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Working to protect and restore Western Watersheds and Wildlife

April 25, 2019

Governor Mark Gordon
Idelman Mansion
2323 Carey Avenue
Cheyenne, Wyoming 82002

Director Brian Nesvik
Wyoming Game and Fish Department
5400 Bishop Boulevard
Cheyenne, Wyoming 82006

Via email to wgfd.hpp@wyo.gov

Dear Governor Gordon and Game and Fish Director Nesvik:

The following are the comments of Western Watersheds Project, American Bird Conservancy, Bighorn Audubon, WildEarth Guardians, Center for Biological Diversity, Council for the Big Horn Range, Prairie Hills Audubon Society, Black Hills Clean Water Alliance, Wyoming Wilderness Association, and Upper Green River Alliance on the Wyoming state sage-grouse Executive Order ("Wyoming plan"). The Wyoming plan is an improvement over the level of sage-grouse conservation measures that preceded it, but in many respects falls well short of minimum levels of protection established in the scientific literature. We recommend that the science-based shortcomings of the Wyoming plan be rectified in order to maintain current populations and, in areas where sage-grouse populations remain in danger of further decline or extirpation, restore populations to healthy and secure levels.

Due in large measure to its large expanses of sagebrush steppe habitat and its low human population density, Wyoming has the largest remaining greater sage-grouse population of any state. The Wyoming statewide population comprises 35% of the remaining sage-grouse in the United States, with three of the largest nesting concentrations left along the Atlantic Rim, in the northeastern Red Desert, and in the Upper Green River Valley. However, these populations face continuing stressors and current populations are a small fraction of historic population densities and continue to decline. In 1910, George Bird Grinnell, one of America's foremost naturalists of the 19th Century, recounted a Wyoming experience viewing sage grouse before the big declines:[1]

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[1] Grinnell, G.B. 1910. American game bird shooting. New York, NY: Forest and Stream Publishing Company, 558 pp.

> In October, 1886, when camped just below a high bluff on the border of Bates Hole, in Wyoming, I saw great numbers of these birds, just after sunrise, flying over my camp to the little spring which oozed out of the bluff 200 yards away. Looking up from the tent at the edge of the bluff above us, we could see projecting over it the heads of hundreds of the birds, and, as those standing there took flight, others stepped forward to occupy their places. The number of Grouse which flew over the camp reminded me of the old time flights of Passenger Pigeons that I used to see when I was a boy. Before long the narrow valley where the water was, was a moving mass of gray. I have no means whatever of estimating the number of birds which I saw, but there must have been thousands of them.

It seems likely that few, if any, Wyoming residents are still alive who can recount such large population densities of sage-grouse, and today this species is present only sparsely on the landscape.

The Wyoming plan centers on focusing protections on Core Areas, a sound concept that has been extended West-wide through the designation of corresponding Priority Habitat Management Areas on federal public lands. Heinrich et al. (2017) found that 58-69% of sage-grouse in Wyoming could be expected to nest and summer within designated Core Areas, with the percentage decreasing over time. The same study highlighted the need to provide additional connectivity protections (*and see* Row et al. 2018), particularly for isolated Core Areas, and winter habitat protections, especially in southwestern Wyoming.

The Wyoming plan was originally generated through a political process, a collaboration in which stakeholders could (and did) hold negotiations hostage through blocking consensus to extract concessions for their industries that are incompatible with sage-grouse conservation. As a result, the Wyoming plan departs from scientifically valid protection levels in ways that undermine the conservation of sage-grouse in the Core Areas established under the plan for their protection. These departures, outlined in greater detail below, include inadequate protective buffers around leks, excessively permissive thresholds of surface disturbance percentage, scientifically invalid methods of calculating site density and surface disturbance limits, an absence of scientifically credible protections for winter habitats, a complete absence of standards governing noise pollution in sensitive sage-grouse habitats, a complete absence of conservation measures addressing impacts of livestock grazing, and the gerrymandering of Core Area boundaries to exclude undisturbed habitats of high sage-grouse density to accommodate future development incompatible with sage-grouse conservation. We will address each of these shortcomings in turn.

