Chapter 1: Grazing and Rangeland Management

~~*Introduction*~~

~~By grazing on plants that provide food and cover, livestock grazing may reduce the quality and quantity of habitats used by greater sage-grouse (*Centrocurecus urophasianus*; hereafter sage-grouse). Livestock may compete with sage-grouse for food, trample and alter sage-grouse habitats, and promote the spread of invasive weeds. Additionally, the mechanical and chemical treatment of sagebrush habitats to improve rangeland conditions for livestock reduced the quality of sagebrush habitats in the past. However, livestock grazing may also improve habitats by stimulating the regrowth of food plants, diversifying habitat structure, reducing invasive weeds, and reducing fire risk. Since 2010, stocking rates of livestock within sage-grouse habitats have remained stable. Although livestock grazing is the predominant land use across the range, livestock grazing impacts individual sage-grouse and does not likely impact populations across management zones (MZs).~~

Comment [Craig1]: I either need to work in native ungulates into this introduction, or move them to a separate chapter. I'm leaning to separate chapter.

~~*Threat description*~~

~~With the arrival European settlers, livestock grazing became widespread across the range of the greater sage-grouse.~~ Prior to the introduction of ~~Before European settlers introduced~~ domesticated livestock, sagebrush ecosystems were not heavily grazed by native herbivores ~~had not significantly grazed the sagebrush ecosystem~~ (Osborne 1953, p. 267; Mack and Thompson 1982, p. 768; Miller ~~*et al.*~~ 1994, pp. 111, 113; Plew and Sundell 2000, p. 132; Grayson 2006, p. 921~~). ~~). Between 1860 and the early 1900's ~~But as European settlements expanded across the western States between 1860 and the early 1900s,~~ unregulated numbers of cattle, sheep, and horses rapidly increased across the western states, ~~and~~ peaking~~ed~~ at the turn of the century (Oliphant 1968, p. vii; Young ~~*et al.*~~ 1976, pp. 194–195; Carpenter 1981, p. 106; Donahue 1999, p. 15; Knick~~ *et al.* 2011, p. 220). ~~Between 1870 and 1900, the number of cattle increased by approximately 378 percent and the number of sheep increased by approximately 423 percent (Donahue 1999, p. 15; Knick *et al.* 2011, p. 220).~~ During this period, excessive overgrazing by

Comment [Craig2]: [with an estimated 19.6 million cattle and 25 million sheep (BLM 2009a, p. 1).]

Comment [Craig3]: I would probably delete this historical stuff, but a similar paragraph is in both bi-state and 2010, so leaving for now.

domestic livestock, along with severe drought, significantly changed plant communities and soils across the sagebrush ecosystem (Knick ~~-~~*et al.* 2003, pp. 116, 616; Knick~~-~~ *et al.* 2011, p. 220). At low elevations the removal of forage, along with increased soil disturbance promoted the establishment of non-native grasses, which in turn was key in shortening mean fire intervals in the sagebrush ecosystem (Boyd et al. 2014, p. 62). Conversely, at higher elevations high livestock stocking rates reduced fine fuels resulting in a decreased fire frequency, resulting in the expansion of fire-sensitive native conifer populations into areas previously dominated by sagebrush/bunchgrass plant communities (Boyd et al. 2014, p. 62). Although the number of livestock and the intensity of livestock grazing has decreased since its historical peak in the early 1900s (Laycock *et al.* 1996, p. 3), the resulting ~~this period's lasting~~ impact on plants and soils remain ~~are now~~ commonplace in sagebrush ecosystems (Knick *et al.* 2003, p. 116; Knick *et al.* 2011, pp. 220, 221).

Livestock grazing is now the most widespread land use across the sagebrush ecosystem (Connelly *et al.* 2004, pp. 7–29; Knick~~-~~ *et al.* 2003, p. 616; Knick ~~-~~*et al.* 2011, p. 219; Boyd et al. 2014, p. 62). Throughout the range of the sage-grouse, there are XX are active grazing allotments occupying XX percent of suitable sage-grouse habitat. Many of these allotments are managed by the BLM and USFS, although grazing occurs on all land surface ownerships. ~~XX percent in active allotments.~~ Nearly all sagebrush habitats have been grazed at some point during the last 150 years (Knick ~~-~~*et al.* 2003, p. 616; Knick *et al.* 2011, p. 219). (Figure 1) IN PROGRESS - ~~Throughout the range of the greater sage-grouse, there are XXX grazing allotments.. Of these, XX are active allotments that occupy approximately XX percent of suitable sage-grouse habitat (XX). The BLM and USGS manage most of the grazed lands.~~

