Alternative 7K on the Payette National Forest

Alternative 7K implements recent court settlements to determine areas that are unsuitable for domestic sheep grazing and closely reflect grazing practices on the Payette National Forest for 2007 and 2008. Figure W-9h displays the spatial extent of the deduction in Alternative 7K overlain with the risk model and the rated trailing routes.

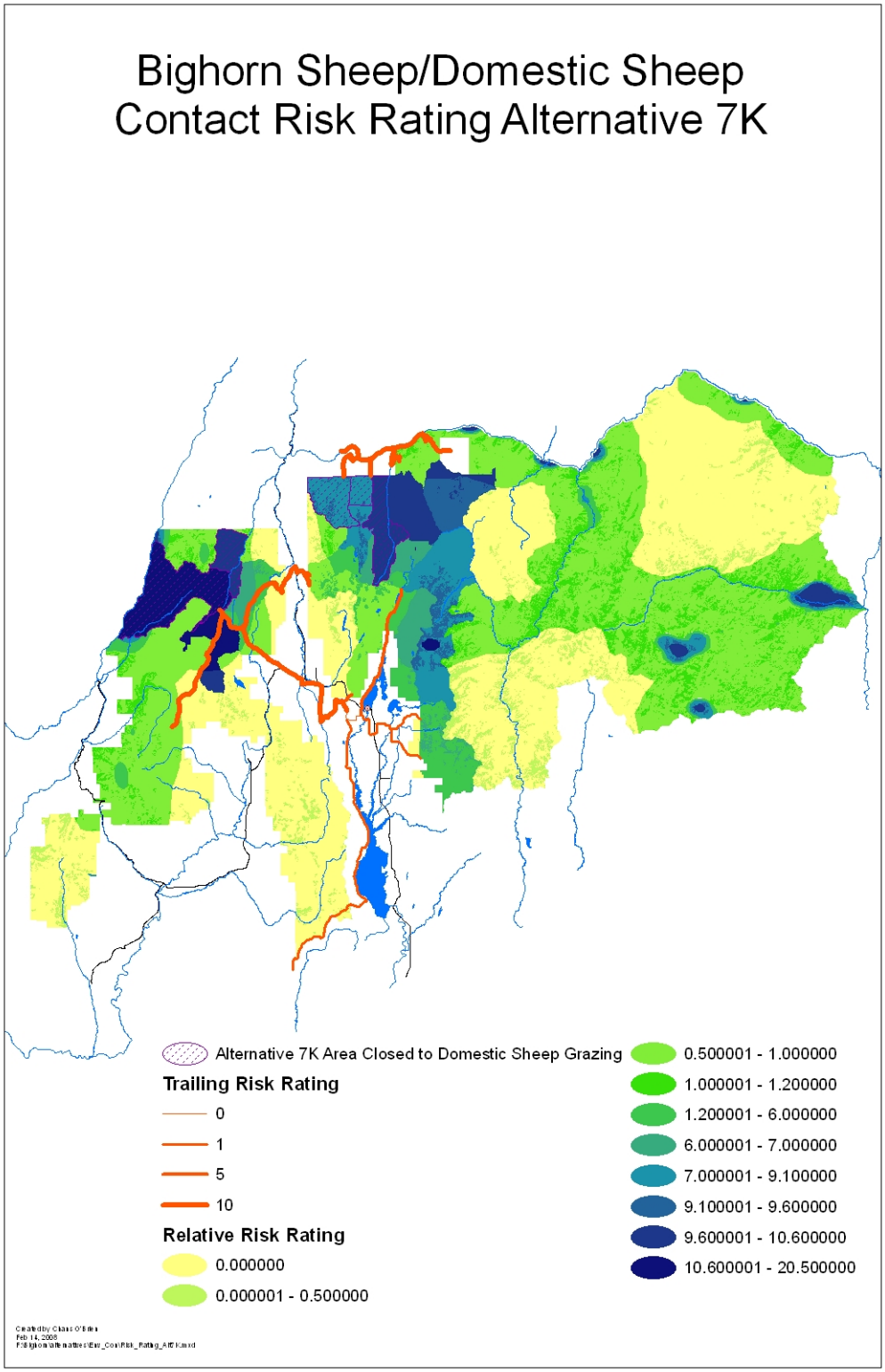
A total of 122,231 acres—122,198 currently within domestic sheep allotments—are no longer suitable for domestic sheep grazing (i.e., inside of the alternative). The 122,231 acres were overlain with the risk model and the total relative risk for each polygon was compiled for the entire changed area encompassed by Alternative 7K. This risk is not the percent risk of contact; it is the percent of the total relative risk that remains outside of the alternative. A risk ratio of the amount of relative risk remaining on the landscape to the amount of relative risk remaining on the landscape was developed (Table W-32). The higher the absolute value of the ratios, the less risk posed by an alternative.

Table W-32. Relative Risk of Contact on the Payette National Forest for Alternatives 7 and 7K

Alternative	Risk Removed (%)	Risk Remaining[1] (%)	Risk Ratio
7	0	100	0
7K	28	72	0.39

[1] Outside of the alternative.

Figure W-9h. Alternative 7K Overlain with Risk Model and Rated Trailing Routes



To further elucidate information about the risk posed by the alternatives, each was further evaluated according to the amount of risk remaining in the high, moderate, and low risk categories. The risk data from the model were grouped into three even categories to represent the three corresponding levels of risk for Alternative 7K (Table W-33).