The 0.6-mile lek buffer in the Wyoming plan is scientifically invalid

The Wyoming plan proposes a No Surface Occupancy (NSO) buffer of 0.6 mile around lek sites, to prevent construction of roads, mines, powerlines, wellsites, or other industrial development. This lek buffer size is too small to effectively prevent the extirpation of lek populations, based on the available science. The lek site, where displaying and breeding occurs each spring, is the hub of nesting activity. According to Taylor et al (2012: 27),

> [F]emale sage-grouse that visit a lek use an approximately 9-mi (15-km) radius surrounding the lek for nesting; a 2-mi (3.2-km) radius encompasses only 35-50% of nests associated with the lek (Holloran and Anderson 2005, Tack 2009). While a lek provides an important center of breeding activity, and a conspicuous location at which to count birds, its size is merely an index to the population dynamics in the surrounding habitat. Thus attempting to protect a lek, without protecting the surrounding habitat, provides little protection at all.

Holloran and Anderson (2005) found in Wyoming that sage grouse nest within 5.3 miles of the lek site. Sage-grouse show strong fidelity to their lek sites, so much so that they return year after year to exactly the same locations to dance and mate.

There have been a number of scientific studies, heavily focused on Wyoming, that demonstrate that lek buffers greater than the 0.6-mile standard applied under the Wyoming plan are necessary to maintain current sage-grouse populations in the face of industrial development. The seminal study was funded by the oil and gas industry and conducted by Holloran (2005), and it found significant negative impacts from both access roads (even when shielded from the lek by intervening topography) and individual producing (post-drilling) oil and gas wells within 1.9 miles from active leks. Measurable impacts on sage-grouse from coalbed methane development in northeast Wyoming were found to extend out to 4 miles (Walker 2008), and subsequent research has recorded effects as far away as 12.4 miles from leks (Taylor et al. 2012). Holloran et al. (2007) found that yearling sage grouse avoided otherwise suitable nesting habitat within 930m (almost 0.6 mile) of oil and gas-related infrastructure. This means that individual wellsites, and their access roads and other related facilities, will be surrounded by a 0.6-mile band of habitat that has substantially lost its habitat capability for use by nesting grouse and is completely inadequate as buffer. Gibson et al. (2018) found that significant negative effects on sage-grouse extended 1.5 to 7.8 miles from powerlines. The National Technical Team (2011: 20) observed, "it should be noted that protecting even 75 to >80% of nesting hens would require a 4-mile radius buffer (Table 1). Even a 4-mile NSO buffer would not be large enough to offset all the impacts reviewed above." Importantly, a 0.6-mile lek buffer covers by area only 2% of the nesting habitat encompassed by a 4-mile lek buffer, which takes in approximately 80% of nesting grouse according to the best available science.

The consequences of industrial development in the context of inadequate lek buffers are reductions in population size and persistence. State researchers, using lek buffers of 0.25 mile, 0.5 mile, 0.6 mile, 1.0 mile, and 2.0 mile, estimated lek persistence of 4, 5, 6, 10, and 28 percent, respectively (Apa et al. 2008). Standard energy development within 2 miles of a lek has been projected to reduce the probability of lek persistence from 87% in areas with no development to 5% (Walker et al. 2007). Applying these calculations, which were officially commended to the Wyoming Game and Fish Director by state sage-grouse researchers Tom Christiansen and Joe Bohne, the 0.6-mile lek buffers currently in place in the state plan would be predicted to yield a 6% chance of lek persistence when applied to development (*see* Apa et al. 2008, Attachment 1).

By contrast, no scientific study has ever recommended a lek buffer of 0.6 mile as an adequate conservation measure. Males use shrubs within 1 km (0.6 mi) from a lek for foraging, loafing, and shelter (Rothenmeier 1979, Autenreith 1981, Emmons and Braun 1984). None of these studies postulate that protection of loafing males during the breeding season is the appropriate level of protection for breeding and nesting activities that occur on the lek and in surrounding habitats. Nor do they even suggest that siting development immediately outside this "loafing zone" will prevent displace of loafing males (let alone protect females during breeding or nesting habitats). Indeed, the best available science (Holloran 2005) specifically tested this hypothesis and found that lek populations during the breeding season declined when producing wells were sited within 1.9 miles of leks and when active drilling occurred within 3.1 miles of leks; this study made no attempt to quantify the buffers needed to protect nesting activities. Therefore, a 0.6-mile is inappropriate even for preventing impacts to breeding birds, much less nesting birds.

