

I. EXECUTIVE SUMMARY

Background

The purpose of the Colorado Greater Sage-grouse Conservation Plan (CCP) is to facilitate the conservation of greater sage-grouse (GrSG) and their habitats in Colorado. This statewide plan is the result of a 2-year effort and is written partly in response to an apparent widespread decline in the numbers of GrSG across their range. Within Colorado, because of declines in population and distribution, the species is on the state's "Species of Concern" list. The plan was written to support several goals that will, if achieved, facilitate the recovery of the species and result in its removal from the state's Species of Concern list.

The status of GrSG on a rangewide level is still undetermined. The U.S. Fish and Wildlife Service (USFWS) received 4 petitions to list the species as either threatened or endangered under the Endangered Species Act, and undertook a 12-month status review to determine if the species was warranted for listing. The USFWS found listing to be not warranted. However, a recent (December, 2007) court decision has remanded the 12-month finding back to the USFWS for consideration.

Process

The CCP was developed by a steering committee with representatives from all of the signatory agencies. A professional facilitator assisted staff from the Colorado Division of Wildlife (CDOW), the Bureau of Land Management, the Natural Resources Conservation Service, the U.S. Forest Service, and the USFWS, including the Refuge System. The committee arrived at its decisions by consensus.

It was essential to have broad-based support for this plan. To assure that the public was involved throughout the planning process, several opportunities for public input were provided. The facilitator conducted confidential interviews with 50 stakeholders to develop the issues. A workshop was held in May of 2006 in Steamboat Springs to fully develop issues, to review a population viability model used to simulate responses of GrSG to different management scenarios, and to begin formulating conservation strategies for GrSG in Colorado.

Local work groups, consisting of multiple stakeholders, exist for 5 of the 6 Colorado GrSG populations. Following the May, 2006 workshop, 5 advisory members (1 from each local work group) joined the steering committee and participated in the completion of conservation strategies. These strategies were presented to the public at a second summit held in Steamboat Springs in October, 2006.

Once a full draft of the CCP was completed, 2 comment periods were provided. In March 2007, staff from participating agencies were given the opportunity to review the draft document for 30 days. Comments received were incorporated by the steering committee into a second draft. That draft was provided to the general public for a 77-day review period. Advisory members assisted

the steering committee in reviewing and incorporating public comments, resulting in this final document.

Plan Summary

The CCP is designed to supplement, not replace local conservation plans created by the local work groups. It is also designed to coordinate GrSG conservation efforts throughout the state. It builds upon the foundation of 5 local plans. The local work groups in Middle Park, North Park, and Northern Eagle - Southern Routt Counties are now implementing completed plans. Two other groups, Northwest Colorado and Parachute – Piceance – Roan, are already active in conservation efforts and have draft plans that are expected to be completed in 2008.

The CCP examines issues addressed by local work groups, as well as range-wide issues such as regional population dynamics, dispersal of birds, and genetic and habitat connectivity. In developing this plan, the best available science was used to analyze the issues facing this species and to assess the tools available to reach conservation goals. The CCP provides guidance for GrSG population and habitat management in locations where a local plan has yet to be completed. Additionally, the statewide plan will provide overarching guidance to managers for conservation of the species in Colorado.

A portion of the CCP is intended as background information and analysis from which the conservation strategies are derived. The basic outline of the plan includes a “Conservation Assessment”, which is a review of what is known about GrSG biology, both generally, and specifically within Colorado. The “Issues Potentially Affecting GrSG” section assesses the challenges facing GrSG conservation, and the “Analysis” uses multiple tools to further evaluate the issues and/or to explore possible management scenarios. The “Conservation Strategy” section should be used by managers in conjunction with the “GrSG Structural Habitat Guidelines” (Appendix A) and the “GrSG Disturbance Guidelines” (Appendix B) to conserve GrSG in Colorado.

The distribution of GrSG across Colorado mirrors the distribution of sagebrush communities, and the species depends on the various components of the sagebrush community for food and cover throughout the year. GrSG occur in portions of 8 Colorado counties: Eagle, Garfield, Grand, Jackson, Moffat, Rio Blanco, Routt, and Summit (due to lack of information, GrSG habitat within Larimer County is minimally addressed in this plan). The most abundant and widely-distributed population is centered in Moffat County.