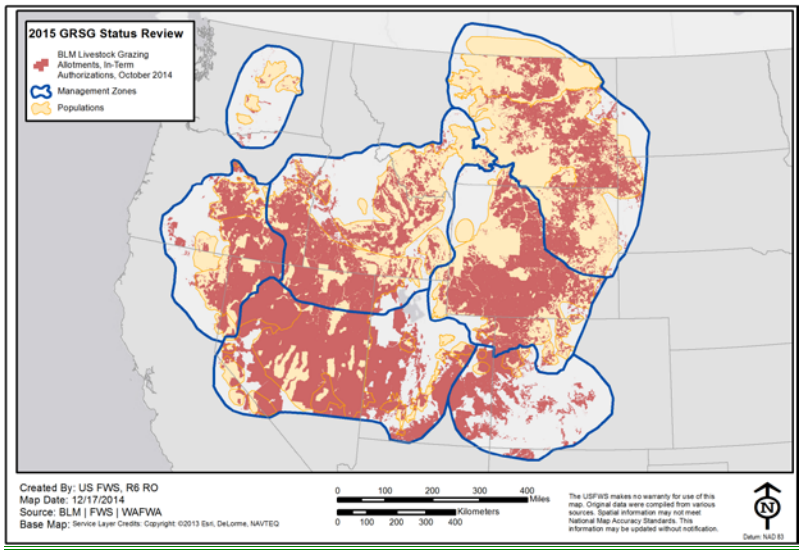
STATE/MZ TABLE. RHAs and AUMs.

Figure 1-. BLM Livestock Grazing Allotments, In-Term Authorizations as of October 2014

Comment [DP4]: Need to verify – not sure about DOD lands and all NPs. If this is not true, change the sentence to read "….usfs, although grazing occurs on most land surface ownerships throughout the species range."

Comment [Craig5]: Craig is calculating from the GIS and finalizing this data. I am putting a summary of magnitude here.

Comment [Craig6]: AUM Allotment and RHA data here. Craig is working on this.



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Impacts

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Grazing can alter sagebrush plant community dynamics, including shifts from a co-dominance of shrubs with an understory of perennial grasses to dominance of grasses, shrubs or invasive annual grasses (Boyd et al. 2014, p. 62). For example, sustained heavy grazing can increase sagebrush dominance and reduce the perennial grasses (Boyd et al. 2014, p. 623) will reduces the suitability of the area for sage-grouse through reduced cover and forage. Light to moderate livestock use can be compatible with maintaining perennial vegetation important for sage-grouse forage and cover (Miller et al., 2004, p. ?; Boyd et al. 2014, p. 63). Actual influence on the ecosystem depends on the intensity and timing of grazing (Aldridge et al. 2008, p. 990; Boyd et al. 2014, p. 63) as well as local climatic conditions and ecology (Crawford et al. 2004, p?; Boyd et al. 2014, p. 63), and generalizations across the range of sage-grouse are not possible.

Livestock grazing directly influences the composition, productivity and structure of herbaceous plans in sagebrush plant communities (Boyd et al. 2014, p. 64), which will influence the quality and

quantity of sage-grouse forage and vegetative cover~~In general, l~~Livestock ~~grazing can change the diversity of plants, reduce food available to sage-grouse, and reduce the protective cover of native shrubs and grasses in sage-grouse habitats (Fleischner 1994, pp. 633–635). Livestock may compete with sage-grouse for food, and may trample sage-grouse nests and food plants (Rasmussen and Griner 1938, p. 863; Patterson 1952, p. 111; Call and Maser 1985, p. 17; Vallentine 1990, p. 226; Holloran and Anderson 2003, p. 309; Coates 2007, p.28). Livestock grazing may also promote the establishment of invasive species, such as cheatgrass (*Bromus tectorum*) (Masters and Sheley 2001, p. 503), which degrades sagebrush habitats. Further, infrastructure associated with livestock grazing, such as watering structures and fencing, may concentrate disturbance, fragment habitats, kill sage-grouse during collisions, and create perches and access corridors for predators (Call and Maser 1985, p. 3; Connelly *et al.* 2000, p. 974; Connelly *et al.* 2004, pp. 1–2). However, grazing may also improve sage-grouse habitats by stimulating the regrowth of food and cover, creating openings, reducing invasive weeds and undesirable woody plants, and reducing fine fuels and the risk of fires (Klebenow 1981, p. 121; Evans 1986, p. 67; Riggs and Urness 1989, p. 358; Mosley 1996 as cited in Connelly *et al.* 2004, pp. 7–49; Merritt *et al.* 2001, p. 4; Olsen and Wallander 2001, p. 30; Stand *et al.* 2008, p. XX; Reisner *et al.* 2013, p. 10; Sheley *et al.* 2014, p. XX).

