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# Big Game Migration Corridors in Wyoming

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## Introduction

Wildlife is an important component in virtually every sector of Wyoming's economy including tourism and recreation, agriculture, minerals, energy, and transportation. Big game hunting and wildlife viewing provide substantial benefits to local and statewide economies. The health and persistence of big game herds and the positive economic effects derived from them rely largely on the effective management of seasonal ranges and the movement pathways or "migration corridors" used by big game animals to move between seasonal ranges. Migration corridors are receiving increasing attention from natural resource managers, conservationists, landowners, and others interested in maintaining large and well-distributed herds of big game animals.

This bulletin, along with Coupal et al. 2004, represents a contribution to the analysis of land ownership and management of segments of big game habitat in Wyoming. It is intended to help integrate conservation of natural resources and rural land development more effectively by identifying areas where big game migration corridors may be threatened.

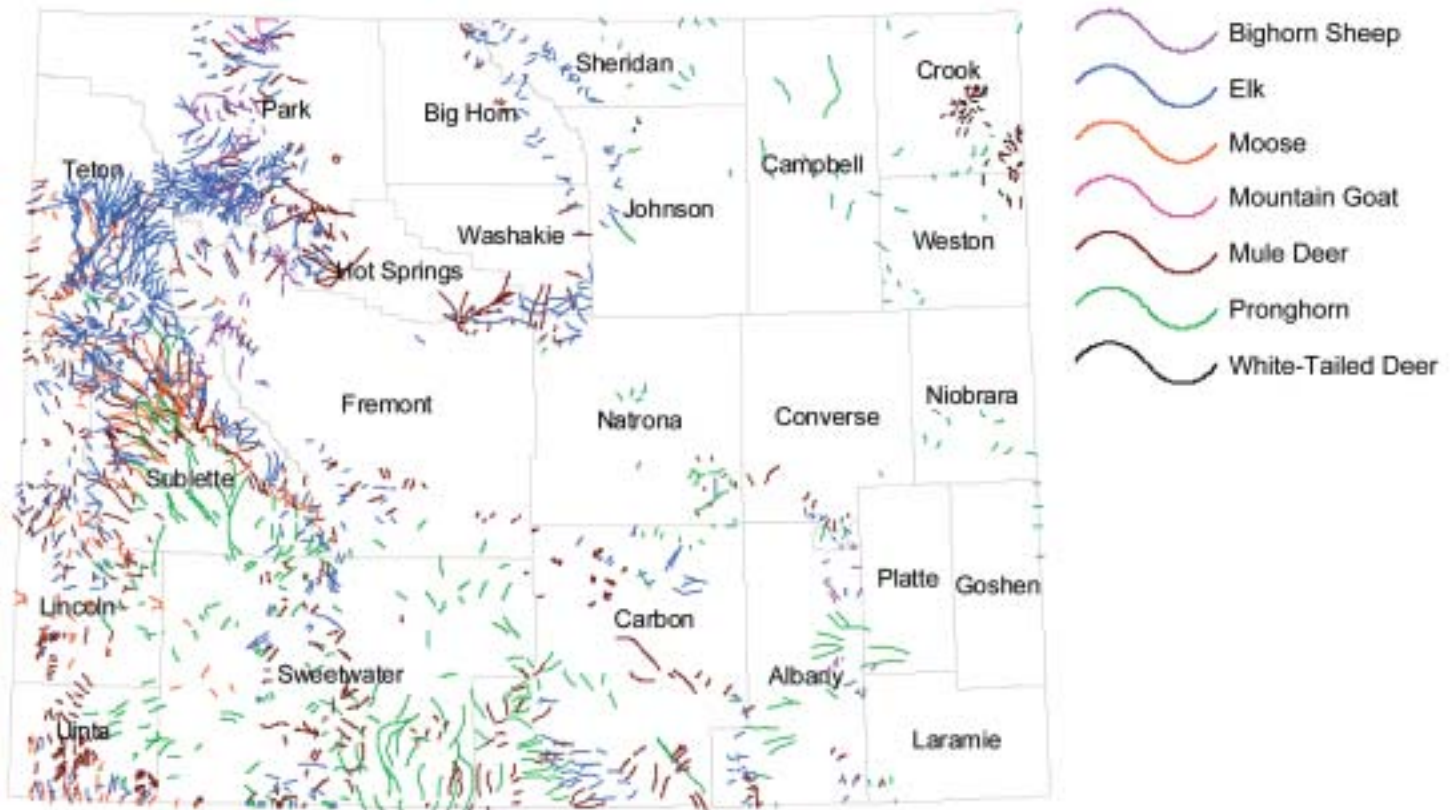
## Wildlife Migration Corridors

Big game animals migrate when seasonal changes reduce food availability, make it hard to move around (due to snow pack, for example), and make local conditions unsuitable for bearing young. Migration corridors provide wildlife with reliable passage between seasonal ranges and also serve as important transition range that provides food for migrating animals. Because the land surface of Wyoming is a complex mix of private land and land under federal or state management, most big game herds in the state encounter a diversity of land-management regimes during their migrations.

