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DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS–R6–ES–2012–0108; 4500030114]

RIN 1018–AZ20

Endangered and Threatened Wildlife and Plants; Threatened Status for Gunnison Sage-grouse

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Final rule.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), determine threatened species status under the Endangered Species Act of 1973, as amended (Act), for the Gunnison sage-grouse (*Centrocercus minimus*), a bird species from southwestern Colorado and southeastern Utah. The effect of this regulation will be to add the Gunnison sage-grouse to the List of Endangered and Threatened Wildlife.

DATES: This rule is effective [INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

ADDRESSES: This final rule is available on the internet at *http://www.regulations.gov* and *http://www.fws.gov/mountain-prairie/species/birds/gunnisonsagegrouse*. Comments and materials we received, as well as supporting documentation we used in preparing this rule, are available for public inspection at *http://www.regulations.gov*. All of the comments, materials, and documentation that we considered in this rulemaking are available by appointment, during normal business hours at: U.S. Fish and Wildlife Service, Western Colorado Field Office, 445 West Gunnison Avenue, Suite 240, Grand Junction, CO 81501–5720; telephone 970–243–2778.

FOR FURTHER INFORMATION CONTACT: Susan Linner, Field Supervisor, U.S. Fish and Wildlife Service, Colorado Ecological Services Office, 134 Union Blvd., Suite 670, P.O. Box 25486 DFC, Denver, CO 80225; telephone 303–236–4774. Persons who use a telecommunications device for the deaf (TDD) may call the Federal Information Relay Service (FIRS) at 800–877–8339.

SUPPLEMENTARY INFORMATION:

Executive Summary

Why we need to publish a rule. Under the Endangered Species Act a species may warrant protection through listing if it is endangered or threatened as those terms are defined in the Act. Listing a species as an endangered or threatened species can only be completed by issuing a rule. In this case, we are required by a judicially approved settlement agreement to make a final determination regarding the Gunnison sage-grouse by no later than November 12, 2014. Elsewhere in today's **Federal Register** we finalize the designation of critical habitat for the species.

This rule will finalize the listing of the Gunnison sage-grouse (*Centrocercus minimus*) as a threatened species.

The basis for our action. Under the Endangered Species Act, we can determine that a species is an endangered or threatened species based on any of five factors: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) Overutilization for commercial, recreational, scientific, or educational purposes; (C) Disease or predation; (D) The inadequacy of existing regulatory mechanisms; or (E) Other natural or manmade factors affecting its continued existence.

As described in detail below, we have determined that the most substantial threats to Gunnison sage-grouse currently and in the future include habitat decline due to human disturbance (Factor A), small population size and structure (Factor E), drought (Factor E), climate change (Factor A), and disease (Factor C). Other threats that are impacting Gunnison sage-grouse to a lesser degree or in localized areas include grazing practices inconsistent with local ecological conditions, fences, invasive plants, fire, mineral development, piñon-juniper encroachment, large-scale water development (Factor A); predation (Factor C), primarily in association with anthropogenic disturbance and habitat decline due to human disturbance (Factor A); and recreation (Factor E). As described in Factor D below, some existing regulatory mechanisms are in place to conserve Gunnison sage-grouse, but individually or collectively they do not fully address the substantial threats faced by the species, particularly habitat decline, small population size and structure, drought, climate change, and disease. The threats listed above are also acting cumulatively, contributing to the challenges faced by Gunnison sage-grouse now and into the future.

Multiple partners, including private citizens, nongovernmental organizations, and Tribal, State, and Federal agencies, are engaged in conservation efforts across the range of Gunnison sage-grouse. Numerous conservation actions have been implemented or are planned for Gunnison sage-grouse, and these efforts have provided and will continue to provide conservation benefit to the species. The Candidate Conservation Agreement with Assurances for Gunnison sage-grouse (CCAA), Gunnison Basin Candidate Conservation Agreement (CCA), conservation plans, multi-county commitments, habitat improvement projects, and similar non-regulatory conservation actions that address habitat-related impacts and issues are described and evaluated under Factor A in this rule. Federal, State, and local laws and regulations, conservation easements, and other regulatory mechanisms are evaluated under Factor D. Scientific research activities are described under Factor B and throughout this rule where applicable. Also, conservation efforts are described and evaluated as appropriate under relevant threat sections throughout this rule.

Peer review and public comment. We sought comments on the proposed rule from independent and qualified specialists to ensure that our determination is based on scientifically sound data, assumptions, and analyses. We invited these peer reviewers to comment on our listing proposal. We also considered all comments and information received during each public comment period.

Previous Federal Actions

Please refer to the proposed listing rule for the Gunnison sage-grouse (78 FR 2486, January 11, 2013) for a detailed description of previous Federal actions concerning this species. Federal actions that have occurred since that publication are described below.

On January 11, 2013, we published a rule proposing to list the Gunnison sage-grouse as endangered throughout its range (78 FR 2486), and a proposed rule to designate 1.7 million acres of critical habitat for the species (78 FR 2540). We opened a public comment period until March 12, 2013, that was subsequently extended until April 2, 2013 (78 FR 15925, March 13, 2013).

On July 19, 2013, we announced that we were extending the final rule deadline by

6 months, from September 30, 2013, to March 31, 2014; and reopened the comment period until September 3, 2013 (78 FR 43123). This extension served to solicit additional scientific information due to scientific disagreement regarding the sufficiency and accuracy of the available data relevant to our listing determinations for Gunnison sage-grouse.

On September 19, 2013, we announced the availability of a draft economic analysis and draft environmental assessment for our proposal to designate critical habitat for Gunnison sage-grouse, and reopened the public comment period on those subjects and the proposed listing and critical habitat rules until October 19, 2013. We also announced two planned public informational sessions and public hearings for the proposed rules (78 FR 57604).

On November 4, 2013, we reopened the public comment period on the proposed rules until December 2, 2013, and announced the rescheduling of three public information sessions and public hearings that were postponed due to the lapse in government appropriations in October 2013 (78 FR 65936).

Public information sessions and public hearings were held in Gunnison, Colorado, on November 19, 2013; Montrose, Colorado, on November 20, 2013; and Monticello, Utah, on November 21, 2013.

In a press release on February 12, 2014, available on our webpage at *http://www.fws.gov/mountain-prairie/species/birds/gunnisonsagegrouse/*, we announced a 6-week extension, to May 12, 2014, for our final decision on our proposed listing and critical habitat rules. This extension was granted by the Court due to delays caused by the lapse in government appropriations in October 2013, and the resulting need to reopen a public comment period and reschedule public hearings.

In a press release on May 6, 2014, available on our webpage at *http://www.fws.gov/mountain-prairie/species/birds/gunnisonsagegrouse/*, we announced a 6-month extension, to November 12, 2014, for our final decision to list Gunnison sage-grouse under the Act. This extension was granted by the Court to provide the Service with additional time to complete a final listing determination for the Gunnison sage-grouse, and if listed, a final critical habitat designation. In the event the Service decided to list the species as threatened, the court order also allowed for the Service to publish a proposed rule under section 4(d) of the Act (which are only available for threatened species) and finalize it with the final listing determination on November 12, if appropriate. We decided not to propose and finalize a 4(d) rule for the Gunnison sage-grouse at this time, but continue to evaluate the potential for issuing a section 4(d) rule in the future to tailor the take prohibitions of the Act to those necessary and advisable to provide for the conservation of the Gunnison sage-grouse.

Elsewhere in today's **Federal Register**, we finalize the designation of critical habitat for the species.

Background

Gunnison sage-grouse and greater sage-grouse (a similar, closely related species) have similar life histories and habitat requirements (Young 1994, p. 44). In this final rule, we use scientific information specific to the Gunnison sage-grouse where available but apply scientific management principles and scientific information for greater sage-grouse that are relevant to Gunnison sage-grouse threats, conservation needs, and strategies—a practice followed by the wildlife and land management agencies that have responsibility for management of both species and their habitat. Throughout this rule, we use *sage-grouse* in reference to both Gunnison and greater sage-grouse whenever the scientific data and information is relevant to both species.

Species Information

A detailed summary of Gunnison sage-grouse taxonomy, the species description, historical distribution, habitat, and life-history characteristics can be found in the 12-month finding published September 28, 2010 (75 FR 59804). More recent scientific information relevant to the species and our evaluation of the species is included throughout this final rule.

Current Distribution and Population Estimates and Trends

Gunnison sage-grouse currently occur in seven populations in Colorado and Utah, occupying 3,795 square kilometers (km^2) (1,511 square miles [mi^2]) (Gunnison Sage-grouse Rangewide Steering Committee) [GSRSC] 2005, pp. 36–37; CDOW 2009a, p. 1). The seven populations are Gunnison Basin, San Miguel Basin, Monticello–Dove Creek, Piñon Mesa, Crawford, Cerro Summit–Cimarron–Sims Mesa, and Poncha Pass (Figure 1). A summary of land ownership and recent population estimates among these seven populations is presented in Table 1, and Figures 2 and 3, respectively. The following information and Figures 2 and 3 are based on lek count data (systematic counts of male sage-grouse attendance at traditional breeding sites) and associated population estimates from Colorado Parks and Wildlife (CPW) and the Utah Division of Wildlife Resources (UDWR) for the period 1996–2014 (CDOW 2010a, p. 2; CPW 2012a, pp.1–4; CPW 2013a, p. 1; CPW 2014d, p. 1).

Figure 1. Locations of Current Gunnison Sage-grouse Populations.

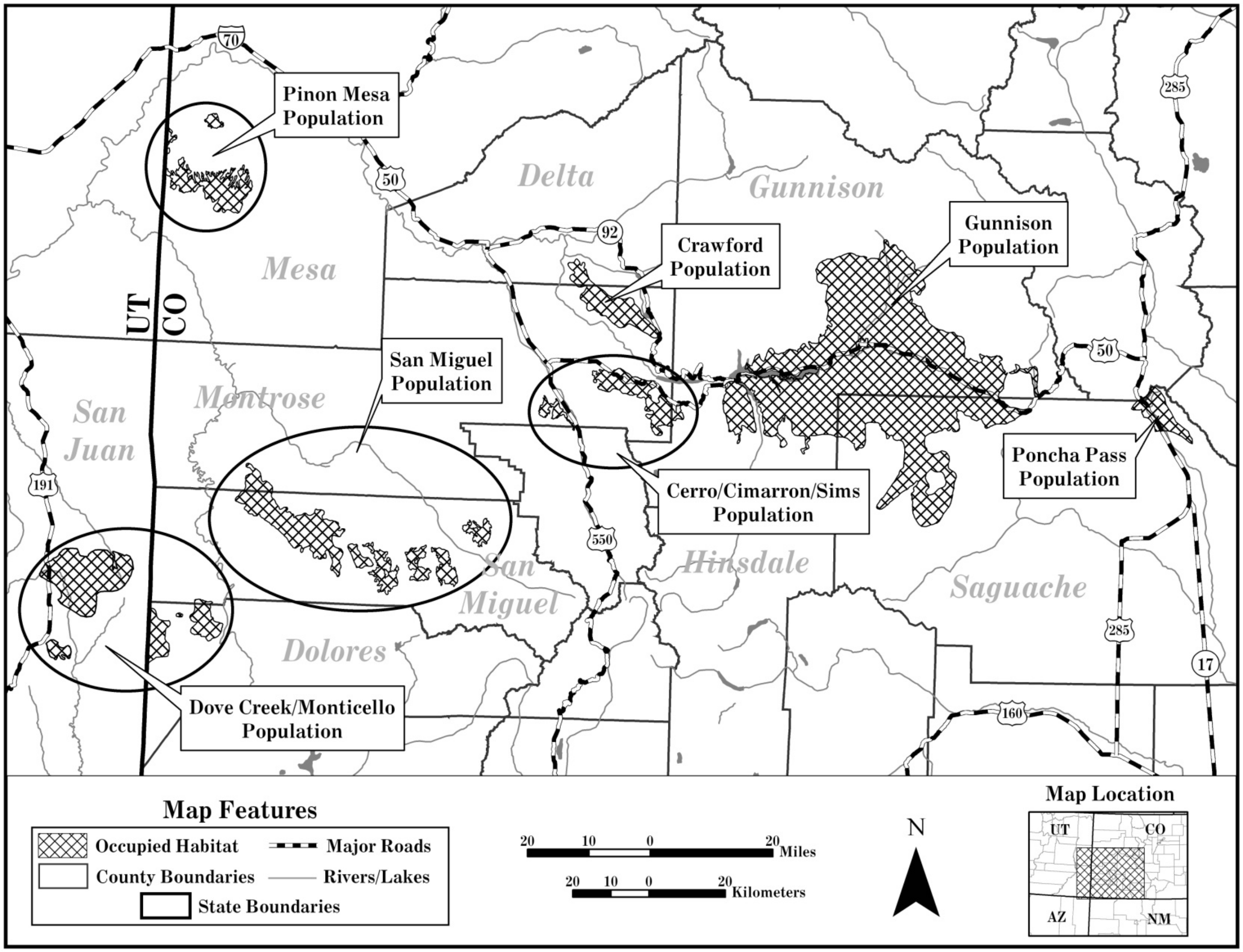


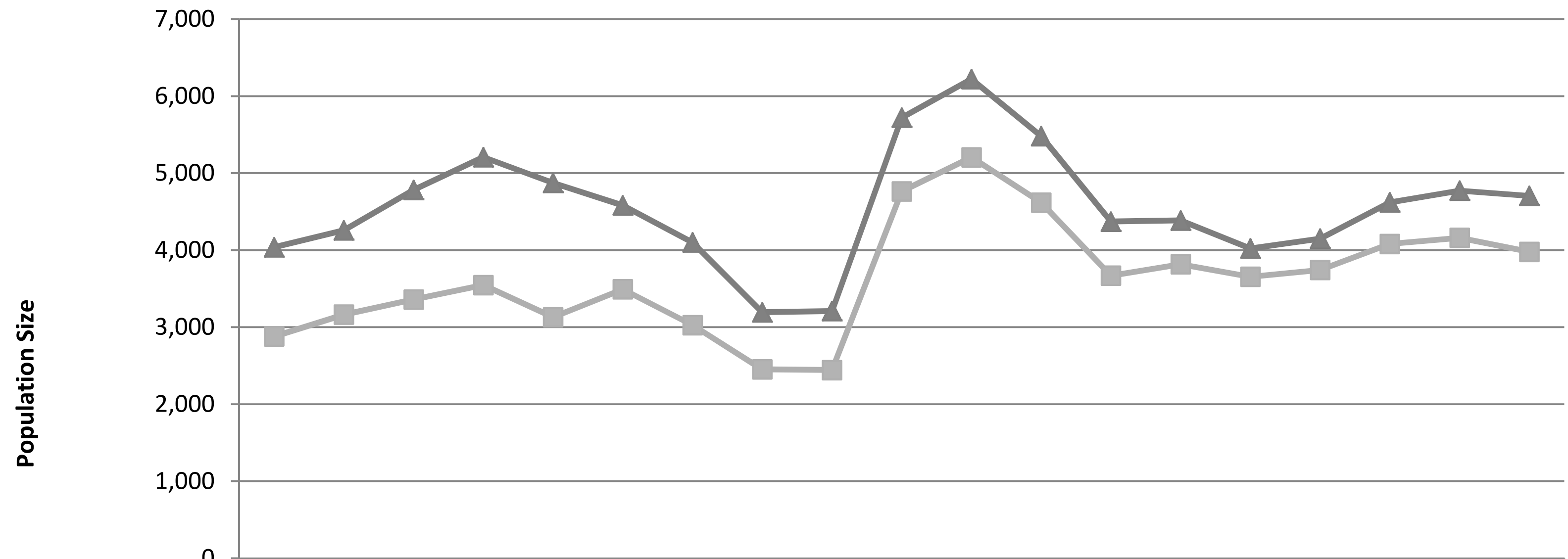
Table 1. Percent surface ownership of Gunnison sage-grouse occupied[a] habitat (GSRSC[b] 2005, pp. D-3–D-6; CDOW[c] 2009a, p. 1; CPW 2013e, spatial data).

			Gunnison Sage-grouse Occupied Habitat Management and Ownership						
			BLM[d]	NPS[e]	USFS[f]	CPW	CO SLB[g]	State of UT	Private
Population	hectares	acres	%	%	%	%	%	%	%
Gunnison Basin	239,641	592,168	51	2	14	2	<1	0	30[i]
San Miguel Basin	41,177	101,750	35[g]	0	1	11	3[g]	0	49[h]
Monticello–Dove Creek (Combined)	45,544	112,543	7	0	0	3	0	<1	90
Dove Creek	16,949	41,881	13	0	0	6	0	0	82
Monticello	28,595	70,661	5	0	0	0	0	1	94
Piñon Mesa	18,080	44,678	28	0	2	0	0	0	70
Cerro Summit–Cimarron–Sims Mesa	15,039	37,161	13	<1	0	11	0	0	76
Crawford	14,170	35,015	63	12	0	0	0	0	24
Poncha Pass	11,229	27,747	48	0	20	0	4	0	28
Rangewide	384,880	951,061	42	2	10	3	<1	<1	43

[a]Occupied Gunnison sage-grouse habitat is defined as areas of suitable habitat known to be used by Gunnison sage-grouse within the last 10 years from the date of mapping, and areas of suitable habitat contiguous with areas of known use, which have no barriers to grouse movement from known use areas (GSRSC 2005, p. 54; CPW 2013e, spatial data).
[b]Gunnison Sage-grouse Rangewide Steering Committee
[c]Colorado Parks and Wildlife
[d]Bureau of Land Management
[e]National Park Service
[f]United States Forest Service
[g]State Land Board
[h]Estimates reported in San Miguel Basin Gunnison Sage-grouse Conservation Plan (San Miguel Basin Gunnison Sage-grouse Working Group (SMBGSWG) 2009, p. 28) vary by 2 percent in these categories from those reported here. We consider these differences insignificant.

[i]Includes approximately 12,000 ac of land on Pinecrest Ranch, west of Gunnison, Colorado. This is restricted fee status land held in private ownership by the Ute Mountain Ute Tribe.

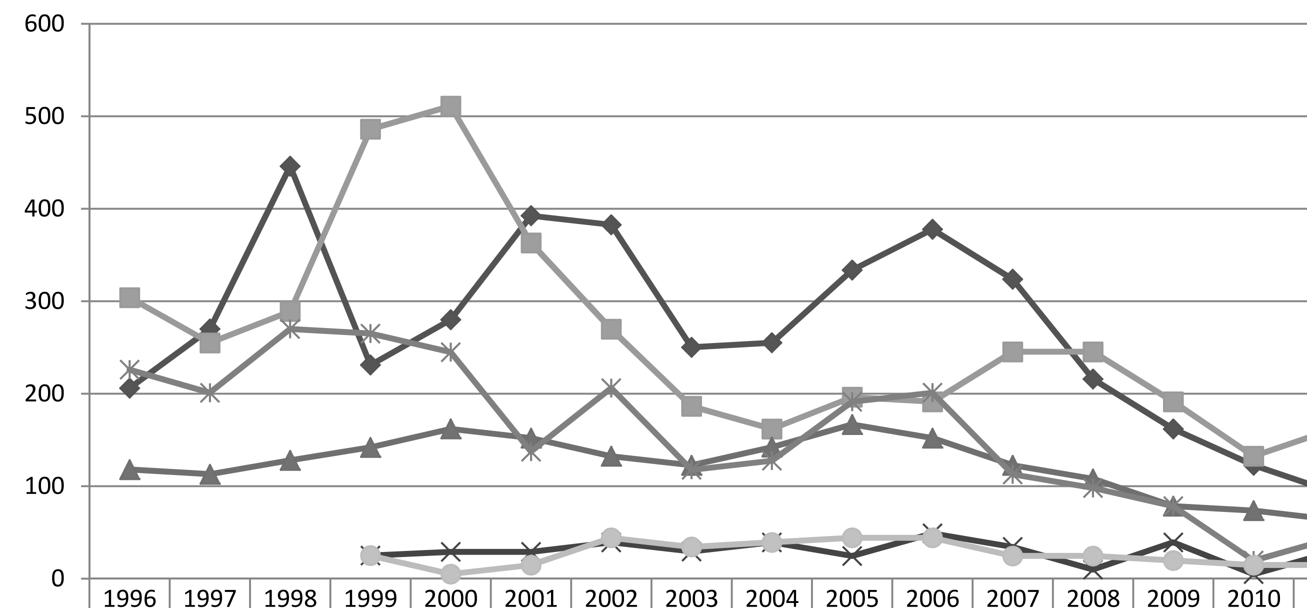
Figure 2. Population estimates by year for the Gunnison Basin population and the rangewide total Gunnison sage-grouse population derived from the formula presented in the Gunnison sage-grouse Rangewide Conservation Plan (GSRSC[a] 2005, pp. 44–45) applied to high male counts on leks (CDOW[b] 2012a, pp. 1–3; CPW 2013a, entire; CPW 2014d, p. 1).



	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Gunnison Basin	2,880	3,164	3,360	3,547	3,130	3,493	3,027	2,453	2,443	4,763	5,205	4,616	3,669	3,817	3,655	3,743	4,082	4,160	3978
Rangewide Totals	4,038	4,258	4,782	5,207	4,873	4,581	4,101	3,194	3,208	5,720	6,220	5,480	4,371	4,386	4,023	4,150	4,621	4,773	4705

[a]Gunnison Sage-grouse Rangewide Steering Committee
[b]Colorado Parks and Wildlife

Figure 3. Population estimates by year for the six satellite Gunnison sage-grouse populations derived from the formula presented in the Gunnison sage-grouse Rangewide Conservation Plan (GSRSC[a] 2005, pp. 44–45) applied to high male counts on leks (CPW[b] 2012a, pp. 1–3; CPW 2013a, entire; CPW 2014e, p. 6) (Note: lek counts did not occur between 1996 and 1998 for the Cerro Summit–Cimarron–Sims Mesa and Poncha Pass populations).



	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
San Miguel Basin	206	270	446	231	280	392	383	250	255	334	378	324	216	162	123
Monticello–Dove Creek (Combined)	304	255	289	486	511	363	270	186	162	196	191	245	245	191	132
Pinon Mesa	118	113	128	142	162	152	132	123	142	167	152	123	108	78	74
Cerro Summit–Cimarron–Sims Mesa				25	29	29	39	29	39	25	49	34	10	39	5
Crawford	226	201	270	265	245	137	206	118	128	191	201	113	98	78	20
Poncha Pass				25	5	15	44	34	39	44	44	25	25	20	15

[a]Gunnison Sage-grouse Rangewide Steering Committee
[b]Colorado Parks and Wildlife

Lek count data are the primary means of estimating and monitoring Gunnison sage-grouse populations. However, sage-grouse populations can fluctuate widely on an annual basis, and there are concerns about the statistical reliability of population estimates based on lek counts (CDOW 2009b, pp. 1–3). Stiver *et al.* (2008, p. 474) concluded that lek counts likely underestimate population size. Another study (Davis 2012, p. 136) indicated that, based on demographic data, lek count indices overestimate population size. Although lek count data are available from as early as the 1950s for some populations, lek count protocols were first standardized and implemented in 1996 (GSRSC 2005, p. 46). Prior to 1996, lek count data are highly variable and uncertain, and are not directly comparable to recent population data (Braun 1998, p. 3; Davis 2012, pp. 139, 143). Therefore, for the purposes of evaluating current population sizes and trends, the analysis in this rule is focused on lek count data from 1996 to 2014. We also consider other available scientific information such as demographic data and population viability analyses (see Factor E). Historical distribution and population information is discussed under Factor A below.

The Gunnison Basin is the largest population (approximately 3,978 birds) and, while showing variation over the period of record, including drought cycles and harsh winters, has been relatively stable, based on lek count estimates (but see further discussion below and in the Factor E analysis). The Gunnison Basin population is the primary influence on the rangewide population size of Gunnison sage-grouse (see Figure 2); thus, the significance of this population to the species' survival and persistence is evident. The Gunnison Basin population area includes approximately 239,600 ha (592,053 ac) of occupied habitat.

In contrast, the remaining six populations, or satellite populations, are much smaller than the Gunnison Basin. All satellite populations were generally in decline until 2010; however, increases in several populations have been observed recently (Figure 3) and could be a product of numerous factors including but not limited to population cycles, translocation efforts, and increased access to leks. San Miguel and Piñon Mesa are currently the largest of the satellite populations, with 206 and 182 birds, respectively, in 2014. The Monticello–Dove Creek populations currently have less than 100 birds combined (74 and 24, respectively). The current (2014) population estimates for the two smallest populations, Cerro Summit–Cimarron–Sims Mesa and Poncha Pass, are 74 and 16, respectively (CPW 2014d, p.1). A count of zero birds at Poncha Pass in 2013 suggests that extirpation of this population may have occurred, although 17 birds were translocated there later that fall, and ten more in spring of 2014, with 16 known to survive into summer 2014 (see Factor B, Scientific Research and Related Conservation Efforts). The satellite population areas are much smaller than the Gunnison Basin population area, all with less than 40,500 hectares (ha) (100,000 acres [ac]) of occupied habitat (Table 1) and, with the exception of the San Miguel population, fewer than 40 males counted on leks (CDOW 2009b, p. 5; CPW 2012a, p. 3; CPW 2013a, p. 1; CPW 2014d, p. 1).

Lek count-based population estimates suggest some satellite populations have increased slightly over the last several years. However, lek count data spanning the last

19 years (1996 to 2014) as a whole indicate that all the satellite populations were generally in decline until 2010 (Figure 3). Several of the satellite populations remain in decline and all remain at population size estimates that indicate concern for their viability, ranging from 206 to 10 birds (Figure 3). Furthermore, some of the recent increases in population sizes can be attributed to translocation and survey efforts, rather than an actual increase in the population. For example, the 2014 estimated population for Piñon Mesa was 182 birds (CPW 2014d, p. 1), much greater than the 2012 estimate of 54 birds. The population in Crawford increased from 20 birds in 2010 to 157 in 2014. These increases may be due in part to the translocation of 93 birds to the Piñon Mesa population between the spring of 2010 and spring of 2013 and 73 birds to Crawford over the same period. (CPW 2014c, entire), and two new leks found in 2012 on Piñon Mesa (CPW 2012a, pp. 2–3). The potential historical range of Gunnison sage-grouse is discussed briefly below by population, and loss of historical range is discussed under Factor A.

<u>Gunnison Basin Population</u>—The Gunnison Basin is an intermontane (located between mountain ranges) basin that includes parts of Gunnison and Saguache Counties, Colorado. The current Gunnison Basin population is distributed across approximately 239,640 ha (592,168 ac) (Table 1), surrounding the City of Gunnison. This population comprises approximately 84 percent of the rangewide population and 62 percent of occupied habitat for the species rangewide. Elevations in the area occupied by Gunnison sage-grouse range from 2,300 to 2,900 meters (m) (7,500 to 9,500 feet [ft]). Approximately 69 percent of the land area occupied by Gunnison sage-grouse in this

population is managed by Federal agencies (67 percent) and CPW (2 percent), and the remaining 30 percent is primarily private lands, including approximately 12,000 ac on Pinecrest Ranch owned by the Ute Mountain Ute Tribe under restricted fee status. Wyoming big sagebrush *(Artemisia tridentata* ssp. *wyomingensis)* and mountain big sagebrush *(A. t.* ssp. *vaseyana)* dominate the upland vegetation, with highly variable growth form depending on local site conditions.

In 1964, Gunnison County was one of five counties containing the majority of all sage-grouse in Colorado. This was likely the case before Euro-American settlement, around the turn of the century, as well (Rogers 1964, pp. 13, 20). The 2014 population estimate for the Gunnison Basin was 3,978 birds (CPW 2014d, p. 1). Population estimates from 1996 to 2014 meet or exceed the population target of 3,000 breeding birds (based on a 10-year average) for the Gunnison Basin, as set forth by the Gunnison Sage-grouse Rangewide Conservation Plan (RCP) (CPW 2013a, p. 10; GSRSC 2005, p. 270). Based on available habitat and other considerations, the RCP identified population targets as attainable population sizes sufficient to conserve Gunnison sage-grouse in each population (GSRSC 2005, p. 255). Approximately 45 percent of leks in the Gunnison Basin occur on private land; and 55 percent are on public land administered primarily by the BLM (GSRSC 2005, p. 75). Five physiographic zones or divisions are recognized in the Gunnison Basin population area for the purposes of monitoring and management actions (CSGWG 1997, pp. 6–7).

San Miguel Basin Population— The San Miguel Basin population estimate in 2014 was 206 individuals (CPW 2014d, p. 1). Population estimates from 1996 to 2014 are less than 50 percent of the population target of 450 Gunnison sage-grouse (based on a 10-year average) for the San Miguel Basin, as set forth by the RCP (CPW 2013a, p. 12; GSRSC 2005, p. 296). This population occurs in Montrose and San Miguel Counties in Colorado, and comprises six small subpopulations (Dry Creek Basin, Hamilton Mesa, Miramonte Reservoir, Gurley Reservoir, Beaver Mesa, and Iron Springs) occupying approximately 41,177 ha (101,750 ac). Gunnison sage-grouse use some of these areas year-round, while others are used seasonally. Gunnison sage-grouse in the San Miguel Basin move widely between the six subpopulation areas (Apa 2004, p. 29; Stiver and Gibson 2005, p. 12). The area encompassed by this population is thought to have once served as critical migration corridors between populations to the north (Piñon Mesa) and northeast (Cerro Summit–Cimarron–Sims Mesa) and to the west (Monticello–Dove Creek) (Oyler-McCance *et al.* 2005, pp. 635–636; SMBGSWG 2009, p. 9), but gene flow among these populations is currently very low (Oyler-McCance *et al.* 2005, p. 635). Historically, Gunnison sage-grouse occupied the majority of available big sagebrush (*Artemisia tridentata*) plant communities in San Miguel and Montrose Counties (Rogers 1964, pp. 22, 115).

Habitat conditions vary among the six subpopulation areas of the San Miguel Basin population areas. The following discussion addresses conditions among the subpopulations beginning in the west and moving east. The majority of occupied acres in the San Miguel Basin population (approximately 25,130 ha (62,100 ac) or 62 percent of the total population area) occur in the Dry Creek Basin subpopulation (SMBGSWG 2009, p. 28). However, the Dry Creek Basin contains some of the poorest quality habitat and the fewest individual Gunnison sage grouse numbers in the San Miguel population (SMBGSWG 2009, pp. 28, 36). Sagebrush habitat in the Dry Creek Basin area is patchily distributed. Where irrigation is possible, private lands in the southeastern portion of Dry Creek Basin are cultivated. Sagebrush habitat on private land has been heavily thinned or removed entirely (GSRSC 2005, p. 96). Elevations in the Hamilton Mesa subpopulation are approximately 610 m (2,000 ft.) higher than in the Dry Creek Basin, resulting in more mesic (moist) conditions. Agriculture is very limited on Hamilton Mesa, and the majority of the vegetation consists of oakbrush (*Quercus gambelii*) and sagebrush. Gunnison sage-grouse use the Hamilton Mesa area (1,940 ha (4,800 ac)) in the summer, but use of Hamilton Mesa during other seasons is unknown.

Gunnison sage-grouse occupy approximately 4,700 ha (11,600 ac) around Miramonte Reservoir (GSRSC 2005, p. 96). Sagebrush stands there are generally contiguous with a mixed-grass and forb understory. Occupied habitat at the Gurley Reservoir area (3,305 ha (7,500 ac)) is negatively affected by human development. Farming attempts in the Gurley Reservoir area in the early 20th century led to the removal of much of the sagebrush, although agricultural activities are now restricted primarily to the seasonally irrigated crops (hay meadows), and sagebrush has reestablished in most of the failed pastures. However, grazing pressure and competition from introduced grasses have limited overall sagebrush representation (GSRSC 2005, pp. 96–97). Sagebrush stands in the Iron Springs and Beaver Mesa areas (2,590 ha and 3,560 ha (6,400 ac and 8,800 ac respectively)) are contiguous with a mixed-grass understory. The Beaver Mesa area has numerous scattered patches of oakbrush.

Monticello–Dove Creek Population—This population includes two separate subpopulations of Gunnison sage-grouse, the Monticello and Dove Creek subpopulations. Genetic data suggest these two subpopulations could be considered one population (GSRSC 2005, p. 37), though we are unaware of any current connectivity between the two. The larger subpopulation is near the town of Monticello in San Juan County, Utah. Gunnison sage-grouse in this subpopulation inhabit a broad plateau on the northeastern side of the Abajo Mountains, with fragmented patches of sagebrush interspersed with large grass pastures and agricultural fields. In 1972, the estimated population size ranged from 583 to 1,050 individuals; by 2002, the population size had decreased, estimated at 178 to 308 individuals (UDWR 2011, p. 1). The 2013 and 2014 population estimates are 74 individuals (CPW 2013a, p. 1; CPW 2014d, p. 1)). Gunnison sage-grouse currently occupy an estimated 28,595 ha (70,661 ac) in the Monticello area (GSRSC 2005, p. 81).

The Dove Creek subpopulation is located primarily in western Dolores County, Colorado, north and west of Dove Creek, although a small portion of occupied habitat extends north into San Miguel County. The majority of sagebrush plant communities in Dolores and Montezuma Counties within Colorado were historically used by Gunnison sage-grouse (Rogers 1964, pp. 22, 112). Habitat north of Dove Creek is characterized as mountain shrub habitat, dominated by oakbrush interspersed with sagebrush. The area west of Dove Creek is dominated by sagebrush, but the habitat is highly fragmented by agricultural fields. Lek counts in the Dove Creek area were more than 50 males in 1999, suggesting a population of about 245 birds (C= High male count; C/0.53 +(C/0.53 X 1.6)), but declined to 2 males in 2009 (CDOW 2009b, p. 71), suggesting a population of 10 birds at that time. Low sagebrush canopy cover, as well as low grass height, exacerbated by drought, may have led to nest failure and subsequent population declines (Connelly *et al.* 2000a, p. 974; Apa 2004, p. 30). The 2014 population estimate was 24 individuals (CPW 2014d, p. 1).

Combined, the Monticello–Dove Creek estimated population size in 2014 was 98 individuals (CPW 2014d, p. 1). Most population estimates from 1996 to 2014 are well below the population target of 500 breeding birds (based on a 10-year average) for the Monticello–Dove Creek population, as set forth by the RCP (CPW 2013a, p. 12; GSRSC 2005, p. 278). Likewise, most population estimates from 1996 to the present time are well below the population target of 250 birds for each subpopulation alone (CPW 2013a, p. 12).

<u>Piñon Mesa Population</u>—The Piñon Mesa population occurs on the northwestern end of the Uncompahgre Plateau in Mesa County, about 35 km (22 mi) southwest of Grand Junction, Colorado. Gunnison sage-grouse likely occurred historically in all suitable sagebrush habitat in the Piñon Mesa area, including the Dominguez Canyon area of the Uncompaghre Plateau, southeast of Piñon Mesa proper (Rogers 1964, pp. 22, 114). Their current distribution is approximately 18,080 ha (44,678 ac) (GSRSC 2005, p. 87) which, based on a comparison of potential presettlement distribution, is approximately 6

percent of presettlement habitat on the northern portion of the Uncompahgre Plateau in Mesa County, Colorado, and Grand County, Utah. The 2014 estimated population was 182 birds (CPW 2014d, p. 1), much greater than the 2012 estimate of 54 birds. Over the last 4 years, CPW has translocated 93 sage-grouse to this area, which may have contributed to the increase observed over the past 2 to 4 years (CPW 2014c, entire), in addition to the discovery of two formerly unknown leks in 2012 (CPW 2012a, pp. 2–3). Population estimates from 1996 to 2014 are below the population target of 200 breeding birds (based on a 10-year average) for the Piñon Mesa population, as set forth by the RCP (CPW 2013a, p. 11; GSRSC 2005, p. 285). Of 12 known leks, only 4 were active in 2012 (CPW 2012a, pp. 2–3). The Piñon Mesa area may have other leks as well, but the high percentage of private land, a lack of roads, and heavy snow cover during spring make locating new leks difficult (CDOW 2009b, p. 109).

Crawford Population—The Crawford population of Gunnison sage-grouse includes approximately 14,170 ha (35,015 ac) of occupied habitat in Montrose County, Colorado, about 13 km (8 mi) southwest of the town of Crawford and north of the Gunnison River. Basin big sagebrush *(A. t.* ssp. *tridentata)* and black sagebrush *(A. nova)* dominate the mid-elevation uplands (GSRSC 2005, p. 62). The 2014 estimated population was 157 individuals (CPW 2014a, p. 1), much greater than the 2010 estimate of 20 birds, and 2011 estimate of 44 birds. This observed increase could be, in part, the product of the translocation of 72 birds to the Crawford population from 2011 to the spring of 2013 (CPW 2014c, entire), although natural increases or other reasons not understood could also be contributing. Furthermore, new lek count techniques for this population were implemented in 2012 (Gunnison County 2013a, p. 190), and increased survey efforts may be partly responsible for observed increases in high male counts and population estimates (Figure 3). Population estimates from 1996 to 2014 are well below the population target of 275 breeding birds (based on a 10-year average) for the Crawford population, as set forth by the RCP (CPW 2013a, p. 11; GSRSC 2005, p. 264). Three leks are currently active in the Crawford population (CPW 2012a, p. 1), all on BLM lands near an 11- km (7-mi) stretch of road. This area represents the largest contiguous sagebrush plant community within the occupied area of the Crawford population (GSRSC 2005, p. 64).

Cerro Summit–Cimarron–Sims Mesa Population—This population is divided into two geographically separate subpopulations, both in Montrose County, Colorado: the Cerro Summit–Cimarron and Sims Mesa subpopulations. It is unknown whether sage-grouse currently move between these subpopulations.

The Cerro Summit–Cimarron subpopulation is centered about 24 km (15 mi) east of the City of Montrose. Rogers (1964, p. 115) noted a small population of sage-grouse in the Cimarron River drainage, but did not report population numbers. The same publication also reported that four individual birds were observed during lek counts at Cerro Summit in 1959. Habitat in this subpopulation area includes 15,039 ha (37,161 ac) of patchy sagebrush habitat fragmented by oakbrush and irrigated pastures. Four leks are currently known in the Cerro Summit–Cimarron group, although only two have been active in recent years (GSRSC 2005, p. 257; CPW 2012a, entire).

The Sims Mesa area, about 11 km (7 mi) south of Montrose, consists of small patches of sagebrush fragmented by piñon-juniper, residential and recreational development, and agriculture (CDOW 2009b, p. 43). Rogers (1964, p. 95) recorded eight males from lek counts at Sims Mesa in 1960. In 2000, the CPW translocated six Gunnison sage-grouse from the Gunnison Basin to Sims Mesa (Nehring and Apa 2000, p. 12). There is only one currently known lek in the Sims Mesa and, since 2003, it has not been attended by Gunnison sage-grouse. However, lek counts on Sims Mesa did not occur in 2011. A lek is designated historic when it is inactive for at least 10 consecutive years, according to CPW standards. Therefore, the current status of the Sims Mesa lek is unknown (CDOW 2009b, p. 7; CPW 2012a, p. 1).

The Cerro Summit–Cimarron–Sims Mesa population estimate in 2014 was 74 individuals (CPW 2014a, p. 1), with all birds in the Cerro Summit–Cimarron areas. Population estimates from 1996 to 2014 are below the population target of 100 breeding birds (based on a 10-year average) for this population, as set forth by the RCP (CPW 2013a, p. 11; GSRSC 2005, p. 258).

Available information indicates that some birds translocated to the Crawford area between 2011 and 2013 went to the Cerro Summit-Cimarron area, then moved back to Crawford (Crawford Area Gunnison Sage-grouse Working Group 2014, p. 3). Translocated birds also returned to the Gunnison Basin permanently (Crawford Area Gunnison Sage-grouse Working Group 2014, p. 3). Genetic information (Oyler-

McCance *et al.* 2005, pp. 635–636; SMBGSWG 2009, p. 9) indicates that there was past gene flow between the Cerro Summit–Cimarron population and the San Miguel population. Therefore, we consider the Cerro Summit–Cimarron population to be an important linkage area, providing connectivity between the two largest populations, the Gunnison Basin and the San Miguel populations, as well as the Crawford population.

Poncha Pass Population—The Poncha Pass Gunnison sage-grouse population is located in Saguache County, approximately 16 km (10 mi) northwest of Villa Grove, Colorado. The known population distribution includes 11,229 ha (27,747 ac) of sagebrush habitat from the summit of Poncha Pass extending south for about 13 km (8 mi) on either side of U.S. Highway 285. Sagebrush in this area is generally intact with little fragmentation, and habitat quality throughout the area appears adequate to support a population of the species (Nehring and Apa 2000, p. 25). Despite this, the area has struggled to sustain a viable population. San Luis Creek runs through the area, providing a perennial water source and wet meadow riparian habitat for brood-rearing. Decker and Rock Creeks also provide water most of the year. However, water flows in the area have been much lower and less dependable in recent years due to drought conditions (Nehring 2013a, pers. comm.).

The Poncha Pass population was reintroduced in the 1970s in a portion of the San Luis Valley where Gunnison sage-grouse were thought to have been extirpated by the 1950s (Rogers 1964, pp. 22, 27, 116). Reestablishment of this population began with 30 birds translocated from the Gunnison Basin in 1971 and 1972 (GSRSC 2005, p. 94). In

1992, a CPW effort to simplify hunting restrictions inadvertently opened the Poncha Pass area to sage-grouse hunting, and at least 30 grouse were harvested from this population. Due to declining population numbers since the 1992 hunt, CPW translocated 24 additional birds from the Gunnison Basin in the spring of 2000 (Nehring and Apa 2000, p. 11). In 2001 and 2002, an additional 20 and 7 birds, respectively, were moved to Poncha Pass by the CPW (GSRSC 2005, p. 94).

Translocated females have bred successfully (Apa 2004, pers. comm.), and male display activity resumed on the historical lek in the spring of 2001. The only known lek is located on BLM-administered land (CDOW 2011a, p. 1; CPW 2012a, p. 3). A high male count of 3 males occurred in 2012, resulting in an estimated population size of 15 for the Poncha Pass population. In 2013, no birds were counted at leks or in surrounding habitat despite considerable survey efforts, suggesting a population estimate of zero birds. In the fall of 2013, CPW translocated 17 birds to the Poncha Pass population from the Gunnison Basin. As of January 2014, 10 of these birds were known to be surviving (Nehring 2014, pers. comm.). In 2014, CPW translocated 10 more birds to the area. Sixteen birds were known to survive into summer of 2014 (all translocated birds had telemetry transmitters). Poncha Pass current and past population estimates from 1996 to 2013 are well below the population target of 75 birds, as set forth by the RCP (CPW 2013a, p. 12; GSRSC 2005, p. 291). We note that given the history of this population, lack of unique genetics (all sage-grouse were introduced from the Gunnison Basin), and concerns about translocation success, we do not consider this population necessary to the recovery of the species.

Additional Special Status Information

The Gunnison sage-grouse has an International Union for Conservation of Nature (IUCN) Red List Category of "endangered" (Birdlife International 2009). NatureServe currently ranks the Gunnison sage-grouse as G1–Critically Imperiled (Nature Serve 2010, entire). The Gunnison sage-grouse is on the National Audubon Society's Watch List 2007 Red Category, which is "for species that are declining rapidly or have very small populations or limited ranges, and face major conservation threats." This information is provided here for background only; these assessments were not factored into our analysis or listing determination in this rule.

Summary of Changes from the Proposed Rule

Based upon our review of the public comments, comments from other Federal and State agencies, peer review comments, issues raised at the public hearing, and new relevant information that has become available since the publication of the proposal, we have reevaluated our proposed listing rule and made changes as appropriate. Other than minor clarifications and incorporation of additional information on the species' biology and populations, this determination differs from the proposal in the following ways:

(1) Based on our analyses of the potential threats to the species, we have determined that Gunnison sage-grouse does not meet the definition of an endangered species, contrary to our proposed rule published on January 11, 2013 (78 FR 2486).

(2) Based on our analyses, we have determined that the species meets the definition of a threatened species. Subsequently, pursuant to this final rule, the species will be added to the list of threatened species set forth in 50 CFR Part 17.

(3) We have expanded the discussion of Ongoing and Future Conservation Efforts, in Factor A below.

(4) We have found that the threat from current residential development in the Gunnison Basin is not as high as we previously concluded. See Factor A analysis and discussion.

Summary of Peer Review and Public Comments

In our January 11, 2013, proposed rules for Gunnison sage-grouse (proposed listing, 78 FR 2486; proposed critical habitat designation, 78 FR 2540), we requested written public comments on the proposal from all interested parties. At various times, public comment periods were extended or reopened (see Previous Federal Actions), with a final comment period on both proposals ending on December 2, 2013. We contacted appropriate State and Federal agencies, county governments, elected officials, scientific organizations, and other interested parties and invited them to comment. We also published notices inviting general public comment in local newspapers throughout the species' range.

Between January 11, 2013, and December 2, 2013, we received a total of 36,171 comment letters on the listing and critical habitat proposals. Of those letters, we determined that approximately 445 were substantive comment letters; 35,535 were substantive form letters; and 191 were non-substantive comment letters. Substantive letters generally contained comments pertinent to both proposed rules, although the vast majority of comments were related to the proposed listing rule. Responses to comments related to critical habitat are provided in the final rule to designate critical habitat for Gunnison sage-grouse, published elsewhere in today's **Federal Register**. Also, we held three public hearings between November 19 and 21, 2013, in response to requests from local and State agencies and governments; we received oral comments during that time (see Previous Federal Actions). All substantive information provided during all comment periods and hearings that pertains to the listing of the species has been incorporated directly into this final rule or addressed below. For the readers' convenience, we combined similar comments and responses.

Comments from Peer Reviewers

In accordance with our peer review policy published in the **Federal Register** on July 1, 1994 (59 FR 34270), we solicited expert opinion from five independent and qualified individuals with scientific expertise on Gunnison sage-grouse biology and conservation. The purpose of the peer review was to ensure that our decisions are based on scientifically sound data, assumptions, and analyses, based on the input of appropriate experts and specialists. We received written responses from all five peer reviewers. We reviewed all comments received from the peer reviewers for substantive issues and new information regarding the listing of the Gunnison sage-grouse. One peer reviewer concluded that our proposals included a thorough and accurate review of the available scientific and commercial data on Gunnison sage-grouse, but did not provide substantive comments. The remaining four letters provided additional relevant information on biology, threats, and scientific research for the species. Two peer review letters were opposed to the proposed listing and questioned our rationale and determinations. All substantive comments from peer reviewers are incorporated directly into this final rule or addressed in the summary of comments below.

(1) Comment: One peer reviewer noted that population growth models of greater sage-grouse (*C. urophasianus*) indicate adult annual survival is the most sensitive vital rate. However, in the proposed rule, we said that limitations in the quality and quantity of nesting and early brood-rearing habitats, in particular, are especially important because Gunnison sage-grouse population dynamics are most sensitive during these life-history stages (GSRSC 2005, p. G-15).

Our Response: Juvenile recruitment has been identified as the most important demographic factor influencing or limiting greater and Gunnison sage-grouse population growth rates and viability (Connelly *et al.* 2004, p. 3-11, GSRSC 2005, p. 173). In a recent demographic and population viability study of Gunnison sage-grouse (Davis 2012), juvenile survival was found to be the most influential vital rate in the Gunnison Basin population, a relatively stable population. However, adult survival was more influential in the San Miguel population, a smaller and steeply declining population where no juvenile recruitment occurred (Davis 2012, pp. 89, 93). Therefore, both juvenile survival and adult survival rates appear to be important to the species' viability. This topic is discussed further under Factor E in this final rule.

(2) Comment: One peer reviewer stated that the methods and rationale regarding the proposed rule's evaluation of residential development and estimated housing development in the Gunnison Basin are not clear for the following reasons: It was unclear how the potential spatial configuration of new housing units was estimated; thus calculations for habitat lost directly or indirectly are not transparent. The reviewer stated that the conclusion that the species should be listed as endangered relies heavily on the analysis of potential threats of additional anthropogenic infrastructure given increasing human populations. The peer reviewer commented that there are potential flaws in the estimated impacts of residential impact in the Gunnison Basin, which relied primarily on Aldridge *et al.* (2012, entire). The peer reviewer noted that to establish the scientific credibility of these conclusions, additional information is required describing the methodology and data used in the analysis as well as reporting the results; for example, citing the spatial data sources, specifically establishing the methods used to come to the level of potential impact (spatially and temporally), providing results specific to each analysis, and specifically establishing the assumptions made. The peer reviewer also stated that an analysis of residential development in the satellite populations is lacking.

Our Response: In Factor A of this final rule, we reevaluate the threat of residential development in the Gunnison Basin and in the six satellite populations, and explain the framework for our assessment. In that revised analysis, based on new information regarding the location and magnitude of past development patterns in Gunnison sage-grouse habitat in the Gunnison Basin, we avoid the use of spatial zones of influence to estimate or extrapolate potential impacts of current and future development, focusing instead on human population growth rates and available developable private lands in occupied habitat.

(3) Comment: A peer reviewer noted that the proposed rule analysis indicated that approximately 85 percent of occupied habitat in the Gunnison Basin has an increased likelihood of current or future road-related disturbance. This conclusion would suggest that the vast majority of sagebrush habitats in the Gunnison Basin are within 700 m of a road, an exceptionally dense road network—as a comparison, Knick *et al.* 2011 (chapter 12 in Studies in Avian Biology No. 38 page 215) estimated that 89 percent of sage-grouse habitats were within 2.5 km of a road in Western Association of Fish and Wildlife Agencies Management Zone 7 (Colorado Plateau), road densities less than those reported here. The reviewer suggested that we provide more specificity on how we analyzed roads. The reviewer noted that, given that this analysis is specific to the spatial scale of the potential spread of invasive weeds associated with roads in general, it may benefit the discussion to include the amount of habitat within 700 m of improved surface roads as well as all roads (assuming two-tracks are included as roads in this analysis).

Our Response: Our analysis included all road types (primary, secondary, etc.) in occupied habitat in the Gunnison Basin, hence the relatively high density of road networks. We did not differentiate by road type, as our primary intent was to estimate exposure of occupied habitat to road networks in general. We revised this final rule to clarify that the extent and severity of weed invasion would vary by road type. See further discussion under “Roads” in Factor A.

(4) Comment: One peer reviewer commented that the proposed rule discusses the short-lived benefits of fire in sage-grouse habitats, including a flush of understory vegetation and forbs. The peer reviewer noted that the proposed rule states that beneficial effects of fire were found by studies in mesic habitats and that, therefore, some benefits may be expected from fire in those habitat types (but this is contradictory to the previous statement). The reviewer stated that effects in Wyoming sagebrush, where most studies have taken place, may be different from those in mountain sagebrush types (such as in Gunnison sage-grouse range).

Our Response: As presented in this final rule, effects of fire in sagebrush habitat and to sage-grouse are highly variable. A clear positive response of Gunnison or greater sage-grouse to fire has not been demonstrated (Braun 1998, p. 9). The few studies that have suggested fire may be beneficial for greater sage-grouse were primarily conducted in mesic areas used for brood-rearing (Klebenow 1970, p. 399; Pyle and Crawford 1996, p. 323; Gates 1983, *in* Connelly *et al.* 2000c, p. 90; Sime 1991, *in* Connelly *et al.* 2000a, p. 972). In mesic habitat, small fires may maintain a suitable habitat mosaic by reducing shrub encroachment and encouraging understory, herbaceous growth. However, without available nearby sagebrush cover, the utility of these sites is questionable, especially within the six small Gunnison sage-grouse populations where fire could further degrade the remaining habitat. More recent research related to Gunnison sage-grouse indicated that due to the fragmented nature of remaining sagebrush habitat across the species' range, prescribed fire may be inappropriate if the goal is to improve sagebrush and overall habitat conditions for the species (Baker 2013, p. 8). This topic is discussed further under Factor A in this final rule.

(5) Comment: A peer reviewer recommended that our analysis include more discussion on the role of water developments in the proliferation of West Nile virus. The reviewer cited a study by Walker and Naugle (2011), arguing that West Nile outbreaks in small, isolated sage-grouse populations—similar to all except perhaps the Gunnison Basin population of Gunnison sage-grouse—may result in extirpation. Given the potential impact to populations from West Nile virus and the predicted spread of this disease associated with climate change, the reviewer stated that the effect of anthropogenic water sources that harbor mosquitoes should be analyzed.

Our Response: In this rule, we reevaluated West Nile virus as a threat to Gunnison sage-grouse and included several new citations. We did not conduct a landscape analysis on the precise quantity or distribution of water developments, but instead focused our analysis on the known distribution of West Nile virus across Gunnison sage-grouse range. In this final rule we find that, due to the known and potential presence and distribution of West Nile virus across the majority of Gunnison sage-grouse range, the high risk of mortality and population-level impacts based on the biology of the species, and the immediacy of those potential impacts, West Nile virus is a potential future threat to Gunnison sage-grouse throughout its range. The threat of West Nile virus is currently lower in the high-elevation areas, such as the Gunnison Basin and most of the Piñon Mesa populations, but we expect it to increase in the near term due to increased drought and the predicted effects of climate change. This topic is discussed in detail under Factor C of this rule.

(6) Comment: A peer reviewer stated that limited evidence is provided to establish predation as a substantial threat to Gunnison sage-grouse.

Our Response: We agree that research and data linking predation and Gunnison sage-grouse abundance and viability are limited. However, available scientific information (primarily for greater sage-grouse) presented in this rule indicates that, particularly in areas of intensive habitat alteration and fragmentation, and in smaller less resilient populations, sage-grouse productivity and, potentially, population persistence could be negatively affected by predation. Because the Gunnison and greater sage-grouse have similar behavior and life-history traits, it is reasonable to assume that predator impacts on Gunnison sage-grouse are similar to those observed in greater sage-grouse. The best available information indicates that predation is having an impact on Gunnison sage-grouse, particularly in the satellite populations, where there is some evidence that predation is affecting chick and juvenile survival, especially in smaller populations. Based on the greater sage-grouse data and the limited data available for Gunnison sage-grouse, we conclude that predation is a threat. While predation likely acts as a threat in localized areas across the range of the species, the stability of the Gunnison Basin population over the last 19 years indicates that predation is not having a significant impact on that population. We believe, however, that the effects of predation are more pronounced in the satellite populations. Given the stability of the Gunnison Basin population, we do not believe that the magnitude of this threat is significant at the rangewide level. This topic is discussed in detail in Factor C of the rule.

(7) Comment: A peer reviewer noted that the proposed rule's analysis on non-renewable energy development is lacking.

Our Response: This final rule includes a revised and expanded evaluation of mineral and energy development (Factor A).

(8) Comment: A peer reviewer stated that there are no data to support the conclusion that habitat conditions with respect to grazing are better on public lands than private lands, due in part to land health standards and more regulation.

Our Response: We agree and have revised our statement in the final rule to more accurately reflect that in our analysis of grazing under Factor A.

(9) Comment: A peer reviewer noted that the proposed rule states, with respect to fences, that "we anticipate that the effect on sage-grouse populations through the creation of new raptor perches and predator corridors into sagebrush habitats is similar to that of powerlines." The reviewer did not think this assumption was correct. The commenter noted that differences in height between a fence post and a utility pole would theoretically result in different spatial scales of functional habitat loss due to differences in the distance from the perch a predator could see while perched.

Our Response: The final rule has been revised to state that fence posts create perching places for raptors and corvids, which may increase their ability to prey on sage-grouse (Braun 1998, p. 145; Oyler-McCance *et al.* 2001, p. 330; Connelly *et al.* 2004, p. 13-12). This topic is discussed in detail in Factor A of this rule.

(10) Comment: A peer reviewer suggested that we review a recent article by Blomberg *et al*. 2012, related to climate change and invasive plants. This article suggests that characteristics of climate and landscape disturbance influence the dynamics of greater sage-grouse populations.

Our Response: We reviewed this article and cited it in Factor A (Invasive Plants) and Factor E (Drought and Extreme Weather) of this rule.

(11) Comment: A peer reviewer noted that the Utah population of Gunnison sage-grouse was at its highest in the 1970s and 1980s (San Juan County Working Group (SJCWG) 2000, Lupis 2005, Prather 2010). During this period, the peer reviewer stated, the primary agricultural crops in the county were winter wheat (*Triticum* spp.) and dryland alfalfa (*Medicago* spp.). Many growers did not use herbicides or insecticides at this time because of the slim profit margin in growing these crops. The peer reviewer suggested that these practices may have resulted in a greater arthropod abundance as a result of increased green vegetation and forb availability, providing more food resources for Gunnison sage-grouse. The reviewer also reported that during this period landowners frequently reported observing flocks of sage-grouse in their fields during harvest and post-harvest periods.

Our Response: While sage-grouse may forage on agricultural croplands (Commons 1997, pp. 28–35), when possible, they tend to avoid landscapes dominated by agriculture (Aldridge *et al.* 2008, p. 991). Influences resulting from agricultural activities extend into adjoining sagebrush, and include increased predation and reduced nest success due to predators associated with agriculture (Connelly *et al.* 2004, p. 7-23). Agricultural lands provide some benefits for sage-grouse as some crops such as alfalfa *(Medicago sativa),* winter wheat (*Triticum aestivum)*, and pinto bean sprouts *(Phaseolus* spp.) are eaten or used seasonally for cover by Gunnison sage-grouse (Braun 1998, pers. comm., Lupis *et al.* 2006, entire). Agricultural fields and their management may provide a surplus of arthropods and forbs for Gunnison sage-grouse, and for hens with broods, in particular. Despite these seasonal benefits, crop monocultures do not provide adequate year-round food or sagebrush cover (GSRSC 2005, pp. 22–30). This topic is discussed in Factor A of this rule (Conversion to Agriculture).

(12) Comment: One peer reviewer felt that the proposed rule neglected to discuss the importance of Conservation Reserve Program (CRP) lands in Utah to Gunnison sage-grouse.

Our Response: Lands within the occupied range of Gunnison sage-grouse enrolled into the CRP occur within Dolores and San Miguel counties in Colorado, and San Juan County in Utah (USDA FSA 2010, entire). A significant portion of the agricultural lands in the Monticello subpopulation are enrolled in the CRP program, and some CRP lands are sometimes used by Gunnison sage-grouse as early-brood-rearing and summer-late fall habitat when they are part of a landscape that otherwise encompasses the species' seasonal habitats (Lupis *et al.* 2006, pp. 959–960; Ward 2007, p. 15). We therefore acknowledge the benefits of CRP lands to Gunnison sage-grouse, as habitat provided under this program is generally more beneficial to the species than lands under more intensive agricultural uses such as crop production. However, CRP lands are generally lacking in the sagebrush and shrub components typically critical to the survival and reproduction of Gunnison sage-grouse and vary greatly in plant diversity and forb abundance (Lupis *et al.* 2006, pp. 959–960; Prather 2010, p. 32). As such, these CRP lands are generally of lower value or quality than native sagebrush habitats. This topic is discussed further in Factor A (Conversion to Agriculture).

(13) Comment: A peer reviewer noted that adult survival and nesting success in San Juan County was higher (Lupis 2005, Ward 2007) than that reported for other populations (Young 1994, Commons 1997, Apa 2004). The reviewer hypothesized that this difference may be due to the effort in San Juan County to reduce mammalian and corvid depredation (Lupis 2005, Ward 2007).

Our Response: While we acknowledge that predator control may be effective under certain circumstances, the cited studies did not evaluate the effect of predator control, nor was that their objective. They only speculated regarding the potential positive effects of predator control on the Monticello (San Juan County) population of Gunnison sage-grouse. This topic is discussed further in Factor C (Predation) of this rule.

(14) Comment: A peer reviewer reported that the Gunnison sage-grouse population in San Juan County may be stable or increasing based on increases in brood sizes and hatch success between 1974 and 2005 (UDWR 1974; Lupis 2005). This reviewer noted that this hypothesis was not supported by lek count indices, which indicated that the population was declining.

Our Response: Lek count data from 1996 through 2014 indicate a decline in the Monticello–Dove Creek population (located in the adjacent counties of San Juan, UT, and Dolores, CO, respectively) collectively and in both of these populations individually. Further, current population estimates are well below the Rangewide Conservation Plan (RCP) population target of 250 birds for each population alone (CPW 2013, p. 12). Sample size for the aforementioned study was limited to three nests, and predator control at the time may have contributed to relatively high nesting success (Lupis 2005, entire); the inference to be drawn from the study is, therefore, limited. The best available scientific information indicates that the Monticello–Dove Creek population is neither stable nor secure. This topic is discussed further in this rule in the Current Distribution and Population Estimates and Trends section below; and in Factor E (Small Population Size and Structure).

(15) Comment: A peer reviewer provided data and information from pertinent studies conducted in Utah and Colorado that the reviewer thought could improve our analysis.

Our Response: We reviewed the provided study information and literature and found that most had already been considered in our proposed rule. In this final rule, we included all new studies, data, and information relevant to our evaluation.

(16) Comment: A peer reviewer thought that the proposed rule was missing a description and summary of the two decades of conservation actions completed by local communities, landowners, public and private agencies, and organizations in Utah and Colorado to conserve the species. The reviewer indicated that stakeholders in both States dedicated significant resources to conservation of the species that have abated numerous threats. The peer reviewer recommended expanding discussion of the efforts of the local working groups, the State agencies, nongovernmental organizations, and counties, as well as Natural Resources Conservation Service (NRCS) programs, including the Sage-grouse Initiative Program.

Our Response: We recognize the contributions made by multiple partners including private citizens, nongovernmental organizations, and Tribal, State, and Federal agencies that are actively engaged in conservation efforts across the range of Gunnison sage-grouse. Numerous conservation actions have been implemented for Gunnison sage-grouse, and these efforts have provided and will continue to provide conservation benefit to the species. The CCAA, Gunnison

Basin CCA, conservation plans, habitat improvement projects, and similar conservation efforts that address habitat-related issues are described and evaluated under Factor A (see Conservation Programs and Efforts Related to Habitat Conservation) in this rule. Laws and regulations, conservation easements, and other regulatory mechanisms are evaluated under Factor D. Scientific research activities are described under Factor B and throughout this rule where applicable. Also, throughout this rule, conservation efforts are described under the relevant factor section.

(17) Comment: A peer reviewer stated that the proposed rule provides information regarding the estimated historical occupied Gunnison sage-grouse habitats, based largely on estimates of potential habitats. As such, these figures may overestimate the historical range of the species. The commenter noted that it is logical to assume that, if a species' habitat declines, so will the population. However, the peer reviewer could not find any data to support the idea that populations have declined over time.

Our Response: Our listing decision is based on the current status of Gunnison sage-grouse and the current and future threats to the species and its habitat. However, the loss of historical range and decline in abundance, and the associated causes, are informative in that they can be used to help forecast how populations and the species may respond to current and future threats.

The onset of Euro-American settlement in the 1800s resulted in significant alterations to sagebrush ecosystems throughout North America, primarily as a result of urbanization, agricultural conversion, and irrigation projects (West and Young 2000, pp. 263–265; Miller *et al.* 2011, p. 147). Areas in Colorado that supported basin big sagebrush were among the first sagebrush community types converted to agriculture because their typical soils and topography are well suited for agriculture (Rogers 1964, p. 13). Decreases in the abundance of sage-grouse paralleled the loss of range (Braun 1998, pp. 2–3), and a gradual but obvious decrease in sage-grouse distribution and numbers in Colorado had begun around 1910 (Rogers 1964, pp. 20–22).

The best available information indicates a reduction of Gunnison sage-grouse distribution since Euro-American settlement in the 1800s, with evidence of the loss of peripheral populations (Schroeder *et al.* 2004, p. 371, and references therein) and a northward and eastward trend of extirpation (Schroeder *et al.* 2004, p. 369, and references therein), meaning western and southern extents of the species' former range are now lost. Based on historical records, museum specimens, and potential sagebrush habitat distribution, the potential historical range of Gunnison sage-grouse was estimated to have been 21,376 square miles, or 13,680,590 ac (GSRSC 2005, pp. 32–35, as adapted from Schroeder *et al.* 2004, entire). This range included parts of central and southwestern Colorado, southeastern Utah, northwestern New Mexico, and northeastern Arizona (Schroeder *et al.* 2004, pp. 368, 370).

Braun *et al.* (2014, entire) provides more detail on historical distribution in

Colorado that largely matches Schroeder *et al.* (2004). Not all of this historical range would have been occupied at any one time. The species' estimated current range is 1,822 square miles, or 1,166,075 ac, in central and southwestern Colorado, and southeastern Utah (Figure 1) (GSRSC 2005, pp. 32–35, as adapted from Schroeder *et al.* 2004, entire). Based on these figures, the species' current range represents about 8.5 percent of its historical range (GSRSC 2005, p. 32). Similarly, Schroeder *et al.* (2004, p. 371) estimated the species' current overall range to be 10 percent of potential presettlement habitat (prior to European settlement in the 1800s). As estimated in our final rule to designate critical habitat for Gunnison sage-grouse (published elsewhere in today's **Federal Register**), the species' "overall range" includes an estimated 1,621,008 ac in southwestern Colorado and southeastern Utah, comprising 923,314 ac (57 percent) of occupied habitat and 697,694 ac (43 percent) of unoccupied habitat. Based on these figures, the current overall range of 1,621,008 acres represents approximately 12 percent of the potential historical range of 13,680,640 ac. The estimates above indicate that approximately 88 to 93 percent of the historical range of Gunnison sage-grouse has been lost. This topic is discussed further under our introduction to Factor A.

(18) Comment: A peer reviewer noted that Davis (2012) suggested Gunnison sage-grouse populations in the Gunnison Basin declined slightly over the last 16 years, but that Davis concluded the Gunnison Basin population, which may comprise 85–90 percent of the entire population, is relatively stable. Population projection models based on Davis' 6-year study suggested that the Gunnison sage-grouse population in the

> Gunnison Basin is declining. However, the peer reviewer noted that lek count data extended farther back in time than the demographic estimates and showed that this population exhibited a considerable increase, so the peer reviewer indicated that inference from this study is limited.

Our Response: Based on an integrated analysis of 16 years of lek count and demographic data (1996–2011), Davis found that the Gunnison Basin population may have been declining slightly through the period of study (Davis 2012, p. 137). That study indicated that the Gunnison Basin population may not be as stable as previously thought, although the time span of the study may not have been long enough to reveal a broader pattern in a larger cyclical time series(Davis 2012, p. 38). A more recent manuscript by Davis *et al*. (*in press*) states that the Gunnison Basin population (1996–2012) is "slightly declining" (line 24), and, while the growth rate of this population has been variable, it is "near stable" (line 341). Consider also that the Gunnison Basin population may not be as large as lek count-based estimates suggest, which are based solely on counting males (Davis 2012, p. 136). Davis (2012, pp. 134, 136) found that, in comparison to demographic data, lek count data showed population growth rates that varied wildly and should be interpreted with caution. This is particularly true for the lek data collected prior to 1996, before the lek survey methodology was standardized (Davis 2012, pp. 136-139). Demographic stochastic simulations resulted in a mean extinction time of 58 years for the Gunnison Basin population, without removing any birds for translocation efforts (removal of birds decreased the estimated mean extinction time) (Davis 2012, pp. 111, 137). Davis (2012, p. 92) noted, however, that if the study had been conducted just a few years earlier or later, a different trend across time could have resulted, because it was based on a 6-year period of time when the population was experiencing a slight decline. This study and other population viability analyses are evaluated in detail in Factor E (Small Population Size and Structure) of this rule.

(19) Comment: One peer reviewer thought that it is difficult to assess what future conditions hold, be it vegetation responses to climate change or the effects of population growth and development resulting in fragmentation and associated effects on the species of conservation concern. The reviewer thought it is also difficult to evaluate how a species such as Gunnison sage-grouse might respond to projected changes, even 5 or 10 years into the future, let alone 50–100 years. Despite these uncertainties, the peer reviewer considered the short- and long-term viability for six of the seven populations of Gunnison sage-grouse to be tenuous, at best.

Our Response: We agree with the reviewer that it is difficult to predict what will happen in the future. However, the Act requires us to determine if a species is endangered (in danger of extinction throughout all or a significant portion of its range) or threatened (likely to become and endangered species within the foreseeable future throughout all or a significant portion of its range). Thus, we are required to make assumptions or predictions into the future based on the best available information.

We agree with the reviewer that the viability of the six smaller ("satellite") populations is at risk (see Small Population Size and Structure below under Factor E).

(20) Comment: A peer reviewer noted that, while the Gunnison basin population appears to have stabilized more recently within a population cycle, the number of current and future threats makes one question whether this population will remain viable into the future. The reviewer thought existing threats, or levels of threats, appear to already threaten the Gunnison basin population. This reviewer questioned whether the remaining Gunnison basin population will persist, if other smaller populations disappear, which seems likely in the near future without considerable management efforts, given projected future threats. The reviewer also questioned whether the localized nature of a single remaining population in the Gunnison Basin is enough to prevent extirpation of the species, considering potential stochastic events and the likely continued and increasing effects of habitat degradation and fragmentation.

Our Response: Based on the best available information, we found that survival of the Gunnison Basin population alone would be insufficient to ensure the species' long-term persistence in the face of ongoing and future threats (see Factor E (Small Population Size and Structure)).

(21) Comment: One peer reviewer questioned whether the Service had access to the considerable amount of telemetry data collected by Colorado Parks and Wildlife (CPW) in recent years, primarily for birds located in the Gunnison Basin. This reviewer fully supported the use of existing information and models, in lieu of restricted access to other important data. The reviewer thought that the Service had done a realistic job of proceeding with existing information, whether it be from model applications to assist

with broader habitat identification across the Gunnison Basin (see Aldridge *et al.* 2012), or biological information and responses (i.e., effects of fences on sage-grouse mortality) based on studies conducted on the closely related greater sage-grouse.

Our Response: We do not have access to the telemetry data collected by CPW. This data has not been published. We do have some telemetry information provided in overview maps and the information was discussed in meetings.

As pointed out in the Species Information section, Gunnison sage-grouse and greater sage-grouse (a similar, closely related species) have similar life histories and habitat requirements (Young 1994, p. 44). In this final rule, we use scientific information specific to the Gunnison sage-grouse where available but also apply scientific management principles and scientific information for greater sage-grouse that are relevant to Gunnison sage-grouse conservation needs and strategies, a practice followed by the wildlife and land management agencies that have responsibility for management of both species and their habitat. We have considered the best available information in our assessment, including data and studies provided by CPW.

(22) Comment: A peer reviewer stated that the effects of powerlines are not all the same, depending on the type of the powerline. The peer reviewer requested that we clarify what types of powerlines we are referring to, and which were evaluated in each of the studies we address.

Our Response: As described in this rule, depending on the infrastructure design, size, location, and site-specific factors, powerlines can directly affect greater sage-grouse by posing a collision and electrocution hazard (Braun 1998, pp. 145–146; Connelly *et al.* 2000a, p. 974) and can have indirect effects by decreasing lek recruitment (Braun *et al.* 2002, p. 10, Walker *et al.* 2007a, p. 2,644), increasing predation (Connelly *et al.* 2004, p. 12-13, Howe *et al.* 2014), fragmenting habitat (Braun 1998, p. 146), and facilitating the invasion of exotic annual plants (Knick *et al.* 2003, p. 612; Connelly *et al.* 2004, p. 7-25). We also specify types of powerlines (transmission or distribution) and their effects on Gunnison sage-grouse as appropriate. This topic is discussed further in Factor A (Powerlines) of this rule.

(23) Comment: A peer reviewer commented that the proposed rule reads as though Wisdom *et al.* (2011) tested electromagnetic fields and found sage-grouse avoidance of them. The reviewer indicates that was not the case. Wisdom *et al.* (2011) found a correlation between sage-grouse extirpations and the presence of powerlines. The reviewer suggested this effect may be related to electromagnetic fields. The reviewer cautioned that we ensure here, and throughout, that this supposition is not presented as a finding.

Our Response: We revised our analysis to explicitly state that no studies have been conducted specifically on the effects of electromagnetic fields on sage-grouse. This topic is discussed further in Factor A (Powerlines) of this rule.

(24) Comment: A peer reviewer noted that Gregg *et al.* (2004) did not actually test grazing impacts on vegetation causing reduction in nest success. Rather, they found that lower heights of grass cover (below 18 cm) resulted in increased nest predation. The peer reviewer suggested that careful choice of wording may be necessary to accurately reflect what was evaluated and found by a study, versus what was inferred and speculated from the results of the study. The reviewer stated that our proposed rule suggested that Gregg *et al.* (2004) evaluated livestock reduction in grass heights and showed a direct link to reduced nesting success for sage-grouse, which was not the case.

Our Response: In this final rule, we clarified that, Gregg *et al.* (1994, p. 165) speculated that the reduction of grass heights due to livestock grazing in sage-grouse nesting and brood-rearing areas may negatively affect nesting success when cover is reduced below the 18 cm (7 in.) needed for predator avoidance. This topic is discussed further under Factor A (Domestic Grazing and Wild Ungulate Herbivory).

(25) Comment: A peer reviewer commented that one could argue that livestock grazing on private lands might be better managed than public lands, because individual landowners may be more cognizant of grazing practices on those lands.

Our Response: In this final rule, we state that livestock grazing allotments containing both Federal and private lands can often be managed by Federal agencies to meet land health standards through coordination and cooperation with grazing permittees (BLM 2013c, p. 1-2). However, we have no information on the extent of grazing, management, or habitat conditions on private lands in Gunnison sage-grouse range, and therefore cannot make a definitive assessment of these areas. Furthermore, although Federal land and livestock grazing may be more regulated, we cannot make any generalizations about how habitat conditions in those areas might compare with private lands where livestock grazing occurs. This topic is discussed further under Factor A (Domestic Grazing and Wild Ungulate Herbivory).

(26) Comment: A peer reviewer commented that the table displaying Land Health Standard data on Federal lands in Gunnison sage-grouse range is confusing.

Our Response: In this final rule, we restructured the table and included additional columns and figures to better show how numbers were calculated (see Table 8 in Factor A (Domestic Grazing and Wild Ungulate Herbivory)). The information in the table was also updated based on comments received from Federal agencies during the public comment periods for the proposed rules.

(27) Comment: One peer reviewer commented that mortality of handled Gunnison sage-grouse (ranging between zero and seven percent) could be significant. The peer reviewer would prefer to see a summary of the percentages by study and age class of birds handled and a sample size to indicate the potential overall population effect. The reviewer suggested that we link the summary to match with the cited number of research related mortalities being typically below three percent. The rule stated that “Mortality

from scientific research is low (two percent) and is not a threat." These all need appropriate citations, and the differences between these numbers should be reconciled.

Our Response: In this final rule, we describe why, overall, we expect that scientific research and related conservation efforts, such as translocation of Gunnison sage-grouse, have a net conservation benefit for the species. However, some unintended, but minor negative effects are known to occur in the process. This topic is addressed further in Factor B (Scientific Research and Related Conservation Efforts, see especially Table 11 summarizing various research efforts).

(28) Comment: A peer reviewer noted that in our table of conservation easements, we have cumulated the percentages based on the area in easements out of the total area (rangewide) considered, as opposed to taking the average of the percentages for each population.

Our Response: In this final rule we updated conservation easement information and acres, based on Lohr and Gray (2013, entire) (see Factor A (Other Regulatory Mechanisms: Conservation Easements)). Therein, we provide conservation easement acres by population and rangewide in occupied and unoccupied habitats. We feel this is a better representation of lands protected under conservation easement for Gunnison sage-grouse; averaging those values across populations would not accurately depict protected acres for the species.

(29) Comment: A peer reviewer expressed concern about what the reviewer perceived as the frequent use of speculation and commentaries as empirical evidence. The peer reviewer stated that we speculate about proposed threats (e.g., climate change) that we have no information on how they may, or may not, affect Gunnison sage-grouse. The reviewer stated that we also frequently use vague language (i.e., "may have", or "is likely to") and then make definitive statements about Gunnison sage-grouse in support for the proposed listing decision.

Our Response: As noted above, throughout this rule, we have carefully identified and qualified instances of speculation or hypotheses from past scientific studies and publications. Our identification of current and future threats to Gunnison sage-grouse is based on the best available scientific information, and we acknowledge where there is uncertainty associated with data or predictions. For instance, in this final rule, we discuss that climate change predictions are based on models with assumptions, and there are uncertainties regarding the magnitude of associated climate change parameters such as the amount and timing of precipitation and seasonal temperature changes.

There is also uncertainty as to the magnitude of effects of predicted climate parameters on sagebrush plant community dynamics. These factors make it difficult to predict whether, or to what extent, climate change will affect Gunnison sage-grouse. We recognize that climate change has the potential to alter Gunnison sage-grouse habitat by facilitating an increase in the distribution of cheatgrass and concurrently increasing the potential for wildfires, and reducing herbaceous vegetation and insect production in drought years, all of which would have negative effects on Gunnison sage-grouse.

This topic is discussed further in Factor A (Climate Change) of this rule, and in Factor E (Drought and Extreme Weather).

(30) Comment: A peer reviewer stated that we frequently make generalizations about the decline of Gunnison sage-grouse abundance, such as, "Fragmentation of sagebrush habitats are a primary cause of the decline of Gunnison and greater sage-grouse populations." However, the reviewer notes, lek counts in the Gunnison Basin population are currently at historic high levels and have increased substantially since the mid-1990s. The reviewer further notes that lek counts from 2005-2007 were the highest counts recorded in the Gunnison Basin population. Since 2007, lek counts in Gunnison Basin have averaged 703 males.

Our Response: Loss, degradation, and fragmentation of Gunnison sage-grouse habitat is discussed in Factor A of this rule. Population trends based on 1996-2014 lek count data show stable to slightly declining levels from 1996 through 2004, then the high levels mentioned from 2005-2007; followed by lower but stable levels since (see Figure 2). The 2008-2014 population level is higher than levels prior to 2005, but around 20 percent lower than the 2006 peak (CPW 2014e. p.2). Population trends are discussed further in the section, Current Distribution and Population Estimates and Trends; and Factor E (Small Population Size and Structure) of this rule. Also see our response to State

Comment 5 below.

(31) Comment: One peer reviewer stated that we had not presented a case that Gunnison sage-grouse are in danger of extirpation in the Gunnison Basin. It is the largest of all Gunnison sage-grouse populations, and three different population viability analyses have all concluded it is relatively stable.

Our Response: In our proposed rule to list Gunnison sage-grouse as endangered (78 FR 2486; January 11, 2013), we found that the species is in danger of extinction throughout its range, primarily due to habitat loss, degradation, and fragmentation associated with residential and human development across its range and, in particular, in the Gunnison Basin. In this final rule we determined that the species is not currently in danger of extinction throughout its range, but is likely to become so in the foreseeable future. As a result, this final rule lists the species as threatened rather than endangered. The basis for this decision is set out in the Determination section below. We also assess the three population viability analyses (PVA) for the Gunnison Basin and other populations in Factor E (Effective Population Size and Population Viability Analyses).

(32) Comment: A peer reviewer noted that we present the PVA from the Rangewide Conservation Plan. However, the reviewer noted that there are two other PVAs we need to address: Garton (2005) and Davis (2012).

Our Response: All three available PVAs for Gunnison sage-grouse are included in our assessment in this final rule (Factor E, Effective Population Size and Population Viability Analyses). Also see our response to peer review comment 31 above.

(33) Comment: A peer reviewer noted that in referring to the PVA in the Rangewide Conservation Plan, we state that small populations (< 50 birds) are "at a serious risk of extinction within the next 50 years (assuming some degree of consistency of environmental influences in sage-grouse demography)." (p. 2531). However, environmental and democratic stochasticity were incorporated into the model (i.e., the model does not assume "consistency of environmental influences").

Our Response: The RCP and actual PVA (see GSRSC 2005, pp. 170 and G-27) state that the estimates assumed some degree of consistency of environmental factors over time. This topic is discussed further in Factor E (Small Population Size and Structure).

(34) Comment: A peer reviewer commented that we misapply the terms habitat loss, fragmentation, and loss.

Our Response: In the scientific literature and community there are widely varying interpretations of habitat loss, degradation, and fragmentation processes, and various methods are applied to measure these processes. Therefore, in this final rule, we collectively refer to these processes as habitat decline, as prefaced in the

Factor A section below. However, we do not alter the terminology as applied by peer-reviewed or other studies. For instance, if a particular study evaluated and presented results on habitat *fragmentation*, we did not interpret the study or authors to mean habitat *loss*, instead. This topic is discussed further in our introduction to Factor A in this rule.

(35) Comment: A peer reviewer stated that we argue more than once that while individual human activities or features may not be a significant threat, it is the cumulative impact of all these features that threatens the Gunnison sage-grouse. However, the peer reviewer stated that this reasoning ignores the spatial (and temporal) variation in these potential threats. The reviewer is of the opinion that proposed threats are not uniformly distributed across space and therefore will not uniformly impact Gunnison sage-grouse populations. The reviewer stated that development will only impact a very small proportion of the habitat in Gunnison Basin and will be restricted to zoned areas. The reviewer stated that preliminary analyses indicate that Gunnison sage-grouse are flexible in their movement patterns and the habitats they use (CPW Demography and Movement project, in prep.). The reviewer stated that the cumulative negative impacts are not as likely as we seem to assume.

Our Response: The historic loss of habitat and current isolation of once connected populations, the declining status of several satellite populations, and presence of current and future threats to habitat all indicate that the cumulative loss or decline of habitat has negatively influenced populations and the species as a whole and is likely to continue to do so into the future. This topic is discussed further in our introduction to Factor A in this rule. Threats to Gunnison sage-grouse habitat are also discussed under Factor A in this rule. We agree that future residential development in occupied habitat in the Gunnison Basin is likely to be more limited than we presented in the proposed rule (see Factor A (Residential Development), but nonetheless find, for the reasons stated in Factor A, that this development remains a threat to the species and supports our determination that the species is likely to become in danger of extinction throughout its range in the foreseeable future.

> (36) Comment: A peer reviewer noted that, related to livestock grazing, Williams and Hild (2011) showed that vegetation conditions in the Gunnison Basin met, or exceeded, the habitat structural guidelines in the Rangewide Conservation Plan. The peer reviewer also stated that we misrepresented the objective of this study in our proposed rule, stating that it was not a grazing study and therefore our criticism is not valid. With 392 transects distributed across Gunnison Basin for this study, the reviewer did not understand our statement that "sampling is limited" (p. 2503).

Our Response: Because livestock grazing effects were not an objective of the Williams and Hild (2011) study, the extent of past or ongoing livestock grazing in these areas was not described, nor did the study compare un-grazed to grazed areas. The Williams and Hild study found that habitat conditions are likely favorable to Gunnison sage-grouse in a portion of the Gunnison Basin (Williams and Hild 2011, entire), although the relationship to livestock grazing effects in those areas is unknown. In this final rule, we clarify that there is limited ability to make inferences from this study for other areas in the Gunnison Basin, due to limitations of the study. Transect locations for the study were prioritized and selected in areas used by radio-collared Gunnison sage-grouse, potentially biasing study results. Therefore, the relationship between livestock grazing and habitat conditions is unclear in this study, and there is limited ability to infer from it conditions in other portions of the Gunnison Basin not prioritized for sampling. This topic is discussed further in Factor A (Domestic Grazing and Wildlife Herbivory) of this rule.

(37) Comment: A peer reviewer stated that our discussion of "presettlement" distribution of Gunnison sage-grouse was highly speculative. The peer reviewer also stated that we assume that Gunnison sage-grouse distribution closely matches the distribution of sagebrush, and that this assumption is used by some authors (e.g., Schroeder, *et al.* 2004, Wisdom *et al.* 2011), but is not necessarily true. The peer reviewer stated that the map by Schroeder *et al.* (2004) is not meant to be a definitive description that accurately defines historical distribution, but a generalization based on available information (i.e., the model includes areas that are not habitat and omits other areas that are habitat). The peer reviewer noted that we also state Gunnison sage-grouse distribution depends on large areas of contiguous sagebrush. The peer reviewer also noted that this assumption does not seem to be well supported since Gunnison sage-grouse have existed in small, isolated populations for decades (Rogers 1964).

Our Response: Related to potential historical range of Gunnison sage-grouse, and the estimated loss of historical range, see our response to Peer Reviewer Comment 17 above. Related to our position that the species depends on sagebrush on a landscape scale for its survival, the best available science supports this, and it is an empirical principle widely accepted by sage-grouse biologists and the scientific community. As discussed in this rule, Gunnison sage-grouse depend on sagebrush for their survival and persistence, and the historical and current distribution of the Gunnison sage-grouse closely matches that of sagebrush (Patterson 1952, p. 9; Braun 1987, p. 1; Schroeder *et al.* 2004, p. 364, and references therein). Habitat fragmentation resulting from human development patterns is especially detrimental to Gunnison sage-grouse because of their dependence on large expanses of sagebrush (Patterson 1952, p. 48; Connelly *et al.* 2004, p. 4-1; Connelly *et al.* 2011a, p. 72) and more contiguous sagebrush habitats (Rogers 1964, p. 19; Wisdom *et al.* 2011, pp. 452-453). The overall declining status of several of the satellite populations (despite translocation/ augmentation efforts) does not support the idea that the species is capable of persisting at low levels or in isolated conditions. Refer to Factor E in this rule for more discussion on this topic.

(38) Comment: A peer reviewer noted that we describe the genetic work by Oyler-McCance *et al.* (1999, 2005) that illustrates the lower genetic diversity of Gunnison sage-grouse compared to greater sage-grouse, and the lower genetic diversity of the small Gunnison sage-grouse populations compared to the Gunnison Basin population. The peer reviewer asserted that lower genetic diversity may have important consequences, but it is unlikely to have an effect anytime in the near future and that it must be demonstrated that low genetic diversity has negative consequences on individuals and populations.

