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COMMENTS ON SAGE-GROUSE ISSUES

Draft Supplemental Environmental Impact Statement

For the

Pinedale Anticline Oil and Gas Exploration

And

Development Project, Sublette County, Wyoming

PREPARED BY

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Overview

The following are my comments on the Draft Supplemental Environmental Impact Statement (DSEIS) for the Pinedale Anticline Oil and Gas Exploration and Development Project, Sublette County, Wyoming. I focused on sage-grouse issues, because this is my area of expertise.

The DSEIS, covering ~198,034 acres with an expected life of 40 years but probable life of 60 years, is an attempt (alternatives B and C) to remove essentially all restrictions to protect wildlife, especially greater sage-grouse so that year-round gas and oil drilling, and associated activities can occur. The former importance of this area for greater sage-grouse receives little recognition and the former designation of sage-grouse as a BLM sensitive species or even a species of special status is not acknowledged. The 'Wildlife Technical Report' (Appendix K) focuses on mule deer with only casual reference to pronghorn.

The Draft SEIS does not use the best science available as the BLM (and industry) continues to use a 0.25-mile buffer for No Surface Occupancy (NSO) during drilling for areas around active sage-grouse leks. Management of sagebrush habitats to benefit sage-grouse is not considered. There is no mention (Appendix C, Attachment 4) of what will be done in the 'Wildlife and Habitat Mitigation Plan' if sage-grouse populations continue to decline. Sufficient data should be available from 1999 through 2006 to model the apparent decline in population of greater sage-grouse to examine time to extirpation of local populations. Both alternatives B and C fail to give adequate consideration to maintaining sage-grouse populations. Overall, the DSEIS fails to take a "hard look" at all of the direct, indirect, and cumulative environmental consequences of the development that will result from either alternative B or C. The DSEIS does not meet the conditions of professional and scientific integrity concerning sage-grouse issues as required by the National Environmental Policy Act.

The literature cited in the DSEIS on sage-grouse is not adequate as only limited reference is made to the research by M. J. Holloran (3 citations) within the Pinedale area, Rowland (2004) is not cited on effects of habitat management practices, and Naugle et al. (2004) is not cited on the pending impacts for sage-grouse caused by actions of the gas and oil industry. Further, there is no detailed analysis of the effects of the either alternative B or C on health of sage-grouse populations as described by Braun et al. (2002) and the Conservation Assessment on greater sage-grouse prepared by Connelly et al. (2004) for the Western Association of Fish and Wildlife Agencies. The long-term ecosystem response to gas and oil development and associated activities is not considered even though there is evidence (Peterson et al. 2003) there will be delayed population reductions and cascades of indirect effects. Elimination of the present restrictions on timing of use will be detrimental to sage-grouse. A conservative and paced approach to increasing development is warranted. Maintaining sagebrush habitats useful to wildlife in the Pinedale area is clearly the responsibility of the BLM as this agency manages much of the landscape and provides approval for most mineral extraction activities.

Background

Sage-grouse (*Centrocercus* spp.) have been demonstrated to be dependent upon sagebrush (*Artemisia* spp.) steppe habitats throughout all of their life processes (Patterson 1952). An overview of the life history of sage-grouse and their habitat is presented in the Appendix. The distribution and abundance of sage-grouse have decreased throughout their formerly occupied range (Connelly and Braun 1997, Braun 1998, Schroeder et al. 1999, Connelly et al. 2004, Schroeder et al. 2004). The actual size of the overall decrease is unknown but most likely exceeds 50% in total area occupied (Schroeder et al. 2004) and 80% in abundance (Braun 1998). Sage-grouse have been extirpated in 4-5 states and one Canadian province and have been listed as endangered in Canada. Six petitions were filed in the United States, covering all populations, to list sage-grouse as threatened or endangered under the Endangered Species Act of 1973. The U. S. Fish and Wildlife Service has responded (12 January 2005) to all of these petitions with the finding of "not warranted." However, sage-grouse populations (*C. urophasianus phaios*) in Washington State have been identified as meriting "warranted but precluded" status, and a petition for listing a distinct population segment of sage-grouse in California and Nevada has been denied. Further, the Wyoming Game and Fish Department has recognized the problems with sage-grouse in Wyoming and, through a statewide working group, prepared and released for review a draft "Wyoming Greater Sage-grouse Conservation Plan" dated November 2002. The BLM earlier recognized greater sage-grouse as a sensitive species requiring special management emphasis.