Recent studies in western Wyoming provide clear examples of the importance of certain corridors for wildlife migration (Sawyer and Lindzey 2000, 2001). These studies reveal several places where animals funnel through natural landscape "bottlenecks" as they migrate such as Trapper's Point west of the town of Pinedale. Several thousand mule deer and pronghorn migrate through this area every year between summer range to the north and winter range to the south. Some of these pronghorn travel up to 320 miles round trip between summer range in Grand Teton National Park and winter range south of Pinedale, the longest overland animal migration in the lower 48 states (Berger 2004).

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**Figure 1. Mapped migration corridors for huntable populations of seven big game species in Wyoming: bighorn sheep, elk, moose, mountain goats, mule deer, pronghorn, and white-tailed deer. Source data from the Wyoming Game and Fish Department.**



An increasing number of houses as well as energy industry development, fences, and roads threaten this and other migration corridors. The bottleneck at Trapper's Point, for example, has decreased from one mile to one-half mile in width due to rural residential subdivisions. Another corridor was blocked in 1983 at Red Rim near the town of Rawlins when pronghorn attempting to migrate to winter range were stopped by a newly erected fence. Approximately 1,000 animals died from starvation and exposure, and the landowner was ordered to modify or remove the fence.

When major roads cut across migration corridors, the effects can be dangerous for animals and humans. For example, hundreds of mule deer are killed in vehicle collisions every spring and fall as they attempt to migrate across U.S. Highway 30 between the towns of Kemmerer and Cokeville, Wyoming, and studies are