The peer reviewer stated that it is inappropriate to suggest that there is a specific population size that is necessary for long-term population survival from a genetic perspective (i.e., that there should be 500-5,000 Gunnison sage-grouse in a population for it to be viable). The peer reviewer commented that the genetic viability of a population depends on the effective population size, the type of genetic variation in the population, and type of selection acting on the population. The peer reviewer noted it is possible that animals can rapidly adapt to inbreeding by the selective elimination of the genes responsible for inbreeding depression and although highly speculative, this may be operating in the small, isolated Gunnison sage-grouse populations. So, the peer reviewer suggested that to argue that inbreeding depression due to low genetic diversity is a basis for listing the species as endangered is not warranted without empirical data focused on this specific question.

Our Response: In this final rule, we have determined that listing the species as threatened, not endangered, is the appropriate determination. We describe the potential negative consequences of genetic deterioration associated with small population size and geographic isolation under Factor E (Genetic Risks)). We also discuss this topic and other relevant information further under Factor E (Small Population Size and Structure) in this rule.

Comments from States

(1) Comment: The Arizona Game and Fish Department noted that there are no records of Gunnison sage-grouse ever existing in Arizona, and estimates of historical range in northeastern Arizona are based on pre-settlement occurrence of sagebrush (*Artemisia* spp.), which has largely been extirpated. Consequently, no viable habitat remains for the Gunnison sage-grouse in Arizona. Any future restoration efforts should focus on the remaining core distributions in Colorado and Utah.

Our Response: Identification of potential pre-settlement Gunnison sage-grouse habitat in Arizona was based on both historical sagebrush distribution and a 1937 observation of sage-grouse in the northeastern corner of that state (Schroeder *et al.* 2004, pp. 368-369, and references therein). Restoration or reintroduction of Gunnison sage-grouse in Arizona is not being proposed.

(2) Comment: The Colorado Office of the Governor noted that letters had been sent from Colorado Parks and Wildlife (CPW) and Colorado Department of Agriculture (CDA), and recommended that the Gunnison sage-grouse should be determined not warranted for listing.

Our Response: The Colorado Office of the Governor referenced CPW and CDA letters in support of a not warranted determination for Gunnison sage-grouse, but provided no other information or data to support their position. We acknowledge receipt of letters from CPW and CDA. Their comments will be addressed in further detail in this section. Our listing determination for the Gunnison sage-grouse is explained in this final rule.

(3) Comment: CPW recommended the following hierarchy in the evaluation of biology and threats.

a. Use of only Gunnison sage-grouse data when it exists.

b. If Gunnison sage-grouse data does not exist, use greater sage-grouse data closest to Gunnison sage-grouse range in Colorado or Utah.

c. If greater sage-grouse data from adjacent populations does not exist, then proceed with the appropriate cautions and limited inference to available information within the range of greater sage-grouse.

Another State commenter suggested that references to greater sage-grouse be omitted altogether.

Our Response: We generally used the above approach recommended by CPW, although we did not distinguish between greater sage-grouse data from populations closest to Gunnison sage-grouse's range. We did not explicitly state that in the proposed rule—we stated that the "best available scientific and commercial data" were used. We also noted that we used information specific to the Gunnison sage-grouse where available but still applied scientific management principles for greater sage-grouse that we determined were relevant to Gunnison sage-grouse management needs and strategies. We followed the same approach in this final rule.

(4) Comment: CPW and CDA stated that lek counts in the San Miguel, Crawford, and Cerro Summit-Cimarron-Sims Mesa populations have increased in recent years, in contrast to the statement in the listing proposal that population trends over the last 12 years indicate that six of the populations are in decline.

Our Response: We used the same CPW lek survey data that these comments refer to in our assessment of population trends from 2001 through 2012. Our conclusion was that the six smaller populations had stable to declining numbers from the first half of the survey period (2001–2006) to the second half of the survey period (2007–2012). We agree that the three previously mentioned populations have increased in the past 2–3 years, along with Piñon Mesa, as indicated in Figure 3 in the proposed listing rule (78 FR 2492, January 11, 2013). However, these populations are not at higher levels than in 2001–2006. It should also be noted that these declining trends in the smaller populations have occurred despite translocation efforts (see Scientific Research and Related Conservation Efforts). Without these translocations, bird numbers likely would be lower for these populations. Furthermore, in this final listing rule, we analyzed population estimates over a longer period, based on lek count data from 1996–2014 (lek count protocols were standardized in 1996 by CPW). Similar to our previous analysis, the long-term data indicate that, despite slight increases in the past several years, the satellite populations have declined overall, with the possible exception of the Cerro Summit-Cimarron-Sims Mesa population, which appears to be stable or increasing, and Piñon Mesa, with its highest count since standardized lek counts began in 1996. This topic is discussed further in the

Current Distribution and Population Estimates and Trends section of this rule.

(5) Comment: CPW stated that the listing proposal does not acknowledge that male counts from recent lek surveys are at historic high levels in the Gunnison Basin, and notes that prior to 1996, surveys lacked a standard protocol and may have had an inconsistent counting effort.

Our Response: The proposed listing rule stated that the Gunnison Basin population, while variable, has been relatively stable over the past 13 years. As the commenter noted, survey data was not standardized until 1996, making comparisons between current populations and populations prior to 1996 difficult. If data from 1953–2014 are considered, the highest lek count occurred in 2006, as shown in Figure 2 in this final listing rule. However, apparent increases in population size based on lek count data may be the result of increased survey effort in recent years. Davis (2012, p. 139) noted a sharp increase in lek areas counted in 1996, when the protocol for lek counts was standardized in the Gunnison Basin. Therefore, the variation in the lek counts may reflect a change in survey effort and not a change in population size. (Also see Davis 2012, p. 143, Figure 5.1, which displays the increase in lek areas counted beginning around 1996.) Additionally, Davis (2012, pp. 137–138) and Davis *et al.* (in press) indicate that the Gunnison Basin population, although relatively stable, has declined slightly in recent years, following earlier increases. These topics are discussed further in the following sections of this rule: Current Distribution and Population Estimates and Trends; and Small Population Size and Structure.

(6) Comment: CPW stated that both the PVA described in the RCP (GSRSC 2005) and the Garton (2005) PVA should be referenced and considered in the final rule. Another commenter stated that the Garton (2005) PVA overestimated the species' long-term viability.

Our Response: We describe and evaluate the RCP and Garton PVAs, as well as that of Davis (2012), in this final rule (see Factor E).

(7) Comment: CPW noted that the proposed rule to list the species cites the RCP PVA regarding the risk of extinction for small populations less than 50 birds, but does not explain why several small populations have persisted at low numbers for decades.

Our Response: The Cerro Summit-Cimarron-Sims Mesa population has had an estimated population of less than 50 birds for 14 of the past 16 years. The Poncha Pass population has remained at less than 50 birds from 1999–2014, and lek surveys found no birds in 2013. Poncha Pass is nearing extirpation, and the Cerro Summit-Cimarron-Sims Mesa population may also be at risk—with five small leks known in the Cerro Summit-Cimarron subpopulations and only one lek, which is inactive, in the Sims Mesa subpopulation. The four remaining satellite populations generally have population estimates of more than 50 birds, but less than 500 birds. These four populations would be expected to persist for a longer period of time than the two smallest populations, but are not secure from the threats described in this final rule below. Additionally, as noted in our response to State comment 4, several smaller populations have been augmented with birds from the Gunnison Basin population. Without these translocations, the numbers would have likely been lower for these populations.

As presented in this final rule, based on 1996–2014 lek count data, a number of the satellite populations are declining. Several population viability analyses indicate a high extinction risk for all of the satellite populations (see response to Peer Review comment 31 above). Our assessment of the current and future threats to these populations indicates that these trends are likely to continue if the threats are not addressed. The best available information indicates a reduction of Gunnison sage-grouse distribution since Euro-American settlement in the 1800s, with evidence of the loss of peripheral populations and a northward and eastward trend of extirpation (Schroeder *et al.* 2004, pp. 369, 371, and references therein). These downward trends and historical losses further indicate the high vulnerability of the satellite populations to extirpation. These topics are discussed further in the following sections of this rule: Current Distribution and Population Estimates and Trends; and Small Population Size and Structure.

(8) Comment: CPW stated that an updated refinement of historical habitat estimated by Schroeder *et al.* (2004) is critical to an accurate assessment of changes in distribution, since they believe this study likely overestimates the historical range of Gunnison sage-grouse.

Our Response: Historical range estimates from Schroeder *et al.* (2004, pp. 370–

371) were modified by the RCP (GSRSC 2005, pp. 34–35) based on more complete information on historical and current habitat and distribution of the species. We are not aware of any further refinements to estimates of historical range. Information from Braun *et al.* (2014) matches information presented by Schroeder *et al.* (2004) and does not add or detract from changes & additions to historical range presented in the RCP (GSRSC 2005, p. 33-35). Consequently, the RCP (GSRSC 2005, entire) provides the best available information concerning the likely historical range of the species. That information indicates that the Gunnison sage-grouse currently occupies about 8.5 percent of its potential historical range. Further analysis in this final rule indicates that approximately 88 to 93 percent of the historical range of Gunnison sage-grouse has been lost since Euro-American settlement. While there is some uncertainty in all of these figures, the best available information indicates there has been a considerable loss of habitat and a reduction in the range and distribution of Gunnison sage-grouse. Our listing decision is based on the current status of Gunnison sage-grouse and the current and future threats to the species and its habitat. However, the loss of historical range and decline in Gunnison sage-grouse abundance, and their causes, have contributed to the species' current status. This topic is discussed further in our introduction to Factor A of this rule.

(9) Comment: CPW noted a discrepancy between current occupied range estimates of 4,720 square kilometers (km^2) in our 2006 decision and 3,795 km^2 in the 2013 proposed rule to list the species, which results in a loss of 925 km^2 of currently occupied range.

Our Response: Both estimates cite GSRSC (2005). However, the 2006 final listing determination used an initial estimate based on Schroeder *et al.* (2004). The 2013 estimate is a refined estimate based on the GSRSC and CPW data.

(10) Comment: CPW recommended that we rely primarily on Rogers (1964) to determine historic distribution of the Gunnison sage-grouse, and noted three citations of Rogers (1964) in the proposed rule to list the species that should more precisely quote the author. Another commenter stated that historic distribution estimates by Rogers (1964) are inferior to Schroeder *et al.* (2004).

Our Response: Rogers (1964) was written prior to the identification of Gunnison sage-grouse as a separate species, and summarized overall sage-grouse distribution in Colorado (including greater sage-grouse) based on both qualitative and quantitative data and reports from various sources. This study is informative in that it provides a broad picture of the species' status, distribution, and trends in Colorado over time, among other data and information. As such, Rogers (1964) is considered and cited in this final rule. However, the study did not conduct a spatial analysis of the species' potential historic range or the loss of habitat over time, as was done by Schroeder *et al*. (2004, entire). Consequently, we concluded it is appropriate to consider and evaluate this more recent, quantitative study specific to Gunnison sage-grouse (Schroeder *et al.* 2004, entire), as modified by GSRSC (2005, pp. 34–35). We verified information derived from Rogers (1964, entire) and provided more precise citations in this final rule.

(11) Comment: CPW noted that the Wisdom *et al.* (2011) standard for identifying a population stronghold could likely never have been met in the range of Gunnison sage-grouse, even historically, due to the high elevation basins and naturally fragmented nature of sagebrush communities in Colorado.

Our Response: We agree that the distribution of Gunnison sage-grouse habitat is naturally disconnected due to the presence of unsuitable habitats such as forests, deserts, and canyons across the landscape (Rogers 1964, p. 19). This is evident in Figure 18.1 of Wisdom *et al.* (2011). The authors combined the occupied and extirpated ranges of both greater sage-grouse and Gunnison sage-grouse for their "stronghold" analysis. Given the much larger range of greater sage-grouse, with typically larger patches of contiguous sagebrush habitat, conclusions from the analysis are likely more applicable to greater sage-grouse. Therefore, in this final rule, we discuss Wisdom *et al*. (2011, entire) and its conclusions, but do not further use the term "stronghold" because the term, based on the scale of analysis, was more applicable to greater sage-grouse. This topic and study is discussed further in our introduction to Factor A in this rule, and throughout the rule where applicable.

(12) Comment: CPW and others stated that the proposed rule used the rate of residential development associated with the entirety of Gunnison County, including the Crested Butte area, and is not representative of development rates in Gunnison sage-grouse habitats. Other commenters also noted that human population growth rates have

slowed in recent years leading to slower rates of development. Lastly, commenters recommended that a single source of human population growth (such as Colorado Department of Local Affairs) be used. Other commenters suggested that the human population is increasing.

Our Response: Our estimates regarding human population growth in the Gunnison Basin in the proposed rule to list the species were largely based on Colorado Water Conservation Board studies that included all of Gunnison County, including areas not occupied by Gunnison sage-grouse, and were derived before the economic downturn (78 FR 2495, January 11, 2013). We recognize that a large portion of projected human population growth for Gunnison County is expected to occur outside of Gunnison sage-grouse occupied habitat, such as in the Crested Butte area and within the City of Gunnison. For this final rule, we apply current data from the Colorado Department of Local Affairs to our analysis of human population growth and project residential development in Gunnison and other counties across the Gunnison sage-grouse range. For each sage-grouse population area, we consider total private lands available for development as a proportion of total occupied habitat, accounting for perpetual conservation easements that would preclude or limit such development. This analysis indicates that human populations are expected to continue increasing across the species' range, but that residential development is a threat of a low magnitude in the Gunnison Basin now, but is expected to increase in the future. Residential development is a substantial current and future threat to the San Miguel, Cerro Summit-Cimarron-Sims Mesa, and Poncha Pass populations. This topic is discussed further in the Factor A, Residential Development section of this final rule.

(13) Comment: CPW disagreed with the conclusion in the proposed rule that roads are a “major threat” to the continued existence of Gunnison sage-grouse and stated that the proposed rule used speculation from Oyler-McCance *et al.* (2001) that overstated the threat from roads and powerlines.

Our Response: In its discussion of roads, the proposed rule stated that “Roads within Gunnison sage-grouse habitats have been shown to impede movement of local populations between the resultant patches, with road avoidance presumably being a behavioral means to limit exposure to predation (Oyler-McCance *et al.* 2001, p. 330).” The proposed rule then gave several examples, with additional citations, of impacts due to roads including: increased disturbance, corridors for predators, invasion of exotic plants, and resultant avoidance by sage-grouse. The proposed rule does not cite Oyler-McCance *et al.* (2001) in its discussion of powerlines. In this final rule, we describe impacts from roads and conclude that increased road use and construction will continue at least through 2050, and is a current and future threat to the species (see Factor A).

(14) Comment: CPW and one other commenter questioned the use of Aldridge *et al.* (2012) regarding nest site selection and urged caution in applying results across the entire Gunnison Basin, particularly the firm conclusion that habitat within 2.5 km (1.6

miles (mi)) of roads and residential developments is unsuitable for the species. CPW also presented data from a GIS analysis that it conducted.

Our Response: In the proposed rule to list the species, we did not use 2.5 km (1.6 mi) in any recommendations regarding thresholds for nest selection; although we did cite papers by Aldridge *et al.* (2008 and 2011). We agree that some recommendations from the modeling effort completed by Aldridge *et al.* (2012) are based on confusing probabilities regarding selection of nest sites, in particular, the relationship between relative probability of nest occurrence and distance to residential development. Figure 5f in Aldridge *et al.* (2012) indicates that the probability of nest occurrence is greatest when the nest is approximately 2.5 km (1.6 mi) from development. This probability decreases at both shorter and greater distances from development; although one would expect the probability of nest occurrence to continue to increase with increasing distance from residential development. The variable of residential density was more intuitive, with the likelihood of nesting decreasing with increasing residential density. Other variables such as the proportion of sagebrush cover and road density had more influence on nest site selection and were also more intuitive. For example, the probability of nesting decreased abruptly with decreasing sagebrush cover and with increasing road density. In this final rule, we updated our older citation (Aldridge *et al.* 2011); we added a citation regarding CPW's preliminary GIS analysis of the frequency of successful and unsuccessful nests at increasing distances from roads (CPW 2013b); and we do not apply spatial zones of influence to evaluate impacts of residential development as is discussed in Factor A.

(15) Comment: CPW urged caution in citing Braun (1995), Bui *et al.* (2010), and Aldridge and Boyce (2007) regarding impacts from roads due to the speculative nature of authors' conclusions.

Our Response: We did not cite Braun (1995) or Bui *et al.* (2010) in discussions of Factor A, including roads, in the proposed rule or in this final rule. Aldridge and Boyce (2007) were cited in discussions of residential development, roads, and nonrenewable energy development. Related to this comment, when citing Aldridge and Boyce (2007), we indicate that this and other studies cited were on greater sage-grouse. However, as discussed in our response to State comment 3 above, due to similar life histories and habitat requirements between these two species, we consider information specific to greater sage-grouse as relevant to Gunnison sage-grouse, a practice followed by the wildlife and land management agencies that have responsibility for both species and their habitats.

(16) Comment: CPW and some other commenters questioned the conclusions regarding powerlines and impacts on Gunnison sage-grouse from raptor perches and habitat fragmentation.

Our Response: The discussion of powerlines in the proposed rule provided numerous citations regarding aspects such as raptor perches, habitat fragmentation, and the spread of invasive plants. Citations note when the studies were specific to greater sage-grouse. In some instances, the only information is specific to greater sage-grouse, in which case, we regard it as the best available information (see our response to comment 3). We revise our language in this final rule to clarify usage of the terms habitat loss, degradation, and fragmentation (see our response to peer review comment 34).

(17) Comment: CPW disagreed with the conclusion in the proposed rule to list the species that grazing in combination with climate change and other factors is a threat to Gunnison sage-grouse and questioned citations from Gregg *et al.* (1994) and Connelly *et al.* (2000a) regarding optimal grass height. CPW also noted a conflict between critical habitat requirements of grass height of 10–15 cm and aforementioned citations that recommend grass height of 18 cm or more.

Our Response: In the proposed rule, we concluded that habitat degradation resulting from improper grazing (described in Factor A in the proposed rule), particularly with the interacting factors of invasive weed expansion and climate change, is a threat to Gunnison sage-grouse persistence. The proposed rule also noted that livestock grazing may have positive effects on sage-grouse (78 FR 2501, January 11, 2013). Properly managed livestock grazing is not likely to adversely impact Gunnison sage-grouse. Gregg *et al.* (1994) described a study conducted on greater sage-grouse in Oregon and speculated about potential impacts from livestock grazing. In this final rule, we clarify that "Gregg *et al.*

(1994, p. 165) speculated that the reduction of grass heights due to livestock grazing in sage-grouse nesting and brood-rearing areas may negatively affect nesting success when cover is reduced below the 18 cm (7 in.) needed for predator avoidance." Connelly *et al.* (2000a) was not cited in the grazing discussion in the proposed rule to list, but was cited in the proposed rule to designate critical habitat. Seasonally specific primary constituent elements described in the proposed and final rules to designate critical habitat include a guideline of 10–15 cm (4–6 in) grass height based on recommendations in the RCP (GSRSC 2005, p. H-6). In this final rule, we clarify that recommendations vary for Gunnison sage-grouse habitat requirements and vegetation characteristics. We note that Connelly *et al.* (2000a, p. 977) recommended greater than 18 cm (7 in) grass height for breeding habitats, and that the GSRSC (2005, p. H-6) (the basis of the critical habitat proposal for breeding habitats) recommended a grass height of 10–15 cm (3.9–5.9 in).

(18) Comment: CPW noted that the proposed rule to list the species suggests that livestock trample seedlings, and that this constitutes competition. CPW stated that they were unaware of any research that has demonstrated competition between grazers and sage-grouse. One other commenter stated that Connelly *et al.* (2004) does not describe trampling of sagebrush seedlings.

Our Response: Connelly *et al.* (2004, p. 7-31) states that livestock trample sagebrush, and provides citations; we note in this final rule that Connelly *et al.* (2004) was citing other references. In the proposed rule, we surmised that livestock may compete directly with sage-grouse for rangeland resources by consuming forbs and shrubs. However, as the commenter mentions, this question has not been researched, and our conclusion is therefore inferred rather than proven. In this final rule, we deleted specific references to competition between livestock and sage-grouse. However, we present evidence that indicates consumption of important vegetation by livestock negatively affects sage-grouse that use those resources, such as the reduction of forbs and grasses that may affect chick survival (see Factor A).

(19) Comment: CPW disagreed with the conclusion and inference that browsing by big game on mountain shrubs resulted in a negative effect on Gunnison sage-grouse habitat.

Our Response: This final rule includes a discussion of available information regarding impacts of wild ungulate herbivory in Gunnison sage-grouse habitat, including one study (Japuntich *et al.* 2010, pp. 7–9) that documented reduced size and vigor of mountain shrubs (not sagebrush), which could reduce accumulations of drifting snow, which might in turn reduce the availability of soil moisture for forbs and grasses. If all of these impacts occurred, nesting and brood-rearing habitat could be affected. In this final rule, we conclude that the effects of livestock grazing are likely being exacerbated by intense browsing of woody species by wild ungulates in portions of the Gunnison Basin and the Crawford area (see Factor A, Domestic Grazing and Wild Ungulate Herbivory).

(20) Comment: CPW asserted that the proposed rule relied on speculation by Braun (1998), Oyler-McCance *et al.* (2001), and Stevens (2011) regarding the effects of fences on Gunnison sage-grouse. CPW also provided additional information regarding research it conducted that tracked more than 1,000 radio-marked greater sage-grouse and documented two mortalities from collisions with fences. A follow-up letter from CPW also noted four mortalities resulting from collisions with utility lines. One other commenter stated that fences fragment habitat.

Our Response: We cite multiple references in Factor A of this final rule that implicate the potential impacts of fences on Gunnison sage-grouse. Based on the information provided by CPW specific to Gunnison sage-grouse, mortalities from collisions with fences and utility lines are likely minimal, and we have included the information that CPW provided on strike-related mortalities. We conclude that fences may be a contributing factor in the species' decline; however, we have no specific data on the scope of this threat (see Factor A, Fences).

(21) Comment: CPW stated that the Service does not know what the final measures in the Bureau of Land Management's (BLM) Resource Management Plans (RMPs) will be concerning travel management, and that the Service overstates the threat of roads. Consequently, CPW states that our conclusion that the revised RMPs are inadequate to address that threat of roads outlined by Aldridge *et al.* (2012) was premature.

Our Response: We use the best available information to reach our conclusion in this final rule that roads are a threat to Gunnison sage-grouse (see Factor A, Roads). The BLM is in the process of amending its RMPs and we do not know how road issues will be addressed in the amended plans. Under the Act, we are required to assess the adequacy of RMPs with respect to relevant threats based on the RMPs as they exist at the time of this listing decision. Thus, while we conclude that road impacts can be reduced by regulatory mechanisms, the existing mechanisms are currently not fully addressing the threat. We recognize the complexity of threats to Gunnison sage-grouse and the limited capacity of regulatory mechanisms to address some of those threats. For example, impacts caused by disease, small population size, or climate change are not easily addressed by regulatory mechanisms. However, other impacts such as current and future roads, hunting, grazing, or development can often be addressed with adequate regulatory mechanisms

(22) Comment: CPW stated that the discussion regarding vegetative structure guidelines incorporated into management plans and permit renewals is confusing.

Our Response: We clarify discussions regarding vegetative structure guidelines in this final rule (see Factor A, Domestic Grazing and Wild Ungulate Herbivory).

(23) Comment: CPW asserted that the Service did not acknowledge that Gunnison sage-grouse habitat is highly variable rather than continuous across the landscape.

Our Response: We acknowledge that Gunnison sage-grouse habitat is highly variable across the landscape, and we do not consider it to be continuous currently or historically. We included a discussion of the naturally disconnected nature of Gunnison sage-grouse habitat in this final rule (see Factor A).

(24) Comment: CPW and several other commenters suggested that the Service evaluate structural habitat guidelines recommended in the RCP with data reported by the BLM and Williams and Hild (2011).

Our Response: The final rule includes conclusions from vegetation monitoring efforts in the Gunnison Basin conducted by Williams and Hild in 2010 and 2011. This topic is discussed further in the Domestic Grazing and Wildlife Herbivory section in Factor A of this final rule.

(25) Comment: CPW presented new information regarding small populations and inbreeding depression.

Our Response: We include and consider this information in this final rule. We note that this new information indicates that the San Miguel Basin Gunnison sage-grouse effective population size is below the level at which inbreeding depression has been observed to occur (Stiver *et al.* 2008, p. 479), and that the authors postulated that the observed lowered hatching success rate of Gunnison sage-grouse in their study may be caused by inbreeding depression. Finally, we conclude that because the remaining Gunnison sage-grouse satellite populations are smaller than the San Miguel population, they are also likely small enough to induce inbreeding depression, and could be losing adaptive potential (see Factor E).

(26) Comment: CPW and two other commenters disagreed with conclusions in the proposed rule regarding minimum and effective population sizes, and the amount of habitat needed to support a viable population.

Our Response: We do not recommend or adopt a specific number for a minimum viable population size, other than concluding that, based on the best available information, several of the satellite populations are trending toward extirpation. With their low absolute and effective population sizes, the satellite populations are particularly at risk from stochastic environmental and genetic factors (see Factor E, Small Population Size). We address the amount of habitat needed to provide for the conservation of the species in our final critical habitat determination for Gunnison sage-grouse published elsewhere in today's **Federal Register**. In this final rule we also reviewed the three available PVAs for Gunnison sage-grouse, which applied various techniques to estimate the viability of populations. Collectively, these studies and population trends from 1996–2014 indicate that one or more of the satellite populations may become extinct within the foreseeable future (see Factor E).

(27) Comment: CPW noted that drought can impact nest success, but not adult survival, suggesting that Gunnison sage-grouse can accommodate drought cycles.

Our Response: We agree that adults are less vulnerable to impacts from drought. Adult survival rates of Gunnison sage-grouse in the Gunnison Basin were not influenced by drought conditions in 2005 (CPW 2013c, p. 9; Davis 2012, p. 55). However, if a drought persists through multiple nesting seasons, recruitment will likely be impacted. This topic is discussed further under the following sections in this final rule: Drought and Extreme Weather, Small Population Size and Structure, and Climate Change.

(28) Comment: CPW and CDA noted that at least 79 percent of occupied habitat in the Gunnison Basin is protected from development, including government-owned lands, private lands with Conservation Easements, Candidate Conservation Agreements with Assurances, and/or similar legal agreements that preclude development to the detriment of grouse. Therefore, these agencies asserted, the Gunnison Basin is adequately protected for the conservation of the species.

Our Response: While the conservation and habitat protection efforts undertaken in the Gunnison Basin are commendable, and help reduce the impact of development on the species and its habitat, these measures vary in their capacity to avoid or minimize impacts such as the effects of habitat decline. Consequently, we were not able to conclude that Gunnison sage-grouse habitat is adequately protected, despite the benefits of the various conservation efforts. Conservation efforts and regulatory mechanisms are evaluated in this final rule.

(29) Comment: CPW, the Utah Office of the Governor, and several other commenters requested clarification regarding the interpretation and use of the Significant Portion of Range (SPR) policy.

Our Response: On July 1, 2014, we published a final policy interpreting the phrase "Significant Portion of its Range" (SPR) (79 FR 37578). In accordance with that policy, the first step in our analysis of the status of a species is to determine its status throughout all of its range. If we determine that the species is in danger of extinction (endangered), or likely to become so in the foreseeable future (threatened), throughout all of its range, we list the species as an endangered or threatened species and no SPR analysis is required. In this case, we have determined in this rule that the Gunnison sage-grouse is threatened throughout all of its range, therefore we did not perform an SPR analysis.

(30) Comment: CPW, CDA, and the Utah Office of the Governor asserted that speculation in the literature was sometimes portrayed as science.

Our Response: Under the standards of the Endangered Species Act (Act), we are required to base our determinations of species status on the best available information. Our first choice is information from recent, peer-reviewed publications that is specific to Gunnison sage-grouse. However, sometimes the only available information may be based on studies of greater sage-grouse. Additionally scientific data are sometimes limited, studies are conflicting, or results are uncertain or seemingly inconclusive. Scientific information includes both empirical evidence, and expert knowledge or opinion. In this final rule, we carefully identified and qualified instances of speculation or hypotheses from past scientific studies and publications.

(31) Comment: CDA noted that agriculture in Colorado generates $40 billion annually, with cattle anticipated to contribute approximately $3.5 billion to agricultural production in 2013. CDA stated that cattle production would likely be seriously harmed, should the species be listed.

Our Response: The Act does not allow us to consider economic impacts in decisions on whether to list a species, which must be made solely on the basis of scientific and commercial information related to the 5 factors in Section 4(a)(1) of the Act. Economic impacts may be considered in the designation of critical habitat, and are discussed in our final critical habitat rule. Our final critical habitat determination for Gunnison sage-grouse is published elsewhere in today's **Federal Register.**

(32) Comment: The Utah Office of the Governor noted that the timing on the proposed rule is based solely on the need to meet a court approved settlement date, which did not include participation by the States of Utah or Colorado. Some commenters suggested that more time is needed for public review.

Our Response: The publication deadline for the proposed rule was set by a court approved settlement agreement; however, the timeline for this final rule was initially set according to the statutory requirements of the Act and has been extended several times by court order. The Act requires that a final listing rule be published within one year of the publication of the proposed rule. As allowed by the Act, however, we extended this statutory deadline by 6 months due to substantial disagreement regarding the sufficiency or accuracy of available data relevant to our determination. Invoking this statutory extension postponed the final listing decision from September 30, 2013 to March 31, 2014. We also re-opened the public comment period several times. In addition, due to a government shutdown in October 2013 that caused us to postpone and reschedule public meetings, the court granted our request for an additional 6 weeks beyond the statutory timeline. Finally, the court granted our subsequent request for an additional 6 month extension to allow us to consider the possibility that the species should be listed as threatened rather than endangered, and to consider whether a 4(d) rule would be appropriate. This action extended the deadline for this final rule until November 12, 2014.

(33) Comment: The Utah Office of the Governor stated that the Service's 2010 warranted-but-precluded finding and 2013 proposed rule to list Gunnison sage-grouse under the Act differs from the 2006 finding that concluded the species was not warranted for listing, without presentation of any new information that would indicate a

different conclusion is justified. Several commenters asserted that the decision to list was due to litigation.

Our Response: Litigation resulted in a settlement agreement that established a schedule for us to submit a proposed rule to list the species or a finding that listing was not warranted by a date certain. The litigation had nothing to do with the ultimate decision to list, or not. The 2006 not-warranted, the 2010 warranted-but-precluded finding, and the 2013 proposed rule to list the species were based upon the best scientific and commercial information available at that time. The 2006 finding concluded that the rangewide population was stable to slightly increasing (71 FR 19961–19962, April 18, 2006). The 2013 proposed listing rule included information from new studies, 8 additional years of recent survey information (2006–2013), as well as population data from 1996–2000, and concluded that the Gunnison Basin population was relatively stable and the six smaller populations were in decline (78 FR 2488, January 11, 2013). This final rule incorporates additional information received since publication of the proposed rule. The basis for our determination in this final rule is provided in the Determination section of this rule.

(34) Comment: The Utah Office of the Governor and one other commenter stated that a Federal listing of the species at this time provides no additional protection or resources from those already in place and that voluntary cooperation of private landowners will be much more effective in improving habitat than protections than what may be afforded by listing and critical habitat designation. The Utah Office of the

Governor also noted that a final regulation providing for a listing will cause the State to reassess its conservation efforts for this species, and may result in reallocation of these efforts to other species.

Our Response: By statute, the Service must list a species if it meets the definition of threatened or endangered. There is no provision in the Act that would allow us to decline to list a species that meets the definition of threatened or endangered if no additional protection would occur. Moreover, the Act would confer additional protection to the Gunnison sage-grouse that could help arrest and reverse its decline. Once listing of the Gunnison sage-grouse becomes effective, actions authorized, funded or carried out by Federal agencies that may affect the species will require section 7 consultations under the Act in all areas occupied by the species. Section 9 prohibitions against "take" will further protect the species from human-caused mortality due to both direct effects and indirect effects such as continued habitat decline and harassment. We recognize that the voluntary cooperation of private landowners has improved conservation of the species in many areas. However, declining population trends indicate that these efforts have not been able to stabilize rangewide conditions (habitat and populations) for the species. We maintain that the best chance for conservation and ultimately recovery of the species will require both the protections afforded by listing and critical habitat designation as well as voluntary conservation measures undertaken by private landowners, with support from the States in accomplishing these measures.

(35) Comment: The Utah Office of the Governor described efforts of the San Juan Local Working Group, by Federal and State agencies, private landowners, and universities to address concerns regarding declining numbers of Gunnison sage-grouse. Similarly, Colorado's Office of the Governor identified dozens of conservation efforts that have been carried out in Colorado that they believe address Gunnison sage-grouse.

Our Response: We acknowledge and commend conservation efforts undertaken in Utah and recognize their importance in a county where more than 90 percent of occupied habitat is on private lands. We also commend the conservation efforts undertaken in Colorado by CPW, local jurisdictions and other entities. This final rule describes many of the conservation measures, including local, State, and Federal laws and regulations, conservation easements, the Gunnison Basin CCA, and enrollment in the Colorado CCAA, that have been undertaken to improve or protect Gunnison sage-grouse habitat. We have carefully considered the projects and programs noted by Colorado and Utah in the development of this final rule.

(36) Comment: The Utah Office of the Governor described Gunnison sage-grouse population trends in Utah and stated that reliance on current population figures would be an arbitrary and capricious application of facts because adequate time has not been allowed to determine if numbers will return to stable levels following the severe winter in 2010. In contrast, CPW stated that severe winters are not a threat to the species.

Our Response: We recognize that there is annual variability in population numbers for the Gunnison sage-grouse. Consequently, we place more emphasis on longer-term population trends over a number of years than on population estimates from any given year. Our analysis considers Gunnison sage-grouse population trends from 1996 (when lek count protocols were standardized) through 2013. We do not conclude that severe winters are a threat to the species.

Comments from Federal Agencies

(37) Comment: We received multiple comments expressing concerns regarding the long-term viability of the Poncha Pass population, noting that bird movement between Poncha Pass and the Gunnison Basin is not likely. One commenter suggested that Poncha Pass and other small populations may be better managed as satellite populations, rather than individual self-sustaining populations.

Our Response: We are also concerned about the long-term viability of the Poncha Pass population, particularly in view of the 2013 lek count surveys, which did not detect any birds. CPW translocated 17 additional birds from the Gunnison Basin in the fall of 2013, and 10 more in spring of 2014 (CPW 2014e, p.7). Six males were counted in the Poncha Pass population during the spring 2014 lek count (CPW 2014d, p.2). This population will likely require repeated augmentations to avoid extirpation. This topic is discussed further under the following sections in this final rule: Current Distribution and Population Estimates and Trends; and Factor E.

(38) Comment: One agency noted that although the proposed rule to list the species repeatedly states that the effects from grazing are inconclusive, the final conclusion was that habitat degradation from improperly managed grazing, particularly with the interacting factors of invasive weed expansion and climate change, is a threat to the species. Several commenters recommended that historical grazing practices be differentiated from improved current grazing practices.

Our Response: The key word in our conclusion in the proposed rule is "improperly." Livestock grazing that is done in a manner consistent with local ecological conditions, including soil types, precipitation zones, vegetation composition and drought conditions, is not likely to negatively impact Gunnison sage-grouse, and is compatible with the needs and conservation of the species. See discussion under Factor A. The final rule also notes that properly managed livestock grazing may have positive effects on sage-grouse. We also recognize that maintenance of sustainable grazing practices on private rangelands can aid in recovery of the Gunnison sage-grouse by discouraging further conversion of the species' habitat into habitat unsuitable to the species (i.e., due to development).

(39) Comment: Several commenters noted that the proposed rule might have overstated the impacts from grazing on Gunnison sage-grouse habitat as indicated by BLM Land Health Assessments (LHA). A comment stated that available data may vary by office, and the LHA is only a snapshot in time; therefore, it cannot indicate trends. Additionally, grazing is only one of many causal factors on land health. The commenter also noted that failure to meet indicators for Land Health Standard 4 (which evaluates

ecological indicators for Special Status Species) may be due to population trends rather than existing habitat conditions.

Our Response: This final rule recognizes the limitations and uncertainties associated with LHA and supporting data. Our conclusion for livestock grazing effects on Gunnison sage-grouse and its habitat also acknowledges limitations associated with LHA data (see Factor A, Domestic Grazing and Wildlife Herbivory).

(40) Comment: One commenter recommended we clarify the impact from different fence types with regard to habitat fragmentation, increased predator activities, and collisions.

Our Response: This final rule discusses the various factors that influence fence strike risks. We acknowledge that those risks vary depending on fence design, landscape topography, and spatial configuration. In the Factor A discussion of fences, we note that in 10 years of tracking radio-collared sage-grouse in Colorado, CPW has documented only two fence strike mortalities in Gunnison sage-grouse. This information suggests that direct mortality of Gunnison sage-grouse due to fence strikes is low.

(41) Comment: We received a comment requesting that the Service recognize that fire and fuels treatment projects managed under very narrow parameters may be a beneficial tool in managing Gunnison sage-grouse habitat. The commenter also noted

that impacts from cheatgrass on fire regimes in Colorado do not appear to be the same as in the Great Basin, and suggests that fire has a role to play in rejuvenating unoccupied or marginal habitats by creating "micro-mosaics" that benefit the species during different portions of its life cycle.

Our Response: The final rule acknowledges that small fires may have beneficial impacts to Gunnison sage-grouse habitat and concludes that fire is currently not a threat to the species. It also concludes that wildfires may become a threat in the future if cheatgrass continues to expand. Recent research indicates that prescribed fire may be inappropriate due to the direct loss and fragmentation of the remaining sagebrush habitat within the species' range, (Baker 2013, p. 8). We include this information and citation in this final rule (see Factor A, Fire).

(42) Comment: One commenter expressed concern regarding the potential effects of climate change to the long-term sustainability of Gunnison sage-grouse, particularly in the Dove Creek and Dry Creek areas.

Our Response: We too are concerned about the potential effects of climate change on Gunnison sage-grouse rangewide. The final rule concludes that climate change is currently not a threat to the species, but is likely to become a threat in the foreseeable future. Our analysis includes consideration of climate change projections for the western U.S. A climate change vulnerability assessment for the Gunnison Basin described the Gunnison sage-grouse as highly vulnerable to impacts from climate change (TNC *et al.* 2011, p. iii). This topic is discussed further under Factor A, Climate Change in this final rule.

(43) Comment: The United States Forest Service (USFS) suggested expanding the CCA from Gunnison Basin to other Gunnison sage-grouse populations on Federal lands. One other commenter expressed concern regarding a possible expansion of the CCA to areas outside of the Gunnison Basin.

Our Response: We agree that the CCA could have benefitted Gunnison sage-grouse in other populations outside of the Gunnison Basin, and provided a means for Federal land agencies to streamline ESA section 7 requirements associated with their programs and activities. Although CCAs cannot be implemented for listed species, adoption of a similar plan that builds on the principles of the CCA is a viable option for the satellite populations in the future. We also note the BLM is now in the process of amending all field office resource management plans within the range of the Gunnison sage-grouse to increase protections for this species. This effort will likely build on what was included in the CCA for BLM-managed lands in the Gunnison Basin.

Comments from the Public

(44) Comment: Several commenters asserted that listing the Gunnison sage-grouse will adversely impact the local economy.

Our Response: The Act does not allow us to consider economic impacts in decisions on whether to list a species, which must be made solely on the basis of scientific and commercial information regarding the 5 factors in Section 4(a)(1) of the Act. However, economic impacts may be considered in the designation of critical habitat. Our final critical habitat determination for Gunnison sage-grouse is published elsewhere in today's **Federal Register**. As part of the process of completing the final critical habitat rule, we completed an Economic Analysis that evaluates the potential economic impacts of designating critical habitat on transportation, livestock grazing, mineral and fossil fuel extraction, residential development, recreation, agriculture, and renewable energy (Industrial Economics, Inc. 2014). We also completed an environmental assessment pursuant to the National Environmental Policy Act (NEPA) on the proposed critical habitat designation that evaluated the affected environment, including potential economic impacts to the human environment. These are discussed further in our final critical habitat rule, published elsewhere in today's Federal Register.

(45) Comment: Several commenters suggested that the Service should work cooperatively with other Federal agencies, State wildlife agencies, farm bureaus, and local governments to partner with landowners on conservation efforts. One commenter asserted that the Service has no on-the-ground experience with Gunnison sage-grouse conservation.

Our Response: We encourage partnerships between the Service, other agencies, and landowners and have worked cooperatively in such partnership to further

Gunnison sage-grouse conservation. In 2005, for example, we participated in development of the RCP (GSRSC 2005). This Plan established management guidelines throughout the range of the species. In 2006, we entered into a CCAA for the Gunnison sage-grouse with Colorado Division of Wildlife (now CPW). We estimate, in of December, 2014 when this rule becomes effective, 40 Certificates of Inclusion (CI) will have been completed for private properties, enrolling 94,391 ac in four Gunnison sage-grouse populations, although only roughly 81,156 ac of these acres fall within suitable Gunnison sage-grouse habitat. We also cooperated with Federal agencies and other stakeholders in the Gunnison Basin to complete a CCA to promote conservation of the species in the Gunnison Basin population on Federal lands. As stated above, our listing decision is based on the best available scientific information. Accordingly, our focus is on well-supported, scientific data and information for the species, generally at a broader scope than is acquired at the local level.

(46) Comment: Several commenters expressed differing views on whether livestock grazing in Gunnison sage-grouse habitat should be restricted.

Our Response: We determined that grazing that is inconsistent with local ecological conditions is a threat to the species, and grazing in general may have inadvertent effects at a local level (Factor A, Domestic Grazing and Wild Ungulate Herbivory).

Although grazing on both public and private lands may affect Gunnison sage-grouse, privately owned lands typically lack a Federal nexus for section 7 consultations under the Act, in which case grazing practices would not be affected by the Act unless they were to result in “take” of Gunnison sage-grouse, as prohibited by section 9 of the Act. However, more than 300 Federal grazing allotments on nearly 405,000 ha (1,000,000 ac) are located within the final critical habitat designation (Industrial Economics, Inc. 2014, p. 3-1). On Federal allotments, through the section 7 consultation process, the managing agency (BLM or USFS) may choose to implement AUM reductions, seasonal restrictions, rotational grazing, or other changes to minimize impacts or avoid jeopardy to the species and any adverse modification to critical habitat. We do not intend to preclude grazing within critical habitat, but may seek grazing modifications where warranted to promote the conservation and recovery of the species. We discuss livestock grazing under Factor A, Domestic Grazing and Wild Ungulate Herbivory in this final rule.

(47) Comment: Several commenters expressed differing views on whether energy and mineral development should be further restricted.

Our Response: The Monticello-Dove Creek and San Miguel Basin populations support numerous mineral and fossil fuel extraction activities. One wind project and one potash mine are under development in the Monticello-Dove Creek population. There are no active uranium mines in Gunnison sage-grouse habitat.

Oil and gas extraction occurs on both Federal and private lands within the species' range. Mineral and fossil fuel extraction activities on private lands without Federal mineral rights are unlikely to have a Federal nexus for section 7 consultations under the Act. Existing Federal regulations, such as BLM RMPs, and State regulations from the Colorado Oil and Gas Conservation Commission (COGCC) provide some protection to the species and its habitat. With respect to mineral and energy development projects on Federal lands or that otherwise have a Federal nexus (e.g., the project is authorized, funded or carried out by a Federal agency), we may seek project modifications during ESA section 7 consultations to benefit Gunnison sage-grouse. We consider current energy and mineral development a low threat to the species, as discussed under Factor A, Mineral Development and Renewable Energy Development, in this final rule.

(48) Comment: Several commenters expressed differing views regarding the effectiveness of predator control.

Our Response: Predator removal efforts may sometimes provide short-term gains in sage-grouse numbers, but predator numbers quickly rebound without continual control efforts (Hagen 2011, p. 99). The impacts of predation on greater sage-grouse can increase where habitat quality has been compromised by anthropogenic activities such as exurban development and road development (Coates 2007, pp. 154–155; Bui 2009, p. 16; Hagen 2011, p. 100). This is discussed further under Factor C, Predation.

(49) Comment: Several commenters stated that conservation efforts and recovery should focus on public lands.

Our Response: Conservation of the Gunnison sage-grouse will require collaboration between Federal, State, and local agencies wherever the species occurs. Federal agencies manage 54 percent of currently occupied habitat for Gunnison sage-grouse. Although there is an abundance of public lands within the current range of the Gunnison sage-grouse, Federal lands alone are insufficient to conserve the species. Therefore, conservation and recovery efforts limited to public lands are not sufficient to ensure conservation of the species.

(50) Comment: Some commenters support or oppose development of a captive breeding program or translocation of Gunnison sage-grouse. One commenter stated that the State of Colorado does not have the funds necessary to conduct a long-term captive breeding program.

Our Response: Establishing wild populations from captive-reared gallinaceous birds is very difficult, expensive, and only rarely successful; a captive breeding program in Idaho for greater sage-grouse had only minimal success (GSRSC 2005, p. 181). The CPW started a captive-rearing program in 2009 to study whether techniques can be developed to captively rear and release Gunnison sage-grouse. To date, survival of captive-reared chicks has been low, as we cited in our proposed rule (78 FR 2518, January 11, 2013). Translocation of wild Gunnison sage-grouse from Gunnison Basin to other populations has had some success, although our understanding of translocation contributions is limited. Without these translocations, current numbers would likely be lower for these populations. These topics are discussed further under Scientific Research and Related Conservation Efforts in this final rule.

(51) Comment: Some commenters suggested that a Gunnison sage-grouse working group or recovery team should be established.

Our Response: Local working groups including landowners, interested individuals and groups, local governments, land management agencies, and State wildlife agencies have developed conservation plans for the following Gunnison sage-grouse populations: Gunnison Basin, Crawford, Dove Creek, San Miguel Basin, Monticello, Piñon Mesa, and Poncha Pass. As a result, all populations with the exception of the Cerro Summit-Cimarron-Sims Mesa population have conservation plans. Following the development of these local conservation plans, the RCP (GSRSC 2005, entire) was developed, which included participation by the BLM, CPW, NPS, NRCS, USFS, the Service, and Utah Division of Wildlife Resources (UDWR). The RCP was intended to supplement local plans and provide guidance to aid in conservation of the Gunnison sage-grouse. Population targets were recommended for each population. These planning efforts are discussed in further detail in Factor A of this final rule. We also discuss future conservation measures for this species below in this final rule. The Act requires development of a recovery plan in most cases for endangered and threatened species, which often results in establishment of a recovery team.

(52) Comment: Some commenters suggested that sagebrush habitat should be preserved and, when necessary, recovered.

Our Response: Because sage-grouse are obligate users of sagebrush, preserving and recovering sagebrush habitat is key to sage-grouse conservation. Other habitat types such as riparian meadows and agricultural lands may also be important for Gunnison sage-grouse, but only if they are in close proximity to sagebrush-dominated habitat (75 FR 59808, September 28, 2010). Several Federal agencies as well as CPW and UDWR continue to work to improve the quality of sagebrush communities through grazing management, fencing, re-seeding, fuels management, and other habitat improvement strategies (GSRSC 2005, pp. 214–219). Listing the species and designating critical habitat will further conserve Gunnison sage-grouse habitat.

(53) Comment: Several commenters noted the importance of open water and wet meadows and some also suggested that these habitat types should be re-established in some areas by removal of sagebrush.

Our Response: High quality brood-rearing habitat for Gunnison sage-grouse includes mesic meadows, springs, seeps, and low vegetation riparian areas, all dependent on adequate moisture and consequently at risk in today's changing climate (TNC *et al.* 2011, p. H-9). Prescribed burning and mechanical treatments can be used on a small scale to create a mosaic of small open patches; however, care should be taken to avoid further fragmentation of sagebrush habitat (GSRSC 2005, pp. 206–207).

(54) Comment: Some commenters suggested that seasonal closures of roads and recreation areas should be implemented as appropriate.

Our Response: Closures have been authorized and used by Federal agencies and counties to protect Gunnison sage-grouse habitat in several populations (BLM 2013c, attachment 2; Gunnison County Board of County Commissioners 2013a, Appendix A; NPS 2013, p. 1; USFS 2013, pp. 11 and 14). We evaluate these efforts in this final rule (see Factor A, Roads, and Factor D).

(55) Comment: One commenter suggested that number of leks, number of birds on leks, survival rates, and other ecological parameter be monitored and used as triggers for requiring additional conservation efforts.

Our Response: The local and rangewide conservation plans include monitoring plans. The CPW has conducted annual monitoring of these parameters following a standard protocol since 1996. Monitoring of habitat conditions, treatment actions, and compliance are an integral part of the CCAA for Gunnison sage-grouse.

(56) Comment: Several commenters stated that the Gunnison sage-grouse population in the Gunnison Basin is stable and not at risk of extinction; consequently, since this is a significant portion of the species' range, the species is not endangered. One commenter noted that the six smaller populations did not constitute a significant portion of the species' range.

Our Response: Please see our response to comment 29 above. We include an explanation of how we considered and applied the concept of SPR in this final rule.

(57) Comment: Several commenters expressed various opinions regarding the stability of the six smaller populations outside of Gunnison Basin.

Our Response: The six satellite populations are small, all were generally in decline from 1996 until 2010, and several continue to show a declining trend. The San Miguel and Piñon Mesa populations are currently the largest of the satellite populations, with 206 and 182 birds, respectively, in 2014. The Monticello-Dove Creek population currently has less than 100 birds total. Population estimates in 2014 for what have been the two smallest populations, Cerro Summit-Cimarron-Sims Mesa and Poncha Pass, were 74 and 16, respectively (CPW 2014a, p.1). Based on lek count-based population estimates, some satellite populations have increased slightly over the last several years, or intermittently over time. However, the last 19 years (1996 to 2014) of lek count data as a whole indicate all the satellite populations are were in decline in 2010. Several of the satellite populations have increased since 2010. Although population estimates for Piñon Mesa are currently higher than in any year since 1996, this population has been augmented with 93 birds from Gunnison Basin since 2010. The Crawford population has also been augmented, with 73 birds over the same period; and while the 2014 population estimate of 157 in this population is the highest since 2006, it is considerably less than the post-1996 high of 270 in 1998.

For all six satellite populations, population estimates from 1996 to 2014 are below population targets (based on a 10-year average), set forth by the RCP (CPW 2014d, p. 1; GSRSC 2005, pp. 255-302). The RCP population targets are the number of birds thought necessary to conserve Gunnison sage-grouse in those population areas (GSRSC 2005, p. 255). Combined, the satellite populations comprise about 16 percent of the rangewide population of Gunnison sage-grouse and include approximately 37 percent of rangewide occupied habitat. These topics are discussed further in Factors A and E of this rule.

(58) Comment: Several commenters stated that lek counts are not accurate.

Our Response: As described in this final rule (see Current Distribution and

Population Estimates and Trends), lek count data are the primary means of estimating and monitoring Gunnison sage-grouse populations. However, sage-grouse populations can fluctuate widely on an annual basis, and there are concerns about the statistical reliability of population estimates based on lek counts (CDOW 2009b, pp. 1–3). Stiver *et al.* (2008, p. 474) concluded that lek counts likely underestimate population size. Another study (Davis 2012, p. 136) indicated that, based on demographic data, lek count indices overestimate population size. Although lek count data are available from as early as the 1950's for some populations, lek count protocols were first standardized and implemented in 1996 (GSRSC 2005, p. 46). Prior to 1996, lek count data are highly variable and uncertain, and are not directly comparable to recent population data (Braun 1998, p. 3; Davis 2012, pp. 139, 143). Therefore, for the purposes of evaluating current population sizes and trends, the analysis in this final rule is focused on the standardized lek count data from 1996 to 2013. We also consider other available scientific information regarding Gunnison sage-grouse populations such as demographic data and population viability analyses (see Factor E).

(59) Comment: Several commenters recommended that population data prior to 2001 be evaluated.

Our Response: In the 2010 12-month finding we relied on population data over the past decade to quantitatively assess recent trends (75 FR 59808, September

28, 2010). The starting point of 2001 was also used for trend analysis in the 2013 proposed rule (78 FR 2491, January 11, 2013). In this final listing rule, we analyzed population estimates over a longer period, based on lek count data from 1996–2013. Similar to our previous analysis, the long-term data indicates that despite slight increases in the past several years, the satellite populations have declined overall, with the possible exception of the Cerro Summit-Cimarron-Sims Mesa population, which appears stable to increasing at this time.

(60) Comment: Some commenters stated that there are too many caveats in the rangewide conservation plan to rely on it for distribution and abundance information.

Our Response: The current distribution of the Gunnison sage-grouse is thought to be well understood, based on several decades of surveys and data. Although not conclusive, CPW aerial surveys during 2013 found no new leks or occupied areas. Nevertheless, current distribution and abundance data are estimates due to adverse weather, access, and survey error. Earlier data is further compromised by the use of incomplete museum records and historical accounts, as well as varying methodologies and survey intensities. Pre-settlement data is by necessity an extrapolation based on species accounts and the likely distribution of suitable habitat. This is the best available information, and forms the basis of historical and current distribution and abundance information, as presented in this final rule.

(61) Comment: Some commenters asserted that the Gunnison sage-grouse is not a separate species from greater sage-grouse.

Our Response: Gunnison sage-grouse and greater sage-grouse were recognized as separate species in 2000 based on morphological, genetic, and behavioral differences, and geographical isolation. Consequently, the American Ornithologist's Union accepted the Gunnison sage-grouse as a distinct species. Due to the several lines of evidence separating the two species, we determined in our 2010 12-month finding that the best available information indicates that the Gunnison sage-grouse is a valid taxonomic species and a listable entity under the Act (75 FR 59804, September 28, 2010).

(62) Comment: Several commenters stated that habitat fragmentation and degradation are the main reasons for a steep decline in Gunnison sage-grouse abundance. One commenter asserted that we overestimated the impact from fragmentation, and another commenter asserted that habitat has not been lost or fragmented in the past 50 years.

Our Response: Habitat loss and fragmentation are recognized as primary causes of the decline in abundance and distribution of sage-grouse across western North America (Rogers 1964, pp. 13-24; Braun 1998, entire; Schroeder *et al.* 2004, p. 371), and in Gunnison sage-grouse across its former range (Oyler-McCance *et al.* 2001, p. 330; GSRSC 2005, p. 149; Wisdom *et al.* 2011, pp. 465-469). Gunnison sage-grouse depend on sagebrush for their survival and persistence, and the historical and current distribution of the Gunnison sage-grouse closely matches that of sagebrush (Patterson 1952, p. 9; Braun 1987, p. 1; Schroeder *et al.* 2004, p. 364, and references therein). Current and future threats described under Factor A of this final rule will further contribute to habitat loss and decline and, based on historical and current population trends, a continued decline in the abundance of Gunnison sage-grouse across its range.

(63) Comment: One commenter noted that there has been no chick survival in the Miramonte area of the San Miguel population.

Our Response: Although sample size in a study of the San Miguel Basin (Miramonte subpopulation) was small (eight chicks were studied), no chicks survived to 30 days of age, meaning no recruitment (survival of bird from hatching to breeding age) occurred over a 4-year period (Davis 2012, p. 37). We provide this information in this final rule (see Predation; and Davis Population Viability Analysis sections).

(64) Comment: Some commenters noted that the bio-geographical characteristics of the upper Gunnison Basin differ markedly from the lower Gunnison Basin.

Our Response: There is wide habitat variation within and between all of the Gunnison sage-grouse populations. We presume this comment is directed to the idea of population redundancy in the Gunnison Basin. This topic is discussed in Factor E, Small Population Size and Structure, of this final rule.

(65) Comment: One commenter stated that there is no data indicating the Dove Creek population was within the historical range of the Gunnison sage-grouse prior to introducing the species to this area in 2010 and 2011.

Our Response: CPW began collecting lek count data from Dove Creek in 1993, which predates efforts to augment that population. Dove Creek is included in historical, recent, and current descriptions of the species' range (Schroeder *et al.* 2004, pp. 368–371). The 2006 not warranted finding described the Dove Creek subpopulation as ranging from 10–358 birds from 1995–2005 (71 FR 19957–19961, April 18, 2006).

(66) Comment: One commenter stated that the Dove Creek population declined following the 2002–2003 drought and has not yet rebounded.

Our Response: Drought conditions from 1999 through about 2003 (with residual effects lasting through about 2005) were closely associated with reductions in the sizes of all populations (CDOW 2009b, entire; CPW 2013c, p. 9) (see Figures 2 and 3 in this final rule) and lower nest success (CPW 2013c, p. 2). To date, several of the smaller satellite populations have not rebounded from declines around that time (see Figure 3 in this final rule).

(67) Comment: Some commenters stated that conversion to cropland has not fragmented sagebrush habitat in the past 20–30 years.

Our Response: As stated in this final rule (Factor A, Agricultural Conversion), except in Gunnison County, the total area of harvested cropland has declined over the past two decades in all counties within the occupied range of Gunnison sage-grouse (USDA NASS 2010, entire). Further, the majority of agricultural land use in Gunnison County is in hay production, and this has also declined over the past two decades (USDA NASS 2010, p. 1). We do not have any information to predict changes in the amount of land devoted to agricultural purposes. However, because of this long-term trend in reduced land area devoted to agriculture, we do not expect a significant amount of Gunnison sage-grouse habitat to be converted to agricultural purposes in the future.

(68) Comment: Some commenters stated that there are no new road projects; therefore, roads have not increased fragmentation.

Our Response: Roads of all kinds can impact Gunnison sage-grouse through direct loss of habitat, mortality from collisions, habitat fragmentation, and habitat degradation. Existing roads will continue to require maintenance, and usage may increase due to increases in recreational activities or in the human population. We discuss roads under Factor A in this final rule.

(69) Comment: Several commenters stated that grazing minimizes fragmentation by preventing development, conversion to cropland, and loss of water rights.

Our Response: We agree that livestock grazing operations generally result in less habitat fragmentation than alternatives such as residential development, conversion to cropland, mineral and fossil fuel extraction, or road construction.

(70) Comment: Two commenters noted that ranches are no longer being subdivided; therefore, fragmentation due to this factor is not occurring.

Our Response: Exurban development and subdivision of ranches likely slowed during the recent economic downturn. However, it still occurs, particularly in the Piñon Mesa and Gunnison Basin populations, and we expect it to continue into the future in some areas. We discuss this issue in this final rule (see Factor A, Residential Development).

(71) Comment: Some commenters asserted that the conclusion that large blocks of sagebrush habitat are needed by Gunnison sage-grouse is in error because it is based on greater sage-grouse research. Other commenters stated that not all sagebrush habitat will support Gunnison sage-grouse.

Our Response: With regard to the first comment, references cited in the proposed and final rules regarding the need for large expanses of sagebrush sometimes pertain to greater sage-grouse, but also include references specific to Gunnison sage-grouse. References specific to Gunnison sage-grouse that discuss the need for large blocks of sagebrush habitat include Oyler-McCance *et al.* (2001, pp. 327–330), Wisdom *et al.* (2011, p. 451), and Baker (2013, p. 8). Regarding the second comment, we agree that not all sagebrush habitat will support Gunnison sage-grouse. Much sagebrush habitat is outside the current range of the species or is in patches that are too small in size and are fragmented, and some sagebrush habitat does not contain the physical and biological features necessary to sustain the species.

(72) Comment: One commenter stated that Blue Mesa Reservoir resulted in the largest habitat fragmentation in Gunnison County.

Our Response: Our proposed rule noted the potential impacts of development of a large irrigation project, but it was not clear that we were referring to Blue Mesa Reservoir. As clarified in this final rule (see Factor A, Large Scale Water Development), development of Blue Mesa Reservoir in 1965 in the Gunnison Basin flooded an estimated 3,700 ha (9,200 ac), or 1.5 percent of potential habitat for Gunnison sage-grouse in the Gunnison Basin (McCall 2005, pers. comm.), and according to Gunnison County (2013a, p. 124), at least one known lek. Based on the size and location of Blue Mesa Reservoir, we presume that habitat connectivity and dispersal of birds between the Gunnison Basin population and satellite populations to the west were impacted.

(73) Comment: One commenter noted that mountain shrub habitat is used by the Gunnison sage-grouse and therefore, mountain shrub should not be lumped in with piñon-juniper (*Pinus edulis-Juniperus* spp.) habitat.

Our Response: We agree that some deciduous shrub communities (primarily Gambel oak and serviceberry) are used seasonally by Gunnison sage-grouse (Young *et al.* 2000, p. 451). See discussion under Factor A, Piñon-Juniper Encroachment.

(74) Comment: Several commenters asserted that Gunnison sage-grouse numbers were highest during a period of higher livestock grazing, and that there is no negative correlation between grazing intensity and Gunnison sage-grouse numbers. Other commenters noted either improvement or degradation of habitat associated with livestock grazing. One commenter asked what we consider to be a proper grazing regime.

Our Response: Excessive grazing by domestic livestock during the late 1800s and early 1900s, along with severe drought, significantly impacted sagebrush ecosystems (Knick *et al.* 2003, p. 616). Overgrazing by livestock was cited as one of several contributing factors in the early loss and deterioration of sagebrush range in the region (Rogers 1964, p. 13). Historical accounts indicate that overgrazing of sagebrush range in Colorado began around 1875. Overgrazing was apparently at its worst in the early 1900s and continued until the BLM was organized in 1934 (Rogers 1964, p. 13). Around 1910, a gradual but marked decline in sage-grouse numbers and distribution in Colorado had begun (Rogers 1964, pp. 20-22). This information indicates that historical livestock grazing practices and overgrazing were a contributing factor in the early loss and degradation of sagebrush habitats and initial declines in sage-grouse numbers and distribution. Although current livestock stocking rates in the range of Gunnison sage-grouse are lower than historical levels (Laycock *et al.* 1996, p. 3), long-term effects from historical overgrazing, including changes in plant communities and soils, persist today (Knick *et al.* 2003, p. 116). In addition, widespread use of water developments across the West has since increased livestock access to sagebrush habitats, and so even reduced numbers of livestock still pose impacts (Connelly 2004, pp. 7-33, 7-35, 7-92). We know that grazing can have negative impacts to sagebrush and consequently to Gunnison sage-grouse at local scales. Grazing inconsistent with local ecological conditions is occurring over a large portion of the range of the species. Habitat degradation that can result from grazing practices inconsistent with local ecological conditions, particularly with the interacting factors of invasive weed expansion and climate change, is a threat to Gunnison sage-grouse persistence. See Factor A, Domestic Grazing and Wild Ungulate Herbivory.

(75) Comment: Several commenters stated that Gunnison sage-grouse chicks depend on insects in cattle manure.

Our Response: Anecdotal reports and opinion papers (Brunner 2006, p. 16; Gunnison County 2013a, p. 95) have suggested that cattle manure attracts and supports insect populations upon which sage-grouse depend for survival, and that sage-grouse “follow” cattle through pastures. However, there is no evidence to support this theory. Further, there are no data to substantiate the idea that in sagebrush areas not actively grazed by livestock, sage-grouse are limited in some way (Connelly *et al.* 2007, p. 37). This topic is discussed in Factor A of this final rule (see Factor A, Domestic Grazing and Wild Ungulate Herbivory.).

(76) Comment: Several commenters expressed differing opinions on whether livestock grazing reduces or increases the risk of catastrophic fire.

Our Response: We know that livestock grazing influences fire ecology in sage-grouse habitat. However, due to the spatial complexity of fire in sagebrush ecosystems (Crawford *et al.* 2004, p. 7), and the numerous factors that determine the effects of grazing on sagebrush habitats, the effects of grazing on sage-grouse by altering fire regimes likely vary widely across time and space. This topic is discussed in detail in Factor A, Domestic Grazing and Wild Ungulate Herbivory, of this final rule.

(77) Comment: Several commenters asked what has changed from 2006, when the Service concluded that grazing was not a threat, to 2013, when the Service concluded that grazing was a threat.

Our Response: Both the 2006 not warranted determination (71 FR 19954, April 18, 2006) and the 2013 proposed rule to list the species (78 FR 2486, January 11, 2013) presented similar observations:

- Excessive grazing by domestic livestock during the late 1800s and early 1900s, along with severe drought, significantly affected sagebrush ecosystems, causing long-term impacts that persist today.

- Although we know that historical livestock grazing practices and overgrazing were a contributing factor in the early loss and degradation of sagebrush habitats and initial declines in sage-grouse numbers and distribution, the correlation between historical grazing and reduced sage-grouse numbers is not exact.

- Habitat manipulations to improve livestock forage, such as sagebrush removal, can affect sage-grouse habitat.

In 2006, we concluded that there was insufficient data to demonstrate that current grazing was a rangewide threat to the species. In 2013, several new references related to grazing were available for consideration (Coates 2007, Hagen *et al.* 2007, Aldridge *et al.* 2008, France *et al.* 2008, BLM 2008, BLM 2009a, Gunnison County Stockgrowers 2009, Knick *et al.* 2011, Pyke 2011, Williams and Hild 2011, BLM 2012a). Our conclusion in 2013 was that habitat degradation can result from improperly managed grazing, and, particularly with the interacting factors of invasive weed expansion and climate change, is a threat to Gunnison sage-grouse persistence. Climate change was not included as a factor in 2006, but in 2013 we stated that climate change is likely to become an increasingly important threat to the persistence of Gunnison sage-grouse. We also noted in our 2013 proposed rule that livestock grazing can cause local impacts, but population-level impacts are unlikely. We make the same conclusions in this final rule (see Factor A, Domestic Grazing and Wild Ungulate Herbivory).

(78) Comment: Some commenters stated that wildlife herbivory needs to be addressed.

Our Response: In the proposed and final rules, we discuss wild ungulate herbivory. It occurs throughout the range of the Gunnison sage-grouse, and there are instances of overgrazing by wild ungulates on a local level. In this final rule, we note that the effects of livestock grazing are likely being exacerbated by browsing of woody species by wild ungulates in portions of the Gunnison Basin and the Crawford area (see Factor A, Domestic Grazing and Wild Ungulate Herbivory).

(79) Comment: One commenter noted that very little private or public land in Dolores County is grazed.

Our Response: More than 81 percent of lands in Dove Creek are privately owned. We do not have information regarding what percentage of private lands occupied by Gunnison sage-grouse in Dolores County is grazed.

(80) Comment: One commenter suggested that grazing should be reduced or eliminated on public lands.

Our Response: Properly managed livestock grazing is not likely to impact Gunnison sage-grouse such that it threatens populations or the species. The BLM and USFS manage grazing allotments on their lands, and currently consider conservation of Gunnison sage-grouse on many of their allotments. Allotments occur on approximately 292,000 ha (720,000 ac) or 77 percent of occupied habitat (Industrial Economics, Inc. 2013, p. 3-1). Stocking rates have declined significantly in recent years. Both agencies have designated the Gunnison sage-grouse as a “Sensitive Species.” This designation requires the BLM and the USFS to address the species in their RMPs, and their Land and Resource Management Plans (LRMPs), respectively. Management actions in these plans include changes to seasons of use, AUM reductions, rotational grazing, and other changes to grazing management practices. When the Gunnison sage-grouse is listed, actions on allotments that might affect the species will require ESA section 7 consultations under the Act in all areas occupied by the species. Section 9 prohibitions against “take” will also apply.

(81) Comment: Several commenters asserted that invasive plants such as cheatgrass and piñon-juniper are not a proven threat to Gunnison sage-grouse; they have only been proven a threat with greater sage-grouse. One commenter noted that cheatgrass has

increased within the Gunnison sage-grouse range and is a major threat in the Gunnison Basin.

Our Response: Cheatgrass can shorten fire intervals in sagebrush communities. Piñon-juniper encroachment is potential evidence of extended fire intervals. Either change in fire intervals can adversely impact habitat for the Gunnison sage-grouse by reducing sagebrush cover. Based on what is known about the effects of cheatgrass and piñon-juniper on greater sage-grouse, it is reasonable to infer their expansion has similar effects on Gunnison sage-grouse. In this final rule we conclude that neither invasive weeds nor piñon-juniper encroachment are substantial threats to Gunnison sage-grouse at this time, due to their limited extent; however, they are potential future threats (see Factor A, Invasive Plants and Piñon-Juniper Encroachment).

(82) Comment: Several commenters stated that drought is causing a decline in Gunnison sage-grouse numbers; conversely, one commenter stated that drought is not a threat. Several commenters also stated that the Monticello-Dove Creek area has degraded Gunnison sage-grouse habitat due to climate change and drought.

Our Response: The proposed rule to list the species stated that it is too speculative to conclude that drought alone is a threat to the species at this time; however, based on rapid species decline in drought years, it is likely that drought exacerbates other known threats and thus can negatively affect the species.

Drought and associated effects are discussed further in Factors A and E and Cumulative Effects From Factors A through E of this rule.

(83) Comment: Several commenters stated that prescribed fire creates a desirable habitat mosaic, but may also cause a short-term decline in sagebrush.

Our Response: In Factor A (Fire) of the proposed and final rules we state that in mesic areas used for brood-rearing, small fires may maintain a suitable habitat mosaic by reducing shrub encroachment and encouraging understory growth. However, without available sagebrush cover nearby, the utility of these sites is questionable.

(84) Comment: Some commenters asserted that climate change is not a threat because it will not occur within the foreseeable future.

Our Response: Climate change is ongoing and cumulative. The proposed and final rules conclude that climate change is not a threat to the Gunnison sage-grouse at this time, but is likely to become a threat to the persistence of the species over the next 40 years. The Gunnison sage-grouse was found to be "highly vulnerable" to climate change in the Gunnison Basin (TNC *et al.* 2011, p. 48).

(85) Comment: Some commenters noted that fire suppression and reduced fire frequency due to grazing have caused piñon-juniper encroachment into sagebrush habitat.

Our Response: Piñon-juniper encroachment has been attributed to the reduced role of fire, the introduction of livestock grazing, increases in global carbon dioxide concentrations, climate change, and natural recovery from past disturbance. Most Gunnison sage-grouse population areas are experiencing low to moderate levels of piñon-juniper encroachment, although considerable encroachment has occurred at Piñon Mesa (see Factor A, Piñon-Juniper Encroachment in All Population Areas). We discuss the relationship between fire and piñon-juniper encroachment in this final rule (see Factor A, Fire and Piñon-Juniper Encroachment).

(86) Comment: Some commenters noted that the historical fire rotation was 178–357 years in Wyoming big sagebrush (*A. t. wyomingensis*) and 90–143 years in mountain big sagebrush; these rotation intervals may or may not be changing.

Our Response: These time periods are from Bukowski and Baker (2013, p. 5). The authors concluded that fire size, rate of burning, and severity may be changing due to land-use changes, fire exclusion, and invasive species such as cheatgrass. Crawford *et al.* (2004, p. 2) stated that fire ecology changed dramatically with European settlement. In high elevation sagebrush habitat, fire return intervals increased from 12–24 years to more than 50 years, resulting in invasion of conifers and a resulting loss in shrubs and herbaceous understory; at lower elevations, fire return intervals decreased dramatically from 50–100 years to less than 10 years due to invasion by annual grasses. TNC *et al.* (2011, p. 12) predicted a trend of higher fire frequency and severity in the Gunnison Basin due to climate change.

(87) Comment: Two commenters noted that drought has encouraged invasive plants.

Our Response: Drought can increase the likelihood of some invasive plants such as cheatgrass out-competing native perennials. The potential effects of drought and invasive plants on Gunnison sage-grouse and its habitat are further described in Factors A (Invasive Plants) and E (Drought) of this final rule.

(88) Comment: One commenter stated that climate change is adversely affecting Gunnison sage-grouse, but it cannot be mitigated by the Service.

Our Response: The Service can do little to avert climate change; however, actions can be taken to minimize specific impacts and improve the resiliency of species in the face of climate change. For example, the preferred Gunnison sage-grouse habitat for early brood-rearing includes riparian areas and wet meadows near sagebrush that provide the insects and forbs essential for chick survival. These habitat types are highly vulnerable to impacts from climate change and have been seriously degraded, but management actions can be taken to maintain and restore these important habitats (TNC *et al.* 2011, p. H-9–10).

(89) Comment: One commenter stated that if there are similar trends in Gunnison sage-grouse populations separated by long distances, the driver could be climate change.

Our Response: This hypothesis is plausible, although there is no evidence to support this hypothesis. This final rule discusses the potential impacts of climate change and drought in Factors A (Climate change) and E (Drought), and the associated effects on Gunnison sage-grouse.

(90) Comment: Several commenters stated that predator numbers have increased and are likely a threat to the Gunnison sage-grouse.

Our Response: Predator populations can increase as a result of habitat fragmentation and degradation, causing otherwise suitable habitat to become a population sink for sage-grouse. The best available information indicates that, as we stated in our proposed rule, predation is a current and future threat to the species, particularly in the satellite populations Predation is discussed further under Factor C in this final rule.

(91) Comment: Several commenters suggested that predator levels could be managed to relieve the threat from predation.

Our Response: Predator removal efforts sometimes result in short-term population gains for sage-grouse, but predator numbers quickly rebound without continual control (Hagen 2011, p. 99). Predation may be limiting some of the smaller populations of Gunnison sage-grouse, and in those cases predator control efforts may be appropriate. The best available information indicates that, as we stated in our proposed rule, predation is a current and future threat to the species, particularly in the satellite populations. While predation likely acts as a threat in localized areas across the range of the species, the stability of the Gunnison Basin population over the last 19 years indicates that predation is not having a significant impact on that population. We believe, however, that the effects of predation are more pronounced in the satellite populations. Given the stability of the Gunnison Basin population, we do not believe that the magnitude of this threat is significant at the rangewide level.While predation is a threat rangewide, we believe that the effects of predation are localized and more pronounced in the satellite populations, and therefore we do not believe that the magnitude of this threat is significant (see Factor C, Predation).

(92) Comment: Some commenters recommended that we reevaluate our conclusions regarding nest depredation by elk (*Cervus canadensis*) and cattle.

Our Response: The proposed and final rules document that livestock can trample nests, either destroying eggs or causing abandonment by hens. We also cite references that list several species of nest predators, including elk and domestic cows (see Factor C). However, the best available information indicates that nest predation by livestock and elk has negligible impacts on Gunnison sage-grouse at the population level (See Factor C, Predation).

(93) Comment: Some commenters noted that many predators of Gunnison sage-grouse are protected and cannot be controlled.

Our Response: Migratory birds such as raptors are protected under the Migratory Bird Treaty Act (16 U.S.C. 703–712). Take of these species requires a Federal permit. However, most mammalian predators of Gunnison sage-grouse and some birds may be controlled. Nevertheless, predator control efforts will likely only be effective under special circumstances (see our response to comment 48).

(94) Comment: Some commenters believed that raptor concentrations associated with powerlines are not evidence of increased predation on Gunnison sage-grouse, and that perch deterrents are not successful over the long-term. One commenter provided a paper that summarized studies regarding sage-grouse and powerlines (EDM International, Inc. 2011).

Our Response: In the proposed and final rules, we present numerous peer-reviewed studies that have demonstrated an increase in corvids and raptors associated with powerlines and transmission lines, which we infer could logically lead to increased predation of sage-grouse. We discuss these topics further under

Factors A (Powerlines) and E (Predation) in this final rule.

(95) Comment: Some commenters suggested that the risk from the parasite *Tryptmosoma cruzi* and the encephalitis virus should be investigated.

Our Response: In Factor C of this final rule we evaluate the best available information on diseases in Gunnison sage-grouse and greater sage-grouse, including West Nile virus, an encephalitis virus lethal to greater sage-grouse and other gallinaceous birds. We also discuss other pathogens potentially relevant to Gunnison sage-grouse, based on data provided by CPW. We are not aware of other scientific information related to disease in Gunnison sage-grouse. To our knowledge, *Tryptmosoma cruzi* is a disease endemic to Latin America and does not pose a threat to sage-grouse.

(96) Comment: Some commenters stated that there is no evidence that disease is currently a threat. One commenter noted that there is a low abundance of the mosquito species that are known vectors of West Nile virus, and all mosquitos and Gunnison sage-grouse sampled by CPW tested negative.

Our Response: In the proposed rule, we determined that West Nile virus is a potential future threat, but it, and other diseases and parasitic infections, were not considered a current threat. We received comments from the scientific community expressing concern with this conclusion, particularly in regard to

West Nile virus, based on the following information: To date, West Nile virus has not been documented in Gunnison sage-grouse, but is present in all counties throughout the species' range (USGS 2013, entire). Walker and Naugle (2011, p. 140) predicted that West Nile virus outbreaks in small, isolated, and genetically depauperate populations could reduce sage-grouse numbers below a threshold from which recovery is unlikely because of limited or nonexistent demographic and genetic exchange from adjacent populations. Therefore, a West Nile virus outbreak in any Gunnison sage-grouse population, except perhaps the Gunnison Basin population, could limit the persistence of that population. This information is discussed further in Factor C of this final rule.

(97) Comment: One commenter stated that Sovada *et al.* (1995) does not support the assertion that red fox and corvid populations are increasing.

Our Response: We removed this citation from the final rule, because the study is not relevant to our analysis. Our proposed rule, in error, stated that Sovada *et al.* (1995, p. 5) found that "red fox and corvids, which historically were rare in the sagebrush landscape, have increased in association with human altered landscapes." However, the author only speculated that abundance of these species had increased in sagebrush habitats over time. In this final rule, we discuss how anthropogenic pressures can influence the diversity and density of predators based on other studies (see Factor C).

(98) Comment: One commenter stated that predation threats to Gunnison sage-grouse cannot be presumed to be similar to predation threats to greater sage-grouse.

Our Response: In the proposed and final rules, we use the best available scientific and commercial data. We also note that we use information specific to the Gunnison sage-grouse where available but still applied scientific management principles for greater sage-grouse that are relevant to Gunnison sage-grouse management needs and strategies.

(99) Comment: One commenter asserted that the threat of predation by raptors is exaggerated.

Our Response: The proposed and final rules state that predation is the most commonly identified cause of direct mortality for Gunnison sage-grouse during all life stages and discuss common predators of adults, juveniles, and eggs. We also present information from scientific studies that demonstrate the potential impact of raptor predation on sage-grouse (see Factor C, Predation).

(100) Comment: One commenter noted that in Dolores County at least one person has contracted West Nile virus, and a significant number of dead birds have been found.

Our Response: The proposed rule to list the species stated that there have been no confirmed avian mortalities from West Nile virus in San Miguel, Dolores, and

Hinsdale Counties (78 FR 2519, January 11, 2013). For updates in the final rule, we revisited records from the Centers for Disease Control (USGS 2013, entire) for West Nile reports in Colorado and Utah. Those records indicate that a total of 84 dead wild birds (species other than Gunnison sage-grouse) infected by West Nile virus have been reported from nine counties within the current range of the Gunnison sage-grouse since 2002, when reporting began in Colorado and Utah. In this final rule we conclude that West Nile virus is a future threat to Gunnison sage-grouse (see Factor C).

(101) Comment: Several commenters stated that conservation easements, CCAs, and CCAAs protect Gunnison sage-grouse, either directly or through protection of sagebrush habitat. Varying estimates of lands under conservation easements were provided, with most commenters citing the properties and acreages identified in Lohr and Gray (2013). Other commenters provided estimates of lands enrolled in the CCAA. Another commenter noted that 17.4 percent of all private lands in both occupied and unoccupied proposed critical habitat are protected through either conservation easements or CCAAs. Since 1995, a commenter reported, private landowners, local, and State expenditures towards Gunnison sage-grouse conservation exceed $31 million.

Our Response: We applaud these efforts towards Gunnison sage-grouse conservation. Continuation of conservation efforts across the species' range will be necessary for conservation and recovery of the species. Conservation easements and CCAAs provide some level of protection for the species from future development on enrolled lands. In this final rule, we add information provided in Lohr and Gray (2013), update estimates for lands enrolled in CCAAs and conservation easements, and consider these conservation efforts in our listing decision as appropriate (see Factors A and D).

(102) Comment: Several commenters asserted that the current regulations are either adequate or inadequate to address threats to the Gunnison sage-grouse.

Our Response: There have been major strides in improving regulations to protect Gunnison sage-grouse and its habitat. Examples include Gunnison and Montrose County regulations for land use permitting in occupied habitat. Nonetheless, for the reasons stated in Factor D of this rule, existing regulatory mechanisms currently do not fully address the threat of habitat decline caused by human development in the species range. In addition, under the Act, the adequacy or inadequacy of regulatory mechanisms is just one of several factors upon which our determination to list a species must be based. As described in the proposed and final rules, there are multiple other threats contributing to the species' decline rangewide. Therefore, even the most protective local regulations may be insufficient to address all threats to the species, or halt recent declines in many of the populations, such that protection of the species under the Act is not warranted. In Factor D of this final rule, we evaluate the best available information related to existing regulatory mechanisms that address threats to Gunnison sage-grouse and its habitat (Factors A through C, and E)..

(103) Comment: Several commenters stated that the Service should discuss existing land use policies and regulatory mechanisms with local governments.

Our Response: The Service has been engaged with Federal agencies, the States of Colorado and Utah, the Ute Mountain Ute Tribe, affected counties, and other interested parties throughout the listing process via letters, emails, telephone calls, meetings, and other means. Verbal and written comments have been carefully considered and in many instances incorporated into this final rule.

(104) Comment: Some commenters noted that resources on private lands are not managed to a lesser standard than resources on Federal lands.

Our Response: These comments may have been referring to our assessment of private lands in the grazing section of the proposed rule. In this final rule (see Factor A, Domestic Grazing and Wild Ungulate Herbivory), we revise our language to state that we have more limited information on the extent of grazing, management, and habitat conditions on non-Federal lands. Although Federal land and livestock grazing may be more regulated, we cannot make any generalizations about how habitat conditions in those areas might compare with private lands where livestock grazing occurs. We note, however, that grazing allotments containing both Federal and private lands are, in some cases, managed to meet BLM land health standards through coordination and cooperation with grazing permittees (BLM 2013c, p. 1-2).

(105) Comment: Some commenters noted that as a designated "sensitive species" the BLM must address Gunnison sage-grouse conservation in their Resource Management Plans and associated activity plans.

Our Response: We acknowledge that the commenter is correct (see Factor D, Federal Laws and Regulations).

(106) Comment: Some commenters stated that the COGCC protects wildlife resources and their habitat.

Our Response: The COGCC implements several environmental regulations that provide protection to the Gunnison sage-grouse and its habitat. These regulations generally apply to both Federal and private lands, although they may conflict with Federal regulations in some cases. The COGCC classifies all Gunnison sage-grouse occupied habitat as "Sensitive Wildlife Habitat" that requires operators to: (1) consult with CPW to evaluate options for minimizing adverse habitat impacts, (2) educate employees and contractors on conservation practices, (3) consolidate new facilities to minimize disturbance, (4) control road access and limit traffic, and (5) monitor wells remotely when possible. The COGCC also designates lek areas as "Restricted Surface Occupancy Areas" that requires operators to: (1) comply with all requirements for "Sensitive Wildlife Habitat" and (2) avoid all new ground-disturbing activities if feasible. The COGCC does not require these protections in unoccupied habitat (COGCC 2014). We discuss COGCC regulations in this final rule (see Factor D, State Laws and Regulations).

(107) Comment: Some commenters noted that parcels of 35 ac (14 ha) or more are not exempted from State or county oversight.

Our Response: We include this information in this final rule, and acknowledge that counties have regulatory controls applicable to plus-35 acre development and projects (see Factor D, Local Laws and Regulations).

(108) Comment: Some commenters suggested that a PECE analysis should be conducted.

Our Response: Our Policy for Evaluation of Conservation Efforts (PECE) is used by the Service when making listing decisions under the Act. It established criteria for determining when we can consider in our listing determination future formalized conservation efforts that have not yet been implemented, or have been implemented, but have not yet demonstrated whether they are effective at the time of the listing decision. Numerous conservation actions have already been implemented for Gunnison sage-grouse, and these efforts have provided and will continue to provide conservation benefit to the species. These implemented efforts are considered in the appropriate section of this rule. Additionally, there are recently formalized future conservation efforts that intend to provide conservation benefits to the Gunnison sage-grouse; some of which have not been fully implemented or shown to be effective. A PECE analysis was conducted by the Service for these conservation efforts that are too recent to have demonstrated effectiveness as of this listing determination. This is described further under Conservation Programs and Efforts Related to Habitat Conservation. Efforts that are considered regulatory are considered under Factor D of this rule.

(109) Comment: Two commenters stated that the BLM and USFS must modify all existing leases and permit allotments in Gunnison sage-grouse habitat to incorporate enforceable terms and conditions to protect the species.

Our Response: Current BLM RMPs and USFS LRMPs provide some regulatory protection for the species. Changes to grazing allotment management have occurred, consistent with existing RMPs, over the past 10 years as permits have been revised or renewed. The extent to which appropriate measures to reduce or eliminate other threats to the species have been incorporated into planning documents or are being implemented, varies across the species' range and will likely continue to evolve as a result of BLM's on-going revision of several RMPs in the species' range and its planned landscape-level, targeted RMP amendments for the conservation of Gunnison sage-grouse on BLM-administered public lands in Colorado and Utah (see Factor D, Federal Laws and Regulations).