~~The intensity, duration, and distribution of livestock grazing likely influence the condition of the rangeland habitats more than the density of livestock (Aldridge *et al.* 2008, p. 990). However, relationships between livestock grazing and sage-grouse population levels are not well understood (Braun 1987, p. 137; Connelly and Braun 1997, p. 231). Over the last 150 years, livestock have grazed throughout nearly all sage-grouse habitats throughout the species range, confounding any evaluation of potential impacts, especially at the large landscape scales that are important to sage-grouse (Knick *et al.* 2011, p. 232). Although livestock grazing may impact individual sage-grouse, livestock does not likely impact sage-grouse populations. However, we discuss the potential impacts to sage-grouse from livestock grazing in more detail below.~~

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(Fleischner 1994, pp. 633–635). By reducing protective vegetative cover ~~and promoting the spread of invasive weeds,~~ livestock grazing may make nesting and brood-rearing habitats less suitable for sage-grouse. Sage-grouse rely on the cover of tall grasses and shrubs to hide from predators, especially during the nesting season, and hens will preferentially choose nesting sites based on the height of grasses and shrubs (Hagen- *et al.* 2007, p. 46). Grass height is a strong predictor of nest survival and hiding cover can increase nest success, a key vital rate for sage-grouse (Doherty et al. 2014, pp. 322-323). Loss of this cover may increase predation during nesting and brood-rearing, subsequently reducing ~~If livestock graze the grasses and shrubs below certain heights, females may not be able to avoid predators when nesting or brood-rearing, and~~ reproductive success rates ~~may decline~~ (Gregg *et al.* 1994, p. 165). Maintaining adequate residual grass height and cover under shrubs minimized the effect of grazing on sage-grouse productivity (Boyd et al. 2014, p. 64). Livestock grazing may also reduce cover and height of sagebrush in key wintering habitats (Rasmussen and Griner 1938, p. ?), potentially affecting sage-grouse condition and survival during this season. ~~Livestock grazing may also reduce water infiltration rates, reduce the cover of herbaceous plants and vegetative litter, compact soils, and increase soil erosion in mesic (wet), brood-rearing areas (Braun 1998, p. 147; Doblkin *et al.* 1998, p. 213). These changes may reduce the diversity of plants and promote invasive plants weeds, such as cheatgrass (Leopold 1949, p. 165; Billings 1951, p. 112; Mack and Thompson 1982, p. 761; Miller and Eddleman 2000, p. 19; Knick *et al.* 2011, p. 232; Reisner *et al.* 2013, p. 10). However, sage-grouse may also seek out and use openings in meadows created by cattle grazing (Klebenow 1981, p. 121).~~

~~Further, livestock grazing may help control invasives weeds and woody plants encroachment (Riggs and Urness 1989, p. 358; Mosley 1996 as cited in Connelly *et al.* 2004, pp. 7–49; Merritt *et al.* 2001, p. 4; Olsen and Wallander 2001, p. 30) and woody plant encroachment (Riggs and Urness 1989, p. 358) which may improve habitats, although removing the grazing may better prevent a cheatgrass invasion (Reisner *et al.* 2013, p. 10).~~

Comment [Craig7]: KEVIN's GRASS HEIGHT STUDY HERE? No correlation to livestock or grazing. ..

Comment [DP8]: added above in discussion on grass height.

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Comment [Craig9]: Needs paragraph conclusion.

Comment [DP10]: conclusionary paragraph added at end of section on domestic livestock

Livestock ~~and sage-grouse feed on the same food plants, including grasses, shrubs, and forbs (flowering plants other than grasses) (Vallentine 1990, pp. 240–241, 226; Pederson *et al.* 2003, p. 43), and sage-grouse may compete with livestock for food. Livestock~~ grazing reduces ~~can reduce the food plants~~ available food for sage-grouse ~~to the sage-grouse~~ (Braun 1987, p. 137; Vallentine 1990, pp. 240–241, 226; Dobkin 1995, p. 18; Connelly and Braun 1997, p. 231; Beck and Mitchell 2000, pp. 998–1,000; Pederson *et al.* 2003, p. 43). If food resources which ~~. For example, forbs~~ provide important nutrients to pre-laying hens, ~~and their availability may influence a~~ the hen's overall nutrition would be negatively impacted~~,~~ which in turn may influence nest initiation rates, clutch sizes, and reproductive success rates (Barnett and Crawford 1994, p.117; Coggins 1998, p. 30). ~~Livestock may feed on more forbs if they congregate in wet areas, and~~A ~~a~~ reduction in forbs can also reduce the survival of chicks (Aldridge and Brigham 2002, p. 441; Aldridge and Brigham 2003, p. 30). Livestock grazing may also reduce water infiltration rates, reduce the cover of herbaceous plants ~~and vegetative litter~~, compact soils, and increase soil erosion in mesic (wet), brood-rearing areas (Braun 1998, p. 147; Dobkin *et al.* 1998, p. 213), further impacting the ability of broods to obtain sufficient food resources. Alternatively~~However~~, some grazing can ~~also~~ improve forage conditions for sage-grouse by stimulating the regrowth of forbs (Evans 1986, p. 67). ~~Therefore, although livestock and sage-grouse feed on similar plants, there is no evidence that competition between sage-grouse and livestock impacts sage-grouse population levels.~~

As livestock graze, they may trample sage-grouse nests and food plants, and hens may abandon their nests if livestock approach too closely (Rasmussen and Griner 1938, p. 863; Patterson 1952, p. 111; Call and Maser 1985, p. 17; Holloran and Anderson 2003, p. 309; Coates 2007, p.28). Nearby livestock frequently force skittish ~~hens~~ females to flush from their nests (Coates 2008b, p. 462), inadvertently revealing the nest and its eggs to predators, such as ravens (Coates 2007, p.33). Livestock also may trample sagebrush seedlings, which could provide food and cover (Connelly~~-~~ *et al.* 2004, pp. 7–31). Trampling by livestock can also reduce or eliminate biological soil crusts, which may promote ~~a~~ cheatgrass invasion (Mack and Thompson 1982, p. 764; Young and Allen 1997, p. 531; Masters and

Comment [DMD11]: Does the citation refer to grasses? I am not aware of any diet studies that identified grasses as sage-grouse foods.

