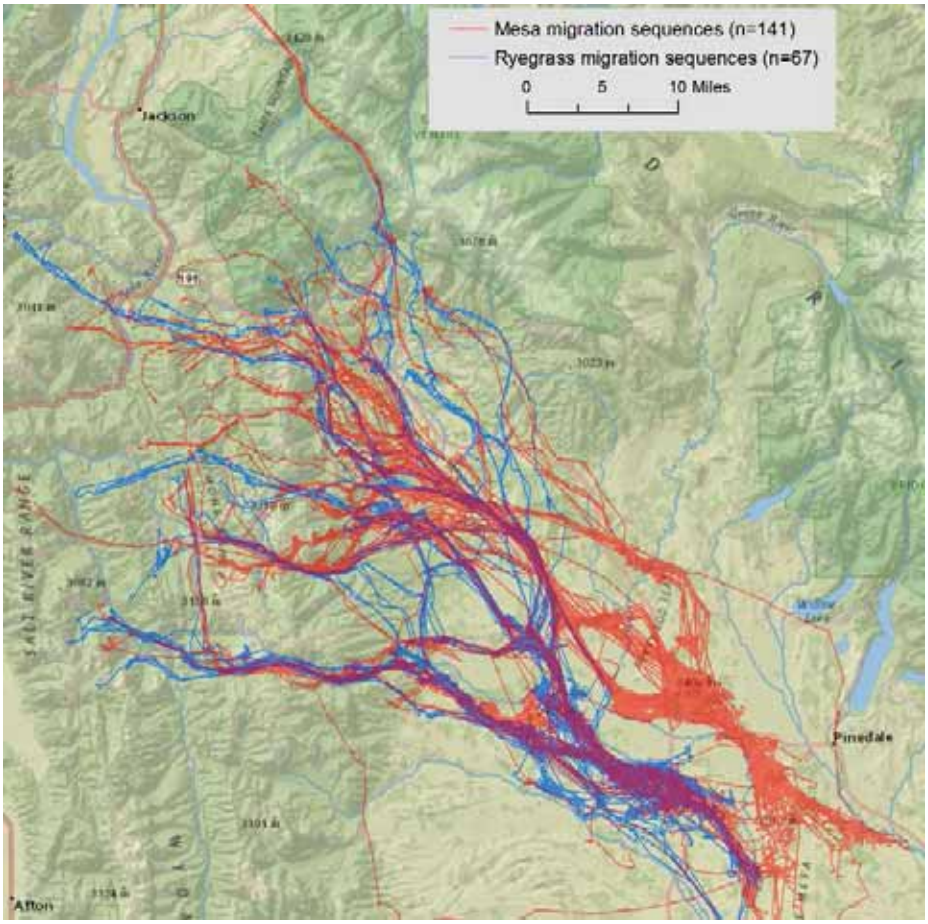
2014 Mule Deer Migration Supplement



Prepared for:

Pinedale Anticline Project Office (PAPO)
P.O. Box 768, Pinedale, WY 82941

Prepared by:

Hall Sawyer and Ryan Nielson

Western EcoSystems Technology, Inc.
200 South 2nd St., Suite B, Laramie, Wyoming

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WEST Inc.
Environmental & Statistical Consultants

NATURAL RESOURCES ◆ SCIENTIFIC SOLUTIONS

OVERVIEW

As part of the PAPO wildlife monitoring, we maintain a sample (~30 animals) of GPS-collared deer to monitor winter distribution as it relates to gas development and annual winter counts. The GPS data provide additional opportunity to delineate migration routes for these populations. Because most mule deer in the upper Green River Basin are migratory, detailed information on migration routes are helpful for management, planning, mitigation, and conservation efforts. Here, we provide updated mule deer migration routes for the Mesa and Ryegrass-Soapholes populations.

METHODS

Population-level migration routes – We used the Brownian bridge movement model (BBMM; Horne et al. 2007) to estimate individual and population-level migration routes from GPS data. The BBMM estimates the probability of use, or a utilization distribution (UD), for a sequence of locations. Migration sequences for the spring and fall migration of each animal were identified manually, as locations between distinct winter and summer ranges, including the 12-hr period prior to and following migration (Sawyer et al. 2009). Once migration sequences were extracted from GPS data, we used the "BBMM" package in R (Nielson et al. 2012) to estimate UDs for individual routes. Individual UDs were then averaged to estimate a population-level migration route (Sawyer et al. 2009, White et al. 2010). Assuming a representative sample of animals, the population-level migration route reflects both the spatial extent of a migratory population, as well as the intensity of use within the migration route.