The North Park and Northwest Colorado populations of GrSG are the largest and most stable in Colorado, although portions of the Northwest population have declined from historic levels. The Middle Park population is smaller, but stable, based on historic lek counts. The Northern Eagle – Southern Routt Counties population illustrates a downward trend in the number of males attending leks since the late-1960s. There are little to no long-term data regarding the Parachute – Piceance – Roan population, but local observations and comparison data collected during the spring of 1976 suggests that recent counts in 2005, 2006, and 2007 indicate that GrSG numbers

have declined from historic levels. Lastly, the Meeker - White River population has been in decline since the 1950s and only 1 active lek is currently identified in this area.

The CCP provides a review of the literature regarding the life history of GrSG (“Conservation Assessment”), with a focus on data from Colorado, including some CDOW data that have not yet been published. Habitat needs of sage-grouse were differentiated according to the season of use. GrSG habitat in Colorado differs slightly from habitat in other portions of the species range in North America (Connelly et al. 2003c). Specifically, in Colorado the shrub overstory has more coverage of non-big sagebrush shrubs, big sagebrush hybridization is more prevalent than elsewhere in the West, and due to older soils and geologic formations, the understory herbaceous vegetation is less prominent than in other portions of the species’ range.

For Colorado, 3 primary seasons were identified: breeding (March through July), summer-fall (July through September), and winter (October through February). Guidelines for appropriate structural characteristics for sage-grouse habitat have been developed in the past, but we used Colorado-specific data to develop “GrSG Habitat Structural Guidelines” for Colorado (Appendix A). These guidelines are intended to be helpful to managers seeking to evaluate and improve habitat for GrSG in Colorado.

Information regarding GrSG habitat use and movements, both from Colorado and other portions of the range of the species, is also summarized in the “Conservation Assessment” section of the CCP. These data were then used to develop “GrSG Disturbance Guidelines” (Appendix B), which are referred to extensively within the “Conservation Strategy” section. Development of these guidelines considered the relationship between the biology of the GrSG and the impacts of human activities. These guidelines provide direction to those undertaking activities in GrSG habitat, to minimize or avoid impacts of those activities on GrSG.

A list of issues that may impact GrSG was assembled. Issue discussion was refined through public dialogue held at the population workshop (May, 2006). The narrative discussion of each issue (“Issues Potentially Affecting GrSG”) includes a literature review about both positive and negative impacts to GrSG and their habitat. Eighteen issues were identified and discussed, but of all these issues, oil and gas development, housing, and improper grazing are expected to have the greatest impacts on GrSG across their range in Colorado. On a more local basis, surface mining of coal, predation, and the increasing demands for recreation are anticipated to have an impact on this species.

The “Analysis” section provides a number of tools to assist managers in assessing and addressing various issues and their impacts on Colorado’s GrSG. Population modeling and geographic information system (GIS) mapping were used extensively to evaluate GrSG population viability under a variety of development scenarios. Although not perfect, these tools allow the use of the best available science to predict the impacts of various human activities on GrSG populations.

A Colorado GrSG population viability analysis (PVA) provided a risk analysis tool that allowed predictions of the relative probability of extinction of a population under differing management scenarios. This model used input from available population research and *VORTEX* software. Because of the variability of the natural world, the model cannot provide an absolute prediction of population persistence (e.g., if hypothetical management scenario A occurs, how likely is the

population to persist?), but rather a relative prediction of population persistence (e.g., population fares better under hypothetical management scenario A than B). The PVA provides an examination of the potential impacts of future oil and gas development, housing, surface mining, and hunting on the persistence of local GrSG populations (i.e., what happens to GrSG populations when current conditions change).

The PVA analyses that examined the impact of oil and gas development on GrSG population persistence generated the greatest amount of discussion. The analyses were conducted for the 3 populations (North Park, Northwest Colorado, and Parachute – Piceance – Roan) that are most likely to be affected by oil and gas exploration and development. At the onset, a relatively simplistic model was developed. The model used data generated in 2 Wyoming studies (the only data available at the time of CCP development), and the simulations showed population decline from the onset of development, with severe impacts to all 3 populations.