Comment [DP12]: Revision deletes the reference to grasses

Sheley 2001, p. 503; Reisner *et al*. 2013, p. 10; Chambers et al. 2014, p. 361). In addition to increasing wildfire risk (Chambers et al. 2014, p. 366, and references therein), ~~However, there is no evidence that trampling of nests, habitats, or soils by livestock impacts population levels of sage-grouse.~~ the establishment of invasive species, such as cheatgrass degrades sagebrush habitats by reducing plant diversity, understory cover and food resources. In some cases livestock grazing may help control invasives and woody plant encroachment (Riggs and Urness 1989, p. 358; Mosley 1996 as cited in Connelly *et al.* 2004, pp. 7–49; Merritt *et al.* 2001, p. 4; Olsen and Wallander 2001, p. 30) which may improve habitats and may have role in reducing wildfire risk (Boyd et al. 2014, p. 68). In some cases ~~However,~~ sage-grouse may also seek out and use openings in meadows created by cattle grazing (Klebenow 1981, p. 121).

Infrastructure associated with livestock grazing, such as watering structures and fencing, may concentrate disturbance, fragment habitats, kill sage-grouse during collisions, and create perches and access corridors for predators (Call and Maser 1985, p. 3; Connelly *et al.* 2000, p. 974; Connelly *et al.* 2004, pp. 1–2).

Water ~~D~~developments for~~that deliver water to~~ livestock, such as springs, tanks, and guzzlers, are common ~~on public lands~~ in sage-grouse habitats (Connelly~~-~~ *et al.* 2004, pp. 7–35), and influence the distribution of livestock and grazing intensity within a pasture (Boyd et al. 2014, p. 65). Congregation of ~~Domestic~~ livestock ~~may artificially congregate~~ around water developments ~~,~~ concentrates~~ing the~~ grazing and allows for~~ and~~ trampling of vegetation around these structures (Braun 1998, p. 147; Knick ~~-~~*et al.*, 2011, p. 230). While these areas may subsequently be unsuitable for sage-grouse, the strategic placement of livestock water developments ~~, which~~ could ~~also~~ protect other habitats by localizing and minimizing the area of impact. There have been documented incidences of sage-grouse drowning in stock tanks which can have substantial localized population level effects (Boyd et al. 2014, p. 65), but the range-wide impact is unknown. Water developments may also provide mesic vegetation on which sage-grouse forage.

This could provide an important resource in summer habitats (Boyd et al. 2014, p. 65) when the availability of succulent plants may be limited.

Diverting water from waterways for livestock can reduce riparian and wet meadow habitats for sage-grouse, which provide key brood-rearing habitats (Donnelly et al. in press). Water diversions may therefore reduce the availability of these habitats, and potentially brood condition and survival. Water developments could also breed mosquitos that spread the West Nile virus (WNv) which is fatal to sage-grouse (Boyd et al. 2014, p. 65; see Diseases chapter for more detail).

Comment [DP13]: This is the NRCS paper that is supposedly in press. If it is not (or at least not in time) we can reference Connelly et al. 2011 or Schroeder et al. 1999.

~~and w~~Water developments ~~could also breed mosquitos that spread the West Nile virus (WNv; see the Diseases section).~~ The placement of salt or mineral blocks for livestock can also influence livestock grazing distribution and use, but results of studies examining this factor are inconsistent. In arid areas, such as the range of sage-grouse, water developments have a far greater influence on livestock distribution than do salt or mineral blocks (Boyd et al. 2014, p. 65, and references therein).

~~However, there is no evidence that intensified grazing of livestock around water developments impacts sage-grouse populations.~~

~~IN PROGRESS~~ Thousands of miles of fences across the sage-grouse range are used to manage domestic livestock (Knick et al. 2011, pp. 224-225). ~~Another indirect negative impact to sage-grouse from livestock grazing occurs due to the placement of thousands of miles of fences for livestock management purposes (see the Infrastructure Fence section).~~ Fences cause direct mortality through collision and indirect mortality through the creation of avian predator perch sites, the potential creation of predator corridors along fences (particularly if a road is maintained next to the fence), incursion of ~~exotic species~~invasive plants along the fencing corridor, and habitat fragmentation (Call and Maser 1985, p. 22; Braun 1998, p. 145; Connelly *et al*. 2000a, p. 974; Beck *et al*. 2003, p. 211; Knick *et al*. 2003, p. 612; Connelly *et al*. 2004, pp. 1–2; see Fences chapter for more detail.).

