensitive
Mammals		
Pale western big eared	*Corynorhinus townsendii pallescens*	Federal concern

Species	Latin Name	State or federal status
bat		
Gray wolf	*Canis lupus*	Federal threatened
Pacific western big eared bat	*Corynorhinus townsendii townsendii*	Federal concern
Canada lynx	*Lynx lynx*	Federal proposed threatened
California wolverine	*Gulo gulo luteus*	Federal concern
Small footed myotis bat	*Myotis ciliolabrum*	Federal concern
Long-eared myotis bat	*Myotis evotis*	Federal concern
Long-legged myotis bat	*Myotis volans*	Federal concern
Fringed myotis bat	*Myotis thysanodes*	Federal concern
Yuma myotis	*Myotis yumanensis*	Federal concern
Northern kit fox	*Vulpes macrotis*	State threatened
Pygmy rabbit	*Brachylagus idahoensis*	State sensitive/Federal concern
California bighorn sheep	*Ovis canadensis californiana*	Federal concern
Prebles shrew	*Sorex preblei*	Federal concern
Silver-haired bat	*Lasionycteris noctivagans*	Federal concern

2 FOCAL SPECIES CHARACTERIZATION AND STATUS

Terrestrial focal species were selected using a scientific process of review and elimination. To begin this process, species lists were downloaded from the IBIS Database and the Oregon Natural Heritage Program Database. The preliminary focal species appeared on one or more of the following lists:

1. Rare, Threatened, and Endangered and Plants and Animals of Oregon.
2. Partners in Flight Priority and Focal Species List for Oregon.
3. Species used to model impacts from adjacent hydro-development under the USFWS Habitat Evaluation Procedure (HEP Species).
4. Managed Species (game species).
5. Functional Specialists (species that perform very few functions in their habitats).
6. Critical functional link species (species are species that perform a particular ecological function within a community).
7. Species with an association to salmon.

Each of these lists were put into table form and then imported into a MS Access database. All of the species that occur in the Subbasin were cross-referenced against each of the lists referenced above. A sort technique was used to create a list of species that were on more than one of the above lists. From this list, a preliminary focal species list was created. This list was then brought before the technical team for review at a meeting on January 15, 2004.

During the review process, the technical team decided to group a number of wildlife-habitat types together because they felt their groups could more accurately reflect wildlife habitat relationships in the Malheur Subbasin.

Table 3: Malheur Technical Team Wildlife-Habitat Groups.

Malheur Technical Team Wildlife-Habitat Groups	Includes IBIS Wildlife-Habitat Type	Malheur Subbasin Acreage
Mixed Conifer Forest	Montane Mixed Conifer Forest Interior Mixed Conifer Forest Lodgepole Pine Forest and Woodlands Ponderosa Pine Forest and Woodlands* Alpine Grasslands and Shrublands	386,714
Mountain Mahogany Woodlands	Western Juniper and Mountain Mahogany+	152,174
Shrub-steppe	Shrub-steppe Interior Grasslands Desert Playa and Salt Scrub Shrublands	2,325,419
Agriculture, Pastures, and Mixed Environs	Agriculture, Pastures, and Mixed Environs	128,640
Urban and Mixed Environs	Urban and Mixed Environs	1,140
Open Water - Lakes, Rivers, and Streams	Open Water - Lakes, Rivers, and Streams	9,550
Herbaceous Wetlands	Herbaceous Wetlands	27,941
Interior Riparian-Wetlands	Interior Riparian-Wetlands	603
	Total Acres:	**3,032,175**

***** The IBIS database includes interior white oak in this wildlife-habitat type. White oak does not occur in the Malheur Subbasin.
+ Western juniper was not included in the technical team habitat type due to its current encroachment nature in the Subbasin.

The following focal species were chosen or rejected for the given rationale:

1. Elk and blue grouse were chosen to represent mixed conifer habitats because there is data available on these species. Elk require healthy mixed conifer habitats for cover.
2. Clark's nutcracker was discussed as being unsuitable as a focal species for mixed conifer habitats primarily because of their generalist tendencies and their ability to adapt to human disturbance.
3. Pileated woodpeckers were chosen to represent mixed conifer habitats based on the rationale that improved habitat for one cavity nesting species benefits all cavity nesting species.
4. All three species chosen to represent mixed conifer forests and alpine grasslands were chosen to allow for the description of various habitat types within the descriptions of each species. In this way, the intricacies of each habitat type would be addressed by the chosen focal species.
5. Mule deer was chosen as a focal species for mountain mahogany habitats. There was some debate regarding how to address western juniper, given that it is a problem species in the Subbasin. It was decided that mule deer would adequately represent

juniper in its native, healthy state, and the encroachment habits of juniper would be addressed elsewhere.

6. More habitat types were grouped together to accurately reflect wildlife-habitat relationships with respect to shrub-steppe habitats (See Table 3 above).
7. Sage Grouse was chosen as a focal species for shrub-steppe habitats because it is a shrub-steppe obligate species that is sensitive to degradation of the habitat, so it makes a good indicator species for the habitat.
8. California bighorn sheep were chosen because they are a good indicator for the health of high-altitude shrub-steppe habitat.
9. Pronghorn antelope are sensitive to habitat loss and degradation, making the species a good indicator of shrub-steppe habitat health.
10. Collard lizards were discussed with respect to shrub-steppe habitats, but rejected because the species is not necessarily associated with a single habitat type.
11. The group discussed salt scrub and playa habitats and found it difficult first to define the habitat type and then to find an indicator species that is obligate to that habitat. The group decided to group the habitat with shrub-steppe, giving it protection under a wider umbrella.
12. Red fox was discussed as a focal species to represent agriculture and mixed environs, but was rejected because of its questionable historic presence this far west.
13. Horned lark was chosen as a representative of grassland health (grasslands are grouped with shrub-steppe habitats).
14. California quail was chosen to represent agriculture and mixed environs because they are a common species in those habitat types.
15. Bald eagle and river otter were chosen to represent open water habitats. They are both good indicators of open water habitat health.
16. Spotted and leopard frogs were chosen as focal species to represent herbaceous wetland habitats because they are good indicators of habitat health.
17. The yellow warbler and the yellow-breasted chat represent interior riparian habitats, both riparian obligate bird species and good indicators of riparian habitat health.

The final focal species list is shown in Table 4.

Table 4: Wildlife Focal Species Used in the Malheur River Subbasin Assessment.

Wildlife-Habitat Type	Focal Species
Mixed Conifer (Montane Mixed Conifer, Interior Mixed Conifer, Lodgepole Pine, Ponderosa Pine, and Alpine Grasslands and Shrublands)	Elk, Pileated Woodpecker, Blue Grouse
Western Juniper and Mt. Mahogany Woodlands (Where Juniper is in its native state, not its encroachment state.)	Mule Deer
Shrub-steppe Habitats (Interior Grasslands, Shrub-steppe, Desert Playa and Salt Scrub Shrublands)	Sage Grouse, Horned Lark, California Bighorn Sheep, Pronghorn
Agriculture, Pastures, and Mixed Environs (Includes Urban and Mixed Environs)	California Quail
Open Water, Lakes, Rivers and Streams	Bald Eagle, River Otter
Herbaceous Wetlands	Spotted and Leopard Frog
Interior Riparian Habitat	Yellow Warbler, Yellow-Breasted Chat

2.1 Managed Species

Managed species include those focal species that are monitored and managed by Oregon Department of Fish and Wildlife (ODFW) for sustainable harvest. ODFW monitors species and implements management strategies at the Wildlife Management Unit (WMU) level. ODFW divides the State of Oregon into 77 WMUs to allow for accurate data collection and specific management of smaller wildlife populations occurring within each WMU. Specific Management Objectives (MOs) pertaining to population size, sex ratio, ratio of young, etc. are established for species managed within each WMU to maintain harvestable populations. In addition, different hunting regulations and species harvest limits are established for populations within each WMU.

The Malheur Subbasin includes portions of six WMUs. However, the Beulah (WMU #65) and Malheur River (WMU #66) comprise the majority of the Malheur Subbasin. Because ODFW data on species populations, harvest and abundance trends are compiled by WMU, the species accounts below typically focus on data from the Beulah and Malheur River WMUs specifically. Supplemental data from adjacent or adjoining WMUs is only included when important insight or perspective into species populations potentially occurring in the Malheur Subbasin is provided.

2.1.1 Rocky Mountain elk

Two subspecies of elk occur in Oregon: the Roosevelt elk (*Cervus elaphus roosevelti*) and the Rocky Mountain elk (*C. e. nelsoni*). Roosevelt elk occur throughout western Oregon, with concentrations in the Cascade and Coast Range Mountains (ODFW 2003a). Rocky mountain elk occur in eastern Oregon with major populations in the Blue Mountains and South-central Oregon (ODFW 2003a). Rocky Mountain elk have potential for occurrence throughout the Malheur

Subbasin, and the species was chosen as a Subbasin plan focal species to provide an indication of the health and functioning of mixed coniferous forest habitat.

Rocky Mountain elk are intensely monitored and managed by ODFW. Oregon's Elk Management Plan (ODFW 2003a) provides specific elk Management Objectives (MOs) for winter population size and post-season bull ratios in each WMU. Although the Malheur Subbasin includes portions of 6 WMUs, this species assessment focuses on the Beulah and Malheur River WMUs, which comprise the vast majority of the Malheur watershed.

In general, populations of both subspecies of elk in Oregon have stabilized after being severely impacted by settlement in the 1800's, and successfully recovering following transplantations, hunting restrictions and measures for recovery implemented throughout the early 1900's (ODFW 2003a). Elk populations were reduced to only a few small herds along the coast and in Northeast Oregon by about 1910. The Oregon legislature provided protection for elk in 1899 by making it illegal to sell meat from wild animals and by closing elk season from 1909 through 1932 (ODFW 2003a). As elk populations rebounded from near decimation, complaints from private individuals about elk damage increased and elk hunting restrictions were lifted. After a 45% statewide increase in Rocky Mountain elk populations in the 1970's, elk populations within Oregon stabilized, and, in 1981, MOs for population size and bull ratios were established for most Rocky Mountain elk WMUs. **Figure 1** provides estimates of Oregon State elk populations from 1979 through 2001.

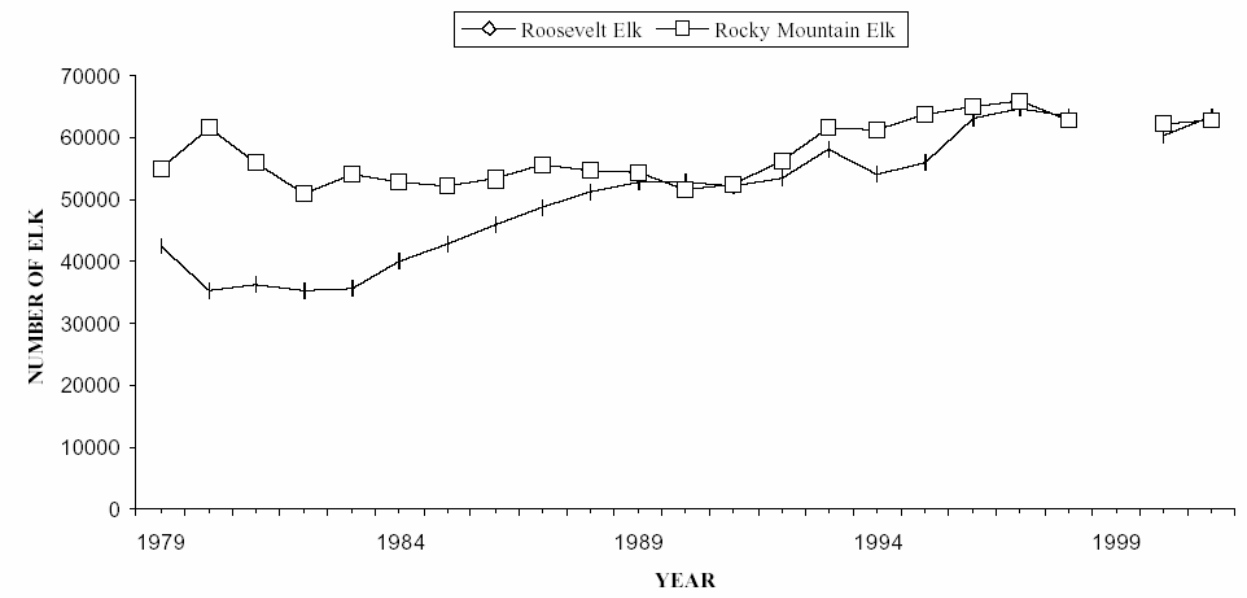

Figure 1: Elk Population Estimates in Oregon, 1979-2001 (taken from ODFW 2003a).

In the Beulah and Malheur River WMUs, elk populations are known to be stable and management now focuses on meeting MOs and minimizing elk damage complaints. Population size objectives for the Beulah and Malheur River WMUs are 1,600 and 1,500 individuals respectively (W. Van Dyke and R. Garner, ODFW Biologists, pers. comm.). These MOs have been met approximately within each WMU for at least the last five years. Combined elk

populations from the Beulah and Malheur River WMUs include a current elk population herd size for the Malheur watershed of approximately 3,100 individuals.

Table 5 below shows recorded bull and calf ratios for elk in the Ochoco-Malheur Zone (which includes the Beulah and Malheur River WMUs) for the years 1999 through 2001 (post-season ratios reflect the previous biological year herd composition). Recent bull and calf ratios for 2002-2004 herd composition surveys, which are conducted in March each year, are consistent with ratios calculated for 1999-2001 and WMU MOs (J. Hurtado, ODFW Assistant Staff Biologist, pers. comm.).

Table 5: ODFW Elk Survey Results for WMUs in the Ochoco-Malheur Zone, 1999-2001 (Including Beulah and Malheur River; from ODFW 2001).

		Elk Classified in 2001				Bulls Per 100 Cows					Calves Per 100 Cows			
Unit	Watershed District	Bulls	Cows	Calves	Total	2001	2000	1999	P3Yr	MO	2001	2000	1999	P3Yr
Northside	John Day	133	896	280	1309	15	11	7	11	10	31	44	33	36
Murderers Cr.	John Day	164	742	213	1119	22	15	21	19	15	29	35	34	33
Beulah	Malheur	62	261	59	382	24	17	17	19	15	23	31	31	28
Malheur River	Malheur	67	444	142	653	15	14	16	15	16	32	49	50	43
Silves	Malheur	109	652	249	1010	17	20	19	19	16	38	52	47	46
Ochoco	Deschutes	216	1217	536	1969	18	14	19	19	20	44	46	53	48
Grizzly	Deschutes	21	49	17	87	43	22	31	31	15	35	52	84	57
Maury	Deschutes	43	292	145	490	15	23	19	19	20	50	52	36	51
Ochoco/Malheur	Zone	815	4553	1641	7005	18	16	17	17	-	44	44	42	41

Summer elk forage consists of a combination of lush forbs, grasses, and shrubs high in nutrients that are easily digestible. Generally, higher elevation wet meadows, springs, and riparian areas in close proximity to forested stands offer these conditions for the longest period. Such areas provide nutritious forage and moist, cool places for bedding and escaping summer heat and insects. Generally elk populations in the vicinity of the Malheur River Subbasin move from higher-elevation areas located in the northern portion of the watershed in the summer, to lower-elevation winter grounds beginning in September or October. During mild winters, elk may not move far from summer range. Elk may use intermediate areas called transition range. Transition range is typically used in the late fall or early spring as migratory elk move between summer and winter ranges. Even with Rocky Mountain elk, some reside year-round in traditional winter and transition range.

Table 6 below provides a summary of elk harvest in the Beulah and Malheur River WMUs for 2000-2002. As mentioned, elk populations in these WMUs are considered stable and healthy and hunting restrictions are managed to meet defined MOs and minimize elk damage on private and agricultural lands.

Table 6: Rocky Mountain Elk Harvest in the Beulah and Malheur River WMUs 2000-2002.

WMU/Year	# of Hunters	Hunter Days	Antlerless	Total Bulls	Total Elk	% Success
Beulah 2000	3179	17607	353	321	674	21
Beulah 2001	3334	19795	379	389	768	23
Beulah 2002	2991	18623	148	238	386	13
Malheur R. 2000	2665	16818	312	234	546	20
Malheur R. 2001	2348	15088	239	251	490	21
Malheur R. 2002	2447	15659	198	169	367	15

Source: ODFW data (J. Hurtado, ODFW Assistant Staff Biologist, pers. comm.).

Optimum elk habitat is thought to consist of a forage cover ratio of 60% forage area and 40% cover (Thomas et al.1979). Cover quality is defined in two ways; satisfactory and marginal. Satisfactory cover consists of stands of coniferous trees that are > 40 feet tall, with a canopy closure of > 70%. Marginal cover is defined as coniferous trees > 10 feet tall with a canopy closure of > 40%. Cover provides protection from weather and predators. Forage areas are all areas that do not fall into the definition of cover. Optimal elk use of forage areas occurs within 600 feet of cover areas (Reynolds 1962, Harper 1969, Hershey and Leege 1976, Pedersen and Adams 1974). Proper spacing of forage and cover areas is very important in order to maximize use of these areas by elk (Thomas et al. 1979).

Within the Malheur subbasin, the 60/40 forage to cover ratio described above is only met in the coniferous forest areas found in the northern higher-altitude portions of the watershed. However, agricultural lands and shrub-steppe habitat regions provide suitable wintering grounds. ODFW current concerns in regard to elk management in the Malheur watershed focuses on:

1) reducing elk conflicts and damage complaints in agricultural areas;

2) maintaining sufficient cover and forage on summer and winter ranges, and

3) providing a stable population that in turn provides stable hunting and viewing opportunities (W. Van Dyke, ODFW Biologist, pers. comm.).

These three issues are largely intertwined. Juniper encroachment and the general degradation of shrub-steppe habitat has resulted in a reduced shrub component and minimized available forage for elk on historic wintering grounds. This has resulted in increased herd movement into developed agricultural areas. ODFW has designated the east side of the Beulah WMU as an "elk de-emphasis zone" and has altered management to remove elk from this area.

2.1.2 Blue grouse

The blue grouse is a ground-dwelling gamebird that occurs in coniferous forests typically dominated by Douglas fir (*Pseudotsuga menziesii*) or true firs (*Abies* spp.). Within the State of Oregon the species' distribution is restricted to coniferous forest habitat types (Csuti et al. 1997). Blue grouse roost in trees and nest on the ground. Their winter diet consists of conifer needles, mainly of pine and fir. In Oregon blue grouse populations are concentrated along the Coast and

Cascade Mountain Ranges and in coniferous habitat found in the northeastern parts of the State. The blue grouse was chosen as one of three focal species associated with mixed conifer forest in the Malheur Subbasin. Species occurrence within the Subbasin is limited to those areas in the northern portion of the watershed where coniferous habitat exists.

Although the blue grouse holds no formal State or Federal protected status in Oregon, the species is managed by ODFW as a harvestable upland gamebird species. Harvest limits reflect the fact that ODFW considers blue grouse populations throughout Eastern Oregon to be stable and healthy. The 2004 hunting season for blue grouse in the Malheur Subbasin and throughout Eastern Oregon extends from September 1 through November 28. The daily bag limit is 3 blue grouse per hunter and the possession limit is 6 blue grouse per hunter (ODFW 2003b).

Blue grouse population trends for Eastern Oregon as determined from ODFW survey and harvest data indicate generally stable numbers (W. Van Dyke, ODFW Biologist, pers. comm.).

Table 7: ODFW Blue Grouse Population Trends for Eastern Oregon.

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Birds / 10 miles	7.2	5.2	3.3	1.6	4	3.3	5.8	6.4	7.1	5.8	11.1	13.6
Chicks/Adult	0.9	0.6	0.4	1.6	1.4	0.6	1	1	2	1.2	0.9	2

Source: ODFW unpublished data.

Generally stable numbers of blue grouse in the coniferous forest habitat of the Malheur Subbasin and throughout Eastern Oregon are reflected in the ODFW harvest statistics for blue grouse (Table 8). Again, there are year-to-year exceptions to these trends depending upon grouse hatching success. However, in absence of hunting, grouse population numbers are not likely to drastically increase (W. Van Dyke, ODFW Biologist, pers. comm.). There is a high "turnover" rate with grouse (i.e., high adult mortality and high juvenile recruitment) with up to 70% of individuals "replaced" generation to generation (W. Van Dyke, ODFW Biologist, pers. comm.). Grouse abundance and densities in suitable coniferous habitat in the Malheur Subbasin are likely to remain near current levels as harvest is not currently thought to influence watershed blue grouse populations. Loss of coniferous forest to wildfire is probably the greatest threat, since the birds must have needles of conifers available as winter food.

Table 8: ODFW Blue Grouse Harvest Statistics for Eastern Oregon.

Year	Hunters	Harvest
1980	10,620	21,439
1981	10,506	24,862
1982	8,781	16,413
1983	9,063	18,365
1984	No survey	No survey
1985	9,363	22,174
1986	5,816	14,249
1987	6,927	23,136
1988	6,201	13,518

Year	Hunters	Harvest
1989	No survey	No survey
1990	7,571	20,346
1991	5,460	11,373
1992	6,615	15,492
1993	4,995	7,721
1994	6,850	11,890
1995	5,957	11,557
1996	4,765	17,531

Source: ODFW unpublished data.

2.1.3 Sage grouse

The sage grouse is an upland gamebird species that is associated with sagebrush habitat. It is one of four focal species chosen for the subbasin to provide an indication of the health and functioning of shrub-steppe habitat within the Malheur watershed. The USFWS was recently petitioned to list the sage grouse as a Threatened or Endangered subspecies because regional populations of sage grouse are experiencing notable declines. On January 5, 2004 the USFWS determined that divided listings for subspecies and regional populations were "without merit" based upon a lack of genetic and population evidence defining these smaller species groups as Distinct Population Segments eligible for species listing. In a recent news release dated April 15, 2004, the Service announced its completion of evaluating three petitions to list the greater sage grouse range-wide as either threatened or endangered. The Service has determined that the petitions and other available information provide substantial biological information indicating that further review of the status of the species is warranted. This status review will determine whether the greater sage grouse warrants listing as a threatened or endangered species.

Sage-grouse populations are known to be migratory or non-migratory (resident) (Beck 1975, Berry and Eng 1985, Connelly et al.1988, and Wakkinen 1990), depending upon location and associated landform. Where topographic relief exists, sage grouse often move to higher elevations from spring through fall as snow melts and plant growth advances (Interagency Sage Grouse Planning Team 2000). Non-migratory populations may spend the entire year within an area of 100 square kilometers or less in size. In migratory populations, seasonal movements may exceed 75 km, and home ranges may exceed 1,500 square kilometers (Interagency Sage Grouse Planning Team 2000). There may be two or more seasonal ranges in such cases. For example, there may be a breeding range, a brood-rearing range, and a winter range, indicating that migratory sage-grouse populations depend on large expanses of habitat.