By comparison, an interagency team of sage-grouse experts from state and federal agencies performed a comprehensive review of the scientific literature and recommended a 4-mile lek buffer for siting industrial development in sage-grouse habitat (National Technical Team 2011), a prescription in greater accord with the science. Apa et al. (2008, emphasis added) reviews the best available science by a team of state sage grouse biologists, and states,

> "Yearling female greater sage-grouse avoid nesting in areas within 0.6 miles of wellpads, and brood-rearing females avoid areas within 0.6 miles of producing wells. This suggests a 0.6-mile buffer around all suitable nesting and brood-rearing habitat is required to minimize impacts to females during these seasonal period." This report further clarifies, "These suggest that all areas within at least 4-miles of a lek should be considered nesting and brood-rearing habitats in the absence of mapping."

Thus, state experts in this report in effect recommended a 4.6-mile NSO buffer around active leks. This recommendation is buttressed by the findings of Holloran et al. (2007) that yearling sage grouse avoided otherwise suitable nesting habitat within 930m (almost 0.6 mile) of oil and gas-related infrastructure. This means that individual wellsites, and their access roads and other related facilities, will be surrounded by a 0.6-mile band of habitat that has substantially lost its habitat capability for use by nesting grouse. Aldridge and Boyce (2007) suggested that even larger buffers of 10 km (6.2 miles) are warranted. Manier et al. (2014) subsequently reviewed all available science and reported an "interpreted range" of appropriate lek buffers ranging from 3.1 to 5 miles. The Wyoming plan's 0.6-mile lek buffers are clearly outside this "interpreted range."

We recommend that, at a minimum, in all Core Area lands a 5.3-mile buffer preventing surface occupancy or disturbance, including the siting of industrial infrastructure or facilities, should apply around leks (after Doherty et al. 2011), and that within this buffer, any existing powerlines must be buried or removed.

The 5% surface disturbance threshold in the Wyoming plan is scientifically invalid

Knick et al. (2013) concluded that 99% of the active leks in the study area (encompassing the entire western range of the greater sage grouse) were surround by habitat with 3% or less surface disturbance (defined using GIS as residential or industrial development). Kirol (2012), found for his Wyoming study area that surface disturbance greater than or equal to 4% of the land area had a significant negative impact on greater sage grouse brood rearing habitat. Thus, a limit of 3% surface disturbance is necessary within Core Areas to prevent lek population declines from excessive density of infrastructure and/or facilities.

The federally-convened National Technical Team (2011: 7, internal footnote omitted) was particularly explicit regarding the necessity to implement the 3% disturbance threshold rigorously, in outlining the following land management prescriptions:

> Manage priority sage-grouse habitats so that discrete anthropogenic disturbances cover less than 3% of the total sage-grouse habitat regardless of ownership. Anthropogenic features include but are not limited to paved highways, graded gravel roads, transmission lines, substations, wind turbines, oil and gas wells, geothermal wells and associated facilities, pipelines, landfills, homes, and mines.
>
> - In priority habitats where the 3% disturbance threshold is already exceeded from any source, no further anthropogenic disturbances will be permitted by BLM until enough habitat has been restored to maintain the area under this threshold (subject to valid existing rights).
> - In this instance, an additional objective will be designated for the priority area to prioritize and reclaim/restore anthropogenic disturbances so that 3% or less of the total priority habitat area is disturbed within 10 years.

There is <u>no scientific evidence</u>, however, indicating that sage grouse can tolerate a greater percentage of surface disturbance. Indeed, a limit of 5% surface disturbance allows full-field oil and gas development at the standard wellsite density for full-field development of 160-acre spacing (four wellsites per square mile), which has been shown to cause lek populations to decline to extirpation. In order to bring the Wyoming plan into compliance with the best available science, the disturbance percentage threshold allowed in Core Areas should be reduced from 5% to 3%.

Application of site density and disturbance percentage thresholds based on the Disturbance Density Calculation Tool (DDCT) is scientifically invalid

The amount of cumulative disturbance allowed in sage-grouse core habitat at the project analysis area scale is calculated by an algorithm known as the Density Disturbance Calculation Tool ("DDCT"). But this tool essentially allows projects to average out their cumulative disturbance over a much greater land base than will actually be impacted, masking high-density disturbance effects in a localized area. The DDCT is used to establish an area for measuring the amount of disturbance that may be allowed under a project proposal. The DDCT essentially buffers a proposed project area by 4 miles, identifies all occupied leks within this area and buffers them by 4 miles, and uses the combined area as the denominator to calculate the total land area from which to derive the total percentage of land that could be disturbed by the project. This results in well densities and percentage of surface disturbance that exceed the 1 well per square mile and 3% disturbance thresholds of significant impact to sage grouse populations within individual project areas. In cases where the DDCT area/project analysis area is very large, more than one well or mine site is permitted to be developed in a given square mile as long as the surrounding Priority Habitat lands are relatively free from other development disturbance. This allows a density of wellsites that exceeds science-based thresholds at which significant impacts to sage grouse inhabiting the habitat in question begin to occur. Indeed, it is apparent that the DDCT method was specifically developed to allow industrial projects in Core Areas at levels of disturbance known to be incompatible with sage-grouse population survival.