Extensive rangeland treatment has been conducted to improve conditions for livestock in the sagebrush-steppe region (Connelly *et al*. 2004, p. 7- 28; Knick *et al*., in press, p.28). Sagebrush has been deliberately eliminated and then seeded with nonnative grasses (Connelly *et al.* 2004, p. 7–28), effectively reducing, and in some cases eliminating, sagebrush and many native grasses and forbs used by the sage-grouse for food and cover (Hull 1974, p. 217; Connelly *et al.* 2004, p. 4-4). Impacts of the planting of non-native monocultures for the benefit of livestock are relative to scale of the planting (Boyd et al. 2014, p. 67). By the 1970s, over 2 million ha (5million ac) of sagebrush are estimated to have been mechanically treated, sprayed with herbicide, or burned in an effort to remove sagebrush and increase herbaceous forage and grasses for livestock (Crawford *et al*. 2004, p. 12). The BLM treated over 1,800,000 ha (4,447,897 ac) from 1940 to 1994 (Miller and Eddleman 2000, p. 20). All sagebrush habitats used by sage-grouse have been treated in some way to reduce shrub cover since European settlement in western North America (Braun 1998, p. 146). Reduction in sage-grouse habitat quality and likely numbers in the 1970s were associated with extensive rangeland treatments to increase forage for domestic livestock (Crawford et al. 2004, p. 12). Negative impacts of range treatments for domestic livestock to breeding sage-grouse (Connelly *et al.* 2000a, p. 972), nesting success rates, brood carrying capacity (Klebenow 1970, p. 399) and winter cover and food (Pyrah 1972 and Higby 1969 as cited in Connelly et al 2000, p. 973) have been documented. Sagebrush height, and grass and forb communities rarely return to pre-treatment conditions or even to the extent they provide sage-grouse habitat, even years (up to 30) after initial treatment (Hess and Beck 2012, pp. 91-92; Boyd et al. 2014, p. 66). The type and extent sage-grouse response to range treatments depends on the extent to which forbs and sagebrush are killed.

Some range-land treatments can be beneficial for sage-grouse habitats. Small treatments interspersed with non-treated sagebrush habitats did not affect sage-grouse use, presumably due to minimal effects on food or cover (Braun 1998, p. 147). Application of herbicides to reduce sagebrush cover may enhance some brood-rearing habitats by increasing the coverage of herbaceous plant foods (Autenrieth 1981, p. 65; Boyd et al. 2014, p. 66 and references therein). Mechanical treatments, if

carefully designed and executed, can be beneficial to sage-grouse by improving herbaceous cover, forb production, and sagebrush re-sprouting (Braun 1998, p. 147), but this may only be true at higher elevations (Boyd et al. 2014, p. 66. ~~Historically, Federal land managers and private landowners mechanically and chemically treated sagebrush habitats to reduce shrub cover and improve forage conditions to benefit livestock throughout the sagebrush steppe ecosystem (Connelly *et al.* 2004, pp. 7-28; Knick *et al.* 2011, p. 220; Pyke 2011, p. 534). SsagebrushSagebrush was deliberately eliminated and then seeded with nonnative grasses (Connelly *et al.* 2004, p. 7-28), effectively reducing, and in some cases eliminating, many native grasses and forbs used by the sage-grouse for food and cover (Hull 1974, p. 217; Connelly *et al.* 2004, p. 4-4). Due to the widespread presence of livestock grazing across the sagebrush ecosystem, nearly all sage-grouse habitats were treated at some point to reduce shrub cover (Braun 1998, p. 146; Crawford *et al.* 2004, p. 12). Historically, tThese sagebrush removal treatments may have reduced the quality of habitats and population numbers of sage-grouse (Crawford *et al.* 2004, p. 12). Below, we describe potential impacts to sage-grouse and their habitat from two types of land conversion techniques used more frequently in the past to improve rangeland conditions for livestock:~~

~~Breeding populations of sage-grouse in a particular area may decline following the chemical control of sagebrush (Connelly *et al.* 2000a, p. 972). In addition to removing food plants and cover, chemical control can also force sage-grouse to flee avoid habitats and may reduce nesting success rates, brood carrying capacity, food available during the winter, and thermal cover (Klebenow 1970, p. 399; Connelly *et al.* 2000a, p. 973). However, chemical treatments to reduce sagebrush cover may increase food plants available to sage-grouse (Autenrieth 1981, p. 65), and s~~ Small chemical treatments may not impact sage-grouse if intact sagebrush remains nearby (Braun 1998, p. 147).