(110) Comment: Some commenters noted that although conservation easements are voluntary, they are legally binding once they have been recorded; therefore, they may offer regulatory protection. One commenter stated that voluntary conservation measures

do not constitute adequate regulatory mechanisms if they are not enforceable and are not rangewide.

Our Response: We consider conservation easements to be an effective regulatory tool for the conservation of Gunnison sage-grouse, to the extent that they permanently limit or restrict land uses for identified conservation values and purposes and prevent long-term or permanent habitat loss (see Factor D, Other Regulatory Mechanisms: Conservation Easements). Other conservation efforts such as the CCA and CCAA are not considered regulatory mechanisms; and are therefore evaluated in Factor A, Conservation Programs and Efforts Related to Habitat Protection.

(111) Comment: One commenter suggested that the Land and Water Conservation Fund could be used to acquire Gunnison sage-grouse habitat.

Our Response: We agree that this would be a reasonable expenditure for the Land and Water Conservation Fund. However, there is a backlog of Federal land acquisition needs, estimated at more than $30 billion, which could impede timely use of the Fund for this purpose.

(112) Comment: One commenter asserted that conservation agreements are a violation of Federal and State constitutions.

Our Response: Conservation agreements have been successfully used by Federal and State agencies for several years to improve the status of many wildlife species and their habitats; we are not aware of any instances where they have been found to be unconstitutional, nor do we have any reason to believe that they are unconstitutional.

(113) Comment: Several commenters stated that oil and gas companies may cease operations if the Gunnison sage-grouse is listed or critical habitat is designated for the species. Some commenters asserted that they have been unable to lease their mineral rights as a result of the anticipated listing of the species. Several commenters also noted that a large percentage of county revenues in Dolores and Montezuma Counties are from oil and gas activities.

Our Response: While restrictions may be placed on various types of development that are subject to consultation under section 7 of the Act (on Federal lands or with Federal permitting or funding), the Service does not intend to preclude mineral or fossil fuel extraction as a result of listing or designating critical habitat. As noted in our response to comment 106, the COGCC implements several environmental regulations on both Federal and private lands that provide some protection to the Gunnison sage-grouse and occupied habitat. The BLM generally requires conservation measures on leases it issues. We may also seek project modifications during section 7 consultations to benefit Gunnison sage-grouse.

(114) Comment: Some commenters suggested that wind energy development should be allowed to proceed.

Our Response: The Endangered Species Act contains provisions to allow development projects to go forward even if they are within critical habitat or could result in take of a listed species, if those projects are done in accordance with sections 7 and 10 of the Act. For a discussion of wind energy development as a threat to the species, see discussion of Renewable Energy Development in Factor A.

(115) Comment: Some commenters expressed concern that potash mining in Gunnison sage-grouse habitat may cease operations if the species is listed or critical habitat designated. RM Potash expressed concerns that listing may delay their project (Thorson 2013).

Our Response: Potash exploration is planned on BLM lands within Gunnison sage-grouse unoccupied habitat in San Miguel and Dolores Counties. The BLM requires operators to adopt conservation efforts specified in the RMP for this area. These conservation efforts are required with or without listing the species under the Act. When the species is listed and critical habitat is designated, section 7 consultation will also be required. The amount of time necessary to complete a section 7 consultation will vary depending on the complexity of the project and the anticipated level of impacts to the species. In this final rule we consider the development of leasable minerals such as potash a low threat to the species (see Factor A, Mineral Development).

(116) Comment: Two commenters stated that oil and gas development threatens some Gunnison sage-grouse populations in San Miguel County.

Our Response: Approximately 13 percent of occupied habitat within the San Miguel Basin population has authorized Federal leases for oil and gas development; production is currently occurring on approximately five percent of this lease area. Currently, 25 gas wells are active within occupied habitat and 18 additional active wells are immediately adjacent to occupied habitat. All of these wells are in or near the Dry Creek subpopulation. In this final rule we consider the development of leasable minerals such as oil and gas a low threat to the species (see Factor A, Mineral Development).

(117) Comment: Two commenters suggested that energy companies could contribute money for Gunnison sage-grouse conservation.

Our Response: Energy companies that pursue development in Gunnison sage-grouse habitat must follow stipulations provided in the applicable BLM RMP (if Federal minerals are involved) and comply with applicable COGCC regulations. The annual costs associated with required conservation efforts represent a contribution by energy companies.

(118) Comment: One commenter suggested that energy development is not a threat to the Gunnison sage-grouse because: (1) there is not adequate information to indicate that renewable energy development is a threat, and (2) impacts from non-renewable energy development are very localized.

Our Response: We do not consider renewable energy development to be a threat to the species at this time (see Factor A, Renewable Energy Development). As noted in our responses to comment 116, we consider the development of non-renewable energy (leasable minerals) a low threat to the species (see Factor A, Mineral Development).

(119) Comment: One commenter asked if power companies will be able to clear sagebrush under their power lines.

Our Response: The Endangered Species Act contains provisions to allow projects to go forward even if they are within habitat, critical habitat or could result in take of a listed species, if those projects are done in accordance with sections 7 and 10 of the Act. Listed species, both within and outside of critical habitat, are protected from take, which includes harming (e.g., shooting, killing, trapping, collecting) and harassing individual animals. Incidental take that may result from, but is not the purpose of, otherwise legal activities without a Federal nexus may be allowed with a permit available from the Service under section 10 of the Act.

Pursuant to section 7 of the Act, Federal agencies are also required to consult with the Service regarding any action authorized, funded, or carried out by the agency that may affect a listed species, both within and outside of critical habitat, to ensure that the Federal action does not jeopardize the existence of any listed species. Sagebrush clearing under power lines would likely need to be addressed, and effects minimized, through section 7 or 10 of the Act.

(120) Comment: One commenter suggested that leks in areas of energy development be relocated.

Our Response: Relocating leks is likely not in the best interest of the species. Sage-grouse often will continue to return to altered breeding habitats including leks, nesting areas, and early brood-rearing areas due to the species' strong site fidelity, despite past nesting or productivity failures (Rogers 1964, pp. 35–40; Wiens and Rotenberry 1985, p. 666; Young 1994, p. 42; Lyon 2000, p. 20; Connelly *et al.* 2004, pp. 3-4–3-6; Holloran and Anderson 2005, p. 747). Broad-scale characteristics within surrounding landscapes influence habitat selection, and adult Gunnison sage-grouse exhibit a high fidelity to all seasonal habitats, resulting in low adaptability to habitat changes. A study of greater sage-grouse concluded that strong site fidelity makes natural re-colonization slow and that anthropogenic translocations into areas with no resident populations are unlikely to succeed (Doherty 2008, pp. 80–81). We believe that this conclusion applies to the Gunnison sage-grouse as well because it exhibits similar site fidelity characteristics.

(121) Comment: One commenter stated that information regarding impacts from energy development is based on studies of greater sage-grouse rather than Gunnison sage-grouse.

Our Response: There is more information available specific to greater sage-grouse due to the fact that Gunnison sage-grouse was not recognized as a distinct species until 2000, which means only 14 years of species-specific research is potentially available. The greater sage-grouse also has a much broader range, with several states monitoring and managing the species. The life history and ecology of the two species are very similar, therefore, with minimal information available regarding impacts to Gunnison sage-grouse from energy development, it is reasonable to also consider impacts to greater sage-grouse from energy development when determining whether or not this development is a threat to the Gunnison sage-grouse. In this final rule we do not consider renewable energy development to be a current threat to the species rangewide; we consider non-renewable energy development to be a threat of low magnitude to Gunnison sage-grouse (see Factor A, Mineral Development and Renewable Energy Development).

(122) Comment: One commenter asserted that the Federal government has put an end to oil and gas drilling throughout the range of the Gunnison sage-grouse.

Our Response: Of approximately 22,000 ha (54,000 ac) leased by BLM within Gunnison sage-grouse habitat in Colorado, 38 percent are currently in production, with 67 active wells. In Utah, approximately 1,100 ha (2,700 ac) are leased within Gunnison sage-grouse habitat, with none currently in production. On non-Federal lands there are five active wells in Colorado and three active wells in Utah (Industrial Economics, Inc. 2013, p. 5-4). Since 2005, the BLM has temporarily withheld new oil and gas leases from sales throughout occupied Gunnison sage-grouse habitat in Colorado. However, leases can be sold on unoccupied habitat, and oil and gas development continues on private lands.

(123) Comment: Several commenters stated that voluntary conservation measures and local regulations should be fully considered.

Our Response: We agree. Local regulations and voluntary conservation measures such as conservation easements, CCAAs, and CCAs provide formal protection for the Gunnison sage-grouse. We recognize that such efforts contribute to the conservation of Gunnison sage-grouse. Under Factor D we evaluate whether threats to the Gunnison sage-grouse are adequately addressed by existing regulatory mechanisms, including local regulations, conservation easements, State regulations, and Federal regulations. CCAAs and CCAs are discussed under Factor A, Conservation Programs and Efforts Related to habitat Protection.

(124) Comment: Several commenters stated that the DPS analysis needs to be described in more detail for the seven Gunnison sage-grouse populations.

Our Response: The term "distinct population segment" (DPS) is included in the definition of species in Section 3(16) of the Act, which describes a DPS as any species of vertebrate fish or wildlife which interbreeds when mature. We have a policy that guides our consideration of DPS issues. In addition to full taxonomic species and subspecies, a DPS of any vertebrate species is eligible for consideration for purposes of listing, delisting, or reclassifying. The authority to list a DPS is to be used sparingly and only when the biological evidence indicates that such action is warranted. In order to be considered a DPS, a population must be both discrete and significant. If a population segment is discrete and significant, it can be evaluated with regard to whether it is endangered or threatened. This analysis is different from an SPR (Significant Portion of the Range) analysis. We considered the entire range of the Gunnison sage-grouse in our listing evaluation and found that it warranted listing throughout its range; therefore, there was no need to evaluate individual population segments for consideration as a DPS. In addition, we do not believe any biological evidence warrants the listing of any DPS.

(125) Comment: Several commenters stated that the proposed rules rely too much on the use of linguistically uncertain or vague wording to support their conclusions.

Our Response: Natural sciences, including wildlife biology, typically do not deal in absolutes. Studies seldom evaluate all members of a species or address all possible variables. Consequently, conclusions often include wording to address this uncertainty. Tools such as adaptive management can strengthen the decision-making process by incorporating new information and adjusting decisions accordingly. This has occurred with the Gunnison sage-grouse—as more information has become available, we have adjusted and refined our recommendations from the proposed to the final rule.

(126) Comment: One commenter stated that if a stressor is not a threat; the regulatory mechanisms associated with that stressor cannot be considered a threat.

Our Response: We agree. For example, if hunting is not considered a threat, then the regulations associated with hunting would not be considered inadequate. In other instances, it may not be possible to adequately address a threat through regulatory mechanisms (e.g., small population size, disease, climate change). We also recognize that regulatory mechanisms may help reduce impacts of a particular threat (e.g., residential development in Gunnison County), and yet not fully address this or other threats to the species.

(127) Comment: Two commenters asserted that tribal concerns have not been addressed.

Our Response: We have considered tribal concerns in this final rule. The Service underwent a Government to Government consultation with the Ute Mountain Ute Tribe regarding the Species Management Plan developed for the tribal-owned Pinecrest Ranch. This topic is discussed in detail in Factor A (Conservation Programs and Efforts) of this final rule.

> (128) Comment: Some commenters asserted that initial town hall meetings were not conducted properly because no public meetings were held in Montezuma County, there was a faulty sound system, too short of a time-frame for the meeting, poor coordination, and some comments were not recorded.

Our Response: No public meetings were held in Montezuma County because no critical habitat was proposed in that county, nor is the species known to occur in that area. We apologize to anyone who experienced difficulties in hearing the discussions, did not feel that adequate time was provided, or felt there was poor coordination between the Service and local governments. In November, 2013, additional public hearings were held in Gunnison and Montrose, Colorado; and in Monticello, Utah to ensure that we provided adequate opportunity for public comment to occur through our hearing process. In addition, written comments were accepted during the reopened comment periods. These processes are discussed in Previous Federal Actions in this final rule.

(129) Comment: Two commenters asserted that the Service's decision-making process for listing is influenced by the International Union for Conservation of Nature (IUCN).

Our Response: The IUCN does not influence our decision-making process. We provided information on IUCN's ranking of the species for background only; these assessments are not factored into our analysis or listing determination in this rule. We make this clarification in this final rule (see Additional Special Status Information).

(130) Comment: One commenter suggested that the RCP not be considered in the listing decision because of its questionable legality and methodology.

Our Response: We believe that the RCP used sound methods which constituted the best available information at the time. The RCP specifically states that it is not a legal or regulatory document (GSRSC 2005, p. 1). Accordingly, we do not consider it a regulatory mechanism, but do consider it in Factor A as a Conservation Program and Effort. The plan was developed cooperatively by the BLM, CPW, NPS, NRCS, USFS, the Service, and UDWR. It was intended to supplement local conservation plans and provide additional guidance to aid in conservation of the Gunnison sage-grouse. New research and monitoring data has been collected since the plan was written; however, we still regard this as a valuable document. In many instances it provides the best available information regarding habitat requirements, distribution and abundance, threats, and current conservation strategies for the species.

(131) Comment: Some commenters recommended that a range management school be created to address Gunnison sage-grouse and other issues.

Our Response: In 2006, the Gunnison County Stockgrowers' Association, supported by a Grazing Lands Conservation Initiative Grant, organized a training workshop, called Range Management School, for 37 participants including private ranchers, permittees of Federal grazing allotments, Federal land managers, and other interested parties. We support this type of educational program.

(132) Comment: Two commenters suggested that a classification of "threatened" is a better approach than a classification of "endangered."

Our Response: Based upon the analysis of additional data and new information received during the comment period, we have concluded that "threatened" is the appropriate determination. Our analysis and a detailed explanation for this determination are presented in this final rule (see Determination).

(133) Comment: One commenter stated that snowmobiling does not conflict with lek activities because snowmobiling season ends before lek activities begin and snowmobiling requires snow depths adequate to bury sagebrush.

Our Response: Snowmobiling was evaluated as a recreational activity under Factor E in the proposed rule to list the species. We cited several sources that identified snowmobiles as one form of recreation that may be of concern. In this final rule we conclude that recreational activities in general are not a threat at a rangewide or population level, but could impact individuals at the local level (see Factor B).

(134) Comment: Two commenters suggested that overutilization for scientific research may be a factor in Gunnison sage-grouse declines.

Our Response: We describe mortality risks from scientific research in the proposed and final rules to list the species and conclude that the associated mortality rate is low (two percent) and is not a threat at the population or species level (see Factor B).

(135) Comment: One commenter asserted that chemicals used in households and farming have affected Gunnison sage-grouse habitat more than other factors.

Our Response: We evaluate the effects of pesticides, contaminants associated with non-renewable energy development, and accidental spills associated with pipelines and transportation corridors in this final rule. We conclude that none of these posed a threat to the species (see Factor E, Pesticides and Herbicides).

(136) Comment: One commenter stated that Gunnison sage-grouse are in an extinction vortex.

Our Response: ”Extinction vortex” is a modeling term that describes the process in a declining population where greater rates of decline occur as the population falls below a minimum viable number and approaches extinction. This final rule evaluates population trends across the range of the Gunnison sage-grouse. We determined that this species is threatened (i.e., likely to become an endangered species within the foreseeable future throughout all of its range). However, we do not believe that the species is at this time in an “extinction vortex,” which implies that extinction is inevitable.

(137) Comment: One commenter stated that the number of off-highway vehicle (OHV) permits issued is not a good indication of the level of OHV use.

Our Response: The proposed and final rules note that the number of annual OHV registrations in Colorado increased from approximately 12,000 in 1991 to approximately 131,000 in 2007 (see Factor E, Recreation). This information is provided simply to note that OHV activity has increased. Although other factors also should be considered in determining the level of use by OHVs, an increase of more than an order of magnitude in registrations from 1991 to 2007 indicates that the level of use increased during that time period. We conclude that recreation does not pose a rangewide threat to the species, although it has the potential to cause individual or local impacts.

(138) Comment: One commenter stated that aircraft-wildlife strikes pose a risk to aviation.

Our Response: We are not aware of any studies or information demonstrating that Gunnison sage-grouse collisions with aircraft have occurred or are a concern.

(139) Comment: One commenter stated that a recovery plan is needed.

Our Response: Recovery Plans are typically drafted after a species is listed and provide guidance for recovery of threatened and endangered species and the ecosystems upon which they depend. Section 4(f)(1) of the Act requires the Service to develop and implement these plans unless a plan will not promote the conservation of a species. Recovery plans should include: management actions to conserve the species; objective, measurable criteria for determining when a species can be removed from the list; and an estimate of the time and cost required to achieve recovery. We anticipate commencing a recovery planning process in the near future. Until that time, we are including a conservation strategy (see Conservation Measures for Gunnison Sage-Grouse Recovery) in this rule that will provide guidance for conservation efforts in the interim.

(140) Comment: Several commenters noted specific ongoing projects or programs that improve Gunnison sage-grouse habitat.

Our Response: We considered the projects and programs noted by the commenters in making our listing determination and finalizing this rule. Under Factors A and D in the proposed and final rules to list the species, we describe many of the conservation measures including local, State and Federal laws and regulations, conservation easements, the Gunnison Basin CCA, and enrollment in the Colorado CCAA that have been undertaken to improve or protect Gunnison sage-grouse habitat.

(141) Comment: Some commenters suggested that the Service collaborate with the Colorado Farm Bureau (CFB) in Gunnison sage-grouse management.

Our Response: We welcome input and participation from the CFB and other organizations. We received a comment letter from CFB that encouraged continued collaboration between the Service, private landowners, local and state governments, and others. We agree that working cooperatively with interested parties will aid in conservation and recovery of the Gunnison sage-grouse.

(142) Comment: One commenter stated that when landowners enroll lands in the Conservation Reserve Program (CRP) they often stop maintaining ponds and wet meadows to the detriment of Gunnison sage-grouse.

Our Response: We are not aware of any information regarding the extent of ponds and wet meadows lost following enrollment in the CRP. We consider enrolled lands, particularly those enrolled under the CRP State Acres for Wildlife Enhancement initiative, to improve Gunnison sage-grouse habitat in most cases. The CRP is implemented by the Farm Service Agency and promotes the conversion of environmentally sensitive land to long-term vegetative cover. The objectives of the program include reduction of soil erosion, protection of water resources, and enhancement of wildlife habitat. Approximately 23,000 ha (57,000 ac) of Gunnison sage-grouse occupied habitat are currently enrolled in the CRP (Industrial Economics, Inc. 2013, p. 4-5).

(143) Comment: One commenter stated that wind farms are compatible with CRP, and wildlife protection.

Our Response: The compatibility of wind farms with CRP as they relate to Gunnison sage-grouse, and wildlife protection would vary for each site, depending on the protective measures in place for wildlife, the location and number of turbines, the type of vegetative cover, and other variables.

(144) Comment: One commenter stated that no explanation was provided for why Gunnison sage-grouse are no longer found in Arizona and New Mexico.

Our Response: We note in the proposed and final rules that a description of the species' historical distribution was provided in the 2010 12-month finding. In the 12-month finding, we state that much of what was once Gunnison sage-grouse habitat was lost prior to 1958 (75 FR 59808, September 28, 2010). This included habitat loss throughout Arizona and New Mexico, as well as portions of Utah and Colorado. We summarize this information in the Background and Factor A sections of this final rule.

(145) Comment: One commenter asserted that there is no evidence of Gunnison sage-grouse movement from Gunnison Basin to other populations.

Our Response: Both the Cerro Summit-Cimarron-Sims Mesa and Crawford populations are approximately 2 km (1.2 mi) from the Gunnison Basin population at their nearest points, which is well within movement distances documented for Gunnison sage-grouse. Sage-grouse require a diversity of seasonal habitats and are wide-ranging; therefore, they are capable of making large seasonal movements (Connelly *et al.* 2000a). Preliminary data in the Gunnison Basin documented bird movements as great as 56 km (35 mi) (Phillips 2013, p. 4). Most populations are currently geographically isolated, with low amounts of gene flow between populations. However, genetic analysis indicated that a recent migrant came to the Crawford population from the Gunnison Basin population; historically, populations were connected through more contiguous areas of sagebrush habitat (Oyler-McCance *et al.* 2005).

(146) Comment: One commenter recommended that we distinguish between smaller distribution power lines and larger transmission power lines when assessing impacts and planning mitigation.

Our Response: This final rule states that depending on the infrastructure design, size, location, and other factors, powerlines can directly affect greater sage-grouse by posing a collision and electrocution hazard (Braun 1998, pp. 145–146; Connelly *et al.* 2000a, p. 974) and can have indirect effects by decreasing lek recruitment (Braun *et al.* 2002, p. 10; Walker *et al.* 2007a, p. 2,644), increasing predation (Connelly *et al.* 2004, p. 13-12), fragmenting habitat (Braun 1998, p. 146), and facilitating the invasion of exotic annual plants (Knick *et al.* 2003, p 612; Connelly *et al.* 2004, p. 7-25) (see Factor A, Powerlines). However, we have no information to precisely measure how powerlines and transmission lines vary in design or distribution across the range of Gunnison sage-grouse, and how those effects might vary across time and space.

(147) Comment: One commenter asserted that the proposed rules dismissed information provided by CPW.

Our Response: In the proposed and final rules, we consider all information provided by CPW, and reference that information as appropriate throughout the rules.

(148) Comment: One commenter recommended citing Davis (2012) regarding nest success.

Our Response: In this final rule (see Factor E, Effective Population Size and Population Viability Analyses), we include a thorough discussion and evaluation of Davis's (2012) findings, including observed differences in nest success between populations.

(149) Comment: Several commenters stated that we should not interfere in CPW's management of Gunnison sage-grouse.

Our Response: We recognize the proactive management of Gunnison sage-grouse by CPW and continue to work with this agency for the species' conservation. However, our analysis in this final rule indicates that Gunnison sage-grouse meets the definition of a threatened species; therefore, we must list it under the Act.

(150) Comment: One commenter noted that historical Gunnison sage-grouse habitat on BLM land in the Sims Mesa area has been severely damaged by sagebrush removal.

Our Response: Sagebrush removal on Sims Mesa may have contributed to the one known lek there being currently inactive. Sage-grouse have an obligate relationship with sagebrush. The original distribution of sage-grouse closely followed that of sagebrush. Loss, fragmentation, and degradation of this habitat is a major threat and a primary reason for listing the species and designating critical habitat. If alteration of sagebrush habitat continues, remnant populations may become extirpated.

(151) Comment: One commenter noted that there is not adequate data available to determine whether recent declines of Gunnison sage-grouse observed by Davis (2012) in the Gunnison Basin are short-term population fluctuations or the beginning of a long-term decline.

Our Response: We agree. This concern supports the importance of continued monitoring and conservation of Gunnison sage-grouse populations. This study is discussed and evaluated in detail in Factor E of this final rule. We believe, however, that the threat from residential development in the Gunnison Basin will increase in the future. Habitat fragmentation and disturbance from new roads, powerlines, fences, and other infrastructure are also likely to increase (see Factor A). Additionally, climate change is likely to increase the threats from drought and West Nile Virus in the future (discussed further in Factors A, C, and E). Thus, these future threats must be considered along with the results of the Davis (2012) study.

(152) Comment: One commenter asked if grazing will be considered “take.”

Our Response: Whether a particular activity will result in “take” is determined on a case-by-case basis. Grazing practices that could result in take can be addressed through ESA section 7 or section 10 processes as applicable, including appropriate review under the terms of the Gunnison Basin Candidate Conservation Agreement.

(153) Comment: Some commenters noted that all of the affected county governments have taken the following actions:

- Participation in a Memorandum of Understanding,
- Signatories to the Conservation Agreement,
- Formally committed to adopting a Habitat Prioritization Tool, which will better predict preferred habitat for the species, and
- Formally committed to updating and adopting an amended Rangewide Conservation Plan.

Our Response: We considered this information in this final rule (see Factor D, Local Laws and Regulations).

(154) Comment: Some commenters asserted that many of the peer review comments do not support listing.

Our Response: We requested comments from appropriate and independent individuals with scientific expertise based on their review of the proposed rules to list the Gunnison sage-grouse and to designate critical habitat for the species. We received numerous comments back from these individuals; some in agreement, some disagreements, and many suggestions for improving the proposed rules. Substantive comments are discussed above in the Peer Reviewer Comment section. We considered all of these comments and incorporated many of their suggestions into this final rule.

(155) Comment: One commenter expressed concern that hang gliding and paragliding could be impacted by listing.

Our Response: In this final rule, we conclude that recreational activities are not a threat at a rangewide or population level, but could impact the species at a local level (see Factor E, Recreation). Nevertheless, for those projects and activities with a Federal nexus, project and activity modifications may be requested by the Service through the section 7 consultation process to limit impacts on Gunnison sage-grouse, as necessary.

(156) Comment: One commenter noted that most of the mineral ownership is severed from surface ownership within the range of the Gunnison sage-grouse.

Our Response: In this final rule we note that the BLM has regulatory authority for oil and gas leasing on Federal lands and on private lands with split-estate, or

Federal mineral estate (see Factor D, Federal Laws and Regulations).

Summary of Factors Affecting the Species

Section 4 of the Endangered Species Act (16 U.S.C. 1533), and its implementing regulations at 50 CFR part 424, set forth the procedures for adding species to the Federal Lists of Endangered and Threatened Wildlife and Plants. Under section 4(a)(1) of the Act, we may list a species based on any of the following five factors: (A) the present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; and (E) other natural or manmade factors affecting the species' continued existence. Listing actions may be warranted based on any of the above threat factors, singly or in combination.

Below, we carefully assess the best scientific and commercial information available regarding the past, present, and future threats to Gunnison sage-grouse. We consider all such information in analyzing the five factors identified in section 4(a)(1) of the Endangered Species Act to determine whether Gunnison sage-grouse meets the definition of an endangered or threatened species.

A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range.

In this section, we evaluate various factors influencing the decline of sagebrush and important sage-grouse habitats. The term *habitat decline* includes any quantitative or qualitative degradation of habitat by area, structure, function, or composition (Noss *et al.* 1995, pp. 2, 17). In this rule, we collectively refer to habitat loss, degradation, and fragmentation as 'habitat decline'. There are varying interpretations of the term habitat decline, and various methods for measuring or evaluating it. In this rule, we apply the following general concepts and definitions to our analysis. Habitat loss or destruction (such as sagebrush conversion) includes the permanent or long-term reduction of habitat and generally occurs at smaller scales. Habitat degradation includes the reduction of habitat quality or characteristics and generally occurs at smaller scales. Habitat fragmentation, or the breaking apart of contiguous habitat, occurs at larger or landscape scales, often as the result of cumulative loss and degradation of habitat over space and time. In this final rule, we provide information indicating each of these processes has occurred across Gunnison sage-grouse range, though those processes may vary over time and space. Consequently, effects at the individual, population, and species levels due to habitat decline are variable and not always certain.

Habitat loss and fragmentation are recognized as primary causes of the decline in abundance and distribution of sage-grouse across western North America (Rogers 1964, pp. 13-24; Braun 1998, entire; Schroeder *et al.* 2004, p. 371), and in Gunnison sage-grouse in Colorado, Utah, and across their former range (Oyler-McCance *et al.* 2001, p. 330; GSRSC 2005, p. 149; Wisdom *et al.* 2011, pp. 465-469). Gunnison sage-grouse depend on sagebrush for their survival and persistence, and the historic and current distribution of the Gunnison sage-grouse closely matches that of sagebrush (Patterson 1952, p. 9; Braun 1987, p. 1; Schroeder *et al.* 2004, p. 364, and references therein). Habitat fragmentation resulting from human development patterns is especially detrimental to Gunnison sage-grouse because of their dependence on large expanses of sagebrush (Patterson 1952, p. 48; Connelly *et al.* 2004, p. 4-1; Connelly *et al.* 2011a, p. 72) and more contiguous sagebrush habitats (Rogers 1964, p. 19; Wisdom *et al.* 2011, pp. 452-453). In addition, female Gunnison and greater sage-grouse exhibit strong site fidelity to nesting locations (Connelly *et al.* 1988; Young 1994; Lyon 2000, Connelly *et al.* 2004, Holloran and Anderson 2005, Thompson 2012). Sage-grouse often will continue to return to altered breeding habitats (leks, nesting areas, and early brood-rearing areas), despite any past failures in nesting or productivity (Rogers 1964, pp. 35-40; Wiens and Rotenberry 1985, p. 666; Young 1994, p. 42; Lyon 2000, p. 20, Connelly *et al.* 2004, pp. 3-4 to 3-6; Holloran and Anderson 2005, p. 747). Consequently, there may be lags in the response of sage-grouse to development or habitat changes, similar to those observed in other sagebrush obligate birds (Harju *et al.* 2010, entire; Wiens and Rotenberry 1985, p. 666).

The distribution of sage-grouse habitat is naturally disconnected due to the presence of unsuitable habitats such as forests, deserts, and canyons across the landscape (Rogers 1964, p. 19). However, the onset of Euro-American settlement in the 1800s resulted in significant human alterations to sagebrush ecosystems throughout North America, primarily as a result of urbanization, agricultural conversion, and irrigation projects (West and Young 2000, pp. 263-265; Miller *et al.* 2011, p. 147). Areas in

Colorado that supported basin big sagebrush were among the first sagebrush community types converted to agriculture because their soils and topography are well-suited for agriculture (Rogers 1964, p. 13). Decreases in the abundance of sage-grouse paralleled the loss of range (Braun 1998, pp. 2-3), and a gradual but marked decrease in sage-grouse distribution and numbers in Colorado had begun around 1910 (Rogers 1964, pp. 20-22). Our listing decision is based on the current status of Gunnison sage-grouse and the current and future threats to the species and its habitat. However, the loss of historical range and decline in abundance, and the associated causes of those declines, have contributed to the species' current precarious status. Further, historical information can be evaluated to help forecast how populations and the species may respond to current and future threats.

Based on historical records, museum specimens, and potential sagebrush habitat distribution, the potential historic range of Gunnison sage-grouse was estimated to be 21,376 square miles, or 13,680,590 ac (GSRSC 2005, pp. 32-35, as adapted from Schroeder *et al.* 2004, entire). This range included parts of central and southwestern Colorado, southeastern Utah, northwestern New Mexico, and northeastern Arizona (Schroeder *et al.* 2004, pp. 368, 370). However, only a portion of this historical range would have been occupied at any one time. The species' estimated current range is 1,822 square miles, or 1,166,075 ac, in central and southwestern Colorado, and southeastern Utah (Figure 1) (GSRSC 2005, pp. 32-35, as adapted from Schroeder *et al.* 2004, entire). Based on these figures, the species' current range represents approximately 8.5 percent of its historical range (GSRSC 2005, p. 32). Similarly, Schroeder *et al.* (2004, p. 371) estimated the species' current overall range to be 10 percent of potential presettlement habitat (prior to Euro-American settlement in the 1800s). As estimated in our final rule to designate critical habitat for Gunnison sage-grouse published elsewhere in today's **Federal Register**, the species' current potential range includes an estimated 1,621,008 ac in southwestern Colorado and southeastern Utah, comprised of 923,314 ac (57 percent) of occupied habitat and 697,694 ac (43 percent) of unoccupied habitat. Based on these figures, the current potential range of 1,621,008 ac represents approximately 12 percent of the potential historic range of 13,680,640 ac. The estimates above indicate that approximately 88 to 93 percent of the historical range of Gunnison sage-grouse has been lost since Euro-American settlement. We acknowledge that these estimates are uncertain and imprecise. Nevertheless, the best available information indicates a reduction of Gunnison sage-grouse distribution since Euro-American settlement in the 1800s, with evidence of the loss of peripheral populations and a northward and eastward trend of extirpation (Schroeder *et al.* 2004, pp. 369, 371, and references therein). This contraction in the birds' range indicates the vulnerability of all the populations to extirpation.

In southwestern Colorado, between 1958 and 1993, an estimated 20 percent (155,673 ha (384,676 ac)) of sagebrush was lost, and 37 percent of sagebrush plots examined were fragmented (Oyler-McCance *et al.* 2001, p. 326). Another study estimated that approximately 342,000 ha (845,000 ac) of sagebrush, or 13 percent of the pre-Euro-American settlement sagebrush extent, were lost in Colorado, which included both greater sage-grouse and Gunnison sage-grouse habitat (Boyle and Reeder 2005, p. 3-3). However, the authors noted that the estimate of historic sagebrush area used in their analyses was conservative, possibly resulting in an underestimate of historic sagebrush losses (Boyle and Reeder 2005, p. 3-4). Within the range of Gunnison sage-grouse, the principal areas of sagebrush loss were in the Gunnison Basin, San Miguel Basin, and areas near Dove Creek, Colorado. The authors point out, however, that the rate of loss in the Gunnison Basin was lower than other areas of sagebrush distribution in Colorado. At that time, the Gunnison Basin contained approximately 250,000 ha (617,000 ac) of sagebrush and areas of riparian aspen forest, mixed-conifer forest, and oakbrush (Boyle and Reeder 2005, p. 3-3). Within the portion of the Gunnison Basin currently occupied by Gunnison sage-grouse, 170,000 ha (420,000 ac) is composed exclusively of sagebrush vegetation types, as derived from Southwest Regional Gap Analysis Project (SWReGAP) landcover data (multi-season satellite imagery acquired 1999–2001) (USGS 2004, entire).

Sagebrush habitats within the range of Gunnison sage-grouse are becoming increasingly fragmented as a result of various changes in land uses and the expansion in the density and distribution of invasive plant species (Oyler-McCance *et al.* 2001, pp. 329–330; Schroeder *et al.* 2004, p. 372). Based on spatial modeling, a variety of human developments including roads, energy development, residential development, and other factors known to cause habitat decline were correlated with historical loss of range and extirpation of Gunnison and greater sage-grouse (Wisdom *et al.* 2011, pp. 465-468). This model indicated that no “strongholds” (secure areas where the risk of extirpation appears low) of occupied range are evident for Gunnison sage-grouse (Wisdom *et al.*, 2011, p. 469). Landscapes containing large and contiguous sagebrush patches and sagebrush patches in close proximity had an increased likelihood of sage-grouse persistence (Wisdom *et al.* 2011, p. 462).

In this final rule, we discuss Wisdom *et al*. (2011, entire) and its conclusions, but do not use the term "stronghold." Nevertheless, consistent with Wisdom *et al*. (2011, entire) and numerous other studies noted above, we maintain that the persistence of Gunnison sage-grouse is dependent on large and contiguous sagebrush habitats, that human development and disturbance contribute to the decline of this needed habitat, and that such impacts negatively affect the survival and persistence of Gunnison sage-grouse.

The degree to which habitat fragmentation prevents a species' movement across the landscape depends, in part, on that species' ability to move large distances and thereby adjust to changes on the landscape. Sage-grouse are wide-ranging and capable of making large seasonal movements, because they require a diversity of seasonal habitats (Connelly *et al.* 2000a, pp. 968-969, and references therein). Movements of Gunnison sage-grouse as great as 56 km (35 mi) have been documented in the Gunnison Basin (Phillips 2013, p. 4). In contrast, the maximum recorded movement distance of Gunnison sage-grouse in the Monticello population is 8.2 km (5.1 mi), associated with winter movement (Ward 2007, p. 15). Prather (2010, p. 70) noted that such behavior may be due to the presence of large areas of piñon-juniper (i.e., less suitable habitats) which bracket currently occupied habitat in the Monticello population area.

Population dynamics of greater sage-grouse in northwestern Colorado functioned at much smaller scales than expected for a species capable of moving large distances (Thompson 2012, p. 256). The majority of juvenile dispersal was intra-population movement (within one breeding population), with only one inter-population movement (between separate breeding populations) observed during one study (Thompson 2012, p. 169). As a result, juvenile recruitment into home breeding ranges ranged between 98 and 100 percent (Thompson 2012, p. 170). Based on observed bird dispersal in that study, gene flow and connectivity can likely be maintained for populations within 5 to 10 km (most dispersals were less than 10 km) and possibly as far as 20 km (the maximum dispersal distance of one of the subpopulations studied) in greater sage-grouse (Thompson 2012, p. 285-286). The populations of greater sage-grouse studied were within areas where birds are known for moving between populations.

Because individual movement patterns likely vary by population and area, their susceptibility to habitat loss and degradation may also differ. We expect that where habitat is already more limited (quantity and quality) and isolated, such as in the six satellite populations, habitat loss and decline will have more serious consequences in terms of population fitness and survival. Where habitat is already severely limited or degraded, or where sage-grouse populations are small, any loss of habitat may impact those populations. In addition, habitat loss impacts are expected to be greater in important and/or limiting seasonal habitats, such as areas used during moderate to severe winters, or in lekking, nesting, or brood-rearing habitats (GSRSC 2005, p. 161).

The loss of leks or the decline of nesting or brood-rearing habitats can have serious consequences for sage-grouse population viability by reducing reproductive success and recruitment (survival of young to breeding age). Limitations in the quality and quantity of nesting and early brood-rearing habitats, in particular, are especially important because Gunnison sage-grouse population dynamics are most sensitive during these life-history stages (GSRSC 2005, p. G-15). Juvenile recruitment is one of the most important demographic factors influencing or limiting sage-grouse population growth rates and viability (Connelly *et al.* 2004, p. 3-11, GSRSC 2005, p. 173). In a recent demographic and population viability study of Gunnison sage-grouse, juvenile survival was found to be the most influential vital rate in the Gunnison Basin population, which is currently a relatively stable population (Davis 2012).

Brood-rearing habitat must provide adequate cover adjacent to areas rich in forbs and insects to assure chick survival during this period (Connelly *et al.* 2000a, p. 971; Connelly *et al.* 2004, p. 4-11). Late brood-rearing habitats (also referred to as summer-fall habitats) may include riparian areas, wet meadows, and irrigated fields that provide an abundance of forbs and insects for hens and chicks (Schroeder *et al.* 1999, p. 4; Connelly *et al.* 2000a, p. 980). In northwest Colorado, dispersal, migration, and settlement patterns of juvenile greater sage-grouse—factors important to population persistence—were more influenced by limitations associated with local traditional breeding (lek) and brood-rearing areas than by landscape-level vegetation structure and composition (i.e., the spatial distribution and configuration of vegetation types) (Thompson 2012, pp. 317, 341). The same study recommended restoration, creation, and protection of early and late brood-rearing habitats to increase chick survival rates (Thompson 2012, p. 135). The importance of brood-rearing habitat for juvenile survival, recruitment, and hence, population viability of sage-grouse is evident. These key habitats are particularly susceptible to drought (see Factor E, Drought) and predicted climate change effects (The Nature Conservancy 2011, p. 11) (see Climate Change in this Factor A analysis).

As presented above, habitat decline, including loss, fragmentation, and degradation of quality, has known adverse effects on Gunnison sage-grouse populations. Gunnison sage-grouse depend on sagebrush for their survival and persistence, and the historical and current distribution of the Gunnison sage-grouse closely matches that of sagebrush (Patterson 1952, p. 9; Braun 1987, p. 1; Schroeder *et al.* 2004, p. 364, and references therein). Approximately 88 to 93 percent of the species' former range has been lost since the 1800s (see discussion above), and much of the remaining habitat is degraded or fragmented (Oyler-McCance *et al.* 2001, p. 326; Oyler-McCance *et al.* 2001, pp. 329–330; Schroeder *et al.* 2004, p. 372; Wisdom *et al.*, 2011, p. 469). Future habitat loss will have greater impacts in seasonally important habitats and in smaller populations where available habitat is already limited (GSRSC 2005, p. 161). As described later in this section, many of the factors that result in habitat decline may be amplified by the effects of climate change, thereby influencing long-term population trends. The following sections examine factors that can result in or contribute to habitat decline to evaluate whether they, individually and cumulatively, threaten Gunnison sage-grouse.

Residential Development

In our proposed rule to list Gunnison sage-grouse as endangered (78 FR 2486, January 11, 2013), we determined habitat loss and fragmentation from residential development to be a principal threat to Gunnison sage-grouse conservation. We received numerous comments and new information from the scientific community, government agencies, and other entities related to residential development in the range of Gunnison sage-grouse. Many of the comments we received suggested that our initial analysis incorrectly applied scientific and other information related to residential development and its effects, likely overestimating its threat to the species, particularly in relation to the Gunnison Basin area.

In light of these comments, in this final rule, we reevaluate the threat of residential development to Gunnison sage-grouse. First, we evaluate scientific information related to effects of residential and infrastructural development on sage-grouse and sagebrush habitats in general, including studies specific to Gunnison sage-grouse where available. Second, we discuss human population growth and residential development trends and projections across the broader Rocky Mountain region. Finally, we assess the impact of current and future human population growth and residential development rangewide and within the individual Gunnison sage-grouse populations. As in the proposed listing rule, much of our analysis here is focused on the current and potential future effects of residential development and habitat loss in the Gunnison Basin, since it contains the vast majority of occupied habitat and Gunnison sage-grouse.

The level of habitat loss due to residential development varies widely across the seven populations of Gunnison sage-grouse. Federal land ownership of occupied habitat in some populations reduces the potential impact of residential development, which largely occurs on private lands. Conversely, portions of occupied habitat in private ownership may predispose some sage-grouse populations to greater impacts due to higher levels of development (GSRSC 2005, p. 160). As described in the following sections, current and future human population growth rates and patterns also vary widely across the species' range. Concentration of residential growth in or near municipal and other areas outside of occupied or suitable habitat will likely avoid or minimize impacts, while rural and exurban development in occupied habitat will likely increase impacts on the species.

Other factors may also affect the impact of residential development on Gunnison sage-grouse populations or habitat. These factors include, but are not limited to, the extent and density of already developed land and existing infrastructure, changes in future patterns of residential growth, new or additional development of infrastructure (e.g., roads, powerlines, irrigation) associated with human population growth, the site-specific quality or quantity of suitable habitat on affected lands, resiliency or sensitivity of the affected sage-grouse population or group of birds, and indirect effects of development such as functional habitat loss due to weed invasion, noise disturbance, and other anthropogenic stressors. Functional habitat loss results from disturbance that changes a habitat's successional state or reduces or removes one or more habitat functions or values; presents physical barriers that preclude use of otherwise suitable areas; or introduces activities that prevent animals from using suitable habitat due to behavioral avoidance.

In evaluating the impact that residential development has on the species, we acknowledge that enrollment in the Candidate Conservation Agreement with Assurances (CCAA) for Gunnison sage-grouse, local regulatory mechanisms, Federal efforts such as the Gunnison Basin Candidate Conservation Agreement (CCA), and implementation of future conservation easements and similar conservation efforts will, upon effective implementation, likely reduce, but not necessarily preclude, impacts from residential development. However, as described in more detail in *Conservation Programs and Efforts Related to Habitat Conservation* in this Factor A analysis and in *Local Laws and Regulations* in the Factor D analysis, currently available data and information indicates that these conservation efforts do not fully address this and other threats, or are too uncertain with respect to their implementation and effectiveness for us to forecast or evaluate how all of these efforts will individually or collectively influence future residential development in the species' range, the resultant habitat decline, and related impacts on Gunnison sage-grouse.

We base our analysis of residential development primarily on the following available information: (1) current and future human population growth rates in and around occupied habitat as an indicator of residential development; (2) total available private land area and conservation easement protection (prohibited or restricted residential development) in the context of total occupied habitat; and (3) the current and potential loss of occupied and unoccupied habitats as a result of residential development, and its direct and indirect effects on Gunnison sage-grouse individuals and populations. Broadly, we consider private lands in occupied habitat without conservation easement as being at higher risk of residential development, relative to those lands currently under conservation easement (see Other Regulatory Mechanisms: Conservation Easements in the Factor D analysis). Applying the best available information, these factors depict the intensity and immediacy of impacts due to residential development, and the exposure and anticipated response of Gunnison sage-grouse to that impact.

Effects of Residential Development

Residential development is likely contributing to habitat decline in parts of the range of Gunnison sage-grouse. It was estimated that 3 to 5 percent of all sage-grouse historical habitat in Colorado has been negatively affected by town and urban development (Braun 1998, p. 7). Habitat fragmentation resulting from human development patterns is especially detrimental to Gunnison sage-grouse because of their dependence on large areas of sagebrush (Patterson 1952, p. 48; Connelly *et al.* 2004, p. 4-1; Connelly *et al.* 2011a, p. 72) and more contiguous sagebrush habitats (Rogers 1964, p. 19; Wisdom *et al.* 2011, pp. 452-453). Greater sage-grouse range retraction was linked to patterns of remaining sagebrush habitat and loss due to factors including human population growth and the peripherality of populations (Aldridge *et al*. 2008). Infrastructure such as roads and power lines associated with residential development (urban and exurban) further contribute to habitat decline and other impacts such as increased risk of predation. Those specific effects are discussed elsewhere in this rule, but we recognize the cumulative effects of development and related infrastructure increase the level of impact on Gunnison sage-grouse.

Aldridge developed a landscape-scale spatial model predicting Gunnison sage-grouse nesting probability based on nesting data from the western portion of the Gunnison Basin (Aldridge *et al.* 2012, entire). The study extrapolated the model to the entire Gunnison Basin to predict the likelihood of Gunnison sage-grouse nesting throughout the area (Aldridge *et al.* 2012, p. 403). Results of the model indicated that Gunnison sage-grouse select nest sites in landscapes with a low density of residential development (<1 percent in a 1.5 km [0.9 mi] radii) (Aldridge *et al.* 2012, p. 400). Nest site selection by Gunnison sage-grouse decreased near residential developments, out to approximately 2.5 km (1.6 mi) from any given residential development (Aldridge *et al.* 2012, p. 400). Since early brood-rearing habitat is often in close proximity to nest sites (Connelly *et al.* 2000a, p. 971), impacts to nesting habitat likely also affect nearby brood-rearing habitat (however, individual females with broods may move large distances (Connelly 1982, as cited in Connelly *et al.* 2000a, p. 971)).

Similar to the above findings (and those referenced in Aldridge *et al.* 2008), based on spatial modeling of anthropogenic factors and nest and brood habitat selection, Aldridge (2005, entire) found that nesting greater-sage grouse and broods also tended to avoid urban development areas and other human developments such as roads or cropland, potentially due to predator avoidance behavior. As discussed elsewhere in this rule, there are numerous other studies indicating that the expansion of roads and other human development in occupied habitat can negatively affect sage-grouse (see, e.g., Roads below.)

The RCP (GSRSC 2005, pp. 160–161) hypothesized that residential density in excess of one housing unit per 1.3 km^2 (0.5 mi^2) could cause declines in Gunnison sage-grouse populations. However, because the analyses that formed the basis for this hypothesis were preliminary and did not take into account potential lags in the response of Gunnison sage-grouse to development (Wiens and Rotenberry 1985, p. 666), the threshold at which impacts are expected could be higher or lower (GSRSC 2005, p. F-3). The resulting impacts are expected to occur in nearly all seasonal habitats, including moderate to severe winter use areas, nesting and brood-rearing areas, and leks (GSRSC 2005, p. 161).

Based on preliminary analysis of radio telemetry, a CPW researcher reported that Gunnison sage-grouse do not totally avoid residences, and that some farmyards and areas with low housing density are used by individual birds (Phillips 2013, p. 8). Further information about this study was provided during the public comment period by CPW, including preliminary results of the distances for successful and unsuccessful nests to the nearest road in Gunnison and Saguache Counties (CPW 2013b, pp. 8-9). CPW has not provided us with these data, however, or a map of the reported locations. We are also uncertain as to what percentage of roads in the study may have been closed to protect nesting Gunnison sage-grouse, which may influence nest survival. Further, this preliminary analysis of CPW's telemetry data has not been peer reviewed. While this information may suggest that individual Gunnison sage-grouse within the Gunnison Basin vary in their response to development, the preliminary nature of the study doesn't allow us to draw any definite conclusions.

Residential development can cause habitat decline both by the direct loss of occupied habitat and by indirect effects (e.g., off-site or functional habitat loss, habitat degradation, loss of unoccupied habitat). We consider both in the analysis that follows, though we assess direct loss from a quantitative perspective and indirect effects more qualitatively.

Indirect Effects of Residential Development

As stated above, we know that indirect effects of development such as functional habitat loss due to weed invasion, noise disturbance, and other anthropogenic stressors occur, and that these indirect effects act cumulatively with the direct loss of occupied and unoccupied habitats to fragment native sagebrush habitats and increase threats, for example, through an increase in the number and types of predators (see Factor C, Predation). The impact of residential development is also increased by the additional disturbance footprint and the area of species' avoidance of other associated infrastructure such as roads, powerlines, and fences. Because we have no specific information about the level of these impacts, we have evaluated them qualitatively, but we focus the remainder of our analysis on the direct effects of residential development.

Human Population Growth in the Rocky Mountains

Human population growth in the rural Rocky Mountains is driven by the availability of natural amenities, recreational opportunities, aesthetically desirable settings and views, and perceived remoteness (Riebsame *et al.* 1996, p. 396, 402; Theobald *et al.* 1996, p. 408; Gosnell and Travis 2005, pp. 192–197; Mitchell *et al.* 2002, p. 6; Hansen *et al.* 2005, pp. 1899–1901). The increase in residential and commercial development associated with expanding human populations is different from historical land use patterns in the rural Rocky Mountains (Theobald 2001, p. 548). The allocation of land for resource-based activities such as agriculture and livestock production is decreasing as the relative economic importance of these activities diminishes (Theobald *et al.* 1996, p. 413; Sammons 1998, p. 32; Gosnell and Travis 2005, pp. 191–192). Currently, agribusiness occupations constitute approximately 3 percent of the total job base in Gunnison County (Colorado Department of Local Affairs (CDOLA) 2009b, p. 4). Recent conversion of farm and ranch lands to housing development has been significant in Colorado (Odell and Knight 2001, p. 1144). Many large private ranches in the Rocky Mountains, including the Gunnison Basin, are being subdivided into both high-density subdivisions and larger, scattered ranchettes with lots typically greater than 14 ha (35 ac), which encompass a large, isolated house (Riebsame *et al.* 1996, p. 399; Theobald *et al.* 1996, p. 408).

The resulting pattern of residential development in the rural Rocky Mountains is less associated with existing town sites or existing subdivisions, and is increasingly exurban in nature (Theobald *et al.* 1996, pp. 408, 415; Theobald 2001, p. 546). Exurban development is described as low-density growth outside of urban and suburban areas (Clark *et al.* 2009, p. 178; Theobald 2004, p. 140) with less than one housing unit per 1 ha (2.5 ac) (Theobald 2003, p. 1627; Theobald 2004, p. 139). Also, the pattern is one of increased residential lot size and the diffuse scattering of residential lots in previously rural areas with a premium placed on adjacency to federal lands and isolated open spaces (Riebsame *et al.* 1996, p. 396, 398; Theobald *et al.* 1996, pp. 413, 417; Theobald 2001, p. 546; Brown *et al.* 2005, p. 1858). Residential subdivision associated with exurban development causes landscape fragmentation (Gosnell and Travis 2005, p. 196) primarily through the accumulation of roads, buildings, (Theobald *et al.*1996, p. 410; Mitchell *et al.* 2002, p. 3) and other infrastructure such as power lines (GSRSC 2005, p. 146).

Human Population Growth across the Range of Gunnison Sage-Grouse

The GSRSC (2005, p. 146) identified current and potential issues affecting Gunnison sage-grouse populations, based on conservation status information, local working group plans, and similar documents. Residential development, and associated habitat loss or degradation, urban development, roads, utility corridors, and fences were all identified as current or potential issues in each of the seven populations.

Human population growth is occurring throughout much of the range of Gunnison sage-grouse. The human population in all Colorado counties within the range of Gunnison sage-grouse has increased by approximately 57.8 percent in the last several decades, since 1985 (Table 2). During the same period, human population growth in Utah counties in Gunnison sage-grouse range increased by about 24.5 percent (Table 3), less than that of Colorado counties. Residential development in the Gunnison sage-grouse range is expected to increase to meet the demand of growing human populations.

Table 2. Human Population Growth in Colorado Counties in Gunnison Sage-Grouse Range, 1985 to 2012 (Colorado Department of Local Affairs (CDOLA) 2012, entire).

County	**Overlap with Gunnison Sage-Grouse Population[a]**	**1985 Human Population**	**2012 Human Population**	**Human Population Growth from 1985 to 2012**
Gunnison	Gunnison Basin Cerro Summit-Cimarron-Sims Mesa	10,390	15,475	48.9%
Ouray	Cerro Summit-Cimarron-Sims Mesa San Miguel- Overlap with unoccupied habitat only	2,130	4,530	112.7%
San Miguel	Monticello-Dove Creek San Miguel	3,189	7,580	137.7%
Hinsdale	Gunnison Basin-Overlap with unoccupied habitat only	472	810	71.6%
Saguache	Gunnison Basin Poncha Pass	4,400	6,304	43.3%
Mesa	Piñon Mesa	88,0121	147,855	68.0%
Montrose	Cerro Summit-Cimarron-Sims Mesa San Miguel	24,389	40,732	67.0%
Montezuma	Monticello-Dove Creek-Overlap with unoccupied habitat only	19,283	25,437	31.9%
Delta	Crawford	23,466	30,436	29.7%
Dolores	Monticello-Dove Creek	1,548	1,994	28.8%
Chaffee	Poncha Pass	12,349	18,151	47.0%
Total		**189,637**	**299,304**	**57.8%**

[a]Based on county overlap with occupied habitat (GSRSC 2005, pp. 54-102) unless noted otherwise.

Table 3. Human Population Growth in Utah Counties in Gunnison Sage-Grouse Range, 1985 to 2011 (Demographic and Economic Analysis (DEA) 2011, entire).

County	**Overlap with Gunnison Sage-Grouse Population[a]**	**1985 Human Population**	**2011 Human Population**	**Human Population Growth from 1985 to 2011**
San Juan	Dove Creek-	12,300	14,954	21.6%

	Monticello			
Grand	Piñon Mesa- Overlap with unoccupied habitat only	7,200	9,322	29.5%
Total		**19,500**	**24,276**	**24.5%**

[a]Based on county overlap with occupied habitat (GSRSC 2005, pp. 54-102) unless noted otherwise.

These trends are expected to continue into the future (GSRSC 2005, p. 150-153). The year 2050 projected human population for the entire Gunnison River Basin (a watershed area spanning multiple counties), which encompasses the majority of Gunnison sage-grouse occupied habitat across all population areas, is expected to be 2.3 times (233 percent) greater than the 2005 population, with Mesa and Montrose Counties being the most populous in that area (Colorado Water Conservation Board (CWCB) 2009, pp. 15, 53). Across the six satellite populations, the human population in Colorado is forecasted to grow by about 60 percent, with most of this growth (and total number of persons) occurring in Mesa, Montrose, and Delta Counties (Table 4). Similar to the past, future human population growth in Utah counties in Gunnison sage-grouse range is expected to be low, approximately 14 percent by the year 2040, lower than Colorado counties. In some counties, the population growth is projected to occur mainly in urban areas. For example, in Grand County, Utah, and Mesa County, Colorado, significant growth is expected within the cities of Moab and Grand Junction, respectively. Also, we recognize that in some counties, what appears to be significant growth from the baseline may actually be minimal in terms of total persons added to the population (for example, see Hinsdale County in Table 4). In response to public comments regarding human population growth figures for Gunnison County provided in our proposed listing rule (78 FR 2486, January 11, 2013), we discuss future human population growth for Gunnison County in detail in the following section.

Table 4. Human Population Forecast in Colorado Counties in Gunnison Sage-Grouse Range, 2013 to 2040 (CDOLA 2011, entire).

County	**Overlap with Gunnison Sage-Grouse Population[1]**	**2013 (Current) Human Population**	**2040 Human Population Forecast**	**Human Population Growth from 2013 to 2040**
Gunnison	Gunnison Basin Cerro Summit-Cimarron-Sims Mesa	15,982	22,107	38.3%
Ouray	Cerro Summit-Cimarron-Sims Mesa San Miguel- Overlap with unoccupied habitat only	4,662	6,108	31.0%
San Miguel	San Miguel Monticello-Dove Creek	8,148	16,426	101.6%
Hinsdale	Gunnison Basin-Overlap with unoccupied habitat only	853	1,378	61.6%
Saguache	Gunnison Basin Poncha Pass	6,478	9,133	41.0%
Mesa	Piñon Mesa	150,123	226,263	50.7%
Montrose	Cerro Summit-Cimarron-Sims Mesa San Miguel	41,751	75,048	79.8%
Montezuma	Monticello-Dove Creek-Overlap with unoccupied habitat only	26,481	42,947	62.2%
Delta	Crawford	31,741	59,142	86.3%
Dolores	Monticello-Dove Creek	2,097	3,313	57.9%
Chaffee	Poncha Pass	18,726	30,282	61.7%
Rangewide Total		307,042	492,147	60.3%

[a]Based on county overlap with occupied habitat (GSRSC 2005, pp. 54-102) unless noted otherwise.

Table 5. Human Population Forecast in Utah Counties in Gunnison Sage-Grouse Range, 2013 to 2040 (DEA 2012, entire).

County	Overlap with Gunnison Sage-Grouse Population[a]	2010 Human Population	2040 Human Population Forecast	Human Population Growth from 2013 to 2040
San Juan	Dove Creek-Monticello	14,746	15,191	3.0%
Grand	Piñon Mesa-Overlap with unoccupied habitat only	9,225	12,147	31.7%

Rangewide Total	23,971	27,338	14.0%

[a]Based on county overlap with occupied habitat (GSRSC 2005, pp. 54-102) unless noted otherwise.

In addition to past and projected human population growth, the impact of residential development on Gunnison sage-grouse depends on total private land area in occupied habitat available for development. Substantial Federal land ownership of occupied habitat in the Crawford, Gunnison Basin, Poncha Pass, and portions of the San Miguel Basin populations helps reduce the threat of residential development in these areas. Conversely, large portions of occupied habitat in the Dove Creek-Monticello, Piñon Mesa, Cerro Summit-Cimarron-Sims Mesa, and some portions of the San Miguel populations are in private ownership, making those areas more vulnerable to residential development and associated impacts (GSRSC 2005, p. 160). Within all Gunnison sage-grouse populations, the area of private land under conservation easement (which generally prohibits subdivision and restricts other residential or agricultural development to defined areas) will help ameliorate impacts from human population growth and residential development that might otherwise occur (see Factor D discussion, Other Regulatory Mechanisms: Conservation Easements).

Below, Table 6 synthesizes future human population growth rates in Gunnison sage-grouse population areas, total private land area, and conservation easement protection in occupied habitats. As noted above, we focused our analysis on the potential for direct habitat loss in occupied habitats, where negative impacts are more likely to occur. We qualitatively ranked past and forecasted human population growth for area counties in Colorado (based on Tables 2 and 4) and Utah (based on Tables 3 and 5), considering both percent growth and total number of persons. Below, we apply information from Table 6 to determine the impact of residential development to individual Gunnison sage-grouse populations and to the species rangewide.

Table 6. Human population growth rates and conservation easements in Gunnison sage-grouse occupied habitat.

Gunnison Sage-Grouse Population	Human Population Growth Rates[a]		Total Occupied Habitat (acres)	Private Land in Occupied Habitat		Private Land in Occupied Habitat under Conservation Easement[b]		Private Land in Occupied Habitat not under Conservation Easement		Percentage of Total Occupied Habitat at Higher Risk of Residential Development[c]
	Past: 1985 to 2012	Forecast: 2013 to 2040		Acres	%	Acres	Percentage of Private Land in Occupied Habitat	Acres	Percentage of Private Land in Occupied Habitat	
San Miguel Basin	M	M	101,750	49,492	49%	6,961	14.1%	42531	85.9%	41.8%
Monticello-Dove Creek	L	L	112,543	100,773	90%	5,482	5.4%	95,291	84.6%	84.7%
Piñon Mesa	H	H	44,678	31,313	70%	15,317	48.9%	15,996	51.1%	35.8%
Cerro Summit-Cimarron-Sims Mesa	H	H	37,161	28,218	76%	3,484	12.3%	24,734	87.7%	66.6%
Crawford	L	M	35,015	8,481	24%	2,005	23.6%	6,476	76.4%	18.5%
Poncha Pass	L	L	27,747	7,893	28%	0	0.0%	7,893	100.0%	28.4%
Gunnison Basin	L	L	592,168	178,855	30%	40,769	22.8%	138,086	77.2%	23.3%
Rangewide Total			**951,062**	**405,025**	**43%**	**74,018**	**18.3%**	**331,007**	**81.7%**	**34.8%**

a Based on a qualitative assessment of past and forecast human population growth for area counties in Colorado (Tables 2 and 4) and Utah (Tables 3 and 5), considering percent growth and total number of persons: H- High; M- Moderate; L- Low.
b Lohr and Gray (2013, entire)
c Calculated by dividing acres of "private land in occupied habitat not under conservation easement" by "total occupied habitat."

Based on the factors presented in Table 6 above, residential development is likely to have the greatest impact on the San Miguel and Cerro Summit-Cimarron-Sims Mesa populations of Gunnison sage-grouse. In the San Miguel Basin population, moderate human population growth has occurred and is projected through the year 2040; and private land comprises about 49 percent of total occupied habitat, of which 14 percent is under conservation easement. This means that approximately 42 percent of total occupied habitat in the San Miguel population area is at higher risk of residential development (Table 6). The rate of residential development in the San Miguel Basin population area increased between 2005 and 2008 but slowed in 2009 (CDOW 2009b, p. 135). However, a 429-ha (1,057-ac) parcel north of Miramonte Reservoir is currently being developed. The CPW reports that potential impacts to Gunnison sage-grouse resulting from this development may be reduced by placing a portion of the property into a conservation easement and the relocation of a proposed major road to avoid occupied habitat (CDOW 2009b, p. 136). A downward trend in the San Miguel population over the last decade or more (Figure 3) indicates it may not have the resilience (see Small Population Size and Structure) to sustain substantial habitat losses. Therefore, residential development is a current and future threat to Gunnison sage-grouse in the San Miguel Basin population.

Likewise, in the Cerro Summit-Cimarron-Sims Mesa area, considerable human population growth has occurred and is forecast through the year 2040; and private land comprises about 76 percent of total occupied habitat, of which 12 percent is under conservation easement. This means that approximately 67 percent of total occupied habitat in the Cerro Summit-Cimarron-Sims Mesa population area is at higher risk of residential development (Table 6). Scattered residential development has recently occurred along the periphery of occupied habitat in the Cerro Summit-Cimarron-Sims Mesa population (CDOW 2009b, p. 45). Already limited habitat (Table 6) and low population numbers (Figure 3) indicate the Cerro Summit-Cimarron-Sims Mesa population may not have the resilience (see Small Population Size and Structure) to sustain substantial habitat losses. Therefore, residential development is a current and future threat to Gunnison sage-grouse in the Cerro Summit-Cimarron-Sims Mesa population.

Although past and future human population growth in the Poncha Pass population is estimated to be low, and the proportion of land at higher risk of residential development is low (about 28 percent) (see Table 6), other information indicates that residential development is nevertheless a threat to the Poncha Pass population. Residential subdivision continues to be concentrated in the northern part of the Poncha Pass population area where Gunnison sage-grouse occur most, and CPW considers this to be the highest priority threat to this population (CDOW 2009b, p. 124). As noted earlier, where habitat is already severely limited, or where sage-grouse populations are small, any loss of habitat may impact those populations (GSRSC 2005, p. 161). Due to the pattern of residential development, already limited sagebrush habitat in the area (about 20,000 acres), and critically low population numbers (zero birds counted in 2013; Figure 3), residential development is a current and future threat to the Poncha Pass population of Gunnison sage-grouse.

For the remaining four Gunnison sage-grouse populations, we find that current residential development may impact individual birds or areas of habitat, but is a threat of low magnitude at the population level at the present time. In these areas, past or projected human population growth rates are very low, indicating that residential development will be limited (Monticello-Dove Creek); or private land available for residential development (considering Federal land ownership and conservation easement protection) is limited (Piñon Mesa and Crawford). For these three populations, we also believe that the threat of residential development will remain low in the future. With respect to the Gunnison Basin population, however, as described in more detail below, over half of the 23.3 percent of total occupied habitat that is at higher risk of residential development (see Table 6) is high priority habitat, because it includes seasonally important habitat for the species. The potential loss or degradation of even relatively smaller portions of habitat due to future residential development is a concern, especially if important seasonal habitats are affected, so we believe that threats related to residential development will be higher in the future in the Gunnison Basin (see Reevaluation of Residential Development in the Gunnison Basin).

The analysis above is focused on the threat of residential development in occupied habitats for Gunnison sage-grouse. However, it is reasonable to assume that residential development will also occur in important but currently unoccupied habitats. These habitats may now or in the future provide dispersal corridors for birds between occupied habitat, subpopulations, or populations; or provide areas for range migration or expansion. The threat of habitat loss or degradation due to residential development in the San Miguel and Cerro Summit-Cimarron-Sims Mesa populations will likely reduce habitat connectivity between satellite populations and potential connectivity between the Gunnison Basin population and satellite populations to the west. The GSRSC (2005, p. 167) identified habitat areas in the San Miguel population that provide potential linkages with the Dove Creek-Monticello population to the west, Piñon Mesa population to the north, and Cerro Summit-Cimarron-Sims Mesa population to the east. Potential linkages in the Cerro Summit-Cimarron-Sims Mesa population were also identified that may provide connectivity with the San Miguel population to the west, Crawford population to the northeast, and Gunnison Basin population to the east. Genetic evidence indicates maintaining or enhancing habitat connectivity between populations is important for Gunnison sage-grouse survival into the future (See detailed discussion in Factor E analysis, Small Population Size and Structure).

Reevaluation of Residential Development in the Gunnison Basin Population Area

In our proposed rule to list Gunnison sage-grouse as endangered, we concluded that residential development was a principal threat to the species as a whole. That analysis was focused on the potential impacts of residential development in the Gunnison Basin population area, since the vast majority of occupied habitat and birds occur there. As noted above, based on numerous public comments and new information we received on the proposed rule, we have reevaluated the threat of residential development to the species, both in the individual populations and rangewide. In this section, we describe in greater detail the basis for our conclusions regarding the effects of residential development, both at the present time and in the foreseeable future, on individual birds or areas of habitat in the Gunnison Basin population area.

Current Impacts of Residential Development

Approximately 239,640 ha (592,168 ac) of occupied habitat occur in the Gunnison Basin. Of this, approximately 161,336 ha (398,669 ac) (67 percent) are on Federal lands; 5,906 ha (14,595 ac) (2 percent) are State land; and 72,380 ha (178,855 ac) (30 percent) are private land (Table 1). In this rule, our evaluation of residential development in the Gunnison Basin is based largely on human demographic information for Gunnison County, where nearly three-quarters (approximately 71 percent) of the Gunnison Basin population of Gunnison sage-grouse occurs (the remainder occurs in Saguache County). Based on the available information, we expect that the rate of future residential development in the Saguache County portion of the Gunnison Basin will be similar to that of Gunnison County. Approximately 30 percent of Gunnison sage-grouse occupied habitat in the Gunnison Basin occurs on private lands.

When evaluating Gunnison County overall (including both Gunnison sage-grouse habitat and non-habitat areas), our analysis found that the cumulative number of human developments (including housing, infrastructure, and improvements to existing development) increased considerably since the early 1970s. The number of new developments averaged approximately 70 per year from the late 1800s to 1969, increasing to approximately 450 per year from 1970 to 2008 (USFWS 2010a, pp. 1-5). Furthermore, there has been an increasing trend toward development away from major roadways (primary and secondary paved roads) into areas of occupied Gunnison sage-grouse habitat that had previously undergone very limited development (USFWS 2010b, p. 7). Between 1889 and 1968, approximately 51 human developments were located more than 1.6 km (1 mi) from a major road in currently occupied Gunnison sage-grouse habitat. Between 1969 and 2008, this number increased to approximately 476 developments (USFWS 2010b, p. 7).

However, the majority of residential development in Gunnison County is outside of Gunnison-sage grouse occupied habitat. About 26 percent of housing units in Gunnison County occur within Gunnison sage-grouse occupied habitat (Gunnison County 2013a, Appendix G, p. 9). Although significant development has occurred in the past, residential growth in Gunnison County has been influenced heavily by development in the East River Valley near Crested Butte, outside of occupied habitat for Gunnison sage-grouse (Gunnison County 2013a, pp. 69-70). Furthermore, the majority of existing development in the lower Gunnison Basin is concentrated near the City of Gunnison, outside of occupied habitat or in more marginalized habitat (Gunnison County 2013c, p. 5). Gunnison County building permit data indicate that since 1980, over 70 percent of all county building permits have been located within subdivisions that are already served by water and sewer services (urban service areas). If building permits for the City of Gunnison are included, over 80 percent of all new development since 1980 has occurred in urban service areas (Gunnison County 2013a, p. 68). Urban service areas (utilities, trash, etc.) in Gunnison County may include small areas of Gunnison sage-grouse habitat, but are generally less suitable than more rural areas; therefore, human development and activities in such areas are likely to have less impact to Gunnison sage-grouse.

Available data nonetheless indicates human developments in occupied Gunnison sage-grouse habitat in Gunnison County occur and have increased over time. We conducted a GIS analysis of parcel ownership data to evaluate the spatial and temporal pattern of past human development (including infrastructure) within occupied Gunnison sage-grouse habitat in the Gunnison Basin population area. Our analyses were limited to the portion of occupied habitat in Gunnison County because parcel data was available only for Gunnison County and not Saguache County. Approximately 18 percent of the land area within the range of Gunnison sage-grouse in Gunnison County has a residential density greater than one housing unit per 1.3 km^2 (0.5 mi^2) (USFWS 2010b, p. 8). The GSRSC (2005, pp. 160–161) hypothesized that residential density in excess of one housing unit per 1.3 km^2 (0.5 mi^2) could cause declines in Gunnison sage-grouse populations, though there are limitations with this assumption (see discussion above). Based on this estimate, current human residential densities in the Gunnison Basin population area are such that they may be having an impact on Gunnison sage-grouse in at least 18 percent of the occupied area.

In our proposed rule to list Gunnison sage-grouse as endangered, we also applied a 1.5 km (.93 mi) “zone of influence” to residential development in Gunnison County (based on Aldridge *et al.* 2012, p. 400), in an effort to evaluate how the current level of residential development may be impacting habitat and limiting the Gunnison Basin population of sage-grouse (for more details, see 78 FR 2486, January 11, 2013). That analysis led us to conclude that within occupied Gunnison sage-grouse habitat in Gunnison County, 49 percent of the land area within the range of Gunnison sage-grouse had at least one housing unit within a radius of 1.5 km (0.9 mi). We found that this level of residential development strongly decreased the likelihood of Gunnison sage-grouse using these areas as nesting habitat. Based on this analysis, we determined that residential development, particularly in the Gunnison Basin, was currently a principal threat to the species. This conclusion was critical to our proposal to list the species as endangered.

Since the listing proposal, we have received significant comments and new information regarding this conclusion, and particularly our application of the Aldridge *et al.* 2012 study, to find that human development is currently negatively affecting the species' utilization of 49 percent of occupied habitat in Gunnison County. As noted by various commentators, this conclusion is at odds with the current status of the Gunnison Basin population, which, as described above, is and has been relatively stable for the last 19 years, based on lek count data. If residential development was currently negatively impacting such a significant percentage of occupied habitat in the Gunnison Basin population, we would expect to see some evidence of this in these population trends. This is so even recognizing that, as a consequence of their site fidelity to seasonal habitats (Lyon and Anderson 2003, p. 489), measurable population effects may lag behind negative changes in habitat (Harju *et al.* 2010, entire; Wiens and Rotenberry 1985,

p. 666). As a result, we believe that our use of Aldridge *et. al* 2012, as described above, significantly overestimated the impact that current levels of residential development in Gunnison County are having on the species.

Based on this reevaluation, we conclude that current development in the Gunnison Basin population area is a threat of low magnitude to the persistence of this Gunnison sage-grouse population. Despite past residential development in the Gunnison Basin, the Gunnison Basin population of Gunnison sage-grouse has remained relatively stable over the past 19 years, based on lek count data and population estimates (Figure 2). The Gunnison Basin population is currently large and relatively stable and appears to be resilient (see further discussion under Small Population Size and Structure section). Therefore, this population has been able to sustain the negative effects of development at current levels.

Future Impacts of Residential Development

Residential development in occupied habitat in the Gunnison Basin will increase in the future, which means the impacts from such development will also increase. Based on new information received since the proposed rule, however, we believe that the rate of increase may be less than what we determined in the proposed rule. Projections for human population growth in Gunnison County range from about 0.75 percent to 2.15 percent annually, depending on the source (Table 7). The current (2013) estimated human population of Gunnison County is 15,982 (CDOLA 2011, entire). By 2050, the human population in Gunnison County is projected to be 20,877 to 37,828 people (Table

7). In our proposed rule to list Gunnison sage-grouse as endangered (78 FR 2486, January 11, 2013), we applied the Colorado Water Conservation Board's (CWCB) middle-growth scenario of 1.7 percent annual growth for Gunnison County (CWCB 2009, p. 53). We now recognize this figure may overestimate actual growth in the area due to that study's broader geographic focus (Colorado watersheds) and purpose (to forecast water use and demands). The Colorado State Demographer (CDOLA 2011, entire) estimated an average annual growth rate of 1.2 percent for Gunnison County, with approximately 22,107 people by the year 2040, or approximately 38 percent greater than the 2013 population. Coincidentally, these projections are near the average of the range of projected growth rates from the various sources (Table 7), and represent a reliable estimate of expected future growth in the Gunnison Basin area.

Table 7. Human Population Projections for Gunnison County.

Source	Average Annual Growth Rate	Population Projection	Source/ Citation
Colorado Water Conservation Board	1.06%- low scenario 1.70%- middle scenario 2.15%- high scenario	By the year 2050: 23,314- low scenario 31,086- middle scenario 37,828- high scenario	CWCB 2009, p. 53
Colorado State Demographer	1.2%	By the year 2040: 22,107	CDOLA 2011, entire
Gunnison County	1%	By the year 2050: 20,877	Gunnison County 2013a, p. 69
Gunnison City Council	0.75%	n/a	City of Gunnison 2013, p. 4

Future population growth in the Saguache County portion of the Gunnison Basin is projected to be 1.5 percent per year, with an estimated population of 9,133 by the year 2040, or approximately 41 percent greater than the 2013 population (Table 4 above).

All population projections from Table 4 and Table 7 above indicate the density and distribution of human residences in the Gunnison Basin will increase in the future. The precise rate of human population growth in Gunnison or Saguache Counties, however, is not the determinative factor in assessing whether the Gunnison Basin population of Gunnison sage-grouse will persist into the future. As discussed below, future residential development in occupied habitat in the Gunnison Basin is constrained by the relatively limited area of developable private lands. In addition, if future residential development follows past patterns, much of this future development in Gunnison County will occur outside of Gunnison sage-grouse habitat and within existing urban or otherwise developed areas. Nonetheless, even under this development pattern, approximately 26 percent of future residential development in Gunnison County would occur in occupied Gunnison sage-grouse habitat (Gunnison County 2013a, Appendix G, p. 9).

Of the 239,640 ha (592,168 ac) of occupied habitat in the Gunnison Basin, approximately 72,380 ha (178,855 ac) (30 percent) are on private lands (Table 6). Approximately 16,499 ha (40,769 ac) (22.8 percent) of these private lands, or 6.9 percent of occupied habitat in the Gunnison Basin population area, are currently under conservation easement where development is prohibited or restricted to protect conservation values, including values for Gunnison sage-grouse on some properties (Gunnison County 2013b, p. 21; Lohr and Gray 2013, p. 54). (Refer to Factor D analysis, Other Regulatory Mechanisms: Conservation Easements for a detailed discussion.) Approximately 55,881 ha (138,086ac) (77.2 percent) of private lands are not currently under conservation easement and, thus, are at higher risk of residential development. This constitutes 23.3 percent of the entire occupied range in the Gunnison Basin. Therefore, about 23.3 percent of the 239,640 ha (592,168 ac) of total occupied habitat in the Gunnison Basin is at higher risk of residential development (relative to lands not protected under conservation easement).

Over half of this at risk occupied habitat currently consists of high priority habitat for the species. Based on the habitat recommendations in the RCP, the Gunnison Basin Sage-Grouse Strategic Committee developed a Habitat Prioritization Tool (Gunnison County 2013a, Appendix G; see detailed description under Local Laws and Regulations, Gunnison County), which identifies sage-grouse habitat and then discounts the value of the habitat based on distance to structures, roads, and power lines. The Habitat Prioritization Tool determined that, of private lands in occupied habitat in the Gunnison Basin not under conservation easement, over half are Tier 1 habitat, or high value habitat (e.g., lekking, nesting, brood-rearing, or wintering habitat); the remaining habitat is classified as Tier 2, or lower value habitat (Cochran 2013, pers. comm.) that is closer to structures, roads, and power lines. This tool does not quantify or map unoccupied habitats. Based on this figure, of the 55,881 ha (138,086 ac) or 23.3 percent of total occupied habitat in the Gunnison Basin at higher risk of residential development (as discussed below), 28,033 ha (69,270 ac) of those are Tier 1, or priority habitat.

The GSRSC (2005, p. 161) cautioned that, in the Gunnison Basin population, any habitat loss from residential development should be avoided or mitigated because of this population's high conservation importance. As noted earlier, the GSRSC (2005, p.161) suggested that the greatest impacts from permanent habitat loss are expected in seasonal habitats most important to Gunnison sage-grouse, such as areas used during moderate to severe winters or in lekking, nesting, or brood-rearing habitats. These areas are quantified within the Tier 1 habitats of the Habitat Prioritization Tool described above, and constitute approximately 69,000 acres. Forty-five percent of the leks in the Gunnison Basin population area occur on private lands (see discussion above in the *Current Distribution and Population Estimates and Trends* section), and any impacts within 4 miles of these leks could affect nesting and brood-rearing activities.

Additional residential development in those high value habitats could result in increased impacts on Gunnison sage-grouse in the Gunnison Basin. Lesser impacts would be expected in Tier 2 habitats, and from indirect effects of development in unoccupied habitats. These impacts, particularly to the seasonally important habitats, are a concern, and we expect impacts, and the level of threat posed by residential development, to increase in the future, although at a somewhat lower rate than what we described in the proposed listing rule.

Although exurban development will likely increase as in other parts of the rural west, if past residential growth patterns in Gunnison County continue, we can expect the majority of residential development to occur outside of occupied habitat and near municipalities and existing infrastructure. Nevertheless, under these past residential growth patterns, we would still expect approximately 26 percent of residential growth in the future to occur in occupied habitat.

While we recognize that current conservation efforts, including conservation easements, enforcement of current county land use regulations, and CCAA implementation are likely to help reduce (but not necessarily preclude) the effects of past and future residential development on Gunnison sage-grouse and its habitat in the Gunnison Basin, we find that such efforts will not fully address this and other threats (see Factor A, Conservation Programs and Efforts Related to Habitat Conservation, and Factor D, Regulatory Mechanisms). In addition, future residential development of private lands will likely demand new or additional infrastructure on adjacent properties such as Federally administered lands, which may cause additional impacts to Gunnison sage-grouse habitat (see Cumulative Effects From Factors A through E). Although we cannot forecast what those impacts might look like, we anticipate that such impacts on Federal lands will be addressed, to some degree, through Federal programs and policies such as the Gunnison Basin CCA (see Conservation Programs and Efforts Related to Habitat Conservation in this Factor A analysis).

In summary, the threat to Gunnison sage-grouse as a result of current residential development is less than we previously thought as discussed above. While individual birds may be affected, current residential development is a threat of low magnitude to Gunnison Basin birds at the population level. Approximately 23.3 percent of the 239,640 ha (592,168 ac) of total occupied habitat in the Gunnison Basin is at higher risk of development (i.e., are not protected by conservation easement) in the future, relative to lands where development is precluded, prohibited, or restricted (under State or Federal ownership or conservation easement). Approximately 50 percent of these developable lands are in priority habitats, and their potential loss or degradation in the future would be a concern for the Gunnison Basin population. In addition, indirect and cumulative effects of infrastructure associated with residential development will increase the impacts of future residential development. Based on these reasons, we find that residential development is currently a threat of low magnitude to the Gunnison Basin population of Gunnison sage-grouse, but that it is an increasing threat in the future.

Summary of Residential Development

Residential development is likely contributing to habitat loss and degradation throughout the range of Gunnison sage-grouse. Habitat fragmentation resulting from human development patterns is especially detrimental to Gunnison sage-grouse because of their dependence on large areas of sagebrush (Patterson 1952, p. 48; Connelly *et al.* 2004, p. 4-1; Connelly *et al.* 2011a, p. 72) and more contiguous sagebrush habitats (Rogers 1964, p. 19; Wisdom *et al.* 2011, pp. 452-453). Infrastructure such as roads and power lines associated with residential development (urban and exurban) likely further contribute to habitat loss and other impacts such as increased risk of predation, particularly in the satellite populations. Residential development, and associated habitat loss or degradation, urban development, roads, utility corridors, and fences have all been identified as current or potential issues in each of the seven populations (GSRSC 2005, p.

146). Increasing rural and exurban development in sagebrush habitats will continue impacting Gunnison sage-grouse.

Human population growth is occurring throughout much of the range of Gunnison sage-grouse. The human population in all Colorado counties within the range of Gunnison sage-grouse has increased by approximately 57.8 percent in the last several decades, since 1985 (Table 2). During the same period, human population growth in Utah counties in Gunnison sage-grouse range increased by about 24.5 percent (Table 3), much less than that of Colorado counties. Population increases are expected to continue into the future (GSRSC 2005, p. 150-153). Across the six satellite populations, the human population in Colorado is forecasted to grow by about 60 percent, with most of this growth (and total number of persons) occurring in Mesa, Montrose, and Delta Counties (Table 4). Residential development is expected to increase to meet the demand of these growing human populations. Projected human population growth rates in the Gunnison Basin population are considered low relative to other populations. However, residential development in the Gunnison Basin, including development in occupied habitat, is expected to continue into the future and potentially impact the species and its habitat.

Our analysis was focused on the direct loss of occupied habitat due to residential development, in which negative impacts on the species are more quantifiable. Indirect effects (e.g., off-site or functional habitat loss, loss of unoccupied habitat) of habitat decline due to residential development are also expected, however, and are evaluated qualitatively in the above analysis. Residential growth rates and patterns vary widely across the range of Gunnison sage-grouse. Based on these considerations, our framework for assessing the threat of residential development was based primarily on human population growth rates (current and projected), the availability of developable private lands, the ameliorating effects of conservation efforts, and other information (see Table 6 and discussions above). Our evaluation found that residential development is a substantial threat to the San Miguel, Cerro Summit-Cimarron-Sims Mesa, and Poncha Pass populations of Gunnison sage-grouse, both now and in the future. Based on the best available information, current residential development in the remaining Gunnison sage-grouse populations may impact individual birds or areas of habitat, but is currently a threat of low magnitude at the population level. Residential development will continue into the future in these areas and, as discussed above, such development in areas of important seasonal habitats would be a concern in these populations.

Rangewide, approximately 34.8 percent of occupied Gunnison sage-grouse habitat is at higher risk of residential development (Table 6), relative to lands not under conservation easement or Federal or State ownership. As described above, human population growth is occurring throughout much of the range of Gunnison sage-grouse, although the rate and pattern of residential development varies widely by sage-grouse population. These trends are expected to continue into the future, resulting in further residential development, associated infrastructure, and habitat loss in parts of the species' range.

The threat of habitat loss or degradation due to residential development in the San Miguel and Cerro Summit-Cimarron-Sims Mesa populations will likely reduce habitat connectivity between satellite populations and, potential connectivity between the Gunnison Basin population and satellite populations to the west. The GSRSC (2005, p. 167) identified habitat areas in the San Miguel population that provide potential linkages with the Dove Creek-Monticello population to the west, Piñon Mesa population to the north, and Cerro Summit-Cimarron-Sims Mesa population to the east. Potential linkages in the Cerro Summit-Cimarron-Sims Mesa population were also identified that may provide connectivity with the San Miguel population to the west, Crawford population to the northeast, and Gunnison Basin population to the east. Genetic evidence indicates maintaining or enhancing habitat connectivity between populations is important for Gunnison sage-grouse survival into the future (See discussion in Factor E analysis, Small Population Size and Structure). Based on the above information, we find residential development to be a threat to Gunnison sage-grouse rangewide, both now and into the future.

Roads

Impacts to Gunnison sage-grouse from roads may include direct habitat loss, direct mortality, barriers to migration corridors or seasonal habitats, facilitation of predation and spread of invasive vegetative species, and other indirect influences such as noise (Forman and Alexander 1998, pp. 207–231). Greater sage-grouse mortality resulting from collisions with vehicles does occur, but mortalities are typically not monitored or recorded (Patterson 1952, p. 81). Therefore, it is difficult to determine the influence of road-related mortalities on sage-grouse populations. We have no information on the frequency or number of mortalities of Gunnison sage-grouse due to roads or vehicles, but because of similarities in their habitat and habitat use, we expect effects to be similar to those observed in greater sage-grouse (described below). Roads have been shown to fragment Gunnison sage-grouse habitat, with road avoidance by birds presumably to limit exposure to human activity and predation (Oyler-McCance *et al.* 2001, p. 330). The probability of Gunnison sage-grouse habitat occupancy (presence based on pellet surveys or sage-grouse observation) was positively correlated with distance from roads and habitat patch size (Oyler-McCance *et al.* 1999, p. 29).