Sage grouse breed on sites called leks (strutting grounds). The same lek sites tend to be used year after year (Interagency Sage Grouse Planning Team 2000). They are established in open areas surrounded by sagebrush, which is used for escape and protection from predators (Gill 1965, Patterson 1952). Examples of lek sites include landing strips; old lake beds or playas; low sagebrush flats; openings on ridges; roads; crop land; and burned areas (Connelly et al. 1981, Gates 1985). As grouse populations decline, the number of males attending leks may decline or the use of some leks may be discontinued. Likewise, as populations increase, male attendance on leks increases, new leks may be established, or old leks may be reoccupied. Annual counts of males on leks are used to assess population trends.

In general, sage grouse populations remain stable in the basin where suitable habitat exists. As the shrub component of the species preferred habitat decreases, the likelihood of abandonment of habitat and even historic lek sites increases. Shrubby vegetation, especially big sagebrush, is necessary to provide cover for species flocks and without this important habitat requirement sage grouse occurrence in the watershed may decline. Sagebrush leaves make up the bulk of the annual diet of sage grouse. Populations in the basin have remained stable where suitable habitat exists but the amount of suitable habitat has been declining for the last 30 years due to juniper encroachment and wildfire. Sage grouse are longer lived than most species of upland game bird and therefore hunting must be limited to protect the population overall (W. Van Dyke, ODFW Biologist, pers. comm.).

Figure 2 (below) showing the current and historic distribution of sage grouse throughout the species range was taken from *Greater Sage Grouse and Sagebrush-Steppe Ecosystems, Management Guidelines* (Interagency Sage Grouse Planning Team 2000). This report was developed by the Interagency Sage Grouse Planning Team, which includes the BLM, USFWS, USFS, ODFW and the Oregon department of State Lands. The management guidelines and supporting background information provided in the report are intended to promote the conservation of greater sage grouse and their sagebrush habitats on Oregon and Washington public lands administered by the BLM. Figure 2 reveals the extreme decline in sage grouse range in throughout North America. While these population declines range wide are notable, declines in sage grouse population in the vicinity of the Malheur subbasin are not as notable.

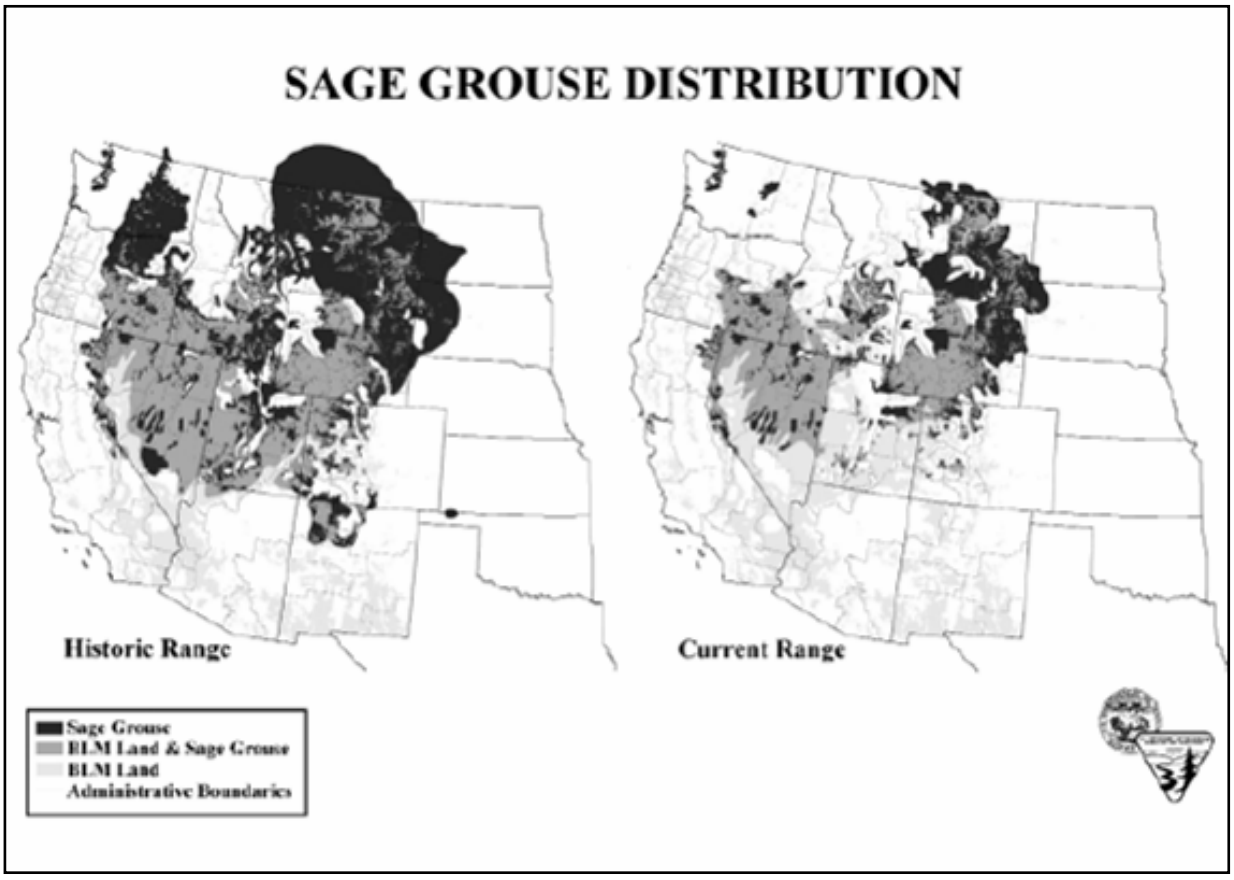

Figure 2: Current and Historic Sage Grouse Range in North America, from Greater Sage Grouse and Sagebrush-Steppe Ecosystems, Management Guidelines (Interagency Sage Grouse Planning Team 2000).

Figure 3 shows the trend in sage grouse population change from 1966 through 1996 based on North American Breeding Bird Survey (BBS) detection data (For a discussion of the limits of BBS data, see Section 2.2). Although sage grouse have experienced precipitous declines on average across the species range, Figure 3 shows that populations may be increasing regionally in Southeastern Oregon. In the specific vicinity of the Malheur watershed, however, it is difficult to determine the exact trend toward sage grouse population change.

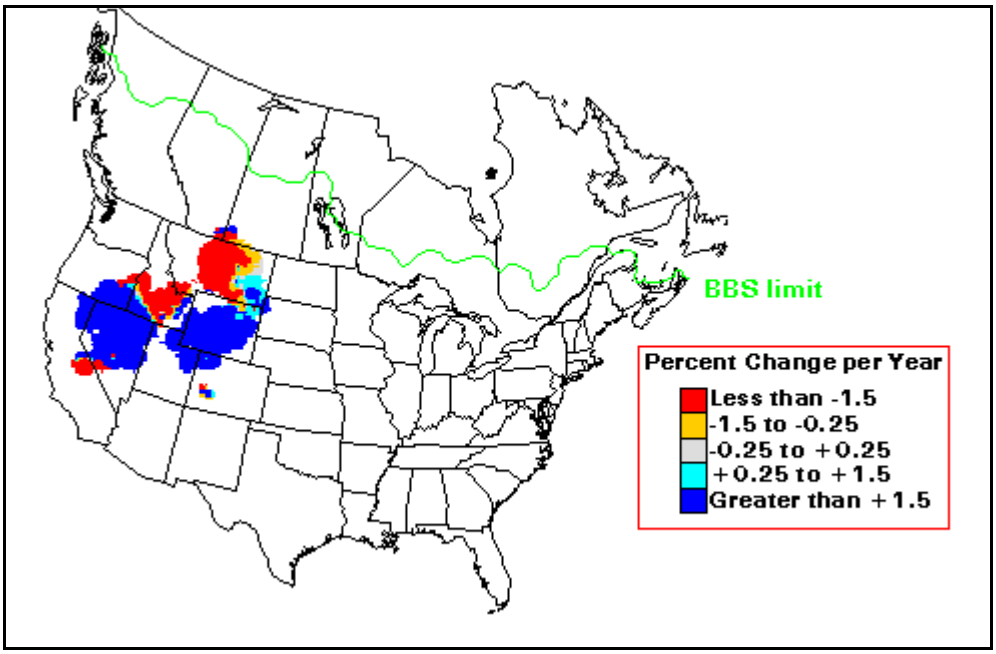

Figure 3: Sage grouse BBS trend map, 1966 – 1996.

2.1.4 Pronghorn

The pronghorn is an ungulate species that is unique to North America. Although often called "antelope", the species has no living relatives in the old world (unlike deer and elk), and pronghorn are not related to true antelope of Africa and Asia (ODFW 2001). This wide-ranging herd species is typically associated with arid sagebrush habitat and open rangeland, and occurs throughout eastern Oregon and the Great Plains of North America. Pronghorn are game species managed by ODFW and species populations hold no formal State or Federal protected status in Oregon (ONHP 2003). Pronghorn was chosen as one of four subbasin focal species providing an indication of the health and functioning of shrub-steppe habitat within the Malheur watershed.

The Oregon Gap Analysis Program is currently managed by the Oregon Natural Heritage Program in cooperation with ODFW, Oregon State University, EPA, Defenders of Wildlife, the Nature Conservancy, USFWS, and USGS (Kagan et al. 1999, Scott et al. 1993). Gap analysis and scientific modeling was used to produce a map of the current and historic distribution of pronghorn habitat in Oregon (Figure 4 and Figure 5). Although this is useful as habitat information, it is based on potential habitat for pronghorn and not on actual population distribution patterns.

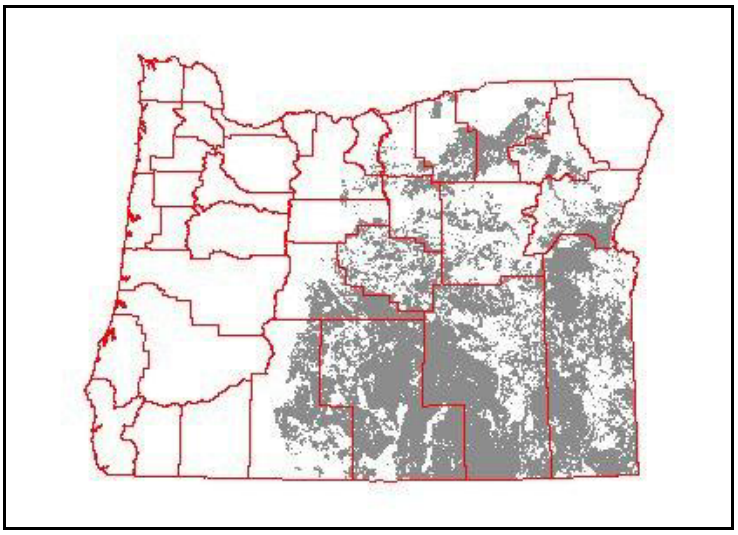

Figure 4: Current Distribution of Pronghorn Habitat in Oregon from Gap Analysis (ONHP Website 2004).

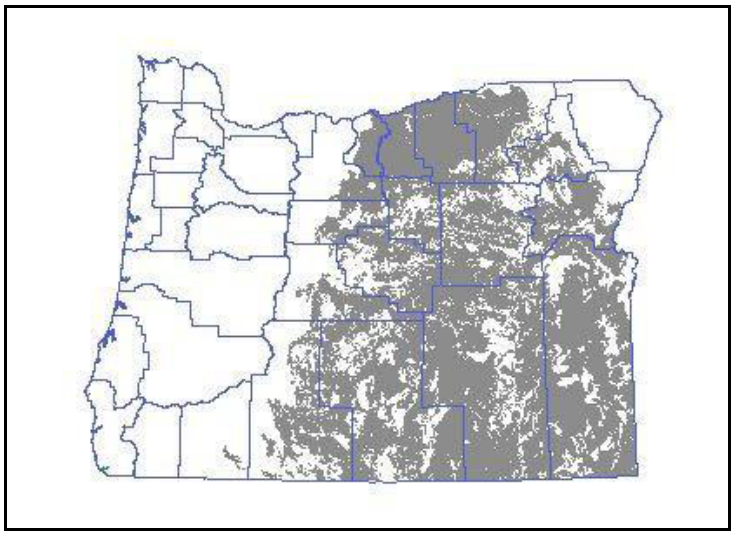

Figure 5: Historic Distribution of Pronghorn Habitat in Oregon from Gap Analysis (ONHP Website 2004).

Comparison of Figure 4 and Figure 5 reveals a general decline in pronghorn habitat throughout Oregon. However, in Eastern Oregon and the vicinity of the Malheur, declines in pronghorn distribution are notably minimal and are consistent with patterns of habitat loss and development. Within the Malheur watershed in specific, Gap Analysis shows a change in distribution of pronghorn habitat away from developed areas in the eastern portion of the subbasin, concentrating populations in remaining suitable shrub-steppe habitat and open rangeland. As with other ungulate species of the subbasin, in recent years this has resulted in increased conflicts between pronghorn and private landowners in agricultural areas (see below).

Pronghorn are ODFW-managed game species, although there exist no formal MOs for populations within subbasin WMUs. ODFW district biologists for the Beulah and Malheur River management units report recent pronghorn population estimates of approximately 1000 and 3000 individuals respectively (W. Van Dyke, ODFW Biologist, pers. comm.). Pronghorn are known to have large home ranges (10 to 20 square kilometers; Csuti et al. 1997) and may exhibit large herd movements in response to seasonal availability of forage or snow accumulation.

ODFW allows restricted controlled hunts for pronghorn in both the Beulah and Malheur River WMUs. In both units, tags issued for the controlled hunts are limited and are awarded through public drawing (ODFW 2004). The 2004 Beulah WMU controlled hunt is scheduled for August 14 through August 22. In the Malheur River WMU, two pronghorn controlled hunts are scheduled: August 14 through 22; and, August 25th through September 2nd. In the Beulah unit, hunters with tags are allowed one pronghorn of either sex. In the Malheur River unit, the pronghorn bag limit is one buck. In 2003, 103 tags were issued fro the Beulah WMU and a total of 208 tags were issued for the Malheur River unit (ODFW 2004). Accounting for hunter success, which runs around 70%, total pronghorn harvest over the past five years between combining Beulah and Malheur River WMU estimates ranges between approximately 170 and 220 head.

ODFW reports similar issues of habitat loss and degradation affecting pronghorn populations within the Malheur subbasin as described for sage grouse in regard to other herd ungulates. Pronghorn herds require large areas with suitable shrub and grass/herb forage over which to range. Shrub-steppe habitat degradation in the subbasin – and, specifically, decline in the habitat shrub component – has, in recent years, forced pronghorn wintering herds into areas where conflicts with land owners are common. This trend is likely to continue to the extent that loss and degradation of suitable habitat and available forage continues in the Malheur watershed. Loss and degradation of habitat in the Malheur Subbasin is attributed to juniper encroachment, and wildfire in shrub-steppe, which results in cheatgrass and other weed invasions. These changes in suitable habitat have increased pronghorn use of irrigated alfalfa fields for forage in the summer and during tough winters, causing conflicts between agricultural and wildlife use.

2.1.5 California bighorn sheep

Historically, 2 subspecies of bighorn sheep (*Ovis canadensis*) occurred in Oregon. The Rocky Mountain subspecies (*O. c. canadensis*) ranged through the northeastern corner of the State from the John Day-Burnt River divide, north and east to the Snake River and the Oregon-Washington state line. The California subspecies (*O. c. californiana*) occurred in Southeast and South-central Oregon and throughout much of the John Day and Deschutes River drainages (ODFW 2001). Settlement of the west resulted in over hunting, changes in land use, introduction of livestock and associated diseases, which negatively impacted native bighorn populations, and bighorn were completely extirpated from Oregon by 1945 (ODFW 2003). The species is included as a Malheur subbasin focal species in association with rugged shrub-steppe canyon and mountain habitat in the watershed.

Re-introduction and re-establishment of bighorn sheep herds has been successfully accomplished in various suitable locations throughout Oregon. This includes a herd of California bighorn sheep, which were introduced in the rugged terrain of the subbasin existing north of Riverside

and south of Juntura. In 1987 and 1988 approximately 17 individuals were introduced in the area near riverside (Figure 6). Although little is known about the specific historic distribution of bighorn sheep in this area, re-introduction was initiated because of the perceived suitability of habitat in the localized region (R. Garner, ODFW Biologist, pers. comm.). Historically, bighorn sheep were found on Ironside Mountain. An old herd from Red's Creek probably ranged over a large part of the Malheur Basin (W. Van Dyke, ODFW Biologist, pers. comm.).

Bighorn sheep live among the rocky slopes of mountain and canyon terrain. Within the Malheur subbasin, the bighorn sheep herd is confined to the lower end of the species' elevational range (Black Butte elevation is 5,513 feet), but general movement to lower elevations during the winter is still common. The sheep are unable to paw through thick snow to access vegetation, and thus typically follow the development of suitable forage plants to higher elevations as they begin to grow in the spring. In the summer and in arid desert areas, if it becomes too hot or water holes are severely depleted, bighorn sheep will rest in the daytime shade and resume their feeding at night to conserve water, even though they are ordinarily diurnal animals (Wehausen, 2002).

Bighorn sheep are extremely agile on precipitous slopes, and use these areas for lambing, bedding, mating, and escaping predators (Monson, 1980). The more open areas used for feeding are only considered safe if flanked by steep rocky cliffs. The bighorn sheep's muscular bodies and hard hooves allow deft maneuvering on these steep mountains, and they are known to race up the hillside at 15 miles per hour, jumping 20 feet across deep crevices, and using footholds of only 2 inches wide (Blood, 2000). Such agility allows bighorn sheep to outrun their predators which have less-sure footing.

The current population of California bighorn sheep in the Malheur subbasin has expanded from the small, introduced herd to a current estimate of approximately 100 individuals. California bighorn sheep are a Federal Species of Concern and an Oregon Natural Heritage Program List 4 species, indicating taxa that are "of conservation concern but are not currently threatened or endangered" (ONHP 2001). Within the Malheur subbasin, ODFW allows an extremely restricted hunt of the Riverside herd. Over the past 5 years, bighorn sheep harvest has been limited to one individual per year. The herd is surveyed at least once a year by ODFW and it is thought that the population is thriving and will continue to grow within the limits of the suitable habitat available in the watershed (Figure 6).

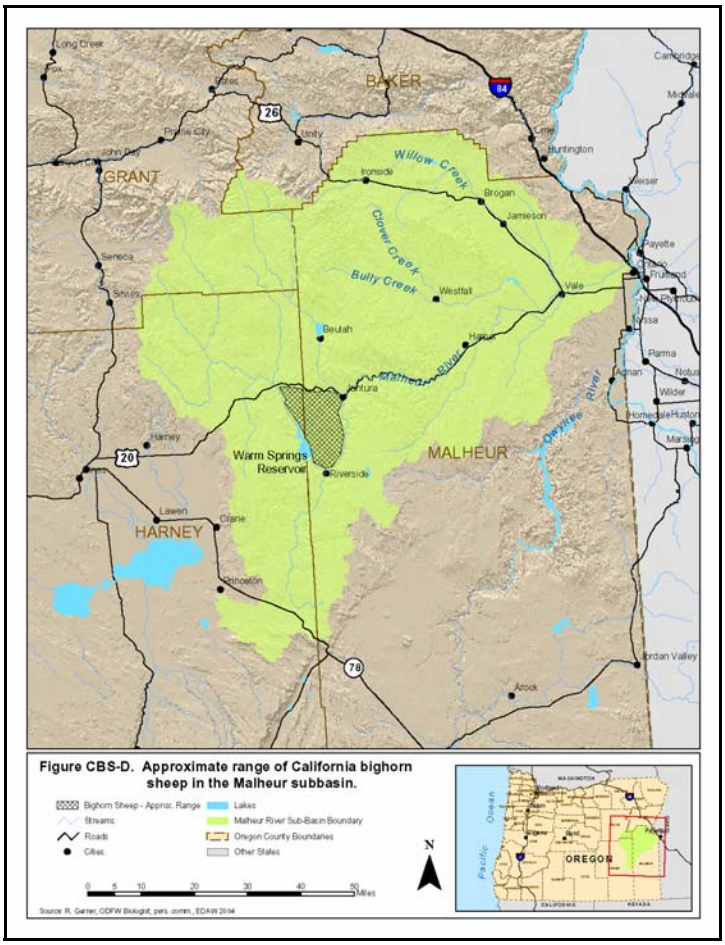

Figure 6: Approximate Range of California Bighorn Sheep in Malheur Subbasin.

Juniper encroachment into suitable habitat is a problem for the riverside herd. Re-introduction efforts into remaining suitable habitat in the subbasin is limited by domestic sheep which carry the *Pasturella* bacteria. Up to 80% of the bighorn sheep herd is killed when infected with this bacteria. Subsequent lamb survival is poor for the following three to five years. Suitable bighorn habitat remains today in Cottonwood Creek (south of Harper), along the mainstem of the Malheur River, and in lower Black Canyon, Hog Creek, and Calf Creek areas. ODFW will not re-introduce bighorn into these areas because of domestic sheep allotments and operations (W. Van Dyke, ODFW Biologist, pers. comm.).

2.1.6 Mule deer

The Rocky Mountain mule deer (*Odocoileus hemionus hemionus*) is native to Eastern Oregon and the largest member of the genus found in Oregon (ODFW 2001). Historically, populations in Oregon have fluctuated. Explorers in the early 1800s reported a scarcity of big game, and then 20 years later, gold miners reporting abundant deer herds. This century has seen similar fluctuations in the State of Oregon. Scientific studies of the 1930s reported that between 1926 and 1933 Oregon's mule deer population ranged from 39,000 to 75,000 animals (ODFW 2001). The estimated population in 1996 was 260,700, which was 18 percent below the established

statewide management objective of 317,400 mule deer. Mule deer populations have been generally declining throughout western North America during the last several years (ODFW 2001).

Female mule deer generally breed as yearlings (18 months old) and adult does typically produce twins each year when sufficient habitat is available. In Oregon, fawns are born in mid-May to early June, approximately 7 months after breeding. Fawn survival to breeding age largely determines the growth or decline of mule deer populations. Major factors contributing to mortality include nutrition, weather, habitat quality, predation, and accidents (ODFW 2001).

Mule deer occupy a wide range of habitat types: from desert shrub-steppe to coniferous and deciduous woodlands. In general, however, mule deer occupy more open, rugged areas. Although mule deer commonly are considered to be "browsers", they consume a wide variety of plant materials and in some seasons graze extensively (ODFW 2001). During summer, deer are scattered over much of eastern Oregon. Winter weather forces deer to migrate to lower elevations. Winter is a critical period of life for mule deer when they rely on occasional browsing of shrubs and trees for survival. Sagebrush, bitterbrush, rabbit-brush, juniper, and mountain-mahogany, are among those species typically browsed (ODFW 2001). In the most productive winter ranges of Central and Southeastern Oregon, favorite shrubs such as bitterbrush and mountain mahogany stand above the snow, in typical years, providing winter food and shelter. The importance of mountain mahogany as forage for mule deer compelled inclusion of the mule deer as a Malheur Subbasin focal species associated with mountain mahogany habitats.

