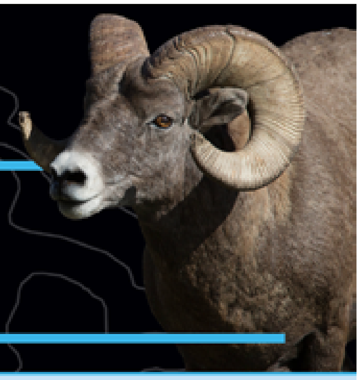
U.S. Department of the Interior
Bureau of Land Management



Principles and Practices

of Integrating Science into Land Management

CASE STUDIES

The case studies in this series showcase examples of integrating science into Bureau of Land Management (BLM) decisions and activities. They highlight how science has helped the bureau successfully manage diverse programs across many geographical areas. These examples are not intended as programmatic guidance or policy direction; the application of science will be unique to each circumstance. Rather, they reflect the critical thinking and systematic, transparent process advocated by the BLM's "Principles and Practices of Integrating Science into Land Management: Guidelines." By using that document's recommended Checklist of actions, they demonstrate key principles and practices of effective science integration at work in a variety of fields and resource areas. Individual case studies differ in how they satisfy Checklist objectives, illustrating that the Checklist is intended to be a flexible tool—one that can be customized to meet the unique aspects and needs of different projects. Comprehensive details about individual studies (including related articles and publications) can be found on the BLM's Science in Practice Portal, through the BLM Library and the Alaska Resources Library & Information Services, and through links in these documents.

CHECKLIST

☐ **1. DEFINE THE MANAGEMENT QUESTION(S)**, including related management objectives. All interested parties must clearly understand the management issue(s) if the five guiding principles and practices are to be successfully applied.

☐ **2. FIND** available science relevant to the management question(s). Be systematic, rigorous, and objective, and use a method that is easy for others to follow and that is well-documented.

☐ **3. EVALUATE** the potential relevance and reliability of the science identified in Step 2.

☐ **4. SUMMARIZE** the science, address any conflicting science, and identify any information gaps.

☐ **5. APPLY** your science-based conclusions to the management question(s) to decide the best course of action for achieving management objectives.

☐ **6. ASSESS** how the application of science affected public support, the sustainability and effectiveness of the decision, confidence in the course of action selected, and further learning about the system and the effects of management actions. Plan any future assessments and/or develop and implement a monitoring plan.

Snapshot of Checklist actions from "Principles and Practices of Integrating Science into Land Management: Guidelines." The numbered actions in the case study below track with this list and show how the BLM implemented the principles and practices for integrating science into the BLM's work. Please refer to the full document for details.

CASE STUDY 3: Assessing the Risk of Contact between Bighorn Sheep and Domestic Sheep for Grazing Permit Renewals in Idaho

1. DEFINE THE MANAGEMENT QUESTION(S).
Iconic bighorn sheep roam the rocky terrain of North America from Canada to New Mexico, but their history has been wrought with struggle. Extirpation of bighorn sheep in many areas coincided with western expansion, and the unregulated hunting and domestic livestock grazing that accompanied it. Domestic sheep and goats carry bronchopneumonia-causing bacteria, but have developed immunity to the microorganisms through centuries of husbandry and natural selection. Bighorn sheep, which did

Bighorn rams (USGS).

not co-evolve with the same pathogens, are susceptible to infection from domestic sheep when contact between the two gregarious species occurs. Once spread to the wild sheep, these bacteria and the subsequent sickness often cause death, with population-level consequence ranging from poor lamb recruitment to massive, all-ages decimation of bighorn sheep populations. Currently, without an effective vaccine or other disease control method, the best management strategy is to keep domestic and wild sheep separated. To incorporate this bighorn sheep disease risk into the grazing permit renewal process, a BLM interdisciplinary team needed to be able to answer a key question:

- *What is the potential for bighorn sheep to come in contact with domestic sheep during a 10-year grazing permit?*

2. FIND.

Several scientific publications have identified the potential for disease transmission from domestic sheep to bighorn sheep, highlighting the need to keep the two species away from each other. While evaluating the management implications of this finding for a forest plan, the Payette National Forest of west-central Idaho developed a computer model to quantify the relative risk of wild sheep contacting domestic sheep. Using a combination of peer-reviewed modeling methodology and thousands of telemetry points showing bighorn movement, the model, known as the Risk of Contact Tool (RCT), produced an annual estimated rate of contact by bighorn sheep for different geographic areas. BLM Idaho, facing similar challenges in keeping domestic and wild sheep separated, obtained the model and accompanying literature, and began to evaluate the RCT for use in National Environmental Policy Act (NEPA) analyses for livestock grazing permit renewals.

Domestic sheep.

3. EVALUATE.

Southern Idaho's sagebrush steppe, with sweeping vistas, rimrock plateaus, and winding canyons, is different than the terrain evaluated by the Payette National Forest. Since a major component of the RCT is identifying where bighorn habitat occurs, BLM Idaho had to remodel habitat for its specific application and geography. Generally, the rocky features used by bighorn sheep in southern Idaho are not as pronounced, elongated, and continuous as the vast, vertical faces of the Salmon and Snake River canyons of central Idaho. To account for this broken and relatively shallow terrain, the new model eliminated consideration of slope in mapping habitat. This change better characterized the areas used by bighorn sheep in the BLM's management area, as evident by evaluation of GPS (Global Positioning System) location data with the two modeled terrain datasets.