The presence of roads increases human access and resulting disturbance effects in remote areas (Forman and Alexander 1998, p. 221; Forman 2000, p. 35; Connelly *et al.* 2004, pp. 7-6 to 7-25). In addition, roads can provide corridors for predators to move into previously unoccupied areas. Some mammalian species known to prey on sage-grouse, such as red fox *(Vulpes vulpes),* raccoons *(Procyon lotor),* and striped skunks *(Mephitis mephitis),* have greatly increased their distribution by dispersing along roads (Forman and Alexander 1998, p. 212; Forman 2000, p. 33; Frey and Conover 2006, pp. 1114–1115). Corvids (Family Corvidae: crows, ravens, magpies, etc.) also use linear features such as primary and secondary roads as travel routes (Bui 2009, p. 31), expanding their movements into previously unused regions (Knight and Kawashima 1993, p. 268; Connelly *et al.* 2004, p. 12-3). Corvids are significant sage-grouse nest predators and were responsible for more than 50 percent of nest predations in Nevada (Coates 2007, pp. 26–30). See Factor C below for further discussion of predation.

The expansion of road networks also contributes to exotic plant invasions via introduced road fill, vehicle transport, and road maintenance activities (Forman and Alexander 1998, p. 210; Forman 2000, p. 32; Gelbard and Belnap 2003, p. 426; Knick *et al.* 2003, p. 619; Connelly *et al.* 2004, p. 7-25). Invasive species are not limited to roadsides, but also encroach into surrounding habitats (Forman and Alexander 1998, p. 210; Forman 2000, p. 33; Gelbard and Belnap 2003, p. 427). Upgrading unpaved four-wheel-drive roads to paved roads resulted in increased cover of invasive plant species within the interior of adjacent plant communities (Gelbard and Belnap 2003, p. 426). This effect was associated with road construction and maintenance activities and vehicle traffic, and not with differences in site characteristics. The incursion of invasive and exotic plants into native sagebrush systems can negatively affect Gunnison sage-grouse through habitat losses and conversions (see Invasive Plants).

Gunnison sage-grouse may avoid road areas because of noise, visual disturbance, pollutants, and predators moving along a road, which further reduces the amount of available habitat. An unpublished study by Western State Colorado University and CPW in the Gunnison Basin found that anthropogenic noise was significantly higher at leks closer to roads and human activity centers than leks farther from those sources (Piquette *et al.* 2013, pp. 7-8). Leks with higher noise levels were associated with lower Gunnison sage-grouse male counts and attendance (Piquette *et al.* 2013, pp. 10-11). The landscape-scale spatial model predicting Gunnison sage-grouse nest site selection showed strong avoidance of areas with high road densities of roads classed 1 through 4 (primary paved highways through primitive roads with 2-wheel drive sedan clearance) within 6.4 km (4 mi) of nest sites (Aldridge *et al.* 2012 p. 397). Nest sites also decreased with increased proximity to primary and secondary paved highways (roads classes 1 and 2) (Aldridge *et al.* 2012, p. 401). Male greater sage-grouse lek attendance was shown to decline within 3 km (1.9 mi) of a deep seam natural gas well haul road where traffic volume exceeded one vehicle per day (Holloran 2005, p. 40). Surface coal mining activity and associated vehicle traffic on haul roads in the North Park of Colorado was correlated with a 94 percent reduction in the number of displaying greater sage-grouse males over a 5-year period on leks situated within 2 km (1.24 mi) of roads (Remington and Braun 1991). Peak male greater sage-grouse attendance at leks experimentally treated with noise from natural gas drilling and roads decreased 29 percent and 73 percent, respectively, relative to paired control (no treatment) areas (Blickley *et al.* 2012, p. 467). Male sage-grouse depend on acoustical signals to attract females to leks (Gibson and Bradbury 1985, p. 82; Gratson 1993, p. 692). If noise from roads interferes with mating displays, and thereby female attendance, younger males will not be drawn to the lek and eventually leks will become inactive (Amstrup and Phillips 1977, p. 26; Braun 1986, pp. 229–230).

In a study on the Pinedale Anticline in Wyoming, greater sage-grouse hens that bred on leks within 3 km (1.9 mi) of roads associated with oil and gas development traveled twice as far to nest as did hens that bred on leks greater than 3 km (1.9 mi) from roads. Nest initiation rates for hens bred on leks close to roads also were lower (65 versus 89 percent), affecting population recruitment (33 versus 44 percent) (Lyon 2000, p. 33; Lyon and Anderson 2003, pp. 489–490). Roads may be the primary impact of oil and gas development to sage-grouse, due to their persistence and continued use even after drilling and production have ceased (Lyon and Anderson 2003, p. 490). Lek abandonment patterns suggested that daily vehicular traffic along road networks for oil wells can impact greater sage-grouse breeding activities (Braun *et al.* 2002, p. 5). Similar data are not available for Gunnison sage-grouse, so we do not know how the species responds to roads and traffic associated with energy development, though we expect effects would be similar to those observed in greater sage-grouse.

One study showed that road density was not an important factor affecting greater sage-grouse persistence or rangewide patterns in sage-grouse extirpation (Aldridge *et al.* 2008, p. 992). However, the authors did not consider the intensity of human use of roads in their modeling efforts. They also indicated that their analyses may have been influenced by inaccuracies in spatial road data sets, particularly for secondary roads (Aldridge *et al.* 2008, p. 992). Spatial modeling of historic range where greater and Gunnison sage-grouse have been extirpated had a 25 percent higher density of roads than occupied range (Wisdom *et al.* 2011, p. 467). Wisdom *et al.*'s (2011, entire) greater and Gunnison sage-grouse rangewide analysis supports the findings of numerous local studies showing that roads can have both direct and indirect impacts on sage-grouse distribution and individual fitness (reproduction and survival) (e.g., Lyon and Anderson 2003 p. 490, Aldridge and Boyce 2007, p. 520).

Recreational activities including off-highway vehicles (OHV), all-terrain vehicles, motorcycles, mountain bikes, and other mechanized methods of travel have also been recognized as a potential direct and indirect threat to Gunnison sage-grouse and their habitat (BLM 2009a, p. 36). In Colorado, the number of annual off-highway vehicle (OHV) registrations has increased dramatically from 12,000 in 1991 to 131,000 in 2007 (BLM 2009a, p. 37). Four wheel drive, OHV, motorcycle, specialty vehicle, and mountain bike use is expected to increase in the future based on increased human population in Colorado and within the range of Gunnison sage-grouse. Numerous off-road routes and access points to habitat used by Gunnison sage-grouse combined with increasing capabilities for mechanized travel and increased human population further contribute to habitat decline.

Roads in the Gunnison Basin Population Area—

Currently, 1,349 km (838 mi) of roads accessible to 2-wheel-drive passenger cars occur in occupied Gunnison sage-grouse habitat in the Gunnison Basin on all land ownerships. Four-wheel-drive vehicle roads, as well as motorcycle, mountain bike, horse, and hiking trails are heavily distributed throughout the range of Gunnison sage-grouse (BLM 2009a, pp. 27, 55, 86), which further increases the overall density of roads and their direct and indirect effects on Gunnison sage-grouse. User-created roads and trails have increased since 2004 (BLM 2009a, p. 33), although we do not know the scope of this increase.

On BLM lands in the Gunnison Basin, approximately 2,050 km (1,274 mi) of roads are currently within 6.4 km (4 mi) of Gunnison sage-grouse leks (BLM 2010a, p. 147). This distance is thought to be important, because eighty-seven percent of all Gunnison sage-grouse nests were located less than 6.4 km (4 mi) from the lek of capture (Apa 2004, p. 21). However, the BLM proposed to reduce the roads on its Gunnison Basin lands from 2,050 km (1,274 mi) to 1,157 km (719 mi) (BLM 2010a, p. 147), including implementation of other conservation measures from the Gunnison Basin Candidate Conservation Agreement (CCA) (BLM 2013b, entire) (see Conservation Programs and Efforts Related to Habitat Conservation below). The NPS completed a Motorized Vehicle Access Plan and Environmental Assessment for the Curecanti National Recreation Area (NPS 2010, 78 FR 72028). As of January 2014, roads open to the public within Gunnison sage-grouse habitat (occupied and unoccupied) were reduced from 91.1 km (56.6 mi) to 39.6 km (24.6 mi) (Stahlnecker 2014, pers. com) (also discussed below).

The U.S. Forest Service (USFS) is implementing their 2010 Travel Management Plan to benefit Gunnison sage-grouse. Approximately 66 km (41 mi) of road have recently been decommissioned on USFS lands in the Gunnison Basin. An additional 40–56 km (25–35 mi) of roads were proposed for decommissioning by the USFS in 2013. The BLM, USFS, CPW, and Gunnison County currently close 36 roads at 47 closure points to all motorized traffic from March 15 to May 15 to minimize impacts to Gunnison sage-grouse during the breeding season. Six USFS closures extend to June 15 to protect nesting Gunnison sage-grouse. These closures limit motorized access to all known leks and adjacent habitats on public lands in the Gunnison Basin (Gunnison County 2013a, pp. 78, 127). The USFS implements winter and spring travel closures for motorized and mechanized activities in the Flat Top Mountain and Almont Triangle areas, which includes a total of more than 11,000 ha (27,000 ac). While road closures may be violated in a small number of situations, we expect these seasonal closures are having a beneficial effect on Gunnison sage-grouse in the majority of the Gunnison Basin area through avoidance or minimization of impacts during sensitive periods.

Using GIS and a spatial dataset of roads in the Gunnison Basin, we evaluated the potential effects of roads to Gunnison sage-grouse and their habitat. To account for secondary effects from invasive weed spread from roads (see discussion below in Invasive Plants), we applied a 0.7-km (0.4-mi) "zone of influence" (Bradley and Mustard 2006, p. 1146) to all roads in the Gunnison Basin. These analyses indicate that approximately 85 percent of occupied habitat in the Gunnison Basin has an increased likelihood of current or future road-related invasive weed invasion, although the extent and severity of weed invasion would vary by road and area. It is likely that all occupied habitat in the Gunnison Basin may be negatively affected in some way by the direct or indirect impacts of roads (see the discussion below). In addition, available information indicates that noise from roads and other human activity centers such as the airport may be negatively impacting Gunnison sage-grouse reproduction in the Gunnison Basin by reducing male sage-grouse attendance at nearby leks (Piquette *et al*. 2013, entire).

The CPW (2013b, pp. 8-9) calculated the distance from roads (highways and county roads) for 185 separate successful and unsuccessful sage-grouse nests in the Gunnison Basin population, based on telemetry and nesting data collected from 2005 to 2010. Roads included highways and county roads in Gunnison and Saguache counties. The study did not evaluate "primitive" roads as the Aldridge *et al.* 2012 study did, making this analysis more conservative. A GIS analysis of the distance frequencies of the 185 nests did not indicate an avoidance of roads by sage-grouse, in contrast to the findings of other authors cited above (see discussion above). Rather, CPW believes the data showed a correlation between a decline in the number of nests and increasing distance from roads. Approximately 45 percent of studied nests were within 300 m (984 ft) of a road, and 70 percent were within 500 m (1,640 ft). Nest frequency declined around distances greater than 500 m (1,640 ft) from roads. However, road density was not described and the distance to nests may be a reflection of road density rather than site selection. We are also uncertain as to what percentage of these roads may have been closed to protect nesting Gunnison sage-grouse, which may influence nest survival. The CPW acknowledged, moreover, that their analysis was not peer reviewed, and did not account for factors such as age (yearling vs. adult), re-nesting (however, only 3.2 percent of females studied re-nested), or time (i.e., the same female observed across years) (CPW 2013b, pp. 8-9). CPW also recognized that its report of nesting success in relation to roads only addressed one aspect of potential threats to Gunnison sage-grouse from roads, and did not address additional threats from roads such as impacts on suitability of brood-rearing and seasonal habitat components, changes in lekking behavior, noise impacts, depredation risks and chick and adult mortality (CPW 2013b, p.9). While the CPW study may indicate that Gunnison sage-grouse in the Gunnison Basin are not totally avoiding roads, the best available scientific information on the effects of roads on sage-grouse and their habitats nevertheless indicates that roads are likely having a negative impact on Gunnison sage-grouse in the Gunnison Basin population, though the extent and magnitude of those impacts are unknown.

Roads in All Other Population Areas—

Approximately 140 km (87 mi), 243 km (151 mi), and 217 km (135 mi) of roads (all road classes) occur on BLM lands within the Cerro Summit-Cimarron-Sims Mesa, Crawford, and San Miguel Basin population areas, respectively, all of which are managed by the BLM (BLM 2009a, p. 71). We do not have information on the total length of roads within the Monticello-Dove Creek, Piñon Mesa, or Poncha Pass Gunnison sage-grouse populations. However, several maps provided by the BLM show that roads are widespread and common throughout these population areas (BLM 2009a, pp. 27, 55, 86).

In the Crawford population area, Montrose County seasonally closes C77 Road from March 15 through May 15 to protect Gunnison sage-grouse during the breeding season (Gunnison County 2013, App. 1.G.40). Likewise, Saguache County seasonally closes three roads in the Poncha Pass population, and one road in the Gunnison Basin population area (Gunnison County 2013, App. 1.I.49). San Miguel County vacated, reclaimed, and relocated a county road in the San Miguel Basin to protect a lek in the Miramonte area (Gunnison County 2013, App. 1.K.67). San Miguel County also restricts road traffic speed year-round to 10 miles per hour or less on another road in the

Miramonte area (Gunnison County 2013, App. 1.K.67.b). An Ouray County resolution (Resolution Number 2013-022, entire), adopted on May 28, 2013, provides that seasonal restrictions (March 15 until May 15) be implemented for roads (not belonging to adjacent property owners or their guests), and appropriate terms and conditions be applied during this same time period at construction sites within 0.6 miles of a lek to minimize and avoid impacts on breeding and brood-rearing habitat. This affects portions of the San Miguel and Cerro Summit-Cimarron-Sims Mesa populations. We expect these seasonal closures and restrictions are benefitting Gunnison sage-grouse in important portions of these populations through avoidance and minimization of impacts during sensitive periods. However, we believe that roads are having negative impacts at some level on all Gunnison sage-grouse populations.

Summary of Roads

As described above in the Residential Development section, the human population is increasing throughout the range of Gunnison sage-grouse (CDOLA 2009a, pp. 2–3; CWCB 2009, p. 15), and data indicates this trend will continue. Gunnison sage-grouse are dependent on large landscapes to meet their life history needs (GSRSC 2005, pp. 26–30) and contiguous sagebrush habitat (Rogers 1964, p. 19; Wisdom *et al.* 2011, pp. 452-453). The collective influences of fragmentation and disturbance from roads reduce the amount of effective habitat to the extent that they are avoided by sage-grouse (Aldridge *et al.* 2012, p. 402; Aldridge and Boyce 2007, p. 520; Knick *et al.* 2011, pp. 212–219 and references therein; CPW 2013, pp. 8-9). Given the current and future human demographic and economic trends discussed above under the Residential

Development Section, we conclude that increased road use and increased road construction associated with residential development will continue to increase. Seasonal closures are likely providing benefits to Gunnison sage-grouse in portions of its range and during sensitive periods. Nevertheless, habitat decline associated with roads, as described above, is a current and future threat to Gunnison sage-grouse rangewide.

Powerlines

Depending on the infrastructure design, size, location, and site-specific factors, powerlines can directly affect greater sage-grouse by posing a collision and electrocution hazard (Braun 1998, pp. 145–146; Connelly *et al.* 2000a, p. 974) and can have indirect effects by decreasing lek recruitment (Braun *et al.* 2002, p. 10, Walker *et al.* 2007a, p. 2,644), increasing predation (Connelly *et al.* 2004, p. 13-12), fragmenting habitat (Braun 1998, p. 146), and facilitating the invasion of exotic annual plants (Knick *et al.* 2003, p. 612; Connelly *et al.* 2004, p. 7-25). In 10 years of tracking and studying over 1,000 radio-collared sage-grouse in Colorado, CPW has documented only three powerline strike-related mortalities (two confirmed cases, and one suspected case) of Gunnison sage-grouse; and one powerline strike-related mortality of greater sage-grouse (CPW 2013b, p. 11; Phillips and Griffin 2013, pers. comm.). In contrast, powerline collisions in southeastern Idaho accounted for 33 percent of juvenile mortality of greater sage-grouse in low-elevation areas (Beck *et al.* 2006, p. 1,075). Based on spatial modeling, proximity to powerlines is positively correlated with Gunnison and greater sage-grouse extirpation and loss of range (Wisdom *et al.* 2011, pp. 467–468). Due to the potential spread of invasive species and predators as a result of powerline construction and maintenance, the most substantial impact of powerlines on Gunnison sage-grouse likely comes from indirect effects, rather than from direct mortality. The effects of powerlines to Gunnison sage-grouse are expected to be similar to those observed in greater sage-grouse due to similar life histories and behavior.

In areas where vegetation is low and the terrain relatively flat, power poles provide an attractive hunting, roosting, and nesting perch for many species of raptors and corvids, known predators of Gunnison sage-grouse (Steenhof *et al.* 1993, p. 27; Connelly *et al.* 2000a, p. 974; Manville 2002, p. 7; Vander Haegen *et al.* 2002, p. 503) (see Factor C, Predation). Power poles increase a raptor's range of vision, allow for greater speed during attacks on prey, and serve as territorial markers (Steenhof *et al.* 1993, p. 275; Manville 2002, p. 7), thereby increasing the likelihood of predation where sage-grouse occur. Raptors may actively seek out power poles where natural perches are limited. For example, within 1 year of construction of a 596-km (370-mi) transmission line in southern Idaho and Oregon, raptors and common ravens began nesting on the supporting poles (Steenhof *et al.* 1993, p. 275). Within 10 years of construction, 133 pairs of raptors and ravens were nesting along this stretch (Steenhof *et al.* 1993, p. 275). Raven counts increased by approximately 200 percent along the Falcon-Gondor transmission line corridor in Nevada within 5 years of construction (Atamian *et al.* 2007, p. 2). Howe *et al.* (2014) found (1) the average distance to a transmission line from selected raven nest sites was approximately 2.5 times closer than from random sites, and (2) areas comprised of nonnative vegetation next to sagebrush were more likely to be used by ravens (p.42), suggesting that ravens selected nest sites (1) closer to transmission lines, and (2) in close proximity to land cover edges and areas where land cover edges adjoined one another. A post hoc analysis revealed that ravens were most likely to nest near edges of adjoining big sagebrush and land cover types that were associated with direct human disturbance or fire (Howe *et al.*, p. 43). It is reasonable to assume an increase in the abundance of corvids within occupied Gunnison sage-grouse habitats can lead to increased predation (see Factor C, Predation, for further discussion).

As with corvids, eagles can also increase following power line installation. Golden eagle *(Aquila chryrsaetos)* predation on sage-grouse on leks increased from 26 to 73 percent of the total predation after completion of a transmission line within 200 meters (m) (220 yards (yd)) of an active sage-grouse lek in northeastern Utah (Ellis 1985, p. 10). The lek was eventually abandoned, and Ellis (1985, p. 10) concluded that the presence of the powerline resulted in changes in sage-grouse dispersal patterns and caused fragmentation of the habitat. Golden eagles are found throughout the range of Gunnison sage-grouse (USGS 2010, p. 1), and golden eagles were found to be the dominant species recorded perching on power poles in Utah in Gunnison sage-grouse habitat (Prather and Messmer 2009, p. 12). An increase in the abundance of golden eagles associated with power lines within occupied Gunnison sage-grouse habitats would be expected to increase predation rates (see Factor C, Predation, for further discussion).

Greater sage-grouse leks within 0.4 km (0.25 mi) of new powerlines constructed for coalbed methane development in the Powder River Basin of Wyoming had significantly lower recruitment compared to leks further from these lines, presumably resulting from increased raptor predation (Braun *et al.* 2002, p. 10). Connelly *et al.* (2004, p. 7-26) assumed a 5- to 6.9-km (3.1- to 4.3-mi) radius buffer around the perches, based on the average foraging distance of these corvids and raptors, and estimated that the area potentially influenced by additional perches provided by powerlines was 672,644 to 837,390 km^2 (259,641 to 323,317 mi^2), or 32 to 40 percent of their assessment area. The impact on a given area would depend on local densities of corvids and raptors (see discussion in Factor C, Predation).

Powerlines may negatively impact sage-grouse habitats even if raptors are not present. The use of otherwise suitable habitat by sage-grouse near powerlines increased as distance from the powerline increased for up to 600 m (660 yd) (Braun 1998, p. 8), indicating sage-grouse avoidance of powerlines. Based on those unpublished data, Braun (1998, p. 8) reported that the presence of powerlines may limit Gunnison and greater sage-grouse use within 1 km (0.6 mi) in otherwise suitable habitat. Greater sage-grouse tended to avoid using brood-rearing habitats within 4.7 km (2.9 mi) of wind energy transmission lines in Wyoming (LeBeau 2012, p. 27).

Electromagnetic fields emitted by power and transmission lines can alter the behavior, physiology, endocrine systems and immune function in birds, with negative consequences on reproduction and development (Fernie and Reynolds 2005, p. 135). Birds are diverse in their sensitivities to electromagnetic field exposures, with domestic chickens being very sensitive. Many raptor species are less affected (Fernie and

Reynolds 2005, p. 135). Based on spatial modeling, sage-grouse extirpation appears to be correlated to the presence of powerlines (Wisdom *et al.* 2011, p. 467). However, no studies have been conducted specifically on the effects of electromagnetic fields on sage-grouse. Therefore, we do not know how electromagnetic fields may impact Gunnison sage-grouse.

In addition, linear corridors through sagebrush habitats can facilitate the spread of invasive species, such as cheatgrass *(Bromus tectorum)* (Gelbard and Belnap 2003, pp. 424–426; Knick *et al.* 2003, p. 620; Connelly *et al.* 2004, p. 1-2). However, we were unable to find any information regarding the amount of invasive species incursion associated with powerlines within Gunnison sage-grouse habitat.

Powerlines in the Gunnison Basin Population Area—

On approximately 121,000 ha (300,000 ac) of BLM land in the Gunnison Basin, 36 rights-of-way for power facilities, power lines, and transmission lines have resulted in the direct loss of 350 ha (858 ac) of occupied habitat (Borthwick 2005a, pers. comm.; Borthwick 2005b, pers. comm.). In the Curecanti National Recreation Area, Gunnison County Electric Association has a right of way for 63 km (39 mi) of overhead power lines, and Western Area Power Administration (WAPA) has a 31- km (19 mi) right of way for transmission lines.

As discussed above, the impacts of these lines likely extend beyond their actual footprint. Based on the average foraging distance of corvids and raptors, Connelly *et al.*

(2004, p. 7–26) assumed a 5- to 6.9-km (3.1- to 4.3-mi) radius buffer around the perches, and estimated that the area potentially influenced by additional perches provided by powerlines was 672,644 to 837,390 km^2 (259,641 to 323,317 mi^2), or 32 to 40 percent of their assessment area. We performed a similar GIS analysis of large transmission line location in relation to overall habitat area and Gunnison sage-grouse lek locations in the Gunnison Basin population area to obtain an estimate of the potential effects in the Basin. These analyses indicate that 68 percent of the Gunnison Basin population area is within 6.9 km (4.3 mi) of an electrical transmission line and is potentially influenced by avian predators using the additional perches provided by transmission lines. This area within 6.9 km (4.3 mi) of an electrical transmission line contains 65 of 109 active leks (60 percent) in the Gunnison Basin population. While we recognize that powerlines will not entirely preclude the use of adjacent habitats by Gunnison sage-grouse, these results suggest that increased predation risks associated with transmission lines could affect a substantial portion of the Gunnison Basin population. Four sage-grouse collisions with taller utility lines were documented during a demographic study (Davis 2012, entire) in the Gunnison Basin, but none of those birds were killed as a result (Phillips 2013, p. 4). There have been no documented strike-related mortalities of Gunnison sage-grouse in the Gunnison Basin (Phillips and Griffin 2013, pers. comm.). Conservation measures from the Gunnison Basin CCA (BLM 2013b, entire) are expected to reduce impacts from some future power line projects and activities on Federal lands in the Gunnison Basin (see Conservation Programs and Efforts Related to Habitat Conservation).

Powerlines in All Other Population Areas—

A transmission line runs through the Dry Creek Basin group in the San Miguel Basin population, and the Beaver Mesa group has two transmission lines. None of the transmission lines in the San Miguel Basin have raptor proofing, nor do most distribution lines (Ferguson 2005, pers. comm.), so their use by raptors and corvids as perch sites for hunting and use for nest sites is not discouraged. In the winter of 2012, one Gunnison sage-grouse individual in the San Miguel population died due to a powerline strike (Phillips and Griffin 2013, pers. comm.). One major electric transmission line runs east-west in the northern portion of the current range of the Monticello population (San Juan County Gunnison Sage-grouse Working Group 2005, p. 17). There have been no documented strike-related mortalities of Gunnison sage-grouse in the Dove Creek or Piñon Mesa population areas (Phillips and Griffin 2013, pers. comm.), and because of their limited extent in occupied habitat, powerlines do not appear to be a threat to the Piñon Mesa population. One transmission line parallels Highway 92 in the Crawford population and distribution lines run from there to homes on the periphery of the current range (Ferguson 2005, pers. comm.). Several transmission and utility lines intersect occupied habitat in the Poncha Pass area and may be negatively impacting an already small population and limited available habitat. A bird translocated from the Gunnison Basin to the Poncha Pass area in 2013 was found dead under the large transmission line on the west side of Highway 285; necropsy results indicated collision was a likely cause of death (Phillips and Griffin 2013, pers. comm.; Nehring 2013b, pers. comm.). During the same year, one radio collar was found under a powerline, but no bird was observed (i.e., an unconfirmed mortality) (Phillips and Griffin 2013, pers. comm.)

Summary of Powerlines

Human populations are projected to increase to varying degrees in and near most Gunnison sage-grouse populations (see Residential Development discussion above). As a result, we expect an associated increase in distribution powerlines to meet this demand. Powerlines are likely negatively affecting Gunnison sage-grouse as they contribute to habitat decline and facilitation of predators of Gunnison sage-grouse. Given the current demographic and economic trends described in the Residential Development Section above, we conclude that existing powerlines and anticipated distribution of powerlines associated with residential and other development will continue to increase. Direct and indirect impacts resulting from powerlines are a current and future threat to Gunnison sage-grouse persistence rangewide.

Domestic Grazing and Wild Ungulate Herbivory

At least 87 percent of occupied Gunnison sage-grouse habitat on Federal lands is currently grazed by domestic livestock (USFWS 2010c, entire). We lack information on the proportion of Gunnison sage-grouse habitat on private lands that is currently grazed, but it is reasonable to expect that the proportion of grazed area is similar to that on Federal lands because livestock grazing is the most widespread type of land use across the sagebrush biome (Connelly *et al.* 2004), and almost all sagebrush areas are managed for livestock grazing (Knick *et al.* 2003). Livestock grazing can have negative or positive impacts on sage-grouse, depending on the timing and intensity of grazing and the habitat type or attribute of interest (Crawford *et al.* 2004, p. 2). Excessive grazing by domestic livestock during the late 1800s and early 1900s, along with severe drought, significantly impacted sagebrush ecosystems (Knick *et al.* 2003, p. 616). Overgrazing by livestock was cited as one of several contributing factors in the early loss and deterioration of sagebrush range in the region (Rogers 1964, p. 13). Historical accounts indicate that overgrazing of sagebrush range in Colorado began around 1875. Overgrazing was apparently at its worst in the early 1900's and continued until the BLM was organized in 1934 (Rogers 1964, p. 13). Around 1910, a gradual but marked decline in sage-grouse numbers and distribution in Colorado had begun (Rogers 1964, pp. 20-22). Though there is no evidence of direct correlation, this information suggests that historical livestock grazing practices and overgrazing were a contributing factor in the early loss and degradation of sagebrush habitats and initial declines in sage-grouse numbers and distribution. Although current livestock stocking rates in the range of Gunnison sage-grouse are lower than historical levels (Laycock *et al.* 1996, p. 3), long-term effects from historical overgrazing, including changes in plant communities and soils, persist today (Knick *et al.* 2003, p. 116).

In addition, widespread use of water developments in connection with livestock grazing across the West has since increased livestock access to sagebrush habitats, and so even reduced numbers of livestock still pose impacts (Connelly *et al.* 2004, pp. 7-33, 7-35, 7-92). However, in some cases, small scale water development may benefit the species. For instance, in the recent past, landowners in San Juan County, Utah, in the range of the Monticello population of Gunnison sage-grouse did not have automatic control valves on water developments for livestock watering. This resulted in overflow creating seasonal wet meadow and mesic habitats often used by Gunnison sage-grouse and broods. The recent use of more advanced watering devices and shutoff valves has resulted in the loss of many of these created wet meadow sites, potentially contributing to sage-grouse declines in the area (Prather 2010, p. 27). Water developments are also a potential source of West Nile virus, a serious risk factor to sage-grouse populations. Unless they are designed and managed specifically to benefit Gunnison sage-grouse, we conclude that the negative effects of water development outweigh the positives (see Factor C discussion, Disease).

Although livestock grazing and associated land treatments have likely altered plant composition, increased topsoil loss, and increased spread of exotic plants, the impacts on Gunnison sage-grouse populations are not clear. Few studies have directly addressed the effect of livestock grazing on sage-grouse (Beck and Mitchell 2000, pp. 998-1000; Wamboldt *et al.* 2002, p. 7; Crawford *et al.* 2004, p. 11), and little direct experimental evidence links grazing practices to Gunnison sage-grouse population levels (Braun 1987, pp. 136–137, Connelly and Braun 1997, p. 7-9). Rowland (2004, pp. 17–18) conducted a literature review and found no experimental research that demonstrates grazing alone is responsible for reduction in sage-grouse numbers.

Despite the obvious impacts of grazing on plant communities within the range of the species, the GSRSC (2005, p. 114) could not find a direct correlation between historical grazing and reduced Gunnison sage-grouse numbers. Impacts from livestock grazing on individual birds and site-specific habitat conditions may have impacts at the population level as well, given the widespread nature of grazing. However, no studies have documented the impacts (positive or negative) of grazing at the population level.

Sage-grouse need significant grass and shrub cover for protection from predators, particularly during nesting season, and females will preferentially choose nesting sites based on these qualities (Hagen *et al.* 2007, p. 46). However, specific recommendations on vegetation characteristics and habitat requirements for sage-grouse vary. Nest success in Gunnison sage-grouse habitat was positively correlated with greater grass and forb heights; and shrub density and cover (Young 1994, p. 38). In contrast, nest site vegetation characteristics did not have a strong influence on nest success between the Gunnison Basin and San Miguel populations, where temporal factors had the greatest influence (Davis 2012, pp. 1, 10). It is thought that, in Colorado, sagebrush canopy cover conceals nests more than grass (GSRSC 2005, p. 73). In Oregon, grass height at greater sage-grouse nests was taller at successful nests than at unsuccessful nests (specific grass species that tend to be taller than others were also positively associated with successful nests) (Gregg 1991, p. 2). Gregg *et al.* (1994, p. 165) speculated that a reduction of grass heights due to livestock grazing in sage-grouse nesting and brood-rearing areas would negatively affect nesting success whenever cover is reduced below the 18 cm (7 in.) needed for predator avoidance. Maintaining average grass height greater than 18 cm (7 in.) was recommended by Connelly *et al.* 2000a, p. 977). However, guideline standards from Connelly *et al.* (2000a, entire) are derived primarily from research and publications from the Great Basin and northwest, where bunch grasses predominate (GSRSC 2005, p. 73).

The RCP (GSRSC 2005, p. H-6) provided structural habitat guidelines for Gunnison sage-grouse and recommends a grass height of 10 to 15 cm (3.9 – 5.9 in.) in breeding habitats. Lupis (2005, entire) found that despite reduced grass and forb cover, all (100 percent) Gunnison sage-grouse nests monitored in the Monticello population were successful. However, sample size for the study was limited to three nests, and predator control at the time may have contributed to relatively high nesting success (Lupis 2005, entire); inference from this study is therefore limited. Based on measurements of cattle foraging rates on bunchgrasses both between and under sagebrush canopies, the probability of foraging on under-canopy bunchgrasses depends on sagebrush size and shape. Consequently, the effects of grazing on nesting habitats might be site-specific (France *et al.* 2008, pp. 392–393). Effects of grazing on nesting habitats are dependent on the timing as well as duration and intensity of grazing. Grazing on grasses and forbs during nesting and early brood rearing seasons could impact food sources for young broods, as well as alter the desired herbaceous plant community. Grazing on grasses and forbs in late-fall or winter could reduce residual vegetation important for hiding cover for nesting hens the following spring. In addition, grazing on shrubs, especially sagebrush, during winter months may cause impacts to both hiding/thermal cover as well as the primary food resource for Gunnison sage-grouse.

Livestock grazing can also impact fire return intervals, which in turn can affect Gunnison sage-grouse habitat quality. Fire ecology in the sagebrush steppe ecosystem has changed dramatically with European settlement. In high elevation sagebrush habitat, fire return intervals have increased from 12–24 years to more than 50 years, resulting in the dominance of woody vegetation (typically juniper and/or piñon pine) and the decline of important shrubs and herbaceous understories. At lower elevations, fire return intervals have decreased dramatically from 50–100 years to less than 10 years due to invasion by annual grasses resulting in the loss of native perennial shrubs, forbs, and grasses (Crawford *et al.* 2004, p. 8). By changing vegetative structure and composition, livestock grazing can contribute to either condition (an increase in woody vegetation or invasive annual grasses) (Beck and Mitchell 2000, p. 995-996, and references therein), increasing the risk of larger, more severe, or more frequent wildfires (also see Piñon-Juniper Encroachment and Invasive Plants sections in this rule). On the other hand, livestock grazing may reduce herbaceous fuel accumulation and continuity and, consequently, the risk of wildfires in sagebrush habitats (Davies *et al.* 2010, p. 662).

We know that livestock grazing influences fire ecology in sage-grouse habitat. However, due to the spatial complexity of fire in sagebrush ecosystems (Crawford *et al.* 2004, p.7), and the numerous factors determining the effects of grazing on sagebrush habitats (as described above), the effects of grazing on sage-grouse by altering fire ecology likely vary widely across time and space. Grazing by livestock, especially if done in a manner not consistent with local ecological conditions, including soil types, precipitation zones, vegetation composition and drought conditions, can reduce the suitability of breeding and brood-rearing habitat, negatively affecting sage-grouse populations (Braun 1987, p. 137; Dobkin 1995, p. 18; Connelly and Braun 1997, p. 231; Beck and Mitchell 2000, pp. 998–1000; USFWS 2013e, p. 45). Livestock and wild ungulate numbers must be managed at levels that allow native sagebrush vegetative communities to minimally achieve Proper Functioning Conditions for riparian areas or Rangeland Health Standards for uplands (USFWS 2013e, p. 45). Domestic livestock grazing reduces water infiltration rates and the cover of herbaceous plants and litter, compacts the soil, and increases soil erosion (Braun 1998, p. 147; Dobkin *et al.* 1998, p. 213). These impacts change the proportion of shrub, grass, and forb components in the affected area, and facilitate invasion of exotic plant species that do not provide suitable habitat for sage-grouse (Mack and Thompson 1982, p. 761; Miller and Eddleman 2000, p. 19; Knick *et al.* 2011, pp. 228–232).

Cattle feed mostly on grasses, but will make seasonal use of forbs and shrub species like sagebrush (Vallentine 1990, p. 226), the primary source of nutrition for sage-grouse. Within the range of Gunnison sage-grouse, sheep use of sagebrush habitats occurs primarily during the winter and spring months, depending on elevation. Sheep feed primarily on sagebrush and other shrubs. A sage-grouse hen's nutritional condition affects nest initiation rate, clutch size, and subsequent reproductive success (Barnett and Crawford 1994, p. 117; Coggins 1998, p. 30). Grazing management practices that are inconsistent with local ecological conditions in mesic sites result in a reduction of forbs and grasses available to sage-grouse chicks, thereby affecting chick survival (Aldridge and Brigham 2003, p. 30). Chick survival is one of the most important factors in maintaining Gunnison sage-grouse population viability (GSRSC 2005, p. 173). We conclude that livestock utilization of forage resources has the potential to negatively impact Gunnison sage-grouse, though the magnitude of those effects depends on location, grazing practices, and site-specific factors.

Livestock can trample sage-grouse nests and nesting habitat. Although the effect of trampling at a population level is unknown, outright nest destruction has been documented, and the presence of livestock can cause sage-grouse to abandon their nests (Rasmussen and Griner 1938, p. 863; Patterson 1952, p. 111; Call and Maser 1985, p. 17; Holloran and Anderson 2003, p. 309; Beck and Mitchell 2000, p. 994; Coates 2007, p. 28). Sage-grouse have been documented to abandon nests following partial nest predation by cows (Coates 2007, p. 28). In general, all recorded encounters between livestock and grouse nests resulted in hens flushing from nests, which could expose the eggs to predation. Visual predators like ravens likely use hen movements to locate sage-grouse nests (Coates 2007, p. 33). Livestock also may trample sagebrush seedlings, thereby removing a source of future sage-grouse food and cover (Connelly *et al.* 2004, pp. 7–31, and references therein). Trampling of soil by livestock can reduce or eliminate biological soil crusts making these areas susceptible to cheatgrass invasion (Mack 1981, pp. 148–149; Young and Allen 1997, p. 531).

Livestock grazing may also have positive effects on sage-grouse under some habitat conditions. Sage-grouse use grazed meadows significantly more during late summer than ungrazed meadows because grazing had stimulated the regrowth of forbs (Evans 1986, p. 67). Greater sage-grouse sought out and used openings in meadows created by cattle grazing in northern Nevada (Klebenow 1981, p. 121). Also, both sheep and goats have been used to control invasive weeds (Mosley 1996 *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) in sage-grouse habitat. Anecdotal reports and opinion papers (Brunner 2006, p. 16; Gunnison County 2013a, p. 95) have suggested that cattle manure attracts and supports insect populations upon which sage-grouse depend for survival, and that sage-grouse "follow" cattle through pastures. However, there is no empirical evidence to support this theory. Further, there are no data to substantiate the idea that in areas not actively grazed by livestock, sage-grouse are limited in some way (Connelly *et al.* 2007, p. 37).

Sagebrush plant communities are not adapted to domestic grazing disturbance. Grazing changed the functioning of systems into less resilient, and in some cases, altered communities (Knick *et al.* 2011, pp. 229–232). The ability to restore or rehabilitate areas depends on the condition of the area relative to the ability of a site to support a specific plant community (Knick *et al.* 2011, pp. 229–232). For example, if an area has a balanced mix of shrubs and native understory vegetation, a change in grazing management can restore the habitat to its potential historical species composition (Pyke 2011, pp. 536–538). Wambolt and Payne (1986, p. 318) found that resting areas from grazing had a better perennial grass response than other treatments. Active restoration is likely required where native understory vegetation is much reduced (Pyke 2011, pp. 536–540). But, if an area has soil loss or invasive species, returning the site to the native historical plant community may be impossible (Daubenmire 1970, p. 82; Knick *et al.* 2011, pp. 230–231; Pyke 2011, p. 539).

Aldridge *et al.* (2008, p. 990) did not find any relationship between sage-grouse persistence and livestock densities. However, the authors noted that livestock numbers do not necessarily correlate with range condition. They concluded that the intensity, duration, and distribution of livestock grazing are more influential on rangeland condition than the density of livestock (Aldridge *et al.* 2008, p. 990). Currently, little direct evidence links grazing practices to population levels of Gunnison or greater sage-grouse. Although grazing has not been examined at large spatial scales, as discussed above, we do know that grazing that is incompatible with local ecological conditions and that does not allow native sagebrush vegetative communities to minimally achieve Proper Functioning Conditions for riparian areas or Rangeland Health Standards for uplands can have negative impacts to individuals, nests, breeding productivity, and sagebrush and, consequently, to sage-grouse at local scales (USFWS 2013e, p. 44). However, how these impacts operate at large spatial scales and thus on population levels is currently unknown.

Livestock Grazing Allotments and Habitat Monitoring—

Our analysis of grazing is focused on BLM lands because nearly all of the information available to us regarding current grazing management within the range of Gunnison sage-grouse was provided by the BLM. Similar information was provided by the USFS, but was more limited since the USFS has less occupied habitat in grazing allotments and has a different habitat monitoring approach than BLM (see discussion below). A summary of domestic livestock grazing management on BLM and USFS lands in occupied Gunnison sage-grouse habitat is provided in Table 8.

Table 8. Summary of domestic livestock grazing management and allotment data on BLM[a] and USFS[b] lands in occupied habitat for each of the Gunnison sage-grouse (GUSG) populations (from BLM (2013b, p. 3-1) and USFWS (2010c), compilation of data provided by BLM and USFS).

Population	**USFS**	**BLM**						
	Number of Active USFS Allotments	Number of Active BLM Allotments	Active BLM Allotments with GUSG[c] Objectives		BLM Allotments Assessed under LHA[d]		Assessed BLM Allotments Meeting LHA Objective (Standard 4)	
Gunnison	34	62	62	100%	62	100%	20	32%
San Miguel Basin	*no data*	12	11	92%	10	83%	4[g]	40%
Dove Creek	*n/a*[e]	3	0	0%	3	100%	Unknown[h]	---
Monticello	*n/a*[e]	6	6	100%	5	83%	4	80%
Piñon Mesa	*no data*	15	8	53%	4	27%	4	100%
Cerro Summit–Cimarron–Sims Mesa	*n/a*[e]	6	1	17%	6	100%	1[i]	17%
Crawford[f]	*n/a*[e]	8	8	100%	8	100%	7[j]	88%
Poncha Pass	*no data*	8	8	100%	8	100%	8	100%
Total	**34**	**124**	**83**	**67%**	**101**	**81%**	**48**	**48%**

[a]Bureau of Land Management
[b]United States Forest Service
[c]Gunnison sage-grouse
[d]Land Health Assessments
[e]No United States Forest land in occupied habitat in this population area
[f]Includes allotments on National Park Service lands but managed by the Bureau of Land Management
[g]BLM did not evaluate land health specific to GUSG Habitat Objectives in 8 of the 12 active allotments in the San Miguel Basin population area
[h]BLM did not evaluate land health specific to GUSG Habitat Objectives in any of the 3 active allotments in the Dove Creek population area
[i]BLM did not evaluate land health specific to GUSG Habitat Objectives in 5 of the 6 active allotments in the Cerro Summit-Cimarron-Sims Mesa population area; however, general land health standards were met on BLM lands in this area
[j]BLM found that 6 allotments (75 percent) were "meeting with problems" for GUSG Habitat Objectives. Generally these allotments were found to be low for some aspect of vegetation characteristics for breeding habitat recommended in GSRSC (2005 H-6)

Some of the available information on domestic livestock grazing and its relationship to habitat conditions on Federal lands is in the form of BLM's Land Health Assessment (LHA) data. The purpose of LHAs is to determine the status of resource conditions within a specified geographic area at a specific time. The LHA process incorporates land health standards that define minimum resource conditions that must be achieved and maintained. Further discussion on the LHA process is provided in the following section.

The USFS does not apply the LHA process, but monitors allotment trends through a combination of procedures including seasonal inspections, permanent photo points, and inventory and mapping of plant community conditions and changes over time (USFS 2010). The majority of Gunnison sage-grouse occupied habitat in USFS grazing allotments is located in the Gunnison Basin population area (Table 8 of Factor A (Livestock Grazing Allotments and Habitat Monitoring)), and grazing information from USFS as it relates to Gunnison sage-grouse is therefore limited to this area (USFWS 2010c, p2).

Although grazing also occurs on lands owned or managed by other entities, we have more limited information on the extent of grazing, management, and habitat conditions in those areas. However, substantial portions of sage-grouse habitat on private land in the Gunnison Basin, Crawford, San Miguel, and Piñon Mesa population areas are enrolled in the CCAA (see Conservation Programs and Efforts Related to Habitat Conservation below in this Factor A section). Based on the RCP conservation objective of securing and maintaining 90 percent of seasonally important habitat (severe winter, nesting, and late brood-rearing habitats) for the Gunnison sage-grouse in each population area (GSRSC 2005, pp. 223-224), the CCAA identifies targets for private land protection for each population area, including private lands not already considered as protected under a conservation easement (USFWS 2006, pp. 11-12). Roughly 91 percent of the Gunnison Basin population area target, 95 percent of the Crawford population area target, 46 percent of the San Miguel population area target, and 217 percent of the Piñon Mesa population area target on private lands are enrolled in the CCAA (Table 10). Except for properties recently enrolled in the program, all enrolled private lands have been monitored by CPW using standardized vegetation transects and rangeland health assessments and, despite recent drought conditions and ongoing land uses, no significant deviations from baseline habitat conditions were observed (CPW 2014a, p. 1). All enrolled properties continue to be in compliance with the terms of their Certificate of Inclusion (CI) (CPW 2014a, p. 1). This information suggests that the current level of livestock grazing and operations on those lands is compatible with Gunnison sage-grouse habitat needs.

Although Federal land and livestock grazing may be more regulated than private lands grazing, we cannot make any generalizations about how habitat conditions in those areas might compare with private lands where livestock grazing occurs. Grazing allotments containing both Federal and private lands are, in some cases, managed to meet land health standards through coordination and cooperation with grazing permittees (BLM 2013c, p. 1-2). Furthermore, many livestock operations within the range of

Gunnison sage-grouse are employing innovative grazing strategies and conservation actions (BLM 2012a, pp. 1-2; Gunnison County Stockgrowers 2009, entire) in collaboration with the BLM and Forest Service.

BLM Land Health Assessment Standards—

LHA standards are based on the recognized characteristics of healthy ecosystems and include considerations of upland soils, riparian systems, plant and animal communities, habitat conditions and populations of special status species, and water quality (BLM 1997, pp. 6-7). Each LHA standard, such as the condition and health of soils, riparian areas, or plant communities, has varying degrees of applicability to basic Gunnison sage-grouse habitat needs. The LHA standard most applicable to Gunnison sage-grouse is LHA Standard 4, which is specific to special status species (BLM 1997, p. 7). *Special status species* include Federally threatened, endangered, proposed, and candidate species; recently delisted (5 years or less) species; and BLM sensitive species. *BLM sensitive species* are those that require special management consideration to promote their conservation and reduce the likelihood and need for future listing under the Act; they are designated by the BLM State Director(s) (BLM 2008). Gunnison sage-grouse was designated as a BLM sensitive species in 2000, when it was recognized as a separate species from greater sage-grouse (BLM 2009a, p. 7). Therefore, Gunnison sage-grouse is managed by the BLM as a special status species.

In addition to requiring stable and increasing populations and suitable habitat for special status species, the specific indicators for LHA Standard 4 include the presence of: minimal noxious weeds, sustainably reproducing native plant and animal communities, mixed age classes sufficient to sustain recruitment and mortality fluctuations, habitat connectivity, photosynthetic activity throughout the growing season, diverse and resilient plant and animal communities in balance with habitat potential, plant litter accumulation, and several plant communities in a variety of successional stages and patterns (BLM 1997, p. 7). BLM deems an allotment that meets LHA Standard 4 to meet or exceed a minimum resource condition for those species considered for that area.

If livestock grazing is found to be a causal factor for not meeting LHA standards, including LHA Standard 4, BLM implements changes to grazing management to address those issues and to move toward achieving desired resource conditions. Examples of adjustments include reduction of stocking rates or utilization, changes in seasons of use, reductions in duration of use, implementation of resting or deferred rotation grazing systems, or change in livestock class. Under BLM Instruction Memoranda WO-IM-2010-071, CO-IM-2010-028 and CO-IM-2013-033 (see further discussion in Factor D on Instruction Memoranda), BLM must consider Gunnison sage-grouse habitat needs and objectives when analyzing grazing management and permit renewals (BLM 2013a, Attachment 1-10).

We recognize that LHAs are largely qualitative and other factors such as impacts from invasive species, drought, OHV use, or the lingering effects of historical overgrazing, may influence the outcome of LHA determinations. Furthermore, BLM's application of LHA standards, methodologies used, and data interpretation varies widely by Field Office and State (Veblen *et al.* 2011, p. 3; BLM 2013c, p. 1-3), and the potentially subjective nature of the methodology is evident in the information on each populations presented below. Therefore, the relationship between LHA determinations and the effects of domestic livestock grazing on Gunnison sage-grouse is very imprecise. We also recognize that if an allotment does not fully meet LHA Standard 4, it does not mean the habitat is degraded or unsuitable for Gunnison sage-grouse; and a "not meeting" ranking is not always attributable to livestock grazing (BLM 2013c, p. 1-2). For instance, some vacant allotments (not grazed by livestock) are not currently meeting LHA Standard 4 (BLM 2013c, p. 1-3), meaning current grazing practices are not a causal factor for that ranking. A "not meeting" determination could also be based primarily on the declining status of a special status species' population, including species other than Gunnison sage-grouse. Finally, LHAs are typically only conducted every 10 years, triggered by changes in management such as grazing permit renewal and similar actions and, therefore, do not directly indicate rangeland trend (BLM 2013c, p. 1-3). However, the fact that some grazing allotments or areas within grazing allotments are not meeting LHA objectives indicates that habitat conditions may be degraded for Gunnison sage-grouse in parts of its range, and that domestic livestock grazing may be contributing to these conditions in some instances. A more thorough examination of each allotment not meeting LHA Standard 4 would be required to determine to what extent livestock grazing is a causal factor.

Livestock Grazing in the Gunnison Basin Population Area—

The BLM manages approximately 51 percent of the area currently occupied by Gunnison sage-grouse in the Gunnison Basin. Nearly all (98 percent) of this area is actively grazed USFWS 2010c, p. 1). The USFS manages livestock grazing on approximately 14 percent of the occupied portion of the Gunnison Basin population area. Therefore, this information on livestock grazing is pertinent to approximately 65 percent of occupied habitat in the Gunnison Basin.

In 2013, of 62 active BLM grazing allotments in the Gunnison Basin population, all had incorporated Gunnison sage-grouse habitat objectives as described above and completed LHAs. LHA Standard 4 was met in 32 percent of these allotments in 2013 (Table 8 of Factor A (Livestock Grazing Allotments and Habitat Monitoring); BLM 2013c, p. 3-1). In 2012, on actively grazed BLM lands in the Gunnison Basin, approximately 8 percent was "meeting", 17 percent was "moving towards", and 63 percent was "not meeting" Standard 4; while 11 percent was of "unknown" status (BLM 2012a, pp. 2-3).

Although 2013 data shows that 68 percent of allotments may not be meeting LHA Standard 4, the data show that 32 percent of allotments were meeting this standard, which is an improvement over the 8 percent indicated by the 2012 data. Nonetheless, recognizing the limitations of LHA methodology and data as discussed above, the information above suggests that there may be reduced habitat conditions on BLM land in the Gunnison Basin. The cause of these conditions may or may not be directly related to grazing management practices that were inconsistent with local ecological conditions, either in the past or at present, but the overall trend is for improving conditions with respect to LHA Standard 4. The BLM has also implemented a CCA for Gunnison Basin

(BLM 2013b, entire), which has specific measures for livestock grazing within all occupied habitat in the Gunnison Basin to help improve Gunnison sage-grouse habitat quality (BLM 2013b, Attachment 5-4) (see Conservation Programs and Efforts Related to Habitat Conservation later in this Factor A analysis).

In 2007 and 2008, the BLM Gunnison Field Office conducted Gunnison sage-grouse habitat assessments in two major occupied habitat locations in the Gunnison Basin population, quantifying vegetation structural characteristics and plant species diversity. Data were collected and compared to Gunnison sage-grouse Structural Habitat Guidelines in the 2005 Rangewide Conservation Plan (RCP) (GSRSC, 2005, Appendix H) during optimal growing conditions in these two major occupied areas. Of 97 transects, guidelines were met in 45 percent for sagebrush cover; 30 percent for grass cover; 25 percent for forb cover; 75 percent for sagebrush height; 81 percent for grass height; and 39 percent for forb height (BLM 2009a, pp. 31–32). This information suggests that habitat conditions in those areas generally fell short of standards for Gunnison sage-grouse, particularly in relation to grass cover, forb cover, and forb height. However, it is not known whether those conditions were attributable to livestock grazing or other factors such as big game forage use or weather patterns.

Livestock grazing has also negatively impacted several Gunnison sage-grouse treatments (projects aimed at improving habitat condition) in the Gunnison Basin (BLM 2009a, p. 34). Although these areas are generally rested from domestic livestock grazing for 2 years after treatment, several have been heavily used by cattle shortly after the treatment and the effectiveness of the treatments decreased (BLM 2009a, p. 34), which reduced the potential benefits of the treatments.

As noted earlier, the USFS does not use the LHA process, but monitors allotment trends through a combination of procedures including seasonal inspections, permanent photo points, and inventory and mapping of plant community conditions and changes over time (USFS 2010, entire). Three (9 percent) of the 34 USFS allotments in Gunnison sage-grouse occupied habitat in the Gunnison Basin population area have incorporated habitat objectives in their grazing plans. However, we have no specific data that evaluate allotment conditions as they relate to these objectives. Overall, the USFS reports that its grazing allotments in the Gunnison Basin population area appear to be improving in forb and grass cover but are declining in sagebrush cover (USFS 2010, entire).

All of this information indicates that grazing management may be a factor in degraded habitat conditions for Gunnison sage-grouse in parts of the Gunnison Basin. Given that there are far more acres of occupied Gunnison sage-grouse habitat in the Gunnison Basin that are actively grazed than in other populations, and over 50 percent of land (295,000 ac) in the Gunnison Basin is under BLM management, most of which is actively grazed, overall exposure to Federal grazing management is higher in the Gunnison Basin than elsewhere. This raises concerns about the long-term habitat impacts of grazing management on BLM land, and supports the need for BLM to continue to monitor and improve LHA trends and grazing allotment management.

BLM reviews and renews grazing permits at 10 year intervals. Since at least 2010 BLM has modified grazing permit terms and conditions in areas determined to be "not meeting" LHA standards through the permit renewal process. Examples of new permit terms or conditions required by the BLM include implementation of rotational grazing systems, deferment or elimination of grazing in certain pastures, reduced grazing duration, changes in season of use, reduced stocking rates, fencing livestock out of riparian areas, or incorporating specific habitat objectives for Gunnison sage-grouse or other special status species (BLM 2012a, pp. 1-2). It is anticipated that these changes will minimize further impacts to habitat and, if continued in the future through Instruction Memoranda or Resource Management Plan Amendments (see Factor D discussion), improve degraded habitats for Gunnison sage-grouse in the Gunnison Basin. Likewise, conservation measures from the CCA (BLM 2013b, entire) should continue to reduce impacts from livestock grazing and operations on Federal lands in the Gunnison Basin (see Conservation Programs and Efforts Related to Habitat Conservation later in this Factor A analysis for more details).

Some data indicate habitat conditions within a part of occupied habitat in the Gunnison Basin may be favorable to Gunnison sage-grouse (Williams and Hild 2011, entire). Detailed vegetation monitoring was conducted on six study sites, across the Gunnison Basin during 2010 and 2011 in order to determine baseline habitat conditions for a potential future study of the effects of manipulating livestock grazing on Gunnison sage-grouse habitat (Williams and Hild 2011, entire). Transects were conducted on private, BLM, USFS, and CPW land. Despite lower than average precipitation in 2010, and wide variability of habitat conditions across the study area, most vegetation measurements were within the structural habitat guidelines for Gunnison sage-grouse from the 2005 Rangewide Conservation Plan (GSRSC[b] 2005, pp. H-6-H-8). However, measuring livestock grazing effects was not an objective of the study (Phillips 2013, p. 4). The extent of past or current livestock grazing in these areas was not described, nor did the study compare un-grazed to grazed areas. Further, transect locations were prioritized and selected in important breeding areas used by radio-collared Gunnison sage-grouse, potentially biasing study results. Therefore, the relationship between livestock grazing and habitat conditions is unknown under this study, and there is limited ability to infer conditions in other portions of the Gunnison Basin not prioritized for sampling.

Livestock Grazing in All Other Population Areas—

The BLM manages approximately 36 percent of the area currently occupied by Gunnison sage-grouse in the San Miguel Basin, and approximately 79 percent of this area is actively grazed. Grazing also occurs on lands owned or managed by other entities within the San Miguel Basin, but we have no information on the extent of grazing in these areas. Within the occupied range in the San Miguel population, no active BLM grazing allotments have Gunnison sage-grouse habitat objectives incorporated into the allotment management plans or Records of Decision for permit renewals (USFWS 2010c, p. 9). In 2013, 10 (83 percent) of 12 active allotments in the San Miguel population area had LHAs completed in the last 15 years; however, BLM only evaluated land health specific to Gunnison sage-grouse habitat objectives in four (33 percent) of these 12 allotments. Of the four allotments evaluated, all were found to be meeting LHA Standard 4. LHA data are not available for conditions in the remaining 8 allotments where Gunnison sage-grouse habitat objectives were not considered (Table 8 of Factor A (Livestock Grazing Allotments and Habitat Monitoring); BLM 2013c, p. 3-1). Therefore, for the four allotments in the San Miguel population area for which we have information, it appears that grazing is managed in a manner consistent with land health standards and habitat requirements for Gunnison sage-grouse.

More than 81 percent of the area occupied by the Dove Creek group is privately owned. The BLM manages 11 percent of the occupied habitat, and 41 percent of this area is actively grazed. Within the occupied range in the Dove Creek group of the Monticello-Dove Creek population, there are three active BLM grazing allotments, and none of these have Gunnison sage-grouse habitat objectives incorporated into the allotment management plans or Records of Decision for permit renewals (Table 8 of Factor A (Livestock Grazing Allotments and Habitat Monitoring); USFWS 2010c, p. 3; BLM 2013c, p. 3-1). In 2013, all three active allotments in occupied habitat had completed LHAs. However, because Gunnison sage-grouse habitat objectives were not considered in these assessments, habitat conditions for Gunnison sage-grouse are unknown (BLM 2013c, p. 3-1). Gunnison sage-grouse are not specifically considered in grazing management plans or permits in this area. Due to the lack of data specific to Gunnison sage-grouse, it is unknown how livestock grazing may be influencing the species or its habitat in the Dove Creek population area.

More than 95 percent of the area occupied by the Monticello population is privately owned. The BLM manages 4 percent of the occupied habitat, and 83 percent of this area is grazed. Within the occupied range in the Monticello population, all 6 active BLM grazing allotments have Gunnison sage-grouse habitat objectives incorporated into the allotment management plans or Records of Decision for permit renewals (USFWS 2010c, p. 6). In 2009 (the most recent information received from BLM on this topic), 88 percent of the area of occupied habitat in active allotments had a recently completed LHA. Approximately 60 percent of the area in occupied habitat in active allotments was found by the BLM to meet LHA Standard 4. Given the small amount of land managed by the BLM in this area, most of which is meeting Standard 4, this information suggests that grazing on the majority of the small percentage of lands managed by the BLM in the Monticello population area is likely managed in a manner consistent with land health standards and habitat requirements for Gunnison sage-grouse.

The majority of occupied habitat in the Monticello population is in private ownership and is actively grazed by cattle. Sheep historically grazed this area as well (Messmer 2013, p. 16). A significant portion of the agricultural lands in Monticello population are enrolled in the Conservation Reserve Program (CRP), and much of these lands are used by Gunnison sage-grouse (Lupis *et al.* 2006, pp. 959–960; Ward 2007, p. 15). CRP land has provided a considerable amount of brood-rearing habitat in the Monticello group because of its forb component. Grazing of CRP land in Utah occurred in 2002 under emergency Farm Bill provisions due to drought and removed at least some of the grass and forb habitat component, thus likely negatively affecting Gunnison sage-grouse chick survival (see NRCS and Private Land Conservation Efforts). Radio-collared males and non-brood-rearing females exhibited temporary avoidance of grazed fields during and after grazing (Lupis *et al.* 2006, pp. 959–960), although one hen with a brood continued to use a grazed CRP field and successfully fledged her brood.

The BLM manages 28 percent of occupied habitat in the Piñon Mesa population area, and approximately 97 percent of this area is grazed. Over 50 percent of occupied habitat in this population area is privately owned, and while grazing certainly occurs on these lands, we have no information on its extent. Within the occupied range in the Piñon Mesa population, 8 of 15 (53 percent) active BLM grazing allotments have Gunnison sage-grouse habitat objectives incorporated into the allotment management plans or Records of Decision for permit renewals (USFWS 2010c, p. 5). In 2013, four of these allotments (27 percent) had completed LHAs. Of the four allotments in which LHAs were completed, all (100 percent) were found to be meeting LHA Standard 4 (Table 8 of Factor A (Livestock Grazing Allotments and Habitat Monitoring); BLM 2013c, p. 3-1). Therefore, for the small portion of the Piñon Mesa population area for which we have information, it appears that grazing is managed in a manner consistent with Gunnison sage-grouse habitat requirements.

Over 76 percent of the area occupied by the Cerro Summit–Cimarron–Sims Mesa population is privately owned. The BLM manages only 13 percent of the occupied habitat, of which 83 percent is grazed. Within the occupied range in the Cerro Summit–Cimarron–Sims Mesa population, 1 of 6 active BLM grazing allotments have Gunnison sage-grouse habitat objectives incorporated into the allotment management plans or Records of Decision for permit renewals (USFWS 2010c, p. 7). In 2013, of six active allotments, all had completed LHAs; however, BLM only evaluated land health specific to Gunnison sage-grouse habitat objectives in one (17 percent) of these six allotments. That single allotment was found to be meeting LHA Standard 4. However, general land health standards (not specific to Gunnison sage-grouse) were met on BLM lands in this area, although such conditions may or may not meet the needs of Gunnison sage-grouse. LHA data specific to Gunnison sage-grouse habitat objectives are not available for the remaining five allotments (Table 8 of Factor A (Livestock Grazing Allotments and Habitat Monitoring); BLM 2013c, p. 3-1). However, for the small portion of the Cerro Summit-Cimarron-Sims Mesa population area for which we have information, it appears that grazing is being managed in a manner consistent with land health standards and habitat requirements for Gunnison sage-grouse.

Lands administered by the BLM and NPS comprise over 75 percent of occupied habitat in the Crawford population, and 96 percent of this area is actively grazed. Grazing allotments on NPS lands in this area are administered by the BLM. In 2013, of eight active allotments in the Crawford population, all had incorporated Gunnison sage-grouse habitat objectives and completed LHAs. Seven (88 percent) of these eight allotments were found to be meeting LHA Standard 4, however 6 of those allotments were defined as "meeting with problems" (generally these allotments were found to be low for some aspect of vegetation characteristics for breeding habitat recommended in GSRSC) (Table 8 of Factor A (Livestock Grazing Allotments and Habitat Monitoring);

BLM 2013c, p. 3-1). Based on this information, it appears that grazing may be managed in a manner consistent with Gunnison sage-grouse conservation in the majority of the Crawford population area.

The BLM manages nearly half of occupied habitat in the Poncha Pass population area, and approximately 98 percent of this area is actively grazed. Within the occupied range in the Poncha Pass population, all eight active BLM grazing allotments have Gunnison sage-grouse habitat objectives incorporated into the allotment management plans or Records of Decision for permit renewals (USFWS 2010c, p. 4). In 2013, all active allotments in occupied habitat had completed LHAs, and all were meeting LHA objectives. Based on this information it appears that grazing is managed in a manner consistent with Gunnison sage-grouse conservation on BLM land in the Poncha Pass population area.

Wild Ungulate Herbivory in All Population Areas—

Overgrazing by deer and elk may cause local degradation of habitats by removal of forage and residual hiding and nesting cover. Hobbs *et al.* (1996, pp. 210–213) documented a decline in available perennial grasses as elk densities increased. Such grazing could negatively impact nesting cover for sage-grouse. The winter range of deer and elk overlaps the year-round range of the Gunnison sage-grouse. Excessive but localized deer and elk grazing has been documented in the Gunnison Basin (BLM 2005a, pp. 17–18; Jones 2005, pers. comm.).

Grazing by deer and elk occurs in all Gunnison sage-grouse population areas. Although we have no information indicating that competition for resources is limiting Gunnison sage-grouse in the Gunnison Basin, BLM observed that certain mountain shrubs were being browsed heavily by wild ungulates (BLM 2009a, p. 34). Subsequent results of monitoring in mountain shrub communities indicated that drought and big game were having large impacts on the survivability and size of mountain mahogany *(Cercocarpus utahensis),* bitterbrush *(Purshia tridentata),* and serviceberry *(Amelanchier alnifolia)* in the Gunnison Basin (Japuntich *et al.* 2010, pp. 7–9). The authors speculated that observed reductions in shrub size and vigor will reduce drifting snow accumulation resulting in decreased moisture availability to grasses and forbs during the spring melt. Reduced grass and forb growth could negatively impact Gunnison sage-grouse nesting and early brood-rearing habitat. It is also thought that elk numbers and their seasonal occurrence in the Crawford population may be contributing to habitat impacts and direct disturbance of Gunnison sage-grouse (BLM 2013c, p. 4-9).

Summary of Domestic Grazing and Wild Ungulate Herbivory

Livestock management and domestic grazing have the potential to degrade Gunnison sage-grouse habitat. Grazing incompatible with local ecological conditions, as described above, can adversely impact nesting and brood-rearing habitat by decreasing vegetation available for concealment from predators. Grazing incompatible with local ecological conditions also has been shown to compact soils, decrease herbaceous abundance, increase erosion, and increase the probability of invasion of exotic plant species (GSRSC 2005, p. 173).

The impacts of livestock operations on Gunnison sage-grouse depend upon stocking levels and season of use. We recognize that not all livestock grazing results in habitat degradation, and many livestock operations within the range of Gunnison sage-grouse are employing innovative grazing strategies and conservation actions (BLM 2012a, pp. 1-2; Gunnison County Stockgrowers 2009, entire) in collaboration with the BLM and Forest Service. As discussed above, habitat conditions are likely favorable to Gunnison sage-grouse in part of the Gunnison Basin (Williams and Hild 2011, entire), although the relationship of livestock grazing to habitat conditions in those areas is unknown.

As described above, the relationship between LHA determinations and the effects of domestic livestock grazing on Gunnison sage-grouse is imprecise, and the application of LHA methods varies widely across the species' range. The best available information suggests that LHA objectives important to Gunnison sage-grouse are not being met across parts of the species' range and that livestock grazing is likely contributing to those conditions in some instances. Reduced habitat quality in those areas, as reflected in LHA data, is likely negatively impacting Gunnison sage-grouse in some of the populations, including the Gunnison Basin. In summary, for BLM allotments, 67 percent have Gunnison sage-grouse habitat objectives, and 39 percent are meeting LHA Standard 4 (Table 8 of Factor A (Livestock Grazing Allotments and Habitat Monitoring)).

Numerous public comments on our proposed rule to list Gunnison sage-grouse as endangered (78 FR 2486, January 11, 2013) suggested that because the Gunnison Basin population is large and stable (but see additional discussion regarding this assumption in Factor E (Small Population Size and Structure)), current livestock grazing practices are not having adverse effects on this population. While we agree that, relative to the satellite populations, the Gunnison Basin population is large and lek count data indicate it is currently stable, there are no data to demonstrate whether livestock grazing is limiting the population. The best available data suggests that livestock grazing that is done in a manner inconsistent with local ecological conditions is likely negatively impacting localized areas of habitat and individual birds in the Gunnison Basin and in other populations.

We know that grazing incompatible with local ecological conditions can have negative impacts to sagebrush and consequently to Gunnison sage-grouse at local scales. Impacts to sagebrush plant communities as a result of grazing are occurring on a large portion of the range of the species. As described in more detail below, conservation measures from the Gunnison Basin CCA (BLM 2013b, entire) should continue to reduce impacts from livestock grazing and operations on Federal lands in the Gunnison Basin. Likewise, conservation measures from the CCAA Program have minimized impacts from livestock grazing and operations on private lands across the range of Gunnison sage-grouse (see Conservation Programs and Efforts Related to Habitat Conservation later in this Factor A discussion). We expect livestock grazing to continue throughout the range of Gunnison sage-grouse for as long as it is economically viable. Since the winter range of deer and elk overlaps the year-round range of Gunnison sage-grouse and there is documentation of isolated localized excessive grazing by deer and elk as discussed above, effects of domestic livestock grazing are likely intensified by browsing of woody species by wild ungulates in portions of the Gunnison Basin and the Crawford area, and potentially other populations. Habitat degradation that can result from grazing in a manner incompatible with local ecological conditions, particularly with the interacting factors of invasive weed expansion and climate change, is a current and future threat to Gunnison sage-grouse persistence.

Fences

Effects of fencing on sage-grouse include direct mortality through collisions, creation of raptor and corvid perch sites, the potential creation of predator corridors along fences (particularly if a road is maintained next to the fence), incursion of exotic species along the fencing corridor, and habitat decline (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, p. 1-2). However, fences can also benefit Gunnison sage-grouse by facilitating the management of livestock forage use and distribution to achieve desired habitat objectives (GSRSC 2005, pp. 211-213).

Sage-grouse frequently fly low and fast across sagebrush flats, and fences can create a collision hazard resulting in direct mortality (Call and Maser 1985, p. 22; Christiansen 2009, pp. 1–2). Not all fences present the same mortality risk to sage-grouse. Mortality risk appears to be dependent on a combination of factors including design of fencing, landscape topography, and spatial relationship with seasonal habitats (Christiansen 2009, pp. 1–2). This variability in fence mortality rate and the lack of systematic fence monitoring make it difficult to determine the magnitude of direct strike mortality impacts to sage-grouse populations; however, in some cases the level of mortality is likely significant to localized areas within populations. Greater sage-grouse fence collisions during the breeding season in Idaho were found to be relatively common and widespread, with collisions being influenced by the technical attributes of the fences, fence length and density, topography, and distance to nearest active sage-grouse lek (Stevens 2011, pp. 102–107; Stevens *et al.* 2012a; p. 300; Stevens *et al.* 2012b, p. 1377). Stevens *et al.* (2012a; p. 299) found 41 of 60 recorded collisions (73 percent) in spring of 2010 were less than 500m from a lek and only 1 collision > 500m from a lek, indicating that fences near leks containing certain topographic properties may pose an increased risk to sage-grouse.

Although we expect the impacts of fences to Gunnison sage-grouse are similar to those observed in greater sage-grouse, studies on fence strike-related mortality in Gunnison sage-grouse are more limited. In 10 years of tracking and studying over 1,000 radio-collared sage-grouse in Colorado, CPW has documented only two strike-related mortalities in Gunnison sage-grouse due to fences (one confirmed case in Poncha Pass attributed to bird release methods; and one unconfirmed case in the Gunnison Basin); and only two strike-related mortalities in greater sage-grouse due to fences (CPW 2013b, p. 11; Phillips and Griffin 2013, pers. comm.). This information suggests that, in Colorado, direct mortality of sage-grouse due to fence strikes is minimal, although without a more thorough study, the anecdotal information may be misleading.

Although the effects of direct strike mortality on populations are not fully analyzed, fences are generally widespread across the landscape. At least 1,540 km (960 mi) of fence are on BLM lands within the Gunnison Basin (Borthwick 2005b, pers. comm.; BLM 2005a, 2005e) and an unquantified amount of fence is located on land owned or managed by other landowners. Many miles of historic fence occurs on NPS lands, some of which may be affecting Gunnison sage-grouse. As of 2013, the NPS has removed 1.6 km (1 mi) of unnecessary fencing, and will continue inventorying efforts for additional removal where fencing is not needed. The NPS is also constructing 8.8 km (5.5 mi) of fence to prevent cattle grazing on a retired portion of an allotment. The fence is built to CPW suggested wildlife-friendly specifications with raptor perch deterrents and marked fence wires. Fences are present within all other Gunnison sage-grouse population areas as well, but we have no quantitative information on the amount or types of fencing in these areas.

Fence posts create perching places for raptors and corvids, which may increase the ability of these birds to prey on sage-grouse (Braun 1998, p. 145; Oyler-McCance *et al.* 2001, p. 330; Connelly *et al.* 2004, p. 13-12). This impact is potentially significant for sage-grouse reproduction because corvids were responsible for more than 50 percent of greater sage-grouse nest predations in Nevada (Coates 2007, pp. 26-30). Greater sage-grouse avoidance of habitat adjacent to fences, presumably to minimize the risk of predation, effectively results in habitat fragmentation even if the actual habitat is not removed (Braun 1998, p. 145). Because of similarities in behavior and habitat use, the response of Gunnison sage-grouse should be similar to that observed in greater sage-grouse.

Summary of Fences

Fences contribute to habitat decline and increase the potential for loss of individual grouse through collisions or enhanced predation. Fences can also benefit Gunnison sage-grouse by facilitating better management of livestock grazing forage use and distribution in sagebrush habitats. Despite some fence removal, we expect that the majority of existing fences will remain on the landscape indefinitely. In the smaller Gunnison sage-grouse populations, fencing cumulatively affects the ability of the species to persist. We also recognize that fences are located throughout all Gunnison sage-grouse populations and are, therefore, contributing to the decline of remaining habitat and are a potential source of mortality within all populations. For these reasons, fences are likely a contributing factor to the decline of Gunnison sage-grouse populations, both directly and indirectly, and are therefore a current and future threat to the species.

Invasive Plants

For the purposes of this rule, we define invasive plants as those that are not native to an ecosystem and that have a negative impact on Gunnison sage-grouse habitat.

Invasive plants alter native plant community structure and composition, productivity, nutrient cycling, and hydrology (Vitousek 1990, p. 7) and may cause declines in native plant populations through competitive exclusion and niche displacement, among other mechanisms (Mooney and Cleland 2001, p. 5446). Invasive plants reduce and can eliminate vegetation that sage-grouse use for food and cover, and generally do not provide quality sage-grouse habitat. Sage-grouse depend on a variety of native forbs and the insects associated with them for chick survival, and on sagebrush, which is used exclusively throughout the winter for food and cover. In eastern Nevada, leks with post-fire invasive grasses showed reduced lek recruitment and reduced annual survival of male greater sage-grouse as compared to leks surrounded by native sagebrush habitats, despite favorable rainfall and climatic conditions (Blomberg *et al.* 2012). Reduced adult survival, reproduction, and recruitment at the local levels may, in turn, negatively impact sage-grouse populations.

Along with replacing or removing vegetation essential to sage-grouse, invasive plants negatively impact existing sage-grouse habitat. They can create long-term changes in ecosystem processes, such as fire-cycles (see discussion below under Fire in this Factor A analysis) and other disturbance regimes that persist even after an invasive plant is removed (Zouhar *et al.* 2008, p. 33). A variety of nonnative annuals and perennials are invasive to sagebrush ecosystems (Connelly *et al.* 2004, pp. 7-107 and 7-108; Zouhar *et al.* 2008, p 144). Cheatgrass is considered most invasive in Wyoming big sagebrush communities (Connelly *et al.* 2004, p. 5-9). Other invasive plants found within the range of Gunnison sage-grouse that are reported to take over large areas include: spotted knapweed *(Centaurea maculosa),* Russian knapweed *(Acroptilon repens),* oxeye daisy *(Leucanthemum vulgare)*, yellow toadflax *(Linaria vulgaris)*, and field bindweed *(Convolvulus arvensis)* (BLM 2009a, p. 28, 36; Gunnison Watershed Weed Commission (GWWC) 2009, pp. 4–6).

Although not yet reported to affect large expanses in the range of Gunnison sage-grouse, the following weeds are also known to occur in the species' range and have successfully invaded large expanses of native wildlife habitats in other parts of western North America: diffuse knapweed *(Centaurea diffusa),* whitetop *(Cardaria draba),* jointed goatgrass *(Aegilops cylindrica),* and yellow starthistle *(Centaurea solstitialis).* Other invasive plant species present within the range of Gunnison sage-grouse that are problematic yet less likely to overtake large areas include: Canada thistle *(Cirsium arvense)*, musk thistle *(Carduus nutans),* bull thistle *(Cirsium vulgare),* houndstongue *(Cynoglossum officinale),* black henbane *(Hyoscyamus niger),* common tansy *(Tanacetum vulgare),* and absinth wormwood *(A. biennis)* (BLM 2009a, p. 28, 36; GWWC 2009, pp. 4–6).

Cheatgrass impacts sagebrush ecosystems by potentially shortening fire intervals from several decades, to as low as 3 to 5 years (depending on sagebrush plant community type and site productivity), perpetuating its own persistence and intensifying the role of fire (Whisenant 1990, p. 4). Another study found that cheatgrass presence can shorten fire intervals to less than 10 years resulting in the elimination of shrub cover and reducing the availability and quality of forb cover (Connelly *et al.* 2004, p. 7-5). Elevated carbon dioxide levels associated with climate change may increase the competitive advantage (via increased growth and reproduction rates) of exotic annual grasses, such as cheatgrass, in higher elevation areas, such as in Gunnison sage-grouse range, where its current distribution is limited (Miller *et al.* 2011, pp. 181–183). Decreased summer precipitation reduces the competitive advantage of summer perennial grasses, reduces sagebrush cover, and subsequently increases the likelihood of cheatgrass invasion (Bradley 2009, pp. 202–204; Prevey *et al.* 2009, p. 11). Future decreased summer precipitation could increase the susceptibility of sagebrush areas in Utah and Colorado to cheatgrass invasion (Bradley 2009, p. 204).

A variety of restoration and rehabilitation techniques are used to treat invasive plants, but they can be costly and are mostly unproven and experimental at a large scale. No broad-scale cheatgrass eradication method has yet been developed. Habitat treatments that either disturb the soil surface or deposit a layer of litter increase cheatgrass establishment in the Gunnison Basin when a cheatgrass seed source is present (Sokolow 2005, p. 51). Rehabilitation and restoration techniques for sagebrush habitats are mostly unproven and experimental, raising further concerns about soil disturbance and removal of any remaining sage-brush habitats. (Pyke 2011, p. 543). Therefore, researchers recommend using habitat treatment tools, such as brush mowers, with caution and suggest that treated sites should be monitored for increases in cheatgrass emergence (Sokolow 2005, p. 49).

Invasive Plants in the Gunnison Basin Population Area—

Quantifying the total amount of Gunnison sage-grouse habitat impacted by invasive plants is difficult due to differing sampling methodologies, incomplete sampling, inconsistencies in species sampled, and varying interpretations of what constitutes an infestation (Miller *et al.*, 2011, pp. 155–156). Cheatgrass has invaded areas in the Gunnison sage-grouse range, supplanting sagebrush habitat in some areas (BLM 2009a, p. 60). However, we do not have a reliable estimate of the amount of area occupied by cheatgrass in the range of Gunnison sage-grouse. While not ubiquitous, cheatgrass is found at numerous locations throughout the Gunnison Basin (BLM 2009a, p. 60) and has been identified as an impact to sage-grouse habitat in that population (GSRSC 2005, p. 78).

Cheatgrass infestation within a particular area can range from a small number of individuals scattered sparsely throughout a site, to complete or near-complete understory domination of a site. Cheatgrass has increased throughout the Gunnison Basin in the last decade and is becoming increasingly detrimental to sagebrush community types (BLM 2009a, p. 7). Currently in the Gunnison Basin, cheatgrass attains site dominance most often along roadways; however, other highly disturbed areas have similar cheatgrass densities. In the Gunnison Basin, cheatgrass is currently present in almost every grazing allotment in Gunnison sage-grouse occupied habitat; and other invasive plant species, such as Canada thistle, black henbane, spotted knapweed, Russian knapweed, kochia (*Kochia scoparia*), bull thistle, musk thistle, oxeye daisy, yellow toadflax and field bindweed, are found in riparian areas and roadsides (BLM 2009a, p. 7).

Weed control efforts in the Gunnison Basin vary by area and agency or organization. NPS weed control efforts have been successful at reducing weeds (undesirable plant species, typically including exotic or introduced species) in targeted areas. Gunnison County, the Gunnison Basin Weed Commission, and other partners aggressively treat and control weeds on all lands in the Gunnison Basin. From 2006 to 2012, a total of 517 ha (1,280 ac) of land was treated for weeds in and near occupied habitat for Gunnison sage-grouse (Gunnison County 2013a, p. 105), however it is unclear what portion of habitat this represents. Gunnison County also recently adopted best management practices for weeds identified in the Gunnison Basin CCA (Gunnison County 2013a, p. 78). Other measures related to weed control by Gunnison County include reclamation standards and inspections (Gunnison County 2013a, p. 106), educational programs and consultations (Gunnison County 2013a, p. 107). While beneficial and necessary, such control efforts are likely inadequate to address the threat of invasive plants, particularly in the face of climate change and drought which are likely to intensify the proliferation of these species in the range of Gunnison sage-grouse.

Although disturbed areas most often contain the highest cheatgrass densities, cheatgrass can readily spread into less disturbed and even undisturbed habitat. A strong indicator for future cheatgrass invasion is the proximity to current locations (Bradley and Mustard 2006, p. 1146) as well as summer, annual, and spring precipitation, and winter temperature (Bradley 2009, p. 196). Although we lack the information to make a detailed determination on the actual extent or rate of increase, given its invasive nature, it appears that cheatgrass and its negative influence on Gunnison sage-grouse will increase in the

Gunnison Basin in the future due to future human disturbances, potential exacerbation from climate change interactions, and the lack of success to date with control efforts at broad scales. Based on experience from other areas in sagebrush ecosystems concerning the rapid spread of cheatgrass and the shortened fire return intervals that can result, the spread of cheatgrass within Gunnison sage-grouse habitat and the negative effects to Gunnison sage-grouse populations will likely increase over time.

Invasive Plants in All Other Population Areas—

Cheatgrass is present throughout much of the San Miguel Basin population area (BLM 2005c, p. 6), but is most abundant in the Dry Creek Basin area (CDOW 2005, p. 101), which comprises 62 percent of the San Miguel Basin population. It is also present in the five Gunnison sage-grouse subpopulations east of Dry Creek Basin, although at much lower densities that do not currently pose a serious threat to Gunnison sage-grouse (CDOW 2005, p. 101).

Invasive species are present at low levels in the Monticello group (San Juan County GSGWG 2005, p. 20). However, there is no evidence that they are affecting the population.

Cheatgrass dominates 10–15 percent of the sagebrush understory in the current range of the Piñon Mesa population (Lambeth 2005, pers. comm.). It occurs in the lower elevation areas below Piñon Mesa that were formerly Gunnison sage-grouse range. Cheatgrass invaded two small prescribed burn areas in or near occupied habitat conducted in 1989 and 1998 (BLM 2005d, p. 6), and continues to be a concern with new ground-disturbing projects. Within the Piñon Mesa population, 520 ha (1,284 ac) of BLM lands are currently mapped with cheatgrass as the dominant species (BLM 2009a, p. 3). This is not a comprehensive inventory of cheatgrass occurrence, as it only includes areas where cheatgrass dominates the plant community and does not include areas where the species is present at lower densities.

Invasive plants, especially cheatgrass, occur primarily along roads, other disturbed areas, and isolated areas of untreated vegetation in the Crawford population area. According to BLM (2005c, p.6), in the Crawford population area, the threat of cheatgrass may be greater than all other nonnative species combined and could be a major limiting factor when and if disturbance is used to improve habitat conditions, unless mitigated.

Cheatgrass distribution has not been comprehensively mapped for the Monticello-Dove Creek population area; however, cheatgrass is beginning to be assessed on a site-specific and project-level basis. No significant invasive plant occurrences are currently known in the Poncha Pass population area.

Summary of Invasive Plants

Invasive plants negatively impact Gunnison sage-grouse primarily by reducing or eliminating native vegetation that sage-grouse require for food and cover, resulting in habitat decline. Although invasive plants, especially cheatgrass, have affected some Gunnison sage-grouse habitat, the impacts do not currently appear to be threatening individual populations or the species rangewide. However, invasive plants continue to expand their range, facilitated by ground disturbances such as fire, grazing, and human infrastructure. Climate change will likely alter the range of individual invasive species, accelerating the decline of sagebrush communities. Even with treatments, given the history of invasive plants on the landscape, and our continued inability to control such species, invasive plants will persist and will likely continue to spread throughout the range of the species indefinitely. Although currently not a major threat to the persistence of Gunnison sage-grouse at the species level, we anticipate invasive species to become an increasing threat to the species in the future, particularly when considered in conjunction with future climate projections and potential changes in sagebrush plant community composition and dynamics.

Fire

Mountain big sagebrush, the most important and widespread sagebrush species for Gunnison sage-grouse, is killed by fire and can require decades to recover. In nesting and wintering sites, fire causes direct loss of habitat due to reduced cover and forage (Call and Maser 1985, p. 17), with effects likely lasting 75 years or longer until sagebrush recovers (Baker 2011, p. 16). While there may be limited instances where burned habitat is beneficial (via prescribed fire or wildfire), these gains are lost if alternative sagebrush habitat is not readily available (Woodward 2006, p. 65). Another study (Baker 2013, p.

8) suggested that prescribed burning in sagebrush habitat may be detrimental, given the already limited range of Gunnison sage-grouse (see above sections, Current Distribution and Population Estimates, and Factor A introduction). Findings from that study indicated that historical fire regimes in Gunnison sage-grouse range resulted in large areas of contiguous sagebrush across the landscape when Gunnison sage-grouse were more widespread and abundant. Fire treatments to thin or reduce sagebrush, with its potential negative effects, would not be as beneficial to the species as efforts made to expand areas of contiguous sagebrush (Baker 2013, pp. 1, 8). Likewise, using fire to remove all trees in sagebrush habitats is likely not appropriate, based on the historical presence of piñon-juniper in these communities. Piñon-juniper abundance likely fluctuated over time in response to fire, at times occupying approximately 20 percent of the sagebrush landscape (Baker 2013, p. 8). Thus, on the whole, we conclude that fire negatively affects Gunnison sage-grouse and its habitat.