Mule deer populations throughout the Malheur subbasin are experiencing notable declines (W. Van Dyke, ODFW Biologist, pers. comm.). The population size MO for mule deer within the Beulah WMU is established at 13,700 individuals. This MO had been nearly met up until 1999 when the Beulah WMU mule deer herd size was estimated at around 13,000 individuals. Since 1996 the Beulah WMU herd has suffered steady declines and is currently estimated at around 10,000 deer.

The Malheur River WMU mule deer population has experienced trends similar to that of the Beulah WMU herd. The population size MO for mule deer in the Malheur River WMU, like that of the Beulah WMU, is established at 13,700 individuals. The Malheur River herd was estimated at over 11,000 deer through around the mid 1990s, and then the population began to decrease (R. Garner, ODFW Biologist, pers. comm.). The current size of the Malheur River WMU mule deer herd is approximately 10,700 individuals, 78% of the desired population MO (R. Garner, ODFW Biologist, pers. comm.).

Combining current population estimates for the Beulah and Malheur River WMUs, the approximate size of the mule deer herd in the Malheur subbasin is 20,700 individuals. Combined population size MOs for these two WMUs indicates that ODFW has determined that the subbasin should support a minimum of 27,400 deer. These estimates indicate that the population of mule deer occurring in the Malheur River subbasin currently exists at about 25% under ODFW population size MOs.

Table 9 below provides harvest statistics on mule deer for the Beulah and Malheur River WMUs. Decreases in the percent success experienced by hunters in these WMUs reflect declining mule deer populations.

Table 9: Rocky Mountain Mule Deer Harvest in the Beulah and Malheur River WMUs 2000-2002.

WMU/Year	# of Hunters	Hunter Days	Antlerless	Total Buck	Total Deer	% Success
Beulah 2000	2761	13777	311	1199	1510	55
Beulah 2001	3230	16157	475	1376	1851	57
Beulah 2002	3174	17197	395	1149	1544	49
Malheur R. 2000	2374	15218	25	1016	1041	44
Malheur R. 2001	2496	13145	22	1090	1112	45
Malheur R. 2002	2639	17236	8	896	904	34

Source: ODFW unpublished data.

Noted declines in mule deer populations within the Malheur Subbasin result from a combination of factors. First, mule deer predation by cougars and coyote in the vicinity of the Malheur Subbasin is thought to be at record high levels (W. Van Dyke, ODFW Biologist, pers. comm.). Cougars are known to take all age classes of mule deer, while coyote predation is principally focused on fawns and weakened individuals within a herd. Such predation pressure has, in recent years, resulted in both low fawn/adult ratios and decreased adult survival (W. Van Dyke, ODFW Biologist, pers. comm.).

The second, and most robust, factor influencing declines in mule deer populations within the Malheur Subbasin, is the degradation of shrub-steppe habitat – specifically, the reduction in available mountain mahogany and other shrub species. A habitat requirement and key environmental correlate for Malheur Subbasin populations of mule deer is the presence of shrub forage species in shrub-steppe winter habitat. A combination of influences including fire suppression and range use patterns has resulted in the encroachment of juniper into shrub-steppe habitat. Juniper, with its extensive hydrological demands and ability to withstand altered fire regimes, out-competes native shrub species including mountain mahogany and bitterbrush. Such shrub species are a necessary component in mule deer winter and transitional habitat in that they provide forage for deer above deep snow cover. Without these important shrubby forage species, winter habitat in the Malheur Subbasin cannot maintain historic mule deer populations. Low elevation wildfire in the Subbasin has converted shrub-steppe understories to cheatgrass, which inhibits rehabilitation efforts in these areas. Another significant problem is the lack of reproduction by bitterbrush and mountain mahogany, probably due to grazing pressure by domestic cattle (W. Van Dyke, ODFW Biologist, pers. comm.).

2.1.7 California quail

The California quail is an upland game bird species managed for recreational harvest by ODFW. The original habitat of native California quail populations in Oregon was likely lower valleys, oak woodlands, chaparral and native grassland with scattered brushy areas (Csuti et al. 1997). However, the species has been found to be highly adaptive and now inhabits developed rural environments and agricultural regions throughout Oregon (Csuti et al. 1997). The California quail was chosen as a focal species for the Malheur Subbasin as a terrestrial species representative of urban areas, agriculture, pastures and mixed environs.

Breeding Bird Survey inventory data suggest that, on average, California quail abundance is declining throughout the State of Oregon. The data indicates that between 4 and 6 California quail were typically detected during BBS inventories conducted in 1968, whereas more recent State detection averages are between 2 and 4 detections per survey. However, in the vicinity of the Malheur Subbasin, California quail abundance and densities are thought to be at record high levels (W. Van Dyke, ODFW Biologist, pers. comm.).

Figure 7 below shows the average trend in California quail BBS inventory detections by region across the contiguous U.S. (For a discussion of the limits of BBS data, see Section 2.2). Although statewide California quail population may be decreasing, Figure 7 shows a distinct increase in California quail populations occurring in the Malheur Subbasin vicinity over time.

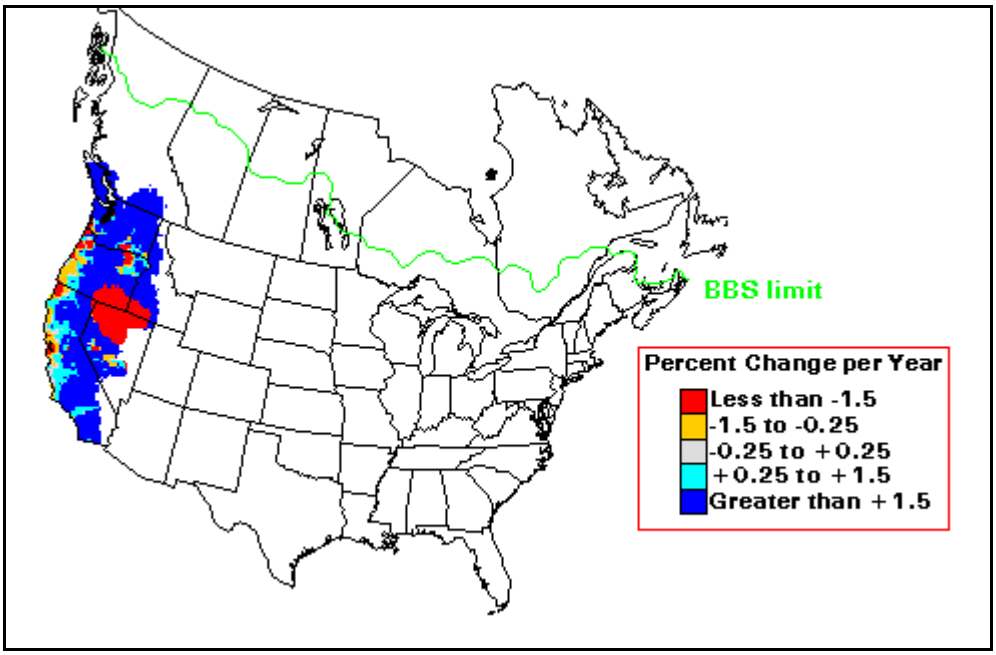

Figure 7: California Quail BBS Trend Map, 1966 – 1996.

ODFW monitors California quail populations through field surveys and collection of harvest data. Density estimates for the species calculated by ODFW for 1990 through 2001 (Table 10 below) emphasize that California quail are currently occurring in Eastern Oregon in record numbers. This extreme abundance likely reflects the ability of the species to adapt to developing habitat conditions in eastern Oregon. Conversion of native habitat for agriculture has resulted in

increased California quail populations throughout the developed and agricultural regions of the Malheur Subbasin and Eastern Oregon.

Table 10: ODFW California quail density estimates for Eastern Oregon.

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Birds / 10 miles	14.4	9.8	11.1	6.3	14.6	8.2	16.5	13.5	18.7	19.2	18	20.8
Chicks/Adult	1.9	1.6	2	2.3	2.8	1.8	3	3	1.9	1.8	2.4	2.4

ODFW harvest data for California quail also reflect a general trend toward increasing species density. As noted with other abundant upland game bird species (e.g., blue grouse, etc.) fewer and fewer hunters are successfully harvesting more California quail (W. Van Dyke, ODFW Biologist, pers. comm.). The 2004 hunting season for California quail in the vicinity of the Malheur River Subbasin runs from October 11, 2003 through January 31, 2004. Each hunter is allowed a 10-bird bag limit and 20-bird possession limit for the species (ODFW 2003b).

2.2 Unmanaged Species

For the purpose of this Subbasin plan, unmanaged terrestrial focal species include those species *not* managed by ODFW for sustainable harvest. However, this does not necessarily preclude species monitoring and management by local, State or Federal resource agencies. Many of the species described below – especially those with formal State or Federal protective status – are monitored by local, State or Federal agencies and/or environmental, recreational and special interest groups. For such species, there are often available data of local or regional species distribution and abundance. In absence of such supplemental data, estimates of population distribution and abundance within the Malheur Subbasin are based upon the availability of suitable habitat in the Malheur watershed.

North American Breeding Bird Survey (BBS) data is referenced in many places in this section. The North American Breeding Bird Survey (BBS) is coordinated by the USGS and Canadian Wildlife Service. It is a primary source of population trend and distribution information for most species of North American birds. The survey unit is a roadside route of 39.4 km (24.5 miles) long. An observer surveys the route once each year during the peak of the breeding season for that region. The observer stops at 0.8 km (0.5 mile) intervals, and records all birds seen or heard within a 0.4 km radius circle of each stop during a 3-min sampling period. The starting point and direction of each route is randomly located within a degree block of latitude and longitude. Overall sampling efficiency of the BBS was evaluated and determined that trend analysis is limited for bird species with the following attributes: 1) not sampled by the BBS, 2) small sample-size, 3) highly variable, or 4) low relative abundance. Possession of one of these attributes does not necessarily eliminate the species from trend analyses. These species can be well surveyed by the BBS within portions of their breeding range or during certain time periods. However, long-term regional or survey-wide trend estimates for these species may be less accurate (http://www.mbr-pwrc.usgs.gov/bbs/introbbs.html).

Other BBS biases include:

1) Proportion of range in the survey area- Data is limited to survey routes. Analysis of survey data cannot tell us the proportion of the individuals of a species that is breeding outside the range of the survey. Species that are recorded only on the margins of the surveyed area are often of low sample size or are highly variable, but many species (e.g., Canada Goose) may have substantial populations within the survey area. Trends are always specific to the areas surveyed.

2) Roadside biases-The BBS is a roadside survey, and a major criticism of the survey has been that habitat changes along roadsides may not be representative of regional habitat changes. Trends from the BBS may therefore reflect only populations along roads rather than regional bird population changes.

3) Habitat biases-Within the range of the BBS, many habitats are not well covered, and species that specialize in those habitats are poorly sampled. Wetland birds and species occupying alpine tundra habitats are examples of groups that are thought to be poorly represented in the survey (http://www.mbr-pwrc.usgs.gov/bbs/introbbs.html).

2.2.1 Pileated Woodpecker

The pileated woodpecker is the largest (18 inches) North American woodpecker (Csuti et al. 1997). The species ranges throughout the forests of the eastern U.S. and Canada and occurs throughout the Pacific Northwest south to central California (National Geographic 1999). In western North America, species occurrence is limited by the presence of forest habitats with large trees – especially snags – available for nesting and foraging (Csuti et al. 1997). Given these specific habitat requirements, pileated woodpeckers are only likely to occur in the Malheur Subbasin in the northern coniferous forests existing in the watershed.

The pileated woodpecker holds no formal State or Federal protective status in Oregon, and no specific studies on the distribution and abundance of pileated woodpeckers have been conducted in the Malheur Subbasin. Data on pileated woodpecker occurrence in eastern Oregon is largely limited to Breeding Bird Survey (BBS) and Christmas Bird Count (CBC) survey data. Figure 8 shows the average count of pileated woodpeckers recorded during BBS inventories.

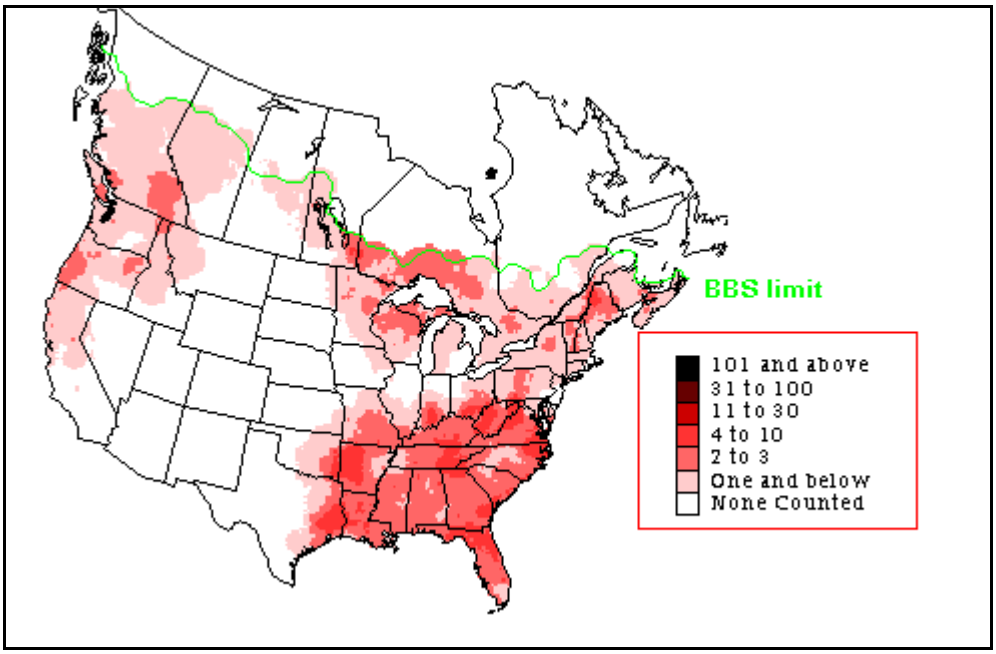

Figure 8: Pileated Woodpecker Summer Distribution Map Based Upon BBS Average Detection Data, 1982-1996.

As anticipated, BBS data on pileated woodpecker occurrence is largely consistent with the availability of suitable forest habitat. Although pileated woodpeckers may forage in open areas, the species typically requires established forests over 70 years of age for suitable nesting habitat (Csuti et al. 1997). Figure 8 indicates that pileated woodpecker typically occur only in the northern portions of Eastern Oregon – including the national forest in the northwestern region of the Malheur watershed – where these specific habitat requirements are met.

Pileated woodpeckers forage over large home ranges of over 1,000 acres that they attend throughout the year (Csuti et al. 1997). The species exhibits only small-scale seasonal movements and can be found in suitable forest habitat throughout the year. Thus, CBC survey data for pileated woodpeckers (Figure 9) is largely consistent with BBS data.

BBS inventory data for Oregon suggests a slight, gradual statewide increase in pileated woodpecker populations. Pileated woodpeckers need large snags for nesting and a variety of snags and dead and down logs for foraging. These needs could lead to conflict in forest management practices where a reduction of fuels leads to a reduction of foraging habitat.

Figure 10 below, shows trends in pileated woodpecker populations indicated by average BBS species detections, suggests pileated woodpecker populations have increased notably in the forested habitat of Northeastern Oregon. This suggested increase in species abundance may be attributed to the aging of regional forests to include trees and snags of suitable size for the cavity nester. Within the Malheur Subbasin, conifer recruitment and the encroachment of coniferous forest south into areas previously dominated by shrub-steppe habitat may also contribute to increasing trends in pileated woodpecker species abundance.

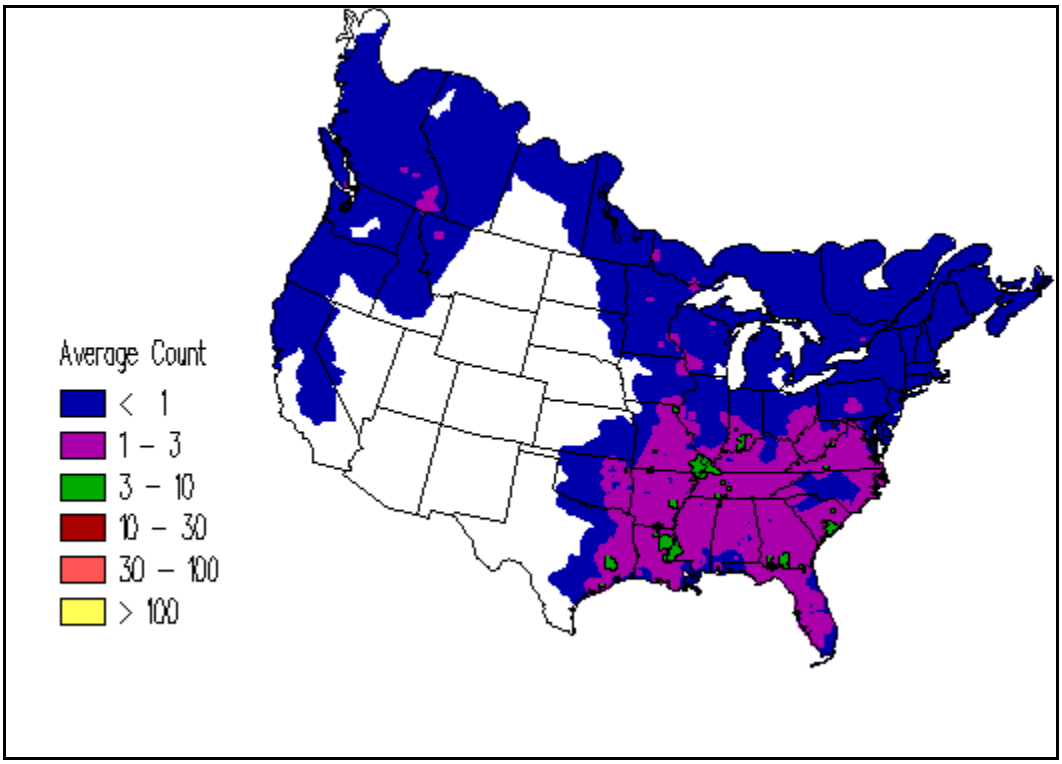

Figure 9: Pileated Woodpecker Winter Distribution Based Upon Average CBC Detection Data.

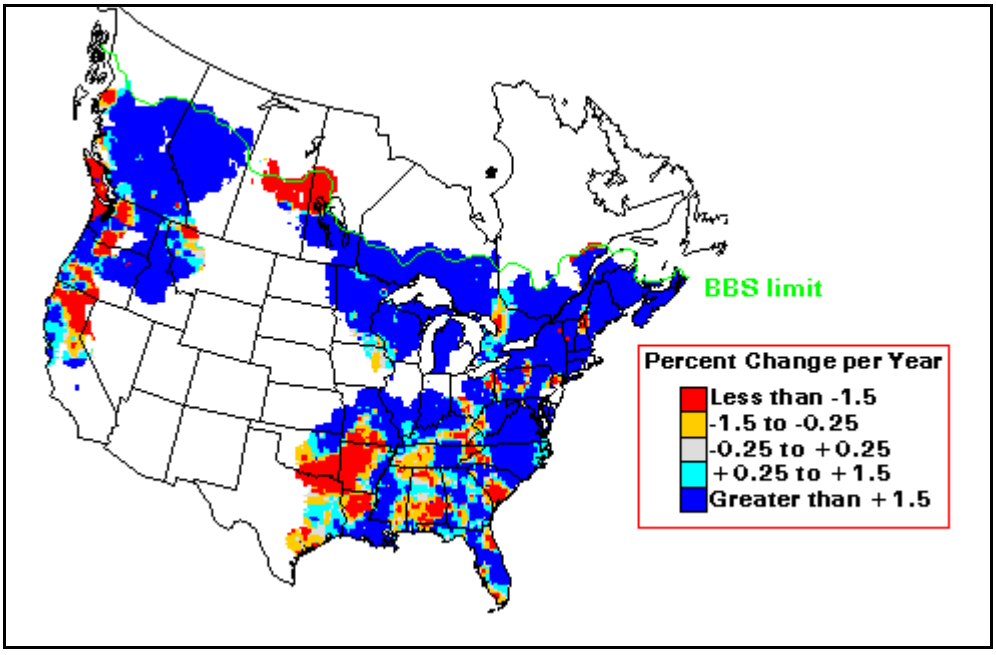

Figure 10: Pileated Woodpecker BBS Trend Map, 1966 - 1996.

2.2.2 Horned Lark

The horned lark is a small (7 inches) passerine bird species that typically occurs in open unvegetated or sparsely vegetated areas (Csuti et al. 1997). Horned larks breed in open areas from the Arctic tundra south through the continental U.S., and winter from southern Canada to South America (National Geographic 1999). Horned larks were chosen as a Malheur Subbasin focal species in association with shrub-steppe habitat. However, the specific and relatively unusual habitat requirements and key environmental correlates for the species likely result in a direct correlation between trends in horned lark populations and the degree of shrub-steppe habitat degradation in the Subbasin. Horned larks nest in expansive areas with little or no vegetation (Csuti et al. 1997). Increases in regional populations throughout Oregon have been attributed to agricultural development and, specifically, the conversion of sagebrush and shrub-steppe habitat to non-native annual grassland (Csuti et al. 1997). These factors have resulted in increasing horned lark populations in the Malheur Subbasin as described below.

Horned larks hold no formal State or Federal protected status, and no specific studies have been conducted documenting the distribution and abundance of horned larks in the Malheur Subbasin. Data on horned lark occurrence in eastern Oregon is limited to BBS and CBC survey results. Figure 11 below shows the average distribution of horned lark BBS survey detections for the contiguous U.S.