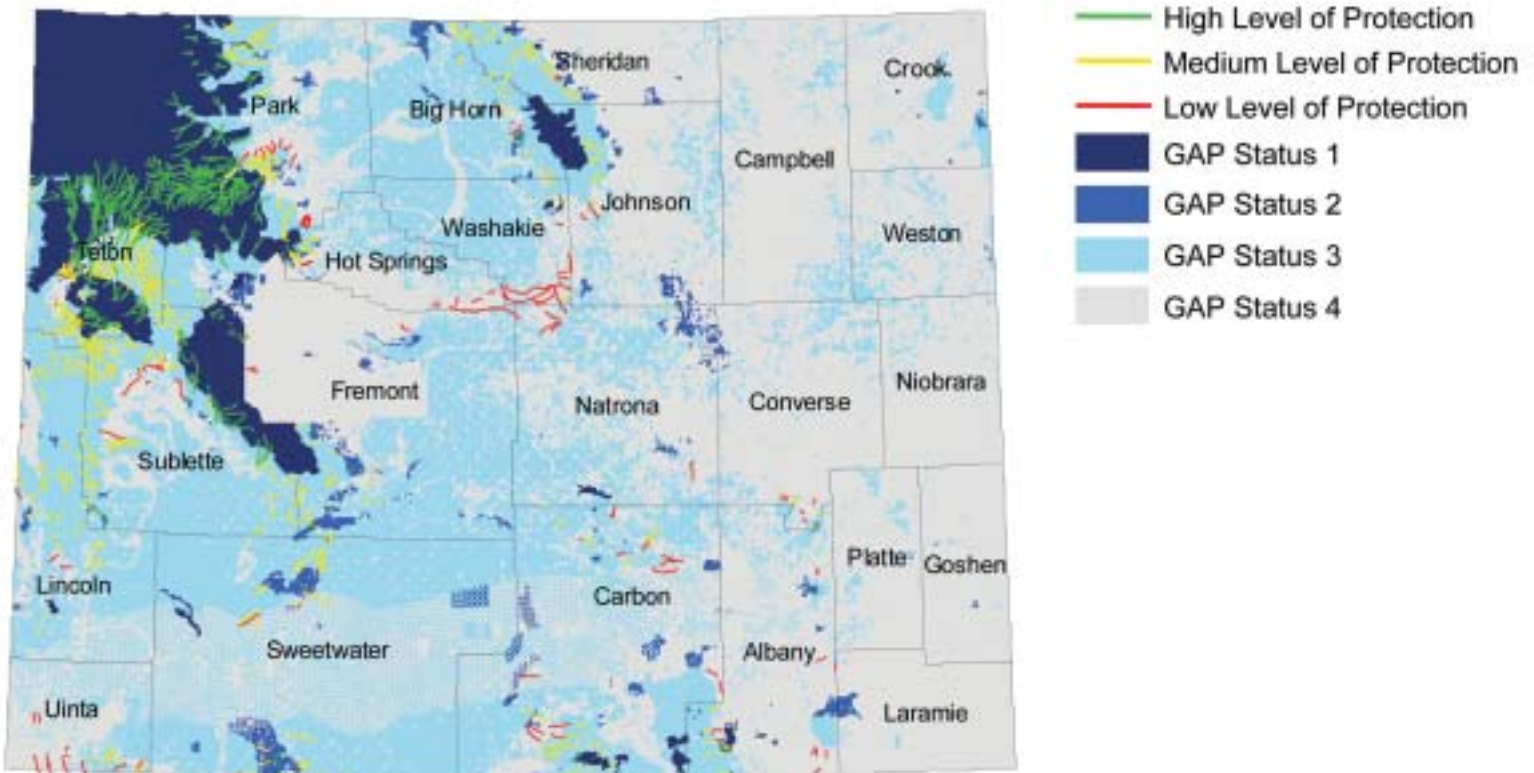
underway to try to reduce this mortality (Gordon et al. 2004).

### Mapping Big Game Migration Corridors at Risk

Given that disruption of migration can reduce the size and viability of big game herds, natural resource managers are increasingly focused on maintaining the quality of migration corridors. Because resources for land and wildlife management are limited, managers need to know which corridors are at risk from disturbances. The study presented here is intended to help identify areas of the state where migration corridors are most at risk.

For this study, migration corridors are defined as pathways regularly used by huntable populations of big game (outside of national parks) for movement between seasonal ranges, as identified and originally mapped by the Wyoming Game and Fish Department.

**Figure 2. Mapped migration corridors for huntable populations of elk in Wyoming overlaid on the GAP land status map from Merrill et al. (1996). Corridors with high levels of protection (green, LOP less than 2) cross GAP Status 1 lands that are mostly protected from development. Corridors with medium levels of protection (yellow, LOP of 2-3) cross GAP Status 2 or 3 lands with moderate protection. Corridors with low levels of protection (red, LOP greater than 3) cross GAP Status 3 or 4 lands with relatively little protection. See text for more detailed description of GAP land status categories.**



ment. As with all datasets pertaining to free-ranging wildlife, the set of migration corridors used in this study is not perfect. An unknown number of actual migration corridors does not yet appear in the dataset, and corridors currently included are not mapped with 100 percent precision. However, this set of migration corridors is complete and accurate enough to provide coarse-scale inferences on the status of migration corridors for all seven big game species. As migration corridors are mapped more completely and precisely in the future, this analysis can be repeated to provide more accurate results.

Digital maps of migration corridors for huntable populations of seven big game species in Wyoming (bighorn sheep, elk, moose, mountain goats, mule deer, pronghorn and white-tailed deer) were prepared using hard-copy data supplied by the Wyoming Game and Fish Department (Figure 1). The original

data are based mainly on the expert opinions of Wyoming Game and Fish Department biologists along with a small fraction of data from studies of radio-collared animals in various parts of the state.