The nature of historical fire patterns in sagebrush communities, particularly in Wyoming big sagebrush, is not well understood, and a high degree of variability likely occurred (Miller and Eddleman 2001, p. 16; Zouhar *et al.* 2008, p. 154; Baker 2011, p. 195). In general, mean fire return intervals in low-lying, xeric (dry) big sagebrush communities range from over 100 to 350 years, with return intervals from 50 to over 200 years in more mesic (wet) areas, at higher elevations, during wetter climatic periods, and in locations associated with grasslands (Baker 2006, p. 181; Mensing *et al.* 2006, p. 75; Baker 2011, pp. 194–195; Miller *et al.* 2011, p. 166).

Herbaceous understory vegetation plays a critical role throughout the breeding season as a source of forage and cover for Gunnison sage-grouse females and chicks. The response of herbaceous understory vegetation to fire varies with differences in species composition, pre-burn site condition, fire intensity, and pre- and post-fire patterns of precipitation. Any beneficial flush of perennial grasses and forbs following fire in sagebrush communities is often minimal and lost after only a few years, with little difference in herbaceous vegetation between burned and unburned sites, but reduced sagebrush in burned sites (Cook *et al.* 1994, p. 298; Fischer *et al.* 1996a, p. 196; Crawford 1999, p. 7; Wrobleski 1999, p. 31; Nelle *et al.* 2000, p. 588; Paysen *et al.* 2000, p. 154; Wambolt *et al.* 2001, p. 250).

In addition to altering plant community structure through shrub removal and potential weed invasion, fires can influence invertebrate food sources (Schroeder *et al.* 1999, p. 5). Studies in greater sage-grouse habitats indicate fire indeed influences the abundance of important insect species (Fischer *et al.* 1996a, p. 196; Nelle *et al.* 2000, p. 589; Pyle and Crawford 1996, p. 322). However, the response (positive or negative) and duration of those effects, and subsequent recovery of insect populations, varied widely between studies and areas. Therefore, although the best available information indicates that fire may influence sage-grouse survival by altering the availability of insect prey, the magnitude of those effects is uncertain.

The invasion of the exotic annual grass cheatgrass increases fire frequency within the sagebrush ecosystem (Zouhar *et al.* 2008, p. 41; Miller *et al.* 2011, p. 170). As described in the previous section (Invasive Species), cheatgrass readily invades sagebrush communities, especially disturbed sites, and changes historical fire patterns by providing an abundant and easily ignitable fuel source that facilitates fire spread. While sagebrush is killed by fire and is slow to reestablish, cheatgrass recovers within 1 to 2 years of a fire event (Young and Evans 1978, p. 285). This annual recovery leads to a readily burnable fuel source and ultimately a reoccurring fire cycle that prevents sagebrush reestablishment (Eiswerth *et al.* 2009, p. 1324). The extensive distribution and highly invasive nature of cheatgrass poses increased risk of fire and permanent loss of sagebrush habitat, as areas disturbed by fire are highly susceptible to further invasion and ultimately habitat conversion to an altered community state. For example, Link *et al.* (2006, p. 116) show that risk of fire increases from approximately 46 to 100 percent when ground cover of cheatgrass increases from 12 to 45 percent or more. However, BLM (2013b, p. 1-7) noted that changes in fire frequency due to cheatgrass invasion, such as those observed in the Great Basin region of the western United States, have not been observed on BLM lands in Gunnison sage-grouse range.

As discussed above, there are numerous potential negative effects of fire to sagebrush habitat and, presumably, Gunnison sage-grouse. A clear positive response of Gunnison or greater sage-grouse to fire has not been demonstrated (Braun 1998, p. 9). The few studies that have suggested fire may be beneficial for greater sage-grouse were primarily conducted in mesic areas used for brood-rearing (Klebenow 1970, p. 399; Pyle and Crawford 1996, p. 323; Gates 1983, *in* Connelly *et al.* 2000c, p. 90; Sime 1991, *in* Connelly *et al.* 2000a, p. 972). In this type of habitat, small fires may maintain a suitable habitat mosaic by reducing shrub encroachment and encouraging understory, herbaceous growth. However, without available nearby sagebrush cover, the utility of these sites is questionable. This is especially true within the six small Gunnison sage-grouse populations, where fire could further degrade the remaining habitat. More recent research indicated that, due to the fragmented nature of remaining sagebrush habitat across the species' range, prescribed fire may be inappropriate if the goal is to improve sagebrush conditions and overall habitat quality for the species (Baker 2013, p. 8).

Fire in the Gunnison Basin Population Area—

Six prescribed burns have occurred on BLM lands in the Gunnison Basin since 1984, totaling approximately 409 ha (1,010 ac) (BLM 2009a, p. 35). The fires created large sagebrush-free areas that were further degraded by poor post-burn livestock management (BLM 2005a, p. 13). As a result, these areas are less suitable as Gunnison sage-grouse habitat. Approximately 8,470 ha (20,930 ac) of prescribed burns occurred on Forest Service lands in the Gunnison Basin since 1983 (USFS 2009, p. 1). A small wildfire on BLM lands near Hartman Rocks burned 8 ha (20 ac) in 2007 (BLM 2009a, p. 35). The NPS completed a prescribed burn on the north rim of the Black Canyon of the National Park in mixed montane shrub and mountain big sagebrush communities to remove invading juniper trees. Very few mountain big sagebrush were killed as a result of the burn. The total area of occupied Gunnison sage-grouse habitat in the Gunnison Basin burned in recent decades is approximately 8,887 ha (21,960 ac), which constitutes 1.5 percent of the occupied Gunnison sage-grouse habitat area. Cumulatively, this 1.5 percent area equates to a relatively small amount of habitat burned over a period of nearly three decades. This information suggests that there has not been a demonstrated change in fire cycle in the Gunnison Basin population area to date. The Nature Conservancy *et al.* (2011, p. 12) predicts that, due to climate change, wildfire frequency and severity will increase in the Gunnison Basin (see Climate Change section in this Factor A analysis). However, CPW recently completed a literature review regarding fire in high elevation Intermountain sage-brush basins, such as the Gunnison Basin, and concluded that the probability of catastrophic fire in these areas in the future is low, due to historic fire return intervals, the low number of lightning strikes in the Gunnison Basin, and a low relative risk of cheatgrass invasion after fires (CPW 2014g, Attachment 2).

Fire in All Other Population Areas—

Two prescribed burns conducted in 1986 (105 ha (260 ac)) and 1992 (140 ha (350 ac)) on BLM land in the San Miguel Basin on the north side of Dry Creek Basin had localized negative impacts on Gunnison sage-grouse. The burns were conducted for big game forage improvement, but the sagebrush died and was largely replaced with weeds (BLM 2005b, pp. 7-8). The Burn Canyon wildfire in the Dry Creek Basin and Hamilton Mesa areas burned 890 ha (2,200 ac) in 2000. Three wildfires have occurred in Gunnison sage-grouse habitat since 2004 on lands managed by the BLM in the Crawford, Cerro Summit–Cimarron–Sims Mesa, and San Miguel Basin population areas. There have been no fires since 2004 on lands managed by the BLM within the Monticello-Dove Creek population. Because these fires were mostly small in size, we do not believe they resulted in substantial impacts to Gunnison sage-grouse at the species level.

Several wildfires near or within the Piñon Mesa population area have occurred in the past 20 years. One fire burned a small amount of occupied Gunnison sage-grouse habitat in 1995, and several fires burned in potential Gunnison sage-grouse habitat. Individual burned areas in this population ranged from 3.6 ha (9 ac) to 2,160 ha (5,338 ac). A wildfire in 2009 burned 1,053 ha (2,602 ac), predominantly within vacant or unknown Gunnison sage-grouse habitat (suitable habitat for sage-grouse that is separated from occupied habitats that has not been adequately inventoried, or without recent documentation of grouse presence) near the Piñon Mesa population.

Since 2004, a single 2.8-ha (7-ac) wildfire occurred in the Cerro Summit-Cimarron-Sims Mesa population area, and two prescribed fires, both less than 12 ha (30 ac), were implemented in the San Miguel population area. No fire activity is reported within occupied Gunnison sage-grouse habitat in the last two decades in the Poncha Pass population area (CDOW 2009b, pp. 125–126) or the Monticello-Dove Creek population area (CDOW 2009b, p. 75; UDWR 2009, p. 5). Although fire can have devastating effects on Gunnison sage-grouse habitats, as discussed above, because fires have burned primarily outside of occupied Gunnison sage-grouse habitat in the Piñon Mesa population area and fire has been recently absent or minimal in most other population areas, fire has not resulted in substantial impacts to Gunnison sage-grouse in these population areas.

Summary of Fire

Fires can cause the proliferation of weeds and can degrade suitable sage-grouse habitat, which may not recover to suitable conditions for decades, if at all (Pyke 2011, p. 539). Recent fires in Gunnison sage-grouse habitat were mostly small in size and did not result in substantial impacts to Gunnison sage-grouse, and there has been no obvious change in fire cycle in any Gunnison sage-grouse population area to date. Therefore, we do not consider fire to be a current threat to Gunnison sage-grouse. While the best available scientific information does not currently allow us to predict the extent or location of future fire events, it does indicate that fire frequency may increase in the future as a result of cheatgrass encroachment on the sagebrush habitat and the projected effects of climate change (see Invasive Plants and Climate Change discussions, above and below in this Factor A analysis, respectively). Fire is, therefore, likely to become a threat to Gunnison sage-grouse in the future.

Climate Change

Our analyses under the Act include consideration of ongoing and projected changes in climate and its associated effects. The terms “climate” and “climate change” are defined by the Intergovernmental Panel on Climate Change (IPCC). “Climate” refers to the mean and variability of different types of weather conditions over time, with 30 years being a typical period for such measurements, although shorter or longer periods also may be used (IPCC 2007, p. 78; IPCC 2013, p. 1450). The term “climate change” thus refers to a change in the mean or variability of one or more measures of climate (e.g., temperature or precipitation) that persists for an extended period, typically decades or longer, whether the change is due to natural variability, human activity, or both (IPCC

2007, p. 78; IPCC 2013, p. 1450). Various types of changes in climate can have direct or indirect effects on species. These effects may be positive, neutral, or negative and they may change over time, depending on the species and other relevant considerations, such as the effects of interactions of climate with other variables (e.g., habitat fragmentation) (IPCC 2007, pp. 8–14, 18–19). In our analyses, we use our expert judgment to weigh relevant information, including uncertainty, in our consideration of various aspects of climate change.

According to the IPCC, "Warming of the climate system in recent decades is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global sea level" (IPCC 2007, p. 1). Average Northern Hemisphere temperatures during the second half of the 20th century were very likely higher than during any other 50-year period in the last 500 years and likely the highest in at least the past 1,300 years (IPCC 2007, p. 30). Over the past 50 years, cold days, cold nights, and frosts have become less frequent over most land areas, and hot days and hot nights have become more frequent. Heat waves have become more frequent over most land areas, and the frequency of heavy precipitation events has increased over most areas (IPCC 2007, p. 30).

For the southwestern region of the United States, including western Colorado, warming is occurring more rapidly than elsewhere in the country (Karl *et al.* 2009, p. 129). Annual average temperature in west-central Colorado increased about 1.11 °C (2 °F) over the past 30 years, but high variability in annual precipitation precludes the detection of long-term precipitation trends (Ray *et al.* 2008, p. 5). Under high greenhouse gas emission scenarios, future projections for the southwestern United States show increased probability of drought (Karl *et al.* 2009, pp. 129–134), and the number of days over 32 °C (90 °F) could double by the end of the century (Karl *et al.* 2009, p. 34). Climate models predict annual temperature increase of approximately 2.2 °C (4 °F) in the Southwest by 2050, with summers warming more than winters (Ray *et al.* 2008, p. 29). Projections also show declines in snowpack across the West with the most dramatic declines at lower elevations (below 2,500 m (8,200 ft)) (Ray *et al.* 2008, p. 29).

Colorado's complex, mountainous topography results in a high degree of spatial variability across the State. As a result, predicting localized climate changes is challenging for mountainous areas because current global climate models are unable to capture this variability at local or regional scales (Ray *et al.* 2008, pp. 7, 20). To obtain climate projections specific to the range of Gunnison sage-grouse, we requested a statistically downscaled model from the National Center for Atmospheric Research for a region covering western Colorado. The resulting projections indicate the highest probability scenario is that average summer (June through September) temperature could increase by 2.8 °C (5.1 °F), and average winter (October through March) temperature could increase by 2.2 °C (4.0 °F) by 2050 (University Corporation for Atmospheric Research (UCAR) 2009, pp. 1–15). Annual mean precipitation projections for Colorado are unclear; however, data indicate a shift towards increased winter precipitation and decreased spring and summer precipitation (Ray *et al.* 2008, p. 34; Karl *et al.* 2009, p. 30). Similarly, there is a high probability of a 5 percent increase in average winter precipitation and a 5 percent decrease in average spring-summer precipitation in 2050 (UCAR 2009, p. 15). These predicted changes in precipitation and temperature will likely alter sagebrush plant community composition and dynamics, but to what degree is uncertain.

For sagebrush, spring and summer precipitation comprises the majority of the moisture available to the species; thus, the interaction between reduced precipitation in the spring-summer growing season and increased summer temperatures will likely decrease growth of mountain big sagebrush. This effect could result in a significant long-term reduction in the distribution of sagebrush communities (Miller *et al.* 2011, pp. 171–174). In the Gunnison Basin, increased summer temperature was strongly correlated with reduced growth of mountain big sagebrush (Poore *et al.* 2009, p. 558). Based on these results and the likelihood of increased winter precipitation falling as rain rather than snow, and the corresponding increase in evaporation and decrease in deep soil water recharge, Poore *et al.* (2009, p. 559) predict decreased growth of mountain big sagebrush, particularly at the lower elevation limit of the species. Because Gunnison sage-grouse are sagebrush obligates, loss of sagebrush would result in a reduction of suitable habitat and negatively impact the species. The interaction of climate change with other stressors likely has impacted and will impact the sagebrush steppe ecosystem where Gunnison sage-grouse occur.

Climate change is likely to alter fire frequency, community assemblages, and the ability of nonnative species to proliferate. Increasing temperature as well as changes in the timing and amount of precipitation will alter the competitive advantage among plant species (Miller *et al.* 2011, pp. 175–179), and may shift individual species and ecosystem distributions (Bachelet *et al.* 2001, p. 174). Temperature increases may increase the competitive advantage of cheatgrass in higher elevation areas where its current distribution is limited (Miller *et al.* 2011, p. 182). Decreased summer precipitation reduces the competitive advantage of summer perennial grasses, reduces sagebrush cover, and subsequently increases the likelihood of cheatgrass invasion (Prevey *et al.* 2009, p. 11). This impact could increase the susceptibility of areas within Gunnison sage-grouse range to cheatgrass invasion (Bradley 2009, p. 204), which would reduce the overall cover of native vegetation, reduce habitat quality, and potentially decrease fire return intervals, all of which would negatively affect the species. In addition, The Nature Conservancy *et al.* (2011, p. 12) predicted increased fire frequency and severity in the Gunnison Basin associated with climate change.

Under drought conditions, plants generally are less vigorous and less successful in reproduction, and may require several years to recover following drought (Weltzin *et al.* 2003, p. 946). Increased drought and shifts in the magnitude and timing of temperature and precipitation could reduce herbaceous and insect production within Gunnison sage-grouse habitats.

A recent climate change vulnerability index applied to Gunnison sage-grouse ranked the species as "highly vulnerable" to modeled climate change by the year 2050 (The Nature Conservancy 2011, p. 11). The mechanism of this vulnerability was the degradation of high-quality brood-rearing habitat due to the loss of adequate moisture for the maintenance of mesic meadows, springs, seeps, and riparian areas, as well as potential changes in the fire regime and subsequent loss of sagebrush cover. A reduction in the quality and amount of these resources, including brood-rearing habitats in particular, will likely affect key demographic processes such as the productivity of breeding hens and survival of chicks and juveniles, resulting in reduced population viability. A recent analysis indicated juvenile survival was the most influential vital rate affecting population growth rates in the Gunnison Basin (Davis 2012, pp. 89). Drought conditions from 1999 through 2003 were closely associated with reductions in the sizes of all Gunnison sage-grouse populations, including the Gunnison Basin (CDOW 2009b, entire). While geographic and microclimatic variation in the Gunnison Basin may provide some degree of local variation and, perhaps, local population redundancy to resist environmental pressures, past drought has had widespread impacts on this population, as indicated by negative trends in nearly all lek complexes during that period (see Drought in this Factor A analysis; and Resiliency, Redundancy, and Representation in the Factor E analysis for further discussion on this topic).

Summary of Climate Change

Climate change predictions are based on models with assumptions, and there are uncertainties regarding the magnitude of associated climate change parameters such as the amount and timing of precipitation and seasonal temperature changes. There is also uncertainty as to the magnitude of effects of predicted climate parameters on sagebrush plant community dynamics. These factors make it difficult to predict to what extent climate change will affect Gunnison sage-grouse. We recognize that climate change has the potential to alter Gunnison sage-grouse habitat by facilitating an increase in the distribution of cheatgrass and concurrently increasing the potential for wildfires, and reducing herbaceous vegetation and insect production in drought years, which would have negative effects on Gunnison sage-grouse. We do not consider climate change to be a current threat to Gunnison sage-grouse because of the uncertainties described above. However, based on the best available information on climate change projections over the next 35 years or so, climate change has the potential to alter important seasonal habitats and food resources of Gunnison sage-grouse, the distribution and extent of sagebrush, and the occurrence of invasive weeds and associated fire frequencies. Climate change effects, including increased drought, are also predicted in the Gunnison Basin population. Therefore, we find that climate change is a substantial future threat to Gunnison sage-grouse rangewide.

Mineral Development

Mineral commodity development on Federal lands includes three primary types: leasable, locatable, and salable minerals. Below, we define each type of mineral development and assess the scope of those activities and their potential impacts across Gunnison sage-grouse range.

Leasable Mineral Development

Leasable minerals are defined and administered under the Mineral Leasing Act of 1920, as amended, and include oil and gas, oil shale, coal, geothermal, potash, sodium, and sulfur. In this section, we first discuss the effects of oil and gas development on sage-grouse and sage-grouse habitats in general. We then evaluate potential and ongoing development of oil and gas, coal and coal-bed methane, and other leasable minerals across the range of Gunnison sage-grouse. Available scientific information on the effects of mineral development to sage-grouse is related primarily to oil and gas development. However, in terms of effects on the species and its habitat, we expect other types of mineral development to have impacts similar to that of oil and gas development, though those impacts may vary in magnitude and scope.

Effects of Oil and Gas Development

Oil and gas, or fluid mineral, development for energy resources on Federal (BLM and USFS) lands is regulated by the BLM (see Factor D analysis below for a more thorough discussion). The BLM (1999, p. 1) has classified the area encompassing all Gunnison sage-grouse habitat for its oil and gas potential. Two population areas, San Miguel Basin and Monticello-Dove Creek, have areas with high potential, and one, the Crawford population area, has medium potential. BLM classifies the oil and gas potential for the remaining populations as low or none. San Miguel County, where much oil and gas activity has occurred in the last few years, ranked 9 out of 39 in Colorado counties producing natural gas in 2009 (Colorado Oil and Gas Conservation Commission 2010a, p. 1) and 29 of 39 in oil production in 2009 (Colorado Oil and Gas Conservation commission 2010b, p. 2).

Energy development impacts sage-grouse and sagebrush habitats through direct habitat loss from well pad construction, seismic surveys, roads, powerlines and pipeline corridors, and indirectly from noise, gaseous emissions, changes in water availability and quality, and human presence. The interaction and intensity of effects could cumulatively or individually lead to habitat degradation and fragmentation (Suter 1978, pp. 6–13; Aldridge 1998, p. 12; Braun 1998, pp. 144–148; Aldridge and Brigham 2003, p. 31; Knick *et al.* 2003, pp. 612, 619; Lyon and Anderson 2003, pp. 489–490; Connelly *et al.* 2004, pp. 7-40 to 7-41; Holloran 2005, pp. 56–57; Holloran *et al.* 2007, pp. 18–19; Aldridge and Boyce 2007, pp. 521–522; Walker *et al.* 2007a, pp. 2652–2653; Zou *et al.* 2006, pp. 1039–1040; Doherty *et al.* 2008, p. 193; Leu and Hanser 2011, pp. 270–271). Increased human presence resulting from oil and gas development can also impact sage-grouse either through avoidance of suitable habitat or disruption of breeding activities (Braun *et al.* 2002, pp. 4–5; Aldridge and Brigham 2003, pp. 30–31; Aldridge and Boyce 2007, p. 518; Doherty *et al.* 2008, p. 194). The development of oil and gas resources requires surveys for economically recoverable reserves, construction of well pads and access roads, subsequent drilling and extraction, and transport of oil and gas, typically through pipelines. Ancillary facilities can include compressor stations, pumping stations, electrical generators and powerlines (Connelly *et al.* 2004, p. 7-39; BLM 2007, p. 2-110). Surveys for recoverable resources occur primarily through loud seismic exploration activities. These surveys can result in the crushing of vegetation. Well pads vary in size from 0.10 ha (0.25 ac) for coal-bed natural gas wells in areas of level topography to greater than 7 ha (17.3 ac) for deep gas wells and multi-well pads (Connelly *et al.* 2004, p. 7-39; BLM 2007, p. 2-123). Pads for compressor stations require 5–7 ha (12.4–17.3

ac) (Connelly *et al.* 2004, p. 7-39). Individually, impacts from well pads, infrastructure, and ancillary features may be small; however, the cumulative impact of such development can be significant.

The amount of direct habitat loss within an area of oil and gas development is ultimately determined by well densities and the associated loss from ancillary facilities. Roads associated with oil and gas development were suggested as the primary impact to greater sage-grouse due to their persistence and continued use even after drilling and production ceased (Lyon and Anderson 2003, p. 489). Declines in male greater sage-grouse lek attendance were reported within 3 km (1.9 mi) of a well or haul road with a traffic volume exceeding one vehicle per day (Holloran 2005, p. 40). Because of reasons discussed previously, the effects of oil and gas development to Gunnison sage-grouse are expected to be similar to those observed in greater sage-grouse. Sage-grouse also may be at increased risk for collision with vehicles simply due to the increased traffic associated with oil and gas activities (Aldridge 1998, p. 14; BLM 2003, p. 4-222).

Habitat fragmentation resulting from oil and gas development infrastructure, including access roads, may have greater effects on sage-grouse than habitat loss associated with drill sites. Energy development and associated infrastructure works cumulatively with other human activity or development to decrease available habitat and increase fragmentation. Greater sage-grouse leks had the lowest probability of persisting (40–50 percent) in a landscape with less than 30 percent sagebrush within 6.4 km (4 mi) of the lek. These probabilities were even less in landscapes where energy development also was a factor (Walker *et al.* 2007a, p. 2652).

Oil and Gas Development Across the Gunnison Sage-Grouse Range—

As noted above, high oil and gas development potential exists in the San Miguel Basin and Monticello-Dove Creek population areas, medium potential exists in the Crawford population area, and low or no potential exists in the remaining population areas. Approximately 33 percent of the Gunnison Basin population area was ranked as having low oil and gas potential with the remainder having no potential for oil and gas development (GSRSC 2005, p. 130). No Federal lands are currently leased for oil and gas development within the Gunnison Basin population area.

Energy development within the range of Gunnison sage-grouse is occurring primarily in the San Miguel Basin and Dove Creek population areas in Colorado. The San Miguel Basin and Monticello-Dove Creek population areas occur in the Paradox Basin, a known oil and gas producing region. The majority of oil and gas development and potential in the Paradox Basin, however, is outside of Gunnison sage-grouse habitat (Industrial Economics, Inc. (IEc) 2014, p. 5-2, and references therein). In addition, to date, low levels of development and production have occurred in this area relative to recent development in other regions within the western U.S. Oil and gas production in San Juan County, Utah, which includes the Monticello portion of occupied range for Gunnison sage-grouse, has declined since the late 1980's (IEc 2014, p. 5-1 to 5-2, and references therein). In the San Miguel Basin, approximately 8,000 acres are leased for oil and gas development in occupied habitat on BLM land and, of that area, about 5,000 acres (63 percent) are producing (IEc 2014, p. 5-4, and references therein). The entire San Miguel Basin population area has high potential for oil and gas development (GSRSC 2005, p. 130).

Fluid mineral development in the Paradox Basin is currently taking place on 44 active, producing, or permitted wells in occupied habitat in the San Miguel and Monticello-Dove Creek populations. Of these, 38 active or producing wells occur in the San Miguel population area on BLM land; 5 newly permitted wells occur on non-Federal land in the Dove Creek population in Colorado; and 1 active well occurs on private land in the Monticello population in Utah (IEc 2014, pp. 5-4 to 5-5, and references therein). In the San Miguel population, most wells are in or near the Dry Creek subpopulation area. The exact locations of potential future wells are not known, but because the area is small, they will likely lie within 3 km (2 mi) of one of only three leks in this area (CDOW 2005, p. 108).

In the remainder of the Gunnison sage-grouse range, a total of 10 oil and gas wells occur in occupied habitat. Eight oil and gas wells occur in the Gunnison Basin population area, and one in each of the Crawford and Cerro Summit-Cimarron-Sims Mesa population areas (derived from Colorado Oil and Gas Commission 2010, GIS dataset). We are not aware of any new fluid mineral development in these or other population areas since 2010. No oil and gas wells or Federal leases are within the Piñon Mesa population area (BLM 2009a, p. 1), and no potential for oil or gas exists in this area except for a small area on the eastern edge of the largest habitat block (BLM 1999, p. 1; GSRSC 2005, p. 130). The Crawford population is in an area with medium potential for oil and gas development. A single Federal lease occurs on less than 1 percent of the Crawford population area (GSRSC 2005, p. 130). We are not aware of any information which indicates that oil and gas development is a threat to the Poncha Pass population. Based on the best available information, we conclude that oil and gas development is not a current or future threat to the Piñon Mesa, Crawford, or Poncha Pass populations.

Since 2005, the BLM has deferred (temporarily withheld from lease sales) federal parcels nominated for oil and gas leasing in occupied Gunnison sage-grouse habitat in Colorado (see further discussion in Factor D Federal Laws and Regulations). Even with this temporary deferment, however, we expect energy development on public and private lands in the San Miguel Basin and the Monticello-Dove Creek areas to continue over the next 20 years based on the length of development and production projects described in existing project and management plans. Gas development may be negatively impacting a portion of the Dry Creek subpopulation because this area contains some of the poorest habitat and smallest grouse populations within the San Miguel population ((SMBGSWG) 2009, pp. 28 and 36). Overall, we believe that this stressor is localized and, although it is likely to increase in the future, it is not now, or likely to become a rangewide threat to the species in the future.

Coal and Coal-bed Methane Development in All Population Areas

While coal resources and several active coal fields (Somerset, Crested Butte, Grand Mesa, etc.) exist in the region, there are no active coal operations in Gunnison sage-grouse habitat (Colorado Division of Reclamation, Mining, and Safety (CDRMS) 2013), and recoverable coal resources are limited in Gunnison sage-grouse range. We have reviewed the best available scientific information regarding the potential for development of any coal resources in the Gunnison sage-grouse range, and found that it is unlikely in the near future due to technological, geologic, economic, and other constraints (USFWS 2014a, entire). Therefore, we find that coal and coal-bed methane development are not current or future threats to Gunnison sage-grouse.

Other Leasable Mineral Development

Potash exploration is currently underway in the Monticello-Dove Creek population area, but outside of occupied habitat for Gunnison sage-grouse. During 2009 and 2010, BLM received applications for 22 prospecting permits on approximately 40,000 acres of BLM land in this area (outside of occupied habitat). Recently, BLM prepared an Environmental Analysis for six proof-of-concept drill sites. The company that submitted the application estimates that between 250,000 and two million tons of potash may be recovered per year for at least 20 years. If preliminary explorations determine that extraction is feasible, potash development will likely follow (IEc 2014, p. 5-6). However, because it is unknown where and to what extent development would occur, the degree to which potash development would affect Gunnison sage-grouse and its habitat is unknown at this time.

Summary of Leasable Mineral Development

The San Miguel Basin and Dove Creek populations are the only areas within Gunnison sage-grouse range that currently have a moderate amount of oil and gas production. However, impacts to Gunnison sage-grouse and its habitat in this area are limited in scope relative to other regions of oil and gas development within the western U.S. We recognize that portions of the range, such as the Dry Creek subpopulation of the San Miguel population, may currently be impacted by fluid mineral development. However, current and potential leasable energy development is limited to a small portion of the species' overall range. To date, the majority of oil and gas development has occurred outside of occupied habitat for Gunnison sage-grouse.

While the San Miguel, Monticello-Dove Creek, and Crawford populations have high or medium potential for future development, the potential for future development is low throughout the remaining population areas, which represent the majority of the species' range. While coal resources and several active coal fields exist in the region, there are no active coal operations in Gunnison sage-grouse habitat, and recoverable coal resources are limited in Gunnison sage-grouse range (USFWS 2014a, entire). In the near future, there is a potential for potash development in the Monticello-Dove Creek population; however, the magnitude of the impacts (if any) of this development on the species are unknown at this time (see above discussion). Because of the localized scale of these impacts, we consider leasable mineral development to be a threat of low magnitude to species as a whole. However, given the small and isolated nature of the populations where oil and gas development is most likely to occur, oil and gas development is a current and future threat to those populations.

Locatable and Salable Mineral Development in All Population Areas

Locatable minerals include both metallic minerals (gold, silver, uranium, vanadium, lead, zinc, copper, etc.) and certain unique, valuable non-metallic minerals (gemstones, fluorspar, mica, gypsum, asbestos, mica, etc.). The Mining Law of 1872 governs the exploration, purchase, and development of locatable minerals on mining claims. This law grants citizens of the United States the opportunity to explore for, discover, develop, and purchase certain valuable mineral deposits on public domain minerals. Unpatented mining claims established under the Mining Law of 1872 give the holder the right to mine locatable minerals on Federal lands. Locating a mining claim requires discovery of a valuable mineral through exploration. The BLM administers mining claims and related notices and approvals on BLM and USFS lands. The BLM reviews and approves a "Plan of Operations" for mining on Federal lands resulting in surface disturbance of more than 5 acres, and, in Colorado, financial warranty (e.g., cash bond) is required for reclamation through the Colorado Division of Reclamation, Mining and Safety (CDRMS). A mine operator need only file a "Notice of Intent" with BLM before proceeding with locatable mineral exploration or prospecting resulting in surface disturbance of 5 acres or less. Operators are required to provide financial warranty for reclamation costs associated with disturbance from exploration, which is also filed and held by the CDRMS. "Casual use" activities related to locatable minerals on Federal lands that cause negligible disturbance (e.g., no use of earth moving equipment or explosives) have no legal requirements. The quantity and extent of casual use activities, and thus the effects on Gunnison sage-grouse and its habitat, are unknown.

Salable minerals, or mineral materials, include sand, gravel, stone, clay, pumice, cinders, and similar minerals. Salable minerals on Federal lands are subject to mineral material disposal under the Materials Act of 1947, as amended. Mining of these minerals entails a sales contract or a free-use permit from the responsible Federal agency.

The Service accessed CDRMS mine and mine claim data (CDRMS 2013, entire) to evaluate mineral potential and development in Gunnison sage-grouse occupied range in Colorado. The CDRMS's dataset includes both active and terminated or expired mining permits since about 1984 to present, including locatable and salable minerals. Our analysis found that in Gunnison sage-grouse occupied habitat in Colorado, there are 19 active mining permits ("active" means the permits are valid and current, not necessarily that actual mining is occurring), comprising 324.07 acres. Of this number, our analysis found that 247.96 acres (77 percent) are in the Gunnison Basin population, and are associated primarily with sand and gravel operations (USFWS 2014b, p. 1).

Fifty recently expired or terminated mining permits exist in Gunnison sage-grouse occupied range in Colorado, affecting approximately 256.5 acres. Again, the majority of area affected was in the Gunnison Basin, including 194.1 acres (75.6 percent) associated with sand and gravel, borrow material, and gold mining. Some of these mining permit applications were withdrawn, or mining did not occur (USFWS 2014b, p. 2).

Where mining has not yet been permitted or occurred, active (recorded) *mining claims* indicate potential development of those resources in the future, since identifying a claim requires discovery of a valuable mineral. Currently, in Gunnison sage-grouse occupied habitat in Colorado, there are 694 active mining claims, totaling approximately 9,966 acres, or 1.15 percent of rangewide occupied habitat. Approximately 7.79 percent and 2.10 percent of occupied habitat in the San Miguel Basin and Dove Creek populations, respectively, are under mining claims. For each of the other five Gunnison sage-grouse populations, the area under mining claims is less than 1 percent of total occupied habitat in those populations (USFWS 2014b, p. 3). These data indicate that mining potential and future development is limited in scope in the range of Gunnison sage-grouse. It is uncertain what proportion of these mining claims will be developed in the future, and to what extent they will be developed. Future development depends on economic and market conditions, permitting requirements, and multiple other factors.

Future development of some mining claims, however, could affect individual Gunnison sage-grouse or populations. Future development of uranium mining claims in the San Miguel population area, in particular, could result in impacts on this population of Gunnison sage-grouse and its habitat. This area includes the Uravan Mineral Belt, which has historically been the most productive uranium region in Colorado, and provides an important national reserve of uranium (IEc 2014, pp. 5-1, 5-5 to 5-6). The Department of Energy, which is responsible for managing uranium leasing and development, is currently in the process of evaluating the continuation of existing uranium leases under a Draft Programmatic Environmental Impact statement. In recent years, uranium mining activity in this area has nearly ceased due to a decrease in global uranium prices. One active uranium mine occurs in occupied habitat in the San Miguel population. However, this mine is currently not in production (IEc 2014, p. 5-5 to 5-6). Construction of the first conventional uranium mill in 25 years, the Piñon Ridge Uranium Mill, is proposed near, but outside of, occupied habitat in the San Miguel Basin. However, this mill may not be built until uranium prices increase (IEc 2014, p. 5-5 to 5-6). Such a project may result in indirect impacts on Gunnison sage-grouse, though we cannot predict the scope or magnitude of those impacts.

We were unable to acquire similar data for mining activity in the State of Utah, and as a result we do not know the degree to which mineral claims or mines overlap occupied habitat in the Monticello population area. Published maps indicate there are four small mines (less than 5 ac of disturbance at any one time) on the periphery of occupied habitat in the Monticello population area. These include two uranium mines and one flagstone mine that are inactive; and one uranium/ vanadium mine that was active as of 2008 (UGS 2008a, pp. 4-5, 7). The majority of uranium and vanadium potential and past production in San Juan County is south-southeast of the city of Monticello, Utah, outside of occupied habitat (UGS 2005, entire). Several large mines (more than 5 ac of disturbance at any one time), including uranium and copper (inactive and active) occur northeast of Monticello, Utah (UGS 2008b, pp. 2, 5), outside the species' range. This information indicates that the overall current and potential development of locatable and salable minerals is very limited in Gunnison sage-grouse occupied range in Utah.

Future mineral development, especially in seasonally important habitats or in smaller or declining populations, will likely impact Gunnison sage-grouse populations. Indirect effects such as functional habitat loss associated with mineral operations, as well as impacts from associated infrastructure, are also likely.

Summary of Locatable and Salable Mineral Development

Mining, especially in seasonally important habitats or in smaller or declining populations, will likely impact Gunnison sage-grouse populations. Indirect effects such as functional habitat loss associated with mining operations, as well as impacts from associated infrastructure, are also likely. However, currently active mines and mining claims are limited in geographic scope, and thus are considered a threat of low magnitude to Gunnison sage-grouse rangewide. If uranium prices increase in the future, development in the San Miguel Basin could potentially pose a threat to this already small and vulnerable population of Gunnison sage-grouse.

Renewable Energy Development—Geothermal and Wind

Geothermal energy production is similar to oil and gas development in that it requires surface exploration, exploratory drilling, field development, and plant construction and operation, and likely results in similar degrees of direct and functional habitat loss (see Effects of Oil and Gas Development). Wells are drilled to access the thermal source, and drilling can require 3 weeks to 2 months of continuous activity (Suter

1978, p. 3), which may cause disturbance to sage-grouse. The ultimate number of wells, and, therefore, potential loss of habitat, depends on the thermal output of the source and expected production of the plant (Suter 1978, p. 3). Pipelines are needed to carry steam or superheated liquids to the generating plant, which is similar in size to a coal- or gas-fired plant, resulting in further habitat destruction and indirect disturbance. Direct habitat loss occurs from well pads, structures, roads, pipelines and transmission lines, and impacts would be similar to those described above for oil and gas development. The development of geothermal energy requires intensive human activity during field development and operation, which could lead to habitat loss. Furthermore, geothermal development could cause toxic gas release. The type and effect of these gases depends on the geological formation in which drilling occurs (Suter 1978, pp. 7–9). The amount of water necessary for drilling and condenser cooling can be high. Local water depletions may be a concern if such use results in the loss or degradation of brood-rearing habitat.

Geothermal Energy in the Gunnison Basin Population Area—

The entire Gunnison Basin, or 87 percent of rangewide occupied habitat, is within a region of known geothermal potential (BLM and USFS 2010, p. 1). Currently, geothermal leases in the Gunnison Basin occur in the same general vicinity on private, BLM, USFS, and Colorado State Land Board lands, near Tomichi Dome and Waunita Hot Springs in southeastern Gunnison County. The cumulative area of geothermal leases in occupied habitat is approximately 3,399 ha (8,400) ac, including 1,861 ha (4,600 ac) on BLM land, and 1,538 ha (3,800 ac) on USFS land. This comprises 1.4 percent of occupied habitat in the Gunnison Basin.

In 2012, all of the leased area described above was acquired by a conservation group that does not intend to develop the resource. Geothermal leases are issued for 10 years and may be extended for two five-year periods (IEc 2014, p. 7-2, and references therein). Therefore, we do not anticipate geothermal development of these leases prior to 2032. If geothermal development occurs on the leases in the future, it would likely negatively impact Gunnison sage-grouse through habitat loss and disturbance of birds. One active lek and two inactive leks are located within the leased parcels. In addition, six active leks and four inactive leks are within 6.4 km (4 mi) of the lease application parcels indicating that a high degree of seasonal use may occur within the area surrounding these leks (GSRSC 2005, p. J-4). A significant amount of high-quality Gunnison sage-grouse nesting habitat also exists on and near the leased parcels (Aldridge *et al.* 2012, p. 402). Thus, geothermal development is a potential future threat to the Gunnison Basin population.

Geothermal Energy in All Other Population Areas—

Geothermal development potential exists in the San Luis Valley including portions of the Poncha Pass population area. No geothermal leases currently exist in the San Luis Valley or Poncha Pass areas (BLM 2012b, entire; IEc 2014, p. 7-2). Further, the 2013 BLM San Luis Valley Geothermal Amendment to their Resource Management Plan prohibits all geothermal development within Gunnison sage-grouse occupied habitat through a no surface occupancy stipulation (BLM 2012b, entire; BLM 2013e, p. 2-11; BLM 2013f, entire). Therefore, geothermal development does not appear to be a current or future threat to Gunnison sage-grouse in the Poncha Pass population. We found no other information on the presence of existing, pending, or authorized geothermal energy sites, nor any other areas with high potential for geothermal energy development, within any other Gunnison sage-grouse population area. Thus, at this time, geothermal development outside the Gunnison Basin does not appear to be a threat to Gunnison sage-grouse.

Wind Energy Development—

Most published reports of the effects of wind development on birds focus on the risks of collision with towers or turbine blades. However, a recent study conducted in south-central Wyoming examined the short-term behavioral response of greater sage-grouse to wind energy development (LeBeau 2012, entire). In the two years following construction, greater sage-grouse were not avoiding habitats near wind turbines, and even selected for habitats closer to turbines during the summer months. Male lek attendance was apparently unaffected by wind energy development in the area. However, the author cautioned that these responses may have been due to typically high site fidelity of sage-grouse despite anthropogenic disturbances, and that impacts may not be realized until two to 10 years following development, similar to oil and gas development in sage-grouse habitats. The study reported that other fitness and vital rates such as nesting and brood survival rates declined near constructed wind turbines, potentially as a result of increased predation and edge effects created by wind energy infrastructure (LeBeau 2012, entire).

Avoidance of human-made structures such as powerlines and roads by sage-grouse and other prairie grouse is well-documented (Holloran 2005, p. 1; Pruett *et al.* 2009, pp. 1255–1256) (also see Roads and Powerlines sections above). Wind power requires many of the same features for construction and operation as do nonrenewable energy resources. Therefore, we anticipate that potential impacts from habitat decline due to roads and powerlines, noise, and increased human presence (Connelly *et al.* 2004, pp. 7-40 to 7-41) will generally be similar to those discussed above for mineral energy development.

Wind farm development begins with site monitoring and collection of meteorological data to accurately characterize the wind regime. Turbines are installed after the meteorological data indicate the appropriate siting and spacing. Roads are necessary to access the turbine sites for installation and maintenance. Each turbine unit has an estimated footprint of 0.4 to 1.2 ha (1 to 3 ac) (BLM 2005e, pp. 3.1–3.4). One or more substations may be constructed depending on the size of the farm. Substation footprints are 2 ha (5 ac) or less in size (BLM 2005e, p. 3.7).

The average footprint of a turbine unit is relatively small from a landscape perspective. Turbines require careful placement within a field to avoid loss of output from interference with neighboring turbines. Spacing improves efficiency but expands the overall footprint of the field. Sage-grouse populations are impacted by the direct loss of habitat associated with the construction of access roads, as well as indirect loss of habitat and behavioral avoidance of the wind turbines. Sage-grouse could be killed by flying into turbine rotors or towers (Erickson *et al.* 2001, entire), although reported collision mortalities have been few. One sage-grouse was found dead within 45 m (148 ft) of a turbine on the Foote Creek Rim wind facility in south-central Wyoming, presumably from flying into a turbine (Young *et al.* 2003, Appendix C, p. 61). This is the only known sage-grouse mortality at this facility during three years of monitoring. We have no recent reports of sage-grouse mortality due to collisions with wind turbines; however, many facilities may not be monitored. No deaths of gallinaceous birds were reported in a comprehensive review of avian collisions and wind farms in the United States; the authors hypothesized that the average tower height and flight height of grouse, and diurnal migration habitats of some birds minimized the risk of collision (Johnson *et al.* 2000, pp. ii-iii; Erickson *et al.* 2001, pp. 8, 11, 14, 15).

Noise is produced by wind turbine mechanical operation (gear boxes, cooling fans) and airfoil interaction with the atmosphere. No published studies have focused specifically on the noise effects of wind power to Gunnison or greater sage-grouse. In studies conducted in oil and gas fields, noise may have played a factor in habitat selection and decrease in greater sage-grouse lek attendance (Holloran 2005, pp. 49, 56). However, comparison between wind turbine and oil and gas operations is difficult based on the character of sound. Adjusting for manufacturer type and atmospheric conditions, the audible operating sound of a single wind turbine has been calculated as the same level as conversational speech at 1 m (3 ft) at a distance of 600 m (2,000 ft) from the turbine. This level is typical of background levels of a rural environment (BLM 2005e, p. 5-24).

However, commercial wind farms do not have a single turbine, and multiple turbines over a large area would likely have a much larger noise print. Low-frequency vibrations created by rotating blades also produce annoyance responses in humans (Van den Berg 2004, p. 1), but the specific effect on birds is not documented.

Moving blades of turbines cast moving shadows that cause a flickering effect producing a phenomenon called "shadow flicker" (American Wind Energy Association (AWEA) 2008, p. 5-33). Shadow flicker could mimic predator shadows and elicit an avoidance response in birds during daylight hours, but this potential effect has not been investigated. However, greater sage-grouse hens with broods have been observed under turbines at Foote Creek Rim in south-central Wyoming (Young 2004, pers. comm.), suggesting those birds were not disturbed by the motion of turbine blades.

Wind Energy in the Monticello Population Area—

There is increasing interest in wind energy development in the vicinity of the Monticello population in San Juan County, Utah (UDWR 2011, p. 3). Three wind energy projects are proposed in the vicinity of Gunnison sage-grouse habitat (IEc 2014, p. 7-2). The San Juan County Commission recently issued a permit for wind energy development on private land in occupied habitat in the Monticello population area, and development is currently underway there by Eco-Power Wind Farms, LLC (IEc 2014, p. 7-2). Other landowners have recently been approached to lease their properties for wind development as well (Messmer 2013, p. 14). The two other wind projects are proposed for areas outside of occupied Gunnison sage-grouse habitat (IEc 2014, p. 7-2 to 7-3, and references therein).

In addition, the State of Utah recently completed a statewide screening study to identify geographic areas with a high potential for renewable energy development (UDNR 2009, entire). An area approximately 80,200-ha (198,300-ac) in size northwest of the city of Monticello, UT, was identified, with a high level of confidence, as a wind power production zone with a high potential for utility-scale wind development (production of greater than 500 megawatts) (UDNR 2009, p. 19). The mapped wind power production zone overlaps with nearly all Gunnison sage-grouse occupied habitat in the Monticello population, as well as the large area surrounding the perimeter of occupied habitat. The Monticello population is currently small (approximately 70 individuals), with apparent low resilience (see discussion and analysis in Factor E below), making it particularly sensitive to habitat loss and other impacts. Therefore, we conclude that future wind energy development poses a threat to the Monticello population of Gunnison sage-grouse.

Wind Energy in All Other Population Areas—

We found no additional information on the presence of existing, pending, or authorized wind energy sites, or any other areas with high potential for wind energy development within any other Gunnison sage-grouse population area.

Summary of Renewable Energy Development

Based on the above information, we do not consider renewable energy development to be a current threat to Gunnison sage-grouse range-wide. However, in the Gunnison Basin, geothermal development potential is high; if geothermal energy development were to increase here in the future, it may influence the overall long-term viability of the Gunnison Basin population; thus, it is a potential future threat to that population. Similarly, information suggests wind energy development may increase in the future in the Monticello population, potentially contributing to further population declines in this small and vulnerable population. Therefore, wind energy development is a future threat to the Monticello population of Gunnison sage-grouse.

Piñon-Juniper Encroachment

Piñon-juniper woodlands are a native habitat type dominated by piñon pine *(Pinus edulis)* and various juniper species *(Juniperus* species) that can encroach upon, infill, and eventually replace sagebrush habitat and other rangelands. Piñon-juniper extent has increased ten-fold in the Intermountain West since Euro-American settlement, causing the loss of many bunchgrass and sagebrush-bunchgrass communities (Miller and Tausch 2001, pp. 15–16). Piñon-juniper woodlands have also been expanding throughout portions of the range of Gunnison sage-grouse (BLM 2009a, pp. 14, 17, 25), although we do not have information that quantifies this expansion. Piñon-juniper expansion has been attributed to the reduced influence of fire, the introduction of livestock grazing, increases in global carbon dioxide concentrations, climate change, and natural recovery from past disturbance (Miller and Rose 1999, pp. 555–556; Miller and Tausch 2001, p. 15; Baker 2011, p. 199). In addition, Gambel oak (*Quercus gambelii*) invasion as a result of fire suppression is a potential threat to Gunnison sage-grouse (CDOW 2002, p.139) if stands become thick and begin to choke out sagebrush understory. However, some deciduous shrub communities (primarily Gambel oak and serviceberry) are used seasonally by Gunnison sage-grouse (Young *et al.* 2000, p. 451).

Removal of piñon-juniper is a common treatment to improve sage-grouse habitat. Similar to powerlines, trees provide perches for raptors, and as a consequence, Gunnison sage-grouse avoid areas with piñon-juniper (Commons *et al.* 1999, p. 239). In Oregon, greater sage-grouse lek activity ceased when conifer canopy exceeded 4 percent of the land area, suggesting that low levels of piñon-juniper encroachment can lead to population-level impacts (Baruch-Mordo *et al.* 2013, p. 238). The number of male Gunnison sage-grouse observed on leks in the Crawford population doubled after piñon-juniper removal and mechanical treatment of mountain sagebrush and deciduous brush (Commons *et al.* 1999, p. 238). However, removal of all trees in a given area is likely not appropriate, based on the historical presence of piñon-juniper communities when Gunnison sage-grouse were more abundant and widespread. Piñon-juniper abundance likely fluctuated over time in response to fire, at times occupying approximately 20 percent of the sagebrush landscape (Baker 2013, p. 8).

Piñon-Juniper Encroachment in All Population Areas—

The Gunnison Basin population area is not currently undergoing significant piñon-juniper encroachment (Boyle and Reeder 2005, Figure 4-1); however, all other populations have some degree of documented encroachment. A considerable portion of the Piñon Mesa population is experiencing piñon-juniper encroachment. Approximately 9 percent (1,140 ha [3,484 ac]) of occupied habitat in the Piñon Mesa population area has piñon-juniper coverage, while 7 percent (4,414 ha [10,907 ac)] of vacant or unknown (suitable habitat for sage-grouse that is separated from occupied habitats that either (1) has not been adequately inventoried, or (2) has not had documentation of grouse presence in the past 10 years (GSRSC 2005, p. 258) and 13 percent (7,239 ha [17,888 ac]) of potential habitat (unoccupied habitats suitable for occupation of sage-grouse if practical restoration were applied) have encroachment (BLM 2009a, p. 17).

Some areas on lands managed by the BLM within other population areas are undergoing piñon-juniper invasion. However, the extent of the area affected has not been quantified (BLM 2009a, p. 74; BLM 2009a, p. 9). Approximately 9 percent of the 1,300 ha (3,200 ac) of the current range in the Crawford population is dominated by piñon-juniper (GSRSC 2005, p. 264). However, BLM (2005d, p. 8) estimated that as much as 20 percent of the Crawford population area is occupied by piñon-juniper, although much of that has been removed by habitat treatments in recent years. Piñon and juniper trees have also been encroaching in peripheral habitat on Sims Mesa, and to a lesser extent on Cerro Summit, but not to the point where it is a threat to the Cerro Summit-Cimarron-Sims Mesa population area (CDOW 2009b, p. 47). Piñon and juniper trees are reported to be encroaching throughout the current range in the Monticello group, based on a comparison of historical versus current aerial photos, but no quantification or mapping of the encroachment has occurred (San Juan County GSWG 2005, p. 20). A relatively recent invasion of piñon and juniper trees between the Dove Creek and Monticello groups appears to be contributing to their isolation from each other (GSRSC 2005, p. 276).

Within the range of Gunnison sage-grouse, approximately 5,341 ha (13,197 ac) of piñon-juniper have been treated with various methods designed to remove piñon and juniper trees since 2005, and nearly half of which occurred in the Piñon Mesa population area (CDOW 2009b, pp. 111–113). Mechanical treatment of areas experiencing piñon-juniper encroachment continues to be one of the most successful and economical treatments for the benefit of Gunnison sage-grouse habitat. However, such treatments may have minimal benefit at the population level, since the majority of affected populations have continued to decline since 1996 (Figure 3) despite considerable efforts to remove piñon-juniper in those areas.

Summary of Piñon-Juniper Encroachment

Most Gunnison sage-grouse population areas are experiencing low to moderate levels of piñon-juniper encroachment; however, considerable piñon-juniper encroachment in the Piñon Mesa population has occurred. The encroachment of piñon-juniper into sagebrush habitats can contribute to the decline of Gunnison sage-grouse habitat. However, piñon-juniper treatments, particularly when completed in the early stages of encroachment when the sagebrush and forb understory is still intact, have the potential to benefit sage-grouse (Commons *et al.* 1999, p. 238). Approximately 5,341 ha (13,197 ac) within the range of Gunnison sage-grouse has been treated to address piñon-juniper encroachment. Based on the rate of past treatment efforts (CDOW 2009c, entire), we expect piñon-juniper encroachment and corresponding treatment efforts to continue. Piñon-juniper encroachment is contributing to habitat decline in a limited area, but the level of encroachment is not sufficient to pose a threat to Gunnison sage-grouse at a population or rangewide level at this time. However, in combination with other factors such as those contributing to habitat decline (roads, powerlines, invasive plants, etc.), piñon-juniper encroachment poses a threat to the species. In addition, future conditions due to drought or climate change may intensify the problem such that piñon-juniper encroachment becomes a more serious threat, particularly in the smaller, declining populations.

Conversion to Agriculture

While sage-grouse may forage on agricultural croplands (Commons 1997, pp. 28-35), they tend to avoid landscapes dominated by agriculture (Aldridge *et al.* 2008, p. 991) and do not nest or winter in agricultural lands where shrub cover is lacking. Effects resulting from agricultural activities extend into adjoining sagebrush, and include increased predation and reduced nest success due to predators associated with agriculture (Connelly *et al.* 2004, p. 7-23). Agricultural lands provide limited benefits for sage-grouse as some crops such as alfalfa *(Medicago sativa),* winter wheat (*Triticum* *aestivum)*,and pinto bean sprouts *(Phaseolus* spp.) are eaten or used seasonally for cover by Gunnison sage-grouse (Braun 1998, pers. comm., Lupis *et al.* 2006, entire). Since lek monitoring began, the Monticello population of Gunnison sage-grouse appears to have been at its highest numbers during the 1970's and 1980's (SJCWG 2003, p. 5). During this time, winter wheat and dryland alfalfa were the primary agricultural crops in the area, and many growers did not use herbicides or insecticides because of the slim profit margin in growing these crops. Also during this period, landowners frequently reported observing flocks of sage-grouse in their fields during harvest and post-harvest periods (Messmer 2013, p. 19). These agricultural fields and their management may have provided a surplus of arthropods and forbs for Gunnison sage-grouse, and for hens with broods, in particular. Despite these seasonal benefits, crop monocultures do not provide adequate year-round food or cover (GSRSC 2005, pp. 22–30).

Current Agriculture in All Gunnison Sage-grouse Population Areas—

The following estimates of land area dedicated to agriculture (including grass/forb pasture) were derived primarily from Southwest Regional Gap Analysis Project (SWReGAP) landcover data (USGS 2004, entire). Agricultural parcels are distributed patchily amongst what was recently a sagebrush landscape. These agricultural parcels are likely used briefly by grouse to move between higher quality habitat patches. Habitat conversion to agriculture is most prevalent in the Monticello-Dove Creek population area, where approximately half of Gunnison sage-grouse occupied range is currently in agricultural production (primarily cropland and pastureland). The conversion of sagebrush to agricultural use eliminated suitable vegetation cover at three leks in the

Monticello population, and those leks are no longer used by Gunnison sage-grouse (SJCWG 2000, p. 15; GBSC 2005, p. 81). However, habitat loss due to agricultural conversion has been mitigated somewhat by the Conservation Reserve Program (CRP) (see section below, NRCS and Private Land Conservation Efforts, in this Factor A analysis).

In the Gunnison Basin, approximately 9 percent of the occupied range is currently in agricultural production. In Gunnison County, approximately 38,419 ha (94,936 ac) is currently in agricultural production (primarily irrigated hay and pastureland) (Gunnison County 2013a, p. 97, 123; GSRSC 2005, p. 73), though we do not know what proportion of these lands occur in occupied range. Approximately 15 percent of the occupied range in the San Miguel Basin is currently in agricultural production. In the Cerro Summit–Cimarron–Sims Mesa population, approximately 14 percent of the occupied range is currently in agricultural production. Habitat conversion due to agricultural activities is limited in the Crawford, Piñon Mesa, and Poncha Pass populations, with 3 percent or less of the occupied range currently in agricultural production in each of the population areas.

Substantial portions of sage-grouse habitat on private land in the Gunnison Basin, Crawford, San Miguel, and Piñon Mesa population areas are currently enrolled in the CCAA (see Conservation Programs and Efforts Related to Habitat Conservation in this Factor A analysis). Except for properties recently enrolled in the program, all enrolled private lands have been monitored using standardized vegetation transects and rangeland health assessments and, despite recent drought conditions and ongoing land uses, no significant deviations from baseline habitat conditions were observed. CPW reports that all enrolled properties continue to be in compliance with the terms of their Certificates of Inclusion (CIs) (CPW 2014a, p. 1). This information suggests that the current level of livestock grazing and operations on those lands is compatible with Gunnison sage-grouse habitat needs.

Except in Gunnison County, where cropland is relatively limited, total cropland has declined over the past two decades in all counties within the occupied range of Gunnison sage-grouse (USDA NASS 2010, entire). The majority of agricultural land use in Gunnison County is hay production, and this has also declined over the past two decades (USDA NASS 2010, p. 1). We do not have any information to predict changes in the amount of land devoted to agricultural purposes. However, because of this long-term downward trend in land area devoted to agriculture, we do not expect a significant amount of Gunnison sage-grouse habitat to be converted to agricultural purposes in the future.

Summary of Conversion to Agriculture

Throughout the range of Gunnison sage-grouse, the amount of land area devoted to agriculture is declining. Therefore, although we expect most land currently in agricultural production to remain so indefinitely, we do not expect significant additional, future habitat conversion to agriculture within the range of Gunnison sage-grouse. The loss of sagebrush habitat from 1958 to 1993 was estimated to be approximately 20 percent throughout the range of Gunnison sage-grouse (Oyler-McCance *et al.* 2001, p. 326). One exception is the Monticello-Dove Creek population, where more than half of the occupied range is currently in agriculture or other land uses that are generally incompatible with Gunnison sage-grouse conservation. This habitat loss is being mitigated somewhat by the enrollment of lands in CRP. Because of its limited extent, we do not consider future conversion of sagebrush habitats to agriculture to be a current or future threat to the persistence of Gunnison sage-grouse.

However, the extent of historical conversion of sagebrush to agriculture has fragmented the remaining Gunnison sage-grouse habitat to a degree that currently occupied lands are inadequate for the species' conservation, especially in light of other threats discussed throughout this rule. As described above in the introduction to this Factor A analysis, the onset of Euro-American settlement in the 1800s resulted in significant human alterations to sagebrush ecosystems throughout North America, primarily as a result of urbanization, agricultural conversion, and irrigation projects (West and Young 2000, pp. 263-265; Miller *et al.* 2011, p. 147). Areas in Colorado that supported basin big sagebrush were among the first sagebrush community types converted to agriculture because their soils and topography are well-suited for agriculture (Rogers 1964, p. 13). Decreases in the abundance of sage-grouse paralleled the loss of range (Braun 1998, pp. 2-3), and a gradual but marked decrease in sage-grouse distribution and numbers in Colorado had begun around 1910 (Rogers 1964, pp. 20-22). However, due to the long-term downward trend in land area devoted to agriculture, we do not expect agricultural conversion to be a significant cause of further range contraction into the future.

Large-Scale Water Development and Irrigation

Irrigation projects have generally resulted in loss of sage-grouse habitat (Braun 1998, p. 6). Development of Blue Mesa Reservoir in 1965 in the Gunnison Basin flooded an estimated 3,700 ha (9,200 ac), or 1.5 percent of potential habitat for Gunnison sage-grouse (McCall 2005, pers. comm.), and according to Gunnison County (2013a, p. 124), at least one known lek. Based on the size and location of Blue Mesa Reservoir, we presume that habitat connectivity and dispersal of birds between the Gunnison Basin population and satellite populations to the west were impacted. Three other reservoirs inundated approximately 2 percent of habitat in the San Miguel Basin population area (Garner 2005, pers. comm.).

The demand for water in Gunnison sage-grouse range is expected to increase into the future due to increased temperatures resulting from climate change (see Climate Change in this Factor A analysis), severe drought (see Drought and Extreme Weather in the Factor E analysis), and human population growth (see Residential Development in this Factor A analysis). Water demand from the Upper Colorado River Basin, which encompasses Gunnison sage-grouse occupied range, is expected to increase over the next several decades, and there are likely to be significant shortfalls between projected water supply and demand through 2060 (BOR 2013, entire). However, it is unknown if, when, or where future water projects in the Upper Colorado River Basin would occur.

A small amount of Gunnison sage-grouse habitat has been lost to large-scale water development projects, but in potentially important areas (see discussion above). We expect these existing reservoirs to be maintained indefinitely, thus acting as another source of habitat fragmentation. With increased water demand in the future, we expect that water developments and irrigation practices may further contribute to impacts on Gunnison sage-grouse, though the scope and magnitude of those effects are unknown. Based on this information, we conclude that large-scale water developments and irrigation are a threat of low magnitude to Gunnison sage-grouse rangewide, both now and in the future. Small-scale water developments, such as stock ponds and tanks, are described and evaluated in the Domestic Grazing and Wildlife Herbivory (Factor A analysis), and Disease (Factor C analysis) sections of this rule.

Conservation Programs and Efforts Related to Habitat Conservation

Consideration of Conservation Efforts in this Rulemaking

Multiple partners including private citizens, nongovernmental organizations, Tribal, State, and Federal agencies are engaged in conservation efforts across the range of Gunnison sage-grouse. Numerous conservation actions have already been implemented for Gunnison sage-grouse, and these efforts have provided and will continue to provide conservation benefit to the species. These implemented efforts are considered below.

Additionally, there are recent and planned conservation efforts that are intended to provide conservation benefits to the Gunnison sage-grouse; some of which have not been fully implemented or shown to be effective. The Service's Policy for Evaluation of Conservation Efforts When Making Listing Decisions (PECE; 68 FR 15100, March 28, 2003) describes our procedure for evaluating the certainty of implementation and effectiveness of these recent and future actions. The purpose of PECE is to ensure consistent and adequate evaluation of recently formalized conservation efforts when making listing decisions. The policy provides guidance on how to evaluate formalized conservation efforts that have not yet been implemented or have not yet demonstrated effectiveness. The evaluation focuses on the certainty that the conservation efforts will be implemented and effectiveness of the conservation efforts. The policy defines "formalized conservation efforts" as "specific actions, activities, or programs designed to eliminate or reduce threats or otherwise improve the status of species" that are identified in a conservation agreement, conservation plan or similar document, and presents nine criteria for evaluating the certainty of implementation and six criteria for evaluating the certainty of effectiveness of such conservation efforts. These criteria are not considered comprehensive evaluation criteria. The certainty of implementation and the effectiveness of a formalized conservation effort may also depend on species-specific, habitat-specific, location-specific, and effort-specific factors.

Conservation efforts that are not sufficiently certain to be implemented and effective cannot contribute to a determination that listing is unnecessary or a determination that to list as threatened rather than endangered (PECE, 68 FR 15115).

Accordingly, before considering whether a future formalized conservation effort contributes to forming a basis for not listing a species, or listing a species as threatened rather than endangered, we must find that the conservation effort is sufficiently certain to be implemented, and effective, so as to have contributed to the elimination or adequate reduction of one or more threats to the species identified through the section 4(a)(1) (five-factor) analysis. If a conservation effort meets the criteria described in PECE, we are able to include and rely upon these recent and future efforts in our current threats analysis and status determination.

We completed an evaluation of the recently developed multi-county Conservation Agreement and Memorandum of Understanding (MOU), the 2013 Gunnison Basin CCA and the Ute Mountain Ute Tribe's 2014 Species Management Plan pursuant to PECE; however, only the CCA met the criteria established under PECE and thus may be considered in determining whether the species is warranted for listing or is threatened rather than endangered. Neither the MOU nor the multi-county conservation agreement can contribute to these determinations because they do not include specific conservation efforts as defined in the PECE polic, and the Tribal plan only met 7 of the 15 PECE criteria. Therefore, we did not rely upon these conservation efforts in our current threats analysis and status determination.

The 2006 Colorado Gunnison sage-grouse CCAA, 2013 Gunnison Basin CCA, habitat improvement projects, and other non-regulatory conservation efforts that address habitat-related issues are described and evaluated below in this section. Habitat-related and other conservation efforts provided through Federal, state, tribal, and local laws and regulations, conservation easements, and similar regulatory mechanisms are evaluated under Factor D below. Also, throughout this rule, conservation efforts are described under relevant threat sections.

2006 Colorado Candidate Conservation Agreement with Assurances (CCAA)

In April 2005, the Colorado Division of Wildlife (CDOW, now called Colorado Parks and Wildlife (CPW)) applied to the Service for an Enhancement of Survival Permit for the Gunnison sage-grouse pursuant to section 10(a)(1)(A) of the Act. The permit application included a proposed Candidate Conservation Agreement with Assurances (CCAA) between CPW and the Service. The standard that a CCAA must meet is that the "benefits of the conservation measures implemented by a property owner under a CCAA, when combined with those benefits that would be achieved if it is assumed that conservation measures were also to be implemented on other necessary properties, would preclude or remove any need to list the species" (64 FR 32726, June 17, 1999). The draft CCAA, the permit application, and the draft environmental assessment were made available for public comment on July 6, 2005 (70 FR 38977). The CCAA and environmental assessment were finalized in October 2006, and the associated permit was issued on October 23, 2006, with a term of 20 years.

The goal of the CCAA is to reduce threats to Gunnison sage-grouse and help provide for secure, self-sustaining local populations by enrolling, protecting, maintaining, and enhancing or restoring non-federally owned Colorado habitats of Gunnison sage-grouse (as described further below). Landowners with eligible property in southwestern

Colorado could voluntarily sign up under the CCAA and associated permit through a Certificate of Inclusion (CI) that specifies the land enrolled in the CCAA and the habitat protection or enhancement measures the landowner will implement on these lands. Eligible lands include non-Federal lands in Colorado within the current range of Gunnison sage-grouse where occupied, vacant/ unknown, or potentially suitable habitats occur, as mapped and identified in the RCP. After Gunnison sage-grouse is listed under the Act, the CCAA remains in place and the permit becomes effective. The permit exempts take of Gunnison sage-grouse incidental to otherwise lawful activities specified in the CCAA (e.g., crop cultivation or harvesting, livestock grazing, farm equipment operation, commercial/ residential development), when performed in accordance with the terms of the CCAA, provided the participating landowner is implementing conservation measures voluntarily agreed to in the landowner's CI (USFWS 2006, entire). Landowners may only enroll properties in the CCAA and receive these benefits before a species is listed under the Act.

CPW may terminate landowner participation in the CCAA or otherwise revoke the CI if the landowner fails to comply with or implement the terms of the agreement. Further, the Service may suspend or revoke the permit for just cause or if continuation of permitted activities would likely result in jeopardy to Gunnison sage-grouse (USFWS 2006, p. 20). However, except for recently enrolled properties, all properties have been monitored using standardized vegetation transects and rangeland health assessments and, despite recent drought conditions and ongoing land uses, no significant deviations from baseline habitat conditions have been observed. According to CPW, which is responsible for administering the CCAA with Service oversight, all enrolled properties continue to be in compliance with the terms of their CIs (CPW 2014a, p. 1).

Colorado Parks and Wildlife has made great strides to enroll landowners, protect habitat, and alleviate threats to Gunnison sage-grouse under this voluntary program. We estimate that by December 2014, when this rule becomes effective, 40 CIs will have been completed for private properties, enrolling 94,391 ac, roughly 81,156 ac that are in suitable habitat, in four Gunnison sage-grouse populations. This includes 32 CIs (54,580 ac (roughly 50,410 ac in suitable habitat)) in the Gunnison Basin; 2 CIs (4,231 ac (roughly 3,921 ac in suitable habitat)) in Crawford; 3 CIs (16,820 ac (roughly 13,694 ac in suitable habitat)) in San Miguel; and 3 CIs (18,761 ac (roughly 13,131 ac in suitable habitat)) in Piñon Mesa (Table 9).

Table 9. Completed and In-Progress CIs under the Gunnison Sage-grouse CCAA (CPW 2014a, entire; CPW 2014g, Appendix 3).

Population	**Total**		
	#	Enrolled Acres	Acres* in Suitable Habitat
Gunnison Basin	32	54,580	50,410
Crawford	2	4,231	3,921
San Miguel	3	16,820	13,694
Piñon Mesa	3	18,761	13,131
Rangewide Totals	40	94,391	81,156

*These are estimates based on Geospatial analyses

Based on the RCP conservation objective of securing and maintaining 90 percent of seasonally important habitat for the Gunnison sage-grouse in each population area (GSRSC 2005, pp. 223-224), the CCAA identifies targets for private land protection for each population area, including private lands not already considered as protected under a conservation easement (USFWS 2006, pp. 11-12). However, we note that there are lands that are part of the CCAA, and are also protected under a conservation easement. Targeted CCAA acreages on private lands are intended to complement lands already receiving some protection because they are under Federal ownership.

A habitat protection objective of 75 percent of seasonally important habitat was identified for the Cerro Summit-Cimarron-Sims Mesa population, because this area is thought to function more as a habitat linkage between the San Miguel Basin, Gunnison, and Crawford populations (GSRSC 2005, pp. 223-224; USFWS 2006, p. 10). The CCAA habitat protection target for the Gunnison Basin population was based on important seasonal habitats since these are mapped in this area. In the remaining populations where important seasonal habitats are not mapped, CCAA targets were based on available occupied habitat (USFWS 2006, pp. 11-12). Roughly 99 percent of the Gunnison Basin population area target, 95 percent of the Crawford population area target, 45 percent of the San Miguel population area target, and 217 percent of the Piñon Mesa population area target on private lands are enrolled in the CCAA (Table 10).

Table 10. CCAA Habitat Protection Targets on Private Land and Enrollment (CPW 2014a, entire; CPW 2014b, entire).

Population	**CCAA Target (ac) on Private Land**	**Enrolled CIs (ac)[a] on Private Land**	**% of CCAA Target on Private Land**
Gunnison Basin	55,302	54,580	99%

Crawford	4,143	4,231	95%
San Miguel	37,690	16,820	45%
Piñon Mesa	8,635	18,761	217%

[a] CI acreage in suitable habitat based on geospatial analyses. Includes some properties also protected by conservation easements.

The CCAA promotes the conservation of Gunnison sage-grouse on portions of private lands in the Gunnison Basin, Crawford, San Miguel, and Piñon Mesa populations. In these areas, threats to Gunnison sage-grouse are reduced and habitats covered by the CCAA are protected, maintained, enhanced, or restored. In particular, private land uses including livestock grazing and agricultural production are managed to be consistent with the needs of Gunnison sage-grouse and the species' conservation. Although enrollment of property in the CCAA is voluntary and not permanent or binding, the program's regulatory assurances and take authority provide an incentive for participating landowners to continue enrollment and compliance with terms of their CI. However, there are instances in which those assurances and incentives would no longer be desirable to the landowner. For instance, a landowner may choose to opt out of the CCAA to sell subject lands, whether for development or other purposes, meaning the benefits to Gunnison sage-grouse provided under the program would cease as well unless the new owner decided to continue the property's enrollment in the CCAA. Thus, although residential development is expected to be very limited on enrolled properties under the terms of the CIs (USFWS 2006, p. 13), the CCAA does not preclude the sale of those properties nor their subsequent development. Such development would likely result in further habitat loss and decline for Gunnison sage-grouse, though we cannot predict the scope or magnitude of those impacts. Therefore, the Service views the CCAA differently from conservation easements in terms of its regulatory certainty (see Other Regulatory

Mechanisms: Conservation Easements, Factor D analysis; and Residential Development, in this Factor A analysis). Nevertheless, we consider lands enrolled under the CCAA to be a net gain for Gunnison sage-grouse conservation, particularly in regard to the reduction of habitat-related impacts due to ongoing land uses on private lands.

2013 Gunnison Basin Candidate Conservation Agreement

Candidate Conservation Agreements are formal, voluntary agreements between the Service and one or more parties to address the conservation needs of one or more candidate species or species likely to become candidates in the near future. Participants commit to implement specific actions designed to remove or reduce threats to the covered species, so that listing may not be necessary. Unlike CCAAs, CCAs do not provide assurances that additional conservation measures will not be required if a species is listed or critical habitat is designated.

In January 2010, the BLM, USFS, NPS, and other members of the Gunnison Basin Sage-Grouse Strategic Committee (Strategic Committee) began preparing a Candidate Conservation Agreement (CCA) with the Service to promote the conservation of the Gunnison Basin population of Gunnison sage-grouse (BLM 2013b, entire). The CCA was completed and signed by the Federal land management agencies on August 23, 2012. On April 12, 2013, the Federal land management agencies submitted a joint biological assessment (BA) and letter to the Service requesting an ESA Section 7 formal conference on the CCA. The Service issued its conference opinion on July 29, 2013 (USFWS 2013b, entire) and subsequently signed the CCA. The conference opinion evaluated anticipated effects of the CCA on Gunnison sage-grouse and estimated incidental take over a 20-year period, or through July 29, 2033.

The CCA serves as a project screen and requires implementation of conservation measures associated with specified actions under three Federal land use programs: development (roads, transmission lines, etc.), recreation (such as trails and special recreation permits, etc.), and livestock grazing (permit renewals and operations). Larger or impact intensive projects (e.g., construction of a new transmission line, energy development) are not covered under the CCA, and any conservation measures required for these projects on Federal lands in the Gunnison Basin will be addressed separately through ESA section 7 consultation. However, the actions addressed by the CCA, as listed above, comprise the most common land use authorizations where Gunnison sage-grouse occur on Federal lands in the Gunnison Basin. The CCA and conference opinion cover an estimated 160,769 ha (397,267 ac) of occupied habitat on Federal lands in the Gunnison Basin. This constitutes about 67 percent of the estimated 239,953 ha (592,936 ac) of total occupied habitat in the Gunnison Basin; approximately 78 percent of rangewide occupied habitat on Federal lands; and approximately 42 percent of rangewide total occupied habitat for the species.

Conservation measures in the CCA and conference opinion are actions that the signatory agencies agreed to implement to further the recovery of Gunnison sage-grouse. A key component of the CCA's site-specific conservation measures is a requirement for offsetting habitat loss or disturbance to ensure a net increase in priority habitats, and no net loss (maintenance) of secondary habitats for Gunnison sage-grouse. A number of other conservation measures and practices will be implemented pursuant to the CCA by the Federal agencies during the ESA section 7 consultation process to avoid and minimize project impacts on Gunnison sage-grouse.

The Service commends the Federal agencies, and the Gunnison Basin Sage-grouse Strategic Committee for their efforts in the design of the CCA and implementation of conservation measures to benefit Gunnison sage-grouse. In our conference opinion, we found that, despite incidental negative effects on individual birds and potential short-term, localized, and unavoidable effects, implementation of the CCA will provide a long-term, net benefit for Gunnison sage-grouse on a landscape scale. The conservation measures and mitigation scheme are required for the signatory Federal agencies engaging in covered activities, and are based on current applicable land management plans of the respective agencies. As noted earlier, approximately 87 percent of the rangewide population of Gunnison sage-grouse occurs in the Gunnison Basin population. Implementation of the proposed action and its conservation measures will help reduce several substantial threats known to affect the species on Federal lands in the Gunnison Basin, including habitat decline. Although we analyzed the CCA under our PECE policy and found it satisfies all the criteria for consideration in our listing determination, approximately 22 percent of rangewide occupied habitat on Federal lands—all within the satellite population areas—are not covered under the CCA or a similar agreement. Additional protections on those Federal lands will be necessary to conserve these smaller, declining populations. Therefore, while the CCA is effective in reducing some threats in the Gunnison Basin population, it is not effective at reducing the threats to the species rangewide such that listing is not warranted.

NRCS and Private Lands Conservation Efforts

The NRCS's Sage-Grouse Initiative (SGI) is a rangewide, collaborative, targeted effort to implement conservation practices which alleviate threats that some agricultural activities can pose to greater and Gunnison sage-grouse while improving the sustainability of working ranches. Through SGI, the NRCS and its partners help ranchers proactively conserve and improve sage-grouse habitat. The SGI includes a monitoring and evaluation component for projects to measure the response of sage-grouse populations and vital rates (USFWS 2010d, p. 5).

In 2010, the Service issued the SGI Conference Report (USFWS 2010d, entire) to facilitate the SGI and conservation of Gunnison and greater sage-grouse rangewide. In the Conference Report, the Service provided guidance and conservation recommendations for avoiding and minimizing adverse effects to sage-grouse associated with the SGI, and found that the implementation of the SGI and identified conservation measures would have a net benefit on the species. The report identified primary conservation practices (management, vegetative, and structural) implemented by the NRCS to benefit sage-grouse and its habitat, and specific conservation measures (e.g., avoiding fence construction near leks) for those practices. The report did not provide for exemption of incidental take of sage-grouse if either species is listed under the Act (USFWS 2010d, entire).

Also under the SGI and related private land programs (e.g., Farm Bill), the NRCS, Farm Service Agency (FSA), U.S. Fish and Wildlife Service Partners for Fish and Wildlife (PFW), CPW, and other partners have implemented numerous habitat improvement projects on private lands to benefit Gunnison sage-grouse. Since 1998, the Service's Colorado PFW has completed 20 habitat improvement or restoration projects in Gunnison sage-grouse habitat including projects on 638.5 ac of wetland habitat; 3,957 ac of upland habitat; and 4.3 mi of riparian habitat in Gunnison, Saguache, and Montrose Counties, with most treated acres in Gunnison County. Project types included restoration, improvement, and management actions such as enhancement of wetland and brood-rearing habitat, treating sagebrush, reseeding of native vegetation, fencing installation, grazing management, and removal of piñon-juniper (USFWS 2014c, entire). Contributing partners for these projects have included CPW, NRCS, and Rocky Mountain Bird Observatory. In addition, in 2006 the NRCS Gunnison Basin Conservation District sponsored a Range Management School to assist ranchers in managing and monitoring their lands to benefit Gunnison sage-grouse and meet the requirements of the CCAA (Gunnison County 2013a, pp. 204-206).

Projects undertaken through SGI and related private land programs, as described above, have benefitted Gunnison sage-grouse and its habitat, but are limited in extent. Therefore, it is unlikely that such actions are able to offset habitat loss and decline across the species' range.

The CRP is another Federally sponsored program that has helped offset the loss of Gunnison sage-grouse habitat. Administered by the FSA, this program provides incentives to landowners to plant more natural vegetation in lands formerly devoted to agricultural production. The NRCS provides technical assistance and planning in the implementation of CRP. The CRP helps address the threat of habitat decline due to agricultural conversion.

Lands within the occupied range of Gunnison sage-grouse currently enrolled in the CRP are limited to Dolores and San Miguel counties in Colorado, and San Juan County in Utah (USDA FSA 2010, entire). From 2000 to 2008, CRP enrollment averaged 10,622 ha (26,247 ac) in Dolores County, 1,350 ha (3,337 ac) in San Miguel County, and 14,698 ha (36,320 ac) in San Juan County (USDA FSA 2010, entire). In 2011, approximately 9,793 ha (24,200 ac) were enrolled in the CRP program within occupied habitat in the Monticello population (UDWR 2011, p. 7). This area represents approximately 34 percent of the occupied habitat in the Monticello population, and approximately 22 percent of the entire Monticello-Dove Creek population area. By 2011, lands that had dropped out of the CRP program were replaced by newly enrolled properties, and the total acreage of lands enrolled in the CRP program remained at the maximum allowed by the FSA for San Juan County, UT (UDWR 2011, p. 7).

Gunnison sage-grouse are known to regularly use CRP lands in the Monticello population (Lupis *et al.* 2006, pp. 959–960; Ward 2007, p. 15). In San Juan County, Gunnison sage-grouse use CRP lands in proportion to their availability (Lupis *et al.* 2006,

p. 959). The CRP areas are used by grouse primarily as foraging and brood-rearing habitat, but these areas vary greatly in plant diversity and forb abundance, generally lack any shrub cover (Lupis *et al.* 2006, pp. 959-960; Prather 2010, p. 32), and thus are less suitable for nesting and wintering habitat.

Except in emergency situations such as drought, CRP-enrolled lands are not hayed or grazed. In response to a severe drought, four CRP parcels totaling 1,487 ha (3,674 ac) in San Juan County, UT, were emergency grazed for a duration of one to two months in the summer of 2002 (Lupis *et al.* 2006, p. 959). Males and broodless females avoided the grazed areas while cattle were present but returned after cattle were removed (Lupis *et al.* 2006, pp. 960-961). Thus, the effects from grazing were likely negative but apparently short in duration.

Largely as a result of agricultural conversion, sagebrush patches in the Monticello-Dove Creek subpopulation area have progressively become smaller and more fragmented, thereby limiting the amount of high quality nesting and winter habitat (GSRSC 2005, pp. 82, 276). Overall, the CRP has provided important foraging habitat and has protected a portion of the Monticello-Dove Creek population from more intensive agricultural use and development. Continued enrollment of lands in CRP and management of those lands are conservation priorities of the local sage-grouse working group (SJCWG 2003, entire). However, the overall value of CRP lands to Gunnison sage-grouse to reduce or remove the threat of habitat loss and fragmentation is currently limited because these lands largely lack sagebrush cover required by the species throughout most of the year. The value of CRP lands to the species will likely increase over time with the establishment of sagebrush in those areas. The extent to which existing CRP lands will be reenrolled in the future is unknown. However, given the recent enrollment, we expect lands to continue to be enrolled into the future.

Tribal Species Management Plan

Approximately 12,000 ac of occupied habitat on Pinecrest Ranch are owned by the Ute Mountain Ute Tribe (Tribe) under restricted fee status. The Pinecrest Ranch includes a total of 18,749 ac in the Gunnison Basin population area west of Gunnison, Colorado. The Tribe uses the ranch primarily for livestock grazing and for important traditional and cultural purposes. In February 2014, the Tribe completed a Species Management Plan (SMP) to promote the conservation of Gunnison sage-grouse and its habitat on the Pinecrest Ranch while maintaining a sustainable agricultural operation and other traditional uses of the property (Ute Mountain Ute Tribe 2014a, entire). On April 9, 2014, the Tribe approved and adopted the SMP for the Pinecrest Ranch per Resolution No. 2014-059 (Ute Mountain Ute Tribe 2014b, pp. 1-2).

The SMP includes management actions and/ or considerations that will benefit Gunnison sage-grouse including, but not limited to, continued predator control, seasonal restrictions for construction and development activities, road restrictions and closures, wildlife-friendly fencing, outreach and education, and sustainable grazing practices which are compatible with maintaining habitat that meets the species' needs (UMUT 2014, pp. 7-15). While we think the SMP provides a benefit to species, we evaluated the species management plan under our PECE policy, but found the plan met only 7 of the 15 criteria.

Other Conservation Efforts

To varying degrees, most counties in Colorado either support or are involved in other conservation efforts for Gunnison sage-grouse, such as local working groups, habitat improvement projects, and research projects (Gunnison County 2013b, Appendix 1 A-K, CPW 2014g, Attachment 3 and Appendix A; Office of the Governor of Colorado 2014, entire). Through CPW, the State of Colorado has also been a leader in sage-grouse research and conservation efforts throughout the species' range (CPW 2014g, entire; Office of the Governor of Colorado 2014, entire). We have considered all such conservation efforts in this listing determination, and highlight some of the more significant of these efforts below.

Except for the Cerro Summit-Cimarron-Sims Mesa population, each of the Gunnison sage-grouse population areas has a Conservation Plan authored by Local Working Groups with publication dates of 1997 to 2011 (CSGWG 1997; Dove Creek/Monticello Local Working Group 1998; GSRSC 2005; Piñon Mesa Gunnison Sage-grouse Working Group 2000; Poncha Pass Local Working Group 2000; Gunnison Sage-grouse Working Group 2000; SJCWG 2000 and 2003; SMBGSWG 2009; Crawford Area Sage-grouse Working Group 2011). These plans provide guidance and recommendations for management of Gunnison sage-grouse and have been the basis for identifying and prioritizing local conservation efforts. We have reviewed all of the Local

Working Group plans and the implementation reporting we received with respect to these plans. While these plans are providing a conservation benefit to the species, the actions in these plans are all voluntary and many of the satellite populations are in a downward trajectory, therefore the actions do not reduce the threats, such as residential development (Factor A), which may require compensatory mitigation to ameliorate, and, to the species to a point where listing is not warranted.

The Gunnison Sage-Grouse Rangewide Conservation Plan (RCP) was developed by the states of Colorado and Utah and 5 Federal agencies, including the Service, in 2005 to supplement the local working group plans and to offer a rangewide perspective for conservation of the species. The RCP includes specific, recommended avoidance and minimization measures, as well as species and habitat conservation targets. However, similar to the local plans, the RCP is a guidance document only, is voluntary, and does not provide regulatory mechanisms for Gunnison sage-grouse conservation (GSRSC 2005, p. 1). Where RCP recommended conservation measures have been implemented, we have evaluated and included them in our analysis. For example, the RCP recommends road closures and the enactment of county regulations to minimize impacts to the species; where appropriate, the existing efforts that implement these recommendations are included in our analysis. Overall, however, there is no requirement to implement the recommendations in the RCP and past implementation of these recommendations has generally been ad hoc and opportunistic. Given this history, we find that the RCP is not effective at reducing the threats acting on the species to the point where listing the species is not warranted.

Other conservation efforts in the species' range include the North Rim Landscape Strategy developed by Federal and state agencies, partners, and stakeholders to supplement the Crawford Area Conservation Plan. The strategy identifies broad recommendations for resource management and conservation of Gunnison sage-grouse in the Crawford population area, but is not a legal decision document (BLM 2013c, p. 4-5).