Stopover sites – A key advantage of the BBMM approach is that it allows route segments used as stopover sites (i.e., foraging and resting habitat) to be discerned from those used primarily for movement. Stopovers are important to migratory mule deer because they allow animals to maximize energy intake by migrating in concert with plant phenology (Sawyer and Kauffman 2011). We identified stopover sites from the population-level migration route as the top 10% of UD values.

Proportional level of use – Another benefit of the BBMM approach is that when multiple migration routes radiate from a common winter range, as is often the case with mule deer, we can identify which parts of those routes are more heavily used than others. By overlaying the 99% contour of each animal's migration route, we calculated the proportion of marked animals that used each migration segment. This step is especially helpful for agencies, industry, and other stakeholders to prioritize which routes are most critical or important. Based on the proportion of the sampled population (<10%, 10 to 20%, or >20%) that used each route segment, we categorized route segments into low, moderate, and high-use areas. In this application, the level of use simply reflects the proportion of sampled animals that used each route or corridor (Sawyer et al. 2009).

RESULTS

We used 141 migrations collected from 70 mule deer in the Mesa and 67 migrations from 27 deer in the Ryegrass-Soapholes to estimate population-level migration routes for winter area (Figs. 1-3). The population-level migration routes were characterized by patches of stopover habitat where deer spent most of their time, connected by areas through which deer moved quickly (Figs. 2 & 3). As mule deer moved further from winter ranges (north and west), common migration routes splintered into multiple routes that led to different summer ranges.

Route segments within the population-level route did not receive equal levels of use; rather, some were used by a larger proportion of the population than others (Figs. 4 & 5). For the Mesa migration, the high-use route went through Trapper's Point, west across Cora Butte and US 191 near Boroff Hill, crossed the Green River, then north across Webb Draw and Beaver Rim to the south Hoback Rim, and ended in Noble Basin before splintering into multiple routes. For the Ryegrass migration, there were three high-use routes (Fig. 5). All routes started near Grindstone Draw and moved west across US 189 and into the Ryegrass. At Aspen Ridge the two high-use routes split: one moves westerly between North and South Horse Creeks to Merna Butte. The other continues north to Beaver Ridger, where it splits into two northerly routes that lead over the South Hoback Rim and into Noble Basin. Interestingly, the northeastern route to Noble Basin follows the same high-use route used by the Mesa deer. Shapefiles of all routes were provided to Wyoming Game and Fish Department.