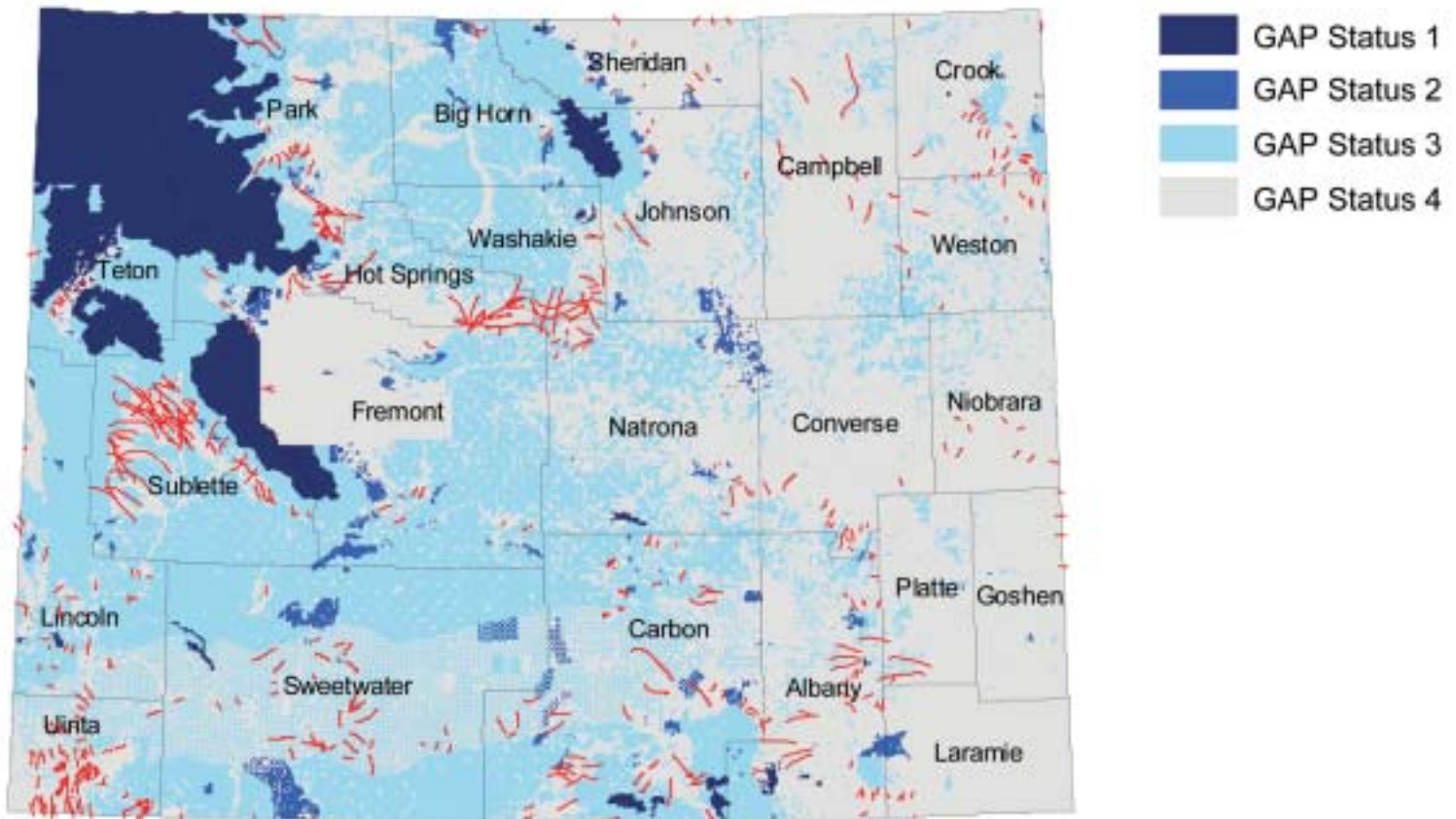
The mapped migration corridors were then overlaid on a map showing the relative level of protection from development for different land management categories produced by the Wyoming Gap Analysis Project (GAP) (Merrill et al. 1996). The GAP analysis identified four main levels of protection:

**Status 1** lands, such as U.S. Department of Agriculture (USDA) Forest Service wilderness and U.S. Department of Interior (USDI) national parks and monuments, are the most protected;

**Status 2** lands include USDI national recreation areas, USDA Forest Service research natural areas, state wildlife habitat management areas, and similar types;



**Figure 3. Segments of mapped migration corridors with low levels of protection (red) for huntable populations of seven big game species in Wyoming overlaid on a GAP land status map.**



**Status 3** lands are largely USDA Forest Service and USDI Bureau of Land Management surface land managed for multiple use; and

**Status 4** lands, such as state trust, tribal, and private lands, are the least protected from land or resource development.