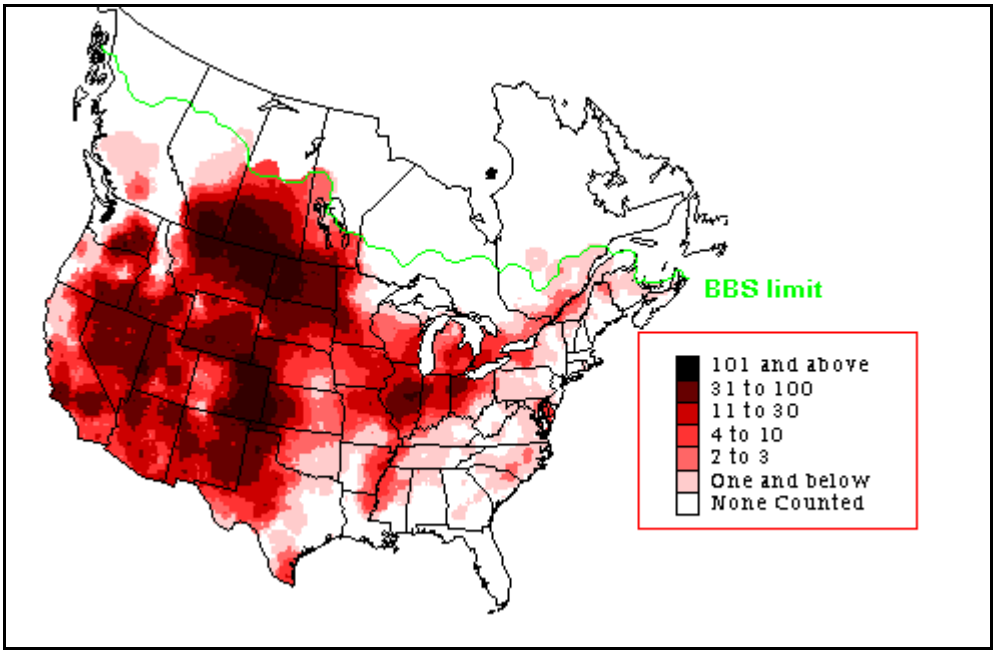

Figure 11: Horned Lark Summer Distribution Map Based upon BBS Average Detection Data, 1982-1996.

Relative to other areas of the species' range in the contiguous U.S., horned lark abundance is high in the Malheur Subbasin vicinity. This high relative abundance likely reflects the amount of suitable shrub-steppe habitat and open fields and pastures in the Subbasin.

Winter abundance of horned larks, as reflected in CBC data, is also relatively high in the vicinity of the Malheur Subbasin. Horned lark populations breeding in Oregon likely undergo only small-scale seasonal movements. However, breeding populations are supplemented by larks that breed farther north and join regional flocks in Eastern Oregon to over-winter. Figure 12 below shows the average count of horned larks recorded during winter CBC surveys in the contiguous U.S.

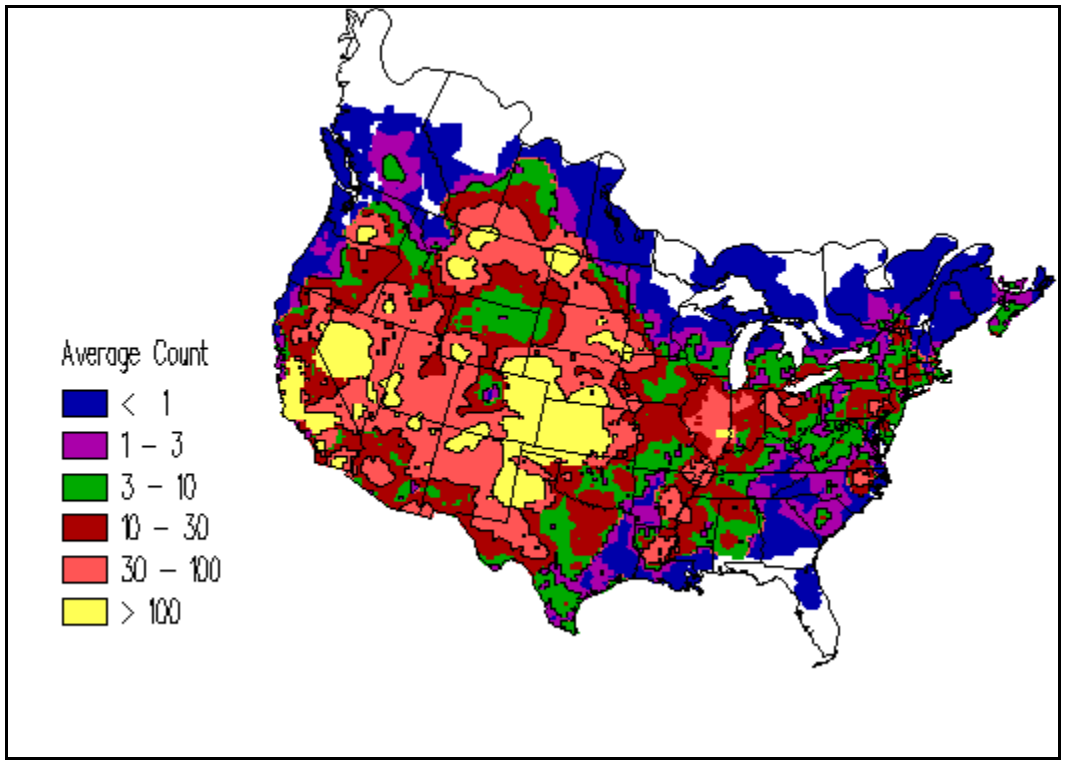

Figure 12: Horned Lark Winter Distribution Based upon Average CBC Detection Data.

Horned lark winter abundance in the vicinity of the Malheur Subbasin is consistent with species numbers recorded in suitable wintering habitat throughout the Great Plains and the interior grasslands of the U.S.

BBS data for Oregon indicate that the abundance of horned larks breeding across the State in general is decreasing. The data shows the decline in average horned lark counts recorded during BBS inventories in Oregon from 1968 through 1998. Statewide declines likely reflect habitat loss and urbanization in Oregon, especially in areas west of the Cascade Mountains.

However, Figure 13, showing trends in horned lark average BBS detections across the contiguous U.S., suggests that horned lark abundance in Eastern Oregon and, specifically, in the vicinity of the Malheur Subbasin is increasing.

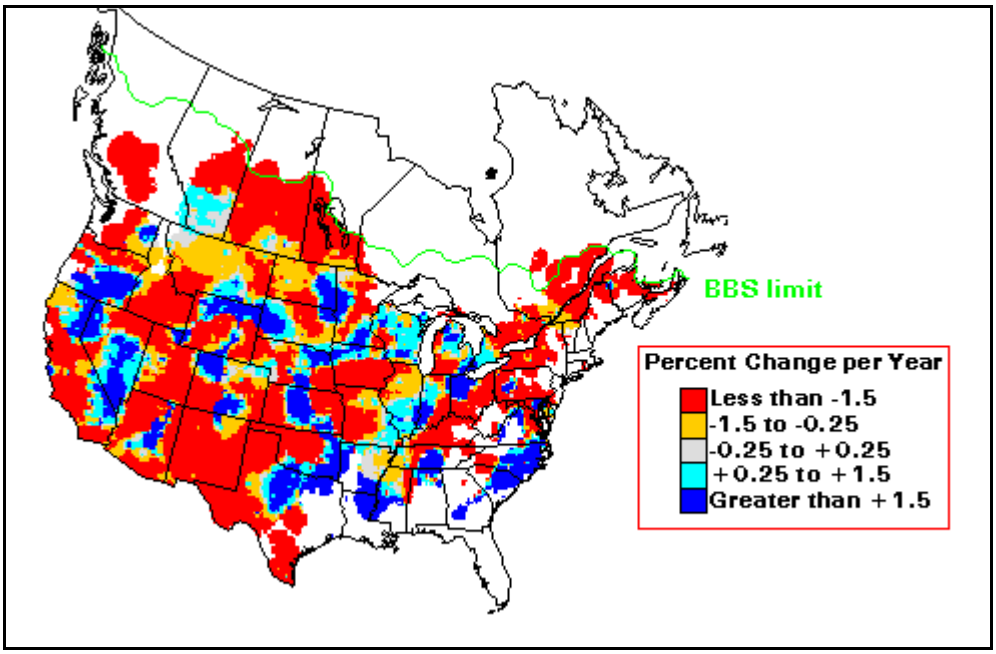

Figure 13: Horned Lark BBS Trend Map, 1966 - 1996.

These suggested increases in horned lark abundance in Eastern Oregon likely reflect the conversion of forested or vegetated areas to agriculture, and the degradation of native shrub-steppe habitat. Horned lark population increases in the vicinity of the Subbasin are likely to continue to the extent that agricultural areas are further developed and annual non-native grassland replaces habitat areas with a former shrub component.

2.2.3 Bald Eagle

The bald eagle is a large (36 inches) bird of prey typically associated with coasts, rivers, lakes, and marshes (Csuti et al. 1997). The species breeds from Alaska and Canada south to California and Florida, though it is rare in the interior of North America (Csuti et al. 1997). The bald eagle is a Federal and Oregon State Threatened species, and is designated as a List 2 species with the Oregon Natural Heritage Program (indicating a species potentially threatened with extirpation).

Because of the bald eagles' protected status, bald eagles are monitored by resource agencies throughout their range. Isaacs and Anthony with the Oregon Cooperative Fish and Wildlife Research Unit in affiliation with Oregon State University and the Washington Department of Fish and Wildlife have been monitoring active and historic bald eagle nests and breeding territories since 1971 (Isaacs and Anthony 2002). Such monitoring includes land and aerial surveys to determine the breeding status of eagle pairs using known nest sites, and to detect any potential new bald eagle nesting territories. In addition, the U.S. Geological Survey, Forest and Rangeland Ecosystem Science Center's Snake River Field Station coordinates midwinter bald eagle surveys, in which several hundred individuals count eagles along standard, non-overlapping survey routes. Midwinter bald eagle surveys are conducted during the first 2 weeks of January each year to assess the status of over-wintering populations.

No known bald eagle nest sites or breeding territories exist in the Malheur Subbasin (Isaacs and Anthony 2002). Active bald eagle breeding territories located in the vicinity of the Malheur Subbasin are limited to:

- The South Silvies territory located along the Silvies River approximately 15 miles east of the Malheur watershed in Harney County (Isaacs and Anthony 2002). This breeding territory has been known and active since 1991 and typically produces one or two young.
- A nest off of Unity Reservoir in Baker County about 10 miles north of the Subbasin (Isaacs and Anthony 2002). The breeding territory and attending eagle pair have been monitored since 1984 and typically produce between 1 and 3 young. Although adults have been seen on the territory, no successful fledging of chicks has been documented at this location in approximately the past five years.
- An active breeding territory off of the Phillips Reservoir in Baker County about 15 miles north of the Malheur Subbasin (Isaacs and Anthony 2002). Adults attending this territory have produced, on average, 1 or 2 young a year since the nest was located in 1989.
- A newly established nest off of Birch Creek approximately 15 miles south east of the Malheur Subbasin (Isaacs and Anthony 2003). This nest was first located in 2003 and represents the first nesting pair of bald eagles in Malheur County since eagle surveys began 26 years ago (K. Paul, USFWS Biologist, pers. comm.).
- There are one or two nests on Oxbow reservoir (W. Van Dyke, ODFW Biologist, pers. comm.).

Small numbers of bald eagles are known to winter in the Malheur Subbasin. However, over-wintering eagle populations are limited by the availability of suitable wintering habitat in the Malheur watershed. Bald eagles typically over-winter near open water where suitable, large perch sites are available. Such habitat only exists in the Malheur watershed in the vicinity of the Beulah, Warm Springs and Bully Creek Reservoirs and along the mainstem of the Malheur River from Juntura to Ontario.

Two midwinter bald eagle survey routes include portions of the Malheur Subbasin: the Vale-Beulah Reservoir and Malheur River survey routes. Table 11 and Table 12 below provide results of midwinter eagle surveys for these routes from 1988 through 2000.

Table 11: Bald eagle Detections Recorded on Midwinter Survey Routes in the Malheur Subbasin (Vale-Beulah Reservoir), 1988-2000.

Year	Site Number	Route Name	Total Bald Eagles	Adult Bald Eagles	Immature Bald Eagles	Age-Not-known Bald Eagles
1988	37-01	VALE - BEULAH RESERVOIR	5	4	1	0
1990	37-01	VALE - BEULAH RESERVOIR	5	5	0	0
1992	37-01	VALE - BEULAH RESERVOIR	8	7	1	0

Year	Site Number	Route Name	Total Bald Eagles	Adult Bald Eagles	Immature Bald Eagles	Age-Not-known Bald Eagles
1993	37-01	VALE - BEULAH RESERVOIR	7	6	1	0
1994	37-01	VALE - BEULAH RESERVOIR	6	4	2	0
1995	37-01	VALE - BEULAH RESERVOIR	2	2	0	0
1996	37-01	VALE - BEULAH RESERVOIR	4	4	0	0
1997	37-01	VALE - BEULAH RESERVOIR	5	4	1	0
1998	37-01	VALE - BEULAH RESERVOIR	2	2	0	0
1999	37-01	VALE - BEULAH RESERVOIR	5	5	0	0
2000	37-01	VALE - BEULAH RESERVOIR	4	4	0	0

Table 12: Bald Eagle Detections Recorded on Midwinter Survey Routes in the Malheur Subbasin (Malheur River), 1988-2000.

Year	Site Number	Route Name	Total Bald Eagles	Adult Bald Eagles	Immature Bald Eagles	Principal drainage
1988	37-02	MALHEUR RIVER	2	2	0	MALHEUR LAKE & MALHEUR RIVER
1989	37-02	MALHEUR RIVER	0	0	0	MALHEUR LAKE & MALHEUR RIVER
1990	37-02	MALHEUR RIVER	0	0	0	MALHEUR LAKE & MALHEUR RIVER
1991	37-02	MALHEUR RIVER	1	1	0	MALHEUR LAKE & MALHEUR RIVER
1992	37-02	MALHEUR RIVER	1	1	0	MALHEUR LAKE & MALHEUR RIVER
1993	37-02	MALHEUR RIVER	5	5	0	MALHEUR LAKE & MALHEUR RIVER
1994	37-02	MALHEUR RIVER	4	2	2	MALHEUR LAKE & MALHEUR RIVER
1995	37-02	MALHEUR RIVER	2	1	1	MALHEUR LAKE & MALHEUR RIVER
1996	37-02	MALHEUR RIVER	0	0	0	MALHEUR LAKE & MALHEUR RIVER
1997	37-02	MALHEUR RIVER	0	0	0	MALHEUR LAKE & MALHEUR RIVER
1998	37-02	MALHEUR RIVER	0	0	0	MALHEUR LAKE & MALHEUR RIVER
1999	37-02	MALHEUR RIVER	2	2	0	MALHEUR LAKE & MALHEUR RIVER
2000	37-02	MALHEUR RIVER	1	1	0	MALHEUR LAKE & MALHEUR

From 1988 through 2000, midwinter bald eagle surveys at the Beulah reservoir resulted in an average of 4.8 eagles detected each survey. Over this same period, an average of 1.6 bald eagles was detected during each survey along the Malheur River. Eagles detected during midwinter surveys likely include breeding adults and young produced from the active breeding territories listed above, as well as individuals that have migrated south from northern breeding territories. In Oregon, bald eagles defend territories extending a few hundred yards around active nests during the breeding season and then undergo small-scale local migrations to wintering areas with suitable open-water foraging habitat (Csuti et al. 1997). However, there is augmentation of wintering populations by long distance migrants traveling from areas north to Washington State and Canada (Csuti et al. 1997).

The potential for bald eagle occurrence in the Malheur watershed has likely increased due to changes resulting from hydroelectric development, although several eagle nest trees were submerged under Brownlee-Eagle Island. The bald eagle was chosen as a Malheur Subbasin focal species associated with open water habitat, lakes, rivers and streams. Historically, little suitable foraging habitat was available for bald eagles in the Subbasin. Although bald eagles will eat carrion, water birds, and small mammals, the species is known to feed mainly on fish (Csuti et al. 1997). Prior to development of the reservoirs, it is likely that the species did not over-winter or occur in the Malheur Subbasin with consistency. Bald eagle populations throughout North America have been slowly recovering from record lows recorded in the early 1970's largely attributed to the use of DDT. Midwinter eagle survey data collected during 801 surveys conducted along 78 survey routes in the State of Oregon indicate that state wintering populations have increased by 1.4% from 1988 through 2000. As Oregon populations continue to increase, it is likely that bald eagle breeding territories will be established along suitable open water habitat in the Malheur Subbasin (K. Paul, USFWS Biologist, pers. comm.).

Of the fifteen terrestrial focal species for the Malheur subbasin, only the bald eagle is afforded protection as a federally listed species. Within Oregon, the bald eagle is designated as both a State and Federal threatened species and an ONHP (Oregon Natural Heritage Program) List 2 species (indicating a species threatened with extirpation in the State of Oregon).

Since bald eagles were first listed throughout the lower 48 states in 1967, the species has dramatically increased in numbers and expanded its range. This improvement is a direct result of the banning of DDT and other persistent organochlorines, habitat protection, and other recovery efforts (USFWS 1999.) In addition to a constant upward trend in population, productivity data for the past 10 years show that the target for productivity identified in the recovery plan for the Pacific region (USFWS 1986) has been met and remains relatively constant.

Most Bald Eagle population goals set in the 1986 recovery plan have been met or exceeded (USFWS 1999). In 1994, populations in the contiguous U.S. were estimated at approximately 4,450 occupied breeding areas with 1.16 young produced per occupied area. This estimate reflected a 462% increase over 1974 estimates. In 1998, population estimates showed 5,748 breeding areas with all but two states supporting nesting pairs. Sprunt et al. (1973) estimated that an eagle population requires a rate of 0.7 young per pair per year to be sustainable. In the Pacific Region, the rate has averaged 1 young per pair; accordingly, the population is expected to continue to grow (USFWS 1999).

Although the Bald Eagle recovery is impressive, not all goals have been reached. In the Pacific Region, 28 of 37 (76%) recovery zones have met population goals (USFWS 1999). Eleven of the 28 zones have more than doubled their goals. However, the recovery plan for the Pacific Region (USFWS 1986) states that the goal requires 80% of recovery zones to meet population goals. This goal may not be reached because not all recovery zones have preferred habitat. Success rates for breeding areas have exceeded 65% for several years.

Ten bald eagle recovery zones exist within the State of Oregon. The Harney Basin/Warner Mountain recovery zone (21), which includes the vicinity of the Malheur watershed, has historically supported only very limited numbers of breeding bald eagles (< 3 known active breeding territories). Desired future conditions for the bald eagle within the Malheur watershed may be limited due to habitat constraints. Bald eagles are only likely to be found around watershed reservoirs (Warm Springs, Beulah, and Bully Creek). However, giving the increase in use of suitable nesting areas around watershed reservoirs, it is likely that nesting may occur in these locations in the near future.

2.2.4 River Otter

The river otter is a large, aquatically adapted member of the weasel family (Mustelidae). This shy and secretive animal is a strong and graceful swimmer, with an ability to dive to depths of about 60 feet. Like other members of its family, the river otter has a long body, short legs, and a long neck. The head is broad and flattened and its muscular, tapering tail typically equals about one third of its total body length. The pelage is dark brown above and lighter below. The lips cheeks, chin, and throat also are a lighter brown (Whitaker and Hamilton 1998).

River otters are found throughout North America north of Mexico, with the exception of the arid southwestern deserts (Csuti et al. 1997). Beginning in the 19th century or earlier, river otter numbers and distribution declined significantly (Organ 1989). A 1976 study suggested that river otter were believed to be present in forty-four states and eleven Canadian provinces and territories (Deems and Pursley 1978). Whitaker and Hamilton (1998), however, indicate that habitat loss, over-harvesting, and pollution have reduced the otter's range to a third of its original distribution and resulted in complete extirpation from the mid-Atlantic and central U.S.

River otters use both freshwater and brackish habitats. They occur in lacustrine (i.e., lake) and riverine waterbodies, as well as associated wetland habitats (Whitaker and Hamilton 1998). Prey availability appears to be the main factor influencing habitat selection (Melquist and Hornocker 1983). Also of importance is the presence of adequate shelter and limited human activity. Habitat use varies during the course of the year based on accessibility and food availability. For example, mudflats and open marshes are often used during the summer, but rarely during the winter when snow and ice limited accessibility.

Little information is available on the specific distribution of river otters in the State of Oregon, and no specific information is available on the distribution of otters within the Malheur subbasin. Both ODFW and BLM biologists have reported observing the species in suitable aquatic habitat throughout the Malheur subbasin (W. Van Dyke, ODFW Biologist, pers comm., A. Bamman, BLM Biologist, pers. comm.). Otters have been chosen as 1 of 2 focal species providing an indication of the health and functioning of open water, lakes, rivers and streams in the Malheur

watershed. They are likely to be found throughout the subbasin in slow-moving open water reaches with a sufficient prey base of small fish species. It is likely that the population of river otters in the subbasin declined in response to trapping and initial settlement of the region, and then rebounded in response to increased available aquatic habitat resulting from reservoir development along the Malheur River and its tributaries.

2.2.5 Columbia Spotted Frog

The Columbia spotted frog is a relatively aquatic *Rana* frog species that is rarely found far from water. The Columbia spotted frog (CSF) is olive green to brown in color, with irregular black spots. They may have white, yellow, or salmon coloration on the underside of the belly and legs (Engle 2004). Females may grow to approximately 100 mm (4 inches) snout-to-vent length, while males may reach approximately 75 mm (3 inches) snout-vent length (Nussbaum et al. 1983; Stebbins 1985; Leonard et al. 1993). Spotted frogs are typically associated with clear, slow-moving or ponded surface waters, with little shade (Reaser 1997). The species has been chosen as a Malheur subbasin focal species to provide an indication of the health and functioning of herbaceous wetland habitat within the watershed.

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.

Spotted frogs occur in a variety of still water habitats and can also be found in streams and creeks. Utilized aquatic sites can be found in 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, spotted frogs will use areas where water does not freeze, such as spring heads and undercut streambanks with overhanging vegetation (IDFG et al. 1995). Spotted frogs may disperse into forest, grassland, and shrubland during wet weather (NatureServe 2003). They will use streamside small mammal burrows as shelter. Overwintering sites in the Great Basin include undercut banks and spring heads (Blomquist and Tull 2002).

Figure 14 shows the current and historic range of spotted frogs throughout western North America. This figure includes both the Columbia spotted frog and the Oregon spotted frog, (*R. pretiosa*), which ranges west of Columbia spotted frog populations. The Columbia spotted frog and Oregon spotted frog were originally con-specific subspecies but have since been divided into separate species based upon genetic and life history distinctions.