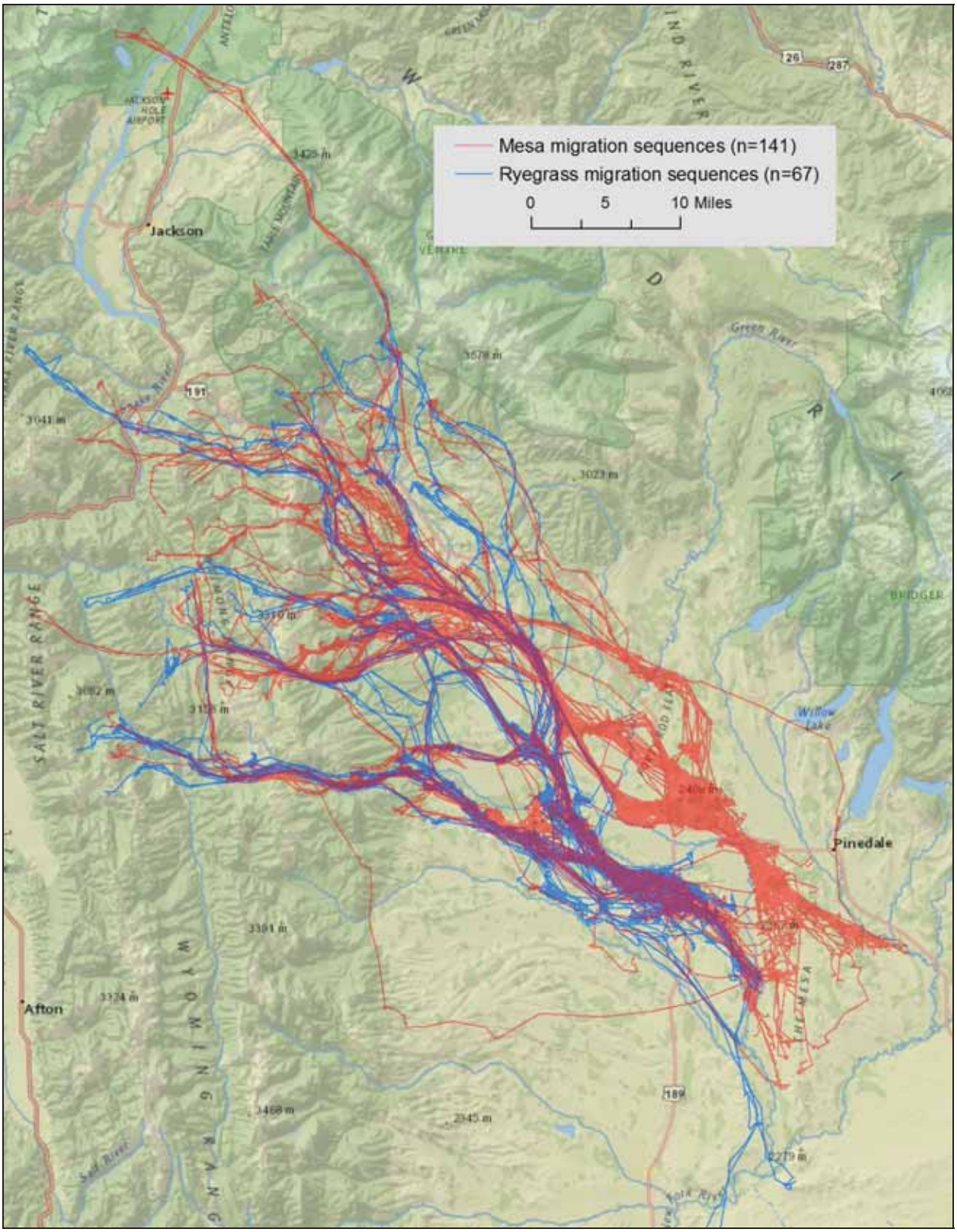

Figure 1. Migration sequences from Mesa (*n*=141) and Ryegrass (n=67) used in migration analysis, 2003-2013.