Table W-33. Relative Risk Remaining on the Payette National Forest Outside of the Alternative by Risk Category for Alternatives 7 and 7K

Alternative	High Risk (%)	Moderate Risk (%)	Low Risk (%)
7	100	100	100
7K	5	65	100

Alternative 7K retains 72 percent of the total relative risk on the landscape in areas outside of the alternative, compared with 100 percent in Alternative 7. The overall risk ratio improves from 0 to 0.39. For Alternative 7K, 5 percent of the area outside of the alternative remains in the high risk category, compared with Alternative 7, which is 100 percent. Most of the potential risk of contact removed in Alternative 7K is in the high risk areas. However, 5 percent in the high risk category still leaves a high risk on the landscape. A substantial amount of moderate (65 percent) and low (100 percent) risk areas remain in this alternative. A substantial potential for the risk of contact in Alternative 7K remains, due to the total relative risk and risk ratios noted above and the small percentage of high, moderate, and low risk areas that remain.

All trailing routes that intersect with areas considered unsuitable for domestic sheep grazing are closed to domestic sheep use in Alternative 7K, except for the Salmon River Driveway, which remains open to the junction with Hornet Creek Road (see Figure W-9h). The high risk portion of the Salmon River Driveway in the Cuddy Mountain area is closed, reducing the risk in this area. The potential risk of contact between bighorn and domestic sheep on or near these trailing routes is eliminated in this alternative, relative to Alternative 7. However, trailing routes rated as high, medium, and low risk still cross the Payette National Forest. The high risk trailing routes adjacent to the Payette National Forest that lead to the main Salmon River and routes along the main Salmon River remain open. Figures W-1e and W-1g display telemetry and observational points located near the trailing routes; all were rams. Figures RR-3 and RR-4 (see *Rangeland Resources* section) show the habitat located near trailing routes. Figure W-9h shows this alternative overlain with the rated trailing routes. Although risk decreases from the removal of trailing routes when compared with Alternative 7, a substantial potential risk of contact is still present. The risk of contact results from the trailing routes on and adjacent to the Payette National Forest that remain outside this alternative.

To further breakdown the proposed changes in Alternative 7K, the components of GPRs and source habitat are reviewed.

Geographic Population Range—Figure W-9a demonstrates the GPRs for the two metapopulations. The GPRs cover a combined 1,172,564 acres (51 percent) of the Payette National Forest: 254,020 acres (11 percent of the Payette National Forest) comprise the

Hells Canyon GPR and 918,544 acres (40 percent of the Payette National Forest) comprise the Salmon River GPR. Alternative 7K determines 122,231 acres—10 percent of both GPRs—as unsuitable for domestic sheep grazing (i.e., inside of the alternative). The total percentage of bighorn sheep GPR that falls outside this alternative is 90 percent: 73 percent of the Hells Canyon GPR and 94 percent of the Salmon River GPR (Table W-34).

Table W-34. Percentage of Geographic Population Ranges (GPRs) Affected by Alternatives 7 and 7K on the Payette National Forest

Alternatives	Area Outside of the Alternative			Area Inside of the Alternative		
	Total GPR (%)	Hells Canyon GPR (%)	Salmon River GPR (%)	Total GPR (%)	Hells Canyon GPR (%)	Salmon River GPR (%)
7	100	100	100	0	0	0
7K	90	73	94	10	27	6

Under Alternative 7K, 122,231 acres on the Payette National Forest is considered unsuitable for domestic sheep grazing, including a portion of the area that overlaps with modeled GPRs. This alternative protects sheep whose populations overlap this portion of the area. However, 90 percent of bighorn sheep GPRs still overlap with areas outside this alternative, which accounts for most of the current estimated occupied habitat. The greater this overlap, the greater the potential for the risk of contact, which according to appeal direction threatens bighorn sheep viability by allowing continued grazing of domestic sheep in or near occupied bighorn sheep habitat. Furthermore, these GPRs are based on "depressed" populations and would be expected to expand with population recovery. As previously demonstrated, bighorn sheep will travel long distances between habitat patches where they could encounter domestic sheep. Managing 90 percent of the GPR outside this alternative leaves a substantial portion of the potential risk of contact within estimated current occupied habitat.

Source Habitat—A total of 25,345 acres (21 percent of the area covered by the alternative) of summer source habitat for bighorn sheep overlaps with the area inside of the alternative. This alternative determines 7 percent of total bighorn sheep summer source habitat on the Payette National Forest as unsuitable for domestic sheep grazing (Table W-35). A total of 15,206 acres (12 percent of the area covered by the alternative) of winter source habitat for bighorn sheep overlaps with the area inside of the alternative, which amounts to 8 percent of the total bighorn sheep winter source habitat (Table W-35).