Much of the present distribution of sage-grouse is on publicly owned lands administered by the Bureau of Land Management (BLM) and the U. S. Forest Service (USFS). Management of wildlife on public lands is the responsibility of the respective state wildlife agency while management of wildlife habitat on public lands is the responsibility of the land management agency (usually BLM or USFS). Further, multiple use is most frequently prescribed for public lands administered by the BLM and USFS. Multiple uses typically include recreation, watershed, wildlife production and harvest, livestock production, and mineral exploration and development (including oil and gas production).

Energy production on public lands is not recent (Braun et al. 2002) and there has been exploration and development of typical sources such as coal, oil, and, gas dating to the 1880's. While past interest has seemed to be cyclic, depending upon demand, the recent interest in gas, and especially development of gas from coal bed methane and "tight sands" gas deposits, seems to be almost unprecedented. Many areas proposed for gas production in the western United States have been among the most productive for sagebrush-dependent wildlife, especially sage-grouse. Thus, increased development of energy resources in sagebrush steppe habitats has the potential to negatively affect sage-grouse.

The Pinedale area in Sublette and Sweetwater counties in south central Wyoming is an area known to be productive for wildlife and especially sage-grouse (Patterson 1952). Wyoming, in general, has had the strongest sage-grouse

population in the world. Fragmentation of the habitats upon which this population depends will slowly unravel the entire presently linked sage-grouse population in Wyoming. This has already happened in most other states with disastrous results and has already started in Wyoming -- most noticeably at the periphery of the historical distribution. Once this continuity becomes fragmented, the overall distribution fabric is lost and sage-grouse populations will become disjointed and subject to greatly reduced abundance as well as local extirpation. Due to this linkage, it is crucial for BLM to consider the impact of development on the Pinedale Anticline to the status of overall sage-grouse populations in southwestern Wyoming. The BLM has failed to recognize the importance on maintaining continuous populations although they acknowledge the population in the Pinedale Anticline decreased from 1999 through 2006 with local extirpation of groups of sage-grouse using two leks.

Pinedale Anticline Area Sage-grouse Population and Habitat Trends

Long-term monitoring efforts (20-30 years at the minimum) and research studies to tease apart impacts of energy development and other multiple use activities are critically needed in the Pinedale Anticline area. These efforts should focus on public lands (and include immediately adjacent private and State lands) and be funded by Federal land management agencies and the oil and gas industry. Monitoring and evaluation is briefly mentioned (Appendix C, Attachment 4) but no mention is made of what procedures will be followed if sage-grouse populations decline. The cumulative effects of all human-induced practices in the sagebrush steppe on sage-grouse population health as measured by numbers of active leks, trends in numbers of males counted, and chicks per hen need to be fully evaluated and studied to prevent, or at least understand, sage-grouse declines as the result of the present development. This development and production is scheduled to continue through at least 2023 with expected further declines in numbers of sage-grouse.

Understanding the Sage-grouse Population and Minimum Viable Population Size

Sage-grouse are specialists at using widely spaced resources scattered over large (hundreds of miles) expanses. All populations studied make seasonal movements from winter to breeding/nesting areas and then to late brood rearing and fall use sites. Movements can be as short as 5-10 miles to in excess of 60-80 miles. Thus, it can be argued that all populations are migratory with only the distance moved differing. This is true for most grouse species. Data presented by Lyon (2000) demonstrate that some sage-grouse in western Wyoming make substantial seasonal movements (as long as 60 miles).

The present data in the scientific literature are equivocal about the size of a minimum viable population for most wildlife species and estimates range from 500 to 5,000 breeding individuals (Franklin 1980, Soule 1980). All sage-grouse do not breed every year (for example, only a few dominant males are responsible for most matings and some females do not lay eggs as yearlings). Consequently, effective

spring population size (i.e., those individuals actually breeding) is smaller than the total number of individual sage-grouse in a population. For sage-grouse, it is doubtful that 500 individuals in spring would represent a population that would persist > 50 years. However, positive habitat management could reasonably be expected to provide adequate habitats to sustain a population for > 50 years provided all necessary habitat components were available over a contiguous area of not less than 50 mi^2, given a population density of 10 birds/mi^2 or at least 100 mi^2 given a population density of 5 birds/mi^2. Healthy, apparently sustainable populations, with some emigration and immigration, of > 3,000 total estimated individuals in the spring population are known to occupy "closed" areas (Jackson County, Colorado) of about 400 mi^2 of sagebrush steppe and associated riparian areas. The DSEIS should seek to ensure these minimum viable population sizes and areas if sage-grouse are to remain as a viable long-term component of the sagebrush ecosystem in southwestern Wyoming. This can be achieved if suitable mitigation as described in this analysis is required by BLM.