~~Mechanical treatments used to remove sagebrush, such as mowing, burning, plowing, grubbing, and bulldozing can reduce the quality and quantity of sage-grouse habitats and may impact some sage-grouse populations (Swenson *et al.* 1987, p. 128; Bruan 1998, p. 147; Connelly *et al.* 2000a, p. 973;~~

~~Connelly *et al.* 2004, pp. l7–47). Mechanical treatments were used more in the past than today (Braun 1998, p. 147). If carefully designed and implemented, mechanical treatments can benefit sage-grouse by improving cover, increasing growth of food plants, and re-sprouting sagebrush (Braun 1998, p. 147).~~ The success of restoring or rehabilitating overgrazed areas depends on the condition of the area relative to its site potential (Knick *et al.* 2011, p. 232). In areas with a balanced mix of shrubs and native understory vegetation, a change in grazing management can restore the habitat to its potential vigor (Pyke 2011, p. 538). Rest from grazing is known influence perennial grass response than other treatments (Wambolt and Payne 1986, p. 318), although prescribed grazing of non-native perennial grasses may help promote restoration of sagebrush (Boyd et al. 2014, p. 67). At least one author has suggested modifying grazing management, including removal of grazing in some areas, to allow for habitat restoration (Pyke 2011, p. 537). Active restoration is required where the native understory is reduced (Pyke 2011, p. 539). If an area has soil loss or invasives, returning the native plant community may be impossible (Daubenmire 1970, p. 82; Knick *et al.* 2011, p. 232; Pyke 2011, p. 539).

Livestock grazing on BLM lands is managed through limitations on number of animal unit months (AUM), and length and dates of grazing. Permitted AUMs represent potential maximum use based on land conditions and trend, whereas actual use will vary due to economics, non-use due to forage or drought conditions, and unreported trespass (Knick and Connelly 2011, p. 221). Land condition is a consideration in establishing grazing strategies for individual allotments and the BLM follows defined standards and guidelines for determining the health of individual allotments (Knick and Connelly 2011, p. 222). An important objective of the BLM in managing livestock grazing is to maintain residual cover of herbaceous vegetation to reduce predation during nesting and to maintain the integrity of riparian vegetation and other wetlands (BLM 2011, p. 14). Unfortunately, individual allotments are not assessed on a regular basis due to limitations in budget and staffing (cite), and therefore, permits can be renewed without a review of whether or not the allotment meets the necessary standards and guidelines. BLM must consider many factors when establishing allotment restrictions, and sage-grouse habitat is not

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always considered if the allotment falls outside of PHMA. Therefore, not all allotments on BLM lands are managed for sage-grouse conservation. NEED TO ADD INFORMATION ABOUT GRAZING ALLOTMENTS FROM THE NEW RMPS HERE- CONDITION STATS, AMOUNT IN AND OUT OF PHMA.

Comment [DP14]: This presumes that we have identified PHMA in the introduction section.

The relationships between livestock grazing and sage-grouse population levels are not well understood (Braun 1987, p. 137; Connelly and Braun 1997, p. 231), and there are no studies that directly test effects of livestock grazing on sage-grouse habitat (Boyd et al. 2014, p. 64). Impacts are often contextual relative to scale (i.e. localized severe impacts may not have larger population level impacts), and indirect impacts (e.g. increase in invasive plant species) are likely more problematic than direct impacts (e.g. nest trampling, food competition; Beck and Mitchell 2000, p. 997). Researchers have documented both positive and negative effects of livestock grazing on sage-grouse and their habitats (Beck and Mitchell 2000, p. 997; Davies et al. 2011; Pyke 2011, p. 537; Boyd et al. 2014; Chambers et al. 2014 pp. 369-370). Over the last 150 years, livestock have grazed nearly all sage-grouse habitats throughout the species range, confounding any evaluation of potential impacts, especially at the large landscape scales that are important to sage-grouse (Knick *et al*. 2011, p. 232). Poorly managed grazing will continue to degrade sagebrush habitats important to sage-grouse, but in many areas across the specie's range, well-managed grazing practices are compatible with sagebrush systems (Boyd et al. 2014, p. 60; Chambers et al. 2014, p. 369) and can improve habitat conditions for sage-grouse. None of the individual components discussed above (loss of cover, competition for food, etc.) have been demonstrated to have population level impacts to sage-grouse, although they have undoubtedly had localized effects. Range management treatments are the exception, where negative population responses have been recorded, although a range-wide impact has not been documented in the scientific literature. Given the inconclusive nature of the scientific literature we cannot determine an overall impact of domestic livestock grazing on sage-grouse persistence. However, maintaining grazing activities compatible with local conditions on large landscapes may be preferable to the loss of those landscapes

through habitat fragmentation via urbanization or other causes (Boyd et al. 2014, p. 67). We are also unable to determine if there is a change in the impact of grazing from our 2010 warranted determination.