Table W-35. Bighorn Sheep Source Habitat on the Payette National Forest for Alternatives 7 and 7K

Alternatives	Summer Source Habitat Inside of the Alternative		Winter Source Habitat Inside of the Alternative		Summer Source Habitat Outside of the Alternative (%)	Winter Source Habitat Outside of the Alternative (%)
	Acres	Percent	Acres	Percent		
7	0	0	0	0	100	100
7K	25,345	7	15,206	8	93	92

Some portion of the risk of contact on the Payette National Forest is eliminated in this alternative by determining source habitat to be unsuitable for domestic sheep grazing. However, a risk of contact results from any overlap between source habitat and domestic sheep grazing or from any overlap of travel corridors that bighorn sheep traverse between their naturally fragmented source habitats and domestic sheep grazing. The high amount of source habitat outside this alternative leaves a high potential for risk of contact on the landscape.

Summary—The risk model indicates that 72 percent of the total relative risk remains across the area outside of Alternative 7K, with a risk ratio of 0.39. Some of what remains is in the high risk category (5 percent), although most of what remains is in the moderate (65 percent) and low (100 percent) risk categories. Additionally, 90 percent of the GPRs, 93 percent of summer source habitat, and 92 percent of winter source habitat remain outside of the alternative. Trailing routes that pose a considerable potential for the risk of contact remain open to domestic sheep use across the Payette National Forest. This alternative eliminates some of the potential for risk of contact between bighorn and domestic sheep on the Payette National Forest, but a high level of risk remains. The amount of high, moderate, and low risk areas that remains on the landscape and the trailing routes that remain open to domestic sheep use is of particular concern. This alternative has the potential for a high risk of contact between bighorn and domestic sheep, although the risk is less than Alternative 7.

Comparison of the Alternatives

Ranking of the Alternatives

The following tables compare and contrast the information presented above for all of the alternatives. Table W-36 displays the changes by alternative to suitability and allotments that remain outside of the alternatives.

Table W-36. Areas Determined Unsuitable for Domestic Sheep Grazing (Inside of the Alternative) on the Payette National Forest

Alternative	Unsuitable for Domestic Sheep Grazing			Current Allotments Remaining Open (%)	Rank for Effects to Domestic Sheep Grazing[1]
	Total Acres	Acres Within Current Domestic Sheep Allotments	Suitable Acres		
1B, 2, 5, and 7	0	5,288	0	100	1
3, 4, and 6	82,002	25,988	6,113	95	2
7E	2,300,253	490,476	100,310	0	7
7G	1,172,565	298,378	61,842	39	4
7H	2,039,586	459,644	94,231	6	6
7J	1,837,441	311,428	58,785	37	5
7K	122,231	122,198	24,981	75	3

[1] Ranked 1 through 7, with 1 having the least effect and 7 having the greatest effect.

Alternatives 3, 4, and 6 and Alternative 7K (of the modified Alternative 7 alternatives) have the least effect on acres available to domestic sheep grazing. Alternative 7E and 7H have the greatest effect. Other alternatives have an intermediate effect.

Frank Church River of No Return Wilderness

The alternatives vary in how they treat the area of the Frank Church River of No Return Wilderness area that is administered by the Payette National Forest. In some alternatives, the wilderness is considered unsuitable for domestic sheep grazing (i.e., inside of the alternative); in others, the wilderness is outside or partially outside of the alternative. However, after alternative development was complete, it was discovered that, although the Wilderness Act of 1964 does not prohibit range suitability for domestic animal grazing, Forest Service policy regarding the area administered by the Payette National Forest is that as commercial livestock allotments are closed, the area would be removed from future range suitability. Therefore, the entire Payette National Forest portion of the Frank Church River of No Return Wilderness area has been removed from suitability for commercial livestock grazing, although pack animals are permitted. The overall ranking of alternatives does not change from including the wilderness area as suitable for domestic sheep grazing, but the actual amount of total risk for bighorn sheep may differ (Table W-37).

Table W-37. Relative Risk of Contact on the Payette National Forest and Outside the Frank Church Wilderness Area for all Alternatives

Alternative	Total Risk Removed (%)	Risk Remaining on Landscape (%)	Risk Ratio for All Acres	Risk Ratio for All Acres Outside of the Frank Church Wilderness	Rank for Minimizing Potential of Contact[1]
1B, 2, 5, and 7	0	100	0	0	7
3, 4, and 6	11	89	0.12	0.15	6
7E	100	0	∞	∞	1
7G	80	20	3.92	3.20	4
7H	96	4	25.63	21.63	2
7J	83	17	4.92	4.03	3
7K	28	72	0.39	0.50	5

[1] Ranked 1 through 7, with 1 minimizing the potential for contact the most and 7 minimizing the potential for contact the least.

Alternative 7E reduces the potential risk of contact between domestic and bighorn sheep the most, since all areas and trailing routes within the Payette National Forest boundaries are closed to domestic sheep use. Alternative 7H is the next alternative that reduces risk the most, with a risk ratio of 25.63 and only 4 percent of the total risk remaining on areas outside of the alternative. Alternatives 7J and 7G are intermediate choices for reducing the potential risk of contact. Note that eliminating the wilderness as suitable acres for domestic sheep in all alternatives does not change the rankings; however, it does narrow the gap in risk ratios between some alternatives, primarily 7J and 7G, and widen the gap between 7K and Alternatives 3, 4, and 6. Alternatives 7K and 3, 4, and 6 have the lowest risk ratios and leave the highest amount of risk on the landscape.