The Lost Creek Uranium In Situ Recovery Project in the northern Red Desert of Wyoming exemplifies how development can exceed disturbance and density limits under the DDCT. The 4,254-acre permit area is located inside a Core Area, and it intersects the 4-mile buffers of 15 sage-grouse leks.[2] The DDCT area for this project is 147,060 acres, almost 230 square miles. If this were a hypothetical oil and gas project with the same 147,060-acre DDCT area, 229 wells would be allowed in the 4,254-acre permit area, for a density of 34.4 wellsites per square mile within the permit area. Within the actual perimeter of development, wellsite density will exceed 50 wells per half-section, or 100 wellsites per square mile. This extreme density would destroy habitat function for sage-grouse locally, even though well density for the DDCT area would still be within the one well per square-mile limit in the Core Area strategies.

In the case of the Lost Creek project, the extra-large DDCT area allowed intense development within the permit area. The project expects to disturb (i.e., bulldoze) 345 acres, which, when combined with preexisting disturbance, amounts to less than one percent for the DDCT area, but when compared to the 4,254-acre permit area, would yield 8.1 percent disturbance, far above the stated limit in the state and federal Core Area strategies. Virtually all development in this project was planned to occur along the ore trend, meaning that the actual density within the developed portion of the Permit Area will be much greater than 8.1%. The DDCT area for this project, by contrast, totals 147,060 acres, yielding a percent disturbance of less than 1% when considering the existing and proposed disturbance according to the current calculation protocol. The 345-acre development area also violated the strategies' limitation on site density. The DDCT assumes individual development sites (like oil and gas wells) will only each affect 4 to 5 acres. But for this project, the state wildlife agency classified the entire 4,254-acre development area as a single "site," which, although it meets the one site per square mile requirement, will eliminate half of a square mile section of directly bulldozed habitats within the 4,254-acre project area where it is located, and certainly have deleterious effects on sage-grouse for miles around. The DDCT area for this project is so large that 229 oil and gas wellsites could have been permitted within the six-square-mile project area (or 38 wellsites per square mile) without exceeding the putative one wellpad per square mile limit on site density for the DDCT analysis area. The Wyoming plan must

[2] Calculations derived from data presented in the Lost Creek In Situ Recovery Project Final EIS at ES-2, 4.9-8, 4.9-27, and Appendix D.

prevent this type of excessive development through scientifically sound calculation methods for site density and disturbance percentage.

Knick et al. (2013) measured disturbance across an area much smaller (a 3-mile buffer around leks) than a DDCT area. A DDCT analysis area can exceed 225 square miles based on the BLM analysis of the Lost Creek uranium project. Therefore, 5% surface disturbance as measured across a DDCT area is an even higher percentage of surface disturbance when calculated using the Knick et al. (2013) protocol.

A number of scientific studies (including Holloran 2005, Doherty 2008, Walker et al. 2007a, Tack 2009, Taylor et al. 2012, and Copeland et al. 2013) have determined that significant sage-grouse population declines occur when site density of industrial facilities exceeds one site per square mile. Importantly, none of these studies calculate site density using the DDCT method, or using comparably-sized areas. The National Technical Team (2011) recommended that disturbance density be calculated per square-mile section, based on their review of the best available science. This is supported by subsequent scientific study by Knick et al. (2013), who found that a limit of 3% development (based on a 3-mile buffer around leks) was the threshold beyond which sage grouse populations were rarely able to sustain themselves. Accordingly, disturbance caps and site density in Core Areas need to be calculated on a per-square-mile-section basis in order to maintain developed areas at levels compatible with sage-grouse persistence, per the recommendations of the National Technical Team (2011).