Gunnison County has been particularly active in Gunnison sage-grouse conservation activities. In 2005, it hired a Gunnison Sage-grouse Coordinator and organized a Strategic Committee to facilitate implementation of conservation measures in the Gunnison Basin under both the local Conservation Plan (CSGWG 1997, entire) and RCP (GSRSC 2005, entire). An estimated $30 million has been invested in conservation actions by these groups and partners in the Gunnison Basin (Gunnison County 2013a, p. 147). Gunnison County reports that it alone has contributed more than $1 million to Gunnison sage-grouse conservation (Gunnison County 2013a, p. 218). In 2009, Gunnison County adopted the Gunnison Basin Sage-grouse Strategic Plan (Gunnison County 2013a, Appendix E) to foster coordination and guide local citizens in the conservation of Gunnison sage-grouse. Also in 2009, the Gunnison County Sage-Grouse Conservation Action Plan (Gunnison County 2013a, Appendix F) was developed to guide and prioritize the implementation of specific conservation actions identified in the Strategic Plan. Gunnison County and the Gunnison Basin Sage-Grouse Strategic Committee (local working group for the Gunnison Basin population area) have also made significant public outreach efforts including holding the Gunnison Sage-Grouse Festival, providing website information for the public, and education and communication with area landowners (Gunnison County 2013a, p. 59).

The Crawford Working Group (Delta and Montrose County areas) also hired a Gunnison sage-grouse coordinator in December 2009. Likewise, Saguache County hired a part-time coordinator for the Poncha Pass population in 2013. These efforts facilitate coordination relative to sage-grouse management and reflect positively on these counties' commitment to Gunnison sage-grouse conservation.

Gunnison County and several other counties in the species' range have also enacted regulatory and related measures to benefit Gunnison sage-grouse and its habitat, as discussed under Factor D (Local Laws and Regulation).

The Gunnison Climate Adaptation Pilot Project, led by the Gunnison Climate Change Working Group, implemented several habitat projects in 2012 and 2013 to restore and improve the resiliency of Gunnison sage brood-rearing habitats (riparian areas and wet meadows) to address climate change in the Gunnison Basin (The Nature Conservancy (TNC) 2012, entire). The projected vulnerability of the Gunnison Basin to climate change was the primary impetus for the pilot project (see Climate Change). Long-term monitoring will determine effectiveness of the projects. Additional projects under this initiative are planned for the future (The Nature Conservancy (TNC) 2011, p. 1).

A review of a database compiled by the CPW that included local, State, and Federal ongoing and pending Gunnison sage-grouse conservation actions in Colorado from 2005 to 2009 (CDOW 2009c, entire) revealed a total of 224 individual conservation efforts, most of which were habitat improvement or protection projects. As of 2012, 165 of those efforts were completed, resulting in the treatment (enhancement or restoration) of 9,324 ha (23,041 ac), or approximately 2.5 percent of occupied Gunnison sage-grouse habitat. A monitoring component was included in 45 percent of the completed efforts, although we do not have information on their overall effectiveness. Five habitat improvement or protection projects occurred between January 2011 and September 2012, treating an additional 300 acres (CPW 2012b, p. 7). Further discussions of habitat improvement projects occurred before 2005 and subsequent to the 2012 summary document (CPW 2012b, entire; CPW 2014e, entire; CPW 2014g entire). These are not discussed here but were considered. Individually, these projects are generally all relatively small in scale, in relation to the individual populations where they have occurred. Cumulatively, these conservation efforts are providing a conservation benefit to the species, however, given the general downward trend of many of the satellite populations and the inability of these efforts to reduce threats such as residential development, we find these conservation efforts are not effective at reducing the threats acting on the species to the point where listing the species is not warranted.

Multi-County Rangewide Efforts

In 2013, the “Conservation Agreement for Gunnison Sage-grouse”, and a Memorandum of Understanding, was drafted by 11 Colorado and Utah Counties across the range of Gunnison sage-grouse (Gunnison, Saguache, Dolores, Montezuma, Delta, Montrose, Hinsdale, Mesa, San Miguel, and Ouray Counties in Colorado; and San Juan County in Utah) (hereafter, County Coalition). To date, the Governors of the States of Colorado and Utah; and County Commissioners from all nine counties in occupied range from both States have signed the agreement. Hinsdale and Montezuma Counties do not contain occupied range for Gunnison sage-grouse and, therefore, did not sign the agreement. While the agreement itself is not regulatory, signatories of the agreement committed to implementing appropriate resolutions, regulations, and guidelines to enhance the species and its habitat in an effort to increase populations of Gunnison sage-grouse (County Coalition 2013, entire). Specifically, they have formally committed to adopting a Habitat Prioritization Tool, which will better predict preferred habitat for the species, and they have formally committed to updating and adopting an amended Rangewide Conservation Plan. We did evaluate these multi-county efforts under our PECE policy, but found they did not include specific conservation efforts as defined by the PECE policy, and hence cannot contribute to a determination that listing is unnecessary or a determination to list the species as threatened rather than endangered.

Summary of Conservation Programs and Efforts Related to Habitat Protection

Numerous conservation actions have been implemented for Gunnison sage-grouse, and these efforts have provided and will continue to provide conservation benefit to the species. The CCAA and CCA provide significant conservation benefit to the species and its habitat on private lands rangewide and Federal lands in the Gunnison Basin, respectively, reducing the impacts of primarily habitat-related threats in those areas. However, the identified conservation efforts, taken individually and in combination, do not fully address the substantial threats of rangewide habitat decline (Factor A), small population size and structure (Factor E), drought (Factor E), climate change (Factor A), and disease (Factor C). The Gunnison Basin CCA provides some protection for Gunnison sage-grouse on Federal lands in the Gunnison Basin, but does not cover the remaining, more vulnerable satellite populations. Similarly, the existing CCAA benefits Gunnison sage-grouse, but does not provide sufficient coverage of the species' range to ensure the species' long-term conservation. Based on their voluntary nature and track records, the RCP, local working group plans, and other conservation efforts are not effective at reducing the threats acting on the species to the point where listing the species is not warranted. Thus, although the ongoing conservation efforts are a positive step toward the conservation of the Gunnison sage-grouse and have undoubtedly reduced the severity of certain threats to populations, on the whole we find that current conservation efforts are not sufficient to offset the full scope of threats to Gunnison sage-grouse.

Summary of Factor A

Gunnison sage-grouse require large areas of sagebrush for long-term persistence, and thus are affected by factors that occur at the landscape scale. Broad-scale characteristics within surrounding landscapes influence habitat selection, and adult Gunnison sage-grouse exhibit a high fidelity to all seasonal habitats, resulting in low adaptability to habitat changes. Habitat loss, degradation, and fragmentation of sagebrush habitats are a primary cause of the decline of Gunnison and greater sage-grouse populations (Patterson 1952, pp. 192–193; Connelly and Braun 1997, p. 4; Braun

1998, p. 140; Johnson and Braun 1999, p. 78; Connelly *et al.* 2000a, p. 975; Miller and Eddleman 2000, p. 1; Schroeder and Baydack 2001, p. 29; Johnsgard 2002, p. 108; Aldridge and Brigham 2003, p. 25; Beck *et al.* 2003, p. 203; Pedersen *et al.* 2003, pp. 23–24; Connelly *et al.* 2004, p. 4-15; Schroeder *et al.* 2004, p. 368; Leu *et al.* 2011, p. 267). Documented negative effects of fragmentation include reduced lek persistence, lek attendance, population recruitment, yearling and adult annual survival, female nest site selection, and nest initiation rates, as well as the loss of leks and winter habitat (Holloran 2005, p. 49; Aldridge and Boyce 2007, pp. 517–523; Walker *et al.* 2007a, pp. 2651–2652; Doherty *et al.* 2008, p. 194).

We examined a number of factors that contribute to habitat decline. Habitat loss due to residential and infrastructural development (including roads and powerlines) is a current and future threat to Gunnison sage-grouse range-wide. Due to habitat decline, the seven individual populations are now mostly isolated, with limited migration and gene flow among populations, increasing the likelihood of population extirpations. Functional habitat loss also contributes to habitat decline as sage-grouse avoid areas due to human activities and noise, even when sagebrush remains intact. The collective disturbance from human activities around residences and infrastructure results in habitat decline that negatively impacts Gunnison sage-grouse survival. Human populations are increasing across the species' range, a trend expected to continue into the future. Resulting habitat decline is diminishing the probability of Gunnison sage-grouse survival and persistence, particularly in the satellite populations.

Other habitat-related threats that are impacting Gunnison sage-grouse include grazing practices inconsistent with local ecological conditions, fences, invasive plants, fire, mineral development, piñon-juniper encroachment, and large-scale water development and irrigation. The cumulative presence of all these features and activities constitutes a threat to Gunnison sage-grouse as they collectively contribute to habitat decline. In particular, the satellite populations are less resilient and more vulnerable to extirpation and environmental pressures including habitat loss and fragmentation (see discussion in Factor A analysis above and in the Factor E analysis below).

Several issues discussed above, such as fire, invasive species, and piñon-juniper encroachment, may not currently have a substantial impact on Gunnison sage-grouse. For example, while it may be impacting individual birds or populations, piñon-juniper encroachment does not currently pose a threat to the species because of its limited distribution throughout the range of Gunnison sage-grouse. However, the documented synergy among these three issues (piñon-juniper encroachment, fire and invasive species), results in a high likelihood that they will pose a threat to the species in the future. Nonnative invasive plants, including cheatgrass and other noxious weeds, continue to expand their range, facilitated by ground disturbances such as fire, grazing incompatible with local ecological conditions, and human infrastructure. Invasive plants negatively impact Gunnison sage-grouse primarily by reducing or eliminating native vegetation that sage-grouse require for food and cover, resulting in habitat decline (both direct and functional). Cheatgrass is present at varying levels in nearly all Gunnison sage-grouse population areas, but there has not yet been a demonstrated change in fire cycle in the range of Gunnison sage-grouse. However, climate change will likely alter the range of invasive plants, intensifying the proliferation of invasive plants to the point that they become a threat to the species. Even with aggressive treatments, invasive plants will likely persist and continue to spread throughout the range of Gunnison sage-grouse.

Livestock management inconsistent with local ecological conditions has the potential to degrade sage-grouse habitat at local scales by causing the loss of nesting cover and decreases in native vegetation, and by increasing the probability of incursion of invasive plants. Given the widespread nature of grazing within the range of Gunnison sage-grouse, the potential for population-level impacts is probable. Effects of domestic livestock grazing inconsistent with local ecological conditions are likely being exacerbated by intense browsing of woody species by wild ungulates in parts of the Gunnison Basin. We conclude that habitat degradation that can result from grazing practices inconsistent with local ecological conditions is a threat to Gunnison sage-grouse.

We do not consider nonrenewable energy development to be impacting Gunnison sage-grouse habitat to the extent that it is a threat to the long-term persistence of the species at this time, because its current and anticipated extent is limited throughout the range of Gunnison sage-grouse. We do not consider renewable energy development to be a threat to the persistence of Gunnison sage-grouse rangewide at this time. However, geothermal and wind energy development could increase in the Gunnison Basin and Monticello areas, respectively, in the future.

We recognize ongoing and proposed conservation efforts by all entities across the range of the Gunnison sage-grouse, and commend all parties for their vision and participation. Local communities, landowners, agencies, and organizations in Colorado and Utah have dedicated resources to Gunnison sage-grouse conservation and have implemented numerous conservation efforts. We encourage continued implementation of these efforts into the future to promote the conservation of Gunnison sage-grouse. Our review of conservation efforts indicates that the measures identified are not fully addressing the most substantial threats to Gunnison sage-grouse including habitat decline (Factor A), small population size and structure (Factor E), drought (Factor E), climate change (Factor A), and disease (Factor C). All of the conservation efforts are limited in size and the measures provided to us were not implemented at the scale (even when considered cumulatively) that would be required to effectively reduce the threats to the species and its habitat across its range. The Gunnison Basin CCA, for example, provides some protection for Gunnison sage-grouse on Federal lands in the Gunnison Basin, but does not cover the remaining, more vulnerable satellite populations. Similarly, the existing CCAA benefits Gunnison sage-grouse on participating lands, but does not provide sufficient coverage of the species' range to ensure the species' long-term conservation. Thus, although the ongoing conservation efforts are a positive step toward the conservation of the Gunnison sage-grouse, and some have likely reduced the severity of some threats to the species, on the whole we find that current conservation efforts are not sufficient to offset the full scope of threats to Gunnison sage-grouse.

We have evaluated the best scientific information available on the present or threatened destruction, modification, or curtailment of the Gunnison sage-grouse's habitat or range. Based on the current and anticipated habitat threats identified above and their cumulative effects as they contribute to the overall decline of Gunnison sage-grouse habitat, we have determined that the present or threatened destruction, modification, or curtailment of Gunnison sage-grouse habitat poses a threat to the species throughout its range. This threat is substantial and current, and is projected to continue and increase into the future with additional anthropogenic pressures.

B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes.

Hunting

Hunting for Gunnison sage-grouse is not currently permitted under Colorado and Utah law. Hunting was eliminated in the Gunnison Basin in 2000 due to concerns with meeting Gunnison sage-grouse population objectives (Colorado Sage Grouse Working Group (CSGWG) 1997, p. 66). Hunting has not occurred in the other Colorado populations of Gunnison sage-grouse since 1995 when the Piñon Mesa area was closed (GSRSC 2005, p. 122). Utah has not allowed hunting of Gunnison sage-grouse since 1989 according to GSRSC (2005, p. 82), or as early as the mid-1970's according to SJCWG (2000, p. 11).

Both Colorado and Utah report they will consider hunting of Gunnison sage-grouse only if populations can be sustained (GSRSC 2005, pp. 5, 8, 229). The local Gunnison Basin working group plan calls for a minimum population of 500 males (based on lek counts) before hunting would occur again (CSGWG 1997, p. 66). The minimum population level in the Gunnison Basin population has been exceeded in all years since 1996, except 2003 and 2004 (CDOW 2009d, pp. 18–19). However, the sensitive State regulatory status and potential political ramifications of hunting the species has precluded the States from opening a hunting season. If hunting does ever occur again, harvest will likely be restricted to only 5 to 10 percent of the fall population, and will be structured to limit harvest of females to the extent possible (GSRSC 2005, p. 229). However, the ability of these measures to be implemented is in question, as adequate means to estimate fall population size have not been developed (Reese and Connelly 2011, pp. 110–111) and limiting female harvest may not be possible (WGFD 2004, p. 4; WGFD 2006, pp. 5, 7).

In 1992, a CPW effort to simplify hunting restrictions inadvertently opened the Poncha Pass area to sage-grouse hunting, and at least 30 grouse were harvested from this population. The area was closed to sage-grouse hunting the following year and has remained closed to hunting since (Nehring and Apa 2000, p. 3). One sage-grouse was known to be illegally harvested in 2001 in the Poncha Pass population (Nehring 2010, pers. comm.), but based on the best available information illegal harvest has not contributed to Gunnison sage-grouse population declines in either Colorado or Utah. We do not anticipate hunting to be opened in the Gunnison Basin or smaller populations for many years, if ever. Consequently, we do not consider hunting to be a threat to the species now or in the future.

Lek Viewing and Counts

The Gunnison sage-grouse was designated as a new species in 2000 (American Ornithologists' Union 2000, pp. 847–858), which has prompted a much increased interest by bird watchers to view the species on their leks (Pfister 2010, pers. comm.). Daily human disturbances on sage-grouse leks could cause a reduction in mating, and some reduction in total production (Call and Maser 1985, p. 19). Human disturbance, particularly if additive to disturbance by predators, could reduce the time a lek is active, as well as reduce its size by lowering male attendance (Boyko *et al.* 2004, *in* GSRSC 2005, p. 125). Smaller lek sizes have been hypothesized to be less attractive to females, thereby conceivably reducing the numbers of females mating. Disturbance during the peak of mating also could result in some females not breeding (GSRSC 2005, p. 125). Furthermore, disturbance from lek viewing might affect nesting habitat selection by females (GSRSC 2005, p. 126), as leks are typically close to areas in which females nest. If females move to poorer quality habitat farther away from disturbed leks, nest success could decline. If chronic disturbance causes sage-grouse to move to a new lek site away from preferred and presumably higher quality areas, both survival and nest success could decline. Whether any or all of these have significant population effects would depend on timing and degree of disturbance (GSRSC 2005, p. 126).

Throughout the range of Gunnison sage-grouse, public viewing of leks is limited by a general lack of knowledge of lek locations, seasonal road closures in some areas, and difficulty in accessing many leks. Furthermore, 52 of 109 active Gunnison sage-grouse leks occur on private lands, further limiting public access. The BLM closed a lek in the Gunnison Basin to viewing in the late 1990s due to declining population counts perceived as resulting from recreational viewing, although no scientific studies were conducted (BLM 2005a, p. 13; GSRSC 2005, pp. 124, 126).

The Waunita lek east of Gunnison is the only lek in Colorado designated by the CPW for public viewing (Waunita Watchable Wildlife Area) (CDOW 2009b, p. 86). Since 1998, a comparison of male counts on the Waunita lek versus male counts on other leks in the Doyleville zone show that the Waunita lek's male counts generally follow the same trend as the others (CDOW 2009d, pp. 31–32). In fact, in 2008 and 2009, the Waunita lek increased in the number of males counted along with three other leks, while seven leks decreased in the Doyleville zone (CDOW 2009d, pp. 31–32). These data suggest that lek viewing on the Waunita lek has not impacted Gunnison sage-grouse attendance at leks. Two lek viewing tours per year are organized and led by UDWR on a privately owned lek in the Monticello population. The lek declined in males counted in 2009, but 2007 and 2008 had the highest counts for several years, suggesting that lek viewing is not impacting that lek either. Data collected by CPW on greater sage-grouse viewing leks also indicates that controlled lek visitation has not impacted greater sage-grouse at the viewed leks (GSRSC 2005, p. 124).

A lek viewing protocol has been developed and has largely been followed on the Waunita lek, likely reducing impacts to sage-grouse (GSRSC 2005, p. 125). During 2004–2009, the percentage of individuals or groups of people in vehicles following the Waunita lek viewing protocol in the Gunnison Basin ranged from 71 to 92 percent (CDOW 2009b, pp. 86, 87; Magee *et al.* 2009, pp. 7, 10). Violations of the protocol, such as showing up after the sage-grouse started to display and creating noise, caused one or more sage-grouse to flush from the lek (CDOW 2009b, pp. 86, 87). Despite the protocol violations, the percentage of days from 2004 to 2009 that grouse were flushed by humans was relatively low, ranging from 2.5 percent to 5.4 percent (Magee *et al.* 2009, p. 10). The current lek viewing protocol includes regulations to avoid and minimize disturbance from photography, research, and education-related viewing; regulations and related information are provided to the public online (CDOW 2009b, p. 86; Gunnison County 2013a, p. 127; CPW 2013, entire). Implementation of this protocol should preclude lek viewing from becoming a threat to this lek.

The CPW and UDWR will continue to coordinate and implement lek counts to determine population levels. We expect annual lek viewing and lek counts to continue into the future. Lek counts may disturb individual birds. However, since the Waunita lek is open to viewers on a daily basis throughout the lekking season, and lek counters only approach an individual lek 2-3 times per season, all leks counted will receive lower disturbance from counters than the Waunita lek receives from public viewing, so we do not consider lek counts a threat to Gunnison sage-grouse populations or the species.

Scientific Research and Related Conservation Efforts

Overall, it is expected that scientific research and related conservation efforts by the States, such as translocation of Gunnison sage-grouse, have a net conservation benefit for the species, because they contribute to improved understanding of the species' conservation needs and may have helped to augment some of the satellite populations, likely contributing to their continued persistence. However, some unintended negative effects are known to occur in the process. Gunnison sage-grouse have been the subject of multiple scientific studies, some of which included capture and handling. Most field research has been conducted in the Gunnison Basin population, San Miguel Basin population, and Monticello portion of the Monticello-Dove Creek population. Between zero and seven percent mortality of handled adults or juveniles and chicks has occurred during recent Gunnison sage-grouse studies where trapping and radio-tagging was done (Apa 2004, p. 19; Childers 2009, p. 14; Lupis 2005, p. 26; San Miguel Basin Gunnison Sage-grouse Working Group (SMBGSWG) 2009, p. A-10). For these studies combined, of 688 birds captured, 11 (1.6 percent) died (Table 11). Additionally, one radio-tagged hen was flushed off a nest during subsequent monitoring and did not return after the second day, resulting in the loss of 10 eggs (Ward 2007, p. 52). The CPW does not feel that these losses or disturbance are having significant impacts on the sage-grouse (CDOW 2009b, p. 29), and we agree with this assessment.

Table 11. Mortality of Gunnison Sage-Grouse from Recent Studies.

Study Focus	Total Birds Handled/	Mortality	Source

	Captured/ Studied	Number of Individuals	% of Total Birds	
Habitat use, movement, survival of Gunnison sage-grouse in southwest Colorado	138	3	2.2%	Apa 2004, p. 19
Gunnison sage-grouse habitat use	336[a]	7	2.1%	Childers 2009, p. 14
Summer ecology of Gunnison sage-grouse	14	1	7.1%	Lupis 2005, p. 26
Summary of CPW research projects in the Gunnison Basin and San Miguel populations from 2004 to 2009	200	0	0.0%	SMBGSWG 2009, p. A-10
Total	688	11	1.6%	n/a

[a]This figure includes 218 adults and 118 chicks captured; of these, 5 adults (2.3%) and 2 chicks (1.7%) died.

Translocation of birds from the Gunnison Basin population has been used to augment some of the satellite populations and may contribute to their persistence. However, related to translocated birds, there are potential genetic and population viability concerns for the satellite (receiving) populations and the Gunnison Basin (source) population (see Small Population Size and Structure in Factor E). Trapping and translocation of Gunnison sage-grouse may also increase mortality rates, either due directly to capturing and handling, or indirectly (later in time) as a result of translocation to areas outside the individuals' natal (home) range.

From the spring of 2000 to the spring 2013, CPW translocated a total of 300 radio-collared Gunnison sage-grouse from the Gunnison Basin population to the following satellite populations: Poncha Pass (41 birds), San Miguel Basin (Dry Creek Basin) (51 birds), Piñon Mesa (93 birds), Dove Creek (42 birds), and Crawford (73 birds). During this time, CPW reported only four bird deaths associated with capture myopathy (muscle damage due to extreme exertion or stress associated with capture and transport), including two deaths in 2007 and two in 2009 (CPW 2014c, entire). Excluding capture myopathy cases, data for birds with unknown fates (i.e., due to dropped or expired radio collars), and some of the more recent (2013) translocated birds, CPW has tracked the survival of 176 Gunnison sage-grouse translocated to date. Survival of all translocated birds to 12 months following translocation was higher in the spring (53.8 percent) than fall (39.6 percent); higher for yearlings (55.4 percent) and juveniles (61.3 percent) than adults (40.0 percent); and comparable for males (50.0 percent) and females (48.8 percent). By population, survival to 12 months was highest in Dove Creek (60 percent) and Crawford (59.6 percent), followed by Piñon Mesa (40 percent), Dry Creek Basin (35.3 percent), and Poncha Pass (20.0 percent). Overall survival of translocated birds to 12 months was approximately 48 percent (CPW 2013d, entire; Wait 2013, pers. comm.; CPW 2014c, entire). Therefore, about 50 percent of these translocated birds died within the first 12 months following translocation, greater than the average annual mortality rate of non-translocated sage-grouse (approximately 20 percent) (CDOW 2009b, p. 9). However, some birds with an unknown fate (e.g., a dropped radio collar with no sign of death) were assumed dead and, therefore, the data may overestimate actual mortality rates (Wait 2013, pers. comm.).

In the fall of 2013, an additional 17 Gunnison sage-grouse were translocated to the Poncha Pass population from the Gunnison Basin. As of January 2014, 10 of these birds were known to be surviving (Nehring 2014, pers. comm.). In spring of 2014, 10 more birds were translocated to the Poncha Pass population from the Gunnison Basin (CPW 2014e, p. 7). In the fall of 2013 and spring of 2014, CPW translocated 23 birds from the Gunnison Basin to the Miramonte subpopulation of the San Miguel population (CPW 2014e, p. 7). Survival data for these birds were not available upon the drafting of this final rule.

Greater sage-grouse translocations have not fared any better than those of Gunnison sage-grouse. Over 7,200 greater sage-grouse were translocated between 1933 and 1990, but only five percent of the translocation efforts were considered to be successful in producing sustained, resident populations at the translocation sites (Reese and Connelly 1997, pp. 235–238, 240). More recent translocations from 2003 to 2005 into Strawberry Valley, Utah, resulted in a 40 percent annual mortality rate (Baxter *et al.* 2008, p. 182). We believe the lack of success of translocations found in greater sage-grouse is applicable to Gunnison sage-grouse because the two species exhibit similar behavior and life-history traits, and translocations are also managed similarly.

Because the survival rate for translocated sage-grouse has not been as high as desired, the CPW started a captive-rearing program in 2009 to investigate techniques for captive breeding and rearing of chicks, and methods to release chicks into wild, surrogate broods, to potentially increase brood survival and recruitment (CDOW 2009b, pp. 9-12). The GSRSC conducted a review of captive-rearing attempts for both greater sage-grouse and other gallinaceous birds and concluded that survival will be very low, unless innovative strategies are developed and tested (GSRSC 2005, pp. 181–183). However, greater sage-grouse have been reared in captivity, and survival of released chicks was similar to that of wild chicks (CDOW 2009b, p. 10). Consequently, the CPW started a captive-breeding project for Gunnison sage-grouse. After establishing a captive, breeding flock, 78 domestically-reared chicks were introduced to wild Gunnison sage-grouse broods in 2010 and 2011 at two treatment ages. While survival of successfully-adopted, domestically-reared chicks was slightly lower than that of wild-reared chicks through 14 weeks, across both years none of the domestically-reared chicks were recruited into the breeding population (Wiechman 2014c, pers. comm.). Although introduced chick survival was relatively low, chick survival during captivity increased with improved protocols, and valuable knowledge on Gunnison sage-grouse rearing techniques has been gained (CPW 2011b). In another study, approximately 42 percent of captive-reared chicks introduced to wild females and their broods survived to 30 days of age. Of chicks that did not survive, 26.3 percent of chicks were lost due to predation, and 25.6 percent were lost due to exposure to the elements (Thompson 2012, pp. 29, 93).

As techniques improve, the CPW intends to develop a captive-breeding manual for Gunnison sage-grouse (CDOW 2009b, p. 11). Although adults or juveniles have been captured and moved out of the Gunnison Basin, as well as eggs, the removal of the grouse only accounts for a very small percentage of the total population of the Gunnison Basin sage-grouse population (less than 1 percent per year).

The CPW has a policy regarding trapping, handling, and marking techniques approved by its Animal Use and Care Committee (SMBGSWG 2009, p. A-10, Childers

2009, p. 13). Evaluation of research projects by the Animal Use and Care Committee and improvement of trapping, handling, and marking techniques over the last several years has resulted in fewer mortalities and injuries. In fact, in the San Miguel Basin, researchers have handled more than 200 sage-grouse with no trapping mortalities (SMBGSWG 2009, p. A-10). The CPW has also drafted a sage-grouse trapping and handling protocol, which is required training for people handling Gunnison sage-grouse, to minimize mortality and injury of the birds (CDOW 2002, pp. 1–4 in SMBWG 2009, pp. A-22-A-25). Injury and mortality does occasionally occur from trapping, handling, marking, and flushing off nests. However, research-related mortality is typically below two percent of handled birds (Table 11), indicating there is minimal effect on Gunnison sage-grouse at the population level.

Overall, we find that ongoing and future scientific research and related conservation efforts provide a net conservation benefit for the species. Primarily due to handling, capture, and translocations, short-term negative effects to individuals occur as does injury and mortality, but these effects do not pose a threat to Gunnison sage-grouse populations or the species. Translocation of birds from the Gunnison Basin population has been used to augment some of the satellite populations and may have contributed to their persistence, albeit with potential genetic and population viability concerns for the receiving populations (see Genetic Risks), and for the Gunnison Basin (source) population (see Small Population Size and Structure in Factor E). Based on the best available information, scientific research and associated activities as described above have a relatively minor impact and are not a threat to the Gunnison sage-grouse.

Summary of Factor B

We have no evidence to suggest that legal hunting resulted in the overutilization of Gunnison sage-grouse. However, Gunnison sage-grouse harvest from an inadvertently opened hunting season resulted in a significant population decrease in the small Poncha Pass population. Nevertheless, we do not expect hunting to be permitted in the near future. Illegal hunting has only been documented once in Colorado and is not a known threat in Colorado or Utah. Lek viewing has not affected the Gunnison sage-grouse, and lek viewing protocols designed to reduce disturbance have generally been followed. CPW is currently revising its lek viewing protocol to make it more stringent and to include considerations for photography, research, and education-related viewing. Mortality from scientific research and capture or handling of wild birds is low, generally less than 2 percent and is not a threat. We know of no overutilization for commercial or educational purposes. Thus, based on the best scientific and commercial data available, we conclude that overutilization for commercial, recreational, scientific, or educational purposes is not a threat to Gunnison sage-grouse.

C. Disease or Predation.

Disease

No research focusing on the types or pathology of diseases in Gunnison sage-grouse has been published. However, multiple bacterial and parasitic diseases have been documented in greater sage-grouse (Patterson 1952, pp. 71–72; Schroeder *et al.* 1999, pp. 14, 27). Some early studies have suggested that greater sage-grouse populations are adversely affected by parasitic infections (Batterson and Morse 1948, p. 22). However, the role of parasites or infectious diseases in population declines of greater sage-grouse is unknown based on the few systematic surveys conducted (Connelly *et al.* 2004, p. 10-3). No parasites have been documented to cause mortality in Gunnison sage-grouse, but the protozoan, *Eimeria* spp., which causes coccidiosis, has been reported to cause death in greater sage-grouse (Connelly *et al.* 2004, p. 10-4). Infections tend to be localized to specific geographic areas, and no cases of greater sage-grouse mortality resulting from coccidiosis have been documented since the early 1960s (Connelly *et al.* 2004, p. 10-4).

Parasites have been implicated in greater sage-grouse mate selection, with potentially subsequent effects on the genetic diversity of this species (Boyce 1990, p. 263; Deibert 1995, p. 38). These relationships may be important to the long-term ecology of greater sage-grouse, but they have not been shown to be significant to the immediate status of populations (Connelly *et al.* 2004, p. 10-6). Although diseases and parasites have been suggested to affect isolated sage-grouse populations (Connelly *et al.* 2004, p. 10-3), we have no evidence indicating that parasitic diseases are a threat to Gunnison sage-grouse populations.

Greater sage-grouse are subject to a variety of bacterial, fungal, and viral pathogens. The bacterium *Salmonella* sp. has caused a single documented mortality in the greater sage-grouse and studies have shown that infection rates in wild birds are low (Connelly *et al.* 2004, p. 10-7). The bacteria are apparently contracted through exposure to contaminated water supplies around livestock stock tanks (Connelly *et al.* 2004, p. 10-7). Other bacteria found in greater sage-grouse include *Escherichia coli*, botulism *(Clostridium* spp.), avian tuberculosis *(Mycobacterium avium),* and avian cholera *(Pasteurella multocida).* These bacteria have never been identified as a cause of mortality in greater sage-grouse and the risk of exposure and hence, population effects, is low (Connelly *et al.* 2004, p. 10-7 to 10-8). In Gunnison sage-grouse, domestically-reared chicks have died due to bacterial infections by *Klebsiella spp.*, *E. coli*, and *Salmonella spp*. In one case (CDOW 2009b, p. 11), bacterial growth was encouraged by a wood-based brooder substrate used to raise chicks. However, in a subsequent study (CPW 2011b, pp. 14-15) where the wood-based substrate was not used, similar bacterial infections and chick mortality still occurred. This was likely a product of warm and potential moist substrates which promoted bacterial growth and spread. After switching to a gravel-based substrate and administering antibiotics, bacteria-related mortalities decreased. While this appears to suggest that Gunnison sage-grouse may be less resistant to bacterial infections than greater sage-grouse, most of the bacteria found can be present at non-lethal levels in wild Gunnison sage-grouse (Wiechman 2014a, pers. comm.). However, we have no information that shows the risk of exposure in the wild is different for Gunnison sage-grouse; therefore, these bacteria do not appear to be a threat to the species.

To limit the risk of disease transmission from introduced avian species, Gunnison County's Land Use Resolution (LUR) Number 07–17 regulates the importation of non-indigenous, gallinaceous game birds. This regulation requires that species only be imported from a source certified by the State of Colorado to be disease free (Gunnison County 2013a, p. 130).

West Nile virus was introduced into the northeastern United States in 1999 and has subsequently spread across North America (Marra *et al.* 2004, p. 394). Greater sage-grouse are highly susceptible to West Nile virus (Clark *et al.* 2006, p. 19; McLean 2006, p. 54) and do not develop a resistance to the disease. Death is almost certain once an individual is infected with the disease (Clark *et al.* 2006, p. 18). Transmission occurs when mosquitoes acquire the virus by biting an infected bird, and then transfer it by feeding on a new host (avian or mammalian). *Culex* species are recognized as the most efficient mosquito vectors for West Nile virus (Turell *et al.* 2005, p. 60), and *Culex tarsalis* is the dominant vector of the virus in sagebrush habitats (Naugle *et al.* 2004, p. 711). West Nile virus transmission is regulated by multiple factors, including temperature, precipitation, biology of the mosquito vector (Turrell *et al.* 2005, pp. 59-60), and the presence of anthropogenic water sources, such as stock ponds and tanks, coal bed methane ponds, and irrigated agricultural fields that support mosquito life cycles (Reisen *et al.* 2006, p. 309; Walker and Naugle 2011, pp. 131–132). The peak of West Nile virus activity typically occurs in the summer from July through August, though this varies by region (Walker *et al.* 2004).

In Gunnison sage-grouse range and other parts of the west, water sources are commonly developed to support livestock operations and improve animal distribution and forage use. Some water developments are designed specifically to benefit Gunnison sage-grouse, although this practice was recommended prior to our knowledge of West Nile virus as a serious risk factor for sage-grouse (Walker and Naugle 2011, p. 29) (see discussion below; also see discussion of the potential benefits of water development to Gunnison sage-grouse in Domestic Grazing and Wildlife Herbivory in Factor A above). The precise quantity and distribution of water developments in Gunnison sage-grouse range is unknown. However, we know that at least 87 percent of occupied Gunnison sage-grouse habitat on Federal lands is currently grazed by domestic livestock (USFWS 2010c, entire), suggesting that water developments are common and widespread across the species range. A similar proportion of area on private lands is likely grazed by domestic livestock as well. It is expected that some of these water sources are contributing to the persistence of mosquito populations and, therefore, to the potential spread of West Nile virus across the range of Gunnison sage-grouse. Management or modification of water developments in sage-grouse habitats is one way to control mosquito vector populations and, therefore, sources of West Nile virus (Walker and Naugle 2011, p. 29, and references therein).

The virus persists largely within a mosquito-bird-mosquito infection cycle (McLean 2006, p. 45). However, direct bird-to-bird transmission of the virus has been documented in several species (McLean 2006, pp. 54, 59), including the greater sage-grouse (Walker and Naugle 2011, p. 132; Cornish 2009, pers. comm.). The frequency of direct transmission has not been determined (McLean 2006, p. 54). Cold ambient temperatures preclude mosquito activity and virus amplification, so transmission to and in sage-grouse is limited to the summer (mid-May to mid-September) (Naugle *et al.* 2005, p. 620; Zou *et al.* 2007, p. 4), with a peak in July and August (Walker and Naugle 2011, p. 131). Reduced and delayed West Nile virus transmission in sage-grouse has occurred in years with lower summer temperatures (Naugle *et al.* 2005, p. 621; Walker *et al.* 2007b, p. 694). In non-sagebrush ecosystems, high temperatures associated with drought conditions increase West Nile virus transmission by allowing for more rapid larval mosquito development and shorter virus incubation periods (Shaman *et al.* 2005, p. 134; Walker and Naugle 2011, p. 131).

Greater sage-grouse congregate in mesic (moist) habitats in the mid-late summer (Connelly *et al.* 2000, p. 971), thereby increasing their risk of exposure to mosquitoes. Likewise, Gunnison sage-grouse use more mesic habitats in the summer and early fall (GSRSC 2005, p. 30, and references therein), increasing their exposure to mosquitoes. If West Nile virus outbreaks coincide with drought conditions that aggregate birds in habitat near water sources, the risk of exposure to West Nile virus will be elevated (Walker and Naugle 2011, p. 131). Greater sage-grouse inhabiting higher elevation sites in summer (similar to areas of the Gunnison Basin) are likely less vulnerable to contracting West Nile virus than birds at lower elevation (similar to Dry Creek Basin of the San Miguel population) as ambient temperatures are typically cooler at higher elevations (Walker and Naugle 2011, p. 131).

West Nile virus has caused population declines in wild bird populations on the local and regional scale (Walker and Naugle 2011, pp. 128–129) and has reduced the survival rates of greater sage-grouse (Naugle *et al.* 2004, p. 710; Naugle *et al.* 2005, p. 616). Experimental results, combined with field data, suggest that a widespread West Nile virus infection has negatively affected greater sage-grouse (Naugle *et al.* 2004, p. 711; Naugle *et al.* 2005, p. 616). As noted above, the selective use of mesic habitats by sage-grouse during the summer and fall increases their exposure to West Nile virus. Greater sage-grouse are highly susceptible to West Nile virus (Clark *et al.* 2006, p. 19; McLean 2006, p. 54) and do not develop a resistance to the disease. Death is certain once an individual is infected with the disease (Clark *et al.* 2006, p. 18). Furthermore, other gallinaceous bird species such as ruffed grouse (*Bonasa umbellus*), wild turkey (*Meleagris gallopavo*), and chukar partridge (*Alectoris chukar*), have died as a result of West Nile virus infection (CDC 2013, entire).

It is reasonable to assume the Gunnison sage-grouse is susceptible to West Nile virus based on the confirmed cases of infection and mortality in greater sage-grouse and other taxonomically related birds. We are also aware of at least 3 Gunnison sage-grouse dying of West Nile disease, although these birds were growing in captivity in Fort Collins, CO where the virus is more likely to be present (Wiechman 2014b, pers. comm). To date, however, West Nile virus has not been documented in Gunnison sage-grouse despite the presence of West Nile virus across most of the species' range (see discussion below). This may be the result of the small number of birds marked and studied; limited local abundance of the principle mosquito vector species, *Culex*; unsuitable conditions in

Gunnison sage-grouse habitat for the virus to become virulent or widespread; or any number of other factors. West Nile virus activity within the range of Gunnison sage-grouse is apparently low compared to other parts of Colorado, Utah, and the western United States. However, West Nile virus surveillance may not occur every year or in every county (USGS 2013, entire), meaning that incidents likely go undetected. Furthermore, rural areas with smaller human populations, such as the majority of lands within Gunnison sage-grouse range, may have decreased detection and reporting rates of avian mortalities, thus potentially biasing the modeled distribution of West Nile virus (Ward *et al.* 2006, p. 102).

To date, across Gunnison sage-grouse occupied range, only San Miguel and Dolores, Counties in Colorado have no confirmed avian mortalities associated with West Nile virus, nor has the virus been reported in human or mosquito infection data in those counties. However, adjacent counties have confirmed West Nile virus presence, so the virus is potentially present in San Miguel and Dolores Counties as well. A total of 84 dead wild birds (species other than Gunnison sage-grouse) infected by West Nile virus have been reported from nine counties within the current range of Gunnison sage-grouse since 2002, when reporting began in Colorado and Utah. These include Chaffee, Delta, Gunnison, Mesa, Montrose, Ouray, and Saguache Counties in Colorado; and Grand and San Juan Counties in Utah. Seventy and 14 of these bird deaths were reported in Colorado and Utah, respectively. Fifty-two (62 percent) of reported cases were in Mesa County where the Piñon Mesa population is found. Also, the majority of reported cases were in Colorado counties (USGS 2013, entire; USFWS 2013a, entire). However, as noted above, areas with higher human population densities, such as Mesa County, Colorado, can result in increased detection and reporting rates, thus potentially biasing the modeled distribution of West Nile virus (Ward *et al.* 2006, p. 102). In Utah, 13 (93 percent) avian mortality reports were in Grand County, and 1 (7 percent) was in San Juan County. Sixty-four (76 percent) of the 84 total reported bird mortalities in Colorado and Utah occurred in 2003 and 2004, when summer temperatures were above average and, likely contributing to the spread of West Nile virus (Reisen *et al.* 2006, p. 1). Since that time, reported avian mortalities associated with West Nile virus across the range of Gunnison sage-grouse have declined, and no avian infections or mortalities were reported from 2008 through 2012 (USGS 2013, entire; USFWS 2013a, entire).

A CPW study with the Colorado Mosquito Control Company in 2004 used mosquito trap monitoring to evaluate the relative risk of West Nile virus on Gunnison sage-grouse in the Gunnison Basin. Trapping resulted in a total of 6,729 mosquitoes throughout the Gunnison Basin from June 1 through August 30. Testing of mosquito samples conducted by the Colorado Department of Public Health observed nine species of mosquito, including *Culex tarsalis*, the primary vector of West Nile virus. However, the relative abundance of *C. tarsalis* was low, comprising about 15.8 percent of all samples collected. No other *Culex* species were observed. The other species observed are not known to be effective transmitters of West Nile virus to avian species. All mosquito samples tested negative for West Nile virus. Sixteen Gunnison sage-grouse were radiomarked by CPW during the same summer, and no mortalities of marked or unmarked birds were observed (Phillips 2013, p. 6). One avian mortality (a species other than Gunnison sage-grouse) due to West Nile infection was reported in Gunnison County in 2003 (USGS 2013, entire; USFWS 2013a, p.1).

Walker and Naugle (2011, p. 140) predict that West Nile virus outbreaks in small, isolated, and genetically depauperate populations could reduce sage-grouse numbers below a threshold from which recovery is unlikely because of limited or nonexistent demographic and genetic exchange from adjacent populations. If so, a West Nile virus outbreak in any Gunnison sage-grouse population, except perhaps the Gunnison Basin population, assuming it remains large and resilient, would challenge their survival.

As described above, West Nile virus is present throughout most of the range of Gunnison sage-grouse. Although the disease has not yet been documented in any Gunnison sage-grouse, it has caused large mortality events and has also caused the deaths of other gallinaceous birds including greater sage-grouse. Similar to observations in greater sage-grouse (Walker and Naugle 2011, p. 131), higher elevation populations of Gunnison sage-grouse, such as the Gunnison Basin may be at lower risk of West Nile virus infection and outbreaks. Also, the frequency of avian mortalities (species other than sage-grouse) associated with the virus have apparently declined since 2004 across the range of Gunnison sage-grouse. However, increased temperature and drought conditions are expected to increase in the future due to climate change across the range (see Climate Change in Factor A). Such conditions will contribute to the prevalence and spread of West Nile virus and, therefore, the exposure of Gunnison sage-grouse to this disease. Therefore, due to the known presence of West Nile virus across the majority of

Gunnison sage-grouse range, the high risk of mortality and population-level impacts based on the biology of the species, and the immediacy of those potential impacts, we conclude that West Nile virus is a future threat to Gunnison sage-grouse rangewide. The threat of West Nile virus is currently lower in the high elevation areas, such as the Gunnison Basin population, but is expected to increase in the foreseeable future due to increased drought and the predicted effects of climate change. No other diseases or parasitic infections are known to be a threat to Gunnison sage-grouse now or in the future.

Predation

Predation is the most commonly identified cause of direct mortality for sage-grouse during all life stages (Schroeder *et al.* 1999, p. 9; Connelly *et al.* 2000b, p. 228; Connelly *et al.* 2011b, p. 66). However, sage-grouse have co-evolved with a variety of predators, and their cryptic plumage and behavioral adaptations have allowed them to persist despite this mortality factor (Schroeder *et al.* 1999, p. 10; Coates 2008, p. 69; Coates and Delehanty 2008, p. 635; Hagen 2011, p. 96). Until recently, little published information has been available that indicates predation is a limiting factor for the greater sage-grouse (Connelly *et al.* 2004, p. 10-1), particularly where habitat quality has not been compromised (Hagen 2011, p. 96). Although many predators will consume sage-grouse, none specialize on the species (Hagen 2011, p. 97). Generalist predators have the greatest effect on ground-nesting birds because predator numbers are independent of the density of a single prey source since they can switch to other prey sources when a given prey source is not abundant (Coates 2007, p. 4). We presume that the effects of predation observed in greater sage-grouse are similar to those anticipated in Gunnison sage-grouse since overall behavior and life-history traits are similar for the two species. However, as discussed below, those effects may be more substantial and of greater concern for smaller, declining populations, such as the six satellite populations of Gunnison sage-grouse.

Major predators of adult sage-grouse include many species including golden eagles *(Aquila chrysaetos),* red foxes *(Vulpes fulva),* and bobcats *(Felis rufus)* (Hartzler 1974, pp. 532–536; Schroeder *et al.* 1999, pp. 10–11; Schroeder and Baydack 2001, p. 25; Rowland and Wisdom 2002, p. 14; Hagen 2011, p. 97). Juvenile sage-grouse also are killed by many raptors as well as common ravens *(Corvus corax),* badgers *(Taxidea taxus)*, red foxes, coyotes *(Canis latrans),* and weasels *(Mustela* spp.) (Braun 1995, entire; Schroeder *et al.* 1999, p. 10). Nest predators include badgers, weasels, coyotes, common ravens, American crows *(Corvus brachyrhyncos),* magpies *(Pica* spp.), elk *(Cervus canadensis)* (Holloran and Anderson 2003, p. 309), and domestic cows *(Bovus* spp.) (Coates *et al.* 2008, pp. 425–426). Ground squirrels *(Spermophilus* spp.) also have been identified as nest predators (Patterson 1952, p. 107; Schroeder *et al.* 1999, p. 10; Schroder and Baydack 2001, p. 25), but recent data show that they are physically incapable of puncturing eggs (Holloran and Anderson 2003, p 309; Coates *et al.* 2008, p. 426; Hagen 2011, p. 97). Several other small mammals visited sage-grouse nests in Nevada, but none resulted in predation events (Coates *et al.* 2008, p. 425).

The most common predators of Gunnison sage-grouse eggs are weasels, coyotes, and corvids (Young 1994, p. 37). Most raptor predation of sage-grouse is on juveniles and older age classes (GSRSC 2005, p. 135). Golden eagles were found to be the dominant raptor species recorded perching on power poles in Utah in Gunnison sage-grouse habitat (Prather and Messmer 2009, p. 12), indicating a possible source of predation. In a study conducted from 2000 to 2009 in the western portion of the Gunnison Basin, 22 and 40 percent of 111 adult Gunnison sage-grouse mortalities were the result of avian and mammalian predation, respectively (Childers 2009, p. 7). Twenty-five and 35 percent of 40 chick mortalities were caused by avian and mammalian predation, respectively (Childers 2009, p. 7). A causative agent of mortality was not determined in the remaining mortalities (approximately one-third of all known mortalities) in the western portion of the Gunnison Basin from 2000 to 2009 (Childers 2009, p. 7).

Adult male Gunnison and greater sage-grouse are very susceptible to predation while on the lek (Schroeder *et al.* 1999, p. 10; Schroeder and Baydack 2001, p. 25; Hagen 2011, p. 5), presumably because they are conspicuous while performing their mating displays. Because leks are attended daily by numerous grouse, predators also may be attracted to these areas during the breeding season (Braun 1995, p. 2). In a study of greater sage-grouse mortality causes in Idaho, it was found that, among males, 83 percent of the mortality was due to predation and 42 percent of those mortalities occurred during the lekking season (March through June) (Connelly *et al.* 2000b, p. 228). In the same study, 52 percent of the mortality of adult females was due to predation and 52 percent of those mortalities occurred between March and August, which includes the nesting and brood-rearing periods (Connelly *et al.* 2000b, p. 228).

Predation of adult sage-grouse is low outside the lekking, nesting, and brood-rearing season (Connelly *et al.* 2000b, p. 230; Naugle *et al.* 2004, p. 711; Moynahan *et al.* 2006, p. 1536; Hagen 2011, p. 97). Adult female greater sage-grouse are susceptible to predators while on the nest but mortality rates are low (Hagen 2011, p. 97). Greater sage-grouse selected nest and brood-rearing sites with lower avian predator densities than nearby random locations (Dinkins *et al.* 2012, p. 605). Hens will abandon their nest when disturbed by predators (Patterson 1952, p. 110), likely reducing this mortality (Hagen 2011, p. 97). Sage-grouse populations are likely more sensitive to predation upon females given the highly negative response of Gunnison sage-grouse population dynamics to adult female reproductive success and chick mortality (GSRSC, 2005, p. 173).

Estimates of predation rates on juvenile sage-grouse are limited and variable due to the difficulties in studying this age class (Aldridge and Boyce 2007, p. 509; Hagen 2011, p. 97). For greater sage-grouse, chick mortality from predation ranged from 10 to 51 percent in 2002 and 2003 on three study sites in Oregon (Gregg *et al.* 2003, p. 15; 2003b, p. 17). Mortality due to predation during the first few weeks after hatching was estimated to be 82 percent (Gregg *et al.* 2007, p. 648). Survival of juveniles to their first breeding season was estimated to be low (10 percent). In northwest Colorado, mortality due to predation was estimated at 26.3 percent in captive reared greater sage-grouse chicks introduced to the wild (Thompson 2012, pp. 29, 93). Given the known sources and rates of adult mortality due to predation, it is reasonable to assume that predation is a contributor to the high juvenile mortality rates as well (Crawford *et al.* 2004, p. 4).

Sage-grouse nests are subject to varying levels of predation. Predation can be total (all eggs destroyed) or partial (one or more eggs destroyed). However, hens abandon nests in either case (Coates, 2007, p. 26). Over a 3-year period in Oregon, 106 of 124 nests (84 percent) were preyed upon (Gregg *et al.* 1994, p. 164). Nest predation rates of 41 percent were reported in one study in Wyoming (Patterson 1952, p. 104), while another study reported a predation rate of 12 percent in Wyoming (Holloran and Anderson 2003, p. 309). Moynahan *et al.* (2007, p. 1777) attributed 131 of 258 (54 percent) of nest failures to predation in Montana. Re-nesting efforts may partially compensate for the loss of nests due to predation (Schroeder 1997, p. 938), but re-nesting rates for greater sage-grouse are highly variable (Connelly *et al.* 2011b, p. 63). Further, re-nesting rates are low in Gunnison sage-grouse (Young, 1994, p. 44; Childers, 2009, p. 7), indicating that re-nesting may not offset losses caused by predation. Loss of breeding hens and young chicks to predation can influence overall greater and Gunnison sage-grouse population numbers, as these two groups contribute most significantly to population productivity (GSRSC, 2005, p. 29, Baxter *et al.* 2008, p. 185; Connelly *et al,* 2011, pp. 64–65).

Nesting success of greater sage-grouse is positively correlated with the presence of big sagebrush and grass and forb cover (Connelly *et al.* 2000, p. 971). Females actively select nest sites with these qualities (Schroeder and Baydack 2001, p. 25; Hagen *et al.* 2007, p. 46). Nest predation appears to be related to the amount of herbaceous cover surrounding the nest (Gregg *et al.* 1994, p. 164; Braun 1995, pp. 1–2; DeLong *et al.* 1995, p. 90; Braun 1998; Coggins 1998, p. 30; Connelly *et al.* 2000b, p. 975; Schroeder and Baydack 2001, p. 25; Coates and Delehanty 2008, p. 636). Therefore, loss of nesting cover from any source (e.g., grazing, fire) has the potential to reduce nest success and adult hen survival. Also, habitat alteration that reduces cover for young chicks can increase their rate of predation (Schroeder and Baydack 2001, p. 27). Conversely, Coates (2007, p. 149) found that badger predation was facilitated by nest cover as it attracts small mammals, a badger's primary prey.

In a review of published nesting studies, Connelly *et al.* (2011, pp. 63–64) reported that nesting success was greater in unaltered habitats versus habitats affected by anthropogenic activities. Where habitat has been altered, it has been shown that the associated influx of predators can decrease annual recruitment of greater sage-grouse (Gregg *et al.* 1994, p. 164; DeLong *et al.* 1995, p. 91; Coates 2007, p. 2;), and the same cause-effect relationship has been speculated in other cases as well (Schroeder and Baydack 2001, p. 28; Braun 1995, pp. 1–2; Braun 1998; Hagen 2011, pp. 97–98). Agricultural development, landscape fragmentation, and human populations can increase predation pressure on all life stages of greater sage-grouse by forcing birds to nest in less suitable or marginal habitats, increasing travel time through altered habitats where they are vulnerable to predation, and increasing the diversity and density of predators (see further discussion below) (Ritchie *et al.* 1994, p. 125; Schroeder and Baydack 2001, p. 25; Connelly *et al.* 2004, p. 7-23; and Summers *et al.* 2004, p. 523; GSRSC 2005, p.135).

We believe the above information for greater sage-grouse is also applicable to Gunnison sage-grouse since overall behavior and life-history traits are similar between the two species (Young 1994, p. 4).

In the Strawberry Valley of Utah, a high density of red fox contributed to historically low survival rates of female (30 percent) and male (29.7 percent) greater sage-grouse. The authors speculated that the high density of red foxes were attracted to the area by Strawberry Reservoir and associated anthropogenic activities (Bambrough *et al.* 2000, p. 1). The red fox population has apparently increased within the Gunnison Basin (BLM, 2009, p. 37), and the species was only recently observed in habitat within the Monticello, Utah, population area (UDWR 2011, p. 4). In addition to wild predators, domestic species including dogs *(Canis domesticus)* and cats *(Felis domesticus)* have been introduced by ranches, farms, and housing developments into greater sage-grouse habitats (Connelly *et al.* 2004, p. 12-2).

Raven abundance has increased as much as 1,500 percent in some areas of western North America since the 1960s (Coates 2007, p. 5). Breeding bird survey trends from 1966 to 2007 indicate increases throughout Colorado and Utah (USGS, 2009, pp. 1–2). The presence of ravens was negatively associated with greater sage-grouse nest and brood success in western Wyoming (Bui 2009, p. 27). It was suggested that raven numbers have increased in the Piñon Mesa population, though data have not been collected to verify this (CDOW 2009b, p. 110). Raven numbers in the Monticello population area remain high (UDWR 2011, p. 4).

Local attraction of ravens to nesting hens may be facilitated by loss and fragmentation of native shrublands, which increases the exposure of nests to predators (Aldridge and Boyce 2007, p. 522; Bui 2009, p. 32; Howe *et al.* 2014, p. 41-44). Human-made structures in the environment increase the effect of raven predation, particularly in low canopy cover areas, by providing ravens with perches (Braun 1998, pp. 145–146; Coates 2007, p. 155; Bui 2009, p. 2; Howe *et al.* 2014, p. 41-44) (also see discussion under Factor A above). Reduction in patch size and diversity of sagebrush habitat, as well as the construction of fences, powerlines, and other infrastructure, also are likely to encourage the presence of the common raven (Coates *et al.* 2008, p. 426; Bui 2009, p. 4; Howe *et al.* 2014, p. 44). For example, raven counts have increased by approximately 200 percent along the Falcon-Gondor transmission line corridor in Nevada (Atamian *et al.* 2007, p. 2). Ravens contributed to lek disturbance events in the areas surrounding the transmission line (Atamian *et al.* 2007, p. 2), but as a cause of decline in surrounding sage-grouse population numbers, this could not be separated from other potential impacts, such as West Nile virus. Holloran (2005, p. 58) attributed increased sage-grouse nest predation to high corvid abundance, which resulted from anthropogenic food and perching subsidies in areas of natural gas development in western Wyoming. Bui (2009, p. 31) also found that ravens used road networks associated with oil fields in the same Wyoming location for foraging activities. Holmes (2009, pp. 2–4) also found that common raven abundance increased in association with oil and gas development in southwestern Wyoming.

Raven abundance was strongly associated with sage-grouse nest failure in northeastern Nevada, with resultant negative effects on sage-grouse reproduction (Coates 2007, p. 130). The presence of high numbers of predators within a sage-grouse nesting area may negatively affect sage-grouse productivity without causing direct mortality. Increased raven abundance was associated with a reduction in the time spent off the nest by female sage-grouse, thereby potentially compromising their ability to secure sufficient nutrition to complete the incubation period (Coates 2007, pp. 85–98). Another model utilized known raven nest locations and found a 31 percent decrease in the odds of nesting by ravens for every 1-km increase in distance from a transmission line (Howe *et al.* 2014), indicating that the presence of transmission lines may increase the presence of and risk of predation by ravens in sage-grouse habitat.

As more suitable grouse habitat is converted to exurban development, agriculture, or other non-sagebrush habitat types, grouse nesting and brood-rearing become increasingly spatially restricted (Bui 2009, p. 32). Future human population growth and associated development and infrastructure will likely further restrict nesting habitat within the species' range. Additionally, Gunnison sage-grouse have been shown to avoid residential development and infrastructure in some areas, resulting in functional habitat loss (Aldridge *et al.* 2012, p. 402). Of 99 nest sites studied in the western portion of the Gunnison Basin population, 69 (approximately 70 percent) occurred within 13 percent of the available habitat (Aldridge *et al.* 2012, p. 400). Unnaturally high nest densities, which result from habitat fragmentation or disturbance associated with the presence of edges, fencerows, or trails, may increase predation rates by making foraging easier for predators (Holloran 2005, p. C37). Increased nest density could negatively influence the probability of a successful hatch (Holloran and Anderson, 2005, p. 748).

The influence of the human footprint in sagebrush ecosystems may be underestimated (Leu and Hanser 2011, pp. 270–271) since it is uncertain how much more habitat sage-grouse (a large landscape-scale species) need for persistence in increasingly fragmented landscapes (Connelly *et al.* 2011a, pp. 80–82). Therefore, the influence of ravens and other predators associated with human activities may be underestimated. In addition, nest predation may be higher, more variable, and have a greater impact on the small, fragmented Gunnison sage-grouse populations, particularly the six smallest populations (GSRSC 2005, p. 134).

Except for the few studies presented here, data that link Gunnison sage-grouse population numbers and predator abundance are limited. Still, in at least the six smaller populations, the best available information suggests that predation may be limiting Gunnison sage-grouse survival and persistence. The lack of recruitment in the San Miguel population may be associated with predation (CDOW 2009b, p. 31; Davis 2012, p. 162). In this area, six of 12 observed nests were destroyed by predation. None of the chicks from the remaining successful nests survived beyond two weeks. Those observations are in contrast to the Gunnison Basin where approximately 20 percent of radio-marked chicks survived their first year during that period. Further, trends in lek count and other data indicate there has been no recruitment of young into the San Miguel population since around 2005. The CPW suspects these trends are most likely due to predation (CDOW 2009b, p. 30-31; Davis 2012, pp. 37, 79). The other five satellite populations are smaller than the San Miguel population; therefore, it is reasonable to expect that predation may be limiting those populations as well.

Actions to Address Predation

Due to low population numbers and the potential impact of predation, a predator control program initiated by CPW occurred between March 2011 and June 2012 in the Miramonte subpopulation area of the San Miguel population to evaluate the effects of predator removal on Gunnison sage-grouse juvenile recruitment in the subpopulation (CPW 2012b, pp. 8-10). Over the two-year period, the United States Department of Agriculture Animal and Plant Health Inspection Service removed 155 coyotes, 101 corvids, two bobcats, eight badgers, two raccoons, and three red foxes. Radio-marked hens, nest success, and chick survival were monitored during this time, and results were compared to baseline data collected for the same area from 2007 to 2010. Prior to predator control, of eight marked chicks, no individuals survived to 3 months. From 2011 through August of 2012, during which predator control occurred, of 10 marked chicks, four (40 percent) chicks survived to three months, and two (20 percent) survived at least one year. The study did not compare chick survival rates to non-predator removal areas, so it is unknown whether the apparent increase in chick survival was due to predator control or other environmental factors (e.g., weather, habitat conditions, etc.).

Predator removal efforts have sometimes shown short-term gains that may benefit fall populations, but not breeding population sizes (Cote and Sutherland 1997, p. 402; Hagen 2011, pp. 98–99; Leu and Hanser 2011, p. 270). Predator removal may have greater benefits in areas with low habitat quality, but predator numbers quickly rebound without continual control (Hagen 2011, p. 99). Red fox removal in Utah appeared to increase adult greater sage-grouse survival and productivity, but the study did not compare these rates against other nonremoval areas, so inferences are limited (Hagen 2011, p. 98).

Coyote control efforts failed to have an effect on greater sage-grouse nesting success in southwestern Wyoming (Slater 2003, p. 133). However, coyotes may not be an important predator of sage-grouse. In a coyote prey base analysis, sage-grouse and bird egg shells made up a very small percentage (0.4–2.4 percent) of analyzed scat samples (Johnson and Hansen 1979, p. 954). Additionally, coyote removal can have unintended consequences resulting in the release of smaller predators, like the red fox, many of which may have more negative impacts on sage-grouse (Mezquida *et al.* 2006, p. 752).

Removal of ravens from an area in northeastern Nevada caused only short-term reductions in raven populations (less than 1 year), as apparently transient birds from neighboring sites repopulated the removal area (Coates 2007, p. 151). Additionally, badger predation appeared to partially compensate for decreases due to raven removal (Coates 2007, p. 152). In their review of literature regarding predation, Connelly *et al.*

(2004, p. 10-1) noted that only two of nine studies examining survival and nest success indicated that predation had limited a sage-grouse population by decreasing nest success, and both studies indicated low nest success due to predation was ultimately related to poor nesting habitat. It has been suggested that removal of anthropogenic “subsidies” (e.g., landfills, tall structures) may be an important step to reducing the presence of sage-grouse predators (Bui 2009, pp. 36–37). Leu and Hanser (2011, p. 270) also argue that reducing the effects of predation on sage-grouse can only be effectively addressed by precluding these features.

In 1999, property was transferred from the BLM to Gunnison County for the purposes of the Gunnison County Landfill. This conveyance required implementation of a mitigation plan for potential impacts to Gunnison sage-grouse, including establishment of a mitigation fund known as the Gunnison Sage-grouse Conservation Trust. To date, over $250,000 has been allocated from the trust fund for Gunnison sage-grouse projects in occupied habitat in Gunnison County. Projects include, but are not limited to, habitat improvements, conservation easements, road closures, and outreach and education (Gunnison County 2013a, pp. 147-150). Gunnison County has actively controlled ravens at the Gunnison County Landfill since 2003. Between 200 and 250 ravens are removed annually within the landfill boundaries. Further efforts to control ravens in the Gunnison Basin are under consideration by the county and the Gunnison Basin Sage-grouse Strategic Committee (Gunnison County 2013a, p. 132). The effects of these control efforts on Gunnison sage-grouse survival have not been studied.

Gunnison County and CPW have jointly funded an ongoing study (Magee 2013, pers. comm.) of the distribution and abundance of ravens and crows (corvids), which may help inform managers of the potential influence of these species in the Gunnison Basin. Of twelve survey sites in the Gunnison Basin, the site most used by ravens was the Gunnison County Landfill. Preliminary distribution and abundance data indicate that a large number of ravens are utilizing the landfill as their primary food source (Magee 2013, pers. comm.). Additional information from surveys during spring and early summer of 2014 may provide information on raven use of sagebrush habitats during the sage-grouse breeding and nesting season when Gunnison sage-grouse are more vulnerable to predation. Evaluating raven predation on Gunnison sage-grouse was not an objective of this study. However, preliminary data on raven abundance, spatial and temporal distribution, and movements suggest that ravens are not preying on Gunnison sage-grouse as primary food source in the Gunnison Basin. Planned spring and early summer surveys may indicate otherwise, but the results of these surveys were not available at the time of drafting of this final rule.

Summary of Predation

Due to the extent of human influence and alteration of habitat across its range, Gunnison sage-grouse may be increasingly subject to levels and impacts of predation that would not normally occur in the historically contiguous, intact sagebrush habitats, or in larger, more resilient populations. Gunnison sage-grouse are adapted to minimize predation through cryptic plumage and behavior, however predation is strongly influenced by anthropogenic factors on the landscape, and human presence on the landscape will continue to increase. The impacts of predation on greater sage-grouse can increase where habitat quality has been compromised by anthropogenic activities (exurban development, road development, powerlines, etc.) (e.g., Coates 2007, pp. 154, 155; Bui 2009, p. 16; Hagen 2011, p. 100; Howe *et al.* 2014, p. 41-44). Landscape fragmentation and habitat decline associated with human populations have the potential to increase predator populations through increasing the ease of securing prey and subsidizing food sources and nest or den substrate for predators. Consequently, otherwise suitable habitat may change into a habitat sink (habitat in which reproduction is insufficient to balance mortality) for grouse populations (Aldridge and Boyce 2007, p. 517).

Anthropogenic influences on sagebrush habitats that increase suitability for ravens may also limit sage-grouse populations (Bui 2009, p. 32). Current land-use practices in the Intermountain West favor high predator (in particular, raven) abundance relative to historical numbers (Coates *et al.* 2008, p. 426). The interaction between changes in habitat and predation may have substantial effects to sage-grouse at the landscape level (Coates 2007, pp. 3–5; Howe *et al.* 2014, p. 41-44).

Research and data linking predation to Gunnison sage-grouse abundance and viability are limited. However, the studies presented above suggest that, particularly in areas of intensive habitat alteration and fragmentation and in smaller less resilient populations, sage-grouse productivity and, potentially, population viability could be negatively affected by predation. Since the Gunnison and greater sage-grouse have similar behavior and life-history traits, it is reasonable to assume that predator impacts on Gunnison sage-grouse are similar to those documented in greater sage-grouse. As more habitats are altered or lost due to human development, including dispersed development, we expect predators to spread and increase in numbers into the future, thereby increasing the risk of predation. Ongoing effects from predation are likely greater in the smaller satellite populations, and will likely increase if these populations continue declining in abundance. Therefore, the best available information indicates that, as we stated in our proposed rule, predation is a current and future threat to the species, particularly in the satellite populations. While predation likely acts as a threat in localized areas across the range of the species, the stability of the Gunnison Basin population over the last 19 years indicates that predation is not having a significant impact on that population. We believe, however, that the effects of predation are more pronounced in the satellite populations. Given the stability of the Gunnison Basin population, we do not believe that the magnitude of this threat is significant at the rangewide level.

Summary of Factor C

We have reviewed the available information on the effects of disease and predation on the long-term persistence of the Gunnison sage-grouse. The only disease that is known to be a threat to the survival of the Gunnison sage-grouse is West Nile virus. This virus is distributed throughout most of the species' range. However, despite its near 100 percent lethality, disease occurrence is sporadic in other taxa across the species' range and has not yet been detected in Gunnison sage-grouse. While we have no evidence of West Nile virus acting on Gunnison sage-grouse individuals or populations, because of its presence within the species' range, its lethality to sage-grouse, and the continued development of anthropogenic water sources in the area that support mosquito vector populations, the virus is a future threat to the species. We anticipate that West Nile virus will persist within the range of Gunnison sage-grouse indefinitely and that the threat it presents will be exacerbated by any factor (e.g., drought, climate change) that increases ambient temperatures and the presence of the vector on the landscape.

The best available information shows that existing and future habitat decline, and fragmentation in particular, will increase the effects of predation on this species, particularly in the six smaller populations, resulting in a reduction in sage-grouse productivity and abundance in the future.

We evaluated the best available scientific information regarding disease and predation and their effects on the Gunnison sage-grouse. Based on the information available, we have determined that predation and disease are threats to the species throughout its range at the present time and are likely to increase in the future. In particular, West Nile virus poses a substantial threat to Gunnison sage-grouse rangewide in the foreseeable future.

D. The Inadequacy of Existing Regulatory Mechanisms.

Under this factor, we examine whether threats to the Gunnison sage-grouse are adequately addressed by existing regulatory mechanisms. Existing regulatory mechanisms that can provide some protection for Gunnison sage-grouse include: (1) local land use laws, regulations and ordinances; (2) State laws and regulations; and (3) Federal laws and regulations. Regulatory mechanisms, if they exist, may preclude the need for listing if such mechanisms adequately address the threat to the species such that listing is not warranted. Conversely, threats to a species may be exacerbated when not addressed at all by existing regulatory mechanisms, or if the existing mechanisms are not adequately implemented or enforced.

Multiple partners, including private citizens, nongovernmental organizations, Tribes, Counties, States, and Federal agencies, are engaged in conservation efforts across the range of Gunnison sage-grouse. Conservation efforts by these parties that are voluntary or are not enforceable, however, including conservation strategies and guidance, are typically not regulatory mechanisms. Non-regulatory conservation efforts that address habitat related issues, such as the Rangewide Conservation Plan, the Colorado CCAA and the Gunnison Basin CCA, are described and evaluated under Factor A, and other non-regulatory conservation efforts are described and assessed under relevant threat sections. In this section, pursuant to Factor D, we review and evaluate only regulatory mechanisms undertaken by local, State, and Federal entities designed to reduce or remove threats to Gunnison sage-grouse and its habitat.

Local Laws and Regulations

Approximately 43 percent of Gunnison sage-grouse rangewide occupied habitat is privately owned (Table 1), and local laws and regulations are most applicable in those areas. Local laws and regulations vary widely by county across Gunnison sage-grouse range. Below we first broadly address general county regulations that have the potential to affect Gunnison sage-grouse and its habitat and then move on to local laws and regulations that specifically address Gunnison sage-grouse.

Under state law, all county governments have general authority to regulate land use development in their jurisdictions through the implementation of comprehensive or master plans, zoning, and subdivision planning (Colo. Rev. Stat. § 30-28-101 *et seq.*; Utah 2011, entire), and to protect wildlife habitat through enforcement of wildlife-related regulations or requirements (Colo. Rev. Stat. § 24-65.1-104; Utah Code § 17-27a-403). Local laws and regulations enacted pursuant to this authority may benefit Gunnison sage-grouse depending on the regulations adopted in a particular county and the degree to which threats to Gunnison sage-grouse and its habitat are considered and addressed in these local regulations.

By statute, the State of Colorado grants Colorado counties broad authority for planning and regulation of land use and development in their respective jurisdictions (Colo. Rev. Stat. § 30–28–101 *et. seq.*). This law provides that whenever local land use regulations impose higher standards than other statutes, the provisions of the regulations made under local authority (i.e., county planning) shall apply (Colo. Rev. Stat. § 30–28–

123). Furthermore, Colorado law authorizes local governments to plan for and regulate land uses in order to protect significant wildlife habitat and species (Colo. Rev. Stat. § 30–29-104).

In our proposed rule, we reported that Colorado law exempts parcels of land that are 35 acres or larger from county land use regulations (78 FR 2523). This is only partially correct. Under Colorado law, a county does not have authority to regulate the subdivision of land that creates parcels that are each 35 acres or larger ("plus-35 acre parcels") (Colo. Rev. Stat. § 30–28–101(10)(b)). However, Colorado counties retain authority to regulate the actual use and development of plus-35 acre parcels (for example, home, road, or infrastructure development). All Colorado counties in the occupied range of Gunnison sage-grouse have land use regulations that apply to development of plus-35 acre parcels (Delta County 2013-R-025; Dolores County policy on subdivisions exemptions; Gunnison County 95-34; Mesa County 31; Montrose County 45-2012, 02-2013, 24-2013, 14-2006; Ouray County 2013-022; Saguache County 2013-LU-11; San Juan County Utah Statute Summary; San Miguel Article 1). Similarly, the State of Utah grants County governments, including San Juan County, which encompasses the Monticello population of Gunnison sage-grouse, authority to regulate and control property (i.e., zoning) and development (Utah 2011, entire).

County or city ordinances in San Juan County, Utah, that address agricultural lands, transportation, and zoning for various types of land uses have the potential to affect sage-grouse habitat, behavior, and abundance. Similarly, general, non-sage-grouse specific local land use codes and permitting requirements in the Colorado portion of the species' range can affect development in occupied habitat and thus have implications for the species and its habitat. We do not, however, have sufficient information about implementation of general local land use laws and regulations to determine what uses, if any, have been modified pursuant to these general authorities to avoid or lessen impacts to Gunnison sage-grouse. Therefore, we are unable to conclude that such general county land use codes and regulations within Gunnison sage-grouse occupied habitat constitute adequate regulatory mechanisms to reduce the threats to the species. (Local land use regulations specific to Gunnison sage-grouse are discussed individually and separately below.)

Many Colorado counties within Gunnison sage-grouse range have requirements for County review of development proposals, which may include generic "1041" wildlife habitat regulations, requiring review and/or coordination with CPW/UDWR for new subdivision and development requests in sensitive wildlife habitat (Delta County 2011-R-054. 2012-R-044, 2013-R-025; Delta County 2011-R-054; Dolores County land use regulations; Mesa County 7.6.4; Ouray County 6, 25, and site development permit; Saguache County Article XX). However, we do not have sufficient information to determine whether and how these general wildlife habitat regulations have been applied to Gunnison sage-grouse habitat, what recommendations may have been made by CPW/ UDWR regarding the avoidance of impacts to Gunnison sage-grouse under these non-sage-grouse specific regulations, and how or if the counties incorporated any such recommendations in their land use authorization. Therefore, we cannot conclude that the generic county requirements to consult with state wildlife agencies for actions that occur within sensitive wildlife habitat constitute adequate regulatory mechanisms to reduce the threats to the species. (Again, wildlife habitat regulations specific to Gunnison sage-grouse are discussed separately below.)

Several counties without specific land use regulations directed at Gunnison sage-grouse habitat conservation do have regulations that contain restrictions that may benefit the species. These measures may include control of dogs, seasonal road closures, or requirements for clustering housing units within subdivisions. Specifically, San Juan County, Utah, and Gunnison, San Miguel, Mesa, and Montrose Counties, Colorado include regulations to control dogs from roaming freely and Dolores, Gunnison, Mesa, San Juan, and San Miguel Counties have regulations that apply to road closures (CPW 2014g; Appendix A).

Counties within Gunnison sage-grouse range with regulations or policies that include conservation measures or considerations specifically targeted at Gunnison sage-grouse and its habitat include Dolores, Gunnison, Montrose, Ouray, and San Miguel Counties, Colorado (Dolores County 05-13-04; Gunnison County 2013a, pp. 33-57; Gunnison County 2013b, p. 11; Gunnison County 11-106 07-17 and 2013-23; Gunnison County 2014-24; Montrose County 2013, entire; Montrose County 39-2013; Ouray County 2013-022; San Miguel County land use code, 2-16, 5-407, 5-26; San Miguel County Wright’s Mesa Zone Districts), as described below. We anticipate that land use regulations designed specifically for Gunnison sage-grouse will typically be more effective in conserving the species and its habitat than the standard regulations described above that do not address the species specifically.

Gunnison County Sage-Grouse Regulations (Gunnison Basin Population)

The Gunnison Basin population is located in Gunnison and Saguache County, Colorado. Gunnison County has adopted specific regulations to further the conservation of the Gunnison sage-grouse and its habitat (Gunnison County Land Use Resolution (LUR) § 11.106 including amendments 07-17 and 2013-23). Approximately 79 percent of private lands in occupied habitat in the Gunnison Basin population is in Gunnison County, and is thereby subject to those regulations. The remaining 21 percent of private lands in the Gunnison Basin population is in Saguache County, which does not currently have similar species-specific regulations in place, although Saguache County is working to develop species-specific criteria (CPW 2014g, Attachment 3, Appendix A).

Gunnison County's Land Use Resolution (LUR) 11.106 was adopted in 1977 and broadly provides for the regulation of land uses in sensitive wildlife habitat areas. In 2007, Gunnison County Board of County Commissioners approved Resolution Number 07-17, which amended LUR 11.106, to create a review process and protective standards specific to Gunnison sage-grouse. In 2013, Gunnison County further amended LUR § 11.106 to incorporate use of the Gunnison Basin Sage Grouse Habitat Prioritization Tool, a GIS model developed by the Gunnison Basin Sage-grouse Strategic Committee in 2012 that first stratifies or values Gunnison sage-grouse habitat (largely based on distances to leks) and then discounts the value of the habitat based on soils, and on distance to developed areas including structures, roads, and power lines. This process stratifies occupied habitat in the Gunnison Basin into three types (Gunnison County 2013a, Appendix G; see detailed description under Local Laws and Regulations, Gunnison County). *Tier 1* habitat includes important seasonal habitats and is considered the highest value for the species; *Tier 2* habitat includes the remainder of occupied habitat in the Gunnison Basin that is closer to structures, roads, and power lines, and is generally of lower value to the species. Occupied habitat that does not stratify into Tier 1 or Tier 2 is not considered Gunnison sage-grouse habitat under Gunnison County's sage-grouse regulations. CPW telemetry data from 2004 to 2010 for approximately 500 collared Gunnison sage-grouse in the Gunnison Basin showed that, of 10,140 radio locations in Saguache and Gunnison County, approximately 79.63 percent (8,074) and 15.65 percent (1,587) points occurred in Tier 1 habitat and Tier 2 habitats, respectively (including all occupied habitat in the Gunnison Basin regardless of ownership) (Gunnison County 2013b, p. 25; Gunnison County 2013d, p. 1). This indicates a preference for modeled Tier 1 habitats by the Gunnison Basin birds and supports the model's reliability.

As amended, Gunnison County LUR § 11.106 requires the County to review applications for land use change permits, building permits, individual sewage disposal system permits, Gunnison County access permits, and Gunnison County Reclamation permits (Gunnison County Public Works Department 2014a, 2014b; subject to some exceptions) specifically for potential impacts to Gunnison sage-grouse and occupied habitat. If the activity to be permitted is located wholly or partially in Gunnison sage-grouse habitat identified pursuant to the Habitat Prioritization Tool, then the County performs a site-specific analysis and works with the applicant to ensure that the project meets the County's sage-grouse specific and other wildlife protective standards for such development (LUR § 11.106.G – 11.106.J). In general, these standards direct that covered land use activities and projects be designed to avoid, minimize, and/or mitigate impacts on the species and its habitat. According to Gunnison County, standard avoidance and minimization measures included in permits subject to LUR § 11.106 include restrictions on pets and animals and on the siting and timing of construction, adjustment of building envelopes, and other recommendations (Gunnison County 2013a, pp. 24-31). Mitigation techniques as defined and used by Gunnison County include visual and sound buffers, limitation of human activities during sensitive time periods, and controls on the location of development. Gunnison County's use of the term "mitigation" thus differs from the Service's definition of this term, which is the full suite of activities to avoid, minimize, and compensate for adverse impacts to sage-grouse and sage-grouse habitat.

From July 2006 through September 2014, Gunnison County reviewed 461 projects under § 11.106 for impacts to Gunnison sage-grouse. Gunnison County reports that, to date, the majority of development projects have been located within existing areas of development, including outbuildings or additions to buildings. According to the County seventy-one (15.4 percent) of the projects reviewed involved development within 1 km (0.6 mi) of a lek (CPW 2014g, Attachment 3, p. 27). Implementation of the County regulations likely reduced impacts from these projects, but did not fully compensate for disturbance or lost habitat.

Pursuant to Gunnison County Resolution No. 95-34, adopted on June 6, 1995, "individual parcels of land greater than 35 acres in size are subject to the same county review and regulatory processes as individual parcels less than 35 acres in size except, as is generally provided in current state statute, for the act of subdividing such parcels into resultant parcels all of which are 35 acres or greater in size" (Gunnison County 2013a, pp. 34-35). As a result, development on parcels that are 35 acres or larger requires one or more of the County permits identified above and are subject to review and regulation under LUR § 11.106.

Gunnison County reports that five separate developments involving 35-acre or greater parcels ("plus-35 acre") have occurred in the County since 2003. This included a total of about 2,700 acres divided into 75 parcels, with portions occurring in occupied habitat for Gunnison sage-grouse. Two of the five projects were reviewed by Gunnison County under LUR § 11.106 for Gunnison sage-grouse concerns and included permit conditions to avoid and minimize potential impacts from their development. The County reports that the other three projects did not occur in Gunnison sage-grouse habitats. The Ohio Creek area, which has experienced the greatest concentration of plus-35 acre development in the county since lek counts were standardized in 1996, has had increasing numbers of Gunnison sage-grouse since that time (based on increased high male counts at the Ohio Creek lek) (Gunnison County 2013a, pp. 35-37).

Recently, Gunnison County has started requiring monetary compensation for reclamation of habitats disturbed in Tier 1 and Tier 2 Gunnison sage-grouse habitat (Gunnison County Public Works Department 2014a, 2014b; subject to some exceptions). This is a recently enacted regulation for which we have little more information that what is presented here. Additional regulatory measures implemented by Gunnison County in coordination with State and Federal agencies include: closing of shed antler collection in the Gunnison Basin by the Colorado Wildlife Commission due to its disturbance of Gunnison sage-grouse during the early breeding season, and a BLM/USFS/Gunnison County/CPW collective effort to implement and enforce road closures during the early breeding season (March 15 to May 15) (see Roads for more details). These regulatory efforts have provided a benefit to Gunnison sage-grouse during the breeding period.

We commend Gunnison County for the regulatory measures (and other actions it has taken, as described in the Factor A discussion above and elsewhere in this final rule), to conserve Gunnison sage-grouse and its habitat. The County regulations have helped to reduce some of the negative effects of human development and infrastructure on the species and its habitat. However, Gunnison County's current Gunnison sage-grouse related regulations do not prevent human development in Gunnison sage-grouse habitat nor do they prevent additional habitat loss and fragmentation that occurs as a result. Further, they do not address or require offsetting or mitigation for the habitat loss and fragmentation that cannot be avoided and that occurs as a result of permitted development in the species' habitat. Gunnison County's sage-grouse regulations have not, therefore, sufficiently or adequately reduced this threat, which is the primary concern related to human development (see Factor A, Residential Development).

San Miguel County Gunnison Sage-Grouse Regulations (San Miguel population)

In 2005, San Miguel County amended its Land Use Codes to require consideration and implementation, to the extent possible, of conservation measures recommended in the 2005 RCP (GSRSC 2005, entire) for the Gunnison sage-grouse when considering land use activities and development located within its habitat (San Miguel County 2005). More specifically, under its Land Use Code, the County has specific requirements that apply when there is a request for a special use permit (such as for oil and gas facilities or wind turbines) in occupied habitat. Special use permits are not, however, typically required for residential development projects, which limits the County's involvement in review of projects adversely affecting Gunnison sage-grouse and their habitat. In addition, when the County receives an application for a special use permit for activities in sage-grouse habitat, it only solicits recommended conservation measures from the CPW and a local Gunnison sage-grouse working group, and does not require implementation of the recommended conservation measures. As a result, implementation of recommended conservation measures is dependent on negotiations between the County and the applicant.

Some positive measures (e.g., locating a special use activity outside grouse habitat, establishing a 324-ha (800-ac) conservation easement; implementing speed limits to reduce likelihood of bird/vehicle collisions) have been implemented as a result of this process. Most measures that result from discussions with applicants, however, result in measures that may minimize, but do not prevent, or mitigate for impacts (Henderson 2010, pers. comm.). In addition, as noted above, residential development proposals typically do not require a special use permit so are not subject to this review and negotiation process. San Miguel County also has regulations relating to the Wrights Mesa Zone Districts that restrict fence building, sagebrush removal, powerlines, housing, and roads within 0.6 miles of a lek (San Miguel County 2010, entire). In addition, San Miguel County hired a Gunnison Sage-grouse Coordinator for the San Miguel Basin population in March 2006 to implement the regulatory process.

The San Miguel County Land Use Codes provide some conservation benefit to the species by encouraging landowners to voluntarily minimize impacts of residential development in grouse habitat where the County has authority to do so (with special use permits). The County's regulations do not prevent human disturbance in occupied habitat or address or require offsetting or mitigation for habitat loss and fragmentation resulting from such disturbance. As a result, we find that San Miguel County's regulations do not adequately address the threat of habitat loss, degradation and fragmentation which is the primary concern related to human development (see Factor A, Residential Development).

<u>Dolores, Ouray, and Montrose County Sage-Grouse Regulations (San Miguel and Cerro Summit-Cimarron-Sims Mesa populations)</u>

Ouray County adopted a resolution (Resolution Number 2013-022) on May 28, 2013, directed at protecting Gunnison sage-grouse breeding and brood-rearing habitat from land use activities including construction and motor vehicle use. The resolution provides that seasonal restrictions (March 15 until May 15) be implemented for roads (not belonging to adjacent property owners or their guests) and appropriate terms and conditions be applied during this same time period at construction sites within 0.6 miles of a lek to minimize and avoid impacts on breeding and brood-rearing habitat (Ouray County 2013, entire). The restrictions do not specify what avoidance or minimization will occur with development permits in these areas.

On November 4, 2013, Montrose County adopted special regulations ("1041 regulations" 39-2013) that are intended to avoid and minimize impacts from land use activities on Gunnison sage-grouse and occupied habitat, similar to the approach adopted by Gunnison County. Building permits are required for construction within 0.6 miles of an active lek, and land use projects or permitting in occupied habitat will require conservation actions to avoid or minimize impacts on Gunnison sage-grouse (Montrose County 2013, entire).

On May 20, 2013 Dolores County clarified what planning and regulatory means are available for local efforts in preservation of Gunnison sage-grouse (Dolores County Resolution 05-13-04). The resolution highlights coordination with CPW (and other agencies) to review the impacts to wildlife from any change of use application submitted to the County. It also highlights regular coordination with both the BLM and the U.S. Forest Service.

While these three recently enacted county regulations likely provide some conservation benefits to the species, none of them provide the requisite certainty that they will be effective in ameliorating the threat human development poses to the species and its habitat. For example, the Ouray County regulations do not specify what terms or conditions will be required for construction in occupied habitat, and neither the Montrose nor Dolores County regulations specify how mitigation will occur where effects cannot be avoided. None of these county regulations prevent human development in occupied habitat and the additional habitat loss and fragmentation that occurs as a result, or address or require offsetting or mitigation of habitat loss for the species, which is the primary concern related to human development (see Factor A, Residential Development). As a result, none of these local land regulations eliminate or adequately reduce the impact of human development on Gunnison sage-grouse and their habitat.