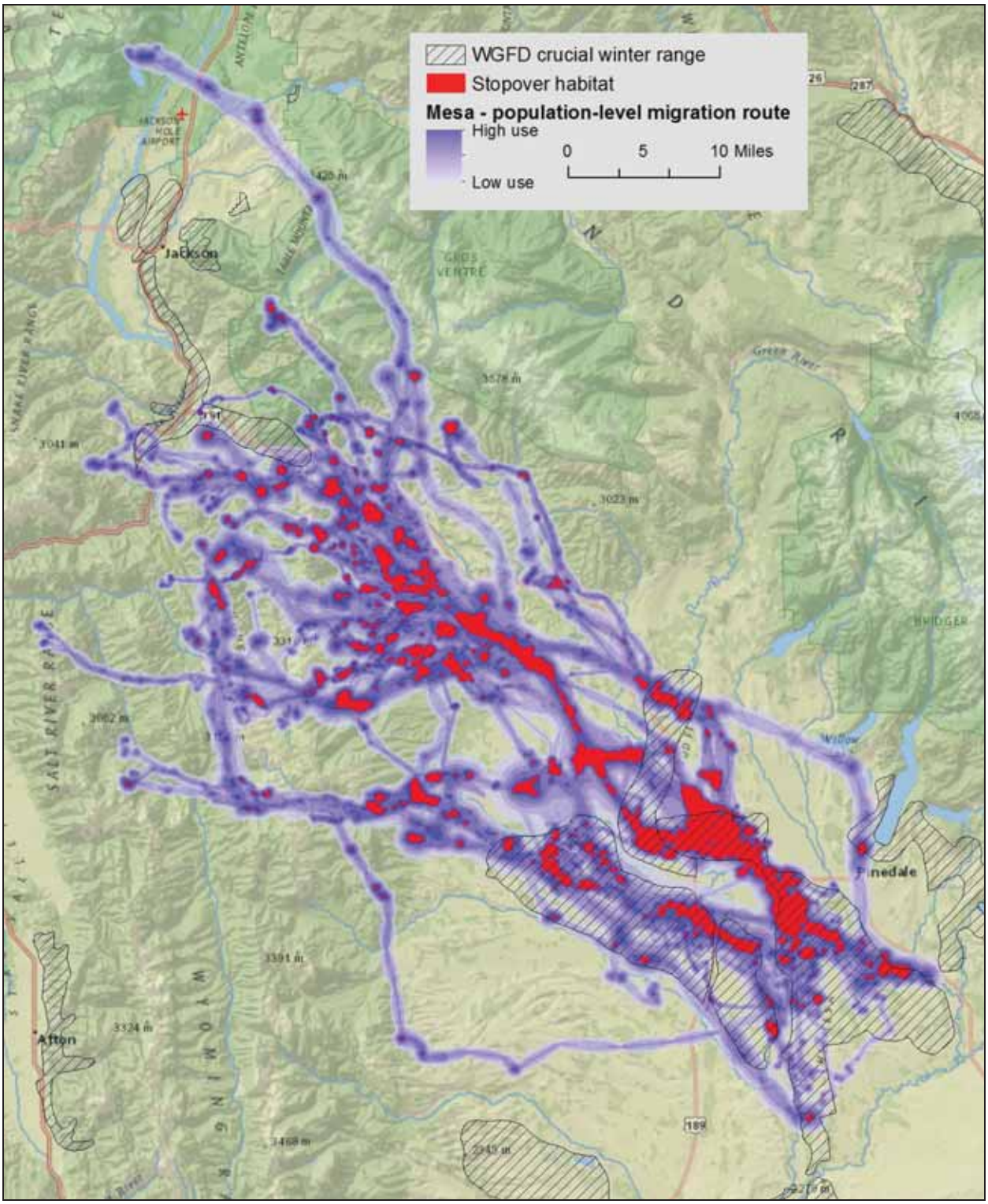

Figure 2. Population-level migration route and stopover sites for the Mesa mule deer population.