Sage-grouse Management in the Pinedale Anticline Area

Review of existing documents for the Pinedale Anticline Area indicates the BLM has consistently ignored sage-grouse needs and the scientific literature upon which developed guidelines (Braun et al. 1977, Connelly et al. 2000) to maintain sage-grouse populations are based. Most seriously, the BLM has chosen a 0.25-mile distance from active leks for avoidance of or restrictions on development even though the scientific literature indicates there should be no manipulation of sagebrush habitats within 3 miles of active leks (Connelly et al. 2000). *The 0.25-mile restriction during drilling appears to have been created to justify existing practices and is not based on any reputable science.* The BLM's own analysis (see Pinedale Anticline Project Draft EIS 1999: 5-34 as an example) reports that, "of leks with at least one well within a 0.25-mile radius, four times as many are inactive than active" and that "more than three times as many leks with at least one oil or gas well within a 0.50-mile radius are inactive". The need for a larger distance prohibition on disturbance around leks in the Pinedale Anticline Project Area has been brought to BLM's attention previously through studies for which it contracted. The August 2006 final report ("Pinedale Anticline Project Area Wildlife Monitoring Data Trends Analysis") prepared for BLM by Ecosystem Research Group conducted a linear regression between lek count trends and distance to nearest well. It found (page 28) "ERG believes seasonal restriction of no construction within 2 miles of an active lek to be appropriate and effective. However, the data suggests that the restriction calling for NSO within 0.25 miles of a lek is not enough to avoid a declining trend, and would better protect the grouse if it were raised to 1 mile, the approximate distance at which leks on the Anticline are no longer in a declining trend, based on figure 5.1.5.2."

The Upper Green River Basin Sage-grouse working group (which includes several industry representatives) in its draft conservation plan (dated 20 December 2006) recommended expanding the NSO restriction beyond the current 0.25 miles.

In their recommendations, page 55 of their draft plan states: "Current and past sage-grouse research in the Upper Green River Basin has shown that currently used habitat protection stipulations are not effective. The NSO ¼ mile buffer around sage-grouse leks has proven to be an inadequate distance and should be of greater distance."

Oil and gas well site development as well as development of roads, power lines, etc. all cause manipulation of habitat and reduction in area useable to sage-grouse. Research funded through the Wyoming Cooperative Wildlife Research Unit (Holloran and Anderson 2004, 2005a, b; Holloran 2005, Holloran et al. 2005, Thompson et al. 2006) on sage-grouse in the Pinedale Anticline area by industry and the BLM provide clear documentation of the needs of sage-grouse in this area as well as the sage-grouse response to oil and gas developments. All effects of oil and gas development are negative for sage-grouse.

As part of its mitigation guidelines and standard practices for surface disturbing activities, Wyoming BLM has imposed a restriction on activity within 2 miles of leks during the 8:00 PM to 8:00 AM interval from 1 March through 15 May which has been extended through 15 July (to benefit nesting females and broods) within 2 miles from leks. These dates provide minimal mitigation during the breeding and nesting periods as there is little monitoring of adherence to these restrictions and those in place can be and have been routinely modified. In actual practice, there is little protection from physical disturbance of habitats useful to sage-grouse nesting outside of the artificial 0.25-mile radius from active leks. The industry (Alternative B) and BLM (Alternative C) now propose to remove even the minimal stipulations during drilling to protect sage-grouse from oil and gas development activities. The DSEIS also fails to adequately address the cumulative effects on sage-grouse of all treatments (not limited to oil and gas developments).

Mitigation Measures To Protect Sage-grouse

Present mitigation measures to protect sage-grouse and their habitats in the Pinedale Anticline area DSEIS are minimal (Appendix C, Attachment 4) and have little scientific basis. The BLM should endorse and follow the "*Guidelines to manage sage grouse populations and their habitats*" (Connelly et al. 2000). Consideration should also be given to following the concluding comments of Braun et al. (2002) that strongly recommend that it is the responsibility of the oil and gas industry to demonstrate their activities have no negative impacts initially, short-term, or over the long-term. Effective mitigation practices, in addition to those in the *Guidelines* (Connelly et al. 2000), include permanent and seasonal road closures, burial and or modification of power lines, removal or modifications of fences and other structures, fertilization of sage-grouse winter ranges with nitrogen, and reduction or complete permanent elimination of other uses such as livestock grazing, especially on areas where oil and gas production is permitted. Mitigation should also consider those impacts that can be reasonably expected including cumulative (with other factors) effects. Full mitigation would require increasing the number (on a per unit basis) of

sage-grouse in non-affected areas to equal the reduction in numbers of sage-grouse in affected areas. Research on developing methodology to enhance sagebrush habitats (to support higher densities of sage-grouse) should also be productive.