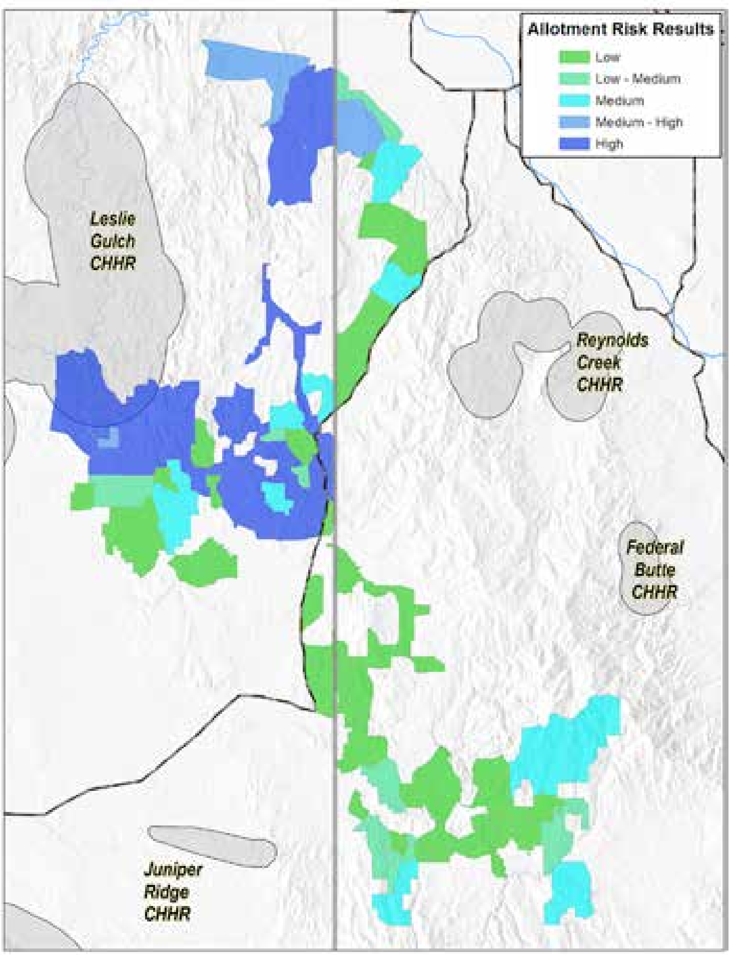
Table comparison of GPS points within modeled habitat categories in the BLM Idaho assessment area.

Habitat Model	GPS Observations in Preference Habitat	GPS Observations in Connectivity Habitat	GPS Observations in Non-Habitat
Original (Payette National Forest) model	5,359 (39.6%)	3,213 (23.7%)	4,972 (36.7%)
Revised model developed by BLM Idaho	11,736 (86.7%)	1,467 (10.8%)	341 (2.5%)

After vetting changes to the habitat model with wildlife biologists familiar with the region and its local bighorn sheep populations, the team completed an initial risk analysis with the RCT. Results were shared with stakeholders via draft maps, tables, and face-to-face presentations, and stakeholder feedback and suggestions were incorporated into a second model iteration. The team documented changes to the modeling process, and, after satisfying the concerns brought forth by collaborators, incorporated the modeling results into the grazing permit renewal analysis.

4. SUMMARIZE.

The RCT produces an annual rate of contact of bighorn sheep intersecting a geographic area, such as a grazing allotment used by domestic sheep. Breaking down each allotment and pasture, the team used tables and maps to summarize the annual rate of contact. Based on feedback from stakeholders, team members also calculated the rate of contact for trailing corridors used for moving domestic sheep across the landscape. To assist in the decisionmaking process, the team also provided stakeholders and decisionmakers a brief overview of the background of the RCT and its use in the Payette National Forest, and illustrated changes made to the habitat model by BLM Idaho with comparison tables and maps.



Sample risk summary map.

5. APPLY.

The RCT provides an objective, quantitative method to compare bighorn sheep contact risk in areas occupied by domestic sheep. This risk, however, is only one consideration in grazing permit renewal analysis. Often, several additional compounding factors that relate to both the domestic sheep operations and the bighorn sheep populations require attention during the decisionmaking process. Timing and duration of trailing and grazing of domestic sheep, domestic herd size and sex composition, and livestock management practices are all factors that need to be considered. Similarly, bighorn sheep population potential, proximity, and interaction with other populations, carrying capacity, and disease history should also be considered. Using the RCT results as a baseline, the assessment team worked with ranchers, state agency wildlife biologists, and surrounding land management agencies to identify and assess the compounding dynamics of the entire situation to come to the most appropriate land use decision possible.

In one specific scenario assessed by BLM Idaho, the line officer deemed the threat of disease transmission to bighorn sheep too high for continued domestic sheep grazing under a 10-year permit. BLM Idaho then offered the livestock operator the chance to convert operations from sheep to cattle. As a result, the livestock operator was able to continue using grazing privileges under the BLM's multiple-use mandates, and the local bighorn sheep population became safer from the threat of disease. The presence of bighorn sheep continues to be enjoyed by many other land users, including hunters, hikers, campers, and photographers.

6. ASSESS.

While this specific decision was unpopular with certain groups, the Environmental Impact Statement's explanation of the evidence justified the management action and set a precedent for BLM Idaho's objective, science-based approach to evaluating and permitting domestic sheep grazing. Other offices around the state now evaluate grazing permits by using the RCT to identify areas of potential concern for contact between domestic and bighorn sheep and to help inform resource management and planning efforts and other grazing permit renewals. A U.S. district court ruling in favor of the U.S. Forest Service's use of the RCT in the Payette Forest Plan further validated the BLM's use of the tool to inform management actions.

Little rams in northern Idaho.

For more information, contact: **Paul Makela (Wildlife Program Lead)** or **Jayson Murgoitio (GIS Specialist)**.

Photos by BLM staff unless otherwise noted.

This case study series is sponsored by the BLM's National Science Committee to support science-based decisionmaking throughout the agency.