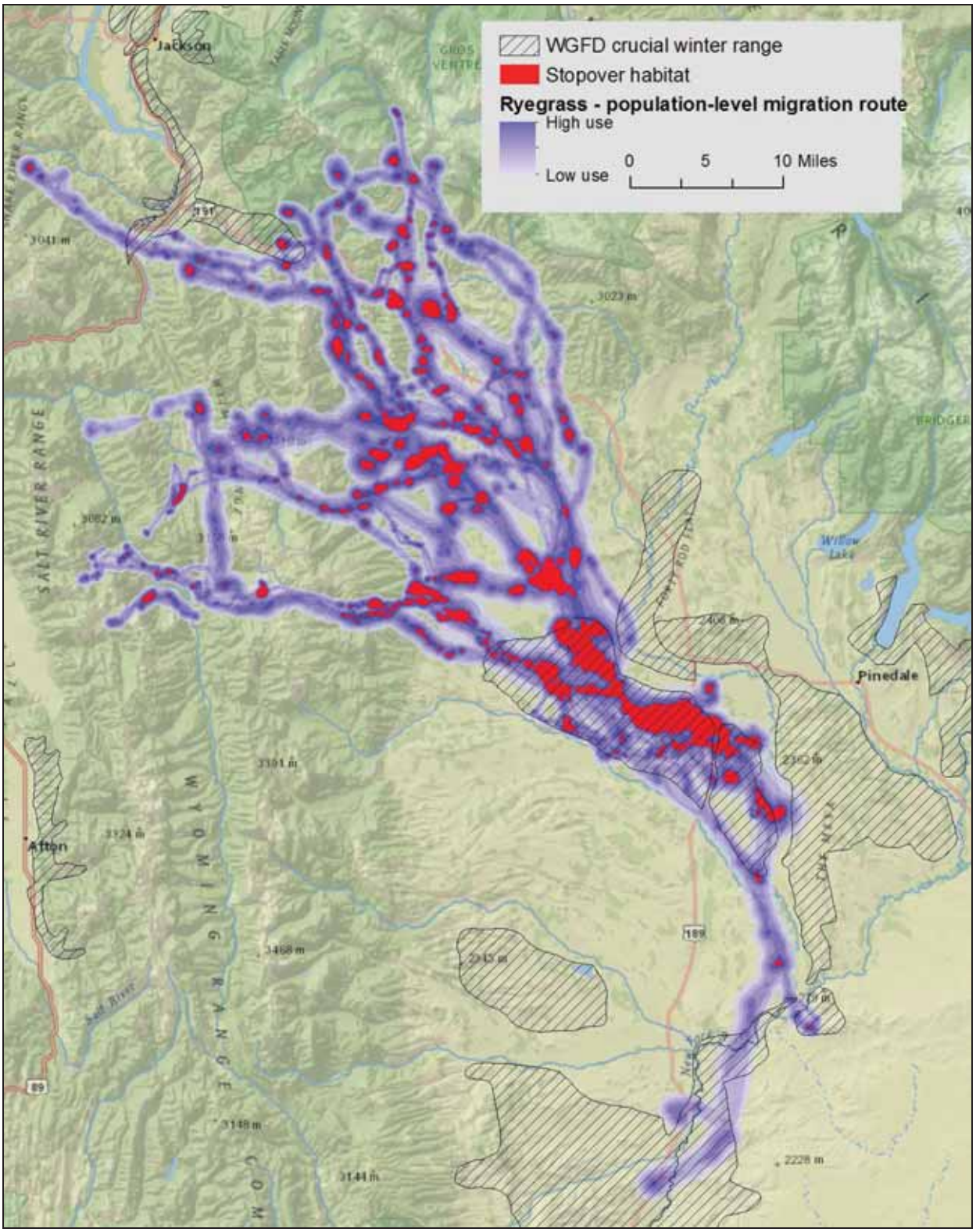

Figure 3. Figure 2. Population-level migration route and stopover sites for the Ryegrass-Soapholes mule deer population.

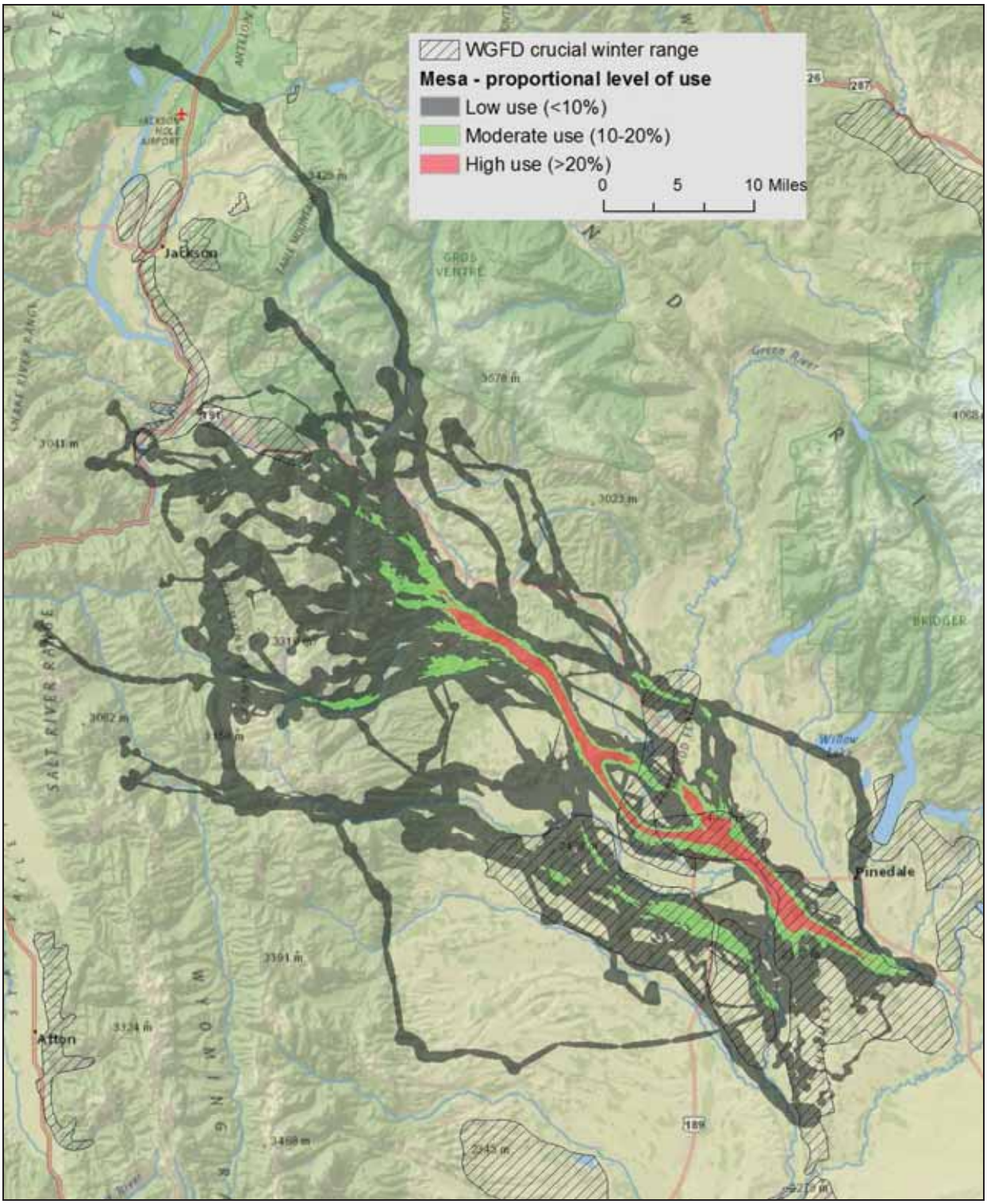

Figure 4. Low, moderate, and high-use segments within the Mesa population-level migration route.