With the understanding that this was a rather simplistic, but graphic model, a new model was developed that considered different oil and gas development and production scenarios. A major assumption implicit in the new model is that reclamation and mitigation efforts can provide an effective and positive GrSG population response following oil and gas development. In the model, the best-case scenario also assumes: the period of severe impacts is short; the GrSG population demographics return to their pre-development levels in a short period of time; and the maximum level of impact in Colorado is only 1/2 of that reported in Wyoming. Simulations run with these parameters showed a downward trend in GrSG populations for the first 15 - 20 years, and then a population rebound in years 30 through 50. In simulations run with demographic rates not returning to their pre-development levels in a short period of time, population recovery was very slow. This analysis suggests 3 guidelines for mitigating the impacts of energy development on GrSG: minimize the period of greatest demographic impact, minimize the time for demographic recovery, and maximize demographic recovery to predevelopment levels. The model does not evaluate whether these guidelines are achievable.

With energy development identified as a significant issue that could jeopardize GrSG persistence in Colorado, potential mitigation scenarios were considered and analyzed. One option to address impacts to GrSG is simply to avoid impacts. If impacts cannot be avoided, the next scenario would be to minimize the impacts. If impacts cannot be avoided or minimized, mitigation would be required to maintain GrSG populations.

The CDOW completed an analysis that explores these concepts by identifying potential “refuge areas” designed to protect GrSG and other sage-obligate species. The “refuge” concept is structured around core areas that would have very strict protections, while non-core areas would experience development with more relaxed protections. Future development within the core refuges would be dependent upon performance standards and GrSG recovery in the non-core areas. A GIS analysis identified “core” GrSG areas using the intersection of 4-mile lek buffers, male sage-grouse density, and sagebrush patch size. These areas were then refined to protect approximately 50% of the GrSG. Protection of 10% of the total area of 7 northwest Colorado counties would protect 74% of the GrSG. How this analysis might be used is beyond the scope of this plan, but should lead to further discussions among agencies and stakeholders.

With increasing demands to produce energy domestically, some efforts have been made to develop off-site mitigation. Since there is not yet a clearly defined method to examine the balance of habitat lost and habitat gained, any off-site mitigation should be addressed using an adaptive management approach. Success of results must be based on the effects of mitigation on the sagebrush community and on the demographic responses in GrSG populations. The birth and death rates, the age distribution, the sex ratios, and the size of the population need to return to pre-project levels to consider mitigation actions successful.

Colorado has a rapidly growing human population. Although the PVA was used to explore the relative impacts (among populations) from housing on GrSG, the model is not spatially explicit; i.e., it cannot make predictions about where development may occur. Therefore, additional analyses were conducted using GIS as a tool to determine where impacts on GrSG from future human population growth (and resulting housing increases) are likely to be greatest.

First, federal census data that project human population growth were used, in conjunction with the amount of GrSG habitat on privately-held lands and knowledge of local planning efforts. This allowed some relative predictions about which sage-grouse populations are in the greatest danger from housing development. GrSG populations in Middle Park, Northern Eagle - Southern Routt Counties and the Routt County portion of Northwest Colorado were found to be at high risk of impacts from housing development. GrSG in the Meeker - White River population are also at risk, because although the projected human growth rate in that area is on the low end, most of the available GrSG habitat is on private land near the human population center of Meeker.

Second, areas where housing growth may be expected to occur (within GrSG population areas) were examined. A spatially explicit growth model provided a prediction of (on a relatively broad-scale) where housing growth may occur, and parcel size data (subdivision of parcels often occurs before new housing is developed) were examined for a finer-scale look at housing growth location.

These results highlighted areas to prioritize for protection from housing development. GrSG habitat in the Northern Eagle - Southern Routt Counties and Middle Park populations have the greatest need for protection, followed closely by habitat in western Routt County (part of the Northwest Colorado GrSG area). These results do not indicate that habitat protection in other populations is unnecessary, but they emphasize that the greatest impacts to GrSG populations from housing are likely to occur in these 3 areas.