Strong protections for winter concentration areas must be added

It is not sufficient to protect merely the breeding, nesting, and brood-rearing habitats; if sage-grouse cannot survive the winter due to degradation or industrialization of their winter habitats, populations will necessarily decline toward extirpation. In Wyoming, Core Areas were designated on the basis of buffers around active lek sites, which encompass the breeding and nesting habitats used by grouse during spring and summer. But protecting wintering habitats is equally important to assuring the continued existence and ultimate recovery of the species, and these wintering habitats are frequently located outside the protective boundaries of designated Priority Habitats. BLM's analysis highlights the importance of protecting these habitats: "Doherty et al. (2008) demonstrated that Greater Sage-Grouse in the Powder River Basin avoided otherwise suitable wintering habitats once they have been developed for energy production, even after timing and lek buffer stipulations had been applied." Buffalo RMP Revision DEIS at 367. In addition, Carpenter et al. (2010) found that wintering sage grouse avoided otherwise suitable habitats within a 1.2-mile radius of wellsites. Dzialek et al. (2012: 12) confirmed these relationships for wintering sage grouse in Wyoming, and concluded:

> First, we can say with increasing confidence that the winter pattern of occurrence among sage-grouse shows consistency throughout disparate portions of its distribution. Second, avoidance of human activity appears to be a general feature of winter occurrence among sage-grouse.

This indicates a broad consistency in sage-grouse sensitivity to human development in wintering habitats throughout the species' range.

Distance from development and density of development are key factors in developing winter concentration area protections. Holloran et al. (2015) determined that increasing wellpad density had a negative impact on sage-grouse winter habitat use regardless of whether liquid gathering systems were used to reduce human activity levels or not. The study also found a negative impact of wellsites within 1.75 miles on wintering grouse, even in cases where liquid gathering systems were used to reduce road traffic.

In accordance with the best available science, the State of Wyoming should map wintering habitats statewide and apply the following restrictions on development in designated winter habitats: (1) close all lands within 1.2 miles of winter concentration areas to future oil and gas leasing, coal location, non-energy minerals leasing, mineral materials sales, and seek withdrawal of these lands from locatable mineral entry; (2) for valid existing lease rights, apply a limit of 3% surface disturbance and one energy or mining site per square-mile section, and exclude new surface occupancy within 1.2 miles of winter concentration areas.

At present, only timing limitations apply to industrial projects in winter concentration areas. This is completely inadequate because industrial facilities constructed in the summer will remain throughout every subsequent winter. Timing stipulations fail utterly to address the threat of habitat destruction, habitat fragmentation, displacement of and stress to sage-grouse resulting from vehicle traffic, noise, and human activity along roads and at industrial sites, displacement of grouse and increased predation resulting from overhead powerlines and tall structures, construction of wind farms, and other human intrusions know to disturb, displace, and causer population declines of sage-grouse. For these reasons, winter concentration areas should receive at least the level of protection from permitted industrial activities as recommended by the National Technical Team (2011) for priority habitats.

Science-based restrictions on noise must be added

Advances in science make it increasingly clear that noise from roads or industrial facilities is having a major negative effect on sage-grouse and their ability to make use of otherwise suitable habitats. Noise can mask the breeding vocalizations of sage-grouse (Blickley and Patricelli 2012), displaces grouse from leks (Blickley et al. 2012a), and causes stress to the birds that remain (Blickley et al. 2012b). According to Blickley et al. (2010), "The cumulative impacts of noise on individuals can manifest at the population level in various ways that can potentially range from population declines up to regional extinction. If species already threatened or endangered due to habitat loss avoid noisy areas and abandon otherwise suitable habitat because of a particular sensitivity to noise, their status becomes even more critical." Noise must be limited to a maximum of 10 A-weighted decibels (dBA) above the ambient natural noise level after the recommendations of Patricelli et al. (2012); the ambient noise level in central Wyoming was found to be 22 dBA (Patricelli et al. 2012) and in western Wyoming it was found to be 15 dBA (Ambrose and Florian 2014, 2015; Ambrose et al. 2015).

Sage-grouse lek population declines occur once noise levels exceed the 25 dBA level. With this in mind, ambient noise levels should be defined as 15 dBA and cumulative noise should be limited to 25 dBA in occupied breeding, nesting, brood-rearing, and wintering habitats, which equates to 10 dBA above the scientifically-derived ambient threshold.