The total length and the proportion of length on land in each status category were determined for each migration corridor. Each corridor was then assigned a level of protection (LOP) index, which was the weighted average of the protection statuses of all lands crossed by the corridor.<sup>2</sup>

Corridors with high levels of protection have LOP values less than 2.0, indicating that they cross mostly Status 1 and 2 lands. Corridors that cross mainly Status 3 and 4 lands have less protection and LOP values greater than 3.0. As examples of how classifying and mapping the corridors provides an overview of protection status, Figure 2 shows the distribution of migration corridors with high, medium, and low levels of protection for one species, elk, and Figure 3 shows a combined view of only those corridor segments with low levels of protection for any of the seven big game species.

<sup>2</sup> LOP = (1 X proportion of corridor length on Status 1 lands) + (2 X proportion of corridor length on Status 2 lands) + (3 X proportion of corridor length on Status 3 lands) + (4 X proportion of corridor length on Status 4 lands).

**Table 1. Total cumulative length and statewide average level of protection (LOP) for mapped migration corridors for seven big game species in Wyoming (see text for calculation details). Lower LOP values indicate corridors that cross mainly public lands with higher levels of protection, while higher LOP values indicate corridors that cross mainly public lands with lower levels of protection and/or private lands.**

	<b>Total cumulative length of mapped migration corridors (miles)</b>	<b>Statewide average level of protection (LOP) for mapped corridors</b>
Bighorn sheep	349	2.6
Elk	2,214	2.8
Mountain goats	40	3.0
Moose	802	3.1
Mule deer	2414	3.2
Pronghorn	1906	3.4
White-tailed deer	89	3.6

The summary data in Table 1 are consistent with knowledge of the distribution, abundance, and life history of each big game species. Mule deer and elk have the greatest cumulative length of mapped migration routes, reflecting their widespread and abundant distribution in Wyoming. Despite their relative abundance in the state, pronghorn have only the third greatest cumulative length of migration routes, in part because pronghorn tend to remain at lower elevations more than either mule deer or elk. In addition to reducing the total land area over which migration occurs, this affinity for lower elevation habitats also places pronghorn in areas that accumulate little snow, and thus their migrations are often shorter compared to species inhabiting higher and more mountainous regions. Moose, bighorn sheep, white-tailed deer, and mountain goats all have relatively low cumulative migration route lengths due to their relative rarity and restricted distributions in the state.

Migration corridors for white-tailed deer have the lowest levels of protection (highest average LOP, 3.6) because this species occurs primarily in shrub and tree-dominated riparian habitats in the eastern third of Wyoming where almost all land surface is privately owned (Status 4). In contrast, bighorn sheep occur mostly in higher and more rugged portions of

northwestern Wyoming where much of the land is under USDI National Park Service and USDA Forest Service wilderness management (Status 1). Predictably, migration corridors for bighorn sheep have the highest levels of protection (lowest average LOP, 2.6).

### Conclusions and Uses of the Maps

The maps in this publication and the data on which they are based are not adequate for directing specific, on-the-ground actions intended to facilitate big game migration. Such actions need to be based on more precise data on the position of migration corridors, specific threats to those corridors, management plans on relevant lands, and local knowledge and expertise.

The best use of these maps is to highlight general regions that encompass clusters of relatively threatened migration corridors. For example, inspection of Figure 3 (showing segments of migration corridors with low levels of protection for seven big game species) reveals three such regions: north-central Sublette County (upper Green River basin), southern Washakie and Hot Springs counties (Bridger and southern Big Horn Mountains), and south-central Uinta County (northern foothills of the Uinta Mountains). Protecting and enhancing big game migration within these regions may become a priority for natural resource managers.

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