Alternative 7E minimizes the potential risk of contact to the highest degree by leaving no areas on the Payette National Forest suitable for domestic sheep grazing. Alternative 7H leaves 4 percent of the total relative risk outside the alternative. Alternatives 7G and 7J are intermediate in their potential risk of contact: Alternative 7G has more risk due to the higher amount of moderate risk that remains on the landscape while 7J leaves some moderate risk, but more of the risk that remains is distributed to the low risk category. Alternatives 7K and 3, 4, and 6 pose the highest risk by leaving a high potential for risk of contact, large amounts of moderate risk areas, and even larger amounts of low risk areas. Each alternative can be ranked according to the percentage of high, moderate, and low risk areas that remain (Table W-38).

Table W-38. Relative Risk Remaining on the Payette National Forest Outside of the Alternative by Risk Category for all Alternatives

Alternative	Percentage Remaining Outside of the Alternative			Risk According to Percentage Remaining Outside of the Alternative		
	High Risk (%)	Moderate Risk (%)	Low Risk (%)	High Risk Remaining	Moderate Risk Remaining	Low Risk Remaining
1B, 2, 5, and 7	100	100	100	4	6	6
3, 4, and 6	13	96	95	3	5	5
7E	0	0	0	1	1	1
7G	0	18	30	1	3	3
7H	0	0	12	1	1	2
7J	0	9	35	1	2	4
7K	5	65	100	2	4	6

[1] Alternatives ranked with a 1 have the least amount of risk remaining.

According to appeal direction, viability is threatened by allowing continued grazing of domestic sheep in or near occupied bighorn sheep habitat and the alternatives vary by the amount of occupied habitat they consider unsuitable for domestic sheep grazing (Table W-39). Only Alternatives 7E, 7G, and 7H determine occupied habitat, as defined by the GPRs, as unsuitable for domestic sheep grazing. Alternatives 7E and 7H also buffer the GPRs adjacent to current occupied habitat, further minimizing the potential risk of contact from either stray domestic sheep or bighorn sheep that may not conform to modeled occupied habitat. Alternative 7J allows some areas within the GPRs to be outside of the alternative, with a higher area of the Hells Canyon GPR outside of the alternative. Alternatives 7K and 3, 4, and 6 both leave a large amount of the GPRs outside of the alternatives.

Table W-39. Geographic Population Ranges (GPR) Outside of Each Alternative on the Payette National Forest

Alternative	Outside of Alternative			Rank According to Percentage Outside of Each Alternative		
	Total GPR (%)	Hells Canyon GPR (%)	Salmon River GPR (%)	Total GPR	Hells Canyon GPR	Salmon River GPR
1B, 2, 5, and 7	100	100	100	5	5	4
3, 4, and 6	93	68	100	4	3	3
7E	0	0	0	1	1	1
7G	0	0	0	1	1	1
7H	0	0	0	1	1	1
7J	7	15	5	2	2	2
7K	90	73	94	3	4	3

The last comparison is of source habitat that each alternative leaves outside of the alternative (Table W-40). Alternative 7E leaves no source habitat outside of the alternative, and Alternative 7H leaves 8 percent and 7 percent of summer and winter source habitat, respectively, outside of the alternative. Alternative 7J leaves slightly more source habitat outside of the alternative and Alternative 7G leaves even more. Alternatives 7K and 3, 4, and 6 both leave a large amount of source habitat outside of the alternatives.

Table W-40. Bighorn Sheep Source Habitat on the Payette National Forest for all Alternatives

Alternative	Remaining Outside of the Alternative				Rank for Source Habitat Left Outside of the Alternative	
	Summer Source Habitat (%)	Summer Source Habitat (Acres)	Winter Source Habitat (%)	Winter Source Habitat (Acres)	Summer Source Habitat	Winter Source Habitat
1B, 2, 5, and 7	100	0	100	0	7	7
3, 4, and 6	92	29,021	87	25,021	5	5
7E	0	379,609	0	196,172	1	1
7G	31	260,431	29	139,183	4	4
7H	8	347,563	7	181,668	2	2
7J	13	330,510	10	177,015	3	3
7K	93	25,345	92	15,206	6	6

The trailing routes that remain open in each alternative also differed. Alternative 7E left no trailing routes open to domestic sheep use, thus eliminating the risk of contact from trailing routes on the Payette National Forest. Alternative 7H determined all high and moderate risk rated trailing routes to be closed to domestic sheep use, but some low risk trailing routes remained open. Alternatives 7G and 7J determined some of the high risk trailing routes to be closed to domestic sheep use; but other high, moderate, and low risk trailing routes remained

open, with their subsequent risk of contact. Alternative 7K also considers some high risk trailing routes as closed but leaves more high, moderate, and low risk trailing routes open to domestic sheep use than Alternatives 7G or 7J. The risk of contact in Alternative 7K from trailing routes is somewhat higher than for Alternatives 7G or 7J. Alternatives 3, 4, and 6 and Alternative 7 (and 1B, 2, and 5) leave all trailing routes open to domestic sheep use.

Compliance with the Hells Canyon National Recreation Area Act

The Forest Plan (USDA Forest Service 2003) had an appeal issue related to the consistency between language in the HCNRA Act and its implementing regulations (36 CFR 292.48) and maintaining domestic sheep grazing because of the risk of disease transmission (USDA Forest Service 2006a).