It is reasonable to suppose that if noise that mimics oil and gas truck traffic causes elevated levels of stress-related metabolites in grouse on the lek (Blickley et al. 2012b), that this physiological response would be substantially similar during other parts of this bird's life cycle. Indeed, these researchers stated, "Noise at energy development sites is less seasonal and more widespread and may thus affect birds at all life stages, with a potentially greater impact on stress levels." Patricelli et al. (2012) recognized this explicitly:

> "Second, and much more importantly, if noise levels drop down to stipulated levels at the edge of the lek, then much of the area surrounding the lek will be exposed to higher noise levels (see Figures 3 & 4). This management strategy therefore protects only a fraction of sage-grouse activities during the breeding season—mate assessment and copulation on the lek—leaving unprotected other critical activities in areas around the lek, such as foraging, roosting, nesting and brood rearing."

The federal approach of measuring noise exceedances within 0.6 mile of the lek, instead of at the periphery of occupied seasonal habitat, is scientifically invalid because it fails to address noise impacts to nesting habitats, wintering habitats, and brood-rearing habitats. In the Wyoming Basins Ecoregional Assessment (Hanser et al. 2011: 131), the authors pointed out, "Any drilling <6.5 km [approximately 4 miles] from a sage-grouse lek could have indirect (noise disturbance) or direct (mortality) negative effects on sage-grouse populations."

For Wyoming, the ambient noise level should be set at 15 dBA and maximum noise allowed should not exceed 25 dBA to prevent lek declines due to noise.

Core Areas should be recommended for closure to future mineral leasing

Regardless of the intensity level of development, the best outcome for sage-grouse is undeveloped habitat. With this in mind, we recommend that sage-grouse Core Areas be closed to future leasing for fluid minerals and other types of mineral development. If this recommendation were to be implemented, existing oil and gas leases would continue to be developed under the protection levels specified in the Wyoming plan, and if the leaseholders followed through on their due diligence to explore and develop their leases, productive leases would continue to be held by production until minerals were no longer being produced. Unproductive or speculative leases would expire if not produced prior to the end of their 10-year lease terms, and over time the leaseholders would choose either to invest in developing the mineral resource, or allow the lease to remain undisturbed habitat, based on their own choice. Over time, as undeveloped leases expire, Core Areas would come to be predominantly free from oil and gas leases, thereby eliminating future conflicts between oil and gas development and the need for sage-grouse habitat conservation.

Conservation measures to address livestock grazing impacts to sage-grouse are needed

The Wyoming plan defines livestock grazing as a "*de minimis* activity" of no conservation importance, and applies no conservation protections to address its impacts. This is a factual misrepresentation, and indeed the U.S. Fish and Wildlife Service reviewed the science and determined that livestock grazing posed a principal threat to sage-grouse survival and recovery in its 2010 finding that the greater sage-grouse was 'warranted, but precluded' for listing under the Endangered Species Act. It is obvious in Wyoming that livestock grazing is having a major impact on sage-grouse populations, because there are vast areas of the state where grouse populations have declined greatly from historic population levels in the absence of significant road, powerline, mining, and/or oil and gas development. For these parts of the state, livestock grazing is the only human-caused factor that has changed and continues to alter sage-grouse habitats away from their pristine pre-Settlement conditions.

Sage-grouse inhabit wide-open habitats with abundant avian predators, are clumsy fliers, and rely primarily on hiding and camouflage to escape their predators. In this context, maintaining adequate grass cover in sagebrush habitat provides critical hiding cover, without which land managers tilt the scales toward the predators. The increased predation that follows is a direct result of excessive grazing and inadequate livestock management, not the predators themselves. In addition, livestock grazing can lead to cheatgrass invasion and a cycle of frequent range fires that eliminate the sagebrush that sage-grouse need to survive (Reisner et al. 2013).

The best available science has established that at least 7 inches (18 cm) of residual stubble height needs to be provided in nesting and brood-rearing habitats throughout their season of use. According to Gregg et al. (1994: 165), "Land management practices that decrease tall grass and medium height shrub cover at potential nest sites may be detrimental to sage grouse populations because of increased nest predation… Grazing of tall grasses to <18 cm would decrease their value for nest concealment… Management activities should allow for maintenance of tall, residual grasses or, where necessary, restoration of grass cover within these stands." Hagen et al. (2007) analyzed all scientific datasets up to that time and concluded that the 7-inch threshold was the threshold below which significant impacts to sage-grouse occurred (*see also* Herman-Brunson et al. 2009). Prather (2010) found for Gunnison sage-grouse that occupied habitats averaged more than 7 inches of grass stubble height in Utah, while unoccupied habitats averaged less than the 7-inch threshold. According to Taylor et al. (2010:4),

> The effects of grazing management on sage-grouse have been little studied, but correlation between grass height and nest success suggest that grazing may be one of the few tools available to managers to enhance sage-grouse populations. Our analyses predict that already healthy populations may benefit from moderate changes in grazing practices. For instance, a 2 in increase in grass height could result in a 10% increase in nest success, which translates to an 8% increase in population growth rate.