To further mitigate the impacts from the significant oil and gas developments that are occurring and being planned for the Pinedale Anticline area, the BLM should designate, as part of the NEPA process, peripheral areas that will not be subject to gas and oil development that protect at least 90% of known sage-grouse winter use areas. Specifically, BLM should make provision that peripheral areas outside of the core development area will not be subject to gas and oil development until the core area has been fully developed and reclaimed (and demonstrated to be used by sage-grouse for all life processes). Set aside areas should be at least one Township (36 mi^2) in size with connectivity corridors to other non-disturbed areas of at least 1 mile in width.

Sage-grouse Monitoring Requirements

Assessment of the long-term effects of any use or disturbance, especially oil and gas or other energy-related development, on sage-grouse and the health of the sagebrush steppe should be based on collection and analysis of population information in spring, collection and analysis of harvest information, and numbers of birds counted in selected winter habitats. Sage-grouse population statistics collected in spring are those related to number of active leks per unit of area and total number of cocks counted on a sample of randomly selected, statistically defensible accessible leks. Harvest data collection should focus on analysis of wings for changes in ratios of chicks/hen and males to females in both adult (including yearlings if not separable) and chick age classes. These data should be used to model sage-grouse populations in the Pinedale Anticline area to examine timing of extirpation of local leks and subpopulations. Data are sufficient to conduct models based on 1999-2006 trends.

Long-term Effects On Pinedale Anticline Area Sage-grouse Populations

The importance of sustained, long-term monitoring cannot be overstated. It is clear that oil and gas development will negatively affect sage-grouse populations (Braun et al. 2002) and only the magnitude of the impacts is unknown. The oil and gas industry should fund the monitoring and long-term research needed throughout the life of the project and this should be a specific requirement in any new oil and gas development projects. This critical monitoring should continue until the sage-grouse population returns to pre-disturbance levels, which could exceed 30 to 60 years. Cause and effect studies using an active adaptive management approach (Walters 1986) are necessary to fully understand the implications of oil and gas development on sage-grouse. The industry has the responsibility to demonstrate their activities have no negative impacts initially, short-term, or over the long-term on the distribution and abundance of sage-grouse in areas explored and developed for oil and gas production.

There was no attempt in the DSEIS to consider even minimal suggestions on identification and protection of winter habitats, brood habitats, or scientifically defensible buffers for NSO around active leks. The discussion of Monitoring in the DSEIS is minimal and consideration of mitigating impacts on sage-grouse is essentially non-existent.

Conclusions

Neither alternatives B or C adequately describe or analyze the expected impacts of unrestricted oil and gas development on sage-grouse distribution and abundance within the Pinedale Anticline Area. My professional judgment is that alternatives B and C will accelerate the present declines in distribution and abundance in sage-grouse populations in the Pinedale Anticline area. Both alternatives B and C are prescriptions for extinction of local subpopulations of sage-grouse. All of the proposed mitigation measures (Appendix C, Attachment 4) for sage-grouse are totally inadequate. Even if the few listed (Appendix C, page C-27) were implemented, they would have little positive impact on sage-grouse populations.

Key Recommendations

<u>Mitigation Measures</u>

1. The BLM should adopt a policy of no surface disturbance within 3 miles of occupied leks as data clearly show negative impacts to sage-grouse at the present distance of 0.25 miles or even 2 miles. Further, adequate data are available to demonstrate that most female sage-grouse nest within 3 miles of active leks. *This is the minimum required to maintain and stabilize the decline in the present sage-grouse population.* The BLM, at the minimum, must expand the year long NSO area to at least 1 mile and preferably 3 miles, if sage-grouse, are to remain viable in the Pinedale Anticline area.