Population management zones (i.e., targets) were developed for the numbers of strutting males on leks for each Colorado GrSG population. These zones were based on the most reliable counts of strutting males for each population. Sage-grouse populations are known to fluctuate, so the management zones developed for the CCP incorporated normally expected population fluctuations, and are defined as ranges (“population management zones”) in the number of males, rather than a single target number for each population.

For each population, a “Population Management Zone” was developed whose center is the median of the best available years of high male lek counts, and whose lower and upper bounds

are the 25th and 75th quartiles of those counts, respectively. Secure populations are characterized by long periods of time with male population numbers well above the recommended median. If a population falls below the median, managers must evaluate the decline. Consistent declines should trigger aggressive implementation of conservation strategies to prevent decline to or below the 25th quartile.

This analysis also examined “Potential Population Opportunity Zones” where populations could be managed to expand into potential and vacant habitat. We explored the relationship between the number of male GrSG on leks and the available habitat. A “habitat model” was developed, which defines a linear relationship between these 2 variables. Using information on potentially available, unoccupied GrSG habitat, and the number of males predicted (by the habitat model) to occur in that habitat, “Potential Population Opportunity Zones” were defined in 3 of the 6 Colorado GrSG populations.

Population management zones (i.e., targets) for GrSG populations in Colorado.

Population	Population Management Zone		Population Opportunity Zone?
	Lower Bound (25% quartile)	Upper Bound (75% quartile)	
Meeker - White River	Inadequate information		Unknown
Middle Park	185	286	Yes
Northern Eagle - Southern Routt Counties	90	102	Yes
North Park	639	1214	No
Northwest Colorado	2019	2254	Yes
Parachute – Piceance – Roan	179	203	No

Once the analyses were completed, the assistance of the 5 advisory members (from local work groups) was enlisted to draft conservation strategies. These strategies do not replace, but rather enhance strategies previously developed by local work groups. Detail was provided in the strategies to allow local work groups to address topics that were not addressed during their plan development and to allow managers in areas without work groups to implement conservation actions. An important contribution of this plan is that many of the strategies consider cumulative landscape or statewide impacts. Conservation strategies were grouped to directly address the issues identified earlier in the plan. Some strategies addressed multiple issues, including those under the following headings: habitat enhancement; habitat linkages; habitat monitoring; information, communication and education; population monitoring; and research.

For many potential issues, complete information regarding impacts to GrSG and/or the best management response or approach is lacking. Nevertheless, because it is known that the issues are likely to impact GrSG, management actions must proceed in the face of uncertainty about the details of a given impact. Thus, the strategies are written with a primarily passive adaptive management approach in mind: multiple strategies recommend (1) monitoring GrSG population and habitat response to management; (2) research to evaluate management and to improve the understanding of the causes of impacts and possible solutions (which will ultimately also

improve management); and (3) updating and improving management as necessary, based on feedback from (1) and (2).

The strategies are not prioritized. Prioritization of conservation strategies will be undertaken by the Implementation Team, which will be named by participating agencies within 6 months of the signing of this plan. Prioritization will occur at both statewide and population levels, since not all the strategies in this plan are relevant to each population. During prioritization, the Implementation Team will meet with local work groups to gather input on strategies that are most applicable and time-sensitive to GrSG conservation in the individual population areas. The implementation plan will also establish a reporting timeline and process to gauge effectiveness of the CCP.

Conclusion

The challenges facing GrSG conservation in Colorado are significant. This plan is designed to provide all public and private land and project managers with a useful document that can guide and assist management efforts to conserve GrSG. The core of the plan is the strategy section, and it provides managers with a suite of options. This section, when implemented in conjunction with the “Working Appendices”, and using the principles of adaptive management, offers the best opportunity for conservation of GrSG in Colorado.

The strength of this plan comes not only from its exhaustive analysis of the issues and development of strategies for GrSG conservation, but also from the extensive inclusion of public stakeholders in plan development. The integration of stakeholders throughout the process ensures that this final product meets the needs not only of government agencies, but also those of private land owners and others using and living in the sagebrush biome.