The exception to this 7-inch rule is found in the mixed-grass prairies of the Dakotas, where sparser cover from sagebrush and greater potential for tall grass have led to a recognition that a 26-cm (10.6-inch) stubble height standard is warranted (Kaczor 2008, Kaczor et al. 2011). Foster et al. (2014) found that livestock grazing could be compatible with maintaining sage-grouse populations, but notably stubble heights they observed averaged more than 7 inches during all three years of their study, and averaged more than 10.2 inches in two of the three years of the study.

Scientific results from Wyoming are consistent with the need to maintain 7-inch grass height in sage-grouse habitats. Heath et al (1997) found that near Farson, Wyoming, nests with taller grass heights were more successful than those with shorter heights. Holloran et al. (2005) found that residual grass height and residual grass cover were the most important factors correlated with sage-grouse nest success in their central and southwestern Wyoming study area, with habitats with the tallest and densest grasses showing the greatest nest success. Doherty et al. (2014) found a similar relationship between grass height and nest success in northeast Wyoming and south-central Montana but did not prescribe a recommended grass height. While there are those who have attempted to cast doubt on the necessity of maintaining grass heights to provide sage-grouse hiding cover, based on timing differences in grass height measurements between failed nests and successful nests, these concerns have been scientifically refuted for Wyoming. The significance of the Doherty et al. (2014) study was explicitly tested by Smith et al. (2018), who confirmed that grass height continued to have a significant effect on nest success for this Wyoming study after correction factors were applied to the data.

Connelly et al. (2000) reviewed the science of that time and recommended an 18-cm (7-inch) residual stubble height standard. Stiver et al. (2015) also recommended 18-cm (7-inch) grass height for all breeding and nesting habitats, and explicitly stated that this and other established measures should not be altered unless scientific evidence definitively indicates that the 7-inch threshold is inappropriate. There is no such scientific evidence for Wyoming indicating that the 7-inch threshold is inappropriate, and therefore this 7-inch (18 cm) residual grass height standard should be added as a requirement in the Wyoming plan. In addition, Braun (2006) recommended a maximum 25% forage utilization standard for livestock (*and see* Holechek et al. 2010). Controlling forage utilization levels confers numerous benefits on sage grouse and their habitats, and we recommend applying a standard in the Wyoming plan that sets 25% forage utilization as the maximum for livestock grazing in Core Areas.

Barbed-wire fencing of the type commonly employed to control domestic livestock presents multiple impacts for sage-grouse. Fences used for livestock management pose a major threat to sage-grouse. Stevens et al. (2013) found that fence collisions are an important source of grouse mortality, and fences on flat areas near leks were a particularly high risk for causing sage-grouse fatalities. Christiansen (2009) documented 146 sage-grouse fence collisions and mortalities along a 4.7-mile length of barbed-wire fence in western Wyoming over a 2½-year period. Studies have found that marking fences only reduce sage-grouse collisions by as little as 57%, such that up to 43% of the collisions on unmarked fences continue to occur on marked fence sections (Van Lanen et al. 2017). The BLM's National Technical Team (2011) recommended that unused fences should be removed, and their rights-of-way withdrawn. Removal of this existing fencing would decrease potential raptor perching and subsequently the indirect impacts of raptors preying on grouse as and other prey species. The removal of fencing could also eliminate any direct mortality due to grouse colliding with problem fences.

In addition, stock watering reservoirs (as well as coalbed methane retention ponds) provide breeding habitat for mosquitoes that carry West Nile virus. West Nile has been implicated in major sage-grouse population declines in the Powder River Basin (Doherty 2007, Walker et al. 2007a, Walker and Naugle 2011), and presents an ongoing threat to sage-grouse (Taylor et al. 2012), which have demonstrated little to no ability to develop a natural immunity to this non-native disease (Walker et al. 2007b). Accordingly, new stock watering (or fluid mineral production) reservoirs should be prohibited in Core Areas, and existing manmade reservoirs should be breached and eliminated to the extent possible.