~~The success of restoring or rehabilitating overgrazed areas depends on the condition of the area relative to its site potential (Knick *et al.* 2011, p. 232). In areas with a balanced mix of shrubs and native understory vegetation, a change in grazing management can restore the habitat to its potential vigor (Pyke 2011, p. 538). Rest from grazing is known to have a more substantial influence on perennial grass response than other treatments (Wambolt and Payne 1986, p. 318). Active restoration is required where the native understory is reduced (Pyke 2011, p. 539). If an area has soil loss or invasives species, returning the native plant community may be impossible (Daubenmire 1970, p. 82; Knick *et al.* 2011, p. 232; Pyke 2011, p. 539).~~

Grazing by Wild Ungulates

Wild, ~~Native herbivores~~native, ungulates (hoofed mammals), such as elk (*Cervus elaphus*), mule deer (*Odocoileus hemionus*), and pronghorn antelope (*Antilocapra americana*) share the sagebrush ecosystem with sage-grouse (Miller *et al.* 1994, p. 111) and feed on the same grasses, forbs, and shrubs (Kufeld 1973, p. 106–107; Kufeld *et al.* 1973 as cited in Wallmo and Regelin 1981, pp. 387–396 and 389–396; Allen *et al.* 1984, p. 1; Vallentine 1990, pp. 235, 236; Wambolt and Sherwood 1999, p. 225). ~~Like livestock near watering structures, c~~Concentrated grazing by native ungulates ~~(hoofed mammals) in localized areas~~ may reduce vegetation available to sage-grouse for food and cover. Elk and deer may concentrate and overgraze near small-scale, supplemental feeding and watering stations (Doman and Rasmussen 1944, p. 319; Smith 2001, pp. 179–181). Additionally, native ungulates may graze heavily on sagebrush during the winter, when food is scarce, and overgrazing can kill sagebrush and reduce shrub cover in specific areas (Wambolt 1996, p. 502; Wambolt and Hoffman 2004, p. 195). However, unlike domestic livestock, wild, native ungulates roam freely, spreading potential impacts diffusely across the

landscape or concentrating it in specific areas. Therefore, there is no evidence that grazing by ~~wild~~ native ungulates impacts sage-grouse population levels.

~~***Current impacts***~~

~~**Mechanism**~~

~~Livestock graze on the plants that sage-grouse depend on for food and cover and may reduce the quality and quantity of these resources that are available to sage-grouse. As they graze, livestock may also trample sage-grouse habitats and nests, may change soil properties to favor invasive weeds~~plants~~, and force hens ~~females~~ to flee ~~abandon~~ their nests. Water developments, fences, and land conversion to benefit livestock may further degrade sage-brush habitats and increase mortality from collisions. However, livestock grazing may also benefit sage-grouse by stimulating the growth of important food plants, creating openings in sagebrush habitats, reducing noxious weeds, and reducing the risk of wildfire.~~

Comment [DMD15]: Need to support this paragraph with citations.

Comment [Craig16]: Maybe this is too repetitive?

Comment [DP17]: I deleted for that reason – realizing I may have messed up the standard chapter format

~~Results of impact~~

~~By reducing food and cover, altering habitats, introducing noxious weeds~~invasive plants~~, and increasing disturbance and potential collisions, livestock grazing may impact individual sage-grouse by reducing foraging and breeding success rates. However, there is no evidence that livestock grazing impacts vital rates or population levels of sage-grouse.~~

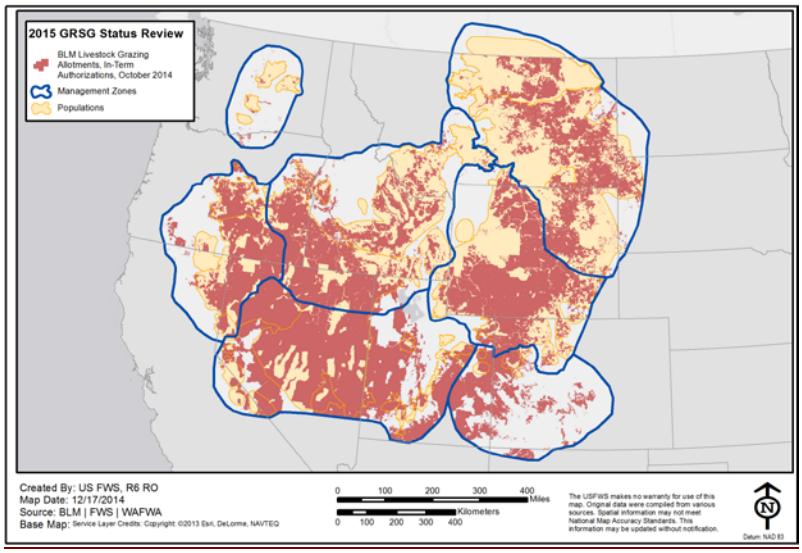
~~**Timing**~~

~~Impacts to sage-grouse from grazing by livestock and native ungulates may occur throughout the year.~~

~~**Table 14-1. List of impacts by management zone.**~~

Comment [DP18]: I deleted this table as I don't think we can to this assessment for livestock or wild ungulate grazing.