The following determinations have been made regarding compatibility with the HCNRA Act and the HCNRA Comprehensive Management Plan (CMP) for the action alternatives analyzed for this DSEIS.

Alternatives 7G, 7E, and 7H

All three of these alternatives eliminate domestic sheep grazing from the Payette National Forest system lands within the boundary of the HCNRA. They also eliminate domestic sheep grazing at least six 6 air miles from the boundary of the HCNRA.

Eliminating domestic sheep grazing in the HCNRA and surrounding area is compatible with the HCNRA Act and its implementing regulations by providing for the protection, restoration, and maintenance of bighorn sheep and their habitat. All three alternatives are in compliance with the HCNRA CMP by maintaining a separation between bighorn and domestic sheep that is likely to keep the two species apart at the current population levels.

Alternatives 7J and 7K

These alternatives eliminate domestic sheep grazing from the Payette National Forest system lands within the boundary of the HCNRA. However, both alternatives allow grazing within 3 air miles of the boundary of the HCNRA in the Lick Creek Lookout area. Mixing of the two species in this area is likely over a 5-year period, if bighorn sheep occupy habitats they have in the recent past. This represents at least a moderate risk to bighorn sheep. Consequently, alternative 7J and 7K are not in compliance with the compatibility requirements of the HCNRA Act beyond the immediate future.

Alternatives 1B, 2, 3, 4, 5, 6, and 7

All of these alternatives allow domestic sheep grazing in the Payette National Forest system lands within the boundary of the HCNRA. Mixing of the two species in this area is likely over a 5-year period. This represents at least a high risk to bighorn sheep, if bighorn sheep occupy habitats they have in the recent past. All of these alternatives are not in compliance with the compatibility requirements of the HCNRA Act.

Synthesis

From these results, it is apparent that Alternative 7E, followed by Alternative 7H, reduces the potential risk of contact between bighorn and domestic sheep to the greatest extent. They also have the largest effect on livestock allotments. Alternatives 7G and 7J are the next best alternatives for minimizing the potential risk of contact, with intermediate effects to the livestock allotments. However, some differences exist between Alternatives 7G and 7J. Alternative 7G does not considered the modeled occupied habitat (GPR) to be suitable for domestic sheep grazing. However, it does leave slightly more moderate risk on the landscape outside of the alternative. The risk ratio for Alternatives 7J and 7G reflecting the overall risk are very close, with Alternative 7J having the higher ratio. Alternative 7J, however, leaves occupied habitat outside of the alternative, as much as 15 percent of the Hells Canyon GPR and 5 percent of the Salmon River GPR. Grazing in the GPR poses a potential risk not reflected by the other numbers for this alternative (such as total risk, risk ratio, category risk, and source habitat). Neither Alternatives 7G nor 7J buffer the occupied habitat. Alternative 7K and then Alternatives 3, 4, and 6 are ranked next for minimizing risk, although they both leave a substantial amount of risk on the landscape but have much smaller effects to livestock allotments.

Consistent with 36 CFR §219.20(a), the following pages will supplement the Cumulative Effects section, page 3-328, of the Chapter 3 Terrestrial Wildlife Habitat and Species section of the 2003 Southwest Idaho Ecogroup Land and Resource Management Plans Final Environmental Impact Statement.

Cumulative Effects

Species of Special Interest

Bighorn Sheep

Activities and disturbances that take place on National Forest System lands can affect larger-scale functions beyond National Forest borders, and conversely, the management of lands outside of the National Forest may influence National Forest ecosystems. Management on other adjacent ownerships, including private, state, and other federal lands, may or may not consider the broad needs of ecosystem integrity or the more specific components, including wildlife populations. Therefore, National Forest System lands must provide for these attributes to contribute to functioning ecosystems and viable populations, regardless of ownerships. Adjacent lands under varied ownerships and interspersed ownerships may have different management direction regarding wildlife populations than the National Forests. Therefore, any Forest Service management activities affecting the specific components, particularly those components that are scarce outside of National Forest System lands, would affect the overall ecology and habitat properties these components provide for the entire region. How the Payette National Forest manages habitat can have far-reaching impacts on other ownerships and throughout the region, such as the dispersal of wildlife, and in this specific case, the impacts of disease. National Forest System lands can also be influenced in similar ways by the habitat management on other ownerships. Understanding the interactions that generate processes in wildlife populations and how they change with

management actions through space and time is crucial to providing for well-distributed habitat across the Planning Unit.

Each one of the alternatives discussed above would have effects both off and on National Forest System lands. Figure W-9i displays the extent of the two metapopulations with other landownerships. Those alternatives that eliminate all or most of the potential risk of contact between domestic and bighorn sheep on the Payette National Forest (Alternatives 7E and 7H) are hoped to also provide a large benefit to the broad metapopulations by reducing the probability of disease transmission between the species and subsequent spread across the metapopulation. The alternative that reduces the risk so that all of the current occupied bighorn sheep habitat on the Payette National Forest is considered unsuitable for domestic sheep grazing (Alternative 7G) should also reduce the probability of disease in the metapopulations, although perhaps not completely since sheep can have contact at the boundaries of the occupied habitat or expanding populations may increase the extent of occupied habitat. Those areas of potential moderate risk and some of the low risk contribute to this effect at the boundaries. Those Alternatives (7J; 7K; and 3, 4, and 6) that reduce areas suitable for domestic sheep grazing on the Payette National Forest but include some areas of occupied habitat, may also reduce the incidence of disease in the populations. However, disease may still cycle in the metapopulations since the potential for the risk of contact may be greater by retaining current occupied habitat outside of the alternative. As discussed above, those alternatives with higher potential risks of contact are expected to have potential effects of disease beyond the boundaries of the Payette National Forest within the larger metapopulations.