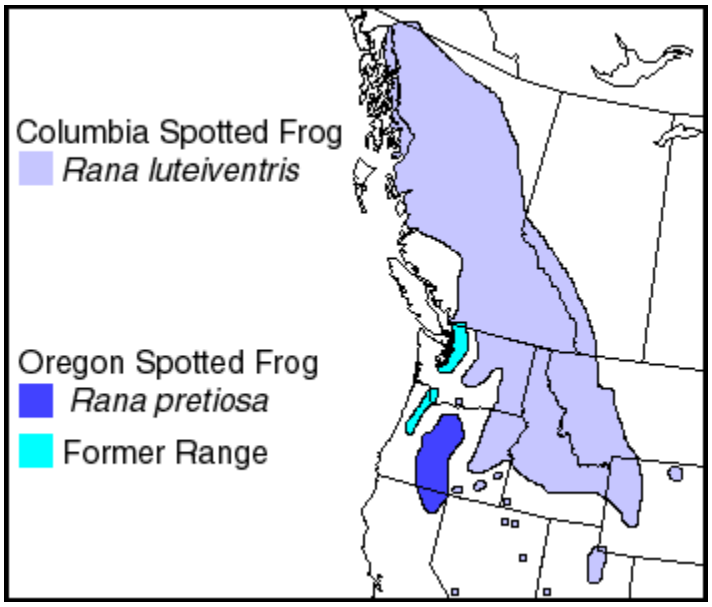

Figure 14: North American Range of Spotted Frogs. (Source: USGS, Northern Prairie Wildlife Research Center).

The historic range of the northern population of Columbia spotted frog is most likely similar to that of the current range. The historic range for southern populations (e.g., Great Basin, Wasatch Front, and West Desert) was likely larger in size. Due to habitat loss and alteration, fragmentation, water diversion, dams, and loss of beaver the current distribution and abundance of Columbia spotted frogs has dramatically decreased. Such population declines are likely to be most notable along the edges of the species' known current range. The Malheur subbasin, Malheur County and Southeastern Oregon in general are located along the southeastern fringe of the Columbia spotted frogs known range. The density and distribution of spotted frogs in this region are likely to have been reduced significantly from historic levels. As indicated in Figure 14, the current species distribution appears to include small, isolated remnant populations.

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, which runs along the southeastern boundary of the Malheur subbasin approximately 5 to 10 miles into the Owyhee watershed (USFWS 2002c).

Cynthia Tait, BLM Vale District biologist, has coordinated monitoring of herpetological study in the vicinity of the Malheur subbasin since 1994. Her research efforts have focused on *Rana* species occurring in the watershed, which include the Columbia spotted frog, northern leopard frog and non-native bullfrog. Columbia spotted frog detections in the Malheur River watershed resulting from this 10-year effort are indicated in Figure 15. Columbia spotted frog detections in the Malheur subbasin include those noted during long-term monitoring in a mark-and-recapture study of populations at Kingsbury Gulch in a tributary to the North Fork Malheur River west of

Juntura, as well as incidental spotted frog detections recorded by BLM during subbasin field study (C. Tait, BLM Biologist, Vale District, pers. comm.).

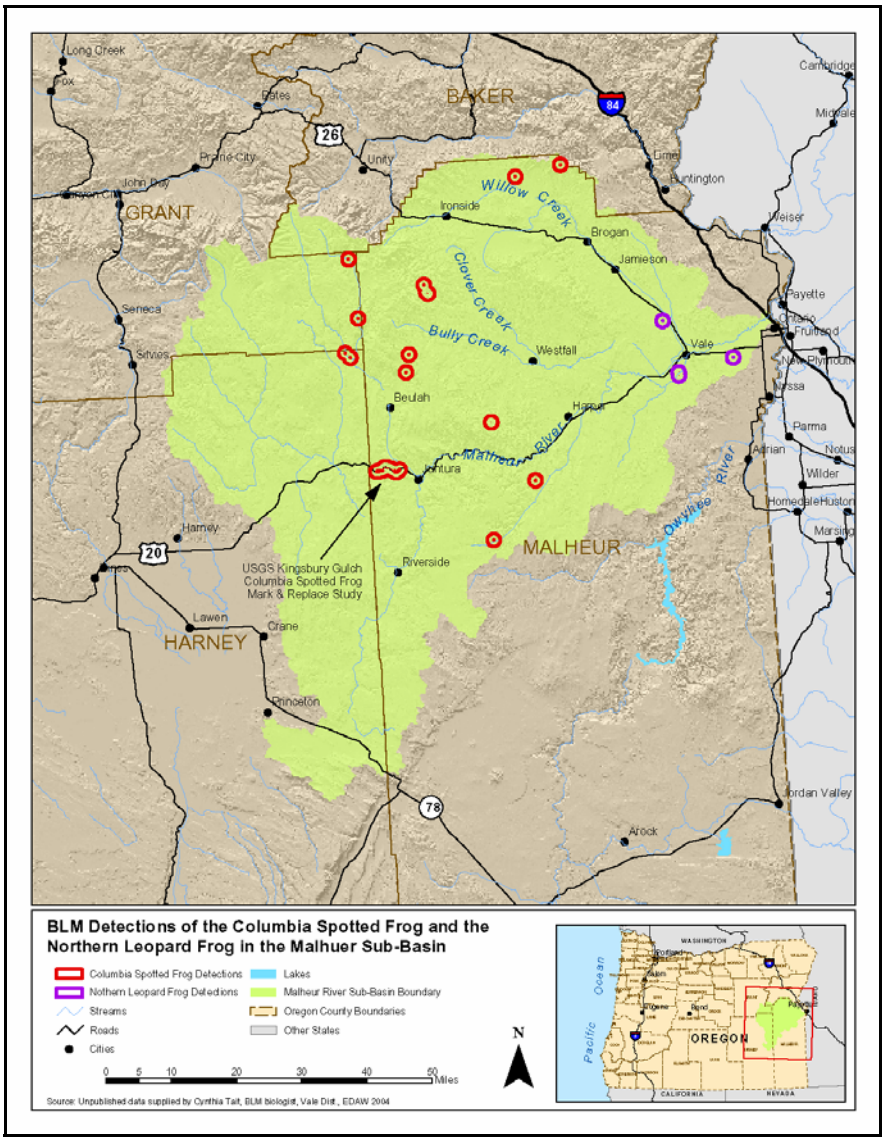

Figure 15: Rana sp. Occurrences in the Malheur Watershed.

Spotted frogs are able to withstand more arid habitat conditions than other native frog species of Southeastern Oregon (i.e., leopard frog) and, therefore, have a more widespread distribution within the Malheur subbasin. Subbasin-specific limiting factors for the species include predation by bullfrogs, bass and other predatory fish species. However, because spotted frogs are often found in natural stream systems and shallow tributary-associated wetlands where the potential for bullfrog and predatory fish species occurrence is limited, species conflicts and predation pressure is not as significant as with subbasin leopard frog populations (see below).

2.2.6 Leopard Frog

The northern leopard frog is one of the most widely distributed amphibians in North America (WDFW 199). Recently, however, declines in populations have been reported range wide, including regionally in the vicinity of the Malheur subbasin. In Oregon, little is known of the historic and current range of the northern leopard frog. The State and the Malheur subbasin lies along the eastern limit of the species' range, and most sources indicate only isolated species detections regionally in Eastern Oregon (Corkran and Thoms 1996, Leonard et al. 1993). The northern leopard frog is included as one of two Malheur subbasin focal species providing an indication of the health and functioning of herbaceous wetland habitat in the watershed. Although the species has no Federal protected status, Oregon populations of leopard frogs are designated by ODFW as "sensitive critical" indicating a species for which "listing as threatened or endangered may be appropriate if immediate conservation actions are not taken" (ONHP 2001).

The northern leopard frog is considered to be able to adapt to a diversity of habitats (Stebbins 1951) over a broad range of elevations. It is thought to prefer cattail swamps, marshy expanses, and shallow, slow-moving streams. It easily expands into irrigation ditches and other man-made waterways. Leopard frogs require permanent deep water for overwintering, in proximity to seasonal ponds and wetlands for breeding. Tadpoles feed on algae, rotting vegetation, and detritus. Adult frogs feed primarily on insects, but will also eat other frogs (including small leopard frogs), worms, snails, crustaceans, spiders, and other kinds of animals (WDFW 1999).

Figure 16 shows the distribution of northern leopard frogs throughout the species' current known range in North America. As indicated, Oregon lies along the western limits of the species range and little is known of the leopard frog's occurrence in the State.

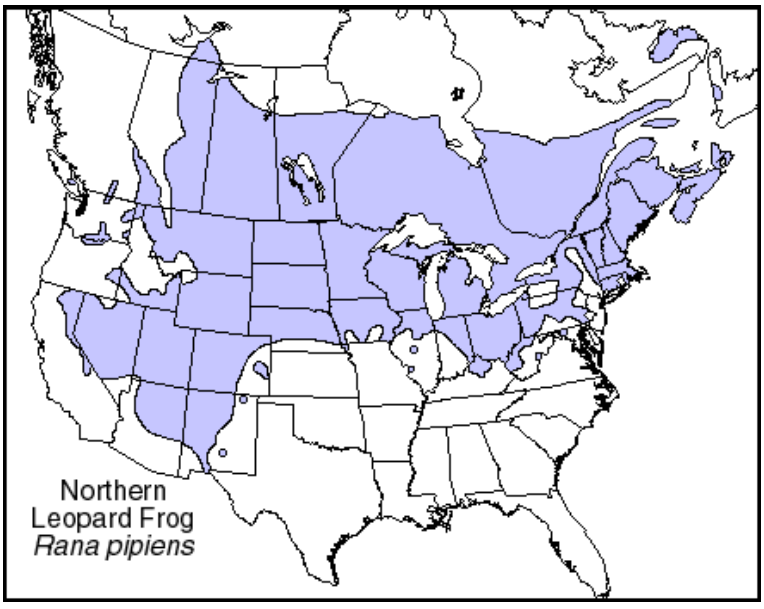

Figure 16: North American Range of Northern Leopard Frog. (Source: USGS, Northern Prairie Wildlife Research Center.)

Northern leopard frogs breed in spring, soon after ice and snow have disappeared, usually in March or April, but this varies with altitude and latitude. Males arrive at ponds first and females follow generally 5-7 days later. Egg masses are typically attached to emergent vegetation, including sedges or rushes, but can be unattached. They are generally deposited in water less than 65 cm. deep and tend to be clumped in areas well exposed to sunlight (WDFW 1999).

The majority of the mortality among leopard frogs occurs when individuals are tadpoles. Waterfowl, fish, bullfrogs and aquatic insects are thought to be responsible for much of this mortality. Snakes will eat adult frogs during the summer and fall months. Because leopard frogs move from breeding to summer to overwintering habitats, vehicles on roads are a significant mortality source. Roads built between breeding ponds and larger summer, fall, overwintering water bodies can result in large numbers of vehicle-killed leopard frogs (WDFW 1999).

Bullfrogs, which are native to eastern North America, have the potential to displace native frogs, including northern leopard frogs (Hayes and Jennings 1986). Adult bullfrogs are large and will consume almost any moving object that will fit in their mouths. Newly metamorphosed bullfrogs are significantly larger than leopard frogs, and have been documented to eat them (McAlpine and Dilworth 1989). The range of the northern leopard frog includes most of the northern United States. However, like many amphibian species, leopard frogs have suffered extensive declines throughout their historic range (WDFW 1999).

BLM herpetological data for the subbasin indicate a limited occurrence of leopard frogs along the lower Malheur in the vicinity of Vale. The bulk of the species' range extends east of the Malheur watershed and most suitable habitat for leopard frogs exists in association with the agricultural lands of the lower Malheur (C. Tait, BLM Biologist, Vale District, pers. comm.). BLM data provide by Cynthia Tait, BLM vale District biologist, indicate 3-recorded detections of leopard frog in the eastern portion of the Malheur watershed (Figure 15). The distribution of leopard frogs along the Malheur seems to be limited to the eastern reaches of the watershed due to habitat restrictions. That is, in contrast to spotted frogs, which occur in shallow streams and associated wetlands, leopard frogs require deeper areas of standing water or slow-moving aquatic habitat. Such habitat is found in the large river reaches and irrigation ditches associated with the developed agricultural areas of the lower Malheur. It is unlikely that the distribution of leopard frogs will extend westward into the watershed given the habitat requirements of the species.

2.2.7 Yellow Warbler

The yellow warbler is a small (4.5-5 inches) avian neotropical migrant that breeds throughout most of North America and winters south in Mexico, Central America and eastern South America (Csuti et al. 1997, National Geographic Society 1999). In the Pacific States, the yellow warbler is known to be closely associated with riparian habitat – especially willows (*Salix* spp.) and cottonwoods (*Populus* spp.) – and the species' breeding range within Oregon generally corresponds to the occurrence of suitable riparian vegetation (Csuti et al. 1997, Ehrlich et al. 1988). Although the yellow warbler currently holds no formal state or federal protective status, the species has been cited for conservation concern throughout portions of its breeding range due to population declines largely attributed to loss and degradation of suitable riparian habitat.

The yellow warbler is one of two focal species chosen under this subbasin plan as a suitable indicator of the health and functioning of riparian habitat in the Malheur watershed. Yellow warblers are likely to occur throughout the subbasin during the breeding season wherever suitable riparian shrub habitat exists. Although no specific studies have been conducted delineating the yellow warbler's distribution within the Malheur subbasin, the species' habitat requirements likely limit occurrence within the watershed to those areas supporting contiguous patches of riparian shrubs. Studies have shown that distance between willows in riparian vegetation is the best indicator of the potential for yellow warbler nesting, with higher breeding densities correlated with increased willow density (Knopf and Sedgewick 1992). However, in some portions of the species' breeding range (e.g., montane areas), yellow warblers have been found to nest in a variety of shrub habitats far-removed from water (Beedy and Granholm 1985, Gaines 1992). Thus, the species may potentially nest where habitat with suitable dense shrub structure occurs throughout the Malheur subbasin.

Available data on yellow warbler abundance within the Malheur watershed is limited to BBS and CBC survey results. Because the species' occurrence in the Malheur subbasin and throughout most of North America is limited to the summer breeding season (April- September; in Oregon breeding is generally initiated by late May, [Csuti et al. 1997]), yellow warblers detected during CBC surveys likely represent only rare instances of incidental over-wintering. Figure 17 below shows the counted distribution of breeding yellow warblers throughout the species North American breeding range based upon BBS data.

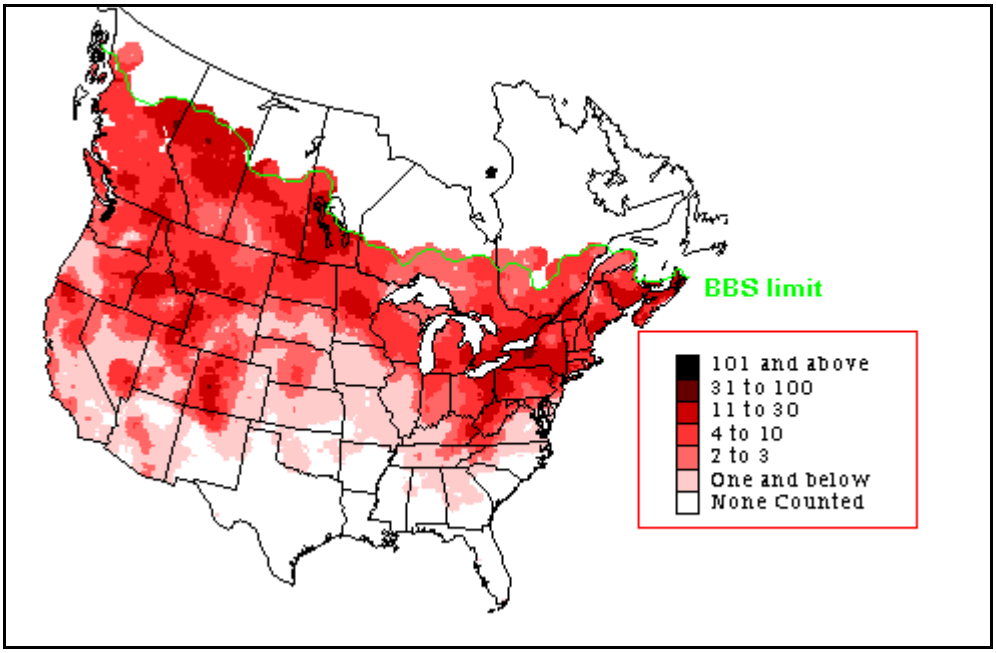

Figure 17: Yellow warbler Summer Distribution Map Based upon BBS Average Detection Data, 1982-1996.

As indicated in Figure 17, BBS data indicate that the Malheur subbasin supports moderate densities of breeding yellow warblers in comparison to species densities found elsewhere in its range. Although BBS data specific to the Malheur subbasin alone is not available, large-scale

distribution data (Figure 17) indicate that yellow warbler densities are likely highest in the north and northeast portions of the subbasin. Such apparent gradations in densities largely correspond to the presence of riparian – and specifically riparian shrub habitat – in the Malheur subbasin.

Figure 18 below shows the change in yellow warbler distribution detected from BBS data across the species' breeding range from 1966 through 1996. This data reveals an apparent steady decline in yellow warbler breeding populations within the Malheur subbasin across this time period. This decline in yellow warbler breeding populations is consistent with the decline in riparian habitat, and available shrub habitat, noted throughout the basin.

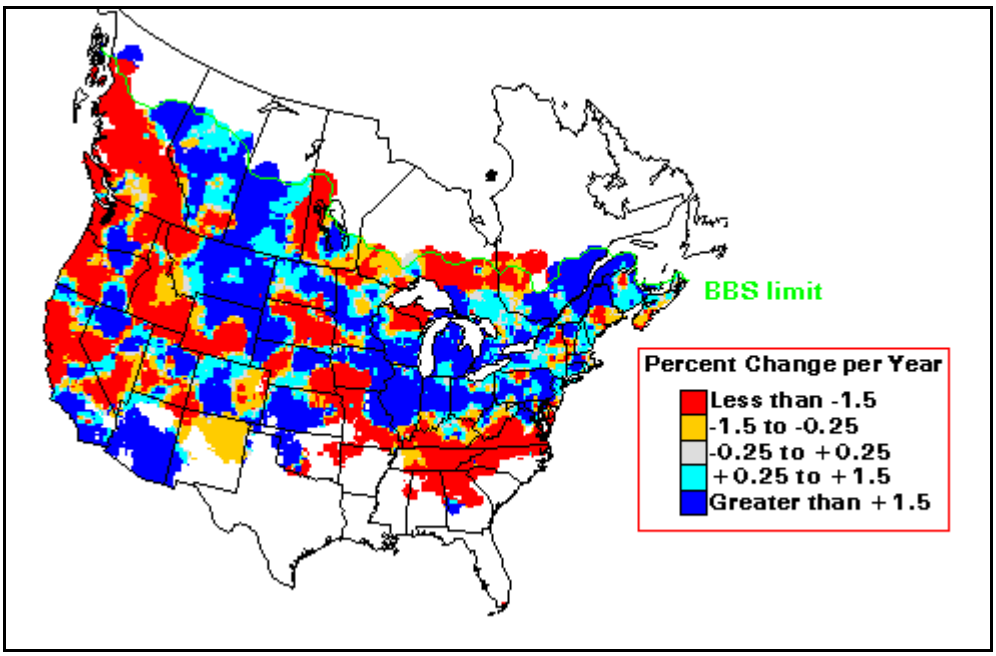

Figure 18: Yellow Warbler BBS Trend Map, 1966 - 1996.

BBS data for yellow warbler abundance across the State of Oregon was reported in percent change for the time periods of 1966 through 1979, and 1980 through 2002. These data suggest that the declines in detections of breeding yellow warblers noted during BBS inventories were most robust during the period of 1966 through 1979 in comparison with more recent years.

BBS data collected in Oregon shows a decline in average yellow warbler counts. Average yellow warbler counts have been steadily declining throughout the State since BBS data have been recorded. However, the average number of yellow warblers counted during BBS inventories throughout the state (currently between about 2 and 3 birds detected each survey) remains far below the average number of yellow warblers detected during surveys conducted in the vicinity of the Malheur subbasin (between 4 and 30; Figure 18. This discrepancy likely reflects the general degree of development in the Malheur subbasin in comparison with the entirety of Oregon.

2.2.8 Yellow-breasted Chat

Like the yellow warbler, the yellow-breasted chat is included as a focal species to provide an indication of the health and functioning of riparian habitat riparian-wetland systems within the Malheur subbasin. The yellow-breasted chat is the largest (7 ½ inches) North American wood warbler (National Geographic 1999). The species shares the same family (Parulidae) and many general habitat requirements of the yellow warbler (Csuti et al. 1997). However, in contrast to local yellow warbler populations, BBS data indicate a slight increasing trend in chat abundance within the Malheur subbasin across time (see below). Explanation for this apparent inconsistency in abundance trends between these two avian riparian-associates is provided through comparison of each species' specific habitat requirements.

The yellow-breasted chat is an avian neo-tropical migrant that breeds throughout much of North America and winters in Mexico and south through Central America (Eckerle and Thompson 2001). Like the yellow warbler, the yellow-breasted chat is largely associated with riparian habitat (Csuti et al. 1997). However, chats are also likely to be found nesting in dense shrub not necessarily associated with water or a riparian corridor. Unlike the yellow warbler which is often associated with the willows found in riparian systems, yellow-breasted chats are thought to be found in a variety of dense shrub habitat – including dense non-native blackberry (*Rubus* spp.) bramble thickets (Csuti et al. 1997, Eckerle and Thompson 2001). In fact, in much of the species' breeding range, chats are associated with the early successional stages of forest regeneration and are often found living in altered habitats close to human habitation (Royal BC Museum 2003). Thus, in comparison to the yellow warbler, chats are better able to adapt to the changing riparian habitat conditions accompanying residential, agricultural and hydro-electric development throughout the Malheur subbasin, Oregon and the species North American breeding range.

No specific studies have been conducted on the abundance and distribution of yellow-breasted chats in the vicinity of the Malheur subbasin. Information on chat abundance in eastern Oregon is limited to BBS data. Figure 19 shows the distribution of chat detections recorded during BBS across the species' range. In general, yellow-breasted chats are distributed across their breeding range at relatively low densities with the exception of portions of the Southeast United States (Figure 19). Given this range-wide trend in breeding densities, chat abundance in the vicinity of the Malheur subbasin is high (with approximately 2 to 10 chats detected during each local BBS inventory) relative to other parts of the species' breeding range.