2. All areas used by sage-grouse during both average or "normal" and severe winters should be given special protection from wild fire, manipulation of sagebrush, and human-induced disturbance. *This is the minimum required to maintain and stabilize the present sage-grouse population.*

3. Adherence to time of use for restriction of activities from 6:00 PM through 9:00 AM during the breeding and nesting periods should be strictly monitored and enforced. *This is the minimum required to maintain and stabilize the present sage-grouse population.*

4. Management of mid to late summer brood-rearing areas should encourage forb regrowth while maintaining at least a 6 inch residual grass height with taller (> 24 inches in height) live sagebrush of > 15 % canopy cover in close (< 200 yds) proximity for use as escape cover. No gas and oil development activities should be

allowed in areas identified to be used for nesting or brood rearing. *This is the minimum required to maintain and stabilize the present sage-grouse population.*

5. Mitigation should be required for all activities known to negatively impact sage-grouse. Mitigation measures should include, but are not limited to: burial or modification of power lines, off set drilling, road closures and time restrictions, removal of livestock grazing, nitrogen fertilization of winter and nesting areas, removal or modification of existing fences, etc. Full mitigation would be to replace the exact number of sage-grouse impacted by development activities by increasing the number per unit of area that the remaining areas can support to equal the number displaced. *This is the minimum required to maintain and stabilize the present sage-grouse population.* The ratio of 3 acres to 1 acre for off-site mitigation proposed by the industry will not be adequate. Sage-grouse are a landscape scale species and it will take set aside, from all development and other disturbances, of multiple, peripheral, contiguous areas each equivalent to at least one Township (36^2 mi) and probably > 50^2 mi of suitable habitat with connectivity corridors of at least 1 mile in width to maintain a viable population. These areas must be outside of core development areas. Some lease buy outs in areas not presently developed, especially within 2-3 miles of active leks, should be considered.

<u>Monitoring Requirements (Minimum)</u>

1. Standard surveys of all areas to locate active leks should be conducted in spring 2007 and continue at 3-year intervals. This will provide data on lek extinction and recruitment caused by oil and gas development activities. *This is the minimum required to monitor the sage-grouse population.*

2. Leks classified as active should be counted (number of cocks present) 3-4 times each spring at 7-10 day intervals starting in late March-early April and continuing into mid May. Those leks classified as inactive should be checked in late April/early May every 2-3 years to ascertain change in status. *This is the minimum required to monitor the sage-grouse population.*

3. Harvest data based on examination of sage-grouse wings collected from hunters should continue on a well-defined population basis. Statistics needed to measure responses of sage-grouse to oil and gas development are those relating to nest success, chicks per hen, and age/gender composition. *This is the minimum required to monitor the sage-grouse population.* Most of these data are being collected by Wyoming Department of Game and Fish personnel. BLM must recognize the value of these data and use them in adaptive management and in modeling sage-grouse population trends.

4. Monitoring of the proposed 'coordinated mitigation approaches' (whatever they may be) must be standardized, long-term (40-60 years) and scientifically defensible. It would also be appropriate for monitoring to include all peripheral areas set aside from development as outlined in this analysis (Mitigation Measures, Item 5)

5. Vegetation in areas disturbed that are reclaimed following cessation of development should be described at 2-3 year intervals as to live sagebrush canopy cover and height, grass cover and height, and forb cover and height.

6. Monitoring should be both on- and off-site where mitigation activities are implemented.

7. Industry should fund all monitoring efforts and scientific studies.

<u>Other Management Issues</u>

1. Habitat guidelines published by Connelly et al. (2000) should be incorporated into preparation of a "desired future condition" to be achieved to improve nest success and early chick sage-grouse survival. *This is the minimum required to enhance the sage-grouse population.* Desired future condition should be defined for core and peripheral areas where no development will occur until the disturbed core areas are reclaimed and used by sage-grouse for all life processes.

2. Nesting areas, since they are difficult to locate at a population or subpopulation scale, should be defined as all area within 3 miles of active leks. This will provide a minimum amount of protection. *This is the minimum required to maintain the sage-grouse population.*

3. Early chick survival has been identified as a problem in Wyoming. BLM and industry should immediately implement strategies to improve sage-grouse chick survival. These strategies do not include burning or spraying to kill sagebrush but should include livestock management and wet meadow enhancement. Sage-grouse need abundant forbs and grasses (Appendix) within an area with live sagebrush canopy for successful nesting and early brood rearing.

4. The cumulative impacts of all human-induced activities within a given, describable sage-grouse population unit should be studied over a period sufficiently long (20-30 years) to be able to predict actual long- and short-term effects. When industry is involved in causing the impacts, they should be expected to fully support, financially, all studies as they have the burden to demonstrate their activities are not negative to sage-grouse.