Summary of Local Laws and Regulations

We commend the efforts that local governments have made to date (those regulations not yet completed are not included) to enact and strengthen local regulatory protections for Gunnison sage-grouse. Existing local laws and regulations are helping and will continue to help to reduce the negative effects of human development and infrastructure on the species. Continuation, enhancement, and expansion of these efforts across the species' range will likely be necessary for conservation of the species. Nevertheless, current local laws and regulations do not fully address the full scope of threats to the species (Factors A through C and E), including habitat loss due to residential and human development (see Residential Development). The permanent loss, and associated fragmentation and degradation, of sagebrush habitat are considered the greatest threat to Gunnison sage-grouse (GSRSC 2005, p. 2). Residential development is likely contributing to habitat loss and degradation throughout the range of Gunnison sage-grouse. Future development, especially in areas of important seasonal habitats, is a concern throughout the range, including in the Gunnison Basin, where we believe that the level of impact from residential development will increase in the future (Factor A). For the reasons described above, existing local regulations and laws do not fully address this threat. Likewise, existing local regulations and laws do not address other substantial threats to the species, including small population size and structure (Factor E), drought (Factor E); or disease (Factor C).

State Laws and Regulations

Colorado and Utah State laws and regulations may influence Gunnison sage-grouse conservation by providing specific authority for sage-grouse conservation over lands that are directly owned by the States. As described in more detail below, the States also have broad authority to regulate and protect wildlife on all lands within their borders, and State laws provide mechanisms for indirect conservation through regulation of threats to the species (e.g., noxious weeds). In the previous section, we described the authorities granted by Colorado and Utah to local and county governments in regulating land use development within their respective jurisdictions to conserve wildlife, including the Gunnison sage-grouse.

Colorado Revised Statutes (C.R.S.) section 33–1–104 gives the CPW Board responsibility for the management and conservation of wildlife resources within State borders. The CPW, which operates under the direction of the CPW Board, is required by statute to provide counties with information on “significant wildlife habitat,” and provide technical assistance in establishing guidelines for designating and administering such areas, if asked (C.R.S. § 24–65.1–302). The CPW Board also has authority to regulate possession of the Gunnison sage-grouse, set hunting seasons, and issue citations for poaching (C.R.S § 33–1–106). These authorities, as implemented by the CPW Board, provide individual Gunnison sage-grouse with protection from direct mortality from hunting, as described below.

The Wildlife Resources Code of Utah (Utah Code Annotated Title 23) provides UDWR with the powers, duties, rights, and responsibilities to protect, propagate, manage, conserve, and distribute wildlife throughout the State (Utah Code Ann. § 23-14-1). Section 23–13–3 of the Code declares that wildlife existing within the State, not held by private ownership and legally acquired, is property of the State. Section 23–14–18 authorizes the Utah Wildlife Board to prescribe rules and regulations for the taking and/or possession of protected wildlife, including Gunnison sage-grouse. These authorities provide adequate protection to individual Gunnison sage-grouse from direct mortality from hunting, as described below.

Gunnison sage-grouse are managed by CPW and UDWR on all lands within each State as resident native game birds. In both States this classification allows the direct human taking of the bird during hunting seasons authorized and conducted under State laws and regulations. In 2000, CPW closed the hunting season for Gunnison sage-grouse in the Gunnison Basin, the only area then open to hunting for the species. The hunting season for Gunnison sage-grouse in Utah has been closed since 1989 according to GSRSC (2005, p. 82), or as early as the mid-1970's according to SJCWG (2000, p. 11). The Gunnison sage-grouse is listed as a species of special concern in Colorado, as a sensitive species in Utah, and as a Tier I species under the Utah Wildlife Action Plan, providing heightened priority for management (CDOW 2009b, p. 40; UDWR 2009, p. 9). Hunting and other State regulations that deal with issues such as harassment provide adequate protection for individual birds (see discussion under Factor B), but do not protect the habitat or address other substantial threats such as drought, climate change, or disease.

In 2009, the Colorado Oil and Gas Conservation Commission (COGCC), which is the entity responsible for permitting oil and gas well development in Colorado, adopted new rules addressing the impact of oil and gas development on wildlife resources (COGCC as amended 2014, entire). These COGCC rules require that permittees and operators on all lands within the state of Colorado determine whether their proposed development location overlaps with "sensitive wildlife habitat," or is within a restricted surface occupancy (RSO) area. If it does, the COGCC rules require that the Commission consult with CPW, the operator and the surface owner to allow it to determine whether conditions of approval are necessary to "minimize adverse impacts" from the proposed oil and gas operations in the identified sensitive wildlife habitat or RSO area (COGCC 2014). For purposes of this rule, "minimize adverse impacts" means, "wherever reasonably practicable, to (i) avoid adverse impacts from oil and gas operations on wildlife resources, (ii) minimize the extent and severity of those impacts that cannot be avoided, (iii) mitigate the effects of unavoidable remaining impacts, and (iv) take into consideration cost-effectiveness and technical feasibility with regard to actions taken and decisions made to minimize adverse impacts to wildlife resources, consistent with the other provisions of the Act." (*Id.*) Consultation with CPW is not required under certain circumstances, however, such as when the Director of the COGCC issues a variance, a previously CPW-approved wildlife mitigation plan exists, and others (COGCC 2014).

All oil and gas operations in sensitive wildlife habitat or RSO areas authorized since implementation of the regulations in 2009 are also required to comply with specified general operating requirements, including (1) educating employees and contractors on conservation practices, (2) consolidating new facilities to minimize disturbance, (3) controlling road access and limiting traffic, where approved by the surface owner and appropriate authorities, and (4) monitoring wells remotely when possible (COGCC 2014). The COGCC Director may waive these requirements, however (COGCC 2014). With respect to RSO areas, operators are also required to avoid these areas in planning and conducting new oil and gas operations "to the maximum extent technically and economically feasible," again subject to various exceptions (COGCC 2014).

The 2009 COGCC rules identified certain areas as “sensitive wildlife habitat” and RSO areas for Gunnison sage-grouse (COGCC 2009). In September 2013, COGCC amended its rules to, among other things, update and expand the definitions and maps of sensitive wildlife habitat and RSO areas for Gunnison sage-grouse (COGCC 2013). The COGCC rules as amended define sensitive wildlife habitat for the Gunnison sage-grouse lek based on 4 mile buffers around lek sites and RSO areas for the species as areas within 0.6 miles of a lek (COGCC 2014; COGCC 2013).

We find that while COGCC’s rules provide for greater consideration of Gunnison sage-grouse needs, the rules only apply to oil and gas development, and they do not adequately address the threats to Gunnison sage-grouse. Oil and gas operations that were approved before the COGCC’s 2009 adoption of the wildlife protection rules are not subject to Rule 1202’s wildlife consultation and conditions of approval requirements, for example, even if operations have not yet begun (COGCC 2014). The limitations on new oil and gas development operations in RSO areas also do not apply to applications that were approved before May 1, 2009 on federal land or April 1, 2009 on all other land (COGCC 2014). Unless operations change in a manner that requires additional COGCC authorization, drilling operations that are already on the landscape may continue to operate without further restriction into the future. In addition, the COGCC regulations qualify implementation of many of its conservation measures to “wherever reasonably practicable” and like terms, which can limit the effectiveness of these measures in avoiding or minimizing impacts to the species. We also are not aware of any situations where RSOs have been effectively applied or where conservation measures have been implemented for potential oil and gas development impacts to Gunnison sage-grouse on private lands underlain with privately owned minerals.

Colorado and Utah have laws that directly address the priorities for use of State school section lands, which require that management of these properties be based on maximizing financial returns. We have no information on any conservation measures that will be implemented under statutes or regulations for Gunnison sage-grouse on State school section lands.

In 2007, the Colorado State Land Board (SLB) purchased the Miramonte Meadows property (approximately 809 ha (2,300 ac) next to the Dan Noble State Wildlife Area (SWA)). Roughly 526 ha (1,300 ac) of this property is considered prime Gunnison sage-grouse habitat (Garner 2010, pers. comm.). Discussions with the SLB have indicated a willingness to implement habitat improvements (juniper removal) on the property. They have also accepted an application to designate the tract as a "Stewardship Trust" parcel. The Stewardship Trust program is capped at 119,383 to 121,406 ha (295,000 to 300,000 ac), and no more property can be added until another tract is removed from the program. Because of this cap, it is unknown if or when the designation of the tract as a Stewardship Trust parcel may occur. The scattered nature of State school sections (generally single sections of land) across the landscape and the requirement to conduct activities to maximize financial returns minimize the likelihood of implementation of measures that will benefit Gunnison sage-grouse. Thus, no regulatory mechanisms are present on State trust lands to minimize habitat decline and thus help ensure conservation of the species. However, State school section lands account for only 1 percent of occupied habitat in Colorado and 1 percent in Utah, so impacts from development and relevant laws or regulation pertaining to State lands may be negligible in terms of effects on Gunnison sage-grouse.

Some States require landowners to control noxious weeds, which are a potential habitat threat to sage-grouse (as discussed in Factor A, Invasive Plants). The types of plants considered to be noxious weeds vary by State. Cheatgrass, which is a particular threat to sage-grouse, is listed as a Class C species in Colorado (Colorado Department of Agriculture 2010, p. 3). The Class C designation delegates to local governments the choice of whether or not to implement activities for the control of cheatgrass. Gunnison, Saguache, and Hinsdale Counties target cheatgrass with herbicide applications (GWWC 2009, pp. 2–3). The CPW annually sprays for weeds on SWAs (CDOW 2009b, p. 106). The State of Utah, however, does not consider cheatgrass as noxious within the State (Utah Department of Agriculture 2010a, p. 1) nor in San Juan County, Utah (Utah Department of Agriculture 2010b, p. 1). The laws dealing with other noxious and invasive weeds may provide some protection for sage-grouse in local areas by requiring some control of the invasive plants, although large-scale control of the most problematic invasive plants is not occurring. Rehabilitation and restoration techniques for sagebrush habitats are mostly unproven and experimental (Pyke 2011, p. 543). Neither Colorado nor Utah's regulatory mechanisms have been demonstrated to be effective in addressing the overall impacts of invasive plants on the decline of sagebrush habitat within the species' range.

Federal Laws and Regulations

Gunnison sage-grouse are not covered or managed under the provisions of the Migratory Bird Treaty Act (16 U.S.C. 703–712) because they are considered resident game species. Federal agencies are responsible for managing 54 percent of the total Gunnison sage-grouse habitat. The Federal agencies with the most sagebrush habitat are BLM, an agency of the Department of the Interior, and USFS, an agency of the Department of Agriculture. The NPS in the Department of the Interior also has responsibility for lands that contain Gunnison sage-grouse habitat.

<u>BLM</u>

About 42 percent of Gunnison sage-grouse occupied habitat is on BLM-administered land (see Table 1). The Federal Land Policy and Management Act of 1976 (FLPMA) (43 U.S.C. 1701 et seq.) is the primary Federal law governing most land uses on BLM-administered lands. Section 102(a)(8) of FLPMA specifically recognizes wildlife and fish resources as being among the uses for which these lands are to be managed. Regulations pursuant to FLPMA (30 U.S.C. 181 et seq.) and other statutory authorities that address wildlife habitat protection on BLM-administered land include 43 CFR 3162.3–1 and 43 CFR 3162.5–1 (oil and gas); 43 CFR 4120 et seq. (grazing); and 43 CFR 4180 et seq. (grazing).

Gunnison sage-grouse has been designated as a BLM Sensitive Species since they were first identified and described as a species in 2000 (BLM 2009a, p. 7). The management guidance afforded sensitive species under BLM Manual 6840–Special Status Species Management (BLM 2008, entire) states that “Bureau sensitive species will be managed consistent with species and habitat management objectives in land use and implementation plans to promote their conservation and to minimize the likelihood and need for listing” under the Act (BLM 2008, p. 05V). BLM Manual 6840 further requires that Resource Management Plans (RMPs) should address sensitive species, and that implementation “should consider all site-specific methods and procedures needed to bring species and their habitats to the condition under which management under the Bureau sensitive species policies would no longer be necessary” (BLM 2008, p. 2A1). As a designated sensitive species under BLM Manual 6840, sage-grouse conservation must be addressed in the development and implementation of RMPs on BLM lands.

RMPs are the basis for all actions and authorizations involving BLM-administered lands and resources. They establish allowable resource uses, resource condition goals and objectives to be attained, program constraints and general management practices needed to attain the goals and objectives, general implementation sequences, and intervals and standards for monitoring and evaluating the plan to determine its effectiveness and the need for amendment or revision (43 CFR 1601 et seq.).

The RMPs also provide a framework and programmatic guidance for activity plans, which are site-specific plans written to implement decisions made in an RMP. Examples include Allotment Management Plans that address livestock grazing, oil and gas field development, travel management (motorized and mechanized road and trail use), and wildlife habitat management. Activity plan decisions normally require additional planning and National Environmental Policy Act (NEPA) analysis. If an RMP contains specific direction regarding Gunnison sage-grouse habitat, conservation, or management, the specific direction for the species is an enforceable regulatory mechanism to ensure that the species and its habitats are considered during permitting and other decision making for activities that occur on BLM lands.

The BLM in Colorado manages Gunnison sage-grouse habitat under six existing RMPs. These include the Gunnison Field Office (1993), Uncompahgre Field Office (1989), Gunnison Gorge National Conservation Area (NCA) (2004), Tres Rios Field Office (1985), Grand Junction Field Office (1987), and San Luis Valley Field Office (1991) RMPs. A new RMP for the BLM Dominguez-Escalante NCA, designated in 2009 and encompassing Gunnison sage-grouse habitat in the vicinity of the Piñon Mesa population, is also under development.

In Utah, Gunnison sage-grouse habitat falls under the Monticello Field Office (2008) and Moab Field Office (2008) RMPs. All six of the existing Colorado RMPs contain broad objectives for Gunnison sage-grouse conservation, but lack specific land use allocation decisions, stipulations, and enforceable measures to achieve those objectives. Three of these RMPs were under revision as of the drafting of this rule, including the Tres Rios, Grand Junction, and Uncompahgre Field Offices, covering all or portions of the San Miguel, Piñon Mesa, Crawford, Cerro Summit-Cimarron-Sims Mesa, and Dove Creek populations.

All ongoing RMP revisions include in their range of alternatives or preferred alternative various stipulations and measures, such as spatial buffers, seasonal limitations, and other site-specific restrictions and best management practices, for land use activities in important Gunnison sage-grouse habitat (leks, nesting habitat, brood-rearing habitat, winter habitat). Many of these recommendations are derived or adapted from the RCP (GSRSC 2005, entire) or local Gunnison sage-grouse working group plans (see Multi-County and Rangewide Efforts in Factor A above) and should provide conservation benefits to the species and its habitat, if adopted into Final RMP Plan Revisions and Records of Decision (BLM 2009a, p.6).

In May of 2014, BLM Headquarters issued guidance and direction to BLM Colorado and Utah to undertake a landscape-level, targeted RMP Amendment for the conservation of Gunnison sage-grouse on BLM-administered public lands in Colorado and Utah (BLM 2014a). This process is expected to be completed within 18-24 months, and will evaluate the adequacy of all current RMPs, including those which may be revised during the current plan amendment review process. It is unknown what conservation measures will be included in the planned RMP Amendments or in the three BLM Colorado RMPs that are currently under revision rangewide.

All existing Colorado BLM RMPs date from 1985 to 1993 and, as described above, contain broad objectives for Gunnison sage-grouse conservation, but generally lack specific land use allocation decisions, stipulations, and enforceable measures to ensure that those objectives are achieved. This may be attributed, in part, to the broader view and approach in land use planning and resource decisions typical of older RMPs.

More recent (i.e., 2000 and later) RMPs or revisions typically contain more detailed and resource-specific decisions and protections than their predecessors. The Gunnison Gorge NCA RMP (BLM 2004) contains management decisions adequate to conserve Gunnison sage-grouse and its habitat in the Crawford population. This RMP designates an ACEC in habitat occupied by Gunnison sage-grouse where management and protection of the Gunnison sage-grouse and its habitat will be emphasized. Within this area, the plan contains specific protections to maintain or increase Gunnison sage-grouse numbers and its distribution, improve the quality of sage-grouse habitat, and to prevent, minimize and mitigate fragmentation and loss of habitat. The RMP adopts and incorporates the Gunnison sage-grouse conservation plan, Crawford Area, Colorado (Crawford Area Gunnison Sage-Grouse Working Group 2011), as part of the direction and management objectives of the ACEC.

Current BLM RMPs in Utah and Colorado do provide limited regulatory protection for Gunnison sage-grouse as they are implemented through project-level planning. These protections include conservation measures to be implemented during travel management (the management of the motorized and non-motorized use of public lands), energy development, and grazing permit renewals.

The 2008 Final RMP for the BLM Monticello Field Office in Utah incorporates the recommendations of the 2005 RCP, which provides a level of benefit for Gunnison sage-grouse. For example, this RMP precludes oil and gas development, roads, power lines, fences, and other aboveground structures within 0.6 mile of a Gunnison sage-grouse lek. It also prohibits grazing in allotments containing Gunnison sage-grouse during the breeding season, It does not, however, specifically limit oil and gas development and the construction of other infrastructure in Gunnison sage-grouse habitat beyond 0.6 mile, which includes nesting, brood rearing, and wintering habitat.

In general, other than the Gunnison Gorge NCA RMP, the remaining RMPs provide only partial protection for Gunnison sage-grouse in terms of land use allocation decisions specific to the species and its habitat and, therefore, are considered inadequate to protect the species

In addition to land use planning through its RMPs, BLM uses Instruction Memoranda (IM) to provide instruction to district and field offices regarding specific resource issues. Instruction Memoranda provide policy guidance or directives, but do not contain binding legal decisions such as those promulgated under an RMP. IMs are temporary directives, generally of short duration (1 to 2 years), intended to address urgent resource concerns by providing interim direction to staff until a threat passes or until the resource issue can be addressed through revisions or updates to manuals or RMPs.

BLM has issued a number of IMs addressing Gunnison sage-grouse. On July 12, 2005 BLM Colorado issued IM Number CO–2005–038, stating BLM's intent and commitment to assist with and participate in the implementation of the 2005 RCP. This guidance has been used for BLM-administered lands in the State of Colorado to provide conservation benefit for Gunnison sage-grouse (BLM 2009a, p. 6). On August 17, 2010, BLM Colorado issued IM number CO-2010-028 on Gunnison sage-grouse and greater sage-grouse habitat management policy, which provides direction regarding implementation of National BLM sage-grouse guidance, ensures continued coordination with CPW and other agency partners regarding sage-grouse conservation planning, and calls for fluid mineral leasing deferrals in core Greater sage-grouse habitats until Field Office plan revisions have been completed (BLM 2010b, entire).

On July 15, 2013, BLM Colorado issued IM Number CO-2013-033 to provide policy guidance to Colorado Field Offices on Gunnison sage-grouse habitat management, land uses, and resource management planning (BLM 2013d, p. 1). This IM updated and superseded the 2010 IM, Number CO-2010-028. The 2013 IM was developed in coordination with the Service and provided direction regarding management and ongoing land use planning in Gunnison sage-grouse occupied habitat, including the application of specific conservation measures for the species (BLM 2013d, p. 2).

On May 30, 2014, BLM HQ issued a new IM, 2014-100, which applies to all Gunnison sage-grouse proposed occupied critical habitat in both Colorado and Utah (BLM 2014b entire). In order to protect important habitat across the range of the species, BLM will continue to apply conservation measures and focus any type of development in non-habitat areas. All disturbances will be focused outside of a 4-mile buffer around leks, except where there are valid existing rights or where benefits to Gunnison sage-grouse may be greater than under other alternatives (BLM 2014b, p.1). The Policy identifies conservation measures for activities including Land Use Planning, Proper Livestock Grazing, Wildland Fire and Fuels Management, Processing Fluid Mineral Leases and Solid Mineral Leases (BOM 2014b pp. 2-5). This IM is expected to remain in effect until the RMP Amendment process is complete in 2016. While this IM is of short duration, we anticipate that its implementation will reduce threats to the Gunnison sage-grouse on BLM lands from the covered activities.

Fluid Minerals

The BLM has regulatory authority for oil and gas leasing on Federal lands and on private lands with a severed Federal mineral estate, as provided at 43 CFR 3100 et seq., and they are authorized to require stipulations as a condition of issuing a lease. The BLM's Land Use Planning Handbook describes program-specific guidance for fluid minerals (which include oil and gas) and the handbook specifies that RMP decisions will identify restrictions on areas subject to leasing, including closures, as well as lease stipulations (BLM 2005e, Appendix C, pp.23-24). The handbook also specifies that all stipulations must have waiver, exception, or modification criteria documented in the plan, and notes that the least restrictive constraint to meet the resource protection objective should be used (BLM 2005e, Appendix C, pp. 23-24).

To our knowledge, BLM Field Offices are deferring the sale of new drilling leases, which was first implemented in the 2010 IM, in habitats they have identified as “priority” or “core” habitats for Gunnison sage-grouse until RMP revisions are complete and/or adequate protective lease stipulations are in place. However, there is currently no regulatory mechanism in effect which assures that future lease sales in occupied habitat on BLM administered lands will not occur or that operations on federal leases are conducted in a manner consistent with protection of the Gunnison sage-grouse.

In addition, oil and gas leases already exist in 17 percent of the Piñon Mesa population area, and 49 percent of the San Miguel Basin population. For existing oil and gas leases on BLM land in occupied Gunnison sage-grouse habitat, oil and gas companies may conduct drilling operations subject to BLM-imposed permit conditions. Specifically, the BLM has regulatory authority to condition “Application for Permit to Drill” authorizations that are conducted under a lease that does not contain specific Gunnison sage-grouse conservation stipulations, consistent with lease rights, but utilization of these conditions is discretionary and we are uncertain at this time how widely such authority has or will be applied to avoid or minimize impacts to Gunnison sage-grouse.

We also note that onshore federal oil and gas leases include a provision (also known as a standard lease term) that allows movement of the drilling area or facilities by 200m (650ft) to avoid sensitive resources (43 CFR 3101.1(c)). However, in most cases this small amount of movement would have little to no conservation benefit to Gunnison sage-grouse because sage-grouse respond to nonrenewable energy development at much further distances (Holloran *et al.* 2007, p. 12; Walker *et al.* 2007, p. 10). Pursuant to its permitting authority as described above, our experience is that many of the BLM field offices work with the operators to move a proposed drilling site farther from sensitive resources and justify such a move through a site-specific NEPA process.

Given the already small and fragmented nature of the populations where future oil and gas leases are likely to occur, additional development within occupied habitat would negatively impact those populations by contributing to further habitat decline. Since we have no information on what minimization and mitigation measures might be applied to future leases at this time, we cannot assess the conservation benefit of potential BLM regulations to those populations.

Salable and Locatable Minerals

As discussed under Factor A (Locatable and Salable Mineral Development), currently active mines and mining claims are limited in geographic scope and mining is expected to have limited impacts on Gunnison sage-grouse populations. As a result, we found current locatable and salable mineral development to be a threat of low magnitude to Gunnison sage-grouse. We have no information indicating that any regulatory mechanisms currently exist to reduce impacts of mines.

Grazing

As stated previously, Gunnison sage-grouse are a BLM Sensitive Species and therefore receive Special Status Species management considerations. The BLM regulatory authority for grazing management is provided at 43 CFR part 4100 (Regulations on Grazing Administration Exclusive of Alaska). Livestock grazing permits and leases contain terms and conditions determined by BLM to be appropriate to achieve management and resource condition objectives on the public lands and other lands administered by BLM, and to ensure that habitats are, or are making significant progress toward being, restored or maintained for BLM special status species (43 CFR 4180.1(d)). BLM's State or regional standards for grazing administration must address habitat for endangered, threatened, proposed, candidate, or special status species, and habitat quality for native plant and animal populations and communities (43 CFR 4180.2(d)(4) and (5)). BLM's guidelines for ensuring that grazing standards are met similarly must address restoring, maintaining, or enhancing habitats of BLM special status species to promote their conservation, as well as maintaining or promoting the physical and biological conditions to sustain native populations and communities (43 CFR 4180.2(e)(9) and (10)); BLM 2009b, p. 8). The BLM is required to take appropriate action no later than the start of the next grazing year upon determining that existing grazing practices or levels of grazing use are significant factors in failing to achieve the standards and conform with the guidelines (43 CFR 4180.2(c)).

The BLM is required to consult with their Resource Advisory Councils (RACs) to expand the rangeland health standards required under 43 CFR part 4180 so that there are public land health standards relevant to all ecosystems, not just rangelands, and that these standards apply to all BLM programs and actions across public lands, not just livestock grazing (BLM Land Health Manual 4180 (BLM 2009b, p. 8)). Both southwest Colorado and southeast Utah have RACs established by the BLM.

A detailed analysis of grazing on BLM-administered lands and its impacts on the Gunnison sage-grouse is included above in Factor A. As of 2012, all active BLM grazing permits in occupied Gunnison sage-grouse habitat managed by the BLM Gunnison Field Office have vegetation structure guidelines specific to Gunnison sage-grouse incorporated into Allotment Management Plans or Records of Decision for permit renewals as habitat objectives (BLM 2012a, pp. 3-4). These Gunnison sage-grouse habitat objectives are designed to provide good habitat for the species. Similar objectives are also incorporated into Allotment Management Plans in portions of some of the smaller population areas (see section, Public Lands Grazing in other Population Areas under Factor A). However, as noted earlier (see Domestic Grazing and Wild Ungulate Herbivory under Factor A), available information suggests that LHA objectives important to Gunnison sage-grouse are not being met across parts of the species' range. Reduced habitat quality in those areas, as reflected in unmet LHA objectives, may be negatively impacting Gunnison sage-grouse. However, the relationship between LHA determinations and the effects of domestic livestock grazing on Gunnison sage-grouse is difficult to quantify.

Specific Gunnison sage-grouse habitat objectives from the 2005 RCP are incorporated into some Federal grazing permits and are an effective means of ensuring that the needs of Gunnison sage-grouse are met on grazed lands. Certain grazing permits also contain standard terms and conditions, such as forage utilization standards, that may indirectly help achieve habitat objectives for Gunnison sage-grouse. However, terms and conditions applied within BLM's existing livestock grazing permits and leases are currently inadequate in parts of the range of Gunnison sage-grouse. As discussed under Factor A (Summary of Domestic Grazing and Wild Ungulate Herbivory), the best available information suggests that Land Health Assessment objectives important to Gunnison sage-grouse are not being met across localized parts of the species' range and that livestock grazing is likely contributing to those conditions in some instances. Reduced habitat quality in those areas, as reflected in LHA data, is likely negatively impacting Gunnison sage-grouse in some of the populations. While it is anticipated that future terms and conditions in BLM grazing permits will minimize further grazing impacts to habitat on BLM-administered lands, it is currently unknown what terms and conditions might be incorporated into grazing permits and how such terms and conditions may improve degraded habitats for Gunnison sage-grouse.

USFS

The USFS manages 10 percent of the occupied Gunnison sage-grouse habitat (Table 1). Management of National Forest System lands is guided principally by the National Forest Management Act (NFMA) (16 U.S.C. 1600–1614, August 17, 1974, as amended). The NFMA specifies that all National Forests must have a Land and Resource Management Plan (LRMP) (16 U.S.C. 1600) to guide and set standards for all natural resource management activities on each National Forest or National Grassland. The NFMA requires USFS to incorporate standards and guidelines into LRMPs (16 U.S.C. 1600), which include provisions to manage plant and animal communities for diversity, based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives.

The Gunnison sage-grouse is a USFS sensitive species in both Region 2 (Colorado) and Region 4 (Utah). USFS policy provides direction to USFS Forests to analyze potential impacts of programs and activities to endangered, threatened, proposed, or sensitive species in a biological evaluation. The National Forests within the range of sage-grouse provide important seasonal habitats for the species, particularly the Grand Mesa, Uncompahgre, and Gunnison (collectively known as GMUG) National Forests. The 1991 Amended Land and Resource Management Plan for the GMUG National Forests has not incorporated Gunnison sage-grouse conservation measures or habitat objectives. Similarly, the 1996 the Forest Plan for the Rio Grande National Forest does not contain Gunnison sage-grouse specific conservation measures. The newer 2013 Forest Plan for the San Juan National Forest does contain measures to protect Gunnison sage-grouse, although there is very little Gunnison sage-grouse habitat on this national forest. The Regional Forester signed the 2005 RCP, agreeing to follow and implement the recommendations in the plan. Nonetheless, only three of the 34 grazing allotments in occupied grouse habitat on National Forest lands have incorporated Gunnison sage-grouse habitat objectives from the RCP, indicating that USFS regulations and the USFS agreement to implement the RCP are currently inadequate to protect the species.

The only Gunnison sage-grouse population within USFS lands that is in an area of high or even medium potential for oil and gas reserves is the San Miguel Basin, and USFS lands only make up 1.4 percent of that population (GSRSC 2005, D–8). Although the 2014 BLM IM does not specifically apply to USFS lands, USFS considers the IM in evaluating leasing decisions. The BLM, which regulates oil and gas leases on USFS lands, has the authority to defer leases and would make a leasing decision consistent with their 2014 IM in coordination with USFS (McDonald 2014, pers. com).

While USFS consideration of Gunnison sage-grouse as a sensitive species and commitment to follow the recommendations contained in the 2005 RCP (GSRSC 2005, entire) can provide some conservation benefits to the species, both of these actions are primarily voluntary in nature and thus are not treated as regulatory mechanisms in our evaluation process. Considering the above information, the USFS has implemented some regulatory mechanisms and policies to provide for the long-term conservation of Gunnison sage-grouse and is a signatory to the CCA for the Gunnison Basin (see Factors A and E). However, we find that USFS regulations are not fully addressing the conservation of Gunnison sage-grouse because the GMUG and Rio Grande National

Forests, which cover the vast majority of Gunnison sage-grouse habitats on national forest lands, are governed by older Forest Plans that do not contain detailed conservation standards for this species.

<u>NPS</u>

The NPS manages 2 percent of occupied Gunnison sage-grouse habitat (Table 1), which means that there is little opportunity for the agency to affect range-wide conservation of the species. The NPS Organic Act (16 U.S.C. § 1) states that NPS will administer areas under their jurisdiction "by such means and measures as conform to the fundamental purpose of said parks, monuments, and reservations, which purpose is to conserve the scenery and the natural and historical objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." Lands in the Black Canyon of the Gunnison National Park and the Curecanti National Recreation Area include portions of occupied habitat in the Crawford and Gunnison Basin populations and are managed under NPS's General Management Plan for these Park units (NPS 1997, entire). Under this plan, resource objectives related to Gunnison sage-grouse include protection of the species and its habitat, protection of threatened and endangered species, and minimization of the causes and impacts of habitat fragmentation (NPS 1997, pp. 18-19). In addition, the NPS has nearly completed an area Resource Stewardship Strategy, a plan that identifies more specific conservation measures and actions, including an emphasis on Gunnison sage-grouse conservation, for implementation of the General Management Plan (Stahlnecker 2014, pers. comm.). In the meantime, NPS's ability to actively manage for

Gunnison sage-grouse is not limited by the scope of their management plans, as discussed below.

The NPS completed a Fire Management Plan in 2006 that covers both of the areas mentioned above (NPS 2006, entire). Both prescribed fire and fire use (allowing wildfires to burn) are identified as a suitable use in Gunnison sage-grouse habitat. However, Gunnison sage-grouse habitat is identified as a Category C area, meaning that, while fire is a desirable component of the ecosystem, ecological constraints must be observed. For Gunnison sage-grouse, constraints in the plan include limitation of acreage burned per year and limitation of percent of project polygons burned. Moreover, the NPS is currently following the fire-related conservation measures in the local conservation plans as described in Multi-County and Rangewide Conservation Efforts above under Factor A, and the 2005 RCP fire recommendations (Stahlnecker 2010, pers. comm.). In most cases, implementation of NPS fire management policies should result in minimal adverse effects since emphasis is placed on activities that will minimize impacts to Gunnison sage-grouse habitat. Overall, implementation of NPS plans should reduce impacts to Gunnison sage-grouse because they include conservation measures to protect Gunnison sage-grouse habitat.

Recreational activities are generally managed more intensively on NPS land than on other Federal lands. Nevertheless, recreational activities within occupied habitat on NPS land may have adverse effects on Gunnison sage-grouse individuals (see Factor E discussion). However, given the limited amount of occupied habitat on NPS land (2 percent of the Gunnison Basin population area), recreation on those lands is likely having negligible impacts on Gunnison sage-grouse at the population or species level.

Grazing management activities on NPS lands are governed by BLM regulations, and their implementation and the results of these regulations are likely similar to those discussed for the BLM, because they occur under the same management criteria and guidance. In 2013, all of the active allotments in the Crawford population, including NPS allotments, had incorporated Gunnison sage-grouse habitat objectives and completed LHAs (see Grazing section in Factor A). Grazing management plans on NPS lands appear to be provide conservation measures for the species. Overall, NPS regulations reduce threats to Gunnison sage-grouse on the 2 percent of occupied habitat in the Gunnison Basin population under NPS jurisdiction. However, they do not significantly reduce threats on a rangewide basis.

Environmental Protection Agency

On December 15, 2009, the EPA published in the **Federal Register** (74 FR 66496) a rule titled, "Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the Clean Air Act." In this rule, the EPA Administrator found that the current and projected concentrations of the six long-lived and directly emitted greenhouse gases—carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride—in the atmosphere threaten the public health and welfare of current and future generations; and that the combined emissions of these greenhouse gases from new motor vehicles and new motor vehicle engines contribute to the greenhouse gas pollution that threatens public health and welfare. In effect, the EPA has concluded that the greenhouse gases linked to climate change are pollutants, whose emissions can now be subject to the Clean Air Act (42 U.S.C. 7401 et seq.; see 74 FR 66496, December 15, 2009). On October 15, 2012, EPA and the National Highway Transportation Safety Administration (NHTSA) issued a joint Final Rulemaking to extend the National Program of harmonized greenhouse gas and fuel economy standards to model year 2017 through 2025 passenger vehicles (77 FR 62624). On June 17, 2013, EPA and NHTSA implemented standards for medium- and heavy-duty vehicles (model years 2014 through 2018) (78 FR 36370). These regulations are relatively new, and at present, we have no basis to conclude that implementation of the Clean Air Act in the near future (40 years, based on global climate projections) will substantially reduce the current rate of global climate change through regulation of greenhouse gas emissions. Thus, we conclude that while the Clean Air Act may reduce greenhouse gas emissions, it does not address the primary threats to the Gunnison sage-grouse, such as drought, nonnatives, fire frequency, and decrease of sagebrush.

Other Regulatory Mechanisms: Conservation Easements

Conservation easements are voluntary legal agreements between a landowner and a land trust, nongovernmental organization, or government agency that permanently limit or restrict land uses for identified conservation values and purposes and are binding regulatory mechanisms once established. With very few exceptions, conservation easements require that individual parcels be owned and conveyed as single units in perpetuity, thereby ensuring they are not subdivided for development in the future. Conservation easements also restrict land uses by defining specific areas for residential or agricultural development, including roads and driveways, and may include other parameters for land management practices to achieve conservation values (Lohr and Gray 2013, p. 2). Therefore, we generally consider conservation easements to be an effective regulatory tool to prevent long-term or permanent habitat loss. Conservation easements across Gunnison sage-grouse range are held by nongovernmental organizations and land trusts (The Nature Conservancy, Colorado Cattlemen's Agricultural Land Trust, and others), state agencies (CPW, UDWR), and Federal agencies (Natural Resources Conservation Service (NRCS), NPS, and BLM). Some conservation easements include conservation measures specific to Gunnison sage-grouse, while many are directed at other species, such as big game (GSRSC 2005, pp. 59–103).

Following is a summary of the estimated amount of lands under conservation easement for occupied and unoccupied Gunnison sage-grouse habitat in Colorado and Utah, based on Lohr and Gray (2013, entire) (Table 12). This report also included lands not under conservation easement, but which are owned by entities that manage the property for Gunnison sage-grouse and other conservation values (e.g., The Nature Conservancy properties), or which carry covenants that restrict subdivision and development in perpetuity (e.g., Eagle Ridge Ranch in the Gunnison Basin). Rangewide, approximately 35,195 ha (86,968 ac), or 22.6 percent, of private lands in occupied Gunnison sage-grouse habitat were under conservation easement as of 2013 (Lohr and

Gray 2013, entire). Another 51,040 ac, or 11 percent, of private lands in mapped unoccupied habitat are also under conservation easement (Lohr and Gray 2013, entire). Combined, conservation easements include approximately 138,008 ac, or 16 percent, of all occupied and unoccupied habitat on private land (840,346 ac) across the species' range.

Of all the Gunnison sage-grouse populations, the Gunnison Basin contains the most acres under conservation easement (102,986 ac total in occupied and unoccupied habitat). In proportion to total occupied habitat, conservation easements in the Piñon Mesa and Crawford population areas are significant (74 and 41 percent, respectively). Approximately 30 percent of private land in unoccupied habitat is also protected under conservation easement in the Gunnison Basin and Crawford population areas (Table 12).

Table 12. Conservation easements in Gunnison sage-grouse occupied[a] and unoccupied[a] habitats (Lohr and Gray 2013, entire; Gunnison County 2013b, p. 21).

Population	Private Land in Occupied Habitat (ac)	Private Land in Occupied Habitat Under CE		Private Land in Unoccupied Habitat (ac)	Private Land in Unoccupied Habitat Under CE	
		Acres	% of total		Acres	% of total
Monticello-Dove Creek	100,702	6,117	5%	200,318	0	0%
Piñon Mesa	27,283	20,076	74%	64,275	20,246	31%
San Miguel Basin	49,492	6,938	14%	45,843	1,486	3%
Cerro Summit-Cimarron-Sims Mesa	28,218	3,995	14%	20,117	3,774	19%
Crawford	8,481	3,470	41%	44,552	8,665	20%
Gunnison Basin	178,531	46,372	26%	56,614	16,348	29%
Poncha Pass	4,792	0	0%	11,128	521	5%
Rangewide Totals	397,499	86,968	22%	442,847	51,040	12%

[a]Occupied and unoccupied habitat acres and conservation easements provided in Lohr and Gray (2013) were based on the Service's proposed critical habitat designation for Gunnison sage-grouse (78 FR 2540, January 11, 2013).

In the context of potential threats to Gunnison sage-grouse, conservation easements and the protections they afford are most relevant to the threat of residential and human development. Therefore, in the Residential Development section of this rule (Factor A), we further analyzed existing conservation easements by Gunnison sage-grouse population and across the species' range. Therein, Table 6 summarizes conservation easement acres in occupied habitat for each Gunnison sage-grouse population, and also provides estimates for those portions of occupied habitat not under conservation easement, for the purposes of evaluating the threat of residential development.

Total conservation easements recorded to date cover about 18.3 percent of private lands in rangewide occupied habitat for Gunnison sage-grouse. The Service has analyzed the conservation and regulatory benefit of existing conservation easements throughout the range of the species. However, conservation easements are offered and held by numerous entities and happen opportunistically with willing sellers across the range of the species.

Summary of Factor D

Gunnison sage-grouse conservation has been addressed in some local, State, and Federal, laws, regulations, and land management plans. We commend Gunnison, San Miguel, Ouray, and Montrose Counties for enacting special regulations for Gunnison sage-grouse for land uses within their jurisdictions. Existing local laws and regulations will help to reduce some of the negative effects of human development and infrastructure on Gunnison sage-grouse. Continuation and enhancement of these efforts across the species' range will be necessary for conservation of the species. Past residential and exurban development throughout the species range is a primary cause of habitat decline. Future human development will further contribute to habitat loss (see Factor A, Residential Development, Roads, and Powerlines). As described above, existing local laws and regulations do not fully address this threat to the species. Local regulatory mechanisms also do not fully address other substantial threats to the species, including small population size (Factor E), invasive plants (Factor A), disease (Factor B), and climate change (Factor A).

Implementation of Federal agency regulations specifically for Gunnison sage-grouse conservation provides obvious benefits to the species, considering that approximately 54 percent of rangewide occupied habitat occurs on Federal lands (Table 1). Protections afforded to Gunnison sage-grouse vary by agency and field office or unit, but many of these protections are discretionary or undertaken on a voluntary basis rather than required by a regulatory mechanism. BLM's land use management plans are regulatory mechanisms, but for the most part do not currently include requirements directed at sage-grouse conservation. This will likely change in the future, as a result of the ongoing revision process for some RMPs in the species' range and the planned rangewide RMP Amendment to address sage-grouse threats. Nonetheless, we do not know at this time what conservation measures will be included in these future RMPs or the degree to which they may address threats to the species. As a result, we do not consider or rely on these future planning efforts in this rule. BLM's 2014 IM for

Gunnison sage-grouse in Colorado provides a more consistent foundation for the management and conservation of the species on BLM land in Colorado, but it is a temporary measure and is not a binding regulatory mechanism. Based on this analysis, and our more detailed evaluation of BLM and other possible Federal regulatory mechanisms, we find that existing Federal laws and regulations are not fully addressing the full scope of threats to the species (Factors A through C, and E).

The CPW, UDWR, and other entities have acquired and continue to pursue conservation easements in Colorado and Utah, respectively, to conserve Gunnison sage-grouse habitat and meet the species' needs. We determined that perpetual conservation easements offer protection from habitat loss, but that conservation values and objectives for those properties vary according to the terms of the easement. Existing conservation easements provide a level of protection from future development on these lands, but are limited in geographic scope such that they do not adequately address the threat of habitat loss across the species' range. State wildlife regulations provide protection for individual Gunnison sage-grouse from direct mortality due to hunting but do not address habitat loss and other threats such as drought, climate change, or disease. While the COGCC regulations discussed above provide some protection and mitigation (as defined by COGCC, not the Service) for loss of Gunnison sage-grouse habitat, they do not prevent ongoing habitat loss and fragmentation (Factor A).

We evaluated the best available information related to existing regulatory mechanisms that address threats (Factors A through C, and E) to Gunnison sage-grouse and its habitats. Based on our analysis, we find that some existing regulatory mechanisms are in place to conserve Gunnison sage-grouse, but individually or collectively they do not fully address the substantial threats faced by Gunnison sage-grouse across their range. Further, while these existing regulatory mechanisms may help reduce current threats to the species, they are insufficient to fully reduce or eliminate the increase in threats that may act on the species in the future.

E. Other Natural or Manmade Factors Affecting Its Continued Existence.

Other factors potentially affecting the Gunnison sage-grouse's continued existence include small population size and structure; drought, recreational activities, pesticides and herbicides, and contaminants.

Small Population Size and Structure

Negative effects on population viability, such as reduced reproductive success or loss of genetic variation and diversity, become more evident as populations decline or become more isolated. In this section, we evaluate the issue of small and declining population size and structure in Gunnison sage-grouse, and associated genetic risks and other effects. We also evaluate existing population viability analyses for the species. Finally, we synthesize this information to assess resiliency, redundancy, and representation of the individual Gunnison sage-grouse populations and the species as a whole.

Relevant Species Information

In general, while various natural factors would not limit sage-grouse populations across large geographic scales under historical conditions or in larger populations, they may contribute to local population declines or extirpations when populations are small, isolated, or when weather patterns, habitats, or mortality rates are altered. When coupled with mortality stressors related to human activity and significant fluctuations in annual population size, long-term persistence of small populations (in general) is unlikely (Traill *et al.* 2010, entire). Sage-grouse have low reproductive rates and high annual survival rates (Schroeder *et al.* 1999, pp. 11, 14; Connelly *et al.* 2000a, pp. 969–970), resulting in a long recovery period from disturbances due to slower potential or intrinsic population growth rates than is typical of other game birds. Also, as a consequence of their site fidelity to seasonal habitats (Lyon and Anderson 2003, p. 489), measurable population effects may lag behind negative changes in habitat (Harju *et al.* 2010, entire; Wiens and Rotenberry 1985, p. 666).

As described in the Current Distribution and Population Estimates and Trends subsection in the Background section above, the Gunnison Basin is the largest population of Gunnison sage-grouse (3978 individuals in 2014) and, while showing variation over the period of record, has been relatively stable since 1996, based on lek count data (Figure 2). However, as discussed later in this section, demographic data indicate this population may not be quite as stable as suggested by lek count data (Davis 2012, p. 38). The Gunnison Basin population declined during the period 2005-2010, as shown by rates of growth estimated from demographic parameter estimates measured during that time period (Davis 2012, entire), and from lek count indices (CPW 2014e, entire). In addition to this, an integrated population model that used this short term demographic data in conjunction with the longer time series of lek count data estimated a rate of growth slightly less than 1.0 (lambda = 0.984) with confidence intervals that overlapped 1.0 (0.879-1.179) for the period 1996-2012 (Davis *et al. in press*). This 1996-2012 estimate was not statistically significantly different from a lambda of 1.0, suggesting the population is currently largely stable. The Gunnison Basin population comprises about 84 percent of the rangewide population of Gunnison sage-grouse and includes 63 percent of rangewide occupied habitat.

In contrast, the remaining six populations, also referred to in this final rule as satellite populations, were generally in decline from 1996 until 2010; however, increases in several populations have been observed recently (Figure 3) and could be a product of numerous factors including but not limited to population cycles, translocation efforts, and increased access to leks . The San Miguel and Piñon Mesa populations are currently the largest of the satellite populations, with 206 and 182 birds, respectively, in 2014. The Monticello-Dove Creek and Crawford populations currently have less than 160 birds. Population estimates in 2014 for the two smallest populations, Cerro Summit-Cimarron-Sims Mesa and Poncha Pass, were 74 and16, respectively (CPW 2014, p.6). The 16 radio-telemetered birds known at Poncha Pass in summer 2014 are the remainder of 27 birds translocated from Gunnison Basin in fall of 2013 and spring of 2014.

Based on lek count-based population estimates, some satellite populations have increased slightly over the last several years, or intermittently over time. However, the last 19 years (1996 to 2014) of lek count data as a whole indicate that the satellite populations are in decline, with the possible exception of the Cerro Summit-Cimarron-Sims Mesa population which appears to be relatively stable to increasing, and Piñon Mesa, which is at its highest over the 19 year period (Figure 3). However, some of the recent increases in population sizes may be attributable to translocation and survey efforts, rather than an actual increase in the population, which may be the case with Piñon Mesa. For example, the 2014 estimated population for Piñon Mesa was 182 birds (CPW 2014, p. 6), much greater than the 2012 estimate of 54 birds. This increase could be, in part, a product of the 93 birds translocated to Piñon Mesa population between the spring of 2010 and spring of 2013 (CPW 2014c, entire) and the discovery of two new leks in 2012 (CPW 2012a, pp. 2-3). For all six satellite populations, population estimates from 1996 to 2014 are below population targets (based on a 10-year average), as set forth by the RCP (CPW 2013, p. 11; GSRSC 2005, pp. 255-302) (see Current Distribution and Population Estimates and Trends in the Background section for more details). The RCP identified population targets as attainable population sizes sufficient to conserve Gunnison sage-grouse in those population areas (GSRSC 2005, p. 255). This constitutes the current and best available information on population targets for Gunnison sage-grouse.

Combined, the satellite populations comprise about 16 percent of the rangewide population of Gunnison sage-grouse and include approximately 37 percent of rangewide occupied habitat. Small population size and population structure occur in all of the six satellite populations, or across approximately 37 percent of occupied range for the species. The small sizes of the satellite populations of Gunnison sage-grouse make them particularly sensitive to stochastic and demographic fluctuations, and this vulnerability is exacerbated by other threats such as drought (GSRSC 2005, p. G-22). Small population size, declining population trends, and apparent isolation indicate long-term population persistence and evolutionary potential are compromised in the satellite populations (see Genetic Risks).

Genetic Risks

Small populations face three primary genetic risks: inbreeding depression; loss of genetic variation; and accumulation of new mutations. In general, these negative genetic consequences influence a species' fitness, or ability to reproduce and survive in the face of environmental pressures. Inbreeding can have individual and population level consequences by either increasing the phenotypic expression of recessive, deleterious alleles (the expression of harmful genes through the physical appearance) or by reducing the overall fitness of individuals in the population (GSRSC 2005, p. 109 and references therein).

Gunnison sage-grouse have low levels of genetic diversity, particularly in comparison to greater sage-grouse (Oyler-McCance *et al.* 2005, p. 635). There is no consensus regarding how large a population must be in order to prevent inbreeding depression. However, the San Miguel Basin satellite population has an effective population size (the number of individuals in a population that contribute their genes to the next generation) that is below the level at which inbreeding depression has been observed to occur (Stiver *et al.* 2008, p. 479). Since the remaining Gunnison sage-grouse satellite populations are smaller than the San Miguel population, they are likely small enough to induce inbreeding depression, and thus could be losing adaptive potential (Stiver *et al.* 2008, p. 479).

Population structure of Gunnison sage-grouse was investigated using mitochondrial DNA sequence (mtDNA, maternally-inherited DNA located in cellular organelles called mitochondria) and nuclear microsatellite data from six geographic areas (Crawford, Gunnison Basin, Curecanti area of the Gunnison Basin, Monticello-Dove Creek, Piñon Mesa, and San Miguel Basin) (Oyler-McCance *et al.* 2005, entire). The Cerro Summit-Cimarron-Sims Mesa population was not included in the analysis due to inadequate sample sizes. The Poncha Pass population also was not included as it is composed of individuals translocated from Gunnison Basin. Levels of genetic diversity were highest in the Gunnison Basin, which had more alleles and many but not all of the alleles present in other populations. All other populations had much lower levels of diversity. The lower diversity levels were thought to be the result of small population sizes and a high degree of geographic isolation (Oyler-McCance *et al.* 2005, entire).

Collectively, the smaller populations contained 24 percent of the genetic diversity of the species. Individually, each of the satellite populations may not be crucially important genetically to the survival of the species, but collectively it is reasonable to assume that 24 percent of the genetic diversity is important to the future rangewide survival and adaptability of the species. Some of the genetic makeup contained within the satellite populations (with the potential exception of the Poncha Pass population since it consists of birds from the Gunnison Basin) may be critical to maintaining adaptability in the face of issues such as climate change or other environmental change. All populations sampled were found to be genetically discrete units (Oyler-McCance *et al.* 2005, p. 635), so the loss of any of them would result in a decrease in genetic diversity of the species. In addition, having multiple populations across a broad geographic area (population redundancy) provides insurance against catastrophic events, such as prolonged drought, and the aggregate number of individuals across all populations increases the probability of demographic persistence and preservation of overall genetic diversity by providing an important genetic reservoir (GSRSC 2005, p. 179). The satellite populations are important to the long-term viability of Gunnison sage-grouse because they: (1) increase species abundance rangewide; (2) minimize the threat of catastrophic events to the species since the populations are widely distributed across the landscape; and (3) provide additional genetic diversity not found in the Gunnison Basin (GSRSC 2005, p. 199).

Habitat loss and decline can lead to range contraction and population extinction (see Factor A). As a species' range contracts and distances between populations increase, opportunities for gene flow are reduced. Historically, the Monticello-Dove Creek, San Miguel, Crawford, and Piñon Mesa populations were larger and were connected through more contiguous areas of sagebrush habitat. The loss and fragmentation of sagebrush habitat between the late 1950s and the early 1990s led to the current isolation of these populations, which is reflected in low amounts of gene flow and isolation by distance (Oyler-McCance *et al.* 2005, p. 635). However, Oyler-McCance *et al.* (2005, p. 636) noted that a few individuals in their analysis appeared to have the genetic characteristics of a population other than their own, suggesting they were dispersers from a different population. Two probable dispersers were individuals moving from the San Miguel Basin population into Monticello-Dove Creek and Crawford. The San Miguel population itself appeared to have a mixture of individuals with differing probabilities of belonging to different clusters. This information suggests that the San Miguel population may act as a conduit of gene flow among the satellite populations surrounding the larger Gunnison Basin population. Additionally, another potential disperser into Crawford was found from the Gunnison Basin (Oyler-McCance *et al.* 2005, p. 636). This result is not surprising given their close geographic proximity. The genetic makeup of the outlying Monticello-Dove Creek and Piñon Mesa populations were consistently distant from all other populations and from each other. This and other tests indicated that geographic distances (or separation) are correlated with the genetic distance between populations of Gunnison sage-grouse (Oyler-McCance *et al.* 2005, p. 635).

Movement of local (not translocated) birds between the Monticello and Dove Creek populations has not been documented. In 2011, five translocated and radio-collared hens released in Dove Creek during the spring were recorded in Utah during the breeding season (Messmer 2013, p. 4). These movements may not be representative of typical behavior of local birds, however, since translocated birds have been known to make erratic or irregular movements following translocation.

While we acknowledge there are likely benefits from translocating Gunnison sage-grouse from the Gunnison Basin to satellite populations (see Scientific Research and Related Conservation Efforts in Factor B), such efforts may have diluted the genetic makeup and potentially unique characteristics of some of the receiving populations (e.g., Piñon Mesa, which is thought to be more unique genetically). However, more research is needed to determine the success of translocations, what the effect is on genetic make-up within populations, and whether translocations should continue in all satellite populations.

In northwestern Colorado, dispersal of juvenile male greater sage-grouse had more influence on genetic diversity in populations than dispersal of females (Thompson 2012, p. 256). Based on observed bird dispersal, gene flow and connectivity in greater sage-grouse can likely be maintained for populations 5 to 10 km apart (most dispersals were less than 10 km) and possibly as far as 20 km (the maximum dispersal distance of birds studied) (Thompson 2012, p. 285-286). If genetic diversity and dispersal mechanisms operate similarly in Gunnison sage-grouse populations (typical dispersals less than 10 km), it is unlikely that gene flow and genetic diversity is currently being maintained due to the distance between these populations. The seven Gunnison sage-grouse populations are generally more than 10 km apart from each other (based on mapped occupied habitat), and most are 20 km apart or more (Figure 1).

Lowered hatching success is a well-documented indicator of inbreeding in wild bird populations. In one study, it was suggested that the low hatching success rates observed in Gunnison sage-grouse may have been due to inbreeding depression (Stiver *et al.* 2008, p. 479, and references therein). Other bird species that had undergone genetic bottlenecks have had similar hatchability rates. Independent of genetic pressures or differences in a given population, some eggs fail to hatch because they are infertile or simply do not develop fully. Based on a review of sage-grouse research in Colorado, an estimated 10 percent of eggs produced will likely fail to hatch, even in healthy populations (CPW 2013b, p. 12). However, we expect that hatch failure rates would likely increase above that level in smaller populations where inbreeding is more likely to occur.

Effective Population Size and Population Viability Analyses

Effective population size (Ne) is an important parameter in conservation biology. It is defined as the number of individuals contributing their genes to the next generation. In technical terms, effective population size is an idealized population size of breeding adults that would experience the same rate of (1) loss of heterozygosity (the amount and number of different genes within individuals in a population), (2) change in the average inbreeding coefficient (a calculation of the amount of breeding by closely related individuals), or (3) change in variance in allele (one member of a pair or series of genes occupying a specific position in a specific chromosome) frequency through genetic drift (the fluctuation in gene frequency occurring in an isolated population) as the actual population (Wright 1930, entire).

The effective size of a population is often much less than its actual size or number of individuals. As effective population size decreases, the rate of loss of allelic diversity via genetic drift increases. Two consequences of this loss of genetic diversity, reduced fitness through inbreeding depression and reduced response to sustained directional selection (‘‘adaptive potential’’), are thought to elevate extinction risk (Stiver *et al.*, 2008, p. 472 and references therein). While no consensus exists on the population size needed to retain a level of genetic diversity that maximizes evolutionary potential (i.e., the ability to adapt to local changes) for a given species, up to 5,000 greater sage-grouse may be necessary to maintain an effective population size of 500 birds (Aldridge and Brigham, 2003, p. 30). Other recent recommendations also suggest populations of at least 5,000 individuals to deal with evolutionary and demographic constraints (Traill *et al.* 2009, p. 3, and references therein). While the persistence of wild populations is usually influenced more by ecological rather than by genetic effects, once populations are reduced in size, genetic factors become increasingly important (Lande 1995, p. 318).

Population viability analysis (PVA) is a risk assessment tool used to predict the relative probability of extinction for a species, population, or various population sizes under different management scenarios to aid in decision-making for conservation and management. Fundamentally, population viability and persistence depends on a population’s growth rate (births and deaths) and the recruitment of individuals through immigration and emigration. PVA does not predict the real or absolute risk of extinction for a species or population, only their relative extinction risk under various scenarios, and thus should be interpreted and applied with caution. To date, three population viability analyses or studies have been conducted for Gunnison sage-grouse: (1) a PVA developed as part of the RCP in 2005 by Dr. Phil Miller through CPW (GSRSC 2005, Appendix G); (2) a PVA developed for the Service in 2005 by Dr. Edward Garton (Garton 2005, entire); and (3) a demographic study and PVA developed by Dr. Amy Davis at Colorado State University (Davis 2012, entire). Each of these studies and their results are described in detail below.

RCP Population Viability Analysis

Dr. Phillip Miller prepared a population viability analysis (PVA) for the Gunnison sage-grouse for CPW as part of the RCP (GSRSC 2005, Appendix G). The purpose of this PVA was to assist the CPW in evaluating the relative risk of extinction for each population under the conditions at that time (i.e., the risk of extinction if nothing changed), to estimate relative extinction probabilities and loss of genetic diversity over time for various population sizes, and to determine the sensitivity of Gunnison sage-grouse population growth rates to various demographic parameters (GSRSC 2005, p. 169). The PVA was used by the RCP as a tool to predict the relative, not absolute or precise, probability of extinction for the different populations under various management scenarios based on information available at that time. The model did not incorporate certain factors including habitat loss and fragmentation, density-dependent reproduction, effects of disease, or inbreeding depression, all of which may affect the demographic rates and, therefore, status of a given population (GSRSC 2005, p. 170). Furthermore, while Gunnison sage-grouse demographic data were used where available, the PVA also applied greater sage-grouse demographic data, as needed (GSRSC 2005, p. 169). We believe it is appropriate to apply greater sage-grouse data where Gunnison sage-grouse data are not available or limited. However, this may weaken inferences in assessing the viability of Gunnison sage-grouse due to the species' unique behavioral and genetic characteristics (Young *et al.* 2000b, entire) and potentially different vital rates, such as annual survival (Davis 2012, p. 63) and nesting success rates (Davis 2012, p. 11). In contrast, another more recent PVA applied only Gunnison sage-grouse demographic data (Davis 2012, entire) (see Davis Population Viability Analysis), and thus it is likely more reliable in terms of assessing the viability of the species.

This 2005 PVA indicated that, in the absence of additional habitat loss and fragmentation and the factors noted above, stable populations in excess of 500 birds had an extinction risk of less than 5 percent within the next 50 years following the study (that is, through 2055) and may be considered "secure" (GSRSC 2005, p. 170; GSRSC 2005, p. G-21). The PVA found that the probability of the Gunnison Basin population going extinct within the next 50 years was less than approximately 1 percent (GSRSC 2005, p. G-21). The Gunnison Basin population was approximately 3,000 individuals around the time the PVA was developed (2005). If the model were re-run, with approximately 3,978 birds as of 2014, the predicted risk of extinction would be even lower due to this population increase (Phillips 2013, p. 2). This view does not take into account, however, other new information that could be incorporated into an updated model re-run, such as the Gunnison sage-grouse demographic data collected by Davis (2012, entire). The model concluded that the Gunnison Basin population, and therefore the species, is likely to survive over the long term (GSRSC 2005, p. 179), barring catastrophic events such as disease or prolonged drought (assuming a degree of consistency of environmental influences on sage-grouse demography) or a significant reduction in carrying capacity through habitat loss.

In contrast, the analysis found that small populations (< 25 to 50 birds) are at high risk of extinction within the next 50 years (through the year 2055) (assuming some degree of consistency of environmental influences on sage-grouse demography), even if these populations are expected to increase over the long-term (GSRSC 2005, pp. 170 and G-27). A stable population of 50 birds had an extinction probability of 59 percent within the next 50 years; a stable population of 25 birds had an extinction probability of 86 percent within the next 50 years. The analysis also found that the probability of extinction was higher yet for declining populations of this size (GSRSC 2005, p. G-27). However, the model found that augmentation of birds (approximately 10 birds every five years) would considerably reduce the probability of extinction (to near zero) for these smaller populations (GSRSC 2005, pp. 176-179).

Based on the RCP PVA (GSRSC 2005, Appendix G), in the absence of intervention such as translocating of birds, the Cerro Summit–Cimarron–Sims Mesa (74 birds) and Dove Creek (24 birds) populations are currently at high risk of extirpation (GSRSC 2005, pp. 168–179). Likewise, the Poncha Pass population has remained below 50 birds since 1999, and has generally declined over this period (Figure 3), indicating this population is also at high risk of extirpation, based on this PVA. Zero birds were counted at leks in the spring of 2013 for the Poncha Pass population. However, 17 birds were translocated into the population in the fall of 2013, with 16 surviving in the spring of 2014 and 10 more birds were translocated in the spring of 2014 (see Scientific Research and Related Conservation Efforts in Factor B). Considerable translocation efforts from 2010 to 2013 have likely contributed to increased population estimates in the Crawford and Piñon Mesa populations (see Current Distribution and Population Estimates and Trends; and Scientific Research and Related Conservation Efforts). Without the recent increases in bird numbers, Crawford and Piñon Mesa population would also likely be at serious risk of population extinction (i.e., around 50 birds and a 59 percent or greater probability of extinction), based on this PVA.

Garton Population Viability Analysis

To estimate population viability, Garton (2005, entire) analyzed trends in abundance for Gunnison sage-grouse populations and the species rangewide using male lek count data from the preceding 50 years from CPW and the UDWR. Due to inconsistencies in data collection over time, the analysis was conducted for two time periods—long-term lek data collected since 1957 for CPW, and since 1976 for UDWR, through 2005; and short-term lek data from 1995-2005 when sampling methodologies were standardized and became more consistent. Relative population size from past years was calculated by setting the most recent population estimate at the time (in 2005) to 100 and calculating the previous years' population size relative to that, so that it could be viewed as a percentage of the 2005 population level.

Garton's (2005, pp. 3-4) analysis indicated that the rangewide population varied between a low of 40 percent of the 2005 lek count in 1991 and 1993; to a high of 140 percent of the 2005 lek count in 1969. He suggested that unusual counts, which represented at least a 50 percent change in abundance, were preceded or followed by more typical count indices, and that these outlier data probably reflect measurement errors rather than actual changes population size. For instance, lek count data collected for 2005 show a considerable increase in the number of males attending leks, with an approximate 50 percent increase from 2004 estimates of rangewide abundance. This aberration is thought to be the result of unusual weather conditions during that period and, consequently, possible double- or triple-counting of males across multiple lek sites at various elevations (Garton 2005, pp. 2-3, and references therein). Because of this, the analyses were conducted both with and without 2005 data. Including the 2005 data in the long-term analysis (since 1957) resulted in a slightly increasing population trend; without the 2005 count data, the analysis showed a slightly decreasing population trend, which Garton (2005, p. 4) suggested was a better descriptor of observed trends in population estimates. Statistical analyses of the Cerro Summit-Cimarron-Sims Mesa and Dove Creek populations could not be completed due to low lek counts and inconsistencies in sampling over time. Likewise, the small Poncha Pass population was not analyzed because it had been surveyed for only 6 years and the population was augmented with birds from Gunnison Basin during that time.

The long-term analysis (1957-2005) by Garton (2005, entire) found that the rangewide population of Gunnison sage-grouse was stable, neither increasing nor decreasing, during that time period. Annual rates of change were highly variable, with some of that variability likely attributed to different sampling methods rather than actual population change. The shorter analysis period (1995-2005) yielded the same results, although the variability was reduced, likely due to more consistent data collection methods. Individual populations reflected the trends in the rangewide analysis, in that some populations were slightly increasing and some were slightly decreasing.

As observed in similar analyses conducted for the greater sage-grouse (Connelly *et al.* 2004, entire), density-dependent models appeared to more accurately describe observed population trends in Gunnison sage-grouse. Garton's study suggested an apparent inverse density-dependent pattern of population change in Gunnison sage-grouse, resulting in a low probability (less than 1 percent) that the population will decline to low abundances (below 25 percent of the 2005 population index), provided environmental factors (e.g., catastrophic drought, disease, continuing habitat loss) do not reduce equilibrium population size or increase the variability in population change (Garton 2005, pp. 4-5).

Of the populations studied, Gunnison Basin and Piñon Mesa showed slightly increasing trends in abundance of Gunnison sage-grouse; San Miguel Basin, Crawford, and Monticello showed slightly decreasing trends in abundance from 1995 to 2005 (Table 13 below). The short-term analysis (1995-2005) indicated that the San Miguel Basin population was declining rapidly, as much as a 10 percent decline per year, though there was uncertainty in this prediction due to possible sampling errors. Declines were also evident in the Monticello population.

Table 13. Summary of population trends for the Gunnison sage-grouse from 1995 to 2005 (Garton 2005, entire). Values are the finite rate of change in the population, where 1 is no change, numbers less than 1 indicate a decline, and numbers greater than 1 indicate an increase.

POPULATION	FINITE RATE OF CHANGE 1995-2005
Gunnison Basin	1.05
Piñon Mesa	1.09
San Miguel Basin	0.902
Crawford	0.999
Monticello	0.99
Rangewide	1.049

Six peer reviewers evaluated the report by Garton (2005, entire). We received comments from five of the reviewers, three generally favorable towards the report and its conclusions and two expressing concerns regarding limitations in the data sets, assumptions, and/or analyses. For example, one would have to assume that habitat availability over time would remain stable in order to conclude that Gunnison sage-grouse numbers are unlikely to experience a decline in the future. Also, while the conclusions showed that the number of males per lek remained relatively stable over time, the proportion of leks on which males were counted appeared to have declined, which could be indicative of population declines. Peer reviewers also recommended that more appropriate statistical tests would need to be applied to come to any conclusion about potential population trends and that emphasis should be on an independent analysis of each geographically isolated population because each population exhibits independent population dynamics. Population trend analyses were conducted on a population basis as well as rangewide. There was concern expressed that habitat loss over time was not accounted for, that population declines would go unnoticed, and that population trends would appear far too optimistic.

Davis Demographic Study and Population Viability Analysis

The Davis PVA (2012, entire) utilized demographic data specific to Gunnison sage-grouse populations and incorporated other variables such as extreme weather, fire, disease, and predation known to affect survival and reproduction rates in Gunnison sage-grouse. This is in contrast to the RCP PVA (GSRSC 2005, Appendix G) which combined greater and Gunnison sage-grouse demographic data and did not account for environmental variation (fire, disease, predation) other than simulating a 3-year drought resulting in increased mortality; and the Garton PVA (Garton 2005, entire) which only examined lek count-based population estimates and trends to estimate viability. To estimate and project Gunnison sage-grouse population trends, Davis (2012, pp. 1, 18) conducted a demographic study of the Gunnison Basin and San Miguel populations, the two largest populations. CPW acknowledged that this study represents the most current and longest set of demographic data collected for Gunnison sage-grouse (Phillips 2013, p. 2). Demographic parameters (survival and reproduction rates) from both populations collected from 2005 to 2010 were used to estimate population size and viability over the next 30 years (Davis 2012, p. 79). These demographic data were combined with longer-term lek count data from 1996 to 2011 (lek count protocols were standardized in 1996

(GSRSC 2005, p. 46)) in the Gunnison Basin to model that population. The purpose of the model (i.e., an integrated model that combined the two datasets) was to reduce potential weaknesses and biases in both datasets—high variability and uncertainty with the lek count data, and the small sample size of the shorter-term demographic data—thereby statistically improving estimates and predictions (Davis 2012, pp. 125-126). Key methods and findings of this study are summarized below.

The demographic component of the study found no apparent difference in nest success rates or adult survival between the San Miguel and Gunnison Basin populations (Davis 2012, p. 37). However, the results may be due in part to the limited duration and small sample size of the study, especially in the San Miguel population (Davis 2012, p. 92). Nest success from 2005 to 2011 varied widely between 21 and 60 percent, with an average of 39 percent (Davis 2012, p. 9). Contrary to expectations, nest site vegetation characteristics did not have a strong influence on nest success in the Gunnison Basin and San Miguel populations (Davis 2012, p. 10). Temporal factors appeared to have the greatest influence on nesting success, as earlier season nesting tended to be more successful than later season nesting, and the longer that incubation occurred, the greater the risk of nest failure (Davis 2012, p. 1). No yearlings were observed in the San Miguel population during the study (Davis 2012, p. 12).

Juvenile recruitment was also evaluated within and between the two populations (Davis 2012, p. 27). Chick survival (hatching to 30 days of age) was higher in the Gunnison Basin than the San Miguel population (Davis 2012, p. 44). Although sample size in the San Miguel Basin was small (eight chicks were studied), none survived to 30 days of age, meaning no recruitment (survival of bird from hatching to breeding age) occurred over a 4-year period (Davis 2012, p. 37). Of 282 chicks studied in the Gunnison Basin, 124 (44 percent) survived to 30 days of age (Davis 2012, pp. 37-38). A slight negative trend in chick survival and stronger negative trend in juvenile survival in the Gunnison Basin population occurred from 2005 to 2010 (Davis 2012, p. 27). Juvenile recruitment declined from 26 percent in 2005 to 5 percent in 2010. These results indicate that lower juvenile recruitment may be contributing to the study's observed population declines in the Gunnison Basin (birds from the San Miguel population were not included in the juvenile survival analysis, as none survived to 31 days), and that the population may not be as stable as has been suggested. However, study results may be due to the limited sample size (duration) of the study, and a longer study may indicate that declines observed are fluctuations within a larger cyclical time series (Davis 2012, p. 38).

Adult and yearling survival rates were also analyzed within and between the two populations. The effect of harsh winter conditions on these demographic rates was also studied. Male survival rates were lower during the lekking season (March - April), and female survival rates were lower during the nesting and chick rearing season (May-August) (Davis 2012, p. 55). Harsh winters (as indicated by above normal snow depth), which occurred during 2007 and 2008 in the Gunnison Basin, and during 2009 and 2010 in the San Miguel Basin, had minimal effect on Gunnison sage-grouse survival (Davis 2012, pp. 55, 65). The study found no differences in adult and yearling survival between the San Miguel and Gunnison Basin populations. This was surprising, given the apparent decline in bird numbers in the San Miguel population based on lek count estimates, suggesting declines are likely due to reduced recruitment and juvenile survival rates rather than reduced adult survival (Davis 2012, p. 66).

The Davis PVA applied the derived baseline demographic data for survival and reproduction rates to estimate population growth of Gunnison sage-grouse, including an analysis of viability and extinction risk. The study also evaluated the effects of bird translocation efforts on the survival of the San Miguel (destination) population and the Gunnison Basin (source) population (Davis 2012, p. 79, 87). Based on the six years of demographic data collected from 2005 to 2010 in the Gunnison Basin, and four years of demographic data collected from 2007 to 2010 in the San Miguel population, deterministic population models indicated that both the Gunnison Basin and San Miguel populations were declining during those time periods, with more pronounced declines in the latter (Davis 2012, p. 87). For the four years when data was collected in both populations (2007-2010), population growth rates (λ) ranged from 0.65 to 0.91 in the Gunnison Basin, and 0.52 to 0.68 in the San Miguel population (Davis 2012, pp. 87-88). A λ value of 1.0 indicates a stable population; values less than 1.0 indicate a declining population; and values greater than 1.0 indicate an increasing population. Of the six years of study (2005-2010) in the two populations combined, population growth rates ranged from 0.65 in 2010, to 1.14 in 2006 (Davis 2012, p. 134). Of the six years of study in the Gunnison Basin alone (from 2005 to 2010), four of these years indicated population declines and two years indicated population growth (Davis 2012, p. 87).

Incorporating environmental stochasticity (variability in population growth rates due to external factors such as weather, fire, disease, and predation) and demographic stochasticity (variability in population growth rates due to survival and reproduction rates), model simulations also predicted population declines in the future (Davis 2012, pp. 105-106). Combining the six years of demographic data (2005 to 2010) from both populations, environmental stochastic simulations resulted in a minimum extinction time of 31 years for both populations. *Minimum extinction time* is the earliest time at which population extinction occurred among the various modeled simulations in this study. This is in contrast to the *mean extinction time*, the average time of all modeled simulations at which population extinction occurred. Mean or expected extinction time in this PVA for the Gunnison Basin population is 58 years (Davis 2012, p. 137). Davis also (2012, p. 92) noted, however that if the study had been conducted just a few years earlier or later, a different trend across time could have resulted, because it was based on a 6-year period of time when the population was experiencing a slight decline.

Assuming and incorporating an additional year of increasing, constant, or declining population growth into these simulations to model demographic stochasticity resulted in minimum extinction times of 41, 29, and 20 years, respectively for both populations combined (Davis 2012, p. 88). Additionally, the extinction risk (i.e., proportion of simulations that went extinct within 30 years) was substantially larger for San Miguel than for Gunnison Basin (0.53 for San Miguel, 0 for Gunnison Basin) (Davis 2012, p. 88). Demographic stochastic simulations for the Gunnison Basin population approached extinction, but none went extinct over the 30-year period. Therefore, the estimated extinction risk was 0.00 for the Gunnison Basin population over this period, indicating a low probability of extinction over the next 30 years due to demographic stochasticity alone (Davis 2012, pp. 88, 106). However, looking further out, demographic stochastic simulations resulted in mean extinction time of 58 years for the Gunnison Basin population, without removing any birds for translocation efforts (removal of birds decreased the mean extinction time) (Davis 2012, pp. 111, 137). These demographic projections indicate the Gunnison Basin population is relatively stable, but may be in decline (Davis 2012, p. 137-138). However, see discussion involving the integrated model below. Additionally, Davis also (2012, p. 92) noted that if the study had been conducted just a few years earlier or later, a different trend across time could have resulted, because it was based on a 6-year period of time when the population was experiencing a slight decline.

Davis (2012, p. 96) also examined the periodic removal of birds from the Gunnison Basin and whether a long-term translocation effort would be sustainable since it could negatively affect the viability of that population depending upon the number of birds translocated each time and the frequency of translocations. Results indicated that, in general, more frequent removal of birds from the source population had a greater effect than removing a larger number less frequently.

If trends observed during the study continue into the future, declines in both the San Miguel and Gunnison Basin populations are expected to occur over the next 30 years (i.e., by 2042). However, the results may be due in part to the limited duration and small sample size of the study (Davis 2012, p. 92) (see also discussion involving the integrated model below.) Davis (2012, pp. 89, 93) indicated that adult survival may be the most important vital rate for steeply declining populations, such as the San Miguel population, while juvenile survival is most important for increasing or slightly declining populations, such as the Gunnison Basin population.

An evaluation of translocation efforts indicated that more frequent translocations would increase population persistence in the San Miguel population, but with negative effects on the Gunnison Basin, or source, population (decreased mean and minimum extinction times) (Davis 2012, p. 91). Frequent translocations would avoid extinction of the San Miguel population, based on the population models, although this would mean maintaining a population of translocated birds (Davis 2012, p. 96). Furthermore, juvenile recruitment in that population would need to be improved for the population to persist on its own (Davis 2012, p. 97).

To further evaluate population viability, Davis (2012, pp. 125-126) combined baseline demographic data and lek count data from the Gunnison Basin in a separate, integrated population model. Short-term demographic data were combined with long-term lek count data from 1996 to 2011 (16 years) to reduce potential weaknesses in both datasets—high variability and uncertainty with the lek count data and small sample size of the demographic data—with the goal of statistically improving estimates and predictions (Davis 2012, pp. 125-126). Lek count protocols were standardized in 1996 (GSRSC 2005, p. 46); prior to that time, data showed high variability and uncertainty and, therefore, were not included in the analysis (Davis 2012, pp. 139, 143). The analysis indicated that the Gunnison Basin population has declined slightly over the past 16 years, with a mean annual population growth rate of 0.94, with a 95 percent confidence interval of 0.83 to 1.04. This growth range was found to be narrower (more accurate) than growth estimates based on lek count data alone (0.79-1.92, with a mean of 1.04) or demographic data alone (0.65-1.14, with a mean of 0.89) (Davis 2012, p. 134). On average, the population appeared to be relatively stable over the 16-year period, but the end of the time series showed a slight decline (Davis 2012, p. 138). However, it was noted that results of the study are preliminary, and further testing is needed to validate the model (Davis 2012, p. 140).

More recently, incorporating an additional year of lek count data into their integrated model (1996-2012), Davis *et al*. (*in press*) states that the Gunnison Basin population is “slightly declining” and the growth rate of this population has been variable, but is “near stable.” The updated growth rate was calculated to be 0.988, with the 95 percent confidence interval also including stable and slightly increasing growth rates (0.893 to 1.079).

Davis (2012, p. 139) cautioned against making conclusions and population estimates based on lek count data collected prior to 1996, due to the data’s high variability and uncertainty. The number of lek areas surveyed in Colorado increased beginning in 1996, when lek count protocols were standardized (GSRSC 2005, p. 46), indicating increases in abundance that may not be accurate (Davis 2012, p. 143). Even standardized lek counts show high variability and uncertainty and, therefore, should not be used alone to estimate or project Gunnison sage-grouse populations (Davis 2012, p. 165). Demographic data showed consistently lower population growth rates than indicated by standardized lek count data, suggesting an imperfect relationship between the two data types. Lek count data sometimes resulted in extremely high values of population growth that were not realistic based on demographic analyses (Davis 2012, pp. 134, 136).

Discussion of all Population Viability Analyses

The most current and comprehensive demographic study and population viability analysis for Gunnison sage-grouse (Davis PVA) indicated that the San Miguel population is showing a decline, and the Gunnison Basin population has been relatively stable over the past 16 years (up to 2011), with a slight decline towards the end of the study period (Davis 2012, entire). Incorporating environmental and demographic stochasticity into the models also predicted declines in both of these populations in the future (Davis 2012, pp. 105-106). Combining demographic data from both populations, environmental stochastic simulations resulted in a minimum extinction time of 31 years (i.e., 2043) for the two populations combined (Davis 2012, p. 88). For the San Miguel population, demographic stochastic simulations indicated a high probability (0.53) of extinction over the next 30 years (2042) (Davis 2012, p. 88). Demographic stochastic simulations for the Gunnison Basin population approached extinction over this period, but none went extinct over the 30-year period (extinction risk of 0.00) (Davis 2012, pp. 88, 106). However, looking further out, demographic simulations resulted in a mean extinction time of 58 years for the Gunnison Basin population (without removing any birds for translocation efforts) (Davis 2012, pp. 111, 137), or by about 2070. Davis (2012, p. 92) noted, however, that if the study had been conducted just a few years earlier or later, a different trend across time could have resulted, because it was based on a 6-year period of time when the population was experiencing a slight decline.

The Davis PVA also suggested that the Gunnison Basin population may not be as stable as previously thought (Davis 2012, p. 38). Based on an integrated analysis of 16 years of lek count and demographic data, the Gunnison Basin population may be declining slightly (Davis 2012, p. 137). Further, based on Davis's findings, we infer that the Gunnison Basin population may not be as large as lek count-based estimates suggest. Davis (2012, pp. 134, 136) found that lek count data resulted in extremely high values of population growth that were not realistic based on demographic data for the Gunnison Basin population. Davis 2012 (p. 138) and Davis *et al. in press* state, however, that the Gunnison Basin population has shown only a slight decline since 1996, which they also describe as currently being "relatively stable" and "near-stable."

In contrast, the earliest population viability analysis for Gunnison sage-grouse from the RCP (GSRSC 2005, Appendix G) indicated a low probability of extinction (less than 1 percent) for the Gunnison Basin population (with approximately 3,000 birds at the time); and a low extinction risk (less than 5 percent) for smaller populations (more than 500 birds) over the next 50 years (i.e., to 2055) (GSRSC 2005, p. G-21). This model concluded that the Gunnison Basin population, and therefore the species, is likely to survive over the long term (GSRSC 2005, p. 179). We are concerned, however, with the reliability of the estimated extinction probabilities and conclusions from this study, for reasons noted above and as follows. Applying the extinction probabilities from this study, some satellite populations would have been considered relatively secure in recent years based on estimated abundance. For example, the San Miguel and Monticello populations, with approximately 200 to 400 birds or more in recent years (see Figure 3), would have had a relatively low risk of extinction over the 50 years ending in 2055 according to the RCP PVA. However, these populations have declined since 2005 (Figure 3; also see Relevant Species Information in this section) to a point that their survival and long-term viability is currently at risk. This suggests that the extinction risk for individual Gunnison sage-grouse populations, including the Gunnison Basin, and the entire species is higher than was estimated in this study (i.e., the study may have overestimated the viability of Gunnison sage-grouse). This PVA combined greater and Gunnison sage-grouse demographic data and did not account for environmental variation (such as fire, disease, and predation), in contrast to the Davis PVA.

Long-term (1957-2005) and short-term analyses (1996-2005) from Garton (2005, entire) found that the rangewide population of Gunnison sage-grouse was generally stable, neither increasing nor decreasing during that time period. Accordingly, some populations were declining and some were increasing. The study did not estimate extinction probabilities. We are concerned with the current relevance of the Garton (2005, entire) study, however, as nine additional years of lek count data have become available since the study was conducted. These new lek count data, combined with other data from 1996 to 2010 (per Davis 2012, entire), provide a more precise estimate of population levels and trends than from information that was available in 2005. As discussed earlier, lek count protocols were first standardized in 1996 (GSRSC 2005, p. 46), and lek count data collected prior to that year were prone to high variability and uncertainty (Davis (2012, p. 139). Based on lek count population estimates, relatively stable trends in the Gunnison Basin population 1996 to 2014 match that of the findings in Garton (2005, entire). However, a relatively stable rangewide population, as indicated by Garton (2005, entire), is not supported by recent declines in several of the satellite populations from 1996 to 2014 (Figure 3; also see Relevant Species Information above). The apparent rangewide stability of Gunnison sage-grouse under the 2005 Garton PVA is influenced primarily by the largest population (the Gunnison Basin - about 63 percent of the species' range) (Figure 2). However, based on overall declining trends in several of the satellite populations (encompassing about 37 percent of the species' occupied range; and 16 percent of the known birds), as well as the questions raised by the Davis PVA regarding the long-term stability of the Gunnison Basin population, we do not agree that the species is stable rangewide. Finally, in contrast to the Davis PVA, the Garton PVA only examined lek count-based population estimates and trends to estimate viability, and did not consider demographic or environmental factors or stochasticity.

Each of these population viability models has its own limitations and weaknesses, as described above. Again, a PVA does not predict the real or absolute risk of extinction for a species or population, only their relative extinction risk under various scenarios, and thus should be interpreted and applied with caution. Further, the available PVAs for

Gunnison sage-grouse have resulted in somewhat disparate findings. The two earlier PVAs (GSRSC 2005, entire; Garton 2005, entire) collectively suggest most Gunnison sage-grouse populations are relatively stable and that the species is likely to persist into the future, attributable primarily to the large size and apparently stable trend of the Gunnison Basin population. On the other hand, the Davis model (2012, entire) showed that the second largest population, the San Miguel population, is at risk of extinction, with 53 percent of model simulations reaching extinction in the next 30 years (by 2042) (Davis 2012, p. 88), and that even the largest Gunnison Basin population is declining with a mean extinction time of 58 years from now, or by about 2070, due to demographic stochasticity alone (Davis 2012, pp. 111, 137). Davis (2012, p. 92) noted, however, that if the study had been conducted just a few years earlier or later, a different trend across time could have resulted, because it was based on a 6-year period of time when the population was experiencing a slight decline. Based on recent population trend data and related information, we identified concerns with the two earliest PVAs and their current relevance and reliability for assessing the status of Gunnison sage-grouse now and in the future.

For the reasons stated above and here, we find that Davis (2012, entire) and Davis *et al. (in press*) represent the most current and best available scientific information regarding the viability of Gunnison sage-grouse. We recognize that absolute extinction probabilities provided in the Davis PVA are uncertain. However, based on that study (Davis 2012, entire), the survival and persistence of the San Miguel population appears to be at risk, with a 53 percent chance of extinction by about 2042. Based on this finding, it is reasonable to assume that the viability of the remaining satellite populations is also at similar risk due to their small size, though we recognize that environmental, demographic, genetic, and other factors likely vary between populations, and that these differences will influence survival and viability rates. Due to demographic fluctuations alone, the Davis PVA also indicated that the Gunnison Basin population's viability is at risk in the future, with a mean extinction time of 58 years, or by about 2070.

Resiliency, Redundancy, and Representation

In this section, we synthesize the information above to evaluate resiliency, redundancy, and representation as they relate to the viability of Gunnison sage-grouse. *Resiliency* refers to the capacity of an ecosystem, population, or organism to recover quickly from disturbance by tolerating or adapting to changes or effects caused by a disturbance or a combination of disturbances. *Redundancy*, in this context, refers to the ability of a species to compensate for fluctuations in or loss of populations across the species' range such that the loss of a single population has little or no lasting effect on the structure and functioning of the species as a whole. *Representation* refers to the conservation of the diversity of a species, including genetic makeup.

Small population sizes, declining population trends, low genetic diversity, geographic isolation, and overall low viability (see preceding discussions in this section) indicate that long-term persistence and evolutionary or adaptive potential are compromised in the six satellite populations. This, in turn, suggests that resiliency is very low in the satellite populations, meaning they are less likely to tolerate or adapt to the changes and effects from current and future threats (see discussions in Factors A through C, and E). For example, drought conditions from 1999 through about 2003 (with residual effects lasting through about 2005) were closely associated with reductions in the sizes of all Gunnison sage-grouse populations (CDOW 2009b, entire; CPW 2013c, p. 9) (Figures 2 and 3) and lower nest success (CPW 2013c, p. 2). To date, most of the smaller satellite populations have not rebounded from declines around that time (Figure 3) (see Drought and Extreme Weather in this Factor E discussion below).