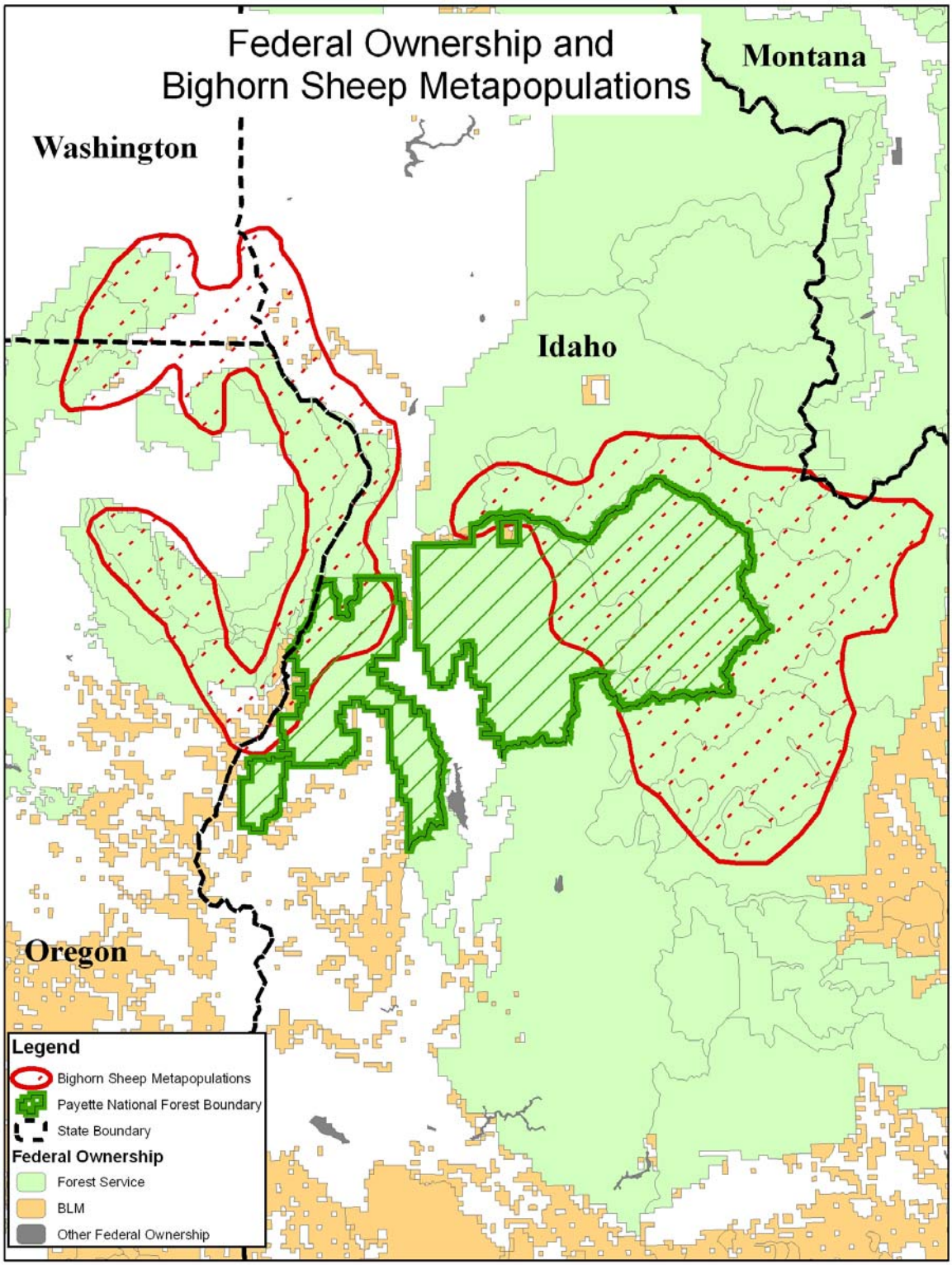
Other ownerships can also be affected by changes in National Forest domestic sheep allotments. Other federal and state agencies that issue domestic sheep permits can see changes in their capacity to issue permits if some of the biological and physical infrastructure needed to continue domestic sheep grazing is lost on the Payette National Forest. A similar trend could also extend to private lands. While reducing the infrastructure could have effects on the economics associated with domestic sheep grazing, it could also reduce additional risks to bighorn sheep by reducing potential risks of contact from other ownerships.

Figure W-9i displays the ownerships that can affect the potential risk of contact to bighorn sheep on the Payette National Forest. Even if the Payette National Forest eliminated all domestic sheep grazing (Alternative 7E), a potential risk of contact could exist from the adjoining ownerships that graze domestic sheep, particularly given the overlap of the GPRs and metapopulations onto adjacent ownerships. Domestic sheep are currently grazed on adjacent National Forests, the BLM, and private farm flocks. Therefore, disease could still be a factor for bighorn sheep populations on the Payette National Forest, regardless of how much domestic sheep grazing remains outside of the alternatives. The effects to the two metapopulations are unknown, since the potential risk of contact from lands other than the Payette National Forest is unknown.