5. The concept of creating (and transferring) 'credits' to non-disturbed lands from areas disturbed by development should not be adopted as mitigation lands for sage-grouse should be immediately adjacent to or within 5-10 miles of the areas developed. Lands selected for mitigation should be at least equal in value for sage-grouse and should be sufficiently close to serve as refugia for birds 'displaced' from areas developed. It is not clear that displaced birds will survive to reproduce as existing habitats most likely are presently supporting the maximum number of grouse possible given the quality and quantity of the habitat. It is not likely that

peripheral areas set aside from development will be able support increased numbers of sage-grouse without habitat improvement (livestock management, wet meadow development, fertilization, etc. but, excluding use of herbicides, burning, and widespread mowing or chopping to kill sagebrush). Further, I know of no proven method to recreate sagebrush-steppe landscapes at even a minimal scale that would be used by sage-grouse for all life processes. A 'credit' or 'banking' program for sagebrush-steppe landscapes that is workable is not readily apparent.

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Thank you for the opportunity to comment. Please respond to the issues raised in these comments through the NEPA process.

Sincerely yours,

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APPENDIX

An Overview of Sage-grouse Life History and Habitat Use

Sage-grouse are sagebrush dependent species and evolved to use sagebrush steppe on a landscape scale. Thus, they may use as little as 10% (all habitat that might be available) in severe winters (Beck 1977) to as much as 70% + during late summer and fall. Winter use sites are those with large expanses of sagebrush available above the snow, frequently in drainages, large flats along ridge tops, and on west and southwest exposures (Hupp and Braun 1989). Winter food is the leaves of sagebrush of a variety of species from low sagebrush (*A. arbuscula*), silver sagebrush (*A. cana*), black sagebrush (*A. nova*), three-tip sagebrush (*A. tripartita*), to a variety of subspecies of big sagebrush (*A. tridentata*). Taller and denser sagebrush cover is important during this period (Connelly et al. 2000).

Breeding areas may be adjacent to or far removed from winter use sites. Areas chosen for breeding are those that are open within the sagebrush type with wide visibility and few impediments to hearing acuity. Sage-grouse display areas have low vegetation but with taller live sagebrush within 100-200 yards. Thus, escape and loafing cover is keenly important during the breeding season. Most importantly, sites chosen for use for display are in areas where movement of females searching for nesting sites is common. Nesting may occur as close as within 100 yards of an active lek with most nests being within 3 miles of the lek of mating. However, movements of 20 to 60 miles from lek of capture to actual nest sites have been reported (Connelly et al. 2000, Lyon 2000). During the breeding and pre-nesting period, newly growing green forbs become an important part of the diet for all sage-grouse, but especially for females. Live canopy cover of sagebrush and a diversity of herbaceous plants with taller residual cover are exceedingly important during the nesting period (Connelly et al. 2000).

Nesting areas used by sage-grouse are generally in sagebrush uplands with a live canopy cover of 15 to 25%. Taller and bushy live sagebrush plants are preferred for nest sites. These sites frequently are in larger patches of sagebrush and nests generally are placed under the tallest live sagebrush bush. Upon hatching sage-grouse move their chicks into more open habitats with live sagebrush where forbs are plentiful and grasses provide cover and increased insect availability. Live sagebrush canopy cover can be as little as 10-15% in early brood rearing areas (Connelly et al. 2000). As broods mature, movements become longer and hens with chicks move to wet meadow or riparian areas within the sagebrush type. Taller, more robust sagebrush continues to be important for loafing and escape cover. In the absence of succulent forbs in uplands, hen sage-grouse quickly move their broods to moist or wet areas, if available. If these movements are long or fast, chick survival suffers. Maintaining healthy sagebrush uplands is important to chick survival and apparent nest success.

During late brood rearing, movements of broods as well as those of unsuccessful hens and males may be relatively short depending upon moisture and availability of forbs. With advent of fall, broods combine into larger flocks with older birds of both genders. Movements into sagebrush uplands, especially areas with late forb green up, become pronounced, as do distances involved. This continues into late fall and early winter when snow initiates movement to winter ranges. Foraging on sagebrush leaves continues for adults throughout the summer, fall, and winter even though substantial amounts of forbs are taken when available. Chick sage-grouse start using sagebrush leaves in late July and early August when their diets become similar to those of adults.