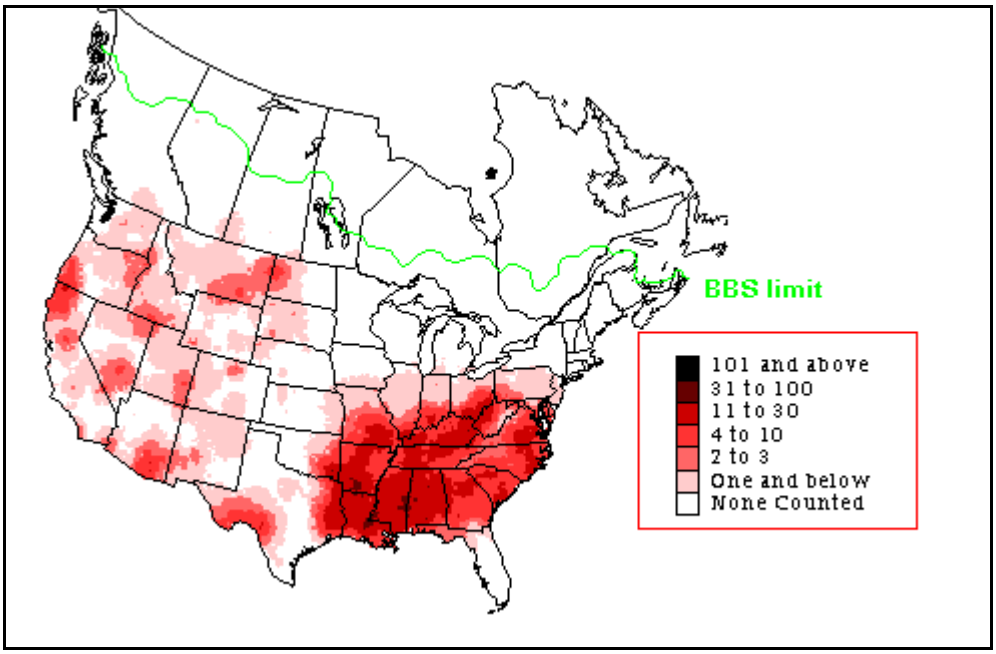

Figure 19: Yellow-breasted Chat Summer Distribution Map Based upon BBS Average Detection Data, 1982-1996.

Figure 20 below shows the average percent change in yellow-breasted detections recorded during BBS across the species breeding range from 1966 through 1996. As indicated in the Malheur subbasin vicinity and for eastern Oregon in general, the relative abundance and distribution of yellow-breasted chats in these regions appear to have slightly increased as reflected through a 0.25% to 1.5% increase in average BBS detections. This slight regional increase runs contrary to abundance trends indicated for the State of Oregon in general in Figure 20.

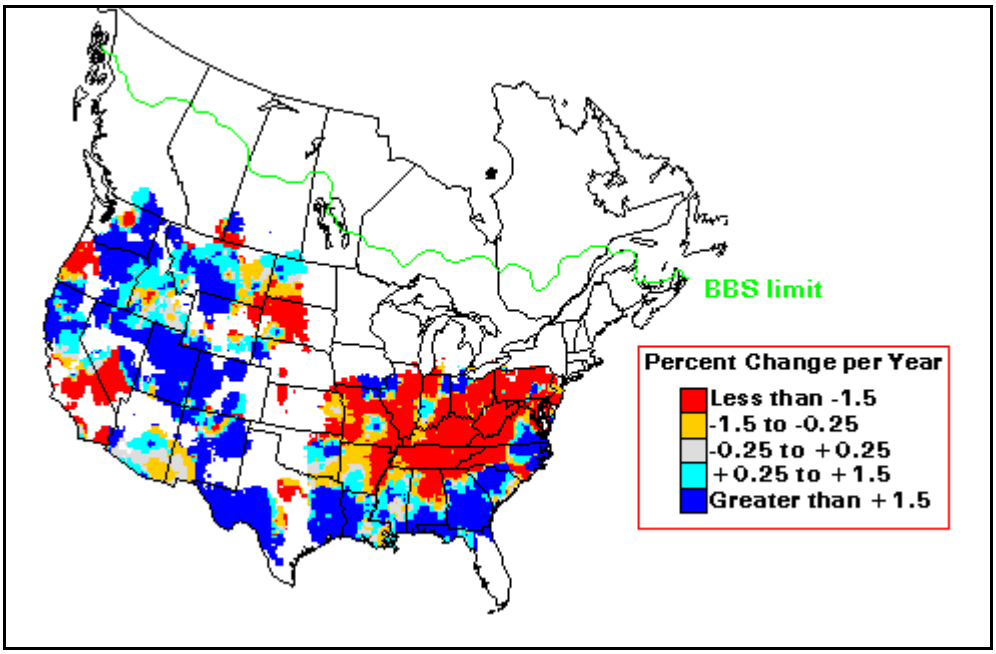

Figure 20: Yellow-breasted Chat BBS Trend Map, 1966 - 1996.

On average, BBS detections of yellow-breasted chats within the State of Oregon decreased 1.2% from 1966 through 2002. Also on average, between 1 and 2 chats were detected during breeding bird surveys conducted in Oregon in the 1960's whereas recent surveys often times result in less than a single chat detection. However, BBS inventories conducted in the vicinity of the Malheur subbasin have shown increased chat detections over time. This regional trend likely reflects typical changes in riparian habitat and wildlife habitat associated with development in rural areas and chats' ability to successfully adapt to such changes. Although the quality of riparian habitat may be degraded for species such as the yellow warbler, which are dependent upon microhabitat features common to native historic riparian conditions (i.e., high density of willow), yellow-breasted chat populations can be positively impacted by initial rural development. Specifically, increased edge habitat and dense non-native shrub provide suitable nesting habitat for yellow-breasted chats.

The contrast in population trends between the two riparian-associated focal species provides a formidable indication of the changes in riparian habitat throughout the watershed. Riparian corridors, where they existed historically, have decreased in width and changed in character. Wide swaths of willow- and cottonwood-dominated riparian corridors have diminished in width and non-native shrub species have become established. Although such habitat changes have negatively impacted riparian-associated species dependent upon historic native conditions, such as the yellow warbler, the yellow-breasted chat has successfully adapted to the habitat changes experienced in the Malheur watershed. This apparent trend is unlikely to continue as the watershed becomes further developed. As indicated by BBS data, yellow-breasted chat populations only appear to be increasing in the eastern rural portions of the State. West of the Cascade Mountains regions watersheds have become further urbanized resulting in habitat loss that has negatively impacted chat populations.

3 CURRENT AND REFERENCE ENVIRONMENTAL CONDITIONS

Data and maps of historic and current vegetation were obtained from the Oregon Natural Heritage Program's (ONHP) Gap Analysis Program**.** The Oregon Natural Heritage Program developed the historic or pre-settlement vegetation coverage for the southeast Oregon region by reviewing the current vegetation information and updating it to reflect plausible presettlement vegetation patterns (http://oregonstate.edu/ornhic/vegetation.html). Due to limits in available data on historic conditions in the Malheur Subbasin, the accuracy of historic vegetation information is limited and the extent of riparian habitats may be overestimated (J. Kagan, Pers. Comm. 2004).

To develop the current vegetation map, ONHP collected fine scale data from southeastern Oregon (on the Burns, Lakeview and north Vale BLM districts), from northeastern Oregon (from the Wallowa-Whitman, Umatilla, Malheur, Ochoco and Deschutes National Forests), and from the Willamette Valley (from ODFW). This data was integrated into a "2002 Statewide Existing best approximation cover", which is a mix of 1:24,000 high-resolution data, with the 1:100,000 gap data used to fill in the holes (http://oregonstate.edu/ornhic/vegetation.html).

To analyze the data for terrestrial wildlife-habitat types, ONHP fine scale plant community type data was grouped into course scale wildlife-habitat types that were obtained for the Malheur Subbasin on the IBIS website. Both historic and current maps and data were grouped in exactly the same way. Using tables generated by GIS (Arc-View), it was then possible to compare historic and current areas of wildlife-habitat types and determine the amount of change (see Table 13). The accuracy of these data is limited by the accuracy of the original mapping of the historic and current vegetation.

3.1 Characterization of Historic

The ONHP historic or pre-settlement (1850's) mapping and data show that historically, the Malheur Subbasin was dominated by mixed conifer habitats in the upper elevations and shrub-steppe habitats at lower elevations. There were riparian meadows, wetland habitats, lakes, rivers, and streams (See Table 13). A map of historic wildlife-habitat types is provided in Figure 21 and data is charted by watershed in Figure 22.

Regular fire cycles influenced both forest and shrub-steppe habitats. The return interval in fire tolerant ponderosa pine and mixed conifer forests is low severity fires with every 1-25 years (Agee, 1981). Fires of moderate severity were common at a 25-100 year interval in dry Douglas fir, mixed evergreen, red fir and lodgepole pine forests (Agee 1993). Mountain big sagebrush habitats were maintained with a 20-30 year fire cycle, and Wyoming big sage habitats were maintained by a 50-100 year fire cycle (BLM 2000).

There is a close temporal association between western juniper expansion and the introduction of large numbers of livestock into the Northwest region (both beginning in the late 1800's) lending strong support to the conclusion that livestock grazing and the reduction in fire frequency (due to loss of fine fuels from grazing) are the major causes of juniper expansion (Belsky 1996).

Table 13: Characterization of Wildlife-Habitat Types (Percent of Total; Total subbasin is 4730 square miles).

Wildlife-Habitat Type	Historic Malheur Subbasin	Current Malheur Subbasin	Absolute Change Malheur Subbasin	Relative Change Malheur Subbasin
Montane Mixed Conifer	0.5%	0.2%	-0.3%	-61.3%
Interior Mixed Conifer	1.7%	4.0%	2.3%	139.2%
Lodgepole Pine	0.7%	0.7%	0.0%	-3.4%
Ponderosa Pine	7.9%	5.4%	-2.5%	-32.0%
Alpine Grasslands	0.0%	0.6%	0.6%	Data gap
Western Juniper/Mt Mahogany	2.0%	4.7%	2.7%	134.7%
Interior Grasslands	3.6%	4.8%	1.2%	32.8%
Shrub-steppe	78.9%	68.4%	-10.5%	-13.3%
Desert Playa and Salt Scrub	0.0%	0.0%	0.0%	11.9%
Agriculture, Pasture, Mixed Environs	0.0%	8.2%	8.2%	Not Applicable
Open Water-Lakes, Rivers, Streams	0.1%	0.2%	0.2%	338.7%
Herbaceous Wetlands	Data gap	0.1%	Data gap	Data gap
Interior Riparian-Wetlands	Data gap	0.1%	Data gap	Data gap
Aspen	0.021%	0.023%	0.002%	10.5%
Regenerating young forest	0.0%	0.0%	0.0%	Not Applicable
Barren	2.8%	2.4%	-0.5%	-16.0%
Urban and Mixed Environs	0.0%	0.0%	0.0%	Not Applicable

Source: ONHP Gap Analysis Program Data. The accuracy of this data depends on the accuracy of the original mapping of the historic and current vegetation.

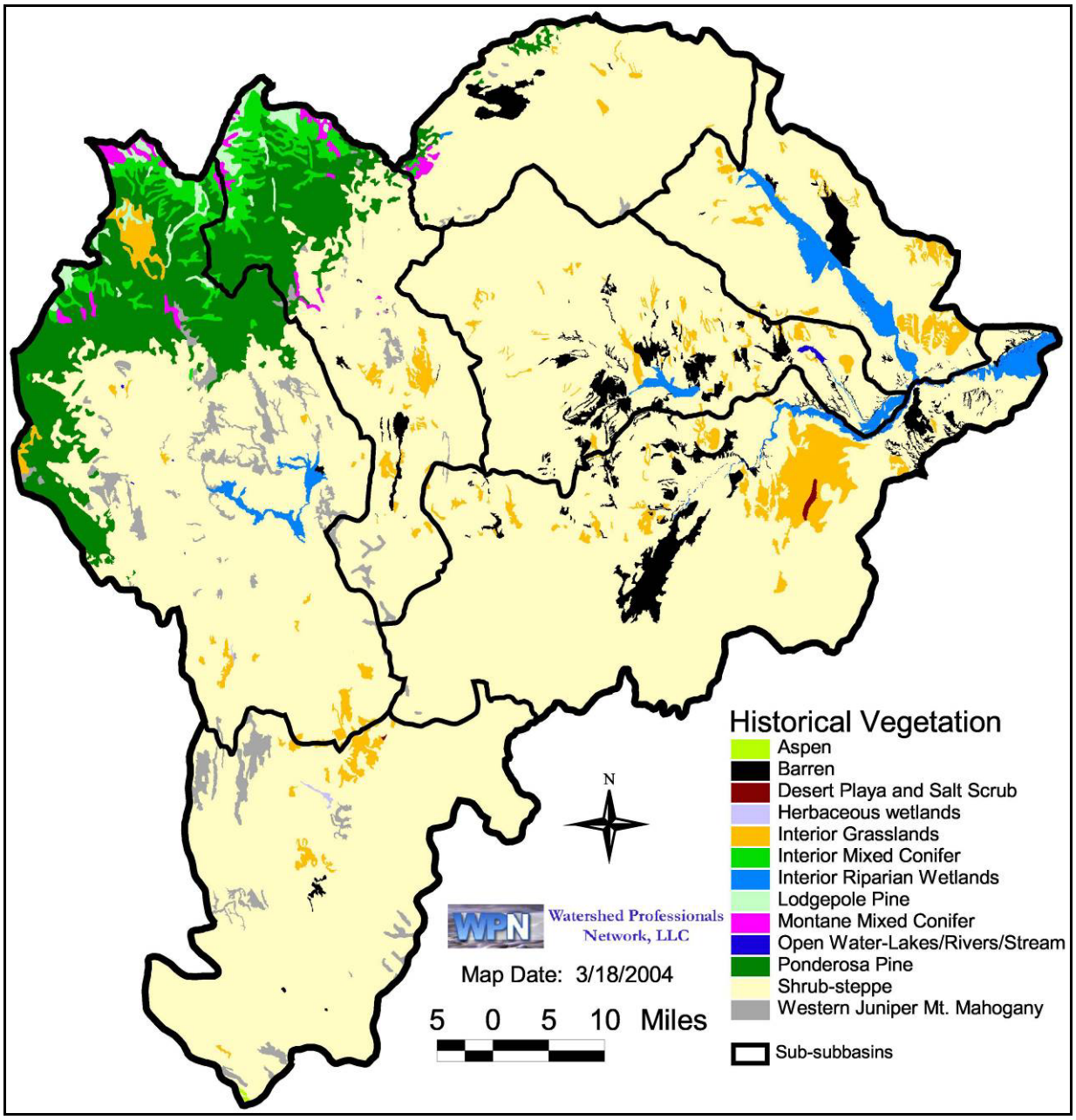

Figure 21: Historical Vegetation Grouped by Wildlife-Habitat Type.

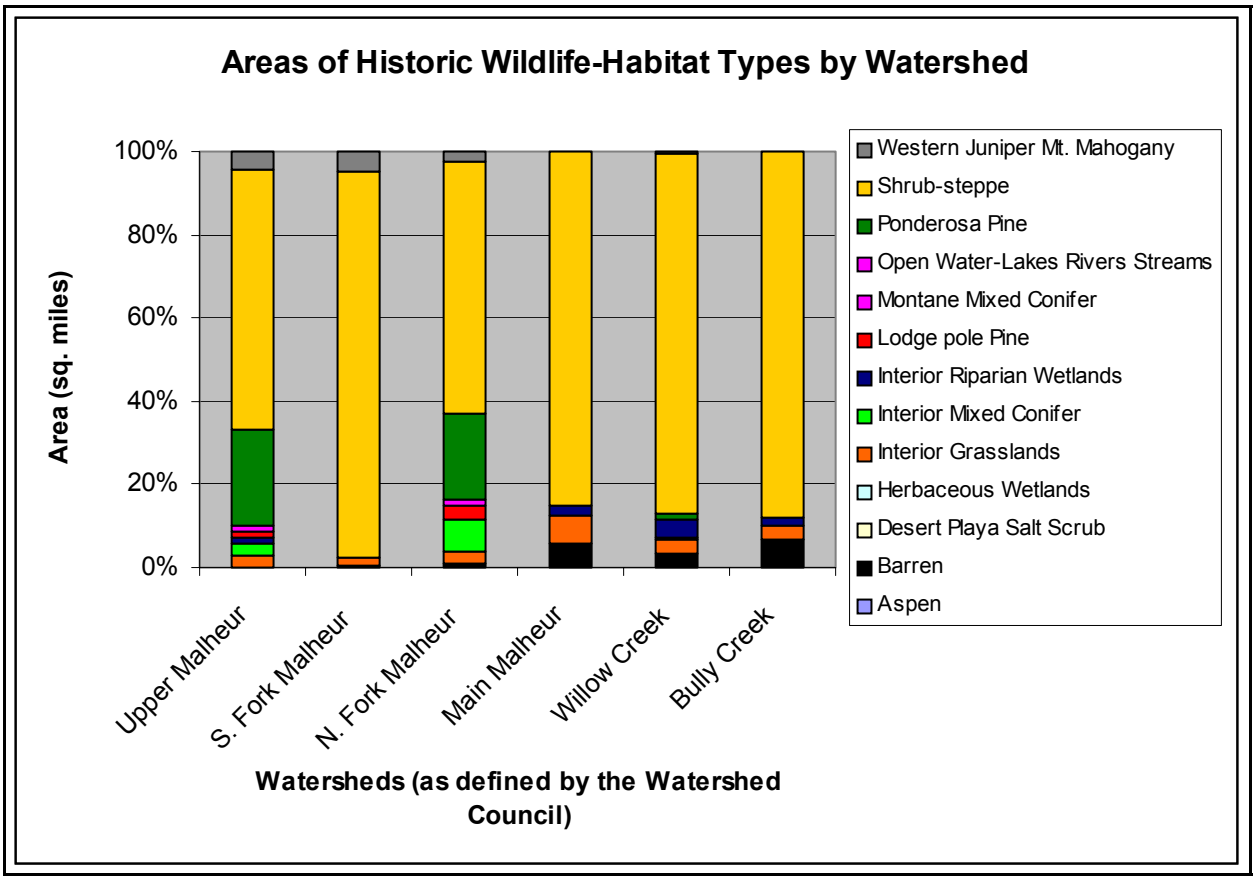

Figure 22: Areas of Historic Wildlife-Habitat Types by Watershed.

3.2 Characterization of Current

Currently the vegetation types in the Malheur Subbasin are similar to those historically, with forested habitats in the higher elevations and shrub-steppe habitats in the lower elevations of the Subbasin. However, loss or degradation of terrestrial habitat has occurred throughout the Subbasin due to agricultural development, fire suppression, livestock grazing, logging, western juniper encroachment, noxious weed invasion, roads, and other human disturbance activities.

Loss or degradation of habitat has affected shrub-steppe, ponderosa pine, interior grassland, riparian and wetland habitats due to logging, grazing and agricultural use. For a comparison of change from historic to current habitat conditions, refer to Table 13. A map of current wildlife-habitat types is provided in Figure 23 and current habitat data is charted by watershed in Figure 24.

Historically, native sagebrush and bunchgrass communities were maintained by periodic fire. As a result of fire suppression, many shrub-steppe habitats currently support a much greater woody species composition than was present prior to European settlement. Western juniper has invaded sagebrush communities on more moist, mesic sites where it has not been limited by fire (BLM 2003).

Fire suppression and timber harvest practices have changed the character of the forested habitats. Many ponderosa pine forests have been invaded with Douglas fir, and western juniper has invaded nearly all forest habitats. The increase in tree seedling establishment, combined with Douglas fir and western juniper expansion has resulted in dense forest stands that are more susceptible to disease, catastrophic insect infestations, and intense fire. There is an increase in fuel loading in many habitats where fire has been less frequent. There are forests that retain their historically open character and some remaining old growth. Old growth forest distribution, occurrence, and connectivity are below historic ranges (BLM 2003).

Without accurate data regarding the extent of historic wetland and riparian habitats, it is difficult to assess loss of those habitats. This is a clear data gap in the Malheur Subbasin. However, habitat degradation is currently a problem for riparian and wetland habitats. Livestock and ungulate grazing has impacted riparian and wetland habitats. Grazing of cattle and sheep has altered upland and riparian structure and function. Livestock grazing can affect the riparian environment by changing and reducing vegetation or actually eliminate riparian areas as a result of channel widening, channel aggradation, or lowering of the water table (Armour et al 1991). Loss of dense stands of willow habitat has resulted in the decline in yellow warbler populations.

Livestock and ungulate grazing has also impacted shrub-steppe habitats. Frequently more desirable forage plants such as grasses and important broadleaf herbs are lost in shrub-steppe habitats due to selective grazing (Monsen, 1983). Many shrub-steppe species favor grass or shrub-grass types for nesting, foraging, or hiding, indicating that the grass component of historical shrublands was important historically (Wisdom et. al. 2000). Continued degradation of shrub-steppe habitats caused by grazing combined with cheatgrass and other exotic plant invasions can permanently alter habitat potential. Changes in shrub-steppe habitat have resulted in loss of winter range habitat for elk and mule deer, loss of spring and summer forage for pronghorn, and decline in populations and distribution of sage grouse.

Encroachment of western juniper into shrub-steppe habitats has altered habitat structure and productivity and reduced habitat for sage grouse, elk, mule deer and other species. A major portion of the Subbasin has problems with encroachment by western juniper. Western juniper has invaded sagebrush communities on more moist, mesic sites where it has not been limited by fire (BLM 2003). The increase in western juniper has resulted in an alteration of habitat where grassland and shrubland communities have developed into late successional woodlands.

Cheatgrass and other exotic weeds have invaded a number of other large areas. Cheatgrass is the most severe weed problem encountered within the Intermountain Region (Monsen 1983). Noxious weeds reduce available wildlife habitat and outcompete desirable plant species.

Grazing and changes in fire patterns have been linked to loss of soil and biological soil crusts, which contribute to degradation of shrub-steppe habitats. In rangelands, biological soil crusts function as living mulch by retaining soil moisture and discouraging annual weed growth. They reduce wind and water erosion, fix atmospheric nitrogen, and contribute to soil organic matter (Belnap et. al. 2001). Biological soil crusts moderate extreme temperatures at soil surfaces, and enhance seeding establishment of native vascular plants (Wisdom et. al. 2000). While there is data available on restoration and management of biological soil crusts, this is a subject that would benefit from additional study in the Subbasin.

Road densities have decreased suitable habitat for deer, elk, and bighorn sheep. Increasing road densities cause habitat fragmentation, increase wildlife mortality, increase noxious weed invasion, increase human use patterns including poaching and other disturbances, and alter riparian functioning.