Furthermore, given the continuous bighorn sheep source habitat that exists in the region (Figure W-9j), across state boundaries, and throughout Idaho, the effects of the potential risk of contact from the Payette National Forest can extend beyond the boundaries of the known GPRs. It is unknown how many bighorn sheep intermingle between populations, although given their metapopulation structure, intermingling throughout the region can be assumed.

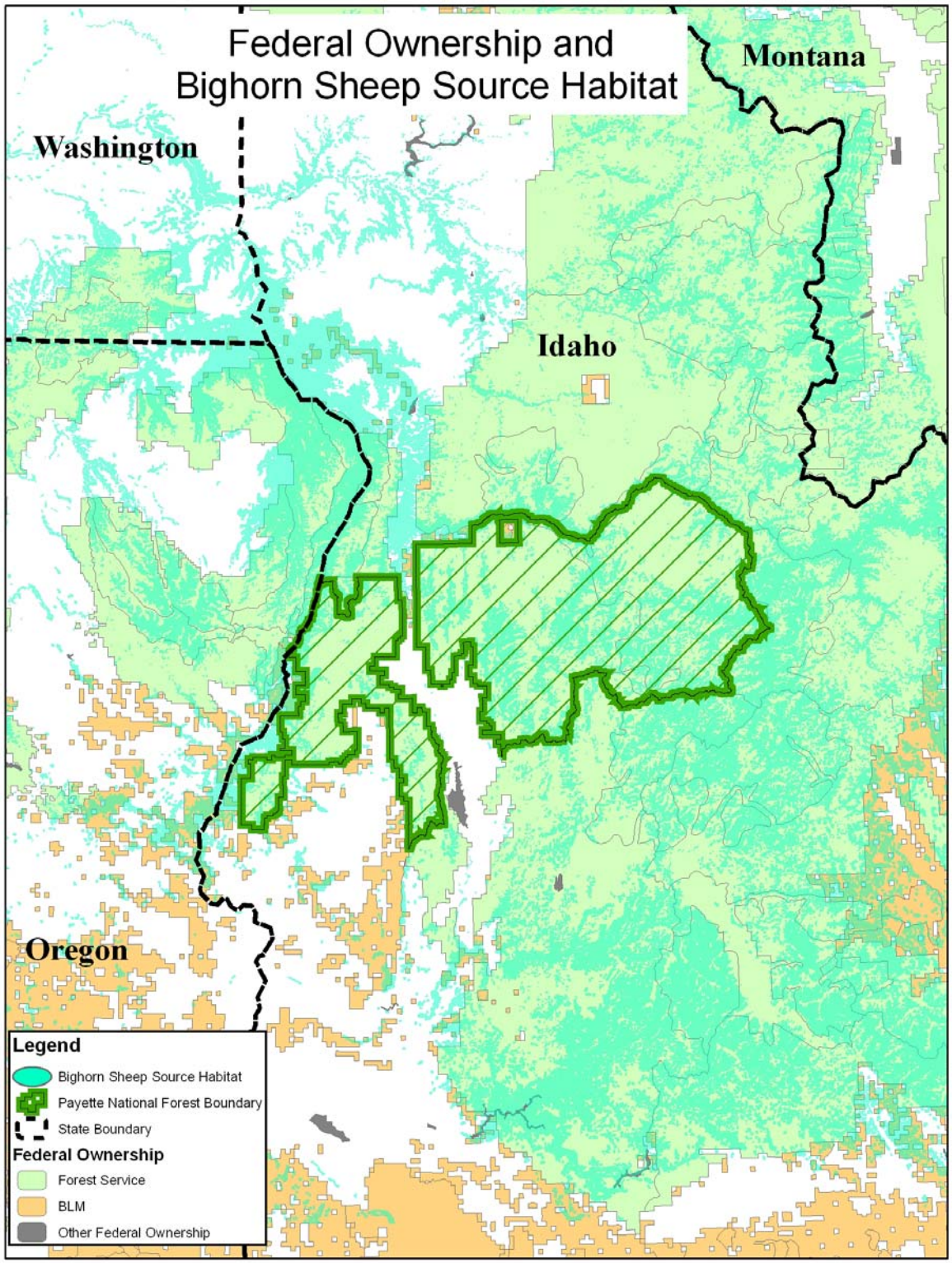
Radiotelemetry data from the Hells Canyon metapopulation shows that subpopulations are interconnected, which increases the risk of disease transmission moving throughout the metapopulations. Conversely, other ownerships that graze domestic sheep can be a potential source of disease to populations of bighorn sheep on the Payette National Forest, regardless of the alternative implemented by the Payette National Forest. GPRs were only modeled from the data available to the Payette National Forest. Data from other ownerships may exist that were not used in the modeling, particularly for the Salmon River GPR. The GPR could extend beyond the boundaries of the Payette National Forest, particularly to the east and south, given the continuous habitat.

Figure W-9i. Regional Metapopulations and Landownerships[1]



[1] Metapopulation boundaries have not incorporated more recent GPR modeling.