Management Zone	Timing of Impacts (Season)	Immediacy of Impacts	Severity of Impacts	Extent of Impacts	Resource or Life stage impacted	Notes
Example	Spring (or all the time, etc.)	Happening right now (or planned)	Direct mortality (or habitat destruction, etc.)	Impacting X% of occupied range by MZ pops (see Kevin's models)	Lekking adults, broods	This is an example…
1						
2						
3						
4						
5						
6						
7						



~~Figure 1_. BLM Livestock Grazing Allotments, In-Term Authorizations as of October 2014~~

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~~**Compounded effects**~~

~~The compounding effects will be discussed in greater detail in the Compounded Effects chapter. In brief, the following impacts are likely to interact with livestock grazing described in this chapter.~~

~~1) Noxious weeds;~~

~~2) Infrastructure to water and contain livestock (water developments and fences); and~~

~~3) Land conversion, such as mechanical and chemical treatments to reduce sagebrush cover to improve rangeland conditions for livestock.~~

Projected Future impacts

Timescale for Projecting this ~~Threat~~THREAT

Comment [DMD19]: Should be a brief paragraph indicating the time horizon for the threat; e.g., in the 2010 finding the foreseeable future for grazing was several decades.

~~asfasfd~~ We have not identified any information indicating that either domestic livestock or wild ungulate grazing on public or private lands will cease in the future. While the intensity and species grazed will likely be fluid on a local scale, we cannot predict how these changes will impact sage-grouse at the population level or higher, if at all. Therefore, the time-scale for projecting this threat is that it will occur indefinitely into the future based on current information.

~~**Likelihood of future impacts**~~

~~Impacts to individual sage-grouse will continue throughout the range. However, it unlikely that livestock grazing will impact populations or MZs within the foreseeable future.~~

~~**Anticipated changes from present (direct, indirect; same amount of range? Populations?)**~~

~~asfasf~~

~~Threat~~THREAT amelioration

Comment [Craig20]: Holding.

~~**Active Conservation**~~

Through the Conservation Efforts Database (CED), the Service collected information relating to conservation actions that were completed, in progress, or planned. Based on a summary report of that information created on XXXXXX, the following table indicate the number of actions and approximate areas for ~~threat~~THREAT amelioration. These numbers are self-reported; the Service will further review and certify these actions if they are pivotal to any determination.

In 2010, NRCS launched SGI to voluntarily reduce threats facing sage-grouse on private lands. To date, SGI has assisted private landowners enhance rangeland health inside PACs by enrolling 2,437, 645 acres in grazing systems, re-vegetating 48,120 acres former rangeland with sagebrush and native perennial bunchgrasses, controlling invasives on 15,509 acres, and restoring 179 acres of wet meadow (NRCS 2015, p. 6). Of the over two million acres enrolled in grazing systems, 76 percent are clustered within five populations (MZ I: Powder River Basin, Yellowstone Watershed, and the Dakotas; MZ II: Wyoming Basin; MZ IV:Snake/Salmon/Beaverhead) (NRCS 2015, p. 7). In addition over 74 percent of the newly seeded acres are concentrated in five populations (MZ I: Dakotas, Yellowstone Watershed; MZ II: Northwest Colorado; MZ IV: Northern Great Basin, Box Elder) (NRCS 2015, p. 7).

~~The Service addresses regulatory actions in a separate chapter????~~

Table 14-1: List of Conservation Efforts (ameliorating ~~threat~~THREAT described in this chapter) by management zone

Management Zone	Type of Conservation Effort	Sum of Acres or Miles	Number of Actions	Notes

Management Zone	Type of Conservation Effort	Sum of Acres or Miles	Number of Actions	Notes
1				
2				
3				
4				
5				
6				
7				

~~Threat~~THREAT Amelioration Summary

need to tie the summary back to the benefit of maintaining large landscapes, and good grazing = compatible.

~~asdfasdf~~

~~*Assessment of Potential Threat*~~

~~Although livestock grazing impact individual sage-grouse, it does not likely impact sage-grouse populations or MZs. These magnitude and intensity of impacts from livestock grazing will remain stable into the foreseeable future.~~

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Comment [DMD21]: Per conversations on 2/26/2015- this should now include the following pieces:
•Quote 2010 conclusion (e.g. "We find that the threat of disease is not significant to the point that the greater sage-grouse warrants listing at this time.")
•What are the impacts at various scales:
oIndividuals
oPopulations
oManagement Zone
o"Range"
•Regulatory mechanisms may be ameliorating these impacts including x, y z. See cumulative effects and/or regulatory mechanisms chapter for further explanation.
•Based on the new science, we conclude that THIS STRESSOR is affecting the species in X way.
Language
•Avoid the terms "threatened or threatening" as a verb or adverb and "threat" as noun; may consider using:
oImpact
oStressor
oNegatively affecting
oNegligible impact (on its own), but could have cumulative impacts

PLACEHOLDER FOR SYNERGISTIC THREATS – CHAMBERS ET AL. 2014 DESCRIBES HOW GRAZING INTERACTS WITH FIRE ALSO INVASIVES.

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