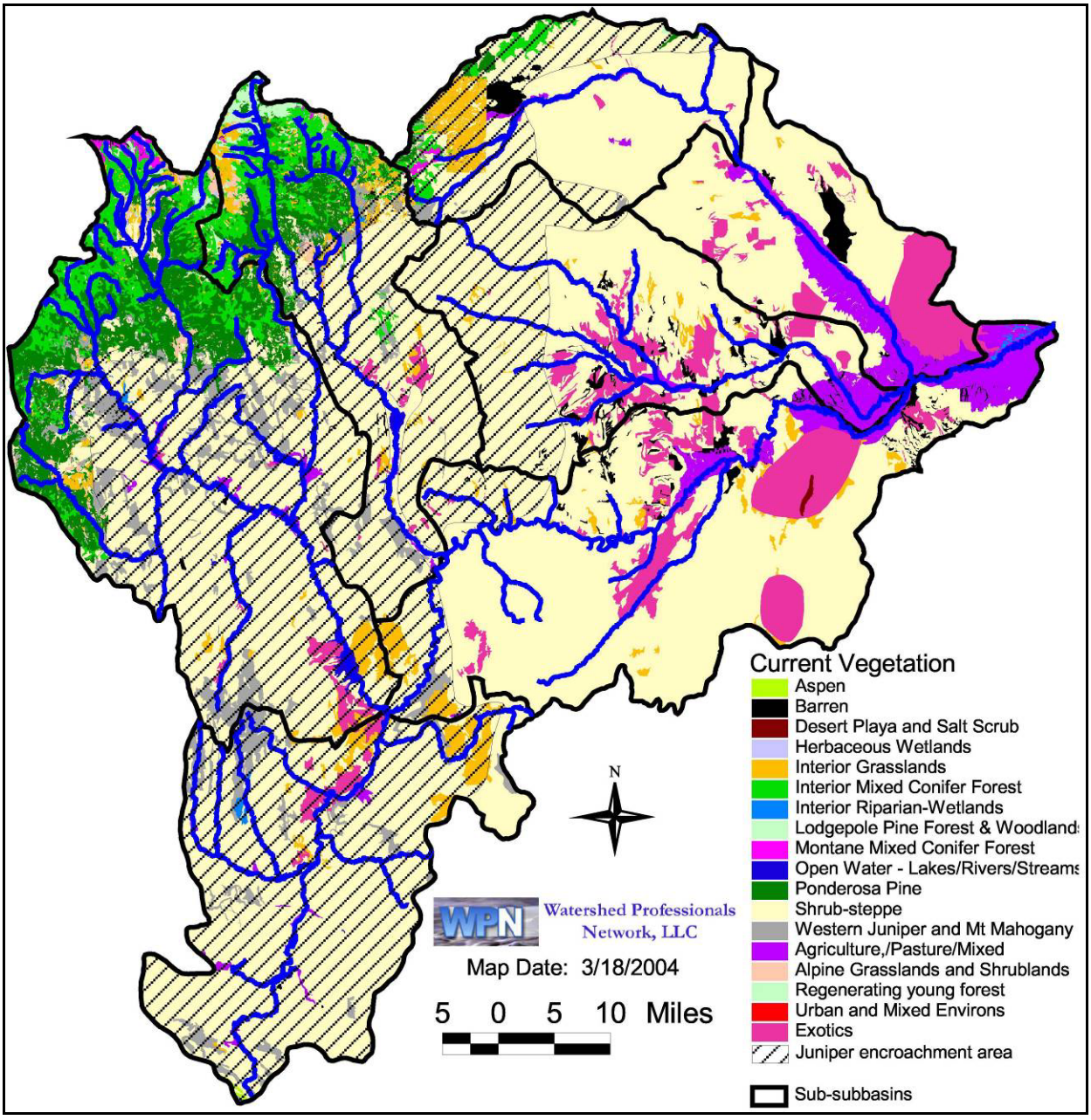

Figure 23: Current Vegetation Grouped by Wildlife-Habitat Type.

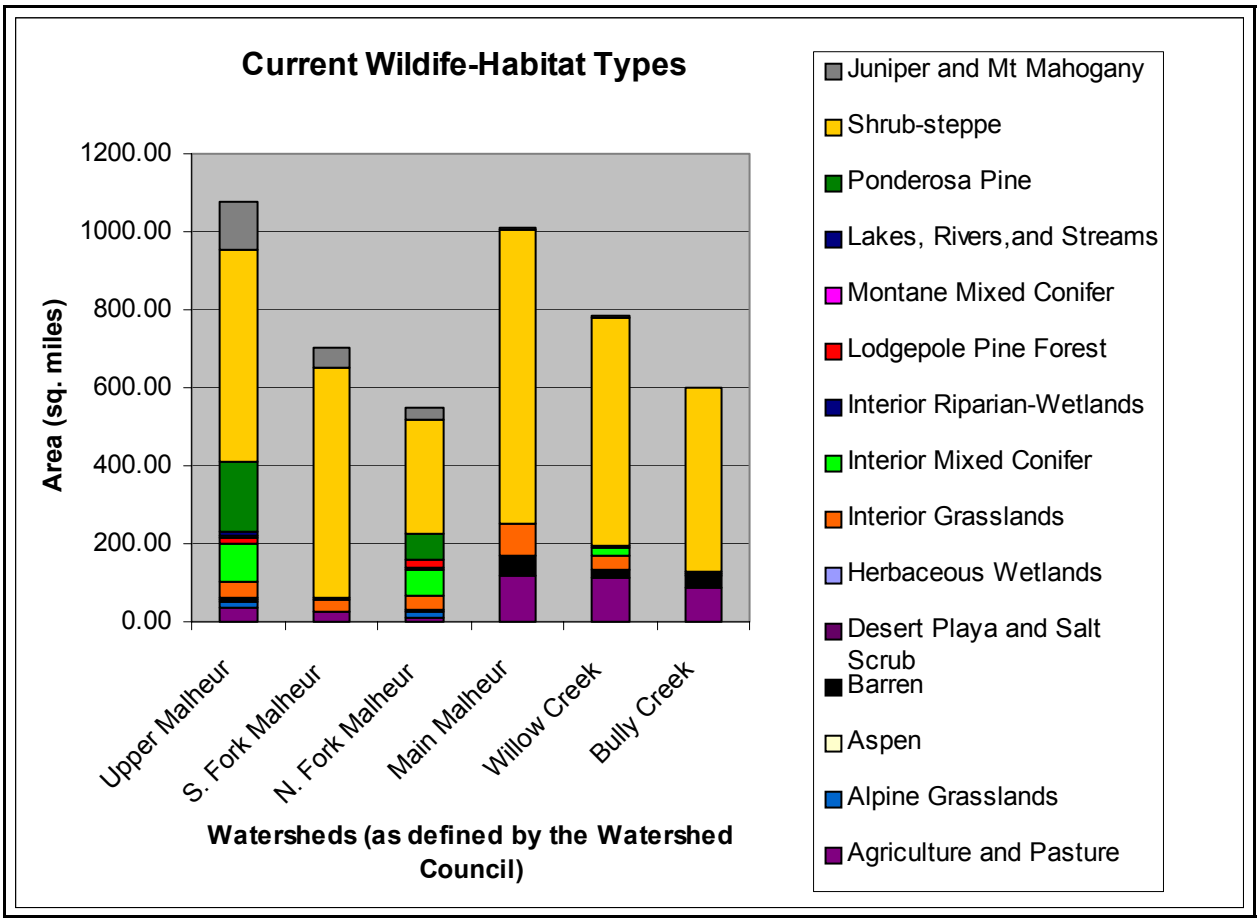

Figure 24: Areas of Current Wildlife Habitat Types by Watershed.

3.3 Characterization of Potential

The likely future condition of habitats in the Malheur Subbasin is highly site dependent. Where there has been minimal site degradation, habitats have the ability to recover from fire suppression and other disturbance. Where site degradation has caused permanent changes in site integrity or ecological function, restoration to the potential habitat type and condition is limited. Traditional successional theory implies that a degraded site can recover if the process is reversed. This is not possible or is very slow, however, if severe soil erosion, invasion of a new and very dominant species, or change from a fire-dependent to a fire-safe plant community has resulted in near-permanent changes in the abiotic or biotic community (NRC, 1994). In many cases, disturbance results in a new trajectory of succession that involves both native and exotic species. Multiple stable states of vegetation types may coexist after disturbance, so that succession will not return the site to its original vegetation, but may result in one of several types. The type of resulting vegetation may depend on factors like the kind of disturbance or exotic introductions (Roundy, et al. 1995).

3.4 Trend with No New Actions

Fire suppression, increases in agricultural land use, forestry practices, encroachment by western juniper and invasion of exotic species are some of the major changes that have occurred in the Subbasin since historic times. Increases in agricultural development, roads, dams and other flood-control activities have resulted in a decrease and degradation of riparian and wetland habitats (IBIS, 2004). Current riparian shrublands contain many exotic plant species and generally are less productive than historically. Alteration of fire regimes, habitat fragmentation, livestock grazing, and the addition of >800 exotic plant species have changed the character of shrub-steppe habitat (IBIS, 2004). The increase in western juniper has resulted in a decrease in shrub-steppe habitats and alteration of shrub-steppe diversity, quality, and productivity. Forest habitats have been fragmented by roads, timber harvest, and influenced by periodic livestock grazing and altered fire regimes (IBIS, 2004). Forestry practices and fire suppression have altered forest habitats resulting in an increase in disease and insect infestations, and increased the likelihood of catastrophic fire events (see Figure 25). Loss of habitat is also evident in shrub-steppe, ponderosa pine, interior grassland and riparian and wetland habitats (see Figure 26).

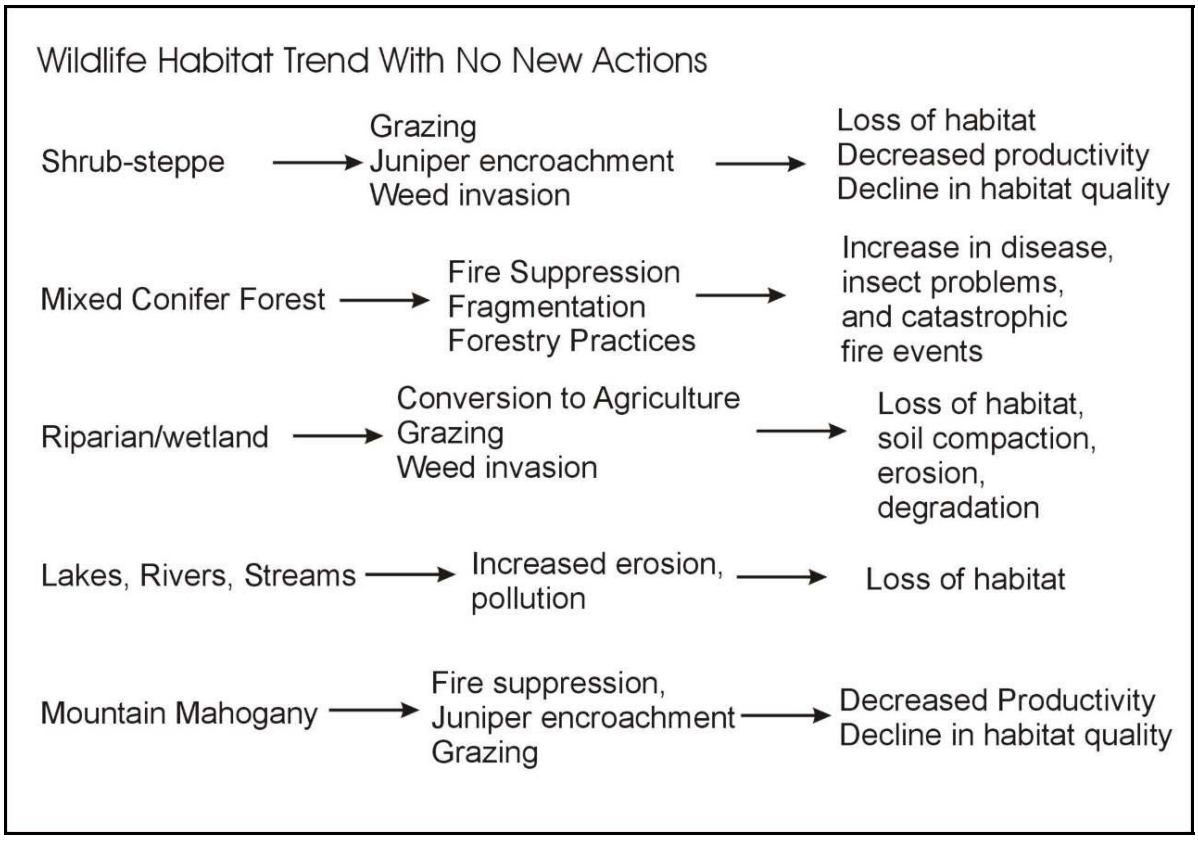

Figure 25: Examples of Trend in Wildlife Habitat with No New Actions.

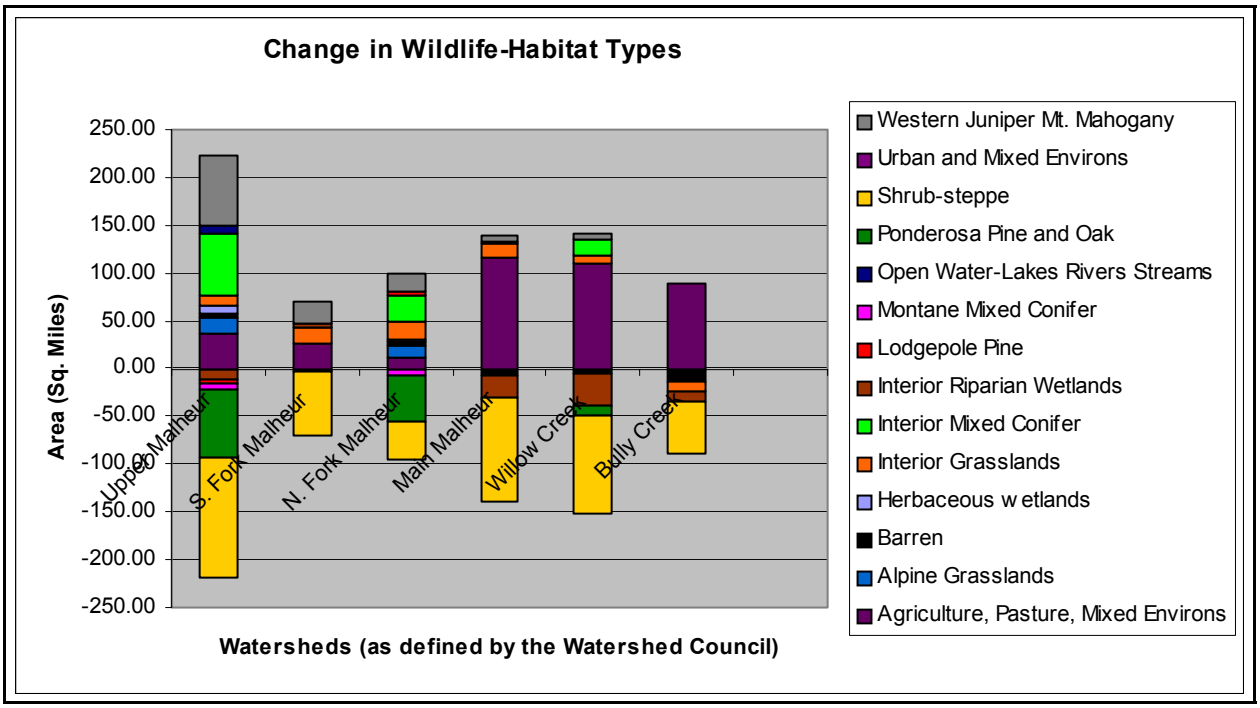

Figure 26: Amount of Change in Wildlife-Habitat Types.

3.5 Out of Subbasin Effects

The sections below describe limiting factors outside of the Malheur River Subbasin that may influence the occurrence of terrestrial focal species populations within the watershed. Out-of-subbasin effects are likely to influence population dynamics to the degree that terrestrial focal species range outside of the Malheur watershed. In this regard, terrestrial focal species can be effectively divided into three categories based on patterns of seasonal movements:

- Long Distant Migrants – including horned lark, bald eagle, yellow warbler, and yellow-breasted chat;
- Regional Migrants – including Rocky Mountain elk, pronghorn, California bighorn sheep, and Rocky Mountain mule deer; and,
- Sedentary Species – including pileated woodpecker, blue grouse, sage grouse, California quail, river otter, Columbia spotted frog and leopard frog.

Within each category, individual terrestrial species will exhibit varying degrees of seasonal movements and specific habitat fidelity. Although somewhat arbitrary, such categorization will help facilitate effective analysis of out-of-subbasin effects in the sections below.

3.5.1 Limiting Factors Outside Subbasin for Migratory Species

Long Distant Migrants

Terrestrial focal species that exhibit long-distance migrations are limited to avian species. The category can be further divided to define: a) species that move from regional breeding areas in or around the State of Oregon (which may include the Malheur watershed itself), to specific wintering areas in the vicinity of the Malheur subbasin where they form flocks or loose aggregations (horned lark and bald eagle); and, b) neo-tropical migrants that occur in the Malheur subbasin exclusively for breeding, and winter south of the U.S. in Central and South America (yellow warbler and yellow-breasted chat).

Horned lark and bald eagle wintering populations are influenced by alteration to breeding habitat and specific territories outside the subbasin. Throughout North America bald eagle breeding populations have been increasing due to intensive recovery efforts and, specifically, restrictions on the use of pesticides such as DDT. This pronounced out-of-subbasin effect will likely result in establishment of bald eagle breeding territories within the Malheur watershed in the near future (K. Paul, USFWS Biologist, pers. comm.). In general, loss of breeding habitat outside of the Malheur subbasin has resulted in horned lark population declines. However, the horned lark population known to breed and winter in the subbasin is increasing. This is likely due to the fact that the majority of the horned larks that breed outside of the subbasin and winter in the Malheur watershed breed in adjacent regions where conversion of natural habitat to agriculture and open fields provides increased habitat for species nesting.

Broad-scale declines in avian Neotropical migrant species – and in North American yellow warbler and yellow-breasted chat populations in specific – have resulted in local, State and Federal protected status designations. Both the yellow warbler and the yellow-breasted chat have experienced notable population declines attributed to loss and degradation of suitable habitat on wintering and breeding grounds. Such out-of-basin effects are likely to continue resulting in declines in populations occurring in the vicinity of the Malheur subbasin.

Regional Migrants

Species that may exhibit seasonal movements into adjacent regions outside of the watershed are likely to experience out-of-subbasin effects similar to those factors influencing population dynamics within the Malheur subbasin. Most notably in regard to big game species included within this migrant category, degradation of shrub-steppe habitat resulting from juniper encroachment and subsequent elimination of shrub forage species in adjacent areas outside of the subbasin will increase pressure on herds to congregate in areas where suitable forage does exist. Adjacent subbasins and habitat in Eastern Oregon are experiencing problems similar to those noted in the Malheur watershed. This continued trend will likely result in increased conflicts between regional migrant herd species and residents in agricultural and developed areas.

Sedentary Species

Although sedentary species, including the pileated woodpecker, blue grouse, sage grouse, California quail, river otter, Columbia spotted frog and leopard frog, show high site fidelity and are unlikely to range outside of suitable subbasin habitat, these species are not immune to out-of-

subbasin effects. Aquatic species may be notably influenced by regional pollution to the degree that air quality may affect subbasin water quality. All species will be influenced by habitat loss or degradation in adjacent areas, as this is likely to affect recruitment of individuals into Malheur subbasin populations.

3.5.2 Out-of-Subbasin Harvest of Managed Species

Although ODFW establishes species MOs at the level of the WMU, State- and range-wide consideration of population abundance, distribution and status is of primary importance in management of species for sustainable harvest. Statewide coordination of species management and harvest precludes the potential for undue influence of out-of-subbasin harvest on Malheur subbasin managed species populations.

4 IDENTIFICATION AND ANALYSIS OF LIMITING FACTORS

The following sections provide an assessment of environmental factors that may affect the population dynamics of terrestrial focal species occurring in the Malheur subbasin in regard to habitat requirements and key environmental correlates for each species.

4.1 Important Environmental Factors for Species Survival by Life Stage

Specific habitat requirements and limiting factors for each of the fifteen Malheur subbasin focal species are provided in the species accounts in Section 3.2.4 and in Table 14 below. Environmental factors that affect the constellation of terrestrial focal species selected for the subbasin as a whole emphasizes: habitat loss and habitat degradation.

In terms of habitat loss, relative to other regions of Oregon and North America in general, the Malheur subbasin has been only minimally affected by regional development. However, the nature of subbasin development has resulted in increased potential conflicts between focal species habitats and local human economic uses. Development of the natural resources throughout much of the subbasin has resulted in the conversion of native habitat types for agriculture. Such conversion provides suitable forage areas for ungulate focal species (e.g., mule deer, elk, pronghorn) while limiting the availability of suitable native habitat. This results in alteration in species range to developed agricultural areas.

Concomitant to the effect of habitat loss in the subbasin, is the noted effect of degradation of remaining native habitat. In specific, degradation of shrub-steppe habitat has significantly affected focal species populations. Those species chosen for their association with this particular habitat type – i.e., sage grouse, horned lark, pronghorn, California bighorn sheep – have seen distributional changes and trends in abundance depending upon the nature of their association with shrub-steppe. This habitat type is so dominant in the subbasin that other species typically associated with alternative habitats have also been affected.

4.2 Optimal Habitat Characteristics of Focal Species

The optimal habitat characteristics associated with each subbasin terrestrial focal species are listed in Table 14. Optimal habitat characteristics are the specific habitat requirements of a particular species. They are valuable in this context for determining biological objectives for each species. These optimal characteristics refer to the habitat attributes that optimize a particular species' population and survival.

Table 14: Optimal Habitat Characteristics of Focal Species.

Species	Subbasin Habitat	Optimal Habitat Characteristics
Pileated Woodpecker	Coniferous Forest Habitat	Forest older than 70 years of age High snag density
Elk	Winter Habitat	60/40 forage cover ratio Limited disturbance within habitat High density of mountain mahogany and bitterbrush in winter range
Blue Grouse	Coniferous Forest	Dense underbrush cover Large contiguous habitat
Sage grouse	Shrub-steppe Habitat	Suitable sagebrush cover Undisturbed lek sites
Horned Lark	Open Areas	Unvegetated ground for nesting
Pronghorn	Shrub-steppe Habitat	Suitable shrub component Available winter forage Undisturbed rangeland
California Bighorn Sheep	High Elevation Steppe	Undisturbed areas Continued limited harvest
Mule Deer	Winter Habitat	Increase shrub-steppe shrub component Minimized juniper encroachment Increased mountain mahogany Limited coyote and cougar predation
California Quail	Shrub-steppe	Open fields nearby Shrub component for cover
Bald Eagle	Open Water Habitat	Healthy water with suitable fish prey Nearby perch sites Large snags/trees for nesting Expansive open water habitat for foraging
River Otter	Open Water/Rivers	Slow-moving ponded areas Large fish prey base
Columbia spotted frog	Aquatic Sites	Minimal bullfrog occurrence Minimal non-native predatory fish Maintained water quality
Leopard Frog	Aquatic Sites	Deeper slow-moving ponded sites Minimal bullfrog occurrence Maintained water quality
Yellow Warbler	Riparian Habitat	Increased willow density Contiguous riparian corridors
Yellow-breasted chat	Riparian Habitat	Dense shrub component Contiguous riparian habitat

4.3 Determination of Species Key Ecological Functions

Key ecological functions (KEFs) of species are those roles that organisms play that affect the biodiversity, productivity, and sustainability of their ecosystems. Communities with the greatest functional variance and lowest redundancy in particular KEFs are those potentially at greatest risk of environmental change. Geographic areas with the weakest spatial links of particular KEFs across the landscape can be identified for potential conservation or restoration actions (Marcot, 1998).