Figure W-9j. Ownerships and Continuous Habitat for Bighorn Sheep across Central Idaho and Adjacent States



The extent of connectivity between the Hells Canyon metapopulation and the Salmon River metapopulation is unknown, since both populations are at depressed levels. The connectivity corridors, which are the routes bighorn sheep move between areas, are also unknown.

From the visual perspective of Figure W-9j, the patterns of influence across a landscape that could exist between populations of bighorn sheep are apparent. A disease outbreak affecting one population may readily spread to another, given the continuous habitat, known modeled GPRs, and the potential for individuals of separate populations to come into contact. Shared summer ranges may also contribute to disease spread; therefore, if one population is at a higher risk of contracting disease, it increases the risk to other populations within the metapopulation, above and beyond just the immediate risk of proximity to domestic sheep and goats. This information can be used to infer that for habitat and population connectivity risks between the Payette National Forest and other ownerships do occur. This DSEIS only considers risks from the Payette National Forest commercial livestock allotments. Pack animals and other potential disease sources are not considered. Furthermore, Singer and Gudorf (1999) found grazing domestic cattle was negatively correlated with success of bighorn sheep populations (based on forage competition), although the effect on success was not as large as grazing domestic sheep. This effect would also occur across ownerships.

Conclusion

Models have shown that reducing the impact of disease on bighorn sheep has greater effects to population persistence than increasing areas of suitable habitat and/or corridors (Gross et al. 2000). Empirical data found that persistence of bighorn sheep populations was negatively correlated with the presence of domestic sheep, and that larger patch size, larger home-range size, greater migratory tendency, and the absence of domestic sheep are the most critical factors for population persistence in bighorn sheep (Singer et al. 2001). Habitat is not currently limiting to bighorn sheep on the Payette National Forest, but access to that habitat is limited when domestic sheep are present. Competition for the same habitat and the species' inherent attraction to each other increases the risk of contact whenever the species are in close enough proximity. Given the wide-ranging behavior of bighorn sheep, close proximity can encompass fairly large areas. Modeling done by Gross et al. (2000) found that mild disease events tended to have more persistent effects on population growth than severe infections, due to the dispersal of bighorn sheep from populations with mild disease. More severe events resulting in rapid, large die-offs tend to prevent dispersal. If the social structure is destroyed at the time of the event, regardless of the disease severity, population dispersal and dynamics can be affected (V. L. Coggins, Oregon Department of Fish and Game, pers. comm.). Larger population sizes with higher rates of dispersal had higher rates of persistence in the absence of disease; increased rates of movement facilitated disease transmission but also buffered the effects of disease by contributing to a spatially structured population and overall larger population size (Gross et al. 2000). Genetic exchange between populations is crucial for healthy metapopulations to function (Bleich et al. 1996). Careful attention to substructuring within and between populations is critical to management plans (Bleich et al. 1996). Furthermore, small populations and small patches of suitable habitat should not be undervalued, as these can be critical in a larger colonization process (Krausman and Leopold 1986). Unoccupied habitat patches represent an important aspect of bighorn sheep metapopulation dynamics because these areas may be the sites of future

populations and critical for long-term persistence (Nunney and Campbell 1993, Hanski 1998).

The bighorn sheep is a species that needs the large areas to create the spatially structured population required for their persistence. Small, isolated populations are not optimal for this species. Therefore, the need to minimize contact with domestic sheep within the large areas needed by bighorn sheep is crucial for strong, healthy populations of bighorn sheep. Keeping an adequate spatial buffer between bighorn sheep and domestic sheep is the most reliable method of preventing contact between these species (Desert Bighorn Council Technical Staff 1990, Schommer and Woolever 2001, Singer et al. 2001, WAFWA 2007), but spatial buffers are not always adequate given the distances bighorn sheep rams will travel (Wehausen et al., unpublished data) Clifford et al. (2007) recommended that if eliminating the risk of interspecies contact (thereby eliminating the probability of respiratory disease transmission to bighorn sheep from domestic sheep) is a management goal, at a minimum, domestic sheep grazing should not occur within the known population utility distribution of the bighorn sheep. Husbandry practices such as removing domestic sheep well before the onset of rut, following vigilant herd management to reduce strays, and responding to wandering bighorn sheep, are other methods to separate the species and reduce risk, but extensive monitoring efforts are required and are not always effective (DSEIS IDT and Cooperators 2007, 2008).

In large portions of habitat found in Alaska and Canada where domestic sheep are not grazed, the distribution of native sheep remains essentially unchanged from historical distribution (Valdez and Krausman 1999). Singer and Gudorf (1999) also reported that bighorn sheep were more successful if they were located further from domestic sheep. Similar effects have also been observed in Hells Canyon.

As bighorn sheep numbers increase and populations expand their geographic range, probabilities of domestic sheep contact could increase (Clifford et al. 2007). The models and expert opinions used in this analysis are based on current population levels; future movement of bighorn sheep can change during population growth or exploration by rams seeking mates (Clifford et al. 2007). Habitat is based on current habitat, which may also change due to succession, disturbance, and management. Changes in habitat could alter quantity and/or location on the landscape. Continued monitoring is essential to understanding the management implications of bighorn sheep movement, population growth, changing habitat, and changes in livestock grazing practices. Adjustments to the selected alternative may be needed, based on this monitoring.