In sum, the Wyoming plan should strike the "*de minimis*" description of livestock grazing, recognize its potential for serious and widespread impacts to sage-grouse habitats, and add standards to maintain and improve sage-grouse habitats. These should include a 7-inch residual grass height standard for sage-grouse breeding, nesting, and brood-rearing habitats in the context of livestock grazing, a prohibition on new fence and reservoir construction, and guidance to reduce or eliminate existing fences and small manmade reservoirs inside sage-grouse habitats.

High-density grouse habitats gerrymandered out of Core Area designations should be protected

One of the foundational fictions of the Wyoming state sage-grouse plan is that Core Area boundaries were designated on the basis of science, and all areas of high grouse density and undeveloped habitat quality were protected in Core Areas. The reality is quite different. At the outset of the State's consensus-based Core Area mapping process, the original boundaries of Core Areas were drawn to exclude high-density sage-grouse habitats that extractive industries were interested in developing, particularly in the Powder River Basin, Atlantic Rim area, and upper Green River Valley (*see* Attachment 2). As a result, thousands of acres of undeveloped habitat were denied protection despite their vibrant sage-grouse populations and relatively undeveloped condition. Some of these (the Jonah Field is a great example) have been essentially destroyed for the purposes of sage-grouse habitat effectiveness. After the original round of politically-driven alterations of Core Area boundaries were finalized, further reductions occurred, eliminating thousands more acres of important sage-grouse habitats originally designated as Core Areas such as those granted for the DKRW coal-to-liquids project, Atlantic Rim coalbed methane project, Whirlwind LLC White Mountain wind farm, and Chokecherry-Sierra Madre wind farm (*see* Attachment 3), excluding lands that are within 5.3 miles of the highest-population leks that represent the smallest area encompassing 75% of the Wyoming sage-grouse population. The Wyoming plan should be improved by expanding Core Areas to encompass lands within the 75% breeding density as outlined in Doherty et al. (2010), which continue to have active sage-grouse leks associated with them.

Conclusions

The significant biological inadequacies of the Wyoming plan are not a matter of conjecture or guesswork; Copeland et al. (2013) modeled the population consequences of the Wyoming state plan, and found that if all of the State of Wyoming sage-grouse policy provisions (which include a 5% disturbance cap calculated using a Disturbance Density Calculation Tool) were implemented fully and to the letter (and thus far, they have not been), that a 9 to 15% decline in greater sage-grouse populations would still occur statewide, including a 6 to 9% decline within designated Core Areas (where the 5% disturbance cap would be applied).

Populations statewide continue to decline over the long term with the exception of slight increases in Jackson Hole and the Bighorn Basin (Edmunds et al. 2018), even in the absence of significant mineral development linked to a bust in coal and natural gas commodity prices during the last decade. The viability of the regional sage-grouse population in northeast Wyoming continues to be in doubt (*see* Attachment 5, and some scientists have characterized this population as being in the extinction vortex (*see* Garton et al. 2015, Attachment 6). According to BLM (2013: 2-14), "The Powder River population has a high (86 percent) probability of falling below 200 males by 2017, from stressors including West Nile virus and impacts of energy development (USFWS 2013)." This is a key linkage to sage-grouse populations in Montana and the Dakotas (*see* Row et al. 2018, Fig. 4). From a practical standpoint, it is in the mutual interest of the State of Wyoming, conservationists, and industry interests to recover Wyoming sage-grouse populations to the point where all populations are viable and secure from the threat of extinction. This recovery will not occur as long as a business-as-usual approach is pursued, and Core Area protections become symbolic if they only protect habitats where industry has no plans to develop, and have loopholes for significant human-caused impacts that occur within Core Areas.

We urge you to maintain and strengthen the Wyoming state sage-grouse plan, and to improve it by expanding Core Areas to encompass important habitats that were previously excluded to enable unencumbered industrial development, to strengthen protections to align with the best available science rather than collaboration-based compromises that do not provide for the basic biological needs of the sage-grouse, and to add provisions to address threats to sage-grouse and their habitats that have been omitted from previous iterations of the state sage-grouse Executive Orders. Several key studies are attached; if you have difficulties locating any of the referenced scientific studies, we can provide almost all of them upon request. Recovering the greater sage-grouse to healthy and abundant population levels is the solution that benefits all concerned parties.

Thank you for considering these recommendations,

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