In contrast, resilience currently appears to be relatively high in the Gunnison Basin population, likely due to a large effective population. For instance, drought has coincided with declines in the Gunnison Basin population (CDOW 2009b, entire; Figure 2), including declines at many of the lek complex areas (USFWS 2013c, pp. 1-2), but the population has since rebounded to pre-drought levels (see Drought and Extreme Weather in this section below for a detailed discussion). However, as the effects from drought, climate change, disease, and other substantial threats increase in the future, it is uncertain whether resilience in this population will be sufficient to offset declines (see Drought and Extreme Weather (Factor E discussion below), Climate Change (Factor A), and Disease (Factor C)). As discussed earlier, model simulations of environmental and demographic stochasticity (natural fluctuations) resulted in extinction of the Gunnison Basin population in 31 years (minimum extinction time) and 58 years (mean extinction time), respectively. This analysis suggested the Gunnison Basin population may not be as stable (i.e., resilient) as previously thought (Davis 2012, entire) (see Davis Population

Viability Analysis in this Factor E analysis). Davis also (2012, p. 92) noted, however, that if the study had been conducted just a few years earlier or later, a different trend across time could have resulted, because it was based on a 6-year period of time when the population was experiencing a slight decline.

While population redundancy currently exists across the species' range, the best available information indicates the six satellite populations are at risk of extirpation in approximately 30 years (see preceding discussions in this section). Maintaining multiple satellite populations is important to the long-term viability of Gunnison sage-grouse because they: (1) increase species abundance rangewide; (2) minimize the threat of catastrophic events to the species since the populations are widely distributed across the landscape; and (3) provide additional genetic diversity not found in the Gunnison Basin (GSRSC 2005, p. 199). With the loss of any population, population redundancy will be lowered, thereby decreasing the species' chances of survival in the face of environmental, demographic, and genetic stochastic factors and catastrophic events (extreme drought, fire, disease, etc.). Therefore, multiple populations across a broad geographic area are required to provide insurance against catastrophic events, and the aggregate number of individuals across multiple populations increases the probability of demographic persistence and preservation of overall genetic diversity by providing an important genetic reservoir (representation) (GSRSC 2005, p. 179).

Five physiographic zones or divisions are recognized in the Gunnison Basin population area for the purposes of monitoring and management actions (CSGWG 1997, pp. 6-7). It has been suggested that these zones represent subpopulations, or relatively discrete breeding populations, and that they provide adequate population redundancy and insurance against environmental disturbances such as drought (CPW 2013c, pp. 2, 9-10; Gunnison County 2013a, pp. 137-138; 169-170; Gunnison County 2013b, p. 43). In this rule (see Drought and Extreme Weather in this Factor E analysis), we present information which indicates that, while some local redundancy may exist in the Gunnison Basin population, it is not at a large enough scale to withstand environmental pressures. While geographic and microclimatic variation in the Gunnison Basin likely provide some degree of local variation and, perhaps, local population redundancy to resist environmental pressures, past drought has had apparently extensive impacts on this population, as indicated by concurrent negative trends in the majority of lek complexes (see Drought and Extreme Weather in this Factor E analysis). This information suggests that population redundancy in the Gunnison Basin is limited, and is inadequate at the landscape scale necessary to withstand more environmental pressures than those experienced to date, such as prolonged drought, climate change effects, disease, or any combination of those threats.

As discussed above, representation across the species' range is currently low due to apparently isolated populations and limited gene flow. Genetic diversity is highest in the Gunnison Basin population, but low in the studied satellite populations (Oyler-McCance *et al.* 2005, entire). If population sizes continue declining, genetic diversity will likely decrease as well (see Genetic Risks above in this Factor E analysis).

Based on the information above, we find that resiliency, redundancy, and representation in Gunnison sage-grouse are inadequate overall to ensure the species' long-term viability. In particular, the best available information indicates population redundancy will be more limited in the near future, due to the extirpation of one or more satellite populations, thereby decreasing the species' chances of survival in the face of limiting factors. Current and future threats to the Gunnison Basin population (in particular, see Drought and Extreme Weather (Factor E discussion below), Climate Change (Factor A), and Disease (Factor C)) combined with the probable loss of one or more satellite populations and overall reduction of range indicate the long-term persistence of Gunnison sage-grouse is at risk.

Summary of Small Population Size and Structure

Negative effects on population viability, such as reduced reproductive success or loss of genetic variation and diversity are a concern as populations decline and become smaller or more isolated. Small population size and population structure occur in all of the six satellite populations, or across approximately 37 percent of occupied range for the species (see Relevant Species Information in this section). Lek count data for the last 19 years (1996 to 2014) as a whole indicate that several satellite populations are in decline (despite increases in numbers in some populations in the last several years Figure 3). Integrating lek count data and demographic data, the Gunnison Basin population, the largest population, may be declining slightly and may not be quite as stable as previously thought (Davis *et al. in press;* Davis 2012, pp. 134, 38). Furthermore, because lek count data tend to overestimate populations (Davis 2012, pp. 134, 136) the Gunnison Basin population may not be large as has been estimated.

Based on small effective population sizes, the satellite populations are at risk of inbreeding depression and could be losing evolutionary or adaptive potential (Stiver *et al.* 2008, p. 479). Lower levels of genetic diversity were apparent in studied satellite populations of Gunnison sage-grouse, thought to be the result of small population sizes and a high degree of geographic isolation (Oyler-McCance *et al.* 2005, entire). All satellite populations sampled were found to be genetically discrete units (Oyler-McCance *et al.* 2005, p. 635), so their loss would result in a decrease in genetic diversity of the species. The only population currently providing individuals for translocation is the Gunnison Basin population; however, we believe care should be taken to ensure that this population can sustain the loss of individuals required by a long-term translocation program to other populations.

Historically, the satellite populations were larger and better connected through more contiguous areas of sagebrush habitat. The loss and fragmentation of sagebrush habitat between the late 1950's and the early 1990's led to the current isolation of these populations, as indicated by the low amounts of gene flow and isolation by distance (Oyler-McCance *et al.* 2005, p. 635). Genetic information suggests gene flow is limited between all populations (Oyler-MCance *et al.* 2005, entire) (see Genetics discussion above in this section).

Available PVAs for Gunnison sage-grouse have resulted in somewhat disparate findings, each with their own limitations or weaknesses. We found that Davis (2012, entire) represents the best available scientific information regarding the viability of Gunnison sage-grouse. This represents the longest and most current demographic study and population viability analysis for Gunnison sage-grouse. Based on that study, the Gunnison Basin and San Miguel populations, the two largest populations, are declining, with more pronounced declines in the latter (Davis 2012, p. 87). The survival and persistence of the San Miguel population, and likely the smaller satellite populations as well, appear to be at risk in the near future. Though we expect the Gunnison Basin population will persist longer than the satellite populations, Davis (2012, entire) indicated that its future viability is also at risk due to natural environmental and demographic fluctuations.

Small population size, declining population trends, and apparent isolation indicate long-term population persistence and evolutionary potential (i.e., resiliency) are compromised in the satellite populations. In general, while various natural factors would not limit sage-grouse populations across large geographic scales under historical conditions or in larger populations, they may contribute to local population declines or extirpations when populations are small or when weather patterns, habitats, or mortality rates are altered. Multiple populations across a broad geographic area provide insurance against catastrophic events (population redundancy), such as prolonged drought, and the aggregate number of individuals across all populations increases the probability of demographic persistence and preservation of overall genetic diversity by providing an important genetic reservoir (representation) (GSRSC 2005, p. 179). As discussed above, the best available information indicates the viability of the six satellite populations is currently at risk due to small population size and structure, and those cover 37 percent of the species occupied range. Loss of as much as 37 percent of the species' occupied range would impact the species' overall viability. The cumulative effects of ongoing and future threats, such as habitat loss (Factor A) and drought (discussed below), will further contribute to declining and increasingly isolated populations and, ultimately, smaller population size and structure.

Based on the best available information, we determined that resiliency, redundancy, and representation in Gunnison sage-grouse are inadequate, or will be inadequate in the near term, to ensure the species' long-term viability. The best available information indicates population redundancy, in particular, will be limited or compromised in the near term, due to the probable extirpation of one or more satellite populations, thereby decreasing the species' chances of survival in the face of limiting factors. The rangewide cumulative effects of ongoing and future threats (Factors A through C, and E) will further compromise resiliency, redundancy, and representation of the species. Current and future threats to the Gunnison Basin population (in particular, see Drought (Factor E discussion below), Climate Change (Factor A), and Disease (Factor C)) combined with the probable loss of satellite populations and overall reduction of range indicate the long-term persistence of Gunnison sage-grouse is at risk.

Drought and Extreme Weather

Drought and extreme weather such as severe winters have the potential to impact the survival and, therefore, persistence of Gunnison sage-grouse. Drought is a common occurrence throughout the range of the Gunnison and greater sage-grouse (Braun 1998, p. 148) and is considered a universal ecological driver across the Great Plains region (Knopf 1996, p. 147). Infrequent, severe drought may cause local extinctions of annual forbs and grasses that have invaded stands of perennial species, and recolonization of these areas by native species may be slow (Tilman and El Haddi 1992, p. 263). Drought reduces vegetation cover (Milton *et al.* 1994, p. 75; Connelly *et al.* 2004, p. 7-18), potentially resulting in increased soil erosion and subsequent reduced soil depths, decreased water infiltration, and reduced water storage capacity. Drought also can exacerbate other natural events such as defoliation of sagebrush by insects. For example, approximately 2,544 km^2 (982 mi^2) of sagebrush shrublands died in Utah in 2003 as a result of drought and infestations with the *Aroga* (webworm) moth (Connelly *et al.* 2004, p. 5-11). Sage-grouse are affected by drought through the loss of vegetative habitat components, reduced insect production (Connelly and Braun 1997, p. 9), and increased risk of West Nile virus infections as described in the Factor C discussion above. These habitat component losses can result in declining sage-grouse populations due to increased nest predation and early brood mortality associated with decreased nest cover and food availability (Braun 1998, p. 149; Moynahan *et al.* 2007, p. 1781).

Greater sage-grouse populations declined during the 1930s period of drought (Patterson 1952, p. 68; Braun 1998, p. 148). Drought conditions in the late 1980s and early 1990s also coincided with a period when sage-grouse populations were at historically low levels (Connelly and Braun 1997, p. 8). Although drought has been a consistent and natural part of the sagebrush-steppe ecosystem, drought impacts on sage-grouse can be exacerbated when combined with other habitat impacts, such as human developments, that reduce cover and food (Braun 1998).

Aldridge *et al.* (2008, p. 992) found that the number of severe droughts from 1950 to 2003 had a weak negative effect on patterns of greater sage-grouse persistence. However, they cautioned that drought may have a greater influence on future sage-grouse populations as temperatures rise over the next 50 years, and synergistic effects of other threats affect habitat quality (Aldridge *et al.* 2008, p. 992). Drought has also been shown to have a negative effect on chick survival rates in greater sage-grouse (Aldridge 2005, entire), a key factor in sage-grouse population reproduction, survival, and persistence (GSRSC 2005, p. 173). Populations on the periphery of the range may suffer extirpation during a severe and prolonged drought (Wisdom *et al.* 2011, pp. 468–469). In eastern Nevada, annual recruitment of greater sage-grouse was higher in years with higher precipitation, based on annual precipitation, annual rainfall, and average winter snow depth. Likewise, greater sage-grouse population growth was positively correlated with annual rainfall and mean monthly winter snowpack in the study area. Annual survival of adult male greater sage-grouse was negatively affected by high summertime temperatures (i.e., higher survival rates occurred in years with relatively low maximum temperatures) (Blomberg *et al.* 2012, pp. 7, 9). In contrast, adult survival rates of Gunnison sage-grouse in the Gunnison Basin were not apparently influenced by drought conditions in 2005 (CPW 2013c, p. 9; Davis 2012, p. 55).

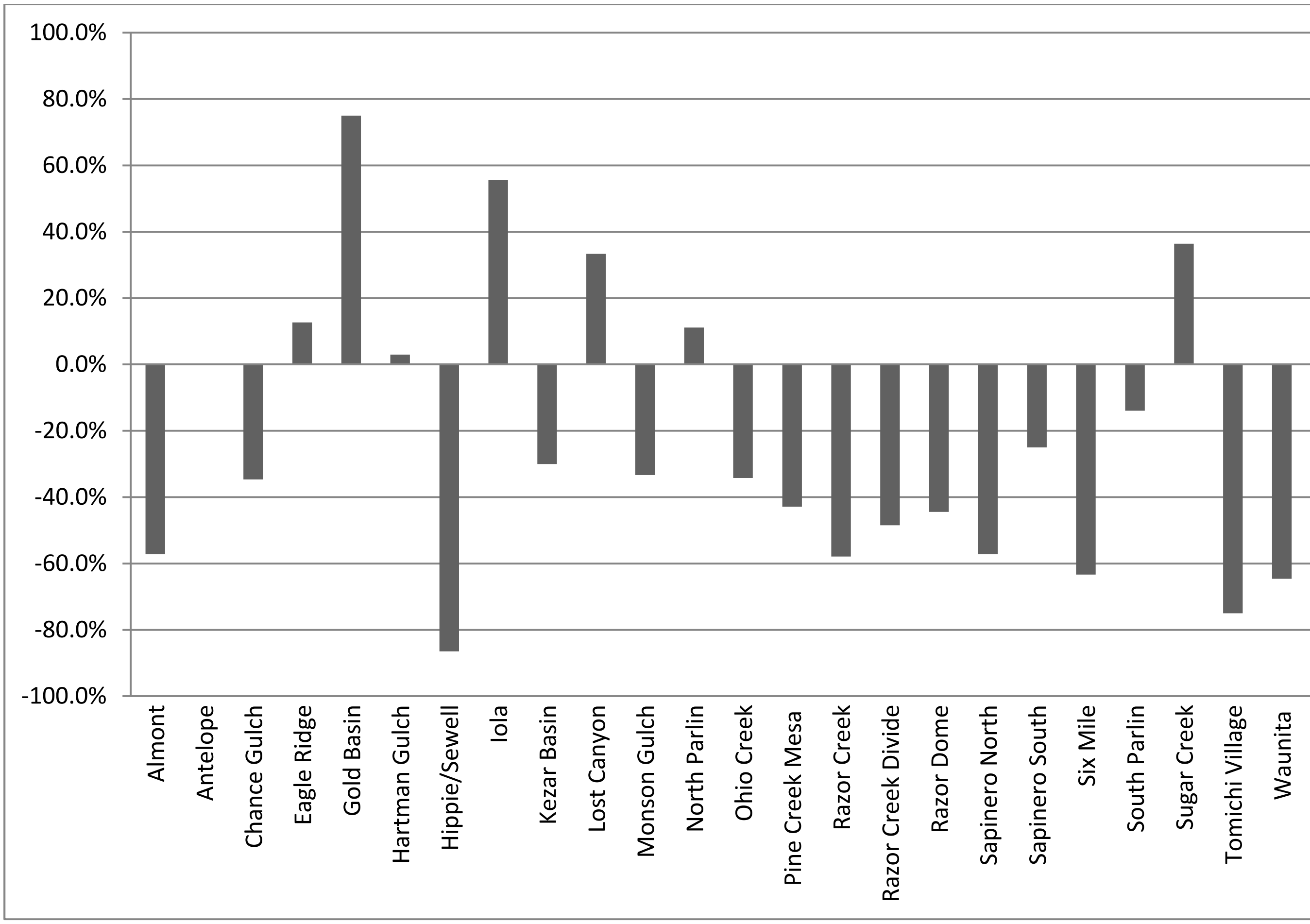
Drought conditions from 1999 through about 2003 (with residual effects lasting through about 2005) were closely associated with reductions in the sizes of all populations of Gunnison sage-grouse (CDOW 2009b, entire; CPW 2013c, p. 9) (Figures 2 and 3) and lower nest success (CPW 2013c, p. 2). The driest summer on record in the Gunnison Basin occurred in 2002 (Gunnison County 2013a, pp. 112, 141). Based on population trends from lek count data, the Gunnison Basin population declined by about 30 percent from 2001 to 2003, but has since rebounded to pre-drought numbers (USFWS 2013c, p. 1; Figure 2). Therefore, larger populations of Gunnison sage-grouse may be capable of enduring moderate or severe, but relatively short-term, drought. However, to date, most of the smaller satellite populations have not rebounded from declines around that time (Figure 3). This information highlights the potential significance of drought and its influence on Gunnison sage-grouse populations. It also indicates that resiliency is currently limited in the satellite populations (see Resiliency, Redundancy, and Representation). The small sizes of the satellite populations of Gunnison sage-grouse make them particularly sensitive to stochastic and demographic fluctuations, and this vulnerability is intensified by drought (GSRSC 2005, p. G-22).

Overall, habitat appeared to be negatively affected by drought conditions across a broad area of the Gunnison sage-grouse's range from 1999 through about 2003, though those effects varied by population area (see our April 18, 2006, finding (71 FR 19954) for a detailed discussion). Defoliation and mortality of sagebrush plants, and the loss of grass and forb understories, was reported in 2003 across the range of Gunnison sage-grouse (GSRSC 2005, p. 143, and references therein), and in 2013 in the Gunnison Basin and Dry Creek Basin area of the San Miguel population (CPW 2013c, p. 10, and references therein). However, the reduction of sagebrush density, allowing for greater herbaceous growth and stimulating the onset of sagebrush seed crops, may have been beneficial to sagebrush habitats in certain areas over the long term (GSRSC 2005, p.143; CPW 2013c, p. 10). Nonetheless, as indicated by declining Gunnison sage-grouse populations during and following drought periods, the negative impacts of drought appear to outweigh any positive effects.

The above information indicates that regional drought has operated at large enough scales to impact all populations of Gunnison sage-grouse. Furthermore, it appears that past drought has had broad-scale, measurable impacts on even the Gunnison Basin population, despite its larger geographic area and population size. Figure 4 below shows changes in high male sage-grouse counts at lek complexes in the Gunnison Basin from 2001 to 2003. Based on lek count data, the largest declines in the Gunnison Basin occurred during this time (Figure 2). Of 25 total lek complexes in the Gunnison Basin (not including leks where no birds were observed or where counts did not occur), approximately 68 percent declined from 2001 to 2003, including many of the larger complex areas with typically more birds. The largest lek complex in the Gunnison Basin, Ohio Creek, declined by about 34 percent, from 530 birds in 2001 to 348 birds in 2003 (USFWS 2013c, pp. 1-2). The eight lek complexes that remained stable or increased during this period (32 percent of total lek complexes) were typically smaller lek complexes with fewer birds (Lost Canyon, Gold Basin, Iola, North Parlin, and Sugar

Creek); or, if larger, only minor increases in bird numbers were observed (Antelope, Hartman Gulch, Eagle Ridge) (USFWS 2013c, p. 3).

Figure 4. Change in high male counts at lek complexes[a] in the Gunnison Basin from 2001 to 2003 (USFWS 2013c, pp. 1-2)[b].



[a] Lek complex, or lek areas, are comprised of several geographically grouped or proximate leks.

[b] Graph does not include lek complexes where no counts occurred or where zero birds were observed from 2001 to 2003. These include Cochetopa Dome, McCabe Lane, Needle Creek, Ninemile, and Willow Creek lek areas.

While geographic and microclimatic variation in the Gunnison Basin likely provides a degree of local variation and, perhaps, local population redundancy to resist environmental pressures, past drought had apparent widespread impacts on this population, as indicated by negative trends in the majority of lek complexes during that time. This suggests that population redundancy in the Gunnison Basin is limited, and is inadequate at the landscape scale necessary to withstand more substantial environmental pressures such as prolonged drought, climate change effects, disease, or a combination of those threats. The drought from 2001 to 2003 was severe but relatively short in duration. More severe, prolonged, or frequent drought would likely have more serious impacts. The species' apparent sensitivity to drought effects in all populations, including the Gunnison Basin and across most lek complexes in that population, suggests the species would have limited capacity to withstand or adapt to more significant drought and the interacting effects of climate change, disease, and other threats. Drought is also discussed under the Climate Change (Factor A); and Resiliency, Redundancy, and Representation (Factor E) sections.

Harsh or severe winters appear to have minimal influence on Gunnison sage-grouse survival. Davis (2012, p. 55) evaluated the effect of harsh winter conditions (as indicated by above normal snow depth) on adult and yearling survival rates in the Gunnison Basin and San Miguel populations. The winter of 2007 to 2008 was one of the most severe winters on record in the Gunnison Basin, with snow depths that exceeded records for all but 2 winters in the last 50 years (CPW 2013c, p. 2; Gunnison County 2013a, p. 112). Severe winter conditions during 2007 and 2008 in the Gunnison Basin, and during 2009 and 2010 in the San Miguel Basin, had minimal effect on Gunnison sage-grouse survival in both populations; and, in the Gunnison Basin, the highest nesting success during the study was observed the following spring (Davis (2012, p. 55; CPW 2013c, p. 2).

Data are not available to evaluate whether the observed population declines are due to drought alone. Drought likely intensifies other stressors such as predation (Factor C), invasive plants (Factor A), and fire (Factor A). However, based on the best available information, drought has contributed to substantial declines in all Gunnison sage-grouse populations. Therefore, we conclude that drought is a substantial threat to Gunnison sage-grouse rangewide, both now and into the future.

Recreation

Nonconsumptive recreational activities can degrade wildlife resources, water, and the land by distributing refuse, disturbing and displacing wildlife, increasing animal mortality, and simplifying plant communities (Boyle and Samson 1985, pp. 110–112). Sage-grouse response to disturbance may be influenced by the type of activity, recreationist behavior, predictability of activity, frequency and magnitude, timing, and activity location (Knight and Cole 1995, p. 71). We do not have any published literature concerning measured direct effects of recreational activities on Gunnison or greater sage-grouse, but can infer potential impacts on Gunnison sage-grouse from studies on related species and from research on nonrecreational activities. Displacement of male sharp-tailed grouse has been reported at leks due to human presence, resulting in loss of reproductive opportunity during the time of disturbance (Baydack and Hein 1987, p. 537). Female sharp-tailed grouse were observed at undisturbed leks while absent from disturbed leks during the same time period (Baydack and Hein 1987, p. 537). Disturbance of incubating female sage-grouse could cause displacement from nests, increased predator risk, or loss of nests. Disruption of sage-grouse during vulnerable periods at leks, or during nesting or early brood-rearing could affect reproduction or survival (Baydack and Hein 1987, pp. 537–538).

Recreational use of off-highway vehicles (OHVs) is one of the fastest-growing outdoor activities. In the western United States, greater than 27 percent of the human population used OHVs for recreational activities between 1999 and 2004 (Knick *et al.* 2011, p. 217). Knick *et al.* (2011, p. 219) reported that widespread motorized access for recreation facilitated the spread of predators adapted to humans and the spread of invasive plants. Any high-frequency human activity along established corridors can affect wildlife through habitat loss and fragmentation (Knick *et al.* 2011, p. 219). The effects of OHV use on sagebrush and sage-grouse have not been directly studied (Knick *et al.* 2011, p. 216). However, Gunnison sage-grouse local working groups and conservation plans considered recreational uses, such as off-road vehicle use and biking, to be a risk factor in many areas (see Factor D discussion, Multi-County and Rangewide Efforts).

Recreation from OHVs, hikers, mountain bikes, campers, snowmobiles, bird watchers, and other sources has affected many parts of the range, especially portions of the Gunnison Basin and Piñon Mesa population areas (BLM 2005a, p. 14; BLM 2005d, p. 4; BLM 2009a, p. 36). These activities can result in abandonment of lekking activities and nest sites by Gunnison sage-grouse, energy expenditure reducing survival, and greater exposure to predators (GSRSC 2005).

Recreation is a significant use on lands managed by BLM (Connelly *et al.* 2004, p. 7-26). For example, recreational activities within the Gunnison Basin are widespread, occur during all seasons of the year, and have expanded as more people move to the area or travel there to recreate (BLM 2009a, pp. 36–37). Four wheel drive, OHV, motorcycle, and other mechanized travel has been increasing rapidly. The number of annual OHV registrations in Colorado increased from 12,000 in 1991 to 131,000 in 2007 (BLM 2009a, p. 37). Recreational activities can have direct and indirect impacts to the Gunnison sage-grouse and their habitat (BLM 2009a, p. 36). The Grand Mesa, Uncompaghre, and Gunnison (GMUG) National Forest is the fourth most visited National Forest in the Rocky Mountain Region of the USFS (Region 2), and is the second most heavily visited National Forest on the western slope of Colorado (DEIS Gunnison Basin Federal Lands Travel Management 2009, p. 137). However, it is unknown what percentage of the visits occurs within Gunnison sage-grouse habitat on the Gunnison Ranger District (DEIS Gunnison Basin Federal Lands Travel Management 2009, p. 137). With human populations expected to increase in towns and cities within and adjacent to the Gunnison

Basin and nearby populations (see Factor A analysis), the impacts to Gunnison sage-grouse from recreational use will continue to increase.

The BLM, USFS, CPW, and Gunnison County currently close 36 roads at 47 closure points in the Gunnison Basin to all motorized traffic from March 15 to May 15 to minimize impacts during the breeding season. Six road closures by the USFS extend to June 15 to protect nesting Gunnison sage-grouse. These closures limit motorized access to all known leks and adjacent habitats on public lands in the Gunnison Basin (Gunnison County 2013a, pp. 78, 127). While road closures may be violated in a small number of situations, road closures are having a beneficial effect on Gunnison sage-grouse through avoidance or minimization of impacts during the breeding season. Conservation measures from the CCA (BLM 2013b, entire), including road closure and reclamation, seasonal road closures, and over-snow travel area closures during severe winters, are expected to ameliorate impacts from some recreational activities on Federal lands in the Gunnison Basin (see Conservation Programs and Efforts Related to Habitat Conservation section in Factor A for more details).

Dispersed camping occurs at a low level on public lands in all of the population areas, particularly during the hunting seasons for other species. However, we have no information indicating that these camping activities are impacting Gunnison sage-grouse.

Domestic dogs accompanying recreationists or associated with residences can disturb, harass, displace, or kill Gunnison sage-grouse. Dogs, whether under control, on leash, or loose, have been shown to result in significant disturbance responses by various wildlife species (Sime 1999, entire, and references therein). The primary consequence of dogs being off leash is harassment, which can lead to physiological stress as well as the separation of adult and young birds, or flushing incubating birds from their nest. However, we have no data indicating that this activity is impacting Gunnison sage-grouse populations.

Recreational activities as discussed above do not singularly pose a threat to Gunnison sage-grouse. However, there may be certain situations where recreational activities are impacting local concentrations of Gunnison sage-grouse, especially in areas where habitat is already fragmented such as in the six satellite populations and in certain areas within the Gunnison Basin.

Pesticides and Herbicides

Insects are an important component of sage-grouse chick and juvenile diets (GSRSC 2005, p. 132 and references therein). Insects, especially ants (Hymenoptera) and beetles (Coleoptera), can comprise a major proportion of the diet of juvenile sage-grouse and are important components of early brood-rearing habitats (GSRSC 2005, p. 132 and references therein). Most pesticide applications are not directed at control of ants and beetles. Insecticides are used primarily to control insects causing damage to cultivated crops on private lands and to control grasshoppers (Orthoptera) and Mormon crickets *(Mormonius sp.*) on public lands.

Few studies have examined the effects of pesticides to sage-grouse, but at least two pesticides have caused direct mortality of greater sage-grouse as a result of ingestion of alfalfa sprayed with organophosphorus insecticides (Blus *et al.* 1989, p. 1142; Blus and Connelly 1998, p. 23). In one case, a field of alfalfa was sprayed with methamidophos and dimethoate when approximately 200 greater sage-grouse were present; 63 of these sage-grouse were later found dead, presumably as a result of insecticide exposure (Blus *et al.* 1989; p. 1142, Blus and Connelly 1998, p. 23). Both methamidophos and dimethoate remain registered for use in the United States (Christiansen and Tate 2011, p. 125), but we found no further records of sage-grouse mortalities from their use. In another case in 1950, rangelands treated with toxaphene and chlordane bait to control grasshoppers in Wyoming resulted in game bird mortality of 23.4 percent (Christiansen and Tate 2011, p. 125). Forty-five greater sage-grouse deaths were recorded, 11 of which were most likely related to the insecticide (Christiansen and Tate 2011, p. 125, and references therein). Greater sage-grouse who succumbed to vehicle collisions and mowing machines in the same area also were likely compromised from insecticide ingestion (Christiansen and Tate 2011, p. 125). Neither toxaphene nor chlordane has been registered for grasshopper control since the early 1980's (Christiansen and Tate 2011, p. 125, and references therein) and thus they are not a threat to Gunnison sage-grouse.

Infestations of Russian wheat aphids *(Diuraphis noxia)* have occurred in Gunnison sage-grouse occupied range in Colorado and Utah (GSRSC 2005, p. 132).

Disulfoton, a systemic organophosphate that is extremely toxic to wildlife, was routinely applied to over a million acres of winter wheat crops to control the aphids during the late 1980s. We have no data indicating there were any adverse effects to Gunnison sage-grouse (GSRSC 2005, p. 132). More recently, an infestation of army cutworms *(Euxoa auxiliaries)* occurred in Gunnison sage-grouse habitat along the Utah-Colorado State line. Thousands of acres of winter wheat and alfalfa fields were sprayed with insecticides such as permethrin, a chemical that is toxic to wildlife, by private landowners to control them (GSRSC 2005, p. 132), but again, we have no data indicating any adverse effects to Gunnison sage-grouse.

Game birds that ingested sublethal levels of insecticides have been observed exhibiting abnormal behavior that may lead to a greater risk of predation (Dahlen and Haugen 1954, p. 477; McEwen and Brown 1966, p. 609; Blus *et al.* 1989, p. 1141). Wild sharp-tailed grouse poisoned by malathion and dieldrin exhibited depression, dullness, slowed reactions, irregular flight, and uncoordinated walking (McEwen and Brown 1966, p. 689). Although no research has explicitly studied the indirect levels of mortality from sublethal doses of insecticides (e.g., predation of impaired birds), it was inferred to be the cause of mortality among some study birds (McEwen and Brown 1966 p. 609; Blus *et al.* 1989, p. 1142; Connelly and Blus 1991, p. 4). Both Post (1951, p. 383) and Blus *et al.* (1989, p. 1142) located depredated sage-grouse carcasses in areas that had been treated with insecticides. Exposure to these insecticides may have predisposed sage-grouse to predation. Sage-grouse mortalities also were documented in a study where they were exposed to strychnine bait used to control small mammals (Ward *et al.* 1942 as cited in

Schroeder *et al.* 1999, p. 16). While we do not have specific information on these effects occurring in Gunnison sage-grouse, the effects observed in greater sage-grouse can be expected if similar situations arise within Gunnison sage-grouse habitat.

Cropland spraying may affect populations that are not adjacent to agricultural areas, given the distances traveled by females with broods from nesting areas to late brood-rearing areas (Knick *et al.* 2011, p. 211). The actual footprint of this effect cannot be estimated, because the distances sage-grouse travel to get to irrigated and sprayed fields is unknown (Knick *et al.* 2011, p. 211). Similarly, actual mortalities from insecticides may be underestimated if sage-grouse disperse from agricultural areas after exposure.

Much of the research related to pesticides that had either lethal or sublethal effects on greater sage-grouse was conducted on pesticides that have been banned or have had their use restricted for more than 20 years due to their toxic effects on the environment (e.g., dieldrin). We currently do not have any information to show that the banned pesticides are having negative impacts to sage-grouse populations through either illegal use or residues in the environment. For example, sage-grouse mortalities were documented in a study where they were exposed to strychnine bait used to control small mammals (Ward *et al.* 1942 as cited in Schroeder *et al.* 1999, p. 16). According to the U.S. Environmental Protection Agency (EPA), above-ground uses of the rodenticide strychnine were prohibited in 1988 and those uses remain temporarily cancelled today. We do not know when, or if, above-ground uses will be permitted to resume. Currently, strychnine is registered for use only below-ground as a bait application to control pocket gophers (*Thomomys* sp.; EPA 1996, p. 4). Therefore, the current legal use of strychnine baits is unlikely to present much of an exposure risk to sage-grouse. No information on illegal use, if it occurs, is available. We have no other information regarding mortalities or sublethal effects of strychnine or other banned pesticides on sage-grouse.

Although a reduction in insect population levels resulting from insecticide application can potentially affect nesting sage-grouse females and chicks (Willis *et al.* 1993, p. 40; Schroeder *et al.* 1999, p. 16), there is no information as to whether insecticides are impacting survivorship or productivity of the Gunnison sage-grouse.

Use of insecticides to control mosquitoes is infrequent and probably does not have detrimental effects on sage-grouse. Available insecticides that kill adult mosquitoes include synthetic pyrethroids such as permethrin, which are applied at very low concentrations and have very low vertebrate toxicity (Rose 2004). Organophosphates such as malathion have been used at very low rates to kill adult mosquitoes for decades, and are judged relatively safe for vertebrates (Rose 2004).

Herbicide applications can kill sagebrush and forbs important as food sources for sage-grouse (Carr 1968 *in* Call and Maser 1985, p. 14). The greatest impact resulting from a reduction of either forbs or insect populations is to nesting females and chicks due to the loss of potential protein sources that are critical for successful egg production and chick nutrition (Johnson and Boyce 1991, p. 90; Schroeder *et al.* 1999, p. 16). A comparison of applied levels of herbicides with toxicity studies of grouse, chickens, and other gamebirds (Carr 1968, *in* Call and Maser 1985, p. 15) concluded that herbicides applied at recommended rates should not result in sage-grouse poisonings.

In summary, historically insecticides have been shown to result in direct mortality of individuals, and also can reduce the availability of food sources, which in turn could contribute to mortality of sage-grouse. Despite the potential effects of pesticides, we could find no information to indicate that the use of these chemicals, at current levels, negatively affects Gunnison sage-grouse population numbers. Schroeder *et al.*'s (1999, p. 16) literature review found that the loss of insects can have significant impacts on nesting females and chicks, but those impacts were not detailed. Many of the pesticides that have been shown to have an effect on sage-grouse have been banned in the United States for more than 20 years. We currently do not have any information to show that either the illegal use of banned pesticides or residues in the environment are presently having negative impacts to Gunnison sage-grouse populations. While the reduction in insect availability via insecticide application has not been documented to affect overall population numbers in sage-grouse, it appears that insect reduction, because of its importance to chick production and survival, could be having as yet undetected negative impacts in populations with low population numbers. At present, however, there is no information available to indicate that either herbicide or insecticide applications pose a threat to the species.

Contaminants

Gunnison sage-grouse exposure to various types of environmental contaminants may potentially occur as a result of agricultural and rangeland management practices, mining, energy development and pipeline operations, and transportation of materials along highways and railroads.

We expect that the number of sage-grouse occurring in the immediate vicinity of wastewater pits associated with energy development would be small due to the small amount of energy development within the species' range, the typically intense human activity in these areas, the lack of cover around the pits, and the fact that sage-grouse do not require free standing water. Most bird mortalities recorded in association with wastewater pits are water-dependent species (e.g., waterfowl), whereas dead ground-dwelling birds (such as the sage-grouse) are rarely found at such sites (Domenici 2008, pers. comm.). However, if the wastewater pits are not appropriately screened, sage-grouse may have access to them and could ingest water and/or become oiled while pursuing insects. If these birds then return to sagebrush cover and die, their carcasses are unlikely to be found as only the pits are surveyed.

A few gas and oil pipelines occur within the San Miguel population. Exposure to oil or gas from pipeline spills or leaks could cause mortalities or morbidity to Gunnison sage-grouse. Similarly, given the network of highways and railroad lines that occur throughout the range of the Gunnison sage-grouse, there is some potential for exposure to contaminants resulting from spills or leaks of hazardous materials being conveyed along these transportation corridors. We found no documented occurrences of impacts to Gunnison sage-grouse from such spills, and we do not expect they are a significant source of mortality or threat to the species because these types of spills occur infrequently and may involve only a small area within the occupied range of the species.

Summary of Factor E: Other Natural or Manmade Factors

Based on the information above, we find that small population size and structure is a threat to the six satellite populations of Gunnison sage-grouse, both now and into the future. Although genetic consequences of low Gunnison sage-grouse population numbers have not been definitively detected to date, the results from Stiver *et al.* (2008, p. 479) suggest that six of the seven populations may have effective sizes low enough to induce genetic deterioration, and that all seven could be losing adaptive potential. While some of these consequences may be ameliorated by translocations, information indicates the long-term viability of Gunnison sage-grouse is compromised by this situation, particularly when combined with threats discussed in other Factors. Therefore, we have determined that genetics risks related to the small population size of Gunnison sage-grouse are a threat to the species.

Available PVAs for Gunnison sage-grouse have resulted in somewhat disparate findings, each with their own limitations or weaknesses. We found that Davis (2012, entire) represents the best available scientific information regarding the viability of Gunnison sage-grouse. This represents the longest and most current demographic study and population viability analysis for Gunnison sage-grouse. Based on that study, the Gunnison Basin and San Miguel populations, the two largest populations, are declining, with more pronounced declines in the latter (Davis 2012, p. 87). The survival and persistence of the San Miguel population, and likely the smaller satellite populations as well, appear to be at risk in the near future. Though we expect the Gunnison Basin population will persist longer than the satellite populations, Davis (2012, entire) indicated that its future viability is also at risk due to natural environmental and demographic fluctuations.

Small population size, declining population trends, and apparent isolation indicate long-term population persistence and evolutionary potential (i.e., resiliency) are compromised in the satellite populations. In general, while various natural factors would not limit sage-grouse populations across large geographic scales under historical conditions or in larger populations, they may contribute to local population declines or extirpations when populations are small or when weather patterns, habitats, or mortality rates are altered. Multiple populations across a broad geographic area (population redundancy) provide insurance against catastrophic events, such as prolonged drought, and the aggregate number of individuals across all populations increases the probability of demographic persistence and preservation of overall genetic diversity by providing an important genetic reservoir (representation) (GSRSC 2005, p. 179). As discussed, viability of the six satellite populations is currently at risk, and those cover 37 percent of the species occupied range. Loss of as much as 37 percent of the species' occupied range would impact the species' overall viability. The cumulative effects of ongoing and future threats, such as habitat loss (Factor A) and drought (discussed above), will further contribute to declining and increasingly isolated populations and, ultimately, smaller population size and structure.

Based on the best available information, we determined that resiliency, redundancy, and representation in Gunnison sage-grouse are inadequate, or will be inadequate in the future, to ensure the species' long-term viability. The best available information indicates population redundancy, in particular, will be limited or compromised in the future, due to the probable extirpation of one or more satellite populations, thereby decreasing the species' chances of survival in the face of limiting factors. The rangewide cumulative effects of ongoing and future threats (see discussions in Factors A through C, and E) will further compromise resiliency, redundancy, and representation of the species. Current and future threats to the Gunnison Basin population (in particular, see Drought, Climate Change, and Disease sections) combined with the probable loss of one or more satellite populations and overall reduction of range indicate the long-term persistence of Gunnison sage-grouse is at risk.

While sage-grouse have evolved with drought, population trends suggest that drought is at least correlated with, and likely an underlying cause of, observed declines. We found that drought is a current and future threat to Gunnison sage-grouse. Based on the best available information, pesticides are being used infrequently enough and in accordance with manufacturer labeling such that they are not adversely affecting populations of the Gunnison sage-grouse. The most likely impact of insecticides on

Gunnison sage-grouse is the reduction of insect prey items. However, we could find no information to indicate that use of insecticides, in accordance with their label instructions, is a threat to Gunnison sage-grouse. We similarly do not have information indicating that contaminants, as described above, are a threat to the species.

Cumulative Effects from Factors A through E

Many of the threats described in this finding may cumulatively or synergistically impact Gunnison sage-grouse beyond the scope of each individual threat. For example, grazing practices inconsistent with local ecological conditions alone may only affect portions of Gunnison sage-grouse habitat. However, grazing practices inconsistent with local ecological conditions, combined with invasive plants, drought, and recreational activities may collectively result in substantial habitat decline across large portions of the species' range. In turn, climate change may exacerbate those effects, further diminishing habitat and increasing the isolation of already declining populations, making them more susceptible to genetic deterioration, disease, or catastrophic events such as drought and fire. Drought, a substantial threat to Gunnison sage-grouse rangewide, likely intensifies other threats such as predation, invasive plants, habitat loss, and fire. The impact of residential development is increased by the additional disturbance footprint and area of species' avoidance of other infrastructure such as roads, powerlines, and fences. Further, predation on Gunnison sage-grouse may increase as a result of the increase in human disturbance and development. The impact of residential development can be increased by other anthropogenic stressors resulting in habitat loss and decline, such as powerlines, roads, and other infrastructure. Numerous threats are likely acting cumulatively to further increase the likelihood that the species will become extinct in the future. The cumulative effects of ongoing and future threats (Factors A through E), and small and declining population size and structure, in particular, are likely to further reduce resiliency, redundancy, and representation of the species.

Determination

We have carefully assessed the best scientific and commercial information available regarding the past, present, and future threats to the Gunnison sage-grouse. We consider the five factors identified in section 4(a)(1) of the Act in determining whether the Gunnison sage-grouse meets the Act's definition of an endangered species (section 3(6)) or a threatened species (section 3(20)).

Section 3 of the Act defines an "endangered species" as "any species which is in danger of extinction throughout all or a significant portion of its range," and defines a "threatened species" as "any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range." Although these statutory definitions are similar, there is a crucial temporal distinction between them. The statutory definition of an "endangered species," a species that "is in danger of extinction," connotes an established, present condition. The statutory definition of a "threatened species," a species that is "likely to become an endangered species within the foreseeable future," connotes a predicted or expected future condition. Thus, a key statutory difference between a threatened and endangered species is the time of when a species may be in danger of extinction, either now (endangered) or in the foreseeable future (threatened).

As a result of new information and comments received on the proposed rule, we have reconsidered our prior determination that the Gunnison sage-grouse is currently in danger of extinction and therefore meets the definition of an “endangered species” under the Act. This reconsideration focuses on the principal threat relied upon in the proposed rule, the threat to the species posed by current residential development and associated infrastructure, especially in the critical Gunnison Basin population area.

In the proposed rule, we reported that the results of a GIS analysis of parcel ownership and development in occupied habitat in Gunnison County indicated that the current level of residential development in this habitat was strongly decreasing the likelihood of Gunnison sage-grouse using 49 percent of this land area as nesting habitat. This analysis was based on a model indicating Gunnison sage-grouse tend to select nest sites in larger landscapes (1.5 km [0.9 mi] radii) with a low density of residential development (Aldridge 2012, p. 10). We considered the results of applying this modeling to the current level of residential development to be particularly concerning given the close link of nesting habitat to early brood rearing habitat and the sensitivity of the species population dynamics during these life history stages. In assessing the risk posed by current levels of residential development, we also noted that the GSRSC (2005, pp. 160-61) hypothesized that residential density in excess of one housing unit per 1.3 km^2 (0.5 mi^2) could cause declines in Gunnison sage-grouse populations, and that under this hypothesis residential development is limiting the species in approximately 18 percent of its habitat in Gunnison County.

Since our proposed listing rule, we reevaluated residential development and found it to be a current threat to the species as a whole, but that it is a lower magnitude threat to the Gunnison Basin population than we previously thought. Our reevaluation of residential development in the Gunnison Basin (Factor A above) found that human developments in occupied Gunnison sage-grouse habitat in Gunnison County occur and have increased over time. Our overall conclusion, however, was that current development in the Gunnison Basin population area is a threat of low magnitude to the persistence of this Gunnison sage-grouse population. The Gunnison Basin population is currently relatively stable, based on population trends since 1996. It is also the most important population for the species' survival with approximately 63 percent of occupied habitat, approximately 60 percent of the leks, and 84 percent of the rangewide population occurring in Gunnison Basin. Thus the current level of threat of residential development in the Gunnison Basin is not causing the rangewide population to trend towards extinction.

Based on the factors presented in the Residential Development Section above (Factor A), outside of the Gunnison Basin, residential development is likely to have the greatest impact on the San Miguel, Cerro Summit-Cimarron-Sims Mesa, and Poncha Pass populations of Gunnison sage-grouse. For the remaining three Gunnison sage-grouse populations, we found that current residential development may impact individual birds or areas of habitat, but is a threat of low magnitude at the population level at the present time. Although residential development is a current and future threat to the San Miguel, Cerro Summit-Cimarron-Sims Mesa, and Poncha Pass populations, we do not believe that it is a significant threat to the species rangewide such that it meets the definition of an endangered species.

We find that the other factors that we identified as threats in the proposed rule (inadequate regulatory mechanisms, genetic issues and small population sizes, predation, improper grazing management, and the interaction among climate change, invasive plants and drought/weather) are still current threats to the species, but when considered individually and cumulatively with other current threats (including the lower level of the threat of development to the Gunnison Basin population), they do not support a finding that the species is currently in danger of extinction. Based on the preceding analysis, we have determined that Gunnison sage-grouse is not an endangered species as defined in the Act.

However, considering both our analysis of the species' status here and in the proposed listing rule, and new information and comments received following publication of the proposed rule, we find that Gunnison sage-grouse qualifies as a threatened species under the Act because it is likely to become in danger of extinction throughout all of its range in the foreseeable future.

The Act does not define the term ''foreseeable future.'' In a general sense, the foreseeable future is the period of time over which events can reasonably be anticipated. In the context of the definition of ''threatened species,'' the Service interprets the foreseeable future as the extent of time over which the Secretary can reasonably rely on predictions about the future in making determinations about the future conservation status of the species. It is important to note that references to ''reliable predictions'' are not meant to refer to reliability in a statistical sense of confidence or significance; rather the words ''rely'' and ''reliable'' are intended to be used according to their common, non-technical meanings in ordinary usage. In other words, we consider a prediction to be reliable if it is reasonable to depend upon it in making decisions, and if that prediction does not extend past the support of scientific data or reason so as to venture into the realm of speculation.

In considering threats to the species and whether they rise to the level such that listing the species as a threatened or endangered species is warranted, we assess factors such as the imminence of the threat (is it currently affecting the species or, if not, when do we expect the effect from the threat to commence, and whether it is reasonable to expect the threat to continue into the future), the scope or extent of the threat, the severity of the threat, and the synergistic effects of all threats combined. If we determine that the species is not currently in danger of extinction, then we must determine whether, based upon the nature of the threats, it is reasonable to anticipate that the species may become in danger of extinction within the foreseeable future. As noted in the 2009 Department of the Interior Solicitor's opinion on foreseeable future, ''in some cases, quantifying the foreseeable future in terms of years may add rigor and transparency to the Secretary's analysis if such information is available. Such definitive quantification, however, is rarely possible and not required for a foreseeable future analysis'' (M–37021, January 16, 2009; p. 9). In some specific cases where extensive data are available to allow for the modeling of extinction probability over various time periods (e.g., the PVAs performed on the Gunnison sage-grouse), the Service has provided quantitative estimates of what may be considered to constitute the foreseeable future.

We consider foreseeable future in this final rule to be 40-60 years based on the following:

(1) The most current and comprehensive demographic study and population viability analysis (Davis 2012). In contrast to the RCP PVA described below, this study exclusively used demographic information from Gunnison sage-grouse and included environmental stochastic factors such as fire, disease, and drought. This analysis was done for the Gunnison Basin (2005-2010) and the San Miguel populations (2007-2010), the two largest populations (Davis 2012, entire). The study concluded that the small San Miguel Basin population had a high probability (53 percent chance) of going extinct in the next 30 years. For the Gunnison Basin population, the model found a minimum extinction time of 31 years and a mean extinction time of 58 years, based on a six-year data set during a period with a slightly declining population. However, because the study occurred during a drought period and the overall population declined during this period, which is inconsistent with the long-term record of stability for this population, we are also utilizing the RCP PVA in our consideration of the foreseeable future.

(2) A second population viability analysis done in conjunction with the RCP. This PVA found that small populations of birds (< 25 and 25 to 50 birds) are at a high risk of extinction within the next 50 years (2055) with an 86 percent and 59 percent chance of extinction respectively (GSRSC 2005, pp. 170 and G-27). For the Gunnison Basin population, this PVA found the probability of extinction in the next 50 years was less than 1 percent (GSRSC 2005, p. G-21).

(3) The Gunnison Basin Climate Change Vulnerability Assessment (The Nature Conservancy (TNC) *et al*. 2011, p. 4), which uses a timeframe of 50 years to project the likely effects of climate change in the Gunnison Basin.

As noted in the proposed listing rule, we anticipate that current threats to the species will increase over time throughout the species' range. Based on the analysis of the listing Factors A-E described above, we now find that the Gunnison sage-grouse is ''likely to become endangered throughout all or a significant portion of its range within the foreseeable future'' based on the following continuing, new, and increasing threats, which are acting on the species individually and cumulatively, contributing to the challenges faced by Gunnison sage-grouse in the foreseeable future:

(1) Small population size and population structure (Factor E) occur in all of the six satellite populations, or across approximately 37 percent of occupied range for the species. Without concerted management effort, one or more of the satellite populations are likely to go extinct in the next 50 years. Satellite populations are isolated and small, with generally declining trends, low resilience, and low genetic diversity. The small sizes of the satellite populations of Gunnison sage-grouse make them particularly sensitive to

stochastic and demographic fluctuations, and this vulnerability is exacerbated by other threats such as drought. Having multiple populations across a broad geographic area (population redundancy) is needed to provide insurance against such catastrophic events.

(2) Gunnison sage-grouse require large areas of sagebrush for long-term persistence, and thus are affected by factors that occur at the landscape scale. Habitat decline, including habitat loss, degradation, and fragmentation of sagebrush habitats (Factor A), is a primary cause of the decline of Gunnison sage-grouse populations. Habitat loss due to residential and infrastructural development (including roads, powerlines, and fences) is a significant threat to Gunnison sage-grouse across its range. Due to habitat decline, the seven individual populations are now mostly isolated, with limited migration and gene flow among populations, increasing the likelihood of population extirpations.

a. Thirty-two percent of occupied Gunnison sage-grouse habitat rangewide is at risk of residential development (Factor A). Residential development is a substantial risk to the San Miguel, Poncha Pass, and Cerro-Cimarron-Sims populations, and the effects of residential development will likely reduce connectivity among satellite populations and potential connectivity between the Gunnison Basin and satellite populations to the west. Although our reevaluation found the threat of current residential development in the Gunnison Basin to be of a lower magnitude than previously thought, we believe that the level of impact and threat from residential development will increase in the Gunnison Basin population in the future.

The collective influences of fragmentation and disturbance from roads (Factor A) reduce the amount of effective habitat, as roads are largely avoided by sage-grouse. Powerlines and fences (Factor A) also fragment habitat and are avoided by sage-grouse. They are also sources of direct mortality through strikes, electrocution, and by attracting and increasing the predator population.

(3) Drought (Factor E) has contributed to substantial declines in all Gunnison sage-grouse populations. Drought likely intensifies other stressors such as predation, invasive plants, and fire. Based on the best available information, we concluded that drought is a substantial threat to Gunnison sage-grouse rangewide, both now and into the future.

(4) Warming is occurring more rapidly in the southwestern region of the United States, including western Colorado, than elsewhere in the country. Based on the best available information on climate change projections over the next 35 years or so, climate change (Factor A) has the potential to alter important seasonal habitats and food resources of Gunnison sage-grouse, the distribution and extent of sagebrush, and the occurrence of invasive weeds and associated fire frequencies. Climate change effects, including increased drought, are predicted in all populations.

(5) West Nile virus (Factor C) is present throughout most of the range of Gunnison sage-grouse. Although the disease has not yet been documented in any Gunnison sage-grouse, it has caused large mortality events and has also caused the deaths of other gallinaceous birds including greater sage-grouse. The effects of drought and increased temperatures will contribute to the prevalence and spread of West Nile virus and, therefore, the exposure of Gunnison sage-grouse to this disease. We concluded that West Nile virus is a future threat to Gunnison sage-grouse rangewide.

(6) The Davis PVA (2012) is the most current and comprehensive demographic study and population viability analysis. This study exclusively used demographic information from Gunnison sage-grouse and incorporated environmental stochasticity (variability in population growth rates due to external factors such as weather, fire, disease, and predation) and demographic stochasticity (variability in population growth rates due to survival and reproduction rates). Model simulations predicted population declines in the

future (Davis 2012, pp. 105-106). Combining the six years of demographic data (2005 to 2010) from both populations, environmental stochastic simulations resulted in a minimum extinction time of 31 years and a mean or expected extinction time in this PVA of 58 years. Although this model shows that the extinction probability for the Gunnison Basin population is farther into the future, it still supports a determination that the species is likely to become endangered in the foreseeable future.

(7) We have found the above-listed factors to be significant threats that are acting on Gunnison sage-grouse populations rangewide and collectively are likely to increase over time. We further examined whether these threats to the Gunnison sage-grouse are adequately addressed by existing regulatory mechanisms (Factor D). We evaluated the adequacy of existing local, State, and Federal plans, laws, and regulations currently in place across the range of the species and determined that while they will help to reduce the negative effects of human development and infrastructure on Gunnison sage-grouse in some respects, and that continuation of these efforts across the species' range will be necessary for conservation of the species, cumulatively the existing regulatory mechanisms are not being appropriately implemented such that land-use practices result in habitat conditions that adequately support the life-history needs of the species. Existing plans, laws, and regulations are not effective at ameliorating the threats resulting from small population size and structure, habitat decline, drought, climate change, and disease as discussed above. Further, while these regulatory mechanisms may help reduce current threats to the species, they are insufficient to fully reduce or eliminate the increase in threats that may act on the species in the future.

(8) Other current and future threats to the species identified in this final rule, including grazing management inconsistent with local ecological conditions, fences, invasive plants, fire, mineral development, piñon-juniper encroachment, large scale water development (all in Factor A); predation (primarily associated with anthropogenic disturbance and habitat decline)(Factor C); and recreation (Factor E) are acting at a

> more localized level, and while individually may affect some populations more than others, they do not individually or cumulatively rise to the level of a significant rangewide threat. However, the current impacts of these threats do contribute to the overall status of the species as "likely to become endangered in the foreseeable future". As discussed under the Threat Factors sections above, we also expect that many of these threats will increase in the future.

Summary of the Threatened Determination

In summary, multiple threats affecting Gunnison sage-grouse and its habitat are occurring and interacting synergistically, resulting in increasingly fragmented habitat and other threats. We expect all of these threats to increase in the future. The components of human infrastructure, once present on the landscape, become virtually permanent features, fragmenting sagebrush habitats, and resulting in the reduction or elimination of proactive and effective management alternatives. We anticipate other threats such as drought, climate change, invasive species, and fire frequency to increase in the future and to act synergistically to become greater threats to Gunnison sage-grouse. We anticipate renewable energy development, particularly geothermal and wind energy development, to increase in some population areas. Taken cumulatively, the ongoing and future habitat-based impacts in all populations will likely act to fragment and further isolate populations of the Gunnison sage-grouse. As these threats increase, one or more of the satellite populations are likely to go extinct due to small population size, genetic factors, and stochastic environmental events and the remaining populations will become in danger of extinction.

Therefore, we find that Gunnison sage-grouse is likely to become endangered throughout all of its range in the foreseeable future, and thus is a threatened species as defined by the Act.

As noted above, in determining that Gunnison sage-grouse is a threatened species, we also considered ongoing conservation efforts and existing regulatory mechanisms. Based on the best available information (Factor A and Factor D), such conservation efforts are not currently adequate to address the full scope of threats to Gunnison sage-grouse, particularly habitat loss and decline, small population size and structure, drought, climate change, and disease. While some efforts have provided conservation benefits at the rangewide scale, such as the CCAA and CEs, these and other conservation efforts are limited in scope and therefore limited in their ability to effectively reduce or remove the threats to the species and its habitat across its range. Thus, although ongoing conservation efforts are a positive step toward conserving Gunnison sage-grouse, and some have undoubtedly reduced the severity of certain threats to the species, on the whole we find that current conservation efforts are not sufficient to offset the full scope of threats to Gunnison sage-grouse or prevent the increase in threats that result in the species likely becoming in danger of extinction in the foreseeable future. Therefore, we cannot conclude that the species is not warranted for listing.

Therefore, on the basis of the best available scientific and commercial information, we are listing Gunnison sage-grouse as threatened in accordance with sections 3(20) and 4(a)(1) of the Act.

The Gunnison sage grouse is restricted in its range and the threats occur throughout its range. Therefore, we assessed the status of the species throughout its entire range. Under the Act and our implementing regulations, a species may warrant listing if it is endangered or threatened throughout all or a significant portion of its range. Because we have determined that Gunnison sage-grouse is threatened throughout all of its range, no portion of its range can be "significant" for purposes of the definitions of "endangered species" and "threatened species." See the Final Policy on Interpretation of the Phrase “Significant Portion of Its Range” in the Endangered Species Act’s Definitions of “Endangered Species” and “Threatened Species” (79 FR 37577).

Available Conservation Measures

Conservation measures provided to species listed as endangered or threatened under the Act include recognition, recovery actions, requirements for Federal protection, and prohibitions against certain practices. Recognition through listing results in public awareness and conservation by Federal, State, Tribal, and local agencies, private organizations, and individuals. The Act encourages cooperation with the States and requires that recovery actions be carried out for all listed species. The protection required by Federal agencies and the prohibitions against certain activities are discussed, in part, below.

The primary purpose of the Act is the conservation of endangered and threatened species and the ecosystems upon which they depend. The ultimate goal of such conservation efforts is the recovery of these listed species, so that they no longer need the protective measures of the Act. Subsection 4(f) of the Act requires the Service to develop and implement recovery plans for the conservation of endangered and threatened species. The recovery planning process involves the identification of actions that are necessary to halt or reverse the species' decline by addressing the threats to its survival and recovery. The goal of this process is to restore listed species to a point where they are secure, self-sustaining, and functioning components of their ecosystems.

Recovery planning includes the development of a recovery outline shortly after a species is listed, and preparation of a draft and final recovery plan. The recovery outline guides the immediate implementation of urgent recovery actions and describes the process to be used to develop a recovery plan. The recovery plan identifies site-specific management actions that set a trigger for a review of the five factors that control whether a species remains endangered or threatened or may be downlisted or delisted, and methods for monitoring recovery progress. Revisions of the plan may be made to address continuing or new threats to the species, as new substantive information becomes available. Incorporating or adapting components of the Gunnison sage-grouse RCP for a recovery outline will be considered. Recovery plans also establish a framework for agencies to coordinate their recovery efforts and provide estimates of the cost of implementing recovery tasks. Recovery teams (composed of species experts, Federal and State agencies, nongovernmental organizations, and stakeholders) are often established to develop recovery plans. When completed, the recovery outline, draft recovery plan, and the final recovery plan will be available on our website (*http://www.fws.gov/endangered*), or from our Western Colorado Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Implementation of recovery actions generally requires the participation of a broad range of partners, including other Federal agencies, States, Tribes, nongovernmental organizations, businesses, and private landowners. Examples of recovery actions include habitat restoration (e.g., restoration of native vegetation), research, captive propagation and reintroduction, and outreach and education. The recovery of many listed species cannot be accomplished solely on Federal lands because their range may occur primarily or solely on non-Federal lands. To achieve recovery of these species requires cooperative conservation efforts on private, State, and Tribal lands.

Funding for recovery actions may be available from a variety of sources, including Federal budgets, State programs, and cost share grants for non-Federal landowners, the academic community, and nongovernmental organizations. In addition, pursuant to section 6 of the Act, the States of Colorado and Utah will be eligible for Federal funds to implement management actions that promote the protection and recovery of the Gunnison sage-grouse. Information on our grant programs that are available to aid species recovery can be found at: *http://www.fws.gov/grants*.

Please let us know if you are interested in participating in recovery efforts for this species. Additionally, we invite you to submit any new information on this species whenever it becomes available and any information you may have for recovery planning purposes (see **FOR FURTHER INFORMATION CONTACT**).

Section 7(a) of the Act requires Federal agencies to evaluate their actions with respect to any species that is proposed or listed as endangered or threatened and with respect to its critical habitat, if any is designated. Regulations implementing this interagency cooperation provision of the Act are codified at 50 CFR part 402. When a species is listed, section 7(a)(2) of the Act requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of the species or destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency must enter into consultation with the Service.

Federal agency actions within the species' habitat that may require consultation as described in the preceding paragraph include management and any other landscape-altering activities on Federal lands administered by the Bureau of Land Management, U.S. Forest Service, and National Park Service; issuance of section 404 Clean Water Act permits by the Army Corps of Engineers; construction and management of gas pipeline and power line rights-of-way by the Federal Energy Regulatory Commission; and construction and maintenance of roads or highways by the Federal Highway Administration.

The Act and its implementing regulations set forth a series of general prohibitions and exceptions that apply to all endangered and threatened wildlife. The prohibitions of section 9(a)(2) of the Act, codified at 50 CFR 17.21 for endangered wildlife, in part, make it illegal for any person subject to the jurisdiction of the United States to take (includes harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect; or to attempt any of these), import, export, ship in interstate commerce in the course of commercial activity, or sell or offer for sale in interstate or foreign commerce any listed species. Under the Lacey Act (18 U.S.C. 42–43; 16 U.S.C. 3371–3378), it is also illegal to possess, sell, deliver, carry, transport, or ship any such wildlife that has been taken illegally. Certain exceptions apply to agents of the Service and State conservation agencies.

We may issue permits to carry out otherwise prohibited activities involving endangered and threatened wildlife species under certain circumstances. Regulations governing permits are codified at 50 CFR 17.22 for endangered species, and at 17.32 for threatened species. With regard to endangered wildlife, a permit must be issued for the following purposes: for scientific purposes, to enhance the propagation or survival of the species, and for incidental take in connection with otherwise lawful activities.

It is our policy, as published in the **Federal Register** on July 1, 1994 (59 FR 34272), to identify to the maximum extent practicable at the time a species is listed, those activities that would or would not constitute a violation of section 9 of the Act. The intent of this policy is to increase public awareness of the effect of a listing on proposed and ongoing activities within the range of listed species. The following activities could potentially result in a violation of section 9 of the Act; this list is not comprehensive:

(1) Unauthorized collecting, handling, possessing, selling, delivering, carrying, or transporting of the species, including import or export across State lines and international boundaries, except for properly documented antique specimens of these taxa at least 100 years old, as defined by section 10(h)(1) of the Act.

(2) Actions that would result in the loss of sagebrush overstory plant cover or height. Such activities could include, but are not limited to, the removal of native shrub vegetation by any means for any infrastructure construction project; direct conversion of sagebrush habitat to agricultural land use; habitat improvement or restoration projects involving mowing, brush-beating, Dixie harrowing, disking, plowing, Tebuthiuron (Spike) and other herbicide applications, or prescribed burning; and fire suppression activities.

(3) Actions that would result in the loss or reduction in native herbaceous understory plant cover or height, and a reduction or loss of associated arthropod communities. Such activities could include, but are not limited to, livestock grazing, the

application of herbicides or insecticides, prescribed burning and fire suppression activities; and seeding of nonnative plant species that would compete with native species for water, nutrients, and space.

(4) Actions that would result in Gunnison sage-grouse avoidance of an area during one or more seasonal periods. Such activities could include, but are not limited to, the construction of vertical structures such as power lines, fences, communication towers, buildings; motorized and non-motorized recreational use; and activities such as well drilling, operation, and maintenance, which would entail significant human presence, noise, and infrastructure.

Questions regarding whether specific activities would constitute a violation of section 9 of the Act should be directed to the Western Colorado Field Office (see **FOR FURTHER INFORMATION CONTACT**). Requests for copies of the regulations concerning listed animals and general inquiries regarding prohibitions and permits may be addressed to the U.S. Fish and Wildlife Service, Endangered Species Permits, Denver Federal Center, P.O. Box 25486, Denver, Colorado, 80225-0489 (telephone (303) 236-4256; facsimile (303) 236-0027).

Under section 4(d) of the ESA, the Secretary has discretion to issue such regulations as he deems necessary and advisable to provide for the conservation of threatened species. Our implementing regulations (50 CFR 17.31) for threatened wildlife generally incorporate the prohibitions of section 9 of the Act for endangered wildlife, except when a “special rule” promulgated pursuant to section 4(d) of the Act has been issued with respect to a particular threatened species. In such a case, the general prohibitions in 50 CFR 17.31 would not apply to that species, and instead, the special rule would define the specific take prohibitions and exceptions that would apply for that particular threatened species, which we consider necessary and advisable to conserve the species. The Secretary also has the discretion to prohibit by regulation with respect to a threatened species any act prohibited by section 9(a)(1) of the ESA. Exercising this discretion, which has been delegated to the Service by the Secretary, the Service has developed general prohibitions that are appropriate for most threatened species in 50 CFR 17.31 and exceptions to those prohibitions in 50 CFR 17.32. We continue to evaluate the appropriateness of issuing a special rule for the Gunnison sage-grouse in the future.

Conservation Measures for Gunnison Sage-Grouse Recovery

We want to work cooperatively with and to support the ongoing conservation efforts of the many public and private partners across the range. Our desire is to build on the important existing conservation efforts of many partners to bring the species to a point where listing will no longer be necessary.

In 2005, the Gunnison sage-grouse Range-wide Conservation Plan (RCP) (Gunnison Sage-grouse Rangewide Steering Committee 2005) identified conservation actions for the Gunnison sage-grouse. In 2013, the counties belonging to the County Coalition for Gunnison sage-grouse indicated that they would work with Colorado Parks

& Wildlife (CPW) to update and revise the RCP in the near future to better reflect best available science and conservation progress made to date. Our partners, the counties, and the public asked the Service for our perspective on what conservation actions would be necessary to conserve the Gunnison sage-grouse. In advance of the revision of the RCP, and in advance of recovery planning for the species, the Service gathered the best available information and conferred with our partners to outline conservation recommendations that, if achieved, would improve the Service's confidence in the conservation of Gunnison sage-grouse. The conservation recommendations identified here are intended to update, modify, and build on the conservation strategies in the 2005 RCP and to be discussed in the context of an upcoming revision to the RCP. The approach and actions identified in this section, if completed, would help increase the satellite populations' redundancy to the Gunnison Basin population, thereby increasing the resiliency of the species. The Service further recommends that a recovery strategy include population and habitat targets for the Gunnison Basin and the satellite populations using a scientifically defensible, peer-reviewed approach.

Targeting Satellite Populations for Conservation Efforts

The Gunnison Basin is the largest population (approximately 3,978 birds in 2014) and, while showing variation from 1996 to 2014, has been relatively stable. However, redundancy to the Gunnison Basin population is a necessary element to have confidence in the conservation of the Gunnison sage-grouse. Confidence in redundancy provided by a satellite population is based on whether the satellite population is able to withstand perturbations and recover and persist. We recommend developing a recovery strategy that will be built around the resilience of multiple satellite populations to provide redundancy to the Gunnison Basin population.

The total abundance of Gunnison sage-grouse is an important indicator of species-level resiliency. Of the six satellite populations, Poncha Pass and Cerro Summit–Cimarron–Sims Mesa have very low population numbers to the extent that their potential to provide redundancy would be very limited without extraordinary conservation actions taking place over a long period of time. Therefore, to maximize the potential to achieve resilience in the satellite populations that would provide redundancy to the Gunnison Basin population, our initial recommendations for conservation measures focus on the Piñon Mesa, Crawford, San Miguel, and Dove Creek–Monticello satellite populations. In addition, the Service agrees with the RCP assertion that the Cerro Summit–Cimarron–Sims Mesa area is needed for the conservation of Gunnison sage-grouse, as it has and should continue to provide an important habitat linkage to the other satellite populations. However, the Service recommends focusing limited conservation resources on the four larger satellite populations while still protecting the Cerro Summit–Cimarron–Sims Mesa area. This approach should yield the quickest conservation results and improve the resilience of the species as a whole.

Summary of Service Recommendations

As soon as possible, we want to work with CPW and UDWR to convene science experts to identify targets for population numbers, habitat acreage, sagebrush cover, and limiting factors for the above-identified satellite populations. Development of the targets will guide recovery efforts and improve confidence in the conservation of the species as they are achieved.

Overarching Conservation Objectives

We recommend protections that should apply rangewide and could be achieved on Federal and non-Federal lands.

<u>Protection of Gunnison sage-grouse habitat that is currently occupied, or that becomes occupied through future expansion</u>

Any further loss of habitat quality or quantity of habitat will decrease the long-term viability of Gunnison sage-grouse. In addition, current occupied habitat is not of sufficient quality or quantity to provide confidence in conservation of the Gunnison sage-grouse. Therefore the goal should be to protect **all habitat that is occupied or that becomes occupied through future expansion** from future loss and/or degradation, including temporary degradation related to indirect impacts of surface occupancy and/or disruptive activities.

A 4-mile restriction on surface disturbance (e.g. No Surface Occupancy) for all surface-disturbing activities around a lek should be enforced. If there are circumstances that preclude No Surface Occupancy within 4 miles around a lek, such as existing disturbances, disruptive activities, or valid existing fluid or locatable mineral rights in occupied habitat, permitted activities should follow the mitigation hierarchy of avoiding impact to the degree possible, minimizing impact, and providing compensatory mitigation to offset any unavoidable impacts. In addition, for those areas where No Surface Occupancy is precluded, the following recommendations apply:

- Limit permitted surface disturbances to 1 per section with no more than 3 percent surface disturbance, factoring in existing and new impacts, in that section.

Protect **breeding habitat and leks** from future loss and/or degradation, including temporary degradation related to indirect impacts of surface occupancy and/or disruptive activities.

- Leks and the area within 0.6 miles <u>must</u> be avoided and protected from surface occupancy and disruptive activities.
    - If avoidance and/or disturbance is not possible due to pre-existing valid rights, adjacent development, or split estate issues, development and/or disruptive activities should <u>only</u> be allowed in non-habitat areas with an adequate buffer to preclude impacts to sage-grouse habitat from noise and other human activities.

Protect **nesting habitat** from any future loss and/or degradation, including temporary degradation related to indirect impacts of surface occupancy and/or disruptive activities.

- The area from 1 to 6.5 km (0.6 to 4.0 mi) around a lek must be protected between March 1st and July 15th. Outside of this period, some disturbance may occur, but only if the disturbance does not exceed the disturbance cap, all feasible measures are taken to minimize impacts, and it is determined that the cumulative impact does not negatively affect reproductive success or reduce an individual's physiological ability to cope with environmental stress, and will not in the future.

Protect **winter habitat** from any future loss and/or degradation, including temporary degradation related to indirect impacts of surface occupancy and/or disruptive activities.

- Winter habitats need to be identified by CPW or UDWR and protected from October 1st to March 1st. If winter habitat and winter refuge areas are not identified, **all potential winter habitat** must be protected from October 1st to March 1st. Outside of this period, some disturbance may occur, but only if the disturbance does not exceed the disturbance cap, all feasible measures are taken to minimize impacts, and if it is determined that the cumulative impact does not remove or negatively impact the stands of sage-brush necessary for Gunnison sage-grouse winter survival.

Maintain **summer brood-rearing habitat**. In grazed areas, require grazing management appropriate to local ecological conditions to promote and achieve habitat characteristics representative of healthy sagebrush ecosystems and sage-grouse habitat.

- Areas within 0.4 km (0.25 mi) of known late summer/brood-rearing habitat must be maintained or enhanced to represent habitat characteristics representative of brood-rearing habitats described in the RCP.

Prevent noise disturbance during the breeding season.

- Do not allow any disruptive activities or surface occupancy that will increase noise levels 10 dBa above ambient noise level measured at sunrise at the perimeter of leks during the breeding season (March 1^{st} to May 31^{st}).

Increase Occupied Habitat

Reclaim and restore degraded habitat to meet characteristics of functional, seasonal sage-grouse habitats.

- Existing disturbances should meet reclamation standards that are aimed at restoring disturbances to functional sage-grouse habitat as described in the RCP and are representative of the pre-disturbance habitat type.

Range-wide Mitigation Strategy

In the Gunnison Basin and the satellite populations, any development and/or disruptive activities in occupied habitat will impact Gunnison sage-grouse. We recommend the development of land-use regulations that prescribe the following mitigation hierarchy of avoid, minimize, and compensate for unavoidable impacts, at the State or local level.

If avoidance of surface disturbance and disruptive activities around leks cannot be achieved, efforts to minimize and compensate for impacts will not offset impacts. Avoidance of direct and/or indirect disturbance of the area within 0.6 miles of existing leks is critical, due to sage-grouse site fidelity (Connelly 2000).

If land use regulations quantify the negative impacts of surface disturbance and disruptive activities on Gunnison sage-grouse and then require an offset that provides a net conservation benefit, that would help ensure that negative impacts do not overshadow conservation efforts. To be effective, mitigation policy must require avoidance of impacts as the highest priority, then minimization of impacts and finally offset of unavoidable impacts through conservation actions.

The San Miguel and Dove Creek–Monticello satellite populations may be impacted by oil and gas development. To manage the potential impact of oil and gas development, mitigation policy should specify best management practices and conservation measures to minimize impacts of oil and gas development to Gunnison sage-grouse and their habitat.

Conservation Actions Recommended for San Miguel, Dove Creek–Monticello, Crawford, and Piñon Mesa satellite populations.

The following are near-term high-priority recommendations for four of the satellite populations.

Assess Existing Habitat Availability and Quality

Habitat loss and degradation are recognized as causes of the decline in abundance and distribution of Gunnison sage-grouse. The Service agrees with the 2005 RCP recommendation that Gunnison sage-grouse seasonal habitat should be identified, habitat quality assessed, and changes in habitat monitored over time. If CPW and UDWR identify seasonal habitat types and assess habitat quality, it will improve their ability to identify potential limiting habitat types and prioritize habitat restoration efforts. The Gunnison Basin Sage-Grouse Habitat Prioritization Tool (HPT) identifies sage-grouse habitat and then discounts the value of the habitat based on distance to structures, roads, and power lines. However, the HPT covers only the Gunnison Basin and does not possess the functionality to determine habitat quality. A tool should be developed for all of the populations to monitor and detect changes to habitat quality and seasonal habitat availability. A habitat mapping tool could help identify where and how to improve habitat quality, prioritize habitat improvement projects, evaluate development threats and protection needs, and adaptively manage Gunnison sage-grouse for the satellite populations.

Reduce Pinyon-Juniper Encroachment

Pinyon-juniper encroachment degrades and, if untreated, eliminates sage-grouse habitat. Treatment of phase I and phase II encroachment levels of pinyon-juniper adjacent to occupied habitat is often the quickest and least expensive method to restore sagebrush habitat for sage-grouse. Under the Natural Resource Conservation Service (NRCS) Sage-Grouse Initiative (SGI), a geo-spatial analysis of potential pinyon-juniper removal is being completed for each of the Western Association of Fish & Wildlife Association (WAFWA) sage-grouse Management Zones (MZ). The range of the Gunnison sage-grouse is in MZ VII. Once the analysis is completed for MZ VII, phase I and II encroaching pinyon-juniper should be removed, starting within 6.5 km (4 mi) of occupied habitat and expanding out by 6.5 km (4 mi) as restored habitat is occupied until habitat targets are achieved for each satellite population.

Road Closures

Disturbance from roads and vehicular traffic near leks during the breeding season must be reduced and/or minimized. Road closures, seasonal timing restrictions, and proper siting of new roads should be used to eliminate or minimize disturbance. In the Piñon Mesa population, a seasonal closure and time of day restrictions for the section of MS County Road that is directly adjacent to one of the leks will remove a significant source of potential disturbance to that population.

Grazing Management Appropriate to Ecological Conditions

Overgrazing that is not appropriate for ecological conditions on the range can lead to habitat degradation. Continued enrollment of ranchers into the NRCS SGI will improve grazing management. Landowners and land managers who manage cattle on both private and public lands should be encouraged to manage across ownerships for sage-grouse conservation. The Service will consider lands already enrolled in the Candidate Conservation Agreement with Assurances, implementation of NRCS practices on private rangelands that follow Conference Opinion guidance, and lands subject to other programs that require signed commitments to manage grazing appropriate to ecological conditions when assessing the acreage being grazed in a manner appropriate to ecological conditions in a satellite population.

Prioritize Translocations

The small population size and structure of the six satellite populations of Gunnison sage-grouse raises concerns about the probability of extirpation of the satellite populations and extinction of the species due to demographic and/or environmental stochasticity. Colorado Parks & Wildlife has indicated that recent translocations have had a positive influence on the population counts seen in 2012–2013. In order to maximize the population augmentation benefits of translocation, the Colorado Parks & Wildlife Trap and Transplant Committee should revise the translocation strategy to allow for prioritization of the Piñon Mesa, Crawford, San Miguel, and Dove Creek–Monticello satellite populations. The revision should address how timing (spring and/or fall), age class (adult or yearling), gender, and quantity of transplants can increase the resilience of the Piñon Mesa, Crawford, San Miguel, and Dove Creek–Monticello satellite populations. CPW should also continue to evaluate the effectiveness of translocation strategies to maximize their effectiveness.

Protection of Targeted Occupied Habitat

The Service agrees with the RCP recommendation that 90 percent of habitats currently occupied, or that become occupied through future expansion should be protected through a combination of voluntary agreements, land use planning, conservation easements, fee-title acquisition, or land trades. We would consider a variety of conservation efforts as providing protection of occupied habitat. For example:

<u>BLM Lands with an RMP that protects Gunnison sage-grouse</u>

BLM lands that will be managed under the new range-wide Resource Management Plan (RMP) amendment for Gunnison sage-grouse with sufficient protections can be considered as providing habitat protection.

Candidate Conservation Agreement with Assurances (CCAA)

Private lands already enrolled under the Candidate Conservation Agreement for Gunnison sage-grouse that is administered by Colorado Parks & Wildlife will be considered as providing habitat protection.

Enrollment in the Sage-Grouse Initiative (SGI)

Private lands managed under Conservation Plans that follow the guidance of the Natural Resource Conservation Service's Sage-Grouse Initiative (SGI) will be considered as providing habitat protection.

Enrollment in the Conservation Reserve Program (CRP)

The Service will consider private lands enrolled in the Farm Service Agency's Conservation Reserve Program (CRP) within the Dove Creek–Monticello satellite population as providing habitat protection based on its assessment of the quality of habitat provided by CRP practices.

The CRP State Acres for Wildlife Enhancement (SAFE) program allows continuous sign-up and is designed to address State and regional high-priority wildlife objectives. Producers within a SAFE area can submit offers to voluntarily enroll acres in CRP contracts for 10–15 years. In exchange, producers receive annual CRP rental payments, incentives, and cost-share assistance to establish, improve, connect, or create higher quality habitat. In Colorado, the goal of the Colorado Western Slope Grouse CRP SAFE project is to restore and enhance habitat for the Columbian sharp-tailed grouse, greater sage-grouse, and Gunnison sage-grouse. The project seeks to enroll 12,600 acres in CRP.

Enrollment in CRP is limited by FSA to 25 percent of cropland in a county, unless a waiver is granted. The enrollment caps for the Dove Creek–Monticello satellite population counties are: San Juan County, Utah 33,550 acres; Dolores County, Colorado, 22,152 acres; and San Miguel County, Colorado, 5,404 acres.

Current enrollment in San Juan County is 33,654 acres. Three additions could be made in San Juan County, Utah, to increase the Gunnison sage-grouse conservation value of the CRP program: (1) The addition of a CRP SAFE program targeting Gunnison sage-grouse would make continuous signup available and could also provide additional incentives for landowners; (2) A waiver to exceed the 25 percent cropland limit to allow increased CRP enrollment and incentive to create Gunnison sage-grouse habitat; and (3) The addition of sagebrush and more forbs to the CRP seed mix would improve Gunnison sage-grouse habitat more quickly than relying on natural reestablishment.

In Dolores County, Colorado, 6,431 acres of occupied habitat and 10,869 acres of potentially suitable habitat are currently enrolled in CRP. In San Miguel County, Colorado, 303 acres of occupied habitat and 4,742 acres of potentially suitable habitat are currently enrolled in CRP. The 2005 RCP identified the lack of sagebrush as an issue and recommends that CRP target establishment of 5,000 acres of sagebrush within 3 miles of leks in Utah and 3,000 acres of sagebrush within 6.5 km (4 mi) of leks in Colorado.

Protection under Conservation Easements

Conservation easements with provisions that protect Gunnison sage-grouse habitat will be considered as providing habitat protection on private lands. The Service recommends that efforts to increase acreage under conservation easements first prioritize areas closest to active leks.

In San Miguel County and Montrose County, new conservation easements should focus on the Miramonte Basin, Iron Mesa, and Gurley Basin.

In the Dove Creek–Monticello population, the majority of occupied habitat is privately owned (87 percent in Dove Creek; 95 percent in Monticello). Conservation easements in the Dove Creek–Monticello population should prioritize landowners participating in the Conservation Reserve Program (CRP), if the habitat is recognized as already providing a high conservation value for the population.

Targeted opportunities under the NRCS Agricultural Conservation Easement Program (ACEP) could play a major role in restoring sagebrush and understory grasses and forbs to provide the protection levels needed for the population persistence.

Summary

An updated conservation strategy for the Gunnison sage-grouse should reflect the complexity of the species' biology, the distribution of the species across the landscape, and the diverse stakeholders who are critical to success. The Service will assess not only population and habitat status and trends, but also the degree to which current and projected threats are addressed when determining the confidence in the long-term conservation of Gunnison sage-grouse. The status and trend of the total population size of Gunnison sage-grouse as well as the status and trend of the Gunnison Basin and satellite populations influence confidence in the resilience and redundancy evaluation. The Service also needs to know that sage-grouse habitat for the satellite populations are of sufficient quality and quantity to support populations with a high likelihood of persistence. Sufficient habitat quality and quantity combined with resilient population levels could provide confidence that the relative extinction risk in the future for the satellite populations is sufficiently low. Finally, an assessment of habitat quality and quantity for all the populations will highlight potential limiting habitat factors and target conservation to efforts that should yield the highest and most expedient impact on Gunnison sage-grouse populations.

Required Determinations

National Environmental Policy Act (42 U.S.C. 4321 et seq.)

We have determined that environmental assessments and environmental impact statements, as defined under the authority of the National Environmental Policy Act (NEPA; 42 U.S.C. 4321 *et seq.*), need not be prepared in connection with listing a species as an endangered or threatened species under the Endangered Species Act. We published a notice outlining our reasons for this determination in the **Federal Register** on October 25, 1983 (48 FR 49244).

Government-to-Government Relationship with Tribes

In accordance with the President's memorandum of April 29, 1994 (Government-to-Government Relations with Native American Tribal Governments; 59 FR 22951), Executive Order 13175 (Consultation and Coordination With Indian Tribal Governments), and the Department of the Interior's manual at 512 DM 2, we readily acknowledge our responsibility to communicate meaningfully with recognized Federal Tribes on a government-to-government basis. In accordance with Secretarial Order 3206 of June 5, 1997 (American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act), we readily acknowledge our responsibilities to work directly with tribes in developing programs for healthy ecosystems, to acknowledge that tribal lands are not subject to the same controls as Federal public lands, to remain sensitive to Indian culture, and to make information available to tribes.

The Service consulted with the Ute Mountain Ute Tribe (Tribe) on March 26, 2014, regarding the proposed listing of Gunnison sage-grouse and proposed critical habitat designation, and potential impacts to Tribal activities on Pinecrest Ranch (USFWS 2014d, entire). Owned by the Tribe under restricted fee status, Pinecrest Ranch includes 18,749 ac of land in the Gunnison Basin population area west of Gunnison, Colorado, including approximately 12,000 ac of occupied habitat for Gunnison sage-grouse. The consultation was focused primarily on potential exemptions from take of Gunnison sage-grouse on the ranch and exclusion of the ranch from critical habitat designation. In consideration of the information provided by the Tribe and Tribal conservation efforts for Gunnison sage-grouse (see discussion in Factor D), the Service is excluding the ranch from the critical habitat designation (published elsewhere in today's **Federal Register**).

References Cited

A complete list of references cited in this rulemaking is available on the Internet at *http://www.regulations.gov* and upon request from the Western Colorado Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Authors

The primary authors of this package are the staff members of the Western Colorado Field Office.

List of Subjects in 50 CFR Part 17

Endangered and threatened species, Exports, Imports, Reporting and recordkeeping requirements, Transportation.

Final Regulation Promulgation

Accordingly, we amend part 17, subchapter B of chapter I, title 50 of the Code of Federal Regulations, as follows:

PART 17—[AMENDED]

1. The authority citation for part 17 continues to read as follows:

Authority: 16 U.S.C. 1361–1407; 1531–1544; 4201–4245; unless otherwise noted.

2. Amend § 17.11(h) by adding an entry for "Sage-grouse, Gunnison" to the List of Endangered and Threatened Wildlife in alphabetical order under "Birds" to read as follows:

§ 17.11 Endangered and threatened wildlife.

* * * * *

(h) * * *

Species		Historic range	Vertebrate population where endangered or threatened	Status	When listed	Critical habitat	Special rules
Common name	Scientific name						
* * * * * * *							
Birds							
* * * * * * *							
Sage-grouse, Gunnison	*Centrocercus minimus*	U.S.A. (AZ, CO, NM, UT)	Entire	T	854	17.95(b)	NA
* * * * * * *							

*   *   *   *   *

Dated: November 7, 2014.

Daniel M. Ashe,

Director, U.S. Fish and Wildlife Service.

Billing Code 4310–55–P

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