The functional redundancy charts in the IBIS database show the following wildlife-habitat types as having consistently the lowest functional redundancy for the key ecological functions charted: Herbaceous Wetlands, Salt Scrub Shrublands, Lakes, Rivers and Streams, Interior Grasslands, and Mountain Mahogany Woodlands. These would be considered habitats potentially at the greatest risk of environmental change. Although this information is important to consider, many other factors point to shrub-steppe and riparian habitats as critical for terrestrial wildlife in the Subbasin, in particular for many of the chosen focal species. See Section 4.4 regarding limiting factors in the Subbasin.

4.4 Key Disturbance and Limiting Factors

Loss of habitat and degradation of habitat quality are the key disturbance factors limiting populations within the Subbasin. Overgrazing by native ungulates and livestock, alteration of fire cycles, introduction of non-native plant species, and roads have caused major changes in native vegetation communities, including riparian areas, wet meadows, and upland habitats over the past century. This has directly impacted many native bird and mammal species. The following list details the factors contributing to loss of habitat and degradation of habitat quality in the Malheur Subbasin. This list is a brief overview of detailed information from Section 3.2.

- Fire suppression has altered forest structure and function.
- Conversion of low elevation shrublands and valley floors to pasture or cropland has reduced overwintering habitat for ungulates and contributed to loss of riparian and wetland habitats.
- Livestock grazing, primarily by sheep, has spread disease that has nearly eliminated native bighorn sheep from much of their previous range.
- Livestock and ungulate grazing has impacted shrub-steppe habitats. Changes in shrub-steppe habitat have resulted in loss of winter range habitat for elk and mule deer, loss of spring and summer forage for pronghorn, and decline in populations and distribution of sage grouse.
- Encroachment of western juniper into shrub-steppe habitats has altered habitat structure and productivity and reduced habitat for sage grouse, elk, mule deer and other species.
- Road densities have decreased suitable habitat for deer, elk, and bighorn sheep and impacted riparian areas.

- Loss of beaver and beaver dam complexes from most streams and meadows has eliminated productive riparian and floodplain habitat important to many native wildlife species.
- Extirpation of salmon due to dams has eliminated a critical food and nutrient source for many other wildlife species in the Subbasin.
- Fire in shrub-steppe habitats has encouraged invasion of cheatgrass and other non-native species, destroying habitat for many species of wildlife and plants.
- Cheatgrass and other exotic weeds have invaded a number of other large areas. Noxious weeds reduce available wildlife habitat and outcompete desirable plant species.
- Much of the original acreage of wetland and riparian habitats has been converted to agricultural crops. Grazing has impacted a large portion of the remaining acreage.
- Grazing and changes in fire patterns have been linked to continued losses of biological soil crusts.

4.5 Key Disturbance Factors Outside Subbasin Limiting Populations

Migratory bird habitat has been altered outside the Subbasin, often negatively affecting bird populations. Dams on the Columbia River and its tributaries have negatively affected salmon and other fish populations. This change in fish populations has in turn affected the wildlife and ecological processes that depend on those fish. See Section 3.5 for more details regarding out-of-subbasin effects.

4.6 Opportunities for Human Intervention to Have/Not Have a Beneficial Effect

Opportunities for human intervention to have a beneficial effect include prescribed fire, improvements in various land management practices, revegetation efforts, and changes to grazing management practices including rest or retirement from grazing.

Prescribed fire and other forestry management practices including selective thinning can help to restore the forest ecosystems in the Malheur Subbasin.

Management practices that avoid habitat degradation past its functional or biotic threshold are preferable and less costly than attempting restoration after a habitat has been functionally degraded. Examples include use of fire or mechanical treatments to control juniper before the understory vegetation or soil is lost, or using careful grazing management strategies to maintain a healthy perennial understory in sagebrush habitats (Shaw et al. 2004)

Different revegetation practices can be used including restoration, reclamation and rehabilitation. Restoration is defined as reproducing the ecosystem structure and function that existed prior to disturbance, assuming the site was a desirable native ecosystem. Reclamation refers to a level of

restoration that requires a high level of system function, but may use non-native species and allow for structurally less complexity than restoration. Rehabilitation implies making the land productive again, but doing so by creating an alternate ecosystem with different structure and function from the original system. Rehabilitated lands may have low diversity, include only non-native species and require artificial inputs such as irrigation and fertilizer to exist. Rehabilitated land is used entirely for utilitarian purposes (Roundy et al. 1995).

Restoring rangelands to their original biodiversity is costly to implement initially, but results in ecosystems that require less maintenance input over the long term, and are more stable. Wildlife species such as sage grouse may require this level of restoration for optimal populations. Where restoration is not desirable or feasible, reclamation would be another less intensive choice. Reclamation can bring lands back to a functional state, improve diversity, and give lands a higher conservation value. Rehabilitation may only bring disturbed lands back to some level of productivity, without improving wildlife habitat or diversity.

Retirement from grazing can restore some lands, but may not improve others. This is especially true of arid lands where numerous observations of lands upon release from grazing or other disturbance have not shown a return to the original vegetation (Roundy et al, 1995). Riparian and wetland habitats are more likely to benefit and recover using rest from grazing as a restoration strategy. As rest between grazing increases, riparian health increases (Tate 2003). Fencing livestock out of the riparian zone is the only grazing strategy that consistently results in the greatest rate of vegetative recovery and the greatest improvement in riparian function (Kauffmann et al 1993).

The following are a number of conditions that can be corrected by human intervention:

- Degraded riparian and wetland habitats can be improved using exclusion from grazing, other grazing management techniques, and restoration or reclamation techniques.

- Sagebrush habitats with intact understory vegetation can be improved using grazing management techniques.

- Juniper encroachment can be controlled using mechanical or chemical treatments if the control is attempted before the understory vegetation or soil is lost.

5 BIOLOGICAL OBJECTIVES

Biological objectives describe the physical and biological changes needed to achieve the vision for the Subbasin. They have 2 components: the species level biological performance, which describes population responses to habitat conditions, and the habitat level environmental characteristics, describing the environmental changes that are needed to achieve the desired population responses (ISAB 2003).

The biological objectives for species in the Malheur Subbasin were obtained from the species' optimal habitat characteristics (See Table 14). The biological objectives for habitats address the key disturbance and limiting factors affecting habitats in the Subbasin (See Sections 3.2 and 4.5).

In regard to terrestrial focal species, biological objectives can best be achieved through restoration of two important habitat types: riparian and shrub-steppe. Of the fifteen terrestrial focal species designated under this Malheur subbasin plan, eleven would be directly affected through protection and restoration of native shrub-steppe and riparian habitat in the Malheur watershed. All focal species populations would be, at least in part, affected by such restoration efforts in the subbasin, and these specific habitat restoration objectives would help to influence focal species population toward historic and/or sustainable levels.

5.1 Species Level Objectives

5.1.1 Terrestrial Focal Species Status

The large majority of focal species population declines noted in the vicinity of the Malheur subbasin can be, at least in part, attributed to reduction and degradation of shrub-steppe and riparian habitat in the watershed. Big game ungulate species – including elk, pronghorn, bighorn sheep, and mule deer – have all been affected by loss of suitable forage and range habitat. Suitable sage grouse breeding sites become more and more limited in the Subbasin, as the shrub component of shrub-steppe habitat is reduced thereby limiting necessary protective cover for the species. Populations of horned lark and California quail have increased above historic levels resulting in increased potential conflicts with landowners.

In terms of riparian-associated focal species, loss of riparian corridors has directly affected populations of yellow warbler. Degradation of riparian habitat quality is indicated by an increase in populations of yellow-breasted chat. Riparian decreases and habitat degradation have also affected aquatic associates (bald eagle, river otter, spotted frog and leopard frog) through decreases in water quality. Table 15 below lists the status of each focal species as described in section 2.

Table 15: Malheur Focal Species Population Status.

Species	Decreasing	Stable	Increasing	Unknown	Notes
Rocky Mountain Elk		X			Stable
Pronghorn	X				Decrease in habitat
Blue Grouse		X			Stable to Slightly Increasing
Sage Grouse	X				Petitioned for T & E Listing
CA Bighorn Sheep		X			Stable reintroduction
Mule Deer	X				Predation and habitat degradation
California Quail			X		Increase in Ag habitat
Pileated Woodpecker			X		Forest habitat aging provides additional habitat
Horned Lark			X		Prefer degraded Shrub-steppe
Bald Eagle			X		More open water in the basin
River Otter		X			Present in Subbasin
Columbia Spotted Frog	X				Habitat Loss
Leopard Frog				X	Subbasin at western limit of species range
Yellow warbler	X				Habitat loss
Yellow-breasted Chat			X		Adaptable to variety of shrub habitats

5.1.2 Biological Objectives for Terrestrial Species

The following list outlines the optimal habitat characteristics for focal species that were listed in Table 14. These optimal habitat characteristics have been translated into the following biological objectives for focal species in the Malheur Subbasin:

- Pileated Woodpecker - Maintain some forests older than 70 years of age. Retain all large-diameter (>53 cm [21 in] d.b.h.) ponderosa pine, cottonwood, Douglas-fir, and western larch snags, preferably in clumps, and provide opportunities for snag recruitment throughout the mixed conifer habitats. As a long-term strategy, conduct mid-scale assessment of species snag use and the dynamics of snags in landscapes and adjust the strategy accordingly (Wisdom et. Al. 2000).

- Elk - Maintain 60/40 forage to cover ratio. Increase densities of mountain mahogany and bitterbrush in winter range.

- Blue Grouse - Maintain some forest areas with dense underbrush cover. Maintain some large contiguous areas of habitat.

- Sage Grouse - Optimize sage grouse breeding, nesting, and winter habitat diversity with regards to density, height, structure, and composition. Maintain undisturbed lek sites.

- Pronghorn - Maintain healthy sagebrush-steppe understory populations. Forbs compose the majority of pronghorn diets during spring and summer, and livestock grazing decreases the abundance of forbs (Wisdom 2000). Increase available winter browse forage.

- California Bighorn Sheep - Provide undisturbed areas in canyon and mountain shrub-steppe. Reduce human activities near important seasonal foraging areas and around known lambing areas of bighorn sheep (Wisdom 2000). Restore habitat links between summer and winter range and access to escape cover that have been lost due to changes in historical fire regimes. Restore quality and quantity of forage where succession has caused substantial reductions. Implement use of prescribed fire to reestablish inherent fire regime-vegetation patterns (Wisdom 2000).

- Mule Deer - Increase the shrub component in shrub-steppe habitats. Control juniper to protect mountain mahogany and bitterbrush in winter range.

- Bald Eagle - Maintain healthy water quality with suitable fish prey. Maintain/establish nearby perch sites. Maintain/establish large snags/trees for nesting. Maintain expansive open water habitat for bald eagle foraging.

- River Otter - Maintain slow-moving pooled areas. Maintain large fish prey base.

- Frog Species - Control bullfrog occurrence. Maintain minimal non-native predatory fish. Maintain/restore high water quality. Maintain deeper slow-moving pooled sites.

- Yellow Warbler - Increase willow density. Maintain/restore contiguous riparian corridors.

- Yellow-breasted Chat - Increase willow density. Maintain/restore contiguous riparian corridors.

5.2 Habitat Level Objectives

The following addresses the limiting factors for habitats that are listed in Section 4.4. A number of the limiting factors affecting the Malheur Subbasin are also found as limiting factors within the whole Columbia Basin. The Interior Columbia Basin Ecosystem Management Project developed many biological objectives to address limiting factors in the Interior Columbia Basin. Some of the following information is summarized from "Source Habitats for Terrestrial Vertebrates of Focus in the Interior Columbia Basin: Broad-Scale Trends and Management Implications." by Michael J. Wisdom and others (Wisdom et. Al. 2000).

- Use prescribed fire, timber harvest, and thinning to change forest composition and structure to reduce risk of stand-replacing wildfires and shift to maintenance with prescribed low-intensity underburn fires.

- Retain stands of ponderosa pine where mature forest conditions are present, and actively manage to promote their sustainability through the use of prescribed burning and understory thinning.
- Look for opportunities to acquire lands in lower elevation forest and forest-rangeland mosaics. Close and restore excess roads to reduce fragmentation of landscapes by roads. Use thinning to restore landscapes to a more native condition. Where natural process areas occur, prioritize road closures and restoration in adjacent areas to increase the interior core of habitats with native patterns.
- Restore the native grass and forb components of the upland woodland, shrubland, and grassland community in areas where intact understories still occur. Restoration measures include seedings and plantings in combination with effective methods of site preparation, effective management of grazing by domestic and wild ungulates, and control of human activities such as off road vehicle usage and other ground-disturbing factors.
- Proper management of grazing by domestic ungulates.
- Reduce human activities near important seasonal foraging areas and around known lambing areas of bighorn sheep (Wisdom 2000).
- Restore the native grass, forb, and shrub composition within the sagebrush-steppe habitat types.
- Identify and conserve large areas of remaining native upland shrublands and upland herblands where ecological integrity is still relatively high, and actively manage to promote their long-term sustainability.
- Control existing juniper encroachment areas with juniper management techniques.
- Decrease juniper encroachment through maintaining healthy desired vegetation communities.
- Close and restore excess roads to reduce fragmentation of landscapes by roads. Where natural process areas occur, prioritize road closures and restoration in adjacent areas to increase the interior functional core of habitats.
- Control cheatgrass and other exotic plants.
- Increase quality and amount of riparian areas through restoration of hydrologic flows, vegetation restoration, road management, and control of grazing and recreational activities (Wisdom 2000).
- Research biological soil crusts and their effects on soil stability. Research management opportunities for protection and restoration of biological soil crusts.

5.3 Summary of Biological Objectives

The following biological objectives are derived from the optimal habitat characteristics and the key disturbance and limiting factors for habitats in the Malheur Subbasin. Both habitat and focal species objectives are listed together by habitat group in the summary tables below.

Table 14: **Summary Table of Biological Objectives for Terrestrial Species/Forested Habitats.**

Species/Habitat Benefit	Biological Objective
Mixed Conifer Forest	
Pileated Woodpecker	Maintain some forests older than 70 years of age.
Pileated Woodpecker	Retain all large-diameter (>53 cm [21 in] d.b.h.) ponderosa pine, cottonwood, Douglas-fir, and western larch snags, preferably in clumps, and provide opportunities for snag recruitment throughout the mixed conifer habitats. As a long-term strategy, conduct mid-scale assessment of species snag use and the dynamics of snags in landscapes and adjust the strategy accordingly (Wisdom et. Al. 2000).
Elk	Maintain 60/40 forage/cover ratio.
Blue Grouse	Maintain some forest areas with dense underbrush cover.
Blue Grouse	Maintain some large contiguous areas of habitat.
Habitat	Limit disturbance within areas of habitat.
Habitat	Retain stands of ponderosa pine where old-forest conditions are present, and actively manage to promote their long-term sustainability through the use of prescribed burning and understory thinning (Wisdom 2000).
Habitat	Look for opportunities to acquire lands in lower elevation forest and forest-rangeland mosaics. Close and restore excess roads to reduce fragmentation of landscapes by roads. Use thinning to restore landscapes to a more native condition. Where natural process areas occur, prioritize road closures and restoration in adjacent areas to increase the interior functional core of habitats (Wisdom 2000).
Habitat	Use prescribed fire, timber harvest, and thinning to change forest composition and structure to reduce risk of stand-replacing wildfires and shift to maintenance with prescribed Low-intensity underburn fires (Wisdom 2000).

Table 15: Summary Table of Biological Objectives for Terrestrial Species/Shrub Habitats.

Species/Habitat Benefit	Biological Objective
Shrub Steppe	
Sage Grouse	Optimize sage grouse breeding, nesting, and winter habitat diversity with regards to density, height, structure, and composition.
Sage Grouse	Maintain undisturbed lek sites.
Pronghorn	Maintain healthy sagebrush-steppe understory populations. Forbs compose the majority of pronghorn diets during spring and summer, and livestock grazing decreases the abundance of forbs (Wisdom 2000).
Pronghorn	Increase available winter browse forage.
California Bighorn Sheep	Provide undisturbed areas in high elevation Shrub-steppe.
California Bighorn Sheep	Reduce human activities near important seasonal foraging areas and around known lambing areas of bighorn sheep (Wisdom 2000).

Species/Habitat Benefit	Biological Objective
California Bighorn Sheep	Restore habitat links between summer and winter range and access to escape cover that have been lost due to changes in historical fire regimes. Restore quality and quantity of forage where succession has caused substantial reductions. Implement use of prescribed fire to reestablish inherent fire regime-vegetation patterns (Wisdom 2000).
Mule Deer and birds	Increase the shrub component.
Habitat	Decrease juniper encroachment through maintaining healthy native vegetation.
Habitat	Restore the native grass, forb, and shrub composition within the sagebrush cover types (Wisdom 2000).
Habitat	Research biological soil crusts and their effects on soil stability. Research management opportunities for protection and restoration of biological soil crusts.
Habitat	Control existing juniper encroachment areas with juniper management techniques.
Habitat	Maintain some undisturbed areas.
Habitat	Identify and conserve large areas of remaining native upland shrublands and upland herblands where ecological integrity is still relatively high, and actively manage to promote their long-term sustainability (Wisdom 2000).
Habitat	Control cheatgrass and other exotic plants.
Habitat	Identify and conserve remaining core areas of shrub-steppe habitats where ecological integrity is still high (Wisdom 2000).
Habitat	Proper management of grazing by domestic and wild ungulates (Wisdom 2000).
Habitat	Restore the native grass and forb components of the upland woodland, shrubland, and grassland community groups to historical levels throughout the basin. Restoration measures include seedings and plantings in combination with effective methods of site preparation, effective management of grazing by domestic and wild ungulates, and control of human activities such as offroad vehicle usage and other ground-disturbing factors (Wisdom 2000).
Habitat	Reduce the negative effects of factors associated with roads. These include the indiscriminate poisoning and recreational shooting of ground squirrels, accidental and deliberate killing of snakes and lizards, the capture of reptiles as pets, and the poaching and disturbance of pronghorn populations (Wisdom 2000).
Habitat	Conservation of large core areas to provide long-term habitat stability; these areas will function as anchor points for restoration, corridor connections, and for other key functions of landscape management (Wisdom 2000).
Mountain Mahogany	
Elk, Mule Deer	Increase densities of mountain mahogany and bitterbrush in winter range.
Ungulates	Control juniper to protect mountain mahogany and bitterbrush habitats.

Table 16: Summary Table of Biological Objectives for Terrestrial Species/Water Habitats.

Species/Habitat Benefit	Biological Objective
Open Water	
Bald Eagle	Maintain healthy water quality with suitable fish prey.
Bald Eagle	Maintain/establish nearby perch sites.
Bald Eagle	Maintain/establish large snags/trees for nesting.
Bald Eagle	Maintain expansive open water habitat for bald eagle foraging.
River Otter	Maintain slow-moving ponded areas.
River Otter	Maintain large fish prey base.
Herbaceous Wetlands	
Frog Species	Control bullfrog occurrence.
Frog Species	Maintain minimal non-native predatory fish.
Frog Species	Maintain/restore high water quality.
Leopard Frog	Maintain deeper slow-moving ponded sites.
Columbia Spotted Frog	Maintain characteristic CSF breeding habitat: shallow waters of ponds, wetlands or backwaters of streams where there is emergent vegetation.
Riparian Areas	
Yellow Warbler, Yellow-breasted Chat	Increase willow density.
Yellow Warbler, Yellow-breasted Chat	Maintain/restore contiguous riparian corridors.
Habitat	Limit disturbance within habitat.
Habitat	Increase quality and amount of riparian shrublands and woodlands through restoration of hydrologic flows, vegetation restoration, road management, and control of grazing and recreational activities (Wisdom 2000).
Habitat	Restore habitat by fencing and other proper grazing management strategies.

5.3.1 Habitats for High Priority Protection

The following habitats have been identified for high priority protection:

- Functioning wetland and riparian habitats,
- Functional and intact sagebrush steppe habitats,
- Functional and intact quality mountain mahogany habitats,
- Functional mature forests and open grown ponderosa pine habitats.

5.3.2 Habitat to Reestablish Access

Habitats in the Malheur Subbasin that provide corridors for wildlife movements are critical to reestablishing access between habitats. Corridors of vegetation linking wildlife habitats provide valuable areas for movement and are useful habitats themselves. Animals use these areas for

dispersal, which limits overcrowding of existing habitats and allows recolonization of areas from which animals have disappeared. Corridors can help promote genetic diversity within species, which makes populations less susceptible to disease and predation. They can also provide animals an escape from local disasters or changes in food availability in some areas. The following habitats make good wildlife corridors:

- Riparian habitats; creeks, streams, and rivers,
- Roadless areas in forested habitats at least 30-100m in width that connect large patches of habitat,
- Undisturbed areas that link one type of habitat to another, for example forests to shrub-steppe.

Planning for wildlife corridors requires spatial analysis of current animal migration areas combined with available habitat that could provide wildlife corridors. Once identified, these areas can be established and protected for wildlife use.

5.3.3 Habitat for Restoration

The following habitats have been identified for restoration:

- Degraded riparian and wetland habitats,
- Degraded sagebrush steppe habitats with intact understory,
- Juniper encroachment areas with intact understory and soils.

6 SUBBASIN-WIDE HYPOTHESES AND ASSUMPTIONS

6.1 Working Hypotheses

- Fire suppression has altered forest structure and function; prescribed fire, timber harvest, and thinning can be used to change forest composition and structure to reduce risk of stand-replacing wildfires and shift to maintenance with prescribed low-intensity underburn fires.
- Functioning riparian and wetland habitats support a variety of wildlife species; degraded riparian and wetland habitats can be improved using exclusion from grazing, other grazing management techniques, and restoration or reclamation techniques.
- Functional shrub-steppe habitats support sage grouse populations, winter ranges for elk and mule deer, and many other wildlife species; shrub-steppe habitats with intact understory vegetation can be improved using restoration and proper grazing management techniques.
- Western juniper and other weedy species encroachment results in wildlife habitat loss; juniper and encroachment can be controlled using chemical or mechanical treatments if the control is attempted before the understory vegetation or soil is lost.
- Road densities have decreased suitable habitat for deer, elk, and bighorn sheep. Increasing road densities causes habitat fragmentation, increases wildlife mortality, increases noxious weed invasion, increases human use patterns including poaching and other disturbances, and alters riparian functioning; closing and restoring excess roads reduces fragmentation of landscapes by roads. Where functioning habitat areas occur, prioritize road closures and restoration in adjacent areas to increase the interior functional core of habitats.
- Grazing and changes in fire patterns have been linked to continued losses of biological soil crusts; research on biological soil crusts and their effects on soil stability and rangeland health can be conducted along with research of management opportunities for protection and restoration of biological soil crusts.

7 REFERENCES

All references are included in a separate document