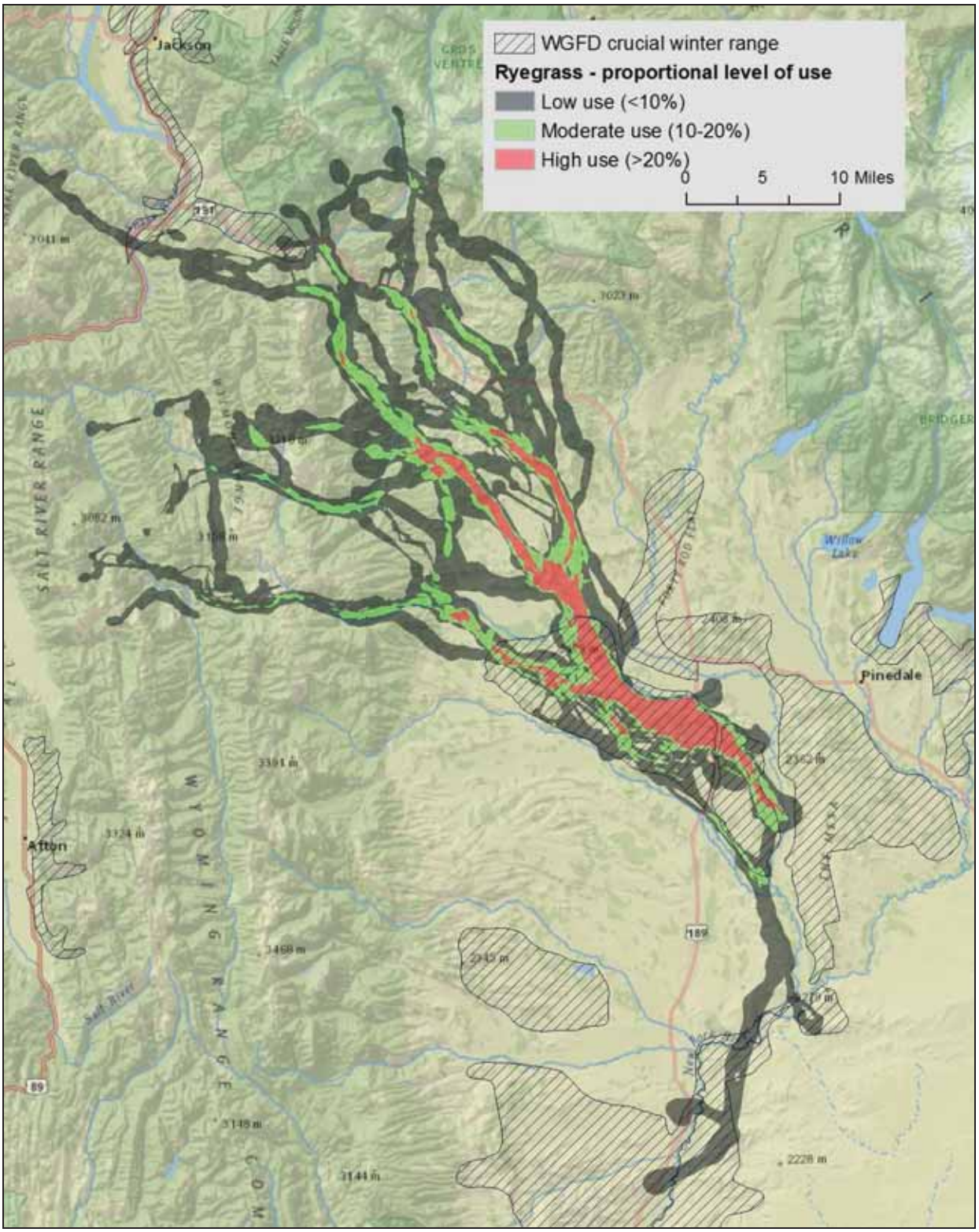

Figure 4. Low, moderate, and high-use segments within the Ryegrass-Soapholes population-level migration route.

REFERENCES

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